RCA Electron Tube Handbook HB-3

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Safety Precautions (I) For Receiving Tubes

High voltage rectifier and shunt regulator receiving tubes operate at potentials which may result in the production of X-Radiation.

Precautions must be exercised during the servicing of equipment employing these devices to assure that the high voltage is adjusted to the recommended value and that any shielding components are replaced to their intended positions before the equipment is operated.

NOTE: For additional Safety Precautions, refer to sheet *Safety Precautions (II) For Receiving Tubes* which follows.

Safety Precautions (II) For Receiving Tubes

SHOCK HAZARD WARNING

Most electron tubes present a shock hazard in use because of the voltages at which they operate. This hazard applies to all applications and is not restricted to high-voltage circuits. Therefore, precautions should be taken when servicing equipment in which electron tubes are used.

Some electron tubes such as high-voltage rectifiers and shunt regulators operate with very high electrode voltages. Extreme care should be taken during testing or adjustment of circuits in which such tubes are employed. Precautions must be exercised during the replacement or servicing of these tubes in equipment to assure that the high-voltage output terminal is properly grounded while inserting or removing the tube from its socket or while connecting or disconnecting the top cap connector. The tube and its associated apparatus, especially all parts which may be at high-potential with respect to ground,should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel cannot possibly come in contact with any high-potential point in the electrical system.

It should be noted that high voltages may appear at normally low-potentials points in the circuit as a result of capacitor breakdown or incorrect circuit connections. Therefore, before any part of the circuit is touched, the power supply switch should be turned off and both terminals of any capacitor should be grounded.

X-RADIATION WARNING

High-voltage rectifier and shunt regulator receiving tubes operate at potentials which may result in the production of X-Radiation. Types covered in the HB-3 Handbook which fall into these categories and which have EIA published values for X-Radiation are tested for an X-Radiation characteristic as specified in their published data.

X-Radiation is measured in accordance with JEDEC Publication No. 67 A, "Recommended Practice for Measurement of X-Radiation from Receiving Tubes", and controlled in accordance with JEDEC Publications No. 73 A, "Recommended Practice for Quality Control of X-Radiation from High Voltage Rectifier and Shunt Regulator Receiving Tubes". These publications are available from the Electronic Industries Association, 2001 Eye St. N. W., Washington, D. C. 20006.

Safety Precautions (II) For Receiving Tubes

Operation of these devices above the design-maximum values indicated in their Maximum Ratings may result in either temporary or permanent changes in the X-Radiation characteristic of the tube. Equipment design must be such that these absolute values are not exceeded.

The high voltages associated with these devices result in production of X-Radiation which may constitute a health hazard on prolonged exposure at close range unless the tube is adequately shielded. Equipment design must provide for this shielding.

Precautions must be exercised during the servicing of equipment employing these devices to assure that the high-voltage is adjusted to the recommended value and that any shielding components are replaced to their intended positions before the equipment is operated.

THE EQUIPMENT MANUFACTURER SHOULD PROVIDE A WARNING LABEL IN AN APPROPRIATE POSITION ON THE EQUIPMENT TO ADVISE THE SERVICEMAN OF ALL PRECAUTIONS HEREIN.

DIODE CONSIDERATIONS
DIODE-TRIODE AND DIODE-PENTODE TUBES

Certain multi-unit tubes contain one or more diode plates, each having its own base pin, in addition to a triode or pentode unit. Such types may employ either a unipotential cathode or a filamentary cathode.

In unipotential-cathode tubes the cathode is common to the triode or pentode unit and the diode(s). In filamentary-cathode tubes the filament is likewise common to the triode or pentode unit and the diode(s). However, in filament types, diode operation is affected by the position of the diode plate(s) with respect to the filament, and, therefore, the position of the diode plate(s) is specified on the individual tube data sheets.

The rectifying action of the diode is commonly used for the following purposes:

Detection: Detection may be accomplished by using either a half-wave or full-wave circuit arrangement to supply signal voltage to the triode or pentode unit of the tube or to another amplifier tube. The half-wave circuit will provide approximately twice the rectified voltage obtainable from a full-wave circuit for the same applied signal voltage. Since the amplitude variation of the envelope of the rectified voltage is usually of greater importance than rectifier power, the half-wave circuit is more commonly used in practice.

AVC: Regulation of amplifier gain, generally called Automatic Volume Control, may be accomplished by using the output of a diode rectifier in a number of ways. The diode output may be applied to the control grids of the preceding amplifier tubes, or it may be applied, in the case of rf pentodes, to their suppressors, plates and/or screens.

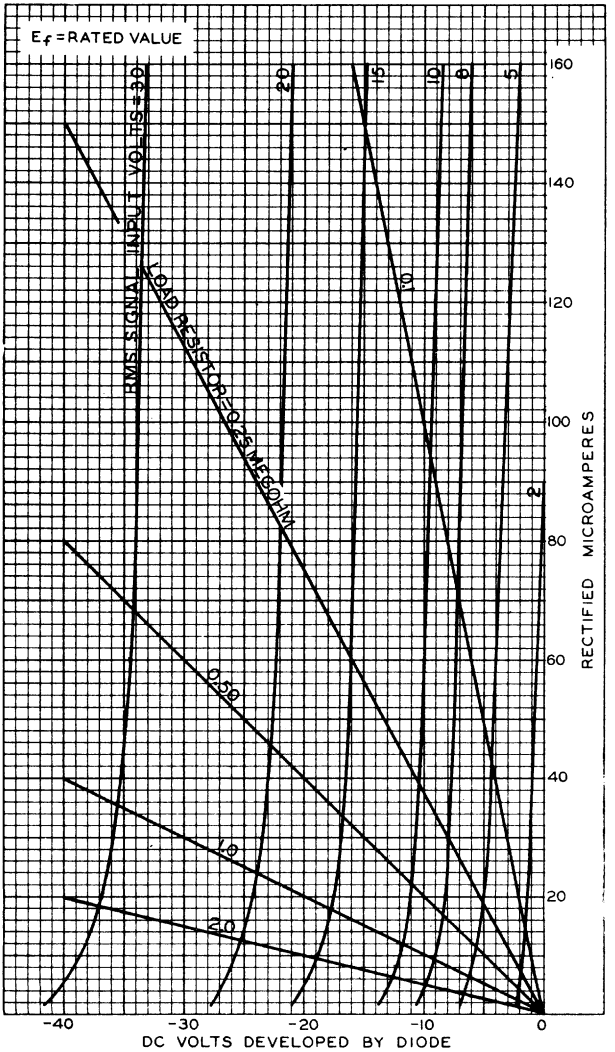
The above functions can be performed simultaneously by using a single diode, two diodes in parallel, or by two diodes operating independently. A number of typical circuit arrangements are shown on the following pages.

Average Characteristic Curves for diodes in diode-triode and diode-pentode tubes are shown on the next page.

AVERAGE DIODE CHARACTERISTICS

HALF-WAVE RECTIFICATION-SINGLE DIODE UNIT

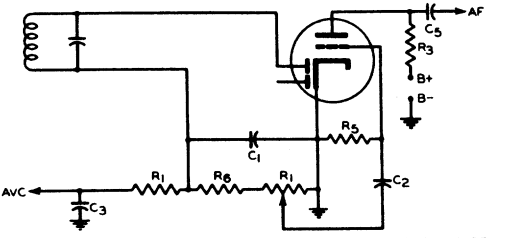
SEE PRECEDING PAGE



DIODE CONSIDERATIONS

TYPICAL DIODE-TRIODE CIRCUITS

HALF-WAVE DETECTOR, AVC, ZERO-BIAS AMPLIFIER



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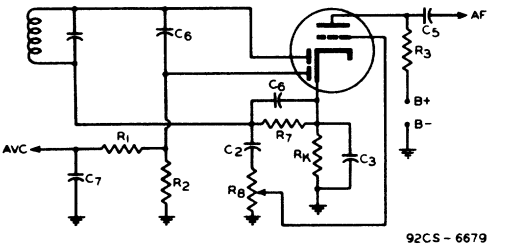
HALF-WAVE DETECTOR AND DELAYED AVC, CATHODE-BIAS AMPLIFIER



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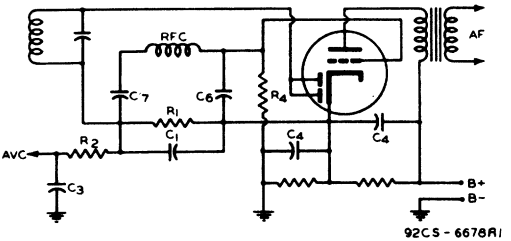
HALF-WAVE DETECTOR, AVC, FIXED-BIAS AMPLIFIER



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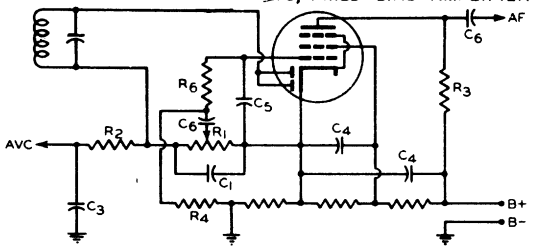
TYPICAL VALUES

C1: 150 μμf for 450-1600 kc
C2: 0.01 μf
C3: 0.1 μf
C4: 0.5 μf or larger
C5: 0.01 to 0.1 μf or larger
C6: 100 μμf
C7: 0.01 to 0.05 μf
R1: 0.5 Megohm
R2: 1.0 Megohm
R3: 0.1 Megohm
R4: 0.05 to 1.0 Megohm
R5: 10 Megohms
R6: 22000 Ohms
R7: 0.25 Megohm
R8: 1 to 2 Megohm

DIODE CONSIDERATIONS

TYPICAL DIODE-PENTODE CIRCUITS

HALF-WAVE DETECTOR AND AVC, FIXED-BIAS AMPLIFIER



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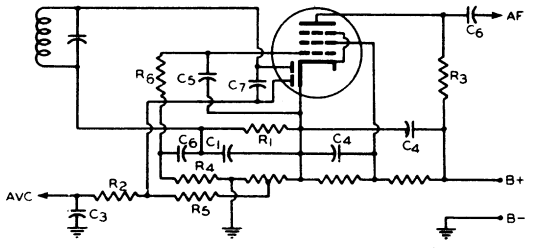
HALF-WAVE DETECTOR, SEPARATE AVC, FIXED-BIAS AMPLIFIER



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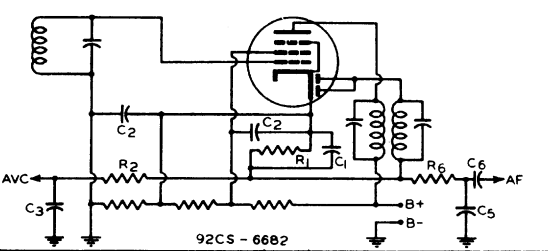
HALF-WAVE DETECTOR, AVC, FIXED-BIAS H-F AMPLIFIER



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TYPICAL VALUES

C1: 150 μμf for 450-1600 kc
C2, C3: 0.1 μf
C4: 0.5 μf or larger
C5: 100 μμf or smaller
C6: 0.01 to 0.1 μf
C7: 500 to 1000 μμf

R1: 0.5 to 1.0 Megohm
R2: 1.0 to 1.5 Megohms
R3: 0.1 to 0.2 Megohm
R4: 0.5 to 1.0 Megohm
R5: 1.0 Megohm
R6: 0.1 to 0.2 Megohm

Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.

KEY TO RESISTANCE-COUPLED AMPLIFIER CHARTS

Note: Chart number references, listed below, supersede those which may appear on individual tube data sheets for these types.

Tube Type	Chart No.	Tube Type	Chart No.	Tube Type	Chart No.	Tube Type	Chart No.	Tube Type	Chart No.
3AU6....	2	5BK7A...	10	6BZ7.....	10	6T8A.....	5	12AX7A.....	9
3AV6....	9	5BQ7A...	10	6C4.....	3	7AU7.....	3	12AY7.....	1
3BC5....	11	5T8.....	5	6CB6.....	11	8CG7.....	8	12SL7GT....	5
3CB6....	11	6AB4....	4	6CB6A.....	11	8CN7.....	5	12SN7GTA...	8
3CF6....	11	6AG5....	11	6CF6.....	11	8FQ7.....	8	19T8.....	5
4AU6....	2	6AT6....	5	6CG7.....	8	9AU7.....	3	20EZ7.....	9
4AV6....	9	6AU6A...	2	6CN7.....	5	12AT6....	5	5879▲.....	6
4BC5....	11	6AV6....	9	6EU7.....	9	12AT7....	4	5879*.....	7
4BQ7A...	10	6BC5....	11	6FQ7.....	8	12AU6....	2	7025.....	9
4BZ7....	10	6BK7B...	10	6SL7GT....	5	12AU7A...	3	7199▲.....	12
4CB6....	11	6BQ7A...	10	6SN7GTB...	8	12AV6....	9	7199*.....	13

▲ Pentode Unit

* Triode Unit or Triode Connection

SYMBOLS USED IN RESISTANCE-COUPLED AMPLIFIER CHARTS

C = Blocking Capacitor (μf).

C_k = Cathode Bypass Capacitor (μf).

C_{g2} = Screen-Grid Bypass Capacitor (μf).

E_{bb} = Plate-Supply Voltage. Voltage at plate equals plate-supply voltage minus drop in R_p and R_k.

R_k = Cathode Resistor (ohms).

R_{g2} = Screen-Grid Resistor (megohms).

R_g = Grid Resistor (megohms) for following stage.

R_p = Plate Resistor (megohms).

V.G. = Voltage Gain.

E_o = Output Voltage (peak volts). This voltage is obtained across R_g (for following stage) at any frequency within the flat region of the output vs. frequency curve, and is for the condition where the signal level is adequate to swing the grid of the resistance-coupled amplifier tube to the point where its grid starts to draw current.

Note: The listed values for E_o are the peak output voltages available when the grid is driven from a low-impedance source. The listed values for the cathode resistors are optimum for any signal source. With a high-impedance source, protection against severe distortion and loss of gain due to input loading may be obtained by the use of a coupling capacitor connected directly to the input grid and a high-value resistor connected between the grid and ground.

Resistance-Coupled Amplifiers

CIRCUIT ADVANTAGES

For most of the types shown, the data pertain to operation with cathode bias; for all of the pentodes, the data pertain to operation with series screen-grid resistor. The use of a cathode-bias resistor where feasible and a series screen-grid resistor where applicable offers several advantages over fixed-voltage operation.

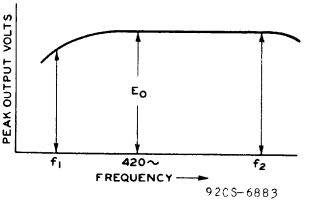
The advantages are: (1) effects of possible tube differences are minimized; (2) operation over a wide range of plate-supply voltages without appreciable change in gain is feasible; (3) the low frequency at which the amplifier cuts off is easily changed; and (4) tendency toward motorboating is minimized.

NUMBER OF STAGES

These advantages can be enhanced by the addition of suitable decoupling filters in the plate supply of each stage of a multi-stage amplifier. With proper filters, three or more amplifier stages can be operated from a single power-supply unit of conventional design without encountering any difficulties due to coupling through the power unit. When decoupling filters are not used, not more than two stages should be operated from a single power-supply unit.

GENERAL CIRCUIT CONSIDERATIONS

In the discussions which follow, the frequency (f_2) is that value at which the high-frequency response begins to fall off. The frequency (f_1) is that value at which the low-frequency response drops below a satisfactory value, as discussed below. A variation of 10 per cent in values of resistors and capacitors has only slight effect on performance. One-half-watt resistors are usually suitable for R_{g2}, R_g, and R_k resistors. Capacitors C and C_{g2} should have a working voltage equal to or greater than E_{bb}. Capacitor C_k may have a low working voltage in the order of 10 to 25 volts.



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Resistance-Coupled Amplifiers

Triode Amplifier *(Heater-Cathode Type)*

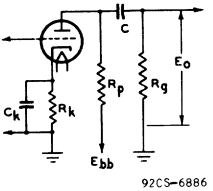

Diagram No.1

Capacitors C and C_k have been chosen to give an output voltage equal to 0.8 E_o for a frequency (f_1) of 100 cycles. For any other values of (f_1), multiply values of C and C_k by $100/f_1$. In the case of capacitor C_k, the values shown in the charts are for an amplifier with dc heater excitation; when ac is used, depending on the character of the associated circuit, the gain, and the value of f_1, it may be necessary to increase the value of C_k to minimize hum disturbances. It may be desirable to operate the heater at a positive voltage of from 15 to 40 volts with respect to the cathode. The voltage output at f_1, or "n" like stage equals $(0.8)^n E_o$ where E_o is peak output voltage of final stage. For an amplifier of typical construction, the value of f_2 is well above the audio-frequency range for any value of R_p.

Pentode Amplifier *(Heater-Cathode Type)*

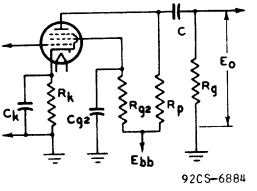

Diagram No.2

Capacitors C, C_k, and C_{g2} have been chosen to give an output voltage equal to 0.7 E_o for a frequency (f_1) of 100 cycles. For any other value of f_1, multiply values of C, C_k, and C_{g2} by $100/f_1$. In the case of capacitor C_k, the values shown in the charts are for an amplifier with dc heater excitation; when ac is used, depending on the character of the associated circuits, the voltage gain, and the value of f_1, it may be necessary to increase the value of C_k to minimize hum disturbances. It may be desirable to operate the heater at a positive voltage of from 15 to 40 volts with respect to the cathode. The voltage output at f_1 for "n" like stages equals $(0.7)^n E_o$ where E_o is the peak output voltage of final stage. For an amplifier of typical construction, and for R_p values of 0.1, 0.25, and 0.5 megohm, approximate values of f_2 are 20000, 10000, and 5000 cps, respectively.

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RESISTANCE-COUPLED AMPLIFIER CHARTS

(1) 12AY7•

See *Circuit Diagram 1*

E_{bb}	R_p	R_g	R_{g2}	R_k	C_{g2}	C_k	C	E_o*	V.G.
90	0.1	0.24	—	1800	—	—	—	13	24
	0.24	0.51	—	3700	—	—	—	14	26
	0.51	1.0	—	7800	—	—	—	16	27
180	0.1	0.24	—	1300	—	—	—	31	27
	0.24	0.51	—	2800	—	—	—	33	29
	0.51	1.0	—	5700	—	—	—	33	30
300	0.1	0.24	—	1200	—	—	—	58	28
	0.24	0.51	—	2300	—	—	—	30	30
	0.51	1.0	—	4800	—	—	—	56	31

(2) 3AU6, 4AU6, 6AU6A, 12AU6

See *Circuit Diagram 2*

E_{bb}	R_p	R_g	R_{g2}	R_k	C_{g2}	C_k	C	E_o*	V.G.
90	0.22	0.22	0.340	2700	0.057	5.8	0.0081	16	79
	0.22	0.47	0.370	2900	0.050	5.4	0.0055	22	104
	0.22	1.0	0.380	3100	0.050	5.3	0.0034	25	125
	0.47	0.47	1.00	6000	0.027	2.8	0.0042	13	105
	0.47	1.0	1.00	6200	0.023	2.7	0.0027	17	137
	0.47	2.2	1.00	6300	0.027	2.8	0.0019	25	161
	1.0	1.0	1.90	10800	0.017	1.7	0.0025	10	139
	1.0	2.2	2.40	13100	0.017	1.7	0.0017	19	184
180	0.22	0.22	0.520	1340	0.059	8.8	0.0081	31	143
	0.22	0.47	0.520	1390	0.059	8.7	0.0053	43	192
	0.22	1.0	0.520	1420	0.059	8.6	0.0032	48	223
	0.47	0.47	1.05	2700	0.039	5.5	0.0041	34	189
	0.47	1.0	1.15	2880	0.037	5.4	0.0027	43	249
	0.47	2.2	1.20	2960	0.036	5.4	0.0019	50	294
	1.0	1.0	2.40	5500	0.028	3.2	0.0023	33	230
	1.0	2.2	2.70	6000	0.022	2.8	0.0015	40	323
300	0.22	0.22	0.530	780	0.077	13.2	0.0082	53	200
	0.22	0.47	0.540	783	0.077	13.2	0.0053	65	270
	0.22	1.0	0.540	800	0.077	13.1	0.0033	74	316
	0.47	0.47	1.15	1590	0.057	8.4	0.0045	56	275
	0.47	1.0	1.22	1650	0.049	7.4	0.0027	72	357
	0.47	2.2	1.31	1720	0.045	7.2	0.0017	82	418
	1.0	1.0	2.50	3300	0.036	5.3	0.0022	57	352
	1.0	2.2	2.80	3500	0.031	4.2	0.0015	72	466

• One triode unit. * Peak volts.
▲ Coupling capacitors should be selected to give desired frequency response. Cathode resistors should be adequately bypassed.

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RESISTANCE-COUPLED AMPLIFIER CHARTS

(3)

6C4, 7AU7,• 9AU7,• 12AU7A•

See *Circuit Diagram 1*

E_{bb}	R_p	R_g	R_{g2}	R_k	C_{g2}	C_k	C	E_o*	V.G.
	0.047	0.047	—	1600	—	3.2	0.061	9	10
	0.047	0.1	—	1800	—	2.5	0.033	11	11
	0.047	0.22	—	2000	—	2.0	0.015	14	11
	0.1	0.1	—	3000	—	1.6	0.032	10	11
90	0.1	0.22	—	3800	—	1.1	0.015	15	11
	0.1	0.47	—	4500	—	1.0	0.007	18	11
	0.22	0.22	—	6800	—	0.7	0.015	14	11
	0.22	0.47	—	9500	—	0.5	0.0065	20	11
	0.22	1.0	—	11500	—	0.43	0.0035	24	11
	0.047	0.047	—	920	—	3.9	0.062	20	11
	0.047	0.1	—	1200	—	2.9	0.037	26	12
	0.047	0.22	—	1400	—	2.5	0.016	29	12
	0.1	0.1	—	2000	—	1.9	0.032	24	12
180	0.1	0.22	—	2800	—	1.4	0.016	33	12
	0.1	0.47	—	3600	—	1.1	0.007	40	12
	0.22	0.22	—	5300	—	0.8	0.015	31	12
	0.22	0.47	—	8300	—	0.56	0.007	44	12
	0.22	1.0	—	10000	—	0.48	0.0035	54	12
	0.047	0.047	—	870	—	4.1	0.065	38	12
	0.047	0.1	—	1200	—	3.0	0.034	52	12
	0.047	0.22	—	1500	—	2.4	0.016	68	12
	0.1	0.1	—	1900	—	1.9	0.032	44	12
300	0.1	0.22	—	3000	—	1.3	0.016	68	12
	0.1	0.47	—	4000	—	1.1	0.007	80	12
	0.22	0.22	—	5300	—	0.9	0.015	57	12
	0.22	0.47	—	8800	—	0.52	0.007	82	12
	0.22	1.0	—	11000	—	0.46	0.0035	92	12

• One triode unit. * Peak volts.

RESISTANCE-COUPLED AMPLIFIER CHARTS

(4)

6AB4, 12AT7 •

See *Circuit Diagram 1*

E_{bb}	R_p	R_g	R_{g2}	R_k	C_{g2}	C_k	C	E_o*	V.G.
90	0.1	0.1	—	2680	—	2.4	0.026	8	24
	0.1	0.22	—	3060	—	2.00	0.014	11	25
	0.1	0.47	—	3390	—	1.84	0.0074	13	28
	0.22	0.22	—	5500	—	1.33	0.0136	10	25
	0.22	0.47	—	6300	—	1.01	0.0067	14	28
	0.22	1.0	—	6930	—	0.92	0.0038	15	28
	0.47	0.47	—	10900	—	0.63	0.007	13	26
	0.47	1.0	—	12500	—	0.52	0.0043	14	28
	0.47	2.2	—	13500	—	0.47	0.0031	18	28
180	0.1	0.1	—	1407	—	3.6	0.029	20	31
	0.1	0.22	—	1674	—	3.0	0.016	28	33
	0.1	0.47	—	1786	—	2.6	0.0083	31	34
	0.22	0.22	—	2890	—	1.75	0.0140	24	33
	0.22	0.47	—	3860	—	1.34	0.0077	35	33
	0.22	1.0	—	4660	—	1.14	0.0047	42	33
	0.47	0.47	—	6960	—	0.83	0.0075	31	31
	0.47	1.0	—	8450	—	0.67	0.0046	39	32
	0.47	2.2	—	9600	—	0.55	0.0032	45	32
300	0.1	0.1	—	974	—	4.0	0.028	37	34
	0.1	0.22	—	1404	—	3.1	0.015	57	34
	0.1	0.47	—	2169	—	2.5	0.0083	78	33
	0.22	0.22	—	2510	—	1.9	0.015	50	33
	0.22	0.47	—	4200	—	1.3	0.0074	78	33
	0.22	1.0	—	4950	—	1.1	0.0046	85	32
	0.47	0.47	—	5700	—	0.90	0.0076	57	33
	0.47	1.0	—	8720	—	0.62	0.0041	81	32
	0.47	2.2	—	9700	—	0.57	0.0030	88	32

• One triode unit. * Peak volts.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

RESISTANCE-COUPLED AMPLIFIER CHARTS

(5)

5T8, 6AT6, 6CN7, 6SL7GT,• 6T8A, 8CN7, 12AT6, 12SL7GT,• 19T8

See *Circuit Diagram 1*

E_{bb}	R_p	R_g	R_{g2}	R_k	C_{g2}	C_k	C	E_o*	V.G.
	0.1	0.1	—	4200	—	2.5	0.025	5.4	22
	0.1	0.22	—	4600	—	2.2	0.014	7.5	27
	0.1	0.47	—	4800	—	2.0	0.0065	9.1	30
	0.22	0.22	—	7000	—	1.5	0.013	7.3	30
90	0.22	0.47	—	7800	—	1.3	0.007	10	34
	0.22	1.0	—	8100	—	1.1	0.0035	12	37
	0.47	0.47	—	12000	—	0.83	0.006	10	36
	0.47	1.0	—	14000	—	0.7	0.0035	14	39
	0.47	2.2	—	15000	—	0.6	0.002	16	41
	0.1	0.1	—	1900	—	3.6	0.027	19	30
	0.1	0.22	—	2200	—	3.1	0.014	25	35
	0.1	0.47	—	2500	—	2.8	0.0065	32	37
	0.22	0.22	—	3400	—	2.2	0.014	24	38
180	0.22	0.47	—	4100	—	1.7	0,0065	34	42
	0.22	1.0	—	4600	—	1.5	0.0035	38	44
	0.47	0.47	—	6600	—	1.1	0.0065	29	44
	0.47	1.0	—	8100	—	0.9	0.0035	38	46
	0.47	2.2	—	9100	—	0.8	0.002	43	47
	0.1	0.1	—	1500	—	4.4	0.027	40	34
	0.1	0.22	—	1800	—	3.6	0.014	54	38
	0.1	0.47	—	2100	—	3.0	0.0065	63	41
	0.22	0.22	—	2600	—	2.5	0.013	51	42
300	0.22	0.47	—	3200	—	1.9	0.0065	65	46
	0.22	0.1	—	3700	—	1.6	0.0035	77	48
	0.47	0.47	—	5200	—	1.2	0.006	61	48
	0.47	1.0	—	6300	—	1.0	0.0035	74	50
	0.47	2.2	—	7200	—	0.9	0.002	85	51

• One triode unit. * Peak volts.

RESISTANCE-COUPLED AMPLIFIER CHARTS

6

As Pentode: 5879

See *Circuit Diagram 2*

E_{bb}	R_p	R_g	R_{g2}	R_k	C_{g2}	C_k	C	E_o*	V.G.
90	0.1	0.1	0.35	1700	0.044	4.6	0.020	13	29
	0.1	0.22	0.35	1700	0.046	4.5	0.012	17	39
	0.1	0.47	0.35	1700	0.047	4.4	0.006	20	47
	0.22	0.22	0.80	3000	0.034	3.2	0.010	15	43
	0.22	0.47	0.80	3000	0.035	3.1	0.005	21	59
	0.22	1.0	0.80	3000	0.036	3.0	0.003	24	67
	0.47	0.47	1.9	7000	0.021	1.8	0.005	21	59
	0.47	1.0	1.9	7000	0.022	1.7	0.003	25	75
	0.47	2.2	1.9	7000	0.023	1.7	0.002	28	87
180	0.1	0.1	0.35	700	0.060	7.4	0.020	24	39
	0.1	0.22	0.35	700	0.062	7.3	0.012	28	56
	0.1	0.47	0.35	700	0.064	7.2	0.006	33	65
	0.22	0.22	0.80	1200	0.045	5.5	0.010	24	65
	0.22	0.47	0.80	1200	0.046	5.3	0.005	31	87
	0.22	1.0	0.80	1200	0.048	5.2	0.003	34	101
	0.47	0.47	1.9	2500	0.033	3.5	0.005	27	98
	0.47	1.0	1.9	2500	0.034	3.4	0.003	32	122
	0.47	2.2	1.9	2500	0.035	3.3	0.002	37	140
300	0.1	0.1	0.35	300	0.075	10.8	0.020	25	51
	0.1	0.22	0.35	300	0.077	10.6	0.012	32	68
	0.1	0.47	0.35	300	0.080	10.5	0.006	35	83
	0.22	0.22	0.80	600	0.056	7.9	0.010	28	81
	0.22	0.47	0.80	600	0.057	7.5	0.005	37	109
	0.22	1.0	0.80	600	0.058	7.4	0.003	41	123
	0.47	0.47	1.3	1200	0.044	5.3	0.005	34	125
	0.47	1.0	1.3	1200	0.046	5.2	0.003	42	152
	0.47	2.2	1.3	1200	0.047	5.1	0.002	48	174

* Peak volts.

RESISTANCE-COUPLED AMPLIFIER CHARTS

(7)

As Triode: 5879

See *Circuit Diagram 1*

E_{bb}	R_p	R_g	R_{g2}	R_k	C_{g2}	C_k	C	E_o*	V.G.
	0.047	0.047	—	1800	—	2.9	0.060	9	10
	0.047	0.1	—	2100	—	2.4	0.033	12	11
	0.047	0.22	—	2200	—	2.3	0.016	14	21
	0.1	0.1	—	3200	—	1.8	0.027	10	12
90	0.1	0.22	—	3900	—	1.3	0.015	13	13
	0.1	0.47	—	4300	—	1.0	0.007	16	13
	0.22	0.22	—	6200	—	0.87	0.015	12	13
	0.22	0.47	—	8100	—	0.53	0.006	16	13
	0.22	1.00	—	9000	—	0.49	0.003	19	14
	0.047	0.047	—	1200	—	3.5	0.063	21	12
	0.047	0.1	—	1600	—	2.6	0.033	29	13
	0.047	0.22	—	1800	—	2.4	0.016	35	13
	0.1	0.1	—	2200	—	1.9	0.031	26	13
180	0.1	0.22	—	2900	—	1.35	0.015	33	14
	0.1	0.47	—	3400	—	1.1	0.007	40	14
	0.22	0.22	—	4500	—	0.92	0.015	28	14
	0.22	0.47	—	6400	—	0.61	0.006	39	14
	0.22	1.00	—	8200	—	0.52	0.003	47	14
	0.047	0.047	—	1100	—	3.9	0.063	42	13
	0.047	0.1	—	1500	—	2.8	0.033	65	13
	0.047	0.22	—	1700	—	2.5	0.016	71	14
	0.1	0.1	—	2000	—	2.1	0.032	45	15
300	0.1	0.22	—	3400	—	1.4	0.015	74	15
	0.1	0.47	—	3700	—	1.1	0.007	83	15
	0.1	0.22	—	4300	—	0.97	0.015	50	15
	0.22	0.47	—	7200	—	0.63	0.007	88	15
	0.22	1.00	—	7400	—	0.63	0.003	94	15

* Peak volts.

RESISTANCE-COUPLED AMPLIFIER CHARTS

8

6CG7,• 6FQ7,• 6SN7GTB,• 8CG7,• 8FQ7,• 12SN7GTA•

See *Circuit Diagram 1*

E_{bb}	R_p	R_g	R_{g2}	R_k	C_{g2}	C_k	C	E_o*	V.G.
	0.047	0.047	—	1870	—	3.1	0.063	14	13
	0.047	0.1	—	2230	—	2.5	0.031	18	14
	0.047	0.22	—	2500	—	2.1	0.016	20	14
	0.1	0.1	—	3370	—	1.8	0.034	15	14
90	0.1	0.22	—	4100	—	1.3	0.015	20	14
	0.1	0.47	—	4800	—	1.1	0.006	23	15
	0.22	0.22	—	7000	—	0.80	0.013	16	14
	0.22	0.47	—	9100	—	0.65	0.007	22	14
	0.22	1.00	—	10500	—	0.60	0.004	25	15
	0.047	0.047	—	1500	—	3.6	0.066	33	14
	0.047	0.1	—	1860	—	2.9	0.055	41	14
	0.047	0.22	—	2160	—	2.2	0.015	47	15
	0.1	0.1	—	2750	—	1.8	0.028	35	15
180	0.1	0.22	—	3550	—	1.4	0.015	45	15
	0.1	0.47	—	4140	—	1.3	0.007	51	16
	0.22	0.22	—	5150	—	1.0	0.016	36	16
	0.22	0.47	—	7000	—	0.71	0.007	45	16
	0.22	1.00	—	7800	—	0.61	0.004	51	16
	0.047	0.047	—	1300	—	3.6	0.061	59	14
	0.047	0.1	—	1580	—	3.0	0.032	73	15
	0.047	0.22	—	1800	—	2.5	0.015	83	16
	0.1	0.1	—	2500	—	1.9	0.031	68	16
300	0.1	0.22	—	3130	—	1.4	0.014	82	16
	0.1	0.47	—	3900	—	1.2	0.0065	96	16
	0.22	0.22	—	4800	—	0.95	0.015	68	16
	0.22	0.47	—	6500	—	0.69	0.0065	85	16
	0.22	1.00	—	7800	—	0.58	0.0035	96	16

• One triode unit. * Peak volts.

RESISTANCE-COUPLED AMPLIFIER CHARTS

(9)

3AV6, 4AV6, 6AV6, 6EU7,• 12AV6, 12AX7A,• 20EZ7,• 7025•

See *Circuit Diagram 1*

E_{bb}	R_p	R_g	R_{g2}	R_k	C_{g2}	C_k	C	E_o*	V.G.
	0.1	0.1	—	4400	—	2.7	0.023	5	29
	0.1	0.22	—	4700	—	2.4	0.013	6	35
	0.1	0.47	—	4800	—	2.3	0.007	8	41
	0.22	0.22	—	7000	—	1.6	0.012	6	39
90	0.22	0.47	—	7400	—	1.4	0.006	9	45
	0.22	1.0	—	7600	—	1.3	0.003	11	48
	0.47	0.47	—	12000	—	0.9	0.006	9	48
	0.47	1.0	—	13000	—	0.8	0.003	11	52
	0.47	2.2	—	14000	—	0.7	0.002	13	55
	0.1	0.1	—	1800	—	4.0	0.025	18	40
	0.1	0.22	—	2000	—	3.5	0.013	25	47
	0.1	0.47	—	2200	—	3.1	0.006	32	52
	0.22	0.22	—	3000	—	2.4	0.012	24	53
180	0.22	0.47	—	3500	—	2.1	0.006	34	59
	0.22	1.0	—	3900	—	1.8	0.003	39	63
	0.47	0.47	—	5800	—	1.3	0.006	30	62
	0.47	1.0	—	6700	—	1.1	0.003	39	66
	0.47	2.2	—	7400	—	1.0	0.002	45	68
	0.1	0.1	—	1300	—	4.6	0.027	43	45
	0.1	0.22	—	1500	—	4.0	0.013	57	52
	0.1	0.47	—	1700	—	3.6	0.006	66	57
	0.22	0.22	—	2200	—	3.0	0.013	54	59
300	0.22	0.47	—	2800	—	2.3	0.006	69	65
	0.22	1.0	—	3100	—	2.1	0.003	79	68
	0.47	0.47	—	4300	—	1.6	0.006	62	69
	0.47	1.0	—	5200	—	1.3	0.003	77	73
	0.47	2.2	—	5900	—	1.1	0.002	92	75

• One triode unit. * Peak volts.

RESISTANCE-COUPLED AMPLIFIER CHARTS

(10)

4BQ7A,• 4BZ7,• 5BK7A,• 5BQ7A,• 6BK7B,• 6BQ7A,• 6BZ7•

See *Circuit Diagram 1*

E_{bb}	R_p	R_g	R_{g2}	R_k	C_{g2}	C_k	C	E_o*	V.G.
	0.047	0.047	—	1580	—	4.0	0.058	9	18
	0.047	0.10	—	1760	—	3.5	0.032	13	19
	0.047	0.22	—	1820	—	3.0	0.015	16	20
	0.1	0.1	—	2920	—	2.1	0.029	12	19
90	0.1	0.22	—	3570	—	1.7	0.015	17	20
	0.1	0.47	—	4020	—	1.4	0.0075	20	20
	0.22	0.22	—	6040	—	0.98	0.0135	16	19
	0.22	0.47	—	7500	—	0.78	0.0075	21	20
	0.22	1.0	—	8800	—	0.63	0.0036	25	20
	0.047	0.047	—	694	—	6.0	0.062	25	23
	0.047	0.1	—	817	—	4.4	0.032	32	24
	0.047	0.22	—	905	—	4.0	0.0155	35	25
	0.10	0.1	—	1596	—	2.80	0.030	30	23
180	0.10	0.22	—	1630	—	2.30	0.0152	32	24
	0.10	0.47	—	1860	—	2.00	0.0073	38	24
	0.22	0.22	—	3950	—	1.24	0.0150	35	22
	0.22	0.47	—	4500	—	0.96	0.0072	41	23
	0.22	1.0	—	5530	—	0.79	0.0038	49	23
	0.047	0.047	—	438	—	6.70	0.062	38	26
	0.047	0.1	—	542	—	5.50	0.032	48	27
	0.047	0.22	—	644	—	4.30	0.016	57	27
	0.10	0.10	—	1009	—	3.5	0.031	42	25
300	0.10	0.22	—	1332	—	2.5	0.015	56	26
	0.10	0.47	—	1609	—	2.1	0.0074	64	25
	0.22	0.22	—	2623	—	1.5	0.015	50	24
	0.22	0.47	—	3900	—	1.1	0.0073	70	24
	0.22	1.0	—	4920	—	0.88	0.0039	84	24

• One triode unit. * Peak volts.

RESISTANCE-COUPLED AMPLIFIER CHARTS

(11)

3BC5, 3CB6, 3CF6, 4BC5, 4CB6, 6AG5, 6BC5, 6CB6, 6CB6A, 6CF6

See *Circuit Diagram 2*

E_{bb}	R_p	R_g	R_{g2}	R_k	C_{g2}	C_k	C	E_o*	V.G.
	0.22	0.22	0.480	3800	0.046	5.5	0.0084	10	89
	0.22	0.47	0.480	3800	0.049	5.5	0.0054	16	114
	0.22	1.0	0.500	4400	0.045	5.3	0.0034	23	128
	0.47	0.47	1.04	7200	0.033	2.9	0.0044	10	111
90	0.47	1.0	1.04	7700	0.033	2.8	0.0029	15	133
	0.47	2.2	1.10	8400	0.031	2.6	0.0020	18	152
	1.0	1.0	2.50	16000	0.018	1.4	0.0023	10	118
	1.0	2.2	2.50	18600	0.016	1.2	0.0017	11	139
	0.22	0.22	0.550	1600	0.072	9.5	0.0090	30	161
	0.22	0.47	0.620	1800	0.062	8.5	0.0053	36	208
	0.22	1.0	0.650	1900	0.062	8.5	0.0034	43	239
	0.47	0.47	1.00	3400	0.059	6.0	0.0048	34	183
180	0.47	1.0	1.00	3500	0.059	6.0	0.0031	41	229
	0.47	2.2	1.00	3800	0.059	5.8	0.0020	46	262
	1.0	1.0	2.60	7300	0.029	2.7	0.0022	33	227
	1.0	2.2	2.60	7400	0.029	2.7	0.0016	38	281
	0.22	0.22	0.600	980	0.085	13.0	0.0085	51	223
	0.22	0.47	0.680	1090	0.084	12.0	0.0055	64	288
	0.22	1.0	0.700	1150	0.081	11.0	0.0033	74	334
	0.47	0.47	1.25	2000	0.064	7.9	0.0045	52	285
300	0.47	1.0	1.34	2150	0.061	7.6	0.0029	67	363
	0.47	2.2	1.53	2350	0.057	7.1	0.0019	79	416
	1.0	1.0	2.60	4000	0.044	5.2	0.0023	51	334
	1.0	2.2	3.00	4700	0.038	4.3	0.0015	69	427

• One triode unit. * Peak volts.

RESISTANCE-COUPLED AMPLIFIER CHARTS

(12)

7199 (Pentode Unit)

See *Circuit Diagram 2*

E_{bb}	R_p	R_g	R_{g2}	R_k	C_{g2}	C_k	C	E_o*	V.G.
	0.22	0.22	0.560	3700	0.046	4.50	0.0090	12	73
	0.22	0.47	0.600	3900	0.043	4.30	0.0055	17	95
	0.22	1.0	0.640	4200	0.039	4.00	0.0033	19	109
	0.47	0.47	0.870	6000	0.036	2.70	0.0046	16	95
90	0.47	1.0	0.980	6700	0.044	3.00	0.0030	22	113
	0.47	2.2	1.00	6700	0.043	2.80	0.0020	25	131
	1.0	1.0	2.00	12200	0.021	1.44	0.0028	15	119
	1.0	2.2	2.20	12800	0.024	1.74	0.0016	21	167
	0.22	0.22	0.530	1570	0.069	7.50	0.0088	32	82
	0.22	0.47	0.600	1730	0.064	7.40	0.0064	38	164
	0.22	1.0	0.650	1820	0.061	7.30	0.0034	45	190
	0.47	0.47	1.12	3200	0.053	5.30	0.0046	35	147
180	0.47	1.0	1.40	3500	0.042	5.10	0.0028	40	209
	0.47	2.2	1.57	3740	0.040	5.40	0.0019	45	250
	1.0	1.0	2.50	6500	0.039	2.80	0.0024	34	179
	1.0	2.2	3.40	7500	0.026	2.30	0.0015	39	277
	0.22	0.22	0.600	9200	0.086	11.2	0.0085	52	182
	0.22	0.47	0.670	1010	0.076	10.5	0.0052	66	236
	0.22	1.0	0.720	1100	0.076	10.0	0.0033	77	257
	0.47	0.47	1.25	1950	0.060	7.0	0.0044	41	221
300	0.47	1.0	1.43	3210	0.053	6.4	0.0027	72	296
	0.47	2.2	1.45	2200	0.055	6.3	0.0019	82	345
	1.0	1.0	3.00	4100	0.040	4.2	0.0022	57	295
	1.0	2.2	3.30	4340	0.037	3.6	0.0016	74	378

*** Peak volts.**

RESISTANCE-COUPLED AMPLIFIER CHARTS

(13)

7199 (Triode Unit)

See *Circuit Diagram 1*

E_{bb}	R_p	R_g	R_{g2}	R_k	C_{g2}	C_k	C	E_o*	V.G.
90	0.047	0.047	—	1292	—	3.3	0.060	8	12
	0.047	0.1	—	1401	—	2.8	0.032	10	13
	0.047	0.22	—	1470	—	2.4	0.016	11	13
	0.10	0.1	—	2630	—	1.60	0.029	9	13
	0.10	0.22	—	3090	—	1.24	0.015	12	13
	0.10	0.47	—	3440	—	1.10	0.008	14	14
	0.22	0.22	—	6550	—	0.70	0.015	12	12
	0.22	0.47	—	8270	—	0.51	0.0077	16	12
	0.22	1.0	—	9130	—	0.44	0.0045	18	12
180	0.047	0.047	—	723	—	4.0	0.061	16	14
	0.047	0.1	—	836	—	3.5	0.032	20	14
	0.047	0.22	—	948	—	2.9	0.016	24	15
	0.10	0.1	—	1543	—	2.0	0.031	17	14
	0.10	0.22	—	2002	—	1.6	0.016	24	14
	0.10	0.47	—	2522	—	1.2	0.0082	30	13
	0.22	0.22	—	4390	—	0.79	0.015	24	13
	0.22	0.47	—	6122	—	0.57	0.0078	33	12
	0.22	1.0	—	8060	—	0.47	0.0046	41	12
300	0.047	0.047	—	534	—	4.0	0.061	27	15
	0.047	0.1	—	726	—	3.6	0.031	38	15
	0.047	0.22	—	840	—	3.0	0.015	44	15
	0.10	0.1	—	1117	—	2.3	0.031	26	15
	0.10	0.22	—	1613	—	1.7	0.0155	41	14
	0.10	0.47	—	2043	—	1.31	0.0078	51	14
	0.22	0.22	—	3133	—	0.93	0.015	36	13
	0.22	0.47	—	4480	—	0.69	0,0079	51	13
	0.22	1.0	—	4930	—	0.56	0.0045	55	13

* Peak volts.

GRID-No. 2 INPUT RATING CHART

The Grid-No.2 Input Rating Chart shown on the back of this page presents graphically the relationship between the grid-No.2 voltage and the maximum grid-No.2 input for certain multi-electrode tube types.

The chart shows that full rated grid-No.2 input is permissible at grid-No.2 voltages up to 50 per cent of the maximum rated grid-No.2 supply voltage. From the 50 per cent point to the full rated value of supply voltage, the grid-No.2 input must be decreased. The decrease in allowable grid-No.2 input follows a curve of the parabolic form.

This chart is useful for applications utilizing either a fixed grid-No.2 voltage, or a series grid-No.2 voltage-dropping resistor.

Where a fixed grid-No.2 voltage is used, it is necessary only to determine that the grid-No.2 input is within the boundary of the operating area on the chart at the selected value of grid-No.2 voltage to be used.

Where a grid-No.2 voltage-dropping resistor is used, the minimum value of resistor that will assure tube operation within the boundary of the curve can be determined from the following relation:

$$R_{g2} \geq \frac{E_{c2}\ (E_{cc2} - E_{c2})}{P_{c2}}$$

where:

R_{g2} = minimum value for grid-No.2 voltage-dropping resistor in ohms.

E_{c2} = selected value of grid-No.2 voltage in volts.

E_{cc2} = grid-No.2 supply voltage in volts.

P_{c2} = grid-No.2 input in watts corresponding to E_{c2}.

EXAMPLES

Example I - *Use of a Fixed Grid-No.2 Supply Voltage:*

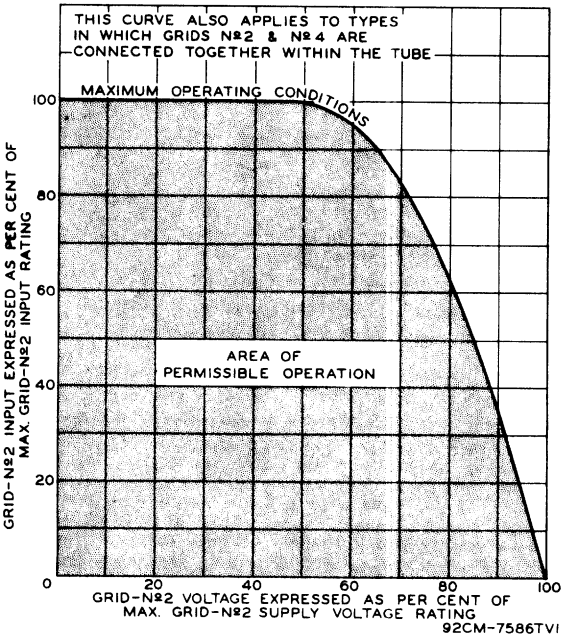
The tube data for a certain tube stipulates a maximum grid-No.2 supply voltage rating of 300 volts, and a maximum grid-No.2 input rating of 1 watt. It is desired to operate the tube with a fixed voltage of 200 volts between grid No.2 and cathode. This value is 66-2/3% of the maximum grid-No.2 supply voltage rating. From the chart, the maximum grid-No.2 input, therefore, must be limited to 88% of the maximum grid-No.2 input rating or 0.88 watt.

GRID-Nº 2 INPUT RATING CHART

Example 2 - *Use of a Grid-No.2 Voltage-Dropping Resistor:*

The tube data for a certain tube stipulates a maximum grid-No.2 supply voltage rating of 300 volts, and a maximum grid-No.2 input rating of 1 watt. It is desired to operate the tube with a grid-No.2-to-cathode voltage of 250 volts, obtained through a dropping resistor from a 300-volt power supply. Because 250 volts is 83% of 300 volts, the maximum grid-No.2 input must be limited, as shown on the chart, to 56% of the maximum grid-No.2 input rating, or 0.56 watt. Then, the minimum value required for the grid-No.2 voltage-dropping resistor will be:

$$R_{g2} = \frac{250\ (300 - 250)}{0.56} = 22{,}320 \text{ ohms}$$

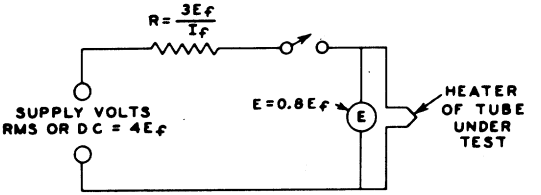


TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

HEATER WARM-UP TIME MEASUREMENT
FOR TUBE TYPES INTENDED FOR USE IN SERIES HEATER-STRING ARRANGEMENT

Heater warm-up time is measured in the circuit shown below as follows: The heater is placed in series with a resistance having a value 3 times the heater operating resistance. A voltage having a value 4 times the rated heater voltage is then applied. Heater warm-up time is then defined as the time required for the voltage across the heater to reach 80 per cent of its rated value.

TEST CIRCUIT FOR DETERMINING HEATER WARM-UP TIME

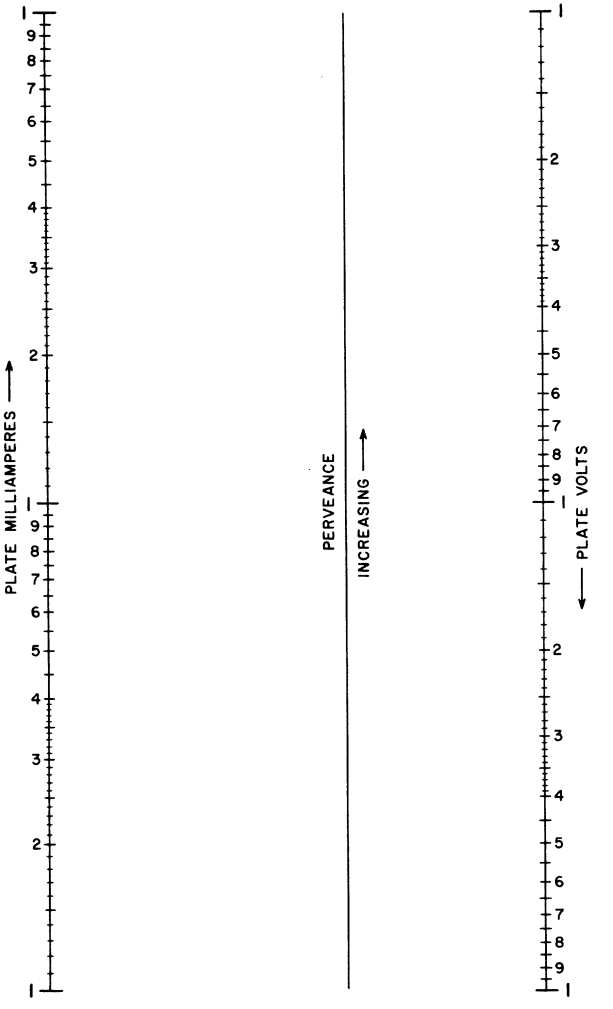


Ef = RATED HEATER VOLTAGE OF TUBE UNDER TEST.
If = RATED HEATER CURRENT OF TUBE UNDER TEST.

92CS-8503

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

AVERAGE PLATE-CHARACTERISTIC NOMOGRAPH
For Diodes and Rectifiers



RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DIODE
NOMOGRAPH
7-61

Diode Nomograph

The Diode Nomograph on the preceding page may be used to determine for a diode unit (1) tube voltage drop for any plate current, or (2) plate current for any plate voltage when values for a single plate-voltage, plate-current condition are available from the published data. The nomograph may also be used to compare the perveance ($G = I_b/E_b^{\frac{3}{2}}$) of several diodes.

For convenience, PLATE VOLTS and PLATE MILLIAMPERES are plotted on two-decade logarithmic scales with the PERVEANCE line located between them.

To determine for a specific diode unit the desired tube voltage drop or plate current:

1. Obtain the plate-voltage, plate-current condition from the published data for the type.
2. Select convenient values for the decade scales for PLATE VOLTS and PLATE MILLIAMPERES.
3. Locate and connect with a straightedge the points for PLATE VOLTS and PLATE MILLIAMPERES obtained from the data.
4. Mark the intersection of the straightedge and the PERVEANCE line.
5. With this intersection as a pivot point, line up the straightedge with the desired value of PLATE VOLTS or PLATE MILLIAMPERES, and read the corresponding value of tube voltage drop or plate current on the appropriate scale.

Because the pivot point for a specific diode unit represents its perveance, the pivot points for several units (plotted to the same scales) indicate their relative perveance.

EXAMPLE

The published data for type 5U4GB gives a tube voltage drop (Per plate) of 44 volts at plate ma. = 225.

1. To determine the tube voltage drop at plate ma. = 100:
   a. On the nomograph, establish the decade scale for PLATE VOLTS as 1, 10, 100 (reading down) and the scale for PLATE MILLIAMPERES as 10, 100, 1000 (reading up).
   b. Locate and connect the points "PLATE VOLTS = 44" and "PLATE MILLIAMPERES = 225" with a straightedge.
   c. Mark the intersection of the straightedge and the PERVEANCE line.
   d. Pivot the straightedge about this intersection, line it up with the point "PLATE MILLIAMPERES = 100", and read "PLATE VOLTS = 25"—the tube voltage drop (Per plate).
2. To determine the plate current at plate volts = 33:
   a. Use the same pivot point on the PERVEANCE line as in "1d" above, line up the straightedge with the point "PLATE VOLTS = 33", and read "PLATE MILLIAMPERES = 150".

LIMITATIONS

For readings in the order of 1 volt and/or 1 milliampere or less, the nomograph is not accurate because of the effects of contact potential and initial electron velocity.

VACUUM-POWER-TUBE SERVICE

TYPICAL OPERATION: POWER OUTPUT APPROX. WATTS	RCA TYPE
Class A Amplifiers, AF	
0.6	5556
3.8	801A
3.9	2E24
30	845
Class AB_1 Amplifiers, AF[b]	
15[a]	807
15[a]	1625
22[a]	6146
22[a]	6146W
22[a]	6159
22[a]	6159W
22[a]	6883
22[a]	8032
–	7870
–	7801
40[a]	2E26
44	829B
56[a]	807
56[a]	1625
80	6816
80	6884
80	7457
80	7842
80	7843
80	7844
80	8596
82[a]	6146
82[a]	6146A
82[a]	6146W
82[a]	6159
82[a]	6159W
82[a]	6883
82[a]	8032
96[e]	6146B/8298A
96[e]	6159B
96[e]	6883B/8032A/ 8552
–	8165/4-65A
115	845
190[c]	7271
300[c]	828
–	6155
380[c]	813
410[c]	7094
–	4-125A/4D21

TYPICAL OPERATION: POWER OUTPUT APPROX. WATTS	RCA TYPE
–	4E27A/5-125B
580	7034/4X150A
590	7203/4CX250B
590	7204/4CX250F
–	6156
–	4-250A/5D22
–	8438/4-400A
800	8167/4CX300A
1600	7650
–	8166/4-1000A
–	8168/4CX1000A
–	8239/3X3000F1
–	8170/4CX5000A
31,900	8171/4CX10000D
57,000	8281/4CX15000A
Class AB_2 Amplifiers, AF[b]	
40[c]	6524
40[c]	6850
42[c]	2E24
42[c]	2E26
42[c]	815
72	1624
80[c]	807
80[c]	1625
90[c]	6146
90[c]	6146A
90[c]	6146W
90[c]	6159
90[c]	6159W
90[c]	6883
90[c]	8032
110[c]	6146B/8298A
110[c]	6159B
110[c]	6883B/8032A/ 8552
140	6816
140	6884
140	7457
140	7842
140	7843
140	7844
140	8596
–	6155
–	4-125A/4D21
–	4E27A/5-125B
630	7034/4X150A

VACUUM-POWER-TUBE SERVICE (Cont'd)

TYPICAL OPERATION: POWER OUTPUT APPROX. WATTS	RCA TYPE
–	6156
–	4-250A/5D22
Class B Amplifiers, AF[b]	
45	801A
235[c]	811A
235[c]	812A
250[c]	8005
590[c]	810
600[c]	8000
1640	5786
1650[c]	833A
2400[c]	833A
8800	5762/7C24
10,000	891R
10,500	892R
15,000	889A
15,000	889RA
22,000	892
22,500	207
46,000	880
50,000	9C25
55,000	5771
61,000	9C21
100,000	5671
117,000	5770

TYPICAL OPERATION: POWER OUTPUT APPROX. WATTS	FREQ. MHz	RCA TYPE
Class B Amplifiers, RF Telephony		
–	3000	7801
–	3000	7870
–	30	5556
5.5	20	837
7.5	60	801A
10.5[a]	125	815
12.5[a]	60	807
12.5[a]	60	1625
20	100	834
36[e]	30	828
40[e]	60	8005

TYPICAL OPERATION: POWER OUTPUT APPROX. WATTS	FREQ. MHz	RCA TYPE
50[e]	30	813
–	110	6155
60[a]	30	810
65[a]	3	8000
–	7	6156
150[a]	35	833A
225[a]	2	833A
400	110	827R
1800	1.6	892R
2000	50	889A
2000	4	889RA
4000	1.6	207
4000	1.6	892
9000	2	880
12,000	1.6	5771
Class B Amplifiers, Television Service		
230	900	6161
250	216	7034/4X150A
300	800	4624
440	216	7203/4CX250B
440	216	7204/4CX250F
–	200	4X500A
1200	900	6181
2800	200	6076
6350	216	5762/7C24
5500	800	8501
12,000	216	6166
12,000	800	6448
14,000	216	6166A/7007
19,000	800	6806
Class C Amplifiers, Plate-Modulated RF Telephony		
1.7	3000	7801
1.7	3000	7870
–	6	5556
9[a]	460	6524
9[a]	460	6850
11	200	837
13.5[a]	125	2E24
13.5[a]	125	2E26
17[a]	200	832A
17	400	7801
17	400	7870

VACUUM-POWER-TUBE SERVICE (Cont'd)

TYPICAL OPERATION		RCA TYPE
POWER OUTPUT APPROX. WATTS	FREQ. MHz	
18	60	801A
24	60	1624
28[a]	60	807
28[a]	60	1625
30[a]	125	815
34[a]	60	6146
34[a]	60	6146A
34[a]	60	6146W
34[a]	60	6159
34[a]	60	6159W
34[a]	60	6883
34[a]	60	8032
42[a]	60	6146B/8298A
42[a]	60	6159B
42[a]	60	6883B/8032A/8552
–	2500	2C39A
–	2500	2C39WA
–	2500	6897
45	400	6816
45	400	6884
45	400	7457
45	400	7842
45	400	7843
45	400	7844
45	400	8596
50[a]	200	829B
58	100	834
70[a]	200	829B
85[a]	30	812A
88[a]	30	811A
90[a]	60	7271
–	150	8165/4-65A
100[a]	30	828
115[a]	60	8005
120	900	6161
180[a]	60	7094
180[a]	30	813
230	150	7034/4X150A
235	175	7203/4CX250B
235	175	7204/4CX250F
235	175	8167/4CX300A
250[a]	30	810
250[a]	30	8000
–	125	6155
–	75	6156

TYPICAL OPERATION		RCA TYPE
POWER OUTPUT APPROX. WATTS	FREQ. MHz	
600	400	7650
635	30	833A
800	600	4618
800	600	7213
810	160	5786
825	110	827R
950	400	6181
1000	20	833A
–	110	8438/4-400A
–	1000	8166/4-1000A
2700	110	6076
4000	50	889A
4000	40	889RA
–	30	8170/4CX5000A
4200	30	5762/7C24
4500	900	6448
5000	1.6	892R
5500	60	6166
5800	30	8171/4CX10000D
6000	1.6	207
6000	1.6	892
6000	60	6166A/7007
10,000	400	6806
18,000	30	9C25
27,000	25	880
29,000	1.6	5771
38,000	5	9C21
40,000	1.6	5671
45,000	20	5770
Class C Amplifiers, Grid-Modulated RF Telephony		
5.5	20	837
8	60	1624
10.5[a]	125	815
36[a]	30	828
50[a]	30	813
65[a]	30	8000
400	110	827R
Class C Amplifiers, Suppressor-Modulated RF Telephony		
5	20	837
–	75	4E27A/5-125B

VACUUM-POWER-TUBE SERVICE (Cont'd)

TYPICAL OPERATION		RCA TYPE
POWER OUTPUT APPROX. WATTS	FREQ. MHz	
Class C Amplifiers, Television Service		
230	900	6161
1200	900	6181
4000	216	5762/7C24
5300	216	8D21
12,000	216	6166
12,000	216	6166A/7007
Class C Amplifiers, RF Telegraphy and FM Telephony		
3.2	3000	7801
3.2	3000	7870
–	30	5556
–	3370	2C40
–	3370	2C40A
–	1500	2C43
–	2500	2C39A
–	2500	2C39WA
–	2500	6897
20[a]	125	2E24
20[a]	125	2E26
22	20	837
25	60	801A
26	200	832A
27	400	7801
27	400	7870
30[d]	175	4604
35	60	1624
40	60	807
40	60	1625
40	1215	6816
40	1215	6884
40	1215	7457
40	1215	7842
40	1215	7843
40	1215	7844
40	1215	8596
44[a]	125	815
46[a]	100	6524
46[a]	100	6850
52[a]	60	6146
52[a]	60	6146A
52[a]	60	6146W/7212
52[a]	60	6159
52[a]	60	6159W/7357
52[a]	60	6883
52[a]	60	8032
63[a]	60	6146B/8298A
63[a]	60	6159B
63[a]	60	6883B/8032A/8552
70	200	829B
75	100	834
85	470	8072
85	470	8462
80	400	8596
90[a]	200	829B
105	1215	8226
130[a]	30	812A
135[a]	30	811A
–	150	8165/4-65A
150	30	828
160	60	7271
170	60	8005
180	900	6161
225	500	8167/4CX300A
235	470	8121
250	500	7203/4CX250B
250	500	7204/4CX250F
255[a]	60	7094
275[a]	30	813
300	470	8122
325	220	5713
340	400	8226
370	150	7034/4X150A
375[a]	30	810
375[a]	30	8000
–	120	6155
–	120	4-125A/4D21
–	75	4E27A/5-125B
375	1215	7650
600	900	6181
1000[a]	20	833A
1000	160	5786
–	75	6156
–	75	4-250A/5D22
–	110	8438/4-400A
–	120	4X500A
1050	110	827R

VACUUM-POWER-TUBE SERVICE (Cont'd)

TYPICAL OPERATION		RCA TYPE
POWER OUTPUT APPROX. WATTS	FREQ. MHz	
1350	600	4618
1350	600	7213
1440[a]	30	833A
–	110	8166/4-1000A
–	30	8170/4CX500A
2300	890	4632
5500	900	8501
6500[a]	300	8D21
7000	30	5762/7C24
9000	216	6166
10,000	400	8437
10,000	50	889A
10,000	50	889RA
10,000	1.6	891R
10,000	1.6	892R
10,000	216	6166A/7007
11,000	900	6448
13,500	900	6806
14,000	1.6	892
15,000	1.6	207
16,000	30	8178/4CX10000D
32,500	30	9C25
36,500	110	8281/4CX15000A
40,000	25	880
44,000	25	5771
70,000	1.6	5671
100,000	5	9C21
114,000	20	5770
500,000	0.425	6949, 6949WI
Class C Amplifiers or Oscillators Self-Rectifying		
175[e]	27	811A[f]
200[e]	27	812A
225	30	813
330[e]	50	8005
550[e]	30	8000
835[a]	20	833A
1050	160	5786
1150	30	833A
3350	30	5762/7C24
Class C Amplifiers or Oscillators with Separate Plate Supply		
135	30	811A[f]

TYPICAL OPERATION		RCA TYPE
POWER OUTPUT APPROX. WATTS	FREQ. MHz	
135	30	812A[f]
280	30	813
330[e]	27	8005
600[d]	30	8000
1100[a]	30	833A
1150	160	5786
1460	30	833A
5650	30	5762/7C24
CW Oscillator (Magnetron)		
30,000	915	8684
Linear RF Amplifiers Single-Sideband Suppressed Carrier—Two-Tone Modulation		
40	30	7457
40	30	8596
49[a]	30	6146B/8298A
49[a]	30	6159B
49[a]	30	6883B/8032/8552
80	30	8072
80	30	8462
95[a]	60	7271
120	30	811A
170	30	8121
295	30	7203/4CX250B
295	30	7204/4CX250F
380	30	8122
400	175	8167/4CX300A
410	30	4624
680	30	7650
5000	30	4628
25,000	550	6806
600,000	10	6949, 6949WI
Linear RF Amplifiers, Single-Sideband Suppressed Carrier—Single-Tone Modulation		
–	3000	7801
–	3000	7870
40	60	6816
40	60	6884
40	60	7457
40	60	7842

VACUUM-POWER-TUBE SERVICE (Cont'd)

TYPICAL OPERATION		RCA TYPE
POWER OUTPUT APPROX. WATTS	FREQ. MHz	
40	60	7843
40	60	7844
41	60	6146A
120	60	811A
95	60	7271
210	60	7094
250	150	7034/4X150A
295	175	7203/4CX250B
295	175	7204/4CX250F
680	30	7650
1250	60	4618
1250	60	7213
–	30	8168/4CX1000A
–	30	8170/4CX5000A
10,600	60	6166
12,000	60	6166A/7007
12,000	550	6448
600,000	10	6949, 6949VI
Linear RF Amplifiers, AM Telephony		
2000	400	4628
2500	400	4635
Linear RF Amplifiers-Particle Acceleration		
kW		
300	475	4612
Plate-Pulsed Amplifiers or Oscillators		
–	3370	2C40A
4.5	1215	7649
14	1250	5946
17	1215	4621
17	1215	8227
39	1215	7651
65	1215	7214
–	500	8184
180	450	2041
300	450	2041
500	440	2054
1500	200	6950
1500	50	4603
1500	50	4603VI
2000	425	6952
2000	425	8587

TYPICAL OPERATION		RCA TYPE
POWER OUTPUT APPROX. kW	FREQ. MHz	
2000	425	4616
2000	425	4616VI
2500	440	2054
5000	250	7835
8000	425	4617
10,000	250	7835
Pulsed Oscillator (Klystron)		
21,000	2586	8568
Grid-Pulsed Amplifiers or Oscillators		
2.3	1215	7649
10	1215	4621
10	1215	8227
20	1215	7651
20	1215	7214
100	450	2041
180	450	2041
275	425	4616, 4616VI
1200	30	4603, 4603VI
RF-Frequency Multipliers		
WATTS		
7[a]	Tripler to 462	6524
7[a]	Tripler to 462	6850
140	Doubler to 900	6161
180	Doubler to 600	6161

TYPICAL OPERATION		RCA TYPE
PEAK POWER OUTPUT APPROX.	PULSE LENGTH μs	
Pulse Modulators		
3.4 kW	100	6293
40 kW	1.2	3E29
–	–	4610

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

VACUUM-POWER-TUBE SERVICE (Cont'd)

PEAK PLATE AMPERES	RCA TYPE
Voltage Regulators	
0.5	3C33
0.5	4614
1	4600A

RECTIFIERS

MAX. PLATE RATINGS		RCA TYPE
PEAK AMPERES	AVERAGE AMPERES	
Half-Wave, Mercury-Vapor Types[g]		
0.5	0.125	816
1	0.25	866A
2	0.5	866A
5	1.25	872A
5	1.25	8008
6	1.5	575A
6	1.5	673
8.3	1.8	6894
8.3	1.8	6895
10[g]	2.5[g]	575A
10[g]	2.5[g]	673
10	2.5	615/7018
10	2.5	869B
15	2.5	5558
11.5[h]	2.5[g]	6894
11.5[h]	2.5[g]	6895
16	4	5561
20[m]	5[m]	869B

MAX. PLATE RATINGS		RCA TYPE
PEAK AMPERES	AVERAGE AMPERES	
77	6.4	635/7019
40	6.4	5561
40	10	857B
Full-Wave, Mercury-Vapor Types[f]		
10	2.5	604/7014
Half-Wave, Gas Type[g]		
1	0.25	3B28
2	0.5	3B28
Half-Wave, Vacuum Types[g]		
0.04	0.002	5825
0.06	0.0075	2X2A
0.15	0.02	8013A
0.27	0.25	579B
0.75	0.1	8020
0.8	0.13	1616
1	0.25	836

[a] Intermittent Commercial and Amateur Service.
[b] Typical power output is for two tubes, except for twin-unit types.
[c] Not recommended as Oscillator in this class of service.
[d] Intermittent Commercial and Amateur Service only.
[e] Two tubes.
[f] Not recommended as Oscillator in this class of service.
[g] In phase operation, unless otherwise specified.
[h] Quadrature operation.

* FOR DETAILED DATA ON TYPES NOT LISTED IN THESE CHARTS, REFER TO INDIVIDUAL DATA SHEETS IN THE TRANSMITTING TUBE SECTION

These charts are arranged in three parts:
1 & 2 - Data 3-Terminal Diagrams

PART 1

DATA

POWER TUBES FOR CW APPLICATIONS (Unless Otherwise Specified[a])

RCA Type	Description	Cooling	Filament Heater		Maximum Ratings						
					Plate			Grid No 2		Grid No 1	
			Volts	Amp	Volts	A	Dissip Watts	Volts	Watts	Volts	mA (Watts)
2C39A	Lighthouse Triode	Forced Air	6.3	1.0	1000	.125	100	–	–	-150	50
2C39WA	Lighthouse Triode-Hi Temp	Forced Air	5.8	1.0	Ref.	MIL-E-1/778E ----------					
2C40	Lighthouse Triode, Hi Freq	Natural	6.3	0.75	450	.022	5.0	–	–	–	–
2C43	Lths Tri Hi Plate Dis	Natural	6.3	0.90	450	.036	10	–	–	–	–
2E24	Quick Heat, Beam Power	Natural	6.3	0.65	600	.085	13.5	200	2.5	-175	3.5
2E26	Beam Pwr Pentode	Natural	6.3	0.80	600	.085	13.5	200	2.5	-175	3.5

PART 1 (CONT'D)

RCA Type	Description	Cooling	Filament Heater		Maximum Ratings							
					Plate			Grid No 2			Grid No 1	
			Volts	Amp	Volts	A	Dissip Watts	Volts	Watts	Volts	mA (Watts)
3C33[a]	Twin Triode	Natural	12.6	1.125	2000 Peak	500Peak .120DC	15 each of two units	—	—	-200	7.5 IN
3E29[a]	Twin Beam Power Tube	Natural	6.3/ 12.6	2.25/ 1.125	5750 Peak 5000 DC	10[b] Peak	15[b]	850	3[b] IN	-225	1[b] IN
					Max on: 12 μs		b. both units in parallel Max Int: 1200 μs				
4-125A/ 4D21	Beam Power Tetrode	Forced Air	5.0	6.5	3000	.225	125	400	20	-500	5W
4-250A/ 5D22	Beam Power Tetrode	Forced Air	5.0	14.5	4000	.350	250	600	35	-500	5W
4E-27A/ 5-125B	Beam Power Pentode	Natural	5.0	7.5	4000	.200	125	750	20	-500	10W
4X500A	Beam Power Tetrode	Forced Air	5.0	13.5	4000	.350	500	500	30	-500	50[c]W
8D21	Twin Tetrode	Water	3.2	125	6000	5.0	6000[c]	1000	400[c]	-1000	650
807	Power Pentode	Natural	6.3	0.90	750	.100	30	300	3.5	-200	5

a. Type **3C33** for **Pulse Regulator Applications.** Type **3E29** for **Pulse Modulator Applications.**
c. Two Tubes.

PART 1 (CONT'D)

RCA Type	Description	Cooling	Filament Heater		Maximum Ratings							
					Plate			Grid No 2		Grid No 1		
			Volt	Amp	Volts	A	Dissip Watts	Volts	Watts	Volts	mA (Watts)
810	Hi Mu Triode	Natural	10.0	4.5	2000	.250	125	–	–	-500	75
813	Hi Gain Beam Power	Natural	10.0	5.0	2250	.225	125	400	22	-300	30
827R	Beam Power Tube	Forced Air	7.5	25	3500	.500	800	1000	150	-500	150
828	Low Freq Pentode	Natural	10	3.25	2000	.150	80	750	23	–	–
829B	Twin Beam Power	Forced Air	6.3	2.25	750	.240	45	250	8	-175	20
830B	Low Freq Triode	Natural	10.0	2.0	1000	.150	60	–	–	-300	30
832A	Twin Beam Pwr Tube	Natural	6.3	1.6	750	.090	15	250	5	-100	6
834	VHF Triode	Natural	7.5	3.1	1250	.100	50	–	–	-400	20
837	Low Freq Pentode	Natural	12.6	0.7	500	.080	12	200	8	-200	8

PART 1 (CONT'D)

RCA Type	Description	Cooling	Filament Heater		Maximum Ratings							
					Plate			Grid No 2		Grid No 1		
			Volts	Amp	Volts	A	Dissip Watts	Volts	Watts	Volts	mA (Watts)	
845	Triode	Natural	10.0	3.25	1250	.120	100	—	—	-400	—	
860	Tetrode	Natural	10.0	3.25	3000	.150	100	500	10	-800	40	
880	Triode	Water	12.6	320	10500	6.0	20k	—	—	-1200	800	
891R	Lo Freq Triode	FA[d]	22.0	60	10000	2.0	4k	—	—	-3000	150	
892	Lo Freq Triode	Water	22.0	60	15000	2.0	10k	—	—	-3000	400	
892R	Lo Freq Triode	FA	22.0	60	12500	2.0	4k	—	—	-3000	400	
1624	Beam Power Tube	Natural	2.5	2.0	600	.090	25	300	3.5	-200	5	
1625	Beam Power Tube	Natural	12.6	0.45	750	.100	30	300	3.5	-200	5	
5556	Lo Freq Triode	Natural	4.5	1.1	350	.040	10	—	—	-150	10	

d. Forced Air.

RCA Type	Description	Cooling	Filament Heater		Maximum Ratings						
					Plate			Grid No 2		Grid No 1	
			Volts	Amp	Volts	A	Dissip Watts	Volts	Watts	Volts	mA (Watts)
5713	Power Triode	FA	3.3	11.5	1500	.30	250	–	–	-250	50
5786	Compact Triode	FA	11.0	12.5	3000	0.5	600	–	–	-500	150
6146 [e]	Hi Eff Beam Pwr Tube	Natural	6.3	1.25	750	.150	25	250	3	-150	4.0
6155	Beam Power Tube	FA	5.0	6.5	3000	.225	125	400	20	-500	15
6156	Beam Power Tube	FA	5.0	14.1	4000	.350	250	600	35	-500	20
6159	Glass Beam Power Tube	Natural	26.5	0.3	750	.150	25	250	3	-150	4.5
6181	UHF Power Tetrode	FA	120	1.55	2000	1.25	2000	500	40	-300	200
6883 [f]	Beam Power Tube	Natural	12.6	0.62	750	.150	25	250	3	-150	4.0
6897	Lighthouse Triode	FA	6.3	1.0	1000	125	100	–	–	-150	50
7271	Beam Power Tube	Natural	13.5	1.25	1350	.340	80	425	20	-300	30

[e] *For later version of this type refer to 6146B/8298A data sheets, located in the TRANSMITTING TUBE SECTION.*

[f] *For later version of this type refer to 6883B/8032A/8552 data sheet, located in the TRANSMITTING TUBE SECTION.*

PART 1 (CONT'D)

RCA Type	Description	Cooling	Filament Heater		Maximum Ratings							
					Plate			Grid No 2			Grid No 1	
			Volts	Amp	Volts	A	Dissip Watts	Volts	Watts	Volts	mA (Watts)
8000	Triode	Natural	10.0	4.5	2500	.300	175	—	—	-500	45
8005	Power Triode	Natural	10.0	3.25	1750	.125	75	—	—	-125	25
8032	Beam Power Tube Glass	Natural	13.5	0.58	750	.150	25	250	3.0	-150	4.0
8165/ 4-65A	VHF Power Tetrode	Natural	6.0	3.5	3000	.150	65	400	10	-500	5W
8166/ 4-1000A	VHF Power Tetrode	FA	7.5	21	6000	.700	1000	1000	75	-500	25W
8168/ 4CX1000A	Radial Beam Tetrode	FA	6.0	10.5	3000	1.0	1000	400	12	-60	—
8170/ 4CX5000A	Beam Power Tube	FA	7.5	75	7500	3.000	5000	1500	250	—	75W
8239/ 3X3000F1	Lo Mu Triode	FA	7.5	52	6000	2.500	3000	—	—	—	50W
8438/ 4-400A	Radial Tetrode Beam	FA	5.0	14.5	4000	.350	400	600	35	-500	10W

PART 2 — DATA

RCA Type	Prime Service	Amplification or Mu	Max Freq MHz	Physical			Typical Operation		
				Ht In	Dia In	Wt Oz	Freq MHz	Input (mA) Watts	Output Watts
2C39A	UHF Amp	100	2500	2-3/4	1-1/4	2	500	6	40
2C39WA	UHF Amp	—	—	2-3/4	1-1/4	2	—	—	—
2C40	UHF Amp	36	3370	2-9/16	1-5/16	2	—	—	—
2C43	UHF Amp	48	1500	2-11/16	1-5/16	2	—	—	—
2E24	Mobile	7.5	125	3-5/8	1-5/16	3	125	0.2	27
2E26	Hi Power Amp	6.5	125	3-1/2	1-5/16	3	125	0 17	27
3C33	Regulator	11	—	3-1/2	2-3/8	—	—	—	—
3E29	Modulator	9	—	4-1/8	2-3/8	3.5	Pulse: 1.2 μs Duty: .001 %		

PART 2 (CONT'D)

RCA Type	Prime Service	Amplification or Mu	Max Freq MHz	Physical			Typical Operation		
				Ht In	Dia In	Wt Oz	Freq MHz	Input (mA) Watts	Output Watts
4-125A/4D21	VHF Amp	6.2	120	5-1/2	2-7/8	6	120	2.5	375
4-250A/5D22	Hi Pwr VHF Amp	5.1	75	6-1/8	3-1/2	8	75	2.5	1000
4E-27A/5-125B	Hi Pwr Amp	5	75	6	2-3/4	6	75[c]	0.9[c]	375[c]
4X500A	Hi Pwr Amp	6.2	120	4-1/2	2-5/8	28	110	18	1180
8D21	VHF Osc Amp	5	300	12	5-3/4	—	300	500[c]	6500[c]
807	VHF Amp	8	60	5-3/4	2-1/16	3	60	.3	54
810	Hi Gain VHF Amp	36	30	8-1/2	2-1/8R	—	30	19	575
813	VHF Amp	8.5	30	7-1/2	2-9/16	8	30	4.0	375
827R	FM & VHF TV	16	110	6-3/8	4-5/8R	72	110	50	1050

c. Two Tubes.

PART 2 (CONT'D)

RCA Type	Prime Service	Amplification or Mu	Max Freq MHz	Physical			Typical Operation		
				Ht In	Dia In	Wt Oz	Freq MHz	Input (mA) Watts	Output Watts
828	Audio Amp	–	30	7-7/16	2-1/16	–	AF	0	385
829B	VHF Amp	9	200	4-1/8	2-3/8	–	200	0.8	115
830B	RF Amp	25	15	6-11/16	2-1/16	–	15	7	90
832A	VHF Amp	6.5	200	3-3/16	2-5/16	–	200	0.19	26
834	RF Amp	10.5	100	6-7/8	2–11/16	–	100	4.5	75
837	RF Amp	–	20	5-3/4	2-1/16	–	20	0.4	22
845	Modulator	5.3	AF	7-7/8	2-5/16	–	AF	–	115
860	VHF Amp	200	30	8-3/4	4-1/4R	–	30	7	165

PART 2 (CONT'D)

RCA Type	Prime Service	Amplification or Mu	Max Freq MHz	Physical			Typical Operation		
				Ht In	Dia In	Wt Oz	Freq MHz	Input (mA) Watts	Output Watts
880	VHF Amp	20	25	11-1/2	7	—	1.5	1500	40k
891R	RF Amp	8.5	1.6	2	6R	—	1.6	310	10k
892	RF Osc	50	1.6	20-1/8	5-9/16R	—	1.6	565	14k
892R	RF Osc	50	1.6	22	6R	—	1.6	495	10k
1624	UHF Amp	—	60	5-3/4	2-1/16	—	60	0.43	35
1625	Freq Mult	8	60	5-3/4	2-1/16	—	60	0.2	50
5556	Lo Freq Triode	8.5	6	5-5/8	2-3/16	—	6	0.25	6.0
5713	VHF Amp	25	220	4-25/32	2-1/16	—	220	8	290
5786	Industrial	32	160	9-3/8	2-7/8	1-1/2 lb	160	36	1000

PART 2 (CONT'D)

RCA Type	Prime Service	Amplification or Mu	Max Freq MHz	Physical			Typical Operation		
				Ht In	Dia In	Wt Oz	Freq MHz	Input (mA) Watts	Output Watts
6146A	Amateur	4.5	60	3-3/16	1-21/32	2.3	60	0.2	70
6155	RF Amp	6.2	120	5-3/32	2-7/16	3	120	2.0	375
6156	RF Amp	5.1	75	5-29/32	3-7/16	6	75	3.4	1000
6159	RF Amp	4.5	60	3-13/16	1-21/32	2.3	60	0.2	52
6181	UHF TV	8	900	7-7/16	5	5 lb	900	150	600
6883	RF Amp	4.5	60	3-13/16	1-9/16	2	60	0.2	70
6897	UHF Amp	–	2500	2-3/4	1-1/4	2	500	–	40
7271	RF Amp	8	60	4.75	2.00	3.5	60	90	225

PART 2 (CONT'D)

RCA Type	Prime Service	Amplification or Mu	Max Freq MHz	Physical			Typical Operation		
				Ht In	Dia In	Wt Oz	Freq MHz	Input (mA) Watts	Output Watts
8000	VHF Amp	16.5	30	8-1/2	2-1/8R	–	30	18	575
8005	Oscillator	20	60	6-7/16	5-7/8	–	60	8.5	220
8032	Mobile RF Amp	4.5	60	3-13/16	1-21/32	2.3	60	0.2	70
8165/4-65A	RF Amp	5	50	4-3/16	2-3/8	3.0	50	1.7	280
8166/4-1000A	RF Amp	7	110	9-1/4	5-1/4	1.5 lb	110	15	3400
8168/4CX1000A	Lin RF Amp	–	110	4-3/4	3-3/8	27	–	–	1680
8170/4CX5000A	RF Amp	4.5	30	9-1/8	4-15/16	9.5 lb	–	–	–
8239/3X3000F1	AF Amp	4.8	–	10-1/2	4-3/16	7-1/2 lb	–	0	10k
8438/4-400A	RF Amp	5.1	110	6-3/8	3-9/16	9.0	75	5.8	1100

PART 3

TERMINAL DIAGRAMS

PART 3 (CONT'D)

834
1624
6155
837
1625
6156
845
5556
6159
860
5713
6181
880
5786
6883
891R 892 892R
6146A
6897

7271
8000
8005
8032
8165/4-65A
8166/4-1000A
8168/4CX1000A
8170/4CX5000A
8239/3X3000F1
8438/4-400A

RCA Transmitting Tube Operating Considerations

The following operating considerations for RCA transmitting tubes are intended for use with the data sheets on individual tube types given in the Handbook. Operating considerations unique to a particular tube type are not included in this presentation but are covered by the Handbook data sheets for the given type.

RATINGS

Refer to the *General Section* of the Handbook for a detailed discussion on Rating Systems and Tube Ratings.

CLEANING

As with other high-voltage equipment, it is essential that external parts of power tubes be kept free from accumulated dirt and moisture to minimize surface leakage and the possibility of arc-over.

Some tube configurations contain re-entrant areas at the edge of the insulator seals. Particular care should be taken to prevent foreign matter from coming in contact with these areas. Unless adequately protected by filtered air, these areas collect dirt rapidly as a result of electrostatic forces and the nature of the air circulation around the tube.

The external parts of the tube should periodically be wiped free of dirt. A recommended procedure for cleaning ceramic-metal tubes is as follows:

1. Remove silicone grease or similar material by use of acetone, or equivalent.

   Caution: Do not allow silicone grease or similar materials to remain on any rf contact surfaces. Severe burning of the contact surfaces of cylindrical-terminal types will occur if the contact fingers do not mate firmly with clean metal contact surfaces.

2. Clean rf contact surfaces with a very fine grade of silicon carbide abrasive pad, or equivalent.

   Caution: Do not permit the cleaning pad to come in contact with the ceramic surfaces. Rub gently to prevent removal of plating.

COOLING CONSIDERATIONS

Tube life can always be extended by maintaining envelope temperatures substantially below the maximum temperature ratings.

The user is cautioned that typical cooling characteristics in the published data are offered only as a guide, and that maximum envelope temperatures in the intended operation are the final rating criteria.

Temperature measurements of the tube envelope must be made to insure operation within maximum ratings. For glass-bulb types, the bulb "hot-spot" must be located with the tube operating in its intended application. A simple technique for locating the "hot-spot" in low-power, receiving-type tubes is to apply a low-temperature-melting paint, such as Tempilaq[a], to the entire bulb surface; the point at which this material first begins to melt is the hottest point on the bulb. For most power tubes, however, this technique is not satisfactory because of radiation effects. Therefore, it is recommended that a thermocouple be moved over the envelope to locate the hottest point on the bulb. (Although the individual thermocouple readings are not precise, the relative readings are sufficient.) Spots of various higher temperature Tempilaq paints may then be applied only to the hottest area; the lowest Tempilaq paint which will not melt must be at or below the maximum temperature rating. See Ref. 1. In general, the hottest point of a ring terminal is at the seal or

junction of the terminal and its adjacent glass or ceramic insulator. For some tube types the temperature measurement points are specified on the *Dimensional Outline* in the published data.

All types of heat transfer—radiation, convection, conduction, and combinations thereof—are employed in the various cooling techniques: natural, forced-air, liquid, and conduction cooling.

Natural Cooling—This method is generally used for glass-bulb types having plate dissipation ratings up to about 300 watts.

Temperature should be measured at the hottest point on the bulb using techniques previously discussed.

Adequate free space around the tube is required for all natural cooled types. Avoid reflective heat surfaces such as tube shields. These and other design considerations affecting natural methods of cooling are described in Ref.2.

Forced-Air Cooling—

Glass-Bulb-Types—Forced-air cooling may be applied to glass-bulb types to enhance the convection cooling and reduce bulb temperature. In some glass-bulb types, ratings are given for both natural and forced-air cooling. (The ratings with forced-air cooling reflect the higher permitted value of dissipation.) In general, any natural-cooled type may require some forced-air cooling if operation is near the maximum ratings or if limited space is available around the tube. The final decision can be made only after temperature measurements are made to insure operation below the maximum temperature rating.

Radiator Types—The external plate construction lends itself to compactness, higher

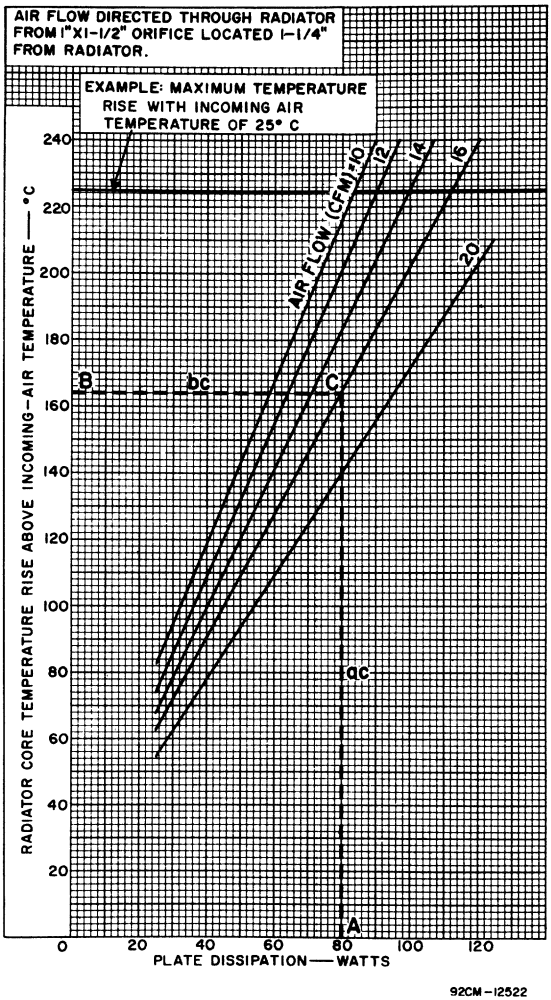
frequency operation, increased power capability, and intense-cooling techniques. Because the plate is part of the envelope, transfer of heat by radiation from the plate to the envelope is eliminated. The simplest intense-cooling technique is forced-air. All RCA forced-air-cooled, external-plate types contain integral radiators, which are brazed, pressed, or otherwise secured to the plate to insure intimate thermal contact.

Most of the heat within an electron tube is generated at the plate; additional heat generated from the other electrodes migrates to the plate. Precaution, however, must be taken to insure that none of the other terminals exceed their maximum rated temperature value. It may be necessary to direct some forced air across these terminals.

In general, there are two basic types of radiators: the stacked-disc type of finned radiator for TRANSVERSE FORCED-AIR COOLING, and the radial-fin type of radiator for AXIAL FORCED-AIR COOLING.

Transverse Cooling—Air flow is directed across the radiator from an orifice in a plane normal to the major axis of the tube and at the center of the radiator. More efficient cooling may be accomplished by providing a cowling to direct and confine the air. Pressure drop across the radiator itself is normally insignificant. Typical cooling characteristics for transverse cooling, such as shown in Fig.1, are given in the published data. The following steps illustrate the use of the chart:

1. Estimate probable *Plate Dissipation* from electrical conditions, locate as point "A" on the abscissa axis (80 watts in example), and erect a perpendicular line "ac".
2. Determine temperature rise by subtracting estimated incoming-air temperature (assume 36°C in example) from estimated



IG.1 - EXAMPLE OF TYPICAL COOLING CHARACTERISTICS

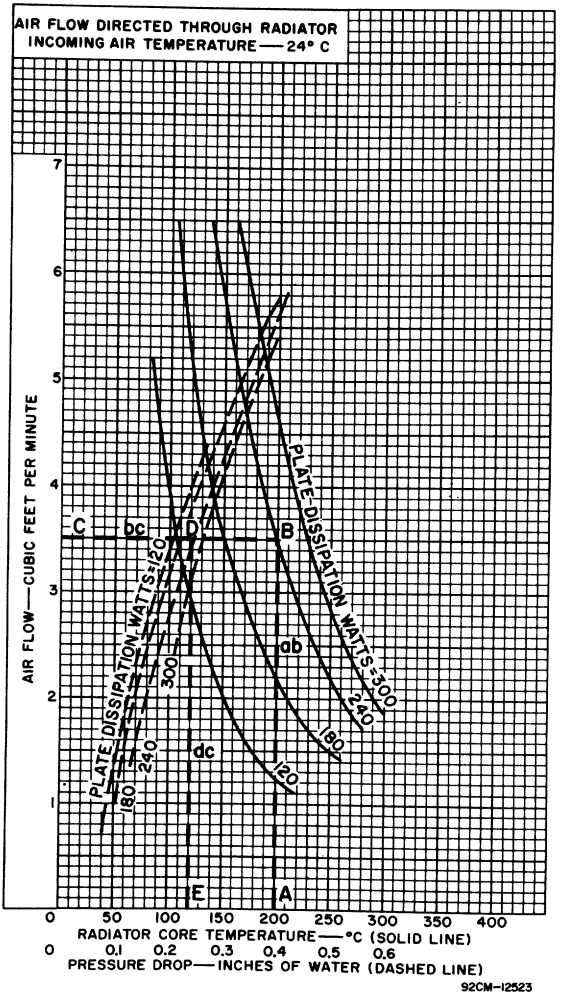
tube operating temperature (assume 200°C in example), locate the determined value (200°C-36°C = 164°C in example) as point "B" on the ordinate axis, and construct horizontal line "bc".

3. Determine air flow by interpolating the air flow curves at the intersection of lines "ac" and "bc", point "C" (16 cfm in example).

Axial Cooling—Air flow is directed through the radiator by suitable ducts. Air flow may be in either direction unless otherwise specified. Typical cooling characteristics for axial cooling, such as shown in Fig.2, are given in the published data. The following steps illustrate the use of the chart:

1. Select a tube operating temperature as discussed in this section, locate as point "A" on the abscissa (assume 200°C in example), erect perpendicular line "ab", extend this line until it crosses the estimated plate dissipation curve (240 watts in example) for temperature (solid line), and designate as point "B".
2. Determine air flow by constructing a horizontal line "bc" from point "B" to the ordinate axis and designate point "C" (3.5 cfm in example).
3. Determine the pressure drop across the radiator for the air flow in (2), locate point "D" on line "bc" at the estimated plate dissipation curve (240 watts in example) for pressure drop (dashed line), construct a perpendicular line "de" to the abscissa axis, designate as point "E", and read pressure drop (0.24 inch of water in the example).

See Ref. 3 for detailed information on the blower requirements for forced-air-cooled tubes.



IG.2 - EXAMPLE OF TYPICAL COOLING CHARACTERISTICS

Liquid Cooling—The liquid-cooling system consists, in general, of a source of cooling liquid, a feed-pipe system which carries the liquid to the water jacket surrounding, and provision for interlocking with the power supplies the liquid flow through the cooling courses. A more sophisticated system would also contain a liquid regeneration loop, flow regulators, and gages. For more detailed information on liquid-cooling systems, see Refs. 4 and 5.

Proper functioning of the coolant system is of the utmost importance. Even a momentary failure of the liquid flow may damage the tube. Without coolant the heat of the filament or heater alone may be sufficient to cause serious harm to some tube types. It is necessary, therefore, to provide a method of preventing tube operation in case the coolant supply should fail. A suitable method is the use of coolant-flow interlocks which open the power supplies when the flow is insufficient or ceases. If there is an interruption of the power supplies, it is then necessary to return the filament or heater voltage to zero and to restart in the normal manner described in the published data. The coolant flow must start before application of any voltage and continue for several seconds after removal of all voltages.

The absolute minimum coolant flow required through the system is given in the published data. Under no circumstances should the temperature of the coolant at any outlet ever exceed the maximum value given in the published data.

When the coolant fluid is water and the tube is used in equipment under conditions such that the ambient temperature is below 0 °C, precautions should be taken to prevent the water from freezing in the system.

Use of Water as Coolant—For availability and ease in handling, water is recommended as the coolant wherever possible. It is of utmost importance to maintain a high quality of water in the cooling system. Contamination in the water will hasten scale formation, corrosion, and excessive electrolysis; any one of these conditions can greatly reduce tube life.

Use of Liquids other than Water as Coolant—When ambient temperatures fall below 0°C, it is possible to use coolants such as ethylene-glycol-water solution and FC75b. Neither of these two coolants is as effective a coolant as water, therefore, the plate dissipation and flow data must be modified from that given for water. A more extensive discussion of ethylene-glycol-water solution and FC75 as coolants is given in Ref. 4. For information on the use of any coolant for which ratings are not given in the data, contact your RCA field representative or the nearest District Sales Office. A coolant such as oil will require a special plating on the metal of the tube envelope, such as nickel and rhodium to protect the metal surfaces from chemical attack.

Conduction Cooling—The conduction-cooling system consists, in general, of a constant temperature device (heat sink) and suitable heat-flow path (coupling) between the heat sink and tube. Primary consideration of the system should be given to the design of a heat-flow path (coupling device) with high thermal conductivity.

Heat Sink—The heat sink should be designed to act as a constant-temperature device to prevent any increase in temperature by dissipating the heat beyond the equipment compartment. Heat sinks can take the form of solids or liquids. In most applications such a heat sink is available in the form of equipment chassis, plate line, or output cavity.

Coupling—There are numerous insulating materials available to serve as the heat-coupling device, such as beryllium oxide (beryllia)[C], high-aluminum oxide (high-alumina), mica, and other insulating bodies. Since the thermal conductivity of these insulators varies considerably, the choice of insulator will depend primarily on the plate dissipation in the given application. For a detailed discussion on conduction cooling, see Ref. 6

In hf operation the inductive element of the plate circuit is usually a relatively long coil, which does not provide a good thermal path from plate to chassis. Larger shunt capacity can be tolerated, however, and heat can be conducted through a portion of it to the chassis. In uhf operation the permissible shunt capacity of the plate circuit is limited, but the inductive element is short and can usually be made with sufficient cross-sectional area to form an excellent thermal path. In vhf operation a careful compromise of the above is required to obtain adequate rf performance and reasonable cooling.

PRECAUTIONS

The voltages at which power tubes are operated are extremely dangerous. Protection circuits must be provided which will protect operation and maintenance personnel, protect the tube in the event of abnormal circuit operation, and protect the tube circuits in the event of abnormal tube operation. Power tubes require mechanical protective devices such as interlocks, relays, and circuit breakers. Circuit breakers alone may not provide adequate protection in certain high-power-tube circuits when the power-supply filter, modulator, or pulse-forming network stores considerable energy. Additional protection may be provided by the use of high-speed electronic circuits

or electronic "crow-bars" to bypass the fault current until mechanical circuit breakers are opened.

Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel cannot possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies and discharge high-voltage capacitors when any gate or door on the protective housing is opened, and should prevent the closing of this primary circuit until the door is again locked.

ELECTRICAL CONSIDERATIONS

Cathode—RCA transmitting tubes use a wide variety of cathodes. All utilize thermionic emission and should be operated at a constant temperature.

Refer to the *General Section* of the Handbook for a detailed discussion on TYPES OF CATHODES AND THEIR USE.

Filament or Heater—The rated filament or heater voltage should be applied for the heating time specified in the published data to allow the cathode to reach normal operating temperature before voltages are applied to other electrodes.

The life of the cathode can be conserved by adjusting to the lowest filament or heater supply voltage that will give the desired performance. In general, the filament or heater voltage values given in the published data include the maximum value and the typical value. Exceeding the maximum value will damage or severely shorten the life of the cathode.

The filament or heater voltage should be adjusted to the typical value initially, then reduced to provide satisfactory tube performance; any further reduction will show some degradation.

Good regulation of the filament or heater voltage about the value found above is, in general, economically advantageous from the view-point of tube life. When the rated value is shown with a percentage value in the published data, the percentage value indicates the tolerable momentary fluctuations from the rated value. For longer life, especially at higher operating frequencies, these fluctuations should be reduced by improved power supply regulation.

The cathode may be subjected to back bombardment as the frequency is increased with resultant increase in temperature. In pulse types back bombardment normally need not be considered when the duty factor is small. However, higher duty factors increase the possibility of this effect. In any event, the filament or heater supply voltage should be reduced as described above.

Standby Operation—During standby periods, the tube may be operated at decreased filament or heater voltage to conserve life. It is recommended that the filament or heater voltage be reduced to no less than 80 per cent of normal during standby periods of up to 2 hours. For longer periods, the filament or heater voltage should be turned off.

Filament Overvoltage Pulse Circuits—In certain battery-operated equipment, such as emergency-type, remote-area, or mobile applications, it is of utmost importance to conserve battery power. Quick-heating RCA power tubes provide useful power outputs within about one second from a cold start. This fast "warm-up" feature eliminates the need for standby filament

power, resulting in significant conservation of battery power.

In general, "warm-ups" of about one second are adequate in equipment where the microphone switch actuating the transmitter power relay is located in the cradle of the handset, such as a conventional telephone, or similar wall-type installation. However, when the switch is the push-button type located on the handset, faster "warm-ups" are demanded. Extremely fast "warm-ups" of less than 200 milliseconds are possible for such "push-to-talk" microphone switches by the use of a suitably designed filament overvoltage pulse circuit or "hot-shot" circuit.

The diagram shown in Fig.3 depicts the filament-voltage waveform during a transmission using a "hot-shot" circuit. An overvoltage

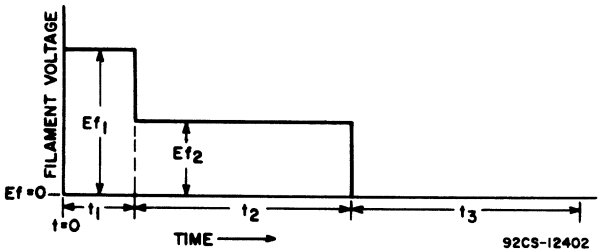


FIG.3 - FILAMENT VOLTAGE WAVE FORM

E_{f1} is applied for time t_1. A transfer switch then reduces the filament voltage to the rated value, E_{f2}, for the remainder of transmission time t_2. During standby time t_3, the filament voltage is zero.

The block diagram shown in Fig.4 depicts the basic requirements of a "hot-shot" circuit in conjunction with the communication equipment. The auxiliary circuit must provide a low-impedance filament overvoltage source, a rated filament voltage source, an accurately timed means of switching these sources, and a

protective circuit to prevent possible damage to the tube filament from repeated applications of overvoltage with insufficient time for the filament to cool between transmissions. Both filament voltages are obtained from the transmitter power supply. Power is supplied simultaneously to the transmitter and timer

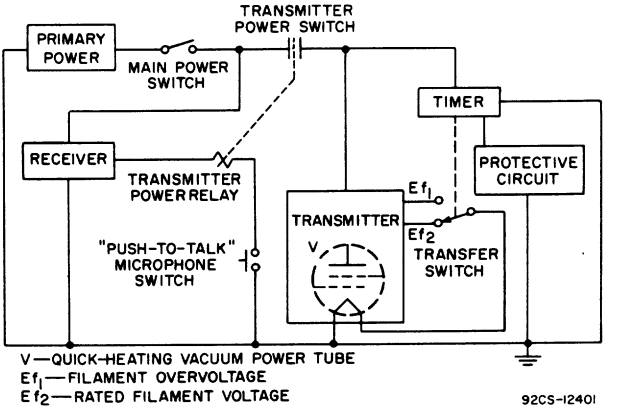


FIG.4 - BASIC RECEIVER-TRANSMITTER WITH AUXILIARY "HOT-SHOT" CIRCUIT

by the **"push-to-talk"** microphone switch. The **transfer switch,** which is initially connected to the **filament overvoltage** source, is switched by the **timer** to the **rated filament voltage** source in the required time (pulse duration) after application of power to the transmitter.

Before a "hot-shot" circuit can be designed for a quick-heating tube, it is necessary to establish maximum ratings for the peak voltage (on the order of 2 to 3 times the rated filament voltage) and duration of the filament overvoltage pulse for the desired heating time. Filament overvoltage pulse ratings are given in the published data on quick-heating tube types.

Any "hot-shot" circuit design must provide protection against the application of the filament overvoltage pulse to a hot filament.

It is recommended that a dummy filament, simulating the resistance of the specific tube type, be used in the initial testing or checking of a "hot-shot" circuit design. Otherwise, any fault—especially an excessive pulse duration can cause catastrophic failure of the tube.

Plate Voltage Supply—Power-amplifier tubes usually obtain plate voltage from rectifiers provided with suitable filter circuits, although batteries or local dc generators are sometimes used, especially in portable and mobile equipment.

A time-delay relay should be provided in the plate-supply circuit to delay application of plate voltage until the filament or heater has reached normal operating temperature.

An interlocking relay system should be provided to prevent application of plate voltage prior to the application of sufficient bias voltage and/or rf drive to grid No. 1; otherwise, with insufficient bias, the resultant high plate current may cause excessive plate dissipation with consequent damage to the tube. RF-load shorts or other causes of high output VSWR may also cause high dissipations, excessive voltage gradients, or insulator flashovers. The VSWR should be monitored and the detected signal used to actuate the interlock system to remove the plate voltage in less than 10 milliseconds after the fault occurs.

In beam power tubes with closely spaced electrodes, extremely high-voltage gradients occur even with moderate tube operating voltages. Consequently, momentary fault currents may cause catastrophic failure unless protection is provided. A series impedance in the plate lead is recommended. A resultant plate impedance, which will provide a plate-

voltage-supply regulation of no better than 10 per cent, is usually sufficient.

Grid-No.2 Voltage Supply—The grid No.2 must be protected by a time-delay and interlocking relay similar to the plate-voltage-supply protection described for Plate Voltage Supply. The plate voltage should be applied simultaneously with or before the grid-No.2 voltage; otherwise, with voltage on grid No.2 only, grid-No.2 current may be large enough to cause excessive grid-No.2 dissipation. If the grid-No.2 voltage is obtained from the plate voltage supply, these precautions will have been accomplished.

Grid-No.2 current is composed of a positive-current component resulting from cathode emission to grid No.2 and a negative-current component resulting from secondary-emission phenomena. Because the net result of these component currents is read on a meter in the grid-No.2 circuit, grid-No.2 dissipation can not be accurately determined. Operation similar to conditions given under *Typical Operation* in the published data will minimize the possibility of exceeding maximum dissipation.

In tubes with precision-aligned grids, such as Cermolox tubes, the grid-No.2 circuit must be capable of maintaining the proper grid-No.2 voltage in the presence of moderate negative dc current as well as normal values of positive current. Complete protection can be achieved by the use of a well-regulated power supply, a grid-No.2-to-ground impedance that is low enough to prevent gradual build-up of grid-No.2 voltage and/or catastrophic build-up (runaway) under negative-current conditions, and a current-overload relay to protect the grid No.2 against positive or negative currents on the order of one-tenth the required plate current.

‹CA Transmitting Tube
)perating Considerations

rid-No. l Voltage Supply—The grid-No.1 bias ircuit should preferably be adjustable to ermit small variations of grid-No.1 voltage. his bias adjustment will permit setting the esired plate current, and it will minimize ariations in tube performance. Sufficient ixed bias or cathode resistor bias should be rovided to protect the tube in the event that he drive signal is lost.

The design of the bias-voltage supply should nclude an instantaneous over-current relay. he action of the over-current relay and the nherent regulation of the supply should be uch that no damage to the tube or supply will esult from an accidental short at the tube onnection or from an internal tube fault.

The rf-power-input transmission line should e provided with VSWR protection to remove rive power as well as plate (and grid No.2) oltage within 10 milliseconds in the event f abnormal changes in input VSWR during peration.

CLASSES OF SERVICE

F Power Amplifiers—The current and power alues in the Maximum Ratings are averaged over ny audio-frequency cycle of sine-wave form. he driver stage should be capable of supplying t low distortion the No.1 grid(s) with the alue of peak af voltage given in the *Typical peration* of the published data. In no case hould the Grid-No.1-Circuit Resistance exceed he value specified under *Maximum Circuit alues*. Transformer or impedance coupling evices are recommended.

Individual bias adjustment for each tube unit) should be used to balance the loading nd minimize distortion. In push-pull operation he bias of each tube (unit) should be adjusted o divide the value of zero-signal plate cur-ent in the published data equally between the wo tubes (units).

RCA Transmitting Tube Operating Considerations

Except for class A amplifiers, the average plate and grid No.2 currents vary with the amplitude of the driving signal. Hence, serious distortion and inadequate power output will result with large input signals unless the plate and grid-No.2 power supplies are well regulated.

Class A—This class normally does not draw grid-No.1 current or requires tube driving power and can employ simple cathode bias. Where class A_2 (indicating grid-No.1 current flows during part of the cycle) is specified, the grid-No.1 circuit precautions discussed under class AB_2 operation will apply.

Class AB_1—The subscript 1 in class AB_1 indicates that grid-No.1 current does not flow during any part of the cycle.

Class B and Class AB_2—These classes normally draw grid-No.1 current (indicated by the subscript 2 in AB_2) with large signals and, therefore, require tube driving power. To minimize distortion, the grid-No.1 bias supply preferably should be regulated or held to a low value of effective resistance. Transformer coupling should be used.

RF Power Amplifiers or Oscillators—On modern ceramic-metal envelope types, the frequency selected is usually the maximum value at which reasonable gain and efficiency are obtained. In glass-envelope types, the maximum frequency is selected as the frequency above which excessive rf envelope losses require voltage deratings and reduced efficiency requires input deratings.

Driving power values given in the published data include only the power that must be delivered to the tube and bias supply. The term, "driving power", is normally used only at low frequencies where circuit losses are small.

Where *Driver-Power Output* is shown in the published data, the rf losses associated with a typical input circuit are also included.

In cathode-drive circuits, a portion of the driver-power output and the developed rf power output act in series to supply the load circuit. If the driving power is increased, the output will always increase. In a grid-drive circuit, a saturation effect takes place; i.e., above a certain value of driving voltage and current, the output increases very slowly and may even decrease. It is important to recognize this difference and not try to saturate a cathode-drive stage; otherwise, the maximum grid-No.1 and grid-No.2 input may easily be exceeded.

Parasitic oscillations may be experienced under certain operating conditions. Such oscillations result in erratic performance and may cause damage to the tube and/or associated circuitry. Operating conditions and external circuits should be adjusted for operation without oscillations. References 10 and 11 are suggested for further information on the detection and suppression of parasitic oscillations.

Class C Plate-Modulated-Power Amplifiers—In plate-modulated class C amplifier service, the tube can be modulated 100 per cent. The grid-No.2 voltage must be modulated simultaneously with the plate voltage so that the ratio of grid-No.2 voltage to plate voltage remains constant.

Grid-No.2 voltage should be obtained preferably from a separate source modulated from a separate winding on the modulation transformer.

Bias voltage may be obtained from a grid-No.1 resistor, but preferably is obtained from a combination of grid-No.1 resistor with either fixed supply or cathode resistor to protect the tube in the event the drive signal is lost.

In cathode-drive, plate-modulated, class C rf power amplifier service, the tube can be modulated 100 per cent if the rf driver stage is simultaneously modulated 100 per cent. Care should be taken to insure that the driver-modulation and amplifier-modulation voltages are exactly in phase.

Class C CW Power Amplifiers—In class C rf telegraphy service, the tube may generally be supplied with bias by any convenient method: from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods. However, when the tube is used in the final amplifier or a preceding stage of a transmitter designed for break-in operation and oscillator keying, an amount of fixed bias must be used to limit the plate current and, therefore, the plate dissipation to a safe value. Some fixed bias is preferred in any event to protect the tube in case the drive signal is lost.

Grid-No.2 voltage should be obtained preferably from a separate source. It can also be obtained from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should be used only when the tube is used in a circuit which is not keyed.

Linear RF Power Amplifiers—The classes of operation suitable for linear rf power amplifiers include: class A, class AB_1, class AB_2, class B with bias, and class B with zero bias. Class A operation is the more nearly linear, but it is also the least efficient. Application is generally limited to low-power-level amplification. Class AB_1 produces the best compromise for linearity, efficiency, and gain. Class AB_2 or class B operation provides higher output for applications where sufficient driving power is available to permit some "swamping", and where linearity requirements are less stringent. Class B zero-bias operation

with suitable high mu triodes may be used when adequate driving power is available.

In general, grid-No.2 voltage should be obtained from a separate, well-regulated source. In circuits where the grid-No.1 current is drawn, a separate, well-regulated source is also required.

(1) - **Single-Sideband, Suppressed Carrier Service**—Single sideband suppressed carrier operation is a form of linear amplifier service in which only one sideband is transmitted, and the carrier is suppressed.

The values of *Distortion Products Level* given under *Typical Operation* in the published data are referenced to either of the two tones for "two-tone" modulation and are without the use of feedback to enhance linearity.

(2) - **Class B and Class C Television Service**—Television is a form of linear amplifier service in which the rf carrier is modulated by a video signal. Typical operation is given at conditions of a specified bandwidth measured between the half-power points.

The values for the pertinent parameters given under *Typical Operation* in the published data are given at the synchronizing (sync) level and pedestal level (black level or blanking level).

(3) - **Class B Telephony Service**—Class B telephony service is a form of linear amplifier service in which the grid is excited with an rf carrier that is modulated at audio frequencies in one of the preceding stages. Under these conditions, plate dissipation is greatest when the carrier is unmodulated. Grid bias should be obtained from a dc voltage source of good regulation.

Pulsed RF Amplifiers and Oscillators—This service consists of the generation and amplification of an rf signal, the envelope of which is a waveform limited to intermittent

pulses of defined shape, duration, and repetition frequency. Pulse duration and duty factor are sometimes limited directly by the maximum ratings. More frequently, the maximum ratings define a relationship between these factors as a maximum "ON" time in a given time interval in order to cover pulse-train inputs. Typical operation, in general, is given for conditions with a rectangular waveshape pulse of a given duration and duty factor. For operation at pulse durations or duty factors other than those given in the published data, see Ref.12.

In the amplifier service, the power supply pulses should preferably start shortly after and end shortly before the rf drive pulse to reduce the possibility of parasitic oscillations. If the rf drive pulses are "gated" within the power-supply pulses (the rf drive pulse starts shortly after and ends shortly before the power-supply pulses), the desired "gate" conditions should be observed carefully when no rf drive pulse is present to be assured that no oscillations are present.

The peak input energy required during the pulse is normally obtained from capacitor banks that must store many times this peak value to prevent excessive voltage droop. Consequently, it is particularly important to observe all the precautions for limiting tube input during faults which are described under Grid-No.2 Voltage Supply.

Pulse-Modulated RF Amplifiers—This service consists of the simultaneous amplification and pulse modulation of a cw rf signal. If differs from the other more conventional modulated rf amplifier services in that the modulating waveform is limited to intermittent pulses of defined shape, duration, and repetition frequency. This type of amplification/modulation is normally done at low power levels; hence, few power tubes are rated specifically for this service.

Pulse Modulator Service—The tube supplies a modulation signal consisting of intermittent pulses of defined shape, duration, and repetition frequency. Ratings, waveforms, and precautions are similar to those given for pulsed rf amplifier service (except there is no rf drive signal).

Observation of the exact waveforms must be made with an oscilloscope. In this manner, transient voltage or current spikes caused by unavoidable circuit reactances may be observed. Transient values must be held within the maximum ratings given in the published data.

High-power pulse modulators, when used to "clip" or "flat-top" the output waveform by the overdriving technique, must provide grid-No.1 and grid-No.2 input protection.

Plate current flow during the "OFF" time will contribute to plate dissipation; the bias voltage should be sufficient to hold the plate current below the required levels for any tube. The control limits, such as found in the Characteristics Range Values will provide information in determining the required bias. Current flow during the rise time and the fall time of a "rectangular" pulse can contribute significantly to plate dissipation; this current flow should be considered if the theoretical plate dissipation is close to the rated value.

Voltage Regulator Service—The tube acts as a "pass tube" having a controllable voltage drop in a series-regulated voltage-supply circuit. The plate voltage rating can be interpreted as applying to the actual plate-to-cathode voltage of the tube rather than the supply voltage. In this case, adequate protective devices must be used to protect the tube in the event of a shorted load. Special precaution should be made to observe the maximum circuit values for grid-No.1 and grid-No.2 impedance. For information on voltage regulator circuits, see Refs. 13,14, and 15.

RCA Transmitting Tube Operating Considerations

It is recommended that only tube types rated for this service be used since the use of a high power vacuum tube in a high-voltage, low-current application will frequently result in the selection of a tube inadequately controlled in the low-current region.

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[a] Made by the Tempil Corp., 132 W. 22nd Street, New York 1, New York.

[b] Manufactured by the Fluorchemical Division, Minnesota Mining and Manufacturing Co., 900 Bush Avenue, St.Paul 6, Minnesota.

[c] **Warning: Beryllia dust and fumes are highly toxic to mucous membranes and may cause serious ulcers when imbedded under the skin. See References 7, 8, and 9.**

REFERENCES

Copies for references 1, 3, 4, and 6 may be obtained by writing to Commercial Engineering, Radio Corporation of America, Harrison, New Jersey.

1. *Techniques for Measuring Electron-Tube Bulb Temperatures, RCA Application Note, AN-200.*

2. *Design Manual of Natural Methods of Cooling Electronic Equipment,* Department of the Navy, Bureau of Ships, Navships 900, 192.

3. *Blower Requirements for RCA Forced-Air-Cooled Tubes,* RCA Application Note, AN-161.

4. *Application Guide for RCA Super-Power Tubes,* 1CE-279A.

5. *Design Manual of Methods of Liquid Cooling Electronic Equipment,* Department of the Navy, Bureau of Ships, Navships 900, 195.

6. J. W. Gaylord, *"The Conduction Cooling of Power Tubes in Vehicular Communication Equipment,"* IEEE Transactions on Vehicular Communications, September, 1963.

Cont'd

7. D. W. White, Jr. and J. E. Burke, *"The Metal Beryllium"* (book), published by the American Society for Metals, Cleveland, Ohio.

8. Donald P. O'Neil, *"Toxic Materials Machined Safely,"* American Machinist, June 4. 1955.

9. Sidney Laskin, Robert A. N. Turner, and Herbert E. Stokinger, *"Analysis of Dust and Fume Hazards in a Beryllium Plant,"* U.S. Atomic Energy Commission, MDDC-1355.

10. F. E. Terman, *"Radio Engineers' Handbook,"* pages 498 to 503 of 1943 edition. Published by McGraw-Hill Pub. Co., Inc.

11. EE Staff of MIT, *"Applied Electronics,"* page 619.

12. *Predicted Cathode Capability,* RCA Power Tube Engineering Note, IEN-1.

13. F. V. Hunt, & R. W. Hickman, Review of Scientific Instruments, *"On Electronic Voltage Stabilizers,"* January, 1939.

14. F. E. Terman, *"Radio Engineers' Handbook,"* pages 614 and 615 of 1943 edition. Published by McGraw-Hill Pub. Co., Inc.

15. Cruft Electronics Staff, *"Electronic Circuits and Tubes,"* page 575. Published by McGraw-Hill Pub. Co., Inc.

Transmitting Tube Ratings vs Operating Frequency

The MAXIMUM RATINGS given for each type on its data pages apply only when the type is operated at frequencies lower than some specified value which depends on the design of the type. As the frequency is raised above the specified value, the radio-frequency currents, dielectric losses, and heating effects increase rapidly. Most types can be operated above their specified maximum frequency provided the plate voltage and plate input are reduced in accordance with the information given in the following tabulation.

TUBE TYPE	OPERATING FREQUENCY Mc	MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM RATED PLATE VOLTAGE & PLATE INPUT		
		TELEPHONY		TELEGRAPHY
		Class B, Class C Grid or Suppressor Modulated	Class C Plate-Modulated	Class C Unmodulated
8D21	300	100	–	100
207	Same as for Type 892			
211	15	100	100	100
	30	88	80	80
	80	70	50	50
801-A	60	100	100	100
	75	93	80	80
	120	78	50	50
803	20	100	100	100
	40	86	77	77
	60	80	60	60
805	30	100	100	100
	45	90	82	82
	80	77	55	55
807	60	100	100	100
	80	90	80	80
	125	75	55	55
809	60	100	100	100
	70	93	88	88
	120	75	50	50
810	30	100	100	100
	60	88	70	70
	100	80	50	50
813[a]	30	100	100	100
	60	88	75	75
	120	76	50	50

[a] In Self-Rectifying Oscillator or Amplifier Service, and in Amplifier or Oscillator Service with Separate, Rectified, Unfiltered, Single-Phase, Full-Wave Plate Supply, the 813 has the same maximum permissible percentages as those shown for Class C Telegraphy.

Transmitting Tube Ratings vs Operating Frequency

TUBE TYPE	OPERATING FREQUENCY Mc	MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM RATED PLATE VOLTAGE & PLATE INPUT		
		TELEPHONY		TELEGRAPHY
		Class B, Class C Grid or Suppressor Modulated	Class C Plate-Modulated	Class C Unmodulated
814	30 50 75	100 90 85	100 80 64	100 80 64
815	125 175 200	100 85 75	100 80 70	100 80 70
828	30 50 75	100 90 80	100 80 65	100 80 65
830-B	15 30 60	100 87 74	100 77 54	100 77 54
832-A	200 250	– –	100 89	100 89
834	100 170 350	100 89 73	100 80 53	100 80 53
835	20 40 100	100 85 70	100 80 50	100 80 50
837	20 40 60	– – –	100 76 62	100 76 62
838	30 60 120	100 85 70	100 75 50	100 75 50
860	Same as for Type 838			
880	 25 50 75 100	*Voltage* *Input* 100 100 80 94 68 85 60 75	100 72 56 45	100 75 62 50
889-A	50 100 150	100 85 72	100 75 50	100 75 50
889R-A	 40 65 100	 100 85 72	 100 78 60	*Volt.* *Input* 100 100 87 73 65 50

Transmitting Tube Ratings vs Operating Frequency

TUBE TYPE	OPERATING FREQUENCY Mc	MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM RATED PLATE VOLTAGE & PLATE INPUT		
		TELEPHONY		TELEGRAPHY
		Class B, Class C Grid or Suppressor Modulated	Class C Plate-Modulated	Class C Unmodulated
891	1.6 7.5 20	– – –	– – –	100 75 50
891-R	1.6 7.5 20	– – –	– – –	100 75 50
892	1.6 7.5 20	100 85 76	100 85 75	100 75 50
892-R	1.6 7.5 20	100 85 76	100 75 50	100 75 50
1613	45 60 90	– – –	100 90 85	100 90 85
1614	80 120	– –	100 75	100 75
1619	45 60 90	100 93 85	100 90 77	100 90 77
1624	60 80 125	100 90 75	100 80 55	100 80 55
1625	Same as for Type 807			
1626	30 60 90	– – –	– – –	100 96 93
5713	220	–	–	100
5763	 50 175	 – –	*Volt. Input* 100 100 100 80	*Volt. Input* 100 100 100 80
5771	 1.6 25 50	 100 100 75	 100 100 75	*Volt. Input* 120 112.5 100 75
5786	160	–	100	100
6417	Same as for Type 5763			
8005	60 80 100	100 90 83	100 75 60	100 75 60

CIRCUITS FOR HOT-CATHODE MERCURY-VAPOR & GAS RECTIFIER TUBES

Numerical Relationships Among Electrical Quantities

E = Trans. Sec. Voltage (RMS)
E_{av} = Average DC Output Voltage
E_{bmi} = Peak Inverse Anode Voltage
E_m = Peak DC Output Voltage
E_r = Major Ripple Voltage (RMS)
f = Supply Frequency
f_r = Major Ripple Frequency
P_{dc} = DC Power ($E_{av} \times I_{av}$)
I_{av} = Average DC Output Current
I_b = Average Anode Current
I_p = Anode Current (RMS)
I_{pm} = Peak Anode Current
P_{al} = Line Volt-Amperes
P_{ap} = Trans. Pri. Volt-Amperes
P_{as} = Trans. Sec. Volt-Amperes

Note: Conditions assumed involve sine-wave supply; zero voltage drop in tubes; no losses in transformer and circuit; no back emf in the load circuit; and no phase-back.

RATIO	Fig. 1	Fig. 2	Fig. 3	Fig. 4	Fig. 5*	Fig. 6	Fig. 7	Fig. 8
Voltage Ratios								
E/E_{av}	2.22	1.11	1.11	0.854	0.854	0.427	0.785	0.74
E_{bmi}/E	1.41	2.83	1.41	2.45	2.45	2.45	2.83	2.83
E_{bmi}/E_{av}	3.14	3.14	1.57	2.09	2.09	1.05	2.22	2.09
E_m/E_{av}	3.14	1.57	1.57	1.21	1.05	1.05	1.11	1.05
E_r/E_{av}	1.11	0.472	0.472	0.177	0.04	0.04	0.106	0.04
Frequency Ratio								
f_r/f	1	2	2	3	6	6	4	6
Current Ratios								
I_p/I_{av}	1.57	0.785	0.785	0.578	0.289	0.578	0.5	0.408
I_b/I_{av}	1	0.5	0.5	0.33	0 167	0.33	0.25	0.167
Resistive Load								
I_{pm}/I_{av}	3.14	1.57	1.57	1.21	0.52	1.05	1.11	1.05
I_{pm}/I_b	3.14	3.14	3.14	3.63	3.14	3.14	4.5	6.3
Inductive Load□								
I_{pm}/I_{av}	—	1	1	1	0.5	1	1	1
Power Ratios								
Resistive Load								
P_{as}/P_{dc}	3.49	1.74	1.24	—	—	—	—	—
P_{ap}/P_{dc}	2.69	1.23	1.24	—	—	—	—	—
P_{al}/P_{dc}	2.69	1.23	1.24	—	—	—	—	—
Inactive Load□								
P_{as}/P_{dc}	—	1.57	1.11	1.71	1.48	1.05	1.57	1.81
P_{ap}/P_{dc}	—	1.11	1.11	1.21	1.05	1.05	1.11	1.29
P_{al}/P_{dc}	—	1.11	1.11	1.21	1.05	1.05	1.11	1.05

* Bleeder current of 2% full-load current will provide exciting current for balance coil and thus avoid poor regulation at light loading.

□ The use of a large filter-input choke is assumed.

CIRCUITS FOR HOT-CATHODE MERCURY-VAPOR & GAS RECTIFIER TUBES

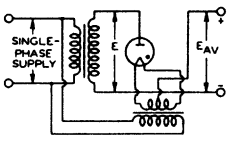


FIG. 1 HALF-WAVE SINGLE-PHASE

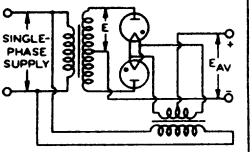


FIG. 2 FULL-WAVE SINGLE-PHASE

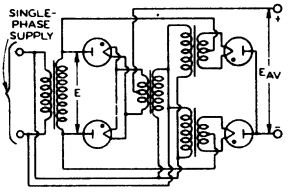


FIG. 3 SERIES SINGLE-PHASE

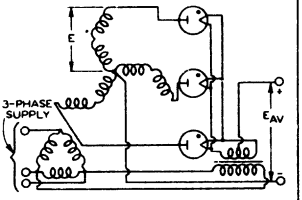


FIG. 4 HALF-WAVE THREE-PHASE

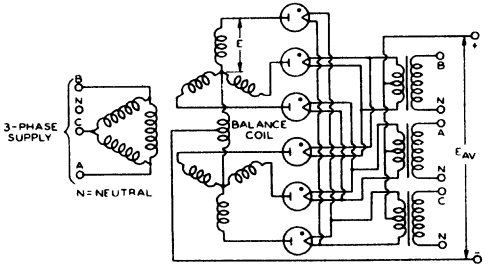


FIG 5 PARALLEL THREE-PHASE (QUADRATURE OPERATION)

92CL-7673A

CIRCUITS FOR HOT-CATHODE MERCURY-VAPOR & GAS RECTIFIER TUBES

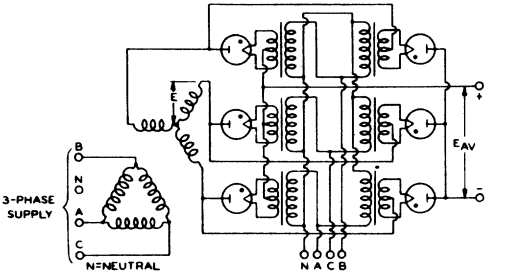


FIG. 6 SERIES THREE-PHASE (QUADRATURE OPERATION)

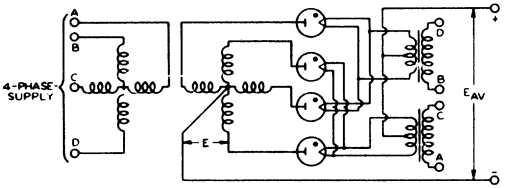


FIG. 7 HALF-WAVE FOUR-PHASE (QUADRATURE OPERATION)

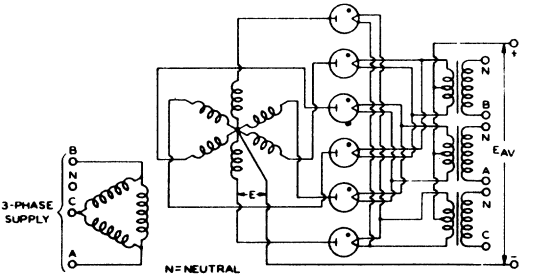


FIG. 8 HALF-WAVE SIX-PHASE (QUADRATURE OPERATION)

92CL-7673B

OZ4-A

Full-Wave Gas Rectifier

METAL TYPE HAVING IONICALLY HEATED CATHODE

GENERAL DATA

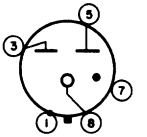
Electrical:

Cathode . . . . . Ionically Heated Type

Mechanical:

Operating Position. . . . . Any
Maximum Overall Length. . . . . 2-5/8"
Maximum Seated Length . . . . . 2-1/16"
Maximum Diameter. . . . . 1-5/16"
Dimensional Outline . . . . . See *General Section*
Envelope. . . . . .Metal Shell MT8G
Base. . . .Small-Wafer Octal 5-Pin (JEDEC Group 1, No.B5-215)
Basing Designation for BOTTOM VIEW. 4R

Pin 1 - Shell
Pin 3 - Plate No.2
Pin 5 - Plate No.1



Pin 7 - No Connection
Pin 8 - Cathode

FULL-WAVE RECTIFIER

Maximum and Minimum Ratings, *Design-Center Values Except as Noted:*

PEAK INVERSE PLATE VOLTAGE PER PLATE. . . .	880	max.	volts
PEAK STARTING-SUPPLY VOLTAGE PER PLATE. . .	300▲	min.	volts
PEAK PLATE CURRENT PER PLATE.	330	max.	ma
DC OUTPUT CURRENT	110	max.	ma
	30▲	min.	ma

Typical Operation:

With vibrator-type power supply and capacitor input to filter

Peak Plate Supply Voltage Per Plate●.	440	volts
Filter-Input Capacitor.	8	μf
Total Effective Plate Supply Impedance Per Plate .	600	ohms
DC Output Voltage at input to filter.	310	volts
DC Output Current	100	ma

Characteristics:

Tube Voltage Drop for plate ma. =110 (Per plate) .	24	volts

Minimum Circuit Value:

Total Effective Plate Supply Impedance Per Plate.	300 min.	ohms

▲ Absolute value. Under no circumstances should the tube be operated with less than this value.

● Open-circuit voltage—flat portion of transformer voltage wave.

Half-Wave Vacuum Rectifier

ELECTRICAL

Bogey Values

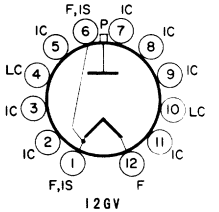
Filament (Coated) Voltage, AC or DC	1.25 V
Filament Current	0.2 A
Direct Interelectrode Capacitance (Approx.)	
Without external shield	
Plate to filament	1.6 pF

MECHANICAL

Operating Position	Any
Type of Cathode	Coated Filament
Maximum Overall Length	3.125 in
Seated Length	2.500 to 2.750 in
Diameter	1.062 to 1.188 in
Dimensional Outline (JEDEC No.9-98)	See *General Section*
Envelope	JEDEC T9
Caps (Alternates)	
Small (JEDEC No.C1-1)	
Small with Tubular Support (JEDEC No.C1-34)	
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Filament, Internal Shield
Pin 2 – Do Not Use[a]
Pin 3 – Do Not Use[a]
Pin 4 – See **Note**
Pin 5 – Do Not Use[a]
Pin 6 – Same as Pin 1
Pin 7 – Do Not Use[a]
Pin 8 – Do Not Use[a]
Pin 9 – Do Not Use[a]
Pin 10 – See **Note**
Pin 11 – Do Not Use[a]
Pin 12 – Filament
Cap – Plate



12GV

Note: *May be used only under conditions specified in Operating Considerations.*

PULSED-RECTIFIER SERVICE

Design-Maximum Ratings

For operation in a 525-line, 30-frame system

Inverse Plate Voltage		
Total dc and peak[b]	26000	V
DC	22000	V
Peak Plate Current	50	mA
Average Plate Current	0.5	mA
Filament Voltage, AC or DC	1.05 to 1.45	V

Characteristics, Instantaneous Value

Tube Voltage Drop for plate mA = 7	225	V

[a] Socket terminals 2, 3, 5, 7, 8, 9, and 11 should not be used as tie points.

[b] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

◄ Indicates a change.

OPERATING CONSIDERATIONS

Socket Connections. Socket terminals 4 and 10 may be used as tie points for components at or near the cathode potential; otherwise, do not use.

The high voltages at which the 1AD2 is operated are very dangerous. Great care should be taken in the design of equipment to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in the measurement of filament voltage. Under all circumstances, circuit parts which may be at high potentials should be enclosed or adequately insulated.

X-Radiation. The voltages employed in some television receivers and other high-voltage equipment are sufficiently high that high-voltage rectifier tubes may produce *X-radiation* which can constitute a health hazard unless such tubes are adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

1G3GT/1B3GT

Half-Wave Vacuum Rectifier

ELECTRICAL

Filament, Coated

	Min	*Av*	*Max*	
Voltage (AC)	1.05	1.25	1.45	V
Current at 1.25 volts	-	0.2	-	A

Direct Interelectrode Capacitance (Approx.)[a]

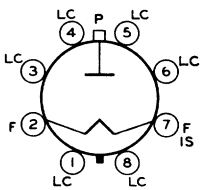
Plate to filament & internal shield	1.3	pF

MECHANICAL

Operating Position . . . . . Any
Maximum Overall Length . . . . . 3-9/16 in
Seated Length . . . . . 2-13/16 ± 3/16 in
Maximum Diameter . . . . . 1-9/32 in
Bulb T9
Cap . . . . . Small with Tubular Support (JEDEC No.C1-34)
Bases (Alternates)
- Intermediate-Shell Octal:
  - 8-Pin (JEDEC Group 1, No.B8-6)
  - 7-Pin, Arrangement 2 (JEDEC Group 1, No.B7-166)
  - 6-Pin, Arrangement 1 (JEDEC Group 1, No.B6-8)
  - 5-Pin, Arrangement 2 (JEDEC Group 1, No.B5-82)
- Short Intermediate-Shell Octal:
  - 7-Pin (JEDEC Group 1, No.B7-47)
- Short Intermediate-Shell Octal with External Barriers:
  - 6-Pin, Arrangement 1 (JEDEC Group 1, No.B6-60)
  - 5-Pin, Arrangement 2 (JEDEC Group 1, No.B5-85)

Basing Designation for BOTTOM VIEW 3C

Pin 1[b] - Limited Connection[c]
Pin 2 - Filament
Pin 3 - Same as Pin 1
Pin 4[d] - Same as Pin 1
Pin 5 - Same as Pin 1
Pin 6[e] - Same as Pin 1
Pin 7 - Filament, Internal Shield
Pin 8 - Same as Pin 1
Cap - Plate



PULSED-RECTIFIER SERVICE

Maximum Ratings, Design-Maximum Values

For operation in a 525-line, 30-frame system

Inverse Plate Voltage		
Total dc and peak[f]	26000	V
DC	22000	V
Peak Plate Current	50	mA
Average Plate Current	0.5	mA

Characteristics, Instantaneous Value

Tube Voltage Drop for plate mA = 7	100	V

RADIO-FREQUENCY RECTIFIER SERVICE

Maximum Ratings, Design-Maximum Values

For operation in a 525-line, 30-frame system

Peak Inverse Plate Voltage	33000	V
Peak Plate Current	35	mA
Average Plate Current	1.1	mA
Frequency Range of Supply Voltage	1.5 to 100	kc/s

Characteristics, Instantaneous Value

Tube Voltage Drop for plate mA = 7	100	V

[a] Without external shield.

[b] On the 5-pin bases, pin 1 is omitted.

[c] See *Operating Considerations*.

[d] On the 5-pin bases, the 6-pin bases, and the 7-pin base JEDEC No.B7-166, pin 4 is omitted.

[e] On the 5-pin bases, the 6-pin bases, and the 7-pin base JEDEC No.B7-47, pin 6 is omitted.

[f] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

OPERATING CONSIDERATIONS

Socket Connections. Socket terminals 1, 3, 4, 5, 6, and 8 may be connected to socket terminal 7 or to a corona shield which is connected to socket terminal 7. Socket terminals 4 and 6 may be used as tie points for components at or near filament potential. Otherwise, do not use.

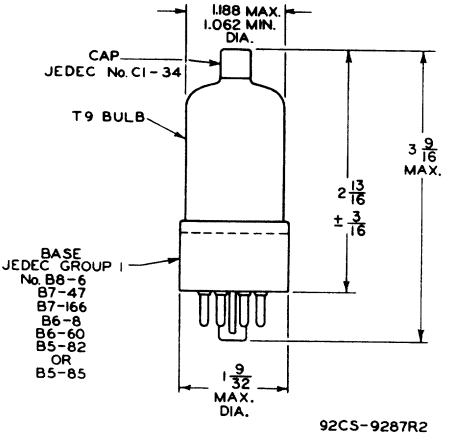
Measurement of Filament Voltage. To measure the filament voltage when the filament is at a high dc potential with respect to ground, it is recommended that a simple method utilizing visual comparison of the filament temperature be used. The color temperature of the filament, operating from a pulse- or rf-power source, may be checked by observing in a darkened room the reflection of the incandescent filament upon the surface of the internal shield. A visual comparison of this color temperature with that obtained when the filament of another 1G3GT/1B3GT is operated from a dc or low-frequency ac supply of 1.25 volts, provides a convenient means for adjusting the amount of excitation to produce 1.25 volts (rms) at the filament terminals.

The high voltages at which the 1G3GT/1B3GT is operated are very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in the measurement of filament voltage. Under all circumstances, circuit parts which may be at high potentials should be enclosed or adequately insulated.

X-Radiation. The voltages employed in some television receivers and other high-voltage equipment are sufficiently high that high-voltage rectifier tubes may produce *X-radiation* which can constitute a health hazard unless such tubes are adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

IL4

R-F AMPLIFIER PENTODE

MINIATURE TYPE

Filament	Coated	
Voltage	1.4	d-c volts
Current	0.05	amp.
Direct Interelectrode Capacitances:°		
Grid to Plate	0.008 max.	μμf
Input	3.6	μμf
Output	7.5	μμf
Maximum Overall Length		2-1/8"
Maximum Seated Height		1-7/8"
Maximum Diameter		3/4"
Bulb		T-5-1/2
Base ▲		Miniature Button 7-Pin

Pin 1 - Filament -, Internal Shield
Pin 2 - Plate
Pin 3 - Screen
Pin 4 - No Connection
Pin 5 - Filament -, Internal Shield
Pin 6 - Grid
Pin 7 - Filament +

BOTTOM VIEW (6AR)

RCA Socket — Stock No. 9914
Mounting Position — Any

Maximum And Minimum Ratings Are Design-Center Values

AMPLIFIER

Plate Voltage	110 max. volts
Screen Voltage	90 max. volts
Screen Supply Voltage	110 max. volts
Grid Voltage	0 min. volts
Total Cathode Current	6.5 max. ma.

Typical Operation and Characteristics - Class A_1 Amplifier

Plate Voltage	90	90	volts
Screen Voltage	67.5	90	volts
Grid Voltage	0	0	volts
Plate Resistance	0.6	0.35	megohm
Transconductance	925	1025	μmhos
Grid Bias for Plate Current = 10 μ amp.	-6	-8	volts
Plate Current	2.9	4.5	ma.
Screen Current	1.2	2.0	ma.

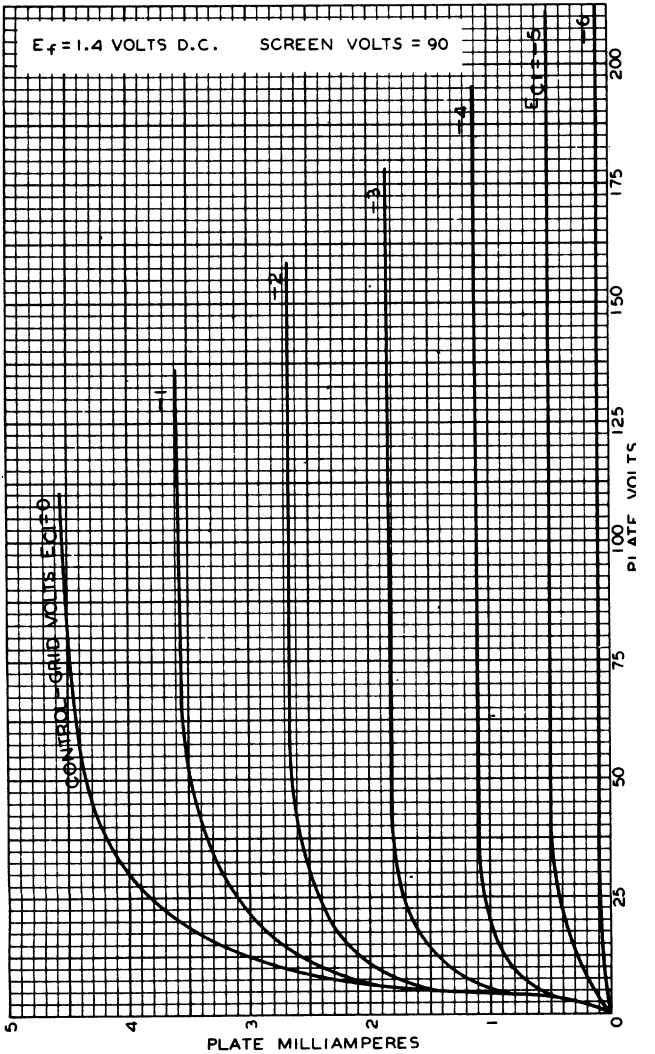
° With no external shield.

▲ *The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole.*

IL4

IL4

AVERAGE PLATE CHARACTERISTICS



MARCH 18, 1942

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-6382

IV2

HALF-WAVE VACUUM RECTIFIER

9-PIN MINIATURE TYPE

GENERAL DATA

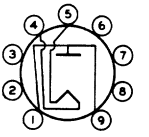
Electrical:

Filament, Coated:		
Voltage*	0.625	ac volt
Current	0.3	amp
Direct Interelectrode Capacitance (Approx.):°		
Plate to filament	0.8	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Maximum Diameter	7/8"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1) ←
Basing Designation for BOTTOM VIEW	9U ←

Pin 1 - Plate
Pin 2 - Internal Connection - Do Not Use
Pin 3 - Same as Pin 2
Pin 4 - Filament



Pin 5 - Filament
Pin 6 - No Connection ♦
Pin 7 - Same as Pin 2
Pin 8 - Same as Pin 2
Pin 9 - Plate

PULSED-RECTIFIER SERVICE

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system□

INVERSE PLATE VOLTAGE:			
Total dc and peak (Absolute maximum)⊕	8250■	max.	volts ←
DC	6600	max.	volts ←
PEAK PLATE CURRENT	10	max.	ma
AVERAGE PLATE CURRENT	0.5	max.	ma

* Under no circumstances should the filament voltage be less than 0.525 volt or more than 0.725 volt.

° Without external shield.

♦ May be used for a tie point for components at or near filament potential; otherwise do not use.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

⊕ The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

■ Under no circumstances should this absolute value be exceeded.

←Indicates a change.

1V2

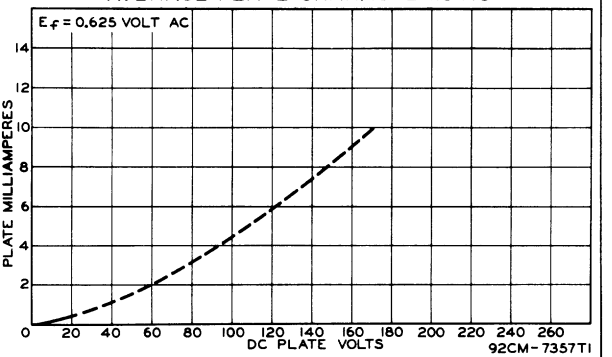
HALF-WAVE VACUUM RECTIFIER

OPERATING CONSIDERATIONS

When the *filament voltage* is measured, it is recommended that a thermal rms voltmeter be used. The meter and its leads must be insulated to withstand 15,000 volts and the stray capacitances to ground should be minimized.

→ To provide the required insulation in Noval sockets designed with a cylindrical center shield, it is necessary to remove the center shield.

AVERAGE PLATE CHARACTERISTIC



→ Indicates a change.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1X2B

Half-Wave Vacuum Rectifier

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Filament, Coated:

	Min.	Av.	Max.	
Voltage (AC)	1.05	1.25	1.45	volts
Current at 1.25 volts	–	0.2	–	amp

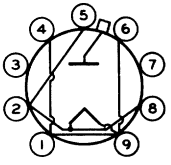
Direct Interelectrode Capacitance (Approx.):[a]

Plate to filament & internal shield	1	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-27/32"
Seated Length	2-7/16" ± 1/8"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Cap	Skirted Miniature (JEDEC No.C1-2 or C1-33)
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9Y

Pin 1 – Filament, Internal Shield
Pin 2 – Filament
Pin 3 – Limited Connection[b]
Pin 4 – Same as Pin 1



Pin 5 – Same as Pin 2
Pin 6 – Same as Pin 1
Pin 7 – Same as Pin 3
Pin 8 – Same as Pin 2
Pin 9 – Same as Pin 1
Cap – Plate

PULSED-RECTIFIER SERVICE

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[c]

INVERSE PLATE VOLTAGE:		
Total dc and peak[d]	22000 max.	volts
DC	18000 max.	volts
PEAK PLATE CURRENT	45 max.	ma
AVERAGE PLATE CURRENT	0.5 max.	ma

Characteristics, Instantaneous Value:

Tube Voltage Drop for plate ma. = 7	100	volts

[a] Without external shield.

[b] See *Operating Considerations.*

[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[d] The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

← Indicates a change.

OPERATING CONSIDERATIONS

Socket Connections. Socket terminals 3 and 7 may be used as tie points for components at or near filament potential; otherwise, do not use.

Measurement of Filament Voltage. To measure the filament voltage when the filament is at a high dc potential with respect to ground, it is recommended that a simple method utilizing visual comparison of the filament temperature be used. The color temperature of the filament, operating from a pulse-or-rf-power source, may be checked by observing in a darkened room the reflection of the incandescent filament upon the surface of the internal shield. A visual comparison of this color temperature with that obtained when the filament of another 1X2B is operated from a dc or low-frequency ac supply of 1.25 volts, provides a convenient means for adjusting the amount of excitation to produce 1.25 volts (rms) at the filament terminals.

The high voltages at which the 1X2B is operated are very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in the measurement of filament voltage. Under all circumstances, circuit parts which may be at high potentials should be enclosed or adequately insulated.

X rays. The voltages employed in some television receivers and other high-voltage equipment are sufficiently high that high-voltage rectifier tubes may produce *X rays* which can constitute a health hazard unless such tubes are adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

2AS2

Half-Wave Vacuum Rectifier

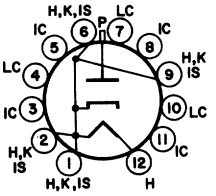
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	2.5 ± 0.4	volts
Current at heater volts = 2.5	0.330	amp
Direct Interelectrode Capacitance (Approx.):[a]		
P to (K + IS + H)	1.4	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.625"
Seated Length	3.000" to 3.250"
Diameter	1.062" to 1.188"
Bulb	T9
Cap	Small (JEDEC No.C1-1) or Small With Tubular Support (JEDEC No.C1-34)
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW	12EW

Pin 1 - Heater, Cathode, Internal Shield
Pin 2 - Same as Pin 1
Pin 3 - Do Not Use[b]
Pin 4 - See *Note*
Pin 5 - Do Not Use[b]
Pin 6 - Same as Pin 1
Pin 7 - See *Note*
Pin 8 - Do Not Use[b]
Pin 9 - Same as Pin 1
Pin 10 - See *Note*
Pin 11 - Do Not Use[b]
Pin 12 - Heater
Cap - Plate



NOTE: May be used only under conditions specified in Operating Considerations.

PULSED-RECTIFIER SERVICE

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[c]

Inverse Plate Voltage:		
Total dc and peak[d]	30000 max.	volts
DC	24000 max.	volts
Peak Plate Current	80 max.	volts
Average Plate Current	1.5 max.	volts

Characteristics, Instantaneous Value:

Tube Voltage Drop for plate ma. = 7	100	volts

[a] Without external shield.
[b] Socket terminals 3, 5, 8, and 11 should not be used as tie points.

c As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

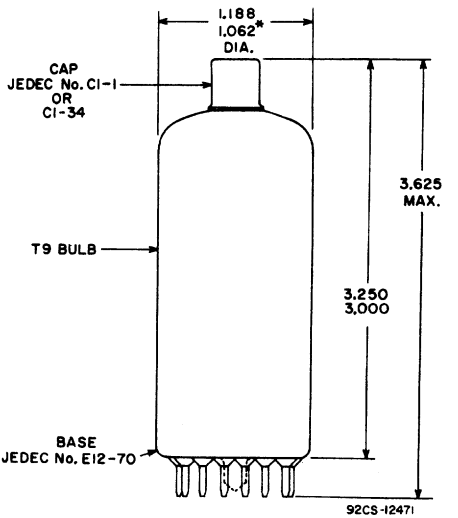
d This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

OPERATING CONSIDERATIONS

Socket Connections. Socket terminals 4, 7, and 10 may be used as tie points for components at or near the cathode potential; otherwise, do not use.

Ths high voltages at which the 2AS2 is operated are very dangereous. Great care should be taken in the design of equipment to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in the measurement of heater voltage. Under all circumstances, circuit parts which may be high potentials should be enclosed or adequately insulated.

X-radiation. The voltages employed in some television receivers and other high-voltage equipment are sufficiently high that high-voltage rectifier tubes may produce *X-radiation* which can constitute a health hazard unless such tubes are adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.



DIMENSIONS IN INCHES

* Applies to minimum diameter except in area of seal.

2AV2

Half-Wave Vacuum Rectifier

Useful in High-Voltage, Low-Current Applications such as Pulse-Operated, Focus-Rectifier Circuits in Color TV Receivers

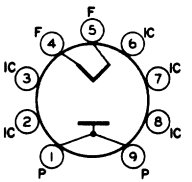
ELECTRICAL

Filament Characteristics and Ratings		
Voltage (AC)	1.80 ± 0.27	V
Current at 1.80 V	0.225	A ←
Direct Interelectrode Capacitance (Approx.)[a]		
Plate to filament	0.8	pF ←

MECHANICAL

Operating Position	Any
Type of Cathode	Coated Filament
Maximum Overall Length	2-3/16 in
Maximum Seated Length	1-15/16 in
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16 ± 3/32 in
Diameter	0.750 to 0.875 in
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Socket	See *Operating Considerations*
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9U

Pin 1 – Plate
Pin 2 – Do Not Use[b]
Pin 3 – Do Not Use[b]
Pin 4 – Filament
Pin 5 – Filament



Pin 6 – Do Not Use[b]
Pin 7 – Do Not Use[b]
Pin 8 – Do Not Use[b]
Pin 9 – Plate

HALF-WAVE PULSED RECTIFIER

Design-Maximum Ratings

Except as Noted

For Operation in a 525-line, 30-frame system[c]

Inverse Plate Voltage		
Peak (Absolute-maximum value)[d]	8250[e]	V
DC	7000	V
Plate Current		
Peak	50	mA ←
Average	0.6	mA

Characteristics, Instantaneous Value

Tube Voltage Drop for plate mA = 1	20	V ←

← Indicates a change.

[a] Without external shield.

[b] See *Operating Considerations*.

[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations". Federal Communications Commission.

[d] The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[e] Under no circumstances should this absolute-maximum value be exceeded.

OPERATING CONSIDERATIONS

Socket Connections. The base pins of the 2AV2 fit the Noval 9-contact socket. Socket terminals 2, 3, 6, 7, and 8 should not be used as tie points for external-circuit components. The socket should be made of material having low leakage and should have adequate insulation between its filament and plate terminals to withstand the maximum peak-inverse plate voltage. To provide the required insulation in Noval 9-contact sockets having a cylindrical center shield, it is necessary to remove the center shield. In addition, it is recommended that socket clips for pins 2, 3, 6, 7, and 8 be removed to minimize leakage and the possibility of arc-over.

Measurement of Filament Voltage. It is recommended that a thermal rms voltmeter be used to measure filament voltage. The meter and its leads must be insulated to withstand 15,000 volts. To minimize loading of the rectifier circuit during this measurement, stray capacitances to ground should be kept as low as possible.

High Voltages. The high voltage at which the 2AV2 is operated are very dangerous. Great care should be taken in the design of equipment to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in measuring the filament voltage particularly in those circuits where the filament is not grounded. In all cases, all circuit parts which may be at high potentials should be enclosed and interlock switches should be used to open the primary circuit of the high-voltage power supply when access to the equipment is required.

2BJ2

Half-Wave Vacuum Rectifier

9-PIN MINIATURE TYPE

For High-Voltage Rectifier Service in Transistorized TV Receivers

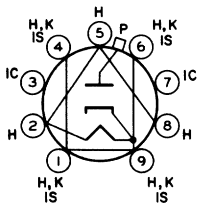
ELECTRICAL

Heater Characteristics and Ratings		
Voltage (AC)	2.30 ± 0.30	V
Current at 2.30 V	0.300	A
Direct Interelectrode Capacitance (Approx.)		
Without external shield		
P to (K + IS + H)	1.0	pF

MECHANICAL

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-27/32 in
Seated Length	2-7/16 ± 1/8 in
Diameter	0.750 to 0.875 in
Dimensional Outline (JEDEC No.6-7)	See *General Section*
Bulb	T6-1/2
Cap	Skirted Miniature (JEDEC No.C1-2 or C1-33)
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9RT

Pin 1 – Heater, Cathode, Internal Shield
Pin 2 – Heater
Pin 3 – Do Not Use
Pin 4 – Same as Pin 1
Pin 5 – Heater
Pin 6 – Same as Pin 1
Pin 7 – Do Not Use
Pin 8 – Heater
Pin 9 – Same as Pin 1
Cap – Plate



PULSED-RECTIFIER SERVICE

For operation in a 525-line, 30-frame system

Maximum Ratings, Design-Maximum Values

Peak Inverse Plate Voltage[a]	20000	V
Peak Plate Current	80	mA
Average Plate Current	1.0	mA

Characteristic, Instantaneous Value

Tube Voltage Drop for plate mA = 7	80	V

[a] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

OPERATING CONSIDERATIONS

Socket Connections. The base pins of the 2BJ2 fit the Noval 9-contact socket. Socket terminals 3 and 7 should not be used as tie points for external-circuit components.

The high voltages at which the 2BJ2 is operated are very dangerous. Great care should be taken in the design of equipment to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in the measurement of heater voltage. Under all circumstances, circuit parts which may be at high potentials should be enclosed or adequately insulated.

X-radiation. The voltages employed in some television receivers and other high-voltage equipment are sufficiently high that high-voltage rectifier tubes may produce X-radiation which can constitute a health hazard unless such tubes are adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

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Electronic Components and Devices Harrison, N. J.

2BJ2A

Half-Wave Vacuum Rectifier

9-PIN MINIATURE TYPE

Designed to minimize X-Radiation

$-e_{bm}$ = 22,000 max. V i_{bm} = 80 mA

ELECTRICAL CHARACTERISTICS – Bogey Values

Heater Voltage, ac or dc	E_h	2.30	V
Heater Current at E_h = 2.3 V	I_h	0.300	A
Direct Interelectrode Capacitance:[a]			
P to (K + IS + H)	$c_{p\text{-all}}$	1.0	pF
Instantaneous Tube Voltage Drop for Instantaneous Plate Current (i_b) = 7 mA	e_b	80	V

MECHANICAL CHARACTERISTICS

Maximum Overall Length	2.844in. (72.24 mm)
Maximum Seated Length	2.562in. (65.07 mm)
Maximum Bulb Diameter	0.875in. (22.22 mm)
Envelope	JEDEC T 6½
Top Cap	Skirted minaiture (JEDEC NO. CI-2, CI-33 orCI-45
Base	Small-Button noval 9-pin (JEDEC E9-I)
Terminal Diagram	JEDEC 9RT
Type of Cathode	Coated Unipotential
Operating Position	Any

MAXIMUM RATINGS[b] – High Voltage Rectifier

For operation as a pulsed rectifier tube in a 525-line, 30-frame system[c]

Inverse Plate Voltage[d]			
Total DC and Peak (absolute max.)	$-e_{bm}$	22,000	V
Average (absolute max.)	$E_{b(av)}$	20,000	V
Plate Current:			
Peak (design max.)	i_{bm}	80	mA
Average (design max.)	$I_{b(av)}$	1.0	mA
Heater Voltage (absolute max.)	E_h	2.6	V
Heater Voltage (absolute min.)	E_h	2.0	V

[a] Measured without external shield in accordance with the current issue of EIA Standard RS-191B.
[b] As defined in the current issue of EIA Standard RS-239A.
[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.
[d] This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10μs.

OPERATING CONSIDERATIONS

Socket Connections. The base pins of the 2BJ2A fit the standard noval socket. Socket terminals 1, 3, 4, 6, and 7 may be connected to terminal 9 or to a corona shield which connects to terminal 9. Terminals 3 and 7 may be used as tie points at or near cathode potential. Otherwise, do not use.

Measurement of Heater Voltage. It is recommended that a thermocouple rms voltmeter be used to measure heater voltage. The meter and its leads must be insulated to withstand 22,000 V. To minimize loading of the rectifier circuit during this measurement, stray capacitances to ground should be kept as low as possible.

X-RADIATION CHARACTERISTIC

X-Radiation, Maximum

Statistical Value Controlled On A Lot
Sampling Basis *0.5mR/hr*

X-Radiation is measured in accordance with JEDEC Publication No. 67 A, "Recommended Practice for Measurement of X-Radiation from Receiving Tubes", and controlled in accordance with JEDEC Publication No. 73 A, "Recommended Practice for Quality Control of X-Radiation Emitted from High Voltage Rectifier and Shunt Regulator Receiving Tubes".

Operation of the 2BJ2A outside of the absolute values indicated above may result in either temporary or permanent

changes in the X-radiation characteristic of the tube. Equipment design must be such that these absolute values are not exceeded.

WARNING
X–Radiation

The high voltages associated with the 2BJ2A result in production of X-Radiation which may constitute a health hazard on prolonged exposure at close range unless the tube is adequately shielded. Equipment design must provide for this shielding.

Precautions must be exercised during the servicing of equipment employing the 2BJ2A to assure that the high voltage is adjusted to the recommended value and that any shielding components are replaced to their intended positions before the equipment is operated.

SHOCK HAZARD

The high voltages at which the 2BJ2A is operated can be extremely dangerous to the user or serviceman. Extreme care should be taken in the use of, and for the servicing and adjustment of, any high voltage circuit.

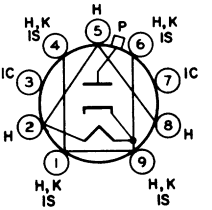
Precautions must be exercised during the replacement or servicing of the 2BJ2A in equipment to assure that the high voltage output terminal is properly grounded while inserting or removing the tube from its socket or while connecting or disconnecting the top cap connector.

THE EQUIPMENT MANUFACTURER SHOULD PROVIDE A WARNING LABEL IN AN APPROPRIATE POSITION ON THE EQUIPMENT TO ADVISE THE SERVICEMAN OF ALL PRECAUTIONS HEREIN.

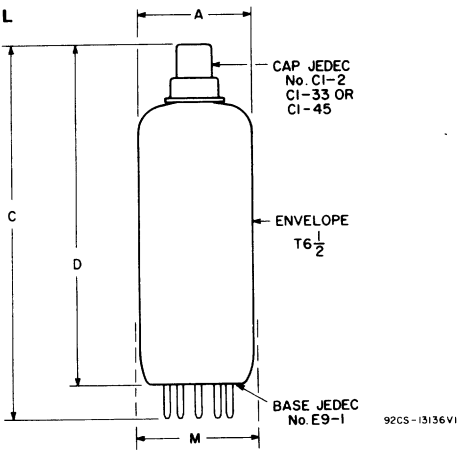
2BJ2A

TERMINAL DIAGRAM – JEDEC 9RT – Bottom View

Pin 1 – Heater, Cathode, Internal Shield
Pin 2 – Heater
Pin 3 – Do Not Use
Pin 4 – Same as Pin 1
Pin 5 – Heater
Pin 6 – Same as Pin 1
Pin 7 – Do Not Use
Pin 8 – Heater
Pin 9 – Same as Pin 1
Cap – Plate



DIMENSIONAL OUTLINE



DIMENSION	INCHES			MILLIMETERS		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A*	0.800	–	0.845	20.32	–	21.46
C	–	–	2.844	–	–	72.24
D	2.312	2.347	2.562	58.72	61.90	65.07
M*	–	–	0.875	–	–	22.22
MILLIMETER DIMENSION DERIVED FROM INCH DIMENSION						
*As defined in the current issue of EIA standards RS-209-A1.						

2BN4A

Medium-Mu Triode

The 2BN4A is the same as the 6BN4A except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	2.35	V
Warm-up Time (Average)	11	s

2CN3A

Half-Wave Vacuum Rectifier

4 - Second Heater Warm-up Time

The 2CN3A is the same as the 6CN3A except for:

Heater Characteristics and Ratings

Current	0.900 ± 0.050	A
Voltage (ac or dc) at 0.900 A	1.80	V

2CW4

High-Mu Triode

Nuvistor Type

The 2CW4 is the same as the 6CW4 except for:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (ac or dc) at 0.450 A	2.1	V
Warm-up Time (Average)	8	s

2CY5

Sharp-Cutoff Tetrode

The 2CY5 is the same as the 6CY5 except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	2.4	V
Warm-up Time (Average)	11	s

2DS4

High-Mu Triode

Nuvistor Type
Having Extended Cutoff Characteristic

The 2DS4 is the same as the 6DS4 except for:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (ac or dc) at 0.450 A	2.1	V
Warm-up Time (Average)	8	s

2DV4

Medium-Mu Triode

Nuvistor Type

The 2DV4 is the same as the 6DV4 except for:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (ac or dc) at 0.450 A	2.1	V
Warm-up Time (Average)	8	s

2ER5

High-Mu Triode

The 2ER5 is the same as the 6ER5 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A.	2.3	V

2FH5

High-Mu Triode

The 2FH5 is the same as the 6FH5 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A.	2.35	V
Warm-up time (Average)	11	s

2FS5

Beam Hexode

The 2FS5 is the same as the 6FS5 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A.	2.4	V
Warm-up time (Average)	11	s

2GK5

High-Mu Triode

The 2GK5 is the same as the 6GK5 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A.	2.3	V
Warm-up time (Average)	11	s

2GU5

Beam Hexode

The 2GU5 is the same as the 6GU5 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	2.4	V
Warm-up time (Average)	11	s

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2K26
KLYSTRON

SINGLE-RESONATOR, REFLEX TYPE

Frequency: 6250 to 7060 Mc.

GENERAL DATA

Electrical:

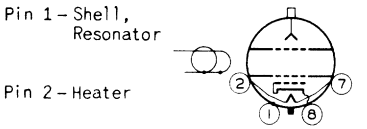
Heater, for Unipotential Cathode:

Voltage	6.3 ± 0.5	ac or dc volts
Current	0.44	amp
Frequency Range	6250 to 7060	Mc

Mechanical:

Mounting Position	Any
Dimensions, Terminal Connections, and Mechanical Tuning Mechanism	See Outline Drawing
Resonant Cavity	Integral Part of Tube
Envelope	Metal
Cap	Miniature with Wafer
Base	Small-Wafer Octal 4-Pin with Pin No.4 replaced by Coaxial Output Line

BOTTOM VIEW



NOTE: COAXIAL OUTPUT LINE PASSES THROUGH VACANT PIN POSITION NO. 4

CW OSCILLATOR – Class C

Maximum Ratings, ***Absolute Values:***

DC RESONATOR VOLTAGE	330 max.	volts
DC REFLECTOR VOLTAGE:		
Positive Value	0 max.	volts
Negative Value	350 max.	volts
DC RESONATOR CURRENT	35 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	50 max.	volts
Heater positive with respect to cathode.	50 max.	volts
AMBIENT TEMPERATURE OF SHELL	110 max.	°C
TEMPERATURE OF COAXIAL OUTPUT LINE	90 max.	°C

Typical Operation □ at 6660 Mc in Mode "A" with 3/4" × 1-1/2" Wave Guide

DC Resonator Voltage	300	volts
DC Reflector Voltage Range▲	−65 to −120	volts
DC Resonator Current	25	ma
DC Reflector Current	less than 7	μa

(continued on next page)

□, ▲: See next page.

2K26

2K26
KLYSTRON

Half-Power Electronic-Tuning Frequency Change■	55	Mc
Power Output	120	mw

▲ Adjusted for maximum power output at the given operating frequency.

■ Change in frequency between the two half-power points when the reflector voltage is varied above and below the point of maximum power output corresponding to the given frequency.

□ The coaxial output line is coupled to the specified wave guide through the wide-band coaxial coupling unit shown on following pages.

INSTALLATION NOTES

A socket for the 2K26 may be obtained by removing the clip from the No.4 pin position of an octal socket and drilling the No.4 opening large enough to admit the coaxial line and the surrounding coupling unit. To guard against excessive strain on the coaxial output line, the tube must be securely fastened by a clamp on the base of the socket mounting. Bumping or continued pressure on the output line will seriously damage the tube. The proper area for clamping on the shoulder of the header skirt is shown on the Outline Drawing.

2K26
KLYSTRON

OPERATING NOTES

All tabulated data and curve information shown for the 2K26 were taken with the specified coupling unit and wave guide. It is important that this coupling unit or its electrical equivalent be used to insure tube interchangeability and satisfactory tuning characteristics. In addition, the standing-wave ratio of the coupler should not exceed 0.8 db. (1.1 voltage-standing-wave ratio).

In most applications the cathode of the 2K26 is operated at a negative potential with respect to ground so that the tube shell, which is integral with the resonator, is at ground potential. In those applications which do not operate with the shell at ground potential, it is essential that the 2K26 be surrounded by a grounded shield and tuned with an insulated tool, in order to protect the user from contact with high voltage. The shield design should permit adequate ventilation to assure that ambient temperature, as measured with a thermometer inserted between the metal tube shell and the shield, will be less than the maximum rated value. Ambient temperature changes will cause the resonator to expand or contract, producing a change in frequency. For best frequency stability, the 2K26 should be operated at nearly constant ambient temperature and with a well-regulated power supply.

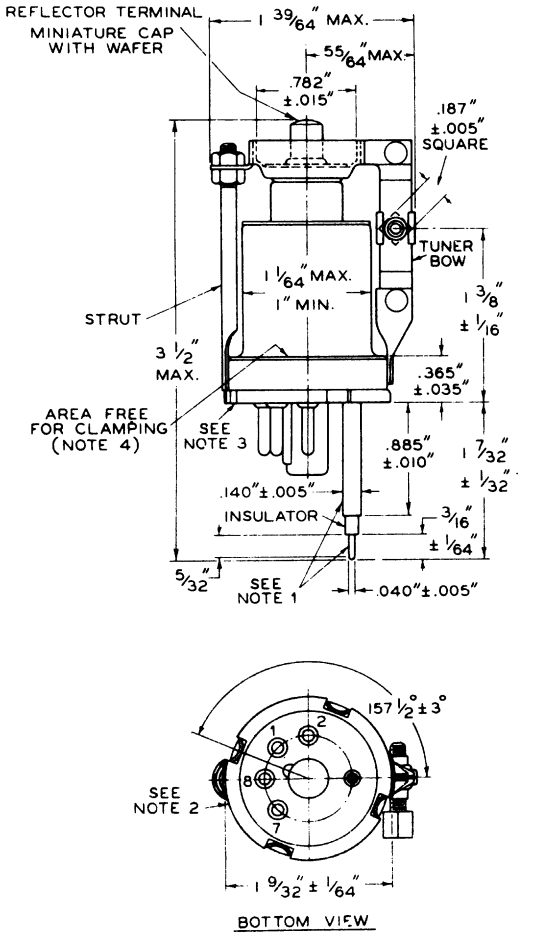
Shielding of the reflector and resonator voltage leads as close to the tube as possible is essential to avoid modulation of the tube output by any external voltages. In addition, the connection to the reflector terminal must be insulated to withstand the total acceleration and reflector voltage. To avoid damage to the tube, the reflector potential must never become positive with respect to the cathode.

Tuning of the 2K26 is accomplished by mechanical and electronic means. The mechanical tuning system is designed to permit approximate adjustment of frequency, but is not recommended for use where continual or frequent adjustment of frequency is required. Approximately five full turns of the frequency-adjustment screw are sufficient to tune the tube over its rated frequency range. The electronic tuning range is dependent upon reflector voltage, the type of load and the kind of coupling to the load.

Voltage modes are regions within the total range of reflector voltage in which oscillations will occur. The typical operating conditions and curves shown for type 2K26 apply to mode "A", the only mode recommended for this tube.

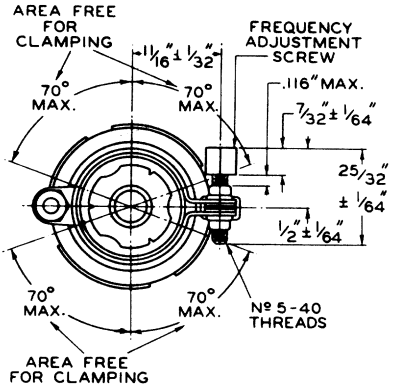
2K26

2K26
KLYSTRON



2K26

KLYSTRON



TOP VIEW

NOTE 1: THE INNER AND OUTER CONDUCTORS OF THE COAXIAL OUTPUT LINE ARE CONCENTRIC WITHIN 0.010".

NOTE 2: BASE-PIN AND COAXIAL-OUTPUT-LINE POSITIONS ARE HELD TO TOLERANCES SUCH THAT PINS AND OUTPUT LINE WILL FIT FLAT-PLATE GAUGE HAVING (a) THICKNESS OF 1-7/32", (b) 4 HOLES WITH DIAMETER OF 0.1030" ± 0.0005" FROM TOP SURFACE OF GAUGE TO A DEPTH OF 0.25" AND THEN WITH DIAMETER INCREASED BY APPROXIMATELY 1/64" FOR REMAINING DEPTH OF HOLE, SO LOCATED ON A 0.6870" ± 0.0005" DIAMETER CIRCLE THAT THE DISTANCE ALONG THE CHORD BETWEEN ANY TWO ADJACENT HOLE CENTERS IS 0.2630" ± 0.0005", (c) ONE HOLE WITH DIAMETER OF 0.1600" ± 0.0005" TO DEPTH OF 1-7/32" WHOSE CENTER IS LOCATED ON THE SPECIFIED PIN CIRCLE A DISTANCE DETERMINED BY LAYING OFF ON THE TOP SURFACE OF THE GAUGE COUNTERCLOCKWISE FROM THE LAST OF THE FOUR HOLES TWO CONSECUTIVE CHORDS EACH 0.2630" ± 0.0005", AND (d) A CENTER HOLE WITH A MINIMUM DIAMETER OF 0.400" TO CLEAR THE BASE PLUG AND KEY. PIN AND OUTPUT-LINE FIT IN GAUGE SHALL BE SUCH THAT GAUGE TOGETHER WITH SUPPLEMENTARY WEIGHT TOTALING 2 LBS. WILL NOT BE LIFTED WHEN PINS AND COAXIAL OUTPUT LINE ARE WITHDRAWN.

NOTE 3: SMALL-WAFER OCTAL 4-PIN BASE WITH PIN No. 4 REPLACED BY COAXIAL OUTPUT LINE.

NOTE 4: MINIMUM WIDTH OF SHOULDER IS 0.045".

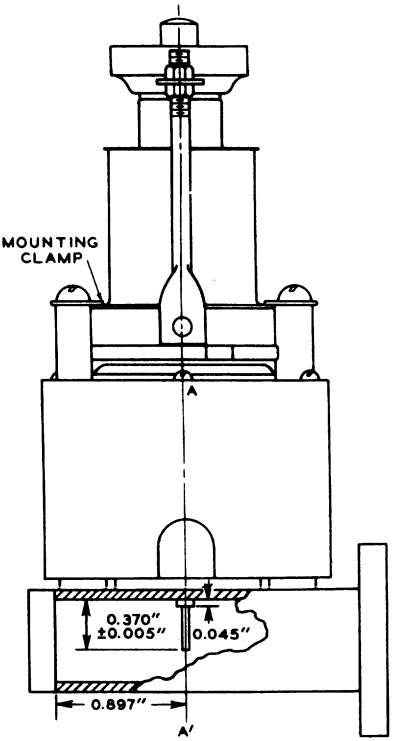
2K26

2K26

KLYSTRON

COUPLING ARRANGEMENT

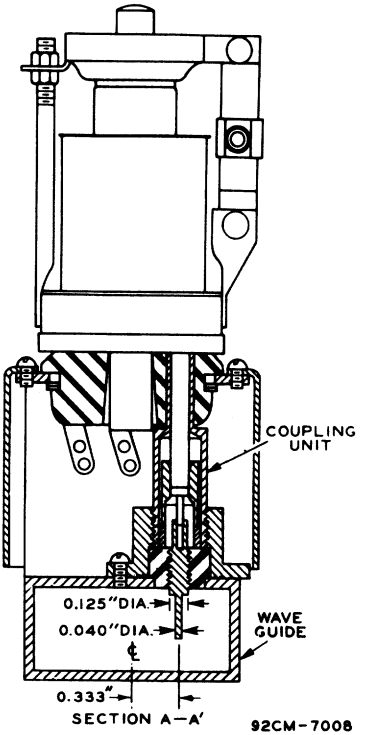
RCA-2K26 Coupled to a 3/4" x 1-1/2" Wave Guide Through a Coaxial Transducer Coupling Circuit



2K26

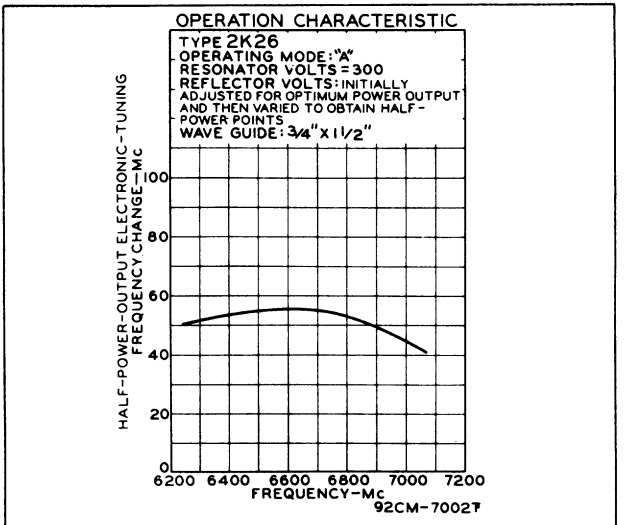
KLYSTRON

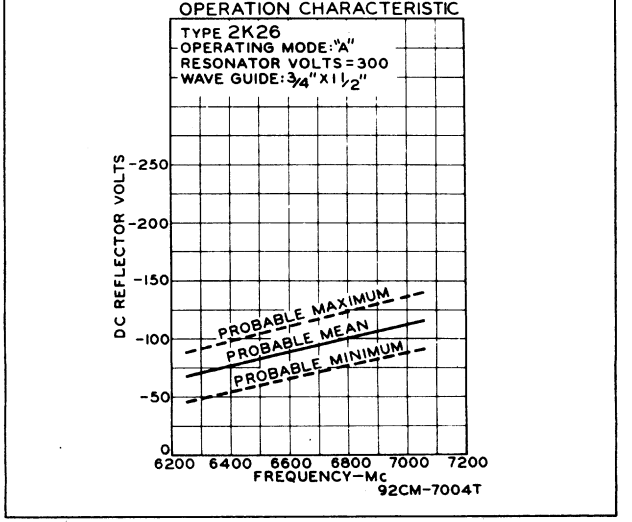
COUPLING ARRANGEMENT (Cont'd)



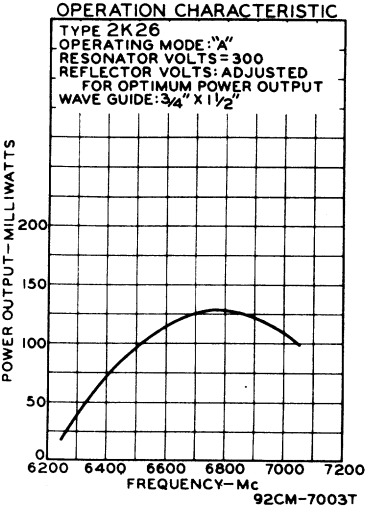
2K26

2K26
KLYSTRON





2K26
KLYSTRON



TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA HARRISON NEW JERSEY

2X2-A
HALF-WAVE VACUUM RECTIFIER

For applications critical as to severe shock and vibration

GENERAL DATA

Electrical:

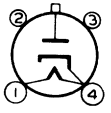
Heater, for Unipotential Cathode:

	Min.	Av.	Max.	
Voltage	2.25	2.50	2.75	ac volts
Current at 2.50 volts	1.55	1.75	1.95	amp

Mechanical:

Mounting Position	Any
Maximum Overall Length	4-17/32" ←
Seated Length	3-25/32" ± 1/8"
Maximum Diameter	1-9/16"
Dimensional Outline	*See General Section*
Weight (Approx.)	1.3 oz ←
Eulb	ST-12
Cap	Small (JETEC No.C1-1) ←
Base	Small-Shell Small 4-Pin (JETEC No.A4-5) ←
Basing Designation for BOTTOM VIEW	4AB

Pin 1 - Heater
Pin 2 - No Connection
Pin 3 - No Connection



Pin 4 - Heater, Cathode
Cap - Plate

HALF-WAVE RECTIFIER

Maximum Ratings, *Design-Center Values:*

PEAK INVERSE PLATE VOLTAGE	12500 max.	volts
PEAK PLATE CURRENT	60 max.	ma
DC OUTPUT CURRENT	7.5 max.	ma
HOT-SWITCHING TRANSIENT CURRENT, for duration of 0.2 second max.	100 max.	ma
AMBIENT TEMPERATURE	70 max.	oC ←

Typical Operation:

AC Plate-Supply Voltage (RMS)	5500	volts
Total Effective Plate-Supply Impedance	0.3	megohm
Filter Input Capacitor	0.1	μf
DC Output Current	2	ma
DC Output Voltage (At input to filter)	4500	volts

SHOCK TEST DATA ←

Impact Acceleration	250 max.	g

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. The tubes are subjected to a total of 3 blows in each of the 3 primary mutually

← Indicates a change.

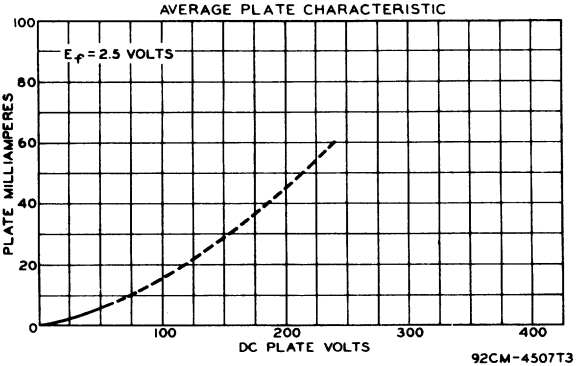
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

2X2-A

HALF-WAVE VACUUM RECTIFIER

perpendicular tube planes when tested in the Navy Type, High-Impact (flyweight) Shock Machine. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and will not be inoperative.

AVERAGE PLATE CHARACTERISTIC



92CM-4507T3

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

3A2A

Half-Wave Vacuum Rectifier

9-PIN MINIATURE TYPE

Designed to minimize X-Radiation

$-e_{bm}$ = 20,000 max. V i_{bm} = 80 mA

ELECTRICAL CHARACTERISTICS – Bogey Values

Heater Voltage, ac or dc	E_h	3.15	V
Heater Current at E_h = 3.15 V	I_h	0.22	A
Direct Interelectrode Capacitance:[a]			
P to (K + IS + H)	$c_{p\text{-all}}$	1.0	pF
Instantaneous Tube Voltage Drop for Instantaneous Plate Current (i_b) = 7 mA	e_b	70	V

MECHANICAL CHARACTERISTICS

Maximum Overall Length	2.844in. (72.24 mm)
Maximum Seated Length	2.562in. (65.07 mm)
Maximum Diameter	0.875in. (22.22 mm)
Envelope	JEDEC T6½
Top Cap	Skirted Miniature (JEDEC NO. CI–2, CI–33 or CI–45)
Base	Small-Button Noval 9–pin (JEDEC E9–I)
Terminal Diagram	JEDEC 9DT
Type of Cathode	Coated Unipotential
Operating Position	Any

MAXIMUM RATINGS[b] – High Voltage Rectifier

For operation as a pulsed rectifier tube in a 525-line, 30-frame system[c]

Inverse Plate Voltage[d]			
Total DC and Peak (absolute max.)	$-e_{bm}$	20,000	V
Average (absolute max.)	$E_{b(av)}$	18,000	V
Plate Current:			
Peak (design max.)	i_{bm}	80	mA
Average (design max.)	$I_{b(av)}$	1.5	mA
Heater Voltage (absolute max.)	E_h	3.65	V
Heater Voltage (absolute min.)	E_h	2.65	V

[a] Measured without external shield in accordance with the current issue of EIA Standard RS-191B.
[b] As defined in the current issue of EIA Standard RS-239A.
[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.
[d] This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10μs.

OPERATING CONSIDERATIONS

Socket Connections. The base pins of the 3A2A fit the standard noval socket. Socket terminals 1, 3, 4, 6, and 7 may be connected to terminal 9 or to a corona shield which connects to terminal 9. Terminals 3 and 7 may be used as tie points at or near cathode potential. Otherwise, do not use.

Measurement of Heater Voltage. It is recommended that a thermocouple rms voltmeter be used to measure heater voltage. The meter and its leads must be insulated to withstand 20,000 V. To minimize loading of the rectifier circuit during this measurement, stray capacitances to ground should be kept as low as possible.

X-RADIATION CHARACTERISTIC

X-Radiation, Maximum

Statistical Value Controlled On A Lot Sampling Basis *0.5mR/hr*

X-Radiation is measured in accordance with JEDEC Publication No. 67 A, "Recommended Practice for Measurement of X-Radiation from Receiving Tubes", and controlled in accordance with JEDEC Publication No. 73 A, "Recommended Practice for Quality Control of X-Radiation Emitted from High Voltage Rectifier and Shunt Regulator Receiving Tubes".

Operation of the 3A2A outside of the absolute values indicated above may result in either temporary or permanent

changes in the X-radiation characteristic of the tube. Equipment design must be such that these absolute values are not exceeded.

WARNING

X-Radiation

The high voltages associated with the 3A2A result in production of X-Radiation which may constitute a health hazard on prolonged exposure at close range unless the tube is adequately shielded. Equipment design must provide for this shielding.

Precautions must be exercised during the servicing of equipment employing the 3A2A to assure that the high voltage is adjusted to the recommended value and that any shielding components are replaced to their intended positions before the equipment is operated.

SHOCK HAZARD

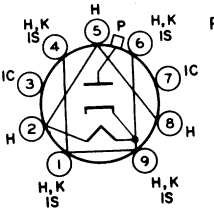
The high voltages at which the 3A2A is operated can be extremely dangerous to the user or serviceman. Extreme care should be taken in the use of, and for the servicing and adjustment of, any high voltage circuit.

Precautions must be exercised during the replacement or servicing of the 3A2A in equipment to assure that the high voltage output terminal is properly grounded while inserting or removing the tube from its socket or while connecting or disconnecting the top cap connector.

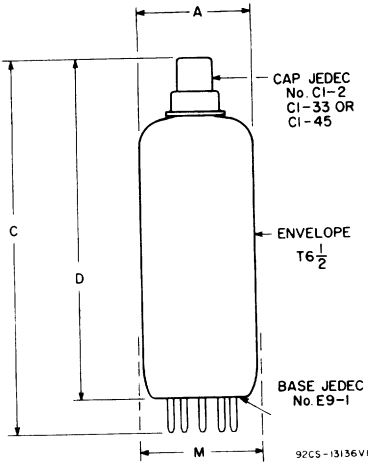
THE EQUIPMENT MANUFACTURER SHOULD PROVIDE A WARNING LABEL IN AN APPROPRIATE POSITION ON THE EQUIPMENT TO ADVISE THE SERVICEMAN OF ALL PRECAUTIONS HEREIN.

TERMINAL DIAGRAM – JEDEC 9RT – Bottom View

Pin 1 – Heater, Cathode, Internal Shield
Pin 2 – Heater
Pin 3 – Do Not Use
Pin 4 – Same as Pin 1
Pin 5 – Heater
Pin 6 – Same as Pin 1
Pin 7 – Do Not Use
Pin 8 – Heater
Pin 9 – Same as Pin 1
Cap – Plate



DIMENSIONAL OUTLINE



DIMENSION	INCHES			MILLIMETERS		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A*	0.800	–	0.845	20.32	–	21.46
C	–	–	2.844	–	–	72.24
D	2.312	2.347	2.562	58.72	61.90	65.07
M*	–	–	0.875	–	–	22.22
MILLIMETER DIMENSION DERIVED FROM INCH DIMENSION						
*As defined in the current issue of EIA standards RS-209-A1.						

3A3A

Half-Wave Vacuum Rectifier

For High-Voltage Rectifier Circuits in Color and Black-and-White TV Receivers

ELECTRICAL CHARACTERISTICS

Bogey Values

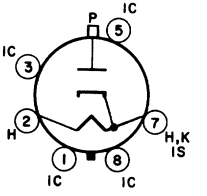
Heater Characteristics and Ratings			
Voltage (AC)	E_h	3.15	V
Current at 3.15 V	I_h	0.220	A
Direct Interelectrode Capacitance (Approx.)			
Without external shield			
P to (K + IS + H)	$c_{p\text{-all}}$	1.5	pF
Instantaneous Tube Voltage Drop			
For i_b = 7 mA	e_b	100	V

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.812 in
Maximum Seated Length	3.250 in
Maximum Diameter	1.281 in
Envelope	JEDEC T9
Caps (Alternates)	
Small (JEDEC No.C1-1)	
Small with Tubular Support (JEDEC No.C1-34)	
Base (Alternates)	
Intermediate-Shell Octal:	
6-Pin, Arrangement 1 (JEDEC Group 1, No.B6-8)	
Short Intermediate-Shell Octal with External Barriers:	
6-Pin, Arrangement 1 (JEDEC Group 1, No.B6-60)	

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Do Not Use
Pin 2 – Heater
Pin 3 – Do Not Use
Pin 5 – Do Not Use
Pin 7 – Heater, Cathode, Internal Shield
Pin 8 – Do Not Use
Cap – Plate



Note: May be used only under conditions specified in Operating Considerations.

PULSED-RECTIFIER SERVICE

Design-Maximum Ratings
For operation in a 525-line, 30-frame system

Peak Inverse Plate Voltage[a]	-	30000	V
Peak Plate Current	i_b	100	mA
Average Plate Current	$I_{b(av)}$	2	mA
Heater Voltage, AC	E_h	2.65 min—3.65 max	V

[a] This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10 μs.

OPERATING CONSIDERATIONS

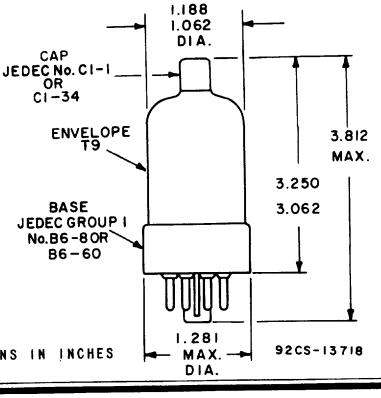
Socket terminals 1, 3, 4, 5, 6 and 8 may be connected to terminal 7 or to a corona shield which connects to terminal 7. Socket terminals 4 and 6 may be used as tie points at or near cathode potential. Otherwise, do not use.

The high voltages at which the 3A3A is operated may be extremely dangerous to the user. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel cannot possibly come in contact with any high potential points in the electrical system. The interlock devices should function to break the primary circuits of the high-voltage supply when any gate or door on the protective housing is opened, and should prevent the closing of this primary circuit until the door is locked again.

It should be noted that *high voltages* may appear at normally low-potential points in the circuit as a result of capacitor breakdown or incorrect circuit connections. Therefore, before any part of the circuit is touched, the power-supply switch should be turned off and both terminals of any capacitor should be grounded.

Operation of the 3A3A with a plate voltage above approximately 16000 volts (absolute value) results in the production of X-radiations which can constitute a health hazard on prolonged exposure at close range unless the tube is adequately shielded. Relatively simply shielding should prove adequate, but the need for this precaution should be considered in equipment design.

DIMENSIONAL OUTLINE



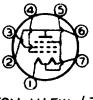
RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

3A4

POWER AMPLIFIER PENTODE

MINIATURE TYPE

Filament	Coated		
Filament Arrangement	*Series **	*Parallel***	
Voltage	2.8	1.4	d-c volts
Current	0.1	0.2	amp.
Direct Interelectrode Capacitances:°			
Grid to Plate	0.34 max.		μμf
Input	4.8		μμf
Output	4.2		μμf
Maximum Overall Length			2-1/8"
Maximum Seated Height			1-7/8"
Maximum Diameter			3/4"
Bulb			T-5-1/2
Base▲			Miniature Button 7-Pin
Pin 1 - Fil.(- series)		Pin 5	{Fil. Mid-Tap (- parallel)
Pin 2 - Plate		Pin 6 - Plate	
Pin 3 - Screen		Pin 7 - Filament +	
Pin 4 - Grid			
RCA Socket			Stock No.9914
Mounting Position	BOTTOM VIEW (7BB)		Any



Maximum Ratings Are Design-Center Values

A-F POWER AMPLIFIER

Plate Voltage	150 max. volts
Screen Voltage	90 max. volts
Plate Dissipation	2.0 max. watts
Screen Dissipation	0.4 max. watt
Total Zero-Sig.Cathode Current■	18 max. ma.

Typical Operation and Characteristics-Class A1 Amplifier:●

Filament Arrangement	*Parallel ***		
Plate Voltage	135	150	volts
Screen Voltage	90	90	volts
Grid Voltage	-7.5	-8.4	volts
Peak A-F Grid Voltage	7.5	8.4	volts
Zero-Sig. Plate Current	14.8	13.3	ma.
Max.-Sig. Plate Current	14.9	14.1	ma.
Zero-Sig. Screen Current	2.6	2.2	ma.
Max.-Sig. Screen Current	3.5	3.5	ma.
Plate Resistance	90000	100000	ohms
Transconductance	1900	1900	μmhos
Load Resistance	8000	8000	ohms
Total Harmonic Distortion	5	6	%
Max.-Sig. Power Output	600	700	mw

R-F POWER AMPLIFIER

D-C Plate Voltage	150 max. volts
D-C Screen Voltage	135 max. volts
D-C Grid Voltage	-30 max. volts
D-C Plate Current	20 max. ma.
D-C Grid Current	0.25 max. ma.
Total D-C Cathode Current ■	25 max. ma.
Plate Input	3 max. watts
Screen Input	0.9 max. watt
Plate Dissipation	2 max. watts

*, **, °, ▲, ■, ● : See next page.

← Indicates a change.

3A4

POWER AMPLIFIER PENTODE

(continued from preceding page)

→ *Typical Operation at 10 Mc with Parallel Filament Arrangement:***

D-C Plate Voltage	150	volts
D-C Screen Voltage	135	volts
Grid Resistor	0.2	megohm
D-C Plate Current	18.3	ma.
D-C Screen Current	6.5	ma.
D-C Grid Current	0.13	ma.
Power Output (approx.)	1.2	watts

* Filament voltage applied across the two sections in series between pins No.1 and No.7. Grid voltage is referred to pin No.1.

** Filament voltage applied across the two sections in parallel between pin No.5 and pins No.1 and No.7 connected together. Grid voltage is referred to pin No.5.

° With no external shield.

■ For series-filament operation. A shunting resistor must be connected across the section between pins No.1 and No.5 to by-pass excess cathode current in this section. The value of the shunting resistor should be adjusted to make the voltage across the shunted section equal to the voltage across the section between pins No.5 and No.7. When other tubes in series-filament arrangement contribute to the filament current of the 3A4, an additional shunting resistor may be required between pins No.1 and No.7.

● Typical operating values for the 3A4 with filament sections in series will be approximately the same as those shown for parallel-filament operation.

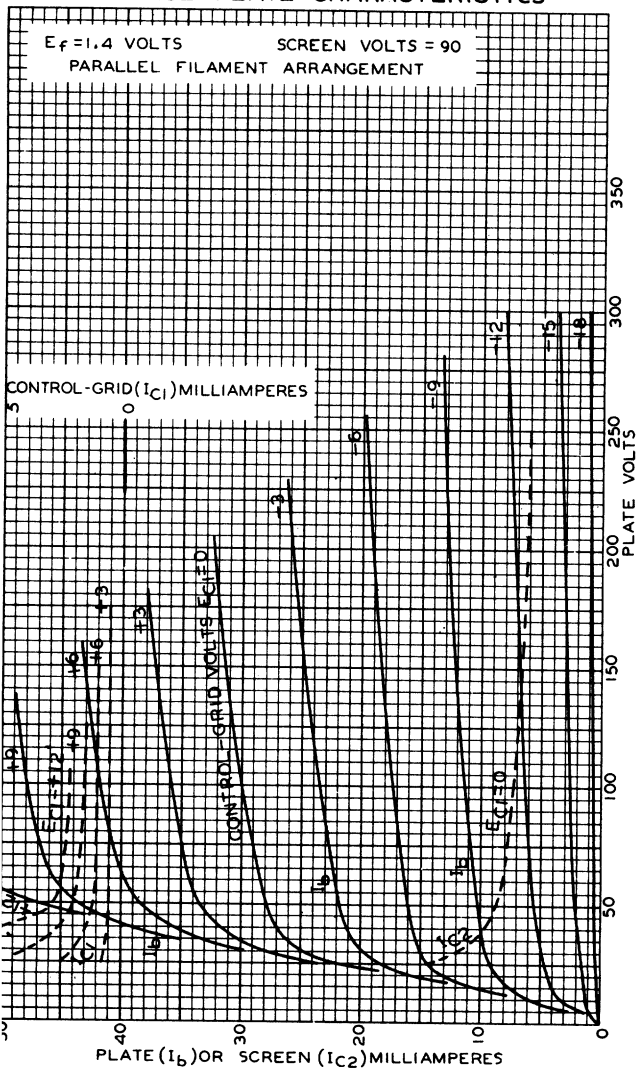
▲ *The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole.*

← Indicates a change.

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

3A4

AVERAGE PLATE CHARACTERISTICS



3A5

H-F TWIN TRIODE
MINIATURE TYPE

Filament	Coated		
Filament Arrangement	*Series**	*Parallel***	
Voltage	2.8	1.4	d-c volts
Current	0.11	0.22	amp.

Direct Interelectrode Capacitances:°

	Triode Unit T_1	*Triode Unit T_2*	
Grid to Plate	3.2	3.2	μμf
Grid to Filament	0.9	0.9	μμf
Plate to Filament	1.0	1.0	μμf
Plate to Plate	0.32		μμf

Maximum Overall Length	2-1/8"
Maximum Seated Height	1-7/8"
Maximum Diameter	3/4"
Bulb	T-5-1/2"

Base▲ — Miniature Button 7-Pin

Pin 1 - Filament -
Pin 2 - Plate T_2
Pin 3 - Grid T_2
Pin 4 - {Fil. Mid-Tap ((+ parallel)
Pin 5 - Grid T_1
Pin 6 - Plate T_1
Pin 7 - Fil.(+ series)

BOTTOM VIEW (7BC)

RCA Socket — Stock No.9914
Mounting Position — Any

For convenience, one triode unit is identified as T_1; the other as T_2.

Maximum Ratings Are Design-Center Values

A-F POWER AMPLIFIER

Plate Voltage	135 max.	volts
Plate Current	5 max.	ma.
Plate Dissipation	0.5 max.	watt
Characteristics - Class A, Amplifier:		
Plate Voltage	90	volts
Grid Voltage	-2.5	volts
Amplification Factor	15	
Plate Resistance	8300	ohms
Transconductance	1800	μmhos
Plate Current	3.7	ma.

R-F POWER AMPLIFIER & OSCILLATOR - Class C Telegraphy

Key-down conditions per tube without modulation

D-C Plate Voltage	135 max.	volts
D-C Grid Voltage	-30 max.	volts
D-C Plate Current (per unit)	15 max.	ma.
D-C Grid Current (per unit)	2.5 max.	ma.
Plate Input (per unit)	2.0 max.	watts
Plate Dissipation (per unit)	1.0 max.	watt
Typical Operation At 40 Mc With Both Units In Push-Pull:		
D-C Plate Voltage	135	volts
D-C Grid Voltage ●	-20	volts
	4000	ohms
	570	ohms
Peak R-F Grid-to-Grid Voltage	90	volts
D-C Plate Current	30	ma.
D-C Grid Current (approx.)	5	ma.
Driving Power (approx.)	0.2	watt
Power Output (approx.)	2	watts

*, **, o, ●, ▲, : see next page

3A5

3A5

H-F TWIN TRIODE

(continued from preceding page)

* Filament voltage applied across the two sections in series between pins No.1 and No.7. Grid voltage is referred to Pin No.1. For series filament operation, a shunting resistor must be connected across the section between pins No.1 and No.4. to by-pass excess cathode current in this section. The value of the shunting resistor should be adjusted to make the voltage across the shunted section equal to the voltage across the section between pins No.4 and No.7. When other tubes in series-filament arrangement contribute to the filament current of the 3A5, an additional shunting resistor may be required between pins No.1 and No.7.

** Filament voltage applied across the two sections in parallel between pin No.4 and pins No.1 and No.7 connected together. Grid voltage is referred to pins No.1 and No.7 tied together.

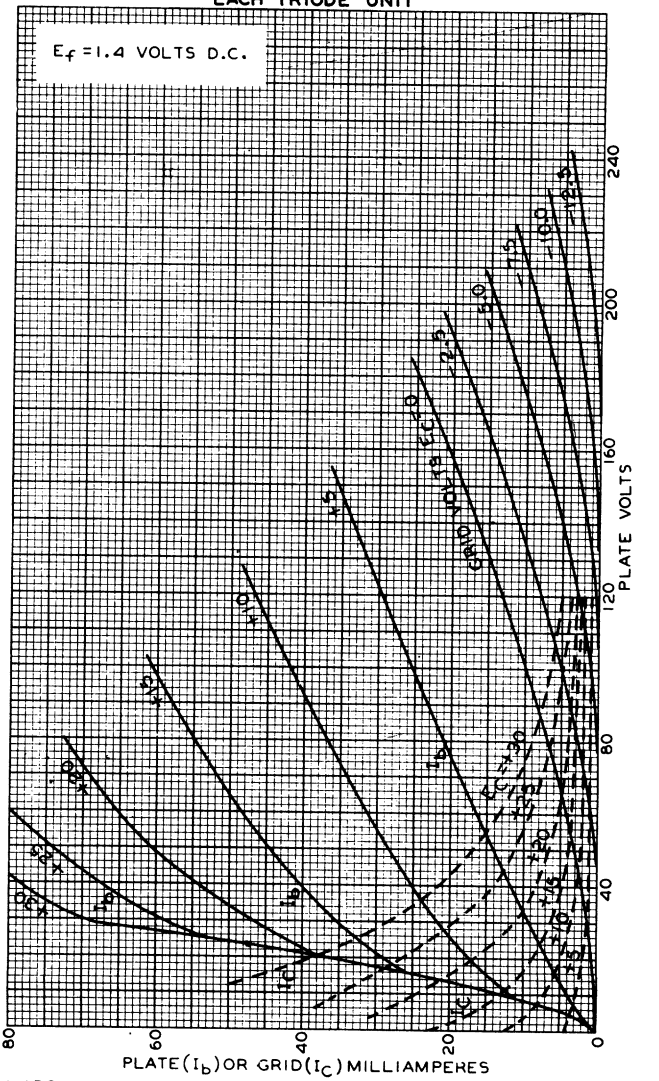
o With no external shield

● Obtained by grid resistor (4000), cathode resistor (570), or fixed supply.

▲ *The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole.*

3A5.

AVERAGE PLATE CHARACTERISTICS
EACH TRIODE UNIT



MARCH 14, 1942
RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.
92C-6376

3AF4A

Medium-Mu Triode

7-PIN MINIATURE TYPE

The 3AF4A is the same as the 6AF4A except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	3.15	volts
Warm-up time (Average)	11	sec

3AL5

Twin Diode

7-PIN MINIATURE TYPE

The 3AL5 is the same as the 6AL5 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	3.15	volts
Warm-up time (Average)	11	sec

3AT2

Half-Wave Vacuum Rectifier

DUODECAR TYPE

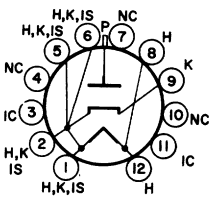
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	3.15 ± 0.32	volts
Current at heater volts = 3.15	0.220	amp
Direct Interelectrode Capacitance (Approx.):[a]		
P to (K+IS+H)	1.5	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.625"
Seated Length	3.000" to 3.250"
Diameter	1.062" to 1.188"
Dimensional Outline	See *General Section*
Bulb	T9
Cap	Small (JEDEC No.C1-1) or Small With Tubular Support (JEDEC No.C1-34)
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW	12FV

Pin 1 - Heater, Cathode, Internal Shield
Pin 2 - Same as Pin 1
Pin 3 - *Do Not Use*
Pin 4 - No Internal Connection
Pin 5 - Same as Pin 1
Pin 6 - Same as Pin 1
Pin 7 - Same as Pin 4
Pin 8 - Heater
Pir 9 - Same as Pin 1
Pir 10 - Same as Pin 4
Pin 11 - *Do Not Use*
Pin 12 - Heater
Cap - Plate



PULSED-RECTIFIER SERVICE

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[b]

Peak Inverse Plate Voltage[c]	30000 max.	volts
Peak Plate Current	88 max.	ma
Average Plate Current	1.7 max.	ma

[a] Without external shield.

[b] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[c] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

OPERATING CONSIDERATIONS

The high voltages at which the 3AT2 is operated are very dangerous. Great care should be taken in the design of equipment to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in the measurement of heater voltage. Under all circumstances, circuit parts which may be at high potentials should be enclosed or adequately insulated.

X-radiation. The voltages employed in some television receivers and other high-voltage equipment are sufficiently high that high-voltage rectifier tubes may produce *X-radiation* which can constitute a health hazard unless such tubes are adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

3AU6

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

The 3AU6 is the same as the 6AU6A except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	3.15	volts
Warm-up time (Average)	11	sec

3AV6

Twin Diode—High-Mu Triode

7-PIN MINIATURE TYPE

The 3AV6 is the same as the 6AV6 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	3.15	volts
Warm-up time (Average)	11	sec

RCA

3B28

HALF-WAVE GAS RECTIFIER

HOT-CATHODE TYPE

GENERAL DATA

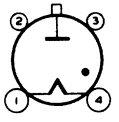
Electrical:

Filament, Coated:		
Voltage	2.5 ± 5%	ac volts
Current at 2.5 volts	5	amp
Minimum Heating Time Befor Anode Voltage is Applied	10	seconds
Peak Anode Voltage Drop (Approx.)	10	volts

Mechanical:

Mounting Position	Any
Overall Length	5.87" to 6.15"
Seated Length	5.25" to 5.53"
Maximum Diameter	2-1/16"
Bulb	T-16
Cap	Medium (JETEC No.C1-5)
Base	Medium-Shell Small 4-Pin, Bayonet (JETEC No.A4-10)
Basing Designation for BOTTOM VIEW	$4P_1$

Pin 1 – Filament
Pin 2 – No Connection
Pin 3 – No Connection



Pin 4 – Filament, Cathode Shield
Cap – Anode

HALF-WAVE RECTIFIER

Maximum Ratings, *Absolute values:*

	Rating I	*Rating II*	
PEAK INVERSE ANODE VOLTAGE	5000 max.	10000 max.	volts
ANODE CURRENT:			
Peak	2 max.	1 max.	amp
Average*	0.5 max.	0.25 max.	amp
Fault, for duration of 0.1 second max.	20 max.	20 max.	amp
FREQUENCY OF POWER SUPPLY	500 max.	150 max.	cps
AMBIENT TEMPERATURE	−75 to +90	−75 to +90	°C

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Filament Current	1	–	5.40	amp
Critical Anode Voltage	2	–	50	volts
Peak Anode Voltage Drop	3	–	14	volts

Note 1: With 2.5 volts rms on filament.
Note 2: With 2.38 volts rms on filament.

* Averaged over any period of 30 seconds maximum.

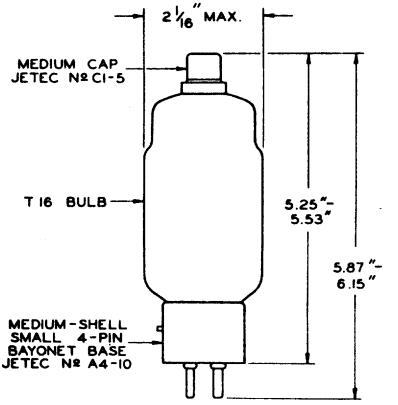
3B28

HALF-WAVE GAS RECTIFIER

Note 3: With 2.5 volts rms on filament, peak anode current of 2 amperes provided by half-cycle pulse from a 60-cps sine wave and recurring approximately once a second. Tube drop is measured by an oscilloscope connected between anode and center tap of filament transformer.

OPERATING NOTES

The filament-supply voltage for the 3B28 may be either in phase or out of phase with the anode voltage. With out-of phase excitation (quadrature operation), improved utilization of the cathode is possible. Although the 3B28 carries no higher anode-current rating for quadrature operation than for in-phase operation, quadrature operation is conducive to appreciably longer tube life. For optimum results, the filament and anode voltages should be 90° out of phase. In practical applications however, nearly, full realization of the advantages of this type of excitation is possible even when the phase difference between the filament and anode supply voltages ranges from the optimum value by as much as ± 30°. In polyphase operation where the anode voltage shifts from one phase to another during the current-conduction period, quadrature operation is obtained when the filament voltage passes through zero at the center of the current-conduction period.



92CM-7642

RCA

3B28

HALF-WAVE GAS RECTIFIER

For Circuit Figures, see Front of this Section

CIRCUIT	MAX. TRANS. SEC. VOLTS (RMS) E	APPROX. DC OUTPUT VOLTS TO FILTER E_{av}	MAX. DC OUTPUT AMPERES I_{av}	MAX. DC OUTPUT KW TO FILTER P_{dc}
Fig. 1 **Half-Wave** **Single-Phase** In-Phase Operation	7000▲ 3500●	3200 1600	0.25 0.5	0.8 0.8
Fig. 2 **Full-Wave** **Single-Phase** In-Phase Operation	3500▲ 1700●	3200 1600	0.5 1.0	1.6 1.6
Fig. 3 **Series** **Single-Phase** In-Phase Operation	7000▲ 3500●	6400 3200	0.5 1.0	3.2 3.2
Fig. 4 **Half-Wave** **Three-Phase** In-Phase Operation	4000▲ 2000●	4800 2400	0.75 1.5	3.6 3.6
Fig. 5 **Parallel** **Three-Phase** Quadrature Operation	4000▲ 2000●	4800 2400	1.5 3.0	7.2 7.2
Fig. 6 **Series** **Three-Phase** Quadrature Operation	4000▲ 2000●	9600 4800	0.75 1.5	7.2 7.2
Fig. 7 **Half-Wave** **Four-Phase** Quadrature Operation			*Resistive Load* / *Inductive Load*	*Resistive Load* / *Inductive Load*
	3500▲	4500	0.9 / 1.0	4.0 / 4.5
	1700●	2250	1.8 / 2.0	4.0 / 4.5
Fig. 8 **Half-Wave** **Six-Phase** Quadrature Operation			*Resistive Load* / *Inductive Load*	*Resistive Load* / *Inductive Load*
	3500▲	4800	0.95 / 1.0	4.5 / 4.8
	1700●	2400	1.9 / 2.0	4.5 / 4.8

▲ For maximum peak inverse anode voltage of 10000 volts.
● For maximum peak inverse anode voltage of 5000 volts.

3BA6

Remote-Cutoff Pentode

The 3BA6 is the same as the 6BA6 except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	3.15	V
Warm-up Time (Average)	11	s

3BN4A

Medium-Mu Triode

The 3BN4A is the same as the 6BN4A except for:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (ac or dc) at 0.450 A	3	V
Warm-up Time (Average)	11	s

3BN6

Beam Tube

The 3BN6 is the same as the 6BN6 except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	3.15	V
Warm-up Time (Average)	11	s

3BU8/3GS8

Sharp-Cutoff Twin Pentode
With Common Cathode, Grid No. 1, and Grid No. 2

The 3BU8/3GS8 is the same as the 6BU8 except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	3.15	V
Warm-up Time (Average)	11	s

3BY6

Pentagrid Amplifier

The 3BY6 is the same as the 6BY6 except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	3.15	V
Warm-up Time (Average)	11	s

3BZ6

Semiremote-Cutoff Pentode

The 3BZ6 is the same as the 6BZ6 except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600A	3.15	V
Warm-up Time (Average)	11	s
Heater-Cathode Voltage		
Peak Value	+200, −300 max	V
Average Value	+100, −200 max	V

3CB6

Sharp-Cutoff Pentode

The 3CB6 is the same as the 6CB6A except for:

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	3.15	V
Warm-up Time (Average)	11	s
Heater-Cathode Voltage		
Peak Value	+200, -300 max	V
Average Value	100 max	V

Half-Wave Vacuum Rectifier

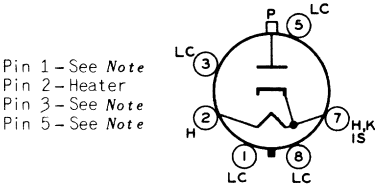
For High-Voltage Rectifier Circuits in TV Receivers

ELECTRICAL

Heater Characteristics and Ratings		
Voltage (AC)	3.60 ± 0.54	V
Current at 3.60 V.	0.225	A
Direct Interelectrode Capacitance (Approx.)		
Without external shield		
P to (H + K + IS)	1.6	pF

MECHANICAL

Mounting Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	4-1/16 in
Seated Length	3-1/8 to 3-1/2 in
Maximum Diameter	1-9/32 in
Bulb	T9
Cap	Small with Tubular Support (JEDEC No. C1-34)
Base (Alternates)	
Intermediate Shell Octal:	
6-Pin, Arrangement 1 (JEDEC Group 1, No. B6-8)	
Short Intermediate-Shell Octal with External Barriers:	
6-Pin, Arrangement 1 (JEDEC Group 1, No. B6-60)	
Basing Designation for BOTTOM VIEW	8MH ←



Pin 1 – See *Note*
Pin 2 – Heater
Pin 3 – See *Note*
Pin 5 – See *Note*

Pin 7 – Heater, Cathode, Internal Shield
Pin 8 – See *Note*

Note: May be used only under conditions specified in Operating Considerations

PULSED-RECTIFIER SERVICE

For operation in a 525-line; 30-frame system[a]

Design-Maximum Ratings

Peak Inverse Plate Voltage	30000	V
Peak Plate Current	100	mA
Average Plate Current	2	mA

Characteristic, Instantaneous Value

Tube Voltage Drop for plate mA = 11	100	V

[a] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission. The duty cycle of the voltage pulse must not exceed 15 per cent of one scanning cycle.

← Indicates a change.

OPERATING CONSIDERATIONS

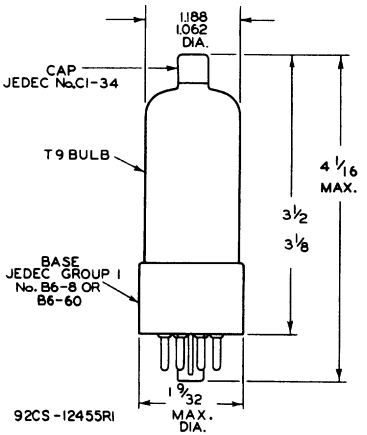
Socket terminals 1, 3, 4, 5, 6 and 8 may be connected to terminal 7 or to a corona shield which connects to terminal 7. Socket terminals 4 and 6 may be used as tie points at or near cathode potential. Otherwise, do not use.

The high voltages at which the 3CA3 is operated may be extremely dangerous to the user. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel cannot possibly come in contact with any high potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supply when any gate or door on the protective housing is opened, and should prevent the closing of this primary circuit until the door is locked again.

It should be noted that *high voltages* may appear at normally low-potential points in the circuit as a result of capacitor breakdown or incorrect circuit connections. Therefore, before any part of the circuit is touched, the power-supply switch should be turned off and both terminals of any capacitor should be grounded.

Operation of the 3CA3 with a plate voltage above approximately 16000 volts (absolute value) results in the production of X-radiations which can constitute a health hazard on prolonged exposure at close range unless the tube is adequately shielded. Relatively simply shielding should prove adequate, but the need for this precaution should be considered in equipment design.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

3CA3A

Half-Wave Vacuum Rectifier

Designed to minimize X-Radiation
$-e_{bm}$ = 38,000 max. V i_{bm} = 100 mA

ELECTRICAL CHARACTERISTICS – Bogey Values

Heater Voltage, ac or dc	E_h	3.60	V
Heater Current at E_h = 3.60 V	I_h	0.225	A
Direct Interelectrode Capacitance:[a]			
P to (K + IS + H)	$c_{p\text{-all}}$	1.6	pF
Instantaneous Tube Voltage Drop for Instantaneous Plate Current (i_b) = 7 mA	e_b	60	V

MECHANICAL CHARACTERISTICS

Maximum Overall Length	3.812in. (96.82 mm)
Maximum Seated Length	3.250in. (82.55 mm)
Maximum Diameter	1.188in. (30.17 mm)
Envelope	JEDEC T9
Top Cap	Small embossed (JEDEC C1-50)
Base	Ultra-Short Small-Wafer with External Barriers: 6-pin (JEDEC No. B6-253)
Terminal Diagram	JEDEC 8EZ
Type of Cathode	Coated Unipotential
Operating Position	Any

MAXIMUM RATINGS[b] – High Voltage Rectifier

For operation as a pulsed rectifier tube in a 525-line, 30-frame system[c]

Inverse Plate Voltage[d]			
Total DC and Peak (absolute max.)	$-e_{bm}$	38,000	V
Average (absolute max.)	$E_{b(av)}$	30,000	V
Plate Current:			
Peak (design max.)	i_{bm}	100	mA
Average (design max.)	$I_{b(av)}$	2.0	mA
Heater Voltage (absolute max.)	E_h	4.14	V
Heater Voltage (absolute min.)	E_h	3.06	V

[a] Measured without external shield in accordance with the current issue of EIA Standard RS-191.
[b] As defined in the current issue of EIA Standard RS-239A.
[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.
[d] This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10μs.

OPERATING CONSIDERATIONS

Socket Connections. The base pins of the 3CA3A fit the standard octal socket. Socket terminals 1, 3, 4, 5, 6, and 8 may be connected to terminal 7 or to a corona shield which connects to terminal 7. Terminals 4 and 6 may be used as tie points at or near cathode potential. Otherwise, do not use.

Measurement of Heater Voltage. It is recommended that a thermocouple rms voltmeter be used to measure heater voltage. The meter and its leads must be insulated to withstand 38,000 V. To minimize loading of the rectifier circuit during this measurement, stray capacitances to ground should be kept as low as possible.

X-RADIATION CHARACTERISTIC

X-Radiation, Maximum

Statistical Value Controlled On A Lot Sampling Basis *25mR/hr*

X-Radiation is measured in accordance with JEDEC Publication No. 67 A, "Recommended Practice for Measurement of X-Radiation from Receiving Tubes", and controlled in accordance with JEDEC Publication No. 73 A, "Recommended Practice for Quality Control of X-Radiation Emitted from High Voltage Rectifier and Shunt Regulator Receiving Tubes".

Operation of the 3CA3A outside of the absolute values indicated above may result in either temporary or permanent

changes in the X-radiation characteristic of the tube. Equipment design must be such that these absolute values are not exceeded.

WARNING

X-Radiation

The high voltages associated with the 3CA3A result in production of X-Radiation which may constitute a health hazard on prolonged exposure at close range unless the tube is adequately shielded. Equipment design must provide for this shielding.

Precautions must be exercised during the servicing of equipment employing the 3CA3A to assure that the high voltage is adjusted to the recommended value and that any shielding components are replaced to their intended positions before the equipment is operated.

SHOCK HAZARD

The high voltages at which the 3CA3A is operated can be extremely dangerous to the user or serviceman. Extreme care should be taken in the use of, and for the servicing and adjustment of, any high voltage circuit.

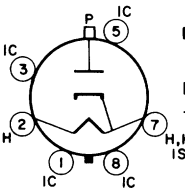
Precautions must be exercised during the replacement or servicing of the 3CA3A in equipment to assure that the high voltage output terminal is properly grounded while inserting or removing the tube from its socket or while connecting or disconnecting the top cap connector.

THE EQUIPMENT MANUFACTURER SHOULD PROVIDE A WARNING LABEL IN AN APPROPRIATE POSITION ON THE EQUIPMENT TO ADVISE THE SERVICEMAN OF ALL PRECAUTIONS HEREIN.

3CA3A

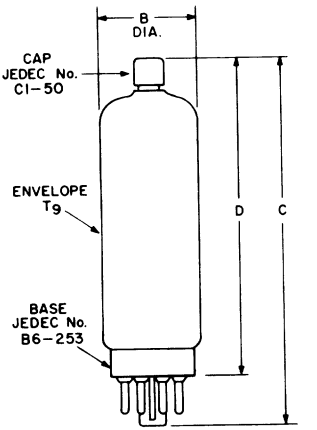
TERMINAL DIAGRAM – JEDEC 8EZ – Bottom View

Pin 1 – Do Not Use
Pin 2 – Heater
Pin 3 – Do Not Use
Pin 5 – Do Not Use



Pin 7 – Heater, Cathode, Internal Shield
Pin 8 – Do Not Use
Top Cap – Plate

DIMENSIONAL OUTLINE



92CS-15232VI

DIMENSION	INCHES		MILLIMETERS	
	Min.	Max.	Min.	Max.
B	1.062*	1.188	26.98*	30.17
C	–	3.812	–	96.82
D	3.062	3.250	77.78	82.55
MILLIMETER DIMENSION DERIVED FROM INCH DIMENSION				
*Applies to the minimum diameter except in the area of the seal.				

Pentagrid Amplifier

The 3CS6 is the same as the 6CS6 except for the following items:

Heater Characteristics and Ratings

Current	0.600±0.040	A
Voltage (ac or dc) at 0.600 A	3.15	V
Warm-up time (Average)	11	s

Half-Wave Vacuum Rectifier

ELECTRICAL CHARACTERISTICS - Bogey Values

Filament Voltage, ac	E_f	3.15	V
Filament Current at E_f = 3.15 V	I_f	0.280	A
Direct Interelectrode Capacitance:[a]			
P to (F + IS)	$c_{p\text{-all}}$	1.5	pF
Instantaneous Tube Voltage Drop for Instantaneous Plate Current (i_b) = 7 mA	e_b	50	V

MECHANICAL CHARACTERISTICS

Maximum Overall Length	3.812 in (96.82 mm)
Maximum Seated Length	3.250 in (82.55 mm)
Maximum Diameter	1.281 in (32.53 mm)
Envelope	JEDEC T9
Top Cap (Alternates):	Small (JEDEC C1-1)
	Small with Tubular Support (JEDEC C1-34)
	Small embossed (JEDEC C1-48)

Base (Alternates):
- Intermediate-Shell Octal:
  6-Pin, Arrangement 1 (JEDEC Group 1, No.B6-8)
- Short Intermediate-Shell Octal with External Barriers:
  6-Pin, Arrangement 1 (JEDEC Group 1, No.B6-60)
- Ultra Short Small-Wafer Octal with External Barriers:
  6-Pin, (JEDEC Group 1, No.B6-253)

Terminal-Connections Designation	JEDEC 8MK
Type of Cathode	Coated Filament
Operating Position	Any

MAXIMUM RATINGS - Design-Maximum Values[b]

For operation as a pulsed rectifier tube in a 525-line, 30-frame system

Peak Inverse Plate Voltage[c]		33,000	V
Plate Current:			
Peak	i_b	100	mA
Average	$I_{b(av)}$	2	mA
Filament Voltage, ac	E_f	2.65 to 3.65	V

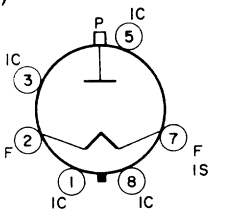
[a] Measured without external shield in accordance with the current issue of EIA Standard RS-191.

[b] As defined in the current issue of EIA Standard RS-329.

[c] This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10 μs.

TERMINAL DIAGRAM (Bottom View)

Pin 1 - Do Not Use
Pin 2 - Filament
Pin 3 - Do Not Use
Pin 5 - Do Not Use
Pin 7 - Filament
Internal Shield
Pin 8 - Do Not Use
Top Cap - Plate



JEDEC 8MK

OPERATING CONSIDERATIONS

Socket Connections. The base pins of the 3CU3 fit the standard octal socket. Socket terminals 1, 3, 4, 5, 6 and 8 may be connected to terminal 7 or to a corona shield which connects to terminal 7. Terminals 4 and 6 may be used as tie points at or near filament potential. Otherwise, do not use.

High Voltages. The high voltages at which the 3CU3 is operated may be extremely dangerous to the user. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential with respect to ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel cannot possibly come in contact with any high potential point in the electrical system.

Operation of the 3CU3 with a plate voltage above approximately 16,000 V results in the production of X-radiation which can constitute a health hazard on prolonged exposure at close range unless the tube is adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

Sharp-Cutoff Tetrode

The 3CY5 is the same as the 6CY5 except for the following items:

Heater Characteristics and Ratings:

Current	0.450 ± 0.030	A
Voltage (ac or dc) at 0.450 A	2.9	V
Warm-up time (Average)	11	s

Half-Wave Vacuum Rectifier

ELECTRICAL CHARACTERISTICS – Bogey Values

Heater Voltage, ac	E_h	3.15	V
Heater Current at E_h=3.15 V	I_h	0.48	A
Warm-up Time	T_h	4	s
Direct Interelectrode Capacitance:[a]			
P to (K + IS + H)	$c_{p\text{-all}}$	1.6	pF
Instantaneous Tube Voltage Drop for Instantaneous Plate Current (i_b) = 7 mA	e_b	60	V

MECHANICAL CHARACTERISTICS

Maximum Overall Length . . . . . 4.312 in (109.52 mm)

Maximum Seated Length . . . . . 3.750 in (95.25 mm)

Maximum Diameter . . . . . 1.188 in (30.17 mm)

Envelope . . . . . JEDEC T9

Top Cap . . . . . Small embossed (JEDEC C1-48)

Base:

Ultra-Short Small-Wafer with External Barriers:
6-pin (JEDEC No. B6-253)

Terminal-Connections Designation . . . . . JEDEC 8EZ

Type of Cathode . . . . . Coated Unipotential

Operating Position . . . . . Any

MAXIMUM RATINGS – Design-Maximum Values[b]

For operation as a pulsed rectifier tube in a 525-line, 30-frame system

Inverse Plate Voltage:[c]			
Total DC and Peak	$-e_{bm}$	38,000	V
DC	$E_{b(av)}$	30,000	V
Plate Current:			
Peak	i_b	110	mA
Average	$I_{b(av)}$	2.2	mA
Heater Voltage	E_h	2.65 to 3.65	V

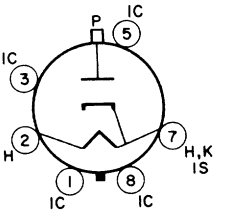
[a] Measured without external shield in accordance with the current issue of EIA Standard RS-191.

[b] As defined in the current issue of EIA Standard RS-239.

[c] This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10 μs.

TERMINAL DIAGRAM (Bottom View)

Pin 1 - Do Not Use
Pin 2 - Heater
Pin 3 - Do Not Use
Pin 5 - Do Not Use
Pin 7 - Heater, Cathode, Internal Shield
Pin 8 - Do Not Use
Top Cap - Plate



JEDEC 8EZ

OPERATING CONSIDERATIONS

Socket Connections. The base pins of the 3CZ3 fit the standard octal socket. Socket terminals 1, 3, 4, 5, 6 and 8 may be connected to terminal 7 or to a corona shield which connects to terminal 7. Terminals 4 and 6 may be used as tie points at or near cathode potential. Otherwise, do not use.

High Voltages. The high voltages at which the 3CZ3 is operated may be extremely dangerous to the user. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential with respect to ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel cannot possibly come in contact with any high potential point in the electrical system.

X-Radiation. Operation of the 3CZ3 with a plate voltage above approximately 16,000 V results in the production of X-radiation which can constitute a health hazard on prolonged exposure at close range unless the tube is adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

3CZ3A

Half-Wave Vacuum Rectifier

Designed to minimize X-Radiation
$-e_{bm}$ = 38,000 max. V
Warm-up Time = 4 sec.

ELECTRICAL CHARACTERISTICS – Bogey Values

Heater Voltage, ac or dc	E_h	3.15	V
Heater Current at E_h = 3.15 V	I_h	0.48	A
Warm-up Time	T_h	4	s
Direct Interelectrode Capacitance:[a]			
P to (K + IS + H)	$c_{p\text{-all}}$	1.6	pF
Instantaneous Tube Voltage Drop for Instantaneous Plate Current (i_b) = 7 mA	e_b	60	V

MECHANICAL CHARACTERISTICS

Maximum Overall Length	4.312in. (109.52 mm)
Maximum Seated Length	3.750in. (95.25 mm)
Maximum Diameter	1.188in. (30.17 mm)
Envelope	JEDEC T9
Top Cap	Small embossed (JEDEC C1-50)
Base	Ultra-Short Small-Wafer with External Barriers: 6-pin (JEDEC No. B6-253)
Terminal Diagram	JEDEC 8EZ
Type of Cathode	Coated Unipotential
Operating Position	Any

MAXIMUM RATINGS[b] – High Voltage Rectifier

For operation as a pulsed rectifier tube in a 525-line, 30-frame system[c]

Inverse Plate Voltage[d]			
Total DC and Peak (absolute max.)	$-e_{bm}$	38,000	V
DC (absolute max.)	$E_{b(av)}$	30,000	V
Plate Current:			
Peak (design max.)	i_{bm}	110	mA
Average (design max.)	$I_{b(av)}$	2.2	mA
Heater Voltage (absolute max.)	E_h	3.65	V
Heater Voltage (absolute min.)	E_h	2.65	V

[a] Measured without external shield in accordance with the current issue of EIA Standard RS-191B.
[b] As defined in the current issue of EIA Standard RS-239A.
[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.
[d] This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10μs.

OPERATING CONSIDERATIONS

Socket Connections. The base pins of the 3CZ3A fit the standard octal socket. Socket terminals 1, 3, 4, 5, 6, and 8 may be connected to terminal 7 or to a corona shield which connects to terminal 7. Terminals 4 and 6 may be used as tie points at or near cathode potential. Otherwise, do not use.

Measurement of Heater Voltage. It is recommended that a thermocouple rms voltmeter be used to measure heater voltage. The meter and its leads must be insulated to withstand 38,000 V. To minimize loading of the rectifier circuit during this measurement, stray capacitances to ground should be kept as low as possible.

X-RADIATION CHARACTERISTIC

X-Radiation, Maximum

Statistical Value Controlled On A Lot
Sampling Basis *25mR/hr*

X-Radiation is measured in accordance with JEDEC Publication No. 67 A, "Recommended Practice for Measurement of X-Radiation from Receiving Tubes", and controlled in accordance with JEDEC Publication No. 73 A, "Recommended Practice for Quality Control of X-Radiation Emitted from High Voltage Rectifier and Shunt Regulator Receiving Tubes".

Operation of the 3CZ3A outside of the absolute values indicated above may result in either temporary or permanent

changes in the X-radiation characteristic of the tube. Equipment design must be such that these absolute values are not exceeded.

WARNING

X-Radiation

The high voltages associated with the 3CZ3A result in production of X-Radiation which may constitute a health hazard on prolonged exposure at close range unless the tube is adequately shielded. Equipment design must provide for this shielding.

Precautions must be exercised during the servicing of equipment employing the 3CZ3A to assure that the high voltage is adjusted to the recommended value and that any shielding components are replaced to their intended positions before the equipment is operated.

SHOCK HAZARD

The high voltages at which the 3CZ3A is operated can be extremely dangerous to the user or serviceman. Extreme care should be taken in the use of, and for the servicing and adjustment of, any high voltage circuit.

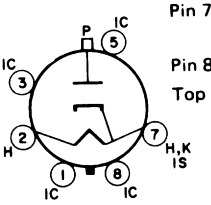
Precautions must be exercised during the replacement or servicing of the 3CZ3A in equipment to assure that the high voltage output terminal is properly grounded while inserting or removing the tube from its socket or while connecting or disconnecting the top cap connector.

THE EQUIPMENT MANUFACTURER SHOULD PROVIDE A WARNING LABEL IN AN APPROPRIATE POSITION ON THE EQUIPMENT TO ADVISE THE SERVICEMAN OF ALL PRECAUTIONS HEREIN.

3CZ3A

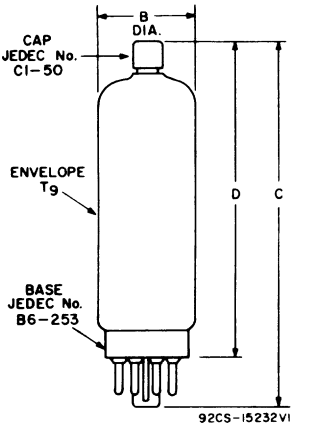
TERMINAL DIAGRAM – JEDEC 8EZ – Bottom View

Pin 1 – Do Not Use
Pin 2 – Heater
Pin 3 – Do Not Use
Pin 5 – Do Not Use



Pin 7 – Heater, Cathode, Internal Shield
Pin 8 – Do Not Use
Top Cap – Plate

DIMENSIONAL OUTLINE



DIMENSION	INCHES		MILLIMETERS	
	Min.	Max.	Min.	Max.
B	1.062*	1.188	26.98*	30.17
C	–	4.312	–	109.52
D	3.500	3.750	88.90	95.25
MILLIMETER DIMENSION DERIVED FROM INCH DIMENSION				
*Applies to the minimum diameter except in the area of the seal.				

Full-Wave Vacuum Rectifier

GENERAL DATA

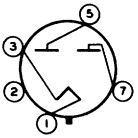
Electrical:

Filament, Coated:		
Voltage (AC or DC)	3.3 ± 10%	volts
Current at 3.3 volts	3.8	amp

Mechanical:

Operating Position	Any
Maximum Overall Length	4-5/8"
Maximum Seated Length	4-1/16"
Diameter	1.438" to 1.562"
Bulb	T12
Base	Short Medium-Shell Octal 5-Pin with External Barriers, Style A (JEDEC Group 1, No.B5-234) or Short Medium-Shell Octal 5-Pin with External Barriers, Style B (JEDEC Group 1, No.B5-239)
Basing Designation for BOTTOM VIEW	5DE

Pin 1 - Filament
Pin 2 - Internal Connection—Do Not Use



Pin 3 - Filament
Pin 5 - Plate No.2
Pin 7 - Plate No.1

FULL-WAVE RECTIFIER

Maximum Ratings, *Design-Maximum Values:*

PEAK INVERSE PLATE VOLTAGE	1050 max.	volts
AC PLATE SUPPLY VOLTAGE PER PLATE (RMS)	See *Rating Chart I*	
PEAK PLATE CURRENT PER PLATE	1.2 max.	amp
HOT-SWITCHING TRANSIENT PLATE CURRENT PER PLATE[a]	6.5 max.	amp
DC OUTPUT CURRENT	See *Rating Chart I*	
BULB TEMPERATURE (At hottest point on bulb surface)	200 max.	°C

Typical Operation:

With capacitor input to filter

AC Plate-to-Plate Supply Voltage (RMS)	550	volts
Filter-Input Capacitor[b]	40	μf
Total Effective Plate Supply Impedance Per Plate	32	ohms
DC Output Voltage (Approx.) at input to filter at full-load current of 350 ma.	300	volts

Characteristics:

Tube-Voltage Drop for plate ma. = 350 (Per plate)	25	volts

[a] Even occasional hot-switching with capacitor-input circuits permits the flow of plate current having magnitudes which can adversely affect the life and reliability of rectifier tubes. If capacitor-input circuits are to be used, protect the circuits against the adverse effects of possible hot-switching, and do not exceed a hot-switching transient plate current per plate of 6.5 amperes during the initial cycles of the hot-switching transient. If hot-switching is required in operation, the use of choke-input circuits is recommended. Such circuits limit the hot-switching current to a value no higher than that of the peak plate current.

[b] Values of capacitance higher than those indicated may be used, provided the effective plate supply impedance is increased to prevent exceeding the maximum peak-plate-current rating.

RATING CHARTS and OPERATION CHARACTERISTICS

Rating Chart I represents graphically the relationships between maximum ac voltage input and maximum dc output current derived from the fundamental ratings for conditions of capacitor input and choke input to filters. This graphical presentation gives the equipment designer considerable latitude in choice of operating conditions.

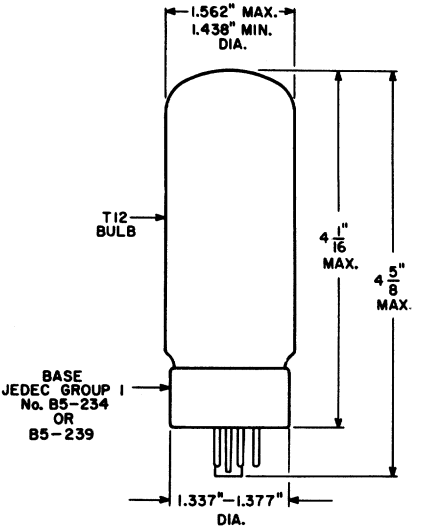
Rating Chart II represents graphically the relationship between maximum rectification efficiency and maximum dc output current per plate for conditions of capacitor input to filter.

A choice of operating values of dc output current per plate and rectification efficiency should be made such that they fall within the area of permissible operation to insure that the maximum peak-plate-current rating will not be exceeded. If the operating values chosen fall outside the permissible operating area, a different choice of parameters should be made. For a given value of ac voltage input and dc output current, it is possible to reduce the rectification efficiency either by increasing the plate supply resistance per plate or by using a smaller value of input filter capacitor.

Rating Chart III represents graphically the relationships between minimum effective plate supply resistance per plate and maximum ac plate supply voltage per plate under no-load conditions of capacitor input to filter when occasional hot-switching is employed.

If occasional hot-switching is required with capacitor-input circuits, it is important to protect the tube and the circuits against the flow of plate currents having magnitudes in excess of the maximum hot-switching-current rating of 6.5 amperes. To limit the hot-switching current, adequate series plate supply resistance per plate is necessary. This resistance value may be determined with the formula shown in legend of *Rating Chart III*. To insure that the maximum hot-switching current is not exceeded, a value of series plate supply resistance per plate should be chosen such that it is equal to or greater than the minimum value indicated by the curve.

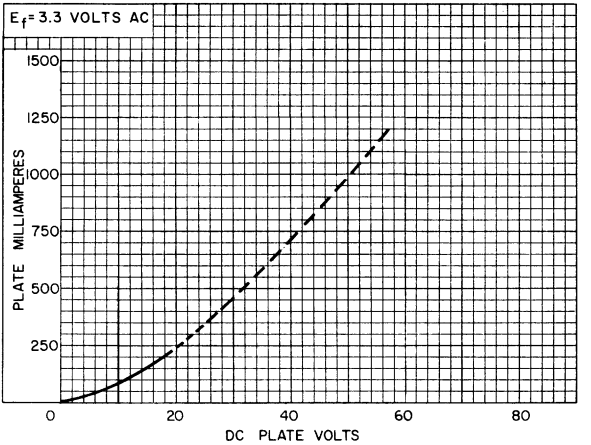
If appreciable series inductance is present in the plate supply, a value of series plate supply resistance smaller than that indicated by the curve may be employed provided it is experimentally determined that the combined effect of inductance and plate supply resistance used are adequate to limit the hot-switching current to the indicated maximum-rated value.



92CS-10983R1

3DG4

AVERAGE PLATE CHARACTERISTIC
Each Plate



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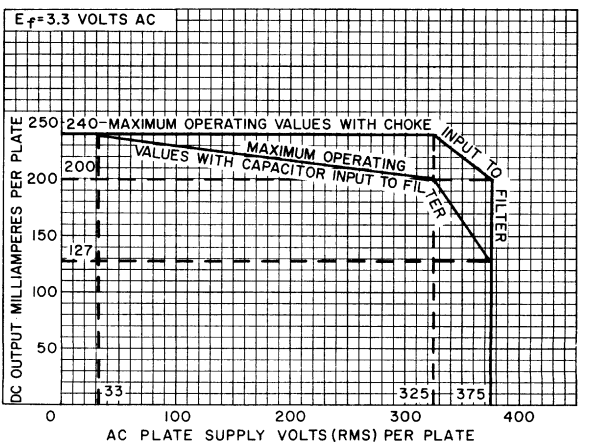
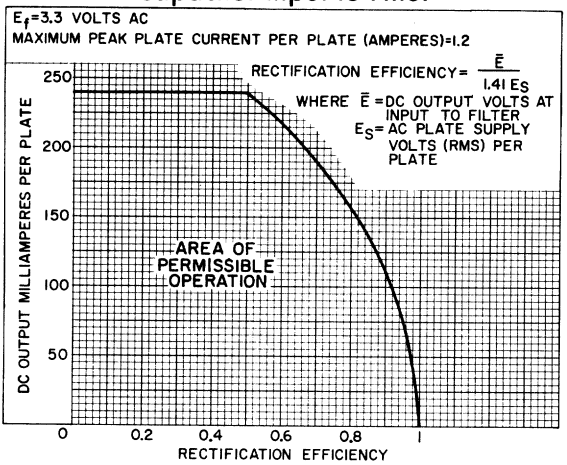
RATING CHART I



92CS-10982RI

RATING CHART II
Capacitor Input to Filter



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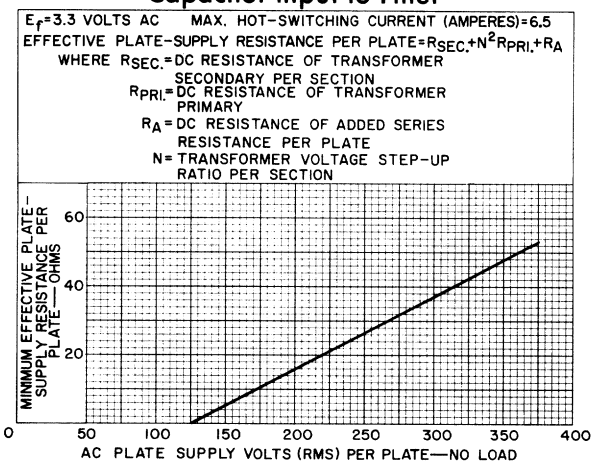
RATING CHART III
Capacitor Input to Filter



92CS-10977

3DK6

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

The 3DK6 is the same as the 6DK6 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	3.15	volts
Warm-up time (Average)	11	sec
Peak heater-cathode voltage:		
Heater negative with respect to cathode	300[a] max.	volts
Heater positive with respect to cathode	200[b] max.	volts

3DT6A

Sharp-Cutoff Pentode

With Two Independent Control Grids

7-PIN MINIATURE TYPE

The 3DT6A is the same as the 6DT6A except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	3.15	volts
Warm-up time (Average)	11	sec

[a] The dc component must not exceed 200 volts.
[b] The dc component must not exceed 100 volts.

3DZ4

Medium-Mu Triode

7-PIN MINIATURE TYPE

The 3DZ4 is the same as the 6DZ4 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	3.2	volts
Warm-up time (Average)	11	sec
Peak heater-cathode voltage:		
Heater negative with respect to cathode	180 max.	volts
Heater positive with respect to cathode	180[b] max.	sec

3EA5

Sharp-Cutoff Tetrode

7-PIN MINIATURE TYPE

The 3EA5 is the same as the 6EA5 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	2.9	volts
Warm-up time (Average)	11	sec

3EH7

Semiremote-Cutoff Pentode

9-PIN MINIATURE TYPE

The 3EH7 is the same as the 6EH7 expect for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	3.4	volts

[b] The dc component must not exceed 100 volts.

3EJ7

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

The 3EJ7 is the same as the 6EJ7 except for the following items:

Heater Characteristics and Ratings:		
Current.	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600.	3.4	volts

3ER5

High-Mu Triode

7-PIN MINIATURE TYPE

The 3ER5 is the same as the 6ER5 except for the following items:

Heater Characteristics and Ratings:		
Current.	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450.	2.8	volts

3FH5

High-Mu Triode

7-PIN MINIATURE TYPE

The 3FH5 is the same as the 6FH5 except for the following items:

Heater Characteristics and Ratings:		
Current.	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450.	3.0	volts
Warm-up time (Average)	11	sec

3FS5

Beam Hexode

7-PIN MINIATURE TYPE

The 3FS5 is the same as the 6FS5 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	2.9	volts
Warm-up time (Average)	11	sec

3GK5

High-Mu Triode

7-PIN MINIATURE TYPE

The 3GK5 is the same as the 6GK5 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	2.8	volts
Warm-up time (Average)	11	sec

3GS8

Sharp-Cutoff Twin Pentode

With Common Cathode, Grid No.1, and Grid No.2

The 3GS8 is the same as the 4GS8/4BU8 except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	E_h	3.15	V

3HM5/3HA5

High-Mu Triode

The 3HM5/3HA5 is the same as the 6HM5/6HA5 except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	E_h	2.7	V
Warm-up time (Average)		11	s

3HS8

Sharp-Cutoff Twin Pentode

The 3HS8 is the same as the 6HS8 except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	E_h	3.15	V
Warm-up time (Average)		11	s

3JC6, 3JC6A

Sharp-Cutoff Pentodes

The 3JC6 and 3JC6A are the same as the 6JC6 and 6JC6A, respectively, except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	E_h	3.5	V
Warm-up time (Average)		11	s

3JD6

Sharp-Cutoff Pentode

The 3JD6 is the same as the 6JD6 except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	E_h	3.5	V
Warm-up time (Average)		11	s

3KT6

Semiremote-Cutoff Pentode

The 3KT6 is the same as the 6KT6 except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	E_h	3.5	V
Warm-up time (Average)		11	s

4-400A

Beam Power Tube

FORCED-AIR COOLED

GENERAL DATA

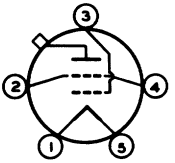
Electrical:

Filament, Thoriated Tungsten:		
Voltage (AC or DC)	5 ± 5%	volts
Current at 5 volts	14.5	amp
Transconductance, for plate volts = 2500, grid-No.2 volts = 500, and plate ma. = 100	4000	μmhos
Mu-Factor, Grid No.2 to Grid No.1	5.1	
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to plate	0.12	μμf
Grid No.1 to filament, grid No.2, and base shell	13	μμf
Plate to filament, grid No.2, and base shell	4.6	μμf

Mechanical:

Operating Position	Vertical, base down ←
Maximum Overall Length	6-3/8"
Seated Length	5-3/8" ± 1/4"
Maximum Diameter	3-9/16"
Weight (Approx.)	9 oz
Cap	Skirted Small (JEDEC No.C1-22)
Base[a]	Special Metal-Shell Giant 5-Pin
Basing Designation for BOTTOM VIEW	5BK

Pin 1 - Filament
Pin 2 - Grid No.2
Pin 3 - Grid No.1



Pin 4 - Grid No.2
Pin 5 - Filament
Cap - Plate

Thermal: ←

Forced-Air Cooling:
Upward through base toward bulb:
Base-cooling air flow from a small fan or centrifugal blower should be applied simultaneously with filament power. In continuous service 15 cfm at a static pressure of 0.4 inch of water are required through the base when the recommended socket and chimney are used.

Base-Seal Temperature	200 max.	°C
Plate-Seal Temperature	225 max.	°C

← Indicates a change.

RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.
DATA 9-62

→ **Components:**

Socket. . . . Johnson 122-275, National HX-100, or equivalent
Chimney . . . . . Penta Labs PL-C1, or equivalent
Heat-Radiating Plate Connector. . . Eimac HR-6, or equivalent

AF POWER AMPLIFIER & MODULATOR — Class AB

Maximum CCS[b] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE.	4000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE. . .	800 max.	volts
MAX.-SIGNAL DC PLATE CURRENT[c]	350 max.	ma
GRID-No.2 INPUT[c].	35 max.	watts
GRID-No.1 (CONTROL-GRID) INPUT[c]	10 max.	watts
PLATE DISSIPATION[c].	400 max.	watts

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS[b] Ratings, *Absolute-Maximum Values:*

→ *At frequencies up to 110 Mc*

DC PLATE VOLTAGE.	3200 max.	volts
DC GRID-No.2 VOLTAGE.	600 max.	volts
DC GRID-No.1 VOLTAGE.	-500 max.	volts
DC PLATE CURRENT.	275 max.	ma
GRID-No.2 INPUT	35 max.	watts
GRID-No.1 INPUT	10 max.	watts
PLATE DISSIPATION	270 max.	watts

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[d] and RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS[b] Ratings, *Absolute-Maximum Values:*

At frequencies up to 110 Mc

DC PLATE VOLTAGE.	4000 max.	volts
DC GRID-No.2 VOLTAGE.	600 max.	volts
DC GRID-No.1 VOLTAGE.	-500 max.	volts
DC PLATE CURRENT.	350 max.	ma
GRID-No.2 INPUT	35 max.	watts
GRID-No.1 INPUT	10 max.	watts
PLATE DISSIPATION	400 max.	watts

[a] Metal base shell should be grounded by means of suitable spring fingers.
[b] Continuous Commercial Service.
[c] Averaged over any audio-frequency cycle of sine-wave form.
[d] Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

→ Indicates a change.

4AU6

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4AU6 is the same as the 6AU6 except for the following items:

Heater Characteristics and Ratings *(Design-Maximum Values):*		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	4.2	volts
Warm-up time (Average)	11	sec

4AV6

Twin Diode—High-Mu Triode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4AV6 is the same as the 6AV6 except for the following items:

Heater Characteristics and Ratings *(Design-Maximum Values):*		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	4.2	volts
Warm-up time (Average)	11	sec

4BC5

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4BC5 is the same as the 6BC5 except for the following items:

Heater Characteristics and Ratings *(Design-Center Values):*			
Current	0.450 ± 0.030		amp
Voltage (AC or DC) at heater amperes = 0.450	4.2		volts
Warm-up time (Average)	11		sec
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts

[a] The dc component must not exceed 100 volts.

4BC8

Medium-Mu Twin Triode

With Semiremote-Cutoff Characteristic

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4BC8 is the same as the 6BC8 except for the following items:

Heater Characteristics and Ratings *(Design-Center Values):*		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	4.2	volts
Warm-up time (Average)	11	sec

4BL8

Medium-Mu Triode— Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4BL8 is the same as the 6BL8 except for the following items:

Heater Characteristics and Ratings *(Design-Center Values):*		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	4.6	volts

4BN6

Beam Tube

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4BN6 is the same as the 6BN6 except for the following items:

Heater Characteristics and Ratings *(Design-Maximum Values):*		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	4.2	volts
Warm-up time (Average)	11	sec

4BQ7A

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4BQ7A is the same as the 6BQ7A except for the following items:

Heater Characteristics and Ratings *(Design-Center Values)*:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater current = 0.600	4.2	volts
Warm-up time (Average)	11	sec

4BS8

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4BS8 is the same as the 6BS8 except for the following items:

Heater Characteristics and Ratings *(Design-Center Values)*:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater current = 0.600	4.5	volts
Warm-up time (Average)	11	sec

4BU8

Sharp-Cutoff Twin Pentode

With Common Cathode, Grid No.1, & Grid No.2

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4BU8 is the same as the 6BU8 except for the following items:

Heater Characteristics and Ratings *(Design-Maximum Values)*:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater current = 0.450	4.2	volts
Warm-up time (Average)	11	sec

4BZ6

Semiremote-Cutoff Pentode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4BZ6 is the same as the 6BZ6 except for the following items:

Heater Characteristics and Ratings *(Design-Maximum Values)*:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater current = 0.450	4.2	volts
Warm-up time (Average)	11	sec

4BZ7

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4BZ7 is the same as the 6BZ7 except for the following items:

Heater Characteristics and Ratings *(Design-Center Values)*:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater current = 0.600	4.2	volts
Warm-up time (Average)	11	sec

4CB6

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4CB6 is the same as the 6CB6 except for the following items:

Heater Characteristics and Ratings *(Design-Center Values)*:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater current = 0.450	4.2	volts
Warm-up time (Average)	11	sec
Peak heater-cathode voltage:		
Heater negative with respect to cathode	300[a] max.	volts
Heater positive with respect to cathode	200[b] max.	volts

[a] The dc component must not exceed 200 volts.
[b] The dc component must not exceed 100 volts.

4CS6

Pentagrid Amplifier

7-PIN MINIATURE TYPE

The 4CS6 is the same as the 6CS6 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	4.2	volts
Warm-up time (Average)	11	sec

4CY5

Sharp-Cutoff Tetrode

7-PIN MINIATURE TYPE

The 4CY5 is the same as the 6CY5 except for the following items:

Heater Characteristics and Ratings:		
Current	0.300 ± 0.020	amp
Voltage (AC or DC) at heater amperes = 0.300	4.5	volts
Warm-up time (Average)	11	sec

4DE6

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

The 4DE6 is the same as the 6DE6 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	4.2	volts
Warm-up time (Average)	11	sec

4DK6

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

The 4DK6 is the same as the 6DK6 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	4.2	volts
Warm-up time (Average)	11	sec

4DT6A

Sharp-Cutoff Pentode

With Two Independent Control Grids

7-PIN MINIATURE TYPE

The 4DT6A is the same as the 6DT6A except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	4.2	volts
Warm-up time (Average)	11	sec

4EH7

Semiremote-Cutoff Pentode

9-PIN MINIATURE TYPE

The 4EH7 is the same as the 6EH7 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	4.4	volts

4EJ7

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

The 4EJ7 is the same as the 6EJ7 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	4.4	volts

4ES8

Variable-Mu Twin Triode

9-PIN MINIATURE TYPE

The 4ES8 is the same as the 6ES8 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	4	volts
Warm-up time (Average)	11	sec

4EW6

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

The 4EW6 is the same as the 6EW6 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	4.2	volts
Warm-up time (Average)	11	sec

4GM6

Semiremote-Cutoff Pentode

7-PIN MINIATURE TYPE

The 4GM6 is the same as the 6GM6 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	4.2	volts
Warm-up time (Average)	11	sec

4HM6

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	4.2	volts
Warm-up time (Average)	11	sec
Peak heater-cathode voltage:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*[a]	
Grid No.1 to plate	0.031	0.024	pf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	8.7	8.7	pf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	2.15	3.0	pf

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	125	volts
Grid No.3 (Suppressor Grid)	*Connected to cathode at socket*	
Grid No.2 Supply Voltage	125	volts
Cathode Resistor	56	ohms
Plate Resistance (Approx.)	0.156	megohm
Transconductance	15000	μmhos
Plate Current	13	ma
Grid No.2 Current	3.2	ma
Grid No.1 Voltage (Approx.) for transconductance (μmhos) = 100	-3	volts

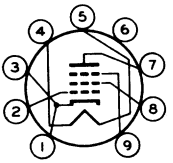
Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

4HM6

Basing Designation for BOTTOM VIEW. 9PM

Pin 1 -Cathode
Pin 2 -Grid No.1
Pin 3 -Cathode
Pin 4 -Heater
Pin 5 -Heater
Pin 6 -No Internal Connection



Pin 7 -Plate
Pin 8 -Grid No.2
Pin 9 -Grid No.3, Internal Shield

AMPLIFIER — CLASS A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	250 max.	volts
GRID No.2 (SCREEN-GRID) SUPPLY VOLTAGE	250 max.	volts
GRID No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	50 max.	volts
CATHODE CURRENT	25 max.	ma
GRID No.2 INPUT:		
For grid-No.2 voltages up to 125 volts	0.6 max.	watt
For grid-No.2 voltages between 125 and 250 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	2.5 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	1 max.	megohm

[a] With JEDEC shield No.315 connected to ground.

Sharp-Cutoff Twin Pentode

9-PIN MINIATURE TYPE

The 4HS8 is the same as the 6HS8 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	4.2	volts
Warm-up time (Average)	11	sec

4JC6, 4JC6A

Sharp-Cutoff Pentodes

The 4JC6 and 4JC6A are the same as the 6JC6 and 6JC6A, respectively, except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	E_h	4.5	V
Warm-up time (Average)		11	s

4JD6

Sharp-Cutoff Pentode

The 4JD6 is the same as the 6JD6 except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	E_h	4.5	V
Warm-up time (Average)		11	s

4KE8

Medium-Mu Triode—Sharp-Cutoff Pentode

The 4KE8 is the same as the 6KE8 except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	E_h	4.5	V
Warm-up time (Average)		11	s

4KT6

Semiremote-Cutoff Pentode

The 4KT6 is the same as the 6KT6 except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	E_h	4.5	V
Warm-up time (Average)		11	s

5AM8

Diode—Sharp-Cutoff Pentode

CONTROLLED HEATER WARM-UP TIME

The 5AM8 is the same as the 6AM8A except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	E_h	4.7	V

5AN8

Medium-Mu Triode—Sharp-Cutoff Pentode

CONTROLLED HEATER WARM-UP TIME

The 5AN8 is the same as the 6AN8A except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	E_h	4.7	V

5AQ5

Beam Power Tube

CONTROLLED HEATER WARM-UP TIME

The 5AQ5 is the same as the 6AQ5A except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	E_h	4.7	V

5AM8
DIODE–SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

The 5AM8 is the same as the 6AM8 except for the following items:

Heater, for Unipotential Cathodes:		
Voltage	4.7	ac or dc volts
Current	0.6	amp
Warm-up time (Average)*	11	sec

5AN8
MEDIUM-MU TRIODE–SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

The 5AN8 is the same as the 6AN8 except for the following items:

Heater, for Unipotential Cathodes:		
Voltage	4.7	ac or dc volts
Current	0.6	amp
Warm-up time (Average)*	11	sec

5AQ5
BEAM POWER TUBE

7-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

The 5AQ5 is the same as the 6AQ5 except for the following items:

Heater, for Unipotential Cathode:		
Voltage	4.7	ac or dc volts
Current	0.6	amp
Warm-up time (Average)*	11	sec
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲max.	volts

* *For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.*

▲ The dc component must not exceed 100 volts.

5AS4-A

FULL-WAVE VACUUM RECTIFIER

GENERAL DATA

Electrical:

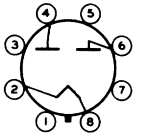
Filament, Coated:

Voltage	5	ac volts
Current	3	amp

Mechanical:

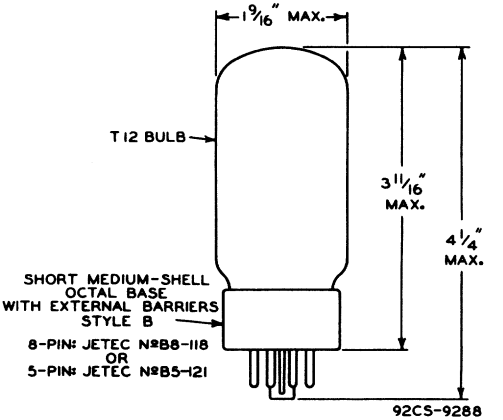
Mounting Position	Vertical, base up or down, or Horizontal with pins 1 and 4 in vertical plane
Maximum Overall Length	4-1/4"
Maximum Seated Length	3-11/16"
Maximum Diameter	1-9/16"
Bulb	T12
Base	Short Medium-Shell Octal 8-Pin with External Barriers, Style B (JETEC No.B8-118), or Short Medium-Shell Octal 5-Pin with External Barriers, Style B (JETEC No.B5-121)
Basing Designation for BOTTOM VIEW	5T

Pin 1 - No Connection
Pin 2 - Filament
Pin 3♦ - Same as Pin 1
Pin 4 - Plate No.2



Pin 5♦ - Same as Pin 1
Pin 6 - Plate No.1
Pin 7♦ - Same as Pin 1
Pin 8 - Filament

MAXIMUM RATINGS, TYPICAL OPERATION, and CURVES for Type 5AS4-A are the same as those shown for Type 5U4-GB



♦ On the 5-pin base, pins 3, 5, and 7 are omitted.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

5AS8

Diode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 5AS8 is the same as the 6AS8 except for the following items:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	4.7	volts
Current	0.6 ± 6%	amp
Warm-up time (Average)	11	sec

5AT8

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 5AT8 is the same as the 6AT8A except for the following items:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	4.7	volts
Current	0.6 ± 6%	amp
Warm-up time (Average)	11	sec

5AU4

Full-Wave Vacuum Rectifier

GENERAL DATA

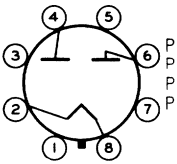
Electrical:

Filament, Coated:		
Voltage (AC or DC)	5	volts
Current	3.75	amp

Mechanical:

Operating Position	Vertical, base down or up, or Horizontal with pins 2 and 4 in vertical plane
Maximum Overall Length	4-3/4"
Maximum Seated Length	4-3/16"
Maximum Diameter	1-11/16"
Bulb	T12
Base	Jumbo-Shell Octal 8-Pin with External Barriers (JEDEC Group 1, No.B8-114)
Basing Designation for BOTTOM VIEW	5T

Pin 1 – No Connection
Pin 2 – Filament
Pin 3 – Same as Pin 1
Pin 4 – Plate No.2



Pin 5 – Same as Pin 1
Pin 6 – Plate No.1
Pin 7 – Same as Pin 1
Pin 8 – Filament

FULL-WAVE RECTIFIER

Maximum Ratings, *Design-Center Values:*

For power-supply frequencies of 25 to 1000 cps

PEAK INVERSE PLATE VOLTAGE	1400 max.	volts
AC PLATE SUPPLY VOLTAGE PER PLATE (RMS, without load)	See *Rating Chart*	
STEADY-STATE PEAK PLATE CURRENT PER PLATE	1.075 max.	amp
TRANSIENT PEAK PLATE CURRENT PER PLATE for duration of 0.2 second maximum	5.25 max.	amp
DC OUTPUT CURRENT	See *Rating Chart*	

Typical Operation:

	With capacitor-input filter		*With choke-input filter*	
AC Plate-to-Plate Supply Voltage (RMS, without load)	600	800	1000	volts
Filter-Input Capacitor[a]	40	40	–	μf
Filter Input Choke	–	–	10	henrys
Total Effective Plate Supply Impedance Per Plate	30	50	–	ohms

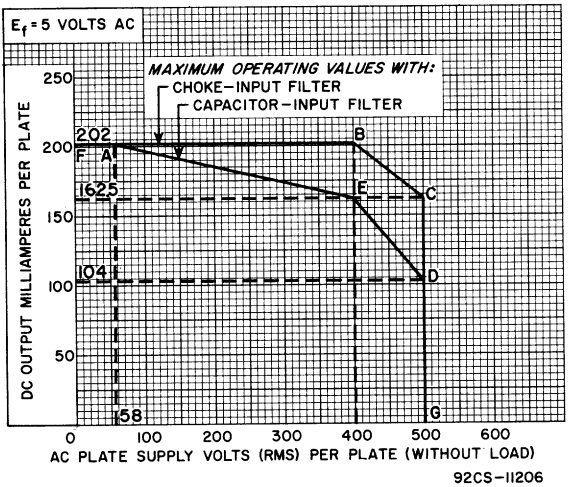
DC Output Voltage at input to filter . . .	275	395	395	volts
DC Output Current . . .	350	325	325	ma

Characteristics:

Tube-Voltage Drop for plate ma. = 350
(Per plate) . . . . . 50 volts

[a] When capacitance values higher than 40 μf are used, the effective plate supply impedance should be increased so that the maximum peak-plate-current rating is not exceeded.

RATING CHART



5AV8

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE
With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	4.7	volts
Current	0.6 ± 6%	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances:[a]		
Triode Unit:		
Grid to plate	1.5	μμf
Grid to cathode and heater	2	μμf
Plate to cathode and heater	0.34	μμf
Pentode Unit:		
Grid No.1 to plate	0.04 max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	7	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	3	μμf
Triode grid to pentode plate	0.005	μμf
Pentode grid No.1 to triode plate	0.006	μμf
Pentode plate to triode plate	0.045	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*	
Plate Supply Voltage	200	200	volts
Grid-No.2 Supply Voltage	–	150	volts
Grid-No.1 Voltage	-6	–	volts
Cathode Resistor	–	180	ohms
Amplification Factor	19	–	
Plate Resistance (Approx.)	5750	300000	ohms
Transconductance	3300	6200	μmhos
Plate Current	13	9.5	ma
Grid-No.2 Current	–	2.8	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-19	-8	volts

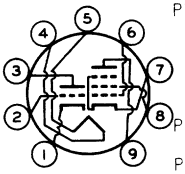
Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2

5AV8

Base. . . . . .Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9DZ

Pin 1 – Triode Cathode
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Grid No.1



Pin 7 – Pentode Cathode, Pentode Grid No.3, Internal Shield
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	300 max.	300 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE.	–	300 max.	volts
GRID-No.2 VOLTAGE	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0 max.	0 max.	volts
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 150 volts	–	0.5 max.	watt
For grid-No.2 voltages between 150 and 300 volts .	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	2.5 max.	2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200 max.	200 max.	volts
Heater positive with respect to cathode.	200[b] max.	200[b] max.	volts

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance:[c]			
For fixed-bias operation. . .	0.5 max.	0.25 max.	megohm
For cathode-bias operation. .	1 max.	1 max.	megohm

[a] Without external shield.
[b] The dc component must not exceed 100 volts.
[c] If either unit is operated at maximum-rated conditions, grid-No.1-circuit resistances for both units should not exceed the stated values.

5B8
MEDIUM-MU TRIODE—SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage	4.7	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

Direct Interelectrode Capacitances:[o]

Triode Unit:		
Grid to plate	1.7	μμf
Grid to cathode & pentode grid No.3 & internal shield, and heater	1.9	μμf
Plate to cathode & pentode grid No.3 & internal shield, and heater	1.4	μμf
Pentode Unit:		
Grid No.1 to plate	0.05 max.	μμf
Grid No.1 to cathode, grid No.2, and heater	6	μμf
Plate to cathode, grid No.3 & triode cathode & internal shield, grid No.2, and heater	2.6	μμf
Plate to cathode, grid No.2, and heater	0.15	μμf
Triode grid to pentode plate	0.0078	μμf
Pentode grid No.1 to triode plate	0.0033	μμf
Pentode plate to triode plate	0.06	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*	
Plate-Supply Voltage	200	200	volts
Grid-No.2 Supply Voltage	–	150	volts
Grid Voltage	-6	–	volts
Cathode Resistor	–	180	ohms
Amplification Factor	19	–	
Plate Resistance (Approx.)	5750	300000	ohms
Transconductance	3300	6200	μmhos
Plate Current	13	9.5	ma
Grid-No.2 Current	–	2.8	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-19	-8	volts

[o]: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

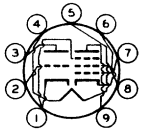
5B8

MEDIUM-MU TRIODE — SHARP-CUTOFF PENTODE

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	.1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9EC

Pin 1 – Pentode Grid No.3, Triode Cathode, Internal Shield
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater



Pin 5 – Heater
Pin 6 – Pentode Grid No.1
Pin 7 – Pentode Cathode
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	300 max.	300 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	–	300 max.	volts
GRID-No.2 VOLTAGE	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive bias value	0 max.	0 max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 150 volts	–	0.5 max.	watt
For grid-No.2 voltages between 150 and 300 volts	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	2.5 max.	2 max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	200 max.	200 max.	volts
Heater positive with respect to cathode	200▲ max.	200▲ max.	volts

o,▲: See next page.

5B8

MEDIUM-MU TRIODE — SHARP-CUTOFF PENTODE

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance:*			
For fixed-bias operation . . .	0.5 max.	0.25 max.	megohm
For cathode-bias operation . .	1 max.	1 max.	megohm

° without external shield.

▲ The dc component must not exceed 100 volts.

* If either unit is operated at maximum rated conditions, grid-No.1-circuit resistances for both units should not exceed the stated values.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5BC3A

Full-Wave Vacuum Rectifier

NOVAR TYPE

For Power Supplies of Equipment Having High DC Power Output Requirements

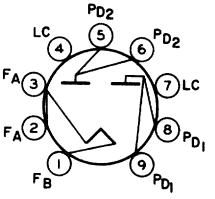
Electrical:

Filament Characteristics and Ratings:		
Voltage (AC)	5.0 ± 0.5	volts
Current at filament volts = 5.0	3.000	amp

Mechanical:

Operating Position	Vertical, base down or up, or Horizontal with pins 2 and 7 in vertical plane
Maximum Overall Length	3.880"
Seated Length	3.250" to 3.500"
Diameter	1.438" to 1.562"
Dimensional Outline (JEDEC No.12-99)	See *General Section*
Bulb	T12
Base	Large-Button Novar 9-Pin with Exhaust Tip (JEDEC No.E9-88)
Basing Designation for BOTTOM VIEW	9QJ

Pin 1 – Filament End B
Pin 2 – Filament End A
Pin 3 – Filament End A
Pin 4 – See Note
Pin 5 – Plate No.2
Pin 6 – Plate No.2
Pin 7 – See Note
Pin 8 – Plate No.1
Pin 9 – Plate No.1



Note: May be used as tie point for ac line providing the peak value of the ac voltage does not exceed 200 volts.

FULL-WAVE RECTIFIER

Maximum Ratings, *Design-Maximum Values:*

Peak Inverse Plate Voltage	1700	volts
AC Plate Supply Voltage Per Plate (RMS, without load)	See accompanying *Rating Chart I*	
Peak Plate Current Per Plate	1	amp
Hot-Switching Transient Plate Current per plate[a]	5	amp
DC Output Current	See accompanying *Rating Chart I*	

Typical Operation:

With capacitor-input filter

AC Plate-to-Plate Supply Voltage (RMS, without load)	600	900	1100	volts
Filter-Input Capacitor[b]	40	40	40	μf
Total Effective Plate Supply Impedance Per Plate	21	67	97	ohms

DC Output Voltage (Approx.) at input to filter at load ma =				
300	290	–	–	volts
275	–	460	–	volts
162	–	–	630	volts
150	335	–	–	volts
137.5	–	520	–	volts
81	–	–	680	volts
With choke-input filter				
AC Plate-to-Plate Supply Voltage (RMS, without load)	900	1100		volts
Filter-Input Choke	10	10		henrys
DC Output Voltage at input to filter (Approx.) at load ma =				
348	340	–		volts
275	–	440		volts
174	355	–		volts
137.5	–	455		volts

[a] Even occasional hot-switching with capacitor-input circuits permits the flow of plate current having magnitudes which can adversely affect the life and reliability of rectifier tubes. If capacitor-input circuits are to be used, protect the circuits against the adverse effects of possible hot-switching, and do not exceed a hot-switching transient plate current per plate of 5 amperes during the initial cycles of the hot-switching transient. If hot-switching is required in operation, the use of choke-input circuits is recommended. Such circuits limit the hot-switching current to a value no higher than that of the peak plate current.

[b] Values of capacitance higher than those indicated may be used, provided the effective plate supply impedance is increased to prevent exceeding the maximum peak-plate-current rating.

RATING CHARTS and OPERATION CHARACTERISTICS

Rating Chart I represents graphically the relationships between maximum ac voltage input and maximum dc output current derived from the fundamental ratings for conditions of capacitor-input and choke-input filters. This graphical presentation gives the equipment designer considerable latitude in choice of operating conditions.

Rating Chart II represents graphically the relationship between maximum rectification efficiency and maximum dc output current per plate for conditions of capacitor-input filter.

A choice of operating values of dc output current per plate and rectification efficiency should be made such that they fall within the area of permissible operation to insure that the maximum peak-plate-current rating will not be exceeded. If the operating values chosen fall outside the permissible operating area, a different choice of parameters should be made. For a given value of ac voltage input and dc output current, it is possible to reduce the rectification efficiency either by increasing the plate supply resistance per plate or by using a smaller value of input filter capacitor.

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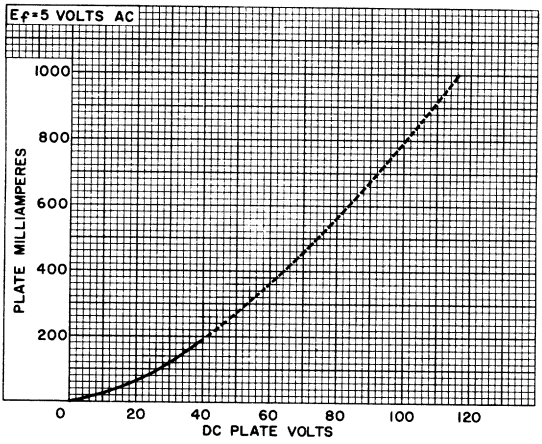
Electronic Components and Devices
Harrison, N. J.

Rating Chart III represents graphically the relationships between minimum effective plate supply resistance per plate and maximum ac plate supply voltage per plate under no-load conditions of capacitor-input filter when occasional hot-switching is employed.

If occasional hot-switching is required with capacitor-input circuits, it is important to protect the tube and the circuits against the flow of plate currents having magnitudes in excess of the maximum hot-switching-current rating of 5 amperes. To limit the hot-switching current, adequate series plate supply resistance per plate is necessary. This resistance value may be determined with the formula shown in legend of *Rating Chart III*. To insure that the maximum hot-switching current is not exceeded, the value of series plate supply resistance per plate should be equal to or greater than the minimum value indicated by the curve.

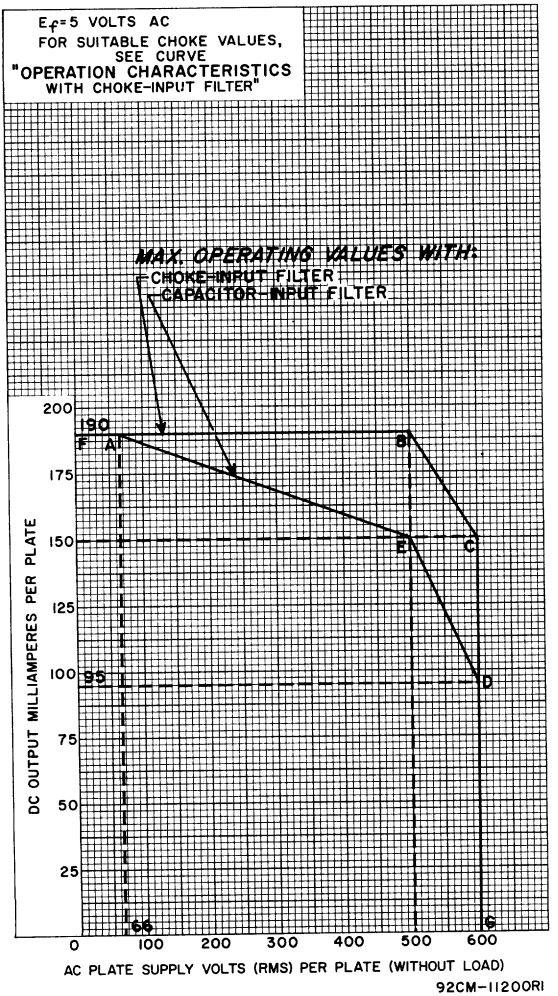
If appreciable series inductance is present in the plate supply, a value of series plate supply resistance smaller than that indicated by the curve may be employed provided it is experimentally determined that the combined effect of inductance and plate supply resistance used are adequate to limit the hot-switching current to the indicated maximum-rated value.

AVERAGE PLATE CHARACTERISTIC
Each Plate



92CS-8440RI

RATING CHART I



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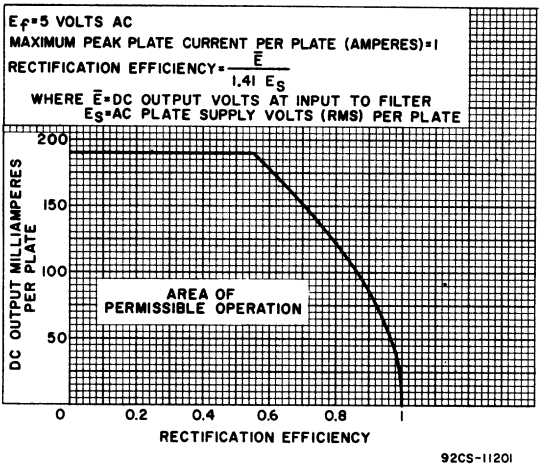
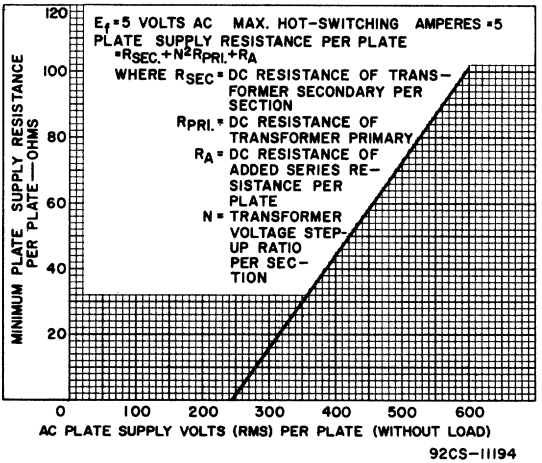
RATING CHART II
Capacitor-Input Filter



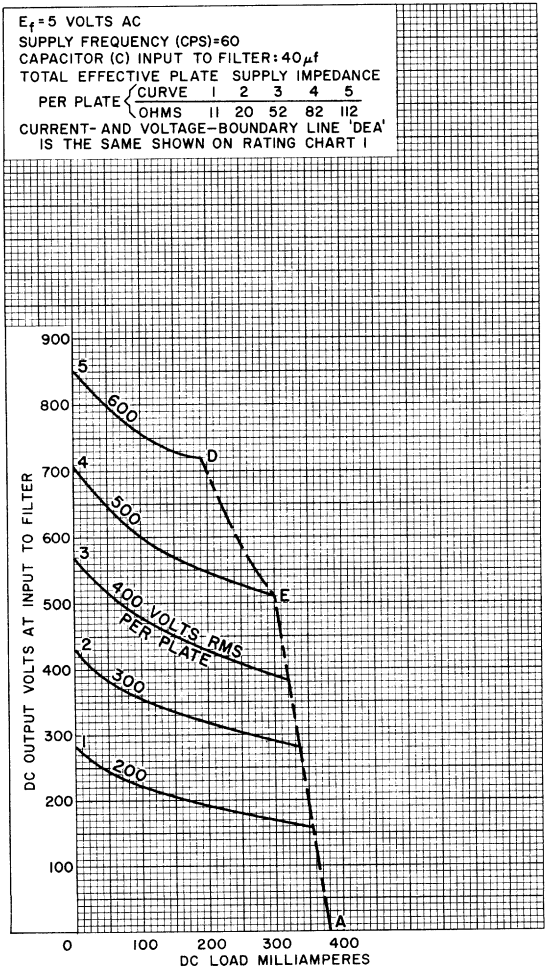
92CS-11201

RATING CHART III
Capacitor-Input Filter



92CS-11194

OPERATION CHARACTERISTICS
Full-Wave Circuit, Capacitor-Input Filter



92CM-11197

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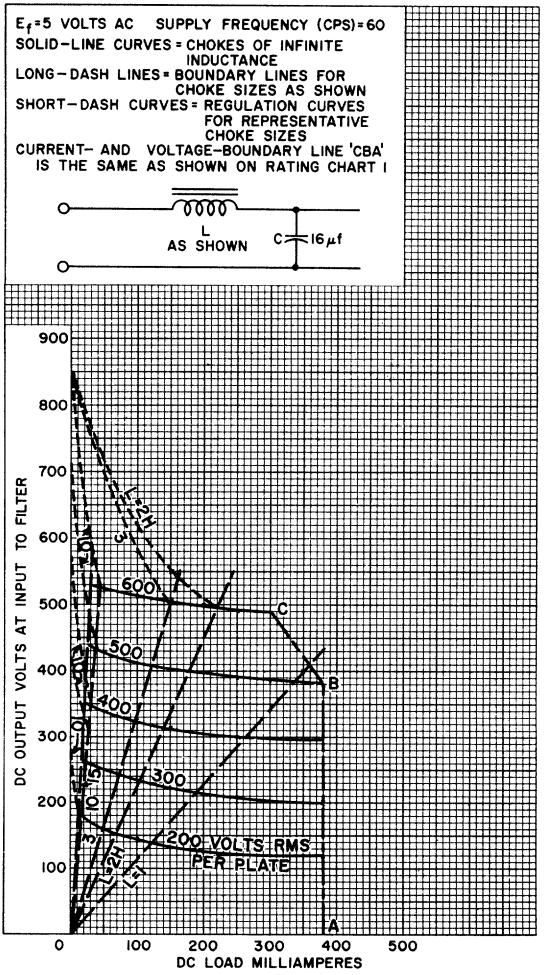
Harrison, N. J.

OPERATION CHARACTERISTICS
Full-Wave Circuit, Choke-Input Filter



92CM-11199

5BK7-A

MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For use in direct-coupled cathode-drive circuits of TV tuners in equipment having series heater-string arrangement

The 5BK7-A is the same as the 6BK7-B except for the following items:

Heater, for Unipotential Cathodes:		
Voltage	4.7	ac or dc volts
Current	0.6	amp

5BQ7-A

MEDIUM-MU TWIN TRIODE

LOW-NOISE 9-PIN MINIATURE TYPE

For use in direct-coupled cathode-drive circuits of TV tuners in equipment having series heater-string arrangement

The 5BQ7-A is the same as the 6BQ7-A except for the following items:

Heater, for Unipotential Cathodes:		
Voltage	5.6	ac or dc volts
Current	0.45	amp
Warm-up time (Average)*	11	sec

5BR8

MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

The 5BR8 is the same as the 6BR8 except for the following items:

Heater, for Unipotential Cathodes:		
Voltage	4.7	ac or dc volts
Current	0.6	amp
Warm-up time (Average)*	11	sec

* *For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.*

Twin Diode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE
With Heater Having Controlled Warm-Up Time

The 5BW8 is the same as the 6BW8 except for the following items:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	4.7	volts
Current	0.6 ± 6%	amp
Warm-up time (Average)	11	sec

5CG8

Medium-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE
With Heater Having Controlled Warm-Up Time

The 5CG8 is the same as the 6CG8A except for the following items:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	4.7	volts
Current	0.6 ± 6%	amp

5CL8A

Medium-Mu Triode—
Sharp-Cutoff Tetrode

9-PIN MINIATURE TYPE
With Heater Having Controlled Warm-Up Time

The 5CL8A is the same as the 6CL8A except for the following items:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	4.7	volts
Current	0.6 ± 6%	amp

5CM8

High-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE
With Heater Having Controlled Warm-Up Time

The 5CM8 is the same as the 6CM8 except for the following items:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	4.7	volts
Current	0.6 ± 6%	amp

5CQ8

Medium-Mu Triode—
Sharp-Cutoff Tetrode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 5CQ8 is the same as the 6CQ8 except for the following items:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	4.7	volts
Current	0.6 ± 6%	amp

5CZ5

Beam Power Tube

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 5CZ5 is the same as the 6CZ5 except for the following items:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	4.7	volts
Current	0.6 ± 6%	amp

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Electron Tube Division Harrison, N. J.

5EA8

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 5EA8 is the same as the 6EA8 except for the following items:

Heater Characteristics and Ratings *(Design-Maximum Values)*:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	4.7	volts

5EU8

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 5EU8 is the same as the 6EU8 except for the following items:

Heater Characteristics and Ratings *(Design-Center Values)*:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	4.7	volts
Cathode Warm-Up Time[a]	35	sec

5EW6

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 5EW6 is the same as the 6EW6 except for the following items:

Heater Characteristics and Ratings *(Design-Maximum Values)*:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	5.6	volts
Warm-up time (Average)	11	sec

[a] The time required for the transconductance to reach 6500 μmhos when the tube is operated from a cold start with dc plate volts = 100, grid volts = 0, and heater amperes = 0.560.

5FG7

Medium-Mu Triode— Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 5FG7 is the same as the 6FG7 except for the following items:

Heater Characteristics and Ratings *(Design-Maximum Values)*:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	4.7	volts

5FV8

Medium-Mu Triode— Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 5FV8 is the same as the 6FV8 except for the following items:

Heater Characteristics and Ratings *(Design-Maximum Values)*:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	4.7	volts

5GH8A

Medium-Mu Triode—
Sharp-Cutoff Pentode

Controlled Heater Warm-up Time

The 5GH8A is the same as the 6GH8A except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	4.7	V

5GM6

Semiremote-Cutoff Pentode

The 5GM6 is the same as the 6GM6 except for:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (ac or dc) at 0.450 A	5.6	V
Warm-up Time (Average)	11	s

5GX6

Sharp-Cutoff Pentode
With Two Independent Control Grids

Controlled Heater Warm-up Time

The 5GX6 is the same as the 6GX6 except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	4.7	V

5HZ6

Sharp-Cutoff Pentode

With Two Independent Control Grids

Controlled Heater Warm-up Time

The 5HZ6 is the same as the 6HZ6 except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	4.75	V

5J6

Medium-Mu Twin Triode

Controlled Heater Warm-up Time

The 5J6 is the same as the 6J6A except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	4.7	V

5KE8

Medium-Mu Triode— Sharp-Cutoff Pentode

The 5KE8 is the same as the 6KE8 except for:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (ac or dc) at 0.450 A	5.6	V
Warm-up Time (Average)	11	s

5MQ8

Medium-Mu Triode— Sharp-Cutoff Pentode

The 5MQ8 is the same as the 6MQ8 except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	5.6	V
Warm-up Time (Average)	11	s

5R4GYB

Full-Wave Vacuum Rectifier

For Industrial & Military Applications

GENERAL DATA

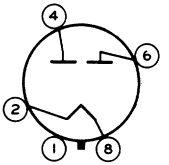
Electrical:

Filament, Coated:[a]
Voltage (AC or DC). . . . . 5 volts
Current . . . . . 2 amp

Mechanical:

Operating Position. . . . . Vertical, base down or up, or Horizontal with pins 2 and 4 in vertical plane
Maximum Overall Length. . . . . 4-1/4"
Maximum Seated Length . . . . . 3-11/16"
Diameter. . . . . 1.438" to 1.562"
Bulb. T12
Base. . . . . Short Medium-Shell Octal 5-Pin Micanol with External Barriers, Style B, Arrangement 1 (JEDEC Group 1, No. B5-121)
Basing Designation for BOTTOM VIEW. 5T

Pin 1 - No Connection
Pin 2 - Filament



Pin 4 - Plate No.2
Pin 6 - Plate No.1
Pin 8 - Filament

FULL-WAVE RECTIFIER

Maximum Ratings, *Absolute-Maximum Values:*

For altitudes up to	*40000*	*20000*	*feet*
PEAK INVERSE PLATE VOLTAGE. . .	2650 max.	3100 max.	volts
AC PLATE SUPPLY VOLTAGE PER PLATE (RMS, without load) . .	See *Rating Chart I*		
PEAK PLATE CURRENT PER PLATE. .	715 max.	715 max.	ma
DC OUTPUT CURRENT PER PLATE . .	See *Rating Chart I*		
HOT-SWITCHING TRANSIENT PLATE CURRENT PER PLATE	[b]	[b]	
BULB TEMPERATURE (At hottest point on bulb surface). . . .	230 max.	230 max.	°C

Typical Operation:

With capacitor-input filter

For altitudes up to	*40000*		*20000*	*feet*
AC-Plate-to-Plate Supply Voltage (RMS, without load) .	1400	1500	2000	volts
Filter-Input Capacitor.	20	20	20	μf
Total Effective Plate Supply Impedance Per Plate[c].	225	250	375	ohms

DC Output Voltage (Approx.) at Input to Filter:				
At half-load ma. =				
75	–	910	1210	volts
125	750	–	–	volts
At full-load ma. =				
150	–	800	1040	volts
250	605	–	–	volts
Voltage Regulation (Approx.): Half-load to full-load current	145	110	170	volts
DC Output Current	250	150	150[c]	ma

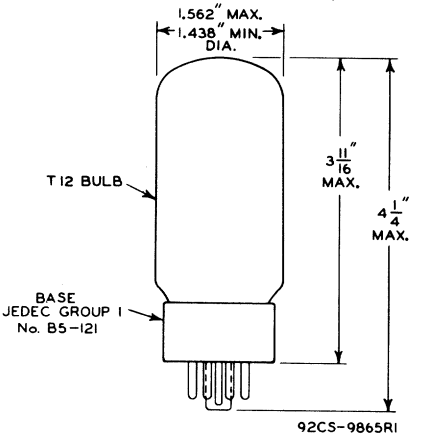
With choke-input filter

For altitudes up to	*40000*	*20000*	*feet*
AC Plate-to-Plate Supply Voltage (RMS, without load)	1500	1900	volts
Filter-Input Choke	5	10	henrys
DC Output Voltage (Approx.) at Input to Filter for dc output ma. =			
87.5	–	800	volts
125	600	–	volts
175	–	760	volts
250	560	–	volts
Voltage Regulation (Approx.): Half-load to full-load current	40	40	volts
DC Output Current	250	175	ma

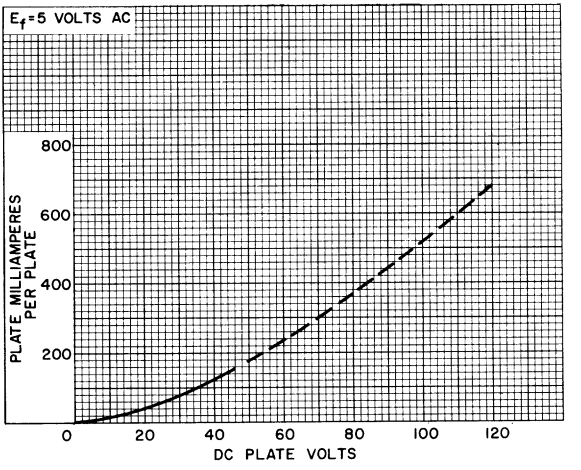
[a] See accompanying chart *Operating Areas for Simultaneous and Delayed Application of Plate Voltage* for conditions necessitating delay in application of plate voltage until filament has reached operating temperature.

[b] If hot-switching is required in operation, choke-input circuits are recommended. Such circuits limit the hot-switching current to a value no higher than that of the peak plate current. When capacitor-input circuits are used, a maximum value of 3 amperes should not be exceeded.

[c] Indicated values for conditions shown will limit peak plate current to the maximum-rated value. When a filter-input capacitor larger than 20 μf is used, it may be necessary to increase plate-supply impedance to a higher value than that shown in the data to limit the peak plate current to the maximum-rated value.


1.562" MAX.
1.438" MIN. DIA.
T12 BULB
3 11/16" MAX.
4 1/4" MAX.
BASE
JEDEC GROUP 1
No. B5-121
92CS-9865RI

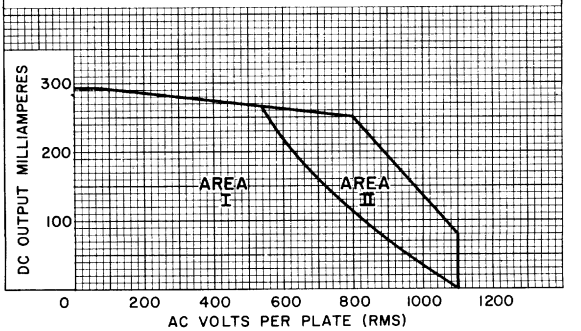
AVERAGE PLATE CHARACTERISTIC



92CS-11183

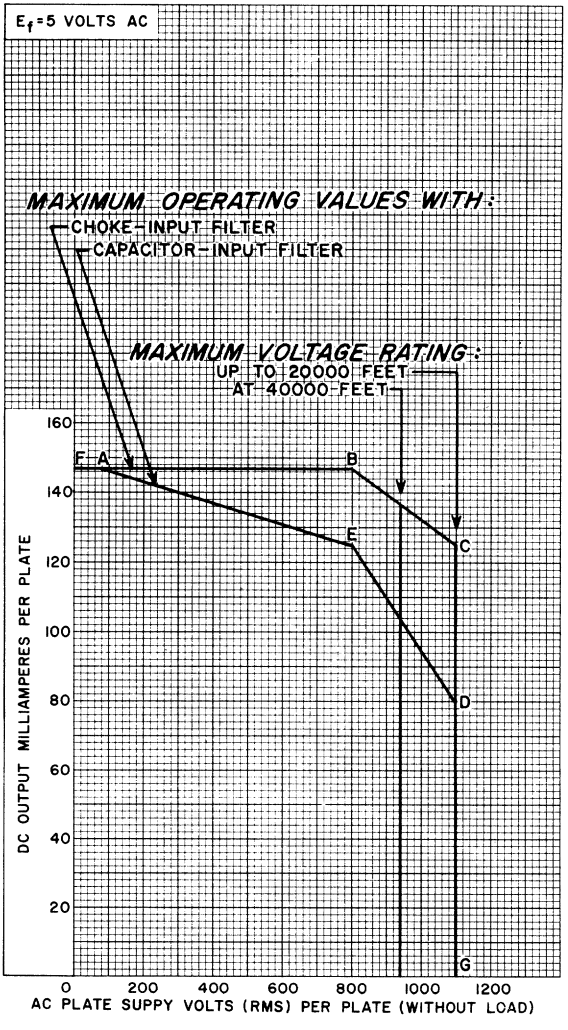
OPERATING AREAS FOR SIMULTANEOUS AND DELAYED APPLICATION OF PLATE VOLTAGE

FULL-WAVE RECTIFIER SERVICE WITH CAPACITOR-INPUT FILTER.
AREA I — FILAMENT AND PLATE VOLTAGE MAY BE APPLIED SIMULTANEOUSLY.
AREA II — FILAMENT SHOULD BE ALLOWED TO REACH OPERATING TEMPERATURE BEFORE PLATE VOLTAGE IS APPLIED. FOR AVERAGE CONDITIONS, THE DELAY IS APPROXIMATELY 10 SECONDS.



92CS-11184

RATING CHART I



92CM-9943RI

RATING CHART II
With Capacitor-Input Filter

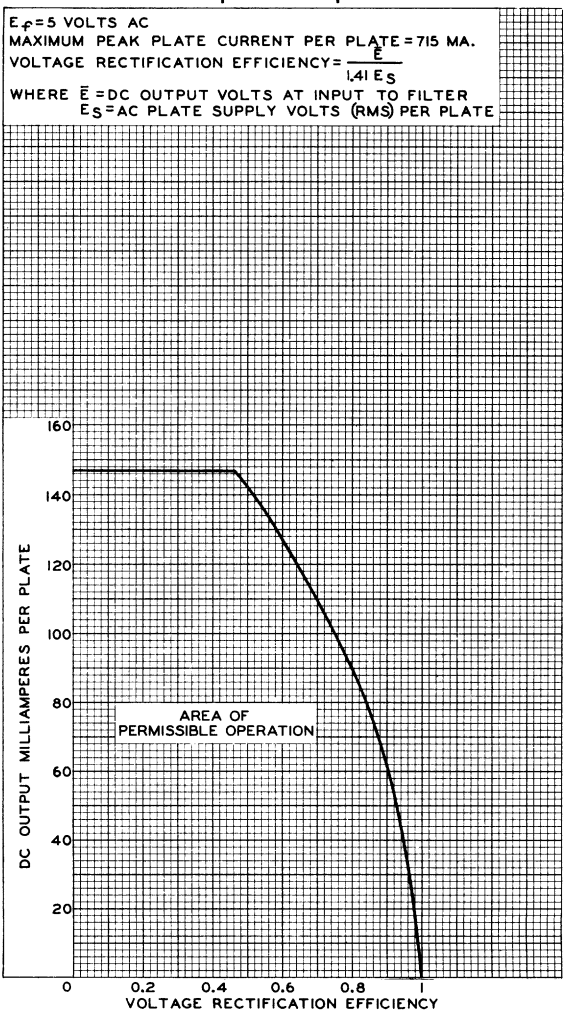
E_f = 5 VOLTS AC

MAXIMUM PEAK PLATE CURRENT PER PLATE = 715 MA.

VOLTAGE RECTIFICATION EFFICIENCY = $\frac{\bar{E}}{1.41\ E_S}$

WHERE $\bar{E}$ = DC OUTPUT VOLTS AT INPUT TO FILTER

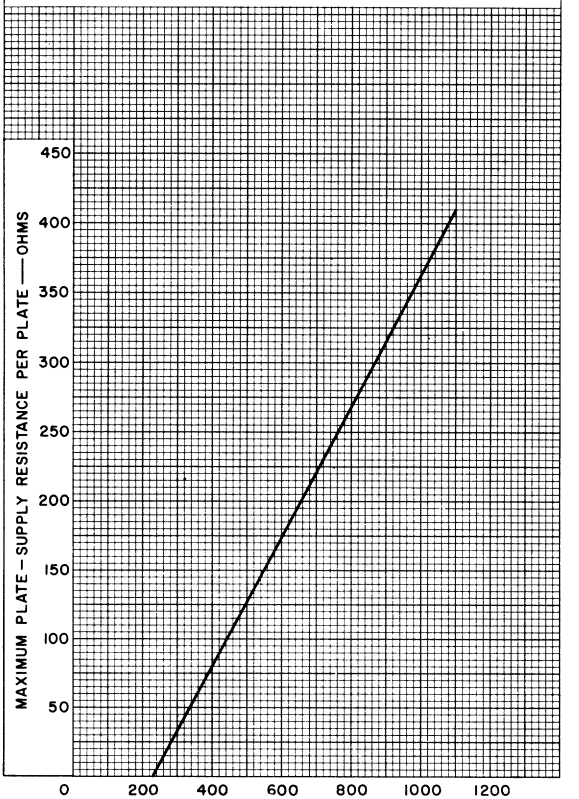
E_S = AC PLATE SUPPLY VOLTS (RMS) PER PLATE



92CM-9953RI

RATING CHART III
With Capacitor-Input Filter

E_f = 5 VOLTS AC
MAXIMUM HOT-SWITCHING AMPERES = 3
PLATE-SUPPLY RESISTANCE PER PLATE = $R_{SEC.} + N^2R_{PRI.} + R_A$
WHERE $R_{SEC.}$ = DC RESISTANCE OF TRANSFORMER SECONDARY PER SECTION
$R_{PRI.}$ = DC RESISTANCE OF TRANSFORMER PRIMARY
R_A = DC RESISTANCE OF ADDED SERIES RESISTANCE PER PLATE
N = TRANSFORMER-VOLTAGE STEP-UP RATIO PER SECTION



92CM-6416R4

5T8

TRIPLE DIODE—HIGH-MU TRIODE

9-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

The 5T8 is the same as the 6T8 except for the following items:

Heater, for Unipotential Cathodes:

Voltage	4.7	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲ max.	volts

▲ The dc component must not exceed 100 volts.

5U4GB

Full-Wave Vacuum Rectifier

GENERAL DATA

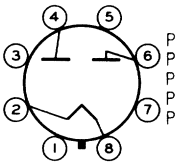
Electrical:

Filament, Coated:
- Voltage (AC or DC). . . . . 5 volts
- Current . . . . . 3 amp

Mechanical:

Operating Position. . . . . Vertical, base down or up, or Horizontal with pins 1 and 4 in vertical plane
Maximum Overall Length. . . . . 4-5/8"
Maximum Seated Length . . . . . 4-1/16"
Diameter. . . . . 1.438" to 1.562"
Bulb. T12
Base. . . . . .Short Medium-Shell Octal 5-Pin with External Barriers, Style B, Arrangement 1 (JEDEC Group 1, No.B5-121), or Short Medium-Shell Octal 8-Pin with External Barriers, Style B (JEDEC Group 1, No.B8-118)
Basing Designation for BOTTOM VIEW. 5T

Pin 1 - No Connection
Pin 2 - Filament
Pin 3[a] - No Connection



Pin 4 - Plate No.2
Pin 5 - Same as Pin 3
Pin 6 - Plate No.1
Pin 7 - Same as Pin 3
Pin 8 - Filament

FULL-WAVE RECTIFIER

Maximum Ratings, *Design-Center Values:*

For power-supply frequencies of 25 to 1000 cps

PEAK INVERSE PLATE VOLTAGE. . . . . 1550 max. volts
AC PLATE SUPPLY VOLTAGE PER PLATE (RMS, without load) . . . . . .See *Rating Chart I*
STEADY-STATE PEAK PLATE CURRENT PER PLATE (See *Rating Chart II*) . . . . . 1 max. amp
TRANSIENT PEAK PLATE CURRENT PER PLATE (See *Rating Chart III*). . . . . 4.6 max. amp
DC OUTPUT CURRENT . . . . . .See *Rating Chart I*

Typical Operation:

	With capacitor-input filter		*With choke-input filter*	
AC Plate-to-Plate Supply Voltage (RMS, without load) . .	600	900	1100	volts
Filter-Input Capacitor[b] .	40	40	–	μf
Filter-Input Choke. . . .	–	–	10	henrys

◄Indicates a change.

Total Effective Plate Supply Impedance Per Plate	21	67	–	ohms
DC Output Voltage at input to filter	290	460	420	volts
DC Output Current	300	275	275	ma

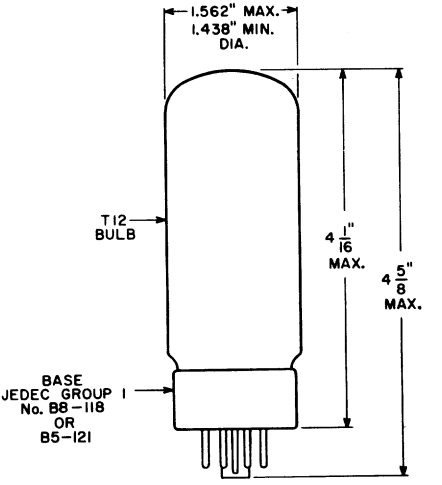
→ Characteristics:

Tube Voltage Drop for plate ma. (Per plate) =	
225	44 volts
275	50 volts
300	54 volts

[a] On the 5-pin base, pins 3, 5, and 7 are omitted.

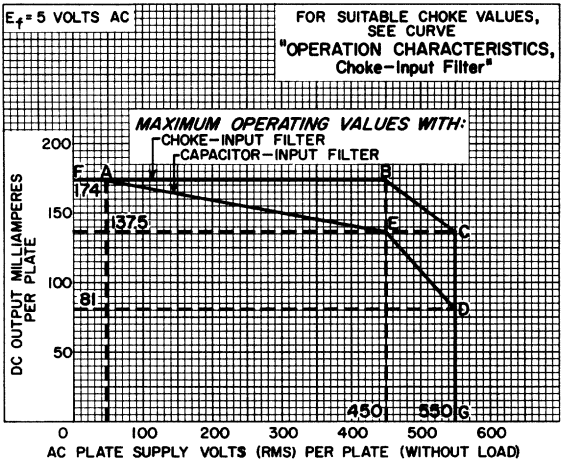
[b] Values of capacitance greater than 40 μf may be used, provided the plate supply impedance is increased to prevent exceeding the maximum peak-plate-current rating.

→ Indicates a change.



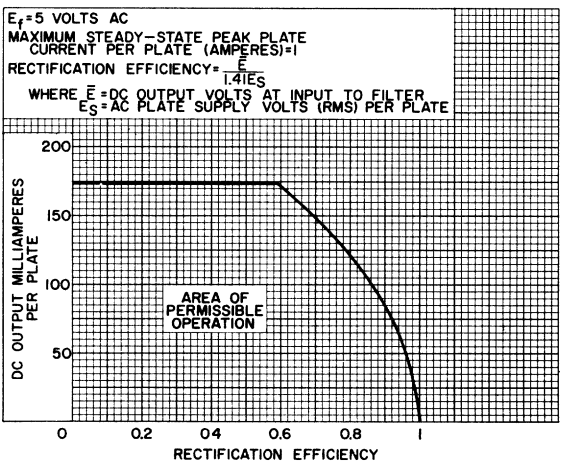
92CS-8444R2

RATING CHART I



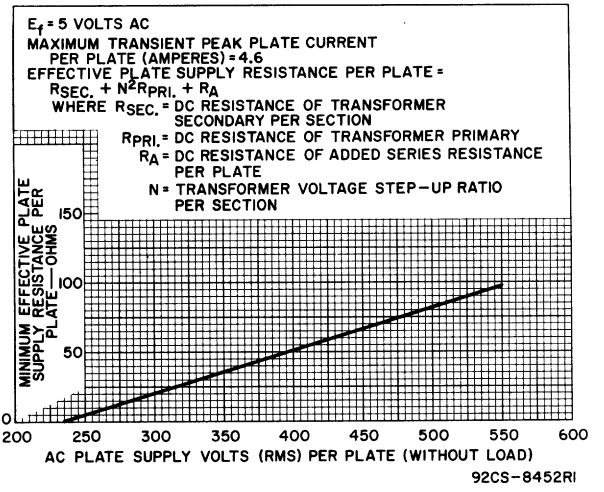
92CS-8450RI

RATING CHART II
Capacitor-Input Filter



92CS-8451RI

RATING CHART III
Capacitor-Input Filter

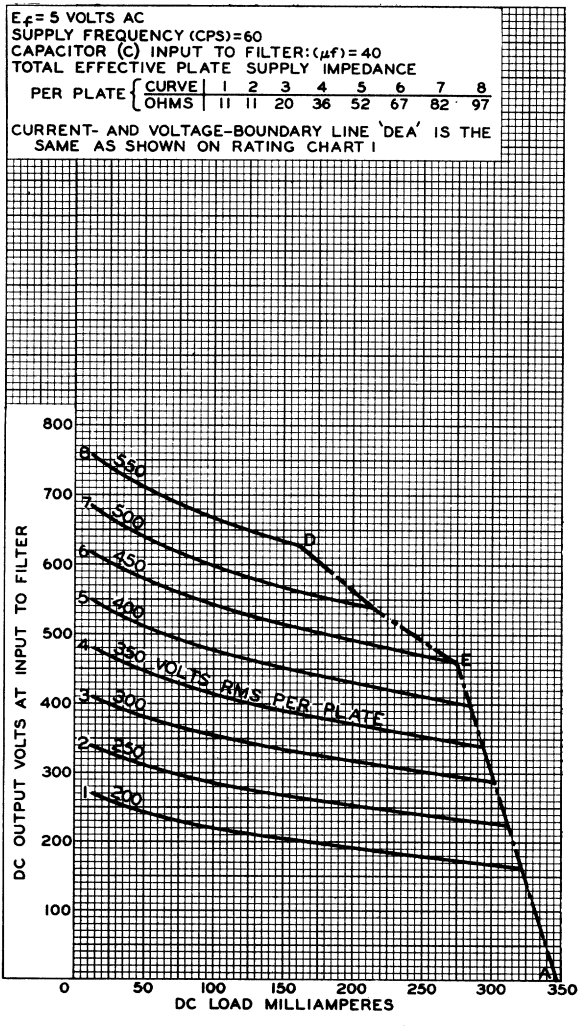


OPERATION CHARACTERISTICS
Full-Wave Circuit, Capacitor-Input Filter

E_f = 5 VOLTS AC
SUPPLY FREQUENCY (CPS) = 60
CAPACITOR (C) INPUT TO FILTER: (μf) = 40
TOTAL EFFECTIVE PLATE SUPPLY IMPEDANCE

PER PLATE	CURVE	1	2	3	4	5	6	7	8
	OHMS	11	11	20	36	52	67	82	97

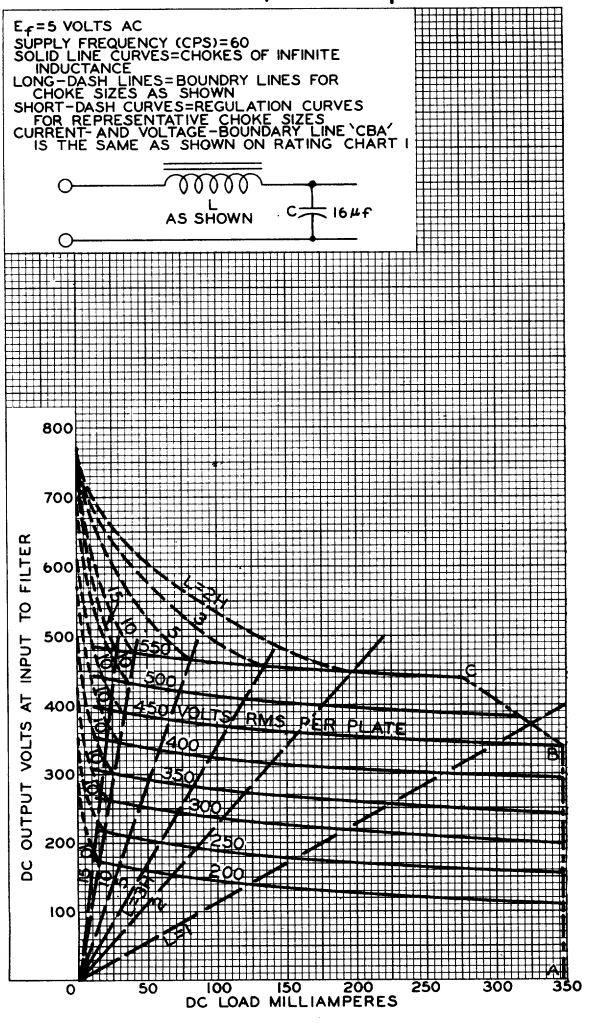
CURRENT- AND VOLTAGE-BOUNDARY LINE 'DEA' IS THE SAME AS SHOWN ON RATING CHART I



92CM-8446RI

5U4GB

OPERATION CHARACTERISTICS
Full-Wave Circuit, Choke-Input Filter



92CM-8447RI

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

5U8

MEDIUM-MU TRIODE–SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

The 5U8 is the same as the 6U8 except for the following items:

Heater, for Unipotential Cathodes:

Voltage	4.7	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲max.	volts

▲ The dc component must not exceed 100 volts.

Full-Wave Vacuum Rectifier

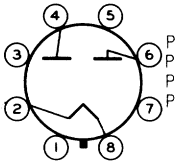
GENERAL DATA

Electrical:

Filament, Coated:		
Voltage (AC or DC)	5 ± 10%	volts
Current at 5 volts	3	amp

Mechanical:

Operating Position	Vertical, base down or up, or Horizontal with pins 2 and 4 in vertical plane
Maximum Overall Length	4-5/8"
Maximum Seated Length	4-1/16"
Diameter	1.438" to 1.562"
Bulb	T12
Base	Short Medium-Shell Octal 8-Pin with External Barriers Style B (JEDEC Group 1, No.B8-118) or Style A (JEDEC Group 1, No.B8-110), or Short Medium-Shell Octal 5-Pin with External Barriers, Style B, Arrangement 1 (JEDEC Group 1, No.B5-121)
Basing Designation for BOTTOM VIEW	5T



Pin 1 – No Connection
Pin 2 – Filament
Pin 3[a] – Same as Pin 1
Pin 4 – Plate No.2
Pin 5 – Same as Pin 1
Pin 6 – Plate No.1
Pin 7 – Same as Pin 1
Pin 8 – Filament

FULL-WAVE RECTIFIER

Maximum Ratings, *Design-Maximum Values:*

For power-supply frequencies of 25 to 1000 cps

PEAK INVERSE PLATE VOLTAGE	1550 max.	volts
AC PLATE SUPPLY VOLTAGE PER PLATE (RMS, without load)	550 max.	volts
STEADY-STATE PEAK PLATE CURRENT PER PLATE	1.4 max.	amp
TRANSIENT PEAK PLATE CURRENT PER PLATE	6.6 max.	amp
DC OUTPUT CURRENT with capacitor-input filter for ac plate supply volts (RMS, per plate, without load) = 470	415 max.	ma

Typical Operation:

	With capacitor-input filter		*With choke-input filter*	
AC Plate-to-Plate Supply Voltage (RMS, without load)	600	850	1000	volts
Filter-Input Capacitor[b]	40	40	–	μf
Filter-Input Choke	–	–	10	henrys

Total Effective Plate Supply Impedance Per Plate	20	50	–	ohms
DC Output Voltage at input to filter . . .	300	440	390	volts
DC Output Current . . .	380	350	350	ma

Characteristics:

Tube-Voltage Drop for plate ma. = 350 (Per plate)	42	volts

[a] On the 5-pin base, pin 3 as well as pins 5 and 7 is omitted.

[b] When capacitance values higher than 40 μf are used, the effective plate supply impedance should be increased so that the maximum peak-plate-current rating is not exceeded.

5V4-GA

FULL-WAVE VACUUM RECTIFIER

For use in full-wave power supplies having high dc requirements

GENERAL DATA

Electrical:

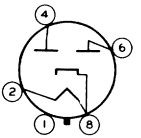
Heater, for Unipotential Cathode:

Voltage	5	ac or dc volts
Current	2	amp

Mechanical:

Operating Position	Any
Maximum Overall Length	3-7/8"
Maximum Seated Length	3-5/16"
Maximum Diameter	1-9/16"
Bulb	T12
Base	Medium-Shell Octal 5-Pin (JETEC No.B5-15), or Short Medium-Shell Octal 5-Pin with External Barriers, Style B, Arrangement 1 (JETEC No.B5-121)
Basing Designation for BOTTOM VIEW	5L

Pin 1 – No Connection
Pin 2 – Heater
Pin 4 – Plate of Unit No.2



Pin 6 – Plate of Unit No.1
Pin 8 – Heater, Cathode

FULL-WAVE RECTIFIER

Maximum Ratings, *Design-Center Values:*

PEAK INVERSE PLATE VOLTAGE	1400 max.	volts
AC PLATE-SUPPLY VOLTAGE PER PLATE (RMS):		
With capacitor-input filter	375 max.	volts
With choke-input filter	500 max.	volts
PEAK PLATE CURRENT PER PLATE	525 max.	ma
DC OUTPUT CURRENT	175 max.	ma

HOT-SWITCHING TRANSIENT PLATE CURRENT PER PLATE:

Even occasional hot-switching with capacitor-input circuits permits the flow of plate current having magnitudes which can adversely affect the life and reliability of tubes. If capacitor-input circuits are to be used, protect the circuits against the possibility of hot-switching and do not exceed a maximum peak current value per plate of 3.5 amperes during the initial cycles of the hot-switching transient. If hot-switching is required in operation, the use of choke-input circuits is recommended. Such circuits limit the hot-switching current to a value no higher than that of the peak plate current.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

5V4-GA

FULL-WAVE VACUUM RECTIFIER

Typical Operation:

With capacitor input to filter		
AC Plate-to-Plate Supply Voltage (RMS)	750	volts
Filter-Input Capacitor*	10	μf
Total Effective Plate-Supply Impedance Per Plate	100	ohms
DC Output Voltage at Input to Filter (Approx.) for dc output current of 175 ma.	410	volts
With choke input to filter		
AC Plate-to-Plate Supply Voltage (RMS)	1000	volts
Filter-Input Choke	4	henries
DC Output Voltage at Input to Filter (Approx.) for dc output current of 175 ma.	410	volts

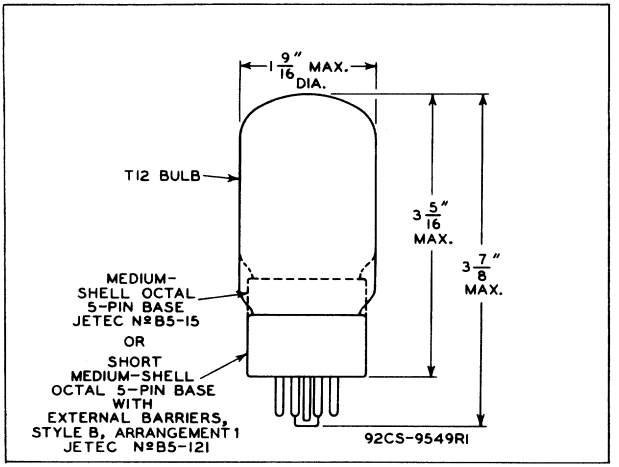
* Higher values of capacitance than indicated may be used, but the effective plate-supply impedance should be increased to prevent exceeding the maximum rating for peak plate current.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

5V4-GA

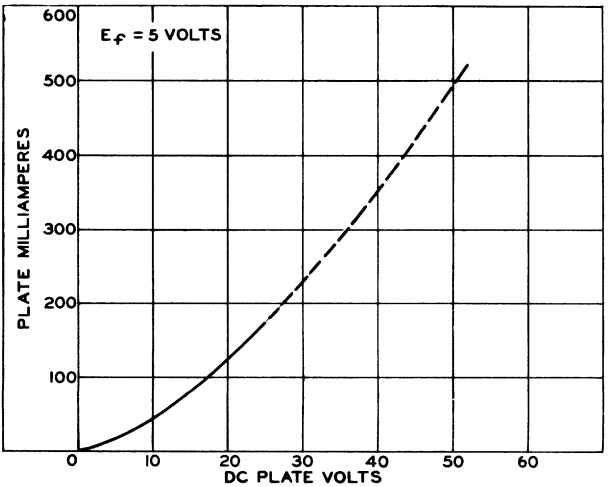
FULL-WAVE VACUUM RECTIFIER



CE-9549R1

AVERAGE PLATE CHARACTERISTIC

EACH UNIT

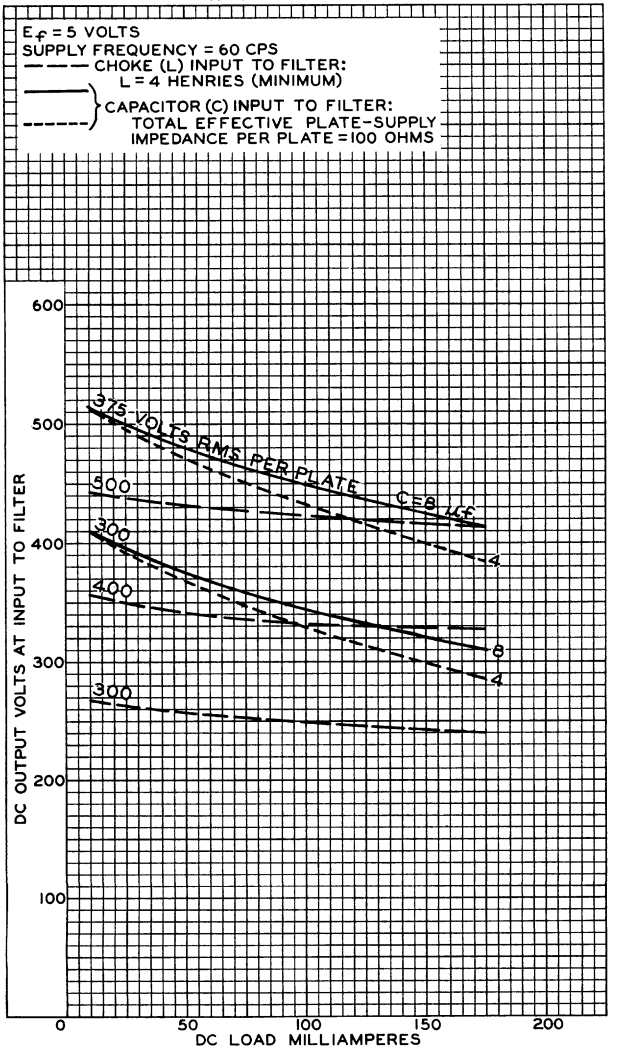


5V4-GA

5V4-GA

OPERATION CHARACTERISTICS

FULL-WAVE RECTIFIER CIRCUIT



5V6-GT

BEAM POWER TUBE

Intended for use in equipment having series heater-string arrangement

The 5V6-GT is the same as the 6V6-GT except for the following items:

Heater, for Unipotential Cathode:

Voltage	4.7	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode.	200 max.	volts
Heater positive with respect to cathode.	200▲ max.	volts

▲ The dc component must not exceed 100 volts.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5X8
TRIODE-PENTODE CONVERTER

9-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

The 5X8 is the same as the 6X8 except for the following items:

Heater, for Unipotential Cathode:

Voltage	4.7	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this section.

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲ max.	volts

▲ The dc component must not exceed 100 volts.

Full-Wave Vacuum Rectifier

GENERAL DATA

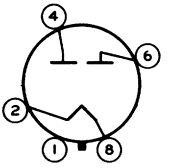
Electrical:

Filament, Coated:
Voltage (AC or DC). . . . . 5 volts
Current . . . . . 2 amp

Mechanical:

Operating Position. . . . . Vertical, base down or up, or Horizontal with pins 2 and 4 in vertical plane ←
Maximum Overall Length. . . . . 3-3/8"
Maximum Seated Length . . . . . 2-13/16"
Maximum Diameter. . . . . 1-9/32" ←
Dimensional Outline . . . . . See *General Section*
Bulb. T9
Base. . . . . Intermediate-Shell Octal 5-Pin, Arrangement 1 (JEDEC Group 1, No.B5-10), or Short Intermediate-Shell Octal 5-Pin with External Barriers, Arrangement 1 (JEDEC Group 1, No.B5-62) ←
Basing Designation for BOTTOM VIEW. 5T

Pin 1 - No Connection
Pin 2 - Filament



Pin 4 - Plate No.2
Pin 6 - Plate No.1
Pin 8 - Filament

FULL-WAVE RECTIFIER

Maximum Ratings, *Design-Center Values:* ←

For power-supply frequencies of 25 to 1000 cps

PEAK INVERSE PLATE VOLTAGE. . . . . 1400 max. volts
AC PLATE SUPPLY VOLTAGE PER PLATE (RMS, without load) . . . . . .See *Rating Chart I*
STEADY-STATE PEAK PLATE CURRENT PER PLATE (See *Rating Chart II*) . . . . . 440 max. ma
TRANSIENT PEAK PLATE CURRENT PER PLATE (See *Rating Chart III*). . . . . 2.5 max. amp
DC OUTPUT CURRENT . . . . . .See *Rating Chart I*

Typical Operation: ←

	With capacitor-input filter	*With choke-input filter*	
AC Plate-to-Plate Supply Voltage (RMS, without load)	700	1000	volts
Filter-Input Capacitor[a] .	20	-	μf

←Indicates a change.

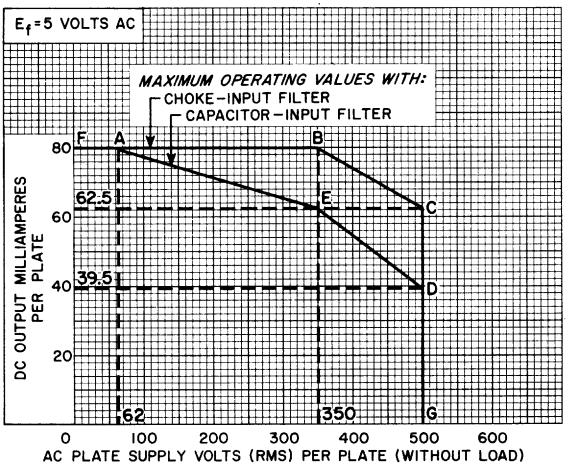
Filter-Input Choke. . . .	-	10	henrys
Total Effective Plate Supply Impedance Per Plate	50	-	ohms
DC Output Voltage at input to filter	360	380	volts
DC Output Current	125	125	ma

→Characteristics, Instantaneous Test Condition:

Tube-Voltage Drop for plate ma. = 125 (Per plate)	50	volts

[a] Values of capacitance greater than 20 μf may be used, provided the plate supply impedance is increased to prevent exceeding the maximum peak-plate-current rating.

RATING CHART I



92CS-7396RI

→Indicates a change.

RATING CHART II
Capacitor-Input Filter

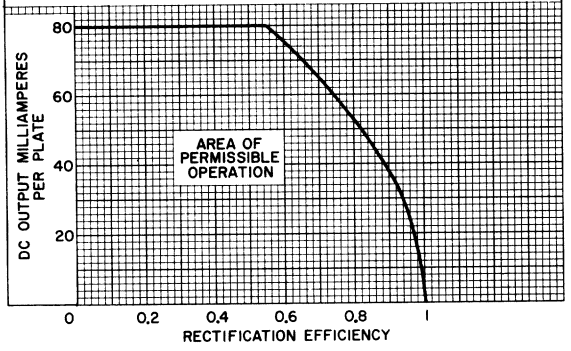
E_f=5 VOLTS AC

MAXIMUM STEADY-STATE PEAK PLATE CURRENT PER PLATE (MILLIAMPERES)=440

RECTIFICATION EFFICIENCY = $\frac{\bar{E}}{1.41\,E_S}$

WHERE $\bar{E}$ = DC OUTPUT VOLTS AT INPUT TO FILTER

E_S = AC PLATE SUPPLY VOLTS (RMS) PER PLATE



92CS-11212

RATING CHART III
Capacitor-Input Filter

E_f=5 VOLTS AC

MAXIMUM TRANSIENT PEAK PLATE CURRENT PER PLATE (AMPERES)=2.5

EFFECTIVE PLATE SUPPLY RESISTANCE PER PLATE=

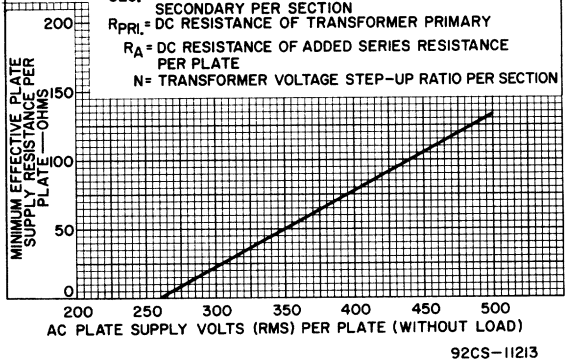
$R_{SEC.} + N^2 R_{PRI.} + R_A$

WHERE $R_{SEC.}$ = DC RESISTANCE OF TRANSFORMER SECONDARY PER SECTION

$R_{PRI.}$ = DC RESISTANCE OF TRANSFORMER PRIMARY

R_A = DC RESISTANCE OF ADDED SERIES RESISTANCE PER PLATE

N= TRANSFORMER VOLTAGE STEP-UP RATIO PER SECTION



92CS-11213

6AB4

HIGH-MU TRIODE

MINIATURE TYPE PARTICULARLY SUITABLE FOR CATHODE-DRIVE CIRCUITS

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

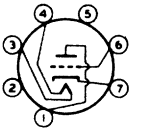
Voltage	6.3		ac or dc volts
Current	0.15		amp

Direct Interelectrode Capacitances:	*Without External Shield*	*With External Shield No. 316 Tied to Cathode*	
Grid to Plate	1.5	1.5	μμf
Grid to Heater and Cathode.	2.2	2.2	μμf
Plate to Heater and Cathode.	0.5	1.4	μμf
Heater to Cathode	2.9	2.9	μμf
Plate to Cathode.	0.24	0.2	μμf
Cathode to Heater and Grid.	5.0	5.2	μμf
Plate to Heater and Grid.	1.7	2.6	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	5CE

Pin 1 - Plate
Pin 2 - Internal Shield
Pin 3 - Heater
Pin 4 - Heater



Pin 5 - No Connection
Pin 6 - Grid
Pin 7 - Cathode

AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	300 max.	volts
GRID VOLTAGE:		
Negative bias value	50 max.	volts
Positive bias value	0 max.	volts
PLATE DISSIPATION	2.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Characteristics:

Plate Voltage	100	250	volts
Cathode-bias Resistor	270	200	ohms
Internal Shield	Connected to ground		
Amplification Factor	60	60	

←Indicates a change

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AB4

6AB4

HIGH-MU TRIODE

Plate Resistance (Approx.)	15000	10900	ohms
Transconductance	4000	5500	μmhos
Grid Bias (Approx.) for plate current of 10 μamp.	-5	-12	volts
Plate Current	3.7	10	ma

CURVES
for the 6AB4 are the same
as those for each unit of Type 12AT7

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AF3
HALF-WAVE VACUUM RECTIFIER

9-PIN MINIATURE TYPE

For television damper service

GENERAL DATA

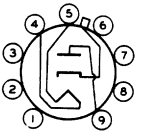
Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current	1.2	amp
Direct Interelectrode Capacitances (Approx.):○		
Plate to cathode and heater	6	μμf
Cathode to plate and heater	9	μμf
Heater to cathode	2.8	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	3-9/32"
Maximum Seated Length	2-7/8" ± 1/8"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Cap	Skirted Miniature (JEDEC No.C1-2)
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9CB

Pin 1 – Internal Connection—Do Not Use♦
Pin 2 – Same as Pin 1
Pin 3 – Same as Pin 1
Pin 4 – Heater



Pin 5 – Heater
Pin 6 – Same as Pin 1
Pin 7 – Same as Pin 1
Pin 8 – Same as Pin 1
Pin 9 – Plate
Cap – Cathode

DAMPER SERVICE

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system□

PEAK INVERSE PLATE VOLTAGE	4500■ max.		volts
PEAK PLATE CURRENT	750	max.	ma
DC PLATE CURRENT	185	max.	ma
PLATE DISSIPATION	6	max.	watts
PEAK HEATER CATHODE VOLTAGE:			
Heater negative with respect to cathode	4500*	max.	volts
Heater positive with respect to cathode	300▲	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	210	max.	°C

Characteristics:

Tube-Voltage Drop for plate ma. = 340	30	volts

○ Without external shield.

♦ Socket terminals 1,2,3,6,7, and 8 should not be used as tie points.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AF3

HALF-WAVE VACUUM RECTIFIER

■ This rating is applicable where the duty cycle of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

* The dc component must not exceed 1000 volts.

▲ The dc component must not exceed 100 volts.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AF4

MEDIUM-MU TRIODE

MINIATURE TYPE

For UHF TV service

The 6AF4 is the same as the 6AF4-A except for the following mechanical dimensions:

Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"

6AF4A

Medium-Mu Triode

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.225	amp
Direct Interelectrode Capacitance (Approx.):[a]		
Grid to plate	1.9	μμf
Grid to cathode and heater	2.2	μμf
Plate to cathode and heater	1.4	μμf
Heater to cathode	2.2[b]	μμf

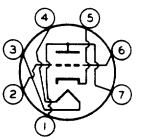
Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	80	volts
Cathode Resistor	150	ohms
Amplification Factor	13.5	
Plate Resistance (Approx.)	2100	ohms
Transconductance	6500	μmhos
Plate Current	17.5	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/8" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7DK

Pin 1 – Plate
Pin 2 – Grid
Pin 3 – Heater
Pin 4 – Heater



Pin 5 – Cathode
Pin 6 – Grid
Pin 7 – Plate

UHF OSCILLATOR

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	150	max.	volts
GRID VOLTAGE:			
Negative-bias value	50	max.	volts
GRID CURRENT	2	max.	ma
CATHODE CURRENT	24	max.	ma
PLATE DISSIPATION	2.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	50	max.	volts
Heater positive with respect to cathode	50[c]	max.	volts

◄ Indicates a change.

6AF4A

Typical Operation:

At frequency of 1000 Mc

Plate Supply Voltage	100	volts
Plate Resistor	220	ohms
Grid Resistor	10000	ohms
Plate Current	17	ma
Grid Current (Approx.)	750	μa

Maximum Circuit Values:

Grid-Circuit Resistance:

For fixed-bias operation	Not recommended	
For cathode-bias operation	0.5 max.	megohm

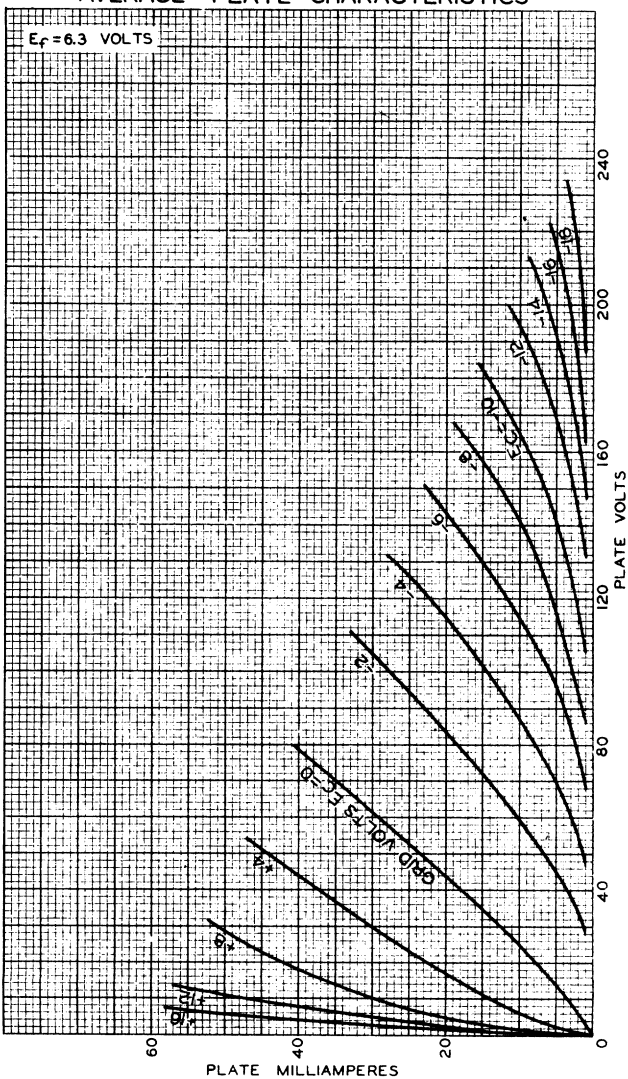
[a] With external shield JEDEC No.316 connected to cathode except as noted.

[b] With external shield JEDEC No.316 connected to plate.

[c] The dc component must not exceed 25 volts.

6AF4-A

AVERAGE PLATE CHARACTERISTICS



FEB. 20, 1952

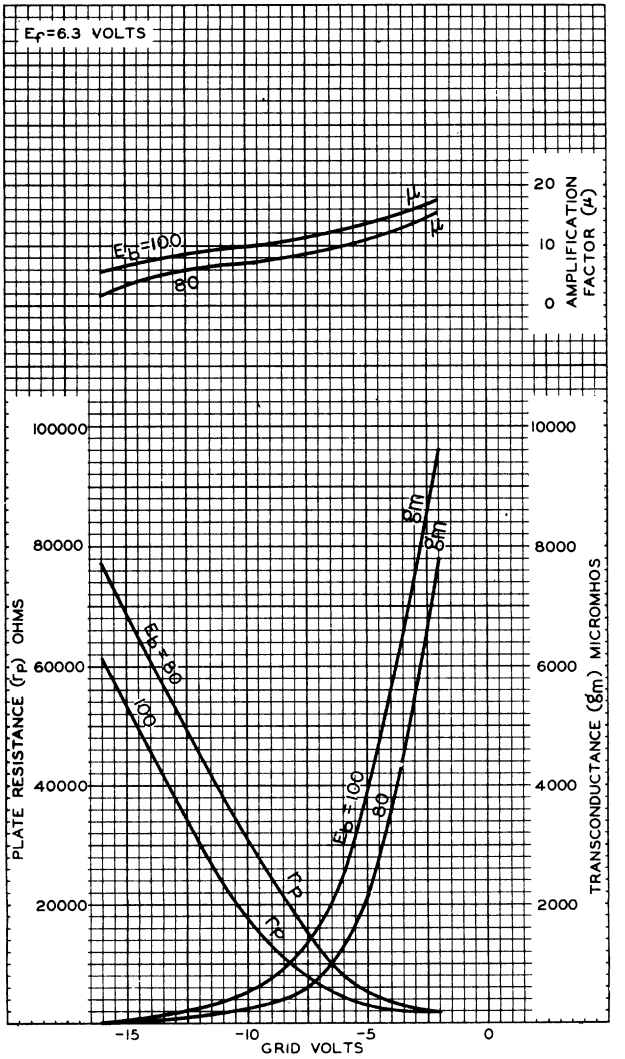
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7756

6AF4-A

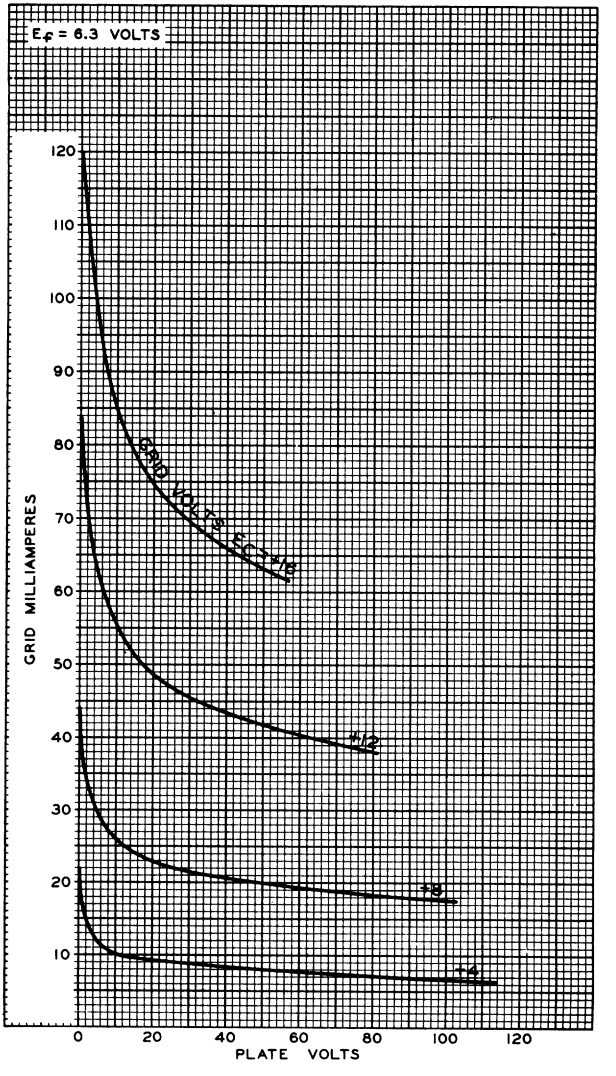
6AF4-A

AVERAGE CHARACTERISTICS



6AF4-A

AVERAGE CHARACTERISTICS

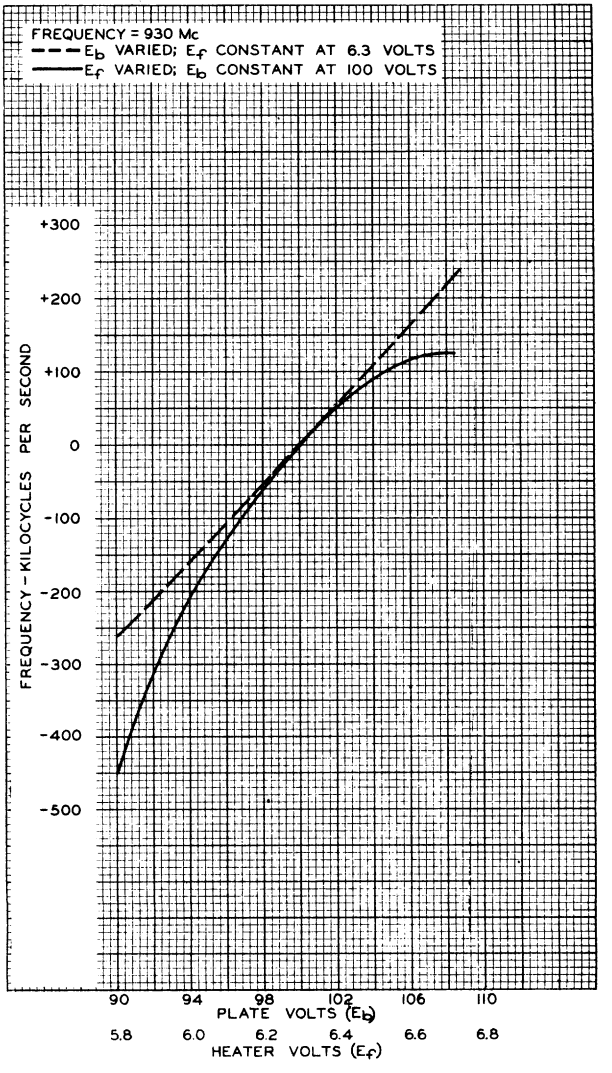


TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AF4-A

6AF4-A

FREQUENCY SHIFT CHARACTERISTICS



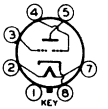
6AF6-G

ELECTRON-RAY TUBE

TWIN-INDICATOR TYPE

Heater	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.15	amp.
Overall Length		2-1/4" {+1/16" -1/4" ◄
Seated Height		1-11/16" {+1/16" -1/4 ◄
Maximum Diameter		1-5/16"
Bulb		T-9
Base		Intermed. Sh. Octal 7-Pin

Pin 1 - No Connection
Pin 2 - Heater
Pin 3 - Ray-Control Electrode, Unit No. 2
Pin 4 - Ray-Control Electrode, Unit No. 1
Pin 5 - Target
Pin 7 - Heater
Pin 8 - Cathode



Mounting Position — BOTTOM VIEW (7AG) — Any**

Maximum and Minimum Ratings Are Design-Center Values

INDICATOR SERVICE

Target Voltage		250 max.	volts ◄
		125 min.	volts ◄
Ray-Control Electrode Supply Voltage		250 max.	volts ◄
D-C Heater-Cathode Potential		90 max.	volts ◄◄
Typical Operation:			◄
Target Voltage	125	250	volts
Series Resistor □	0.5	1.0	megohm
Target Current*	0.65	2.2	ma.
Ray-Control Electrode Voltage †	80	160	approx. volts
Ray-Control Electrode Voltage ††	0	0	approx. volts

** The plane of the ray-control electrodes passes through pins No. 3 and No. 7.

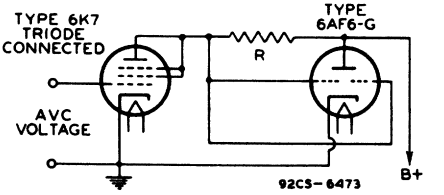
□ Designated R in circuit diagram below.

* With 0 volts on ray-control electrodes. Subject to wide variations.

† For shadow angle of 0° produced by either ray-control electrode.

†† For shadow angle of 95° produced by either ray-control electrode.

TYPICAL CIRCUIT USING TYPE 6AF6-G
WITH RAY-CONTROL ELECTRODES IN PARALLEL

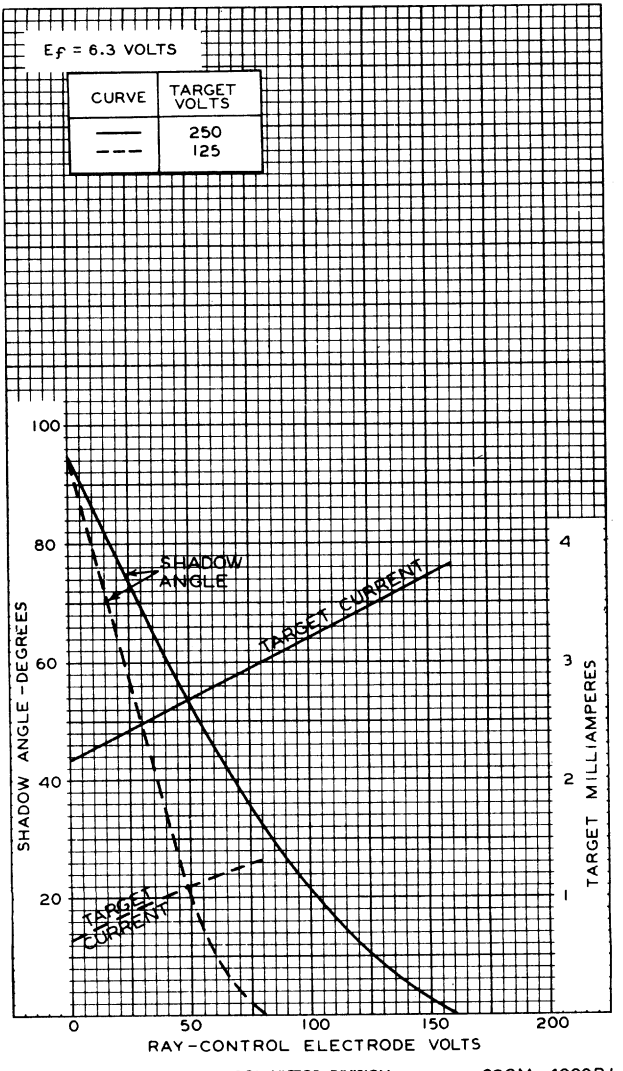


The license extended to the purchaser of tubes appears in the License Notice accompanying them. Information contained herein is furnished without assuming any obligations. ◄ Indicates a change.

6AF6-G

6AF6-G

AVERAGE CHARACTERISTICS



Dual Triode—Sharp-Cutoff Pentode

Dual Triode Has High-Mu Unit & Medium-Mu Unit

DUODECAR TYPE

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at 6.3 volts	1.050	amp
Maximum Heater Cathode Voltage:		
Heater negative with respect to cathode:		
Peak	200	volts
Heater positive with respect to cathode:		
Peak	200	volts
DC component	100	volts
Direct Interelectrode Capacitances: (Without external shield)		
Triode Unit No.1		
Grid to plate	1.9	pf
Input: G_{T1} to (K_{T1}, K_{T2} + IS, K_P + $G3_P$ + IS, H)	3.0	pf
Output: P_{T1} to (K_{T1}, K_{T2} + IS, K_P + $G3_P$ + IS, H)	2.2	pf
Triode Unit No.2		
Grid to plate	3.6	pf
Input: G_{T2} to (K_{T2} + IS, K_P + $G3_P$ + IS, H)	2.4	pf
Output: P_{T2} to (K_{T2} + IS, K_P + $G3_P$ + IS, H)	3.8	pf
Pentode Unit		
Grid No.1 to plate	0.12	pf
Input: $G1_P$ to (K_{T2} + IS, K_P + $G3_P$ + IS, $G2_P$, H)	10.0	pf
Output: P_P to (K_{T2} + IS, K_P + $G3_P$ + IS, $G2_P$, H)	4.5	pf
Pentode plate to plate of triode No.2	0.045 max.	pf
Plate of triode No.1 to plate of triode No.2	0.06 max.	pf

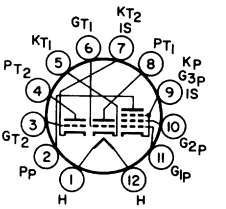
Characteristics, Class A_1 Amplifier:

Triode Units	*No.1*	*No.2*	
Plate Supply Voltage	200	200	volts
Grid Voltage	-2	-	volts
Cathode Resistor	-	220	ohms
Amplification Factor	68	41	
Plate Resistance (Approx.)	12400	9400	ohms
Transconductance	5500	4400	μmhos
Plate Current	7	9.2	ma
Grid Voltage for I_b = 10 μa	-5.5	-	volts
Grid Voltage for I_b = 100 μa	-	-6.5	volts
Pentode Unit			
Plate Supply Voltage	50	200	volts
Grid-No.2 Supply Voltage	150	150	volts
Grid-No.1 Voltage	0	-	volts
Cathode Resistor	-	100	ohms
Plate Resistance (Approx.)	-	68000	ohms
Transconductance	-	11000	μmhos
Plate Current	55[a]	24	ma
Grid-No.2 Current	18[a]	4.8	ma
Grid No.1 Voltage for I_b = 100 μa	-	-10	volts

Mechanical:

Operating Position . . . . . Any
Types of Cathodes. . . . . .Coated Unipotential
Maximum Overall Length . . . . . 2.375"
Seated Length. . . . . 1.750" to 2.000"
Diameter . . . . . 1.062" to 1.188"
Dimensional Outline (JEDEC 9-58) . . . . See *General Section*
Bulb T9
Base . . . . . Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW 12DP

Pin 1 - Heater
Pin 2 - Pentode Plate
Pin 3 - Grid of Triode Unit No.2
Pin 4 - Plate of Triode Unit No.2
Pin 5 - Cathode of Triode Unit No.1
Pin 6 - Grid of Triode Unit No.1
Pin 7 - Cathode of Triode Unit No.2, Internal Shield
Pin 8 - Plate of Triode Unit No.1
Pin 9 - Pentode Cathode, Pentode Grid No.3, Internal Shield
Pin 10 - Pentode Grid No.2
Pin 11 - Pentode Grid No.1
Pin 12 - Heater



AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

	Triode Units No.1	No.2	
Plate Voltage.	330	330	volts
Grid (Control-Grid) Voltage:			
Positive-bias value.	0	0	volts
Plate Dissipation.	1.1	2	watts

Pentode Unit

Plate Voltage.	330	volts
Grid-No.2 (Screen-Grid) Supply Voltage	330	volts
Grid-No.2 Voltage.	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Grid-No.1 (Control-Grid) Voltage:		
Positive-bias value.	0	volts
Grid-No.2 Input:		
For grid-No.2 voltages up to 165 volts	1.25	watts
For grid-No.2 voltages between 165 and 330 volts. .	See *Grid-No.2 Input Rating Chart*	
Plate Dissipation	5	watts

Maximum Circuit Values: *(Values are for Each Unit)*

	Triode Units	*Pentode Unit*	
Grid-No.1-Circuit Resistance:			
For fixed-bias operation . . .	0.5	0.25	megohm
For cathode-bias operation . .	1	1	megohm

[a] Value measured by recurrent waveform such that maximum ratings of tube are not exceeded.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

6AG5

SHARP-CUTOFF PENTODE

MINIATURE TYPE

Useful at Frequencies up to 400 Mc

GENERAL DATA

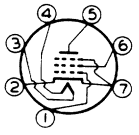
Electrical:

Heater, for Unipotential Cathode:			
Voltage	6.3		ac or dc volts
Current	0.3		amp
Direct Interelectrode Capacitances:	*Without Shield*	*With Shield*°	
Pentode Connection:			
Grid No.1 to plate	0.030 max.	0.020 max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	6.5	6.6	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	1.8	3.1	μμf
Triode Connection, Grid No.2 tied to Plate:			
Grid No.1 to plate and grid No.2	2.5	2.5	μμf
Grid No.1 to cathode & grid No.3 & internal shield, and heater	3.6	3.6	μμf
Plate and grid No.2 to cathode & grid No.3 & internal shield, and heater	3	4.3	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BD

Pin 1 - Grid No.1
Pin 2 - Cathode, Grid No.3, Internal Shield
Pin 3 - Heater
Pin 4 - Heater



Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Cathode, Grid No.3, Internal Shield

° With external shield JETEC No.316 connected to pin No.7.

← indicates a change.

6AG5

6AG5

SHARP-CUTOFF PENTODE

AMPLIFIER - Class A_1

Pentode Connection

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
GRID-No.2 (SCREEN) SUPPLY VOLTAGE	300 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive bias value	0 max.	volts
PLATE DISSIPATION	2 max.	watts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 150 volts	0.5 max.	watt
For grid-No.2 voltages between 150 and 300 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Typical Operation and Characteristics:

Plate Voltage	100	125	250	volts
Grid-No.2 Voltage	100	125	150	volts
Cathode-Bias Resistor	180	100	180	ohms
Plate Resistance (Approx.)	0.6	0.5	0.8	megohm
Transconductance	4500	5100	5000	μmhos
Plate Current	4.5	7.2	6.5	ma
Grid-No.2 Current	1.4	2.1	2.0	ma
Grid-No.1 Voltage (Approx.) for plate current = 10 μamp	-5	-6	-8	volts

AMPLIFIER - Class A_1

Triode Connection - Grid No.2 Connected to Plate

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive bias value	0 max.	volts
PLATE AND GRID-No.2 DISSIPATION (TOTAL)	2.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

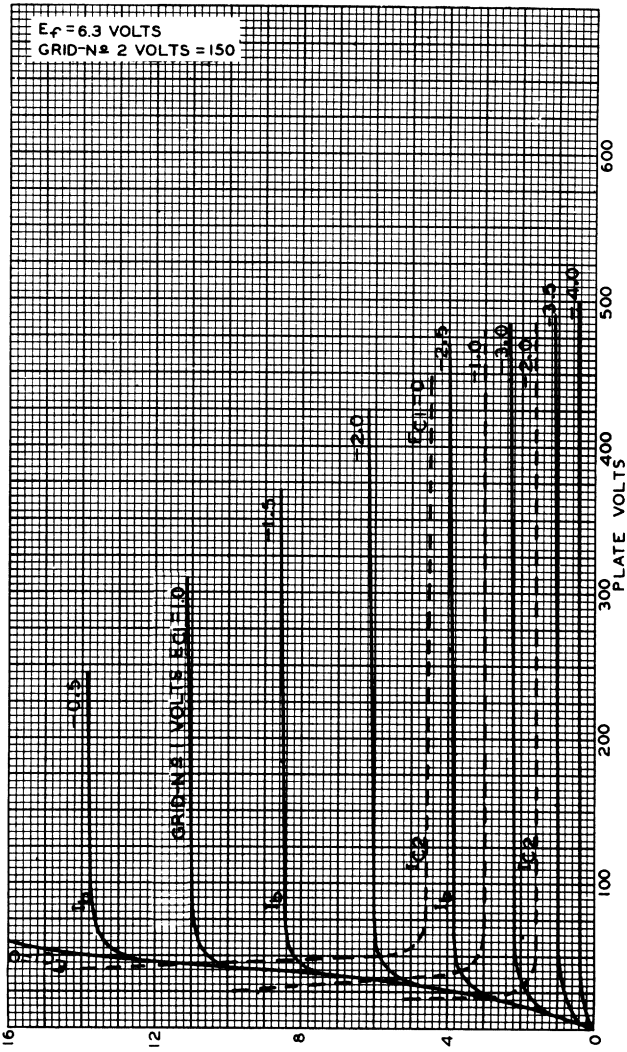
Typical Operation and Characteristics:

Plate Voltage	180	250		volts
Cathode-Bias Resistor	330	820		ohms
Plate Resistance (Approx.)	0.008	0.01		megohm
Amplification Factor	45	42		
Transconductance	5700	3800		μmhos
Plate & Grid-No.2 Current (Total)	7	5.5		ma

→indicates a change.

6AG5

AVERAGE PLATE CHARACTERISTICS


Ef = 6.3 VOLTS
GRID-No 2 VOLTS = 150
GRID-No 1 VOLTS EC1 = 0
-1.5
-3.0
-4.5
-6.0
-7.5
-9.0
-10.5
-12.0
-13.5
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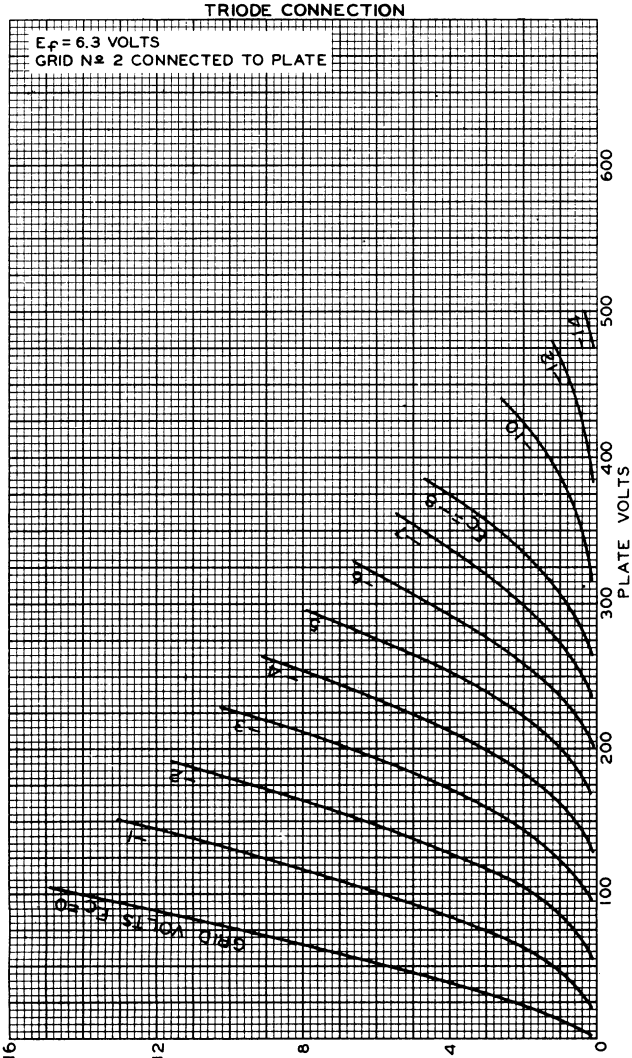
EC1=

6AG5

6AG5
AVERAGE PLATE CHARACTERISTICS
TRIODE CONNECTION



6AG7
POWER PENTODE

SINGLE-ENDED METAL TYPE

GENERAL DATA

Electrical:

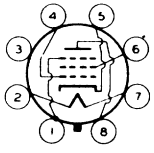
Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.65	amp
Direct Interelectrode Capacitances:		
With Pin No.1 and Pin No.3 connected to Pin No.5		
Grid No.1 to Plate	0.06 max.	μμf
Input	13	μμf
Output	7.5	μμf

Characteristics, Amplifier Class A_1

Plate Voltage	300	volts
Grid-No.2 Voltage	150	volts
Grid-No.1 Voltage	-3	volts
Peak AF Grid-No.1 Signal Voltage	3	volts
Zero-Signal DC Plate Current	30	ma
Max.-Signal DC Plate Current	30.5	ma
Zero-Signal DC Grid-No.2 Current	7	ma
Max.-Signal DC Grid-No.2 Current	9	ma
Plate Resistance (Approx.)	0.13	megohm
Transconductance	11000	μmhos
Load Resistance	10000	ohms
Total Harmonic Distortion	7	per cent
Max.-Signal Power Output	3	watts

Mechanical:

Mounting Position	Any
Maximum Overall Length	3-1/4"
Seated Length	2-19/32" ± 3/32" ←
Maximum Diameter	1-5/16"
Bulb	Metal Shell, MT-8
Base	Small-Wafer Octal 8-Pin (JETEC No.B8-21)
Basing Designation for BOTTOM VIEW	8Y ←



Pin 1 – Shell, Grid No.3
Pin 2 – Heater
Pin 3 – No Connection
Pin 4 – Grid No.1
Pin 5 – Cathode
Pin 6 – Grid No.2
Pin 7 – Heater
Pin 8 – Plate

AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	300 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	300 max.	volts

← Indicates a change

6AG7

6AG7
POWER PENTODE

GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive bias value	0 max.	volts
PLATE DISSIPATION	9 max.	watts
GRID-No.2 INPUT	1.5 max.	watts
→ PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Typical Operation in 4-Mc Bandwidth Video Amplifier Circuit of Fig. 1:

With Grid-Resistor Bias

Used where dc restoration is accomplished in grid-No.1 circuit of the 6AG7

Plate Supply Voltage	300	volts
Grid-No.2 Voltage†	115	volts
Zero-Signal Grid-No.1 Voltage	0	volts
Grid-No.1 Resistor	0.25 to 0.5	megohm
Grid-No.1 Signal Voltage (Peak to Peak)	4	volts
Zero-Signal Plate Current	45	ma
Zero-Signal Grid-No.2 Current	13	ma
Load Resistor	3500	ohms
Voltage Output (Peak to Peak)	135	volts

With Cathode-Resistor Bias

Plate Supply Voltage	300	volts
Grid-No.2 Voltage°	125	volts
from series resistor of	25000	ohms
Grid-No.1 Voltage	-2	volts
Cathode Resistor (Bypassed with capacitor of 250 μf, approx.)	57	ohms
Grid-No.1 Signal Voltage (Peak to Peak)	4	volts
Zero-Signal Plate Current	28	ma
Zero-Signal Grid-No.2 Current	7	ma
Load Resistor	3500	ohms
Voltage Output (Peak to Peak)	140	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	1.0 max.	megohm

† Obtained from supply having good regulation.

° Obtained preferably from 300-volt plate supply through resistor of value shown.

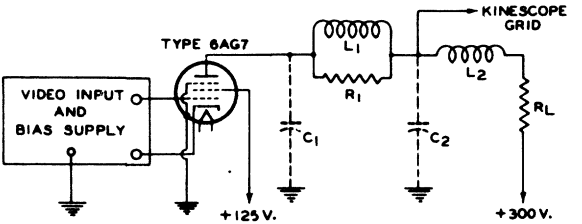
→ Indicates a change

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AG7

POWER PENTODE

Fig. 1 – Typical Video Voltage Amplifier Circuit Having Bandwidth of 4 Mc.

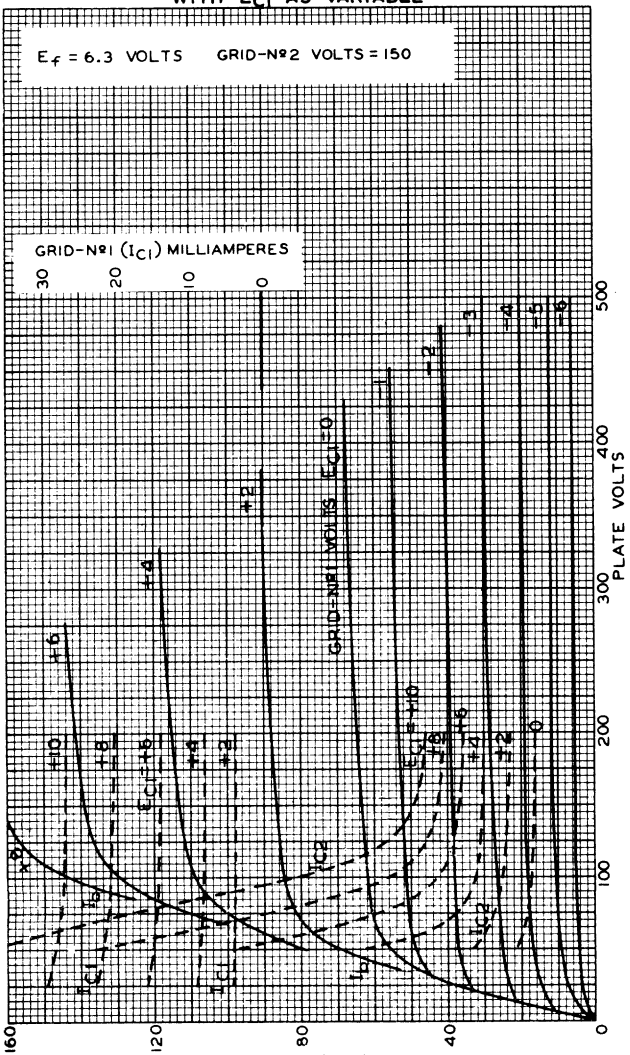


C_1 = 9.5 μμf = Tube Output Capacitance + Socket Capacitance + Wiring Capacitance + Coil Capacitance
C_2 = 19 μμf = Kinescope Capacitance + Socket Capacitance + Wiring Capacitance + Coil Capacitance
L_1 = 250 μh Filter Inductor
L_2 = 125 μh Filter Inductor
R_1 = 20000-Ohm, Non-Reactive Resistor
R_L = 3500-Ohm, 10-Watt, Non-Reactive Resistor

Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.

6AG7

6AG7
AVERAGE PLATE CHARACTERISTICS
WITH E_{C1} AS VARIABLE



OCT. 2, 1952 TUBE DEPARTMENT 92CM-6034R2

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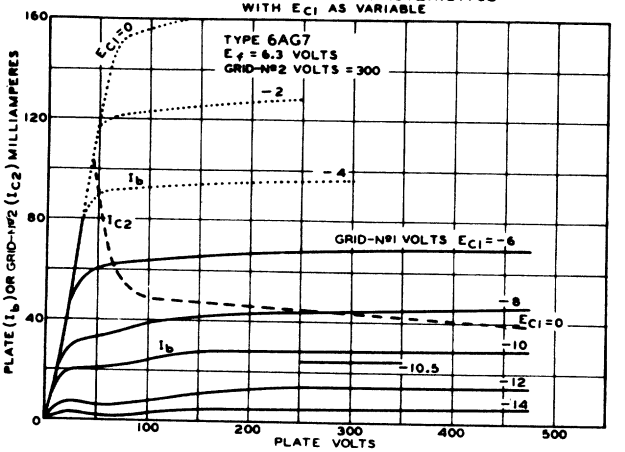
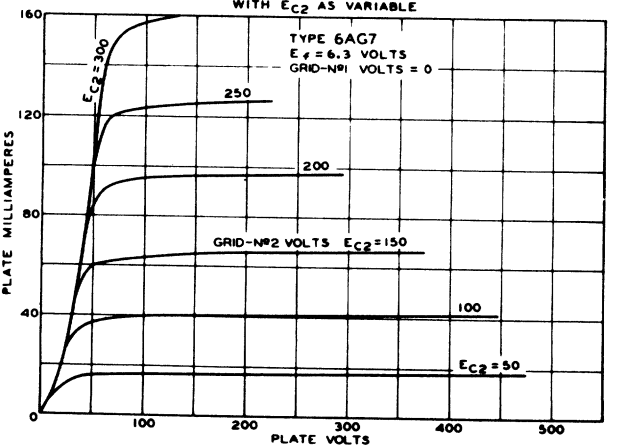
6AG7
POWER PENTODE

AVERAGE PLATE CHARACTERISTICS
WITH E_{C1} AS VARIABLE



92CM-6035T1

AVERAGE PLATE CHARACTERISTICS
WITH E_{C2} AS VARIABLE



92CM-6036T1

TUBE DEPARTMENT
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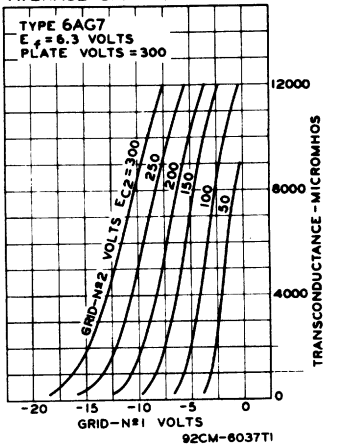
6AG7

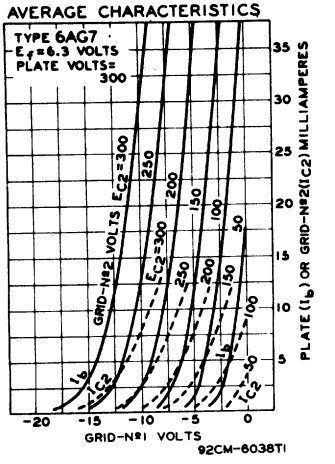
6AG7

POWER PENTODE

AVERAGE CHARACTERISTICS



AVERAGE CHARACTERISTICS



RCA

6AK5

SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

Useful at frequencies up to 400 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.175	amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*[o]	
Grid No.1 to plate	0.03 max.	0.02 max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	4	4	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	2.1	2.8	μμf

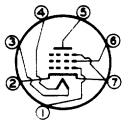
Characteristics, Class A_1 Amplifier:

Plate Voltage	120	180	volts
Grid-No.2 (Screen) Voltage	120	120	volts
Cathode-Bias Resistor	180	180	ohms
Plate Resistance (Approx.)	0.30	0.50	megohm
Transconductance	5000	5100	μmhos
Plate Current	7.5	7.7	ma
Grid-No.2 Current	2.5	2.4	ma
Grid-No.1 Voltage (Approx.) for plate current of 10 μamp	-8.5	-8.5	volts

Mechanical:

Mounting Position	Any
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/8" ±3/32"
Maximum Diameter	3/4"
Dimensional Outline	*See General Section*
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BD

Pin 1 - Grid No.1
Pin 2 - Cathode, Grid No.3, Internal Shield
Pin 3 - Heater



Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Same as Pin 2

[o] With external shield JETEC No.316 connected to cathode.

← indicates a change.

6AK5

SHARP-CUTOFF PENTODE

AMPLIFIER - Class A_1

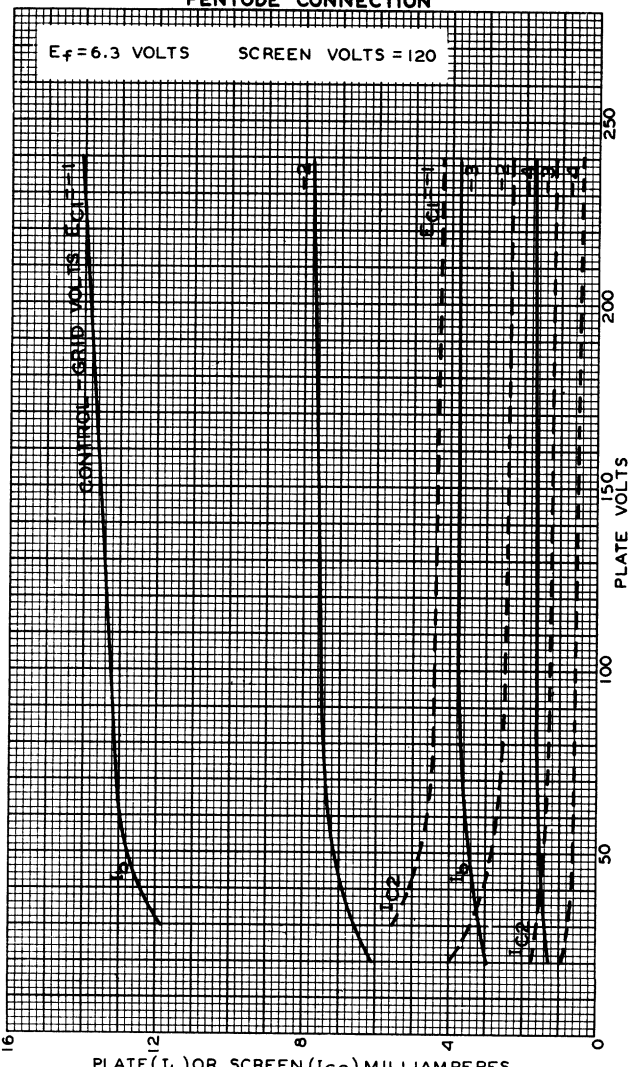
→ **Maximum Ratings,** *Design-Center Values:*

PLATE VOLTAGE	180 max.	volts
GRID-No.2 (SCREEN) SUPPLY VOLTAGE	180 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive bias value	0 max.	volts
PLATE DISSIPATION	1.7 max.	watts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 90 volts	0.5 max.	watt
For grid-No.2 voltages between 90 and 180 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
CATHODE CURRENT	18 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to catnode	120 max.	volts
Heater positive with respect to cathode	120 max.	volts

→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AK5
AVERAGE PLATE CHARACTERISTICS
PENTODE CONNECTION



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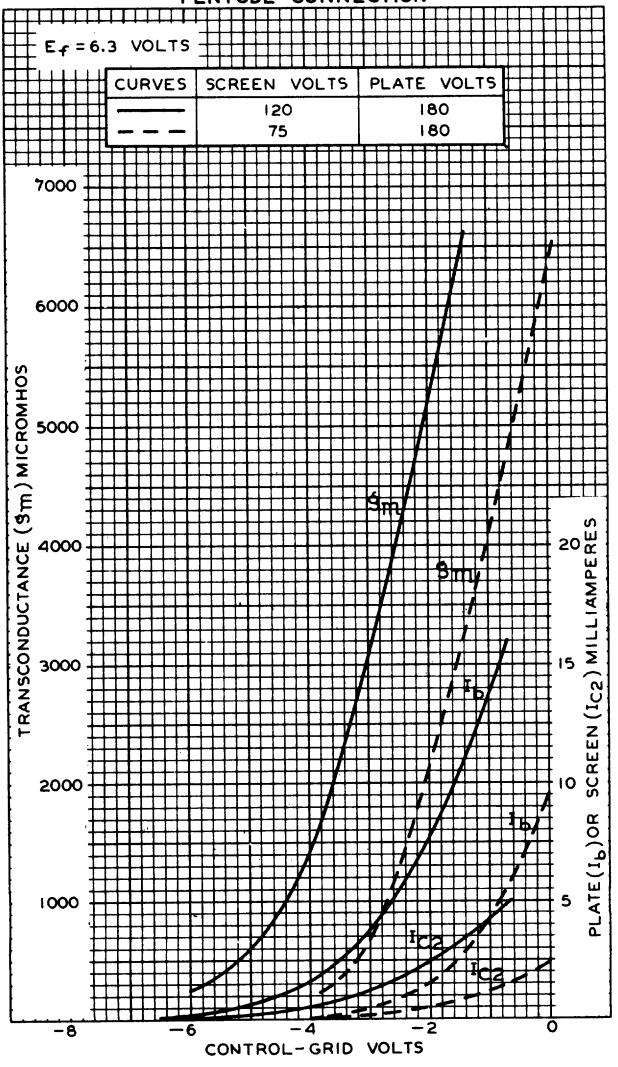
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AK5

6AK5

AVERAGE CHARACTERISTICS
PENTODE CONNECTION



FEB. 19, 1945

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

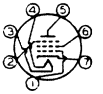
92CM-6505

6AK6

POWER AMPLIFIER PENTODE

MINIATURE TYPE

Heater	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.15	amp.
Direct Interelectrode Capacitances (Approx.) ♦		
Grid to Plate	0.12	μμf
Input	3.6	μμf
Output	4.2	μμf
Maximum Overall Length		2-1/8"
Maximum Seated Height		1-7/8"
Length from Base Seat to Bulb Top (excluding tip)		1-1/2" ± 3/32"
Maximum Diameter		3/4"
Bulb		T-5-1/2
Base ▲		Miniature Button 7-Pin
Pin 1 - Grid No. 1		Pin 5 - Plate
Pin 2 - Grid No. 3		Pin 6 - Grid No. 2
Pin 3 - Heater		Pin 7 - Cathode
Pin 4 - Heater		
RCA Socket		Stock No. 9914
Mounting Position	BOTTOM VIEW (7BK)	Any



Maximum Ratings Are Design-Center Values

A-F AMPLIFIER

Plate Voltage	300 max. volts
Screen Voltage (Grid No. 2)	250 max. volts
Plate Dissipation	2.75 max. watts
Screen Dissipation	0.75 max. watt
D-C Heater-Cathode Potential	100 max. volts

Typical Operation and Characteristics - Class A₁ Amplifier:

Plate Voltage	180	volts
Suppressor (Grid No. 3)	Connected to cathode at socket	
Screen Voltage	180	volts
Grid Voltage (Grid No. 1) ♦	-9	volts
Peak A-F Grid Voltage	9	volts
Zero-Signal Plate Current	15	ma.
Zero-Signal Screen Current	2.5	ma.
Plate Resistance	0.2	megohm
Transconductance	2300	μmhos
Load Resistance	10000	ohms
Total Harmonic Distortion	10	%
Max.-Sig. Power Output	1.1	watts

● With no external shield.

♦ The d-c resistance in the grid circuit under maximum rated conditions should not exceed 0.5 megohm for cathode-bias operation and 0.1 megohm for fixed-bias operation.

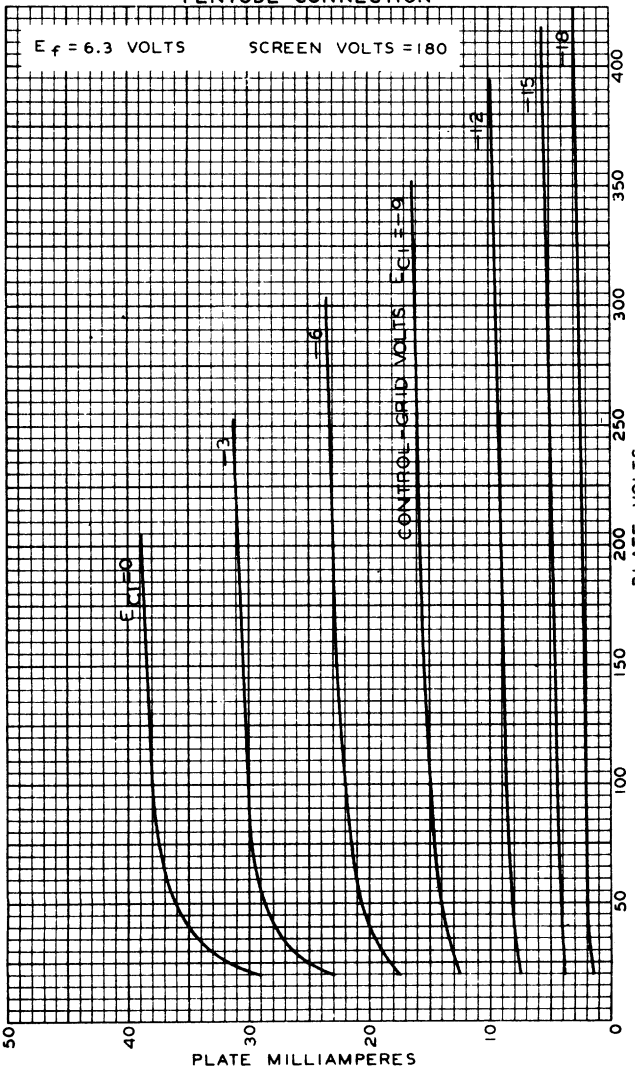
▲ *The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole.*

6AK6

6AK6

AVERAGE PLATE CHARACTERISTICS

PENTODE CONNECTION



AUG. 11, 1943

RCA VICTOR DIVISION

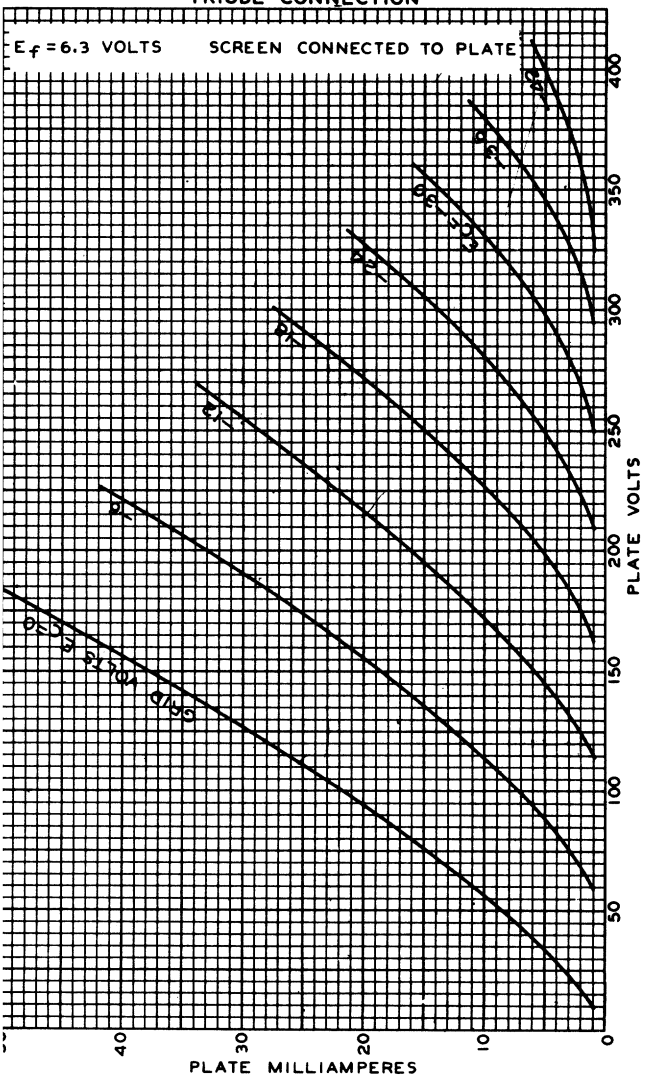
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

92C-6450

6AK6

AVERAGE PLATE CHARACTERISTICS

TRIODE CONNECTION



AUG. 11, 1943
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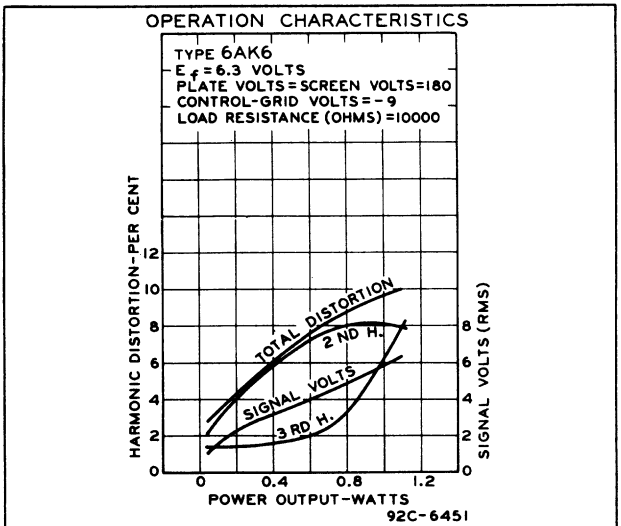
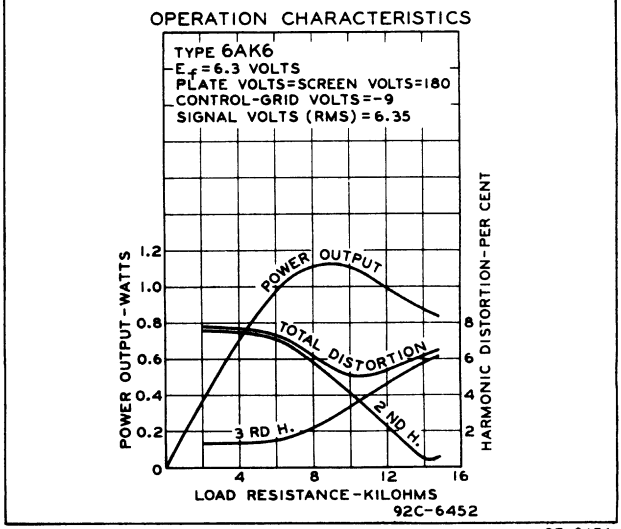
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92C-6449

6AK6

POWER AMPLIFIER PENTODE





RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AL3

Half-Wave Vacuum Rectifier

9-PIN MINIATURE TYPE

GENERAL DATA

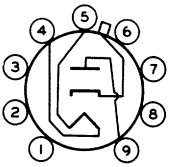
Electrical:

Heater Characteristics and Ratings *(Design-Center Values):*		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.550	amp
Peak heater-cathode voltage	6600 max.	volts
Direct Interelectrode Capacitances (Approx.):[a]		
Plate to cathode and heater	8.6	μμf
Heater to cathode	2	μμf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3-1/2"
Maximum Seated Length	3-1/4"
Diameter	0.750" to 0.875"
Bulb	T6-1/2
Cap	Skirted Miniature (JEDEC No.C1-2)
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9CB

Pin 1 – Do Not Use[b]
Pin 2 – Same as Pin 1
Pin 3 – Same as Pin 1
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Same as Pin 1
Pin 7 – Same as Pin 1
Pin 8 – Same as Pin 1
Pin 9 – Plate
Cap – Cathode

DAMPER SERVICE

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system[c]

PEAK INVERSE PLATE VOLTAGE (Absolute-maximum value)[d]	7500[e] max.	volts
PEAK PLATE CURRENT	550 max.	ma
DC PLATE CURRENT	220 max.	ma
PLATE DISSIPATION	5 max.	watts

[a] Without external shield.

[b] Socket terminals 1,2,3,6,7, and 8 should not be used as tie points.

[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[d] This rating is applicable where the duty cycle of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[e] Under no circumstances should this absolute-maximum value be exceeded.

6AL5

TWIN DIODE

MINIATURE TYPE

GENERAL DATA

Electrical:

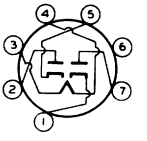
Heater, for Unipotential Cathodes:		
Voltage	6.3	ac or dc volts
Current	0.3	amp
Direct Interelectrode Capacitances (Approx.):°		
Plate No. 1 to Cathode No. 1, Heater, and Internal Shield*	2.5	μμf
Plate No. 2 to Cathode No. 2, Heater, and Internal Shield●	2.5	μμf
Cathode No. 1 to Plate No. 1, Heater, and Internal Shield*	3.4	μμf
Cathode No. 2 to Plate No. 2, Heater, and Internal Shield●	3.4	μμf
Plate No. 1 to Plate No. 2□	0.068 max.	μμf
Cold Resonant Frequency (Each Unit, Approx.)	700	Mc

° With no external shield.
* With plate and cathode of unit No.2 grounded.
● With plate and cathode of unit No.1 grounded.
□ With all other electrodes and internal shield grounded.

Mechanical:

Mounting Position	Any
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/8" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base — Small-Button Miniature 7-Pin (JETEC No.E7-1)	
Basing Designation for BOTTOM VIEW	6BT

Pin 1 – Cathode of Diode No.1
Pin 2 – Plate of Diode No.2
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Cathode of Diode No.2
Pin 6 – Internal Shield
Pin 7 – Plate of Diode No.1



RECTIFIER

Maximum Ratings, *Design-Center Values*:

PEAK INVERSE PLATE VOLTAGE	330 max.	volts
PEAK PLATE CURRENT PER PLATE	54 max.	ma
DC OUTPUT CURRENT PER PLATE	9 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	330 max.	volts
Heater positive with respect to cathode	330 max.	volts

← Indicates a change.

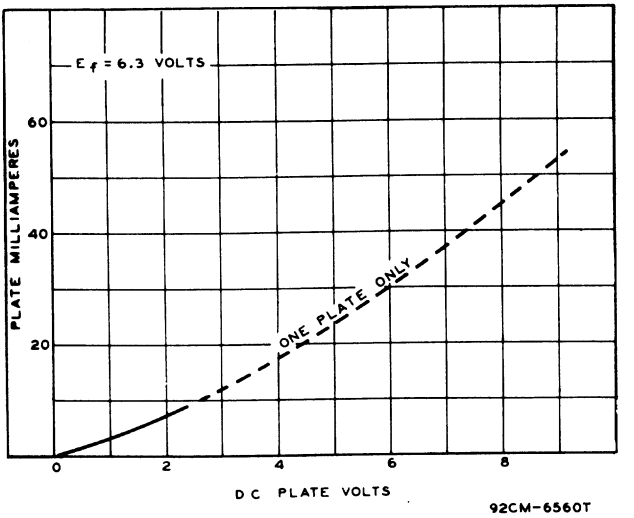
6AL5

6AL5

TWIN DIODE

Typical Operation as Half-Wave Rectifier:		
The Two Units May Be Used Separately or in Parallel		
AC Plate Voltage per Plate (RMS)	117	volts
Min. Total Effect. Plate-Supply Impedance per Plate	300	ohms
DC Output Current per Plate	9	ma

AVERAGE PLATE CHARACTERISTIC



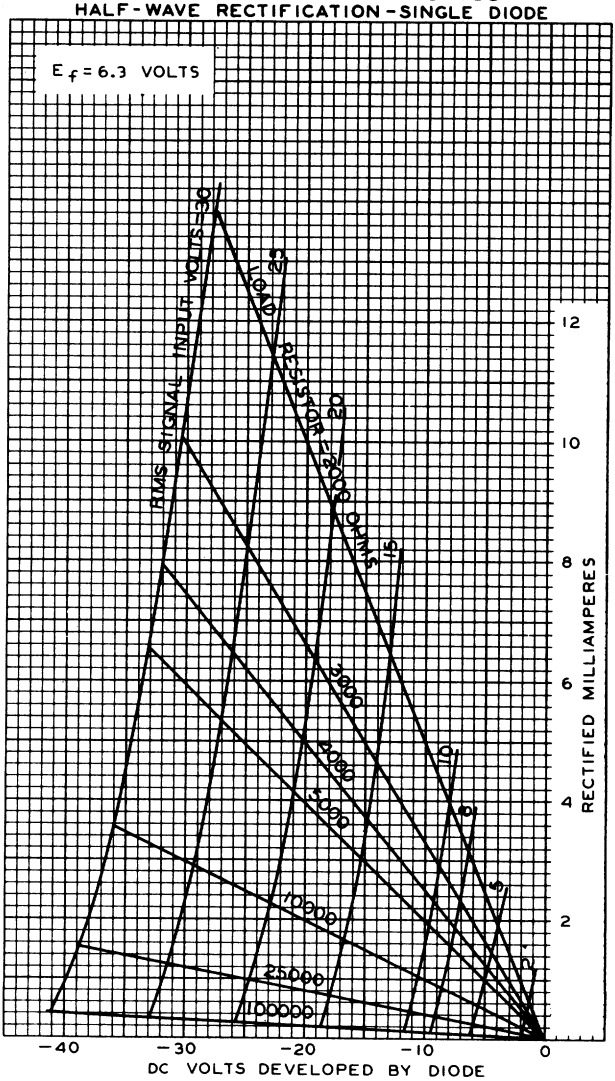
92CM-6560T

RCA

6AL5

AVERAGE CHARACTERISTICS

HALF-WAVE RECTIFICATION - SINGLE DIODE



6AL11

Beam Power Tube—
Sharp-Cutoff Pentode

For Combined FM Detector and Audio-Frequency Output Amplifier Applications in TV Receivers

DUODECAR TYPE

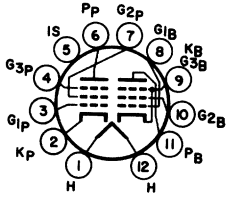
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.9	amp
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts
Direct Interelectrode Capacitances (Approx.):[b]		
Beam Power Unit:		
Grid No.1 to plate	0.26	pf
Input: $G1_B$ to (K_B+$G3_B$,$G2_B$,IS,H)	11	pf
Output: P_B to (K_B+$G3_B$,$G2_B$,IS,H)	12	pf
Pentode Unit:		
$G1_P$ to P_P	0.034	pf
$G3_P$ to P_P	3.2	pf
$G1_P$ to (K_P,$G2_P$,$G3_P$,IS,H)	6.5	pf
$G3_P$ to (K_P,$G1_P$,$G2_P$,P_P,IS,H)	7.5	pf
$G1_P$ to $G3_P$	0.24	pf
P_B to P_P	0.12	pf

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2.625" ←
Seated Length	2.000" to 2.250" ←
Diameter	1.062" to 1.188"
Dimensional Outline (JEDEC 9-59)	See *General Section*
Bulb	T9
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW	12BU

Pin 1 - Heater
Pin 2 - Pentode Cathode
Pin 3 - Pentode Grid No.1
Pin 4 - Pentode Grid No.3
Pin 5 - Internal Shield
Pin 6 - Pentode Plate
Pin 7 - Pentode Grid No.2
Pin 8 - Beam Power Grid No.1
Pin 9 - Beam Power Cathode, Beam Power Grid No.3
Pin 10 - Beam Power Grid No.2
Pin 11 - Beam Power Plate
Pin 12 - Heater



[a] The dc component must not exceed 100 volts.
[b] Without external shield.

← Indicates a change.

6AL11

Characteristics, Class A_1 Amplifier (Pentode Unit):

Plate Supply Voltage	150	volts
Grid-No.3	*Connected to cathode at socket*	
Grid-No.2 Supply Voltage	100	volts
Grid-No.1	*Connected to negative end of cathode resistor*	
Cathode Resistor	560	ohms
Plate Resistance (Approx.)	0.15	megohm
Transconductance, Grid No.1 to Plate	1000	μmhos
Transconductance, Grid No.3 to Plate	400	μmhos
Plate Current	1.3	ma
Grid-No.2 Current	2.1	ma
Grid-No.1 Voltage (Approx.) for plate μa = 30	-4.5	volts
Grid-No.3 Voltage (Approx.) for plate μa = 50	-4.5	volts

PENTODE UNIT — FM SOUND DETECTOR

Maximum Ratings, *Design-Maximum Values:*

Plate Voltage	330 max.	volts
Grid-No.3 (Suppressor-Grid) Voltage	28 max.	volts
Grid-No.2 (Screen-Grid) Supply Voltage	330 max.	volts
Grid-No.2 Voltage	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Grid-No.1 (Control-Grid) Voltage:		
Positive-bias value	0 max.	volts
Plate Dissipation	1.7 max.	watts
Grid-No.2 Input:		
For grid-No.2 voltages up to 165 volts	1.1 max.	watts
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	

BEAM POWER UNIT — AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

Plate Voltage	275 max.	volts
Grid-No.2 (Screen-Grid) Voltage	275 max.	volts
Plate Dissipation	10 max.	watts
Grid-No.2 Input	2 max.	watts

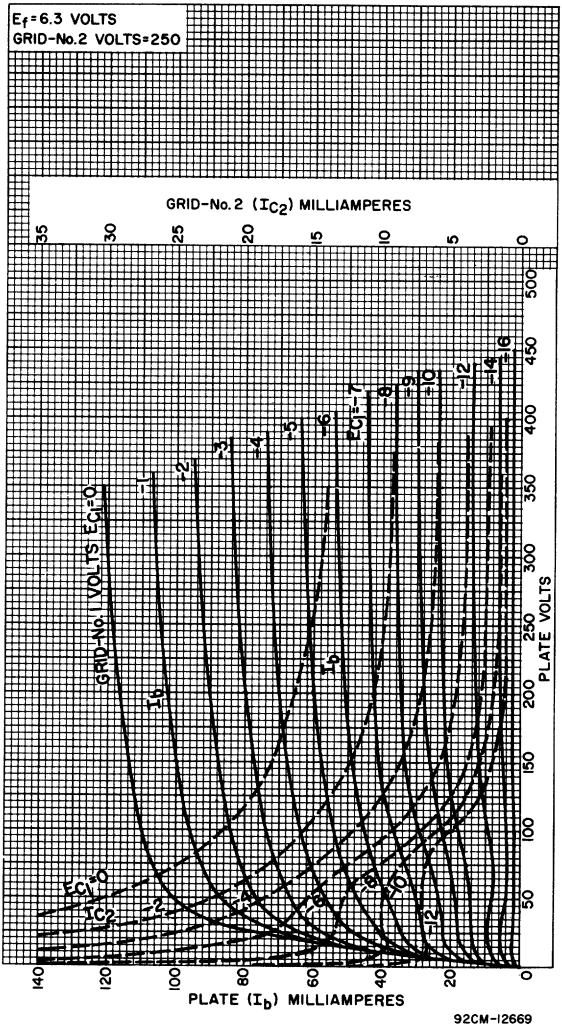
Typical Operation and Characteristics:

Plate Voltage	250	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 (Control-Grid) Voltage	-8	volts
Peak AF Grid-No.1 Voltage	8	volts
Zero-Signal Plate Current	35	ma
Max.-Signal Plate Current	39	ma
Zero-Signal Grid-No.2 Current	2.5	ma
Max.-Signal Grid-No.2 Current	7	ma
Plate Resistance (Approx.)	0.1	megohm
Transconductance	6500	μmhos
Load Resistance	5000	ohms
Total Harmonic Distortion	10	per cent
Max.-Signal Power Output	4.2	watts

Maximum Circuit Values:

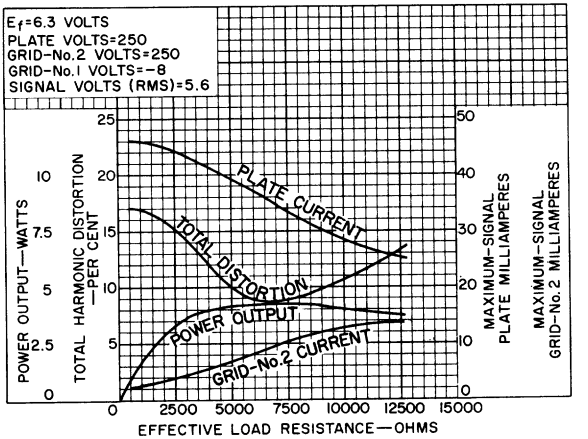
Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	0.5 max.	megohm

AVERAGE CHARACTERISTICS
Beam Power Unit



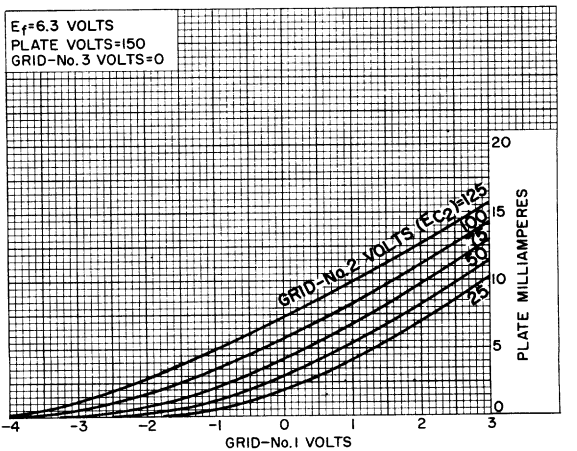
6AL11

OPERATION CHARACTERISTICS
Beam Power Unit



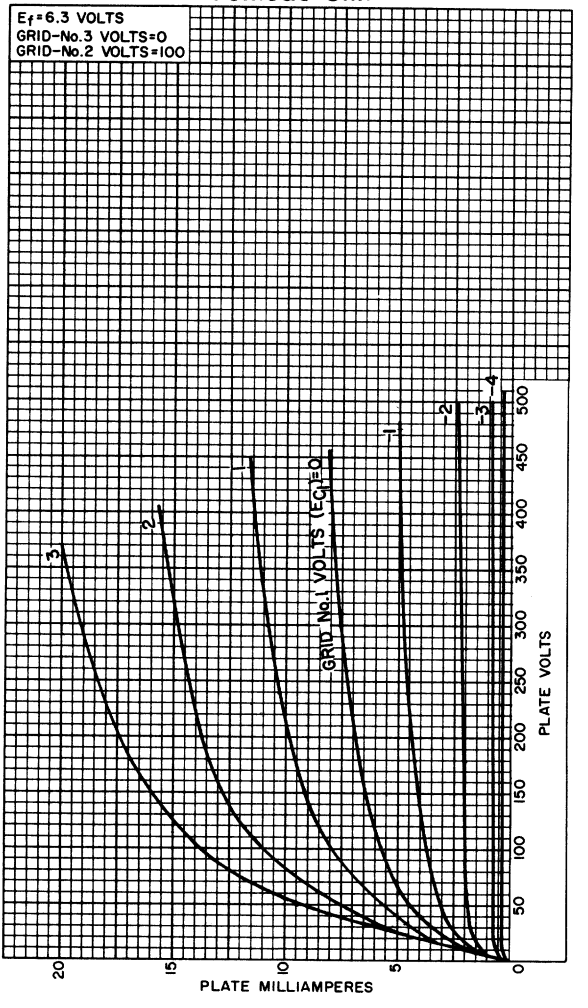
92CS-12663

AVERAGE CHARACTERISTICS
Pentode Unit



92CS-12670

AVERAGE PLATE CHARACTERISTICS
Pentode Unit

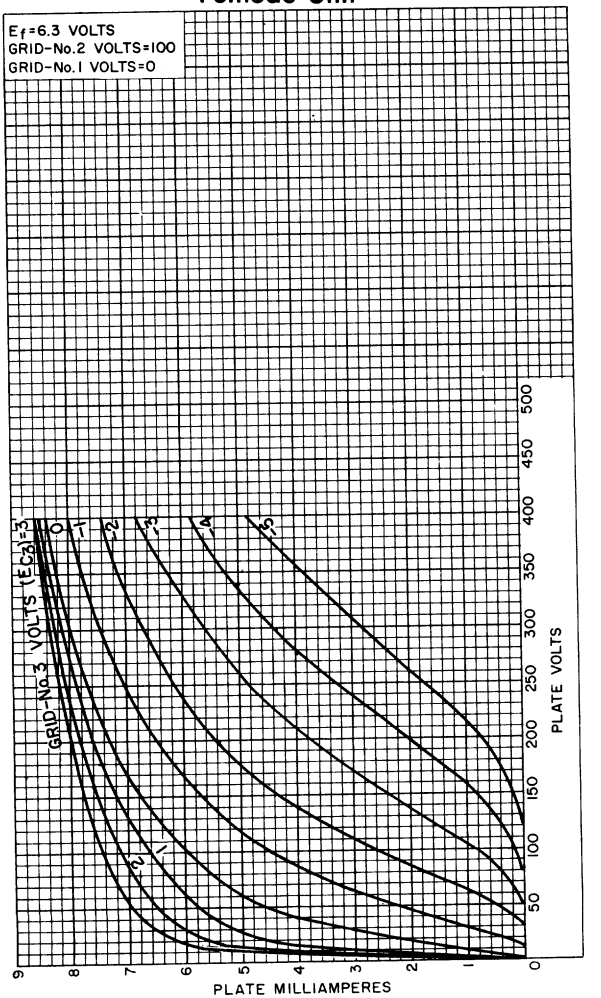


92CM-12671

6AL11

AVERAGE PLATE CHARACTERISTICS

Pentode Unit



92CM-12672

6AM8-A
DIODE—SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

With heater having controlled warm-up time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3	volts
Current	0.45 ± 6%	amp
Warm-up time (Average.)	11	sec
Direct Interelectrode Capacitances:		
Diode Unit:		
Plate to cathode and heater	1.8	μμf
Cathode to plate and heater	3	μμf
Pentode Unit:		
Grid No.1 to plate	0.015 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	6.5	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	2.6	μμf
Pentode grid No.1 to diode plate	0.006 max.	μμf
Pentode plate to diode cathode	0.15 max.	μμf
Pentode plate to diode plate	1 max.	μμf

Characteristics, Class A_1 Amplifier (Pentode Unit):

Plate Supply Voltage	125	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Supply Voltage	125	volts
Cathode Resistor	56	ohms
Plate Resistance (Approx.)	0.3	megohm
Transconductance	7800	μmhos
Plate Current	12.5	ma
Grid-No.2 Current	3.2	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	−6	volts
Grid-No.1 Voltage (Approx.) for plate ma. = 2, and cathode resistor (ohms) = 0	−3	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"

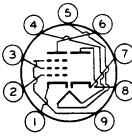
← Indicates a change.

6AM8-A

DIODE—SHARP-CUTOFF PENTODE

Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
→ Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9CY

Pin 1 – Pentode Cathode
Pin 2 – Pentode Grid No.1
Pin 3 – Pentode Grid No.2
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Pentode Plate
Pin 7 – Diode Cathode
Pin 8 – Diode Plate
Pin 9 – Pentode Grid No.3, Internal Shield

PENTODE UNIT — Class A_1 Amplifier

→ **Maximum Ratings,** *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE	0	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330	max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0	max.	volts
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 165 volts	0.55	max.	watt
For grid-No.2 voltages between 165 and 330 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
PLATE DISSIPATION	3.2	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

→ **Maximum Circuit Values:**

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.25	max.	megohm
For cathode-bias operation	1	max.	megohm

DIODE UNIT

Maximum Ratings, *Design-Maximum Values:*

DC PLATE CURRENT	5	max.	ma

→ Indicates a change.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

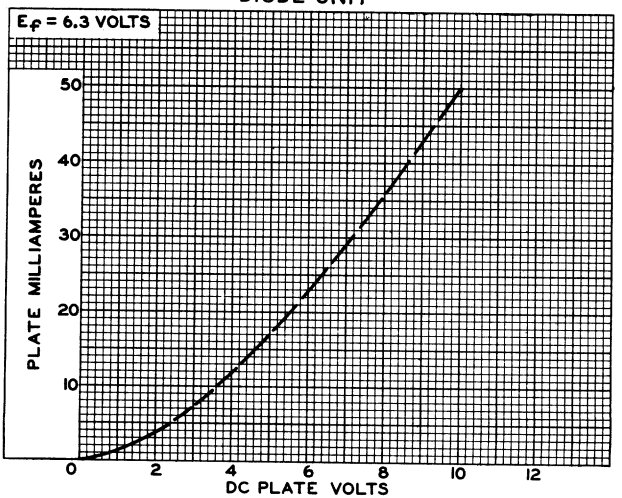
6AM8-A

DIODE—SHARP-CUTOFF PENTODE

PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	200 max.	volts
Heater positive with respect to cathode.	200▲ max.	volts

○ Without external shield.
▲ The dc component must not exceed 100 volts.

AVERAGE PLATE CHARACTERISTIC
DIODE UNIT

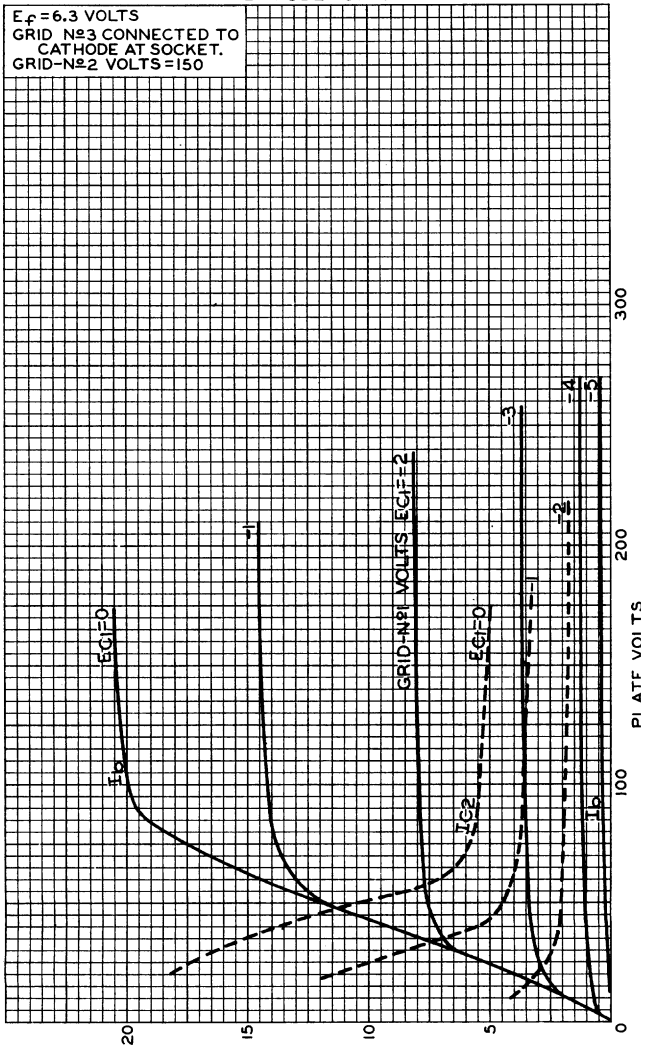


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CS-8504RI

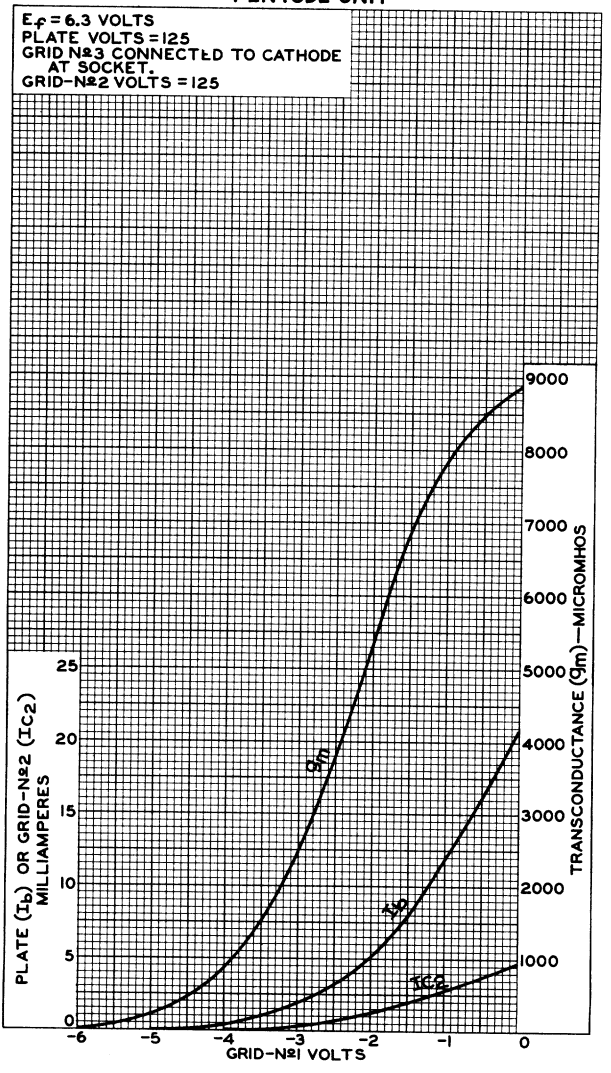
6AM8-A

AVERAGE CHARACTERISTICS

PENTODE UNIT



6AM8-A
AVERAGE CHARACTERISTICS
PENTODE UNIT



6AN4

HIGH-MU TRIODE

7-PIN MINIATURE TYPE

For UHF TV service

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.225	amp

Direct Interelectrode Capacitances (Approx.):

	Without External Shield	*With External Shield°*	
Grid to plate	1.7	1.7	μμf
Grid to cathode and heater	2.9	3.3	μμf
Plate to cathode and heater	0.25	1.8	μμf
Heater to cathode	3	2.9●	μμf
Grid to cathode	2.6	2.6●	μμf
Plate to cathode	0.2	0.18●	μμf
Cathode to grid and heater	5.5	5.7♦	μμf
Plate to grid and heater	1.8	3.4♦	μμf

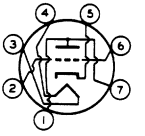
Characteristics, Class A_1 Amplifier:

Plate-Supply Voltage	200	volts
Cathode Resistor	100	ohms
Amplification Factor	70	
Transconductance	10000	μmhos
Plate Current	13	ma
Grid Voltage (Approx.) for plate current of 20 μa	-7	volts

Mechanical:

Mounting Position	Any
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/8" ±3/32"
Maximum Diameter	3/4"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	7DK

Pin 1 - Plate
Pin 2 - Grid
Pin 3 - Heater
Pin 4 - Heater



Pin 5 - Cathode
Pin 6 - Grid
Pin 7 - Plate

° With external shield JETEC No.316 connected to cathode except as noted.
● With external shield JETEC No.316 connected to ground.
♦ With external shield JETEC No.316 connected to grid.

TENTATIVE DATA

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AN4

HIGH-MU TRIODE

AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300	max.	volts
CATHODE CURRENT	30	max.	ma
PLATE DISSIPATION	4	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation.	0.1	max.	megohm
For cathode-bias operation.	0.5	max.	megohm

▲ The dc component must not exceed 100 volts.

TENTATIVE DATA

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AN8-A

Medium-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3	volts
Current	0.45 ± 6%	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances:▲		
Triode Unit:		
Grid to plate	1.5	μμf
Grid to cathode and heater	2	μμf
Plate to cathode and heater	0.26	μμf
Pentode Unit:		
Grid No.1 to plate	0.04 max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	7	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	2.4	μμf
Triode grid to pentode plate	0.02 max.	μμf
Pentode grid No.1 to triode plate	0.02 max.	μμf
Pentode plate to triode plate	0.15 max.	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*	
Plate Supply Voltage	150	125	volts
Grid-No.2 Supply Voltage	–	125	volts
Grid-No.1 Supply Voltage	-3	0	volts
Cathode Resistor	0	56	ohms
Amplification Factor	21	–	
Plate Resistance (Approx.)	4700	170000	ohms
Transconductance	4500	7800	μmhos
Plate Current	15	12	ma
Grid-No.2 Current	–	3.8	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-17	-6	volts
Grid-No.1 Voltage (Approx.) for plate ma. = 1.6, and cathode resistor (ohms) = 0	–	-3	volts

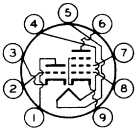
Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"

6AN8-A

Diameter. . . . . .0.750" to 0.875"
Dimensional Outline . . . . . See *General Section*
Bulb. T6-1/2
Base. . . . . .Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9DA

Pin 1 – Triode Plate
Pin 2 – Triode Grid
Pin 3 – Triode Cathode
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Plate
Pin 7 – Pentode Grid No.2



Pin 8 – Pentode Grid No.1
Pin 9 – Pentode Grid No.3, Pentode Cathode, Internal Shield

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

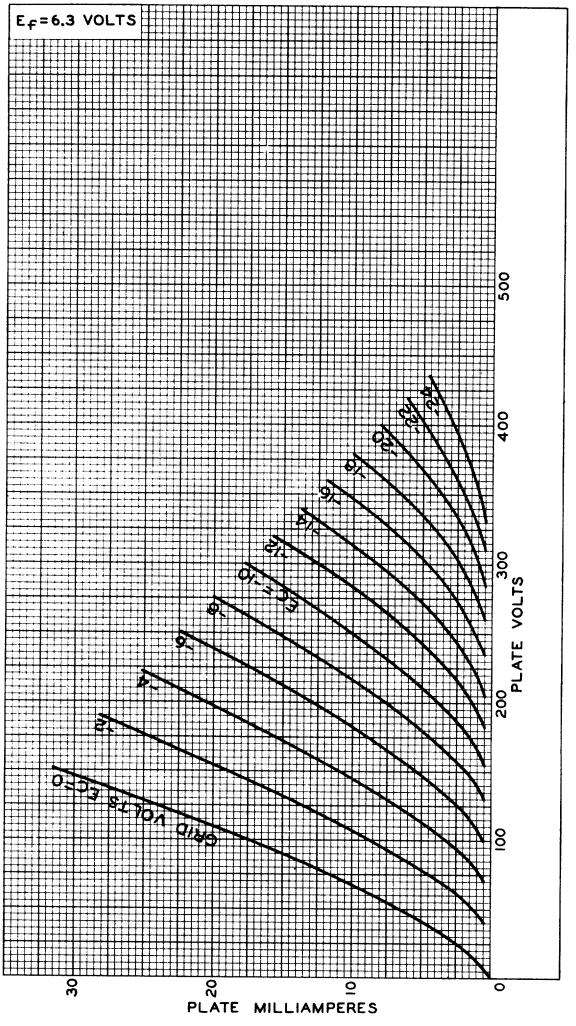
	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	330 max.	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	–	330 max.	volts
GRID-No.2 VOLTAGE	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts	–	0.55 max.	watt
For grid-No.2 voltages between 165 and 330 volts	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	2.8 max.	2.3 max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	200 max.	200 max.	volts
Heater positive with respect to cathode	200● max.	200● max.	volts

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance:★			
For fixed-bias operation	0.5 max.	0.25 max.	megohm
For cathode-bias operation	1 max.	1 max.	megohm

▲ Without external shield.
● The dc component must not exceed 100 volts.
★ If either unit is operated at maximum-rated conditions, grid-No.1-circuit resistances for both units should not exceed the stated values.

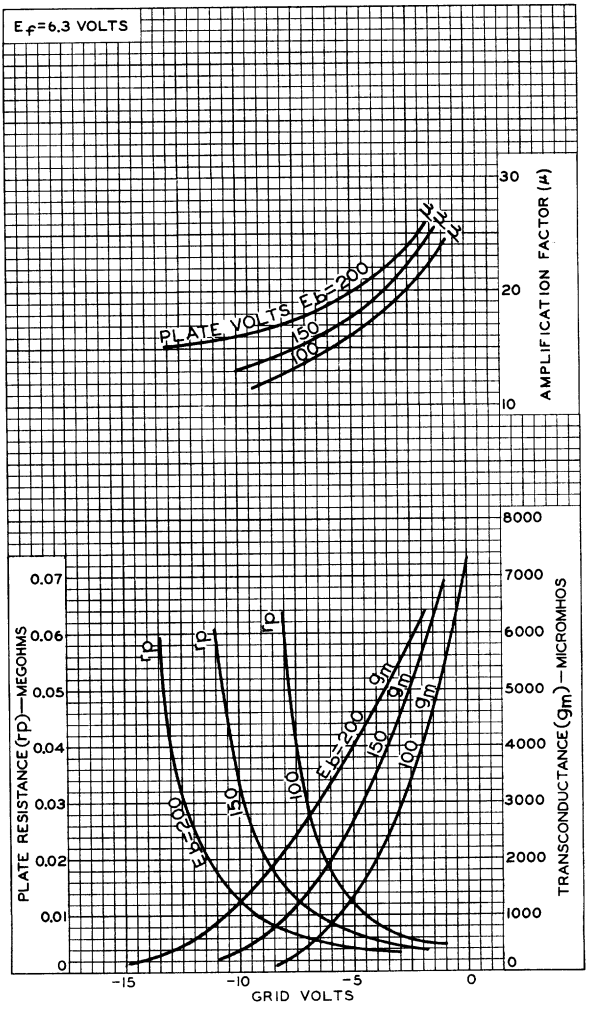
AVERAGE PLATE CHARACTERISTICS
Triode Unit



92CM-8209

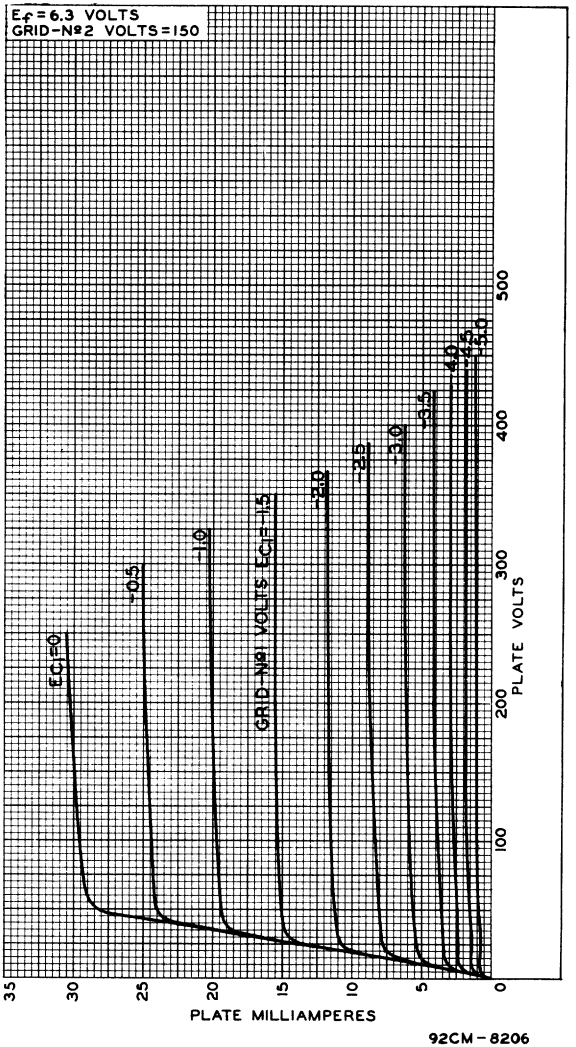
6AN8-A

AVERAGE CHARACTERISTICS
Triode Unit



92CM-8207RI

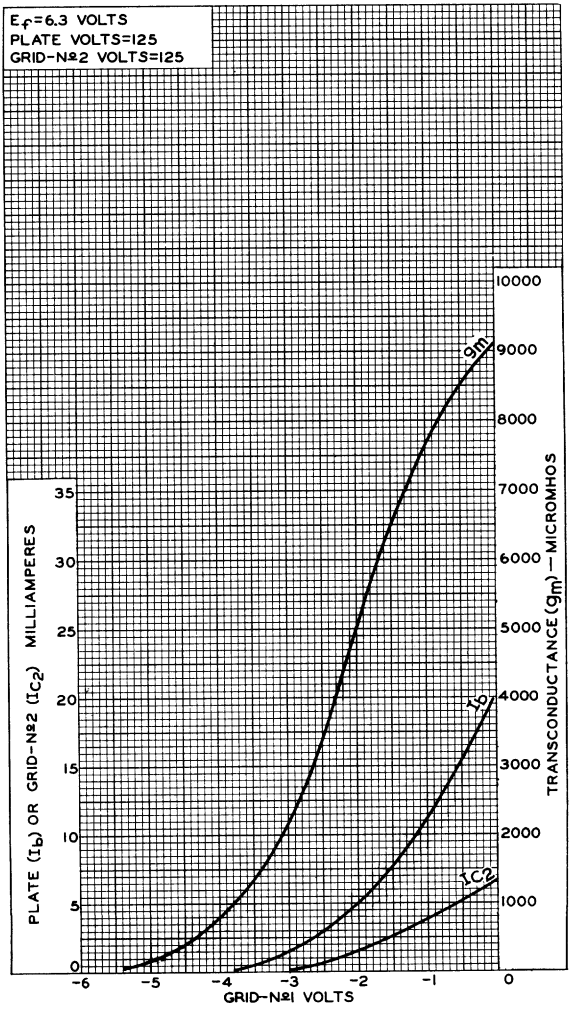
AVERAGE PLATE CHARACTERISTICS
Pentode Unit



92CM-8206

6AN8-A

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-8208RI

6AQ5-A
BEAM POWER TUBE

7-PIN MINIATURE TYPE

With heater having controlled warm-up time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.45	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

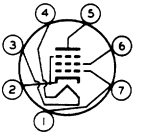
Direct Interelectrode Capacitances (Approx.):[o]

Grid No.1 to plate	0.4	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	8	μμf
Plate to cathode & grid No.3, grid No.2, and heater	8.5	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BZ

Pin 1 – Grid No.1
Pin 2 – Cathode, Grid No.3
Pin 3 – Heater



Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Grid No.1

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	250	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	250	max.	volts
GRID-No.2 INPUT	2	max.	watts
PLATE DISSIPATION	12	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250	max.	°C

o, ▲: See next page.

← Indicates a change.

6AQ5-A

BEAM POWER TUBE

Typical Operation and Characteristics:

Plate Voltage	180	250	volts
Grid-No.2 Voltage	180	250	volts
Grid-No.1 (Control-Grid) Voltage	-8.5	-12.5	volts
Peak AF Grid-No.1 Voltage	8.5	12.5	volts
Zero-Signal Plate Current	29	45	ma
Max.-Signal Plate Current	30	47	ma
Zero-Signal Grid-No.2 Current	3	4.5	ma
Max.-Signal Grid-No.2 Current	4	7	ma
Plate Resistance (Approx.)	58000	52000	ohms
Transconductance	3700	4100	μmhos
Load Resistance	5500	5000	ohms
Total Harmonic Distortion	8	8	%
Max.-Signal Power Output	2	4.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

AMPLIFIER — Class AB_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	250	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	250	max.	volts
GRID-No.2 INPUT	2	max.	watts
PLATE DISSIPATION	12	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250	max.	°C

Typical Push-Pull Operation:

Unless otherwise specified, values are for 2 tubes

Plate Voltage	250	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 (Control-Grid) Voltage●	-15	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	30	volts
Zero-Signal Plate Current	70	ma
Max.-Signal Plate Current	79	ma
Zero-Signal Grid-No.2 Current	5	ma
Max.-Signal Grid-No.2 Current	13	ma
Effective Load Resistance (Plate to plate)	10000	ohms
Total Harmonic Distortion	5	%
Max.-Signal Power Output	10	watts

°, ▲, ●: See next page.

6AQ5-A

BEAM POWER TUBE

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:●		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

VERTICAL-DEFLECTION AMPLIFIER

Triode Connection†

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	250 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE# (Absolute maximum)	1100■ max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 (CONTROL-GRID) VOLTAGE	250 max.	volts
PEAK CATHODE CURRENT	105 max.	ma
DC CATHODE CURRENT	35 max.	ma
PLATE DISSIPATION	9 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲ max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250 max.	°C

Characteristics:

Plate Voltage	250	volts
Grid-No.1 Voltage	-12.5	volts
Amplification Factor	9.5	
Plate Resistance (Approx.)	1970	ohms
Transconductance	4800	μmhos
Plate Current	49.5	ma
Grid-No.1 Voltage (Approx.) for plate ma. = 0.5	-37	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For cathode-bias operation	2.2 max.	megohms

o Without external shield.

▲ The dc component must not exceed 100 volts.

● The type of input coupling used should not introduce too much resistance in the grid-No.1 circuit. Transformer- or impedance-coupling devices are recommended.

† Grid-No.2 (Screen-grid) connected to plate.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

■ Under no circumstances should this absolute value be exceeded.

← Indicates a change.

6AQ5-A

BEAM POWER TUBE

CURVES

For the 6AQ5-A, within its ratings, are the same as those shown for Type 6V6

Semiremote-Cutoff Twin Pentode

DUODECAR TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values)*:			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	0.800		amp
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances:[b]			
Unit No.1:			
Grid No.1 to plate	0.026		pf
Grid No.1 to cathode, grid No.2, grid No.3 & internal shield, and heater	10		pf
Plate to cathode, grid No.2, grid No.3 & internal shield, and heater	2.8		pf
Unit No.2:			
Grid No.1 to plate	0.026		pf
Grid No.1 to cathode, grid No.2, grid No.3, grid No.3 of unit No.1 & internal shield, and heater	10		pf
Plate to cathode, grid No.2, grid No.3, grid No.3 of unit No.1 & internal shield, and heater	3.0		pf
Plate of unit No.1 to plate of unit No.2	0.02	max.	pf
Grid No.1 of unit No.1 to plate of unit No.2	0.002	max.	pf
Grid No.1 of unit No.2 to plate of unit No.1	0.002	max.	pf

Characteristics, Class A_1 Amplifier (Each Unit):

Plate Supply Voltage	125	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Supply Voltage	125	volts
Cathode Resistor	56	ohms
Plate Resistance (Approx.)	0.2	megohm
Transconductance	10500	μmhos
Plate Current	11	ma
Grid-No.2 Current	3.5	ma
Grid-No.1 Voltage (Approx.) for transconductance (μmhos) = 50	−15	volts

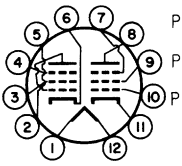
Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	1.875"

6AR11

Seated Length . . . . . 1.250" to 1.500"
Diameter. . . . . 1.062" to 1.188"
Bulb. T9
Base. . . . . .Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW. 12DM

Pin 1 – Heater
Pin 2 – Plate of Unit No.2
Pin 3 – Grid No.2 of Unit No.2
Pin 4 – Grid No.3 of Unit No.2
Pin 5 – Grid No.1 of Unit No.2
Pin 6 – Cathode of Unit No.2
Pin 7 – Grid No.3 of Unit No.1, Internal Shield
Pin 8 – Plate of Unit No.1
Pin 9 – Grid No.2 of Unit No.1
Pin 10 – Grid No.1 of Unit No.1
Pin 11 – Cathode of Unit No.1
Pin 12 – Heater



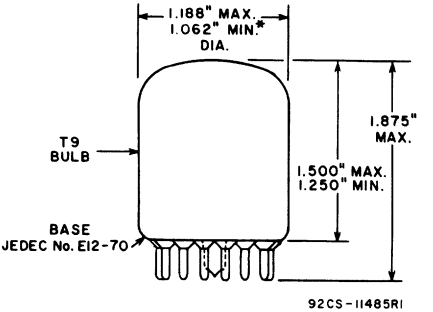
AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE . . . . . 330 max. volts
GRID No.3 (SUPPRESSOR GRID) . . .*Connect to cathode at socket*
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE . . 330 max. volts
GRID-No.2 VOLTAGE . . . . . .See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section
GRID-No.1 (CONTROL-GRID) VOLTAGE:
Positive-bias value . . . . . 0 max. volts
GRID-No.2 INPUT:
For grid-No.2 voltages up to 165 volts . 0.65 max. watt
For grid-No.2 voltages between 165 and 330 volts . . . . .See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section
PLATE DISSIPATION . . . . . 3.1 max. watts

[a] The dc component must not exceed 100 volts.
[b] With external shield JEDEC No.309 connected to cathode of unit under test.



* APPLIES TO MINIMUM DIAMETER EXCEPT IN AREA OF SEAL.

6AS6

SHARP-CUTOFF PENTODE

MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.175	amp

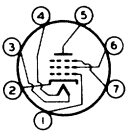
Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield No.316*	
Grid No.1 to Plate	0.025 max.	0.02 max.	μμf
Input	3.9	4.0	μμf
Output	2.2	3.0	μμf
Grid No.1 to Grid No.3	0.15 max.	0.15 max.	μμf
Grid No.3 to Plate	0.7 max.	0.7 max.	μμf
Grid No.3 to All Other Electrodes	3.3	3.4	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/8" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin
Basing Designation for BOTTOM VIEW	$7CM_1$

Pin 1 - Grid No.1
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Grid No.3



AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	180 max.	volts
GRID-No.3 VOLTAGE	27 max.	volts
GRID-No.2 VOLTAGE	140 max.	volts
CATHODE CURRENT	18 max.	ma
PLATE DISSIPATION	1.7 max.	watts
GRID-No.2 INPUT	0.75 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	120 max.	°C

Characteristics:

Plate Voltage	120	120	volts

6AS6

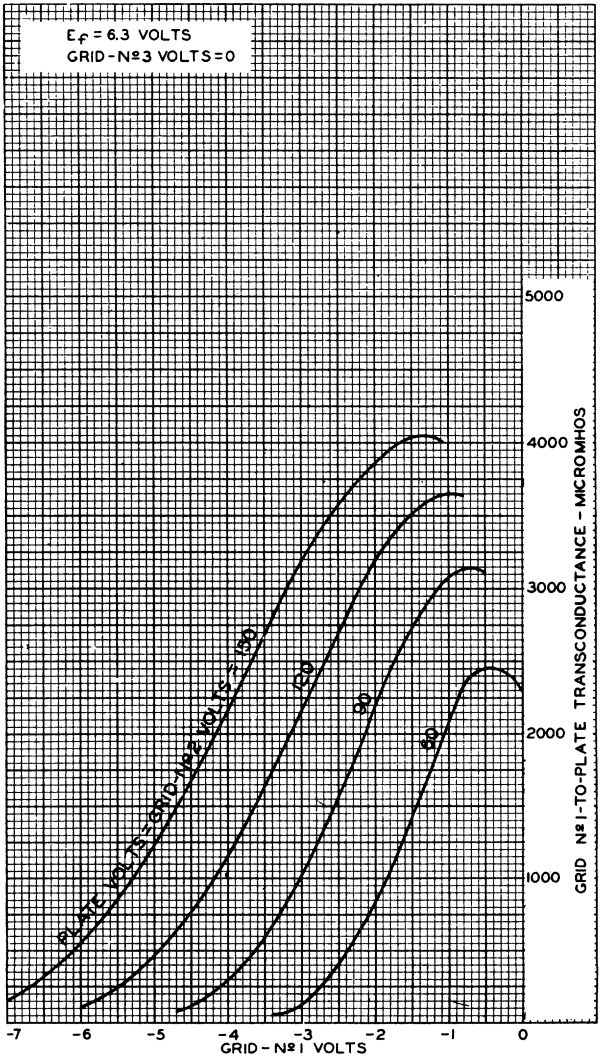
6AS6

SHARP-CUTOFF PENTODE

Grid-No.3 Voltage.	-3	0	volts
Grid-No.2 Voltage.	120	120	volts
Grid-No.1 Voltage.	-2	-2	volts
Plate Resistance (Approx.)	-	0.15	megohm
Transconductance, Grid No.1 to Plate. . . .	1850	3200	μmhos
Transconductance, Grid No.3 to Plate. . . .	810	470	μmhos
Plate Current.	3.6	5.2	ma
Max. Plate Current for Grid-No.1 Volts = -10. . . .	-	100	μamp
Max. Plate Current for Grid-No.3 Volts = -15. . . .	-	20	μamp
Grid-No.2 Current.	4.8	3.5	ma

6AS6

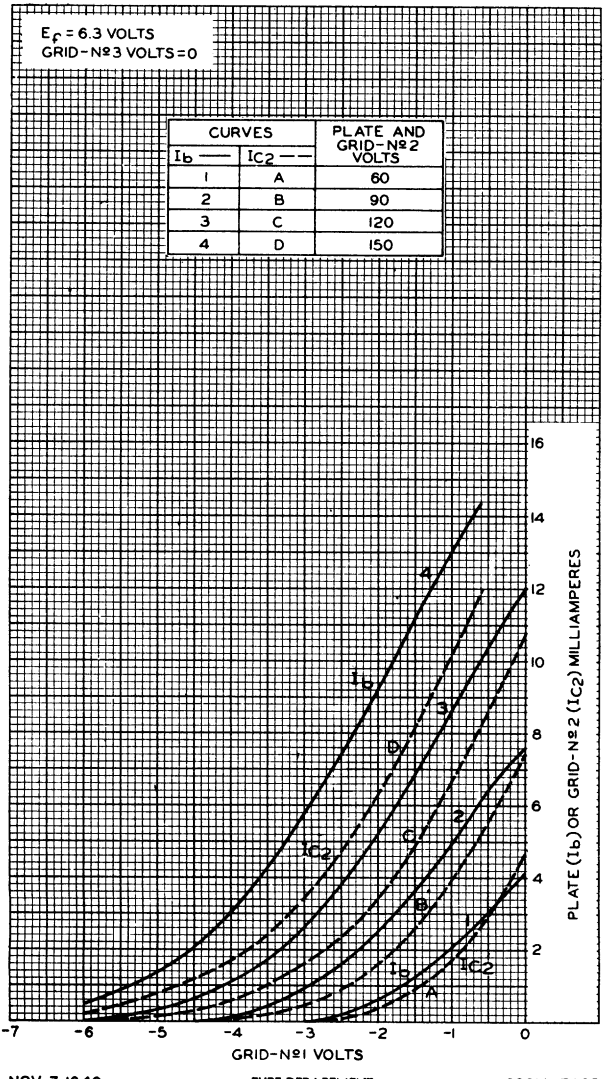
AVERAGE CHARACTERISTICS



6AS6

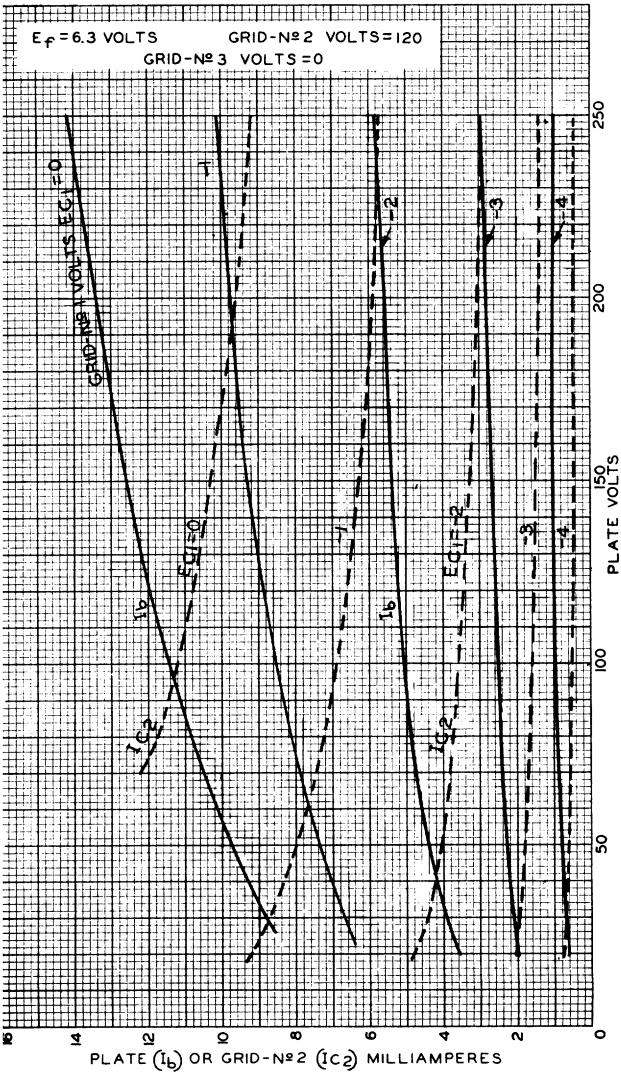
6AS6

AVERAGE CHARACTERISTICS



6AS6

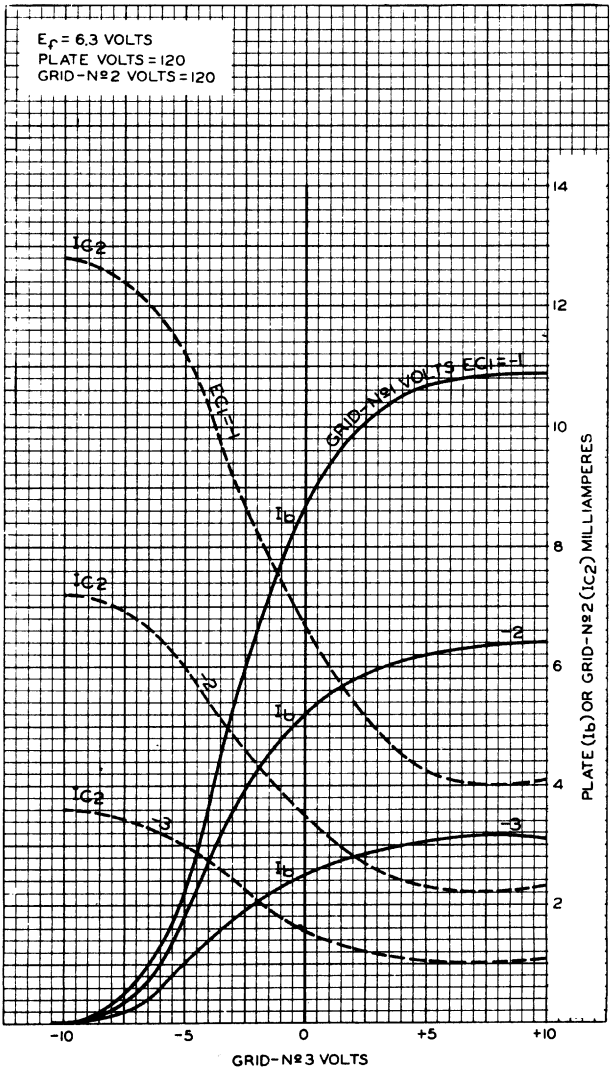
AVERAGE PLATE CHARACTERISTICS



6AS6

6AS6

AVERAGE CHARACTERISTICS



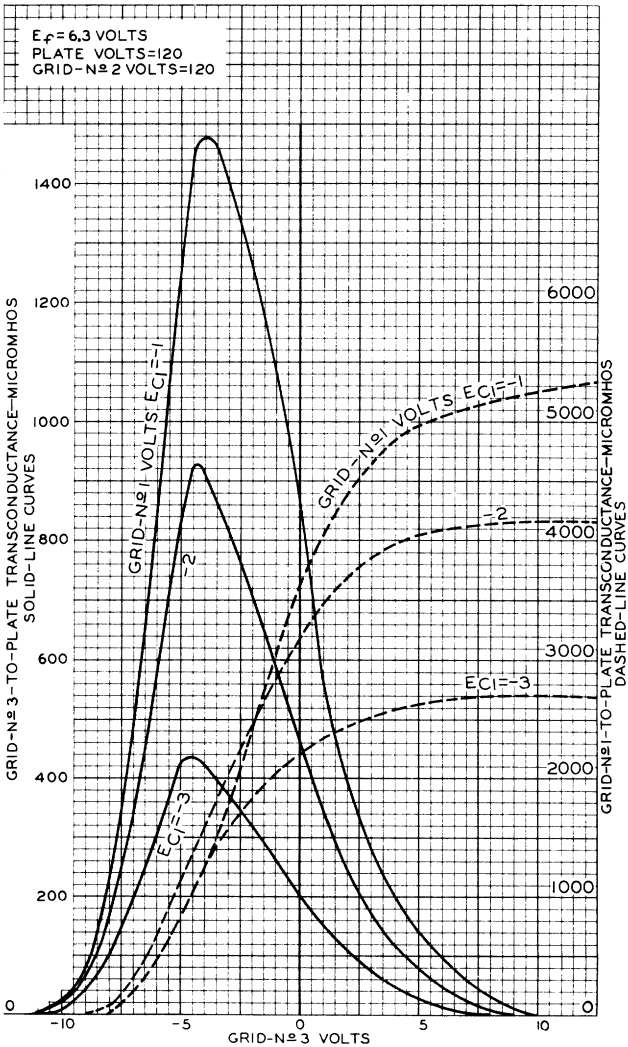
NOV. 9, 1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7403

6AS6

AVERAGE CHARACTERISTICS



6AS7-G

LOW-MU TWIN POWER TRIODE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage	6.3	ac or dc volts
Current	2.5	amp
Direct Interelectrode Capacitances (Approx., each unit):[o]		
Grid to plate	10.5	μμf
Grid to heater and cathode	6.8	μμf
Plate to heater and cathode	2.3	μμf
Heater to cathode	11.0	μμf
Grid of unit No.1 to grid of unit No.2	0.70	μμf
Plate of unit No.1 to plate of unit No.2	1.65	μμf

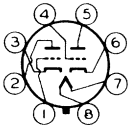
Characteristics, Class A_1 Amplifier (Each unit):

Plate-Supply Voltage	135	volts
Cathode-Bias Resistor[■]	250	ohms
Amplification Factor	2	
Plate Resistance (Approx.)	280	ohms
Transconductance	7000	μmhos
Plate Current	125	ma

Mechanical:

Mounting Position	Any
Maximum Overall Length	5-5/16"
Maximum Seated Length	4-3/4"
Maximum Diameter	2-1/16"
Bulb	ST-16
Base	Medium-Shell Octal 8-Pin (JETEC No.B8-11)
Basing Designation for BOTTOM VIEW	8BD

Pin 1 - Grid of Unit No.2
Pin 2 - Plate of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Grid of Unit No.1
Pin 5 - Plate of Unit No.1
Pin 6 - Cathode of Unit No.1
Pin 7 - Heater
Pin 8 - Heater



DC AMPLIFIER

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	250 max.	volts
PLATE CURRENT	125 max.	ma
PLATE DISSIPATION	13 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	300 max.	volts
Heater positive with respect to cathode	300 max.	volts

[o] Without external shield.
[■] Operation with fixed bias is not recommended.

← Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AS7-G

LOW-MU TWIN POWER TRIODE

Maximum Circuit Values (For maximum rated conditions):

Grid-Circuit Resistance:		
For cathode-bias operation	1.0 max.	megohm
For fixed-bias operation	Not recommended	

BOOSTER SCANNING SERVICE

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

For operation in a 525-line, 30-frame system□

PEAK NEGATIVE-PULSE PLATE VOLTAGE●	1700 max.	volts
DC PLATE CURRENT	125 max.	ma
PLATE DISSIPATION.	13 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode .	300 max.	volts
Heater positive with respect to cathode .	300 max.	volts

Maximum Circuit Values (For maximum rated conditions):

Grid-Circuit Resistance:		
For cathode-bias operation	1.0 max.	megohm
For fixed-bias operation	Not recommended	

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

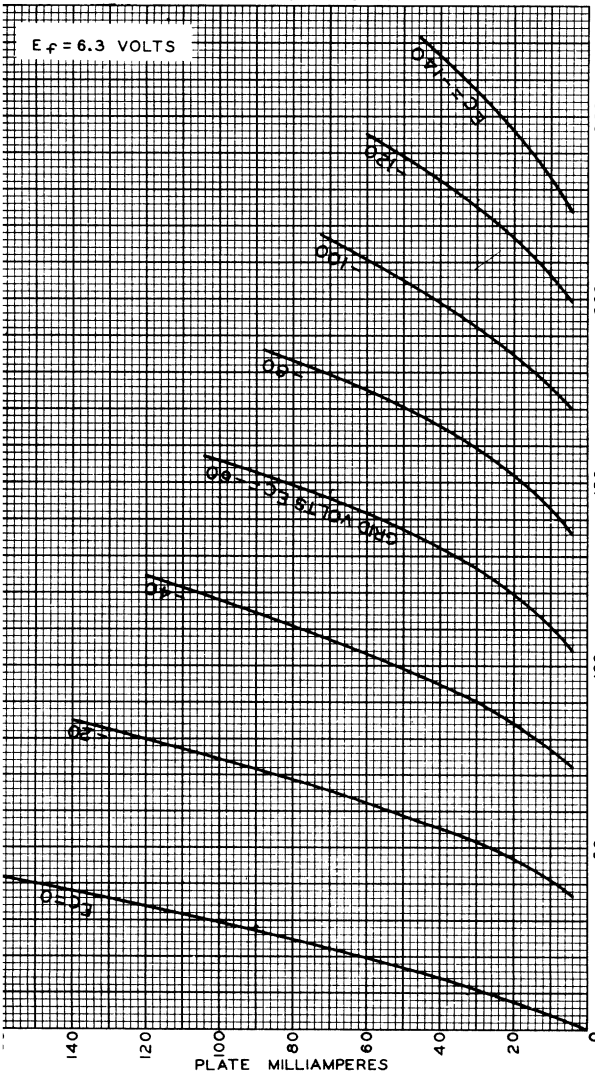
● The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AS7-G

AVERAGE PLATE CHARACTERISTICS

EACH TRIODE UNIT



RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AS8

DIODE–SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage	6.3	ac or dc volts
Current	0.45	amp
Direct Interelectrode Capacitances (Approx.):*		
Diode Unit:		
Plate to heater and cathode and internal shield	3.0	μμf
Pentode Unit:		
Grid No.1 to plate	0.04 max.	μμf
Input	7	μμf
Output	2.2	μμf
Pentode grid to diode plate	0.005 max.	μμf
Pentode plate to diode cathode	0.15 max.	μμf
Pentode plate to diode plate	0.10 max.	μμf

Characteristics, Class A_1:

Plate-Supply Voltage	200	volts
Grid No.3	Connected to cathode at socket	
Grid-No.2 Supply Voltage	150	volts
Cathode-Bias Resistor	180	ohms
Plate Resistance (Approx.)	300000	ohms
Transconductance	6200	μmhos
Grid-No.1 Bias (Approx.) for Plate Current of 10 μamp	-8	volts
Plate Current	9.5	ma
Grid-No.2 Current	3	ma

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding Tip)	1-9/16" ± 3/32"
Maximum Diameter	7/8"
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9DS

Pin 1 – Pentode Grid No.2
Pin 2 – Pentode Grid No.1
Pin 3 – Pentode Cathode
Pin 4 – Heater
Pin 5 – Heater

Pin 6 – Diode Plate
Pin 7 – Pentode Grid No.3, Int.Shield
Pin 8 – Diode Cathode
Pin 9 – Pentode Plate

* With no external shield.

6AS8

6AS8

DIODE–SHARP-CUTOFF PENTODE

PENTODE UNIT - Class A_1 Amplifier

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
GRID-No.3 (SUPPRESSOR) VOLTAGE	0 max.	volts
GRID-No.2 SUPPLY VOLTAGE	300 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	*See Rating Curve at front of this Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive bias value	0 max.	volts
PLATE DISSIPATION	2.5 max.	watts
GRID-No.2 INPUT	0.5 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200● max.	volts

Maximum Circuit Values (For maximum rated conditions):

Grid-No.1-Circuit Resistance:		
For cathode-bias operation	1.0 max.	megohm
For fixed-bias operation	0.25 max.	megohm

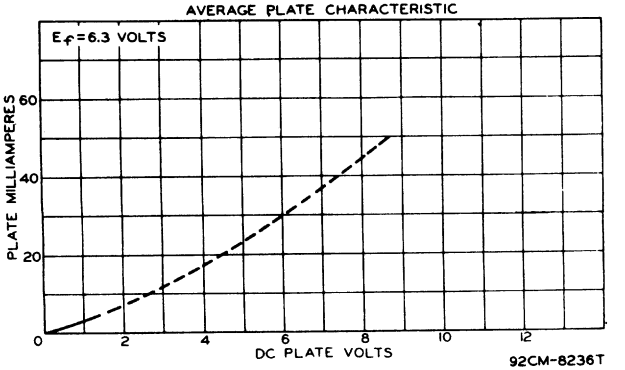
DIODE UNIT

Maximum Ratings, *Design-Center Values:*

PEAK INVERSE PLATE VOLTAGE	330 max.	volts
PEAK PLATE CURRENT	50 max.	ma
DC PLATE CURRENT	5 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200● max.	volts

● The dc component must not exceed 100 volts.

AVERAGE PLATE CHARACTERISTIC



92CM-8236T

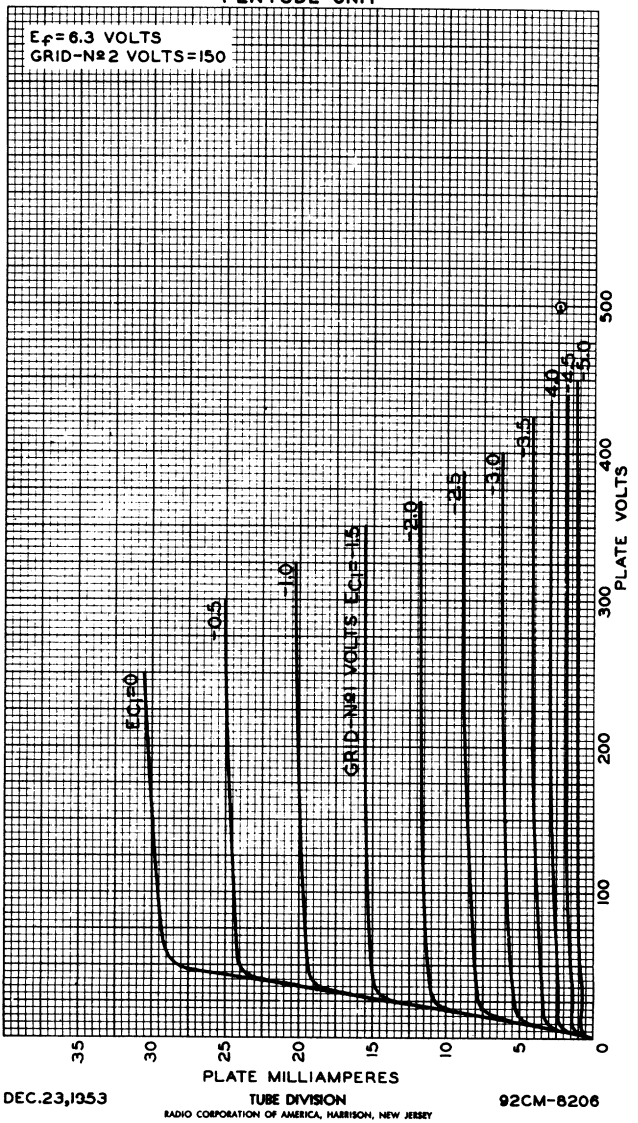
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

6AS8

AVERAGE PLATE CHARACTERISTICS

PENTODE UNIT



DEC.23,1953

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

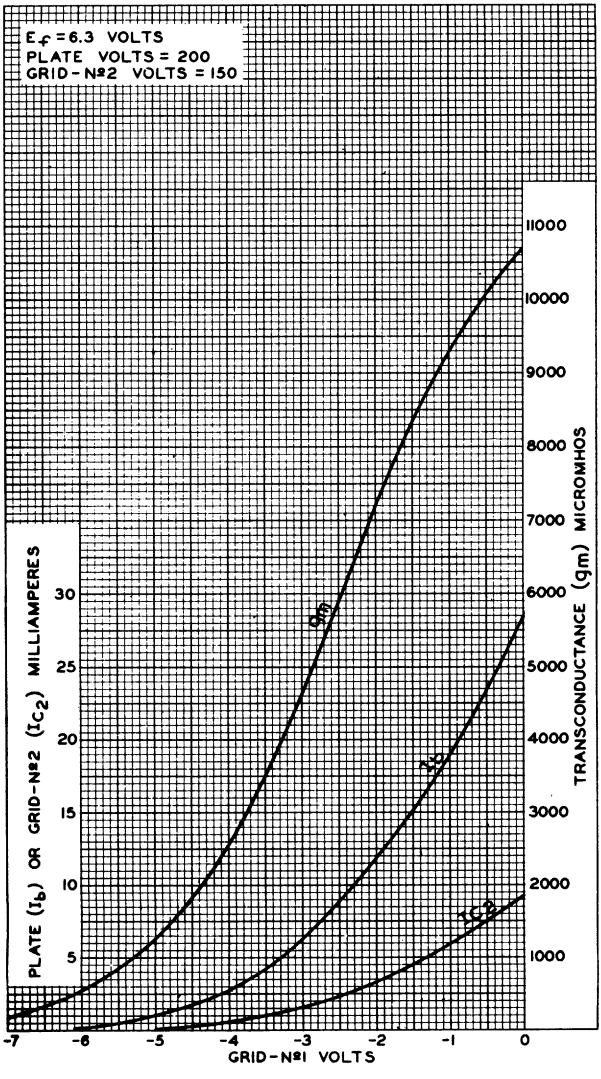
92CM-8206

6AS8

6AS8

AVERAGE CHARACTERISTICS

PENTODE UNIT



DEC. 23, 1953

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8208

Dual Triode—Sharp-Cutoff Pentode

Dual Triode Has High-Mu Unit & Medium-Mu Unit

DUODECAR TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values)*:			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	1.050		amp
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances:[b]			
Triode Unit No.1:			
Grid to plate	1.9		pf
Grid to cathode, cathode of triode unit No.2 & internal shield, pentode cathode & pentode grid No.3 & internal shield, and heater.	3.0		pf
Plate to cathode, cathode of triode unit No.2 & internal shield, pentode cathode & pentode grid No.3 & internal shield, and heater.	2.2		pf
Triode Unit No.2:			
Grid to plate	3.6		pf
Grid to cathode & internal shield, pentode cathode & pentode grid No.3 & internal shield, and heater.	2.4		pf
Plate to cathode & internal shield, pentode cathode & pentode grid No.3 & internal shield, and heater.	3.8		pf
Pentode Unit:			
Grid No.1 to plate	0.11		pf
Grid No.1 to cathode of triode unit No.2 & internal shield, cathode & grid No.3 & internal shield, grid No.2, and heater	9.5		pf
Plate to cathode of triode unit No.2 & internal shield, cathode & grid No.3 & internal shield, grid No.2, and heater	4.4		pf
Pentode plate to plate of triode unit No.2	0.044	max.	pf
Plate of triode unit No.1 to plate of triode unit No.2	0.06	max.	pf

6AS11

Characteristics, Class A_1 Amplifier:

Triode Units

	Unit No.1	Unit No.2	
Plate Supply Voltage	200	200	volts
Grid Voltage	-2	-	volts
Cathode Resistor	-	220	ohms
Amplification Factor	68	41	
Plate Resistance (Approx.)	12400	9400	ohms
Transconductance	5500	4400	μmhos
Plate Current	7	9.2	ma
Grid Voltage (Approx.) for plate μa = 10	-5.5	-	volts
Grid Voltage (Approx.) for plate μa = 100	-	-6.5	volts

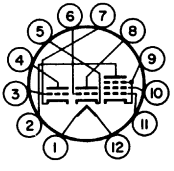
Pentode Unit

Plate Supply Voltage	200	volts
Grid-No.2 Supply Voltage	125	volts
Cathode Resistor	68	ohms
Plate Resistance(Approx.)	70000	ohms
Transconductance	10500	μmhos
Plate Current	24	ma
Grid-No.2 Current	5.2	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	-8	volts

Mechanical:

Operating Position	Any
Types of Cathodes	Coated Unipotential
Maximum Overall Length	2.375"
Seated Length	1.750" to 2.000"
Diameter	1.062" to 1.188"
Bulb	T9
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW	12DP

Pin 1 - Heater
Pin 2 - Pentode Plate
Pin 3 - Grid of Triode Unit No.2
Pin 4 - Plate of Triode Unit No.2
Pin 5 - Cathode of Triode Unit No.1
Pin 6 - Grid of Triode Unit No.1
Pin 7 - Cathode of Triode Unit No.2, Internal Shield



Pin 8 - Plate of Triode Unit No.1
Pin 9 - Pentode Cathode, Pentode Grid No.3, Internal Shield
Pin 10 - Pentode Grid No.2
Pin 11 - Pentode Grid No.1
Pin 12 - Heater

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

Triode Units

	Unit No.1	*Unit No.2*	
PLATE VOLTAGE	330 max.	330 max.	volts
GRID (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0 max.	0 max.	volts
PLATE DISSIPATION	1.5 max.	2 max.	watts

Pentode Unit

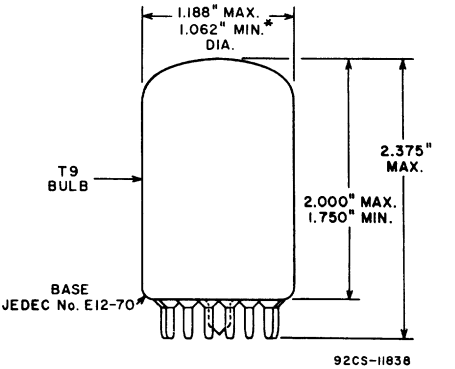
PLATE VOLTAGE	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts
GRID-No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 165 volts.	1.1 max.	watts
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	5 max.	watts

Maximum Circuit Values:

Values are for Each Unit

	Triode Units	*Pentode Unit*	
Grid-No.1-Circuit Resistance:			
For fixed-bias operation.	0.5 max.	0.25 max.	megohm
For cathode-bias operation.	1 max.	1 max.	megohm

[a] The dc component must not exceed 100 volts.
[b] Without external shield.



* APPLIES TO MINIMUM DIAMETER EXCEPT IN AREA OF SEAL.

6AT6
TWIN DIODE—HIGH-MU TRIODE

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.3	amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield°*	
Grid to triode plate	2.0	2.0	μμf
Grid to cathode and heater	2.2	2.2	μμf
Plate to cathode and heater	0.8	1.2	μμf
Plate of diode unit No.2 to triode grid	0.04 max.		μμf

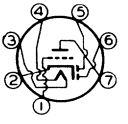
Characteristics, Class A_1 Amplifier (Triode Unit):

Plate Voltage	100	250	volts
Grid Voltage	-1	-3	volts
Amplification Factor	70	70	
Plate Resistance (Approx.)	54000	58000	ohms
Transconductance	1300	1200	μmhos
Plate Current	0.8	1	ma

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Dimensional Outline	*See General Section*
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BT

Pin 1 – Triode Grid
Pin 2 – Cathode
Pin 3 – Heater
Pin 4 – Heater



Pin 5 – Diode Plate No.2
Pin 6 – Diode Plate No.1
Pin 7 – Triode Plate

TRIODE UNIT—AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
GRID VOLTAGE:		
Positive bias value	0 max.	volts
PLATE DISSIPATION	0.5 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

° With external shield JETEC No.316 connected to cathode.

← Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AT6

TWIN DIODE—HIGH-MU TRIODE

→ **Typical Operation as Resistance-Coupled Amplifier:**

See RESISTANCE-COUPLED AMPLIFIER CHART No.7 at front of this Section

→ **DIODE UNITS**

Maximum Ratings, *Design-Center Values:*

PLATE CURRENT (For each diode). . . . . 1.0 max. ma

Diode Considerations:

Consideration of these units, including typical circuits and diode curves, is given at the front of this Section. Diode biasing of the triode unit of the 6AT6 is not suitable.

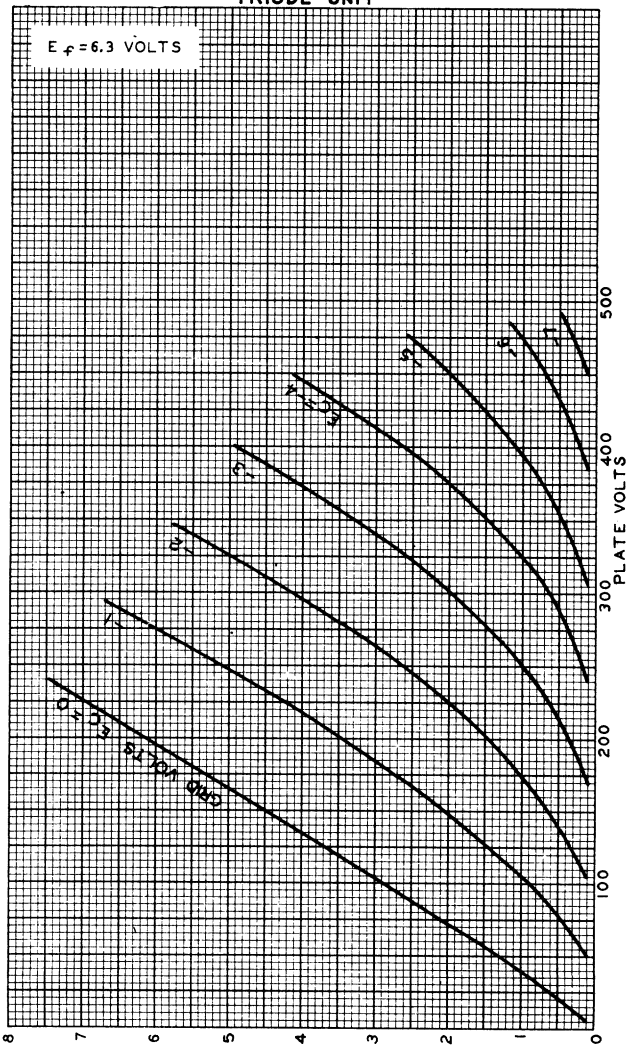
→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AT6

AVERAGE PLATE CHARACTERISTICS

TRIODE UNIT



OCT. 19, 1945

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6610

6AT8-A

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 6AT8-A is the same as the 6X8 except for the following items:

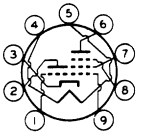
Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)		6.3	volts
Current		0.45 ± 6%	amp
Warm-up time (Average)		11	sec
Direct Interelectrode Capacitances:	*Without External Shield*	*With External Shield▲*	
Triode Unit:			
Grid to plate	1.5	1.5	μμf
Grid to cathode and heater	2	2.4	μμf
Plate to cathode and heater	0.5	1	μμf
Pentode Unit:			
Grid No.1 to plate	0.06 max.	0.03 max.	μμf
Grid No.1 to cathode, grid No.3, grid No.2, and heater	4.6	4.8	μμf
Plate to cathode, grid No.3, grid No.2, and heater	0.9	1.6	μμf
Pentode grid No.1 to triode plate	0.05 max.	0.04 max.	μμf
Pentode plate to triode plate	0.05 max.	0.008 max.	μμf
Heater to cathode	6	6●	μμf

Mechanical:

Basing Designation for BOTTOM VIEW. 9DW

Pin 1 – Triode Grid
Pin 2 – Triode Plate
Pin 3 – Cathode
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Plate
Pin 7 – Pentode Grid No.2
Pin 8 – Pentode Grid No.3
Pin 9 – Pentode Grid No.1



▲ With external shield JEDEC No.315 connected to cathode except as noted.
● With external shield JEDEC No.315 connected to pentode plate.

← Indicates a change.

6AU4-GTA
HALF-WAVE VACUUM RECTIFIER

For television damper service

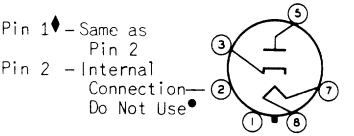
GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current	1.8	amp
Direct Interelectrode Capacitances (Approx.):○		
Plate to cathode and heater	8.5	μμf
Cathode to heater and plate	11.5	μμf
Heater to cathode	4	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	3-13/16"
Maximum Seated Length	3-1/4"
Maximum Diameter	1-9/32"
Bulb	T9
Base	Short Intermediate-Shell Octal 5-Pin with External Barriers, Arrangement 2 (JEDEC Group 1, No.B5-85), or Short Intermediate-Shell Octal 6-Pin with External Barriers, Arrangement 1 (JEDEC Group 1, No.B6-60)
Basing Designation for BOTTOM VIEW	4CG



DAMPER SERVICE

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system□

PEAK INVERSE PLATE VOLTAGE	4500	max.	volts
PEAK PLATE CURRENT	1300	max.	ma
DC PLATE CURRENT	210	max.	ma
PLATE DISSIPATION	6.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	4500▲	max.	volts
Heater positive with respect to cathode	300#	max.	volts

○ Without external shield.

♦ On the 5-pin base, pin 1 as well as pins 4 and 6 is omitted.

● Socket terminals 1,2,4,and 6 should not be used as tie points.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

▲ The dc component must not exceed 900 volts.

The dc component must not exceed 100 volts.

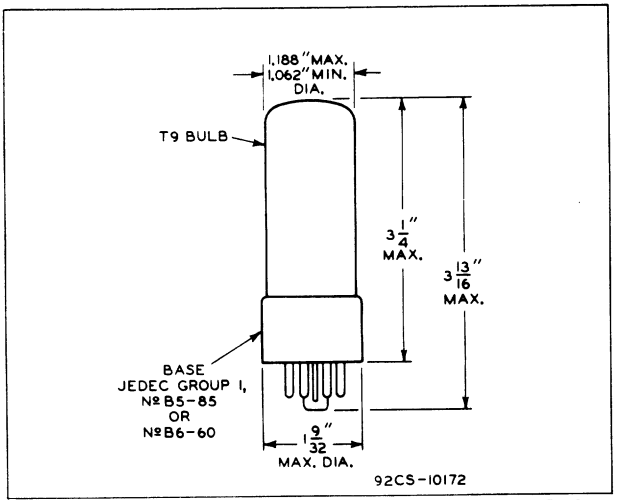
← Indicates a change.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AU4-GTA

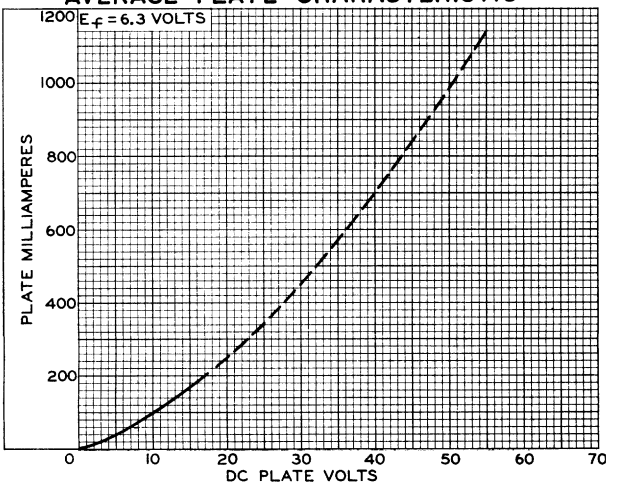
6AU4-GTA

HALF-WAVE VACUUM RECTIFIER



8-59 CE-10172

AVERAGE PLATE CHARACTERISTIC



92CS-8651RI

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6AU5-GT

BEAM POWER TUBE

GENERAL DATA

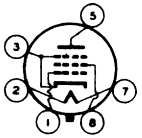
Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	1.25	amp
Direct Interelectrode Capacitances (Approx.):°		
Grid No.1 to plate	0.5	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	11.3	μμf
Plate to cathode & grid No.3, grid No.2, and heater	7	μμf
Transconductance#	5600	μmhos ←
Mu-Factor, Grid No.2 to Grid No.1■	5.9	

Mechanical:

Mounting Position	Any
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-9/32"
Bulb	T-9
Base	Intermediate-Shell Octal 6-Pin (JETEC No.B6-8) ←
	or Short Intermediate-Shell Octal 6-Pin (JETEC No.B6-60)
Basing Designation for BOTTOM VIEW	6CK

Pin 1 - Grid No.1
Pin 2 - Heater
Pin 3 - Cathode, Grid No.3



Pin 5 - Plate
Pin 7 - Heater
Pin 8 - Grid No.2

HORIZONTAL DEFLECTION AMPLIFIER

For operation in a 525-line, 30-frame system□

Maximum Ratings, *Design-Center Values:* ←

DC PLATE VOLTAGE	550 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE* (Absolute maximum)	5500● max.	volts
PEAK NEGATIVE-PULSE PLATE VOLTAGE*	-1250 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE†	200 max.	volts

° With no external shield.

For plate volts = 115, grid-No.2 volts = 175, grid-No.1 volts = -20.

■ For plate volts = 100, grid-No.2 volts = 100, grid-No.1 volts = -4.5.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

* The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

● Under no circumstances should this absolute value be exceeded.

† Preferably obtained through a series dropping resistor of sufficient magnitude to limit the grid-No.2 input to the rated maximum value.

← Indicates a change.

6AU5-GT

BEAM POWER TUBE

PEAK NEGATIVE-PULSE GRID-No.1 (CONTROL-GRID) VOLTAGE	-300 max.	volts
CATHODE CURRENT:		
Peak	400 max.	ma
Average	110 max.	ma
GRID-No.2 INPUT	2.5 max.	watts
PLATE DISSIPATION◇	10 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200♦max.	volts
BULB TEMPERATURE (At hottest point)▲	210 max.	°C

Maximum Circuit Values:

→ Grid-No.1-Circuit Resistance	0.47 max.	megohm

→ **VOLTAGE REGULATOR SERVICE**

Triode Connection--Grid No.2 Connected to Plate

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value	0 max.	volts
CATHODE CURRENT	110 max.	ma
PLATE & GRID-No.2 DISSIPATION (Total)	10 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200♦max.	volts

◇ An adequate cathode-bias resistor or other suitable means is required to protect the tube in the absence of excitation.

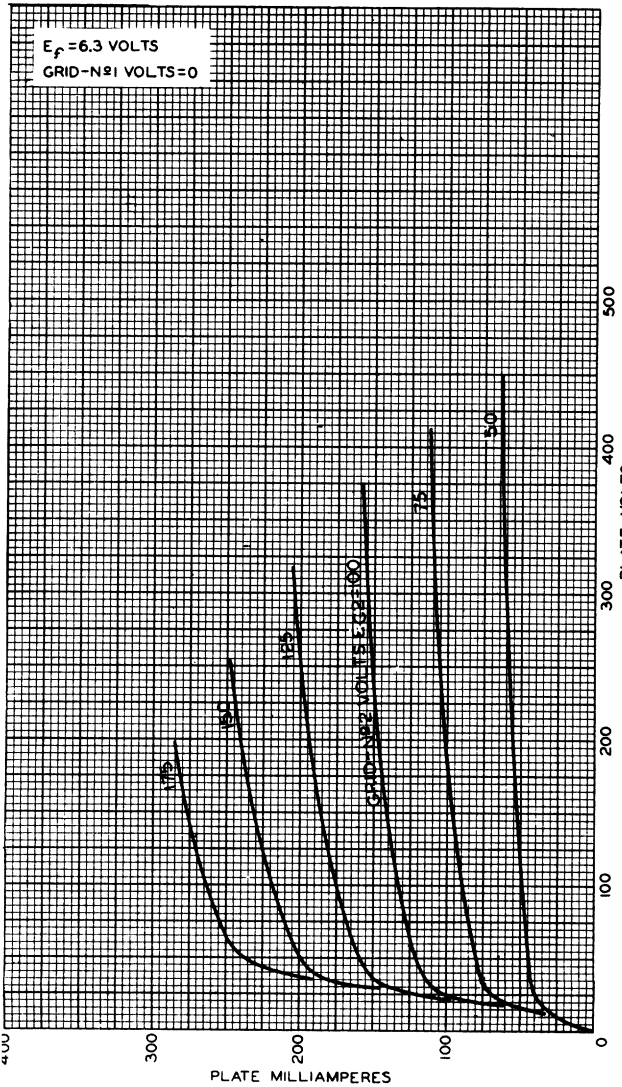
♦ The dc component must not exceed 100 volts.

▲ For tube in vertical position with base down in free space and with natural ventilation, the hottest point on the bulb is in the center of the dome just above open end of cathode sleeve.

→ Indicates a change.

6AU5-GT

AVERAGE PLATE CHARACTERISTICS



SEPT. 8, 1949

TUBE DEPARTMENT

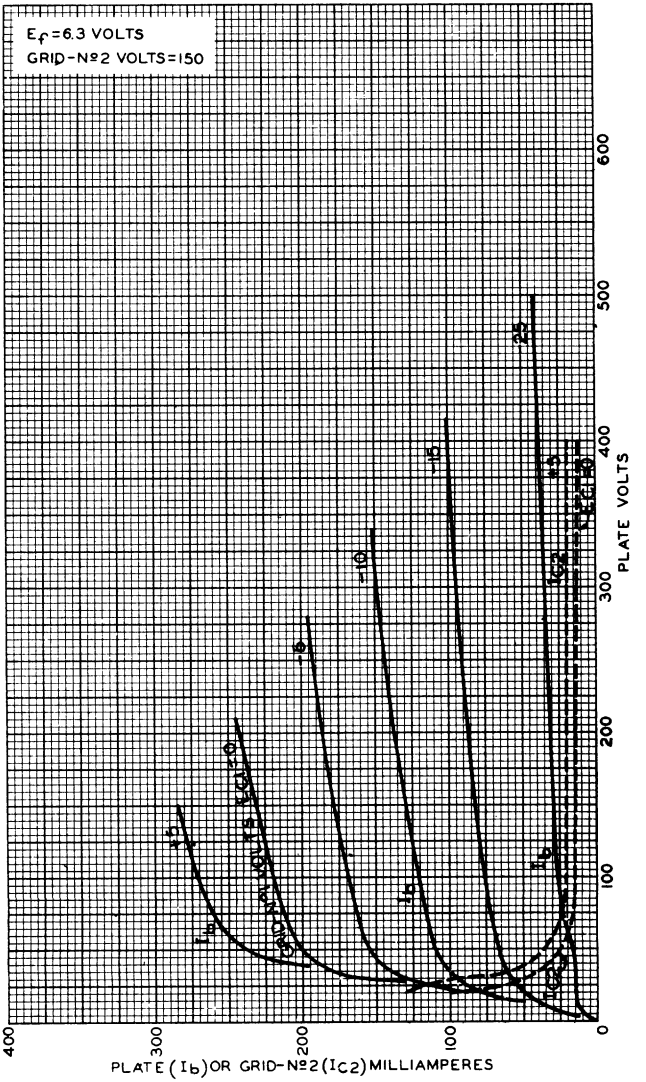
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7355

6AU5-GT

6AU5-GT

AVERAGE PLATE CHARACTERISTICS



AUG. 29, 1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7349

6AU6-A

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current at 6.3 volts	0.3 ± 6%	amp
Warm-up time (Average)	11	sec

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*▲	
Pentode Connection:			
Grid No.1 to plate	0.0035 max.	0.0035 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	5.5	5.5	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	5	5	μμf
Triode Connection:●			
Grid No.1 to plate, grid No.3 & internal shield, and grid No.2	2.6	2.6	μμf
Grid No.1 to cathode and heater	3.2	3.2	μμf
Plate, grid No.3 & internal shield, and grid No.2 to cathode and heater	1.2	8.5	μμf

Characteristics, Class A_1 Amplifier:

	Pentode Connection			
Plate Supply Voltage	100	250	250	volts
Grid No.3	*Connected to cathode at socket*			
Grid-No.2 Supply Voltage	100	125	150	volts
Cathode Resistor	150	100	68	ohms
Plate Resistance (Approx.)	0.5	1.5	1	megohms
Transconductance	3900	4500	5200	μmhos
Plate Current	5	7.6	10.6	ma
Grid-No.2 Current	2.1	3	4.3	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-4.2	-5.5	-6.5	volts

	Triode Connection●	
Plate Supply Voltage	250	volts
Cathode Resistor	330	ohms
Amplification Factor	36	

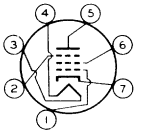
6AU6-A

Plate Resistance (Approx.)	7500	ohms
Transconductance	4800	μmhos
Plate Current	12.2	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BK

Pin 1 – Grid No.1
Pin 2 – Grid No.3, Internal Shield
Pin 3 – Heater



Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Cathode

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

	Triode Connection●	*Pentode Connection*	
PLATE VOLTAGE	275 max.	330 max.	volts
GRID No.3 (SUPPRESSOR GRID)	–	*Connect to cathode at socket*	
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	–	330 max.	volts
GRID-No.2 VOLTAGE	--	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts	–	0.75 max.	watt
For grid-No.2 voltages between 165 and 330 volts	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	3.5 max.	3.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	200 max.	200 max.	volts
Heater positive with respect to cathode	200★ max.	200★ max.	volts

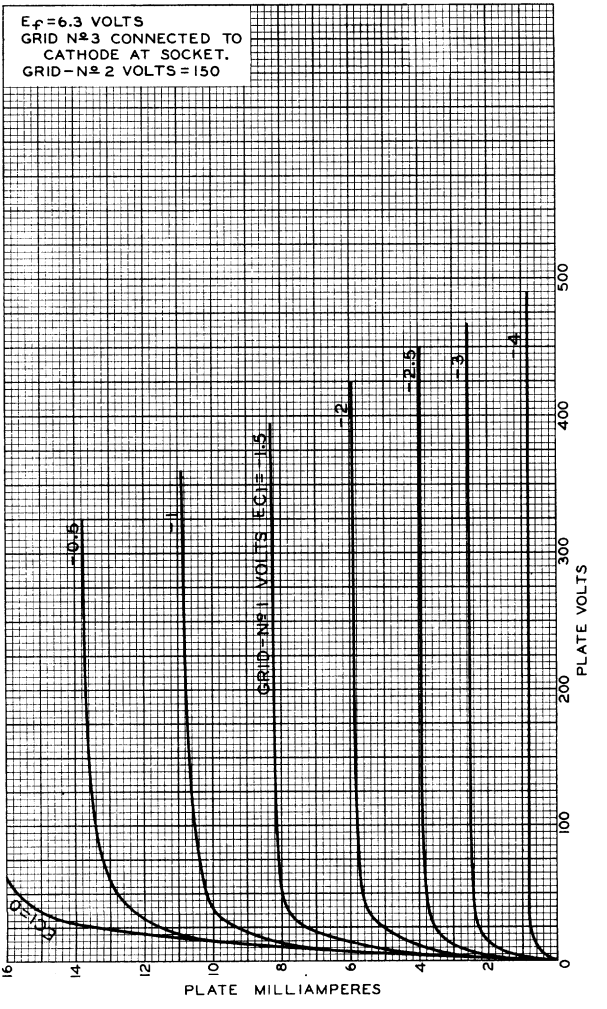
Typical Operation as Resistance-Coupled Amplifier:

See *RESISTANCE-COUPLED-AMPLIFIER CHART No.8* at front of this Section

▲ With external shield JEDEC No.316 connected to cathode.
● Grid No.3 and grid No.2 connected to plate.
★ The dc component must not exceed 100 volts.

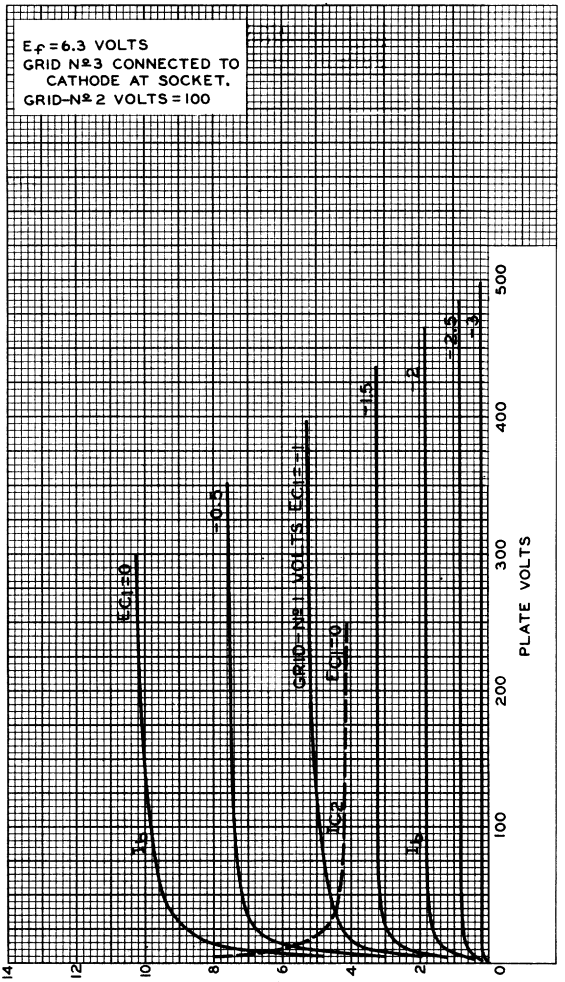
6AU6-A

AVERAGE PLATE CHARACTERISTICS
Pentode Connection



92CM-6613R3

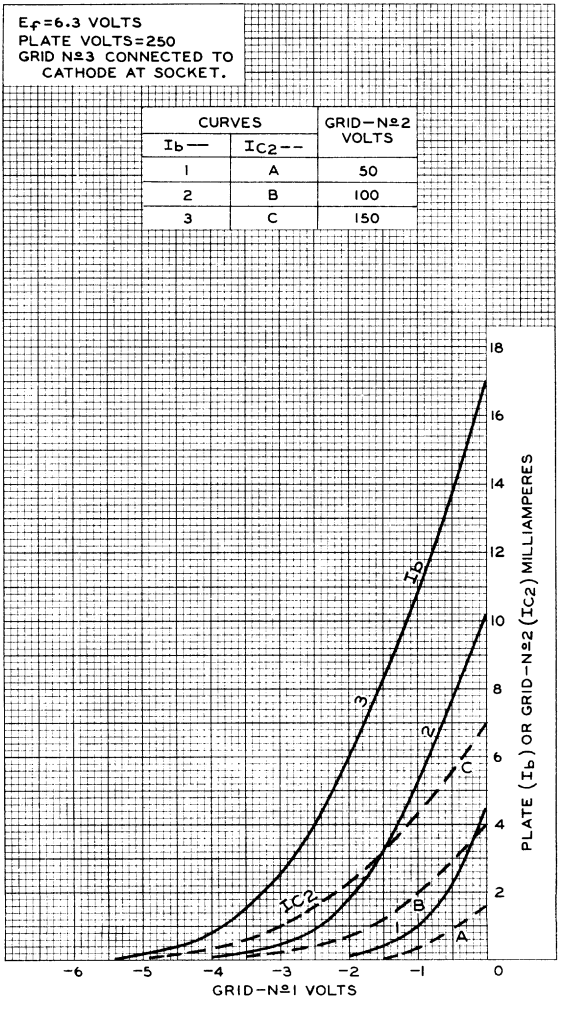
AVERAGE CHARACTERISTICS
Pentode Connection



92CM-6611R3

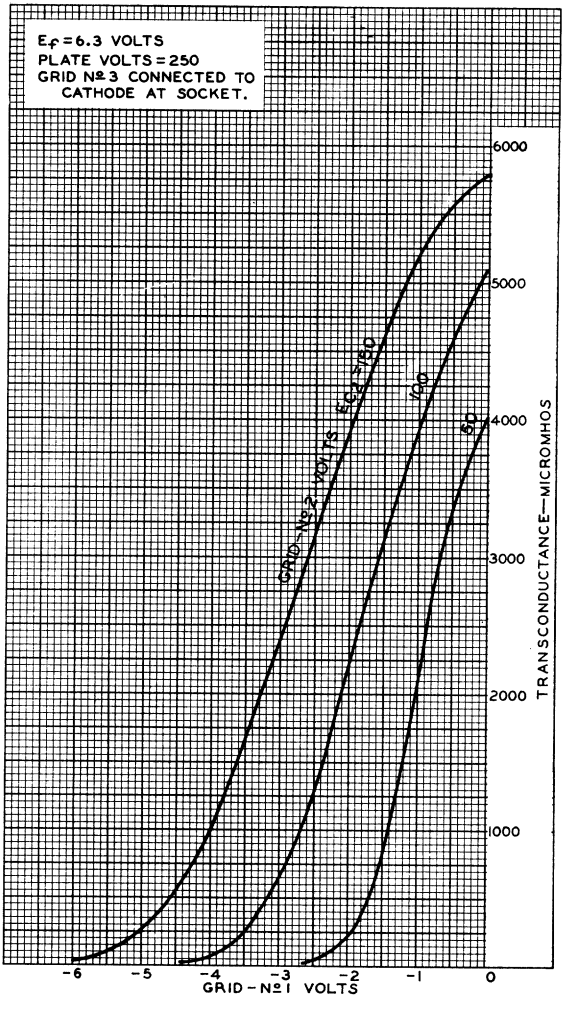
6AU6-A

AVERAGE CHARACTERISTICS
Pentode Connection



92CM-6623R3

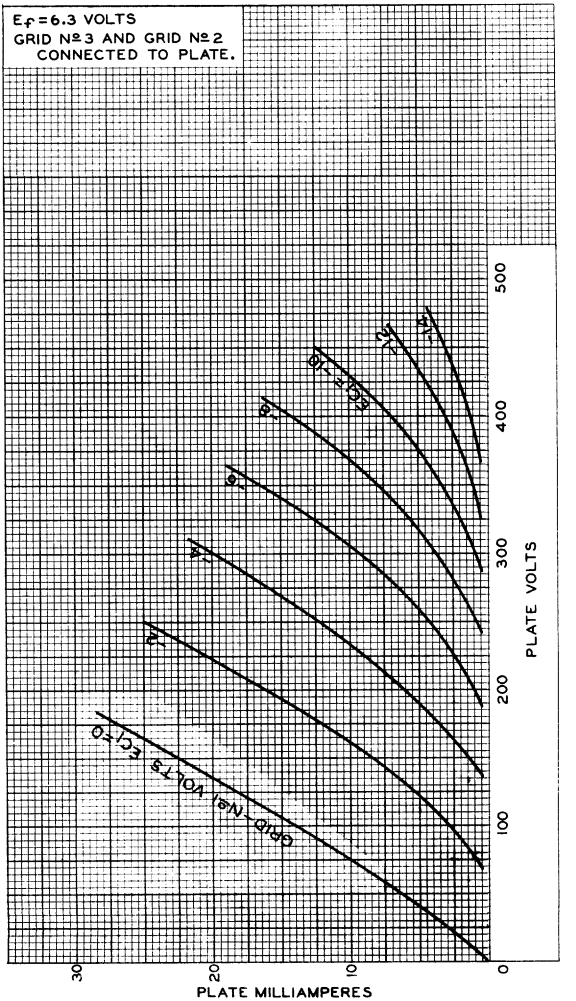
AVERAGE CHARACTERISTICS
Pentode Connection



92CM-6614R3

6AU6-A

AVERAGE PLATE CHARACTERISTICS
Triode Connection



92CM-6854RI

6AU8A

Medium-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE
With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3	volts
Current	0.6 ± 6%	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances:[a]		
Triode Unit:		
Grid to plate	2.2	μμf
Grid to cathode and heater	2.6	μμf
Plate to cathode and heater	0.34	μμf
Pentode Unit:		
Grid No.1 to plate	0.06	μμf
Grid No.1 to cathode & internal shield & grid No.3, grid No.2, and heater	7.5	μμf
Plate to cathode & internal shield & grid No.3, grid No.2, and heater	3.4	μμf
Triode grid to pentode plate	0.022 max.	μμf
Pentode grid No.1 to triode plate	0.006 max.	μμf
Pentode plate to triode plate	0.12 max.	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*		
Plate Supply Voltage	150	40	200	volts
Grid-No.2 Supply Voltage	–	125	125	volts
Cathode Resistor	150	–	82	ohms
Amplification Factor	43	–	–	
Plate Resistance (Approx.)	8100	–	100000	ohms
Transconductance	5300	–	8000	μmhos
Plate Current	9.5	28[b]	17	ma
Grid-No.2 Current	–	10[b]	3.4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	-6.5	–	-7.5	volts

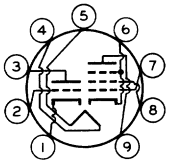
Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

6AU8A

Basing Designation for BOTTOM VIEW. 9DX

Pin 1 – Triode Cathode
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Pentode Cathode, Grid No.3, Internal Shield
Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate

AMPLIFIER – Class A_1

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	330 max.	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE.	–	330 max.	volts
GRID-No.2 VOLTAGE	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts	–	1 max.	watt
For grid-No.2 voltages between 165 and 330 volts . .	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	2.8 max.	3.3 max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode.	200 max.	200 max.	volts
Heater positive with respect to cathode.	200[c] max.	200[c] max.	volts

Maximum Circuit Values:

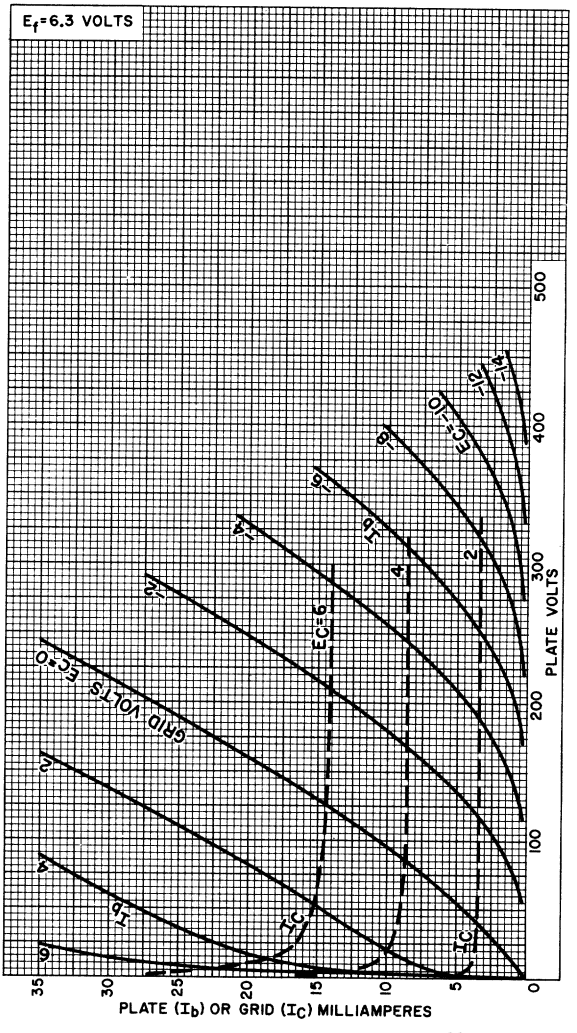
	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance: For fixed-bias operation. . .	0.5 max.	0.25 max.	megohm
For cathode-bias operation. .	1 max.	1 max.	megohm

OPERATING CONSIDERATIONS

Because the *internal shield* is connected to the cathode and grid No.3, the impedance in the cathode circuit should be kept as low as possible to minimize cross-coupling effects.

[a] Without external shield.
[b] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.
[c] The dc component must not exceed 100 volts.

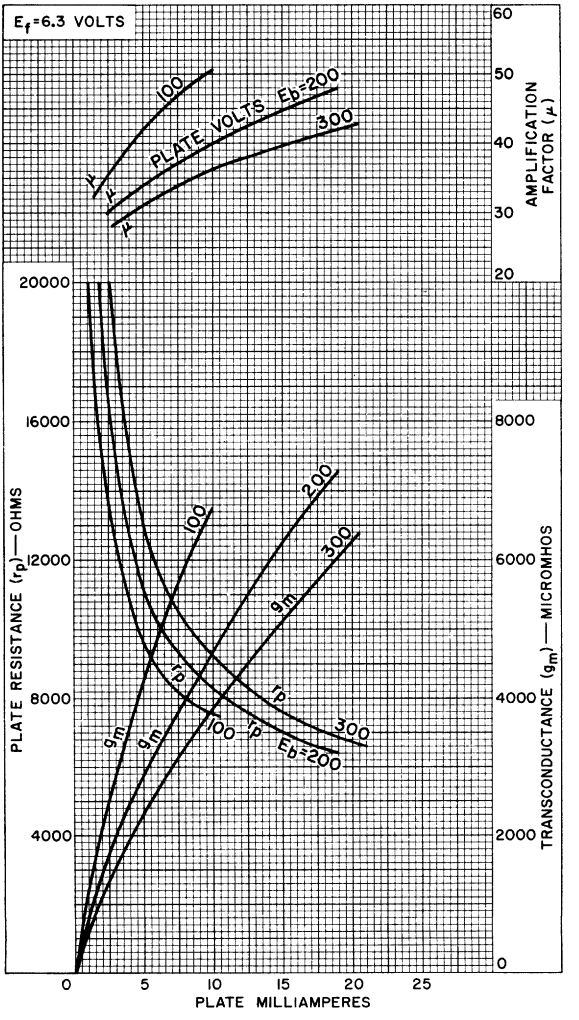
AVERAGE CHARACTERISTICS
Triode Unit



92CM-11140

6AU8A

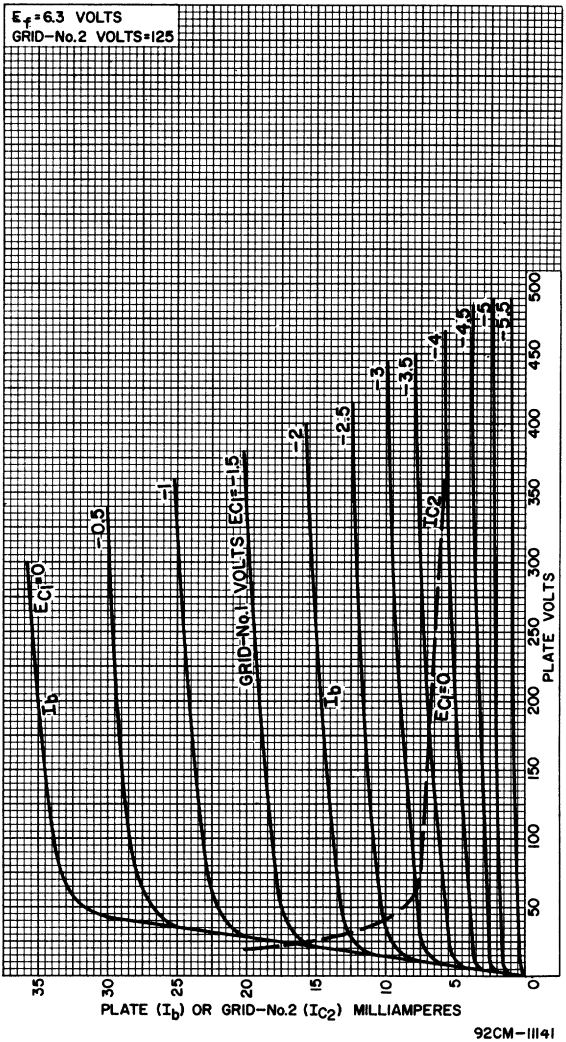
AVERAGE CHARACTERISTICS
Triode Unit



92CM-11144RI

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

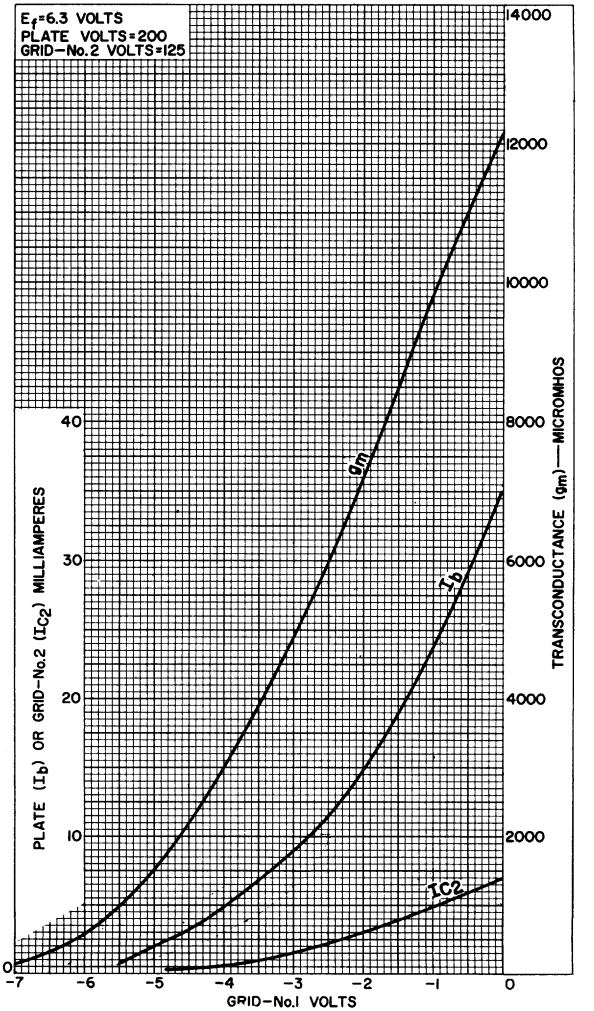
AVERAGE CHARACTERISTICS
Pentode Unit



92CM-11141

6AU8A

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-11142

6AV6

TWIN DIODE—HIGH-MU TRIODE

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage (AC or DC)	6.3 ± 10%		volts
Current	0.3		amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield[o]*	
Triode Unit:			
Grid to plate	2	2	μμf
Grid to cathode and heater	2.2	2.2	μμf
Plate to cathode and heater	0.8	1.2	μμf
Diode-No. 2 plate to triode grid	0.04 max.	0.04 max.	μμf

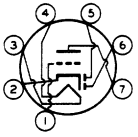
Characteristics, Class A_1 Amplifier (Triode Unit):

Plate Voltage	100	250	volts
Grid Voltage	-1	-2	volts
Amplification Factor	100	100	
Plate Resistance (Approx.)	0.08	0.0625	megohm
Transconductance	1250	1600	μmhos
Plate Current	0.5	1.2	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No. E7-1)
Basing Designation for BOTTOM VIEW	7BT

Pin 1 - Triode Grid
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater



Pin 5 - Diode Plate No. 2
Pin 6 - Diode Plate No. 1
Pin 7 - Triode Plate

TRIODE UNIT — AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
GRID VOLTAGE:			
Positive-bias value	0	max.	volts
PLATE DISSIPATION	0.55	max.	watt

←Indicates a change.

6AV6

TWIN DIODE—HIGH-MU TRIODE

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode. .	200 max.	volts
Heater positive with respect to cathode. .	200▲ max.	volts

Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED AMPLIFIER CHART No. 25 at front of this Section

DIODE UNITS — Two

→**Maximum Ratings,** *Design-Maximum Values:*

PLATE CURRENT (For each diode)	1 max.	ma

→**Characteristics:**

Values are for Each Unit

Plate Current for plate volts = 10	2	ma

Diode Considerations:

Consideration of these units, including typical circuits and diode curves, is given at the front of this Section. Diode biasing of the triode unit of the 6AV6 is not suitable.

o With external shield JEDEC No.316 connected to cathode.

▲ The dc component must not exceed 100 volts.

Curves for the triode unit of the 6AV6 are the same as those shown for Type 12AX7

→Indicates a change.

6AW8A

High-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical: ←

Heater, for Unipotential Cathodes:			
Voltage (AC or DC)		6.3 ± 0.6	volts
Current at 6.3 volts		0.6[a]	amp
Warm-up time (Average)		11	sec
Direct Interelectrode Capacitances:	*Without External Shield*	*With External Shield*[b]	
Triode Unit:			
Grid to plate	2.2	2.2	μμf
Grid to cathode, pentode cathode & grid No.3 & internal shield, and heater	3.2	3.4	μμf
Plate to cathode, pentode cathode & grid No.3 & internal shield, and heater	1.8	3	μμf
Pentode Unit:			
Grid No.1 to plate	0.05 max.	0.04 max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	10	10	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	3.6	4.5	μμf
Pentode grid No.1 to triode plate	0.008 max.	0.005 max.	μμf
Pentode plate to triode plate	0.150 max.	0.025 max.	μμf

Characteristics, Class A_1 Amplifier: ←

	Triode Unit	*Pentode Unit*		
Plate Supply Voltage	200	65	150	volts
Grid-No.2 Supply Voltage	–	150	150	volts
Grid-No.1 Voltage	-2	0	–	volts
Cathode Resistor	–	–	150	ohms
Amplification Factor	70	–	–	
Plate Resistance (Approx.)	0.0175	–	0.2	megohm

←Indicates a change.

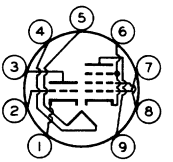
6AW8A

	Triode Unit	*Pentode Unit*	
Transconductance	4000	9500	μmhos
Plate Current	4	46[c] 15	ma
Grid-No.2 Current	–	15[c] 3.5	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-5	-8	volts

Mechanical:

Operating Position . . . . . Any
Maximum Overall Length . . . . . 2-5/8"
Maximum Seated Length . . . . . 2-3/8"
Length, Base Seat to Bulb-Top (Excluding tip) . . . 2" ± 3/32"
Diameter . . . . . 0.750" to 0.875"
Dimensional Outline . . . . . See *General Section*
Bulb T6-1/2
Base . . . . . Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW 9DX

Pin 1 – Triode Cathode
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Pentode Cathode, Grid No.3, Internal Shield
Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate

AMPLIFIER — Class A_1

→**Maximum Ratings,** *Design-Maximum Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	330 max.	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	–	330 max.	volts
GRID-No.2 VOLTAGE	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max.	volts
PLATE DISSIPATION	1.1 max.	3.75 max.	watts
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts	–	1.1 max.	watts
For grid-No.2 voltages between 165 and 330 volts	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	

→Indicates a change.

PEAK HEATER-CATHODE VOLTAGE:					
Heater negative with respect to cathode. . .	200	max.	200	max.	volts
Heater positive with respect to cathode. . .	200[d]	max.	200[d]	max.	volts

Maximum Circuit Values:

	Triode Unit		*Pentode Unit*		
Grid-No.1-Circuit Resistance:					
For fixed-bias operation	0.5	max.	0.25	max.	megohm
For cathode-bias operation	1	max.	1	max.	megohm

[a] In series-heater-string operation, the heater current rating is 0.600 ± 0.040 ampere at 6.3 volts.

[b] With external shield JEDEC No.315 connected to pins 4 and 5.

[c] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

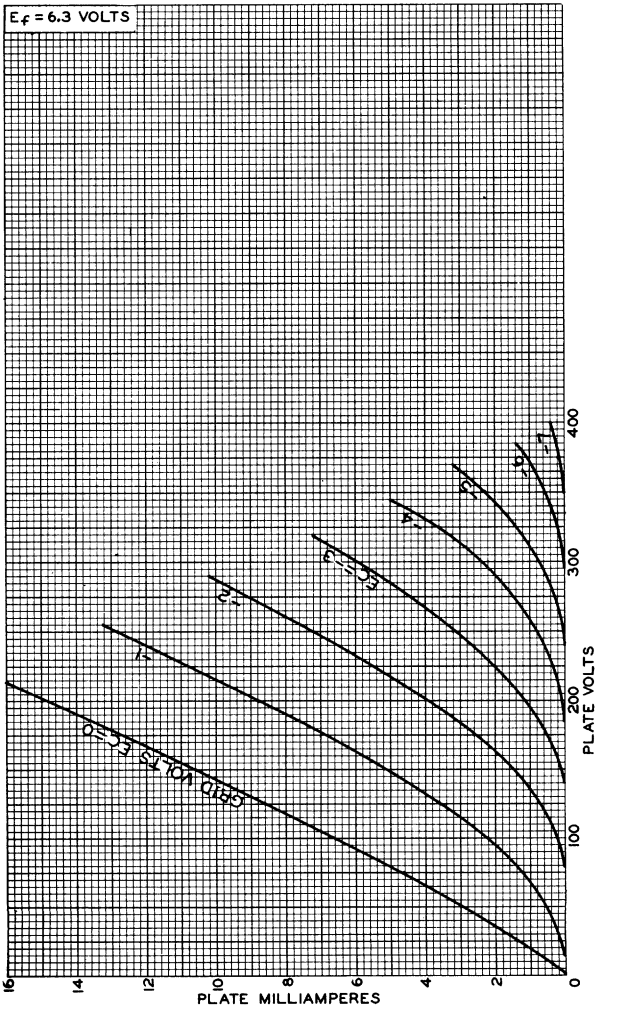
[d] The dc component must not exceed 100 volts.

OPERATING CONSIDERATIONS

Because the internal shield is connected to the pentode cathode and grid No.3, the impedance in the cathode circuit should be kept as low as possible to minimize cross-coupling effects.

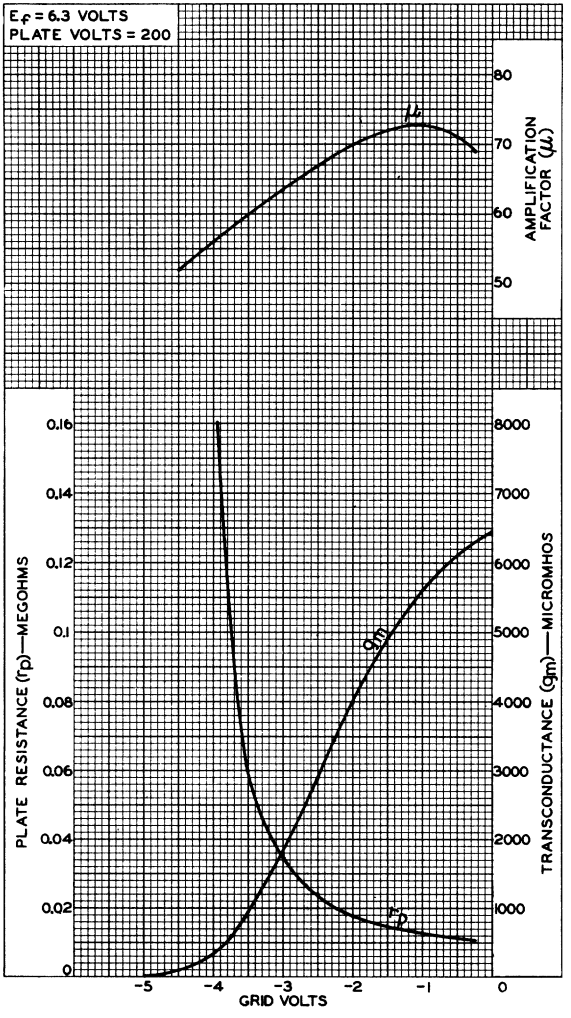
6AW8A

AVERAGE PLATE CHARACTERISTICS
Triode Unit



92CM-8644

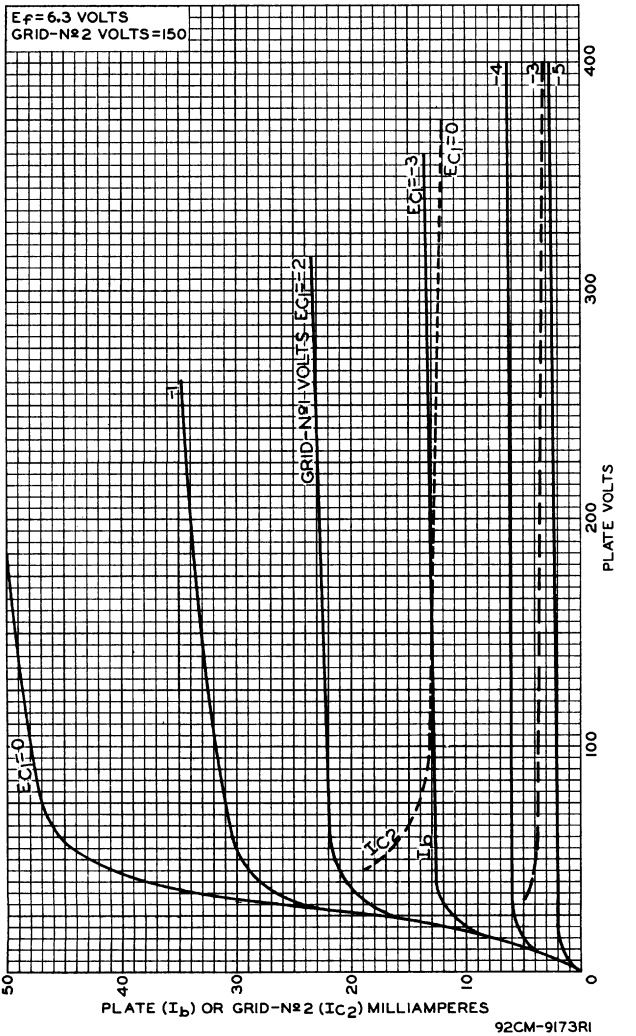
AVERAGE CHARACTERISTICS
Triode Unit



92CM-8647

6AW8A

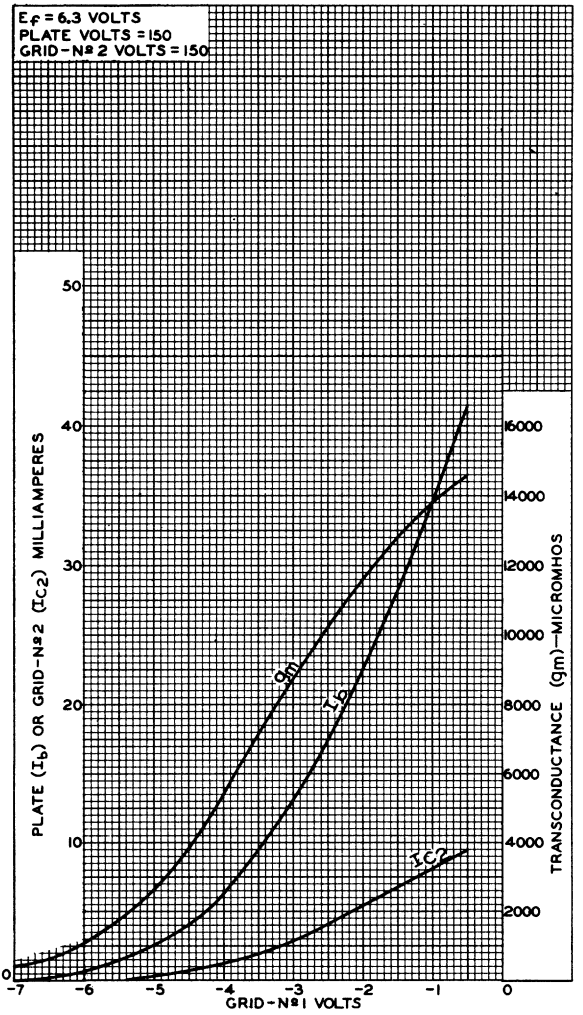
AVERAGE CHARACTERISTICS
Pentode Unit



92CM-9173RI

AVERAGE CHARACTERISTICS

Pentode Unit



92CS-8646RI

Half-Wave Vacuum Rectifier

DUODECAR TYPE

GENERAL DATA

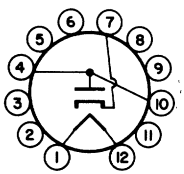
Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.200	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode[a]	5000[b] max.	volts
Heater positive with respect to cathode	300[c] max.	volts
Direct Interelectrode Capacitances (Approx.):[d]		
Plate to cathode and heater	5.5	μμf
Cathode to plate and heater	7.5	μμf
Heater to cathode	2.8	μμf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2.625"
Seated Length	2.000" to 2.250"
Diameter	1.062" to 1.188"
Bulb	T9
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW	12BL

Pin 1 – Heater
Pin 2 – No Internal Connection
Pin 3 – Same as Pin 2
Pin 4 – Plate
Pin 5 – Do Not Use[e]
Pin 6 – Do Not Use[e]
Pin 7 – Cathode
Pin 8 – Do Not Use[e]
Pin 9 – Do Not Use[e]
Pin 10 – Plate
Pin 11 – Same as Pin 2
Pin 12 – Heater



DAMPER SERVICE

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[f]

PEAK INVERSE PLATE VOLTAGE[a]	5000 max.	volts
PEAK PLATE CURRENT	1000 max.	ma
DC PLATE CURRENT	165 max.	ma
PLATE DISSIPATION	5.3 max.	watts

Characteristics, Instantaneous Value:

Tube Voltage Drop for plate ma. = 250	32	volts

[a] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[b] The dc component must not exceed 900 volts.

[c] The dc component must not exceed 100 volts.

[d] Without external shield.

[e] Socket terminals 5,6,8, and 9 should not be used as tie points.

[f] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

6AX4-GTB

Half-Wave Vacuum Rectifier

For Television Damper Service

GENERAL DATA

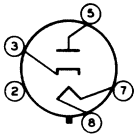
Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	1.2	amp
Direct Interelectrode Capacitances (Approx.):[a]		
Plate to cathode and heater	5	μμf
Cathode to plate and heater	8.5	μμf
Heater to cathode	4	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-9/32"
Dimensional Outline	See *General Section*
Bulb	T9
Base	Intermediate-Shell Octal 5-Pin, Arrangement 2 (JEDEC Group 1, No.B5-82)
Basing Designation for BOTTOM VIEW	4CG

Pin 2 - Internal Connection—Do Not Use[b]
Pin 3 - Cathode



Pin 5 - Plate
Pin 7 - Heater
Pin 8 - Heater

DAMPER SERVICE

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[c]

PEAK INVERSE PLATE VOLTAGE[d]	5000	max.	volts
PEAK PLATE CURRENT	1000	max.	ma
DC PLATE CURRENT	165	max.	ma
PLATE DISSIPATION	5.3	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	5000[e]	max.	volts
Heater positive with respect to cathode	300[f]	max.	volts

Characteristics, Instantaneous Test Condition:

Tube Voltage Drop for plate ma. = 250	32	volts

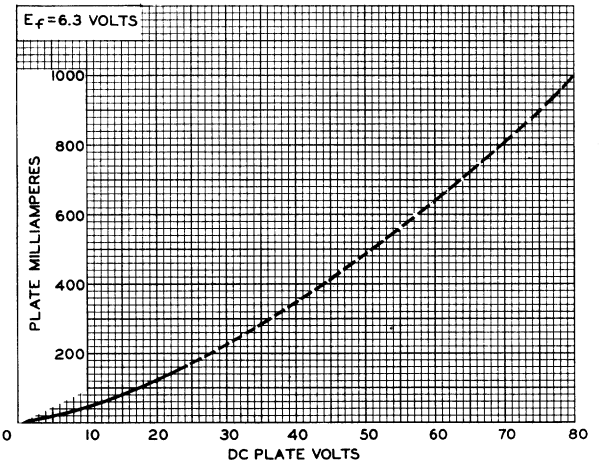
[a] Without external shield.
[b] Socket terminals 1,2,4 and 6 should not be used as tie points.
[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[d] This rating is applicable when the duty cycle of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[e] The dc component must not exceed 900 volts.

[f] The dc component must not exceed 100 volts.

AVERAGE PLATE CHARACTERISTIC



92CS-10850

6AX5-GT

FULL-WAVE VACUUM RECTIFIER

GENERAL DATA

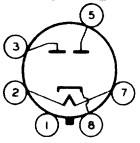
Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac volts
Current	1.2	amp

Mechanical:

Mounting Position	Any
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-9/32"
Bulb	T-9
Base	Short-Intermediate-Shell Octal 6-Pin
Basing Designation for BOTTOM VIEW	G-6S

Pin 1 - No Connection
Pin 2 - Heater
Pin 3 - Plate of Diode No.2
Pin 5 - Plate of Diode No.1
Pin 7 - Heater
Pin 8 - Cathode



FULL-WAVE RECTIFIER

Maximum Ratings, *Design-Center Values*:

PEAK INVERSE PLATE VOLTAGE	1250 max.	volts
PEAK PLATE CURRENT PER PLATE	375 max.	ma
HOT-SWITCHING TRANSIENT PLATE CURRENT For duration of 0.2 second maximum	2.6 max.	amp
AC PLATE SUPPLY VOLTAGE (RMS) PER PLATE	See Rating Chart	
DC OUTPUT CURRENT PER PLATE	See Rating Chart	
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	450 max.	volts
Heater positive with respect to cathode	450 max.	volts

Typical Operation with Capacitor-Input Filter:

AC Plate-to-Plate Supply Voltage (RMS)	700	900	volts
Filter-Input Capacitor▲	10	10	μf
Effective Plate-Supply Impedance Per Plate	50	105	ohms
DC Output Voltage at Input to Filter (Approx.):			
At half-load cur. of 62.5 ma.	395	-	volts
At half-load cur. of 40 ma.	-	540	volts
At full-load cur. of 125 ma.	350	-	volts
At full-load cur. of 80 ma.	-	490	volts
Voltage Regulation (Approx.):			
Half-load to full-load current	45	50	volts

▲ Higher values of capacitance than indicated may be used but the effective plate supply impedance may have to be increased to prevent exceeding the maximum rating for hot-switching transient plate current.

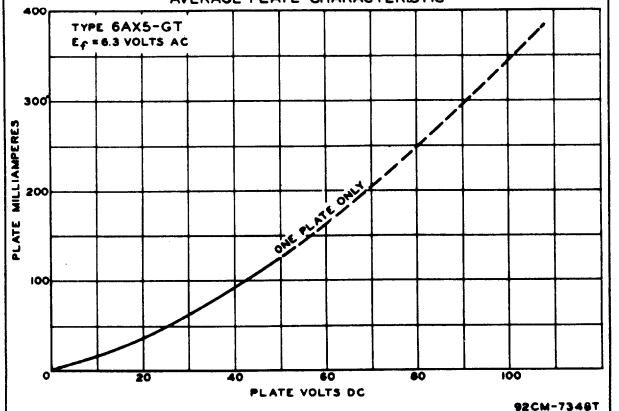
6AX5 - GT

FULL-WAVE VACUUM RECTIFIER

Typical Operation with Choke-Input Filter:

AC Plate-to-Plate Supply Voltage (RMS)	700	900	volts
Filter-Input Choke	10	10	henries
DC Output Voltage at Input to Filter (Approx.):			
At half-load cur. of 75 ma.	270	–	volts
At half-load cur. of 62.5 ma.	–	365	volts
At full-load cur. of 150 ma.	250	–	volts
At full-load cur. of 125 ma.	–	350	volts
Voltage Regulation (Approx.):			
Half-load to full-load Current	20	15	volts

AVERAGE PLATE CHARACTERISTIC



92CM-7348T

RATING CHART and OPERATION CHARACTERISTICS

The *Rating Chart* presents graphically the relationships between maximum ac voltage input and maximum dc output current derived from the fundamental ratings for conditions of capacitor-input and choke-input filters. This graphical presentation gives the equipment designer considerable latitude in choice of operating conditions.

The *Operation Characteristics for Full-Wave Circuit with Capacitor-Input Filter* show not only the typical operating curves for such a circuit, but also show by means of boundary lines "ADK" the limiting current and voltage relationships presented on the Rating Chart.

6AX5-GT

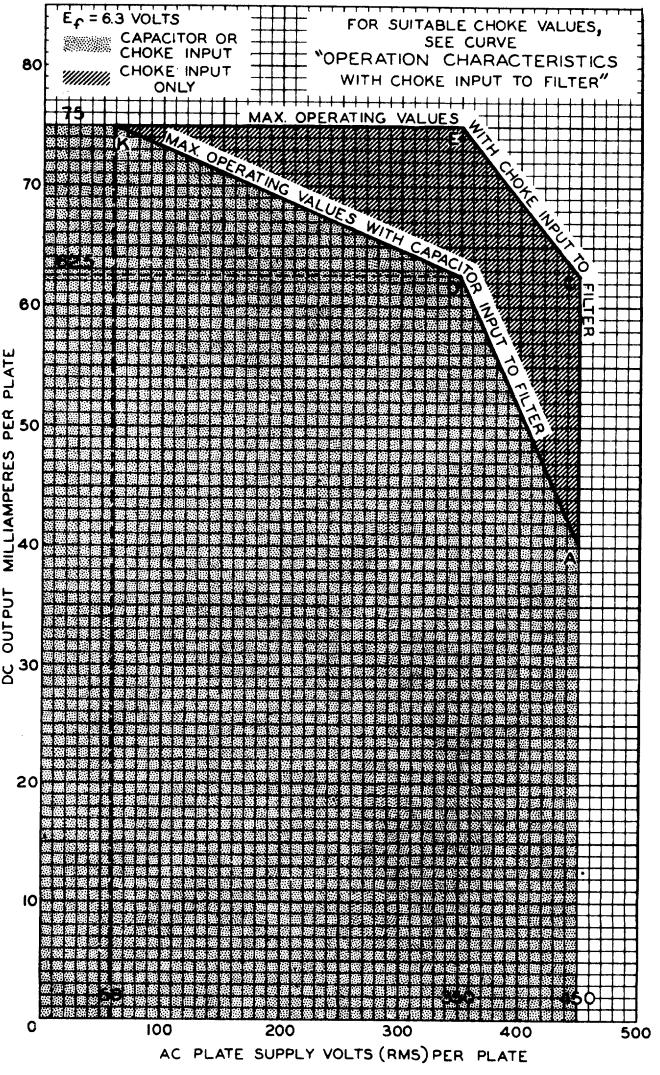
FULL-WAVE VACUUM RECTIFIER

The *Operation Characteristics for Full-Wave Circuit with Choke-Input Filter* show the typical operating curves for such a circuit. They not only show by means of boundary line "CEK" the limiting current and voltage relationships presented on the *Rating Chart*, but also give information as to the effect on regulation of various sizes of chokes. The solid-line curves show the dc voltage outputs which would be obtained if the filter chokes had infinite inductance. The long-dash lines radiating from the zero position are boundary lines for various sizes of chokes as indicated. The intersection of one of these lines with a solid-line curve indicates the point on the curve at which the choke no longer behaves as though it has infinite inductance. To the left of the choke boundary line, the regulation curves depart from the solid-line curves as shown by the representative short-dash regulation curves.

6AX5-GT

6AX5-GT

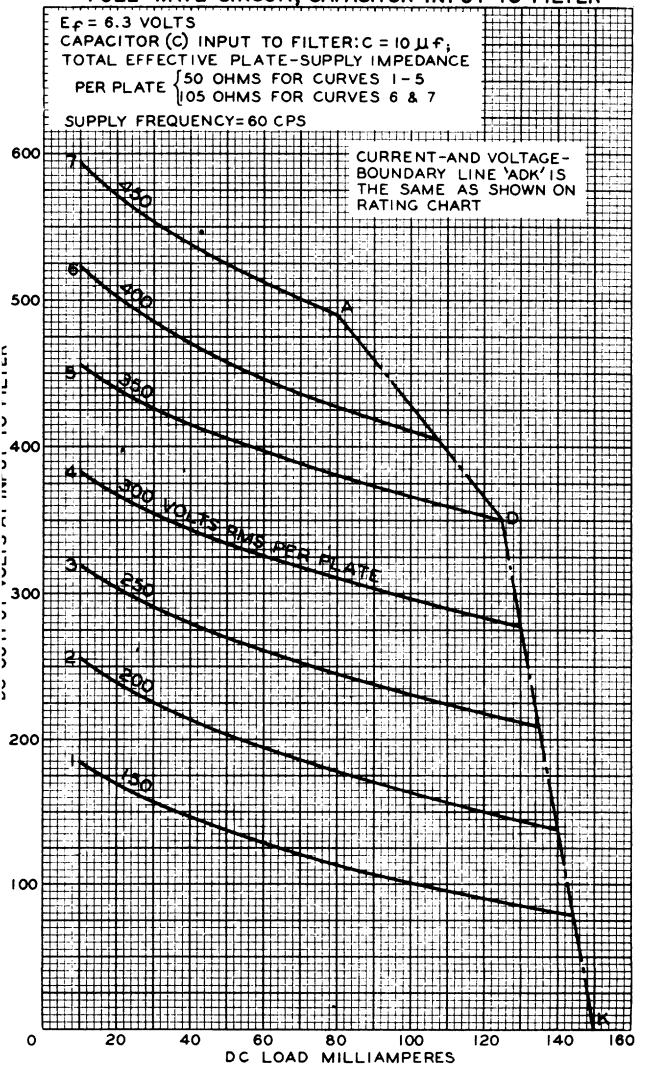
RATING CHART


E_f = 6.3 VOLTS
CAPACITOR OR CHOKE INPUT
CHOKE INPUT ONLY
FOR SUITABLE CHOKE VALUES, SEE CURVE "OPERATION CHARACTERISTICS WITH CHOKE INPUT TO FILTER"
MAX. OPERATING VALUES WITH CHOKE INPUT TO FILTER
MAX. OPERATING VALUES WITH CAPACITOR INPUT TO FILTER
DC OUTPUT MILLIAMPERES PER PLATE
AC PLATE SUPPLY VOLTS (RMS) PER PLATE
0
10
20
30
40
50
60
70
80
100
200
300
400
500
75
K
B
C
A
R2.5
R5
R5
R

6AX5-GT

OPERATION CHARACTERISTICS

FULL-WAVE CIRCUIT, CAPACITOR INPUT TO FILTER

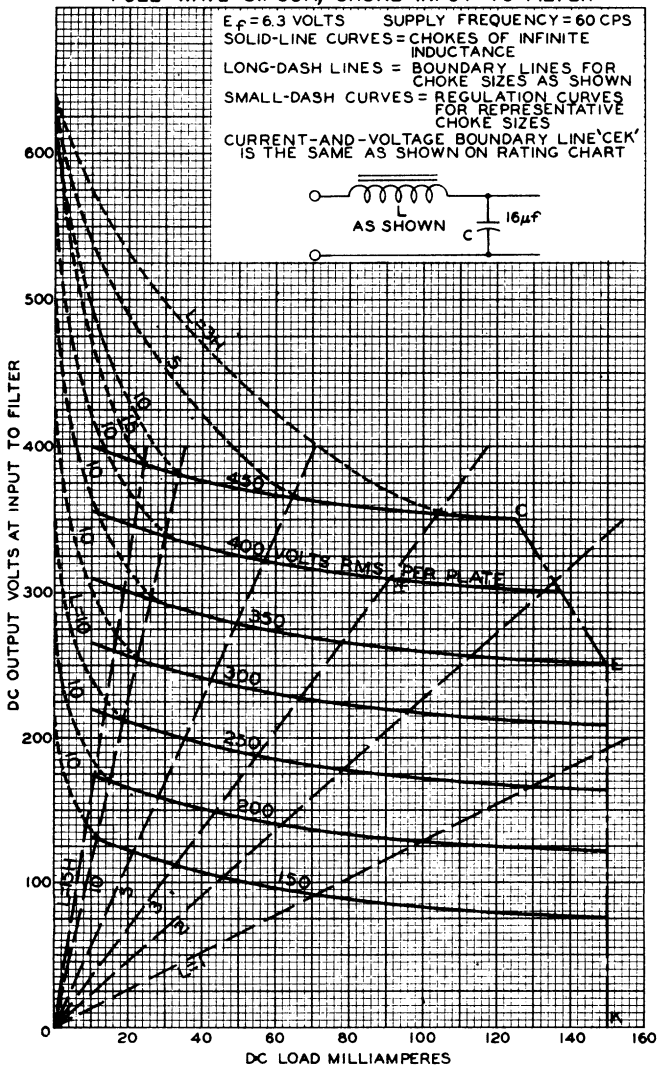


6AX5-GT

6AX5-GT

OPERATION CHARACTERISTICS

FULL-WAVE CIRCUIT, CHOKE INPUT TO FILTER



Half-Wave Vacuum Rectifier

NOVAR TYPE

For Television Damper Service

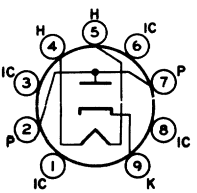
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.200	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode[a]	5000[b] max.	volts
Heater positive with respect to cathode	300[c] max.	volts
Direct Interelectrode Capacitances (Approx.):[d]		
P to (K,H)	6.5	pf
K to (P,H)	9.0	pf
Heater to cathode	2.8	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.005"
Seated Length	2.375" to 2.625"
Dimensional Outline	See *General Section*
Diameter	1.062" to 1.188"
Bulb	T9
Base	Small-Button Novar 9-Pin with Exhaust Tip (JEDEC No. E9-89)
Basing Designation for BOTTOM VIEW	9HP

Pin 1 – Do Not Use[e]
Pin 2 – Plate
Pin 3 – Do Not Use[e]
Pin 4 – Heater



Pin 5 – Heater
Pin 6 – Do Not Use[e]
Pin 7 – Plate
Pin 8 – Do Not Use[e]
Pin 9 – Cathode

DAMPER SERVICE

For operation in a 525-line, 30-frame system[f]

Maximum Ratings, *Design-Maximum Values:*

Peak Inverse Plate Voltage[a]	5000 max.	volts
Peak Plate Current	1100 max.	ma
Average Plate Current	175 max.	ma
Plate Dissipation	6.5 max.	watts

Characteristic, Instantaneous Value:

Tube Voltage Drop for plate ma = 350	32	volts

[a] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[b] The dc component must not exceed 900 volts.

[c] The dc component must not exceed 100 volts.

[d] Without external shield.

[e] Socket terminals 1, 3, 6, and 8 should not be used as tie points. It is recommended that the socket clips for these pins be removed to reduce the possibility of arc-over and to minimize leakage.

[f] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

6AZ8
MEDIUM-MU TRIODE—
SEMIREMOTE-CUTOFF PENTODE

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage	6.3	ac or dc volts
Current	0.45	amp
Direct Interelectrode Capacitances:[o]		
Triode Unit:		
Grid to plate	1.7	μμf
Grid to cathode, internal shield & heater	2	μμf
Plate to cathode, internal shield & heater	1.7	μμf
Pentode Unit:		
Grid No.1 to plate	0.02	μμf
Grid No.1 to cathode, grid No.2, grid No.3 & internal shield & heater	6.5	μμf
Plate to cathode, grid No.2, grid No.3 & internal shield & heater	2.2	μμf
Triode grid to pentode plate	0.027 max.	μμf
Pentode grid No.1 to triode plate	0.020 max.	μμf
Pentode plate to triode plate	0.045 max.	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*	
Plate Supply Voltage	200	200	volts
Grid-No.2 Supply Voltage	-	150	volts
Grid-No.1 Voltage	-6	-	volts
Cathode-Bias Resistor	-	180	ohms
Amplification Factor	19	-	
Plate Resistance (Approx.)	5750	300000	ohms
Transconductance	3300	6000	μmhos
Plate Current	13	9.5	ma
Grid-No.2 Current	-	3	ma
Grid-No.1 Voltage (Approx.) for plate current of 10 μamp	-19	-	volts
Grid-No.1 Voltage (Approx.) for transconductance of 10 μmhos	-	-12.5	volts

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"

o Without external shield.

●: See next page.

6AZ8

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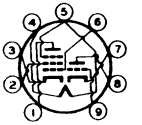
MEDIUM-MU TRIODE—
SEMIREMOTE-CUTOFF PENTODE

Maximum Diameter . . . . . 7/8"
Bulb T-6-1/2
Base . . . . . Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW 9ED

Pin 1 - Pentode Plate
Pin 2 - Pentode Grid No.2
Pin 3 - Pentode Cathode
Pin 4 - Heater
Pin 5 - Pentode Grid No.3, Internal Shield, Heater
Pin 6 - Pentode Grid No.1
Pin 7 - Triode Cathode
Pin 8 - Triode Plate
Pin 9 - Triode Grid



AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values*:

	Triode Unit	*Pentode Unit*●	
PLATE VOLTAGE.	300 max.	300 max.	volts
GRID-No.3 (SUPPRESSOR) VOLTAGE.	–	*See Operating Considerations*	
GRID-No.2 (SCREEN) SUPPLY VOLTAGE.	–	300 max.	volts
GRID-No.2 VOLTAGE. . . .	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive bias value. .	0 max.	0 max.	volts
PLATE DISSIPATION. . . .	2.5 max.	2 max.	watts
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 150 volts. . .	–	0.5 max.	watt
For grid-No.2 voltages between 150 and 300 volts.	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode .	200 max.	▲	volts
Heater positive with respect to cathode .	200# max.	▲	volts

● The pentode unit is provided with a separate base pin for the cathode and for grid No.3 and internal shield which are connected internally to one of the heater leads. This arrangement facilitates the use of an unbypassed cathode resistor to minimize changes in input resistance and input capacitance with bias without causing oscillation which otherwise might occur if grid No.3 were internally connected to the cathode.

The dc component must not exceed 100 volts.

▲: See next page.

6AZ8
MEDIUM-MU TRIODE—
SEMIREMOTE-CUTOFF PENTODE

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance:*			
For fixed-bias operation. . .	0.5 max.	0.25 max.	megohm
For cathode-bias operation. .	1.0 max.	1.0 max.	megohm

OPERATING CONSIDERATIONS

Because *grid No.3* is connected within the tube to one side of the heater (pin No.5), it is important that pin No.5 be connected to ground to maintain grid No.3 at ground potential. If this precaution is not observed and pin No.5 is connected to the ungrounded side of the heater supply, grid No.3 will operate at the heater-supply voltage. As a result, tube characteristics will be changed. Furthermore, if an ac heater supply is used, ac voltage will be applied to grid No.3 with resulting amplitude modulation of the grid-No.3 voltage.

▲ The heater-cathode voltage should not exceed the value of the operating cathode bias. If the heater-cathode voltage exceeds the operating cathode bias value, grid No.3 will be made negative with respect to cathode, and thus possibly cause a change in tube characteristics.

* If either unit is operated at maximum rated conditions, grid-No.1-circuit resistances for both units should not exceed the stated values.

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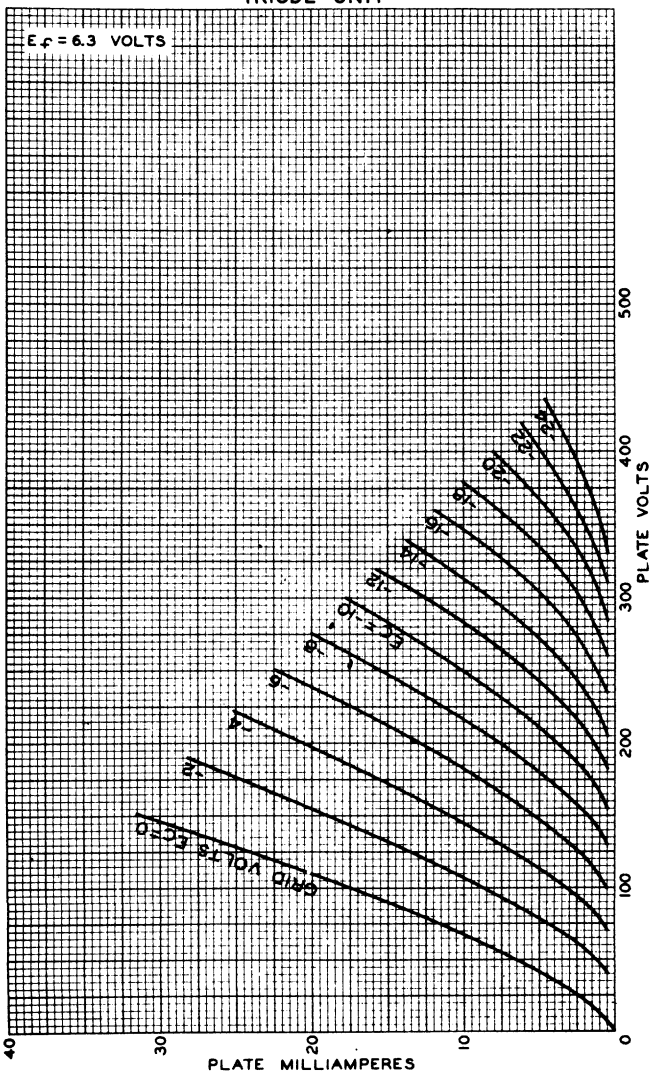
AVERAGE PLATE CHARACTERISTICS

TRIODE UNIT



FEB. 2, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8520

RCA

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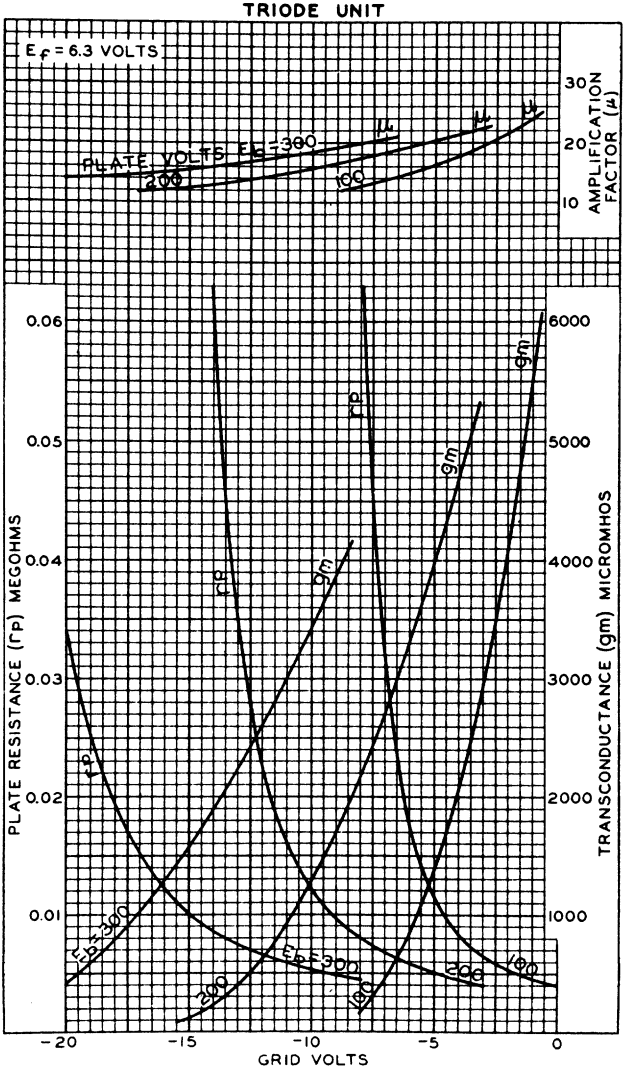
AVERAGE CHARACTERISTICS

TRIODE UNIT



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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AVERAGE PLATE CHARACTERISTICS

PENTODE UNIT

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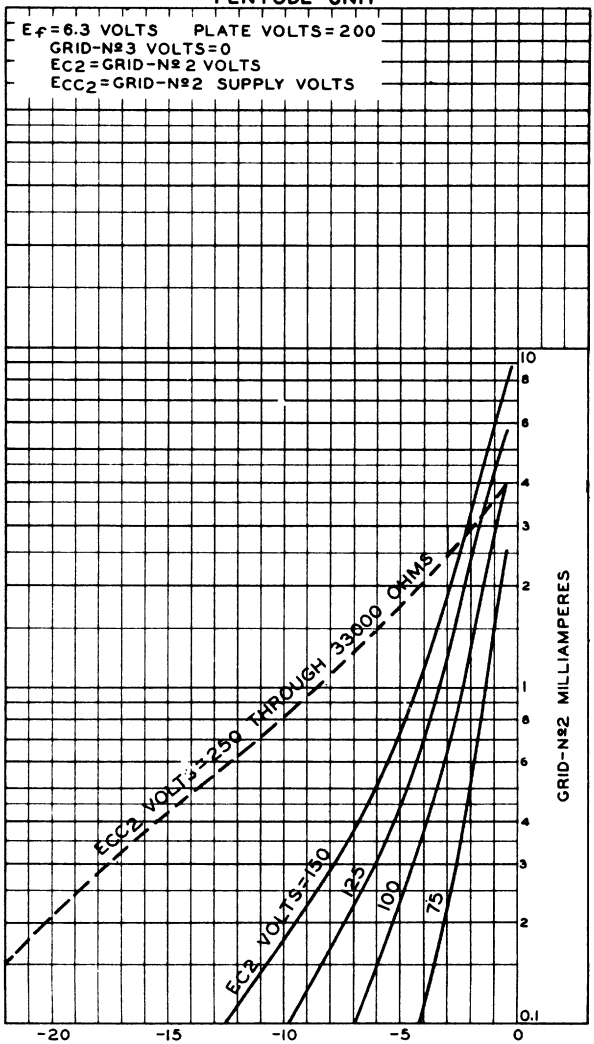
AVERAGE CHARACTERISTICS

PENTODE UNIT



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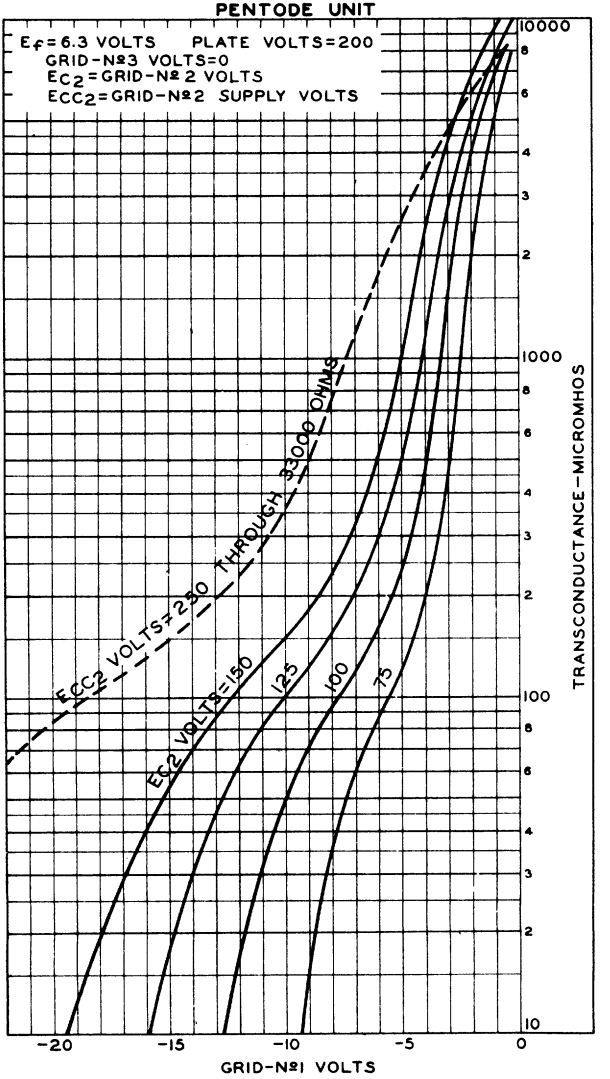
AVERAGE CHARACTERISTICS

PENTODE UNIT



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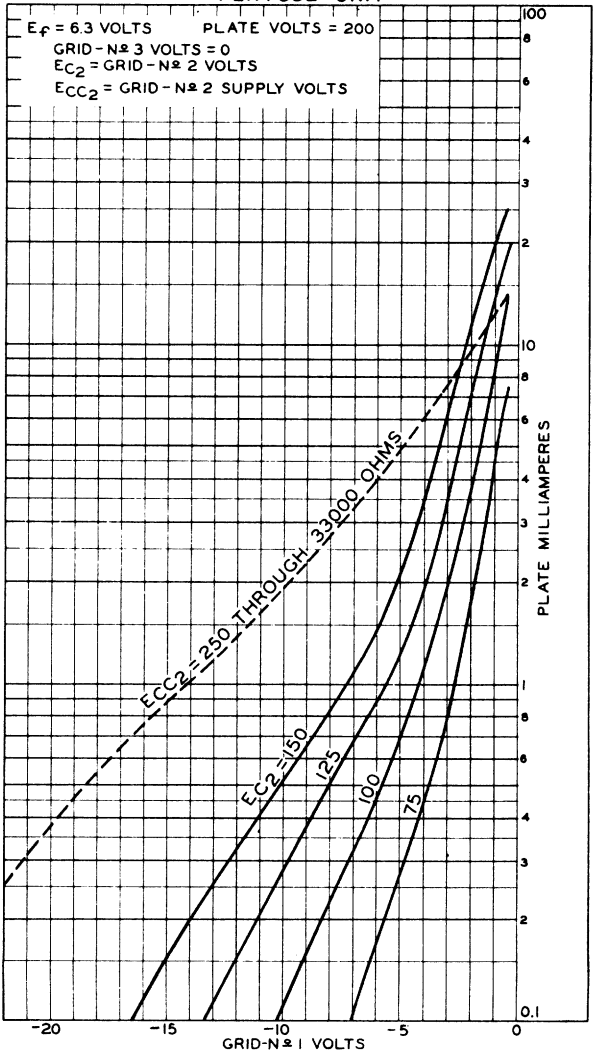
AVERAGE CHARACTERISTICS

PENTODE UNIT



Twin Diode—Medium-Mu-Twin Triode

DUODECAR TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*			
Voltage (AC or DC)	6.3[a]	6.3 ± 0.6	volts
Current	0.600 ± 0.040	0.600[b]	amp
Warm-up time (Average)	11	–	sec
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode	200 max.		volts
Heater positive with respect to cathode	200[c] max.		volts
Direct Interelectrode Capacitances (Approx.):[d]			
Diode Units:			
Plate of unit No.1 to cathode, internal shield, and heater	1.9		pf
Plate of unit No.2 to cathode, internal shield, and heater	1.8		pf
Triode Units:	*Unit No.1*	*Unit No.2*	
Grid to plate	1.5	1.5	pf
Grid to cathode, internal shield, and heater	1.7	1.8	pf
Plate to cathode, internal shield, and heater	1.6	0.6	pf
Plate of diode unit No.1 to plate of diode unit No.2	0.7		pf
Triode grid to plate of diode unit No.1	0.015	0.005	pf
Triode grid to plate of diode unit No.2	0.02	0.005	pf
Plate of triode unit No.1 to plate of triode unit No.2	0.9		pf

Characteristics, Class A_1 Amplifier (Each Triode Unit):

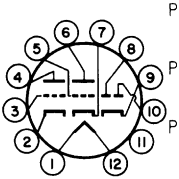
Plate Voltage	250	volts
Grid Voltage	-8	volts
Amplification Factor	18	
Plate Resistance (Approx.)	7200	ohms
Transconductance	2500	μmhos
Plate Current	10	ma
Grid Voltage (Approx.) for plate μa = 50	-20	volts

6B10

Mechanical:

Operating Position	Any
Types of Cathodes	Coated Unipotential
Maximum Overall Length	1.875"
Seated Length	1.250" to 1.500"
Diameter	1.062" to 1.188"
Bulb	T9
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW	12BF

Pin 1 – Heater
Pin 2 – Cathode of Triode Unit No.2
Pin 3 – Grid of Triode Unit No.2
Pin 4 – Plate of Triode Unit No.2
Pin 5 – Grid of Triode Unit No.1
Pin 6 – Plate of Triode Unit No.1



Pin 7 – Cathode of Triode Unit No.1
Pin 8 – Plate of Diode Unit No.2
Pin 9 – Cathode of Diode Units No.1 & No.2
Pin 10 – Plate of Diode Unit No.1
Pin 11 – Internal Shield
Pin 12 – Heater

TRIODE UNITS — AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330 max.	volts
DC CATHODE CURRENT	20 max.	ma
PLATE DISSIPATION	3 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	1 max.	megohm

DIODE UNITS — Two

Values are for Each Unit

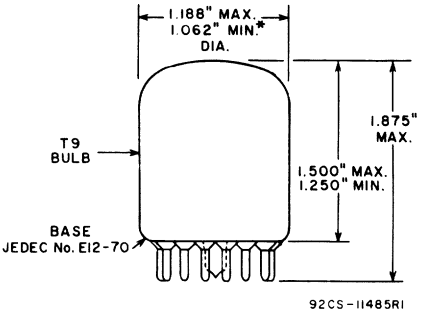
Maximum Ratings, *Design-Maximum Values:*

PLATE CURRENT	5 max.	ma

Characteristics, Instantaneous Value:

Plate Current for plate volts = 5	20	ma

[a] At heater amperes = 0.600.
[b] At heater volts = 6.3.
[c] The dc component must not exceed 100 volts.
[d] Without external shield.



* APPLIES TO MINIMUM DIAMETER EXCEPT IN AREA OF SEAL.

6BA3

Half-Wave Vacuum Rectifier

NOVAR TYPE

For Television Damper Service

Electrical:

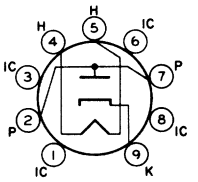
Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.200	amp
Maximum Heater-Cathode Voltage:		
Heater negative with respect to cathode:[a]		
Peak	5500	volts
DC component	900	volts
Heater positive with respect to cathode:		
Peak	300	volts
DC component	100	volts
Direct Interelectrode Capacitances (Approx.):[b]		
Plate to cathode and heater	4.4	pf
Cathode to plate and heater	6.0	pf
Heater to cathode	1.8	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.080"
Maximum Seated Length	2.700"
Diameter	1.062" to 1.188"
Dimensional Outline	See *General Section*
Bulb	T9

Bases (Alternates):
- Small-Button Novar 9-Pin (JEDEC No. E9-75)
- Small-Button Novar 9-Pin with Exhaust Tip (JEDEC No. E9-89)
- Basing Designation for BOTTOM VIEW 9HP

Pin 1 – Do Not Use[c]
Pin 2 – Plate
Pin 3 – Do Not Use[c]
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Do Not Use[c]
Pin 7 – Plate
Pin 8 – Do Not Use[c]
Pin 9 – Cathode



DAMPER SERVICE

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[d]

Peak Inverse Plate Voltage[a]	5000	volts
Peak Plate Current	1000	ma
DC Plate Current	165	ma
Plate Dissipation	5.3	watts

Characteristics, Instantaneous Value:

Tube Voltage Drop for plate ma = 250	32	volts

[a] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[b] Without external shield.

[c] Socket terminals 1, 3, 6, and 8 should not be used for tie points. It is also recommended that socket clips for these pins be removed to reduce the possibility of arc-over and to minimize leakage.

[d] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Remote-Cutoff Pentode

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

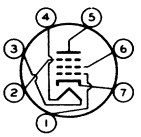
Heater, for Unipotential Cathode:			
Voltage (AC or DC)		6.3 ± 10%	volts ←
Current at 6.3 volts		0.3	amp
Direct Interelectrode Capacitances:			←
	Without External Shield	*With External Shield▲*	
Grid No.1 to plate	0.0035 max.	0.0035 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	5.5	5.5	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	5	5.5	μμf

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	100	250	volts
Grid No.3	*Connected to cathode at socket*		
Grid-No.2 Supply Voltage	100	100	volts
Cathode Resistor	68	68	ohms
Plate Resistance (Approx.)	0.25	1	megohm
Transconductance	4300	4400	μmhos
Plate Current	10.8	11	ma
Grid-No.2 Current	4.4	4.2	ma
Grid-No.1 Voltage (Approx.) for transconductance (μmhos) = 40	-20	-20	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750" ←
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BK ←



Pin 1 – Grid No.1
Pin 2 – Grid No.3, Internal Shield
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Cathode

← Indicates a change.

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330 max.	volts
GRID No.3 (SUPPRESSOR GRID)	*Connect to cathode at socket*	
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts
GRID-No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	55 max.	volts
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 165 volts	0.7 max.	watt
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	3.4 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200● max.	volts

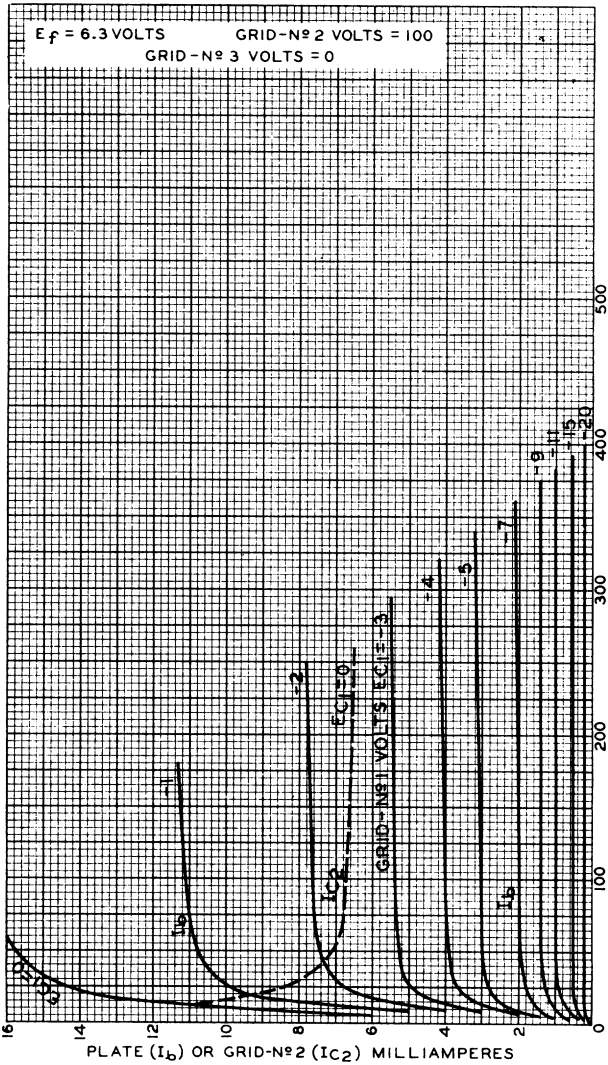
▲ With external shield JEDEC No.316 connected to cathode.

● The dc component must not exceed 100 volts.

→ Indicates a change.

6BA6

AVERAGE PLATE CHARACTERISTICS

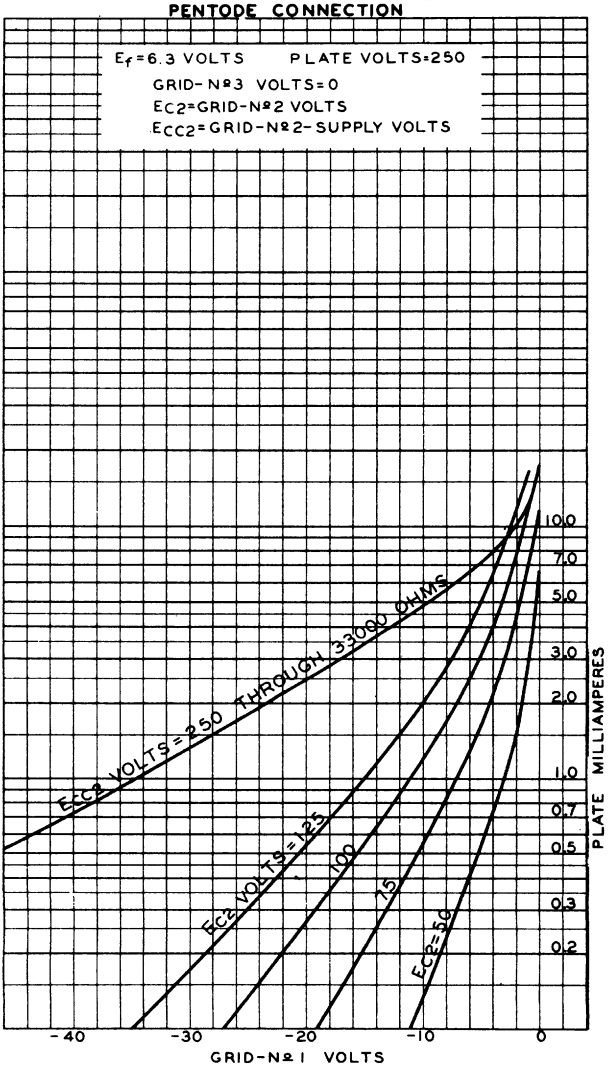


OCT. 22, 1945 RCA VICTOR DIVISION 92CM-6609
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6BA6

6BA6

AVERAGE CHARACTERISTICS
PENTODE CONNECTION

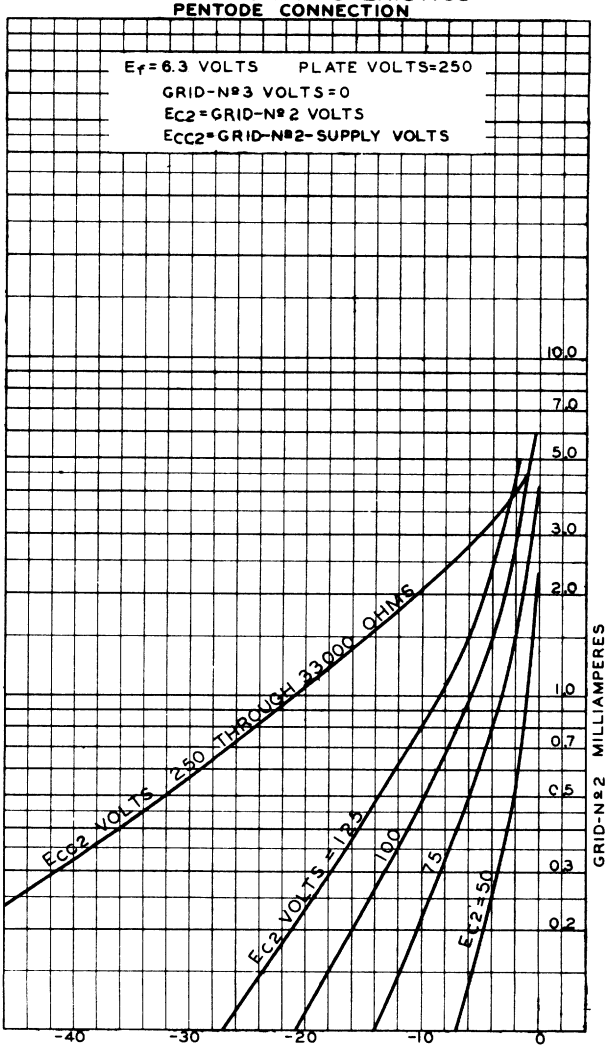


NOV. 12, 1945 RCA VICTOR DIVISION 92CM-6622
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

6BA6

AVERAGE CHARACTERISTICS
PENTODE CONNECTION



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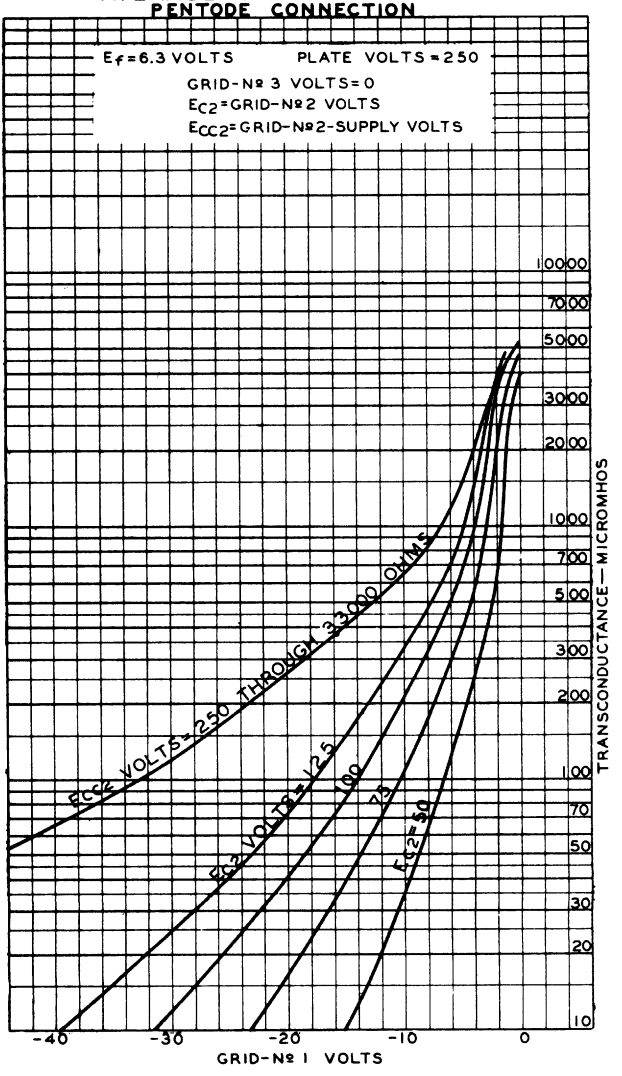
AVERAGE CHARACTERISTICS
PENTODE CONNECTION



6BA7

PENTAGRID CONVERTER

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

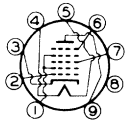
Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.3	amp
Direct Interelectrode Capacitances:o		
Grid No.3 to All Other Electrodes (RF Input)	9.5	μμf
Plate to All Other Electrodes (Mixer Output)	8.3	μμf
Grid No.1 to All Other Electrodes (Osc. Input)	6.7	μμf
Grid No.3 to Plate	0.19 max.	μμf
Grid No.3 to Grid No.1	0.1 max.	μμf
Grid No.1 to Plate	0.05 max.	μμf
Grid No.1 to All Other Electrodes Except Cathode	3.4	μμf
Grid No.1 to Cathode	3.3	μμf
Cathode to All Other Electrodes Except Grid No.1	4.0	μμf

o With no external shield.

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (excluding tip)	2" ± 3/32"
Maximum Diameter	7/8"
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin
Basing Designation for BOTTOM VIEW	8CT

Pin 1 - Grids No.2 & No.4
Pin 2 - Grid No.1
Pin 3 - Cathode
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Grid No.5, Internal Shield
Pin 7 - Grid No.3
Pin 8 - Internal Shield
Pin 9 - Plate

CONVERTER SERVICE

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	300 max.	volts
GRID-No.5 & INTERNAL-SHIELD VOLTAGE ▲	0 max.	volts
GRIDS-No.2 & No.4 VOLTAGE	100 max.	volts
GRIDS-No.2 & No.4 SUPPLY VOLTAGE	300 max.	volts
PLATE DISSIPATION	2.0 max.	watts
GRIDS-No.2 & No.4 DISSIPATION	1.5 max.	watts
TOTAL CATHODE CURRENT	22 max.	ma

▲ See next page.

6BA7
PENTAGRID CONVERTER

GRID-No.3 VOLTAGE:			
Negative bias value.	100 max.		volts
Positive bias value.	0 max.		volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	90 max.		volts
Heater positive with respect to cathode.	90 max.		volts
Characteristics - *Separate Excitation*:*			
Plate Voltage.	100	250	volts
Grid-No.5 & Internal Shield. .	Connected directly to ground		
Grids-No.2 & No.4 (Screen) Voltage . . .	100	100	volts
Grid-No.3 (Control Grid) Voltage	-1	-1	volt
Grid-No.1 (Cscillator Grid) Resistor . .	20000	20000	ohms
Plate Resistance (Approx.)	0.5	1	megohm
Conversion Transconductance	900	950	μmhos
Conversion Transconductance (Approx.)# .	3.5	3.5	μmhos
Plate Current.	3.6	3.8	ma
Grids-No.2 & No.4 Current.	10.2	10	ma
Grid-No.1 Current.	0.35	0.35	ma
Total Cathode Current.	14.2	14.2	ma

NOTE: The transconductance between grid No.1 and grids No.2 & No.4 connected to plate (not oscillating) is approximately 8000 micromhos under the following conditions: signal applied to grid No.1 at zero bias; grids-No.2 and No.4 and plate at 100 volts; grid No.3 grounded. Under the same conditions, the plate current is 32 milliamperes and the amplification factor is 16.5.

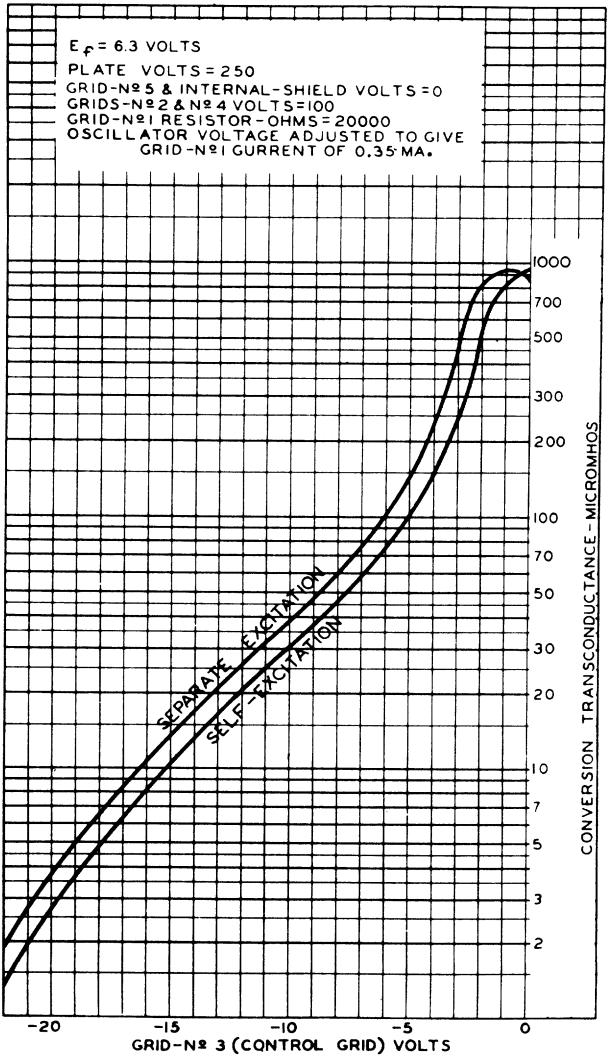
▲ Internal shield (Pins No.6 and No.8) connected directly to ground.

* The characteristics shown with separate excitation correspond very closely with those obtained in a self-excited oscillator circuit operating with zero bias.

With grid-No.3 bias of -20 volts.

6BA7

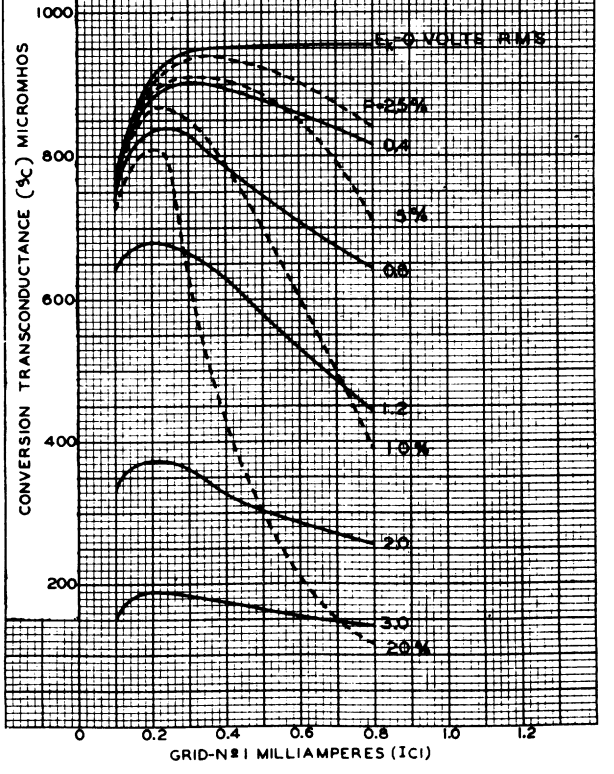
OPERATION CHARACTERISTICS



6BA7

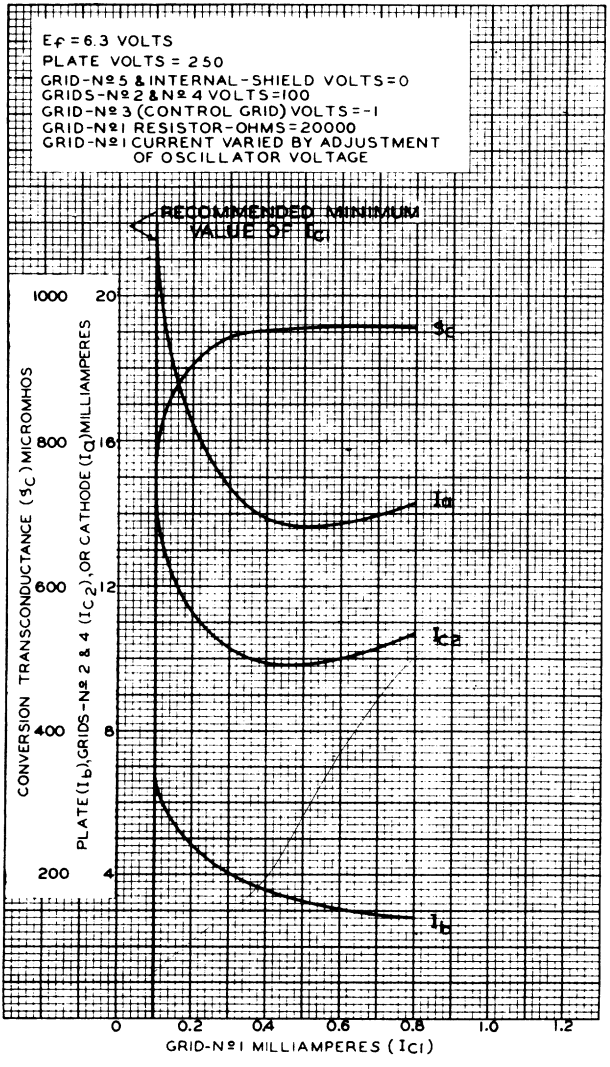
OPERATION CHARACTERISTICS
WITH SELF-EXCITATION

E_f = 6.3 VOLTS
PLATE VOLTS = 250
GRID-№5 & INTERNAL-SHIELD VOLTS=0
GRIDS-№2 & №4 VOLTS = 100
GRID-№3 (CONTROL GRID) VOLTS = -1
GRID-№1 RESISTOR-OHMS = 20000
P-PERCENTAGE RATIO OF E_K TO $E_K + E_g$, WHERE
E_K = VOLTAGE ACROSS OSCILLATOR-COIL SECTION BETWEEN GROUND AND CATHODE AND
E_g = OSCILLATOR VOLTAGE BETWEEN CATHODE AND GRID



6BA7

OPERATION CHARACTERISTICS
WITH SEPARATE OSCILLATOR EXCITATION



6BA8-A

MEDIUM-MU TRIODE — SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage	6.3	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

Direct Interelectrode Capacitances (Approx.):

	Without External Shield	*With External Shield*[o]	
Triode Unit:			
Grid to plate	2.2	2.2	μμf
Grid to cathode and heater	2.5	2.7	μμf
Plate to cathode and heater	0.4	1.9	μμf
Pentode Unit:			
Grid No.1 to plate	0.04	0.03	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	10	10	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	3.6	4.5	μμf
Triode grid to pentode plate	0.016	0.006	μμf
Pentode grid No.1 to triode plate	0.006	0.003	μμf
Pentode plate to triode plate	0.15	0.023	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*		
Plate-Supply Voltage	200	65	200	volts
Grid-No.2 Supply Voltage	–	150	150	volts
Grid-No.1 Voltage	-8	0	0	volts
Cathode Resistor	–	–	180	ohms
Amplification Factor	18	–	–	
Plate Resistance (Approx.)	6700	–	400000	ohms

[o] With external shield JETEC No.315 connected to cathode of unit under test.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6BA8-A

6BA8-A

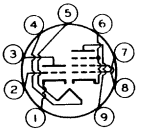
MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

	Triode Unit	*Pentode Unit*		
Transconductance	2700	–	9000	μmhos
Plate Current	8	42*	13	ma
Grid–No.2 Current	–	12.5*	3.5	ma
Grid–No.1 Voltage (Approx.) for plate current of 10 μa	–16	–	–10	volts

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb-Top (Excluding tip)	2" ± 3/32"
Maximum Diameter	7/8"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9DX

Pin 1 – Triode Cathode
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Pentode Cathode, Grid No.3, Internal Shield
Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate

AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	300 max.	300 max.	volts
GRID–No.2 (SCREEN-GRID) SUPPLY VOLTAGE	–	300 max.	volts
GRID–No.2 VOLTAGE	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID–No.1 (CONTROL-GRID) VOLTAGE:			
Negative bias value	–	50 max.	volts
Positive bias value	–	0 max.	volts
PLATE DISSIPATION	2 max.	3.25 max.	watts
GRID–No.2 INPUT: For grid–No.2 voltages up to 150 volts	–	1 max.	watt

* These values can be measured by a method involving a recurrent wave form such that the grid–No.2 input will be kept within ratings in order to prevent damage to the tube.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
TENTATIVE DATA 1

6BA8-A

MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

	Triode Unit	*Pentode Unit*	
For grid-No.2 voltages between 150 and 300 volts	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode. .	200 max.	200 max.	volts
Heater positive with respect to cathode. .	200▲ max.	200▲ max.	volts

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5 max.	0.25 max.	megohm
For cathode-bias operation	1.0 max.	1.0 max.	megohm

▲ The dc component must not exceed 100 volts.

OPERATING CONSIDERATIONS

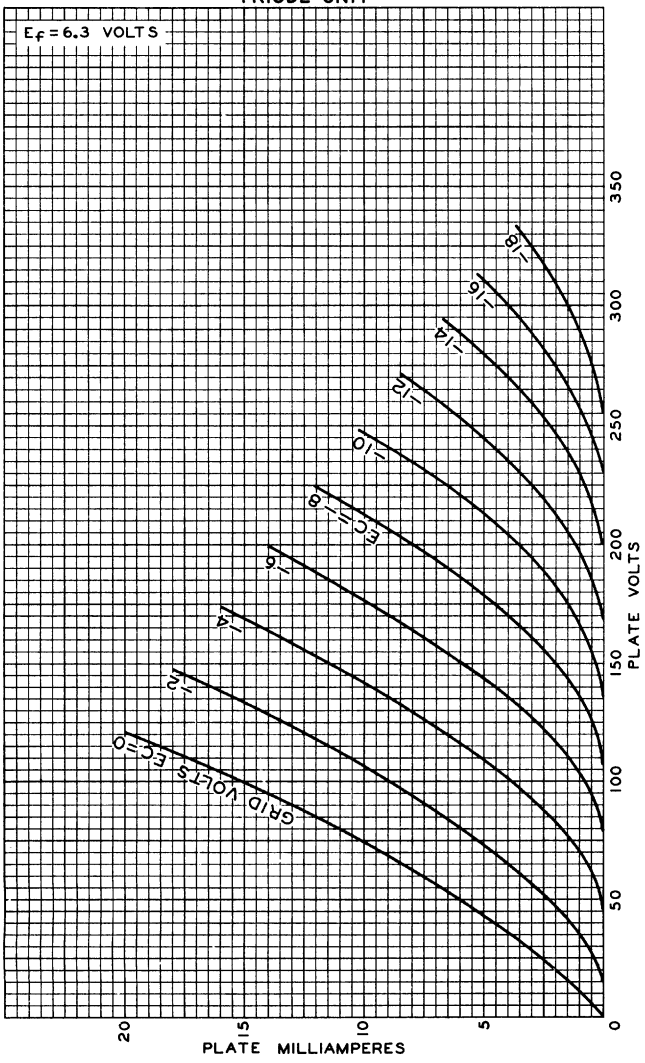
Because the internal shield is connected to the cathode and grid No.3, the impedance in the cathode circuit should be kept as low as possible to minimize cross-coupling effects.

6BA8-A

6BA8-A

AVERAGE PLATE CHARACTERISTICS

TRIODE UNIT



ELECTRON TUBE DIVISION
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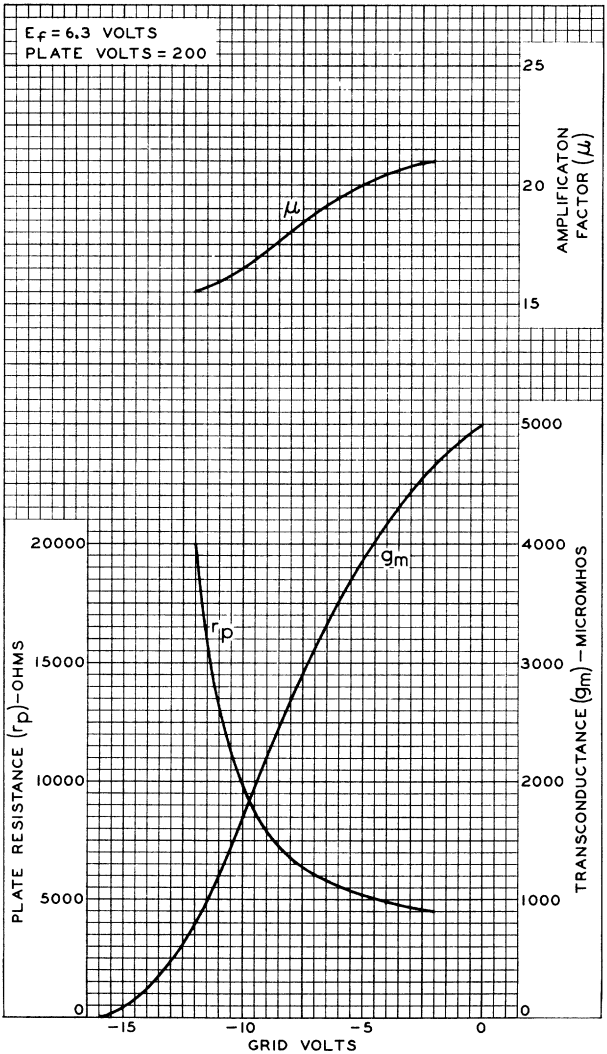
92CM-9338

6BA8-A

AVERAGE CHARACTERISTICS

TRIODE UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

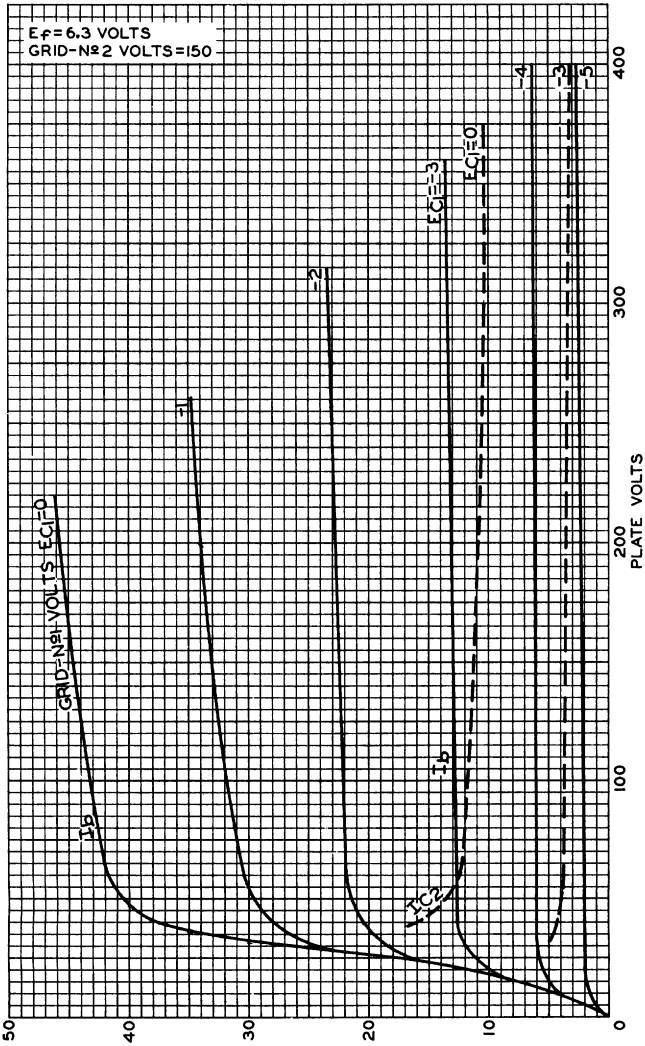
92CM-9339

6BA8-A

6BA8-A

AVERAGE CHARACTERISTICS

PENTODE UNIT



ELECTRON TUBE DIVISION

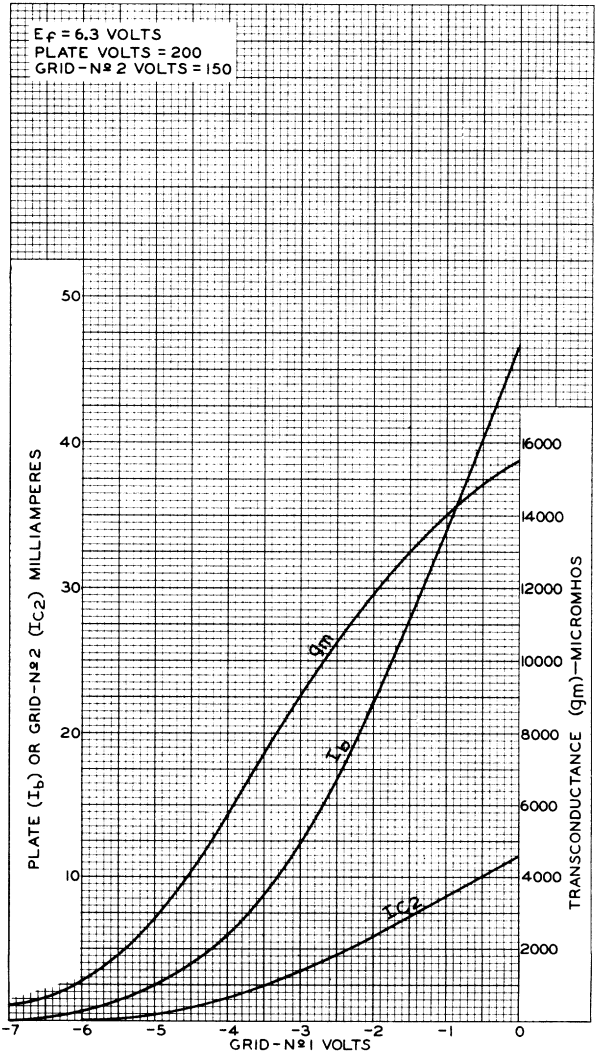
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9173

6BA8-A

AVERAGE CHARACTERISTICS

PENTODE UNIT



6BA11

Medium-Mu Triode—
Sharp-Cutoff Twin Pentode

DUODECAR TYPE

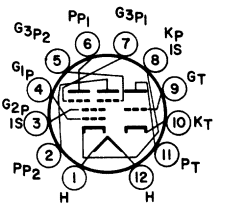
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6[a]	volts
Current at heater volts = 6.3	0.600[b]	amp
Warm-up time (Average)	11	sec
Peak heater-cathode voltage:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[c] max.	volts
Direct Interelectrode Capacitances:[d]		
Triode Unit:		
Grid to plate	2.0	pf
Input: G_T to (K_T,H)	2.0	pf
Output: P_T to (K_T,IS,H)	1.9	pf
Each Pentode Unit:		
$G3_P$ to P_P	2.0	pf
$G3_P$ to all other electrodes	3.6	pf
$G1_P$ to all other electrodes	6.0	pf
P_P to all other electrodes	3.0	pf
$G3_{P1}$ to $G3_{P2}$	0.026 max.	pf

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2.375"
Seated Length	1.750" to 2.000"
Diameter	1.062" to 1.188"
Dimensional Outline	See *General Section*
Bulb	T9
Base	Small-Button Duodecar 12-Pin (JEDEC E12-70)
Basing Designation for BOTTOM VIEW	12ER

Pin 1 - Heater
Pin 2 - Plate of Pentode Unit No.2
Pin 3 - Pentodes Grid No.2, Internal Shield
Pin 4 - Pentodes Grid No.1
Pin 5 - Grid No.3 of Pentode Unit No.2
Pin 6 - Plate of Pentode Unit No.1
Pin 7 - Grid No.3 of Pentode Unit No.1
Pin 8 - Pentodes Cathode, Internal Shield
Pin 9 - Triode Grid
Pin 10 - Triode Cathode
Pin 11 - Triode Plate
Pin 12 - Heater



6BA11

Characteristics, Class A_1 Amplifier:

	Triode Unit	Pentode Units: Each Separately[e]		Pentode Units: Both Operating[f]		
Plate Voltage	250	100	100	100	100	volts
Grid-No.3 Voltage	–	0	0	-10	0	volts
Grid-No.2 Voltage	–	67.5	67.5	67.5	67.5	volts
Grid-No.1 Voltage	-11	0	g	g	g	volts
Amplification Factor	18	–	–	–	–	
Grid No.3 Transconductance	–	–	450	–	–	μmhos
Grid No.1 Transconductance	1800	1700	–	–	–	μmhos
Plate Current	5	–	2.5	0	2.5	ma
Grid No.2 Current	–	–	–	7	4.4	ma
Grid-No.3 Voltage (Approx.) for plate μa = 100	–	–	-3.2	–	–	volts
Grid-No.1 Voltage (Approx.) for plate μa = 100	-18	2.3	–	–	–	volts

AMPLIFIER — Class A_1

	Triode Unit	Pentode Unit	
Maximum Ratings, *Design-Maximum Values:*			
Plate Voltage	300 max.	300 max.	volts
Grid-No.3 (Suppressor-Grid) Voltage:			
Peak positive value	–	50 max.	volts
DC negative value	–	50 max.	volts
DC positive value	–	3 max.	volts
Grid-No.2 (Screen-Grid) Voltage	–	150 max.	volts
Grid-No.1 (Control-Grid) Voltage:			
Negative-bias value	–	50 max.	volts
Cathode Current	20	12 max.	ma
Grid-No.2 Input	–	0.75 max.	watts
Plate Dissipation (Each Plate)	1.5	1.1 max.	watts
Maximum Circuit Values:			
Grid-No.3-Circuit Resistance (Each Grid)	–	0.5 max.	megohm
Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.25 max.	0.5 max.	megohm
For cathode-bias operation	1 max.	0.5 max.	megohm

[a] For parallel heater operation.
[b] For series heater operation current must be limited to 0.600 ± 0.040 amperes.
[c] The dc component must not exceed 100 volts.
[d] Without external shield.
[e] Plate and grid 3 of opposite unit grounded.
[f] Voltages and plate current apply to each section.
[g] Adjusted to give a dc grid-No.1 current of 100 microamperes.

6BC4

MEDIUM-MU TRIODE

9-PIN MINIATURE TYPE

For use as rf amplifier in cathode-drive circuits of TV tuners covering range of 470-890 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.225	amp
Direct Interelectrode Capacitances (Approx.):*		
Grid to plate	1.6	μμf
Grid to heater and cathode	2.9	μμf
Plate to heater and cathode	0.26	μμf
Heater to cathode	2.7	μμf

Characteristics - Class A_1 Amplifier:

Plate Supply Voltage	150	volts
Cathode-Bias Resistor	100	ohms
Amplification Factor	48	
Plate Resistance	4800	ohms
Transconductance	10000	μmhos
Grid Voltage (Approx.) for plate current of 10 μamp	-10	volts
Plate Current	14.5	ma

Mechanical:

Mounting Position	Any
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length, Base Seat to Bulb Top (Excluding Tip)	1-1/8" ± 3/32"
Maximum Diameter	7/8"
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9DR

Pin 1 - Plate
Pin 2 - Grid
Pin 3 - Grid
Pin 4 - Heater
Pin 5 - Heater

Pin 6 - Cathode
Pin 7 - Grid
Pin 8 - Grid
Pin 9 - Plate

AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	250 max.	volts
PLATE DISSIPATION	2.5 max.	watts
CATHODE CURRENT	25 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	75 max.	volts
Heater positive with respect to cathode	75 max.	volts

* With no external shield.

6BC4

6BC4

MEDIUM-MU TRIODE

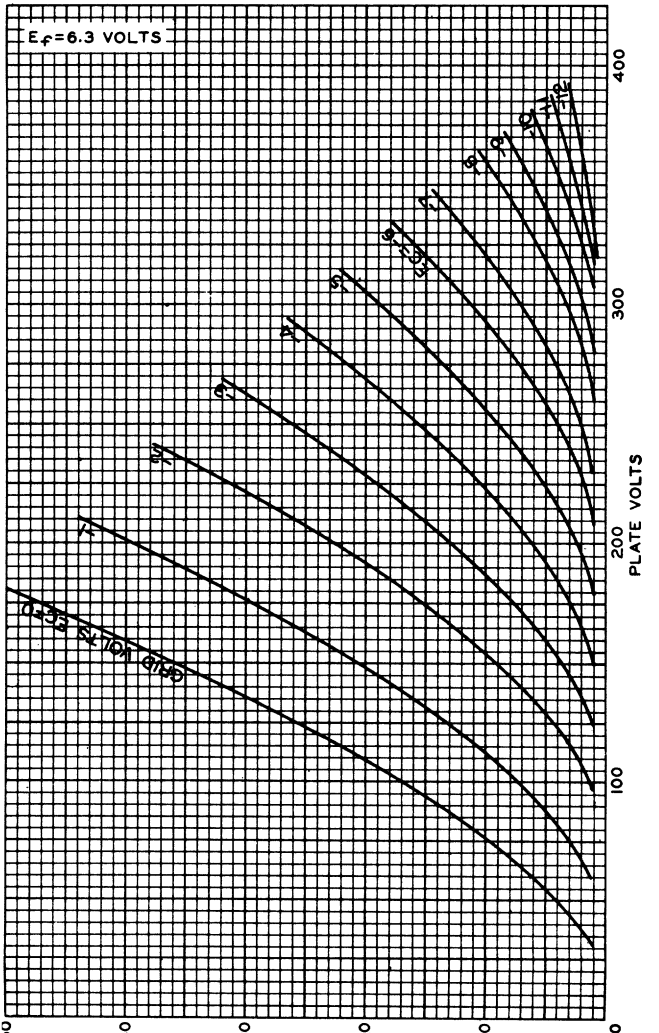
Maximum Circuit Values (For maximum rated conditions):

Grid-Circuit Resistance:

For cathode-bias operation	0.5 max. megohm
For fixed-bias operation	not recommended

6BC4

AVERAGE PLATE CHARACTERISTICS



FEB.12,1954

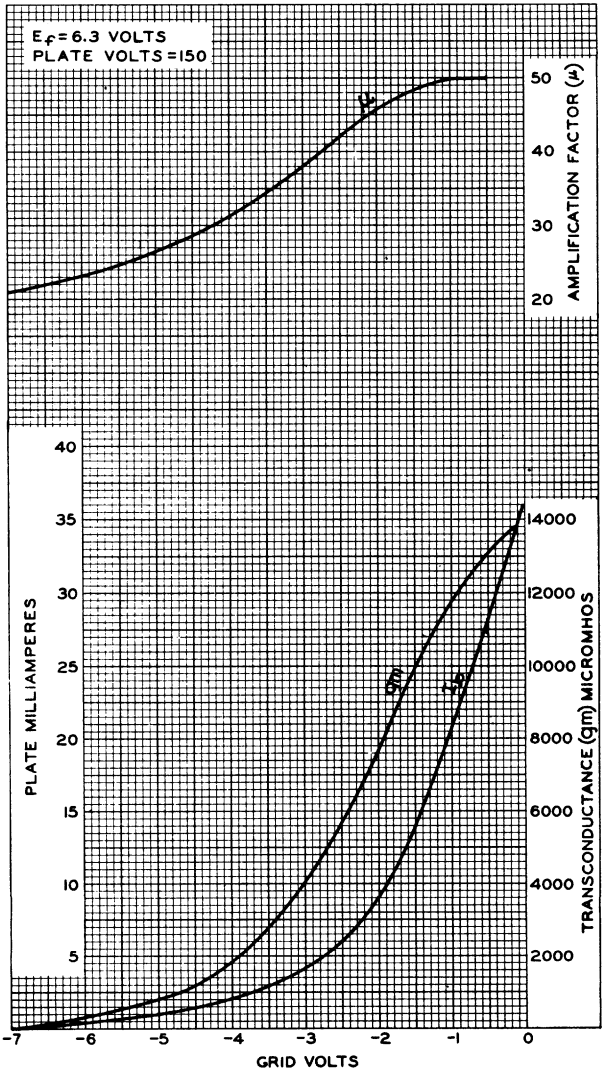
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8241

6BC4

6BC4

AVERAGE CHARACTERISTICS



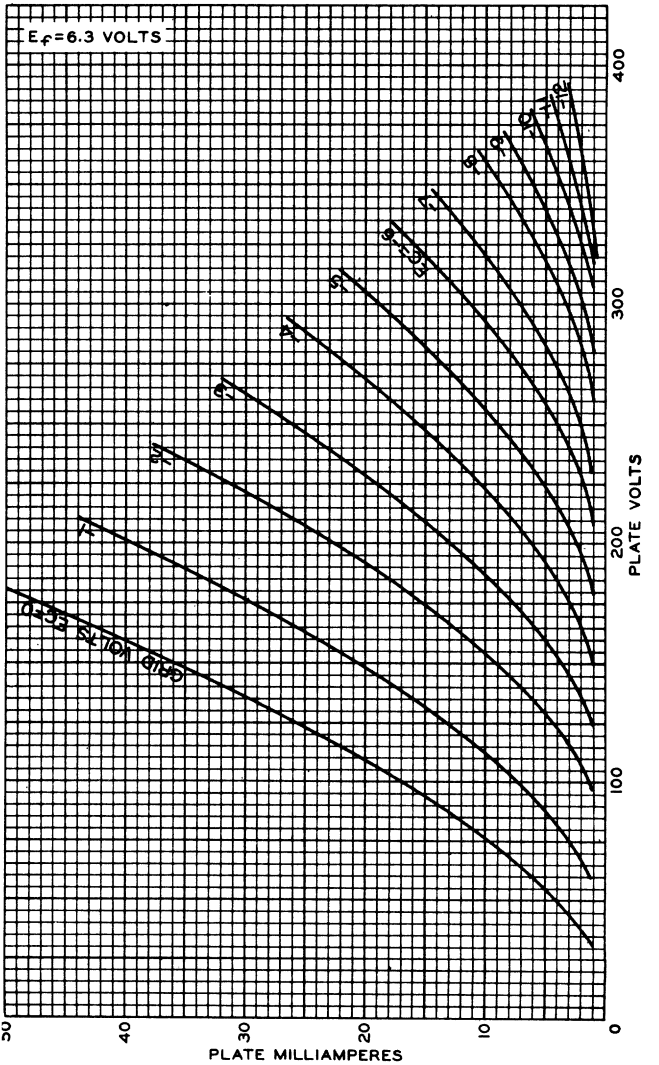
FEB. 12, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8240

6BC4

AVERAGE PLATE CHARACTERISTICS

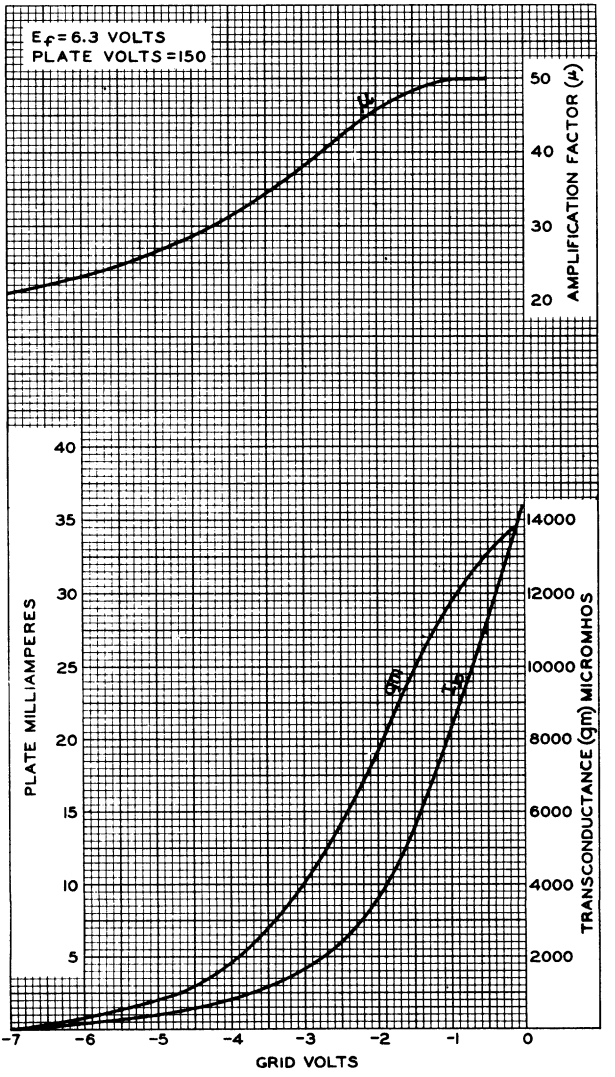


FEB.12,1954
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-8241

6BC4

6BC4

AVERAGE CHARACTERISTICS



6BC5

SHARP-CUTOFF PENTODE

MINIATURE TYPE

Useful at Frequencies up to 400 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.3	amp

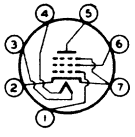
Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield°*	
Pentode Connection:			
Grid No.1 to plate	0.030 max.	0.020 max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	6.5	6.6	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	1.8	2.6	μμf
Triode Connection, Grid No.2 connected to plate:			
Grid No.1 to plate and grid No.2	2.5	2.5	μμf
Grid No.1 to cathode & grid No.3 & internal shield, and heater	3.9	4.0	μμf
Plate and grid No.2 to cathode & grid No.3 & internal shield, and heater	3.0	4.3	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BD

Pin 1 - Grid No.1
Pin 2 - Cathode, Grid No.3, Internal Shield
Pin 3 - Heater



Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Same as Pin 2

° With external shield JETEC No.316 connected to cathode.

← Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6BC5
SHARP-CUTOFF PENTODE

AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	300 max.	volts
GRID-No.2 (SCREEN) SUPPLY VOLTAGE	300 max.	volts
→ GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive bias value	0 max.	volts
PLATE DISSIPATION	2 max.	watts
→ GRID-No.2 INPUT:		
For grid-No.2 voltages up to 150 volts	0.5 max.	watt
For grid-No.2 voltages between 150 and 300 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Typical Operation and Characteristics:

Plate Voltage	100	125	250	volts
Grid-No.2 Voltage	100	125	150	volts
Cathode-Bias Resistor	180	100	180	ohms
Plate Resistance (Approx.)	0.6	0.5	0.8	megohm
Transconductance	4900	6100	5700	μmhos
Grid-No.1 Voltage (Approx.) for plate current of 10 μamp	−5	−6	−8	volts
Plate Current	4.7	8	7.5	ma
Grid-No.2 Current	1.4	2.4	2.1	ma

AMPLIFIER - Class A_1

Triode Connection - Grid No.2 Connected to Plate

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	300 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive bias value	0 max.	volts
PLATE & GRID-No.2 DISSIPATION (TOTAL)	2.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Typical Operation and Characteristics:

Plate Voltage	180	250	volts
Cathode-Bias Resistor	330	820	ohms
Amplification Factor	42	40	
Plate Resistance (Approx.)	6000	9000	ohms
Transconductance	6000	4400	μmhos
Plate & Grid-No.2 Current (Total)	8	6	ma

→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6BC7

TRIPLE DIODE

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

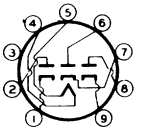
Heater, for Unipotential Cathodes:		
Voltage	6.3	ac or dc volts
Current	0.450	amp
Direct Interelectrode Capacitances (Approx.):[o]		
Plate No.1 to Cathode No.1, Heater, and Internal Shield	3.5	μμf
Plate No.2 to Cathode No.2, Heater, and Internal Shield	5.5	μμf
Plate No.3 to Cathode No.3, Heater, and Internal Shield	3.5	μμf

[o] With no external shield.

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Maximum Diameter	7/8"
Bulb	T-6-1/2
Base	Small Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9R

Pin 1 – Cathode of Diode No.3
Pin 2 – Plate of Diode No.3
Pin 3 – Internal Shield
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Plate of Diode No.2
Pin 7 – Cathode of Diode No.2
Pin 8 – Plate of Diode No.1
Pin 9 – Cathode of Diode No.1

EACH DIODE

Maximum Ratings, *Design-Center Values:*

PEAK INVERSE PLATE VOLTAGE	330 max.	volts
PEAK PLATE CURRENT[□]	54 max.	ma
DC OUTPUT CURRENT	12 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Av.*	*Max.*	
Heater Current	1	0.410	0.450	0.490	amp
Plate Current (1) (Each Unit)	1,2	–	15	21	μamp

[□] In rectifier service, the minimum total effective plate-supply impedance per plate is 560 ohms.

6BC7

6BC7

TRIPLE DIODE

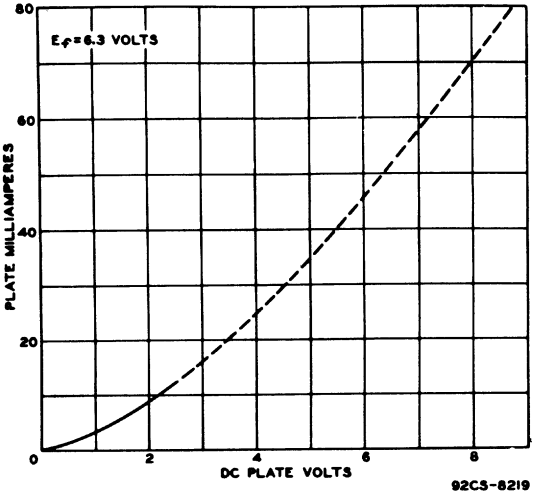
	Note	Min.	Av.	Max.	
Plate Current (2) (Each Unit)	1,3	18	35	65	ma
Ratio of Plate Current of Unit No.3 to Plate Current of Unit No.1 .	1,3	0.77	1	1.3	

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With plate voltage of 0 volts, and plate load resistance of 40000 ohms. Each unit tested separately.

Note 3: With plate voltage of 5 volts and no plate load resistance. Each unit tested separately.

AVERAGE PLATE CHARACTERISTIC FOR EACH DIODE UNIT



6BC8

Medium-Mu Twin Triode With Semiremote-Cutoff Characteristic

9-PIN MINIATURE TYPE

For Use in Cascode-Type Circuits of VHF TV Tuners

ELECTRICAL

Heater Characteristics and Ratings		
Voltage (AC or DC)	6.3 ± 0.6	V
Current at 6.3 V	0.400	A
Heater-Cathode Voltage:		
Peak positive	200	V
Peak negative[a]	200	V
Average	100	V

Direct Interelectrode Capacitances (Approx.)[b]

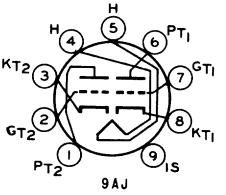
	Unit No.1	Unit No.2	
Grid to plate	1.2	1.2	pF
Input: G to (K, IS, H)	2.6	-	pF
Input:[c] K to (G, IS, H)	-	5.5	pF
Output: P to (K, IS, H)	1.3	-	pF
Output:[c] P to (G, IS, H)	-	2.4	pF
Plate to cathode	-	0.12	pF
Heater to cathode	2.8	2.8	pF
Plate of unit No.1 to plate of unit No.2	0.02		pF
Plate of unit No.2 to plate and grid of unit No.1	0.04		pF

MECHANICAL

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2.187 in
Maximum Seated Length	1.937 in
Maximum Diameter	0.875 in
Length, Base Seat to Bulb Top Excluding tip	1.469 to 1.656 in
Dimensional Outline (JEDEC 6-2)	See *General Section*
Envelope	JEDEC T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC E9-1)

TERMINAL DIAGRAM (Bottom View)

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Internal Shield



9AJ

← Indicates a change.

CHARACTERISTICS, CLASS A$_1$ AMPLIFIER

Values are for Each Unit

Plate Voltage	150	V
Cathode Resistor	220	Ω
Amplification Factor	35	
→ Plate Resistance (Approx.)	5300	Ω
Transconductance	6200	μmho
Plate Current	10	mA
Grid Voltage for g_m = 50 μmho	-13	V

→

AMPLIFIER—CLASS A$_1$

Values are for Each Unit

Design-Maximum Ratings

Plate Voltage[a]	150	V
Cathode Current	22	mA
Plate Dissipation	2.2	W

MAXIMUM CIRCUIT VALUES

Grid-No.1 Circuit Resistance For cathode-bias operation	0.5	MΩ

[a] This rating may be as high as 300 volts under cutoff conditions when the tube is used as a cascode amplifier and the two units are connected in series.

[b] With external shield JEDEC No.315 connected to internal shield.

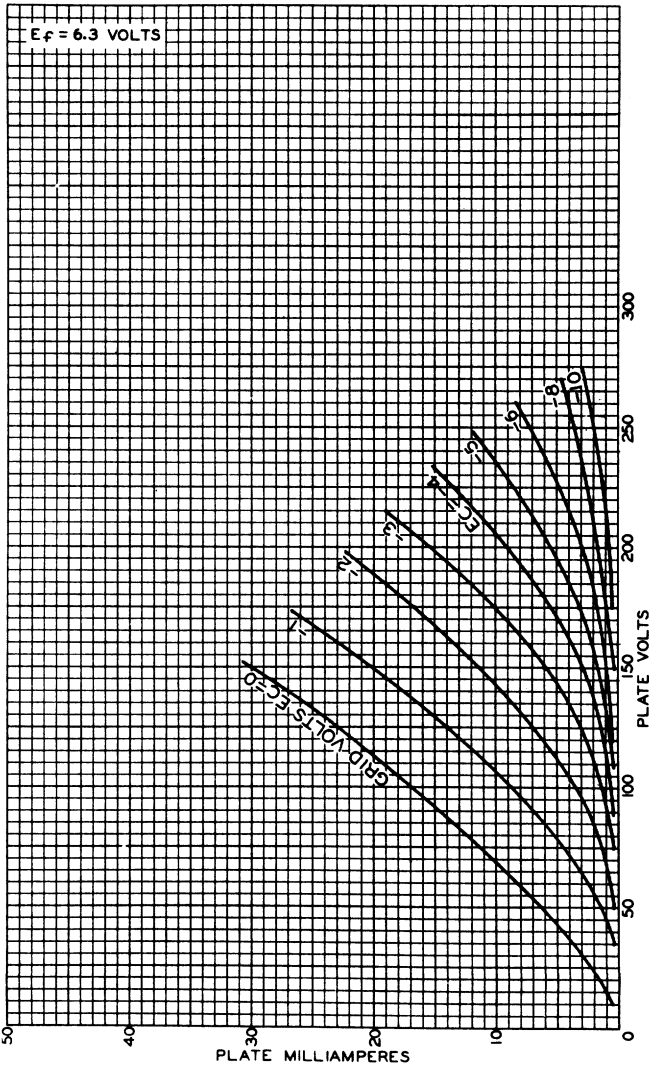
[c] Read as grounded grid amplifier.

→ Indicates a change.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

6BC8

AVERAGE PLATE CHARACTERISTICS
FOR EACH UNIT



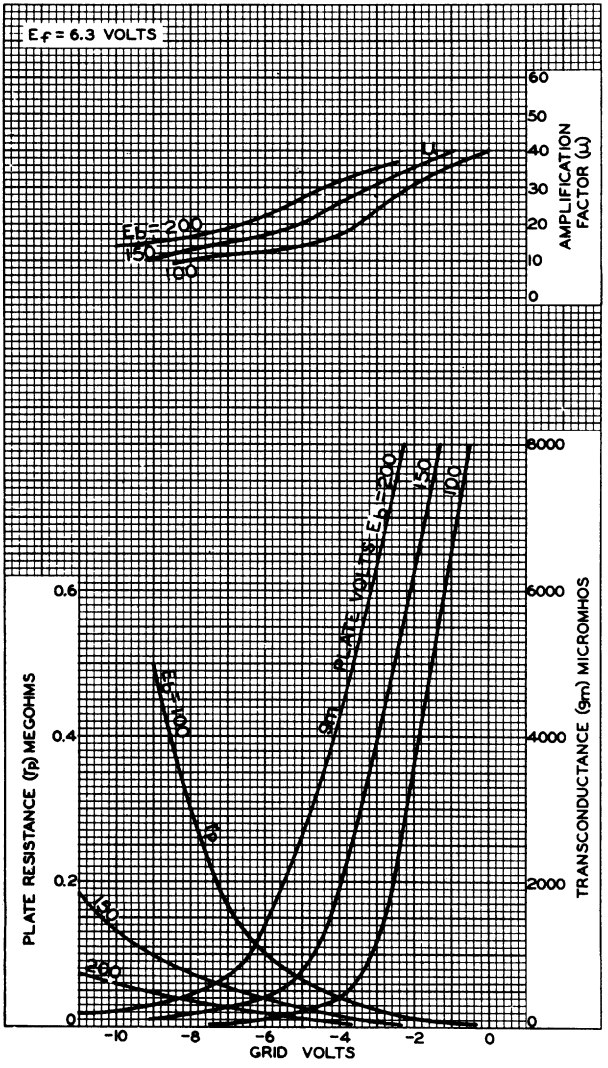
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8789

6BC8

6BC8

AVERAGE CHARACTERISTICS
FOR EACH UNIT

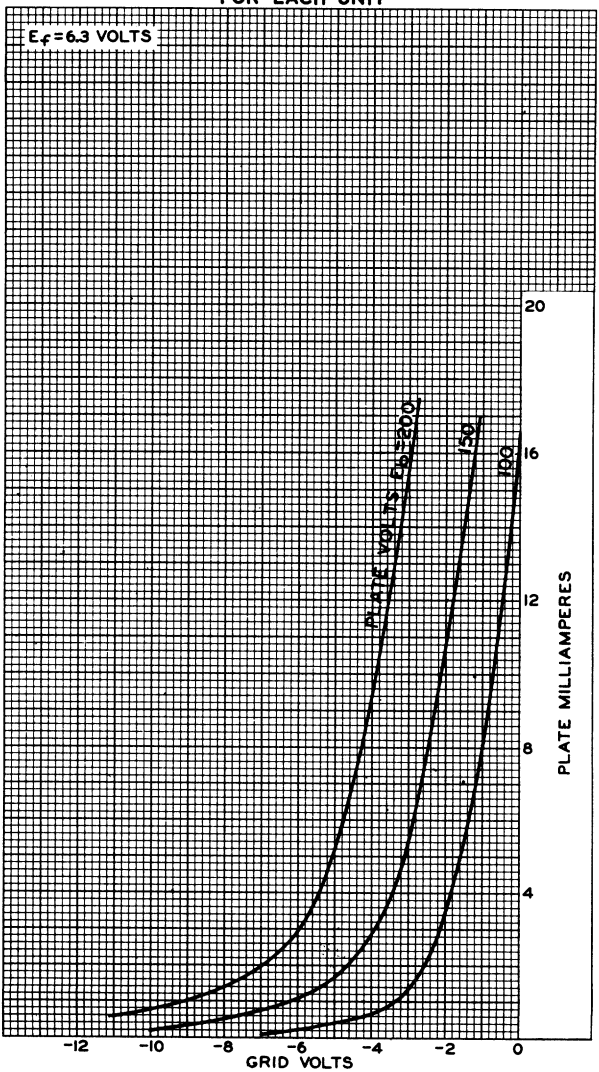


TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8790R1

6BC8

AVERAGE CHARACTERISTICS
FOR EACH UNIT



Dual Triode—Sharp-Cutoff Pentode

Dual Triode Has High-Mu & Medium-Mu Units

DUODECAR TYPE

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at 6.3 volts	1.050	amp
Maximum Heater Cathode Voltage:		
Heater negative with respect to cathode:		
Peak	200	volts
Heater positive with respect to cathode:		
Peak	200	volts
DC component	100	volts
Direct Interelectrode Capacitances: (Without external shield)		
Triode Unit No.1		
Grid to plate	1.9	pf
Input: G_{T1} to (K_{T1}, K_{T2} + IS, K_P + $G3_P$ + IS, H)	3.0	pf
Output: P_{T1} to (K_{T1}, K_{T2} + IS, K_P + $G3_P$ + IS, H)	2.2	pf
Triode Unit No.2		
Grid to plate	3.6	pf
Input: G_{T2} to (K_{T2} + IS, K_P + $G3_P$ + IS, H)	2.4	pf
Output: P_{T2} to (K_{T2} + IS, K_P + $G3_P$ + IS, H)	3.8	pf
Pentode Unit		
Grid No.1 to plate	0.13	pf
Input: $G1_P$ to (K_{T2} + IS, K_P + $G3_P$ + IS, $G2_P$, H)	11.0	pf
Output: P_P to (K_{T2} + IS, K_P + $G3_P$ + IS, $G2_P$, H)	4.6	pf
Pentode plate to plate of triode No.2	0.045 max.	pf
Plate of triode No.1 to plate of triode No.2	0.075 max.	pf

Characteristics, Class A_1 Amplifier:

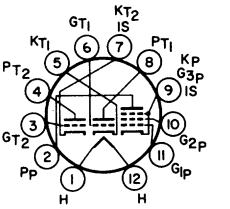
Triode Units	*No.1*	*No.2*	
Plate Supply Voltage	200	200	volts
Grid Voltage	-2	-	volts
Cathode Resistor	-	220	ohms
Amplification Factor	68	41	
Plate Resistance (Approx.)	12400	9400	ohms
Transconductance	5500	4400	μmhos
Plate Current	7	9.2	ma
Grid Voltage for plate μa = 100	-5.5	-6.5	volts

Pentode Unit			
Plate Supply Voltage	35	135	volts
Grid-No.2 Supply Voltage	135	135	volts
Grid-No.1 Voltage	0[a]	-	volts
Cathode Resistor	-	100	ohms
Plate Resistance (Approx.)	-	45000	ohms
Transconductance	-	10400	μmhos
Plate Current	34[b]	17	ma
Grid-No.2 Current	13[b]	4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	-	-6	volts

Mechanical:

Operating Position	Any
Types of Cathodes	Coated Unipotential
Maximum Overall Length	2.375"
Seated Length	1.750" to 2.000"
Diameter	1.062" to 1.188"
Dimensional Outline (JEDEC 9-58)	See *General Section*
Bulb	T9
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW	12DP

Pin 1 - Heater
Pin 2 - Pentode Plate
Pin 3 - Grid of Triode Unit No.2
Pin 4 - Plate of Triode Unit No.2
Pin 5 - Cathode of Triode Unit No.1
Pin 6 - Grid of Triode Unit No.1
Pin 7 - Cathode of Triode Unit No.2, Internal Shield
Pin 8 - Plate of Triode Unit No.1
Pin 9 - Pentode Cathode, Pentode Grid No.3, Internal Shield
Pin 10 - Pentode Grid No.2
Pin 11 - Pentode Grid No.1
Pin 12 - Heater



AMPLIFIER — Class A1

Maximum Ratings, *Design-Maximum Values:*

	Triode Units No.1	*No.2*	
Plate Voltage	330	330	volts
Grid (Control-Grid) Voltage:			
Positive-bias value	0	0	volts
Plate Dissipation	1.5	2	watts

Pentode Unit

Plate Voltage	330	volts
Grid-No.2 (Screen-Grid) Supply Voltage	330	volts
Grid-No.2 Voltage	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Grid-No.1 (Control-Grid) Voltage:		
Positive-bias value	0	volts
Grid-No.2 Input:		
For grid-No.2 voltages up to 165 volts	1.1	watts
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Plate Dissipation	4	watts

Maximum Circuit Values: *(Values are for Each Unit)*

	Triode Units	*Pentode Unit*
Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.5	1 megohm
For cathode-bias operation	1	1 megohm

[a] Applied for short interval (2 sec. max.) so as not to damage tube.
[b] Value measured by recurrent waveform such that maximum ratings of tube are not exceeded.

Half-Wave Vacuum Rectifier

DUODECAR TYPE

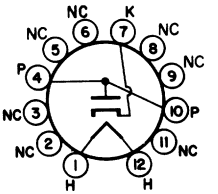
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.200	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode[a]	5000[b] max.	volts
Heater positive with respect to cathode	300[c] max.	volts
Direct Interelectrode Capacitances(Approx.):[d]		
P to (K,H)	10	pf
K to (P,H)	8.0	pf
H to K	3.4	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2.875"
Seated Length	2.250" to 2.500"
Diameter	1.062" to 1.188"
Dimensional Outline	See *General Section*
Bulb	T9
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW	12BL

Pin 1 - Heater
Pin 2 - No Internal Connection
Pin 3 - Same as Pin 2
Pin 4 - Plate
Pin 5 - Same as Pin 2
Pin 6 - Same as Pin 2
Pin 7 - Cathode
Pin 8 - Same as Pin 2
Pin 9 - Same as Pin 2
Pin 10 - Plate
Pin 11 - Same as Pin 2
Pin 12 - Heater



DAMPER SERVICE

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[e]

Peak Inverse Plate Voltage[a]	5000 max.	volts
Peak Plate Current	1200 max.	ma
DC Plate Current	200 max.	ma
Plate Dissipation	6.5 max.	watts

Characteristics, Instantaneous Value:

Tube Voltage Drop for plate ma. = 350	25	volts

[a] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[b] The dc component must not exceed 900 volts.

[c] The dc component must not exceed 100 volts.

[d] Without external shield.

[e] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

6BE6

Pentagrid Converter

7-PIN MINIATURE TYPE

GENERAL DATA

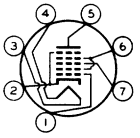
Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)	6.3 ± 10%		volts
Current at 6.3 volts	0.3		amp
Direct Interelectrode Capacitances:			
	Without External Shield	*With External Shield*[a]	
Grid No.3 to all other electrodes (RF input)	7	7	μμf
Plate to all other electrodes (Mixer input)	8	13	μμf
Grid No.1 to all other electrodes (Oscillator input)	5.5	5.5	μμf
Grid No.3 to plate	0.3 max.	0.25 max.	μμf
Grid No.3 to grid No.1	0.15 max.	0.15 max.	μμf
Grid No.1 to plate	0.1 max.	0.05 max.	μμf
Grid No.1 to cathode & grid No.5	3	3	μμf
Cathode & grid No.5 to all other electrodes except grid No.1	15	20	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CH

Pin 1 – Grid No.1
Pin 2 – Cathode, Grid No.5
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2, Grid No.4
Pin 7 – Grid No.3



CONVERTER

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
GRID-No.3 (CONTROL-GRID) VOLTAGE:			
Negative-bias value	55	max.	volts
Positive-bias value	0	max.	volts
GRIDS-No.2 & No.4 (SCREEN-GRID) SUPPLY VOLTAGE	330	max.	volts
GRIDS-No.2 & No.4 VOLTAGE	110	max.	volts

← Indicates a change.

CATHODE CURRENT	15.5	max.	ma
GRIDS-No.2 & No.4 INPUT	1.1	max.	watts
PLATE DISSIPATION	1.1	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts

Characteristics:

With separate excitation[c]

Plate Voltage	100	250	volts
Grid-No.3 Voltage	-1.5	-1.5	volts
Grids-No.2 & No.4 Voltage	100	100	volts
RMS Grid-No.1 (Oscillator Grid) Voltage	10	10	volts
Grid-No.1 Resistor	20000	20000	ohms
Plate Resistance (Approx.)	0.4	1	megohm
Conversion Transconductance	455	475	μmhos
Grid-No.3 Voltage (Approx.) for conversion transconductance (μmhos) =			
10.	-30	-30	volts
100	-6	-6	volts
Plate Current	2.6	2.9	ma
Grids No.2 & No.4 Current	7	6.8	ma
Grid-No.1 Current	0.5	0.5	ma
Cathode Current	10.1	10.2	ma

Oscillator Characteristics (Not Oscillating):

With grids No.2 & No.4 connected to plate

Plate and Grids-No.2 & No.4 Voltage	100	volts
Grid-No.3 Voltage	0	volts
Grid-No.1 Voltage	0	volts
Amplification Factor between grid No.1 and grids No.2 & No.4 connected to plate	20	
Transconductance between grid No.1 and grids No.2 & No.4 connected to plate	7250	μmhos
Cathode Current	25	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10.	-11	volts

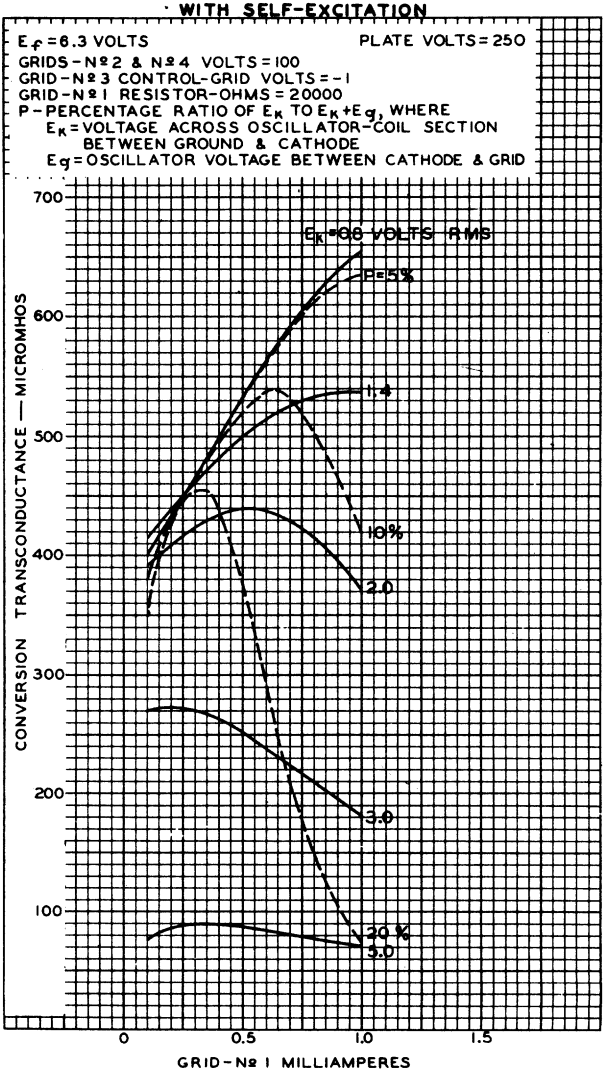
[a] With external shield JEDEC No.316 connected to cathode.

[b] The dc component must not exceed 100 volts.

[c] The characteristics shown with separate excitation correspond very closely with those obtained in a self-excited oscillator circuit operating with zero bias.

6BE6

OPERATION CHARACTERISTICS
WITH SELF-EXCITATION



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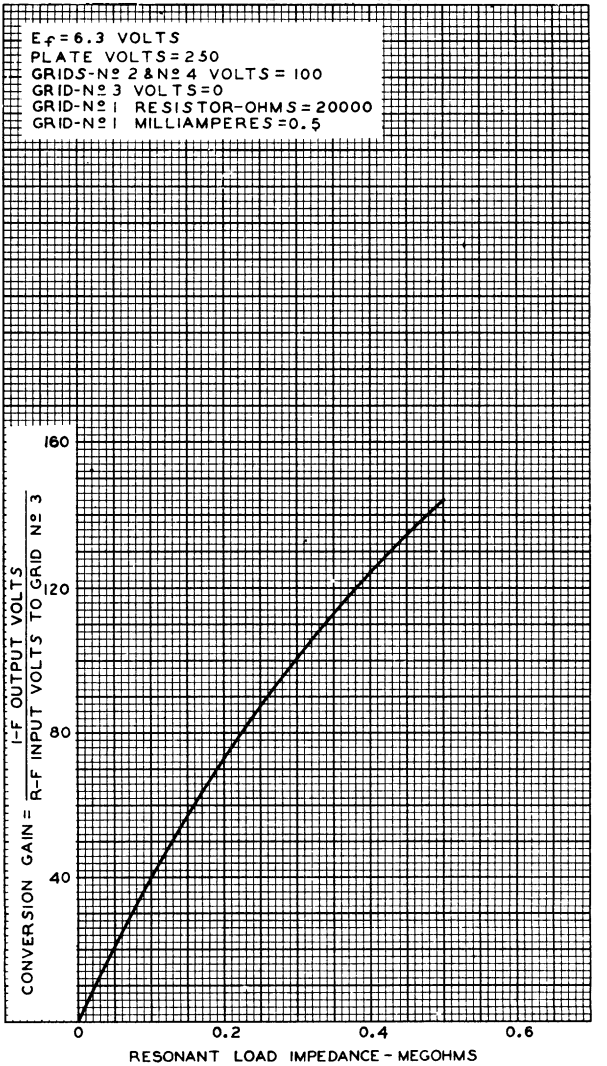
6BE6

6BE6

OPERATION CHARACTERISTIC

WITH SELF-EXCITATION

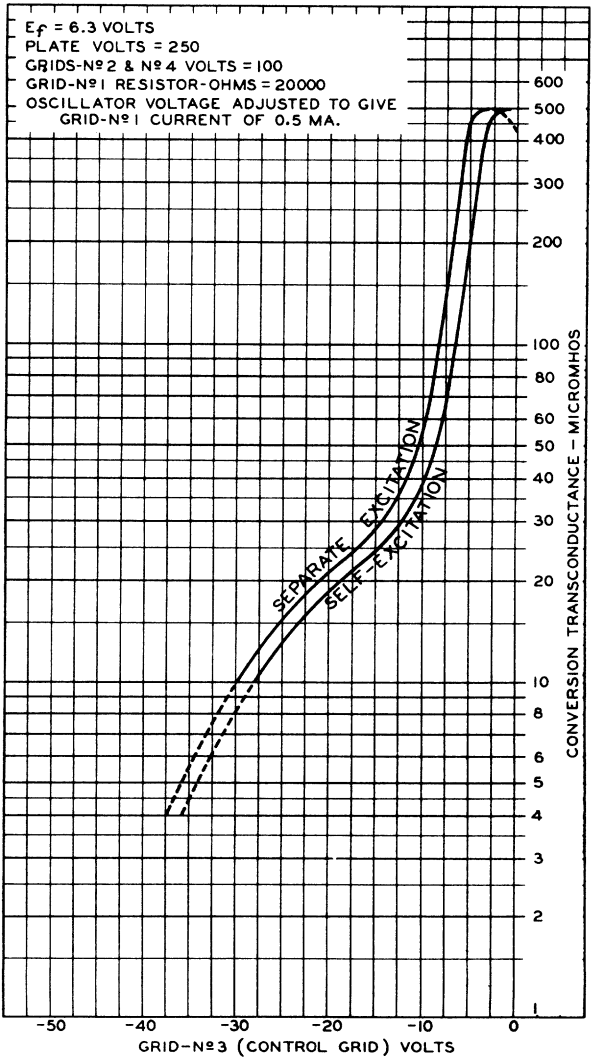


OCT. 16, 1945 RCA VICTOR DIVISION 92CM – 6605

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

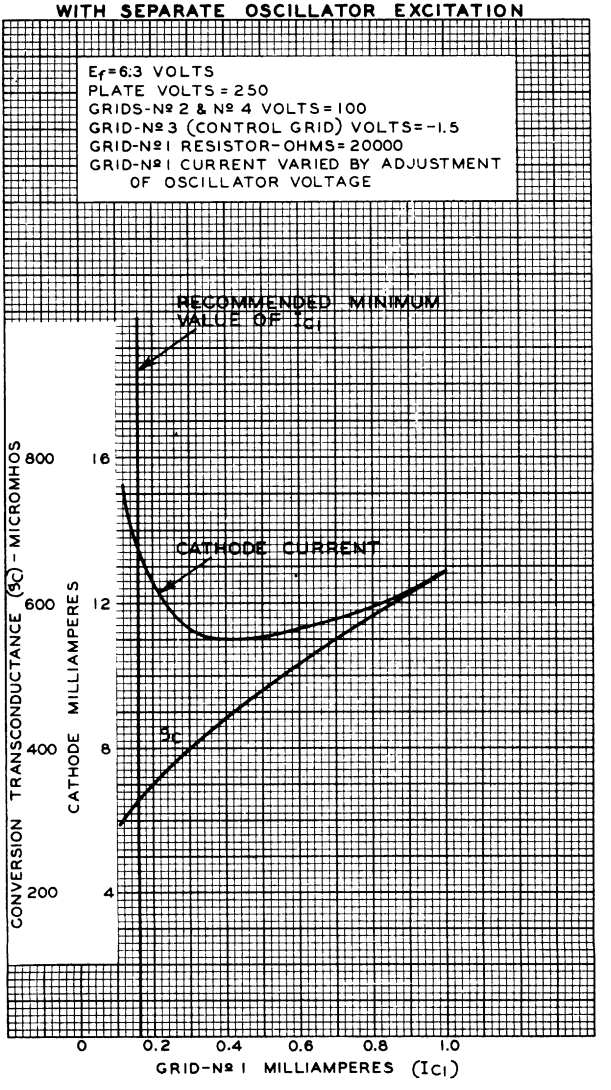
6BE6

OPERATION CHARACTERISTICS



6BE6

OPERATION CHARACTERISTICS
WITH SEPARATE OSCILLATOR EXCITATION



Dual-Control Sharp-Cutoff Pentode—Beam Power Tube

DUODECAR TYPE

For Combined FM-Sound-Detector & AF-Power-Amplifier Applications in Low-B+ TV Receivers

ELECTRICAL CHARACTERISTICS

Bogey Values

Heater Voltage (AC or DC)	E_h	6.3	V
Heater Current	I_h	1.200	A ←
Direct Interelectrode Capacitances			
Without external shield			
Pentode Unit:			
Grid No.1 to plate	c_{g1-p}	0.036	pF
Grid No.3 to plate	c_{g3-p}	3.2	pF
Input: G1 to (K,IS,G3,G2,H)	c_i	6.5	pF
Grid No.3 to all: G3 to (K,IS,P,G2, G1,H)	c_{g3-all}	8.0	pF
Grid No.1 to Grid No.3	c_{g1-g3}	0.11	pF
Beam Power Unit:			
Grid No.1 to plate	c_{g1-p}	0.24	pF
Input: G1 to (K,G3,G2,IS,H)	c_i	13	pF
Output: P to (K,G3,G2,IS,H)	c_o	10	pF
Coupling:			
Pentode plate to beam-power plate	c_{p-p}	0.13	pF

For the following characteristics, see **Conditions**

		Pentode Unit	*Beam Power Unit*	
Plate Resistance (Approx.)	r_p	150	30	kΩ
Transconductance				
Grid No.1 to plate	$g_{m(g1-p)}$	1000	8600	μmho
Grid No.3 to plate	$g_{m(g3-p)}$	400	-	μmho
Zero-Signal Plate Current	I_{bo}	1.3	36	mA
Max-Signal Plate Current	I_b	-	40	mA
Zero-Signal Grid-No.2 Current	I_{c2}	2	3	mA
Max-Signal Grid-No.2 Current	I_{c2}	-	9	mA
Total Harmonic Distortion		-	10	%
Max-Signal Power Output	P_o	-	2.4	W
Cutoff DC Grid-No.1 Voltage for I_b = 10 μA	$E_{c1(co)}$	-4.5	-	V
Cutoff DC Grid-No.3 Voltage for I_b = 10 μA	$E_{c3(co)}$	-4.5	-	V

Conditions

		—Bogey value—		
Heater Voltage	E_h			V
DC Plate Supply Voltage	E_{bb}	150	145	V

← Indicates a change.

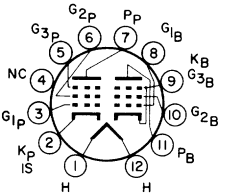
Grid No.3	-	Connected to negative end of R_k	- V
DC Grid-No.2 Supply Voltage	E_{cc2}	100	110 V
Grid No.1	-	Connected to negative end of R_k	-
DC Grid-No.1 Voltage	E_{c1}	-	-6 V
Peak AF Grid-No.1 Voltage	e_{g1m}	-	6 V
Cathode Resistor	R_k	560	- Ω
Load Resistor	R_L	-	3000 Ω

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2.625 in
Maximum Seated Length	2.250 in
Maximum Diameter	1.188 in
Dimensional Outline (JEDEC 9-59)	See *General Section*
Envelope	JEDEC T9
Base	Small-Button Duodecar 12-Pin (JEDEC E12-70)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Heater
Pin 2 – Pentode Cathode, Internal Shield
Pin 3 – Pentode Grid No.1
Pin 4 – No Internal Connection
Pin 5 – Pentode Grid No.3
Pin 6 – Pentode Grid No.2
Pin 7 – Pentode Plate
Pin 8 – Beam-Power Grid No.1
Pin 9 – Beam-Power Cathode, Beam-Power Grid No.3
Pin 10 – Beam-Power Grid No.2
Pin 11 – Beam-Power Plate
Pin 12 – Heater



12EZ

DESIGN-MAXIMUM RATINGS

For operation with Pendode Unit as FM Sound Detector and Beam Power Unit as AF Power Amplifier

		Pentode Unit	*Beam Power Unit*	
DC Plate Voltage	E_b	330	165	V
DC Grid-No.3 (Control-Grid) Voltage	E_{c3}	28	-	V
DC Grid-No.2 (Screen-Grid) Supply Voltage	E_{cc2}	330	-	V
DC Grid-No.2 Voltage	E_{c2}	See *Grid-No.2-Input Rating Chart* at front of Receiving Tube Section	150	V

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

		Pentode Unit	Beam Power Unit	
Positive DC Grid-No.1 (Control-Grid) Voltage. .	E_{c1}	0	-	V
Heater-Cathode Voltage				
Peak	e_{hkm}	±200	±200	V
Average[a]	$E_{hk(av)}$	100	100	V
Heater Voltage (AC or DC).	E_h	5.7 to 6.9		V
Average Cathode Current[a] .	$I_{k(av)}$	-	65	mA
Grid-No.2 Input.	P_{g2}	-	1.8	W
For $E_{c2} \leq 165$ V.	-	1.1	-	W
For $E_{c2} > 165$ V and ≤ 330 V		See *Grid-No.2-Input Rating Chart* at front of Receiving Tube Section	-	W
Plate Dissipation.	P_b	1.7	6.5	W

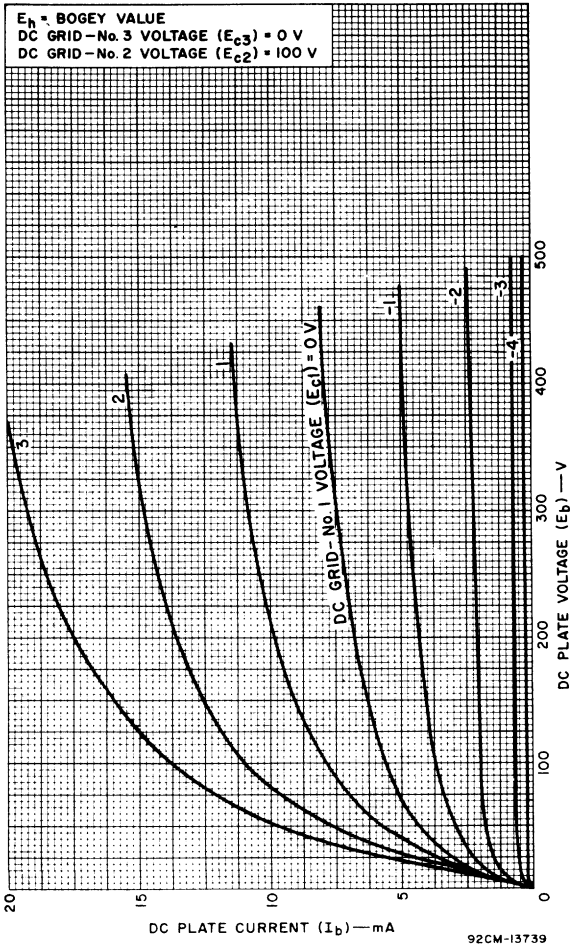
MAXIMUM CIRCUIT VALUES

		Pentode Unit	Beam Power Unit	
Grid-No.1-Circuit Resistance:	$R_{g1(ckt)}$			
For fixed-bias operation	-	250	250	kΩ
For cathode-bias operation	-	500	500	kΩ

[a] Measured with a dc meter.

Typical Plate Characteristics

Pentode Unit



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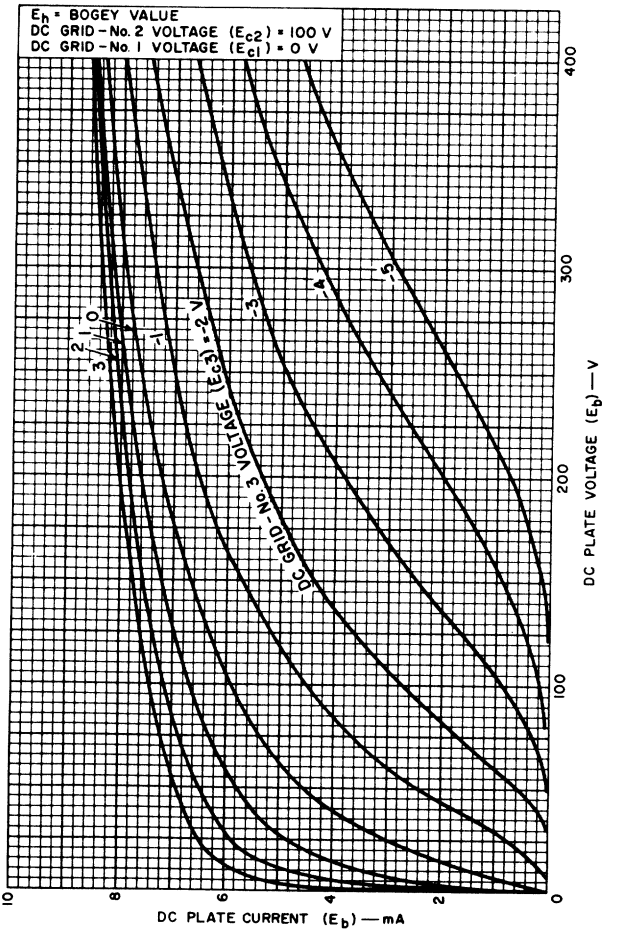
Typical Plate Characteristics

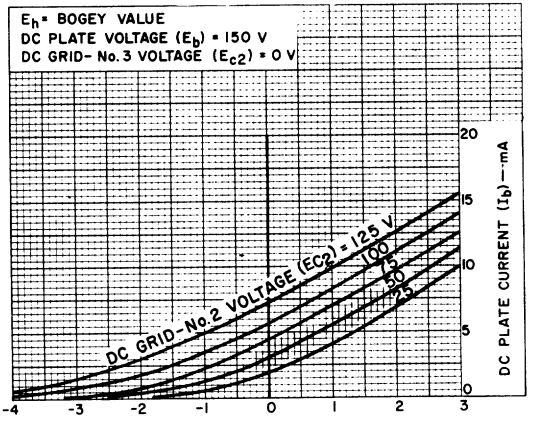
Pentode Unit



92CM-13740

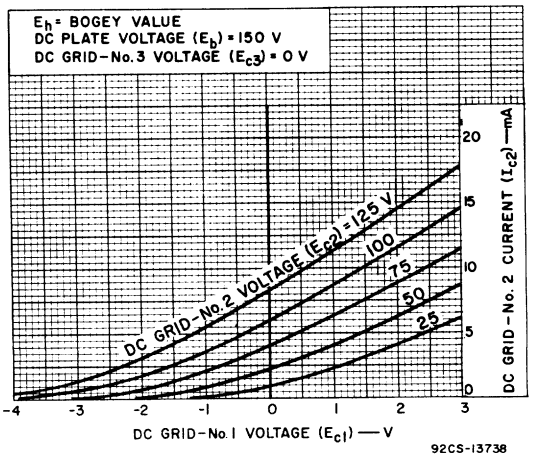
Typical Transfer Characteristics

Pentode Unit



Typical Transfer Characteristics

Pentode Unit



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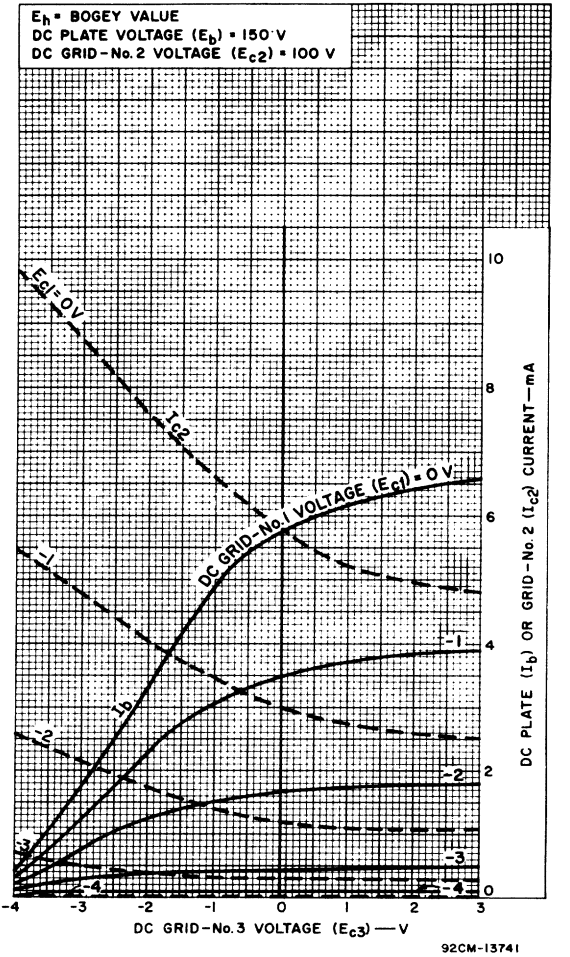
Electronic Components and Devices Harrison, N. J.

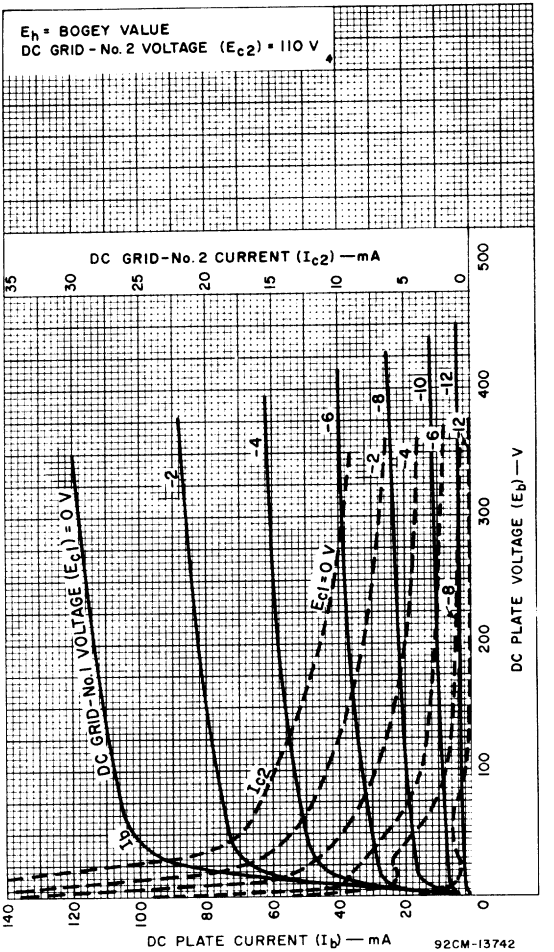
Typical Transfer Characteristics

Pentode Unit



Typical Characteristics

Beam Power Unit



RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

6BH3A

Half-Wave Vacuum Rectifier

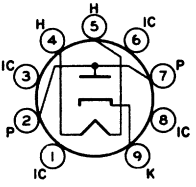
NOVAR TYPE
For Television Damper Service

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.600	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode[a]	5500[b] max.	volts
Heater positive with respect to cathode	300[c] max.	volts
Direct Interelectrode Capacitances (Approx):[d]		
P to (H,K)	6.5	pf
K to (P,H)	9.0	pf
Heater to cathode	2.8	pf

Mechanical:

Mounting Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.005"
Seated Length	2.375" to 2.625"
Diameter	1.062" to 1.188"
Dimensional Outline	See *General Section*
Bulb	T9
Socket	Novar 9-Contact
Base	Small-Button Novar 9-Pin with Exhaust (JEDEC No.E9-89)
Basing Designation for BOTTOM VIEW	9HP



Pin 1 – Do Not Use[e]
Pin 2 – Plate
Pin 3 – Do Not Use[e]
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Do Not Use[e]
Pin 7 – Plate
Pin 8 – Do Not Use[e]
Pin 9 – Cathode

DAMPER SERVICE

For operation in a 525-line, 30-frame system[f]

Maximum Ratings, *Design-Maximum Values:*

Peak Inverse Plate Voltage[a]	5500	max.	volts
Peak Plate Current	1100	max.	ma
Average Plate Current	180	max.	ma
Plate Dissipation	6.8	max.	watts

Characteristic, Instantaneous Value:

Tube Voltage Drop for plate ma = 350	32	volts

[a] This rating is applicable when the duty cycle of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[b] The dc component must not exceed 900 volts.

[c] The dc component must not exceed 100 volts.

[d] Without external shield.

[e] Socket terminals 1, 3, 6, and 8 should not be used as tie points. It is recommended that the socket clips for these pins be removed to reduce the possibility of arc-over and to minimize leakage.

[f] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

6BH6
SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.15	amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield°*	
Grid No.1 to plate	0.0035 max.	0.0035 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	5.4	5.4	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	4.4	4.4	μμf

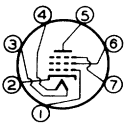
Characteristics, Class A_1 Amplifier:

Plate Voltage	100	250	volts
Grid No.3 (Suppressor)	*Connected to cathode at socket*		
Grid-No.2 Voltage	100	150	volts
Grid-No.1 Voltage	-1	-1	volt
Plate Resistance (Approx.)	0.7	1.4	megohm
Transconductance	3400	4600	μmhos
Plate Current	3.6	7.4	ma
Grid-No.2 Current	1.4	2.9	ma
Grid-No.1 Voltage (Approx.) for plate current of 10 μamp	-5	-7.7	volts

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ±3-3/32"
Maximum Diameter	3/4"
Dimensional Outline	*See General Section*
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CM

Pin 1 - Grid No.1
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate



Pin 6 - Grid No.2
Pin 7 - Grid No.3, Internal Shield

° With external shield JETEC No.316 connected to cathode.

← Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6BH6

SHARP-CUTOFF PENTODE

AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
GRID-No.2 (SCREEN) SUPPLY VOLTAGE	300 max.	volts
→ GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative bias value	50 max.	volts
Positive bias value	0 max.	volts
PLATE DISSIPATION	3 max.	watts
→ GRID-No.2 INPUT:		
For grid-No.2 voltages up to 150 volts	0.5 max.	watt
For grid-No.2 voltages between 150 and 300 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

→ Indicates a change.

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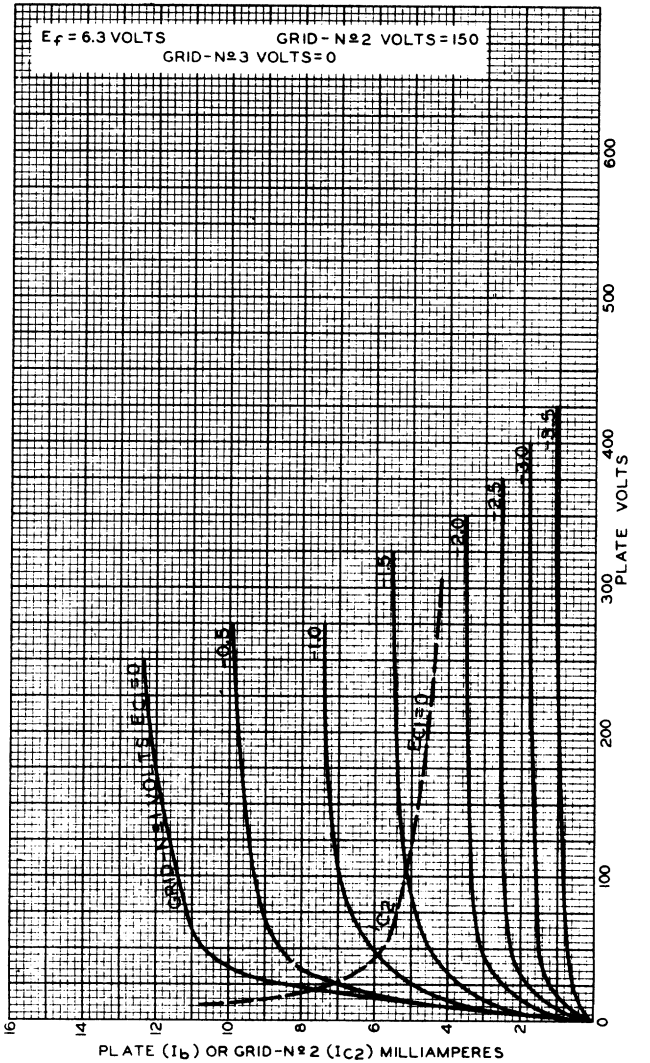
6BH6

AVERAGE PLATE CHARACTERISTICS

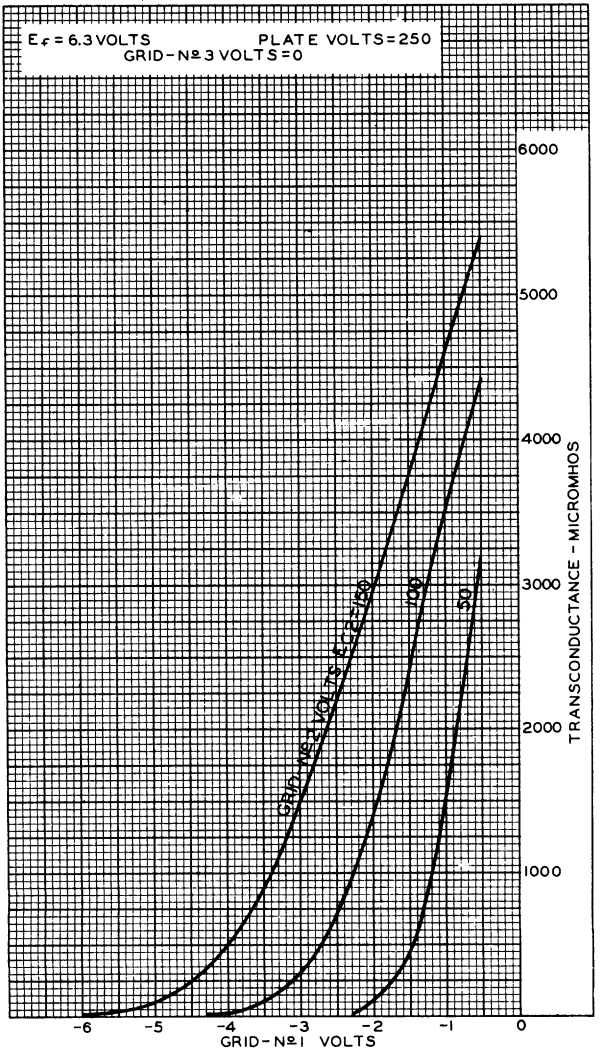


6BH6

RCA

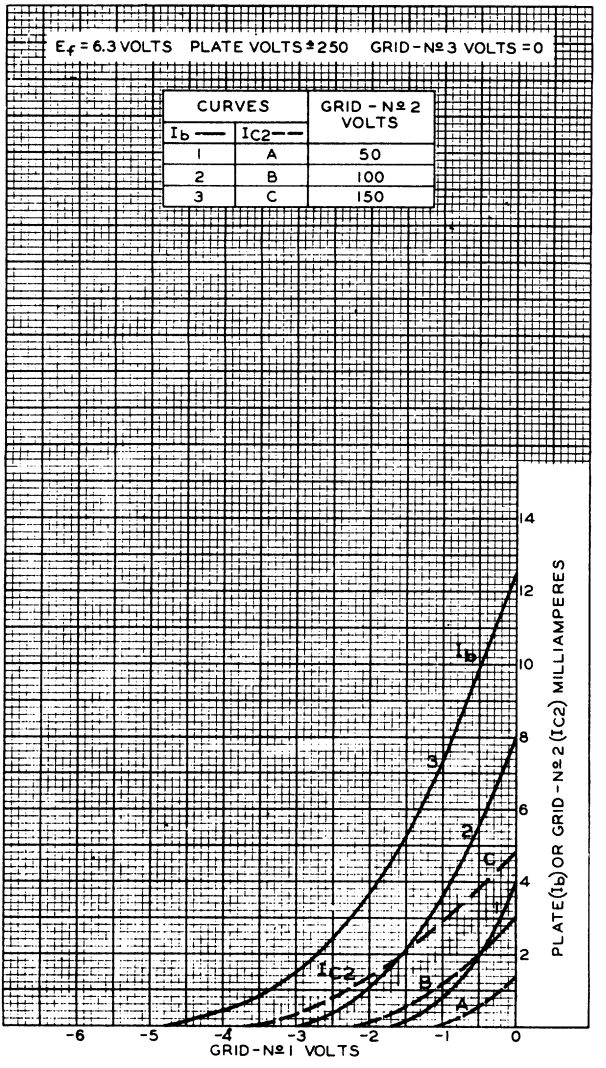
6BH6

AVERAGE CHARACTERISTICS



6BH6

AVERAGE CHARACTERISTICS

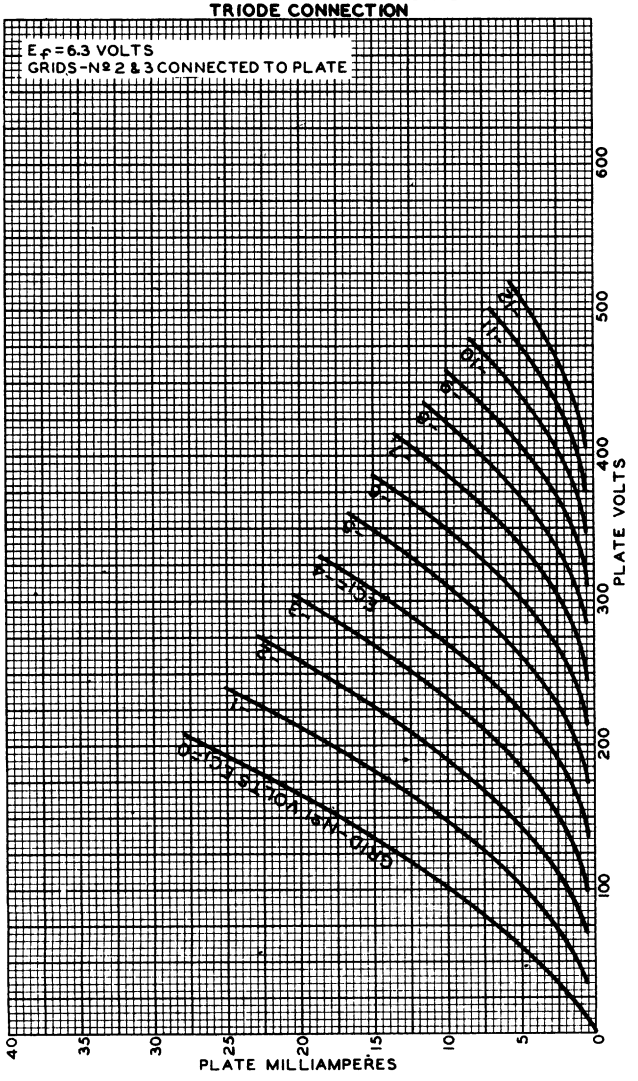


6BH6

6BH6

AVERAGE PLATE CHARACTERISTICS

TRIODE CONNECTION



DEC.10,1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6896

Half-Wave Vacuum Rectifier

DUODECAR TYPE

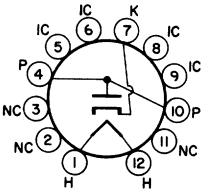
Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*		
Voltage (AC or DC)	6.3 ±0.6	volts
Current at heater volts = 6.3	1.200	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode[a]	3300[b] max.	volts
Heater positive with respect to cathode	300[c] max.	volts
Direct Interelectrode Capacitances (Approx.):[d]		
K to (P,H)	8.0	pf
P to (K,H)	5.5	pf
H to K	2.7	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2.625"
Seated Length	2.000" to 2.250"
Diameter	1.062" to 1.188"
Bulb	T9
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW	12BL

Pin 1 – Heater
Pin 2 – No Internal Connection
Pin 3 – Same as Pin 2
Pin 4 – Plate
Pin 5 – Do Not Use[e]
Pin 6 – Do Not Use[e]
Pin 7 – Cathode
Pin 8 – Do Not Use[e]
Pin 9 – Do Not Use[e]
Pin 10 – Plate
Pin 11 – Same as Pin 2
Pin 12 – Heater



DAMPER SERVICE

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[f]

Peak Inverse Plate Voltage[a]	3300 max.	volts
Peak Plate Current	840 max.	ma
DC Plate Current	140 max.	ma
Plate Dissipation	4 max.	watts

Characteristics, Instantaneous Value.

Tube Voltage Drop for plate ma. = 250	21	volts

[a] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[b] The dc component must not exceed 600 volts.

[c] The dc component must not exceed 100 volts.

[d] Without external shield.

[e] Socket terminals 5,6,8 and 9 should not be used at tie points.

[f] As described in "Standards of Good Engineering Practice Concerning Tevelision Broadcast Stations," Federal Communications Commission.

6BJ6
REMOTE-CUTOFF PENTODE

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.15	amp

Direct Interelectrode Capacitances: ←

	Without External Shield	*With External Shield°*	
Grid No.1 to plate	0.0035 max.	0.0035 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	4.5	4.5	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	5.5	5.5	μμf

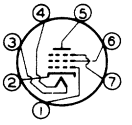
Characteristics, Class A_1 Amplifier:

Plate Voltage	100	250	volts
Grid No.3 (Suppressor)	*Connected to cathode at socket*		
Grid-No.2 Voltage	100	100	volts
Grid-No.1 Voltage	-1	-1	volt
Plate Resistance (Approx.)	0.25	1.3	megohm
Transconductance	3650	3600	μmhos ←
Plate Current	9	9.2	ma
Grid-No.2 Current	3.5	3.3	ma
Grid-No.1 Voltage (Approx.) for transconductance of 10 μmhos	-20	-20	volts ←

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Dimensional Outline	*See General Section*
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1) ←
Basing Designation for BOTTOM VIEW	7CM

Pin 1 – Grid No.1
Pin 2 – Cathode
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Plate



Pin 6 – Grid No.2
Pin 7 – Grid No.3, Internal Shield

° With external shield JETEC No.316 connected to cathode.

← Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6BJ6

6BJ6

REMOTE-CUTOFF PENTODE

AMPLIFIER - Class A1

Maximum Ratings, *Design-Center Values:*

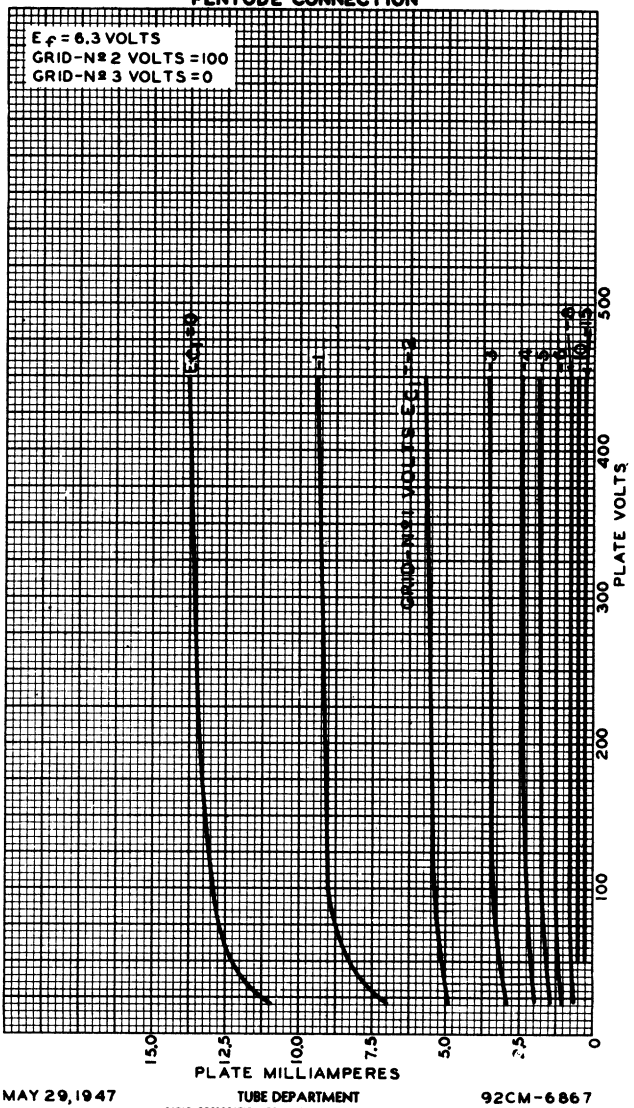
PLATE VOLTAGE	300 max.	volts
GRID-No.2 (SCREEN) SUPPLY VOLTAGE	300 max.	volts
→ GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative bias value	50 max.	volts
Positive bias value	0 max.	volts
PLATE DISSIPATION	3 max.	watts
→ GRID-No.2 INPUT:		
For grid-No.2 voltages up to 150 volts	0.6 max.	watt
For grid-No.2 voltages between 150 and 300 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6BJ6

AVERAGE PLATE CHARACTERISTICS
PENTODE CONNECTION



MAY 29, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

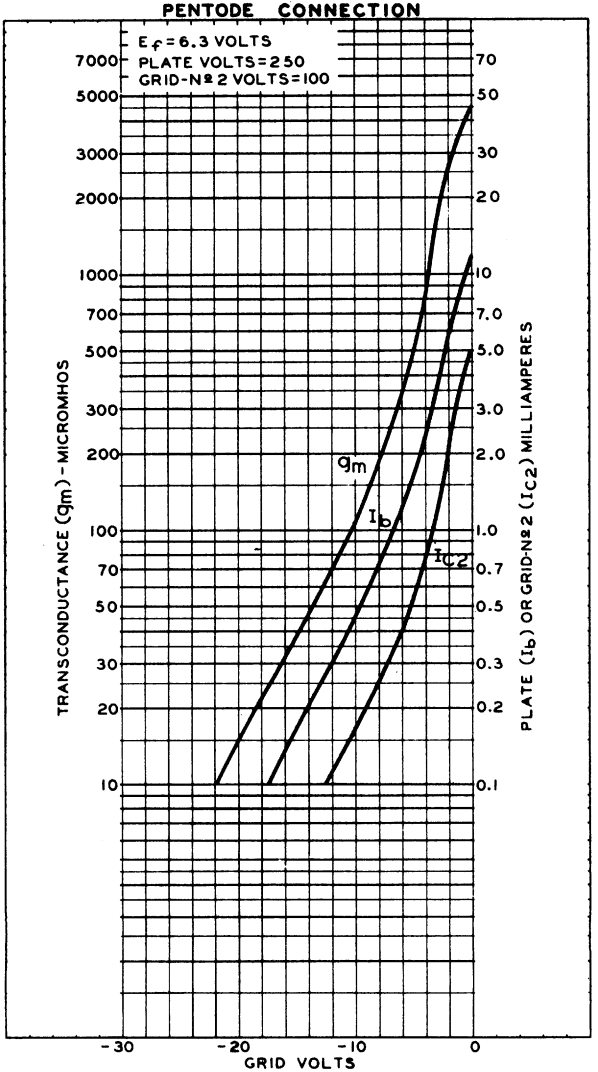
92CM-6867

6BJ6

6BJ6

AVERAGE CHARACTERISTICS

PENTODE CONNECTION

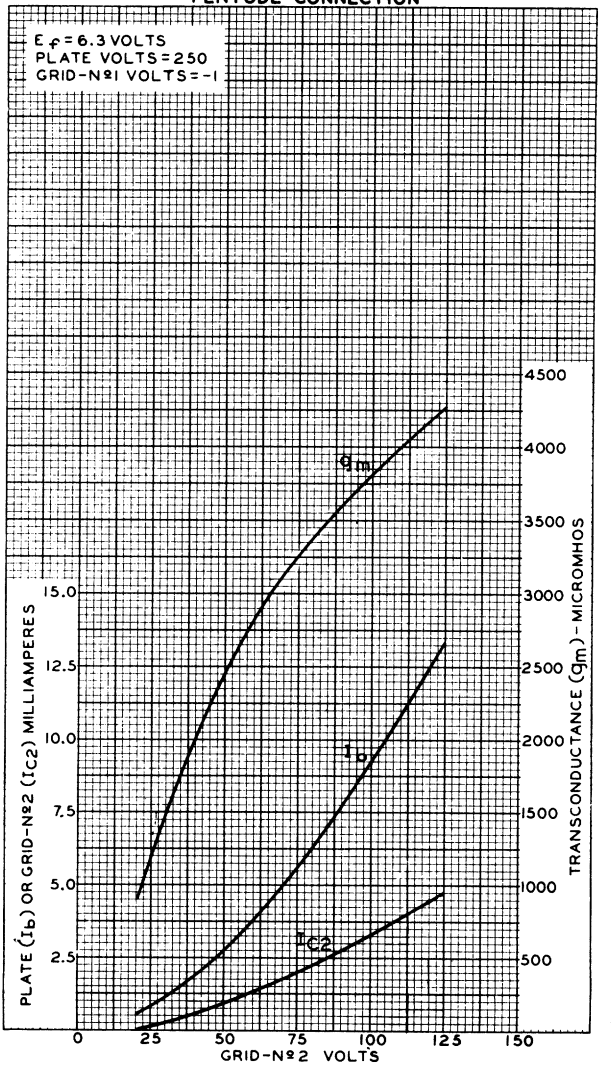


RCA

6BJ6

AVERAGE CHARACTERISTICS

PENTODE CONNECTION



6BJ7
TRIPLE DIODE

9-PIN MINIATURE TYPE

For dc restorer service

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3	volts
Current	0.45	amp
Direct Interelectrode Capacitances (Approx.):[o]		
Plate of unit No.1 to cathode of unit No.1, internal shield, and heater.	3	μμf
Plate of unit No.2 to cathode of unit No.2, internal shield, and heater.	2.6	μμf
Plate of unit No.3 to cathode of unit No.3, internal shield, and heater.	2.6	μμf
Cathode of unit No.1 to plate of unit No.1, internal shield, and heater.	4	μμf
Cathode of unit No.2 to plate of unit No.2, internal shield, and heater.	3.8	μμf
Cathode of unit No.3 to plate of unit No.3, internal shield, and heater.	4	μμf
Plate of unit No.1 to plate of unit No.2.	0.055	μμf
Plate of unit No.2 to plate of unit No.3.	0.036	μμf
Plate of unit No.3 to plate of unit No.1.	0.036	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9AX

Pin 1 - Cathode of Unit No.3
Pin 2 - Plate of Unit No.3
Pin 3 - Internal Shield
Pin 4 - Heater
Pin 5 - Heater

Pin 6 - Plate of Unit No.2
Pin 7 - Cathode of Unit No.2
Pin 8 - Plate of Unit No.1
Pin 9 - Cathode of Unit No.1

DC RESTORER SERVICE

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

PEAK INVERSE PLATE VOLTAGE	330 max.	volts
PEAK PLATE CURRENT	10 max.	ma

[o] Without external shield.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6BJ7

TRIPLE DIODE

DC OUTPUT CURRENT.	1 max.	ma
PEAK HEATER–CATHODE VOLTAGE:		
Heater negative with respect to cathode . .	330 max.	volts
Heater positive with respect to cathode . .	100 max.	volts

Characteristics:

Plate Current for plate volts = 2.7.	10	ma

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6BJ8

TWIN DIODE—MEDIUM-MU TRIODE

9-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage	6.3	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

Direct Interelectrode Capacitances:°

Triode Unit:		
Grid to plate	2.6	μμf
Grid to heater and cathode	2.8	μμf
Plate to heater and cathode	0.31	μμf
Diode Units:		
Diode-No.1 plate to triode grid	0.07 max.	μμf
Diode-No.2 plate to triode grid	0.11 max.	μμf
Diode-No.1 cathode to all other electrodes	4.8	μμf
Diode-No.2 cathode to all other electrodes	4.8	μμf
Diode-No.1 plate to diode-No.2 plate	0.06 max.	μμf
Diode-No.1 plate to diode-No.1 cathode and heater	1.9	μμf
Diode-No.2 plate to diode-No.2 cathode and heater	1.9	μμf
Diode-No.1 cathode to diode-No.1 plate and heater	4.6	μμf
Diode-No.2 cathode to diode-No.2 plate and heater	4.6	μμf
Diode-No.1 plate to all other electrodes	3	μμf
Diode-No.2 plate to all other electrodes	3	μμf

Characteristics, Class A_1 Amplifier (Triode Unit):

Plate Voltage	90	250	volts
Grid Voltage	0	-9	volts
Amplification Factor	22	20	
Plate Resistance (Approx.)	4700	7150	ohms
Transconductance	4700	2800	μmhos
Plate Current	13.5	8	ma
Plate Current for grid volts = -12.5	-	1.7	ma
Grid Voltage (Approx.) for plate μa. = 10	-7	-18	volts

°: See next page.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

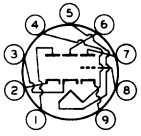
6BJ8

TWIN DIODE—MEDIUM-MU TRIODE

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Maximum Diameter	7/8"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9ER

Pin 1 – Diode–No.2 Plate
Pin 2 – Diode–No.2 Cathode
Pin 3 – Diode–No.1 Cathode
Pin 4 – Heater



Pin 5 – Heater
Pin 6 – Diode–No.1 Plate
Pin 7 – Triode Plate
Pin 8 – Triode Grid
Pin 9 – Triode Cathode

TRIODE UNIT — AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300	max.	volts
GRID VOLTAGE:			
Positive bias value	0	max.	volts
AVERAGE CATHODE CURRENT	20	max.	ma
PLATE DISSIPATION	3.5	max.	watts
PEAK HEATER–CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	1	max.	megohm

TRIODE UNIT — VERTICAL DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	300	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE (Absolute maximum)#	1200■	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	70	max.	ma
Average	20	max.	ma
PLATE DISSIPATION	3.5	max.	watts
PEAK HEATER–CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

○,▲,□,#,■: See next page.

6BJ8

TWIN DIODE—MEDIUM-MU TRIODE

Maximum Circuit Values:

Grid-Circuit Resistance:

For cathode-bias operation.	2.2	max.	megohms

DIODE UNITS — Two

Maximum Ratings, *Design-Center Values:*

Values are for Each Unit

PEAK PLATE CURRENT.	54	max.	ma
DC PLATE CURRENT.	9	max.	ma
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode .	200	max.	volts
Heater positive with respect to cathode .	200▲	max.	volts

○ Without external shield.

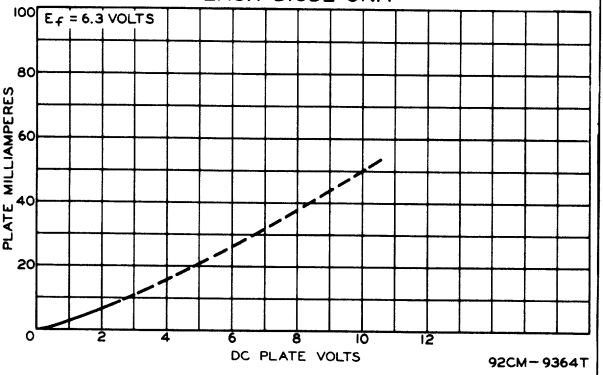
▲ The dc component must not exceed 100 volts.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast stations," Federal Communications Commission.

This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

■ Under no circumstances should this absolute value be exceeded.

AVERAGE PLATE CHARACTERISTIC
EACH DIODE UNIT



92CM-9364T

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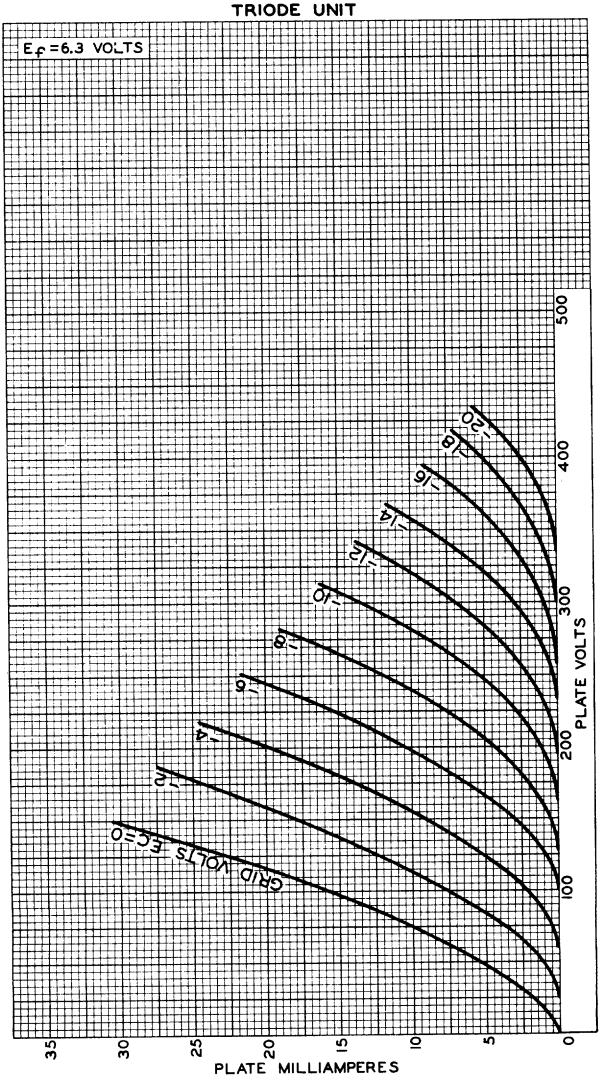
6BJ8

AVERAGE PLATE CHARACTERISTICS

TRIODE UNIT



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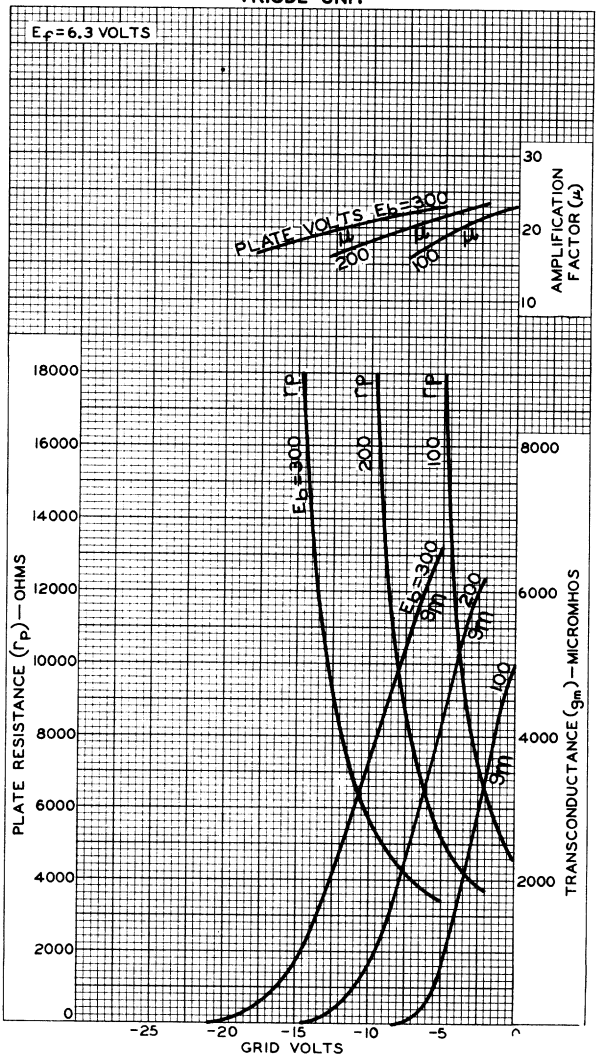
92CM-9531

6BJ8

AVERAGE CHARACTERISTICS

TRIODE UNIT



ELECTRON TUBE DIVISION
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92CM-9535

6BK4B

Beam Triode

High-Voltage, Low-Current Type
For DC Power Supplies in Color-TV Receivers

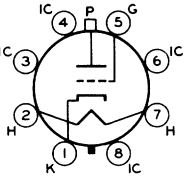
ELECTRICAL

Heater Characteristics and Ratings		
Voltage (AC or DC)	6.3 ± 0.6	V
Current at 6.3 V	0.200	A
Peak heater-cathode voltage:		
Heater negative with respect to cathode.	450[a] max	V
Heater positive with respect to cathode.	Not Recommended	
Direct Interelectrode Capacitances (Approx.)		
Without external shield		
Grid to plate	0.03	pF
Grid to cathode and heater	2.6	pF
Plate to cathode and heater	1.0	pF

MECHANICAL

Operating Position	Any
Maximum Overall Length	5 in
Seated Length	4-1/4 ± 3/16 in
Maximum Diameter	1-23/32 in
Bulb	T12
Cap	Small (JEDEC No.C1-1 or C1-34)
Base (Alternates)	
Short Jumbo-Shell Octal with External Barriers: 8-Pin (JEDEC Group 1, No.B8-71)	
Short Medium-Shell Octal with External Barriers: 8-Pin, Style B (JEDEC Group 1, No.B8-118)	
Basing Designation for BOTTOM VIEW	8GC

Pin 1 – Cathode
Pin 2 – Heater
Pin 3 – Do Not Use
Pin 4 – Do Not Use
Pin 5 – Grid
Pin 6 – Do Not Use
Pin 7 – Heater
Pin 8 – Do Not Use
Cap – Plate



SHUNT VOLTAGE-REGULATOR SERVICE

Maximum Ratings, Design-Maximum Values

DC Plate Voltage	27000	V
Unregulated DC Supply Voltage	60000	V
Grid Voltage		
Peak[b]	-440	V
DC	-135	V
DC Plate Current	1.6	mA
Plate Dissipation	40	W

Typical Operation

As Shunt Voltage-Regulator Tube in Accompanying Circuit

Unregulated Supply		
DC Voltage	36000	V
Equivalent resistance	11	MΩ
Voltage Divider Values		
R_1 (5 W)	220	MΩ
R_2 (2 W)	1	MΩ
R_3 (1/2 W)	0.82	MΩ
Reference Voltage Supply		
DC Value	200	V
Equivalent resistance	1000	Ω
Effective Grid-Plate Transconductance	200	μmhos
DC Plate Current		
For load current of 0 mA	1000	μA
For load current of 1 mA	45	μA
Regulated DC Output Voltage		
For load current of 0 mA	25000	V
For load current of 1 mA	24500	V

MAXIMUM CIRCUIT VALUE

Grid-Circuit Resistance	3	MΩ

[a] Sufficient impedance should be used in series with the cathode to limit the cathode current under prolonged short-circuit conditions to 450 mA. This protective impedance will minimize the danger of heater burnout in case of a momentary internal arc within the tube.

[b] For 20 seconds maximum duration during equipment warm-up period.

CHARACTERISTICS RANGE VALUES

	Note	*Min*	*Max*	
Grid Voltage (1)	1	-7	-	V
Grid Voltage (2)	2	-	-40	V
Grid-Voltage Change	3	-	9	V

Note 1: With dc plate voltage of 30000 volts and dc plate current of 1 mA.

Note 2: With dc plate voltage of 30000 volts and dc plate current of 0.1 mA.

Note 3: Difference between grid voltage (1) and grid voltage (2).

OPERATING CONSIDERATIONS

The 6BK4B *base pins* fit the standard octal socket. Socket terminals for pins 3, 4, 6, and 8 *should not be used for tie points.* Otherwise, tube performance may be adversely affected.

The high voltages at which the 6BK4B is operated may be extremely dangerous to the user. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential with respect to ground, should be housed in a protective enclosure.

At maximum plate dissipation the *plate* of the 6BK4B shows a dull red color. Connection to the plate cap should be made by a connector with flexible lead to prevent any strain on the seal of the cap.

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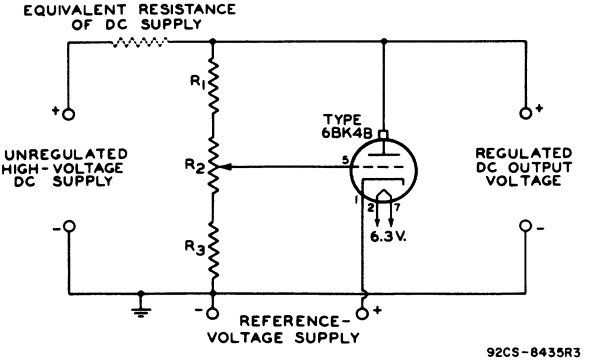
Operation of the 6BK4B with a plate voltage above approximately 16000 volts (absolute value) results in the production of X-Rays which can constitute a health hazard on prolonged exposure at close range unless the tube is adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

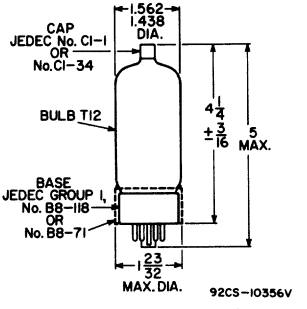
SHUNT VOLTAGE-REGULATOR CIRCUIT



Typical performance data for this basic circuit with certain characteristics of the unregulated dc supply and related voltage-divider values are given in the tabulated data. Other combinations are feasible within the maximum ratings and the maximum circuit values for the 6BK4B.

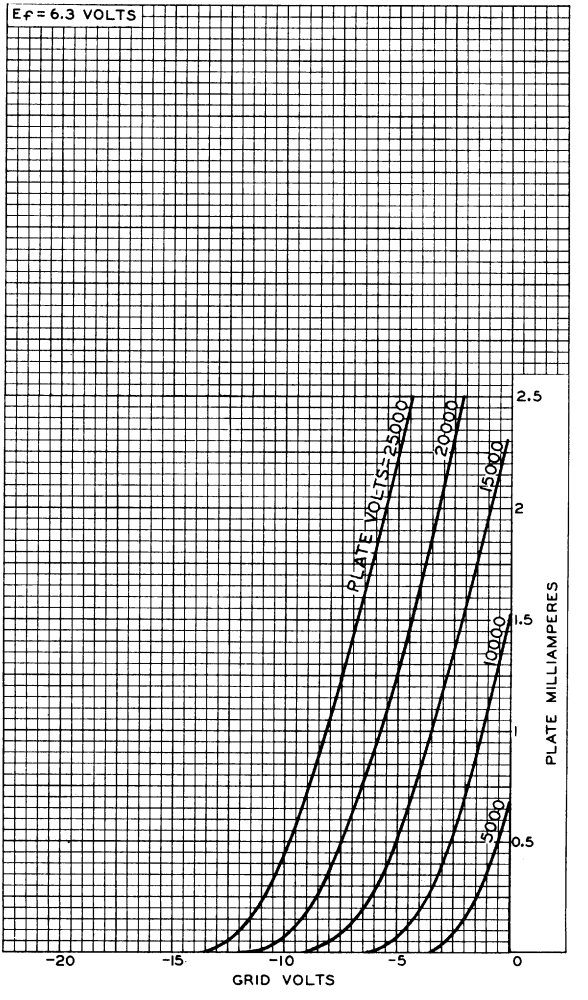
DIMENSIONAL OUTLINE

JEDEC No. 12-36



DIMENSIONS IN INCHES

Average Transfer Characteristics



92CM-8432RI

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6BK7-B

MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

With heater having controlled warm-up time. For TV tuners using direct-coupled cathode-drive circuits.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage	6.3	ac or dc volts
Current	0.45	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

Direct Interelectrode Capacitances:[o]

	Unit No.1	*Unit No.2*	
Grid to plate	1.8	1.8	μμf
Grid to cathode, internal shield, and heater	3	3	μμf
Plate to cathode, internal shield, and heater	1	0.9	μμf
Heater to cathode	2.8	3	μμf
Plate to cathode	0.22	0.22	μμf
Cathode to grid, internal shield, and heater	6	6	μμf
Plate to grid, internal shield, and heater	2.4	2.4	μμf
Grid of unit No.1 to grid of unit No.2	0.004 max.		μμf
Plate of unit No.1 to plate of unit No.2	0.075 max.		μμf

Characteristics, Class A_1 Amplifier (Each Unit):

Plate-Supply Voltage	150	volts
Cathode Resistor	56	ohms
Amplification Factor	43	
Plate Resistance (Approx.)	4600	ohms
Transconductance	9300	μmhos
Plate Current	18	ma
Grid Volts (Approx.) for plate μa = 10	-11	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2

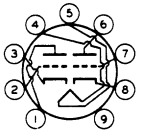
[o] Without external shield.

6BK7-B

MEDIUM-MU TWIN TRIODE

Base. . . . . .Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9AJ

Pin 1 – Plate of Unit No.2
Pin 2 – Grid of Unit No.2
Pin 3 – Cathode of Unit No.2
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Plate of Unit No.1
Pin 7 – Grid of Unit No.1
Pin 8 – Cathode of Unit No.1
Pin 9 – Internal Shield



AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
GRID VOLTAGE:		
Negative-bias value	50 max.	volts
PLATE DISSIPATION	2.7 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	200■ max.	volts
Heater positive with respect to cathode.	200▲ max.	volts

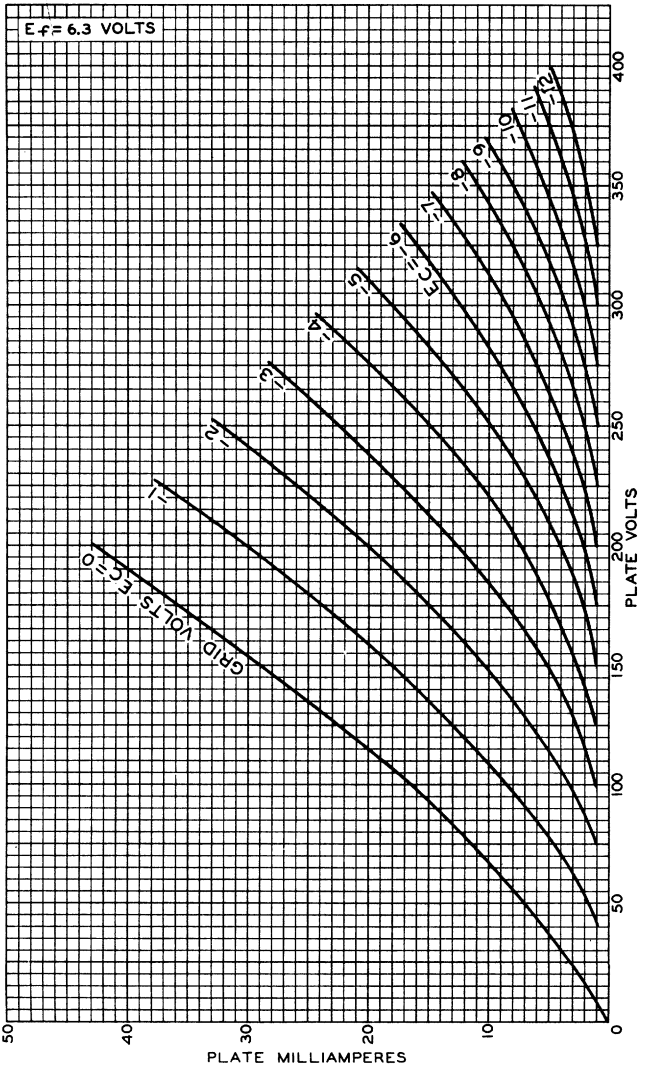
■ Under cutoff conditions in direct-coupled cathode-drive circuits, it is permissible for this voltage to be as high as 300 volts.

▲ The dc component must not exceed 100 volts.

6BK7-B

AVERAGE PLATE CHARACTERISTICS

EACH UNIT



ELECTRON TUBE DIVISION
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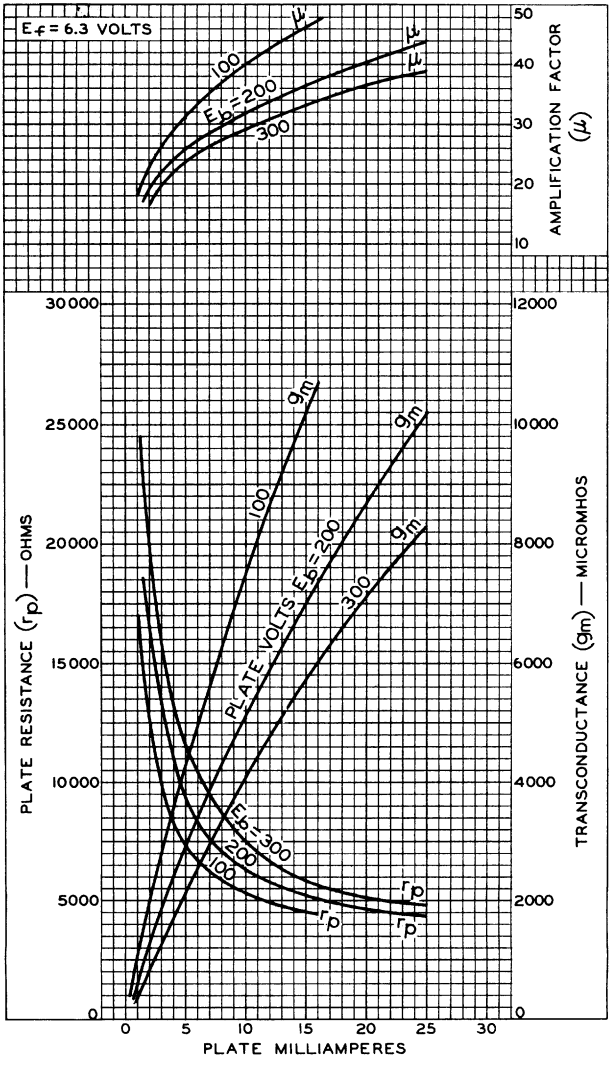
92CM-9764

6BK7-B

6BK7-B

AVERAGE CHARACTERISTICS

EACH UNIT



ELECTRON TUBE DIVISION
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92CM-9768

6BL7-GTA

MEDIUM-MU TWIN TRIODE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage	6.3	ac or dc volts
Current	1.5	amp

Direct Interelectrode Capacitances (Approx.):[o]

	Unit No.1	Unit No.2	
Grid to plate	6	6	μμf
Grid to cathode and heater	4.2	4.6	μμf
Plate to cathode and heater	0.9	0.9	μμf

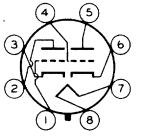
Characteristics, Class A_1 Amplifier (Each Unit):

Plate Voltage	150	250	250	volts
Grid Voltage	0	−17	−9	volts
Amplification Factor	−	−	15	
Plate Resistance (Approx.)	−	−	2150	ohms
Transconductance	−	−	7000	μmhos
Plate Current	65*	4	40	ma
Grid Voltage (Approx.) for plate current of 50 μa	−	−	−23	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-9/32"
Dimensional Outline	*See General Section*
Bulb	T9
Base	Short Intermediate-Shell Octal 8-Pin with External Barriers (JETEC No.B8-58)
Basing Designation for BOTTOM VIEW	8BD

Pin 1 – Grid of Unit No.2
Pin 2 – Plate of Unit No.2
Pin 3 – Cathode of Unit No.2
Pin 4 – Grid of Unit No.1



Pin 5 – Plate of Unit No.1
Pin 6 – Cathode of Unit No.1
Pin 7 – Heater
Pin 8 – Heater

VERTICAL DEFLECTION OSCILLATOR♦

Unless Otherwise Specified, Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	500 max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	400 max.	volts

o,*,♦,□: see next page.

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TENTATIVE DATA

6BL7-GTA

MEDIUM-MU TWIN TRIODE

CATHODE CURRENT:			
Peak	210	max.	ma
DC	60	max.	ma
PLATE DISSIPATION:			
Either plate	10	max.	watts
Both plates (Both units operating)	12	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	4.7	max.	megohms

VERTICAL DEFLECTION AMPLIFIER♦

Unless Otherwise Specified, Values are for Each Unit

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	500	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE#			
(Absolute maximum)	2000■	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	210	max.	ma
DC	60	max.	ma
PLATE DISSIPATION:			
Either plate†	10	max.	watts
Both plates (Both units operating)	12	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For Cathode-bias operation†	4.7	max.	megohms

○ Without external shield.

* This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

♦ When this tube type is operated as a combined vertical deflection oscillator and amplifier, it is recommended that unit No.1 (pins 4, 5, and 6) be used as the oscillator.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

▲ The dc component must not exceed 100 volts.

\# This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

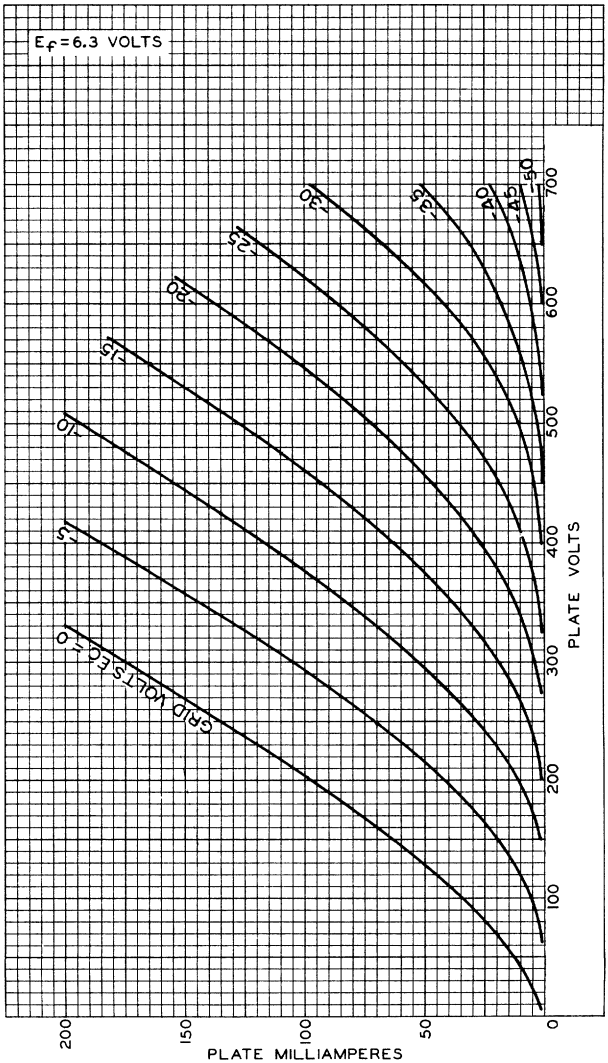
■ Under no circumstances should this absolute value be exceeded.

† In stages operating with grid-resistor bias, an adequate cathode resistor or other suitable means is required to protect the tube in the absence of excitation.

6BL7-GTA

AVERAGE PLATE CHARACTERISTICS

EACH UNIT



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9526

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Center Values):*		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.450	amp
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances:[a]		
Triode Unit:		
Grid to plate	1.5	μμf
Grid to cathode and heater	2.5	μμf
Plate to cathode and heater	1.8	μμf
Pentode Unit:		
Grid No.1 to plate	0.025 max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	5.5	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	3.8	μμf
Pentode plate to triode grid	0.02 max.	μμf
Pentode grid No.1 to triode plate	0.16 max.	μμf
Pentode plate to triode plate	0.07 max.	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*	
Plate Voltage	100	170	volts
Grid-No.2 Voltage	–	170	volts
Grid-No.1 Voltage	-2	-2	volts
Amplification Factor	20	–	
Amplification Factor, Grid No.2 to Grid No.1	–	47	
Plate Resistance (Approx.)	–	0.4	megohm
Transconductance	5000	6200	μmhos
Plate Current	14	10	ma
Grid-No.2 Current	–	2.8	ma
Input Resistance at frequency (Mc) = 50	–	0.01	megohm
Equivalent Noise Resistance	–	1500	ohms

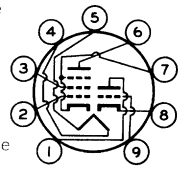
Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential

6BL8

Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9DC

Pin 1 – Triode Plate
Pin 2 – Pentode Grid No.1
Pin 3 – Pentode Grid No.2
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Plate



Pin 7 – Pentode Grid No.3, Pentode Cathode, Internal Shield
Pin 8 – Triode Cathode
Pin 9 – Triode Grid

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

	Triode Unit	*Pentode Unit*	
PLATE SUPPLY VOLTAGE	550 max.	550 max.	volts
PLATE VOLTAGE	250 max.	250 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	–	550 max.	volts
GRID-No.2 VOLTAGE:			
With cathode ma. = 14	–	175 max.	volts
With cathode ma. < 10	–	200 max.	volts
CATHODE CURRENT	14 max.	14 max.	ma
GRID-No.2 INPUT:			
With plate dissipation (watts) > 1.2	–	0.5 max.	watt
With plate dissipation (watts) < 1.2	–	0.75 max.	watt
PLATE DISSIPATION	1.5 max.	1.7 max.	watts

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5 max.	0.5 max.	megohm
For cathode-bias operation	0.5 max.	1 max.	megohm

[a] Without external shield.

6BM8/ECL82

High-Mu Triode—Power Pentode

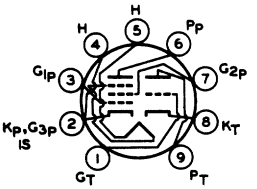
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.780	amp
Peak heater-cathode voltage	100	volts
Direct Interelectrode Capacitances:		
Triode Unit:		
Grid to plate	4.0	pf
Input: G_T to (K_T, H)	2.7	pf
Output: P_T to (K_T, H)	4.0	pf
Grid to heater	0.1 max.	pf
Pentode Unit:		
Grid No.1 to plate	0.3 max.	pf
Input: $G1_P$ to ($K_P + G3_P$ + IS, $G2_P$, H)	9.3	pf
Output: P_P to ($K_P + G3_P$ + IS, $G2_P$, H)	8.0	pf
Grid-No.1 to heater	0.3 max.	pf
Triode plate to pentode grid No.1	0.02 max.	pf
Triode grid to pentode plate	0.02 max.	pf
Triode grid to pentode grid No.1	0.025 max.	pf
Triode plate to pentode plate	0.25 max.	pf

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	3-1/16"
Maximum Seated Length	2-13/16"
Length, Base Seat to Bulb Top (Excluding tip)	2-7/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline (JEDEC No.6-4)	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9EX

Pin 1 – Triode Grid
Pin 2 – Pentode Cathode, Grid No.3, Internal Shield
Pin 3 – Pentode Grid No.1
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Plate
Pin 7 – Pentode Grid No.2
Pin 8 – Triode Cathode
Pin 9 – Triode Plate



CLASS A_1 AMPLIFIER

Characteristics:

	Triode Unit	*Pentode Unit*	
Plate Voltage	100	200	volts
Grid-No.2 Voltage	–	200	volts
Grid-No.1 Voltage	0	-16	volts
Grid-No.1 Voltage (RMS)	–	6.6	volts
Amplification Factor	70	9.5[a]	
Plate Resistance (Approx.)	–	20000	ohms
Transconductance	2500	6400	μmhos
Plate Current	3.5	35[b]	ma
Zero-Signal Grid-No.2 Current	–	7	ma
Load Resistance	–	5600	ohms
Total Harmonic Distortion	–	10	%
Max.-Signal Power Output	–	3.5	watts

Maximum Ratings, *Design-Center Values:*

Plate Supply Voltage	550	900	volts
Plate Voltage	300	600	volts
Grid-No.2 Supply Voltage	–	550	volts
Grid-No.2 Voltage	–	300	volts
Grid-No.2 Input	–	1.8	watts
Plate Dissipation	1	[c]	watts
Average Cathode Current	15	50	ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	1	1	megohm
For cathode-bias operation	2	2	megohms
Between heater and cathode	0.02	0.02	megohm

[a] Grid No. 2 to grid No. 1.

[b] Zero-signal plate current.

[c] At plate voltage less than 250 volts, maximum plate dissipation is 7 watts; at plate voltage greater than 250 volts, maximum plate dissipation is 5 watts.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

6BN4A

Medium-Mu Triode

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.2	amp
Direct Interelectrode Capacitances (Approx.):[a]		
Grid to plate	1.2	μμf
Grid to cathode and heater	3.2	μμf
Plate to cathode and heater	1.4	μμf

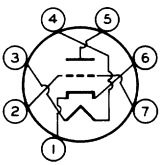
Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	150	volts
Cathode Resistor	220	ohms
Amplification Factor	43	
Plate Resistance (Approx.)	5400	ohms
Transconductance	7700	μmhos ←
Plate Current	9	ma
Grid Volts (Approx.) for plate μa = 100	-6	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7EG

Pin 1 – Cathode
Pin 2 – Grid
Pin 3 – Heater
Pin 4 – Heater



Pin 5 – Plate
Pin 6 – Cathode
Pin 7 – Grid

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	275 max.	volts
GRID VOLTAGE:		
Positive-bias value	0 max.	volts
CATHODE CURRENT	22 max.	ma
PLATE DISSIPATION	2.2 max.	watts

← Indicates a change.

PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	100 max.	volts
Heater positive with respect to cathode.	100 max.	volts

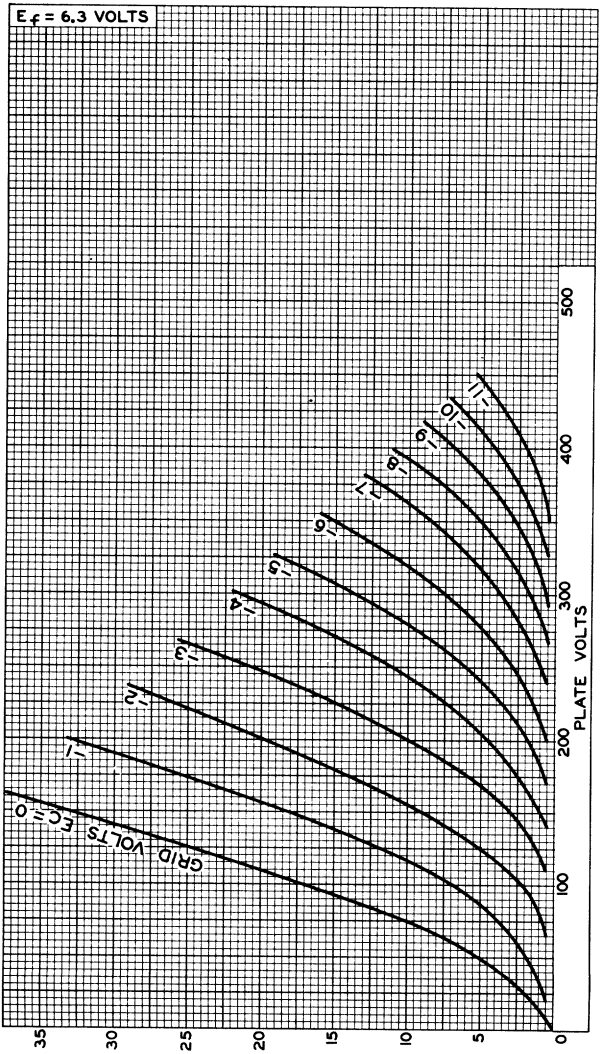
Maximum Circuit Values:

Grid-Circuit Resistance	0.5 max.	megohm

[a] With external shield JEDEC No.316 connected to cathode.

6BN4-A

AVERAGE PLATE CHARACTERISTICS



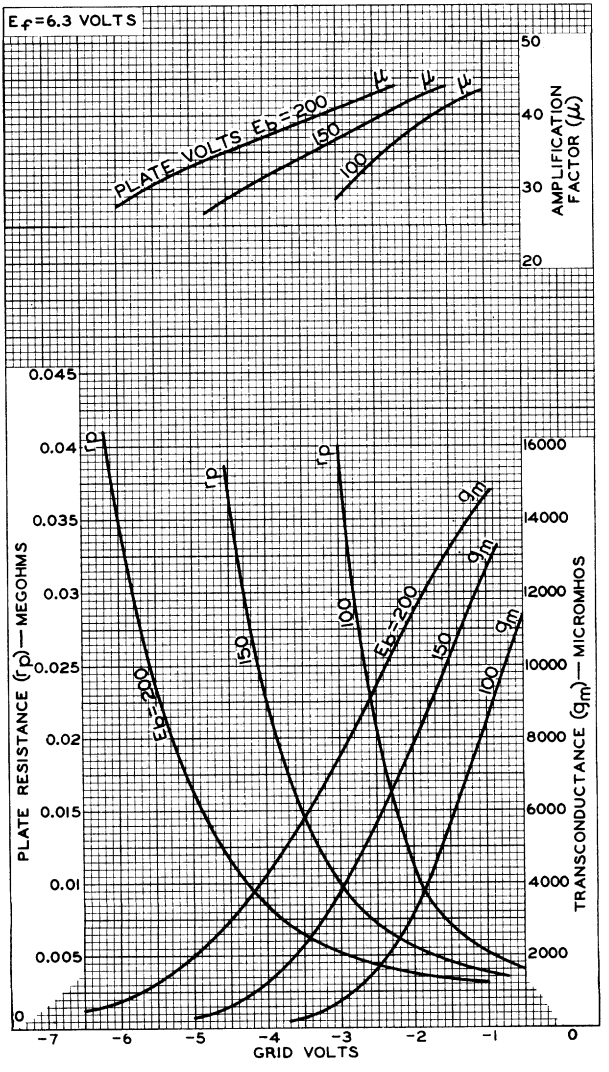
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9941

6BN4-A

6BN4-A

AVERAGE CHARACTERISTICS



6BN6

Beam Tube

7-PIN MINIATURE TYPE

For Use in FM and TV Receivers As Combined Limiter, Discriminator, and Audio-Voltage-Amplifier Tube

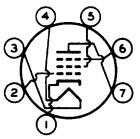
GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts ←
Current at 6.3 volts	0.3	amp
Direct Interelectrode Capacitances:▲		
Grid No.1 to cathode & internal shields, plate, grid No.3, grid No.2, and heater	4.2	μμf
Grid No.3 to cathode & internal shields, plate, grid No.2, grid No.1, and heater	3.3	μμf
Grid No.1 to grid No.3	0.004 max.	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Maximum Diameter	0.650" to 0.750" ←
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7DF



Pin 1 – Cathode, Internal Shields
Pin 2 – Grid No.1
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Grid No.2
Pin 6 – Grid No.3
Pin 7 – Plate

LIMITER & DISCRIMINATOR SERVICE ←

Maximum Ratings, *Design-Maximum Values:*

PLATE SUPPLY VOLTAGE	330 max.	volts
GRID-No.3 (QUADRATURE-GRID) VOLTAGE	●	
GRID-No.2 (ACCELERATOR-GRID) VOLTAGE	110 max.	volts
GRID-No.1 (LIMITER-GRID) VOLTAGE:		
Positive-peak value	60 max.	volts
CATHODE CURRENT	13 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200■max.	volts

← Indicates a change.

Typical Operation:

In accompanying typical quadrature-grid-fm-detector circuit

Input-Signal Center Frequency	*4.5*	*10.7*	*10.7*	*Mc*
Plate Supply Voltage.	270	85	285	volts
Plate Voltage	121	63	122	volts
Grid-No.3 Voltage . .	●	●	●	
Grid-No.2 Voltage . .	100	55	100	volts
Cathode-Circuit Resistance★	200 to 400	200 to 400	200 to 400	ohms
Peak AF Output Voltage	16.8	6	16.6	volts
Minimum Grid-No.1 Signal Voltage (RMS) for AM rejection★ .	2	1.25	2	volts
Minimum Grid-No.1 Signal Voltage (RMS) for limiting action♦	1.25	1.25	1.25	volts
Plate Current	0.44	0.25	0.49	ma
Grid-No.2 Current . .	10	4.1	9.8	ma
Plate Load Resistor .	0.33	0.085	0.33	megohm
Linearity Resistor. .	1000	470	1500	ohms
Integrating Capacitor	0.001	0.002	0.001	μf
Coupling Capacitor. .	0.25	0.25	0.01	μf
Frequency Deviation .	±25	±75	±75	kc
AM Rejection:				
For grid-No.1 signal volts (RMS) = 2 .	25	31	20	db
For grid-No.1 signal volts (RMS) = 3 .	30	30	29	db
Total Harmonic Distortion.	1.8	2	1.6	%

▲ Without external shield.

● For proper operation of this electron tube in the accompanying Typical Quadrature-Grid-FM Detector Circuit, the Q of the quadrature-grid tuned circuit (L_1, C6) should be sufficiently high to assure that a 4-volt rms signal is developed at the quadrature grid when a 2-volt rms signal at the center frequency is applied to grid No.1.

It is recommended that L_1 be shunted by a capacitance of at least 10 μμf. This capacitance may be composed of tube capacitance, stray capacitance, the distributed capacitance of L_1, and a fixed capacitor.

■ The dc component must not exceed 100 volts.

★ The cathode-circuit resistance should be adjusted for maximum AM rejection at the AF output of the circuit at the specified grid-No.1 signal voltage. AM rejection is measured with an applied signal containing 30 per cent amplitude modulation and 30 per cent frequency modulation.

♦ At signal levels above specified value, limiting is within ±2 decibels.

OPERATING CONSIDERATIONS

To insure proper phasing of the signal voltage developed at the quadrature grid, the components of the quadrature-grid circuit should be shielded from those of the control-grid circuit.

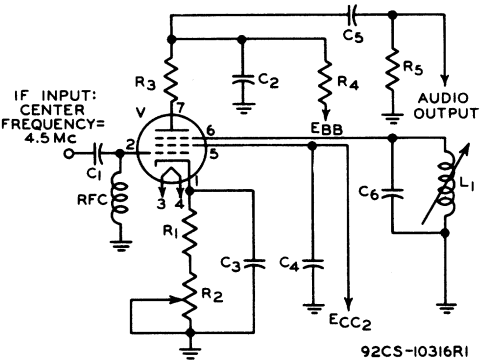
To obtain a symmetrical discriminator-response curve, the plate currents for no input signal and for unmodulated

→ Indicates a change.

input signal should be equal. To assure this equality, it is necessary that the plate voltage and grid-No.2 voltage have the proper values.

The proper plate voltage for any grid-No.2 voltage may be determined from the accompanying *Operation Characteristics* curve. This curve may also be used to determine the average dynamic plate current for any combination of grid-No.2 voltage and plate voltage.

TYPICAL QUADRATURE-GRID-FM-DETECTOR CIRCUIT



C_1: 100 $\mu\mu$f
C_2: Integrating capacitor, 0.001 μf
C_3 C_4: 0.01 μf
C_5: 0.25 μf
C_6: 10 $\mu\mu$f●
L_1: ●
R_1: 200 ohms
R_2: Cathode-bias potentiometer, 200 ohms
R_3: Linearity resistor, 1000 ohms
R_4: Plate-load resistor, 0.33 megohm
R_5: 0.47 megohm
V: Electron-tube-type 6BN6

● For proper operation of this electron tube in the accompanying Typical Quadrature-Grid-FM Detector Circuit, the Q of the quadrature-grid tuned circuit (L_1, C_6) should be sufficiently high to assure that a 4-volt rms signal is developed at the quadrature grid when a 2-volt rms signal at the center frequency is applied to grid No.1.

It is recommended that L_1 be shunted by a capacitance of at least 10 $\mu\mu$f. This capacitance may be composed of tube capacitance, stray capacitance, the distributed capacitance of L_1, and a fixed capacitor.

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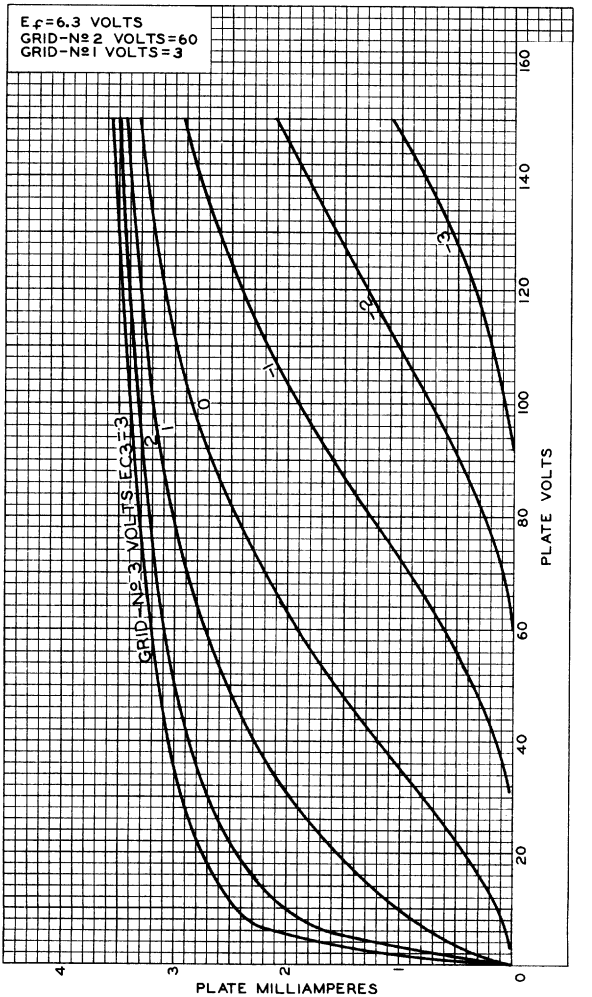
6BN6

AVERAGE PLATE CHARACTERISTICS



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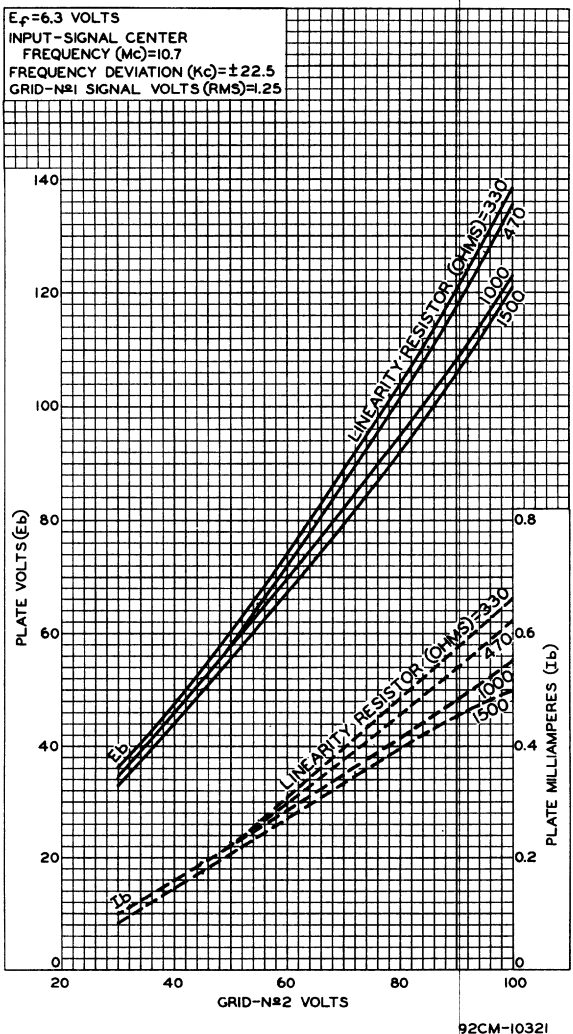
OPERATION CHARACTERISTICS



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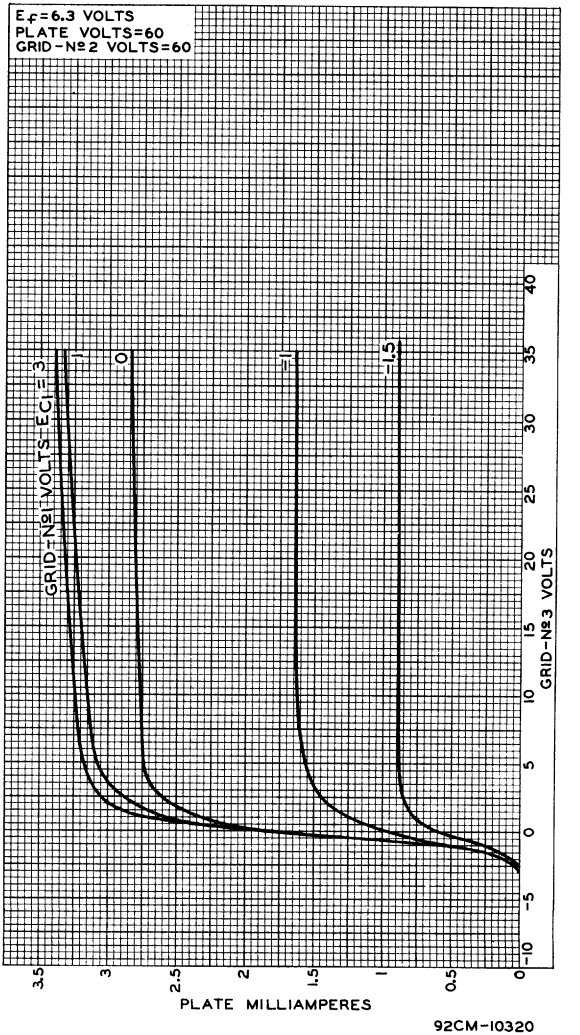
6BN6

AVERAGE CHARACTERISTICS



92CM-10320

AVERAGE CHARACTERISTICS

6BN8

TWIN DIODE—HIGH-MU TRIODE

9-PIN MINIATURE TYPE

With heater having controlled warm-up time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3	volts
Current	0.6 ± 6%	amp ←
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances:		
Triode Unit:		
Grid to plate	2.5	μμf
Grid to heater and cathode	3.6	μμf
Plate to heater and cathode	0.25	μμf
Diode Units:		
Diode-No.1 plate to triode grid	0.06 max.	μμf
Diode-No.2 plate to triode grid	0.1 max.	μμf
Diode-No.1 cathode to all other electrodes	5	μμf
Diode-No.2 cathode to all other electrodes	5	μμf
Diode-No.1 plate to diode-No.2 plate	0.07 max.	μμf
Diode-No.1 plate to diode-No.1 cathode and heater	1.9	μμf
Diode-No.2 plate to diode-No.2 cathode and heater	1.9	μμf
Diode-No.1 cathode to diode-No.1 plate and heater	4.8	μμf
Diode-No.2 cathode to diode-No.2 plate and heater	4.8	μμf
Diode-No.1 plate to all other electrodes	3	μμf
Diode-No.2 plate to all other electrodes	3	μμf

Characteristics, Class A_1 Amplifier (Triode Unit):

Plate Voltage	100	250	volts
Grid Voltage	−1	−3	volts
Amplification Factor	75	70	
Plate Resistance (Approx.)	21000	28000	ohms
Transconductance	3500	2500	μmhos
Plate Current	1.5	1.6	ma
Grid Voltage (Approx.) for plate μa = 10	−2.5	−5.5	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*

← Indicates a change.

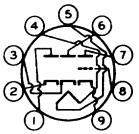
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6BN8

TWIN DIODE—HIGH-MU TRIODE

Bulb. T6-1/2
Base. . . . . .Small-Button Noval 9-Pin (JEDEC No. E9-1)
Basing Designation for BOTTOM VIEW. 9ER

Pin 1 – Diode-No. 2 Plate
Pin 2 – Diode-No. 2 Cathode
Pin 3 – Diode-No. 1 Cathode
Pin 4 – Heater



Pin 5 – Heater
Pin 6 – Diode-No. 1 Plate
Pin 7 – Triode Plate
Pin 8 – Triode Grid
Pin 9 – Triode Cathode

TRIODE UNIT — AMPLIFIER — Class A_1

→ **Maximum Ratings,** *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
GRID VOLTAGE:			
Positive-bias value	0	max.	volts
PLATE DISSIPATION	1.7	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	1	max.	megohm

DIODE UNITS — Two

Maximum Ratings, *Design-Maximum Values:*

Values are for Each Unit

PEAK PLATE CURRENT	54	max.	ma
DC PLATE CURRENT	9	max.	ma
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

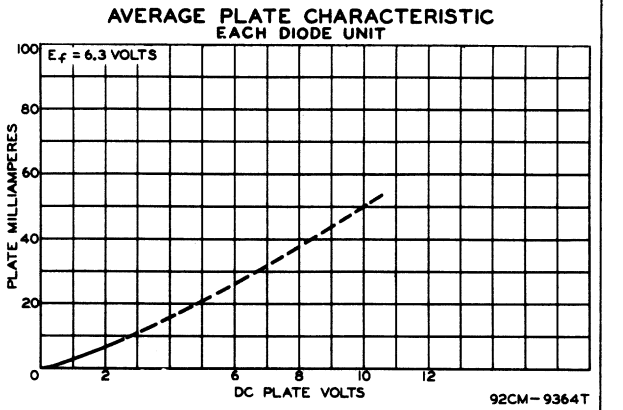
○ Without external shield.
▲ The dc component must not exceed 100 volts.

→ Indicates a change.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6BN8

TWIN DIODE—HIGH-MU TRIODE



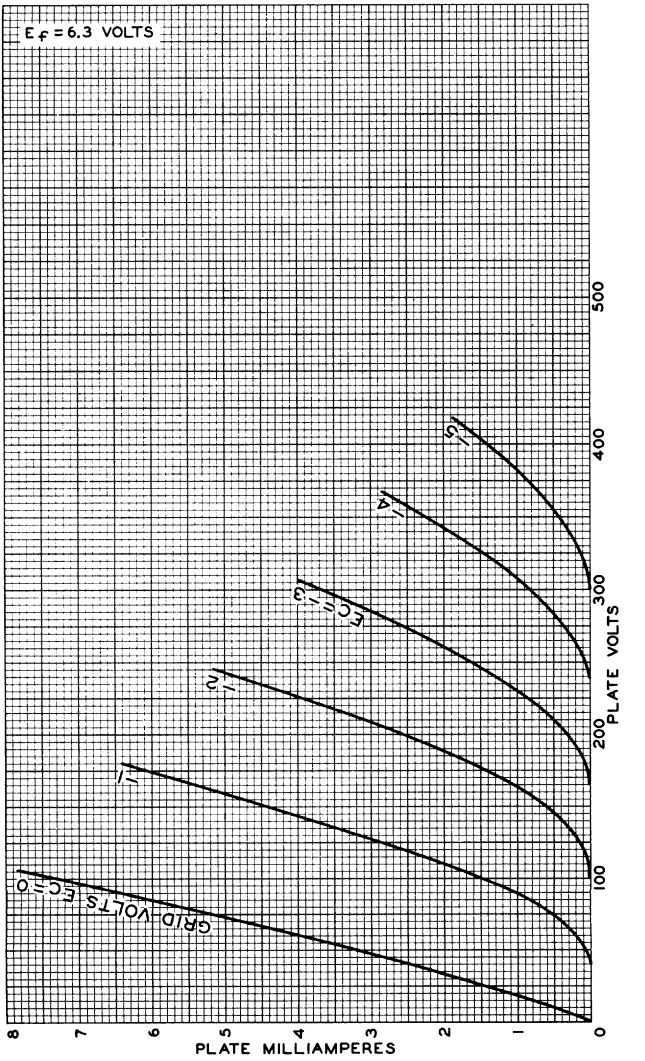
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6BN8

6BN8

AVERAGE PLATE CHARACTERISTICS

TRIODE UNIT



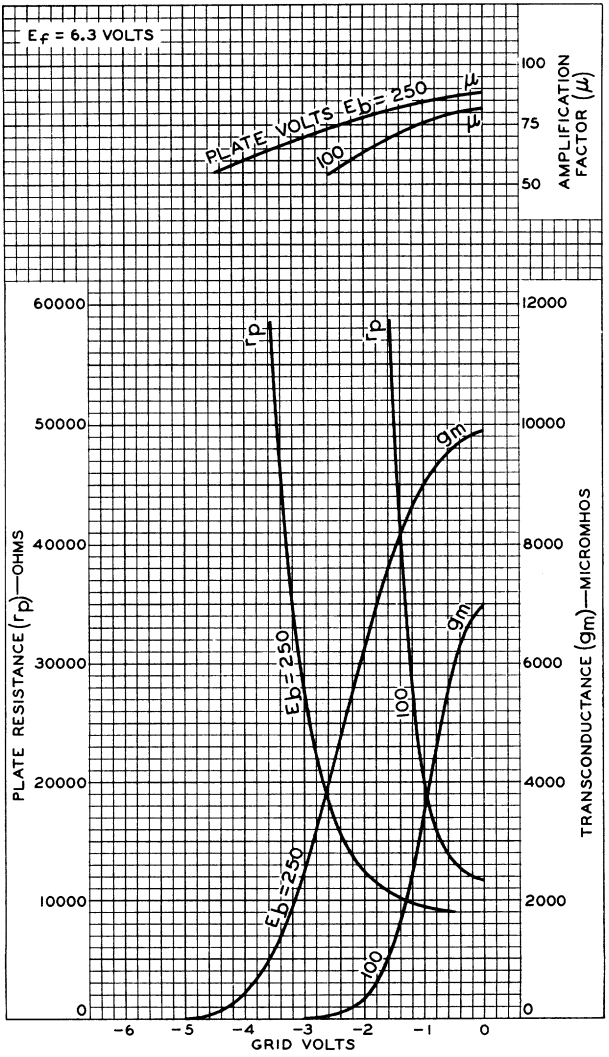
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9363

6BN8

AVERAGE CHARACTERISTICS

TRIODE UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM – 9365

6BQ5
POWER PENTODE

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.76	amp
Direct Interelectrode Capacitances:[o]		
Grid No.1 to plate	0.5 max.	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	10.8	μμf
Plate to cathode & grid No.3, grid No.2, and heater	6.5	μμf

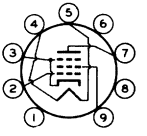
Characteristics, Class A_1 Amplifier:

Plate Voltage	250	volts
Grid-No.2 (Screen-grid) Voltage	250	volts
Grid-No.1 (Control-grid) Voltage	-7.3	volts
Plate Resistance (Approx.)	38000	ohms
Transconductance	11300	μmhos
Plate Current	48	ma
Grid-No.2 Current	5.5	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	3-1/16"
Maximum Seated Length	2-13/16"
Length, Base Seat to Bulb Top (Excluding tip)	2-7/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9CV

Pin 1 - Internal Connection—Do Not Use
Pin 2 - Grid No.1
Pin 3 - Cathode, Grid No.3



Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Same as Pin 1
Pin 7 - Plate
Pin 8 - Same as Pin 1
Pin 9 - Grid No.2

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	300	max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0	max.	volts
CATHODE CURRENT	65	max.	ma
PLATE DISSIPATION	12	max.	watts
GRID-No.2 INPUT[•]	2	max.	watts

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

6BQ5
POWER PENTODE

PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	100	max.	volts
Heater positive with respect to cathode.	100▲	max.	volts
Typical Operation:			
Plate Voltage.	250		volts
Grid-No.2 Voltage.	250		volts
Grid-No.1 Voltage.	-7.3		volts
Peak AF Grid-No.1 Voltage.	6.2		volts
Zero-Signal Plate Current.	48		ma
Max.-Signal Plate Current.	50.6		ma
Zero-Signal Grid-No.2 Current.	5.5		ma
Max.-Signal Grid-No.2 Current.	10		ma
Effective Load Resistance.	4500		ohms
Total Harmonic Distortion.	10		%
Max.-Signal Power Output	5.7		watts
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.3	max.	megohm
For cathode-bias operation	1	max.	megohm

○ Without external shield.
● Grid-No.2 input must not exceed 4 watts under maximum-signal conditions.
▲ The dc component must not exceed 100 volts.

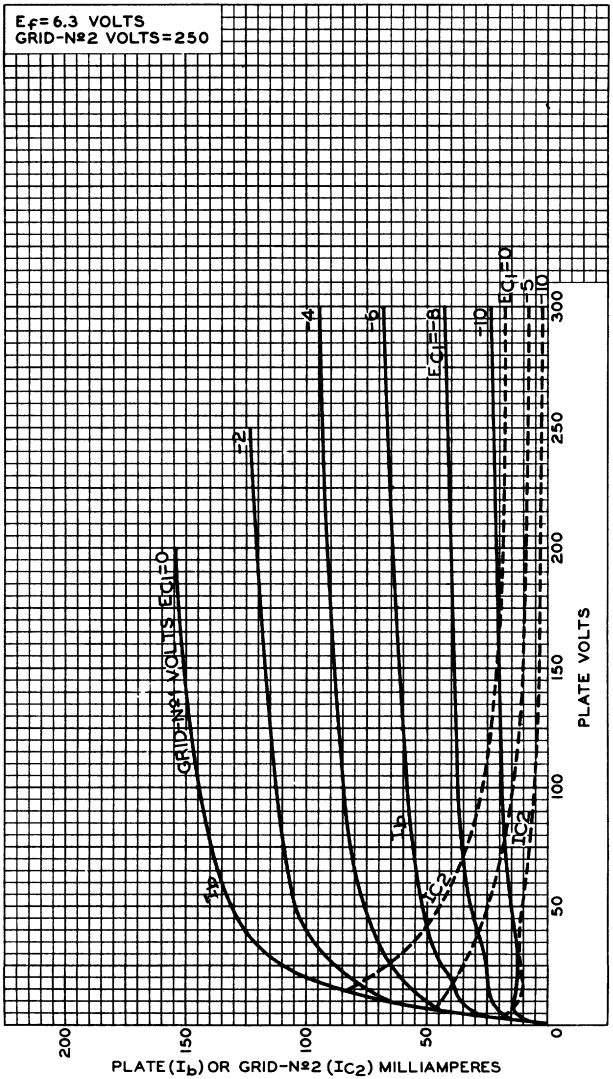
OPERATING CONSIDERATIONS

The *bulb* becomes hot during operation. To insure adequate cooling, therefore, it is essential that free circulation of air be provided.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6BQ5

AVERAGE CHARACTERISTICS

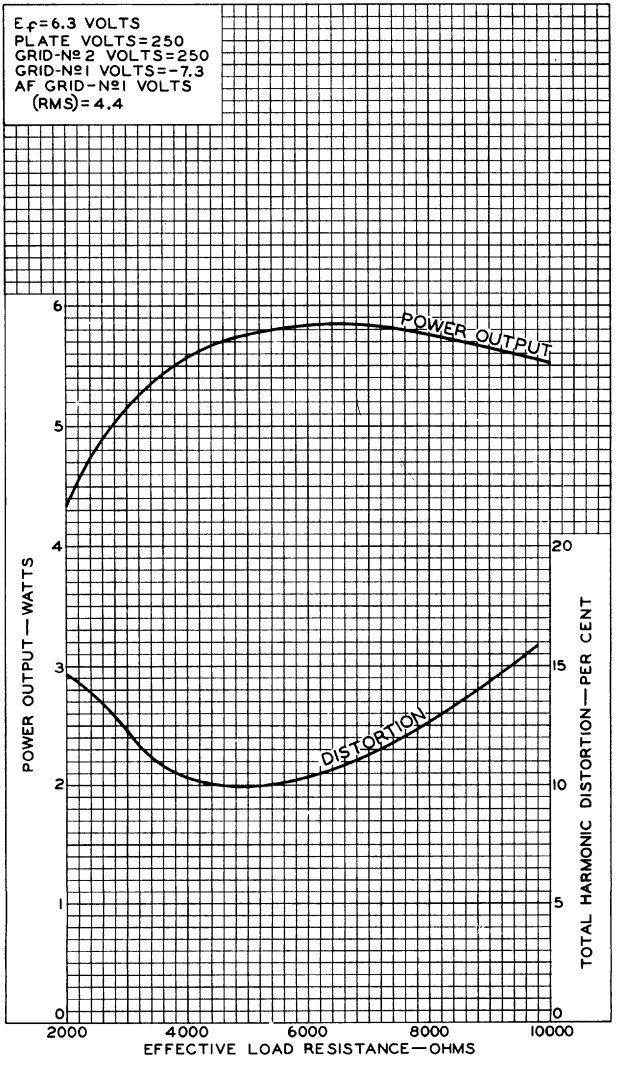


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9903

6BQ5

OPERATION CHARACTERISTICS



6BQ6GTB/6CU6

Beam Power Tube

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	1.2	amp
Direct Interelectrode Capacitances (Approx.):[a]		
Grid No.1 to plate	0.6	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	15	μμf
Plate to cathode & grid No.3, grid No.2, and heater	7	μμf ←

Characteristics, Class A_1 Amplifier: ←

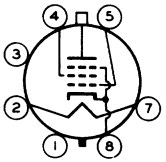
Plate Voltage	60	150	250	volts
Grid-No.2 Voltage	150	150	150	volts
Grid-No.1 Voltage	0	-22.5	-22.5	volts
Mu-Factor, Grid No.2 to Grid No.1	-	4.3	-	
Plate Resistance (Approx.)	-	-	14500	ohms
Transconductance	-	-	5900	μmhos
Plate Current	260[b]	-	57	ma
Grid-No.2 Current	26[b]	-	2.1	ma
Grid-No.1 Voltage (Approx.) for plate ma. = 1	-	-	-43	volts

Mechanical: ←

Operating Position	Any
Maximum Overall Length	3-7/8"
Seated Length	2-7/8" to 3-5/16"
Maximum Diameter	1-9/32"
Bulb	T9
Cap	Skirted Miniature (JEDEC No.C1-2, C1-3, or C1-33)

Bases (Alternates):
- Intermediate-Shell Octal:
  - 7-Pin, Arrangement 1 (JEDEC Group 1, No.B7-7)
  - 6-Pin, Arrangement 2 (JEDEC Group 1, No.B6-81)
- Short Intermediate-Shell Octal with External Barriers:
  - 7-Pin (JEDEC Group 1, No.B7-59)
  - 6-Pin, Arrangement 2 (JEDEC Group 1, No.B6-84)
  - 5-Pin, Arrangement 3 (JEDEC Group 1, No.B5-187)

Basing Designation for BOTTOM VIEW 6AM



Pin 1[c] - No Connection
Pin 2 - Heater
Pin 3[c] - No Connection
Pin 4 - Grid No.2
Pin 5 - Grid No.1
Pin 7 - Heater
Pin 8 - Cathode, Grid No.3
Cap - Plate

← Indicates a change.

6BQ6GTB/6CU6

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system[d]

DC PLATE-SUPPLY VOLTAGE	600	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE (Absolute maximum)[e]	6000[f]	max.	volts
PEAK NEGATIVE-PULSE PLATE VOLTAGE	1250	max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	200	max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 (CONTROL-GRID) VOLTAGE	300	max.	volts
CATHODE CURRENT:			
Peak	400	max.	ma
→ Average	110	max.	ma
GRID-No.2 INPUT	2.5	max.	watts
PLATE DISSIPATION[g]	11	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[h]	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	220	max.	°C

→ **Maximum Circuit Values:**

Grid-No.1-Circuit Resistance	0.47	max.	megohm

[a] Without external shield.

[b] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

[c] On the 6-pin bases, pin 1 as well as pin 6 is omitted. On the 5-pin base, pins 1 and 3 as well as pin 6 are omitted.

[d] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

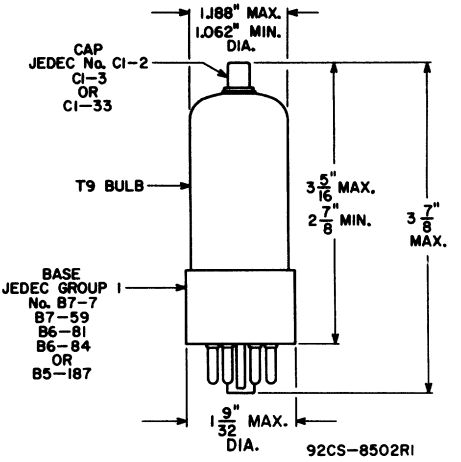
[e] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[f] Under no circumstances should this absolute value be exceeded.

[g] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

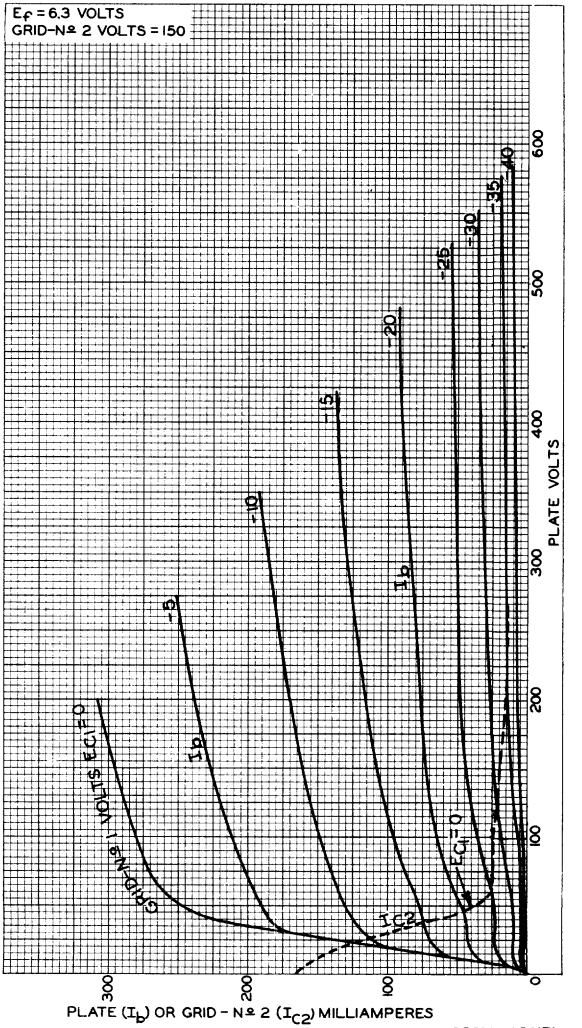
[h] The dc component must not exceed 100 volts.

→ Indicates a change.


1.188" MAX.
1.062" MIN.
DIA.
CAP
JEDEC No. C1-2
C1-3
OR
C1-33
T9 BULB
3 5/16" MAX.
2 7/8" MIN.
3 7/8" MAX.
BASE
JEDEC GROUP 1
No. B7-7
B7-59
B6-81
B6-84
OR
B5-187
1 9/32" MAX.
DIA.
92CS-8502R1

6BQ6GTB/6CU6

AVERAGE CHARACTERISTICS



92CM-8501RI

6BQ7A

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

For TV Tuners Using Direct-Coupled Cathode-Drive Circuits

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Voltage (AC or DC)		6.3	volts
Current		0.4	amp
Direct Interelectrode Capacitances:[a]			
	Unit No.1	*Unit No.2*	
Grid to plate	1.2	1.2	μμf
Grid to cathode, internal shield, and heater	2.6	-	μμf
Cathode to grid, internal shield, and heater	-	5	μμf
Plate to cathode, internal shield, and heater	1.2	-	μμf
Plate to grid, internal shield, and heater	-	2.2	μμf
Plate to cathode	0.12	0.12	μμf
Heater to cathode	2.6	2.6	μμf
Plate of unit No.1 to plate of unit No.2	0.010 max.		μμf
Plate of unit No.2 to plate and grid of unit No.1	0.024 max.		μμf

Characteristics, Class A_1 Amplifier (Each Unit):

Plate Supply Voltage	150	volts
Cathode Resistor	220	ohms
Amplification Factor	38	
Plate Resistance (Approx.)	5900	ohms
Transconductance	6400	μmhos
Plate Current	9	ma
Grid Voltage (Approx.) for plate μa = 100	-6.5	volts

Mechanical:

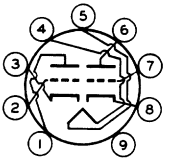
Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

◄ Indicates a change.

6BQ7A

Basing Designation for BOTTOM VIEW. 9AJ

Pin 1 – Plate of Unit No.2
Pin 2 – Grid of Unit No.2
Pin 3 – Cathode of Unit No.2
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Plate of Unit No.1
Pin 7 – Grid of Unit No.1
Pin 8 – Cathode of Unit No.1
Pin 9 – Internal Shield

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	250[b]	max.	volts
PLATE DISSIPATION	2	max.	watts
CATHODE CURRENT	20	max.	ma
→ PEAK HEATER–CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200[b]	max.	volts
Heater positive with respect to cathode.	200[c]	max.	volts

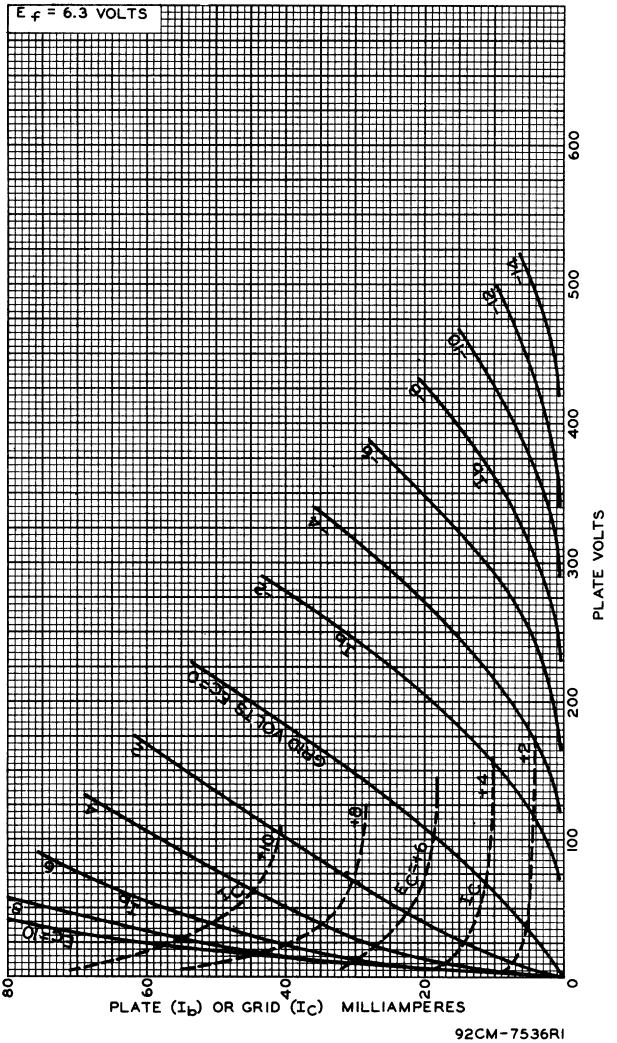
Maximum Circuit Values:

Grid-Circuit Resistance	0.5	max.	megohm

[a] With external shield JEDEC No.315 connected to internal shield.
[b] Under cutoff conditions in direct-coupled cathode-drive circuits, it is permissible for this voltage to be as high as 300 volts.
[c] The dc component must not exceed 100 volts.

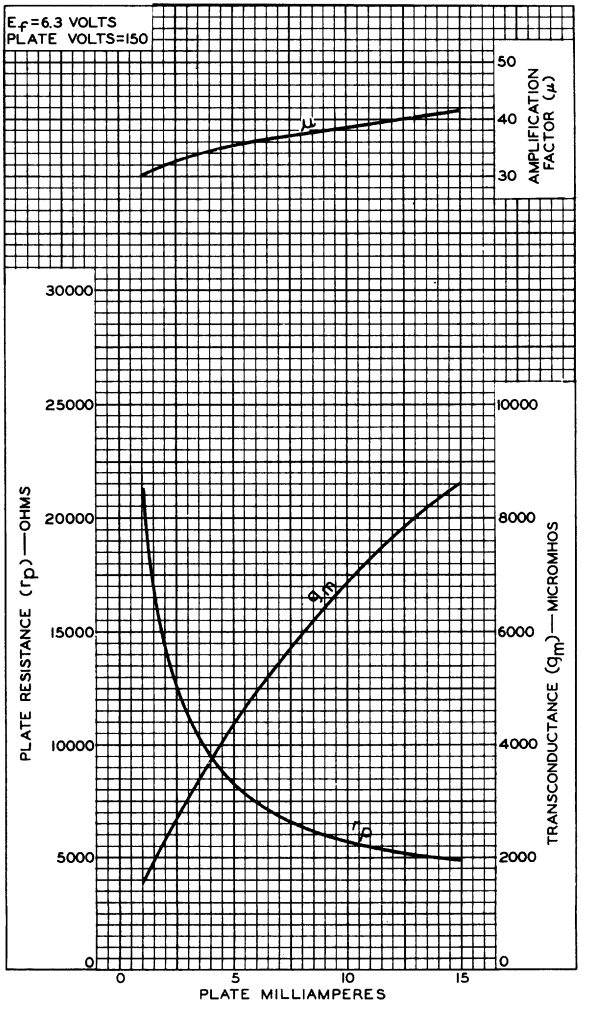
→ Indicates a change.

AVERAGE CHARACTERISTICS
Each Unit



6BQ7A

AVERAGE CHARACTERISTICS
Each Unit



92CM-7538R2

6BR8A

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

Especially Useful as Combined Triode Oscillator and Pentode Mixer in VHF TV Tuners

ELECTRICAL

Heater Characteristics and Ratings			
Voltage (AC or DC)	6.3[a]	6.3 ± 0.6	V
Current	0.450 ± 0.030	0.450[b]	A
Warm-up time (average)	11	-	s
Peak heater-cathode voltage (Each unit)			
Heater negative with respect to cathode		200 max	V
Heater positive with respect to cathode		200[c] max	V

Direct Interelectrode Capacitances (Approx.)

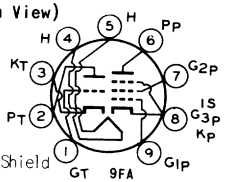
	Without External Shield	*With External Shield*[d]	
Triode Unit			
Grid to plate	1.8	1.8	pF
Input: G_T to (K_T, Kp + G3p + IS, H)	2.8	2.8	pF
Output: P_T to (K_T, Kp + G3p + IS, H)	1.5	2.0	pF
Pentode Unit			
Grid No.1 to plate	0.02	0.01	pF
Input: G1p to (Kp + G3p + IS, G2p, H)	4.6	4.6	pF
Output: Pp to (Kp + G3p + IS, G2p, H)	2.4	3.2	pF
Triode Cathode to Heater	2.4	2.4[e]	pF
Pentode Cathode to Heater	2.4	2.4[e]	pF
Pentode Grid No.1 to Triode Plate	0.2 max	0.2 max	pF
Pentode Plate to Triode Plate	0.1 max	0.02 max	pF

MECHANICAL

Operating Position . . . . . Any
Type of Cathode . . . . . Coated Unipotential
Maximum Overall Length . . . . . 2.187 in
Maximum Seated Length . . . . . 1.937 in
Maximum Diameter . . . . . 0.875 in
Length, Base Seat to Bulb Top . . . . . 1.469 to 1.656 in
Excluding tip
Dimensional Outline (JEDEC 6-2) . . . . . See *General Section*
Envelope . . . . . JEDEC T6-1/2
Base . . . . . Small-Button Noval 9-Pin (JEDEC E9-1)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Triode Grid
Pin 2 – Triode Plate
Pin 3 – Triode Cathode
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Plate
Pin 7 – Pentode Grid No.2
Pin 8 – Pentode Cathode, Grid No.3, Internal Shield
Pin 9 – Pentode Grid No.1



← Indicates a change.

CHARACTERISTICS, CLASS A_1 AMPLIFIER

	Triode Unit	*Pentode Unit*	
Plate Voltage	125	125	V
Grid No.2 Voltage	-	110	V
Grid No.1 Voltage	-1	-1	V
Amplification Factor	40	-	
Plate Resistance (Approx.)	-	0.2	MΩ
Transconductance	7500	5000	μmho
Plate Current	13.5	9.5	mA
Grid-No.2 Current	-	3.5	mA
Grid-No.1 Voltage (Approx.) for plate μA = 20	-9	-9	V

CLASS A_1 AMPLIFIER
Design Maximum Ratings

	Triode Unit	*Pentode Unit*	
Plate Voltage	330	330	V
Grid-No.2 (Screen-Grid) Supply Voltage	-	330	V
Grid-No.2 Voltage	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Grid-No.1 (Control-Grid) Voltage, Positive-bias value	0	0	V
Grid-No.2 Input			
For grid-No.2 voltages up to 165 volts	-	0.55	W
For grid-No.2 voltages between 165 and 330 volts	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Plate Dissipation	2.5	3	W

[a] At heater amperes = 0.450.
[b] At heater volts = 6.3.
[c] The dc component must not exceed 100 volts.
[d] With external shield JEDEC No.315 connected to Pin 4, except as noted.
[e] With external shield JEDEC No.315 connected to Pin 6.

Curves shown under Type 6U8A also apply to the 6BR8A.

→Indicates a change.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

6BS3A

Half-Wave Vacuum Rectifier

NOVAR TYPE

For Television Damper Service

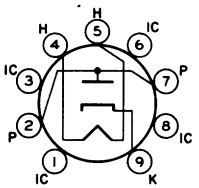
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.200	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode[a]	5000[b] max.	volts
Heater positive with respect to cathode	300[c] max.	volts
Direct Interelectrode Capacitances (Approx):[d]		
P to (K,H)	6.5	pf
K to (P,H)	9.0	pf
Heater to cathode	2.8	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.005"
Seated Length	2.375" to 2.625"
Diameter	1.062" to 1.188"
Dimensional Outline	See *General Section*
Bulb	T9
Base	Small-Button Novar 9-Pin with Exhaust Tip (JEDEC No. E9-89)
Basing Designation for BOTTOM VIEW	9HP

Pin 1 – Do Not Use[e]
Pin 2 – Plate
Pin 3 – Do Not Use[e]
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Do Not Use[e]
Pin 7 – Plate
Pin 8 – Do Not Use[e]
Pin 9 – Cathode



DAMPER SERVICE

Maximum Ratings, *Design-Maxium Values:*

For operation in a 525-line, 30-frame system[f]

Peak Inverse Plate Voltage[a]	5000 max.	volts
Peak Plate Current	1100 max.	ma
Average Plate Current	200 max.	ma
Plate Dissipation	6 max.	watts

Characteristics, Instantaneous Value:

Tube Voltage Drop for plate ma = 140	12	volts

[a] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[b] The dc component must not exceed 900 volts.

[c] The dc component must not exceed 100 volts.

[d] Without external shield.

[e] Socket terminals 1, 3, 6, and 8 should not be used for tie points. It is also recommended that socket clips for these pins be removed to reduce the possibility of arc-over and to minimize leakage.

[f] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

Sharp-Cutoff Twin Pentode

With Common Cathode, Grid No.1, and Grid No.2

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.3	amp
Direct Interelectrode Capacitances:[a]		
Grid No.3 to plate (Each unit)	1.9	μμf
Grid No.1 to all other electrodes	6	μμf
Grid No.3 to all other electrodes (Each unit)	3.6	μμf
Plate to all other electrodes (Each unit)	3	μμf
Grid No.3 (Unit No.1) to grid No.3 (Unit No.2)	0.015 max.	μμf

Characteristics, Class A_1 Amplifier:

With both units operating

Plate Voltage (Each Unit)	100	100	volts
Grid-No.3 Voltage (Each Unit)	-10	0	volts
Grid-No.2 Voltage	67.5	67.5	volts
Grid-No.1 Voltage	[b]	[b]	volts
Plate Current (Each Unit)	-	2.2	ma
Grid-No.2 Current	6.5	3.3	ma
Cathode Current	6.6	7.8	ma

With one unit operating[c]

Plate Voltage	100	100	volts
Grid-No.3 Voltage	0	0	volts
Grid-No.2 Voltage	67.5	67.5	volts
Grid-No.1 Voltage	0	[b]	volts
Grid-No.3-to-Plate Transconductance	-	180	μmhos
Grid-No.1-to-Plate Transconductance	1500	-	μmhos
Plate Current	-	2.2	ma
Grid-No.3 Voltage (Approx.) for plate μa = 100	-	-4.5	volts
Grid-No.1 Voltage (Approx.) for plate μa = 100	-	-2.3	volts

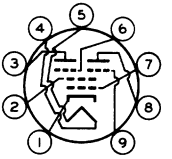
Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2

6BU8

Base. . . . . .Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9FG

Pin 1 - Cathode
Pin 2 - Grid No.2, Internal Shield
Pin 3 - Plate of Unit No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Grid No.3 of Unit No.2
Pin 7 - Grid No.1
Pin 8 - Plate of Unit No.1
Pin 9 - Grid No.3 of Unit No.1

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:* ←

PLATE VOLTAGE (Each unit).	300	max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE (Each unit):			
Peak-positive value.	50	max.	volts
Negative-bias value.	0	max.	volts
Positive-bias value.	3	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE.	150	max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Negative-bias value.	50	max.	volts
CATHODE CURRENT.	12	max.	ma
GRID-No.2 INPUT.	0.75	max.	watt
PLATE DISSIPATION (Each unit).	1.1	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200[d]	max.	volts

Maximum Circuit Values:

Grid-No.3-Circuit Resistance (Each unit) .	0.5	max.	megohm
Grid-No.1-Circuit Resistance	0.5	max.	megohm

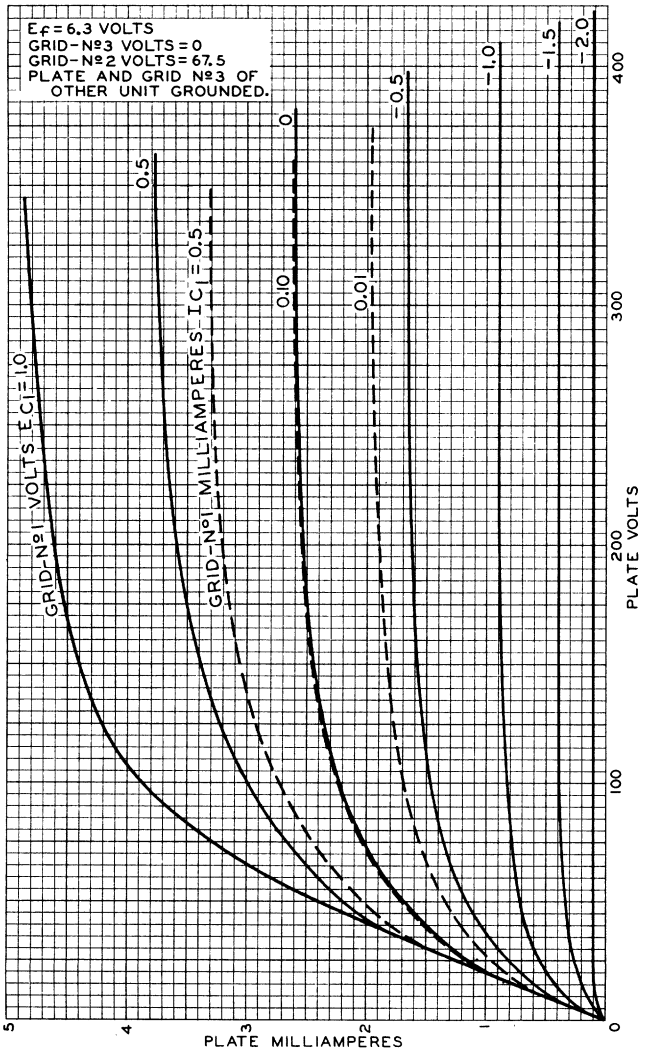
[a] Without external shield.
[b] Adjusted to give a dc grid-No.1 current of 100 microamperes.
[c] With plate and grid No.3 of the other unit connected to ground.
[d] The dc component must not exceed 100 volts.

← Indicates a change.

6BU8

AVERAGE PLATE CHARACTERISTICS

EACH UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9428

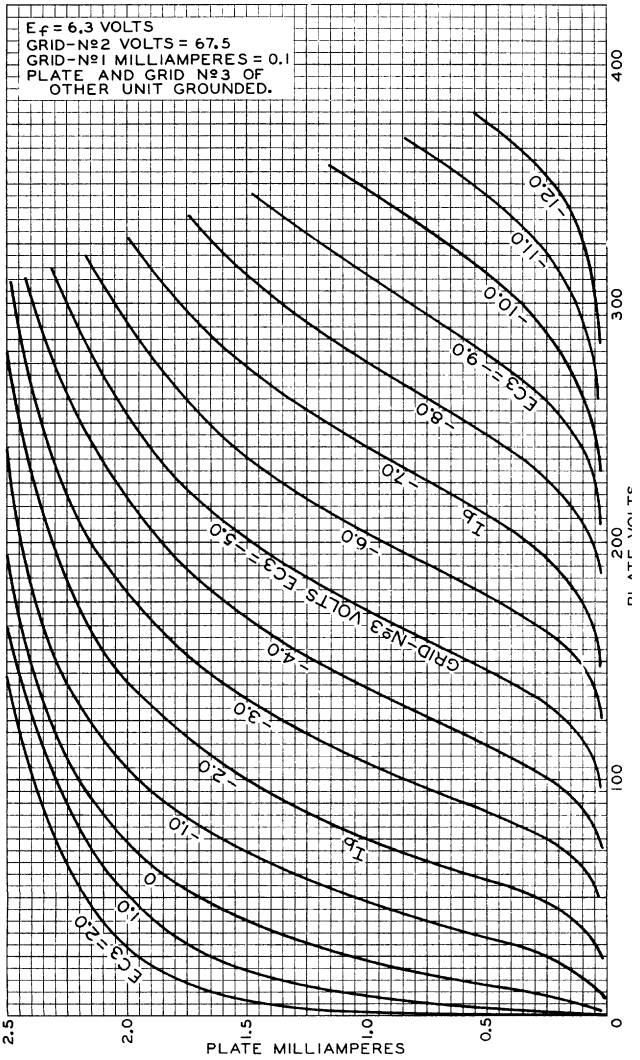
6BU8

RCA

6BU8

AVERAGE PLATE CHARACTERISTICS

EACH UNIT



ELECTRON TUBE DIVISION

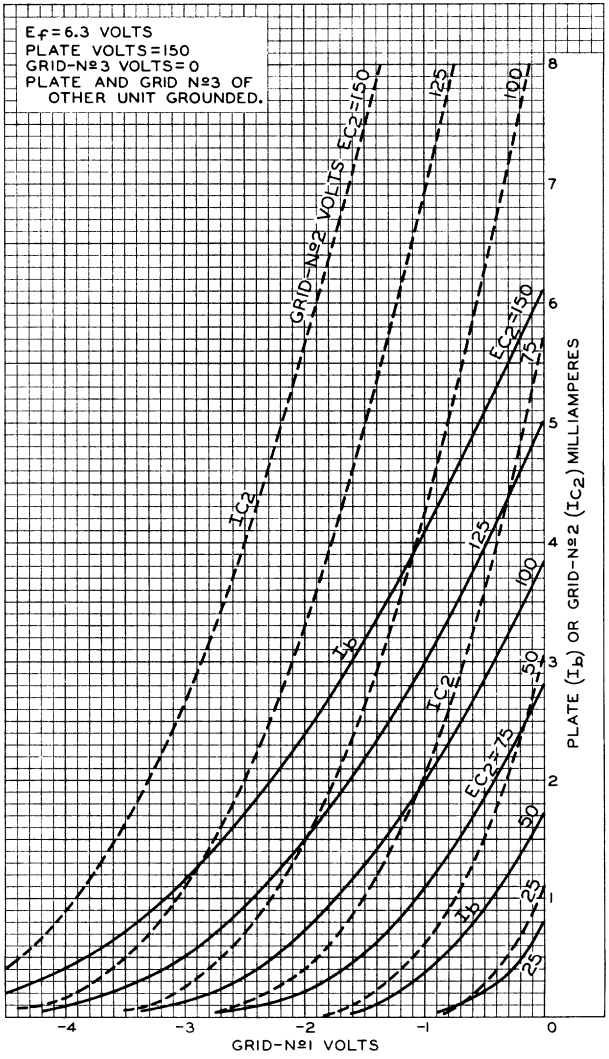
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9429

6BU8

AVERAGE CHARACTERISTICS

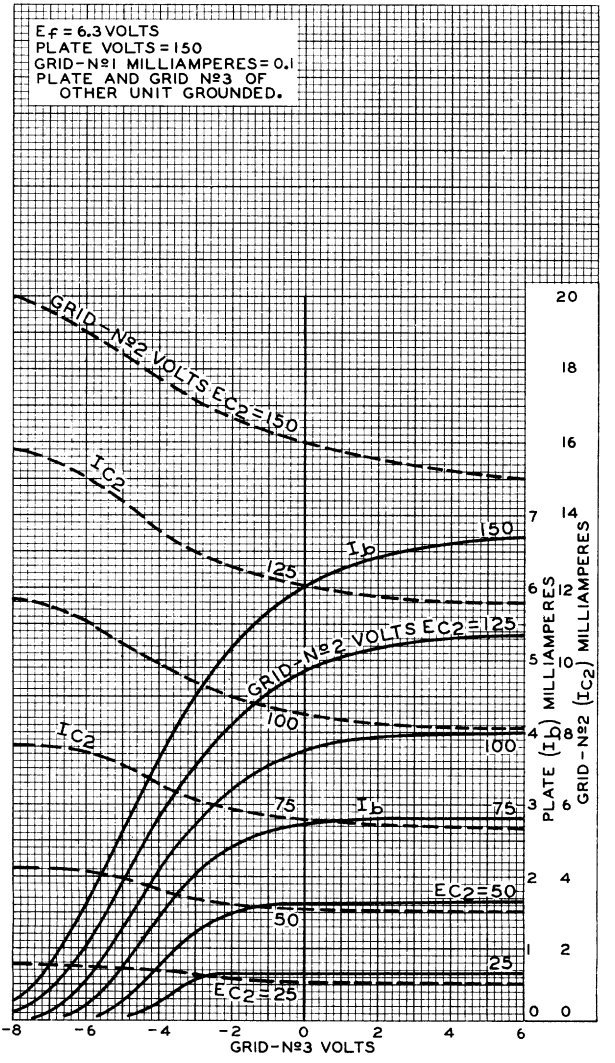
EACH UNIT



6BU8

6BU8

AVERAGE CHARACTERISTICS
EACH UNIT



Twin Diode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current	0.45	amp
Direct Interelectrode Capacitances:[a]		
Pentode Unit:		
Grid No.1 to plate	0.02 max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	4.8	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	2.6	μμf
Diode Units:		
Diode-No.1 plate to cathode and heater	1.3	μμf
Diode-No.2 plate to cathode and heater	1.2	μμf
Pentode grid No.1 to either diode plate	0.006 max.	μμf

Characteristics, Class A_1 Amplifier (Pentode Unit):

Plate Supply Voltage	250	volts
Grid-No.2 Supply Voltage	110	volts
Cathode Resistor	68	ohms
Plate Resistance (Approx.)	0.25	megohm
Transconductance	5200	μmhos
Grid-No.2 Current	3.5	ma
Plate Current	10	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-10	volts

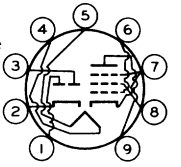
Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

6BW8

Basing Designation for BOTTOM VIEW. 9HK

Pin 1 – Diode Plate No.2
Pin 2 – Diode Cathode
Pin 3 – Diode Plate No.1
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Grid No.1



Pin 7 – Pentode Cathode, Grid No.3, Internal Shield
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate

PENTODE UNIT — AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE.	330	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE . .	330	max.	volts
GRID-No.2 VOLTAGE. . . . . See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section			
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Negative-bias value.	55	max.	volts
Positive-bias value.	0	max.	volts
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 165 volts .	0.55	max.	watt
For grid-No.2 voltages between 165 and 330 volts. . . . . See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section			
PLATE DISSIPATION.	3	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200[b]	max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.1	max.	megohm
For cathode-bias operation	0.5	max.	megohm

DIODE UNITS — Two

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE CURRENT.	5	max.	ma
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200[b]	max.	volts

Characteristics, Instantaneous Test Condition:

Plate Current for plate volts = 5.	20	ma

[a] Without external shield.
[b] The dc component must not exceed 100 volts.

6BY6
PENTAGRID AMPLIFIER

MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.3	amp
Direct Interelectrode Capacitances:*		
Grid No.1 to Plate	0.08 max.	μμf
Grid No.3 to Plate	0.35 max.	μμf
Grid No.1 to Grid No.3	0.15 max.	μμf
Grid No.1 to All Other Electrodes and Heater	5.4	μμf
Grid No.3 to All Other Electrodes and Heater	6.9	μμf
Plate to All Other Electrodes and Heater	7.6	μμf

Characteristics, Class A_1 Amplifier:

Plate Voltage	250	volts
Grids-No.2-and-No.4 Voltage	100	volts
Grid-No.3 Voltage	-2.5	volts
Grid-No.1 Voltage	-2.5	volts
Grid-No.3-to-Plate Transconductance	500	μmhos
Grid-No.1-to-Plate Transconductance	1900	μmhos
Plate Current	6.5	ma
Grids-No.2-and-No.4 Current	9	ma
Grid-No.3 Volts (Approx.) for plate current of 35 μamp and grid-No.1 volts = -4	-15	volts
Grid-No.1 Volts (Approx.) for plate current of 35 μamp and grid-No.3 volts = 0	-12	volts

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length from Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)

BOTTOM VIEW

Pin 1: Grid No.1
Pin 2: Cathode, Grid No.5
Pin 3: Heater
Pin 4: Heater
Pin 5: Plate
Pin 6: Grid No.2, Grid No.4
Pin 7: Grid No.3

*: With no external shield.

6BY6

6BY6

PENTAGRID AMPLIFIER

GATED AMPLIFIER SERVICE

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
GRIDS-No.2-and-No.4 VOLTAGE	*See Rating Curve at front of this Section*	
GRIDS-No.2-and-No.4 SUPPLY VOLTAGE	300 max.	volts
GRID-No.3 SUPPLY VOLTAGE:		
Negative Bias Value	50 max.	volts
Positive Bias Value	0 max.	volts
Positive Peak Value	25 max.	volts
GRID-No.1 SUPPLY VOLTAGE:		
Negative Bias Value	100 max.	volts
PLATE DISSIPATION	2 max.	watts
GRID-No.3 INPUT	0.1 max.	watt
GRIDS-No.2-and-No.4 INPUT	1 max.	watt
GRID-No.1 INPUT	0.1 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200# max.	volts

Characteristics as Sync Separator and Sync Clipper:

Plate Voltage	10	volts
Grid-No.3 Voltage	0	volts
Grids-No.2-and-No.4 Voltage	25	volts
Grid-No.1 Voltage	0	volts
Plate Current	1.4	ma
Grids-No.2-and-No.4 Current	3.5	ma
Grid-No.3 Bias Volts (Approx.) for plate voltage of 25 volts, grids-No.2-and-No.4 voltage of 25 volts, grid-No.1 voltage of 0 volts, and plate current of 50 μamp	-2.5	volts
Grid-No.1 Bias Volts (Approx.) for plate voltage of 25 volts, grids-No.2-and-No.4 voltage of 25 volts, grid-No.3 voltage of 0 volts, and plate current of 50 μamp	-2.3	volts

Maximum Circuit Values:

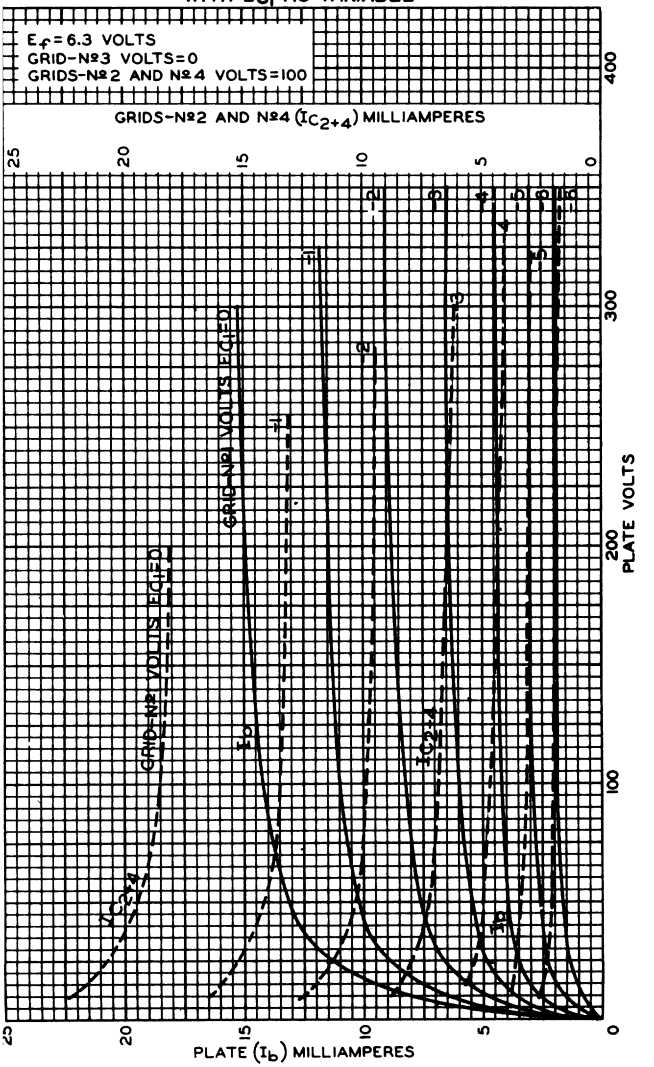
Grid-No.1 or Grid-No.3-Circuit Resistance:		
For fixed-bias operation	0.5 max.	megohm
For cathode-bias operation	1.0 max.	megohm

The dc component must not exceed 100 volts.

6BY6

AVERAGE OPERATION CHARACTERISTICS

WITH E_{C1} AS VARIABLE

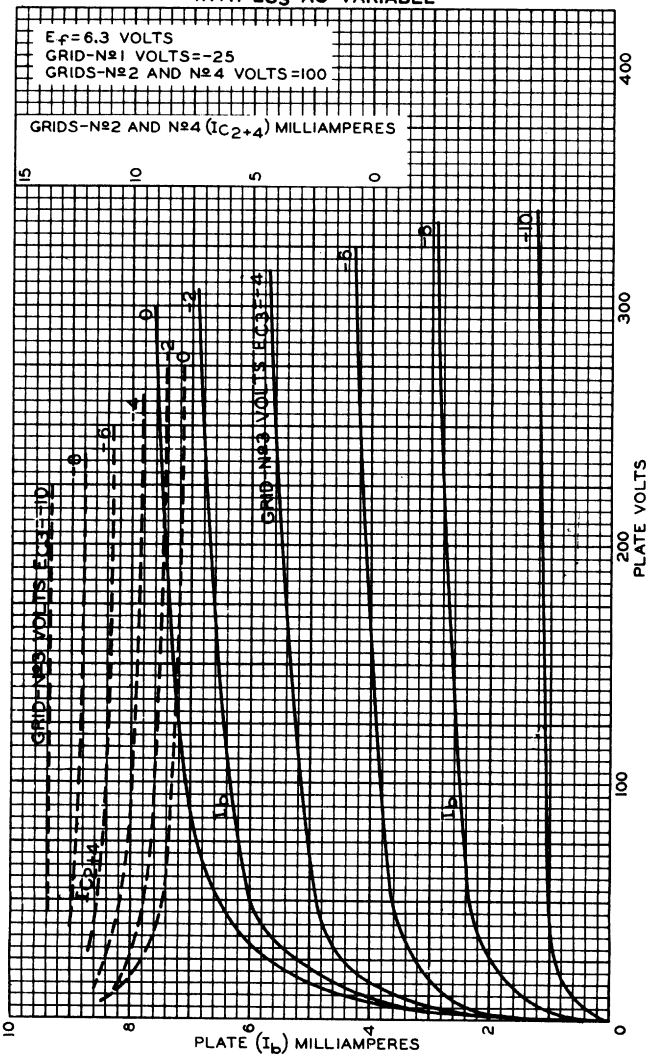


NOV.5,1953 TUBE DEPARTMENT 92CM-8140
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6BY6

6BY6

AVERAGE OPERATION CHARACTERISTICS
WITH E_{C3} AS VARIABLE



NOV. 5, 1953

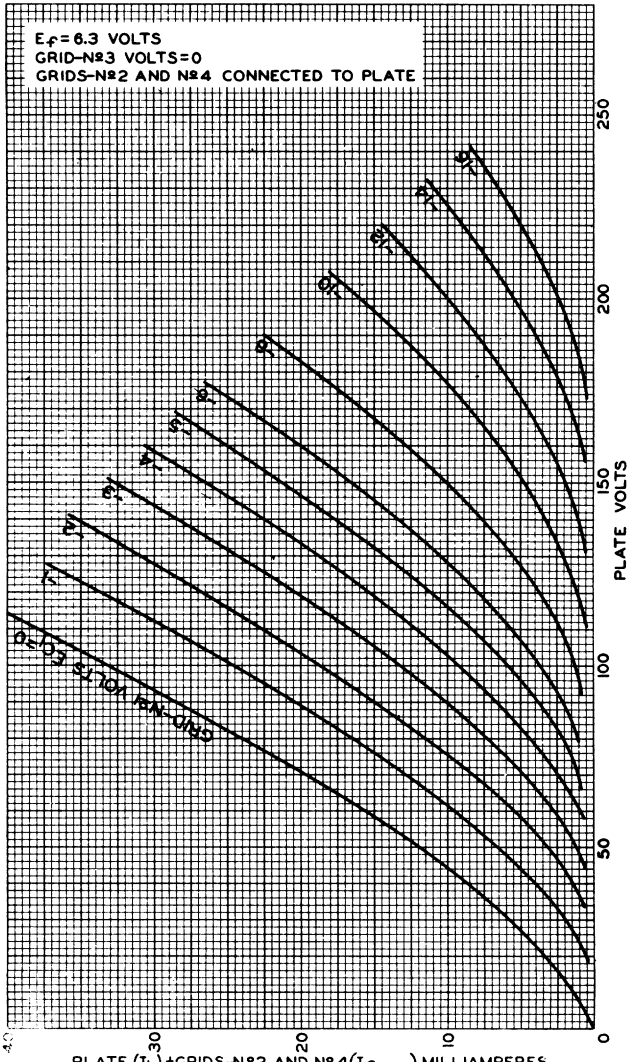
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8139

RCA

6BY6

AVERAGE PLATE CHARACTERISTICS



6BY8

DIODE—SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage	6.3	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

Direct Interelectrode Capacitances:[o]

Diode Unit:		
Plate to cathode, pentode plate, pentode grid No.3 & internal shield, pentode grid No.2, pentode grid No.1, pentode cathode, and heater	4.8[•]	μμf
Pentode Unit:		
Grid No.1 to plate	0.0035 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	5.5	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	5	μμf

Characteristics, Class A_1 Amplifier (Pentode Unit):

Plate-Supply Voltage	100	250	volts
Grid No.3 (Suppressor Grid)	*Connected to cathode at socket*		
Grid-No.2 (Screen-Grid) Supply Voltage	100	150	volts
Cathode Resistor	150	68	ohms
Plate Resistance (Approx.)	0.5	1	megohm
Transconductance	3900	5200	μmhos
Plate Current	5	10.6	ma
Grid-No.2 Current	2.1	4.3	ma
Grid-No.1 (Control-Grid) Voltage (Approx.) for plate μa = 10	-4.2	-6.5	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)

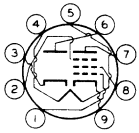
[o],[•]: See next page.

6BY8

DIODE—SHARP-CUTOFF PENTODE

Basing Designation for BOTTOM VIEW 9FN

Pin 1 – Pentode Grid No.1
Pin 2 – Pentode Grid No.3, Internal Shield
Pin 3 – Diode Cathode



Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Diode Plate
Pin 7 – Pentode Plate
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Cathode

PENTODE UNIT — AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300	max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE	0	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	300	max.	volts
GRID-No.2 VOLTAGE. . . . . *See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*			
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Negative-bias value	50	max.	volts
Positive-bias value	0	max.	volts
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 150 volts	0.65	max.	watt
For grid-No.2 voltages between 150 and 300 volts. . . . . *See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*			
PLATE DISSIPATION	3	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.25	max.	megohm
For cathode-bias operation	1	max.	megohm

DIODE UNIT

Maximum Ratings, *Design-Center Values:*

PEAK INVERSE PLATE VOLTAGE	430	max.	volts
PLATE CURRENT:			
Peak	180	max.	ma
DC	45	max.	ma
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

o With external shield JETEC No.315 connected to pentode cathode (pin 9) except as noted.
● With external shield JETEC No.315 connected to ground.
▲ The dc component must not exceed 100 volts.

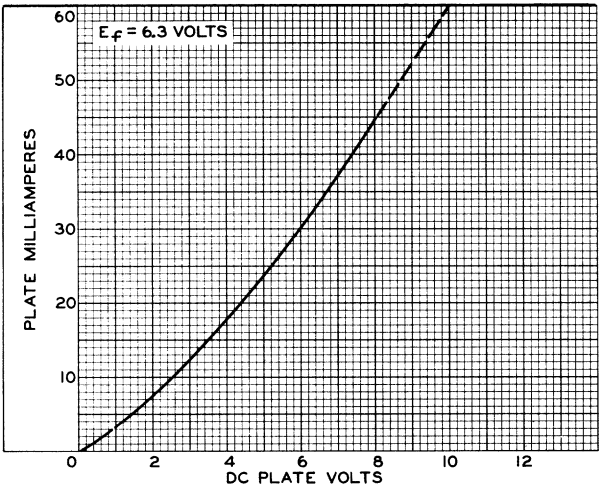
6BY8

DIODE—SHARP-CUTOFF PENTODE

CURVES
shown under Type 6AU6 also apply to the pentode unit of the 6BY8

9-58 TENTATIVE DATA

AVERAGE PLATE CHARACTERISTIC
DIODE UNIT



92CS-9616

6BZ6

SEMIREMOTE-CUTOFF PENTODE

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)		6.3 ± 10%	volts
Current		0.3	amp
Direct Interelectrode Capacitances:			
	Without External Shield	*With External Shield*[o]	
Grid No.1 to plate	0.025 max.	0.015 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	7	7	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	2	3	μμf

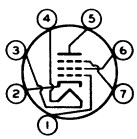
Characteristics, Class A$_1$ Amplifier:

Plate Supply Voltage	125	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Supply Voltage	125	volts
Cathode Resistor	56	ohms
Plate Resistance (Approx.)	0.26	megohm
Transconductance	8000	μmhos
Plate Current	14	ma
Grid-No.2 Current	3.6	ma
Grid-No.1 Voltage (Approx.) for transconductance (μmhos) = 50	-19	volts
Grid-No.1 Voltage (Approx.) for transconductance (μmhos) = 700 and cathode resistor (ohms) = 0	-4.5	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CM

Pin 1 - Grid No.1
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate



Pin 6 - Grid No.2
Pin 7 - Grid No.3, Internal Shield

←Indicates a change.

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6BZ6

SEMIREMOTE-CUTOFF PENTODE

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE	0	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330	max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0	max.	volts
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 165 volts	0.55	max.	watt
For grid-No.2 voltages between 165 and 330 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
PLATE DISSIPATION	2.3	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.25	max.	megohm
For cathode-bias operation	1	max.	megohm

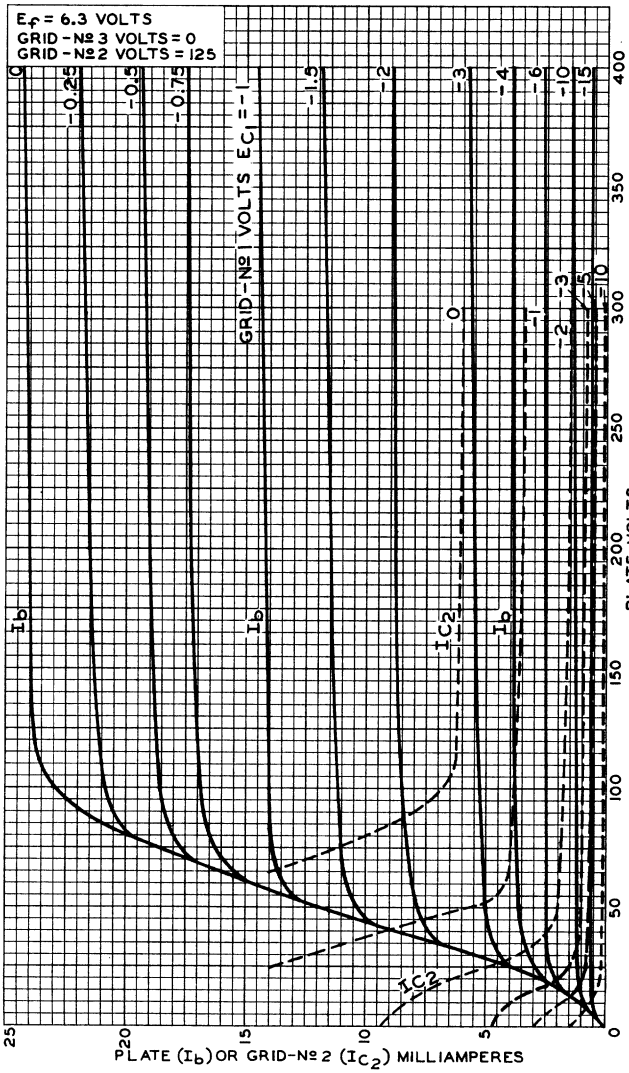
o With external shield JEDEC No.316 connected to cathode.

▲ The dc component must not exceed 100 volts.

→ Indicates a change.

6BZ6

AVERAGE CHARACTERISTICS



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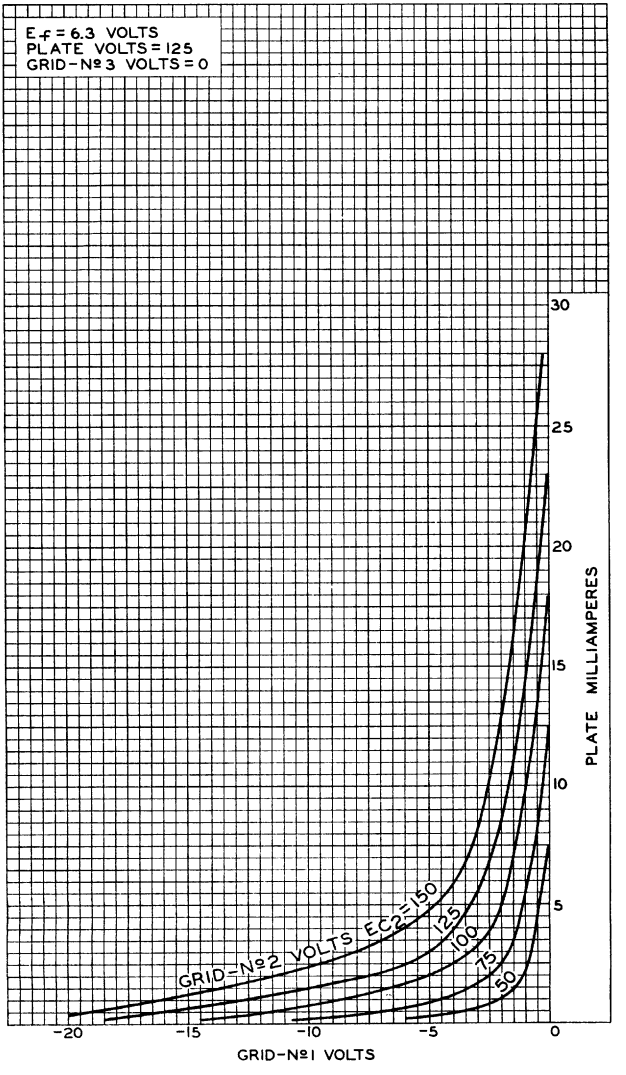
92CM-8508R2

6BZ6

6BZ6

AVERAGE CHARACTERISTICS



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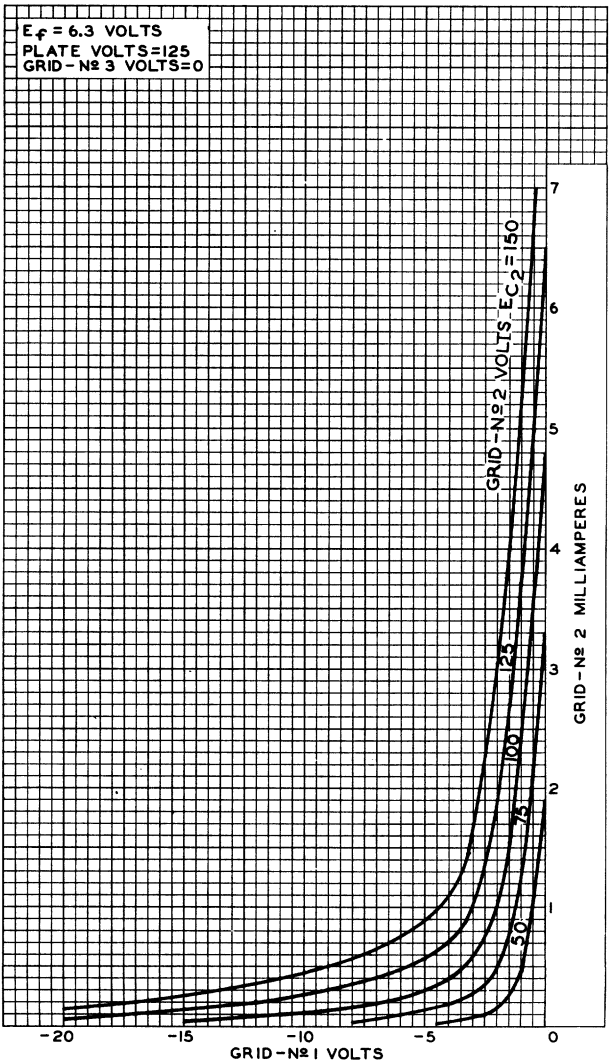
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9481RI

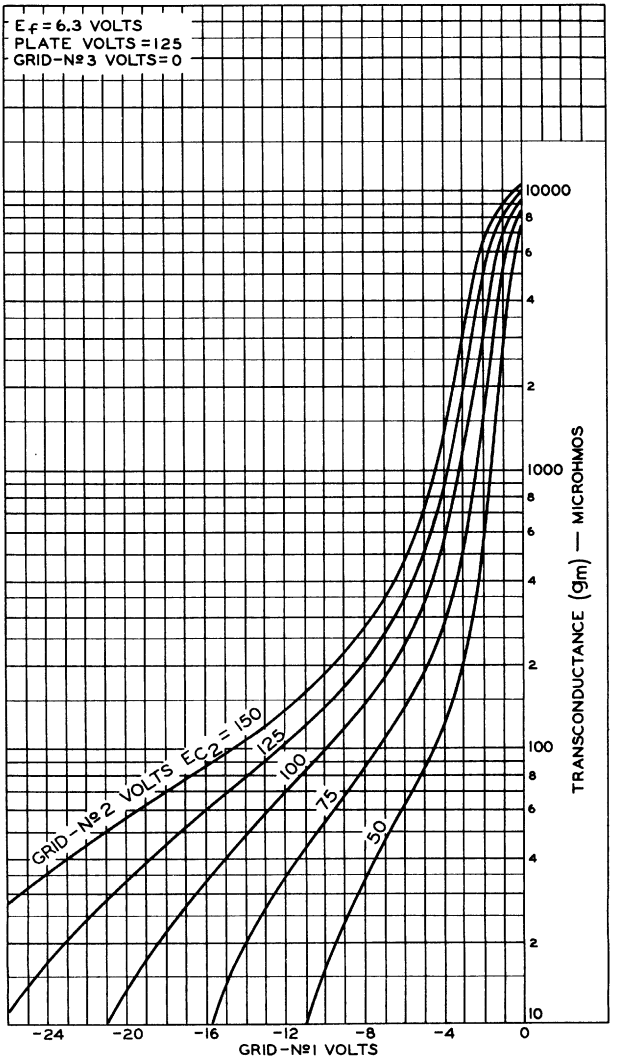
6BZ6

AVERAGE CHARACTERISTICS



6BZ6

AVERAGE CHARACTERISTICS



Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

For TV Tuners Using Direct-Coupled Cathode-Drive Circuits

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.4	amp

Direct Interelectrode Capacitances:[a] ←

	Unit No.1	*Unit No.2*	
Grid to plate	1.2	1.2	μμf
Grid to cathode, internal shield, and heater	2.6	-	μμf
Plate to cathode, internal shield, and heater	1.2	-	μμf
Plate to cathode	0.12	0.12	μμf
Heater to cathode	2.6	2.6	μμf
Cathode to grid, internal shield, and heater	-	5	μμf
Plate to grid, internal shield, and heater	-	2.2	μμf
Plate of unit No.1 to plate of unit No.2	0.010 max.		μμf
Plate of unit No.2 to plate and grid of unit No.1	0.024 max.		μμf

Characteristics, Class A_1 Amplifier (Each Unit): ←

Plate Supply Voltage	150	volts
Cathode Resistor	220	ohms
Amplification Factor	36	
Plate Resistance (Approx.)	5300	ohms
Transconductance	6800	μmhos
Plate Current	10	ma
Grid Voltage (Approx.) for plate μa = 100	-7	volts

Mechanical:

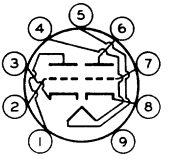
Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

← Indicates a change.

6BZ7

Basing Designation for BOTTOM VIEW. 9AJ

Pin 1 – Plate of Unit No.2
Pin 2 – Grid of Unit No.2
Pin 3 – Cathode of Unit No.2
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Plate of Unit No.1
Pin 7 – Grid of Unit No.1
Pin 8 – Cathode of Unit No.1
Pin 9 – Internal Shield

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE.	250[b]	max.	volts
PLATE DISSIPATION.	2	max.	watts
CATHODE CURRENT.	20	max.	ma
PEAK HEATER–CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200[b]	max.	volts
Heater positive with respect to cathode.	200[c]	max.	volts

→ **Maximum Circuit Values:**

Grid-Circuit Resistance.	0.5	max.	megohm

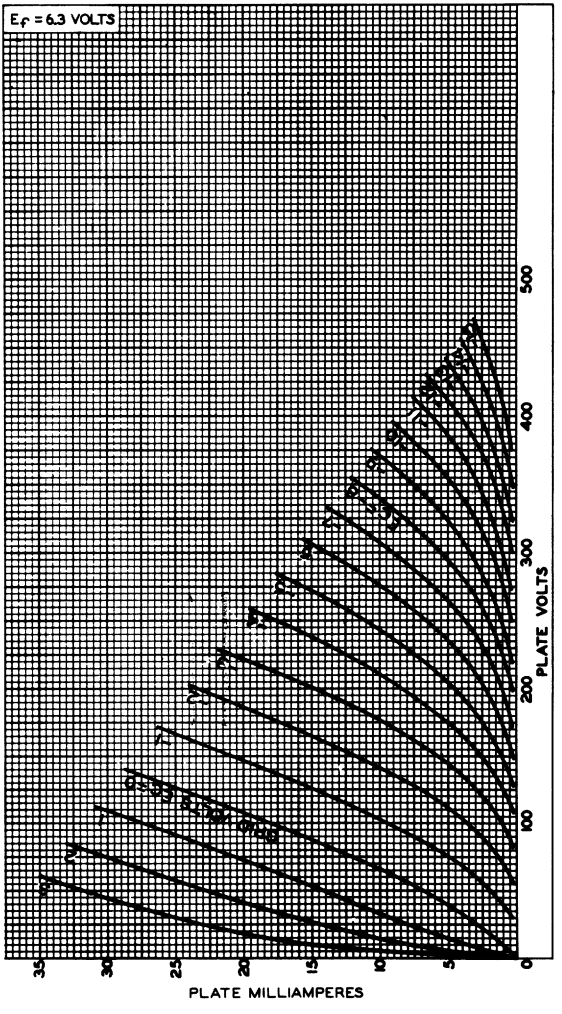
[a] With external shield JEDEC No.315 connected to internal shield.

→ [b] Under cutoff conditions in direct-coupled cathode-drive circuits, it is permissible for this voltage to be as high as 300 volts.

[c] The dc component must not exceed 100 volts.

→ Indicates a change.

AVERAGE PLATE CHARACTERISTICS
Each Unit



92CM-9231

6C4

MEDIUM-MU TRIODE

For use in FM and other HF circuits

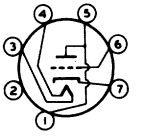
GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.15	amp
Direct Interelectrode Capacitances:°		
Grid to plate	1.6	μμf
Grid to cathode and heater	1.8	μμf
Plate to cathode and heater	1.3	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8" ←
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32" ←
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base — Small-Button Miniature 7-Pin (JETEC No.E7-1)	←
Basing Designation for BOTTOM VIEW	6BG



Pin 1 – Plate
Pin 2 – Internal Connection Do Not Use
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid
Pin 7 – Cathode

AMPLIFIER – Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
PLATE DISSIPATION	3.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		←
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200■ max.	volts

Characteristics:

Plate Voltage	100	250	volts
Grid Voltage	0	-8.5	volts
Amplification Factor	19.5	17	
Plate Resistance (Approx.)	6250	7700	ohms
Transconductance	3100	2200	μmhos
Plate Current	11.8	10.5	ma

Maximum Circuit Values: ←

Grid-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	1.0 max.	megohm

° With no external shield.

■: See next page. ← indicates a change.

6C4

6C4

MEDIUM-MU TRIODE

Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED AMPLIFIER CHART No. 10 at front of this Section.

RF POWER AMPLIFIER & OSCILLATOR—Class C Telegraphy

Maximum Ratings, *Design-Center Values:*

DC PLATE VOLTAGE	300 max.	volts
DC GRID VOLTAGE	-50 max.	volts
DC PLATE CURRENT	25 max.	ma
DC GRID CURRENT	8 max.	ma
PLATE DISSIPATION	5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200■max.	volts

Typical Operation at Frequencies up to 50 Mc:●

DC Plate Voltage	300	volts
DC Grid Voltage	-27	volts
DC Plate Current	25	ma
DC Grid Current (Approx.)	7	ma
Driving Power (Approx.)	0.35	watt
Useful Power Output (Approx.)	5.5	watts

■ The dc component must not exceed 100 volts.

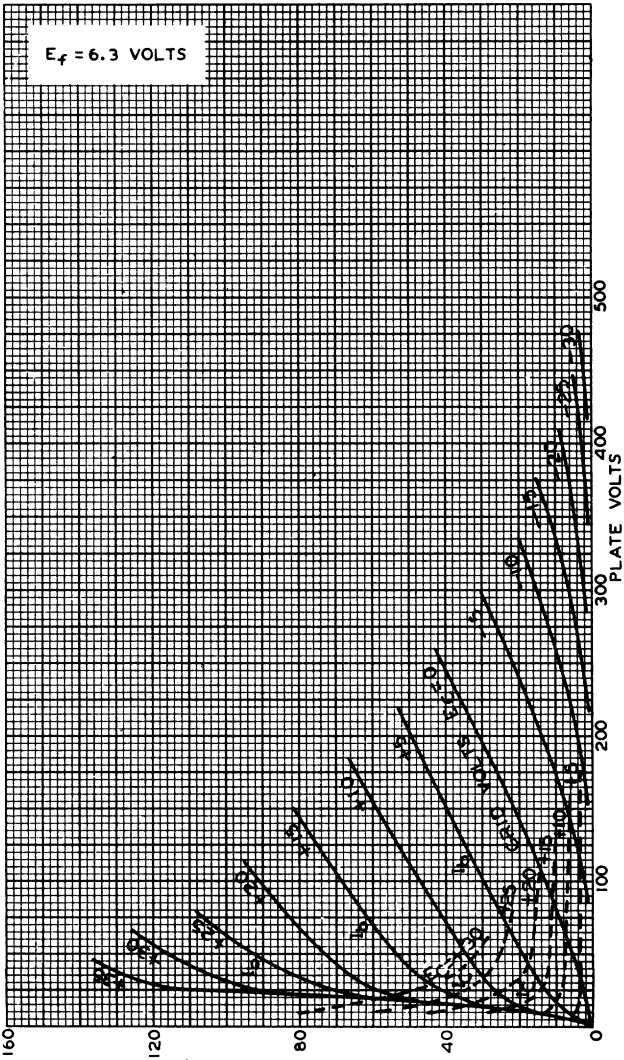
● Approximately 2.5 watts can be obtained when the 6C4 is used at 150 Mc as an oscillator with grid resistor of 10000 ohms and maximum rated input.

→ indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6C4

AVERAGE PLATE CHARACTERISTICS



MARCH 16,1942

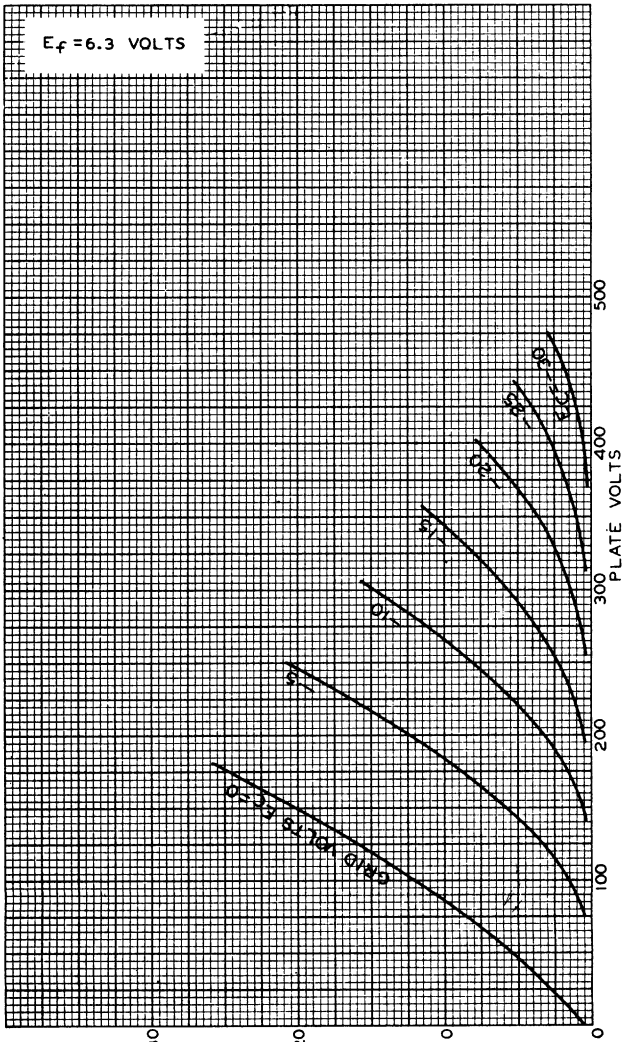
RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-6378

6C4

6C4

AVERAGE PLATE CHARACTERISTICS



MARCH 14, 1942

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-6377

6CA4

Full-Wave Vacuum Rectifier

9-PIN MINIATURE TYPE

GENERAL DATA

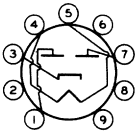
Electrical:

Heater, for Unipotential Cathode:
- Voltage (AC or DC) . . . . . 6.3 volts
- Current . . . . . 1 amp

Mechanical:

Operating Position. . . . . Any
Maximum Overall Length. . . . . 3-1/16"
Maximum Seated Length . . . . . 2-13/16"
Length, Base Seat to Bulb Top (Excluding tip) . 2-7/16" ± 3/32"
Diameter. . . . . 0.750" to 0.875"
Dimensional Outline . . . . . See *General Section*
Bulb. T6-1/2
Base. . . . . Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9M

Pin 1 – Plate No.1
Pin 2 – No Connection
Pin 3 – Cathode
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – No Connection
Pin 7 – Plate No.2
Pin 8 – No Connection
Pin 9 – No Connection

FULL-WAVE RECTIFIER

Maximum Ratings, *Design-Center Values:*

PEAK INVERSE PLATE VOLTAGE.	1000 max.	volts
AC PLATE SUPPLY VOLTAGE PER PLATE (RMS):		
With capacitor-input to filter.	350 max.	volts
PEAK PLATE CURRENT PER PLATE.	450 max.	ma
DC OUTPUT CURRENT	150 max.	ma

HOT-SWITCHING TRANSIENT PLATE CURRENT PER PLATE:

Even occasional hot-switching with capacitor-input circuits permits the flow of plate current having magnitudes which can adversely affect the life and reliability of tubes. If capacitor-input circuits are to be used, protect the circuits against possible adverse effects of hot-switching by the use of a circuit arrangement which will limit the maximum peak current value per plate to a value of I ampere during the initial cycles of the hot-switching transient.

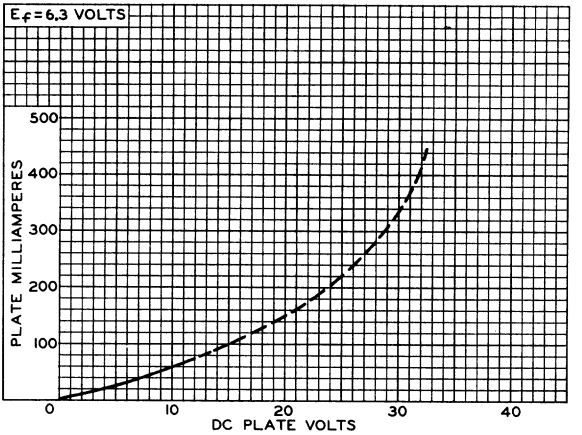
PEAK HEATER-CATHODE VOLTAGE:
- Heater negative with respect to cathode. . 500 max. volts

Typical Operation:

With capacitor input to filter

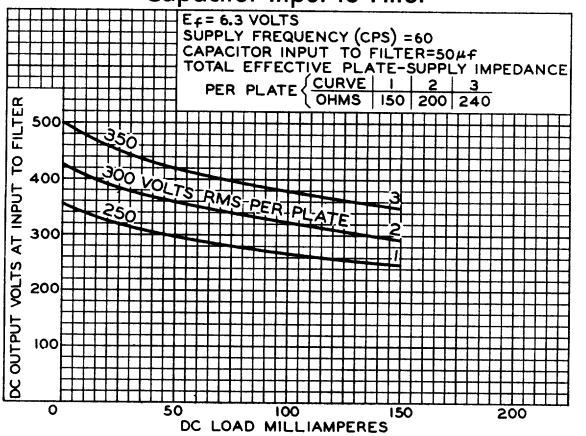
AC Plate-To-Plate Supply Voltage (RMS)	500	600	700	volts
Filter-Input Capacitor	50	50	50	μf
Total Effective Plate-Supply Impedance Per Plate	150	200	240	ohms
DC Output Voltage at Input to Filter (Approx.) for dc output ma. = 150	245	293	347	volts

AVERAGE PLATE CHARACTERISTIC
Each Unit



92CS-10378

OPERATION CHARACTERISTICS
Capacitor Input to Filter



92CS-10379

6CA5

Beam Power Tube

7-PIN MINIATURE TYPE

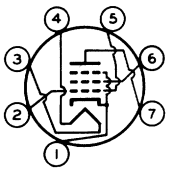
GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	1.2	amp
Direct Interelectrode Capacitances (Approx.):[a]		
Grid No.1 to plate	0.5	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	15	μμf
Plate to cathode & grid No.3, grid No.2, and heater	9	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CV



Pin 1 – Cathode, Grid No.3
Pin 2 – Grid No.1
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Grid No.1
Pin 6 – Grid No.2
Pin 7 – Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	130	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	130	max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0	max.	volts
GRID-No.2 INPUT	1.4	max.	watts
PLATE DISSIPATION	5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	180	max.	°C

Typical Operation and Characteristics:

Plate Voltage	110	125	volts
Grid-No.2 Voltage	110	125	volts

Grid-No.1 Voltage	−4	−4.5	volts
Peak AF Grid-No.1 Voltage	4	4.5	volts
Zero-Signal Plate Current	32	37	ma
Max.-Signal Plate Current	31	36	ma
Zero-Signal Grid-No.2 Current	3.5	4	ma
Max.-Signal Grid-No.2 Current	7.5	11	ma
Plate Resistance (Approx.)	16000	15000	ohms
Transconductance	8100	9200	μmhos
Load Resistance	3500	4500	ohms
Total Harmonic Distortion	5	6	%
Max.-Signal Power Output	1.1	1.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

[a] Without external shield.

[b] The dc component must not exceed 100 volts.

6CB5-A

BEAM POWER TUBE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)		6.3 ± 10%	volts
Current		2.5	amp
Direct Interelectrode Capacitances (Approx.):			
Grid No.1 to plate		0.4	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater		22	μμf
Plate to cathode & grid No.3, grid No.2, and heater		10	μμf

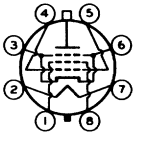
Characteristics, Class A_1 Amplifier:

Plate Voltage	75	175	volts
Grid-No.2 Voltage	150	175	volts
Grid-No.1 Voltage	0	-30	volts
Mu-Factor, Grid No.2 to Grid No.1	-	3.8	
Plate Resistance (Approx.)	-	5000	ohms
Transconductance	-	8800	μmhos
Plate Current	460*	90	ma
Grid-No.2 Current	42*	6	ma
Grid-No.1 Voltage (Approx.) for plate ma. = 1	-	-60	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	5"
Seated Length	4-1/4" ± 3/16"
Maximum Diameter	1-23/32"
Bulb	T12
Cap	Small (JEDEC No.C1-1)
Base	Short Jumbo-Shell Octal 8-Pin with External Barriers (JEDEC Group 1, No.B8-71), or Short Medium-Shell Octal 8-Pin with External Barriers, Style B (JEDEC Group 1, No.B8-118)
Basing Designation for BOTTOM VIEW	8GD

Pin 1 - Grid No.2
Pin 2 - Heater
Pin 3 - Cathode, Grid No.3
Pin 4 - Grid No.1
Pin 5 - Grid No.1



Pin 6 - Cathode, Grid No.3
Pin 7 - Heater
Pin 8 - Grid No.2
Cap - Plate

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system□

DC (Including boost) PLATE VOLTAGE	880 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE#	6800 max.	volts

← Indicates a change.

6CB5-A

BEAM POWER TUBE

PEAK NEGATIVE-PULSE PLATE VOLTAGE . . .	1650	max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE. . .	220	max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE . .	-55	max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 VOLTAGE .	220	max.	volts
CATHODE CURRENT:			
Peak.	850	max.	ma
DC.	240	max.	ma
GRID-No.2 INPUT	4	max.	watts
PLATE DISSIPATION†.	26	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200▲	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface).	220	max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For grid-resistor-bias operation. . .	0.47	max.	megohm

° Without external shield.

* These values can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

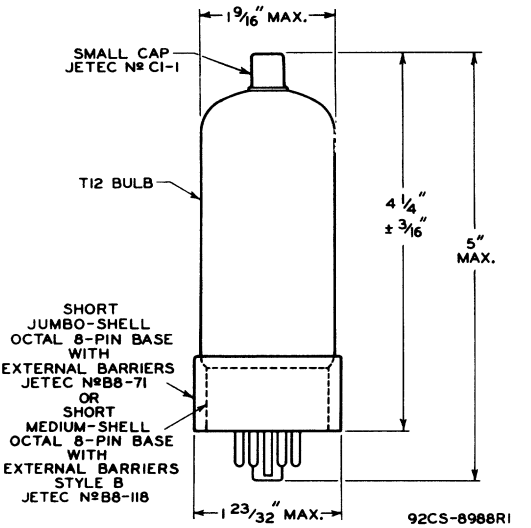
The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

† An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

▲ The dc component must not exceed 100 volts.

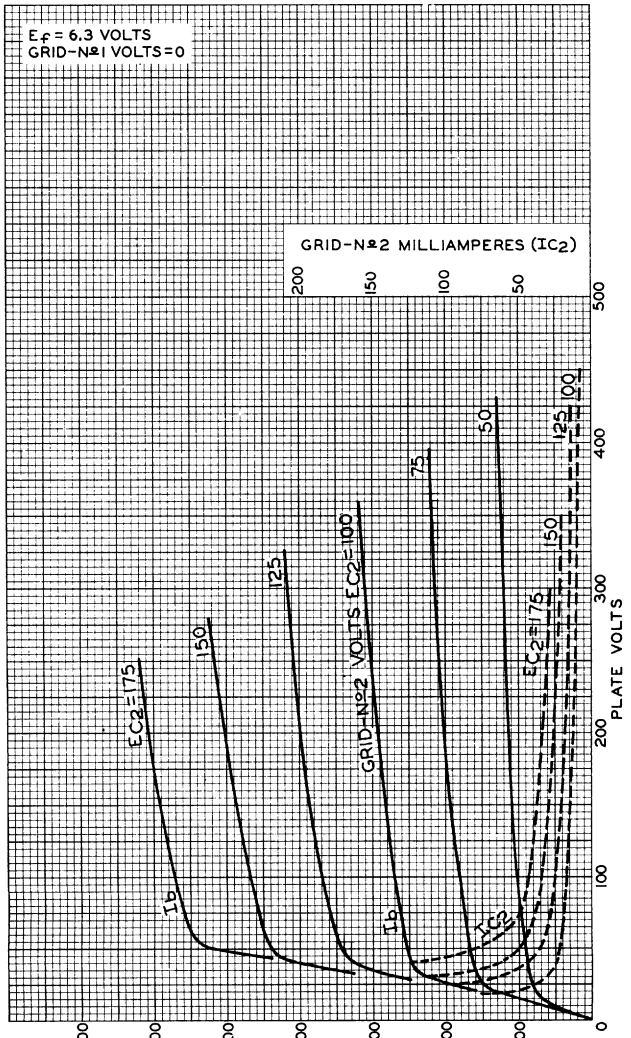
6CB5-A

BEAM POWER TUBE



6CB5-A

AVERAGE CHARACTERISTICS

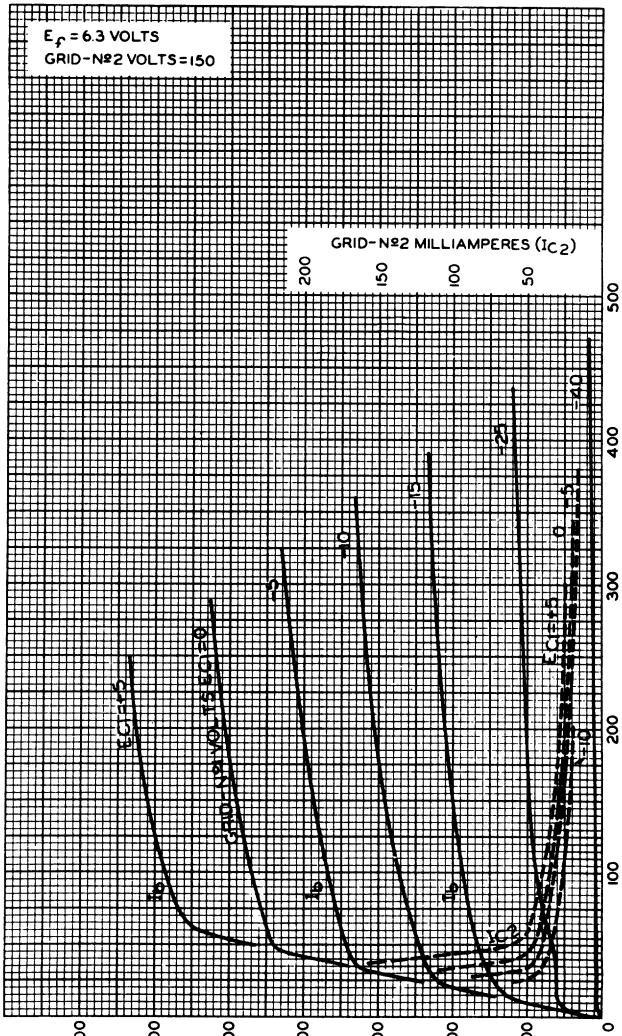


TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8437RI

6CB5-A

AVERAGE CHARACTERISTICS



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8436

6CB6

SHARP-CUTOFF PENTODE

MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.3	amp

Direct Interelectrode Capacitances: ←

	Without External Shield	*With External Shield*°	
Grid No.1 to plate	0.020 max.	0.010 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	6.5	6.5	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	1.9	3.0	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3-4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1) ←
Basing Designation for BOTTOM VIEW	7CM

Pin 1 - Grid No.1
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater

Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Grid No.3, Internal Shield

AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values*: ←

PLATE VOLTAGE	300 max.	volts
GRID-No.2 (SCREEN) SUPPLY VOLTAGE	300 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	2 max.	watts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 150 volts	0.5 max.	watt
For grid-No.2 voltages between 150 and 300 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	

° With external shield JETEC No.316 connected to cathode

← Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6CB6

SHARP-CUTOFF PENTODE

→ PEAK HEATER–CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲max.	volts
Typical Operation and Characteristics:		
Plate Voltage	200	volts
Grid No.3 (Suppressor)	*Connected to cathode at socket*	
Grid-No.2 Voltage	150	volts
Cathode-Bias Resistor	180	ohms
Plate Resistance (Approx.)	0.6	megohm
Transconductance	6200	μmhos
Grid-No.1 Voltage (Approx.) for plate current of 10 μamp	−8	volts
Plate Current	9.5	ma
Grid-No.2 Current	2.8	ma

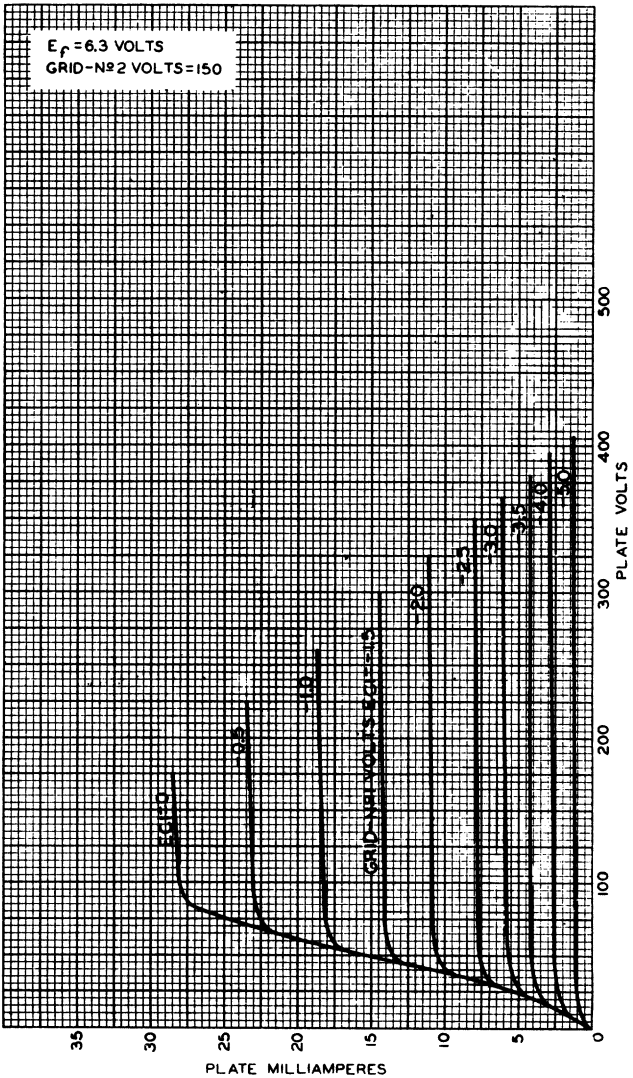
▲ The dc component must not exceed 100 volts.

→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6CB6

AVERAGE PLATE CHARACTERISTICS



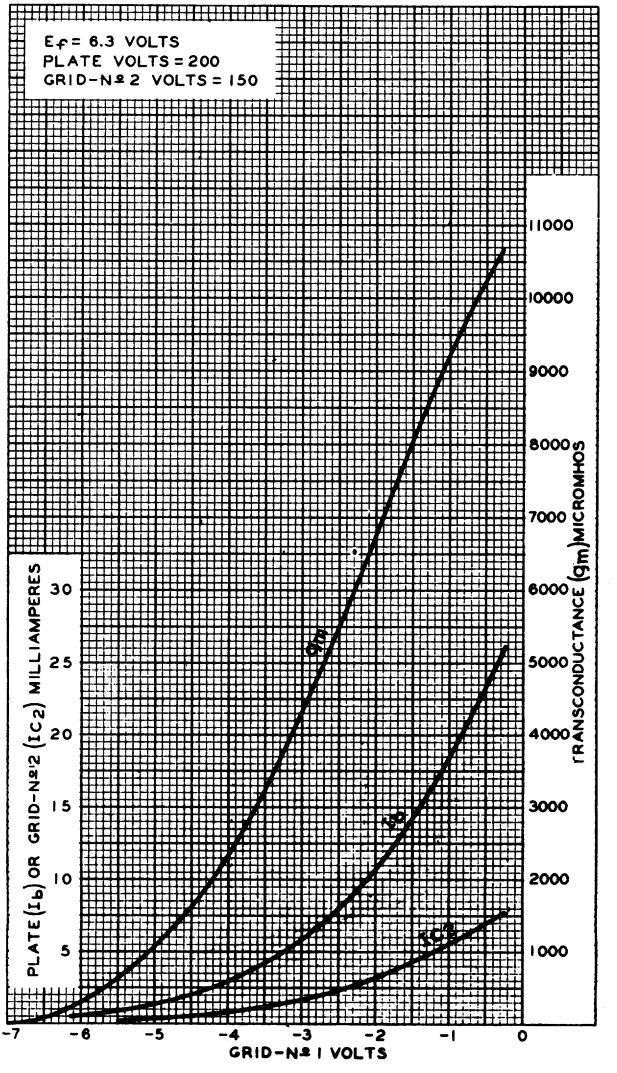
SEPT. 30, 1949

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7378

6CB6

AVERAGE CHARACTERISTICS



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6CB6-A
SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

With heater having controlled warm-up time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.3 ± 6%	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*°	
Grid No.1 to plate	0.025 max.	0.015 max.	μμf
Grid No.1 to cathode & internal shield & grid No.3, grid No.2, and heater	6.5	6.5	μμf
Plate to cathode & internal shield & grid No.3, grid No.2, and heater	2	3	μμf

Characteristics, Class A_1 Amplifier:

Plate-Supply Voltage	125	125	volts
Grid No.3	♦	♦	
Grid-No.2 Supply Voltage	125	125	volts
Grid-No.1 Voltage	-3	-	volts
Cathode Resistor	-	56	ohms
Plate Resistance (Approx.)	-	0.28	megohm
Transconductance	-	8000	μmhos
Plate Current	2.8	13	ma
Grid-No.2 Current	-	3.7	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-	-6.5	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)

°, ♦: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

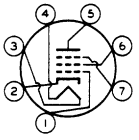
TENTATIVE DATA

6CB6-A

SHARP-CUTOFF PENTODE

Basing Designation for Bottom View. 7CM

Pin 1 – Grid No.1
Pin 2 – Cathode
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Plate



Pin 6 – Grid No.2
Pin 7 – Grid No.3, Internal Shield

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE	0	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330	max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0	max.	volts
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 165 volts	0.55	max.	watt
For grid-No.2 voltages between 165 and 330 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
PLATE DISSIPATION	2.3	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.25	max.	megohm
For cathode-bias operation	1	max.	megohm

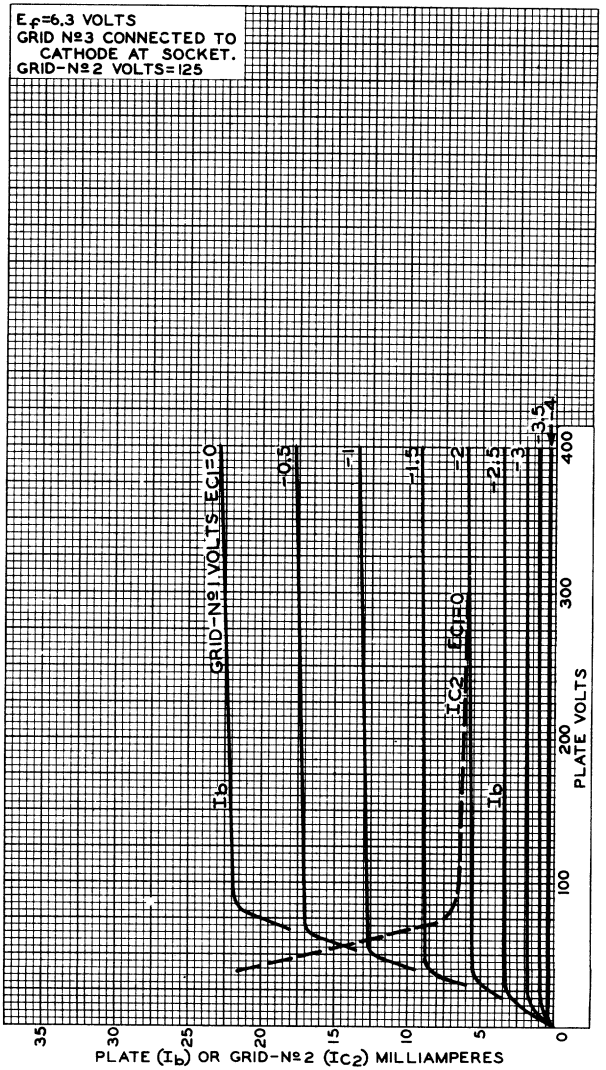
o With external shield JEDEC No.316 connected to cathode.
♦ Connected to cathode at socket.
▲ The dc component must not exceed 100 volts.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

6CB6-A

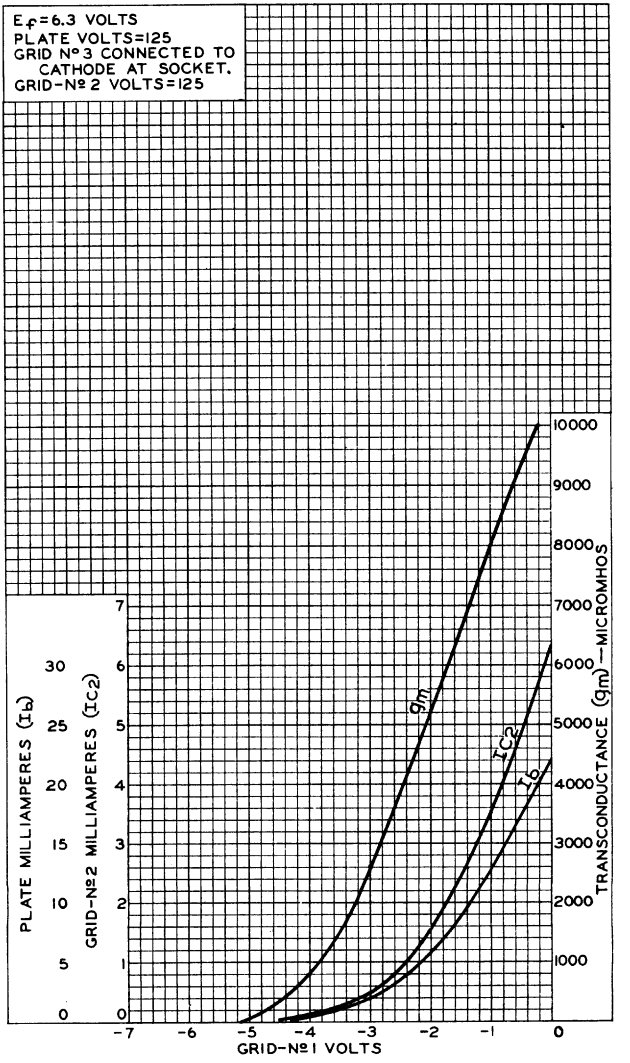
AVERAGE CHARACTERISTICS



6CB6-A

6CB6-A

AVERAGE CHARACTERISTICS



6CD6-GA
BEAM POWER TUBE

Supersedes Type 6CD6-G

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	2.5	amp
Direct Interelectrode Capacitances (Approx.):°		
Grid No.1 to plate	1.1	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	22	μμf
Plate to cathode & grid No.3, grid No.2, and heater	8.5	μμf

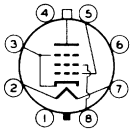
Characteristics, Class A_1 Amplifier:

Plate Voltage	60	175	volts
Grid-No.2 (Screen-Grid) Voltage	100	175	volts
Grid-No.1 (Control-Grid) Voltage	0	−30	volts
Mu-Factor, Grid No.2 to Grid No.1	–	3.9	
Plate Resistance (Approx.)	–	7200	ohms
Transconductance	–	7700	μmhos
Plate Current	230*	75	ma
Grid-No.2 Current	21*	5.5	ma
Grid-No.1 Voltage (Approx.) for plate current of 1 ma	–	−55	volts

Mechanical:

Mounting Position	Vertical, base up or down, or Horizontal with pins 2 and 7 in vertical plane
Maximum Overall Length	5"
Seated Length	4-1/4" ± 3/16"
Maximum Diameter	1-9/16"
Bulb	T-12
Cap	Small (JETEC No.C1-1)
Base	Short Medium-Shell Octal 8-Pin with External Barriers, Style A (JETEC No.B8-110), or Short Medium-Shell Octal 8-Pin with External Barriers, Style B (JETEC No.B8-118)
Basing Designation for BOTTOM VIEW	5BT

Pin 1 – No Connection
Pin 2 – Heater
Pin 3 – Cathode, Grid No.3
Pin 4 – No Connection
Pin 5 – Grid No.1
Pin 6 – No Connection
Pin 7 – Heater
Pin 8 – Grid No.2
Cap – Plate



° Without external shield.

* These values can be measured by a method involving a recurrent wave form such that the cathode current will be kept within ratings in order to prevent damage to the tube.

TENTATIVE DATA

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6CD6-GA

6CD6-GA

BEAM POWER TUBE

HORIZONTAL DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	700	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE (Absolute maximum)⊕	7000■	max.	volts
PEAK NEGATIVE-PULSE PLATE VOLTAGE	1500	max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	175	max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	−50	max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 VOLTAGE	200	max.	volts
CATHODE CURRENT:			
Peak	700	max.	ma
Average	200	max.	ma
GRID-No.2 INPUT	3	max.	watts
PLATE DISSIPATION†	20	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	225	max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For grid-resistor-bias operation†	0.47	max.	megohm

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

■ Under no circumstances should this absolute value be exceeded.

⊕ The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

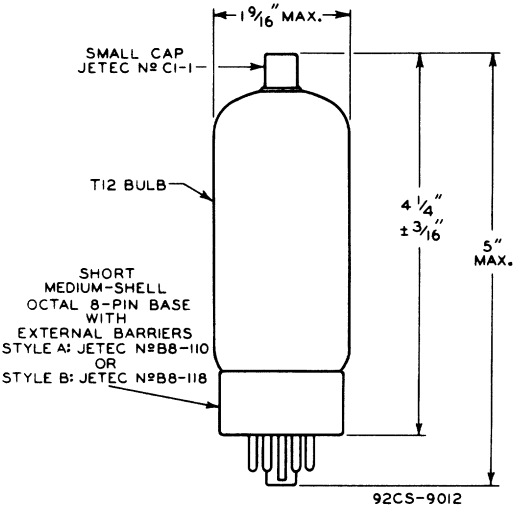
† It is essential that the plate dissipation be limited in the event of loss of grid signal. For this purpose, some protective means such as a cathode resistor of suitable value should be employed.

▲ The dc component must not exceed 100 volts.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6CD6-GA

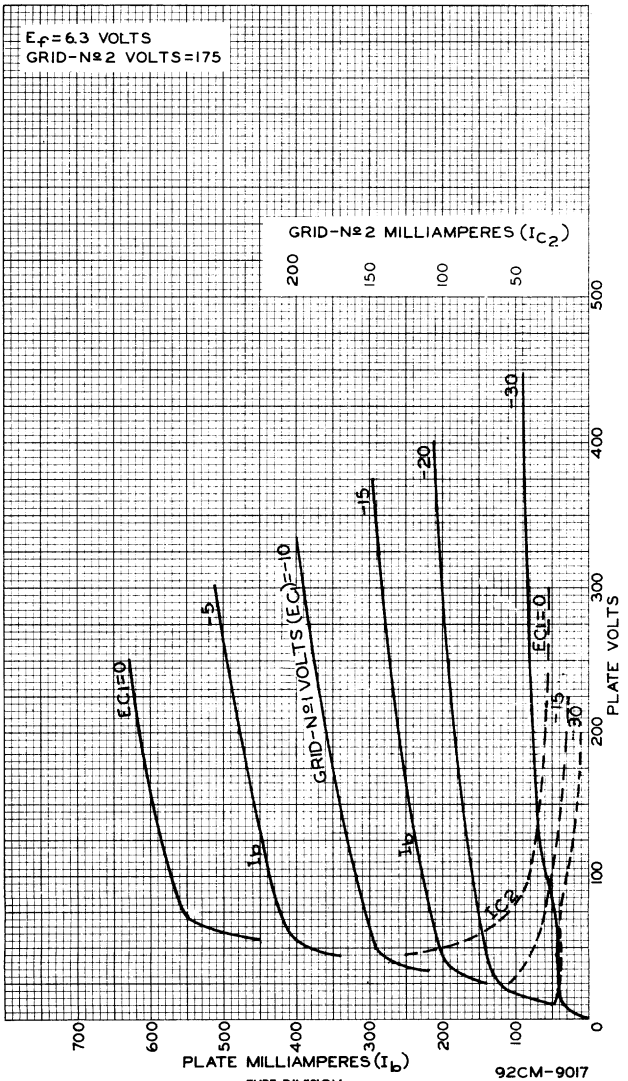
BEAM POWER TUBE



6CD6-GA

6CD6-GA

AVERAGE CHARACTERISTICS

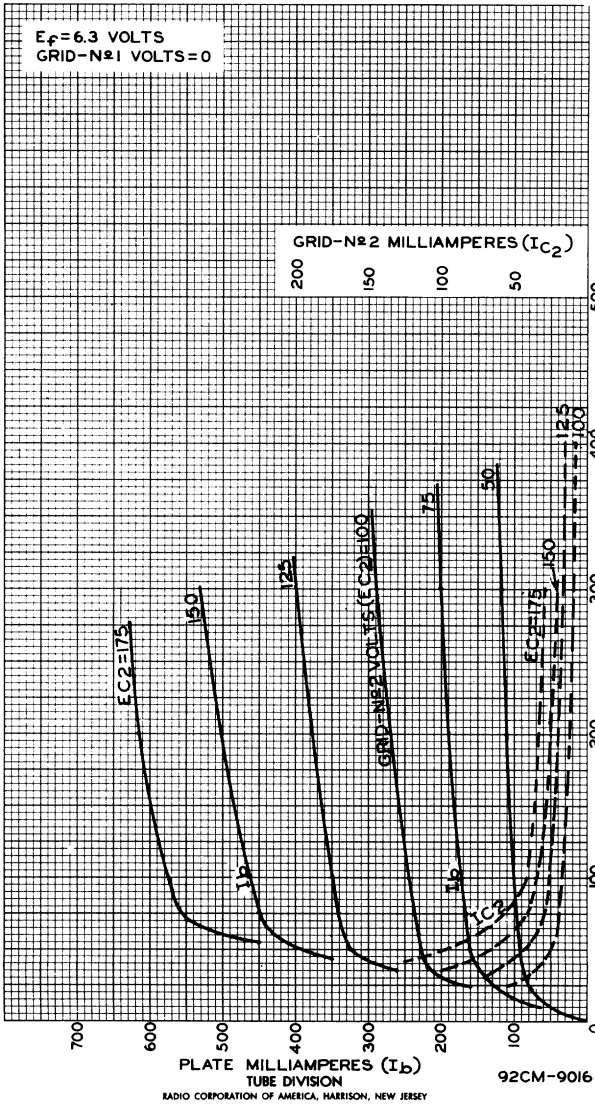


92CM-9017

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6CD6-GA

AVERAGE CHARACTERISTICS



92CM-9016

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

Half-Wave Vacuum Rectifier

Duodecar Type
Pressure-Welded Cathode Coating
For Color-TV Damper-Diode Applications

ELECTRICAL CHARACTERISTICS – Bogey Values

Heater Voltage, ac or dc	E_h	6.3	V
Heater Current	I_h	2.5	A
Direct Interelectrode Capacitances:[a]			
Plate to cathode and heater	$c_{p(k+h)}$	13	pF
Cathode to plate and heater	$c_{k(p+h)}$	18	pF
Heater to cathode	c_{h-k}	5.5	pF
Instantaneous Tube Voltage Drop for instantaneous plate current (i_b) = 680 mA	e_b	20	V

MECHANICAL CHARACTERISTICS

Maximum Overall Length	3.375 in (85.72 mm)
Maximum Seated Length	3.000 in (76.2 mm)
Maximum Diameter	1.188 in (30.1 mm)
Envelope	JEDEC T9
Base[b]	Duodecar 12-Pin with Exhaust Tip (JEDEC E12-70)
Terminal Diagram	JEDEC 12GK
Type of Cathode	Coated Unipotential
Operating Position	Any

MAXIMUM RATINGS – Design-Maximum Values[c]

For operation as a Damper Tube in Color-TV Receivers utilizing a 525-line, 30-frame system

Peak Inverse Plate Voltage.	$-e_{bm}$	5000[d]	V
Heater-Cathode Voltage:			
Peak	e_{hkm}	+300	V
		-5000	V
Average[e]	$E_{hk(av)}$	+100	V
		-900	V
Heater Voltage, ac or dc	E_h	5.7 to 6.9	V
Plate Current:			
Peak	i_{bm}	1500	mA
Average[e]	$I_{b(av)}$	350	mA
Plate Dissipation	P_b	11	W

Envelope Temperature (at hottest point on envelope surface)	T_E	220	°C

[a] Measured without external shield in accordance with the current issue of EIA Standard RS-191.

[b] Designed to mate with Duodecar 12-Contact Socket generally available from your local RCA Distributor.

[c] As defined in the current issue of EIA Standard RS-239.

[d] This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10 μs.

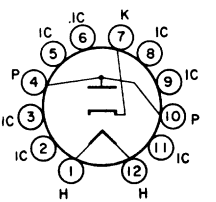
[e] Measured with a dc meter.

OPERATING CONSIDERATIONS

Socket terminals 2, 3, 5, 6, 8, 9 and 11 should not be used as tie points for external-circuit components. It is recommended that the socket tabs be removed to reduce the possibility of arc-over and to minimize leakage.

TERMINAL DIAGRAM (Bottom View)

Pin 1: Heater
Pin 2: Do Not Use
Pin 3: Do Not Use
Pin 4: Plate
Pin 5: Do Not Use
Pin 6: Do Not Use
Pin 7: Cathode
Pin 8: Do Not Use
Pin 9: Do Not Use
Pin 10: Plate
Pin 11: Do Not Use
Pin 12: Heater



JEDEC 12GK

6CG3

Half-Wave Vacuum Rectifier

Duodecar Type
Pressure-Welded Cathode Coating
For Color-TV Damper-Diode Applications

ELECTRICAL CHARACTERISTICS – Bogey Values

Heater Voltage, ac or dc	E_h	6.3	V
Heater Current	I_h	1.8	A
Direct Interelectrode Capacitances:[a]			
Plate to cathode and heater.	$c_{p(k+h)}$	13	pF
Cathode to plate and heater.	$c_{k(p+h)}$	16	pF
Heater to cathode	c_{h-k}	4.0	pF
Instantaneous Tube Voltage Drop for instantaneous plate current (i_b) = 700 mA	e_b	25	V

MECHANICAL CHARACTERISTICS

Maximum Overall Length	3.375 in (85.72 mm)
Maximum Seated Length	3.000 in (76.2 mm)
Maximum Diameter	1.188 in (30.1 mm)
Envelope	JEDEC T9
Base[b]	Duodecar 12-Pin with Exhaust Tip (JEDEC E12-70)
Terminal Diagram	JEDEC 12HF
Type of Cathode	Coated Unipotential
Operating Position	Any

MAXIMUM RATINGS – Design-Maximum Values[c]

For operation as a Damper Tube in Color-TV Receivers utilizing a 525-line, 30-frame system

Peak Inverse Plate Voltage	$-e_{bm}$	5000[d]	V
Heater-Cathode Voltage:			
Peak	e_{hkm}	+300	V
		-5000	V
Average[e]	$E_{hk(av)}$	+100	V
		-900	V
Heater Voltage, ac or dc	E_h	5.7 to 6.9	V
Plate Current:			
Peak	i_{bm}	2100	mA
Average[e]	$I_{b(av)}$	350	mA
Plate Dissipation	P_b	6.5	W

Envelope Temperature (at hottest point on envelope surface)	T_E	220	°C

a Measured without external shield in accordance with the current issue of EIA Standard RS-191.

b Designed to mate with Duodecar 12-Contact Socket generally available from your local RCA Distributor.

c As defined in the current issue of EIA Standard RS-239.

d This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10 μs.

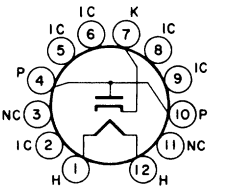
e Measured with a dc meter.

OPERATING CONSIDERATIONS

Socket terminals 2, 5, 6, 8 and 9 should not be used as tie points for external-circuit components. It is recommended that the socket tabs be removed to reduce the possibility of arc-over and to minimize leakage.

TERMINAL DIAGRAM (Bottom View)

Pin 1: Heater
Pin 2: Do Not Use
Pin 3: No Internal Connection
Pin 4: Plate
Pin 5: Do Not Use
Pin 6: Do Not Use
Pin 7: Cathode
Pin 8: Do Not Use
Pin 9: Do Not Use
Pin 10: Plate
Pin 11: No Internal Connection
Pin 12: Heater



JEDEC 12HF

6CG8-A

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)	6.3		volts
Current	0.45 ± 6%		amp
Warm-up time (Average)	11		sec
Direct Interelectrode Capacitances:	*Without External Shield*	*With External Shield▲*	
Triode Unit:			
Grid to plate	1.5	1.5	μμf
Grid to cathode & pentode grid No.3, and heater	2	2.4	μμf
Plate to cathode & pentode grid No.3, and heater	0.5	1	μμf
Pentode Unit:			
Grid No.1 to plate	0.09 max.	0.06 max.	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	4.6	4.8	μμf
Plate to cathode & grid No.3, grid No.2, and heater	0.9	1.6	μμf
Pentode grid No.1 to triode plate	0.05 max.	0.04 max.	μμf
Pentode plate to triode plate	0.05 max.	0.008 max.	μμf
Heater to cathode	6.5	6.5●	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*		
Plate Voltage	125	100	125	volts
Grid No.3	–	*Connected to cathode at socket*		
Grid-No.2 Voltage	–	70	125	volts
Grid-No.1 Voltage	-1	–	-1	volt
Amplification Factor	40	–	–	
Plate Resistance (Approx.)	6000	–	300000	ohms
Transconductance	6500	5700	5500	μmhos
Plate Current	12	–	9	ma
Grid-No.2 Current	–	–	2.2	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-7	–	-6.5	volts

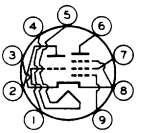
◄ Indicates a change.

6CG8-A

Mechanical:

Operating Position. . . . . Any
Maximum Overall Length. . . . . 2-3/16"
Maximum Seated Length . . . . . 1-15/16"
Length, Base Seat to Bulb Top (Excluding tip). . 1-9/16" ± 3/32"
→ Diameter. . . . . 0.750" to 0.875"
Dimensional Outline . . . . . See *General Section*
Bulb. T6-1/2
Base. . . . . .Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9GF

Pin 1 - Triode Grid
Pin 2 - Triode Plate
Pin 3 - Cathode
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Pentode Plate



Pin 7 - Pentode Grid No.2
Pin 8 - Pentode Grid No.3, Cathode
Pin 9 - Pentode Grid No.1

→ **AMPLIFIER — Class A_1**

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit	*Pentode Unit*
PLATE VOLTAGE	275 max.	275 max. volts
GRID No.3 (SUPPRESSOR GRID) .	-	*Connect to cathode at socket*
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE.	-	275 max. volts
GRID-No.2 VOLTAGE	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max. volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 137.5 volts	-	0.45 max. watt
For grid-No.2 voltages between 137.5 and 275 volts	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section
PLATE DISSIPATION	1.7 max.	2.3 max. watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. . . .	200 max.	200 max. volts
Heater positive with respect to cathode. . . .	200★ max.	200★ max. volts

▲ With external shield JEDEC No.315 connected to cathode except as noted.
● With external shield JEDEC No.315 connected to pentode plate.
★ The dc component must not exceed 100 volts.

Curves shown under Type 6X8 also apply to the 6CG8-A

→ Indicates a change.

Half-Wave Vacuum Rectifier

Novar Type

For Black-and-White-TV Damper Diode Applications

ELECTRICAL CHARACTERISTICS – Bogey Values

Heater Voltage, ac or dc	E_h	6.3	V
Heater Current	I_h	1.2	A
Direct Interelectrode Capacitances:[a]			
Plate to cathode and heater	$c_{p(k+h)}$	6.5	pF
Cathode to plate and heater	$c_{k(p+h)}$	9.0	pF
Heater to cathode	c_{hk}	3.0	pF
Instantaneous Tube Voltage Drop for instantaneous plate current (i_b) = 350 mA	e_b	16	V

MECHANICAL CHARACTERISTICS

Maximum Overall Length (l_m) . . . . . 3.410in.(86.61 mm)

Maximum Seated Length (l_{sm}) . . . . . 3.030in.(76.96 mm)

Maximum Diameter (d_m) . . . . . 1.188in.(30.1 mm)

Envelope . . . . . JEDEC Designation T9

Base[b] . . . . . Small-Button Novar 9-Pin with Exhaust Tip (JEDEC Designation E9-89)

Terminal Connections (See *TERMINAL DIAGRAM*) . . . . . JEDEC Designation 9HP

Type of Cathode . . . . . Coated Unipotential

Operating Position . . . . . Any

MAXIMUM RATINGS – Design-Maximum Values[c]

For operation as a Damper Tube in Black-and-White-TV Receivers utilizing a 525-line, 30-frame system[d]

Peak Inverse Plate Voltage	$-e_{bm}$	5200[e]	V
Heater-Cathode Voltage: Peak	e_{hkm}	+300 -5200	V V
Average[f]	$E_{hk(av)}$	+100 -900	V V
Heater Voltage	E_h	5.7 to 6.9	V

Plate Current:			
Peak	i_{bm}	1200	mA
Average[f]	$I_{b(av)}$	250	mA
Plate Dissipation	P_b	6.5	W
Envelope Temperature (at hottest point on envelope surface)	T_E	220	°C

[a]Measured without external shield in accordance with the current issue of EIA Standard RS-191.

[b]Designed to mate with Novar 9-Contact Socket generally available from your local RCA Distributor.

[c]As defined in the current issue of EIA Standard RS-239.

[d]As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

[e]This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% on one horizontal scanning cycle is 10 μs.

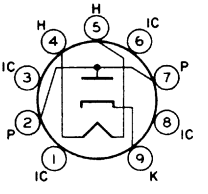
[f]Measured with a dc meter.

OPERATING CONSIDERATIONS

Socket terminals 1, 3, 6, and 8 should not be used as tie points for external-circuit components. It is recommended that these socket tabs be removed to reduce the possibility of arc-over and to minimize leakage.

TERMINAL DIAGRAM (Bottom View)

Pin 1 - Do Not Use
Pin 2 - Plate
Pin 3 - Do Not Use
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Do Not Use
Pin 7 - Plate
Pin 8 - Do Not Use
Pin 9 - Cathode



JEDEC 9HP

Half-Wave Vacuum Rectifier

NOVAR TYPE

PRESSURE-WELDED CATHODE COATING

For Color-TV Damper-Diode Applications

ELECTRICAL CHARACTERISTICS

Bogey Values

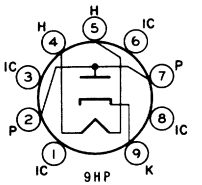
Heater Voltage (AC or DC)	E_h	6.3	V
Heater Current	I_h	1.2	A
Direct Interelectrode Capacitances			
Without external shield			
Plate to cathode and heater	$c_{p(k+h)}$	6.5	pF
Cathode to plate and heater	$c_{k(p+h)}$	9.0	pF
Heater to cathode	c_{h-k}	3.0	pF
Instantaneous Tube Voltage Drop	e_b	16	V
For instantaneous plate current (i_b) = 350 mA			

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.005 in
Maximum Seated Length	2.625 in
Maximum Diameter	1.188 in
Dimensional Outline	See *General Section*
Envelope	T9
Base	Small-Button Novar 9-Pin with Exhaust Tip (JEDEC E9-89)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Do Not Use
Pin 2 – Plate
Pin 3 – Do Not Use
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Do Not Use
Pin 7 – Plate
Pin 8 – Do Not Use
Pin 9 – Cathode



DESIGN-MAXIMUM RATINGS

For operation as a Damper Tube in Black-and-White TV Receivers utilizing a 525-line, 30-frame system

Peak Inverse Plate Voltage	$-e_{bm}$	5500[a]	V
Heater-Cathode Voltage			
Peak	e_{hkm}	+300	V
		-5500	V
Average[b]	$E_{hk(av)}$	+100	V
		-900	V
Heater Voltage (AC or DC)	E_h	5.7 to 6.9	V

Plate Current			
Peak	i_{bm}	1300	mA
Average[b]	$I_{b(av)}$	250	mA
Plate Dissipation	P_b	8.5	W
Envelope Temperature.	T_E	220	°C
At hottest point on envelope surface			

[a] This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10 μs.

[b] Measured with a dc meter.

OPERATING CONSIDERATIONS

Socket terminals 1, 3, 6, and 8 should not be used as tie points for external-circuit components. It is recommended that these socket tabs be removed to reduce the possibility of arc-over and to minimize leakage.

6CL6

POWER PENTODE

MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.65	amp
Direct Interelectrode Capacitances (without external shield):		
Grid No.1 to Plate	0.120	μμf
Input	11	μμf
Output	5.5	μμf

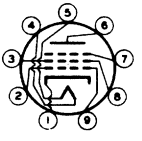
Characteristics, Amplifier Class A_1:

Plate Voltage	250	volts
Grid No.3	Connected to cathode at socket	
Grid-No.2 Voltage	150	volts
Grid-No.1 Voltage	-3	volts
Peak AF Grid-No.1 Signal Voltage	3	volts
Zero-Signal DC Plate Current	30	ma
Max.-Signal DC Plate Current	31	ma
Zero-Signal DC Grid-No.2 Current	7	ma
Max.-Signal DC Grid-No.2 Current	7.2	ma
Plate Resistance (Approx.)	0.15	megohm
Transconductance	11000	μmhos
Grid-No.1 Voltage (Approx.) for plate current of 10 μamp	-14	volts
Load Resistance	7500	ohms
Total Harmonic Distortion	8	per cent
Max.-Signal Power Output	2.8	watts

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (excluding tip)	2" ± 3/32"
Maximum Diameter	7/8"
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)

BOTTOM VIEW



Pin 1 - Cathode
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Plate
Pin 7 - Grid No.3, Int.Shield
Pin 8 - Grid No.2
Pin 9 - Grid No.1

AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
PLATE SUPPLY VOLTAGE	300 max.	volts
GRID-No.3 (SUPPRESSOR) VOLTAGE	0 max.	volts

6CL6

6CL6

POWER PENTODE

GRID-No.2 (SCREEN) VOLTAGE	*See Rating Curve at front of this Section*	
GRID-No.2 SUPPLY VOLTAGE	300 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative bias value	50 max.	volts
Positive bias value	0 max.	volts
PLATE DISSIPATION	7.5 max.	watts
GRID-No.2 INPUT	1.7 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	200 max.	°C

Typical Operation in 4-Mc Bandwidth Video Amplifier Circuit of Fig. 1:

Plate Supply Voltage	300	volts
Grid No.3	Connected to cathode at socket	
Grid-No.2 Supply Voltage	300	volts
Grid-No.1 Bias Voltage	-2	volts
Grid-No.1 Signal Voltage (Peak to Peak)	3	volts
Grid-No.2 Resistor	24000	ohms
Grid-No.1 Resistor	0.1	megohm
Load Resistor	3900	ohms
Zero-Signal Plate Current	30	ma
Zero-Signal Grid-No.2 Current	7.0	ma
Voltage Output (Peak to Peak)	132	volts

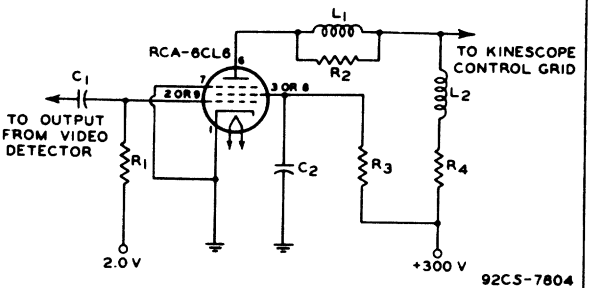
Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

6CL6

POWER PENTODE

Fig. 1 – Typical Video Voltage Amplifier Circuit Having Bandwidth of 4 Mc.



C1: 0.1 μf, 400 volts
C2: 4 μf, 400 volts
L1: Peaking Coil, 180 μh
L2: Peaking Coil, 120 μh

R1: 100000 ohms, 0.5 watt
R2: 47000 ohms, 0.5 watt
R3: 24000 ohms, 2 watts
R4: 3900 ohms, 5 watts non-inductive type

Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.

6CL6

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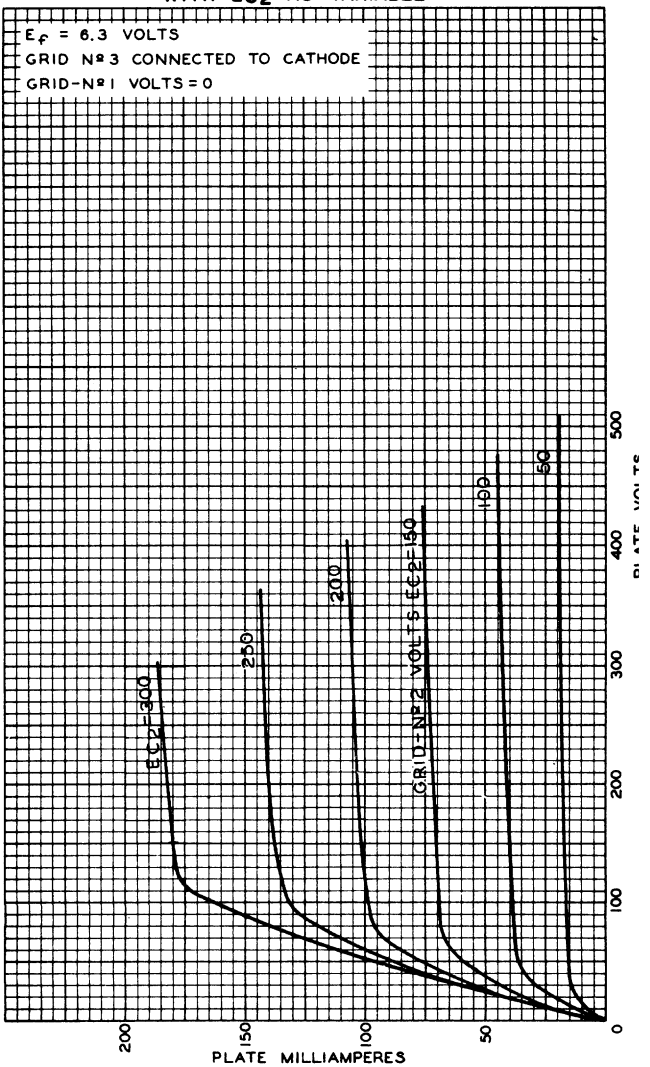
AVERAGE PLATE CHARACTERISTICS
WITH E_{C2} AS VARIABLE



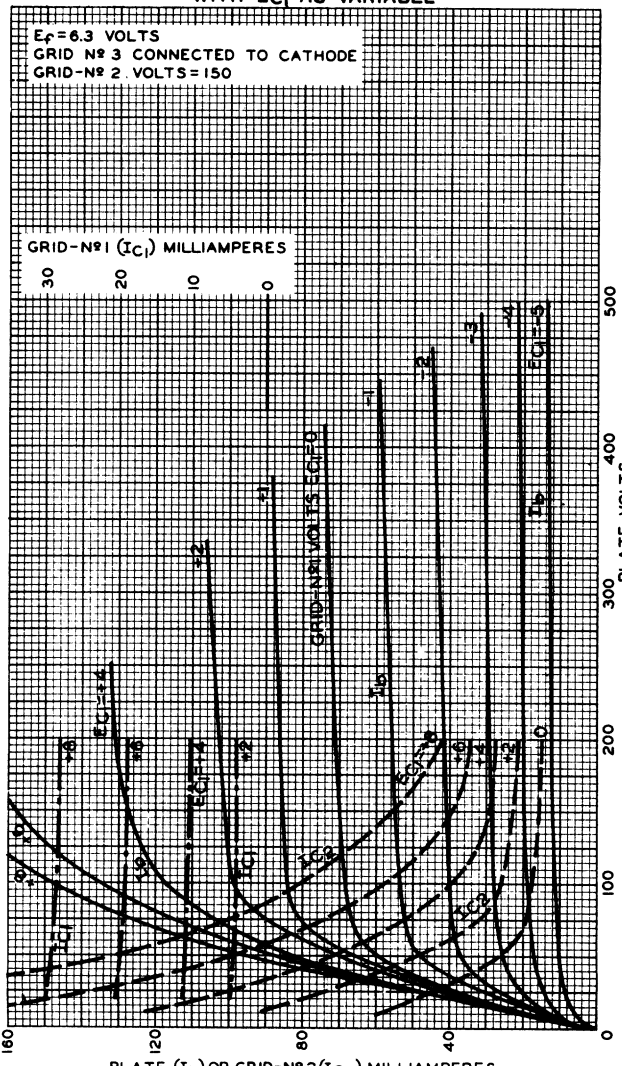
MAY 22, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7803

6CL6

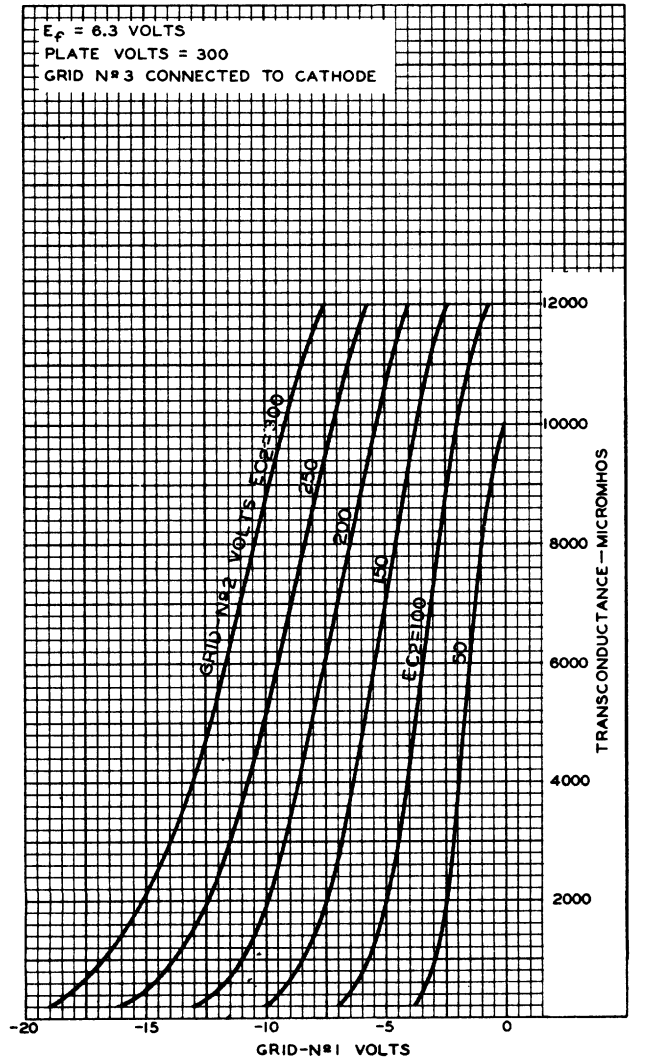
AVERAGE PLATE CHARACTERISTICS
WITH E_{C1} AS VARIABLE



6CL6

6CL6

AVERAGE CHARACTERISTICS



RCA

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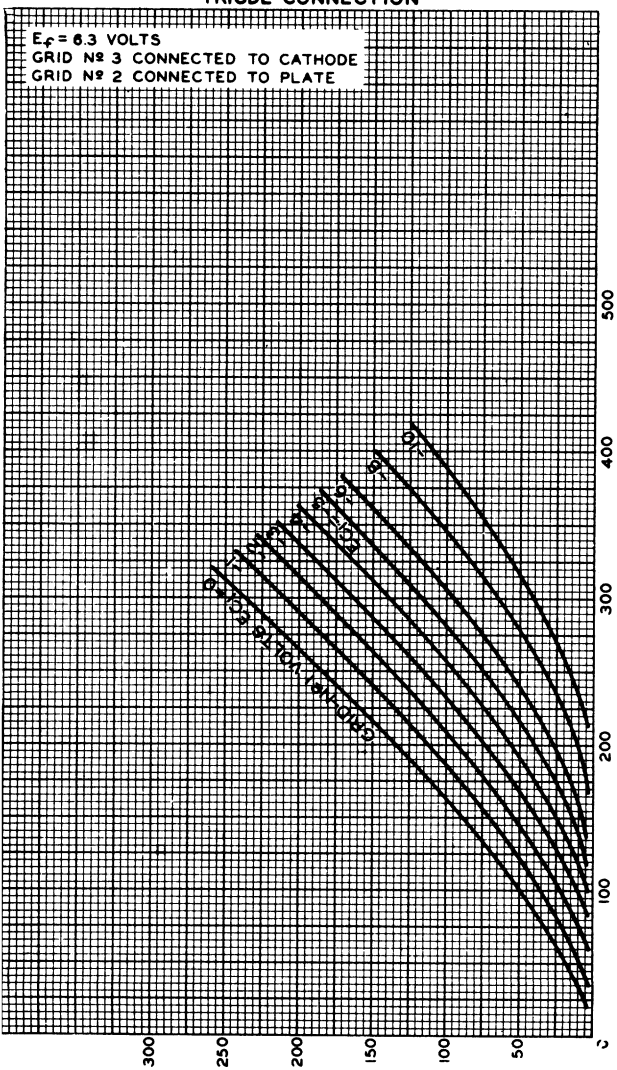
AVERAGE PLATE CHARACTERISTICS

TRIODE CONNECTION



MAY 26, 1952

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7808

6CL8-A
MEDIUM-MU TRIODE—SHARP-CUTOFF TETRODE

9-PIN MINIATURE TYPE

With heater having controlled warm-up time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Voltage (AC or DC)	6.3		volts
Current	0.45 ± 6%		amp
Warm-up time (Average)	11		sec
Direct Interelectrode Capacitances:	*Without External Shield*	*With External Shield*[o]	
Triode Unit:			
Grid to plate	1.8	1.8	μμf
Grid to cathode, tetrode cathode & internal shield, and heater	2.8	2.8	μμf
Plate to cathode, tetrode cathode & internal shield, and heater	1.5	2	μμf
Tetrode Unit:			
Grid No.1 to plate	0.02 max.	0.01 max.	μμf
Grid No.1 to cathode & internal shield, grid No.2, and heater	5	5	μμf
Plate to cathode & internal shield, grid No.2, and heater	2	3	μμf
Tetrode grid No.1 to triode plate	0.015 max.	0.01 max.	μμf
Tetrode plate to triode plate	0.15 max.	0.03 max.	μμf
Heater to cathode (Each Unit)	3	3●	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Tetrode Unit*		
Plate Voltage	125	100	125	volts
Grid-No.2 Voltage	–	70	125	volts
Grid-No.1 Voltage	-1	–	-1	volt
Amplification Factor	40	–	–	
Plate Resistance (Approx.)	5000	–	200000	ohms
Transconductance	8000	7000	6500	μmhos
Plate Current	14	–	12	ma
Grid-No.2 Current	–	–	4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-9	–	-9	volts

← Indicates a change.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

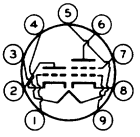
6CL8-A

MEDIUM-MU TRIODE— SHARP-CUTOFF TETRODE

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
→ Basing Designation for BOTTOM VIEW	9FX

Pin 1 – Triode Grid
Pin 2 – Triode Plate
Pin 3 – Triode Cathode
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Tetrode Plate
Pin 7 – Tetrode Grid No.2
Pin 8 – Tetrode Cathode, Internal Shield
Pin 9 – Tetrode Grid No.1



CONVERTER

→ **Maximum Ratings,** *Design-Maximum Values:*

	Triode Unit as Osc.	*Tetrode Unit as Mixer*	
PLATE VOLTAGE	330 max.	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	–	330 max.	volts
GRID-No.2 VOLTAGE	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts	–	0.55 max.	watt
For grid-No.2 voltages between 165 and 330 volts	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	2.5 max.	3 max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	200 max.	200 max.	volts
Heater positive with respect to cathode	200▲ max.	200▲ max.	volts

→ Indicates a change.

6CL8-A

MEDIUM-MU TRIODE—SHARP-CUTOFF TETRODE

Maximum Circuit Values:

	Triode Unit	*Tetrode Unit*	
Grid-No.1-Circuit Resistance:			
For fixed-bias operation. . .	0.5 max.	0.25 max.	megohm
For cathode-bias operation. .	1 max.	1 max.	megohm

○ With external shield JEDEC No.315 connected to cathode of unit under test except as noted.

● ▲ With external shield JEDEC No.315 connected to ground.

The dc component must not exceed 100 volts.

Half-Wave Vacuum Rectifier

NOVAR TYPE

"PRESSURE-WELDED" CATHODE COATING

For Color-TV Damper-Diode Applications

ELECTRICAL CHARACTERISTICS

Bogey Values

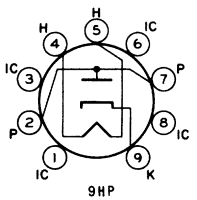
Heater Voltage (AC or DC)	E_h	6.3	V
Heater Current	I_h	2.4	A
Direct Interelectrode Capacitances			
Without external shield			
Plate to cathode and heater	$c_p(k+h)$	20	pF
Cathode to plate and heater	$c_k(p+h)$	18	pF
Heater to cathode	c_{h-k}	4.0	pF
Instantaneous Tube Voltage Drop	e_b	10	V
For instantaneous plate current (i_b) = 350 mA			

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.005 in
Maximum Seated Length	2.625 in
Maximum Diameter	1.188 in
Dimensional Outline	See *General Section*
Envelope	T9
Base	Small-Button Novar 9-Pin With Exhaust Tip (JEDEC E9-89)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Do Not Use
Pin 2 – Plate
Pin 3 – Do Not Use
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Do Not Use
Pin 7 – Plate
Pin 8 – Do Not Use
Pin 9 – Cathode



9HP

DESIGN-MAXIMUM RATINGS

For operation as a Damper Tube in Color TV Receivers utilizing a 525-line, 30-frame system

Peak Inverse Plate Voltage	$-e_{bm}$	5500[a]	V
Heater-Cathode Voltage			
Peak	e_{hkm}	+300	V
		-5500	V
Average	$E_{hk(av)}$	+100	V
		-900	V
Heater Voltage (AC or DC)	E_h	5.7 to 6.9	V

Plate Current			
Peak	i_{bm}	1700	mA
Average	$I_{b(av)}$	400	mA
Plate Dissipation	P_b	12	W

[a] This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10 μs.

OPERATING CONSIDERATIONS

Socket terminals 1, 3, 6, and 8 should not be used as tie points for external-circuit components. It is recommended that these socket tabs be removed to reduce the possibility of arc-over and to minimize leakage.

6CM6

BEAM POWER TUBE

9-PIN MINIATURE TYPE

GENERAL DATA

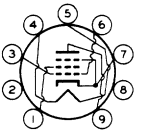
Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.45	amp
Direct Interelectrode Capacitances (Approx.):°		
Grid No.1 to plate	0.7	μμf
Grid No.1 to cathode, grid No.3, grid No.2, and heater	8	μμf
Plate to cathode, grid No.3, grid No.2, and heater	8.5	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9CK

Pin 1 – Grid No.2
Pin 2 – No Connection
Pin 3 – Grid No.1
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Grid No.1
Pin 7 – Cathode, Grid No.3
Pin 8 – No Connection
Pin 9 – Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	315 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	285 max.	volts
GRID-No.2 INPUT	2 max.	watts
PLATE DISSIPATION	12 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲ max.	volts

Typical Operation and Characteristics:

Plate Voltage	180	250	315	volts
Grid-No.2 Voltage	180	250	225	volts
Grid-No.1 (Control-Grid) Voltage	-8.5	-12.5	-13	volts
Peak AF Grid-No.1 Voltage	8.5	12.5	13	volts
Zero-Signal Plate Current	29	45	34	ma
Max.-Signal Plate Current	30	47	35	ma
Zero-Signal Grid-No.2 Current	3	4.5	2.2	ma
Max.-Signal Grid-No.2 Current	4	7	6	ma

°,▲: See next page.

6CM6

BEAM POWER TUBE

Plate Resistance (Approx.)	50000	50000	80000	ohms
Transconductance	3700	4100	3750	μmhos
Load Resistance	5500	5000	8500	ohms
Total Harmonic Distortion	8	8	12	%
Max.-Signal Power Output	2	4.5	5.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

VERTICAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	315	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE# (Absolute maximum)	2000■	max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	285	max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 (CONTROL-GRID) VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	120	max.	ma
DC	40	max.	ma
GRID-No.2 INPUT	1.75	max.	watts
PLATE DISSIPATION	8	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For cathode-bias operation	2.2	max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Triode Connection†

Maximum Ratings, *Design-Center Values Except as Noted:*

DC PLATE VOLTAGE	315	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE# (Absolute maximum)	2000■	max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 (CONTROL-GRID) VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	120	max.	ma
DC	40	max.	ma
PLATE DISSIPATION	9	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

o,▲,□,#,■,†: See next page.

6CM6

BEAM POWER TUBE

Characteristics:

Plate Voltage	250	volts
Grid-No.1 Voltage	-12.5	volts
Amplification Factor	9.8	
Plate Resistance (Approx.)	1960	ohms
Transconductance	5000	μmhos
Plate Current	49.5	ma
Grid-No.1 Voltage (Approx.) for plate ma. = 0.5	-37	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: For cathode-bias operation	2.2 max.	megohms

[c] Without external shield.

▲ The dc component must not exceed 100 volts.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

■ Under no circumstances should this absolute value be exceeded.

† Grid-No.2 connected to plate.

CURVES
shown under Types 6V6 and 6V6-GT, within ratings, also apply to the 6CM6

6CM7

Medium-Mu Dual Triode

With Dissimilar Units

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Voltage (AC or DC)		6.3	volts
Current		0.6 ± 6%	amp ◄
Warm-up time (Average)		11	sec
Direct Interelectrode Capacitances (Approx.):[a]	*Unit No.1*	*Unit No.2*	
Grid to plate	3.8	3	μμf
Grid to cathode and heater	2	3.5	μμf
Plate to cathode and heater	0.5	0.4	μμf

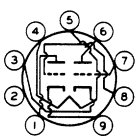
Characteristics, Class A_1 Amplifier: ◄

	Unit No.1	*Unit No.2*	
Plate Voltage	200	250	volts
Grid Voltage	-7	-8	volts
Amplification Factor	21	18	
Plate Resistance (Approx.)	10500	4100	ohms
Transconductance	2000	4400	μmhos
Plate Current	5	20	ma
Plate Current for grid volts = -10.	-1	-	ma
Grid Voltage (Approx.) for plate μa = 10	-14	-	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9ES

Pin 1 - Plate of Unit No.2
Pin 2 - No Connection
Pin 3 - Cathode of Unit No.1
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Grid of Unit No.2
Pin 9 - Cathode of Unit No.2

◄ Indicates a change.

VERTICAL-DEFLECTION OSCILLATOR

Values are for Unit No. 1

→Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[b]

DC PLATE VOLTAGE	550	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	220	max.	volts
CATHODE CURRENT:			
Peak	77	max.	ma
Average	17	max.	ma
PLATE DISSIPATION	1.45	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[c]	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias, grid-resistor-bias, or cathode-bias operation	2.2	max.	megohms[a]

VERTICAL-DEFLECTION AMPLIFIER

Values are for Unit No. 2

→Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[b]

DC PLATE VOLTAGE	550	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[d]	2200	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	220	max.	volts
CATHODE CURRENT:			
Peak	77	max.	ma
Average	22	max.	ma
PLATE DISSIPATION	6	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[c]	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation	1	max.	megohm
For cathode-bias operation	2.5	max.	megohms

[a] Without external shield.

[b] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[c] The dc component must not exceed 100 volts.

[d] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

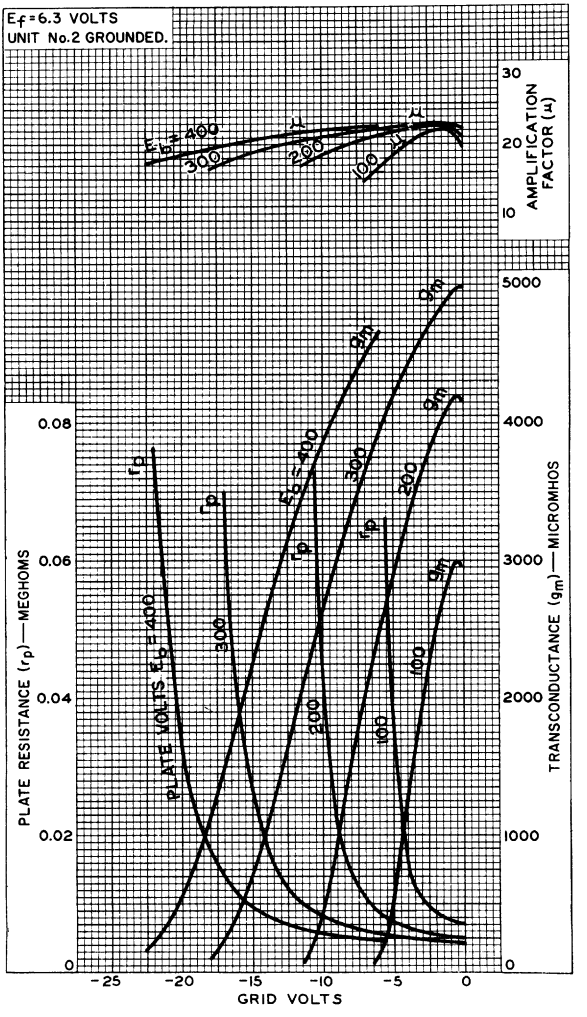
→Indicates a change.

AVERAGE PLATE CHARACTERISTICS
Unit No.1

92CM-8617

6CM7

AVERAGE CHARACTERISTICS
Unit No.1



92CM-8616RI

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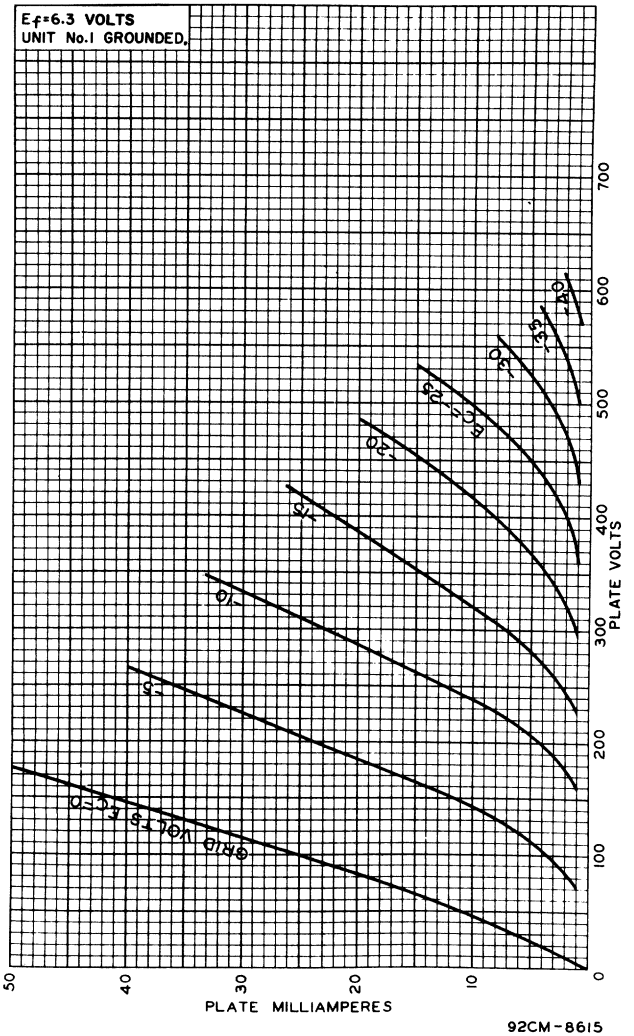
Electron Tube Division
Harrison, N. J.

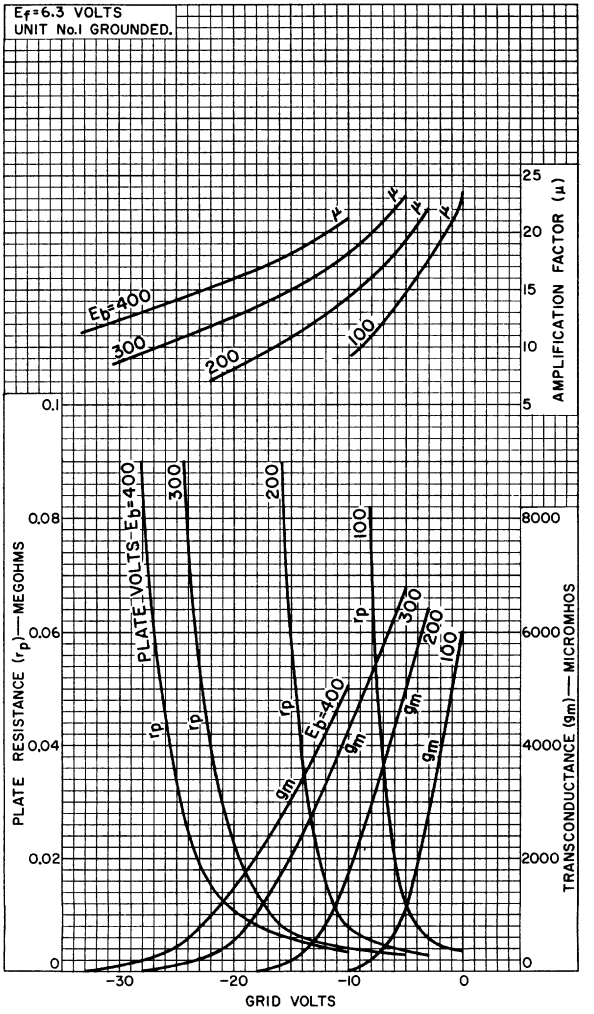
AVERAGE PLATE CHARACTERISTICS
Unit No.2



92CM-8615

6CM7

AVERAGE CHARACTERISTICS
Unit No.2



92CM-8613R1

Twin Diode—High-Mu Triode

9-PIN MINIATURE TYPE
With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values)*:

Heater-section arrangement	*Parallel*	*Series*	*Series*	
Voltage (AC or DC)	3.15[a]	6.3[b]	6.3 ± 0.6	volts
Current	0.600 ± 0.040	0.300 ± 0.020	0.300[c]	amp
Warm-up time (Average)	11	11	-	sec

Peak heater-cathode voltage (Each unit):

Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[d]	max.	volts

Direct Interelectrode Capacitances (Approx):[e]

Triode Unit:		
Grid to plate	1.8	pf
Grid to cathode and heater	1.5	pf
Plate to cathode and heater	0.5	pf
Diode Units:		
Diode-No.1 plate to cathode of diodes No.1 and No.2 & internal shield, and heater	3.6	pf
Diode-No.2 plate to cathode of diodes No.1 and No.2 & internal shield, and heater	3.6	pf
Triode grid to either diode plate	0.006	pf

Characteristics, Class A_1 Amplifier (Triode Unit):

Plate Voltage	100	250	volts
Grid Voltage	−1	−3	volts
Amplification Factor	70	70	
Plate Resistance (Approx.)	54000	58000	ohms
Transconductance	1300	1200	μmhos
Plate Current	0.8	1	ma

Mechanical:

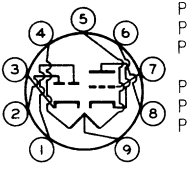
Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

←Indicates a change.

6CN7

Basing Designation for BOTTOM VIEW. 9EN

Pin 1 – Diode–No.2 Plate
Pin 2 – Diode–No.1 Plate
Pin 3 – Cathode of Diodes No.1 & No.2, Internal Shield



Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Triode Cathode
Pin 7 – Triode Grid
Pin 8 – Triode Plate
Pin 9 – Heater Tap

TRIODE UNIT — AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
GRID VOLTAGE:			
Positive-bias value	0	max.	volts
PLATE DISSIPATION	1.1	max.	watts

Typical Operation as Resistance-Coupled Amplifier:

See *RESISTANCE-COUPLED AMPLIFIER CHART No.7* at front of this section

DIODE UNITS — Two

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE CURRENT	5.5	max.	ma

Characteristics, Instantaneous Value:

Plate Current for plate volts = 5	20	ma

[a] At heater amperes = 0.600.
[b] At heater amperes = 0.300.
[c] At heater volts = 6.3
[d] The dc component must not exceed 100 volts.
[e] Without external shield.

CURVES
For Triode shown under Type 6T8A also apply to the 6CN7

6CQ4

Half-Wave Vacuum Rectifier

GENERAL DATA

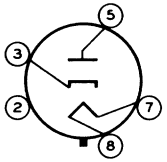
Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.600	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode[a]	5500[b] max.	volts
Heater positive with respect to cathode	300[c] max.	volts
Direct Interelectrode Capacitances (Approx.):[d]		
Plate to cathode and heater	8.5	μμf
Cathode to plate and heater	11.5	μμf
Heater to cathode	4	μμf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3-13/16"
Maximum Seated Length	3-1/4"
Maximum Diameter	1-9/32"
Bulb	T9
Bases (Alternates):	
Intermediate-Shell Octal with External Barriers: 5-Pin, Arrangement 2 (JEDEC Group 1, No.B5-147)	
Short Intermediate-Shell Octal with External Barriers: 5-Pin, Arrangement 2 (JEDEC Group 1, No.B5-85)	
Basing Designation for BOTTOM VIEW	4CG

Pin 2 - Do Not Use[e]
Pin 3 - Cathode
Pin 5 - Plate



Pin 7 - Heater
Pin 8 - Heater

DAMPER SERVICE

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[f]

PEAK INVERSE PLATE VOLTAGE[a]	5500 max.	volts
PEAK PLATE CURRENT	1200 max.	ma
DC PLATE CURRENT	190 max.	ma
PLATE DISSIPATION	6.5 max.	watts

Characteristics, Instantaneous Value:

Tube Voltage Drop for plate ma. = 250	25	volts

[a] This rating is applicable when the duty cycle of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[b] The dc component must not exceed 900 volts.

[c] The dc component must not exceed 100 volts.

[d] Without external shield.

[e] Socket terminals 1, 2, 4, and 6 should not be used as tie points.

[f] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

Medium-Mu Triode—Sharp-Cutoff Tetrode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3	volts
Current	0.45 ± 6%	amp ←
Warm-up time (Average)	11	sec

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*▲	
Triode Unit:			
Grid to plate	1.8	1.8	μμf
Grid to cathode and heater	2.7	2.7	μμf
Plate to cathode and heater	0.4	1.2	μμf
Tetrode Unit:			
Grid No.1 to plate	0.019 max.	0.015 max.	μμf
Grid No.1 to cathode & internal shield, grid No.2, and heater	5	5	μμf
Plate to cathode & internal shield, grid No.2, and heater	2.5	3.3	μμf
Tetrode plate to triode plate	0.07 max.	0.01 max.	μμf
Heater to cathode (Each unit)	3	3●	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Tetrode Unit*	
Plate Supply Voltage	125	125	volts
Grid-No.2 Supply Voltage	–	125	volts
Grid-No.1 Supply Voltage	–	-1	volt
Cathode Resistor	56	–	ohms
Amplification Factor	40	–	
Plate Resistance (Approx.)	5000	140000	ohms
Transconductance	8000	5800	μmhos
Plate Current	15	12	ma
Grid-No.2 Current	–	4.2	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	-7	-7	volts

Mechanical:

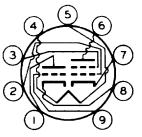
Operating Position . . . . . Any

← Indicates a change.

6CQ8

Maximum Overall Length. . . . . 2-3/16"
Maximum Seated Length . . . . . 1-15/16"
Length, Base Seat to Bulb Top (Excluding tip). 1-9/16" ± 3/32"
→Diameter. . . . . 0.750" to 0.875"
Dimensional Outline . . . . . See *General Section*
Bulb. T6-1/2
Base. . . . . .Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9GE

Pin 1 – Triode Plate
Pin 2 – Tetrode Grid No.1
Pin 3 – Tetrode Grid No.2
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Tetrode Plate



Pin 7 – Tetrode Cathode, Internal Shield
Pin 8 – Triode Cathode
Pin 9 – Triode Grid

AMPLIFIER — Class A_1

→**Maximum Ratings,** *Design-Maximum Values:*

	Triode Unit	*Tetrode Unit*	
PLATE VOLTAGE	330 max.	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE.	–	330 max.	volts
GRID-No.2 VOLTAGE	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0 max.	0 max.	volts
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 165 volts	–	0.7 max.	watt
For grid-No.2 voltages between 165 and 330 volts		See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID INPUT.	0.55 max.	–	watt
PLATE DISSIPATION	3.1 max.	3.2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode. . . .	200 max.	200 max.	volts
Heater positive with respect to cathode. . . .	200★ max.	200★ max.	volts

Maximum Circuit Values:

	Triode Unit	*Tetrode Unit*	
Grid-No.1-Circuit Resistance:			
For fixed-bias operation. .	0.5 max.	0.25 max.	megohm
For cathode-bias operation.	1 max.	1 max.	megohm

→Indicates a change.

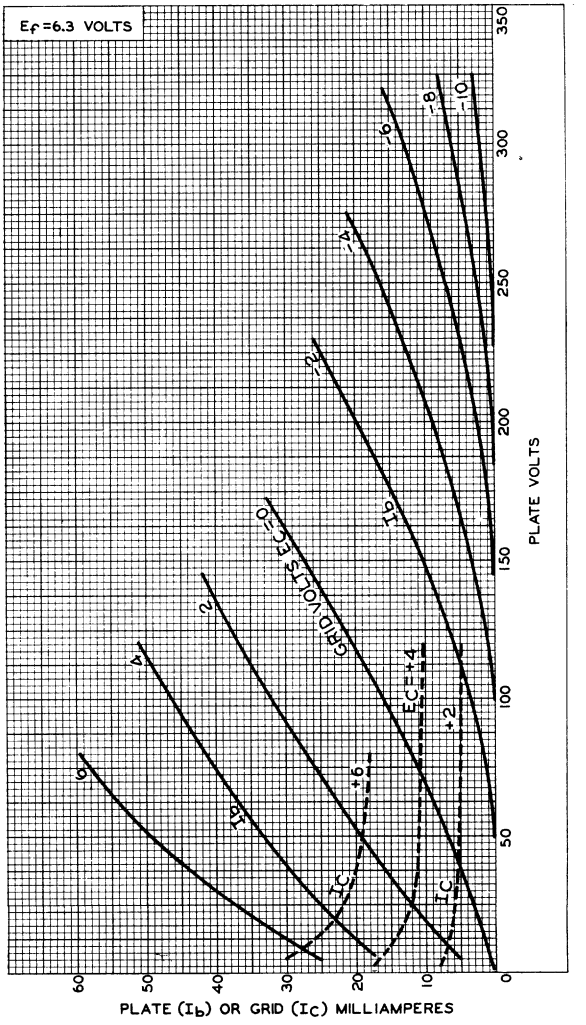
▲ With external shield JEDEC No.315 connected to cathode of unit under test except as noted.

● With external shield JEDEC No.315 connected to ground.

★ The dc component must not exceed 100 volts.

6CQ8

AVERAGE CHARACTERISTICS
Triode Unit



92CM-9190RI

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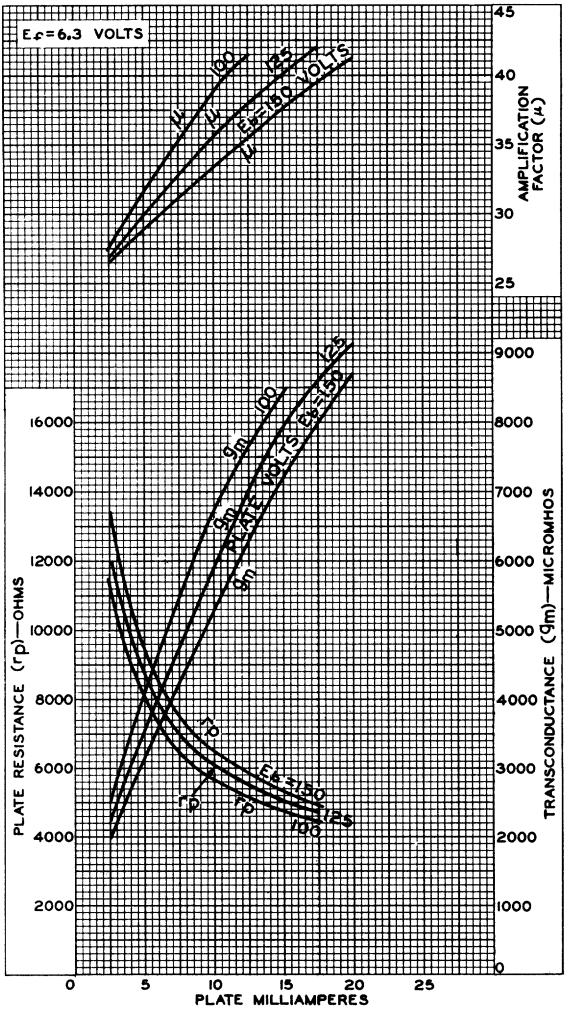
Electron Tube Division
Harrison, N. J.

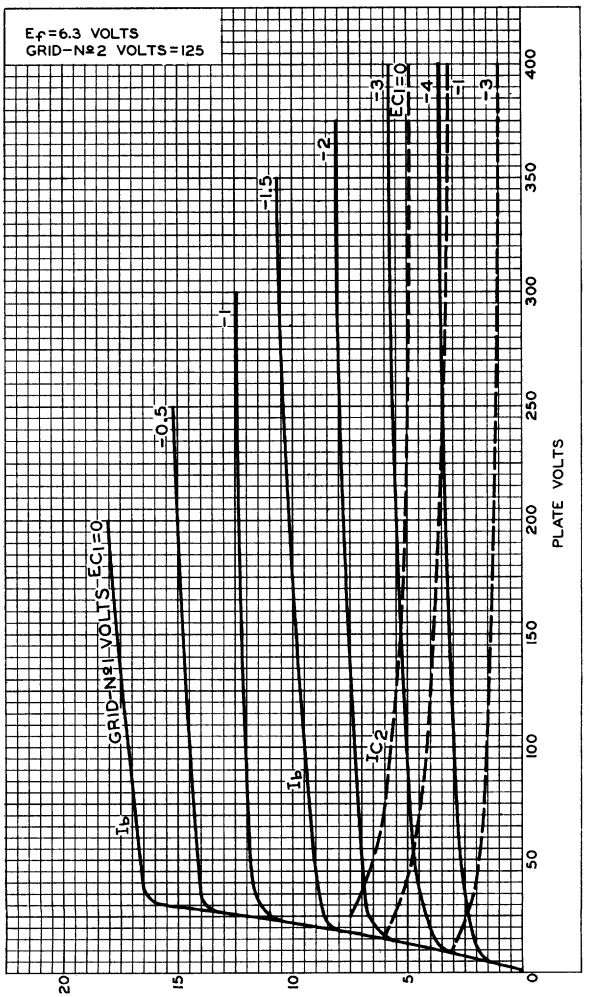
AVERAGE CHARACTERISTICS
Triode Unit



92CM-787IRI

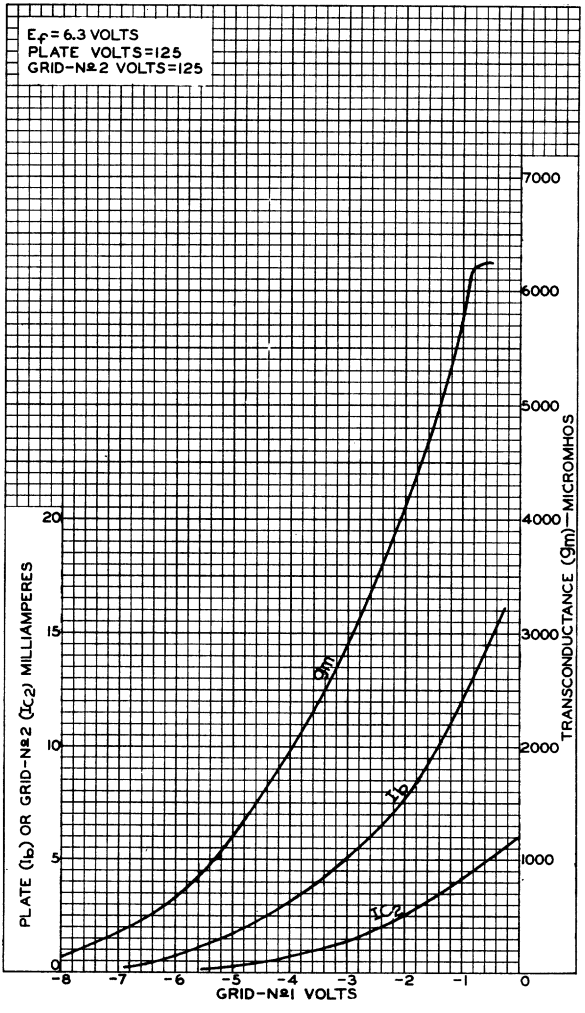
6CQ8

AVERAGE CHARACTERISTICS
Tetrode Unit



92CM-9197

AVERAGE CHARACTERISTICS
Tetrode Unit



92CM-9195

6CS6

PENTAGRID AMPLIFIER

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage	6.3		ac or dc volts
Current	0.3		amp
Direct Interelectrode Capacitances (Approx.):[o]			
Grid No.1 to plate		0.07 max.	μμf ←
Grid No.3 to plate		0.36 max.	μμf
Grid No.1 to grid No.3		0.22 max.	μμf ←
Grid No.1 to cathode & grid No.5, grid No.4 & grid No.2, grid No.3, and heater		5.5	μμf
Grid No.3 to cathode & grid No.5, grid No.4 & grid No.2, grid No.1, and heater		7	μμf
Plate to cathode & grid No.5, grid No.4 & grid No.2, grid No.3, grid No.1, and heater		7.5	μμf

Characteristics, Class A_1 Amplifier:

Plate Voltage	100	100	volts
Grid-No.2 & Grid-No.4 Voltage	30	30	volts
Grid-No.3 Voltage	-1	0	volt
Grid-No.1 Voltage	0	-1	volt
Plate Resistance (Approx.)	0.7	1	megohm
Grid-No.3-to-Plate Transconductance	1500	-	μmhos ←
Grid-No.1-to-Plate Transconductance	-	1100	μmhos ←
Plate Current	0.8	1	ma ←
Grid-No.2 & Grid-No.4 Current	5.5	1.3	ma ←
Grid-No.3 Voltage (Approx.) for plate current of 50 μamp	-2.2	-	volts
Grid-No.1 Voltage (Approx.) for plate current of 50 μamp	-	-2.5	volts

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Dimensional Outline	*See General Section*
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CH

Pin 1 - Grid No.1
Pin 2 - Cathode, Grid No.5
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2, Grid No.4
Pin 7 - Grid No.3

[o] Without external shield.

← Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6CS6

PENTAGRID AMPLIFIER

GATED AMPLIFIER SERVICE

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	300	max.	volts
GRID-No.2 & GRID-No.4 SUPPLY VOLTAGE	300	max.	volts
GRID-No.2 & GRID-No.4 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
PLATE DISSIPATION	1	max.	watt
GRID-No.2 & GRID-No.4 INPUT:			
For grid-No.2 & grid-No.4 voltages up to 150 volts	1	max.	watt
For grid-No.2 & grid-No.4 voltages between 150 and 300 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
CATHODE CURRENT	14	max.	ma
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Typical Operation as Sync Separator and Sync Clipper:

Plate Voltage	10	volts
Grid-No.2 & Grid-No.4 Voltage	30	volts
Grid-No.3 Voltage	0	volts
Grid-No.1 Voltage	0	volts
→ Plate Current	2.0	ma
→ Grid-No.2 & Grid-No.4 Current	4.5	ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.47	max.	megohm
Grid-No.3-Circuit Resistance	2.2	max.	megohms

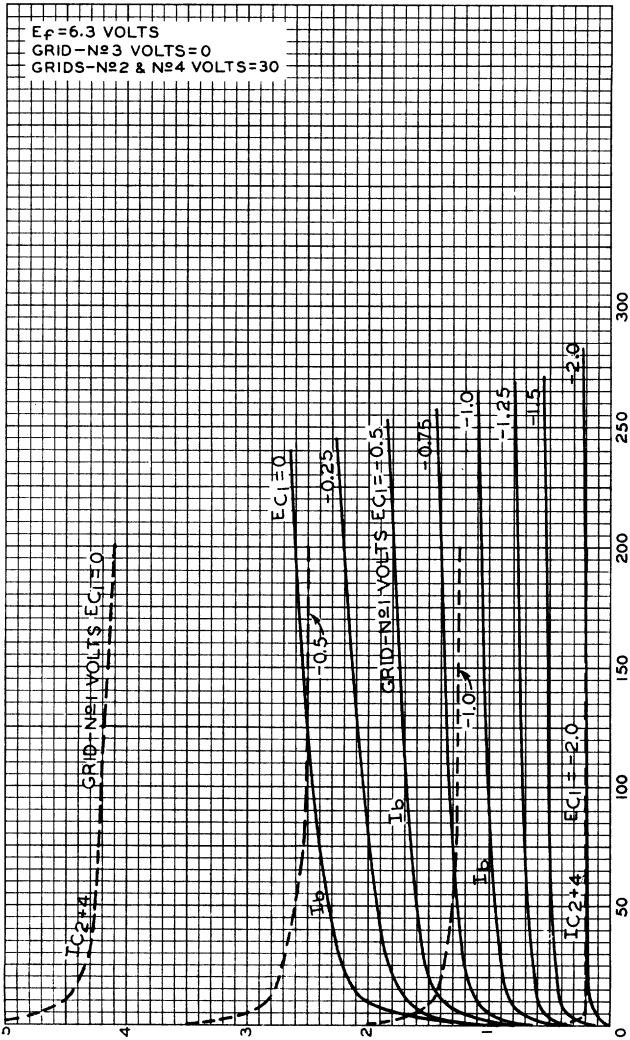
▲ The dc component must not exceed 100 volts.

→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6CS6

AVERAGE CHARACTERISTICS

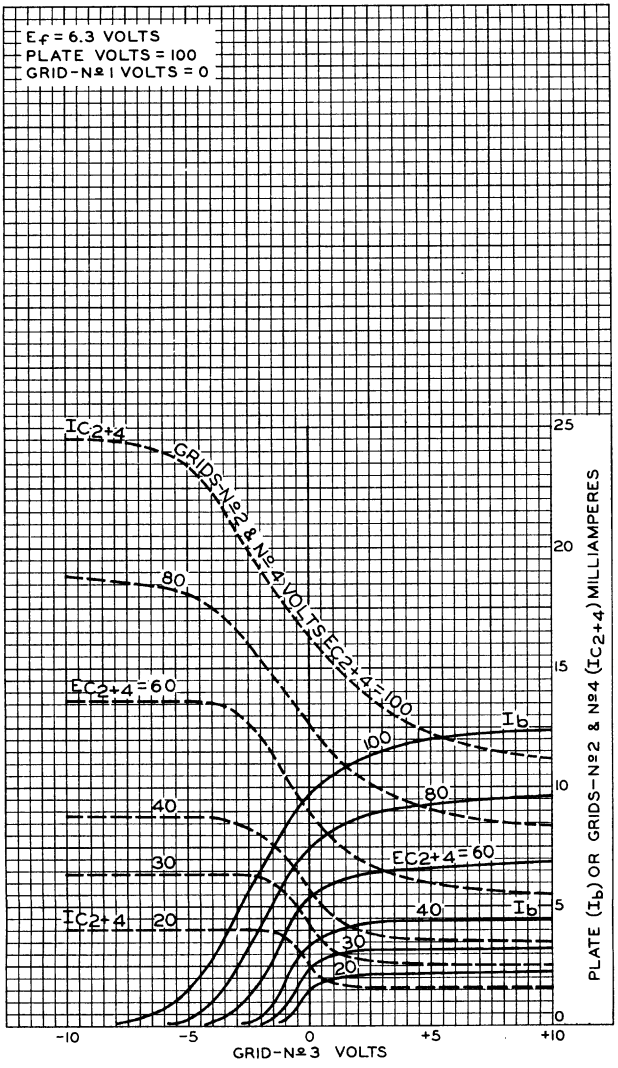


TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8922

6CS6

AVERAGE CHARACTERISTICS



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8926

6CS7

MEDIUM-MU DUAL TRIODE

With Dissimilar Units

9-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage	6.3	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

Direct Interelectrode Capacitances (Approx.):°

	Unit No.1 Oscillator	*Unit No.2 Amplifier*	
Grid to plate	2.6	2.6	μμf
Grid to cathode and heater	1.8	3	μμf
Plate to cathode and heater	0.5	0.5	μμf

Characteristics, Class A_1 Amplifier:

	Unit No.1 Oscillator	*Unit No.2 Amplifier*	
Plate Voltage	250	250	volts
Grid Voltage	-8.5	-10.5	volts
Amplification Factor	17	15.5	
Plate Resistance (Approx.)	7700	3450	ohms
Transconductance	2200	4500	μmhos
Plate Current	10.5	19	ma
Plate Current for grid volts = -16	–	3	ma
Grid Voltage (Approx.) for plate current of:			
10 microamperes	-24	–	volts
50 microamperes	–	-22	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2

°: See next page.

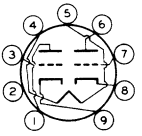
6CS7

6CS7

MEDIUM-MU DUAL TRIODE
With Dissimilar Units

Base. . . . . .Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW 9EF

Pin 1 – Plate of Unit No.2
Pin 2 – No Connection
Pin 3 – Grid of Unit No.2
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Plate of Unit No.1
Pin 7 – Grid of Unit No.1
Pin 8 – Cathode of Unit No.1
Pin 9 – Cathode of Unit No.2



VERTICAL-DEFLECTION OSCILLATOR

Values are for Unit No.1

Maximum Ratings, *Design-Center Values:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	500	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	400	max.	volts
CATHODE CURRENT:			
Peak	70	max.	ma
DC	20	max.	ma
PLATE DISSIPATION	1.25	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	2.2	max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Values are for Unit No.2

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	500	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE# (Absolute maximum)	2200■	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	105	max.	ma
DC	30	max.	ma
PLATE DISSIPATION	6.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

o,□,▲,#,■: See next page.

6CS7

MEDIUM-MU DUAL TRIODE

With Dissimilar Units

Maximum Circuit Values:

Grid-Circuit Resistance. . . . . 2.2 max. megohms

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

▲ The dc component must not exceed 100 volts.

This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

■ Under no circumstances should this absolute value be exceeded.

○ Without external shield.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

Half-Wave Rectifier

9-Pin Miniature Type

i_{bm} = 1200 max. mA P_b = 4.75 max. W

For Black-and-White and Small-Screen Color-TV Damper Diode Applications

ELECTRICAL CHARACTERISTICS - Bogey Values

Heater Voltage, ac or dc	E_h	6.3	V
Heater Current	I_h	1.2	A
Direct Interelectrode Capacitances:[a]			
Plate to cathode and heater	$c_{p(k+h)}$	12.0	pF
Cathode to plate and heater	$c_{k(p+h)}$	9.5	pF
Heater to cathode	c_{hk}	2.8	pF
Instantaneous Tube Voltage Drop for instantaneous plate current (i_b) = 350 mA.	e_b	16	V

MECHANICAL CHARACTERISTICS

Maximum Overall Length (l_m) . . . . . 3.125 in (79.37 mm)
Maximum Seated Length (l_{sm}) . . . . . 2.875 in (73.02 mm)
Maximum Diameter (d_m) . . . . . 0.875 in (22.22 mm)
Envelope. . . . . JEDEC Designation 6-1/2
Base . . . . Small-Button Noval 9-Pin JEDEC Designation E9-1
Terminal Connections
(See *TERMINAL DIAGRAM*) . . . . JEDEC Designation 9RX
Type of Cathode . . . . . Coated Unipotential
Operating Position . . . . . Any

MAXIMUM RATINGS - Design-Maximum Values[b]

For operation as a Damper Tube in TV Receivers utilizing a 525-line, 30-frame system[c]

Peak Inverse Plate Voltage	$-e_{bm}$	5000[d]	V
Heater-Cathode Voltage:			
Peak	e_{hkm}	+300	V
		-5000	V

Average[e]	$E_{hk(av)}$	+100	V
		-900	V
Heater Voltage, ac or dc	E_h	5.7 to 6.9	V
Plate Current:			
Peak	i_{bm}	1200	mA
Average[e]	$I_{b(av)}$	250	mA
Plate Dissipation	P_b	4.75	W
Envelope Temperature (at hottest point on envelope surface)	T_E	220	°C

[a] Measured without external shield in accordance with the current issue of EIA Standard RS-191.

[b] As defined in the current issue of EIA Standard RS-239.

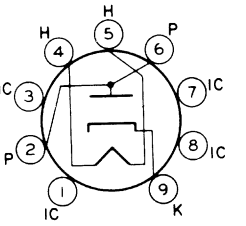
[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

[d] This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10 μs.

[e] Measured with a dc meter.

TERMINAL DIAGRAM (Bottom View)

Pin 1 - Do Not Use
Pin 2 - Plate
Pin 3 - Do Not Use
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Plate
Pin 7 - Do Not Use
Pin 8 - Do Not Use
Pin 9 - Cathode



JEDEC 9RX

OPERATING CONSIDERATIONS

Socket terminals 1, 3, 7, and 8 should not be used as tie points for external-circuit components. It is recommended that these socket tabs be removed to reduce the possibility of arc-over and to minimize leakage.

6CU5

Beam Power Tube

7-PIN MINIATURE TYPE

GENERAL DATA

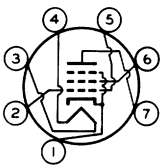
Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	1.2	amp
Direct Interelectrode Capacitances (Approx.):[a]		
Grid No.1 to plate	0.6	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	13	μμf
Plate to cathode & grid No.3, grid No.2, and heater	8.5	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CV

Pin 1 – Cathode, Grid No.3
Pin 2 – Grid No.1
Pin 3 – Heater



Pin 4 – Heater
Pin 5 – Grid No.1
Pin 6 – Grid No.2
Pin 7 – Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	150	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	130	max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0	max.	volts
PLATE DISSIPATION	7	max.	watts
GRID-No.2 INPUT	1.4	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	220	max.	°C

◄ Indicates a change.

Typical Operation and Characteristics:

Plate Voltage	120	volts
Grid-No.2 Voltage	110	volts
Grid-No.1 Voltage	-8	volts
Peak AF Grid-No.1 Voltage	8	volts
Zero-Signal Plate Current	49	ma
Max.-Signal Plate Current	50	ma
Zero-Signal Grid-No.2 Current	4	ma
Max.-Signal Grid-No.2 Current	8.5	ma
Plate Resistance (Approx.)	10000	ohms
Transconductance	7500	μmhos
Load Resistance	2500	ohms
Total Harmonic Distortion	10	%
Max.-Signal Power Output	2.3	watts

Maximum Circuit Values:

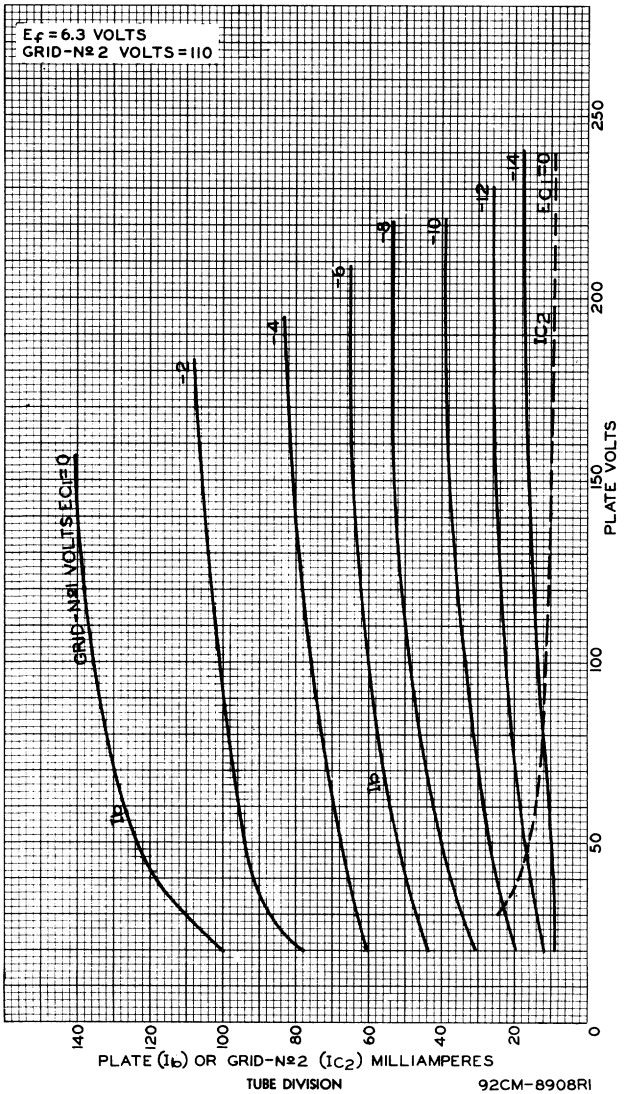
Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

[a] Without external shield.

[b] The dc component must not exceed 100 volts.

6CU5

AVERAGE CHARACTERISTICS

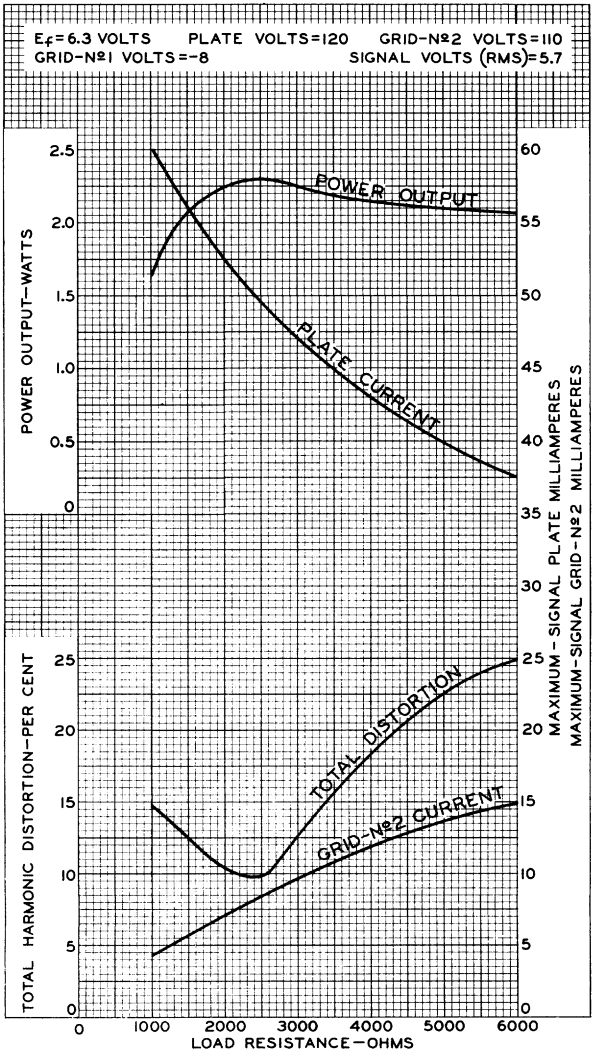


TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-8908RI

6CU5

6CU5

OPERATION CHARACTERISTICS



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8918

6CU8

MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

With heater having controlled warm-up time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3	volts
Current	0.45 ± 6%	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances:[o]		
Triode Unit:		
Grid to plate	1.6	μμf
Grid to cathode & pentode grid No.3 & internal shield, and heater	1.9	μμf
Plate to cathode & pentode grid No.3 & internal shield, and heater	1.6	μμf
Pentode Unit:		
Grid No.1 to plate	0.025 max.	μμf
Grid No.1 cathode, grid No.3 & triode cathode & internal shield, grid No.2, and heater	7	μμf
Plate to cathode, grid No.3 & triode cathode & internal shield, grid No.2, and heater	2.4	μμf
Pentode grid No.1 to triode plate	0.03 max.	μμf
Pentode plate to triode plate	0.07 max.	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*	
Plate Supply Voltage	125	125	volts
Grid-No.2 Supply Voltage	–	125	volts
Grid-No.1 Voltage	-1	0	volts
Cathode Resistor	0	56	ohms
Amplification Factor	24	–	
Plate Resistance (Approx.)	4100	170000	ohms
Transconductance	5800	7800	μmhos
Plate Current	17	12	ma
Grid-No.2 Current	–	3.8	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-12	-6	volts
Grid-No.1 Voltage (Approx.) for plate ma. = 1.6, and cathode resistor (ohms) = 0	–	-3	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"

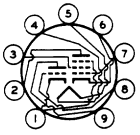
← Indicates a change.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6CU8
MEDIUM-MU TRIODE—SHARP-CUTOFF PENTODE

Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
→ Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9GM

Pin 1 – Triode Cathode, Pentode Grid No.3, Internal Shield
Pin 2 – Pentode Plate
Pin 3 – Pentode Grid No.2



Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Cathode
Pin 7 – Pentode Grid No.1
Pin 8 – Triode Grid
Pin 9 – Triode Plate

AMPLIFIER — Class A_1

→ **Maximum Ratings,** *Design-Maximum Values:*

	Triode Unit		*Pentode Unit*		
PLATE VOLTAGE	330	max.	330	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	–		330	max.	volts
GRID-No.2 VOLTAGE	–		*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0	max.	0	max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts	–		0.55	max.	watt
For grid-No.2 voltages between 165 and 330 volts	–		*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
PLATE DISSIPATION	2.8	max.	2.3	max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	200	max.	200	max.	volts
Heater positive with respect to cathode	200▲	max.	200▲	max.	volts

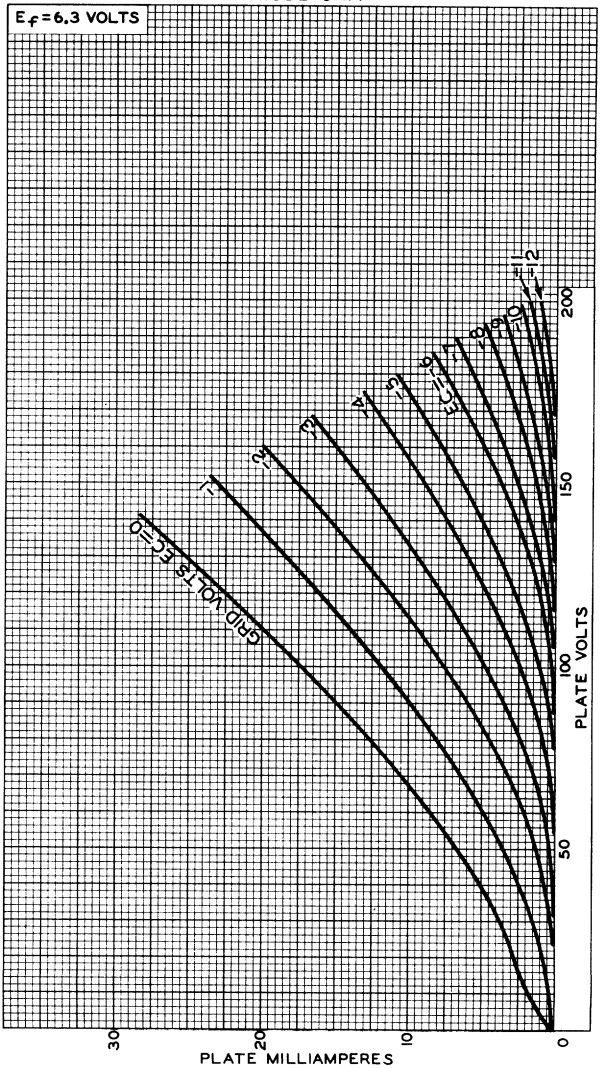
o Without external shield.
▲ The dc component must not exceed 100 volts.

→ Indicates a change.

6CU8

AVERAGE PLATE CHARACTERISTICS

TRIODE UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

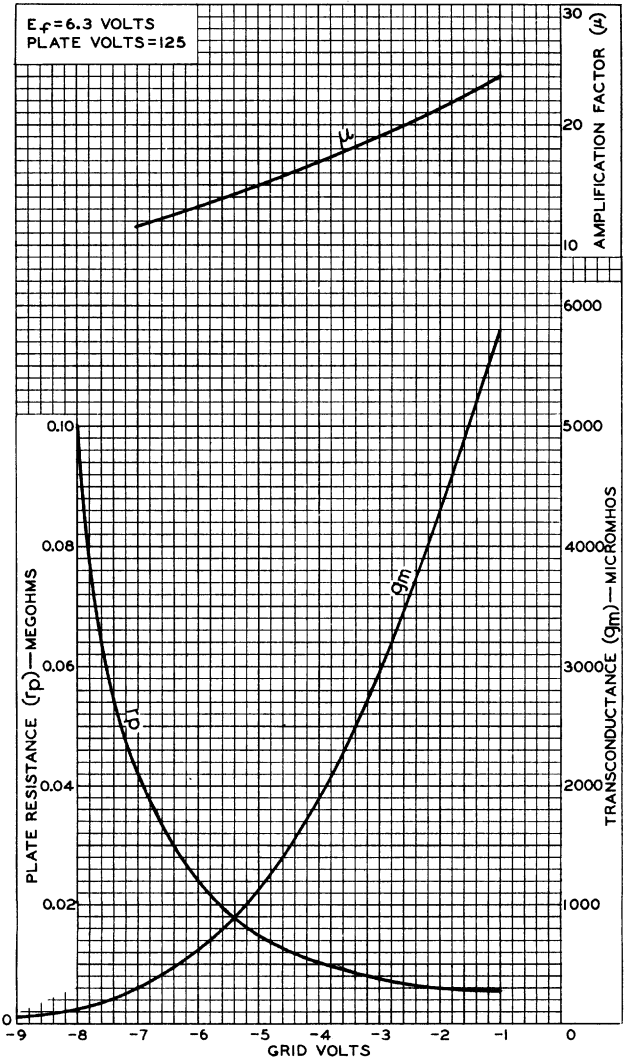
92CM-10353

6CU8

6CU8

AVERAGE CHARACTERISTICS

TRIODE UNIT



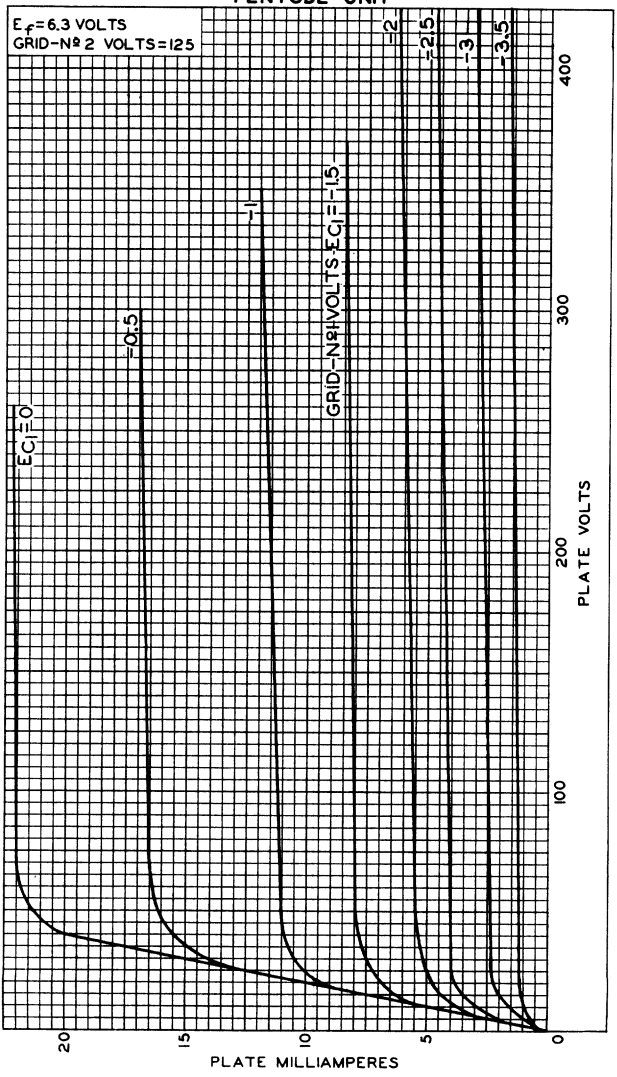
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10352

6CU8

AVERAGE PLATE CHARACTERISTICS

PENTODE UNIT



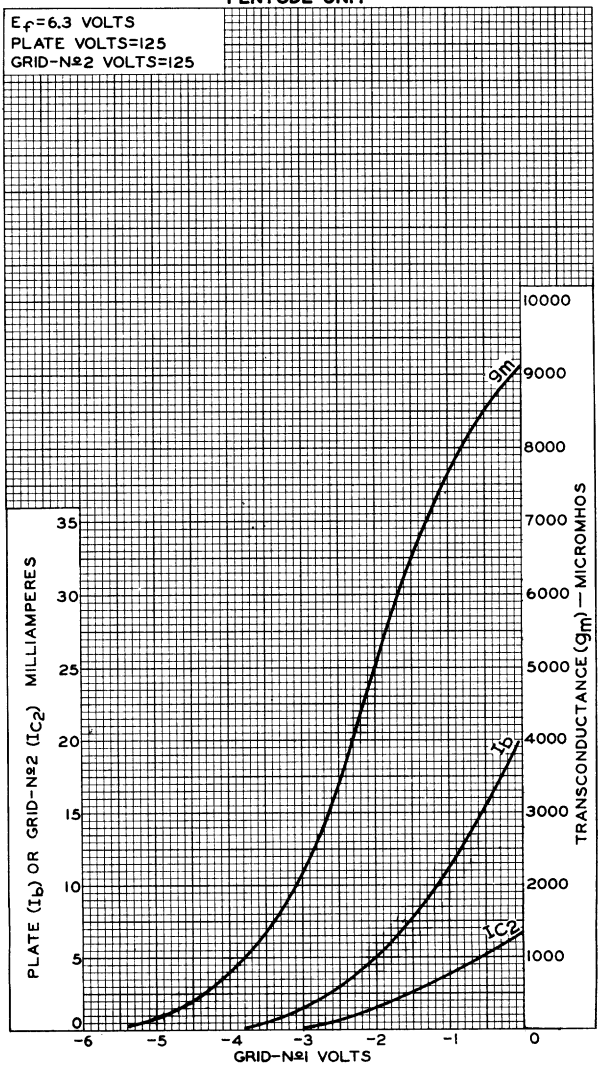
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-10646

6CU8

6CU8

AVERAGE CHARACTERISTICS

PENTODE UNIT



6CW4

High-Mu Triode

NUVISTOR TYPE

For Use as Grounded-Cathode, Neutralized RF-Amplifier Tube in Tuners of VHF Television and FM Receivers

GENERAL DATA

Electrical: ←

Heater Characteristics and Ratings *(Design-Maximum Values)*:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.135	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances (Approx.):		
Grid to plate	0.92	pf
Grid to cathode, shell, and heater	4.3	pf
Plate to cathode, shell, and heater	1.8	pf
Plate to cathode	0.18	pf
Heater to cathode	1.6	pf

Characteristics, Class A$_1$ Amplifier:

Plate Supply Voltage	110	volts
Grid Supply Voltage	0	volts
Cathode Resistor	130	ohms
Amplification Factor	65	
Plate Resistance (Approx.)	6600	ohms
Transconductance	9800	μmhos
Plate Current	7	ma
Grid Voltage (Approx.) for plate μa = 10.	-4	volts

Mechanical:

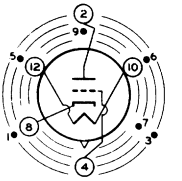
Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	0.800"
Maximum Seated Length	0.625"
Maximum Diameter	0.440"
Envelope	Metal Shell MT4
Socket	Cinch Mfg. Corp. No.133 65 10 001, ← Industrial Electronic Hardware Co. No. Nu 5044 or No. Nu 5060, or equivalent
Base	Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)

← Indicates a change.

6CW4

Basing Designation for BOTTOM VIEW. 12AQ

Pin 1[a] - Do Not Use
Pin 2 - Plate
Pin 3 - Same as Pin 1
Pin 4 - Grid
Pin 5 - Same as Pin 1
Pin 6 - Same as Pin 1
Pin 7 - Same as Pin 1
Pin 8 - Cathode
Pin 9 - Same as Pin 1
Pin 10 - Heater
Pin 12 - Heater



INDEX=LARGE LUG
●=SHORT PIN

AMPLIFIER — Class A1

Maximum Ratings, *Design-Maximum Values:*

PLATE SUPPLY VOLTAGE	300[b]	max.	volts
→ PLATE VOLTAGE	135	max.	volts
GRID VOLTAGE:			
Negative-bias value	55	max.	volts
Peak-positive value	0	max.	volts
CATHODE CURRENT	15	max.	ma
→ PLATE DISSIPATION:			
With a minimum series plate-circuit resistance of 5000 ohms	1.5	max.	watts
For lower values of series plate-circuit resistance.	See accompanying *Plate-Dissipation-Rating Chart*		

Typical Operation:

Plate Voltage	70	volts
Grid Supply Voltage	0	volts
Grid Resistor	47000	ohms
Amplification Factor	68	
Plate Resistance (Approx.)	5440	ohms
Transconductance	12500	μmhos
→ Plate Current	7.2	ma

Maximum Circuit Values:

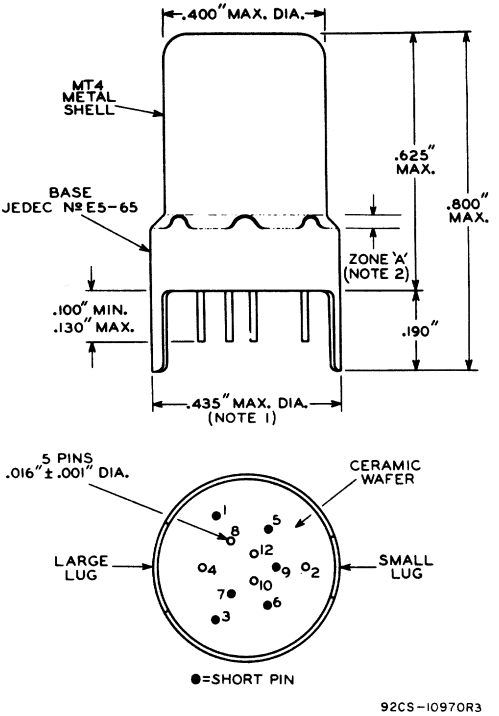
Grid-Circuit Resistance:[c]			
For fixed-bias operation	0.5	max.	megohm
For cathode-bias operation	2.2	max.	megohms

[a] Pin is of a length such that its end does not touch the socket insertion plane.

→ [b] A plate supply voltage of 300 volts may be used provided sufficient plate-circuit resistance and agc voltage are used to limit the voltage at the plate of the tube to 135 volts under conditions of maximum-rated plate dissipation (1.5 watts).

→ [c] For operation at metal-shell temperatures up to 135° C.

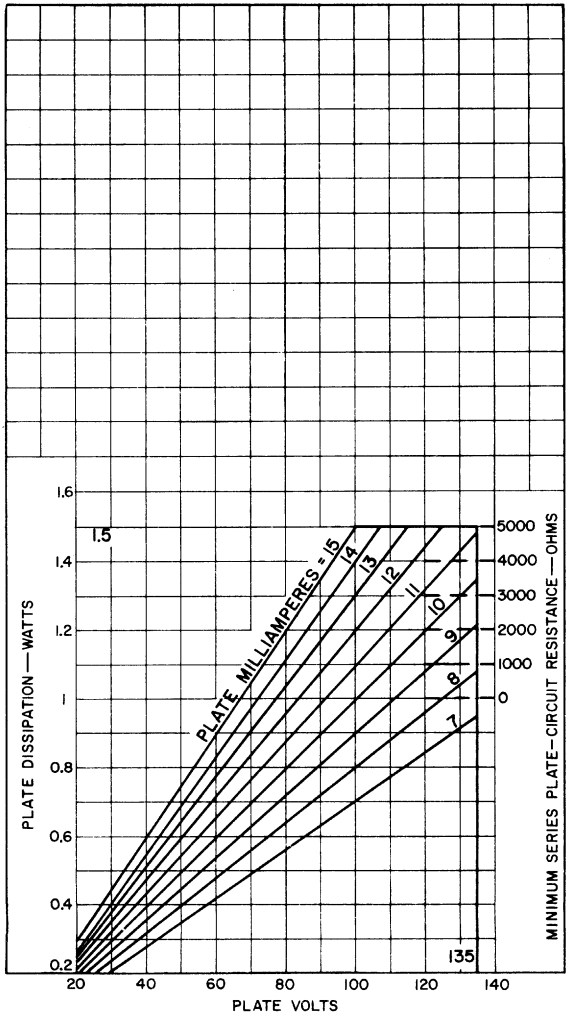
→ Indicates a change.



NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

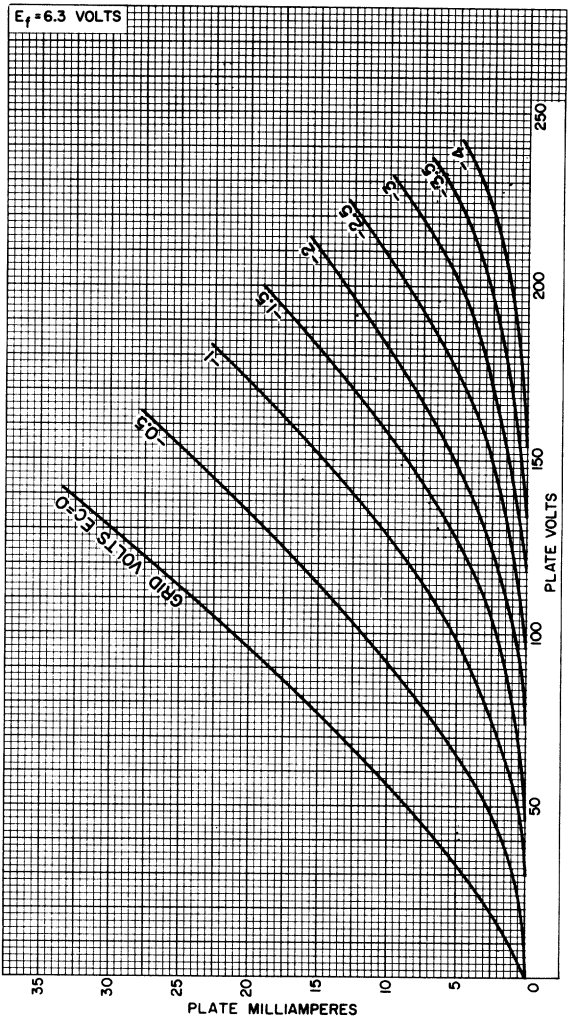
NOTE 2: SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A" BETWEEN BROKEN LINES.

PLATE-DISSIPATION-RATING CHART



92CM-11681

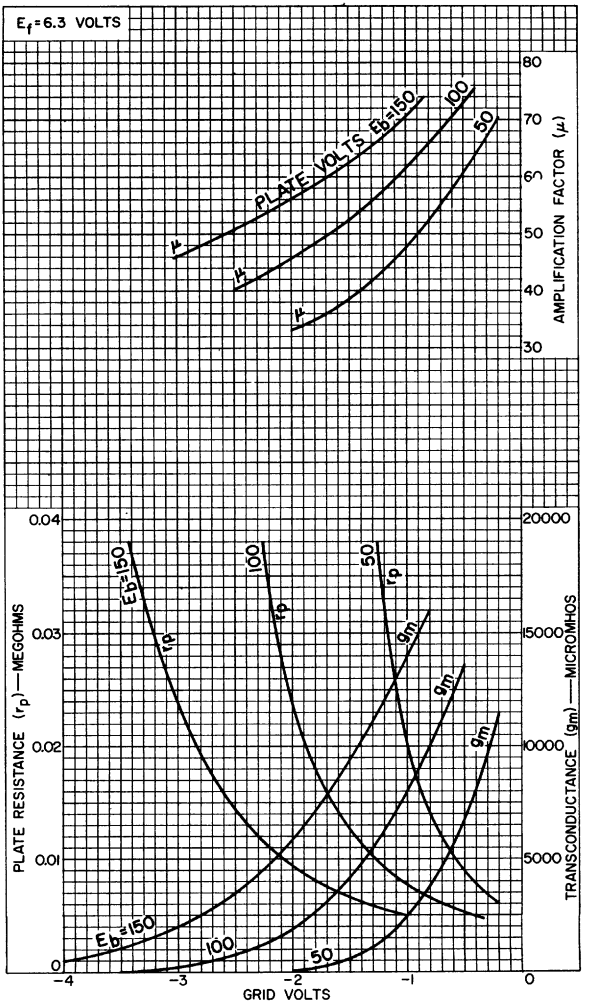
AVERAGE PLATE CHARACTERISTICS



92CM-10524RI

6CW4

AVERAGE CHARACTERISTICS



92CM-10520R1

6CW5

Beam Power Tube

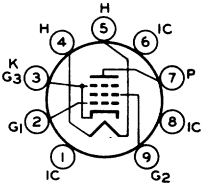
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at 6.3 volts	0.760	amp
Maximum Heater-Cathode Voltage:		
Heater negative with respect to cathode:		
Peak	330	volts
DC Component	220	volts
Heater positive with respect to cathode:		
Peak	330	volts
DC Component	220	volts
Direct Interelectrode Capacitances:		
Input: G1 to (K + G3, G2, H)	13.0	pf
Output: P to (K + G3, G2, H)	6.8	pf
Plate to grid No.1	0.6 max.	pf
Grid No.1 to heater	0.25 max.	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3-1/16"
Maximum Seated Length	2-13/16"
Length, Base Seat to Bulb Top (Excluding tip)	2-7/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline (JEDEC No.6-4)	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9CV

Pin 1 - Do Not Use
Pin 2 - Grid No.1
Pin 3 - Cathode, Grid No.3
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Do Not Use
Pin 7 - Plate
Pin 8 - Do Not Use
Pin 9 - Grid No.2



AMPLIFIER — Class A_1

Characteristics:

Plate Voltage	170	volts
Grid-No.2 (Screen-Grid) Voltage	170	volts
Grid-No.1 (Control-Grid) Voltage	-12.5	volts
Mu-Factor, Grid No.2 to Grid No.1	8	
Plate Resistance (Approx.)	26000	ohms
Transconductance	11000	μmhos
Plate Current	70	ma
Grid-No.2 Current	3.5	ma

Maximum Ratings, *Design-Maximum Values:*

Plate Supply Voltage	600	volts
Plate Voltage	275	volts
Grid No.2 Supply Voltage	600	volts
Grid No.2 Voltage	220	volts
Average Cathode Current	110	ma
Grid No.2 Input:		
Peak	7	watts
Average	2.1	watts
Plate Dissipation	14	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1	megohm

VERTICAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[a]

DC Plate Voltage	275	volts
Peak Positive-Pulse Plate Voltage	2200[b]	volts
DC Grid-No.2 Voltage	275	volts
Peak Negative-Pulse Grid-No.1 Voltage	250	volts
Cathode Current:		
Peak	240	ma
Average	110	ma
Grid No.2 Input	2.1	watts
Plate Dissipation	12	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	2.2	megohms

[a] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[b] Maximum pulse duration 6 percent of a cycle with a maximum of 1.2 milliseconds.

RCA

6CX8

6CX8

MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current	0.75	amp
Direct Interelectrode Capacitances:[o]		
Triode Unit:		
Grid to plate	4.4	μμf
Grid to cathode and heater	2.2	μμf
Plate to cathode and heater	0.38	μμf
Pentode Unit:		
Grid No.1 to plate	0.06	μμf
Grid No.1 to cathode & internal shield & grid No.3, grid No.2, and heater	9	μμf
Plate to cathode & internal shield & grid No.3, grid No.2, and heater	4.4	μμf
Triode grid to pentode plate	0.018 max.	μμf
Pentode grid No.1 to triode plate	0.005 max.	μμf
Pentode plate to triode plate	0.17 max.	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*		
Plate Supply Voltage	150	40	200	volts
Grid-No.2 Supply Voltage	–	125	125	volts
Grid-No.1 Voltage	–	0	–	volts
Cathode Resistor	150	–	68	ohms
Amplification Factor	40	–	–	
Plate Resistance (Approx.)	8700	–	70000	ohms
Transconductance	4600	–	10000	μmhos
Plate Current	9.2	40*	24	ma
Grid-No.2 Current	–	15.5*	5.2	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	-5	–	-8.5	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

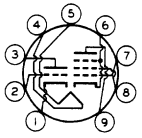
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6CX8

MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

Basing Designation for BOTTOM VIEW. 9DX

Pin 1 – Triode Cathode
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Pentode Cathode, Grid No.3, Internal Shield
Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit		*Pentode Unit*		
PLATE VOLTAGE.	330	max.	330	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	–		330	max.	volts
GRID-No.2 VOLTAGE.	–		*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value.	0	max.	0	max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts.	–		1.1	max.	watts
For grid-No.2 voltages between 165 and 330 volts.	–		*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
PLATE DISSIPATION.	2	max.	5	max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	200	max.	200	max.	volts
Heater positive with respect to cathode	200▲	max.	200▲	max.	volts

Maximum Circuit Values:

	Triode Unit		*Pentode Unit*		
Grid-No.1-Circuit Resistance:					
For fixed-bias operation . .	0.5	max.	0.25	max.	megohm
For cathode-bias operation .	1	max.	1	max.	megohm

o Without external shield.

* This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

▲ The dc component must not exceed 100 volts.

6CY5
SHARP-CUTOFF TETRODE

7-PIN MINIATURE TYPE

For use as rf amplifier in VHF tuners of television receivers

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts ←
Current	0.2	amp
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to plate	0.03	μμf
Grid No.1 to cathode & internal shield, grid No.2, and heater	4.5	μμf
Plate to cathode & internal shield, grid No.2, and heater	3	μμf

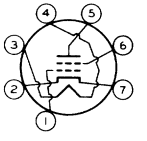
Characteristics, Class A_1 Amplifier:

Plate Voltage	125	volts
Grid-No.2 Voltage	80	volts
Grid-No.1 Voltage	-1	volt
Plate Resistance (Approx.)	0.1	megohm
Transconductance	8000	μmhos
Plate Current	10	ma
Grid-No.2 Current	1.5	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-6	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750" ←
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7EW

Pin 1 - Grid No.1
Pin 2 - Cathode, Internal Shield
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Cathode, Internal Shield



AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:* ←

PLATE VOLTAGE	180 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	180 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	

← Indicates a change.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6CY5

SHARP-CUTOFF TETRODE

GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
CATHODE CURRENT	20 max.	ma
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 90 volts	0.5 max.	watt
For grid-No.2 voltages between 90 and 180 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

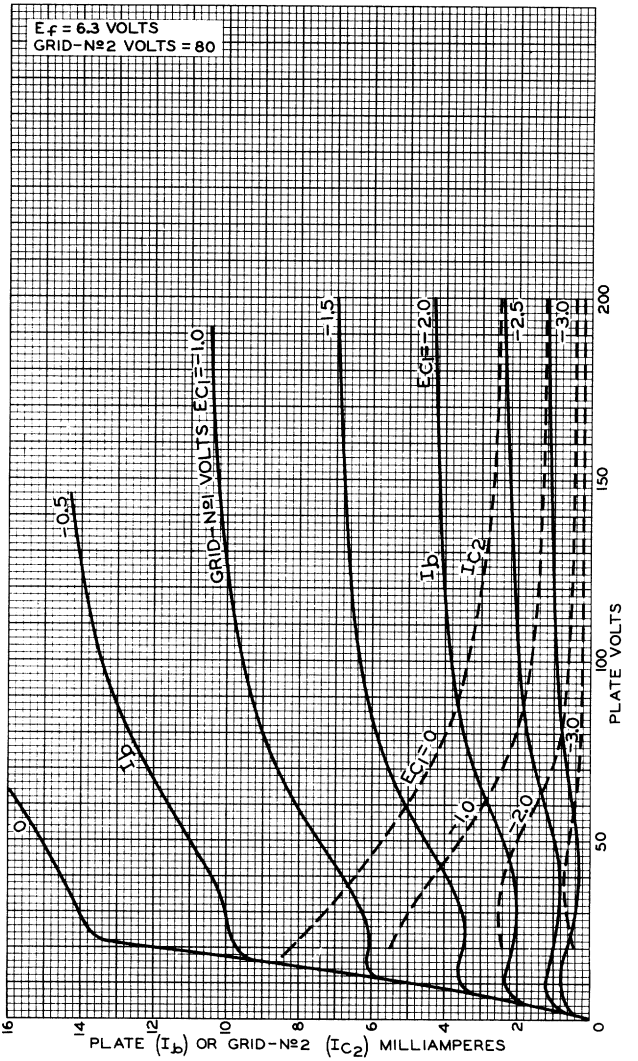
Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.5 max.	megohm

[o] With external shield JEDEC No.316 connected to cathode.

6CY5

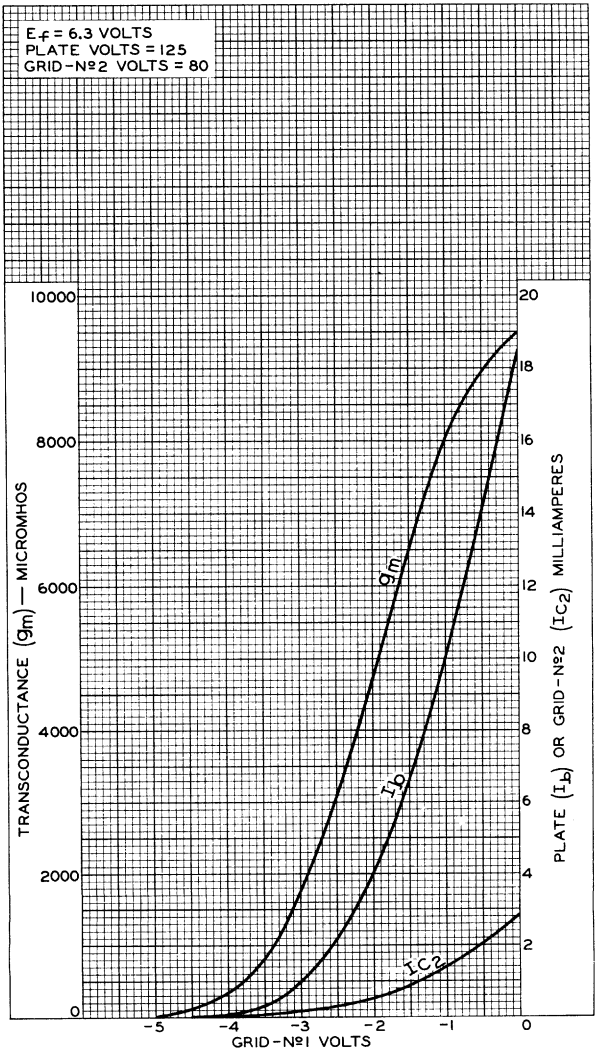
AVERAGE CHARACTERISTICS



6CY5

6CY5

AVERAGE CHARACTERISTICS



6CY7

DUAL TRIODE

With High-Mu Unit and Low-Mu Unit

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Voltage (AC or DC)	6.3 ± 10%		volts
Current	0.75		amp
Direct Interelectrode Capacitances (Approx.):[o]	*Unit No.1*	*Unit No.2*	
Grid to plate	1.8	4.4	μμf
Grid to cathode and heater	1.5	5	μμf
Plate to cathode and heater	0.3	1	μμf

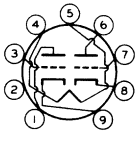
Characteristics, Class A_1 Amplifier:

	Unit No.1	*Unit No.2*		
Plate Supply Voltage	250	60	150	volts
Grid Voltage	-3	0	-	volts
Cathode Resistor	-	-	620	ohms
Amplification Factor	68	-	5	
Plate Resistance (Approx.)	52000	-	920	ohms
Transconductance	1300	-	5400	μmhos
Plate Current	1.2	80*	30	ma
Plate Current for grid volts = -30	-	-	3.5	ma
Grid Voltage (Approx.) for plate μa = 10	-5.5	-	-	volts
Grid Voltage (Approx.) for plate μa = 200	-	-	-40	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9LG

Pin 1 - Plate of Unit No.2
Pin 2 - Internal Connection—Do Not Use
Pin 3 - Grid of Unit No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Cathode of Unit No.2

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6CY7
DUAL TRIODE
With High-Mu Unit and Low-Mu Unit

VERTICAL-DEFLECTION OSCILLATOR

Values are for Unit No.1

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	350	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	400	max.	volts
PLATE DISSIPATION	1	max.	watt
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200▲	max.	volts
Heater positive with respect to cathode	200	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	2.2	max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Values are for Unit No.2

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	350	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE#	1800	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	120	max.	ma
Average	35	max.	ma
PLATE DISSIPATION	5.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200▲	max.	volts
Heater positive with respect to cathode	200	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For cathode-bias operation	2.2	max.	megohms

○ Without external shield.

* This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

▲ The dc component must not exceed 100 volts.

This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

6CZ5

Beam Power Tube

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.45 ± 6%	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances:▲		
Grid No.1 to plate	0.4 max.	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	9	μμf
Plate to cathode & grid No.3, grid No.2, and heater	6	μμf

Characteristics, Class A_1 Amplifier:

Plate Voltage	75	250	volts
Grid-No.2 Voltage	250	250	volts
Grid-No.1 Voltage	0	-15	volts
Plate Resistance (Approx.)	-	73000	ohms
Transconductance	-	4800	μmhos
Plate Current	130●	46	ma
Grid-No.2 Current	16●	4.6	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	-	-40	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	3-1/16"
Maximum Seated Length	2-13/16"
Length, Base Seat to Bulb Top (Excluding tip)	2-7/16" ± 3/32"
Maximum Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9HN

Pin 1 - Grid No.2
Pin 2 - No Connection
Pin 3 - Grid No.1
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid No.1

Pin 7 - Cathode, Grid No.3
Pin 8 - Internal Connection—Do Not Use
Pin 9 - Plate

← Indicates a change.

6CZ5

VERTICAL-DEFLECTION AMPLIFIER

→ **Maximum Ratings,** *Design-Maximum Values:*

For operation in a 525-line, 30-frame system★

DC PLATE VOLTAGE	350	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE♦	2200	max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	315	max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 (CONTROL-GRID) VOLTAGE	275	max.	volts
CATHODE CURRENT:			
Peak	155	max.	ma
Average	45	max.	ma
GRID-No.2 INPUT	2.2	max.	watts
PLATE DISSIPATION	10	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200♦	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250	max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5	max.	megohm
For cathode-bias operation	1	max.	megohm

▲ Without external shield.

● This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

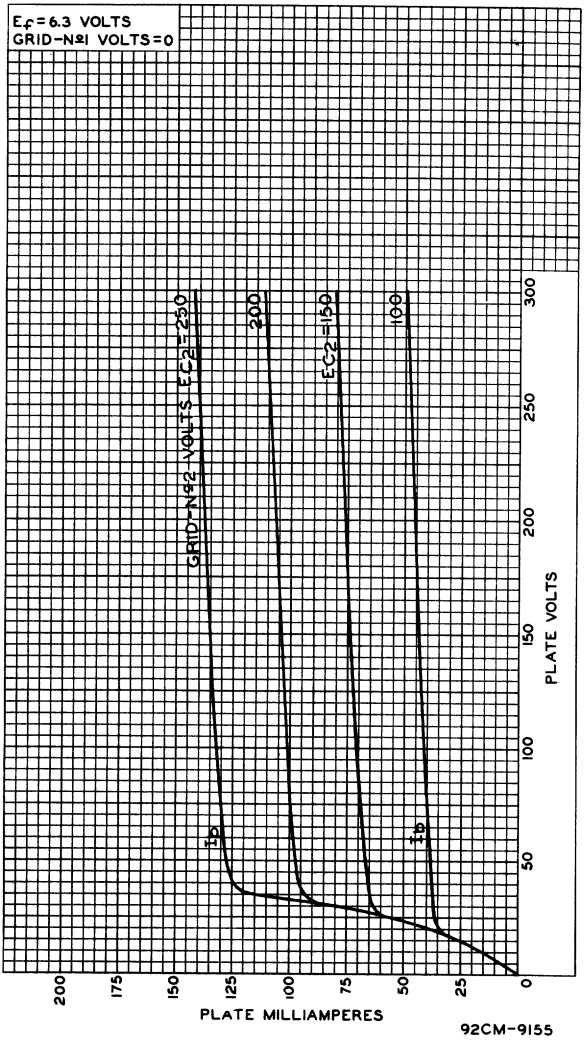
★ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

♦ This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

♦ The dc component must not exceed 100 volts.

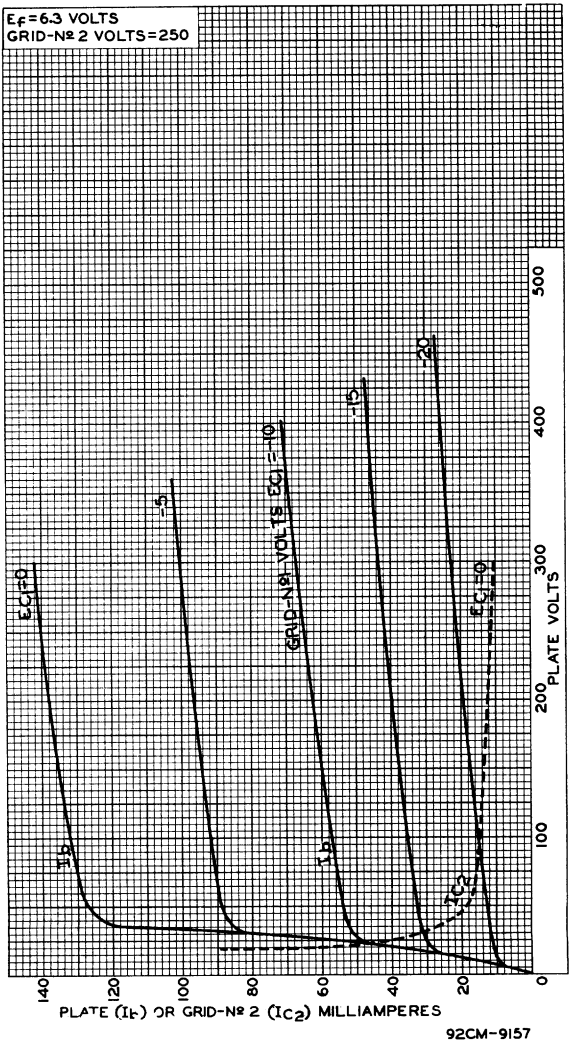
→ Indicates a change.

AVERAGE PLATE CHARACTERISTICS



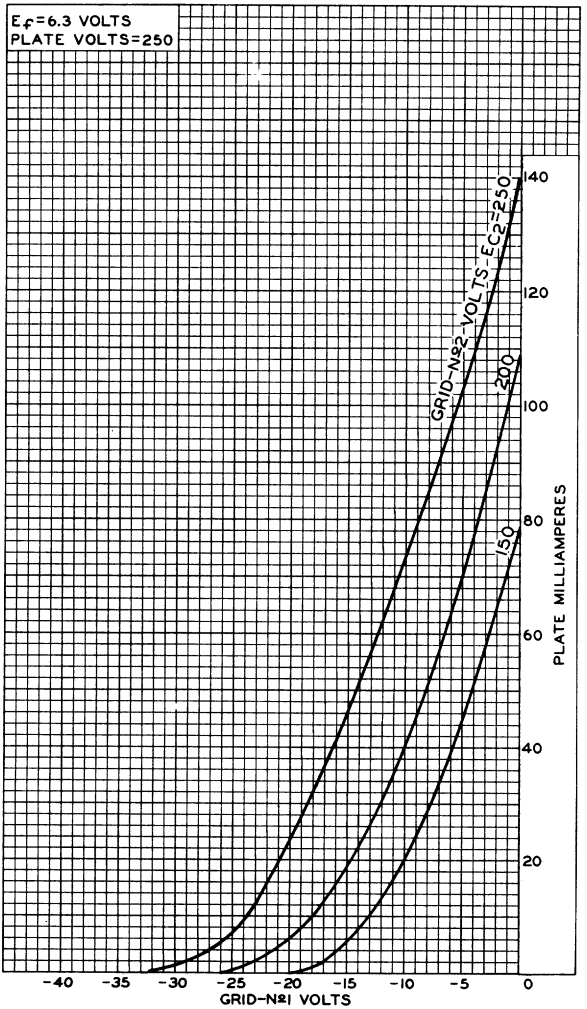
6CZ5

AVERAGE CHARACTERISTICS



92CM-9157

AVERAGE CHARACTERISTICS



92CM-9156RI

6DA4

HALF-WAVE VACUUM RECTIFIER

For television damper service

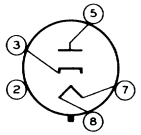
GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current	1.2	amp
Direct Interelectrode Capacitances (Approx.):○		
Plate to cathode and heater	6	μμf
Cathode to plate and heater	8	μμf
Heater to cathode	3	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-9/32"
Dimensional Outline	*See General Section*
Bulb	T9
Base	Intermediate-Shell Octal 5-Pin, Arrangement 2 (JEDEC Group 1, No.B5-82), Intermediate-Shell Octal 6-Pin, Arrangement 1 (JEDEC Group 1, No.B6-8), Short Intermediate-Shell Octal 5-Pin with External Barriers, Arrangement 2 (JEDEC Group 1, No.B5-85), or Short Intermediate-Shell Octal 6-Pin with External Barriers, Arrangement 1 (JEDEC Group 1, No.B6-60)
Basing Designation for BOTTOM VIEW	4CG



Pin 1♦ – Same as Pin 2
Pin 2 – Internal Connection—Do Not Use●
Pin 3 – Cathode
Pin 5 – Plate
Pin 7 – Heater
Pin 8 – Heater

DAMPER SERVICE

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system□

PEAK INVERSE PLATE VOLTAGE*	4400	max.	volts
PEAK PLATE CURRENT	900	max.	ma
DC PLATE CURRENT	155	max.	ma
PLATE DISSIPATION	5.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	4400▲	max.	volts
Heater positive with respect to cathode	300✱	max.	volts

6DA4

HALF-WAVE VACUUM RECTIFIER

Characteristics:

Tube-Voltage Drop for plate ma. = 250 . . . . . 22 volts

○ Without external shield.

◆ On the 5-pin bases, pin 1 as well as pins 4 and 6 is omitted.

● Socket terminals 1,2,4 and 6 should not be used as tie points.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

* This rating is applicable when the duty cycle of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

▲ The dc component must not exceed 900 volts.

The dc component must not exceed 100 volts.

6DB5

Beam Power Tube

9-PIN MINIATURE TYPE

GENERAL DATA

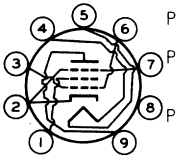
Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	1.2	amp
Direct Interelectrode Capacitances (Approx.):[a]		
Grid No.1 to plate	0.2	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	13	μμf
Plate to cathode & grid No.3, grid No.2, and heater	8	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/4"
Maximum Seated Length	2-1/2"
Length, Base Seat to Bulb Top (Excluding tip)	2-1/8" ± 3/32"
Diameter	0.750" to 0.875"
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9GR

Pin 1 - Grid No.2
Pin 2 - Cathode, Grid No.3
Pin 3 - Grid No.1
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid No.1



Pin 7 - Cathode, Grid No.3
Pin 8 - Internal Connection—Do Not Use
Pin 9 - Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	150	max.	volts
GRID-No.2 INPUT	1.25	max.	watts
PLATE DISSIPATION	10	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts

Typical Operation and Characteristics:

Plate Supply Voltage	110	200	volts
Grid-No.2 Supply Voltage	110	125	volts
Grid-No.1 (Control-grid) Voltage	-7.5	-	volts
Cathode Resistor	-	180	ohms

Peak AF Grid-No.1 Voltage	7.5	8.5	volts
Zero-Signal Plate Current	49	46	ma
Max.-Signal Plate Current	50	47	ma
Zero-Signal Grid-No.2 Current	4	2.2	ma
Max.-Signal Grid-No.2 Current	10	8.5	ma
Plate Resistance (Approx.)	13000	28000	ohms
Transconductance	8000	8000	μmhos
Load Resistance	2000	4000	ohms
Total Harmonic Distortion	10	10	%
Max.-Signal Power Output	2.1	3.8	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	2.2 max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system[c]

DC PLATE VOLTAGE	300 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE (Absolute maximum)[d]	2000[e] max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	150 max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 (CONTROL-GRID) VOLTAGE	250 max.	volts
CATHODE CURRENT:		
Peak	200 max.	ma
Average	55 max.	ma
GRID-No.2 INPUT	1.25 max.	watts
PLATE DISSIPATION	10 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[b] max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	2.2 max.	megohms

[a] Without external shield.

[b] The dc component must not exceed 100 volts.

[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[d] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

[e] Under no circumstances should this absolute value be exceeded.

6DC6

SEMIREMOTE-CUTOFF PENTODE

MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.3	amp
Direct Interelectrode Capacitances (No external shield):		
Grid No.1 to plate	0.02 max.	μμf
Input	6.5	μμf
Output	2	μμf

Mechanical:

Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base — Small-Button Miniature 7-Pin (JETEC No.E7-1)	
Basing Designation for BOTTOM VIEW	7CM

Pin 1 – Grid No.1
Pin 2 – Cathode
Pin 3 – Heater
Pin 4 – Heater

Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Grid No.3, Internal Shield

AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
GRID-No.3 (SUPPRESSOR) VOLTAGE	0 max.	volts
GRID-No.2 SUPPLY VOLTAGE	300 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	See Rating Curve at front of this Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive bias value	0 max.	volts
PLATE DISSIPATION	2 max.	watts
GRID-No.2 INPUT	0.5 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲ max.	volts

Typical Operation and Characteristics:

Plate Supply Voltage	200	volts
Grid No.3	Connected to cathode at socket	
Grid-No.2 Voltage	150	volts
Cathode-Bias Resistor	180	ohms
Plate Resistance (Approx.)	0.5	megohm

▲ The dc component must not exceed 100 volts.

6DC6

6DC6

SEMIREMOTE-CUTOFF PENTODE

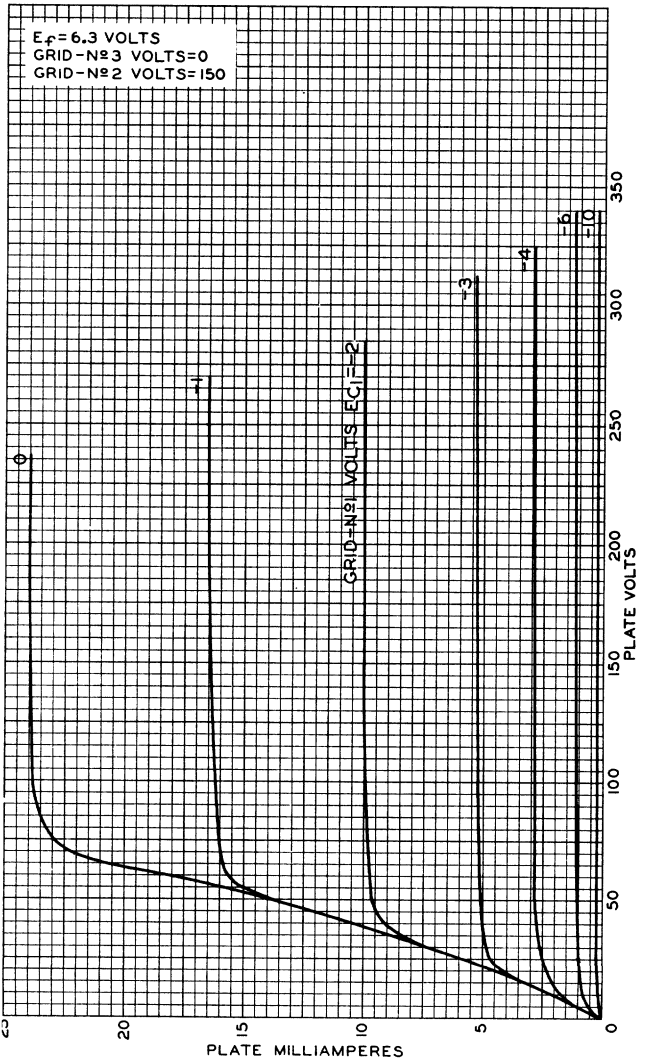
Transconductance	5500	μmhos
Grid-No.1 Voltage (Approx.) for transconductance of 50 μmhos	-12.5	volts
Plate Current	9	ma
Grid-No.2 Current	3	ma

Maximum Circuit Values (For maximum rated conditions):

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	1.0 max.	megohm

6DC6

AVERAGE PLATE CHARACTERISTICS



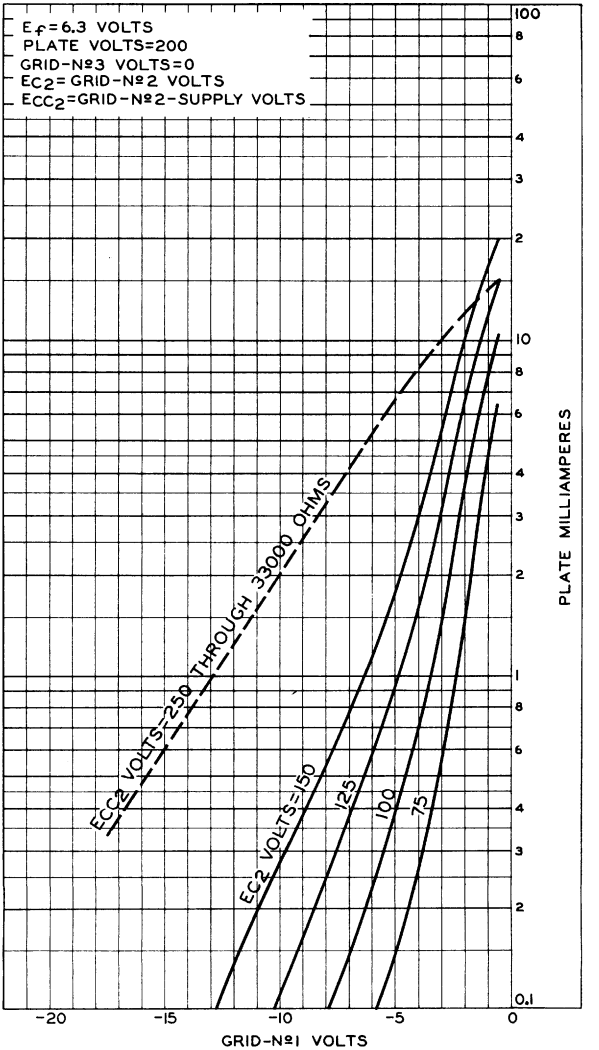
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8330RI

6DC6

6DC6

AVERAGE CHARACTERISTICS

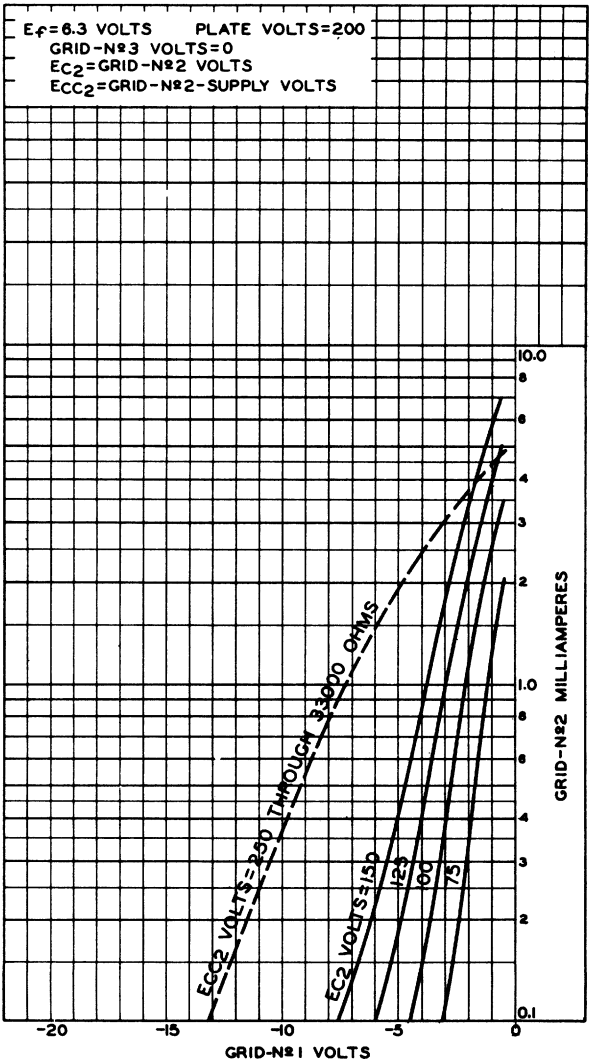


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8337

6DC6

AVERAGE CHARACTERISTICS

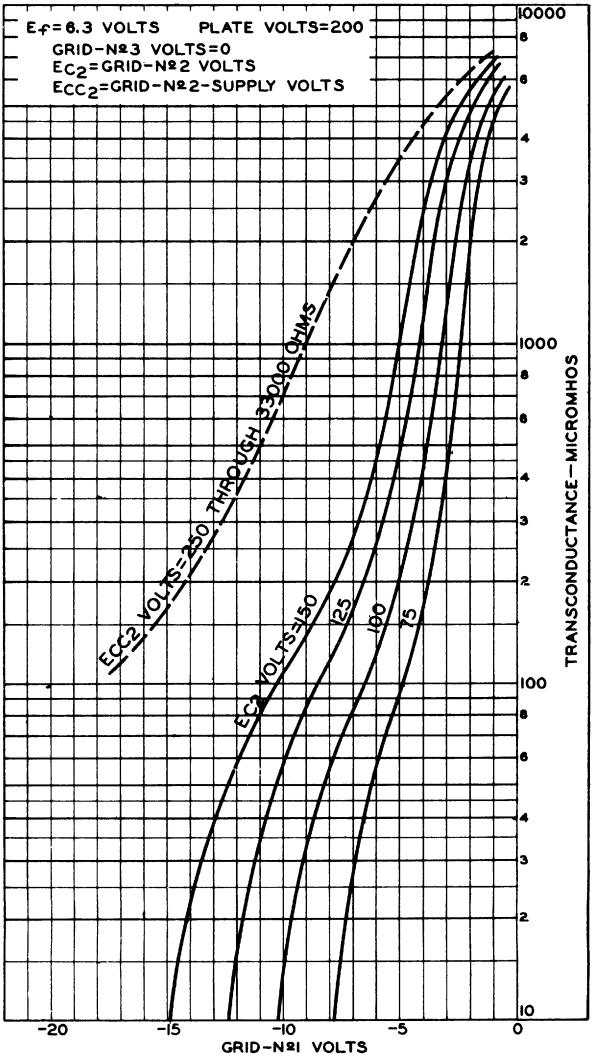


JUNE 15,1954 TUBE DIVISION 92CM-8338
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6DC6

6DC6

AVERAGE CHARACTERISTICS



6DE4

Half-Wave Vacuum Rectifier

For Television Damper Service

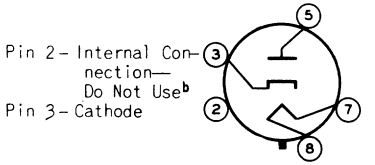
GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	1.6	amp
Direct Interelectrode Capacitances (Approx.):[a]		
Plate to cathode and heater	8.5	μμf
Cathode to plate and heater	11.5	μμf
Heater to cathode	4	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	3-13/16"
Maximum Seated Length	3-1/4"
Maximum Diameter	1-9/32" ←
Bulb	T9
Base	Short Intermediate-Shell Octal 5-Pin with External Barriers, Arrangement 2 (JEDEC Group 1, No. B5-85)
Basing Designation for BOTTOM VIEW	4CG



Pin 2 - Internal Connection—Do Not Use[b]
Pin 3 - Cathode
Pin 5 - Plate
Pin 7 - Heater
Pin 8 - Heater

DAMPER SERVICE

Maximum Ratings, *Design-Maximum Values:* ←

For operation in a 525-line, 30-frame system[c]

PEAK INVERSE PLATE VOLTAGE[d]	5500	max.	volts
PEAK PLATE CURRENT	1100	max.	ma
DC PLATE CURRENT	180	max.	ma
PLATE DISSIPATION	6.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode[d]	5500[e]	max.	volts
Heater positive with respect to cathode	300[f]	max.	volts

Characteristics, Instantaneous Value: ←

Tube Voltage Drop for plate ma. = 350	34	volts

[a] Without external shield.
[b] Socket terminals 1, 2, 4 and 6 should not be used as tie points.
[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

← Indicates a change.

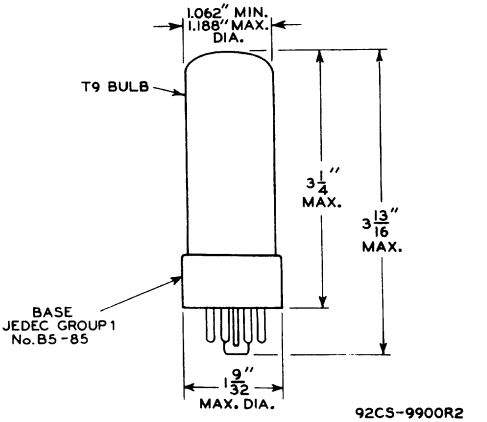
[d] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[e] The dc component must not exceed 900 volts.

[f] The dc component must not exceed 100 volts.

OPERATING CONSIDERATIONS

It is recommended that socket clips for pins 1, 2, 4, and 6 be removed to reduce the possibility of arc-over and to minimize leakage.



6DE6
SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage	6.3 ± 10%		volts
Current	0.3		amp
Direct Interelectrode Capacitances:	*Without External Shield*	*With External Shield*[o]	
Grid No.1 to plate	0.025 max.	0.015 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	6.5	6.5	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	2	3	μμf

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	125	volts
Grid No.3	♦	
Grid-No.2 Supply Voltage	125	volts
Cathode Resistor	56	ohms
Plate Resistance (Approx.)	0.25	megohm
Transconductance	8000	μmhos
Plate Current	15.5	ma
Grid-No.2 Current	4.2	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-9	volts
Grid-No.1 Voltage (Approx.) for transconductance (μmhos) = 700 and cathode resistor (ohms) = 0	-5.5	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)

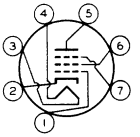
◄ Indicates a change.

6DE6

SHARP-CUTOFF PENTODE

Basing Designation for BOTTOM VIEW. 7CM

Pin 1 – Grid No.1
Pin 2 – Cathode
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Plate



Pin 6 – Grid No.2
Pin 7 – Grid No.3, Internal Shield

AMPLIFIER — Class A_1

→Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE	0	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330	max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0	max.	volts
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 165 volts	0.55	max.	watt
For grid-No.2 voltages between 165 and 330 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
PLATE DISSIPATION	2.3	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.25	max.	megohm
For cathode-bias operation	1	max.	megohm

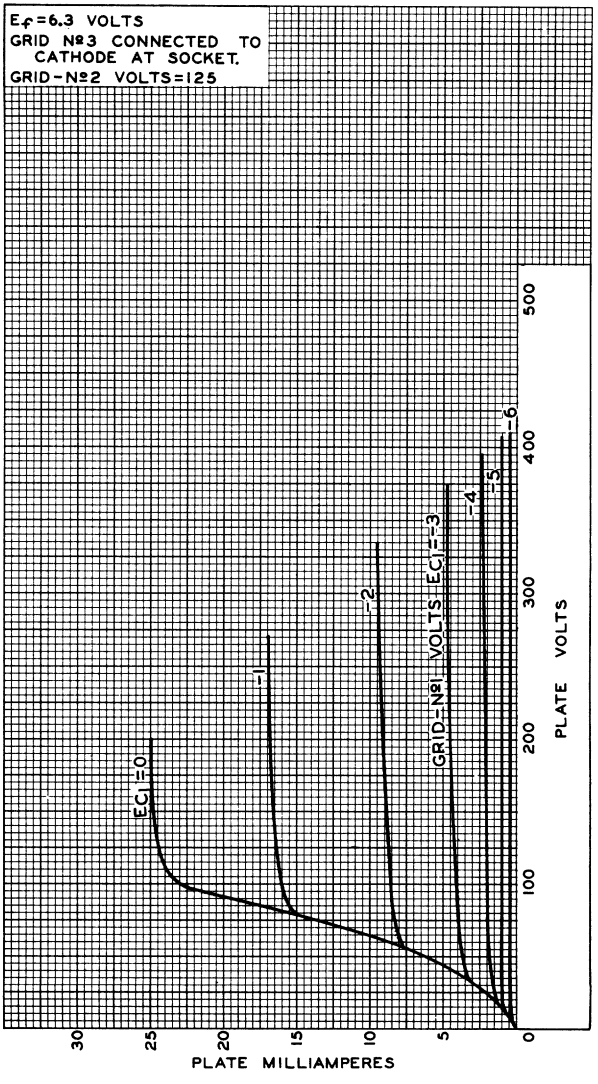
○ With external shield JEDEC No.316 connected to cathode.
◆ Connected to cathode at socket.
▲ The dc component must not exceed 100 volts.

→Indicates a change.

RCA

6DE6

AVERAGE PLATE CHARACTERISTICS

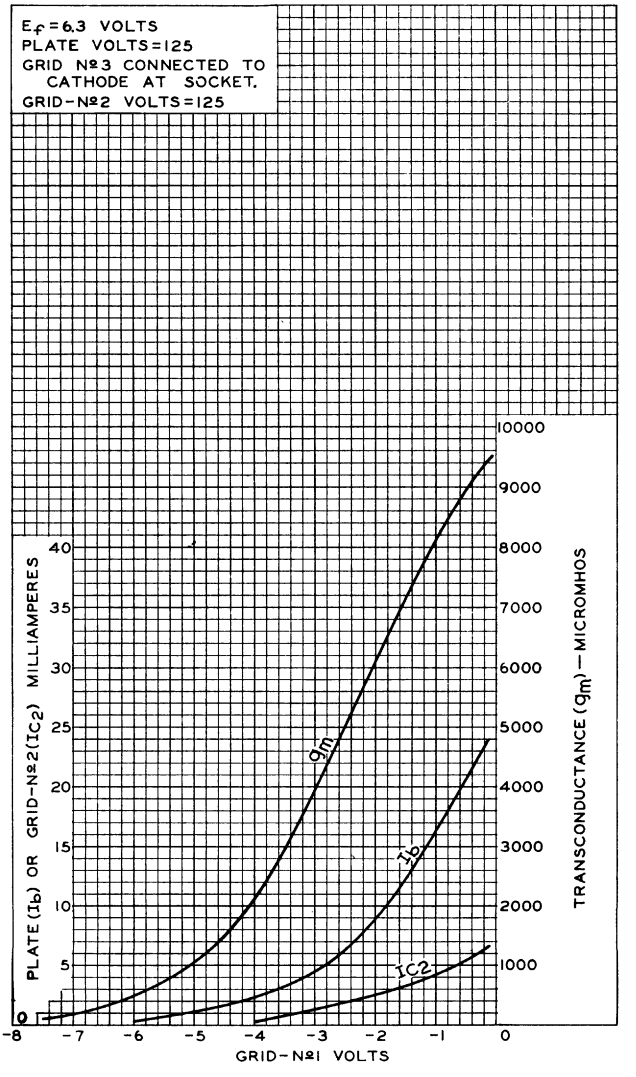


ELECTRON TUBE DIVISION 92CM-8578RI
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6DE6

6DE6

AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8575R1

6DE7

Dual Triode

With Medium-Mu Unit and Low-Mu Unit

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*

Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.900	amp
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts

Direct Interelectrode Capacitances (Approx.):[b]

	Unit No.1	*Unit No.2*	
Grid to plate	4.0	8.5	μμf
Grid to cathode and heater	2.2	5.5	μμf
Plate to cathode and heater	0.52	1.0	μμf

Characteristics, Class A_1 Amplifier:

	Unit No.1	*Unit No.2*		
Plate Voltage	250	60	150	volts
Grid Voltage	-11	0	-17.5	volts
Amplification Factor	17.5	-	6	
Plate Resistance (Approx.)	8750	-	925	ohms
Transconductance	2000	-	6500	μmhos
Plate Current	5.5	80[c]	35	ma
Plate Current for grid volts = -24	-	-	10	ma
Grid Voltage (Approx.) for plate μa = 10	-20	-	-	volts
Grid Voltage (Approx.) for plate μa = 50	-	-	-44	volts

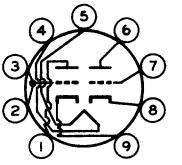
Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

6DE7

Basing Designation for BOTTOM VIEW. 9HF

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Grid of Unit No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Cathode of Unit No.2

VERTICAL-DEFLECTION OSCILLATOR

Values are for Unit No.1

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[d]

DC PLATE VOLTAGE	330 max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	400 max.	volts
CATHODE CURRENT:,		
Peak	77 max.	ma
Average	22 max.	ma
→ PLATE DISSIPATION	1.5 max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For grid-resistor-bias or cathode-bias operation	2.2 max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Values are for Unit No.2

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[d]

DC PLATE VOLTAGE	275 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[#]	1500 max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250 max.	volts
CATHODE CURRENT:		
Peak	175 max.	ma
Average	50 max.	ma
PLATE DISSIPATION	7 max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For grid-resistor-bias or cathode-bias operation	2.2 max.	megohms

[a] The dc component must not exceed 100 volts.

[b] Without external shield.

[c] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

[d] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

→ Indicates a change.

6DE7

DUAL TRIODE

With Medium-Mu Unit and Low-Mu Unit

This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

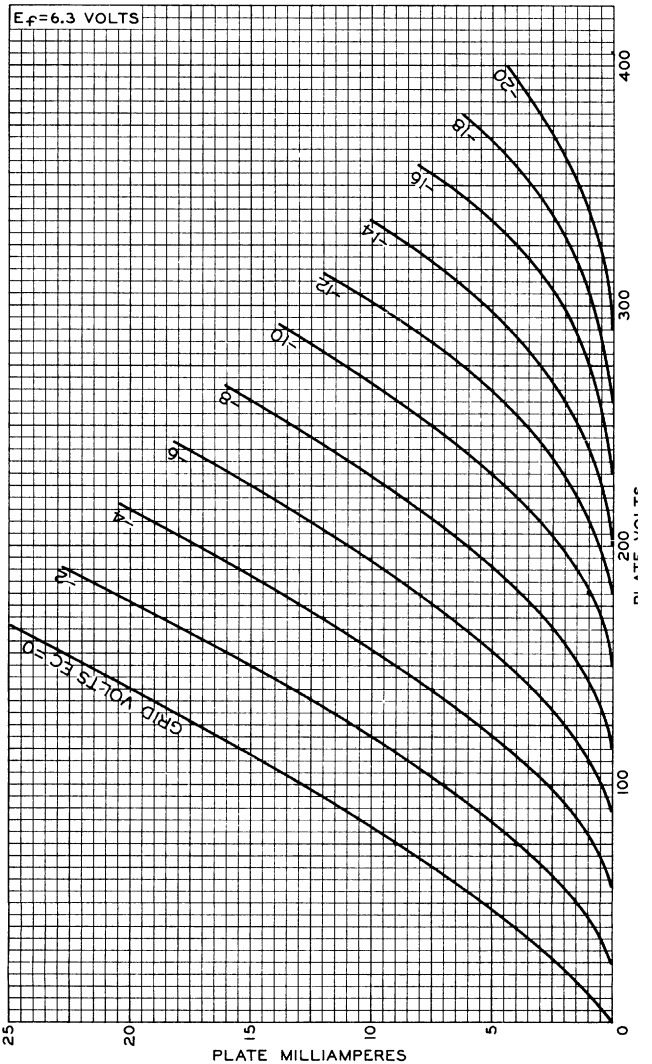
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6DE7

6DE7

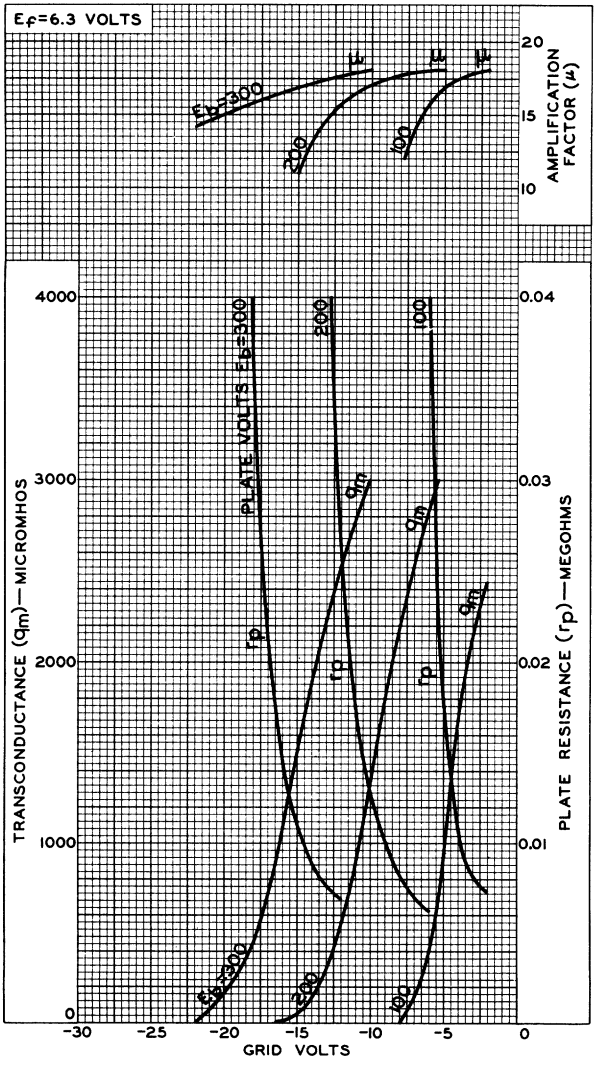
AVERAGE PLATE CHARACTERISTICS

UNIT Nº1



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-9988

6DE7
AVERAGE CHARACTERISTICS
UNIT Nº1



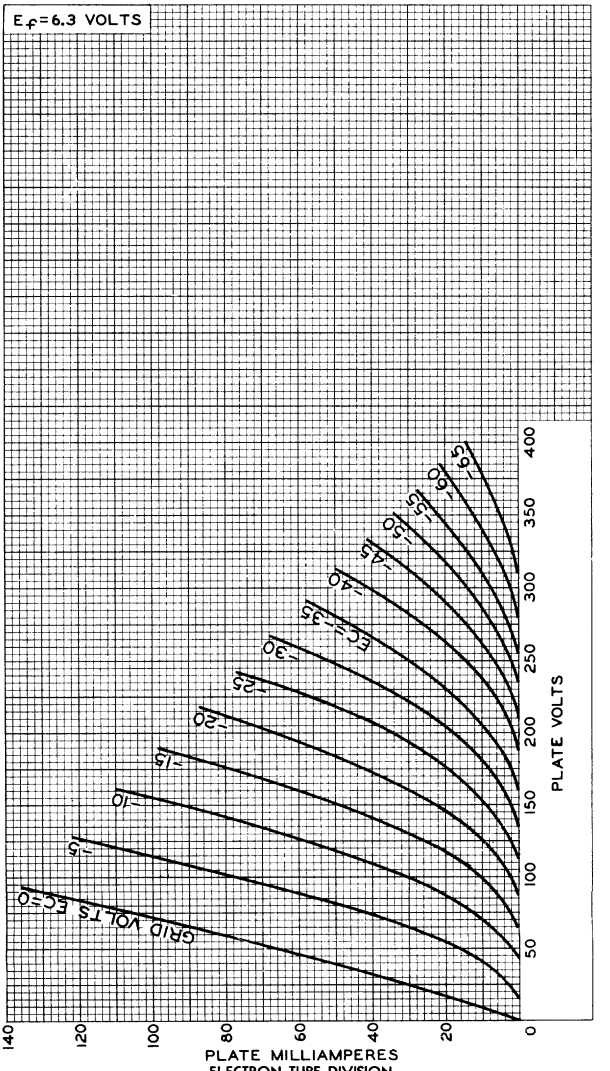
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-9991

6DE7

6DE7

AVERAGE PLATE CHARACTERISTICS

UNIT Nº 2



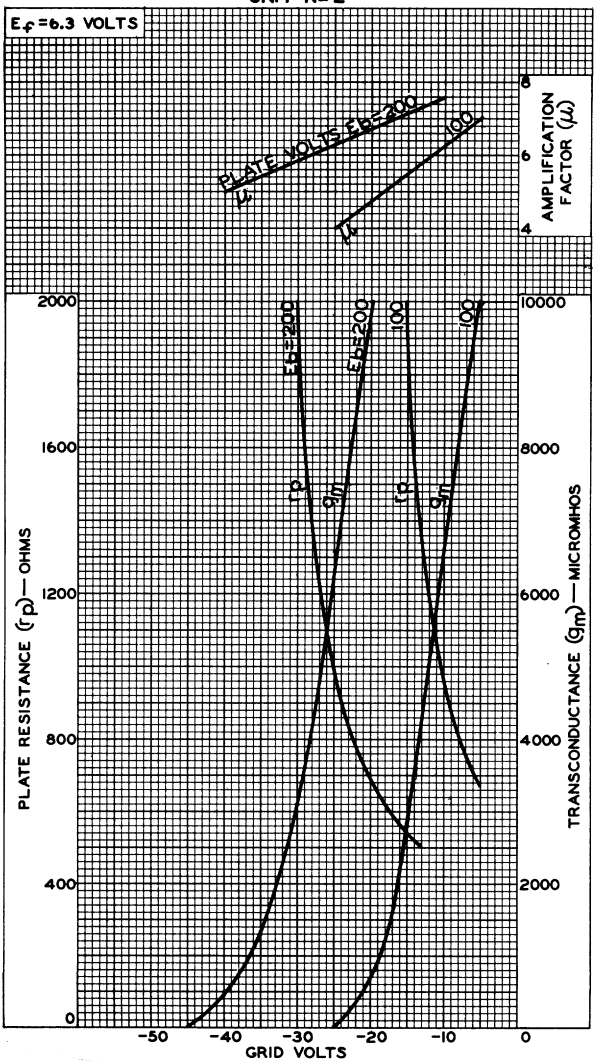
ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9913

6DE7

AVERAGE CHARACTERISTICS
UNIT Nº 2



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-9914

6DG6-GT

BEAM POWER TUBE

GENERAL DATA

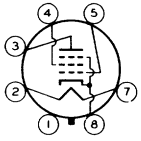
Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	1.2	amp
Direct Interelectrode Capacitances (Approx.):[o]		
Grid No.1 to plate	0.6	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	15	μμf
Plate to cathode & grid No.3, grid No.2, and heater	10	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-9/32"
Dimensional Outline	*See General Section*
Bulb	T-9
Base	Intermediate-Shell Octal 7-Pin (JETEC No.B7-7), Short Intermediate-Shell Octal 7-Pin with External Barriers (JETEC No.B7-59), Intermediate-Shell Octal 6-Pin (JETEC No.B6-81), or Short Intermediate-Shell Octal 6-Pin with External Barriers (JETEC No.B6-84)
Basing Designation for BOTTOM VIEW	7S

Pin 1♦ - No Connection
Pin 2 - Heater
Pin 3 - Plate
Pin 4 - Grid No.2



Pin 5 - Grid No.1
Pin 7 - Heater
Pin 8 - Cathode, Grid No.3

AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	200 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	125 max.	volts
PLATE DISSIPATION	10 max.	watts
GRID-No.2 INPUT	1.25 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Typical Operation and Characteristics:

Plate Voltage	110	200	volts
Grid-No.2 Voltage	110	125	volts
Grid-No.1 (Control-Grid) Voltage	-7.5	0	volts

[o] Without external shield.

♦ On the 6-pin bases, pin 1 as well as pin 6 is omitted.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6DG6-GT

BEAM POWER TUBE

Peak AF Grid-No.1 Voltage	7.5	8.5	volts
Cathode Resistor	0	180	ohms
Zero-Signal Plate Current	49	46	ma
Max.-Signal Plate Current	50	47	ma
Zero-Signal Grid-No.2 Current	4	2.2	ma
Max.-Signal Grid-No.2 Current	10	8.5	ma
Plate Resistance (Approx.)	13000	28000	ohms
Transconductance	8000	8000	μmhos
Load Resistance	2000	4000	ohms
Total Harmonic Distortion	10	10	%
Max.-Signal Power Output	2.1	3.8	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:	
For fixed-bias operation	0.1 max. megohm
For cathode-bias operation	0.5 max. megohm

Curves shown under Type 50L6-GT also apply to the 6DG6-GT

TENTATIVE DATA

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6DK6

SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.3	amp
Direct Interelectrode Capacitances:°		
Grid No.1 to plate	0.02 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	6.3	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	1.9	μμf

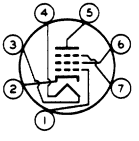
Characteristics, Class A_1 Amplifier:

Plate-Supply Voltage	125	volts
Grid-No.3	*Connected to cathode at socket*	
Grid-No.2-Supply Voltage	125	volts
Cathode Resistor	56	ohms
Plate Resistance (Approx.)	0.35	megohm
Transconductance	9800	μmhos
Plate Current	12	ma
Grid-No.2 Current	3.8	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-6.5	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CM

Pin 1 - Grid No.1
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate



Pin 6 - Grid No.2
Pin 7 - Grid No.3, Internal Shield

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330 max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE	0 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts

°: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

6DK6

SHARP-CUTOFF PENTODE

GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 165 volts	0.55 max.	watt
For grid-No.2 voltages between 165 and 330 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	2.3 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲max.	volts

Maximum Circuit Values:

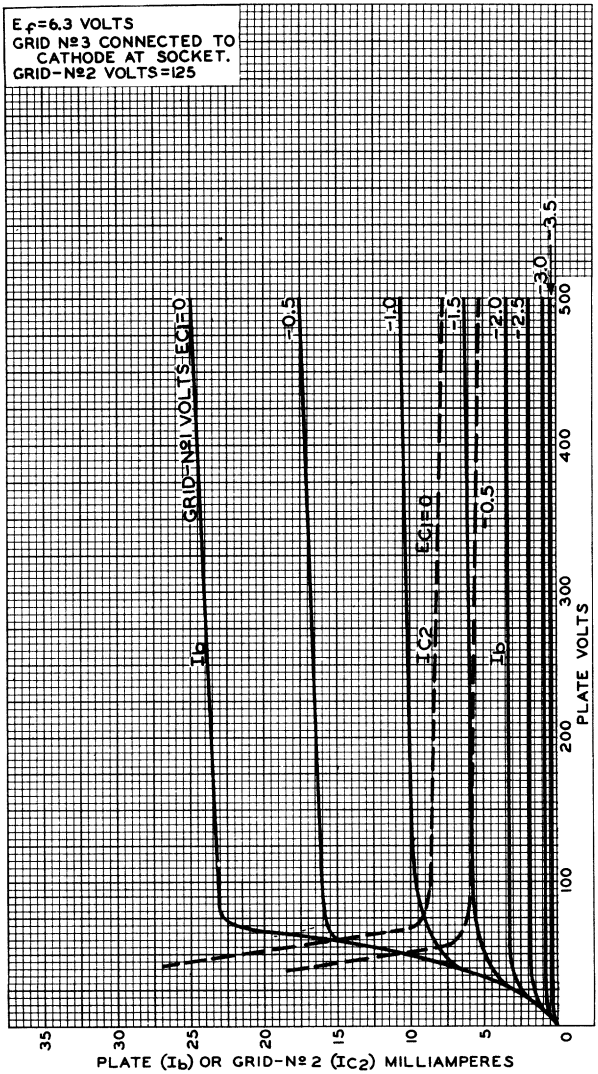
Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	1 max.	megohm

○ Without external shield.

▲ The dc component must not exceed 100 volts.

6DK6

AVERAGE CHARACTERISTICS

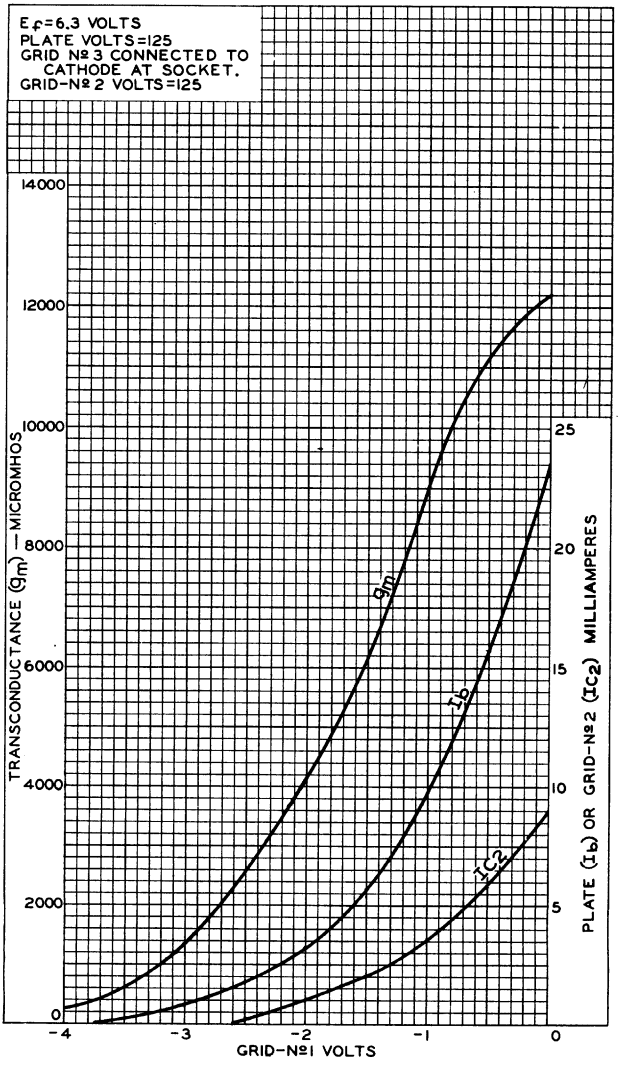


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-9851RI

6DK6

6DK6

AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9852

6DL3

Half-Wave Vacuum Rectifier

NOVAR TYPE

- **Top Cap Cathode Connection**
- **Pressure-Welded Cathode Coating**
- **RCA Dark Heater**
- **Voltage Drop: Eb = 25V for I_b = 800 mA**

ELECTRICAL CHARACTERISTICS – Bogey Values

Heater Voltage, ac or dc	E_h	6.3	V
Heater Current	I_h	2.3	A
Direct Interelectrode Capacitances:[a]			
Plate to cathode and heater	$c_{p(k+h)}$	17.0	pF
Cathode to plate and heater	$c_{k(p+h)}$	13.0	pF
Heater to cathode	c_{h-k}	4.4	pF
Instantaneous Tube Voltage Drop for instantaneous plate current (i_b) = 800 mA	e_b	25	V

MECHANICAL CHARACTERISTICS

Maximum Overall Length	3.850 in (97.79 mm)
Maximum Seated Length	3.470 in (88.1 mm)
Maximum Diameter	1.188 in (30.1 mm)
Envelope	JEDEC T9
Top Cap	Small embossed (JEDEC C1-2, C1-3 or C1-33)
Base[b]	Small-Button Novar 9-Pin with Exhaust Tip (JEDEC E9-89)
Terminal Diagram	JEDEC 9GD
Type of Cathode	Coated Unipotential
Operating Position	Any

MAXIMUM RATINGS – Design-Maximum Values[c]

For operation as a Damper Tube in Color-TV Receivers utilizing a 525-line, 30-frame system

Peak Inverse Plate Voltage	$-e_{bm}$	6500[d]	V
Heater-Cathode Voltage:			
Peak	e_{hkm}	+300	V
		-6500	V
Average[e]	$E_{hk(av)}$	+100	V
		-900	V

Heater Voltage, ac or dc	E_h	5.7 to 6.9	V
Plate Current:			
Peak	i_{bm}	1800	mA
Average[e]	$I_{b(av)}$	400	mA
Plate Dissipation	P_b	11.0	W
Envelope Temperature (at hottest point on envelope surface)	T_E	220	°C

a Measured without external shield in accordance with the current issue of EIA Standard RS-191B.

b Designed to mate with Novar 9-Contact Socket generally available from your local RCA Distributor.

c As defined in the current issue of EIA Standard RS-239A.

d This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system. 15% of one horizontal scanning cycle is 10 μs.

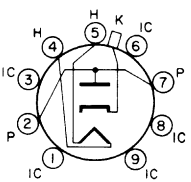
e Measured with a dc meter.

OPERATING CONSIDERATIONS

Socket terminals 1, 3, 6, 8 and 9 should not be used as tie points for external-circuit components. It is recommended that the socket tabs be removed to reduce the possibility of arc-over and to minimize leakage.

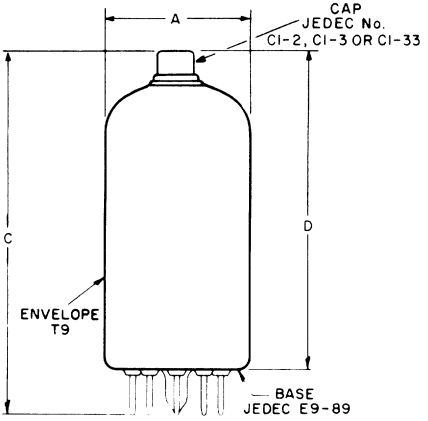
TERMINAL DIAGRAM – JEDEC 9GD (Bottom View)

Pin 1 - Do Not Use
Pin 2 - Plate
Pin 3 - Do Not Use
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Do Not Use
Pin 7 - Plate
Pin 8 - Do Not Use
Pin 9 - Do Not Use
Cap - Cathode

DIMENSIONAL OUTLINE



92CS-17941

DIMENSION	INCHES			MILLIMETERS		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.062*	–	1.188	27.0*	–	30.1
C	–	–	3.850	–	–	97.79
D	–	–	3.470	–	–	88.1
MILLIMETER DIMENSION DERIVED FROM INCH DIMENSION						

*Applies to the minimum diameter except in the area of the seal.

6DN7

MEDIUM-MU DUAL TRIODE

With Dissimilar Units

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current	0.9	amp

Direct Interelectrode Capacitances (Approx.):[o]

	Unit No.1	*Unit No.2*	
Grid to plate	4	5.5	μμf
Grid to cathode and heater	2.2	4.6	μμf
Plate to cathode and heater	0.7	1	μμf

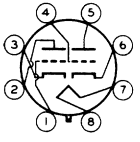
Characteristics, Class A_1 Amplifier:

	Unit No.1	*Unit No.2*		
Plate Voltage	250	150	250	volts
Grid Voltage	-8	0	-9.5	volts
Amplification Factor	22.5	-	15.4	
Plate Resistance (Approx.)	9000	-	2000	ohms
Transconductance	2500	-	7700	μmhos
Plate Current	8	68*	41	ma
Grid Voltage (Approx.) for plate ma. = 10	-18	-	-	volts
Grid Voltage (Approx.) for plate ma. = 50	-	-	-23	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	3"
Maximum Seated Length	2-7/16"
Maximum Diameter	1-9/32"
Bulb	T9
Base	Intermediate-Shell Octal 8-Pin with External Barriers (JEDEC Group 1, B8-142)
Basing Designation for BOTTOM VIEW	8BD

Pin 1 - Grid of Unit No.2
Pin 2 - Plate of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Grid of Unit No.1



Pin 5 - Plate of Unit No.1
Pin 6 - Cathode of Unit No.1
Pin 7 - Heater
Pin 8 - Heater

VERTICAL-DEFLECTION OSCILLATOR

Values are for Unit No.1

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	350 max.	volts

6DN7

MEDIUM-MU DUAL TRIODE
With Dissimilar Units

PEAK NEGATIVE-PULSE GRID VOLTAGE	400	max.	volts
PLATE DISSIPATION	1	max.	watt
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200▲	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation	2.2	max.	megohms
For cathode-bias operation	2.2	max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Values are for Unit No.2

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	550	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE#	2500	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	150	max.	ma
Average	50	max.	ma
PLATE DISSIPATION	10	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200▲	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation	2.2	max.	megohms

○ Without external shield.

* This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

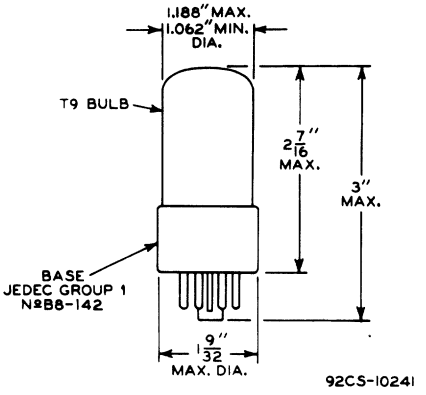
▲ The dc component must not exceed 100 volts.

This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

6DN7

MEDIUM-MU DUAL TRIODE

With Dissimilar Units



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6DQ5

Beam Power Tube

For Use as a Horizontal-Deflection Amplifier Tube in Color and Black-and-White Television Receivers

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	2.500		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances:[b]			
Grid No.1 to plate	0.5		pf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	23.0		pf
Plate to cathode & grid No.3, grid No.2, and heater	11.0		pf

Characteristics, Class A_1 Amplifier:

			Triode Connection[c]	
Plate Voltage	70	175	125	volts
Grid No.2 (Screen-Grid) Voltage	125	125	–	volts
Grid No.1 (Control-Grid) Voltage	0	−25	−25	volts
Amplification Factor	–	–	3.3	
Plate Resistance (Approx.)	–	5500	–	ohms
Transconductance	–	10500	–	μmhos
Plate Current	550[d]	110	–	ma
Grid-No.2 Current	42[d]	5	–	ma
Grid-No.1 Voltage (Approx.) for plate ma. = 1	–	−55	–	volts

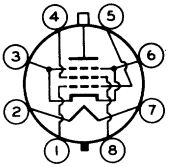
Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	5"
Seated Length	4-1/4" ± 3/16"
Maximum Diameter	1-9/16"
Bulb	T12
Cap	Small (JEDEC No.C1-1)
Base	Short Meduim-Shell Octal 8-Pin with External Barriers, Style B (JEDEC No.B8-118)

6DQ5

Basing Designation for BOTTOM VIEW. 8JC

Pin 1 – Grid No.1
Pin 2 – Heater
Pin 3 – Cathode, Grid No.3
Pin 4 – Grid No.2
Pin 5 – Grid No.1



Pin 6 – Cathode, Grid No.3
Pin 7 – Heater
Pin 8 – Grid No.2
Cap – Plate

HORIZONTAL-DEFLECTION AMPLIFIER

→ **Maximum Ratings,** *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[e]

DC PLATE-SUPPLY VOLTAGE	990 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[f] . . .	6500 max.	volts
PEAK NEGATIVE-PULSE PLATE VOLTAGE	1100 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE. . . .	190 max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 VOLTAGE . .	250 max.	volts
CATHODE CURRENT:		
Peak.	1100 max.	ma
Average	315 max.	ma
GRID-No.2 INPUT	3.2 max.	watts
PLATE DISSIPATION[g].	24 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface).	220 max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For grid-resistor-bias operation[g] . . .	0.47 max.	megohm

[a] The dc component must not exceed 100 volts.

[b] Without external shield.

[c] With grid No.2 connected to plate.

[d] These values can be measured by a method involving a recurrent wave form such that the plate dissipation, grid-No.2 input, and cathode current will be kept within ratings in order to prevent damage to the tube.

[e] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

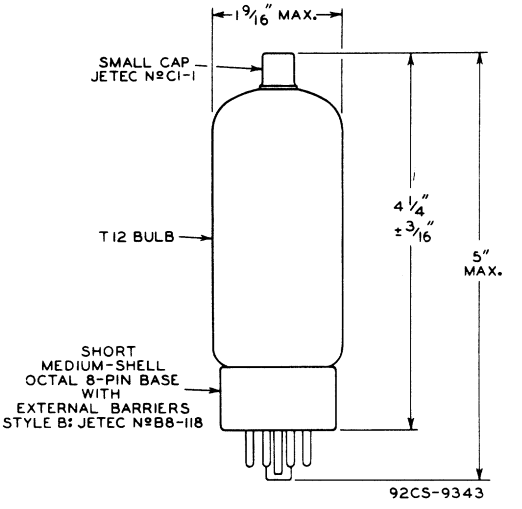
[f] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[g] It is essential that the plate dissipation be limited in the event of loss of grid signal. For this purpose, some protective means such as a cathode resistor of suitable value be employed.

→ Indicates a change.

6DQ5

BEAM POWER TUBE

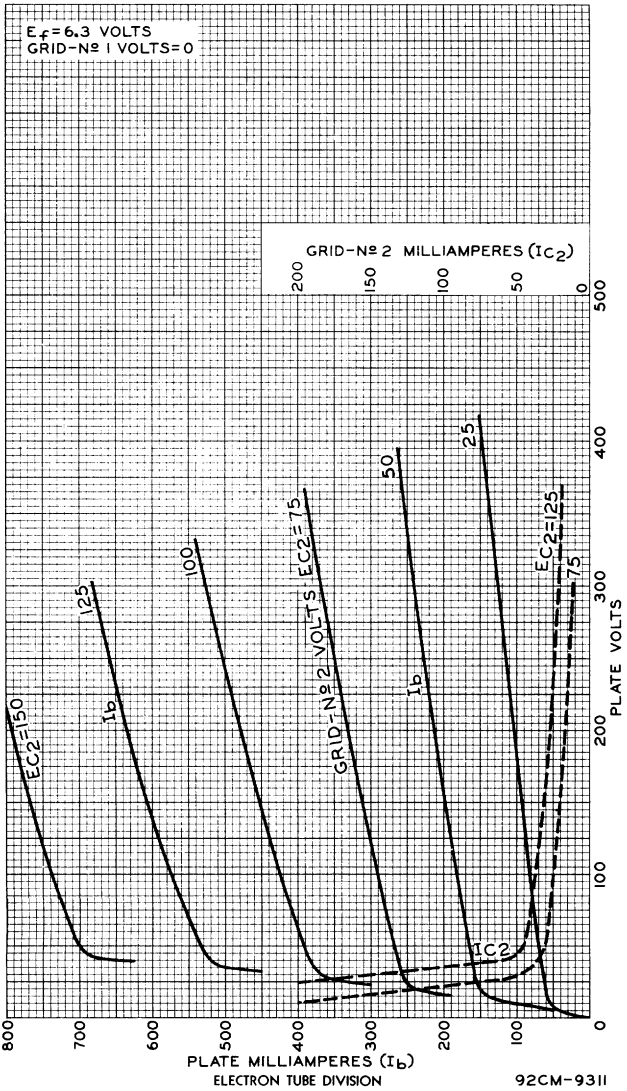


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6DQ5

6DQ5

AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION
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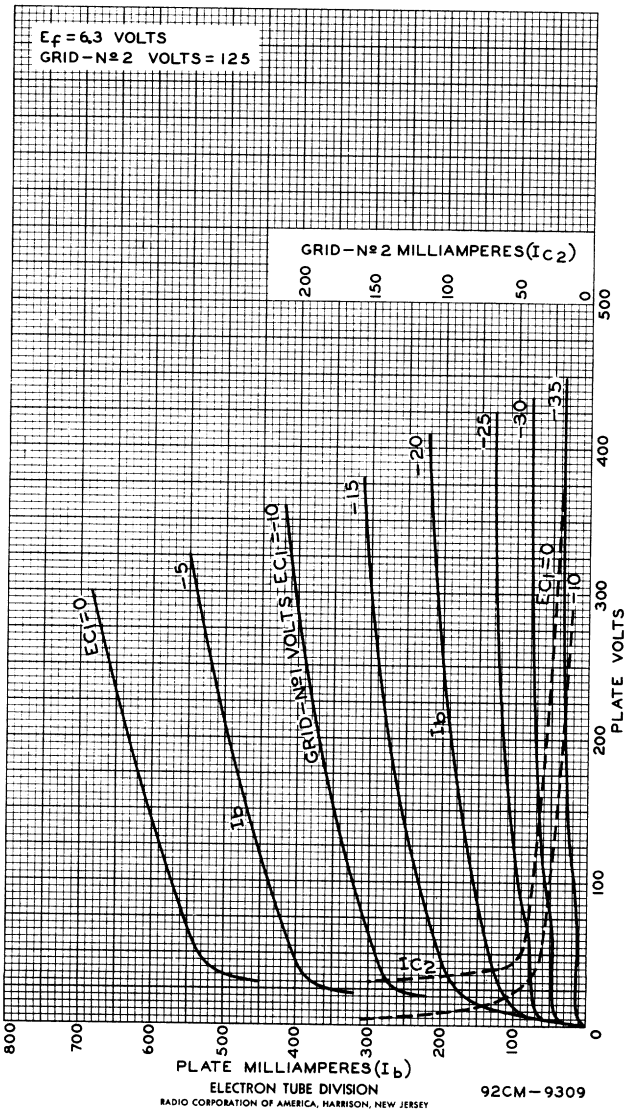
92CM-9311

6DQ5

AVERAGE CHARACTERISTICS



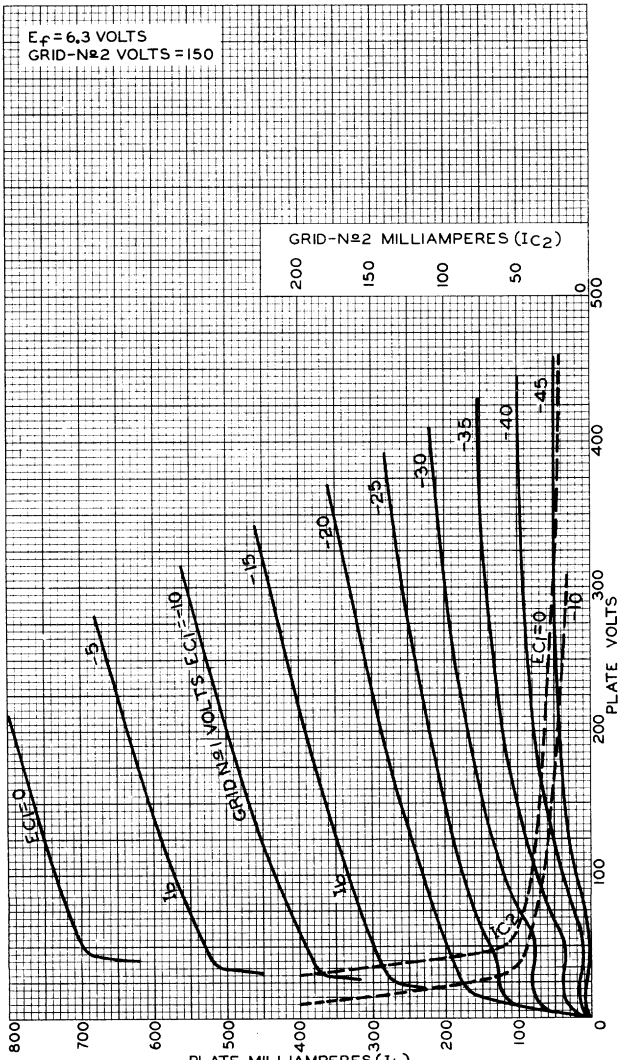
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9309

6DQ5

6DQ5

AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9310

6DR7

DUAL TRIODE

With High-Mu Unit and Low-Mu Unit

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage	6.3 ± 10%	ac or dc volts
Current	0.9	amp

Direct Interelectrode Capacitances (Approx.):[0]

	Unit No.1	Unit No.2	
Grid to plate	4.5	8.5	μμf
Grid to cathode and heater	2.2	5.5	μμf
Plate to cathode and heater	0.34	1	μμf

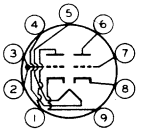
Characteristics, Class A_1 Amplifier:

	Unit No.1	Unit No.2	
Plate Voltage	250	150	volts
Grid Voltage	-3	-17.5	volts
Amplification Factor	68	6	
Plate Resistance (Approx.)	40000	925	ohms
Transconductance	1600	6500	μmhos
Plate Current	1.4	35	ma
Plate Current for plate volts = 60 and grid volts = 0	-	80	ma
Plate Current for grid volts = -24.	-	10	ma
Grid Voltage (Approx.) for plate μa = 10.	-5.5	-	volts
Grid Voltage (Approx.) for plate μa = 50.	-	-44	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9HF

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Grid of Unit No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Cathode of Unit No.2

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

RCA

6DR7

DUAL TRIODE
With High-Mu Unit and Low-Mu Unit

VERTICAL-DEFLECTION OSCILLATOR

Values are for Unit No.1

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system●

DC PLATE VOLTAGE	330	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	400	max.	volts
CATHODE CURRENT:			
Peak	70	max.	ma
Average	20	max.	ma
PLATE DISSIPATION	1	max.	watt
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200■	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For grid-resistor-bias or cathode-bias operation	2.2	max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Values are for Unit No.2

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system●

DC PLATE VOLTAGE	275	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE#	1500	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	175	max.	ma
Average	50	max.	ma
PLATE DISSIPATION	7	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200■	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For grid-resistor-bias or cathode-bias operation	2.2	max.	megohms

○ Without external shield.

● As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

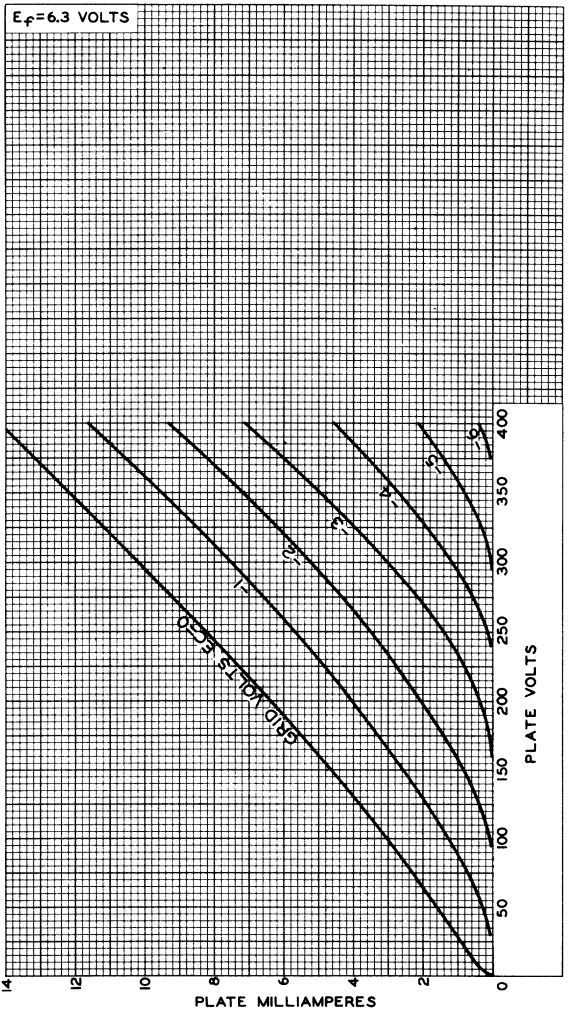
This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

■ The dc component must not exceed 100 volts.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

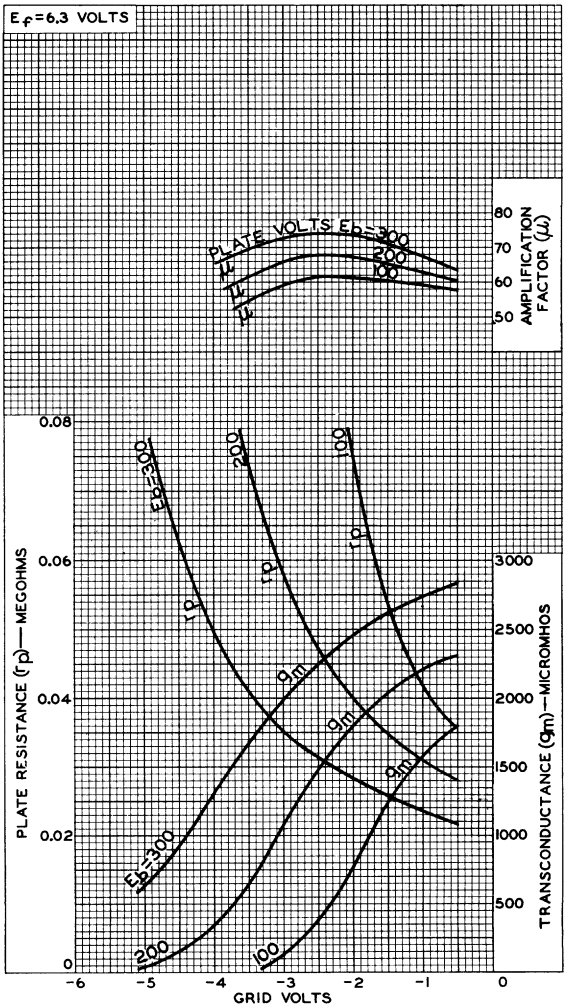
AVERAGE PLATE CHARACTERISTICS
Unit No.1



92CM-9917

6DR7

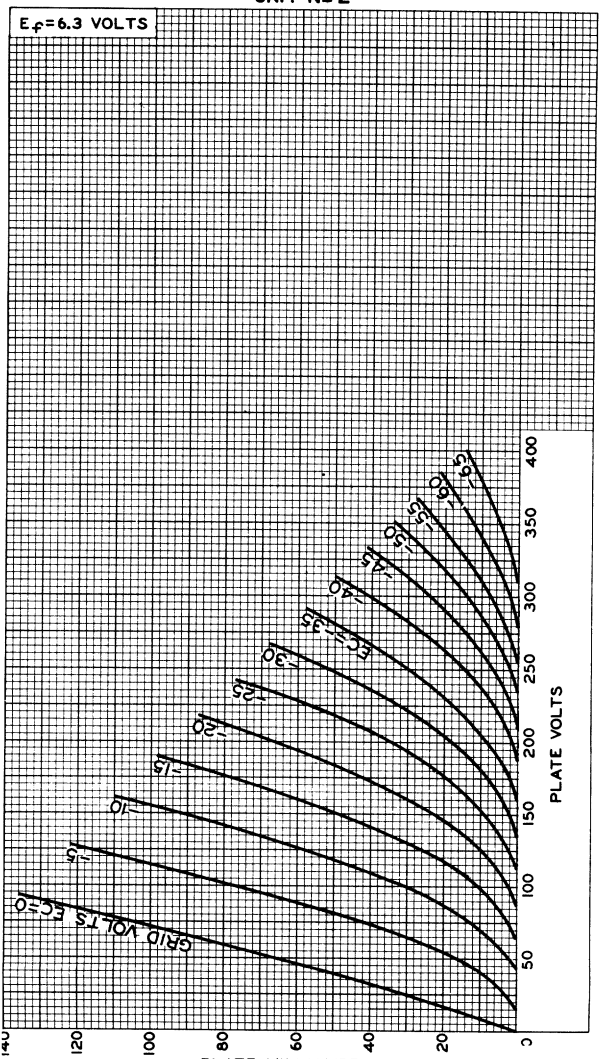
AVERAGE CHARACTERISTICS
Unit No.1



92CM-9915R1

6DR7

AVERAGE PLATE CHARACTERISTICS
UNIT Nº 2



ELECTRON TUBE DIVISION
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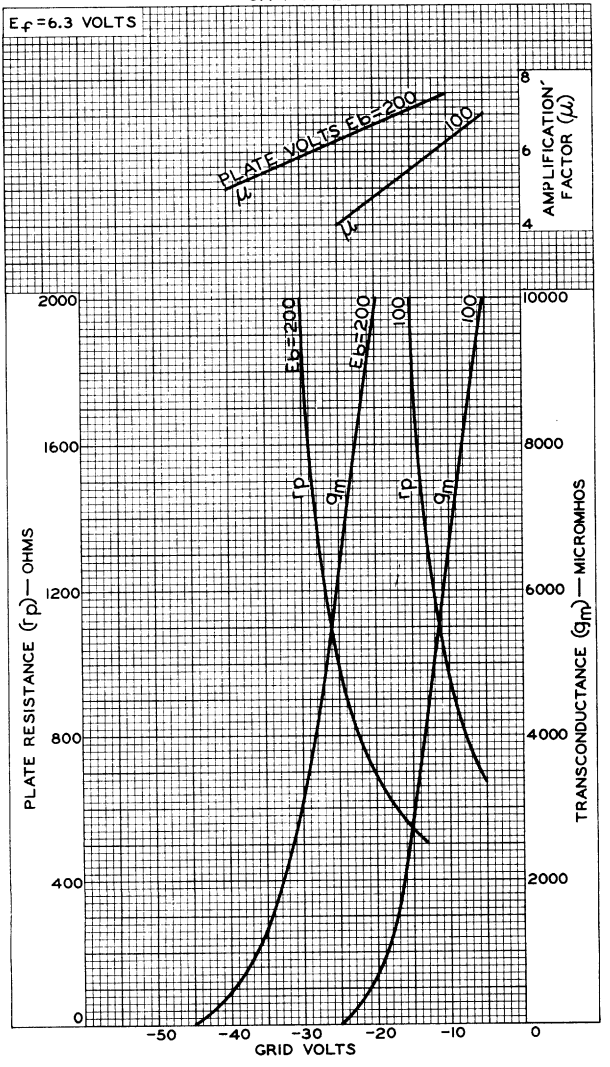
6DR7

6DR7

AVERAGE CHARACTERISTICS

UNIT Nº 2



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9914

6DS4

High-Mu Triode

NUVISTOR TYPE

HAVING EXTENDED CUTOFF CHARACTERISTIC

For Use as Grounded-Cathode, Neutralized RF-Amplifier Tube in Tuners of VHF Television and FM Receivers Featuring Improved Weak-Signal-Area Reception

GENERAL DATA

Electrical: ←

Heater Characteristics and Ratings *(Design-Maximum Values)*:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.135	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances (Approx.):		
Grid to plate	0.92	μμf
Grid to cathode, shell, and heater	4.3	μμf
Plate to cathode, shell, and heater	1.8	μμf
Plate to cathode	0.18	μμf
Heater to cathode	1.6	μμf

Characteristics, Class A$_1$ Amplifier:

Plate Supply Voltage	110	volts
Grid Supply Voltage	0	volts
Cathode Resistor	130	ohms
Amplification Factor	63	
Plate Resistance (Approx.)	7000	ohms
Transconductance	9000	μmhos
Plate Current	6.5	ma
Grid Voltage (Approx.) for plate μa = 100	-5	volts
Grid Voltage (Approx.) for plate μa = 10	-6.8	volts

Mechanical:

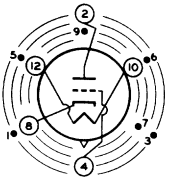
Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	0.800"
Maximum Seated Length	0.625"
Maximum Diameter	0.440"
Envelope	Metal Shell MT4
Socket	Cinch Mfg. Corp. No. 133 65 10 001, ← Industrial Electronic Hardware Co. No. Nu 5044 or No. Nu 5060, or equivalent
Base	Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No. E5-65)

← Indicates a change.

6DS4

Basing Designation for BOTTOM VIEW. 12AQ

Pin 1[a] - Do Not Use
Pin 2 - Plate
Pin 3 - Same as Pin 1
Pin 4 - Grid
Pin 5 - Same as Pin 1
Pin 6 - Same as Pin 1
Pin 7 - Same as Pin 1
Pin 8 - Cathode
Pin 9 - Same as Pin 1
Pin 10 - Heater
Pin 12 - Heater



INDEX=LARGE LUG
●=SHORT PIN

AMPLIFIER — Class A$_1$

Maximum Ratings, *Design-Maximum Values:*

PLATE SUPPLY VOLTAGE	300[b]	max.	volts
PLATE VOLTAGE	135	max.	volts
GRID VOLTAGE:			
Negative-bias value	55	max.	volts
Peak-positive value	0	max.	volts
CATHODE CURRENT	15	max.	ma
→ PLATE DISSIPATION:			
With a minimum series plate-circuit resistance of 5000 ohms	1.5	max.	watts
For lower values of series plate-circuit resistance	See accompanying *Plate-Dissipation-Rating Chart*		

Typical Operation:

Plate Voltage	70	volts
Grid Supply Voltage	0	volts
Grid Resistor	47000	ohms
Amplification Factor	68	
Plate Resistance (Approx.)	5440	ohms
Transconductance	12500	μmhos
→ Plate Current	7	ma

Maximum Circuit Values:

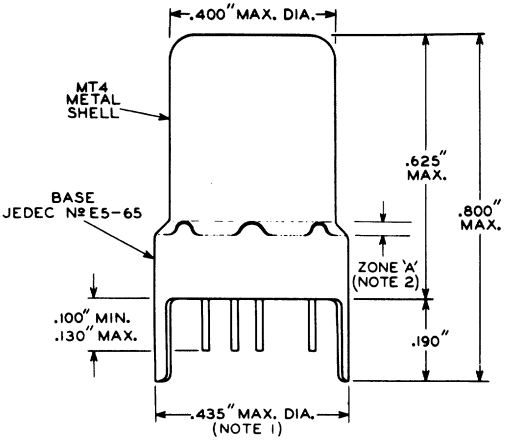
Grid-Circuit Resistance:[c]			
For fixed-bias operation	0.5	max.	megohm
For cathode-bias operation	2.2	max.	megohms

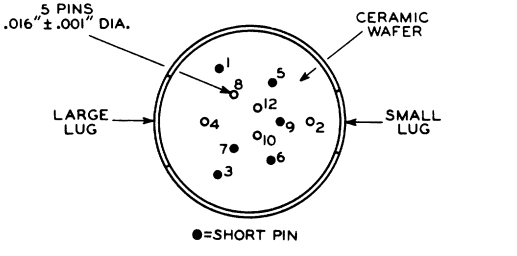
[a] Pin is of a length such that its end does not touch the socket insertion plane.

→ [b] A plate supply voltage of 300 volts may be used provided sufficient plate-circuit resistance and agc voltage are used to limit the voltage at the plate of the tube to 135 volts under conditions of maximum-rated plate dissipation (1.5 watts).

→ [c] For operation at metal-shell temperatures up to 135° C.

→ Indicates a change.





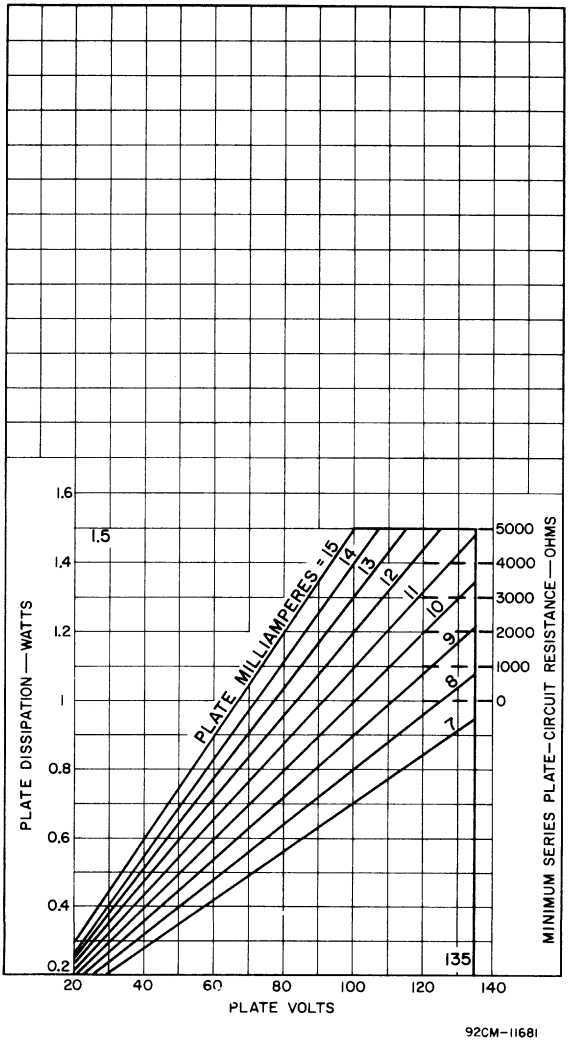
92CS-10970R3

NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

NOTE 2: SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A" BETWEEN BROKEN LINES.

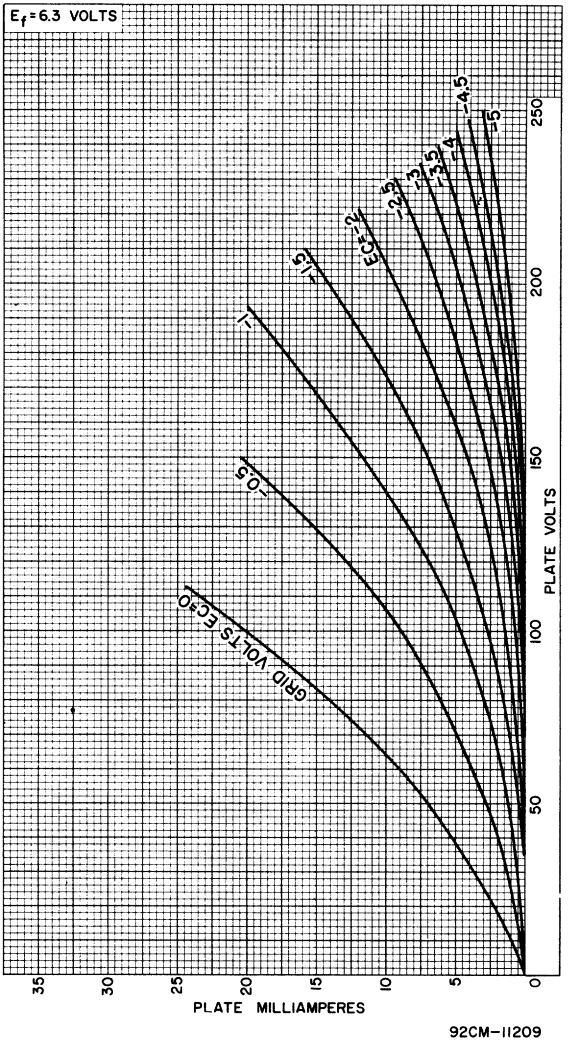
6DS4

PLATE-DISSIPATION-RATING CHART



92CM-11681

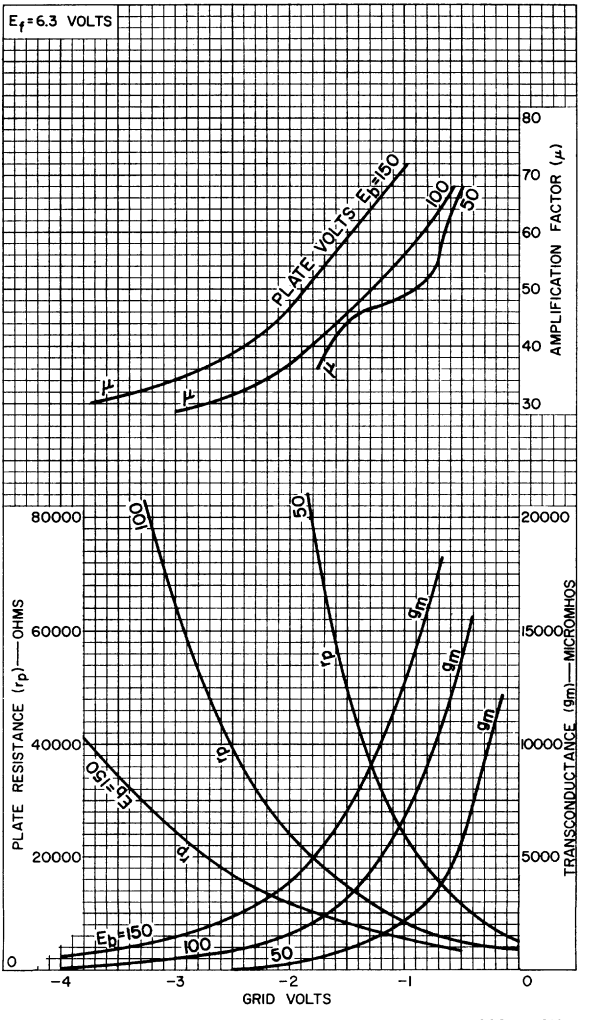
AVERAGE PLATE CHARACTERISTICS



92CM-11209

6DS4

AVERAGE CHARACTERISTICS



92CM-11210

Beam Power Tube

7-PIN MINIATURE TYPE

For Audio Output Service in TV and Radio Receivers

ELECTRICAL CHARACTERISTICS – Bogey Values[a]

Heater Voltage, ac or dc	E_h	6.3	V
Heater Current	I_h	0.8	A
Direct Interelectrode Capacitances:[b]			
Grid No.1 to plate	c_{g1-p}	0.19	pF
Input: G1 to (K, G3, G2, H)	c_i	9.5	pF
Output: P to (K, G3, G2, H)	c_o	6.3	pF

TYPICAL OPERATION AND CHARACTERISTICS

Cathode-Bias Operation

For the following characteristics, see Conditions below:

Zero-Signal Plate Current	I_b	34.5	27	mA
Max.-Signal Plate Current	$I_{b(max.-sig.)}$	32.5	25	mA
Zero-Signal Grid-No.2 Current	I_{c2}	3.5	3	mA
Max.-Signal Grid-No.2 Current	$I_{c2(max.-sig.)}$	9	9	mA
Plate Resistance (Approx.)	r_p	28000	28000	Ω
Transconductance	g_m	6000	5800	μmho
Load Resistance	R_l	6000	8000	Ω
Total Harmonic Distortion	D_t	10	10	%
Max.-Signal Power Output	P_o	2.8	3.6	W
Conditions:				
Heater Voltage	E_h	6.3	6.3	V
Plate Supply Voltage	E_{bb}	200	250	V
Grid-No.2 Voltage	E_{c2}	200	200	V
Cathode-Bias Resistor	R_k	180	270	Ω
Peak AF Grid-No.1 Voltage	e_{clm}	7.5	9.2	V

Fixed-Bias Operation

For the following characteristics, see Conditions below:

Zero-Signal Plate Current	I_b	35	29	mA
Max.-Signal Plate Current	$I_{b(max.-sig.)}$	36	32	mA
Zero-Signal Grid-No.2 Current	I_{c2}	3	3	mA
Max.-Signal Grid-No.2 Current	$I_{c2(max.-sig.)}$	9	10	mA
Plate Resistance (Approx.)	r_p	28000	28000	Ω
Transconductance	g_m	6000	5800	μmho
Load Resistance	R_l	6000	8000	Ω

Total Harmonic Distortion	D_t	9	10 %
Max.-Signal Power Output	P_o	3	3.8 W
Conditions:			
Heater Voltage	E_h	6.3	6.3 V
Plate Voltage	E_b	200	250 V
Grid-No.2 Voltage	E_{c2}	200	200 V
Grid-No.1 (Control-Grid) Voltage	E_{c1}	-7.5	-8.5 V
Peak AF Grid-No.1 Voltage	e_{c1m}	7.5	8.5 V

MECHANICAL CHARACTERISTICS

Dimensional Outline . . . . . JEDEC 5-3
Maximum Overall Length . . . . . 2.625 in (66.67 mm)
Maximum Seated Length . . . . . 2.375 in (60.32 mm)
Maximum Diameter . . . . . 0.750 in (19.05 mm)
Bulb . . . . . T 5-1/2
Base . . . . . Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Terminal Connections (See *TERMINAL DIAGRAM*) . . . . . JEDEC Designation 7BZ
Type of Cathode . . . . . Coated Unipotential
Mounting Position . . . . . Any

MAXIMUM RATINGS – Design-Maximum Values[c]

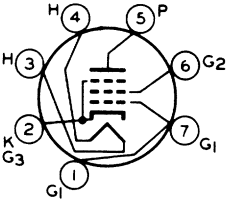
Plate Voltage	E_b	275	V
Grid-No.2 Voltage	E_{c2}	275	V
Grid-No.1 Voltage:			
Positive bias value	E_{c1}	0	V
Plate Dissipation	P_b	9	W
Grid-No.2 Input	P_{g2}	2.2	W
Heater Voltage	E_h	5.7 to 6.9	V
Heater-Cathode Voltage:			
Peak	e_{hkm}	+200	V
DC	E_{hk}	100	V
Envelope Temperature (At hottest point on envelope surface)	T_E	250	°C

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance:	$R_{g1(ckt)}$		
For fixed-bias operation		0.1	MΩ
For cathode-bias operation		1.0	MΩ

a Unless otherwise specified.
b Without external shield. Measured in accordance with the current issue of EIA Standard RS-191.
c As defined in the current issue of EIA Standard RS-239.

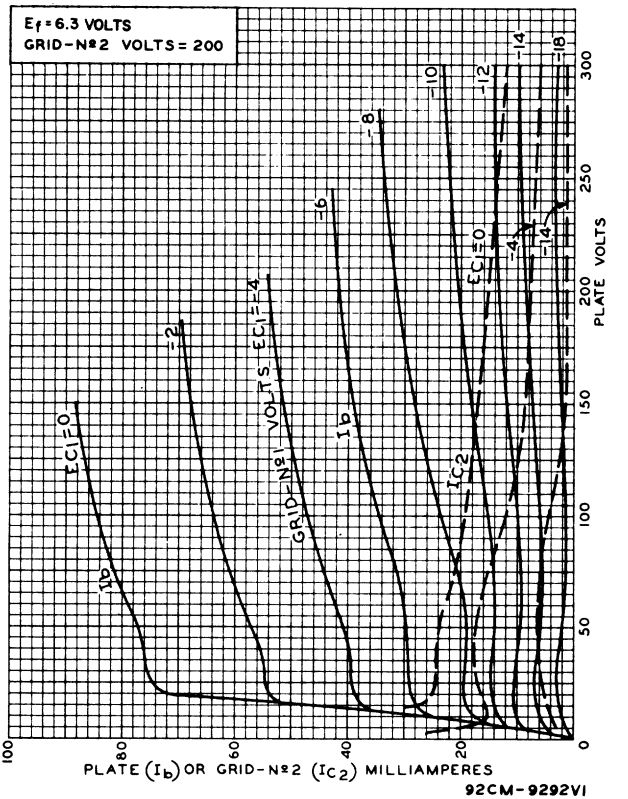
TERMINAL DIAGRAM - Bottom View



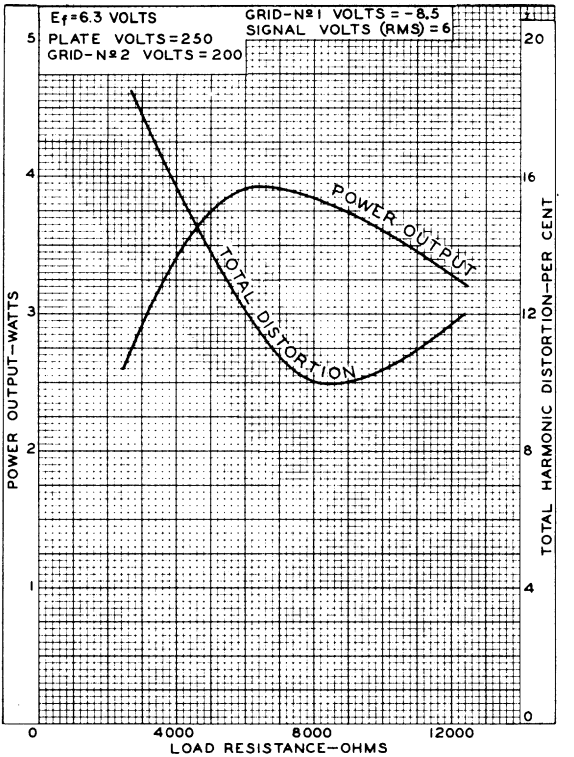
JEDEC 7BZ

Pin 1 - Grid No.1
Pin 2 - Cathode, Grid No.3
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Grid No.1

AVERAGE CHARACTERISTICS



OPERATION CHARACTERISTICS



92CM-9293VI

6DT5
BEAM POWER TUBE

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current	1.2	amp
Direct Interelectrode Capacitances (Approx.):°		
Grid No.1 to plate	0.57	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	12.5	μμf
Plate to cathode & grid No.3, grid No.2, and heater	4.9	μμf

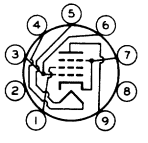
Characteristics, Class A_1 Amplifier:

Plate Voltage	60	80	250	volts
Grid-No.2 Voltage	150	250	250	volts
Grid-No.1 Voltage	0	0	-16.5	volts
Transconductance	–	–	6200	μmhos
Plate Current	95*	195*	44	ma
Grid-No.2 Current	8.5	19	1.5	ma
Grid-No.1 Voltage (Approx.) for plate ma. = 100	–	–	-35	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9HN

Pin 1 – Grid No.2
Pin 2 – No Connection
Pin 3 – Grid No.1
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Grid No.1



Pin 7 – Cathode, Grid No.3
Pin 8 – Internal Connection—Do Not Use
Pin 9 – Plate

VERTICAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	315 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE*	2200 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	285 max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 (CONTROL-GRID) VOLTAGE	250 max.	volts

6DT5

6DT5

BEAM POWER TUBE

CATHODE CURRENT:			
Peak	190	max.	ma
Average	55	max.	ma
GRID-No.2 INPUT	2	max.	watts
PLATE DISSIPATION	9	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200▲	max.	volts
Heater positive with respect to cathode	200	max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5	max.	megohm
For cathode-bias operation	1	max.	megohm

° Without external shield.

* This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

▲ The dc component must not exceed 100 volts.

6DT6-A

Sharp-Cutoff Pentode

With Two Independent Control Grids

7-PIN MINIATURE TYPE

For FM Detector Service

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.3	amp
Direct Interelectrode Capacitances (Approx.):▲		
Grid No.1 to plate	0.02	μμf
Grid No.1 to cathode & internal shield, grid No.3, grid No.2, and heater	5.8	μμf
Grid No.3 to plate	1.7	μμf
Grid No.1 to grid No.3	0.1	μμf
Grid No.3 to cathode & internal shield, plate, grid No.2, grid No.1, and heater	6.1	μμf

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	150	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Supply Voltage	100	volts
Cathode Resistor	560	ohms
Plate Resistance (Approx.)	0.15	megohm
Transconductance, Grid No.1 to Plate	1350	μmhos
Transconductance, Grid No.3 to Plate	515	μmhos
Plate Current	1.55	ma
Grid-No.2 Current	1.8	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-5.2	volts
Grid-No.3 Voltage (Approx.) for plate μa = 10	-4.2	volts

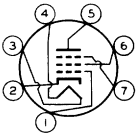
Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)

6DT6-A

Basing Designation for BOTTOM VIEW. 7EN

Pin 1 – Grid No.1
Pin 2 – Cathode, Internal Shield
Pin 3 – Heater



Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Grid No.3

FM DETECTOR

Maximum Ratings, *Design-Maximum Values:*

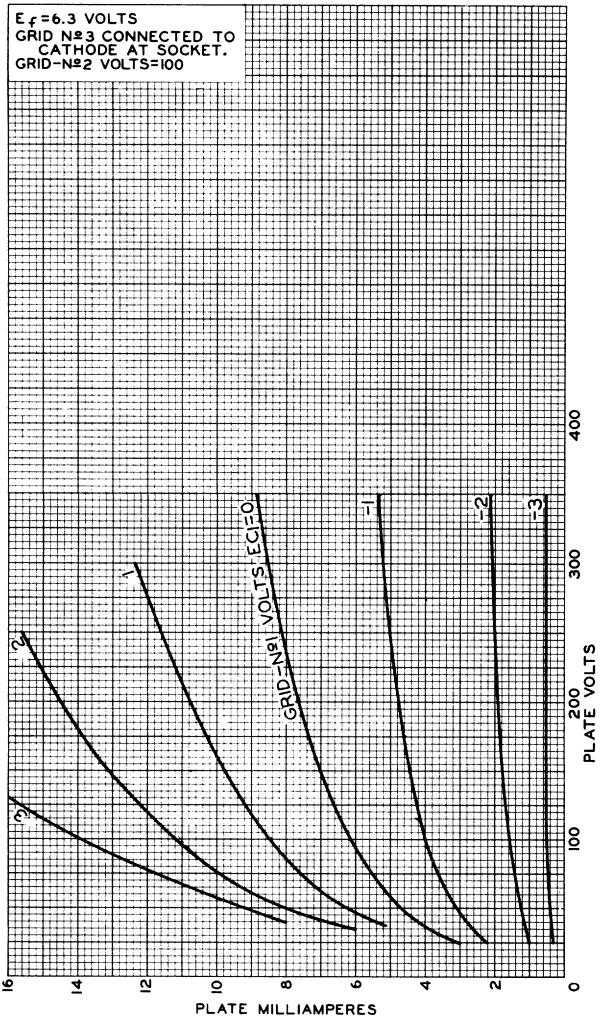
PLATE VOLTAGE.	330 max.	volts
GRID-No.3 (CONTROL-GRID) VOLTAGE	28 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE . .	330 max.	volts
GRID-No.2 VOLTAGE. . . . . *See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value.	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 165 volts .	1.1 max.	watts
For grid-No.2 voltages between 165 and 330 volts. . . . . *See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
PLATE DISSIPATION.	1.7 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	200 max.	volts
Heater positive with respect to cathode.	200● max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	0.5 max.	megohm

▲ With external shield JEDEC No.316 connected to cathode.
● The dc component must not exceed 100 volts.

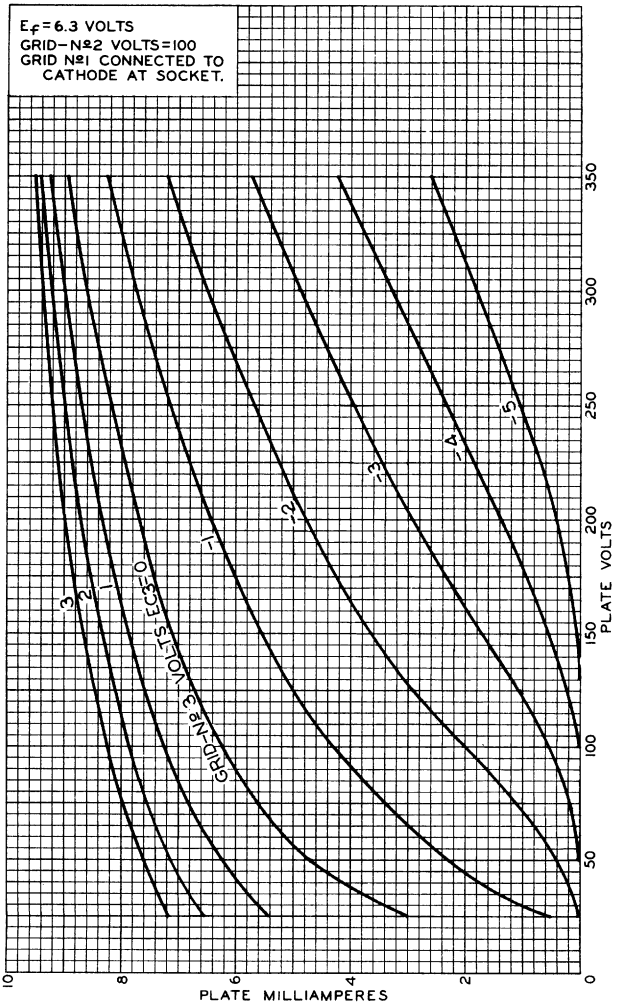
AVERAGE PLATE CHARACTERISTICS



92CM-8827R2

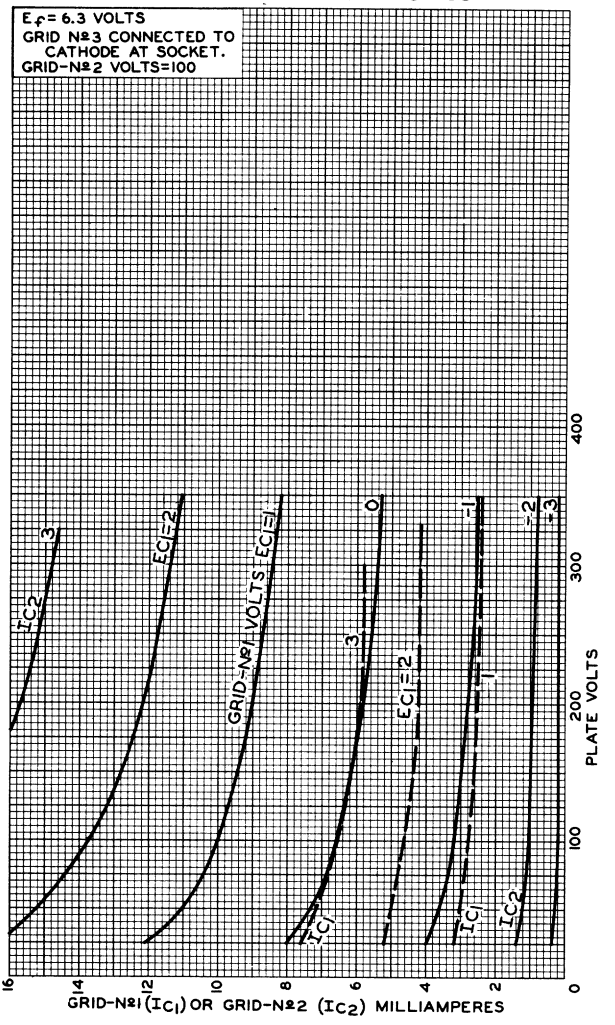
6DT6-A

AVERAGE PLATE CHARACTERISTICS



92CM-8830R2

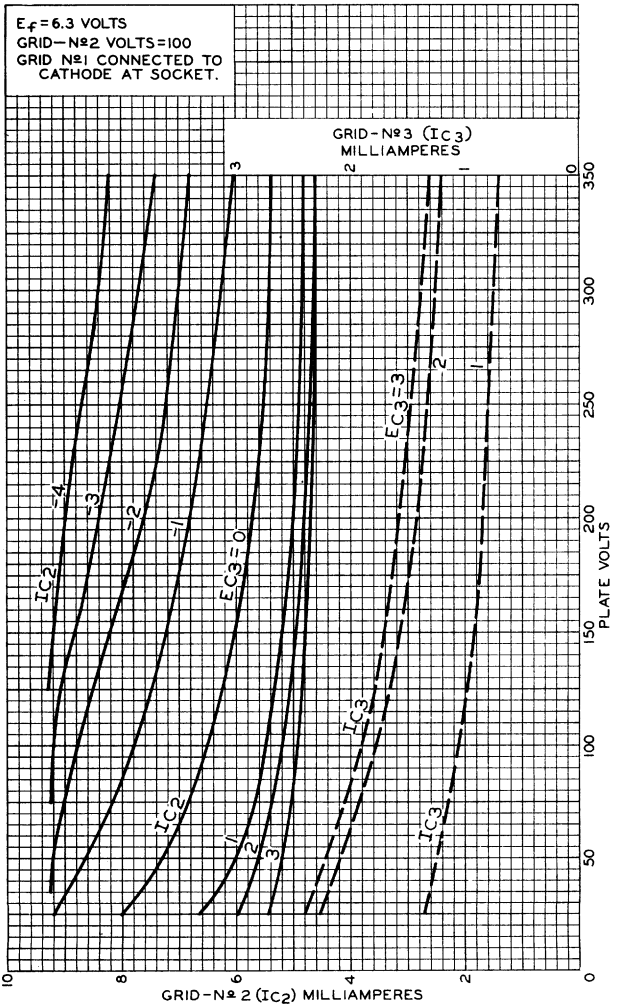
AVERAGE CHARACTERISTICS



92CM-8828R2

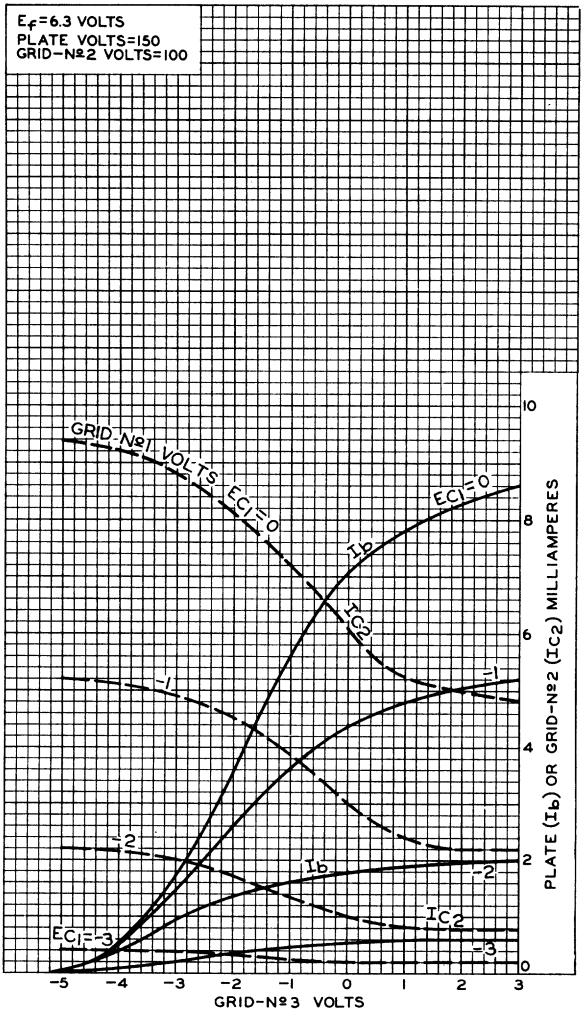
6DT6-A

AVERAGE CHARACTERISTICS



92CM-8829R2

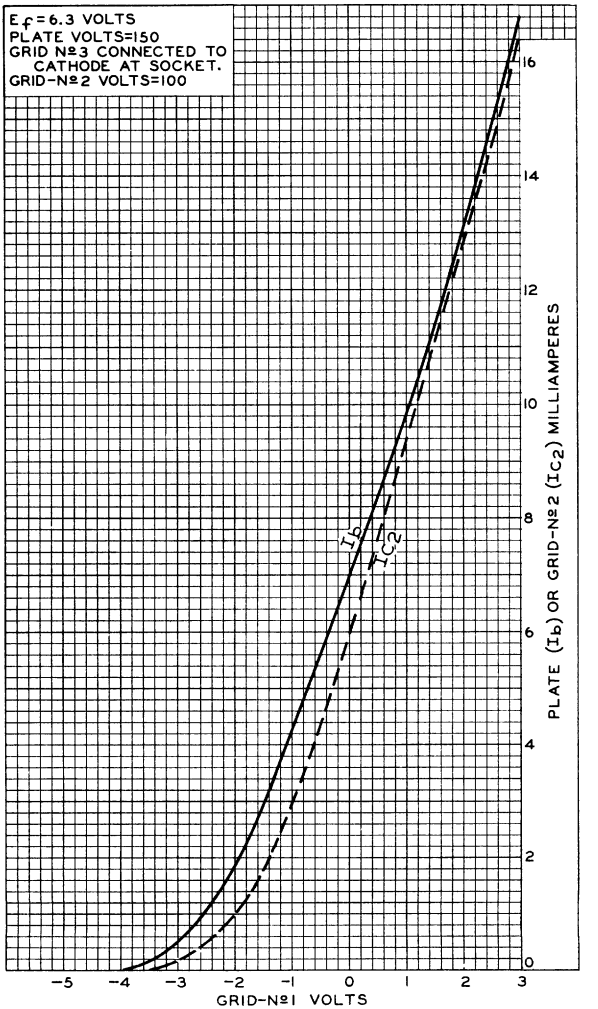
AVERAGE CHARACTERISTICS



92CM-8826RI

6DT6-A

AVERAGE CHARACTERISTICS



92CM-8825R1

6DT8
HIGH-MU TWIN TRIODE

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage	6.3	ac or dc volts
Current	0.3	amp

Direct Interelectrode Capacitances (Approx.):

	Unit No.1	Unit No.2	
Grid-Drive Operation:°			
Grid to plate	1.6	1.6	μμf
Grid to cathode, internal shield, and heater	2.7	2.7	μμf
Plate to cathode, internal shield, and heater	1.6	1.6	μμf
Heater to cathode●	3	3	μμf
Cathode-Drive Operation:□			
Cathode to grid, internal shield, and heater	-	5.3	μμf
Plate to grid, internal shield, and heater	-	2.8	μμf

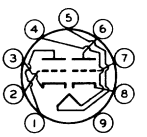
Characteristics, Class A_1 Amplifier (Each Unit):

Plate-Supply Voltage	100	250	volts
Cathode Resistor	270	200	ohms
Amplification Factor	60	60	
Plate Resistance (Approx.)	15000	10900	ohms
Transconductance	4000	5500	μmhos
Plate Current	3.7	10	ma
Grid Voltage (Approx.) for plate current of 10 μa	-5	-12	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Maximum Diameter	7/8"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9AJ

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Internal Shield

° with external shield JETEC No.315 connected to cathode of unit under test except as noted.

●,□: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

6DT8

HIGH-MU TWIN TRIODE

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300	max.	volts
GRID VOLTAGE:			
Negative bias value	50	max.	volts
PLATE DISSIPATION	2.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation.	0.25	max.	megohm
For cathode-bias operation.	1	max.	megohm

● With external shield JETEC No.315 connected to ground.
□ With external shield JETEC No.315 connected to grid of unit under test.
▲ The dc component must not exceed 100 volts.

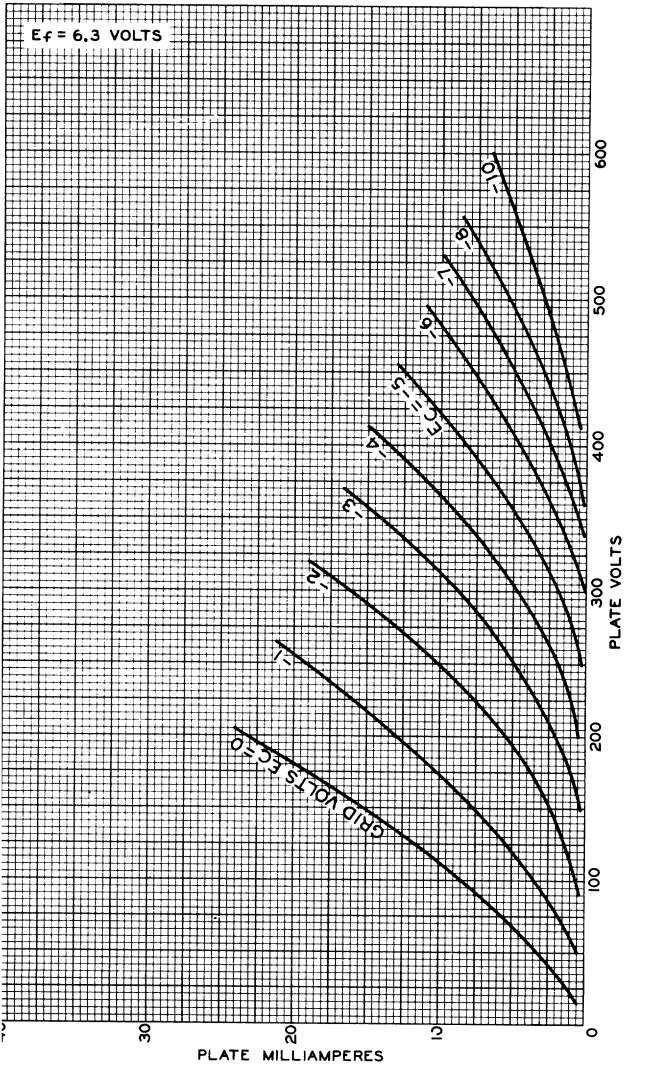
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

6DT8

AVERAGE PLATE CHARACTERISTICS

EACH UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

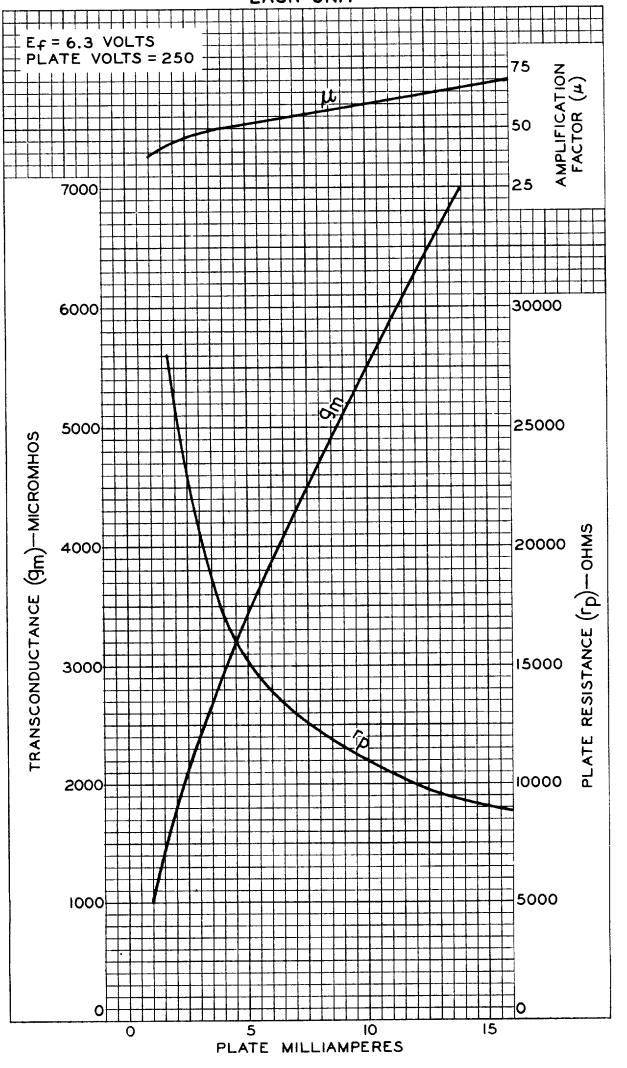
92CM-9397

6DT8

6DT8

AVERAGE CHARACTERISTICS

EACH UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9396

6DV4

Medium-Mu Triode

NUVISTOR TYPE

Having Gold-Plated Envelope and Base Pins to Assure Positive Grounding and Low Pin-Contact Resistance for Oscillator Applications at UHF Frequencies

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.135	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances (Approx.):		
Grid to plate	1.8	pf
Grid to cathode, shell, and heater	4.4	pf
Plate to cathode, shell, and heater	1.9	pf
Plate to cathode	0.25	pf
Heater to cathode	1.4	pf
Grid to cathode	3.7	pf

Characteristics, Class A$_1$ Amplifier:

Plate Supply Voltage	75	volts
Cathode Resistor	100	ohms
Amplification Factor	35	
Plate Resistance (Approx.)	3100	ohms
Transconductance	11500	μmhos
Plate Current	10.5	ma
Grid Voltage (Approx.) for plate μa = 10.	-7	volts

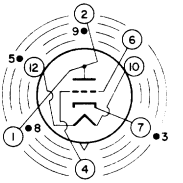
Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	0.800"
Maximum Seated Length	0.625"
Maximum Diameter	0.440"
Envelope	Metal Shell MT4
Socket	Industrial Electronic Hardware Corp. No. MSN0707-1, or equivalent
Base	Medium Ceramic-Wafer Twelvar 7-Pin (JEDEC No.E7-83)

6DV4

Basing Designation for BOTTOM VIEW. 12EA

Pin 1 – Plate
Pin 2 – Plate
Pin 3[a] – Do Not Use
Pin 4 – Grid
Pin 5 – Same as Pin 3
Pin 6 – Grid
Pin 7 – Cathode
Pin 8 – Same as Pin 3
Pin 9 – Same as Pin 3
Pin 10 – Heater
Pin 12 – Heater



INDEX = LARGE LUG
● = SHORT PIN

AMPLIFIER — Class A$_1$

Maximum Ratings, *Design-Maximum Values:*

PLATE SUPPLY VOLTAGE	300[b]	max.	volts
PLATE VOLTAGE	125	max.	volts
GRID VOLTAGE:			
Negative-bias value	55	max.	volts
Peak-positive value	2	max.	volts
CATHODE CURRENT	15	max.	ma
PLATE DISSIPATION	1	max.	watt

Typical Operation:

As oscillator at 950 Mc

Plate Voltage	60	volts
Grid Voltage	−2	volts
Grid Resistor	5600	ohms
Plate Current	8	ma
Grid Current	350	μa

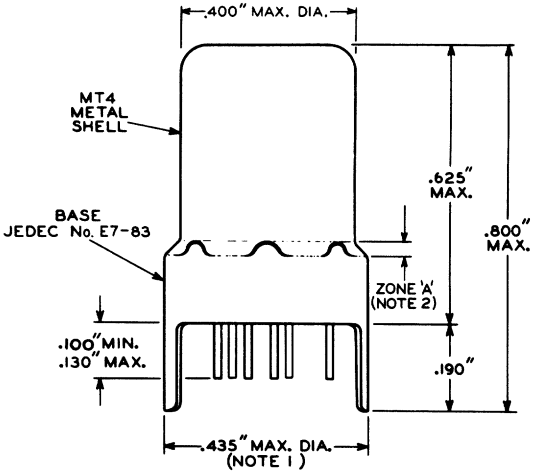
Maximum Circuit Values:

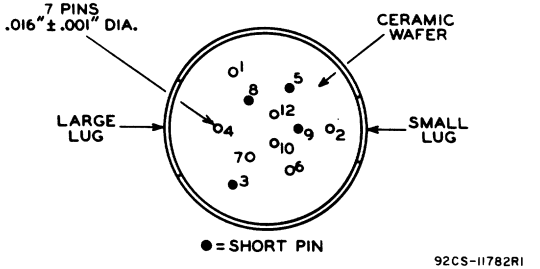
Grid-Circuit Resistance:[c]			
For fixed-bias operation	0.1	max.	megohm
For cathode-bias operation	0.2	max.	megohm

[a] Pin is of a length such that its end does not touch the socket insertion plane.

[b] A plate supply voltage of 300 volts may be used provided that a sufficiently large resistor is used in the plate circuit to limit the plate dissipation to one watt under any condition of operation.

[c] For operation at metal-shell temperatures up to 135° C.



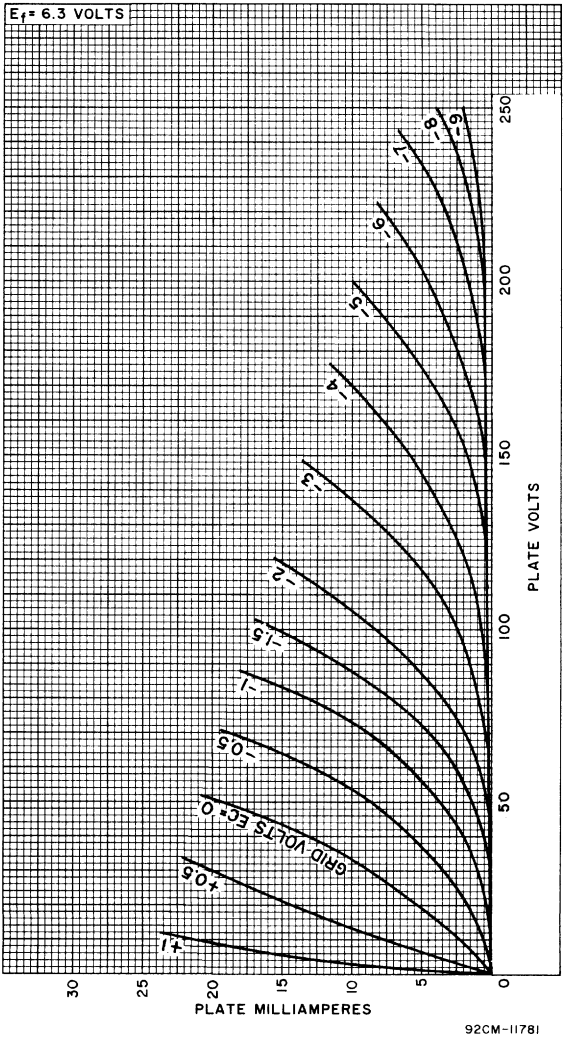


NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

NOTE 2: SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A" BETWEEN BROKEN LINES.

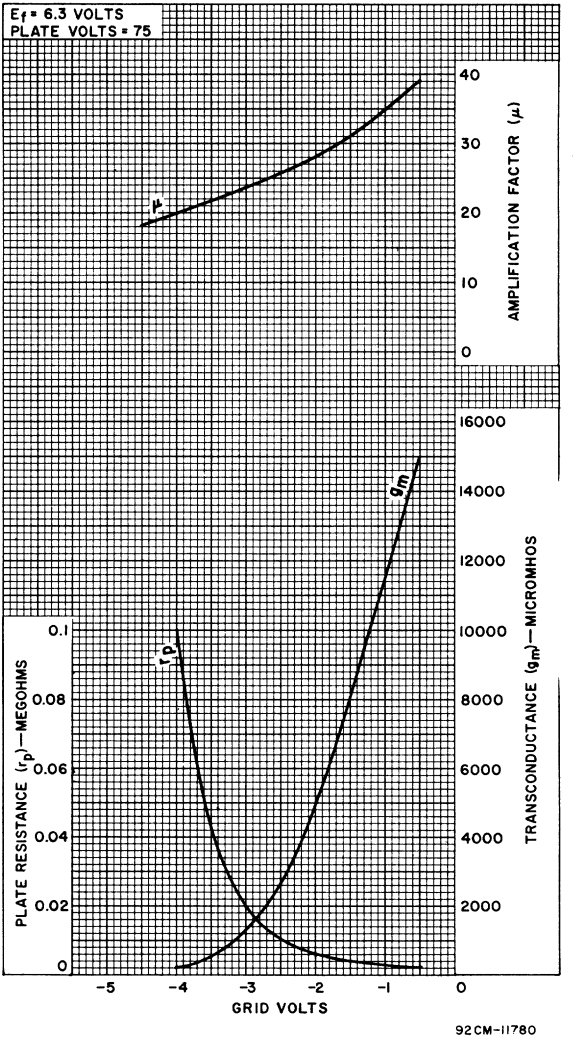
6DV4

AVERAGE PLATE CHARACTERISTICS



92CM-11781

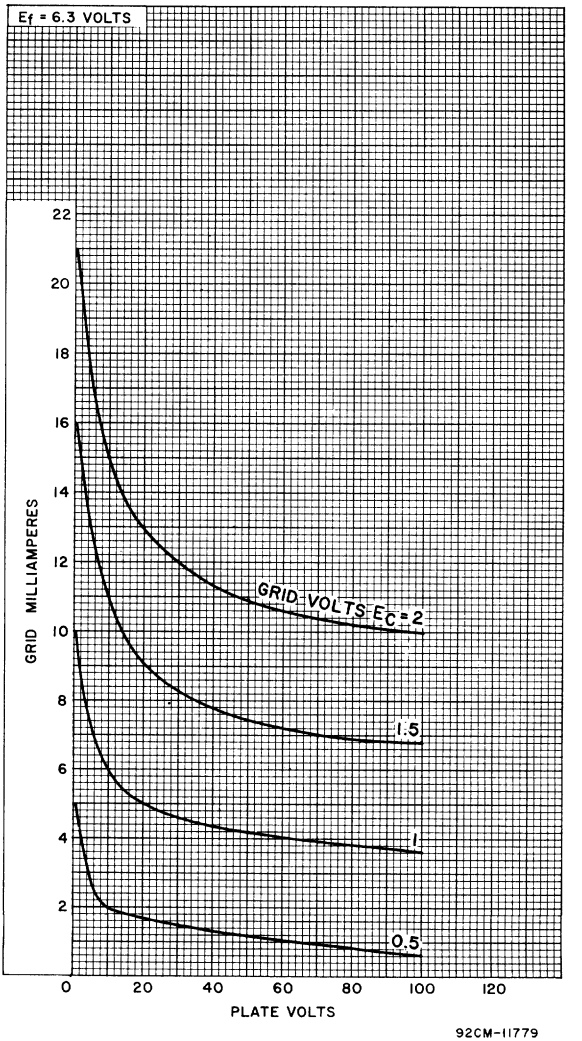
AVERAGE CHARACTERISTICS



92CM-11780

6DV4

AVERAGE CHARACTERISTICS



92CM-11779

6DW4B

Half-Wave Vacuum Rectifier

NOVAR TYPE

For Television Damper Service

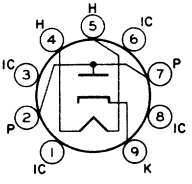
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.200	amp
Maximum heater-cathode voltage:		
Heater negative with respect to cathode:[a]		
Peak	5500	volts
DC component	900	volts
Heater positive with respect to cathode:		
Peak	300	volts
DC component	100	volts
Direct Interelectrode Capacitances (Approx.):[b]		
Plate to cathode and heater	6.5	pf
Cathode to plate and heater	9.0	pf
Heater to cathode	2.8	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.005"
Seated Length	2.375" to 2.625"
Diameter	1.062" to 1.188"
Dimensional Outline (JEDEC 12-99)	See *General Section*
Bulb	T9
Base	Small-Button Novar 9-Pin with Exhaust Tip (JEDEC No.E9-89)
Basing Designation for BOTTOM VIEW	9HP

Pin 1 – Do Not Use[c]
Pin 2 – Plate
Pin 3 – Do Not Use[c]
Pin 4 – Heater



Pin 5 – Heater
Pin 6 – Do Not Use[c]
Pin 7 – Plate
Pin 8 – Do Not Use[c]
Pin 9 – Cathode

DAMPER SERVICE

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[d]

Peak Inverse Plate Voltage[a]	5500	volts
Peak Plate Current	1300	ma
DC Plate Current	250	ma
Plate Dissipation	8.5	watts

Characteristics, Instantaneous Value:

Tube Voltage Drop for plate ma = 350	25	volts

[a] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[b] Without external shield.

[c] Socket terminals 1, 3, 6, and 8 should not be used as tie points. It is recommended that the socket clips for these pins be removed to reduce the possibility of arc-over and to minimize leakage.

[d] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

6DX8

High-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Center Values):*		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.720	amp
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200 max.	volts
Direct Interelectrode Capacitances:[a]		
Triode Unit:		
Grid to plate	2.7	μμf
Grid to all other elements except plate	4.0	μμf
Plate to all other elements except grid	2.3	μμf
Grid to heater	0.1 max.	μμf
Pentode Unit:		
Grid No.1 to plate	0.1 max.	μμf
Grid No.1 to all other elements except plate	9.0	μμf
Plate to all other elements except grid No.1	4.5	μμf
Grid No.1 to heater	0.1 max.	μμf
Triode plate to pentode grid No.1	0.01 max.	μμf
Triode grid to pentode grid No.1	0.01 max.	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*			
Plate Voltage	200	170	200	220	volts
Grid-No.2 Voltage	–	170	200	220	volts
Grid-No.1 Voltage	-1.7	-2.1	-2.9	-3.4	volts
Amplification Factor	65	–	–	–	
Mu Factor, Grid No.2 to Grid No.1	–	36	36	36	
Plate Resistance (Approx.)	–	0.1	0.13	0.15	megohm
Transconductance	4000	11000	10400	10000	μmhos
Plate Current	3	18	18	18	ma
Grid-No.2 Current	–	3	3	3	ma

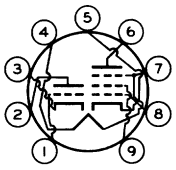
Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"

6DX8

Length, Base Seat to Bulb Top (Excluding tip). . . 2" ± 3/32"
Diameter. . . . . 0.750" to 0.875"
Dimensional Outline . . . . . See *General Section*
Bulb. T6-1/2
Base. . . . . .Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9HX

Pin 1 – Triode Grid
Pin 2 – Triode Plate
Pin 3 – Triode Cathode
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Plate



Pin 7 – Pentode Grid No.3, Pentode Cathode, Internal Shield
Pin 8 – Pentode Grid No.1
Pin 9 – Pentode Grid No.2

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

	Triode Unit	*Pentode Unit*	
PLATE SUPPLY VOLTAGE.	550 max.	550 max.	volts
PEAK PLATE VOLTAGE with maximum plate ma. = 0.1[b] .	600 max.	–	volts
PLATE VOLTAGE	300 max.	300 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE.	–	550 max.	volts
GRID-No.2 VOLTAGE	–	300 max.	volts
CATHODE CURRENT	12 max.	40 max.	ma
GRID-No.2 INPUT	–	1.7 max.	watts
PLATE DISSIPATION	1 max.	4 max.	watts

Typical Operation (Pentode Unit):

As video-output tube

Plate Supply Voltage.	170	200	220	volts
Series Plate Resistor	3000	3000	3000	ohms
Grid-No.2 Voltage	170	200	220	volts
Grid-No.1 Voltage	-2	-2.8	-3.3	volts
Transconductance.	10400	10000	9700	μmhos
Plate Current	18	18	18	ma
Grid-No.2 Current	3.2	3.1	3.1	ma

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance:			
For fixed-bias operation. . . .	1 max.	1 max.	megohm
For cathode-bias operation. . .	3 max.	2 max.	megohms

[a] Without external shield.
[b] With duty factor = 0.18 maximum and pulse duration = 18 microseconds maximum.

6DZ4

Medium-Mu Triode

7-PIN MINIATURE TYPE

For UHF-Oscillator Service in TV Receivers

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	0.225		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	50	max.	volts
Heater positive with respect to cathode	50[a]	max.	volts
Direct Interelectrode Capacitances (Approx):[b]			
Grid to plate	1.8		pf
Grid to cathode and heater	2.2		pf
Plate to cathode and heater	1.3		pf

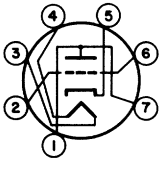
Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	80	volts
Plate Resistor	2700	ohms
Amplification Factor	14	
Plate Resistance (Approx)	2000	ohms
Transconductance	6700	μmhos
Plate Current	15	ma
Grid Voltage (Approx) for plate μa = 20	-11	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/8" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7DK

Pin 1 - Plate
Pin 2 - Grid
Pin 3 - Heater
Pin 4 - Heater



Pin 5 - Cathode
Pin 6 - Grid
Pin 7 - Plate

6DZ4

UHF OSCILLATOR

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	135 max.	volts
GRID VOLTAGE:		
Negative-bias value	50 max.	volts
GRID CURRENT	2 max.	ma
CATHODE CURRENT	20 max.	ma
PLATE DISSIPATION	2.3 max.	watts

Typical Operation:[c]

At frequency of 1000 Mc

Plate Supply Voltage	135	volts
Plate-Circuit Resistance	2700	ohms
Grid Resistor	10000	ohms
Plate Current	15.5	ma
Grid Current (Approx)	800	μa

Maximum Circuit Values:

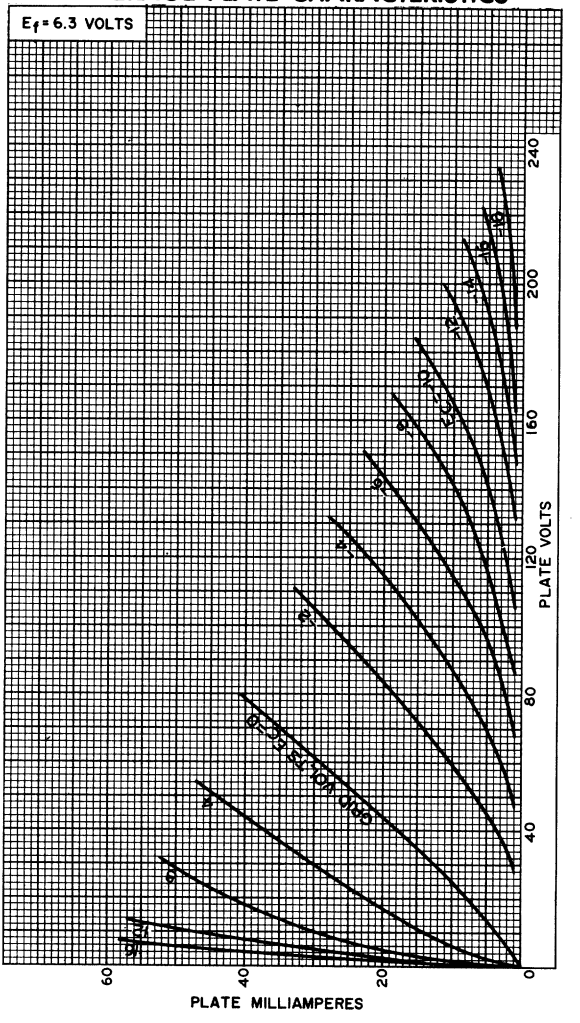
Grid-Circuit Resistance:	
For fixed-bias operation	Not recommended
For cathode-bias operation	0.5 max. megohm

[a] The dc component must not exceed 25 volts.

[b] With external shield JEDEC No.316 connected to cathode.

[c] Measured in JEDEC STANDARD OSCILLATION TEST SET No.400 with external, added resistance in plate circuit.

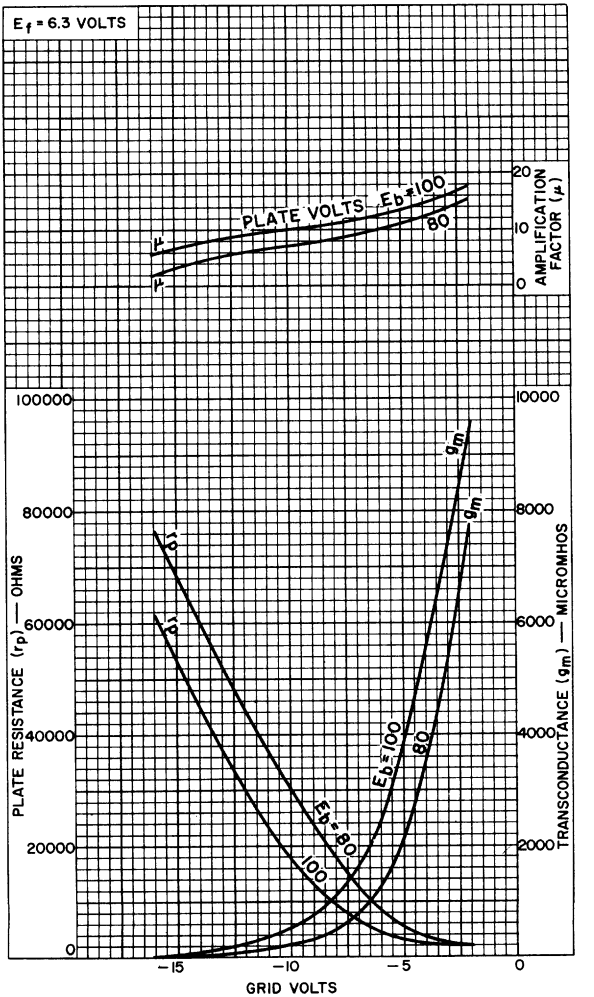
AVERAGE PLATE CHARACTERISTICS



92CM-7756

6DZ4

AVERAGE CHARACTERISTICS



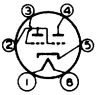
92CM – 7758RI

6E5

ELECTRON-RAY TUBE

INDICAIOR TYPE WITH TRIODE UNIT

Heater	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.3	amp.
Overall Length		4" ± 3/16" ←
Seated Height		3-3/8" ± 3/16" ←
Maximum Diameter		1-3/16"
Bulb		T-9
Base		Small 6-Pin
Pin 1 - Heater		Pin 4 - Target
Pin 2 - Plate		Pin 5 - Cathode
Pin 3 - Grid		Pin 6 - Heater
Mounting Position	BOTTOM VIEW (6R)	Any* ←



Maximum and Minimum Ratings Are Design-Center Values

INDICATOR SERVICE

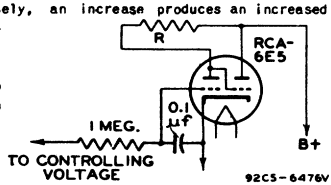
Plate-Supply Voltage		250 max.	volts
Target Voltage		250 max. ← / 125 min. ←	volts
D-C Heater-Cathode Potential		90 max.	volts
Typical Operation:			←
Plate and Target Supply	125	250	volts
Series Triode-Plate Resistor**	1	1	megohm
Target Current*** †	0.8	2	ma.
Triode-Plate Current***	0.1	0.2	ma.
Triode-Grid Voltage (Approx.):			
For shadow angle of 0°	-4.0	-7.5	volts
For shadow angle of 90°	0	0	volts

* The plane of the ray-control electrode passes through pins No. 2 and No. 5.

** Designated as R in circuit diagram. † Subject to wide variations.

*** For zero triode-grid voltage. ← Indicates a change.

The 6E5 is a high-vacuum type of tube designed to indicate visually the effect of change in the controlling voltage. For different controlling voltages, the shaded pattern produced on the fluorescent target varies through an angle from 90° to approximately 0°. The extent of the shaded area is controlled by the voltage on the ray-control electrode which is an extension of the triode plate between cathode and target. The voltage on the ray-control electrode is determined by the voltage applied to the grid of the triode connected as a d-c amplifier as shown in the circuit. A decrease in triode-grid bias decreases the voltage on the ray-control electrode; conversely, an increase produces an increased voltage on the ray-control electrode. In the practical use of the 6E5 as a tuning indicator, controlling voltage applied to the triode-grid is obtained from a suitable point in the a.v.c. circuit.

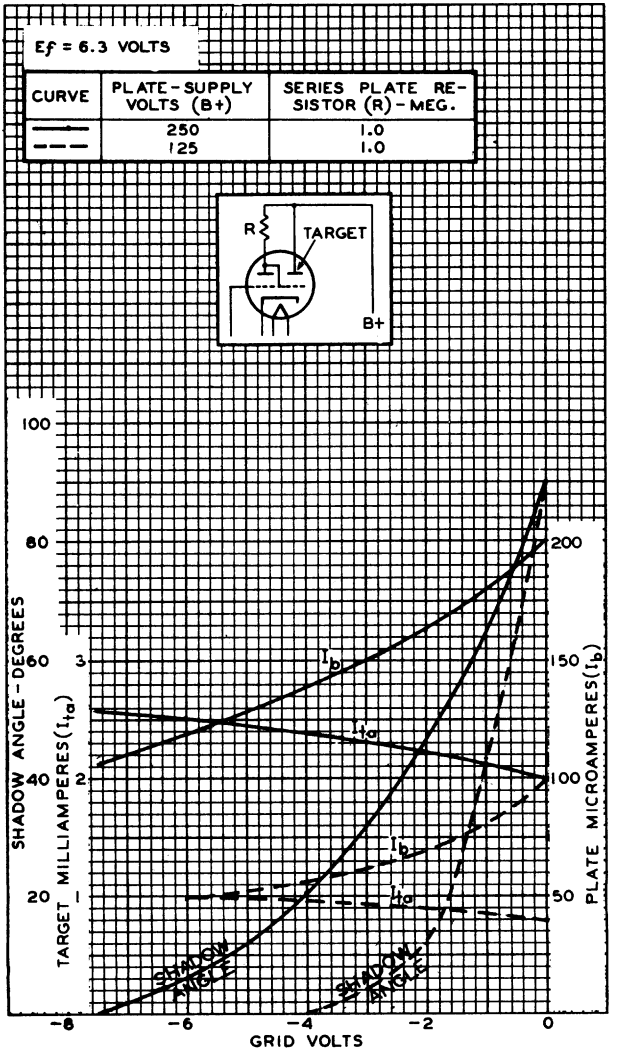


The license extended to the purchaser of tubes appears in the License Notice accompanying them. Information contained herein is furnished without assuming any obligations. ← Indicates a change.

6E5

6E5

AVERAGE CONTROL CHARACTERISTICS



6EA5

Sharp-Cutoff Tetrode

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)		6.3 ± 10%	volts
Current at 6.3 volts		0.2	amp
Direct Interelectrode Capacitances:			
	Without External Shield	*With External Shield*[a]	
Grid No.1 to plate	0.06 max.	0.05 max.	μμf
Grid No.1 to cathode & internal shield, grid No.2, and heater	3.8	4.5	μμf
Plate to cathode & internal shield, grid No.2, and heater	2.3	3	μμf

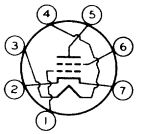
Characteristics, Class A_1 Amplifier:

Plate Voltage	250	volts
Grid-No.2 Voltage	140	volts
Grid-No.1 Voltage	-1	volt
Plate Resistance (Approx.)	0.15	megohm
Transconductance	8000	μmhos
Plate Current	10	ma
Grid-No.2 Current	0.95	ma
Grid-No.1 Voltage (Approx.) for transconductance (μmhos) = 100 or less	-6	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7EW

Pin 1 - Grid No.1
Pin 2 - Cathode, Internal Shield
Pin 3 - Heater
Pin 4 - Heater



Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Cathode, Internal Shield

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	250	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	150	max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0	max.	volts
CATHODE CURRENT	20	max.	ma
GRID-No.2 INPUT	0.5	max.	watt
PLATE DISSIPATION	3.25	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts

[a] With external shield JEDEC No.316 connected to cathode.

[b] The dc component must not exceed 100 volts.

6EA7

Dual Triode

With High-Mu Unit and Low-Mu Unit

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Voltage (AC or DC)	6.3 ± 10%		volts
Current at 6.3 volts	1.05		amp
Direct Interelectrode Capacitances (Approx.):[a]	*Unit No.1*	*Unit No.2*	
Grid to plate	4	8	μμf
Grid to cathode and heater	2.2	6	μμf
Plate to cathode and heater	0.6	1.3	μμf

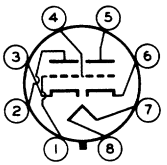
Characteristics, Class A_1 Amplifier:

	Unit No.1	*Unit No.2*		
Plate Voltage	250	60	175	volts
Grid Voltage	-3	0	-25	volts
Amplification Factor	66	-	5.5	
Plate Resistance (Approx.)	30000	-	920	ohms
Transconductance	2200	-	6000	μmhos
Plate Current	2	100[b]	40	ma
Grid Voltage (Approx.) for plate μa = 20	-5.3	-	-	volts
Grid Voltage (Approx.) for plate μa = 200	-	-	-45	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	3"
Maximum Seated Length	2-7/16"
Maximum Diameter	1-9/32"
Bulb	T9
Base	Intermediate-Shell Octal 8-Pin (JEDEC Group 1, B8-6)
Basing Designation for BOTTOM VIEW	8BD

Pin 1 - Grid of Unit No.2
Pin 2 - Plate of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Grid of Unit No.1



Pin 5 - Plate of Unit No.1
Pin 6 - Cathode of Unit No.1
Pin 7 - Heater
Pin 8 - Heater

VERTICAL-DEFLECTION OSCILLATOR

Values are for Unit No.1

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[c]

DC PLATE VOLTAGE	350	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	400	max.	volts
PLATE DISSIPATION	1	max.	watt
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[d]	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation	1	max.	megohm
For cathode-bias operation	2.2	max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Values are for Unit No.2

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[c]

DC PLATE VOLTAGE	550	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[e]	1500	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	175	max.	ma
Average	50	max.	ma
PLATE DISSIPATION	10	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[d]	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation	1	max.	megohm
For cathode-bias operation	2.2	max.	megohms

[a] Without external shield.

[b] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[d] The dc component must not exceed 100 volts.

[e] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

6EA8

Medium-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3	volts
Current	0.45 ± 6%	amp
Warm-up time (Average)	11	sec

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*[a]	
Triode Unit:			
Grid to plate	1.7	1.7	μμf ←
Grid to cathode, pentode cathode & pentode grid No.3 & internal shield, and heater	3	3.2	μμf
Plate to cathode, pentode cathode & pentode grid No.3 & internal shield, and heater	1.4	1.9	μμf
Pentode Unit:			
Grid No.1 to plate	0.02 max.	0.01 max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid-No.2, and heater	5	5	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	2.6	3.4	μμf
Heater to cathode (Each unit)	3	3[b]	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*	
Plate-Supply Voltage	150	125	volts
Grid-No.2 Voltage	–	125	volts
Grid-No.1 Voltage	–	-1	volt
Cathode Resistor	56	–	ohms
Amplification Factor	40	–	
Plate Resistance (Approx.)	5000	200000	ohms ←
Transconductance	8500	6400	μmhos
Plate Current	18	12	ma
Grid-No.2 Current	–	4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-12	-9	volts

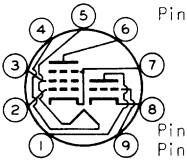
← Indicates a change.

6EA8

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9AE

Pin 1 – Triode Plate
Pin 2 – Pentode Grid No.1
Pin 3 – Pentode Grid No.2
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Plate
Pin 7 – Pentode Cathode, Pentode Grid No.3, Internal Shield
Pin 8 – Triode Cathode
Pin 9 – Triode Grid



AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	330 max.	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	–	330 max.	volts
GRID-No.2 VOLTAGE	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts	–	0.55 max.	watt
For grid-No.2 voltages between 165 and 330 volts	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
→ PLATE DISSIPATION	2.5 max.	3.1 max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	200 max.	200 max.	volts
Heater positive with respect to cathode	200[c] max.	200[c] max.	volts

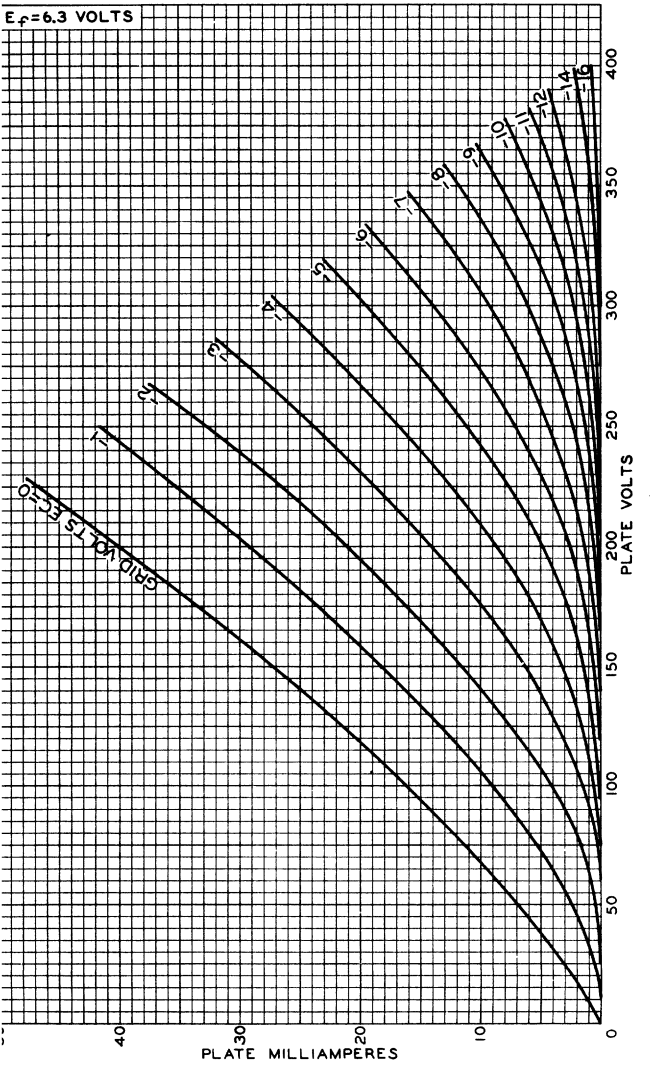
[a] With external shield JEDEC No.315 connected to cathode of unit under test except as noted.
[b] With external shield JEDEC No.315 connected to ground.
[c] The dc component must not exceed 100 volts.

→ Indicates a change.

6EA8

AVERAGE PLATE CHARACTERISTICS

TRIODE UNIT



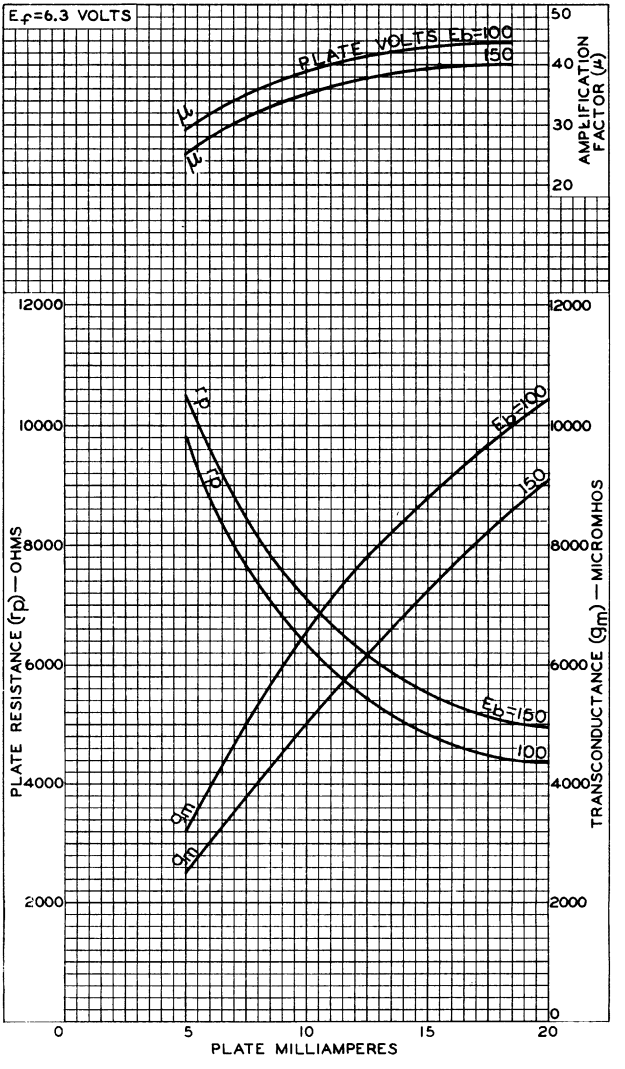
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-9866

6EA8

6EA8

AVERAGE CHARACTERISTICS

TRIODE UNIT



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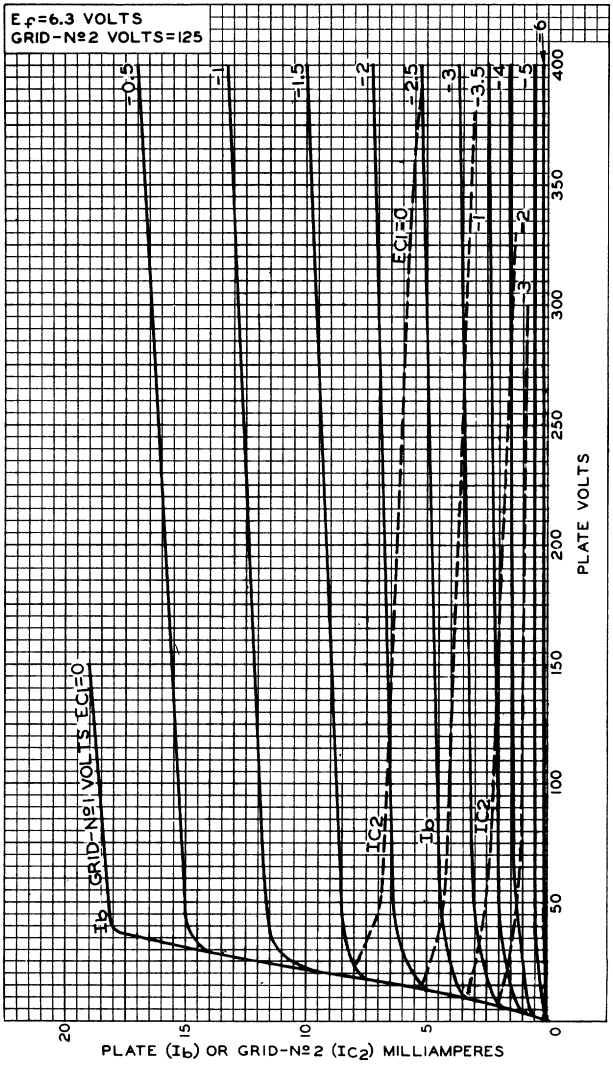
92CM-9882

RCA

6EA8

AVERAGE CHARACTERISTICS
PENTODE UNIT



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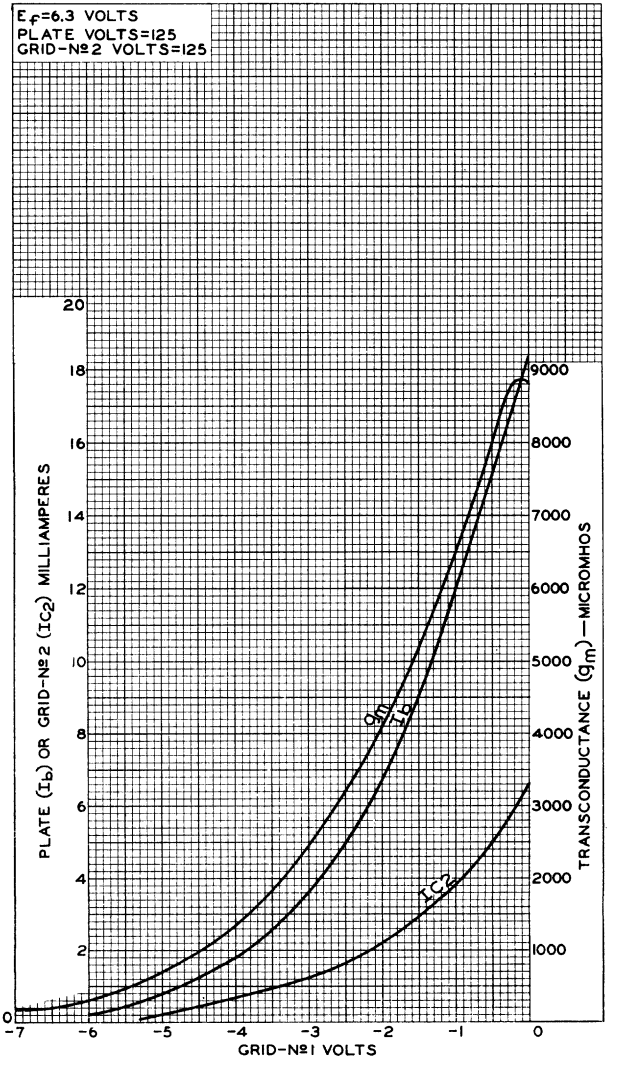
92CM-9867

6EA8

6EA8

AVERAGE CHARACTERISTICS

PENTODE UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9868

6EB8

HIGH-MU TRIODE—SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage	6.3 ± 10%	ac or dc volts
Current	0.75	amp

Direct Interelectrode Capacitances:[o]

Triode Unit:		
Grid to plate	4.4	μμf
Grid to cathode and heater	2.4	μμf
Plate to cathode and heater	0.36	μμf
Pentode Unit:		
Grid No.1 to plate	0.1 max.	μμf
Grid No.1 to cathode & internal shield & grid No.3, grid No.2, and heater	11	μμf
Plate to cathode & internal shield & grid No.3, grid No.2, and heater	4.2	μμf
Triode grid to pentode plate	0.018 max.	μμf
Pentode grid No.1 to triode plate	0.005 max.	μμf
Pentode plate to triode plate	0.17 max.	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*		
Plate-Supply Voltage	250	45	200	volts
Grid-No.2 Supply Voltage	-	125	125	volts
Grid-No.1 Voltage	-2	0	-	volts
Cathode Resistor	-	-	68	ohms
Amplification Factor	100	-	-	
Plate Resistance (Approx.)	37000	-	75000	ohms
Transconductance	2700	-	12500	μmhos
Plate Current	2	40*	25	ma
Grid-No.2 Current	-	15*	7	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	-	-	-9	volts
Grid Voltage (Approx.) for plate μa = 20	-5	-	-	volts

Mechanical:

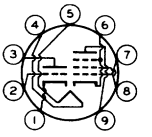
Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2

6EB8

HIGH-MU TRIODE—
SHARP-CUTOFF PENTODE

Base. . . . . .Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9DX

Pin 1 - Triode Cathode
Pin 2 - Triode Grid
Pin 3 - Triode Plate
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Pentode Cathode, Grid No.3, Internal Shield
Pin 7 - Pentode Grid No.1
Pin 8 - Pentode Grid No.2
Pin 9 - Pentode Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit		*Pentode Unit*		
PLATE VOLTAGE	330	max.	330	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE.	-		330	max.	volts
GRID-No.2 VOLTAGE	-		*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value . . .	0	max.	0	max.	volts
PLATE DISSIPATION	1	max.	5	max.	watts
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts	-		1.1	max.	watts
For grid-No.2 voltages between 165 and 330 volts	-		*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. . .	200	max.	200	max.	volts
Heater positive with respect to cathode. . .	200▲	max.	200▲	max.	volts

Maximum Circuit Values:

	Triode Unit		*Pentode Unit*		
Grid-No.1-Circuit Resistance: For fixed-bias operation.	0.5	max.	0.25	max.	megohm
For cathode-bias operation	1	max.	1	max.	megohm

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6EB8

HIGH-MU TRIODE—
SHARP-CUTOFF PENTODE

° Without external shield.

* This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

▲ The dc component must not exceed 100 volts.

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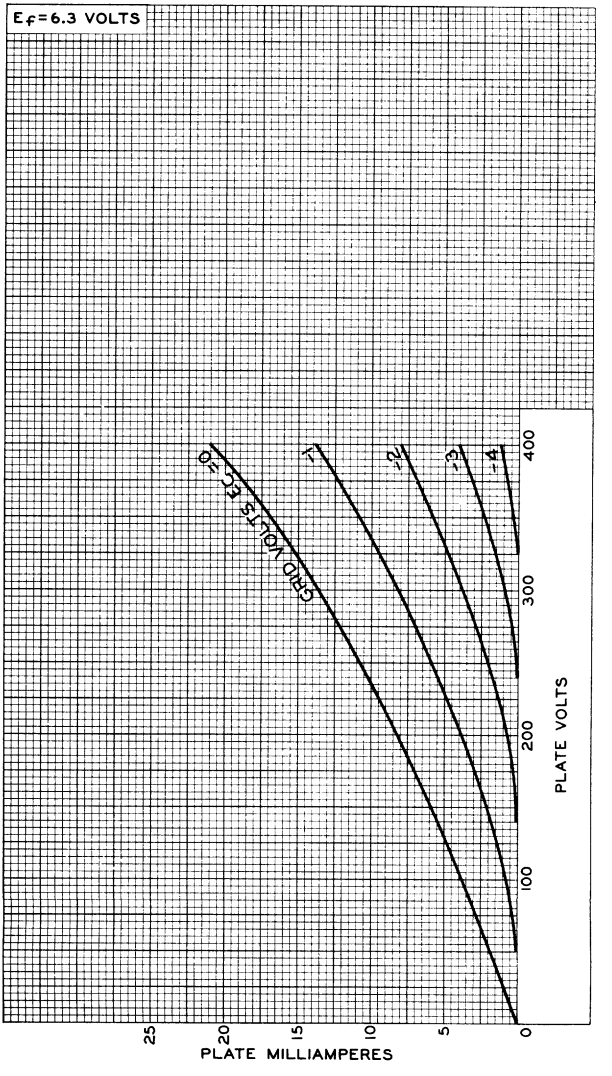
6EB8

6EB8

AVERAGE PLATE CHARACTERISTICS

TRIODE UNIT



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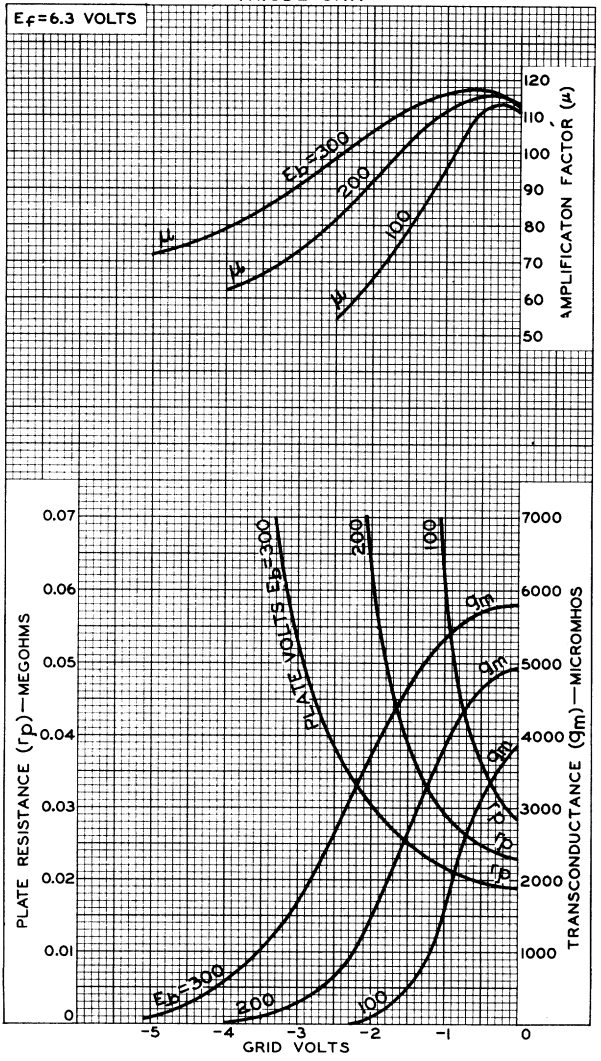
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9907RI

6EB8

AVERAGE CHARACTERISTICS

TRIODE UNIT



6EB8

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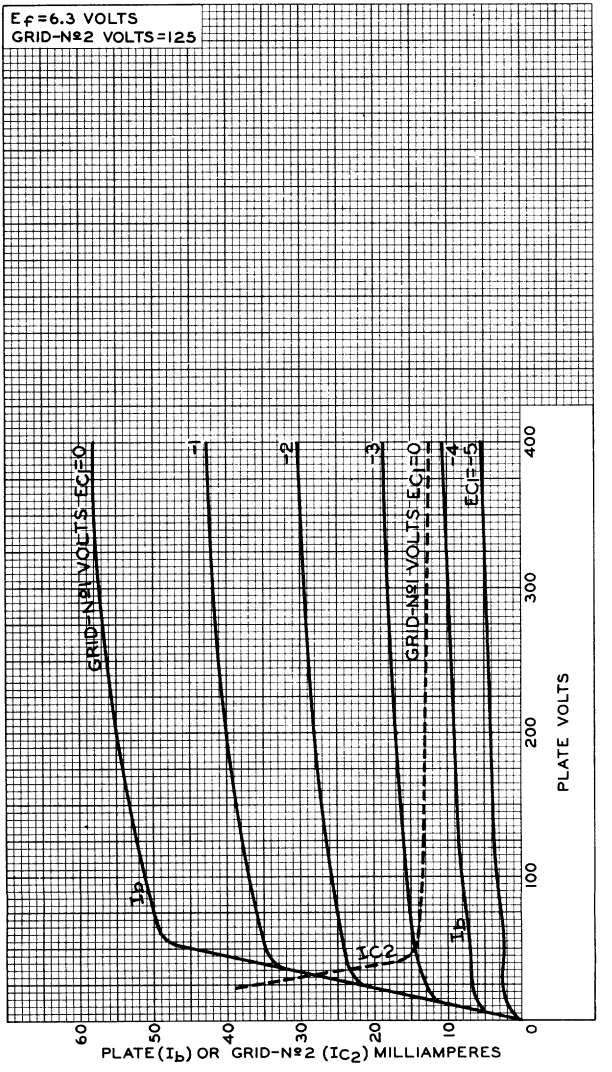
AVERAGE CHARACTERISTICS

PENTODE UNIT



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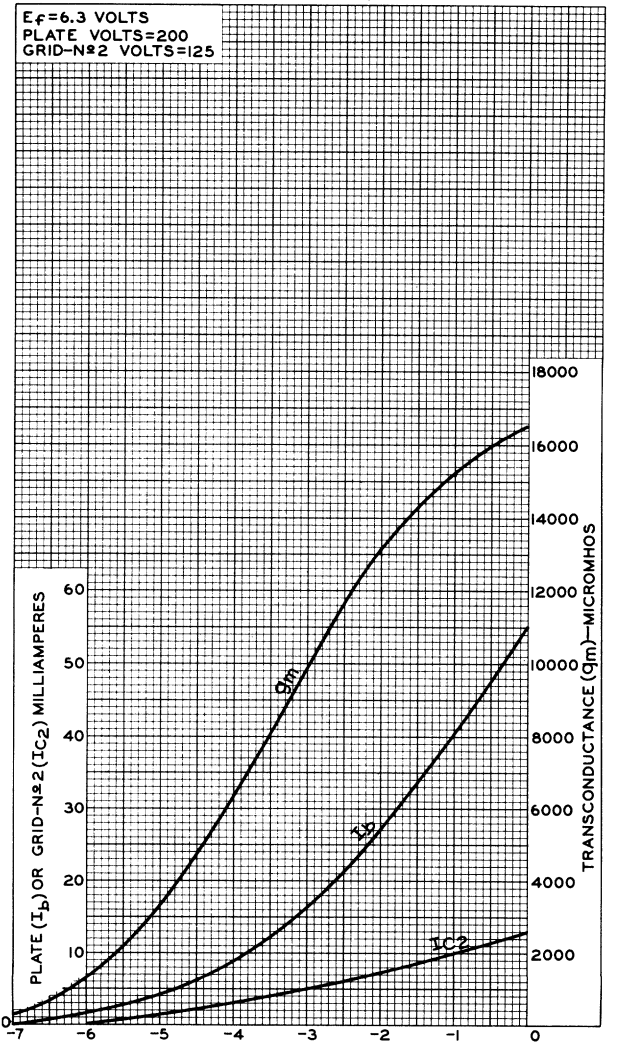
92CM-9906

6EB8

AVERAGE CHARACTERISTICS

PENTODE UNIT



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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-9905

6EH7

Semiremote-Cutoff Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Center Values):*		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.300	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	150 max.	volts
Heater positive with respect to cathode	150 max.	volts
Direct Interelectrode Capacitances:[a]		
Grid No.1 to plate	0.005 max.	μμf
Grid No.1 to cathode, grid No.3, grid No.2, internal shield, and heater	9	μμf
Plate to cathode, grid No.3, grid No.2, internal shield, and heater	3	μμf

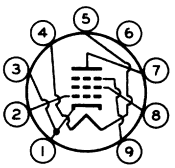
Characteristics, Class A1 Amplifier:

Plate Voltage	200	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Voltage	90	volts
Grid-No.1 Voltage	-2	volts
Plate Resistance (Approx.)	0.5	megohm
Transconductance	12500	μmhos
Plate Current	12	ma
Grid-No.2 Current	4.5	ma

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-13/32"
Maximum Seated Length	2-5/32"
Length, Base Seat to Bulb Top (Excluding tip)	1-25/32" ± 3/32"
Diameter	0.750" to 0.875"
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9AQ

Pin 1 – Cathode
Pin 2 – Grid No.1
Pin 3 – Cathode
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Internal Shield
Pin 7 – Plate
Pin 8 – Grid No.2
Pin 9 – Grid No.3

AMPLIFIER — Class A[1]

Maximum Ratings, *Design-Center Values:*

PLATE SUPPLY VOLTAGE	550 max.	volts
PLATE VOLTAGE	250 max.	volts
GRID No.3 (SUPPRESSOR GRID)	*Connect to cathode at socket*	
GRID No.2 (SCREEN-GRID) SUPPLY VOLTAGE	550 max.	volts
GRID-No.2 VOLTAGE	250 max.	volts
CATHODE CURRENT	20 max.	ma
GRID-No.2 INPUT	0.65 max.	watt
PLATE DISSIPATION	2.5 max.	watts

Typical Operation:

Plate Voltage	200	200	200	200	volts
Grid No.3	*Connected to cathode at socket*				
Grid-No.2 Supply Voltage	200	200	200	200	volts
Grid-No.2 Series Resistor	22000	22000	22000	22000	ohms
Grid-No.1 Voltage	-19.5	-9.5	-6.5	-2	volts
Transconductance	125	625	1250	12500	μmhos
RMS Grid-No.1 Voltage for cross-modulation factor = 0.01	450	160	100	-	mv

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1 max.	megohm

[a] Without external shield.

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

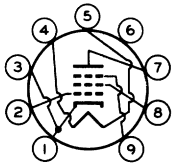
Heater Characteristics and Ratings *(Design-Center Values):*		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.300	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	150 max.	volts
Heater positive with respect to cathode	150 max.	volts
Direct Interelectrode Capacitances:[a]		
Grid No.1 to plate	0.005 max.	μμf
Grid No.1 to cathode, grid No.3, grid No.2, internal shield, and heater	10	μμf
Plate to cathode, grid No.3, grid No.2, internal shield, and heater	3	μμf

Characteristics, Class A_1 Amplifier:

Plate Voltage	190	200	volts
Grid No.3	*Connected to cathode at socket*		
Grid-No.2 Voltage	190	200	volts
Grid-No.1 Voltage	-2.35	-2.5	volts
Plate Resistance (Approx.)	0.35	0.35	megohm
Transconductance	15000	15000	μmhos
Plate Current	10	10	ma
Grid-No.2 Current	4.1	4.1	ma

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-13/32"
Maximum Seated Length	2-5/32"
Length, Base Seat to Bulb Top (Excluding tip)	1-25/32" ± 3/32"
Diameter	0.750" to 0.875"
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9AQ



Pin 1 - Cathode
Pin 2 - Grid No.1
Pin 3 - Cathode
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Internal Shield
Pin 7 - Plate
Pin 8 - Grid No.2
Pin 9 - Grid No.3

AMPLIFIER — Class A[1]

Maximum Ratings, *Design-Center Values:*

PLATE SUPPLY VOLTAGE	550 max.	volts
PLATE VOLTAGE	250 max.	volts
GRID No.3 (SUPPRESSOR GRID)	*Connect to cathode at socket*	
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	550 max.	volts
GRID-No.2 VOLTAGE	250 max.	volts
CATHODE CURRENT	25 max.	ma
GRID-No.2 INPUT	0.9 max.	watt
PLATE DISSIPATION	2.5 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1 max.	megohm

[a] Without external shield.

6EM5

Beam Power Tube

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)	6.3		volts
Current	0.8		amp
Direct Interelectrode Capacitances:[a]			
Grid No.1 to plate	0.7 max.		μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	10		μμf
Plate to cathode & grid No.3, grid No.2, and heater	5.1		μμf

Characteristics, Class A_1 Amplifier: ←

Plate Voltage	60	250	volts
Grid-No.2 Voltage	250	250	volts
Grid-No.1 Voltage	0	-18	volts
Mu Factor, Grid No.1 to Grid No.2	-	8.7	
Plate Resistance (Approx.)	-	0.05	megohm
Transconductance	-	5100	μmhos
Plate Current	180[b]	40	ma
Grid-No.2 Current	30[b]	3	ma
Grid-No.1 Voltage (Approx.) for plate ma. = 0.2	-	-37	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	3-1/16"
Maximum Seated Length	2-13/16"
Length, Base Seat to Bulb Top (Excluding tip)	2-7/16" ± 3/32"
Diameter	0.750" to 0.850"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9HN

Pin 1 - Grid No.2
Pin 2 - No Connection
Pin 3 - Grid No.1
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid No.1

Pin 7 - Cathode, Grid No.3
Pin 8 - Internal Connection—Do Not Use
Pin 9 - Plate

VERTICAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system[c]

DC PLATE VOLTAGE	315 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE (Absolute maximum)[d]	2200[e] max.	volts

← Indicates a change.

DC GRID-No.2 (SCREEN-GRID) VOLTAGE	285	max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 (CONTROL-GRID) VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	210	max.	ma
Average	60	max.	ma
GRID-No.2 INPUT	1.5	max.	watts
PLATE DISSIPATION	10	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200[f]	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250	max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	2.2	max.	megohms
For cathode-bias operation	2.2	max.	megohms

[a] Without external shield.

[b] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

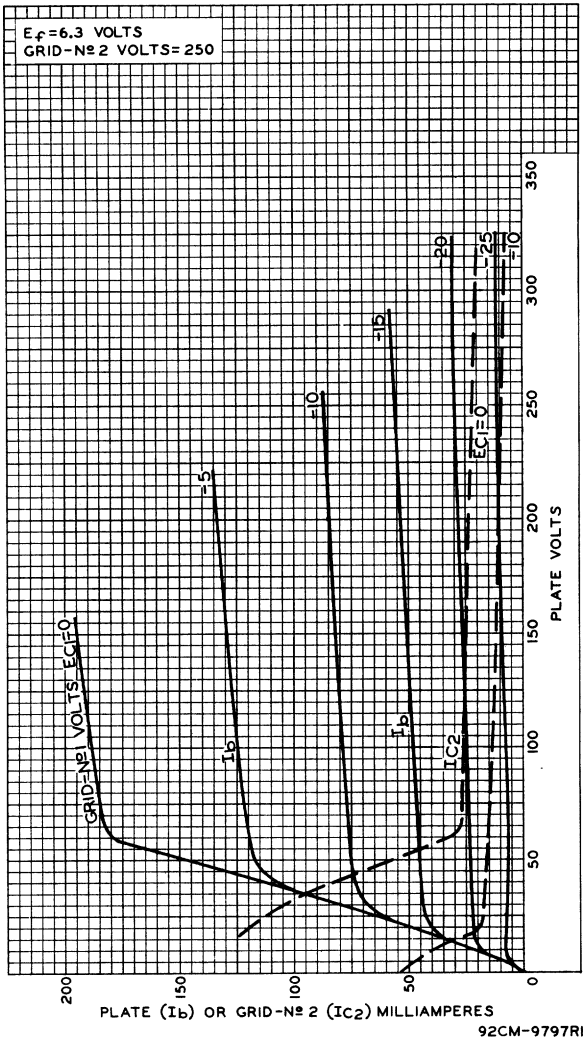
[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[d] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

[e] Under no circumstances should this absolute-maximum value be exceeded.

[f] The dc component must not exceed 100 volts.

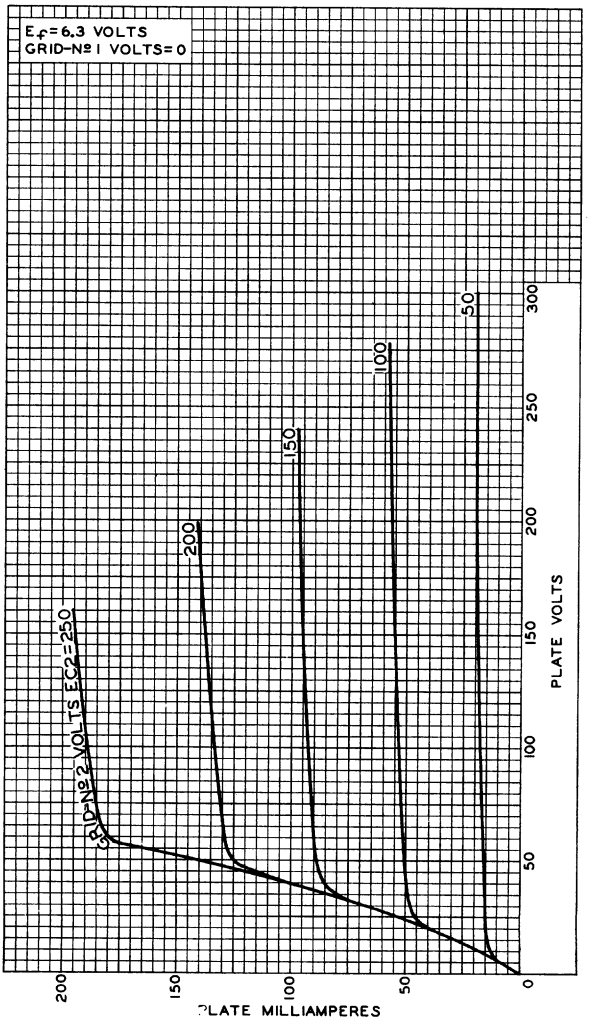
AVERAGE CHARACTERISTICS



92CM-9797RI

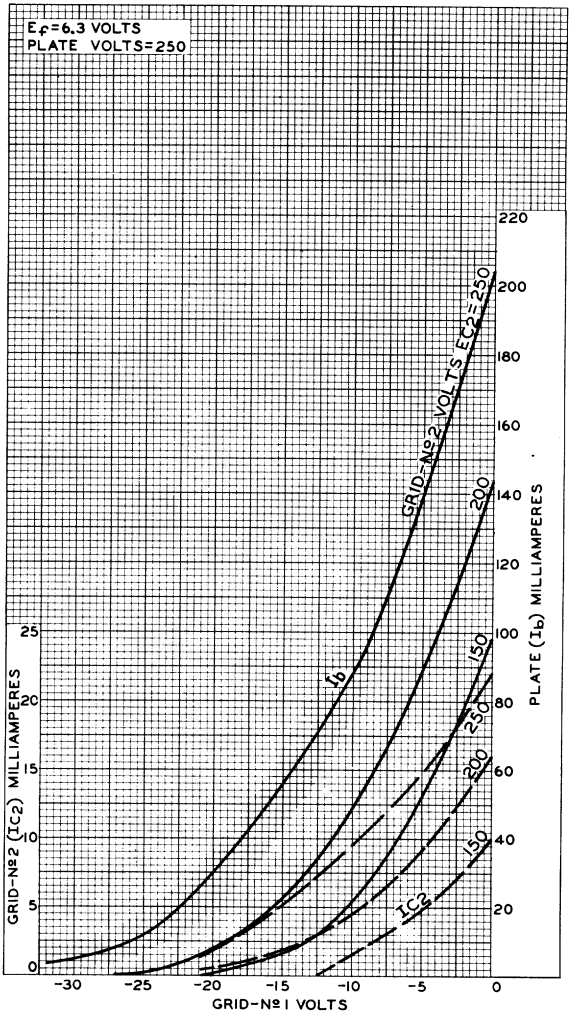
6EM5

AVERAGE PLATE CHARACTERISTICS



92CM-9672

AVERAGE CHARACTERISTICS



92CM-9673RI

6EM7

Dual Triode

With High-Mu Unit and Low-Mu Unit

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Voltage (AC or DC)		6.3 ± 10%	volts
Current at 6.3 volts		0.925	amp
Direct Interelectrode Capacitances (Approx.):[a]			
	Unit No.1	*Unit No.2*	
Grid to plate	4.8	10	μμf
Grid to cathode and heater	2.2	7	μμf
Plate to cathode and heater	0.6	1.8	μμf

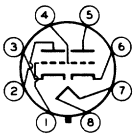
Characteristics, Class A_1 Amplifier:

	Unit No.1	*Unit No.2*	
Plate Voltage	250	150	volts
Grid Voltage	-3	-20	volts
Amplification Factor	68	5.4	
Plate Resistance (Approx.)	40000	750	ohms
Transconductance	1600	7200	μmhos
Plate Current	1.4	50	ma
Plate Current for plate volts = 60 and grid volts = 0	-	95	ma
Plate Current for grid volts = -28	-	10	ma
Grid Voltage (Approx.) for plate μa = 10	-5.5	-	volts
Grid Voltage (Approx.) for plate μa = 100	-	-45	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-7/8" ←
Maximum Seated Length	2-5/16" ←
Maximum Diameter	1-9/32"
Bulb	T9
Base	Short Intermediate-Shell Octal 8-Pin with External Barriers (JEDEC Group 1, B8-58)
Basing Designation for BOTTOM VIEW	8BD

Pin 1 - Grid of Unit No.2
Pin 2 - Plate of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Grid of Unit No.1



Pin 5 - Plate of Unit No.1
Pin 6 - Cathode of Unit No.1
Pin 7 - Heater
Pin 8 - Heater

← Indicates a change.

VERTICAL-DEFLECTION OSCILLATOR

Values are for Unit No.1

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[b]

DC PLATE VOLTAGE	330	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	400	max.	volts
CATHODE CURRENT:			
Peak	77	max.	ma
Average	22	max.	ma
PLATE DISSIPATION	1.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[c]	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For grid-resistor-bias or cathode-bias operation	2.2	max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Values are for Unit No.2

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[b]

DC PLATE VOLTAGE	330	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[d]	1500	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	175	max.	ma
Average	50	max.	ma
PLATE DISSIPATION	10	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[c]	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For grid-resistor-bias or cathode-bias operation	2.2	max.	megohms

[a] Without external shield.

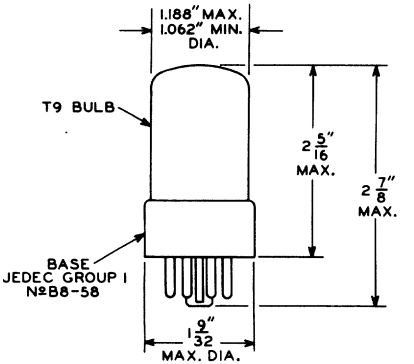
[b] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[c] The dc component must not exceed 100 volts.

[d] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

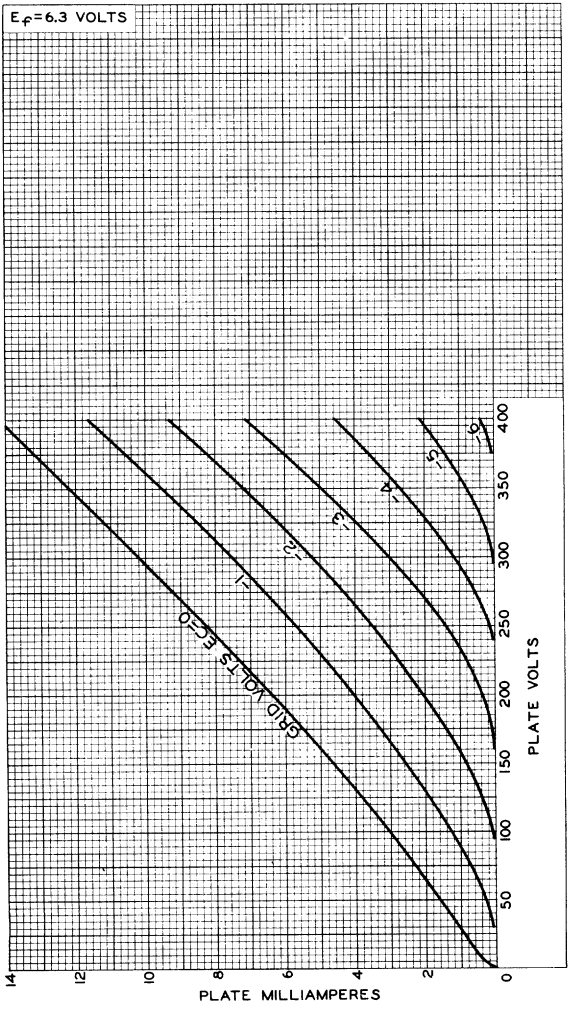
OPERATING CONSIDERATIONS

The *bulb* becomes hot during operation. To insure adequate cooling, therefore, it is essential that free circulation of air be provided.


1.188" MAX.
1.062" MIN.
DIA.
T9 BULB
2 5/16"
MAX.
2 7/8"
MAX.
BASE
JEDEC GROUP 1
No B8-58
1 9/32"
MAX. DIA.
92CS-10880

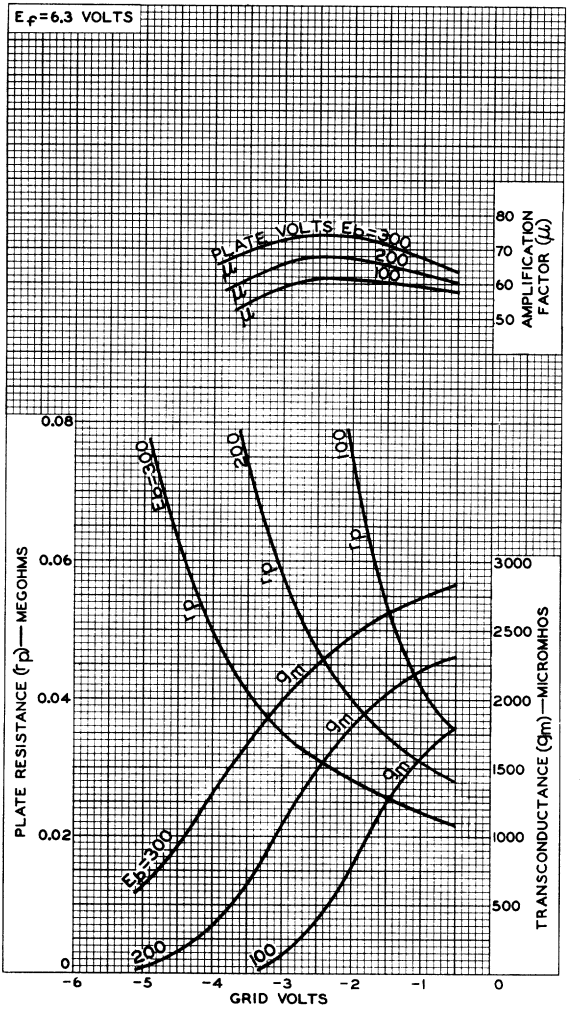
6EM7

AVERAGE PLATE CHARACTERISTICS
Unit No.1



92CM-9912

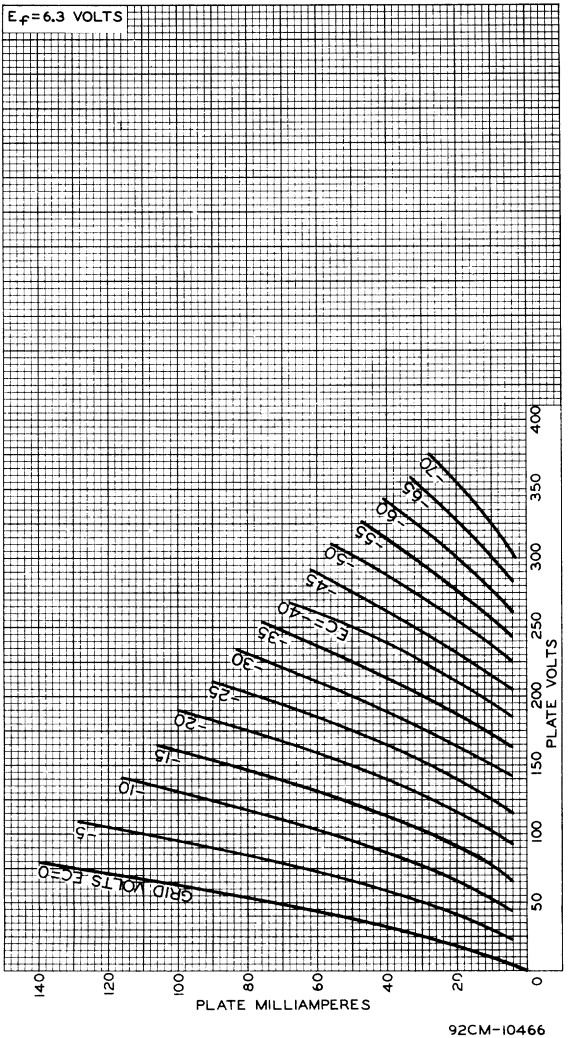
AVERAGE CHARACTERISTICS
Unit No.1



92CM-9915RI

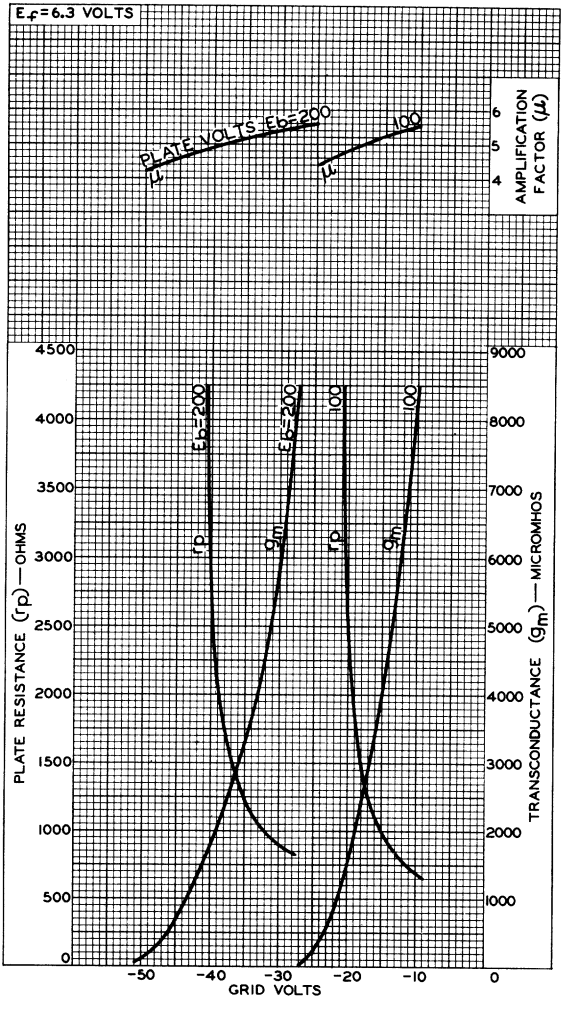
6EM7

AVERAGE PLATE CHARACTERISTICS
Unit No.2



92CM-10466

AVERAGE CHARACTERISTICS
Unit No. 2



92CM-10467

6EN4

Sharp-Cutoff Beam Triode

High-Voltage, Low-Current Type Shunt Voltage-Regulator For DC Power Supplies in Color-TV Receivers

Designed to minimize X-radiation.

Max. DC Plate Volts = 30000 V

Max. Plate Dissipation = 40 watts

ELECTRICAL CHARACTERISTICS — Bogey Values

Heater Voltage, ac or dc	E_h	6.3	V
Heater Current	I_h	0.2	A
Direct Interelectrode Capacitances (approx.)			
Grid to plate	$c_{g\text{-}p}$	1.0	pF
Input: G to (K,H)	c_i	2.6	pF
Output: P to (K,H)	c_o	1.0	pF
Amplification Factor (Approx.)	μ	2000	

MECHANICAL CHARACTERISTICS

Maximum Overall Length	5.00 in (127.0 mm)
Maximum Seated Length	4.4375 in (112.7 mm)
Maximum Diameter	1.562 in (39.6 mm)
Envelope	JEDEC T12
Cap	Small (JEDEC No. C1-50)
Base	Short Medium-Shell Octal 8-Pin With External Barriers, Style B (JEDEC Group 1, No. B8-118)
Terminal Diagram	JEDEC 8NH
Type of Cathode	Coated Unipotential
Operating Position	Any

MAXIMUM RATINGS[a]

SHUNT VOLTAGE-REGULATOR SERVICE

DC Plate Voltage (absolute maximum)	E_b	30000	V
Unregulated DC Supply Voltage	E_{bb}	60000	V
Grid Voltage:			
Negative dc value	$-E_c$	135	V
Negative peak value for 20 seconds maximum during equipment warm-up period	$-E_{cm}$	440	V
DC Plate Current (absolute maximum)	I_b	1.6	mA
Plate Dissipation (absolute maximum)	P_b	40	W
Peak heater-cathode voltage:			V
Heater negative with respect to cathode	$-E_{hk}$	450[b]	V
Heater positive with respect to cathode	$+E_{hk}$	Not Recommended	

Heater Voltage (absolute maximum)	E_h	6.9	V
Heater Voltage (absolute minimum)	E_h	5.7	V

MAXIMUM CIRCUIT VALUES:

Grid-Circuit Resistance	$R_{g(CKT)}$	3	MΩ

Typical Operation:

As Shunt Voltage-Regulator Tube in Accompanying Circuit

Unregulated Supply:		
DC Voltage	36000	V
Equivalent resistance	11	MΩ
Voltage Divider Values:		
R_1 (5 watts)	220	MΩ
R_2 (2 watts)	1	MΩ
R_3 (½ watt)	0.82	MΩ
Reference Voltage Supply:		
DC Value	200	V
Equivalent resistance	1000	Ω
Effective Grid-Plate Transconductance	200	μmhos
DC Plate Current:		
For load current of 0 ma	1000	μA
For load current of 1 ma	45	μA
Regulated DC Output Voltage:		
For load current of 0 ma	25000	V
For load current of 1 ma	24500	V

[a] As defined in the current issue of EIA Standard RS-239A.

[b] Sufficient impedance should be used in series with the cathode to limit the cathode current under prolonged short-circuit conditions to 450 mA. This protective impedance will minimize the danger of heater burnout in case of a momentary internal arc within the tube.

CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

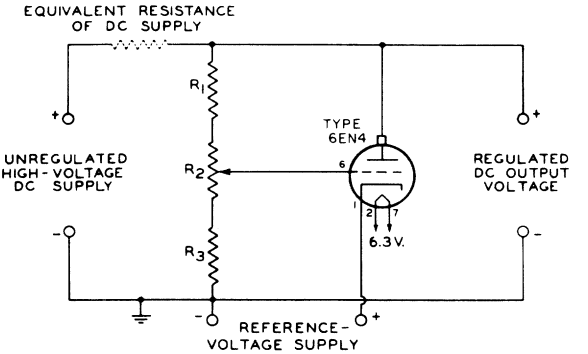
	Note	*Min.*	*Max.*	
Grid Voltage (1)	1	-7	-	V
Grid Voltage (2)	2	-	-40	V
Grid Voltage Change	3	-	9	V

Note 1: With dc plate voltage of 30000 V and dc plate current of 1 mA.

Note 2: With dc plate voltage of 30000 V and dc plate current of 0.1 mA.

Note 3: Difference between grid voltage (1) and grid voltage (2).

SHUNT VOLTAGE-REGULATOR CIRCUIT



Typical performance data for this basic circuit with certain characteristics of the unregulated dc supply and related voltage-divider values are given in the tabulated data. Other combinations are feasible within the maximum ratings and the maximum circuit values for the 6EN4.

OPERATING CONSIDERATIONS

The *base pins* of the 6EN4 fit the standard octal socket. Socket terminals for pins 3, 4 and 8 *should not be used for tie points.* If this precaution is not followed, tube performance may be adversely affected.

The 6EN4 may exhibit a blue glow on the upper half of the inner surface of the bulb wall under normal operating conditions. This effect is caused by fluorescence and is not to be mistaken for gas.

The *plate* of the 6EN4 shows a dull red color when the tube is operated at maximum plate dissipation. Connection to the plate cap should be made by a suitable connector with flexible lead to prevent any strain on the seal of the cap.

The *bulb* of the 6EN4 becomes hot during operation. To insure adequate cooling, it is essential that free circulation of air be provided around the 6EN4. The bulb will eventually darken during service. This darkening is normal and has no effect on tube performance.

X-RADIATION CHARACTERISTIC

X-Radiation, Maximum

Statistical Value Controlled On A Lot
Sampling Basis 0.5mR/hr

X-Radiation is measured in accordance with JEDEC Publication No. 67 A, "Recommended Practice for Measurement of X-Radiation from Receiving Tubes", and controlled in accordance with JEDEC Publication No. 73 A, "Recommended Practice for Quality Control of X-Radiation Emitted from High Voltage Rectifier and Shunt Regulator Receiving Tubes".

Operation of the 6EN4 outside of the absolute values indicated above may result in either temporary or permanent changes in the X-radiation characteristic of the tube. Equipment design must be such that these absolute values are not exceeded.

WARNING

X-Radiation

The high voltage associated with the 6EN4 result in production of X-Radiation which may constitute a health hazard on prolonged exposure at close range unless the tube is adequately shielded. Equipment design must provide for this shielding.

Precautions must be exercised during the servicing of equipment employing the 6EN4 to assure that the high voltage is adjusted to the recommended value and that any shielding components are replaced to their intended positions before the equipment is operated.

SHOCK HAZARD

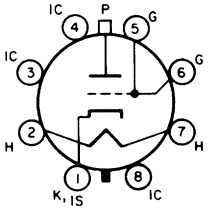
The high voltages at which the 6EN4 is operated can be extremely dangerous to the user or serviceman. Extreme care should be taken in the use of, and for the servicing and adjustment of, any high voltage circuit.

Precautions must be exercised during the replacement or servicing of the 6EN4 in equipment to assure that the high voltage output terminal is properly grounded while inserting or removing the tube from its socket or while connecting or disconnecting the top cap connector.

THE EQUIPMENT MANUFACTURER SHOULD PROVIDE A WARNING LABEL IN AN APPROPRIATE POSITION ON THE EQUIPMENT TO ADVISE THE SERVICEMAN OF ALL PRECAUTIONS HEREIN.

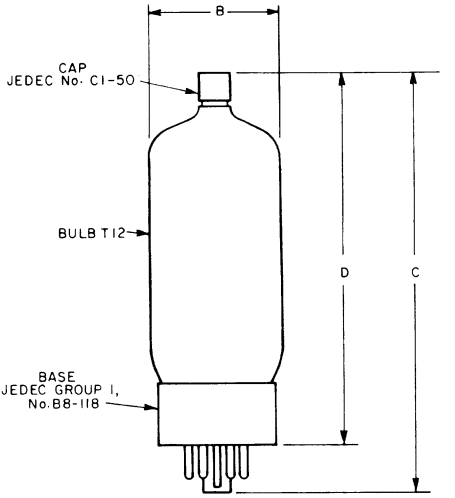
TERMINAL DIAGRAM – JEDEC 8NH – Bottom View

Pin 1: Cathode, Internal Shield
Pin 2: Heater
Pin 3: Do Not Use
Pin 4: Do Not Use
Pin 5: Grid
Pin 6: Grid
Pin 7: Heater
Pin 8: Do Not Use
Cap : Plate



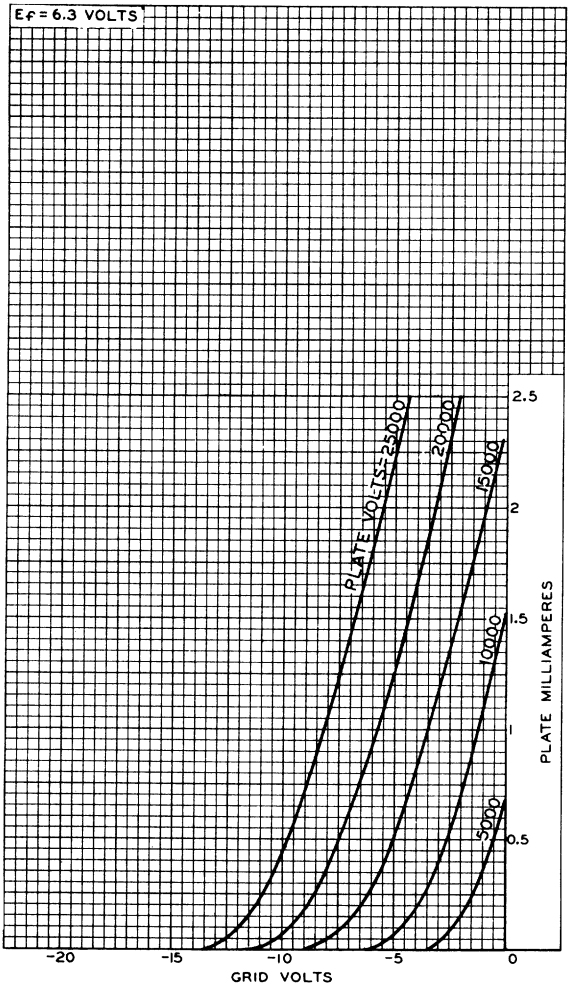
Note: For new equipment design make grid connection to pin 6 only.

DIMENSIONAL OUTLINE



DIMENSION	INCHES			MILLIMETERS		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
B	1.438	–	1.562	36.6	–	39.6
C	–	–	5.00	–	–	127.0
D	4.0625	4.25	4.4375	103.2	108.0	112.7
MILLIMETER DIMENSION DERIVED FROM INCH DIMENSION						

AVERAGE TRANSFER CHARACTERISTICS



92CM-8432RI

Diode—Remote-Cutoff Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.3	amp
Direct Interelectrode Capacitances:▲		
Pentode Unit:		
Grid No.1 to plate	0.002 max.	μμf
Grid No.1 to cathode, grid No.3, grid No.2, internal shield, and heater	5.5	μμf
Plate to cathode, grid No.3, grid No.2, internal shield, and heater	5	μμf
Pentode grid No.1 to diode plate	0.0015 max.	μμf
Pentode plate to diode plate	0.095	μμf

Characteristics, Class A_1 Amplifier (Pentode Unit):

Plate Voltage	100	volts
Grid No.3	*Connected to cathode at socket*	
Internal Shield	*Connected to cathode at socket*	
Grid-No.2 Voltage	100	volts
Grid-No.1 Supply Voltage	0	volts
Grid-No.1 Resistor (Bypassed)	2.2	megohms
Plate Resistance (Approx.)	0.25	megohm
Transconductance	3800	μmhos
Plate Current	9	ma
Grid-No.2 Current	3.5	ma
Grid-No.1 Voltage (Approx.) for transconductance (μmhos) = 40	-20	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9LQ

Pin 1 – Pentode Grid No.3
Pin 2 – Pentode Grid No.1
Pin 3 – Cathode
Pin 4 – Heater
Pin 5 – Heater

Pin 6 – Pentode Grid No.2
Pin 7 – Pentode Plate
Pin 8 – Diode Plate
Pin 9 – Internal Shield

PENTODE UNIT — AMPLIFIER — CLASS A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	300	max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE:			
Positive value	300	max.	volts
Negative value	300	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	300	max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0	max.	volts
Negative-bias value	50	max.	volts
GRID-No.3 INPUT	0.2	max.	watt
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 150 volts	0.6	max.	watt
For grid-No.2 voltages between 150 and 300 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
PLATE DISSIPATION	3	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200●	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	150	max.	°C

DIODE UNIT

Maximum Ratings, *Design-Maximum Values:*

PLATE CURRENT	1	max.	ma

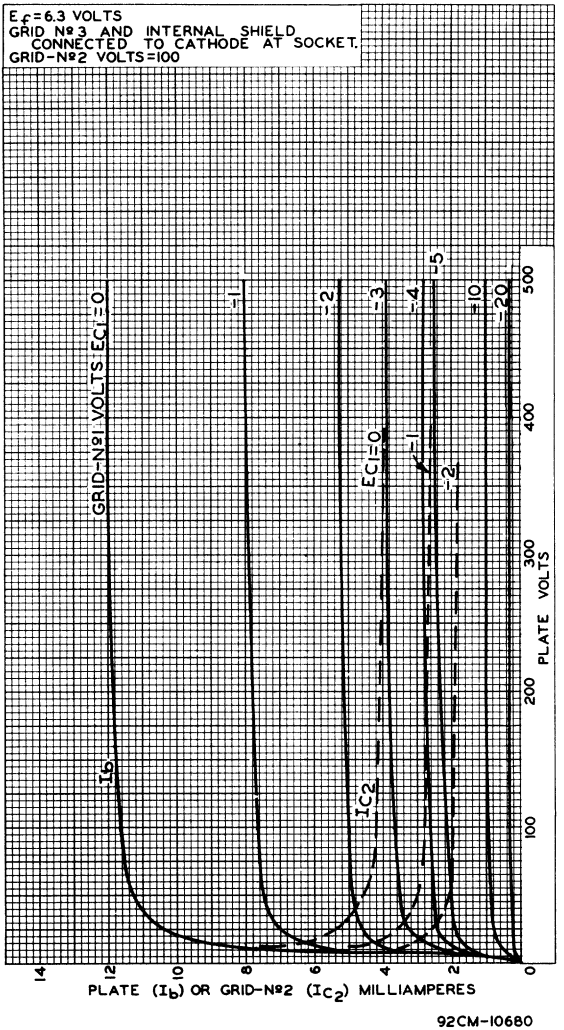
Characteristics, Instantaneous Test Condition:

Plate Current for plate volts = 10	2	ma

▲ Without external shield.

● The dc component must not exceed 100 volts.

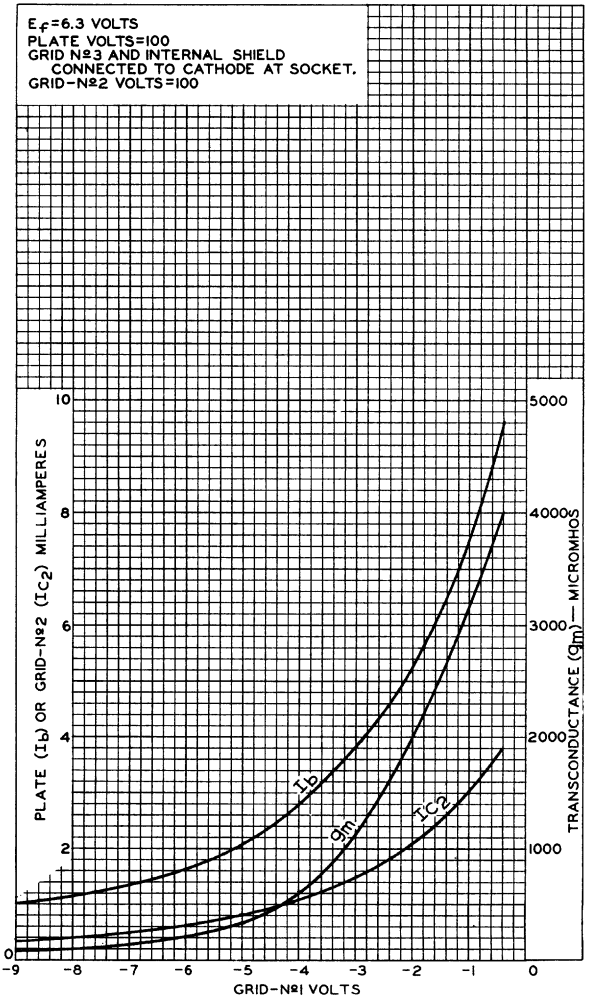
AVERAGE CHARACTERISTICS
Pentode Unit



92CM-10680

6EQ7

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-10674

6ER5

High-Mu Triode

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage (AC or DC)	6.3	volts
Current	0.18	amp

Direct Interelectrode Capacitances: ←

	Without External Shield	*With External Shield*[o]	
Grid to plate	0.38	0.36	μμf
Grid to cathode, internal shield, and heater	4.4	4.4	μμf
Plate to cathode, internal shield, and heater	3	4	μμf
Grid to heater	0.28 max.	0.28 max.	μμf
Plate to cathode	0.24	0.2●	μμf
Cathode to grid	3.1	3.1●	μμf
Heater to cathode	2.5	2.5●	μμf

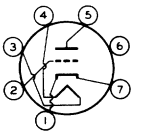
Characteristics, Class A_1 Amplifier: ←

Plate Voltage	200	volts
Grid Voltage	-1.2	volts
Amplification Factor	80	
Plate Resistance (Approx.)	8000	ohms
Transconductance	10500	μmhos
Plate Current	10	ma
Grid Voltage (Approx.) for transconductance (μmhos) = 500	-3.8	volts
Grid Voltage (Approx.) for transconductance (μmhos) = 100	-5.6	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No. E7-1)
Basing Designation for BOTTOM VIEW	7FP ←

Pin 1 - Cathode
Pin 2 - Grid
Pin 3 - Heater
Pin 4 - Heater



Pin 5 - Plate
Pin 6 - Internal Shield
Pin 7 - Cathode

← Indicates a change.

→ **AMPLIFIER — Class A_1**

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	250 max.	volts
GRID VOLTAGE:		
Negative-bias value	50 max.	volts
CATHODE CURRENT	20 max.	ma
PLATE DISSIPATION	2.2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	1 max.	megohm

° With external shield JEDEC No.316 connected to cathode except as noted.
● With external shield JEDEC No.316 connected to ground.

→ Indicates a change.

6ES5

High-Mu Triode

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)		6.3 ± 10%	volts
Current at 6.3 volts		0.2	amp
Direct Interelectrode Capacitances:			
	Without External Shield	*With External Shield*[a]	
Grid to plate	0.5 max.	0.5 max.	μμf
Grid to cathode, internal shield, and heater	3.2	3.2	μμf
Plate to cathode, internal shield, and heater	3.2	4	μμf

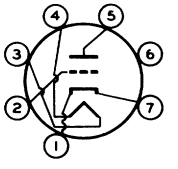
Characteristics, Class A_1 Amplifier:

Plate Voltage	200	volts
Grid Voltage	-1	volt
Amplification Factor	75	
Plate Resistance (Approx.)	8000	ohms
Transconductance	9000	μmhos
Plate Current	10	ma
Grid Voltage (Approx.) for plate μa = 100	-6	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No. E7-1)
Basing Designation for BOTTOM VIEW	7FP

Pin 1 – Cathode
Pin 2 – Grid
Pin 3 – Heater
Pin 4 – Heater



Pin 5 – Plate
Pin 6 – Internal Shield
Pin 7 – Cathode

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	250 max.	volts
GRID VOLTAGE:		
Positive-bias value	0 max.	volts

CATHODE CURRENT	22 max.	ma
PLATE DISSIPATION	2.2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	1 max.	megohm

[a] With external shield JEDEC No.316 connected to cathode.

6ES8

Variable-Mu Twin Triode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3	volts
Current	0.365	amp

Direct Interelectrode Capacitances:	*Without External Shield*	*With External Shield*[a]	
Grid to plate (Each unit)	1.9	1.9	μμf
Plate to cathode (Each unit)	0.18	0.17	μμf
Heater to cathode (Each unit)	3	3[b]	μμf
Plate of unit No.2 to plate of unit No.1	0.04 max.	0.015 max.	μμf
Plate of unit No.2 to grid of unit No.1	0.003 max.	0.003 max.	μμf
Grid of unit No.1 to cathode of unit No.2	0.002 max.	0.002 max.	μμf

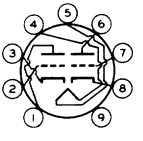
Characteristics, Class A_1 Amplifier (Each Unit):

Plate Voltage	90	90	90	volts
Grid Voltage	-1.2	-5	-9	volts
Plate Resistance (Approx.)	2500	-	-	ohms
Transconductance	12500	625	125	μmhos
Plate Current	15	-	-	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9AJ

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Internal Shield

6ES8

AMPLIFIER — Cascode Type

Maximum Ratings, *Design-Center Values:*

PLATE SUPPLY VOLTAGE with plate current = 0	550 max.	volts
PLATE VOLTAGE (Each Unit)	130 max.	volts
GRID VOLTAGE:		
Negative-bias value (Each Unit)	50 max.	volts
CATHODE CURRENT (Each Unit)	22 max.	ma
PLATE DISSIPATION (Each Unit)	1.8 max.	watts
HEATER-CATHODE VOLTAGE:		
Unit No. 1:[c]		
RMS voltage between cathode and heater	50 max.	volts
Unit No. 2:[d]		
RMS voltage between cathode and heater[e]	50 max.	volts
DC voltage between cathode and heater[e]	130 max.	volts

Typical Operation:

In a cascode-type circuit with the grid of the output unit connected to a voltage divider[f]

Supply Voltage	180	volts
Plate Current	15	ma
Transconductance	12500	μmhos
Noise Figure[g]	6.5	db
Grid Voltage (Approx.) for transconductance (μmhos) = 125	-9	volts
Input Voltage for cross-modulation factor = 0.01 and transconductance (μmhos) = 125	500	millivolts

Maximum Circuit Values:

Grid-Circuit Resistance (Each Unit)	1 max.	megohm

[a] With external shield JEDEC No. 315 connected to cathode of unit under test except as noted.

[b] With external shield JEDEC No. 315 connected to ground.

[c] Grounded-cathode input unit—pins 6, 7, and 8.

[d] Grounded-grid output unit—pins 1, 2, and 3.

[e] Cathode positive with respect to heater.

[f] In order not to exceed the maximum-rated plate voltage when the cascode-type amplifier is controlled, it is necessary to use a voltage divider for the grid of the grounded-grid output unit.

[g] Measured with tube operating in a television tuner.

High-Mu Twin Triode

9-PIN MINIATURE TYPE

For High-Fidelity Audio-Amplifier Applications Critical as to Noise and Hum

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.3	amp
Direct Interelectrode Capacitances (Each Unit, Approx.):		
Grid to plate	1.5	μμf
Grid to cathode and heater	1.6	μμf
Plate to cathode and heater	0.2	μμf

Equivalent Noise and Hum Voltage (Referenced to Grid, Each Unit):

Average Value (RMS) . . . . . 1.8 μvolts

Measured in "true rms" units under the following conditions: Heater volts (AC)= 6.3; center-tap of heater transformer connected to ground; plate supply volts (DC)= 250; plate load resistor (megohms)= 0.1; cathode resistor (ohms)= 2700; cathode bypass capacitor (μf)= 100; grid resistor (ohms)= 0; amplifier frequency range 25 to 10000 cps.

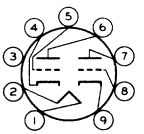
Characteristics, Class A_1 Amplifier (Each Unit):

Plate Voltage	100	250	volts
Grid Voltage	−1	−2	volts
Amplification Factor	100	100	
Plate Resistance (Approx.)	80000	62500	ohms
Transconductance	1250	1600	μmhos
Plate Current	0.5	1.2	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9LS

Pin 1 – Heater
Pin 2 – Heater
Pin 3 – No Connection
Pin 4 – Cathode of Unit No.2
Pin 5 – Grid of Unit No.2



Pin 6 – Plate of Unit No.2
Pin 7 – Plate of Unit No.1
Pin 8 – Grid of Unit No.1
Pin 9 – Cathode of Unit No.1

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

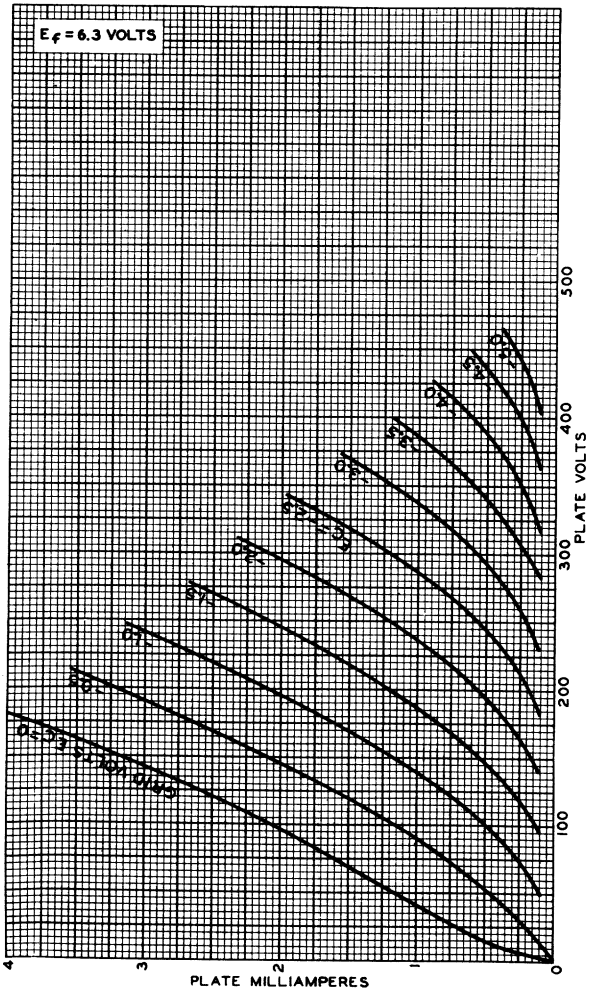
PLATE VOLTAGE	330	max.	volts
GRID VOLTAGE:			
Negative-bias value	55	max.	volts
Positive-bias value	0	max.	volts
PLATE DISSIPATION	1.2	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED-AMPLIFIER CHART No. 25 at front of this Section

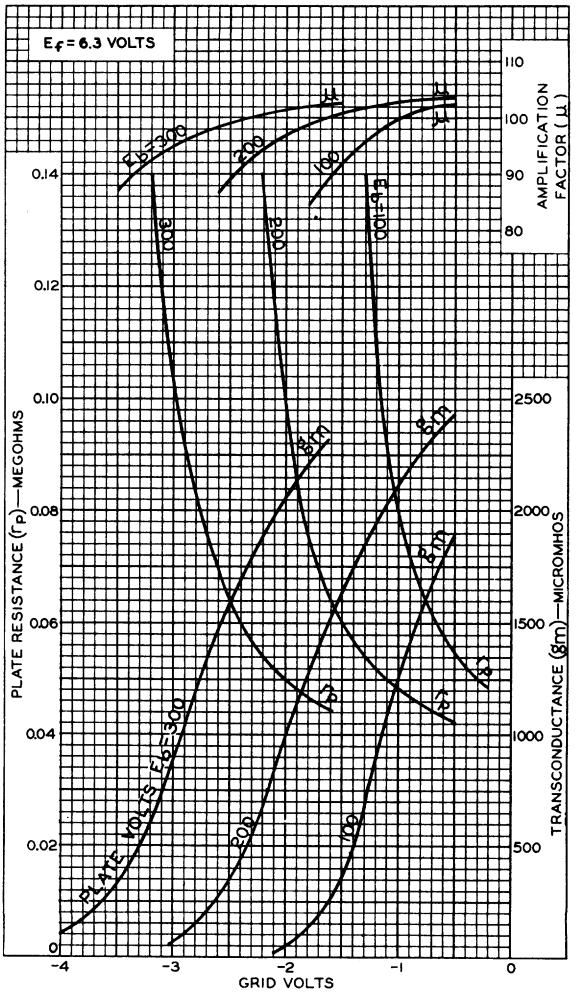
▲ The dc component must not exceed 100 volts.

AVERAGE PLATE CHARACTERISTICS
Each Unit



92CM-10470

AVERAGE CHARACTERISTICS
Each Unit



92CM-10471

6EU8

Medium-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3	volts
Current	0.45 ± 6%	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances:		

	Without External Shield	*With External Shield*[a]	
Triode Unit:			
Grid to plate	1.7	1.7	μμf
Grid to cathode and heater	3	3.2	μμf
Plate to cathode and heater	1.6	1.1	μμf
Pentode Unit:			
Grid No.1 to plate	0.02 max.	0.1 max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	5	5	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	2.6	3.4	μμf
Heater to cathode (Each unit)	3.6	3.6[b]	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*	
Plate Supply Voltage	150	125	volts
Grid-No.2 Supply Voltage	–	125	volts
Grid-No.1 Voltage	–	-1	volt
Cathode Resistor	56	–	ohms
Amplification Factor	40	–	
Plate Resistance (Approx.)	5000	80000	ohms
Transconductance	8500	6400	μmhos
Plate Current	18	12	ma
Grid-No.2 Current	–	4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-12	-9	volts
Cathode Warm-Up Time[c]	35	–	sec

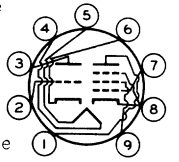
Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"

6EU8

Diameter. . . . . 0.750" to 0.875"
Dimensional Outline . . . . . See *General Section*
Bulb. T6-1/2
Base. . . . . .Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9JF

Pin 1 – Pentode Plate
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Triode Cathode



Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Cathode, Grid No.3, Internal Shield
Pin 9 – Pentode Grid No.2

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE.	330 max.	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	–	330 max.	volts
GRID-No.2 VOLTAGE.	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value.	0 max.	0 max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts.	–	0.55 max.	watt
For grid-No.2 voltages between 165 and 330 volts. .	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION.	3 max.	3.1 max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	200 max.	200 max.	volts
Heater positive with respect to cathode	200[d] max.	200[d] max.	volts

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance . .	0.1 max.	0.1 max.	megohm

[a] With external shield JEDEC No.315 connected to cathode of unit under test except as noted.

[b] With external shield JEDEC No.315 connected to ground.

[c] The time required for the transconductance to reach 6500 μmnos when the tube is operated from a cold start with dc plate volts = 100, grid volts = 0, and heater volts = 5.5.

[d] The dc component must not exceed 100 volts.

6EV5

Sharp-Cutoff Tetrode

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.2	amp
Direct Interelectrode Capacitances:[a]		
Grid No.1 to plate	0.035 max.	μμf
Grid No.1 to cathode & internal shield, grid No.2, and heater	4.50	μμf
Plate to cathode & internal shield, grid No.2, and heater	2.90	μμf

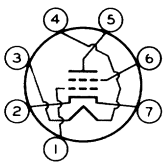
Characteristics, Class A_1 Amplifier:

Plate Voltage	250	volts
Grid-No.2 Voltage	80	volts
Grid-No.1 Voltage	-1	volt
Plate Resistance (Approx.)	0.15	megohm
Transconductance	8800	μmhos
Plate Current	11.5	ma
Grid-No.2 Current	0.9	ma
Grid-No.1 Voltage (Approx.) for transconductance (μmhos) = 100	-4.5	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7EW

Pin 1 - Grid No.1
Pin 2 - Cathode, Internal Shield
Pin 3 - Heater
Pin 4 - Heater



Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Cathode, Internal Shield

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	275	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	180	max.	volts
GRID-No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		

GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0	max.	volts
CATHODE CURRENT	20	max.	ma
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 90 volts	0.2	max.	watt
For grid-No.2 voltages between 90 and 180 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		
PLATE DISSIPATION	3.25	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	100	max.	volts
Heater positive with respect to cathode	100[b]	max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.5	max.	megohm

[a] With external shield JEDEC No.316 connected to cathode.
[b] The dc component must not exceed 50 volts.

6EW6

SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current	0.4	amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*[D]	
Grid No.1 to plate	0.04 max.	0.03 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	10	10	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	2.4	3.4	μμf

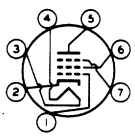
Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	125	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Supply Voltage	125	volts
Cathode Resistor	56	ohms
Plate Resistance (Approx.)	0.2	megohm
Transconductance	14000	μmhos
Plate Current	11	ma
Grid-No.2 Current	3.2	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-3.5	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CM

Pin 1 - Grid No.1
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate



Pin 6 - Grid No.2
Pin 7 - Grid No.3, Internal Shield

6EW6

SHARP-CUTOFF PENTODE

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

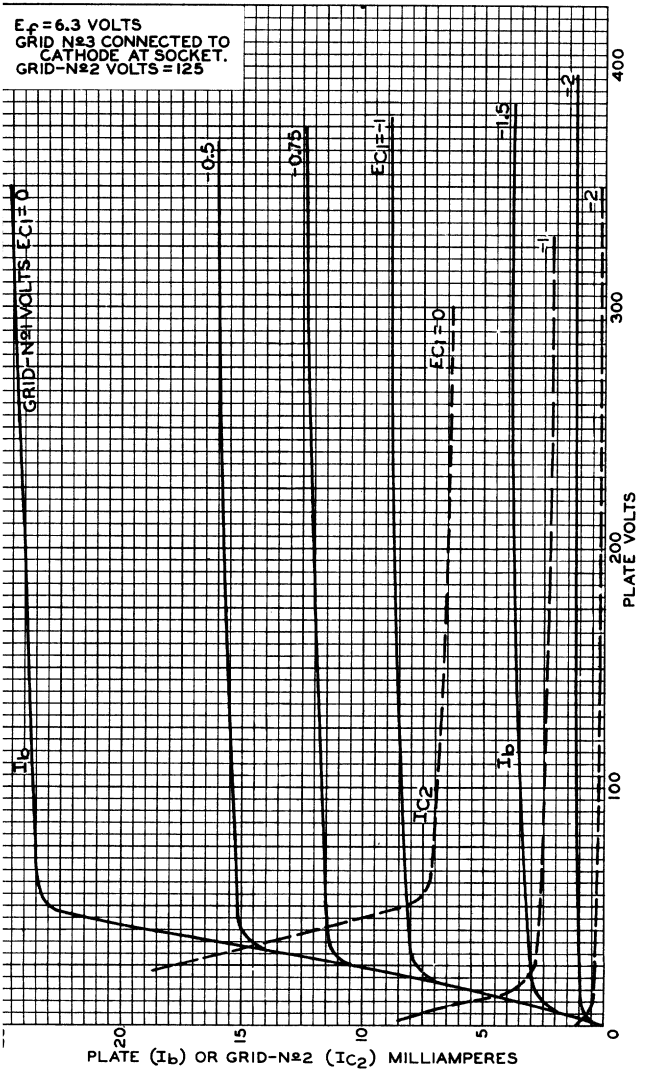
PLATE VOLTAGE	330 max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE	0 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 165 volts	0.65 max.	watt
For grid-No.2 voltages between 165 and 330 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	3.1 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲max.	volts

o With external shield JEDEC No.316 connected to cathode.

▲ The dc component must not exceed 100 volts.

6EW6

AVERAGE CHARACTERISTICS

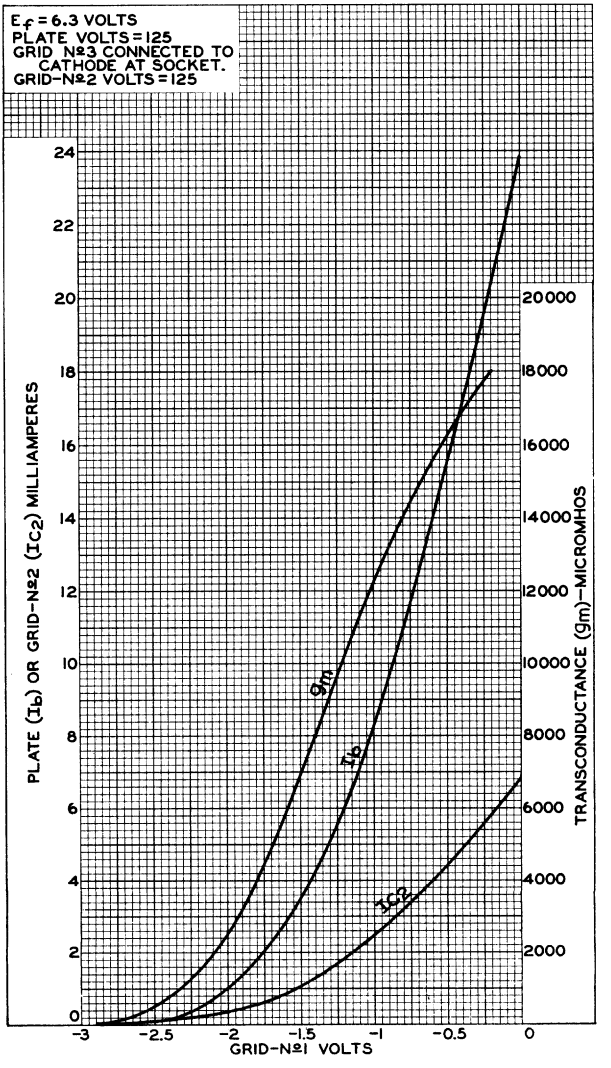


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-9965

6EW6

6EW6

AVERAGE CHARACTERISTICS



6EW7

Dual Triode

With Medium-Mu Unit and Low-Mu Unit

NEONOVAL TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.9	amp
Direct Interelectrode Capacitances (Approx.):[a]		

	Unit No.1	Unit No.2	
Grid to plate	4.2	9	μμf
Grid to cathode and heater	2.2	7	μμf
Plate to cathode and heater	0.4	1.2	μμf

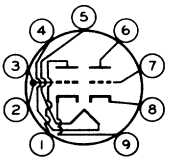
Characteristics, Class A_1 Amplifier:

	Unit No.1	Unit No.2	
Plate Voltage	250	150	volts
Grid Voltage	-11	-17.5	volts
Amplification Factor	17.5	6	
Plate Resistance (Approx.)	8750	800	ohms
Transconductance	2000	7500	μmhos
Plate Current	5.5	45	ma
Plate Current for plate volts = 60 and grid volts = 0	-	95	ma
Plate Current for grid volts = -25	-	8	ma
Grid Voltage (Approx.) for plate μa = 10	-20	-	volts
Grid Voltage (Approx.) for plate μa = 100	-	-40	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2.93"
Maximum Seated Length	2.62"
Length, Base Seat to Bulb Top (Excluding tip)	2.07" to 2.31"
Diameter	1.062" to 1.188"
Bulb	T9
Base	Large-Button Neonoval 9-Pin (JEDEC No.E9-68)
Basing Designation for BOTTOM VIEW	9HF

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Grid of Unit No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Cathode of Unit No.2

VERTICAL-DEFLECTION OSCILLATOR

Values are for Unit No.1

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[b]

DC PLATE VOLTAGE	330	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	400	maax.	volts
CATHODE CURRENT:			
Peak	77	max.	ma
Average	22	max.	ma
PLATE DISSIPATION	1.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[c]	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For grid-resistor-bias or cathode-bias operation	2.2	max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Values are for Unit No.2

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[b]

DC PLATE VOLTAGE	330	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[d]	1500	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	175	max.	ma
Average	50	max.	ma
PLATE DISSIPATION	10	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[c]	max.	volts

Maximum Circuit Values:

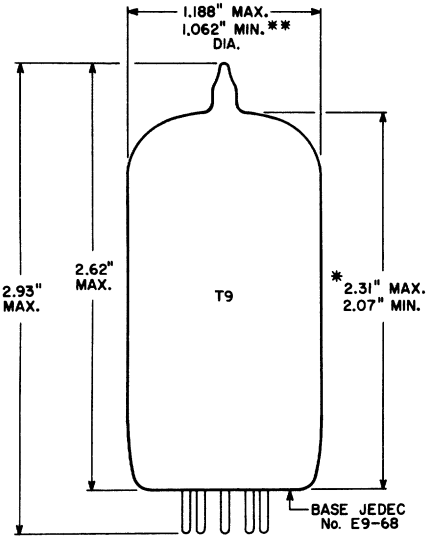
Grid-Circuit Resistance:			
For grid-resistor-bias or cathode-bias operation	2.2	max.	megohms

[a] Without external shield.

[b] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[c] The dc component must not exceed 100 volts.

[d] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

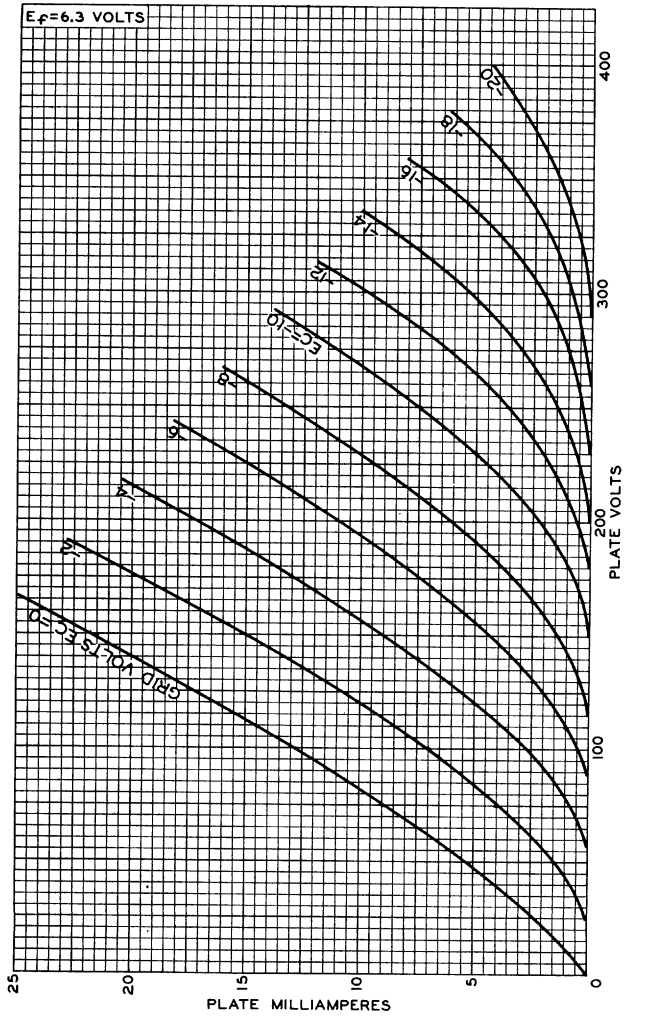


* MEASURED FROM BASE SEAT TO BULB-TOP LINE AS DETERMINED BY A RING GAUGE OF 0.600" INTERNAL DIAMETER.

** APPLIES IN ZONE STARTING 0.375" FROM BASE SEAT.

6EW7

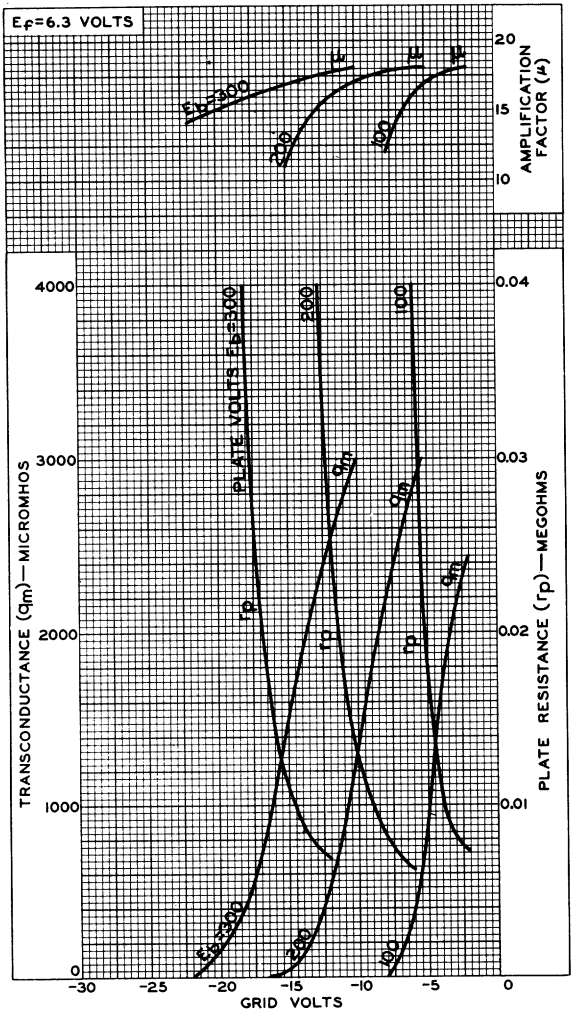
AVERAGE PLATE CHARACTERISTICS
Unit No.1



92CM-9988

RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.

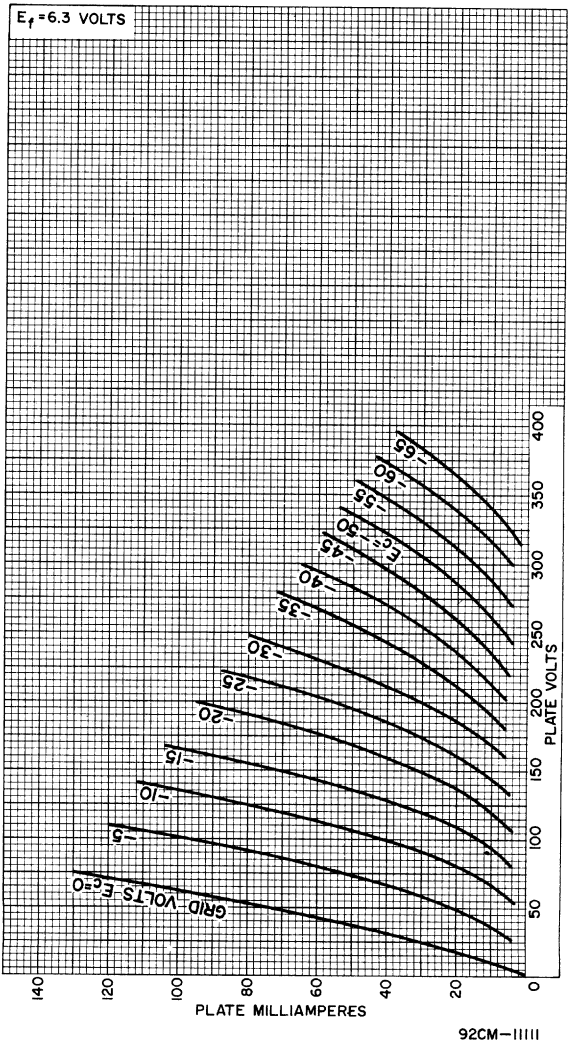
AVERAGE CHARACTERISTICS
Unit No.1



92CM-9991

6EW7

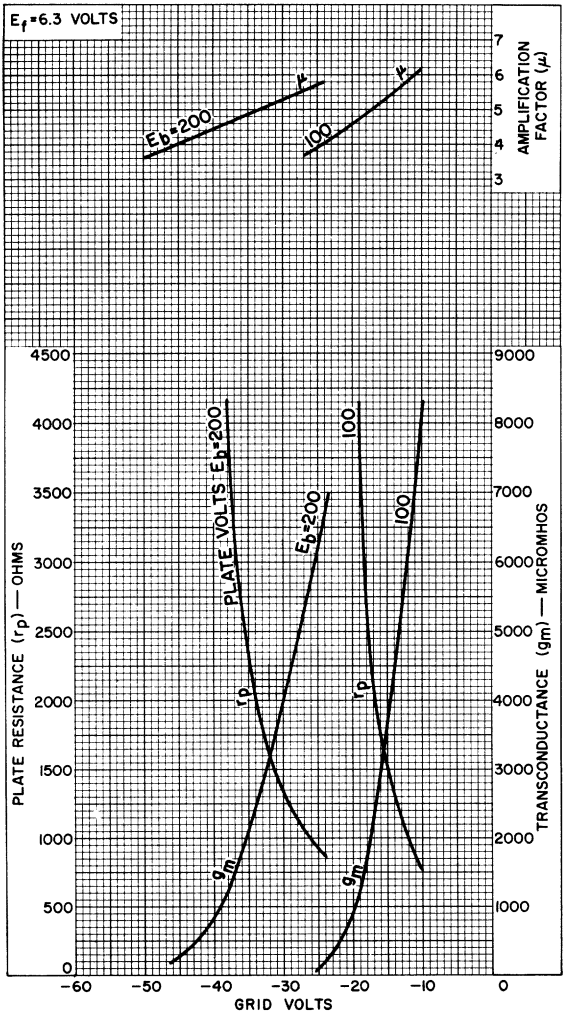
AVERAGE PLATE CHARACTERISTICS
Unit No.2



92CM—11111

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

AVERAGE CHARACTERISTICS
Unit No.2



92CM-11113

High-Mu Triple Triode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.45	amp

Direct Interelectrode Capacitances (Approx.):

	Without External Shield	*With External Shield*[a]	
Grid to plate (Each Unit)	1.5	1.5	μμf
Grid of unit No.1 to cathode of unit No.1 & cathode of unit No.2, and heater	2.4	2.6	μμf
Grid of unit No.2 to cathode of unit No.2 & cathode of unit No.1, and heater	2.4	2.6	μμf
Grid of unit No.3 to cathode of unit No.3 and heater	2.4	2.6	μμf
Plate of unit No.1 to cathode of unit No.1 & cathode of unit No.2, and heater	0.21	1.4	μμf
Plate of unit No.2 to cathode of unit No.2 & cathode of unit No.1, and heater	0.4	1.2	μμf
Plate of unit No.3 to cathode of unit No.3 and heater	0.36	1.2	μμf
Heater of unit No.3 to cathode of unit No.3	0.17	0.15[b]	μμf

Characteristics, Class A_1 Amplifier (Each Unit):

Plate Voltage	125	volts
Grid Voltage	-1	volt
Amplification Factor	57	
Plate Resistance (Approx.)	13600	ohms
Transconductance	4200	μmhos
Plate Current	4.2	ma
Grid Voltage (Approx.) for plate μa = 20	-4	volts

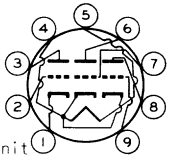
Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

6EZ8

Basing Designation for BOTTOM VIEW. 9KA

Pin 1 - Cathode of Unit No.3
Pin 2 - Grid of Unit No.3
Pin 3 - Plate of Unit No.3
Pin 4 - Cathode of Unit No.2, Cathode of Unit No.1, Heater



Pin 5 - Heater
Pin 6 - Plate of Unit No.2
Pin 7 - Grid of Unit No.2
Pin 8 - Plate of Unit No.1
Pin 9 - Grid of Unit No.1

AMPLIFIER — Class A_1

Unless Otherwise Specified, Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330 max.	volts
GRID VOLTAGE:		
Negative-bias value	50 max.	volts
Positive-bias value	0 max.	volts
PLATE DISSIPATION	2 max.	watts
TOTAL PLATE DISSIPATION (ALL PLATES)	5 max.	watts
HEATER-CATHODE VOLTAGE (Unit No.3):		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

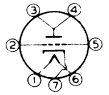
[a] With external shield JEDEC No.315 connected to cathode of unit under test except as noted.

[b] With external shield JEDEC No.315 connected to ground.

6F4
OSCILLATOR TRIODE
ACORN TYPE

For use at frequencies up to 1200 Mc approx.

Heater	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.225	amp.
Direct Interelectrode Capacitances:○		
Grid to Plate	1.9	μμf
Grid to Cathode & Heater	2.0	μμf
Plate to Cathode & Heater	0.6	μμf
Overall Length		1-7/32" ± 5/32"
Overall Diameter (including radial pins)		1-3/32" ± 1/16"
Bulb	*See Outline in General Section*	T-4½
Base	*See Outline in General Section*	Small Radial 7-Pin
Pin 1 - Heater		Pin 5 - Grid
Pin 2 - Grid		Pin 6 - Heater
Pin 3 - Plate		Pin 7 - Cathode
Pin 4 - Plate		
Mounting Position		Any



BOTTOM VIEW (7BR)

Maximum Ratings Are Design-Center Values

A-F AMPLIFIER

Plate Voltage	150 max.	volts
Plate Supply Voltage	300 max.	volts
Plate Current	15 max.	ma.
Plate Dissipation	2 max.	watts
D-C Heater-Cathode Potential	80 max.	volts
Characteristics - Class A_1 Amplifier:		
Plate Voltage	80	volts
Cathode-Bias Resistor□	150	ohms
Amplification Factor	17	
Plate Resistance	2900	ohms
Transconductance	5800	μmhos
Plate Current	13	ma.

R-F POWER AMPLIFIER & OSCILLATOR - Class C Telegraphy

D-C Plate Voltage	150 max.	volts
D-C Plate Supply Voltage	300 max.	volts
D-C Grid Voltage	-50 max.	volts
D-C Plate Current	20 max.	ma.
D-C Grid Current	8 max.	ma.
Plate Dissipation	2 max.	watts
D-C Heater-Cathode Potential	80 max.	volts
Typical Operation at Moderate Frequencies:●		
D-C Plate Voltage	150	volts
D-C Grid Voltage♦	-15	volts
	550	ohms
	2000	ohms
D-C Plate Current	20	ma.
D-C Grid Current (Approx.)⊙	7.5	ma.
Driving Power (Approx.)⊙	0.2	watt
Power Output (Approx.)	1.8	watts

○, □, ●, ♦, ⊙: See next page.

6F4

OSCILLATOR TRIODE

(continued from preceding page)

○ With no external shield.

□ Fixed-bias operation is not recommended. Under maximum rated conditions, the d-c resistance in the grid circuit should not exceed 0.5 megohm.

● Approximately 45 milliwatts can be obtained when the 6F4 is used at 1200 megacycles as an oscillator with 100 volts on plate, maximum rated plate dissipation, and grid resistor of 2000 ohms.

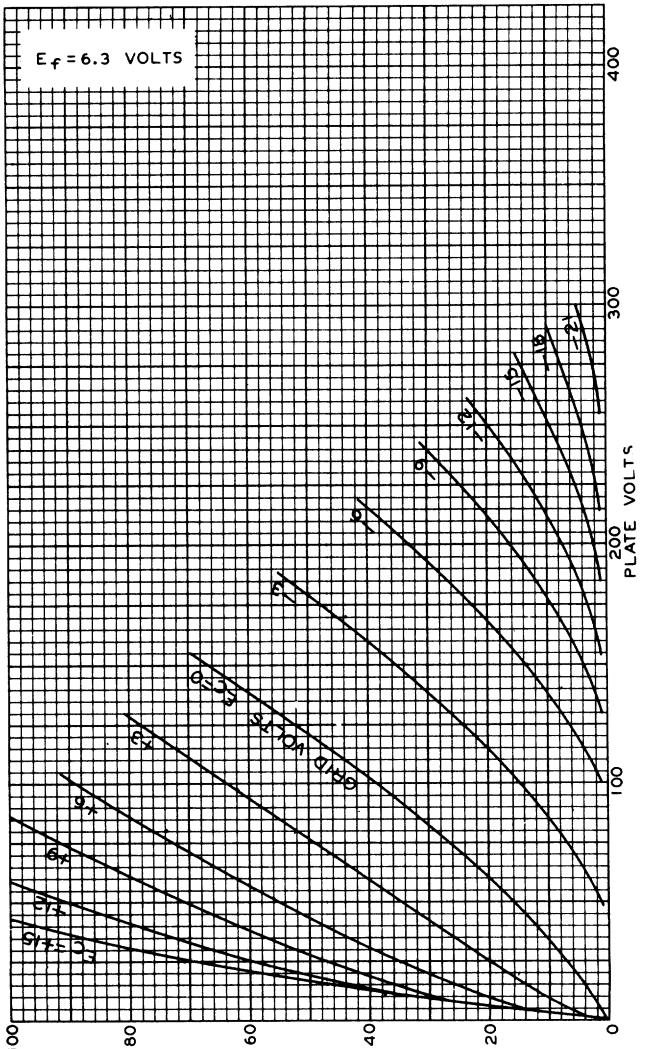
◆ Obtained from fixed supply, or by cathode resistor (550), grid resistor (2000), or partial self-bias methods.

⊙ Subject to wide variations as explained under TUBE RATINGS in General Section.

The *socket* for the 6F4 should be electrically and mechanically compact, and be made with an insulating material having a loss factor not exceeding 0.035 to permit operation of the 6F4 at high frequencies. For most satisfactory performance of the 6F4, it is essential that the inductance of connections between tube and circuit be kept as low as possible.

6F4

AVERAGE PLATE CHARACTERISTICS

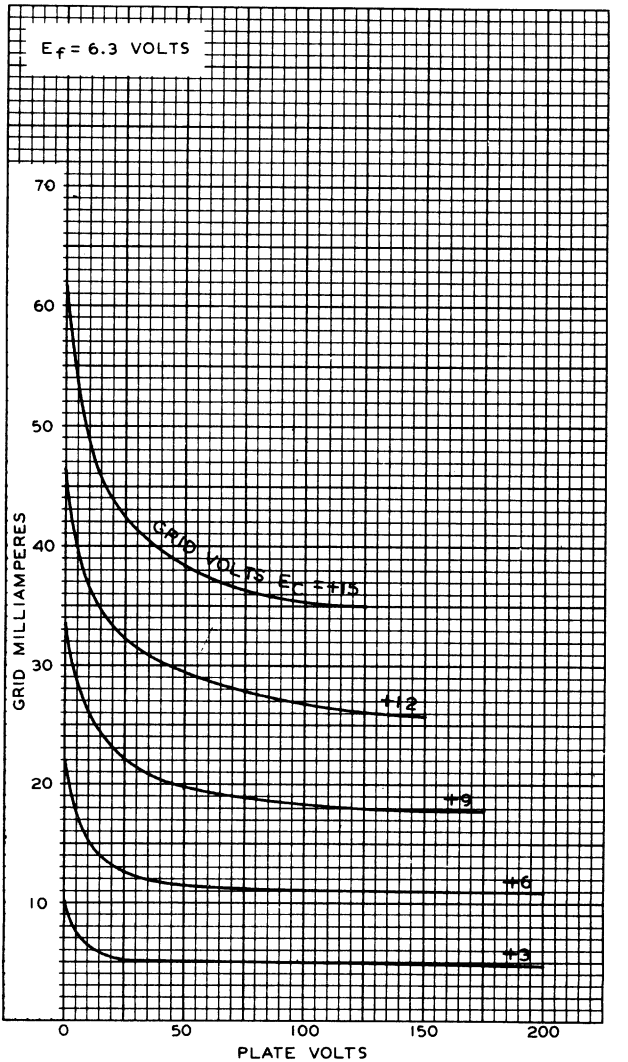


JULY 12, 1944 RCA VICTOR DIVISION 92CM-6567
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6F4

6F4

TYPICAL CHARACTERISTICS



Diode—Sharp-Cutoff Twin-Plate Tetrode

9-PIN MINIATURE TYPE

For Frequency-Divider and Complex-Wave-Generator Circuits of Electronic Musical Instruments

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.3	amp
Direct Interelectrode Capacitances:▲		
Tetrode Unit:		
Grid No.1 to plate A	0.04	μμf
Grid No.1 to plate B	0.03 max.	μμf
Grid No.1 to cathode & internal shield, grid No.2, and heater	5.5	μμf
Plate A to cathode & internal shield, grid No.2, and heater	1.8	μμf
Plate B to cathode & internal shield, grid No.2, and heater	1.8	μμf
Tetrode grid No.1 to diode plate	0.022	μμf
Tetrode plate A to diode plate	0.02 max.	μμf
Tetrode plate B to diode plate	0.055	μμf

Characteristics, Class A_1 Amplifier (Tetrode Unit):

Plates A and B connected together

Plate Voltage	100	volts
Grid-No.2 Voltage	100	volts
Grid-No.1 Supply Voltage	0	volts
Grid-No.1 Resistor (Bypassed)	2.2	megohms
Plate Resistance (Approx.)	90000	ohms
Transconductance	3200	μmhos
Plate Current	3.8	ma
Grid-No.2 Current	1.7	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	−4	volts

Using either Plate A or B, with plate not in use connected to ground

Plate Voltage	100	volts
Grid-No.2 Voltage	100	volts
Grid-No.1 Supply Voltage	0	volts
Grid-No.1 Resistor (Bypassed)	2.2	megohms
Plate Resistance (Approx.)	130000	ohms
Transconductance	1900	μmhos
Plate Current	2.2	ma
Grid-No.2 Current	3	ma

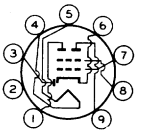
Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"

6FA7

Length, Base Seat to Bulb Top (Excluding tip) . . 2" ± 3/32"
Diameter. . . . . 0.750" to 0.875"
Dimensional Outline . . . . . See *General Section*
Bulb. T6-1/2
Base. . . . . .Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9MR

Pin 1 - Tetrode Plate B
Pin 2 - No Connection
Pin 3 - Diode Plate
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Cathode, Internal Shield
Pin 7 - Tetrode Grid No.1
Pin 8 - Tetrode Grid No.2
Pin 9 - Tetrode Plate A

FREQUENCY-DIVIDER & COMPLEX-WAVE-GENERATOR SERVICE

TETRODE UNIT

Maximum Ratings, *Design-Maximum Values:*

PLATE A VOLTAGE	330	max.	volts
PLATE B VOLTAGE	330	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330	max.	volts
GRID-No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Negative-bias value	50	max.	volts
Positive-bias value	0	max.	volts
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 165 volts	0.65	max.	watt
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
PLATE A DISSIPATION	1.5	max.	watts
PLATE B DISSIPATION	1.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200●	max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For grid-No.1-resistor-bias operation	2.2	max.	megohms

DIODE UNIT

Maximum Ratings, *Design-Maximum Values:*

PLATE CURRENT	1	max.	ma

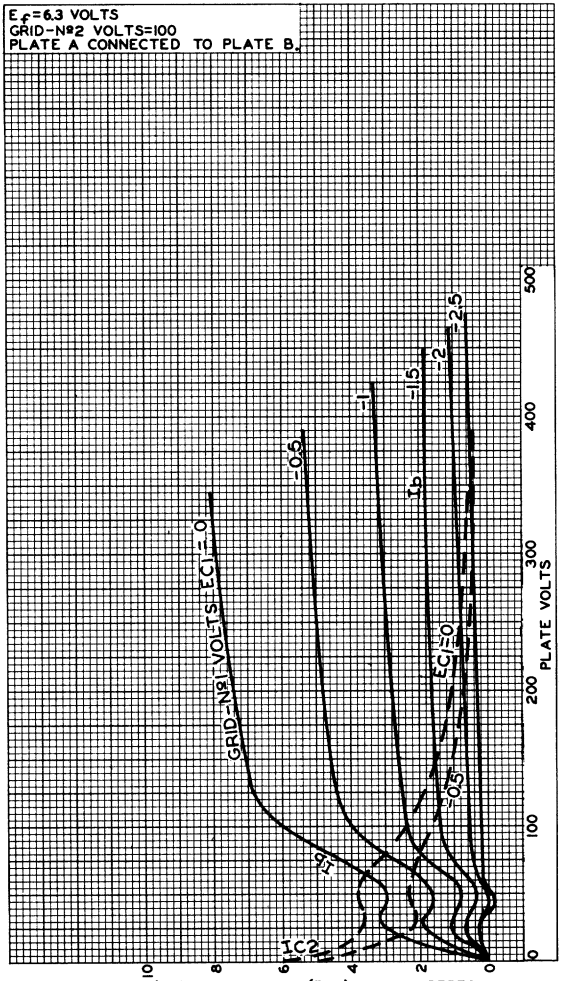
Characteristics, Instantaneous Test Condition:

Plate Current for plate volts = 10. . . .	2	ma

▲ Without external shield.

● The dc component must not exceed 100 volts.

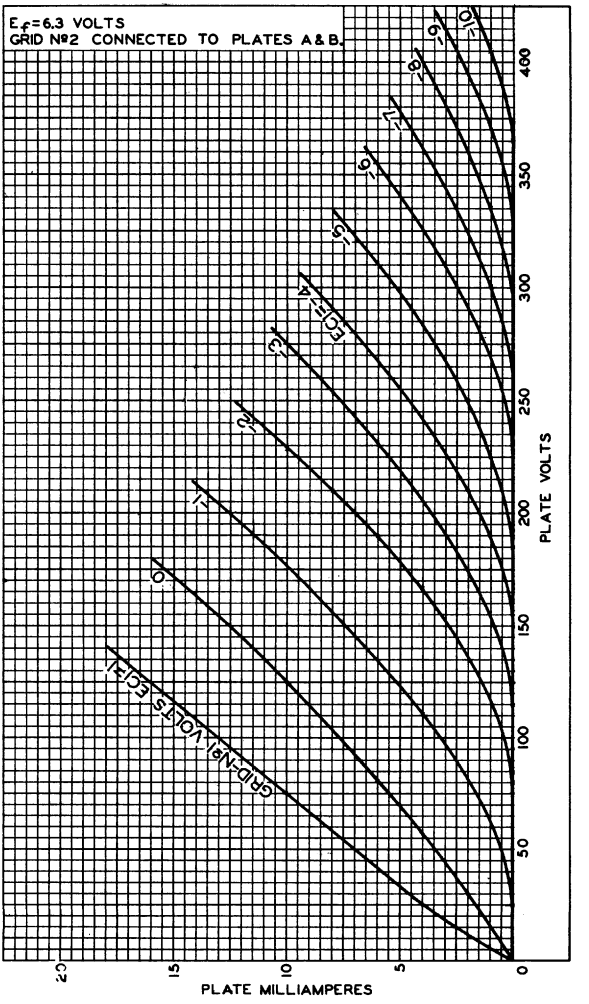
AVERAGE CHARACTERISTICS
Tetrode Unit



92CM-10693

6FA7

AVERAGE PLATE CHARACTERISTICS
Tetrode Unit—Triode Connection



92CM-10695

6FD7

Dual Triode

With High-Mu Unit and Low-Mu Unit

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values)*:			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	0.925		amp
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts

Direct Interelectrode Capacitances (Approx.):[b]

	Unit No.1	*Unit No.2*	
Grid to plate	4.5	10	μμf
Grid to cathode and heater	2.2	6.5	μμf
Plate to cathode and heater	0.4	1.2	μμf

Characteristics, Class A_1 Amplifier:

	Unit No.1	*Unit No.2*		
Plate Voltage	250	60	150	volts
Grid Voltage	-3	0	-17.5	volts
Amplification Factor	64	–	6	
Plate Resistance (Approx.)	40000	–	800	ohms
Transconductance	1600	–	7500	μmhos
Plate Current	1.4	95[c]	40	ma
Grid Voltage (Approx.) for plate μa =,				
10	-5.5	–	–	volts
100	–	–	-40	volts
Transconductance for plate ma. = 1	–	–	500	μmhos
Plate Current for grid volts = -25	–	–	6	ma

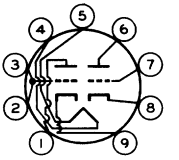
Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2.900"
Maximum Seated Length	2.620"
Length, Base Seat to Bulb Top (Excluding tip)	2.070" to 2.310"
Diameter	1.062" to 1.188"
Bulb	T9
Base	JEDEC No.E9-82

6FD7

Basing Designation for BOTTOM VIEW. 9HF

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Grid of Unit No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Cathode of Unit No.2

VERTICAL-DEFLECTION OSCILLATOR

Values are for Unit No.1

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[d]

DC PLATE VOLTAGE	330 max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	400 max.	volts
CATHODE CURRENT:		
Peak	70 max.	ma
Average	20 max.	ma
PLATE DISSIPATION	1.5 max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For grid-resistor-bias or cathode-bias operation	2.2 max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Values are for Unit No.2

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[d]

DC PLATE VOLTAGE	330 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[e]	1500 max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250 max.	volts
CATHODE CURRENT:		
Peak	175 max.	ma
Average	50 max.	ma
PLATE DISSIPATION	10 max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For grid-resistor-bias or cathode-bias operation	2.2 max.	megohms

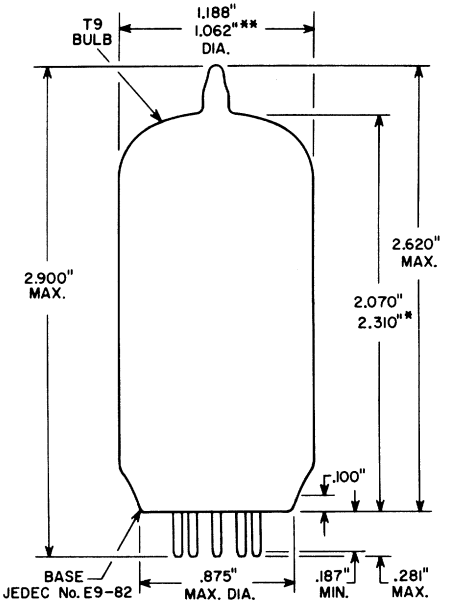
[a] The dc component must not exceed 100 volts.

[b] Without external shield.

[c] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded

[d] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[e] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.



** APPLIES IN ZONE STARTING 0.625" FROM BASE SEAT.

* MEASURED FROM BASE SEAT TO BULB-TOP LINE AS DETERMINED BY A RING GAUGE OF 0.600" INSIDE DIAMETER.

▲ BASE-PIN CONTOUR AND GAUGE (JEDEC No. GE9-4) INFORMATION FOR THIS BASE IS THE SAME AS THAT SHOWN IN GENERAL SECTION FOR BASE JEDEC No. E9-68 (LARGE-BUTTON NEONOVAL 9-PIN).

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values)*:

Voltage (AC or DC) . . .	6.3[a]	6.3 ± 0.6	volts
Current.	0.450 ± 0.030	0.450[b]	amp
Warm-up time (Average) .	11	-	sec
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode .	200 max.		volts
Heater positive with respect to cathode .	200[c] max.		volts

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*[d]	
Triode Unit:			
Grid to plate.	1.8	1.8	μμf
Grid to cathode & pentode grid No.3, and heater. . .	3	3	μμf
Plate to cathode & pentode grid No.3, and heater. . .	1.3	1.9	μμf
Pentode Unit:			
Grid No.1 to plate	0.02 max.	0.01 max.	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	5	5	μμf
Plate to cathode & grid No.3, grid No.2, and heater	2.4	3.4	μμf
Heater to cathode & pentode grid No.3.	6	6[e]	μμf

Characteristics, Class A_1 Amplifier:

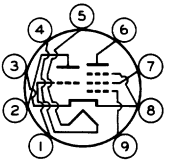
	Triode Unit	*Pentode Unit*		
Plate Voltage.	125	100	125	volts
Grid-No.2 Voltage.	-	100	125	volts
Grid-No.1 Voltage.	-1	0	-1	volts
Amplification Factor	43	-	-	
Plate Resistance (Approx.) . .	5700	-	180000	ohms
Transconductance	7500	7400	6000	μmhos
Plate Current.	13	-	11	ma
Grid-No.2 Current.	-	-	4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 30.	-6.5	-	-7.5	volts

6FG7

Mechanical:

Operating Position. . . . . Any
Type of Cathode . . . . . Coated Unipotential
Maximum Overall Length. . . . . 2-3/16"
Maximum Seated Length . . . . . 1-15/16"
Length, Base Seat to Bulb Top (Excluding tip) . 1-9/16" ± 3/32"
Diameter. . . . . 0.750" to 0.875"
Dimensional Outline . . . . . See *General Section*
Bulb. T6-1/2
Base. . . . . Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9GF

Pin 1 – Triode Grid
Pin 2 – Triode Plate
Pin 3 – Cathode
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Plate



Pin 7 – Pentode Grid No.2
Pin 8 – Cathode, Pentode Grid No.3
Pin 9 – Pentode Grid No.1

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	330 max.	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE.	–	330 max.	volts
GRID-No.2 VOLTAGE	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts	–	0.55 max.	watt
For grid-No.2 voltages between 165 and 330 volts .	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	2.5 max.	3 max.	watts

[a] At heater amperes = 0.450.
[b] At heater volts = 6.3.
[c] The dc component must not exceed 100 volts.
[d] With external shield JEDEC No.315 connected to cathode except as noted.
[e] With external shield JEDEC No.315 connected to ground.

6FH5

High-Mu Triode

7-PIN MINIATURE TYPE
For VHF Tuner and Amplifier Applications

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.2	amp
Direct Interelectrode Capacitances:		

	Without External Shield	*With External Shield*[o]	
Grid to plate	0.6 max.	0.6 max.	μμf
Grid to cathode, internal shield, and heater	3.2	3.2	μμf
Plate to cathode, internal shield, and heater	3.2	4	μμf

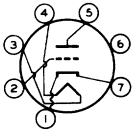
Characteristics, Class A_1 Amplifier:

Plate Voltage	135	volts
Grid Voltage	−1	volt
Amplification Factor	50	
Plate Resistance (Approx.)	5600	ohms
Transconductance	9000	μmhos
Plate Current	11	ma
Grid Voltage (Approx.) for plate μa = 100	−5.5	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7FP

Pin 1 – Cathode
Pin 2 – Grid
Pin 3 – Heater
Pin 4 – Heater



Pin 5 – Plate
Pin 6 – Internal Shield
Pin 7 – Cathode

AMPLIFIER — Class A$_1$

Maximum Ratings, *Design-Maximum Values:*

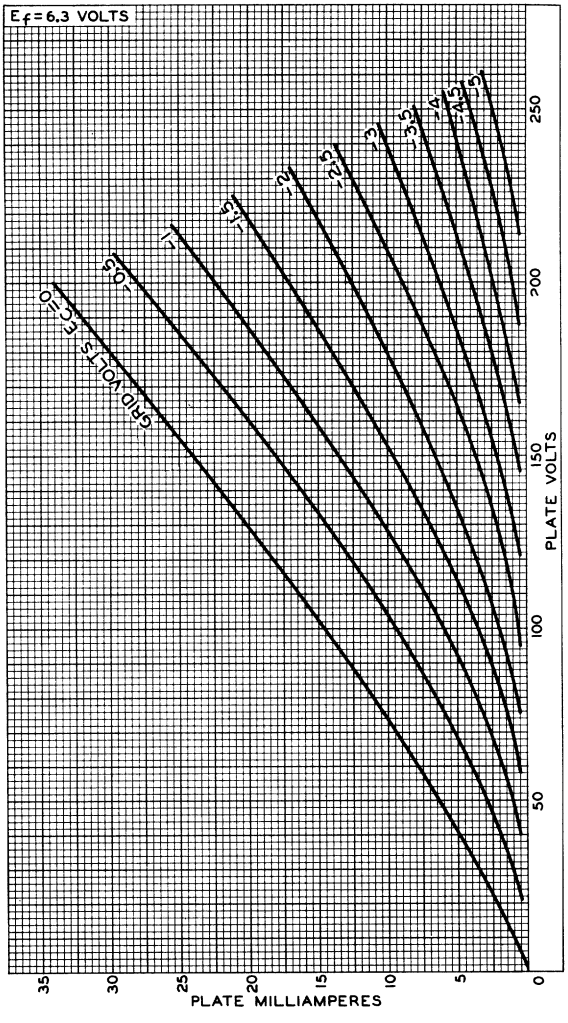
PLATE VOLTAGE	150 max.	volts
GRID VOLTAGE:		
Positive-bias value	0 max.	volts
CATHODE CURRENT	22 max.	ma
PLATE DISSIPATION	2.2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For cathode-bias operation	1 max.	megohm

[o] With external shield JEDEC No.316 connected to cathode.

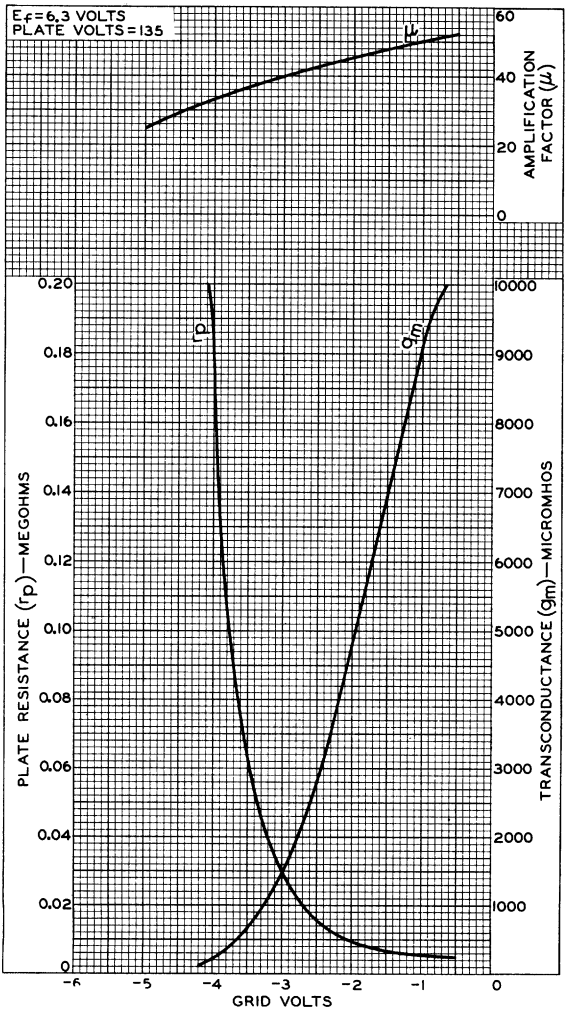
AVERAGE PLATE CHARACTERISTICS



92CM-10355R1

6FH5

AVERAGE CHARACTERISTICS



92CM-10354RI

6FH8

MEDIUM-MU TRIODE— THREE-PLATE TETRODE

9-PIN MINIATURE TYPE

For harmonic-generator applications

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current	0.45	amp
Direct Interelectrode Capacitances:[o]		
Triode Unit:		
Grid to plate	1.4	μμf
Grid to cathode & heater	2.6	μμf
Plate to cathode & heater	1	μμf
Tetrode Unit:		
Grid No.1 to plate No.1	0.06 max.	μμf
Grid No.1 to cathode & heater, plate No.3, plate No.2, and grid No.2	4.5	μμf
Plate No.1 to cathode & heater, plate No.3, plate No.2, and grid No.2	1.4	μμf
Tetrode grid No.1 to triode plate	0.35 max.	μμf
Tetrode plate No.1 to triode plate	0.008 max.	μμf

Characteristics, Class A_1 Amplifier:

Triode Unit		
Plate Voltage	100	volts
Grid Voltage	-1	volt
Amplification Factor	40	
Plate Resistance (Approx.)	7400	ohms
Transconductance	5400	μmhos
Plate Current	7.9	ma
Grid Voltage (Approx.) for plate μa = 100	-7	volts
Tetrode Unit with plates No.2 and No.3 connected to cathode		
Plate-No.1 Voltage	250	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 Voltage	-2	volts
Plate-No.1 Resistance (Approx.)	0.75	megohm
Transconductance, Grid No.1 to Plate No.1	4400	μmhos
Plate-No.1 Current	7.3	ma
Grid-No.2 Current	1.4	ma
Grid-No.1 Voltage (Approx.) for plate-No.1 μa = 100	-7	volts

[o] With external shield JEDEC No.315 connected to cathode.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6FH8

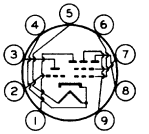
6FH8

MEDIUM-MU TRIODE— THREE-PLATE TETRODE

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9KP

Pin 1 – Tetrode Plate No.3
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater, Cathode
Pin 5 – Heater



Pin 6 – Tetrode Grid No.1
Pin 7 – Tetrode Grid No.2
Pin 8 – Tetrode Plate No.2
Pin 9 – Tetrode Plate No.1

HARMONIC-GENERATOR SERVICE

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit	*Tetrode Unit*	
PLATE VOLTAGE	275 max.	–	volts
PLATE-No.1 VOLTAGE	–	275 max.	volts
PLATE-No.2 VOLTAGE	–	200 max.	volts
PLATE-No.3 VOLTAGE	–	200 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	–	275 max.	volts
GRID-No.2 VOLTAGE	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Negative-bias value	40 max.	40 max.	volts
Positive-bias value	0 max.	0 max.	volts
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 137.5 volts	–	0.45 max.	watt
For grid-No.2 voltages between 137.5 and 275 volts	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	1.7 max.	–	watts
PLATE-No.1 DISSIPATION	–	2.3 max.	watts
PLATE-No.2 DISSIPATION	–	0.3 max.	watt
PLATE-No.3 DISSIPATION	–	0.3 max.	watt

6FH8

MEDIUM-MU TRIODE—THREE-PLATE TETRODE

Typical Operation:

Tetrode Unit with separate plate operation

Plates–No.1, No.2, and No.3 Voltage	100	volts
Grid–No.2 Voltage	50	volts
Grid–No.1 Voltage	−1	volt
Plate–No.1 Current	1.6	ma
Plate–No.2 Current	0.04	ma
Plate–No.3 Current	0.04	ma
Grid–No.2 Current	0.3	ma
Transconductance (Approx.):		
Grid No.1 to plate No.1	2500	μmhos
Grid No.1 to plate No.2	70	μmhos
Grid No.1 to plate No.3	70	μmhos

Maximum Circuit Values:

	Triode Unit	*Tetrode Unit*	
Grid–No.1–Circuit Resistance: For fixed-bias operation	0.5 max.	0.5 max.	megohm

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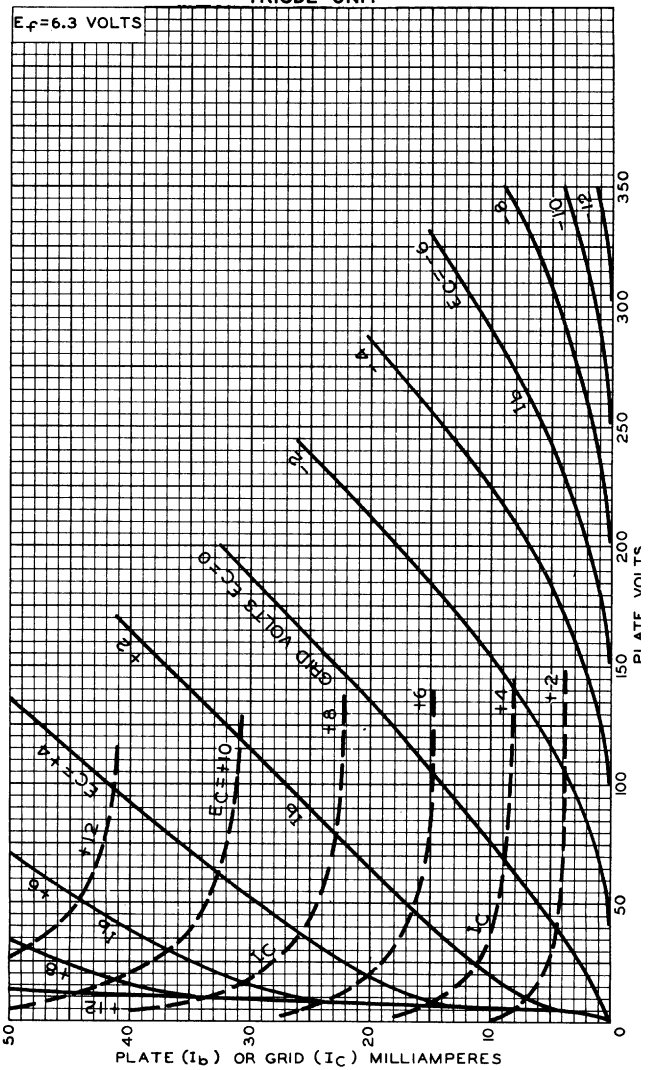
6FH8

AVERAGE CHARACTERISTICS

TRIODE UNIT



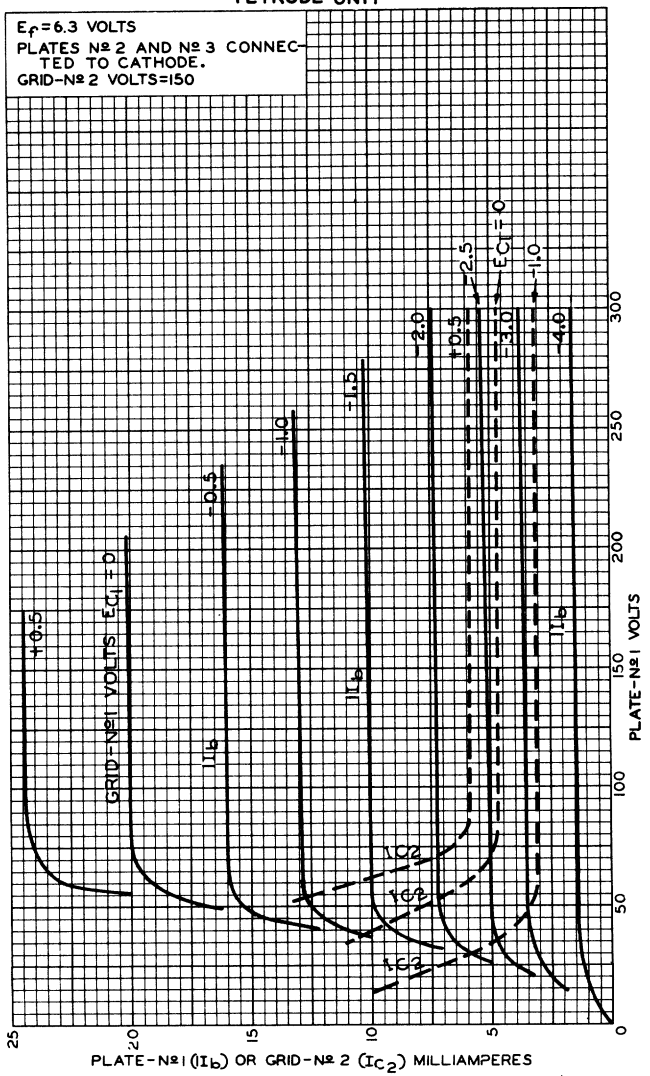
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10220

6FH8

AVERAGE CHARACTERISTICS

TETRODE UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-10221

Medium-Mu Dual Triode

DUODECAR TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values)*:

Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	0.900		amp
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts

Direct Interelectrode Capacitances (Approx.):[b]

	Unit No.1	*Unit No.2*	
Grid to plate	3.8	5.0	pf
Grid to cathode and heater	2.2	4.0	pf
Plate to cathode and heater	0.48	0.54	pf

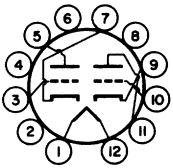
Characteristics, Class A1 Amplifier:

	Unit No.1	*Unit No.2*		
Plate Voltage	250	150	250	volts
Grid Voltage	-8	0	-9.5	volts
Amplification Factor	22.5	-	15.4	
Plate Resistance (Approx.)	9000	-	2000	ohms
Transconductance	2500	-	7700	μmhos
Plate Current	8	68[c]	41	ma
Grid Voltage (Approx.) for plate μa = 10	-18	-	-	volts
Grid Voltage (Approx.) for plate μa = 50	-	-	-23	volts

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2.375"
Seated Length	1.750" to 2.000"
Diameter	1.062" to 1.188"
Bulb	T9
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW	12BM

Pin 1 - Heater
Pin 2 - No Internal Connection
Pin 3 - Grid of Unit No.2
Pin 4 - Same as Pin 2
Pin 5 - Plate of Unit No.2
Pin 6 - Do Not Use
Pin 7 - Cathode of Unit No.2



Pin 8 - Same as Pin 2
Pin 9 - Cathode of Unit No.1
Pin 10 - Grid of Unit No.1
Pin 11 - Plate of Unit No.1
Pin 12 - Heater

VERTICAL-DEFLECTION OSCILLATOR

Values are for Unit No.1

Maximum Ratings, *Design-Maximum Values:*

DC PLATE VOLTAGE	350	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	400	max.	volts
PLATE DISSIPATION	1	max.	watt

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias or cathode-bias operation	2.2	max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Values are for Unit No.2

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[d]

DC PLATE VOLTAGE	550	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[e]	2500	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	150	max.	ma
Average	50	max.	ma
PLATE DISSIPATION	10	max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation	2.2	max.	megohms

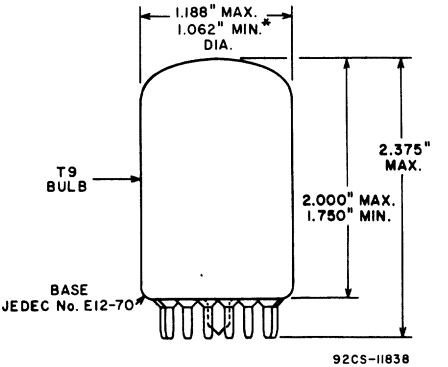
[a] The dc component must not exceed 100 volts.

[b] Without external shield.

[c] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

[d] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[e] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.



* APPLIES TO MINIMUM DIAMETER EXCEPT IN AREA OF SEAL.

6FM7

Dual Triode
With High-Mu Unit and Low-Mu Unit

DUODECAR TYPE

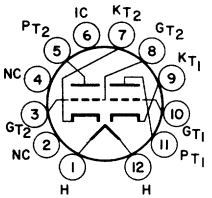
Electrical:

Heater Characteristics and Ratings:			
Voltage (AC or DC)		6.3 ± 0.6	volts
Current at 6.3 volts		1.050	amp
Maximum heater-cathode voltage (Each unit):			
Heater negative with respect to cathode:			
Peak		200	volts
Heater positive with respect to cathode:			
Peak		200	volts
DC component		100	volts
Direct Interelectrode Capacitances (Approx.):[a]	*Unit No.1*	*Unit No.2*	
Grid to plate	4.0	7.0	pf
Input: G to (K, H)	2.4	7.0	pf
Output: P to (K, H)	0.4	1.1	pf

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2.375"
Seated Length	1.750" to 2.000"
Diameter	1.062" to 1.188"
Dimensional Outline (JEDEC 9-58)	See *General Section*
Bulb	T9
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW	12EJ

Pin 1 - Heater
Pin 2 - No Internal Connection
Pin 3 - Grid of Unit No.2
Pin 4 - No Internal Connection
Pin 5 - Plate of Unit No.2
Pin 6 - Do Not Use
Pin 7 - Cathode of Unit No.2
Pin 8 - Grid of Unit No.2
Pin 9 - Cathode of Unit No.1
Pin 10 - Grid of Unit No.1
Pin 11 - Plate of Unit No.1
Pin 12 - Heater



Characteristics, Class A$_1$ Amplifier:

	Unit No.1	*Unit No.2*		
Plate Voltage	250	60	175	volts
Grid Voltage	-3	0[b]	-25	volts
Amplification Factor	66	-	5.5	
Plate Resistance (Approx.)	30000	-	920	ohms
Transconductance	2200	-	6000	μmhos
Plate Current	2	95	40	ma
Grid-Voltage (Approx.) for plate:				
μa = 20	-5.3	-	-	volts
μa = 200	-	-	-45	volts

VERTICAL DEFLECTION OSCILLATOR AND AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system

	Unit No.1 (Oscillator)	*Unit No.2 (Amplifier)*	
DC Plate Voltage	350	550	volts
Peak Positive-Pulse Plate Voltage	–	1500[c]	volts
Peak Negative Pulse-Grid Voltage	400	250	volts
Cathode Current:			
Peak	–	175	ma
Average	–	50	ma
Plate Dissipation	1	10[d]	watts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation	1	1	megohm
For cathode-bias operation	2.2	2.2	megohms

[a] Without external shield.

[b] Applied for short interval (2 seconds maximum) so as not to damage tube.

[c] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

[d] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

Twin Diode—High-Mu Triode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

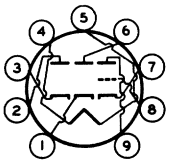
Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.45	amp
Direct Interelectrode Capacitances (Approx.):[a]		
Triode Unit:		
Grid to plate	1.8	μμf
Grid to cathode and heater	1.5	μμf
Plate to cathode and heater	0.16	μμf
Diode Units:		
Diode-No.1 plate to triode grid	0.05	μμf
Diode-No.2 plate to triode grid	0.04	μμf
Diode-No.1 cathode to all other tube electrodes	4.6	μμf
Diode-No.2 cathode to all other tube electrodes	4.8	μμf
Diode-No.1 plate to cathode and heater	2.4	μμf
Diode-No.2 plate to cathode and heater	2.2	μμf

Characteristics, Class A_1 Amplifier (Triode Unit):

Plate Voltage	250	volts
Grid Voltage	-3	volts
Amplification Factor	70	
Plate Resistance (Approx.)	58000	ohms
Transconductance	1200	μmhos
Plate Current	1	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9KR



Pin 1 - Diode-No.2 Cathode
Pin 2 - Diode-No.1 Plate
Pin 3 - Diode-No.1 Cathode
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Diode-No.2 Plate
Pin 7 - Triode Cathode
Pin 8 - Triode Grid
Pin 9 - Triode Plate

TRIODE UNIT — AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
GRID VOLTAGE:			
Positive-bias value	0	max.	volts
PLATE DISSIPATION	1.1	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts

DIODE UNITS — Two

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE CURRENT	5	max.	ma
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts

Characteristics, Instantaneous Test Condition:

Plate Current for plate volts = 5	20	ma

[a] Without external shield.
[b] The dc component must not exceed 100 volts.

6FQ5A

High-Mu Triode

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

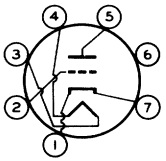
Heater Characteristics and Ratings *(Design-Maximum Values)*:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.180	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances (Approx.):[a]		
Grid to plate	0.52	μμf
Grid to cathode, internal shield, and heater	5.0	μμf
Plate to cathode, internal shield, and heater	3.5	μμf
Heater to cathode	2.5[b]	μμf

Characteristics, Class A_1 Amplifier:

Plate Voltage	135	volts
Grid Voltage	-1.2	volts
Amplification Factor	74	
Plate Resistance (Approx.)	6300	ohms
Transconductance	12000	μmhos
Plate Current	8.9	ma
Grid Voltage (Approx.) for plate μa = 100	-4.5	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7FP



Pin 1 – Cathode
Pin 2 – Grid
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Internal Shield
Pin 7 – Cathode

6FQ5A

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	200 max.	volts
GRID VOLTAGE:		
Negative-bias value	50 max.	volts
CATHODE CURRENT	22 max.	ma
PLATE DISSIPATION	2.5 max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For cathode-bias operation	1 max.	megohm

[a] With external shield JEDEC No.316 connected to cathode except as noted.
[b] With external shield JEDEC No.316 connected to ground.

CURVES
shown under Type 6GK5 also apply to the 6FQ5A

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Voltage (AC or DC)	6.3		volts
Current	0.6 ± 6%		amp
Warm-up time (Average)	11		sec
Direct Interelectrode Capacitances (Approx.):[a]			
	Unit No.1	*Unit No.2*	
Grid to plate	3.6	3.8	μμf
Grid to cathode and heater	2.4	2.4	μμf
Plate to cathode and heater	0.34	0.26	μμf
Plate of unit No.1 to plate of unit No.2	1		μμf

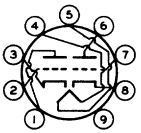
Characteristics, Class A_1 Amplifier (Each Unit):

Plate Voltage	90	250	volts
Grid Voltage	0	-8	volts
Amplification Factor	20	20	
Plate Resistance (Approx.)	6700	7700	ohms
Transconductance	3000	2600	μmhos
Plate Current	10	9	ma
Plate Current for grid volts = -12.5	-	1.3	ma
Grid Voltage (Approx.) for plate μa = 10	-7	-18	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9LP

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - No Connection

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
GRID VOLTAGE:			
Positive-bias value	0	max.	volts
CATHODE CURRENT	22	max.	ma
PLATE DISSIPATION:			
Either plate	4	max.	watts
Both plates (Both units operating)	5.7	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts

Typical Operation as Resistance-Coupled Amplifier:

See *RESISTANCE-COUPLED AMPLIFIER CHART No.29* at front of this Section

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation	1	max.	megohm

HORIZONTAL-DEFLECTION OSCILLATOR

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[c]

DC PLATE VOLTAGE	330	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	660	max.	volts
CATHODE CURRENT:			
Peak	330	max.	ma
Average	22	max.	ma
PLATE DISSIPATION:			
Either plate	4	max.	watts
Both plates (Both units operating)	5.7	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	2.2	max.	megohms

VERTICAL-DEFLECTION OSCILLATOR

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[c]

DC PLATE VOLTAGE	330	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	440	max.	volts
CATHODE CURRENT:			
Peak	77	max.	ma
Average	22	max.	ma

PLATE DISSIPATION:			
Either plate	4	max.	watts
Both plates (Both units operating)	5.7	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	2.2	max.	megohms

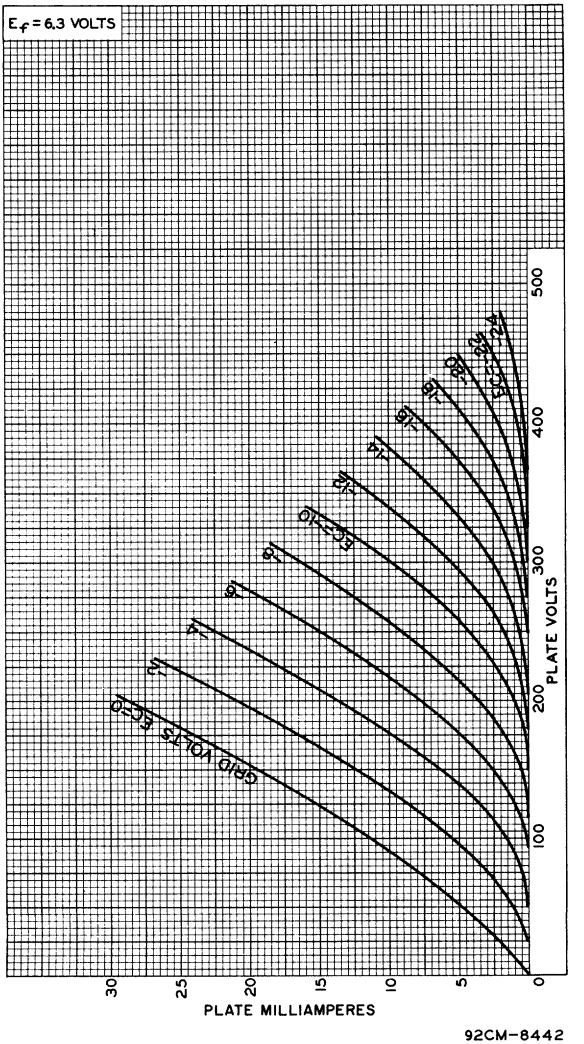
[a] Without external shield.

[b] The dc component must not exceed 100 volts.

[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

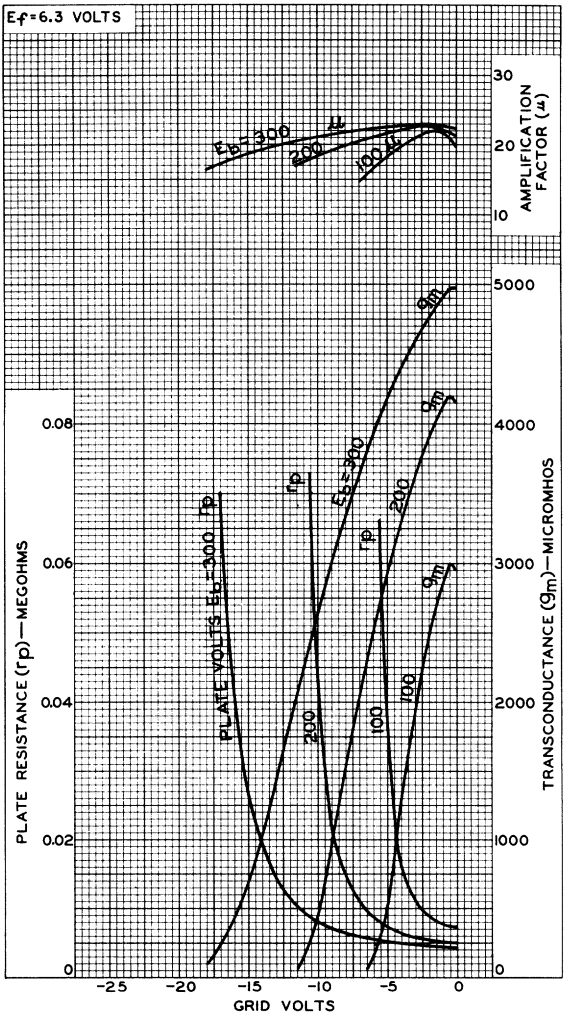
6FQ7

AVERAGE PLATE CHARACTERISTICS
Each Unit



92CM-8442

AVERAGE CHARACTERISTICS
Each Unit



92CM-8441RI

6FS5

Beam Hexode

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values)*:

Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.200	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts

Direct Interelectrode Capacitances (Approx.):

	Without External Shield	*With External Shield*[b]	
Grid No.1 to plate	0.03	0.016	μμf
Grid No.1 to cathode & grid No.4 & grid No.2, grid No.3, and heater	4.8	4.8	μμf
Plate to cathode & grid No.4 & grid No.2, grid No.3, and heater	2	2.8	μμf

Characteristics, Class A_1 Amplifier:

Plate Voltage	275	volts
Grid-No.3 Voltage	135	volts
Grid-No.1 Voltage	-0.2	volt
Plate Resistance (Approx.)	0.24	megohm
Transconductance	10000	μmhos
Plate Current	9	ma
Grid-No.3 Current	0.17	ma
Grid-No.1 Voltage (Approx.) for transconductance (μmhos) = 100	-5	volts

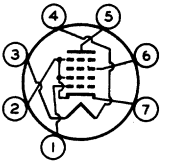
Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)

6FS5

Basing Designation for BOTTOM VIEW. 7GA

Pin 1 – Grid No.1
Pin 2 – Cathode, Grid No.2, Grid No.4
Pin 3 – Heater
Pin 4 – Heater



Pin 5 – Plate
Pin 6 – Grid No.3
Pin 7 – Cathode, Grid No.2, Grid No.4

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	300 max.	volts
GRID-No.3 (SCREEN-GRID) VOLTAGE	150 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	50 max.	volts
Positive-bias value	0 max.	volts
CATHODE CURRENT	20 max.	ma
GRID-No.3 INPUT	0.15 max.	watt
PLATE DISSIPATION	3.25 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation.	0.5 max.	megohm

[a] The dc component must not exceed 100 volts.
[b] With external shield JEDEC No.316 connected to pin 7.

OPERATING CONSIDERATIONS

This type has four grids—grid No.1 (Control grid), grid No.2 (Focusing grid), grid No.3 (Screen grid), and grid No.4 (Suppressor grid). Grid No.2 is (1) internally connected to cathode and grid No.4, (2) aligned with grid No.3, and (3) located between grids No.1 and No.3. The addition of grid No.2 results in an increase in the plate-current-to-screen-current ratio with subsequent noise reduction.

6FV6

SHARP-CUTOFF TETRODE

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

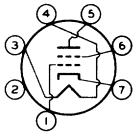
Heater, for Unipotential Cathode:		
Voltage	6.3 ± 10%	ac or dc volts
Current	0.2	amp
Direct Interelectrode Capacitances:[o]		
Grid No.1 to plate	0.03 max.	μμf
Grid No.1 to cathode, grid No.2, internal shield, and heater	4.5	μμf
Plate to cathode, grid No.2, internal shield, and heater	3	μμf
Cathode to heater	2.7[•]	μμf

Characteristics, Class A_1 Amplifier:

Plate Voltage	125	volts
Grid-No.2 (Screen-grid) Voltage	80	volts
Grid-No.1 (Control-grid) Voltage	-1	volt
Plate Resistance (Approx.)	0.1	megohm
Transconductance	8000	μmhos
Plate Current	10	ma
Grid-No.2 Current	1.5	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-6	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7FQ



Pin 1 – Grid No.1
Pin 2 – Internal Shield
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Cathode

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	275 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	180 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

6F V6

SHARP-CUTOFF TETRODE

GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value.	0	max.	volts
CATHODE CURRENT.	20	max.	ma
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 90 volts	0.5	max.	watt
For grid-No.2 voltages between 90 and 180 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
PLATE DISSIPATION.	2	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200*	max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.5	max.	megohm

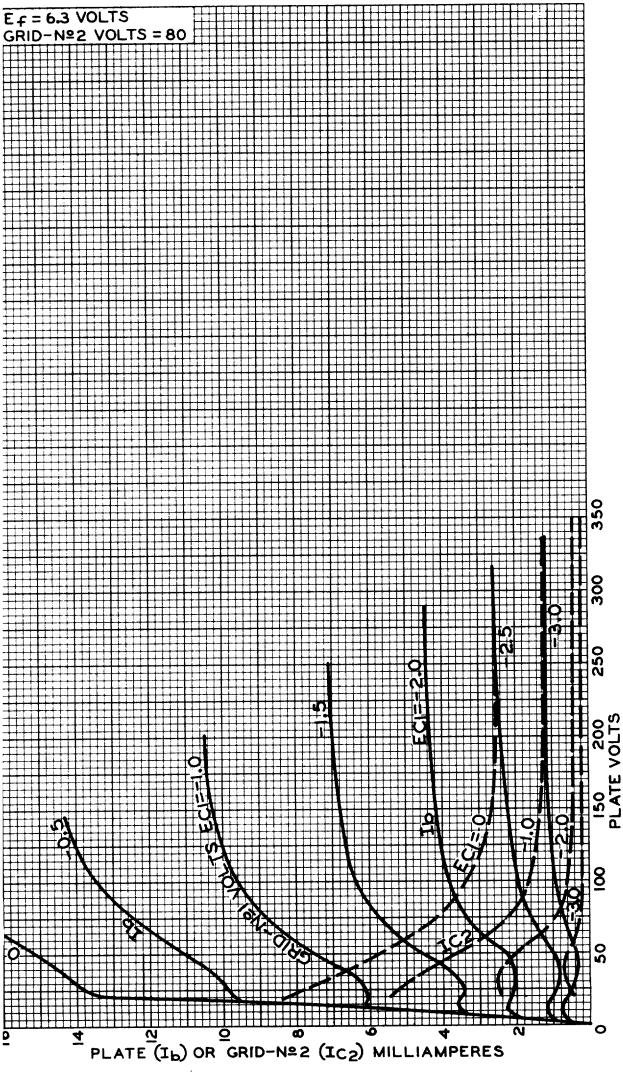
o With external shield JEDEC No.316 connected to cathode except as noted.
● With external shield JEDEC No.316 connected to ground.
* The dc component must not exceed 100 volts.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

6FV6

AVERAGE CHARACTERISTICS

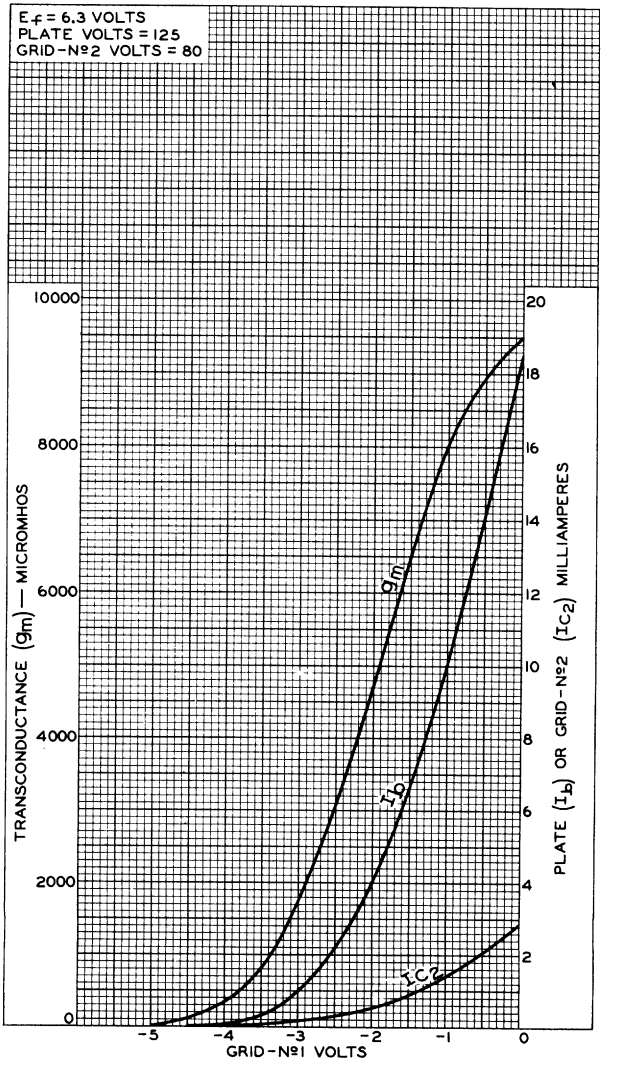


6FV6

RCA

6FV6

AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9519

6FW5

Beam Power Tube

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	1.200		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances (Approx.):[b]			
Grid No.1 to plate	0.5		μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	15.0		μμf
Plate to cathode & grid No.3, grid No.2, and heater	7.0		μμf

Characteristics, Class A_1 Amplifier:

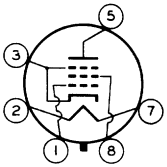
Plate Voltage	60	150	250	volts
Grid-No.2 Voltage	150	150	150	volts
Grid-No.1 Voltage	0	-22.5	-22.5	volts
Amplification Factor	–	4.4	–	
Plate Resistance (Approx.)	–	–	18000	ohms
Transconductance	–	–	7300	μmhos
Plate Current	345[c]	–	65	ma
Grid-No.2 Current	27[c]	–	1.8	ma
Grid-No.1 Voltage (Approx.) for plate ma. = 1	–	–	-42	volts
Grid-No.1 Voltage (Approx.) for peak positive-pulse plate volts = 5000, grid-No.2 volts = 150, and plate ma. = 1	–	–	-100	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3-7/8"
Maximum Seated Length	3-5/16"
Diameter	1.438" to 1.562"
Bulb	T12
Base	Short Medium-Shell Octal 6-Pin with External Barriers, Arrangement 1, Style A, (JEDEC Group 1. No.B6-112)

6FW5

Basing Designation for BOTTOM VIEW. 6CK



Pin 1 – Grid No.1
Pin 2 – Heater
Pin 3 – Cathode, Grid No.3
Pin 5 – Plate
Pin 7 – Heater
Pin 8 – Grid No.2

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[d]

DC PLATE VOLTAGE.	770 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[e]. . .	6500 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE. . .	220 max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 VOLTAGE .	330 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE . .	-55 max.	volts
CATHODE CURRENT:		
Peak.	610 max.	ma
Average	175 max.	ma
GRID-No.2 INPUT	3.6 max.	watts
PLATE DISSIPATION[f].	18 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface).	220 max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance.	1 max.	megohm

[a] The dc component must not exceed 100 volts.

[b] Without external shield.

[c] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

[d] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[e] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[f] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

Dual Triode

With High-Mu Unit and Low-Mu Unit

DUODECAR TYPE

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at 6.3 volts	1.050	amp
Maximum heater-cathode voltage (Each unit):		
Heater negative with respect to cathode:		
Peak	200	volts
Heater positive with respect to cathode:		
Peak	200	volts
DC component	100	volts

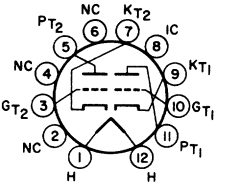
Direct Interelectrode Capacitances (Approx.):[a]

	Unit No.1	*Unit No.2*	
Grid to plate	4.4	9.5	pf
Input: G to (K, H)	2.2	6.5	pf
Output: P to (K, H)	0.4	1.2	pf

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2.875"
Seated Length	2.250" to 2.500"
Diameter	1.062" to 1.188"
Dimensional Outline (JEDEC 9-60)	See *General Section*
Bulb	T9
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW	12E0

Pin 1 - Heater
Pin 2 - No Internal Connection
Pin 3 - Grid of Unit No.2
Pin 4 - No Internal Connection
Pin 5 - Plate of Unit No.2
Pin 6 - No Internal Connection
Pin 7 - Cathode of Unit No.2
Pin 8 - Do Not Use
Pin 9 - Cathode of Unit No.1
Pin 10 - Grid of Unit No.1
Pin 11 - Plate of Unit No.1
Pin 12 - Heater



Characteristics, Class A1 Amplifier:

	Unit No.1	*Unit No.2*		
Plate Voltage	250	60	150	volts
Grid Voltage	-3	0[b]	-17.5	volts
Amplification Factor	65	-	6	
Plate Resistance (Approx.)	40500	-	920	ohms
Transconductance	1600	-	6500	μmhos
Plate Current	1.4	95	35	ma
Plate Current for grid volts = -25	-	-	6	ma
Grid-Voltage for plate μa = 30	-5.5	-	-	volts
Grid-Voltage for plate μa = 50	-	-	-36	volts

VERTICAL DEFLECTION OSCILLATOR AND AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[c]

	Unit No.1 (Oscillator)	*Unit No.2 (Amplifier)*	
DC Plate Voltage	330	275	volts
Peak Positive-Pulse Plate Voltage	-	2000	volts
Peak Negative Pulse-Grid Voltage	400	250	volts
Cathode Current:			
Peak	70	175	ma
Average	20	50	ma
Plate Dissipation	1	7[d]	watts
Maximum Circuit Values:			
Grid-Circuit Resistance	2.2	2.2	megohms

[a] Without external shield.

[b] Applied for short interval (2 seconds maximum) so as not to damage tube.

[c] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

[d] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Beam Power Tube—Sharp-Cutoff Pentode

DUODECAR TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ±0.6	volts
Current at heater volts = 6.3	1.200	amp
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts
Direct Interelectrode Capacitances (Approx.):[b]		
Beam Power Unit:		
Grid No.1 to plate	0.26	pf
Grid No.1 to cathode & grid No.3, grid No.2, internal shield, and heater	12.0	pf
Plate to cathode & grid No.3, grid No.2, internal shield, and heater	12.0	pf
Pentode Unit:		
Grid No.1 to plate	0.034	pf
Grid No.3 to plate	2.8	pf
Grid No.1 to cathode, grid No.2, grid No.3, internal shield, and heater	6.5	pf
Grid No.3 to cathode, grid No.1, grid No.2, plate, internal shield, and heater	7.5	pf
Grid No.1 to grid No.3	0.24	pf
Plate of beam power unit to plate of pentode unit	0.12	pf

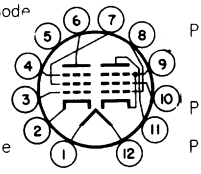
Characteristics, Class A_1 Amplifier (Pentode Unit):

Plate Supply Voltage	150	volts
Grid-No.3 Supply Voltage	*Connected to cathode at socket*	
Grid-No.2 Supply Voltage	100	volts
Cathode Resistor	560	ohms
Plate Resistance (Approx.)	0.15	megohm
Transconductance, Grid No.1 to Plate	1000	μmhos
Transconductance, Grid No.3 to Plate	400	μmhos
Plate Current	1.3	ma
Grid-No.2 Current	2	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-4.5	volts
Grid-No.3 Voltage (Approx.) for plate μa = 10	-4.5	volts

6G11

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2.375"
Seated Length	1.750" to 2.000"
Diameter	1.062" to 1.188"
Bulb	T9
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW	12BU



Pin 1 – Heater
Pin 2 – Pentode Cathode
Pin 3 – Pentode Grid No.1
Pin 4 – Pentode Grid No.3
Pin 5 – Internal Shield
Pin 6 – Pentode Plate
Pin 7 – Pentode Grid No.2
Pin 8 – Beam Power Grid No.1
Pin 9 – Beam Power Cathode, Beam Power Plate
Pin 10 – Beam Power Grid No.2
Pin 11 – Beam Power Plate
Pin 12 – Heater

PENTODE UNIT — FM SOUND DETECTOR

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330 max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE	28 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts
GRID-No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
PLATE DISSIPATION	1.7 max.	watts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 165 volts	1.1 max.	watts
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	

BEAM POWER UNIT — AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

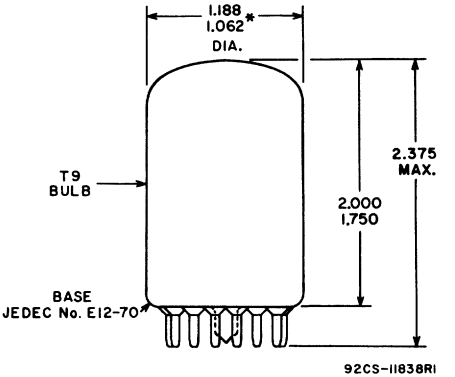
PLATE VOLTAGE	150 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	135 max.	volts
AVERAGE CATHODE CURRENT	65 max.	ma
PLATE DISSIPATION	6.5 max.	watts
GRID-No.2 INPUT	1.8 max.	watts

Typical Operation and Characteristics:

Plate Voltage	120	volts
Grid-No.2 Voltage	110	volts
Grid-No.1 (Control-Grid) Voltage	-8	volts
Peak AF Grid-No.1 Voltage	8	volts

Zero-Signal Plate Current	49	ma
Max.-Signal Plate Current	50	ma
Zero-Signal Grid-No.2 Current	4	ma
Max.-Signal Grid-No.2 Current	8.5	ma
Plate Resistance (Approx.)	10000	ohms
Transconductance	7500	μmhos
Load Resistance	2500	ohms
Total Harmonic Distortion	10	per cent
Max.-Signal Power Output	2.3	watts

[a] The dc component must not exceed 100 volts.
[b] without external shield.



DIMENSIONS IN INCHES

* APPLIES TO MINIMUM DIAMETER EXCEPT IN AREA OF SEAL.

6GB5

Beam Power Tube

MAGNOVAL TYPE

ELECTRICAL

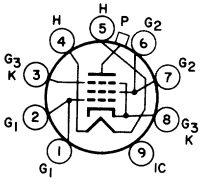
Heater Characteristics and Ratings		
Voltage (AC or DC)	6.3 ± 0.6	V
Current at 6.3 V	1.380	A
Maximum heater-cathode voltage		
Heater negative with respect to cathode:		
Peak	250	V
DC component	125	V
Heater positive with respect to cathode:		
Peak	250	V
DC component	125	V

MECHANICAL

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	4.125 in
Maximum Seated Length	3.750 in
Diameter	1.062 to 1.188 in
Envelope	JEDEC T9
Cap	Skirted Miniature (JEDEC No.C1-2)
Base	Small-Button Magnoval 9-Pin (JEDEC No.E9-23) ←

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Grid-No.1
Pin 2 – Grid-No.1
Pin 3 – Cathode, Grid No.3
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Grid No.2
Pin 7 – Grid No.2
Pin 8 – Cathode, Grid No.3
Pin 9 – Do Not Use
Cap – Plate



9NH

CHARACTERISTICS, INSTANTANEOUS VALUES[a]

Plate Voltage	75	V
Grid-No.2 (Screen-Grid) Voltage	200	V
Grid-No.1 (Control-Grid) Voltage	-10	V
Plate Current	440	mA
Grid-No.2 Current	37	mA

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, Design-Maximum Values

For operation in a 525-line, 30-frame system

DC Plate-Supply Voltage	275	V
Peak Positive-Pulse Plate Voltage[b]	7700	V
DC Grid-No.2 Voltage	275	V

← Indicates a change.

Average Cathode Current	275	mA
Grid-No.2 Input[c]	5	W
Plate Dissipation[d]	17	W

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance		
Without grid current	0.5	MΩ
With grid current (Horizontal output service only)	2.2	MΩ

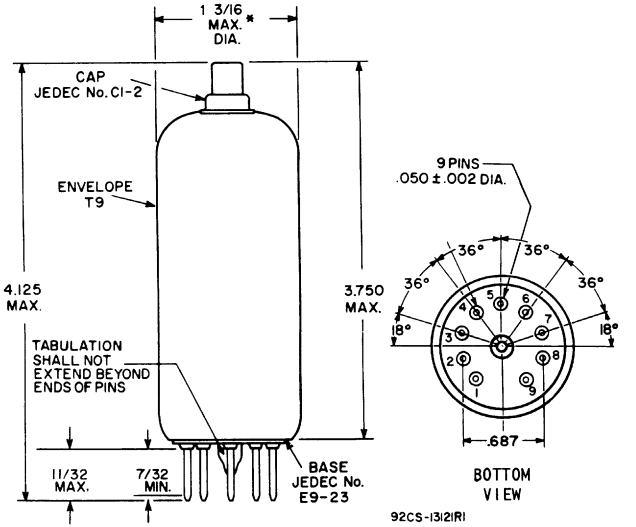
[a] Not to be tested under DC conditions.

[b] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[c] Grid-No.2 input may reach 6 watts for plate-dissipation values below 11 watts.

[d] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

For pin alignment use gauge No.GE9-2.

* Applies in zone starting 0.375 inch from base seat.

6GC5

Power Pentode

NEONOVAL TYPE

GENERAL DATA

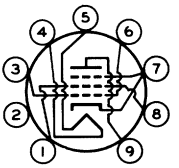
Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.200	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts
Direct Interelectrode Capacitances (Approx.):[b]		
Grid No.1 to plate	0.9	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	18.0	μμf
Plate to cathode & grid No.3, grid No.2 and heater	7.0	μμf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.230"
Maximum Seated Length	2.920"
Length, Base Seat to Bulb Top (Excluding tip)	2.370" to 2.610"
Diameter	1.062" to 1.188"
Bulb	T9
Base	Large-Button Neonoval 9-Pin (JEDEC No.E9-68)
Basing Designation for BOTTOM VIEW	9EU

Pin 1 – Grid No.2
Pin 2 – No Internal Connection
Pin 3 – Grid No.1
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Grid No.1
Pin 7 – Cathode, Grid No.3
Pin 8 – Grid No.2
Pin 9 – Plate

AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	220 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	140 max.	volts
GRID-No.2 INPUT	1.4 max.	watts
PLATE DISSIPATION	12 max.	watts

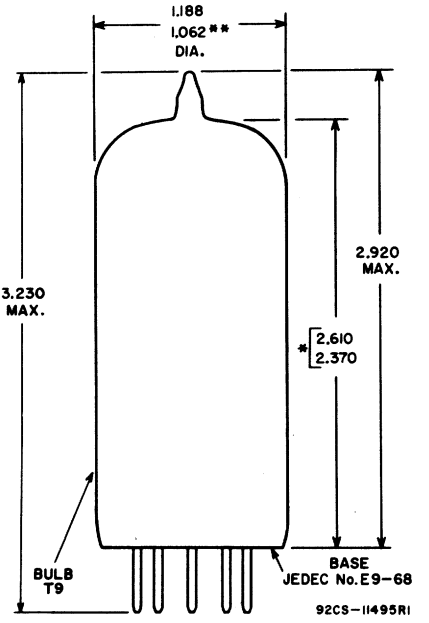
Typical Operation and Characteristics:

	Fixed Bias	*Cathode Bias*	
Plate Supply Voltage.	110	200	volts
Grid-No.2 Supply Voltage.	110	125	volts
Grid-No.1 (Control-Grid) Voltage. .	-7.5	-	volts
Cathode Resistor.	-	180	ohms
Peak AF Grid-No.1 Voltage	7.5	8.5	volts
Zero-Signal Plate Current	49	46	ma
Max.-Signal Plate Current	50	47	ma
Zero-Signal Grid-No.2 Current . . .	4	2.2	ma
Max.-Signal Grid-No.2 Current . . .	10	8.5	ma
Plate Resistance (Approx.).	13000	28000	ohms
Transconductance.	8000	8000	μmhos
Load Resistance	2000	4000	ohms
Total Harmonic Distortion	10	10	%
Max.-Signal Power Output.	2.1	3.8	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation.	0.1 max.	megohm
For cathode-bias operation. . . .	0.5 max.	megohm

[a] The dc component must not exceed 100 volts.
[b] Without external shield.



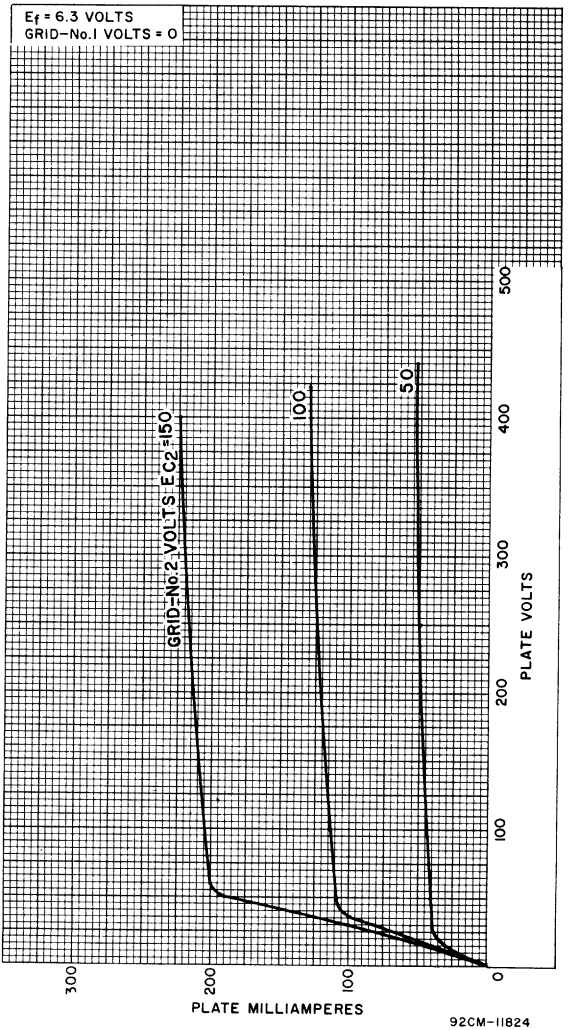
ALL DIMENSIONS IN INCHES

** APPLIES IN ZONE STARTING 0.375" FROM BASE SEAT.

* MEASURED FROM BASE SEAT TO BULB-TOP LINE AS DETERMINED BY A RING GAUGE OF 0.600" INSIDE DIAMETER.

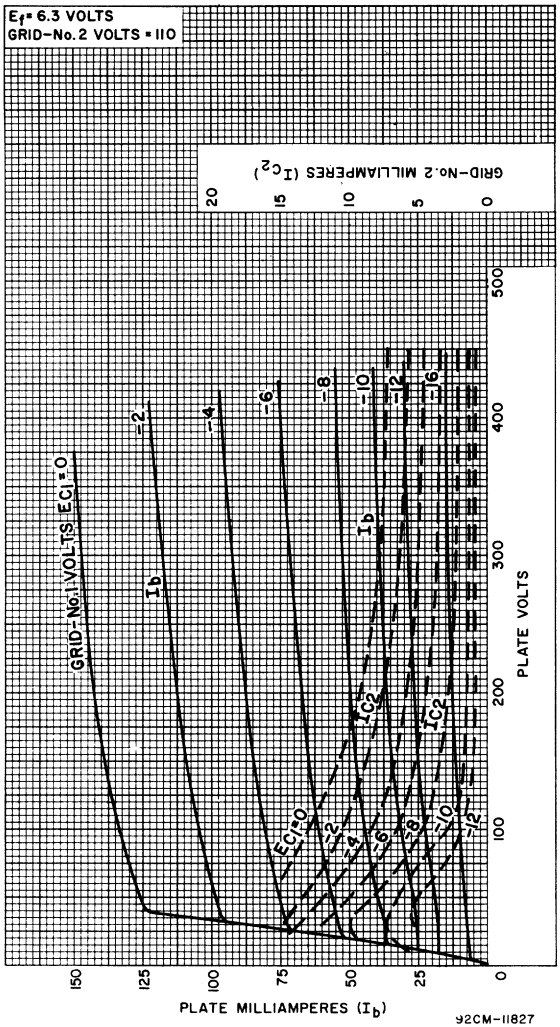
6GC5

AVERAGE PLATE CHARACTERISTICS

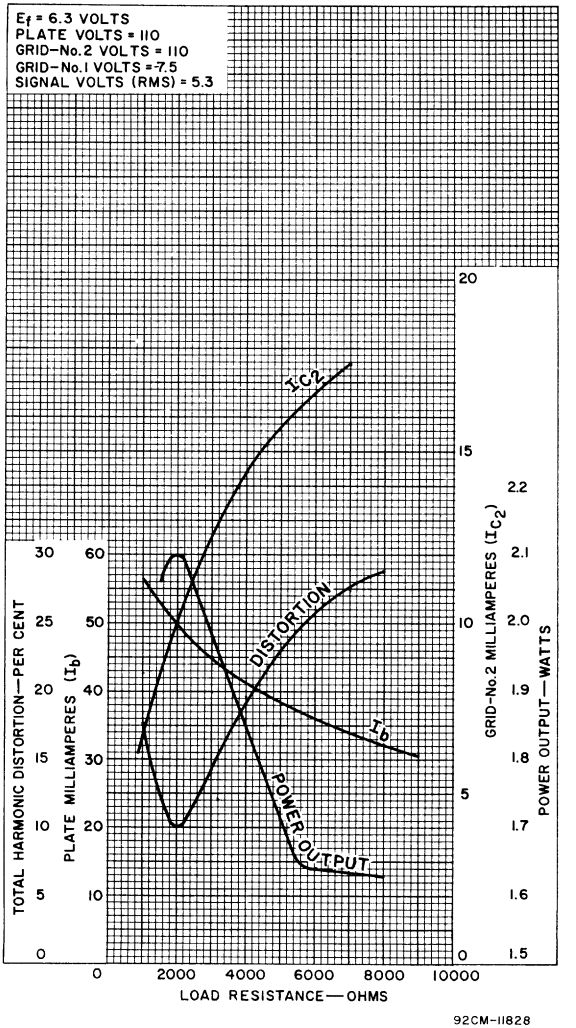


92CM-11824

AVERAGE CHARACTERISTICS



OPERATION CHARACTERISTICS



92CM-11828

6GE5

Beam Power Tube

DUODECAR TYPE

GENERAL DATA

Electrical:

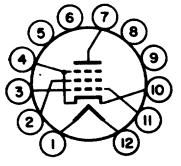
Heater Characteristics and Ratings:			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	1.200		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances (Approx.):[b]			
Grid No. 1 to plate	0.34		pf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	16.0		pf
Plate to cathode & grid No.3, grid No.2, and heater	7.0		pf

Characteristics, Class A_1 Amplifier:					
Plate Voltage	60	150	250	5000	volts
Grid-No.2 Voltage	150	150	150	150	volts
Grid-No.1 Voltage	0	-22.5	-22.5	-	volts
Mu-Factor, Grid No.2 to Grid No.1	-	4.4	-	-	
Plate Resistance (Approx.)	-	-	18000	-	ohms
Transconductance	-	-	7300	-	μmhos
Plate Current	345[c]	-	65	-	ma
Grid-No.2 Current	27[c]	-	1.8	-	ma
Grid-No.1 Voltage (Approx.) for plate ma.= 1.	-	-	-42	-100	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2.875"
Seated Length	2.250" to 2.500"
Diameter	1.437" to 1.563"
Bulb	T12
Base	Large-Button Duodecar 12-Pin (JEDEC No.E12-74)
Basing Designation for BOTTOM VIEW	12BJ

Pin 1 - Heater
Pin 2 - Grid No.2
Pin 3 - Grid No.1
Pin 4 - Cathode, Grid No.3
Pin 5 - Do Not Use[d]
Pin 6 - Do Not Use[d]



Pin 7 - Plate
Pin 8 - Do Not Use[d]
Pin 9 - Do Not Use[d]
Pin 10 - Cathode, Grid No.3
Pin 11 - Grid No.1
Pin 12 - Heater

6GE5

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[e]

DC PLATE-SUPPLY VOLTAGE	770 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[f]	6500 max.	volts
PEAK NEGATIVE-PULSE PLATE VOLTAGE	1500 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	220 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-55 max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 VOLTAGE	330 max.	volts
CATHODE CURRENT:		
Peak	550 max.	ma
Average	175 max.	ma
GRID-No.2 INPUT	3.5 max.	watts
PLATE DISSIPATION[g]	17.5 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	220 max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For grid resistor-bias operation	1 max.	megohm

[a] The dc component must not exceed 100 volts.

[b] Without external shield.

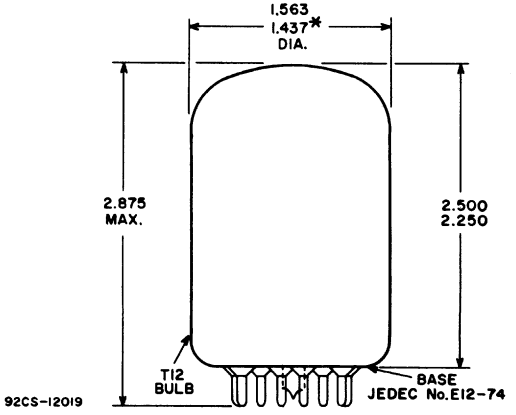
[c] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

[d] Socket terminals 5,6,8, and 9 should not be used as tie points.

[e] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[f] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[g] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.



ALL DIMENSIONS IN INCHES

*APPLIES TO MINIMUM DIAMETER EXCEPT IN THE AREA OF THE SEAL.

6GF7A

Dual Triode

With High-Mu Unit and Low-Mu Unit

NOVAR TYPE

For Combined Vertical-Deflection-Oscillator and-Amplifier Service in TV Receivers

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.985	amp
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts

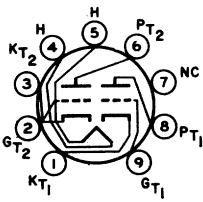
Direct Interelectrode Capacitances (Approx.):

	Unit No. 1	*Unit No. 2*	
Grid to plate	4.6	9.0	pf
G to (K,H)	2.4	6.5	pf
P to (K,H)	0.26	1.4	pf

Mechanical:

Operating Position	Any
Types of Cathodes	Coated Unipotential
Maximum Overall Length	2.380"
Seated Length	1.750" to 2.000"
Diameter	1.062" to 1.188"
Dimensional Outline	See *General Section*
Bulb	T9
Base	Small-Button Novar, 9-Pin with Exhaust Tip (JEDEC No. E9-89)
Basing Designation for BOTTOM VIEW	9QD

Pin 1 – Cathode of Unit No.1
Pin 2 – Grid of Unit No.2
Pin 3 – Cathode of Unit No.2
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Plate of Unit No.2
Pin 7 – No Internal Connection
Pin 8 – Plate of Unit No.1
Pin 9 – Grid of Unit No.1

Characteristics, Class A_1 Amplifier:

	Unit No. 1	*Unit No. 2*			
Plate Voltage	250	60	150	250	volts
Grid Voltage	-3	0	-20	-28	volts
Amplification Factor	64	–	5.4	–	
Plate Resistance (Approx.)	40000	–	750	–	ohms
Plate Current	1.4	95	50	10	ma
Grid-Voltage (Approx.) for plate μa = 10	-5.5	–	–	–	volts
100	–	–	-45	–	volts

VERTICAL-DEFLECTION OSCILLATOR

Values are for Unit No. 1

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[b]

DC Plate Voltage	330	max.	volts
Peak Negative Pulse-Grid Voltage	400	max.	volts
Cathode Current:			
Peak	77	max.	ma
Average	22	max.	ma
Plate Dissipation	1.5	max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For grid-resistor-bias or cathode-bias operation	2.2	max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Values are for Unit No. 2

Maximum Ratings, *Design-Maximum Values Except as Noted:*

For operation in a 525-line, 30-frame system[b]

DC Plate Voltage	330	max.	volts
Peak Positive-Pulse Plate Voltage (Absolute-maximum value)[c]	1500[d]	max.	volts
Peak Negative-Pulse Grid Voltage	250	max.	volts
Cathode Current:			
Peak	175	max.	ma
Average	50	max.	ma
Plate Dissipation	11	max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For grid-resistor-bias operation	2.2	max.	megohms
For cathode-bias operation	2.2	max.	megohms

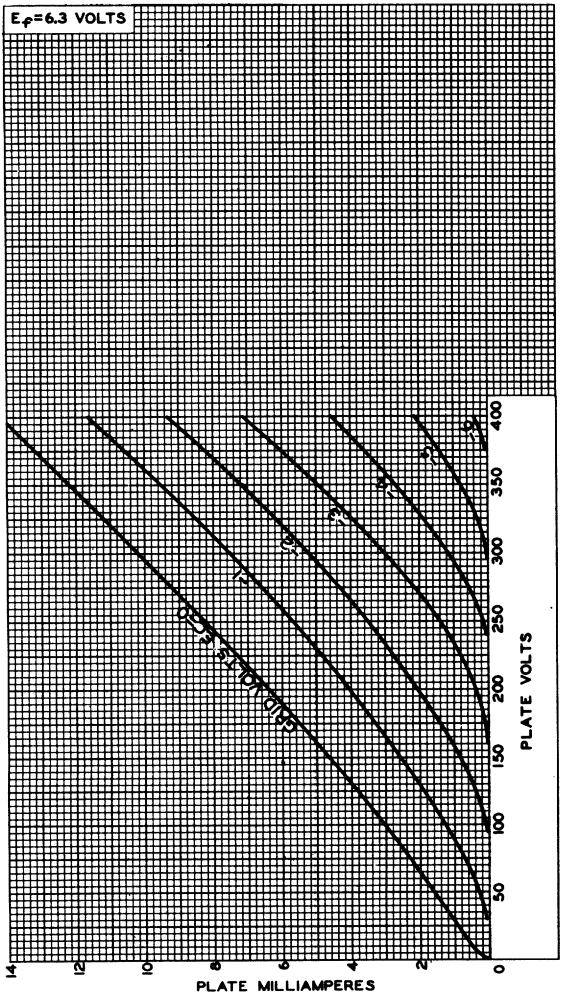
[a] The dc component must not exceed 100 volts.

[b] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations" Federal Communications Commission.

[c] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

[d] Under no circumstances should this absolute-maximum value be exceeded.

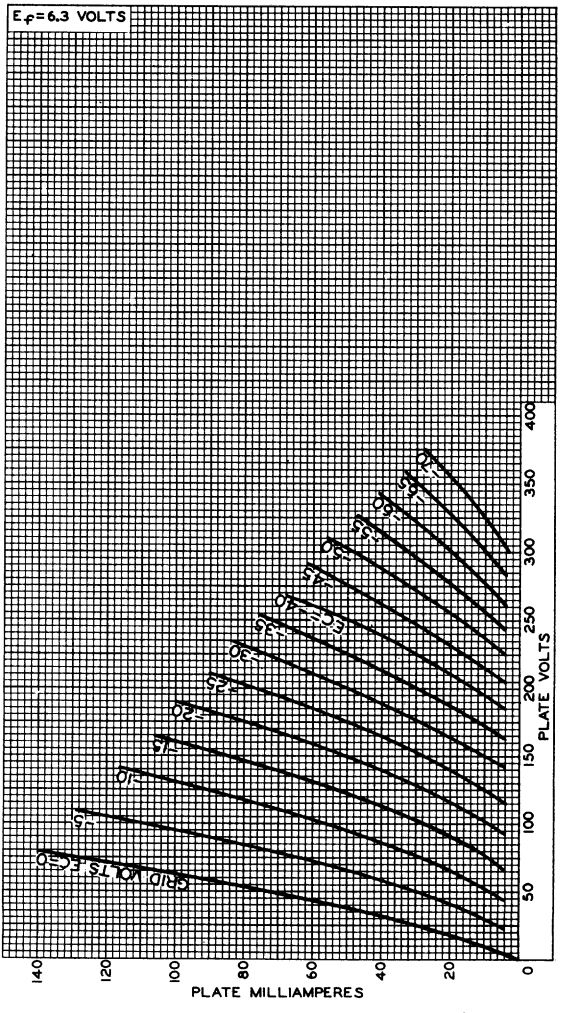
AVERAGE PLATE CHARACTERISTICS
Unit No.1



92CM-9912

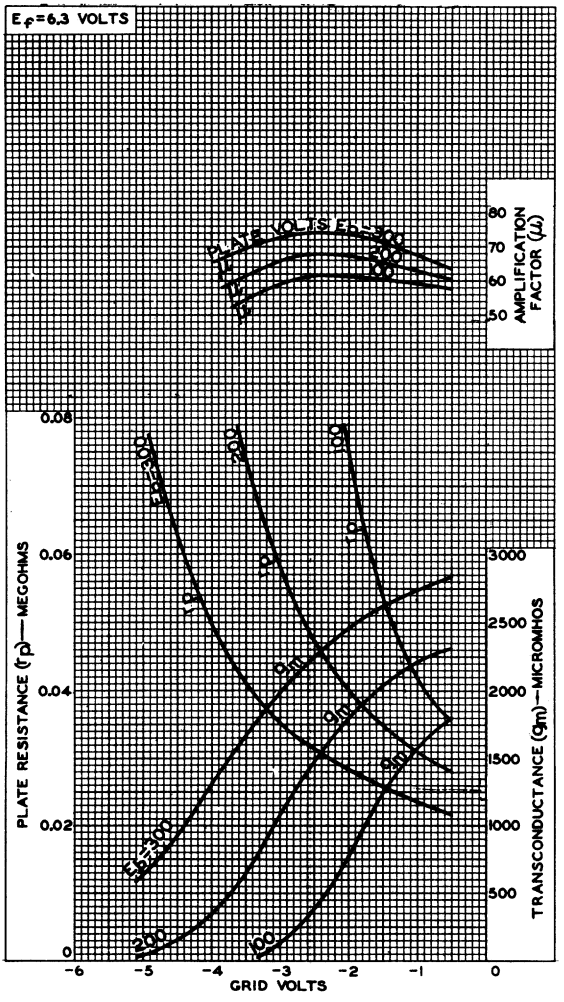
6GF7A

AVERAGE PLATE CHARACTERISTICS
Unit No.2



92CM-10466

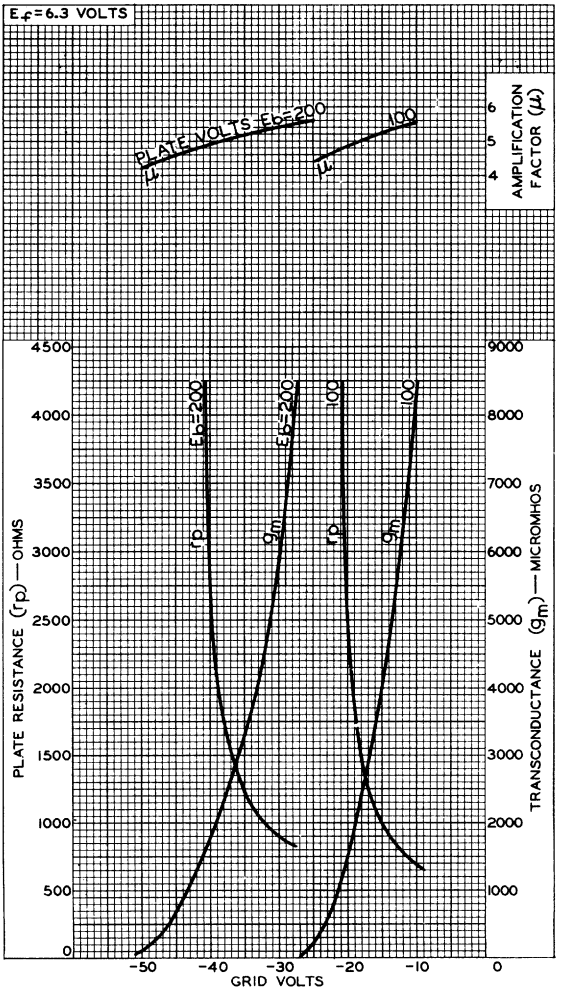
AVERAGE CHARACTERISTICS
Unit No.1



92CM-9915RI

6GF7A

AVERAGE CHARACTERISTICS
Unit No.2



92CM-10467

6GH8A

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

For Multivibrator-Type Horizontal-Deflection Oscillator, AGC Amplifier, and Sync-Separator Applications

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:			
Voltage (AC or DC)	6.3[a]	6.3 ± 0.6	volts
Current	0.450 ± 0.030	0.450[b]	amp
Warm-up time (Average)	11	–	sec
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode		200 max.	volts
Heater positive with respect to cathode		200[c] max.	volts

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*[d]	
Triode Unit:			
Grid to plate	1.7	1.7	pf
Grid to cathode, pentode grid No.3 & pentode cathode & internal shield, and heater	3.0	3.2	pf
Plate to cathode, pentode grid No.3 & pentode cathode & internal shield, and heater	1.4	1.9	pf
Heater to cathode	3.0	3.0[e]	pf
Pentode Unit:			
Grid No.1 to plate	0.02 max.	0.01 max.	pf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	5.0	5.0	pf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	2.6	3.4	pf
Heater to cathode & grid No.3 & internal shield	3.0	3.0[e]	pf

Characteristics, Class A_1 Amplifier:

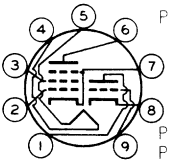
	Triode Unit	*Pentode Unit*	
Plate Voltage	125	125	volts
Grid-No.2 Voltage	–	125	volts
Grid-No.1 Voltage	-1	-1	volt
Amplification Factor	46	–	
Plate Resistance (Approx.)	5400	200000	ohms
Transconductance	8500	7500	μmhos

6GH8A

Plate Current	13.5	12	ma
Grid-No.2 Current	–	4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-8	-8	volts

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9AE



Pin 1 – Triode Plate
Pin 2 – Pentode Grid No.1
Pin 3 – Pentode Grid No.2
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Plate
Pin 7 – Pentode Cathode, Pentode Grid No.3, Internal Shield
Pin 8 – Triode Cathode
Pin 9 – Triode Grid

HORIZONTAL-DEFLECTION OSCILLATOR

For operation in a 525-line, 30-frame system[f]

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	330 max.	350 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	–	330 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0 max.	0 max.	volts
Peak-negative value	–	175 max.	volts
PLATE DISSIPATION	2.5 max.	2.5 max.	watts
GRID-No.2 INPUT	–	0.55 max.	watts
CATHODE CURRENT:			
Peak	–	300 max.	ma
Average	–	20 max.	ma

Maximum Circuit Values (Each Unit):

Grid-No.1-Circuit Resistance: For fixed-bias or cathode-bias operation	2.2 max.	megohms

[a] At heater amperes = 0.450.
[b] At heater volts = 6.3.
[c] The dc component must not exceed 100 volts.
[d] With external shield JEDEC No.315 connected to cathode of unit under test except as noted.
[e] With external shield JEDEC No.315 connected to ground.
[f] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

INTERELECTRODE LEAKAGE

Leakage Resistance between Plate of Each Unit and All Other Electrodes of both units tied together . . . . . 100 min. megohms

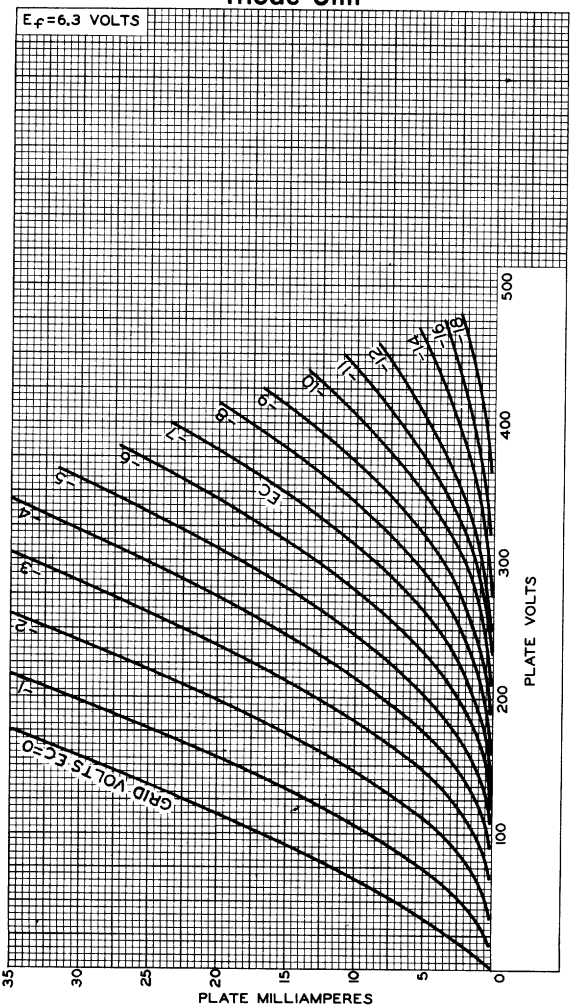
This test is performed under the following conditions: heater volts = 6.3; and plate 300 volts negative with respect to all other electrodes tied together.

Leakage Resistance between Grid No.1 of Each Unit and All Other Electrodes of both units tied together . . . . . 100 min. megohms

This test is performed under the following conditions: heater volts = 6.3; and grid 100 volts negative with respect to all other electrodes tied together.

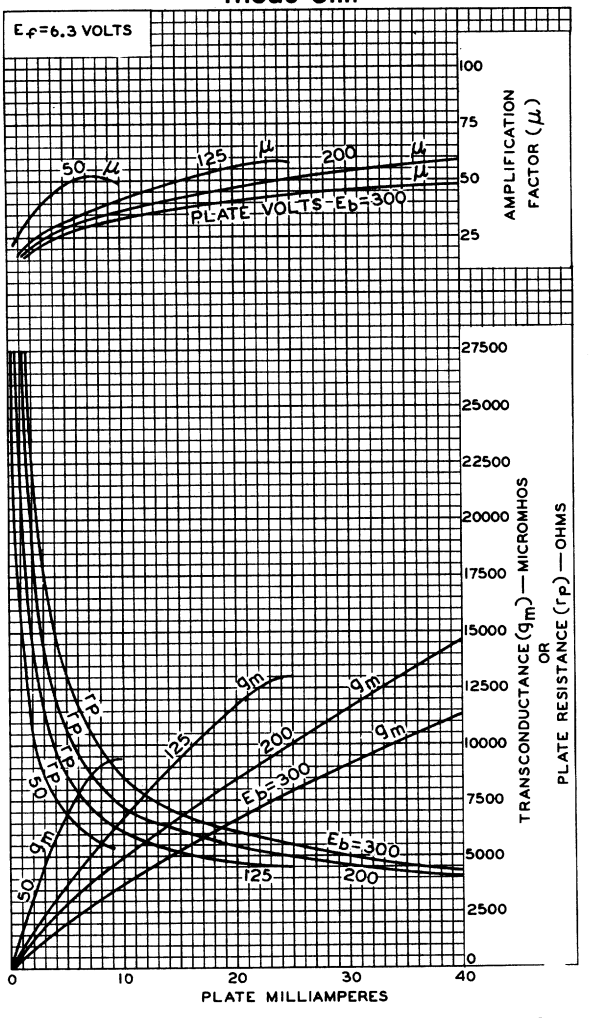
6GH8A

AVERAGE PLATE CHARACTERISTICS
Triode Unit



92CM-10421RI

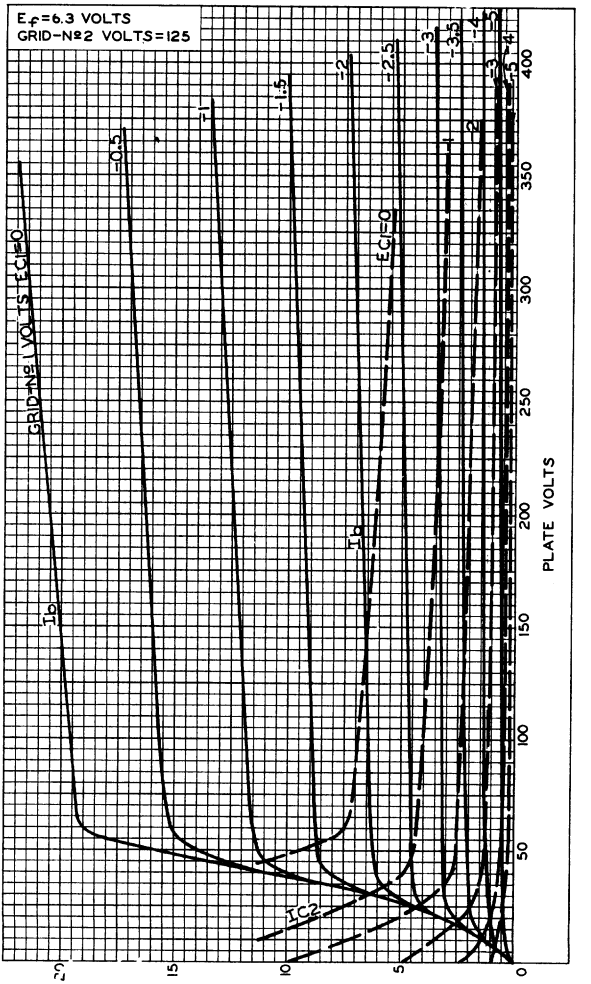
AVERAGE CHARACTERISTICS
Triode Unit



92CM—10428

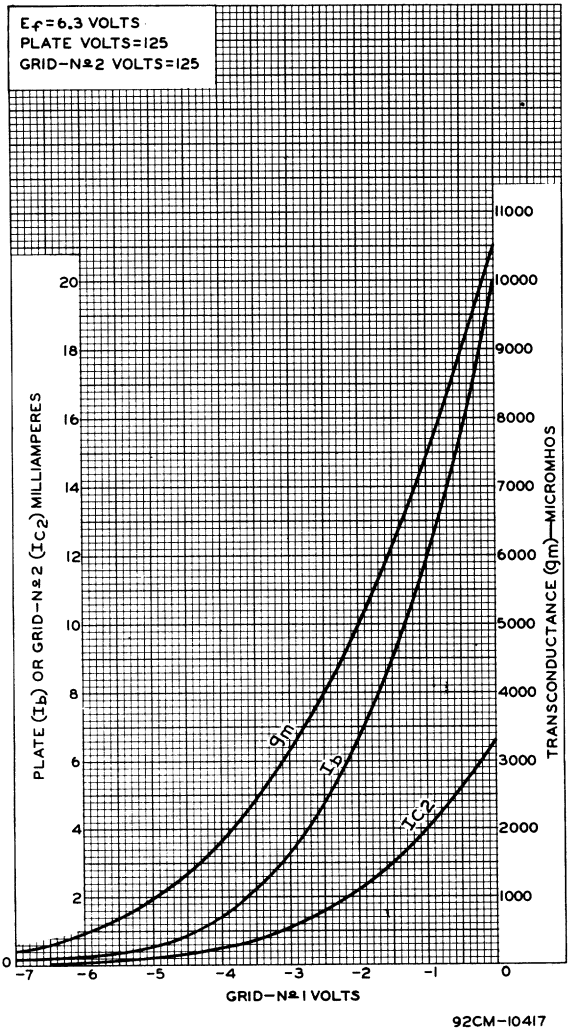
6GH8A

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-10436

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-10417

6GJ5A

Beam Power Tube

NOVAR TYPE

For Horizontal-Deflection-Amplifier Service in Black-and-White TV Receivers

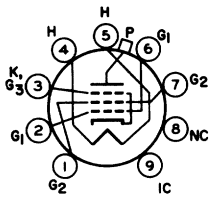
Electrical:

Heater Ratings and Characteristics:			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	1.200		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200	max.[a]	volts
Direct Interelectrode Capacitances (Approx.):[b]			
Grid No.1 to plate	0.26		pf
Input: G1 to (K,G3,G2,H)	15.0		pf
Output: P to (K,G3,G2,H)	6.5		pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.505"
Seated Length	2.875" to 3.125"
Diameter	1.438" to 1.562"
Dimensional Outline	See *General Section*
Bulb	T12
Cap	Skirted Miniature (JEDEC C1-2 or C1-3)
Base	Large-Button Novar 9-Pin with Exhaust Tip (JEDEC No.E9-88)
Basing Designation for BOTTOM VIEW	9QK

Pin 1 - Grid No.2
Pin 2 - Grid No.1
Pin 3 - Cathode, Grid No.3
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid No.1
Pin 7 - Grid No.2
Pin 8 - No Internal Connection
Pin 9 - Do Not Use
Cap - Plate



Characteristics, Class A_1 Amplifier:

	Triode Connection	*Pentode Connection*		
Plate Voltage	150	60	250	volts
Grid-No.2 Voltage	150	150	150	volts
Grid-No.1 Voltage	-22.5	0	-22.5	volts
Mu-factor, Grid No.2 to Grid No.1	4.4	-	-	
Plate Resistance (Approx.)	-	-	15000	ohms
Transconductance	-	-	7100	μmhos

	Triode Connection	Pentode Connection		
Plate Current	–	390[c]	70	ma
Grid-No.2 Current	–	32[c]	2.1	ma
Grid-No.1 Voltage (Approx.) for plate ma = 1.	–	–	-42	volts

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[d]

DC Plate-Supply Voltage	770	max.	volts
Peak Positive-Pulse Plate Voltage[e]	6500	max.	volts
Peak Negative-Pulse Plate Voltage	1500	max.	volts
DC Grid-No.2 (Screen-Grid) Voltage	220	max.	volts
DC Grid-No.1 (Control-Grid) Voltage	-55	max.	volts
Peak Negative-Pulse Grid-No.1 Voltage	330	max.	volts
Cathode Current:			
Peak	550	max.	ma
Average	175	max.	ma
Grid-No.2 Input	3.5	max.	watts
Plate Dissipation[f]	17.5	max.	watts
Bulb Temperature (At hottest point on bulb surface)	240	max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: For grid resistor-bias operation	1	max.	megohm

[a] The dc component must not exceed 100 volts.

[b] Without external shield.

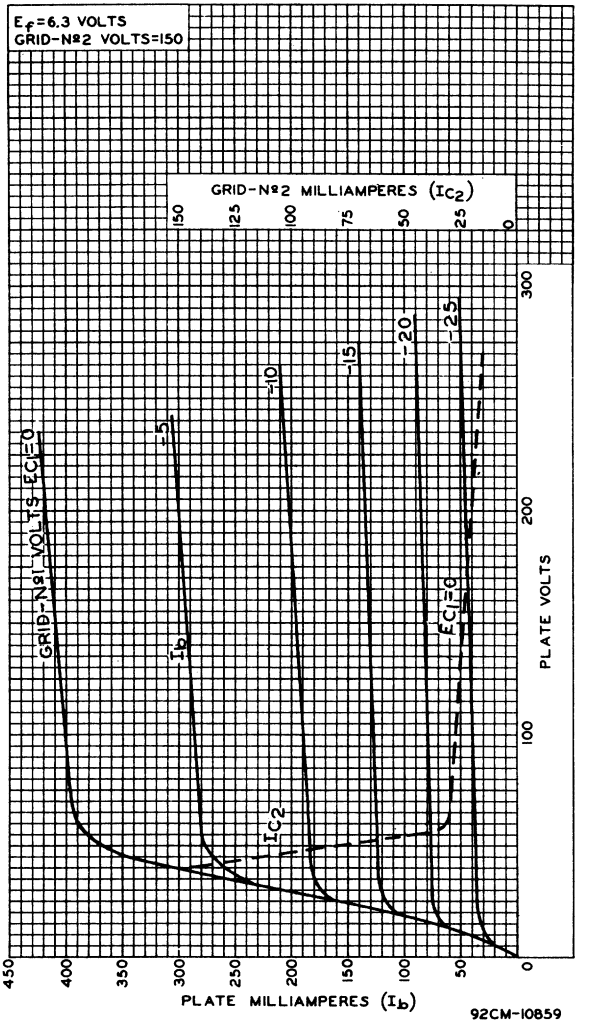
[c] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

[d] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[e] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[f] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

AVERAGE CHARACTERISTICS



Medium-Mu Triode—Sharp-Cutoff Pentode

ELECTRICAL

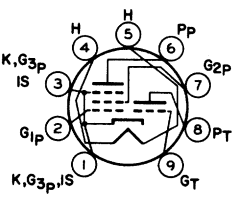
Heater Characteristics and Ratings		
Voltage (AC or DC)	6.3±0.6	V
Current at 6.3 V	0.410	A
Heater-cathode voltage[a]	110 max	V
Direct Interelectrode Capacitances (Approx.)		
Triode Unit		
P_T to G_T	1.8	pF
G_T to K, H	3.3	pF
P_T to all except $G1_P$	1.7	pF
Pentode Unit (With external shield)		
Input	6.2	pF
Output	3.5	pF
P_P to $G1_P$	0.009	pF
$G1_P$ to $G2_P$	1.5	pF
Between Triode and Pentode Units		
P_T to P_P	0.025 max	pF
P_P to G_T	0.01 max	pF
P_T to $G1_P$	0.01 max	pF
G_T to $G1_P$	0.01 max	pF

MECHANICAL

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2 in
Maximum Seated Length	1-3/4 in
Diameter	0.750 to 0.875 in
Envelope	JEDEC T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Cathode, Pentode Grid No.3, Internal Shield
Pin 2 – Pentode Grid No.1
Pin 3 – Same as Pin 1
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Plate
Pin 7 – Pentode Grid No.2
Pin 8 – Triode Plate
Pin 9 – Triode Grid



9QA

CHARACTERISTICS

	Triode Unit	*Pentode Unit*	
Plate Voltage	100	170	V
Grid-No.2 Voltage	-	120	V
Grid-No.1 Voltage	-3	-1.2	V
Amplification Factor	20	55[b]	

	Triode Unit	Pentode Unit	
Plate Resistance (Approx.)	-	0.35	MΩ
Transconductance	9000	11000	μmhos
Plate Current	15	10	mA
Grid No.2 Current	-	3	mA

DESIGN-MAXIMUM RATINGS

	Triode Unit	Pentode Unit	
Plate-Supply Voltage	600	600	V
DC Plate Voltage	140	275	V
Grid-No.2 Supply Voltage	-	600	V
DC Grid-No.2 (Screen-Grid) Voltage	-	275	V
DC Grid-No.1 (Control-Grid) Voltage	-	-50	V
Cathode Current	22	20	mA
Plate Dissipation	1.8	2.4	W
Grid-No.2 Input[c]	-	0.55	W

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance			
For fixed-bias operation	0.5	1	MΩ
For cathode-bias operation	0.5	2.2	MΩ

[a] The hum should be minimized in intercarrier receiver applications by limiting the heater-cathode voltage to 100 volts rms, and in AM receivers to 50 volts rms.

[b] Grid No.2 to grid No.1; approximate value.

[c] When control grid bias is between -1.5 and -2 volts, screen dissipation is limited to 0.50 watt. When this bias is greater than -2 volts, maximum screen dissipation is 0.36 watt.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

6GK5

High-Mu Triode

7-PIN MINIATURE TYPE

For VHF-Amplifier Applications

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.18	amp
Direct Interelectrode Capacitances (Approx.):[a]		
Grid to plate	0.52	μμf
Grid to cathode, internal shield, and heater	5	μμf
Plate to cathode, internal shield, and heater	3.5	μμf
Heater to cathode	2.5[b]	μμf

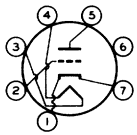
Characteristics, Class A_1 Amplifier:

Plate Voltage	135	volts
Grid Voltage	-1	volt
Amplification Factor	78	
Plate Resistance (Approx.)	5400	ohms
Transconductance	15000	μmhos
Plate Current	11.5	ma
Grid Voltage (Approx.) for transconductance (μmhos) =		
150	-4.2	volts
1500	-2.5	volts
Input Resistance[c]	275	ohms
Input Capacitance[c]	11.2	μμf
Noise Figure[d]	4.7	db

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7FP

Pin 1 - Cathode
Pin 2 - Grid
Pin 3 - Heater
Pin 4 - Heater



Pin 5 - Plate
Pin 6 - Internal Shield
Pin 7 - Cathode

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	200 max.	volts
GRID VOLTAGE:		
Negative-bias value	50 max.	volts
Positive-bias value	0 max.	volts
AVERAGE CATHODE CURRENT	22 max.	ma
PLATE DISSIPATION	2.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For cathode-bias operation	1 max.	megohm

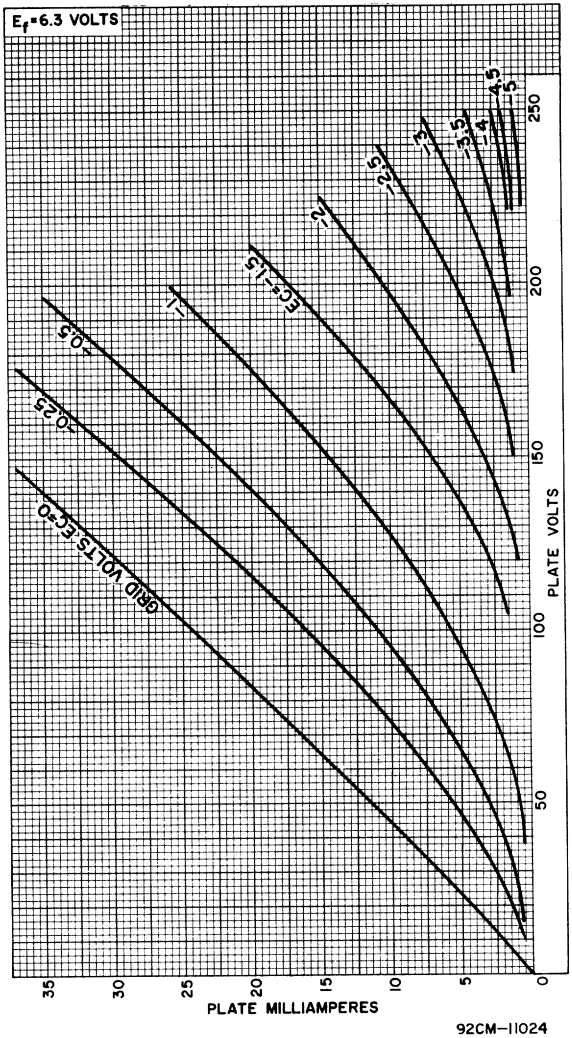
[a] With external shield JEDEC No.316 connected to cathode except as noted.

[b] With external shield JEDEC No.316 and internal shield connected to ground.

[c] Measured at 200 Mc with heater volts = 6.3 and plate effectively grounded for rf voltages.

[d] For a neutralized triode amplifier at a frequency of 200 Mc with signal-source impedance adjusted for minimum noise output.

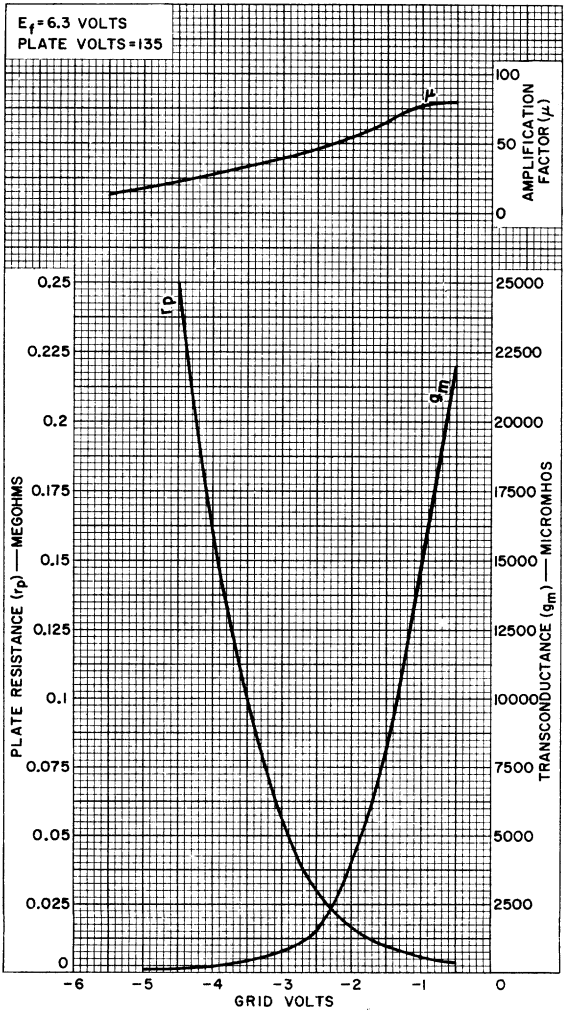
AVERAGE PLATE CHARACTERISTICS



92CM-11024

6GK5

AVERAGE CHARACTERISTICS



92CM-11023

6GK6

Power Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.76	amp
Direct Interelectrode Capacitances:[a]		
Grid No.1 to plate	0.14 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	10	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	7	μμf

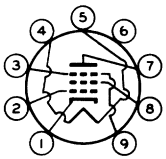
Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	250	volts
Grid-No.2 Supply Voltage	250	volts
Cathode Resistor	135	ohms
Mu-Factor, Grid No.2 to Grid No.1	19	
Plate Resistance (Approx.)	38000	ohms
Transconductance	11300	μmhos
Plate Current	48	ma
Grid-No.2 Current	5.5	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	3-1/16"
Maximum Seated Length	2-13/16"
Length, Base Seat to Bulb Top (Excluding tip)	2-7/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9GK

Pin 1 - Cathode
Pin 2 - Grid No.1
Pin 3 - Grid No.3, Internal Shield
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - No Connection
Pin 7 - Plate
Pin 8 - Grid No.2
Pin 9 - Grid No.3, Internal Shield

AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE SUPPLY VOLTAGE	600 max.	volts
PLATE VOLTAGE	330 max.	volts
GRID-No.2 SUPPLY VOLTAGE	600 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	330 max.	volts

GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	100 max.	volts
CATHODE CURRENT	65 max.	ma
GRID-No.2 INPUT:		
Peak	4 max.	watts
Average	2 max.	watts
PLATE DISSIPATION	13.2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Typical Operation:

Plate Supply Voltage	250	volts
Grid-No.2 Supply Voltage	250	volts
Cathode Resistor	135	ohms
Peak AF Grid-No.1 Voltage	7.3	volts
Zero-Signal Plate Current	48	ma
Max.-Signal Plate Current	50.6	ma
Zero-Signal Grid-No.2 Current	5.5	ma
Max.-Signal Grid-No.2 Current	10	ma
Effective Load Resistance	5200	ohms
Total Harmonic Distortion	10	%
Max.-Signal Power Output	5.7	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.3 max.	megohm
For cathode-bias operation	1 max.	megohm

PUSH-PULL AF POWER AMPLIFIER — Class AB_1

Maximum Ratings, *Design-Maximum Values:*

PLATE SUPPLY VOLTAGE	600 max.	volts
PLATE VOLTAGE	330 max.	volts
GRID-No.2 SUPPLY VOLTAGE	600 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	330 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	100 max.	volts
CATHODE CURRENT	65 max.	ma
GRID-No.2 INPUT:		
Peak	4 max.	watts
Average	2 max.	watts
PLATE DISSIPATION	13.2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Typical Operation:

Values are for 2 tubes

Plate Supply Voltage	250	300	volts
Grid-No.2 Supply Voltage	250	300	volts
Cathode Resistor	130	130	ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage	22.4	28	volts
Zero-Signal Plate Current	62	72	ma

Max.-Signal Plate Current	75	92	ma
Zero-Signal Grid-No.2 Current	7	8	ma
Max.-Signal Grid-No.2 Current	15	22	ma
Effective Load Resistance (Plate to plate)	8000	8000	ohms
Total Harmonic Distortion	3	4	%
Max.-Signal Power Output	11	17	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.3 max.	megohm
For cathode-bias operation	1 max.	megohm

PUSH-PULL AF POWER AMPLIFIER — Class B

Maximum Ratings, *Design-Maximum Values:*

PLATE SUPPLY VOLTAGE	600 max.	volts
PLATE VOLTAGE	330 max.	volts
GRID-No.2 SUPPLY VOLTAGE	600 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	330 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	100 max.	volts
CATHODE CURRENT	65 max.	ma
GRID-No.2 INPUT:		
Peak	4 max.	watts
Average	2 max.	watts
PLATE DISSIPATION	13.2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Typical Operation:

Values are for 2 tubes

Plate Voltage	250	300	volts
Grid-No.2 Voltage	250	300	volts
Grid-No.1 Voltage	-11.6	-14.7	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	22.4	28	volts
Zero-Signal Plate Current	20	15	ma
Max.-Signal Plate Current	75	92	ma
Zero-Signal Grid-No.2 Current	2.2	1.6	ma
Max.-Signal Grid-No.2 Current	15	22	ma
Effective Load Resistance (Plate to plate)	8000	8000	ohms
Total Harmonic Distortion	3	4	%
Max.-Signal Power Output	11	17	watts

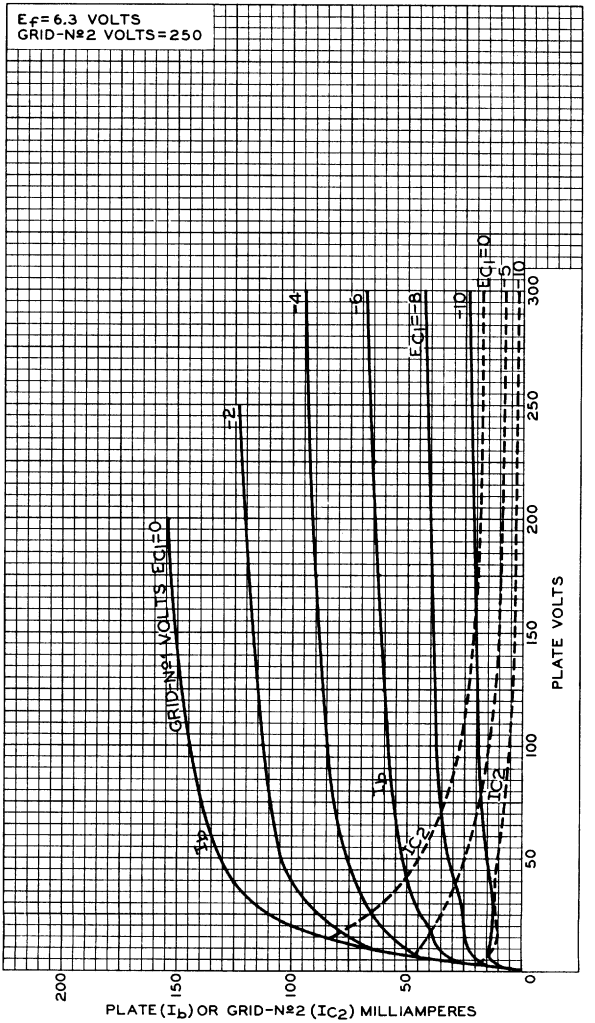
Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.3 max.	megohm
For cathode-bias operation	1 max.	megohm

[a] Without external shield.

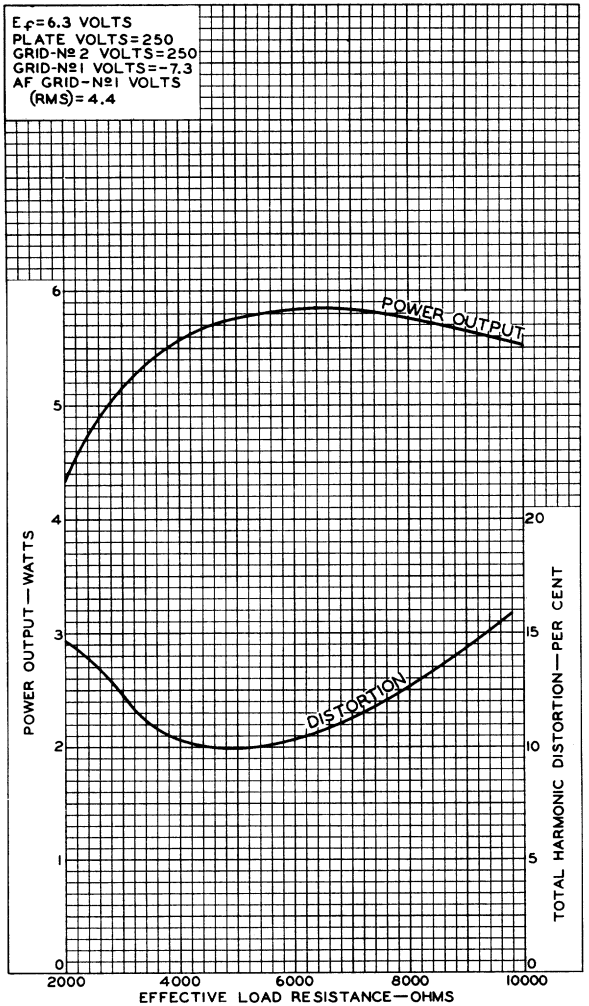
6GK6

AVERAGE CHARACTERISTICS



92CM-9903

OPERATION CHARACTERISTICS



92CM-9902

6GL7

Dual Triode

With High-Mu Unit and Low-Mu Unit

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.05	amp
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts

Direct Interelectrode Capacitances (Approx.):[b]

	Unit No.1	*Unit No.2*	
Grid to plate	4.0	8.0	pf
Grid to cathode and heater	2.2	6.0	pf
Plate to cathode and heater	0.6	1.3	pf

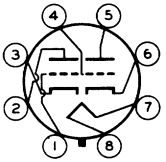
Characteristics, Class A_1 Amplifier:

	Unit No.1		*Unit No.2*		
Plate Voltage	250	275	60	175	volts
Grid Voltage	-3	[c]	0[d]	-25	volts
Amplification Factor	66	–	–	5	
Plate Resistance (Approx.)	30000	–	–	780	ohms
Transconductance	2200	1600	–	6400	μmhos
Plate Current	2	13	100	46	ma
Grid Voltage (Approx.) for plate μa =					
20	-5.3	–	–	–	volts
200	–	–	–	-60	volts

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	3"
Maximum Seated Length	2-7/16"
Maximum Diameter	1-9/32"
Bulb	T9
Base	Intermediate-Shell Octal 8-Pin, (JEDEC Group 1, No.B8-6)
Basing Designation for BOTTOM VIEW	8BD

Pin 1 – Grid of Unit No.2
Pin 2 – Plate of Unit No.2
Pin 3 – Cathode of Unit No.2
Pin 4 – Grid of Unit No.1



Pin 5 – Plate of Unit No.1
Pin 6 – Cathode of Unit No.1
Pin 7 – Heater
Pin 8 – Heater

VERTICAL-DEFLECTION OSCILLATOR

Values are for Unit No.1

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[e]

DC PLATE VOLTAGE	350 max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	400 max.	volts
PLATE DISSIPATION	1 max.	watt

Maximum Circuit Values:

Grid-Circuit Resistance:

For fixed-bias operation	1 max.	megohm
For cathode-bias operation	2.2 max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Values are for Unit No.2

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[e]

DC PLATE VOLTAGE	550 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[f]	1500 max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250 max.	volts
CATHODE CURRENT:		
Peak	175 max.	ma
Average	50 max.	ma
PLATE DISSIPATION	10[g] max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance:

For fixed-bias operation	1 max.	megohm
For cathode-bias operation	2.2 max.	megohms

[a] The dc component must not exceed 100 volts.

[b] Without external shield.

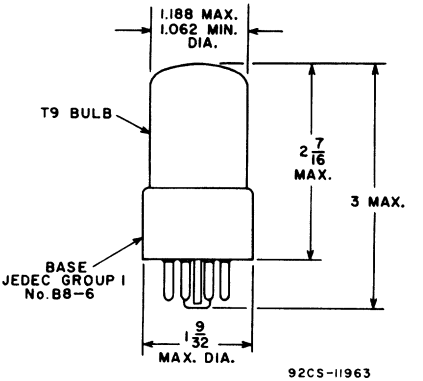
[c] Adjusted for plate ma.=13.

[d] Applied for short interval (two seconds maximum) so as not to damage tube.

[e] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[f] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

[g] In stages operating with grid-leak bias, an adequate cathode-bias resistor or other suitable means is required to protect the tube in the absence of excitation.



ALL DIMENSIONS IN INCHES

6GM6

Semiremote-Cutoff Pentode

7-PIN MINIATURE TYPE

For Gain-Controlled, 40-Mc, Picture-IF Stages of TV Receivers

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)		6.3 ± 10%	volts
Current at 6.3 volts		0.4	amp
Direct Interelectrode Capacitances:			
	Without External Shield	*With External Shield*▲	
Grid No.1 to plate	0.036 max.	0.026 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	10	10	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	2.4	3.4	μμf

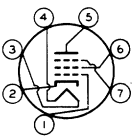
Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	125	volts
Grid No.3 and Internal Shield	*Connected to cathode at socket*	
Grid-No.2 Supply Voltage	125	volts
Cathode Resistor	56	ohms
Plate Resistance (Approx.)	0.2	megohm
Transconductance	13000	μmhos
Plate Current	14	ma
Grid-No.2 Current	3.4	ma
Grid-No.1 Voltage (Approx.) for transconductance (μmhos)= 60	-15	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3-32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CM

Pin 1 - Grid No.1
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate



Pin 6 - Grid No.2
Pin 7 - Grid No.3, Internal Shield

AMPLIFIER — Class A_1

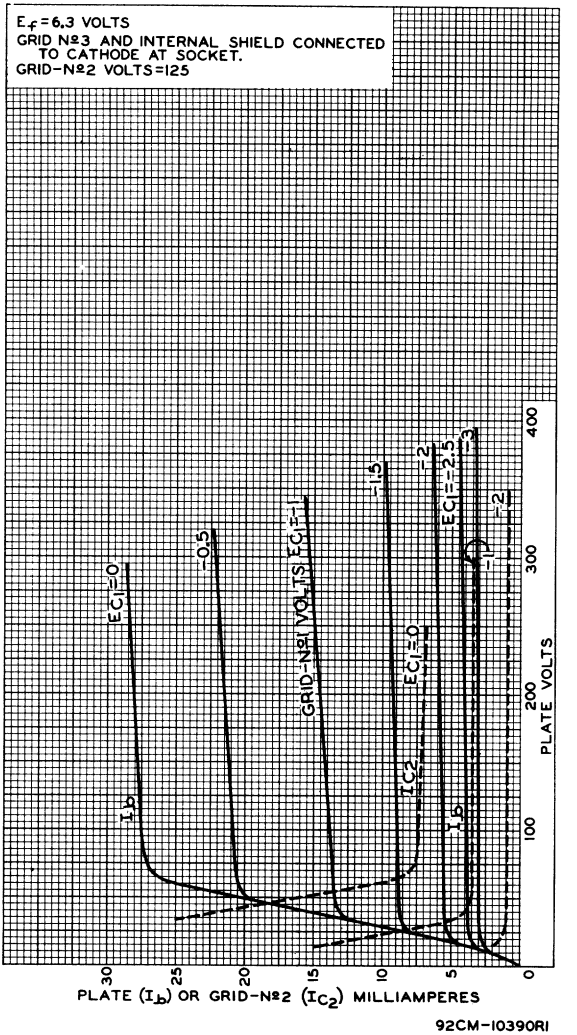
Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330 max.	volts
GRID No.3 (SUPPRESSOR GRID)	*Connect to cathode at socket*	
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 165 volts	0.65 max.	watt
For grid-No.2 voltages between 165 and 330 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	3.1 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200● max.	volts

▲ With external shield JEDEC No.316 connected to cathode.

● The dc component must not exceed 100 volts.

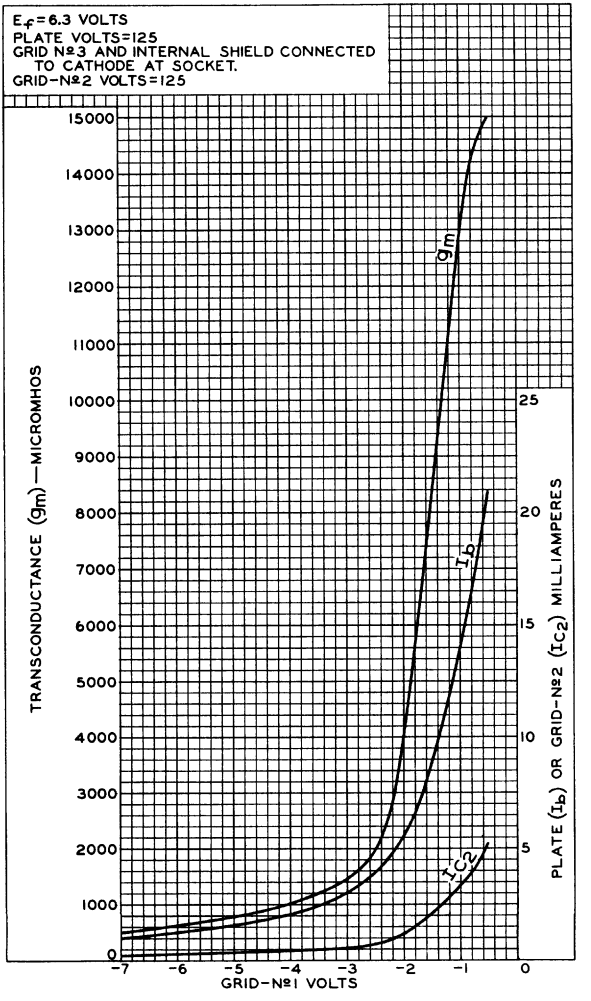
AVERAGE CHARACTERISTICS



92CM-10390RI

6GM6

AVERAGE CHARACTERISTICS



92CM-10391R1

6GN8

High-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.75	amp
Direct Interelectrode Capacitances:[a]		
Triode Unit:		
Grid to plate	4.4	μμf
Grid to cathode and heater	2.4	μμf
Plate to cathode and heater	0.36	μμf
Pentode Unit:		
Grid No.1 to plate	0.1 max.	μμf
Grid No.1 to cathode & internal shield & grid No.3, grid No.2, and heater	11	μμf
Plate to cathode & internal shield & grid No.3, grid No.2, and heater	4.2	μμf
Triode grid to pentode plate	0.018 max.	μμf
Pentode grid No.1 to triode plate	0.005 max.	μμf
Pentode plate to triode plate	0.17 max.	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*		
Plate Supply Voltage	250	60	200	volts
Grid-No.2 Supply Voltage	–	150	150	volts
Grid-No.1 Voltage	-2	0	–	volts
Cathode Resistor	–	–	100	ohms
Amplification Factor	100	–	–	
Plate Resistance (Approx.)	37000	–	60000	ohms
Transconductance	2700	–	11500	μmhos
Plate Current	4	55[b]	25	ma
Grid-No.2 Current	–	18[b]	5.5	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	–	–	-10	volts
Grid Voltage (Approx.) for plate μa = 20	-5	–	–	volts

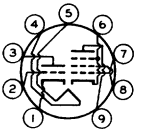
Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2

6GN8

Base. . . . . .Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9DX

Pin 1 – Triode Cathode
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Pentode Cathode, Grid No.3, Internal Shield
Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

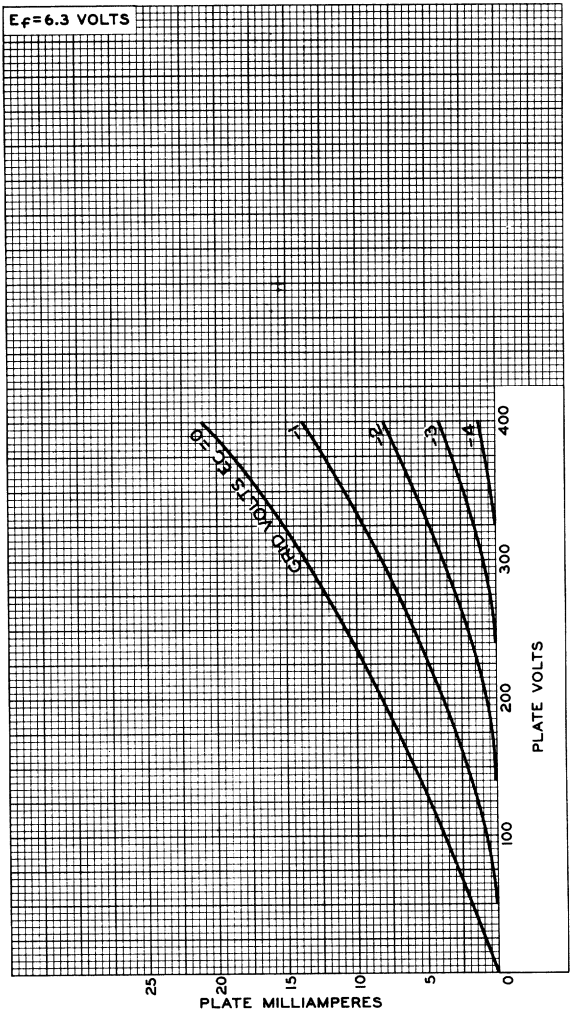
	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	330 max.	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE.	–	330 max.	volts
GRID-No.2 VOLTAGE	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max.	volts
PLATE DISSIPATION	1 max.	5 max.	watts
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts	–	1.1 max.	watts
For grid-No.2 voltages between 165 and 330 volts .		See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode.	200 max.	200 max.	volts
Heater positive with respect to cathode.	200[c] max.	200[c] max.	volts

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance: For fixed-bias operation. . .	0.5 max.	0.25 max.	megohm
For cathode-bias operation. .	1 max.	1 max.	megohm

[a] Without external shield.
[b] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.
[c] The dc component must not exceed 100 volts.

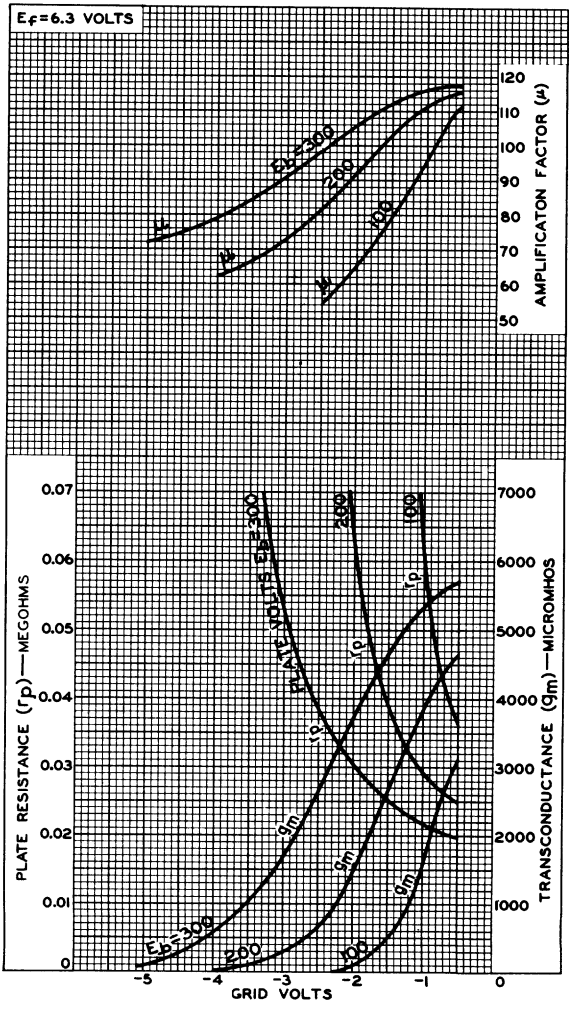
AVERAGE PLATE CHARACTERISTICS
Triode Unit



92CM-9907R1

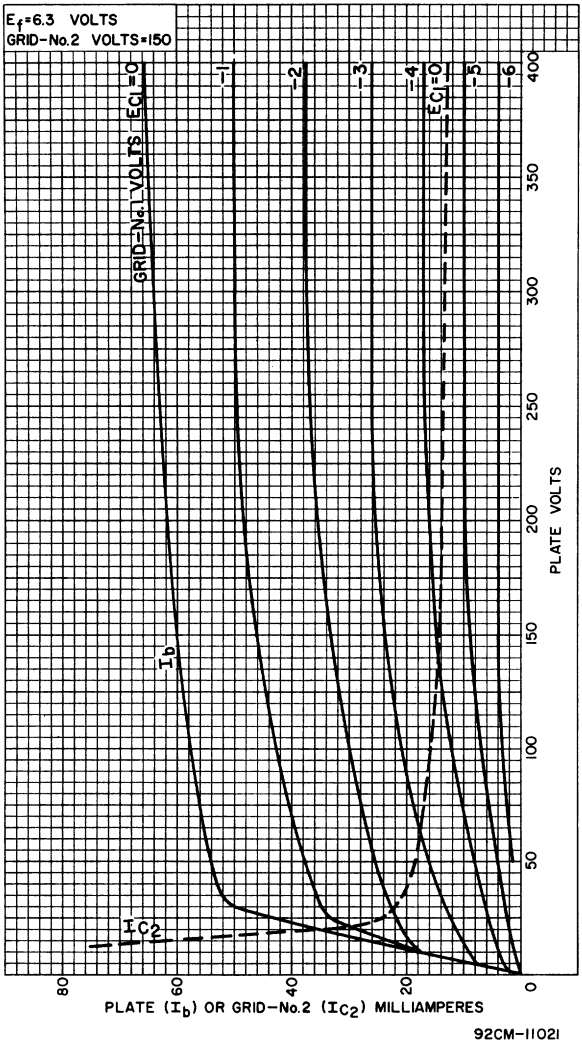
6GN8

AVERAGE CHARACTERISTICS
Triode Unit



92CM-11025

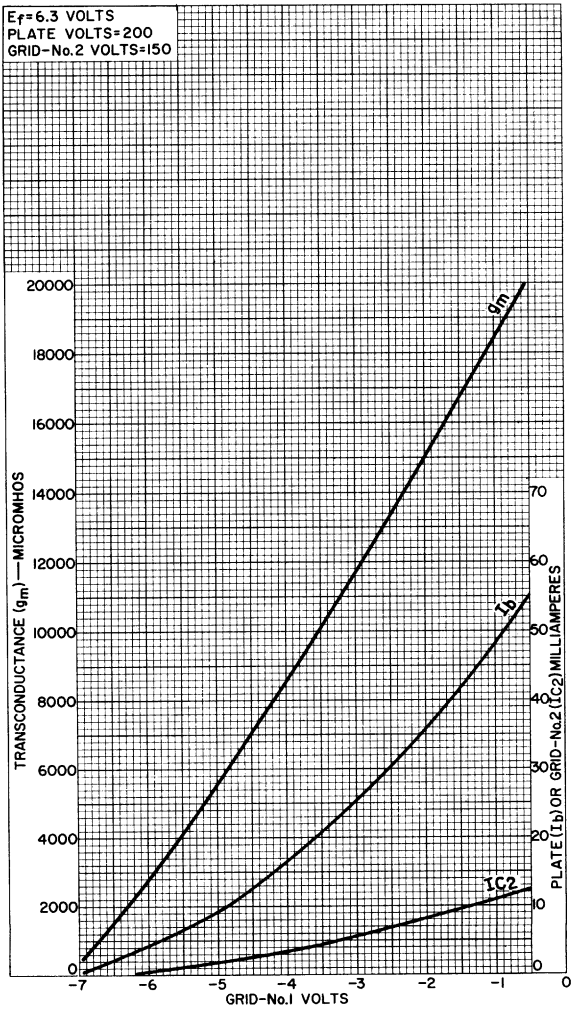
AVERAGE CHARACTERISTICS
Pentode Unit



92CM-11021

6GN8

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-11022

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

6GT5

Beam Power Tube

NOVAR TYPE

For TV Horizontal-Deflection-Amplifier Applications

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	1.200		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances (Approx.):[b]			
Grid No.1 to plate	0.26		pf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	15.0		pf
Plate to cathode & grid No.3, grid No.2, and heater	6.5		pf

Characteristics, Class A_1 Amplifier:

			Triode Connection[c]	
Plate Voltage	60	250	150	volts
Grid-No.2 Voltage	150	150	150	volts
Grid-No.1 Voltage	0	-22.5	-22.5	volts
Amplification Factor	–	–	4.4	
Plate Resistance (Approx.)	–	15000	–	ohms
Transconductance	–	7100	–	μmhos
Plate Current	390[d]	70	–	ma
Grid-No.2 Current	32[d]	2.1	–	ma
Grid-No.1 Voltage (Approx.) for plate ma. = 0.1	–	-42	–	volts

Mechanical: ←

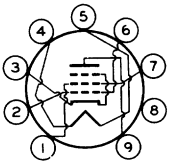
Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.410"
Maximum Seated Length	3.030"
Length, Base Seat to Bulb Top (Excluding tip)	2.510" to 2.690"
Diameter	1.438" to 1.562"
Bulb	T12
Socket	Cinch Mfg. Co. No.149 19 00 033, Industrial Electronic Hardware Co. No.SO-0968-SLI, or equivalent
Base	Large-Button Novar 9-Pin (JEDEC No.E9-76)

← Indicates a change.

6GT5

Basing Designation for BOTTOM VIEW. 9NZ

Pin 1 - Grid No.2
Pin 2 - Grid No.1
Pin 3 - Cathode, Grid No.3
Pin 4 - Heater



Pin 5 - Heater
Pin 6 - Grid No.1
Pin 7 - Grid No.2
Pin 8 - Do Not Use
Pin 9 - Plate

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[e]

DC PLATE-SUPPLY VOLTAGE	770 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[f]	6500 max.	volts
PEAK NEGATIVE-PULSE PLATE VOLTAGE	1500 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	220 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-55 max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 VOLTAGE	330 max.	volts
CATHODE CURRENT:		
Peak	550 max.	ma
Average	175 max.	ma
GRID-No.2 INPUT	3.5 max.	watts
PLATE DISSIPATION[g]	17.5 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	240 max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For grid-resistor-bias operation	1 max.	megohm

[a] The dc component must not exceed 100 volts.

[b] Without external shield.

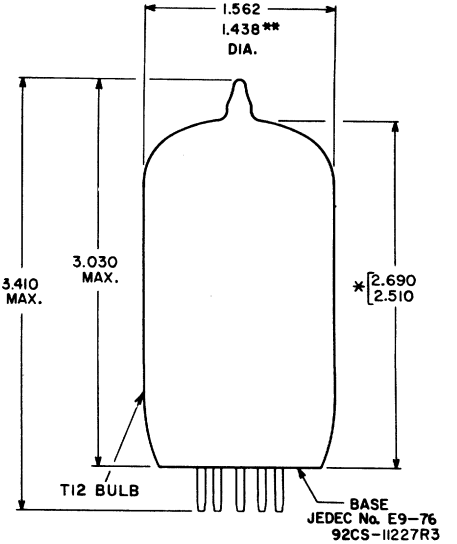
[c] With grid No.2 connected to plate.

[d] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

[e] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

[f] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[g] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.



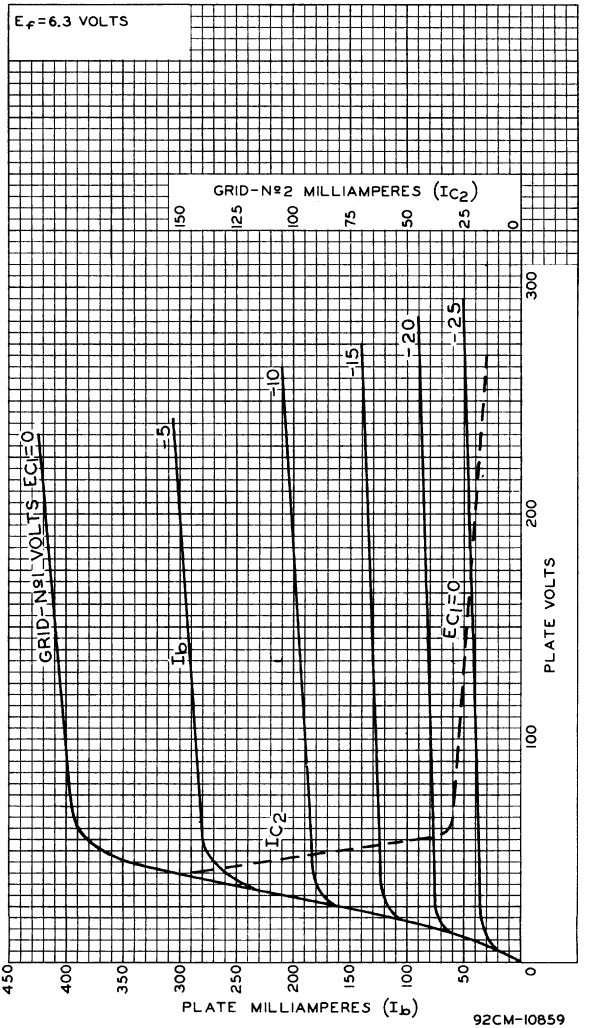
ALL DIMENSIONS IN INCHES

** APPLIES IN ZONE STARTING 0.375" FROM BASE SEAT.

* MEASURED FROM BASE SEAT TO BULB-TOP LINE AS DETERMINED BY A RING GAUGE OF 0.600" INSIDE DIAMETER.

6GT5

AVERAGE CHARACTERISTICS



6GT5A

Beam Power Tube

NOVAR TYPE

For Horizontal-Deflection-Amplifier Service in Black-and-White TV Receivers

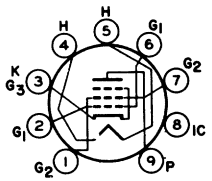
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.200	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode.	200 max.	volts
Heater positive with respect to cathode.	200[a] max.	volts
Direct Interelectrode Capacitances (Approx):[b]		
Grid No.1 to Plate	0.26	pf
Input: G1 to (K+G3,G2,H)	15.0	pf
Output: P to (K+G3,G2,H)	6.5	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2.880"
Seated Length	2.250" to 2.500"
Diameter	1.438" to 1.562"
Dimensional Outline	See *General Section*
Bulb	T12
Base	Large-Button Novar 9-Pin with Exhaust Tip (JEDEC No. E9-88)
Basing Designation for BOTTOM VIEW	9NZ

Pin 1 - Grid No.2
Pin 2 - Grid No.1
Pin 3 - Cathode, Grid No.3
Pin 4 - Heater



Pin 5 - Heater
Pin 6 - Grid No.1
Pin 7 - Grid No.2
Pin 8 - Do Not Use
Pin 9 - Plate

Characteristics, Class A_1 Amplifier:

	Triode Connection[c]	*Pentode Connection*		
Plate Voltage	150	60	250	volts
Grid-No.2 Voltage	150	150	150	volts
Grid-No.1 Voltage	-22.5	0	-22.5	volts
Amplification Factor	4.4	-	-	
Plate Resistance (Approx.)	-	-	15000	ohms
Transconductance	-	-	7100	μmhos
Plate Current	-	390[d]	70	ma
Grid-No.2 Current	-	32[d]	2.1	ma
Grid-No.1 Voltage (Approx.) for plate ma = 0.1	-	-	-42	volts

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[e]

DC Plate-Supply Voltage	770 max.	volts
Peak Positive-Pulse Plate Voltage[f]	6500 max.	volts
Peak Negative-Pulse Plate Voltage	1500 max.	volts
DC Grid-No.2 (Screen-Grid) Voltage	220 max.	volts
DC Grid-No.1 (Control-Grid) Voltage	-55 max.	volts
Peak Negative-Pulse Grid-No.1 Voltage	330 max.	volts
Cathode Current:		
Peak	550 max.	ma
Average	175 max.	ma
Grid-No.2 Input	3.5 max.	watts
Plate Dissipation[g]	17.5 max.	watts
Bulb Temperature (At hottest point on bulb surface)	240 max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For grid-resistor-bias operation	1 max.	megohm

[a] The dc component must not exceed 100 volts.

[b] Without external shield.

[c] With grid No. 2 connected to plate.

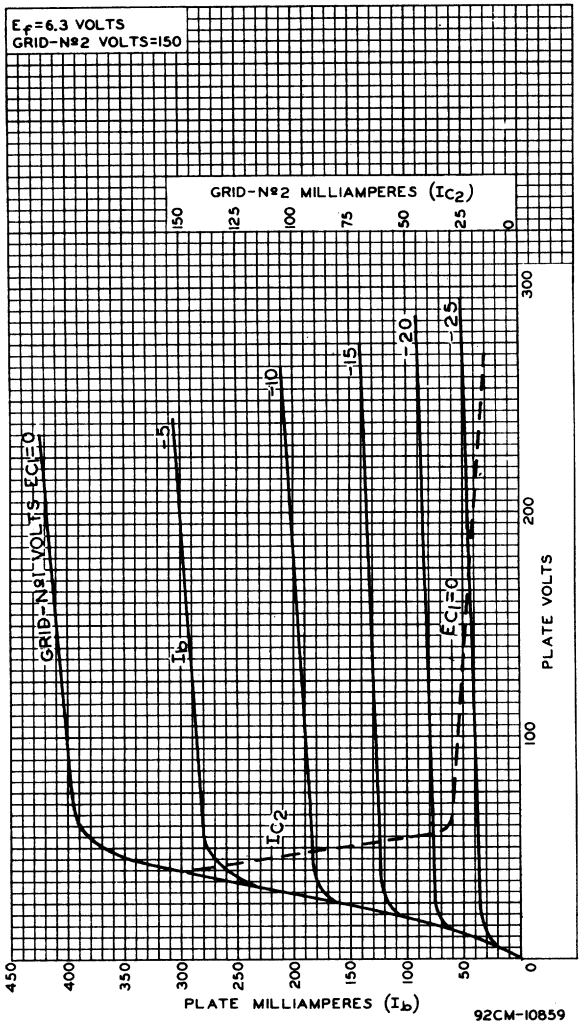
[d] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

[e] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

[f] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[g] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

AVERAGE CHARACTERISTICS



6GU5

Beam Hexode

ELECTRICAL

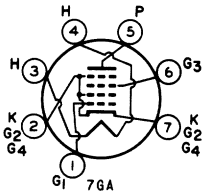
Heater Characteristics and Ratings		
Voltage (AC or DC)	6.3 ± 0.6	V
Current at 6.3 V	0.220	A
Maximum heater-cathode voltage		
Heater negative with respect to cathode		
Peak	200	V
Heater positive with respect to cathode		
Peak	200	V
DC component	100	V
Direct Interelectrode Capacitances (Approx.)		
Without external shield		
Grid No.1 to plate	0.018	pF
Input: G1 to (K + G4 + G2, G3, H)	7.0	pF
Output: P to (K + G4 + G2, G3, H)	3.2	pF

MECHANICAL

Operating Position . . . . . Any
Type of Cathode . . . . . Coated Unipotential
Maximum Overall Length . . . . . 2-1/8 in
Maximum Seated Length . . . . . 1-7/8 in
Length, Base Seat to Bulb Top (Excluding tip) . . 1-1/2 ± 3/32 in
Diameter . . . . . 0.650 to 0.750 in
Dimensional Outline (JEDEC No.5-2) . . . See *General Section*
Envelope . . . . . JEDEC T5-1/2
Base . . . . . Small-Button Miniature 7-Pin (JEDEC No.E7-1)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Grid No.1
Pin 2 – Cathode, Grid No.2, Grid No.4
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.3
Pin 7 – Same as Pin 2



CHARACTERISTICS

Plate Voltage	135	275	V
Grid-No.3 Voltage	135	135	V
Grid-No.1 Voltage	-0.4	-0.4	V
Plate Resistance (Approx.)	0.67	0.165	MΩ
Transconductance	15000	15500	μmhos
Plate Current	9	10	mA
Grid-No.3 Current	0.25	0.17	mA
Grid-No.1 Voltage (Approx.) for transconductance = 100 μmhos	-6.2	-6.5	V
Noise Figure at 200 Mc/s	5.9	5.7	dB

DESIGN-MAXIMUM RATINGS

Plate Voltage	300	V
Grid-No.3 (Screen-Grid) Voltage	150	V
Grid-No.1 (Control-Grid) Voltage		
Negative-bias value	50	V
Positive-bias value	0	V
Cathode Current	20	mA
Grid-No.3 Input	0.15	W
Plate Dissipation	3	W

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance		
For fixed-bias operation	0.5	MΩ

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

6GU7

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

For Use in the Matrixing Circuits of Color TV Receivers. Also Useful in Phase-Inverter and Multivibrator Circuits, and as a General-Purpose Amplifier Tube.

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:			
Voltage (AC or DC)	6.3[a]	6.3 ± 0.6	volts
Current	0.600 ± 0.040	0.600[b]	ma
Warm-up time (Average)	11	-	sec
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode	200 max.		volts
Heater positive with respect to cathode	200[c] max.		volts

Direct Interelectrode Capacitances (Approx.):[d]

	Unit No. 1	Unit No. 2	
Grid to plate	3.0	3.0	pf
Grid to cathode and heater	3.4	3.6	pf
Plate to cathode and heater	0.44	0.34	pf
Plate of unit No.1 to plate of unit No.2	1.0	1.0	pf

Characteristics, Class A_1 Amplifier (Each unit):

Plate Voltage	250	volts
Grid Voltage	-10.5	volts
Amplification Factor	17	
Plate Resistance (Approx.)	5500	ohms
Transconductance	3100	μmhos
Plate Current	11.5	ma
Plate Current for grid volts = -14	4	ma
Grid Voltage (Approx.) for plate μa = 50	-23	volts

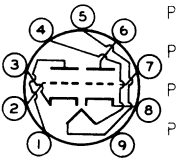
Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

6GU7

Basing Designation for BOTTOM VIEW. 9LP

Pin 1 -Plate of Triode No.2
Pin 2 -Grid of Triode No.2
Pin 3 -Cathode of Triode No.2
Pin 4 -Heater
Pin 5 -Heater



Pin 6 -Plate of Triode No.1
Pin 7 -Grid of Triode No.1
Pin 8 -Cathode of Triode No.1
Pin 9 -No Internal Connection

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

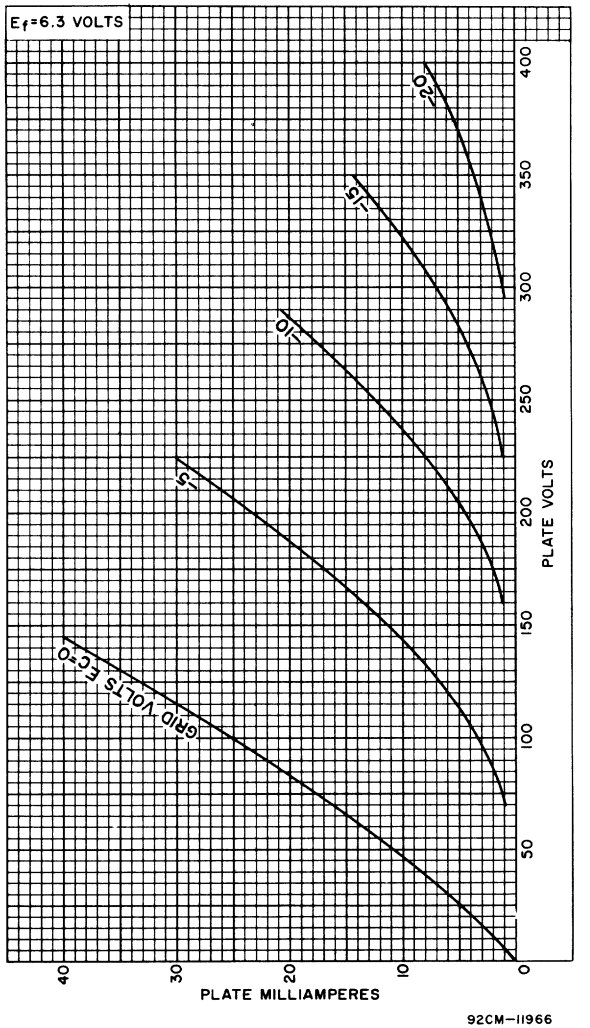
PLATE VOLTAGE	330 max.	volts
GRID VOLTAGE:		
Positive-bias value	0 max.	volts
PLATE DISSIPATION	3 max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation	1 max.	megohm

[a] At heater amperes = 0.600.
[b] At heater volts = 6.3.
[c] The dc component must not exceed 100 volts.
[d] Without external shield.

AVERAGE PLATE CHARACTERISTICS
Each Unit



92CM-11966

Beam Power Tube

DUODECAR TYPE

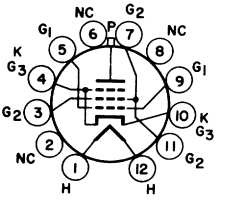
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.200	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts
Direct Interelectrode Capacitances (Approx):[b]		
G1 to P	0.6	pf
Input: G1 to (K+G3,G2,H)	16	pf
Output: P to (K+G3,G2,H)	7.0	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.625"
Seated Length	2.000" to 2.250"
Diameter	1.437" to 1.563"
Dimensional Outline	See *General Section*
Bulb	T12
Cap	Skirted Miniature (JEDEC No.C1-3)
Base	Large-Button Duodecar 12-Pin (JEDEC No.E12-74)
Basing Designation for BOTTOM VIEW	12DR

Pin 1 – Heater
Pin 2 – No Internal Connection
Pin 3 – Grid No.2
Pin 4 – Cathode, Grid No.3
Pin 5 – Grid No.1
Pin 6 – Same as Pin 2
Pin 7 – Grid No.2
Pin 8 – Same as Pin 2
Pin 9 – Grid No.1
Pin 10 – Same as Pin 4
Pin 11 – Grid No.2
Pin 12 – Heater
Cap – Plate



Characteristics, Class A_1 Amplifier:

				Triode Connection[c]	
Plate Voltage	5000	60	250	150	volts
Grid-No.2 Voltage	150	150	150	150	volts
Grid-No.1 Voltage	–	0	-22.5	-22.5	volts
Amplification Factor	–	–	–	4.4	
Plate Resistance (Approx.)	–	–	18000	–	ohms
Transconductance	–	–	7300	–	μmhos
Plate Current	–	345[d]	65	–	ma
Grid-No.2 Current	–	27[d]	1.8	–	ma
Grid-No.1 Voltage (Approx.) for plate ma. = 1	-100	–	-42	–	volts

6GV5

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[e]

DC Plate-Supply Voltage	770 max.	volts
Peak Positive-Pulse Plate Voltage[f]	6500 max.	volts
Peak Negative-Pulse Plate Voltage	1500 max.	volts
DC Grid-No.2 (Screen-Grid) Voltage	220 max.	volts
DC Grid-No.1 (Control-Grid) Voltage	-55 max.	volts
Peak Negative-Pulse Grid-No.1 Voltage	330 max.	volts
Cathode Current:		
Peak	550 max.	ma
Average	175 max.	ma
Grid-No.2 Input	3.5 max.	watts
Plate Dissipation[g]	17.5 max.	watts
Bulb Temperature (At hottest point on bulb surface	220 max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For grid-resistor-bias operation	1 max.	megohm

[a] The dc component must not exceed 100 volts.

[b] Without external shield.

[c] With grid No.2 connected to plate.

[d] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

[e] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

[f] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[g] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

6GW6

Beam Power Tube

GENERAL DATA

Electrical:

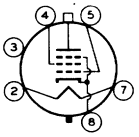
Heater, for Unipotential Cathode:			
Voltage (AC or DC)	6.3 ± 10%		volts
Current at 6.3 volts	1.2		amp
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 150, grid-No.2 volts = 150, grid-No.1 volts = -22.5	4.4		
Direct Interelectrode Capacitances (Approx.):[a]			
Grid No.1 to plate	0.5		μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	17		μμf
Plate to cathode & grid No.3, grid No.2, and heater	7		μμf

Characteristics, Class A_1 Amplifier:

Plate Voltage	60	250	volts
Grid-No.2 Voltage	150	150	volts
Grid-No.1 Voltage	0	-22.5	volts
Plate Resistance (Approx.)	-	15000	ohms
Transconductance	-	7100	μmhos
Plate Current	390[b]	70	ma
Grid-No.2 Current	32[b]	2.1	ma
Grid-No.1 Voltage (Approx.) for plate ma. = 1	-	-42	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	4-1/4"
Seated Length	3-1/2" ± 3/16"
Diameter	1.438" to 1.562"
Bulb	T12
Cap	Skirted Miniature (JEDEC No.C1-3)
Base	Short Medium-Shell Octal 6-Pin with External Barriers, Style B, Arrangement 2 (JEDEC No.B6-122)
Basing Designation for BOTTOM VIEW	6AM



Pin 2 - Heater
Pin 3 - No Connection
Pin 4 - Grid No.2
Pin 5 - Grid No.1
Pin 7 - Heater
Pin 8 - Cathode, Grid No.3
Cap - Plate

6GW6

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[c]

DC PLATE-SUPPLY VOLTAGE	770	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[d]	6500	max.	volts
PEAK NEGATIVE-PULSE PLATE VOLTAGE	1500	max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	220	max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-55	max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 VOLTAGE	330	max.	volts
CATHODE CURRENT:			
Peak	550	max.	ma
Average	175	max.	ma
GRID-No.2 INPUT	3.5	max.	watts
PLATE DISSIPATION[e]	17.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[f]	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	240	max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For grid resistor-bias operation	1	max.	megohm

[a] Without external shield.

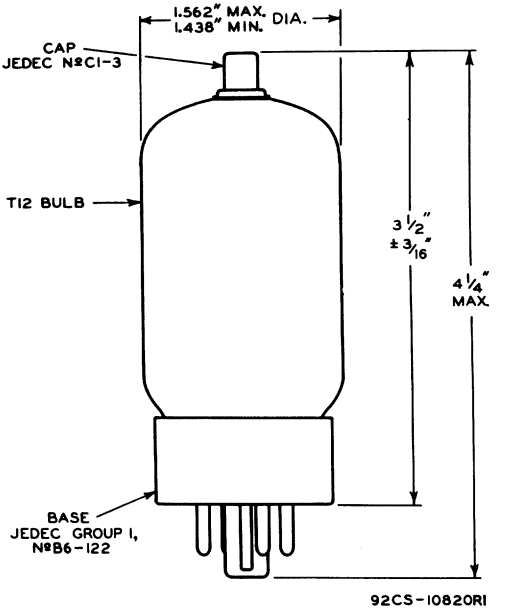
[b] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[d] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

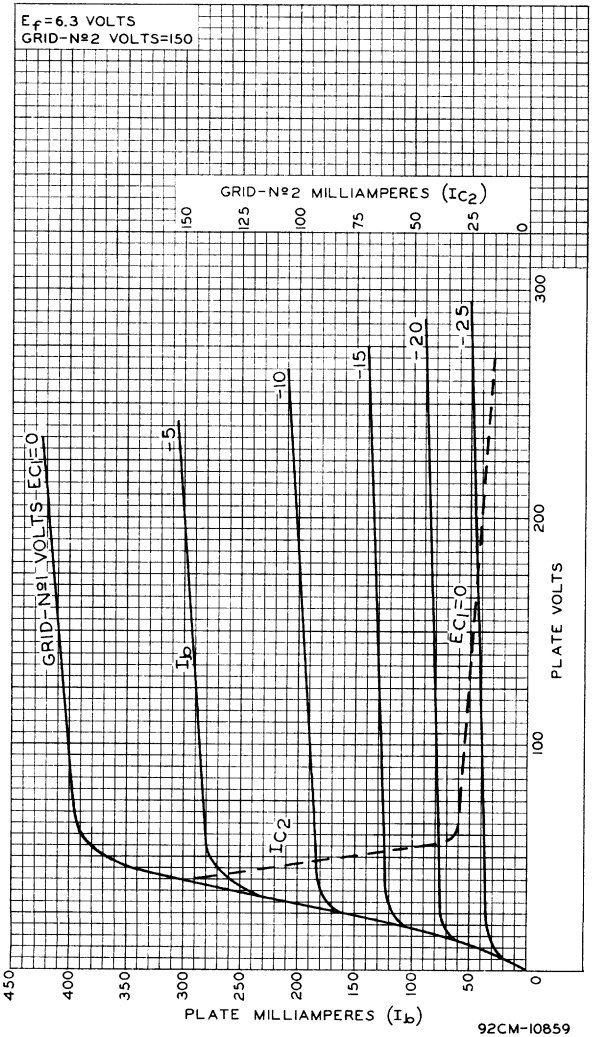
[e] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

[f] The dc component must not exceed 100 volts.


1.562" MAX.
1.438" MIN. DIA.
CAP
JEDEC NºC1-3
T12 BULB
3 1/2"
± 3/16"
4 1/4"
MAX.
BASE
JEDEC GROUP 1,
NºB6-122
92CS-10820RI

6GW6

AVERAGE CHARACTERISTICS



92CM-10859

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

6GW8/ECL86

High-Mu Triode-
Sharp-Cutoff Pentode

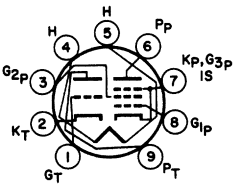
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3	volts
Current at heater volts = 6.3	0.660	amp
Peak heater-cathode voltage	100	volts
Direct Interelectrode Capacitances:		
Triode Unit:		
Grid to plate	1.4	pf
Input: G_T to (K_T, H)	2.3	pf
Output: P_T to (K_T, H)	2.5	pf
Grid to heater	0.006 max.	pf
Pentode Unit:		
Grid No.1 to plate	0.4 max.	pf
Input: G1p to (Kp+G3p+IS,G2p,H)	10.0	pf
Grid No.1 to heater	0.24 max.	pf
Triode plate to pentode grid No.1	0.2 max.	pf
Triode grid to pentode plate	0.006 max.	pf
Triode grid to pentode grid No.1	0.02 max.	pf
Triode plate to pentode plate	0.15 max.	pf

Mechanical:

Operating Position	Any
Maximum Overall Length	3-1/16"
Maximum Seated Length	2-13/16"
Length, Base Seat to Bulb Top (Excluding Tip)	2-7/16" ±3/32"
Diameter	0.750" to 0.875"
Dimensional Outline (JEDEC No.6-4)	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9LZ

Pin 1 – Triode Grid
Pin 2 – Triode Cathode
Pin 3 – Pentode Grid No.2
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Plate
Pin 7 – Pentode Cathode, Grid No.3, Internal Shield
Pin 8 – Pentode Grid No.1
Pin 9 – Triode Plate



CLASS A_1 AMPLIFIER

Characteristics:

	Triode Unit	*Pentode Unit*	
Plate Voltage	250	250	volts
Grid No.2 (Screen-Grid) Voltage	-	250	volts
Grid No.1 (Control-Grid) Voltage	-1.9	-7	volts
Amplification Factor	100	21[a]	
Plate Resistance (Approx.)	-	48000	ohms
Transconductance	1600	10000	μmhos
Plate Current	1.2	36	ma
Grid-No.2 Current	-	6	ma

Maximum Ratings, *Design-Center Values:*

Plate Supply Voltage	550	550	volts
Plate Voltage	300	300	volts
Grid-No.2 Supply Voltage	-	550	volts
Grid-No.2 Voltage	-	300	volts
Average Cathode Current	4	55	ma
Grid-No.2 Input	-	1.8	watts
Plate Dissipation	0.5	9	watts
Grid-No.1 Voltage at grid No.1 μa = 0.3	-1.3	-1.3	volts

Maximum Circuit Values:

Grid-No.1 Circuit Resistance:			
For fixed-bias operation	1	0.5	megohm

[a] Grid No.1 to Grid No.2

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

6GX6

Sharp-Cutoff Pentode

With Two Independent Control Grids

7-PIN MINIATURE TYPE

For FM Sound-Detector Service

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.45 ± 6%	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances (Approx.):[a]		
Grid No.1 to plate	0.022	μμf
Grid No.1 to cathode & internal shield, grid No.3, grid No.2, and heater	8	μμf
Grid No.3 to plate	1.6	μμf
Grid No.1 to grid No.3	0.11	μμf
Grid No.3 to cathode & internal shield, plate, grid No.2, grid No.1, and heater	7.5	μμf

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	150	volts
Grid-No.3 Supply Voltage	0	volts
Grid-No.2 Supply Voltage	100	volts
Grid-No.1 Supply Voltage	0	volts
Cathode Resistor	180	ohms
Plate Resistance (Approx.)	0.14	megohm
Transconductance, Grid No.1 to Plate	3700	μmhos
Transconductance, Grid No.3 to Plate	750	μmhos
Plate Current	3.7	ma
Grid-No.2 Current	3	ma
Grid-No.1 Supply Voltage (Approx.) for plate μa = 20	-4.5	volts
Grid-No.3 Supply Voltage (Approx.) for plate μa = 20	-7	volts

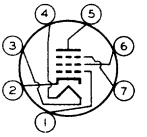
Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)

6GX6

Basing Designation for BOTTOM VIEW. 7EN

Pin 1 – Grid No.1
Pin 2 – Cathode, Internal Shield
Pin 3 – Heater



Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Grid No.3

FM SOUND-DETECTOR SERVICE

Maximum Ratings, *Design-Maximum Values:*

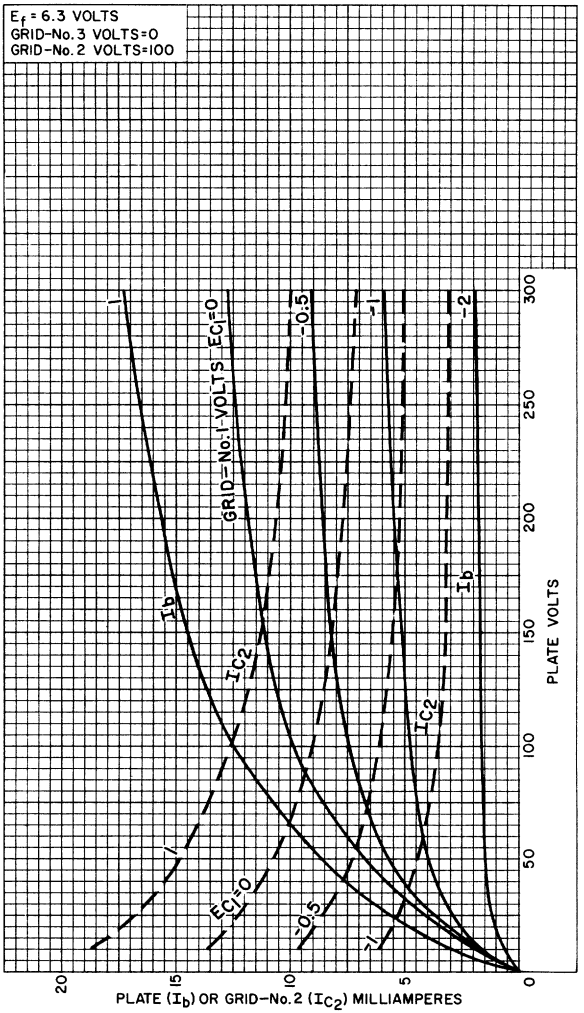
PLATE VOLTAGE	300	max.	volts
GRID-No.3 (CONTROL-GRID) VOLTAGE:			
Negative value (DC and Peak AC)	100	max.	volts
Positive value (DC and Peak AC)	25	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	300	max.	volts
GRID-No.2 VOLTAGE . . . . . See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section			
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Negative-bias value	50	max.	volts
Positive-bias value	0	max.	volts
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 150 volts.	1	max.	watt
For grid-No.2 voltages between 150 and 300 volts . . . . . See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section			
GRID-No.3 INPUT	0.1	max.	watt
PLATE DISSIPATION	1.7	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200[b]	max.	volts

Maximum Circuit Values:

Grid-No.3-Circuit Resistance.	0.68	max.	megohm
Grid-No.1-Circuit Resistance:			
For fixed-bias operation.	0.22	max.	megohm
For cathode-bias operation.	0.47	max.	megohm

[a] Without external shield.
[b] The dc component must not exceed 100 volts.

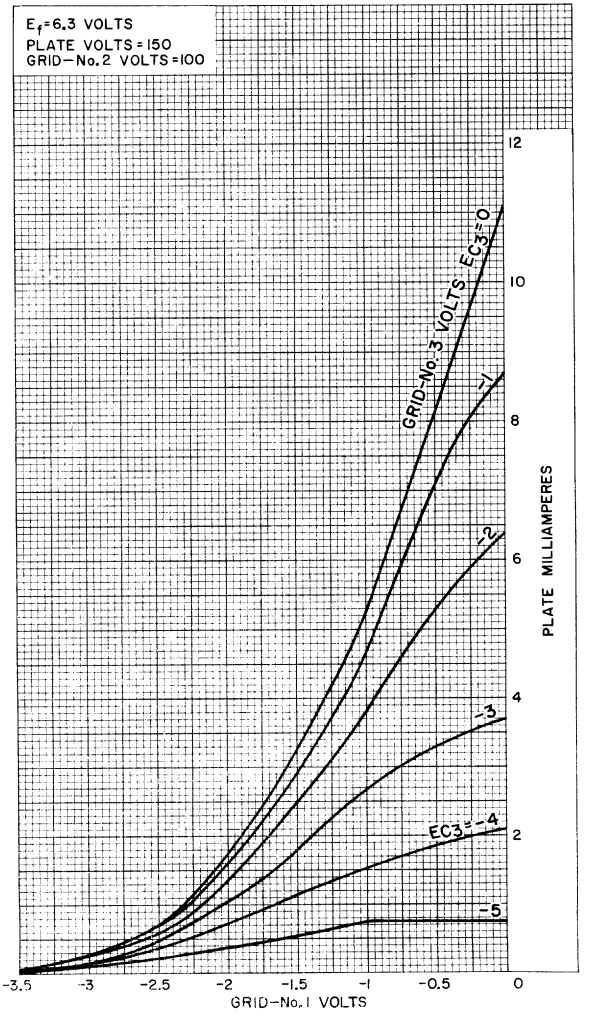
AVERAGE CHARACTERISTICS



92CM-11002

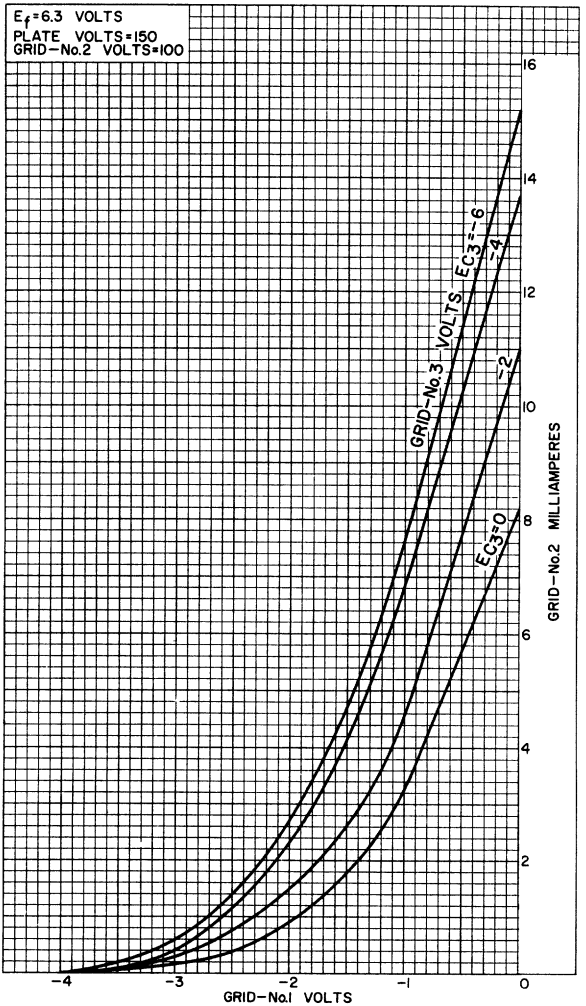
6GX6

AVERAGE CHARACTERISTICS



92CM—11005

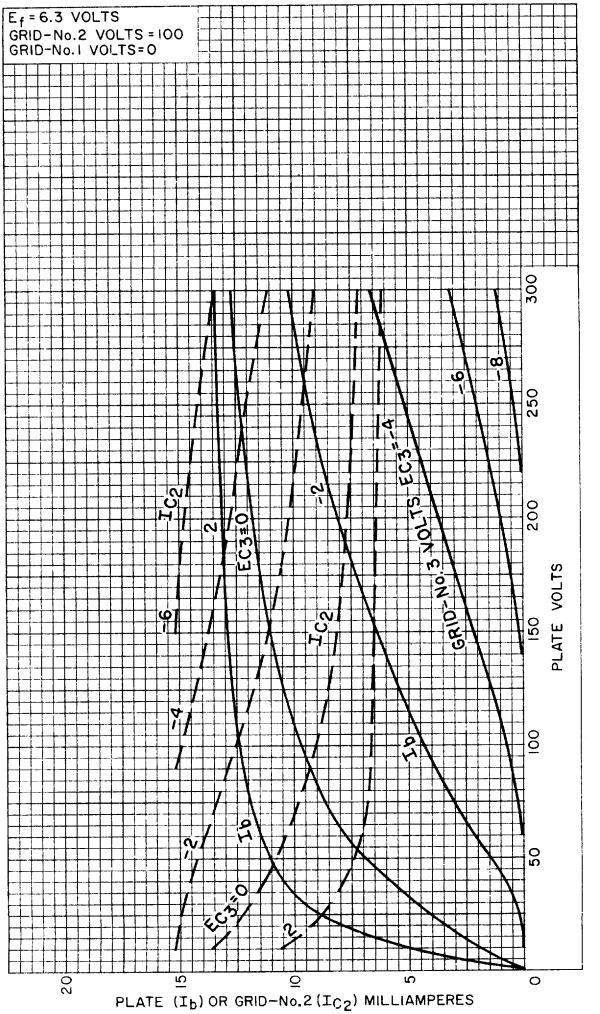
AVERAGE CHARACTERISTICS



92CM-11007

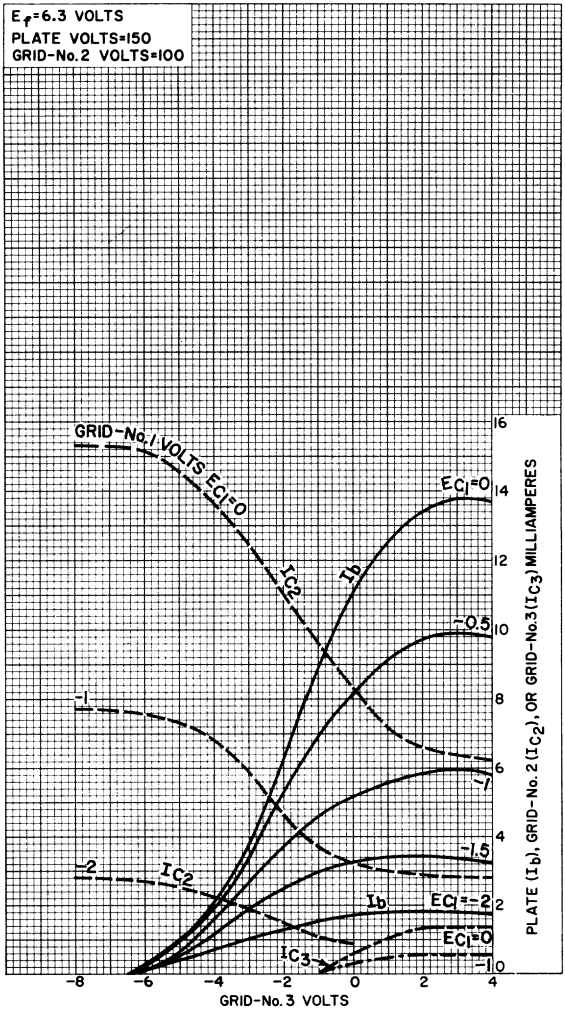
6GX6

AVERAGE CHARACTERISTICS



92CM-11003

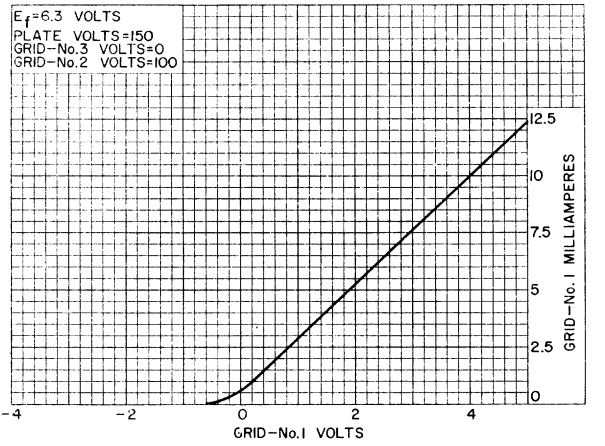
AVERAGE CHARACTERISTICS



92CM-11006

6GX6

AVERAGE GRID-No.1 OPERATION CHARACTERISTIC



92CS-11004

6GY6

Sharp-Cutoff Pentode

With Two Independent Control Grids

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.45 ± 6%	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances (Approx.):[a]		
Grid No.1 to plate	0.026	μμf
Grid No.1 to cathode & internal shield, grid No.3, grid No.2, and heater	8	μμf
Grid No.3 to plate	1.6	μμf
Grid No.1 to grid No.3	0.12	μμf
Grid No.3 to cathode & internal shield, plate, grid No.2, grid No.1, and heater	6.5	μμf

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	150	volts
Grid-No.3 Supply Voltage	0	volts
Grid-No.2 Supply Voltage	100	volts
Grid-No.1 Supply Voltage	0	volts
Cathode Resistor	180	ohms
Plate Resistance (Approx.)	0.14	megohm
Transconductance, Grid No.1 to Plate	3700	μmhos
Transconductance, Grid No.3 to Plate	750	μmhos
Plate Current	3.7	ma
Grid-No.2 Current	3	ma
Grid-No.1 Supply Voltage (Approx.) for plate μa = 20	-4.5	volts
Grid-No.3 Supply Voltage (Approx.) for plate μa = 20	-7	volts

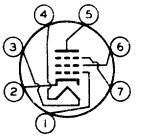
Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)

6GY6

Basing Designation for BOTTOM VIEW. 7EN

Pin 1 – Grid No.1
Pin 2 – Cathode, Internal Shield
Pin 3 – Heater



Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Grid No.3

GATED AGC AMPLIFIER & NOISE INVERTER

For operation in a 525-line, 30-frame system[b]

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	300	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[c]	600	max.	volts
GRID-No.3 (CONTROL-GRID) VOLTAGE:			
Negative-bias value	100	max.	volts
Positive-bias value	0	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	300	max.	volts
GRID-No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Negative-bias value	50	max.	volts
Positive-bias value	0	max.	volts
GRID-NO.2 INPUT:			
For grid-No.2 voltages up to 150 volts	1	max.	watt
For grid-No.2 voltages between 150 and 300 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		
PLATE DISSIPATION	1.7	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[d]	max.	volts

Maximum Circuit Values:

Grid-No.3-Circuit Resistance	0.68	max.	megohm
Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.22	max.	megohm
For cathode-bias operation	0.47	max.	megohm

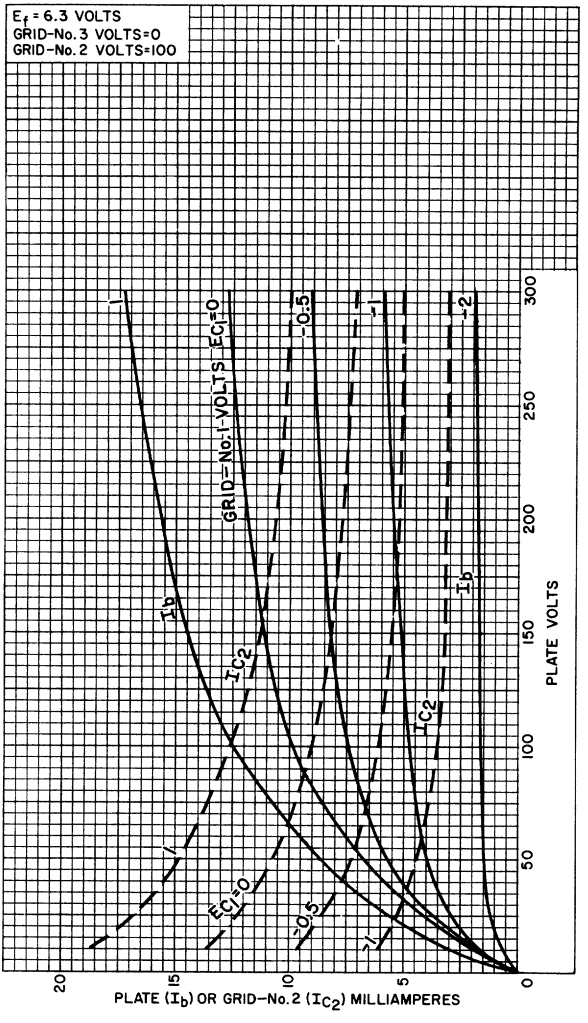
[a] Without external shield.

[b] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[c] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[d] The dc component must not exceed 100 volts.

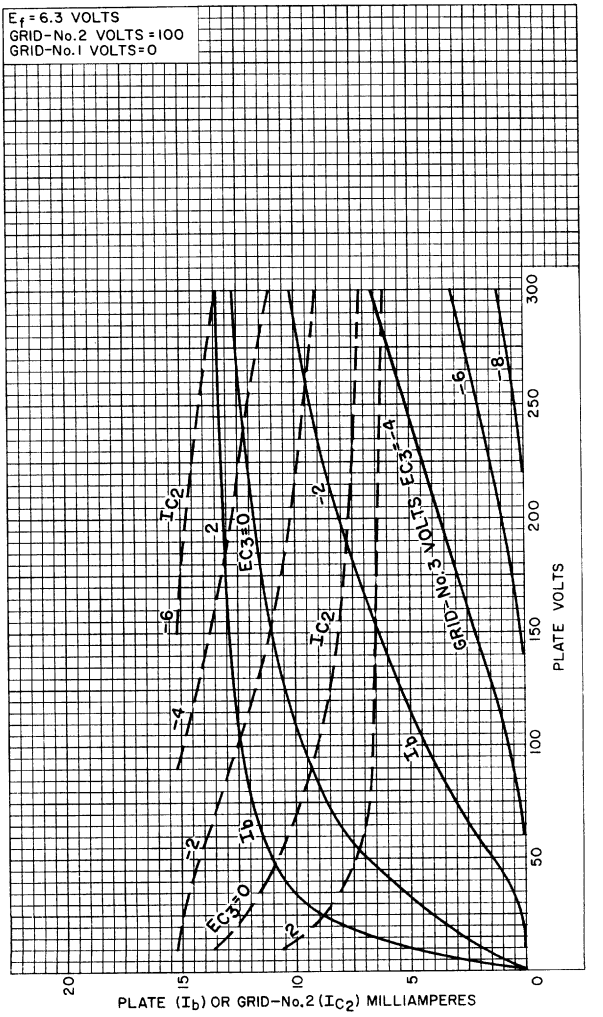
AVERAGE CHARACTERISTICS



92CM-11002

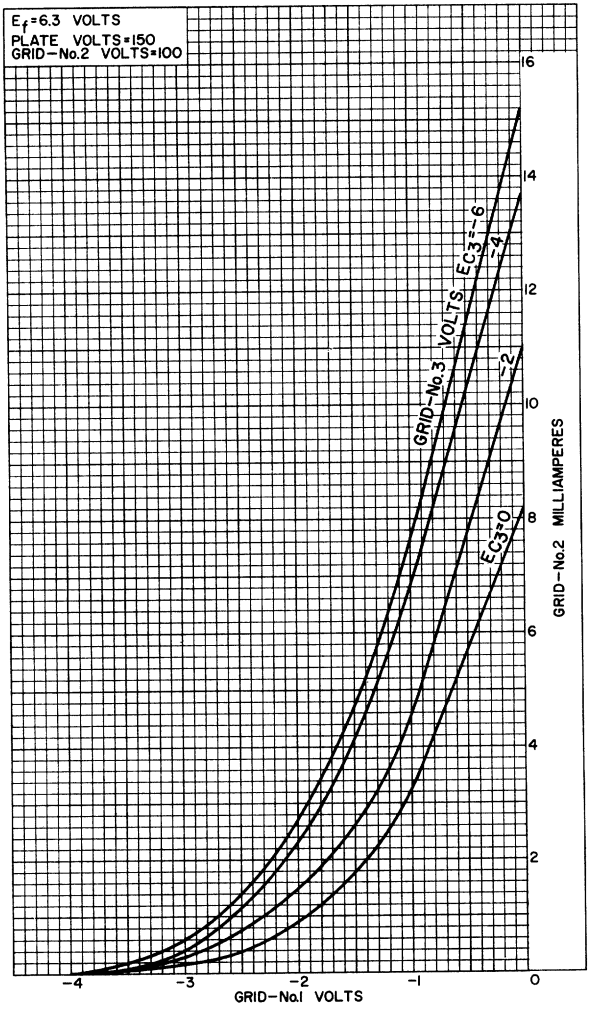
6GY6

AVERAGE CHARACTERISTICS



92CM-11003

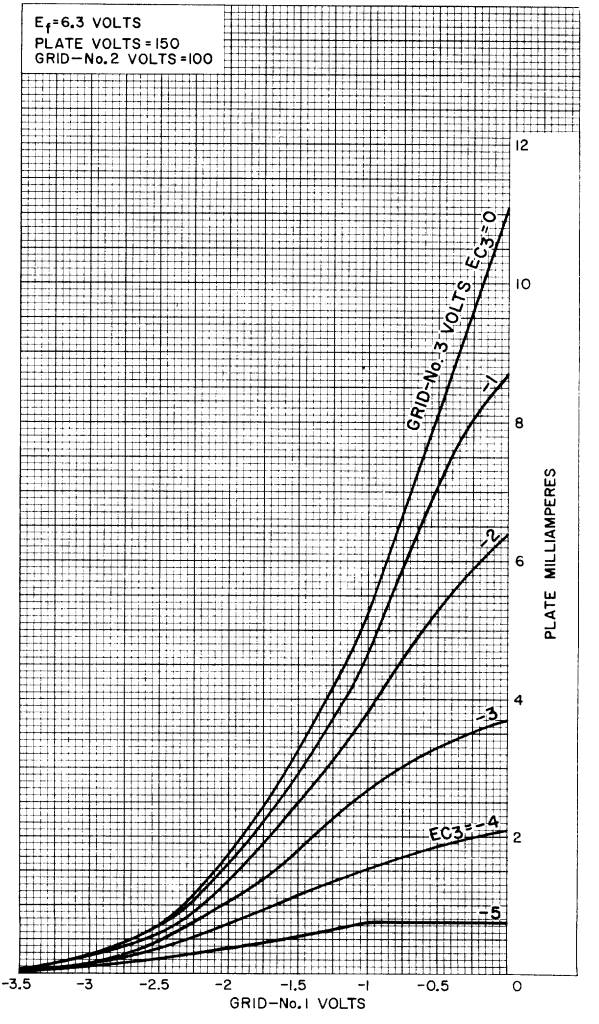
AVERAGE CHARACTERISTICS



92CM-11007

6GY6

AVERAGE CHARACTERISTICS

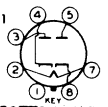


92CM—11005

6H6, 6H6-GT/G

TWIN DIODE

Heater	Coated Unipotential Cathodes		
Voltage	6.3		a-c or d-c volts
Current	0.3		amp.
	6H6	*6H6-GT/G*	
Direct Interelectrode Cap.°			
Plate #1 to Cathode #1	3.0	3.0	μμf
Plate #2 to Cathode #2	3.4	4.0	μμf
Plate #1 to Plate #2	0.10 max.	0.10 max.	μμf
Maximum Overall Length	1-3/4"	3-5/16"	
Maximum Seated Height	1-3/16"	2-3/4"	
Maximum Diameter	1-5/16"	1-5/16"	
Bulb	Metal Shell MT-8	T-9	
Base	Small Wafer, Octal 7-Pin	Intermed. Shell, Octal 7-Pin	
Basing Designation	70	G-7Q	
Pin 1	6H6, Shell; 6H6-GT/G, Internal Shield		
Pin 2	Heater		
Pin 3	Plate #2		
Pin 4		Cathode #2	
Pin 5		Plate #1	
Pin 7		Heater	
Pin 8		Cathode #1	
RCA Socket		Stock No. 9924	←
Mounting Position		Any	



BOTTOM VIEW

Maximum Ratings Are Design-Center Values

RECTIFIER OR DOUBLER

Peak Inverse Voltage		420 max.	volts ←
Peak Plate Current per Plate		48 max.	ma. ←
D-C Heater-Cathode Potential		330 max.	volts ←
*As Half-Wave Rectifier:**			←
A-C Plate Voltage per Plate (RMS)	117	150 max.	volts
Total Effect. Plate-Supply Impedance per Plate ▲	15 min.	40 min.	ohms
D-C Output Current per Plate	8 max.	8 max.	ma.
As Voltage Doubler:			←
	Half-Wave	*Full-Wave*	
A-C Plate Voltage per Plate (RMS)	117	117	volts
Total Effect. Plate-Supply Impedance per Plate ▲	30 min.	15 min.	ohms
D-C Output Current	8 max.	8 max.	ma.

° With shell or external and internal shields connected to cathodes.
* In half-wave service, the two units may be used separately or in parallel.
▲ When a filter-input condenser larger than 40 μf is used, it may be necessary to use more plate-supply impedance than the minimum value shown to limit the peak plate current to the rated value.

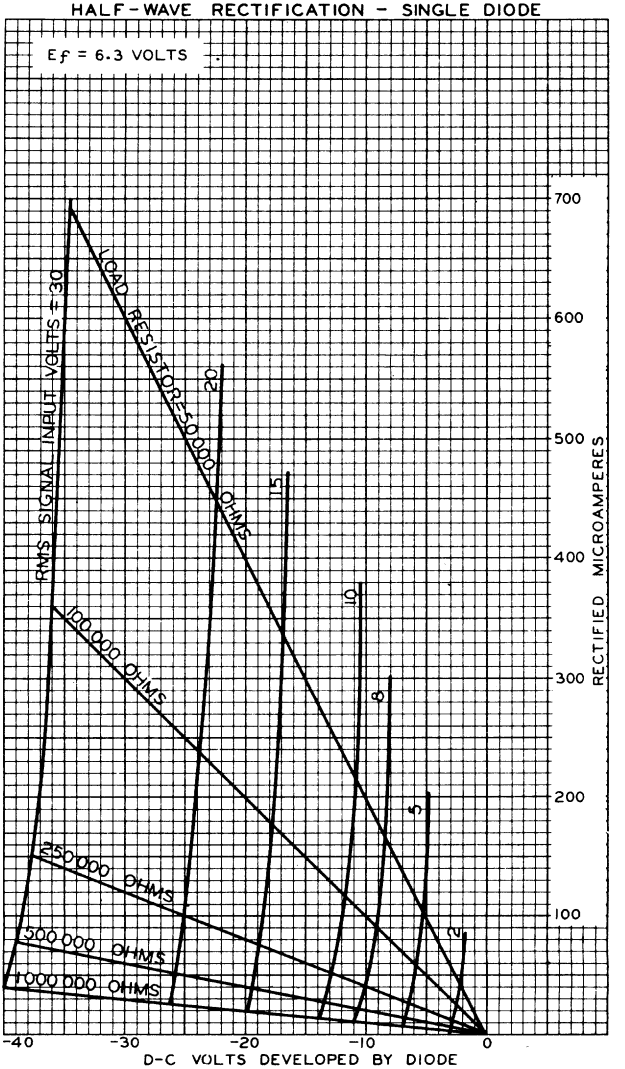
Circuits for the 6H6 and 6H6-GT/G are the same as those shown under Type 25Z5.

← Indicates a change.

6H6

AVERAGE CHARACTERISTICS

HALF-WAVE RECTIFICATION - SINGLE DIODE



6HB6

Power Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

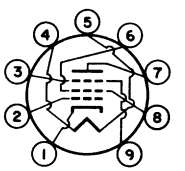
Heater Characteristics and Ratings *(Design-Maximum Values):*			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	0.760		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances (Approx.):[b]			
Grid No.1 to plate	0.18		μμf
Grid No.1 to cathode, grid No.3, grid No.2, and heater	13.0		μμf
Plate to cathode, grid No.3, grid No.2, and heater	8.0		μμf

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	60	250	250	volts
Grid No.3	*Connected to cathode at socket*			
Grid-No.2 Supply Voltage	250	125	250	volts
Grid-No.1 Voltage	0	–	–	volts
Cathode Resistor	–	33	100	ohms
Mu-Factor, Grid No.2 to Grid No.1	–	–	33	
Plate Resistance (Approx.)	–	28000	24000	ohms
Transconductance	–	24000	20000	μmhos
Plate Current	150[c]	40	40	ma
Grid-No.2 Current	37[c]	4.2	6.2	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	–	-6.4	-13	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3-1/16"
Maximum Seated Length	2-13/16"
Length, Base Seat to Bulb Top (Excluding tip)	2-7/16" ± 3/32"
Diameter	0.750" to 0.850"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Basing Designation for BOTTOM VIEW	9PU



Pin 1 – Cathode
Pin 2 – Grid No.1
Pin 3 – Grid No.3
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Grid No.2
Pin 7 – Plate
Pin 8 – Grid No.2
Pin 9 – Grid No.3

VERTICAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[d]

DC PLATE VOLTAGE	350 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[e]	2500 max.	volts
GRID No.3 (SUPPRESSOR GRID)	*Connect to cathode at socket*	
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	volts
GRID No.1 (CONTROL-GRID) VOLTAGE	-100 max.	volts
GRID-No.2 INPUT	2 max.	watts
PLATE DISSIPATION	10 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	1 max.	megohm
For cathode-bias operation	2.2 max.	megohms

[a] The dc component must not exceed 100 volts.

[b] Without external shield.

[c] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

[d] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[e] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

6HB7

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

For VHF Oscillator-Mixer Service in TV Receivers

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6[a]	volts
Current at heater volts = 6.3	0.450[b]	amp
Warm-up time (Average)	11	sec
Peak heater-cathode voltage:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[c] max.	volts
Direct Interelectrode Capacitances:[d]		
Triode Unit:		
G_T to P_T	1.9	pf
Input: G_T to (K+$G3_P$+IS,H)	3.0	pf
Output: P_T to (K+$G3_P$+IS,H)	1.9	pf
Pentode Unit:		
$G1_P$ to P_P	0.010 max.	pf
Input: $G1_P$ to (K+$G3_P$+IS,$G2_P$,H)	5.0	pf
Output: $G1_P$ to (K+$G3_P$+IS,$G2_P$,H)	3.4	pf
H to K[e]	3.8	pf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*	
Plate Supply Voltage	150	125	volts
Grid-No.2 Supply Voltage	–	125	volts
Grid-No.1 Supply Voltage	0	-1	volts
Cathode Resistor	56	–	ohms
Amplification Factor	40	–	
Plate Resistance (Approx.)	5000	200000	ohms
Transconductance	8500	6400	μmhos
Plate Current	18	12	ma
Grid-No.2 Current	–	4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-12	-9	volts

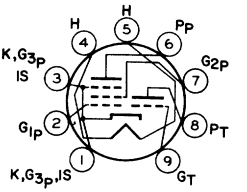
Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding Tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2

6HB7

Base. . . . . .Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9QA

Pin 1 - Cathode, Pentode Grid No.3, Internal Shield
Pin 2 - Pentode Grid No.1
Pin 3 - Same as Pin 1
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Pentode Plate
Pin 7 - Pentode Grid No.2
Pin 8 - Triode Plate
Pin 9 - Triode Grid



AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

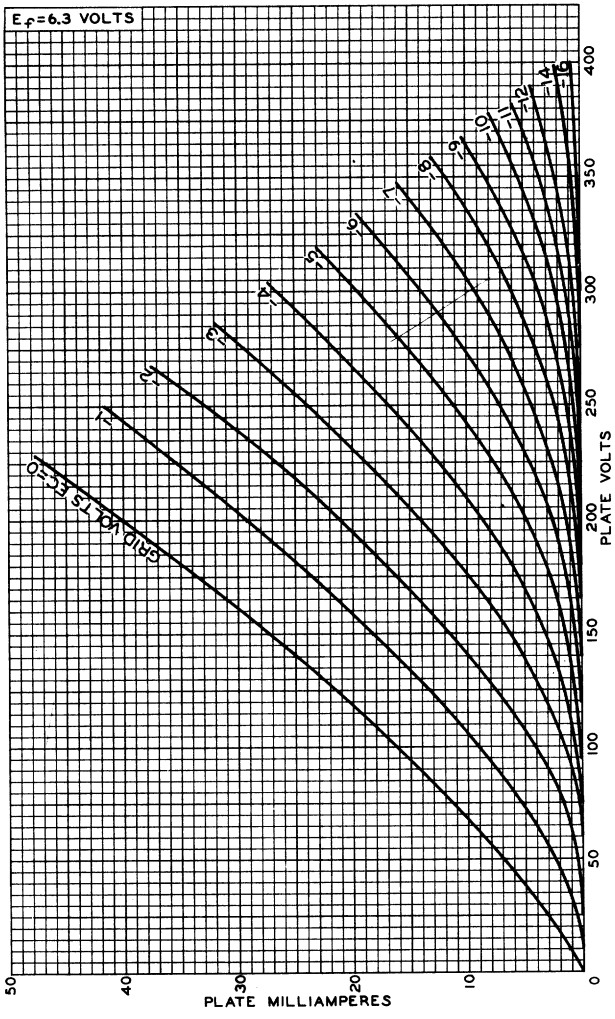
	Triode Unit	*Pentode Unit*	
Plate Voltage	330 max.	330 max.	volts
Grid-No.2 (Screen-Grid) Supply Voltage.	-	330 max.	volts
Grid-No.2 Voltage	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		
Grid-No.1 (Control-Grid) Voltage: Positive-bias value	0 max.	0 max.	volts
Grid-No.2 Input: For grid-No.2 voltages up to 165 volts	-	0.55 max.	watt
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		
Plate Dissipation	2.5 max.	3.1 max.	watts

Maximum Circuit Values:

Grid-No.1 Circuit Resistance: For fixed-bias operation. . .	0.5 max.	0.25 max.	megohm
For cathode-bias operation. .	1.0 max.	0.5 max.	megohm

a For parallel heater operation.
b For series heater operation current must be limited to 0.450 ± 0.030 amperes.
c The dc component must not exceed 100 volts.
d With external shield JEDEC No.315 connected to cathode except as noted.
e With external shield JEDEC No.315 connected to ground.

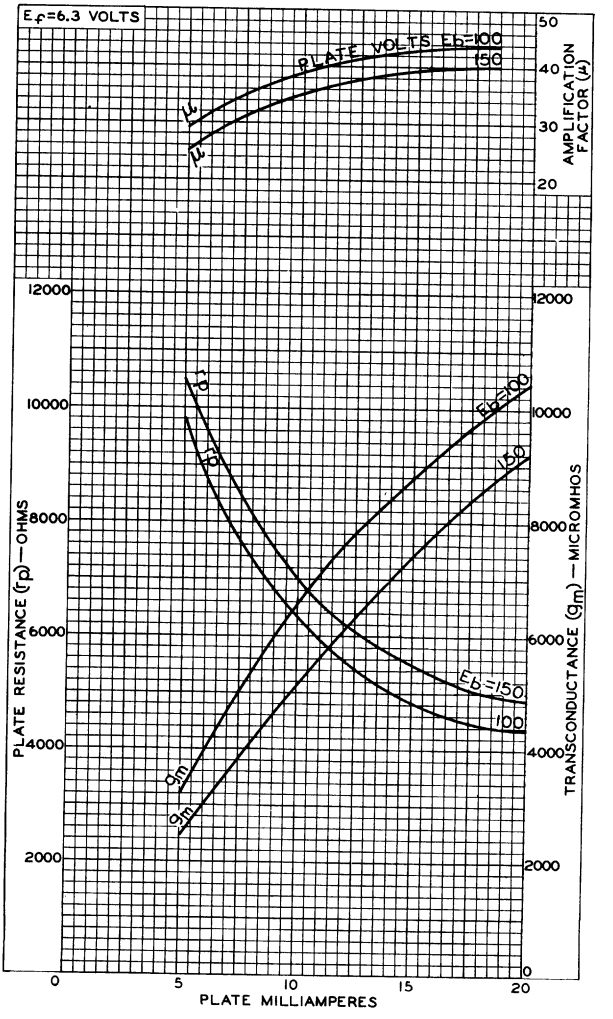
AVERAGE PLATE CHARACTERISTICS
Triode Unit



92CM-9866

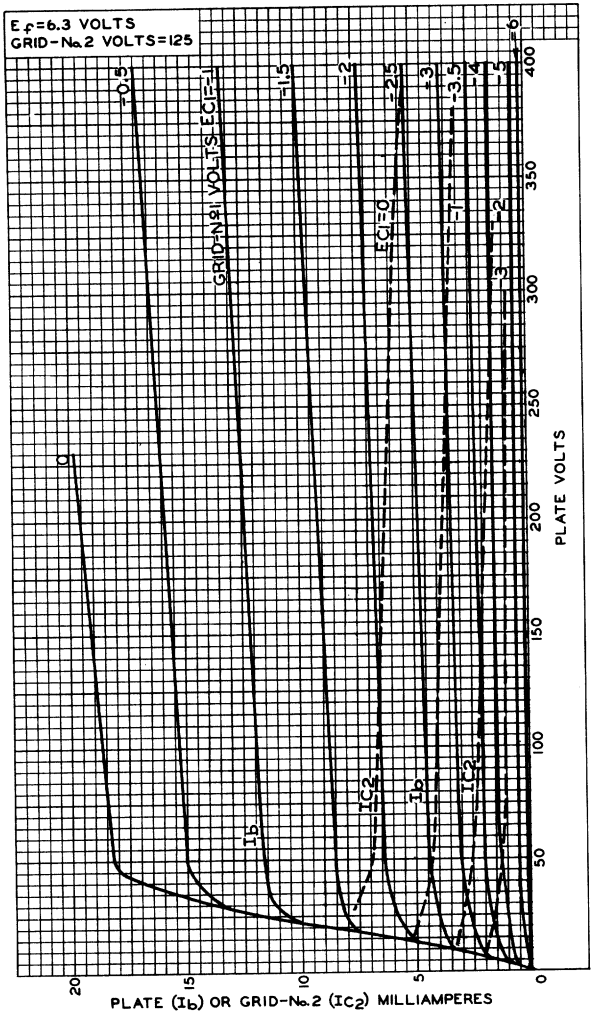
6HB7

AVERAGE CHARACTERISTICS
Triode Unit



92CM-9882R1

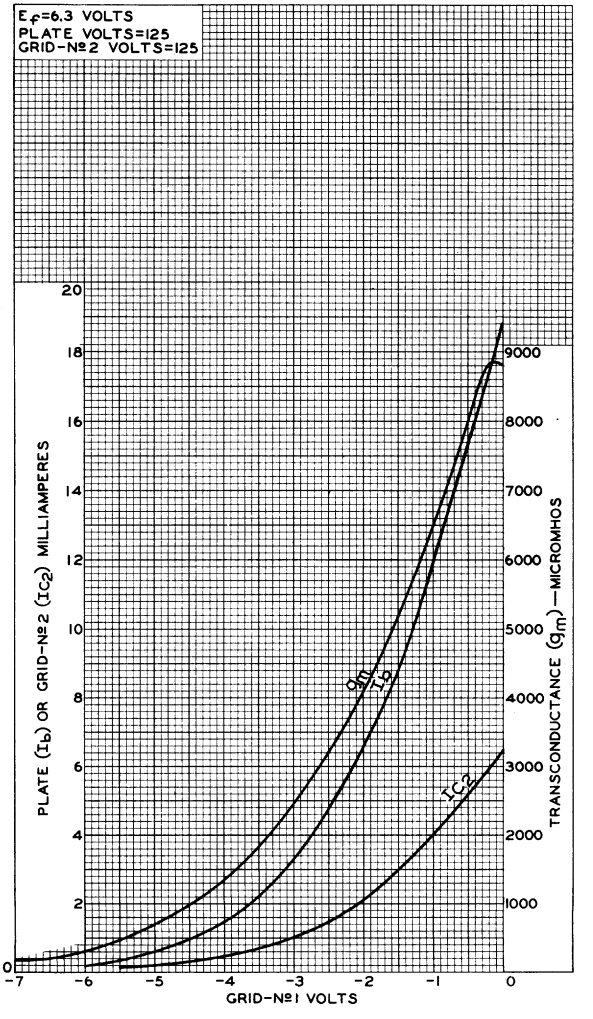
AVERAGE CHARACTERISTICS
Pentode Unit



92CM-9867RI

6HB7

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-9868R1

Beam Power Tube

Duodecar Type

For Vertical-Deflection-Amplifier Circuits in TV Receivers

ELECTRICAL CHARACTERISTICS – Bogey Values

Heater Voltage, ac or dc	E_h		6.3	V
Heater Current	I_h		0.8	A
Direct Interelectrode Capacitances:[a]				
Grid No.1 to plate	c_{g1-p}		0.54	pF
Input: G1 to (K,G3,G2,H)	c_i		9.5	pF
Output: P to (K,G3,G2,H)	c_o		7.0	pF
For the following characteristics, see Conditions below:				
Plate Resistance (approx.)	r_p	–	50000	Ω
Transconductance	g_m	–	4100	μmho
DC Plate Current	I_b	180[b]	43	mA
DC Grid-No.2 Current	I_{c2}	20[b]	3.5	mA
Cutoff DC Grid-No.1 Voltage for I_b = 100 μA.	$E_{c1(co)}$	–	-50	V
Conditions:				
Heater Voltage	E_h	6.3	6.3	V
DC Plate Voltage	E_b	60	250	V
DC Grid-No.2 Voltage	E_{c2}	250	250	V
DC Grid-No.1 Voltage	E_{c1}	0[c]	-20	V

MECHANICAL CHARACTERISTICS

Maximum Overall Length . . . . . 2.875in (73.02 mm)
Maximum Seated Length . . . . . 2.500in (63.5 mm)
Maximum Diameter . . . . . 1.188in (30.1 mm)
Dimensional Outline . . . . . JEDEC 9-60
Envelope . . . . . JEDEC T9
Base . . . . . Small-Button Duodecar 12-Pin (JEDEC E12-70)
Terminal Diagram . . . . . JEDEC 12EY
Type of Cathode . . . . . Coated Unipotential
Operating Position . . . . . Any

MAXIMUM RATINGS – Design-Maximum Values[d]

For operation as a Vertical-Deflection-Amplifier Tube in a 525-line, 30-frame system

DC Plate Supply Voltage	E_{bb}	350	V
Peak Positive-Pulse Plate Voltage[e]	e_{bm}	2500	V

DC Grid-No.2 (Screen-Grid) Voltage .	E_{c2}	300	V
Heater-Cathode Voltage:			
Peak	e_{hkm}	±200	V
Average	E_{hk}	100	V
Heater Voltage, ac or dc	E_h	5.7 to 6.9	V
Cathode Current:			
Peak	i_{km}	260	mA
Average	$I_{k(av)}$	75	mA
Grid-No.2 Input	P_{g2}	2.75	W
Plate Dissipation[f]	P_b	12	W
Envelope Temperature (at hottest point on envelope surface.)	T_E	200	°C
MAXIMUM CIRCUIT VALUES			
Grid-No.1-Circuit Resistance			
With fixed bias	R_{g1}	1.0	MΩ
With cathode bias	R_{g1}	2.2	MΩ

[a] Measured without external shield in accordance with the current issue of EIA Standard RS-191.

[b] This value can be measured by a method involving a recurrent waveform such that the Maximum Ratings of the tube will not be exceeded.

[c] Applied for two seconds maximum so as not to damage tube.

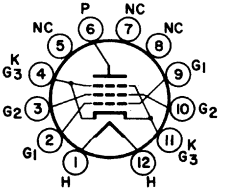
[d] Unless otherwise specified, as defined in the current issue of EIA Standard RS-239.

[e] This rating is applicable when the duration of the voltage pulse does not exceed 15% of one vertical scanning cycle. In a 525-line, 30-frame system, 15% of one vertical scanning cycle is 2.5 ms.

[f] An adequate bias resistor or other means is required to protect the tube in the absense of excitation.

TERMINAL DIAGRAM – Bottom View

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.3, Cathode
Pin 5 - No Connection
Pin 6 - Plate
Pin 7 - No Connection
Pin 8 - No Connection
Pin 9 - Grid No.1
Pin 10 - Grid No.2
Pin 11 - Grid No.3, Cathode
Pin 12 - Heater



JEDEC 12EY

6HF8

High-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.75	amp
Direct Interelectrode Capacitances:▲		
Triode Unit:		
Grid to plate	3.5	μμf
Grid to cathode, pentode cathode & grid No.3 & internal shield, and heater	2.8	μμf
Plate to cathode, pentode cathode & grid No.3 & internal shield, and heater	2.6	μμf
Pentode Unit:		
Grid No.1 to plate	0.1 max.	μμf
Grid No.1 to cathode & internal shield & grid No.3, grid No.2, and heater	10	μμf
Plate to cathode & internal shield & grid No.3, grid No.2, and heater	4.2	μμf
Triode grid to pentode plate	0.015 max.	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*		
Plate Supply Voltage	200	45	200	volts
Grid-No.2 Supply Voltage	–	125	125	volts
Grid-No.1 Voltage	-2	0	–	volts
Cathode Resistor	–	–	68	ohms
Amplification Factor	70	–	–	
Plate Resistance (Approx.)	17500	–	75000	ohms
Transconductance	4000	–	12500	μmhos
Plate Current	4	40●	25	ma
Grid-No.2 Current	–	15●	7	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	–	–	-9	volts
Grid-No.1 Voltage (Approx.) for plate μa = 20	-6	–	–	volts

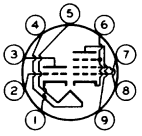
Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"

6HF8

Length, Base Seat to Bulb Top (Excluding tip) . . . 2" ± 3/32"
Diameter . . . . . 0.750" to 0.875"
Dimensional Outline. . . . . .See *General Section*
Bulb T6-1/2
Base . . . . . Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW 9DX

Pin 1 – Triode Cathode
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Pentode Cathode, Grid No.3, Internal Shield
Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE.	330 max.	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	–	330 max.	volts
GRID-No.2 VOLTAGE.	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value. . . .	0 max.	0 max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts.	–	1.1 max.	watts
For grid-No.2 voltages between 165 and 330 volts.	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION.	1 max.	5 max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode . . .	200 max.	200 max.	volts
Heater positive with respect to cathode . . .	200★ max.	200★ max.	volts

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance: For fixed-bias operation .	0.5 max.	0.25 max.	megohm
For cathode-bias operation.	1 max.	1 max.	megohm

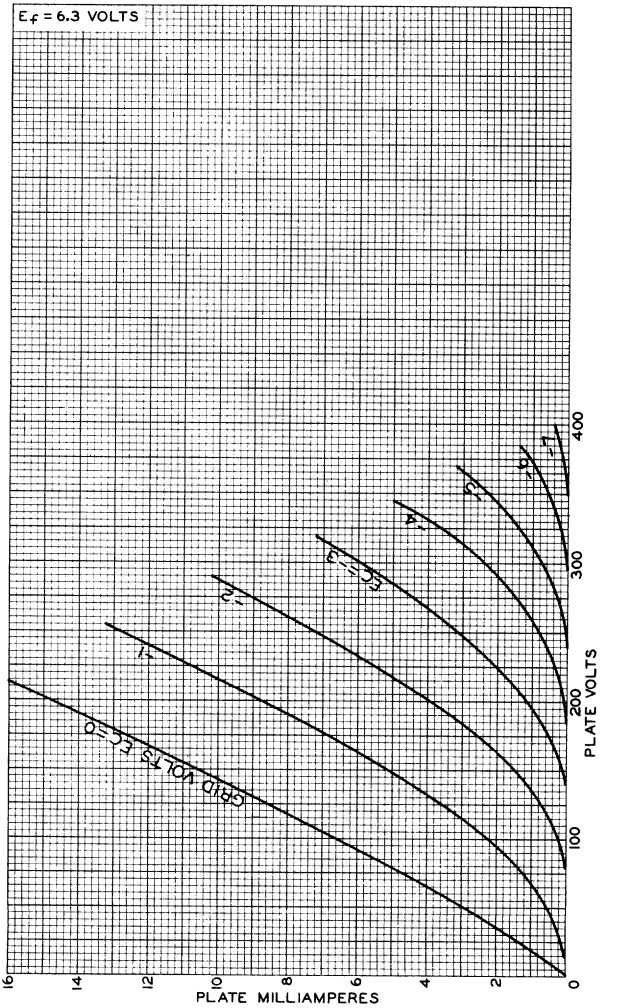
▲ Without external shield.

● This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

★ The dc component must not exceed 100 volts.

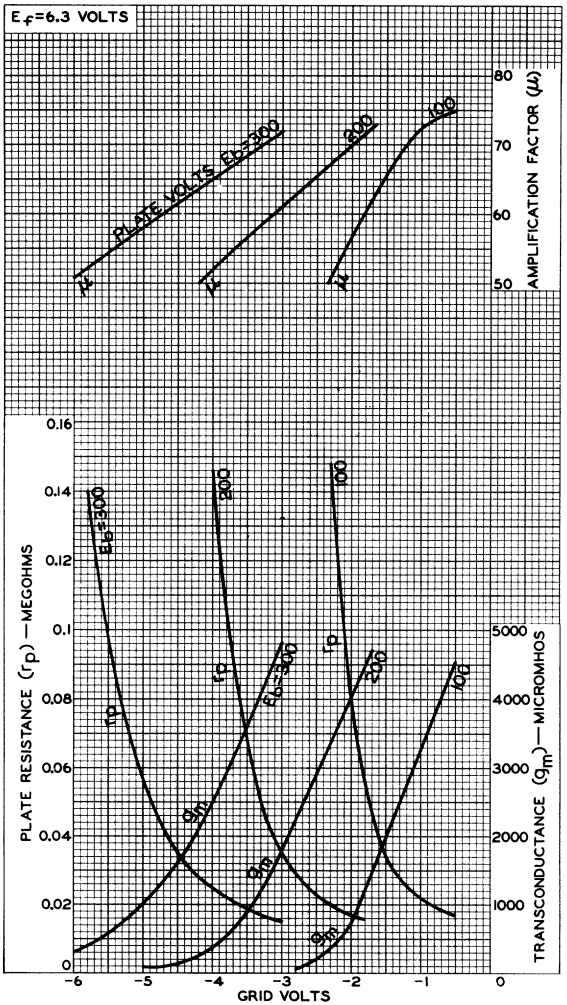
6HF8

AVERAGE PLATE CHARACTERISTICS
Triode Unit



92CM-8644

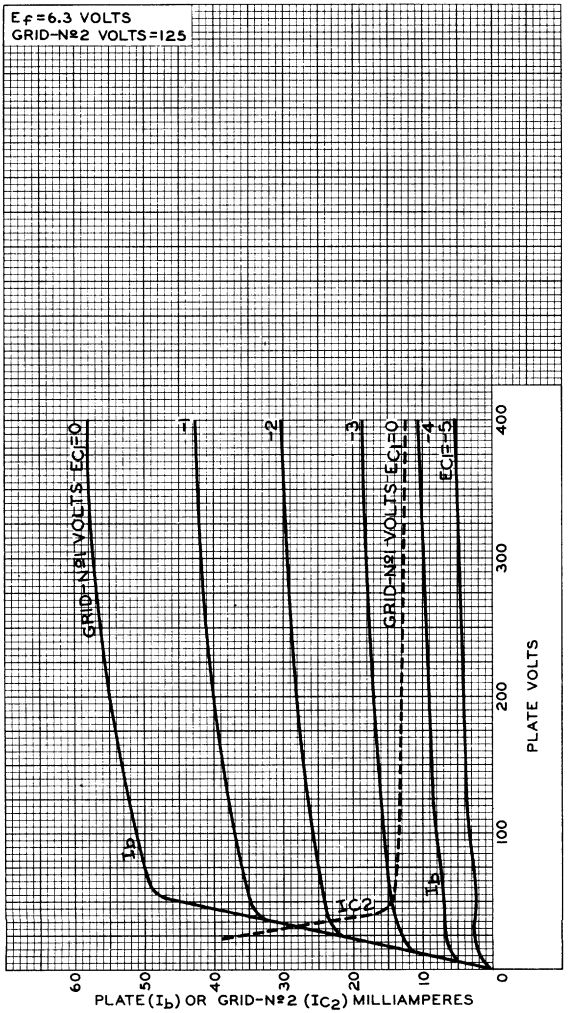
AVERAGE CHARACTERISTICS
Triode Unit



92CM-10874

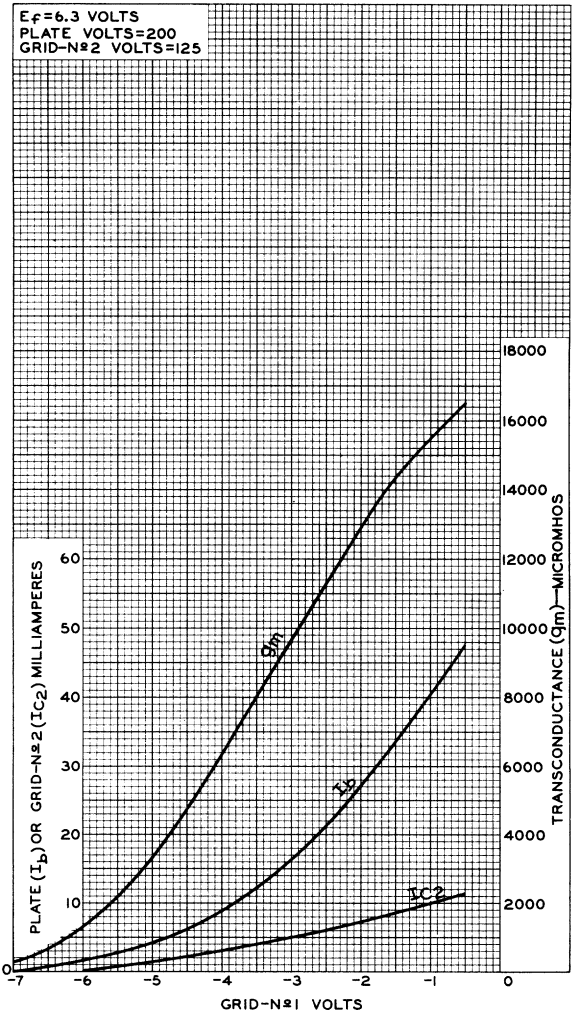
6HF8

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-9906

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-9905RI

6HG5

Beam Power Tube

7-PIN MINIATURE TYPE
CONTROLLED CATHODE WARM-UP TIME MINIMIZES EXTRANEOUS SOUND DURING RECEIVER WARM UP.

For Use in the Audio Output Stages of Television Receivers

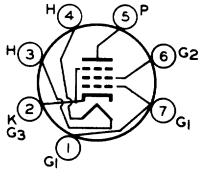
lectrical:

eater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.450	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts
inimum Cathode Warm-up Time:[b]		
Heater volts = 6.3, plate and grid-No.2 volts = 250, and cathode resistor (ohms) = 680	14	sec
irect Interelectrode Capacitances (Approx.):		
G1 to P	0.4	pf
Input: G1 to (K+G3,G2,H)	8.0	pf
Output: P to (K+G3,G2,H)	8.5	pf

lechanical:

)perating Position	Any
'ype of Cathode	Coated Unipotential
laximum Overall Length	2-5/8"
laximum Seated Length	2-3/8"
.ength, Base Seat to Bulb Top (Excluding Tip)	2" ±3/32"
)iameter	0.650" to 0.750"
)imensional Outline	See *General Section*
3ulb	T5-1/2
3ase	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BZ

Pin 1 – Grid No.1
Pin 2 – Cathode, Grid No.3
Pin 3 – Heater



Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Grid No.1

AMPLIFIER — Class A_1

laximum Ratings, *Design-Maximum Values:*

late Voltage	275 max.	volts
rid-No.2 (Screen-Grid) Voltage	275 max.	volts
rid-No.2 Input	2 max.	watts

Plate Dissipation	12 max.		watts
Bulb Temperature (At hottest point on bulb surface)	250 max.		°C

Typical Operation and Characteristics:

Plate Voltage	180	250	volts
Grid-No.2 Voltage	180	250	volts
Grid-No.1 (Control-Grid) Voltage	-8.5	-12.5	volts
Peak AF Grid-No.1 Voltage	8.5	12.5	volts
Zero-Signal Plate Current	29	45	ma
Max.-Signal Plate Current	30	47	ma
Zero-Signal Grid-No.2 Current	3	4.5	ma
Max.-Signal Grid-No.2 Current	4	7	ma
Plate Resistance (Approx.)	58000	52000	ohms
Transconductance	3700	4100	μmhos
Load Resistance	5500	5000	ohms
Total Harmonic Distortion	8	8	%
Max.-Signal Power Output	2	4.5	watts

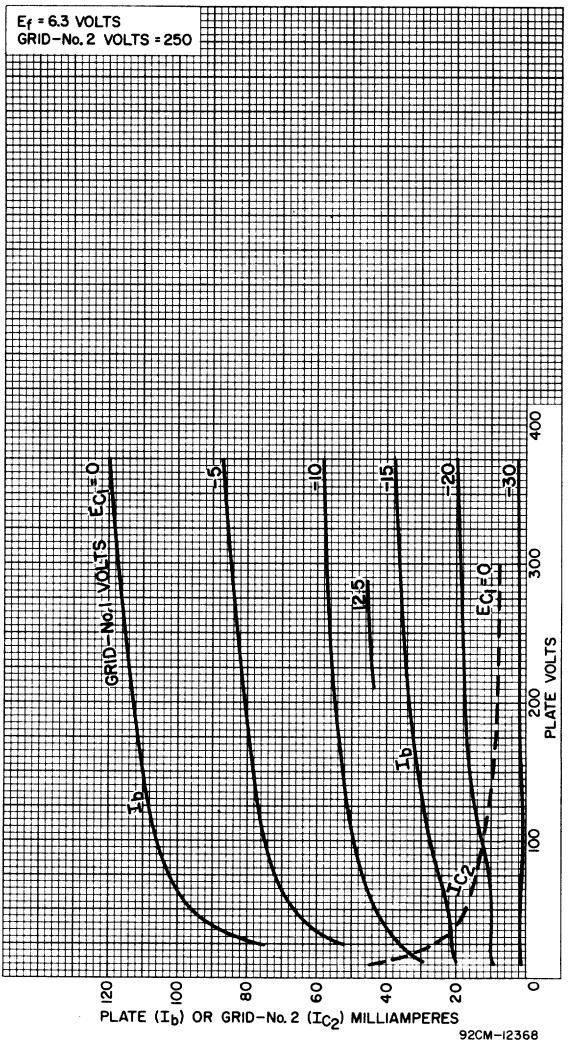
Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

[a] The dc component must not exceed 100 volts.

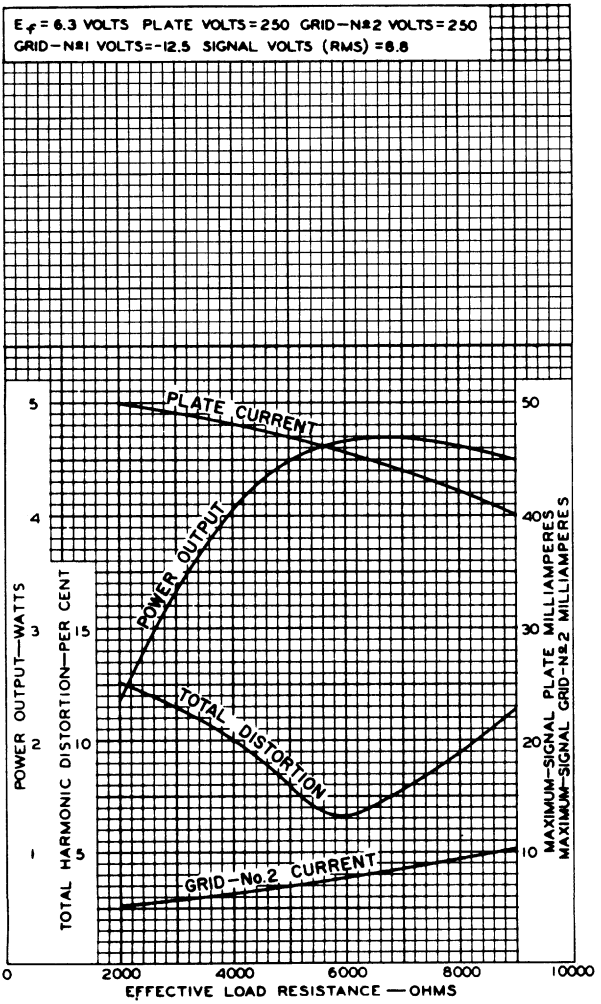
[b] The time interval between the instant all electrode voltages are applied and the instant a current of one milliampere flows in the plate circuit of the 6HG5.

AVERAGE CHARACTERISTICS



6HG5

OPERATION CHARACTERISTICS



92CM-6339R2

6HJ5

Beam Power Tube

DUODECAR TYPE

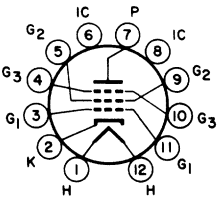
Electrical:

Heater Ratings and Characteristics:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	2.250	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.625"
Seated Length	3.000" to 3.250"
Diameter	1.437" to 1.563"
Dimensional Outline	See *General Section*
Bulb	T12
Base	Large-Button Duodecar 12-Pin (JEDEC No.E12-74)
Basing Designation for BOTTOM VIEW	12FL

Pin 1 – Heater
Pin 2 – Cathode
Pin 3 – Grid No.1
Pin 4 – Grid No.3
Pin 5 – Grid No.2
Pin 6 – Do Not Use



Pin 7 – Plate
Pin 8 – Do Not Use
Pin 9 – Grid No.2
Pin 10 – Grid No.3
Pin 11 – Grid No.1
Pin 12 – Heater

Characteristics, Class A_1 Amplifier:

				Triode Connection[b]	
Plate Voltage	40	60	135	135	volts
Grid-No.3 Voltage	*Connected to cathode at socket*		0	–	volts
Grid-No.2 Voltage	110	135	135	135	volts
Grid-No.1 Voltage	0	0	-22	-22	volts
Amplification Factor	–	–	–	4.2	
Plate Resistance (Approx.)	–	–	5000	–	ohms
Transconductance	–	–	10000	–	μmhos
Plate Current	400[c]	540[c]	80	–	ma
Grid-No.2 Current	42[c]	40[c]	5.5	–	ma
Grid-No.1 Voltage (Approx.) for plate ma. = 1, grid-No.2 volts = 135, plate volts = 4500	–	–	-70	–	volts

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[d]

DC Plate Supply Voltage	770 max.	volts
Peak Positive-Pulse Plate Voltage[e]	7000 max.	volts
Peak Negative-Pulse Plate Voltage	1500 max.	volts
DC Grid-No.3 (Suppressor-Grid) Voltage[f]	70 max.	volts
DC Grid-No.2 (Screen-Grid) Voltage	220 max.	volts
Peak Negative-Pulse Grid-No.1 Voltage	330 max.	volts
Cathode Current:		
Peak	1000 max.	ma
Average	280 max.	ma
Grid-No.2 Input	6 max.	watts
Grid-No.2 Input (warm-up surge)[g]	12 max.	watts
Plate Dissipation[h]	24 max.	watts
Bulb Temperature (At hottest point on bulb surface)	240 max.	°C

Maximum Circuit Values:

Grid-No.1 Circuit Resistance:		
For grid-resistor-bias operation	1 max.	megohm

[a] The dc component must not exceed 100 volts.

[b] With grid No.2 connected to plate at socket.

[c] Instantaneous values.

[d] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

[e] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[f] A positive voltage may be applied to grid No.3 to reduce interference from "snivets" which may occur in television receivers. A typical value for this voltage is 30 volts.

[g] Surge not to exceed 15 second duration.

[h] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

Diode—Sharp-Cutoff Pentode

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values)*:			
Voltage (AC or DC)	6.3[a]	6.3 ± 0.6	volts
Current	0.450 ± 0.030	0.450[b]	amp
Warm-up time (Average)	11	-	sec
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode	200 max.		volts
Heater positive with respect to cathode	200[c] max.		volts
Direct Interelectrode Capacitances:[d]			
Diode Unit:			
Plate to cathode and heater	2.4		μμf
Cathode to plate and heater	3.0		μμf
Pentode Unit:			
Grid No.1 to plate	0.015 max.		μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	7.0		μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	3.2		μμf
Diode plate to pentode grid No.1	0.005 max.		μμf
Diode cathode to pentode plate	0.15 max.		μμf
Diode plate to pentode plate	0.035 max.		μμf

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	125	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Supply Voltage	125	volts
Cathode Resistor	56	ohms
Plate Resistance (Approx.)	0.2	megohm
Transconductance	9300	μmhos
Plate Current	11.5	ma
Grid-No.2 Current	3.6	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-6	volts
Grid-No.1 Voltage (Approx.) for plate ma. = 2, and cathode resistor (ohms) = 0	-3	volts

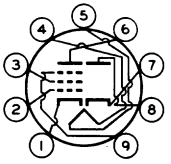
Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"

6HJ8

Diameter. . . . . 0.750" to 0.875"
Dimensional Outline . . . . . See *General Section*
Bulb. T6-1/2
Base. . . . . .Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9CY

Pin 1 – Pentode Cathode
Pin 2 – Pentode Grid No.1
Pin 3 – Pentode Grid No.2
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Plate



Pin 7 – Diode Cathode
Pin 8 – Diode Plate
Pin 9 – Pentode Grid No.3, Internal Shield

PENTODE UNIT — Class A_1 Amplifier

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330 max.	volts
GRID No.3 (SUPPRESSOR GRID)	*Connect to cathode at socket*	
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 165 volts	0.55 max.	watt
For grid-No.2 voltages between 165 and 330 volts	*See Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	3.2 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	1 max.	megohm

DIODE UNIT

Maximum Ratings, *Design-Maximum Values:*

DC PLATE CURRENT	5 max.	ma

Characteristics, Instantaneous Value:

Plate Current for plate volts = 10	50	ma

[a] At heater amperes = 0.450.
[b] At heater volts = 6.3.
[c] The dc component must not exceed 100 volts.
[d] Without external shield.

6HL8

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

For Video and Bandpass Amplifier Applications in TV Receivers

Electrical:

Heater Characteristics and Ratings:

Voltage (AC or DC)	6.3 ± 0.6[a]	volts
Current at heater volts = 6.3	0.600[b]	amp
Warm-up time (Average)	11	sec
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[c] max.	volts

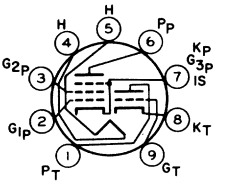
Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*[d]	
Triode Unit:			
G_T to P_T	2.8	2.8	pf
Input: G_T to (K_T,K_P+$G3_P$+IS,H)	2.8	3.0	pf
Output: P_T to (K_T,K_P+$G3_P$+IS,H)	1.6	2.4	pf
Pentode Unit:			
$G1_P$ to P_P	0.030 max.	0.026 max.	pf
Input: $G1_P$ to (K_P+$G3_P$+IS,$G2_P$,H)	7.5	7.5	pf
Output: P_P to (K_P+$G3_P$+IS,$G2_P$,H)	2.4	3.0	pf

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9AE

Pin 1 – Triode Plate
Pin 2 – Pentode Grid No.1
Pin 3 – Pentode Grid No.2
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Plate
Pin 7 – Pentode Cathode, Grid No.3, Internal Shield
Pin 8 – Triode Cathode
Pin 9 – Triode Grid



Characteristics:

	Triode Unit	*Pentode Unit*	
Plate Voltage	125	125	volts
Grid-No.2 Voltage	–	125	volts
Grid-No.1 Voltage	-1	-1	volt
Amplification Factor	40	–	
Plate Resistance (Approx.)	5000	150000	ohms
Transconductance	7000	10000	μmhos
Plate Current	12.5	12	ma
Grid-No.2 Current	–	4.5	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	–	-7	volts

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit	*Pentode Unit*	
Plate Voltage	330 max.	330 max.	volts
Grid-No.2 (Screen-Grid) Supply Voltage	–	330 max.	volts
Grid-No.2 Voltage	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		
Grid-No.1 (Control-Grid) Voltage: Positive-bias value	0 max.	0 max.	volts
Grid-No.2 Input: For grid-No.2 voltages up to 165 volts	–	0.55 max.	watt
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		
Plate Dissipation	2.5 max.	2.5 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: For fixed-bias operation	1 max.	0.25 max.	megohm
For self-bias operation	1 max.	1 max.	megohm

[a] For parallel heater operation.

[b] For series heater operation current must be limited to 0.600 ± 0.040 amperes.

[c] The dc component must not exceed 100 volts.

[d] With external shield, JEDEC No.315, connected to cathode of unit under test.

6HM5/6HA5

High-Mu Triode

7-PIN MINIATURE TYPE

Useful as Grounded-Cathode RF-Amplifier Tube in VHF Tuners

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.180	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	110 max.	volts
Heater positive with respect to cathode	110 max.	volts
Direct Interelectrode Capacitances:[a]		
Grid to plate	0.36	pf
Grid to cathode, internal shield, external shield, and heater	4.3	pf
Plate to cathode, internal shield, external shield, and heater	2.9	pf
Cathode to plate	0.080	pf
Cathode to grid, internal shield, external shield, and heater	3.1	pf
Heater to cathode	2.3	pf
Heater to grid	0.070 max.	pf

Characteristics, Class A_1 Amplifier:

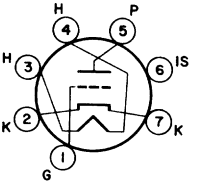
Plate Voltage	135	volts
Grid Voltage	-1	volt
Amplification Factor	72	
Plate Resistance (Approx.)	5000	ohms
Transconductance	14500	μmhos
Plate Current	11.5	ma
Grid Voltage (Approx.) for Transconductance (μmhos) = 150	-5.7	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)

6HM5/6HA5

Basing Designation for BOTTOM VIEW. 7GM



Pin 1 – Grid
Pin 2 – Cathode
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Internal Shield
Pin 7 – Cathode

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

Plate Supply Voltage	600 max.	volts
Plate Voltage	220 max.	volts
Grid Voltage:		
Negative-bias value	50 max.	volts
Positive-bias value	0 max.	volts
Cathode Current	22 max.	ma
Plate Dissipation	2.6 max.	watts

Typical Operation:

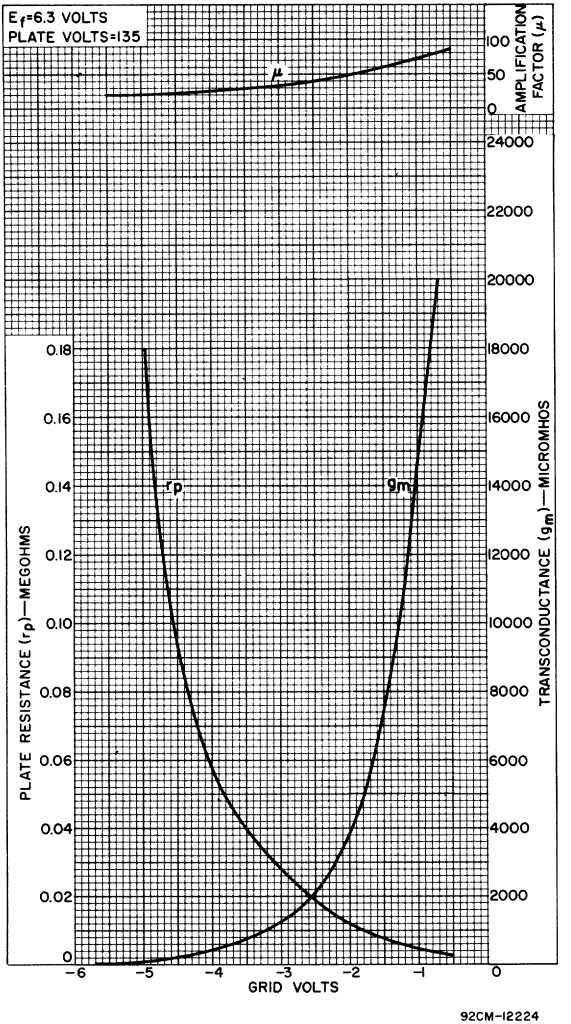
Plate Voltage	135	volts
Grid Voltage. . . . . Adjusted for grid μa =	10	
Plate Load Resistance	1000	ohms
Amplification Factor	80	
Plate Resistance (Approx.)	4000	ohms
Transconductance	20000	μmhos
Plate Current	19	ma

Maximum Circuit Values:

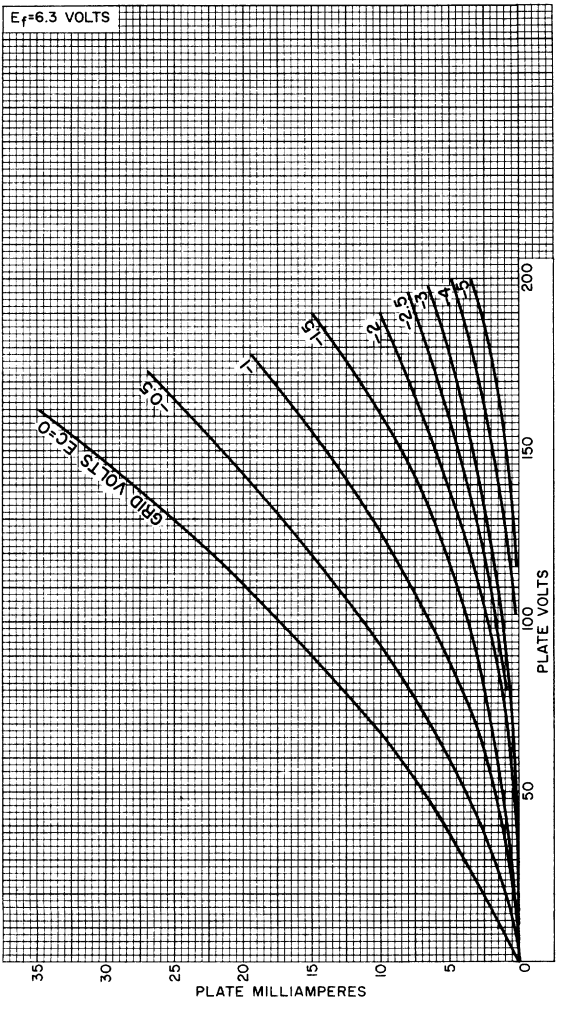
Grid-Circuit Resistance:		
For fixed-bias operation	1 max.	megohm
For cathode-bias operation	1 max.	megohm

[a] With external shield JEDEC No.316 connected to cathode.

AVERAGE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



92CM-12223

6HR6

Semiremote-Cutoff Pentode

7-PIN MINIATURE TYPE

For Intermediate-Frequency-Amplifier Applications in FM, AM, and AM/FM Receivers

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*			
Voltage (AC or DC)	6.3[a]	6.3 ± 0.6	volts
Current	0.450 ± 0.030	0.450[b]	amp
Warm-up time (Average)	11	–	sec
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200 max.		volts
Heater positive with respect to cathode	200[c] max.		volts
Direct Interelectrode Capacitances:[d]			
Grid No.1 to plate	0.006 max.		μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	8.8		μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	5.2		μμf

Characteristics, Class A1 Amplifier:

Plate Supply Voltage	200	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Supply Voltage	115	volts
Grid-No.1 Supply Voltage	0	volts
Cathode Resistor	68	ohms
Plate Resistance (Approx.)	0.5	megohm
Transconductance	8500	μmhos
Plate Current	13.2	ma
Grid-No.2 Current	4.3	ma
Grid-No.1 Voltage (Approx.) for transconductance (μmhos) = 60	-15	volts

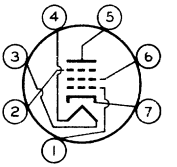
Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)

6HR6

Basing Designation for BOTTOM VIEW. 7BK

Pin 1 – Grid No.1
Pin 2 – Grid No.3, Internal Shield
Pin 3 – Heater



Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Cathode

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

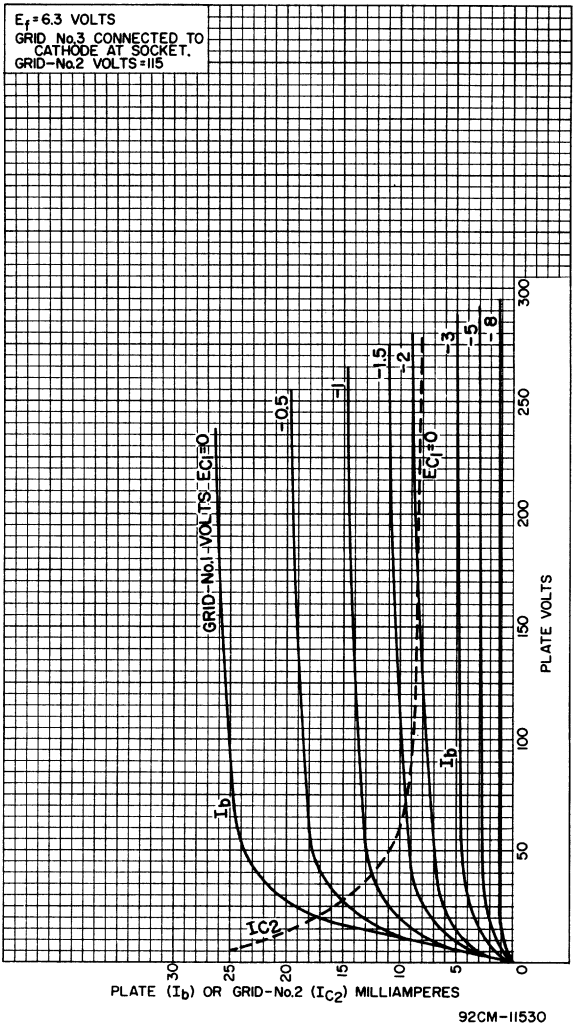
PLATE VOLTAGE	300 max.	volts
GRID No.3 (SUPPRESSOR GRID)	*Connect to cathode at socket*	
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	300 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	50 max.	volts
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 150 volts	1 max.	watt
For grid-No.2 voltages between 150 and 300 volts	*See Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	3 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.5 max.	megohm
For cathode-bias operation	1 max.	megohm

[a] At heater amperes = 0.450.
[b] At heater volts = 6.3.
[c] The dc component must not exceed 100 volts.
[d] Without external shield.

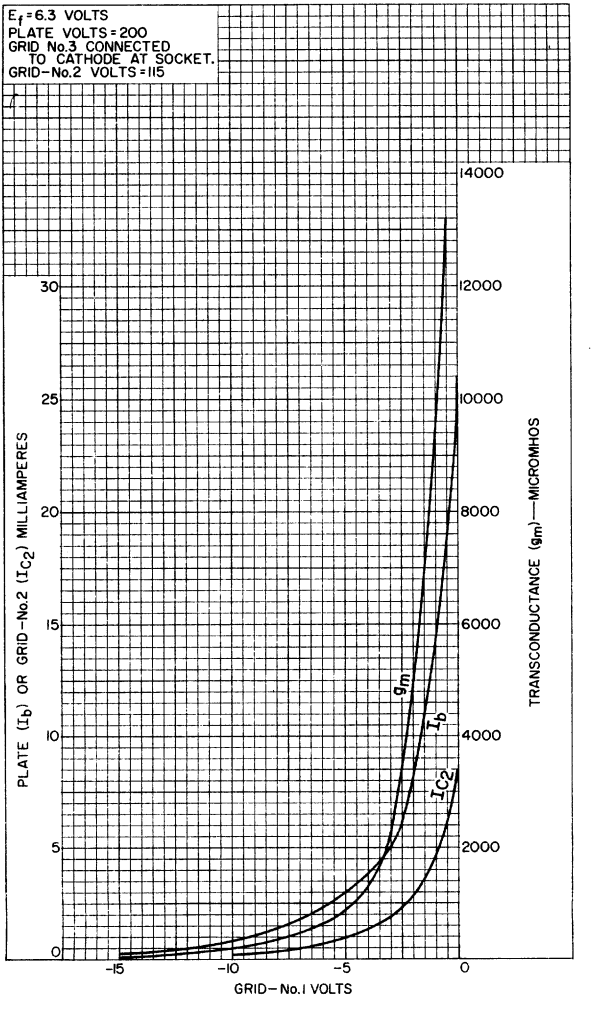
AVERAGE CHARACTERISTICS



92CM-11530

6HR6

AVERAGE CHARACTERISTICS



92CM-11533

6HS6

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE
With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values)*:			
Voltage (AC or DC)	6.3[a]	6.3 ± 0.6	volts
Current	0.450 ± 0.030	0.450[b]	amp
Warm-up time (Average)	11	-	sec
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200 max.		volts
Heater positive with respect to cathode	200[c] max.		volts
Direct Interelectrode Capacitances:[d]			
Grid No.1 to plate	0.006 max.		μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	8.8		μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	5.2		μμf

Characteristics, Class A$_1$ Amplifier:

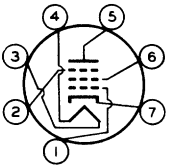
Plate Supply Voltage	75	150	volts
Grid No.3	*Connected to cathode at socket*		
Grid-No.2 Supply Voltage	75	75	volts
Grid-No.1 Supply Voltage	0	0	volts
Cathode Resistor	68	68	ohms
Amplification Factor[e]	50	-	
Plate Resistance (Approx.)	-	0.5	megohm
Transconductance	-	9500	μmhos
Plate Current	-	8.8	ma
Grid-No.2 Current	-	2.8	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-	-4	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)

6HS6

Basing Designation for BOTTOM VIEW. 7BK



Pin 1 – Grid No.1
Pin 2 – Grid No.3, Internal Shield
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Cathode

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

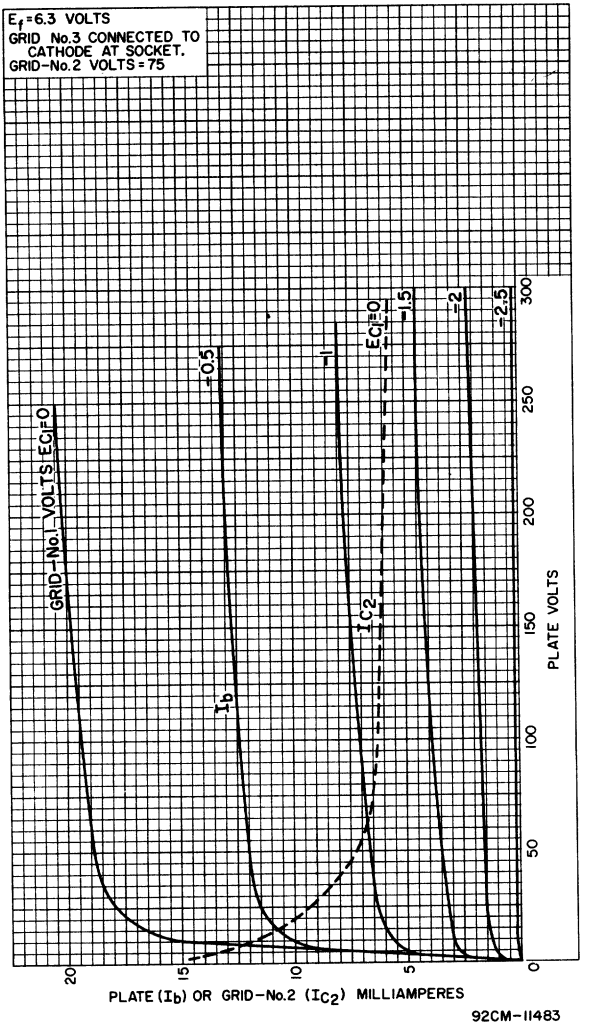
PLATE VOLTAGE	300 max.	volts
GRID No.3 (SUPPRESSOR GRID)	*Connect to cathode at socket*	
GRID-No.2 (SCREEN-GRID)		
SUPPLY VOLTAGE	300 max.	volts
GRID-No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	50 max.	volts
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 150 volts	1 max.	watt
For grid-No.2 voltages between 150 and 300 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	3 max.	watts

Maximum Circuit Values:

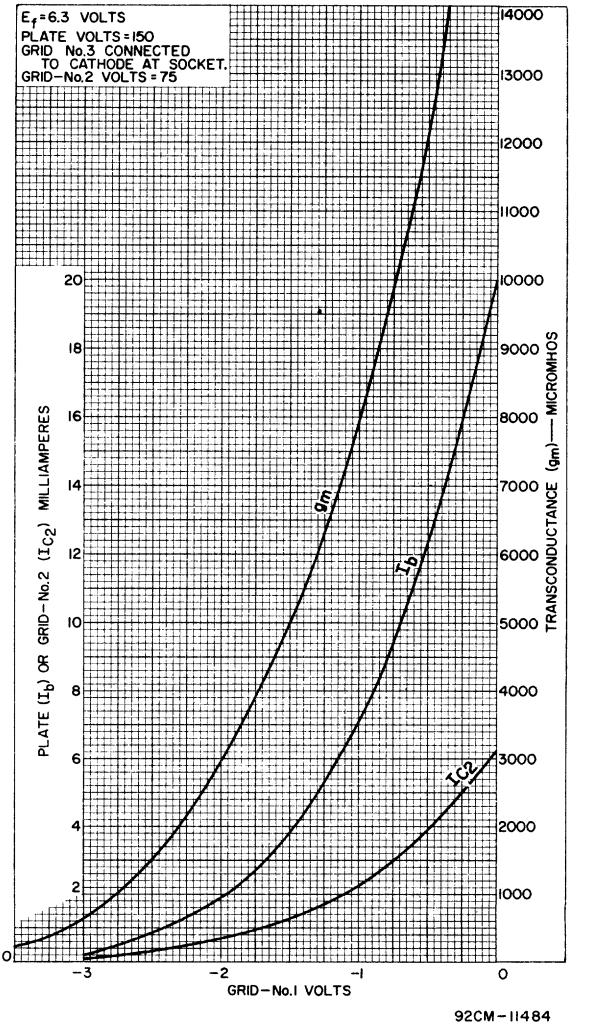
Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.5 max.	megohm
For cathode-bias operation	1 max.	megohm

[a] At heater amperes = 0.450.
[b] At heater volts = 6.3.
[c] The dc component must not exceed 100 volts.
[d] Without external shield.
[e] Triode connection (Grid No.2 connected to plate).

AVERAGE CHARACTERISTICS



AVERAGE CHARACTERISTICS



92CM-11484

Sharp-Cutoff Twin Pentode

With Common Cathode, Grid No.1, & Grid No.2

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	0.300		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances:[b]			
Grid No.3 to plate (Each unit)	2.0		pf
Grid No.1 to all other electrodes	6.0		pf
Grid No.3 (Each unit) to all other electrodes	3.6		pf
Plate (Each unit) to all other electrodes	3.0		pf
Grid No.3 (Unit No.1) to grid No.3 (Unit No.2)	0.015	max.	pf

Characteristics, Class A_1 Amplifier:

	With one unit operating and plate and grid No.3 of other unit connected to ground		
Plate Voltage	100	100	volts
Grid-No.3 Voltage	0	0	volts
Grid-No.2 Voltage	67.5	67.5	volts
Grid-No.1 Voltage	0	[c]	volts
Grid-No.3-to-Plate Transconductance	–	450	μmhos
Grid-No.1-to-Plate Transconductance	1100	–	μmhos
Plate Current	–	2	ma
Grid-No.3 Voltage (Approx.) for plate μa = 100	–	-3.5	volts ←
Grid-No.1 Voltage (Approx.) for plate μa = 100	–	-2.3	volts
	With both units operating		
Plate Voltage (Each unit)	100	100	volts
Grid-No.3 Voltage (Each unit)	-10	0	volts
Grid-No.2 Voltage	67.5	67.5	volts
Grid-No.1 Voltage	[c]	[c]	volts
Plate Current (Each unit)	–	2	ma
Grid-No.2 Current	7	4.4	ma
Cathode Current	7.1	8.5	ma

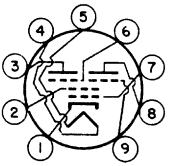
← Indicates a change.

6HS8

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
→ Basing Designation for BOTTOM VIEW	9FG

Pin 1 - Cathode
Pin 2 - Grid No.2, Internal Shield
Pin 3 - Plate of Unit No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Grid No.3 of Unit No.2
Pin 7 - Grid No.1
Pin 8 - Plate of Unit No.1
Pin 9 - Grid No.3 of Unit No.1

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE (Each unit)	300 max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE (Each unit):		
Peak positive value	50 max.	volts
DC negative value	50 max.	volts
DC positive value	3 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	150 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	50 max.	volts
CATHODE CURRENT	12 max.	ma
GRID-No.2 INPUT	0.75 max.	watt
PLATE DISSIPATION (Each unit)	1.1 max.	watts

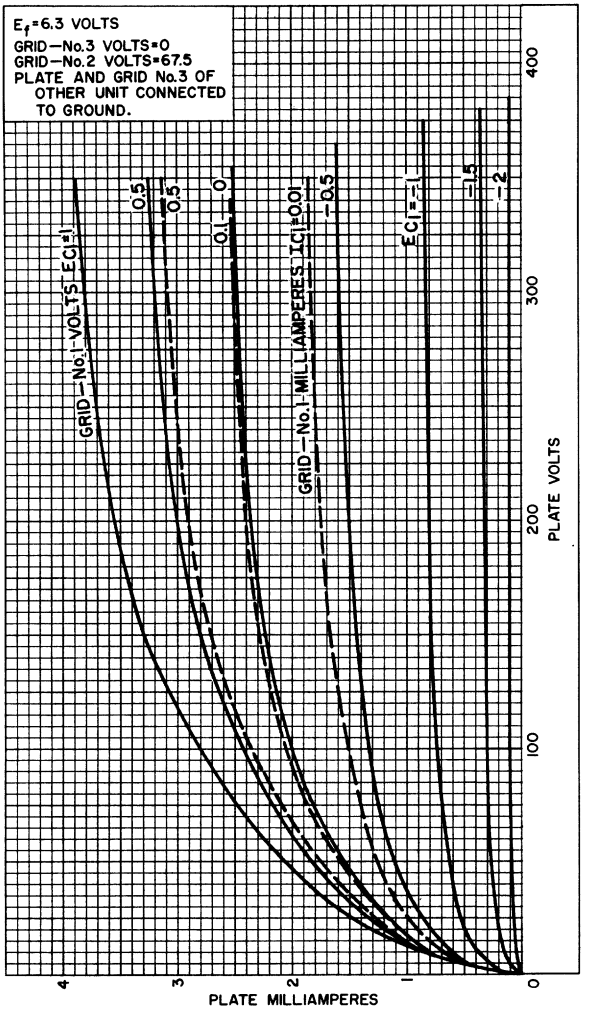
Maximum Circuit Values:

Grid-No.3-Circuit Resistance (Each unit)	0.5 max.	megohm
Grid-No.1-Circuit Resistance	0.5 max.	megohm

[a] The dc component must not exceed 100 volts.
[b] Without external shield.
[c] Adjusted to give a dc grid-No.1 current of 100 microamperes.

→ Indicates a change.

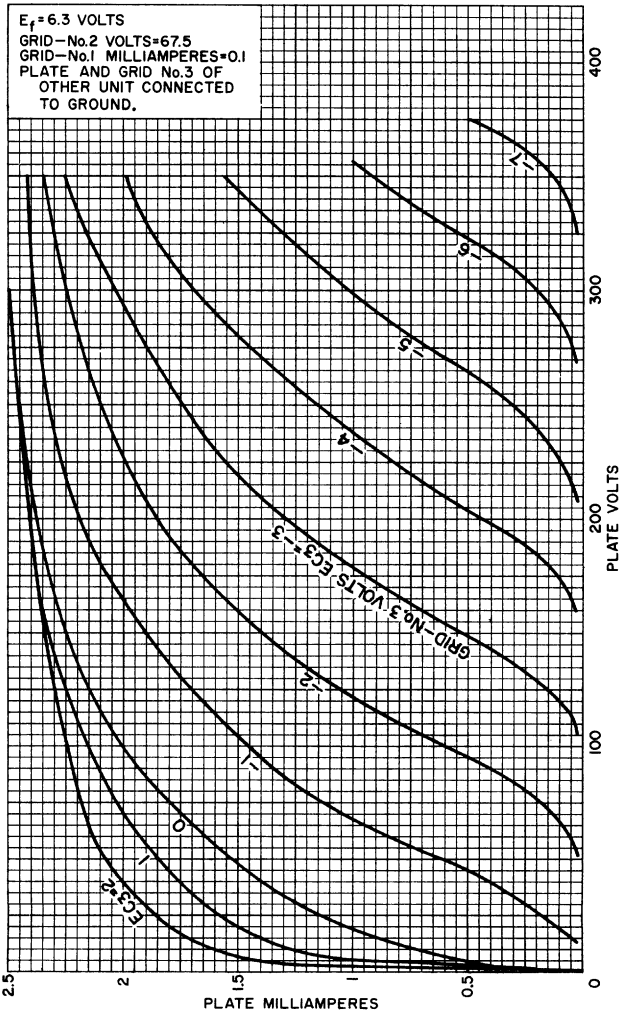
AVERAGE PLATE CHARACTERISTICS
Each Unit



92CM-11099

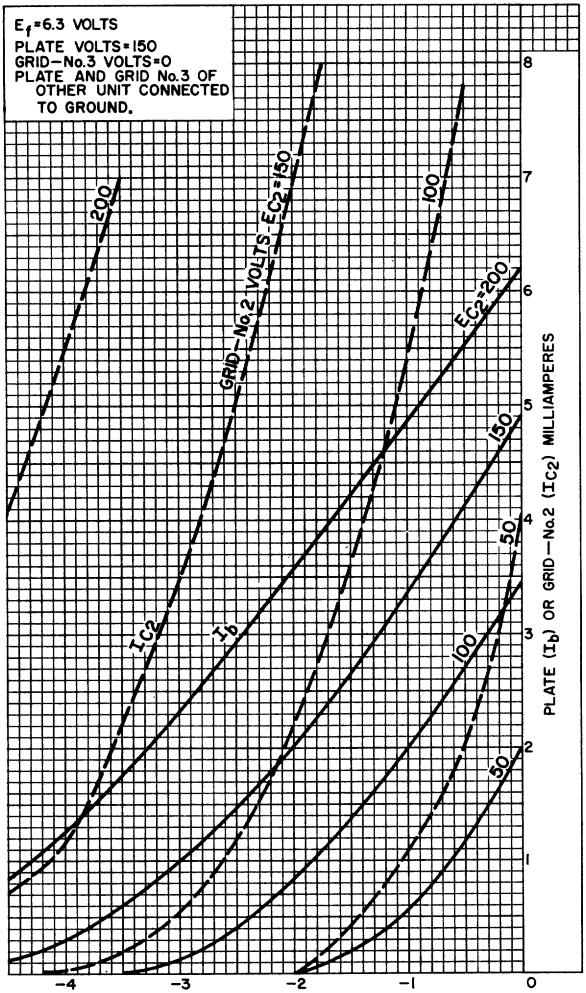
6HS8

AVERAGE PLATE CHARACTERISTICS
Each Unit



92CM—11102

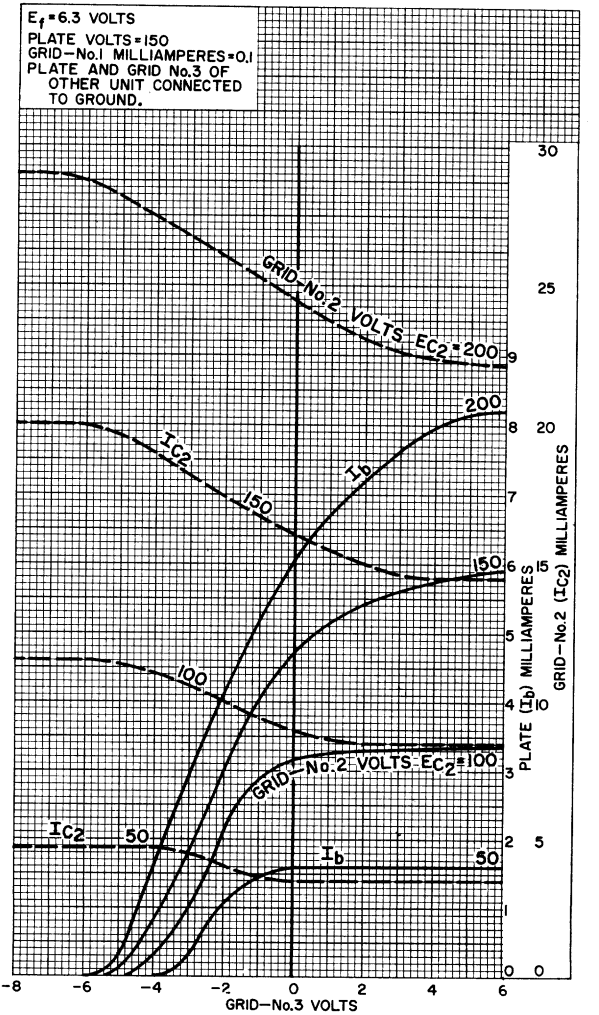
AVERAGE CHARACTERISTICS
Each Unit



92CM—11104

6HS8

AVERAGE CHARACTERISTICS
Each Unit



92CM—11105

6HZ6

Sharp-Cutoff Pentode

With Two Independent Control Grids

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values)*:			
Voltage (AC or DC)	6.3[a]	6.3 ± 0.6	volts
Current	0.450 ± 0.030	0.450[b]	amp
Warm-up time (Average)	11	–	sec
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[c]	max.	volts
Direct Interelectrode Capacitances (Approx):[d]			
Grid No.1 to plate	0.023		pf
Grid No.1 to cathode & internal shield, grid No.3, grid No.2 & internal shield, and heater	8.2		pf
Grid No.1 to grid No.3	0.09		pf
Grid No.3 to plate	1.6		pf
Grid No.3 to cathode & internal shield, plate, grid No.2 & internal shield, grid No.1, and heater	7.2		pf

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	150	volts
Grid-No.3 Supply Voltage	0	volts
Grid-No.2 Supply Voltage	100	volts
Grid-No.1 Supply Voltage	0	volts
Cathode Resistor	180	ohms
Plate Resistance (Approx.)	0.11	megohm
Transconductance, Grid No.1 to Plate	3400	μmhos
Transconductance, Grid No.3 to Plate	600	μmhos
Plate Current	3.2	ma
Grid-No.2 Current	3.2	ma
Grid-No.1 Supply Voltage (Approx.) for plate μa = 20	-4.5	volts
Grid-No.3 Supply Voltage (Approx.) for plate μa = 20	-7	volts

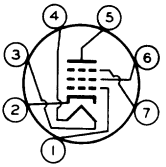
Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"

6HZ6

Bulb. T5-1/2
Base. . . . . .Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation For BOTTOM VIEW. 7EN

Pin 1 - Grid No.1
Pin 2 - Cathode, Internal Shield
Pin 3 - Heater



Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2, Internal Shield
Pin 7 - Grid No.3

FM SOUND-DETECTOR SERVICE

Maximum Ratings, *Design-Maximum Values:*

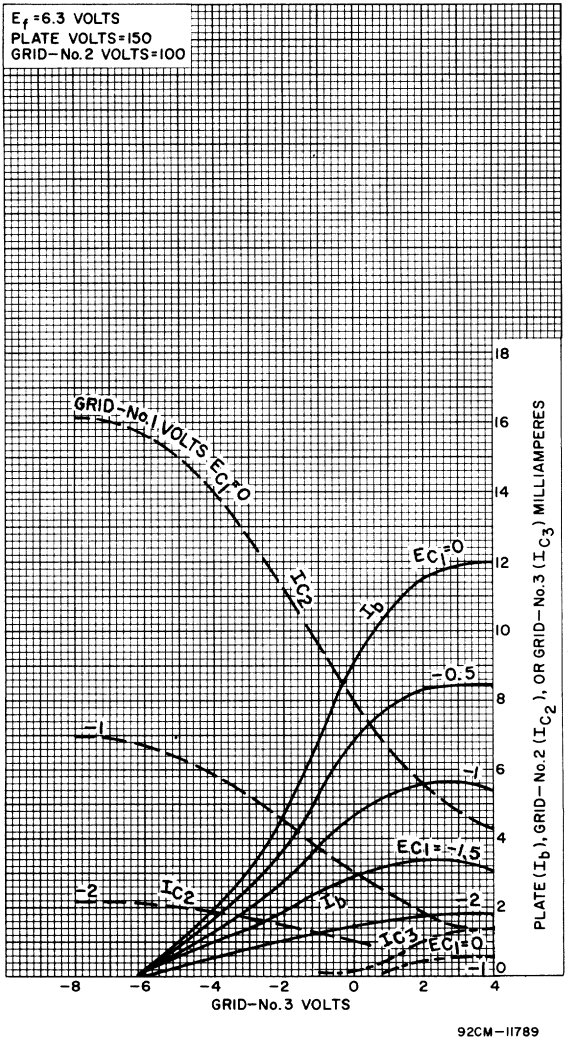
PLATE VOLTAGE	300	max.	volts
GRID-No.3 (CONTROL-GRID) VOLTAGE:			
Negative value (DC and peak)	100	max.	volts
Positive value (DC and peak)	25	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	300	max.	volts
GRID-No.2 VOLTAGE . . . . . See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section			
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Negative-bias value	50	max.	volts
Positive-bias value	0	max.	volts
GRID-No.3 INPUT	0.1	max.	watt
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 150 volts	1	max.	watt
For grid-No.2 voltages between 150 volts and 300 volts . See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section			
PLATE DISSIPATION	1.7	max.	watts

Maximum Circuit Values:

Grid-No.3-Circuit Resistance	0.68	max.	megohm
Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.22	max.	megohm
For cathode-bias operation	0.47	max.	megohm

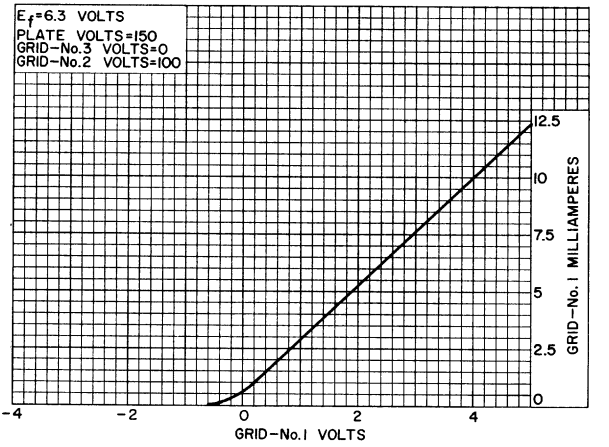
[a] At heater amperes = 0.450.
[b] At heater volts = 6.3.
[c] The dc component must not exceed 100 volts.
[d] Without external shield.

AVERAGE CHARACTERISTICS



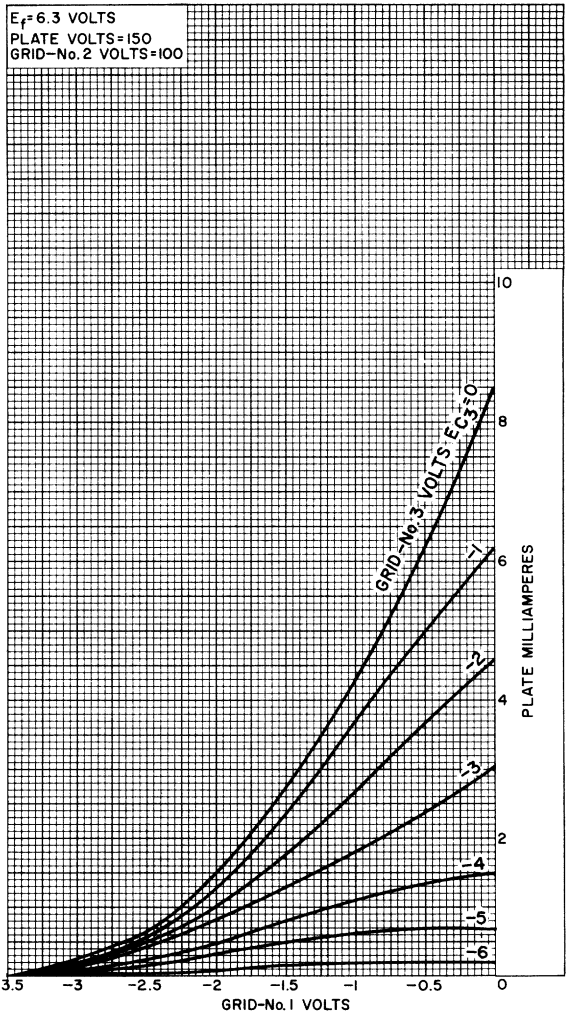
92CM-11789

AVERAGE GRID-No.1 CHARACTERISTIC



92CS-11004

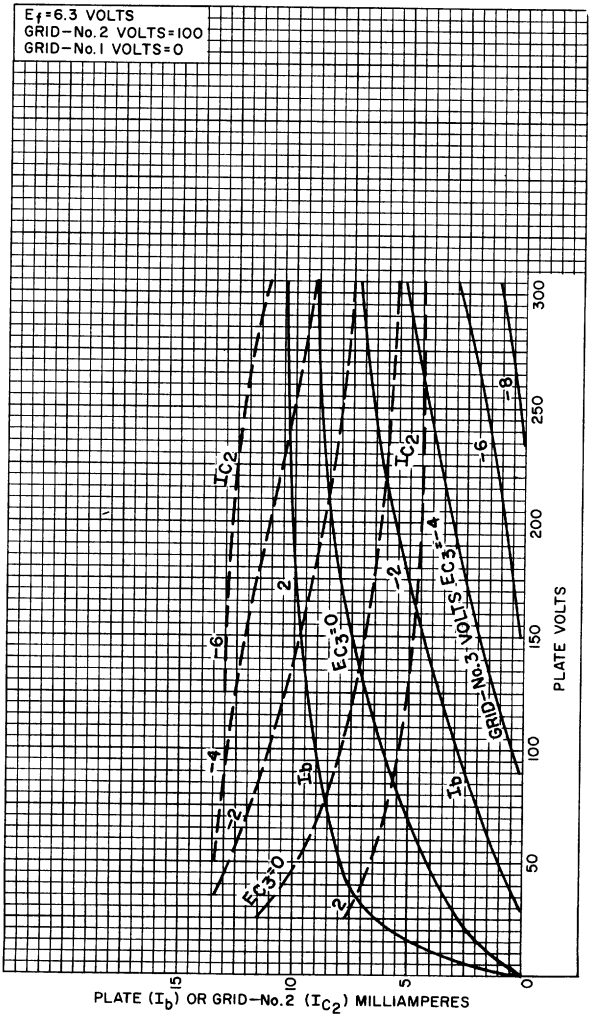
AVERAGE CHARACTERISTICS



92CM-11788

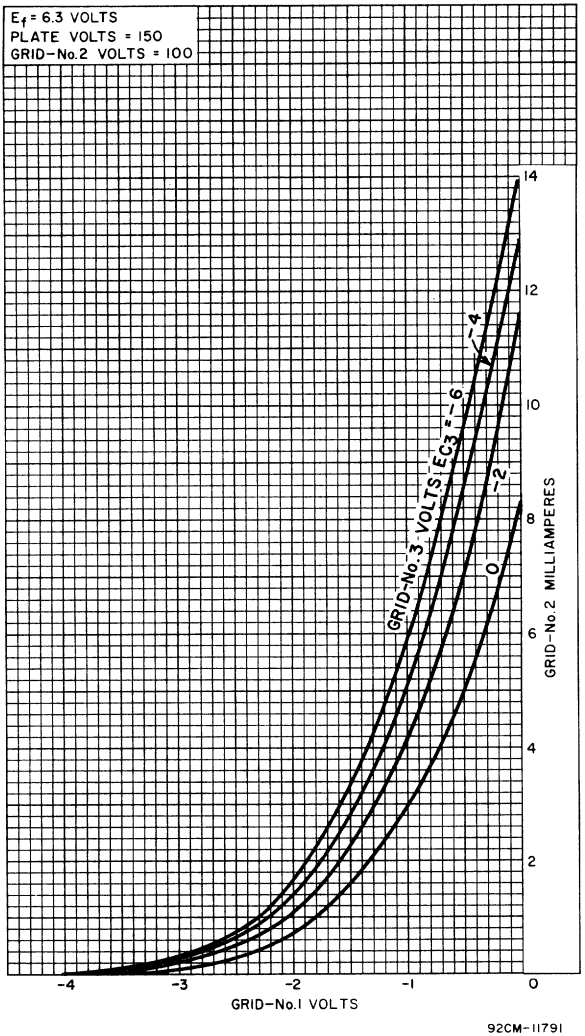
6HZ6

AVERAGE CHARACTERISTICS



92CM-11793

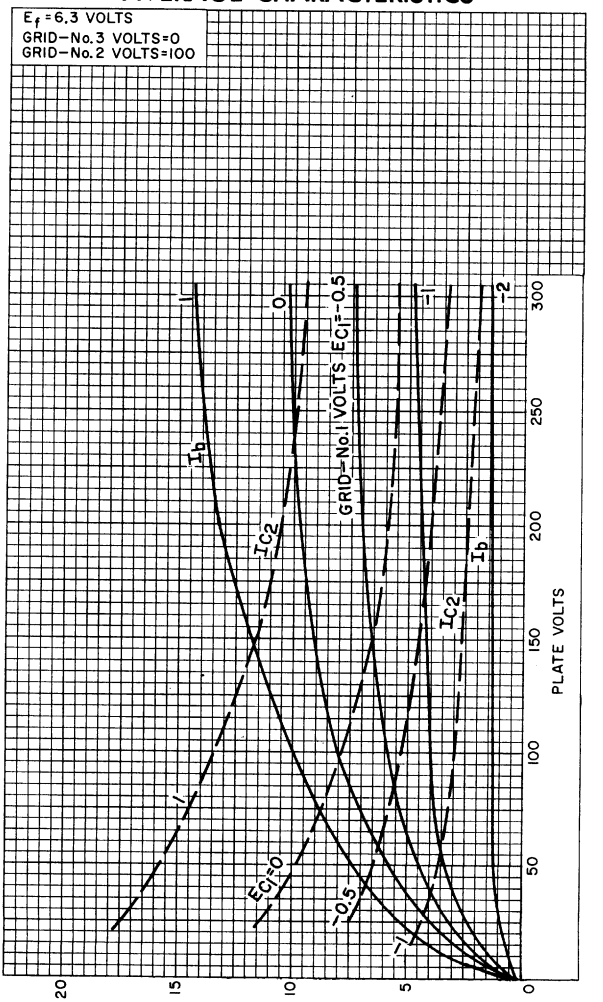
AVERAGE CHARACTERISTICS



92CM-11791

6HZ6

AVERAGE CHARACTERISTICS



92CM–11792

6J4

U-H-F AMPLIFIER TRIODE

GROUNDED-GRID, MINIATURE TYPE

For use at frequencies up to 500 Mc. approx.

Heater	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.4	amp.
Direct Interelectrode Capacitances (Approx.):°		
Plate to Cathode & Heater	0.24 max.	μμf
Grid to Cathode & Heater	5.5	μμf
Grid to Plate	4	μμf
Heater to Cathode	2.8	μμf
Maximum Overall Length		2-1/8"
Maximum Seated Height		1-7/8"
Length from Base Seat to Bulb Top (excluding tip)		1-1/2" ± 3/32"
Maximum Diameter		3/4"
Bulb		T-5-1/2"
Base▲		Miniature Button 7-Pin
Pin 1 - Grid		Pin 5 - Grid
Pin 2 - Cathode		Pin 6 - Grid
Pin 3 - Heater		Pin 7 - Plate
Pin 4 - Heater		
RCA Socket		Stock No. 9914
Mounting Position		Any

BOTTOM VIEW (7BQ)

Maximum Ratings Are Design-Center Values

GROUNDED-GRID AMPLIFIER

Plate Voltage	150 max.	volts
Plate Dissipation	2.25 max.	watts
Plate Current	20 max.	ma.
D-C Heater-Cathode Potential	90 max.	volts

Typical Operation and Characteristics - Class A_1 Amplifier:

Plate Voltage	100	150	volts
Cathode-Bias Resistor* (Suitably by-passed)	100	100	ohms
Amplification Factor	55	55	
Plate Resistance	5000	4500	ohms
Transconductance	11000	12000	μmhos
Plate Current	10	15	ma.

° With close-fitting shield connected to grid.

* The 6J4 should always be used with a cathode-bias resistor suitably by-passed. The d-c resistance in the grid circuit under maximum rated conditions should be limited to 0.25 megohm.

▲*The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole.*

6J4

U-H-F AMPLIFIER TRIODE

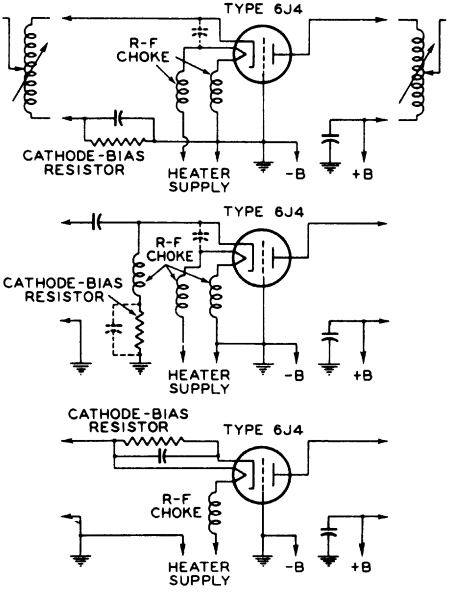
(continued from preceding page)

NOTE:

For grounded-grid operation, all three grid terminals should be grounded to minimize the effects of grid-lead inductance on u-h-f performance.

In arranging the circuit for the 6J4 used as a grounded-grid r-f amplifier or mixer, it is preferable to have the heater operate at the same r-f potential as the cathode, so that the cathode-heater capacitance will not be added across the input-circuit capacitance. Placing r-f chokes in series with the heater leads is suggested as a suitable method of operating heater and cathode at the same r-f potential.

TYPICAL GROUNDED-GRID CIRCUITS
Having Heater at R-F Cathode Potential

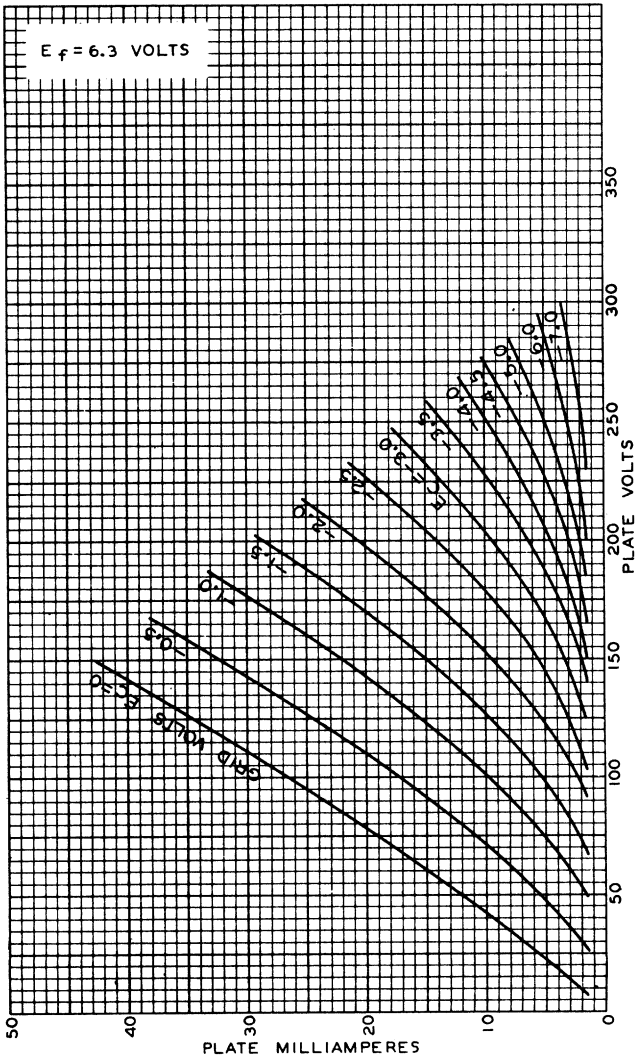


92CM-6550

The license extended to the purchaser of tubes appears in the License Notice accompanying them. Information contained herein is furnished without assuming any obligations.

6J4

AVERAGE PLATE CHARACTERISTICS



FEB. 19 1944

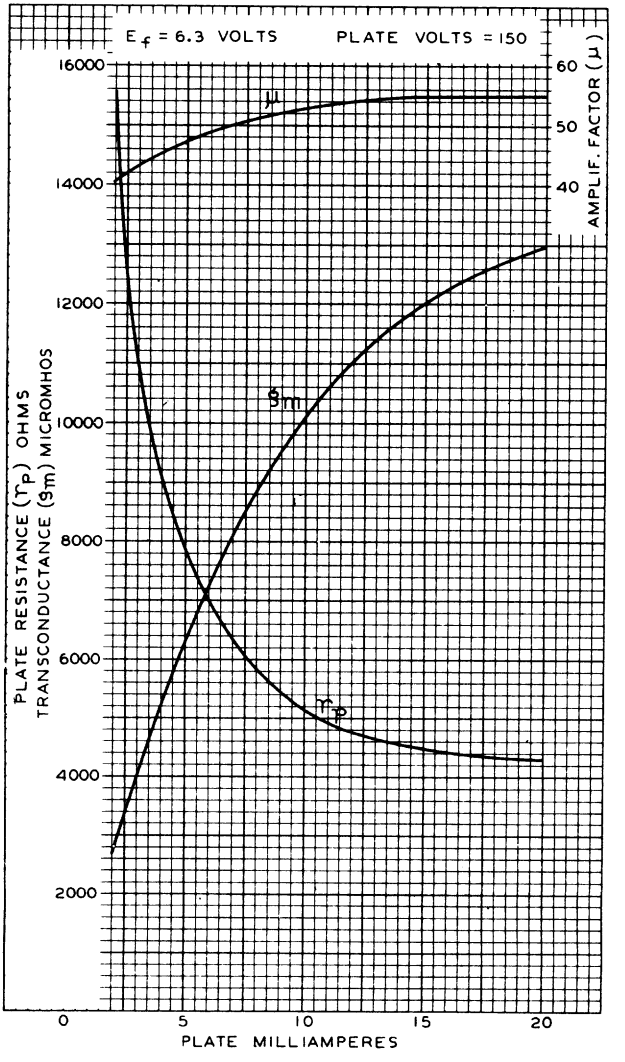
RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

92CM-6543

6J4

6J4

AVERAGE CHARACTERISTICS



MARCH 21,1944 RCA VICTOR DIVISION 92CM-6548
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

6J6A

Medium-Mu Twin Triode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)		6.3	volts
Current		0.45 ± 6%	amp
Warm-up time (Average)		11	sec
Direct Interelectrode Capacitances (Approx.):	*Without External Shield*	*With External Shield*[a]	
Unit No.1			
Grid to plate	1.6	1.5	μμf
Grid to cathode and heater	2.2	2.6	μμf
Plate to cathode and heater	0.4	1.6	μμf
Unit No.2			
Grid to plate	1.6	1.5	μμf
Grid to cathode and heater	2.2	2.6	μμf
Plate to cathode and heater	0.4	1	μμf

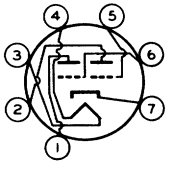
Characteristics, Class A_1 Amplifier (Each Unit):

Plate Supply Voltage	100	volts
Cathode Resistor[b]	50[c]	ohms
Amplification Factor	38	
Plate Resistance (Approx.)	7100	ohms
Transconductance	5300	μmhos
Plate Current	8.5	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BF

Pin 1 - Plate of Unit No.2
Pin 2 - Plate of Unit No.1
Pin 3 - Heater
Pin 4 - Heater



Pin 5 - Grid of Unit No.1
Pin 6 - Grid of Unit No.2
Pin 7 - Cathode

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
GRID VOLTAGE:		
Positive-bias value	0 max.	volts
PLATE DISSIPATION	1.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For cathode-bias operation	0.5 max.	megohm

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy

Key-down conditions per tube without modulation

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

DC PLATE VOLTAGE	300 max.	volts
DC GRID VOLTAGE:		
Negative-bias value	40 max.	volts
Positive-bias value	0 max.	volts
DC PLATE CURRENT	15 max.	ma
DC GRID CURRENT	8 max.	ma
DC PLATE INPUT	4.5 max.	watts
PLATE DISSIPATION	1.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Typical Push-Pull Operation at Frequencies up to 50 Mc:[d]

Values are for Both Units

DC Plate Voltage	150	volts
DC Grid Voltage:		
From a fixed supply of	-10	volts
From a grid resistor of	625	ohms
From a cathode resistor of	220	ohms
DC Plate Current	30	ma
DC Grid Current (Approx.)[e]	16	ma
Driving Power (Approx.)[e]	0.35	watt
Useful Power Output (Approx.)	3.5	watts

[a] With external shield JEDEC No.316 connected to cathode.

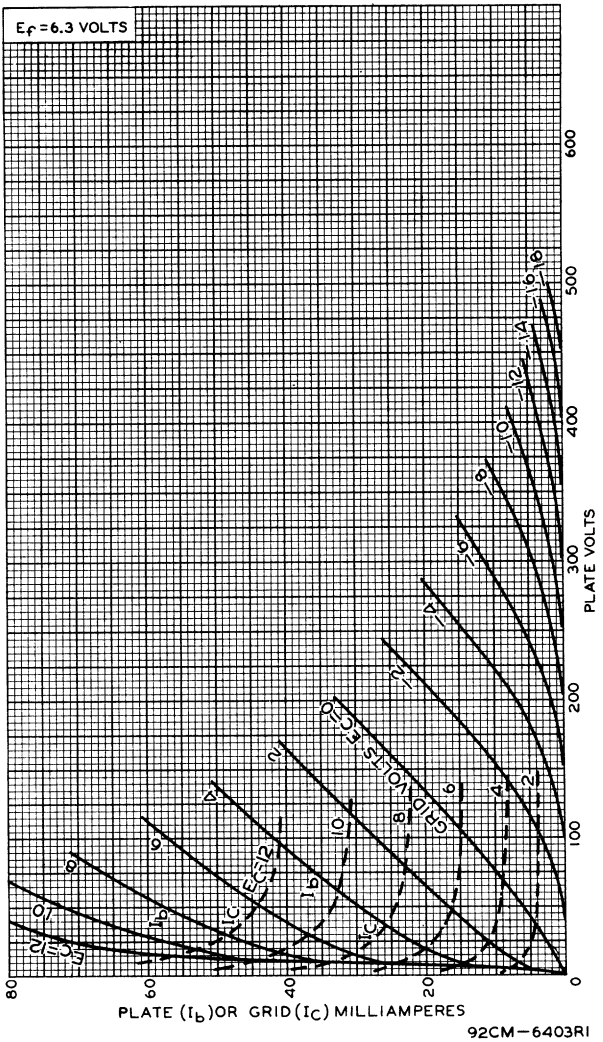
[b] Fixed-bias operation is not recommended.

[c] Value is for both units operating at the specified conditions.

[d] Approximately 1 watt can be obtained when the 6J6A is used at 250 Mc as a push-pull oscillator with a plate voltage of 150 volts, with maximum-rated plate dissipation, and with a grid resistor of 2000 ohms common to both units

[e] For effect of load resistance on grid current and driving power, refer to *TUBE RATINGS—Grid Current and Driving Power* in the *General Section.*

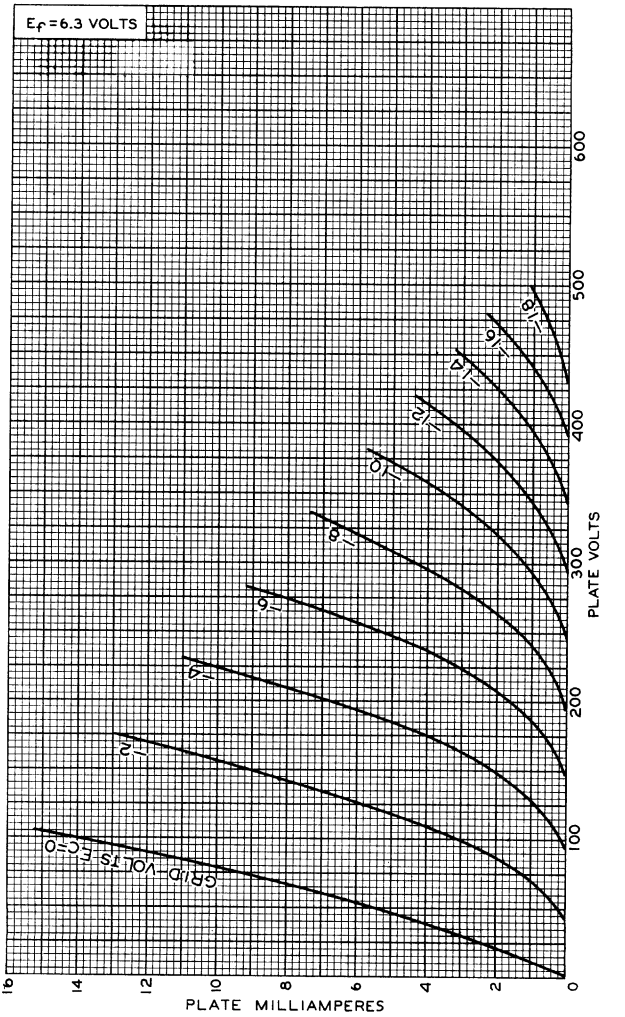
AVERAGE CHARACTERISTICS
Each Unit



92CM-6403RI

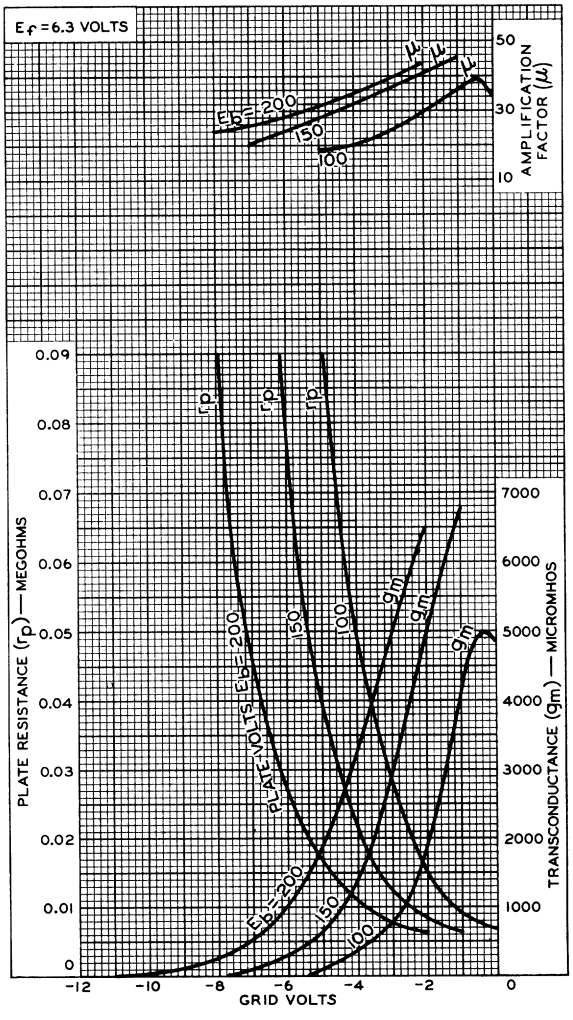
6J6A

AVERAGE PLATE CHARACTERISTICS
Each Unit



92CM-6402R1

AVERAGE CHARACTERISTICS
Each Unit



92CM-7672RI

Pentode—
Beam Power Tube

For Combined Limiter, Quadrature-Grid Discriminator, and Audio Power Output Applications in FM and TV Receivers

DUODECAR TYPE

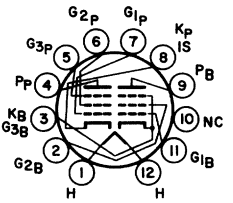
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.950	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts
Direct Interelectrode Capacitances:[b]		
Beam Power Unit:		
Grid No.1 to plate	0.2	pf
Input: $G1_B$ to (K_B+$G3_B$,$G2_B$,H)	11	pf
Output: P_B to (K_B+$G3_B$,$G2_B$,H)	7.0	pf
Pentode Unit:		
Grid No.1 to plate	0.01	pf
$G1_P$ to (K_P+IS,P_P,$G3_P$,$G2_P$,H)	4.0	pf
$G3_P$ to (K_P+IS,P_P,$G2_P$,$G1_P$,H)	3.2	pf

Mechanical:

Operating Position	Any
Types of Cathodes	Coated Unipotential
Maximum Overall Length	2.375"
Seated Length	1.750" to 2.000"
Diameter	1.062" to 1.188"
Dimensional Outline (JEDEC 9-58)	See *General Section*
Bulb	T9
Base	Small-Rutton Duodecar 12-Pin (JEDEC E12-70)
Basing Designation for BOTTOM VIEW	12BT

Pin 1 – Heater
Pin 2 – Beam Power Grid No.2
Pin 3 – Beam Power Cathode, Beam Power Grid No.3
Pin 4 – Pentode Plate
Pin 5 – Pentode Grid No.3
Pin 6 – Pentode Grid No.2
Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Cathode, Internal Shields
Pin 9 – Beam Power Plate
Pin 10 – No Internal Connection
Pin 11 – Beam Power Grid No.1
Pin 12 – Heater



PENTODE UNIT — LIMITER & DISCRIMINATOR SERVICE

Maximum Ratings, *Design-Maximum Values:*

Plate Supply Voltage	330	volts
Grid-No.3 (Quadrature-Grid) Voltage	c	
Grid-No.2 (Accelerator-Grid) Voltage	110	volts
Grid-No.1 (Limiter-Grid) Voltage:		
Positive-peak value	60	volts
Cathode Current	13	ma

Typical Operation:

Input-Signal Center Frequency	*4.5*	*10.7*	*10.7*	*Mc*
Plate Supply Voltage	270	85	285	volts
Plate Voltage	62	121	122	volts
Grid-No.3 Voltage	c	c	c	c
Grid-No.2 Voltage	100	55	100	volts
Cathode-Circuit Resistance[d]	200-400	200-400	200-400	ohms
Peak AF Output Voltage	16.8	6	16.6	volts
Minimum Grid-No.1 Signal Voltage (RMS) for AM rejection[d]	2	1.25	2	volts
Minimum Grid-No.1 Signal Voltage (RMS) for limiting action[e]	1.25	1.25	1.25	volts
Plate Current	0.44	0.25	0.49	ma
Grid-No.2 Current	10	4.1	9.8	ma
Plate Load Resistor	0.33	0.085	0.33	megohm
Linearity Resistor	1000	470	1500	ohms
Integrating Capacitor	0.001	0.002	0.001	μf
Coupling Capacitor	0.25	0.25	0.01	μf
Frequency Deviation	±25	±75	±75	kc
AM Rejection:				
For grid-No.1 signal volts (RMS) = 2	25	31	20	db
For grid-No.1 signal volts (RMS) = 3	30	30	29	db
Total Harmonic Distortion	1.8	2	1.6	%

BEAM POWER UNIT — AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

Plate Voltage	275	volts
Grid-No.2 (Screen-Grid) Voltage	275	volts
Plate Dissipation	10	watts
Grid-No.2 Input	2	watts

Typical Operation and Characteristics:

Plate Voltage	250	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 (Control-Grid) Voltage	-8	volts
Peak AF Grid-No.1 Voltage	8	volts

Zero-Signal Plate Current	35	ma
Max.-Signal Plate Current	39	ma
Zero-Signal Grid No.2 Current	2.5	ma
Max.-Signal Grid No.2 Current	7	ma
Plate Resistance (Approx.)	0.1	megohm
Transconductance	6500	μmhos
Load Resistance	5000	ohms
Total Harmonic Distortion	10	%
Max.-Signal Power Output	4.2	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.25	megohm
For cathode-bias operation	0.5	megohm

[a] The dc component must not exceed 100 volts.

[b] Without external shield.

[c] For proper operation of the pentode unit of the type shown in the accompanying Typical Quadrature-Grid-FM Detector Circuit, the Q of the tuned circuit (L_1, C_6) should be sufficiently high to develop a 4-volt rms signal at the quadrature grid when a 2-volt rms signal at the center frequency is applied to grid No.1.

It is recommended that L_1 be shunted by a capacitance of at least 10 μμf. This capacitance may be composed of tube capacitance, stray capacitance, the distributed capacitance of L_1, and a fixed capacitor.

[d] The cathode-circuit resistance should be adjusted for maximum AM rejection at the AF output of the circuit at the specified grid-No.1 signal voltage. AM rejection is measured with an applied signal containing 30 per cent amplitude modulation and 30 per cent frequency modulation.

[e] At signal levels above specified value, limiting is within ±3 decibels.

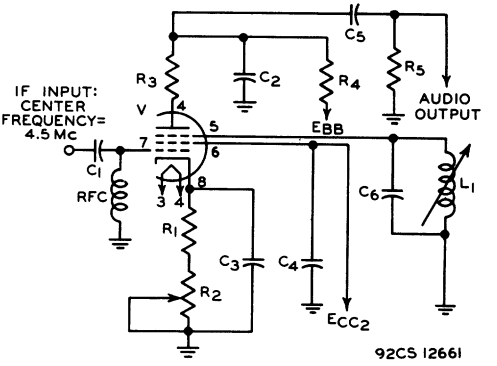
OPERATING CONSIDERATIONS FOR PENTODE UNIT

To insure proper phasing of the signal voltage developed at the quadrature grid, the components of the quadrature-grid circuit should be shielded from those of the control-grid circuit.

To obtain a symmetrical discriminator-response curve, the plate currents for no input signal and for unmodulated input signal should be equal. To assure this equality, it is necessary that the plate voltage and grid-No.2 voltage have the proper values.

The proper plate voltage for any grid-No.2 voltage may be determined from the accompanying *Operating Characteristics, Pentode Unit* curve. This curve may also be used to determine the average dynamic plate current for any combination of grid-No.2 voltage and plate voltage.

TYPICAL QUADRATURE-GRID-FM-DETECTOR CIRCUIT



C_1: 100 $\mu\mu$f
C_2: Integrating capacitor, 0.001 μf
C_3, C_4: 0.01 μf
C_5: 0.25 μf
C_6: 10 $\mu\mu$f[c]
L_1: [c]
R_1: 200 ohms
R_2: Cathode-bias potentiometer, 200 ohms
R_3: Linearity resistor, 1000 ohms
R_4: Plate-load resistor, 0.33 megohm
R_5: 0.47 megohm
V: Pentode Unit of Electron-tube-type 6J10

[c] For footnote see end of data.

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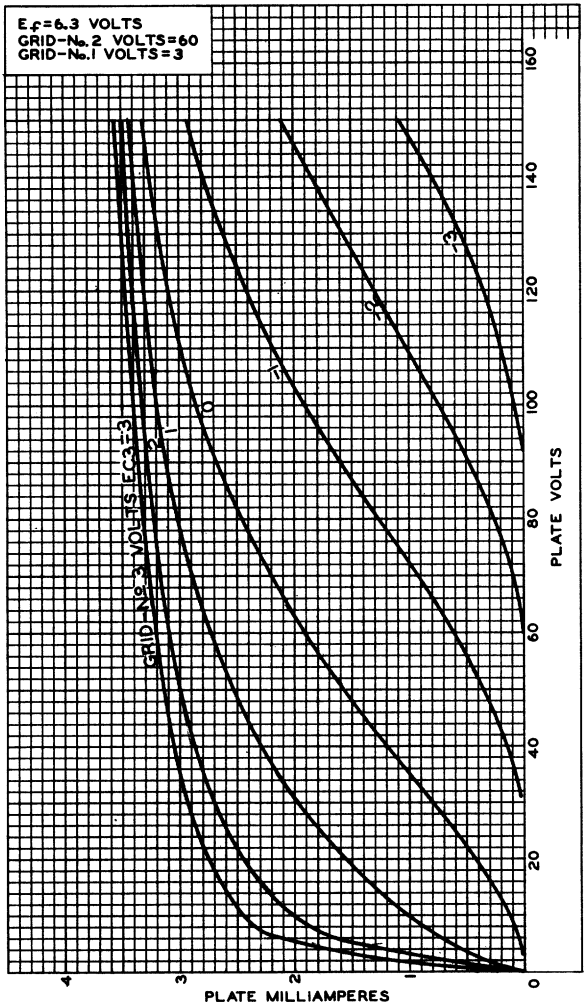
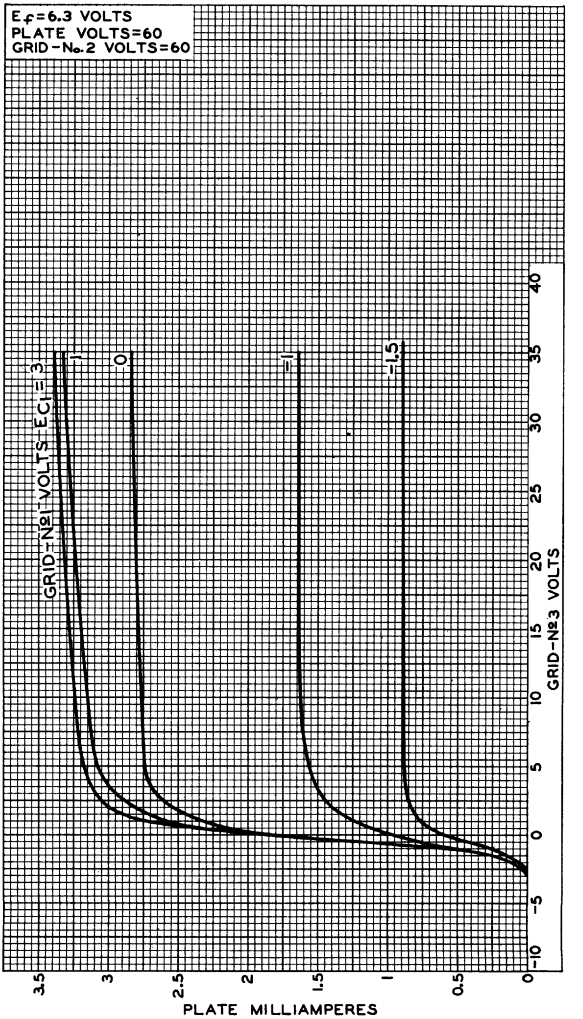
AVERAGE PLATE CHARACTERISTICS
Pentode Unit



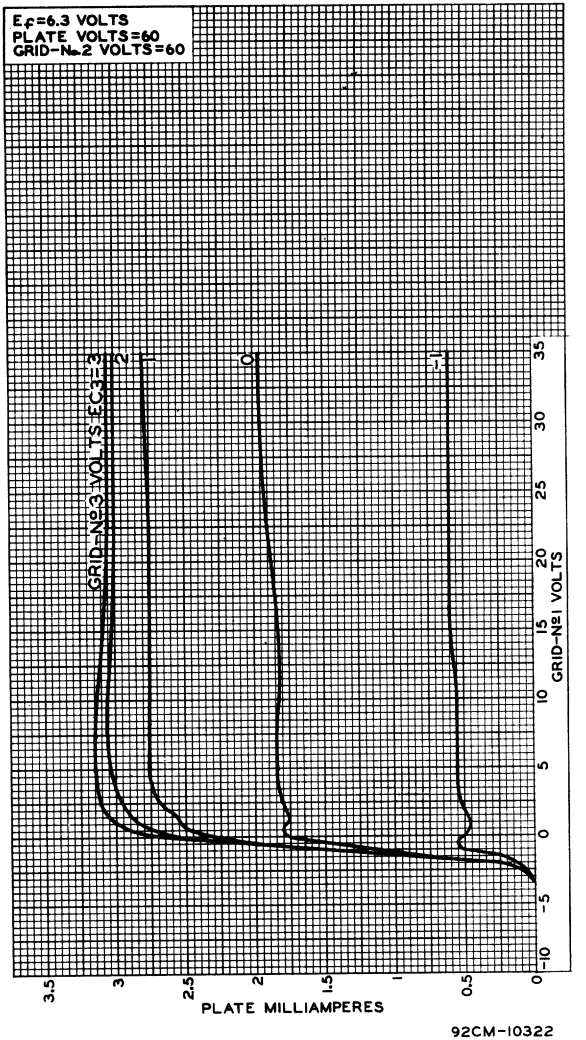
92CM-10319

AVERAGE CHARACTERISTICS
Pentode Unit

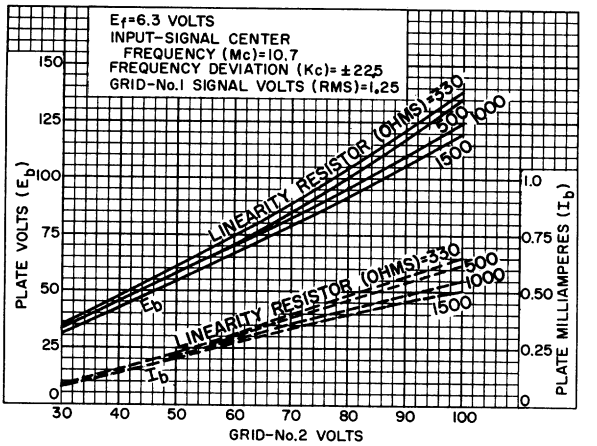


92CM-10320

AVERAGE CHARACTERISTICS
Pentode Unit

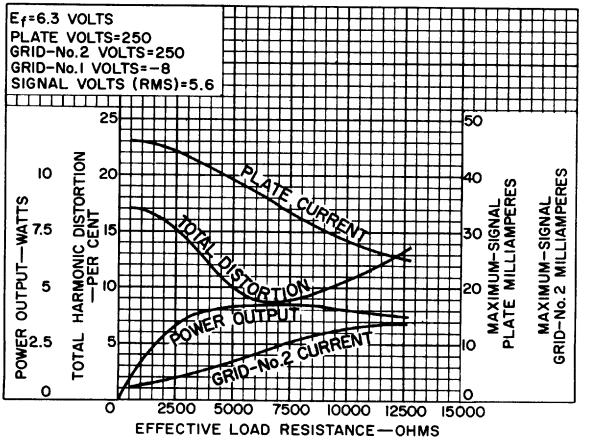


OPERATION CHARACTERISTICS
Pentode Unit



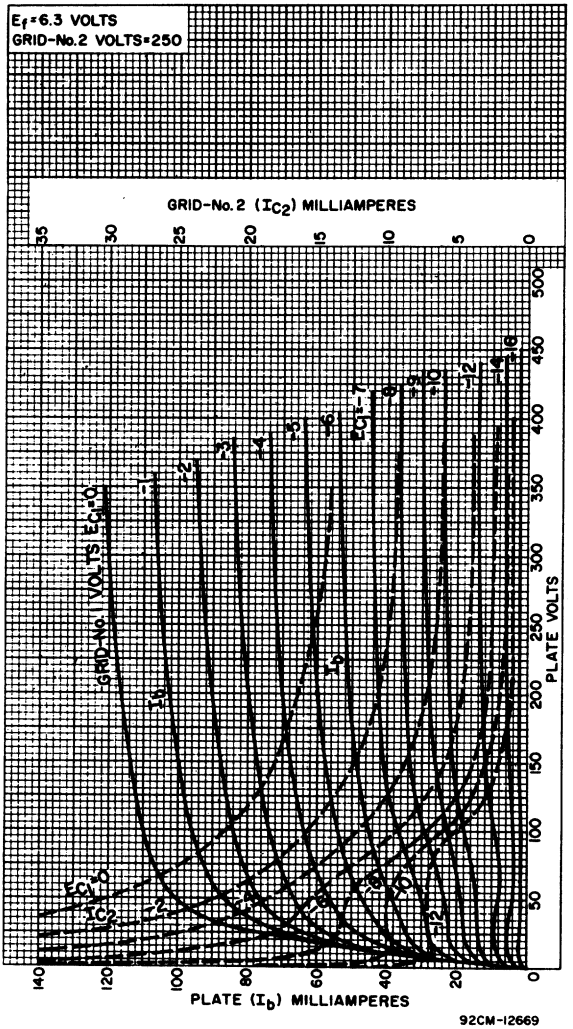
92CS-12662

OPERATION CHARACTERISTICS
Beam Power Unit



92CS-12663

AVERAGE CHARACTERISTICS
Beam Power Unit



6JB6A

Beam Power Tube

NOVAR TYPE
SEPARATE GRID-No.3 BASE-PIN TERMINAL FOR "SNIVETS" CONTROL[a]
For Horizontal-Deflection-Amplifier Service in Black-and-White TV Receivers

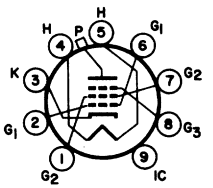
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.200	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[b] max.	volts
Direct Interelectrode Capacitances (Approx.):[c]		
Grid No.1 to plate	0.2	pf
Input: G1 to (K+G3,G2,H)	15.0	pf
Output: P to (K+G3,G2,H)	6.0	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.505"
Seated Length	2.875" ± 3.125"
Diameter	1.438" ± 1.562"
Dimensional Outline	See *General Section*
Bulb	T12
Cap	Skirted Miniature (JEDEC No.C1-2 or C1-3)
Base	Large-Button Novar 9-Pin with Exhaust Tip (JEDEC No.E9-88)
Basing Designation for BOTTOM VIEW	9QL

Pin 1 - Grid No.2
Pin 2 - Grid No.1
Pin 3 - Cathode
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid No.1
Pin 7 - Grid No.2
Pin 8 - Grid No.3
Pin 9 - Do Not Use
Cap - Plate



Characteristics, Class A_1 Amplifier:

	Triode Connection	*Pentode Connection*		
Plate Voltage	150	60	250	volts
Grid No.3	–	*Connected to cathode at socket*		
	–	–		
Grid-No.2 Voltage	150	150	150	volts
Grid-No.1 Voltage	-22.5	0	-22.5	volts
Amplification Factor	4.4	–	–	
Plate Resistance (Approx.)	–	–	15000	ohms

	Triode Connection	*Pentode Connection*		
Transconductance	–	–	7100	μmhos
Plate Current	–	390[d]	70	ma
Grid-No.2 Current	–	32[d]	2.1	ma
Grid-No.1 Voltage (Approx.) for plate current = 1 ma.	–	–	-42	volts

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[e]

DC Plate-Supply Voltage	770 max.	volts
Peak Positive-Pulse Plate Voltage[f]	6500 max.	volts
Peak Negative-Pulse Plate Voltage	1500 max.	volts
DC Grid-No.3 Voltage[a]	70 max.	volts
DC Grid-No.2 (Screen-Grid) Voltage	220 max.	volts
DC Grid-No.1 (Control-Grid) Voltage	-55 max.	volts
Peak Negative-Pulse Grid-No.1 Voltage	330 max.	volts
Cathode Current:		
Peak	550 max.	ma
Average	175 max.	ma
Grid-No.2 Input	3.5 max.	watts
Plate Dissipation[g]	17.5 max.	watts
Bulb Temperature (At hottest point on bulb surface)	240 max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For grid-resistor bias operation[f]	1 max.	megohm

[a] A positive voltage may be applied to grid No.3 to reduce interference from "snivets" which may occur in television receivers. A typical value for this voltage is 30 volts.

[b] The dc component must not exceed 100 volts.

[c] Without external shield.

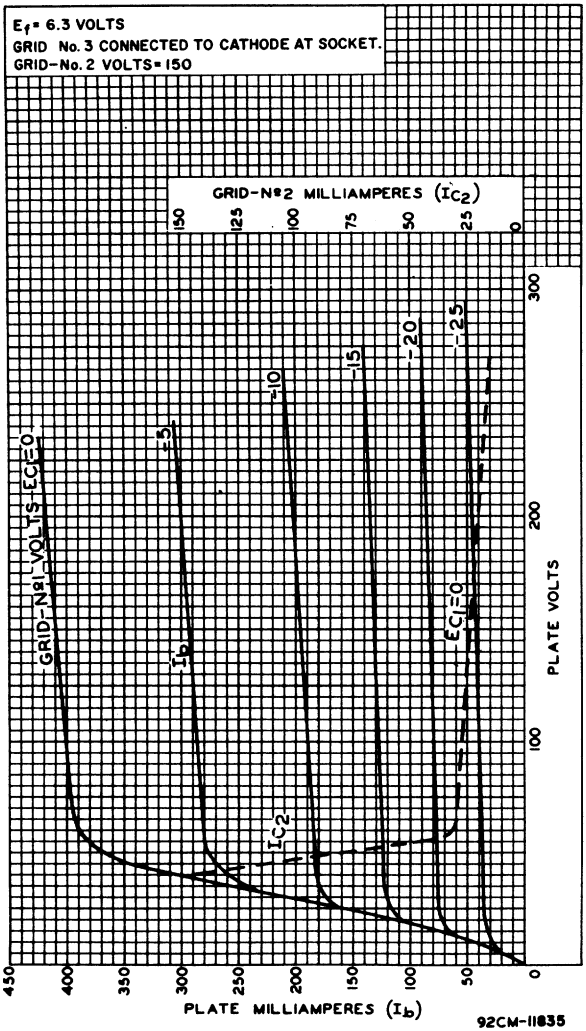
[d] This value can be measured by a method involving a recurrent wave form such that the plate dissipation, grid-No.2 input, and cathode current will be kept within ratings in order to prevent damage to the tube.

[e] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

[f] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525 line, 30-frame system, 15 per cent of one horizontal scanningcycle is 10 microseconds.

[g] It is essential that the plate dissipation be limited in the event of loss of grid signal. For this purpose, some protective means such as a cathode resistor of suitable value should be employed.

AVERAGE CHARACTERISTICS



6JC6

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE
FRAME-GRID CONSTRUCTION

For Use as an IF-Amplifier Tube in TV Receivers. No External Shield Required.

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	0.300		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances:[b]			
Grid No.1 to plate	0.019	max.	pf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	8.2		pf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	3.0		pf

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	125 volts
Grid No.3	*Connected to cathode at socket*
Grid-No.2 Supply Voltage	125 volts
Cathode Resistor	56 ohms
Plate Resistance (Approx.)	0.18 megohm
Transconductance	15000 μmhos
Plate Current	13 ma
Grid-No.2 Current	3.2 ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	-3 volts

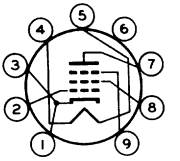
Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

6JC6

Basing Designation for BOTTOM VIEW. 9PM

Pin 1 – Cathode
Pin 2 – Grid No.1
Pin 3 – Cathode
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – No Internal Connection



Pin 7 – Plate
Pin 8 – Grid No.2
Pin 9 – Grid No.3, Internal Shield

AMPLIFIER — CLASS A_1

Maximum Ratings, *Design-Maximum Values:*

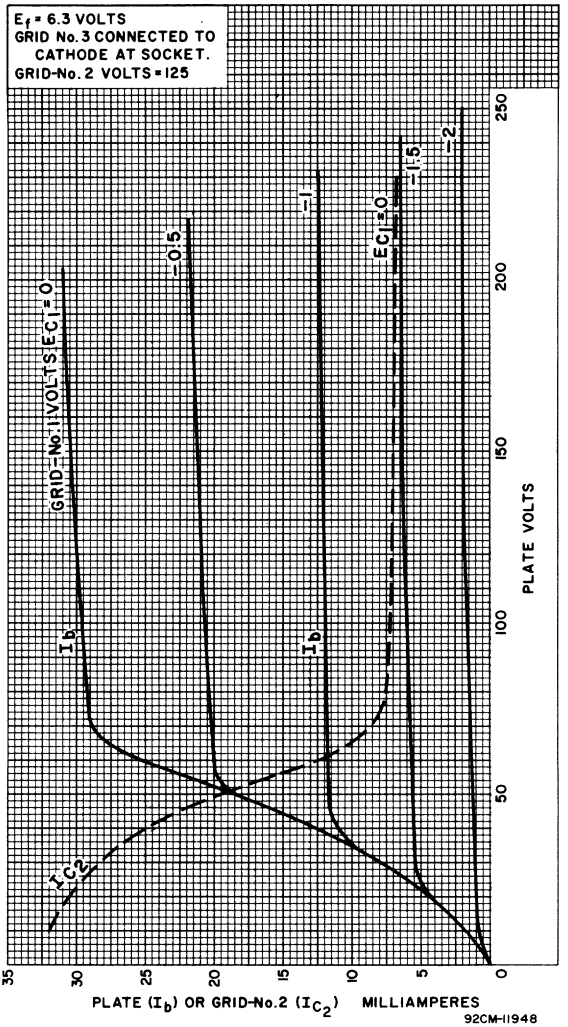
PLATE VOLTAGE	330 max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE:		
Positive value	0 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts
GRID-No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 165 volts	0.6 max.	watt
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	2.5 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	1 max.	megohm

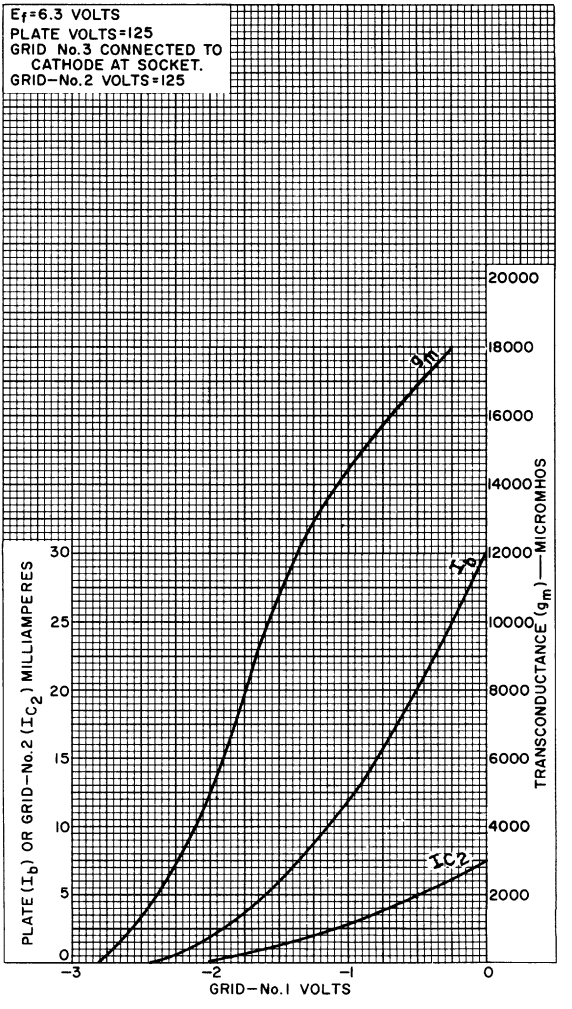
[a] The dc component must not exceed 100 volts.
[b] Without external shield.

AVERAGE CHARACTERISTICS



6JC6

AVERAGE CHARACTERISTICS



92CM—11949

6JC6A

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

FRAME-GRID CONSTRUCTION — DARK HEATER

For Use in IF-Amplifier Stages of Color- and Black-and-White TV Receivers

ELECTRICAL CHARACTERISTICS

Bogey Values[a]

Heater Voltage (AC or DC)	E_h	6.3	V
Heater Current	I_h	0.300	A
Direct Interelectrode Capacitances			
Without external shield			
Grid No.1 to plate	c_{g1-p}	0.019 max	pF
Input: G1 to (K, G3+IS, G2, H)	c_i	8.5	pF
Output: P to (K, G3+IS, G2, H)	c_o	3.0	pF
For the following characteristics, see Conditions			
Plate Resistance (Approx.)	r_p	180	Ω
Transconductance	g_m	16000	μmho
DC Plate Current	I_b	14	mA
DC Grid-No.2 Current	I_{c2}	3.4	mA
Cutoff DC Grid-No.1 Voltage	$E_{c1(co)}$	-3	V
Plate μA = 100			

Conditions

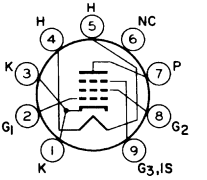
Heater Voltage	E_h	Bogey Value	V
DC Plate Supply Voltage	E_{bb}	125	V
Grid No.3	-	Connected to cathode at socket	
DC Grid-No.2 Supply Voltage	E_{cc2}	125	V
Cathode Resistor	R_k	56	Ω

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2.187 in
Maximum Seated Length	1.937 in
Length, Base Seat to Bulb Top, Excluding tip	1.469 to 1.656 in
Maximum Diameter	0.875 in
Dimensional Outline (JEDEC 6-2)	See *General Section*
Envelope	JEDEC T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC E9-1)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Cathode
Pin 2 – Grid No.1
Pin 3 – Cathode
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – No Internal Connection
Pin 7 – Plate
Pin 8 – Grid No.2
Pin 9 – Grid No.3, Internal Shield



9PM

DESIGN-MAXIMUM RATINGS

For operation as a Class A_1 Amplifier Tube

DC Plate Voltage	E_b	330	V
Positive DC Grid-No.3 (Suppressor-Grid) Voltage	E_{c3}	0	V
DC Grid-No.2 (Screen-Grid) Supply Voltage	E_{cc2}	330	V
DC Grid-No.2 Voltage	E_{c2}	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
DC Grid-No.1 (Control-Grid) Voltage			
Positive-bias value	E_{c1}	0	V
Heater-Cathode Voltage			
Peak	e_{hkm}	±200	V
DC	E_{hk}	100	V
Heater Voltage (AC or DC)	E_h	5.7 to 6.9	V
Grid-No.2 Input	P_{g2}		
For $E_{c2} \leq 165$ V	–	0.7	W
For $E_{c2} \geq 165$ V and ≤ 330 V	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Plate Dissipation	P_b	3.1	W

MAXIMUM CIRCUIT VALUES

Grid-No.1 Circuit Resistance	$R_{g1(ckt)}$		
For fixed-bias operation	–	0.25	MΩ
For cathode-bias operation	–	1	MΩ

[a] Unless otherwise specified.

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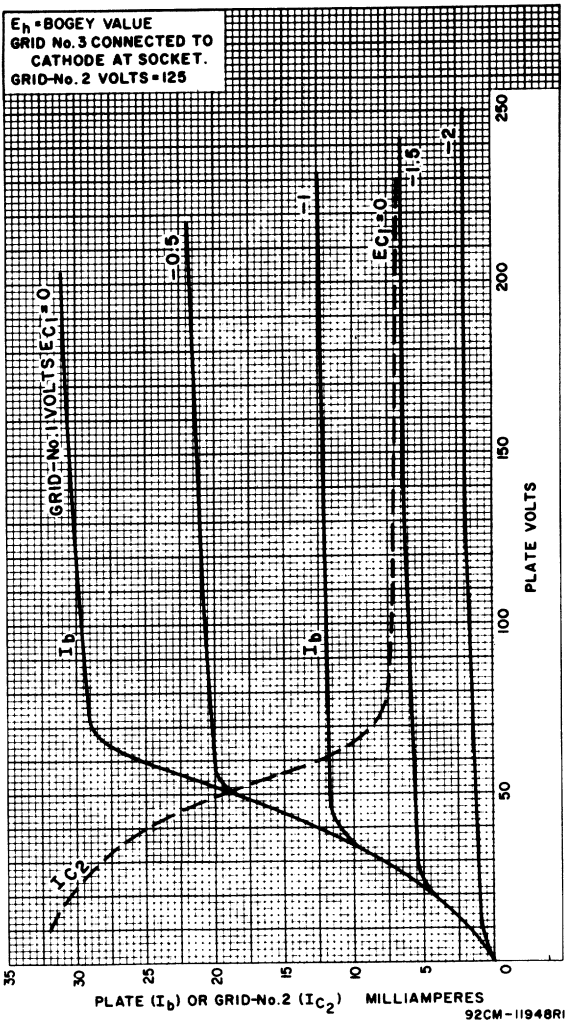
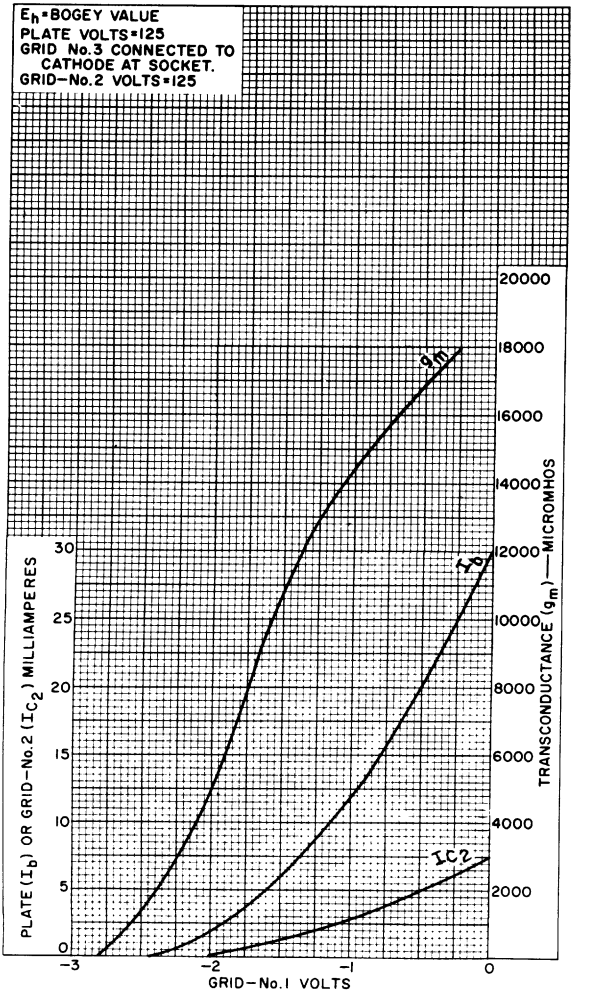
Electronic Components and Devices Harrison, N. J.

Typical Characteristics



Typical Characteristics



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Electronic Components and Devices
Harrison, N. J.

6JC8

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*			
Voltage (AC or DC). . . .	6.3[a]	6.3 ± 0.6	volts
Current	0.450 ± 0.030	0.450[b]	amp
Warm-up time (Average). .	11	-	sec
Peak heater-cathode voltage:			
Heater negative with respect to cathode.	200 max.		volts
Heater positive with respect to cathode.	200[c] max.		volts

Direct Interelectrode Capacitances:

	Without External Shield		*With External Shield*[d]		
Triode Unit:					
Grid to plate	1.3		1.2		μμf
Grid to cathode and heater.	2.8		3.2		μμf
Plate to cathode and heater.	0.44		0.9		μμf
Pentode Unit:					
Grid No.1 to plate. . . .	0.038	max.	0.018	max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater.	4.8		5.0		μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater .	0.9		1.6		μμf
Pentode grid No.1 to triode plate.	0.05	max.	0.036	max.	μμf
Pentode plate to triode plate.	0.075	max.	0.012	max.	μμf
Heater to cathode	6.5		6.5[e]		μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*		
Plate Voltage	125	100	125	volts
Grid-No.2 Voltage	-	70	125	volts
Grid-No.1 Voltage	-1	0	-1	volt
Amplification Factor. . . .	40	-	-	
Plate Resistance (Approx.).	6000	-	300000	ohms
Transconductance.	6500	5700	5500	μmhos

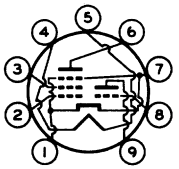
6JC8

	Triode Unit	*Pentode Unit*	
Plate Current	12	- 9	ma
Grid-No.2 Current	-	- 2.2	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-7	- 6.5	volts

Mechanical:

Operating Position . . . . . .Any
Type of Cathode. . . . . .Coated Unipotential
Maximum Overall Length . . . . . 2-3/16"
Maximum Seated Length. . . . . 1-15/16"
Length, Base Seat to Bulb Top (Excluding tip) . . 1-9/16" ± 3/32"
Diameter . . . . . 0.750" to 0.875"
Dimensional Outline. . . . . .See *General Section*
Bulb T6-1/2
Base . . . . . Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW 9PA

Pin 1 - Pentode Grid No.3, Cathode, Internal Shield
Pin 2 - Pentode Grid No.1
Pin 3 - Pentode Grid No.2
Pin 4 - Heater



Pin 5 - Heater
Pin 6 - Pentode Plate
Pin 7 - Pentode Grid No.3, Cathode, Internal Shield
Pin 8 - Triode Grid
Pin 9 - Triode Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	275 max.	275 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	-	275 max.	volts
GRID-No.2 VOLTAGE	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max.	volts
PLATE DISSIPATION	1.7 max.	2.3 max.	watts
GRID-No.2 INPUT: For grid-No.2 voltages up to 137.5 volts	-	0.45 max.	watt
For grid-No.2 voltages between 137.5 and 275 volts	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance: For fixed-bias operation	-	0.1 max.	megohm
For cathode-bias operation	-	0.5 max.	megohm

[a] At heater amperes = 0.450.
[b] At heater volts = 6.3.
[c] The dc component must not exceed 100 volts.
[d] With external shield JEDEC No.315 connected to pin 3 except as noted.
[e] With external shield JEDEC No.315 connected to pin 6.

6JD6

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE
FRAME-GRID CONSTRUCTION

For Use as High-Gain Intermediate-Frequency-Amplifier Tube in Television Receivers. No External Shield Required. Cutoff Characteristic Approaching Semiremote.

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	0.300		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances:[b]			
Grid No.1 to plate	0.019	max.	pf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	8.2		pf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	3.0		pf

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	125	volts
Grid-No.3 Voltage	0	volts
Grid-No.2 Supply Voltage	125	volts
Grid-No.1 Supply Voltage	0	volts
Cathode Resistor	56	ohms
Plate Resistance (Approx.)	160000	ohms
Transconductance	14000	μmhos
Plate Current	15	ma
Grid-No.2 Current	4	ma
Grid-No.1 Voltage (Approx.) for transconductance (μmhos) = 600	-4.5	volts

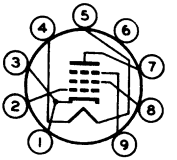
Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

6JD6

Basing Designation for BOTTOM VIEW. 9PM

Pin 1 -Cathode
Pin 2 -Grid No.1
Pin 3 -Cathode
Pin 4 -Heater
Pin 5 -Heater
Pin 6 -No Internal Connection



Pin 7 -Plate
Pin 8 -Grid No.2
Pin 9 -Grid No.3 Internal Shield

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

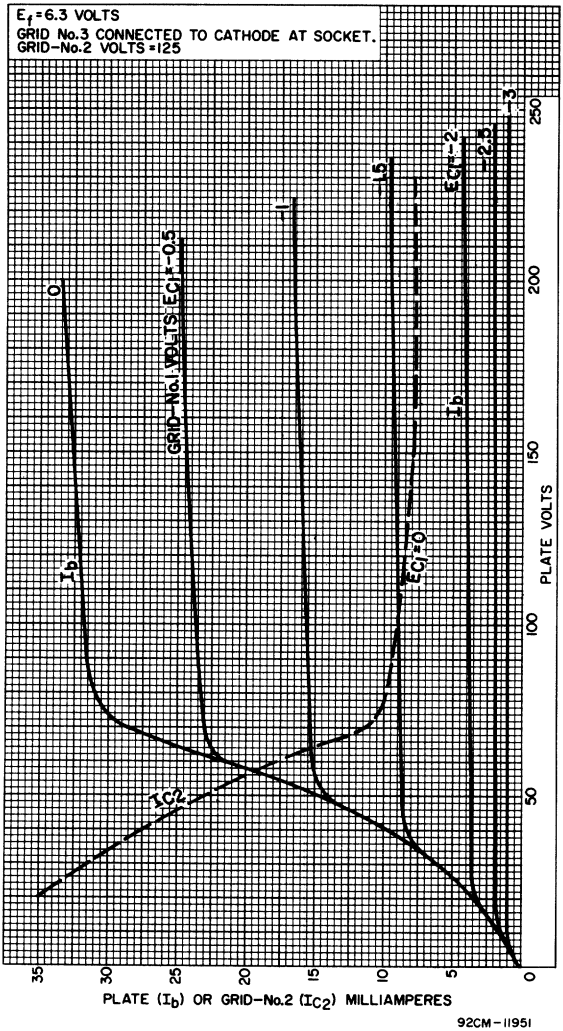
PLATE VOLTAGE	330 max.	volts
GRID-NO.3 (SUPPRESSOR-GRID) VOLTAGE:		
Positive value	0 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts
GRID-NO.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-NO.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
GRID-NO.2 INPUT:		
For grid-No.2 voltages up to 165 volts	0.6 max.	watt
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	2.5 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	1 max.	megohm

[a] The dc component must not exceed 100 volts.
[b] Without external shield.

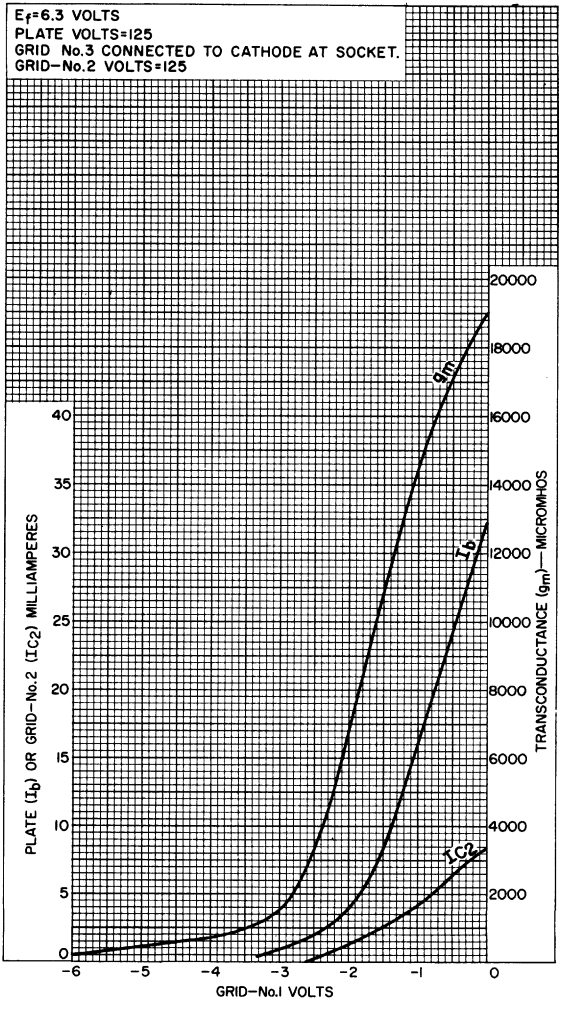
AVERAGE CHARACTERISTICS



92CM-11951

6JD6

AVERAGE CHARACTERISTICS



92CM-11952R1

6JF6

Beam Power Tube

NOVAR TYPE

For Horizontal-Deflection-Amplifier Service in Low-B+, Black-and-White TV Receivers

ELECTRICAL

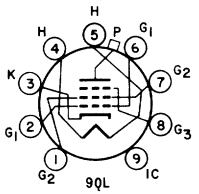
Heater Characteristics and Ratings		
Voltage (AC or DC)	6.3 ± 0.6	V
Current at 6.3 V	1.600	A
Maximum heater-cathode voltage:		
Heater negative with respect to cathode:		
Peak	200	V
Heater positive with respect to cathode:		
Peak	200	V
DC component	100	V
Direct Interelectrode Capacitances (Approx.)[a]		
Grid No.1 to plate	1.2	pF
Input: G1 to (K, G3, G2, H)	22.0	pF
Output: P to (K, G3, G2, H)	9.0	pF

MECHANICAL

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.550 in
Seated Length	2.910 to 3.170 in
Diameter	1.438 to 1.562 in
Dimensional Outline	See *General Section*
Bulb	T12
Cap	Skirted Miniature (JEDEC No.C1-2 or C1-3)
Base	Large-Button Novar 9-Pin with Exhaust Tip (JEDEC No.E9-88)

TERMINAL DIAGRAM (Bottom View)

Pin 1 - Grid No.2
Pin 2 - Grid No.1
Pin 3 - Cathode
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid No.1
Pin 7 - Grid No.2
Pin 8 - Grid No.3
Pin 9 - Do Not Use
Cap - Plate



CHARACTERISTICS

Peak Positive-Pulse Plate Voltage[b]	6500	-	-	V
Plate Voltage	-	50	130	V
Grid No.3	Connected to cathode at socket			
Grid-No.2 Voltage	125	125	125	V
Grid-No.1 Voltage	-	0	-20	V
Plate Resistance (Approx.)	-	-	12000	Ω

Transconductance	-	-	10000	μmho
Plate Current	-	525[c]	80	mA
Grid-No.2 Current		32[c]	2.5	mA
Grid-No.1 Voltage (Approx.) For plate mA = 1	-125	-	-40	V
Triode Amplification Factor (Triode connection: grid No.2 connected to plate at socket. Plate volts = grid-No.2 volts = 125; grid-No.1 volts = -20)	-	-	4.1	

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, Design-Maximum Values

For operation in a 525-line, 30-frame system

DC Plate Supply Voltage	770	V
Peak Positive-Pulse Plate Voltage[d]	6500	V
Peak Negative-Pulse Plate Voltage	1500	V
DC Grid-No.3 Voltage[e]	100	V
DC Grid-No.2 (Screen-Grid) Voltage	220	V
Peak Negative-Pulse Grid-No.1 (Control-Grid) Voltage	330	V
Cathode Current		
Peak	950	mA
Average	275	mA
Grid-No.2 Input	3.5	W
Plate Dissipation[f]	17	W
Bulb Temperature At hottest point on bulb surface	240	°C

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance		
For grid-resistor-bias operation[f]	0.47	MΩ
For plate-pulsed operation (Horizontal-deflection circuits only)	10	MΩ

[a] Without external shield.

[b] Under conditions shown in footnote[d].

[c] This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

[d] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame sysyem, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[e] In horizontal-deflection-amplifier service, a positive voltage may be applied to grid No.3 to reduce interference from "snivets" which may occur in both vhf and uhf television receivers. A typical value for this voltage is 50 volts.

[f] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

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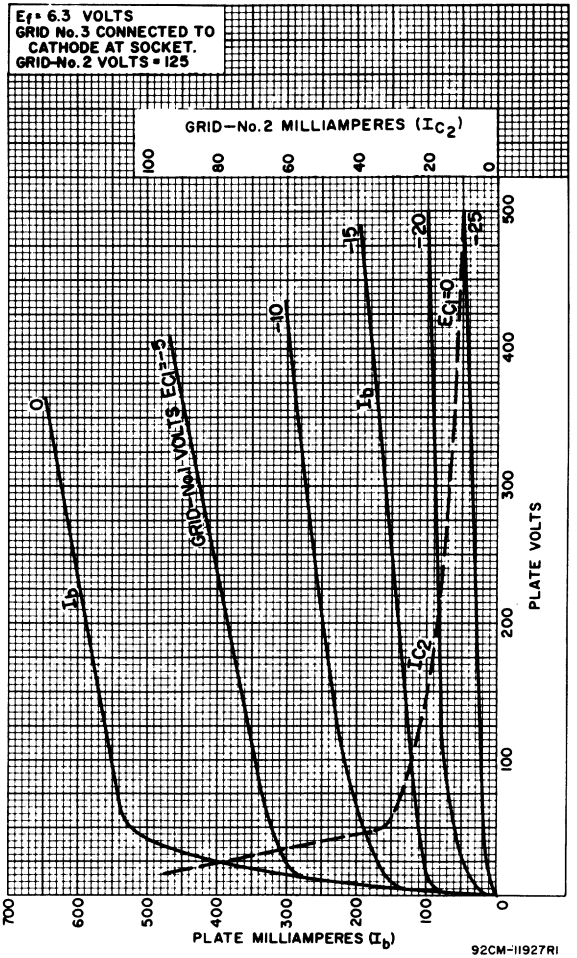
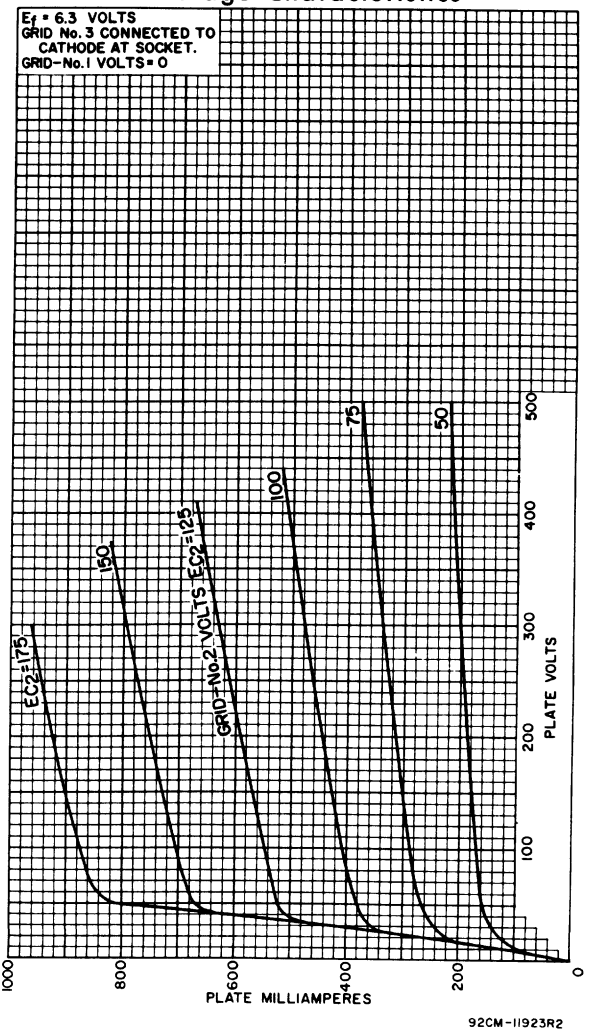
Average Characteristics



6JF6

Average Characteristics



92CM-11923R2

RADIO CORPORATION OF AMERICA
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6JG6A

Beam Power Tube

NOVAR TYPE

SEPARATE GRID-No.3 BASE-PIN TERMINAL FOR "SNIVETS" CONTROL[a]

For Horizontal-Deflection-Amplifier Service in Low-B+ Black-and-White TV Receivers

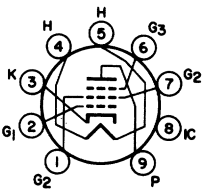
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.600	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[b] max.	volts
Direct Interelectrode Capacitances (Approx.)[c]		
Grid No.1 to plate	0.7	pf
Input: G1 to (K,G3,G2,H)	22.0	pf
Output: P to (K,G3,G2,H)	9.0	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.130"
Seated Length	2.500" to 2.750"
Diameter	1.438" to 1.562"
Dimensional Outline	See *General Section*
Bulb	T12
Base	Large-Button Novar 9-Pin with Exhaust Tip (JEDEC No.E9-88)
Basing Designation for BOTTOM VIEW	9QU

Pin 1 – Grid No.2
Pin 2 – Grid No.1
Pin 3 – Cathode
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Grid No.3
Pin 7 – Grid No.2
Pin 8 – Do Not Use
Pin 9 – Plate



Characteristics, Class A_1 Amplifier:

	Triode Connection[d]	*Pentode Connection*		
Plate Voltage	125	50	130	volts
Grid No.3	*Connected to cathode at socket*			
Grid-No.2 Voltage	–	125	125	volts
Grid-No.1 Voltage	-20	0	-20	volts
Amplification Factor	4.1	–	–	
Plate Resistance (Approx.)	–	–	12000	ohms
Transconductance	–	–	10000	μmhos
Plate Current	–	525[e]	80	ma
Grid-No.2 Current	–	32[e]	2.5	ma
Grid-No.1 Voltage (Approx.) for plate ma = 1	–	–	-40	volts

6JG6A

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[f]

DC Plate Supply Voltage	770 max.	volts
Peak-Positive-Pulse Plate Voltage[g]	6500 max.	volts
Peak Negative-Pulse Plate Voltage	1500 max.	volts
DC Grid-No.3 (Suppressor-Grid) Voltage[a]	75 max.	volts
DC Grid-No.2 (Screen-Grid) Voltage	220 max.	volts
DC Grid-No.1 (Control-Grid) Voltage:		
Negative-bias value	55 max.	volts
Peak Negative-Pulse Grid-No.1 Voltage	330 max.	volts
Cathode Current:		
Peak	950 max.	ma
Average	275 max.	ma
Grid-No.2 Input	3.5 max.	watts
Plate Dissipation[h]	17 max.	watts
Bulb Temperature (At hottest point on bulb surface)	220 max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For grid-No.1-resistor-bias operation	2.2 max.	megohms

[a] A positive voltage may be applied to grid No.3 to reduce interference from "snivets" which may occur in television receivers. A typical value for this voltage is 30 volts.

[b] The dc component must not exceed 100 volts.

[c] Without external shield.

[d] With grid No.2 connected to plate at socket.

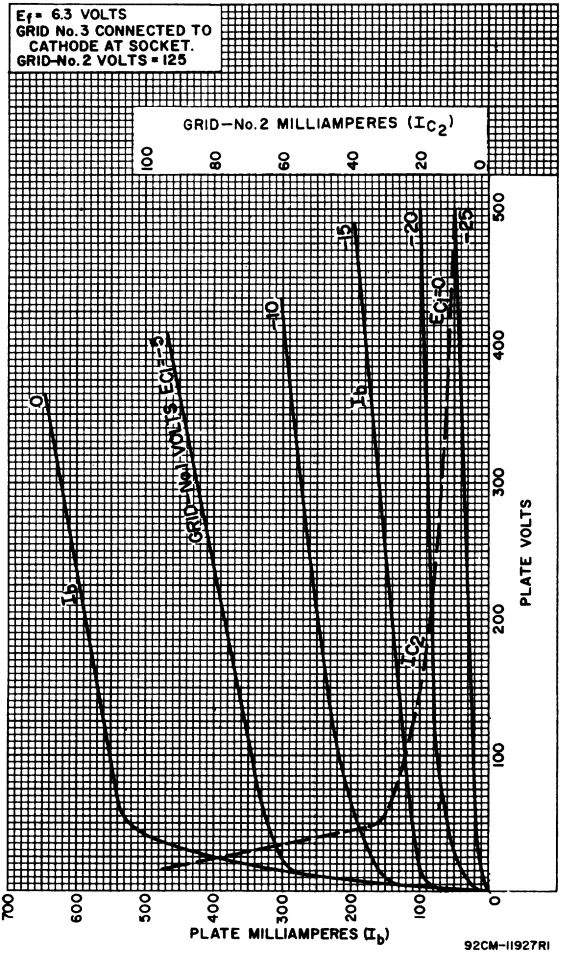
[e] This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

[f] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations, "Federal Connunications Commission.

[g] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system 15 per cent of one horizontal scanning cycle is 10 microseconds.

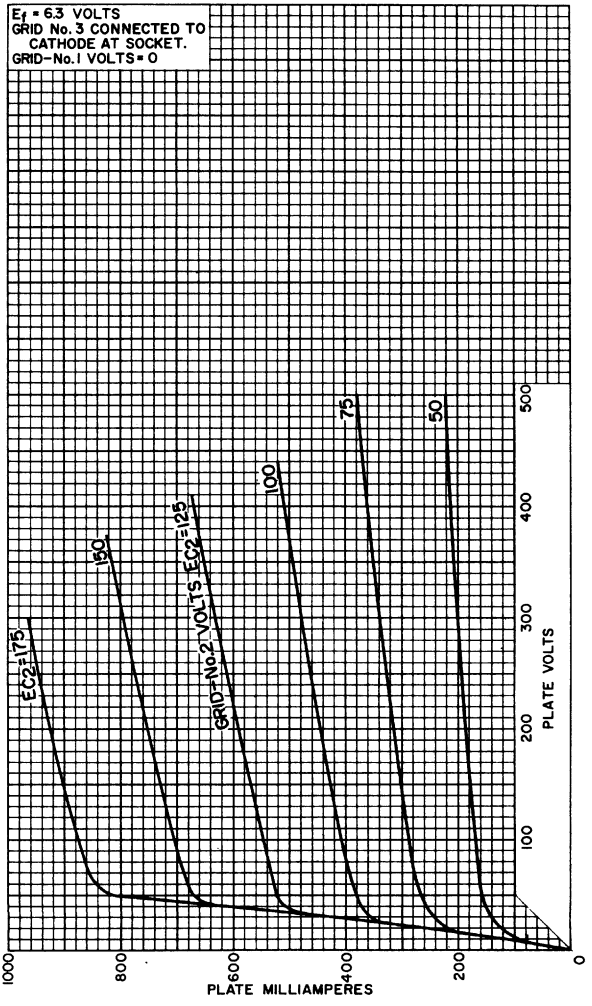
[h] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

AVERAGE CHARACTERISTICS



6JG6A

AVERAGE PLATE CHARACTERISTICS



92CM-11923RI

6JH6

Semiremote-Cutoff Pentode

7-PIN MINIATURE TYPE

For Use in Gain-Controlled Picture-IF Amplifier Stages of Color TV Receivers

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.300	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	200	volts
Heater positive with respect to cathode	200[a]	volts

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*[b]	
Grid No.1 to plate	0.025 max.	0.015 max.	pf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	7	7	pf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	2	3	pf

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	125	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Supply Voltage	125	volts
Cathode Resistor	56	ohms
Plate Resistance (Approx.)	0.26	megohm
Transconductance	8000	μmhos
Plate Current	14	ma
Grid-No.2 Current	3.6	ma
Grid-No.1 Voltage (Approx.) for transconductance (μmhos) = 50 and cathode resistor (ohms) = 0	-19	volts
Transconductance Range for grid-No.1 volts = -4.5 and cathode resistor of 56 ohms	400 - 900	μmhos

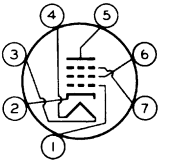
Mechanical:

Mounting Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"

6JH6

Dimensional Outline . . . . . See *General Section*
Bulb. T5-1/2
Base. . . . . .Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW. 7CM

Pin 1 - Grid No.1
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater



Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Grid No.3, Internal Shield

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

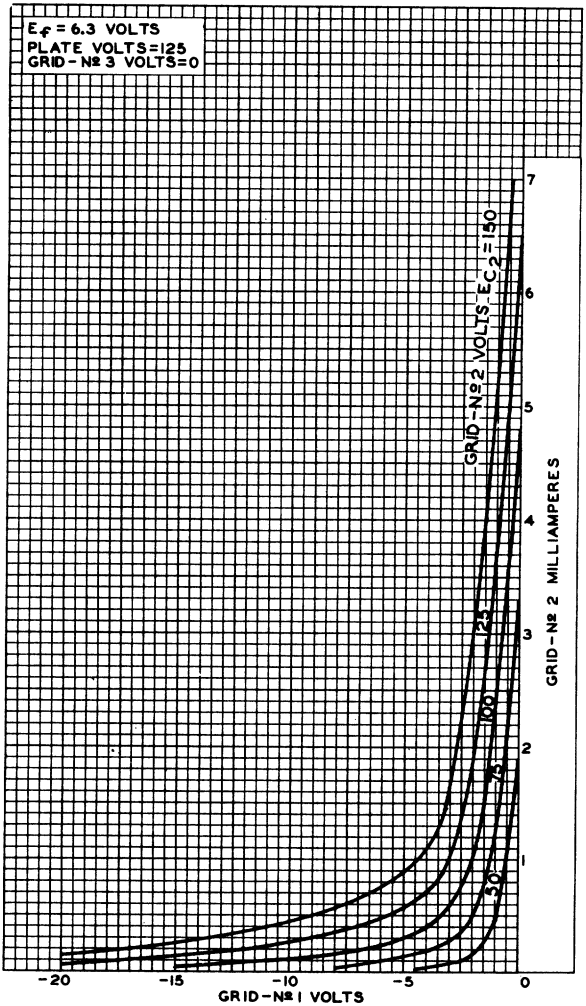
PLATE VOLTAGE	300 max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE	0 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE. . .	300 max.	volts
GRID-No.2 VOLTAGE . . . . . .See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 150 volts	0.55 max.	watt
For grid-No.2 voltages between 150 and 300 volts .See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		
PLATE DISSIPATION	2.3 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation.	0.25 max.	megohm
For cathode-bias operation.	1 max.	megohm

[a] The dc component must not exceed 100 volts.
[b] With external shield JEDEC No.316 connected to cathode.

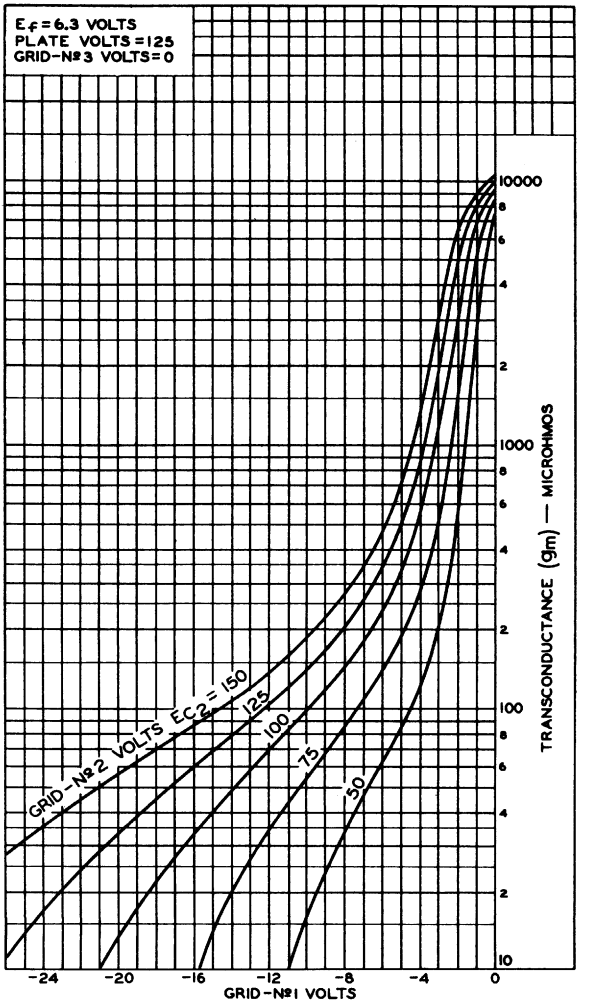
AVERAGE CHARACTERISTICS



92CM-9485RI

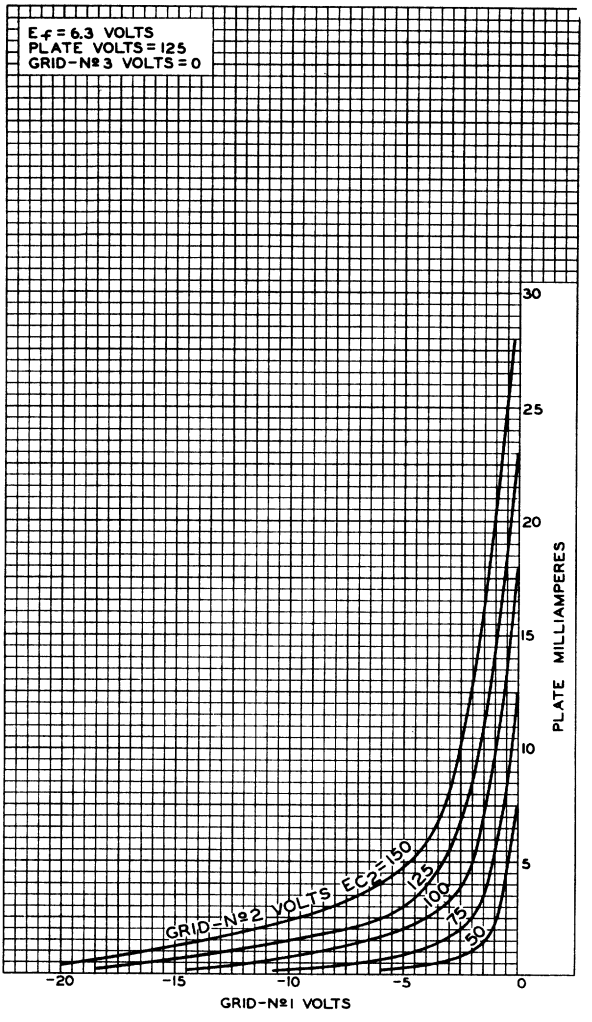
6JH6

AVERAGE CHARACTERISTICS



92CM-8509R1

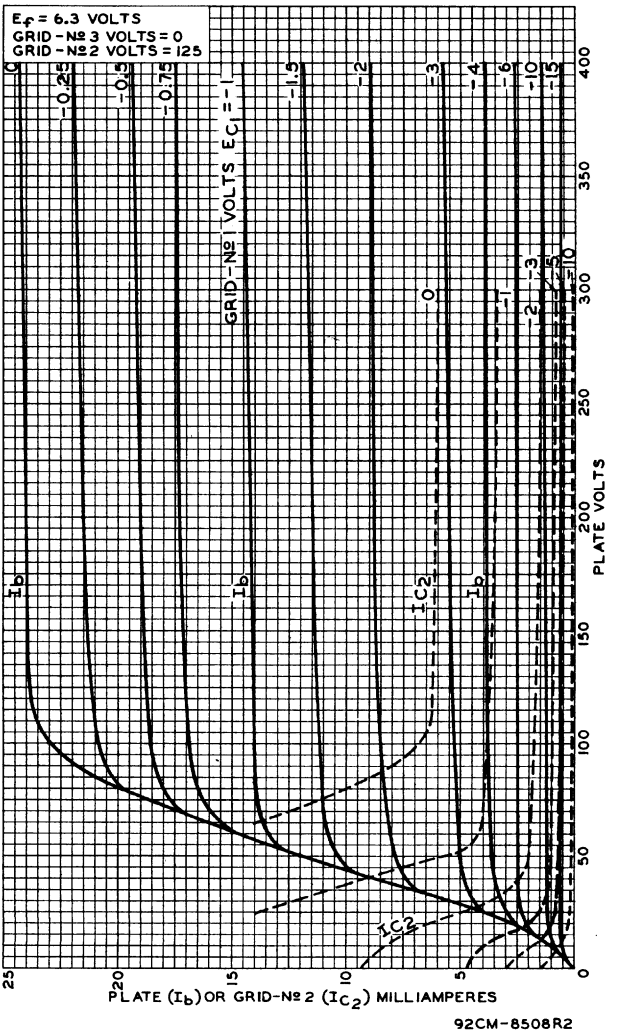
AVERAGE CHARACTERISTICS



92CM-9481R1

6JH6

AVERAGE CHARACTERISTICS



92CM-8508R2

6JH8

Beam-Deflection Tube

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.300	amp
Direct Interelectrode Capacitances:[a]		
Grid No.1 to all other electrodes except both plates	7.5	μμf
Grid No.1 to deflecting electrode No.1	0.04 max.	μμf
Grid No.1 to deflecting electrode No.2	0.07 max.	μμf
Plate No.1 to all other electrodes	5.0	μμf
Plate No.2 to all other electrodes	5.0	μμf
Plate No.1 to plate No.2	0.4	μμf
Deflecting electrode No.1 to all other electrodes	4.8	μμf
Deflecting electrode No.2 to all other electrodes	4.8	μμf
Deflecting electrode No.1 to deflecting electrode No.2	0.38	μμf

Characteristics, Class A_1 Amplifier:

With both plates connected together and with both deflecting electrodes connected to cathode at socket

Plate-No.1 Supply Voltage	250	volts
Plate-No.2 Supply Voltage	250	volts
Grid-No.3 Voltage	250	volts
Cathode Resistor	220	ohms
Total Plate Current	14	ma
Grid-No.3 Current	1.5	ma
Transconductance	4400	μmhos
Grid-No.1 Voltage (Approx.) for total plate μa = 10	-13	volts

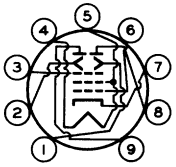
Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

6JH8

Basing Designation for BOTTOM VIEW. 9DP

Pin 1 – Deflecting Electrode No.2
Pin 2 – Deflecting Electrode No.1
Pin 3 – Grid No.3
Pin 4 – Heater



Pin 5[b] – Heater, Internal Shield, Grid No.2
Pin 6 – Grid No.1
Pin 7 – Cathode
Pin 8 – Plate No.2
Pin 9 – Plate No.1

COLOR-TV DEMODULATOR

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE (Each plate). . . .	330 max.	volts
PEAK DEFLECTING-ELECTRODE VOLTAGE (Each electrode):		
Negative value.	165 max.	volts
Positive value.	165 max.	volts
GRID-No.3 (ACCELERATING-GRID) VOLTAGE	330 max.	volts
GRID-No.2 (FOCUSING-GRID) VOLTAGE	*Connect to cathode at socket*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
GRID-No.3 INPUT	1 max.	watt
CATHODE CURRENT	33 max.	ma
PLATE DISSIPATION (Each plate). .	3 max.	watts

Typical Operation:

Plate Supply Voltage (Each plate)	250	volts
Grid-No.3 Voltage	250	volts
Grid No.2	*Connected to cathode at socket*	
Cathode Resistor.	220	ohms
Maximum Deflecting-Electrode Switching Voltage[c].	20	volts
Deflecting-Electrode Voltage for minimum deflecting-electrode switching voltage[c]. .	-14	volts
Voltage Difference Between Deflecting Electrodes for plate-No.1 current and plate-No.2 current to be equal. . . .	0	volts
Maximum Plate-No.1 Current for deflecting-electrode-No.1 volts = -15, and deflecting-electrode-No.2 volts = +15. . .	0.7	ma
Maximum Plate-No.2 Current for deflecting-electrode-No.1 volts = +15, and deflecting-electrode-No.2 volts = -15. . .	0.7	ma

Maximum Deflecting-Electrode-No.1 Current for deflecting-electrode-No.1 volts = +25, and deflecting-electrode-No.2 volts = -25	0.1	ma
Maximum Deflecting-Electrode-No.2 Current for deflecting-electrode-No.1 volts = -25, and deflecting-electrode-No.2 volts = +25	0.1	ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation. . . .	0.1 max.	megohm
For cathode-bias operation. . .	0.25 max.	megohm

[a] Without external shield.

[b] Pin 5 should be connected directly to cathode at socket.

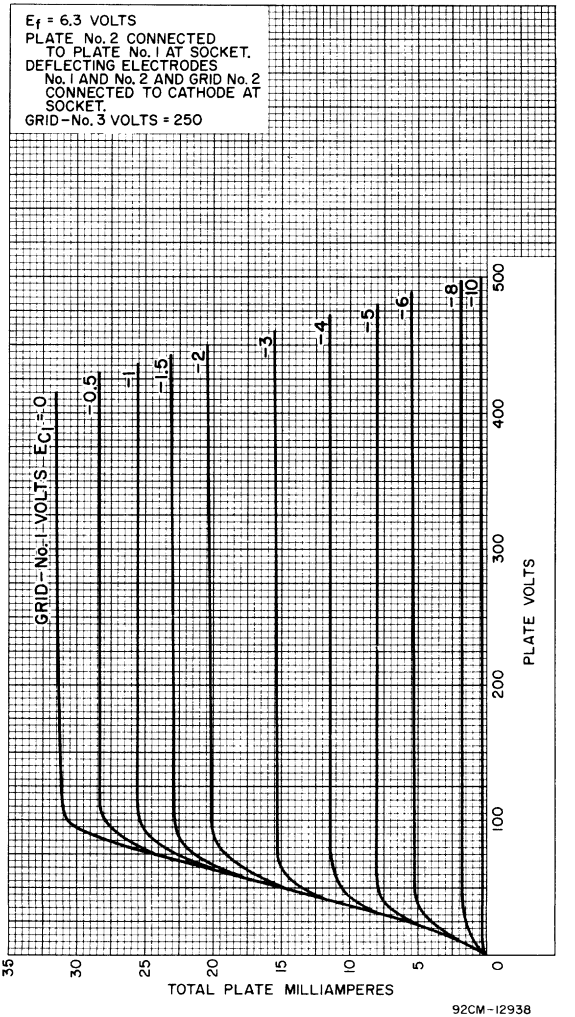
[c] The Deflecting-Electrode Switching Voltage is the total voltage change on either deflecting electrode with an equal and opposite voltage change on the other deflecting electrode required to switch the plate current from one plate to the other plate.

OPERATING CONSIDERATIONS

This type should be located in equipment so that it is not subjected to stray magnetic fields which may affect the intrinsic operating plate-current balance.

6JH8

Average Plate Characteristics



92CM-12938

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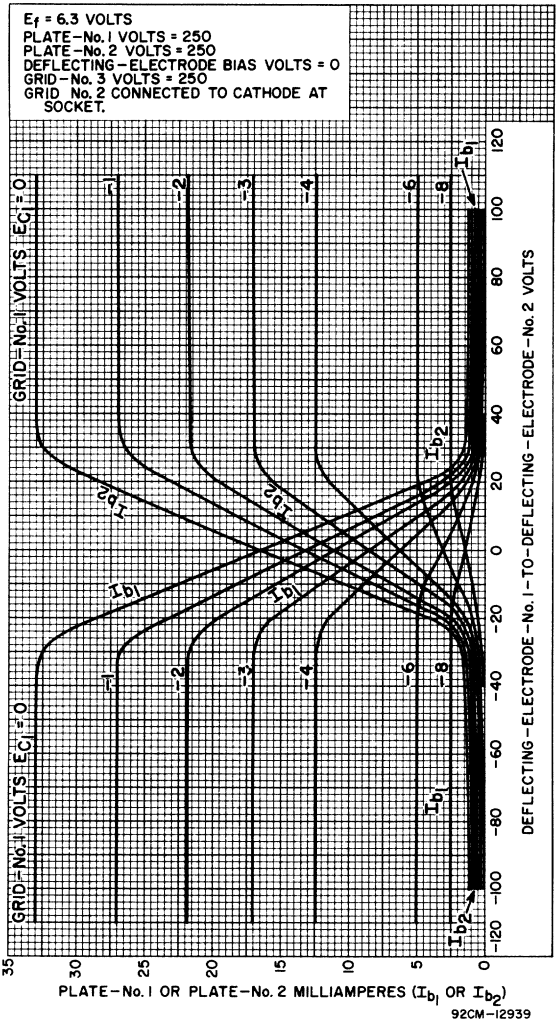
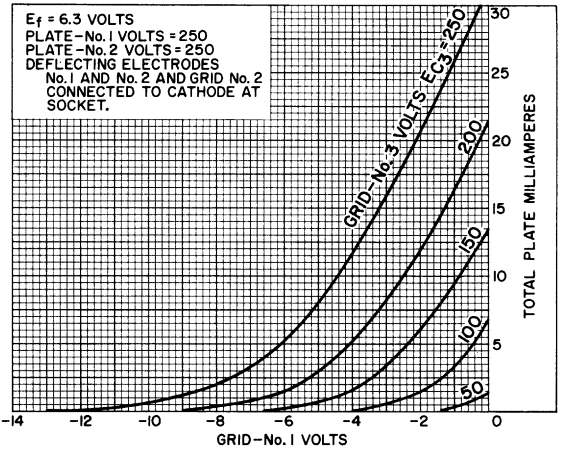
Average Characteristics



Average Characteristics



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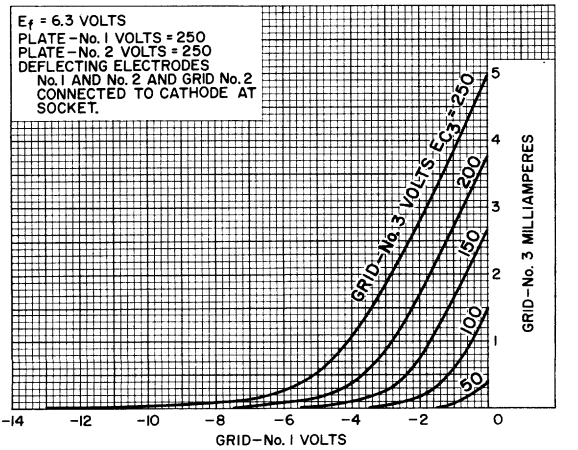

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6JQ6

Beam Power Tube

with an Integral Diode

9-PIN MINIATURE TYPE

PLATE DISSIPATION = 10 WATTS **DARK HEATER**

For Feedback-Stabilized Vertical Deflection Amplifier Applications in Black-and-White and Color TV Receivers

ELECTRICAL CHARACTERISTICS

Bogey Values

Heater Voltage (AC or DC)	E_h		6.3	V
Heater Current	I_h		1.2	A
Direct Interelectrode Capacitances				
Without external shield				
Grid No.1 to plate	e_{g1-p}		0.32	pF
Input: G1 to (K, G3+ P_D, G2, H)	c_i		13.0	pF
Output: P to (K, G3 + P_D, G2, H)	c_o		6.0	pF
For the following characteristics, see Conditions				
Amplification Factor (Triode Connection)[a]	μ		6.5	
Plate Resistance (Approx.)	r_p		10.5	kΩ
Transconductance	g_m		4200	μmho
DC Plate Current	I_b	150[b]	35	mA
DC Grid-No.2 Current	I_{c2}	20[b]	2.5	mA
Cutoff DC Grid-No.1 Voltage. Plate mA = 1	$E_{c1(co)}$		-37	V
Instantaneous Diode-Plate-to-Cathode-Voltage Drop for instantaneous diode-plate current ($r_{b(d)}$) = 2 mA	$e_{b(d)}$		5	V

Conditions

Heater	E_h	6.3	6.3	V
DC Plate Voltage	E_b	40	140	V
DC Grid-No.3 Voltage	E_{c3}	0	0	V
DC Grid-No.2 Voltage	E_{c2}	120	140	V
DC Grid-No.1 Voltage	E_{c1}	0	-18	V

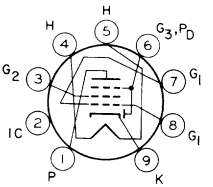
MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Dimensional Outline (JEDEC 6-4)	See *General Section*
Maximum Overall Length	3.062 in (77.77 mm)
Maximum Seated Length	2.812 in (71.42 mm)
Maximum Diameter	0.875 in (22.22 mm)
Envelope	JEDEC Designation T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC Designation E9-1)
Terminal Diagram	9RA

6JQ6

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Plate
Pin 2 – Do Not Use
Pin 3 – Grid No.2
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Grid No.3, Diode Plate
Pin 7 – Grid No.1
Pin 8 – Grid No.1
Pin 9 – Cathode



9RA

DESIGN-MAXIMUM RATINGS[c]

For operation as a Feedback-Stabilized Vertical-Deflection-Amplifier Tube in Black-&-White & Color Television Receivers in a 525-line, 30-frame system

DC Plate Voltage	E_b	425	V
Peak Positive-Pulse Plate Voltage (Absolute-Maximum Value)[d]	e_{bm}	2000	V
DC Grid-No.3 & Diode-Plate Voltage	$E_{c3}, E_{b(d)}$	+10 -150	V V
DC Grid-No.2 (Screen-Grid) Voltage	E_{c2}	330	V
Peak Negative-Pulse Grid-No.1 (Control-Grid) Voltage	e_{c1m}	150	V
Heater-Cathode Voltage			
Peak	e_{hkm}	±200	V
Average[e]	$E_{hk(av)}$	100	V
Heater Voltage (AC or DC)	E_h	5.7 to 6.9	V
Cathode Current			
Peak	i_{km}	250	mA
Average[e]	$I_{k(av)}$	70	mA
Average Diode-Plate (& Grid-No.3) Current[e]	$I_{b(av)\ (d)}$	1	mA
Grid-No.2 Input	P_{g2}	2	W
Plate Dissipation	P_b	10	W
Envelope Temperature (At hottest point on envelope surface)	T_E	240	°C

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance	$R_{g1(ckt)}$		
For grid-No.1-resistor-bias operation	-	2.2	MΩ
For cathode-bias operation	-	2.2	MΩ

[a] With grid No.3 and diode plate connected to cathode and with grid No.2 connected to plate at socket.

[b] This value can be measured by a method involving a recurrent waveform such that the Maximum Ratings of the tube will not be exceeded.

[c] Unless otherwise specified.

[d] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 ms.

[e] Measured with a dc meter.

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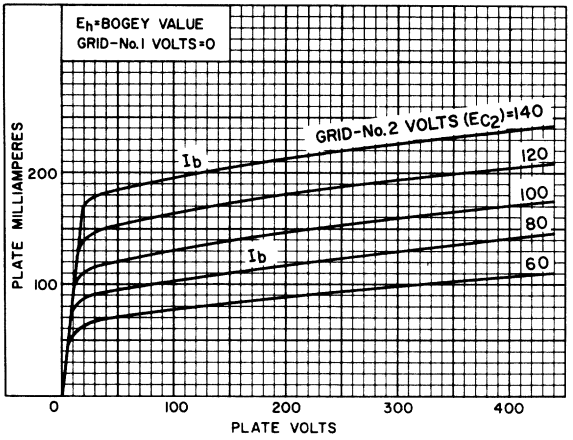
Typical Characteristics



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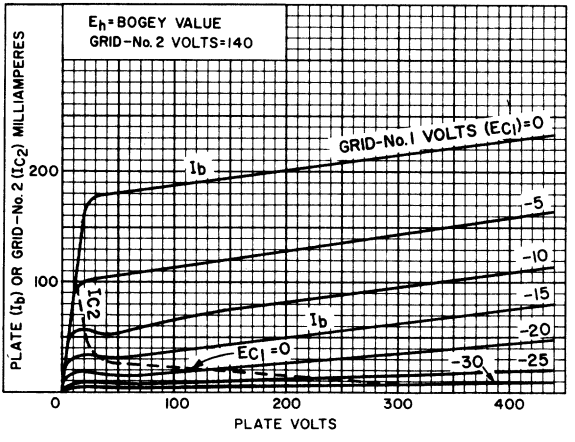


92CS-14661

6JR6

Beam Power Tube

Novar Type

For Horizontal-Deflection-Amplifier Service in Low-B+, Black-and-White TV Receivers

ELECTRICAL CHARACTERISTICS – Bogey Values

Heater Voltage, ac or dc.	E_h	6.3					V
Heater Current	I_h	1.6					A
Direct Interelectrode Capacitances:[a]							
Grid No.1 to plate	c_{g1-p}	0.7					pF
Input: G1 to (K,G3,G2,H)	c_i	22.0					pF
Output: P to (K,G3,G2,H)	c_o	9.0					pF
For the following characteristics, see Conditions below:							
Amplification Factor (Triode Connection)[b]	μ	-	-	4.7	-		
Plate Resistance (Approx.)	r_p	-	-	-	18		kΩ
Transconductance	g_m	-	-	-	7000		μmho
DC Plate Current	I_b	-	470[c]	-	45		mA
DC Grid-No.2 Current	I_{c2}	-	32[c]	-	1.5		mA
Cutoff DC Grid-No.1 Voltage for I_b = 1 mA	$E_{c1(co)}$	-75	-	-	-32		V
Conditions:							
Heater Voltage	E_h	Bogey value					V
Peak Positive-Pulse Plate Voltage[d]	e_{bm}	6500	-	-	-		V
DC Plate Voltage	E_b	-	50	125	130		V
Grid No.3	-	Connected to cathode at socket					
DC Grid-No.2 Voltage	E_{c2}	125	125	125	125		V
DC Grid-No.1 Voltage	E_{c1}	-	0	-20	-20		V

MECHANICAL CHARACTERISTICS

Maximum Overall Length . . . . . 3.130 in (79.50 mm)

Maximum Seated Length . . . . . 2.750 in (69.85 mm)

Maximum Diameter . . . . . 1.562 in (39.67 mm)

Envelope . . . . . JEDEC Designation T12

Dimensional Outline . . . . . JEDEC Designation 12-96

Base[e] . . . . . Large-Button Novar 9-Pin with Exhaust Tip (JEDEC Designation E9-88)

Terminal Connections (See TERMINAL DIAGRAM) . . . . . JEDEC Designation 9QU

Type of Cathode . . . . . Coated Unipotential

Operating Position . . . . . Any

MAXIMUM RATINGS – Design Maximum Values[f]

For operation as a Horizontal-Deflection-Amplifier Tube in a 525-line, 30-frame system

DC Plate Supply Voltage	E_{bb}	770	V
Peak Positive-Pulse Plate Voltage[g]	e_{bm}	6500	V
Peak Negative-Pulse Plate Voltage	$-e_{bm}$	1500	V
DC Grid-No.3 Voltage[h]	E_{c3}	75	V
DC Grid-No.2 (Screen-Grid) Voltage	E_{c2}	220	V
DC Grid-No.1 (Control-Grid) Voltage:			
Negative-bias value	$-E_{c1}$	55	V
Peak Negative-Pulse Grid No.1 Voltage	$-e_{c1m}$	330	V
Heater-Cathode Voltage:			
Peak	e_{hkm}	±200	V
Average	$E_{hk(av)}$	100	V
Heater Voltage, ac or dc	E_h	5.7 to 6.9	V
Cathode Current:			
Peak	i_{km}	950	V
Average	$I_{k(av)}$	275	V
Grid-No.2 Input	P_{g2}	3.5	V
Plate Dissipation[k]	P_b	17	V
Envelope Temperature (at hottest point on envelope surface)	T_E	240	°C

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance:	$R_{g1(ckt)}$		
For grid-No.1-resistor-bias operation		0.47	MΩ
For plate-pulsed operation (horizontal-deflection circuits only)		10	MΩ

a Measured without external shield in accordance with the current issue of EIA Standard RS-191.

b With Grid No.2 connected to plate at socket.

c This value can be measured by a method involving a re- current waveform such that the Maximum Ratings of the tube will not be exceeded.

d Under pulse-duration condition specified in Footnote g.

e Designed to mate with "Novar 9-contact" Socket generally available from your local RCA Distributor.

f As defined in the current issue of EIA Standard RS-239.

g This rating is applicable where the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10 μs.

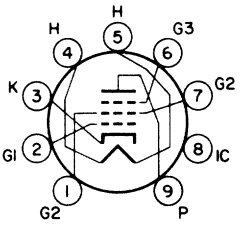
h In horizontal-deflection-amplifier service, a positive voltage may be applied to grid No.3 to reduce interference

from "snivets" which may occur in both vhf and uhf television receivers. A typical operating value for this voltage is 30 V.

k An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

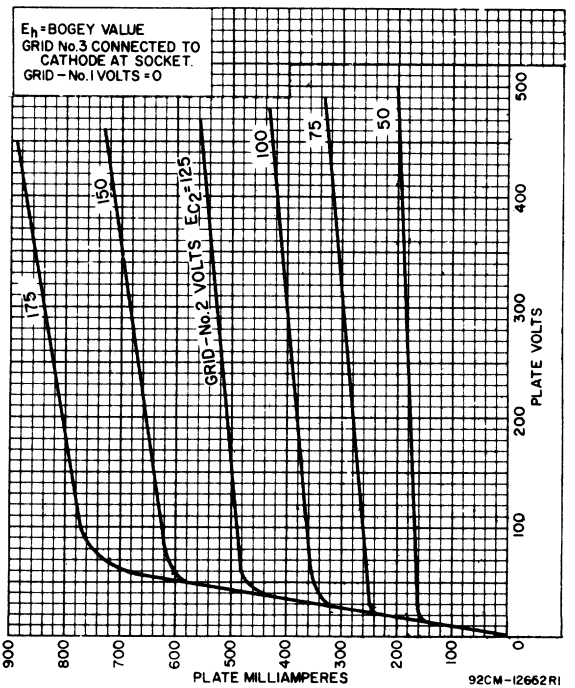
TERMINAL DIAGRAM (Bottom View)

Pin 1 - Grid No.2
Pin 2 - Grid No.1
Pin 3 - Cathode
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid No.3
Pin 7 - Grid No.2
Pin 8 - Do Not Use
Pin 9 - Plate

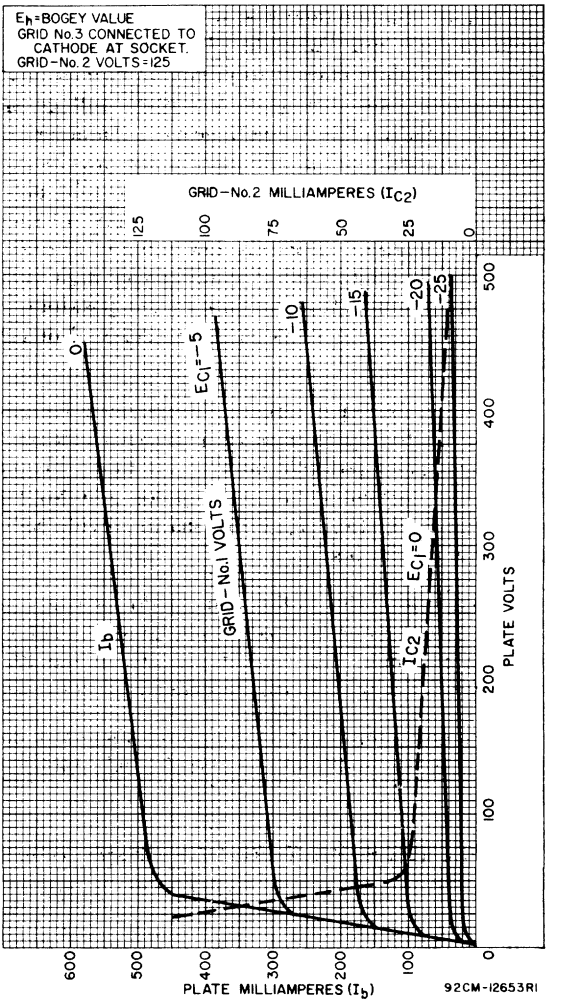


JEDEC 9QU

TYPICAL PLATE CHARACTERISTICS



TYPICAL CHARACTERISTICS



6JT6A

Beam Power Tube

NOVAR TYPE

SEPARATE GRID-Nc 3 BASE-PIN TERMINAL FOR "SNIVETS" CONTROL[a]

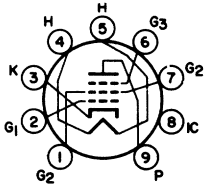
For Horizontal-Deflection-Amplifier Service in Black-and-White TV Receivers

Electrical:

Heater Ratings and Characteristics:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.200	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode.	200 max.	volts
Heater positive with respect to cathode.	200[b] max.	volts
Direct Interelectrode Capacitances (Approx.):[c]		
Grid No.1 to plate	0.26	pf
Input: G1 to (K,G3,G2,H)	15.0	pf
Output: P to (K,G3,G2,H)	6.5	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2.880"
Seated Length	2.250" to 2.500"
Diameter	1.438" to 1.562"
Dimensional Outline	See *General Section*
Bulb	T12
Base	Large-Button Novar 9-Pin with Exhaust Tip (JEDEC No.E9-88)
Basing Designation for BOTTOM VIEW	9QU



Pin 1 - Grid No.2
Pin 2 - Grid No.1
Pin 3 - Cathode
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid No.3
Pin 7 - Grid No.2
Pin 8 - Do Not Use
Pin 9 - Plate

Characteristics, Class A_1 Amplifier:

	Triode Connection[d]	*Pentode Connection*		
Plate Voltage	150	60	250	volts
Grid No.3	-	*Connected to Cathode at socket*		
Grid-No.2 Voltage	150	150	150	volts
Grid-No.1 Voltage	-22.5	0	-22.5	volts
Amplification Factor	4.4	-	-	
Plate Resistance (Approx.)	-	-	15000	ohms
Transconductance	-	-	7100	μmhos

6JT6A

	Triode Connection[d]	*Pentode Connection*		
Plate Current	–	390[e]	70	ma
Grid-No.2 Current	–	32[e]	2.1	ma
Grid-No.1 Voltage (Approx.) for plate ma = 1	–	–	-42	volts

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[f]

DC Plate Supply Voltage	770 max.	volts
Peak Positive-Pulse Plate Voltage[g]	6500 max.	volts
Peak Negative-Pulse Plate Voltage	1500 max.	volts
DC Grid-No.3 (Suppressor-Grid) Voltage[a]	70 max.	volts
DC Grid-No.2 (Screen-Grid) Voltage	220 max.	volts
DC Grid-No.1 (Control-Grid) Voltage: Negative-bias value	55 max.	volts
Peak Negative-Pulse Grid-No.1 Voltage	330 max.	volts
Cathode Current:		
Peak	550 max.	ma
Average	175 max.	ma
Grid-No.2 Input	3.5 max.	watts
Plate Dissipation[h]	17.5 max.	watts
Bulb Temperature (At hottest point on bulb surface)	240 max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: For grid-resistor-bias operation	1 max.	megohm

[a] A positive voltage may be applied to grid No.3 to reduce interference from "snivets" which may occur in television receivers. A typical value for this voltage is 30 volts.

[b] The dc component must not exceed 100 volts.

[c] Without external shield.

[d] With grid No.2 connected to plate at socket.

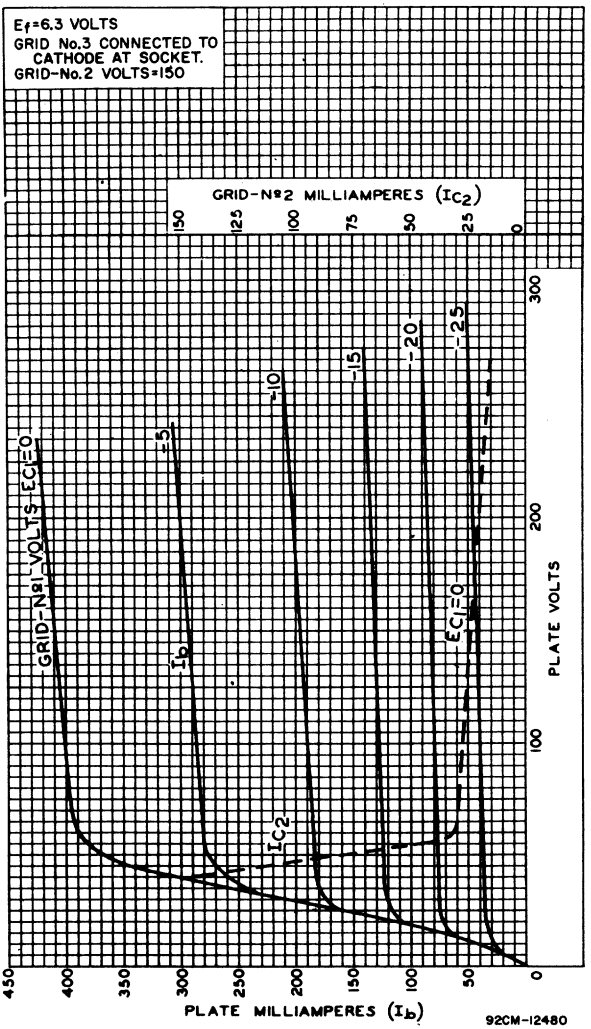
[e] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

[f] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

[g] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[h] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

AVERAGE CHARACTERISTICS



6JU6

Beam Power Tube

NOVAR TYPE

For Horizontal-Deflection-Amplifier Service in Low-B+, Black-and-White TV Receivers

ELECTRICAL CHARACTERISTICS

Bogey Values

Heater Voltage (AC or DC)	E_h	6.3	V
Heater Current	I_h	1.600	A
Direct Interelectrode Capacitances			
Without external shield			
Grid No.1 to plate	c_{g1-p}	1.2	pF
Input: G1 to (K, G3, G2, H)	c_i	22	pF
Output: P to (K, G3, G2, H)	c_o	9.0	pF

For the following characteristics, see Conditions

Amplification Factor	μ	-	-	4.7	-	
Triode connection[a]						
Plate Resistance (Approx.)	r_p	-	-	-	18	kΩ
Transconductance	g_m	-	-	-	7000	μmhos
DC Plate Current	I_b	-	470[b]	-	45	mA
DC Grid-No.2 Current	I_{c2}	-	32[b]	-	1.5	mA
Cutoff DC Grid-No.1 Voltage	$E_{c1(co)}$	-75	-	-	-32	V
Plate mA = 1						

Conditions

Heater Voltage	E_h	Bogey value				V
Peak Positive-Pulse Plate Voltage[c]	e_{bm}	6500	-	-	-	V
DC Plate Voltage	E_b	-	50	125	130	V
Grid No.3		Connected to cathode at socket				
DC Grid-No.2 Voltage	E_{c2}	125	125	125	125	V
DC Grid-No.1 Voltage	E_{c1}	-	0	-20	-20	V

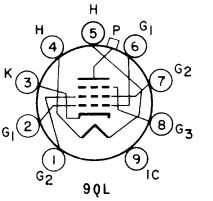
MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.550 in
Maximum Seated Length	3.170 in
Maximum Diameter	1.562 in
Dimensional Outline	See *General Section*
Envelope	JEDEC T12
Top Cap	Skirted Miniature (JEDEC C1-2 or C1-3)
Bases (alternates)	
Large-Button Novar 9-Pin (JEDEC E9-76)	
Large-Button Novar 9-Pin with Exhaust Tip (JEDEC E9-88)	

6JU6

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Grid No.2
Pin 2 – Grid No.1
Pin 3 – Cathode
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Grid No.1
Pin 7 – Grid No.2
Pin 8 – Grid No.3
Pin 9 – Do Not Use
Top Cap – Plate



9QL

DESIGN-MAXIMUM RATINGS

For operation as a Horizontal-Deflection-Amplifier Tube in a 525-line, 30-frame system

DC Plate Supply Voltage	E_{bb}	770	V
Peak Positive-Pulse Plate Voltage[d]	e_{bm}	6500	V
Peak Negative-Pulse Plate Voltage	$-e_{bm}$	1500	V
DC Grid-No.3 Voltage[e]	E_{c3}	75	V
DC Grid-No.2 (Screen-Grid) Voltage	E_{c2}	220	V
DC Grid-No.1 (Control-Grid) Voltage	$-E_{c1}$	55	V
Negative-bias value			
Peak Negative-Pulse Grid-No.1 Voltage	$-e_{c1m}$	330	V
Heater-Cathode Voltage			
Peak	e_{hkm}	±200	V
Average	$E_{hk(av)}$	100	V
Heater Voltage (AC or DC)	E_h	5.7 to 6.9	V
Cathode Current			
Peak	i_{km}	950	mA
Average	$I_{k(av)}$	275	mA
Grid-No.2 Input	P_{g2}	3.5	W
Plate Dissipation[f]	P_b	17	W
Envelope Temperature	T_E	240	°C
At hottest point on envelope surface			

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance	$R_{g1(ckt)}$		
For grid-No.1-resistor-bias operation	-	0.47	MΩ
For plate-pulsed operation (horizontal-deflection circuits only)	-	10	MΩ

[a] With grid No.2 connected to plate at socket.

[b] This value can be measured by a method involving a recurrent waveform such that the Maximum Ratings of the tube will not be exceeded.

[c] Under pulse-duration condition specified in Footnote d.

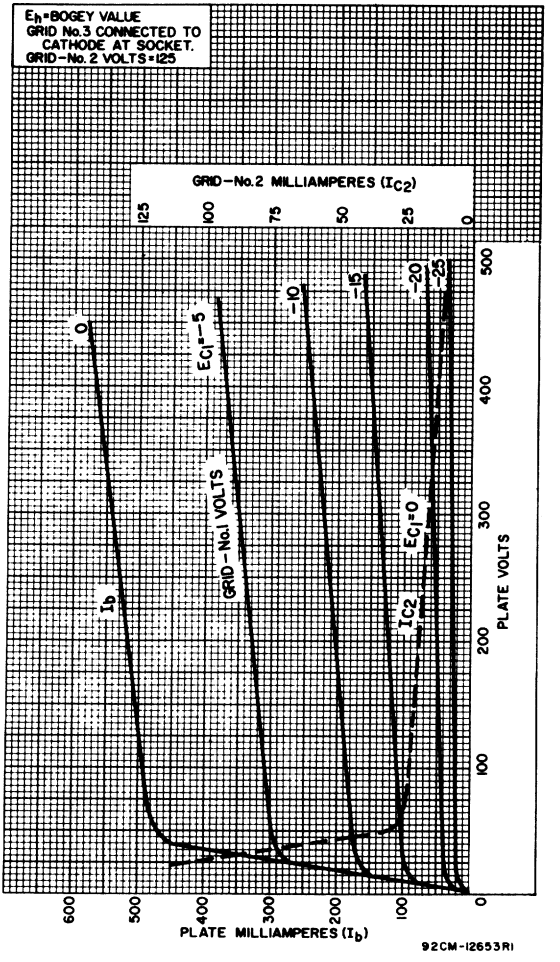
[d] This rating is applicable where the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10 μs.

[e] In horizontal-deflection-amplifier service, a positive voltage may be applied to grid No.3 to reduce interference from "snivets" which may occur in both vhf and uhf television receivers. A typical operating value for this voltage is 30 V.

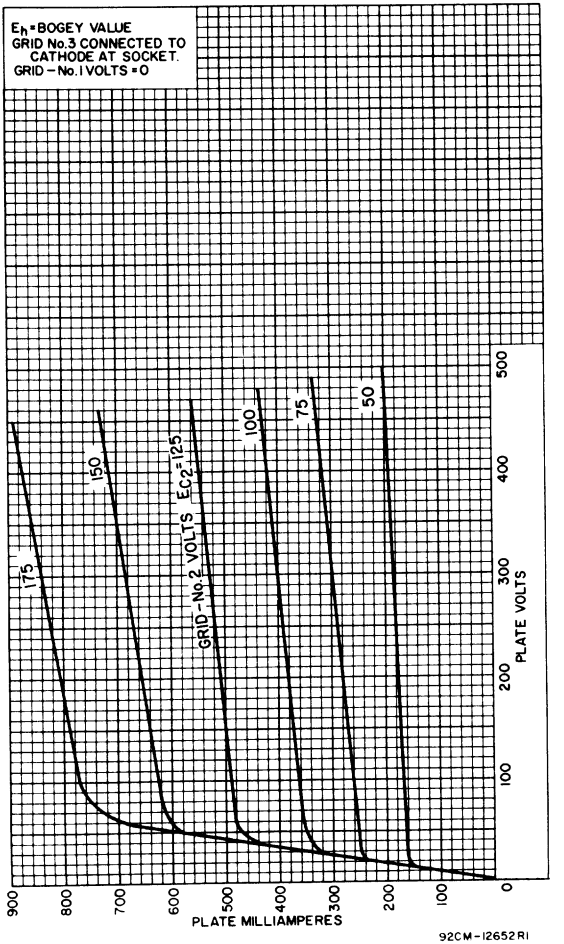
[f] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Typical Characteristics



Typical Plate Characteristics



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6JU8A

Quadruple Diode

9-PIN MINIATURE TYPE

For Phase-Detector and Noise-Immune Color-Killer Circuits in Color-Television Receivers, and for FM-Stereo-Multiplex Equipment

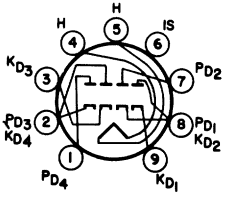
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.600	amp
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	300 max.	volts
Heater positive with respect to cathode	300 max.	volts
Direct Interelectrode Capacitances (Approx.):[a]		
$P_{D1}+K_{D2}$ to K_{D1}	1.8	pf
$P_{D1}+K_{D2}$ to P_{D2}	2.2	pf
P_{D2} to (IS,H)	0.62	pf
$P_{D3}+K_{D4}$ to K_{D3}	1.9	pf
$P_{D3}+K_{D4}$ to P_{D4}	2.2	pf
P_{D4} to (IS,H)	0.94	pf
K_{D1} to (IS,H)	1.8	pf
K_{D3} to (IS,H)	1.9	pf

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9PQ

Pin 1 - Plate of Unit No.4
Pin 2 - Plate of Unit No.3, Cathode of Unit No.4
Pin 3 - Cathode of Unit No.3
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Internal Shield
Pin 7 - Plate of Unit No.2
Pin 8 - Plate of Unit No.1, Cathode of Unit No.2
Pin 9 - Cathode of Unit No.1



6JU8A

Maximum Ratings, *Design-Maximum Values:*

Values are for Each Unit

Peak Inverse Plate Voltage	300 max.	volts
Peak Plate Current	54 max.	ma
DC Output Current	9 max.	ma

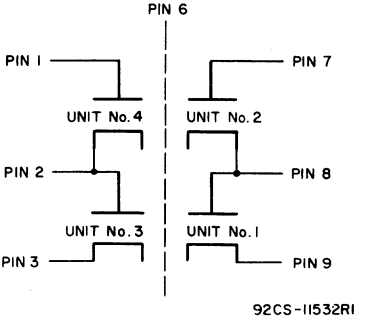
Characteristics, Instantaneous Value:

Values are for Each Unit

Plate Current for plate volts = 10	60	ma

[a] Without external shield.

ARRANGEMENT OF DIODE UNITS



92CS-11532RI

High-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

For Sound-IF, Keyed-AGC, Sync-Separator, Sync-Amplifier, Noise-Suppression Circuits, and Video Amplifier Service

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:			
Voltage (AC or DC)	6.3[a]	6.3 ±0.6	volts
Current	0.600 ±0.040	0.600[b]	amp
Warm-up time (Average)	11	-	sec
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode	200 max.		volts
Heater positive with respect to cathode	200[c] max.		volts
Direct Interelectrode Capacitances:[d]			
Triode Unit:			
Grid to plate	2.2		pf
Grid to cathode and heater	3.0		pf
Plate to cathode and heater	2.0		pf
Pentode Unit:			
Grid No.1 to plate	0.08 max.		pf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2 and heater	8.0		pf
Pentode plate to pentode cathode & grid No.3 & internal shield, grid No.2 and heater	3.2		pf
Pentode grid No.1 to triode plate	0.012 max.		pf
Pentode plate to triode plate	0.24 max.		pf

Characteristics, Class A_1 Amplifier:

	Triode Unit	
Plate Voltage	200	volts
Grid-No.1 Voltage	-2	volts
Amplification Factor	70	
Plate Resistance (Approx.)	17500	ohms
Transconductance	4000	μmhos
Plate Current	4	ma

6JV8

Triode Unit

Grid-No.1 Voltage (Approx.) for plate μa =20.	-5	volts

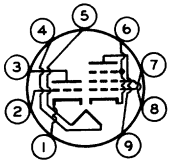
Pentode Unit

Plate Voltage	40	60	125	200	volts
Grid-No.2 Voltage	125	200	125	200	volts
Grid-No.1 Voltage	0	0	-1	-2.9	volts
Plate Resistance (Approx.)	-	-	100000	150000	ohms
Transconductance.	-	-	11500	10700	μmhos
Plate Current	28[e]	51[e]	22	22	ma
Grid-No.2 Current	9[e]	14[e]	4	4	ma
Grid-No.1 Voltage (Approx.) for plate μa =20. . . .	-	-	-5.5	-9	volts

Mechanical:

Operating Position. . . . . Any
Type of Cathodes. . . . . Coated Unipotential
Maximum Overall Length. . . . . 2-5/8"
Maximum Seated Length . . . . . 2-3/8"
Length from Base Seat to Bulb Top (Excluding tip) . 2" ± 3/32"
Diameter. . . . . 0.750" to 0.875"
Dimensional Outline . . . . . See *General Section*
Bulb. T6-1/2
Base. . . . . .Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9DX

Pin 1 -Triode Cathode
Pin 2 -Triode Grid
Pin 3 -Triode Plate
Pin 4 -Heater
Pin 5 -Heater
Pin 6 -Pentode Cathode, Grid No.3, Internal Shield



Pin 7 -Pentode Grid No.1
Pin 8 -Pentode Grid No.2
Pin 9 -Pentode Plate

AMPLIFIER —Class A_1

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	330 max.	330 max.	volts
GRID-NO.2 (SCREEN-GRID) VOLTAGE	-	330 max.	volts
GRID-NO.1 (CONTROL-GRID) VOLTAGE:			
Negative-bias value	50 max.	50 max.	volts
Positive-bias value	0 max.	0 max.	volts
PLATE DISSIPATION	1.1 max.	4 max.	watts
GRID-NO.2 INPUT	-	1.7 max.	watts

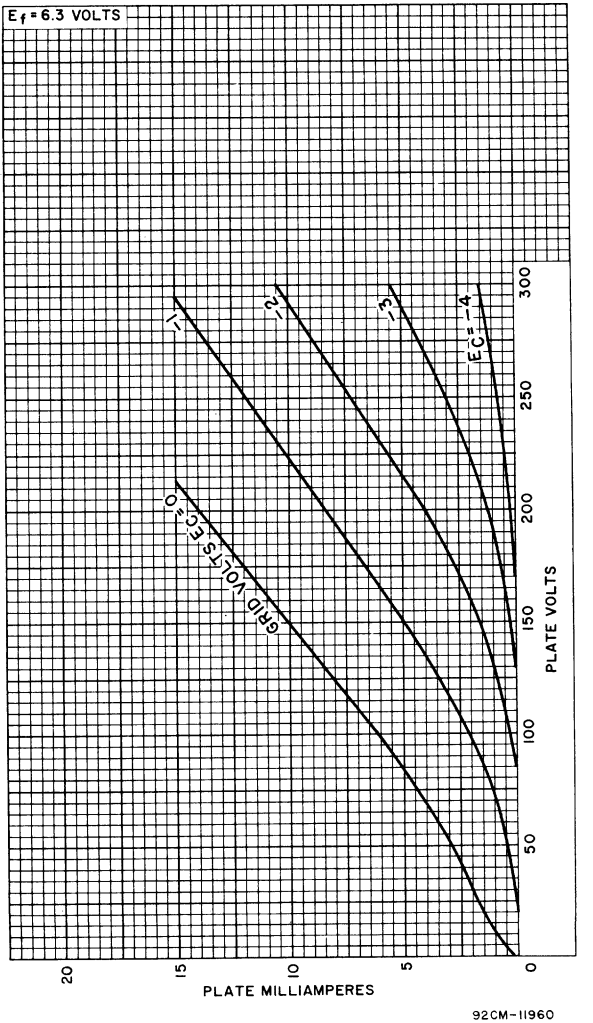
Maximum Circuit Values:

Grid-No.1 Circuit Resistance:			
For fixed-bias operation. . .	0.5 max.	0.25 max.	megohm
For cathode-bias operation	1 max.	1 max.	megohm

[a] At heater amperes = 0.600.
[b] At heater volts = 6.3.
[c] The dc component must not exceed 100 volts.
[d] Without external shield.
[e] This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

6JV8

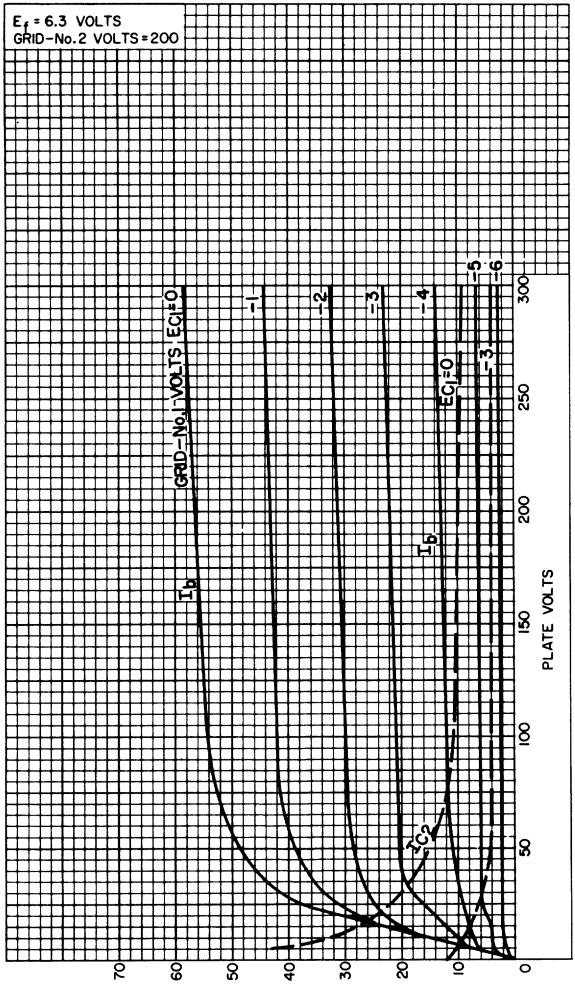
AVERAGE PLATE CHARACTERISTICS
Triode Unit



92CM-11960

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

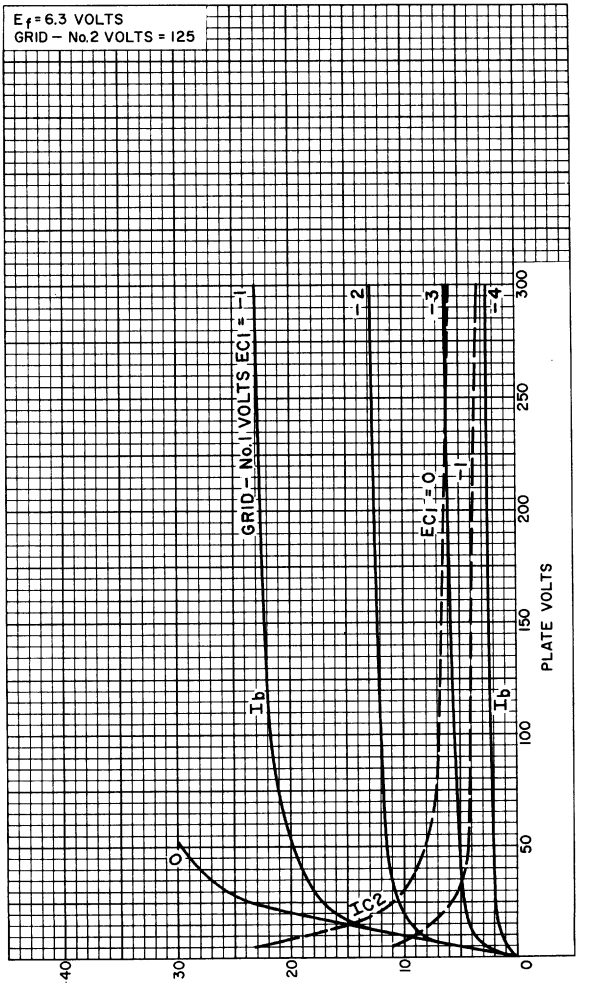
AVERAGE CHARACTERISTICS
Pentode Unit



92CM-11961

6JV8

AVERAGE CHARACTERISTICS
Pentode Unit



92CM–11962

Medium-Mu Triode—Beam Power Tube

DUODECAR TYPE

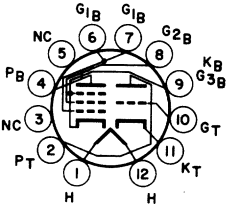
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ±0.6	volts
Current at heater volts = 6.3	1.200	amp
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts
Direct Interelectrode Capacitances (Approx.):[b]		
Triode Unit:		
G_T to P_T	3.6	pf
Input: G_T to (K_T,H)	2.2	pf
Output: P_T to (K_T,H)	0.7	pf
Beam Power Unit:		
$G1_B$ to P_B	0.34	pf
Input: $G1_B$ to (K_B+$G3_B$,$G2_B$,H)	11.0	pf
Output: P_B to (K_B+$G3_B$,$G2_B$,H)	7.0	pf

Mechanical:

Operating Position	Any
Types of Cathodes	Coated Unipotential
Maximum Overall Length	2.375"
Seated Length	1.750" to 2.000"
Diameter	1.062" to 1.188"
Dimensional Outline	See *General Section*
Bulb	T9
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW	12DZ

Pin 1 – Heater
Pin 2 – Triode Plate
Pin 3 – No Internal Connection
Pin 4 – Beam Power Plate
Pin 5 – Same as Pin 3
Pin 6 – Beam Power Grid No.1
Pin 7 – Beam Power Grid No.1
Pin 8 – Beam Power Grid No.2
Pin 9 – Beam Power Cathode, Beam Power Grid No.3
Pin 10 – Triode Grid
Pin 11 – Triode Cathode
Pin 12 – Heater



Characteristics, Class A_1 Amplifier:

	Triode Unit	*Beam Power Tube*		
Plate Voltage	150	45	120	volts
Grid-No.2 Voltage	–	110	110	volts
Grid-No.1 Voltage	-5	0	-8	volts
Amplification Factor	20	–	–	

	Triode Unit	Beam Power Tube		
Plate Resistance (Approx.)	8500	–	1700	ohms
Transconductance	2350	–	1400	μmhos
Plate Current	5.5	122	46	ma
Grid-No.2 Current	–	16.5	3.5	ma
Grid-No.1 Voltage (Approx.)				
for plate μa=10	-11	–	–	volts
100	–	–	-25	volts

VERTICAL-DEFLECTION OSCILLATOR

Triode Unit

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[c]

DC Plate Voltage	250 max.	volts
Peak Negative Pulse-Grid Voltage	400 max.	volts
Cathode Current:		
Peak	70 max.	ma
Average	20 max.	ma
Plate Dissipation	1 max.	watt

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation	1 max.	megohm
For cathode-bias operation	2.2 max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Beam Power Unit

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[c]

DC Plate Voltage	250 max.	volts
Peak Positive-Pulse Plate Voltage	2000 max.	volts
Grid No.2 Voltage	200 max.	volts
Cathode Current:		
Peak	245 max.	ma
Average	70 max.	ma
Plate Dissipation[d]	7 max.	watts
Grid-No.2 Input	1.8 max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation	1 max.	megohm
For cathode-bias operation	2.2 max.	megohms

[a] The dc component must not exceed 100 volts.

[b] Without external shield.

[c] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

[d] In stages operating with grid-leak bias, an adequate cathode-bias resistor or other suitable means is required to protect the tube in the absence of excitation.

6K6-GT

POWER PENTODE

GENERAL DATA

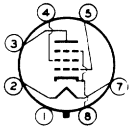
Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.4	amp
Direct Interelectrode Capacitances (Approx.):°		
Grid No.1 to plate	0.5	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	5.5	μμf
Plate to cathode & grid No.3, grid No.2, and heater	6	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-9/32"
Dimensional Outline	*See General Section*
Bulb	T-9
Base	Intermediate-Shell Octal 7-Pin (JETEC No.E7-7), Short Intermediate-Shell Octal 7-Pin with External Barriers (JETEC No.E7-59), Intermediate-Shell Octal 6-Pin (JETEC No.E6-81), or Short Intermediate-Shell Octal 6-Pin with External Barriers (JETEC No.E6-84)
Basing Designation for BOTTOM VIEW	7S

Pin 1♦ - No Connection
Pin 2 - Heater
Pin 3 - Plate
Pin 4 - Grid No.2



Pin 5 - Grid No.1
Pin 7 - Heater
Pin 8 - Cathode, Grid No.3

AF POWER AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	315 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	285 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive bias value	0 max.	volts
GRID-No.2 INPUT	2.8 max.	watts
PLATE DISSIPATION	8.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲max.	volts

° Without external shield.
♦ Pin 1 as well as pin 6 is omitted on the 6-Pin bases.

▲: See next page.

← Indicates a change.

6K6-GT

POWER PENTODE

Typical Operation and Characteristics:

Plate Voltage	100	250	315	volts
Grid-No.2 Voltage	100	250	250	volts
Grid-No.1 Voltage	-7	-18	-21	volts
Peak AF Grid-No.1 Voltage	7	18	21	volts
Zero-Signal Plate Current	9	32	25.5	ma
Max.-Signal Plate Current	9.5	33	28	ma
Zero-Signal Grid-No.2 Current	1.6	5.5	4	ma
Max.-Signal Grid-No.2 Current	3	10	9	ma
Plate Resistance (Approx.)	104000	90000	110000	ohms
Transconductance	1500	2300	2100	μmhos
Load Resistance	12000	7600	9000	ohms
Total Harmonic Distortion	11	11	15	%
Max.-Signal Power Output	0.35	3.4	4.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

PUSH-PULL AF POWER AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	315 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	285 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive bias value	0 max.	volts
GRID-No.2 INPUT	2.8 max.	watts
PLATE DISSIPATION	8.5 max.	watts
→ PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲max.	volts

Typical Operation:

Values are for 2 tubes

	Fixed Bias	*Cathode Bias*	
Plate Voltage	285	285	volts
Grid-No.2 Voltage	285	285	volts
Grid-No.1 Voltage	-25.5	–	volts
Cathode Resistor	–	400	ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage	51	51	volts
Zero-Signal Plate Current	55	55	ma
Max.-Signal Plate Current	72	61	ma
Zero-Signal Grid-No.2 Current	9	9	ma
Max.-Signal Grid-No.2 Current	17	13	ma

▲: See next page.

→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6K6-GT

POWER PENTODE

	Fixed Bias	*Cathode Bias*	
Effective Load Resistance (Plate to plate)	12000	12000	ohms
Total Harmonic Distortion	5	4	%
Max.-Signal Power Output	10.5	9.8	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

AF POWER AMPLIFIER - Class A_1

Triode Connection - Grid No.2 Connected to Plate

Characteristics:

Plate Voltage	250	volts
Grid-No.1 Voltage	-18	volts
Amplification Factor	6.6	
Plate Resistance (Approx.)	2500	ohms
Transconductance	2700	μmhos
Plate Current	37.5	ma
Grid-No.1 Voltage (Approx.) for plate current of 0.5 ma	-48	volts

VERTICAL DEFLECTION AMPLIFIER

Triode Connection - Grid No.2 Connected to Plate

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	315 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE (Absolute maximum)#	1200■max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 VOLTAGE	-250 max.	volts
CATHODE CURRENT:		
Peak	75 max.	ma
Average	25 max.	ma
PLATE DISSIPATION	7 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For cathode-bias operation	2.2 max.	megohms

▲ The dc component must not exceed 100 volts.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

\# This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 percent of one vertical scanning cycle is 2.5 milliseconds.

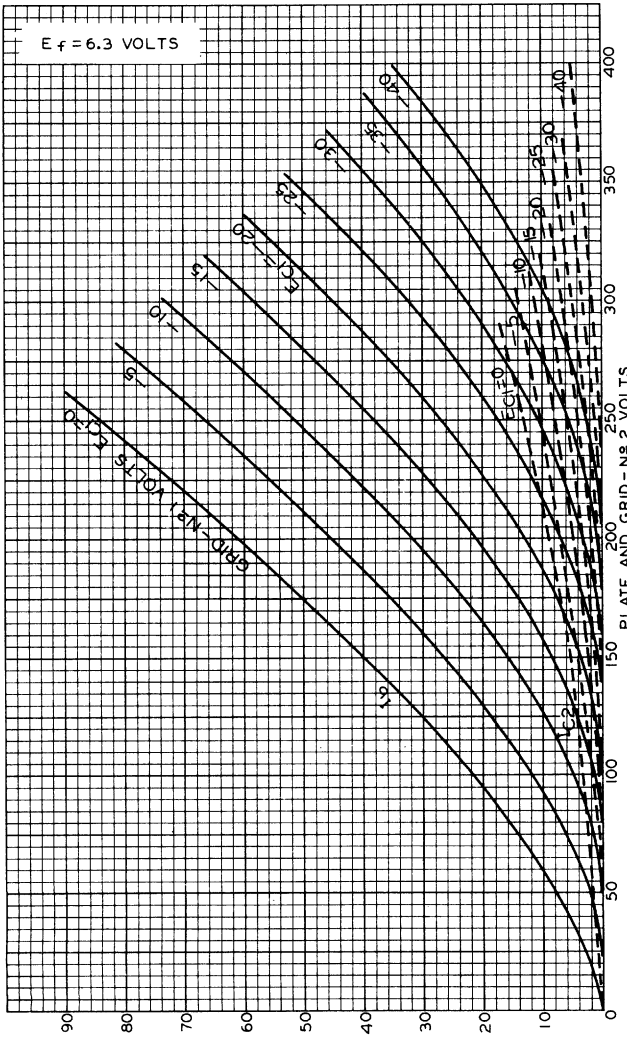
■ Under no circumstances should this absolute value be exceeded.

← Indicates a change.

6K6-GT

6K6-GT

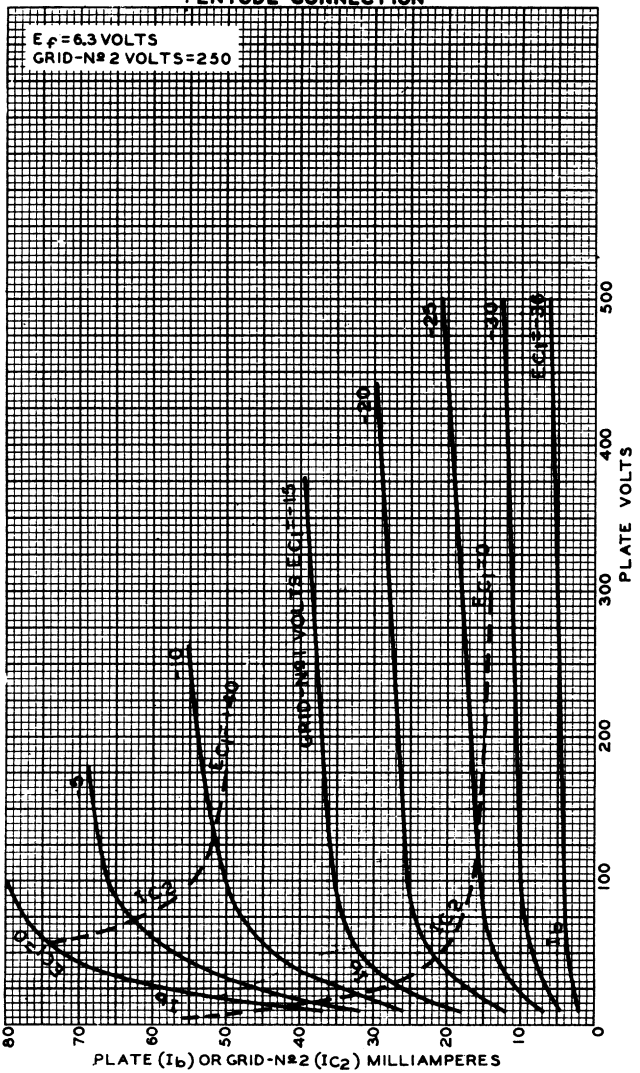
AVERAGE CHARACTERISTICS



6K6-GT

AVERAGE PLATE CHARACTERISTICS

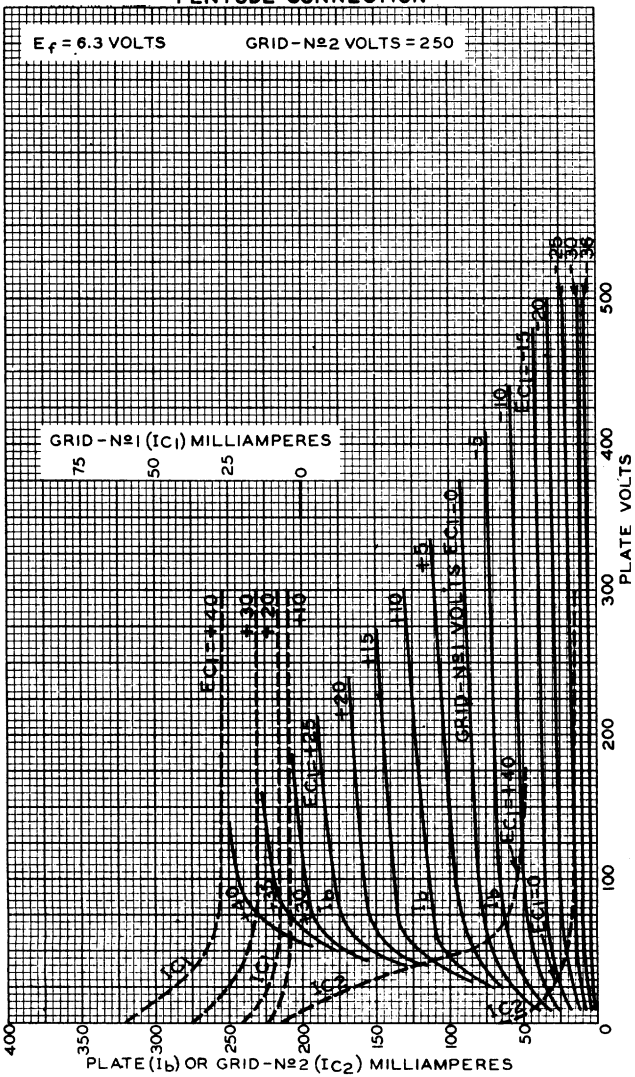
PENTODE CONNECTION



6K6-GT

6K6-GT

AVERAGE PLATE CHARACTERISTICS
PENTODE CONNECTION



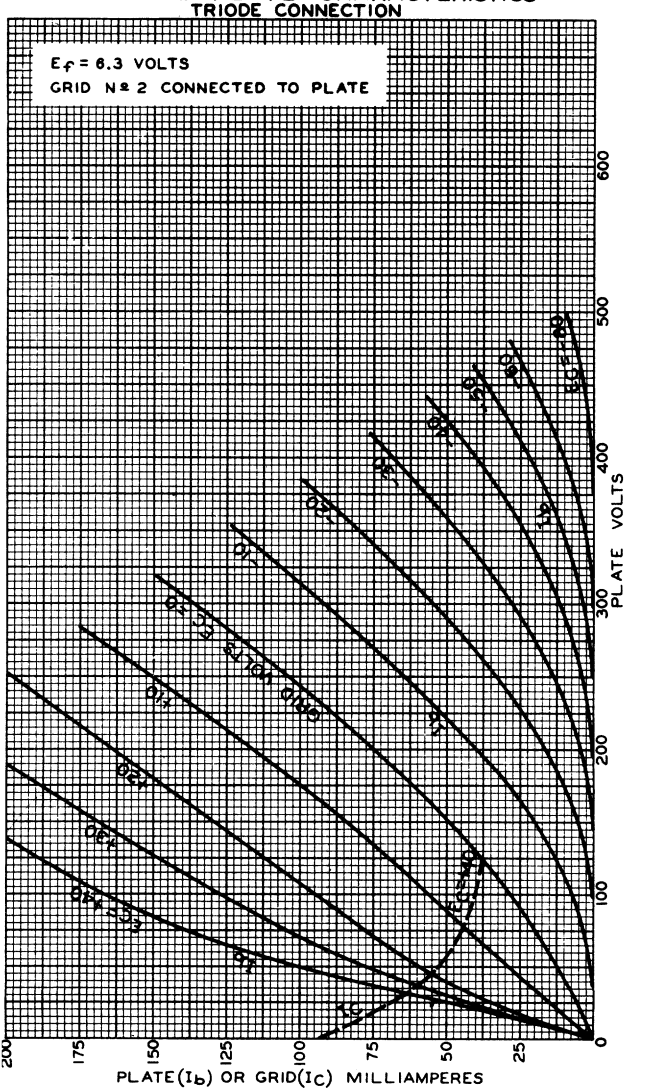
FEB. 13, 1948 TUBE DEPARTMENT 92CM-6311R

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6K6-GT

AVERAGE PLATE CHARACTERISTICS

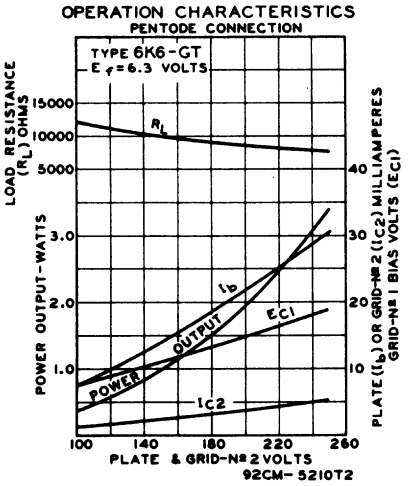
TRIODE CONNECTION

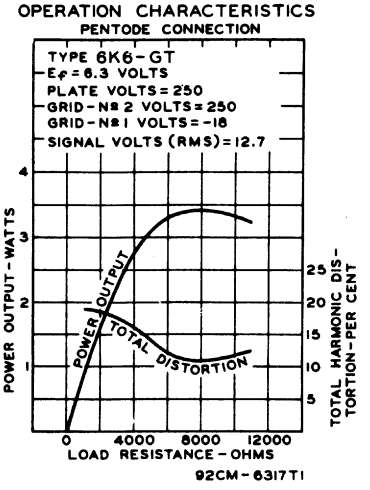


AUG. 18, 1941 TUBE DEPARTMENT 92CM-6313

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6K6-GT
POWER PENTODE





6K11/6Q11

Three-Unit Triode

With Medium-Mu Unit and Two High-Mu Units

DUODECAR TYPE

Electrical:

Heater Characteristics and Ratings:			
Voltage (AC or DC)	6.3[a]	6.3 ± 0.6	volts
Current	0.600 ± 0.040	0.600[b]	amp
Warm-up time (Average)	11	–	sec
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode	200 max.		volts
Heater positive with respect to cathode	200[c] max.		volts

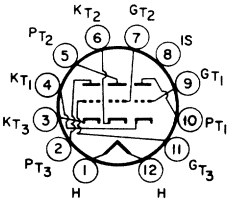
Direct Interelectrode Capacitances (Approx.):[d]

	Unit No.1	*Unit No.2*	*Unit No.3*	
Grid to plate	1.3	1.3	1.3	pf
Input: G to (K,IS,H)	1.9	1.8	1.8	pf
Output: P to (K,IS,H)	1.8	0.7	1.8	pf

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	1.875"
Seated Length	1.250" to 1.500"
Diameter	1.062" to 1.188"
Dimensional Outline (JEDEC 9-56)	See *General Section*
Bulb	T9
Base	Small-Button Duodecar 12-Pin (JEDEC No.E12-70)
Basing Designation for BOTTOM VIEW	12BY

Pin 1 – Heater
Pin 2 – Plate of Unit No.3
Pin 3 – Cathode of Unit No.3
Pin 4 – Cathode of Unit No.1
Pin 5 – Plate of Unit No.2
Pin 6 – Cathode of Unit No.2
Pin 7 – Grid of Unit No.2
Pin 8 – Internal Shield
Pin 9 – Grid of Unit No.1
Pin 10 – Plate of Unit No.1
Pin 11 – Grid of Unit No.3
Pin 12 – Heater



AMPLIFIER — Class A_1

	Unit No.1	*Unit No. 2 or 3*	
Characteristics:			
Plate Voltage	250	250	volts
Grid Voltage	-8.5	-2	volts

	Unit No. 1	*Unit No. 2 or 3*	
Amplification Factor.	17	100	
Plate Resistance (Approx.). . .	7700	62500	ohms
Transconductance.	2200	1600	μmhos
Plate Current	10.5	1.2	ma
Grid Voltage (Approx.) for plate μa = 10	-24	-	volts
Maximum Ratings, *Design-Maximum Values:*			
Plate Voltage	330	330	volts
Grid Voltage:			
Negative-bias value	50	50	volts
Positive-bias value	0	0	volts
Cathode Current	20		ma
Plate Dissipation	2.75	0.3	watts

[a] At heater amperes = 0.600.
[b] At heater volts = 6.3
[c] The dc component must not exceed 100 volts.
[d] Without external shield.

High-Mu Triode—Sharp-Cutoff Pentode

Pentode Unit Has Two Independent Control Grids

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*			
Voltage (AC or DC) . .	6.3[a]	6.3 ± 0.6	volts
Current.	0.600 ± 0.040	0.600[b]	amp
Warm-up time (Average).	11	–	sec
Peak heater-cathode voltage:			
Heater negative with respect to cathode . .	200 max.		volts
Heater positive with respect to cathode . .	200[c] max.		volts
Direct Interelectrode Capacitances:[d]			
Triode Unit:			
Grid to plate.		2.2	μμf
Grid to cathode & internal shield, and heater		2.8	μμf
Plate to cathode & internal shield, and heater		2.2	μμf
Pentode Unit:			
Grid No.1 to plate		0.1 max.	μμf
Grid No.1 to cathode & internal shield, grid No.3, grid No.2, and heater		9.5	μμf
Grid No.1 to grid No.3		0.5	μμf
Grid No.3 to plate		2.2	μμf
Grid No.3 to cathode & internal shield, plate, grid No.2, grid No.1, and heater		7.0.	μμf

Characteristics, Class A_1 Amplifier:

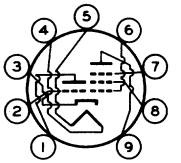
	Triode Unit	*Pentode Unit*	
Plate Supply Voltage	200	150	volts
Grid-No.3 Supply Voltage	–	0	volts
Grid-No.2 Supply Voltage	–	100	volts
Grid-No.1 Supply Voltage	-2	0	volts
Cathode Resistor	–	180	ohms
Amplification Factor	70	–	
Plate Resistance (Approx.)	17500	100000	ohms
Transconductance, Grid No.1 to Plate	4000	4400	μmhos
Transconductance, Grid No.3 to Plate	–	600	μmhos

Plate Current	4	4	ma
Grid-No.2 Current	–	2.8	ma
Grid-No.1 Supply Voltage (Approx.) for plate μa =			
10	-5	–	volts
20	–	-4	volts
Grid-No.3 Supply Voltage (Approx.) for plate μa = 20	–	-7	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9PV

Pin 1 – Triode Plate
Pin 2 – Triode Grid
Pin 3 – Cathode, Internal Shield
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Pentode Grid No.1
Pin 7 – Pentode Grid No.3
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate

GATED AGC AMPLIFIER & NOISE INVERTER

Pentode Unit

For operation in a 525-line, 30-frame system[e]

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	300 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[f]	600 max.	volts
GRID-No.3 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	100 max.	volts
Positive-bias value	0 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	300 max.	volts
GRID-No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	50 max.	volts
Positive-bias value	0 max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 150 volts	1.1 max.	watts

For grid-No.2 voltages between 150 volts and 300 volts.	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION.	2 max.	watts

Maximum Circuit Values:

Grid-No.3-Circuit Resistance	0.68 max.	megohm
Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.5 max.	megohm
For cathode-bias operation	1 max.	megohm

AMPLIFIER — Class A_1

Triode Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE.	300 max.	volts
GRID VOLTAGE:		
Negative-bias value.	50 max.	volts
Positive-bias value.	0 max.	volts
PLATE DISSIPATION.	1.1 max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	1 max.	megohm

[a] At heater amperes = 0.600.

[b] At heater volts = 6.3.

[c] The dc component must not exceed 100 volts.

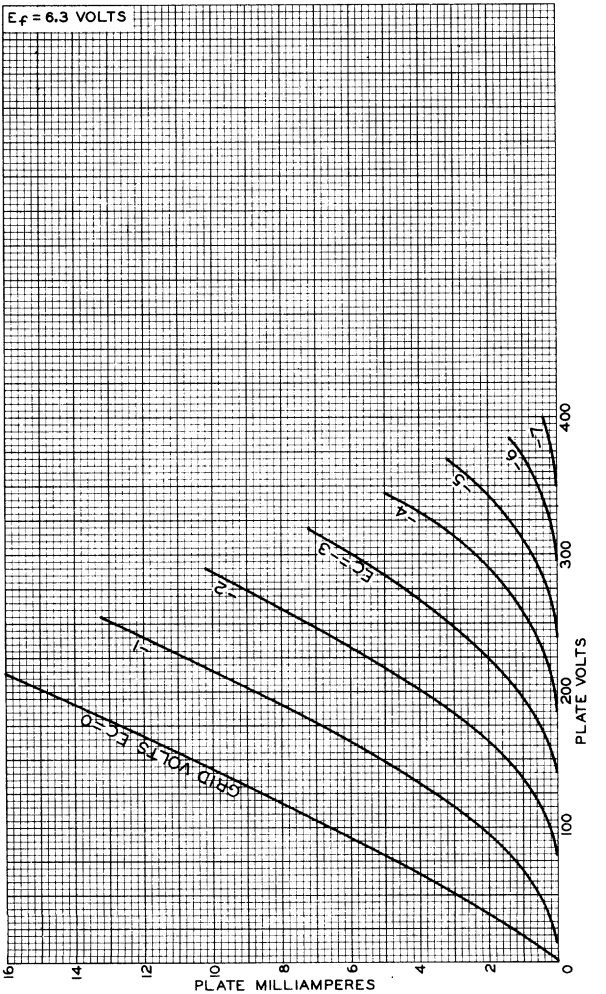
[d] Without external shield.

[e] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commision.

[f] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

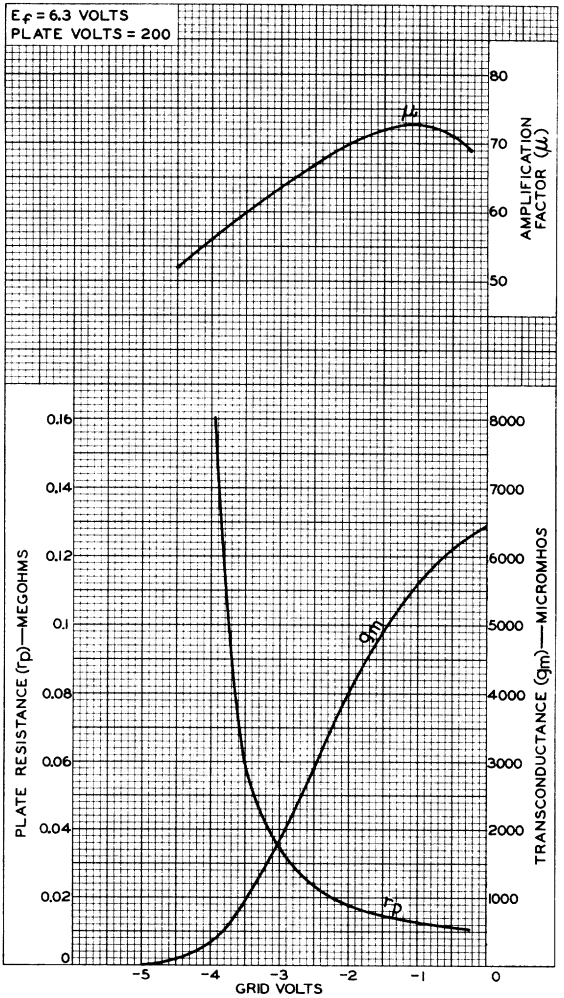
6KA8

AVERAGE PLATE CHARACTERISTICS
Triode Unit



92CM-8644

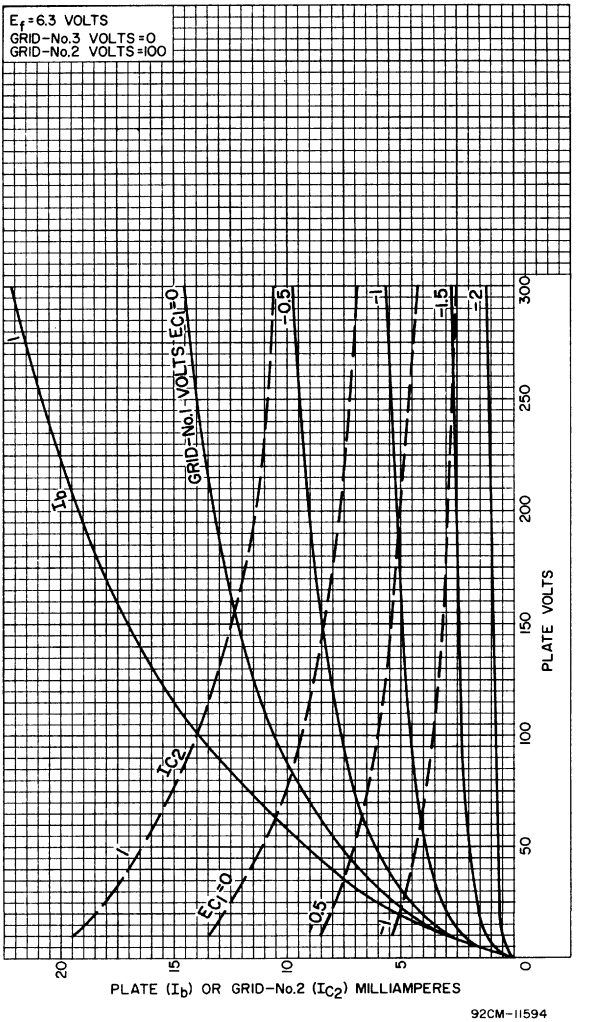
AVERAGE CHARACTERISTICS
Triode Unit



92CM-8647

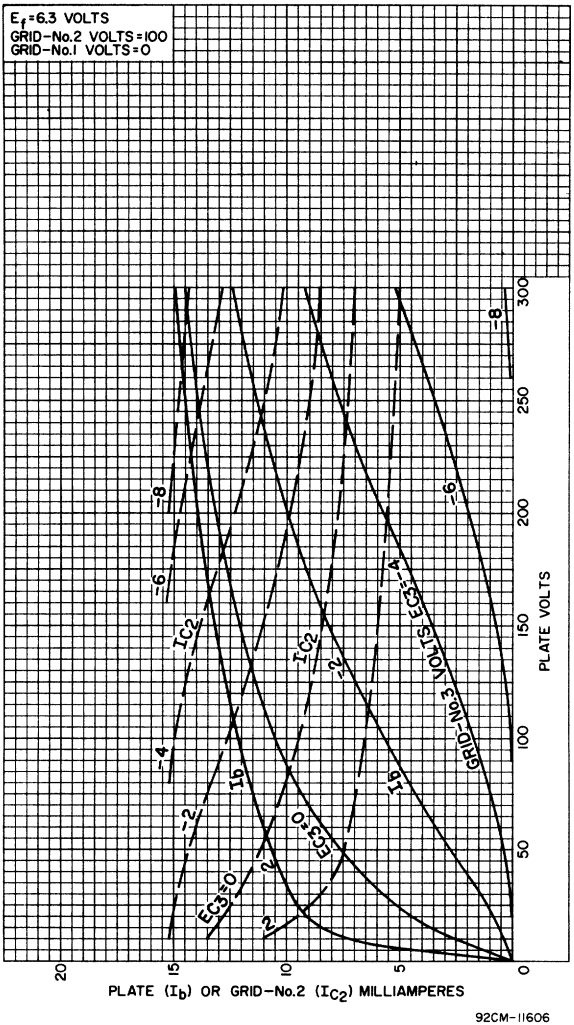
6KA8

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-11594

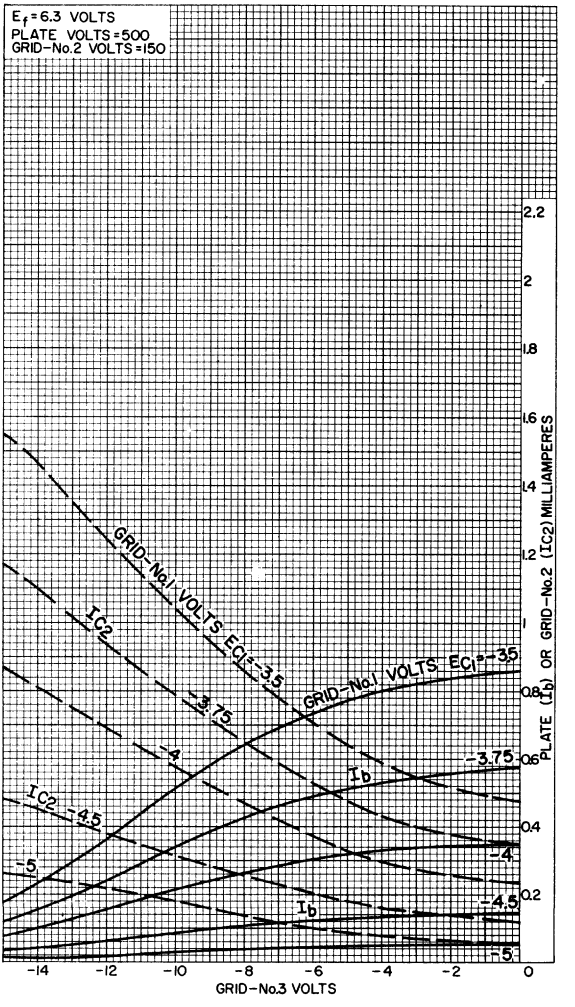
AVERAGE CHARACTERISTICS
Pentode Unit



92CM-11606

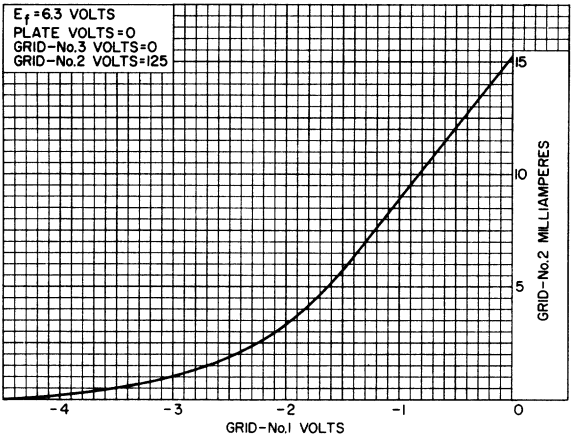
6KA8

AVERAGE CHARACTERISTICS
Pentode Unit

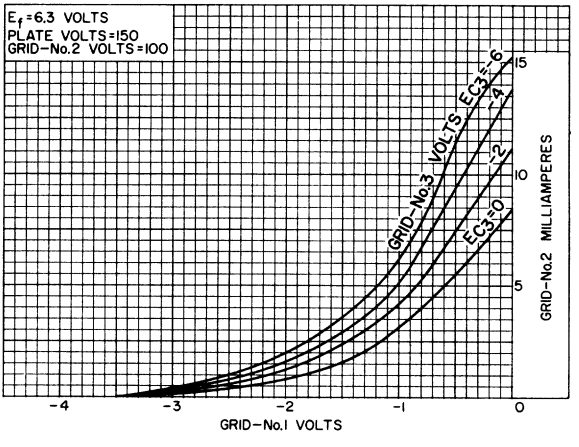


92CM-11600

AVERAGE CHARACTERISTICS
Pentode Unit



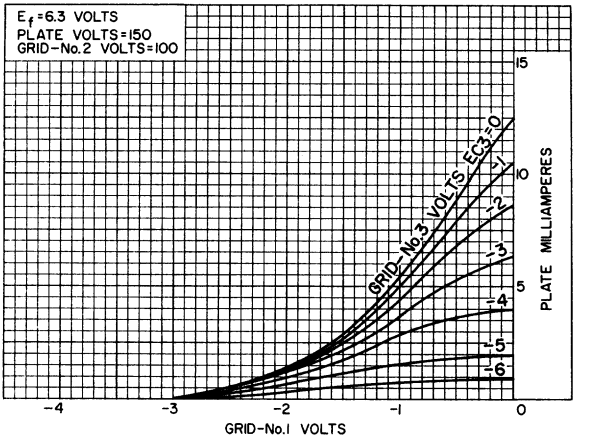
92CS-11603



92CS-11596

6KA8

AVERAGE CHARACTERISTICS
Pentode Unit



92CS-11614

6KD6

Beam Power Tube

Duodecar Type

For Low B+ Horizontal-Deflection-Amplifier Circuits of Color-TV Receivers

ELECTRICAL CHARACTERISTICS – Bogey Values

Heater Voltage, ac or dc. . .	E_h			6.3		V
Heater Current	I_h			2.85		A
Direct Interelectrode Capacitances (approx.):[a]						
Grid No.1 to plate	c_{g1-p}			0.8		pF
Input: G1 to (K,G3,G2,H) .	c_i			40		pF
Output: P to (K,G3,G2,H).	c_o			16		pF
For the following characteristics, see Conditions below:						
Amplification Factor (Triode Connection)[b] . . .	μ	–	–	–	4[c]	
Plate Resistance (approx.)	r_p	–	–	–	6000	Ω
Transconductance	g_m	–	–	–	14000	μmho
DC Plate Current	I_b	–	1100[d]	780[d]	100	mA
DC Grid-No.2 Current. . . .	I_{c2}	–	110[d]	44[d]	2	mA
Cutoff DC Grid-No.1 Voltage for I_b = 1 mA	$E_{c1(co)}$	-125	–	–	-40	V
Conditions:						
Heater Voltage	E_h	←		6.3	→	V
Peak Positive-Pulse Plate Voltage[e]	e_{bm}	5000	–	–	–	V
DC Plate Voltage	E_b	–	45	60	150	V
DC Grid-No.3 Voltage . . .		Connected to cathode at socket				
DC Grid-No.2 Voltage . . .	E_{c2}	110	160	110	110	V
DC Grid-No.1 Voltage . . .	E_{c1}	–	0	0	-22.5	V

MECHANICAL CHARACTERISTICS

Maximum Overall Length. . . . . 4.625 in (117.47 mm)
Maximum Seated Length . . . . . .4.250 in (107.95 mm)
Maximum Diameter. . . . . 1.563 in (39.7 mm)
Dimensional Outline . . . . . JEDEC 12-118
Envelope. . . . . .JEDEC T12
Top Cap[f] . . . . . .Small (JEDEC C1-1)
Base . . . . . Large-Button Duodecar 12-Pin (JEDEC E12-74)

Terminal Diagram . . . . . JEDEC 12GW
Type of Cathode . . . . . Coated Unipotential
Operating Position . . . . . Any

MAXIMUM RATINGS – Design-Maximum Values[g]

For operation as a Horizontal-Deflection-Amplifier Tube in a 525-line, 30-frame system

DC Plate Supply Voltage	E_{bb}	990	V
Peak Positive-Pulse Plate Voltage[h]	e_{bm}	7000[k]	V
DC Grid-No.3 Voltage[m]	E_{c3}	20	V
DC Grid-No.2 (Screen-Grid) Voltage	E_{c2}	200	V
Peak Negative-Pulse Grid-No.1 (Control-Grid) Voltage	$-e_{c1m}$	250	V
Heater-Cathode Voltage:			
Peak	e_{hkm}	±200	V
Average[n]	E_{hk}	100	V
Heater Voltage, ac or dc	E_h	5.7 to 6.9	V
Cathode Current:			
Peak	i_{km}	1400	mA
Average[n]	$I_{k(av)}$	400	mA
Grid-No.2 Input	P_{g2}	5.0	W
Plate Dissipation[p]	P_b	33	W
Envelope Temperature	T_E	225[q]	°C

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance	R_{g1}	2.2	MΩ
Grid-No.3-Circuit Resistance	R_{g3}	0.01	MΩ

[a] Measured without external shield in accordance with the current issue of EIA Standard RS-191.

[b] With grid No.3 and grid No.2 connected, respectively, to cathode and plate at socket.

[c] Conditions: $E_b = E_{c2} = 150$ V, $E_{c1} = -22.5$ V.

[d] This value can be measured by a method involving a recurrent waveform such that the Maximum Ratings of the tube will not be exceeded.

[e] Under pulse-duration condition specified in Footnote h.

[f] Designed to mate with connector of 0.250-inch cap, generally available from your local RCA distributor.

[g] As defined in the current issue of EIA Standard RS-239, unless otherwise specified.

[h] This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10 μs.

[k] Absolute-Maximum Value.

[m] In horizontal-deflection-amplifier service, a positive voltage may be applied to grid No.3 to reduce interference from "snivets," which may occur in both vhf and uhf television receivers. A typical value for this voltage is 20 volts.

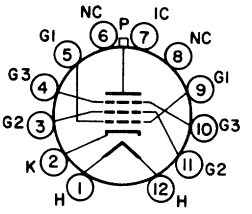
[n] Measured with a DC meter.

[p] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

[q] This rating is applicable when measurement is made using a thermocouple attached to a 0.1-inch wide phosphor-bronze ring placed at the hottest location on the envelope. A maximum rating of 240°C is applicable to direct thermocouple measurements taken at the hottest point on the envelope surface.

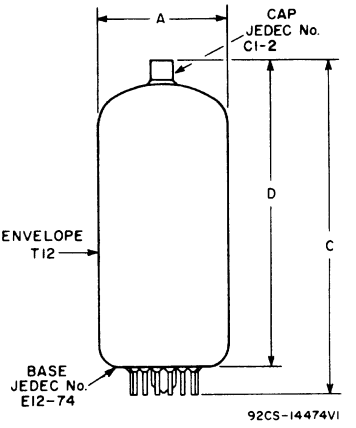
TERMINAL DIAGRAM (Bottom View)

Pin 1 – Heater
Pin 2 – Cathode
Pin 3 – Grid No.2
Pin 4 – Grid No.3
Pin 5 – Grid No.1
Pin 6 – No Connection
Pin 7 – Do Not Use
Pin 8 – No Connection
Pin 9 – Grid No.1
Pin 10 – Grid No.3
Pin 11 – Grid No.2
Pin 12 – Heater
Cap – Plate



JEDEC 12GW

DIMENSIONAL OUTLINE (JEDEC No.12-118)



DIMENSION	INCHES		MILLIMETERS	
	Min.	Max.	Min.	Max.
A	1.437*	1.563	36.5*	39.7
C	–	4.625	–	117.47
D	–	4.250	–	107.95
MILLIMETER DIMENSION DERIVED FROM INCH DIMENSION				
* Applies to the minimum diameter except in the area of the seal.				

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE
FRAME-GRID PENTODE
For Combined Oscillator-Mixer Applications in TV Receivers Having an IF of 40 Mc

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	0.400		amp
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances:[b]			
Triode Unit:			
Grid to plate	1.3		pf
Grid to cathode, pentode cathode & pentode grid No.3 & internal shield, and heater	2.4		pf
Plate to cathode, pentode cathode & pentode grid No.3 & internal shield, and heater	2.0		pf
Pentode Unit:			
Grid No.1 to plate	0.015	max.	pf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	5.0		pf
Plate to cathode & grid No.3, & internal shield, grid No.2, and heater	3.4		pf
Heater to triode cathode and pentode cathode	5.5[c]		pf

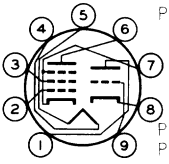
Characteristics, Class A$_1$ Amplifier:

	Triode Unit	*Pentode Unit*	
Plate Supply Voltage	125	125	volts
Grid-No.2 Supply Voltage	–	125	volts
Cathode Resistor	68	33	ohms
Amplification Factor	40	–	
Plate Resistance (Approx.)	5000	125000	ohms
Transconductance	8000	12000	μmhos
Plate Current	13	10	ma
Grid-No.2 Current	–	2.8	ma

Grid-No.1 Voltage (Approx.) for plate μa =			
100	-5	-	volts
50	-	-3	volts

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9DC



Pin 1 - Triode Plate
Pin 2 - Pentode Grid No.1
Pin 3 - Pentode Grid No.2
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Pentode Plate
Pin 7 - Pentode Cathode, Pentode Grid No.3, Internal Shield
Pin 8 - Triode Cathode
Pin 9 - Triode Grid

AMPLIFIER — Class A[1]

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	280 max.	280 max.	volts
GRID-No.2 SUPPLY VOLTAGE	-	280 max.	volts
GRID-No.2 VOLTAGE	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 VOLTAGE:			
Positive-bias value	0 max.	0 max.	volts
CATHODE CURRENT	20 max.	20 max.	ma
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 140 volts	-	0.5 max.	watt
For grid-No.2 voltages between 140 and 280 volts	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	2 max.	2 max.	watts

Maximum Circuit Values:

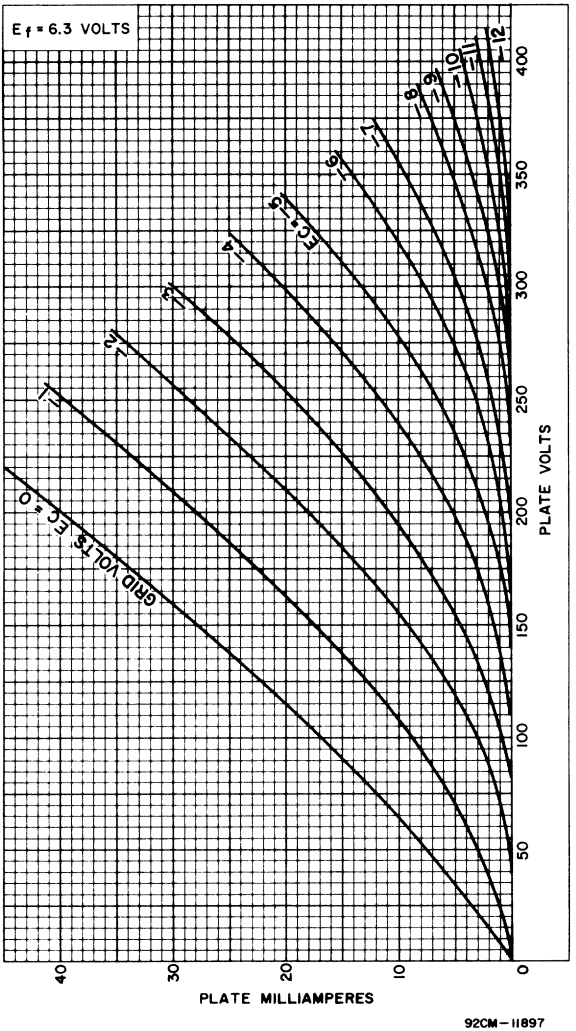
	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5 max.	0.25 max.	megohm
For cathode-bias operation	1 max.	0.5 max.	megohm

[a] The dc component must not exceed 100 volts.

[b] With external shield JEDEC No.315 connected to cathode of unit under test except as noted.

[c] With external shield JEDEC No.315 connected to ground.

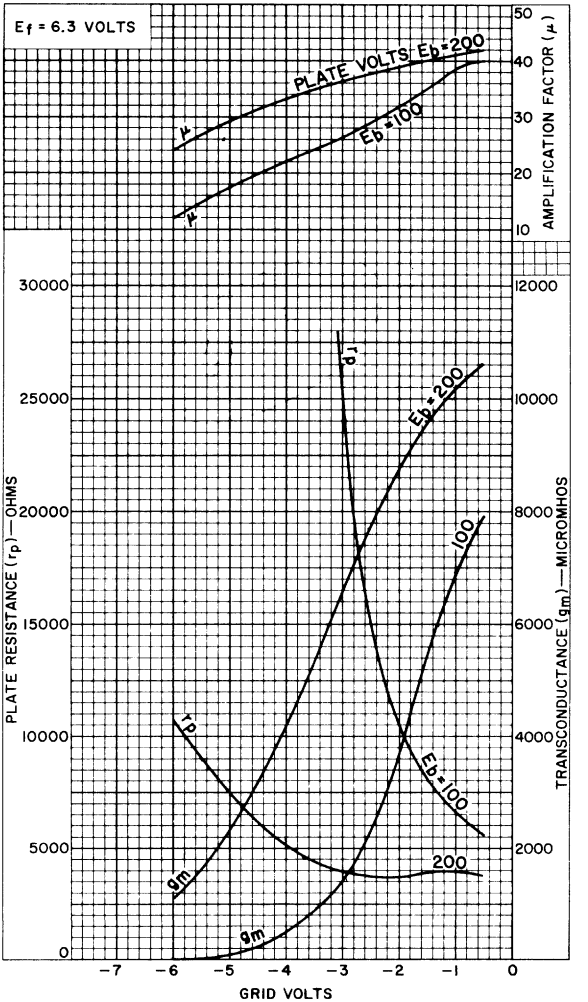
AVERAGE PLATE CHARACTERISTICS
Triode Unit



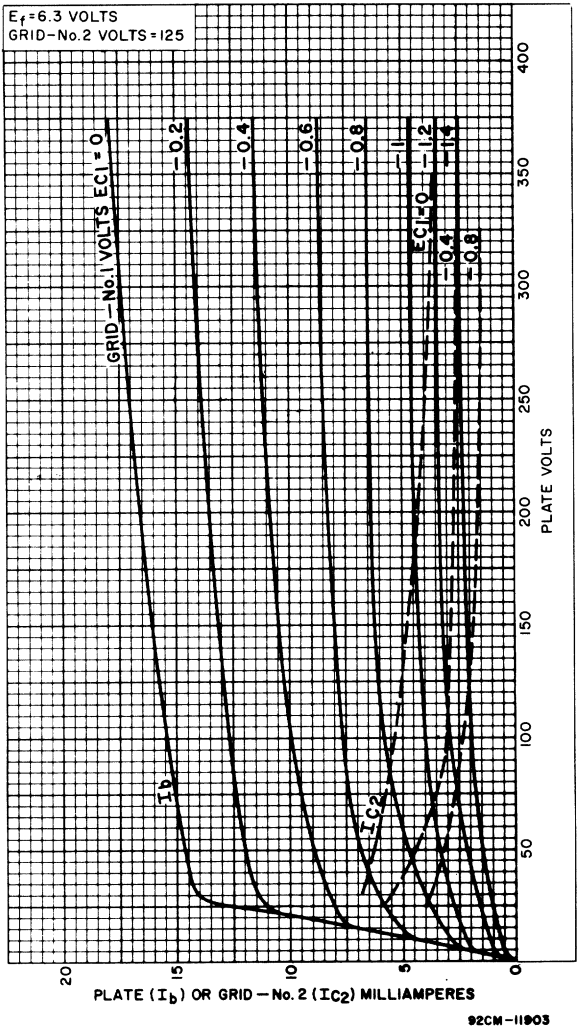
92CM-11897

6KE8

AVERAGE CHARACTERISTICS
Triode Unit



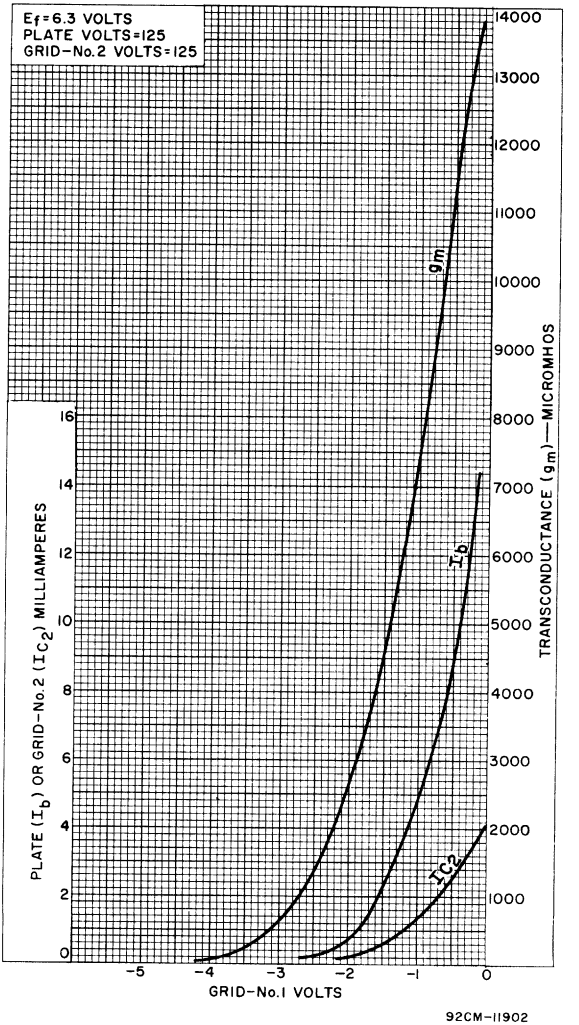
AVERAGE CHARACTERISTICS
Pentode Unit



92CM-11903

6KE8

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-11902

6KM6

Beam Power Tube

NOVAR TYPE

SPECIAL MULTIPLE-FIN PLATE STRUCTURE[a]
SPECIALLY FORMULATED ENVELOPE GLASS[b]

For Color-TV Horizontal-Deflection-Amplifier Applications

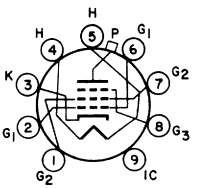
ELECTRICAL

Heater Characteristics and Ratings		
Voltage (AC or DC)	6.3 ± 0.6	V
Current at 6.3 V	1.600	A
Maximum heater–cathode voltage:		
Heater negative with respect to cathode:		
Peak	200	V
Heater positive with respect to cathode:		
Peak	200	V
DC component	100	V
Direct Interelectrode Capacitances (Approx.)		
Without external shield		
Grid No.1 to plate	1.2	pF
Input: G1 to (K, G3, G2, H)	22	pF
Output: P to (K, G3, G2, H)	9.0	pF

MECHANICAL

Operating Position . . . . . Any
Type of Cathode . . . . . Coated Unipotential
Maximum Overall Length . . . . . .3.550 in
Seated Length . . . . . 2.910 to 3.170 in
Diameter . . . . . 1.438 to 1.562 in
Dimensional Outline . . . . . See *General Section*
Bulb T12
Cap . . . . . Skirted Miniature (JEDEC No.C1-2 or C1-3)
Base . . Large-Button Novar 9-Pin with Exhaust Tip (JEDEC E9-88)
Basing Designation for BOTTOM VIEW 9QL

Pin 1 – Grid No.2
Pin 2 – Grid No.1
Pin 3 – Cathode
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Grid No.1
Pin 7 – Grid No.2
Pin 8 – Grid No.3
Pin 9 – Do Not Use
Cap – Plate



CHARACTERISTICS

	For the following characteristics, see Conditions				
Amplification Factor	–	–	4	–	
Triode Connection[c]					
Plate Resistance	–	–	–	6000	Ω
Transconductance	–	–	–	9500	μmho
DC Plate Current	–	560[d]	–	80	mA

DC Grid-No.2 Current	-	31[d]	-	2.4	mA
Cutoff DC Grid-No.1 Voltage, Plate mA = 1	-110	-	-	-42	V
Conditions					
Heater Voltage	6.3	6.3	6.3	6.3	V
Peak Positive-Pulse Plate Voltage[e]	6500	-	-	-	V
DC Plate Voltage	-	60	140	140	V
DC Grid-No.3 Voltage	30	30	0	30	V
DC Grid-No.2 Voltage	140	140	140	140	V
DC Grid-No.1 Voltage	-	0	-24.5	-24.5	V

MAXIMUM RATINGS, DESIGN-MAXIMUM VALUES

For operation in a 525-line, 30-frame system

DC Plate Supply Voltage	770	V
Peak Positive-Pulse Plate Voltage[e]	6500	V
Peak Negative-Pulse Plate Voltage	1500	V
DC Grid-No.3 Voltage[f]	75	V
DC Grid-No.2 (Screen-Grid) Voltage	220	V
Peak Negative-Pulse Grid-No.1 (Control-Grid) Voltage	330	V
Cathode Current		
Peak	950	mA
Average	275	mA
Grid-No.2 Input	3.5	W
Plate Dissipation[g]	20	W
Envelope Temperature, At hottest point on bulb surface	240	°C

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance		
For grid-No.1-resistor-bias operation	0.47	MΩ
For plate-pulsed operation	10	MΩ

[a] Designed to minimize secondary-electron emission from plate and eliminate "knee" discontinuities in zero-bias region.

[b] Designed to reduce glass problems after long periods of high-voltage and elevated temperature operation.

[c] With grid No.3 and grid No.2 connected, respectively, to cathode and plate at socket.

[d] This value can be measured by a method involving a recurrent waveform such that the Maximum Ratings of the tube will not be exceeded.

[e] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[f] In horizontal-deflection-amplifier service, a positive voltage may be applied to grid No.3 to reduce interference from "snivets" which may occur in both vhf and uhf television receivers. A typical operating value for this voltage is 30 volts.

[g] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

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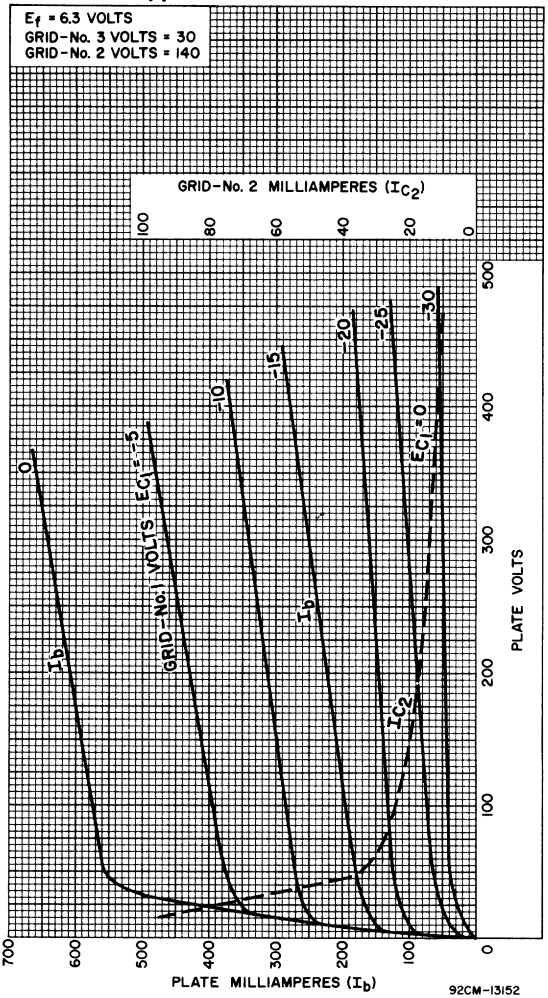
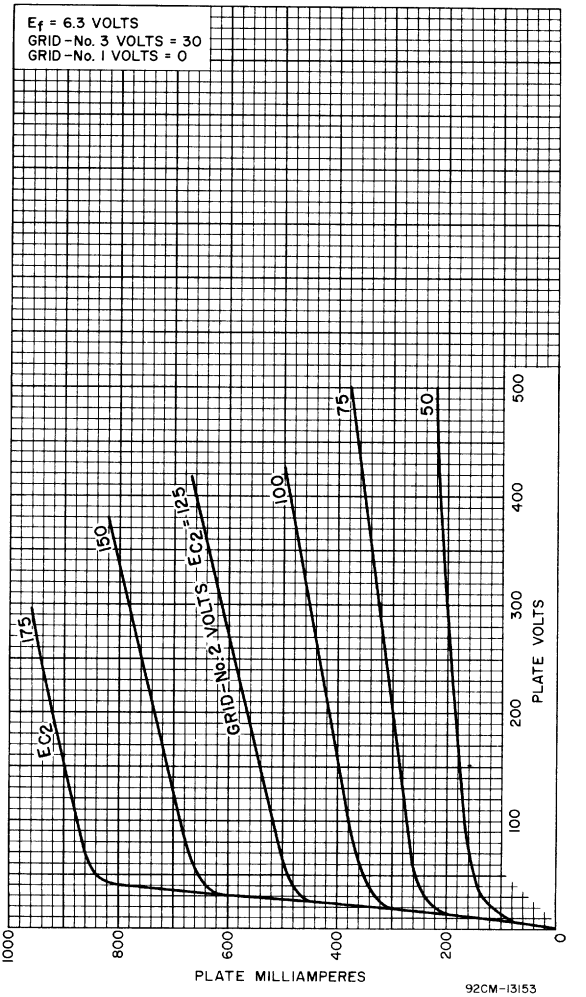
Electronic Components and Devices Harrison, N. J.

Typical Characteristics



Typical Plate Characteristics



RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

6KM8

Diode—
Sharp-Cutoff Three-Plate Tetrode

9-PIN MINIATURE TYPE

For Frequency-Divider and Complex-Wave-Generator Circuits of Electronic Musical Instruments

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	0.300		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances:[b]			
Tetrode Unit:			
Grid No.1 to plate 1A	0.02	max.	pf
Grid No.1 to plate 1B	0.02	max.	pf
Grid No.1 to plate 2	0.06	max.	pf
Grid No.1 to cathode & internal shield, grid No.2, and heater	5.5		pf
Plate 1A to cathode & internal shield, grid No.2, and heater	1.2		pf
Plate 1B to cathode & internal shield, grid No.2, and heater	1.3		pf
Plate 2 to cathode & internal shield, grid No.2, and heater	1.8		pf
Tetrode grid No.1 to diode plate	0.024	max.	pf
Tetrode plate 1A to diode plate	0.18		pf
Tetrode plate 1B to diode plate	0.024		pf
Tetrode plate 2 to diode plate	0.013		pf

Characteristics, Class A_1 Amplifier (Tetrode Unit):

Plates 1A, 1B, and 2 connected together at socket

Plate Voltage	100	volts
Grid-No.2 Voltage	100	volts
Grid-No.1 Supply Voltage	0	volts
Grid-No.1 Resistor (Bypassed)	2.2	megohms
Plate Resistance (Approx.)	30000	ohms
Transconductance	3400	μmhos
Plate Current	4.2	ma
Grid-No.2 Current	1.7	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-4	volts

Triode Connection—
Grid No.2 connected to plates 1A, 1B, and 2 at socket

Plate Voltage	100	volts
Grid-No.1 Supply Voltage	0	volts

6KM8

Grid-No.1 Resistor (Bypassed)	2.2	megohms
Transconductance	4500	μmhos
Amplification Factor	45	
Plate Current	5.5	ma

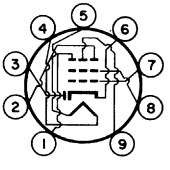
Separate plate operation, plates not under test grounded

Plate Voltage:		
Plate 1A	100	volts
Plate 1B	100	volts
Plate 2	100	volts
Grid-No.2 Voltage	100	volts
Grid-No.1 Supply Voltage	0	volts
Grid-No.1 Resistor (Bypassed)	2.2	megohms
Transconductance:		
Grid No.1 to plate 1A	2000	μmhos
Grid No.1 to plate 1B	2000	μmhos
Grid No.1 to plate 2	1800	μmhos
Plate Resistance (Approx.):		
Plate 1A	0.1	megohm
Plate 1B	0.1	megohm
Plate 2	0.12	megohm
Plate Current:		
Plate 1A	2.3	ma
Plate 1B	2.3	ma
Plate 2	2.1	ma
Grid-No.2 Current:		
For plate 1A volts = 100	3.8	ma
For plate 1B volts = 100	3.8	ma
For plate 2 volts = 100	3.3	ma

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9QG

Pin 1 - Tetrode Plate 1B
Pin 2 - Tetrode Plate 1A
Pin 3 - Diode Plate
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Cathode, Internal Shield
Pin 7 - Tetrode Grid No.1
Pin 8 - Tetrode Grid No.2
Pin 9 - Tetrode Plate 2

FREQUENCY-DIVIDER & COMPLEX-WAVE-GENERATOR SERVICE

TETRODE UNIT

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE:		
PLATE 1A	330 max.	volts
PLATE 1B	330 max.	volts
PLATE 2	330 max.	volts
GRID-No.2 (SCREEN-GRID)		
SUPPLY VOLTAGE	330 max.	volts
GRID-No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	50 max.	volts
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 165 volts	0.65 max.	watt
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE 1A DISSIPATION	1 max.	watt
PLATE 1B DISSIPATION	1 max.	watt
PLATE 2 DISSIPATION	1 max.	watt

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For grid-No.1-resistor-bias operation	2.2 max.	megohms

DIODE UNIT

Maximum Ratings, *Design-Maximum Values:*

PLATE CURRENT	1 max.	ma

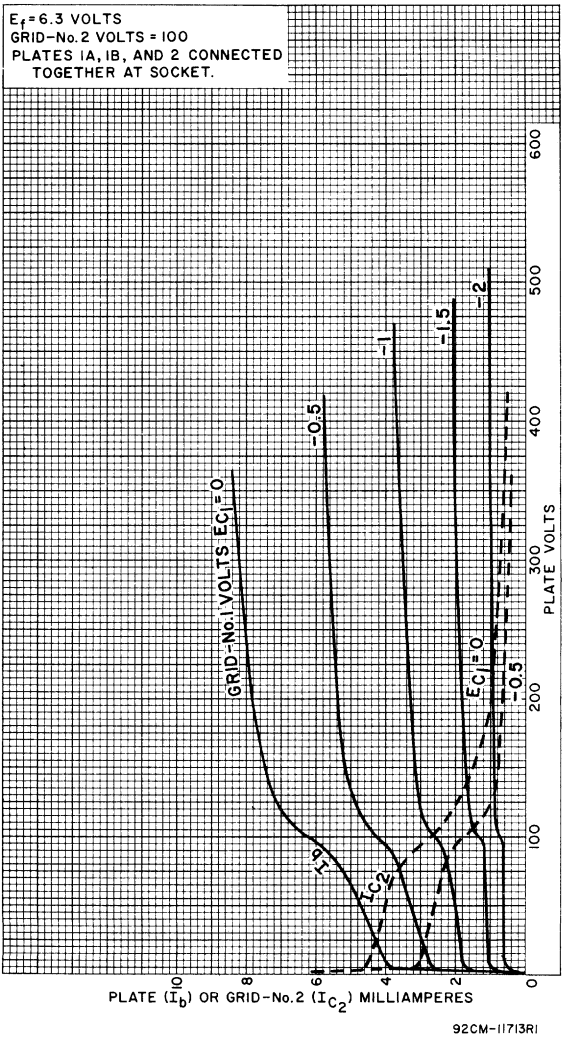
Characteristics, *Instantaneous Test Condition:*

Plate Current for plate volts = 10	2	ma

[a] The dc component must not exceed 100 volts.
[b] Without external shield.

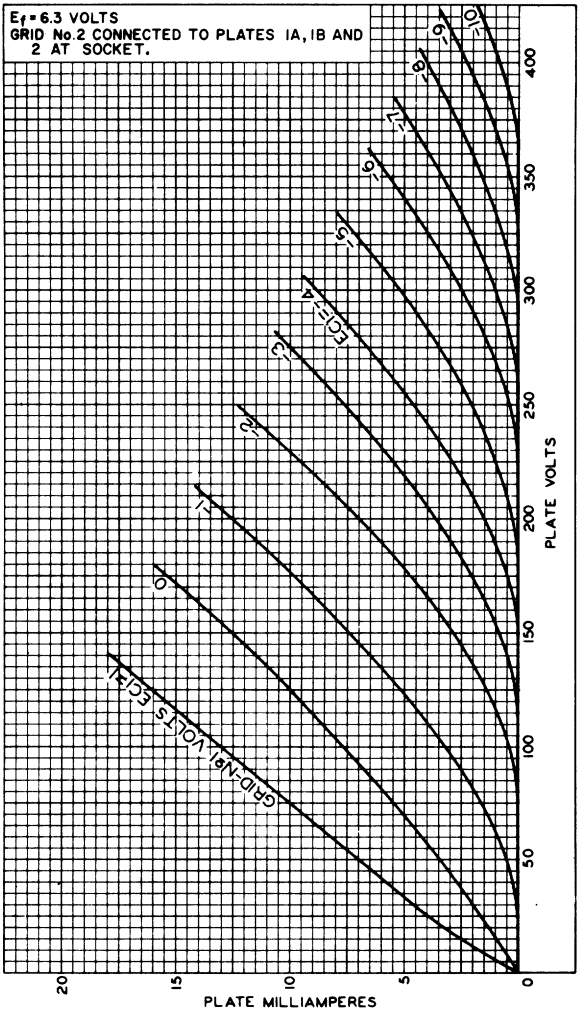
6KM8

AVERAGE CHARACTERISTICS
Tetrode Unit



92CM-11713RI

AVERAGE PLATE CHARACTERISTICS
Tetrode Unit—Triode Connection



92CM-11748

6KT6

Semiremote-Cutoff Pentode

9-PIN MINIATURE TYPE

FRAME-GRID CONSTRUCTION — DARK HEATER

For High-Gain IF-Amplifier Applications in TV Receivers

ELECTRICAL CHARACTERISTICS

		Bogey Values[a]		
Heater Voltage (AC or DC)	E_h	6.3		V
Heater Current	I_h	300		mA
Heater Warm-up Time	-	11		s
Direct Interelectrode Capacitances				
Without external shield				
Grid No.1 to plate	c_{g1-p}	0.019	max	pF
Input: G1 to (K, G3 + IS, G2, H)	c_i	9.5		pF
Output: P to (K, G3 + IS, G2, H)	c_o	3		pF

For the following characteristics, see Conditions

Plate Resistance (Approx.)	r_p	160	-	Ω
Transconductance	g_m	18000	-	μmho
DC Plate Current	I_b	17	-	mA
DC Grid-No.2 Current	I_{c2}	4.2	-	mA
Cutoff DC Grid-No.1 Voltage For g_m = 10 μmho	$E_{c1(co)}$	-	-22	V

Conditions				
Heater Voltage	E_h	Bogey Value		V
DC Plate Supply Voltage	E_{bb}	125	170	V
DC Grid-No.3 Voltage	E_{c3}	0	0	V
DC Grid-No.2 Supply Voltage	E_{cc2}	125	170	V
Grid No.1	-	Connected to negative end of R_k		
Cathode Resistor	R_k	56	56	Ω

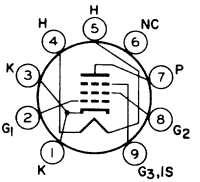
MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2.187 in
Maximum Seated Length	1.937 in
Maximum Diameter	0.875 in
Length, Base Seat to Bulb Top, Excluding tip	1.469 to 1.656 in
Dimensional Outline (JEDEC 6-2)	See *General Section*
Envelope	JEDEC T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC E9-1)

6KT6

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Cathode
Pin 2 – Grid No.1
Pin 3 – Cathode
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – No Internal Connection
Pin 7 – Plate
Pin 8 – Grid No.2
Pin 9 – Grid No.3, Internal Shield



9PM

DESIGN-MAXIMUM RATINGS

For operation as a Class A_1 Amplifier Tube in TV Receivers

DC Plate Voltage	E_b	330	V
DC Grid-No.3 (Suppressor-Grid) Voltage	E_{c3}	+0	V
DC Grid-No.2 (Screen-Grid) Supply Voltage	E_{cc2}	330	V
DC Grid-No.2 Voltage	E_{c2}	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
DC Grid-No.1 (Control-Grid) Voltage	E_{c1}	+0	V
Heater-Cathode Voltage			
Peak	e_{hkm}	±200	V
Average	$E_{hk(av)}$	100	V
Heater Voltage (AC or DC)	E_h	5.7 to 6.9	V
Grid-No.2 Input	P_{g2}		
For $E_{c2} \leq 165$ V	-	0.6	W
For $E_{c2} > 165$ V and < 330 V	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Plate Dissipation	P_b	3.1	W

MAXIMUM CIRCUIT VALUES

Grid-No.1 Circuit Resistance	$R_{g1(ckt)}$		
For fixed-bias operation	-	250	kΩ
For cathode-bias operation	-	1	MΩ

[a] Unless otherwise specified.

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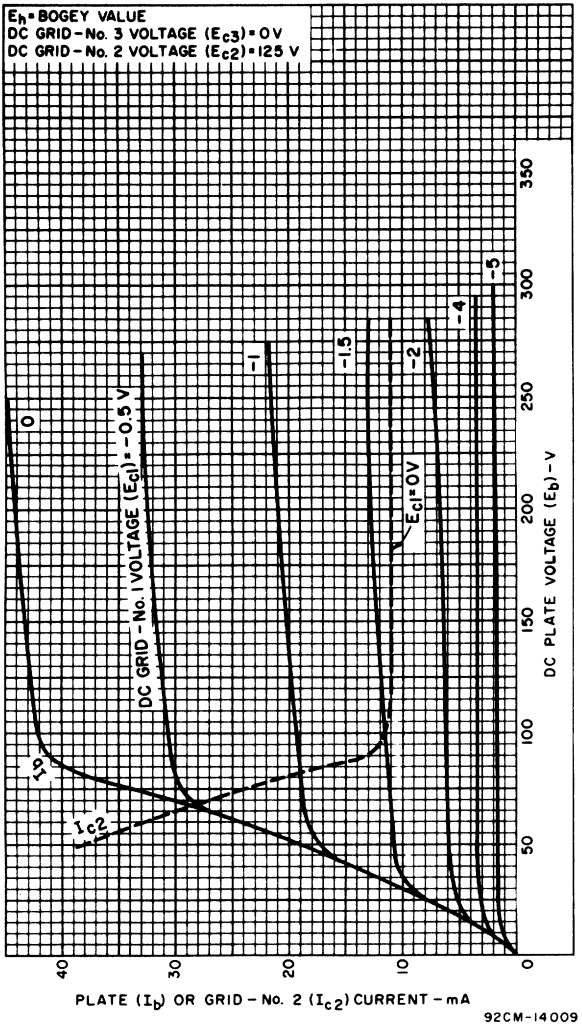
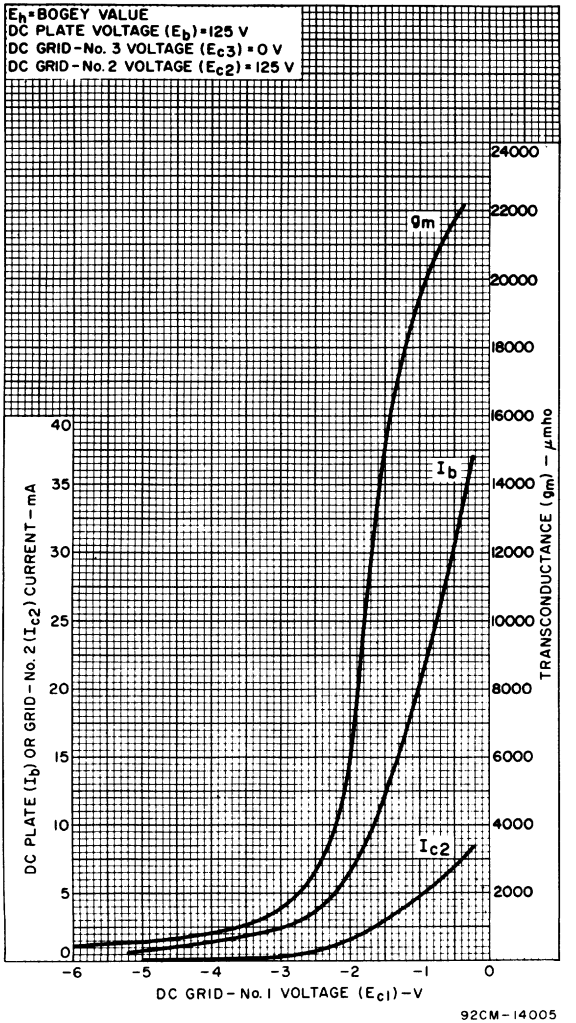
Typical Characteristics



92CM-14009

Typical Characteristics



92CM-14005

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6KT8

High-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

For Color-Killer, Sound IF Amplifier, and Band-pass-Amplifier Applications in TV Receivers

Electrical:

Heater Characteristics and Ratings:			
Voltage (AC or DC)		6.3 ± 0.6	volts
Current at heater volts = 6.3		0.600	amp
Peak heater-cathode voltage:			
	Unit:	*Triode*	*Pentode*[a]
Heater negative with respect to cathode		200 max.	20 max. volts
Heater positive with respect to cathode		200[b] max.	20 max. volts

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*[c]	
Triode Unit:			
G_T to P_T	3.0	3.0	pf
Input: G_T to (H+$G3_P$+IS, K_T)	3.2	3.2	pf
Output: P_T to (H+$G3_P$+IS,K_T)	1.6	2.4	pf
Pentode Unit:			
$G1_P$ to P_P	0.046 max.	0.030 max.	pf
Input: $G1_P$ to (H+$G3_P$+IS,$G2_P$,K_P)	7.5	7.5	pf
Output: P_P to (H+$G3_P$+IS,$G2_P$,K_P)	2.2	2.8	pf
G_T to P_P	0.018 max.	0.003 max.	pf
$G1_P$ to P_T	0.006 max.	0.002 max.	pf

Characteristics, Class A_1 Amplifier:

Unit:	*Triode*	*Pentode*	
Plate Voltage	250	125	volts
Grid-No.2 Voltage	–	125	volts
Grid-No.1 Voltage	−2	−1	volts
Amplification Factor	100	–	
Plate Resistance (Approx.)	31500	150000	ohms
Transconductance	3200	10000	μmhos
Plate Current	1.8	12	ma
Grid-No.2 Current	–	4.5	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	−3.5	−7	volts

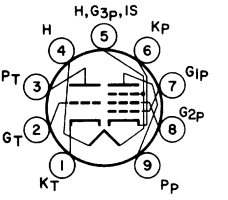
Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"

6KT8

Length, Base Seat to Bulb Top (Excluding Tip). . . . . 1-9/16" ± 3/32"
Diameter . . . . . 0.750" to 0.875"
Dimensional Outline. . . . . .See *General Section*
Bulb T6-1/2
Base . . . . . Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW 9QP

Pin 1 – Triode Cathode
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater
Pin 5 – See Footnote a (Heater, Pentode Grid No.3, Internal Shield)
Pin 6 – Pentode Cathode
Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate



AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

	Unit:	*Triode*	*Pentode*	
Plate Voltage		330 max.	330 max.	volts
Grid-No.2 Supply Voltage		–	330 max.	volts
Grid-No.2 Voltage		See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		
Grid-No.1 Voltage:				
Positive-bias value		0 max.	0 max.	volts
Grid-No.2 Input:				
For grid-No.2 voltages up to 165 volts		–	0.55 max.	watt
For grid-No.2 voltages between 165 and 330 volts		See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		
Plate Dissipation		1 max.	2.5 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5 max.	0.25 max.	megohm
For cathode-bias operation	1 max.	1 max.	megohm

[a] Pin No.5 (Pentode Grid No.3, Internal Shield, and Heater) should be operated at or near ground potential. If the peak cathode-to-grid-No.3 voltage exceeds +20 volts, undesirable changes in the tube characteristics may result.

[b] The dc component must not exceed 100 volts.

[c] With external shield JEDEC No.315 connected to pins 4 and 5.

6KV6

Beam Power Tube

NOVAR TYPE **DARK HEATER**

For High-Voltage-Pulse Shunt-Regulator Applications in Color-TV Receivers

ELECTRICAL CHARACTERISTICS

Bogey Values

Heater Voltage	E_h			6.3	V
Heater Current	I_h			1.600	A
Direct Interelectrode Capacitances					
Without external shield					
Grid No.1 to plate	c_{g1-p}			1.2	pF
Input: G1 to (K,G3,G2,H)	c_i			22	pF
Output: P to (K,G3,G2,H)	c_o			9.0	pF

For the following characteristics, see Conditions

Amplification Factor (Triode Connection)[a]	μ	-	4	-	
Plate Resistance (Approx.)	r_p	-	-	6000	Ω
Transconductance	g_m	-	-	9500	μmho
DC Plate Current	I_b	580[b]	-	80	mA
DC Grid-No.2 Current	I_{c2}	24[b]	-	2.4	mA
Cutoff DC Grid-No.1 Voltage. Plate mA = 1	$E_{c1(co)}$	-	-	-42	V

Conditions

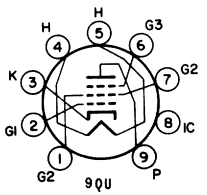
Heater Voltage	E_h	Bogey Value		V
DC Plate Voltage	E_b	100	140	V
DC Grid-No.3 Voltage	E_{c3}	0	0	V
DC Grid-No.2 Voltage	E_{c2}	140	140	V
DC Grid-No.1 Voltage	E_{c1}	0	-24.5	V

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Dimensional Outline (JEDEC 12-96)	See *General Section*
Maximum Overall Length	3.130 in
Maximum Seated Length	2.750 in
Maximum Diameter	1.562 in
Envelope	JEDEC Designation T12
Base[c]	Large-Button Novar 9-Pin with Exhaust Tip (JEDEC Designation E9-88)

TERMINAL DIAGRAM (Bottom View)

Pin 1 - Grid No.2
Pin 2 - Grid No.1
Pin 3 - Cathode
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid No.3
Pin 7 - Grid No.2
Pin 8 - Do Not Use
Pin 9 - Plate



DESIGN-MAXIMUM RATINGS

For operation as a High-Voltage-Pulse Shunt-Regulator Tube in Color-Television Receivers in a 525-line, 30-frame system

DC Plate Supply Voltage (I_b = 0 mA)	E_{bb}	770	V
Peak Positive-Pulse Plate Voltage[c]	e_{bm}	6500	V
Peak Negative-Pulse Plate Voltage.	$-e_{bm}$	1500	V
DC Grid-No.3 Voltage	E_{c3}	75	V
DC Grid-No.2 (Screen-Grid) Voltage	E_{c2}	220	V
Grid No.1 (Control-Grid) Voltage			
Peak negative-pulse value	$-e_{c1m}$	330	V
Negative dc value (bias)	$-E_{c1}$	75	V
Heater-Cathode Voltage			
Peak	e_{hkm}	+200 -500	V
Average[d]	$E_{hk(av)}$	100	V
Heater Voltage (AC or DC)	E_h	5.7 to 6.9	V
Cathode Current			
Peak	i_{km}	950	mA
Average[d]	$I_{k(av)}$	275	mA
Grid-No.2 Input	P_{g2}	3.5	W
Plate Dissipation[e]	P_b	20[f]	W
Envelope Temperature (at hottest point on envelope surface)	T_E	240	°C

MAXIMUM CIRCUIT VALUE

Grid-No.1-Circuit Resistance For grid-No.1-resistor-bias operation	$R_{g1(ckt)}$ -	1	MΩ

[a] With grid No.3 and grid No.2 connected, respectively, to cathode and plate at socket.

[b] This value can be measured by a method involving a recurrent waveform such that the Maximum Ratings of the tube will not be exceeded.

[c] This rating is applicable where the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10 μs.

[d] Measured with a dc meter.

[e] Adequate circuit precautions must be taken to protect the tube in the absence of grid-No.1 bias.

[f] Plate dissipations up to 24 W maximum are permissible for short periods of time (up to 10 s maximum) provided the maximum envelope-temperature rating is not exceeded.

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Electronic Components and Devices Harrison, N. J.

6KV6A

Beam Power Tube

NOVAR TYPE

For High-Voltage-Pulse Shunt-Regulator Applications in Color-TV Receivers

ELECTRICAL CHARACTERISTICS – Bogey Values

Heater Voltage, ac or dc	E_h		6.3		V
Heater Current	I_h		1.6		A
Direct Interelectrode Capacitances:[a]					
Grid No.1 to plate	c_{g1-p}			0.6	pF
Input: G1 to (K,G3,G2,H)	c_i			22	pF
Output: P to (K,G3,G2,H)	c_o			9.0	pF
For the following characteristics, see Conditions below.					
Amplification Factor (Triode Connection)[b]	μ	-	4	-	
Plate Resistance (Approx.)	r_p	-	-	10000	Ω
Transconductance	g_m	-	-	6000	μmho
DC Plate Current	I_b	440[c]	-	40	mA
DC Grid-No.2 Current	I_{c2}	30[c]	-	2.4	mA
Cutoff DC Grid-No.1 Voltage for I_b = 1 mA	$E_{c1(co)}$	-	-	-42	V

Conditions:

		Bogey Value			
Heater Voltage	E_h				V
DC Plate Voltage	E_b	100	140	140	V
DC Grid-No.3 Voltage	E_{c3}	0	0	0	V
DC Grid-No.2 Voltage	E_{c2}	140	140	140	V
DC Grid-No.1 Voltage	E_{c1}	0	-24.5	-24.5	V

MECHANICAL CHARACTERISTICS

Dimensional Outline . . . . . JEDEC No.12-97

Maximum Overall Length . . . . . 3.380in. (85.85 mm)

Maximum Seated Length . . . . . 3.000in. (76.2 mm)

Maximum Diameter . . . . . 1.562in. (39.6 mm)

Envelope . . . . . JEDEC Designation T12

Base[d] . . . . . Large-Button Novar 9-Pin with Exhaust Tip (JEDEC Designation E9-88)

Terminal-Connections Designation . . . . . .JEDEC 9QU
Type of Cathode . . . . . Coated Unipotential
Operating Position . . . . . Any

MAXIMUM RATINGS – Design-Maximum Values[e]

For operation as a High-Voltage-Pulse Shunt-Regulator Tube in Color Television Receivers in a 525-line, 30-frame system.

DC Plate Supply Voltage (I_b = 0 mA)	E_{bb}	900	V
Peak Positive-Pulse Plate Voltage	e_{bm}	6500	V
Peak Negative-Pulse Plate Voltage	$-e_{bm}$	1500	V
DC Grid-No.3 Voltage	E_{c3}	75	V
DC Grid-No.2 (Screen-Grid) Voltage	E_{c2}	220	V
Peak Positive-Pulse Grid-No.2 Voltage	e_{c2m}	600	V
Grid No.1 (Control-Grid) Voltage:			
Peak negative-pulse value	$-e_{c1m}$	330	V
Negative dc value (bias)	$-E_{c1}$	250	V
Heater-Cathode Voltage:			
Peak	e_{hkm}	+200 -500	V
Average[g]	$E_{hk(av)}$	100	V
Heater Voltage	E_h	5.7 to 6.9	V
Cathode Current:			
Peak	i_{km}	950	mA
Average[g]	$I_{k(av)}$	275	mA
Grid-No.2 Input	P_{g2}	2.0	W
Plate Dissipation[h]	P_b	28[k]	W
Envelope Temperature (at hottest point on envelope surface)	T_E	240	°C

MAXIMUM CIRCUIT VALUE

Grid-No.1-Circuit Resistance:	$R_{g1(ckt)}$		
For grid-No.1-resistor-bias operation		1	MΩ

[a]Measured without external shield in accordance with the current issue of EIA Standard RS-191.

[b]With grid No.3 and grid No.2 connected, respectively, to cathode and plate at socket.

[c]This value can be measured by a method involving a recurrent waveform such that the Maximum Ratings of the tube will not be exceeded.

[d]Designed to mate with "Novar 9-Contact" Socket generally available from your local RCA Distributor.

[e]As defined in the current issue of EIA Standard RS-239.

[f]This rating is applicable where the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10μs.

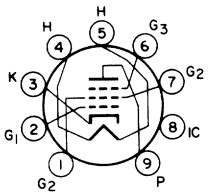
[g]Measured with a dc meter.

[h]Adequate circuit precautions must be taken to protect the tube in the absence of grid-No.1 bias.

[k]Plate dissipations up to 32W maximum are permissible for short periods of time provided the maximum envelope-temperature rating is not exceeded. This condition may exist under high-line voltage, zero picture tube beam current.

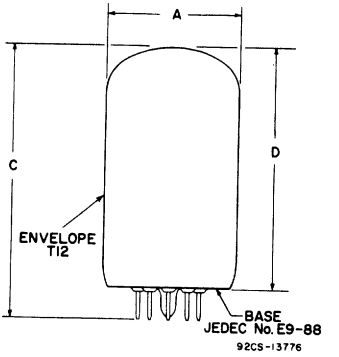
TERMINAL DIAGRAM — Bottom View

Pin 1 - Grid No.2
Pin 2 - Grid No.1
Pin 3 - Cathode
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid No.3
Pin 7 - Grid No.2
Pin 8 - Do Not Use
Pin 9 - Plate



JEDEC 9QU

DIMENSIONAL OUTLINE — JEDEC No. 12-97



DIMENSION	INCHES		MILLIMETERS	
	Min.	Max.	Min.	Max.
A	1.438*	1.562	36.6*	39.6
C	—	3.380	—	85.85
D	2.750	3.000	69.9	76.2
MILLIMETER DIMENSION DERIVED FROM INCH DIMENSION				
* Applies to the minimum diameter except in the area of the seal.				

High-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE **FRAME-GRID CONSTRUCTION**

For Use as a Combined Voltage Amplifier and Video Output Tube in TV Receivers

ELECTRICAL

Heater Characteristics and Ratings		
Voltage (AC or DC)	6.3 ± 0.6	V
Current at heater volts = 6.3	0.775	A
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	200	V
Heater positive with respect to cathode	200[a]	V
Direct Interelectrode Capacitances[b]		
Triode Unit:		
Grid to plate	3.7	pF
Grid to cathode, pentode cathode, pentode grid No.3 & internal shield, and heater	2.5	pF
Plate to cathode, pentode cathode, pentode grid No.3 & internal shield, and heater	2.4	pF
Triode grid to pentode plate	0.015 max	pF
Pentode Unit:		
Grid No.1 to plate	0.12 max	pF ←
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	13.0	pF
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	4.8	pF
Pentode plate to triode plate	0.17 max	pF

Characteristics, Class A_1 Amplifier

	Triode Unit	*Pentode Unit*		
Plate Supply Voltage	-	125	200	V
Plate Voltage	200	-	-	V
Grid-No.2 Supply Voltage	-	125	125	V
Grid-No.1 Supply Voltage	-2	-	-	V
Cathode Resistor	-	82	68	Ω
Amplification Factor	70	-	-	
Plate Resistance (Approx.)	17500	55000	75000	Ω
Transconductance	4000	21000	23000	μmho
Plate Current	4	16.5	20	mA ←
Grid-No.2 Current	-	3.1	3.5	mA ←
Grid-No.1 Voltage (Approx.) for plate current = 100 μA	-4.5	-4.2	-4.2	V

← Indicates a change.

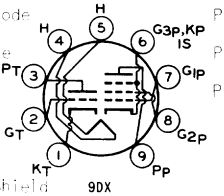
6KV8

MECHANICAL

Operating Position	Any
Maximum Overall Length	2-5/8 in
Maximum Seated Length	2-3/8 in
Length, Base Seat to Bulb Top (Excluding tip)	2 ± 3/32 in
Diameter	0.750 to 0.875 in
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

BASING DIAGRAM (Bottom View)

Pin 1 – Triode Cathode
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Cathode, Pentode Grid No.3, Internal Shield
Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate



9DX

AMPLIFIER — Class A_1

Design-Maximum Ratings

	Triode Unit	*Pentode Unit*	
Plate Voltage	300	300 max	V
Grid-No.2 (Screen-Grid) Supply Voltage	-	300 max	V
Grid-No.2 Voltage	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Grid-No.1 (Control-Grid) Voltage			
Positive-bias value	0	0 max	V
Grid-No.2 Input			
For grid-No.2 voltages up to 150 V.	-	1 max	W
For grid-No.2 voltages between 150 and 300 V.	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Plate Dissipation	1	5 max	W

Maximum Circuit Values

	Triode Unit	*Pentode Unit*
Grid-No.1-Circuit Resistance		
For fixed-bias operation	0.5	0.1 max MΩ
For cathode-bias operation	1	0.25 max MΩ

[a] The dc component must not exceed 100 volts.

[b] Without external shield.

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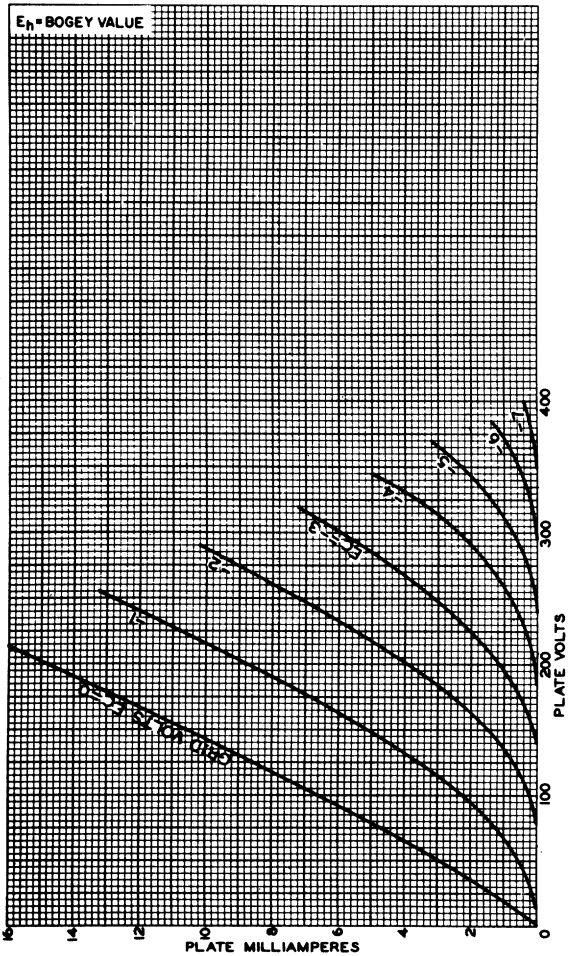
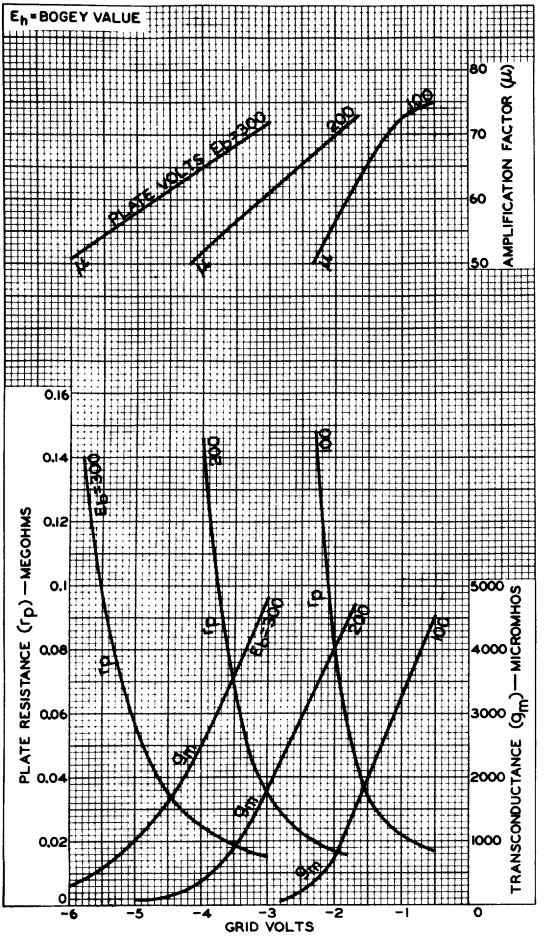
Average Plate Characteristics
Triode Unit



92CM-8644RI

Average Characteristics
Triode Unit



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RADIO CORPORATION OF AMERICA
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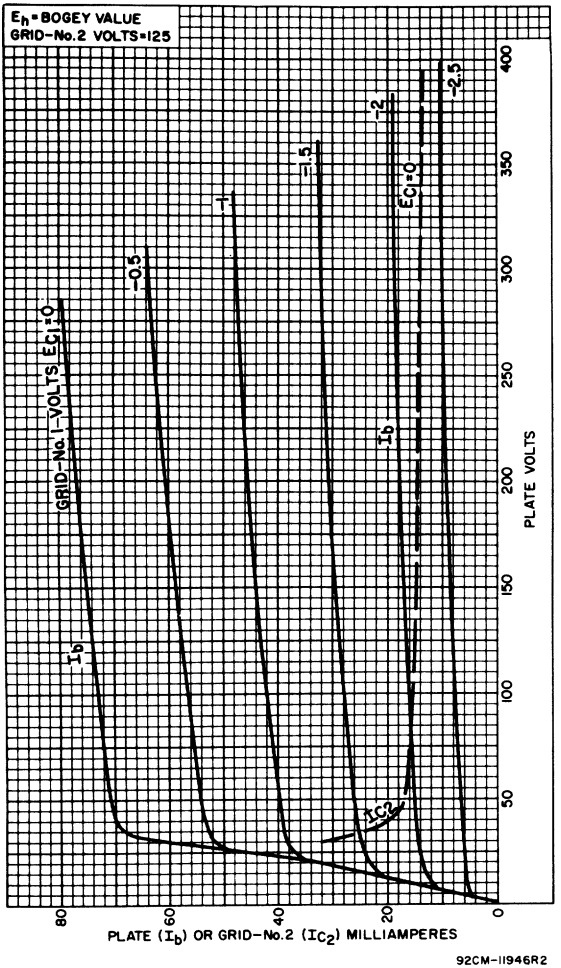
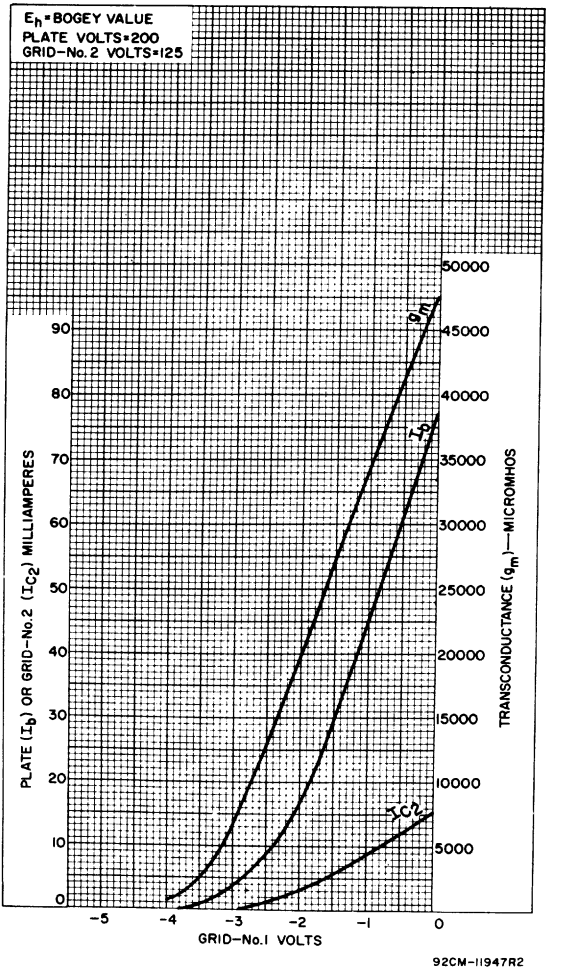
Average Characteristics
Pentode Unit



6KV8

Average Characteristics
Pentode Unit



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Electronic Components and Devices Harrison, N. J.

6KY6

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

FRAME-GRID CONSTRUCTION **DARK HEATER**

For Video-Output-Amplifier Service in Color-TV Receivers

ELECTRICAL CHARACTERISTICS

Bogey Values[a]

Heater Voltage (AC or DC)	E_h	6.3	V
Heater Current	I_h	0.520	A
Direct Interelectrode Capacitances			
Without external shield			
Grid No.1 to plate	c_{g1-p}	0.16 max	pF
Input: G1 to (K, G3 + IS, G2, H)	c_i	14	pF
Output: P to (K, G3 + IS, G2, H)	c_o	6.0	pF

For the following characteristics, see **Conditions**

Plate Resistance (Approx.)	r_p	40	kΩ
Transconductance	g_m	30000	μmho
DC Plate Current	I_b	30	mA
DC Grid-No.2 Current	I_{c2}	5.2	mA
Cutoff DC Grid-No.1 Voltage	$E_{c1(co)}$	-4.5	V
Plate μA = 100			

Conditions

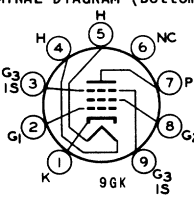
Heater Voltage	E_h	Bogey Value	V
Plate Supply Voltage	E_{bb}	200	V
Grid-No.3		connected to cathode at socket	
Grid-No.2 Supply Voltage	E_{cc2}	135	V
Grid-No.1 Supply Voltage	E_{cc1}	0	V
Cathode Resistor	R_k	47	Ω

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2.625 in
Maximum Seated Length	2.375 in
Length, Base Seat to Bulb Top	
Excluding tip	1.906 to 2.094 in
Maximum Diameter	0.875 in
Dimensional Outline (JEDEC 6-3)	See *General Section*
Envelope	JEDEC T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC E9-1)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Cathode
Pin 2 – Grid No.1
Pin 3 – Grid No.3, Internal Shield
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – No Connection
Pin 7 – Plate
Pin 8 – Grid No.2
Pin 9 – Grid No.3, Internal Shield

DESIGN-MAXIMUM RATINGS

For operation as a Class A_1 Amplifier

Plate Voltage	E_b	330	V
Grid-No.2 (Screen-Grid) Supply Voltage	E_{cc2}	330	V
Grid-No.2 Voltage	E_{c2}	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Grid-No.1 (Control-Grid) Voltage			
Positive-bias value	E_{c1}	0	V
Heater-Cathode Voltage			
Peak	e_{hkm}	±200	V
DC	E_{hk}	100	V
Heater Voltage (AC or DC)	E_h	5.7 to 6.9	V
Grid-No.2 Input	P_{g2}		
For $E_{c2} \leq 165$ V		1	W
For $E_{c2} > 165$ V and ≤ 330 V	-	See *Grid-No.2-Input Rating Chart* at front of Receiving Tube Section	
Plate Dissipation	P_b	9	W

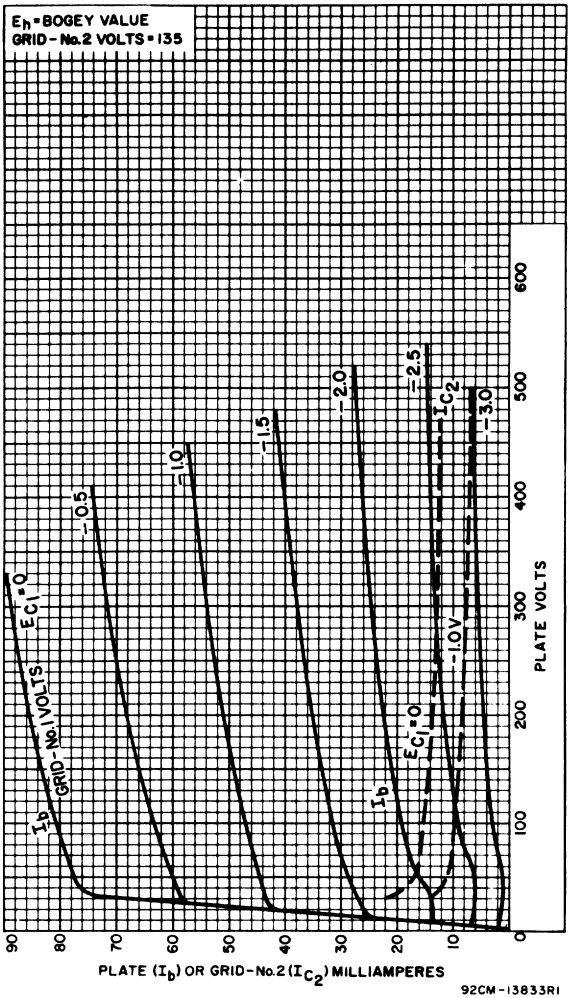
MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance	$R_{g1(ckt)}$		
For fixed-bias operation	-	0.1	MΩ
For cathode-bias operation	-	0.25	MΩ

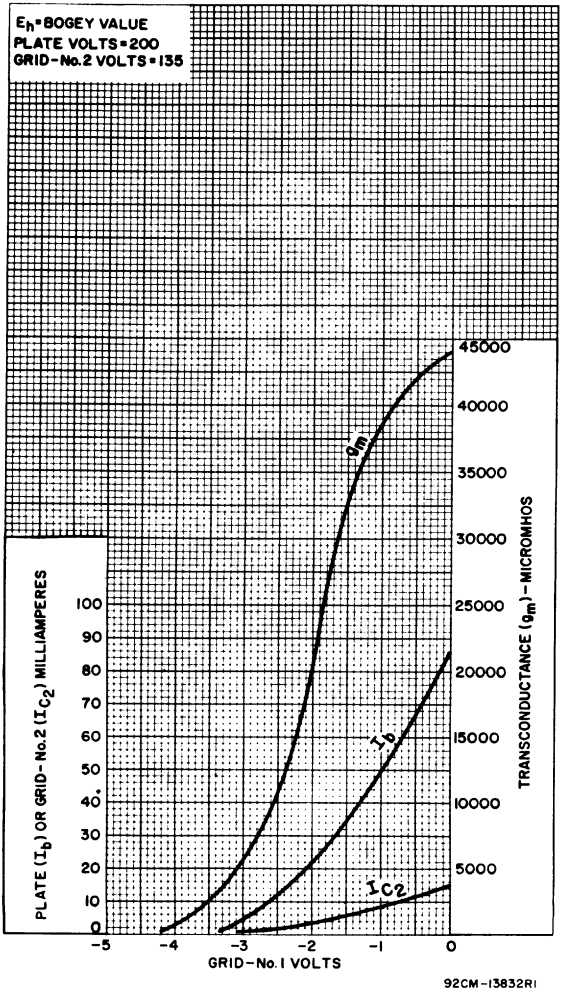
[a] Unless otherwise specified.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Typical Characteristics



Typical Characteristics



RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

6KY8A

High-Mu Triode—Beam Power Tube

NOVAR TYPE

For Combined Vertical-Deflection Oscillator and Amplifier Service in TV Receivers

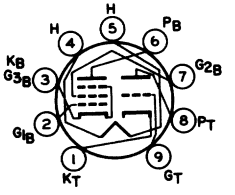
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.100	amp
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts
Direct Interelectrode Capacitances (Approx.):[b]		
Triode Unit:		
Grid to plate	0.44	pf
G_T to (K_T,H)	15.0	pf
P_T to (K_T,H)	7.0	pf
Beam Power Unit:		
Grid No.1 to plate	0.048	pf
$C1_B$ to (K_B+$G3_B$,$G2_B$,H)	2.6	pf
P_B to (K_B+$G3_B$,$G2_B$,H)	0.28	pf

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2.380"
Seated Length	1.750" to 2.000"
Diameter	1.062" to 1.188"
Dimensional Outline	See *General Section*
Bulb	T9
Base	Small Button Novar 9-Pin with Exhaust Tip (JEDEC No.E9-89)
Basing Designation for BOTTOM VIEW	9QT

Pin 1 – Triode Cathode
Pin 2 – Beam Power Grid No.1
Pin 3 – Beam Power Cathode & Grid No.3
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Beam Power Plate
Pin 7 – Beam Power Grid No.2
Pin 8 – Triode Plate
Pin 9 – Triode Grid



Characteristics, Class A_1 Amplifier:

	Triode Unit	*Beam Power Unit*			
Plate Voltage	250	50	135	120	volts
Grid-No.2 Voltage	–	120	120	*Connected to plate at socket*	volts
Grid-No.1 Voltage	-3	0	-10	-10	volts
Amplification Factor	64	–	–	7	

6KY8A

	Triode Unit		*Beam Power Unit*		
Plate Resistance (Approx.).	40000	–	18000	–	ohms
Transconductance.	1600	–	8400	–	μmhos
Plate Current	1.4	170[c]	39	–	ma
Grid-No.2 Current	–	20[c]	3	–	ma
Grid-No.1 Voltage (Approx.) for plate ma = 1	–	–	-24	–	volts

VERTICAL-DEFLECTION OSCILLATOR *(Triode Unit)*

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[d]

DC Plate Voltage.	330 max.	volts
Peak Negative-Pulse Grid Voltage.	400 max.	volts
Peak Cathode Current.	77 max.	ma
Average Cathode Current	22 max.	ma
Plate Dissipation	1.5 max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance: For grid-resistor-bias operation. . . .	2.2 max.	megohms

VERTICAL-DEFLECTION AMPLIFIER *(Beam Power Unit)*

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[d]

DC Plate Voltage.	300 max.	volts
Peak Positive-Pulse Plate Voltage[e]. . . .	2000 abs.max.	volts
DC Grid-No.2 (Screen-Grid) Voltage. . . .	150 max.	volts
Peak Negative-Pulse Grid-No.1 (Control-Grid) Voltage.	250 max.	volts
Peak Cathode Current.	200 max.	ma
Average Cathode Current	70 max.	ma
Plate Dissipation	12 max.	watts
Grid-No.2 Input	1.9 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: For grid-resistor-bias operation. . . .	2.2 max.	megohms

[a] The dc component must not exceed 100 volts.

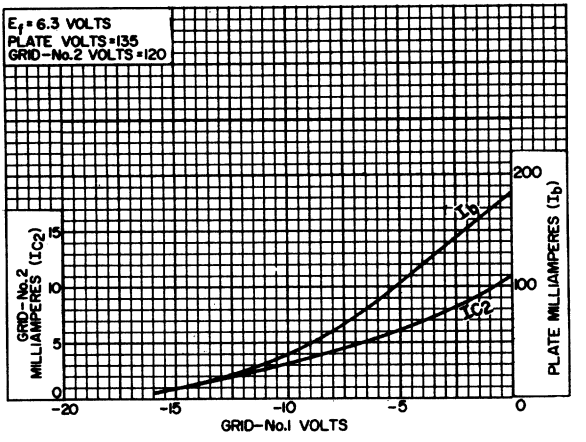
[b] Without external shield.

[c] This value can be measured by a method involving a recurrent wave form such that the plate dissipation and grid-No.2 input will be kept within ratings in order to prevent damage to the tube.

[d] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

[e] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

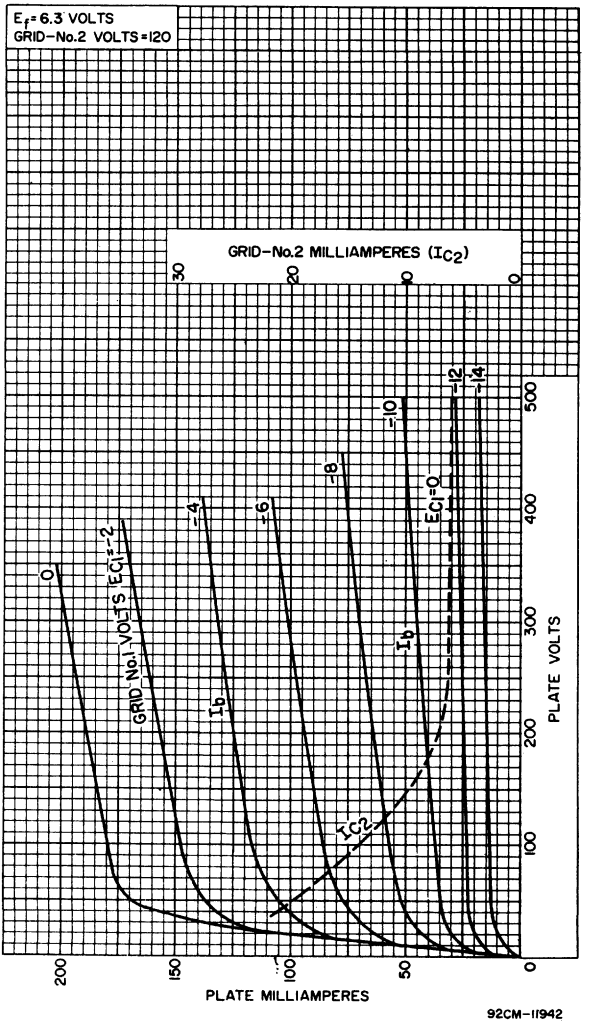
AVERAGE CHARACTERISTICS
Beam Power Unit



92CS-11929

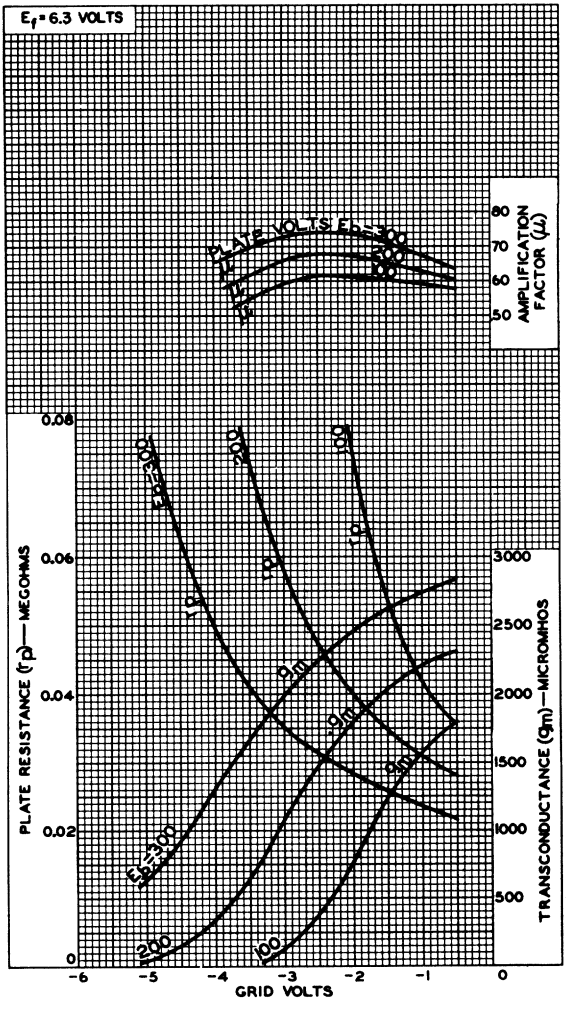
6KY8A

AVERAGE CHARACTERISTICS
Beam Power Unit



92CM-11942

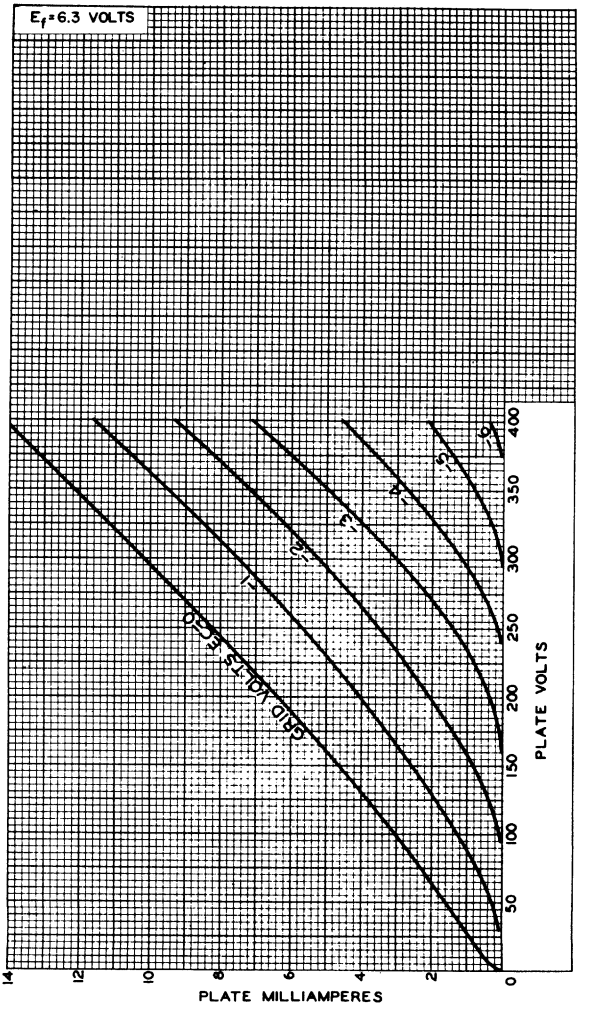
AVERAGE CHARACTERISTICS
Triode Unit



92CM-11946

6KY8A

AVERAGE CHARACTERISTICS
Triode Unit



92CM—11944

6KZ8

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

For Oscillator-Mixer Service in VHF TV-Tuner Applications

Electrical:

Heater Characteristics and Ratings:			
Voltage (AC or DC)	6.3[a]	6.3 ± 0.6	volts
Current	0.450 ± 0.030	0.450[b]	amp
Warm-up time (Average)	11	–	sec
Peak heater-cathode voltage (Each Unit):			
Heater negative with respect to cathode	200 max.		volts
Heater positive with respect to cathode	200[c] max.		volts
Direct Interelectrode Capacitances:[d]			
Triode Unit:			
G_T to P_T	1.6		pf
Input: G_T to (K_T,$G3_P$+K_P+IS,H)	3.2		pf
Output: P_T to (K_T,$G3_P$+K_P+IS,H)	1.8		pf
Pentode Unit:			
$G1_P$ to P_P	0.01 max.		pf
Input: $G1_P$ to (K_P+$G3_P$+IS,$G2_P$,H)	5.5		pf
Output: P_P to (K_P+$G3_P$+IS,$G2_P$,H)	3.4		pf
Heater to cathode (Each Unit)	3.2		pf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*	
Plate Voltage	125	125	volts
Grid-No.2 Voltage	–	125	volts
Grid-No.1 Voltage	-1	-1	volt
Amplification Factor	46	–	
Plate Resistance (Approx.)	5400	200000	ohms
Transconductance	8500	7500	μmhos
Plate Current	13.5	12	ma
Grid-No.2 Current	–	4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-8	-8	volts

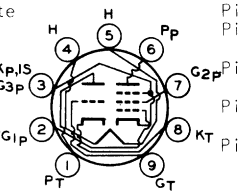
Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

6KZ8

Basing Designation for BOTTOM VIEW. 9FZ

Pin 1 - Triode Plate
Pin 2 - Pentode Grid No.1
Pin 3 - Pentode Cathode, Pentode Grid No.3, Internal Shield
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Pentode Plate
Pin 7 - Pentode Grid No.2
Pin 8 - Triode Cathode
Pin 9 - Triode Grid



AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

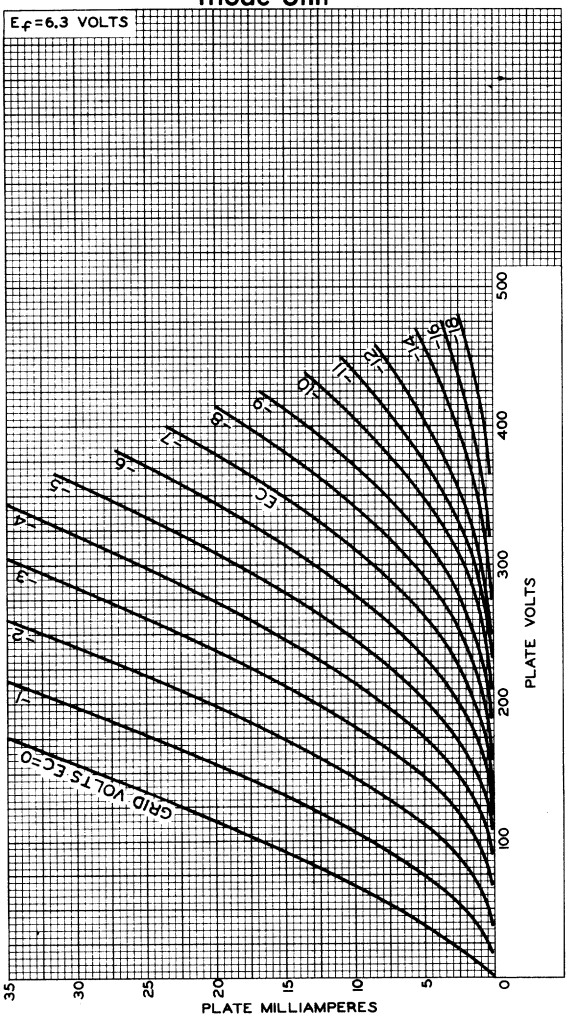
	Triode Unit	*Pentode Unit*	
Plate Voltage.	330 max.	330 max.	volts
Grid-No.2 (Screen-Grid) Supply Voltage	–	330 max.	volts
Grid-No.2 Voltage.	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		
Grid-No.1 (Control-Grid) Voltage: Positive-bias value.	0 max.	0 max.	volts
Plate Dissipation.	2.5 max.	2.5 max.	watts
Grid-No.2 Input: For grid-No.2 voltages up to 165 volts.	–	0.55 max.	watt
For grid-No.2 voltages between 165 and 330 volts.	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: For fixed-bias operation.	0.25 max.	0.25 max.	megohm
For cathode-bias operation.	0.5 max.	0.5 max.	megohm

[a] At heater amperes = 0.480.
[b] At heater volts = 6.3.
[c] The dc component must not exceed 100 volts.
[d] With external shield JEDEC No.315 connected to cathode of unit under test.

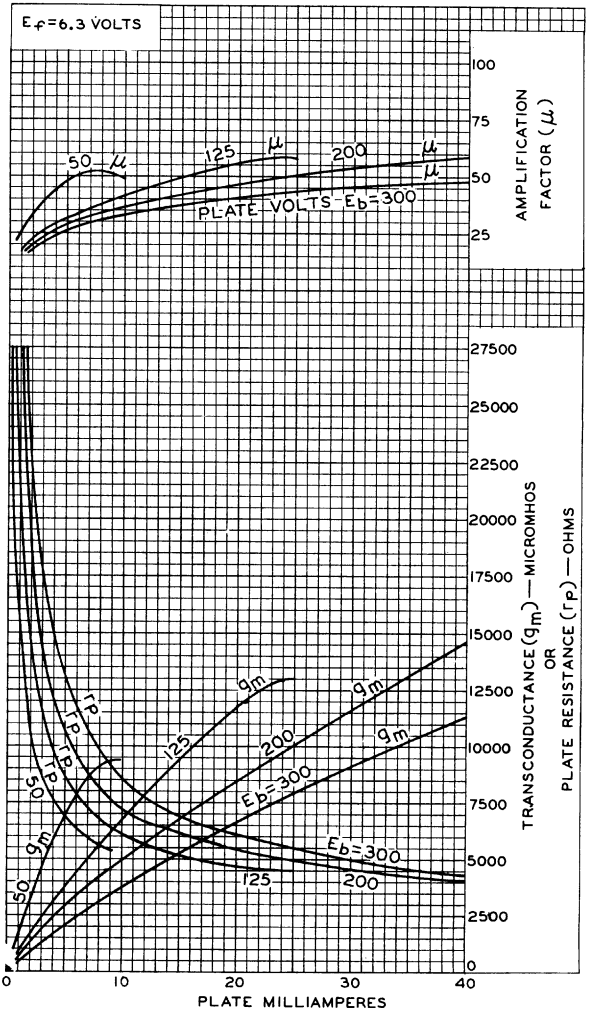
AVERAGE PLATE CHARACTERISTICS
Triode Unit



92CM-10421RI

6KZ8

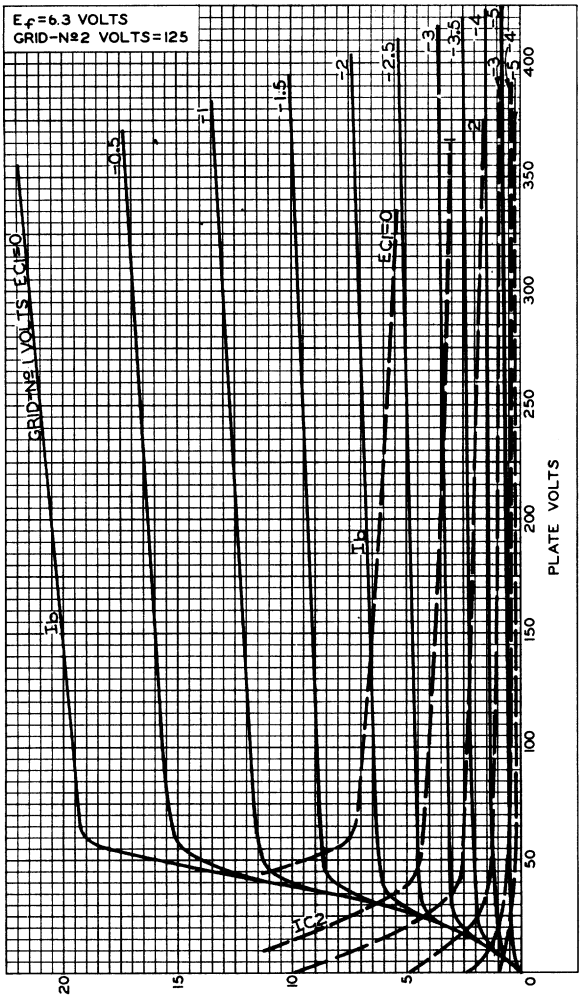
AVERAGE CHARACTERISTICS
Triode Unit



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM—10428

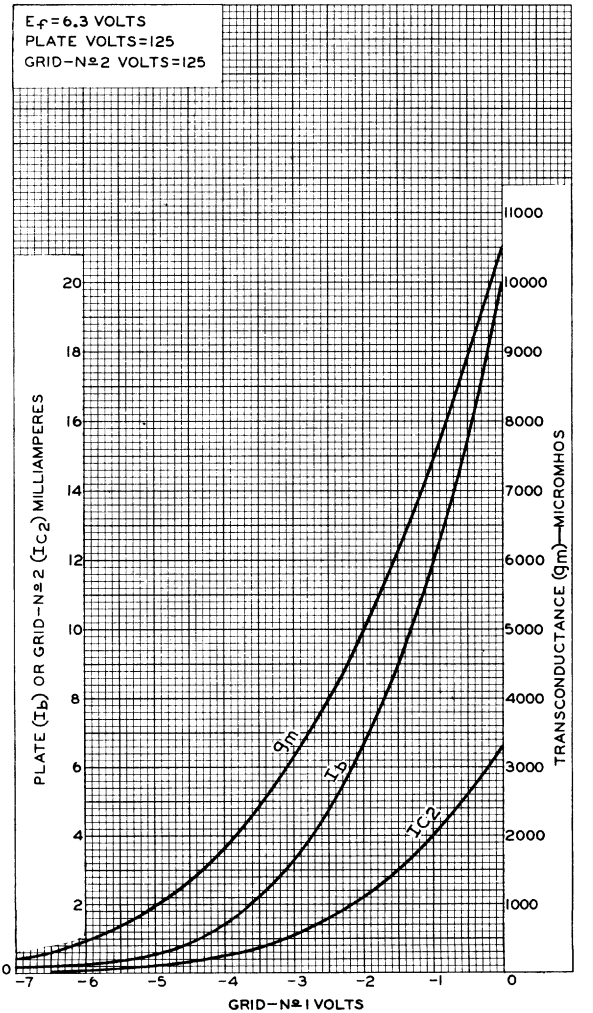
AVERAGE CHARACTERISTICS
Pentode Unit



92CM-10436

6KZ8

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-10417

6L6, 6L6-G

BEAM POWER TUBE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.9	amp

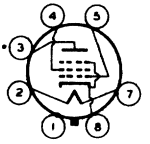
Direct Interelectrode Capacitances (Approx.):

	6L6°	*6L6-G°°*	
Grid No.1 to plate	0.4	0.9	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	10	11.5	μμf
Plate to cathode & grid No.3, grid No.2, and heater	12	9.5	μμf

Mechanical:

	6L6	*6L6-G*
Mounting Position	Any	Any
Maximum Overall Length	4-5/16"	5-5/16"
Maximum Seated Length	3-3/4"	4-3/4"
Maximum Diameter	1-5/8"	2-1/16"
Bulb	Metal Shell MT-10	ST-16
Base	Small-Wafer Octal 7-Pin (JETEC No.B7-22)	Medium-Shell Octal 7-Pin (JETEC No.B7-12)
Basing Designation	7AC	G-7AC

Pin 1 { 6L6, Shell / 6L6-G, No Conn.
Pin 2 - Heater
Pin 3 - Plate



Pin 4 - Grid No.2
Pin 5 - Grid No.1
Pin 7 - Heater
Pin 8 - Cathode, Grid No.3

AF POWER AMPLIFIER - Class A_1†

Triode Connection - Grid No.2 Connected to Plate

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	275 max.	volts
PLATE DISSIPATION	19 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

Typical Operation and Characteristics:

	Fixed Bias	*Cathode Bias*	
Plate Voltage	250	250	volts
Grid-No.1 (Control-Grid) Voltage	-20	-	volts
Cathode-Bias Resistor	-	490	ohms

°, °°, †: See next page.

→ Indicates a change.

6L6
6L6-G

6L6, 6L6-G

BEAM POWER TUBE

	Fixed Bias	*Cathode Bias*	
Peak AF Grid-No.1 Voltage	20	20	volts
Zero-Signal Plate Current	40	40	ma
Max.-Signal Plate Current	44	42	ma
Amplification Factor	8	-	
Plate Resistance (Approx.)	1700	-	ohms
Transconductance	4700	-	μmhos
Load Resistance	5000	6000	ohms
Total Harmonic Distortion	5	6	%
Max.-Signal Power Output	1.4	1.3	watts

→Maximum Circuit Values (For maximum rated conditions):

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

AF POWER AMPLIFIER - Class A_1†

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	360 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	270 max.	volts
PLATE DISSIPATION	19 max.	watts
GRID-No.2 INPUT	2.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

→Typical Operation and Characteristics:

Fixed-Bias Operation

Plate Voltage	200	250	300	350	volts
Grid-No.2 Voltage	200	250	200	250	volts
Grid-No.1 Voltage	-11.5	-14	-12.5	-18	volts
Peak AF Grid-No.1 Voltage	11.5	14	12.5	18	volts
Zero-Signal Plate Current	52	72	48	54	ma
Max.-Signal Plate Current	57	79	55	66	ma
Zero-Signal Grid-No.2 Current	3.5	5.0	2.5	2.5	ma
Max.-Signal Grid-No.2 Current	5.7	7.3	4.7	7.0	ma
Plate Resistance (Approx.)	35000	22500	35000	33000	ohms
Transconductance	5300	6000	5300	5200	μmhos
Load Resistance	3000	2500	4500	4200	ohms
Total Harmonic Distortion	9	10	11	15	%
Max.-Signal Power Output	4	6.5	6.5	10.8	watts

Cathode-Bias Operation

Plate Voltage	200	250	300	volts
Grid-No.2 Voltage	200	250	200	volts

° With shell connected to cathode.
°° With no external shield.
†: See next page.
→Indicates a change.

6L6, 6L6-G

BEAM POWER TUBE

Cathode-Bias Resistor	186	167	218	ohms
Peak AF Grid-No.1 Voltage	11.5	14	12.7	volts
Zero-Signal Plate Current	55	75	51	ma
Max.-Signal Plate Current	56	78	54.5	ma
Zero-Signal Grid-No.2 Current	4.2	5.4	3.0	ma
Max.-Signal Grid-No.2 Current	5.6	7.2	4.6	ma
Load Resistance	3000	2500	4500	ohms
Total Harmonic Distortion	9	10	11	%
Max.-Signal Power Output	4	6.5	6.5	watts

Maximum Circuit Values (For maximum rated conditions): ←

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

PUSH-PULL AF POWER AMPLIFIER - Class A_1 †

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	360 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	270 max.	volts
PLATE DISSIPATION	19 max.	watts
GRID-No.2 INPUT	2.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

Typical Operation and Characteristics: ←

Unless otherwise specified, values are for 2 tubes

	Fixed Bias		*Cathode Bias*		
Plate Voltage	250	270	250	270	volts
Grid-No.2 Voltage	250	270	250	270	volts
Grid-No.1 Voltage	-16	-17.5	-	-	volts
Cathode-Bias Resistor	-	-	124	124	ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage	32	35	35.6	28.2	volts
Zero-Signal Plate Current	120	134	120	134	ma
Max.-Signal Plate Current	140	155	130	145	ma
Zero-Signal Grid-No.2 Current	10	11	10	11	ma
Max.-Signal Grid-No.2 Current	16	17	15	17	ma
Plate Resistance (Per tube) (Approx.)	24500	23500	-	-	ohms
Transconductance (Per tube)	5500	5700	-	-	μmhos
Effective Load Resistance (Plate to plate)	5000	5000	5000	5000	ohms
Total Harmonic Distortion	2	2	2	2	%
Max.-Signal Power Output.	14.5	17.5	13.8	18.5	watts

†: See next page.

←Indicates a change

6L6, 6L6-G
BEAM POWER TUBE

Maximum Circuit Values (For maximum rated conditions):

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

PUSH-PULL AF POWER AMPLIFIER - Class AB_1†

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	360 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	270 max.	volts
PLATE DISSIPATION	19 max.	watts
GRID-No.2 INPUT	2.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

Typical Operation:

Values are for 2 tubes

	Fixed Bias		*Cathode Bias*	
Plate Voltage	360	360	360	volts
Grid-No.2 Voltage▲	270	270	270	volts
Grid-No.1 Voltage	-22.5	-22.5	-	volts
Cathode-Bias Resistor	-	-	248	ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage	45	45	40.6	volts
Zero-Signal Plate Current	88	88	88	ma
Max.-Signal Plate Current	132	140	100	ma
Zero-Signal Grid-No.2 Current	5	5	5	ma
Max.-Signal Grid-No.2 Current	15	11	17	ma
Effective Load Resistance (Plate to plate)	6600	3800	9000	ohms
Total Harmonic Distortion	2	2	4	%
Max.-Signal Power Output	26.5	18	24.5	watts

Maximum Circuit Values (For maximum rated conditions):

Grid-No.1-Circuit Resistance:▲		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

PUSH-PULL AF POWER AMPLIFIER - Class AB_2♦

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	360 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	270 max.	volts
PLATE DISSIPATION	19 max.	watts
GRID-No.2 INPUT	2.5 max.	watts

▲, †, ♦: See next page.

→ Indicates a change.

6L6, 6L6-G
BEAM POWER TUBE

PEAK HEATER–CATHODE VOLTAGE:		
Heater negative with respect to cathode. .	180 max.	volts
Heater positive with respect to cathode. .	180 max.	volts

Typical Operation:

Values are for 2 tubes

		Fixed Bias	
Plate Voltage.	360	360	volts
Grid–No.2 Voltage.	225	270	volts
Grid–No.1 Voltage.	-18	-22.5	volts
Peak AF Grid–No.1–to Grid–No.1 Voltage	52	72	volts
Zero–Signal Plate Current.	78	88	ma
Max.–Signal Plate Current.	142	205	ma
Zero–Signal Grid–No.2 Current.	3.5	5	ma
Max.–Signal Grid–No.2 Current.	11	16	ma
Effective Load Resistance (Plate to plate).	6000	3800	ohms
Peak Grid–Input Power.	140	270	mw
Total Harmonic Distortion.	2	2	%
Max.–Signal Power Output	31	47	watts

Maximum Circuit Values (For maximum rated conditions):

Grid–No.1–Circuit Resistance‡:	
For fixed–bias operation	0.1 max. megohm
For cathode–bias operation	Not recommended

† Subscript 1 indicates that grid–No.1 current does not flow during any part of input cycle.

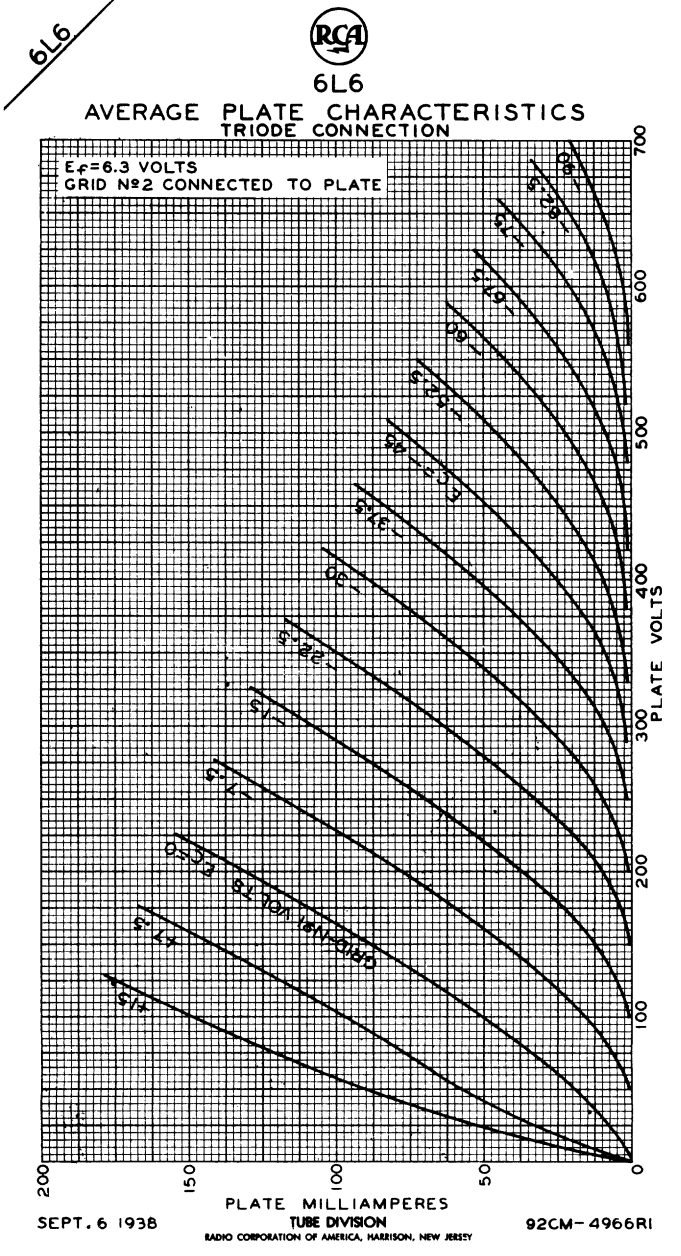
♦ Subscript 2 indicates that grid–No.1 current flows during some part of input cycle.

‡ Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the AB_2 stage. To minimize distortion, the effective resistance per grid–No.1 circuit of the AB_2 stage should be held at a low value. For this purpose, the use of transformer coupling is recommended.

♠ The type of input coupling used should not introduce too much resistance in the grid–No.1 circuit. Transformer– or impedance–coupling devices are recommended.

←Indicates a change.

6L6



SEPT. 6 1938

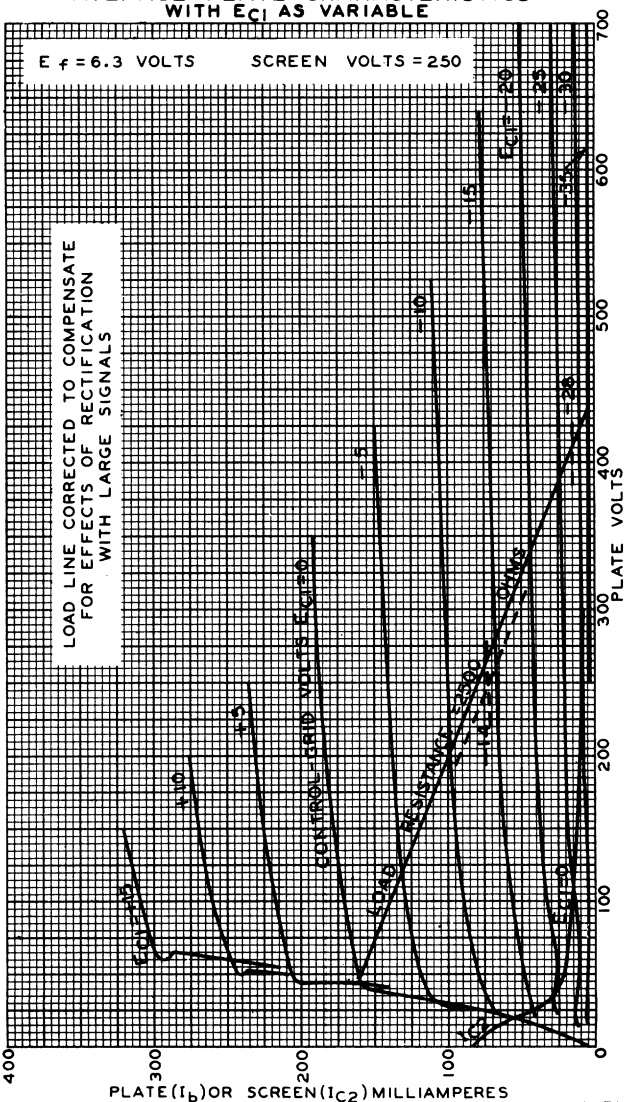
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-4966RI

6L6

AVERAGE PLATE CHARACTERISTICS

WITH E_{C1} AS VARIABLE



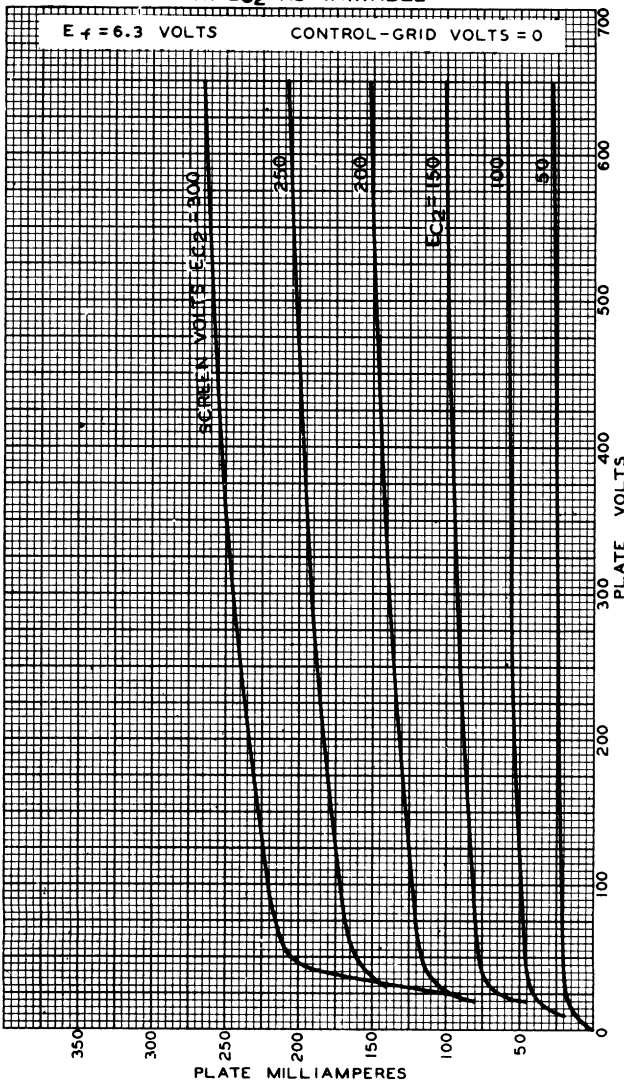
MAY 6, 1936 TUBE DEPARTMENT 92CM-4581RI

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6L6

6L6

AVERAGE PLATE CHARACTERISTICS WITH E_{C2} AS VARIABLE



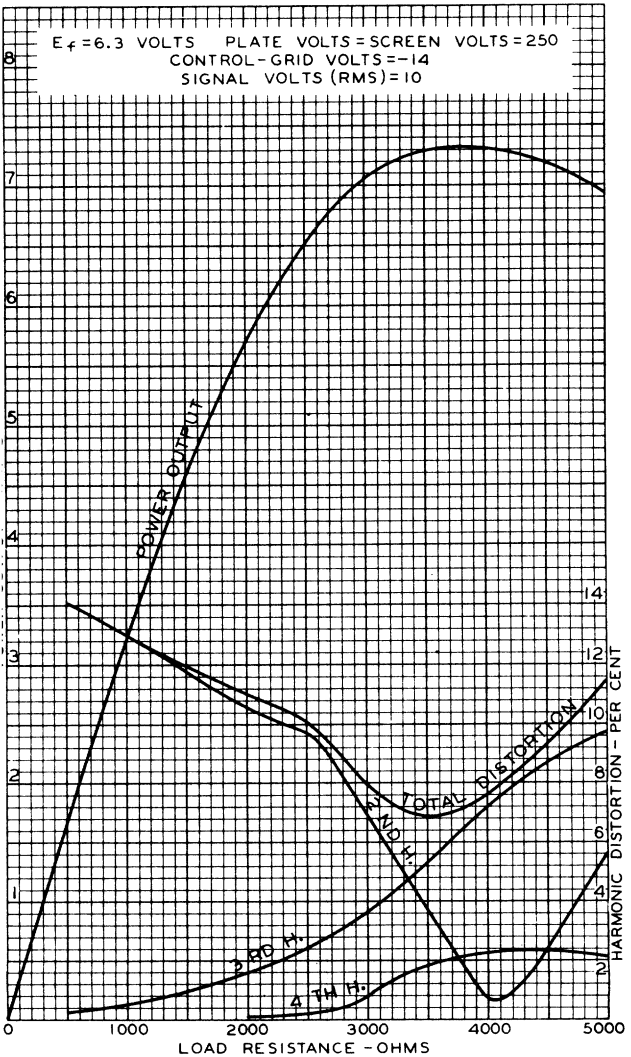
MAY 8, 1936

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-4580RI

6L6

OPERATION CHARACTERISTICS



MAY 7, 1936

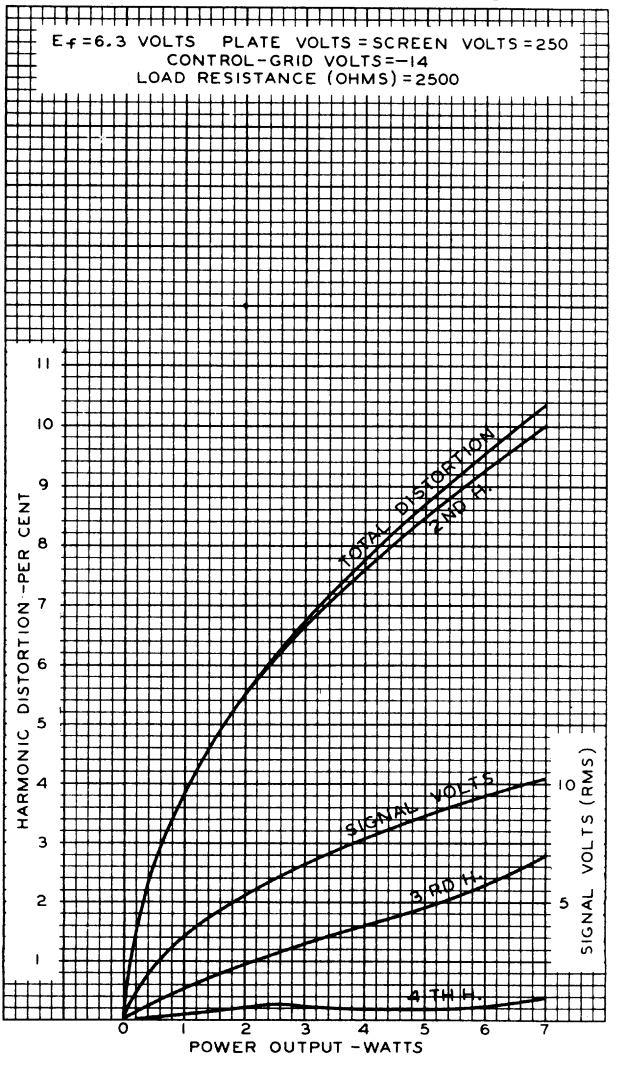
RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-4608

6L6

6L6

OPERATION CHARACTERISTICS



MAY 7,1936

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-4609

6L6-GC

Beam Power Tube

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.9	amp
Direct Interelectrode Capacitances (Approx.):▲		
Grid-No.1 to plate	0.6	μμf
Grid-No.1 to cathode & grid No.3, grid No.2, and heater	10	μμf
Plate to cathode & grid No.3, grid No.2, and heater	6.5	μμf

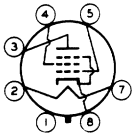
Characteristics, Class A_1 Amplifier:

Plate Voltage	250	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 Voltage	-14	volts
Plate Resistance (Approx.)	22500	ohms
Transconductance	6000	μmhos
Plate Current	72	ma
Grid-No.2 Current	5	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	4-1/4"
Maximum Seated Length	3-11/16"
Diameter	1.438" to 1.562"
Bulb	T-12
Base	Medium-Shell Octal 7-Pin (JEDEC Group 1, No.B7-12), Short Medium-Shell Octal 7-Pin with External Barriers Style A (JEDEC Group 1, No.B7-111) or Style B (JEDEC Group 1, No.B7-119), or Short Medium-Shell Octal 6-Pin with External Barriers Style A (JEDEC Group 1, No.B6-148) or Style B (JEDEC Group 1, No.B6-122)
Basing Designation for BOTTOM VIEW	7AC

Pin 1● - No Connection
Pin 2 - Heater
Pin 3 - Plate
Pin 4 - Grid No.2



Pin 5 - Grid No.1
Pin 7 - Heater
Pin 8 - Cathode, Grid No.3

AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	500	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	450	max.	volts
GRID-No.2 INPUT	5	max.	watts
PLATE DISSIPATION	30	max.	watts

PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode. . 200 max. volts
Heater positive with respect to cathode. . 200★ max. volts

Typical Operation and Characteristics:

Fixed-Bias Operation

Plate Voltage	200	250	300	350	volts
Grid-No.2 Voltage	200	250	200	250	volts
Grid-No.1 (Control-Grid) Voltage	-11.5	-14	-12.5	-18	volts
Peak AF Grid-No.1 Voltage	11.5	14	12.5	18	volts
Zero-Signal Plate Current	52	72	48	54	ma
Max.-Signal Plate Current	57	79	55	66	ma
Zero-Signal Grid-No.2 Current	3.5	5	2.5	2.5	ma
Max.-Signal Grid-No.2 Current	5.7	7.3	4.7	7	ma
Plate Resistance (Approx.)	35000	22500	35000	33000	ohms
Transconductance	5300	6000	5300	5200	μmhos
Load Resistance	3000	2500	4500	4200	ohms
Total Harmonic Distortion	9	10	11	15	%
Max.-Signal Power Output	4	6.5	6.5	10.8	watts

Cathode-Bias Operation

Plate Supply Voltage	200	250	300	volts
Grid-No.2 Supply Voltage	200	250	200	volts
Cathode Resistor	186	167	218	ohms
Peak AF Grid-No.1 Voltage	11.5	14	12.7	volts
Zero-Signal Plate Current	55	75	51	ma
Max.-Signal Plate Current	56	78	54.5	ma
Zero-Signal Grid-No.2 Current	4.2	5.4	3	ma
Max.-Signal Grid-No.2 Current	5.6	7.2	4.6	ma
Load Resistance	3000	2500	4500	ohms
Total Harmonic Distortion	9	10	11	%
Max.-Signal Power Output	4	6.5	6.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:
For fixed-bias operation . . . . . 0.1 max. megohm
For cathode-bias operation . . . . . 0.5 max. megohm

AF POWER AMPLIFIER — Class A_1

Triode Connection — Grid No.2 Connected to Plate

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE. . . . . 450 max. volts
PLATE DISSIPATION. . . . . 30 max. watts
PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode. . 200 max. volts
Heater positive with respect to cathode. . 200★ max. volts

Typical Operation and Characteristics:

	Fixed Bias	*Cathode Bias*	
Plate Supply Voltage	250	250	volts
Grid-No.1 (Control-Grid) Voltage	-20	-	volts
Cathode Resistor	-	490	ohms
Peak AF Grid-No.1 Voltage	20	20	volts
Zero-Signal Plate Current	40	40	ma
Maximum-Signal Plate Current	44	42	ma
Plate Resistance (Approx.)	1700	-	ohms
Amplification Factor	8	-	
Transconductance	4700	-	μmhos
Load Resistance	5000	6000	ohms
Total Harmonic Distortion	5	6	%
Maximum-Signal Power Output	1.4	1.3	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:
- For fixed-bias operation . . . . . 0.1 max. megohm
- For cathode-bias operation . . . . . 0.5 max. megohm

PUSH-PULL AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	500 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	450♦ max.	volts
GRID-No.2 INPUT	5 max.	watts
PLATE DISSIPATION	30 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200★ max.	volts

Typical Operation and Characteristics:

Unless otherwise specified, values are for 2 tubes

	Fixed Bias		*Cathode Bias*		
Plate Supply Voltage	250	270	250	270	volts
Grid-No.2 Supply Voltage	250	270	250	270	volts
Grid-No.1 Voltage	-16	-17.5	-	-	volts
Cathode Resistor	-	-	124	124	ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage	32	35	35.6	28.2	volts
Zero-Signal Plate Current	120	134	120	134	ma
Max.-Signal Plate Current	140	155	130	145	ma
Zero-Signal Grid-No.2 Current	10	11	10	11	ma
Max.-Signal Grid-No.2 Current	16	17	15	17	ma
Plate Resistance (Approx., per tube)	24500	23500	-	-	ohms
Transconductance (Per tube)	5500	5700	-	-	μmhos
Effective Load Resistance (Plate to plate)	5000	5000	5000	5000	ohms
Total Harmonic Distortion	2	2	2	2	%
Max.-Signal Power Output	14.5	17.5	13.8	18.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

PUSH-PULL AF POWER AMPLIFIER — Class AB_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	500 max.	volts
GRID-No.2 VOLTAGE	450♦ max.	volts
GRID-No.2 INPUT	5 max.	watts
PLATE DISSIPATION	30 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200★ max.	volts

Typical Operation:

Values are for 2 tubes

	Fixed Bias			*Cathode Bias*	
Plate Supply Voltage	360	450	450	360	volts
Grid-No.2 Supply Voltage	270	350	400	270	volts
Grid-No.1 (Control-Grid) Voltage♦	-22.5	-30	-37	-	volts
Cathode Resistor	-	-	-	248	ohms
Peak Af Grid-No.1-to-Grid-No.1 Voltage	45	60	70	40.6	volts
Zero-Signal Plate Current	88	95	116	88	ma
Max.-Signal Plate Current	132	194	210	100	ma
Zero-Signal Grid-No.2 Current	5	3.4	5.6	5	ma
Max.-Signal Grid-No.2 Current	15	19.2	22	17	ma
Effective Load Resistance (Plate to plate)	6600	6000	5600	9000	ohms
Total Harmonic Distortion	2	1.5	1.8	4	%
Max.-Signal Power Output	26.5	50	55	24.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:♦		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

PUSH-PULL AF AMPLIFIER — Class AB_2

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	500 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	450♦ max.	volts
GRID-No.2 INPUT	5 max.	watts
PLATE DISSIPATION	30 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200★ max.	volts

Typical Operation:

Values are for 2 tubes

		Fixed Bias	
Plate Voltage	360	360	volts
Grid-No.2 Voltage	225	270	volts
Grid-No.1 (Control-Grid) Voltage♦	-18	-22.5	volts
Peak AF Grid-No.1 to Grid-No.1 Voltage	52	72	volts
Zero-Signal Plate Current	78	88	ma
Max.-Signal Plate Current	142	205	ma
Zero-Signal Grid-No.2 Current	3.5	5	ma
Max.-Signal Grid-No.2 Current	11	16	ma
Effective Load Resistance (Plate to plate)	6000	3800	ohms
Peak Grid-Input Power♠	140	270	mw
Total Harmonic Distortion	2	2	%
Max.-Signal Power Output	31	47	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:♠	
For fixed-bias operation	0.1 max. megohm
For cathode-bias operation	Not recommended

▲ Without external shield.

● On the 6-pin bases, pin 1 as well as pin 6 is omitted.

★ The dc component must not exceed 100 volts.

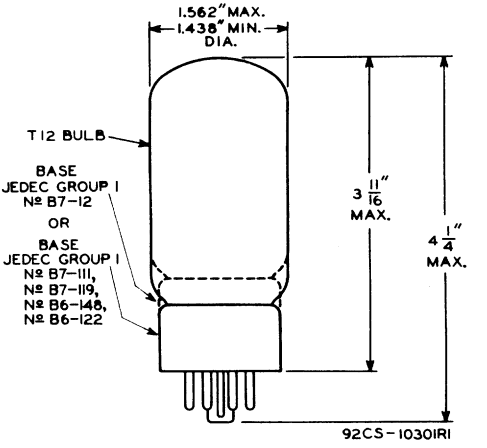
♦ In push-pull circuits where grid No.2 of each tube is connected to a tap on the plate winding of the output transformer, it is permissible for this voltage to be as high as 500 volts.

♦ The type of input coupling used should not introduce too much resistance in the grid-No.1 circuit. Transformer- or impedance-coupling devices are recommended.

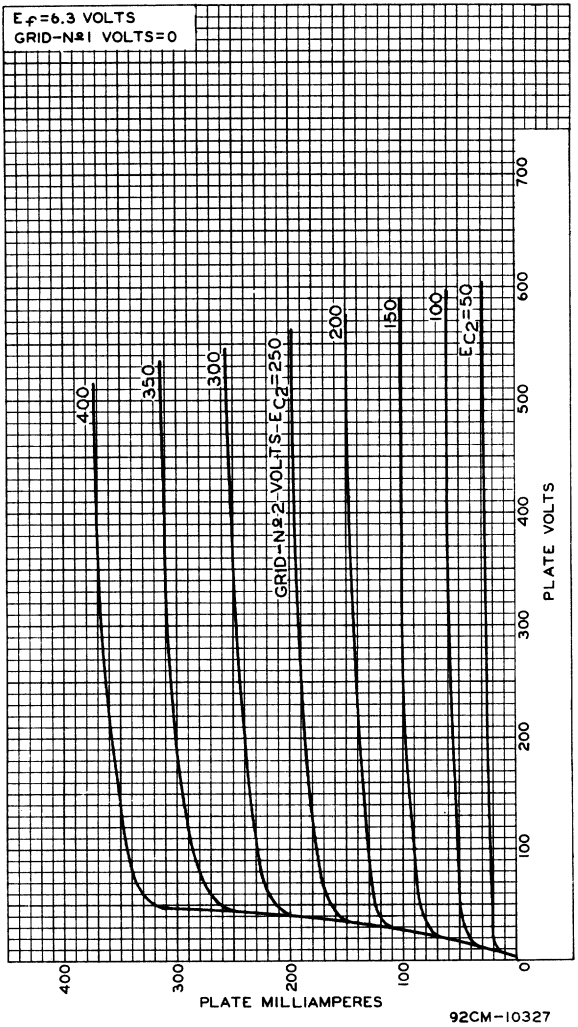
♠ Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the AB_2 stage. To minimize distortion, the effective resistance per grid-No.1 circuit of the AB_2 stage should be held at a low value. For this purpose, the use of transformer coupling is recommended.

OPERATING CONSIDERATIONS

The *bulb* becomes hot during operation. To insure adequate cooling, therefore, it is essential that free circulation of air be provided.

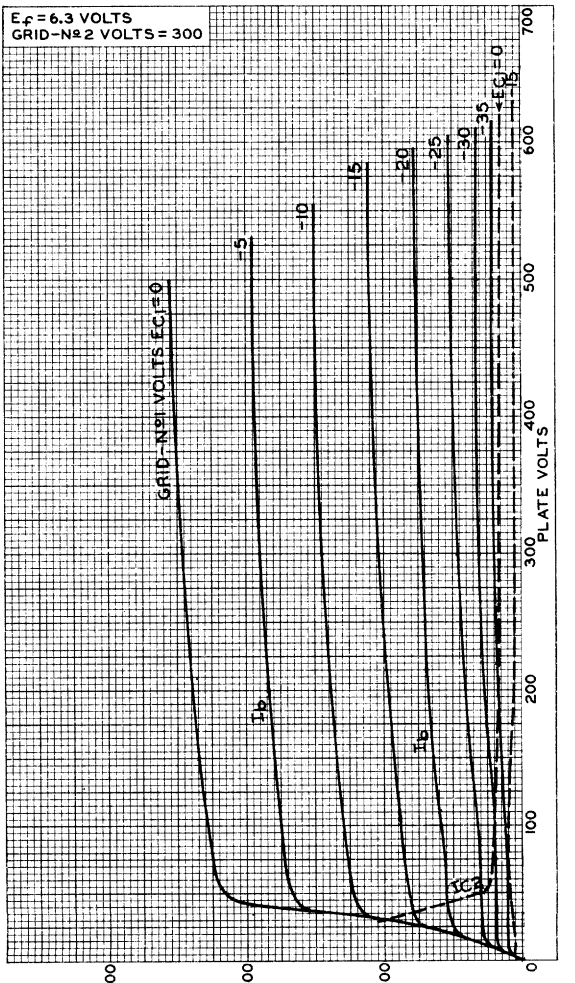

1.562" MAX.
1.438" MIN.
DIA.
T12 BULB
BASE
JEDEC GROUP 1
Nº B7-12
OR
BASE
JEDEC GROUP 1
Nº B7-111,
Nº B7-119,
Nº B6-148,
Nº B6-122
3 11/16" MAX.
4 1/4" MAX.
92CS-10301RI

AVERAGE PLATE CHARACTERISTICS



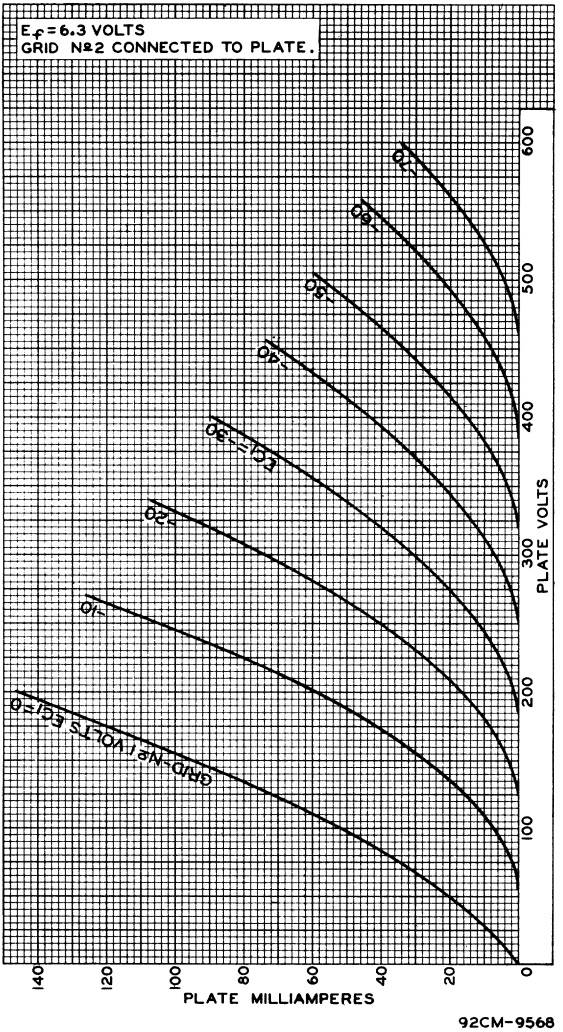
6L6-GC

AVERAGE CHARACTERISTICS



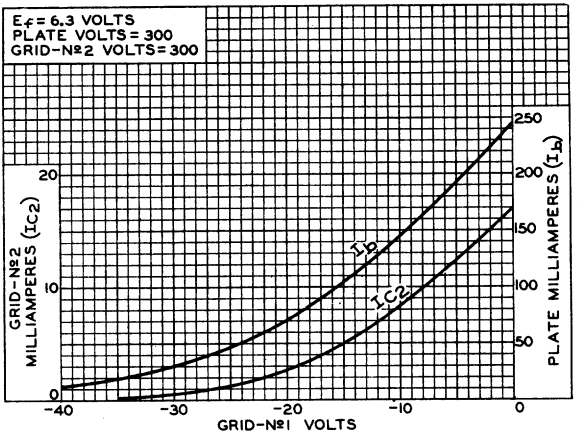
92CM-10133

AVERAGE PLATE CHARACTERISTICS
Triode Connection



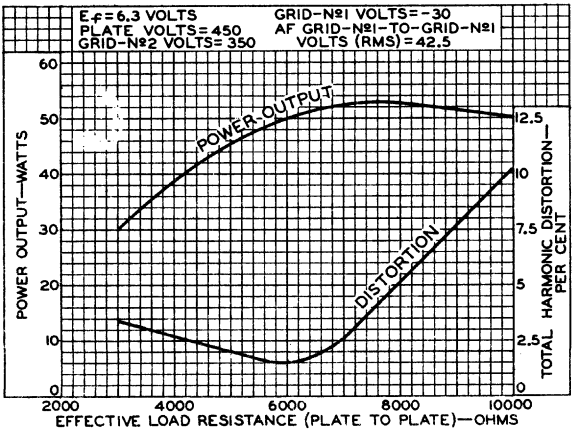
92CM-9568

AVERAGE CHARACTERISTICS



92CS-10126

OPERATION CHARACTERISTICS
Push-Pull Class AB_1



92CS-9575

Beam Power Tube

Duodecar Type

For Color-TV Horizontal-Deflection Amplifier Circuits Using 240 V to over 400 V "B" Supplies

ELECTRICAL CHARACTERISTICS – Bogey Values

Heater Voltage, ac or dc. . .	E_h			6.3		V
Heater Current	I_h			2.25		A
Direct Interelectrode Capacitances:[a]						
Grid No.1 to plate	c_{g1-p}			0.44		pF
Input: G1 to (K,G3,G2,H) .	c_i			33		pF
Output: P to (K,G3,G2,H).	c_o			18		pF
For the following characteristics, see Conditions below:						
Amplification Factor (Triode Connection)[b] . . .	μ	–	–	–	4[c]	
Plate Resistance (approx.)	r_p	–	–	–	6600	Ω
Transconductance	g_m	–	–	–	13400	μmho
DC Plate Current	I_b	–	900[d]	560[d]	105	mA
DC Grid-No.2 Current. . . .	I_{c2}	–	110[d]	46[d]	2.0	mA
Cutoff DC Grid-No.1 Voltage for I_b = 1 mA	$E_{c1(co)}$	-125	–	–	-40	V
Conditions:						
Heater Voltage	E_h	←		6.3	→	V
Peak Positive-Pulse Plate Voltage[e]	e_{bm}	5000	–	–	–	V
DC Plate Voltage	E_b	–	45	50	150	V
Grid No.3		Connected to cathode at socket				
DC Grid-No.2 Voltage . . .	E_{c2}	110	160	110	110	V
DC Grid-No.1 Voltage . . .	E_{c1}	–	0	–	-20	V

MECHANICAL CHARACTERISTICS

Maximum Overall Length. . . . . 4.375 in (111.12 mm)
Maximum Seated Length . . . . . 4.000 in (101.6 mm)
Maximum Diameter. . . . . 1.563 in (39.7 mm)
Dimensional Outline . . . . . JEDEC No.12-90
Envelope. . . . . JEDEC T12
Top Cap[f] . . . . . Small (JEDEC C1-1 or C1-34)

Base . . . . . Large-Button Duodecar 12-Pin (JEDEC E12-74)
Terminal Diagram . . . . . .JEDEC 12GJ
Type of Cathode . . . . . Coated Unipotential
Operating Position . . . . . .Any

MAXIMUM RATINGS – Design-Maximum Values[g]

For operation as a Horizontal-Deflection-Amplifier Tube in a 525-line, 30-frame system

DC Plate Supply Voltage	E_{bb}	990	V
Peak Positive-Pulse Plate Voltage[h] . .	e_{bm}	7000[k]	V
Peak Negative-Pulse Plate Voltage . .	$-e_{bm}$	100	V
DC Grid-No.3 Voltage	E_{c3}	0	V
DC Grid-No.2 (Screen-Grid) Voltage . .	E_{c2}	200	V
Peak Negative-Pulse Grid-No.1 (Control-Grid) Voltage	$-e_{c1m}$	300	V
Heater-Cathode Voltage:			
Peak	e_{hkm}	±200	V
Average[m]	E_{hk}	100	V
Heater Voltage, ac or dc	E_h	5.7 to 6.9	V
Cathode Current:			
Peak	i_{km}	1100	mA
Average[m]	$I_{k(av)}$	315	mA
Grid-No.2 Input	P_{g2}	5.0	W
Plate Dissipation[n]	P_b	30	W
Envelope Temperature	T_E	200[p]	°C

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance . . . . . With Feedback-Type High Voltage Regulation	R_{g1}	1.2	MΩ
Grid-No.1-Circuit Resistance . . . . . With Shunt-Type High Voltage Regulation	R_{g1}	10	MΩ
Grid-No.3-Circuit Resistance	R_{g3}	0	Ω

[a] Measured without external shield in accordance with the current issue of EIA Standard RS-191.

[b] With grid No.3 and grid No.2 connected, respectively, to cathode and plate at socket.

[c] Conditions: $E_b = E_{c2} = 125$ V, $E_{c1} = -25$ V.

[d] This value can be measured by a method involving a recurrent waveform such that the Maximum Ratings of the tube will not be exceeded.

[e] Under pulse-duration condition specified in Footnote h.

[f] Designed to mate with connector of 0.250-inch cap, generally available from your local RCA distributor.

[g] As defined in the current issue of EIA Standard RS-239, unless otherwise specified.

[h] This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10 μs.

[k] Absolute-Maximum Value.

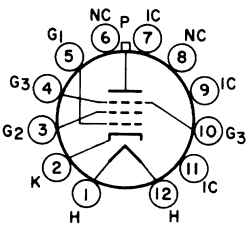
[m] Measured with a DC meter.

[n] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

[p] This rating is applicable when measurement is made using a thermocouple attached to a 0.1-inch wide phosphor-bronze ring placed at the hottest location on the envelope. A maximum rating of 220°C is applicable to direct thermocouple measurements taken at the hottest point on the envelope surface.

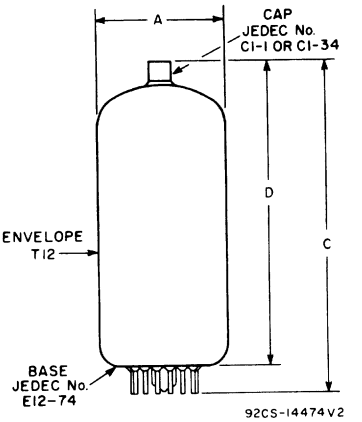
TERMINAL DIAGRAM (Bottom View)

Pin 1 – Heater
Pin 2 – Cathode
Pin 3 – Grid No.2
Pin 4 – Grid No.3
Pin 5 – Grid No.1
Pin 6 – No Internal Connection
Pin 7 – Do Not Use
Pin 8 – No Internal Connection
Pin 9 – Do Not Use
Pin 10 – Grid No.3
Pin 11 – Do Not Use
Pin 12 – Heater
Cap – Plate



JEDEC 12GJ

DIMENSIONAL OUTLINE (JEDEC No.12-90)



DIMENSION	INCHES		MILLIMETERS	
	Min.	Max.	Min.	Max.
A	1.437*	1.563	36.5*	39.7
C	–	4.375	–	111.12
D	3.750	4.000	95.3	101.6
MILLIMETER DIMENSION DERIVED FROM INCH DIMENSION				
* Applies to the minimum diameter except in the area of the seal.				

6LC8

High-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

For Sync-Separator and Noise-Immune Gated-AGC-Amplifier Applications in Color and Black-and White TV Receivers

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:			
Voltage (AC or DC) . . .	6.3[a]	6.3 ± 0.6	volts
Current.	0.600 ± 0.040	0.600[b]	amp
Warm-up time (Average) .	11	–	sec
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode	200 max.		volts
Heater positive with respect to cathode	200[c] max.		volts
Direct Interelectrode Capacitances:[d]			
Triode Unit:			
Grid to plate.	2.2		pf
Grid to cathode & pentode grid No.3 & internal shield, and heater	2.8		pf
Plate to cathode & pentode grid No.3 & internal shield, and heater	2.2		pf
Pentode Unit:			
Grid No.1 to plate	0.1 max.		pf
Grid No.1 to cathode, triode cathode & grid No.3 & internal shield, grid No.2, and heater	10.0		pf
Grid No.3 & triode cathode & internal shield to plate . .	3.4		pf
Grid No.1 to grid No.3 & triode cathode & internal shield	0.36		pf
Grid No.3 & triode cathode & internal shield to plate, cathode, grid No.2, grid No.1, and heater.	12.5		pf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*	
Plate Supply Voltage	200	150	volts
Grid No.3.	–	[e]	

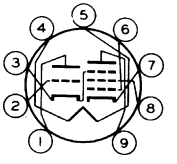
6LC8

	Triode Unit	*Pentode Unit*	
Grid-No.2 Supply Voltage	–	100	volts
Grid-No.1 Voltage	−2	–	volts
Grid No.1	–	e	
Cathode Resistor	–	180	ohms
Amplification Factor	70	–	
Plate Resistance (Approx.)	17500	100000	ohms
Transconductance, Grid No.1 to Plate	4000	4400	μmhos
Transconductance, Grid No.3 to Plate[f]	–	600	μmhos
Plate Current	4	4	ma
Grid-No.2 Current	–	2.8	ma
Grid-No.1 Supply Voltage (Approx.) for plate μa =			
10	−5	–	volts
20	–	−4	volts
Grid-No.3 Supply Voltage (Approx.) for plate μa = 20[f]	–	−7	volts

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ±3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	90Y

Pin 1 – Triode Plate
Pin 2 – Triode Grid
Pin 3 – Triode Cathode, Pentode Grid No.3, Internal Shield
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Pentode Grid No.1
Pin 7 – Pentode Cathode
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate

GATED AGC AMPLIFIER & NOISE INVERTER

Pentode Unit

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[g]

DC PLATE VOLTAGE	300 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[h]	600 max.	volts

GRID-No.3 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	100 max.	volts
Positive-bias value	0 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	300 max.	volts
GRID-No.2 VOLTAGE	See *Grid-No.2-Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	50 max.	volts
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 150 volts	1.1 max.	watts
For grid-No.2 voltages between 150 and 300 volts	See *Grid-No.2-Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	2 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.5 max.	megohm
For cathode-bias operation	1 max.	megohm

AMPLIFIER — Class A_1

Triode Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	300 max.	volts
GRID VOLTAGE:		
Negative-bias value	50 max.	volts
Positive-bias value	0 max.	volts
PLATE DISSIPATION	1.1 max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	1 max.	megohm

[a] At heater amperes = 0.600.

[b] At heater volts = 6.3.

[c] The dc component must not exceed 100 volts.

[d] Without external shield.

[e] Connected to negative end of cathode resistor.

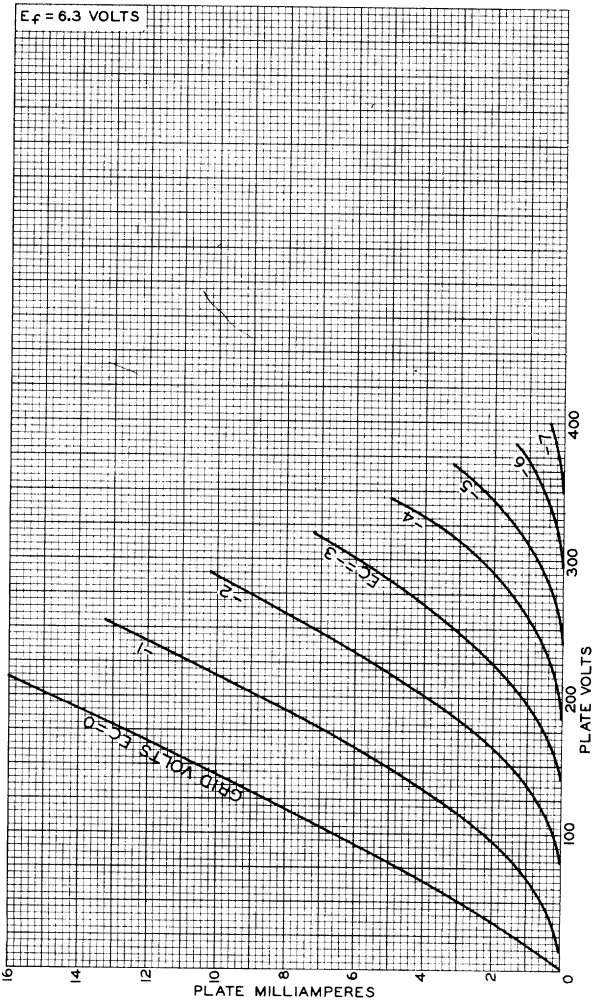
[f] With no external connection to triode plate and triode grid.

[g] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[h] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

6LC8

AVERAGE PLATE CHARACTERISTICS
Triode Unit



92CM-8644

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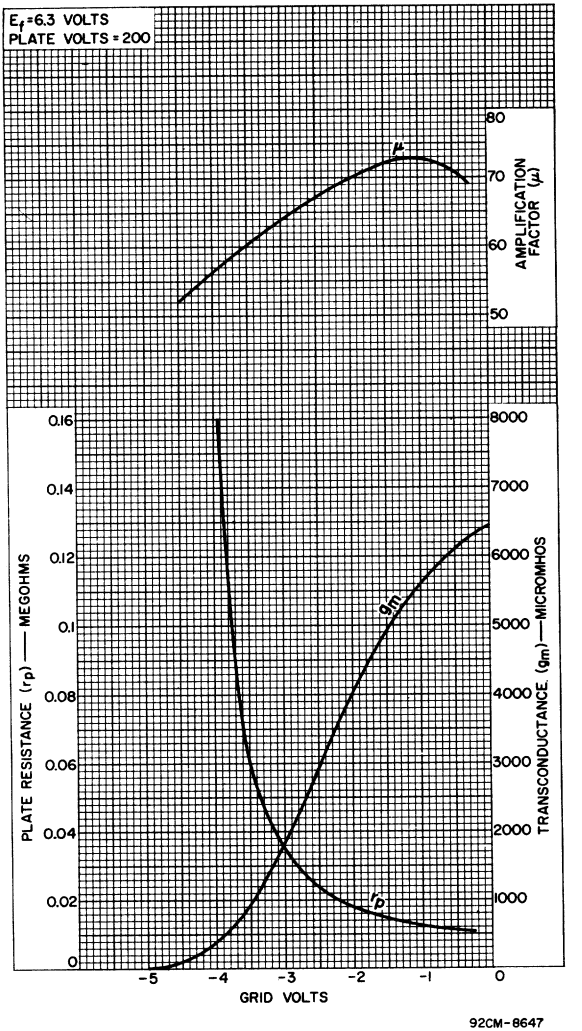
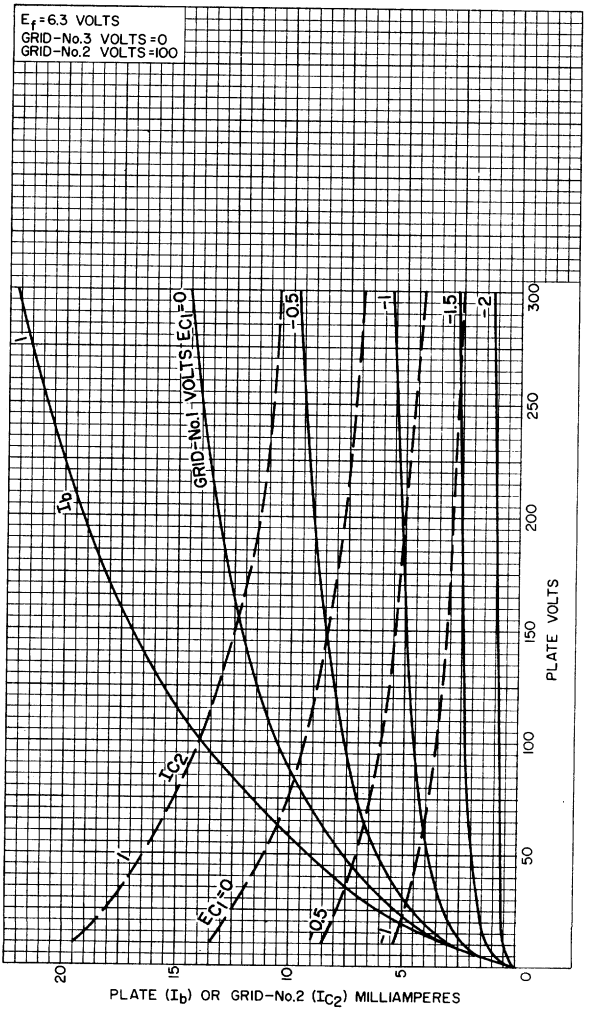
AVERAGE CHARACTERISTICS
Triode Unit



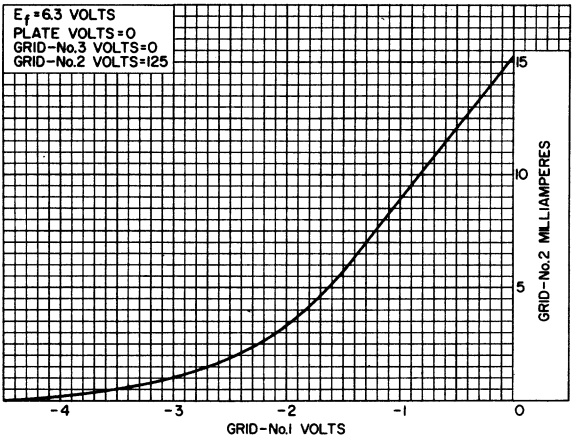
6LC8

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-11594

AVERAGE CHARACTERISTICS
Pentode Unit



92CS-11603

Twin Dual-Control Pentodes

9-PIN MINIATURE TYPE

COMMON-CATHODE, GRID No.1 & GRID No.2 · DARK HEATER

For Combined Color Demodulator and Matrix Amplifier Applications in Color TV Receivers Having High-Level Demodulation Systems

ELECTRICAL CHARACTERISTICS

		Bogey Values	
Heater Voltage, AC or DC	E_f	6.3	V
Heater Current	I_f	760	mA
Direct Interelectrode Capacitances			
Without external shield			
G3 to P (each unit, with other unit connected to ground)	c_{g3-p}	2.7	pF
G1 to (K, P_{P2}, P_{P1}, $G3_{P2}$, $G3_{P1}$, G2, H)	c_{g1-all}	15.5	pF
$G3_{P1}$ to (K, P_{P2}, P_{P1}, $G3_{P2}$, G2, G1, H) / $G3_{P2}$ to (K, P_{P2}, P_{P1}, $G3_{P1}$, G2, G1, H)	c_{g3-all}	6.0	pF
P_{P1} to (K, P_{P2}, $G3_{P2}$, $G3_{P1}$, G2, G1, H) / P_{P2} to (K, P_{P1}, $G3_{P2}$, $G3_{P1}$, G2, G1, H)	c_{p-all}	3.7	pF
$G3_{P1}$ to $G3_{P2}$	c_{g3-g3}	0.10	pF
For the following characteristics, with both units operating, see **Conditions**			
Plate Resistance, Approx., each unit	r_p	50000	Ω
Grid-No.1-to-Plate Transconductance, Each unit	$g_{m(g1p)}$	5800	μmhos
Grid-No.3-to-Plate Transconductance, Each unit	$g_{m(g3p)}$	350	μmhos
DC Plate Current, Each unit	I_b	7.6	mA
DC Grid-No.2 Current[a]	I_{c2}	14.5	mA
Cutoff DC Grid-No.1 Voltage, Approx., each unit, For I_b = 100 μA	$E_{c1(co)}$	-6.3	V
Cutoff DC Grid-No.3 Voltage[b], Approx., each unit, For I_b = 100 μA	$E_{c3(co)}$	-16.5	V
	Conditions		
Heater Voltage	E_f	6.3	V
DC Plate Voltage, Each unit	E_b	100	V
DC Grid-No.3 (Control-Grid) Voltage, Each unit	E_{c3}	0	V
DC Grid-No.2 (Screen-Grid) Voltage	E_{c2}	100	V
DC Grid-No.1 (Control-Grid) Voltage	E_{c1}	-2.5	V

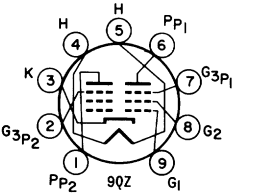
6LE8

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3-1/16 in
Maximum Seated Length	3-13/16 in
Length, Base Seat to Bulb Top Excluding tip	2-7/16 ± 3/32 in
Diameter	0.750 to 0.875 in
Envelope	JEDEC T6-1/2
Dimensional Outline (JEDEC 6-4)	See *General Section*
Base	Small-Button Noval 9-Pin (JEDEC E9-1)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Plate of Unit No.2
Pin 2 – Grid No.3 of Unit No.2
Pin 3 – Cathode
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Plate of Unit No.1
Pin 7 – Grid No.3 of Unit No.1
Pin 8 – Grid No.2
Pin 9 – Grid No.1



DESIGN MAXIMUM RATINGS

DC Plate Voltage (Each unit)	E_b	300	V
DC Grid-No.2 Voltage	E_{c2}	150	V
Heater-Cathode Voltage			
Peak	e_{hkm}	+200	V
		-300	V
Average[c]	$E_{hk(av)}$	100	V
Heater Voltage, AC or DC	E_f	5.7 to 6.9	V
Grid-No.2 Input	P_{g2}	2	W
Plate Dissipation (Each unit)	P_b	2	W

[a] Units in parallel (P_{P1} connected to P_{P2}; $G3_{P1}$ connected to $G3_{P2}$).

[b] For this test, E_{c1} = -3 V so that the Grid-No.2 Input rating will not be exceeded.

[c] Measured with a dc meter.

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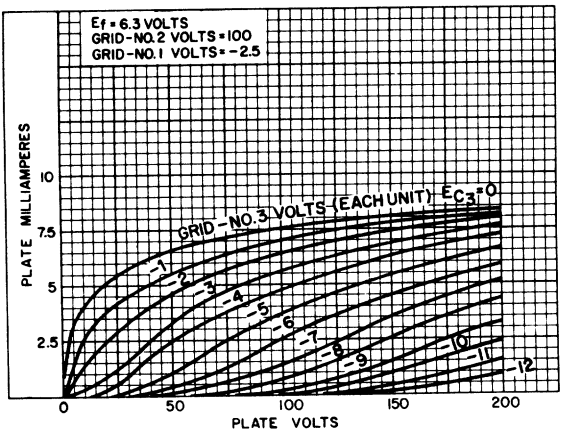
Typical Plate Characteristics

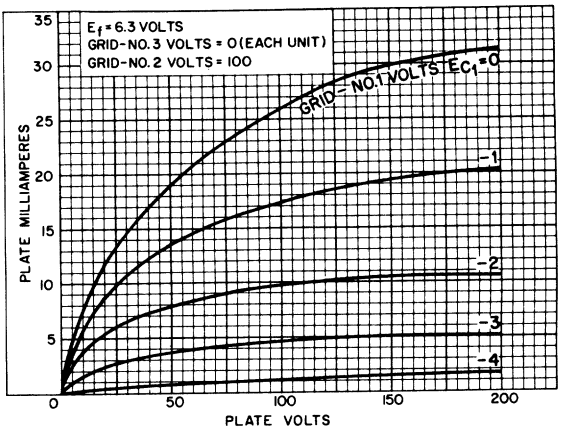
Each Unit, with Both Units Operating



92CS-13459

Typical Plate Characteristics

Each Unit, with Both Units Operating



92CS-13460

High-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

For Video-Amplifier Service in Color-TV Receivers and Other Applications Using Positive Triode-Grid Operation

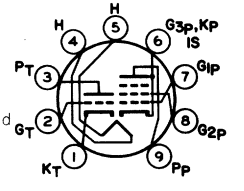
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6[a]	volts
Current at heater volts = 6.3	0.600[b]	amp
Warm-up time (Average)	11	sec
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[c] max.	volts
Direct Interelectrode Capacitances:[d]		
Triode Unit:		
G_T to P_T	2.2	pf
Input: G_T to (K_T,Kp+G3p+IS,H)	3.2	pf
Output: P_T to (K_T,Kp+G3p+IS,H)	1.8	pf
Pentode Unit:		
G1p to Pp	0.060 max.	pf
Input: $G1_p$ to (Kp+G3p+IS,G2p,H)	10	pf
Output: P_p to (Kp+G3p+IS,G2p,H)	3.6	pf
$G1_p$ to P_T	0.008 max.	pf
P_p to P_T	0.15 max.	pf

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ±3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9DX

Pin 1 – Triode Cathode
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Cathode, Grid No.3, Internal Shield
Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate



6LF8

Characteristics, Class A Amplifier:

	Triode Unit		*Pentode Unit*		
Plate Voltage	200	40	75	100	volts
Grid-No.2 Voltage	-	-	150	150	volts
Grid-No.1 Voltage	-2	+3	0	-2.5	volts
Amplification Factor	70	40	-	-	
Plate Resistance (Approx.)	17500	10000	-	200000	ohms
Transconductance	4000	4000	-	11000	μmhos
Plate Current	4	11	50[e]	20	ma
Grid-No.2 Current	-	-	12[e]	5	ma
Grid-No.1 Current	0	2.7	0	0	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-5	-	-	-8	volts

AMPLIFIER — Class A[f]

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit as Class A_1 or A_2 Amplifier	*Pentode Unit as Class A_1 Amplifier*	
Plate Voltage	330 max.	330 max.	volts
Grid-No.2 (Screen-Grid) Supply Voltage	-	330 max.	volts
Grid-No.2 Voltage	-	See *Grid-No.2-Input Rating Chart* at front of Receiving Tube Section	
Grid-No.1 (Control-Grid) Voltage:			
Negative-bias value	55 max.	55 max.	volts
Positive-bias value	4 max.	0 max.	volts
Grid-No.1 Current	8 max.	0 max.	ma
Grid-No.2 Input:			
For grid-No.2 voltages up to 165 volts	-	1.1 max.	watts
For grid-No.2 voltages between 165 and 330 volts	-	See *Grid-No.2-Input Rating Chart* at front of Receiving Tube Section	
Plate Dissipation	1.1 max.	3.75 max.	watts

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5 max.	0.25 max.	megohm
For cathode-bias operation	1 max.	1 max.	megohm

[a] For parallel heater operation.

[b] For series heater operation current must be limited to 0.600 ± 0.040 amperes.

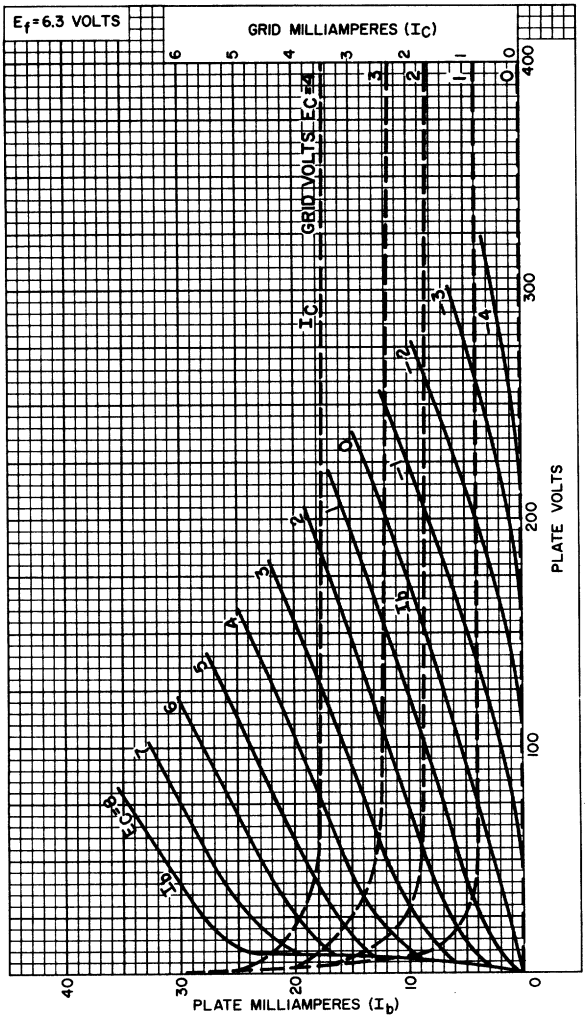
[c] The dc component must not exceed 100 volts.

[d] Without external shield.

[e] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

[f] A Class A Amplifier is an amplifier in which the grid bias and varying grid voltages are such that plate current flows at all times. The subscript 1 added to the class letter denotes that *grid current* does not flow during any part of the input cycle. The subscript 2 denotes that *grid current* flows during some part of the cycle.

AVERAGE CHARACTERISTICS
Triode Unit



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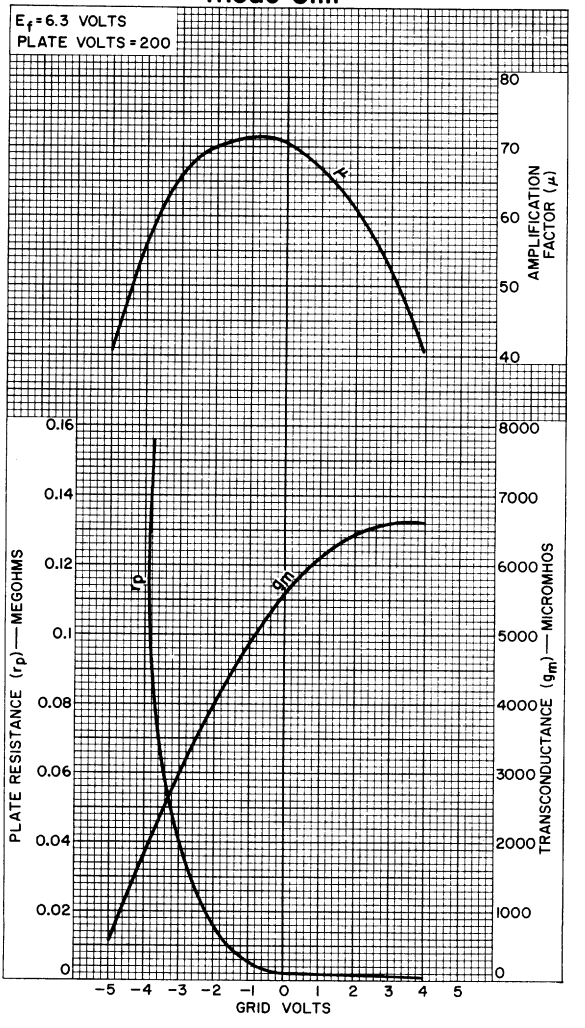
6LF8

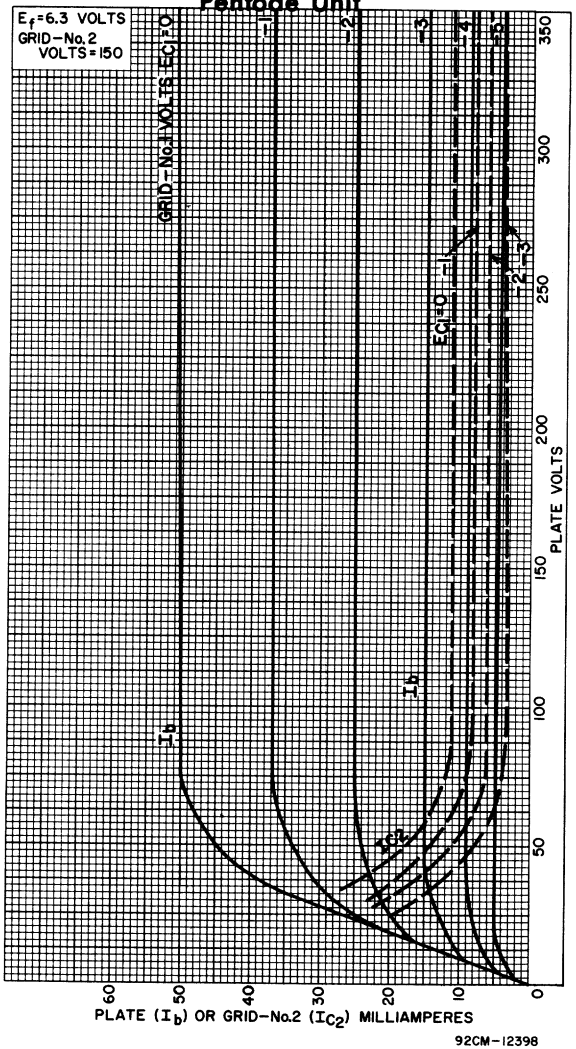
AVERAGE CHARACTERISTICS
Triode Unit



92CM-12388

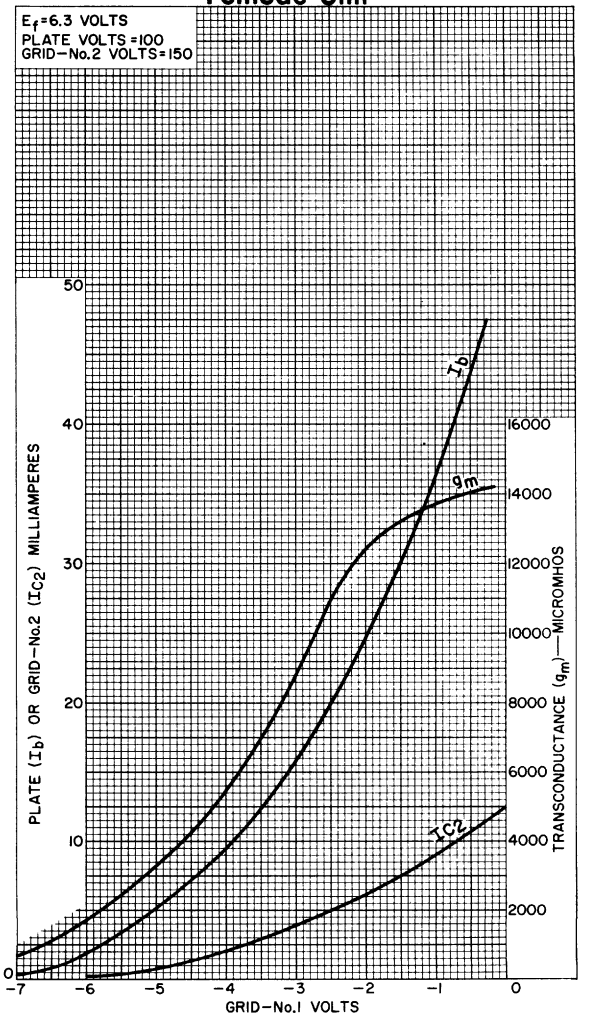
AVERAGE CHARACTERISTICS

Pentode Unit



6LF8

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-12403

6LM8

Medium-Mu Triode—
Semiremote-Cutoff Pentode

9-PIN MINIATURE TYPE

SEPARATE CATHODE BASE-PIN CONNECTIONS

For Color and Black-and-White TV Receivers. Pentode Unit is Particularly Suited for Burst-Amplifier Circuit in Color TV. Triode Unit is Useful as a General-Purpose Amplifier.

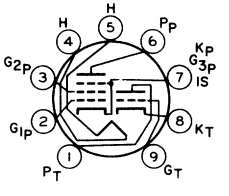
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.450	amp
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts
Direct Interelectrode Capacitances:[b]		
Triode Unit:		
Grid to plate	1.8	pf
Input: G_T to (K_T,K_P+$G3_P$+IS,H)	3.2	pf
Output: P_T to (K_T,K_P+$G3_P$+IS,H)	1.9	pf
Pentode Unit:		
Grid No.1 to plate	0.015 max.	pf
Input: $G1_P$ to (K_P+$G3_P$+IS,$G2_P$,H)	5.5	pf
Output: P_P to (K_P+$G3_P$+IS,$G2_P$,H)	3.8	pf
Heater to cathode (Each unit)	3.2	pf

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length from Base Seat to Bulb Top (Excluding Tip)	1-9/16" ±3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9AE

Pin 1 – Triode Plate
Pin 2 – Pentode Grid No.1
Pin 3 – Pentode Grid No.2
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Plate
Pin 7 – Pentode Cathode, Pentode Grid No.3, and Internal Shield
Pin 8 – Triode Cathode
Pin 9 – Triode Grid



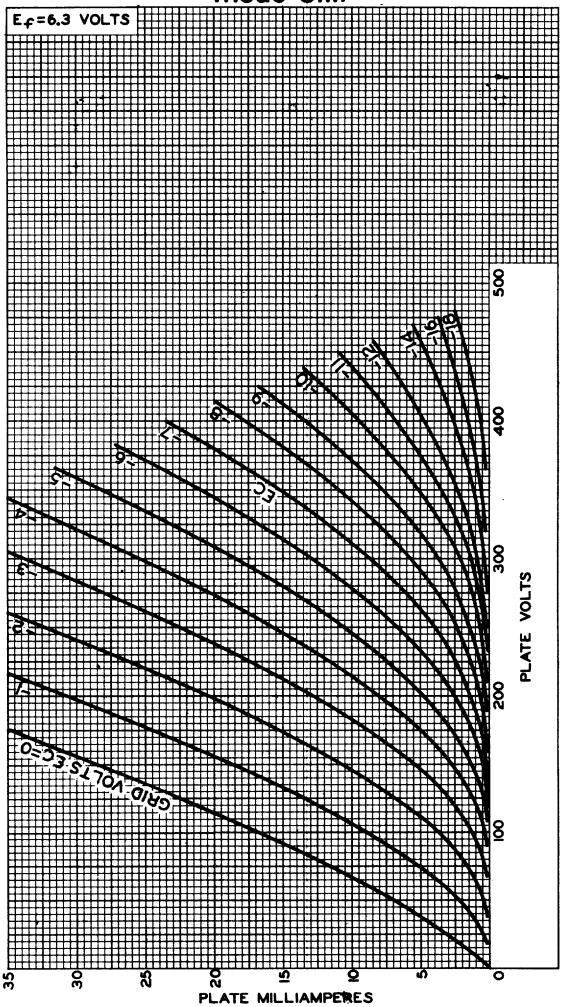
AMPLIFIER — Class A[1]

	Triode Unit	*Pentode Unit*	
Characteristics:			
Plate Voltage	125	125	volts
Grid-No.2 Voltage	–	125	volts
Grid-No.1 Voltage	-1	-2	volts
Amplification Factor	46	–	
Plate Resistance (Approx.)	5400	150000	ohms
Transconductance	8500	6000	μmhos
Plate Current	13.5	12	ma
Grid-No.2 Current	–	4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-8	-14	volts
Maximum Ratings, *Design-Maximum Values:*			
Plate Voltage	330 max.	350 max.	volts
Grid-No.2 (Screen-Grid) Supply Voltage	–	330 max.	volts
Grid-No.2 Voltage	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		
Grid-No.1 (Control-Grid) Voltage: Positive-bias value	0 max.	0 max.	volts
Grid-No.2 Input: For grid-No.2 voltages up to 165 volts	–	0.55 max.	watt
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		
Plate Dissipation	2.5 max.	2.5 max.	watts
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance: For fixed-bias operation	0.5 max.	0.25 max.	megohm
For cathode-bias operation	1 max.	0.5 max.	megohm

[a] The dc component must not exceed 100 volts.

[b] With external shield JEDEC No.315 measured in accordance with EIA Standard RS-191-A.

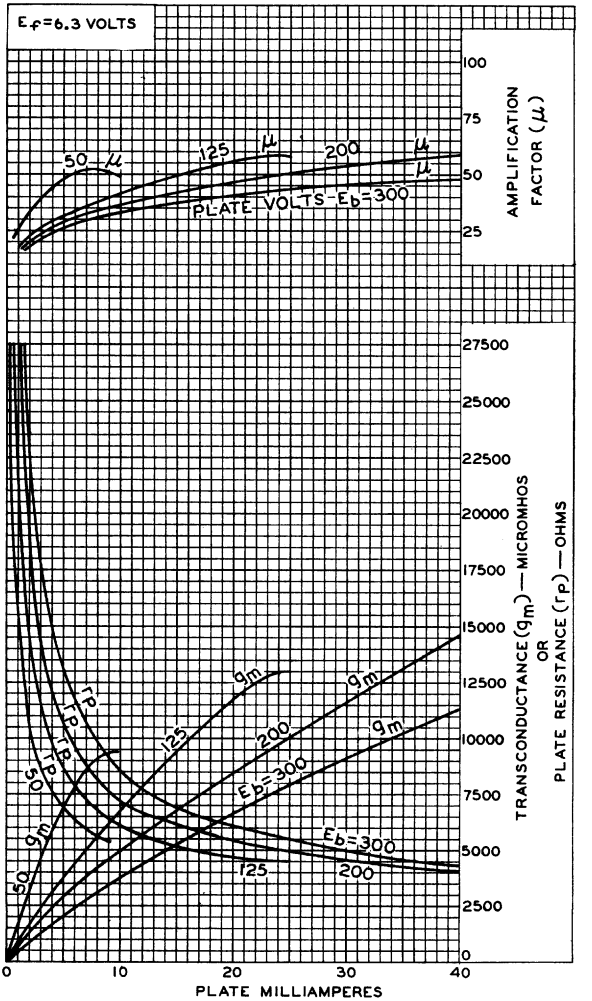
AVERAGE PLATE CHARACTERISTICS
Triode Unit



92CM-10421RI

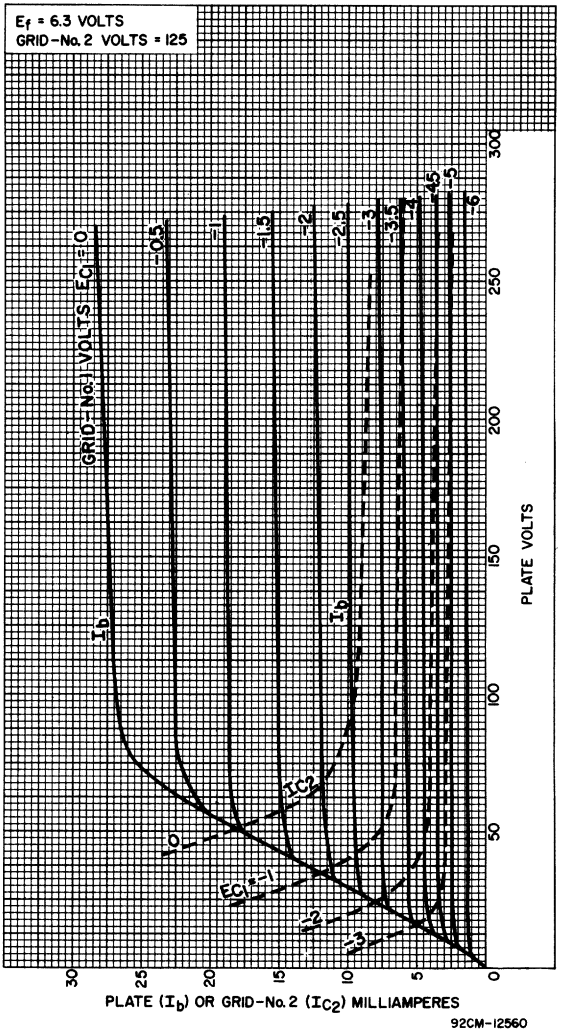
6LM8

AVERAGE CHARACTERISTICS
Triode Unit



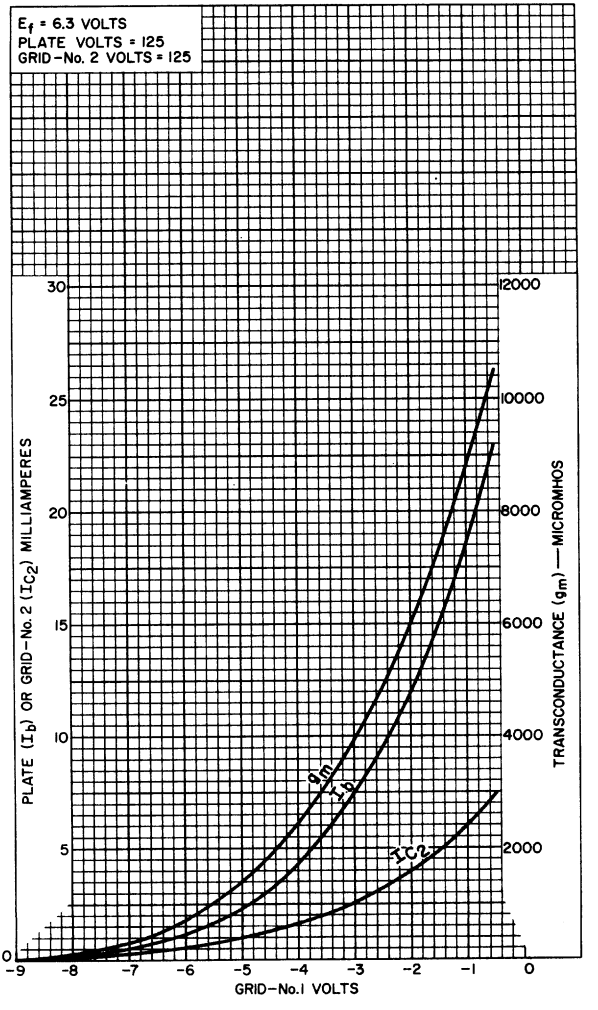
92CM—10428

AVERAGE CHARACTERISTICS
Pentode Unit



6LM8

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-12558

6LQ6

Beam Power Tube

Pb = 30 W **Novar Type** **Overload Pb = 200 W**

For Color-TV Horizontal-Deflection Amplifier Circuits Using 270 V to over 400 V "B" Supplies

ELECTRICAL CHARACTERISTICS—Bogey Values

Heater Voltage, ac or dc	E_h	6.3	V
Heater Current	I_h	2.5	A
Direct Interelectrode Capacitances:[a]			
Grid No.1 to plate	$c_{g1\text{-}p}$	0.56	pF
Input: G1 to (K,G3,G2,H)	c_i	22	pF
Output: P to (K,G3,G2,H)	c_o	11	pF

For the following characteristics, see Conditions below:

Amplification Factor (Triode Connection)[b]	μ	-	-	3[c]	-	-	2.8[d]	
Plate Resistance (Approx.)	r_p	-	-	5800	-	-	7000	Ω
Transconductance	g_m	-	-	9600	-	-	7500	μmho
DC Plate Current	I_b	-	580[e]	130	-	710[e]	95	mA
DC Grid-No.2 Current	I_{c2}	-	40[e]	2.8	-	55[e]	2.4	mA
Cutoff DC Grid-No.1 Voltage for I_b = 1 mA	$E_{c1(co)}$	-120	-	-54	-125	-	-60	V
Conditions:								
Heater Voltage	E_h	←		6.3		→		V
Peak Positive-Pulse Plate Voltage[f]	e_{bm}	5000	-	-	5000	-	-	V
DC Plate Voltage	E_b	-	55	175	-	60	175	V
DC Grid-No.3 Voltage	E_{c3}	30	30	30	30	30	30	V
DC Grid-No.2 Voltage	E_{c2}	125	125	125	145	145	145	V
DC Grid-No.1 Voltage	E_{c1}	-	0	-25	-	0	-35	V

MECHANICAL CHARACTERISTICS

Dimensional Outline . . . . . JEDEC No.12-117

Envelope. . . . . JEDEC Designation T12

Top Cap[g] . . . . . Small (JEDEC Designation C1-1)

Base[h]. . . . . Large-Button Novar 9-Pin with Exhaust Tip (JEDEC Designation E9-88)

6LQ6

Terminal Connections
(See *TERMINAL DIAGRAM*) . . . . . JEDEC Designation 9QL

Type of Cathode . . . . . .Coated Unipotential

MAXIMUM RATINGS—Design-Maximum Values[k]

For operation as a Horizontal-Deflection-Amplifier Tube in a 525-line, 30-frame system

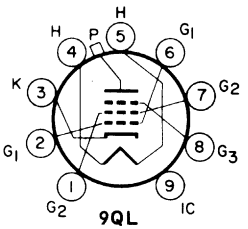
DC Plate Supply Voltage	E_{bb}	990	V
Peak Positive-Pulse Plate Voltage[m]	e_{bm}	7500	V
Peak Negative-Pulse Plate Voltage	$-e_{bm}$	1100	V
DC Grid-No.3 Voltage[n]	E_{c3}	75	V
DC Grid-No.2 (Screen-Grid) Voltage	E_{c2}	220	V
Peak Negative-Pulse Grid-No.1 (Control-Grid) Voltage	$-e_{c1m}$	330	V
Heater-Cathode Voltage:			
Peak	e_{hkm}	±200	V
Average	E_{hk}	100	V
Heater Voltage, ac or dc	E_h	5.7 to 6.9	V
Cathode Current:			
Peak	i_{km}	1200	mA
Average	$I_{k(av)}$	350	mA
Grid-No.2 Input	P_{g2}	5	W
Plate Dissipation[p]	P_b	30	W
Temporary Overload Plate Dissipation[q] . . .	P_b	200	W
Envelope Temperature (at hottest point on envelope surface)	T_E	250	°C

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance:	$R_{g1(ckt)}$		
For grid-No.1-resistor-bias operation	-	0.47	MΩ
For plate-pulsed operation (horizontal-deflection circuits only)	-	10	MΩ

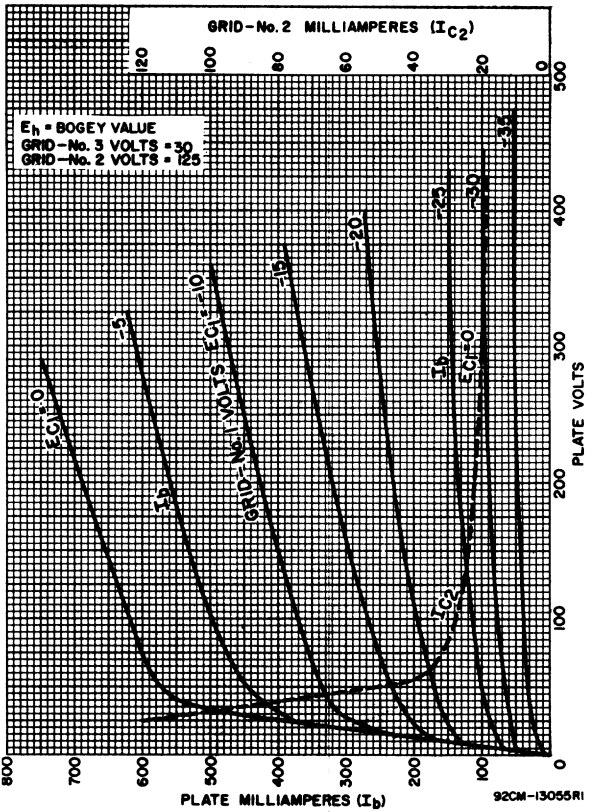
TERMINAL DIAGRAM (Bottom View)

Pin 1 - Grid No.2
Pin 2 - Grid No.1
Pin 3 - Cathode
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid No.1
Pin 7 - Grid No.2
Pin 8 - Grid No.3
Pin 9 - Do Not Use
Top Cap - Plate



9QL

TYPICAL CHARACTERISTICS



[a] Measured without external shield in accordance with the current issue of EIA Standard RS-191.

[b] With grid No.3 and grid No.2 connected, respectively, to cathode and plate at socket.

[c] Conditions: $E_b = E_{c2} = 125$ V, $E_{c1} = -25$ V.

[d] Conditions: $E_b = E_{c2} = 145$ V, $E_{c1} = -35$ V.

[e] This value can be measured by a method involving a recurrent waveform such that the Maximum Ratings of the tube will not be exceeded.

[f] Under pulse-duration condition specified in *Footnote* m.

g Designed to mate with connector of 0.360-inch cap, generally available from your local RCA Distributor.

h Designed to mate with "Novar 9-Contact" Socket generally available from your local RCA Distributor.

k As defined in the current issue of EIA Standard RS-239.

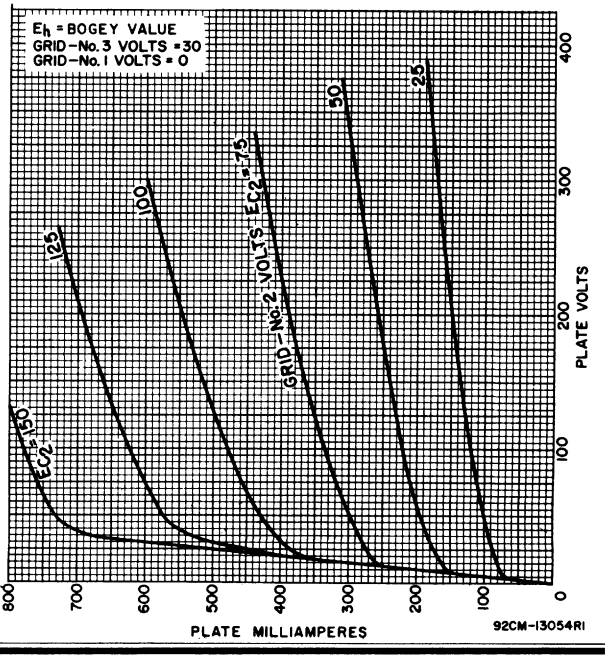
m This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one scanning cycle is 10 μs.

n In horizontal-deflection-amplifier service, a positive voltage should be applied to grid No.3 to reduce interference from "snivets", which may occur in both vhf and uhf television receivers, and to increase power output. A typical value is 30 V.

p An adequate bias resistor or other means is required to protect the tube is the absence of excitation.

q Total continuous or accumulated time not to exceed 40 seconds.

TYPICAL CHARACTERISTICS



6LQ8

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

For Use in Low-B+ Black-and-White TV Receivers Having Low-Voltage Power Supplies

ELECTRICAL CHARACTERISTICS

Bogey Values[a]

Heater Voltage (AC or DC)	E_h	6.3	V
Heater Current	I_h	0.775	A
Direct Interelectrode Capacitances			
Without external shield			
Triode Unit:			
Grid to plate	c_{g-p}	2.8	pF
Input: G_T to (K_T, K_P + G_{3P} + IS, H)	c_i	4.2	pF
Output: P_T to (K_T, K_P + G_{3P} + IS, H)	c_o	2.4	pF
Pentode Unit:			
Grid No.1 to plate	c_{g1-p}	0.12 max	pF
Input: G_{1P} to (K_P + G_{3P} + IS, G_{2P}, H)	c_i	14	pF
Output: P_P to (K_P + G_{3P} + IS, G_{2P}, H)	c_o	4.8	pF
Triode grid to pentode plate	-	0.015 max	pF
Pentode plate to triode plate	-	0.17 max	pF

For the following characteristics, see **Conditions**

		Triode Unit	*Pentode Unit*		
Amplification Factor	μ	46	-	-	
Plate Resistance (Approx.)	r_p	4400	55000	75000	Ω
Transconductance	g_m	10400	21000	23000	μmho
DC Plate Current	I_b	15	16.5	20	mA
DC Grid-No.2 Current	I_{c2}	-	3.1	3.5	mA
Cutoff DC Grid-No.1 Voltage (Plate μA = 100)	$E_{c1(co)}$	-6	-4.2	-4.2	V

Conditions

Heater Voltage	E_h	Bogey value			V
DC Plate Supply Voltage	E_{bb}	125	125	200	V
DC Grid-No.2 Supply Voltage	E_{cc2}	-	125	125	V
Grid No.1	-	Connected to negative end of R_k			
Cathode Resistor	R_k	68	82	68	Ω

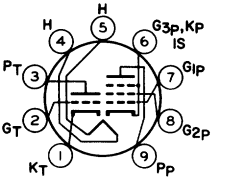
MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2.625 in
Maximum Seated Length	2.375 in
Maximum Diameter	0.875 in
Dimensional Outline	See *General Section*
Envelope	JEDEC T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC E9-1)

6LQ8

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Triode Cathode
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Grid No.3, Pentode Cathode, Internal Shield
Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate



DESIGN-MAXIMUM RATINGS

For operation as a Class A1 Amplifier Tube

		Triode Unit	*Pentode Unit*	
DC Plate Voltage	E_b	300	300	V
DC Grid-No.2 (Screen-Grid) Supply Voltage	E_{cc2}	-	300	V
DC Grid-No.2 Voltage	E_{c2}	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
DC Grid-No.1 (Control-Grid) Voltage				
Positive-bias value	E_{c1}	0	0	V
Heater-Cathode Voltage				
Peak	e_{hkm}	±200		V
Average[b]	$E_{hk(av)}$	100		V
Heater Voltage (AC or DC)	E_h	5.7 to 6.9		V
Grid-No.2 Input	P_{g2}			
For $E_{c2} \leq 150$ V		-	1	W
For $E_{c2} \geq 150$ V and ≤ 300 V		-	- See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Plate Dissipation	P_b	2	5	W

MAXIMUM CIRCUIT VALUES

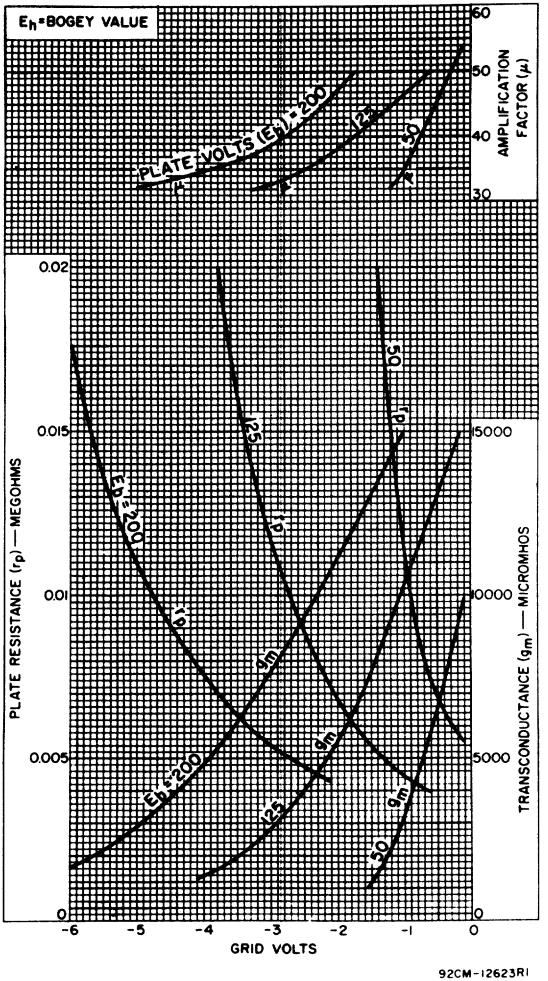
		Triode Unit	*Pentode Unit*	
Grid-No.1 Circuit Resistance	$R_{g1(ckt)}$			
For fixed-bias operation		-	0.1	MΩ
For cathode-bias operation		-	0.25	MΩ

[a] Unless otherwise specified.
[b] Measured with a dc meter.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

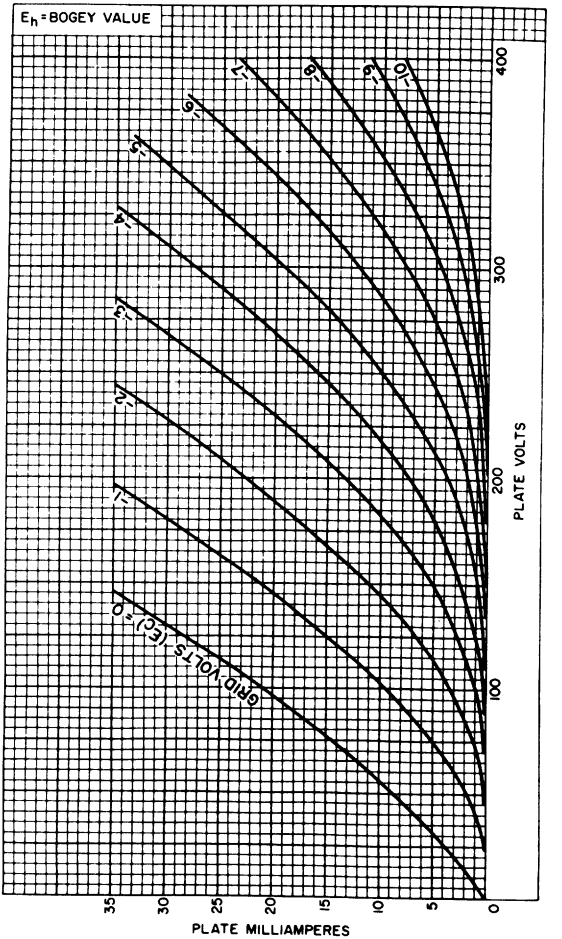
Typical Characteristics

Triode Unit



Typical Plate Characteristics

Triode Unit



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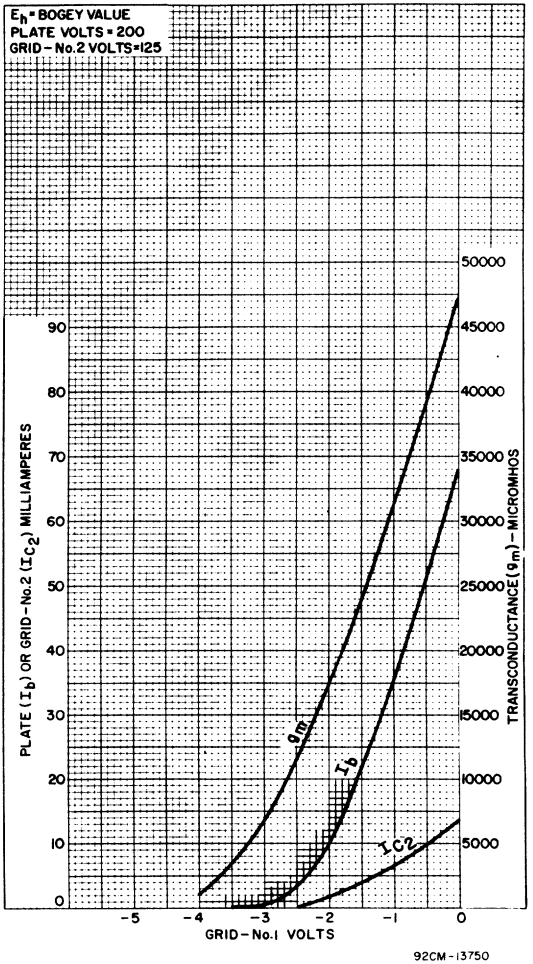
Electronic Components and Devices Harrison, N. J.

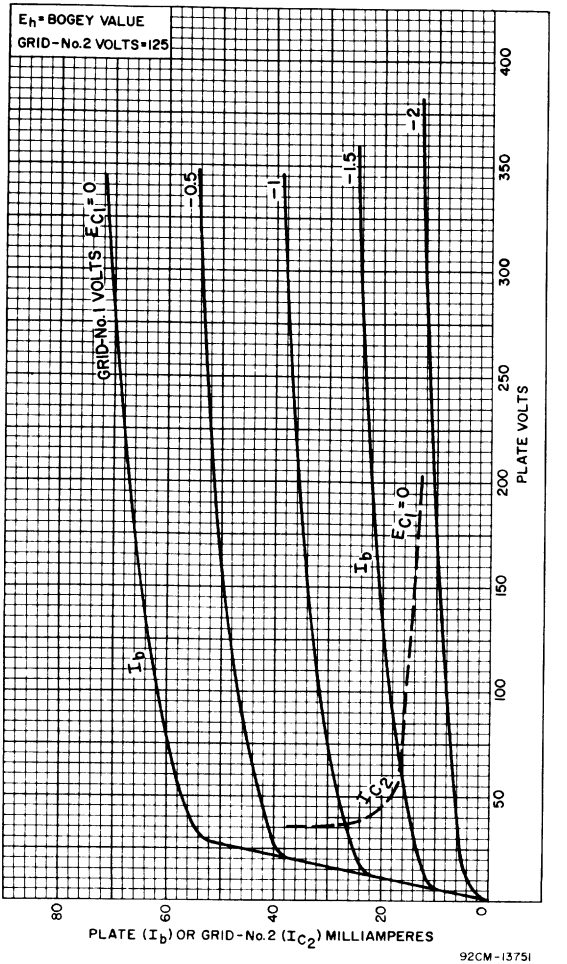
Typical Characteristics

Pentode Unit



Typical Plate Characteristics

Pentode Unit



92CM-13751

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Beam Power Tube

NOVAR TYPE

ELECTRICAL CHARACTERISTICS – Bogey Values

Heater Voltage, ac or dc	E_h	6.3	V
Heater Current	I_h	2.3	A

Direct Interelectrode Capacitances:[a]

Grid No. 1 to plate	$c_{g1\text{-}p}$	0.6	pF
Input: G1 to (K, G3, G2, H)	c_i	22	pF
Output: P to (K, G3, G2, H)	c_o	11	pF

For the following characteristics, see Conditions below:

Amplification Factor (Triode Connection)[b]	μ	–	–	3[c]	
Plate Resistance (Approx.).....	r_p	–	–	6000	Ω
Transconductance	g_m	–	–	11000	μmho
DC Plate Current	I_b	–	800[d]	140	mA
DC Grid-No. 2 Current ..	I_{c2}	–	56[d]	2.0	mA
Cutoff DC Grid-No. 1 Voltage for I_b = 1 mA ..	$E_{c1(co)}$	-125	–	-50	V

Conditions:

Heater Voltage	E_h	← Bogey Value →			V
Peak Positive-Pulse Plate Voltage[e]	e_{bm}	5000	–	–	V
DC Plate Voltage	E_b	–	55	175	V
DC Grid-No. 3 Voltage ..	E_{c3}	30	30	30	V
DC Grid-No. 2 Voltage ..	E_{c2}	130	125	125	V
DC Grid No. 1 Voltage ..	E_{c1}		0	-25	V

MECHANICAL CHARACTERISTICS

Dimensional Outline..... JEDEC No. 12-117
Envelope ..... JEDEC T12
Top Cap ..... Small (JEDEC C1-1)
Base ..... Large-Button Novar 9-Pin with Exhaust Tip (JEDEC E9-88)
Terminal Connections
(See *TERMINAL DIAGRAM*) ..... JEDEC 9QL
Type of Cathode..... Coated Unipotential
Operating Position ..... Any

MAXIMUM RATINGS – Design-Maximum Values [f]

For operation as a Horizontal-Deflection-Amplifier Tube in a 525-line, 30-frame system

DC Plate Supply Voltage	E_{bb}	990	V
Peak Positive-Pulse Plate Voltage[g]	e_{bm}	7500	V
Peak Negative-Pulse Plate Voltage	$-e_{bm}$	1100	V
DC Grid-No. 3 Voltage[h]	E_{c3}	75	V
DC Grid-No. 2 (Screen-Grid) Voltage	E_{c2}	220	V
Peak Negative-Pulse Grid-No. 1 (Control-Grid) Voltage	$-e_{c1m}$	330	V
Heater-Cathode Voltage:			
Peak	e_{hkm}	+200	V
Average	E_{hk}	100	V
Heater Voltage:	E_h	5.7 to 6.9	V
Cathode Current:			
Peak	i_{km}	1200	mA
Average	$I_{k(av)}$	350	mA
Grid-No. 2 Input	P_{g2}	5	W
Plate Dissipation[j]	P_b	30	W
Temporary Overload Plate Dissipation[k]:	P_b	200	W
Envelope Temperature (at hottest point on envelope surface)	T_E	250	°C

MAXIMUM CIRCUIT VALUES

Grid-No. 1-Circuit Resistance:	$R_{g(ckt)}$	
Cathode bias (with min. R_K = 100 Ω)	1.0	megohm
Grid-leak bias (with signal peak clamped to zero bias)	10.0	megohms
Fixed bias (where positive grid current is not drawn)	0.47	megohm

a Measured without external shield in accordance with the current issue of EIA Standard RS-191B.

b With grid No. 3 and grid No. 2 connected, respectively, to cathode and plate at socket.

c Conditions: $E_b = E_{c2} = 125V$, $E_{c1} = -25V$.

d This value can be measured by a method involving a recurrent waveform such that the Maximum Ratings of the tube will not be exceeded.

e Under pulse-duration condition specified in *Footnote* **g**.

f As defined in the current issue of EIA Standard RS-239A.

g This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one scanning cycle is 10 μs.

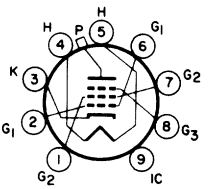
h In horizontal-deflection-amplifier service, a positive voltage should be applied to grid No. 3 to reduce interference from "snivets", which may occur in both vhf and uhf television receivers, and to increase power output. A typical value is 30V.

j An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

k Total continuous or accumulated time not to exceed 40 seconds.

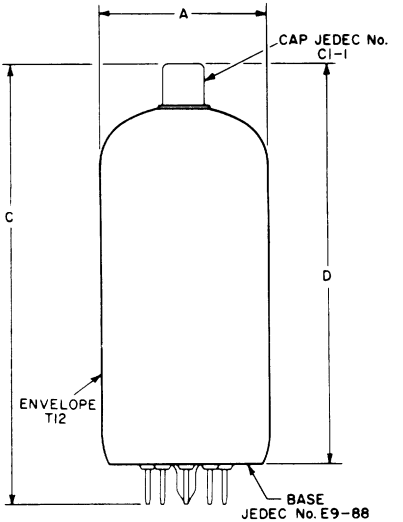
TERMINAL DIAGRAM – JEDEC 9QL (Bottom View)

Pin 1 - Grid No. 2
Pin 2 - Grid No. 1
Pin 3 - Cathode
Pin 4 - Heater
Pin 5 - Heater



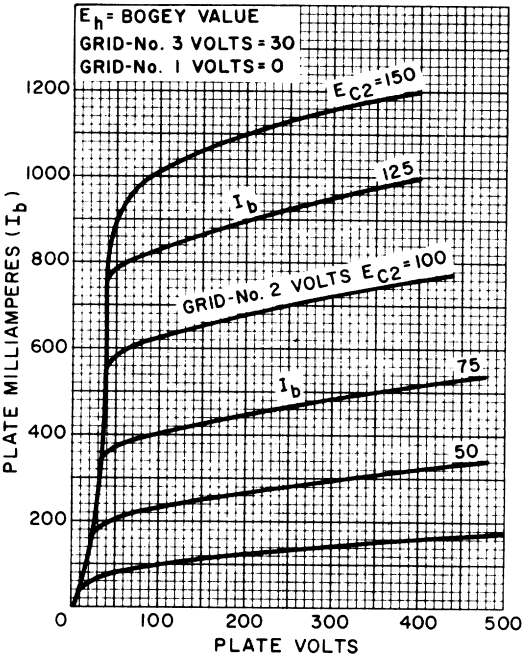
Pin 6 - Grid No. 1
Pin 7 - Grid No. 2
Pin 8 - Grid No. 3
Pin 9 - Do Not Use
Top Cap - Plate

DIMENSIONAL OUTLINE – JEDEC No. 12-117



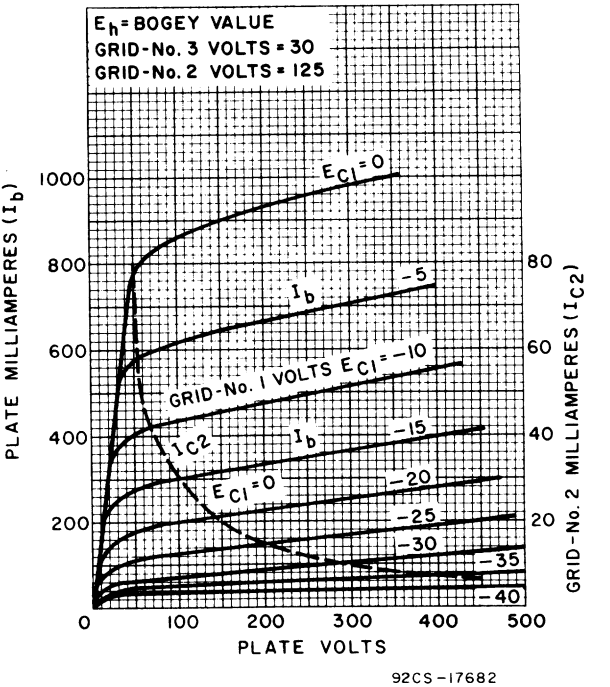
DIMENSION	INCHES		MILLIMETERS	
	Min.	Max.	Min.	Max.
A	1.438*	1.562	36.6*	39.6
C		4.380	95.3	111.25
D	3.750	4.000	95.3	101.6
MILLIMETER DIMENSION DERIVED FROM INCH DIMENSION				
*Applies to the minimum diameter except in the area of the seal.				

TYPICAL CHARACTERISTICS



92CS-17681

TYPICAL CHARACTERISTICS



92CS-17682

6MC6

Beam Power Tube

T12 Novar Type

High Perveance Beam Power Tube
For Horizontal-Deflection Amplifier
Service in Low B+ Color-TV Receivers

- **Plate Dissipation = 33 W**
- **RCA Dark Heater**
- **Peak Cathode Current = 1400 mA**

ELECTRICAL CHARACTERISTICS — Bogey Values

Heater Voltage, ac or dc	E_h	6.3	V
Heater Current	I_h	2.85	A
Direct Interelectrode Capacitances:[a]			
Grid No. 1 to plate	$c_{g1\text{-}p}$	1.0	pF
Input: G1 to (K, G3, G2, H)	c_i	40	pF
Output: P to (K, G3, G2, H)	c_o	16	pF

For the following characteristics, see Conditions below:

Amplification Factor (Triode Connection)[b]	μ	—	—	—	4[c]
Plate Resistance (Approx.)	r_p	—	—	—	6000 Ω
Transconductance	g_m	—	—	—	14000 μmho
DC Plate Current	I_b	—	1100[d]	750[d]	125 mA
DC Grid-No. 2 Current	I_{c2}	—	110[d]	42[d]	3.3 mA
Cutoff DC Grid-No. 1 Voltage for I_b = 1 mA	$E_{c1(co)}$	-125	—	0	-40 V

Conditions:

Heater Voltage	E_h	← Bogey Value →			V
Peak Positive-Pulse Plate Voltage[e]	e_{bm}	5000	—	—	— V
DC Plate Voltage	E_b	—	45	60	175 V
DC Grid-No. 3 Voltage	E_{c3}	30	30	30	0 V
DC Grid-No. 2 Voltage	E_{c2}	110	160	110	110 V
DC Grid-No. 1 Voltage	E_{c1}	—	0	0	-21 V

MECHANICAL CHARACTERISTICS

Envelope . . . . . JEDEC T-12
Top Cap . . . . . Small (JEDEC C1-1)
Base . . . . . Large-Button Novar 9-Pin with Exhaust Tip (JEDEC E9-88)
Terminal Connections
(See *TERMINAL DIAGRAM*) . . . . . JEDEC 9QL
Type of Cathode . . . . . Coated Unipotential
Operating Position . . . . . Any

MAXIMUM RATINGS – Design-Maximum Values [f]

For operation as a Horizontal-Deflection-Amplifier Tube in a 525-line, 30-frame system.

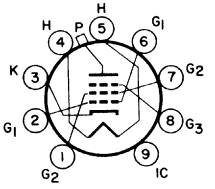
DC Plate Supply Voltage	E_{bb}	990	V
Peak Positive-Pulse Plate Voltage[g]	e_{bm}	7000	V
Peak Negative-Pulse Plate Voltage	$-e_{bm}$	1100	V
DC Grid-No. 3 Voltage[h]	E_{c3}	75	V
DC Grid-No. 2 (Screen-Grid) Voltage	E_{c2}	250	V
Peak Negative-Pulse Grid-No. 1 (Control-Grid) Voltage	$-e_{c1m}$	330	V
Heater-Cathode Voltage:			
Peak	e_{hkm}	±200	V
Average	E_{hk}	100	V
Heater Voltage: 6MC6	E_h	5.7 to 6.9	V
Heater Current: 36MC6	I_h	0.42 to 0.48	A
Cathode Current:			
Peak	i_{km}	1400	mA
Average	$i_{k(av)}$	400	mA
Grid-No. 2 Input	P_{g2}	5	W
Plate Dissipation[j]	P_b	33	W
Envelope Temperature (at hottest point on envelope surface)	T_E	250	°C

MAXIMUM CIRCUIT VALUES

Grid-No. 1 Circuit Resistance:	$R_{g(ckt)}$	
Cathode bias (with min. R_K = 100 Ω)	1.0	megohm
Grid-resistor bias (with signal peak clamped to zero bias)	10.0	megohms
Fixed bias (where positive grid current is not drawn)	0.47	megohm

TERMINAL DIAGRAM – JEDEC 9QL (Bottom View)

Pin 1 – Grid No. 2
Pin 2 – Grid No. 1
Pin 3 – Cathode
Pin 4 – Heater
Pin 5 – Heater

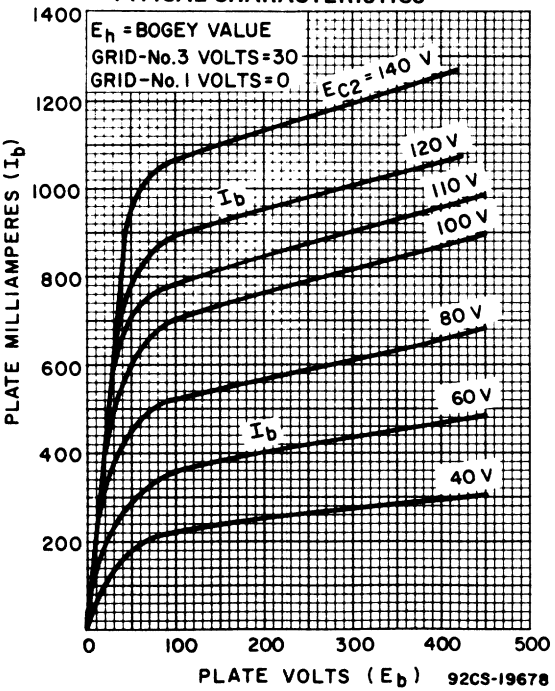


Pin 6 – Grid No. 1
Pin 7 – Grid No. 2
Pin 8 – Grid No. 3
Pin 9 – Do Not Use
Top Cap – Plate

[a] Measured without external shield in accordance with the current issue of EIA Standard RS-191B.

[b] With grid No. 3 and grid No. 2 connected, respectively, to cathode and plate at socket.

TYPICAL CHARACTERISTICS



c Conditions: $E_b = E_{c2} = 175$ V, $E_{c1} = -21$ V.

d This value can be measured by a method involving a recurrent waveform such that the Maximum Ratings of the tube will not be exceeded.

e Under pulse-duration condition specified in *Footnote* **g**.

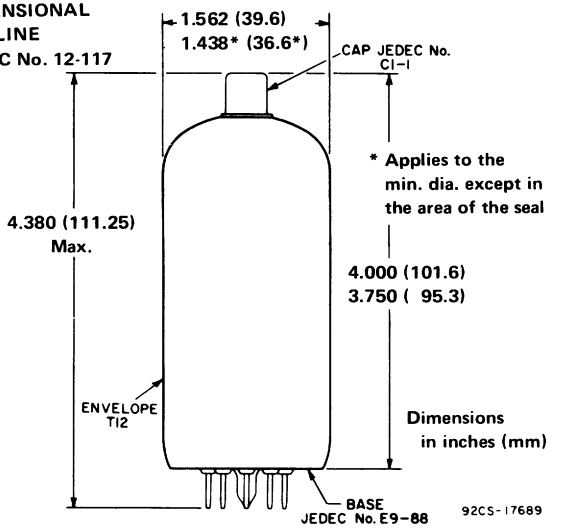
f As defined in the current issue of EIA Standard RS-239A.

g This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one scanning cycle is 10 μs.

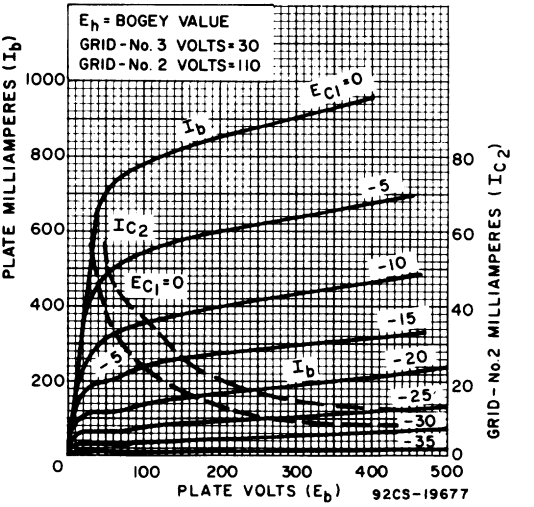
h In horizontal-deflection-amplifier service, a positive voltage should be applied to grid No. 3 to reduce interference from "snivets", which may occur in both vhf and uhf television receivers, and to increase power output. A typical value is 30 V.

j An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

DIMENSIONAL OUTLINE
JEDEC No. 12-117



TYPICAL PLATE CHARACTERISTICS



6MD8

Medium-Mu Triple Triode

NOVAR TYPE

For Matrix-Amplifier Applications in Color-TV Receivers

ELECTRICAL

Heater Characteristics and Ratings		
Voltage (AC or DC)	6.3 ± 0.6	V
Current at 6.3 V	0.900	A
Maximum heater-cathode voltage (Each unit):		
Heater negative with respect to cathode:		
Peak	200	V
Heater positive with respect to cathode:		
Peak	200	V
DC Component	100	V

Direct Interelectrode Capacitances (Approx.)[a]

	Unit No.1	Unit No.2	Unit No.3	
Grid to plate	3.0	3.0	3.0	pF
Input: G to (K, H)	3.6	3.6	3.4	pF
Output: P to (K, H)	0.48	0.48	0.36	pF

MECHANICAL

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2.960 in
Maximum Seated Length	2.580 in
Length, Base Seat to Bulb Top (Excluding tip)	2.060 to 2.240 in
Diameter	1.062 to 1.188 in
Bulb	T9

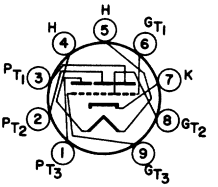
Bases (Alternates)

Small-Button Novar 9-Pin (JEDEC No.E9-75)

Small-Button Novar 9-Pin with Exhaust Tip 9-Pin (JEDEC No.E9-89)

Basing Designation for BOTTOM VIEW 9RQ

Pin 1 - Plate of Unit No.3
Pin 2 - Plate of Unit No.2
Pin 3 - Plate of Unit No.1
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid of Unit No.1
Pin 7 - Cathode
Pin 8 - Grid of Unit No.2
Pin 9 - Grid of Unit No.3



CHARACTERISTICS, CLASS A_1 AMPLIFIER

Values are for Each Unit

Plate Voltage	250	V
Grid Voltage	-10.5	V
Amplification Factor	17	
Plate Resistance (Approx.)	5500	Ω
Transconductance	3100	μmho

Plate Current	11.5	mA
Plate Current for grid volts = -14	4	mA
Grid Voltage (Approx.) for plate μA = 50	-23	V

AMPLIFIER — CLASS A_1

Values are for Each Unit

Maximum Ratings, Design-Maximum Values

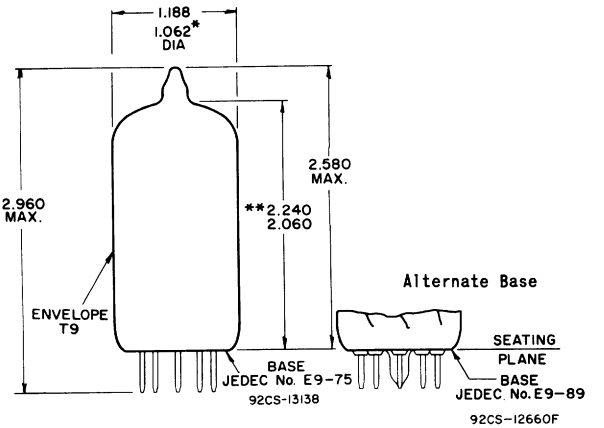
Plate Voltage	330	V
Grid Voltage		
Positive-bias value	0	V
Plate Dissipation	3	W

MAXIMUM CIRCUIT VALUE

Grid-Circuit Resistance		
For fixed-bias operation	1	MΩ

[a] Without external shield.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

Bottom-exhaust version has the same dimensions for maximum overall length and seated length as the top-exhaust outline shown.

* Applies to the minimum diameter except in the area of the seal.

** Measured from the base seat to bulb-top line as determined by arcing gauge of 0.600" I.D.

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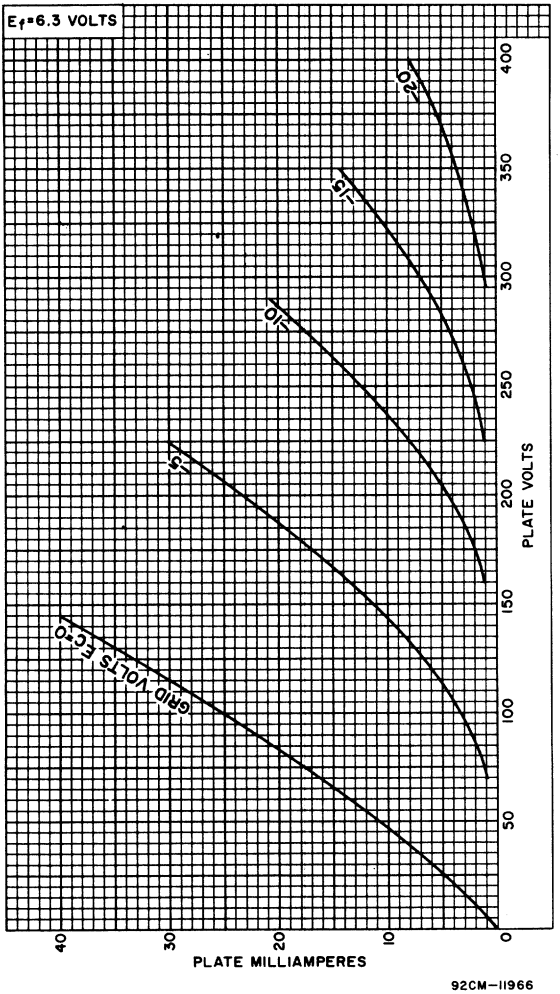
Average Plate Characteristics

EACH UNIT



92CM-11966

6ME6

Beam Power Tube

T12 NOVAR TYPE

P_b = 30 W **Overload P_b = 200 W**

Electrical Characteristics — Bogey Values

Heater Voltage, ac or dc	E_h		6.3	V
Heater Current	I_h		2.3	A
Direct Interelectrode Capacitances:[a]				
Grid No. 1 to plate	$c_{g1\text{-}p}$		0.6	pF
Input: G1 to (K, G3, G2, H)	c_i		22	pF
Output: P to (K, G3, G2, H)	c_o		11	pF
For the following characteristics, see Conditions below:				
Amplification Factor (Triode Connection)[b]	μ	—	—	3.5[c]
Plate Resistance (Approx.)	r_p	—	—	5800 Ω
Transconductance	gm	—	—	9600 μmho
DC Plate Current	I_b	—	580[d]	130 mA
DC Grid-No. 2 Current	I_{c2}	—	40[d]	2.8 mA
Cutoff DC Grid-No. 1 Voltage for I_b = 1 mA	$E_{c1(co)}$	−125	—	−44 V
Conditions:				
Heater Voltage	E_h	←	6.3	→ V
Peak Positive-Pulse Plate Voltage[e]	e_{bm}	5000	—	— V
DC Plate Voltage	E_b	—	55	175 V
DC Grid-No. 3 Voltage	E_{c3}	0	30	30 V
DC Grid-No. 2 Voltage	E_{c2}	125	125	125 V
DC Grid No. 1 Voltage	E_{c1}		0	−25 V

Mechanical Characteristics

Dimensional Outline	JEDEC No. 12-117
Envelope	JEDEC T-12
Top Cap	Small (JEDEC C1-1)
Base	Large-Button Novar 9-Pin with Exhaust Tip (JEDEC E9-88)
Terminal Connections (See *TERMINAL DIAGRAM*)	JEDEC 9QL
Type of Cathode	Coated Unipotential
Operating Position	Any

Maximum Ratings — Design-Maximum Values[f]

For operation as a Horizontal-Deflection-Amplifier Tube in a 525-line, 30-frame system.

DC Plate Supply Voltage	E_{bb}	990	V
Peak Positive-Pulse Plate Voltage[g]	e_{bm}	7500	V
Peak-Negative-Pulse Plate Voltage	$-e_{bm}$	1100	V

DC Grid-No. 3 Voltage[h]	E_{c3}	75	V
DC Grid-No. 2 (Screen-Grid) Voltage	E_{c2}	220	V
Peak Negative-Pulse Grid-No. 1 (Control-Grid) Voltage	$-e_{c1m}$	330	V
Heater-Cathode Voltage:			
Peak	e_{hkm}	±200	V
Average	E_{hk}	100	V
Heater Voltage	E_h	5.7 to 6.9	V
Cathode Current:			
Peak	i_{km}	1200	mA
Average	$I_{k(av)}$	350	mA
Grid-No. 2 Input	P_{g2}	5	W
Plate Dissipation[j]	P_b	30	W
Temporary Overload Plate Dissipation[k]:	P_b	200	W
Envelope Temperature (at hottest point on envelope surface)	T_E	250	°C

Maximum Circuit Values

Grid-No. 1-Circuit Resistance: $R_{g(ckt)}$

Cathode Bias (with min. R_K = 100 Ω	1.0	megohm
Grid-leak Bias (with signal peak clamped to zero bias)	10.0	megohms
Fixed Bias (where positive grid current is not drawn)	0.47	megohm

a Measured without external shield in accordance with the current issue of EIA Standard RS-191B.

b With grid No. 3 and grid No. 2 connected, respectively, to cathode and plate at socket.

c Conditions: $E_b = E_{c2} = 125$ V, $E_{c1} = -25$ V.

This value can be measured by a method involving a recurrent waveform such that the Maximum Ratings of the tube will not be exceeded.

e Under pulse-duration condition specified in *Footnote* **g**.

f As defined in the current issue of EIA Standard RS-239A.

g This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one scanning cycle is 10 μs.

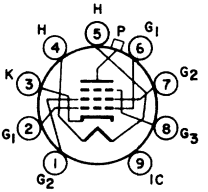
h In horizontal-deflection-amplifier service, a positive voltage should be applied to grid No. 3 to reduce interference from "snivets", which may occur in both vhf and uhf television receivers, and to increase power output. A typical value is 30 V.

j An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

k Total continuous or accumulated time not to exceed 40 seconds.

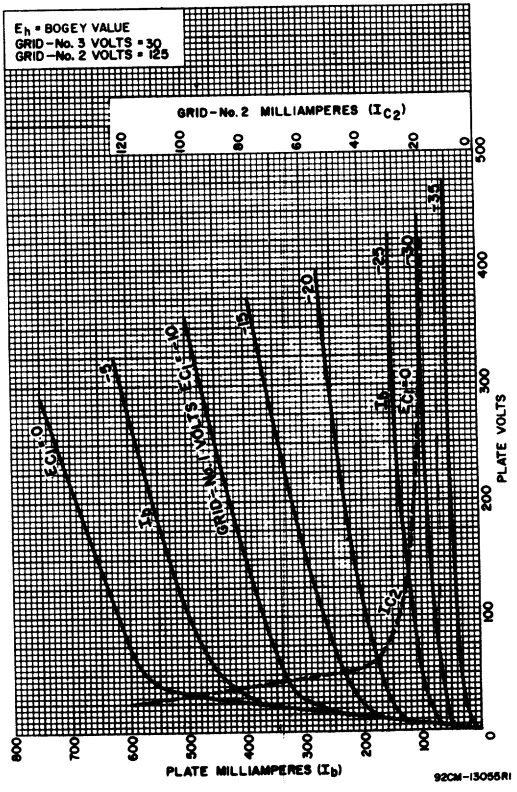
TERMINAL DIAGRAM (BOTTOM VIEW)

Pin 1 - Grid No. 2
Pin 2 - Grid No. 1
Pin 3 - Cathode
Pin 4 - Heater
Pin 5 - Heater



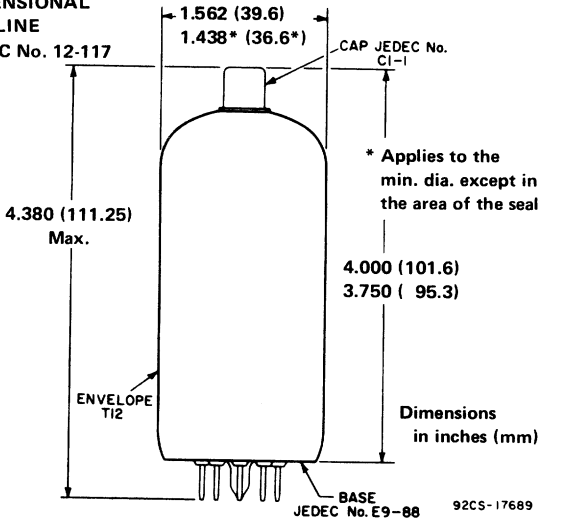
Pin 6 - Grid No. 1
Pin 7 - Grid No. 2
Pin 8 - Grid No. 3
Pin 9 - Do Not Use
Top Cap - Plate

TYPICAL CHARACTERISTICS

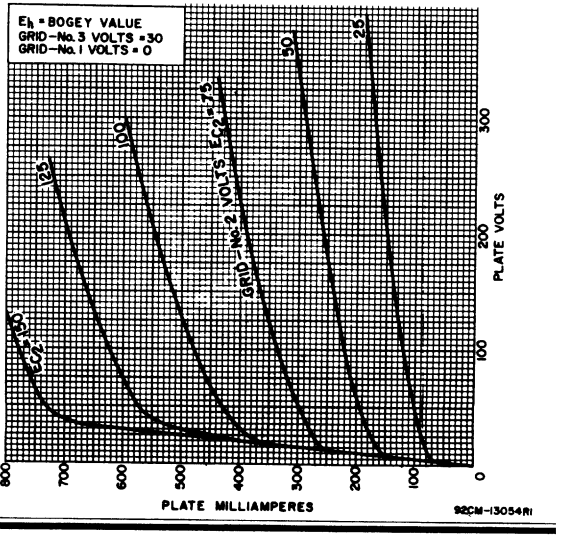


6ME6

DIMENSIONAL OUTLINE
JEDEC No. 12-117



TYPICAL CHARACTERISTICS



Two-Plate Beam-Deflection Tube

BALANCED OUTPUT **9-PIN MINIATURE TYPE** **DARK HEATER**

For Color-Demodulator Applications in Color-TV Receivers and a Variety of Other Switching and Gating Applications

ELECTRICAL CHARACTERISTICS

		Bogey Values[a]	
Heater Voltage (AC or DC)	E_h	6.3	V
Heater Current at E_h = bogey value	I_h	0.300	A
Direct Interelectrode Capacitances			
Without external shield			
Grid No.1 to all except plates		7.5	pF
Either plate to all	$c_{p\text{-}all}$	6.0	pF
Either deflecting electrodes to all other electrodes	$c_{dj\text{-}all}$	6.0	pF
Plate No.1 to Plate No.2	$c_{p1\text{-}p2}$	0.4	pF
Deflecting-electrode No.1 to deflecting-electrode No.2	$c_{dj1\text{-}dj2}$	0.4	pF
Grid No.1 to deflecting-electrode No.1	$c_{g1\text{-}dj1}$	0.07 max	pF
Grid No.1 to deflecting-electrode No.2	$c_{g1\text{-}dj2}$	0.1 max	pF
For the following characteristics see Conditions "A"			
Transconductance, grid No.1 to both plates	g_m	4400	μmho
Total DC Plate Current (plate-No.1 + plate-No.2 current)	$I_{b(tot)}$	14.5	mA
DC Grid-No.3 Current	I_{c3}	0.7	mA
Cutoff DC Grid-No.1 Voltage for $I_{b(tot)}$ = 10 μA	$E_{c1(co)}$	-16	V

Conditions "A"			
Heater Voltage	E_h	Bogey Value	V
DC Plate-No.1 Supply Voltage	E_{bb1}	250	V
Plate No.2	-	Connected to plate No.1	
DC Deflecting-Electrode-No.1 Supply Voltage	-	75	V
DC Deflecting-Electrode-No.2 Supply Voltage	-	75	V
DC Grid-No.3 Supply Voltage	E_{cc3}	350	V
DC Grid-No.1 Supply Voltage	E_{cc1}	0	V
Cathode Resistor	R_k	390	Ω
For the following deflecting-electrode characteristics, see Conditions "B"			
Deflecting-Electrode Switching Voltage[b]	$E_{dj(switching)}$	30 max	V
Voltage Difference between Deflecting Electrodes for equal plate currents ($I_{b1} = I_{b2}$)	-	0	V

Plate-No.1 Current with deflecting electrode-No.1 voltage (E_{dj1}) = 55 V and deflecting-electrode-No.2 voltage (E_{dj2}) = 95 V	I_{b1}	1.3 max	mA
Plate-No.2 Current with (E_{dj1}) = 95 V and (E_{dj2}) = 55 V	I_{b2}	1.3 max	mA
Deflecting-Electrode-No.1 Current with E_{dj1} = 125 V and E_{dj2} = 25 V	I_{dj1}	0.04 max	mA
Deflecting-Electrode-No.2 Current with E_{dj1} = 25 V and E_{dj2} = 125 V	I_{dj2}	0.04 max	mA

Conditions "B"

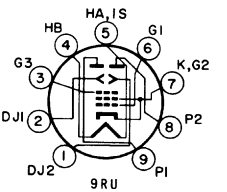
Heater Voltage	E_h	6.3	V
DC Plate-No.1 Supply Voltage	E_{bb1}	250	V
DC Plate-No.2 Supply Voltage	E_{bb2}	250	V
DC Grid-No.3 Supply Voltage	E_{cc3}	350	V
DC Grid-No.1 Supply Voltage	E_{cc1}	0	V
Cathode Resistor	R_k	390	Ω

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2.625 in
Maximum Seated Length	2.375 in
Length, Base Seat to Bulb Top Excluding tip	1.906 to 2.094 in
Maximum Diameter	0.875 in
Dimensional Outline (JEDEC 6-3)	See *General Section*
Envelope	JEDEC T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC E9-1)

TERMINAL DIAGRAM (Bottom View)

Pin 1 - Deflecting Electrode No.2
Pin 2 - Deflecting Electrode No.1
Pin 3 - Grid No.3
Pin 4 - Heater End B
Pin 5 - Heater End A, Internal Shield▲
Pin 6 - Grid No.1
Pin 7 - Grid No.2, Cathode
Pin 8 - Plate No.2
Pin 9 - Plate No.1



▲ Pin No.5 should be connected directly to ground.

DESIGN-MAXIMUM RATINGS

DC Plate Voltage, each plate	E_b	400	V
DC Deflecting-Electrode Voltage, each electrode	E_{dj}	100	V
Peak Deflecting-Electrode Voltage, each electrode	e_{djm}	±200	V
DC Grid-No.3 (Accelerating-Grid) Voltage	E_{c3}	400	V
DC Grid-No.1 (Control-Grid) Voltage Positive-bias value	E_{c1}	0	V
Heater Voltage (AC or DC)	E_h	5.7 to 6.9	V

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DESIGN-MAXIMUM RATINGS (Cont'd)

Average Cathode Current	$I_{K(av)}$	30	mA
Grid-No.3 Input	P_{g3}	2	W
Plate Dissipation, each plate	P_b	2	W

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance	$R_{g1(ckt)}$	
For fixed-bias operation		0.1 MΩ
For cathode-bias operation		0.25 MΩ

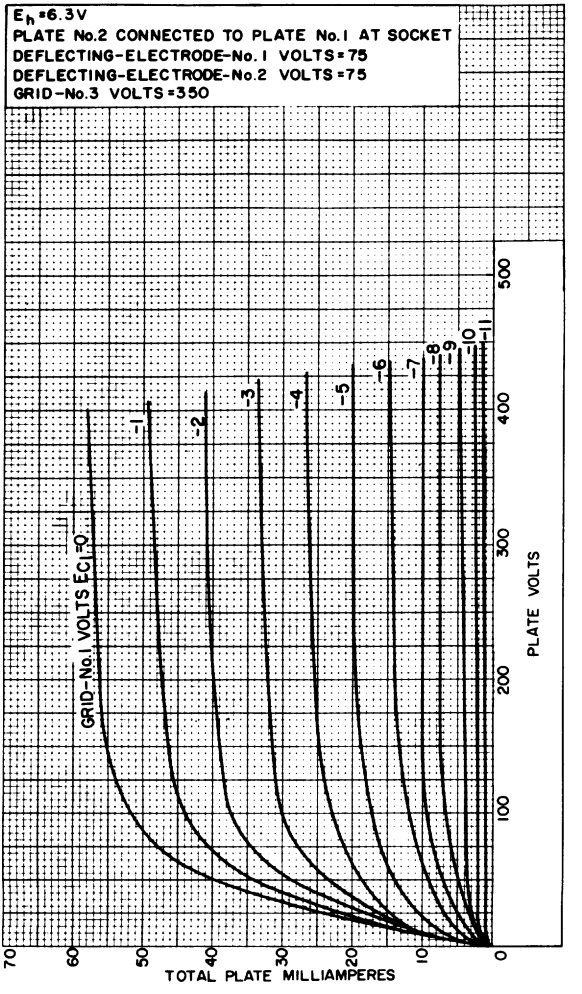
[a] Unless otherwise specified.

[b] Defined as the total voltage change from 75 volts on either deflecting electrode with an equal and opposite change on the other deflecting electrode required to switch the plate current from one plate to the other.

OPERATING CONSIDERATIONS

Magnetic fields adversely affect the intrinsic operating plate-current balance of the 6ME8. To minimize this effect, the tube should be mounted as far as possible from all devices producing extraneous magnetic fields such as transformers, chokes, or similar components. It is recommended that an external shield be used in those applications critical for plate-current balance.

Typical Plate Characteristics



92CM-14470

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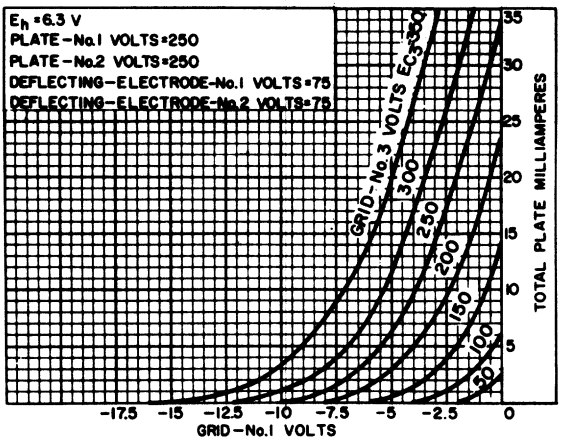
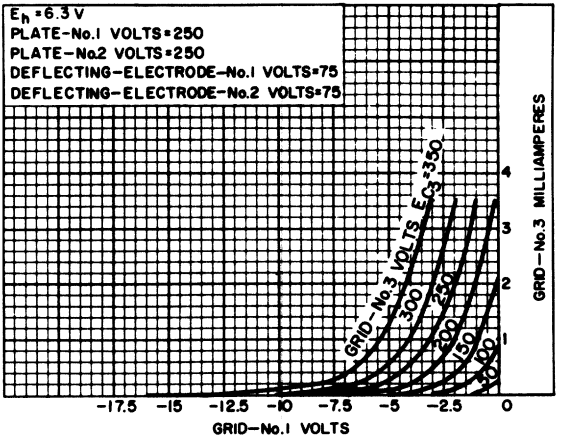
Transfer Characteristics

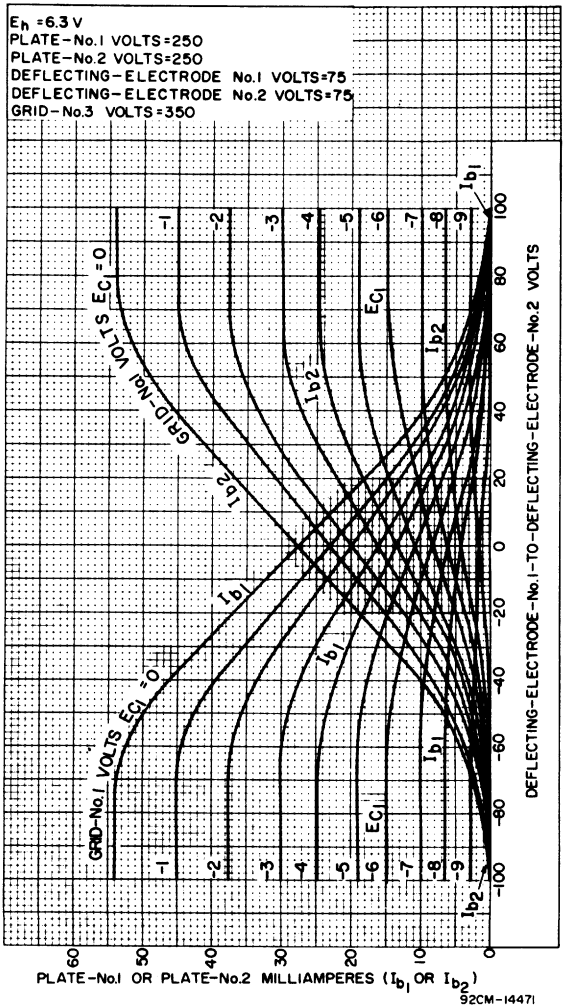


92CS-14468



92CS-14469

Transfer Characteristics



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Medium-Mu Triple Triode

For Matrix-Amplifier Applications in Color-TV Receivers

ELECTRICAL CHARACTERISTICS

Heater Voltage (ac or dc)	E_h	6.3			V
Heater Current	I_h	0.900			A
Direct Interelectrode Capacitances:[a]		*Unit No.1*	*Unit No.2*	*Unit No.3*	
Grid to plate	C_{gp}	2.8	2.8	2.8	pF
Input: G to (K, H)	C_{in}	2.9	2.9	3.0	pF
Output: P to (K, H)	C_{out}	0.36	0.60	0.70	pF
For the following characteristics, see Conditions below: Values are for each unit.					
Amplification Factor	μ	17			
Plate Resistance (Approx.)	r_p	5600			Ω
Transconductance	G_m	3000			μmho
Plate Current	I_b	10			mA
Plate Current for grid volts = -14		4			mA
Grid Voltage (Approx.) for I_b = 50μA		-23			V
Conditions:					
Heater Voltage	E_h	6.3			V
Plate Voltage	E_b	250			V
Grid Voltage	E_c	-10.5			V

MECHANICAL CHARACTERISTICS

Maximum Overall Length	2.875 in (73.02 mm)
Maximum Seated Length	2.50 in (63.5 mm)
Maximum Diameter	1.188 in (30.1 mm)
Dimensional Outline	JEDEC E9-60
Envelope	T9
Base	Small-Button Duodecar 12-Pin with Exhaust Tip (JEDEC No.E12-70)
Terminal Diagram	JEDEC 12HG
Type of Cathode	Coated Unipotential
Operating Position	Any

MAXIMUM RATINGS – Design-Maximum Values[b]

Values are for Each Unit

Plate Voltage	E_{bb}	330	V
Grid Voltage:			
Positive-bias value	E_{cc}	0	V
Plate Dissipation	P_b	3	W
Heater-cathode voltage (Each unit):			
Peak	e_{hkm}	±200	V
Average[c]	$E_{hk(av)}$	100	V
Heater Voltage, ac or dc	E_h	5.7 to 6.9	V

MAXIMUM CIRCUIT VALUE

Grid-Circuit Resistance:			
For fixed-bias operation	R_{g1}	1	MΩ

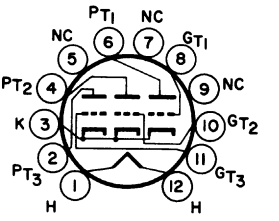
[a] Measured without external shield in accordance with the current issue of EIA Standard RS-191.

[b] As defined in the current issue of EIA Standard RS-239.

[c] Measured with a dc meter.

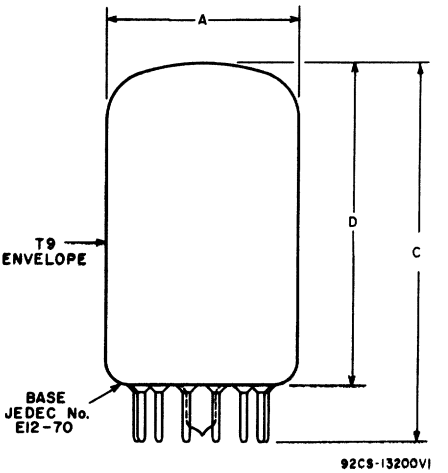
TERMINAL DIAGRAM – Bottom View

Pin 1 - Heater
Pin 2 - Plate of Unit No.3
Pin 3 - Cathode
Pin 4 - Plate of Unit No.2
Pin 5 - No Internal Connection
Pin 6 - Plate of Unit No.1
Pin 7 - No Internal Connection
Pin 8 - Grid of Unit No.1
Pin 9 - No Internal Connection
Pin 10 - Grid of Unit No.2
Pin 11 - Grid of Unit No.3
Pin 12 - Heater



JEDEC 12HG

DIMENSIONAL OUTLINE – JEDEC E9-60



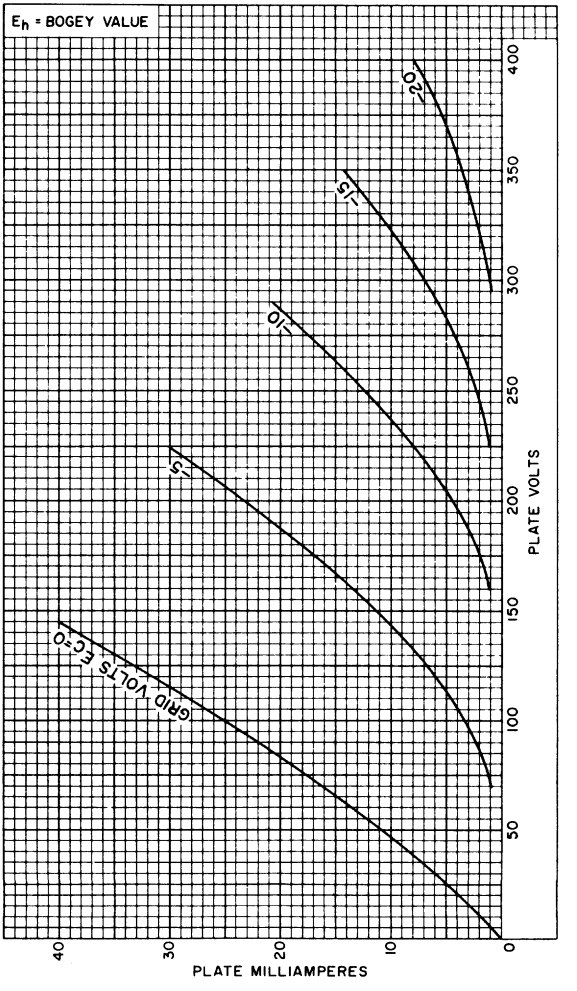
DIMENSION	INCHES		MILLIMETERS	
	Min.	Max.	Min.	Max.
A	1.062*	1.188	27.0*	30.1
C	–	2.875	–	73.02
D	2.250	2.500	57.2	63.5

MILLIMETER DIMENSION DERIVED FROM INCH DIMENSION

* Applies to the minimum diameter except in the area of the seal.

AVERAGE PLATE CHARACTERISTICS

Each Unit



92CM-11966RI

6MN8

High-Mu Triple Triode

Duoducar Type
For Matrix-Amplifier Applications in Color-TV Receivers

ELECTRICAL CHARACTERISTICS - Bogey Values

Heater Voltage (ac or dc)	E_h	6.3			V
Heater Current	I_h	0.9			A
Direct Interelectrode Capacitances:[a]		*Unit No.1*	*Unit No.2*	*Unit No.3*	
Grid to plate	C_{gp}	2.6	2.6	2.6	pF
Input: G to (K, H)	C_{in}	4.6	4.6	4.6	pF
Output: P to (K, H)	C_{out}	0.33	0.57	0.65	pF
For the following characteristics, see Conditions below: Values are for each unit.					
Amplification Factor	μ	47	40		
Plate Resistance (Approx.)	r_p	6250	10,000		Ω
Transconductance	G_m	7500	4000		μmho
Plate Current	I_b	11	4.8		mA
Grid Voltage (Approx.) for I_b = 50μA		-5	-11		V
Conditions:					
Heater Voltage	E_h	6.3	6.3		V
Plate Voltage	E_b	125	200		V
Grid Voltage	E_c	-1	-4		V

MECHANICAL CHARACTERISTICS

Maximum Overall Length . . . . . 2.875 in (73.02 mm)

Maximum Seated Length . . . . . 2.50 in (63.5 mm)

Maximum Diameter . . . . . 1.188 in (30.1 mm)

Dimensional Outline . . . . . JEDEC E9-60
See *Outlines, Glass Tubes* in *General Section*

Envelope T9

Base . . . . . Small-Button Duodecar 12-Pin with Exhaust Tip (JEDEC No.E12-70)

Terminal Diagram . . . . . JEDEC 12HU

Type of Cathode . . . . . Coated Unipotential

Operating Position . . . . . Any

MAXIMUM RATINGS – Design-Maximum Values[b]

Values are for Each Unit

Plate Voltage	E_{bb}	330	V
Grid Voltage:			
Positive-bias value	E_{cc}	0	V
Plate Dissipation	P_b	3	W
Heater-cathode voltage (Each unit):			
Peak	e_{hkm}	±200	V
Average[c]	$E_{hk(av)}$	100	V
Heater Voltage, ac or dc	E_h	5.7 to 6.9	V

MAXIMUM CIRCUIT VALUE

Grid-Circuit Resistance:			
For fixed-bias operation	R_g	1	MΩ

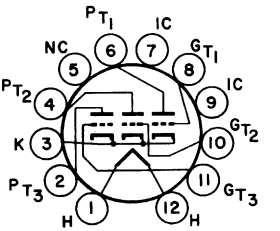
[a] Measured without external shield in accordance with the current issue of EIA Standard RS-191.

[b] As defined in the current issue of EIA Standard RS-239.

[c] Measured with a dc meter.

TERMINAL DIAGRAM – Bottom View

Pin 1 - Heater
Pin 2 - Plate of Unit No.3
Pin 3 - Cathode
Pin 4 - Plate of Unit No.2
Pin 5 - No Internal Connection
Pin 6 - Plate of Unit No.1
Pin 7 - Do Not Use
Pin 8 - Grid of Unit No.1
Pin 9 - Do Not Use
Pin 10 - Grid of Unit No.2
Pin 11 - Grid of Unit No.3
Pin 12 - Heater



JEDEC 12HU

6MQ8

Medium-Mu Triode— Sharp-Cutoff Pentode

9-Pin Miniature Type

For Use as a General-Purpose-Amplifier Tube in Color- and Black-and-White TV Receivers

ELECTRICAL CHARACTERISTICS — Bogey Values[a]

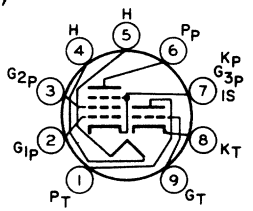
Heater Voltage, ac or dc	E_h	6.3 ± 10%	V
Heater Current	I_h	535	mA
Direct Interelectrode Capacitances:[b]		*(Without External Shield)*	
Triode Unit:			
Grid to plate	c_{g-p}	1.7	pF
Input: G_T to (K_T, $G3_P$ + K_P + IS, H)	c_i	3.0	pF
Output: P_T to (K_T, $G3_P$ + K_P + IS, H).	c_o	1.4	pF
Pentode Unit:			
Grid No.1 to plate . .	c_{g1-p}	0.045	pF
Input: $G1_P$ to (K_P + $G3_P$ + IS, $G2_P$, H) .	c_i	7.5	pF
Output: P_P to (K_P + $G3_P$ + IS, $G2_P$, H).	c_o	2.2	pF

For the following characteristics, see Conditions below:

		Triode Unit	*Pentode Unit*	
Amplification Factor . .	μ	40	-	
Plate Resistance (Approx.)	r_p	5	150	kΩ
Transconductance	g_m	8500	10000	μmho
DC Plate Current	I_b	18	12	mA
DC Grid-No.2 Current. .	I_{c2}	-	4.5	mA
Cutoff DC Grid-No.1 Voltage for I_b = 20 μA.	$E_{c1(co)}$	-12	-7	V
Conditions:				
Heater Voltage	E_h	6.3	6.3	V
DC Plate Voltage . . .	E_b	150	125	V
DC Grid-No.2 Voltage.	E_{c2}	-	125	V
Cathode Resistance. .	R_k	56	62	Ω

TERMINAL DIAGRAM (Bottom View)

Pin 1 - Triode Plate
Pin 2 - Pentode Grid No.1
Pin 3 - Pentode Grid No.2
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Pentode Plate
Pin 7 - Pentode Cathode, Grid No.3 and Internal Shield
Pin 8 - Triode Cathode
Pin 9 - Triode Grid



JEDEC 9AE

6MQ8

MECHANICAL CHARACTERISTICS

Maximum Overall Length	2.187 in (55.54 mm)
Maximum Seated Length	1.937 in (49.19 mm)
Maximum Diameter	0.875 in (22.12 mm)
Envelope	JEDEC T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC E9-1)
Dimensional Outline	JEDEC 6-2
Terminal Diagram	JEDEC 9AE
Type of Cathodes	Coated Unipotential
Operating Position	Any

MAXIMUM RATINGS - Design-Maximum Values[C]

		Triode Unit	*Pentode Unit*	
DC Plate Voltage	E_b	330	330	V
DC Grid-No.2 Supply Voltage	E_{c2}	-	330	V
DC Grid-No.2 Voltage	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section.			
DC Grid-No.1 Voltage:				
Positive-bias value	E_{c1}	0	0	V
Heater-Cathode Voltage:				
Peak	e_{hkm}	±200	±200	V
DC	E_{hk}	100	100	V
Heater Current	I_h	500 to 570		mA
Grid-No.2 Input: For grid-No.2 voltages up to 165 volts	P_{g2}	-	0.55	W
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section.			
Plate Dissipation	P_b	2.7	2.5	W

MAXIMUM CIRCUIT VALUES

Grid-No.1 Circuit Resistance:				
For fixed-bias operation	$R_{g1(ckt)}$	0.5	0.25	MΩ
For cathode-bias operation	$R_{g1(ckt)}$	0.5	0.5	MΩ

INTERELECTRODE LEAKAGE

Minimum Leakage Resistance between grid No.1 of each unit and all other electrodes of both units tied together	$R_{g1\text{-}all}$	100	MΩ

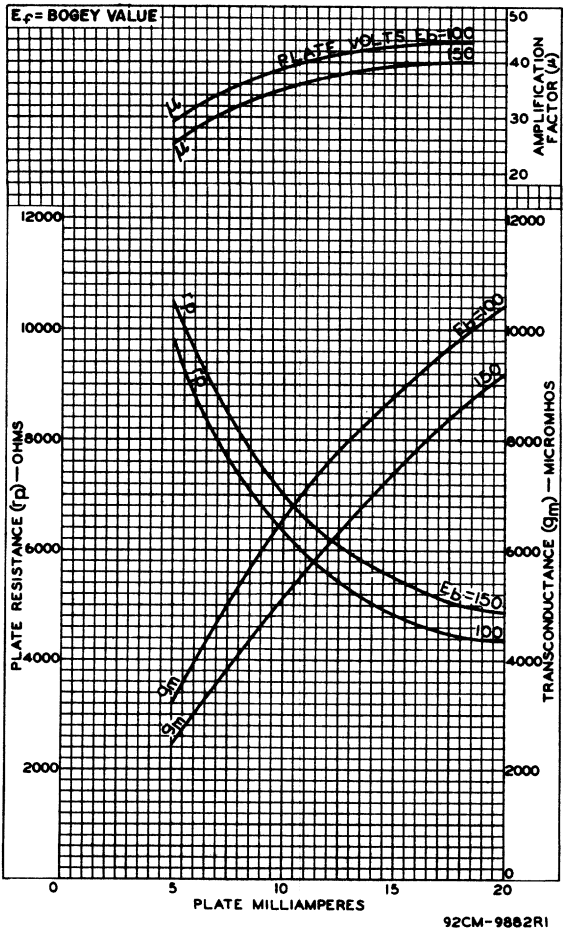
Conditions:
E_h = bogey value, E_{c1} = -100 V with respect to all other electrodes tied together.

[a] Unless otherwise specified.

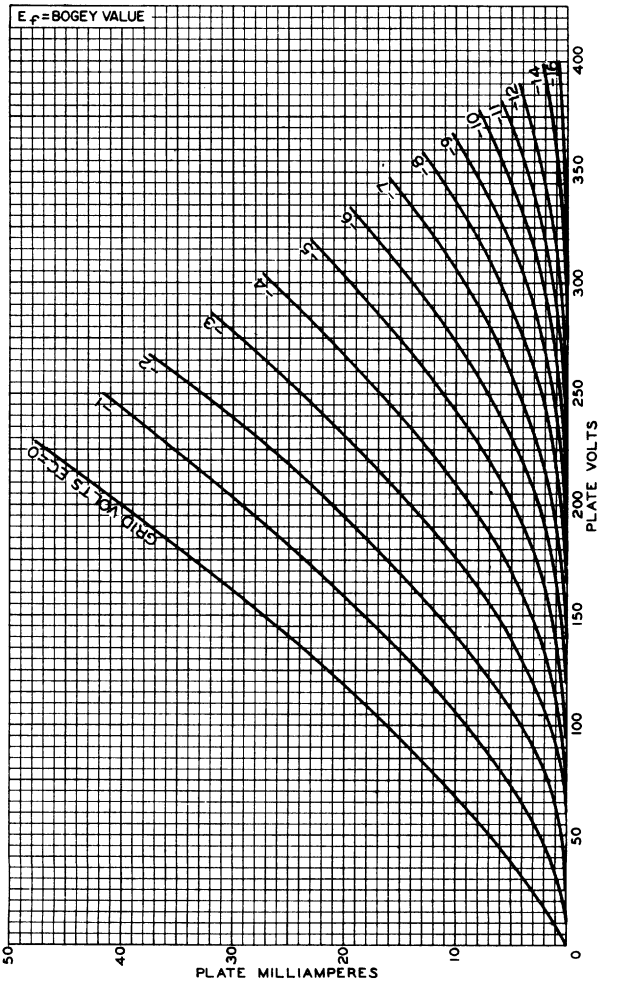
[b] Measured in accordance with the current issue of EIA Standard RS-191.

[c] As defined in the current issue of EIA Standard RS-239.

TYPICAL CHARACTERISTICS – Triode Unit

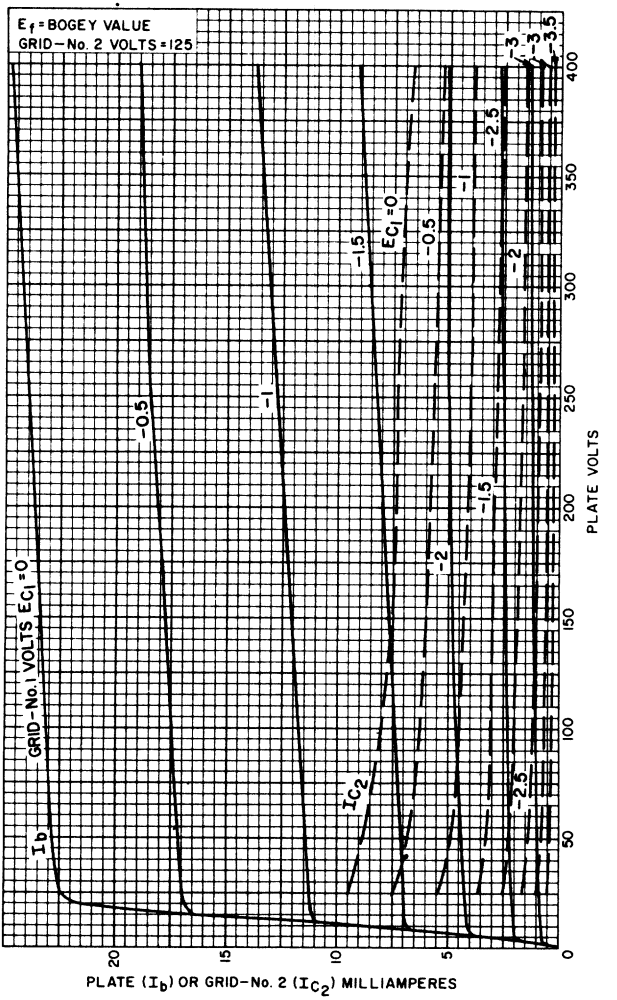


TYPICAL CHARACTERISTICS – Triode Unit



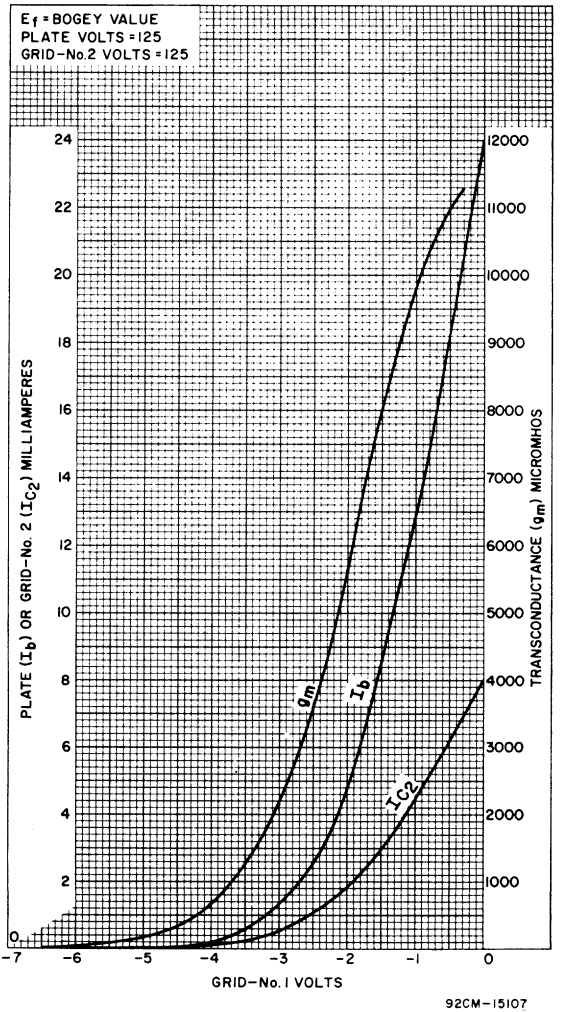
92CM-9866RI

TYPICAL CHARACTERISTICS – Pentode Unit



92CM-15102

TYPICAL CHARACTERISTICS – Pentode Unit



6S4A

Medium-Mu Triode

9-PIN MINIATURE TYPE
With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

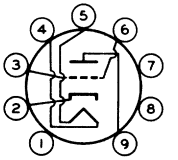
Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.6 ± 6%	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances (Approx.):[a]		
Grid to plate	2.4	μμf
Grid to cathode and heater	4.2	μμf
Plate to cathode and heater	0.6	μμf

Characteristics, Class A_1 Amplifier:

Plate Voltage	250	volts
Grid Voltage	-8	volts
Amplification Factor	16.5	
Plate Resistance (Approx.)	3700	ohms
Transconductance	4500	μmhos
Plate Current	24	ma
Plate Current for grid volts = -15	4	ma
Grid Voltage (Approx.) for plate μa = 50	-22	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9AC



Pin 1 – Internal Connection—Do Not Use
Pin 2 – Cathode
Pin 3 – Grid
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Grid
Pin 7 – Same as Pin 1
Pin 8 – Same as Pin 1
Pin 9 – Plate

VERTICAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[b]

DC PLATE VOLTAGE	550	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[c]	2200	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250	max.	volts

Indicates a change.

CATHODE CURRENT:			
Peak	105	max.	ma
Average	30	max.	ma
PLATE DISSIPATION	8.5	max.	watts
PEAK HEATER–CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200[d]	max.	volts

Maximum Circuit Values:

Grid–Circuit Resistance:			
For cathode–bias operation	2.2	max.	megohms

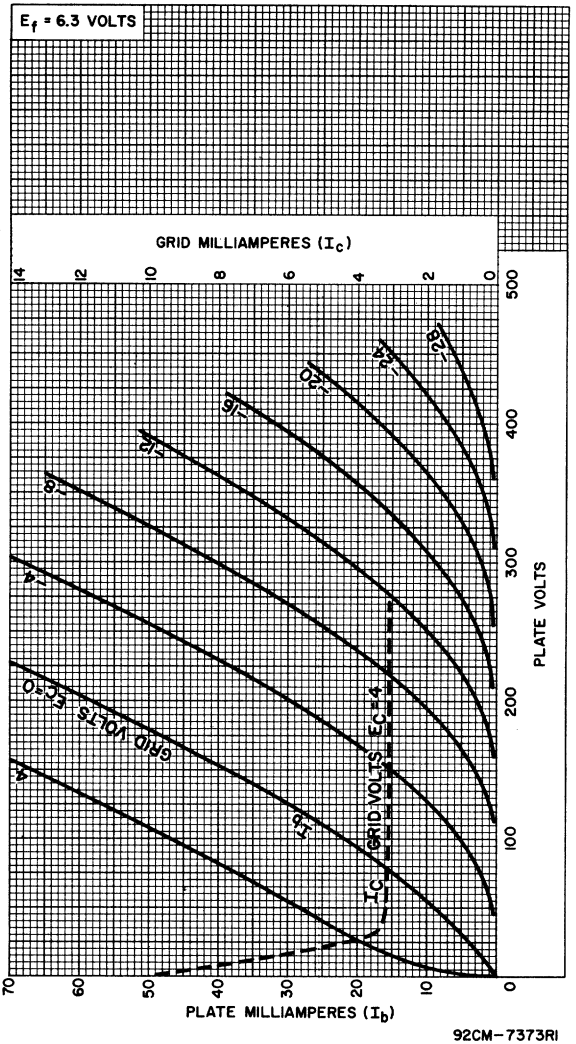
[a] Without external shield.

[b] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[c] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

[d] The dc component must not exceed 100 volts.

AVERAGE CHARACTERISTICS



92CM-7373RI

6SA7, 6SA7-GT/G

PENTAGRID CONVERTER

Heater ■	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.3	amp.

Direct Interelectrode Capacitances:	6SA7	6SA7-GT/G	
Grid #3 to All Other Electrodes (R-F Input)	9.5▲	11▲▲	μμf
Plate to All Other Electrodes (Mixer Output)	12▲	11▲▲	μμf
Grid #1 to All Other Electrodes (Osc. Input)	7▲	8▲▲	μμf
Grid #3 to Plate	0.13 max.▲	0.5 max.▲▲	μμf
Grid #3 to Grid #1	0.15 max.▲	0.4 max.▲▲	μμf
Grid #1 to Plate	0.06 max.▲	0.2 max.▲▲	μμf
Grid #1 to Shell, Grid #5, and All Other Electrodes except Cathode	4.4	-	μμf
Grid #1 to All Other Electrodes except Cathode & Grid #5	-	5	μμf
Grid #1 to Cathode	2.6	-	μμf
Grid #1 to Cathode & Grid #5	-	3	μμf
Cathode to Shell, Grid #5, and All Other Electrodes except Grid #1	5	-	μμf
Cathode and Grid #5 to All Other Electrodes except Grid #1	-	14	μμf
Maximum Overall Length	2-5/8"	3-5/16"	
Maximum Seated Height	2-1/16"	2-3/4"	
Maximum Diameter	1-5/16"	1-5/16"	
Bulb	Metal Shell MT-8	T-9	
Base	Small Wafer	Intermed. Sh. Octal 8-Pin	
Pin 1	6SA7, Shell, Grid #5 6SA7-GT/G, No Conn.		
Pin 2	Heater		
Pin 3	Plate		
Pin 4	Grids #2 & #4		
Pin 5	Grid #1		
Pin 6	6SA7, Cathode 6SA7-GT/G, Cathode & Grid #5		
Pin 7	Heater		
Pin 8	Grid #3		

BOTTOM VIEW (8R)

BOTTOM VIEW (G-8AD)

Mounting Position: Any

Maximum And Minimum Ratings Are Design-Center Values

CONVERTER SERVICE

Plate Voltage	300 max. volts
Grids #2 & #4 Voltage	100 max. volts
Grids #2 & #4 Supply Voltage	300 max. volts
Grid #3 Voltage *	0 min. volts
Plate Dissipation	1.0 max. watt
Screen Dissipation	1.0 max. watt
Total Cathode Current	14 max. ma.

■ In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.
▲ With shell connected to cathode.
▲▲ With external shield connected to cathode.
* For self-excited oscillator.
← Indicates a change.

6SA7, 6SA7-GT/G
PENTAGRID CONVERTER

(continued from preceding page)

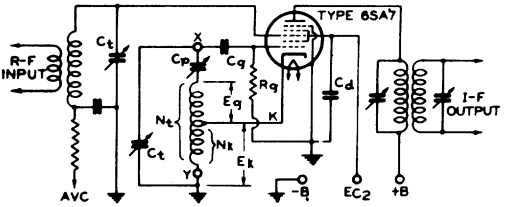
Characteristics:	*Self-excitation**		*Separate Excitation*		
Plate Voltage	100	250	100	250	volts
Grids #2 & #4 Volt.	100	100	100	100	volts
Grid #3 (Control) Volt.	0	0	-2	-2	volts
Grid #1 Resistor	20000	20000	20000	20000	ohms
Plate Res. (Approx.)	0.5	1.0	0.5	1.0	megohm
Conversion Transcond.	425	450	425	450	μmhos
Conversion Transcond. (Approx.) ‡	2	2	2	2	μmhos
Plate Current	3.3	3.5	3.3	3.5	ma.
Grids #2 & #4 Current	8.5	8.5	8.5	8.5	ma.
Grid #1 Current	0.5	0.5	0.5	0.5	ma.
Total Cathode Current	12.3	12.5	12.3	12.5	ma.

NOTE: The transconductance between Grid #1 and Grids #2 & #4 connected to plate (not oscillating) is approximately 4500 μmhos under the following conditions: Grids #1, #3, and shell at 0 volts; Grids #2 & #4 and plate at 100 volts.

* Characteristics are approximate only and are shown for a Hartley circuit with a feedback of approximately 2 volts peak in the cathode circuit.

‡ With Grid #3 bias of -35 volts.

TYPICAL SELF-EXCITED CONVERTER CIRCUIT FOR TYPE 6SA7



C_d = BY-PASS COND.
C_g = 50 μμf
C_p = PADDING COND.
C_t = TUNING COND.

N_t = TOTAL TURNS IN OSC. COIL
N_k = TURNS IN CATHODE SECTION OF OSC. COIL
R_g = 20000 OHMS

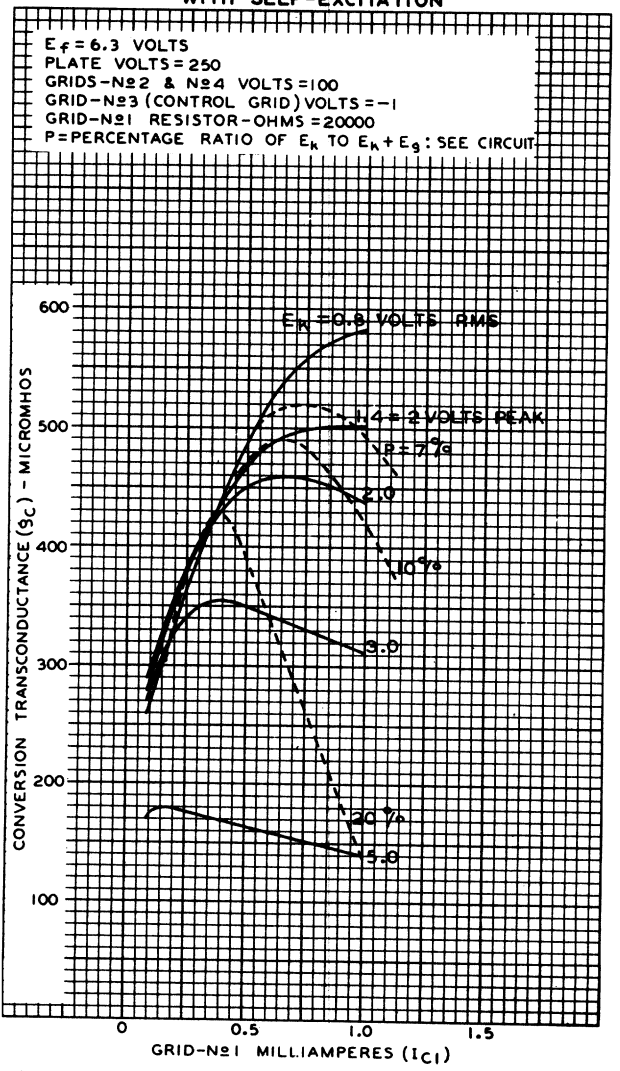
CE-8992

The license extended to the purchaser of tubes appears in the License Notice accompanying them. Information contained herein is furnished without assuming any obligations.

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

6SA7

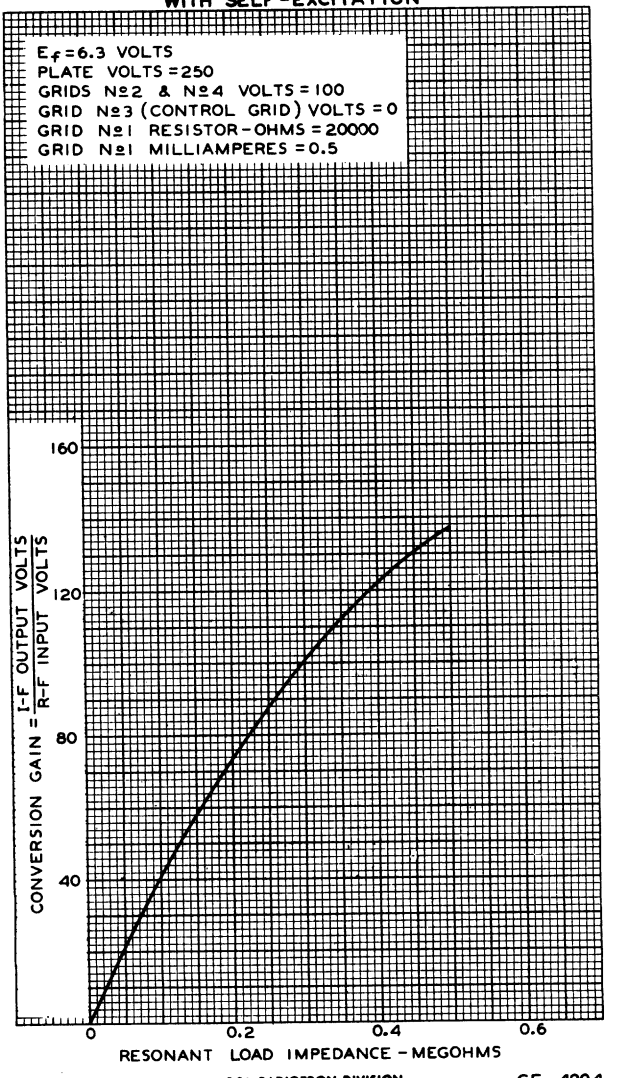
OPERATION CHARACTERISTICS
WITH SELF-EXCITATION



6SA7

6SA7

OPERATION CHARACTERISTIC
WITH SELF-EXCITATION



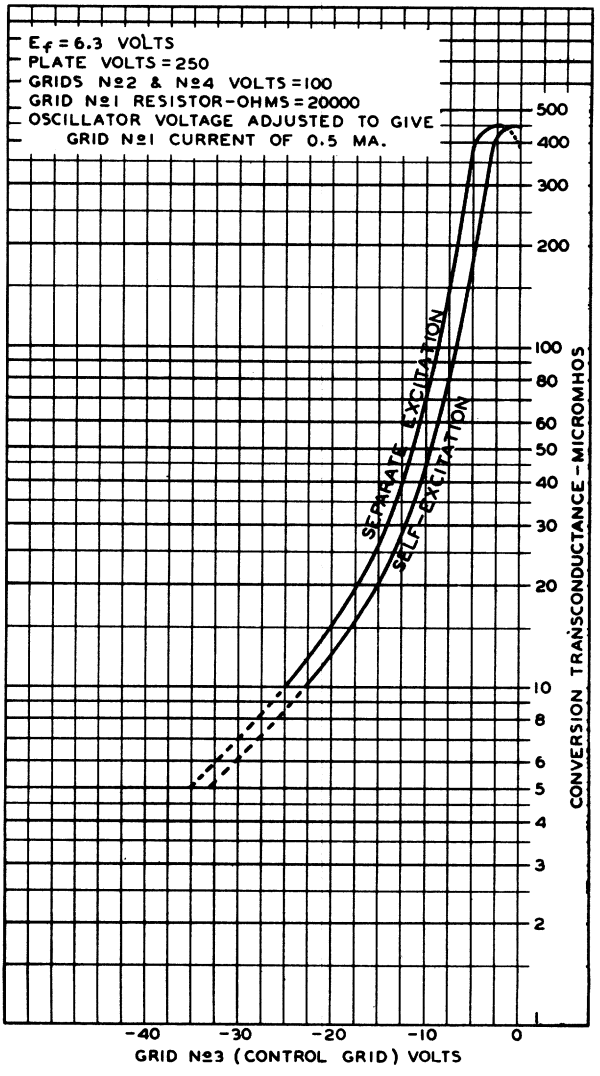
APR. 25, 1941

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

CE-4994

6SA7

OPERATION CHARACTERISTICS

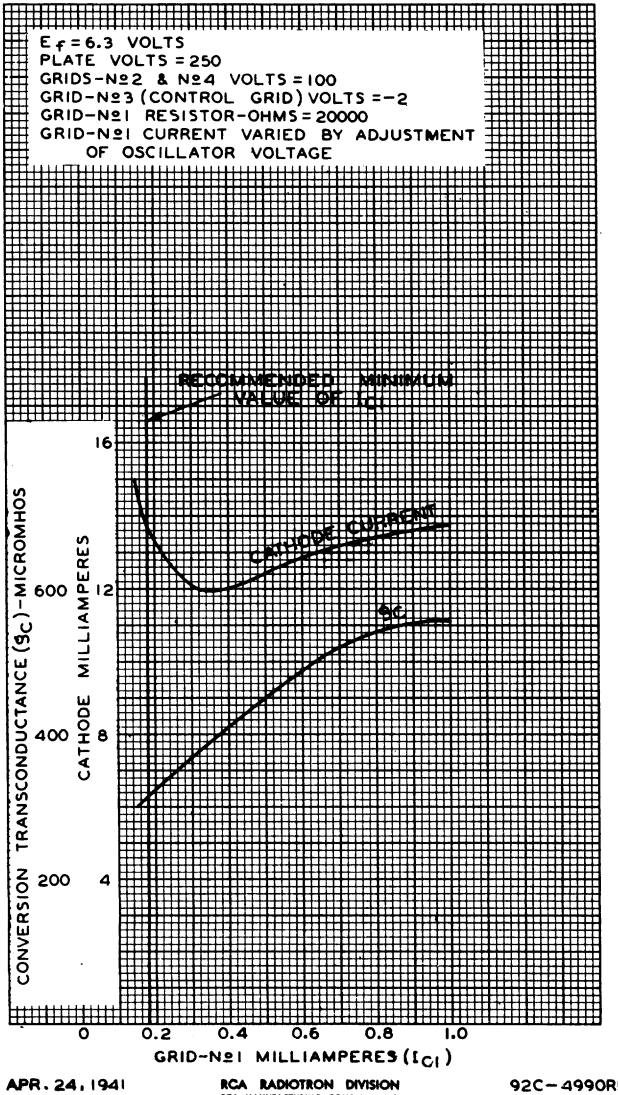


OCT. 25, 1938 RCA RADIOTRON DIVISION RCA MANUFACTURING COMPANY, INC. 92C-4989

6SA7

6SA7

OPERATION CHARACTERISTICS
WITH SEPARATE OSCILLATOR EXCITATION



6 SJ7, 6SJ7-GT
SHARP-CUTOFF PENTODE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.3	amp

Direct Interelectrode Capacitances:

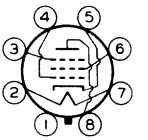
Pentode Connection:	6SJ7°	6SJ7-GT°°	
Grid No.1 to Plate	0.005 max.	0.005 max.	μμf
Input	6	7	μμf ←
Output	7	7	μμf ←
Triode Connection:*			
Grid No.1 to Plate	2.8	2.8	μμf
Grid No.1 to Cathode	3.4	3.4	μμf
Plate to Cathode	11	11	μμf

° With shell connected to cathode.
°° With external shield connected to cathode.
* With grid No.2 and grid No.3 connected to plate.

Mechanical:

Mounting Position	Any	Any
Maximum Overall Length	2-5/8"	3-5/16"
Maximum Seated Length	2-1/16"	2-3/4"
Maximum Diameter	1-5/16"	1-5/16"
Bulb	Metal Shell, MT8G	T-9
Base	Small-Wafer / Octal 8-Pin	Sm.-Wafer Octal 8-Pin, Sleeve
Basing Designation	8N	GT-8N

BOTTOM VIEW



Pin 1 { 6SJ7, Shell / 6SJ7-GT, Base Sleeve }
Pin 2 – Heater
Pin 3 – Grid No.3
Pin 4 – Grid No.1
Pin 5 – Cathode
Pin 6 – Grid No.2
Pin 7 – Heater
Pin 8 – Plate

AMPLIFIER – Class A_1

Pentode Connection

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	300 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	125 max.	volts
GRID-No.2 SUPPLY VOLTAGE	300 max.	volts
PLATE DISSIPATION	2.5 max.	watts
GRID-No.2 DISSIPATION	0.7 max.	watt ←
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive bias value	0 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		←
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

← Indicates a change.

6SJ7
6SJ7-GT

6SJ7, 6SJ7-GT
SHARP-CUTOFF PENTODE

Typical Operation and Characteristics:

Plate voltage	100	250	volts
Grid No.3 (Suppressor)	Connected to cathode at socket		
Grid-No.2 Voltage	100	100	volts
Grid-No.1 Voltage	-3	-3	volts
Plate Resistance (Approx.)	0.7	*	megohm
Transconductance	1575	1650	μmhos
Grid-No.1 Bias (Approx.) for plate current of 10 μamp	-8	-8	volts
Plate Current	2.9	3.0	ma
Grid-No.2 Current	0.9	0.8	ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . 1 max. megohm

AMPLIFIER - Class A_1

Triode Connection - Grids No.2 and No.3 Connected to Plate

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	250 max. volts
PLATE DISSIPATION (Total)	2.5 max. watts
GRID-No.1 VOLTAGE:	
Positive bias value	0 max. volts
→ PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode	90 max. volts
Heater positive with respect to cathode	90 max. volts

Typical Operation and Characteristics:

Plate Voltage	180	250	volts
Grid-No.1 Voltage	-6	-8.5	volts
Amplification Factor	19	19	
Plate Resistance (Approx.)	8250	7600	ohms
Transconductance	2300	2500	μmhos
Plate Current	6.0	9.2	ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . 1 max. megohm

* Greater than 1 megohm.

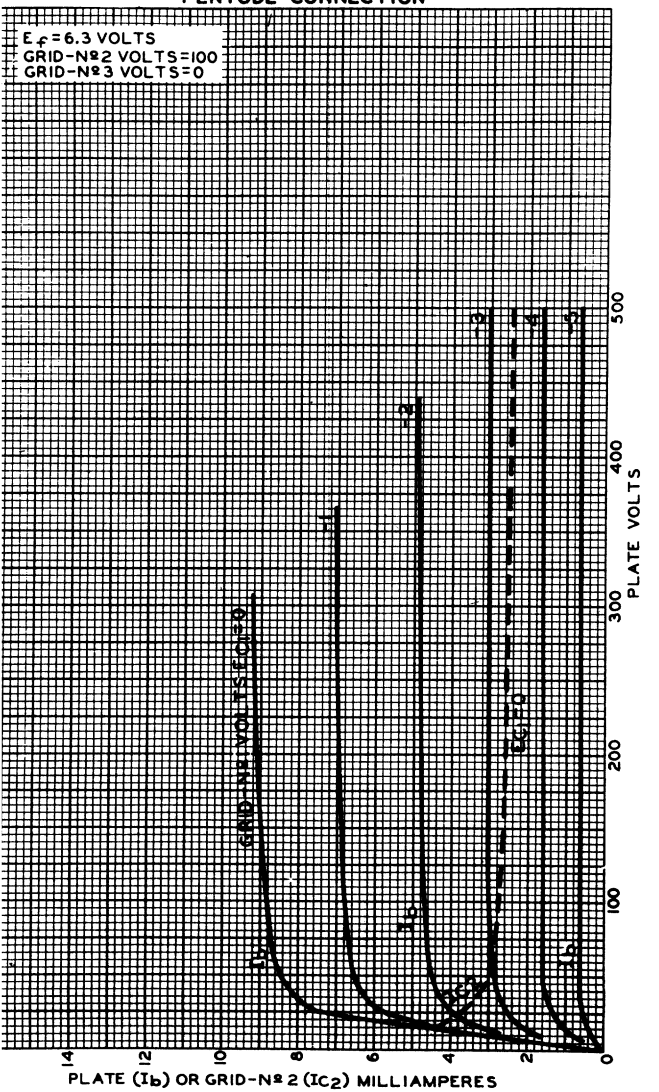
For additional data, see RESISTANCE-COUPLED AMPLIFIER CHART at the front of this Section

→Indicates a change.

6SJ7

AVERAGE PLATE CHARACTERISTICS

PENTODE CONNECTION



CT. 16,1947

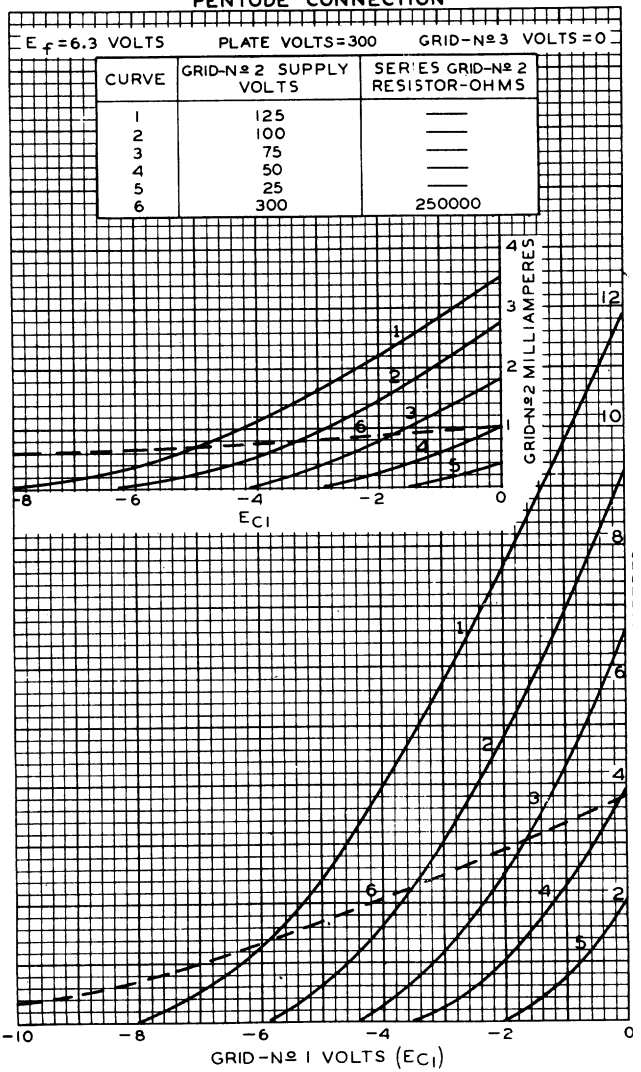
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-4939R1

6SJ7

6SJ7

AVERAGE CHARACTERISTICS
PENTODE CONNECTION



MARCH 5, 1948

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6443R1

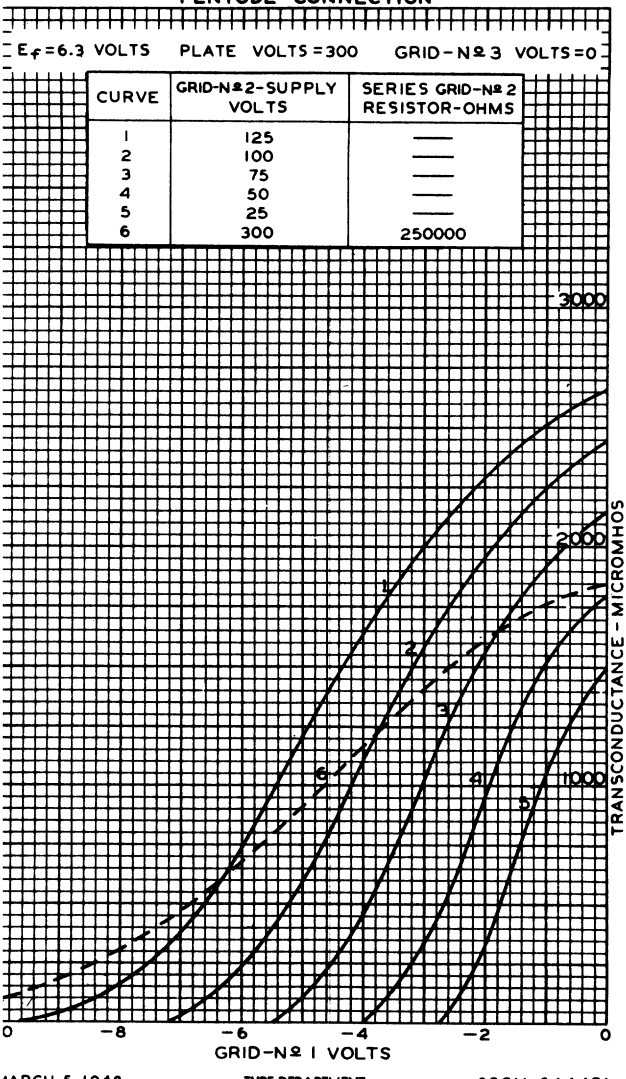
6SJ7

AVERAGE CHARACTERISTICS

PENTODE CONNECTION

E_f = 6.3 VOLTS PLATE VOLTS = 300 GRID-№3 VOLTS = 0

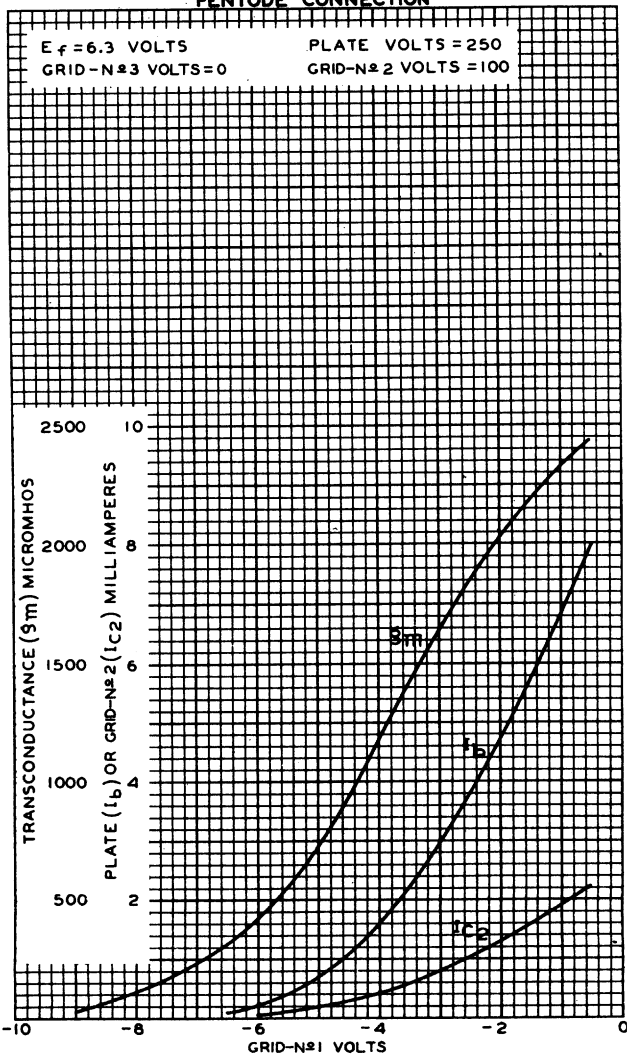
CURVE	GRID-№2-SUPPLY VOLTS	SERIES GRID-№2 RESISTOR-OHMS
1	125	—
2	100	—
3	75	—
4	50	—
5	25	—
6	300	250000



6SJ7

6SJ7

AVERAGE CHARACTERISTICS
PENTODE CONNECTION

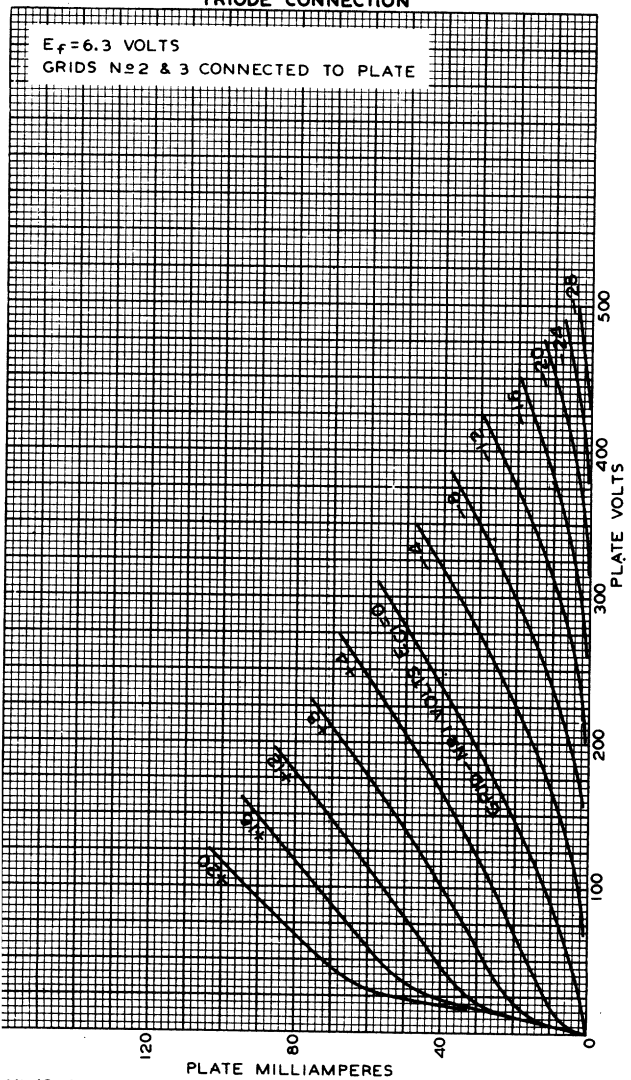


MARCH 5, 1948

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-4937R1

6SJ7
AVERAGE PLATE CHARACTERISTICS
TRIODE CONNECTION



MAY 12, 1948

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6409RI

6SL7-GT
HIGH-MU TWIN TRIODE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:
Voltage. . . . . 6.3 . . . . . ac or dc volts
Current. . . . . 0.3 . . . . . amp

Direct Interelectrode Capacitances (Approx.):[o]

	Unit No.1	*Unit No.2*	
Grid to plate	2.8	2.8	. . . . μμf
Grid to cathode and heater . . .	3.0	3.4	. . . . μμf
Plate to cathode and heater . . .	3.8	3.2	. . . . μμf

Mechanical:

Mounting Position. . . . . Any
Maximum Overall Length . . . . . 3-5/16"
Maximum Seated Length. . . . . 2-3/4"
Maximum Diameter . . . . . 1-9/32" ←
Bulb T-9
Base . . . . . Intermediate-Shell Octal 8-Pin (JETEC No. B8-6) ←
or Short Intermediate-Shell Octal 8-Pin (JETEC No. B8-46)
Basing Designation for BOTTOM VIEW 8BD

Pin 1 - Grid of Unit No.2
Pin 2 - Plate of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Grid of Unit No.1

Pin 5 - Plate of Unit No.1
Pin 6 - Cathode of Unit No.1
Pin 7 - Heater
Pin 8 - Heater

AMPLIFIER—Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Center Values*: ←

PLATE VOLTAGE.	300 max.	volts
GRID VOLTAGE:		
Positive bias value.	0 max.	volts
PLATE DISSIPATION.	1 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode. . .	90 max.	volts
Heater positive with respect to cathode. . .	90 max.	volts

Characteristics:

Plate Voltage.	250	volts

[o] With close-fitting shield (JETEC No.308) connected to cathode. ←

←Indicates a change.

6SL7-GT

HIGH-MU TWIN TRIODE

Grid Voltage	-2	volts
Amplification Factor	70	
Plate Resistance (Approx.)	44000	ohms
Transconductance	1600	μmhos
Plate Current	2.3	ma

→**Typical Operation as Resistance-Coupled Amplifier:**

See RESISTANCE-COUPLED AMPLIFIER CHART No. 7 at front of this Section

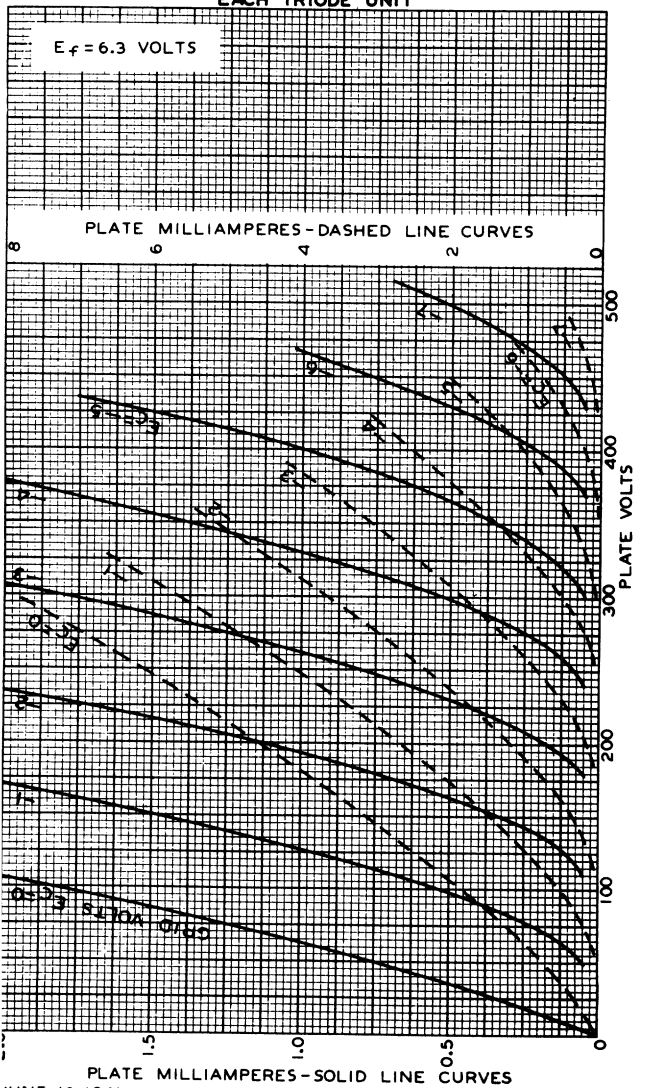
→Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6SL7-GT

AVERAGE PLATE CHARACTERISTICS

EACH TRIODE UNIT



6SN7-GTA

MEDIUM-MU TWIN TRIODE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage	6.3	ac or dc volts
Current	0.6	amp

Direct Interelectrode Capacitances (With no external shield):

	Unit No.1	Unit No.2	
Grid to plate	4	3.8	μμf
Grid to cathode and heater	2.2	2.6	μμf
Plate to cathode and heater	0.7	0.7	μμf

Characteristics, Class A_1 Amplifier (Each Unit):

Plate Voltage	90	250	volts
Grid Voltage	0	-8	volts
Amplification Factor	20	20	volts
Plate Resistance (Approx.)	6700	7700	ohms
Transconductance	3000	2600	μmhos
Plate Current	10	9	ma
Plate Current for grid voltage of -12.5 volts	-	1.3	ma
Grid Voltage (Approx.) for plate current of 10 μamp	-7	-18	volts

Mechanical:

Mounting Position	Any
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-9/32"
Bulb	T-9
Base	Short Intermediate-Shell Octal 8-Pin with External Barriers (JETEC No.B8-58)
Basing Designation for BOTTOM VIEW	8BD

Pin 1 - Grid of Unit No.2
Pin 2 - Plate of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Grid of Unit No.1

Pin 5 - Plate of Unit No.1
Pin 6 - Cathode of Unit No.1
Pin 7 - Heater
Pin 8 - Heater

AMPLIFIER - Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	450 max.	volts
CATHODE CURRENT	20 max.	ma

6SN7-GTA

MEDIUM-MU TWIN TRIODE

PLATE DISSIPATION:			
Either plate	5	max.	watts
Both plates (Both units operating)	7.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation	1	max.	megohm

Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED AMPLIFIER CHART No.29 at front of this Section

HORIZONTAL DEFLECTION OSCILLATOR

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	450	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE♦	600	max.	volts
CATHODE CURRENT:			
Peak	300	max.	ma
Average	20	max.	ma
PLATE DISSIPATION:			
Either plate	5	max.	watts
Both plates (Both units operating)	7.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias, grid-resistor bias, or cathode-bias operation	2.2	max.	megohms

VERTICAL DEFLECTION OSCILLATOR

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	450	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE#	400	max.	volts
CATHODE CURRENT:			
Peak	70	max.	ma
Average	20	max.	ma

▲,□,♦,#: See next page.

6SN7-GTA

MEDIUM-MU TWIN TRIODE

PLATE DISSIPATION:			
Either plate	5	max.	watts
Both plates (Both units operating)	7.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias, grid-resistor bias, or cathode-bias operation	2.2	max.	megohms

VERTICAL DEFLECTION AMPLIFIER

Values are for Each Unit

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	450	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE# (Absolute Maximum)	1500■	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	70	max.	ma
Average	20	max.	ma
PLATE DISSIPATION:			
Either plate	5	max.	watts
Both plates (Both units operating)	7.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For cathode-bias operation	2.2	max.	megohms

▲ The dc component must not exceed 100 volts.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

♦ This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

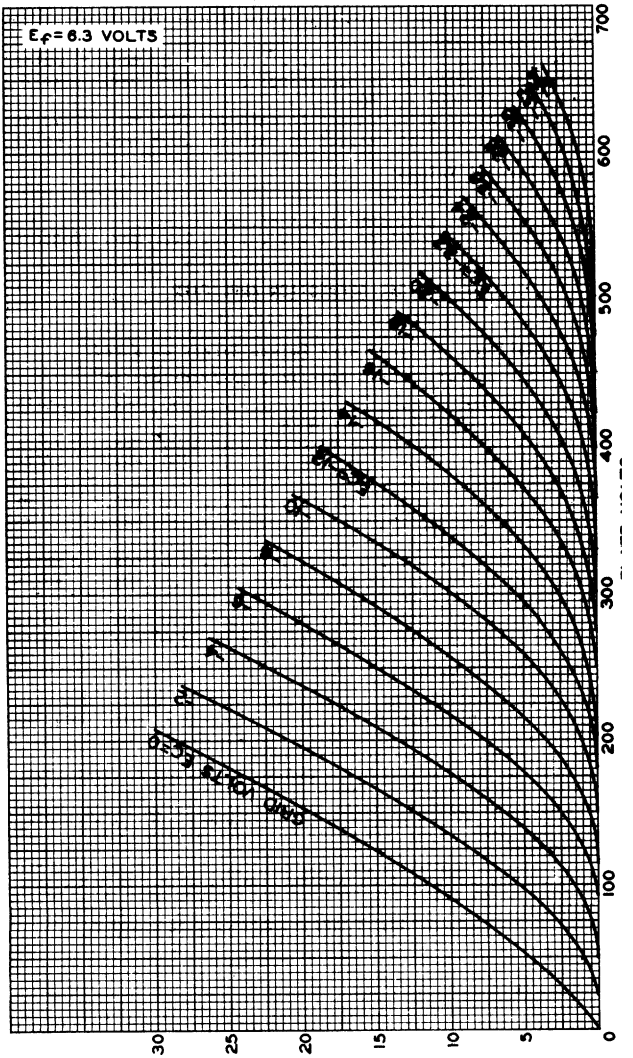
This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

■ Under no circumstances should this absolute value be exceeded.

6SN7-GTA

6SN7-GTA

AVERAGE PLATE CHARACTERISTICS
FOR EACH UNIT



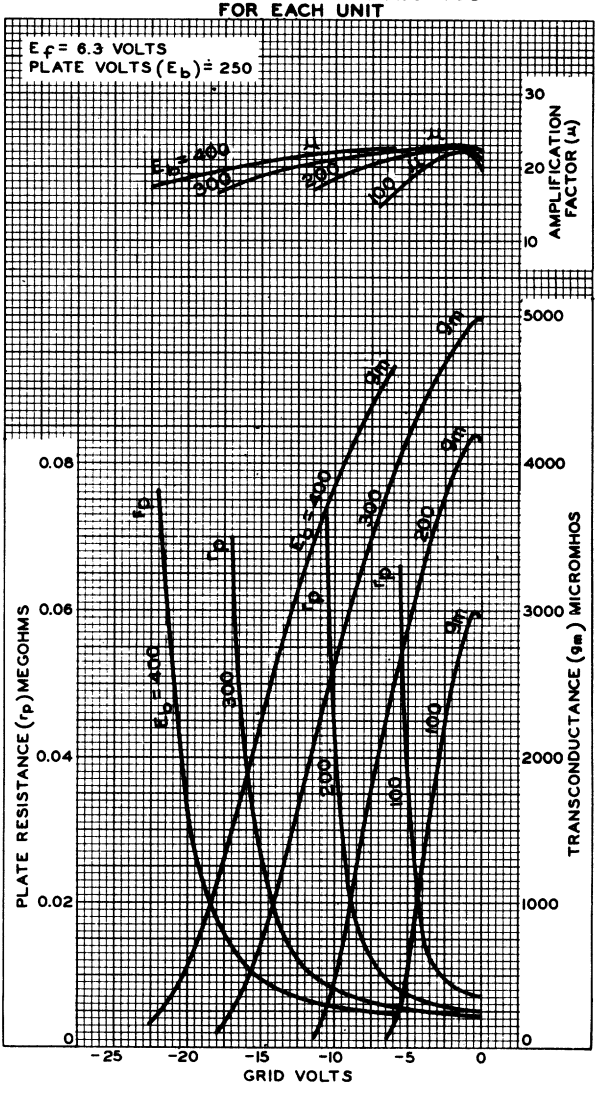
APRIL. 28, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8322

6SN7-GTA

AVERAGE CHARACTERISTICS
FOR EACH UNIT



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6SN7-GTB

MEDIUM-MU TWIN TRIODE

Intended for use in equipment having series heater-string arrangement

The 6SN7-GTB is the same as the 6SN7-GTA except for the following item:

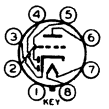
Heater, for Unipotential Cathodes:
Warm-up time (Average) . 11 . . . . . .sec
For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

6SQ7, 6SQ7-GT/G

DUPLEX-DIODE HIGH-MU TRIODE

Heater	Coated Unipotential Cathode		
Voltage	6.3		a-c or d-c volts
Current	0.3		amp.
	6SQ7	*6SQ7-GT/G*	
Direct Interelectrode Cap.	▲	•	
Triode Unit:			
Grid to Plate	1.6	1.8	μμf
Grid to Cathode	3.2	4.2	μμf
Plate to Cathode	3.0	3.4	μμf
Maximum Overall Length	2-5/8"	3-5/16"	
Maximum Seated Height	2-1/16"	2-3/4"	
Maximum Diameter	1-5/16"	1-5/16"	
Bulb	Metal Shell, MT-8	T-9	
Base	Small Wafer, Octal 8-Pin	Small Wafer Octal 8-Pin, Sleeve	
Basing Designation	8Q	GT-8Q	

Pin 1 { 6SQ7, Shell / 6SQ7-GT/G, Base Sleeve
Pin 2 - Triode Grid
Pin 3 - Cathode
Pin 4 - Diode Plate #2
Pin 5 - Diode Plate #1
Pin 6 - Triode Plate
Pin 7 - Heater
Pin 8 - Heater



BOTTOM VIEW

Mounting Position: Any

Maximum Ratings Are Design-Center Values

TRIODE UNIT

Plate Voltage	300 max.	volts
D-C Heater-Cathode Potential	100 max.	volts

Characteristics - Class A_1 Amplifier:

Heater	6.3	6.3	volts
Plate	100	250	volts
Grid	-1	-2	volts
Amp. Fact.	100	100	
Plate Res.	110000	91000	ohms
Transcond.	900	1100	μmhos
Plate Cur.	0.4	0.9	ma.

Typical Operation—Resistance-Coupled Amplifier:
Same as Type 75 in RESISTANCE-COUPLED AMPLIFIER CHART.

DIODE UNITS - Two

Consideration of these units is given under Type 85. Circuits will be similar to those shown for Type 55 with fixed bias. Diode biasing of the triode unit of the 6SQ7 or 6SQ7-GT/G is not suitable. Diode curves under Type 6B7 apply to the 6SQ7 and 6SQ7-GT/G.

▲ With shell connected to cathode. Values are approximate.
• With no external shield. Values are approximate.

The curve under Type 75 also applies to the 6SQ7 and the 6SQ7-GT/G.

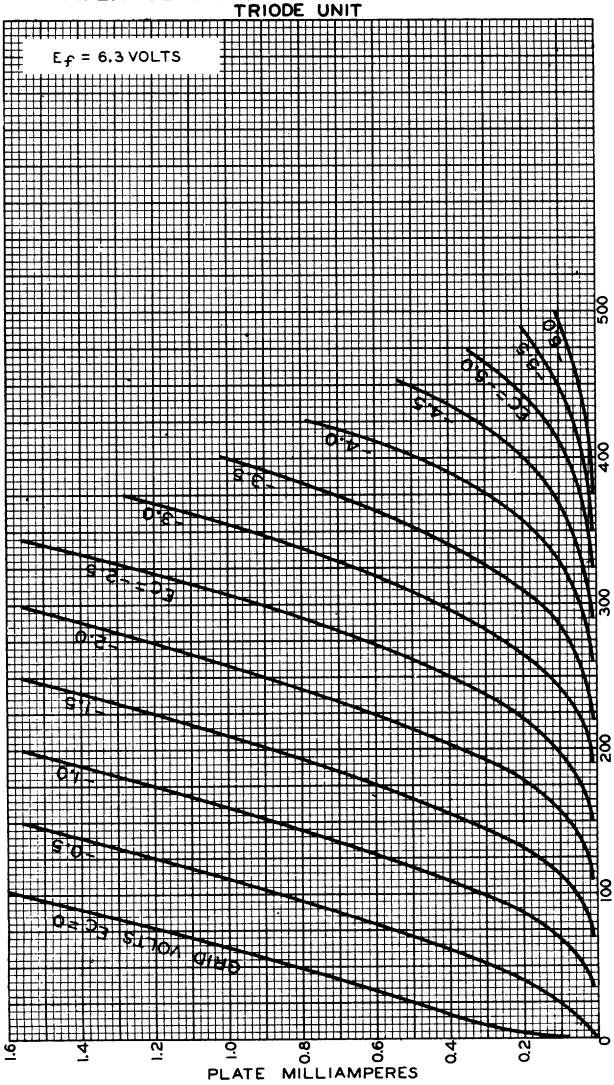
←Indicates a change.

6SQ7

6SQ7

AVERAGE PLATE CHARACTERISTICS

TRIODE UNIT



DEC. 14, 1943

RCA VICTOR DIVISION

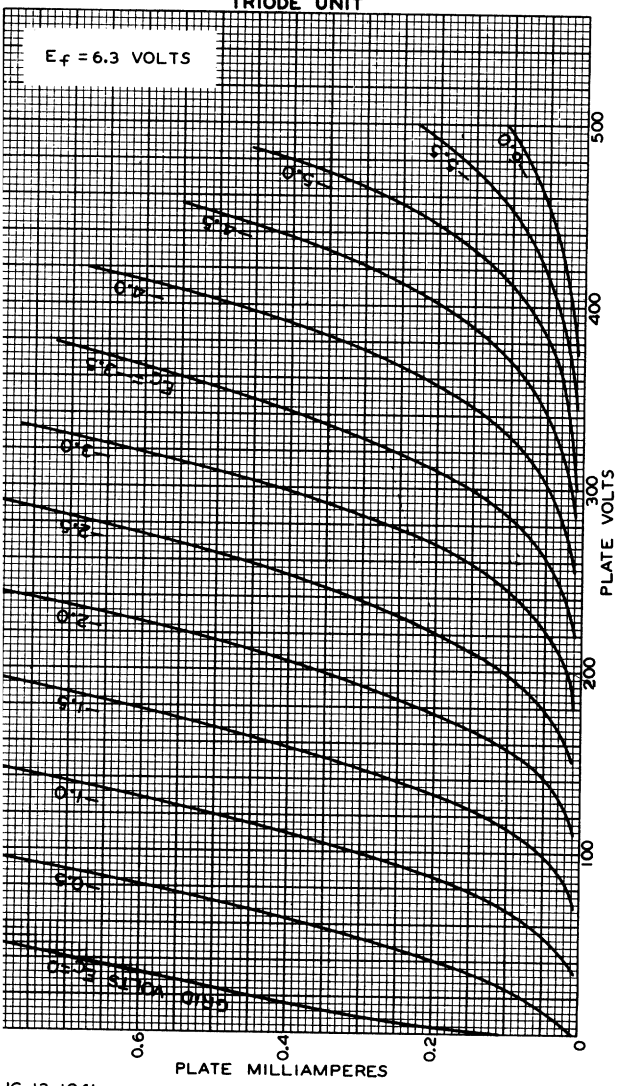
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

92CM-4975R2

6SQ7

AVERAGE PLATE CHARACTERISTICS

TRIODE UNIT



JG. 13, 1941

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-6310

6T8-A

TRIPLE DIODE—HIGH-MU TRIODE

9-PIN MINIATURE TYPE

With heater having controlled warm-up time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage	6.3	ac or dc volts
Current	0.45 ± 6%	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield**	
Triode Unit:			
Grid to plate	1.7	1.7	μμf
Grid to cathode & internal shield (pin 7), and heater	1.6	1.7	μμf
Plate to cathode & internal shield (pin 7), and heater	1.2	2.4	μμf
Diode Units:			
Diode-No.1 plate to cathode & internal shield (pin 7), and heater	3.8	3.8	μμf
Diode-No.2 plate to cathode & internal shield (pin 3), and heater	3.8	3.8●	μμf
Diode-No.3 plate to cathode & internal shield (pin 7), and heater	3.4	3.6	μμf
Diode-No.2 cathode & internal shield (pin 3) to all other electrodes, and heater	7.5	8.5■	μμf
Triode grid to any diode plate	0.034 max.	0.034 max.	μμf

Characteristics, Class A_1 Amplifier (Triode Unit):

Plate Voltage	100	250	volts
Grid Voltage	−1	−3	volts
Amplification Factor	70	70	
Plate Resistance (Approx.)	54000	58000	ohms
Transconductance	1300	1200	μmhos
Plate Current	0.8	1	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"

*,●,■: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

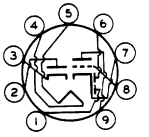
6T8-A

6T8-A

TRIPLE DIODE—HIGH-MU TRIODE

Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9E

Pin 1 – Diode–No.3 Plate
Pin 2 – Diode–No.2 Plate
Pin 3 – Diode–No.2 Cathode, Internal Shield
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Diode–No.1 Plate
Pin 7 – Cathode of Triode & Diodes No.1 & No.3, Internal Shield
Pin 8 – Triode Grid
Pin 9 – Triode Plate

TRIODE UNIT — AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values.*

PLATE VOLTAGE	330 max.	volts
GRID VOLTAGE:		
Positive-bias value	0 max.	volts
PLATE DISSIPATION	1.1 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED AMPLIFIER CHART No.7 at front of this Section

DIODE UNITS — Three

Maximum Ratings, *Design-Maximum Values:*

PLATE CURRENT (For each diode)	5.5 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Characteristics (Each Unit):

Plate Voltage	5	volts
Plate Current	20	ma

Diode Considerations:

Diode No.1, diode No.3, and the triode have a common cathode, and diode No.2 has a separate cathode. Diode No.2 (pins 2 & 3) and diode No.3 (pins 1 & 7) are recommended for use in FM detector applications, while diode No.1 (pins 6 & 7) is recommended for use as an AM detector.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

6T8-A

TRIPLE DIODE—HIGH-MU TRIODE

With external shield JEDEC No.315 connected to pin 7 except as noted.
With external shield JEDEC No.315 connected to pin 3.
With external shield JEDEC No.315 connected to pins 4 and 5.

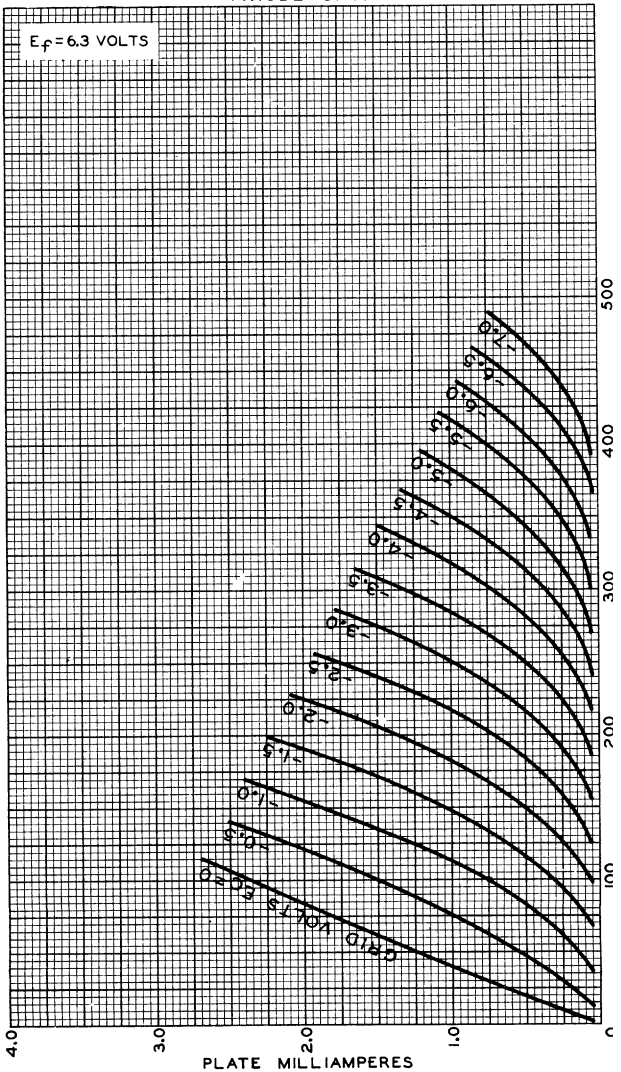
6T8-A

RCA

6T8-A

AVERAGE PLATE CHARACTERISTICS

TRIODE UNIT



ELECTRON TUBE DIVISION

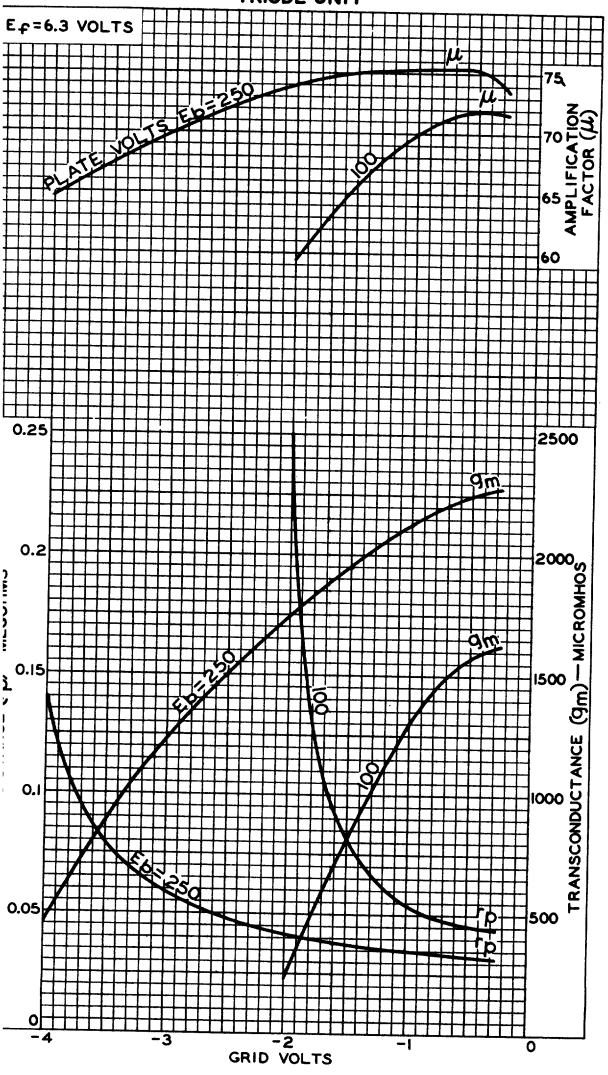
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7063

6T8-A

AVERAGE CHARACTERISTICS

TRIODE UNIT

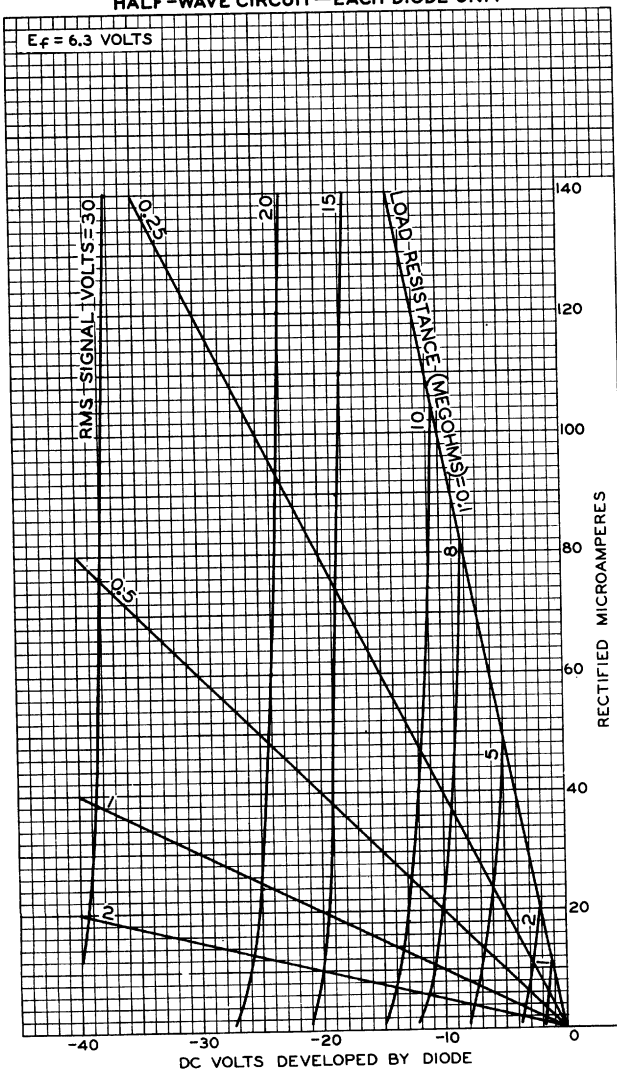


6T8-A

6T8-A

AVERAGE CHARACTERISTICS

HALF-WAVE CIRCUIT—EACH DIODE UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-961

6U8-A

Medium-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Voltage (AC or DC)		6.3	volts
Current		0.45 ± 6%	amp
Warm-up time (Average)		11	sec
Direct Interelectrode Capacitances:	*Without External Shield*	*With External Shield*▲	
Triode Unit:			
Grid to plate	1.8	1.8	μμf
Grid to cathode and heater	2.8	2.8	μμf
Plate to cathode and heater	1.5	2	μμf
Pentode Unit:			
Grid No.1 to plate	0.015 max.	0.007 max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	5	5	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	2.6	3.5	μμf
Pentode grid No.1 to triode plate	0.2 max.	0.2 max.	μμf
Pentode plate to triode plate	0.1 max.	0.02 max.	μμf
Heater to cathode (Each unit)	3	3●	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*		
Plate Voltage	125	100	125	volts
Grid-No.2 Voltage	–	70	110	volts
Grid-No.1 Voltage	-1	–	-1	volt
Amplification Factor	40	–	–	
Plate Resistance (Approx.)	5400	–	200000	ohms
Transconductance	7500	5500	5000	μmhos
Plate Current	13.5	–	9.5	ma
Grid-No.2 Current	–	–	3.5	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-9	–	-8	volts

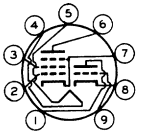
← Indicates a change.

6U8-A

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
→ Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9AE

Pin 1 - Triode Plate
Pin 2 - Pentode Grid No.1
Pin 3 - Pentode Grid No.2
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Pentode Plate



Pin 7 - Pentode Cathode, Pentode Grid No.3, Internal Shield
Pin 8 - Triode Cathode
Pin 9 - Triode Grid

→ AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

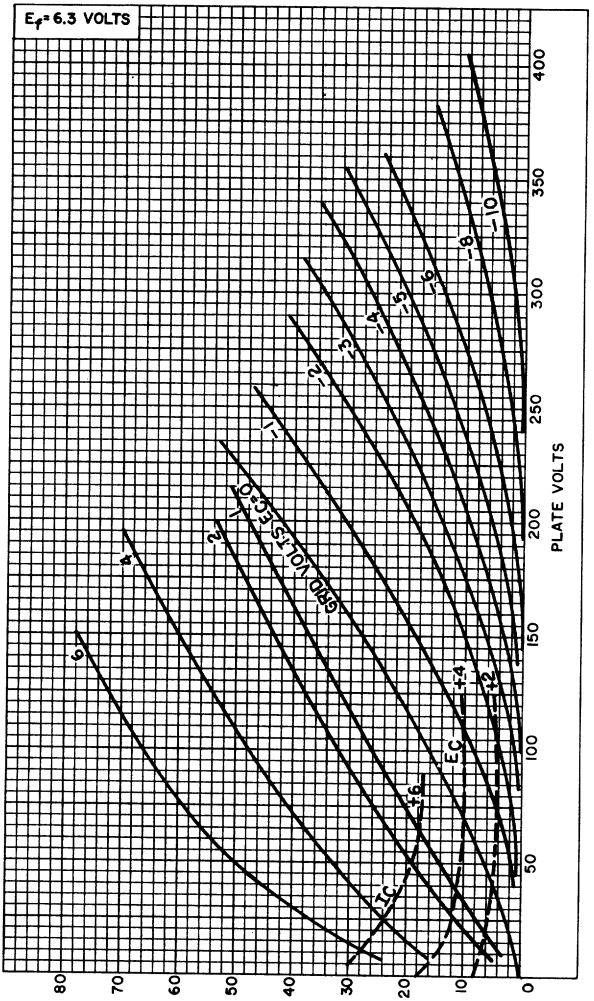
	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	330 max.	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	-	330 max.	volts
GRID-No.2 VOLTAGE	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts	-	0.55 max.	watt
For grid-No.2 voltages between 165 and 330 volts	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	2.5 max.	3 max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	200 max.	200★ max.	volts
Heater positive with respect to cathode	200 max.	200★ max.	volts

Maximum Circuit Values:	*Triode Unit*	*Pentode Unit*	
Grid-No.1-Circuit Resistance: For fixed-bias operation	-	0.5 max.	megohm
For cathode-bias operation	-	1 max.	megohm

▲ With external shield JEDEC No.315 connected to pin 4 except as noted.
● With external shield JEDEC No.315 connected to pin 6.
★ The dc component must not exceed 100 volts.

→ Indicates a change.

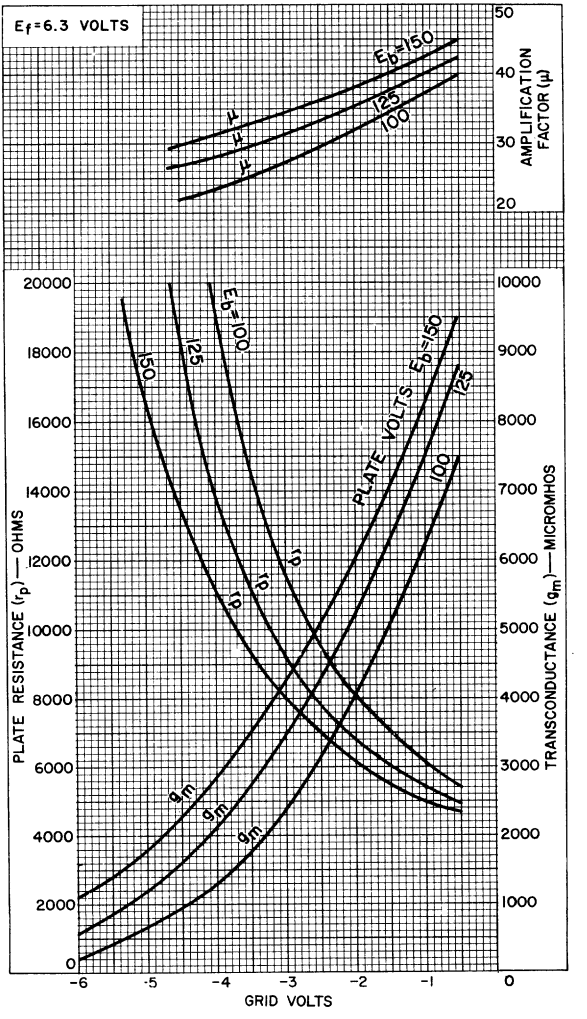
AVERAGE CHARACTERISTICS
Triode Unit



92CM-7873R2

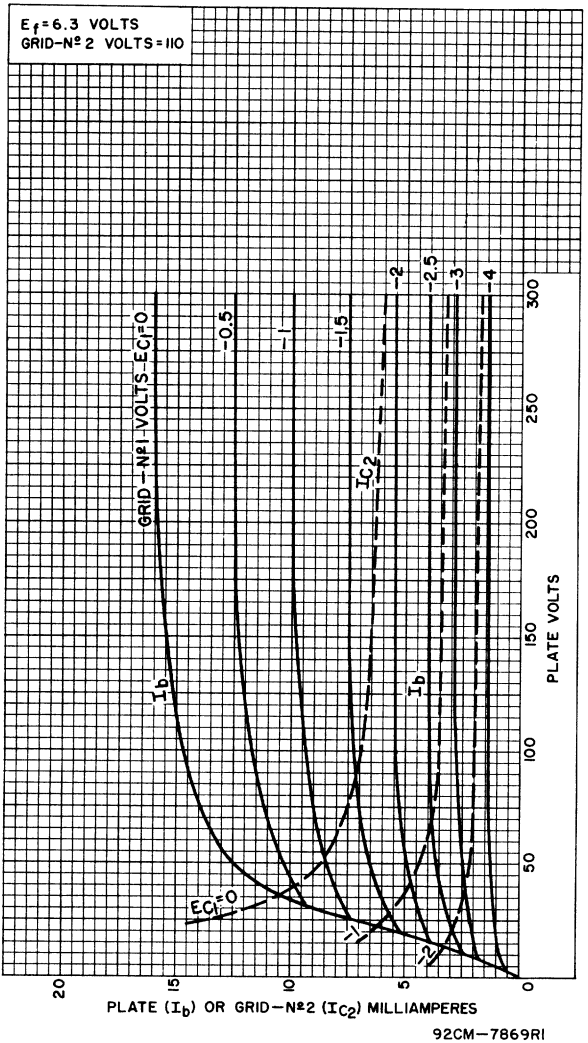
6U8-A

AVERAGE CHARACTERISTICS
Triode Unit



92CM-10900

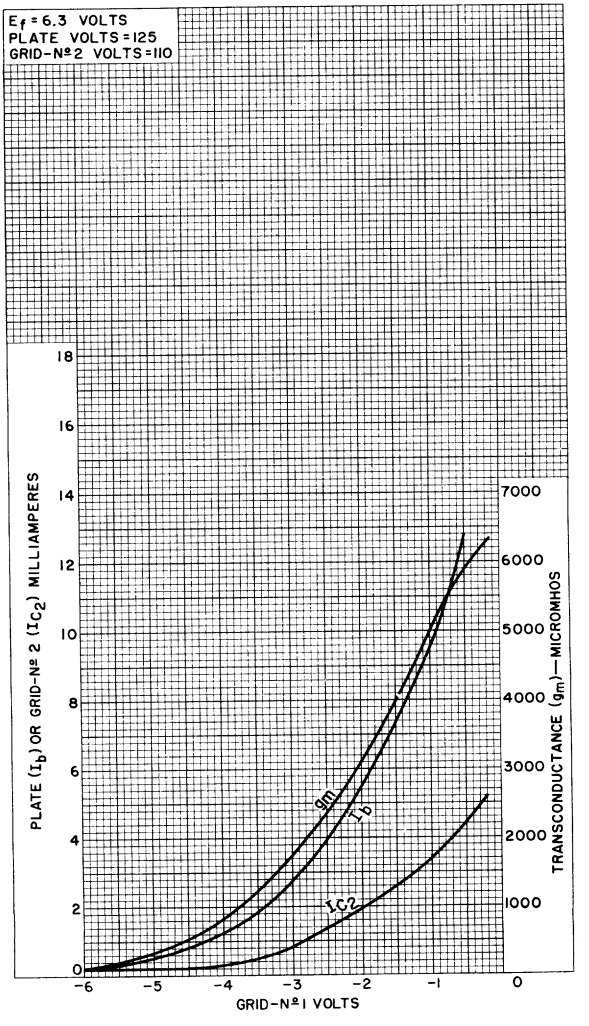
AVERAGE CHARACTERISTICS
Pentode Unit



92CM-7869RI

6U8-A

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-10902

6V3-A
HALF-WAVE VACUUM RECTIFIER

9-PIN MINIATURE TYPE

For Television Damper Service

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	1.75	amp
Direct Interelectrode Capacitances (Approx.):		
Heater to cathode	1.5	μμf
Plate to cathode and heater	8	μμf
Cathode to plate and heater	9	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	3-1/16"
Seated Length	2-21/32" ± 1/8"
Maximum Diameter	7/8"
Bulb	T-6-1/2
Cap	Skirted Miniature (JETEC No.C1-2 or C1-33)
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9BD

Pin 1 – No Connection
Pin 2 – Plate
Pin 3 – Same as Pin 1
Pin 4 – Heater
Pin 5 – Heater

Pin 6 – Same as Pin 1
Pin 7 – Plate
Pin 8 – Same as Pin 1
Pin 9 – Plate
Cap – Cathode

DAMPER SERVICE

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system□

PEAK INVERSE PLATE VOLTAGE		
(Absolute maximum)#	6000■ max.	volts
PEAK PLATE CURRENT	800 max.	ma
DC PLATE CURRENT	135 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode		
(Absolute maximum)#	6750■▲max.	volts
Heater positive with respect to cathode	300● max.	volts

Without external shield.

As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

This rating is applicable where the duty cycle of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

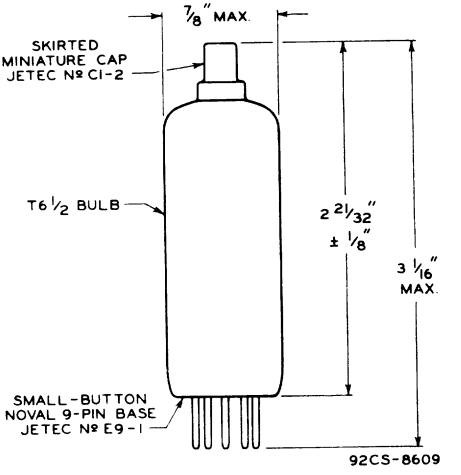
Under no circumstances should this absolute value be exceeded.

The dc component must not exceed 750 volts.

The dc component must not exceed 100 volts.

6V3-A

HALF-WAVE VACUUM RECTIFIER



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6V6GTA

Beam Power Tube

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3	volts
Current	0.45 ± 6%	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances (Approx.):[a]		
Grid-No.1 to plate	0.7	μμf
Grid-No.1 to cathode & grid No.3, grid No.2, and heater	9	μμf
Plate to cathode & grid No.3, grid No.2, and heater	7.5	μμf

Characteristics, Class A_1 Amplifier:

		Triode Connection[b]	
Plate Voltage	250	250	volts
Grid-No.2 Voltage	250	-	volts
Grid-No.1 Voltage	-12.5	-12.5	volts
Amplification Factor	-	9.8	
Plate Resistance (Approx.)	50000	1960	ohms
Transconductance	4100	5000	μmhos
Plate Current	45	49.5	ma
Grid-No.2 Current	4.5	-	ma
Grid-No.1 Voltage (Approx.) for plate ma. = 0.5	-	-36	volts

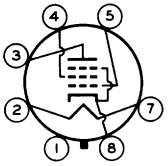
Mechanical:

Operating Position	Any
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-9/32"
Dimensional Outline	See *General Section*
Bulb	T9
Bases (Alternates):	
Intermediate-Shell Octal:	
7-Pin, Arrangement 1, (JEDEC Group 1, No.B7-7)	
6-Pin, Arrangement 2, (JEDEC Group 1, No.B6-81)	
Short Intermediate-Shell Octal with External Barriers:	
7-Pin, (JEDEC Group 1, No.B7-59)	
6-Pin, Arrangement 2, (JEDEC Group 1, No.B6-84)	

6V6GTA

Basing Designation for BOTTOM VIEW. 7AC

Pin 1[c] - No Connection
Pin 2 - Heater
Pin 3 - Plate
Pin 4 - Grid No.2



Pin 5 - Grid No.1
Pin 7 - Heater
Pin 8 - Cathode, Grid No.3

AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	350	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	315	max.	volts
GRID-No.2 INPUT	2.2	max.	watts
PLATE DISSIPATION	14	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200[d]	max.	volts

Typical Operation and Characteristics:

Plate Voltage	180	250	315	volts
Grid-No.2 Voltage	180	250	225	volts
Grid-No.1 (Control-Grid) Voltage	-8.5	-12.5	-13	volts
Peak AF Grid-No.1 Voltage	8.5	12.5	13	volts
Zero-Signal Plate Current	29	45	34	ma
Max.-Signal Plate Current	30	47	35	ma
Zero-Signal Grid-No.2 Current	3	4.5	2.2	ma
Max.-Signal Grid-No.2 Current	4	7	6	ma
Plate Resistance (Approx.)	50000	50000	80000	ohms
Transconductance	3700	4100	3750	μmhos
Load Resistance	3500	5000	8500	ohms
Total Harmonic Distortion	8	8	12	%
Max.-Signal Power Output	2	4.5	5.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.1	max.	megohm
For cathode-bias operation	0.5	max.	megohm

PUSH-PULL AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	350	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	315	max.	volts
GRID-No.2 INPUT	2.2	max.	watts
PLATE DISSIPATION	14	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200[d]	max.	volts

Typical Operation and Characteristics:

Values are for two tubes

Plate Voltage	250	285	volts
Grid-No.2 Voltage	250	285	volts
Grid-No.1 (Control-Grid) Voltage	-15	-19	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	30	38	volts
Zero-Signal Plate Current	70	70	ma
Max.-Signal Plate Current	79	92	ma
Zero-Signal Grid-No.2 Current	5	4	ma
Max.-Signal Grid-No.2 Current	13	13.5	ma
Effective Load Resistance (Plate to plate)	10000	8000	ohms
Total Harmonic Distortion	5	3.5	%
Maximum-Signal Power Output	10	14	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

VERTICAL-DEFLECTION AMPLIFIER

Triode Connection — Grid No.2 Connected to Plate

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[e]

DC PLATE VOLTAGE	350	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[f]	1200	max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 (CONTROL-GRID) VOLTAGE	275	max.	volts
CATHODE CURRENT:			
Peak	115	max.	ma
Average	40	max.	ma
PLATE DISSIPATION	10	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[d]	max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For cathode-bias operation	2.2 max.	megohms

[a] Without external shield.

[b] Grid No.2 connected to plate.

[c] On the 6-pin bases, pin 1 as well as pin 6 is omitted.

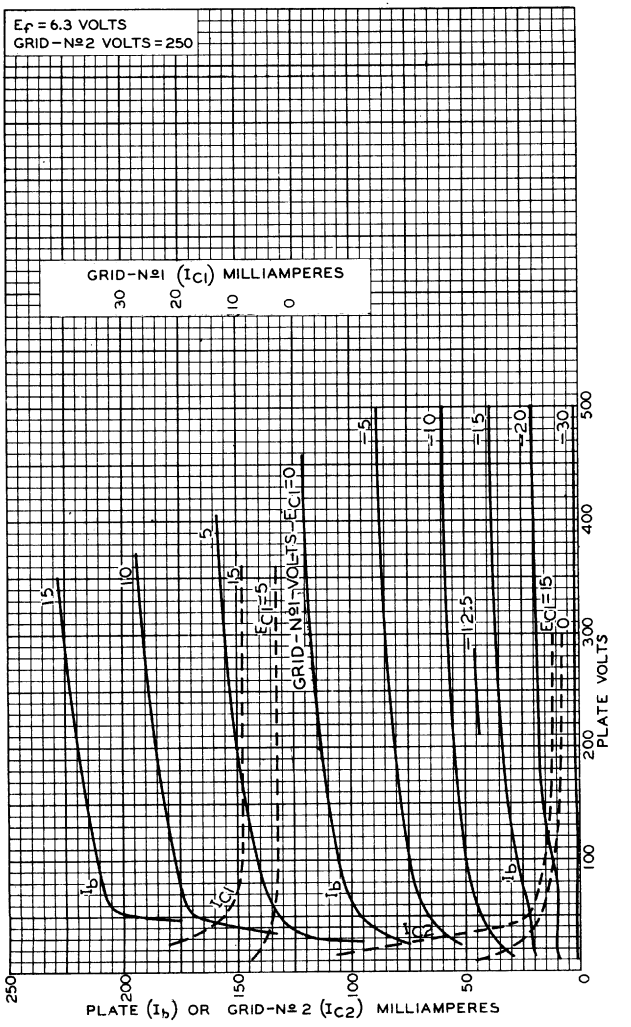
[d] The dc component must not exceed 100 volts.

[e] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[f] This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

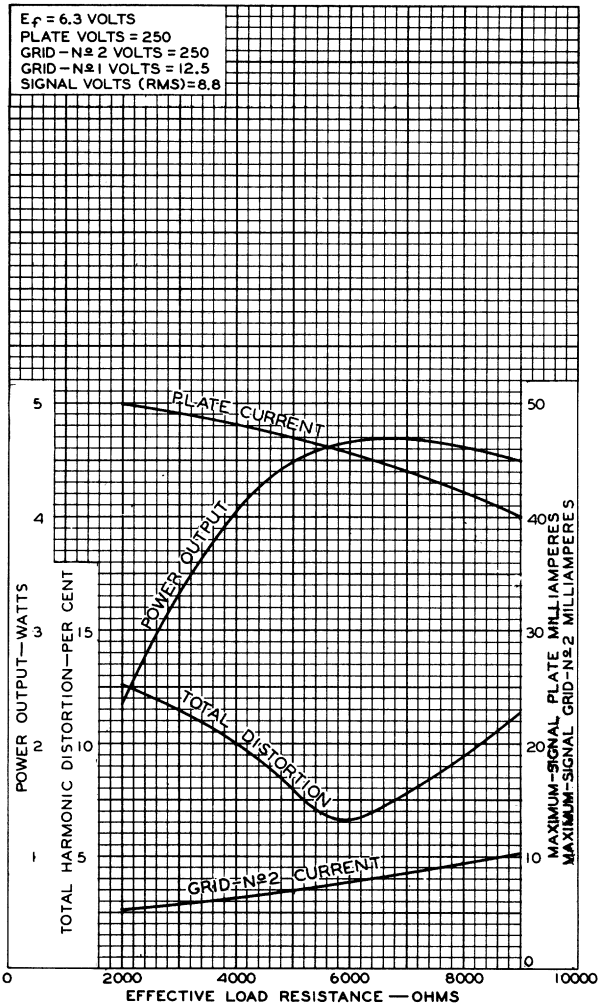
6V6GTA

AVERAGE CHARACTERISTICS



92CM-4807R2

OPERATION CHARACTERISTICS



92CM-6339R2

6W4GT

Half-Wave Vacuum Rectifier

For Television Damper Service

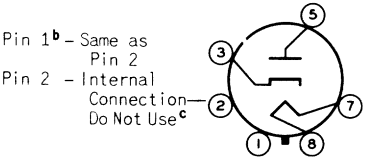
GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	1.2	amp
Direct Interelectrode Capacitances (Approx.):[a]		
Plate to cathode and heater	6	μμf
Cathode to plate and heater	13	μμf
Heater to cathode	7	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-9/32"
Dimensional Outline	See *General Section*
Bulb	T9
Bases (Alternates):	
Intermediate-Shell Octal:	
6-Pin, Arrangement 1 (JEDEC Group 1, No.B6-8)	
5-Pin, Arrangement 2 (JEDEC Group 1, No.B5-82)	
Short Intermediate-Shell Octal with External Barriers:	
6-Pin, Arrangement 1 (JEDEC Group 1, No.B6-60)	
5-Pin, Arrangement 2 (JEDEC Group 1, No.B5-85)	
Basing Designation for BOTTOM VIEW	4CG



DAMPER SERVICE

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system[d]

PEAK INVERSE PLATE VOLTAGE (Absolute maximum)[e]	3850[f]	max.	volts
PEAK PLATE CURRENT	750	max.	ma
DC PLATE CURRENT	125	max.	ma
PLATE DISSIPATION	3.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	2300[g]	max.	volts
Heater positive with respect to cathode.	300[h]	max.	volts

Indicates a change.

Characteristics, Instantaneous Value:

Tube Voltage Drop for plate ma. = 250. . . . 21 volts

[a] Without external shield.

[b] On the 5-pin bases, pin 1 as well as pins 4 and 6 is omitted.

[c] Socket terminals 1, 2, 4 and 6 should not be used as tie points.

[d] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[e] This rating is applicable when the duty cycle of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[f] Under no circumstances should this absolute-maximum value be exceeded.

[g] The dc component (Absolute maximum) must not exceed 500 volts.

[h] The dc component must not exceed 100 volts.

6W6-GT

BEAM POWER AMPLIFIER

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	1.2	amp
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to Plate	0.5 max.	μμf
Input	15	μμf
Output	9	μμf

Characteristics as Beam Power Amplifier:

See AMPLIFIER—Class A_1 below:

Characteristics as Triode-Connected Amplifier:

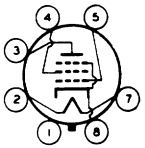
(Grid No.2 connected to plate)

Plate Voltage	225	volts
Grid-No.1 Voltage	−30	volts
Amplification Factor	6.2	
Plate Resistance	1600	ohms
Transconductance	3800	μmhos
Plate Current	22	ma
Grid-No.1 Voltage (Approx.) for plate current of 0.5 ma	−42	volts ←

Mechanical:

Mounting Position	Any
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-9/32"
Bulb	T-9
Base	Intermediate-Shell Octal 6-Pin (JETEC No.B6-8) ← or Intermediate-Shell Octal 7-Pin (JETEC No.B7-7) or Short Intermediate-Shell Octal 6-Pin with External Barriers (JETEC No.B6-60) or Short Intermediate-Shell Octal 7-Pin with External Barriers (JETEC No.B7-59)
Basing Designation for BOTTOM VIEW	G-7AC

Pin 1 – No Connection
Pin 2 – Heater
Pin 3 – Plate
Pin 4 – Grid No.2



Pin 5 – Grid No.1
Pin 7 – Heater
Pin 8 – Cathode, Grid No.3

AMPLIFIER--Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	150 max.	volts
PLATE DISSIPATION	10 max.	watts
GRID-No.2 INPUT	1.25 max.	watts

←Indicates a change.

6W6-GT

6W6-GT

BEAM POWER AMPLIFIER

PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode		200 max.	volts
Heater positive with respect to cathode		200▲max.	volts
Typical Operation and Characteristics:			
Plate Supply Voltage	110	200	volts
Grid-No.2 Voltage	110	125	volts
Grid-No.1 (Control-Grid) Voltage	-7.5	-	volts
Cathode-Bias Resistor	-	180	ohms
Peak AF Grid-No.1 Voltage	7.5	8.5	volts
Zero-Signal Plate Current	49	46	ma
Max.-Signal Plate Current	50	47	ma
Zero-Signal Grid-No.2 Current	4	2.2	ma
Max.-Signal Grid-No.2 Current	10	8.5	ma
Plate Resistance (Approx.)	13000	28000	ohms
Transconductance	8000	8000	μmhos
Load Resistance	2000	4000	ohms
Total Harmonic Distortion (Approx.)	10	10	%
Max.-Signal Power Output	2.1	3.8	watts
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance:			
For fixed-bias operation		0.1 max.	megohm
For cathode-bias operation		0.5 max.	megohm

VERTICAL DEFLECTION AMPLIFIER

Triode Connected--Grid No.2 Connected to Plate

Maximum Ratings, *Design-Center Values Except As Noted:*

For operation in a 525-line, 30-frame system●

DC PLATE VOLTAGE	300 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE°	1200▲max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 (CONTROL-GRID) VOLTAGE	-250 max.	volts
CATHODE CURRENT:		
Peak	140 max.	ma
DC	40 max.	ma
PLATE DISSIPATION	7.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲max.	volts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance:		
For cathode-bias operation	2.2 max.	megohms

▲ The dc component must not exceed 100 volts.

● As described In "Standards of Good Engineering Practice for Television Broadcast Stations", Federal Communications Commission.

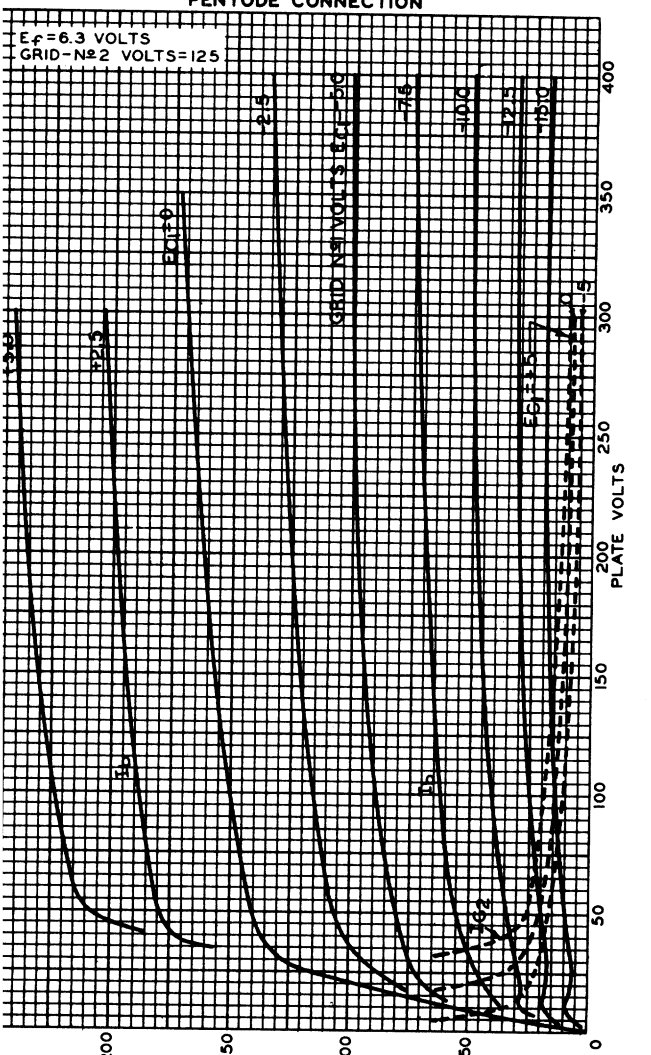
° The duration of the voltage pulse must not exceed 15 per cent of one scanning cycle. In a 525-line, 30-frame system, 15 per cent of one scanning cycle is 2.5 milliseconds.

▲ Under no circumstances should this absolute value be exceeded.

6W6-GT

AVERAGE PLATE CHARACTERISTICS

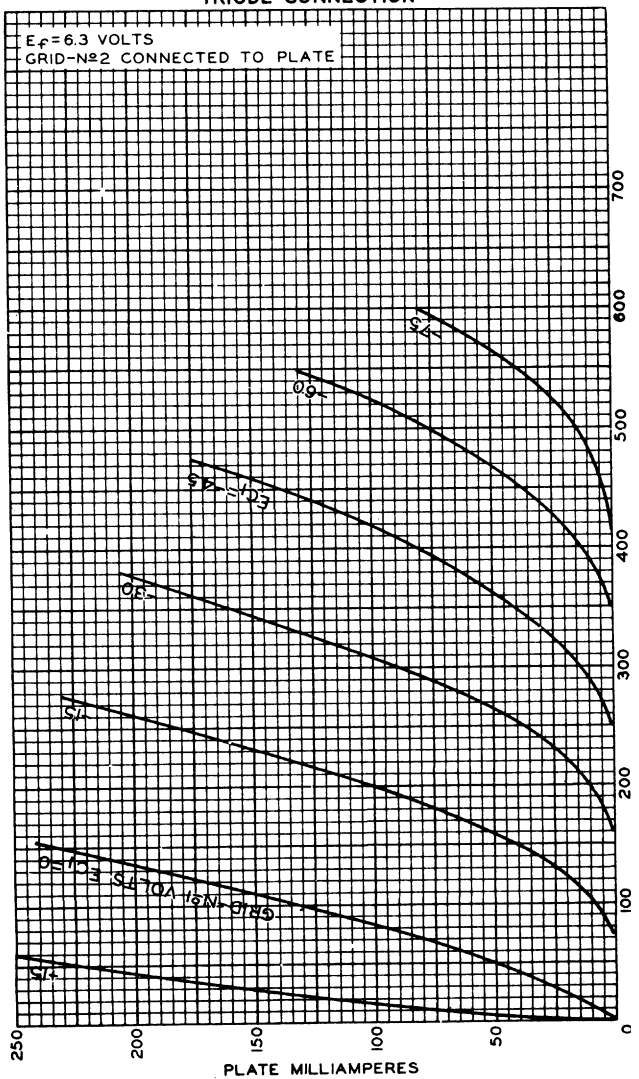
PENTODE CONNECTION



AR.20.1953
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-7942

6W6-GT

6W6-GT
AVERAGE PLATE CHARACTERISTICS
TRIODE CONNECTION



MAR.11,1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7943

6X4

6X4
FULL-WAVE VACUUM RECTIFIER

MINIATURE TYPE

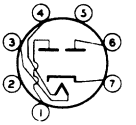
GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6	amp

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length from Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CF



Pin 1 – Plate No.2
Pin 2 – No Connection
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – No Connection
Pin 6 – Plate No.1
Pin 7 – Cathode

RECTIFIER SERVICE

Maximum Ratings, *Design-Center Values:* ←

PEAK INVERSE PLATE VOLTAGE	1250 max.	volts
PEAK PLATE CURRENT PER PLATE	210 max.	ma
AC PLATE SUPPLY VOLTAGE (RMS) PER PLATE	See Rating Chart I	
DC OUTPUT CURRENT PER PLATE	See Rating Chart I	

HOT-SWITCHING CURRENT:

If hot-switching is regularly required in operation, the use of choke-input circuits is recommended. Such circuits limit the hot-switching current to a value no higher than that of the peak plate current. When capacitor-input circuits are used, a maximum peak current value per plate of 1 ampere during the initial cycles of the hot-switching transient should not be exceeded.

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode	450 max.	volts
Heater positive with respect to cathode	450 max.	volts

Typical Operation as Full-Wave Rectifier with Capacitor-Input to Filter: ←

AC Plate-to-Plate Supply Voltage (RMS)	650	volts
Filter Input Capacitor	10	μf
Effective Plate-Supply Impedance per Plate*	520	ohms

*Higher values of capacitance than indicated may be used but the effective plate-supply impedance should be increased to prevent exceeding the maximum rating for peak plate current.

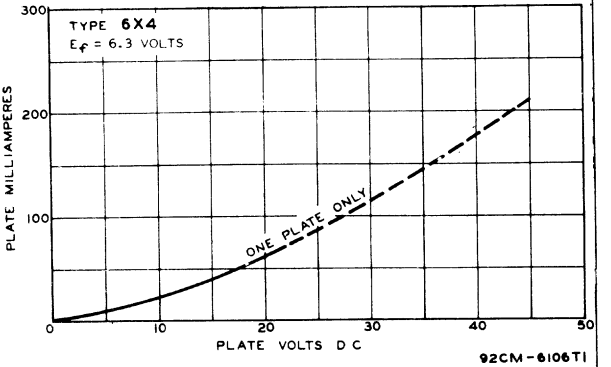
← Indicates a change

6X4

FULL-WAVE VACUUM RECTIFIER

DC Output Voltage at Input to Filter (Approx.):		
At half-load current of 35 ma.	360	volts
At full-load current of 70 ma.	300	volts
Voltage Regulation (Approx.):		
Half-load to full-load current	60	volts
→ **Typical Operation as Full-Wave Rectifier with Choke-Input to Filter:**		
AC Plate-to-Plate Supply Voltage (RMS) . . .	900	volts
Minimum Filter Input Choke	10	henries
DC Output Voltage at Input to Filter (Approx.):		
At half-load current of 35 ma.	385	volts
At full-load current of 70 ma.	370	volts
Voltage Regulation (Approx.):		
Half-load to full-load current	15	volts

AVERAGE PLATE CHARACTERISTIC



92CM-6106TI

RATING CHARTS AND OPERATION CHARACTERISTICS

Rating Chart I represents graphically the relationships between maximum ac voltage input and maximum dc output current derived from the fundamental ratings for conditions of capacitor-input and choke-input filters. This graphical presentation gives the equipment designer considerable latitude in choice of operating conditions.

Rating Chart II represents graphically the relationship between maximum rectification efficiency and maximum dc output current per plate for conditions of capacitor input to filter.

→Indicates a change

6X4

FULL-WAVE VACUUM RECTIFIER

Rating Chart III represents graphically the relationships between minimum plate-supply resistance per plate and maximum ac plate-supply voltage per plate under no-load conditions for conditions of capacitor input to filter when occasional hot-switching is employed.

The *Operation Characteristics for Full-Wave Circuit with Capacitor-Input Filter* show not only the typical operating curves for such a circuit, but also show by means of boundary-lines "DEA" the limiting current and voltage relationships presented on *Rating Chart I*.

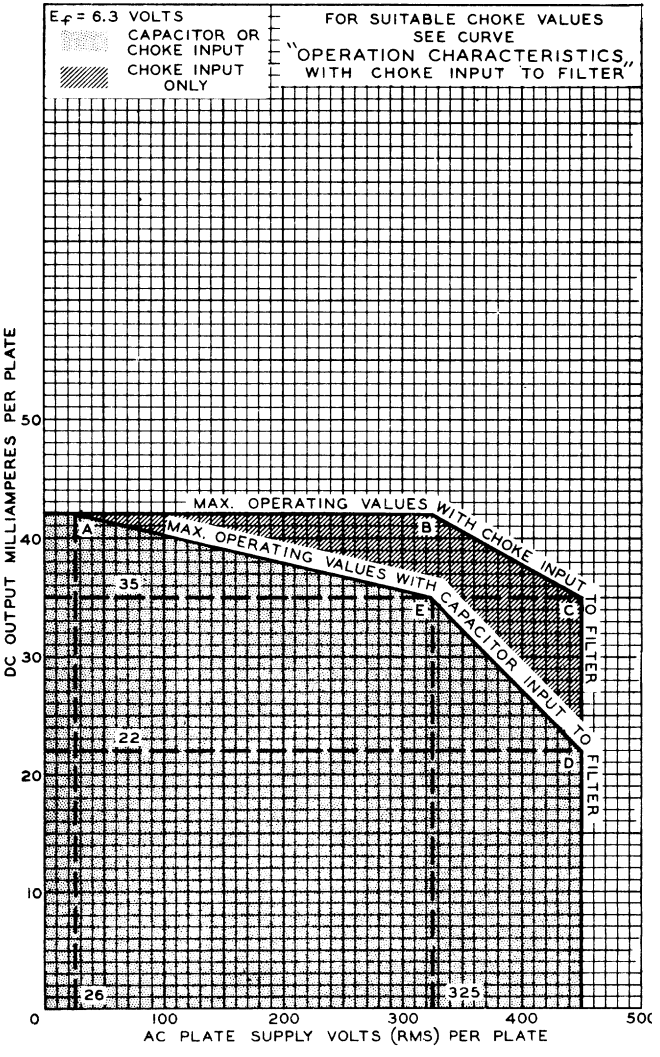
The *Operation Characteristics for Full-Wave Circuit with Choke-Input Filter* show the typical operating curves for such a circuit. They not only show by means of boundary line "ABC" the limiting current and voltage relationships presented on *Rating Chart I*, but also give information as to the effect on regulation of various sizes of chokes. The solid-line curves show the dc voltage outputs which would be obtained if the filter chokes had infinite inductance. The long-dash lines radiating from the zero position are boundary lines for various sizes of chokes as indicated. The intersection of one of these lines with a solid-line curve indicates the point on the curve at which the choke no longer behaves as though it had infinite inductance. To the left of the choke boundary line, the regulation curves depart from the solid-line curves as shown by the representative short-dash regulation curves.

6X4

RCA

6X4

RATING CHART I



6X4

RATING CHART II

CAPACITOR INPUT TO FILTER

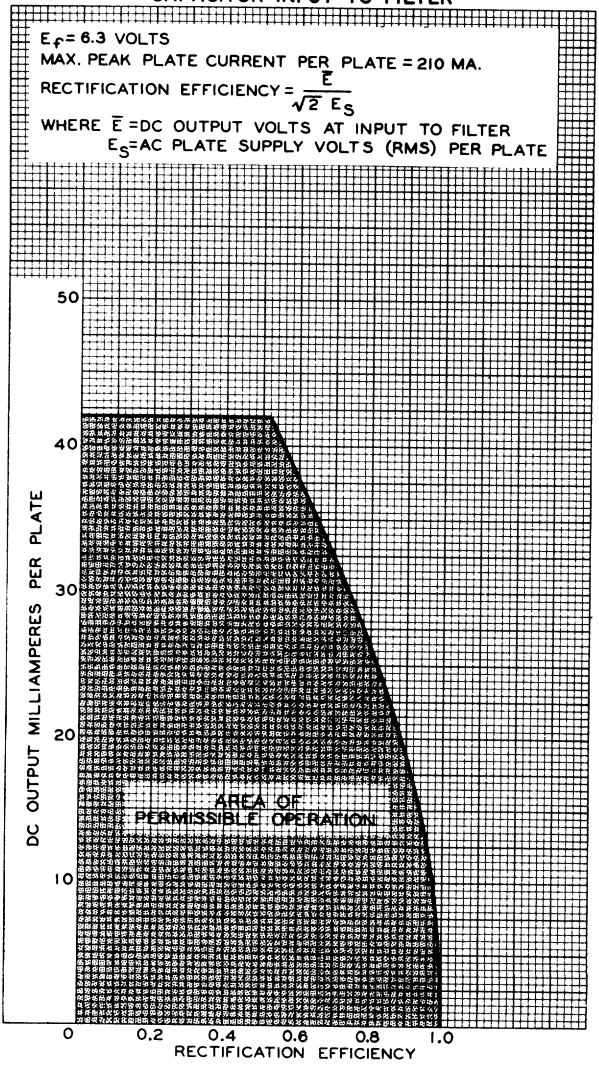
E_f = 6.3 VOLTS

MAX. PEAK PLATE CURRENT PER PLATE = 210 MA.

RECTIFICATION EFFICIENCY = $\frac{\bar{E}}{\sqrt{2}\ E_S}$

WHERE $\bar{E}$ = DC OUTPUT VOLTS AT INPUT TO FILTER

E_S = AC PLATE SUPPLY VOLTS (RMS) PER PLATE

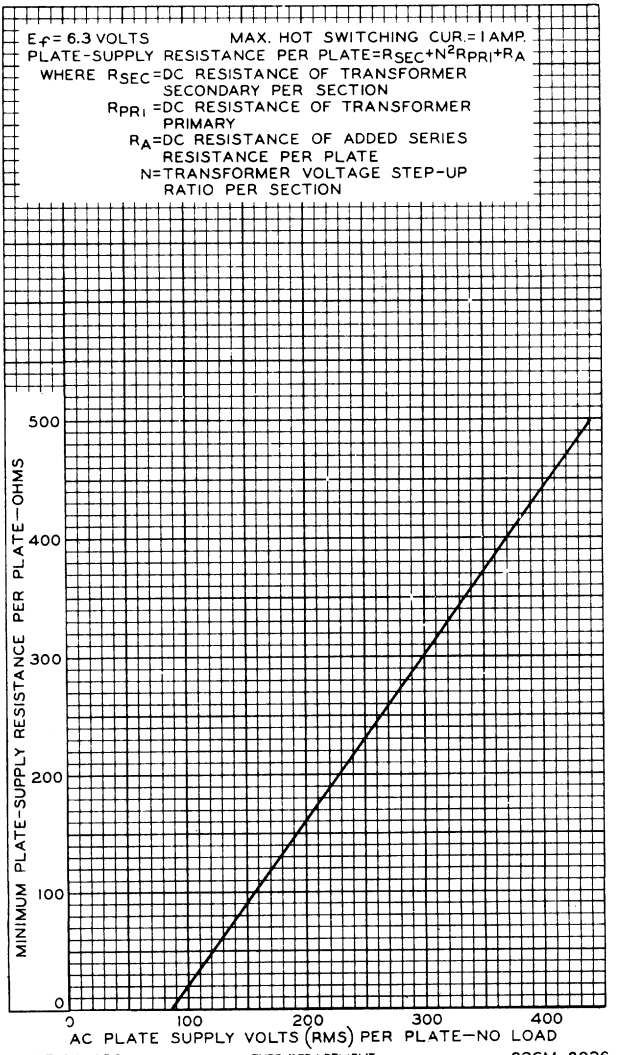


6X4

6X4

RATING CHART III

CAPACITOR INPUT TO FILTER



JUNE 29,1953 TUBE DEPARTMENT 92CM-8026

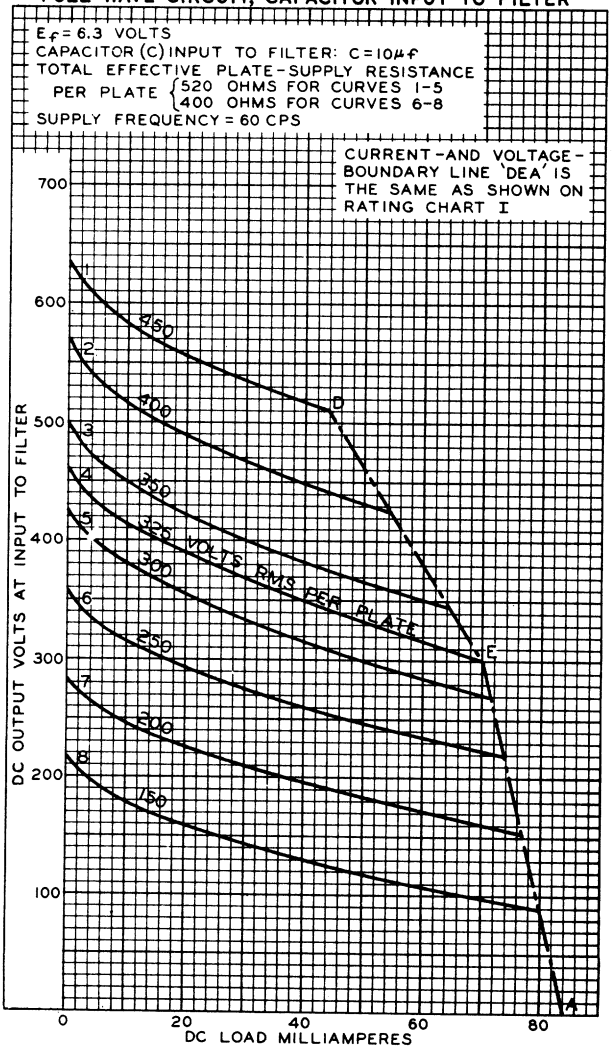
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

6X4

OPERATION CHARACTERISTICS

FULL-WAVE CIRCUIT, CAPACITOR INPUT TO FILTER

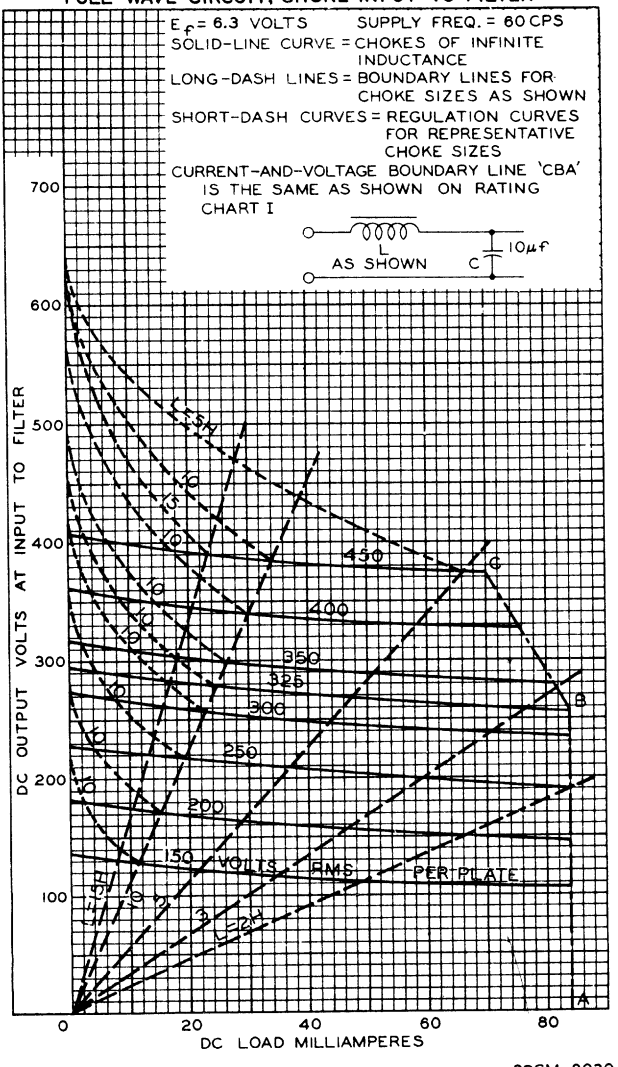


6X4

6X4

OPERATION CHARACTERISTICS

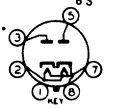
FULL-WAVE CIRCUIT, CHOKE INPUT TO FILTER



6X5, 6X5-GT/G

FULL-WAVE HIGH-VACUUM RECTIFIER

Heater	Coated Unipotential Cathode		
Voltage	6.3		a-c or d-c volts
Current	0.6		amp.
	6X5	*6X5-GT/G*	
Maximum Overall Length	3-1/4"	3-5/16"	
Maximum Seated Height	2-11/16"	2-3/4"	
Maximum Diameter	1-5/16"	1-5/16"	
Bulb	Metal Shell, MT-8	T-9	
Base	Small Wafer / Octal 6-Pin	Intermed. Sh. / Octal 6-Pin	
Basing Designation	6S	G-6S	
Pin 1	6X5, Shell / 6X5-GT/G, No Con.		
Pin 2 - Heater		Pin 5 - Plate #1	
Pin 3 - Plate #2		Pin 7 - Heater	
		Pin 8 - Cathode	
Mounting Position		6X5: Vertical◊ / 6X5-GT/G: Any	



BOTTOM VIEW

Maximum Ratings Are Design-Center Values

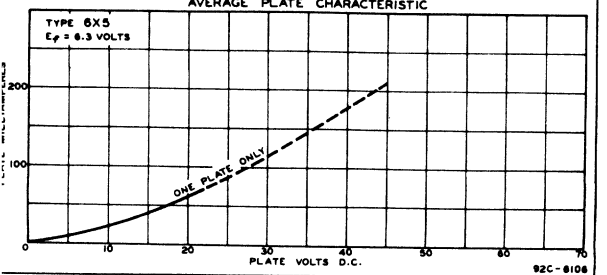
FULL-WAVE RECTIFIER

Peak Inverse Plate Voltage	1250 max. volts
Peak Plate Current per Plate	210 max. ma.
D-C Output Current:	
With condenser input to filter	70 max. ma.
With choke input to filter	70● max. ma.
D-C Heater-Cathode Potential	450 max. volts

Typical Operation:	*Condenser-Input Filter*	*Choke-Input Filter*	
A-C Plate-to-Plate Supply Voltage (RMS)	650	900	volts
Filter Input Condenser	4	–	µf
Min. Total Effect. Plate-Supply Imped. per Plate	150	–	ohms
Filter Inout Choke	–	8	henries
D-C Output Current	70	70	ma.
D-C Voltage (At input to filter):*			
At half-load current (35 ma.)	405	385	volts
At full-load current (70 ma.)	370	380	volts
Difference (Voltage Regulation)	35	5	volts
Percentage Regulation	8.5	1.3	%

◊ Horizontal operation permitted if pins 3 & 5 are in a horizontal plane.
● For choke not less than 8 henries.
* Approximate values.

AVERAGE PLATE CHARACTERISTIC

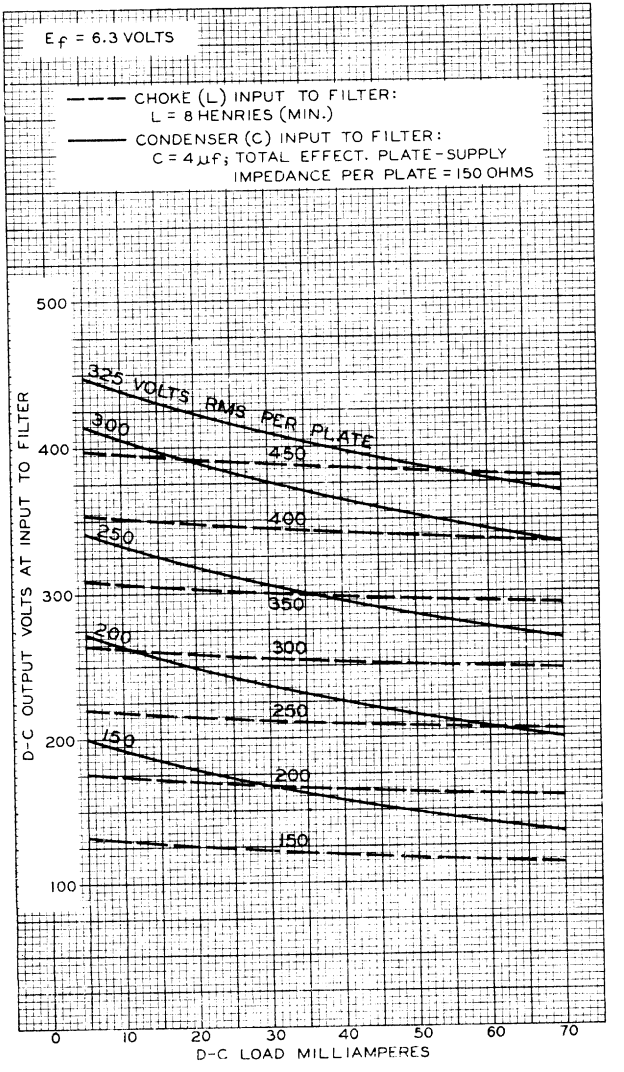


RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6X5

6X5

OPERATION CHARACTERISTICS



Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)	6.3 ± 10%		volts
Current at 6.3 volts	0.45		amp
Direct Interelectrode Capacitances:	*Without External Shield*	*With External Shield*▲	
Triode Unit:			
Grid to plate	1.5	1.5	μμf
Grid to cathode and heater	2	2.4	μμf
Plate to cathode and heater	0.5	1	μμf
Pentode Unit:			
Grid No.1 to plate	0.09 max.	0.06 max.	μμf
Grid No.1 to cathode, grid No.3, grid No.2, and heater	4.6	4.8	μμf
Plate to cathode, grid No.3, grid No.2, and heater	0.9	1.6	μμf
Pentode grid No.1 to triode plate	0.05 max.	0.04 max.	μμf
Pentode plate to triode plate	0.05 max.	0.008 max.	μμf
Heater to cathode	6.5	6.5●	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*		
Plate Voltage	125	100	125	volts
Grid No.3	–	*Connected to cathode at socket*		
Grid-No.2 Voltage	–	70	125	volts
Grid-No.1 Voltage	-1	–	-1	volt
Amplification Factor	40	–	–	
Plate Resistance (Approx.)	6000	–	300000	ohms
Transconductance	6500	5700	5500	μmhos
Plate Current	12	–	9	ma
Grid-No.2 Current	–	–	2.2	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-7	–	-6.5	volts

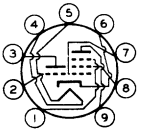
← Indicates a change.

6X8

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
→Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9AK

Pin 1 – Pentode Grid No.3
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Cathode
Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate

→ AMPLIFIER — Class A_1

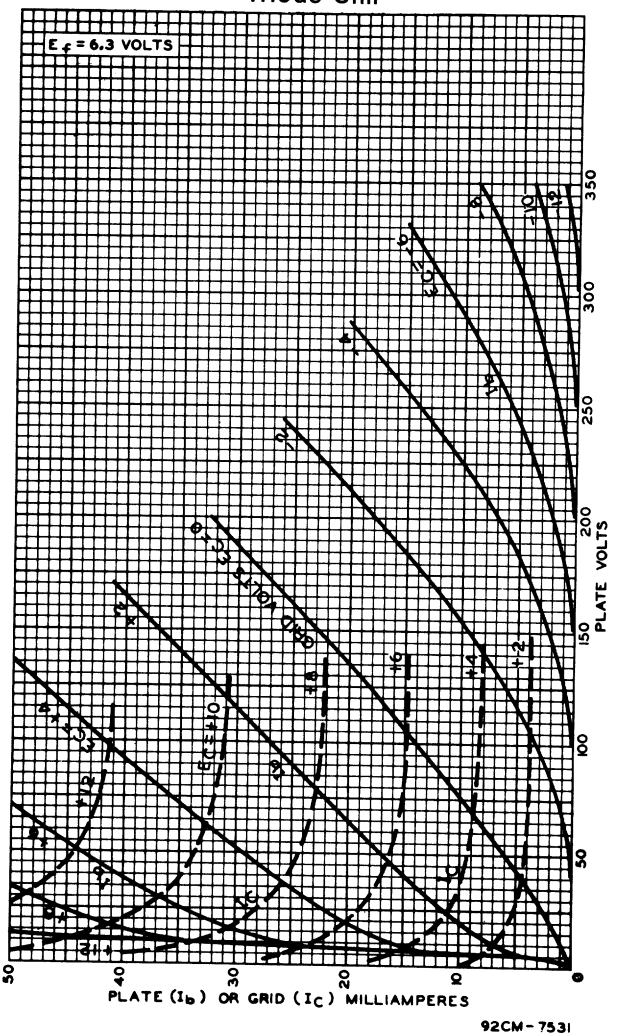
Maximum Ratings, *Design-Maximum Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	275 max.	275 max.	volts
GRID No.3 (SUPPRESSOR GRID)	–	*Connect to cathode at socket*	
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	–	275 max.	volts
GRID-No.2 VOLTAGE	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 137.5 volts	–	0.45 max.	watt
For grid-No.2 voltages between 137.5 and 275 volts	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	1.7 max.	2.3 max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	200 max.	200 max.	volts
Heater positive with respect to cathode	200★ max.	200★ max.	volts

▲ With external shield JEDEC No.315 connected to cathode except as noted.
● With external shield JEDEC No.315 connected to pentode plate.
★ The dc component must not exceed 100 volts.

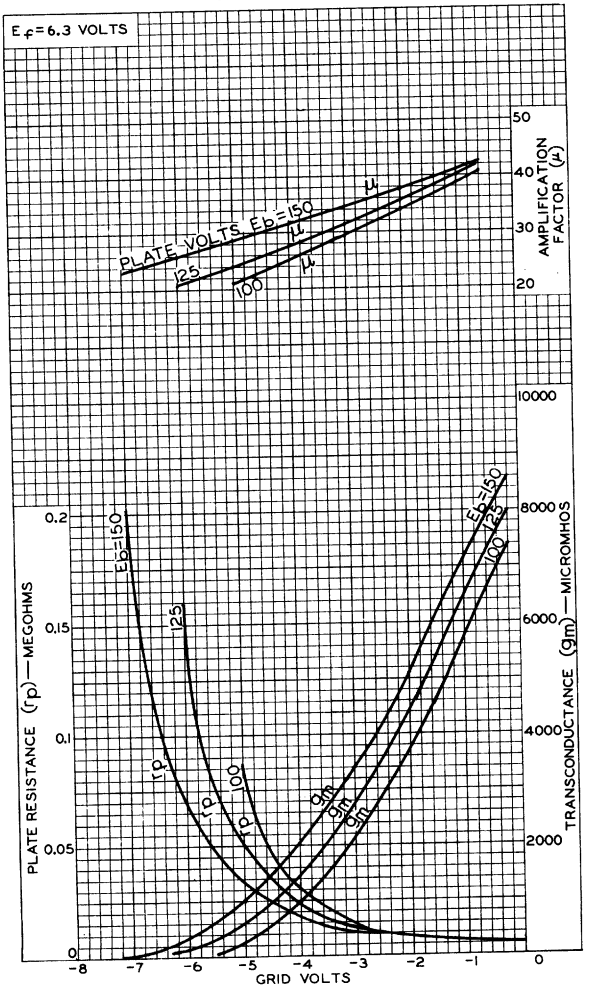
→Indicates a change.

AVERAGE CHARACTERISTICS
Triode Unit



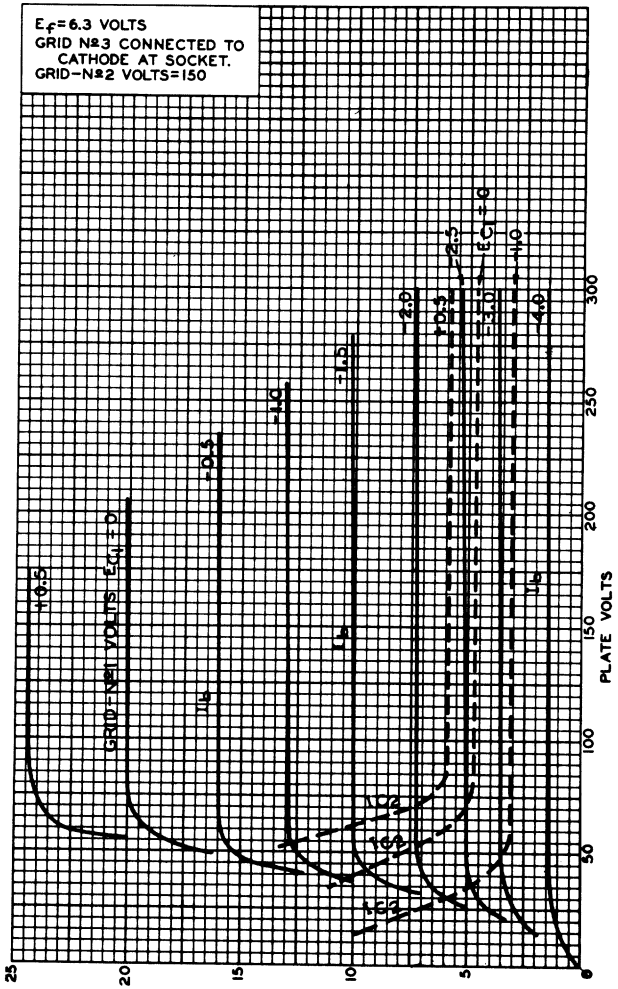
6X8

AVERAGE CHARACTERISTICS
Triode Unit



92CM-10809

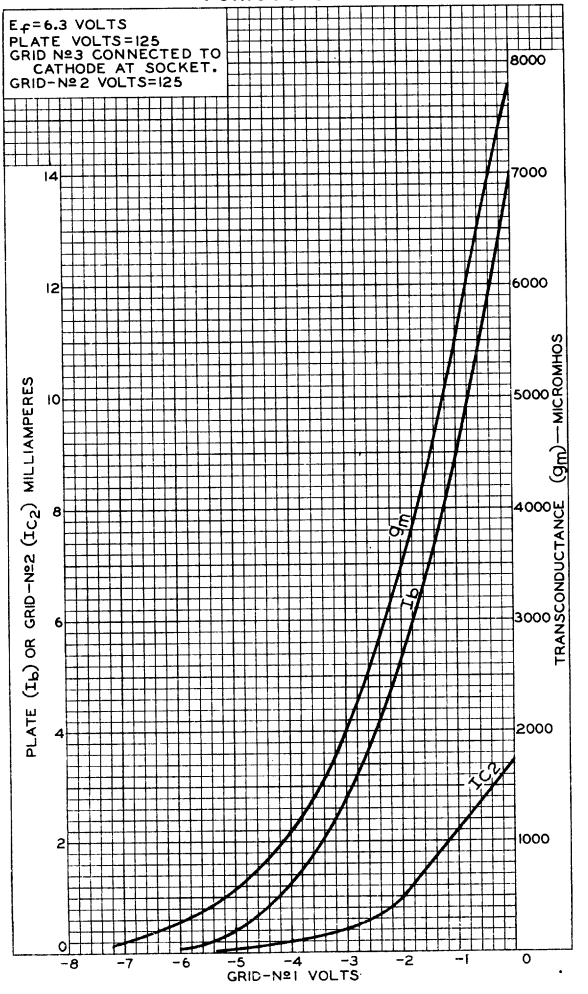
AVERAGE CHARACTERISTICS
Pentode Unit



92CM-7532R1

6X8

AVERAGE CHARACTERISTICS
Pentode Unit



92CM-10810

6Y6-GA
BEAM POWER TUBE

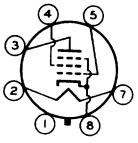
GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	1.25	amp
Direct Interelectrode Capacitances (Approx.):[o]		
Grid No.1 to plate	0.66	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	12	μμf
Plate to cathode & grid No.3, grid No.2, and heater	7.5	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	3-7/8"
Maximum Seated Length	3-5/16"
Diameter	1.438" to 1.562"
Bulb	T12
Base	Medium-Shell Octal 7-Pin (JEDEC Group 1, No.B7-12), or Short Medium-Shell Octal 7-Pin with External Barriers, Style B (JEDEC Group 1, No.B7-119)
Basing Designation for BOTTOM VIEW	7S



Pin 1 - No Connection
Pin 2 - Heater
Pin 3 - Plate
Pin 4 - Grid No.2
Pin 5 - Grid No.1
Pin 7 - Heater
Pin 8 - Cathode, Grid No.3

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	200 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	200 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 100 volts	1.75 max.	watts
For grid-No.2 voltages between 100 and 200 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	12.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

[o] Without external shield.

6Y6-GA

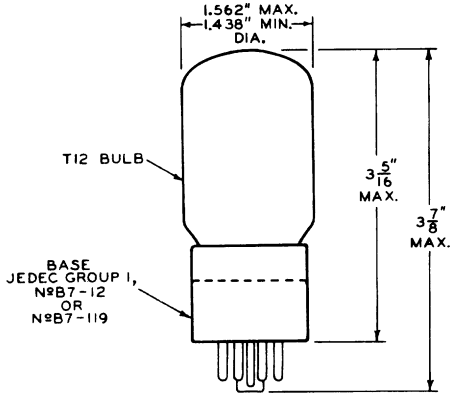
BEAM POWER TUBE

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation.		1 max.	megohm
For cathode-bias operation.		0.5 max.	megohm

Typical Operation and Characteristics:

Plate Voltage	135	200	volts
Grid-No.2 Voltage	135	135	volts
Grid-No.1 Voltage	-13.5	-14	volts
Peak AF Grid-No.1 Voltage	13.5	14	volts
Zero-Signal Plate Current	58	61	ma
Max.-Signal Plate Current	60	66	ma
Zero-Signal Grid-No.2 Current . . .	3.5	2.2	ma
Max.-Signal Grid-No.2 Current . . .	11.5	9	ma
Plate Resistance (Approx.).	9300	18300	ohms
Transconductance.	7000	7100	μmhos
Load Resistance	2000	2600	ohms
Total Harmonic Distortion	10	10	%
Max.-Signal Power Output.	3.6	6	watts



92CS-10248

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

Pentode—Beam Power Tube

DUODECAR TYPE

For Combined Limiter, Discriminator, and Audio Power Output Applications in FM Radio and TV Receivers

ELECTRICAL CHARACTERISTICS

Bogey Values

Heater Voltage	E_h	6.3	V
Heater Current	I_h	0.950	A
Direct Interelectrode Capacitances			
Without external shield			
Pentode Unit:			
$G1_P$ to $G3_P$	$c_{g1\text{-}g3}$	0.009	pF
$G1_P$ to (K_P + IS, P_P, $G3_P$, $G2_P$, H)	$c_{g1\text{-}all}$	4.4	pF
$G3_P$ to (K_P + IS, P_P, $G2_P$, $G1_P$, H)	$c_{g3\text{-}all}$	3.2	pF
Beam Power Unit:			
$G1_B$ to P_B	$c_{g1\text{-}p}$	0.22	pF
Input: $G1_B$ to (K_B + $G3_B$, $G2_B$, H)	c_i	11	pF
Output: P_B to (K_B + $G3_B$, $G2_B$, H)	c_o	7.5	pF

Pentode Unit

For the following characteristics, see Conditions

Transconductance, Grid No.1 to Plate	g_m	-	-	360	μmho
Transconductance, Grid No.3 to Plate	$g_{m(g3\text{-}p)}$	-	-	700	μmho
DC Plate Current	I_b	-	5	-	mA
DC Grid-No.2 Current	I_{c2}	4.5	-	-	mA
Cutoff DC Grid-No.1 Voltage for I_b = 20 μA	$E_{c1(co)}$	-	-	-4	V
Cutoff DC Grid-No.3 Voltage for I_b = 20 μA	$E_{c3(co)}$	-	-	-4	V

Conditions

Heater Voltage	E_h	Bogey value			V
DC Plate Voltage	E_b	135	135	135	V
DC Grid-No.3 Voltage	E_{c3}	4	4	0	V
DC Grid-No.2 Supply Voltage	E_{cc2}	-	280	280	V
DC Grid-No.2 Voltage	E_{c2}	75	-	-	V
DC Grid-No.1 Voltage	E_{c1}	0	0	0	V
Grid-No.2 Resistor	R_{g2}	-	33	33	kΩ

Beam Power Unit

For the following characteristics, see Conditions

Plate Resistance (Approx.)	r_p	100		kΩ
Transconductance	g_m	6500		μmho
DC Plate Current	I_b	35		mA
DC Grid-No.2 Current	I_{c2}	3		mA

Conditions

Heater Voltage	E_h	Bogey value	V
DC Plate Voltage	E_b	250	V
DC Grid-No.2 Voltage	E_{c2}	250	V
DC Grid-No.1 Voltage	E_{c1}	-8	V

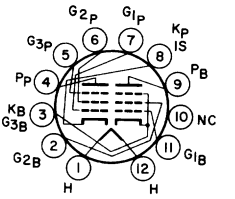
6Z10

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2.375 in
Maximum Seated Length	2.000 in
Maximum Diameter	1.188 in
Dimensional Outline (JEDEC 9-58)	See *General Section*
Envelope	JEDEC T9
Base	Small-Button Duodecar 12-Pin (JEDEC E12-70)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Heater
Pin 2 – Beam Power Grid No.2
Pin 3 – Beam Power Cathode, Beam Power Grid No.3
Pin 4 – Pentode Plate
Pin 5 – Pentode Grid No.3
Pin 6 – Pentode Grid No.2
Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Cathode, Internal Shields
Pin 9 – Beam Power Plate
Pin 10 – No Internal Connection
Pin 11 – Beam Power Grid No.1
Pin 12 – Heater



12BT

DESIGN-MAXIMUM RATINGS

Pentode Unit for FM and TV Limiter and Discriminator Service; Beam Power Unit for Audio Power Output Service

		Pentode Unit	*Beam Power Unit*	
DC Plate Supply Voltage	E_{bb}	330	-	V
DC Plate Voltage	E_b	-	275	V
DC Grid-No.2 (Accelerator-Grid) Supply Voltage	E_{cc2}	330	-	V
DC Grid-No.2 (Screen-Grid) Voltage	E_{c2}	-	275	V
Peak Positive-Pulse Grid-No.1 (Limiter-Grid) Voltage	e_{c1m}	60	-	V
Heater-Cathode Voltage:				
Peak	e_{hkm}	±200	±200	V
DC	E_{hk}	100	100	V
Heater Voltage (AC or DC)	E_h	← 5.7 to 6.9 →		V
Average Cathode Current	$I_{k(av)}$	13	-	mA
Grid-No.2 Input	P_{g2}	-	2	W
Plate Dissipation	P_b	-	10	W

MAXIMUM CIRCUIT VALUES

Beam Power Unit

Grid-No.1-Circuit Resistance:	$R_{g1(ckt)}$		
For fixed-bias operation	-	0.25	MΩ
For cathode-bias operation	-	0.5	MΩ

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TYPICAL OPERATION

Beam Power Unit

Heater Voltage	E_h	Bogey value	V
DC Plate Voltage	E_b	250	V
DC Grid-No.2 Voltage	E_{c1}	250	V
DC Grid-No.1 Voltage	E_{c2}	-8	V
Peak AF Grid-No.1 Voltage	e_{c1m}	8	V
Plate Resistance (Approx.)	r_p	100	kΩ
Transconductance	g_m	6500	μmho
Zero-Signal Plate Current	I_b	35	mA
Maximum-Signal Plate Current	I_b	39	mA
Zero-Signal Grid-No.2 Current	I_{c2}	3	mA
Maximum-Signal Grid-No.2 Current	I_{c2}	13	mA
Load Resistance	R_L	5000	Ω
Total Harmonic Distortion		8.5	%
Maximum-Signal Power Output	P_o	4.2	W

7AU7

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 7AU7 is the same as the 12AU7A except for the following items:

Heater, for Unipotential Cathodes:

	Series	*Parallel*	
Heater arrangement			
Voltage (AC or DC)	7 ± 10%	3.5	volts
Current	0.3	0.6 ± 6%	amp
Warm-up time (Average)	–	11	sec

Beam Power Tube

With Heater Having Controlled Warm-Up Time

The 7EY6 is the same as the 6EY6 except for the following items:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	7.2	volts
Current	0.6 ± 6%	amp
Warm-up time (Average)	11	sec

7AU7

Medium-Mu Twin Triode

The 7AU7 is the same as the 12AU7A except for the following items:

Heater Characteristics and Ratings

	Parallel	*Series*	
Heater-section arrangement			
Voltage (AC or DC)	3.5[a]	7.0 ± 0.7	V
Current	0.600 ± 0.040	0.300[b]	A
Warm-up time (Average)	11	-	s

[a] At 0.600 ampere.
[b] At 7.0 volts.

7EY6

Beam Power Tube

The 7EY6 is the same as the 6EY6 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	7.2	V
Warm-up time (Average)	11	s

7KY6

Sharp-Cutoff-Pentode

The 7KY6 is the same as the 6KY6 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	7.3	V
Warm-up time (Average)	11	s

7KZ6

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE
FRAME-GRID CONSTRUCTION — DARK HEATER

For Video-Output Service in Color-TV Receivers

ELECTRICAL CHARACTERISTICS

Bogey Values[a]

Heater Voltage (AC or DC)	E_h	7.3	V
Heater Current	I_h	0.450	A
Heater Warm-up Time		11	s
Direct Interelectrode Capacitances			
Without external shield			
Grid No.1 to plate	c_{g1-p}	0.16 max	pF
Input: G1 to (K, G3 + IS, G2, H)	c_i	13.0	pF
Output: P to (K, G3 + IS, G2, H)	c_o	6.0	pF

For the following characteristics, see Conditions

Plate Resistance (Approx.)	r_p	45	kΩ
Transconductance	g_m	24000	μmho
DC Plate Current	I_b	25	mA
DC Grid-No.2 Current	I_{c2}	3.6	mA
Cutoff DC Grid-No.1 Voltage	$E_{c1(co)}$	-5.2	V

Conditions

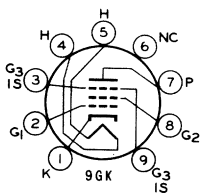
Heater Voltage	E_h	7.3	V
DC Plate Supply Voltage	E_{bb}	250	V
Grid No.3	-	Connected to cathode at socket	
DC Grid-No.2 Supply Voltage	E_{cc2}	115	V
DC Grid-No.1 Supply Voltage	E_{cc1}	0	V
Cathode Resistor	R_k	75	Ω

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2.625 in
Maximum Seated Length	2.375 in
Length, Base Seat to Bulb Top, Excluding tip	1.906 to 2.094 in
Maximum Diameter	0.875 in
Dimensional Outline (JEDEC 6-3)	See *General Section*
Envelope	JEDEC T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC E9-1)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Cathode
Pin 2 – Grid No.1
Pin 3 – Grid No.3 Internal Shield
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – No Internal Connection
Pin 7 – Plate
Pin 8 – Grid No.2
Pin 9 – Same as Pin 3



DESIGN-MAXIMUM RATINGS

For operation as a Class A_1 Amplifier Tube

Plate Voltage	E_b	330	V
Grid-No.2 (Screen-Grid) Supply Voltage	E_{cc2}	330	V
Grid No.2 Voltage	E_{c2}	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Grid-No.1 (Control-Grid) Voltage			
Positive-bias value	E_{c1}	0	V
Heater-Cathode Voltage			
Peak	e_{hkm}	±200	V
DC	E_{hk}	100	V
Heater Current	I_h	0.420 to 0.480	A
Grid-No.2 Input			
For $E_{c2} \leq 165$ V	-	1	W
For $E_{c2} \geq 165$ and ≤ 330 V	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Plate Dissipation	P_b	9	W

MAXIMUM CIRCUIT VALUES

Grid-No.1 Circuit Resistance	$R_{g1(ckt)}$		
For fixed-bias operation	-	0.1	MΩ
For cathode-bias operation	-	0.25	MΩ

[a] Unless otherwise specified.

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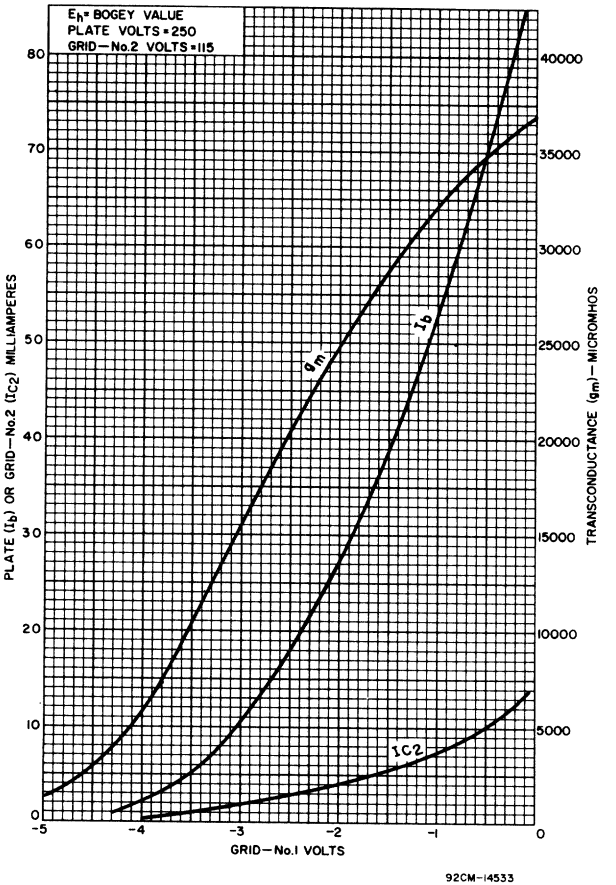
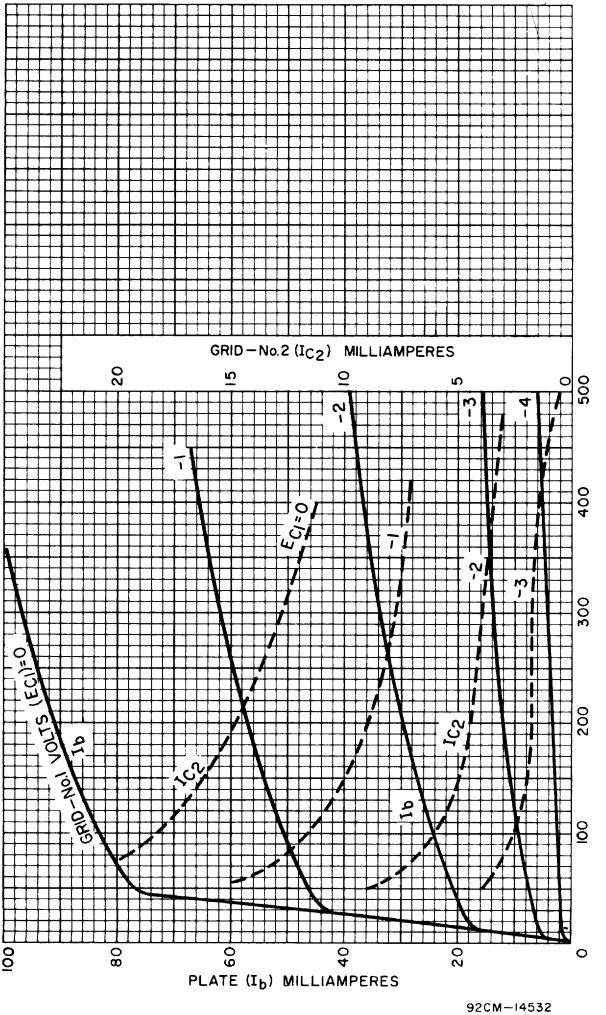
Typical Characteristics



Typical Characteristics



92CM—14532

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Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:			
Current	0.450 ±0.030		amp
Voltage (AC or DC) at heater amperes = 0.450	8.4		volts
Warm-up time (Average)	11		sec
Peak heater-cathode voltage (Each Unit):			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances:[b]			
Triode Unit:			
Grid to plate	2.2		pf
Grid to cathode and heater	2.6		pf
Plate to cathode and heater	0.34		pf
Pentode Unit:			
Grid No.1 to plate	0.044		pf
Grid No.1 to cathode & internal shield & grid No.3, grid No.2, and heater	7.5		pf
Plate to cathode & internal shield & grid No.3, grid No.2, and heater	2.4		pf
Triode grid to pentode plate	0.022	max.	pf
Pentode grid No.1 to triode plate	0.006	max.	pf
Pentode plate to triode plate	0.12	max.	pf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*	
Plate Supply Voltage	150	200	volts
Grid-No.2 Supply Voltage	–	125	volts
Cathode Resistor	150	82	ohms
Amplification Factor	40	–	
Plate Resistance (Approx.)	8200	150000	ohms
Transconductance	4900	7000	μmhos
Plate Current	9	15	ma
Grid-No.2 Current	–	3.4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	-6.5	8	volts

Mechanical:

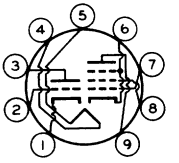
Operating Position . . . . . Any

Type of Cathodes . . . . . Coated Unipotential

8AU8

Maximum Overall Length. . . . . 2-5/8"
Maximum Seated Length . . . . . 2-3/8"
Length, Base Seat to Bulb Top (Excluding tip). . . 2" ± 3/32"
Diameter. . . . . .0.750" to 0.875"
Dimensional Outline . . . . . See *General Section*
Bulb. T6-1/2
Base. . . . . .Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9DX

Pin 1 – Triode Cathode
Pin 2 – Triode Grid
Pin 3 – Triode Plate
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Pentode Cathode, Grid No.3, Internal Shield
Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	300 max.	300 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE.	–	300 max.	volts
GRID-No.2 VOLTAGE	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 150 volts	–	1 max.	watt
For grid-No.2 voltages between 150 and 300 volts . .	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	2.5 max.	3 max.	watts

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance:			
For fixed-bias operation. . .	0.5 max.	0.25 max.	megohm
For cathode-bias operation. .	1 max.	1 max.	megohm

OPERATING CONSIDERATIONS

Because the *internal shield* is connected to the cathode and grid No.3, the impedance in the cathode circuit should be kept as low as possible to minimize cross-coupling effects.

[a] The dc component must not exceed 100 volts.
[b] Without external shield.

8AW8A

High-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

The 8AW8A is the same as the 6AW8A except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	8.4	volts
Warm-up time (Average)	11	sec

8B10

Twin Diode—
Medium-Mu-Twin Triode

DUODECAR TYPE

The 8B10 is the same as the 6B10 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	8.5	volts
Warm-up time (Average)	11	sec

8BA8A

Medium-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

The 8BA8A is the same as the 6BA8A except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	8.4	volts
Warm-up time (Average)	11	sec

8BH8

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

The 8BH8 is the same as the 6BH8 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	8.4	volts
Warm-up time (Average)	11	sec

8BN8

Twin Diode—High-Mu Triode

9-PIN MINIATURE TYPE

The 8BN8 is the same as the 6BN8 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	8.4	volts
Warm-up time (Average)	11	sec

8BQ5

Power Pentode

9-PIN MINIATURE TYPE

The 8BQ5 is the same as the 6BQ5 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	8.0	volts
Warm-up time (Average)	11	sec

8CG7

Medium-Mu Twin Triode

CONTROLLED HEATER WARM-UP TIME

The 8CG7 is the same as the 6CG7 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at 0.450 amp	8.4	volts

8CM7

Medium-Mu Dual Triode

With Dissimilar Units

CONTROLLED HEATER WARM-UP TIME

The 8CM7 is the same as the 6CM7 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at 0.450 amp	8.4	volts

8CN7

Twin Diode—High-Mu Triode

CONTROLLED HEATER WARM-UP TIME

The 8CN7 is the same as the 6CN7 except for the following items:

Heater Characteristics and Ratings:				
Heater-section arrangement	*Parallel*	*Series*	*Series*	
Voltage (AC or DC)	4.2[a]	8.4[b]	8.4 ± 0.8	volts
Current	0.450 ± 0.030	0.225 ± 0.010	0.225[c]	amp

[a] At 0.450 ampere.
[b] At 0.225 ampere.
[c] At 8.4 volts.

8CS7

Medium-Mu Dual Triode

With Dissimilar Units

CONTROLLED HEATER WARM-UP TIME

The 8CS7 is the same as the 6CS7 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at 0.450 amp.	8.4	volts

8CW5

Beam Power Tube

The 8CW5 is the same as the 6CW5 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at 0.600 amp.	8.0	volts

8CX8

Medium-Mu Triode—Sharp-Cutoff Pentode

The 8CX8 is the same as the 6CX8 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at 0.600 amp.	8.0	volts
Warm-up time (Average)	11	sec

8EB8

High-Mu Triode—Sharp-Cutoff Pentode

The 8EB8 is the same as the 6EB8 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at 0.600 amp.	8.0	volts
Warm-up time (Average)	11	sec

Beam Power Tube

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 8EM5 is the same as the 6EM5 except for the following items:

Heater Characteristics and Ratings *(Design-Center Values)*:

Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	8.4	volts
Warm-up time (Average)	11	sec

Twin Diode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Voltage (AC or DC)	8		volts
Current	0.6	± 6%	amp
Warm-up time (Average)	11		sec
Direct Interelectrode Capacitances:[a]			
Diode Units:			
Either plate to cathode & internal shield, pentode grid No.3 & pentode cathode & pentode internal shield, and heater	1.5		μμf
Cathode & internal shield to either plate, pentode grid No.3 & pentode cathode & pentode internal shield, and heater	7.5		μμf
Pentode Unit:			
Grid No.1 to plate	0.1	max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, diode-units cathode & diode-units internal shield, and heater	10		μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, diode-units cathode & diode-units internal shield, and heater	4.2		μμf
Pentode grid No.1 to either diode plate	0.005	max.	μμf
Pentode plate to either diode plate	0.02	max.	μμf

Characteristics, Class A_1 Amplifier (Pentode Unit):

Plate Supply Voltage	60	200	volts
Grid-No.2 Supply Voltage	150	150	volts
Grid-No.1 Voltage	0	-	volts
Cathode Resistor	-	100	ohms
Plate Resistance (Approx.)	-	60000	ohms
Transconductance	-	11500	μmhos
Plate Current	55[b]	25	ma
Grid-No.2 Current	18[b]	5.5	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	-	-10	volts

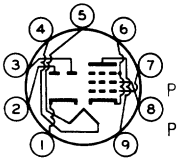
Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"

8ET7

Dimensional Outline. . . . . .See *General Section*
Bulb T6-1/2
Base . . . . . Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW 9LT

Pin 1 – Diode-Units Cathode, Internal Shield
Pin 2 – Diode Plate No.2
Pin 3 – Diode Plate No.1
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Pentode Grid No.3, Cathode, Internal Shield
Pin 7 – Pentode Grid No.1
Pin 8 – Pentode Grid No.2
Pin 9 – Pentode Plate

PENTODE — AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE.	330	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE . .	330	max.	volts
GRID-No.2 VOLTAGE. . . . . See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section			
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value.	0	max.	volts
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 165 volts .	1.1	max.	watts
For grid-No.2 voltages between 165 and 330 volts. . . . . See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section			
PLATE DISSIPATION.	5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200[c]	max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.1	max.	megohm
For cathode-bias operation	0.25	max.	megohm

DIODE UNITS — Two

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

DC PLATE CURRENT	3	max.	ma
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200[c]	max.	volts

Characteristics, Instantaneous Test Condition:

Plate Current for plate volts = 10	1.5	ma

[a] Without external shield.
[b] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.
[c] The dc component must not exceed 100 volts.

8FQ7

Medium-Mu Twin Triode

The 8FQ7 is the same as the 6FQ7 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	8.4	V
Warm-up time (Average)	11	s

8GJ7

Medium-Mu Triode—Sharp-Cutoff Pentode

The 8GJ7 is the same as the 6GJ7 except for the following items:

Heater Characteristics and Ratings

Current	0.300 ± 0.020	A
Voltage (AC or DC) at 0.300A	8.0	V
Warm-up time (Average)	11	s

8GN8

High-Mu Triode—Sharp-Cutoff Pentode

The 8GN8 is the same as the 6GN8 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	8.0	V
Warm-up time (Average)	11	s

8GU7

Medium-Mu Twin Triode

The 8GU7 is the same as the 6GU7 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	8.4	V
Warm-up time (Average)	11	s

8JU8A

Quadruple Diode

The 8JU8A is the same as the 6JU8A except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	8.4	V
Warm-up time (Average)	11	s

8JV8

High-Mu Triode—Sharp-Cutoff Pentode

The 8JV8 is the same as the 6JV8 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	8.5	V
Warm-up time (Average)	11	s

8KA8

High-Mu Triode—Sharp-Cutoff Pentode

Pentode Unit Has Two Independent Control Grids

The 8KA8 is the same as the 6KA8 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	8.4	V
Warm-up time (Average)	11	s

8LC8

High-Mu Triode—Sharp-Cutoff Pentode

The 8LC8 is the same as the 6LC8 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	8.4	V
Warm-up time (Average)	11	s

9C25

Beam Power Tube

FORCED-AIR COOLED — **GROUNDED-GRID TYPE**

GENERAL DATA

Electrical:

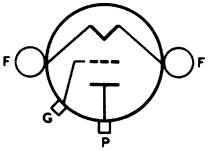
Filament, Multistrand Thoriated Tungsten:		
Excitation	DC or Single Phase AC	
Voltage (AC or DC)	6.0	volts
Current	285	amp
Cold Resistance	0.0025	ohms
Amplification Factor	32	
Direct Interelectrode Capacitances (Approx.):		
Grid to plate	34.0	pf
Grid to filament	60.0	pf
Plate to filament	1.0	pf

Mechanical:

Operating Position	Vertical, filament end up
Maximum Overall Length	17-3/8"
Maximum Diameter	14-1/4"
Weight (Approx.)	85 lbs
Radiator	Integral part of tube
Mounting	Special

Terminal Diagram (See *Dimensional Outline*):

F – Filament
G – Grid



P – Plate

Thermal:

Air Flow:

Upward through radiator	1000 min.	cfm
The specified air flow at a pressure of 2.1 inches of water should be delivered by a blower vertically upward through the radiator before and during the application of any voltages.		
To filament seals	10	cfm
The specified air flow must be directed into the filament header before and during the application of any voltages in order to limit the temperature of the filament and grid seals to the maximum value.		
Incoming Air Temperature	45 max.	°C
Radiator Temperature	210 max.	°C
Bulb Temperature	180 max.	°C
Seal Temperature (Filament, grid, and plate)	165 max.	°C

Indicates a change.

AF POWER AMPLIFIER and MODULATOR — Class B

Maximum CCS[a] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	11500 max.	volts
MAX.-SIGNAL DC PLATE CURRENT[b]	4 max.	amp
MAX.-SIGNAL PLATE INPUT[b]	40 max.	kw
PLATE DISSIPATION[b]	17.5 max.	kw

Typical Operation:

Values are for 2 tubes

DC Plate Voltage	10500	volts
DC Grid Voltage	-250	volts
Peak AF Grid-to-Grid Voltage	1310	volts
Zero-Signal DC Plate Current	1.7	amp
Max.-Signal DC Plate Current	7	amp
Effective Load Resistance (plate to plate)	3300	ohms
Max.-Signal Driving Power (Approx.)	1500	watts
Max.-Signal Power Output (Approx.)	50	kw

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS[a] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	9000 max.	volts
DC GRID VOLTAGE	-2000 max.	volts
DC PLATE CURRENT	3.2 max.	amp
DC GRID CURRENT	0.65 max.	amp
PLATE INPUT	26 max.	kw
PLATE DISSIPATION	11.5 max.	kw

Typical Operation in Grounded-Filament Circuit:

DC Plate Voltage	8000	volts
DC Grid Voltage:[c]		
From a grid resistor of:		
1280 ohms	-650	volts
Peak RF Grid Voltage	1100	volts
DC Plate Current	2.5	amp
DC Grid Current (Approx.)[d]	0.51	amp
Driving Power (Approx.)[d]	510	watts
Power Output (Approx.)	15.8	kw

Typical Operation in Grounded-Grid Circuit:

Same values as for Grounded-Filament Circuit with the following exceptions:

Driving Power (Approx.)[e]	3000	watts
Power Output (Approx.)	18	kw

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[f]

Maximum CCS[a] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	11500 max.	volts
DC GRID VOLTAGE	-2000 max.	volts
DC PLATE CURRENT	4 max.	amp
DC GRID CURRENT	0.65 max.	amp
PLATE INPUT	40 max.	kw
PLATE DISSIPATION	17.5 max.	kw

Typical Operation in Grounded-Filament Circuit:

DC Plate Voltage	10000	11000	volts
DC Grid Voltage:[g]			
From a grid resistor of:			
860 ohms	-500	-	volts
900 ohms	-	-540	volts
From a cathode resistor of:			
125 ohms	-500	-	volts
130 ohms	-	-540	volts
Peak RF Grid Voltage	1000	1050	volts
DC Plate Current	3.5	3.6	amp
DC Grid Current (Approx.)[d]	0.58	0.61	amp
Driving Power (Approx.)[d]	515	575	watts
Power Output (Approx.)	25	29.5	kw

Typical Operation in Grounded-Grid Circuit:

Same values as for Grounded-Grid Circuit with the following exceptions:

Driving Power (Approx.)	3400	3750	watts
Power Output (Approx.)	28	32.5	kw

[a] Continuous Commercial Service.

[b] Averaged over any audio-frequency cycle of sine-wave form.

[c] Obtained from a fixed supply, grid resistor, or a combination of both.

[d] For effect of load resistance on grid current and driving power, refer to TUBE RATINGS — *Grid Current and Driving Power* in the General Section.

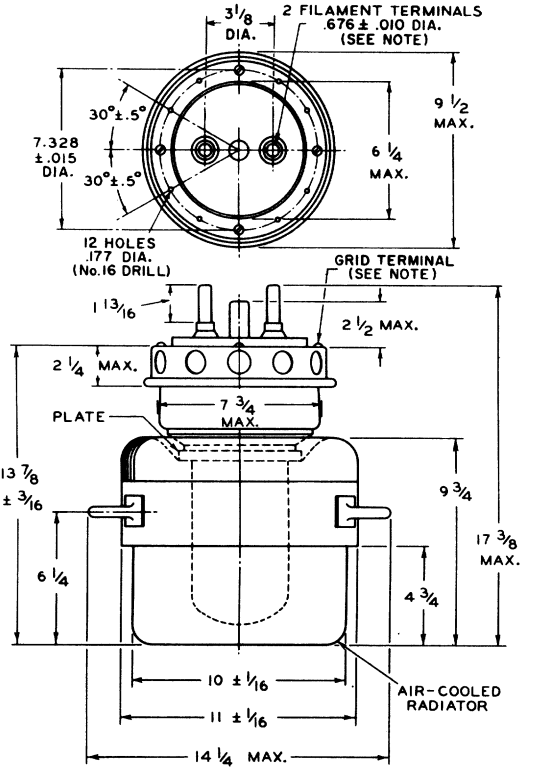
[e] Carrier power of driver modulated 100 per cent.

[f] Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

[g] Obtained from a fixed supply, a cathode resistor, a grid resistor, or from a combination of a fixed supply and self-bias.

MAXIMUM RATINGS vs OPERATING FREQUENCY

OPERATING FREQUENCY Mc	MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM-RATED PLATE VOLTAGE & PLATE INPUT		
	TELEPHONY		TELEGRAPHY
	Class B, Class C Grid or Suppressor Modulated	Class C Plate-Modulated	Class C Unmodulated
30	100	100	100
50	93	87	87
75	87	74	74
100	80	61	61



92CM-6750R2

ALL DIMENSIONS IN INCHES

NOTE: FLEXIBLE CONNECTIONS ARE REQUIRED.

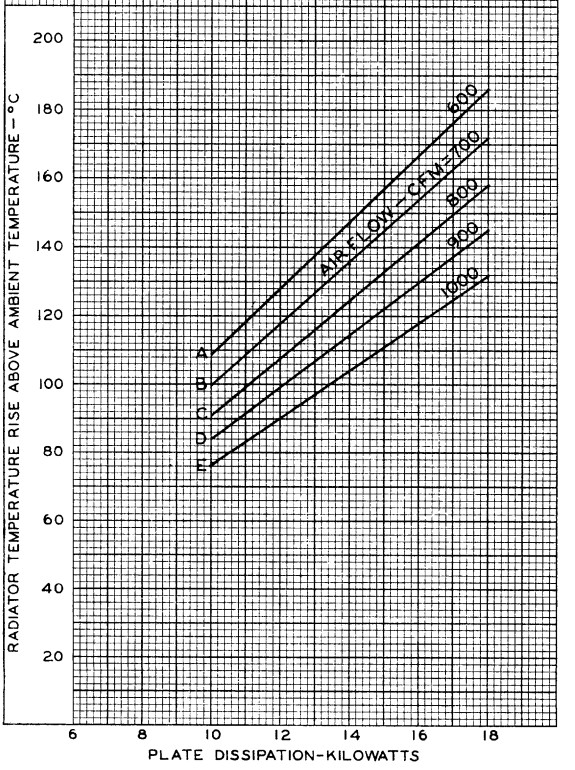
COOLING REQUIREMENTS

E_f = 6 VOLTS
MAXIMUM RADIATOR TEMPERATURE = 180°C

CURVE	PRESSURE DROP INCHES OF WATER
A	0.74
B	1.0
C	1.3
D	1.65
E	2.0

CURVES TAKEN ACCORDING TO NAFM* STANDARDS — BULLETIN Nº 103

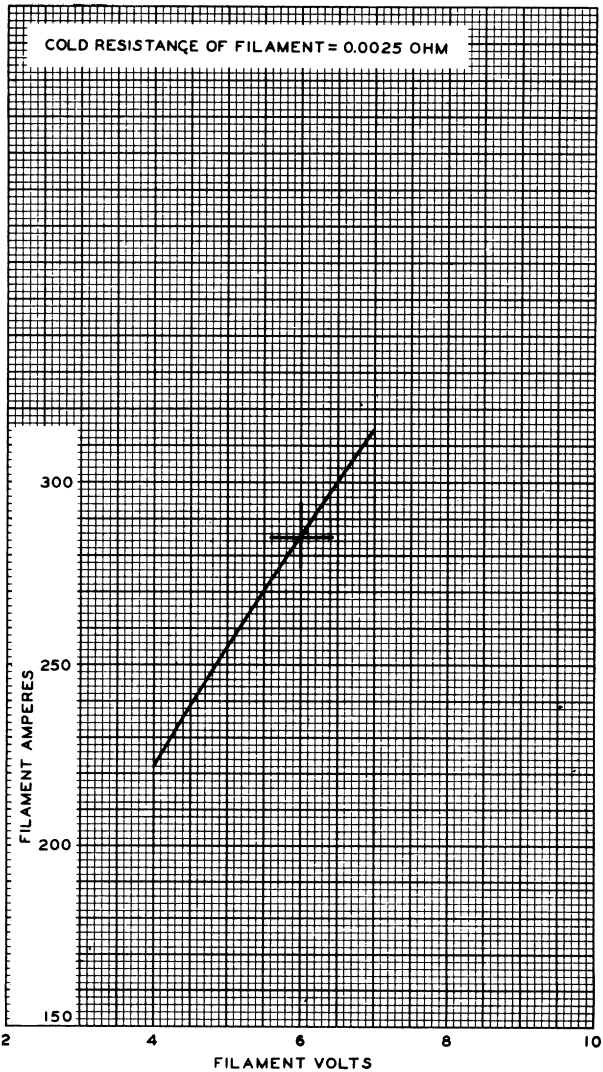
*NATIONAL ASSOCIATION OF FAN MFGRS., GENERAL MOTORS BLDG., DETROIT, MICH.



92CM-6761

9C25

AVERAGE FILAMENT CHARACTERISTIC



MAY 4,1949

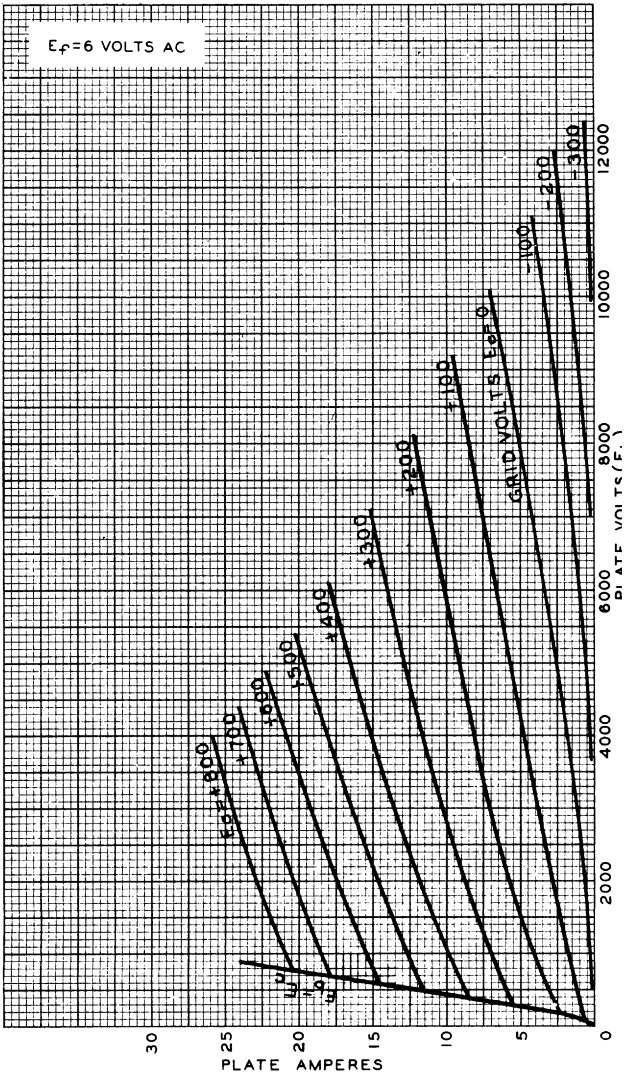
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7269

9C25

9C25

AVERAGE PLATE CHARACTERISTICS



MAY 4,1949

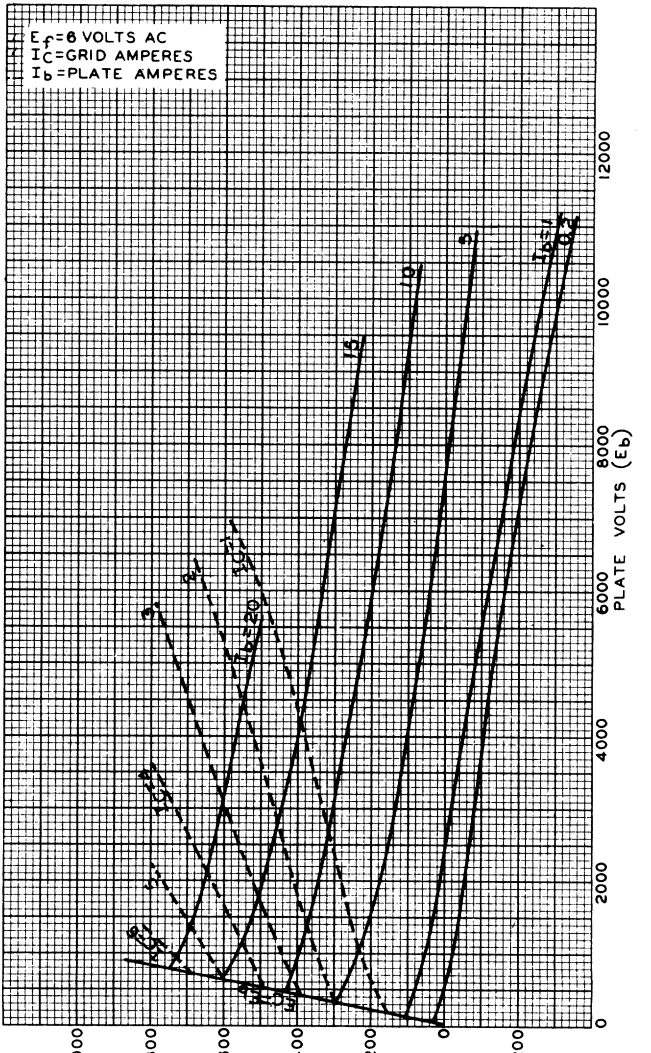
TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7270

9C25

AVERAGE CONSTANT-CURRENT CHARACTERISTICS



MAR. 30, 1949

TUBE DEPARTMENT

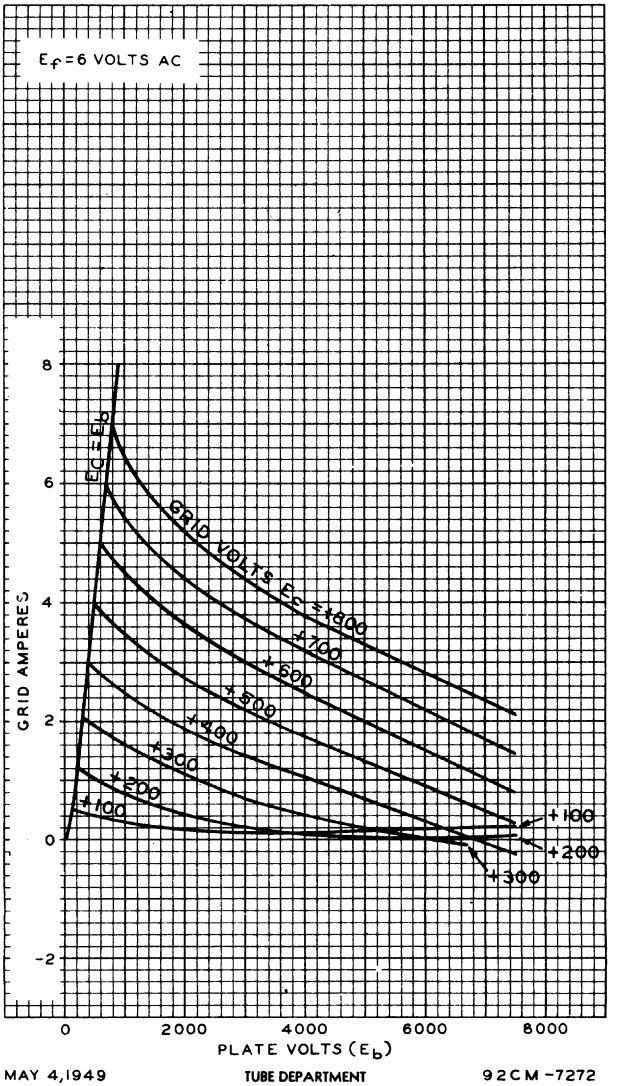
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7234

9C25

9C25

TYPICAL GRID CHARACTERISTICS



MAY 4,1949

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7272

9AU7

Medium-Mu Twin Triode

The 9AU7 is the same as the 12AU7A except for the following items:

Heater, for Unipotential Cathodes

	Series	*Parallel*	
Heater arrangement			
Voltage (AC or DC)	9.4 ± 10%	4.7	V
Current	0.225	0.45 ± 6%	A
Warm-up time (Average)	-	11	s

10AL11

Beam Power Tube—Sharp-Cutoff Pentode

DUODECAR TYPE

The 10AL11 is the same as the 6AL11 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	9.8	V
Warm-up Time (Average)	11	s

10DE7

Dual Triode

With Medium-Mu Unit and Low-Mu Unit

The 10DE7 is the same as the 6DE7 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	9.7	V
Warm-up time (Average)	11	s

10DR7

Dual Triode

With Medium-Mu Unit and Low-Mu Unit

The 10DR7 is the same as the 6DR7 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	9.7	V
Warm-up time (Average)	11	s

10DX8

High-Mu Triode — Sharp-Cutoff Pentode

The 10DX8 is the same as the 6DX8 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	10.2	V

10DE7

Dual Triode

With Medium-Mu Unit and Low-Mu Unit

9-PIN MINIATURE TYPE

The 10DE7 is the same as the 6DE7 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	9.7	volts
Warm-up time (Average)	11	sec

10DR7

Dual Triode

With High-Mu Unit and Low-Mu Unit

9-PIN MINIATURE TYPE

The 10DR7 is the same as the 6DR7 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	9.7	volts
Warm-up time (Average)	11	sec

10DX8

High-Mu Triode
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

The 10DX8 is the same as the 6DX8 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	10.2	volts

10EG7

Dual Triode

With Medium-Mu Unit and Low-Mu Unit

For Equipment Having Series Heater-String Arrangement

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	9.7	volts
Current	0.6 ± 6%	amp
Warm-up time (Average)	11	sec

Direct Interelectrode Capacitances (Approx.):

	Unit No.1	*Unit No.2*	
Grid to plate	4.4	9.5	μμf
Grid to cathode and heater	2.2	7	μμf
Plate to cathode and heater	0.6	1.6	μμf

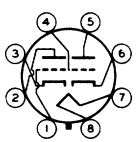
Characteristics, Class A_1 Amplifier:

	Unit No.1	*Unit No.2*	
Plate Voltage	250	150	volts
Grid Voltage	-11	-17.5	volts
Amplification Factor	17.5	6	
Plate Resistance (Approx.)	8750	800	ohms
Transconductance	2000	7500	μmhos
Plate Current	5.5	45	ma
Plate Current for grid volts = -25.	-	8	ma
Plate Current for plate volts = 60 and grid volts = 0	-	95●	ma
Grid Voltage (Approx.) for plate μa = 10	-20	-	volts
Grid Voltage (Approx.) for plate μa = 100	-	-40	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	3"
Maximum Seated Length	2-7/16"
Maximum Diameter	1-9/32"
Bulb	T9
Base	Short Intermediate-Shell Octal 8-Pin with External Barriers (JEDEC Group 1, No.B8-58)
Basing Designation for BOTTOM VIEW	8BD

Pin 1 - Grid of Unit No.2
Pin 2 - Plate of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Grid of Unit No.1



Pin 5 - Plate of Unit No.1
Pin 6 - Cathode of Unit No.1
Pin 7 - Heater
Pin 8 - Heater

VERTICAL-DEFLECTION OSCILLATOR

Values are for Unit No.1

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system★

DC PLATE VOLTAGE	330	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	400	max.	volts
CATHODE CURRENT:			
Peak	77	max.	ma
Average	22	max.	ma
PLATE DISSIPATION	1.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200♦	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For cathode-bias operation	2.2	max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Values are for Unit No.2

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system★

DC PLATE VOLTAGE	330	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE♦	1500	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	175	max.	ma
Average	50	max.	ma
PLATE DISSIPATION	10	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200♦	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For cathode-bias operation	2.2	max.	megohms

▲ Without external shield.

● This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

★ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

♦ The dc component must not exceed 100 volts.

♦ This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

DIMENSIONAL OUTLINE

shown under Type 6EM7 also applies to the 10EG7

10EM7

Dual Triode
With High-Mu Unit and Low-Mu Unit

The 10EM7 is the same as the 6EM7 except for the following items:

Heater Characteristics and Ratings:

Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	9.7	volts
Warm-up time (Average)	11	sec

10GF7

Dual Triode
With High-Mu Unit and Low-Mu Unit

NOVAR TYPE

The 10GF7 is the same as the 6GF7 except for the following items:

Heater Characteristics and Ratings:

Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	9.7	volts
Warm-up time (Average)	11	sec

10GF7A

Dual Triode
With High-Mu Unit and Low-Mu Unit

NOVAR TYPE

The 10GF7A is the same as the 6GF7A except for the following items:

Heater Characteristics and Ratings:

Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	9.7	volts
Warm-up time (Average)	11	sec

10GN8

High-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

The 10GN8 is the same as the 6GN8 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	10.5	volts
Warm-up time (Average)	11	sec

10HF8

High-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

The 10HF8 is the same as the 6HF8 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	10.5	volts
Warm-up time (Average)	11	sec

10JA8

High-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

For Use in Sync-Separator, Sync-Clipper, Voltage Amplifier, Phase-Inverter, and Video Output Amplifier Circuits in TV Receivers

Electrical:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	10.5	volts
Warm-up time (Average)	11	sec
Peak heater-cathode voltage (Each Unit):		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts
Direct Interelectrode Capacitances:[b]		
Triode Unit:		
G_T to P_T	4.0	pf
Input: G_T to (K_T, K_P+$G3_P$+IS,H)	2.6	pf
Output: P_T to (K_T, K_P+$G3_P$+IS,H)	2.6	pf
Pentode Unit:		
$G1_P$ to P_P	0.1 max.	pf
Input: $G1_P$ to (K_P+$G3_P$+IS,$G2_P$,H)	11	pf
Output: P_P to (K_P+$G3_P$+IS,$G2_P$,H)	4.4	pf
$G1_P$ to P_T	0.005 max.	pf
P_P to G_T	0.018 max.	pf
P_P to P_T	0.17 max.	pf

Characteristics, Class A_1 Amplifier:

	Triode Unit		
Plate Voltage	135	200	volts
Grid Voltage	−2	−2	volts
Amplification Factor	60	70	
Plate Resistance (Approx.)	39000	19000	ohms
Transconductance	1550	3700	μmhos
Plate Current	1	3.5	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	−4.8	−7	volts

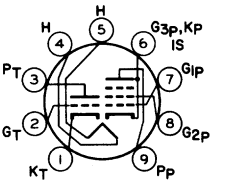
	Pentode Unit			
Plate Voltage	30	135	200	volts
Grid-No.2 Voltage	135	135	135	volts
Grid-No.1 Voltage	0	−1.5	−1.5	volts
Plate Resistance (Approx.)	−	66000	70000	ohms
Transconductance	−	12600	14000	μmhos
Plate Current	32[c]	17	18	ma
Grid-No.2 Current	14[c]	4.2	4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	−	−5	−5	volts

10JA8

Mechanical:

Operating Position	Any
Types of Cathodes	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9DX

Pin 1 - Triode Cathode
Pin 2 - Triode Grid
Pin 3 - Triode Plate
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Pentode Cathode, Pentode Grid No.3, Internal Shield
Pin 7 - Pentode Grid No.1
Pin 8 - Pentode Grid No.2
Pin 9 - Pentode Plate



AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

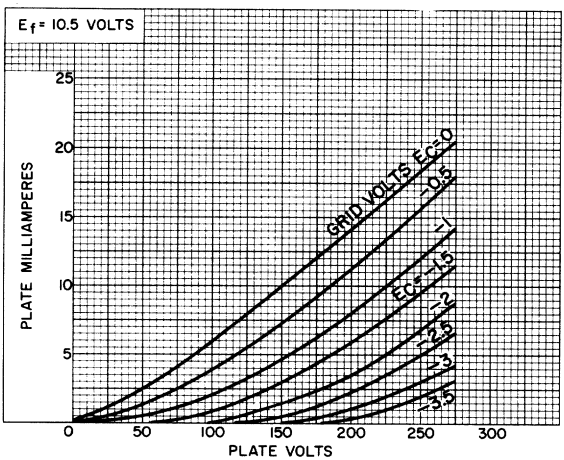
	Triode Unit	*Pentode Unit*	
Plate Voltage	300 max.	330 max.	volts
Grid-No.2 (Screen-Grid) Supply Voltage	-	330 max.	volts
Grid-No.2 Voltage	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		
Grid-No.1 (Control-Grid) Voltage: Positive-bias value	0 max.	0 max.	volts
Plate Dissipation	1 max.	5 max.	watts
Grid-No.2 Input: For grid-No.2 voltages up to 165 volts	-	1.5 max.	watts
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section		

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1 Circuit Resistance:			
For cathode-bias operation	1.0 max.	1.0 max.	megohm
For fixed-bias operation	0.5 max.	0.25 max.	megohm

[a] The dc component must not exceed 100 volts.
[b] Without external shield.
[c] This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

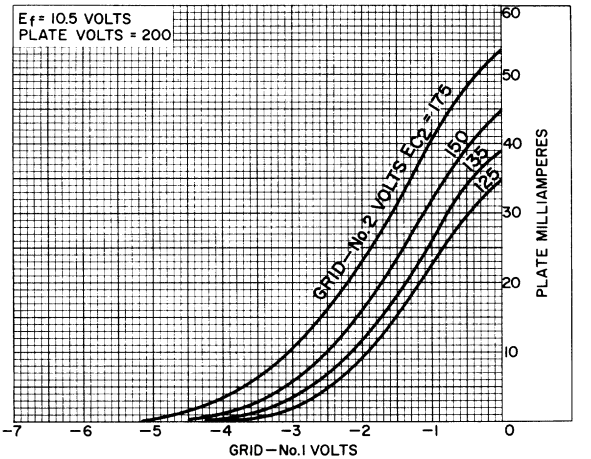
AVERAGE PLATE CHARACTERISTICS
Triode Unit



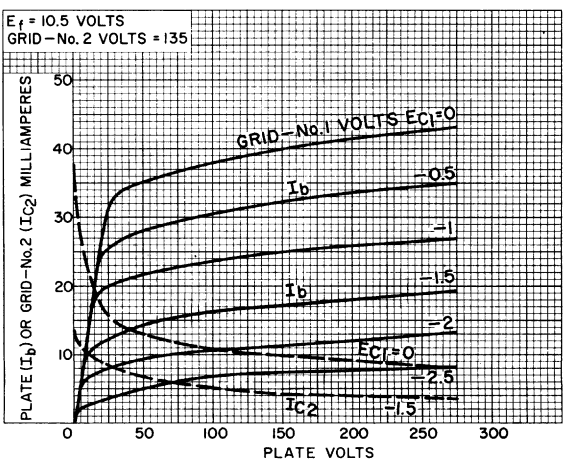
92CS-12158

10JA8

AVERAGE CHARACTERISTICS
Pentode Unit



92CS-12160



92CS-12159

10LE8

Twin Dual-Control Pentode

The 10LE8 is the same as the 6LE8 except for:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	10	V
Warm-up time (Average)	11	s

11AR11

Semiremote-Cutoff Twin Pentode

DUODECAR TYPE

The 11AR11 is the same as the 6AR11 except for:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	11.2	V
Warm-up time (Average)	11	s

11CY7

Dual Triode

With High-Mu Unit and Low-Mu Unit

The 11CY7 is the same as the 6CY7 except for:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	11.0	V
Warm-up time (Average)	11	s

11DS5

Beam Power Tube

The 11DS5 is the same as the 6DS5 except for:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	11.2	V
Warm-up time (Average)	11	s

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

FRAME-GRID CONSTRUCTION

g_m = 30000 μmho

For Video-Output Amplifier Service in Color-TV Receivers

ELECTRICAL CHARACTERISTICS

Bogey Values[a]

		Series	Parallel	
Heater Voltage (AC or DC)	E_h	11.0	5.50	V
Heater Current	I_h	300	600	mA
Direct Interelectrode Capacitances				
Without external shield				
Grid No.1 to plate	c_{g1-p}		0.15 max	pF
Input: G1 to (K, G3 + IS, G2, H)	c_i		14	pF
Output: P to (K, G3 + IS, G2, H)	c_o		5.0	pF

For the following characteristics, see Conditions

Plate Resistance (Approx.)	r_p	40	kΩ
Transconductance	g_m	30000	μmho
DC Plate Current	I_b	30	mA
DC Grid-No.2 Current	I_{c2}	5.2	mA
Cutoff DC Grid-No.1 Voltage. Plate μA = 100	$E_{c1(co)}$	-4.5	V

Conditions

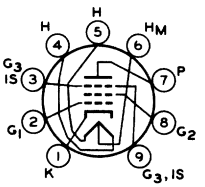
Heater Voltage	E_h	Bogey Value	V
DC Plate Supply Voltage	E_{bb}	200	V
DC Grid-No.3 Voltage	E_{c3}	0	V
DC Grid-No.2 Supply Voltage	E_{cc2}	135	V
DC Grid-No.1 Supply Voltage	E_{cc1}	0	V
Cathode Resistor	R_k	47	Ω

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2.625 in
Maximum Seated Length	2.375 in
Maximum Diameter	0.875 in
Dimensional Outline (JEDEC 6-3)	See *General Section*
Envelope	JEDEC T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC E9-1)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Cathode
Pin 2 – Grid No.1
Pin 3 – Grid No.3, Internal Shield
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Heater Tap
Pin 7 – Plate
Pin 8 – Grid No.2
Pin 9 – Grid No.3, Internal Shield



9BF

DESIGN-MAXIMUM RATINGS

For operation as a Class A_1 Amplifier Tube

DC Plate Voltage	E_b		330	V
DC Grid-No.2 (Screen-Grid) Supply Voltage	E_{cc2}		See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
DC Grid-No.1 (Control-Grid) Voltage				
Positive-bias value	E_{c1}		0	V
Heater-Cathode Voltage				
Peak	e_{hkm}		±200	V
Average[b]	$E_{hk(av)}$		100	V
Heater Voltage (AC or DC)	E_f			
Series	-	9.9 min	12.1 max	V
Parallel	-	4.95 min	6.05 max	V
Grid-No.2 Input	P_{g2}			
For $E_{c2} \leq 165$ V	-		1	W
For $E_{c2} > 165$ V and ≤ 330 V	-		See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Plate Dissipation	P_b		7	W

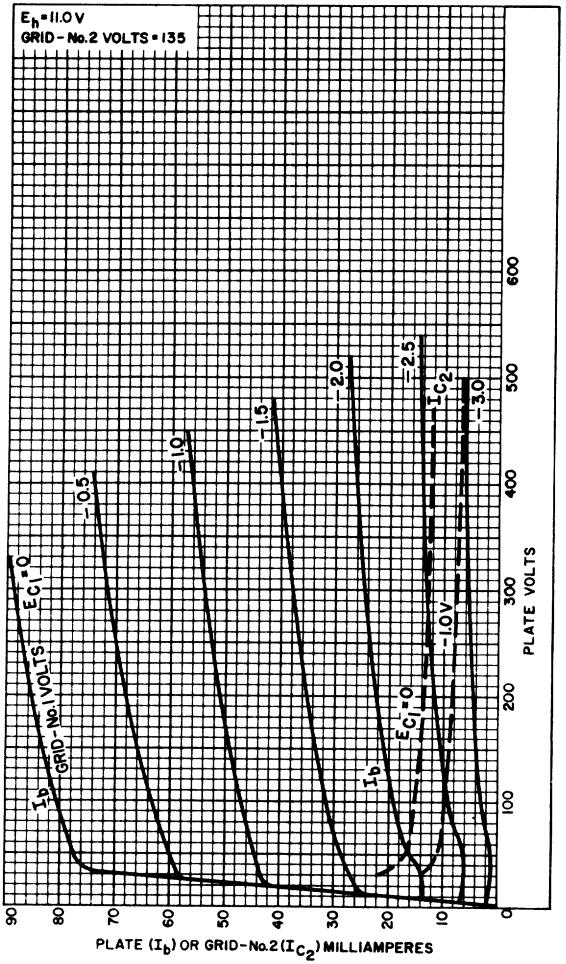
MAXIMUM CIRCUIT VALUES

Grid-No.1 Circuit Resistance	$R_{g1(ckt)}$		
For fixed-bias operation	-	0.1	MΩ
For cathode-bias operation	-	0.25	MΩ

[a] Unless otherwise specified.
[b] Measured with a dc meter.

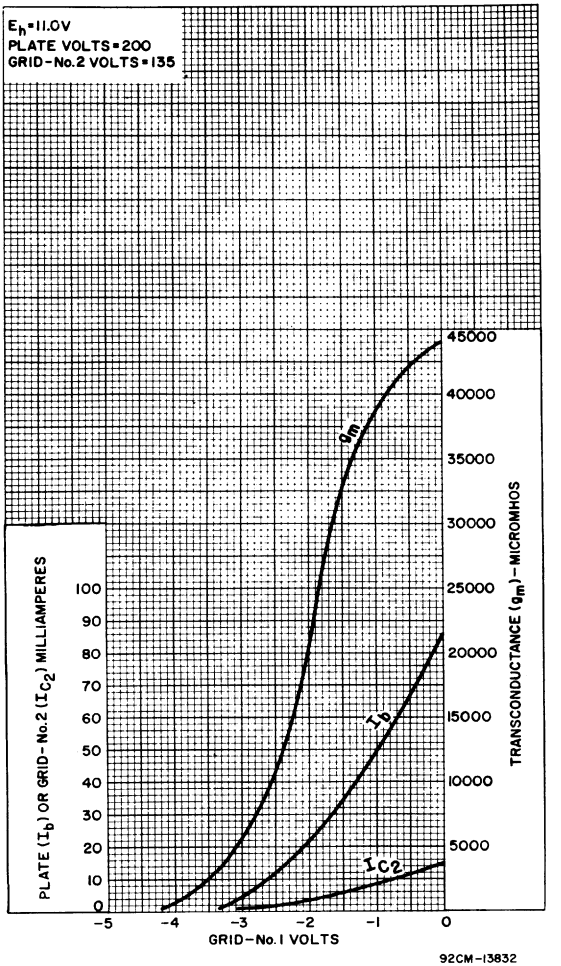
RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Typical Characteristics



92CM-13833

Typical Characteristics



RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

11KV8

High-Mu Triode—
Sharp-Cutoff Pentode

The 11KV8 is the same as the 6KV8 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	10.9	V
Warm-up time (Average)	11	s

11LQ8

Medium-Mu Triode—
Sharp-Cutoff Pentode

The 11LQ8 is the same as the 6LQ8 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	10.9	V
Warm-up time (Average)	11	s

Medium-Mu Triode—
Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

FRAME-GRID CONSTRUCTION (PENTODE UNIT)

For Use in Black-and-White TV Receivers Having Low-Voltage Power Supplies. Triode Unit Useful in Sync-Separator, Sound-IF Circuits, and as a General-Purpose Voltage-Amplifier Tube. Pentode Unit Especially Suited for Video Output Service.

Electrical:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	10.9	volts
Warm-up time (Average)	11	sec
Peak heater-cathode voltage:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts
Direct Interelectrode Capacitances (Approx.):[b]		
Triode Unit:		
Grid to plate	2.8	pf
Input: G_T to (K_T,K_P+$G3_P$+IS,H)	4.2	pf
Output: P_T to (K_T,K_P+$G3_P$+IS,H)	2.4	pf
Pentode Unit:		
Grid No.1 to plate	0.090 max.	pf
Input: G_{1P} to (K_P+$G3_P$+IS,$G2_P$,H)	14	pf
Output: P_P to (K_P+$G3_P$+IS,$G2_P$,H)	4.8	pf
Triode grid to pentode plate	0.015 max.	pf
Pentode plate to triode plate	0.17 max.	pf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*		
Plate Supply Voltage	125	125	200	volts
Grid-No.2 Supply Voltage	–	125	125	volts
Grid-No.1 Supply	Connected to negative end of cathode resistor			
Cathode Resistor	68	82	68	ohms
Amplification Factor	46	–	–	
Plate Resistance (Approx.)	4400	55000	75000	ohms
Transconductance	10400	21000	23000	μmhos
Plate Current	15	19	22	ma
Grid-No.2 Current	–	3.8	4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	-6	-4.2	-4.2	volts

[a] The dc component must not exceed 100 volts.

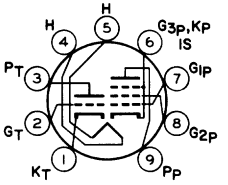
[b] without external shield.

11LQ8

Mechanical:

Operating Position . . . . . .Any
Type of Cathodes . . . . . .Coated Unipotential
Maximum Overall Length . . . . . 2-5/8"
Maximum Seated Length. . . . . 2-3/8"
Length, Base Seat to Bulb Top (Excluding tip). . . . 2" ± 3/32"
Diameter . . . . . 0.750" to 0.875"
Dimensional Outline. . . . . .See *General Section*
Bulb T6-1/2
Base . . . . . Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW 9DX

Pin 1 - Triode Cathode
Pin 2 - Triode Grid
Pin 3 - Triode Plate
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Pentode Grid No.3, Pentode Cathode, Internal Shield
Pin 7 - Pentode Grid No.1
Pin 8 - Pentode Grid No.2
Pin 9 - Pentode Plate



AMPLIFIER — Class A_1

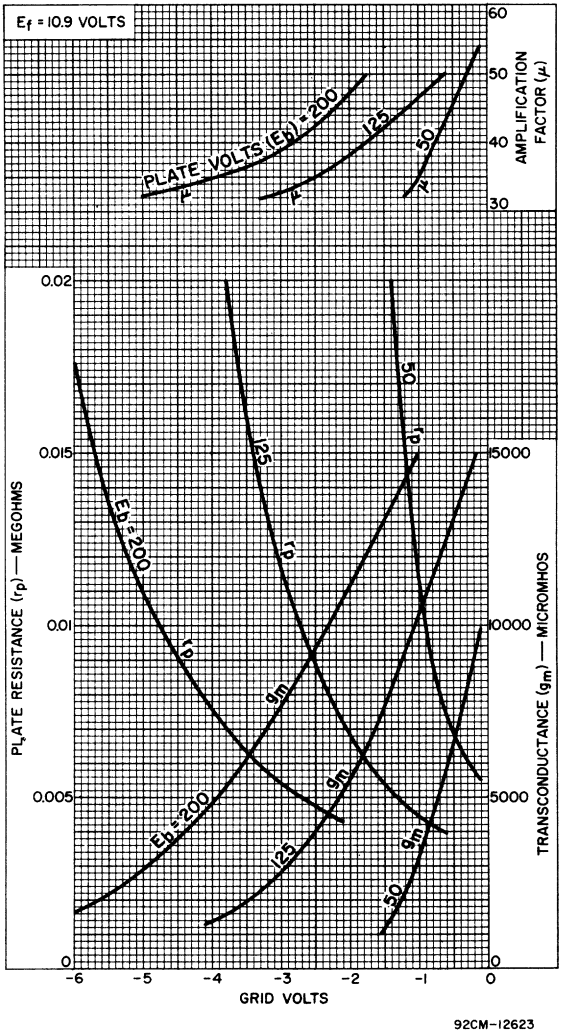
Maximum Ratings, *Design-Maximum Values:*

	Triode Unit	*Pentode Unit*	
Plate Voltage.	300 max.	300 max.	volts
Grid-No.2 (Screen-grid) Supply Voltage	-	300 max.	volts
Grid-No.2 Voltage.	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Grid-No.1 (Control-grid) Voltage: Positive-bias value.	0 max.	0 max.	volts
Grid-No.2 Input: For grid-No.2 voltages up to 150 volts.	-	1 max.	watt
For grid-No.2 voltages between 150 and 300 volts .	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Plate Dissipation.	2 max.	5 max.	watts

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance: For fixed-bias operation . .	0.5 max.	0.1 max.	megohm
For cathode-bias operation .	1 max.	0.25 max.	megohm

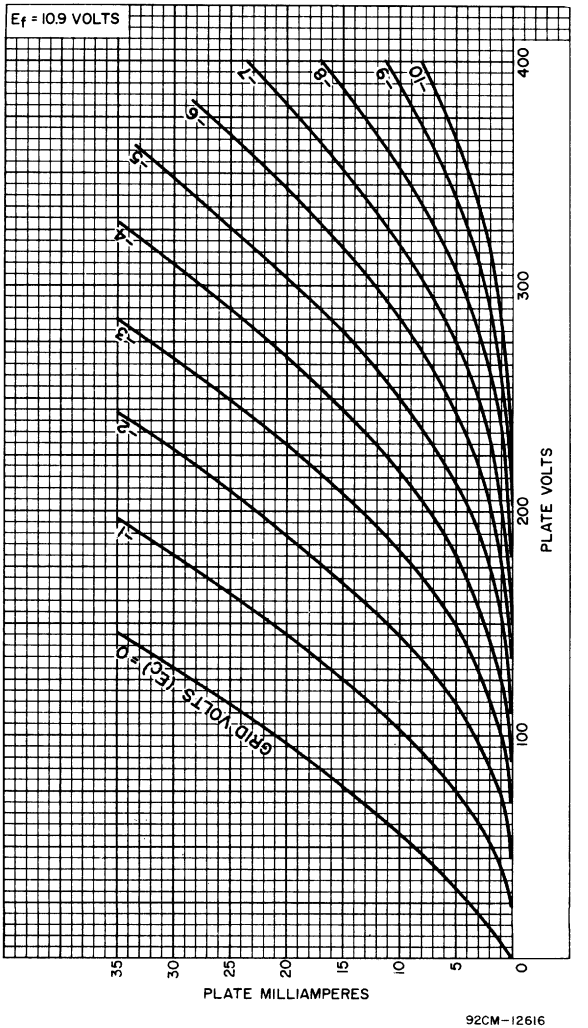
AVERAGE CHARACTERISTICS
Triode Unit



92CM-12623

11LQ8

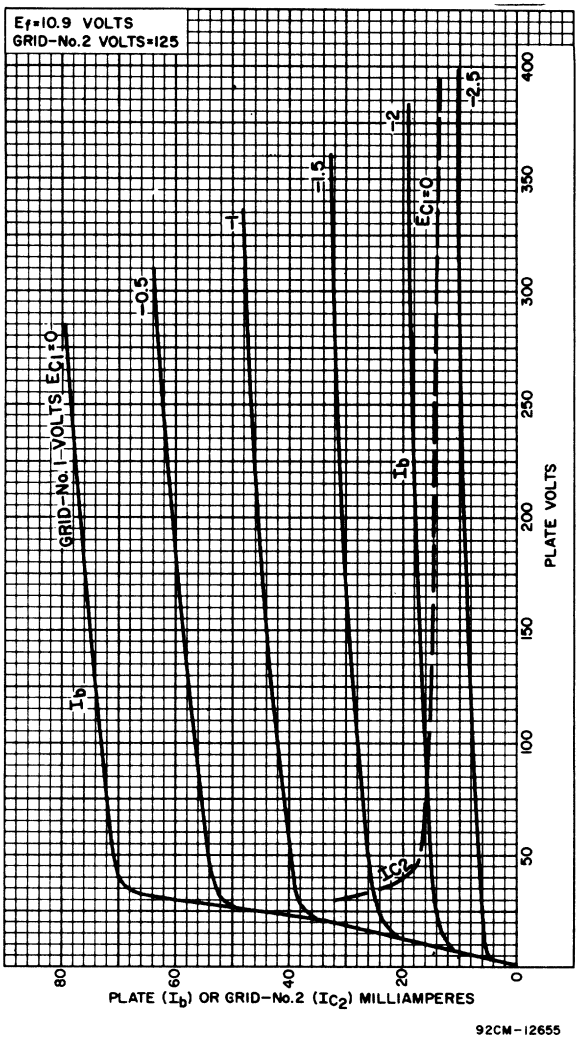
AVERAGE PLATE CHARACTERISTICS
Triode Unit



92CM-12616

AVERAGE CHARACTERISTICS

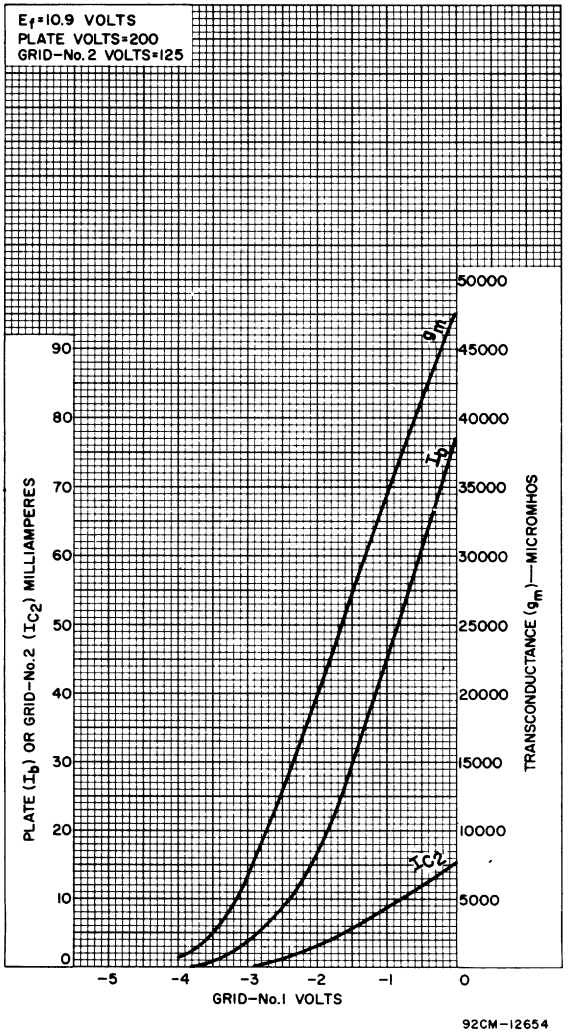
Pentode Unit



92CM-12655

11LQ8

AVERAGE CHARACTERISTICS
Pentode Unit

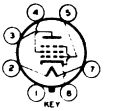


92CM-12654

12A6

BEAM POWER AMPLIFIER

Heater#	Coated Unipotential Cathode	
Voltage	12.6	a-c or d-c volts
Current	0.15	amp.
Direct Interelectrode Capacitances (Approx.):°		
Grid to Plate	0.3	μμf
Input	9.0	μμf
Output	9.0	μμf
Maximum Overall Length		3-1/4"
Maximum Seated Height		2-11/16"
Maximum Diameter		1-5/16"
Bulb		Metal Shell, MT-8
Base		Small Wafer Octal 7-Pin
Pin 1 - Shell		Pin 5 - Grid
Pin 2 - Heater		Pin 7 - Heater
Pin 3 - Plate		Pin 8 - Cathode
Pin 4 - Screen		
Mounting Position		Any



BOTTOM VIEW (7AC)

Maximum Ratings Are Design-Center Values

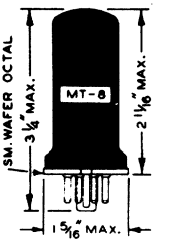
AMPLIFIER

Plate Voltage	250 max.	volts
Screen Voltage	250 max.	volts
Plate Dissipation	7.5 max.	watts
Screen Dissipation	1.5 max.	watts
Operating Conditions and Characteristics-Class A_1 Amplifier:		
Plate	250	volts
Screen	250	volts
Grid *	-12.5	volts
Peak A-F Grid Voltage	12.5	volts
Zero-Signal Plate Current	30	ma.
Max.-Signal Plate Current	32	ma.
Zero-Signal Screen Current	3.5 approx.	ma.
Max.-Signal Screen Current	5.5 approx.	ma.
Plate Resistance	70000 approx.	ohms
Transconductance	3000	μmhos
Load Resistance	7500	ohms
Total Harmonic Distortion	7	%
Max.-Signal Power Output	3.4	watts

In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.

* The d-c resistance in the grid circuit should not exceed 0.1 megohm when fixed bias is used, or 0.5 megohm when cathode bias is used.

° With shell connected to cathode.



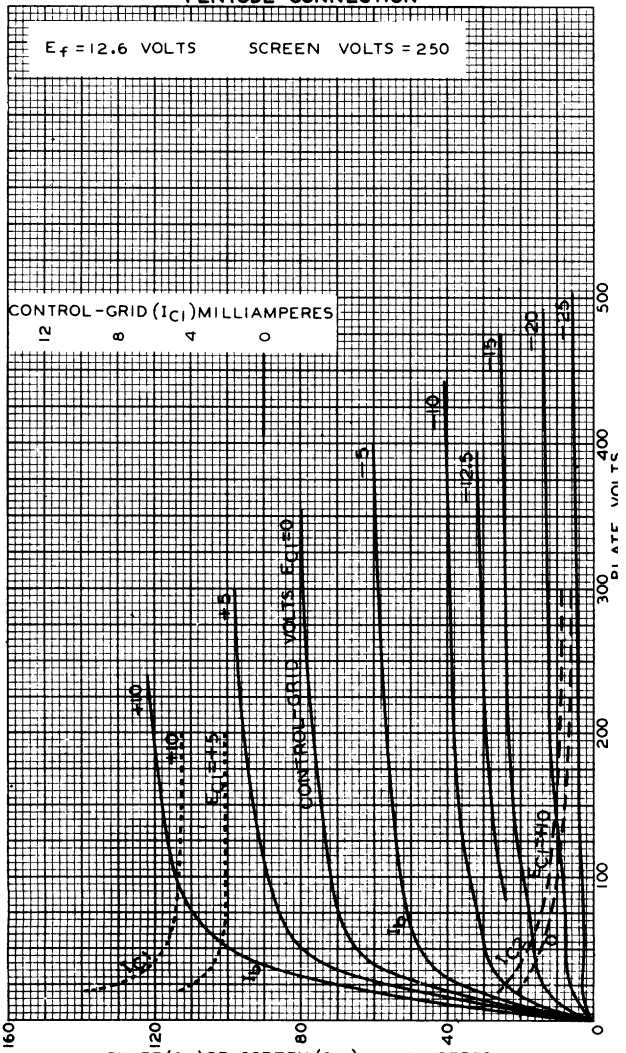
→ Indicates a change.

12A6

12A6

AVERAGE PLATE CHARACTERISTICS

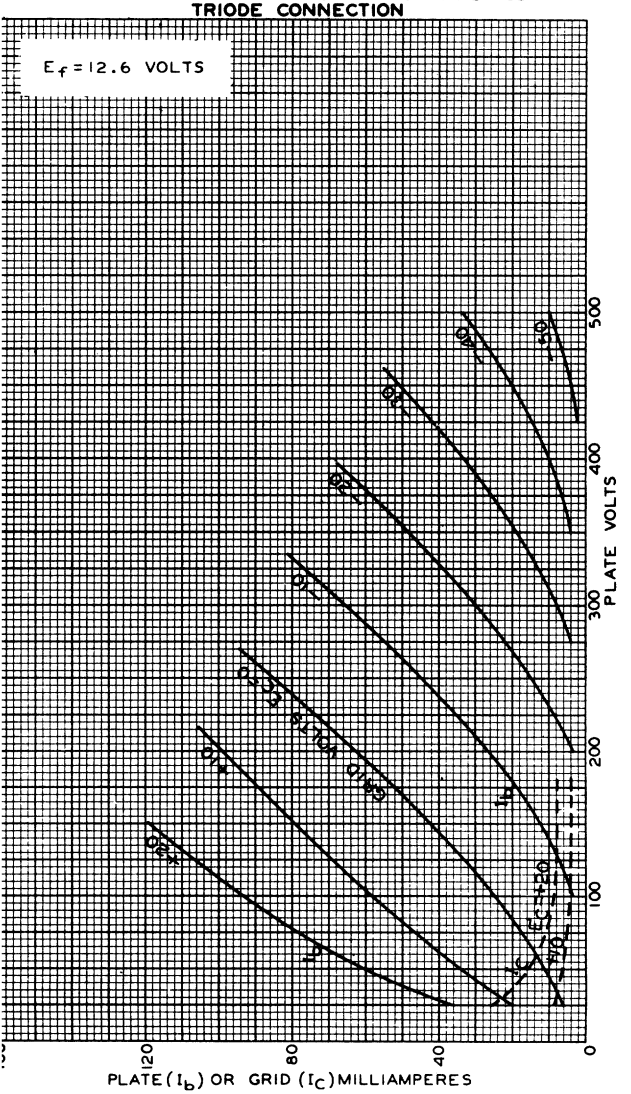
PENTODE CONNECTION



12A6

AVERAGE PLATE CHARACTERISTICS

TRIODE CONNECTION

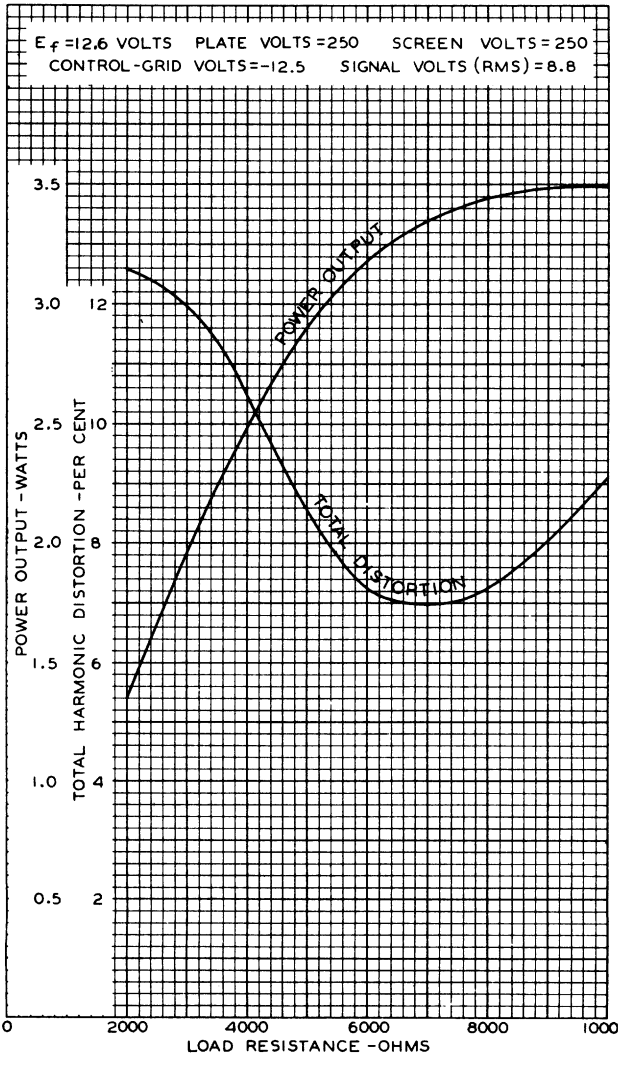


OCT. 13, 1941
RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.
92C-6327

12A6

12A6

OPERATION CHARACTERISTICS



12AB5

BEAM POWER TUBE

9-PIN MINIATURE TYPE

For use in automobile radio receivers operating from 12-volt storage batteries

GENERAL DATA

Electrical:

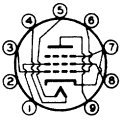
Heater●, for Unipotential Cathode:

Voltage range	10.0 to 15.9	dc volts
This voltage range is on an absolute basis. For longest life, it is recommended that the heater be operated within the voltage range of 11 to 14 volts.		
Current (Approx.), at 12.6 volts	0.2	amp
Direct Interelectrode Capacitances:○		
Grid No.1 to plate	0.7 max.	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	8	μμf
Plate to cathode & grid No.3, grid No.2, and heater	8.5	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Maximum Diameter	7/8"
Dimensional Outline	*See General Section*
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9EU

Pin 1 – Grid No.2
Pin 2 – No Connection
Pin 3 – Grid No.1
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Grid No.1
Pin 7 – Cathode, Grid No.3
Pin 8 – Grid No.2
Pin 9 – Plate

AF POWER AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values:*

For application of these design-center ratings to storage-battery operation, see Operating Considerations

PLATE VOLTAGE	315 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	285 max.	volts
PLATE DISSIPATION	12 max.	watts
GRID-No.2 INPUT	2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250 max.	°C

●,○: see next page.

12AB5

12AB5

BEAM POWER TUBE

Characteristics with 12.6 volts on heater:			
Plate Voltage	250	250	volts
Grid-No.2 Voltage	200	250	volts
Grid-No.1 (Control-Grid) Voltage	–	-12.5	volts
Cathode-Bias Resistor	270	–	ohms
Peak AF Grid-No.1 Voltage	10.5	12.5	volts
Zero-Signal Plate Current	33.5	45	ma
Max.-Signal Plate Current	36	47	ma
Zero-Signal Grid-No.2 Current (Approx.)	1.6	4.5	ma
Max.-Signal Grid-No.2 Current (Approx.)	3.2	7	ma
Plate Resistance (Approx.)	75000	50000	ohms
Transconductance	4000	4100	μmhos
Load Resistance	6000	5000	ohms
Total Harmonic Distortion	8	8	%
Max.-Signal Power Output	3.3	4.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

PUSH-PULL AF POWER AMPLIFIER - Class AB_1

Maximum Ratings, *Design-Center Values:*

For application of these design-center ratings to storage-battery operation, see Operating Considerations

PLATE VOLTAGE	315 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	285 max.	volts
PLATE DISSIPATION	12 max.	watts
GRID-No.2 INPUT	2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250 max.	°C

Characteristics with 12.6 volts on heater:

Values are for 2 tubes

Plate Voltage	250	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 (Control-Grid) Voltage	-15	volts
Peak Af Grid-No.1-to-Grid-No.1 Voltage	30	volts
Zero-Signal Plate Current	70	ma
Max.-Signal Plate Current	79	ma

• Operation of heater in series with other heaters is not recommended.

° Without external shield.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

12AB5

BEAM POWER TUBE

Zero-Signal Grid-No.2 Current (Approx.)	5	ma
Max.-Signal Grid-No.2 Current (Approx.)	13	ma
Effective Load Resistance (Plate to plate)	10000	ohms
Total Harmonic Distortion	5	%
Max.-Signal Power Output	10	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

OPERATING CONSIDERATIONS

The *maximum ratings* in the tabulated data for the 12AB5 are working design-center maximums established according to the standard design-center system of rating electron tubes. Tubes so rated will give satisfactory performance in storage-battery-operated equipment provided the following stipulations are observed:

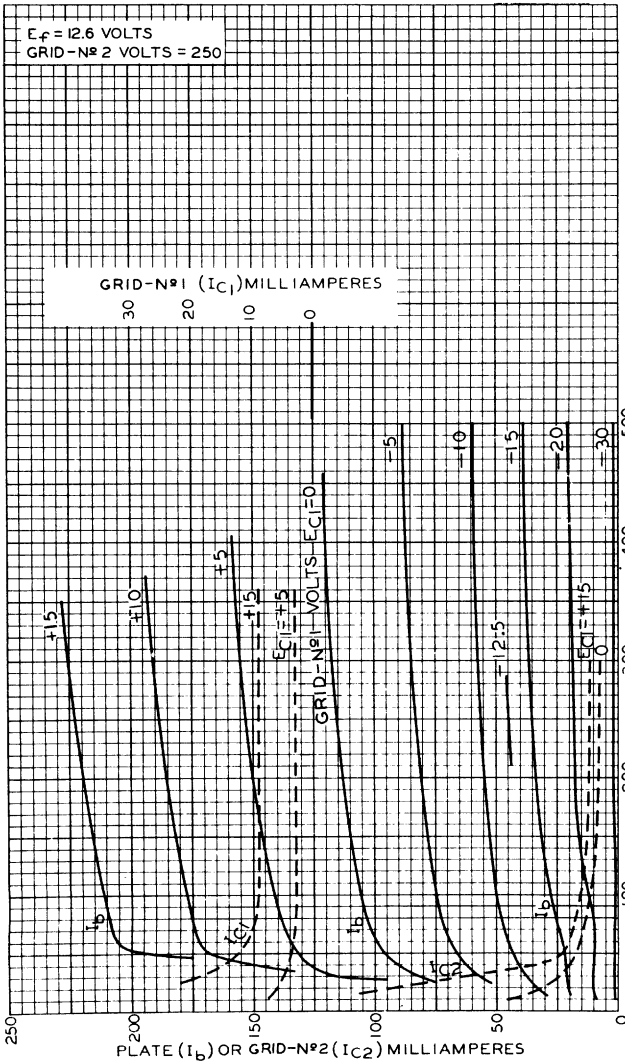
In the case of storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. This fluctuation imposes severe operating conditions on tubes. Under these conditions, the equipment should be designed so that 90 per cent of the design-center maximum values of plate voltage, grid-No.2 voltage, plate dissipation, and grid-No.2 input is never exceeded for a battery terminal potential of 13.2 volts. Although the operating voltages of the 12AB5 in this service will, at times, exceed the design-center maximum values, satisfactory performance with probable sacrifice in life will be obtained.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

12AB5

12AB5

AVERAGE CHARACTERISTICS



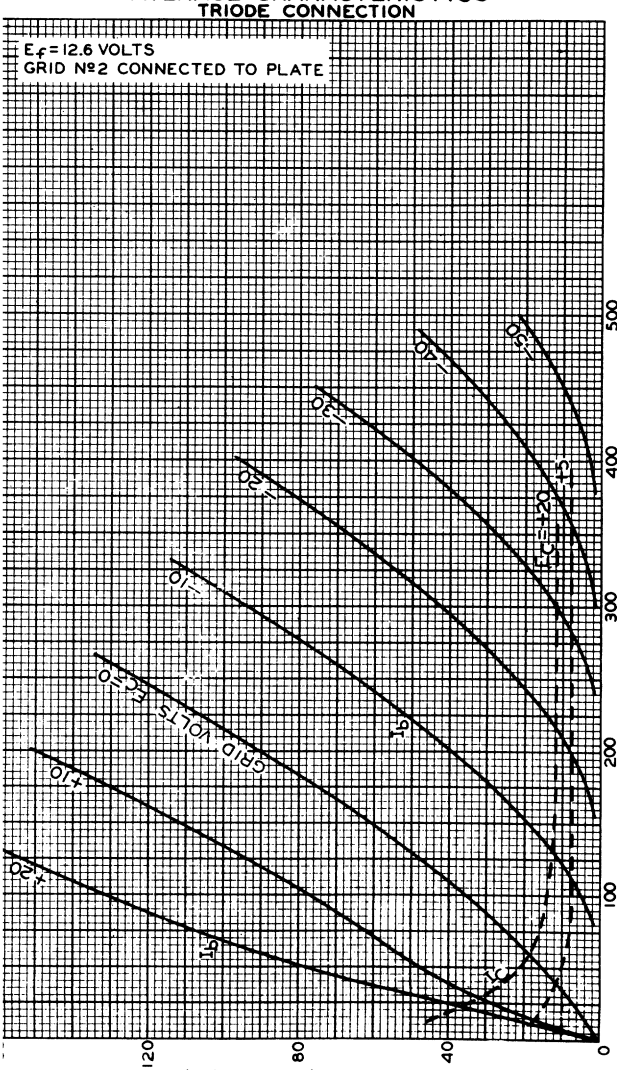
AUGUST 18, 1955 TUBE DIVISION 92CM-8754

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

12AB5

AVERAGE CHARACTERISTICS
TRIODE CONNECTION

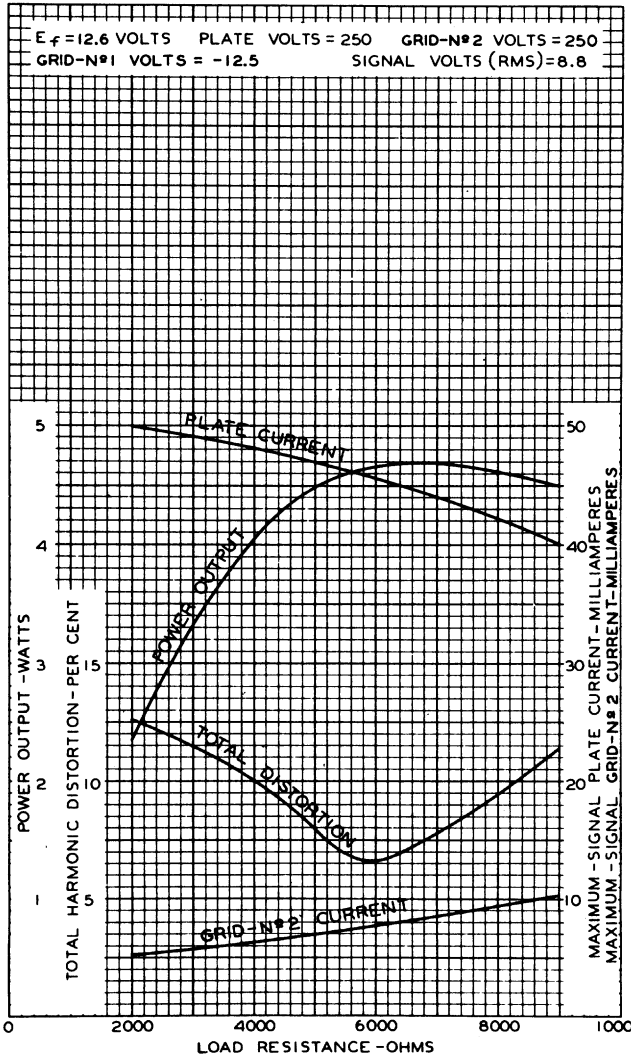


UG. 19, 1955
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-8756

12AB5

12AB5

OPERATION CHARACTERISTICS



AUGUST 18, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8755

12AF3
HALF-WAVE VACUUM RECTIFIER

9-PIN MINIATURE TYPE

For damper service in TV receivers having series heater-string arrangement

The 12AF3 is the same as the 6AF3 except for the following items:		
Heater, for Unipotential Cathode:		
Voltage (AC or DC)	12.6	volts
Current	0.6 ± 6%	amp
Warm-up time (Average)	11	sec

12AL5

TWIN DIODE

MINIATURE TYPE

Heater, for Unipotential Cathodes:		
Voltage	12.6	ac or dc volts
Current	0.15	amp

The 12AL5 is the same as the 6AL5 except for heater rating.

Beam Power Tube—
Sharp-Cutoff Pentode

DUODECAR TYPE

The 12AL11 is the same as the 6AL11 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	12.6	volts
Warm-up time (Average)	11	sec

12AQ5
BEAM POWER AMPLIFIER

MINIATURE TYPE

GENERAL DATA

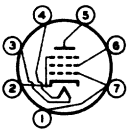
Electrical:

Heater, for Unipotential Cathode:		
Voltage	12.6	ac or dc volts
Current	0.225	amp
Direct Interelectrode Capacitances (Approx., without external shield):		
Grid No.1 to Plate	0.35	μμf
Input	8.3	μμf
Output	8.2	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding Tip)	2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)

BOTTOM VIEW



Pin 1 – Grid No.1
Pin 2 – Grid No.3, Cathode
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Grid No.1

AF POWER AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	250 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	250 max.	volts
PLATE DISSIPATION	12 max.	watts
GRID-No.2 INPUT	2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)●	250 max.	°C

Typical Operation and Characteristics:

Plate Voltage	180	250	volts
Grid-No.2 Voltage	180	250	volts
Grid-No.1 (Control-Grid) Voltage	-8.5	-12.5	volts
Peak AF Grid-No.1 Voltage	8.5	12.5	volts
Zero-Signal Plate Current	29	45	ma
Max.-Signal Plate Current	30	47	ma

●: See next page.

12AQ5

BEAM POWER AMPLIFIER

Zero-Signal Grid-No.2 Current (Approx.)	3	4.5	ma
Max.-Signal Grid-No.2 Current (Approx.)	4	7	ma
Plate Resistance (Approx.)	58000	52000	ohms
Transconductance	3700	4100	μmhos
Load Resistance	5500	5000	ohms
Total Harmonic Distortion	8	8	per cent
Max.-Signal Power Output	2.0	4.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed bias	0.1 max.	megohm
For cathode bias	0.5 max.	megohm

AF POWER AMPLIFIER - Class AB_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	250 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	250 max.	volts
PLATE DISSIPATION	12 max.	watts
GRID-No.2 INPUT	2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)●	250 max.	°C

Typical Operation:

Unless otherwise indicated, values are for 2 tubes

Plate Voltage	250	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 (Control-Grid) Voltage#	-15	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	30	volts
Zero-Signal Plate Current	70	ma
Max.-Signal Plate Current	79	ma
Zero-Signal Grid-No.2 Current (Approx.)	5	ma
Max.-Signal Grid-No.2 Current (Approx.)	13	ma
Plate Resistance (Approx. per tube)	60000	ohms
Transconductance (Per tube)	3750	μmhos
Effective Load Resistance (Plate to plate)	10000	ohms
Total Harmonic Distortion	5	per cent
Max.-Signal Power Output	10	watts

● High ambient temperature and shielding may necessitate a reduction in operating dissipation. When tube shields are used, it is advisable to paint the inside and outside surfaces of the tube shield a dull black and to provide ventilation slots to reduce operating temperature.

#: See next page.

12AQ5

BEAM POWER AMPLIFIER

Maximum Circuit Values Per Tube:▲

Grid-No.1-Circuit Resistance:#

For fixed bias	0.1 max.	megohm
For cathode bias	0.5 max.	megohm

The type of input coupling used should not introduce too much resistance in the grid-No.1 circuit. Transformer- or impedance-coupling devices are recommended.

▲ If the grid-No.1-circuit resistance is common to two tubes, the indicated maximum values per tube should be halved.

Curves shown under Type 6V6 also apply to 12AQ5

12AT6

12AT6

TWIN DIODE—HIGH-MU TRIODE

MINIATURE TYPE

Heater, for Unipotential Cathode:		
Voltage	12.6	ac or dc volts
Current	0.15	amp

The 12AT6 is the same as the 6AT6 except for heater rating.

12AT7
HIGH-MU TWIN TRIODE

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

	Series	*Parallel*	
Heater Arrangement			
Voltage	12.6	6.3	ac or dc volts
Current	0.15	0.3	amp

Direct Interelectrode Capacitances (Approx.)°: ←

	Unit No.1	*Unit No.2*	
Grid-Drive Operation:			
Grid to Plate	1.5	1.5	μμf
Grid to Cathode	2.2	2.2	μμf
Plate to Cathode	0.5	0.4	μμf
Heater to Cathode	2.4	2.4	μμf
Cathode-Drive Operation:			
Plate to Cathode	0.2	0.2	μμf
Grid & Heater to Cathode	4.6	4.6	μμf
Grid & Heater to Plate	1.8	1.8	μμf
Grid to Grid	0.005 max.		μμf
Plate to Plate	0.4 max.		μμf

° With no external shield.

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Maximum Diameter	7/8"
Bulb	T-6-1/2"
Base	Small-Button Noval 9 Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9A

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Heater
Pin 5 - Heater

Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Heater Center-Tap

AMPLIFIER - Class A_1

Values are for each unit

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
GRID VOLTAGE:		
Negative Bias Value	-50 max.	volts
PLATE DISSIPATION	2.5 max.	watts

← Indicates a change

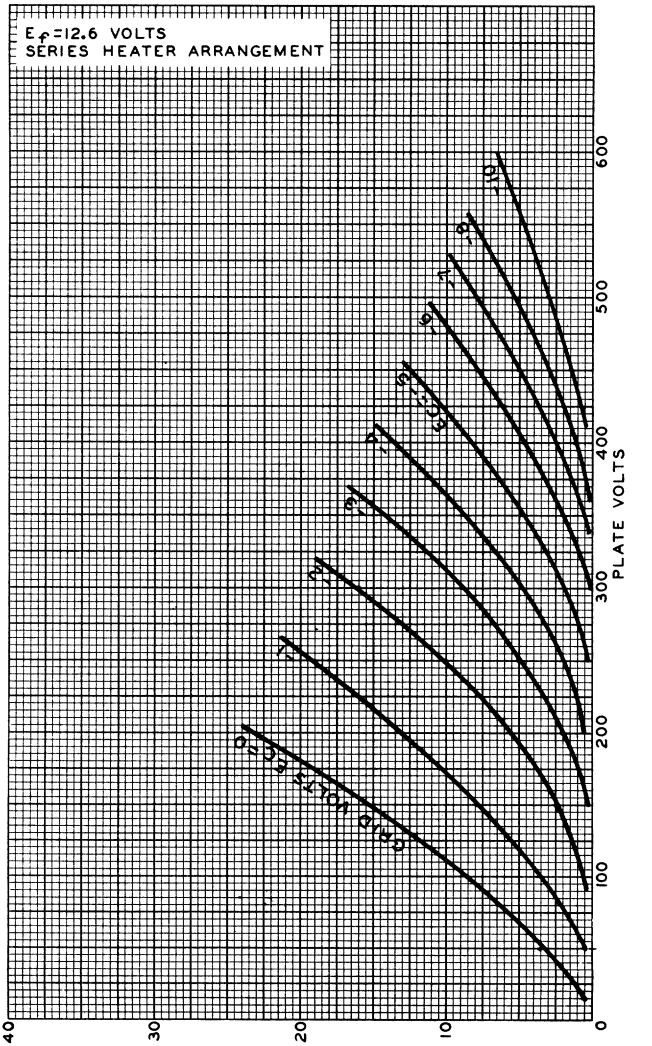
12AT7

HIGH-MU TWIN TRIODE

PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode . .	90 max.		volts
Heater positive with respect to cathode . .	90 max.		volts
→ **Characteristics:**			
Plate Supply Voltage	100	250	volts
Cathode-Bias Resistor	270	200	ohms
Amplification Factor	60	60	
Plate Resistance (Approx.)	15000	10900	ohms
Transconductance	4000	5500	μmhos
Grid Voltage (Approx.)			
for plate current of 10 μamp . .	-5	-12	volts
Plate Current	3.7	10	ma

→ Indicates a change

12AT7
AVERAGE PLATE CHARACTERISTICS
EACH UNIT



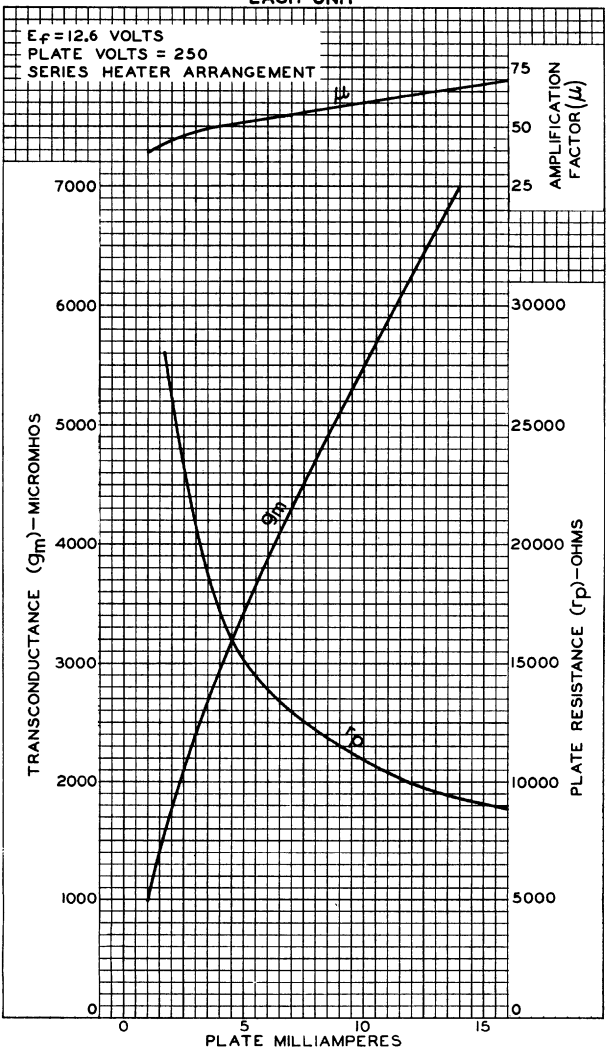
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-7056

12AT7

12AT7

AVERAGE CHARACTERISTICS

EACH UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9314

12AU6

SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

The 12AU6 is the same as the 6AU6 except for the following items:

Heater, for Unipotential Cathode:		
Voltage	12.6	. . . . . ac or dc volts
Current	0.15	. . . . . amp

12AU7A

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

For Applications Critical as to Microphonics

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

	Series	*Parallel*	
Heater arrangement			
Voltage (AC or DC)	12.6	6.3 ± 10%	volts
Current	0.15 ± 6%	0.3	amp

Direct Interelectrode Capacitances (Approx.):[a]

	Unit No.1	*Unit No.2*	
Grid to plate	1.5	1.5	μμf
Grid to cathode and heater	1.6	1.6	μμf
Plate to cathode and heater	0.5	0.35	μμf

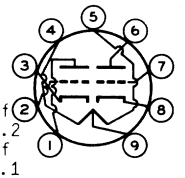
Characteristics, Class A_1 Amplifier (Each Unit):

Plate Voltage	100	250	volts
Grid Voltage	0	-8.5	volts
Amplification Factor	19.5	17	
Plate Resistance (Approx.)	6250	7700	ohms
Transconductance	3100	2200	μmhos
Plate Current	11.8	10.5	ma
Grid Voltage (Approx.) for plate μa = 10	-	-24	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9A

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pins 4 & 9 - Heater of Unit No.2
Pins 5 & 9 - Heater of Unit No.1



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Heater Tap

◄ Indicates a change.

AMPLIFIER — Class A_1

Values are for Each Unit

→Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
CATHODE CURRENT	22	max.	ma
PLATE DISSIPATION:			
Either plate	2.75	max.	watts
Both plates (Both units operating)	5.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts

Typical Operation as Resistance-Coupled Amplifier:

See *RESISTANCE-COUPLED AMPLIFIER CHART No.10* at front of this Section

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation	1	max.	megohm

HORIZONTAL-DEFLECTION OSCILLATOR

Values are for Each Unit

→Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[c]

DC PLATE VOLTAGE	330	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	660	max.	volts
CATHODE CURRENT:			
Peak	330	max.	ma
Average	22	max.	ma
PLATE DISSIPATION:			
Either plate	2.75	max.	watts
Both plates (Both units operating)	5.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	2.2	max.	megohms

VERTICAL-DEFLECTION OSCILLATOR

Values are for Each Unit

→Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[c]

DC PLATE VOLTAGE	330	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	440	max.	volts
CATHODE CURRENT:			
Peak	66	max.	ma
Average	22	max.	ma

→Indicates a change.

PLATE DISSIPATION:			
Either plate.	2.75	max.	watts
Both plates (Both units operating). . .	5.5	max.	watts
PEAK HEATER–CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200[b]	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	2.2	max.	megohms

VERTICAL-DEFLECTION AMPLIFIER

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:* ←

For operation in a 525-line, 30-frame system[c]

DC PLATE VOLTAGE.	300	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[d]. . . .	1200	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE.	275	max.	volts
CATHODE CURRENT:			
Peak.	66	max.	ma
Average	22	max.	ma
PLATE DISSIPATION:			
Either plate.	2.75	max.	watts
Both plates (Both units operating). . .	5.5	max.	watts
PEAK HEATER–CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200[b]	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For cathode-bias operation.	2.2	max.	megohms

[a] Without external shield.

[b] The dc component must not exceed 100 volts.

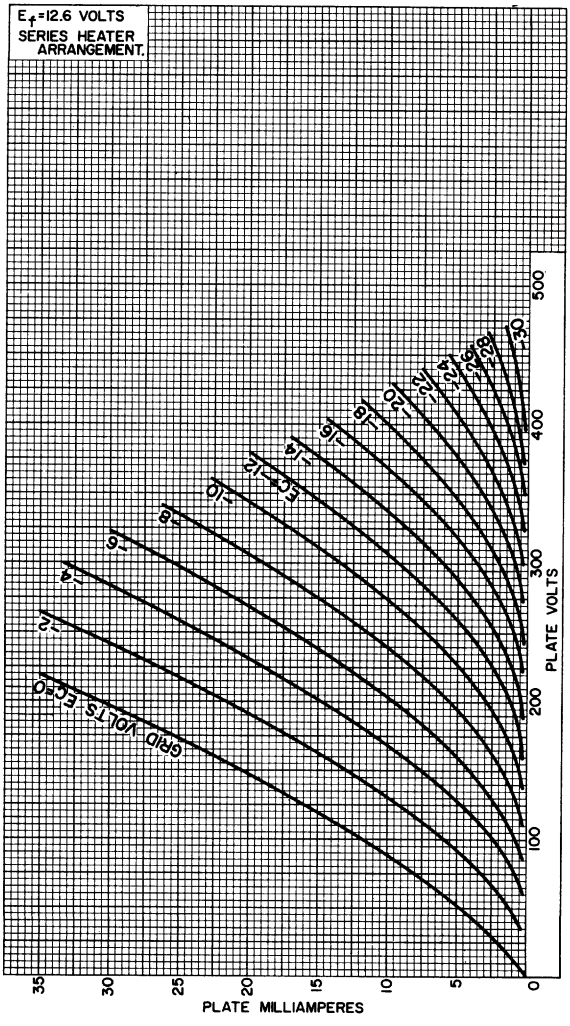
[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[d] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

← Indicates a change.

12AU7A

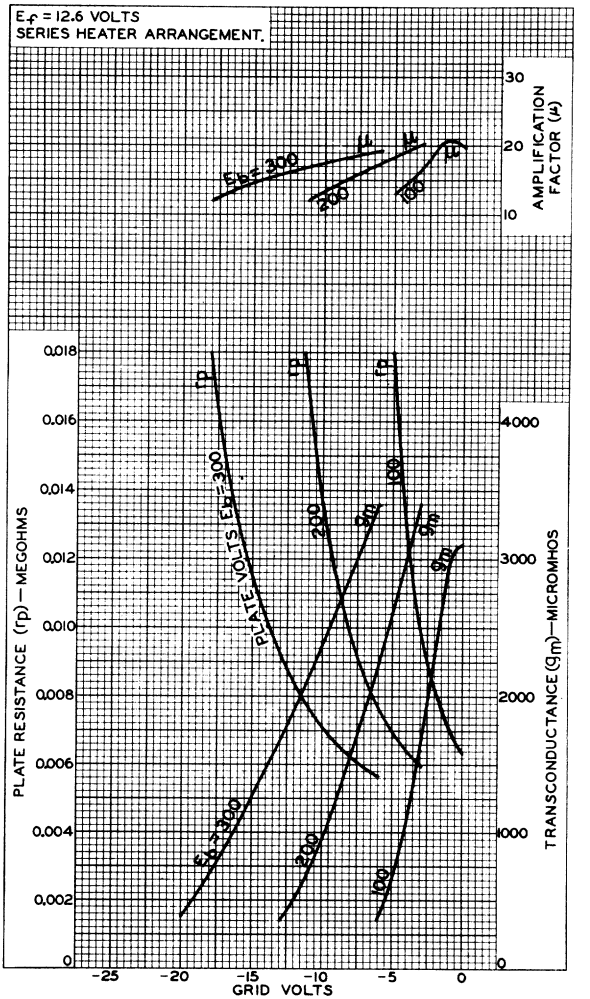
AVERAGE PLATE CHARACTERISTICS
Each Unit



92CM-10548

RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.

AVERAGE CHARACTERISTICS
Each Unit



92CM-8564R2

12AV5-GA
BEAM POWER TUBE

Intended for use in equipment having series heater-string arrangement

The 12AV5-GA is the same as the 6AV5-GA except for the following items:

Heater, for Unipotential Cathode:		
Voltage	12.6	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

12AV6
TWIN DIODE—HIGH-MU TRIODE

7-PIN MINIATURE TYPE

The 12AV6 is the same as the 6AV6 except for the following items:

Heater, for Unipotential Cathode:		
Voltage	12.6	ac or dc volts
Current	0.15	amp

12AX3

Half-Wave Vacuum Rectifier

DUODECAR TYPE
With Heater Having Controlled Warm-Up Time

The 12AX3 is the same as the 6AX3 except for the following items:

Heater Characteristics and Ratings *(Design-Maximum Values):*			
Voltage (AC or DC)	12.6[a]	12.6 ± 1.2	volts
Current	0.600 ± 0.040	0.600[b]	amp
Warm-up time (Average)	11	–	sec

12AX4GTA

Half-Wave Vacuum Rectifier

For Damper Service in TV Equipment With
Heater Having Controlled Warm-Up Time

The 12AX4GTA is the same as the 6AX4GT except for the following items:

Heater Characteristics and Ratings *(Design-Maximum Values):*			
Voltage (AC or DC)	12.6[a]	12.6 ± 1.2	volts
Current	0.600 ± 0.040	0.600[b]	amp
Warm-up time (Average)	11	–	sec

12AX4GTB

Half-Wave Vacuum Rectifier

For Damper Service in TV Equipment With
Heater Having Controlled Warm-Up Time

The 12AX4GTB is the same as the 6AX4GTB except for the following items:

Heater Characteristics and Ratings *(Design-Maximum Values):*			
Voltage (AC or DC)	12.6[a]	12.6 ± 1.2	volts
Current	0.600 ± 0.040	0.600[b]	amp
Warm-up time (Average)	11	–	sec

[a] At heater amperes = 0.600.
[b] At heater volts = 12.6.

12AX7-A

High-Mu Twin Triode

9-PIN MINIATURE TYPE

For High-Fidelity Audio-Amplifier Applications Critical as to Noise and Hum

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Heater arrangement	*Series*	*Parallel*	
Voltage (AC or DC)	12.6	6.3 ± 10%	volts
Current	0.15 ± 6%	0.3	amp

Direct Interelectrode Capacitances (Approx.):▲

	Unit No. 1	*Unit No. 2*	
Grid to plate	1.7	1.7	μμf
Grid to cathode and heater	1.6	1.6	μμf
Plate to cathode and heater	0.46	0.34	μμf

Equivalent Noise and Hum Voltage (Referenced to Grid, Each Unit):

Average Value (RMS) . . . . . 1.8 μvolts

Measured in "true rms" units under the following conditions: Heater volts (AC) = 6.3; center-tap of heater transformer connected to ground; plate supply volts (DC) = 250; plate load resistor (megohms) = 0.1; cathode resistor (ohms) = 2700; cathode bypass capacitor (μf) = 100; grid resistor (ohms) = 0; amplifier frequency range 25 to 10000 cps.

Characteristics, Class A_1 Amplifier (Each Unit):

Plate Voltage	100	250	volts
Grid Voltage	-1	-2	volts
Amplification Factor	100	100	
Plate Resistance (Approx.)	80000	62500	ohms
Transconductance	1250	[illegible]	μmhos
Plate Current	0.5	.2	ma

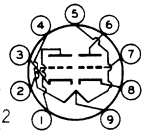
Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No. E9-1)

12AX7-A

Basing Designation for BOTTOM VIEW 9A

Pin 1 – Plate of Unit No.2
Pin 2 – Grid of Unit No.2
Pin 3 – Cathode of Unit No.2
Pins 4 & 9 – Heater of Unit No.2
Pins 5 & 9 – Heater of Unit No.1
Pin 6 – Plate of Unit No.1
Pin 7 – Grid of Unit No.1
Pin 8 – Cathode of Unit No.1
Pin 9 – Heater Tap



AMPLIFIER — CLASS A_1

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

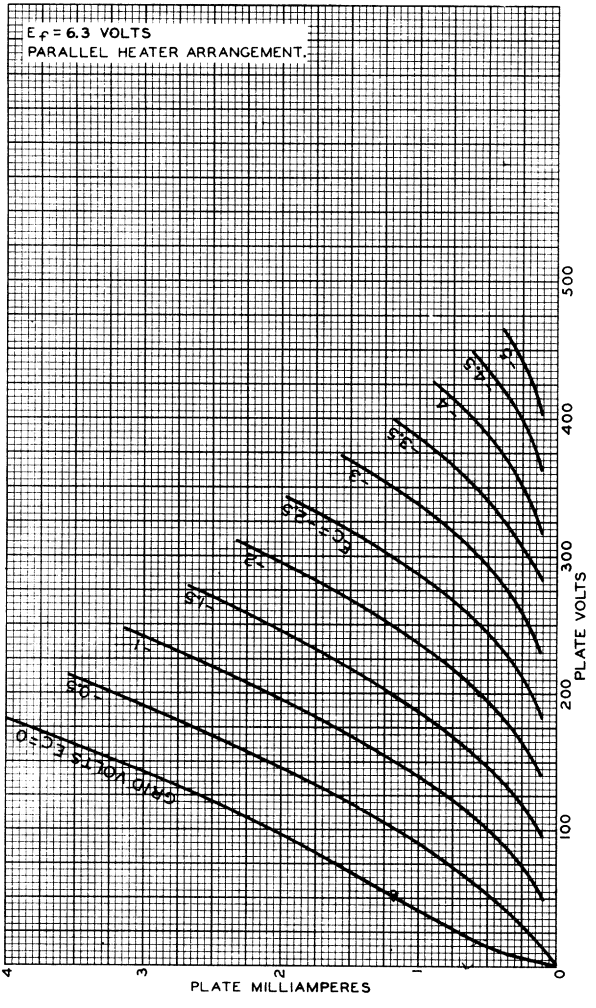
PLATE VOLTAGE	330	max.	volts
GRID VOLTAGE:			
Negative-bias value	55	max.	volts
Positive-bias value	0	max.	volts
PLATE DISSIPATION	1.2	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200●	max.	volts

Typical Operation as Resistance-Coupled Amplifier:

See *RESISTANCE-COUPLED-AMPLIFIER CHART No.25* at front of this Section

▲ Without external shield.
● The dc component must not exceed 100 volts.

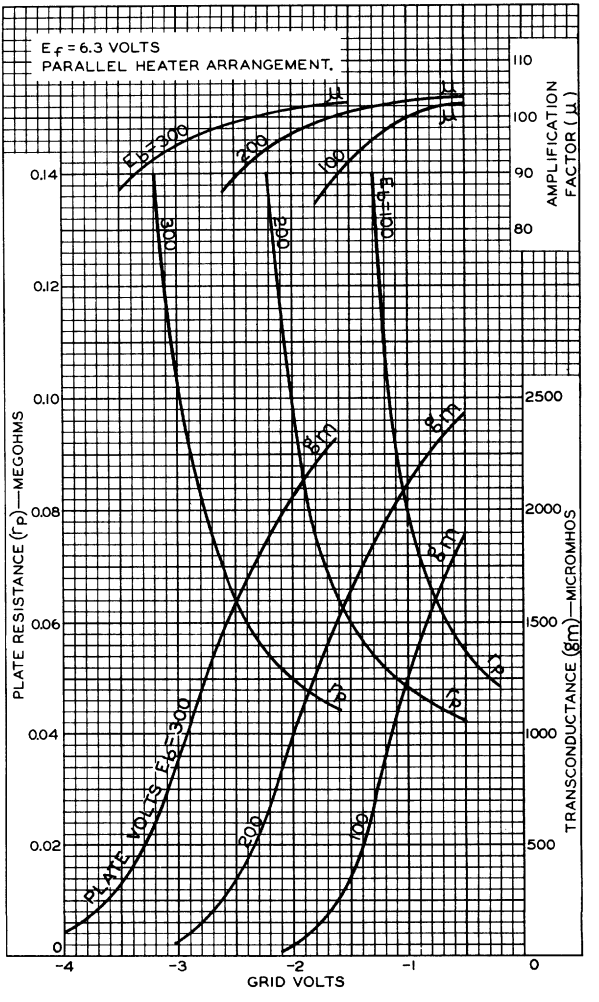
AVERAGE PLATE CHARACTERISTICS
Each Unit



92CM-6879

12AX7-A

AVERAGE CHARACTERISTICS
Each Unit



92CM-6880

12AY3

Half-Wave Vacuum Rectifier

NOVAR TYPE

For TV Damper Service

The 12AY3 is the same as the 6AY3 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC)	12.6	volts
Warm-up time (Average)	11	sec

12AY3A

Half-Wave Vacuum Rectifier

NOVAR TYPE

For TV Damper Service

The 12AY3A is the same as the 6AY3B except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC)	12.6	volts
Warm-up time (Average)	11	sec

12AY7

MEDIUM-MU TWIN TRIODE

MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Heater Arrangement	*Series*	*Parallel*	
Voltage	12.6*	6.3	ac or dc volts
Current	0.15	0.3	amp
Direct Interelectrode Capacitances (Without External Shield)—Each Unit:			
Grid to Plate	1.3		μμf
Input	1.3		μμf
Output	0.6		μμf

Characteristics, Class A_1 Amplifier (Each Unit):

Plate Voltage	250	volts
Grid Voltage	−4	volts
Amplification Factor	40	
Plate Resistance (Approx.)	22800	ohms
Transconductance	1750	μmhos
Plate Current	3	ma
Grid Voltage (Approx.) for plate current of 10 μamp	−11	volts

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Maximum Diameter	7/8"
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin (JETEC No. E9-1)
Basing Designation for BOTTOM VIEW	9A

Pin 1 – Plate of Unit No.2
Pin 2 – Grid of Unit No.2
Pin 3 – Cathode of Unit No.2
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Plate of Unit No.1
Pin 7 – Grid of Unit No.1
Pin 8 – Cathode of Unit No.1
Pin 9 – Heater Mid-Tap

* use of the 12.6-volt connection with an ac-heater supply is not recommended for applications involving low hum.

(continued on next page)

12AY7

MEDIUM-MU TWIN TRIODE

AMPLIFIER-Class A$_1$

Values are for each unit

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
GRID VOLTAGE:		
Negative bias value	50 max.	volts
Positive bias value	0 max.	volts
PLATE DISSIPATION	1.5 max.	watts
CATHODE CURRENT	10 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Typical Operation as Resistance-Coupled Amplifier:

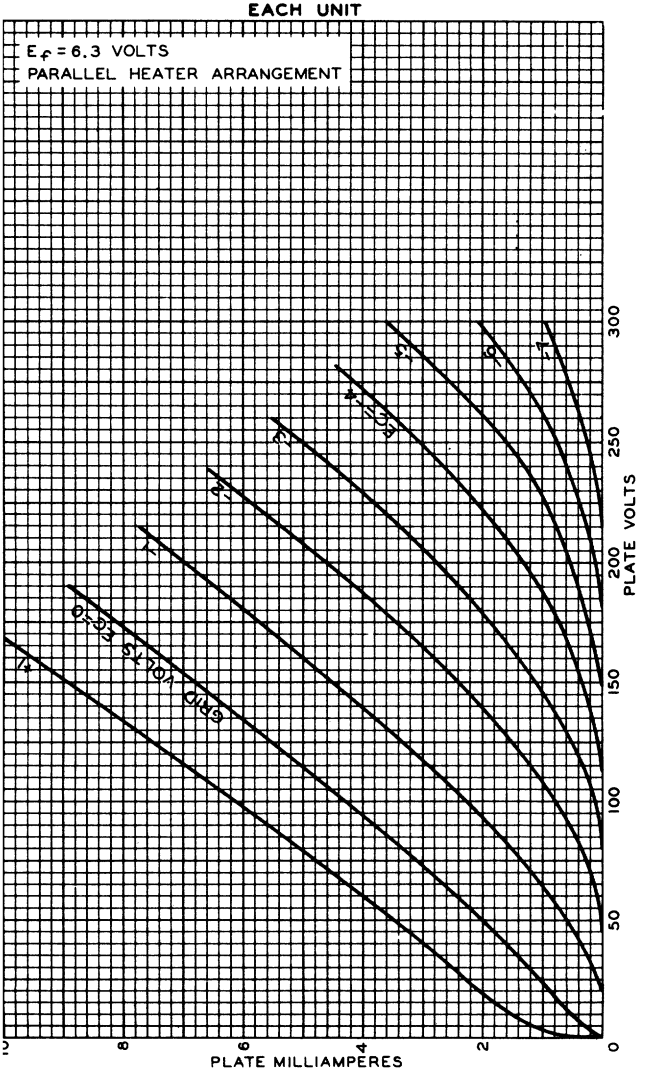
See RESISTANCE-COUPLED AMPLIFIER CHART No.28 at front of Receiving Tube Section

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

12AY7

AVERAGE PLATE CHARACTERISTICS

EACH UNIT



NOV. 5, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7861

12AZ7A

High-Mu Twin Triode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

	Series	*Parallel*	
Heater arrangement			
Voltage (AC or DC)	12.6 ± 10%	6.3	volts
Current	0.225	0.45 ± 6%	amp
Warm-up time (Average)	-	11	sec

Direct Interelectrode Capacitances (Approx.):

	Without External Shield	*With External Shield*[a]	
Unit No.1:			
Grid to plate	2	1.9	μμf
Grid to cathode and heater	2.6	2.8	μμf
Plate to cathode and heater	0.44	1.4	μμf
Unit No.2:			
Grid to plate	2	1.9	μμf
Grid to cathode and heater	2.6	2.8	μμf
Plate to cathode and heater	0.36	1.6	μμf

Characteristics, Class A_1 Amplifier (Each Unit):

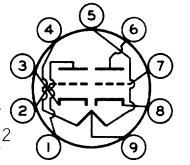
Plate Supply Voltage	100	250	volts
Cathode Resistor	270	200	ohms
Amplification Factor	60	60	
Plate Resistance (Approx.)	15000	10900	ohms
Transconductance	4000	5500	μmhos
Plate Current	3.7	10	ma
Grid Voltage (Approx.) for plate μa = 10	-5	-12	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ±3-32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

Basing Designation for BOTTOM VIEW. 9A

Pin 1 – Plate of Unit No.2
Pin 2 – Grid of Unit No.2
Pin 3 – Cathode of Unit No.2
Pins 4 & 9 – Heater of Unit No.2
Pins 5 & 9 – Heater of Unit No.1
Pin 6 – Plate of Unit No.1
Pin 7 – Grid of Unit No.1
Pin 8 – Cathode of Unit No.1
Pin 9 – Heater Tap



AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
GRID VOLTAGE:			
Negative-bias value	55	max.	volts
PLATE DISSIPATION	2.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation	0.25	max.	megohm
For cathode-bias operation	1	max.	megohm

[a] With external shield JEDEC No.315 connected to cathode of unit under test.
[b] The dc component must not exceed 100 volts.

CURVES
shown under Type 12AT7 also apply to the 12AZ7A

12B4-A
LOW-MU TRIODE

9-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

	Series	*Parallel*	
Heater arrangement			
Voltage	12.6	6.3	ac or dc volts
Current	0.300	0.600	amp
Warm-up time (Average)	-	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

Direct Interelectrode Capacitances (Approx.):[o]		
Grid to plate	4.8	μμf
Grid to cathode and heater	5	μμf
Plate to cathode and heater	1.5	μμf

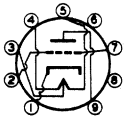
Characteristics, Class A_1 Amplifier:

Plate Voltage	150	volts
Grid Voltage	-17.5	volts
Amplification Factor	6.5	
Plate Resistance (Approx.)	1030	ohms
Transconductance	6300	μmhos
Plate Current	34	ma
Grid Voltage (Approx.) for plate current of 200 μamp	-32	volts
Plate Current for grid voltage of -23 volts	9.6	ma

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Maximum Diameter	7/8"
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9AG

Pin 1 - Cathode
Pin 2 - Grid
Pin 3 - Heater Mid-Tap
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - No Connection
Pin 7 - Grid
Pin 8 - No Connection
Pin 9 - Plate

[o] With external shield JETEC No.315 connected to cathode.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

12B4-A

LOW-MU TRIODE

AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	550	max.	volts
GRID VOLTAGE:			
Negative bias value	50	max.	volts
PLATE DISSIPATION	5.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation	0.47	max.	megohm
For cathode-bias operation	2.2	max.	megohms

VERTICAL DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Center Values Except as Noted*:

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	550	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE (Absolute maximum)#	1000■	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250	max.	volts
CATHODE CURRENT:			
Peak	105	max.	ma
Average	30	max.	ma
PLATE DISSIPATION	5.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater negative with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For cathode-bias operation	2.2	max.	megohms

▲ The dc component must not exceed 100 volts.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

■ Under no circumstances should this absolute value be exceeded.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

12BA6

Remote-Cutoff Pentode

7-PIN MINIATURE TYPE

The 12BA6 is the same as the 6BA6 except for the following items:

Heater Characteristics and Ratings

Voltage (AC or DC)	12.6	V
Current	0.150	A

12BA7

Pentagrid Converter

9-PIN MINIATURE TYPE

The 12BA7 is the same as the 6BA7 except for the following items:

Heater Characteristics and Ratings

Voltage (AC or DC)	12.6	V
Current	0.150	A

12BD6

Remote-Cutoff Pentode

7-PIN MINIATURE TYPE

The 12BD6 is the same as the 6BD6 except for the following items:

Heater Characteristics and Ratings

Voltage (AC or DC)	12.6	V
Current	0.150	A

12BE3

Half-Wave Vacuum Rectifier

DUODECAR TYPE

The 12BE3 is the same as the 6BE3 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	12.6	V
Warm-up time (Average)	11	s

12BE6

Pentagrid Converter

7-PIN MINIATURE TYPE

The 12BE6 is the same as the 6BE6 except for the following items:

Heater Characteristics and Ratings

Voltage (AC or DC)	12.6 V
Current	0.150 A

12BF6

Twin Diode—Medium-Mu Triode

7-PIN MINIATURE TYPE

The 12BF6 is the same as the 6BF6 except for the following items:

Heater Characteristics and Ratings

Voltage (AC or DC)	12.6 V
Current	0.150 A

12BF11

Dual Control Sharp-Cutoff Pentode—Beam Power Tube

DUODECAR TYPE

The 12BF11 is the same as the 6BF11 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	12.6	V
Warm-up time (Average)	11	s

12BH7-A

MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Heater arrangement	*Series*	*Parallel*	
Voltage	12.6	6.3	ac or dc volts
Current	0.3	0.6	amp
Warm-up time (Average)	—	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

Direct Interelectrode Capacitances (Approx.):°

	Unit No.1	*Unit No.2*	
Grid to plate	2.6	2.6	μμf
Grid to cathode and heater	3.2	3.2	μμf
Plate to cathode and heater	0.5	0.4	μμf
Plate of unit No.1 to plate of unit No.2	0.8		μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ±3/32"
Maximum Diameter	7/8"
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9A

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pins 4 & 9 - Heater of Unit No.2
Pins 5 & 9 - Heater of Unit No.1

Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Heater Mid-Tap

AMPLIFIER - Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max. volts

° Without external shield.

12BH7-A

MEDIUM-MU TWIN TRIODE

GRID VOLTAGE:		
Negative bias value	50 max.	volts
Positive bias value	0 max.	volts
CATHODE CURRENT	20 max.	ma
PLATE DISSIPATION	3.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲max.	volts

Characteristics:

Plate Voltage	250	volts
Grid Voltage	-10.5	volts
Amplification Factor	16.5	
Plate Resistance (Approx.)	5300	ohms
Transconductance	3100	μmhos
Plate Current	11.5	ma
Plate Current for grid voltage of -14 volts	4	ma
Grid Voltage (Approx.) for plate current of 50 μamp	-23	volts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	1.0 max.	megohm

HORIZONTAL DEFLECTION OSCILLATOR

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	450 max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE♦	600 max.	volts
CATHODE CURRENT:		
Peak	300 max.	ma
Average	20 max.	ma
PLATE DISSIPATION	3.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias, grid-resistor bias, or cathode-bias operation	2.2 max.	megohms

♦ This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

▲,□: See next page.

12BH7-A

MEDIUM-MU TWIN TRIODE

VERTICAL DEFLECTION OSCILLATOR

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	450 max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	400 max.	volts
CATHODE CURRENT:		
Peak	70 max.	ma
Average	20 max.	ma
PLATE DISSIPATION	3.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias, grid-resistor bias, or cathode-bias operation	2.2 max.	megohms

VERTICAL DEFLECTION AMPLIFIER

Values are for Each Unit

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	450 max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE# (Absolute Maximum)	1500■max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	250 max.	volts
CATHODE CURRENT:		
Peak	70 max.	ma
Average	20 max.	ma
PLATE DISSIPATION	3.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For cathode-bias operation	2.2 max.	megohms

▲ The dc component must not exceed 100 volts.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

\# This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

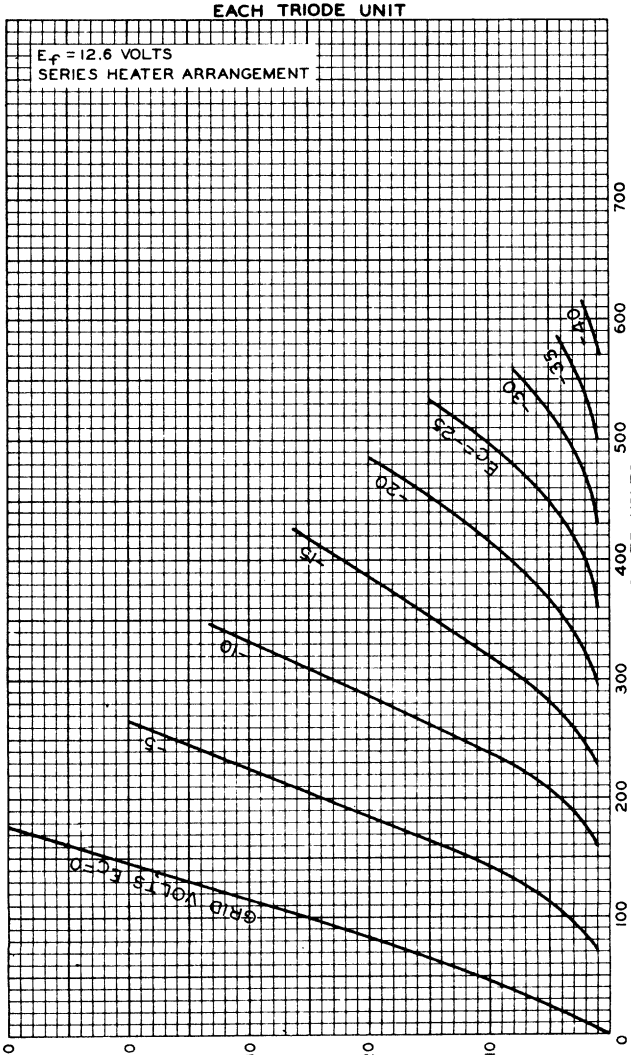
■ Under no circumstances should this absolute value be exceeded.

12BH7-A

12BH7-A

AVERAGE PLATE CHARACTERISTICS

EACH TRIODE UNIT



MAR. 1, 1955

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7742RI

12BQ6GTB/12CU6

Beam Power Tube

The 12BQ6GTB/12CU6 is the same as the 6BQ6GTB/6CU6 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	12.6	volts
Warm-up time (Average)	11	sec

12BS3

Half-Wave Vacuum Rectifier

NOVAR TYPE

For TV Damper Service

The 12BS3 is the same as the 6BS3 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	12.6	volts
Warm-up time (Average)	11	sec

12BS3A

Half-Wave Vacuum Rectifier

NQVAR TYPE

For TV Damper Service

The 12BS3A is the same as the 6BS3A except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	12.6	volts
Warm-up time (Average)	11	sec

12BY7-A

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

	Series	*Parallel*	
Heater arrangement			
Voltage (AC or DC)	12.6 ± 10%	6.3	volts
Current	0.3	0.6 ± 6%	amp
Warm-up time (Average)	–	11	sec
Direct Interelectrode Capacitances:[a]			
Grid No.1 to plate		0.063	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater		10.2	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater		3.5	μμf

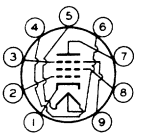
Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	250	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Supply Voltage	180	volts
Cathode Resistor	100	ohms
Plate Resistance (Approx.)	93000	ohms
Transconductance	11000	μmhos
Plate Current	26	ma
Grid-No.2 Current	5.75	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-11.6	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9BF

Pin 1 – Cathode
Pin 2 – Grid No.1
Pin 3 – Grid No.3, Internal Shield
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Heater Tap
Pin 7 – Plate
Pin 8 – Grid No.2
Pin 9 – Grid No.3, Internal Shield

← Indicates a change.

→ AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
GRID No.3 (SUPPRESSOR GRID)	*Connect to cathode at socket*		
GRID-No.2 (SCREEN-GRID) VOLTAGE	190	max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Negative-bias value	55	max.	volts
Positive-bias value	0	max.	volts
GRID-No.2 INPUT	1.2	max.	watts
PLATE DISSIPATION	6.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts

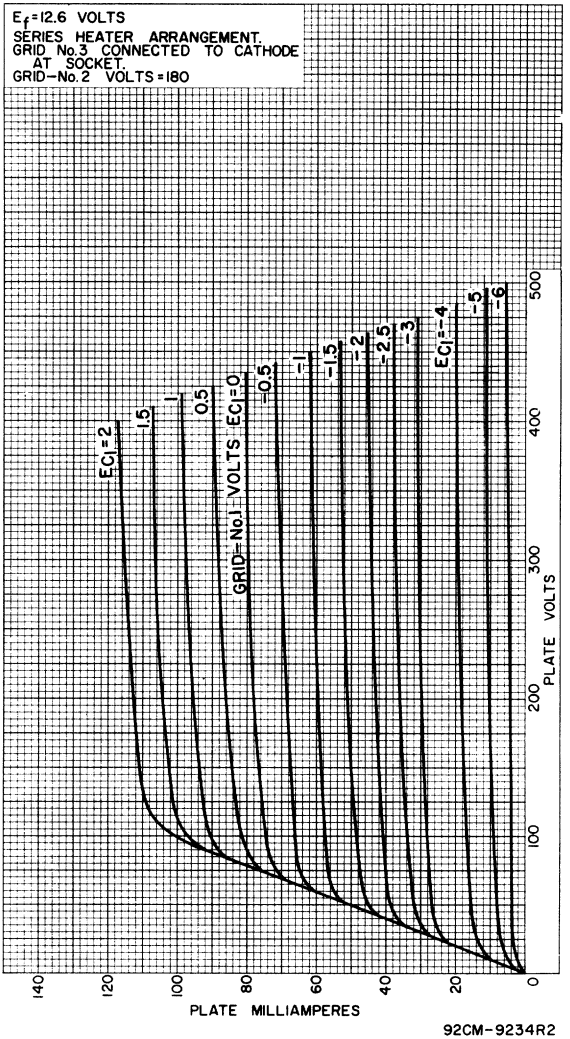
Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.25	max.	megohm
For cathode-bias operation	1	max.	megohm

[a] Without external shield.
[b] The dc component must not exceed 100 volts.

→ Indicates a change.

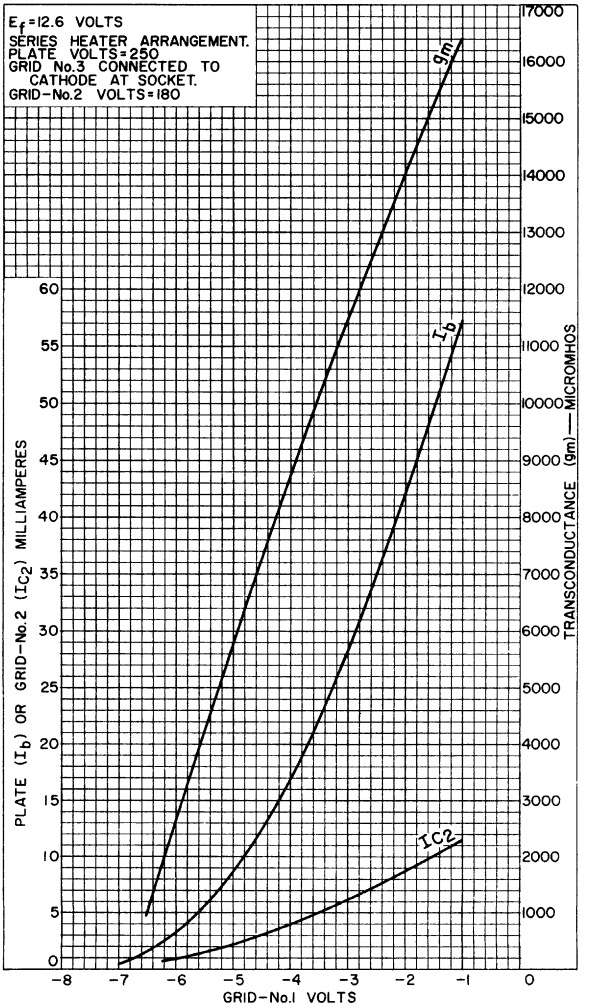
AVERAGE PLATE CHARACTERISTICS



92CM-9234R2

12BY7-A

AVERAGE CHARACTERISTICS



92CM-11051

Semiremote-Cutoff Pentode

7-PIN MINIATURE TYPE

The 12BZ6 is the same as the 6BZ6 except for the following items:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	12.6 ± 10%	volts
Current.	0.15	amp

12CA5

12CA5

BEAM POWER TUBE

MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	12.6	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

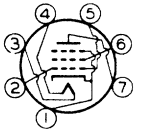
For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

Direct Interelectrode Capacitances (Approx.):[o]		
Grid No.1 to plate	0.5	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	15	μμf
Plate to cathode & grid No.3, grid No.2, and heater	9	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CV

Pin 1 - Cathode, Grid No.3
Pin 2 - Grid No.1
Pin 3 - Heater



Pin 4 - Heater
Pin 5 - Grid No.1
Pin 6 - Grid No.2
Pin 7 - Plate

AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	130 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	130 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive bias value	0 max.	volts
PLATE DISSIPATION	5 max.	watts
GRID-No.2 INPUT	1.4 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200▲max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	180 max.	°C

[o] Without external shield.

▲ The dc component must not exceed 100 volts.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

12CA5

12CA5

BEAM POWER TUBE

Typical Operation and Characteristics:

Plate Voltage	110	125	volts
Grid-No.2 Voltage	110	125	volts
Grid-No.1 Voltage	-4	-4.5	volts
Peak AF Grid-No.1 Voltage	4	4.5	volts
Zero-Signal Plate Current	32	37	ma
Max.-Signal Plate Current	31	36	ma
Zero-Signal Grid-No.2 Current	3.5	4	ma
Max.-Signal Grid-No.2 Current	7.5	11	ma
Plate Resistance (Approx.)	16000	15000	ohms
Transconductance	8100	9200	μmhos
Load Resistance	3500	4500	ohms
Total Harmonic Distortion	5	6	%
Max.-Signal Power Output	1.1	1.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:

For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

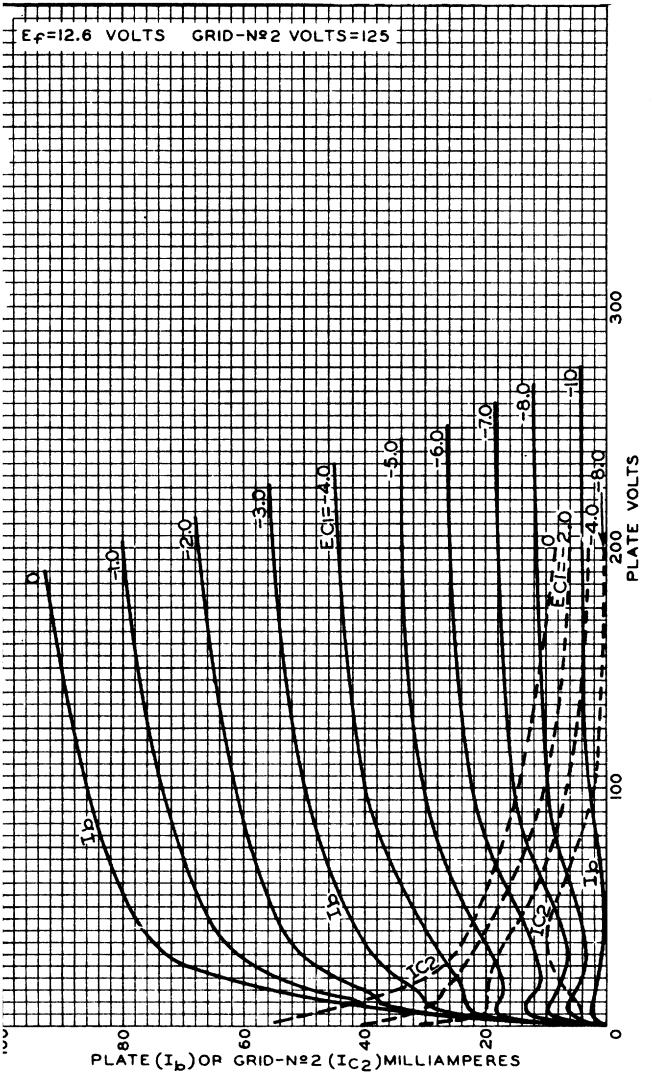
MAR. 1, 1955 TENTATIVE DATA

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

12CA5

AVERAGE PLATE CHARACTERISTICS



JAN. 24, 1955

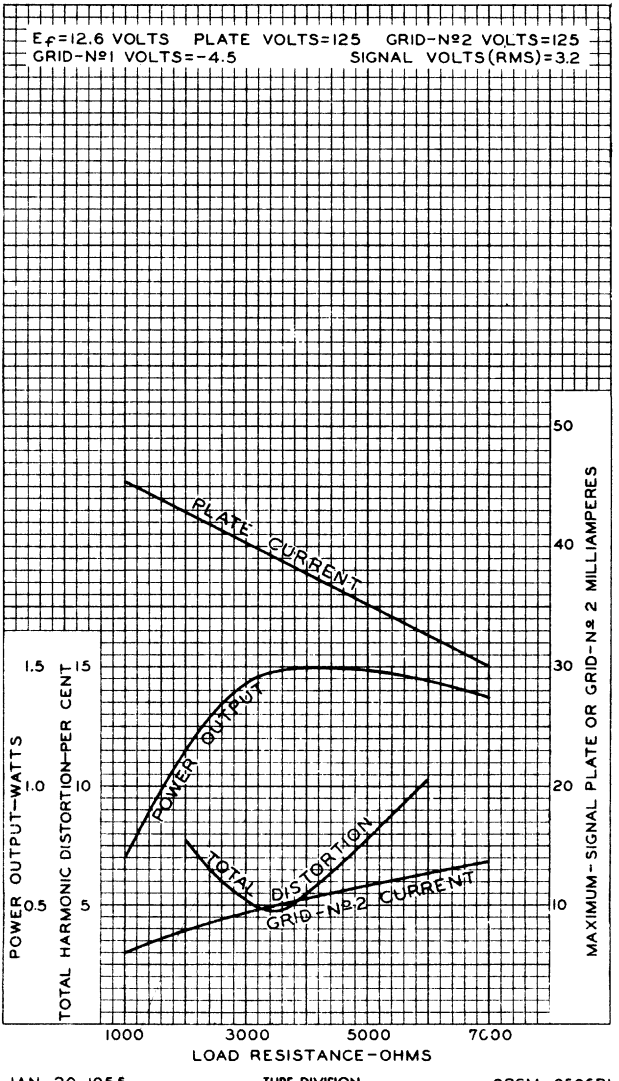
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8507

12CA5

12CA5

OPERATION CHARACTERISTICS



12CK3

Half-Wave Vacuum Rectifier

NOVAR TYPE

For Black-and White TV Damper Service

The 12CK3 is the same as the 6CK3 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage	12.6	V
Warm-up time (Average)	11	s

12CL3

Half-Wave Vacuum Rectifier

NOVAR TYPE

For Color TV Damper Service

The 12CL3 is the same as the 6CL3 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage	12.6	V
Warm-up time (Average)	11	s

12CR6

DIODE–REMOTE-CUTOFF PENTODE

7-PIN MINIATURE TYPE

GENERAL DATA

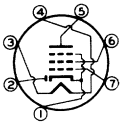
Electrical:

Heater, for Unipotential Cathode:		
Voltage	12.6	ac or dc volts
Current	0.15	amp

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Dimensional Outline	*See General Section*
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No. E7-1)
Basing Designation for BOTTOM VIEW	7EA

Pin 1 – Cathode, Pentode Grid No.3
Pin 2 – Diode Plate
Pin 3 – Heater
Pin 4 – Heater



Pin 5 – Pentode Plate
Pin 6 – Pentode Grid No.2
Pin 7 – Pentode Grid No.1

PENTODE UNIT – Class A_1 Amplifier

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	300 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	300 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive bias value	0 max.	volts
PLATE DISSIPATION	2.5 max.	watts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 150 volts	0.3 max.	watt
For grid-No.2 voltages between 150 and 300 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Characteristics:

Plate Voltage	250	volts
Grid-No.2 Voltage	100	volts
Grid-No.1 Voltage	−2	volts
Plate Resistance (Approx.)	0.8	megohm
Transconductance	2200	μmhos

12CR6

DIODE–REMOTE-CUTOFF PENTODE

Plate Current	9.6	ma
Grid-No.2 Current	2.6	ma
Grid-No.1 Voltage (Approx.) for transconductance of 10 μmhos	-32	volts

Maximum Circuit Values:

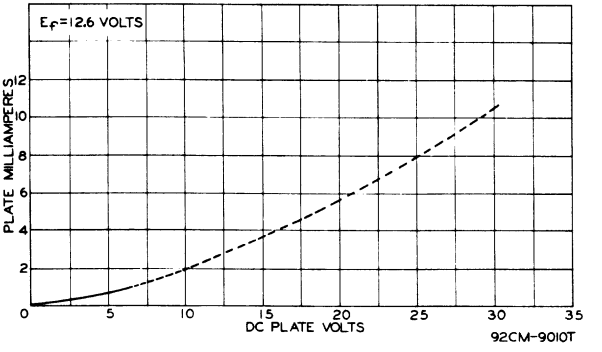
Grid-No.1-Circuit Resistance:		
For cathode-bias operation	1.0 max.	megohm
For fixed-bias operation	0.25 max.	megohm

DIODE UNIT

Maximum Ratings, *Design-Center Values:*

PLATE CURRENT	1.0 max.	ma

AVERAGE PLATE CHARACTERISTIC
DIODE UNIT

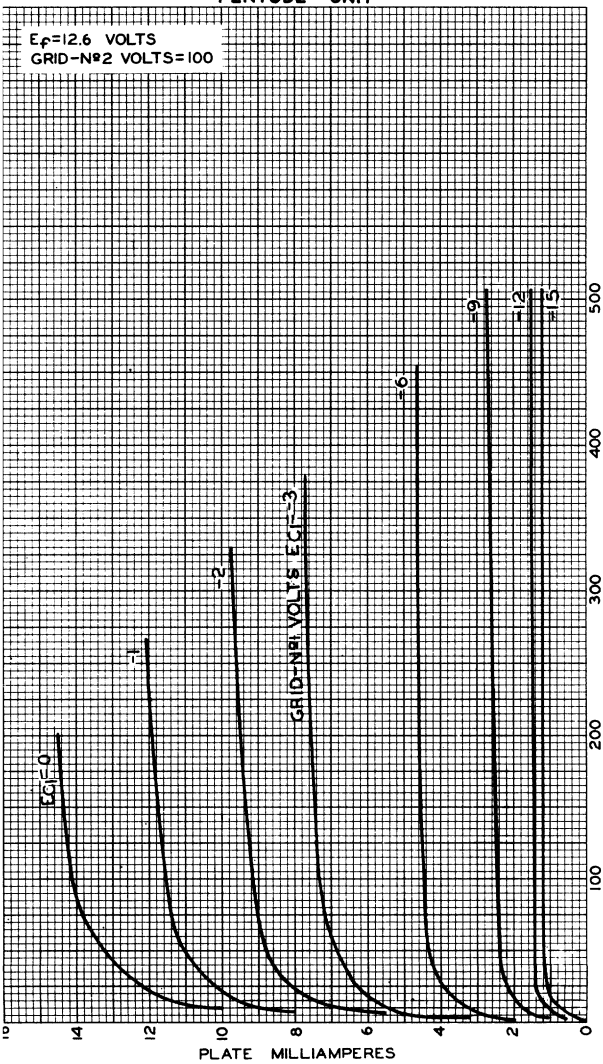


TENTATIVE DATA

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

12CR6

AVERAGE PLATE CHARACTERISTICS
PENTODE UNIT



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

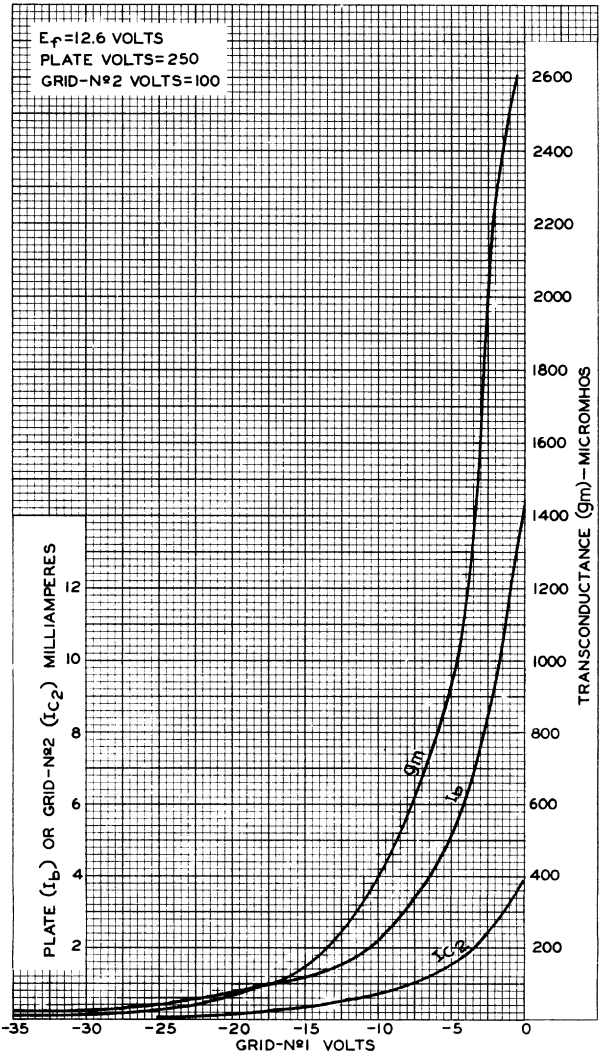
92CM-9006

12CR6

12CR6

AVERAGE CHARACTERISTICS

PENTODE UNIT



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9004

12CU5/12C5

Beam Power Tube

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 12CU5/12C5 is the same as the 6CU5 except for the following items:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	12.6 ± 6%	volts
Current	0.6	amp
Warm-up time (Average)	11	sec

12D4

HALF-WAVE VACUUM RECTIFIER

Intended for TV damper service in equipment having series heater-string arrangement

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	12.6	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

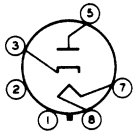
Direct Interelectrode Capacitances (Approx.):○

Plate to cathode and heater	6	μμf
Cathode to plate and heater	8	μμf
Heater to cathode	3	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-9/32"
Dimensional Outline	*See General Section*
Bulb	T9
Base	Intermediate-Shell Octal 5-Pin, Arrangement 2 (JEDEC Group 1, No.B5-82), Intermediate-Shell Octal 6-Pin, Arrangement 1 (JEDEC Group 1, No.B6-8), Short Intermediate-Shell Octal 5-Pin with External Barriers, Arrangement 2 (JEDEC Group 1, No.B5-85), or Short Intermediate-Shell Octal 6-Pin with External Barriers, Arrangement 1 (JEDEC Group 1, No.B6-60)
Basing Designation for BOTTOM VIEW	4CG

Pin 1♦ - Same as Pin 2
Pin 2 - Internal Connection-Do Not Use●



Pin 3 - Cathode
Pin 5 - Plate
Pin 7 - Heater
Pin 8 - Heater

DAMPER SERVICE

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system□

PEAK INVERSE PLATE VOLTAGE*	4400 max.	volts
PEAK PLATE CURRENT	900 max.	ma
DC PLATE CURRENT	155 max.	ma

○,♦,●,□,*: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

12D4

12D4

HALF-WAVE VACUUM RECTIFIER

PLATE DISSIPATION.	5.5 max.	watts
PEAK HEATER–CATHODE VOLTAGE:		
Heater negative with respect to cathode.	4400▲ max.	volts
Heater positive with respect to cathode.	300# max.	volts

○ Without external shield.

◆ On the 5-pin bases, pin 1 as well as pins 4 and 6 is omitted.

● Socket terminals 1,2,4 and 6 should not be used as tie points.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

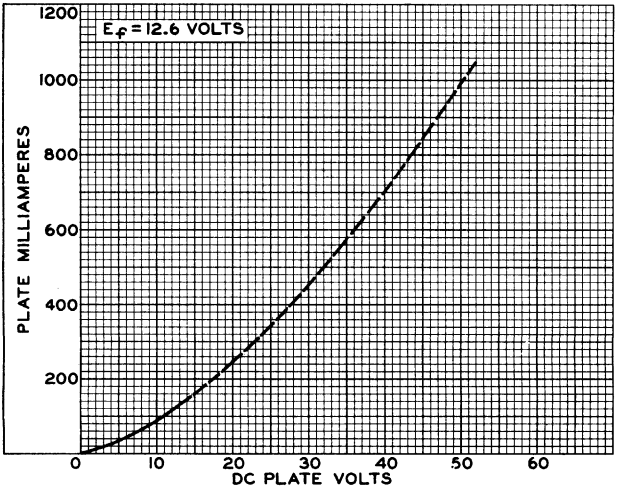
* This rating is applicable when the duty cycle of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

▲ The dc component must not exceed 900 volts.

The dc component must not exceed 100 volts.

4-59 TENTATIVE DATA

AVERAGE PLATE CHARACTERISTIC



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CS-9757

12DB5

Beam Power Tube

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 12DB5 is the same as the 6DB5 except for the following items:

Heater, for Unipotential Cathode:

Voltage (AC or DC)	12.6	volts
Current	0.6 ± 6%	amp
Warm-up time (Average)	11	sec

12DM4

Half-Wave Vacuum Rectifier

For Damper Service in TV Equipment Having Series Heater-String Arrangement

The 12DM4 is the same as the 6DM4 except for the following items:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	12.6	volts
Current	0.6 ± 6%	amp
Warm-up time (Average)	11	sec

12DQ6A

Beam Power Tube

For Equipment Having Series Heater-String Arrangement

The 12DQ6A is the same as the 6DQ6A except for the following items:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	12.6	volts
Current	0.6 ± 6%	amp
Warm-up time (Average)	11	sec

12DQ6B

Beam Power Tube

For Equipment Having Series Heater-String Arrangement

The 12DQ6B is the same as the 6DQ6B except for the following items:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	12.6	volts
Current	0.6 ± 6%	amp
Warm-up time (Average)	11	sec

12DT5
BEAM POWER TUBE

9-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

The 12DT5 is the same as the 6DT5 except for the following items:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	12.6	volts
Current	0.6 ± 6%	amp
Warm-up time (Average)	11	sec

12DT8
HIGH-MU TWIN TRIODE

9-PIN MINIATURE TYPE

The 12DT8 is the same as the 6DT8 except for the following items:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	12.6	volts
Current	0.15	amp

12DZ6

REMOTE-CUTOFF PENTODE

7-PIN MINIATURE TYPE

For use in automobile radio receivers operating directly from 6-cell storage-battery systems

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage range (DC)	10 to 15.9	volts
For longest life, it is recommended that the heater be operated within the voltage range of 11 to 14 volts.		
Current (Approx.) at 12.6 volts	0.19	amp
Direct Interelectrode Capacitances:[o]		
Grid No.1 to plate	0.05 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	9.5	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	4	μμf

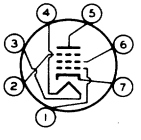
Characteristics, Class A_1 Amplifier:

Heater Voltage	12.6	volts
Plate Voltage	12.6	volts
Grid No.3 and Internal Shield	*Connected to cathode at socket*	
Grid-No.2 Voltage	12.6	volts
Grid-No.1 Supply Voltage	0	volts
Grid-No.1 Resistor (Bypassed)	10	megohms
Grid-No.3 Resistor (Bypassed)	10	megohms
Plate Resistance (Approx.)	25000	ohms
Transconductance	3800	μmhos
Plate Current	4.5	ma
Grid-No.2 Current	2.2	ma
Grids No.1 and No.3 Supply Voltage (Approx.) for transconductance, grid No.1 to plate (μmhos) = 10	-10	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BK

Pin 1 - Grid No.1
Pin 2 - Grid No.3, Internal Shield
Pin 3 - Heater



Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Cathode

[o] Without external shield.

12DZ6

REMOTE-CUTOFF PENTODE

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

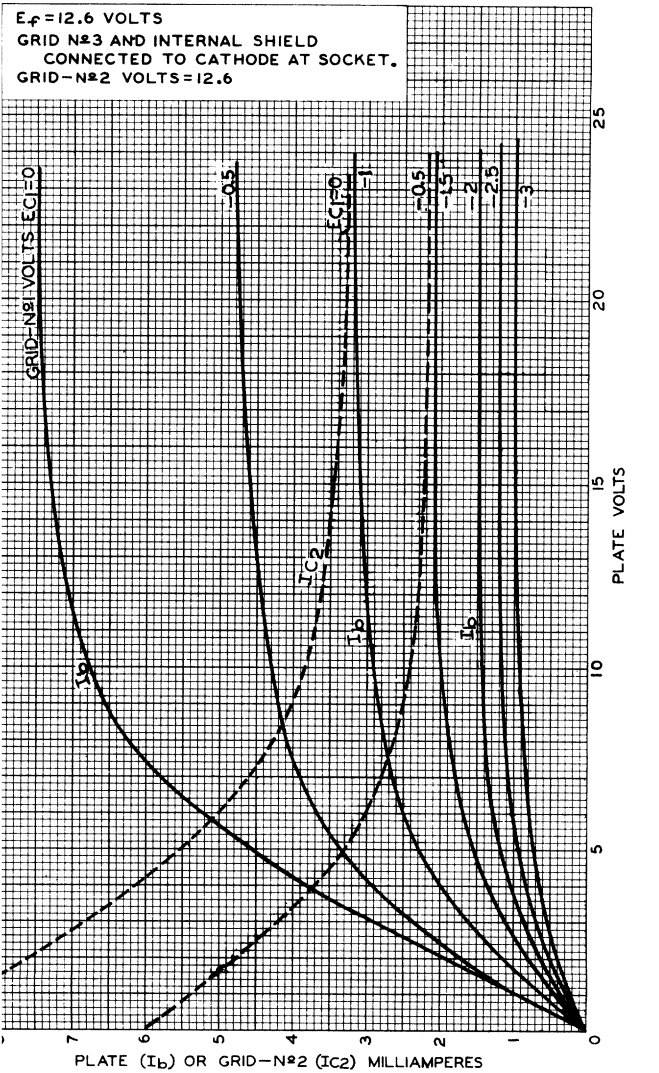
PLATE VOLTAGE	16 max.	volts
GRID No.3 (SUPPRESSOR GRID)	*Connect to cathode at socket*	
GRID-No.2 (SCREEN-GRID) VOLTAGE	16 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	16 max.	volts
Heater positive with respect to cathode	16 max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	10 max.	megohms
Grid-No.3-Circuit Resistance	10 max.	megohms

12DZ6

AVERAGE CHARACTERISTICS



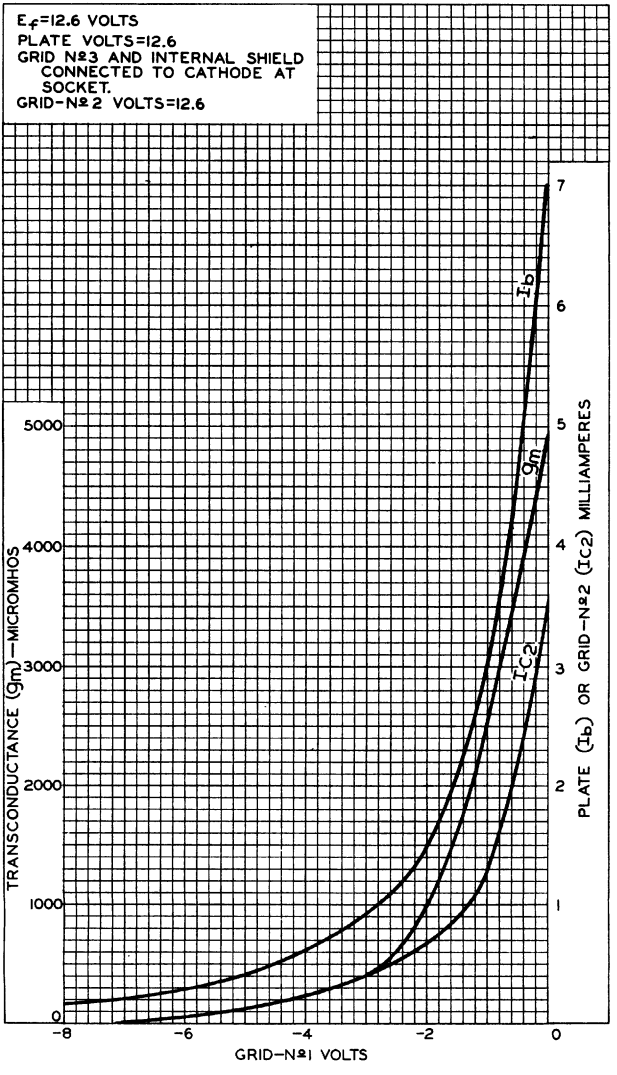
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-10399

12DZ6

RCA

12DZ6

AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM—10404

12FQ8

High-Mu Twin Double-Plate Triode

9-PIN MINIATURE TYPE

For Frequency-Divider and Complex-Wave-Generator Circuits of Electronic Musical Instruments

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	12.6 ± 10%	volts
Current at 12.6 volts	0.15	amp
Direct Interelectrode Capacitances (Approx.):▲		
Grid to either plate (Each unit)	0.9	μμf
Grid to cathode and heater (Each Unit)	1.8	μμf
Plate A of unit No.1 to cathode and heater	0.34	μμf
Plate B of unit No.1 to cathode and heater	0.24	μμf
Plate A of unit No.2 to cathode and heater	0.3	μμf
Plate B of unit No.2 to cathode and heater	0.18	μμf
Plate A to plate B (Each unit)	0.7	μμf
Plate A of unit No.1 to plate A of unit No.2	0.4	μμf

Characteristics, Class A_1 Amplifier (Each Unit):

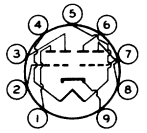
Using either plate A or plate B, with plate not in use connected to ground

Plate Voltage	250	volts
Grid Voltage	-1.5	volts
Amplification Factor	95	
Plate Resistance (Approx.)	76000	ohms
Transconductance	1250	μmhos
Plate Current	1.5	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9KT

Pin 1 - Plate B of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Plate A of Unit No.2
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Plate B of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Plate A of Unit No.1
Pin 9 - Cathode



12FQ8

FREQUENCY-DIVIDER & COMPLEX-WAVE-GENERATOR SERVICE

Values are for Each Unit

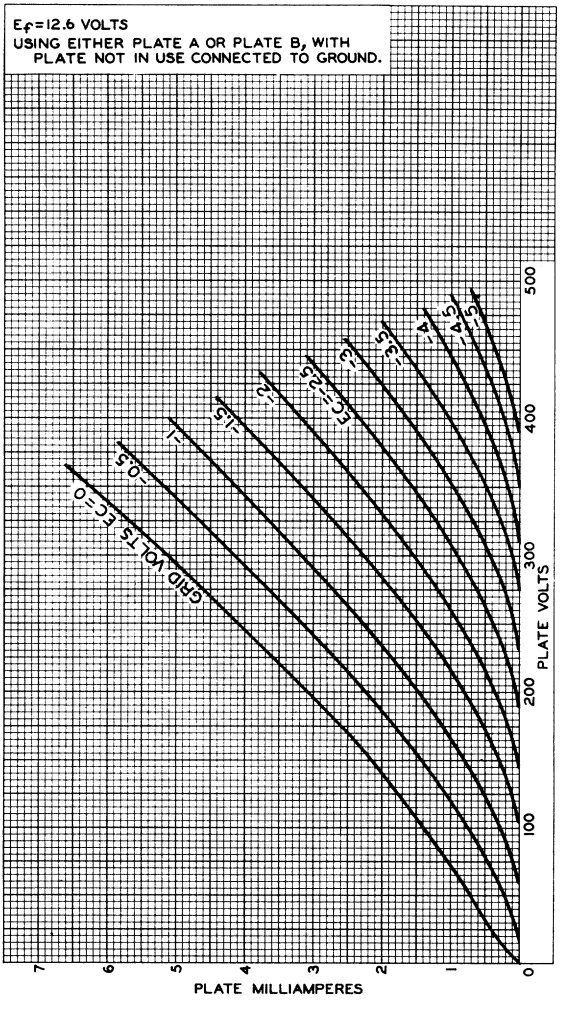
Maximum Ratings, *Design-Maximum Values:*

PLATE A VOLTAGE	330	max.	volts
PLATE B VOLTAGE	330	max.	volts
GRID VOLTAGE:			
Positive-bias value	0	max.	volts
PLATE A DISSIPATION	0.5	max.	watt
PLATE B DISSIPATION	0.5	max.	watt
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200●	max.	volts

▲ Without external shield.

● The dc component must not exceed 100 volts.

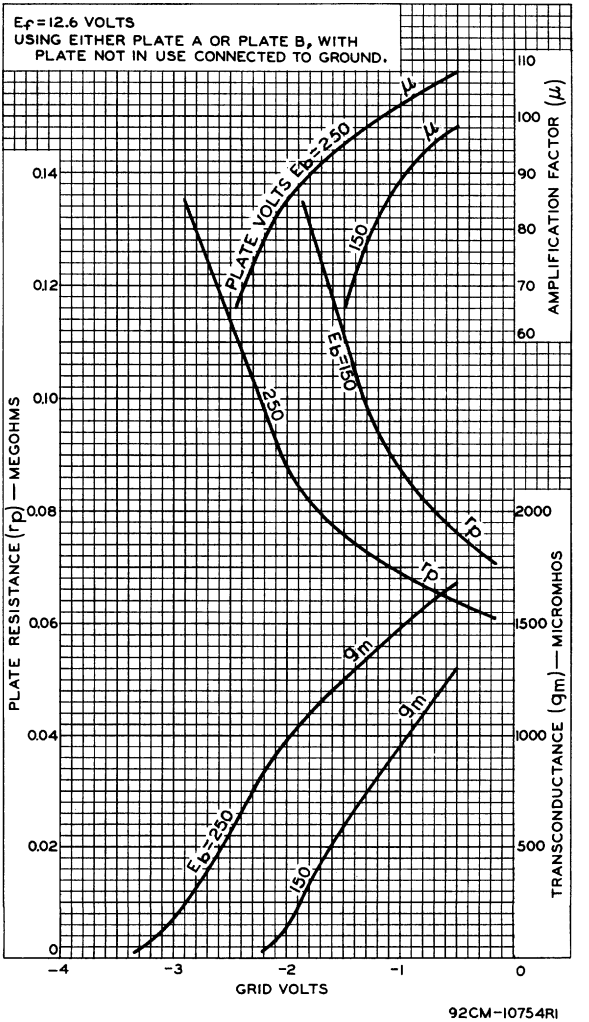
AVERAGE PLATE CHARACTERISTICS
Each Unit



92CM-10755RI

12FQ8

AVERAGE CHARACTERISTICS
Each Unit



92CM-10754RI

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

Power Pentode

7-PIN MINIATURE TYPE

The 12FX5 is the same as the 6oFX5 except for the following items:

Heater Characteristics and Ratings:				
Voltage (AC or DC). . . .	12.6[a]		12.6 ± 1.3	volts
Current	0.450 ± 0.030		0.450[b]	amp
Warm-up time (Average). .	11		-	sec

[a] At heater amperes = 0.450.
[b] At heater volts = 12.6.

Medium-Mu Triode—Pentagrid Converter

9-PIN MINIATURE TYPE

For Automobile Radio Receivers Operating Directly from 6-Cell Storage Batteries

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Center Values):*		
Voltage (DC)[a]	12.6 $^{+3.3}_{-2.6}$	volts
Current at heater volts = 12.6	0.270	amp
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	16 max.	volts
Heater positive with respect to cathode	16 max.	volts
Direct Interelectrode Capacitances:[b]		
Triode Unit:		
Grid to plate	1.3	pf
Grid to cathode & heater	2.2	pf
Plate to cathode & heater	0.25	pf
Heptode Unit:		
Grid No.3 to plate	0.28 max.	pf
Grid No.3 to grid No.1	0.12 max.	pf
Grid No.3 to cathode & grid No.5 & internal shield, plate, grids No.2 & No.4, grid No.1, and heater (RF input)	6.0	pf
Plate to cathode & grid No.5 & internal shield, grids No.2 & No.4, grid No.1, and heater (Mixer output)	5.0	pf
Grid No.1 to cathode & grid No.5 & internal shield, grid No.3, grids No.2 & No.4, and heater (Oscillator input)	5.0	pf
Grid No.1 to cathode & grid No.5 & internal shield	3.0	pf
Cathode & grid No.5 & internal shield to plate, grids No.2 & No.4, grid No.3, and heater (Oscillator output)	17.0	pf
Grid No.1 to plate	0.16 max.	pf
Triode grid to heptode grid No.3	0.01 max.	pf
Triode plate to heptode grid No.3	0.18 max.	pf
Triode plate to heptode plate	0.2 max.	pf

Characteristics, Class A$_1$ Amplifier (Triode Unit):

With heater voltage of 12.6 volts

Plate Voltage	12.6	volts
Grid Voltage developed across a 2.2-megohm grid resistor	-0.8	volt

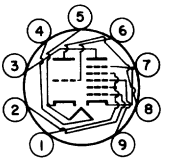
12FX8A

Amplification Factor	10	
Plate Resistance (Approx.)	7150	ohms
Transconductance	1400	μmhos
Plate Current	1.3	ma
Grid Voltage (Approx.) for plate μa = 10.	-3.2	volts

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2.440"
Maximum Seated Length	2.190"
Length, Base Seat to Bulb Top (Excluding tip)	1.720" to 1.910"
Diameter	0.750" to 0.875"
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9KV

Pin 1 - Heptode Grid No.2, Grid No.4
Pin 2 - Heptode Grid No.1
Pin 3 - Heptode Plate
Pin 4 - Heater
Pin 5 - Heater, Triode Cathode



Pin 6 - Triode Grid
Pin 7 - Heptode Grid No.5, Cathode, Internal Shield
Pin 8 - Triode Plate
Pin 9 - Heptode Grid No.3

HEPTODE UNIT — CONVERTER

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	16 max.	volts
GRID-No.3 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	16 max.	volts
Positive-bias value	0 max.	volts
GRIDS-No.2 & No.4 (SCREEN-GRID) VOLTAGE	16 max.	volts

Typical Operation and Characteristics:

With self-excitation and heater voltage of 12.6 volts

Plate Voltage	12.6	volts
Grid-No.3 Voltage developed across a 2.2-megohm grid-No.3 resistor	-0.5	volt
Grids-No.2 & No.4 Voltage	12.6	volts
RMS Grid-No.1 (Oscillator-Grid) Voltage	1.6	volts
Grid-No.1 Resistor	33000	ohms
Plate Resistance (Approx.)	0.5	megohm
Conversion Transconductance	300	μmhos
Grid-No.3 Voltage (Approx.) for conversion transconductance (μmhos) =		
10	-3	volts
1	-8	volts
Plate Current	290	μa
Grids-No.2 & No.4 Current	1.25	ma

Oscillator Characteristics (Not Oscillating):

With grids No.2 & No.4 connected to plate and with heater voltage of 12.6 volts

Plate and Grids-No.2 & No.4 Voltage	12.6	volts
Grid-No.3 Voltage	0	volts
Grid-No.1 Voltage	0	volts
Amplification Factor between grid No.1 and grids No.2 & No.4 connected to plate	9	
Transconductance between grid No.1 and grids No.2 & No.4 connected to plate	3600	μmhos
Cathode Current	4.4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-4.5	volts

Maximum Circuit Values:

Grid-No.3-Circuit Resistance	10 max.	megohms

TRIODE UNIT — AMPLIFIER — Class A[1]

Maximum Ratings, *Design-Center Values:*

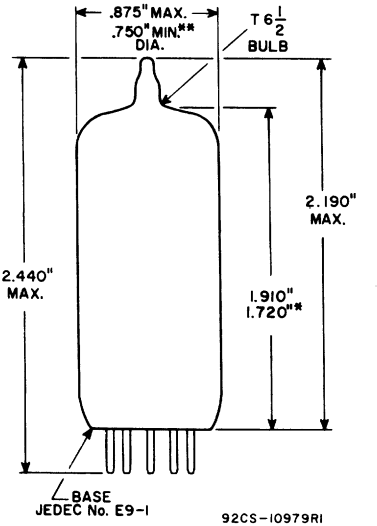
PLATE VOLTAGE	16 max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	10 max.	megohms

[a] For longest life, it is recommended that the heater be operated within the range of 11.0 to 14.0 volts.

[b] Without external shield.



* MEASURED FROM BASE SEAT TO BULB-TOP LINE AS DETERMINED BY A RING GAUGE OF 0.438" INSIDE DIAMETER.

** APPLIES IN ZONE STARTING 0.375" FROM BASE SEAT.

12GC6

Beam Power Tube

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)	12.6		volts
Current	0.6 ± 6%		amp
Warm-up time (Average)	11		sec
Direct Interelectrode Capacitances:[a]			
Grid No.1 to plate	0.55		μμf
Grid No.1 to cathode, grid No.3, grid No.2, and heater	15		μμf
Plate to cathode, grid No.3, grid No.2, and heater	7		μμf

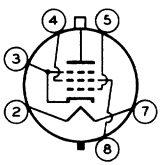
Characteristics, Class A_1 Amplifier:

Plate Voltage	60	250	volts
Grid-No.2 Voltage	150	150	volts
Grid-No.1 Voltage	0	-22.5	volts
Triode Amplification Factor for plate volts = grid-No.2 volts = 150	-	4.1	
Plate Resistance (Approx.)	-	20000	ohms
Transconductance	-	6600	μmhos
Plate Current	345[b]	75	ma
Grid-No.2 Current	30[b]	2.4	ma
Grid-No.1 Voltage (Approx.) for plate ma. = 1	-	-46	volts
Grid-No.1 Voltage (Approx.) for peak positive-pulse plate volts = 5000, grid-No.2 volts = 150, and plate ma. = 1	-	-100	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	4-1/4"
Seated Length	3-1/2" ± 3/16"
Maximum Diameter	1-9/16"
Bulb	T12
Cap	Skirted Miniature (JEDEC No.C1-3)
Base	Short Medium-Shell Octal 6-Pin with External Barriers, Arrangement 2, Style B, (JEDEC Group 1, No.B6-122)
Basing Designation for BOTTOM VIEW	8JX

Pin 2 - Heater
Pin 3 - Cathode, Grid No.3
Pin 4 - Grid No.2



Pin 5 - Grid No.1
Pin 7 - Heater
Pin 8 - Grid No.2
Cap - Plate

HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[c]

DC PLATE VOLTAGE	770	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE[d]	6500	max.	volts
PEAK NEGATIVE-PULSE PLATE VOLTAGE	1500	max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	220	max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 VOLTAGE	330	max.	volts
CATHODE CURRENT:			
Peak	550	max.	ma
Average	175	max.	ma
GRID-No.2 INPUT	4.5	max.	watts
PLATE DISSIPATION[e]	17.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[f]	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	220	max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1	max.	megohm

[a] Without external shield.

[b] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

[c] As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

[d] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[e] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

[f] The dc component must not exceed 100 volts.

12GE5

Beam Power Tube

DUODECAR TYPE

The 12GE5 is the same as the 6GE5 except for the following items:

Heater Characteristics and Ratings:		
Current.	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	12.6	volts
Warm-up time (Average)	11	sec

12GJ5

Beam Power Tube

NOVAR TYPE

The 12GJ5 is the same as the 6GJ5 except for the following items:

Heater Characteristics and Ratings:		
Current.	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	12.6	volts
Warm-up time (Average)	11	sec

12GT5

Beam Power Tube

NOVAR TYPE

The 12GT5 is the same as the 6GT5 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	12.6	volts
Warm-up time (Average)	11	sec

12GT5A

Beam Power Tube

NOVAR TYPE

The 12GT5A is the same as the 6GT5A except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	12.6	volts
Warm-up time (Average)	11	sec

12GW6

Beam Power Tube

The 12GW6 is the same as the 6GW6 except for the following items:

Heater Characteristics and Ratings:		
Current	0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes = 0.600	12.6	volts
Warm-up time (Average)	11	sec

12H6

Twin Diode

The 12H6 is the same as the 6H6 except for the following items:

Heater Characteristics and Ratings:

Voltage (AC or DC)	12.6	volts
Current	0.150	amp

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Electronic Components and Devices Harrison, N. J.

12HG7

Sharp-Cutoff Pentode

FRAME-GRID CONSTRUCTION **T9 ENVELOPE**

9-PIN LARGE-BUTTON NEONOVAL BASE

For Video Output Amplifier Service in Color TV Receivers

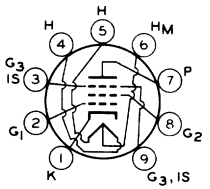
Electrical:

	Series	Parallel	
Heater Characteristics and Ratings:			
Heater-section arrangement			
Voltage (AC or DC)	12.6 ± 1.3[a]	6.3 ± 0.6	volts
Current	0.260	0.520[b]	amp
Maximum heater-cathode voltage:			
Heater negative with respect to cathode		200	volts
Heater positive with respect to cathode:			
Peak		200	volts
DC component		100	volts
Direct Interelectrode Capacitances:[c]			
Grid No.1 to plate		0.15 max.	pf
Input: G1 to (K,G3 + IS,G2,H)		14.0	pf
Output: P to (K,G3 + IS,G2,H)		4.4	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2.930"
Maximum Seated Length	2.620"
Length, Base Seat to Bulb Top (Excluding tip)	2.070" to 2.310"
Diameter	1.062" to 1.188"
Dimensional Outline	(JEDEC No.9-70)
Bulb	T9
Base	Large-Button Neonoval 9-Pin (JEDEC No.E9-68)
Basing Designation for BOTTOM VIEW	9BF

Pin 1 - Cathode
Pin 2 - Grid No.1
Pin 3 - Grid No.3, Internal Shield
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Heater Tap
Pin 7 - Plate
Pin 8 - Grid No.2
Pin 9 - Grid No.3, Internal Shield



Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	300	volts
Grid No.3	Connected to cathode at socket	
Grid-No.2 Supply Voltage	135	volts
Grid No.1	Connected to negative end of cathode resistor	
Cathode Resistor	47	ohms
Plate Resistance (Approx.)	60000	ohms
Transconductance	32000	μmhos
Plate Current	31	ma

Grid-No.2 Current	4.8	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	-4.5	volts

CLASS A_1 AMPLIFIER

Maximum Ratings, *Design-Maximum Values:*

Plate Voltage	400	volts
Grid-No.2 (Screen-Grid) Supply Voltage	330	volts
Grid-No.2 Voltage	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Grid-No.1 (Control-Grid) Voltage: Positive-bias value	0	volts
Grid-No.2 Input: For grid-No.2 voltages up to 165 volts	1	watt
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
Plate Dissipation	10	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: For fixed-bias operation	0.1	megohm
For cathode-bias operation	0.25	megohm

[a] At heater amperes = 0.260.
[b] At heater volts = 6.3.
[c] Without external shield.

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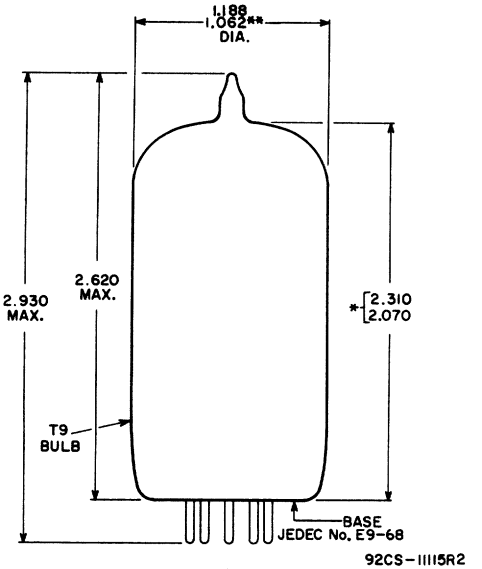
DIMENSIONAL OUTLINE

JEDEC No. 9-70

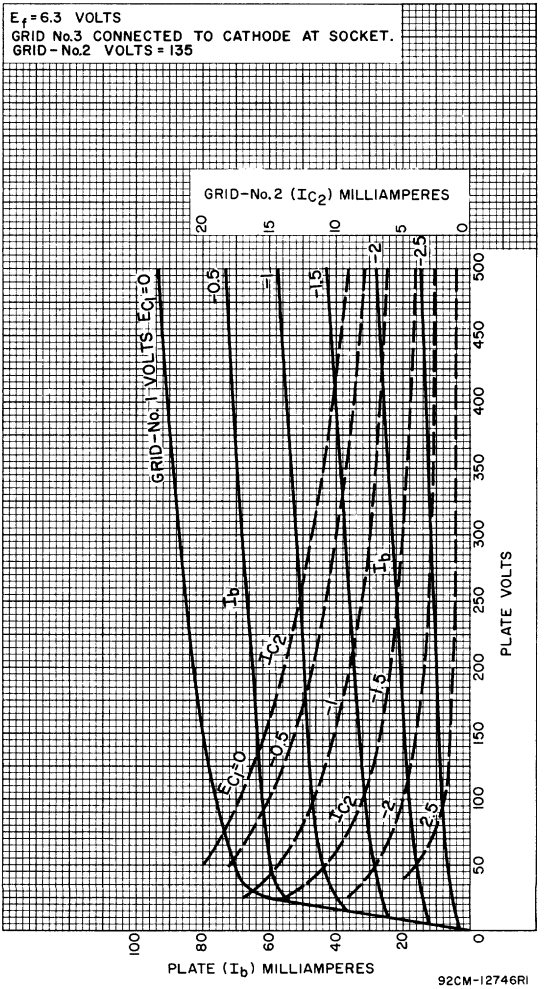


DIMENSIONS IN INCHES

** Applies in zone starting 0.375" from base seat.

* Measured from base seat to bulb-top line as determined by a ring gauge of 0.600" inside diameter.

AVERAGE CHARACTERISTICS



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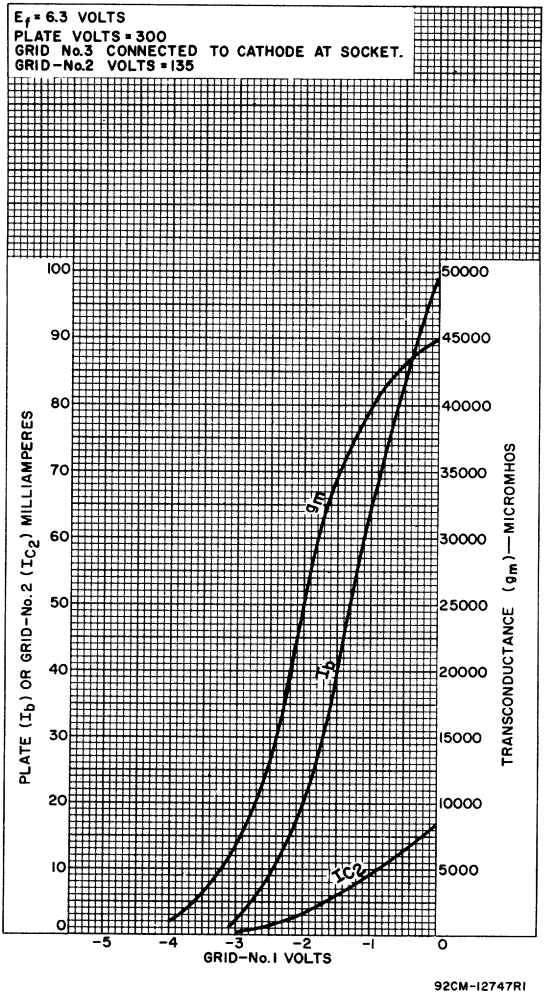
AVERAGE CHARACTERISTICS



12JB6A

Beam Power Tube

NOVAR TYPE

The 12JB6A is the same as the 6JB6A except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	12.6	V
Warm-up time (Average)	11	s

12JQ6

Beam Power Tube
with an Integral Diode

The 12JQ6 is the same as the 6JQ6 except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	12.6	V
Warm-up time (Average)	11	s

12JT6A

Beam Power Tube

NOVAR TYPE

The 12JT6A is the same as the 6JT6A except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	12.6	V
Warm-up time (Average)	11	s

12MN8

High-Mu Triple Triode

DUODECAR TYPE

The 12MN8 is the same as the 6MN8 except for:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	12.6	V
Warm-up time (Average)	11	s

12L8-GT

TWIN-PENTODE POWER AMPLIFIER

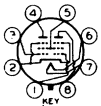
Heater	Coated Unipotential Cathode		
Voltage	12.6		a-c or d-c volts
Current	0.15		amp.

Direct Interelectrode Capacitances (Approx.):°

	Pentode Unit P_1		*Pentode Unit P_2*	
Grid to Plate	0.7		0.7	μμf
Input	5.0		5.0	μμf
Output	6.0		6.0	μμf
Grid to Grid		0.08		μμf
Plate to Plate		1.5		μμf
Grid P_1 to Plate P_2		0.2		μμf
Grid P_2 to Plate P_1		0.1		μμf

Maximum Overall Length	3-5/16"
Maximum Seated Height	2-3/4"
Maximum Diameter	1-5/16"
Bulb	T-9
Base	Intermediate Shell Octal 8-Pin

Pin 1 - Grid P_1
Pin 2 - {Cathode, Suppressor P_1 & P_2}
Pin 3 - Grid P_2



BOTTOM VIEW (8BU)

Pin 4 - Plate P_2
Pin 5 - Screen P_1 & P_2
Pin 6 - Heater
Pin 7 - Heater
Pin 8 - Plate P_1

Mounting Position — Any

For convenience, one pentode unit is identified as P_1; the other as P_2.

Maximum Ratings Are Design-Center Values

AMPLIFIER - Each Unit

Plate Voltage	180 max.	volts
Screen Voltage	180 max.	volts
Plate Dissipation	2.5 max.	watts
Screen Dissipation	1.0 max.	watt
D-C Heater-Cathode Potential	100 max.	volts

Typical Operation and Characteristics - Class A_1 Amplifier:

Plate Voltage	180	volts
Screen Voltage	180	volts
Grid Voltage (Grid No.1)	-9	volts
Peak A-F Grid Voltage	9	volts
Zero-Sig. Plate Cur.	13	ma.
Max.-Sig. Plate Cur.	13.5	ma.
Zero-Sig. Screen Cur.	2.8	ma.
Max.-Sig. Screen Cur.	4.6	ma.
Plate Resistance	0.16	megohm
Transconductance	2150	μmhos
Load Resistance	10000	ohms
Power Output (Total harmonic dist. 10%)	1.0	watt

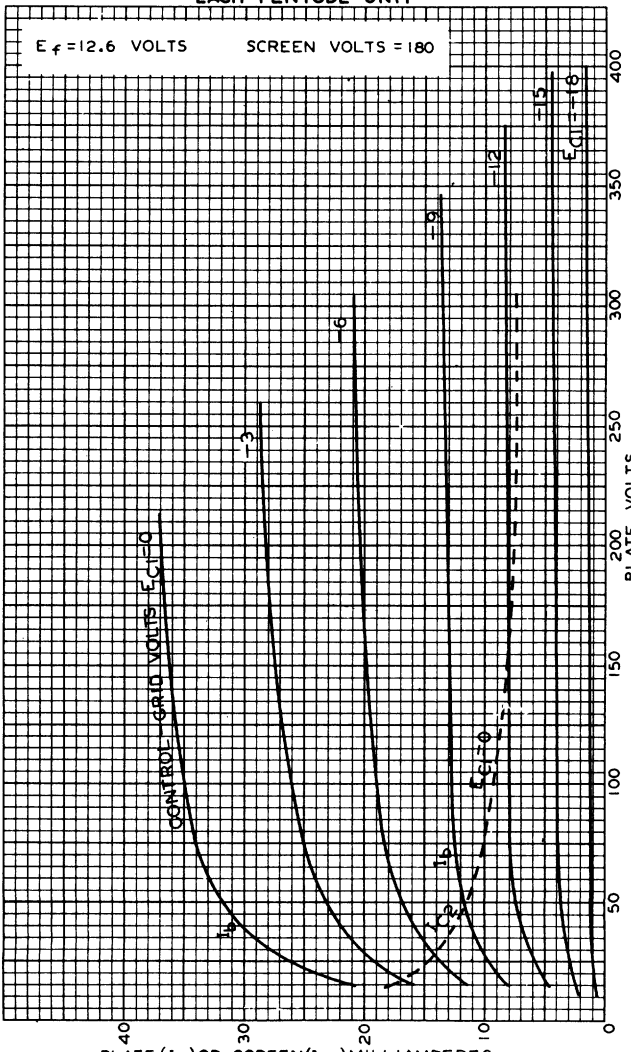
° With no external shield.

12L8-GT

12L8-GT

AVERAGE PLATE CHARACTERISTICS

EACH PENTODE UNIT



OCT. 1, 1943

RCA VICTOR DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92C-6391

12SA7

Pentagrid Converter

The 12SA7 is the same as the 6SA7 except for the following items:

Heater Characteristics and Ratings:

Voltage (AC or DC)	12.6	volts
Current	0.150	amp

12SJ7

Sharp-Cutoff Pentode

The 12SJ7 is the same as the 6SJ7 except for the following items:

Heater Characteristics and Ratings:

Voltage (AC or DC)	12.6	volts
Current	0.150	amp

12SL7GT

High-Mu Twin Triode

The 12SL7GT is the same as the 6SL7GT except for the following items:

Heater Characteristics and Ratings:

Voltage (AC or DC)	12.6	volts
Current	0.150	amp

12SN7GTA

Medium-Mu Twin Triode

The 12SN7GTA is the same as the 6SN7GTA except for the following items:

Heater Characteristics and Ratings:

Voltage (AC or DC)	12.6	volts
Current	0.300	amp

12SQ7

Twin Diode-Medium-Mu Triode

The 12SQ7 is the same as the 6SQ7 except for the following items:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	12.6	volts
Current	0.150	amp

12V6GT

Beam Power Tube

The 12V6GT is the same as the 6V6GT except for the following items:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	12.6	volts
Current	0.225	amp

12W6GT

Beam Power Tube

The 12W6GT is the same as the 6W6GT except for the following items:

Heater Characteristics and Ratings:		
Current	0.600	amp
Voltage (AC or DC)	12.6	volts
Warm-up time (Average)	11	sec
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode	300 max.	volts
Heater positive with respect to cathode	200[a] max.	volts

[a] The dc component must not exceed 100 volts.

12SW7

DUPLEX-DIODE TRIODE

For use with 12-cell storage-battery supply

GENERAL DATA

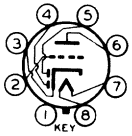
Electrical:

Heater, for Unipotential Cathode:		
Voltage	12.6	ac or dc volts
Current	0.15	amp.
Direct Interelectrode Capacitances—Triode Unit:[o]		
Grid to Plate	2.4	μμf
Grid to Cathode	3.0	μμf
Plate to Cathode	2.8	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-1/16"
Maximum Diameter	1-5/16"
Bulb	Metal Shell, MT8G
Base	Small Wafer Octal 8-Pin
Basing Designation for BOTTOM VIEW	8Q

Pin 1 – Shell
Pin 2 – Triode Grid
Pin 3 – Cathode
Pin 4 – Diode Plate No. 2



Pin 5 – Diode Plate No. 1
Pin 6 – Triode Plate
Pin 7 – Heater
Pin 8 – Heater

CLASS A_1 AMPLIFIER

Maximum Ratings, ***Design-Center Values:***

PLATE VOLTAGE	250 max. volts
PLATE DISSIPATION	2.5 max. watts
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode	90 max. volts
Heater positive with respect to cathode	90 max. volts

Characteristics:

Plate Voltage	26.5	250	volts
Grid Voltage:			
From a fixed supply of	–	-9	volts
From a grid resistor of	2	–	megohms
Amplification Factor	17	16	
Plate Resistance	15500	8500	ohms
Transconductance	1100	1900	μmhos
Plate Current	1.1	9.5	ma.

Typical Operation with Resistance Coupling:

See RESISTANCE-COUPLED AMPLIFIER CHART, Type 6R7.

[o] With shell connected to cathode. Values are approximate.

12SW7

12SW7

DUPLEX-DIODE TRIODE

DIODE UNITS – Two

The two diode plates are placed around a cathode, the sleeve of which is common to the triode unit. Each diode plate has its own base pin. Diode curves in the front of the RECEIVING TUBE SECTION apply to the 12SW7.

Additional curves applying to the 12SW7 are shown under Types 6R7, and 6SR7

12SX7-GT
TWIN-TRIODE AMPLIFIER

For use with 12-cell storage-battery supply

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	12.6	ac or dc volts
Current	0.3	amp

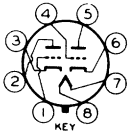
Direct Interelectrode Capacitances (Approx.):[o]

	Triode Unit No.1	*Triode Unit No.2*	
Grid to Plate	3.6	3.6	μμf
Grid to Cathode	3.0	2.8	μμf
Plate to Cathode	0.8	1.2	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-5/16"
Bulb	T-9
Base	Intermediate Shell Octal 8-Pin
Basing Designation for BOTTOM VIEW	8BD

Pin 1 – Grid of Unit No.2
Pin 2 – Plate of Unit No.2
Pin 3 – Cathode of Unit No.2
Pin 4 – Grid of Unit No.1



Pin 5 – Plate of Unit No.1
Pin 6 – Cathode of Unit No.1
Pin 7 – Heater
Pin 8 – Heater

CLASS A_1 AMPLIFIER

Values are for each unit

Maximum Ratings, ***Design-Center Values*:**

PLATE VOLTAGE	300 max.	volts
GRID VOLTAGE:		
Negative bias value	50 max.	volts
Positive bias value	0 max.	volts
CATHODE CURRENT	20 max.	ma.
PLATE DISSIPATION	2.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Typical Operation and Characteristics:

Plate Voltage	26.5	90	250	volts
Grid Voltage:				
From a fixed supply of	–	0	-8	volts
From a grid resistor of	0.05	–	–	megohm
Amplification Factor	21	20	20	
Plate Resistance	11500	6700	7700	ohms

[o] With no external shield.

12SX7-GT

12SX7-GT

TWIN-TRIODE AMPLIFIER

Transconductance	1800	3000	2600	μmhos
Plate Current.	1.8	10	9.0	ma.

Maximum Circuit Values (for maximum rated conditions):

Grid-Circuit Resistance per unit. . . . . 1.0 max. megohm

Typical Operation with Resistance Coupling:

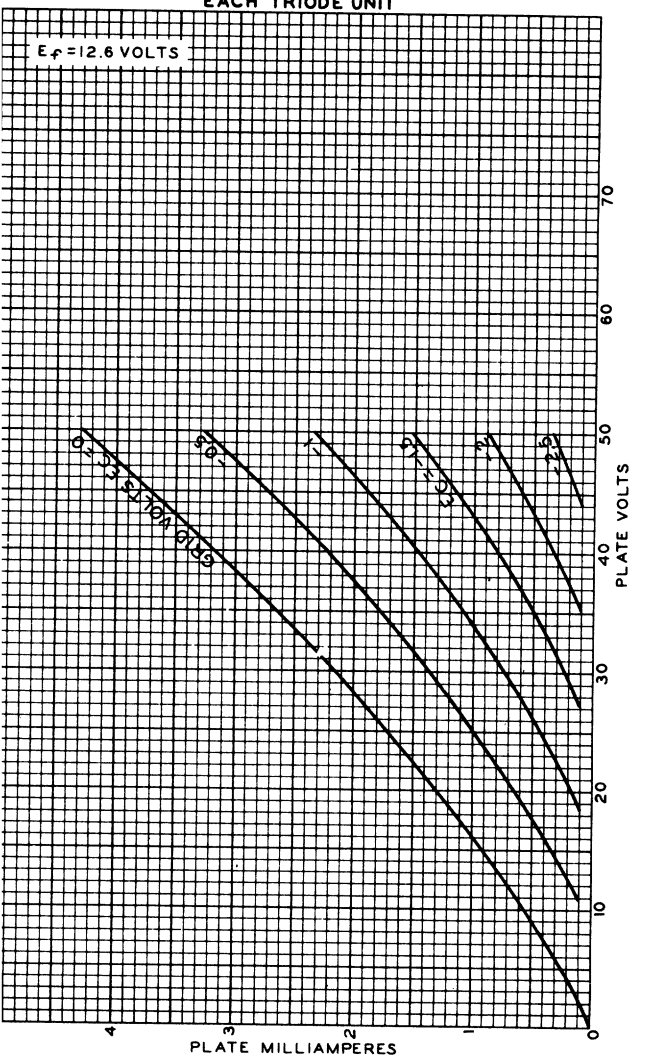
See RESISTANCE-COUPLED AMPLIFIER CHART, Type 6F8-G.

The curves under Types 6J5 and 6SN7-GT also apply to each unit of the 12SX7-GT

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

12SX7-GT

AVERAGE PLATE CHARACTERISTICS
EACH TRIODE UNIT



12SY7

PENTAGRID CONVERTER

SINGLE-ENDED METAL TYPE

For use with 12-cell storage-battery supply

GENERAL DATA

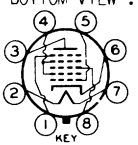
Electrical:

Heater, for Unipotential Cathode:		
Voltage	12.6	ac or dc volts
Current	0.15	amp
Direct Interelectrode Capacitances:		
Grid No.3 to All Other Electrodes (RF Input)	9.5●	μμf
Plate to All Other Electrodes (Mixer Output)	12●	μμf
Grid No.1 to All Other Electrodes (Osc. Input)	7●	μμf
Grid No.3 to Plate	0.13 max.●	μμf
Grid No.1 to Grid No.3	0.15 max.●	μμf
Grid No.1 to Plate	0.06 max.●	μμf
Grid No.1 to Shell, Grid No.5, and All Other Electrodes Except Cathode	4.4	μμf
Grid No.1 to Cathode	2.6	μμf
Cathode to Shell, Grid No.5, and All Other Electrodes Except Cathode	5	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-1/16"
Maximum Diameter	1-5/16"
Bulb	Metal Shell, MT-8G
Base	Small Wafer Octal 8-Pin
Basing Designation for BOTTOM VIEW	8R

Pin 1 – Shell, Grid No.5
Pin 2 – Heater
Pin 3 – Plate
Pin 4 – Grids No.2 & No.4
Pin 5 – Grid No.1
Pin 6 – Cathode
Pin 7 – Heater
Pin 8 – Grid No.3



CONVERTER

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	300 max. volts
GRIDS-No.2 and No.4 (SCREEN) VOLTAGE	100 max. volts
GRIDS-No.2 and No.4 SUPPLY VOLTAGE	300 max. volts
PLATE DISSIPATION	1.0 max. watt
GRIDS-No.2 & No.4 DISSIPATION	1.0 max. watt
TOTAL CATHODE CURRENT	14 max. ma.
GRID-No.3 (CONTROL GRID) VOLTAGE:	
Negative bias value	50 max. volts
Positive bias value	0 max. volts
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode	90 max. volts
Heater positive with respect to cathode	90 max. volts

● With shell connected to cathode.

12SY7

12SY7

PENTAGRID CONVERTER

Characteristics - *Separate Excitation*: *

Plate Voltage.	26.5	100	250	volts
Grids-No.2 & No.4 Voltage	26.5	100	100	volts
Grid-No.3 Voltage.	-1	-2	-2	volts
Grid-No.1 (Oscillator Grid) Resistor	20000	20000	20000	ohms
Plate Resistance (Approx.)	-	0.5	1.0	megohm
Conversion Transconductance	250	425	450	μmhos
Conversion Transconductance (Approx.)	8♦	2□	2□	μmhos
Plate Current.	0.45	3.3	3.5	ma.
Grids-No.2 & No.4 Current	1.7	8.5	8.5	ma.
Grid-No.1 Current.	0.1	0.5	0.5	ma.
Total Cathode Current. . .	2.25	12.3	12.5	ma.

NOTE: The transconductance between grid No.1 and grids No.2 and No.4 connected to plate (not oscillating) is approximately 4500 μmhos under the following conditions: grids No.1, No.3, No.5 and shell at 0 volts; grids No.2 and No.4 and plate at 100 volts. Under the same conditions, the plate current is 27 milliamperes, and the amplification factor is 13.

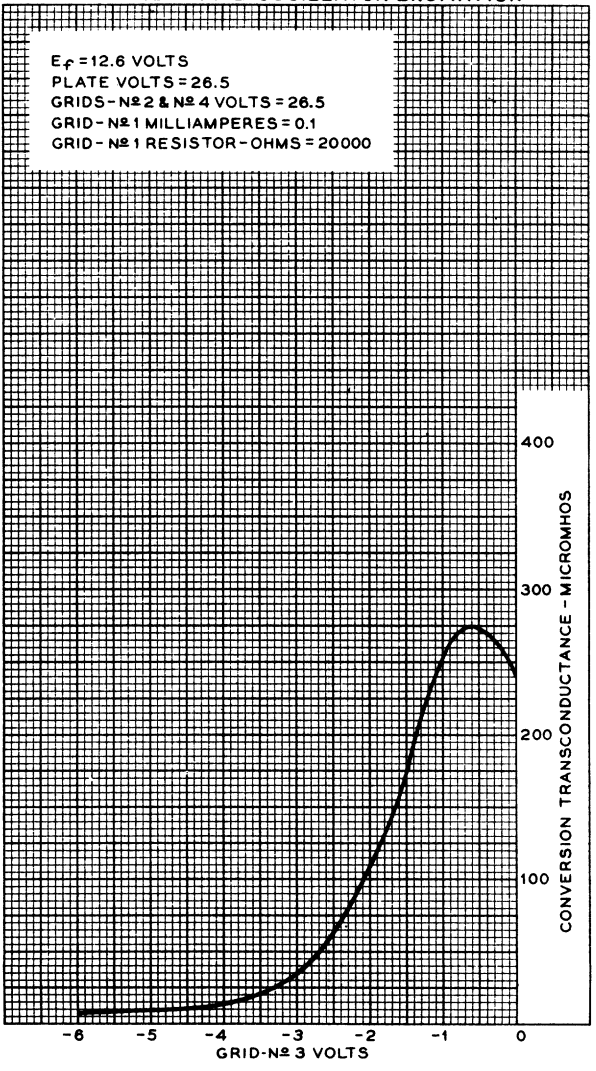
* The characteristics shown with separate excitation correspond very closely with those obtained in a self-excited oscillator circuit operating with zero bias.

♦ With grid-No.3 bias of -6 volts.

□ With grid-No.3 bias of -35 volts.

The curves under Type 6SA7 also apply to the 12SY7.

12SY7
OPERATION CHARACTERISTICS
WITH SEPARATE OSCILLATOR EXCITATION

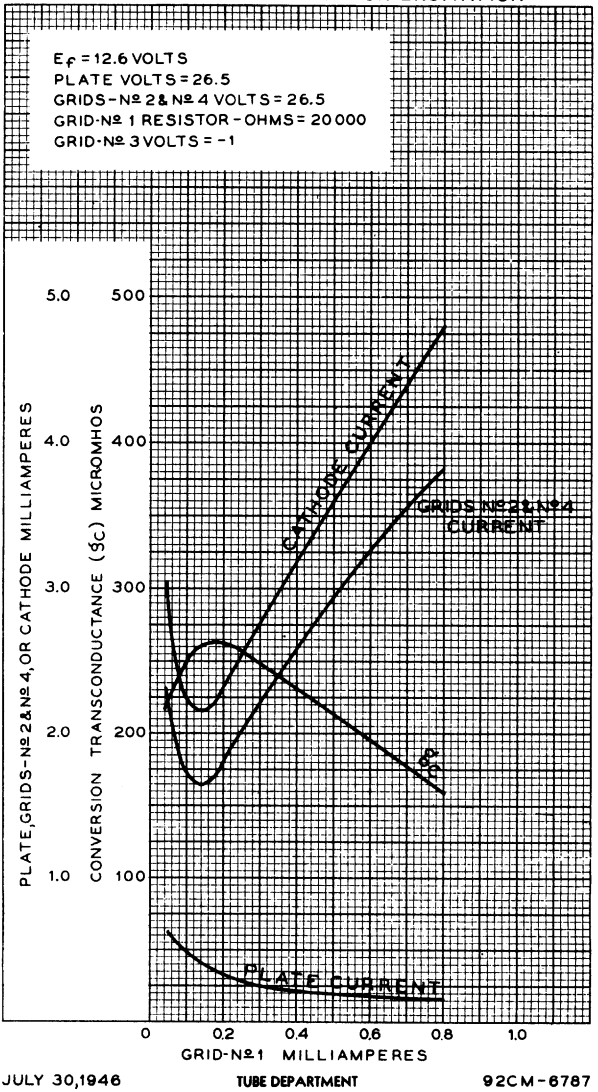


12SY7

12SY7

OPERATION CHARACTERISTICS

WITH SEPARATE OSCILLATOR EXCITATION



JULY 30,1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6787

12X4

Full-Wave Vacuum Rectifier

The 12X4 is the same as the 6X4 except for the following items:

Heater Characteristics and Ratings:		
Current	0.300	amp
Voltage (AC or DC) at heater amperes = 0.300	12.6	volts

13CW4

High-Mu Triode

NUVISTOR TYPE

For Use as Grounded-Cathode, Neutralized RF-Amplifier Tube in Tuners of VHF Television and FM Receivers

The 13CW4 is the same as the 6CW4 except for the following items:

Heater Characteristics and Ratings:		
Current	0.060	amp
Voltage (AC or DC) at heater amperes = 0.060	13.5	volts

13DE7

Dual Triode

With Medium-Mu Unit and Low-Mu Unit

9-PIN MINIATURE TYPE

The 13DE7 is the same as the 6DE7 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	13.0	volts
Warm-up time (Average)	11	sec

13DR7

Dual Triode

With High-Mu Unit and Low-Mu Unit

The 13DR7 is the same as the 6DR7 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	13.0	volts
Warm-up time (Average)	11	sec

13EM7

Dual Triode

With High-Mu Unit and Low-Mu Unit

The 13EM7 is the same as the 6EM7 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	13.0	volts
Warm-up time (Average)	11	sec

13FD7

Dual Triode

With High-Mu Unit and Low-Mu Unit

The 13FD7 is the same as the 6FD7 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	13.0	volts
Warm-up time (Average)	11	sec

13FM7

Dual Triode

With High-Mu Unit and Low-Mu Unit

DUODECAR TYPE

The 13FM7 is the same as the 6FM7 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A.	13.0	V
Warm-up time (Average)	11	s

13GB5

Beam Power Tube

The 13GB5 is the same as the 6GB5 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A.	13.3	V

13GF7

Dual Triode

With High-Mu Unit and Low-Mu Unit

NOVAR TYPE

The 13GF7 is the same as the 6GF7 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A.	13.0	V
Warm-up time (Average)	11	s

13GF7A

Dual Triode

With High-Mu Unit and Low-Mu Unit

NOVAR TYPE

The 13GF7A is the same as the 6GF7A except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	13.0	V
Warm-up time (Average)	11	s

13J10

Pentode — Beam Power Tube

DUODECAR TYPE

The 13J10 is the same as the 6J10 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	13.2	V
Warm-up time (Average)	11	s

13Z10

Pentode — Beam Power Tube

DUODECAR TYPE

The 13Z10 is the same as the 6Z10 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	13.2	V
Warm-up time (Average)	11	s

Twin Diode—High-Mu Triode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	14 ± 10%	volts
Current at 14 volts	0.15	amp
Direct Interelectrode Capacitances:▲		
Triode Unit:		
Grid to plate	1.8	μμf
Grid to cathode and heater	1.6	μμf
Plate to cathode and heater	0.24	μμf
Diode Units:		
Diode-No.1 plate to triode grid	0.09 max.	μμf
Diode-No.2 plate to triode grid	0.07 max.	μμf
Either diode cathode to all other tube electrodes	6.5	μμf
Diode plate to cathode and heater (Each unit)	2.4	μμf

Characteristics, Class A_1 Amplifier (Triode Unit):

Plate Voltage	250	volts
Grid Voltage	-3	volts
Amplification Factor	72	
Plate Resistance (Approx.)	72000	ohms
Transconductance	1000	μmhos
Plate Current	0.7	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9KR

Pin 1 – Diode-No.2 Cathode
Pin 2 – Diode-No.1 Plate
Pin 3 – Diode-No.1 Cathode
Pin 4 – Heater

Pin 5 – Heater
Pin 6 – Diode-No.2 Plate
Pin 7 – Triode Cathode
Pin 8 – Triode Grid
Pin 9 – Triode Plate

TRIODE UNIT — AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330 max.	volts

GRID VOLTAGE:			
Positive-bias value	0	max.	volts
PLATE DISSIPATION	1.1	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200●	max.	volts

DIODE UNITS — Two

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE CURRENT	5	max.	ma
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200●	max.	volts

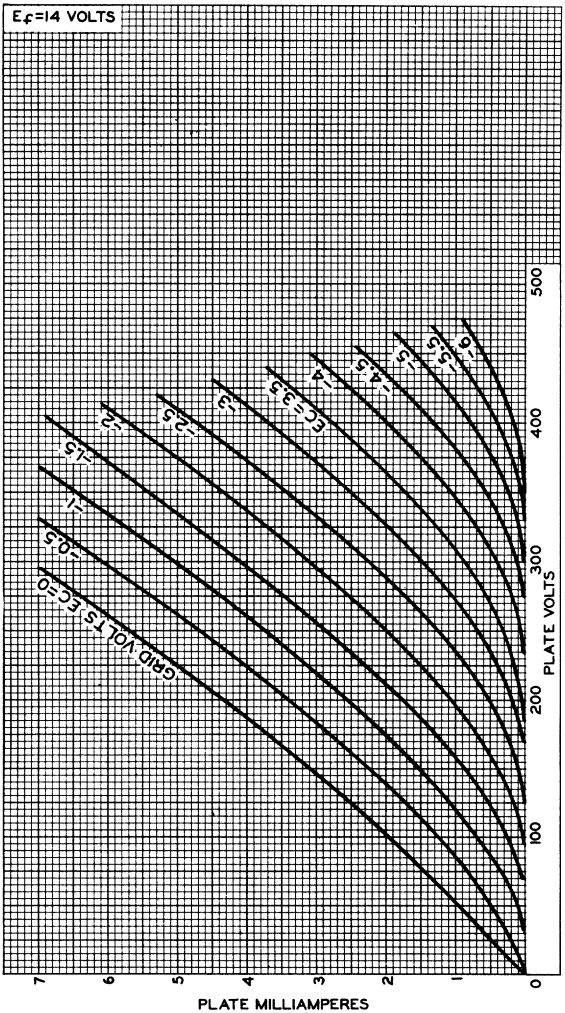
Characteristics, Instantaneous Test Condition:

Plate Current for plate volts = 5	18		ma

▲ Without external shield.

● The dc component must not exceed 100 volts.

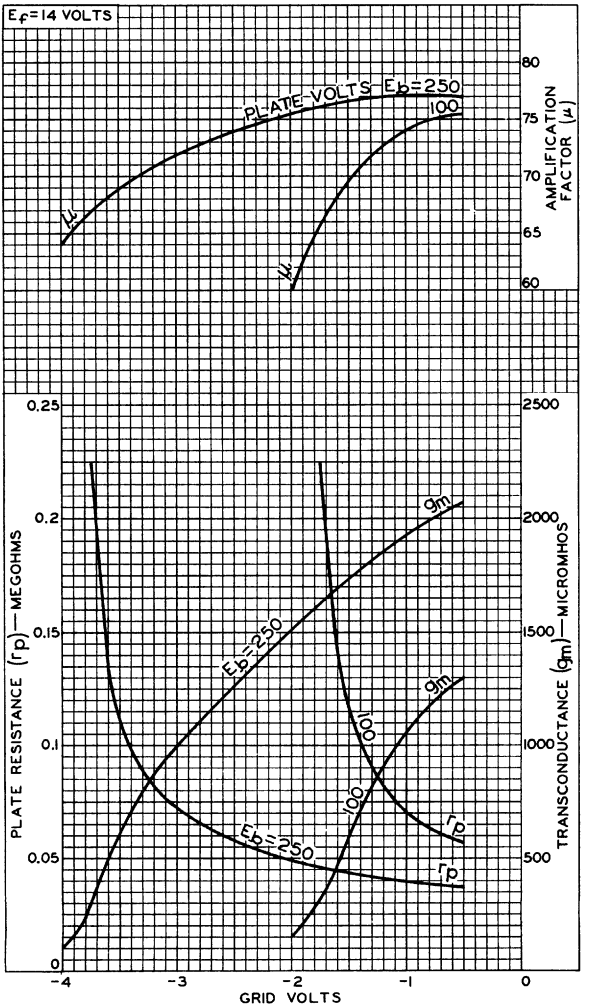
AVERAGE PLATE CHARACTERISTICS
Triode Unit



92CM-10835

14GT8

AVERAGE CHARACTERISTICS
Triode Unit



92CM-10838

15AF11

Dual Triode—
Sharp-Cutoff Pentode

DUODECAR TYPE

The 15AF11 is the same as the 6AF11 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at 0.450 amp.	14.7	volts
Warm-up time (Average)	11	sec

15BD11

Dual Triode—
Sharp-Cutoff Pentode

DUODECAR TYPE

The 15BD11 is the same as the 6BD11 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at 0.450 amp.	14.7	volts
Warm-up time (Average)	11	sec

15CW5

Beam Power Tube

The 15CW5 is the same as the 6CW5 except for the following items:

Heater Characteristics and Ratings:		
Current	0.300 ± 0.020	amp
Voltage (AC or DC) at 0.300 amp.	15.0	volts

15FM7

Dual Triode

DUODECAR TYPE

The 15FM7 is the same as the 6FM7 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at 0.450 amp.	14.8	volts
Warm-up time (Average)	11	sec

15FY7

Dual Triode

DUODECAR TYPE

The 15FY7 is the same as the 6FY7 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at 0.450 amp.	14.7	volts
Warm-up time (Average)	11	sec

15HB6

Power Pentode

The 15HB6 is the same as the 6HB6 except for the following items:

Heater Characteristics and Ratings:		
Current	0.300 ± 0.020	amp
Voltage (AC or DC) at 0.300 amp.	14.7	volts
Warm-up time (Average)	11	sec

15KY8A

High-Mu Triode—
Beam Power Tube

NOVAR TYPE

For Combined Vertical-Deflection Oscillator and Amplifier Service in TV Receivers

The 15KY8A is the same as the 6KY8A except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	15.0	volts
Warm-up time (Average)	11	sec

16GK6

Power Pentode

9-PIN MINIATURE TYPE

The 16GK6 is the same as the 6GK6 except for the following items:

Heater Characteristics and Ratings:		
Current	0.300 ± 0.020	amp
Voltage (AC or DC) at heater amperes = 0.300	16.0	volts
Warm-up time (Average)	11	sec

17AX3

Half-Wave Vacuum Rectifier

DUODECAR TYPE

The 17AX3 is the same as the 6AX3 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	16.8	volts
Warm-up time (Average)	11	sec

17AX4GTA

Half-Wave Vacuum Rectifier

For TV Damper Service

The 17AX4GTA is the same as the 6AX4GTB except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	16.8	volts
Warm-up time (Average)	11	sec

17AY3,17AY3A

Half-Wave Vacuum Rectifier

NOVAR TYPE

For TV Damper Service

The 17AY3 and 17AY3A are the same as the 6AY3 and 6AY3B, respectively, except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	16.8	volts
Warm-up time (Average)	11	sec

17BE3

Half-Wave Vacuum Rectifier

DUODECAR TYPE

The 17BE3 is the same as the 6BE3 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	16.8	volts
Warm-up time (Average)	11	sec

17BF11

Beam Power Tube— Sharp-Cutoff Pentode

DUODECAR TYPE

The 17BF11 is the same as the 6BF11 except for the following items:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	16.8	volts
Warm-up time (Average)	11	sec

17BH3A

Half-Wave Vacuum Rectifier

NOVAR TYPE

For TV Damper Service

The 17BH3A is the same as the 6BH3A except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A.	17	V
Warm-up time (Average)	11	s

17BS3A

Half-Wave Vacuum Rectifier

NOVAR TYPE

For TV Damper Service

The 17BS3A is the same as the 6BS3A except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A.	16.8	V
Warm-up time (Average)	11	s

17CK3

Half-Wave Vacuum Rectifier

NOVAR TYPE

For TV Damper Service

The 17CK3 is the same as the 6CK3 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A.	16.8	V
Warm-up time (Average)	11	s

17CT3

Half-Wave Vacuum Rectifier

9-PIN MINIATURE TYPE
For TV Damper Service

The 17CT3 is the same as the 6CT3 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	16.8	V
Warm-up time (Average)	11	s

17CU5

Beam Power Tube

7-PIN MINIATURE TYPE

The 17CU5 is the same as the 6CU5 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	16.8	V
Warm-up time (Average)	11	s

17D4

Half-Wave Vacuum Rectifier

For TV Damper Service

The 17D4 is the same as the 6DA4 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	16.8	V
Warm-up time (Average)	11	s

17DE4

Half-Wave Vacuum Rectifier

For TV Damper Service

The 17DE4 is the same as the 6DE4 except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	17	V
Warm-up time (Average)	11	s

17DM4A

Half-Wave Vacuum Rectifier

For Television Damper Service

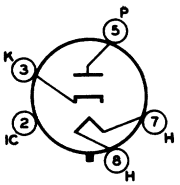
Electrical:

Heater Characteristics and Ratings:		
Current	0.450 ± 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	16.8	volts
Warm-up time (Average)	11	sec
Maximum heater-cathode voltage:		
Heater negative with respect to cathode[a]		
Peak	5000	volts
DC component	900	volts
Heater positive with respect to cathode		
Peak	300	volts
DC component	100	volts
Direct Interelectrode Capacitances (Approx.):		
P to (K,H)	8.5	pf
K to (P,H)	11.5	pf
Heater to cathode	4.0	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3-13/16"
Maximum Seated Length	3-1/4"
Maximum Diameter	1-9/32"
Bulb	T9
Base . . Short Intermediate-Shell Octal 5-Pin (JEDEC No. B5-85)	
Basing Designation for BOTTOM VIEW	4CG

Pin 2 - Do Not Use[b]
Pin 3 - Cathode
Pin 5 - Plate
Pin 7 - Heater
Pin 8 - Heater



DAMPER SERVICE

Maximum Ratings, *Design-Maximum Values:*

For operation in a 525-line, 30-frame system[c]

Peak Inverse Plate Voltage[a]	5000	volts
Peak Plate Current	1200	ma
DC Plate Current	200	ma
Plate Dissipation	6.5	watts

Characteristics, Instantaneous Value:

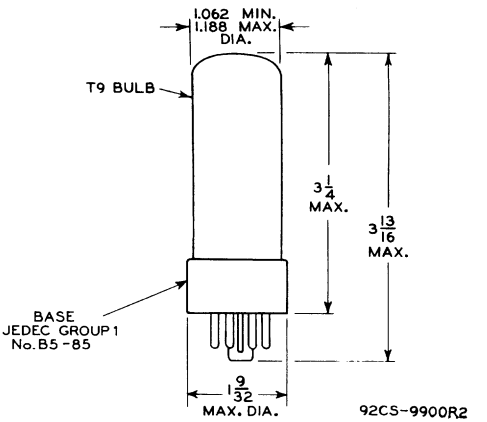
Tube Voltage Drop for plate ma = 400	35	volts

[a] This rating is applicable when the duty cycle of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30 frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

[b] Socket terminals 1, 2, 4 and 6 should not be used as tie points.

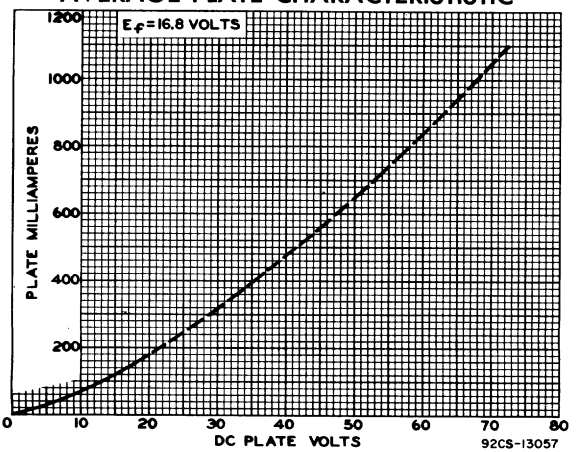
[c] As described is "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

AVERAGE PLATE CHARACTERISTISTIC



RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

17DQ6B

Beam Power Tube

The 17DQ6B is the same as the 6DQ6B except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A.	16.8	V
Warm-up time (Average)	11	s

17GJ5, 17GJ5A

Beam Power Tube

NOVAR TYPE

The 17GJ5 and 17GJ5A are the same as the 6GJ5 and 6GJ5A, respectively, except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A.	16.8	V
Warm-up time (Average)	11	s

17GT5A, 17GW6

Beam Power Tube

NOVAR TYPE

The 17GT5A and 17GW6 are the same as the 6GT5A and 6GW6, respectively except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A.	16.8	V
Warm-up time (Average)	11	s

17JB6, 17JB6A

Beam Power Tube

NOVAR TYPE

The 17JB6 and 17JB6A are the same as the 6JB6 and 6JB6A, respectively except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A.	16.8	V
Warm-up time (Average)	11	s

17JG6, 17JG6A

Beam Power Tube

NOVAR TYPE

The 17JG6 and 17JG6A are the same as the 6JG6 and 6JG6A, respectively, except for the following items:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (AC or DC) at 0.600 A	16.8	V
Warm-up time (Average)	11	s

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

17JQ6

Beam Power Tube
With an Integral Diode

The 17JQ6 is the same as the 6JQ6 except for:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (ac or dc) at 0.450 A	17.0	V
Warm-up time (Average)	11	s

17JR6

Beam Power Tube
Novar Type

The 17JR6 is the same as the 6JR6 except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	16.8	V
Warm-up time (Average)	11	s

17JT6A

Beam Power Tube
Novar Type

The 17JT6A is the same as the 6JT6A except for:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (ac or dc) at 0.450 A	16.8	V
Warm-up time (Average)	11	s

17JZ8

Medium-Mu Triode—
Beam Power Tube

Duodecar Type

The 17JZ8 is the same as the 6JZ8 except for:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (ac or dc) at 0.450 A	16.8	V
Warm-up time (Average)	11	s

17KV6

Beam Power Tube

Novar Type

The 17KV6 is the same as the 6KV6 except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600A	16.8	V
Warm-up time (Average)	11	s

17KV6A

Beam Power Tube

Novar Type

The 17KV6A is the same as the 6KV6A except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600A	16.8	V
Warm-up time (Average)	11	s

18FW6A

Remote-Cutoff Pentode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	18	volts
Current	0.1 ± 6%	amp
Warm-up time (Average)	20	sec
Direct Interelectrode Capacitances:[a]		
Grid No.1 to plate	0.0035 max.	μμf
Grid No.1 to cathode, grid No.3, grid No.2, and heater	5.5	μμf
Plate to cathode, grid No.3, grid No.2, and heater	5	μμf

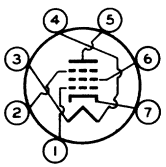
Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	100	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Supply Voltage	100	volts
Cathode Resistor	68	ohms
Plate Resistance (Approx.)	0.25	megohm
Transconductance	4400	μmhos
Plate Current	11	ma
Grid-No.2 Current	4.4	ma
Grid-No.1 Voltage (Approx.) for transconductance (μmhos) = 25	-20	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CC

Pin 1 - Grid No.1
Pin 2 - Grid No.3, Internal Shield
Pin 3 - Heater



Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Cathode

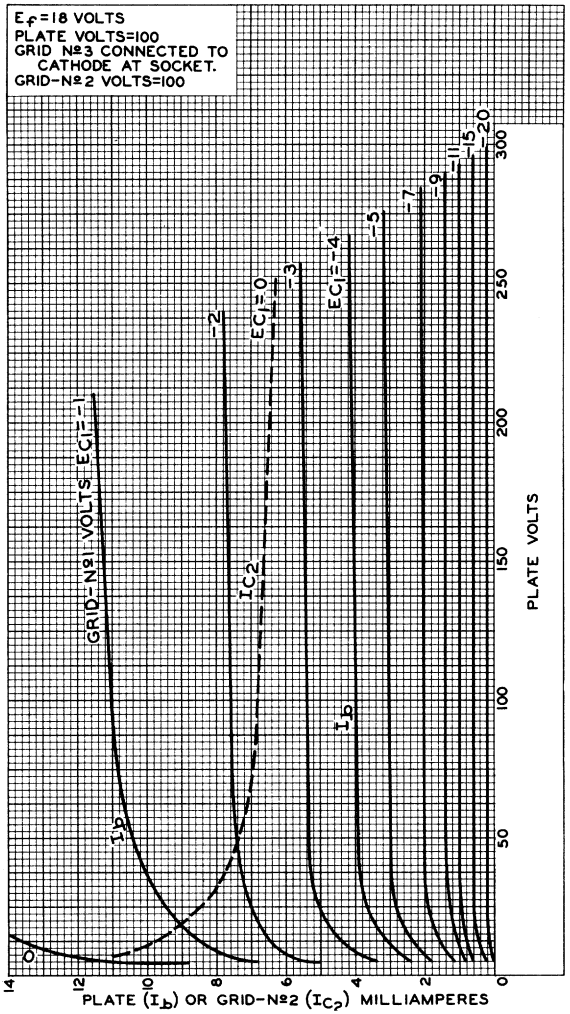
AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	150 max.	volts
GRID No.3 (SUPPRESSOR GRID)	*Connected to cathode at socket*	
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	150 max.	volts
GRID-No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 75 volts	0.6 max.	watt
For grid-No.2 voltages between 75 and 150 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	2.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

[a] With external shield JEDEC No.316 connected to cathode.

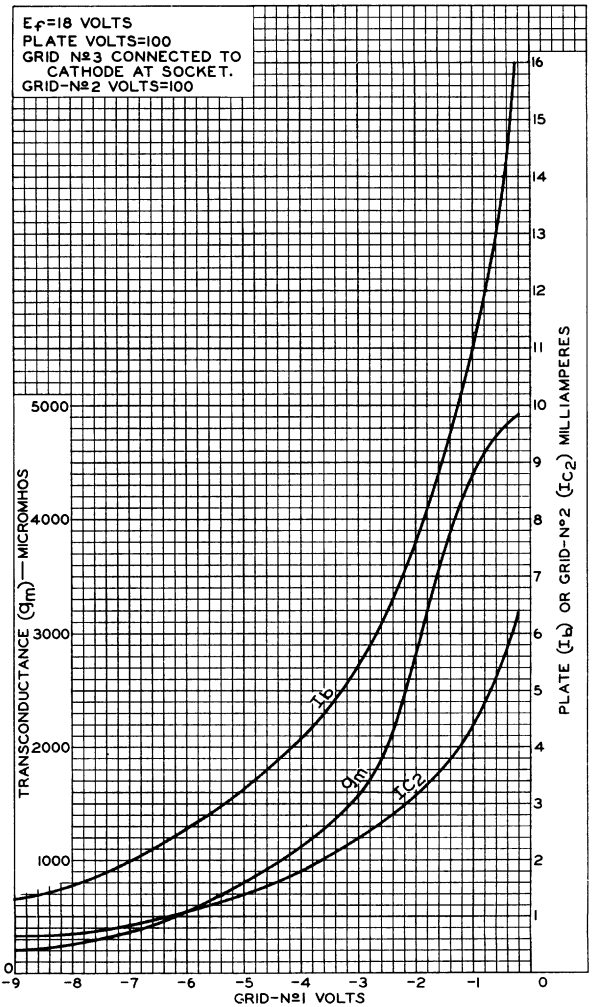
AVERAGE CHARACTERISTICS



92CM-10778

18FW6A

AVERAGE CHARACTERISTICS



92CM-10776

18FX6A

Pentagrid Converter

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

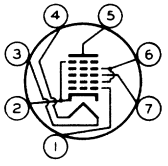
Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)	18		volts
Current	0.1 ± 6%		amp
Warm-up time (Average)	20		sec
Direct Interelectrode Capacitances:	*Without External Shield*	*With External Shield*[a]	
Grid No.3 to all other electrodes (RF input)	7	7	μμf
Plate to all other electrodes (Mixer input)	8	13	μμf
Grid No.1 to all other electrodes (Oscillator input)	5.5	5.5	μμf
Grid No.3 to plate	0.3 max.	0.25 max.	μμf
Grid No.3 to grid No.1	0.15 max.	0.15 max.	μμf
Grid No.1 to plate	0.1	0.05	μμf
Grid No.1 to cathode & grid No.5	3	3	μμf
Cathode & grid No.5 to all other electrodes except grid No.1	15	20	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CH

Pin 1 - Grid No.1
Pin 2 - Cathode, Grid No.5
Pin 3 - Heater
Pin 4 - Heater



Pin 5 - Plate
Pin 6 - Grid No.2, Grid No.4
Pin 7 - Grid No.3

CONVERTER

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	150 max.	volts
GRIDS-No.2 & No.4 (SCREEN-GRIDS) SUPPLY VOLTAGE	150 max.	volts

18FX6A

GRIDS-No.2 & No.4 VOLTAGE	110 max.	volts
GRIDS-No.2 & No.4 INPUT	1.2 max.	watts
PLATE DISSIPATION	1 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	100 max.	volts
Heater positive with respect to cathode.	100 max.	volts

Characteristics:

With Separate Excitation[b]

Plate Voltage	100	volts
Grids-No.2 & No.4 Voltage	100	volts
Grid-No.3 Voltage	-1.5	volts
Grid-No.1 Resistor	20000	ohms
Plate Resistance (Approx.)	0.4	megohm
Conversion Transconductance	480	μmhos
Plate Current	2.3	ma
Grids-No.2 & No.4 Current	6.2	ma
Grid-No.1 Current	0.5	ma
Total Cathode Current	9	ma
Grid-No.3 Voltage (Approx.) for conversion transconductance (μmhos) = 10	-21	volts

Oscillator Characteristics (Not Oscillating):[c]

Plate & Grids-No.2 & No.4 Voltage	100	volts
Grid-No.3 Voltage	0	volts
Grid-No.1 Voltage	0	volts
Amplification Factor[d]	22	
Oscillator Transconductance[d]	7000	μmhos
Cathode Current	24	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-9.2	volts

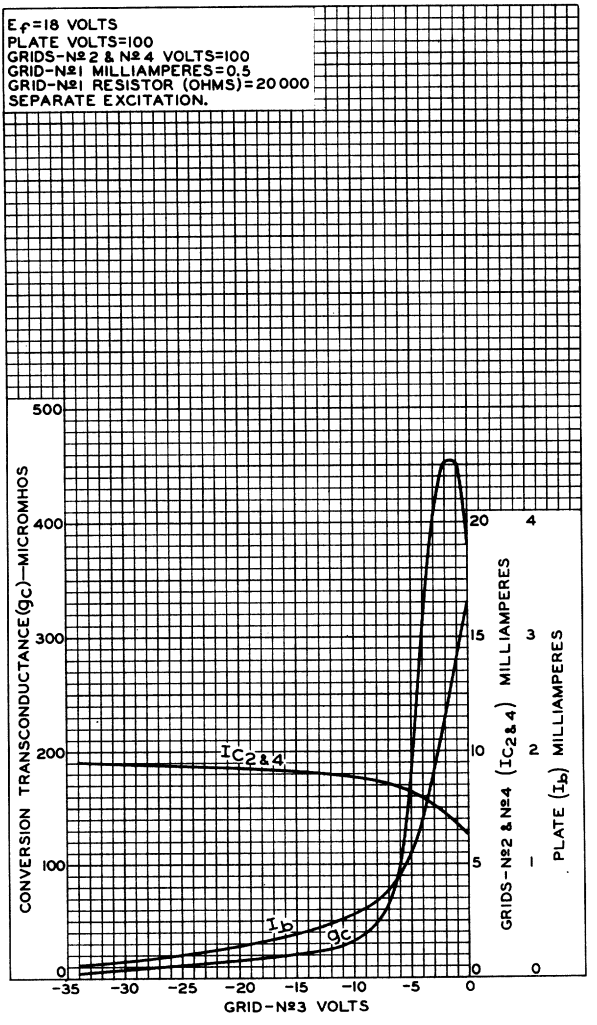
[a] With external shield JEDEC No.316 connected to cathode.

[b] The characteristics shown with separate excitation correspond very closely with those obtained in a self-excited-oscillator circuit operating with zero bias.

[c] With grids No.2 & No.4 connected to plate.

[d] Between grid No.1 and grids No.2 & No.4 connected to plate.

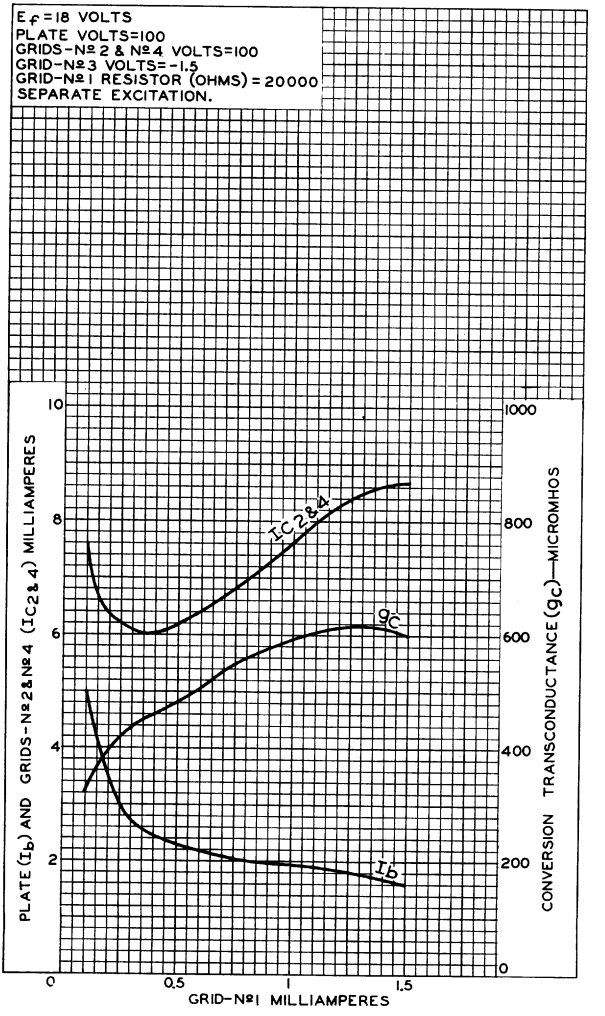
AVERAGE CHARACTERISTICS



92CM-10777

18FX6A

AVERAGE CHARACTERISTICS



92CM-10782

18FY6A

Twin Diode—High-Mu Triode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage (AC or DC)	18	volts
Current	0.1 ± 6%	amp
Warm-up time (Average)	20	sec

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*[a]	
Triode grid to triode plate	1.8	1.8	μμf
Triode grid to cathode and heater	2.4	2.4	μμf
Triode plate to cathode and heater	0.22	2	μμf
Plate of diode unit No.2 to triode grid	0.2 max.	0.2 max.	μμf

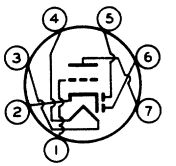
Characteristics, Class A_1 Amplifier (Triode Unit):

Plate Voltage	100	volts
Grid Voltage	-1	volt
Amplification Factor	100	
Plate Resistance (Approx.)	77000	ohms
Transconductance	1300	μmhos
Plate Current	0.6	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BT

Pin 1 – Grid of Triode Unit
Pin 2 – Cathode of Triode Unit and Diode Units No.1 and No.2
Pin 3 – Heater
Pin 4 – Heater



Pin 5 – Plate of Diode Unit No.2
Pin 6 – Plate of Diode Unit No.1
Pin 7 – Plate of Triode Unit

TRIODE UNIT — AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	150 max.	volts
GRID VOLTAGE:		
Positive-bias value	0 max.	volts
PLATE DISSIPATION	0.5 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

DIODE UNITS — Two

Maximum Ratings, *Design-Maximum Values:*

Values are for Each Unit

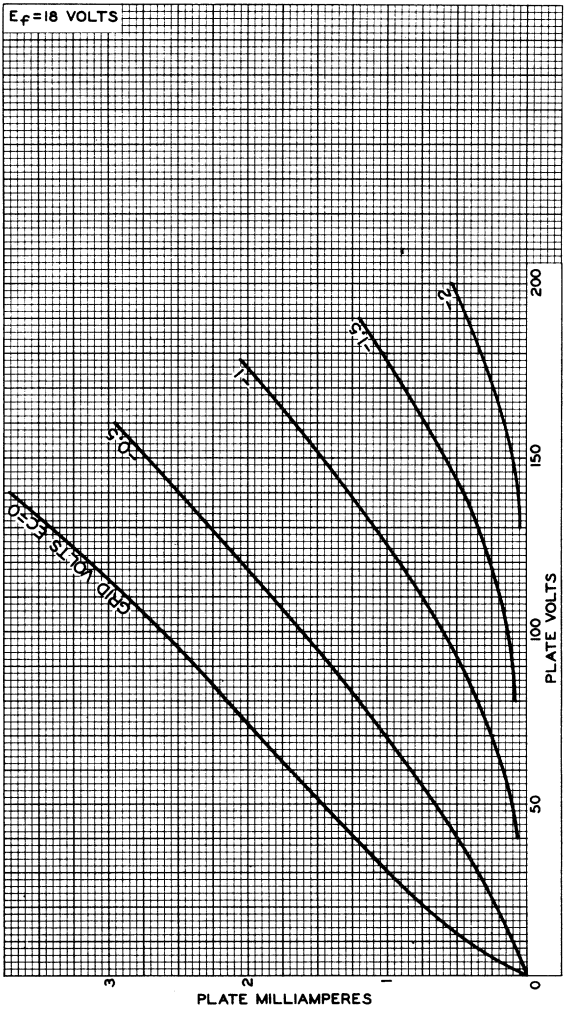
PLATE CURRENT	1 max.	ma

Characteristics, Instantaneous Test Condition:

Plate Current for plate volts = 10	2	ma

[a] With external shield JEDEC No.316 connected to cathode.

AVERAGE PLATE CHARACTERISTICS
Triode Unit



92CM-10775

18GD6A

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)		18	volts
Current		0.1 ± 6%	amp
Warm-up time (Average)		20	sec
Direct Interelectrode Capacitances:	*Without External Shield*	*With External Shield*[a]	
Grid No.1 to plate	0.0035 max.	0.0035 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	6	6	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	5	5	μμf

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	100	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Supply Voltage	100	volts
Cathode Resistor	150	ohms
Plate Resistance (Approx.)	0.5	megohm
Transconductance	4300	μmhos
Plate Current	5	ma
Grid-No.2 Current	2	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-4.7	volts

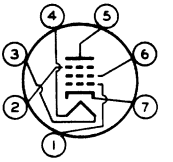
Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)

18GD6A

Basing Designation for BOTTOM VIEW. 7BK

Pin 1 – Grid No.1
Pin 2 – Grid No.3, Internal Shield
Pin 3 – Heater



Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Cathode

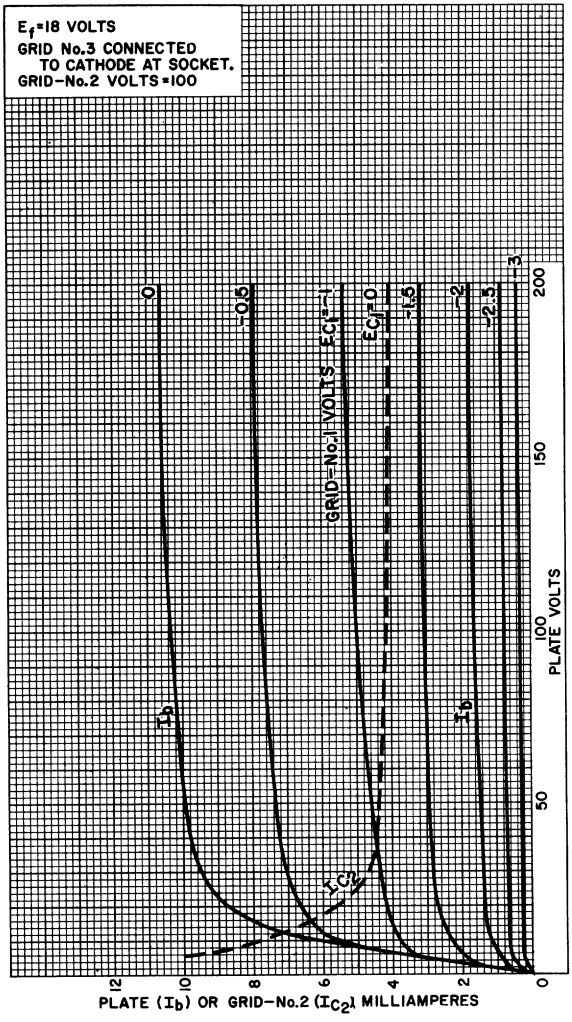
RF AMPLIFIER and AUTODYNE CONVERTER

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE . . . . . 150 max. volts
GRID No.3 (SUPPRESSOR GRID) . . .*Connect to cathode at socket*
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE. . . . 150 max. volts
GRID-No.2 VOLTAGE . . . . . .See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section
GRID-No.2 INPUT:
  For grid-No.2 voltages up to 75 volts . . . 0.6 max. watt
  For grid-No.2 voltages between 75 and 150 volts. . . . . .See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section
PLATE DISSIPATION . . . . . 2.5 max. watts
PEAK HEATER-CATHODE VOLTAGE:
  Heater negative with respect to cathode . . 100 max. volts
  Heater positive with respect to cathode . . 100 max. volts

[a] With external shield JEDEC No.316 connected to cathode.

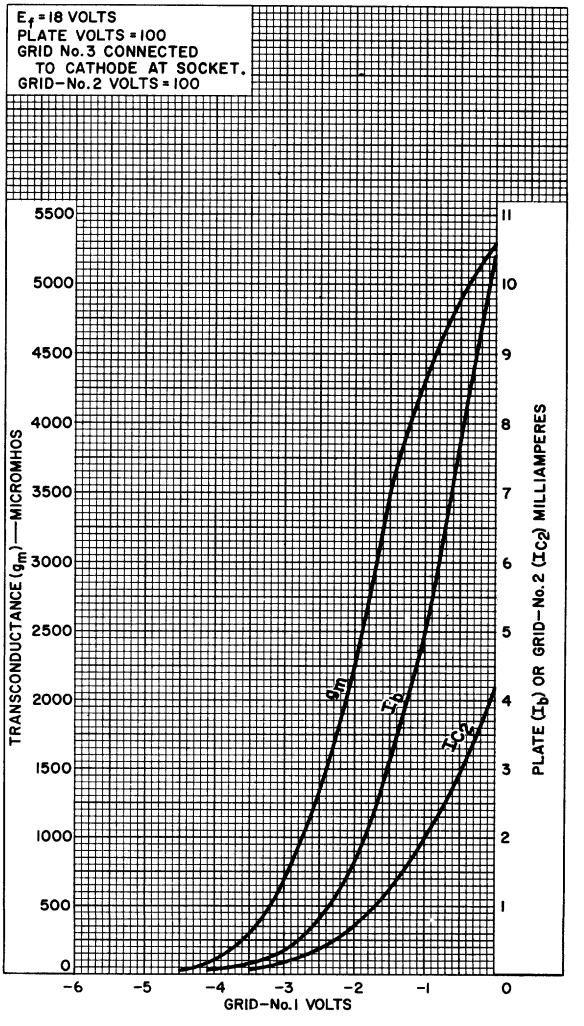
AVERAGE CHARACTERISTICS



92CM-11138R1

18GD6A

AVERAGE CHARACTERISTICS



92CM-11136RI

19CG3

Half-Wave Vacuum Rectifier

Duodecar Type

The 19CG3 is the same as the 6CG3 except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	19.0	V
Warm-up time (Average)	11	s

19CL8A

Medium-Mu Triode—Sharp-Cutoff Tetrode

Controlled Heater Warm-up Time

The 19CL8A is the same as the 6CL8A except for:

Heater Characteristics and Ratings

Current	0.150 ± 0.010	A
Voltage (ac or dc) at 0.150 A	18.9	V

19EA8

Medium-Mu Triode—Sharp-Cutoff Pentode

Controlled Heater Warm-up Time

The 19EA8 is the same as the 6EA8 except for:

Heater Characteristics and Ratings

Current	0.150 ± 0.010	A
Voltage (ac or dc) at 0.150 A	18.9	V

19HR6

Semiremote-Cutoff Pentode

The 19HR6 is the same as the 6HR6 except for:

Heater Characteristics and Ratings

Current	0.150 ± 0.010	A
Voltage (ac or dc) at 0.150 A	18.9	V
Warm-up time (Average)	17	s

19HS6

Sharp-Cutoff Pentode

The 19HS6 is the same as the 6HS6 except for:

Heater Characteristics and Ratings

Current	0.150 ± 0.010	A
Voltage (ac or dc) at 0.150 A	18.9	V
Warm-up time (Average)	17	s

20EZ7

High-Mu Twin Triode

9-PIN MINIATURE TYPE

For High-Gain, Resistance-Coupled, Low-Level Audio-Amplifiers Operating at Low-Signal Levels, such as Preamplifiers for Low-Cost Stereophonic Phonographs

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Voltage (AC or DC)	20		volts
Current	0.1 ± 6%		amp
Direct Interelectrode Capacitances (Approx.):[a]	*Unit No.1*	*Unit No.2*	
Grid to plate	1.5	1.5	μμf
Grid to cathode and heater	1.6	1.6	μμf
Plate to cathode and heater	0.2	0.3	μμf

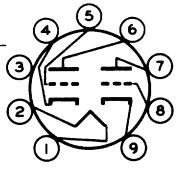
Characteristics, Class A_1 Amplifier (Each Unit):

Plate Voltage	100	250	volts
Grid Voltage	-1	-2	volts
Amplification Factor	100	100	
Plate Resistance (Approx.)	80000	62500	ohms
Transconductance	1250	1600	μmhos
Plate Current	0.5	1.2	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9PG

Pin 1 – Heater
Pin 2 – Heater
Pin 3 – Internal Connection—Do Not Use
Pin 4 – Cathode of Unit No.2
Pin 5 – Grid of Unit No.2
Pin 6 – Plate of Unit No.2
Pin 7 – Plate of Unit No.1
Pin 8 – Grid of Unit No.1
Pin 9 – Cathode of Unit No.1



AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330 max.	volts

Indicates a change.

GRID VOLTAGE:			
Negative-bias value	55	max.	volts
Positive-bias value	0	max.	volts
PLATE DISSIPATION	1.2	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts

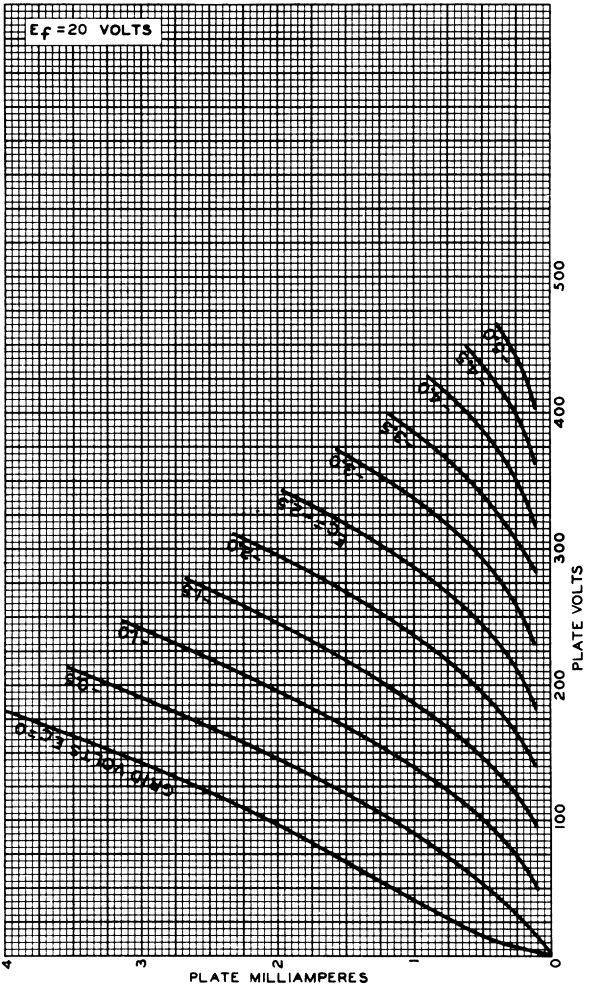
Typical Operation as Resistance-Coupled Amplifier:

See *RESISTANCE-COUPLED-AMPLIFIER CHART No.25* at front of this Section

[a] Without external shield.

[b] The dc component must not exceed 100 volts.

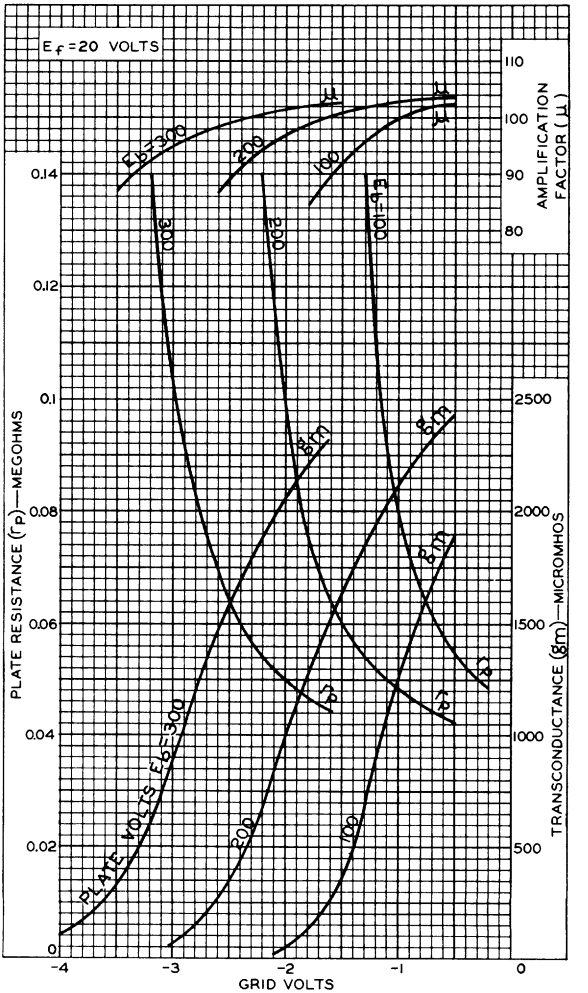
AVERAGE PLATE CHARACTERISTICS
Each Unit



92CM-10804

20EZ7

AVERAGE CHARACTERISTICS
Each Unit



92CM-10805

High-Mu Triode—Beam Power Tube

NOVAR TYPE

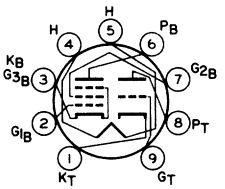
For Combined Vertical-Deflection Oscillator and Amplifier Service in Color TV Receivers

ELECTRICAL CHARACTERISTICS

Bogey Values

Heater Current	I_f	450	mA
Heater Voltage (AC or DC) at I_f = 450 mA	E_f	21.0	V
Heater Warm-up Time (Average)		11	s
Direct Interelectrode Capacitances (Approx.)			
Without external shield			
Triode Unit:			
Grid to plate	c_{gp}	6.0	pF
Input: G_T to (K_T, H)	c_i	6.5	pF
Output: P_T to (K_T, H)	c_o	1.6	pF
Beam Power Unit:			
Grid No.1 to plate	c_{gp}	0.7 max	pF
$G1_B$ to (K_B + $G3_B$, $G2_B$, H)	c_i	16.0	pF
P_B to (K_B + $G3_B$, $G2_B$, H)	c_o	9.0	pF
$G1_B$ to P_T		0.12 max	pF
P_B to P_T		0.32 max	pF
Basing Designation for BOTTOM VIEW		9QT	

Pin 1 – Triode Cathode
Pin 2 – Beam Power Grid No.1
Pin 3 – Beam Power Cathode & Grid No.3
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Beam Power Plate
Pin 7 – Beam Power Grid No.2
Pin 8 – Triode Plate
Pin 9 – Triode Grid



CLASS A_1 AMPLIFIER

For the following characteristics, see **Conditions**

		Triode Unit	*Beam Power Unit*		
Amplification Factor	μ	58	-	- 6.5[a]	
Plate Resistance (Approx.)	r_p	16000	-	12000 -	Ω
Transconductance	g_m	3600	-	9300 -	μmhos
DC Plate Current	I_b	2.3	200[b]	56 -	mA
DC Grid-No.2 Current	I_g	-	20[b]	3 -	mA
Cutoff DC Grid-No.1 Voltage					
I_b = 10 μA	$E_{c(co)}$	-6.6	-	- -	V
I_b = 1 mA (Approx.)	$E_{c(co)}$	-	-	-26 -	V
I_b = 100 μA	$E_{c(co)}$	-	-	-30 -	V

Conditions

		Triode Unit	*Beam Power Unit*			
Heater Voltage	E_f	21.0	21.0	21.0	21.0	V
Plate Voltage	E_b	250	45	135	120	V
Grid-No.2 Voltage	E_c	-	125	120	120	V
Grid-No.1 Voltage	E_c	-4	0	-10	-10	V

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length (l_m)	3.710 in
Maximum Seated Length (l_m)	3.330 in
Length, Base Seat to Bulb Top (Excluding tip)	2.810 to 2.990 in
Diameter (d)	1.438 to 1.562 in
Envelope	T12
Bases (alternates)	
Small-Button Novar 9-Pin (JEDEC No.E9-76)	
Small-Button Novar 9-Pin with Exhaust Tip 9-Pin (JEDEC No.E9-88)	

VERTICAL-DEFLECTION OSCILLATOR *(Triode Unit)*

Maximum Ratings, Design-Maximum Values

For operation in a 525-line, 30-frame system

DC Plate Voltage	E_b	400	V
Peak Negative-Pulse Grid Voltage	e_{cm}	400	V
Peak Cathode Current	i_{km}	105	mA
Average Cathode Current	$I_{k(av)}$	30	mA
Plate Dissipation	P_b	2.5	W
Peak Power Output	P_o	2.5	W

Maximum Circuit Values

Grid-Circuit Resistance	$R_{g(ckt)}$		
For grid-resistor-bias operation		2.2	MΩ

VERTICAL-DEFLECTION AMPLIFIER *(Beam Power Unit)*

Maximum Ratings, Design-Maximum Values

For operation in a 525-line, 30-frame system

DC Plate Voltage	E_b	400	V
Peak Positive-Pulse Plate Voltage[c]	e_{bm}	2500[d]	V
DC Grid-No.2 (Screen-Grid) Voltage	E_c	300	V
Peak Negative-Pulse Grid-No.1 (Control-Grid) Voltage	e_{cm}	250	V
Peak Cathode Current	i_{km}	260	mA
Average Cathode Current	$I_{k(av)}$	75	mA
Plate Dissipation[e]	P_b	14	W
Grid-No.2 Input[e]	P_c	2.75	W
Envelope Temperature	T_E	210	°C

MAXIMUM CIRCUIT VALUES

Grid-Circuit Resistance	$R_{g(ckt)}$		
For fixed-bias operation		1	MΩ
For grid-resistor-bias operation		2.2	MΩ

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Electronic Components and Devices Harrison, N. J.

[a] Triode connection.

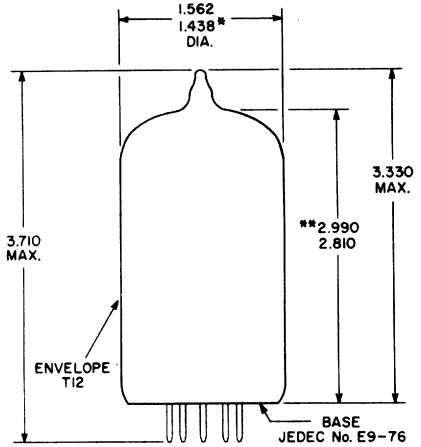
[b] This value can be measured by a method involving a recurrent wave form such that the plate dissipation and grid-No.2 input will be kept within ratings in order to prevent damage to the tube.

[c] This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycles is 2.5 milliseconds.

[d] Absolute Maximum value.

[e] An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

DIMENSIONAL OUTLINE
Top Exhaust (JEDEC No. 12-65)



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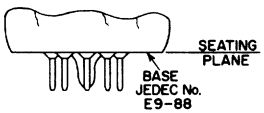


92CS-11127R3B

DIMENSIONS IN INCHES

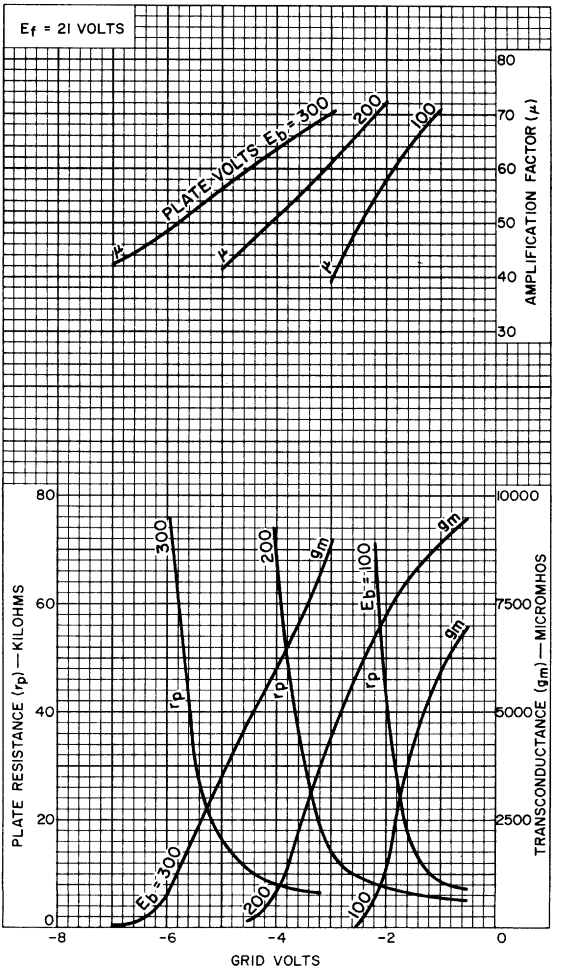
Bottom-exhaust version has the same dimensions for maximum overall length and seated length as the top-exhaust outline shown.

* Applies to the minimum diameter except in the area of the seal.

** Measured from the base seat to bulb-top line as determined by arcing gauge of 0.600" I.D.

Typical Characteristics

Triode Unit



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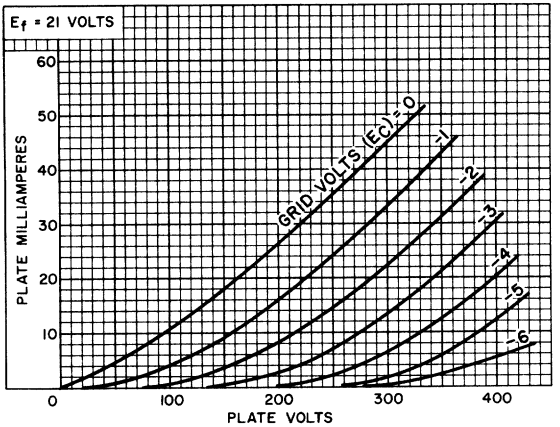
Typical Plate Characteristics

Triode Unit



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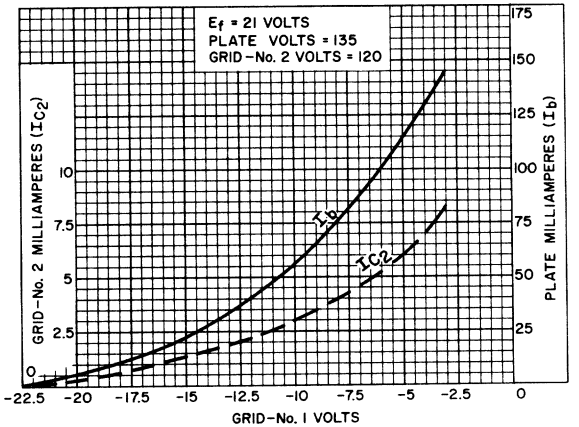
Typical Characteristics

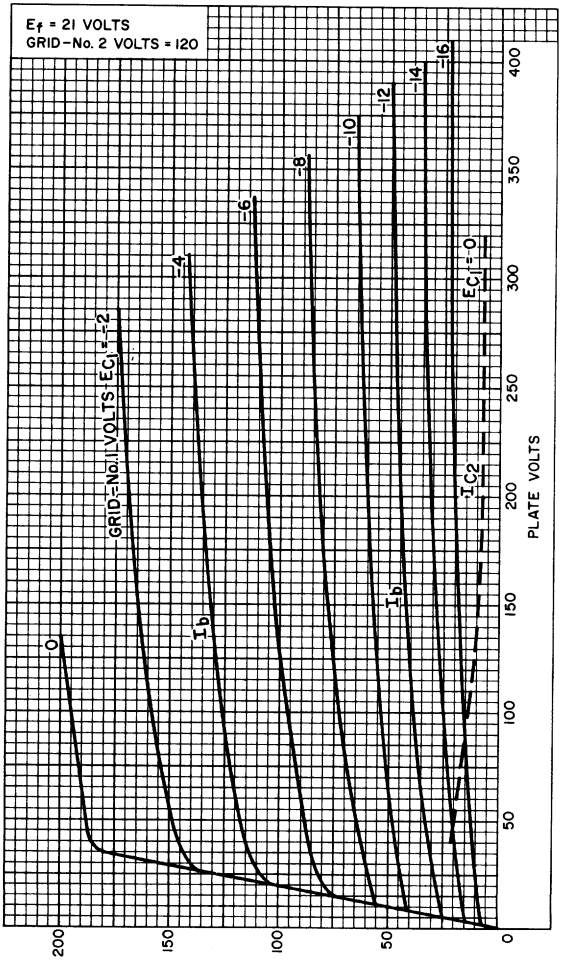
Beam Power Unit



92CS-13509

Typical Characteristics

Beam Power Unit



92CM-13507

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22BH3

Half-Wave Vacuum Rectifier

NOVAR TYPE

For TV Damper Service

The 22BH3 is the same as the 6BH3 except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450A	E_h	22.4	V
Warm-up time (Average)		11	s

22BH3A

Half-Wave Vacuum Rectifier

NOVAR TYPE

For TV Damper Service

The 22BH3A is the same as the 6BH3A except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450A	E_h	22.4	V
Warm-up time (Average)		11	s

22DE4

Half-Wave Vacuum Rectifier

For TV Damper Service

The 22DE4 is the same as the 6DE4 except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450A	E_h	22.4	V
Warm-up time (Average)		11	s

22JF6

Beam Power Tube

NOVAR TYPE

For Horizontal-Deflection-Amplifier Service in Low-B+, Black-and-White TV Receivers

The 22JF6 is the same as the 6JF6 except for the following items:

Heater Characteristics and Ratings

Current	I_h	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450A	E_h	22.0	V
Warm-up time (Average)		11	s

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22JG6A

Beam Power Tube

Novar Type

The 22JG6A is the same as the 6JG6A except for:

Heater Characteristics and Ratings

Current	0.450 ±0.030	A
Voltage (ac or dc) at 0.450 A	22.0	V
Warm-up time (Average)	11	s

22JR6

Beam Power Tube

Novar Type

The 22JR6 is the same as the 6JR6 except for:

Heater Characteristics and Ratings

Current	0.450 ±0.030	A
Voltage (ac or dc) at 0.450 A	22.0	V
Warm-up time (Average)	11	s

22JU6

Beam Power Tube

Novar Type

The 22JU6 is the same as the 6JU6 except for:

Heater Characteristics and Ratings

Current	0.450 ±0.030	A
Voltage (ac or dc) at 0.450 A	22.0	V
Warm-up time (Average)	11	s

22KM6

Beam Power Tube

Novar Type

The 22KM6 is the same as the 6KM6 except for:

Heater Characteristics and Ratings

Current	0.450 ±0.030	A
Voltage (ac or dc) at 0.450 A	22.0	V
Warm-up time (Average)	11	s

22KV6A

Beam Power Tube

Novar Type

The 22KV6A is the same as the 6KV6A except for:

Heater Characteristics and Ratings

Current	0.450 ±0.030	A
Voltage (ac or dc) at 0.450 A	22.0	V
Warm-up time (Average)	11	s

24JE6A

Beam Power Tube

Novar Type

The 24JE6A is the same as the 6JE6A except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	24.0	V
Warm-up time (Average)	11	s

24LQ6

Beam Power Tube

Novar Type

The 24LQ6 is the same as the 6LQ6 except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	24.0	V
Warm-up time (Average)	11	s

24LZ6

Beam Power Tube

NOVAR TYPE

The 24LZ6 is the same as the 6LZ6 except for:

Heater Characteristics and Ratings

Current	0.600 ± 0.040	A
Voltage (ac or dc) at 0.600 A	24	V

25AV5GA

Beam Power Tube

The 25AV5GA is the same as the 6AV5GA except for:

Heater Characteristics and Ratings

Current	0.300 ± 0.020	A
Voltage (ac or dc) at 0.300 A	25	V

25AX4GT

Half-Wave Vacuum Rectifier

FOR TV DAMPER SERVICE

The 25AX4GT is the same as the 6AX4GTB except for:

Heater Characteristics and Ratings

Current	0.300 ± 0.020	A
Voltage (ac or dc) at 0.300 A	25	V

25BK5

Beam Power Tube

9-PIN MINIATURE TYPE

The 25BK5 is the same as the 6BK5 excpet for:

Heater Characteristics and Ratings

Current	0.300 ± 0.020	A
Voltage	25	V

25BQ6GTB/25CU6

The 25BQ6GTB/25CU6 is the same as the 6BQ6GTB/6CU6 except for:

Heater Characteristics and Ratings

Current	0.300 ± 0.020	A
Voltage	25	V

25C5

BEAM POWER TUBE

7-PIN MINIATURE TYPE

GENERAL DATA

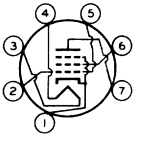
Electrical:

Heater, for Unipotential Cathode:		
Voltage	25	ac or dc volts
Current	0.3	amp
Direct Interelectrode Capacitances (Approx.)°:		
Grid No.1 to plate	0.6	μμf
Grid No.1 to cathode & grid No.3, grid No.2 and heater	13	μμf
Plate to cathode & grid No.3, grid No.2 and heater	8.5	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Maximum Diameter	3/4"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CV

Pin 1 - Cathode, Grid No.3
Pin 2 - Grid No.1
Pin 3 - Heater



Pin 4 - Heater
Pin 5 - Grid No.1
Pin 6 - Grid No.2
Pin 7 - Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	135	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	117	max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive bias value	0	max.	volts
GRID-No.2 INPUT	1.25	max.	watts
PLATE DISSIPATION	6	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200*	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	220	max.	°C

Typical Operation and Characteristics:

Plate Voltage	120	volts
Grid-No.2 Voltage	110	volts
Grid-No.1 Voltage	-8	volts

°,*: See next page.

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TENTATIVE DATA

25C5

BEAM POWER TUBE

Peak AF Grid-No.1 Voltage	8	volts
Zero-Signal Plate Current	49	ma
Max.-Signal Plate Current	50	ma
Zero-Signal Grid-No.2 Current	4	ma
Max.-Signal Grid-No.2 Current	8.5	ma
Plate Resistance (Approx.)	10000	ohms
Transconductance	7500	μmhos
Load Resistance	2500	ohms
Total Harmonic Distortion	10	%
Max.-Signal Power Output	2.3	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

° Without external shield.

* The dc component must not exceed 100 volts.

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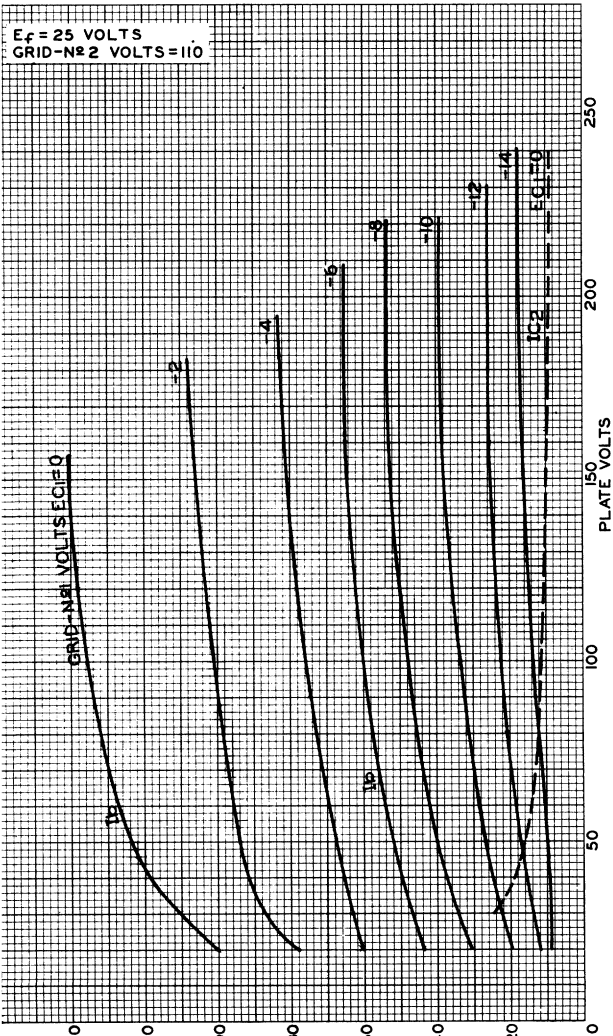
TENTATIVE DATA

25C5

AVERAGE CHARACTERISTICS



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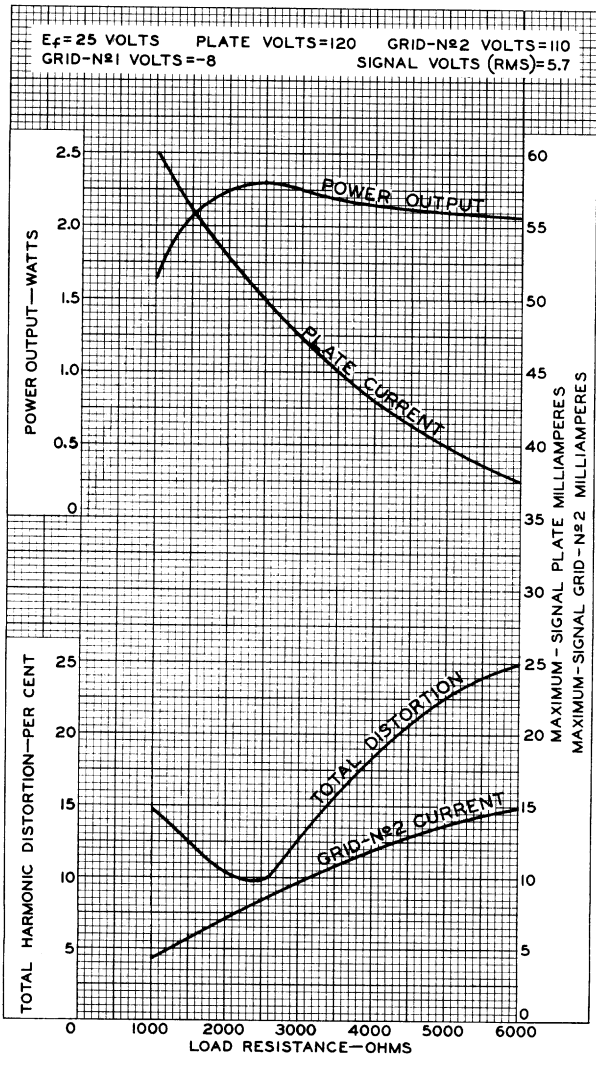
25C5

25C5

OPERATION CHARACTERISTICS



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92CM-8918RI

25CD6GB

Beam Power Tube

The 25CD6GB is the same as the 6CD6GA except for:

Heater Characteristics and Ratings

Current	0.600 A
Voltage (ac or dc)	25.0 V
Warm-up time (Average)	11 s

25CG3

Half-Wave Vacuum Rectifier

Duodecar Type

The 25CG3 is the same as the 6CG3 except for:

Heater Characteristics and Ratings

Current	0.450 ±0.030 A
Voltage (ac or dc) at 0.450 A	25.0 V
Warm-up time (Average)	11 s

25CK3

Half-Wave Vacuum Rectifier

Novar Type

The 25CK3 is the same as the 6CK3 except for:

Heater Characteristics and Ratings

Current	0.300 ± 0.020 A
Voltage (ac or dc) at 0.300 A	25.2 V
Warm-up time (Average)	11 s

25CM3

Half-Wave Vacuum Rectifier

The 25CM3 is the same as the 6CM3 except for:

Heater Characteristics and Ratings

Current	0.600 ±0.040	A
Voltage (ac or dc) at 0.600 A	25.0	V
Warm-up time (Average)	11	s

25DN6

BEAM POWER TUBE

Intended for use in equipment having series heater-string arrangement

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	25	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

Direct Interelectrode Capacitances (Approx.):°

Grid No.1 to plate	0.8	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	22	μμf
Plate to cathode & grid No.3, grid No.2, and heater	11.5	μμf

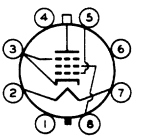
Characteristics, Class A_1 Amplifier:

Plate Voltage	50	125	volts
Grid-No.2 (Screen-Grid) Voltage	100	125	volts
Grid-No.1 (Control-Grid) Voltage	0	-18	volts
Mu Factor, Grid No.2 to Grid No.1	-	4.35	
Plate Resistance (Approx.)	-	4000	ohms
Transconductance	-	9000	μmhos
Plate Current	240*	70	ma
Grid-No.2 Current	30*	6.3	ma
Grid-No.1 Voltage (Approx.) for plate current of 0.5 ma	-	-36	volts

Mechanical:

Operating Position . . . . . Vertical, base up or down, or Horizontal with pins 1 and 3 in vertical plane
Maximum Overall Length . . . . . 5"
Seated Length . . . . . 4-1/4" ± 3/16"
Maximum Diameter . . . . . 1-9/16"
Bulb T12
Cap . . . . . Small (JETEC No.C1-1)
Base . . . . . Short Medium-Shell Octal 8-Pin with External Barriers, Style B (JETEC No.B8-118)
Basing Designation for BOTTOM VIEW 5BT

Pin 1 – No Connection
Pin 2 – Heater
Pin 3 – Cathode, Grid No.3
Pin 4 – No Connection



Pin 5 – Grid No.1
Pin 6 – No Connection
Pin 7 – Heater
Pin 8 – Grid No.2
Cap – Plate

°,*: See next page.

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TENTATIVE DATA

25DN6

BEAM POWER TUBE

HORIZONTAL DEFLECTION AMPLIFIER

Maximum Ratings, *Design-Center Values Except as Noted:*

For operation in a 525-line, 30-frame system□

DC PLATE VOLTAGE	700	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE (Absolute maximum)⊕	6600■	max.	volts
PEAK NEGATIVE-PULSE PLATE VOLTAGE	1500	max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	175	max.	volts
PEAK NEGATIVE-PULSE GRID-No.1 VOLTAGE	200	max.	volts
CATHODE CURRENT:			
Peak	700	max.	ma
Average	200	max.	ma
GRID-No.2 INPUT	3	max.	watts
PLATE DISSIPATION†	15	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	225	max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For grid-resistor-bias operation†	0.47	max.	megohm

° Without external shield.

* These values can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

⊕ This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

■ Under no circumstances should this absolute value be exceeded.

† It is essential that the plate dissipation be limited in the event of loss of grid-No.1 signal. For this purpose, some protective means such as a cathode resistor of suitable value should be employed.

▲ The dc component must not exceed 100 volts.

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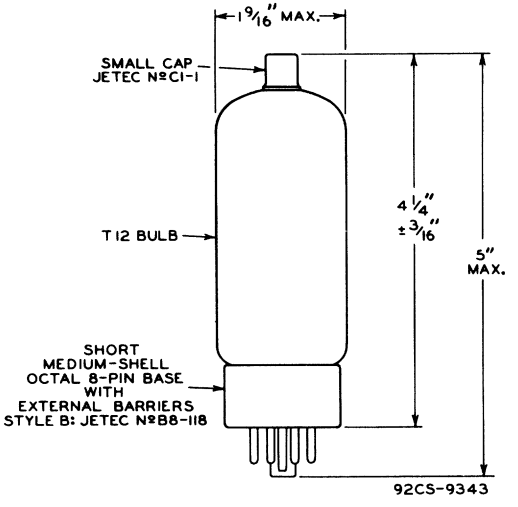
TENTATIVE DATA

25DN6

BEAM POWER TUBE



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25EH5
POWER PENTODE

7-PIN MINIATURE TYPE

The 25EH5 is the same as the 6EH5 except for the following items:

Heater, for Unipotential Cathode:

Voltage	25	ac or dc volts
Current	0.3	amp

25F5A

Beam Power Tube

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

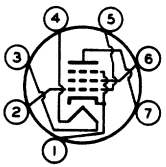
Heater Characteristics and Ratings *(Design-Maximum Values):*			
Current	0.150 ± 0.010		amp
Voltage (AC or DC) at heater amperes = 0.150	25.0		volts
Warm-up time (Average)	17		sec
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances (Approx.):[b]			
Grid No.1 to plate	0.44		pf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	12.0		pf
Plate to cathode & grid No.3, grid No.2, and heater	8.0		pf

Characteristics, Class A_1 Amplifier:

Plate Voltage	110	volts
Grid-No.2 Voltage	110	volts
Grid-No.1 Voltage	-7.5	volts
Plate Resistance (Approx.)	13000	ohms
Transconductance	6400	μmhos
Plate Current	43	ma
Grid-No.2 Current	3.8	ma

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.650" to 0.750"
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CV



Pin 1 - Cathode, Grid No.3
Pin 2 - Grid No.1
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Grid No.1
Pin 6 - Grid No.2
Pin 7 - Plate

25F5A

AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	150 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	130 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
GRID-No.2 INPUT	1.1 max.	watts
PLATE DISSIPATION	5.5 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	220 max.	°C

Typical Operation:

Plate Voltage	110	volts
Grid-No.2 Voltage	110	volts
Grid-No.1 Voltage	-7.5	volts
Peak AF Grid-No.1 Voltage	7.5	volts
Zero-Signal Plate Current	43	ma
Max.-Signal Plate Current	45	ma
Zero-Signal Grid-No.2 Current	3.8	ma
Max.-Signal Grid-No.2 Current	7.3	ma
Effective Load Resistance	2500	ohms
Total Harmonic Distortion	7	%
Maximum-Signal Power Output	1.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

PUSH-PULL AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	150 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	130 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
GRID-No.2 INPUT	1.1 max.	watts
PLATE DISSIPATION	5.5 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	220 max.	°C

Typical Operation:

Values are for two tubes

Plate Voltage	110	volts
Grid-No.2 Voltage	110	volts
Grid-No.1 Voltage	-8	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	14.4	volts
Zero-Signal Plate Current	82	ma
Max.-Signal Plate Current	88	ma
Zero-Signal Grid-No.2 Current	7.2	ma
Max.-Signal Grid-No.2 Current	12.5	ma
Effective Load Resistance (Plate-to-plate)	4500	ohms

Total Harmonic Distortion	2.6	%
Maximum-Signal Power Output	2.9	watts

Maximum Circuit Values:

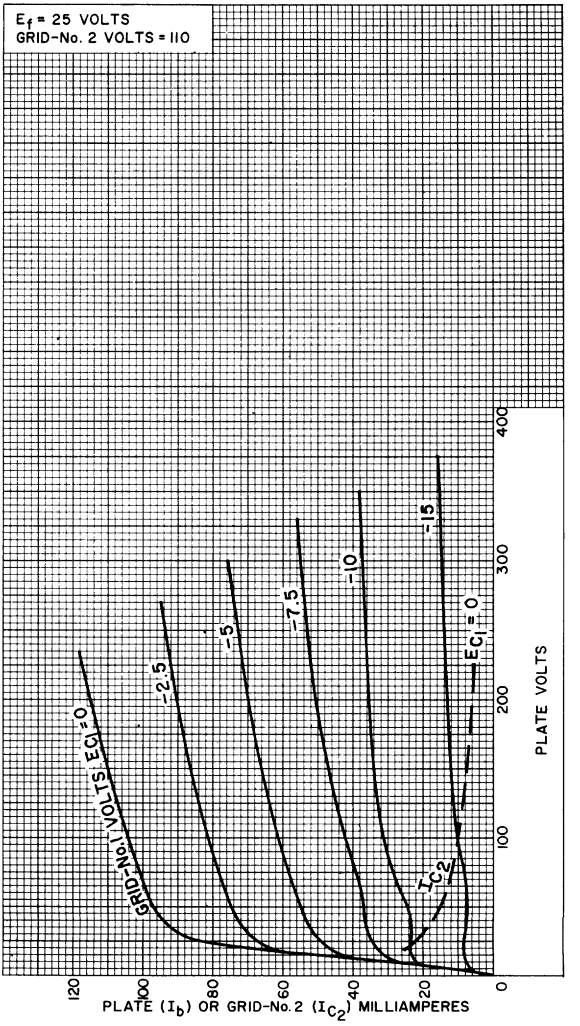
Grid-No.1-Circuit Resistance:

For fixed-bias operation.	0.1 max.	megohm
For cathode-bias operation.	0.5 max.	megohm

[1] The dc component must not exceed 100 volts.
[2] Without external shield.

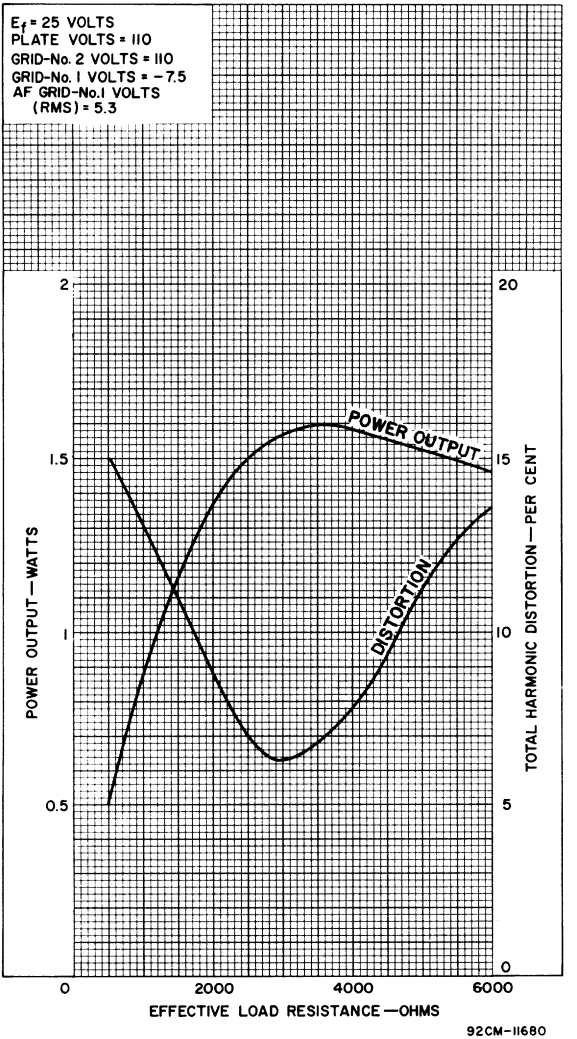
25F5A

AVERAGE CHARACTERISTICS



92CM-11682

OPERATION CHARACTERISTICS



25JQ6

Beam Power Tube
with an Integral Diode

The 25JQ6 is the same as the 6JQ6 except for:

Heater Characteristics and Ratings

Current	0.300 ± 0.020	A
Voltage (AC or DC) at 0.300 A	25.2	V
Warm-up time (Average)	11	s

31LQ6

Beam Power Tube
Novar Type

The 31LQ6 is the same as the 6LQ6 except for:

Heater Characteristics and Ratings

Current	0.450 ± 0.020	A
Voltage (AC or DC) at 0.450 A	31.0	V
Warm-up time (Average)	11	s

26A6

R-F AMPLIFIER PENTODE

MINIATURE REMOTE-CUTOFF TYPE

For use with 12-cell storage-battery supply

GENERAL DATA

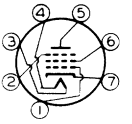
Electrical:

Heater, for Unipotential Cathode:		
Voltage	26.5	ac or dc volts
Current	0.07	amp
Direct Interelectrode Capacitances:[o]		
Grid No.1 to Plate	0.0035 max.	μμf
Input	6.0	μμf
Output	5.0	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length from Base Seat to Bulb Top (excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Miniature Button 7-Pin
Basing Designation for BOTTOM VIEW	$7BK_1$

Pin 1 – Grid No.1
Pin 2 – Grid No.3, Internal Shield
Pin 3 – Heater



Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Cathode

CLASS A_1 AMPLIFIER

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	250 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	100 max.	volts
GRID-No.2 SUPPLY VOLTAGE	250 max.	volts
PLATE DISSIPATION	3 max.	watts
GRID-No.2 DISSIPATION	0.4 max.	watt
GRID-No.1 (CONTROL GRID) VOLTAGE:		
Negative bias value	50 max.	volts
Positive bias value	0 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Typical Operation and Characteristics:

Plate Voltage	26.5	250	volts
Grid No.3 (Suppressor)	Connected to cathode at socket		
Grid-No.2 Voltage	26.5	100	volts
Grid-No.1 Voltage:			
From a grid-No.1 resistor of	2	–	megohms
From a cathode resistor of	–	125	ohms

[o] With external shield connected to cathode.

26A6

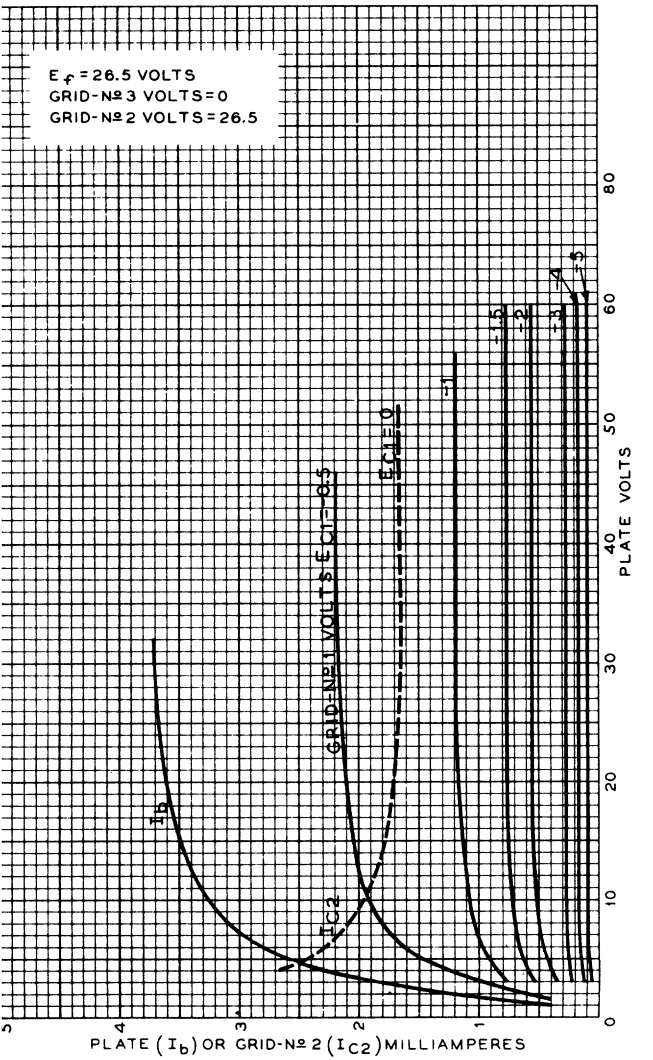
26A6

R-F AMPLIFIER PENTODE

Plate Resistance (Approx.)	0.25	1.0	megohm
Transconductance	2000	4000	μmhos
Grid-No.1 Bias (Approx.) for transconductance of 40 μmhos	-	-25	volts
Grid-No.1 Bias (Approx.) for transconductance of 20 μmhos	-8	-	volts
Plate Current	1.7	10.5	ma.
Grid-No.2 Current	0.7	4.0	ma.

26A6

AVERAGE PLATE CHARACTERISTICS

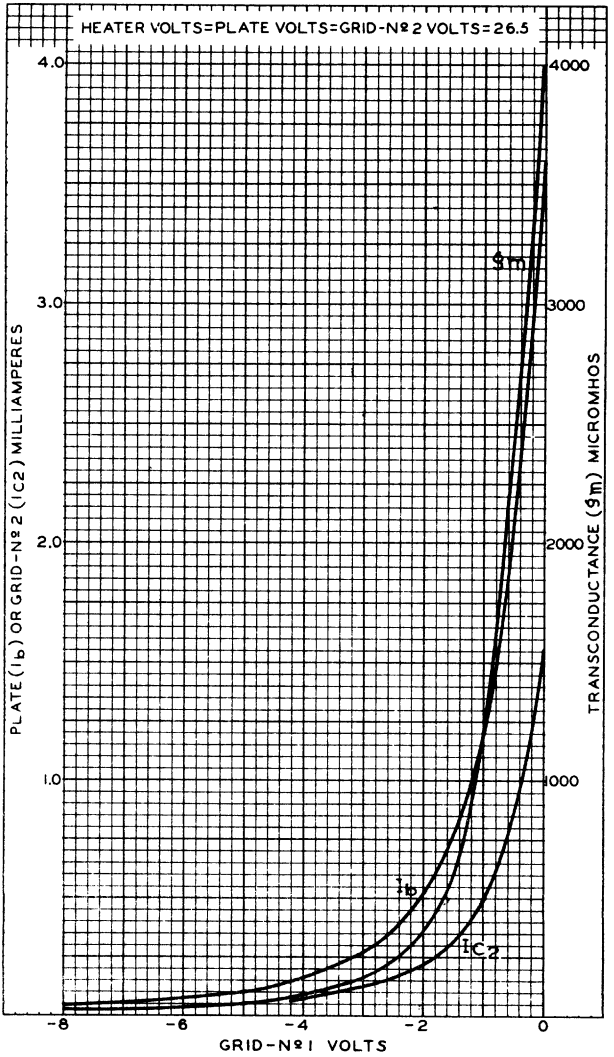


JULY 24, 1946 TUBE DEPARTMENT 92CM-6788
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

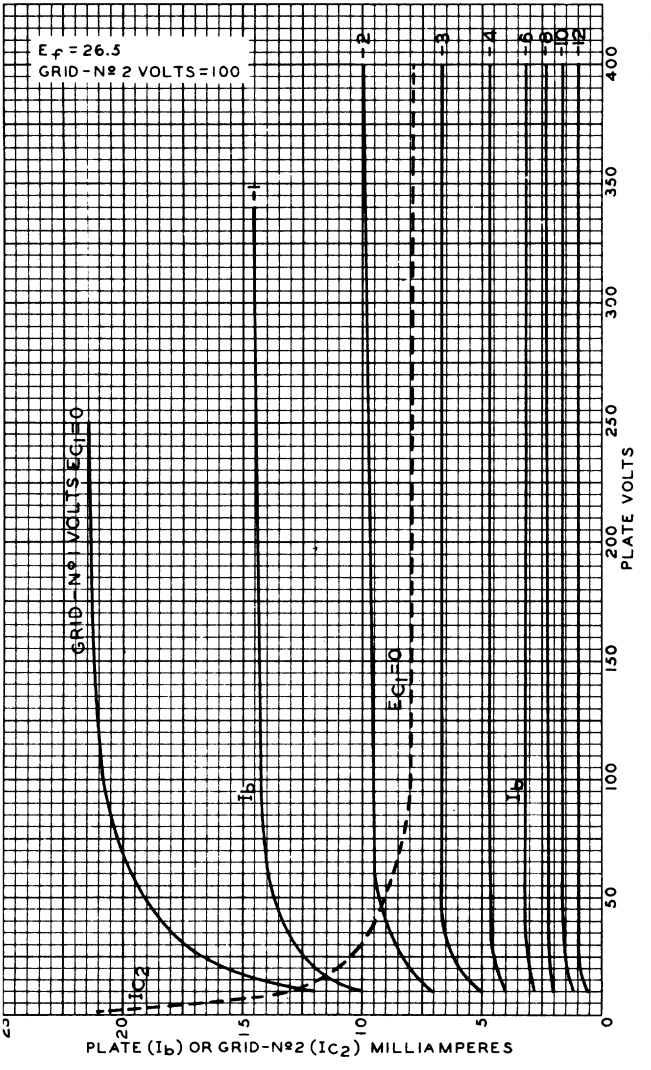
26A6

26A6

AVERAGE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



26A7-GT
TWIN BEAM POWER TUBE

GENERAL DATA

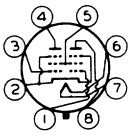
Electrical:

Heater, for Unipotential Cathode:		
Voltage	26.5	ac or dc volts
Current	0.6	amp
Direct Interelectrode Capacitances (Approx.):°		
Grid No.1 to plate▲	1.2	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater▲	16	μμf
Plate to cathode & grid No.3, grid No.2, and heater▲	13	μμf
Grid No.1 of unit No.1 to grid No.1 of unit No.2	0.2	μμf
Plate of unit No.1 to plate of unit No.2	0.2	μμf
Grid No.1 of unit No.1 to plate of unit No.2	0.2	μμf
Grid No.1 of unit No.2 to plate of unit No.1	0.2	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	3-13/16"
Maximum Seated Length	3-1/4"
Maximum Diameter	1-9/32"
Bulb	T-9
Base	Intermediate-Shell Octal 8-Pin (JETEC No.B8-6), or Short Intermediate-Shell Octal 8-Pin (JETEC No.B8-58)
Basing Designation for BOTTOM VIEW	8BU

Pin 1 – Grid No.1 of Unit No.1
Pin 2 – Cathode, Grid No.3 of Units No.1 & No.2
Pin 3 – Grid No.1 of Unit No.2



Pin 4 – Plate of Unit No.2
Pin 5 – Grid No.2 of Units No.1 & No.2
Pin 6 – Heater
Pin 7 – Heater
Pin 8 – Plate of Unit No.1

AMPLIFIER - Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	50 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	50 max.	volts
PLATE DISSIPATION	2 max.	watts

° Without external shield.
▲ Each unit.

←Indicates a change.

26A7-GT

TWIN BEAM POWER TUBE

GRID-No.2 INPUT	0.5 max.	watt
→ PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

→ Typical Operation and Characteristics (Each unit):

Plate Voltage	26.5	volts
Grid-No.2 Voltage	26.5	volts
Grid-No.1 (Control-Grid) Voltage	−4.5	volts
Peak AF Grid-No.1 Voltage	4.5	volts
Zero-Signal Plate Current	20	ma
Max.-Signal Plate Current	20.5	ma
Zero-Signal Grid-No.2 Current	1.9	ma
Max.-Signal Grid-No.2 Current	5.5	ma
Transconductance	5700	μmhos
Load Resistance	1500	ohms
Total Harmonic Distortion	7	%
Max.-Signal Power Output	180	mw

→ Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For maximum rated conditions:		
With cathode bias	0.5 max.	megohm
With fixed bias	0.1 max.	megohm
For conditions where the maximum design values of plate voltage and grid-No.2 voltage do not exceed 26.5 volts:		
With grid-resistor bias	0.5 max.	megohm

AF POWER AMPLIFIER - Class AB_1

Unless otherwise specified, values are on a Per-Tube Basis

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	50 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	50 max.	volts
PLATE DISSIPATION (Per unit)	2 max.	watts
GRID-No.2 INPUT (Per unit)	0.5 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Typical Push-Pull Operation:

Plate Voltage	26.5	volts
Grid-No.2 Voltage	26.5	volts
Grid-No.1 (Control-Grid) Voltage	−7	volts
Peak AF Grid-No.1-to-Grid No.1 Voltage	14	volts
Zero-Signal Plate Current	19	ma

→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

26A7-GT

TWIN BEAM POWER TUBE

Max.-Signal Plate Current.	30		ma
Zero-Signal Grid-No.2 Current (Approx.). .	2		ma
Max.-Signal Grid-No.2 Current (Approx.). .	8.5		ma
Effective Load Resistance (Plate to plate)	2500		ohms
Total Harmonic Distortion.	5		%
Max.-Signal Power Output	500		mw

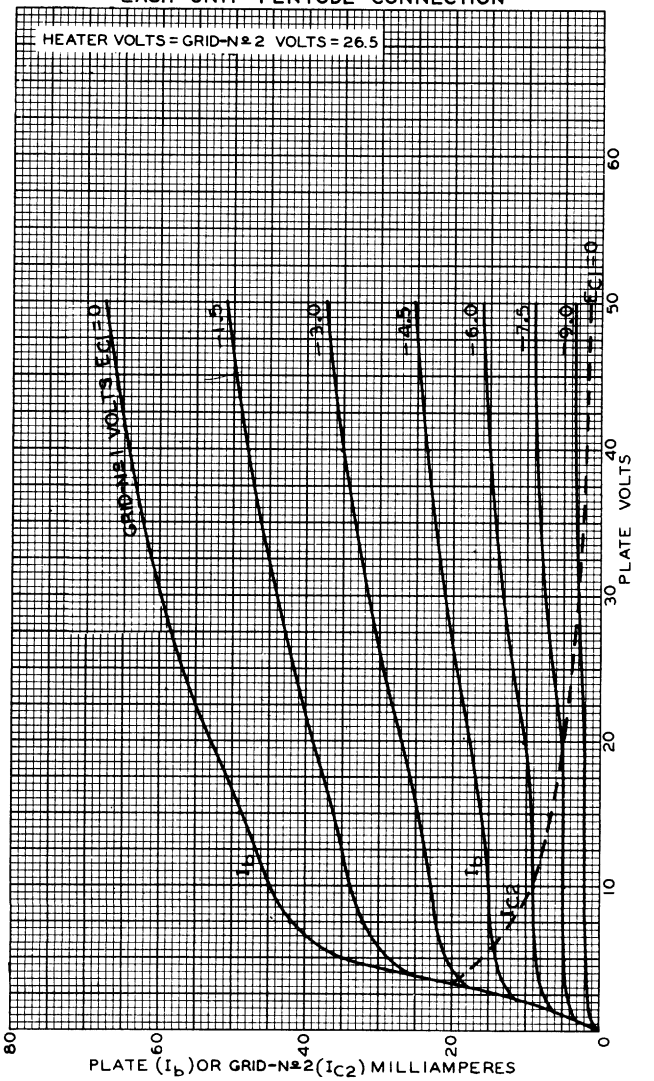
Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For maximum rated conditions:			
With cathode bias.	0.5	max.	megohm
With fixed bias.	0.1	max.	megohm
For conditions where the maximum design values of plate voltage and grid-No.2 voltage do not exceed 26.5 volts:			
With grid-resistor bias.	0.5	max.	megohm

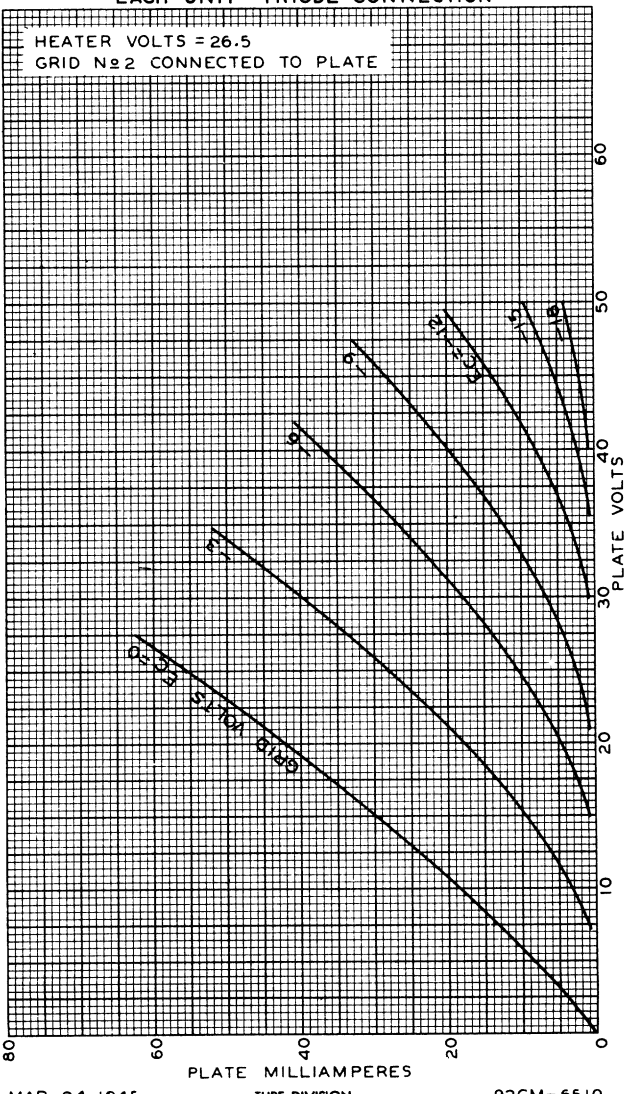
←Indicates a change.

26A7-GT

AVERAGE PLATE CHARACTERISTICS
EACH UNIT - PENTODE CONNECTION



26A7-GT
AVERAGE PLATE CHARACTERISTICS
EACH UNIT - TRIODE CONNECTION



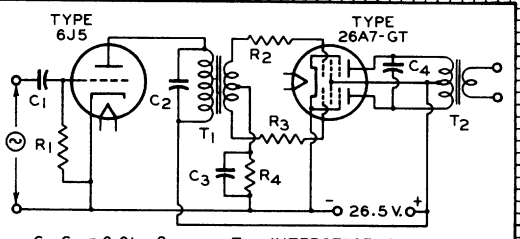
MAR. 24, 1945 TUBE DIVISION 92CM-6510
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

26A7-GT

OPERATION CHARACTERISTICS

PUSH-PULL CIRCUIT

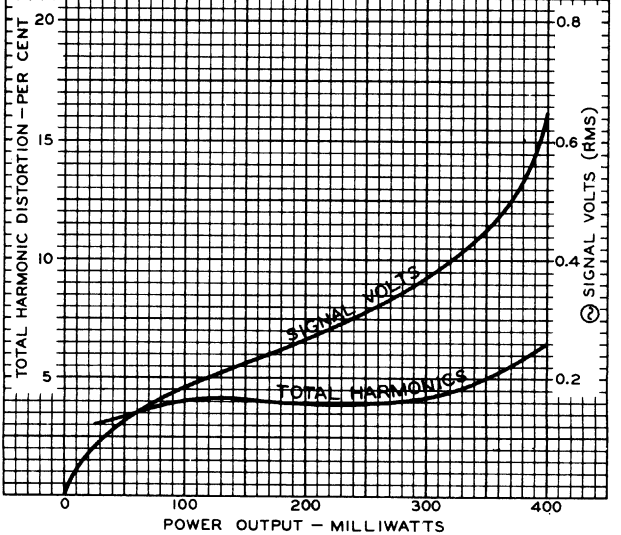
HEATER VOLTS = 26.5



C_1, C_4 = 0.01 μf
C_2 = 0.002 μf
C_3 = 1.0 μf
R_1 = 2.2 MEGOHMS
R_2, R_3 = 100 OHMS
R_4 = 0.2 MEGOHM

T_1 = INTERSTAGE COUPLING TRANSFORMER: TURNS RATIO (PRIMARY TO ½ SECONDARY) = 3:1

T_2 = OUTPUT TRANSFORMER: PLATE-TO-PLATE LOAD, 2000 OHMS



26C6
DUPLEX-DIODE TRIODE

MINIATURE TYPE

For use with 12-cell storage-battery supply

GENERAL DATA

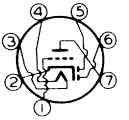
Electrical:

Heater, for Unipotential Cathode:		
Voltage	26.5	ac or dc volts
Current	0.07	amp
Direct Interelectrode Capacitances:[o]		
Triode Unit: Grid to Plate	2.0	μμf
Grid to Cathode & Heater	1.8	μμf
Plate to Cathode & Heater	1.4	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length from Base Seat to Bulb Top (excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Miniature Button 7-Pin
Basing Designation for BOTTOM VIEW	7BT

Pin 1 – Triode Grid
Pin 2 – Cathode
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Diode Plate No.2
Pin 6 – Diode Plate No.1
Pin 7 – Triode Plate



TRIODE UNIT – Class A_1 AMPLIFIER

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	250 max.	volts
PLATE DISSIPATION	2.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Characteristics:

Plate Voltage	26.5	250	volts
Grid Voltage:			
From a fixed supply of	–	-9	volts
From a grid resistor of	2.0	–	megohms
Amplification Factor	17	16	
Plate Resistance	15500	8500	ohms
Transconductance	1100	1900	μmhos
Plate Current	1.1	9.5	ma.

Typical Operation with Resistance Coupling:

See RESISTANCE-COUPLED AMPLIFIER CHART, Type 6R7.

[o] with external shield connected to cathode. Values are approximate.

26C6

DUPLEX-DIODE TRIODE

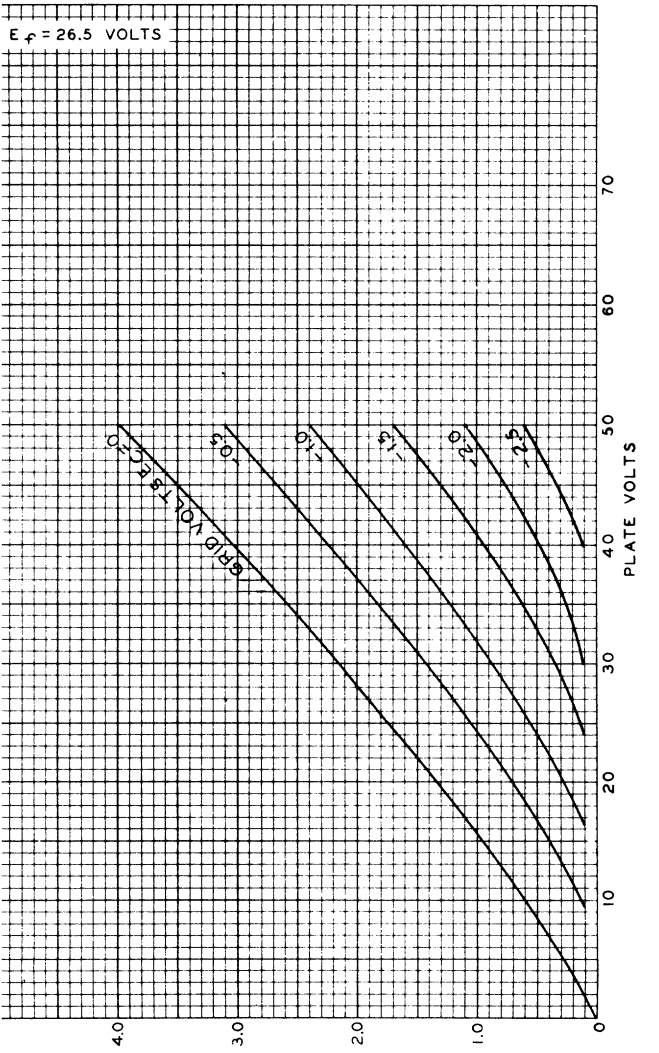
DIODE UNITS – Two

The two diode plates are placed around a cathode, the sleeve of which is common to the triode unit. Each diode plate has its own base pin. Diode curves in the front of the RECEIVING TUBE SECTION apply to the 26C6.

Additional curves applying to the 26C6 are shown under Types 6R7, and 6SR7

26C6

AVERAGE PLATE CHARACTERISTICS



JUNE 10,1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6772

26D6

PENTAGRID CONVERTER

MINIATURE TYPE

For use with 12-cell storage-battery supply

GENERAL DATA

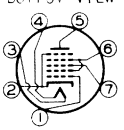
Electrical:

Heater, for Unipotential Cathode:		
Voltage	26.5	ac or dc volts
Current	0.07	amp
Direct Interelectrode Capacitances:		
Grid #3 to All Other Electrodes (RF Input)	7.5●	μμf
Plate to All Other Electrodes (Mixer Output)	14●	μμf
Grid #1 to All Other Electrodes (Osc. Input)	5.8●	μμf
Grid #3 to Plate	0.30 max.●	μμf
Grid #1 to Grid #3	0.15 max.●	μμf
Grid #1 to Plate	0.03 max.●	μμf
Grid #1 to External Shield and All Other Electrodes Except Cathode & Grid No.5	2.9	μμf
Grid #1 to Cathode & Grid #5	2.8▲	μμf
Cathode to External Shield and All Other Electrodes Except Grid #1	15.5	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length from Base Seat to Bulb Top (excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Miniature Button 7-Pin
Basing Designation for BOTTOM VIEW	7CH

Pin 1 – Grid No.1
Pin 2 – Cathode, Grid No.5
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2, Grid No.4
Pin 7 – Grid No.3



CONVERTER

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	300 max. volts
GRIDS-No.2 & No.4 (SCREEN) VOLTAGE	100 max. volts
GRIDS-No.2 & No.4 SUPPLY VOLTAGE	300 max. volts
PLATE DISSIPATION	1.0 max. watt
GRIDS-No.2 & No.4 DISSIPATION	1.0 max. watt
TOTAL CATHODE CURRENT	14 max. ma.
GRID-No.3 (CONTROL GRID) VOLTAGE:	
Negative bias value	50 max. volts
Positive bias value	0 max. volts
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode	90 max. volts
Heater positive with respect to cathode	90 max. volts

● with external shield connected to cathode.
▲ with external shield connected to other electrodes.

RCA

26D6

PENTAGRID CONVERTER

Characteristics - *Separate Excitation*:□				
Plate Voltage.	26.5	100	250	volts
Grids-No.2 & No.4 Voltage. .	26.5	100	100	volts
Grid-No.3 Voltage.	-0.5	-1.5	-1.5	volts
Grid-No.1 (Oscillator-Grid) Resistor	20000	20000	20000	ohms
Plate Resistance (Approx.) .	–	0.5	1.0	megohm
Conversion Transconductance	270	455	475	μmhos
Conversion Transconductance (Approx.)*	–	4	4	μmhos
Conversion Transconductance (Approx.)**	8	–	–	μmhos
Plate Current.	0.45	2.8	3.0	ma.
Grids-No.2 & No.4 Current. .	1.6	8.0	7.8	ma.
Grid-No.1 Current.	0.1	0.5	0.5	ma.
Total Cathode Current. . . .	2.15	11.3	11.3	ma.

Characteristics of Oscillator Section:▲			
Plate Voltage.	26.5	100	volts
Grids-No.2 & No.4 Voltage.	26.5	100	volts
Grid-No.3 Voltage.	0	0	volts
Grid-No.1 Voltage.	0	0	volts
Amplification Factor	–	22	
Transconductance	4500	7200	μmhos
Plate Current.	5.5	27	ma.

□ The characteristics shown with separate excitation correspond very closely with those obtained in a self-excited oscillator circuit operating with zero bias.

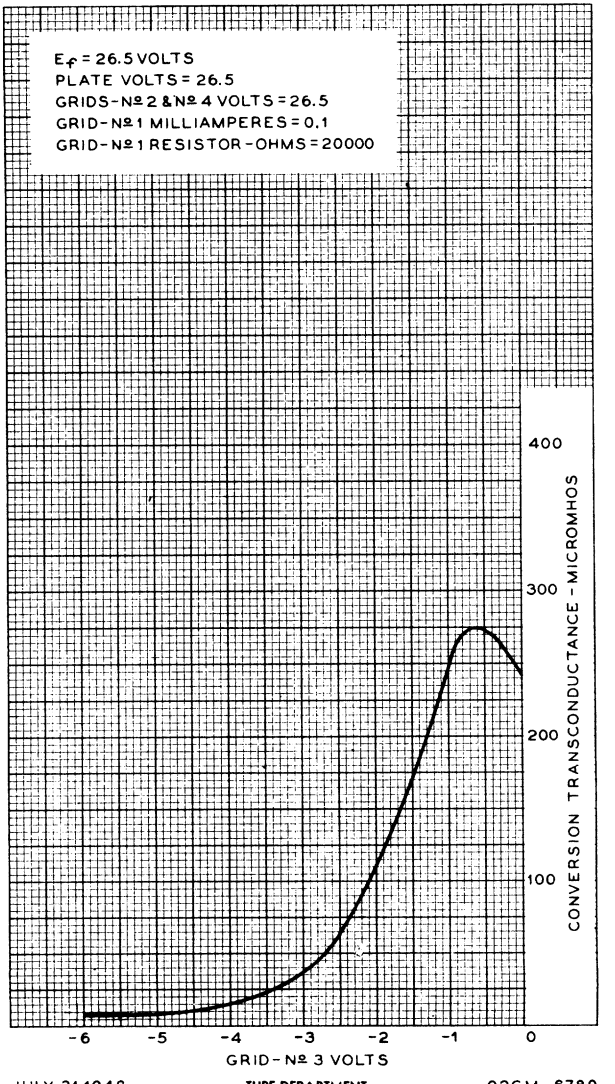
* With grid-No.3 bias of -30 volts.

** With grid-No.3 bias of -6 volts.

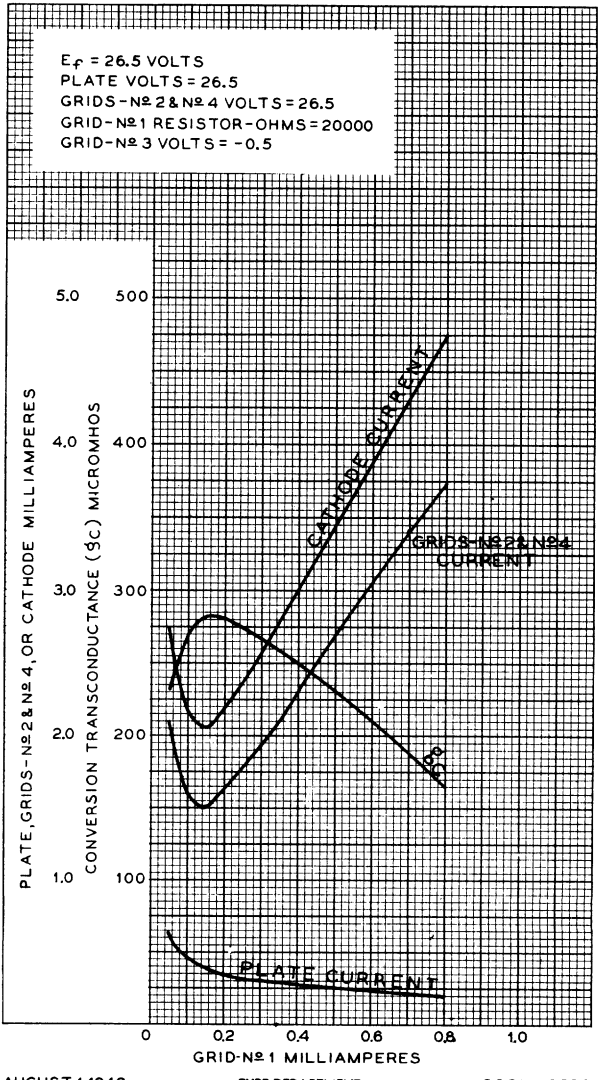
▲ Measured between grid No.1 and grids-No.2 and No.4 connected to plate (not oscillating).

The curves under Type 6BE6 also apply to the 26D6

26D6
OPERATION CHARACTERISTICS
WITH SEPARATE OSCILLATOR EXCITATION



26D6
OPERATION CHARACTERISTICS
WITH SEPARATE OSCILLATOR EXCITATION



32ET5A

Power Pentode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

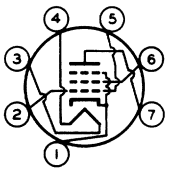
Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*			
Current	0.100 ± 0.006		amp
Voltage (AC or DC) at heater amperes = 0.100	32		volts
Warm-up time (Average)	20		sec
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances (Approx.):[b]			
Grid No.1 to plate	0.6		pf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	12.0		pf
Plate to cathode & grid No.3, grid No.2, and heater	6.0		pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CV

Pin 1 - Cathode, Grid No.3
Pin 2 - Grid No.1
Pin 3 - Heater



Pin 4 - Heater
Pin 5 - Grid No.1
Pin 6 - Grid No.2
Pin 7 - Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	150	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	130	max.	volts
GRID-No.2 INPUT	1.2	max.	watts
PLATE DISSIPATION	5.4	max.	watts

32ET5A

Typical Operation and Characteristics:

Plate Voltage	110		volts
Grid-No.2 Voltage	110		volts
Grid-No.1 Voltage	-7.5		volts
Peak AF Grid-No.1 Voltage	7.5		volts
Zero-Signal Plate Current	30		ma
Zero-Signal Grid-No.2 Current	2.8		ma
Plate Resistance (Approx.)	21500		ohms
Transconductance	5500		μmhos
Load Resistance	2800		ohms
Total Harmonic Distortion	10		%
Max.-Signal Power Output	1.2		watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.1	max.	megohm
For cathode-bias operation	0.5	max.	megohm

[a] The dc component must not exceed 100 volts.
[b] Without external shield.

Half-Wave Vacuum Rectifier

The 34CM3 is the same as the 6CM3 except for the following items:

Heater Characteristics and Ratings

Current	0.450 ± 0.030	A
Voltage (AC or DC) at 0.450 A	33.5	V
Warm-up time (Average)	11	s

34GD5A

Beam Power Tube

7-PIN MINIATURE TYPE
With Heater Having Controlled Warm-Up Time

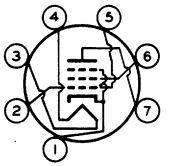
GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	34	volts
Current	0.1 ± 6%	amp
Warm-up time (Average)	20	sec
Direct Interelectrode Capacitances (Approx.):[a]		
Grid No.1 to plate	0.6	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	12	μμf
Plate to cathode & grid No.3, grid No.2, and heater	6	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CV



Pin 1 - Cathode, Grid No.3
Pin 2 - Grid No.1
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Grid No.1
Pin 6 - Grid No.2
Pin 7 - Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	150	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	130	max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Negative-bias value	50	max.	volts
Positive-bias value	0	max.	volts
GRID-No.2 INPUT	1.1	max.	watts
PLATE DISSIPATION	5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250	max.	°C

34GD5A

Typical Operation and Characteristics:

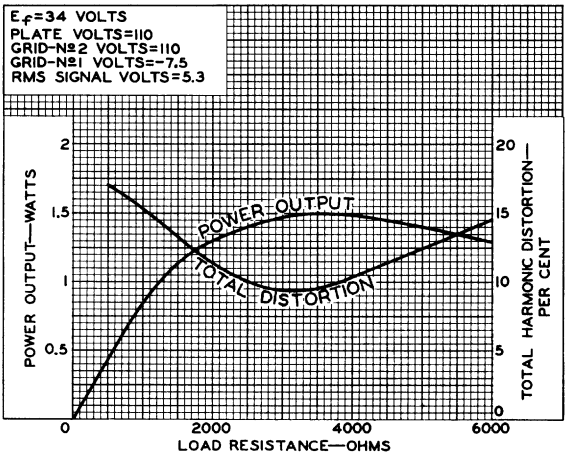
Plate Voltage	110	volts
Grid-No.2 Voltage	110	volts
Grid-No.1 Voltage	-7.5	volts
Peak AF Grid-No.1 Voltage	7.5	volts
Zero-Signal Plate Current	35	ma
Zero-Signal Grid-No.2 Current	3	ma
Plate Resistance (Approx.)	13000	ohms
Transconductance	5700	μmhos
Load Resistance	2500	ohms
Total Harmonic Distortion	10	%
Max.-Signal Power Output	1.4	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

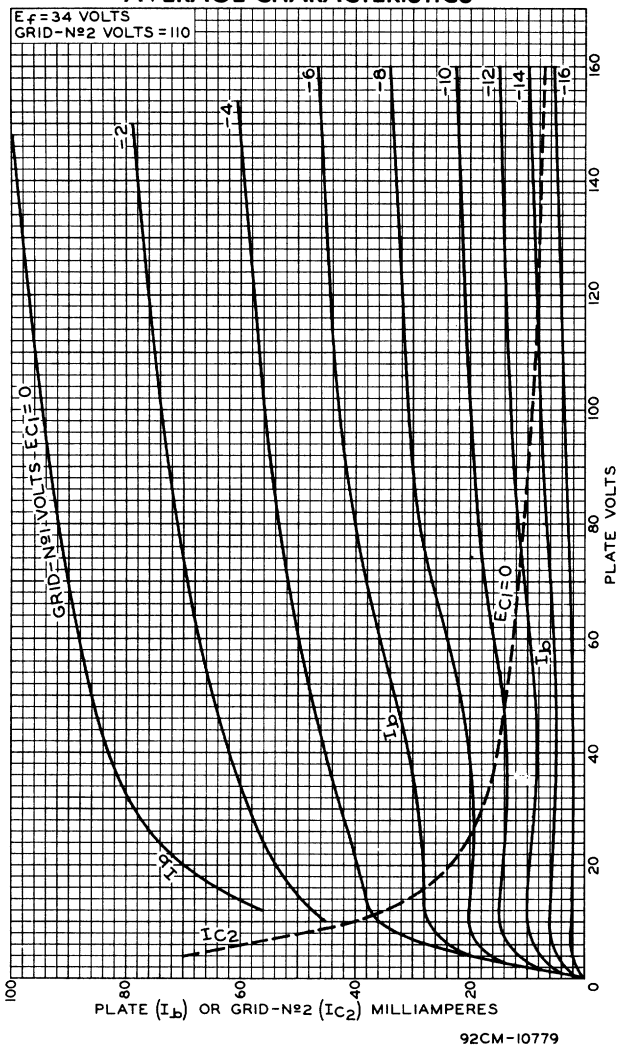
[a] Without external shield.
[b] The dc component must not exceed 100 volts.

OPERATION CHARACTERISTICS



92CS-10780

AVERAGE CHARACTERISTICS



92CM-10779

35C5

Beam Power Tube

7-PIN MINIATURE TYPE

GENERAL DATA

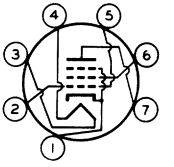
Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	35 ± 10%	volts ←
Current at 35 volts	0.15	amp
Direct Interelectrode Capacitances (Approx.):[a]		
Grid No.1 to plate	0.6	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	12	μμf
Plate to cathode & grid No.3, grid No.2, and heater	9	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CV

Pin 1 - Cathode, Grid No.3
Pin 2 - Grid No.1
Pin 3 - Heater



Pin 4 - Heater
Pin 5 - Grid No.1
Pin 6 - Grid No.2
Pin 7 - Plate

AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:* ←

PLATE VOLTAGE	150	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	130	max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0	max.	volts
GRID-No.2 INPUT	1.1	max.	watts
PLATE DISSIPATION	5.2	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250	max.	°C

←Indicates a change.

Typical Operation and Characteristics:

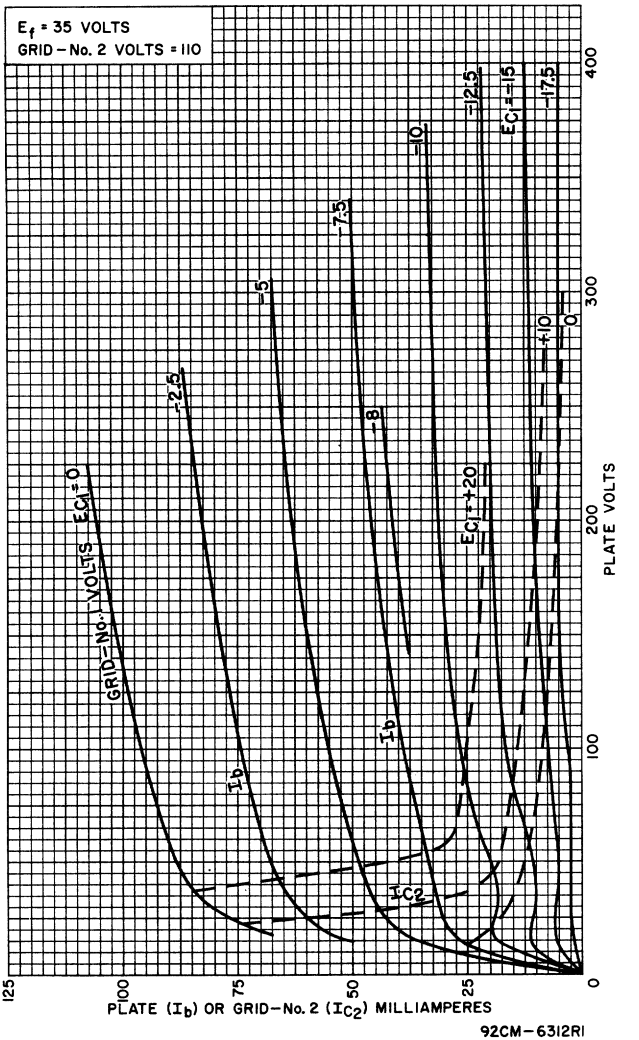
Plate Voltage	110	volts
Grid-No.2 Voltage	110	volts
Grid-No.1 (Control-Grid) Voltage	-7.5	volts
Peak AF Grid-No.1 Voltage	7.5	volts
Zero-Signal Plate Current	40	ma
Max.-Signal Plate Current	41	ma
Zero-Signal Grid-No.2 Current	3	ma
Max.-Signal Grid-No.2 Current	7	ma
Plate Resistance (Approx.)	13000	ohms
Transconductance	5800	μmhos
Load Resistance	2500	ohms
Total Harmonic Distortion	10	%
Max.-Signal Power Output	1.5	watts

Maximum Circuit Values:

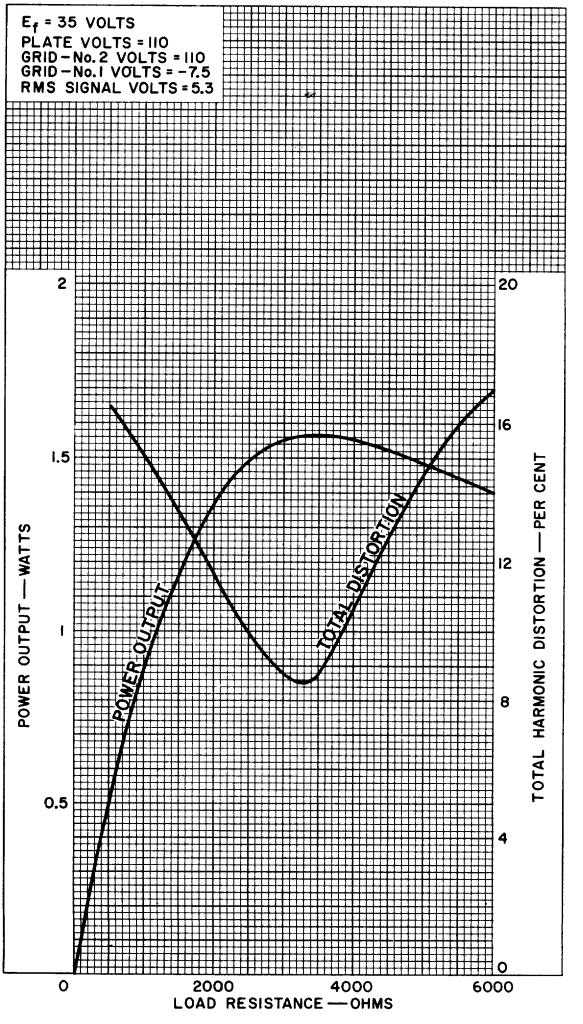
Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

[a] Without external shield.
[b] The dc component must not exceed 100 volts.

AVERAGE CHARACTERISTICS



OPERATION CHARACTERISTICS



92CM-6794

35EH5

Power Pentode

7-PIN MINIATURE TYPE

GENERAL DATA

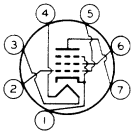
Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	35 ± 10%	volts
Current at 35 volts	0.15	amp
Direct Interelectrode Capacitances (Approx.):▲		
Grid No.1 to plate	0.65	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	17	μμf
Plate to cathode & grid No.3, grid No.2, and heater	9	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CV

Pin 1 – Cathode, Grid No.3
Pin 2 – Grid No.1
Pin 3 – Heater



Pin 4 – Heater
Pin 5 – Grid No.1
Pin 6 – Grid No.2
Pin 7 – Plate

AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	150	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	130	max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0	max.	volts
GRID-No.2 INPUT	1.75	max.	watts
PLATE DISSIPATION	5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200●	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	225	max.	°C

35EH5

Typical Operation and Characteristics:

Plate Supply Voltage	110	volts
Grid-No.2 Supply Voltage	115	volts
Cathode Resistor	62	ohms
Peak AF Grid-No.1 Voltage	3	volts
Zero-Signal Plate Current	32	ma
Max.-Signal Plate Current	32	ma
Zero-Signal Grid-No.2 Current	7.2	ma
Max.-Signal Grid-No.2 Current	12	ma
Plate Resistance (Approx.)	14000	ohms
Transconductance	12000	μmhos
Load Resistance	3000	ohms
Total Harmonic Distortion	8	%
Max.-Signal Power Output	1.2	watts

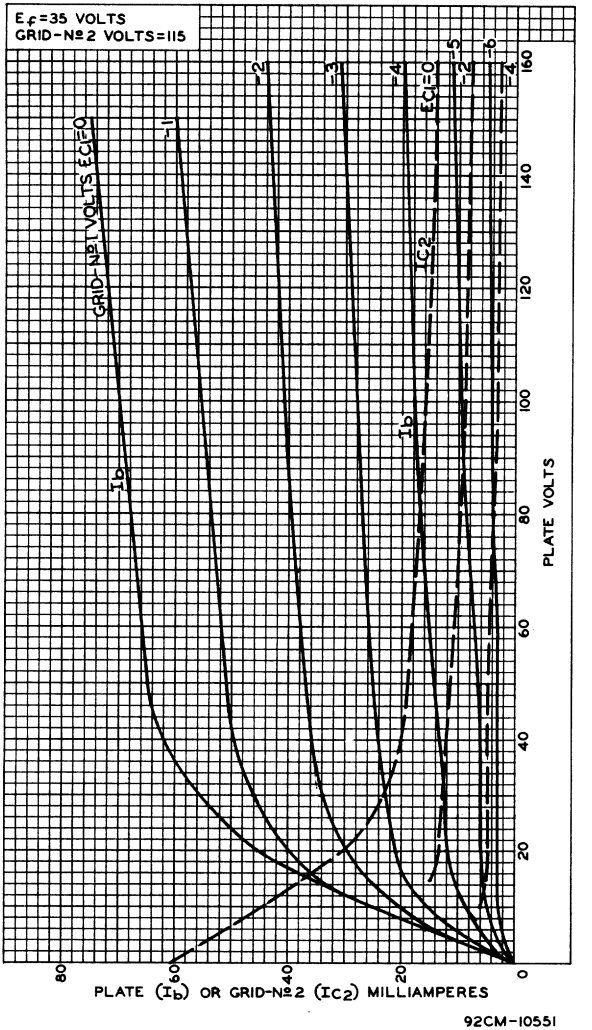
Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

▲ Without external shield.

● The dc component must not exceed 100 volts.

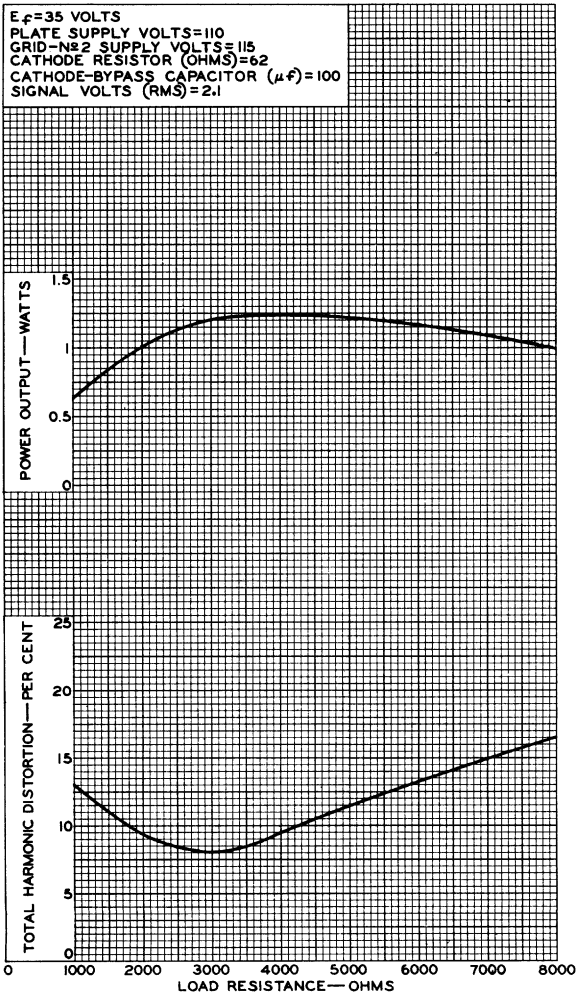
AVERAGE CHARACTERISTICS



92CM-10551

35EH5

OPERATION CHARACTERISTICS



92CM-10547

35L6-GT
BEAM POWER AMPLIFIER

GENERAL DATA

Electrical:

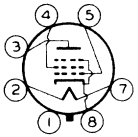
Heater, for Unipotential Cathode:		
Voltage	35	ac or dc volts
Current	0.15	amp
Direct Interelectrode Capacitances (Approx.):[o]		
Grid No.1 to Plate	0.8	μμf
Input	13	μμf
Output	9.5	μμf

[o] With no external shield.

Mechanical:

Mounting Position	Any
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-5/16"
Bulb	T-9
Base	Intermediate-Shell Octal 7-Pin
Basing Designation for BOTTOM VIEW	G-7AC

Pin 1 - No Connection
Pin 2 - Heater
Pin 3 - Plate
Pin 4 - Grid No.2



Pin 5 - Grid No.1
Pin 7 - Heater
Pin 8 - Cathode, Grid No.3

AF POWER AMPLIFIER - Class A_1

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	200 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	117 max.	volts
PLATE DISSIPATION	8.5 max.	watts
GRID-No.2 DISSIPATION	1.0 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Typical Operation and Characteristics:

Plate Voltage	110	200	volts
Grid-No.2 Voltage	110	110	volts
Grid-No.1 (Control-Grid) Voltage	-7.5	-8	volts
Peak AF Grid-No.1 Voltage	7.5	8	volts
Zero-Signal Plate Current	40	41	ma.
Max.-Signal Plate Current	41	44	ma.
Zero-Signal Grid-No.2 Current	3	2	ma.
Max.-Signal Grid-No.2 Current	7	7	ma.
Plate Resistance (Approx.)	14000	40000	ohms
Transconductance	5800	5900	μmhos
Load Resistance	2500	4500	ohms
Total Harmonic Distortion	10	10	%
Max.-Sig. Power Output	1.5	3.3	watts

35L6-GT

35L6-GT
BEAM POWER AMPLIFIER

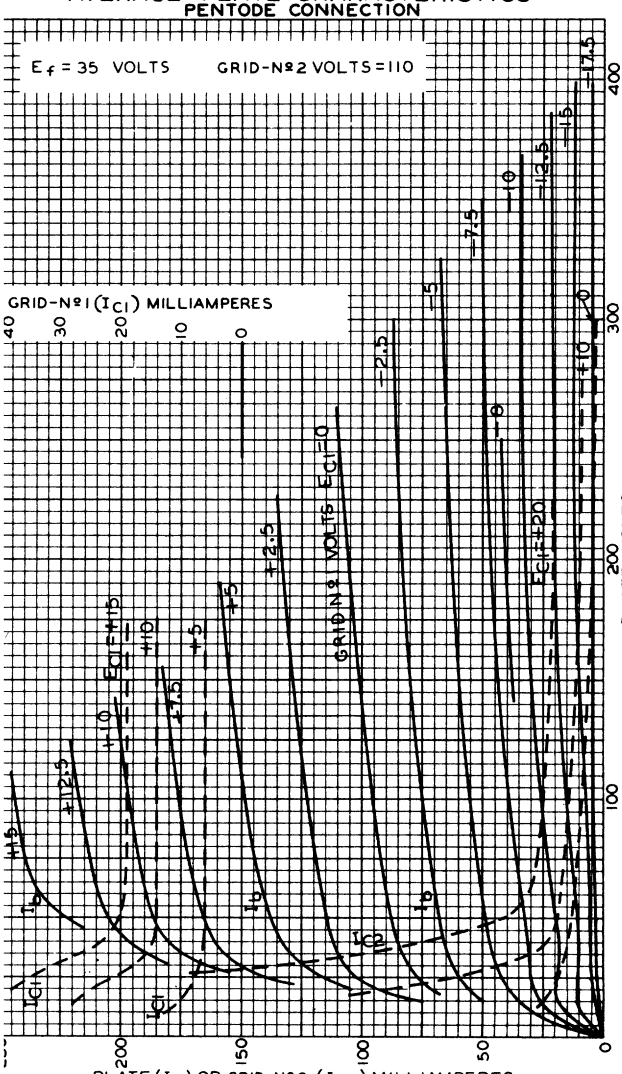
Maximum Circuit Values (for maximum rated conditions):

Grid-No.1-Circuit Resistance:		
For fixed bias	0.1	. . megohm
For cathode bias	0.5	. . megohm

Curves shown under Type 35B5 are also applicable to the 35L6-GT.

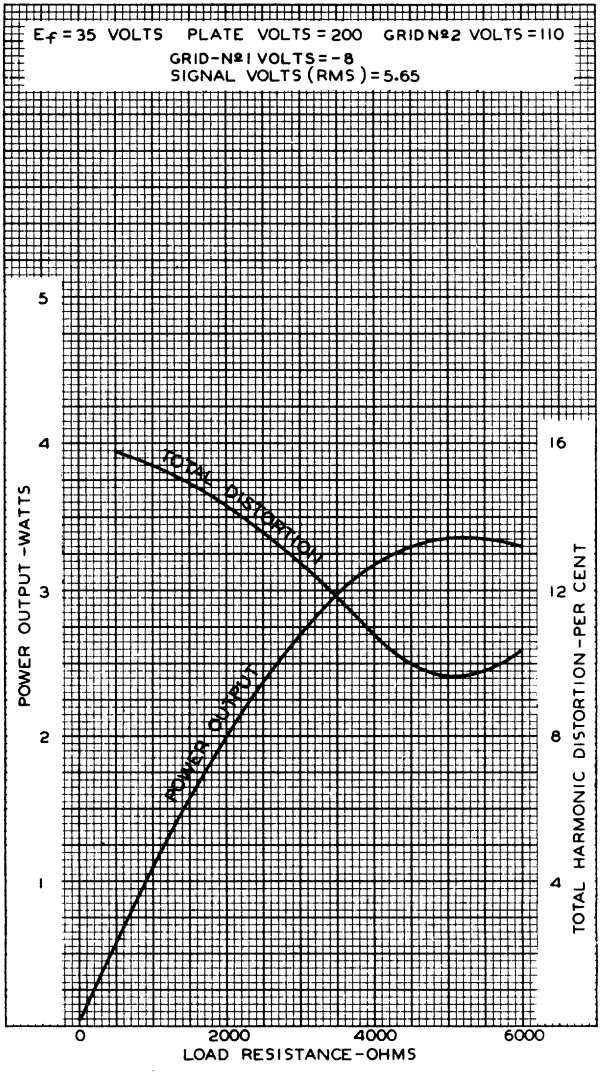
35L6-GT

AVERAGE PLATE CHARACTERISTICS
PENTODE CONNECTION



35L6-GT

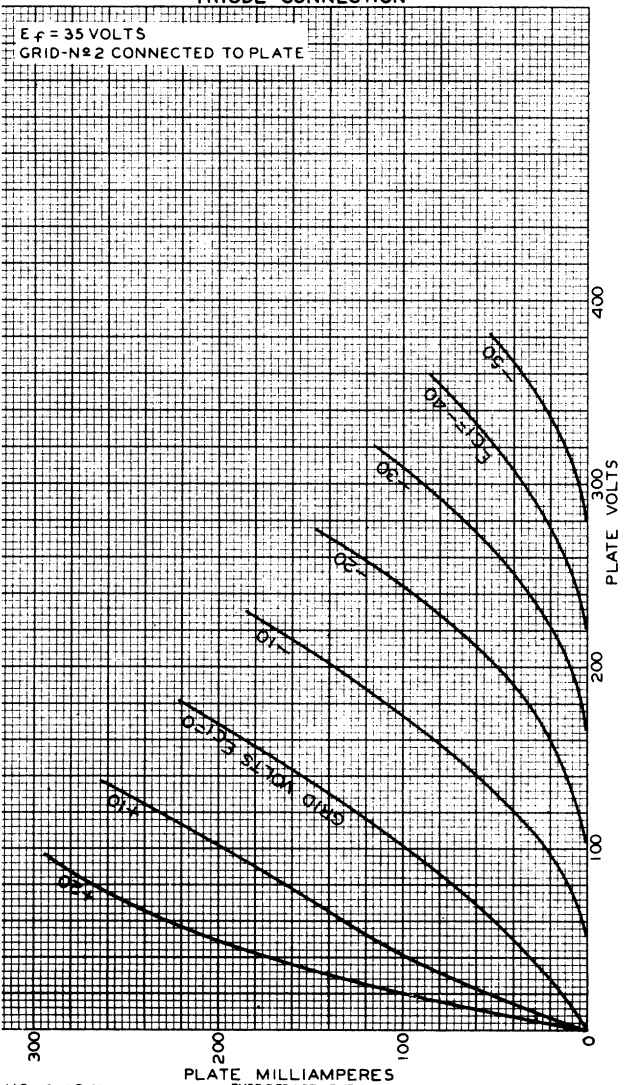
OPERATION CHARACTERISTICS



35L6-GT

AVERAGE PLATE CHARACTERISTICS

TRIODE CONNECTION



AUG. 6, 1941
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-6307RI

35W4
HALF-WAVE VACUUM RECTIFIER

MINIATURE TYPE

GENERAL DATA

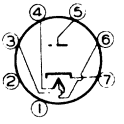
Electrical:

	Without Panel Lamp	With No. 40 or No. 47 Panel Lamp	
Heater, for Unipotential Cathode:			
Voltage (AC or DC):			
Entire Heater (pins 3 & 4). .	35	32	. . volts
Panel-Lamp Section (pins 4 & 6)	7.5	5.5	. . volts
Current (between pins 3 & 4 . .	0.15	–	. . amp
Current (between pins 3 & 6 . .	–	0.15	. . amp

Mechanical:

Mounting Position.	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length.	2-3/8"
Length from Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin
Basing Designation for BOTTOM VIEW	5BQ

Pin 1 – No Connection
Pin 2 – No Connection
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Plate



Pin 6 – Heater Tap
Pin 7 – Cathode
Panel-Lamp Heater Section is between pins 4 & 6

HALF-WAVE RECTIFIER

Maximum Ratings, *Design-Center Values*:

PEAK INVERSE PLATE VOLTAGE	330 max.	volts
PEAK PLATE CURRENT	600 max.	ma
DC OUTPUT CURRENT:		
With Panel Lamp & (No Shunting Resistor.	60 max.	ma
With Panel Lamp & (Shunting Resistor . .	90 max.	ma
Without Panel Lamp	100 max.	ma
PANEL-LAMP-SECTION VOLTAGE (RMS):		
When panel lamp fails.	15 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	330 max.	volts
Heater positive with respect to cathode.	330 max.	volts

Typical Operation with No.40 or No.47 Panel Lamp in Accompanying Half-Wave Circuit with Capacitor-Input Filter:

AC Plate-Supply Volt. (RMS).	117	117	117	117	. . volts
Filter-Input Capacitor . . .	40	40	40	40	. . µf
Min. Total Effective Plate-Supply Impedance . .	15	15	15	15	. . ohms
Panel-Lamp Shunting Res. . .	–	300	150	100	. . ohms
DC Output Current.	60	70	80	90	. . ma ←

← Indicates a change.

35W4

35W4

HALF-WAVE VACUUM RECTIFIER

Typical Operation Without Panel Lamp in Conventional Half-Wave Circuit with Capacitor-Input Filter:

AC Plate-Supply Voltage (RMS)	117	volts
Filter-Input Capacitor	40	μf
Min. Total Effective Plate-Supply Imped.	15	ohms
DC Output Current	100	ma
DC Output Voltage at Input to Filter (Approx.):		
→ At half-load current (50 ma.)	135	volts
At full-load current (100 ma.)	120	volts
Voltage Regulation (Approx.):		
→ Half-load to full-load current	15	volts

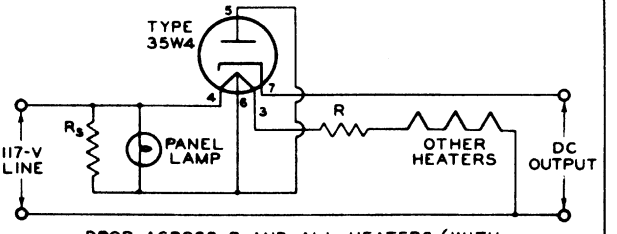
Maximum Circuit Values:

Panel-Lamp Shunting Resistor:*

For dc output current of	70 ma.	800 max.	ohms
	80 ma.	400 max.	ohms
	90 ma.	250 max.	ohms

*Required when dc output current is greater than 60 ma.

HALF-WAVE CIRCUIT
with No.40 or No.47 Panel Lamp



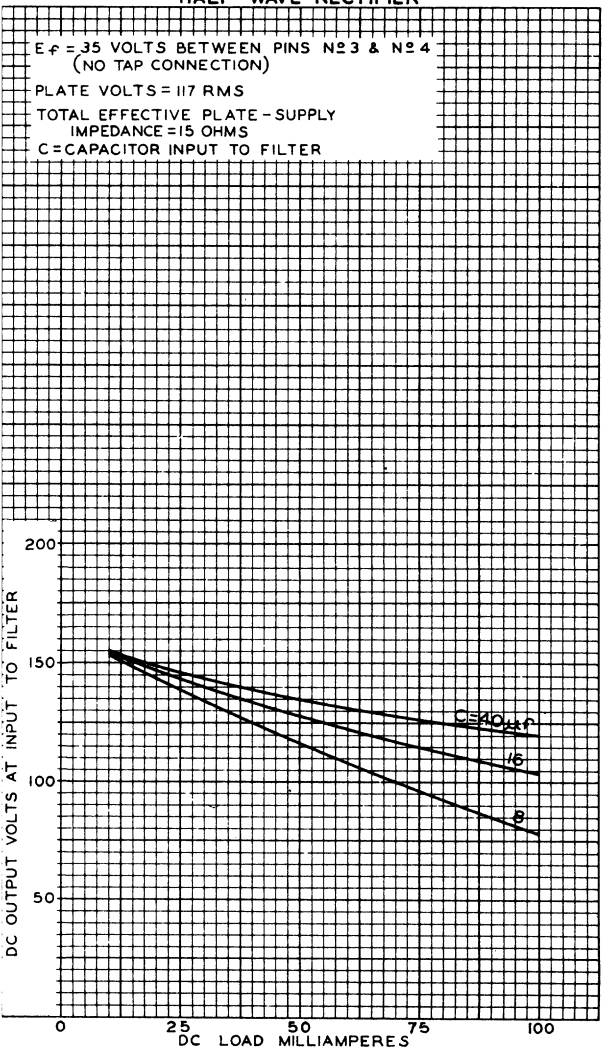
DROP ACROSS R AND ALL HEATERS (WITH PANEL LAMP) SHOULD EQUAL 117 VOLTS AT 0.15 AMPERE. R_s = SHUNTING RESISTOR REQUIRED WHEN DC OUTPUT CURRENT EXCEEDS 60 MILLIAMPERES

92CS-6626

Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.

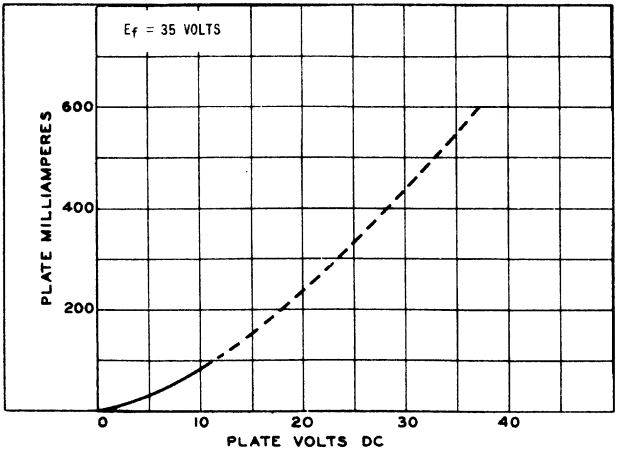
→ Indicates a change.

35W4
OPERATION CHARACTERISTICS
HALF-WAVE RECTIFIER



35W4

AVERAGE PLATE CHARACTERISTIC



92CM-6305TV

36AM3B

Half-Wave Vacuum Rectifier

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

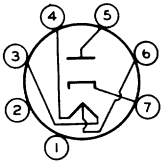
GENERAL DATA

Electrical:

Heater[a], for Unipotential Cathode:		
Voltage (AC or DC):		
Entire heater (Pins 3 and 4)	36	volts
Tap-section (Pins 3 and 6)	32	volts
Current:		
Tap-section (Pins 3 and 6)	0.1 ± 6%	amp
Warm-up time (Average)	20	sec

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	5BQ



Pin 1 - No Connection
Pin 2 - No Connection
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Heater Tap
Pin 7 - Cathode

HALF-WAVE RECTIFIER

Maximum Ratings, *Design-Maximum Values:*

PEAK INVERSE PLATE VOLTAGE	365	max.	volts
PEAK PLATE CURRENT	530	max.	ma
DC OUTPUT CURRENT	82	max.	ma
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	350[b]	max.	volts
Heater positive with respect to cathode	200[c]	max.	volts

Typical Operation:

	In accompanying typical half-wave circuit with capacitor-input filter	
AC Plate Supply Voltage (RMS)	120	volts
Filter-Input Capacitor	40	μf
Total Effective Plate Supply Resistance	[a]	
DC Output Current	75	ma
DC Output Voltage at Input to Filter (Approx.)	118	volts

36AM3B

Characteristics:

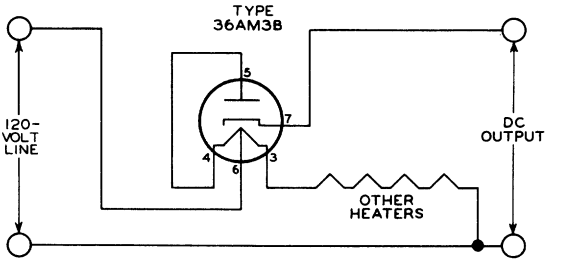
Tube-Voltage Drop for plate ma. = 150 . . . . 16 volts

[a] The *heater* of the 36AM3B is designed so that the heater section between pins 4 and 6 is used as a limiting resistance in the rectifier plate circuit (See accompanying *Typical Half-Wave Circuit*). This type is *not* designed for use with a panel lamp where the heater section between pins 4 and 6 is used as a panel-lamp shunt.

[b] The DC component must not exceed 350 volts.

[c] The DC component must not exceed 100 volts.

TYPICAL HALF-WAVE CIRCUIT



92CS-10238R3

Beam Power Tube

The 36MC6 is the same as the 6MC6 except for:

Heater Characteristics and Ratings

Current	0.450 + 0.030	A
Voltage (AC or DC) at 0.450 A	36.0	V

50B5

BEAM POWER AMPLIFIER

MINIATURE TYPE

GENERAL DATA

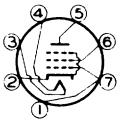
Electrical:

Heater, for Unipotential Cathode:		
Voltage	50	ac or dc volts
Current	0.15	amp.
Direct Interelectrode Capacitances (Approx.):[o]		
Grid-No.1 to Plate	0.5	μμf
Input	13	μμf
Output	6.5	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length from Base Seat to Bulb Top (excluding tip)	2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Miniature Button 7-Pin
Basing Designation for BOTTOM VIEW	7BZ

Pin 1 - Grid No.1
Pin 2 - Cathode, Grid No.3
Pin 3 - Heater



Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Grid No.1

CLASS A_1 AMPLIFIER

Maximum Ratings, *Design-Center Values*:

PLATE VOLTAGE	117 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	117 max.	volts
PLATE DISSIPATION	5.5 max.	watts
GRID-No.2 DISSIPATION	1.25 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Typical Operation and Characteristics:

Plate Voltage	110	volts
Grid-No.2 Voltage	110	volts
Grid-No.1 Voltage	-7.5	volts
Peak A-F Grid-No.1 Voltage	7.5	volts
Zero-Signal Plate Current	49	ma.
Max.-Signal Plate Current	50	ma.

[o] With no external shield.

50B5

50B5

BEAM POWER AMPLIFIER

Zero-Signal Grid-No.2 Current (Approx.)		4	ma.
Max.-Signal Grid-No.2 Current (Approx.)		8.5	ma.
Plate Resistance (Approx.)		14000	ohms
Transconductance		7500	μmhos
Load Resistance		2500	ohms
Total Harmonic Distortion		9	%
Max.-Sig. Power Output		1.9	watts

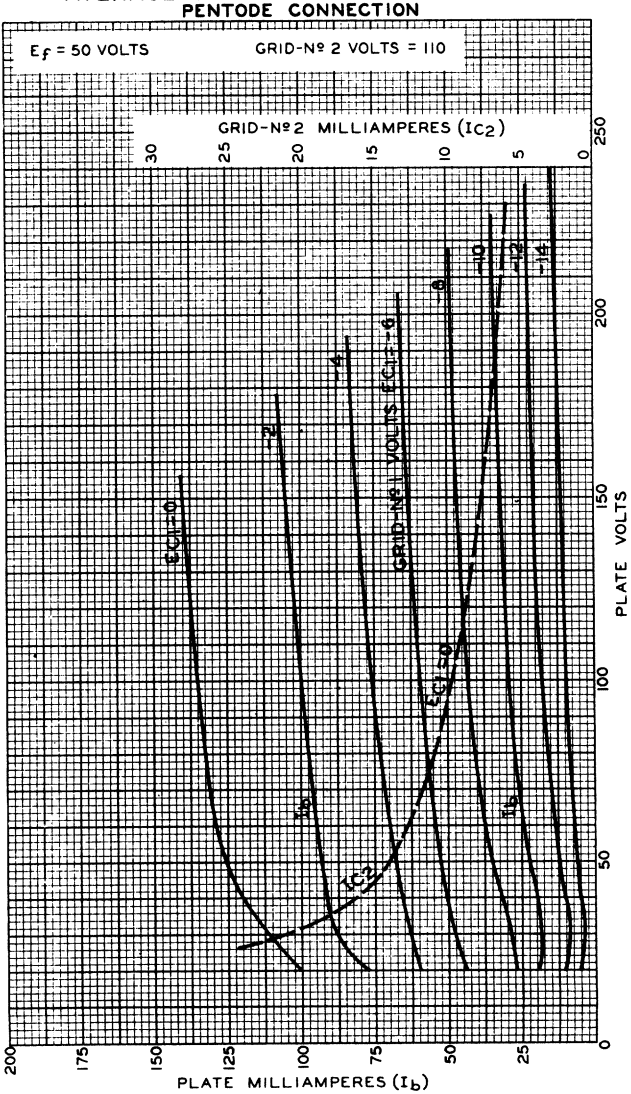
Maximum Circuit Values (for maximum rated conditions):

Grid-No.1-Circuit Res.	fixed bias	0.1	megohm
	cathode bias	0.5	megohm

50B5

AVERAGE PLATE CHARACTERISTICS

PENTODE CONNECTION



OCT. 8, 1945

RCA VICTOR DIVISION

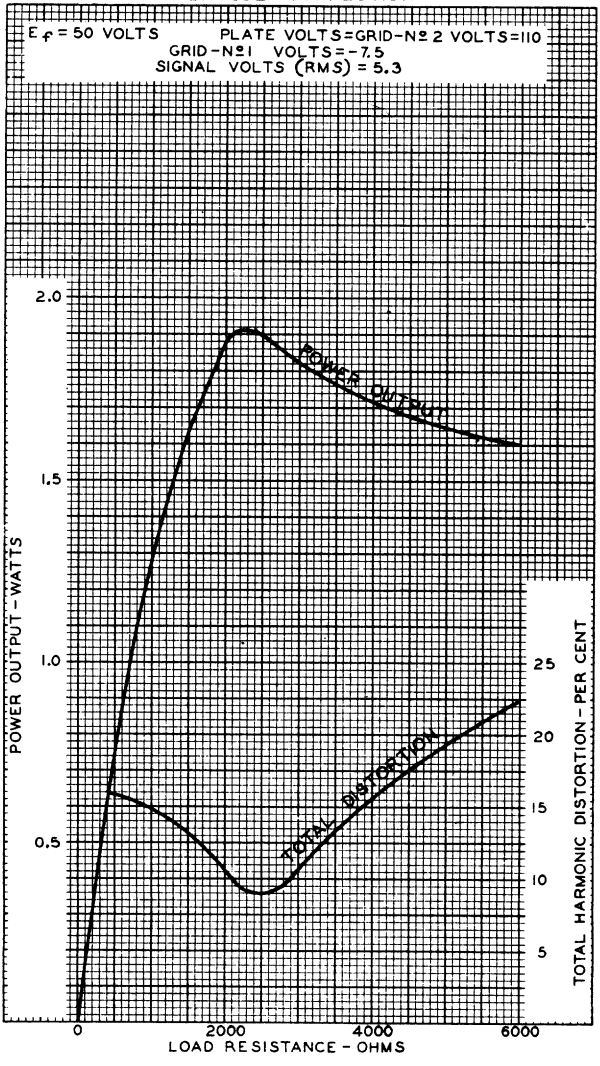
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6603

50B5

OPERATION CHARACTERISTICS

PENTODE CONNECTION



50C5

BEAM POWER TUBE

7-PIN MINIATURE TYPE

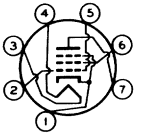
GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	50 + 10%	volts
Current	0.15	amp
Direct Interelectrode Capacitances (Approx.):[o]		
Grid No.1 to plate	0.6	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	13	μμf
Plate to cathode & grid No.3, grid No.2, and heater	8.5	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CV



Pin 1 - Cathode, Grid No.3
Pin 2 - Grid No.1
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Grid No.1
Pin 6 - Grid No.2
Pin 7 - Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	150	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	130	max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE	0	max.	volts
GRID-No.2 INPUT	1.4	max.	watts
PLATE DISSIPATION	7	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	220	max.	°C

◄ Indicates a change.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

50C5

BEAM POWER TUBE

Typical Operation and Characteristics:

Plate Voltage	120	volts
Grid-No.2 Voltage	110	volts
Grid-No.1 Voltage	-8	volts
Peak AF Grid-No.1 Voltage	8	volts
Zero-Signal Plate Current	49	ma
Max.-Signal Plate Current	50	ma
Zero-Signal Grid-No.2 Current	4	ma
Max.-Signal Grid-No.2 Current	8.5	ma
Plate Resistance (Approx.)	10000	ohms
Transconductance	7500	μmhos
Load Resistance	2500	ohms
Total Harmonic Distortion	10	%
Max.-Signal Power Output	2.3	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

° Without external shield.

▲ The dc component must not exceed 100 volts.

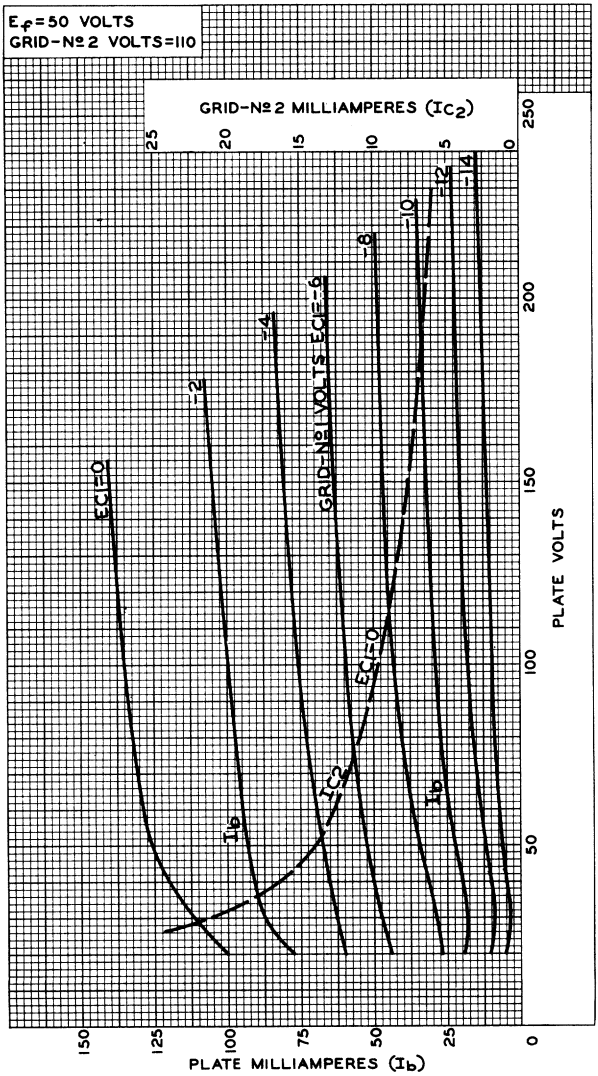
NOTE: Except for a different basing arrangement, which simplifies the problem of meeting Underwriters' Laboratories requirements in the design of ac/dc receivers, the 50C5 is similar to the miniature type 50B5.

→Indicates a change.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

50C5

AVERAGE CHARACTERISTICS



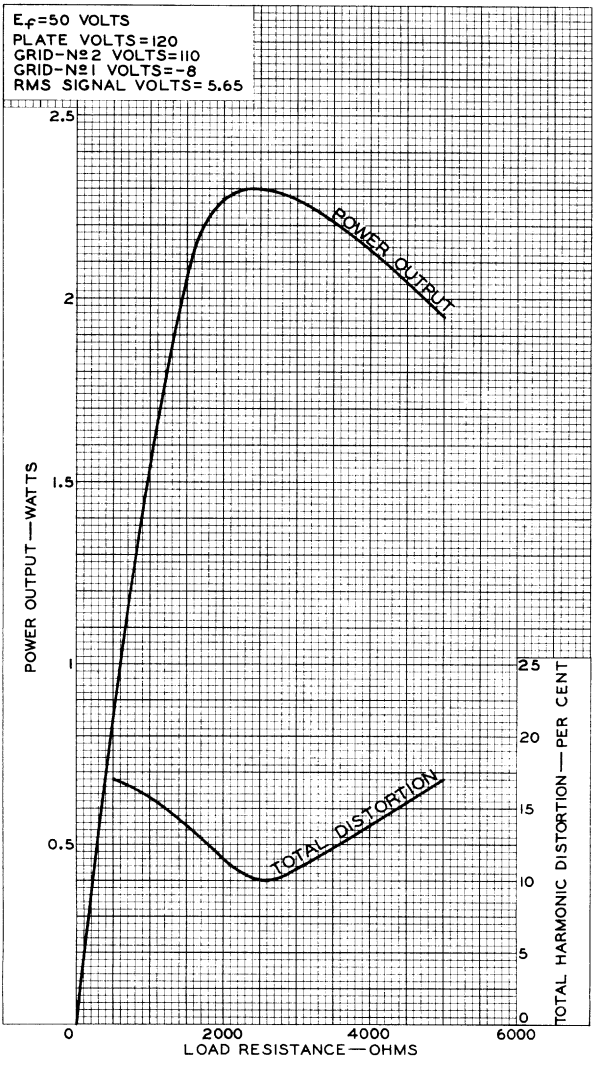
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6603

RCA

50C5

OPERATION CHARACTERISTICS



50DC4

HALF-WAVE VACUUM RECTIFIER

7-PIN MINIATURE TYPE

GENERAL DATA

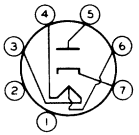
Electrical:

	Without Panel Lamp	*With No.40 or No.47 Panel Lamp*	
Heater, for Unipotential Cathode:			
Voltage:			
Entire heater (Pins 3 and 4)	50 ± 10%	45 ± 10%	ac or dc volts
Panel-lamp section (Pins 4 and 6)	7.5	5.5	ac or dc volts
Current:			
Between pins 3 and 4	0.15	–	amp
Between pins 3 and 6	–	0.15	amp

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	5BQ

Pin 1 – No Connection
Pin 2 – No Connection
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Plate



Pin 6 – Heater Tap
Pin 7 – Cathode

Panel-lamp heater section is between pins 4 and 6.

HALF-WAVE RECTIFIER

Maximum Ratings, *Design-Maximum Values:*

PEAK INVERSE PLATE VOLTAGE	330 max.	volts
PEAK PLATE CURRENT	720 max.	ma
DC OUTPUT CURRENT:		
With panel lamp and no shunting resistor	70 max.	ma
With panel lamp and shunting resistor†	110 max.	ma
Without panel lamp	120 max.	ma
PANEL-LAMP-SECTION VOLTAGE (RMS):		
When panel lamp fails	16.5 max.	volts

† Required when the dc output current is greater than 70 milliamperes.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

50DC4

HALF-WAVE VACUUM RECTIFIER

PEAK HEATER-CATHODE VOLTAGE:					
Heater negative with respect to cathode.	330 max.				volts
Heater positive with respect to cathode.	330 max.				volts

Typical Operation:

With panel lamp in accompanying half-wave circuit with capacitor input to filter

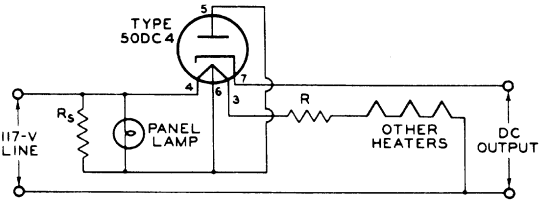
AC Plate-Supply Voltage (RMS). . .	117	117	117	117	volts
Filter-Input Capacitor	40	40	40	40	μf
Minimum Total Effective Plate-Supply Impedance	15	15	15	15	ohms
Panel-Lamp Shunting Resistor . . .	450	200	100	75	ohms
DC Output Current.	70	80	90	100	ma

Without panel lamp in half-wave circuit with capacitor input to filter

AC Plate-Supply Voltage (RMS).	117	volts
Filter-Input Capacitor	40	μf
Minimum Total Effective Plate-Supply Impedance .	15	ohms
DC Output Current.	110	ma
DC Output Voltage at Input to Filter (Approx.):		
At half-load current of 55 ma.	130	volts
At full-load current of 110 ma..	110	volts
Voltage Regulation (Approx.):		
Half-load to full-load current	20	volts

HALF-WAVE CIRCUIT

With panel lamp No.40 or No.47



DROP ACROSS R AND ALL HEATERS (WITH PANEL LAMP) SHOULD EQUAL 117 VOLTS AT 0.15 AMPERE. R_S = SHUNTING RESISTOR REQUIRED WHEN DC OUTPUT CURRENT EXCEEDS 70 MILLIAMPERES

92CS-9923

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ELECTRON TUBE DIVISION
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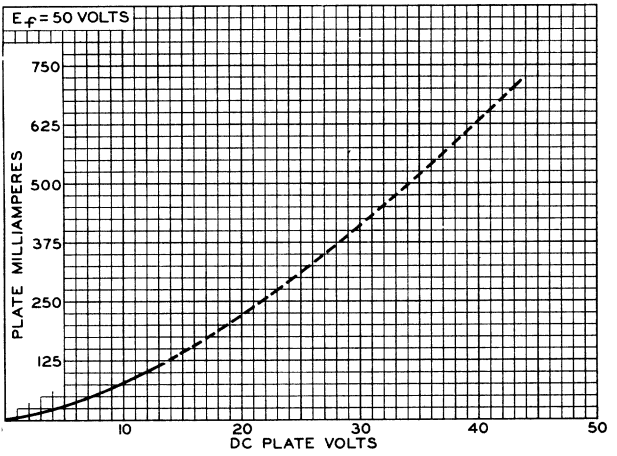
TENTATIVE DATA

50DC4

AVERAGE PLATE CHARACTERISTIC



92CS-9893

50EH5

Power Pentode

7-PIN MINIATURE TYPE

The 50EH5 is the same as the 6EH5 except for the following items:

Heater, for Unipotential Cathode:

Voltage (AC or DC)	50	volts
Current	0.15	amp

50FE5

Beam Power Tube

For Audio-Output Stages of Low-Cost, Compact Stereophonic Equipment

The 50FE5 is the same as the 6FE5 except for the following items:

Heater, for Unipotential Cathode:

Voltage (AC or DC)	50 ± 10%	volts
Current at 50 volts	0.15	amp

Peak Heater–Cathode Voltage:

Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200★ max.	volts

★ The dc component must not exceed 100 volts.

50L6-GT

BEAM POWER AMPLIFIER

Heater ■	Coated Unipotential Cathode	
Voltage	50	a-c or d-c volts
Current	0.15	amp.
Maximum Overall Length		3-5/16"
Maximum Seated Height		2-3/4" ←
Maximum Diameter		1-5/16"
Bulb		T-9
Base	Intermediate Shell Octal 7-Pin	
Pin 1 - No Connection		Pin 5 - Grid
Pin 2 - Heater		Pin 7 - Heater
Pin 3 - Plate		Pin 8 - Cathode
Pin 4 - Screen		
Mounting Position		Any

BOTTOM VIEW (G-7AC)

AMPLIFIER ←

Plate Voltage		200 max.	volts
Screen Voltage		117 max.	volts
Plate Dissipation		10 max.	watts
Screen Dissipation		1.25 max.	watts
Typical Operation and Characteristics - Class A_1 Amplifier:			
Plate	110	200	volts
Screen	110	110	volts
Grid *	-7.5	-8	volts
Peak A-F Grid Voltage	7.5	8	volts
Zero-Sig. Plate Cur.	49	50	ma.
Max.-Sig. Plate Cur.	50	55	ma.
Zero-Sig. Screen Cur.	4	2 approx.	ma.
Max.-Sig. Screen Cur.	11	7 approx.	ma.
Plate Resistance	13000	30000 approx.	ohms
Transconductance	9000	9500	μmhos
Load Resistance	2000	3000	ohms
Total Harmonic Dist.	10	10	%
Power Output	2.1	4.3	watts

■ In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.

* The type of input coupling should not introduce too much resistance in the grid circuit. Transformer- or impedance-coupling devices are recommended. When the grid circuit has a resistance not higher than 0.1 megohm, fixed bias may be used; for higher values, cathode bias is required. With cathode bias, the grid circuit may have a resistance not to exceed 0.5 megohm.

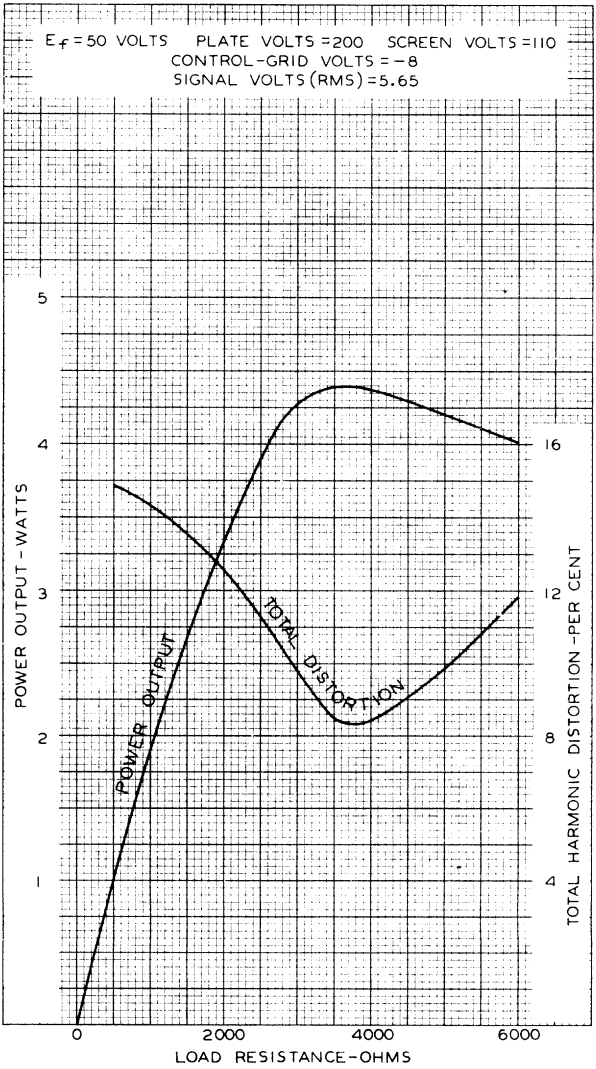
Curves under type 25L6-GT also apply to the 50L6-GT.

←Indicates a change.

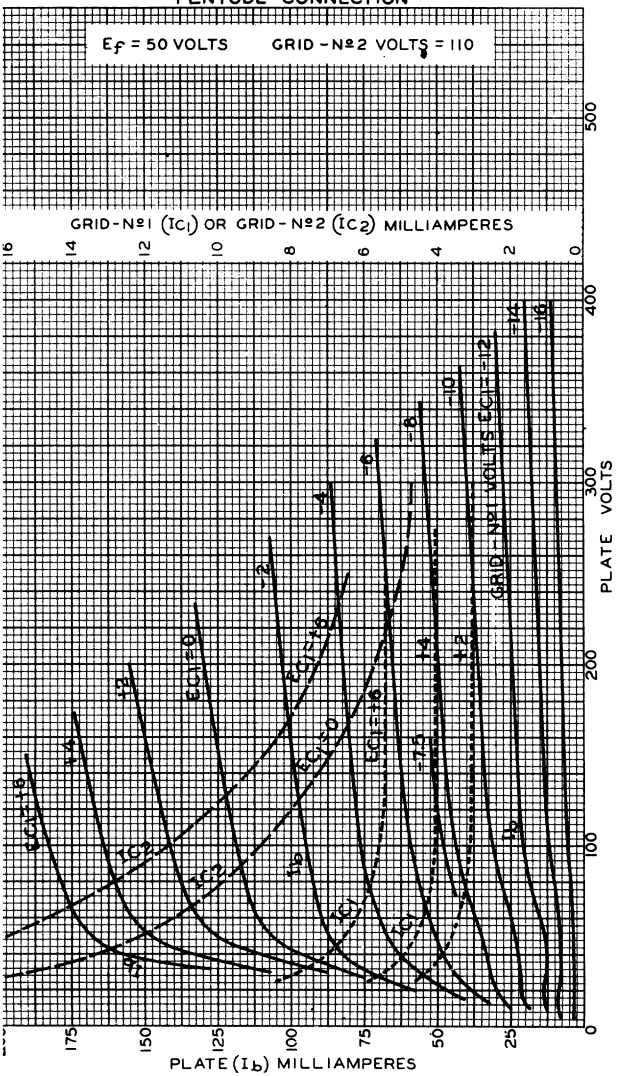
RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

50L6-GT

OPERATION CHARACTERISTICS

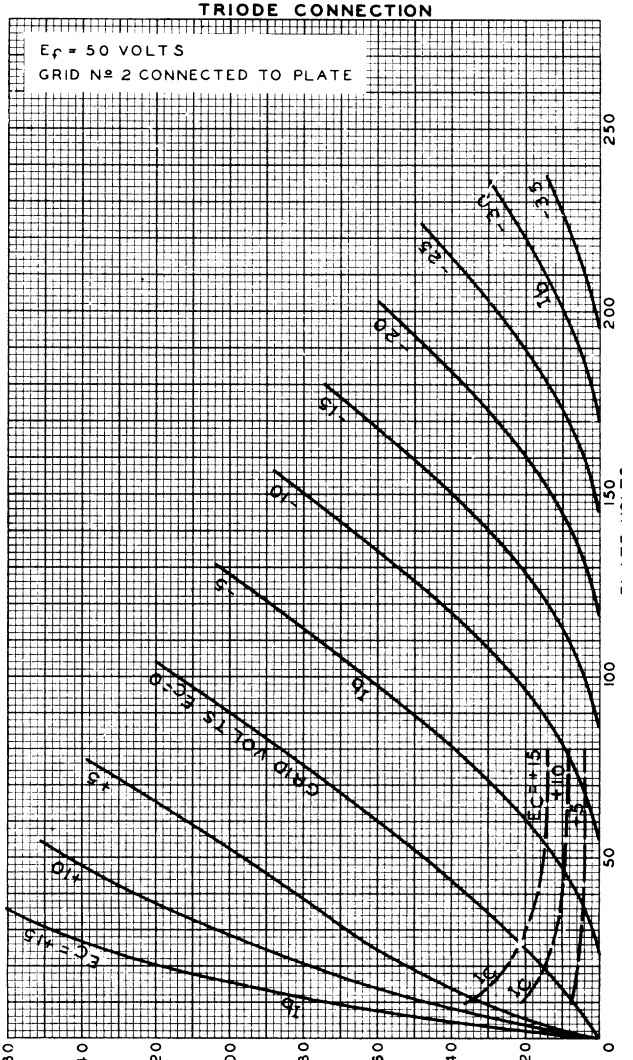


50L6-GT
AVERAGE PLATE CHARACTERISTICS
PENTODE CONNECTION



50L6-GT

50L6-GT
AVERAGE PLATE CHARACTERISTICS
TRIODE CONNECTION



60FX5

Power Pentode

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	60 ± 10%	volts
Current at 60 volts	0.1	amp
Direct Interelectrode Capacitances (Approx.):▲		
Grid No.1 to plate	0.65	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	17	μμf
Plate to cathode & grid No.3, grid No.2, and heater	9	μμf

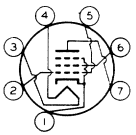
Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	110	volts
Grid-No.2 Supply Voltage	115	volts
Cathode Resistor	62	ohms
Plate Resistance (Approx.)	17500	ohms
Transconductance	13500	μmhos
Plate Current	36	ma
Grid-No.2 Current	10	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CV

Pin 1 – Cathode, Grid No.3
Pin 2 – Grid No.1
Pin 3 – Heater



Pin 4 – Heater
Pin 5 – Grid No.1
Pin 6 – Grid No.2
Pin 7 – Plate

AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	150	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	130	max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0	max.	volts
GRID-No.2 INPUT	2	max.	watts
PLATE DISSIPATION	5.5	max.	watts

60FX5

PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200●	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface).	225	max.	°C

Typical Operation:

Plate Supply Voltage.	110	volts
Grid-No.2 Supply Voltage.	115	volts
Cathode Resistor.	62	ohms
Peak AF Grid-No.1 Voltage	3	volts
Zero-Signal Plate Current	36	ma
Max.-Signal Plate Current	35	ma
Zero-Signal Grid-No.2 Current	10	ma
Max.-Signal Grid-No.2 Current	12	ma
Load Resistance	3000	ohms
Total Harmonic Distortion	8	%
Max.-Signal Power Output.	1.3	watts

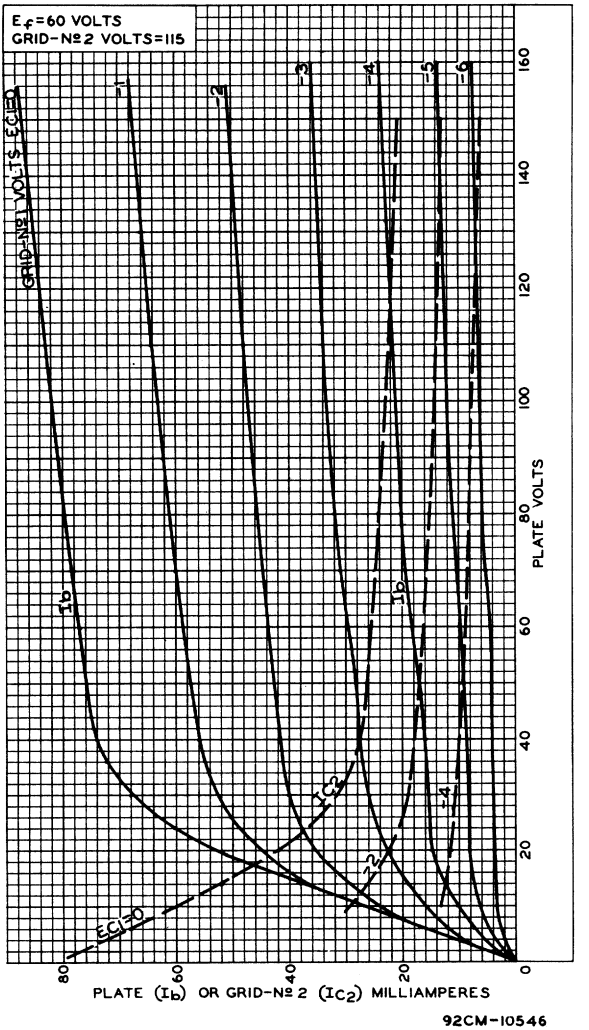
Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation.	0.1	max.	megohm
For cathode-bias operation.	0.5	max.	megohm

▲ Without external shield.

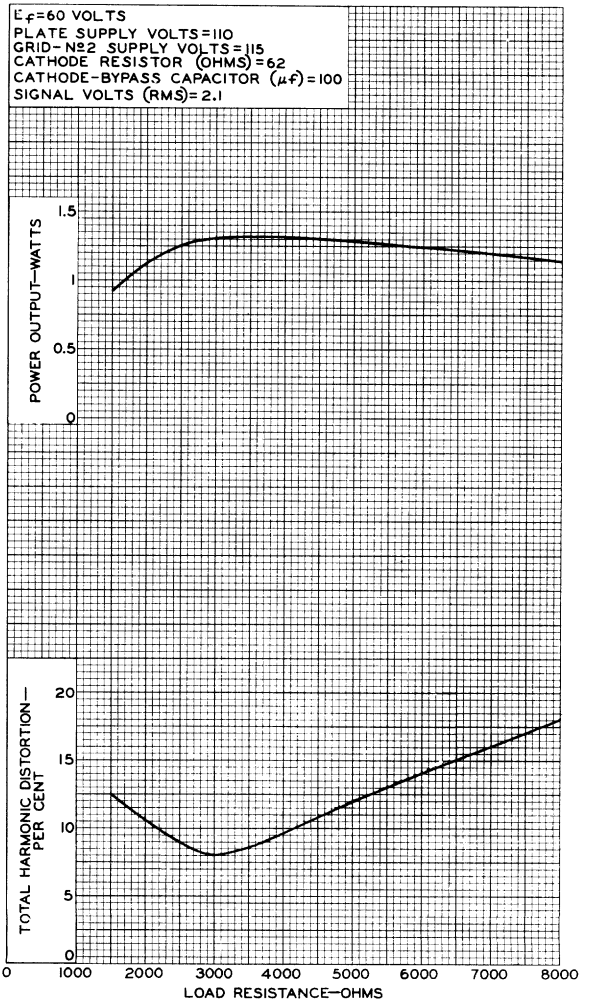
● The dc component must not exceed 100 volts.

AVERAGE CHARACTERISTICS



92CM-10546

OPERATION CHARACTERISTICS



92CM-10545

Full-Wave Mercury-Vapor Rectifier

For DC Power Supplies Having Large Current Requirements

GENERAL DATA

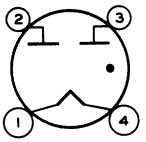
Electrical:

Filament, Coated:	
Voltage (AC or DC)	5.0 volts
Current	3.000 amp

Mechanical:

Operating Position	Vertical, base down
Maximum Overall Length	5-3/8"
Maximum Seated Length	4-3/4"
Maximum Diameter	2-1/16"
Bulb	ST-16
Base	Medium 4-Pin
Basing Designation for BOTTOM VIEW	4C

Pin 1 – Filament
Pin 2 – Plate of Unit No. 2



Pin 3 – Plate of Unit No. 1
Pin 4 – Filament

FULL-WAVE RECTIFIER

Maximum and Minimum Ratings:

PEAK INVERSE VOLTAGE	1550 max.	volts
PEAK PLATE CURRENT PER PLATE	1 max.	amp
CONDENSED MERCURY TEMPERATURE RANGE	20 – 60	°C
With Capacitor-Input Filter		
AC PLATE VOLTAGE PER PLATE (RMS)	450 max.	volts
TOTAL EFFECTIVE PLATE-SUPPLY IMPEDANCE PER PLATE[a]	50 min.	ohms
DC OUTPUT CURRENT	225 max.	ma
With Choke-Input Filter		
AC PLATE VOLTAGE PER PLATE (RMS)	550 max.	volts
INPUT-CHOKE INDUCTANCE	3 min.	henries
DC OUTPUT CURRENT	225 max.	ma

Characteristics:

Tube Voltage Drop (Approx.)	15	volts

[a] When a filter-input capacitor larger than 40 μf is used, it may be necessary to use more plate-supply impedance than the minimum value shown to limit the peak plate current to the rated value.

HALF-WAVE RECTIFIER

As a half-wave rectifier, the 83 is operated with plates connected in parallel. Two 83's so connected in a full-wave circuit can supply twice the output current of a single tube. Both plates within the same tube should be connected to the same terminal of the plate transformer. To equalize the current distribution between plates, a resistor of not less than 50 ohms should be connected in series with each plate.

407A

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:			
Heater-section arrangement	*Series*	*Parallel*	
Voltage (AC or DC)	40.0 ± 2.0	20.0 ± 1.0	volts
Current	0.050[a]	0.100[b]	amp
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode	100 max.		volts
Heater positive with respect to cathode	100 max.		volts
Direct Interelectrode Capacitances:[c]			
Grid to plate (Each unit)	1.1		pf
Grid to cathode, internal shield, and heater (Each unit)	2.2		pf
Plate to cathode, internal shield, and heater (Each unit)	1.0		pf
Plate to plate	0.1 max.		pf

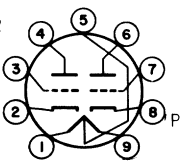
Characteristics, Class A_1 Amplifier (Each Unit):

Plate Supply Voltage	150	volts
Cathode Resistor	240	ohms
Amplification Factor	35	
Plate Resistance (Approx.)	6350	ohms
Transconductance	5500	μmhos
Plate Current	8.2	ma
Grid Voltage for maximum plate μa =45	-10	volts

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/8" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

BOTTOM VIEW



Pins 1&5 - Heater of Unit No.2
Pin 2 - Cathode of Unit No.2
Pin 3 - Grid of Unit No.2
Pin 4 - Plate of Unit No.2
Pin 5 - Heater Tap, Internal Shield
Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pins 9&5 - Heater of Unit No.1

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Absolute-Maximum Values:*

PLATE VOLTAGE	330 max.	volts
GRID VOLTAGE:		
Negative-bias value	55 max.	volts
Positive-bias value	0 max.	volts
CATHODE CURRENT	18 max.	ma
GRID CURRENT	3 max.	ma
PLATE DISSIPATION	1.35 max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance	0.5 max.	megohm

[a] At heater volts = 40.0.
[b] At heater volts = 20.0.
[c] Without external shield.

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	20.0 ± 1.0	volts
Current at heater volts = 20.0	0.050	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances:[a]		
Grid No.1 to plate	0.01	pf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	4.0	pf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	2.8	pf

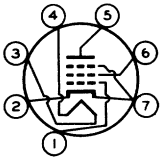
Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	120	volts
Grid-No.2 Supply Voltage	120	volts
Cathode Resistor[b]	200	ohms
Plate Resistance (Approx.)	0.34	megohm
Transconductance	5000	μmhos
Plate Current	7	ma
Grid-No.2 Current	2.2	ma
Grid-No.1 Voltage for maximum plate μa = 200	-10	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/8" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BD

Pin 1 - Grid No.1
Pin 2 - Cathode, Grid No.3
Pin 3 - Heater
Pin 4 - Heater



Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Cathode, Grid No.3

AMPLIFIER — Class A_1

Maximum Ratings, *Absolute-Maximum Values:*

PLATE VOLTAGE	180 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	180 max.	volts
GRID-No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
GRID-No. 2 INPUT:		
For grid-No.2 voltages up to 90 volts	0.5 max.	watt
For grid-No.2 voltages between 90 and 180 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	1.7 max.	watts

[a] With external shield JEDEC No.316 connected to cathode.

[b] Fixed-bias operation is not recommended.

575-A

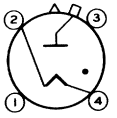
HALF-WAVE MERCURY-VAPOR RECTIFIER

The 575-A is the same as the 673 except for the following items:

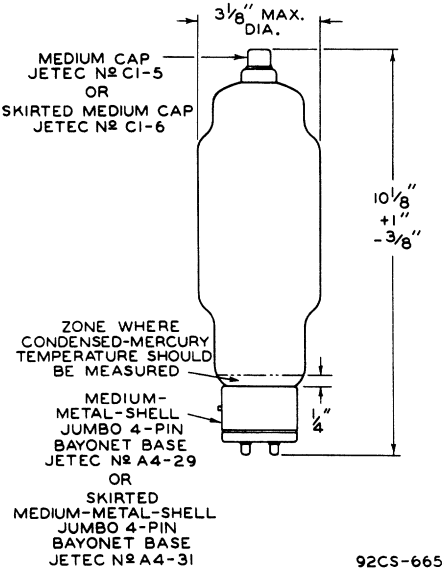
Mechanical:

Overall Length	10-1/8" + 1" - 3/8" ←
Maximum Diameter	3-1/8" ←
Weight (Approx.)	10.8 oz ←
Cap	Medium (JETEC No.C1-5), or Skirted Medium (JETEC No.C1-6) ←
Base	Medium-Metal-Shell Jumbo 4-Pin with Bayonet (JETEC No.A4-29), or Skirted Medium-Metal-Shell Jumbo 4-Pin with Bayonet (JETEC No.A4-31) ←
Basing Designation for BOTTOM VIEW	4AT

Pin 1 – No Connection
Pin 2 – Filament, Cathode Shield



Pin 3 – No Connection
Pin 4 – Filament Cap – Anode



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← Indicates a change.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

Half-Wave Vacuum Rectifier

HIGH-VOLTAGE, LOW-CURRENT TYPE

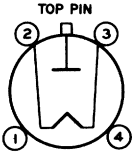
GENERAL DATA

Electrical:

Filament, Thoriated Tungsten:		
Voltage (AC)	2.5 ± 5%	volts
Current at filament volts = 2.5	6	amp

Mechanical:

Operating Position	Vertical, base down or up
Overall Length	7-3/16" ± 1/4"
Maximum Diameter	2-1/8" ←
Bulb	T16
Plate Terminal	0.050"-Diameter Pin Located at Top of Bulb
Base	Medium-Shell Super-Jumbo 4-Pin (JEDEC No.A4-16)
Basing Designation for BOTTOM VIEW	70



Pin 1 – No Internal Connection
Pin 2 – Filament
Pin 3 – Filament
Pin 4 – No Internal Connection
TOP PIN – Plate

HALF-WAVE RECTIFIER

Maximum Ratings, *Absolute-Maximum Values:*

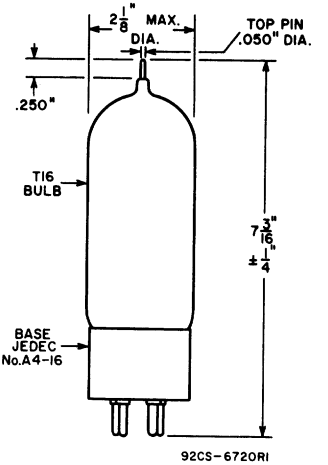
PEAK INVERSE PLATE VOLTAGE	20000 max.	volts
PLATE CURRENT:		
Peak	270 max.	ma
Average	25 max.	ma
AMBIENT TEMPERATURE	50 max.	°C
BULB TEMPERATURE	75 max.	°C

OPERATING CONSIDERATIONS ←

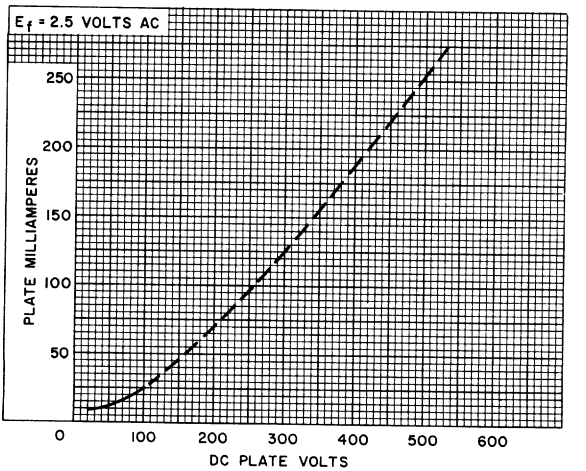
X-Radiation Warning. X radiation is produced when the 579B is operated with a peak inverse plate voltage above 16,000 volts (Absolute-Maximum value). This radiation can constitute a health hazard unless the tube is adequately shielded for X radiation.

← Indicates a change.

579B



AVERAGE PLATE CHARACTERISTIC



Full-Wave Gas and Mercury-Vapor Rectifier

GENERAL DATA

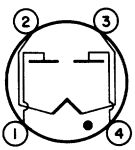
Electrical:[a]

Filament, Coated:		
Voltage (AC)	2.5	volts
Current at 2.5 volts	11.5 ± 1.0	amp
Minimum heating time prior to tube conduction	15	sec
Typical Anode Starting Voltage	10	volts
Peak Tube Voltage Drop at anode amperes = 5	10	volts

Mechanical:

Operating Position	Vertical, base down
Maximum Overall Length	7-1/2"
Maximum Diameter	2-1/16"
Weight (Approx.)	5 oz
Bulb	T16
Socket	Super-Jumbo 4-Contact
Base	Medium-Metal-Shell Super-Jumbo 4-Pin (JEDEC No.A4-81)
Basing Designation for BOTTOM VIEW	4BS

Pin 1 - Anode No.2
Pin 2 - Filament



Pin 3 - Filament
Pin 4 - Anode No.1

Thermal:

Type of Cooling	Convection	
Temperature Rise of Condensed Mercury to Equilibrium Above Ambient Temperature (Approx.):		
No load	18	°C
Full load	28	°C

FULL-WAVE RECTIFIER[a]

Maximum and Minimum Ratings, *Absolute-Maximum Values:*

For power-supply frequency of 60 cps

PEAK INVERSE ANODE VOLTAGE	900 max.	volts
ANODE CURRENT (Each Anode):		
Peak	10 max.	amp
Average[b]	2.5 max.	amp
Fault	150 max.	amp
CONDENSED-MERCURY TEMPERATURE RANGE (Operating)[c]	0 to +90	°C

[a] With circuit returns to filament-transformer center-tap.

[b] Averaged over any interval of 5 seconds maximum.

[c] For longest life, the operating condensed-mercury temperature range after warm-up should be kept between +40° and +90° C which corresponds approximately to +15° to +65° C ambient.

615/7018

Half-Wave Mercury-Vapor Rectifier

GENERAL DATA

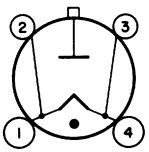
Electrical:[a]

Filament, Coated:		
Voltage (AC)	2.5	volts
Current at 2.5 volts	7 ± 1	amp
Minimum heating time prior to tube conduction	20	sec
Typical Anode Starting Voltage	13	volts
Peak Tube Voltage Drop at anode amperes = 8	12	volts

Mechanical:

Operating Position	Vertical, base down
Maximum Overall Length	6-3/8"
Maximum Diameter	2-1/16"
Weight (Approx.)	4 oz
Bulb	ST16
Cap	Medium (JEDEC No.C1-5)
Socket	Small 4-Contact
Base	Medium-Shell Small 4-Pin with Bayonet (JEDEC No.A4-10)
Basing Designation for BOTTOM VIEW	4AU

Pin 1 – Filament
Pin 2 – Filament
Pin 3 – Filament



Pin 4 – Filament
Cap – Anode

Thermal:

Type of Cooling	Convection	
Temperature Rise of Condensed Mercury to Equilibrium Above Ambient Temperature (Approx.)	30	°C

HALF-WAVE RECTIFIER[a]

Maximum and Minimum Ratings, *Absolute-Maximum Values:*

For power-supply frequency of 60 cps

PEAK INVERSE ANODE VOLTAGE	2000 max.	volts
ANODE CURRENT:		
Peak	10 max.	amp
Average[b]	2.5 max.	amp
Fault	250 max.	amp
CONDENSED-MERCURY TEMPERATURE RANGE (Operating)	+35 to +80	°C

[a] With circuit returns to filament-transformer center-tap.
[b] Averaged over any interval of 5 seconds maximum.

Half-Wave Gas and Mercury-Vapor Rectifier

GENERAL DATA

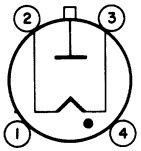
Electrical:[a]

Filament, Coated:		
Voltage (AC)	2.5	volts
Current at 2.5 volts	18 ± 2	amp
Minimum heating time prior to tube conduction	60	sec
Typical Anode Starting Voltage	20	volts
Peak Tube Voltage Drop at anode amperes = 20.	9	volts

Mechanical:

Operating Position	Vertical, base down
Maximum Overall Length	9-1/2"
Maximum Diameter	2-1/16"
Weight (Approx.)	6 oz
Bulb	T16
Cap	Medium (JEDEC No.C1-5)
Socket	Super-Jumbo 4-Contact
Base	Medium-Metal-Shell Super-Jumbo 4-Pin
Terminal Diagram:	BOTTOM VIEW

Pin 1 – No Internal Connection
Pin 2 – Filament
Pin 3 – Filament



Pin 4 – No Internal Connection
Cap – Anode

Thermal:

Type of Cooling	Convection	
Temperature Rise of Condensed Mercury to Equilibrium Above Ambient Temperature (Approx.)	30	°C

HALF-WAVE RECTIFIER[a]

Maximum and Minimum Ratings, *Absolute-Maximum Values:*

For power-supply frequency of 60 cps

PEAK INVERSE ANODE VOLTAGE	1000 max.	volts
ANODE CURRENT:		
Peak	77 max.	amp
Average[b]	6.4 max.	amp
Fault	770 max.	amp
CONDENSED-MERCURY TEMPERATURE RANGE (Operating)[c]	-40 to +100	°C

[a] With circuit returns to filament-transformer center-tap.

[b] Averaged over any interval of 20 seconds maximum.

[c] For longest life, the operating condensed-mercury temperature range after warm-up should be kept between +40° and +100° C which corresponds approximately to +10° to +70° C ambient.

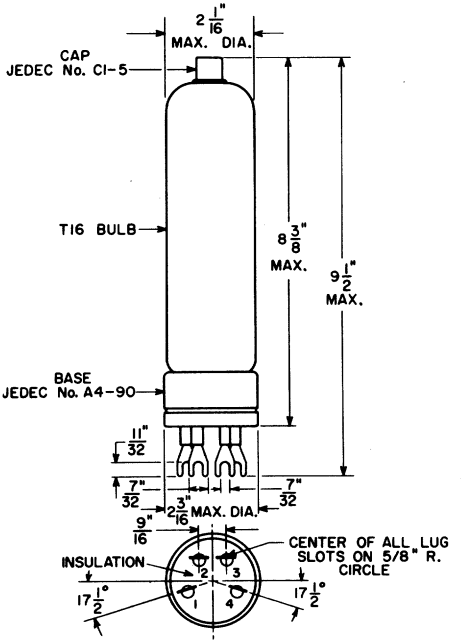
635L/7020

Half-Wave Gas and Mercury-Vapor Rectifier

The 635L/7020 is the same as the 635/7019 except for the following items:

Mechanical:

Maximum Seated Length . . . . . 8-3/8"
Base. . . . . .Special Metal Shell (JEDEC No.A4-90)



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HALF-WAVE MERCURY-VAPOR RECTIFIER

GENERAL DATA

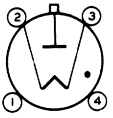
Electrical:

Filament, Coated:		
Voltage	5 ± 5%	ac volts
Current at 5 volts	10	amp
Minimum heating time at rated voltage	30	sec
Peak Tube Voltage Drop (Approx.)	10	volts

Mechanical:

Operating Position	Vertical, base down
Maximum Overall Length	11-7/16" ←
Seated Length	9-9/16" + 1-1/16" − 1/4" ←
Maximum Diameter	3-1/8" ←
Weight (Approx.)	10.8 oz ←
Cap	Medium (JETEC No.C1-5)
Base	Large-Metal-Shell Super-Jumbo 4-Pin with Bayonet (JETEC No.A4-18)
Basing Designation for BOTTOM VIEW	2P

Pin 1 – No Connection
Pin 2 – Filament, Cathode Shield



Pin 3 – Filament
Pin 4 – No Connection
Cap – Anode

Temperature Control:

Heating--When the ambient temperature is so low that the normal rise of condensed-mercury temperature above the ambient temperature will not bring the condensed-mercury temperature up to the minimum value of the operating ranges specified under *Maximum Ratings*, some form of heat-conserving enclosure or auxiliary heater will be required.

Cooling--When the operating conditions are such that the maximum value of the operating condensed-mercury-temperature range is exceeded, provision should be made for forced-air cooling sufficient to prevent exceeding the maximum value.

Temperature Rise of Condensed Mercury to Equilibrium Above Ambient Temperature (Approx.):		
No load*	12	°C
Full load▲	17.5	°C

* With 4.75 volts rms on filament, and no heat-conserving enclosure.

▲ With 5.25 volts rms on filament, quadrature operation, average anode current = 2.5 amperes, and no heat-conserving enclosure.

← Indicates a change.

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HALF-WAVE MERCURY-VAPOR RECTIFIER

HALF-WAVE RECTIFIER — In-Phase Operation•

Maximum Ratings, *Absolute Values: For supply frequency of 60 cps*

	Operating Condensed-Mercury-Temperature Range		
	20° to 60° C	20° to 50° C	
PEAK INVERSE ANODE VOLTAGE	10000 max.	15000 max.	volts
ANODE CURRENT:			
Peak	7 max.	6 max.	amp
Average**	1.75 max.	1.5 max.	amp
Fault, for duration of 0.1 second maximum	100 max.	100 max.	amp

HALF-WAVE RECTIFIER — Quadrature Operation••

Maximum Ratings, *Absolute Values: For supply frequency of 60 cps*

	Operating Condensed-Mercury-Temperature Range		
	20° to 60° C	20° to 50° C	
PEAK INVERSE ANODE VOLTAGE	10000 max.	15000 max.	volts
ANODE CURRENT:			
Peak	10 max.	10 max.	amp
Average**	2.5 max.	2.5 max.	amp
Fault, for duration of 0.1 second maximum	100 max.	100 max.	amp

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Filament Current	1	–	11.5	amp
Critical Anode Voltage	2	–	100	volts
Peak Tube Voltage Drop	3	–	16	volts

Note 1: With 5 volts rms on filament.

Note 2: With 4.75 volts rms on filament, and condensed-mercury temperature at 20° C.

Note 3: With 5 volts rms on filament, condensed-mercury temperature of 35° ± 5° C, peak anode current of 20 amperes provided by half-cycle pulse from a 60-cps sine wave and recurring approximately once a second. Tube drop is measured by an oscilloscope connected between anode and center-tap of filament transformer.

• Filament voltage in phase with anode voltage.

** Averaged over any interval of 20 seconds maximum.

•• Filament voltage out of phase (60° to 120°) with anode voltage.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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HALF-WAVE MERCURY-VAPOR RECTIFIER

For Circuit Figures, see Front of this Section

CIRCUIT	MAX. TRANS. SEC. VOLTS (RMS) E	APPROX. DC OUTPUT VOLTS TO FILTER E_{av}	MAX. DC OUTPUT AMPERES I_{av}	MAX. DC OUTPUT KW TO FILTER Pdc
Fig. 1 **Half-Wave** **Single-Phase** In-Phase Operation	10600□ 7000▲	4800 3200	1.50 1.75	7.1 5.5
Fig. 2 **Full-Wave** **Single-Phase** In-Phase Operation	5300□ 3500▲	4800 3200	3.00 3.50	14.2 11.0
Fig. 3 **Series** **Single-Phase** In-Phase Operation	10600□ 7000▲	9600 6400	3.00 3.50	28.4 22.0
Fig. 4 **Half-Wave** **Three-Phase** In-Phase Operation	6100□ 4000▲	7200 4800	4.50 5.25	32.2 25.0
Fig. 5 **Parallel** **Three-Phase** Quadrature Operation	6100□ 4000▲	7200 4800	15.0 15.0	108 72
Fig. 6 **Series** **Three-Phase** Quadrature Operation	6100□ 4000▲	4300 9600	7.5 7.5	108 72
Fig. 7 **Half-Wave** **Four-Phase** Quadrature Operation			*Resistive Load* *Inductive Load*	*Resistive Load* *Inductive Load*
	5300□	6750	9.0 10.0	60.8 67.5
	3500▲	4500	9.0 10.0	40.5 45.0
Fig. 8 **Half-Wave** **Six-Phase** Quadrature Operation			*Resistive Load* *Inductive Load*	*Resistive Load* *Inductive Load*
	5300□	7200	9.5 10.0	68.4 72.0
	3500▲	4800	9.5 10.0	45.6 48.0

□ For maximum peak inverse anode voltage of 15,000 volts, and condensed-mercury-temperature range of 20° to 50° C.

▲ For maximum peak inverse anode voltage of 10,000 volts, and condensed-mercury-temperature range of 20° to 60° C.

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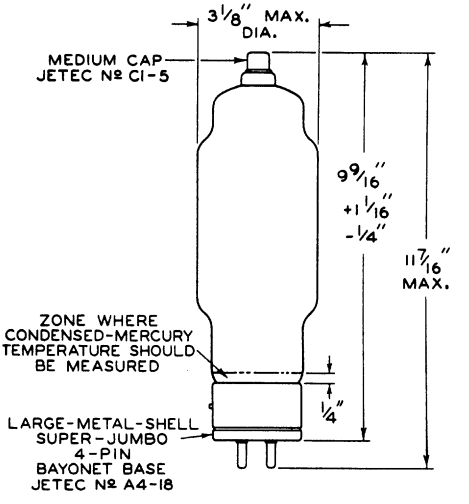
HALF-WAVE MERCURY-VAPOR RECTIFIER

OPERATING CONSIDERATIONS

Shields and rf filter circuits should be provided for the 673 if it is subjected to extraneous high-frequency fields during operation. These fields tend to produce breakdown effects in mercury vapor and are detrimental to tube life and performance. When shields are used, special attention must be given to providing adequate ventilation and to maintaining normal condensed-mercury temperature. Rf filters are employed to prevent damage caused by rf currents which might otherwise be fed back into the rectifier tubes.



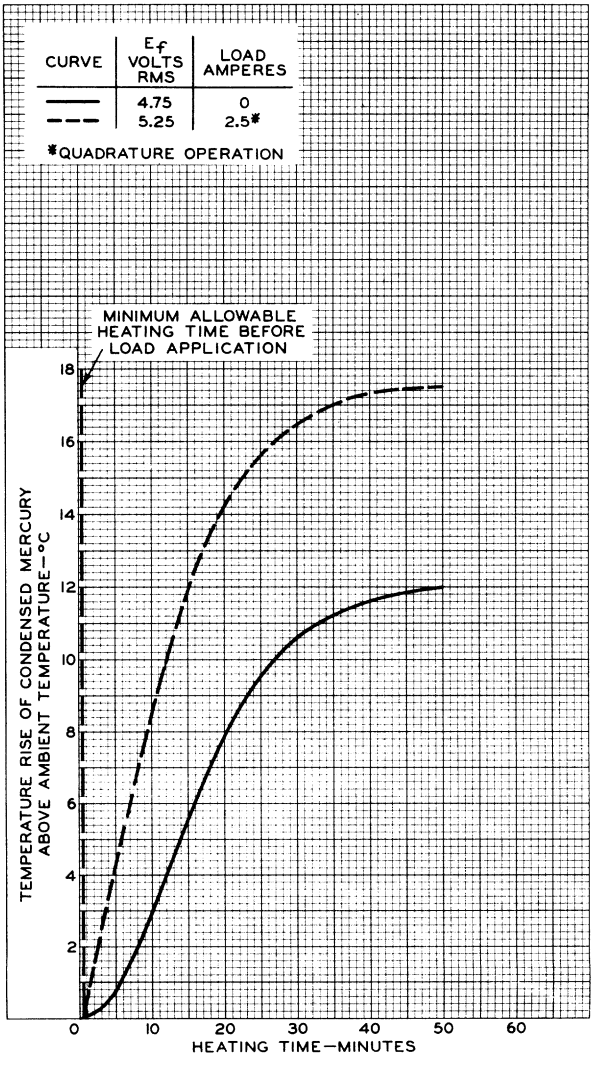
92CS-6655R3

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

673

RATE OF RISE OF COND-MERCURY TEMPERATURE



811A

Power Triode

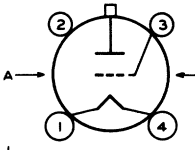
GENERAL DATA

Electrical:

Filament, Thoriated Tungsten:		
Voltage (AC or DC)	6.3	volts
Current	4	amp
Amplification Factor	160	
Direct Interelectrode Capacitances (Approx.):		
Grid to plate	5.6	pf
Grid to filament	5.9	pf
Plate to filament	0.7	pf

Mechanical: ←

Operating Position	Vertical, base down; or Horizontal, pins 1 & 4 in vertical plane
Maximum Overall Length	6-15/32"
Seated Length	5-11/16" ± 5/32"
Maximum Diameter	2-7/16"
Weight	2.7 oz
Bulb	ST19
Cap	Medium (JEDEC No.C1-5)
Base	Medium-Shell Small 4-Pin Micanol with Bayonet (JEDEC No.A4-10)
Basing Designation for BOTTOM VIEW	3G



Pin 1 - Filament
Pin 2 - Do Not Use
Pin 3 - Grid
Pin 4 - Filament
Cap - Plate

AA'=PLANE OF ELECTRODES

AF POWER AMPLIFIER & MODULATOR — Class B

Maximum Ratings, *Absolute-Maximum Values:*

	CCS[a]	*ICAS*[b]	
DC PLATE VOLTAGE	1250 max.	1500 max.	volts
MAX.-SIGNAL DC PLATE CURRENT	175 max.	175 max.	ma
MAX.-SIGNAL PLATE INPUT	165 max.	235 max.	watts
PLATE DISSIPATION[c]	45 max.	65 max.	watts

Typical Operation:

Values are for two tubes[d]

DC Plate Voltage	750	1250	1000	1250	1500	volts
DC Grid Voltage[e]	0	0	0	0	-4.5	volts
Peak AF Grid-to-Grid Voltage	197	145	185	175	170	volts
Zero-Signal DC Plate Current	32	50	44	54	32	ma

← Indicates a change.

	CCS		ICAS			
Max.-Signal DC Plate Current	350	260	350	350	313	ma
Effective Load Resistance (Plate to plate)	5100	12400	7400	9200	12400	ohms
Max.-Signal Driving Power (Approx.)	9.7	3.8	7.5	6.0	4.4	watts
Max.-Signal Power Output (Approx.)	178	235	248	310	340	watts

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum Ratings, *Absolute-Maximum Values:*

	CCS	ICAS	
DC PLATE VOLTAGE	1000 max.	1250 max.	volts
DC GRID VOLTAGE	-200 max.	-200 max.	volts
DC PLATE CURRENT	125 max.	150 max.	ma
DC GRID CURRENT	50 max.	50 max.	ma
PLATE INPUT	115 max.	175 max.	watts
PLATE DISSIPATION	30 max.	45 max.	watts

Typical Operation:

DC Plate Voltage	1000	1250	volts
DC Grid Voltage:[f]			
From a grid resistor of:			
1200 ohms	-55	-	volts
2700 ohms	-	-120	volts
Peak RF Grid Voltage	150	250	volts
DC Plate Current	115	140	ma
DC Grid Current (Approx.)[g]	45	45	ma
Driving Power (Approx.)[g]	6.1	10	watts
Power Output (Approx.)	88	135	watts

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[h]

Maximum Ratings, *Absolute-Maximum Values:*

	CCS	ICAS	
DC PLATE VOLTAGE	1250 max.	1500 max.	volts
DC GRID VOLTAGE	-200 max.	-200 max.	volts
DC PLATE CURRENT	175 max.	175 max.	ma
DC GRID CURRENT	50 max.	50 max.	ma
PLATE INPUT	175 max.	260 max.	watts
PLATE DISSIPATION	45 max.	65 max.	watts

Typical Operation:

DC Plate Voltage	1250	1500	volts
DC Grid Voltage:[j]			
From a grid resistor of:			
1100 ohms	-50	-	volts
1750 ohms	-	-70	volts

From a cathode resistor of:			
270 ohms	-50	-	volts
330 ohms	-	-70	volts
Peak RF Grid Voltage	140	175	volts
DC Plate Current	140	173	ma
DC Grid Current (Approx.)[g]	45	40	ma
Driving Power (Approx.)[g]	5.7	7.1	watts
Power Output (Approx.)	135	200	watts

SELF-RECTIFYING AMPLIFIER[k] — Class C

Maximum CCS Ratings, *Absolute-Maximum Values:*

AC PLATE VOLTAGE (RMS)	1750 max.	volts
DC GRID VOLTAGE	-125 max.	volts
DC PLATE CURRENT	65 max.	ma
DC GRID CURRENT	25 max.	ma
PLATE INPUT	125 max.	watts
PLATE DISSIPATION	45 max.	watts

Typical Operation in Push-Pull Circuit at 27 Mc:

Values are for 2 tubes

AC Plate Voltage (RMS)	1750	volts
DC Grid Voltage:[f,m]		
From a grid resistor of:		
1500 ohms	-70	volts
DC Plate Current	130	ma
DC Grid Current (Approx.)	46	ma
Driving Power (Approx.)[n]	12	watts
Power Output (Approx.)	175	watts
Useful Power Output (Approx.)-		
75% circuit efficiency	130	watts

AMPLIFIER[k] — Class C

With Separate, Rectified, Unfiltered, Single-Phase, Full-Wave Plate Supply

Maximum CCS Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	1125 max.	volts
DC GRID VOLTAGE	-125 max.	volts
DC PLATE CURRENT	160 max.	ma
DC GRID CURRENT	45 max.	ma
PLATE INPUT	175 max.	watts
PLATE DISSIPATION	45 max.	watts

Typical Operation:

DC Plate Voltage	1125	volts
DC Grid Voltage:[f,m]		
From a grid resistor of:		
1400 ohms	-35	volts
DC Plate Current	125	ma
DC Grid Current (Approx.)	25	ma
Driving Power (Approx.)[k]	3	watts
Power Output (Approx.)	135	watts

→ LINEAR RF POWER AMPLIFIER — Class AB_2

Single-Sideband Suppressed-Carrier Service

Maximum Ratings, *Absolute-Maximum Values up to 30 Mc:*

	CCS	ICAS	
DC PLATE VOLTAGE	1250 max.	1500 max.	volts
DC PLATE CURRENT:			
Max.-Signal (Single-Tone) or Peak-Envelope (Two-Tone)	175 max.	175 max.	ma
DC GRID CURRENT	50 max.	50 max.	ma
DC PLATE INPUT:			
Max.-Signal (Single-Tone) or Peak-Envelope (Two-Tone)	165 max.	235 max.	watts
PLATE DISSIPATION	45 max.	65 max.	watts

Typical Operation with "Single-Tone" Modulation:[q]

DC Plate Voltage	1250	1500	volts
DC Grid Voltage[r]	0	−4.5	volts
Zero-Signal DC Plate Current	25	16	ma
Effective RF Load Resistance	5700	6000	ohms
DC Plate Current	130	157	ma
DC Grid Current	30	30	ma
Peak RF Grid Voltage	78	88	volts
Driver Power Output, (Approx.)[s]	7	8	watts
Output-Circuit Efficiency (Approx.)	90	90	%
Useful Max.-Signal Power Output (Approx.)	120[t]	160[t]	watts

Typical Operation with "Two-Tone" Modulation at 30 Mc:[u]

DC Plate Voltage	1250	1500	volts
DC Grid Voltage[r]	0	−4.5	volts
Zero-Signal DC Plate Current	25	16	ma
Effective RF Load Resistance	5700	6000	ohms
DC Plate Current:			
Peak-Envelope	130	157	ma
Average	91	110	ma
Average DC Grid Current	20	20	ma
Peak-Envelope Driver Power Output (Approx.)[s]	7	8	watts
Output-Circuit Efficiency (Approx.)	90	90	%
Distortion Products Level:[v]			
Third order	−26	−25	db
Fifth order	−32	−30	db
Useful Power Output (Approx.):			
Peak-Envelope	120[t]	160[t]	watts
Average	60[t]	80[t]	watts

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Filament Current	1	3.75	4.25	amp
Amplification Factor	1,2	144	176	
Grid-Plate Capacitance	–	4.9	6.3	pf
Grid-Filament Capacitance	–	4.9	6.9	pf

→ Indicates a change.

Plate-Filament Capacitance	-	0.52	0.88	pf
Plate Current	1,3	16	36	ma
Grid Current	1,4	25	85	ma
Useful Power Output	1,5	160	-	watts ←

Note 1: With dc filament voltage of 6.3 volts.

Note 2: With dc plate current of 20 ma. and dc grid voltage of -1 volt.

Note 3: With dc plate voltage of 2000 volts and dc grid voltage of -2 volts.

Note 4: With dc plate voltage of 200 volts and dc grid voltage of +50 volts.

Note 5: With dc plate voltage of 1500 volts; dc plate current of 175 ma; dc grid current of 34 to 50 ma; grid resistor of 3500 ± 10% ohms; and frequency of 15 Mc.

a Continuous Commercial Service.

b Intermittent Commercial and Amateur Service.

c Averaged over any audio-frequency cycle of sine-wave form.

d When two or more tubes are used precautions should be taken to balance the plate currents.

e For ac filament supply.

f Obtained by grid resistor of value shown or by partial self-bias methods.

g For effect of load resistance on grid current and driving power, refer to TUBE RATINGS — *Grid Current and Driving Power* in the General Section.

h Key-down conditions per tube without modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

j Obtained from fixed supply, by grid resistor, by cathode resistor, or by combination methods.

k The 811A is not recommended for oscillator service in applications involving wide variations in load. For such applications, the 812A with its low amplification factor is preferred because of its ability to oscillate over a wide range of load variation.

m The 811A can be biased by any convenient method. However, the use of a grid resistor is preferred because the bias is automatically adjusted as the load on the circuit varies. In those applications, such as are encountered in therapeutic equipment, where grid current and grid voltage may vary widely because of fluctuating loads, it is important to design equipment so that the maximum grid-current and grid-voltage ratings are never exceeded for any load.

n From a self-rectifying driver.

p From a driver with a rectified, unfiltered, single-phase, full-wave plate supply.

q "Single-Tone" operation refers to that class of amplifier service in which the input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.

r Obtained preferably from a separate, well-regulated supply.

s Driver power output represents circuit losses and is the actual power measured at input to the grid circuit. The actual power required depends on the operating frequency and the circuit used.

t This value of useful power is measured at load of output circuit having indicated efficiency.

u "Two-Tone Modulation" operation refers to that class of amplifier service in which the input consists of two equal monofrequency rf signals having constant amplitude. These signals are produced in a single-sideband suppressed-carrier system when two equal-and-constant amplitude audio frequencies are applied to the input of the system.

v Referenced to either of the two tones and without the use of feedback to enhance linearity.

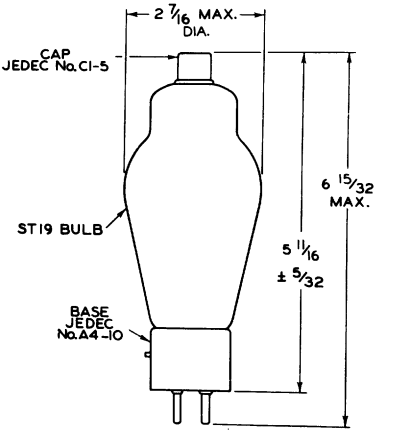
OPERATING CONSIDERATIONS

Plate shows no color when tube is operated at maximum CCS ratings, and shows a barely perceptible red color at maximum ICAS ratings.

← Indicates a change.

MAXIMUM RATINGS vs OPERATING FREQUENCY

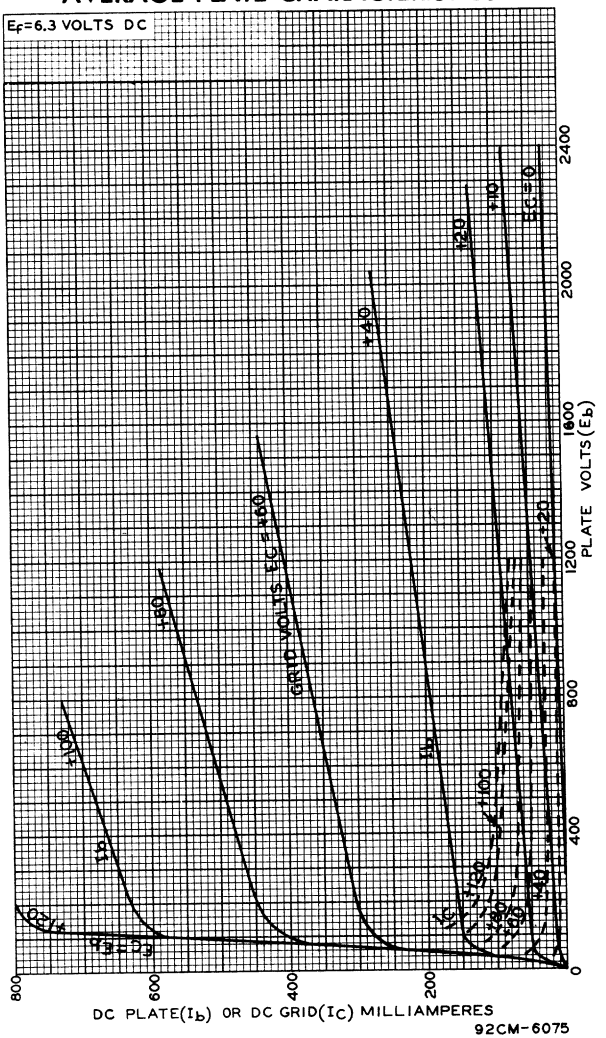
OPERATING FREQUENCY Mc	MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM PLATE VOLTAGE & PLATE INPUT	
	TELEPHONY	TELEGRAPHY
	Class C Plate-Modulated	Class C
30	100	100
60	89	89
80	70	70
100	55	55



92CS-6905R2

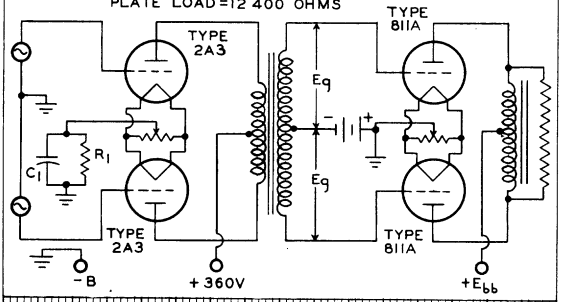
ALL DIMENSIONS IN INCHES

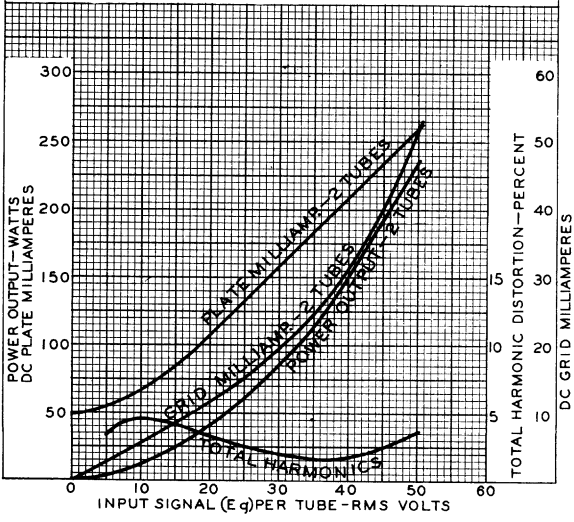
AVERAGE PLATE CHARACTERISTICS



OPERATION CHARACTERISTICS

E_f = 6.3 VOLTS AC FOR 811A's & 2.5 VOLTS AC FOR 2A3's
INPUT: CLASS AB_1 - TWO TYPE 2A3's; PLATE-SUPPLY VOLTS = 360; CATHODE-BIAS RESISTOR (R_1) = 780 OHMS; BYPASS CAPACITOR (C_1) = 80 μf
INTERSTAGE TRANSFORMER (T):
VOLTAGE RATIO $\frac{\text{PRIMARY}}{\frac{1}{2}\text{ SEC.}} = 6$
OUTPUT: CLASS B - TWO TYPE 811A's; PLATE-SUPPLY VOLTS (E_{bb}) = 1250; DC GRID VOLTS = 0; PLATE-TO-PLATE LOAD = 12 400 OHMS

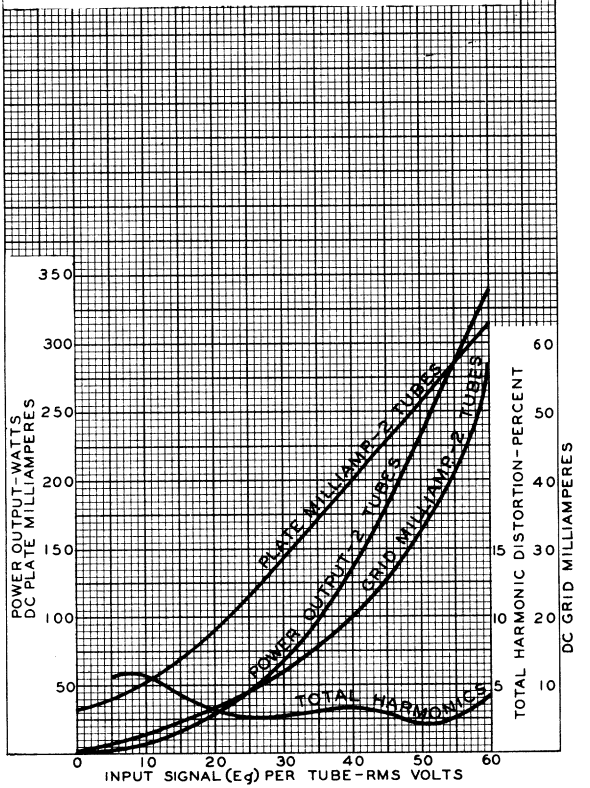




92CM-7138

OPERATION CHARACTERISTICS

E_f=6.3 VOLTS AC FOR 811A's & 2.5 VOLTS AC FOR 2A3's
CIRCUIT ARRANGEMENT: SAME AS ON DWG. 92CM-7138 UNDER TYPE 811A
INPUT: CLASS AB1-TWO TYPE 2A3's; PLATE-SUPPLY VOLTS=360; CATHODE-BIAS RESISTOR (R_1)=780 OHMS; BYPASS CAPACITOR (C_1)=80 μf
INTERSTAGE TRANSFORMER (T):
VOLTAGE RATIO $\frac{\text{PRIMARY}}{\frac{1}{2}\text{ SEC.}}$ = 6
OUTPUT: CLASS B-TWO TYPE 811A's; PLATE-SUPPLY VOLTS (E_{bb})=1500; DC GRID VOLTS = -4.5; PLATE-TO-PLATE LOAD=12400 OHMS



92CM-7139

812A

Power Triode

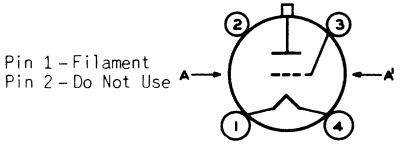
GENERAL DATA

Electrical:

Filament, Thoriated Tungsten:		
Voltage (AC or DC)	6.3 ± 0.3	volts
Current at filament volts = 6.3	4	
Amplification Factor	29	
Direct Interelectrode Capacitances:		
Grid to plate	5.5	pf
Grid to filament	5.4	pf
Plate to filament	0.77	pf

Mechanical: ←

Operating Position	Vertical, base down; or Horizontal, pins 1 and 4 in vertical plane
Maximum Overall Length	6-15/32"
Seated Length	5-11/16" ± 5/32"
Maximum Diameter	2-7/16"
Weight	2.7 oz
Bulb	ST19
Cap	Medium (JEDEC No.C1-5)
Base	Medium-Shell Small 4-Pin Micanol with Bayonet (JEDEC No.A4-10)
Basing Designation for BOTTOM VIEW	3G



AA'=PLANE OF ELECTODES

AF POWER AMPLIFIER & MODULATOR — Class B

Maximum Ratings, *Absolute-Maximum Values:*

	CCS●	*ICAS*●●	
DC PLATE VOLTAGE	1250 max.	1500 max.	volts
MAX.-SIGNAL DC PLATE CURRENT*	175 max.	175 max.	ma
MAX.-SIGNAL PLATE INPUT*	165 max.	235 max.	watts
PLATE DISSIPATION*	45 max.	65 max.	watts

Typical Operation:

Values are for 2 tubes

DC Plate Voltage	1250	1500	volts
DC Grid Voltage#	-40	-48	volts
Peak AF Grid-to-Grid Voltage	225	270	volts
Zero-Signal DC Plate Current	22	28	ma

* Averaged over any audio-frequency cycle of sine-wave form.

●, ●●, #: See next page. ← Indicates a change.

	CCS●	ICAS●●	
Max.-Signal DC Plate Current. .	260	310	ma
Effective Load Resistance (plate-to-plate).	12200	13200	ohms
Max.-Signal Driving Power (Approx.)	3.5	5	watts
Max,-Signal Power Output (Approx.)	235	340	watts

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum Ratings, *Absolute-Maximum Values:*

	CCS●	ICAS●●	
DC PLATE VOLTAGE.	1000 max.	1250 max.	volts
DC GRID VOLTAGE	-200 max.	-200 max.	volts
DC PLATE CURRENT.	125 max.	150 max.	ma
DC GRID CURRENT	35 max.	35 max.	ma
PLATE INPUT	115 max.	175 max.	watts
PLATE DISSIPATION	30 max.	45 max.	watts

Typical Operation:

DC Plate Voltage.	1000	1250	volts
DC Grid Voltage●.	-110	-115	volts
	3400	3300	ohms
Peak RF Grid Voltage.	220	240	volts
DC Plate Current.	115	140	ma
DC Grid Current (Approx.) . . .	33	35	ma
Driving Power (Approx.)	6.6	7.6	watts
Power Output (Approx.).	85	130	watts

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy

Key-down conditions per tube without modulation□□

Maximum Ratings, *Absolute-Maximum Values:*

	CCS●	ICAS●●	
DC PLATE VOLTAGE.	1250 max.	1500 max.	volts
DC GRID VOLTAGE	-200 max.	-200 max.	volts
DC PLATE CURRENT.	175 max.	175 max.	ma
DC GRID CURRENT	35 max.	35 max.	ma
PLATE INPUT	175 max.	260 max.	watts
PLATE DISSIPATION	45 max.	65 max.	watts

Typical Operation:

DC Plate Voltage.	1250	1500	volts
DC Grid Voltage▲▲	-90	-120	volts
	3000	4000	ohms
	530	590	ohms
Peak RF Grid Voltage.	200	240	volts
DC Plate Current.	140	173	ma
DC Grid Current (Approx.) . . .	30	30	ma
Driving Power (Approx.)	5.4	6.5	watts
Power Output (Approx.).	130	190	watts

●,●●,#,⊕,▲▲,□□: See next page.

812-A
POWER TRIODE

SELF-RECTIFYING OSCILLATOR or AMPLIFIER – Class C

Maximum Ratings, ***Absolute Values:***

	CCS●	
AC PLATE VOLTAGE (RMS)	1750 max.	volts
DC GRID VOLTAGE	−125 max.	volts
DC PLATE CURRENT	75 max.	ma
DC GRID CURRENT	20 max.	ma
PLATE INPUT	145 max.	watts
PLATE DISSIPATION	45 max.	watts

Typical Operation in Push-Pull Circuit at 27 Mc.:

Values are for 2 tubes

AC Plate Voltage (RMS)	1740	volts
Grid Resistor●	3500	ohms
DC Plate Current	150	ma
DC Grid Current (at full load)	29	ma
Driving Power (Approx.)▲	12	watts
Power Output (Approx.)	200	watts
Useful Power Output (Approx.)– 75% circuit efficiency	150	watts

AMPLIFIER or OSCILLATOR – Class C

With Separate, Rectified, Unfiltered, Single-Phase, Full-Wave Plate Supply

Maximum Ratings, ***Absolute Values:***

	CCS●	
DC PLATE VOLTAGE	1125 max.	volts
DC GRID VOLTAGE	−125 max.	volts
DC PLATE CURRENT	160 max.	ma
DC GRID CURRENT	32 max.	ma
PLATE INPUT§	175 max.	watts
PLATE DISSIPATION	45 max.	watts

Typical Operation:

DC Plate Voltage	1125	volts
Grid Resistor●	2200	ohms
DC Plate Current	125	ma
DC Grid Current (Approx.)	30	ma
Driving Power (Approx.)§§	5	watts
Power Output (Approx.)	135	watts

● Continuous Commercial Service.

●● Intermittent Commercial and Amateur Service.

For ac filament supply.

● Obtained by grid resistor of value shown or by partial self-bias methods.

▲▲ Obtained from a fixed supply, by grid resistor (3000, 4000) or by cath-resistor (530, 590).

□□, ▲, ⊕, §, §§: See next page.

← Indicates a change.

812-A

812-A
POWER TRIODE

□□ Modulation essentially negative may be used, if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

▲ From a self-rectified driver.

● The 812-A can be biased by any convenient method, but the use of a grid resistor is preferred because the bias is automatically varied as the load on the circuit varies. In those applications where grid current and grid voltage may vary widely because of fluctuating loads, it is important to design equipment so that the maximum grid-current and grid-voltage ratings are never exceeded for any load. An approximate rule is to adjust the grid-current and grid-voltage values at full-load to one-half of the corresponding maximum values. This operating condition permits grid-current and grid-voltage values to rise from zero load to twice their full-load values, and usually provides adequate leeway.

§ Power input to plate is 1.23 times the product of DC Plate Voltage and DC Plate Current.

§§ From a driver with a rectified, unfiltered, single-phase, full-wave plate supply.

NOTE: When the 812-A is used in the final amplifier or a preceding stage of a transmitter designed for break-in operation and oscillator keying, a small amount of fixed bias must be used to maintain the plate current at a safe value. With a plate voltage of 1500 volts, a fixed bias of at least -45 volts should be used.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Filament Current	1	3.75	4.25	amp
Amplification Factor	1,2	26	32	
Grid-Plate Capacitance . . .	-	4.8	6.2	μμf
Grid-Filament Capacitance. .	-	4.4	6.4	μμf
Plate-Filament Capacitance .	-	0.58	0.96	μμf
Grid Current	1,3	17	39	ma
Plate Current.	1,4	18	42	ma
Useful Power Output.	1,5	140	-	watts

Note 1: DC filament voltage = 6.3 volts.

Note 2: With dc grid voltage of -30 volts and plate voltage adjusted to give plate current of 30 ma.

Note 3: With dc plate voltage of 200 volts and dc grid voltage of +50 volts.

Note 4: With dc plate voltage of 1250 volts and dc grid voltage of -30 volts.

Note 5: With dc plate voltage of 1500 volts, plate current of 175 ma., grid current of 34 to 50 ma., grid resistor of 3500 ± 10% ohms and frequency of 15 Mc.

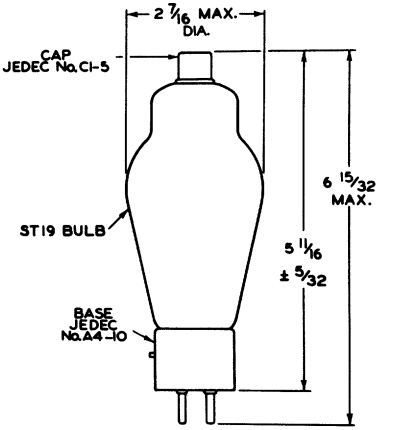
Data on operating frequencies for the 812-A are given on the sheet TRANS. TUBE RATINGS vs FREQUENCY

OPERATING CONSIDERATIONS

Plate shows no color when tube is operated at maximum CCS ratings, and shows a barely perceptible red color at maximum ICAS ratings.

MAXIMUM RATINGS vs OPERATING FREQUENCY

OPERATING FREQUENCY Mc	MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM PLATE VOLTAGE & PLATE INPUT	
	TELEPHONY	TELEGRAPHY
	Class C Plate-Modulated	Class C
30	100	100
60	89	89
80	70	70
100	55	55

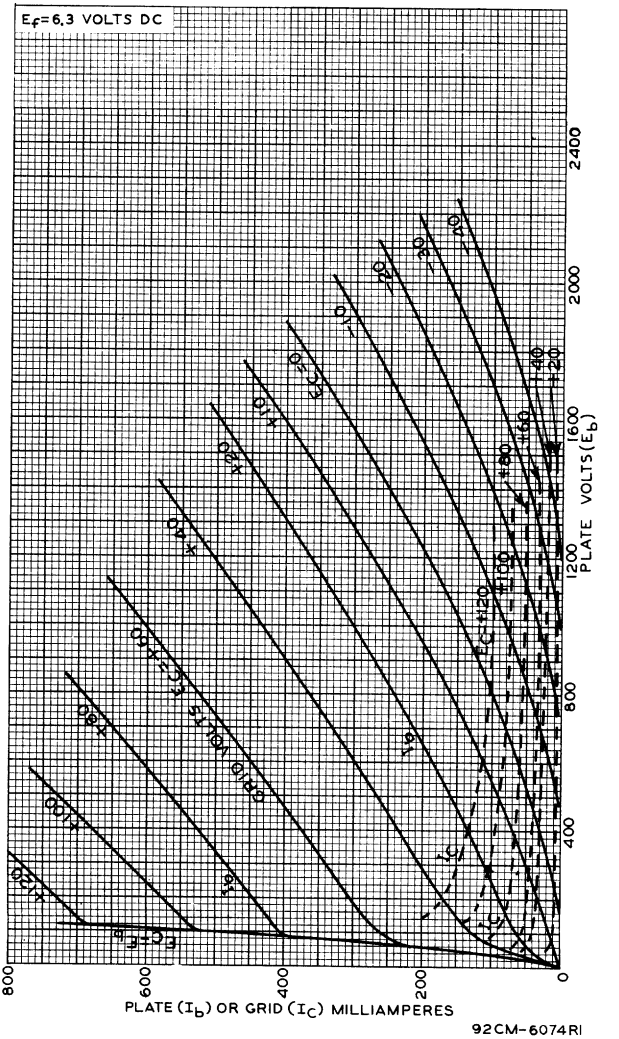


92CS-6905R2

ALL DIMENSIONS IN INCHES

812A

AVERAGE PLATE CHARACTERISTICS



812-A

OPERATION CHARACTERISTICS

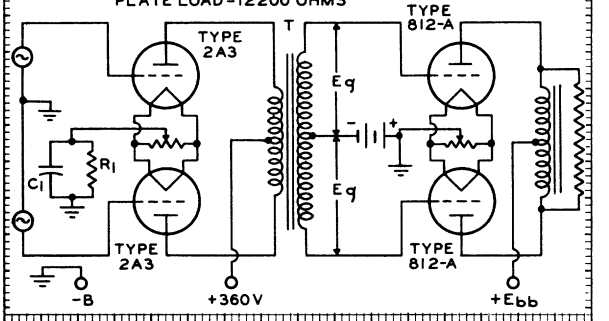
E_f = 6.3 VOLTS AC FOR 812-A's & 2.5 VOLTS AC FOR 2A3's

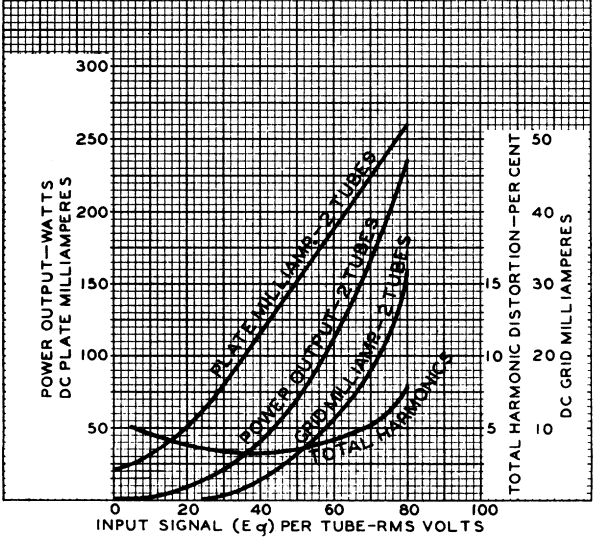
INPUT: CLASS AB_1 – TWO TYPE 2A3's; PLATE-SUPPLY VOLTS = 360; CATHODE-BIAS RESISTOR (R_1) = 780 OHMS; BYPASS CAPACITOR (C_1) = 80 μf

INTERSTAGE TRANSFORMER (T):

VOLTAGE RATIO $\frac{\text{PRIMARY}}{\frac{1}{2}\text{ SEC.}} = 1.4$

OUTPUT: CLASS B – TWO TYPE 812-A's; PLATE VOLTS (E_{bb}) = 1250; DC GRID VOLTS = -40; PLATE-TO-PLATE LOAD = 12200 OHMS



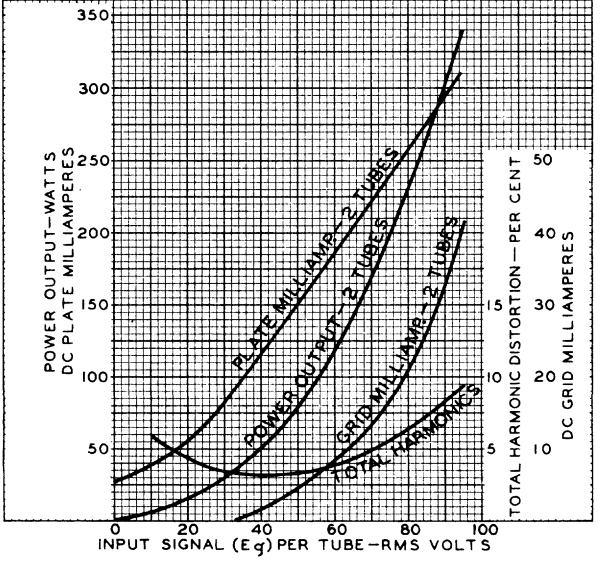


812-A

812-A

OPERATION CHARACTERISTICS

*E_f = 6.3 VOLTS AC FOR 812-A's & 2.5 VOLTS AC FOR 2A3's
CIRCUIT ARRANGEMENT: SAME AS ON DWG. 92CM-6938 UNDER TYPE 812-A
INPUT: CLASS AB_1 — TWO TYPE 2A3's; PLATE-SUPPLY VOLTS = 360; CATHODE-BIAS RESISTOR (R_1) = 780 OHMS; BYPASS CAPACITOR (C_1) = 80 μf
INTERSTAGE TRANSFORMER (T):
VOLTAGE RATIO $\frac{\text{PRIMARY}}{\frac{1}{2}\text{ SEC.}} = 1.4$
OUTPUT: CLASS B — TWO TYPE 812-A's; PLATE VOLTS (E_{bb}) = 1500; DC GRID VOLTS = -48; PLATE-TO-PLATE LOAD = 13200 OHMS



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HALF-WAVE MERCURY-VAPOR RECTIFIER

GENERAL DATA

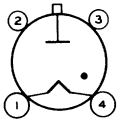
Electrical:

	Min.	*Av.*	*Max.*	
Filament, Coated:				
Voltage	2.25	2.5	2.75	ac volts
Current at 2.5 volts	–	2	2.2	amp
Heating time at rated voltage	10	–	–	sec
Peak Tube Voltage Drop (Approx.)	–	15	–	volts

Mechanical:

Operating Position . . . . . .Vertical, base down
Maximum Overall Length . . . . . 4-11/16"
Seated Length. . . . . 3-15/16" ± 1/8"
Maximum Diameter . . . . . 1-9/16"
Weight (Approx.) . . . . . 1 oz
Bulb ST12
Cap. . . . . .Small (JETEC No.C1-1)
Socket . . . . . .Johnson No.122-224, or equivalent
Base . . . . . .Small-Shell Small 4-Pin (JETEC No.A4-5)
Basing Designation for BOTTOM VIEW 4P

Pin 1 – Filament
Pin 2 – No Connection
Pin 3 – No Connection



Pin 4 – Filament, Cathode Shield
Cap – Anode

Temperature Control:

Heating—When the ambient temperature is so low that the normal rise of condensed-mercury temperature above the ambient temperature will not bring the condensed-mercury temperature up to the minimum value of the operating ranges specified under *Maximum Ratings*, some form of heat-conserving enclosure or auxiliary heater will be required.

Cooling—When the operating conditions are such that the maximum value of the operating condensed-mercury-temperature range is exceeded, provision should be made for forced-air cooling sufficient to prevent exceeding the maximum value.

Temperature Rise of Condensed Mercury to Equilibrium Above Ambient Temperature (Approx.):

No load	22	°C
Full load	26	°C

←Indicates a change.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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HALF-WAVE MERCURY-VAPOR RECTIFIER

HALF-WAVE RECTIFIER

Maximum Ratings, *Absolute Values: For supply frequency of 60 cps*

	Operating Condensed-Mercury-Temperature Range 20° to 60° C	
PEAK INVERSE ANODE VOLTAGE	7500 max.	volts
ANODE CURRENT:		
Peak	500 max.	ma
Average#	125 max.	ma
→ Fault, for duration of 0.1 second maximum	5 max.	amp

Averaged over any interval of 30 seconds maximum.

OPERATING CONSIDERATIONS

Shields and rf filter circuits should be provided for the 816 if it is subjected to extraneous high-frequency fields during operation. These fields tend to produce breakdown effects in mercury vapor and are detrimental to tube life and performance. When shields are used, special attention must be given to providing adequate ventilation and to maintaining normal condensed-mercury temperature. Rf filters are employed to prevent damage caused by rf currents which might otherwise be fed back into the rectifier tubes.

→ Indicates a change.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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HALF-WAVE MERCURY-VAPOR RECTIFIER

For Circuit Figures, see Front of this Section

CIRCUIT	MAX. TRANS. SEC. VOLTS (RMS) E	APPROX. DC OUTPUT VOLTS TO FILTER E_{av}	MAX. DC OUTPUT AMPERES I_{av}	MAX. DC OUTPUT KW TO FILTER P_{dc}
Fig. 1 **Half-Wave** **Single-Phase** In-Phase Operation	5300□	2400	0.125	0.3
Fig. 2 **Full-Wave** **Single-Phase** In-Phase Operation	2600□	2400	0.25	0.6
Fig. 3 **Series** **Single-Phase** In-Phase Operation	5300□	4800	0.25	1.2
Fig. 4 **Half-Wave** **Three-Phase** In-Phase Operation	3000□	3600	0.75	2.7
Fig. 5 **Parallel** **Three-Phase** Quadrature Operation	3000□	3600	1.5	5.4
Fig. 6 **Series** **Three-Phase** Quadrature Operation	3000□	7200	0.75	5.4
Fig. 7 **Half-Wave** **Four-Phase** Quadrature Operation	2600□	3500	*Resistive Load* 0.45 / *Inductive Load* 0.5	*Resistive Load* 1.55 / *Inductive Load* 1.75
Fig. 8 **Half-Wave** **Six-Phase** Quadrature Operation	2600□	3600	*Resistive Load* 0.47 / *Inductive Load* 0.5	*Resistive Load* 1.7 / *Inductive Load* 1.8

□ For maximum peak inverse anode voltage of 7500 volts and condensed-mercury-temperature range of 20° to 60° C.

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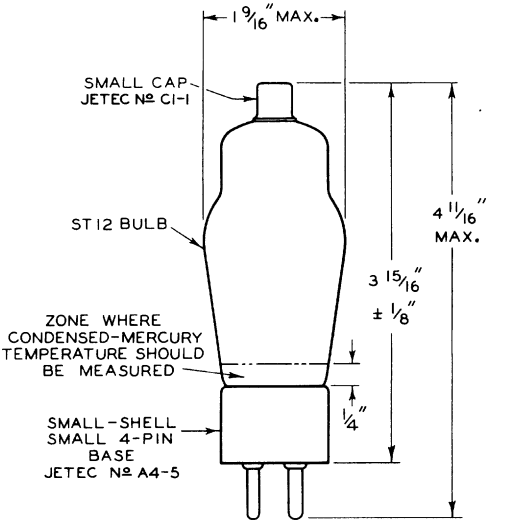
HALF-WAVE MERCURY-VAPOR RECTIFIER



833A

Power Triode

THORIATED-TUNGSTEN FILAMENT — **RUGGED STRUCTURE**
ZIRCONIUM-COATED ANODE — **POST TERMINALS**
1250 WATTS CW INPUT (CCS) TO 30 Mc WITH NATURAL COOLING
1800 WATTS CW INPUT (CCS) TO 20 Mc WITH FORCED-AIR COOLING

GENERAL DATA

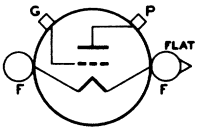
Electrical:

Filament, Thoriated Tungsten:		
Voltage (AC or DC)	10 ± 5%	volts
Current at heater volts = 10	10	amp
Amplification Factor, for grid volts = −10 and plate ma. = 200	35	
Direct Interelectrode Capacitances:		
Grid to plate	6.3	μμf
Grid to filament	12.3	μμf
Plate to filament	8.5	μμf

Mechanical:

Operating Position . . . . . Vertical, with filament posts up or down; Horizontal, with plane of electrodes vertical (on edge) ←
Overall Length . . . . . 8-5/8" ± 3/16"
Maximum Diameter . . . . . 4-19/32"
Bulb T36
Weight (Approx.) . . . . . 1 lb
Terminal Connections (See *Dimensional Outline*):

F - Filament
G - Grid



P - Plate

Thermal:

Cooling:

Natural or *forced air*—depending on the operating conditions. *Natural Cooling* means that adequate free circulation of air around the tube is necessary. *Forced-Air Cooling* means that an air flow of 40 cfm from a 2"-diameter nozzle directed vertically on bulb between grid and plate seals is required to limit temperature between these seals to 145° C.

Fittings: ←

Johnson (E.F. Johnson Company, Waseca, Minn.) Assembly Cat. No.124-212 consisting of ceramic mounting for filament end and two heat-radiating connectors for grid and plate terminals.

●,●●,*: See next page.

← Indicates a change.

AF POWER AMPLIFIER & MODULATOR — Class B

NATURAL COOLING

	CCS●	ICAS●●	
Maximum Ratings, *Absolute-Maximum Values:*			
DC PLATE VOLTAGE	3000 max.	3300 max.	volts
MAX.-SIGNAL DC PLATE CURRENT*	500 max.	500 max.	ma
MAX.-SIGNAL PLATE INPUT*	1125 max.	1300 max.	watts
PLATE DISSIPATION*	300 max.	350 max.	watts
Typical Operation with Natural Cooling:			
Values are for 2 tubes			
DC Plate Voltage	3000	3300	volts
DC Grid Voltage#	−70	−80	volts
Peak AF Grid-to-Grid Voltage	400	440	volts
Zero-Signal DC Plate Current	100	100	ma
Max.-Signal DC Plate Current	750	780	ma
Effective Load Resistance (Plate to plate)	9500	10500	ohms
Max.-Signal Driving Power (Approx.)	20	30	watts
Max.-Signal Power Output (Approx.)	1650	1900	watts

FORCED-AIR COOLING

	CCS●	ICAS●●	
Maximum Ratings, *Absolute-Maximum Values:*			
DC PLATE VOLTAGE	4000 max.	4000 max.	volts
MAX.-SIGNAL DC PLATE CURRENT*	500 max.	500 max.	ma
MAX.-SIGNAL PLATE INPUT*	1600 max.	1800 max.	watts
PLATE DISSIPATION*	400 max.	450 max.	watts
Typical Operation with Forced-Air Cooling:			
Values are for 2 tubes			
DC Plate Voltage	4000	4000	volts
DC Grid Voltage#	−100	−100	volts
Peak AF Grid-to-Grid Voltage	480	510	volts
Zero-Signal DC Plate Current	100	100	ma
Max.-Signal DC Plate Current	800	900	ma
Effective Load Resistance (Plate to plate)	12000	11000	ohms
Max.-Signal Driving Power (Approx.)	29	38	watts
Max.-Signal Power Output (Approx.)	2400	2700	watts

* Averaged over any audio-frequency cycle of sine-wave form.

●, ●●, #: See next page.

833-A
POWER TRIODE

RF POWER AMPLIFIER - Class B Telephony

Carrier conditions per tube for use with a max. modulation factor of 1.0

NATURAL COOLING

	CCS●	*ICAS*●●	
Maximum Ratings, *Absolute Values:*			
DC PLATE VOLTAGE	3000 max.	3300 max.	volts
DC PLATE CURRENT	300 max.	300 max.	ma
PLATE INPUT	450 max.	525 max.	watts
PLATE DISSIPATION	300 max.	350 max.	watts
Typical Operation with Natural Cooling:			
DC Plate Voltage	3000	3300	volts
DC Grid Voltage#	−70	−100	volts
Peak RF Grid Voltage	90	110	volts
DC Plate Current	150	150	ma
DC Grid Current (Approx.)	2	2	ma
Driving Power (Approx.)▲	10	11	watts
Power Output (Approx.)	150	200	watts

FORCED-AIR COOLING

	CCS●	*ICAS*●●	
Maximum Ratings, *Absolute Values:*			
DC PLATE VOLTAGE	4000 max.	4000 max.	volts
DC PLATE CURRENT	300 max.	300 max.	ma
PLATE INPUT	600 max.	675 max.	watts
PLATE DISSIPATION	400 max.	450 max.	watts
Typical Operation with Forced-Air Cooling:			
DC Plate Voltage	4000	4000	volts
DC Grid Voltage#	−120	−120	volts
Peak RF Grid Voltage	120	130	volts
DC Plate Current	150	150	ma
DC Grid Current (Approx.)	2	3	ma
Driving Power (Approx.)▲	14	21	watts
Power Output (Approx.)	225	250	watts

PLATE-MODULATED RF POWER AMPLIFIER - Class C Telephony

Carrier conditions per tube for use with a max. modulation factor of 1.0

NATURAL COOLING

	CCS●	*ICAS*●●	
Maximum Ratings, *Absolute Values:*			
DC PLATE VOLTAGE	2500 max.	3000 max.	volts
DC GRID VOLTAGE	−500 max.	−500 max.	volts
DC PLATE CURRENT	400 max.	400 max.	ma

For ac filament supply.

▲ At crest of audio-frequency cycle with modulation factor of 1.0.

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POWER TRIODE

	CCS●	ICAS●●	
DC GRID CURRENT	100 max.	100 max.	ma
PLATE INPUT	835 max.	1000 max.	watts
PLATE DISSIPATION	200 max.	250 max.	watts

Typical Operation with Natural Cooling:

DC Plate Voltage	2500	3000	volts
DC Grid Voltage⊕	−300	−240	volts
From a grid resistor of	4000	3400	ohms
Peak RF Grid Voltage	460	410	volts
DC Plate Current	335	335	ma
DC Grid Current (Approx.)⊕	75	70	ma
Driving Power (Approx.)⊕	30	26	watts
Power Output (Approx.)	635	800	watts

FORCED-AIR COOLING

	CCS●	ICAS●●	
Maximum Ratings, *Absolute Values:*			
DC PLATE VOLTAGE	3000 max.	4000 max.	volts
DC GRID VOLTAGE	−500 max.	−500 max.	volts
DC PLATE CURRENT	450 max.	450 max.	ma
DC GRID CURRENT	100 max.	100 max.	ma
PLATE INPUT	1250 max.	1800 max.	watts
PLATE DISSIPATION	270 max.	350 max.	watts

Typical Operation with Forced-Air Cooling:

DC Plate Voltage	3000	4000	volts
DC Grid Voltage⊕	−300	−325	volts
From a grid resistor of	3600	3600	ohms
Peak RF Grid Voltage	490	520	volts
DC Plate Current	415	450	ma
DC Grid Current (Approx.)⊕	85	90	ma
Driving Power (Approx.)⊕	37	42	watts
Power Output (Approx.)	1000	1500	watts

RF POWER AMPLIFIER & OSCILLATOR--Class C Telegraphy□□
and
RF POWER AMPLIFIER--Class C FM Telephony

NATURAL COOLING

	CCS●	ICAS●●	
Maximum Ratings, *Absolute Values:*			
DC PLATE VOLTAGE	3000 max.	3300 max.	volts
DC GRID VOLTAGE	−500 max.	−500 max.	volts
DC PLATE CURRENT	500 max.	500 max.	ma

⊕ Obtained by grid resistor, or from a combination of grid resistor with either fixed supply or cathode resistor.

□□ Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

●, ●●, ⊕: See next page.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

833-A

POWER TRIODE

	CCS●		ICAS●●		
DC GRID CURRENT	100 max.		100 max.		ma
PLATE INPUT	1250 max.		1500 max.		watts
PLATE DISSIPATION	300 max.		350 max.		watts
Typical Operation with Natural Cooling:					
DC Plate Voltage	2250	3000	3000	3000	volts
DC Grid Voltage	-125	-200	-160	-155	volts
From a grid resistor of	1500	3600	2300	2150	ohms
From a cathode resistor of	235	425	400	270	ohms
Peak RF Grid Voltage	300	360	310	350	volts
DC Plate Current	445	415	335	500	ma
DC Grid Current (Approx.)⊕	85	55	70	70	ma
Driving Power (Approx.)⊕	23	20	20	25	watts
Power Output (Approx.)	780	1000	800	1150	watts

FORCED-AIR COOLING

	CCS●	ICAS●●	
Maximum Ratings, *Absolute Values:*			
DC PLATE VOLTAGE	4000 max.	4000 max.	volts
DC GRID VOLTAGE	-500 max.	-500 max.	volts
DC PLATE CURRENT	500 max.	500 max.	ma
DC GRID CURRENT	100 max.	100 max.	ma
PLATE INPUT	1800 max.	2000 max.	watts
PLATE DISSIPATION	400 max.	450 max.	watts
Typical Operation with Forced-Air Cooling:			
DC Plate Voltage	4000	4000	volts
DC Grid Voltage▲▲	-200	-225	volts
From a grid resistor of	2650	2400	ohms
From a cathode resistor of	380	380	ohms
Peak RF Grid Voltage	375	415	volts
DC Plate Current	450	500	ma
DC Grid Current⊕	75	95	ma
Driving Power (Approx.)⊕	26	35	watts
Power Output (Approx.)	1440	1600	watts

⊕ Subject to wide variation depending on the impedance of the load circuit. High-impedance load circuits require more grid current and driving power to obtain the desired output. Low-impedance load circuits need less grid current and driving power, but plate-circuit efficiency is sacrificed. The driver stage should have good regulation and should be capable of delivering considerably more than the required driving power.

▲▲ Obtained from fixed supply, by grid resistor, by cathode resistor, or by combination methods.

●, ●●: See next page.

← Indicates a change.

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833-A
POWER TRIODE

NOTE: When the 833-A is used in the final amplifier or a preceding stage of a transmitter designed for break-in operation and oscillator keying, a small amount of fixed-bias must be used to maintain the plate current at a safe value. With a plate voltage of 4000 volts, a fixed bias of at least -90 volts should be used.

→ SELF-RECTIFYING OSCILLATOR OR AMPLIFIER - Class C

NATURAL COOLING

	CCS●	*ICAS*●●	
Maximum Ratings, *Absolute Values:*			
AC PLATE VOLTAGE (RMS)	4250 max.	4650 max.	volts
DC GRID VOLTAGE	-315 max.	-315 max.	volts
DC PLATE CURRENT	250 max.	250 max.	ma
DC GRID CURRENT	50 max.	50 max.	ma
PLATE INPUT**	1180 max.	1290 max.	watts
PLATE DISSIPATION	300 max.	350 max.	watts
Typical Operation with Natural Cooling:			
AC Plate Voltage (RMS)	4000	4400	volts
DC Grid Voltage♦	-80	-85	volts
From a grid resistor of	2200	2400	ohms
DC Plate Current	240	240	ma
DC Grid Current (Approx.)	37	36	ma
Driving Power (Approx.)##	13	13.5	watts
Output-Circuit Efficiency (Approx.)	85	85	%
Useful Power Output (Approx.)	710□	800□	watts

FORCED-AIR COOLING

	CCS●	
Maximum Ratings, *Absolute Values:*		
AC PLATE VOLTAGE (RMS)	5650 max.	volts
DC GRID VOLTAGE	-315 max.	volts
DC PLATE CURRENT	250 max.	ma
DC GRID CURRENT	50 max.	ma
PLATE INPUT	1570 max.	watts
PLATE DISSIPATION	400 max.	watts
Typical Operation with Forced-Air Cooling:		
AC Plate Voltage (RMS)	5300	volts
DC Grid Voltage♦	-97	volts
From a grid resistor of	2700	ohms
DC Plate Current	240	ma
DC Grid Current (Approx.)	35	ma
Driving Power (Approx.)##	14	watts
Output-Circuit Efficiency (Approx.)	85	%
Useful Power Output (Approx.)	975□	watts

** Power input to plate is 1.11 times the product of ac plate voltage (rms) and the dc plate current.

From a self-rectified driver.

●, ●●, ♦, □: See next page. → Indicates a change.

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833-A

POWER TRIODE

AMPLIFIER or OSCILLATOR — Class C

With Separate, Rectified, Unfiltered, Single-Phase, Full-Wave Plate Supply

NATURAL COOLING

	CCS●	ICAS●●	
Maximum Ratings, *Absolute Values:*			
DC PLATE VOLTAGE	2700 max.	3000 max.	volts
DC GRID VOLTAGE	−450 max.	−450 max.	volts
DC PLATE CURRENT	500 max.	500 max.	ma
DC GRID CURRENT	100 max.	100 max.	ma
PLATE INPUT†	1250 max.	1500 max.	watts
PLATE DISSIPATION	300 max.	350 max.	watts
Typical Operation with Natural Cooling:			
DC Plate Voltage	2500	2750	volts
DC Grid Voltage♦	−130	−135	volts
From a grid resistor of	1560	1770	ohms
DC Plate Current	450	450	ma
DC Grid Current (Approx.)	83	76	ma
Driving Power (Approx.)††	27	25	watts
Output-Circuit Efficiency (Approx.)	85	85	%
Useful Power Output (Approx.)	935□	1020□	watts ←

FORCED-AIR COOLING

	CCS●	
Maximum Ratings, *Absolute Values:*		
DC PLATE VOLTAGE	3600 max.	volts
DC GRID VOLTAGE	−450 max.	volts
DC PLATE CURRENT	500 max.	ma
DC GRID CURRENT	100 max.	ma
PLATE INPUT†	1800 max.	watts
PLATE DISSIPATION	400 max.	watts
Typical Operation with Forced-Air Cooling:		
DC Plate Voltage	3300	volts
DC Grid Voltage♦	−155	volts
From a grid resistor of	2100	ohms
DC Plate Current	450	ma
DC Grid Current (Approx.)	73	ma
Driving Power (Approx.)††	26	watts
Output-Circuit Efficiency (Approx.)	85	%
Useful Power Output (Approx.)	1240□	watts ←

● Continuous Commercial Service.

●● Intermittent Commercial and Amateur Service.

† Power input to plate is 1.23 times the product of dc plate voltage times dc plate current.

□ This value of useful power is measured at load of output circuit having the indicated efficiency.

♦, ††: See next page.

← Indicates a change.

833-A
POWER TRIODE

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Filament Current.	1	9.4	10.6	amp
Direct Interelectrode Capacitances:				
Grid to plate	–	5.5	7.1	μμf
Grid to filament. . . .	–	10.1	14.5	μμf
Plate to filament . . .	–	6.4	10.6	μμf
Amplification Factor. . .	2	31.5	38.5	
Grid Current.	3	160	380	ma
Plate Current (1)	3	490	810	ma
Plate Current (2)	4	60	140	ma
Power Output.	5	1150	–	watts

Note 1: With 10 volts dc on filament.

Note 2: With 10 volts ac on filament, dc grid voltage of −10 volts, and dc plate voltage adjusted to give dc plate current of 200 ma.

Note 3: With 10 volts ac on filament, dc plate voltage of 100 volts, and dc grid voltage of +100 volts.

Note 4: With 10 volts ac on filament, dc plate voltage of 2500 volts, and dc grid voltage of −50 volts.

Note 5: In self-excited oscillator circuit, and with 10 volts ac on filament, dc plate voltage of 4000 volts, dc plate current of 450 ma., dc grid current of 80 to 120 ma., grid resistor of 5000 ohms, and frequency of 30 Mc.

♦ Obtained from a grid resistor of the value shown or from a combination of grid resistor and cathode resistor. Fixed bias operation is not recommended. The bias resistor should not be bypassed for the plate and grid voltage supply frequency.

†† From a driver with a rectified, unfiltered, single-phase, full wave plate supply.

RATINGS vs FREQUENCY WITH NATURAL COOLING

FREQUENCY	30	50	75	Mc
MAXIMUM PERMISSIBLE PERCENTAGE of MAXIMUM RATED PLATE VOLTAGE and PLATE INPUT:				
Class B telephony	100	98	94	%
Class C telephony	100	90	72	%
Class C telegraphy	100	90	72	%

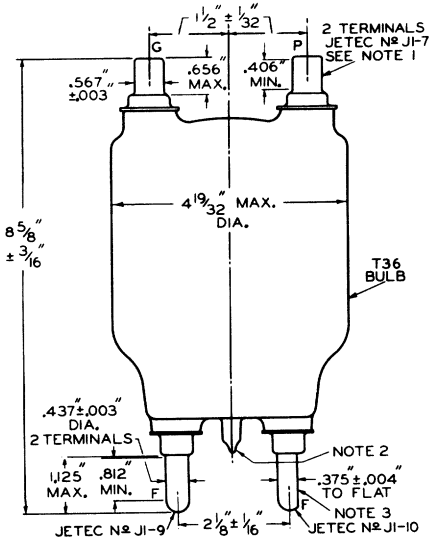
RATINGS vs FREQUENCY WITH FORCED-AIR COOLING

FREQUENCY	20	50	75	Mc
MAXIMUM PERMISSIBLE PERCENTAGE of MAXIMUM RATED PLATE VOLTAGE and PLATE INPUT:				
Class B telephony	100	97	93	%
Class C telephony	100	83	65	%
Class C telegraphy	100	83	65	%

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

833-A

POWER TRIODE



92CM-4786R5

NOTE 1: THE ANGLE FORMED ON A PLANE NORMAL TO THE TUBE AXIS BY THE INTERSECTION OF THE PLANE DETERMINED BY THE AXIS OF THE FILAMENT TERMINALS WITH THE PLANE DETERMINED BY THE AXIS OF THE GRID AND PLATE TERMINALS IS NOT MORE THAN 5°.

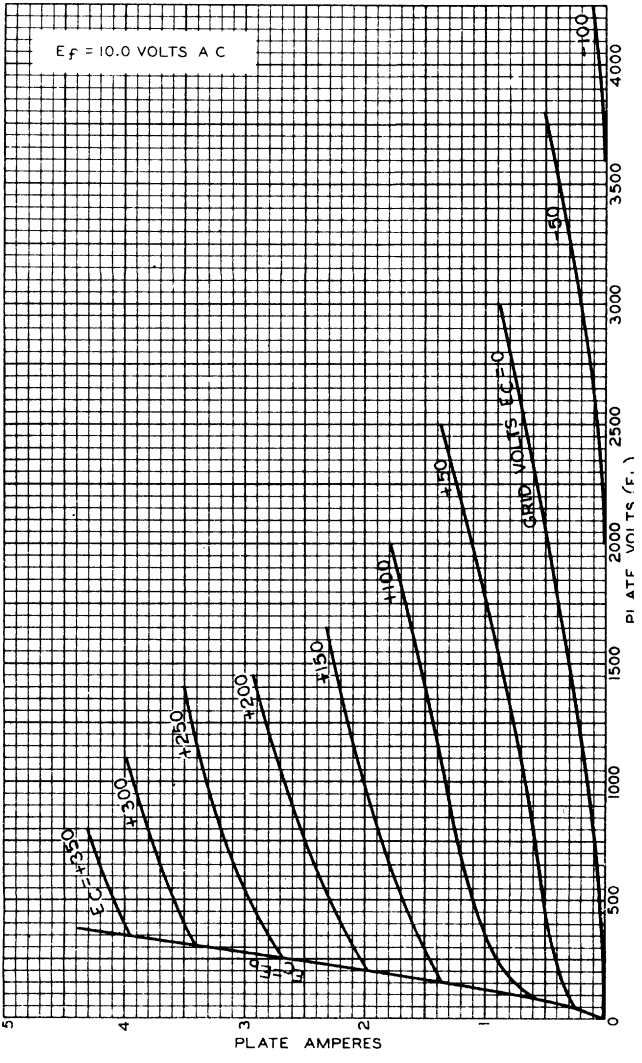
NOTE 2: THE MOUNTING SHOULD PROVIDE LIBERAL CLEARANCE FOR THIS TIP.

NOTE 3: THE PLANE THROUGH THE FLAT SIDE OF THE FILAMENT TERMINAL IS 90° ±7° WITH RESPECT TO THE PLANE THROUGH THE AXES OF THE FILAMENT TERMINALS.

833-A

833-A

AVERAGE PLATE CHARACTERISTICS



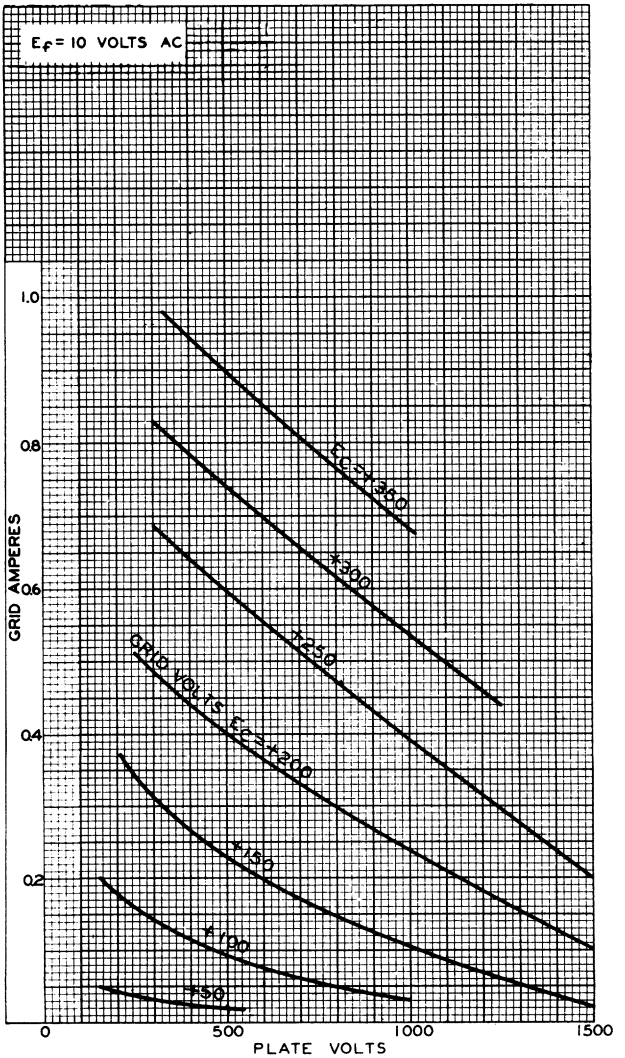
DEC. 1, 1943

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6196

833-A

TYPICAL CHARACTERISTICS



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

835
R-F POWER AMPLIFIER, A-F POWER AMPLIFIER, MODULATOR

Filament	Thoriated Tungsten	
Voltage	10	a-c or d-c volts
Current	3.25	amp.
Amplification Factor	12	
Direct Interelectrode Capacitances:		
Grid to Plate	9.25	μμf
Grid to Filament	6	μμf
Plate to Filament	5	μμf
Maximum Overall Length		7-7/8"
Maximum Diameter		2-5/16"
Bulb		T-18
Base		Jumbo 4-Pin
RCA Socket (Type UT-541-A)		Stock No.9936 ←

For additional data, see Type 211. The 211 and the 835 are identical except for interelectrode capacitances.

Data on operating frequencies for the 835 are given on the sheet TRANS. TUBE RATINGS vs FREQUENCY.

OBSOLETE
NOT RECOMMENDED
FOR RENEWAL

836
HALF-WAVE HIGH-VACUUM RECTIFIER

Heater	Coated Unipotential Cathodes*	←
Voltage	2.5	a-c volts
Current	5.0	amp.
Maximum Overall Length		6-9/16"
Maximum Diameter		2-7/16"
Bulb		ST-19
Cap		Medium
Base		Medium 4-Pin, Bayonet
RCA Socket (Type UR-542-A)		Stock No.9937

Maximum Ratings Are Absolute Values

MAXIMUM RATINGS

Peak Inverse Plate Voltage	5000 max. volts
Peak Plate Current	1.0 max. amp.
Average Plate Current	0.25 max. amp.

* The cathodes should be allowed to come up to operating temperature before plate current is drawn from the tube. For average conditions the delay is approximately 40 seconds.

The 836 has two separate cathodes each of which is connected to its respective heater. Plate circuit return should be made to the center-tap of the heater transformer. ←

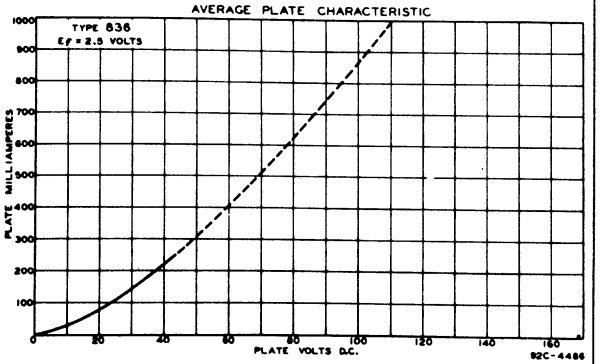
← Indicates a change.

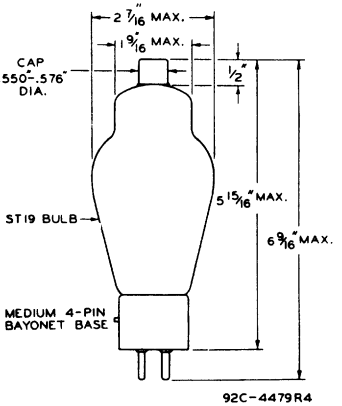
RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

836

836

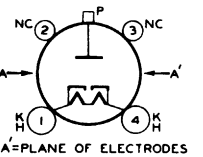
HALF-WAVE HIGH VACUUM RECTIFIER





TUBE MOUNTING POSITION
Any

BOTTOM VIEW OF
SOCKET CONNECTIONS



Pin 1 – Heater & Cathode
Pin 2 – No Connection
Pin 3 – No Connection
Pin 4 – Heater & Cathode
Cap – Plate

← Indicates a change.

Dec. 1, 1942

DATA

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

857-B

HALF-WAVE MERCURY-VAPOR RECTIFIER

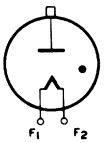
GENERAL DATA

Electrical:

Filamentary Cathode, Coated:		
Voltage	5 ± 5%	ac volts
Current	30	amp
Minimum heating time at rated voltage	60	sec
Peak Tube Voltage Drop (Approx.)	15	volts

Mechanical:

Terminal Connections:



F_1 – Filament (Insulated)

F_2 – Filament, Cathode Shield, Shell (Anode Return)

Cap – Anode

Mounting Position	Vertical with filament end down
Maximum Overall Length (Including flexible leads)	29-7/8"
Seated Length	19-1/2" ± 3/8"
Maximum Diameter	7-1/8"
Weight (Approx.)	4 lbs
Bulb	GT-56
Cap	Skirted Large (JETEC No.C1-10)
Base	Terminal-Support Shell (JETEC No.F0-2)

Temperature Control:

Heating--When the ambient temperature is so low that the normal rise of condensed-mercury temperature above the ambient temperature will not bring the condensed-mercury temperature up to the minimum value of the operating ranges specified under *Maximum Ratings*, some form of heat-conserving enclosure or auxiliary heater will be required.

Cooling--When the operating conditions are such that the maximum value of the operating condensed-mercury temperature range is exceeded, provision should be made for forced-air cooling sufficient to prevent exceeding the maximum value.

Temperature Rise of Condensed-Mercury to Equilibrium Above Ambient Temperature (Approx.):*

No load	11.5	°C
Full load	15	°C

* With filament volts = 4.75 and no heat-conserving enclosure.

← indicates a change.

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

857-B

857-B

HALF-WAVE MERCURY-VAPOR RECTIFIER

HALF-WAVE RECTIFIER

Maximum Ratings, *Absolute Values*: *For supply frequency of 60 cps*

	Operating Condensed-Mercury Temperature Range		
	25° to 60°C	30° to 40°C	
PEAK INVERSE ANODE VOLTAGE.	10000 max.	22000 max.	volts
ANODE CURRENT:			
Peak	40 max.	40 max.	amp
Average**.	10 max.	10 max.	amp
Fault, for duration of 0.2 second max.	400 max.	400 max.	amp

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Filament Current	1	-	33	amp
Critical Anode Voltage . . .	2	-	100	volts
Peak Tube Voltage Drop . . .	3	-	25	volts

Note 1: With 5 volts rms on filament.

Note 2: With 4.75 volts rms on filament, and condensed-mercury temperature at 25°C, or above.

Note 3: With 5 volts rms on filament, condensed-mercury temperature of 35° ± 5°C, peak anode current of 100 amperes provided by half-cycle pulse from a 60-cps sine wave and recurring approximately once a second. Tube drop is measured by an oscilloscope connected between anode and center tap of filament transformer.

OPERATING CONSIDERATIONS

X-Ray Warning. X-rays are produced when the 857-B is operated with a peak inverse voltage above 16000 volts (absolute value). These rays can constitute a health hazard unless the tube is adequately shielded for X-ray radiation. Although relatively simple shielding should prove adequate, make sure that it provides the required protection to the operator.

Shields and rf filter circuits should be provided for the 857-B if it is subjected to extraneous high-frequency fields during operation. These fields tend to produce breakdown effects in mercury vapor and are detrimental to tube life and performance. When shields are used, special attention must be given to providing adequate ventilation and to maintaining normal condensed-mercury temperature. Rf filters are employed to prevent damage caused by rf currents which might otherwise be fed back into the rectifier tubes.

** Averaged over any period of 30 seconds maximum.

→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

857-B

HALF-WAVE MERCURY-VAPOR RECTIFIER

For Circuit Figures, see Front of this Section

CIRCUIT	MAX. TRANS. SEC. VOLTS (RMS) E	APPROX. DC OUTPUT VOLTS TO FILTER Eav	MAX. DC OUTPUT AMPERES Iav	MAX. DC OUTPUT KW TO FILTER Pdc
Fig. 1 **Half-Wave** **Single-Phase** In-Phase Operation	15400□ 7000▲	7000 3200	10 10	70 32
Fig. 2 **Full-Wave** **Single-Phase** In-Phase Operation	7700□ 3500▲	7000 3200	20 20	140 64
Fig. 3 **Series** **Single-Phase** In-Phase Operation	15400□ 7000▲	14000 6400	20 20	280 128
Fig. 4 **Half-Wave** **Three-Phase** In-Phase Operation	8900□ 4000▲	10500 4800	30 30	315 144
Fig. 5 **Parallel** **Three-Phase** Quadrature Operation	8900□ 4000▲	10500 4800	60 60	630 288
Fig. 6 **Series** **Three-Phase** Quadrature Operation	8900□ 4000▲	21000 9600	30 30	630 288
Fig. 7 **Half-Wave** **Four-Phase** Quadrature Operation	7700□ 3500▲	10100 4600	*Resistive Load*: 36 *Inductive Load*: 40 36 40	*Resistive Load*: 364 *Inductive Load*: 404 166 184
Fig. 8 **Half-Wave** **Six-Phase** Quadrature Operation	7700□ 3500▲	10500 4800	*Resistive Load*: 38 *Inductive Load*: 40 38 40	*Resistive Load*: 399 *Inductive Load*: 420 182 192

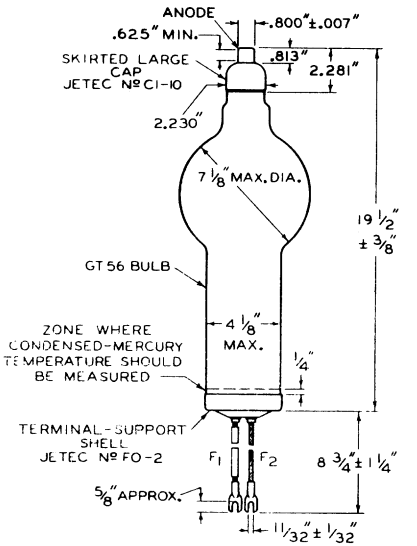
□ For maximum peak inverse anode voltage of 22000 volts and maximum average current of 10 amperes.

▲ For maximum peak inverse anode voltage of 10000 volts and maximum average current of 10 amperes.

857-B

857-B

HALF-WAVE MERCURY-VAPOR RECTIFIER

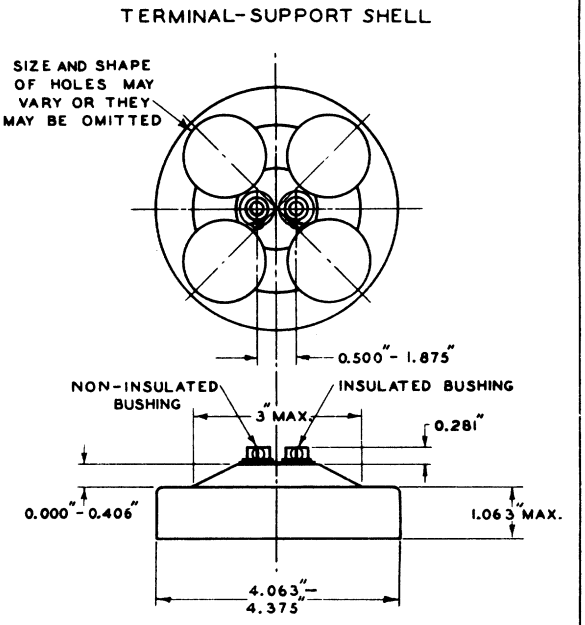


F_1 = FILAMENT (INSULATED)
F_2 = FILAMENT, CATHODE SHIELD, AND SHELL (ANODE RETURN)

92CM-4649R3

857-B

HALF-WAVE MERCURY-VAPOR RECTIFIER

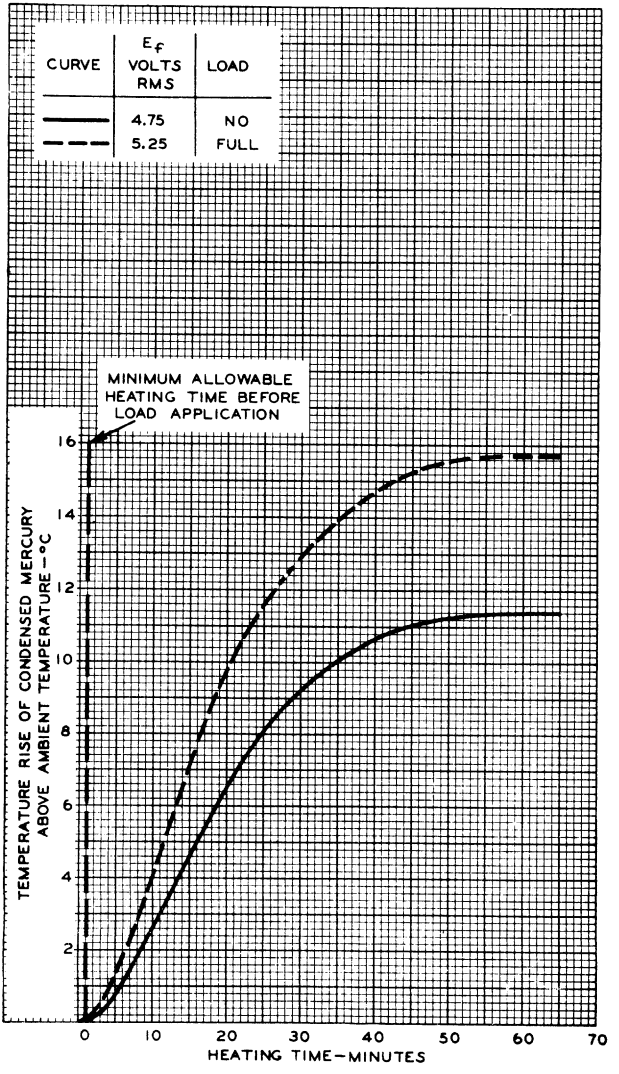


JETEC No. FO-2
RCA No. 3911

RCA

857-B

RATE OF RISE OF COND.-MERCURY TEMPERATURE



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

866-A

HALF-WAVE MERCURY-VAPOR RECTIFIER

GENERAL DATA

Electrical:

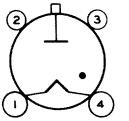
Filament, Coated:

	Min.	Av.	Max.	
Voltage	2.38	2.5	2.62	ac volts
Current at 2.5 volts	–	5	5.4	amp
Heating time at rated voltage	15	–	–	sec
Peak Tube Voltage Drop (Approx.)	–	15	–	volts

Mechanical:

Operating Position	Vertical, base down
Maximum Overall Length	6-9/16"
Maximum Seated Length	5-3/4" ± 3/16"
Maximum Diameter	2-7/16"
Weight (Approx.)	3 oz
Bulb	ST19
Cap	Medium (JETEC No.C1-5)
Socket	Johnson No.123-209, or equivalent
Base	Medium-Shell Small 4-Pin with Bayonet (JETEC No.A4-10)
Basing Designation for BOTTOM VIEW	4P

Pin 1 – Filament
Pin 2 – No Connection
Pin 3 – No Connection



Pin 4 – Filament, Cathode Shield
Cap – Anode

Temperature Control:

Heating—When the ambient temperature is so low that the normal rise of condensed-mercury temperature above the ambient temperature will not bring the condensed-mercury temperature up to the minimum value of the operating ranges specified under *Maximum Ratings*, some form of heat-conserving enclosure or auxiliary heater will be required.

Cooling—When the operating conditions are such that the maximum value of the operating condensed-mercury-temperature range is exceeded, provision should be made for forced-air cooling sufficient to prevent exceeding the maximum value.

Temperature Rise of Condensed Mercury to Equilibrium Above Ambient Temperature (Approx.):

No load*	26	°C
Full load▲	33	°C

* With 2.38 volts rms on filament, and no heat-conserving enclosure.

▲ With 2.62 volts rms on filament, average anode current = 0.5 ampere, and no heat-conserving enclosure.

← Indicates a change.

866-A

HALF-WAVE MERCURY-VAPOR RECTIFIER

HALF-WAVE RECTIFIER

→ **Maximum Ratings,** *Absolute Values: For supply frequency of 60 cps*

	Operating Condensed-Mercury-Temperature Range● 20° to 80° C	20° to 70° C	20° to 60° C	
PEAK INVERSE ANODE VOLTAGE. .	2500 max.	5000 max.	10000 max.	volts
ANODE CURRENT:				
Peak	2 max.	1 max.	1 max.	amp
Average#	0.5 max.	0.25 max.	0.25 max.	amp
Fault, for duration of 0.1 second maximum. . . .	20 max.	20 max.	20 max.	amp

● Operation at 40° ± 5° C is recommended.

Averaged over any interval of 30 seconds maximum.

→ ## OPERATING CONSIDERATIONS

Shields and rf filter circuits should be provided for the 866-A if it is subjected to extraneous high-frequency fields during operation. These fields tend to produce breakdown effects in mercury vapor and are detrimental to tube life and performance. When shields are used, special attention must be given to providing adequate ventilation and to maintaining normal condensed-mercury temperature. Rf filters are employed to prevent damage caused by rf currents which might otherwise be fed back into the rectifier tubes.

→ Indicates a change.

866-A

HALF-WAVE MERCURY-VAPOR RECTIFIER

For Circuit Figures, see Front of this Section

CIRCUIT	MAX. TRANS. SEC. VOLTS (RMS) E	APPROX. DC OUTPUT VOLTS TO FILTER E_{av}	MAX. DC OUTPUT AMPERES I_{av}	MAX. DC OUTPUT KW TO FILTER P_{dc}
Fig. 1 **Half-Wave** **Single-Phase** In-Phase Operation	7000□	3200	0.25	0.8
	3500▲	1600	0.25	0.4
	1700*	800	0.5	0.4
Fig. 2 **Full-Wave** **Single-Phase** In-Phase Operation	3500□	3200	0.5	1.6
	1700▲	1600	0.5	0.8
	800*	800	1	0.8
Fig. 3 **Series** **Single-Phase** In-Phase Operation	7000□	6400	0.5	3.2
	3500▲	3200	0.5	1.6
	1700*	1600	1	1.6
Fig. 4 **Half-Wave** **Three-Phase** In-Phase Operation	4000□	4800	0.75	3.6
	2000▲	2400	0.75	1.8
	1000*	1200	1.5	1.8
Fig. 5 **Parallel** **Three-Phase** Quadrature Operation	4000□	4800	1.5	7.2
	2000▲	2400	1.5	3.6
	1000*	1200	3	3.6
Fig. 6 **Series** **Three-Phase** Quadrature Operation	4000□	9600	0.75	7.2
	2000▲	4800	0.75	3.6
	1000*	2400	1.5	3.6
Fig. 7 **Half-Wave** **Four-Phase** Quadrature Operation			*Resistive Load* / *Inductive Load*	*Resistive Load* / *Inductive Load*
	3500□	4500	0.91 / 1	4.05 / 4.5
	1700▲	2300	0.91 / 1	2.07 / 2.3
	800*	1100	1.82 / 2	1.98 / 2.2
Fig. 8 **Half-Wave** **Six-Phase** Quadrature Operation			*Resistive Load* / *Inductive Load*	*Resistive Load* / *Inductive Load*
	3500□	4800	0.95 / 1	4.6 / 4.8
	1700▲	2400	0.95 / 1	2.3 / 2.4
	800*	1200	1.9 / 2	2.28 / 2.4

□ For maximum peak inverse anode voltage of 10000 volts, and condensed-mercury-temperature range of 20° to 60° C.

▲ For maximum peak inverse anode voltage of 5000 volts, and condensed-mercury-temperature range of 20° to 70° C.

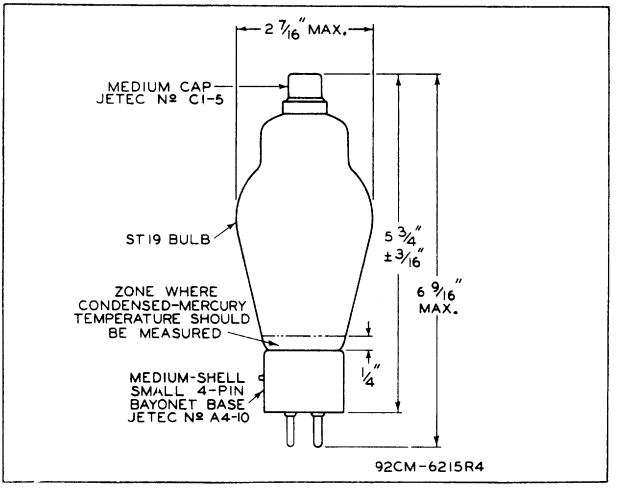
* For maximum peak inverse anode voltage of 2500 volts, and condensed-mercury-temperature range of 20° to 80° C.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

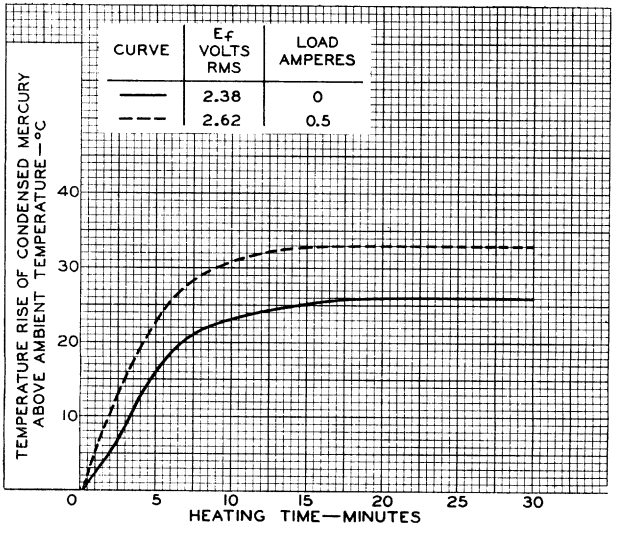
866-A

866-A

HALF-WAVE MERCURY-VAPOR RECTIFIER



RATE OF RISE OF CONDENSED-MERCURY TEMPERATURE



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CS-9028RI

869-B

HALF-WAVE MERCURY-VAPOR RECTIFIER

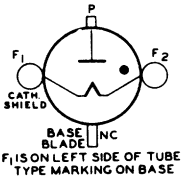
GENERAL DATA

Electrical:

Filamentary Cathode, Coated:			
Voltage	5 ± 5%		ac volts
Current	19		amperes
Minimum Heating Time at Rated Voltage	60		seconds
Peak Tube Voltage Drop (Approx.)	15		volts

Mechanical:

Terminal Connections:



F_1 – Filament, Cathode Shield (Anode Return)

F_2 – Filament Cap – Anode

F_1 IS ON LEFT SIDE OF TUBE TYPE MARKING ON BASE

Mounting Position	Vertical with filament end down
Overall Length	14-1/4" ± 3/16"
Maximum Diameter	5-1/8"
Bulb	GT-40
Cap — Skirted Large	JETEC No.C1-9 / RCA No.3905
Base	JETEC No.A3-20 / RCA No.3502

Temperature Control:

Heating—When the ambient temperature is so low that the normal rise of condensed-mercury temperature above the ambient temperature will not bring the condensed-mercury temperature up to the minimum value of the operating ranges specified under *Maximum Ratings*, some form of heat-conserving enclosure or auxiliary heater will be required.

Cooling—When the operating conditions are such that the maximum value of the operating condensed-mercury temperature range is exceeded, provision should be made for forced-air cooling sufficient to prevent exceeding the maximum value.

Temperature Rise of Condensed Mercury to Equilibrium Above Ambient Temperature (Approx.):*		
No Load	15	°C
Full Load	20	°C

HALF-WAVE RECTIFIER—In-Phase Operation●

Maximum Ratings, *Absolute Values: For supply frequency of 60 cps*

	Operating Condensed-Mercury Temperature Range			
	30° to 60°C	30° to 50°C	30° to 40°C	
PEAK INVERSE ANODE VOLTAGE	10000 max.	15000 max.	20000 max.	volts

* ●: See next page.

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

869-B

869-B

HALF-WAVE MERCURY-VAPOR RECTIFIER

	Operating Condensed-Mercury Temperature Range			
	30° to 60°C	30° to 50°C	30° to 40°C	
ANODE CURRENT:				
Peak	10 max.	10 max.	10 max.	amp
Average** . .	2.5 max.	2.5 max.	2.5 max.	amp
Fault, for duration of 0.1 second max.	100 max.	100 max.	100 max.	amp

HALF-WAVE RECTIFIER—Quadrature Operation••

Maximum Ratings, *Absolute Values: For supply frequency of 60 cps*

	Operating Condensed-Mercury Temperature Range			
	30° to 60°C	30° to 50°C	30° to 40°C	
PEAK INVERSE ANODE VOLTAGE	10000 max.	15000 max.	20000 max.	volts
ANODE CURRENT:				
Peak	20 max.	20 max.	10 max.	amp
Average** . .	5 max.	5 max.	2.5 max.	amp
Fault, for duration of 0.1 second max.	100 max.	100 max.	100 max.	amp

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Filament Current	1	–	21	amp
Critical Anode Voltage . .	2	–	100	volts
Peak Tube Voltage Drop . .	3	–	17	volts

Note 1: With 5 volts rms on filament.

Note 2: With 4.75 volts rms on filament, and condensed-mercury temperature at 30°C.

Note 3: With 5 volts rms on filament, condensed-mercury temperature of 35° ± 5°C, peak anode current of 50 amperes provided by half-cycle pulse from a 60-cps sine wave and recurring approximately once a second. Tube drop is measured by an oscilloscope connected between anode and center tap of filament transformer.

* With filament volts = 4.75 and no heat-conserving enclosure.

• Filament voltage in phase with anode voltage.

•• Filament voltage out of phase (60° to 120°) with anode voltage.

** Averaged over any period of 30 seconds maximum.

OPERATING NOTES

X-Ray Warning. X-rays are produced when the 869-B is operated with a peak inverse anode voltage above 16000 volts (absolute value). These rays can constitute a health hazard unless the tube is adequately shielded for x-ray radiation.

869-B

HALF-WAVE MERCURY-VAPOR RECTIFIER

For Circuit Figures, see Front of this Section

CIRCUIT	MAX. TRANS. SEC. VOLTS (RMS) E	APPROX. DC OUTPUT VOLTS TO FILTER E_{av}	MAX. DC OUTPUT AMPERES I_{av}	MAX. DC OUTPUT KW TO FILTER P_{dc}
Fig. 1 **Half-Wave** **Single-Phase** In-Phase Operation	14000□	6300	2.5	16
	10600▲	4700	2.5	12
	7000*	3100	2.5	8
Fig. 2 **Full-Wave** **Single-Phase** In-Phase Operation	7000□	6300	5.0	32
	5300▲	4700	5.0	24
	3500*	3100	5.0	16
Fig. 3 **Series** **Single-Phase** In-Phase Operation	14000□	12700	5.0	64
	10600▲	9500	5.0	48
	7000*	6300	5.0	32
Fig. 4 **Half-Wave** **Three-Phase** In-Phase Operation	8100□	9500	7.5	72
	6100▲	7100	7.5	54
	4000*	4700	7.5	36
Fig. 5 **Parallel** **Three-Phase** Quadrature Operation	8100□	9500	15.0	143
	6100▲	7100	30.0	215
	4000*	4700	30.0	143
Fig. 6 **Series** **Three-Phase** Quadrature Operation	8100□	19000	7.5	143
	6100▲	14200	15.0	215
	4000*	9500	15.0	143
Fig. 7 **Half-Wave** **Four-Phase** Quadrature Operation			*Resistive Load* / *Inductive Load*	*Resistive Load* / *Inductive Load*
	7000□	9000	9.0 / 10.0	81 / 90
	5300▲	6700	18.0 / 20.0	121 / 135
	3500*	4500	18.0 / 20.0	81 / 90
Fig. 8 **Half-Wave** **Six-Phase** Quadrature Operation			*Resistive Load* / *Inductive Load*	*Resistive Load* / *Inductive Load*
	7000□	9500	9.5 / 10.0	91 / 96
	5300▲	7100	19.0 / 20.0	136 / 143
	3500*	4700	19.0 / 20.0	91 / 96

□ For maximum peak inverse anode voltage of 20000 volts, and condensed-mercury-temperature range of 30° to 40°C.

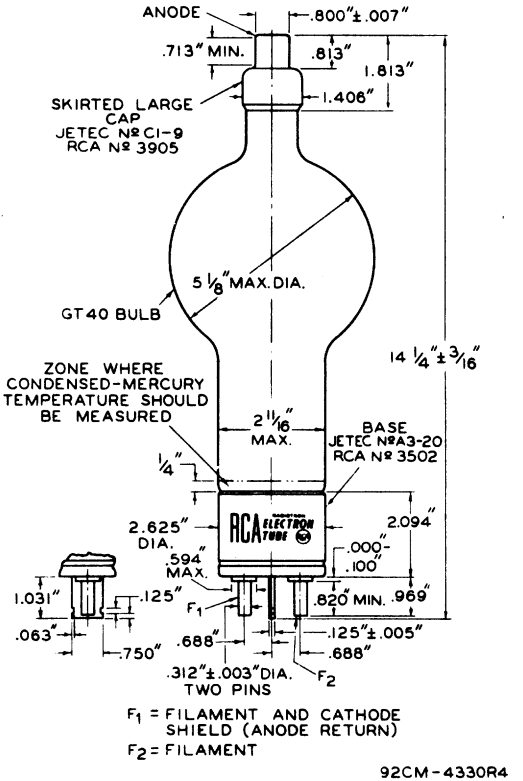
▲ For maximum peak inverse anode voltage of 15000 volts, and condensed-mercury-temperature range of 30° to 50°C.

* For maximum peak inverse anode voltage of 10000 volts, and condensed-mercury-temperature range of 30° to 60°C.

869-B

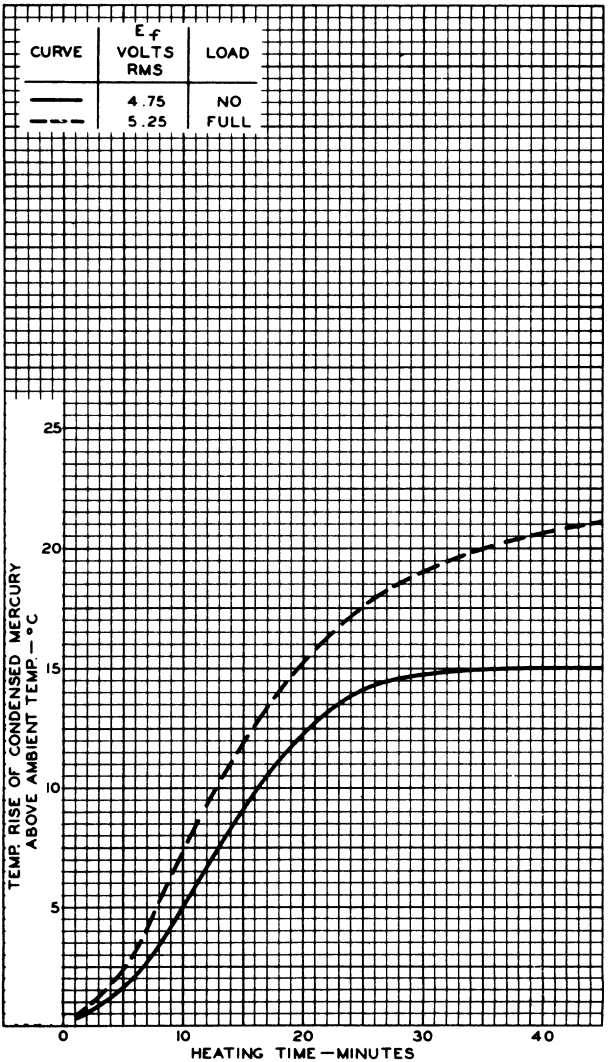
869-B

HALF-WAVE MERCURY-VAPOR RECTIFIER



869-B

RATE OF RISE OF COND.-MERCURY TEMPERATURE



APRIL 12, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7634

872-A

HALF-WAVE MERCURY-VAPOR RECTIFIER

GENERAL DATA

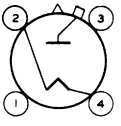
Electrical:

	Min.	Av.	Max.	
Filament, Coated:				
Voltage	4.75	5	5.25	ac volts
Current at 5 volts	–	7.5	8	amp
Heating time at rated voltage	30	–	–	sec
Peak Tube Voltage Drop (Approx.)	–	10	–	volts

Mechanical:

Operating Position	Vertical, base down
Overall Length	8-1/4" ± 1/4"
Maximum Diameter	2-5/16"
Weight (Approx.)	7 oz
Bulb	T18
Cap	Medium (JETEC No.C1-5)
Socket	Johnson No.123-211, or equivalent
Base	Medium-Metal-Shell Jumbo 4-Pin with Bayonet (JETEC No.A4-29)
Basing Designation for BOTTOM VIEW	4AT

Pin 1 – No Connection
Pin 2 – Filament, Cathode Shield



Pin 3 – No Connection
Pin 4 – Filament Cap – Anode

Temperature Control:

Heating—When the ambient temperature is so low that the normal rise of condensed-mercury temperature above the ambient temperature will not bring the condensed-mercury temperature up to the minimum value of the operating ranges specified under ***Maximum Ratings***, some form of heat-conserving enclosure or auxiliary heater will be required.

Cooling—When the operating conditions are such that the maximum value of the operating condensed-mercury-temperature range is exceeded, provision should be made for forced-air cooling sufficient to prevent exceeding the maximum value.

Temperature Rise of Condensed Mercury to Equilibrium Above Ambient Temperature (Approx.):		
No load*	14	°C
Full load▲	19	°C

* With 4.75 volts rms on filament, and no heat-conserving enclosure.
▲ With 5.25 volts rms on filament, average anode current = 1.25 amperes, and no heat-conserving enclosure.

← Indicates a change.

872-A

HALF-WAVE MERCURY-VAPOR RECTIFIER

HALF-WAVE RECTIFIER

Maximum Ratings, *Absolute Values: For supply frequency of 60 cps*

	Operating Condensed-Mercury-Temperature Range●		
	20° to 70° C	20° to 60° C	
PEAK INVERSE ANODE VOLTAGE	5000 max.	10000 max.	volts
ANODE CURRENT:			
Peak	5 max.	5 max.	amp
Average#	1.25 max.	1.25 max.	amp
→ Fault, for duration of 0.1 second maximum.	50 max.	50 max.	amp

● Operation at 40° ± 5° C is recommended.

Averaged over any interval of 15 seconds maximum.

OPERATING CONSIDERATIONS

Shields and rf filter circuits should be provided for the 872-A if it is subjected to extraneous high-frequency fields during operation. These fields tend to produce breakdown effects in mercury vapor and are detrimental to tube life and performance. When shields are used, special attention must be given to providing adequate ventilation and to maintaining normal condensed-mercury temperature. Rf filters are employed to prevent damage caused by rf currents which might otherwise be fed back into the rectifier tubes.

→ Indicates a change.

872-A

HALF-WAVE MERCURY-VAPOR RECTIFIER

For Circuit Figures, see Front of this Section

CIRCUIT	MAX. TRANS. SEC. VOLTS (RMS) E	APPROX. DC OUTPUT VOLTS TO FILTER E_{av}	MAX. DC OUTPUT AMPERES I_{av}	MAX. DC OUTPUT KW TO FILTER P_{dc}
Fig. 1 **Half-Wave** **Single-Phase** In-Phase Operation	7000□	3200	1.25	4
	3500▲	1600	1.25	2
Fig. 2 **Full-Wave** **Single-Phase** In-Phase Operation	3500□	3200	2.5	8
	1700▲	1600	2.5	4
Fig. 3 **Series** **Single-Phase** In-Phase Operation	7000□	6400	2.5	16
	3500▲	3200	2.5	8
Fig. 4 **Half-Wave** **Three-Phase** In-Phase Operation	4000□	4800	3.75	18
	2000▲	2400	3.75	9
Fig. 5 **Parallel** **Three-Phase** Quadrature Operation	4000□	4800	7.5	36
	2000▲	2400	7.5	18
Fig. 6 **Series** **Three-Phase** Quadrature Operation	4000□	9600	3.75	36
	2000▲	4800	3.75	18
Fig. 7 **Half-Wave** **Four-Phase** Quadrature Operation			*Resistive Load* / *Inductive Load*	*Resistive Load* / *Inductive Load*
	3500□	4500	4.5 / 5	20 / 22.5
	1700▲	2250	4.5 / 5	10 / 11.2
Fig. 8 **Half-Wave** **Six-Phase** Quadrature Operation			*Resistive Load* / *Inductive Load*	*Resistive Load* / *Inductive Load*
	3500□	4800	4.75 / 5	22.8 / 24
	1700▲	2400	4.75 / 5	11.4 / 12

□ For maximum peak inverse anode voltage of 10000 volts and condensed-mercury-temperature range of 20° to 40° C.

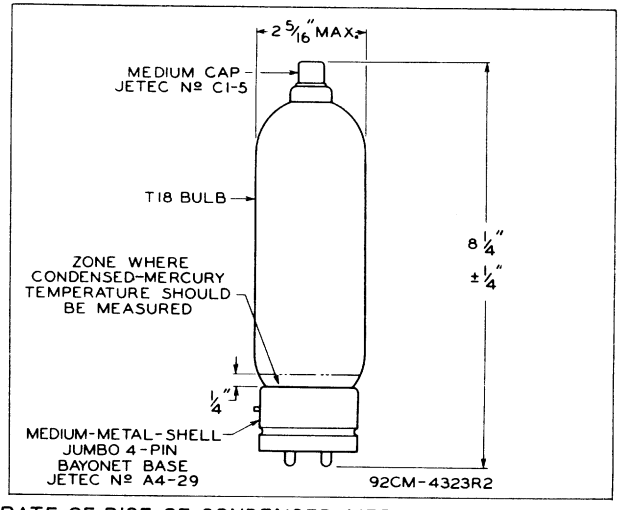
▲ For maximum peak inverse anode voltage of 5000 volts and condensed-mercury-temperature range of 20° to 70° C.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

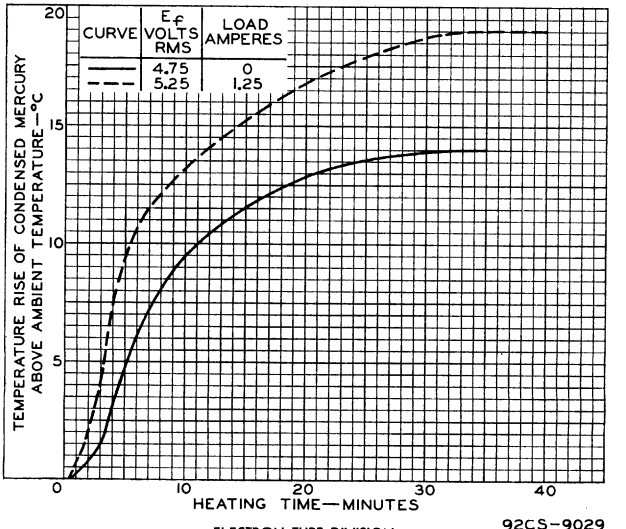
872-A

872-A

HALF-WAVE MERCURY-VAPOR RECTIFIER



RATE OF RISE OF CONDENSED-MERCURY TEMPERATURE



92CS-9029

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

955

DETECTOR, AMPLIFIER, OSCILLATOR

ACORN TYPE

Especially for wavelengths between 0.5 meter and 5 meters

Heater	Coated Unipotential Cathode		
Voltage	6.3	a-c or d-c	volts
Current	0.15		amp.
Direct Interelectrode Capacitances:●			
Grid to Plate	1.4		μμf
Grid to Cathode	1.0		μμf
Plate to Cathode	0.6		μμf
Overall Length		1-7/32" ± 5/32"	
Overall Diameter		1-3/32" ± 1/16"	
Bulb } Base }	*See Outline in GENERAL SECTION*	T-4½ Small Radial 5-Pin	←
Pin 1 - Heater		Pin 4 - Heater	
Pin 2 - Plate		Pin 5 - Cathode	
Pin 3 - Grid			
RCA Socket		Stock No. 9925	
Mounting Position		Any	

Short Part of Bulb: Bottom

BOTTOM VIEW (5BC)

Maximum Ratings Are Design-Center Values

A-F AMPLIFIER

D-C Plate Voltage	250 max.	volts
Plate Dissipation	1.6 max.	watts
D-C Heater-Cathode Potential	80 max.	volts ←

Typical Operation and Characteristics — Class A_1 Amplifier:

D-C Plate Voltage	90	135	180	250	volts
D-C Grid Voltage*	-2.5	-3.75	-5	-7	volts
Amplification Factor	25	25	25	25	
Plate Resistance	14700	13200	12500	11400	ohms
Transconductance	1700	1900	2000	2200	μmhos
D-C Plate Current	2.5	3.5	4.5	6.3	ma.
Load Resistance	-	-	20000	-	ohms
Second Harmonic Dist.	-	-	5	-	%
Power Output	-	-	135	-	mw

Typical Operation with Resistance-Coupling:

Plate-Supply Voltage°	180	volts
D-C Grid Voltage*	-3.5	volts
Load Resistance	250000	ohms
Plate Current	0.42	ma.
Second Harmonic Distortion	5	%
Voltage Output	45 RMS	volts
Voltage Gain	20 approx.	

R-F POWER AMPLIFIER & OSCILLATOR - Class C

Plate Modulated or C.W.

D-C Plate Voltage	180 max.	volts
D-C Plate Current	8 max.	ma.
D-C Grid Current	2 max.	ma.
D-C Heater-Cathode Potential	80 max.	volts ←
Typical Operation:		
D-C Plate Voltage	180	volts
D-C Grid Voltage	-35 approx.	volts
D-C Plate Current	7	ma.

●, *, °: See next page. ← Indicates a change.

955

DETECTOR, AMPLIFIER, OSCILLATOR

(continued from preceding page)

D-C Grid Current	1.5 approx.	ma.
Power Output**	0.5 approx.	watt

Typical Operation:	DETECTOR *Biased*	*Grid-Leak*	
Plate-Supply Voltage o	180	45	volts
Grid Voltage	-7 approx.	Grid Return to Cathode	volts
Load Resistance	0.25	-	megohm
Plate Current	Adjusted to 0.2 ma. approx. with no input signal.	-	ma.
Cathode Resistor	50000 approx.	-	ohms
Grid Leak	-	1 to 5	megohms
Grid Condenser	-	0.00025	µf

→ ● With no external shield.

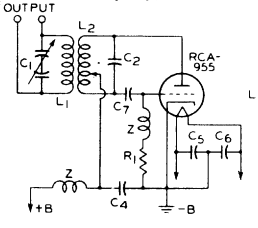
* Under maximum rated conditions, the resistance in the grid circuit should not exceed 0.1 megohm with fixed bias, or 0.5 megohm with cathode bias.

o This is a plate-supply voltage value. The voltage effective at plate will be plate-supply voltage minus the voltage drop in load caused by plate current.

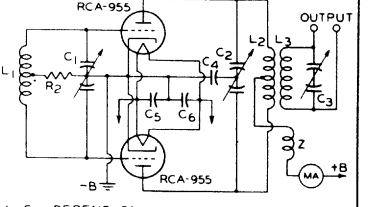
** At 5 meters. Only moderate reduction in this value will be found for wavelengths as low as 1 meter. Below 1 meter, the power output decreases as the wavelength is decreased.

R-F grounding by means of condensers placed close to the tube pins is required if the full capabilities of the 955 for ultra-high-frequency uses are to be obtained.

U-H-F OSCILLATOR
Hartley Type



PUSH-PULL U-H-F OSCILLATOR
Tuned-Plate Tuned-Grid Type



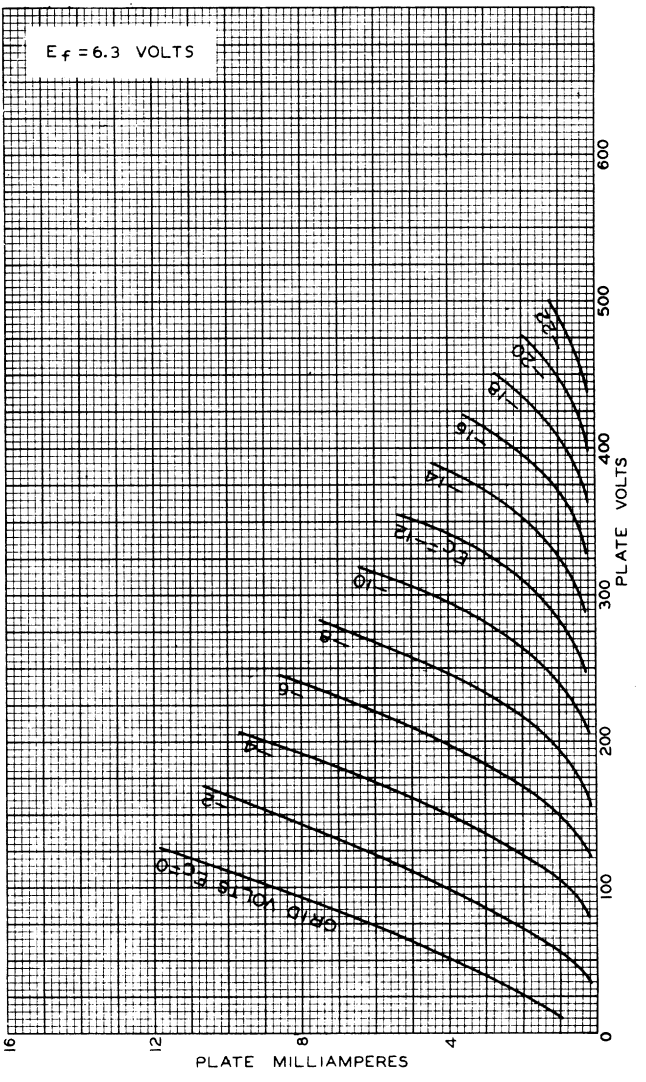
L1 C1, L2 C2, L3 C3 = DEPEND ON FREQUENCY RANGE DESIRED
C4, C5, C6 = 100 µµf
C7 = 50 µµf
R1 = 20000 TO 25000 OHMS, 1/2 WATT
R2 = 10000 TO 12500 OHMS, 1/2 WATT
Z = R-F CHOKE

92CM-6558

The license extended to the purchaser of tubes appears in the License Notice accompanying them. Information contained herein is furnished without assuming any obligations. ← indicates a change.

955

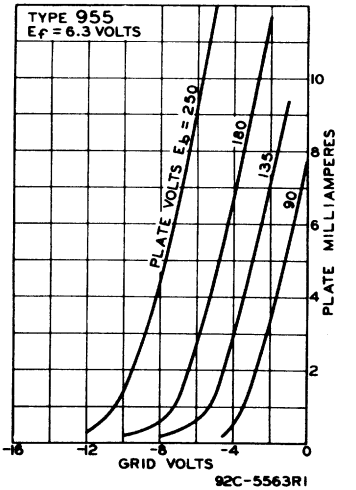
AVERAGE PLATE CHARACTERISTICS



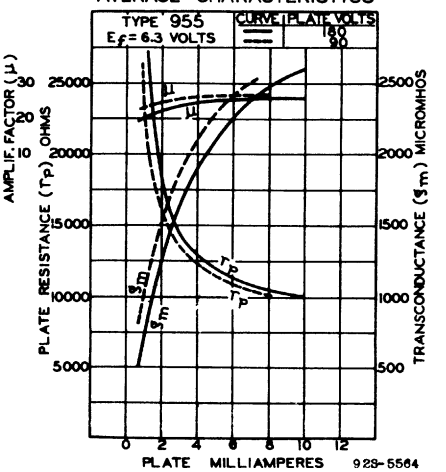
955

CHARACTERISTICS CURVES

AVERAGE CHARACTERISTICS



AVERAGE CHARACTERISTICS

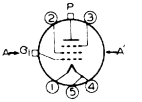


959

DETECTOR AMPLIFIER PENTODE

ACORN TYPE

Filament	Coated	
Voltage	1.25	d-c volts
Current	0.05	amp.
Direct Interelectrode Capacitances:		
Grid to Plate°	0.015 max.	μμf
Input	1.8	μμf
Output	2.5	μμf
Overall Length		1-11/16" ± 3/16"
Overall Diameter		1-3/32" ± 1/16"
Bulb	*See Outline in GENERAL SECTION*	T-4½
End Terminals		Two
Base		Small Radial 5-Pin
Pin 1 - Filament		P - Plate
Pin 2 - Grid No.2		G_1 - Grid No.1
Pin 3 - Grid No.3		AA' - Plane of Electrodes
Pin 4 - Filament -		
Pin 5 - Filament -		
RCA Socket		Stock No. 9925
RCA Grid & Plate Clips		Stock No. 9939
Mounting Position		Vertical◊



P is on Long Part of Bulb: Top
G_1 is on Short Part of Bulb: Bottom

BOTTOM VIEW (5BE)

Maximum Ratings are Design-Center Values

AMPLIFIER

D-C Plate Voltage	145 max.	volts
D-C Screen (Grid No.2) Voltage	67.5 max.	volts
Characteristics — Class A_1 Amplifier:		
D-C Plate Voltage	135	volts
Suppressor (Grid No.3)	Connected to filament(-) at socket	
D-C Screen Voltage	67.5	volts
D-C Grid (No.1) Voltage #	-3	volts
Plate Resistance	0.8 approx.	megohm
Transconductance	500	μmhos
D-C Plate Current	1.7	ma.
D-C Screen Current	0.4	ma.

° With shield baffle.

◊ Horizontal operation permitted if plane of electrodes is vertical (plate on edge).

Under maximum rated conditions, the resistance in the grid circuit should not exceed 0.1 megohm with fixed bias, or 0.5 megohm with cathode bias.

R-f grounding by means of condensers placed close to the tube terminals is required if the full capabilities of the 959 for ultra-high-frequency uses are to be obtained. It is important in the cases of the plate and control-grid circuits that separate r-f grounding returns be made to a common point in order to avoid r-f inter-action through common return circuits. It may also be advisable in some applications to supplement the action of the by-pass condensers by r-f chokes placed close to the condensers in the return or supply lead for the grid, the screen, the suppressor, the plate, and the filament.

◄—Indicates a change.

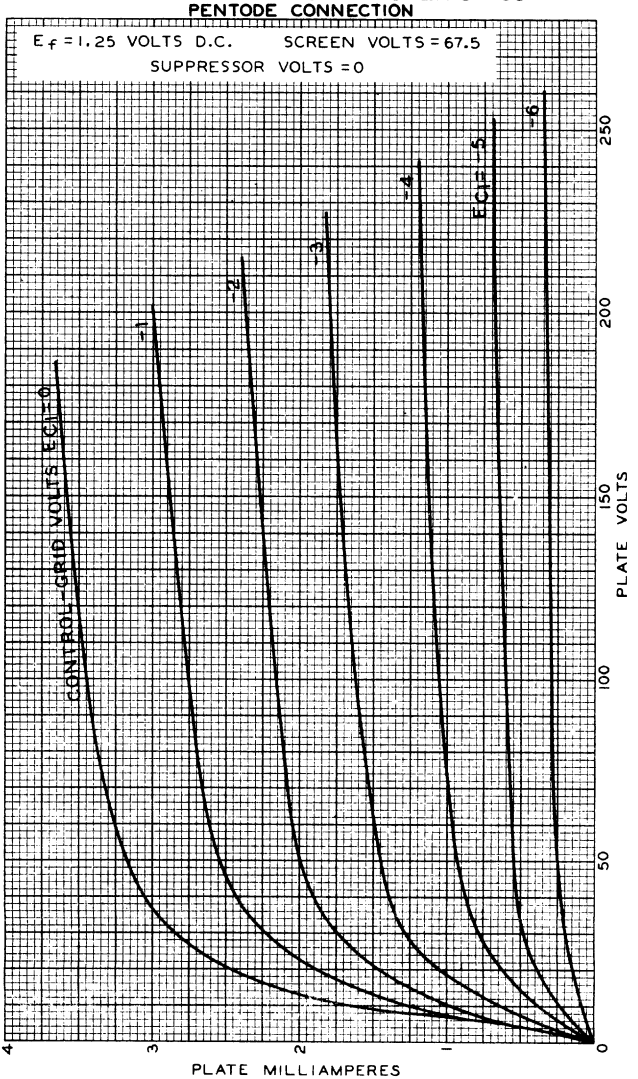
RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

959

959

AVERAGE PLATE CHARACTERISTICS

PENTODE CONNECTION



JUNE 14, 1944

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

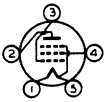
92CM-6338R1

1609

AMPLIFIER PENTODE

For applications critical as to microphonics

Filament	Coated	
Voltage	1.1	d-c volts
Current	0.25	amp.
Direct Interelectrode Capacitances:°		
Grid to Plate	1.0	μμf
Input	7	μμf
Output	7	μμf
Maximum Overall Length		4-3/16"
Maximum Seated Height		3-9/16"
Maximum Diameter		1-9/16"
Bulb		ST-12
Base		Small 5-Pin
Pin 1 - Filament +		Pin 4 - Screen
Pin 2 - Plate		Pin 5 - Filament -
Pin 3 - Grid		
Mounting Position		Any



BOTTOM VIEW

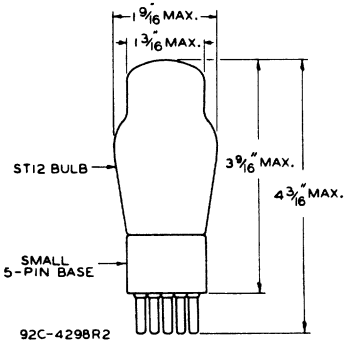
Maximum Ratings Are Absolute Values

A-F AMPLIFIER

Plate Voltage	135 max.	volts
Screen Voltage	67.5 max.	volts
Typical Operation and Characteristics - Class A_1 Amplifier:		
Plate	135	volts
Screen	67.5	volts
Grid *	-1.5	volts
Plate Res.	0.4 approx.	megohm
Transcond.	725	μmhos
Plate Cur.	2.5	ma.
Screen Cur.	0.65	ma.

° Without shield.

* The d-c resistance in the grid circuit of the 1609 should not exceed 0.5 megohm for fixed-bias conditions.



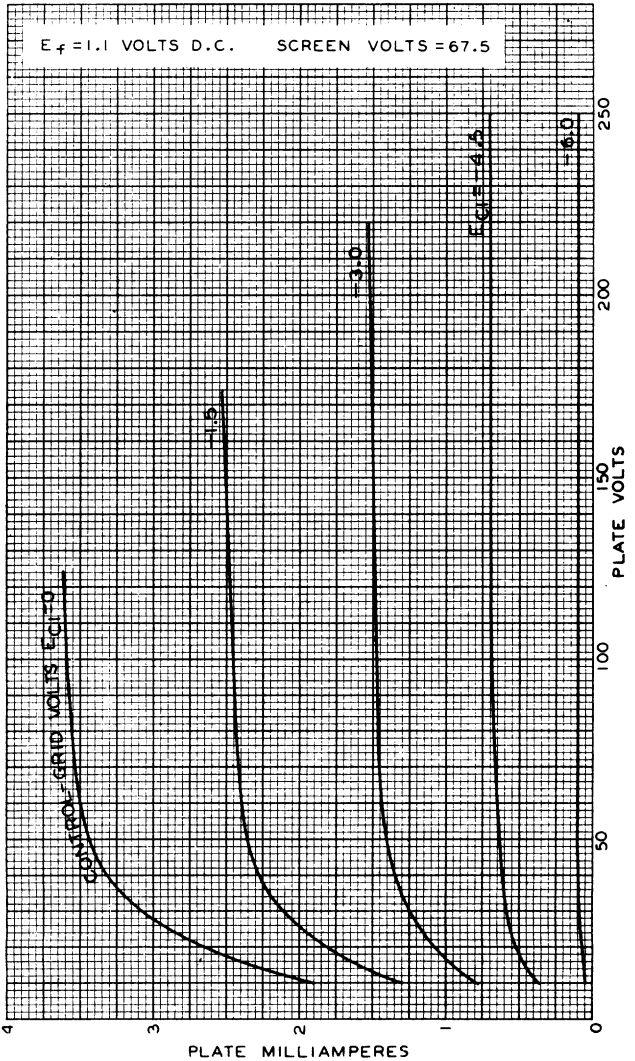
← Indicates a change.

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1609

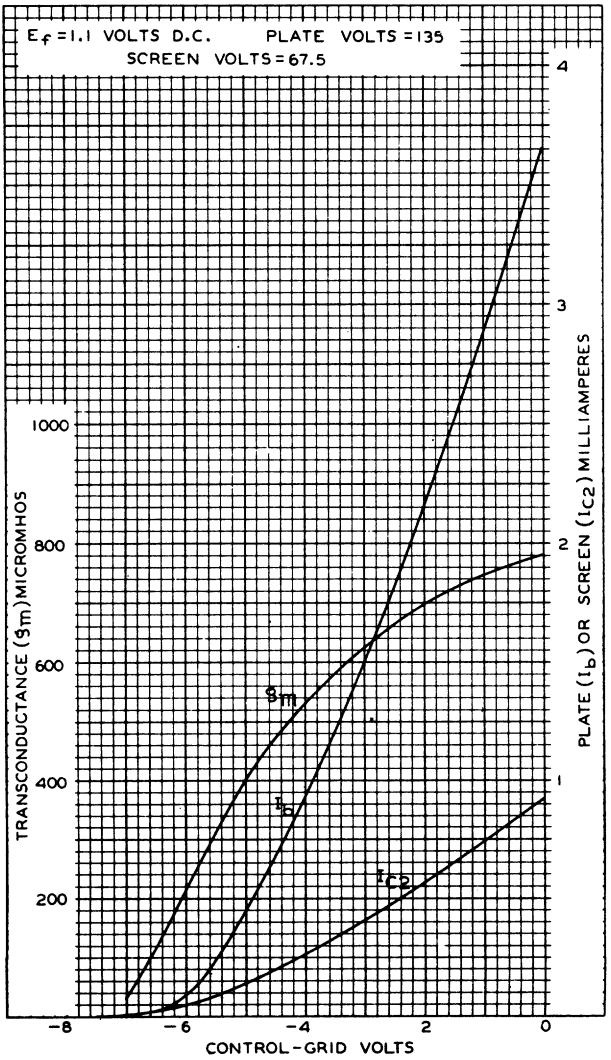
1609

AVERAGE PLATE CHARACTERISTICS



1609

AVERAGE CHARACTERISTICS



1611

1611

POWER AMPLIFIER PENTODE

The 1611 is a power pentode intended for use as a relay tube in equipment on ships for automatically announcing SOS signals. To meet the special requirements of such service, the 1611 features an i_p-e_g characteristic having suitable slope and minimized variation between tubes. Physical characteristics of the 1611 are the same as those of Type 6F6.

RCA-1611 is available only through Radiomarine Corporation of America, 75 Varick Street, New York, N. Y.

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1612

PENTAGRID AMPLIFIER

For applications critical as to microphonics

Heater ■	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.3	amp.
Direct Interelectrode Capacitances: ○		
Grid #1 to Grid #3	0.20 max.	μμf
Grid #1 to Plate	0.001 max.	μμf
Grid #3 to Plate	0.10 max.	μμf
Grid #1 to All Other Electrodes	7.5	μμf
Grid #3 to All Other Electrodes	10	μμf
Plate to All Other Electrodes	11	μμf
Maximum Overall Length		3-1/8"
Maximum Seated Height		2-9/16"
Maximum Diameter		1-5/16"
Bulb		Metal Shell, MT-8
Cap		Miniature
Base		Small Wafer Octal 7-Pin
Pin 1 - Shell		Pin 5 - Grid #3
Pin 2 - Heater		Pin 7 - Heater
Pin 3 - Plate		Pin 8 - Cathode
Pin 4 - Grids #2 & #4		Cap - Grid #1
Mounting Position	BOTTOM VIEW	Any

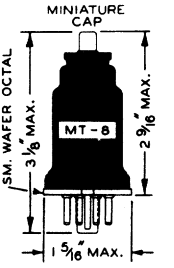
Maximum Ratings Are Design-Center Values

AMPLIFIER

Plate Voltage	250 max.	volts
Screen Voltage	100 max.	volts
Plate Dissipation	1.5 max.	watts ←
Screen Dissipation	1.0 max.	watt ←
Typical Operation and Characteristics - Class A_1 Amplifier:		
Plate	250	volts
Screen (Grids #2 & #4)	100	volts
Control Grid (Grid #1)	-3	volts
Control Grid (Grid #3)	-3	volts
Plate Res.	0.6	megohm ←
Transcond. (Grid #1 - Plate)	1100	μmhos
Transcond. (Grid #1 - Plate)*	5 approx.	μmhos
Plate Cur.	5.3	ma.
Screen Cur.	6.5	ma.

■ In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.
○ With shell connected to cathode.
* With Grid #1 bias = -15 volts; Grid #3 bias = -15 volts.

Curves under Type 6L7 also apply to the 1612.



← Indicates a change.

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

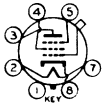
1620

1620

TRIPLE-GRID DETECTOR AMPLIFIER

For applications critical as to microphonics

→ Heater ■	Coated Unipotential Cathode		
Voltage	6.3		a-c or d-c volts
Current	0.3		amp.
Direct Interelectrode Capacitances: ○			
Pentode Connection			
Grid to Plate	0.005 max.		μμf
Input	7.0		μμf
Output	12.0		μμf
Maximum Overall Length			3-1/8"
Maximum Seated Height			2-9/16"
Maximum Diameter			1-5/16"
Bulb			Metal Shell, MT-8
Cap			Miniature
Base			Small Wafer Octal 7-Pin
Pin 1 - Shell			Pin 5 - Suppressor
Pin 2 - Heater			Pin 7 - Heater
Pin 3 - Plate			Pin 8 - Cathode
Pin 4 - Screen			Cap - Grid
Mounting Position	BOTTOM VIEW		Any



Maximum Ratings Are Design-Center Values

AMPLIFIER - Pentode Connection

Plate Voltage		250 max.	volts
Screen Voltage		100 max.	volts
→ *Typical Operation and Characteristics - Class A_1 Amplifier:*			
Plate	100	250	volts
Screen	100	100	volts
Grid #	-3	-3	volts
Suppressor	Connected to cathode at socket		
Plate Res.	1.0	▲	megohm
Transcond.	1185	1225	μmhos
Grid Bias for cathode current cut-off	-7	-7	volts
Plate Cur.	2.0	2.0	ma.
Screen Cur.	0.5	0.5	ma.

AMPLIFIER - Triode Connection ○○

→ Plate Voltage		250 max.	volts
Typical Operation and Characteristics - Class A_1 Amplifier:			
Plate	180	250	volts
Grid #	-5.3	-8	volts
Amp. Fact.	20	20	
Plate Res.	11000	10500	ohms
Transcond.	1800	1900	μmhos
Plate Cur.	5.3	6.5	ma.

■ → For cathode-bias operation of the 1620 a minimum cathode-resistor by-pass condenser of 25 μf is recommended to minimize hum, particularly in circuits where the 1620 is followed by high-gain stages. When a 25 μf condenser or larger is used, the voltage difference between heater and cathode is not critical, but it should be kept as low as possible. If less than a 25 μf condenser is used, positive or negative biasing of the heater with respect to the cathode is required, but the bias value chosen for minimum hum should be within the range of +5 to +50 volts or -5 to -50 volts.

○ With shell connected to cathode.

\# Under maximum rated conditions, the d-c resistance in the grid circuit should not exceed 1.0 megohm.

▲ Greater than 1.0 megohm.

○○ Screen and suppressor tied to plate.

→ indicates a change.

OUTLINE DIMENSIONS for the 1620 are the same as for 1612.

Curves under Type 6J7 also apply to the 1620.

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1616

HALF-WAVE HIGH-VACUUM RECTIFIER

Filament	Coated	
Voltage †	2.5	a-c volts
Current	5.0	amp.
Maximum Overall Length		6-13/16" ←
Maximum Diameter		2-1/16"
Bulb		T-16
Cap		Medium Metal
Base		Medium 4-Pin, Bayonet
RCA Socket (UT-542-A)		Stock No. 9937 ←

Maximum Ratings Are Absolute Values

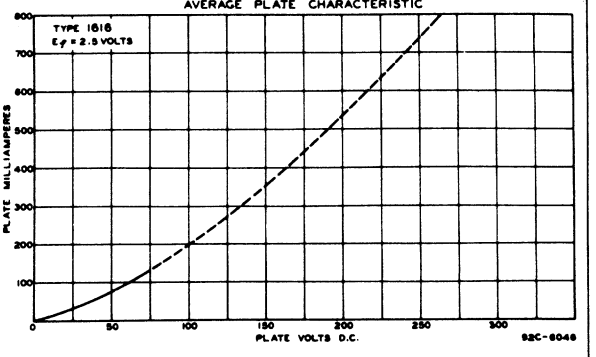
MAXIMUM RATINGS

Peak Inverse Voltage	5500 max.	volts
Peak Plate Current	0.8 max.	amp.
Surge Current	2.5 max.*	amp.
Average Plate Current	0.13 max.	amp.

* Equipment should be designed so that this value is not exceeded during switching operations.

† Should not deviate more than ±5% from the rated value.

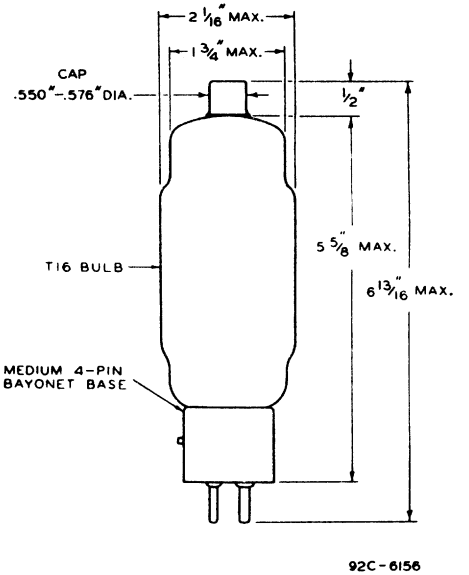
AVERAGE PLATE CHARACTERISTIC



←Indicates a change.

1616

HALF-WAVE HIGH-VACUUM RECTIFIER



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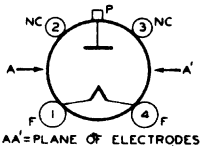
BOTTOM VIEW OF SOCKET CONNECTIONS



AA'=PLANE OF ELECTRODES

F - Filament
NC - No Connection
P - Plate

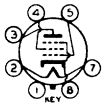
TUBE MOUNTING POSITION

VERTICAL: Base down
HORIZONTAL: Plate in vertical plane (on edge)

POWER AMPLIFIER PENTODE

For applications requiring continuity of service

Heater ■	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.7	amp.
Direct Interelectrode Capacitances (Approx.):°		
Grid to Plate	0.20	μμf
Input	7.5	μμf
Output	11.5	μμf
Maximum Overall Length		3-1/4"
Maximum Seated Height		2-11/16"
Maximum Diameter		1-5/16"
Bulb		Metal Shell, MT-8
Base		Small Wafer Octal 7-Pin
Pin 1 - Shell		Pin 5 - Grid
Pin 2 - Heater		Pin 7 - Heater
Pin 3 - Plate		Pin 8 - Cathode
Pin 4 - Screen		
Mounting Position	BOTTOM VIEW	Any



Maximum Ratings Are Design-Center Values

PUSH-PULL AMPLIFIER - Triode Connection†

Recommended with Cathode-Bias Operation only.

Plate Voltage	300 max. volts
Plate Dissipation	8.3 max. watts

Typical Operation - Class A_1 Amplifier:

Unless otherwise specified, values are for 2 tubes

Plate Supply *	327.5	volts
Cathode Resistor ▲	500	ohms
Peak A-F Grid-to-Grid Voltage	54	volts
Zero-Sig. Plate Current	55	ma.
Max.-Sig. Plate Current	59	ma.
Load Resistance (plate-to-plate)	5000	ohms
Total Harmonic Distortion	1	%
Power Output	2	watts

* Actual voltage between cathode and plate will be plate-supply voltage minus drop in cathode resistor.

▲ Type of input coupling used should not introduce too much resistance in the grid circuit. Transformer- or impedance-coupling devices are recommended. The grid circuit may have a resistance as high as, but not greater than, 0.5 megohm provided the heater voltage is not allowed to rise more than 10% above rated value under any condition of operation.

PUSH-PULL AMPLIFIER - Pentode Connection

Plate Voltage	300 max. volts
Screen Voltage	300 max. volts
Plate Dissipation	7.9 max. watts
Screen Input	1.9 max. watts

Typical Operation - Class A_1 Amplifier:

Unless otherwise specified, values are for 2 tubes

Plate	300	volts
Screen	300	volts
D-C Grid Voltage #	-30	volts
Peak A-F Grid-to-Grid Voltage	60	volts
Zero-Sig. Plate Current	38	ma.
Max.-Sig. Plate Current	69	ma.

■, †, #, °: See next page. ← Indicates a change.

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1621

POWER AMPLIFIER PENTODE

(continued from preceding page)

Zero-Sig. Screen Current	6.5	ma.
Max.-Sig. Screen Current	13	ma.
Load Resistance (plate-to-plate)	4000	ohms
Total Harmonic Distortion	3	%
Power Output	5	watts

■ In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.
o With shell connected to cathode.
† Screen connected to plate.
# Type of input coupling used should not introduce too much resistance in the grid circuit. Transformer- or impedance-coupling devices are recommended. When the grid circuit has a resistance not higher than 0.05 megohm, fixed bias may be used; for higher values, cathode bias is required. With cathode bias, the grid circuit may have a resistance as high as, but not greater than, 0.5 megohm provided the heater voltage is not allowed to rise more than 10% above rated value under any conditions of operation.

OUTLINE DIMENSIONS for the 1621 are the same as those for Type 12A6.

Curves under Type 6F6 also apply to the 1621.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1622

BEAM POWER AMPLIFIER

For applications requiring continuity of service

Heater ■	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.9	amp.
Direct Interelectrode Capacitances (approx.): o		
Grid to Plate	0.4	μμf
Input	10	μμf
Output	12	μμf
Maximum Overall Length		4-5/16"
Maximum Seated Height		3-3/4"
Maximum Diameter		1-9/16" ±1/16" →
Bulb		Metal Shell, MT-10
Base		Small Wafer Octal 7-Pin
Pin 1 - Shell		Pin 5 - Grid
Pin 2 - Heater		Pin 7 - Heater
Pin 3 - Plate		Pin 8 - Cathode
Pin 4 - Screen		
Mounting Position	BOTTOM VIEW (7AC)	Any

Maximum Ratings Are Design-Center Values

PUSH-PULL AMPLIFIER

Plate Voltage	300 max. volts
Screen Voltage	250 max. volts
Plate Dissipation	13.8 max. watts
Screen Dissipation	1.4 max. watts

Typical Operation - Class A_1 Amplifier:

Unless otherwise specified, values are for 2 tubes

Plate Voltage	300	volts
Screen Voltage	250	volts
D-C Grid Voltage #	-20	volts
Peak A-F Grid-to-Grid Voltage	40	volts
Zero-Sig. Plate Current	86	ma.
Max.-Sig. Plate Current	125	ma.
Zero-Sig. Screen Current	4	ma.
Max.-Sig. Screen Current	10.5	ma.
Load Resistance (plate to plate)	4000	ohms
Total Harmonic Distortion	1	%
Power Output	10	watts

■ The heater voltage should never fluctuate so that it exceeds 7 volts. The potential difference between heater and cathode should be kept as low as possible.

\# The type of input coupling used should not introduce too much resistance in the grid circuit. Transformer- or impedance-coupling devices are recommended. When the grid circuit has a resistance not higher than 0.1 megohm, fixed bias may be used; for higher values, cathode bias is required. With cathode bias, the grid circuit may have a resistance not to exceed 0.5 megohm, provided the heater voltage is not allowed to rise more than 10% above the rated value under any condition of operation.

o With shell connected to cathode.

Curves under Type 6L6 also apply to the 1622 within the limitations of its maximum ratings.

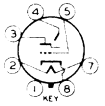
→ Indicates a change.

1629

ELECTRON-RAY TUBE

INDICATOR TYPE WITH TRIODE UNIT

Heater	Coated Unipotential Cathode	
Voltage	12.6	a-c or d-c volts
Current	0.15	amp.
Overall Length		3-15/16" ± 3/16"
Seated Height		3-3/8" ± 3/16" ←
Maximum Diameter		1-3/16"
Bulb		T-9
Base		Small Shell Octal 7-Pin
Pin 1 - No Connection		Pin 5 - Grid
Pin 2 - Heater		Pin 7 - Heater
Pin 3 - Plate		Pin 8 - Cathode
Pin 4 - Target		
Mounting Position		Any▲ ←



BOTTOM VIEW (7AL)

Maximum and Minimum Ratings Are Design-Center Values

INDICATOR SERVICE

Plate-Supply Voltage	250 max.	volts
Target Voltage	250 max.	volts
	125 min.	volts ←
D-C Heater-Cathode Potential	90 max.	volts ←
Typical Operation:		←
Plate and Target Supply Voltage	200 250	volts
Series Triode Plate Resistor□	1 1	megohm
Target Current † ◇	3 4	ma.
Triode-Plate Current◇	0.19 0.24	ma.
Triode-Grid Voltage (Approx.)		
For shadow angle of 0°	-6.5 -8.0	volts
For shadow angle of 90°	0 0	volts

□ Designated as R in the circuit diagram under Type 6E5, in the Receiving Tube Section.

† Subject to wide variation.

◇ For triode-grid bias of 0 volts.

▲ The plane of the ray-control electrode passes through the tube axis and base key.

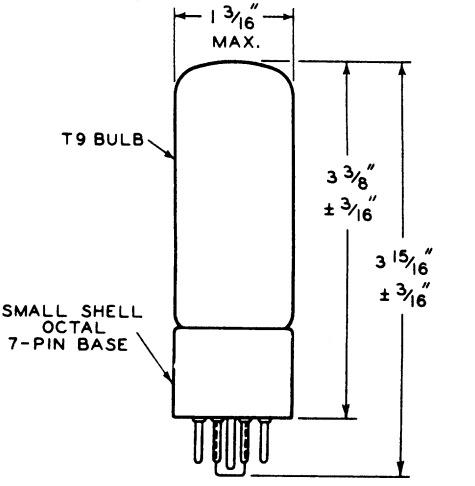
Curves for Type 1629 are the same as for the 6E5 in the Receiving-Tube Section.

← Indicates a change.

1629

1629

ELECTRON-RAY TUBE



1635
HIGH-MU TWIN POWER TRIODE

GENERAL DATA

Electrical:

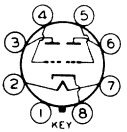
Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.6	amp

Mechanical:

Mounting Position	Any
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-5/16"
Bulb	T-9
Base	Intermediate-Shell Octal 8-Pin
Basing Designation for BOTTOM VIEW	G-8B

Pin 1 - No Connection
Pin 2 - Heater
Pin 3 - Plate of Unit No.2
Pin 4 - Grid of Unit No.2



Pin 5 - Grid of Unit No.1
Pin 6 - Plate of Unit No.1
Pin 7 - Heater
Pin 8 - Cathode

AF POWER AMPLIFIER - Class B

Maximum Ratings, *Design-Center Values*: ←

DC PLATE VOLTAGE	300 max.	volts
PEAK PLATE CURRENT (per plate)	90 max.	ma.
PLATE DISSIPATION (per plate)	3 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Typical Operation: ←

Values are for 2 units unless otherwise specified

DC Plate Voltage	300	300	volts
DC Grid Voltage	0	0	volts
Peak AF Grid-to-Grid Voltage	70	108●	volts
Zero-Signal DC Plate Current	6.6	6.6	ma.
Max.-Signal DC Plate Current	54	54	ma.
Peak Grid Current (per unit)	38	39	ma.
Plate-Supply Impedance	0	1000*	ohms
Effective Load Resistance (plate-to-plate)	12000	12000	ohms
Effective Grid-Circuit Impedance (per unit)	0	516**	ohms
Total Harmonic Distortion	4	5	%
Max.-Signal Power Output	10.4	10.4	watts

●,*,**: See next page.

←Indicates a change.

1635

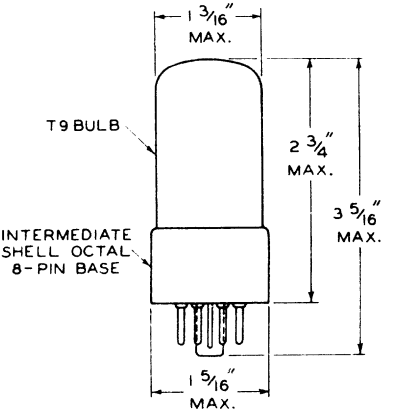
1635

HIGH-MU TWIN POWER TRIODE

● Includes peak voltage drop through the grid-circuit impedance.

* Practical design value.

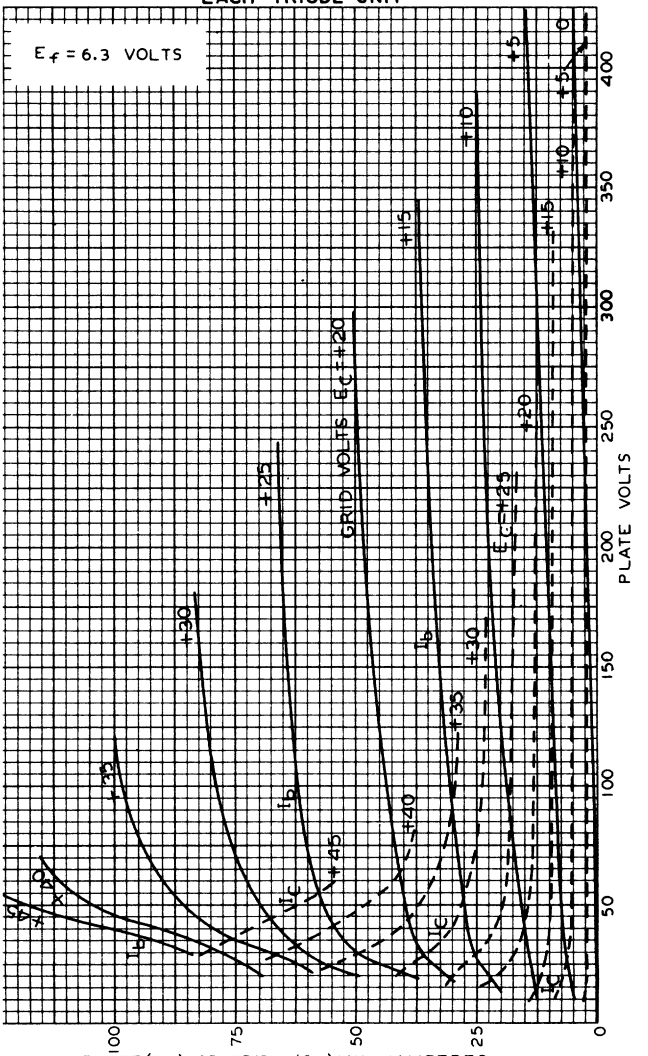
** At 400 cycles for class B stage in which the effective resistance per grid circuit is 500 ohms, and the leakage reactance of the coupling transformer is 50 millihenrys. The driver stage should be capable of supplying the grids of the class B stage with the specified values at low distortion.



92C-6393

1635

AVERAGE PLATE CHARACTERISTICS
EACH TRIODE UNIT

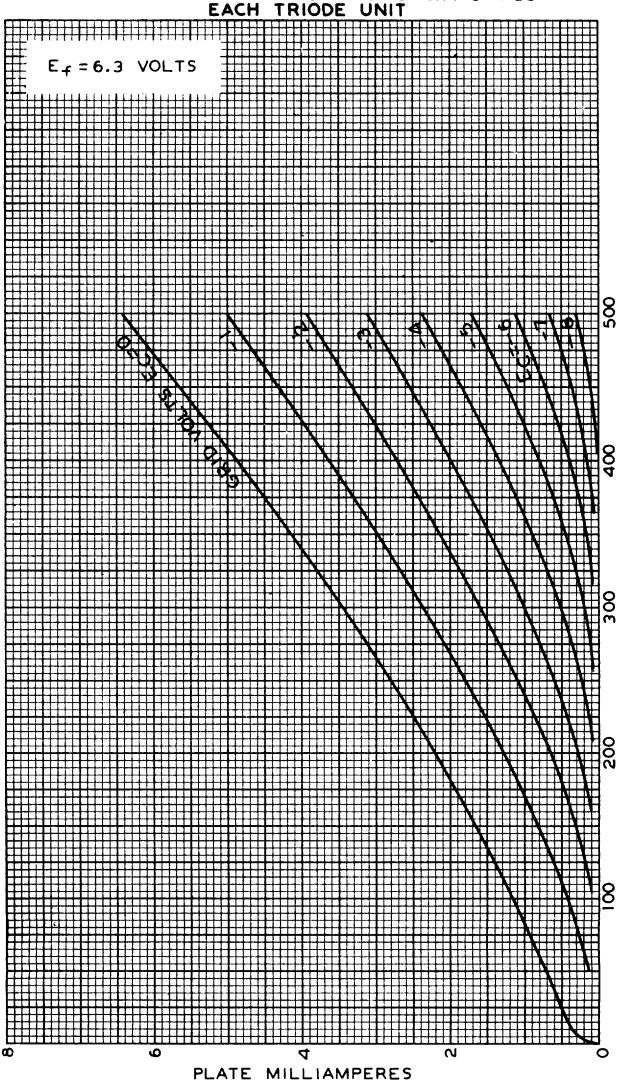


1635

1635

AVERAGE PLATE CHARACTERISTICS

EACH TRIODE UNIT



FEB. 27, 1942

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-6369

Super-Power Triode

5 MW PEAK POWER OUTPUT IN LONG-PULSE SERVICE AT 440 MHz

CERAMIC-METAL SEALS — **INTEGRAL WATER DUCTS**
DOUBLE-ENDED CONSTRUCTION — **17.00 INCH MAX. LENGTH**
COAXIAL-ELECTRODE STRUCTURE — **14.125 INCH MAX. DIAMETER**

WATER COOLED

For Use as a Plate-Pulsed Amplifier at Frequencies up to 605 MHz, for Long Range Search Radar, Pulsed Transmission in Communications Service, and Particle Accelerator Service.

ELECTRICAL

Filamentary Cathode, Multistrand Thoriated Tungsten[n]—		
Current (DC):		
Typical operating range value	6800 to 7200[a]	A
Maximum range value	7000 to 7400[a]	A
Maximum value for starting, even momentarily	2000	A
Minimum time to reach operating current	30	s
Minimum time at normal operating current before plate voltage is applied	60	s
Voltage (DC):[b]		
Typical range value for prescribed operating current	3.6 to 4.5	V
Maximum value under any condition	4.65	V
Direct Interelectrode Capacitances		
Grid to plate	150	pF
Grid to cathode	1600	pF
Plate to cathode	less than 1.0	pF

MECHANICAL

Operating Position	.Tube axis vertical, either end up	
Overall Length	17.00 max	in
Maximum Diameter	14.125 max	in
Terminal Connections	.See *Dimensional Outline*	
Weight		
Uncrated	175	lb
Crated	340	lb

THERMAL[p, q]

Ceramic-Bushing Temperature	150 max	°C
Metal-Surface Temperature	150 max	°C
Minimum Storage Temperature	-65 min	°C

Water Flow

	Typ. Flow g/m	*Absolute Min. Flow* g/m	*Pressure Differential Flow Typ. Flow*[c] psi	
To plate, total flow for two parallel input and output coolant courses	160	150	45	max
To upper grid coolant course	3	2	25	max
To lower coolant course	3	2	25	max

Water Flow (cont'd)

	Typ. Flow g/m	Absolute Min. Flow g/m	Pressure Differential for Typ. Flow[c] psi	
To grid cathode coolant course	35	30	30	max
Resistivity of water at 25°C:				
Plate and grid water			1 min	MΩ-cm
Grid-cathode water			5 min	MΩ-cm
Water temperature from any outlet			70 max	°C
External gas pressure[d]			65 max	psig
Gauge pressure at any inlet[d]			90 max	psig

TERMINAL DIAGRAM (Bottom View)

FI – Filament Terminal (Inner)
FO – Filament Terminal (Outer)
KURF – Upper RF Cathode Terminal
KLRF – Lower RF Cathode Terminal
GUIRF – Upper RF Grid Input Terminal
GUORF – Upper RF Grid Output Terminal
GLIRF – Lower RF Grid Input Terminal
GLORF – Lower RF Grid Output Terminal
PLRF – Lower RF Plate Terminal
PURF – Upper RF Plate Terminal

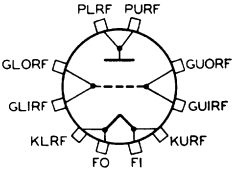


PLATE-PULSED AMPLIFIER—Class B[r]

For a maximum "ON" time[e] of 2200 microseconds in any 34000-microsecond interval

Absolute-Maximum Ratings

	Up to 450 MHz	Up to 605 MHz	
Peak Positive-Pulse Plate Voltage[f,g]	34	25	kV
Peak Negative Grid Voltage	150	150	V
Peak Plate Current	300	300	A
Peak Cathode Current[h]	600	600	A
DC Plate Current	19.5	19.5	A
DC Cathode Current	39	39	A
Plate Input (Average)	664	487	kW
Plate Dissipation (Average)	300	300	kW

Typical Operation

With rectangular wave shape in cathode-drive circuit with duty factor[j] of 0.06 and pulse duration of 2000 microseconds

	At 440 MHz	At 550 MHz	
Peak Positive Pulse Plate-to-Grid Voltage[f,g]	30	33	20 kV
Peak Cathode-to-Grid Voltage[k]	80	60	100 V
Peak Plate Current	285	295	250 A

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

		At 440 MHz	At 550 MHz	
Peak Cathode Current[h]	570	590	500	A
DC Plate Current	17.1	17.7	15	A
DC Cathode Current	34.2	35.4	30	A
Peak Driving Power Output	170	200	225	kW
Useful Power Output at Peak of Pulse (Approx.)	4	5	2.5	MW

Absolute-Maximum Ratings

For a maximum "ON" time of 10000 microseconds in any 155000-microsecond interval

	Up to 450 MHz	
Peak Positive-Pulse Plate Voltage[f,g]	28	kV
Peak Negative Grid Voltage	150	V
Peak Plate Current	250	A
Peak Cathode Current[h]	500	A
DC Plate Current	16.25	A
DC Cathode Current	32.5	A
Plate Input (Average)	45.5	kW
Plate Dissipation (Average)	200	kW

Typical Operation

With rectangular wave shape in cathode-drive circuit at 440 MHz with duty factor[j] of 0.06 and pulse duration of 1000 microseconds

Peak Positive-Pulse Plate-to-Grid Voltage[f,g]	25	kV
Peak Cathode-to-Grid Voltage[k]	50	V
Peak Plate Current	220	A
Peak Cathode Current[h]	440	A
DC Plate Current	13.2	A
DC Cathode Current	27.4	A
Peak Driver Power Output[m]	140	kW
Useful Power Output at Peak of Pulse (Approx.)	2.5	MW

CHARACTERISTICS RANGE VALUES

	Note	Min	Max	
Input Strap-Resonant Frequency	-	90	140	MHz
Output Strap-Resonant Frequency	-	300	340	MHz
Useful Power Output	1	4	-	MW

Note 1: For conditions with filament current at prescribed typical operating value supplied with the tube, see footnote (a), peak positive-pulse plate-to-grid voltage = 32000 max. volts, peak current = 18 max. amperes, frequency = 400 to 450 MHz, pulse duration = 2000 microseconds, duty factor = 0.06, and peak pulse driving power = 220000 max. watts.

[a] The typical and maximum operating filament currents recommended for each tube are specified on a label attached to the outside diameter of the plate terminal of each tube. The specified maximum filament current for each tube is a maximum rating which should not be exceeded, even momentarily, during operation of the tube. The life of the tube can be conserved by operating the filament at the lowest current which will enable the tube to provide the desired power output. Because the filament when operated near the maximum value usually provides emission in excess of any requirements within the tube ratings, the filament current should

be reduced to a value that will give adequate but not excessive emission for any particular application. Good regulation of the filament current is, in general, economically advantageous from the viewpoint of tube life.

[b] Measured between KLRF and KURF (See *Terminal Diagram*).

[c] Measured directly across cooled element for the indicated typical flow.

[d] With the gauge located in an area where the maximum pressure external to the gauge is one atmosphere absolute.

[e] "*ON*" time is defined as the sum of the duration of all individual pulses which occur during the indicated interval. *Pulse duration* is defined as the time interval between the two points on the pulse at which the instantaneous value is 50% of the peak power value. The *peak value* is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

[f] The magnitude of any spike on the plate voltage pulse should not exceed its peak value by more than 10%, and the duration of any spike when measured at the peak-value level should not exceed 100 microseconds. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

[g] Under most conditions pressurized cavities will be required for operation at the indicated typical voltages to prevent flash-over at the tube seals.

[h] Peak cathode current is the total of the peak plate current and the peak rectified grid current. (Pulses are not coincident, hence they cannot be added arithmetically).

[j] Duty factor is the product of the pulse duration and repetition rate.

[k] Preferably obtained from a cathode bias resistor.

[m] The driver stage is required to supply tube losses, rf circuit losses, and rf power added to the plate circuit. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, and in initial tube characteristics during life.

The following footnotes apply to the *RCA Transmitting Tube Operating Considerations* given at the front of this section.

[n] See *Electrical Considerations* - Filament or Heater.

[p] See *Cooling Considerations* - Forced-Air Cooling.

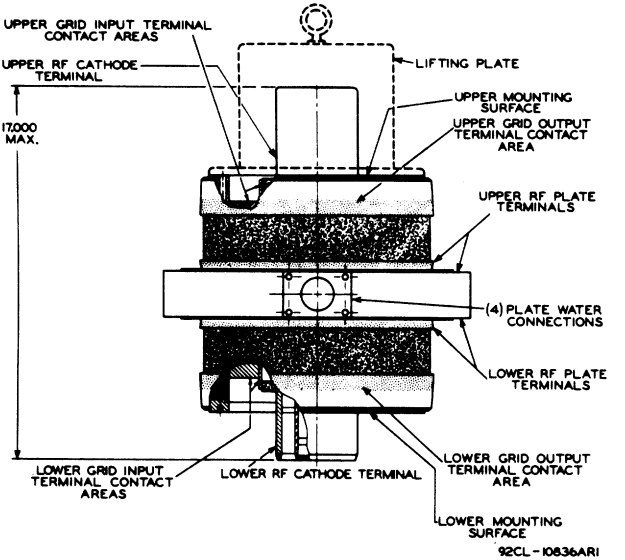
[q] See *Cooling Considerations* - Liquid Cooling.

[r] See *Classes of Service*.

FOR ADDITIONAL INFORMATION ON THIS TYPE, WRITE FOR TECHNICAL BULLETIN AND APPLICATION GUIDE FOR RCA SUPER POWER TUBES, ICE-279A AVAILABLE FROM:

Commercial Engineering
Electronic Components and Devices
Radio Corporation of America
Harrison, New Jersey

SIMPLIFIED DIMENSIONAL OUTLINE[S]



DIMENSIONS IN INCHES

[S] A detailed Dimensional Outline and associated Gauge Drawings are given in the Technical Bulletin available upon request.

4028A

High-Mu Triode

CERAMIC-METAL PENCIL TYPE

FAST WARM-UP TIME **FAST HEAT DISSIPATION**

For use in plate-pulsed operation as a power amplifier, oscillator, and frequency multiplier in compact mobile and aircraft equipment at frequencies up to 4 Gc/s and above and at altitudes up to 25,000 feet without pressurization.

ELECTRICAL

Heater, for Unipotential Cathode		
Voltage (AC or DC)	6.3 ± 10%	V
Current at 6.3 V	0.300	A
Cathode Warmup Time (Average) to reach 80% of operating plate current	10	s
DC plate supply volts = 80, grid volts = 0, cathode resistor = 0 Ω, load resistor = 10 Ω, heater volts = 6.3		
Amplification Factor	70	
Transconductance	22500	μmhos
DC plate mA = 14, dc plate volts = 125, cathode resistor = 50 Ω		
Direct Interelectrode Capacitances		
Grid to plate	2.0	pF
Grid to cathode and heater	5.8	pF
Plate to cathode and heater	0.08 max	pF

MECHANICAL

Operating Position . . . . . Any

Dimensions and Terminal Connections . . . . . See accompanying *Dimensional Outline*

Weight (Approx.) . . . . . 0.3 oz

Sockets

Heater-Terminals Connector . . . . . **Grayhill[a] No. 22-5, or equivalent**

Socket for operation up to about 550 Mc/s (Including heater-terminals connector) . . . . . **Jettron[b] No. CD7010, or equivalent**

Cavities (Including heater-terminals connector) . . . . **J-V-M[c] No. D-7980 Series, Resdel[d] No. 10 Series, AML, Inc,[e] MCL, Inc,[f] or equivalent**

Terminal Connections (see *Dimensional Outline*):

H – Heater Pin
K – Cathode Cylinder (Adjacent to Heater Pins)
G – Grid Flange
P – Plate Cylinder (Adjacent to pinch-off)

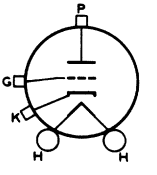


PLATE PULSED SERVICE—CLASS C

Absolute Maximum Ratings (Up to 4 Gc/s)

For a maximum "ON" time[g] of 5 microseconds in any 5000-microsecond interval.

Peak Positive-Pulse Plate-Supply Voltage	2000	V
Peak Plate Current from Pulse Supply	3.0	A
DC Plate Current	3.0	mA
DC Grid Current	1.5	mA
Pulse Duration	1.5	μs
Duty Factor	0.001	
Plate-Seal Temperature[h]	225	°C

Typical Operation as Oscillator with Rectangular Wave Shape in Cathode-Drive Circuit at 3.3 Gc/s

With duty factor[j] of 0.001 and pulse duration of 1 microsecond

Peak Positive-Pulse Plate-Supply Voltage	1750	V
DC Plate Current	2.5	mA
DC Grid Current	1.0	mA
Grid Resistor	50	Ω
Useful Power Output at Peak of Pulse (Approx.)	1000	W

Typical Operation as Frequency Doubler to 1 Gc/s with Rectangular Wave Shape in Cathode-Drive Circuit

Peak Positive-Pulse Plate-Supply Voltage	1200	V
DC Plate Current	0.4	mA
DC Grid Current	0.2	mA
Grid Resistor	2000	Ω
Driver Power Output (Approx.)	50	W
Useful Power Output (Approx.)	100	W

RF POWER AMPLIFIER AND OSCILLATOR—CLASS C TELEGRAPHY[k]
RF POWER AMPLIFIER—CLASS C FM TELEPHONY

Absolute Maximum Ratings (Up to 4 Gc/s)

DC Plate Voltage	300	V
DC Grid Voltage	-50	V
DC Plate Current	35	mA
DC Cathode Current	45	mA
DC Grid Current	15	mA
Plate-Seal Temperature[h]	225	°C
Peak Heater-Cathode Voltage		
Heater negative with respect to cathode	50	V
Heater positive with respect to cathode	50	V

Typical Operation as RF Power Amplifier in Cathode-Drive Circuit at 550 Mc/s

DC Plate Voltage	250	300	V
DC Grid Voltage	-6.5	-9	V
Grid Resistor	500	700	Ω
DC Plate Current	31	35	mA
DC Grid Current	13	13	mA
Driver Power Output (Approx.)	0.2	0.2	W
Useful Power Output (Approx.)	4.8	6	W

Maximum Circuit Value

Grid-Circuit Resistance	0.25	MΩ

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CHARACTERISTICS RANGE VALUES

	Note	Min	Max	
Heater Current	1	0.270	0.330	A
Direct Interelectrode Capacitances				
Grid to plate	-	1.7	2.4	pF
Grid to cathode	-	5.0	6.5	pF
Plate to cathode	-	-	0.08	pF
Heater-Cathode Leakage Current				
Heater negative with respect to cathode	1,2	-	30	μA
Heater positive with respect to cathode	1,3	-	30	μA
Reverse Grid Current	1,4	-	0.3	μA
Transconductance	1,5	18000	27000	μmhos
Plate Current (1)	1,5	13	25	mA

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With 60 volts dc between heater and cathode, heater negative with respect to cathode.

Note 3: With 60 volts dc between heater and cathode, heater positive with respect to cathode.

Note 4: With dc plate voltage of 200 volts, dc grid voltage of -2 volts, grid resistor of 0.5 megohm.

Note 5: With dc plate-supply voltage of 125 volts, cathode resistor of 50 ohms, and cathode bypass capacitor of 1000 μf.

[a] Grayhill, Inc., 561 Hillgrove Ave., LaGrange, Ill.

[b] Jettron Products, Inc., 56 Route 10, Hanover, N.J.

[c] Fidelitone Microwave, Inc., JVM Division, 6415 N. Ravenswood Ave., Chicago, Ill. Indicated No. applies to a series of cavities covering the range from 220 to 3500 Mc/s.

[d] Resdal Engineering Corp., 330 South Fair Oaks Ave., Pasadena, Calif. This series of cavities covers the range from 215 to 2325 Mc/s.

[e] Applied Microwave Laboratory, Inc., 106 Albion St., Wakefield, Mass.

[f] Microwave Cavity Laboratory, Inc., 10 Beach Ave., LaGrange, Ill.

[g] *"ON"* time is defined as the sum of the duration of all individual pulses which occur during the indicated interval. *Pulse duration* is defined as the time interval between the two points on the pulse at which the instantaneous value is 70% of the peak power value. The *peak value* is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

[h] In applications where the plate dissipation exceeds 2.5 watts, it is important that a large area of contact be provided between the plate cylinder and the terminal to provide adequate heat conduction.

[j] Duty factor is the product of pulse duration and repetition rate. For variable pulse durations and pulse repetition rates, the duty factor is defined as the ratio of time "ON" to total elapsed time in any 5000-microsecond interval.

[k] Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio frequency envelope does not exceed 115 per cent of the carrier conditions.

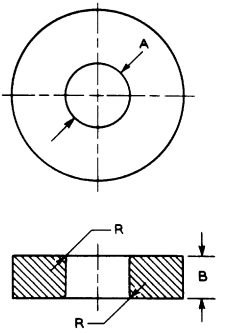
OPERATING CONSIDERATIONS

Connections to the cathode cylinder, grid flange, and plate cylinder should be made by flexible spring contacts. The connectors should make firm, large-surface contact, yet must be sufficiently flexible to insure that no part of the tube is subjected to excessive strain.

The *cathode* should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum rated values shown in the tabulated data.

GAUGES

Gauge	Type	Dimension		
		Diameter A	Thickness B	Radius R
G_1-1	Go	0.25200" +0.00000" -0.00007"	0.320" +0.001" -0.000"	0.003" Max
G_1-2	No-Go	0.24500" +0.00007" -0.00000"	-	-
G_3-1	Go	0.55700" +0.00000" -0.00007"	-	-
G_3-2	No-Go	0.54700" +0.00007" -0.00000"	-	-



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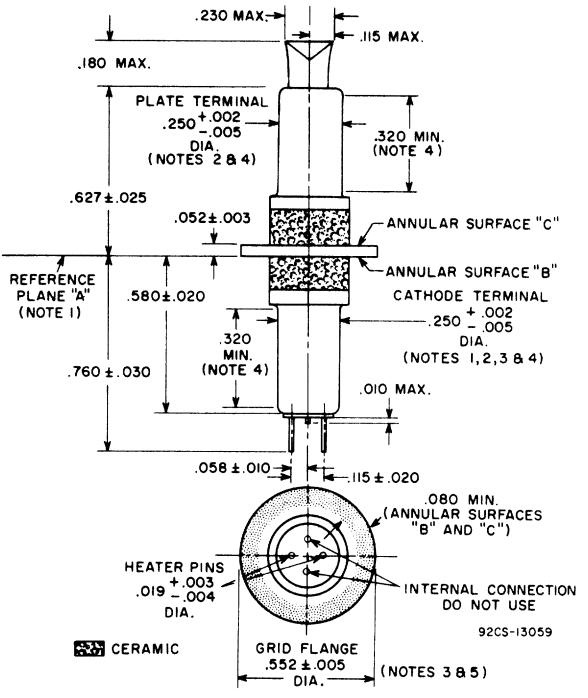
DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

Reference Plane "A" is defined as that plane against which annular surface "B" of the grid flange abuts.

Annular Surface "B" is on the side of the grid flange toward the cathode cylinder.

Annular Surface "C" is on the side of the grid flange toward the plate cylinder.

Note 1: With annular surface "B" resting on reference plane "A". The axis of the cathode cylinder will be within 2° of a line perpendicular to reference plane "A".

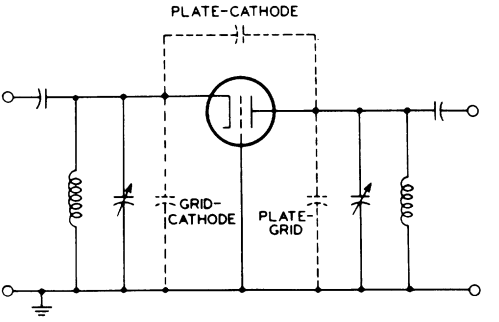
Note 2: The axes of the plate cylinder and cathode cylinder will coincide within 0.010 inch.

Note 3: The axes of the cathode cylinder and grid flange will coincide within 0.005 inch.

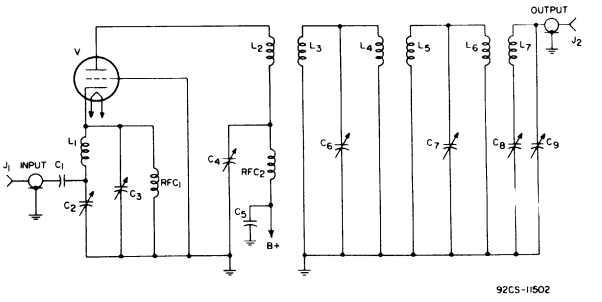
Note 4: The diameter along the 0.320 inch minimum length is measured with "GO" and "NO-GO" ring gauges G1-1 and G1-2, respectively.

Note 5: This diameter is measured with "GO" and "NO-GO" gauges G3-1 and G3-2, respectively.

TYPICAL CATHODE-DRIVE POWER AMPLIFIER CIRCUIT



TYPICAL BROADBAND AMPLIFIER CIRCUIT



C_1: 100 to 500 pF.
C_2, C_3, C_4, C_6, C_7, C_8, C_9: 0.8-8.5 pF
Glass Dielectric Trimmers—JFD VC 20G or equivalent.
C_5: 500 pF.
J_1, J_2: BNC Connectors.
L_1, L_2, L_3, L_4, L_5, L_6, L_7:
For Frequency Range of:
200-500 Mc/s—Two Turns, 1/2 inch Dia., Spaced 3/8 inch, Silver-Plated #14 Wire.
500-1000 Mc/s—One Turn, 1/2 inch Dia., Silver-Plated #14 Wire.
RFC_1, RFC_2: Ohmite Z-450 RF Chokes, or equivalent.
V: RCA-4028A

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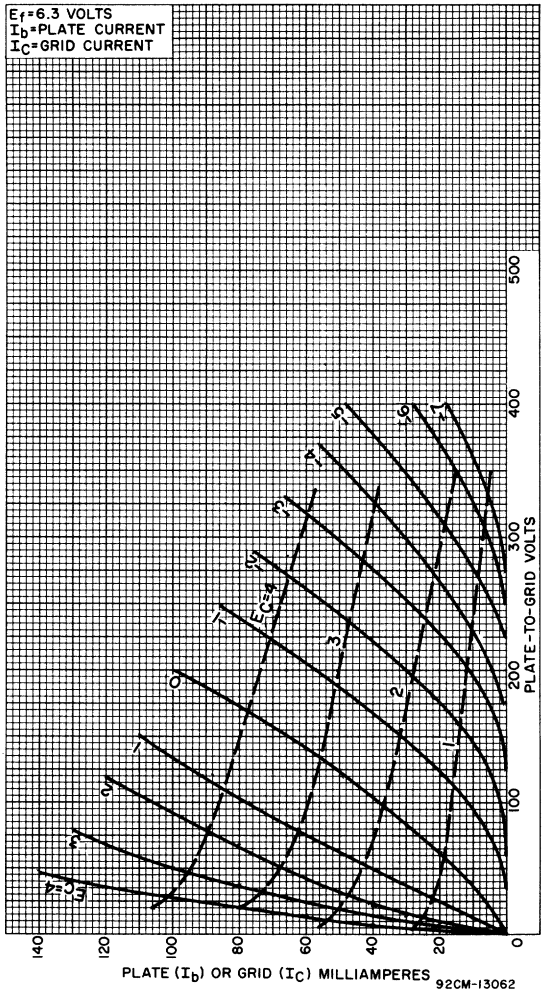
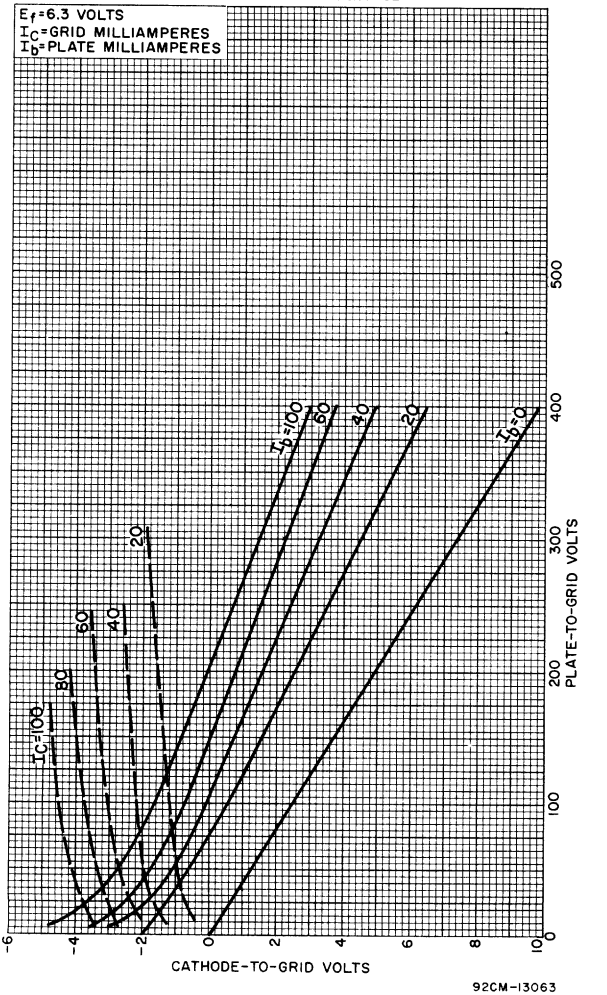
Average Characteristics

CATHODE-DRIVE SERVICE



Average Constant-Current Characteristics

CATHODE-DRIVE SERVICE



92CM-13063

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Typical Oscillator Power Output as a Function of Variations in Heater Voltage

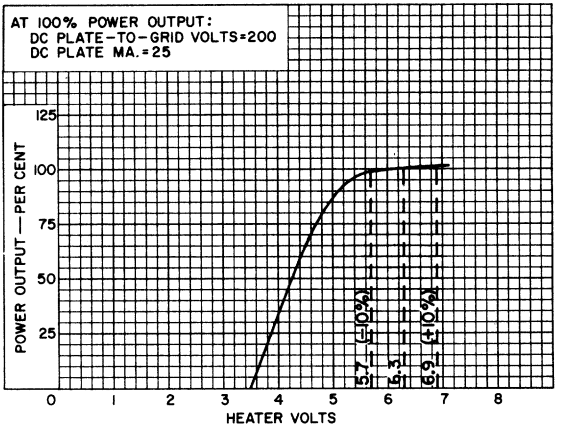

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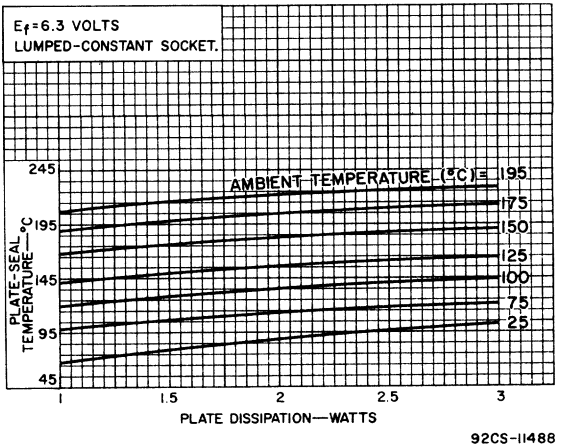
Plate-Seal Temperature as a Function of Ambient Temperature With Lumped-Constant Circuit



92CS-11488

4037A

High-Mu Triode

OCTAL-BASED PENCIL TUBE

For RF-Power-Amplifier, Oscillator, and Frequency-Multiplier Applications at Altitudes up to 100,000 Feet Without Pressurization

Replaces Type 2C40A in Most Applications

ELECTRICAL

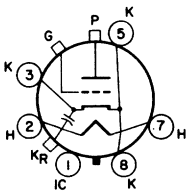
Heater, for Unipotential Cathode		
Voltage (AC or DC)	6.3 ± 10%	V
Current at 6.3 volts	0.145	A
Cathode Warmup Time to reach 90 percent of		
Typical oscillator power output	10 max	s
Operating dc plate current	15 max	s
Amplification Factor	30	
Transconductance for dc plate mA = 18 and dc plate volts = 250	5500	μmhos
Direct Interelectrode Capacitances (Approx.)		
Grid to plate	1.1	pF
Grid to cathode	1.8	pF
Plate to cathode	0.05 max	pF
Cathode to rf cathode terminal	100	pF

MECHANICAL

Operating Position	Any
Maximum Overall Length	3.125 in
Maximum Diameter	1.312 in
Base	Small H-Wafer Octal 6-Pin (JEDEC Group 1, No.B6-108)

Terminal Connections — BOTTOM VIEW

Pin 1 – Do Not Use
Pin 2 – Heater
Pin 3 – Cathode
Pin 5 – Cathode
Pin 7 – Heater
Pin 8 – Cathode
K_R – Cathode rf terminal (Cylinder adjacent to base)
G – Grid (Flange between insulator sections)
P – Plate (Cylinder adjacent to upper insulator section)



THERMAL

Plate Seal Temperature	175 max	°C

CLASS A_1 RF AMPLIFIER

Maximum CCS Ratings, Absolute-Maximum Values up to 2000 Mc/s

For Altitudes up to 25000 ft

DC Plate Voltage	300	V
DC Grid Voltage	-100	V
DC Plate Current	25	mA

Plate Dissipation[a]	6.25	W
Peak Heater-Cathode Voltage		
Heater negative with respect to cathode	90	V
Heater positive with respect to cathode	90	V

Maximum Circuit Value

Grid-Circuit Resistance	0.5	MΩ

RF POWER AMPLIFIER AND OSCILLATOR — CLASS C TELEGRAPHY

Key-down conditions per tube without amplitude modulation[b]

Maximum CCS Ratings, Absolute-Maximum Values up to 2000 Mc/s

For Altitudes up to 25000 ft

DC Plate Voltage	360	V
DC Grid Voltage	-100	V
DC Plate Current	25	mA
DC Grid Current	8	mA
Plate Input	9	W
Plate Dissipation[a]	6.25	W
Peak Heater-Cathode Voltage		
Heater negative with respect to cathode	90	V
Heater positive with respect to cathode	90	V

Typical CCS Operation

As oscillator in cathode-drive circuit

	At 500	2000	3000	Mc/s
DC Plate-to-Grid Voltage	262	252	252	V
DC Cathode-to-Grid Voltage[c]	12	2	2	V
DC Plate Current	23	23	25	mA
DC Grid Current (Approx.)	6	3	4	mA
Useful Power Output (Approx.)	3	0.45	0.1	W

As rf power amplifier in cathode-drive circuit at 500 Mc/s

DC Plate-to-Grid Voltage	326	V
DC Cathode-to-Grid Voltage[c]	51	V
DC Plate Current	23	mA
DC Grid Current (Approx.)	7	mA
Driver Power Output (Approx.)	2	W
Useful Power Output (Approx.)	5	W

Maximum Circuit Value

Grid-Circuit Resistance	0.1	MΩ

PLATE-MODULATED RF POWER AMPLIFIER — CLASS C TELEPHONY

Carrier conditions per tube for use with a max modulation factor of 1

Maximum CCS Ratings, Absolute-Maximum Values up to 2000 Mc/s

For Altitudes up to 25000 ft

DC Plate Voltage	275	V
DC Grid Voltage	-100	V
DC Plate Current	22	mA
DC Grid Current	8	mA

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Plate Input	6	W
Plate Dissipation[a]	4.25	W
Peak Heater-Cathode Voltage		
Heater negative with respect to cathode	90	V
Heater positive with respect to cathode	90	V

Maximum Circuit Value

Grid-Circuit Resistance	0.1	MΩ

CHARACTERISTICS RANGE VALUES

	Note	*Min*	*Max*	
Heater Current	1	0.130	0.160	A
Direct Interelectrode Capacitances				
Grid to plate	-	0.8	1.3	μF
Grid to cathode	-	1.5	2.1	μF
Plate to cathode	-	-	0.05	μF
Heater-Cathode Leakage Current				
Heater negative with respect to cathode	1,2	-	50	μA
Heater positive with respect to cathode	1,3	-	50	μA
Reverse Grid Current	1,4	-	1	μA
Amplification Factor	1,5	22	38	
Transconductance	1,5	4000	7000	μmhos
Plate Current (1)	1,5	13.5	24.5	mA
Plate Current (2)	1,6	-	55	μA
Power Output	1,7	0.15		W

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With 100 volts dc between heater and cathode, heater negative with respect to cathode.

Note 3: With 100 volts dc between heater and cathode, heater positive with respect to cathode.

Note 4: With dc plate voltage of 250 volts, dc grid voltage of -2.5 volts, grid resistor of 0.5 megohm.

Note 5: With dc plate-supply voltage of 250 volts, cathode resistor of 200 ohms, and cathode bypass capacitor of 1000 microfarads.

Note 6: With dc plate voltage of 250 volts and dc grid voltage of -25 volts.

Note 7: With dc plate voltage of 250 volts, grid resistor adjusted to give a dc plate current of 25 milliamperes in a cavity-type oscillator operating at 1800 ± 25 megacycles per second.

[a] In applications where the plate dissipation exceeds 2.5 watts, it is important that a large area of contact be provided between the plate cylinder and the terminal to provide adequate heat conduction.

[b] Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 percent of the carrier conditions.

[c] Obtained from grid resistor.

SPECIAL TESTS AND PERFORMANCE DATA

Low-Pressure Voltage Breakdown Test

This test (similar to MIL-E-1D, par. 4.9.12.1) is periodically performed on a sample lot of tubes. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 25,000 feet. Breakdown should not occur when a 60-cycle rms voltage

of 500 volts is applied between the plate cylinder and grid flange.

Low-Frequency Vibration Performance

This test (similar to MIL-E-1D, par. 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions:

Heater voltage of 6.3 volts, dc plate-supply voltage of 250 volts, grid voltage of -2.5 volts, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 25 cycles per second at an acceleration of 2.5 g. The rms output voltage across the plate load resistor as a result of vibration of the tube should not exceed 100 millivolts.

High-Frequency Vibration Performance

This test (similar to MIL-E-1D, par. 4.9.19.2) is performed on a sample lot of tubes from each production run. The tube is vibrated perpendicular to its axis, with no voltages applied to the tube. Vibration frequency is 40-60 c/s and acceleration is 10 g. At the end of this test, tubes should not show temporary or permanent shorts or open circuits and should meet the following limits:

Heater-Cathode Leakage Current . . . . . 50 max μA

For conditions shown under *Characteristics Range Values Notes 1,2 and 1,3.*

Low-Frequency Vibration (rms) . . . . . 100 max mV

For conditions shown above under *Low-Frequency Vibration Performance.*

Transconductance. . . . . 3900 min μmhos

For conditions shown under *Characteristics Range Values Notes 1,5.*

Shorts and Continuity Test

This test (similar to MIL-E-1D, par. 4.7.3) is performed on all tubes from each production run. Voltage applied between adjacent elements of the tube under test should be between 20 and 70 volts dc or peak ac. Plate and cathode terminals are tied together and connected to the grid terminal through the shorts test equipment. Tubes are tapped with a rubber tapper three times in each of three mutually perpendicular directions. If a short indication is obtained, the tapping cycle is repeated two times for verification. Acceptance criteria is based on the "Resistance vs. Time Duration" curve shown in par. 4.7.7 of MIL-1-D, Amendment 5.

Glass Seal Fracture Tests

Fracture tests are performed on sample lots of subassemblies during manufacture.

1. Tubes (prior to final assembly) are placed on supports spaced 15/16 ± 1/64 inch apart with the grid flange centered

between these supports. Tubes should withstand gradual application, perpendicular to the tube axis, of a force of 30 pounds upon the grid flange without causing fracture of the glass insulation.

2. Tubes (prior to final assembly) are held by clamping to the cathode cylinder. Tubes should withstand gradual application of a torque of 12.5 inch-pounds upon the plate terminal without causing fracture of the glass insulation.

Dynamic Life Performance

This test (similar to MIL-E-1D, par. 4.11.3.2) is performed on a sample lot of tubes from each production run to insure high quality of rf performance. Each tube is life-tested in a cavity-type oscillator at 500 ± 15 Mc/s under the following conditions:

Heater voltage of 6.3 volts, plate-supply voltage of 300 volts, cathode resistor adjusted to give a dc plate current of 25 mA and value recorded, heater positive with respect to cathode by 100 volts, and plate-seal temperature of 175° C min.

At the end of 500 hours, the tube should not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limit.

Power Output. . . . . 0.2 min W

For conditions shown under *Characteristics Range Values Notes 1, 7.*

OPERATING CONSIDERATIONS

Mechanical

The *maximum plate-seal temperature* of 175° C is a tube rating and is to be observed in the same manner as other ratings. The temperature of the plate seal should be measured on the plate seal. The temperature may be measured with temperature-sensitive paint, such as *Tempilaq*. The latter is made by the Tempil Corporation, 132 W. 22nd Street, New York 11, N. Y., in the form of a liquid or stick.

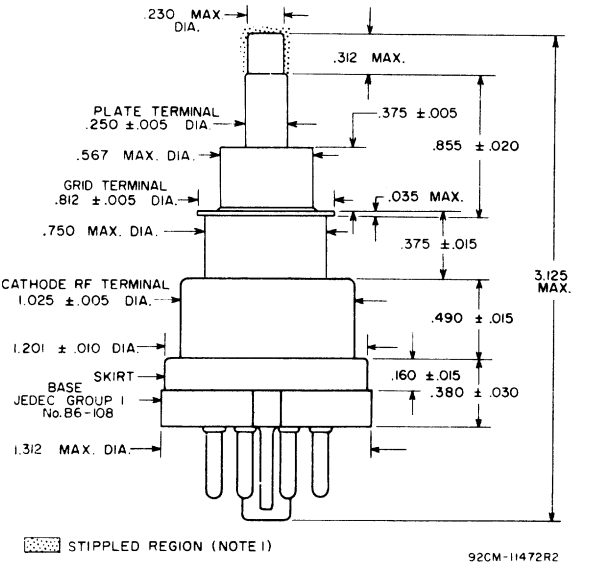
The *mounting* for the 4037A in cavity-type circuits should support the tube by the cathode cylinder which should make firm contact to the cavity surface. Connections to the grid flange and plate cylinder must be made by contacts with flexible leads to allow for variations in tube dimensions and eccentricities of the tube structure. In addition the plate connector should make firm, large-surface contact and be capable of conducting heat so that the plate-seal temperature will not exceed 175° C under any operating conditions. Contact should not be made to the 0.230-inch cap at the plate-terminal end of the tube as indicated on the *Dimensional Outline*.

Electrical

The *cathode* should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not

connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum values shown in the tabulated data.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

Note 1: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these areas.

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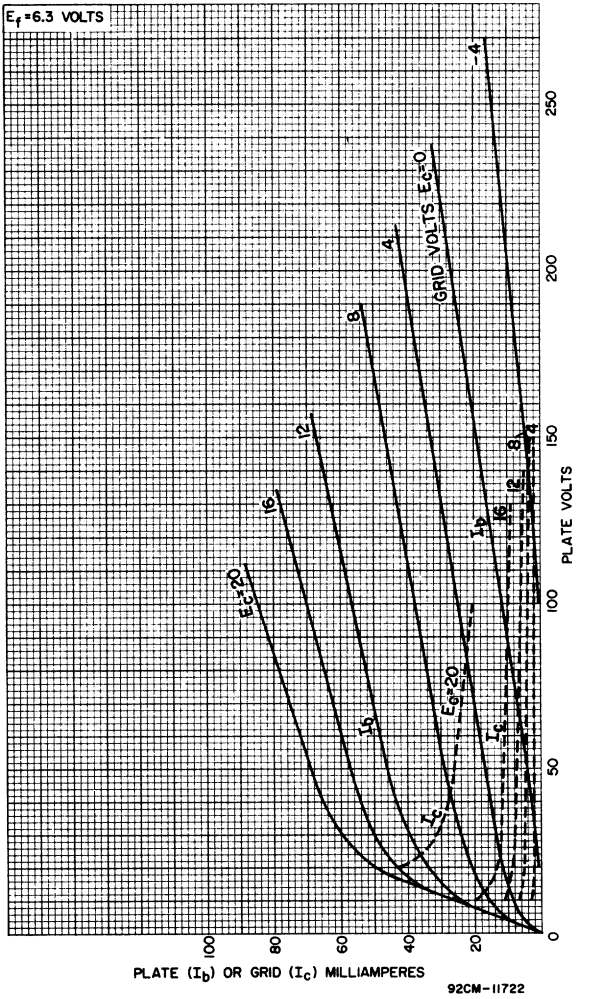
Electronic Components and Devices Harrison, N. J.

Average Characteristics



4053

Traveling-Wave Tube

HELIX-TRANSMISSION-LINE TYPE

FREQUENCY RANGE
1—2 Gc (L-Band)

INTEGRAL PERIODIC-PERMANENT-MAGNET TYPE

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 5%	volts
Current at heater volts = 6.3	1.75	amp
Starting Current	Must never exceed 4 amperes, even momentarily	
Minimum Cathode Heating Time	3	minutes
Frequency Range	1 to 2	Gc
Cold Insertion Loss	60	db
Thermostatic Switch:		
Current rating:		
At 125 volts ac		6 amp
At 240 volts ac		3 amp
Input VSWR	1.8:1 max.	
Output VSWR	1.8:1 max.	

Mechanical:

Operating Position	Any
Maximum Overall Length	20.50"
Maximum Height	3.875"
Maximum Width	3.125"
Maximum Shell Diameter	1.625"
Weight (Approx.)	6.5 pounds
Connectors:	
RF Input	Type N Plug (UG-18 B/U)
RF Output	Type N Plug (UG-18 B/U)
Terminal Leads	See accompanying *Dimensional Outline*

Thermal:

Collector Temperature[a]	225 max.	°C
Air Flow into Radiator	25 min.	cfm

RF POWER AMPLIFIER

Maximum Ratings, *Absolute-Maximum Values:*

DC Collector Voltage	3000	volts
DC Helix Voltage	2500	volts
DC Grid-No.2 Voltage	1700	volts
DC Collector Current	80	ma
DC Helix Current	3	ma
DC Grid-No.2 Current	1	ma
RF Power Input	5	watts

[a] The thermostatic switch will open when collector temperature exceeds 225°C.

Typical Operation at 1.4Gc:

DC Collector Voltage	2200	volts
DC Helix Voltage	2200	volts
DC Grid-No.2 Voltage	1500	volts
DC Collector Current	70	ma
DC Helix Current	0.25	ma
DC Grid-No.2 Current	0.25	ma
Gain at 10 Watts	28	db
Saturated Power Output	13	watts

CHARACTERISTICS RANGE VALUES

	Note	*Min.*	*Max.*	
Heater Current	1	–	2	amp
DC Collector Voltage	2,3	1800	2500	volts
DC Helix Voltage	2,3	1800	2500	volts
DC Grid-No.2 Voltage	3	1150	1600	volts
DC Collector Current	3	60	75	ma
DC Helix Current	3	–	1.1	ma
DC Grid-No.2 Current	–	–	1	ma

Note 1: With heater volts = 6.3.

Note 2: Normally the tube is operated with the helix voltage equal to the collector voltage.

Note 3: Specific operating value is supplied with each tube.

OPERATING CONSIDERATIONS

The *magnetic field* required to focus the electron beam in the 4053 is supplied by integral periodic permanent magnets. Although the periodic-magnet structure is difficult to demagnetize and has little stray field, care should be taken to prevent the presence of any appreciable external transverse magnetic field which might cause defocusing of the electron beam within the tube. Magnetic material should be kept at least eight inches away from the tube.

Impedance match between the 4053 rf power output and the load should have a voltage standing wave ratio (VSWR) no greater than 2:1. With VSWR's in excess of this value, oscillations may occur causing permanent damage to the tube. Tubes should not be operated without a termination.

Forced-air cooling of the collector is necessary whenever collector current is flowing. Failure to observe this precaution may result in permanent damage to the tube. It is recommended that the forced-air cooling be applied when the heater power is applied.

A thermostatic switch is mounted on the collector of the 4053 which opens when the collector temperature exceeds a safe limit. It is recommended that the thermostatic switch be used in an interlock circuit in the power supply for the collector, helix, and grid-No.2 voltages. The thermostatic switch will carry 6 amperes at 125 volts ac or 3 amperes at 240 volts ac.

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The power supply should incorporate a helix-current overload protective device to prevent damage to the tube in the event of loss of collector voltage. Such a condition would cause the entire electron beam current to flow to the helix and thereby overheat that electrode. If it is desired to remove all voltages by a single control, the time-constant values of the power supply should be chosen so that the helix voltage decays faster than the collector voltage.

As the grid-No.2 voltage increases from zero to the operating value, the helix current may reach as high as 10 ma in the vicinity of 200 to 600 volts on grid No.2, then will fall below 2 ma at the proper operating grid-No.2 voltage. The helix supply should have adequate regulation to handle this transient during the turn on procedure. In order to protect the tube, the helix supply should also have an interlock to open the circuit if the helix current exceeds 3 ma longer than a few milliseconds.

Mounting. The 4053 may be mounted in any position by means of bolts through either set of holes in the two mounting blocks.

Electrical connections are made to the 4053 by means of the seven leads. These color-coded, flexible, insulated leads are identified on the *Dimensional Outline*. RF input and output connections are made to type N plugs (UG-18 B/U) on the tube (see *Dimensional Outline*). The collector is connected to the capsule and is normally grounded.

The rated values for collector voltage, helix voltage, and grid-No.2 voltage are high enough to be dangerous to the user. Care should be taken during adjustment of circuits, especially when exposed circuit parts are at a high dc potential.

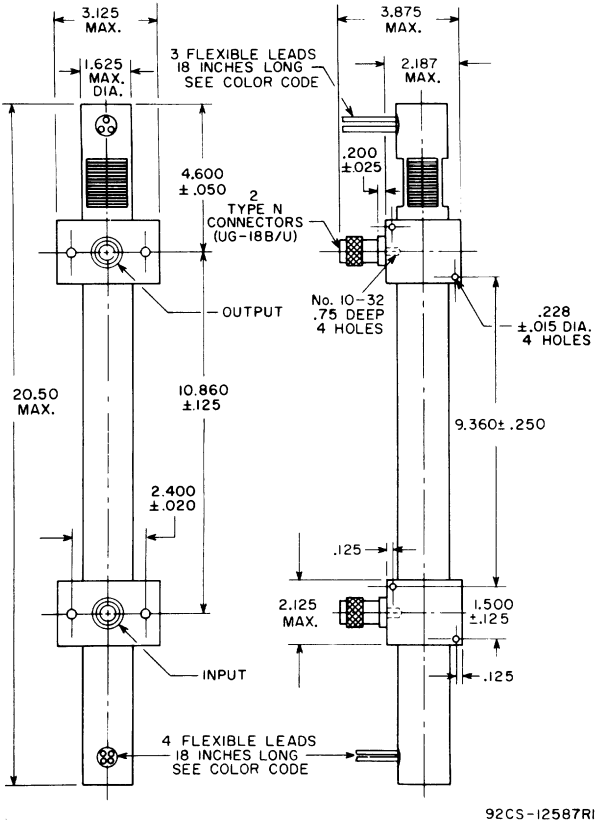
STARTING PROCEDURE

Voltages should be applied to the 4053 in the following sequence: Apply the rated heater voltage and allow tube to warm-up for 3 minutes minimum. Then apply the collector voltage as specified on the tube label. Next, apply the helix voltage as specified on the tube label. Finally, increase the grid-No.2 voltage in a few milliseconds to obtain the collector current specified on the tube label. The three power supplies can be controlled by one switch provided there is a sufficient delay in application of the grid-No.2 voltage to allow the collector and helix voltages to stabilize first.

TURN-OFF PROCEDURE

To turn off the tube, remove the electrode voltages in the following sequence. First reduce the grid-No.2 voltage, then remove the helix voltage, collector voltage, and heater voltage in that order. The three power supplies can be controlled by one switch provided the grid-No.2 voltage decays faster than the collector and helix voltages.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

COLOR CODE OF LEADS

HEATER	Brown
HEATER, CATHODE, GRID No.1	Yellow
HELIX	Orange
GRID No.2	Blue
COLLECTOR, SHELL	Black
THERMOSTATIC SWITCH (2)	White

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Harrison, N. J.

4055

High-Mu Triode

CERAMIC-METAL PENCIL TUBE
OPERATING FREQUENCIES UP TO 4 GHz AND ABOVE

For Plate-Pulsed Operation as a Power Amplifier, Oscillator, and Frequency Multiplier in Compact Mobile and Aircraft Equipment at Altitudes up to 50,000 Feet without Pressurization

ELECTRICAL

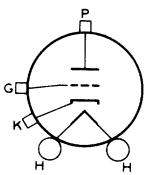
Heater, for Unipotential Cathode		
Voltage (AC or DC)	6.3 ± 10%	V
Current at 6.3 volts	0.295	A
Cathode Warmup Time (Average) to reach 80% of operating power output as rf oscillator or amplifier	5	s
Amplification Factor	70	
Transconductance, for dc plate mA = 35, dc plate volts = 150, and cathode resistor = 11 Ω	35000	μmho
Direct Interelectrode Capacitances[a]		
Grid to plate	2.0	pF
Grid to cathode	5.5	pF
Plate to cathode	0.08 max	pF

MECHANICAL

Operating Position	Any
Weight	0.4 oz
Dimensions and Terminal Connections	See accompanying *Dimensional Outline*
Sockets	
Heater-Terminals Connector	Grayhill[a] No.22-5, or equivalent
Socket for operation up to about 550 MHz (Including heater-terminals connector)	Jettron[b] No.CD7010, or equivalent

TERMINAL DIAGRAM (Bottom View)

H – Heater
K – Cathode



G – Grid
P – Plate

← Indicates a change.

PLATE-PULSED SERVICE—Class C

Maximum Ratings, Absolute-Maximum Values Up to 4 GHz

For a maximum duty factor of 0.01

	For Altitudes up to 25,000 ft	*For Altitudes up to 50,000 ft*	
Peak Plate Voltage	3500 max	2000 max	V
Peak Plate Current	3.0 max	3.0 max	A
DC Plate Current	40 max	40 max	mA
DC Grid Current	15 max	15 max	mA
Plate Dissipation[c]	10 max	10 max	W
Peak Heater-Cathode Voltage			
Heater negative with respect to cathode	60 max	60 max	V
Heater positive with respect to cathode	60 max	60 max	V

Typical Operation as Plate-Pulsed Oscillator at 3.3 GHz

With duty factor of 0.001 and pulse duration of 1 μs

Peak Plate Voltage	1750	V
DC Plate Current	3.0	mA
DC Grid Current	1.4	mA
Grid Resistor	2000	Ω
Useful Power Output at Peak of Pulse (Approx.)	1300	W

Typical Operation as a Power Amplifier in Frequency Range of 1 to 1.2 GHz

With duty factor of 0.001 and pulse duration of 7 μs

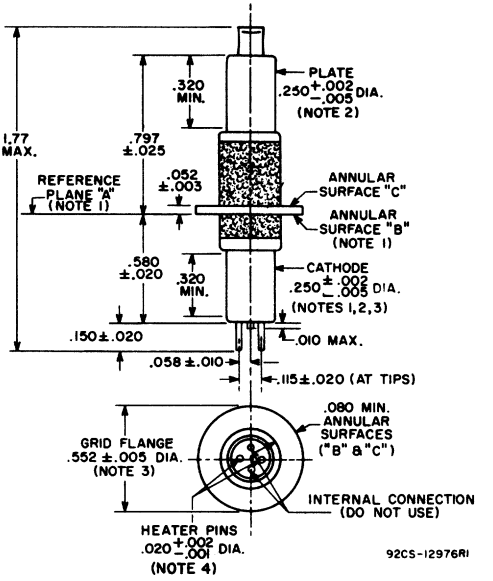
Peak Plate Voltage	1300	V
Peak Plate Current	1.5	A
Peak Driving Power	250	W
Useful Power Output at Peak of Pulse (Approx.)	1000	W

[a] Grayhill, Inc., 561 Hillgrove Ave., La Grange, Ill.

[b] Jettron Products, Inc., 56 Route 10, Hanover, N. J.

[c] When used in a heat sink that will limit the plate-seal temperature to 225° C.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

Reference Plane "A" is defined as that plane against which annular surface "B" of the grid flange abuts.

Annular Surface "B" is on the side of the grid flange toward the cathode cylinder.

Annular Surface "C" is on the side of the grid flange toward the plate cylinder.

Note 1: With annular surface "B" resting on reference plane "A". The axis of the cathode cylinder will be within 2° of a line perpendicular to reference plane "A".

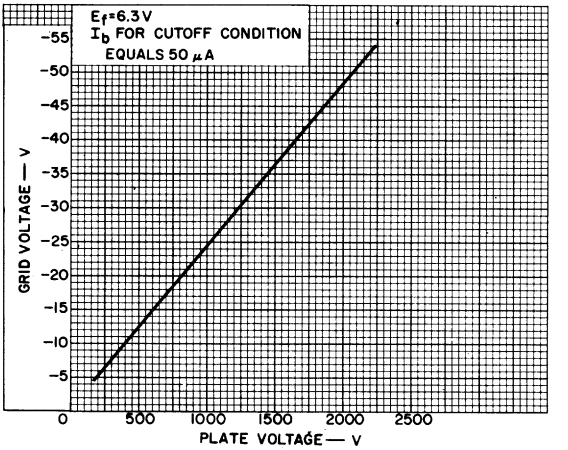
Note 2: The axes of the plate cylinder and cathode cylinder will coincide within 0.010 inch.

Note 3: The axes of the cathode cylinder and grid flange will coincide within 0.005 inch. ←

Note 4: Pin diameter is slightly greater when pretinned. ←

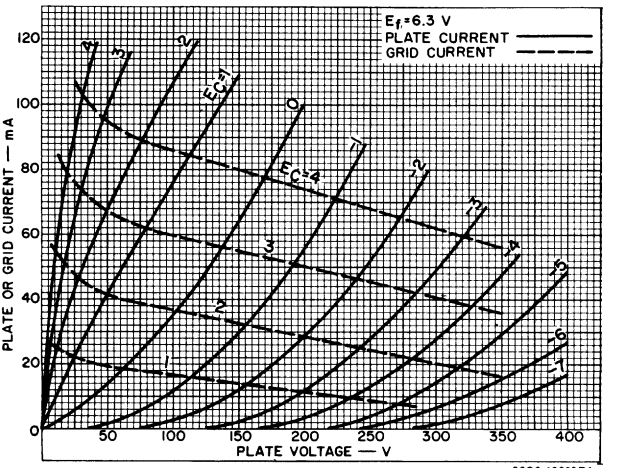
← Indicates a change.

Plate-Current Cutoff Characteristic



92CS-13207

Average Plate and Grid Characteristics



92CS-13208R1

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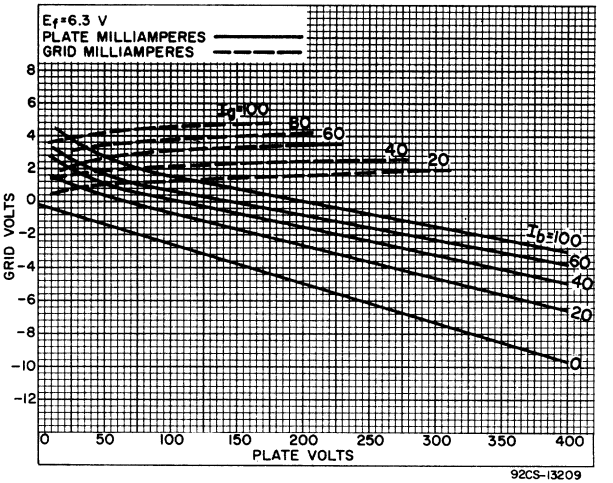
Average Constant-Current Characteristics in Cathode-Drive Service



4058

Medium-Mu Triode

GLASS-METAL PENCIL TYPE

For Use at Frequencies Up to 4000 Mc/s in Pulse Service and 2000 Mc/s in CW Service

ELECTRICAL

Heater, for Unipotential Cathode		
Voltage (AC or DC):		
Under transmitting conditions	6.0 ± 10%	V
Under standby conditions	6.3 max	V
Current at 6.0 V	0.300	A
Amplification Factor	40	
Transconductance	7300	μmhos
For dc plate current of 22 mA and dc plate voltage of 200 V		
Direct Interelectrode Capacitances (Approx.)		
Grid to plate	1.8	pF
Grid to cathode	3.2	pF
Plate to cathode	0.07 max	pF

MECHANICAL

Operating Position	Any
Dimensions and Terminal Connections	See *Dimensional Outline*
Plate Seal Temperature	175 max °C
Weight (Approx.)	0.4 oz
Sockets	
Heater terminals connector	Grayhill No. 22-3[a]

TERMINAL CONNECTIONS (See *Dimensional Outline*)

H – Heater
K – Cathode (Cylinder adjacent to heater pins)
G – Grid (Flange between glass sections)
P – Plate (Cylinder adjacent to pinch-off)

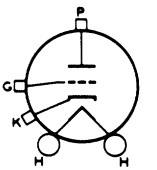


PLATE-PULSED OSCILLATOR[b]—CLASS C

Maximum CCS[c] Ratings, Absolute-Maximum Values

For a maximum "ON" time[d] of 5 microseconds in any 500-microsecond interval.

For altitudes up to 30,000 feet

	Up to 4000 Mc/s	
Peak Positive-Pulse Plate-Supply Voltage[e]	2000	V
Peak Grid-Bias Voltage		
Negative pulse	150	V
Positive pulse	25	V
Peak Plate Current	3	A
From pulse supply		
Peak Rectified Grid Current	1.5	A
DC Plate Current	0.03	A

	Up to 4000 Mc/s	
DC Grid Current [f]	0.013	A
Plate Dissipation [f]	7	W
Pulse Duration	5	μs

Typical Operation with Rectangular Wave Shape in Cathode-Drive Circuit at 3300 Mc/s

With duty factor[g] of 0.01 and pulse duration of 1 microsecond

Peak Positive-Pulse Plate-Supply Voltage [e]	1750	V
Peak Negative-Pulse		
Grid-bias voltage	110	V
From grid resistor of	100	Ω
Peak Plate Current	3	A
From pulse supply		
Peak Rectified Grid Current	1.1	A
DC Plate Current	0.03	A
DC Grid Current	0.011	A
Useful Power Output	800	W
At peak of pulse [h] (approx.)		

RF POWER AMPLIFIER AND OSCILLATOR—CLASS C TELEGRAPHY

Key-down conditions per tube without amplitude modulation[j]

Absolute-Maximum Ratings

For altitudes up to 60,000 feet

	CCS	ICAS [k]	
DC Plate Voltage	330	400	V
DC Grid Voltage	-100	-100	V
DC Plate Current	40	55	mA
DC Grid Current	25	25	mA
DC Cathode Current	55	70	mA
Plate Input	13.2	22	W
Plate Dissipation	8	13	W
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	50	50	W
Heater positive with respect to cathode	50	50	W

Typical Operation as Oscillator in Cathode-Drive Circuit at 500 Mc/s

	CCS	ICAS	
DC Plate-to-Grid Voltage	325	380	V
DC Cathode-to-Grid Voltage [m]	25	30	V
DC Plate Current	35	35	mA
DC Grid Current (Approx.)	11	13	mA
Useful Power Output (Approx.)	5[n]	6[n]	W

Typical Operation as Oscillator in Cathode-Drive Circuit at 1700 Mc/s

	CCS	
DC Plate-to-Grid Voltage [m]	263	V
DC Cathode-to-Grid Voltage	13	V
DC Plate Current	40	mA
DC Grid Current (Approx.)	13	mA
Useful Power Output (Approx.)	1[n]	W

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Typical Operation as RF Power Amplifier in Cathode-Drive Circuit at 500 Mc/s

	CCS	*ICAS*	
DC Plate-to-Grid Voltage	342	395	V
DC Cathode-to-Grid Voltage[m]	42	45	V
DC Plate Current	35	40	mA
DC Grid Current (Approx.)	13	15	mA
Driver Power Output (Approx.)	2.4	3	W
Useful Power Output (Approx.)	7.5[n]	10[n]	W

Maximum Circuit Values

Grid-Circuit Resistance	0.1	0.1	MΩ

FREQUENCY MULTIPLIER

Absolute-Maximum Ratings

For altitudes up to 60,000 feet

	CCS	*ICAS*[k]	
DC Plate Voltage	300	350	V
DC Grid Voltage	-125	-140	V
DC Plate Current	33	45	mA
DC Grid Current	25	25	mA
DC Cathode Current	45	55	mA
Plate Input	9.9	15.9	W
Plate Dissipation	6	9.5	W
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	50	50	V
Heater positive with respect to cathode	50	50	V

Typical Operation as Tripler to 510 Mc/s in Cathode-Drive Circuit

	CCS	*ICAS*	
DC Plate-to-Grid Voltage	410	472	V
DC Cathode-to-Grid Voltage[m]	110	122	V
DC Plate Current	26	36.5	mA
DC Grid Current (Approx.)	4.1	5.8	mA
Driver Power Output (Approx.)	2.75	4.5	W
Useful Power Output (Approx.)	2.1[n]	3.4[n]	W

Maximum Circuit Values

Grid-Circuit Resistance	0.1	0.1	MΩ

[a] Grayhill Inc., 561 Hillgrove Ave., LaGrange, Ill.

[b] In this class of service, the heater should be allowed to warm up for a minimum of 60 seconds before plate voltage is applied.

[c] Continuous Commercial Service.

[d] "ON" time is defined as the sum of the duration of all individual pulses which occur during the indicated interval. *Pulse duration* is defined as the time interval between the two points on the pulse at which the instantaneous value is 70% of the peak power value. The *peak value* is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

[e] The magnitude of any spike on the plate voltage pulse should not exceed a value of 2000 volts with respect to cathode and its duration should not exceed 0.01 microsecond measured at the peak-pulse-value level.

[f] In applications where the plate dissipation exceeds 3 watts, it is important that a large area of contact be provided between the plate cylinder and the connector in order to provide adequate heat conduction.

g Duty factor is the product of pulse duration and repetition rate. For variable pulse durations and pulse repetition rates, the duty factor is defined as the ratio of time "ON" to total elapsed time in any 500-microsecond interval.

h The power output at peak of pulse is obtained from the average power output using the duty factor of the peak pulse. This procedure is necessary since the power output pulse duty factor may be less than the applied voltage pulse duty factor because of a delay in the start of rf power output.

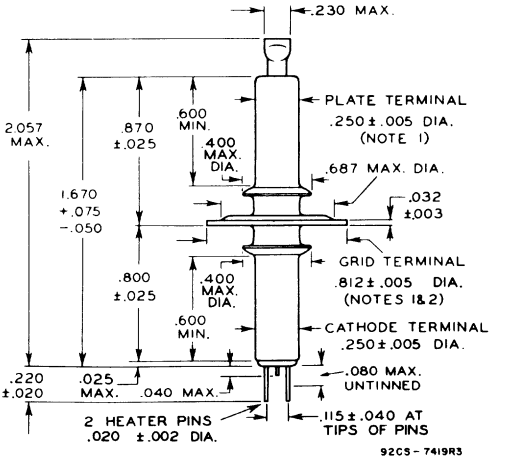
j Modulation, essentially negative, may be used if the positive peak of the audio-frequency envelope does not exceed 115 percent of the carrier conditions.

k Intermittent Commercial and Amateur Service.

m From a grid resistor, or from a suitable combination of grid resistor and fixed supply or grid resistor and cathode resistor.

n This value of useful power is measured at load of output circuit having an efficiency of about 75 percent.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

Note 1: Max. eccentricity of center line (Axis) of plate terminal or grid-terminal flange with respect to the center line (Axis) of the cathode terminal is 0.010 inch.

Note 2: Tilt of grid-terminal flange with respect to rotational axis of cathode terminal is determined by chucking the cathode terminal, rotating the tube, and gauging the total travel distance of the grid-terminal flange parallel to the axis of a point approximately 0.020 inch inward from its edge for one complete rotation. The total travel distance will not exceed 0.020 inch.

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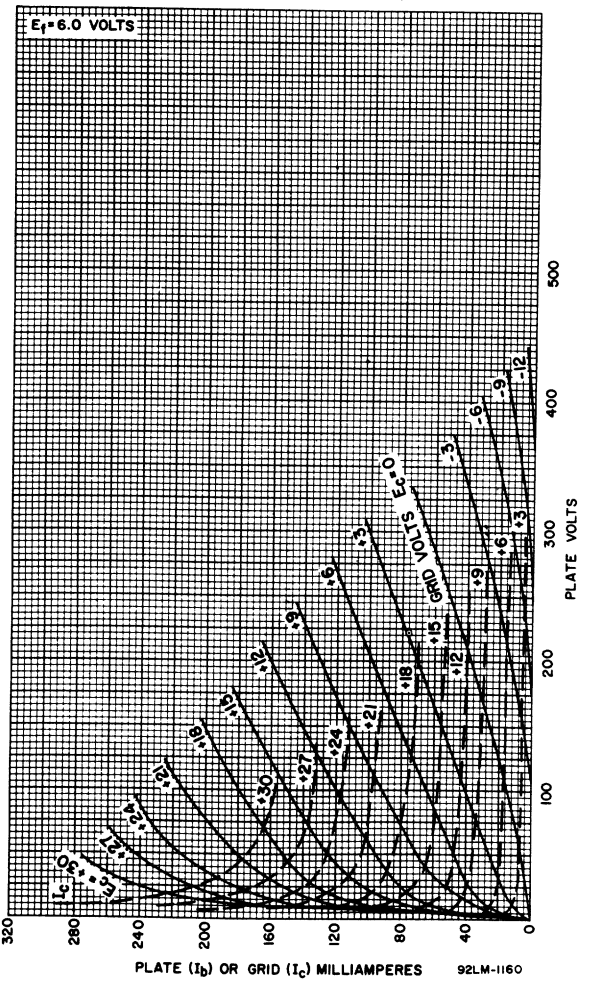
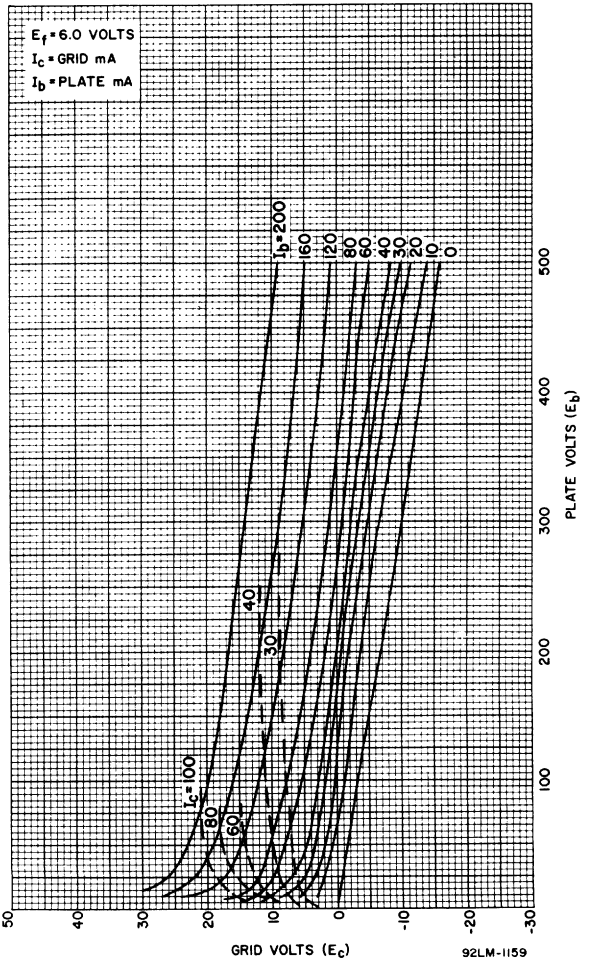
Average Plate Characteristics



Average Constant-Current Characteristics



RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

L-Band Pencil-Tube Oscillator-Amplifier

1090 MHz **500 W PEAK**

These Units[a] are Designed to Implement New Airborne Transponder Systems

ELECTRICAL

Heater, for Unipotential Cathode		
Voltage (AC or DC)	6.3 ± 10%	V
Current at 6.3 volts (Total)	0.66 max	A
Frequency	1090	MHz
Tuning Range	±15	MHz
RF Coaxial Output		
Terminal	Mates with female screw-type connector Sealectro No.50-007-0259, Micon No.1002, or equivalent	
Characteristic impedance (approx.)	50	Ω
Output VSWR (All phase angles)	1.5:1	
Change in Peak Power Output During Modulation[b]	0.5 max	dB
Pulse Rise Time (10% to 90%)	0.05-0.10	μs
Pulse Decay Time (90% to 10%)	0.05-0.20	μs
RF Delay Time (measured at 50% of pulse amplitude)	0.25 max	μs
RF Jitter	0.01 max	μs

MECHANICAL

Operating Position	Any
Dimensions and Terminal Connections	See *Dimensional Outlines*
Weight (Approx.)	7 oz

ENVIRONMENTAL

The units will remain stable within ± 2.5 MHz in frequency and ± 3 dB in peak power output (from nominal conditions) under any combination of the following conditions:

Vibration[c]		
5 to 53 Hz	0.1 inch	DA
53 to 500 Hz	±15	g's
Shock	20	g's
Ambient Temperature	-54 to +125	°C
Altitude	30,000	ft
Output VSWR (All phase angles)	1.5:1	
Plate and Heater Voltage Variation	±10	%
Duty Factor (Long term)	0.01	

GRID-PULSED OSCILLATOR—CLASS C

Absolute-Maximum Ratings

For a maximum long-term duty factor[d] of 0.01[e]

DC Plate Voltage (Each Unit)	1100 max	V
Peak Oscillator Grid Current	0.5 max	A
Peak Amplifier Cathode Current	2.0 max	A
Peak Plate Current		
Oscillator	0.7 max	A
Amplifier	1.5 max	A
Plate Dissipation (Total)	18 max	W

← Indicates a change.

Peak Heater-Cathode Voltage		
Heater negative with respect to cathode. . . .	60 max	V
Heater positive with respect to cathode. . . .	60 max	V

TYPICAL OPERATION

With Rectangular Wave Shape in Grid-Drive Circuit at 1090 MHz

With duty factor of 0.01 and pulse duration of 0.45 microsecond

DC Plate Voltage.	1000	V
Each unit		
Oscillator Grid Bias.	-80	V
Amplifier Cathode Bias.	+25	V
DC Plate Current.	20	mA
Total		
Useful Power Output	500	W
At peak of pulse		

[a] The ruggedized oscillator-amplifier combination is built to satisfy all AIMS/FAA (Army Integrated Meteorological Systems) requirements.

[b] With 56 pulses in 100 microsecond interval.

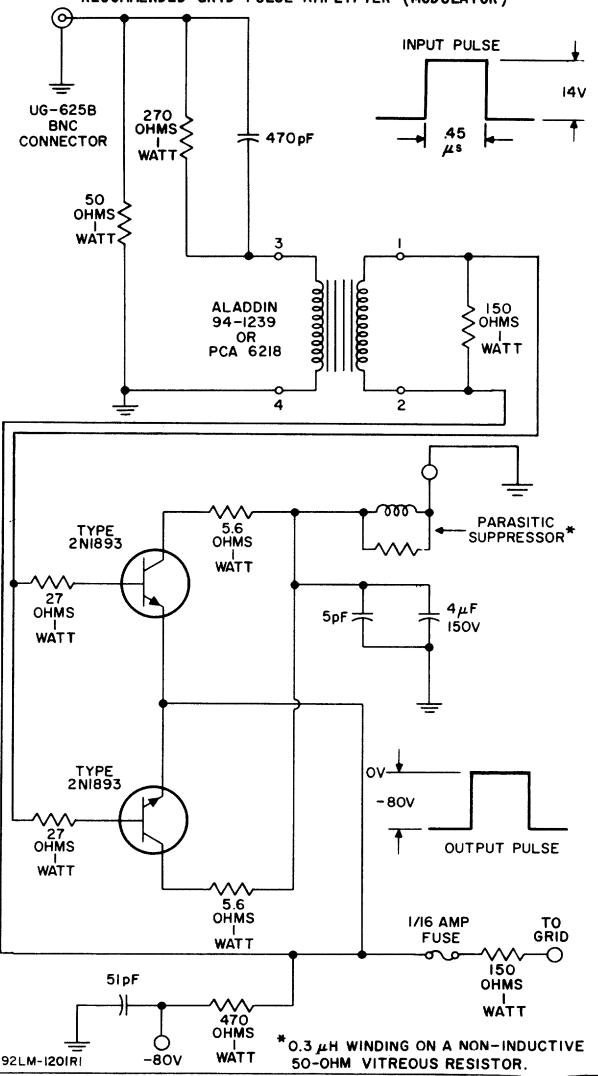
[c] Tested per methods described in MIL-E-5400 and MIL-T-5422.

[d] Duty factor is the product of pulse duration and repetition rate. For variable pulse durations and pulse repetition rates, the duty factor is defined as the ratio of the time "*ON*" to total elapsed time in any 2500-microsecond interval. "*ON*" time is defined as the sum of the duration of all individual pulses which occur during the indicated interval. *Pulse duration* is defined as the time interval between the two points on the pulse at which the instantaneous value is 70% of the peak power value. The *peak value* is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

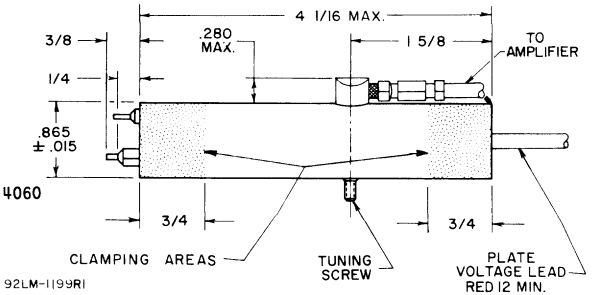
[e] This value is for continuous pulsing. The duty factor can be 0.25 for any interval up to 100 microseconds in length as long as the long-term duty factor does not exceed 0.01.

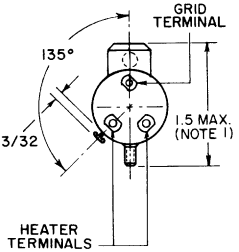
RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

RECOMMENDED GRID-PULSE AMPLIFIER (MODULATOR)

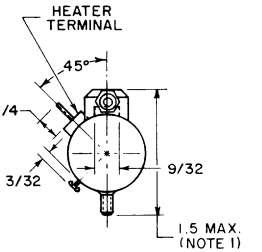


DIMENSIONAL OUTLINE (DIMENSIONS IN INCHES)

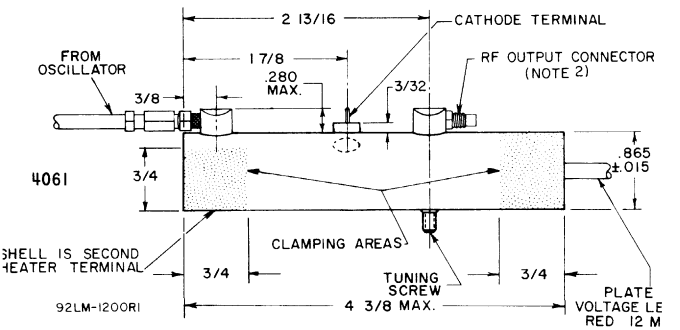




4060—LEFT SIDE VIEW



4061—LEFT SIDE VIEW



Note 1: When adjusted for operation at 1090 MHz.

Note 2: Mates with female screw-type connector Selectro No.50-007-0259, Micon No.1002, or equivalent.

These units are supplied without the mounting brackets; they are also available with brackets upon request.

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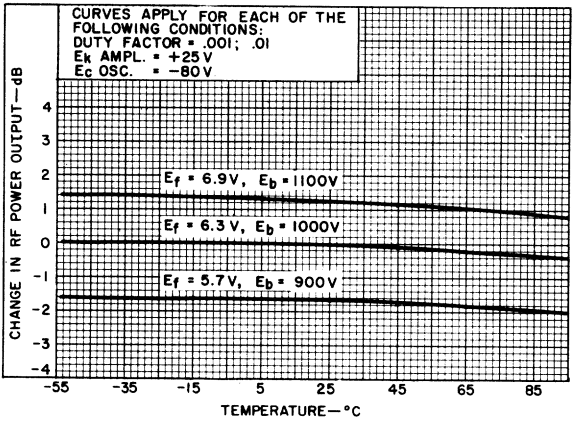
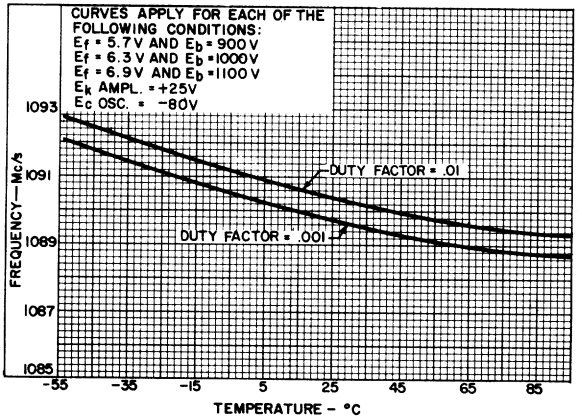
Typical Change in Power Output vs. Temperature



92LS-1204 R1

Typical Output Frequency vs. Temperature



92LS-1203

4062A

High-Mu Triode

CERAMIC-METAL PENCIL TUBE

OPERATING FREQUENCIES UP TO 4 GHz AND ABOVE

For Grid-Pulsed Operation as a Power Amplifier or Oscillator in Compact Mobile and Aircraft Equipment at Altitudes up to 50,000 Feet without Pressurization

ELECTRICAL

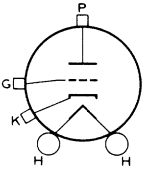
Heater, for Unipotential Cathode		
Voltage (AC or DC)	6.3 ± 10%	V
Current at 6.3 volts	0.295	A
Cathode Warmup Time (Average) to reach 80% of operating plate current		
For conditions: dc plate supply volts = 0, cathode resistor = 0 Ω, load resistor = 10 Ω, heater volts = 6.3	10	s
Amplification Factor	100	
Transconductance, for dc plate mA = 14, dc plate volts = 150, and cathode resistor = 11 Ω	16,000	μS
Direct Interelectrode Capacitances		
Grid to plate	1.75	pF
Grid to cathode and heater	3.9	pF
Plate to cathode and heater	0.08 max	pF

MECHANICAL

Operating Position	Any
Weight (Approx.)	0.4 ounce
Dimensions and Terminal Connections	See accompanying *Dimensional Outline*
Sockets	
Heater-Terminals Connector	Grayhill[a] No.22-5, or equivalent
Socket for operation up to about 550 MHz (Including heater-terminals connector)	Jettron[b] No.CD7010, or equivalent

TERMINAL DIAGRAM (Bottom View)

H – Heater
K – Cathode



G – Grid
P – Plate

GRID-PULSED SERVICE - Class C

Maximum Ratings, Absolute-Maximum Values Up to 4 GHz

For a maximum long-term duty factor of 0.01[c]

DC Plate Voltage	2000 max	V
DC Grid Voltage		
Negative-bias value	200 max	V
Positive value during gating pulse	25 max	V
Peak Plate Current	3.0 max	A
Peak Grid Current	1.5 max	A
Plate Dissipation[d]	10 max	W
Grid Dissipation	0.5 max	W
Peak Heater-Cathode Voltage		
Heater negative with respect to cathode	60 max	V
Heater positive with respect to cathode	60 max	V

Typical Operation with Rectangular Waveshape in Grid-Drive Oscillator Circuit at 1090 MHz

With duty factor of 0.01 and pulse duration of 0.5 microsecond

DC Plate Voltage	1400	V
Grid-Bias Voltage	-80	V
Peak Positive Grid Voltage[e]	20	V
Peak Plate Current	1	A
Useful Power Output at Peak of Pulse	500	W

Typical Operation with Rectangular Waveshape in Grid-Drive Amplifier Circuit at 1090 MHz

With duty factor of 0.005 and pulse duration of 0.5 microsecond

DC Plate Voltage	1000	V
Grid-Bias Voltage	-30	V
Peak Plate Current	1.5	A
Peak Driving Power	150	W
Useful Power Output at Peak of Pulse	600	W

Typical Operation with Rectangular Waveshape in Cathode-Drive Amplifier Circuit at 1090 MHz

With duty factor of 0.01 and pulse duration of 0.5 microsecond

DC Plate Voltage	1000	V
Cathode-Bias Voltage	25	V
Peak Plate Current	1.2	A
Peak Driving Power	180	W
Useful Power Output at Peak of Pulse	600	W

[a] Grayhill, Inc., 561 Hillgrove Ave., LaGrange, Ill.

[b] Jettron Products, Inc., 56 Route 10, Hanover, N.J.

[c] This value is for continuous pulsing. The duty factor can be 0.25 for any interval up to 100 microseconds in length as long as the long-term duty factor does not exceed 0.01.

[d] Plate-seal temperature must be limited to 225°C.

[e] Amplitude of grid-drive gating pulse is adjusted to produce this value.

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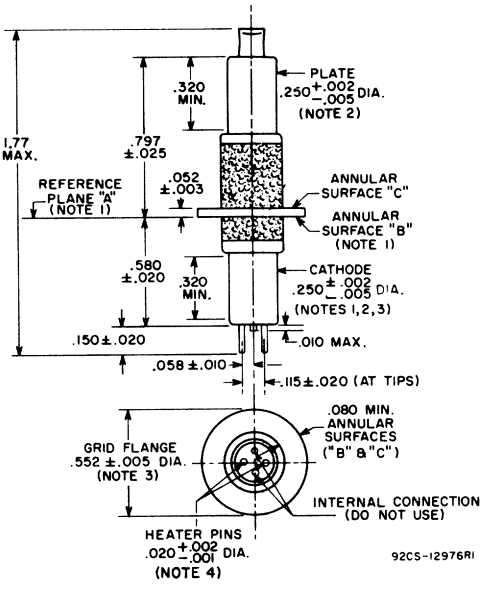
DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

Reference Plane "A" is defined as that plane against which annular surface "B" of the grid flange abuts.

Annular surface "B" is on the side of the grid flange toward the cathode cylinder.

Annular surface "C" is on the side of the grid flange toward the plate cylinder.

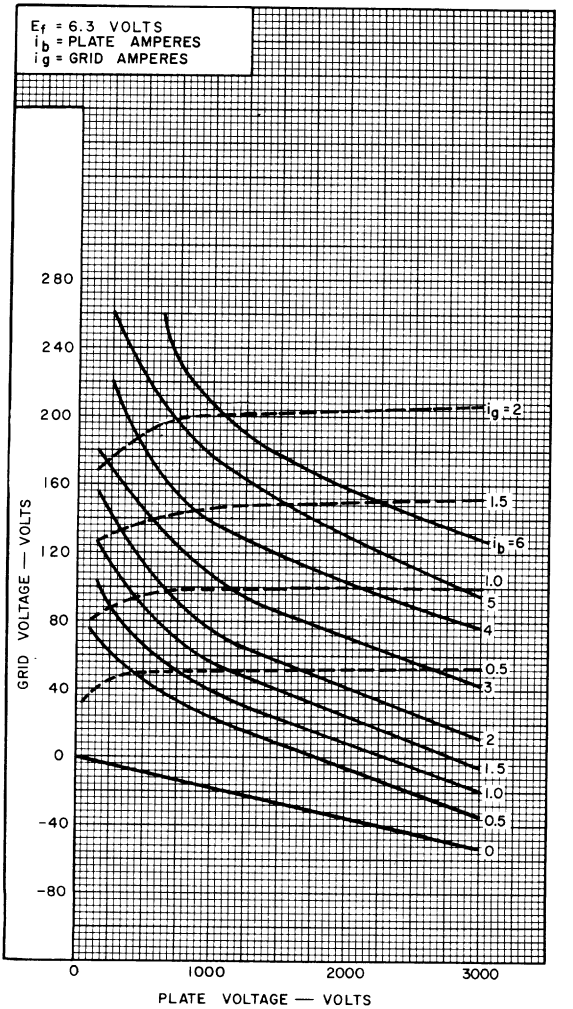
Note 1: With annular surface "B" resting on reference plane "A", the axis of the cathode cylinder will be within 2° of a line perpendicular to reference plane "A".

Note 2: The axes of the plate cylinder and cathode cylinder will coincide within 0.010 inch.

Note 3: The axes of the cathode cylinder and grid flange will coincide within 0.005 inch.

Note 4: Pin diameter is slightly greater when pretinned.

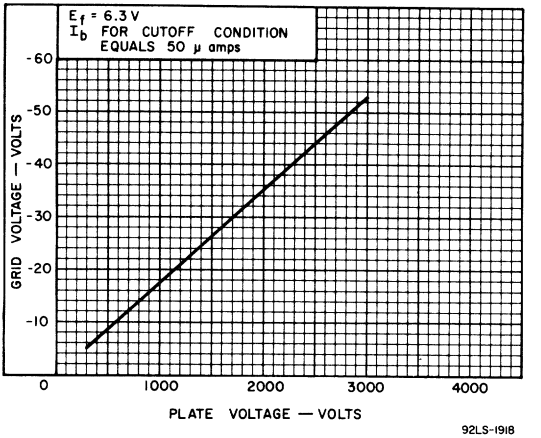
Average Constant-Current Characteristics of Type 4062A in Grid-Pulsed Service



92LM-1915

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Plate-Current Cutoff Characteristic



92LS-1918

4068

Pencil Tube Oscillator

L-Band Cavity Oscillator

ELECTRICAL

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	V
Current at 6.3 volts	0.33 max.	A
Frequency	1090	MHz
Tuning Range	±15	MHz
RF Coaxial Output Terminal	Mates with female snap-on-type connector Sealectro No.51-007-0000, or equivalent	
Characteristic Impedance (Approx.)	50	Ω
Maximum Output VSWR (All phase angles)	1.3:1	

MECHANICAL

Operating Position	Any
Dimensions and Terminal Connections	See Dimensional Outline
Weight (Approx.)	4 oz

ENVIRONMENTAL

The units will remain stable within ± 3 MHz in frequency and − 2 dB in peak power output (from nominal conditions) under any combination of the following conditions:

Operating Temperature	-46 to +71	°C
Altitude	Up to 35,000	ft
Output VSWR (All phase angles)	1.1:1	
Plate and Heater Voltage Variation	±10	%
Duty Factor	Up to 0.01	

GRID-PULSED OSCILLATOR – CLASS C
MAXIMUM RATINGS, Absolute-Maximum Values

For a maximum duty factor[a] of 0.01[cb]

DC Plate Voltage	1540 max.	V
DC Grid Voltage:		
Negative-bias value	100 max.	V
Positive value during gating pulse	0 max.	V
Peak Plate Current	1.2 max.	A
Peak Grid Current	0.7 max.	A

Plate Dissipation	15 max.	W
Grid Dissipation	1.0 max.	W
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode	60 max.	V
Heater positive with respect to cathode	60 max.	V

Typical Operation with Rectangular Waveshape in Grid-Pulsed Circuit at 1090 MHz

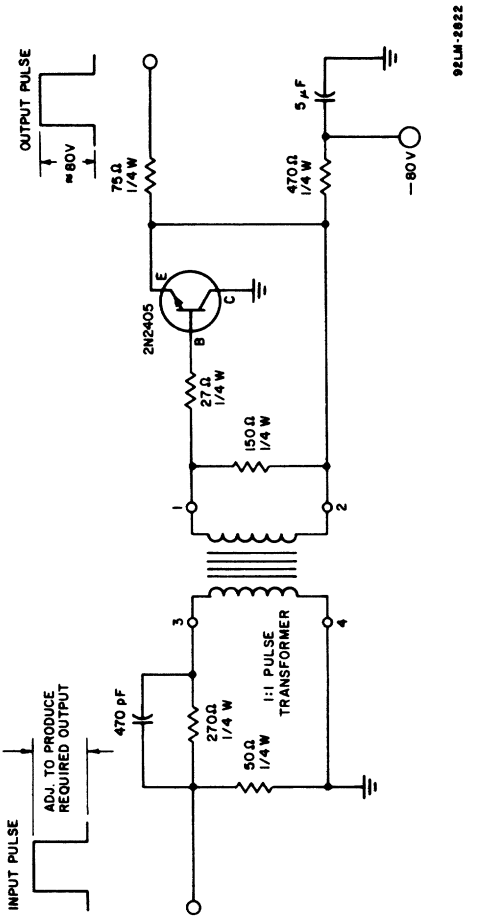
With duty factor of 0.001 and pulse duration of 0.45 microsecond

DC Plate Voltage	1400	V
Grid-Bias Voltage	-80	V
DC Plate Current	1	mA
Useful Power Output at Peak of Pulse	500	W

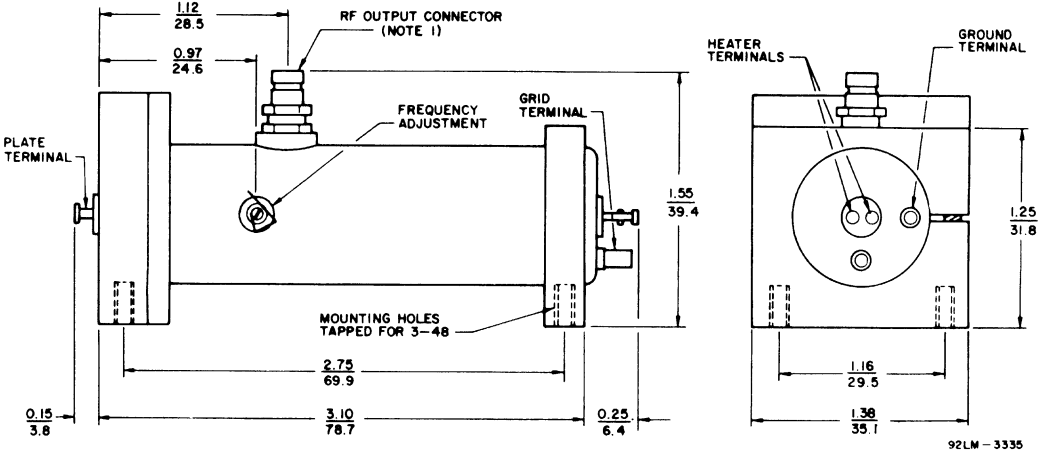
a Duty factor is defined as the product of the pulse duration and repetition rate. For variable pulse durations and pulse repetition rates, the duty factor is defined as the ratio of the "ON" time to total elapsed time in any 500-microsecond interval. "ON" time is defined as the sum of the durations all individual pulses which occur during the indicated interval. Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70% of the peak power value. Peak value is defined as the maximum value of a smooth curve through the average of the fluctations over the top portion of the pulse.

b When operated for 10 minutes per hour. For continuous pulsing, the maximum duty factor is 0.005.

RECOMMENDED GRID-PULSE AMPLIFIER (MODULATOR)



DIMENSIONAL OUTLINE



Note 1: Mates with female snap-on-type connector Sealectro No.51-007-0000, or equivalent

Dimensions in $\frac{\text{Inches}}{\text{mm}}$ unless otherwise noted

The millimeter dimensions are derived from the original inch dimensions (1 inch = 25.4 mm exactly).

Beam Power Tube

FORCED-AIR COOLED
CERAMIC-METAL CONSTRUCTION "ONE-PIECE" ELECTRODE DESIGN
COAXIAL-ELECTRODE STRUCTURE INTEGRAL RADIATOR
MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE

For Voltage-Regulator Applications

GENERAL DATA

Electrical:

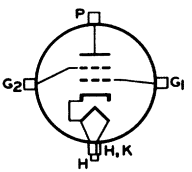
Heater, for Matrix-Type Oxide-Coated Unipotential Cathode:		
Voltage (AC or DC)	5.5 typical 6.0 max.	volts volts
Current at heater volts = 5.5	17.3	amp
Minimum heating time at heater volts = 5.5	5	minutes
Mu-Factor, Grid No.2 to Grid No.1, for plate volts = 2500, grid No.2 volts = 600, and plate ma. = 600.	17	

Mechanical:

Operating Position	Any
Overall Length	3.25"
Diameter	3.725" ± 0.035"
Radiator	Integral part of tube
Weight (Approx.)	2 lbs

Terminal Connections (See *Dimensional Outline*):

G_1 – Grid No.1
G_2 – Grid No.2
H – Heater



K – Cathode
P – Plate

Thermal:

Terminal Temperature (Plate, grid No.2, grid No.1, cathode, and heater)	250 max.	°C

Air Flow:

Through radiator—Adequate air flow to limit the plate-terminal temperature to 250° C should be delivered by a blower through the radiator before and during the application of heater, plate, grid No.2, and grid No.1 voltages. Typical values of air flow directed through the radiator versus plate dissipation are shown in accompanying *Typical-Cooling-Requirements* curve. Plate power, grid-No.2 power, heater power, and air flow may be removed simultaneously.

To grid No.2, grid No.1, cathode, and heater terminals—A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these

terminals so that its temperature does not exceed the specified maximum value of 250° C. An air flow of 10 cfm is usually adequate.

VOLTAGE REGULATOR

Maximum CCS[a] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	3500 max.	volts
DC GRID-No.2 VOLTAGE	1000 max.	volts
DC PLATE CURRENT	1 max.	amp
GRID-No.2 INPUT	50 max.	watts
PLATE DISSIPATION	1750 max.	watts

CHARACTERISTICS RANGE VALUES

	Min.	*Max.*	
1. Heater Current	16.3	18.2	amp
2. Direct Interelectrode Capacitances:			
Grid No.1 to cathode	37	46	μμf
Grid No.1 to grid No.2	46	62	μμf
Grid No.1 to plate[b]	--	0.17	μμf
Grid No.2 to cathode[c]	-	1.40	μμf
Grid No.2 to plate	14.6	17.8	μμf
Plate to cathode[b,c]	-	0.017	μμf
3. Grid-No.1 Voltage[d] (1)	5	30	volts
4. Grid-No.1 Voltage[e] (2)	5	30	volts
5. Grid-No.2 Current[d] (1)	-15	0	ma
6. Grid-No.2 Current[e] (2)	-30	0	ma
7. Pulse Emission Voltage[f]	--	650	volts

[a] Continuous Commercial Service.

[b] With external, flat, metal shield having diameter of 8", and center hole approximately 3" in diameter provided with spring fingers that connect the shield to grid-No.2 terminal. Shield is located in plane of grid-No.2 terminal perpendicular to the tube axis.

[c] With external, flat, metal shield having diameter of 8", and center hole approximately 2-3/8" in diameter provided with spring fingers that connect the shield to grid-No.1 terminal. Shield is located in plane of grid-No.1 terminal perpendicular to the tube axis.

[d] With dc plate voltage 3500 volts, dc grid-No.2 voltage of 400 volts, grid-No.1-circuit resistance of 30,000 ohms, and dc grid-No.1 voltage adjusted to give a dc plate current of 0.25 ampere.

[e] With dc plate voltage of 600 volts, dc grid-No.2 voltage of 400 volts, grid-No.1-circuit resistance of 30,000 ohms, and dc grid-No.1 voltage adjusted to give a dc plate current of 0.5 ampere.

[f] With grid No.1, grid No.2, and plate tied together; and a pulse-voltage source connected between plate and cathode. The half-sinusoid (Approx.) pulse is 2 microseconds between the two points on the pulse at which the instantaneous value is 50% of the peak value, pulse-repetition frequency is 60 cps, and duty factor is 0.00012. The voltage-pulse amplitude is adjusted until a peak cathode current of 90 amperes is obtained. After 2 minutes at this value, the voltage-pulse amplitude will not exceed 650 volts peak.

SPECIAL TEST

5-to-400 cps Vibration Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable-frequency vibration. With heater voltage of 5.5 volts ac, dc plate supply

voltage of 450 volts, dc grid-No.2 supply voltage of 300 volts, and grid-No.1 supply voltage adjusted to give dc plate current of 10 ma. Plate load resistor = 2000 ohms, grid-No.2 resistor = 1000 ohms, and grid-No.1 resistor = 30 ohms. The tube is vibrated along each of three mutually perpendicular axes over a 6-minute sweep consisting of:

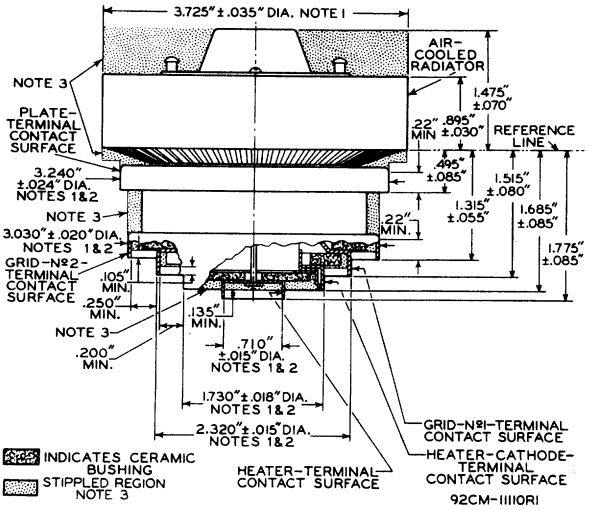
(a) 5 to 22 cps with a fixed double amplitude of 0.240 inch ±10%.
(b) 22 to 200 cps at a fixed acceleration of 10 g ± 10%.
(c) 200 to 400 cps at a fixed acceleration of 3 g ± 10%.

At the end of this test, the tubes are required to meet the limits of items 1,3,4,5,6, and 7 under *Characteristics Range Values.*

OPERATING CONSIDERATIONS

The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel cannot possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.

4600A

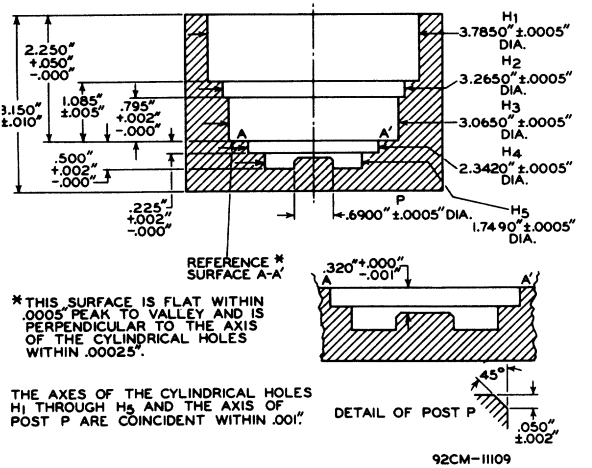


NOTE 1: WITH THE CYLINDRICAL SURFACES OF THE RADIATOR BAND, PLATE TERMINAL, GRID-No.2 TERMINAL, GRID-No.1 TERMINAL, HEATER-CATHODE TERMINAL, AND HEATER TERMINAL CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G_1. PROPER ENTRY OF THE TUBE IS OBTAINED WHEN THE GRID-No.2 TERMINAL IS SEATED ON THE SHOULDER A-A'. THE TUBE IS PROPERLY SEATED ON THE SHOULDER WHEN A 0.010"-THICKNESS GAUGE 1/8" WIDE WILL NOT ENTER MORE THAN 1/16" BETWEEN THE SHOULDER SURFACE AND THE GRID-No.2 TERMINAL. THE GAUGE IS PROVIDED WITH SLOTS TO PERMIT MAKING MEASUREMENT OF SEATING OF GRID-No.2 TERMINAL ON SHOULDER A-A'.

NOTE 2: THE DIAMETER OF EACH TERMINAL IS HELD TO INDICATED VALUES ONLY OVER THE INDICATED MINIMUM LENGTH OF ITS CONTACT SURFACE.

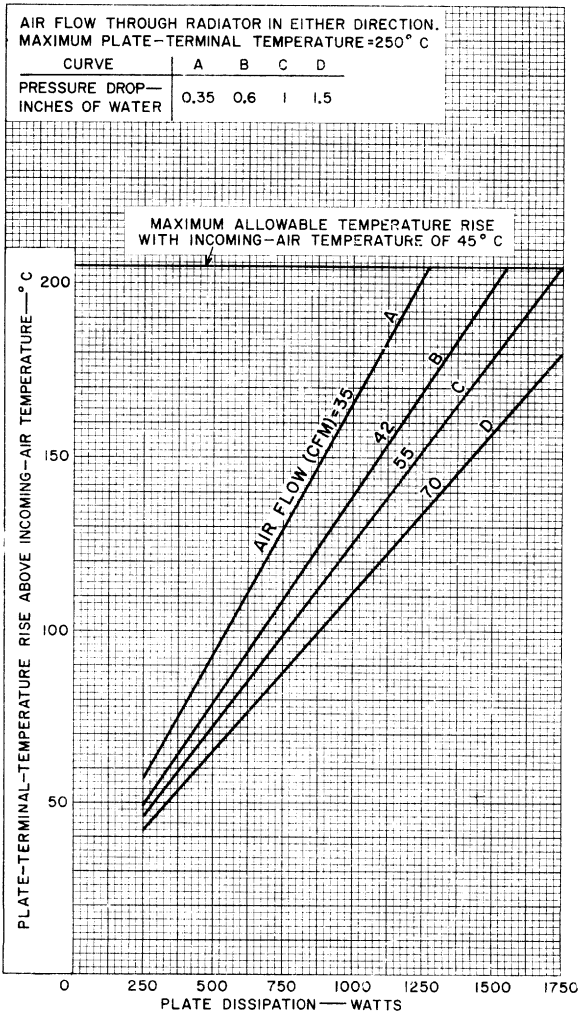
NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.

SKETCH G_1



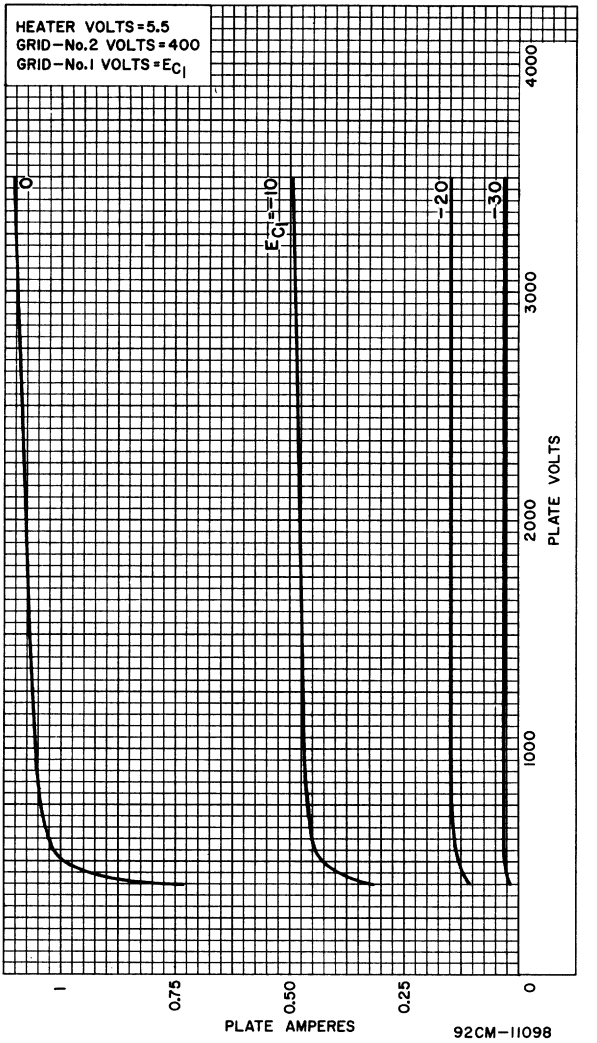
92CM-11109

TYPICAL COOLING REQUIREMENTS



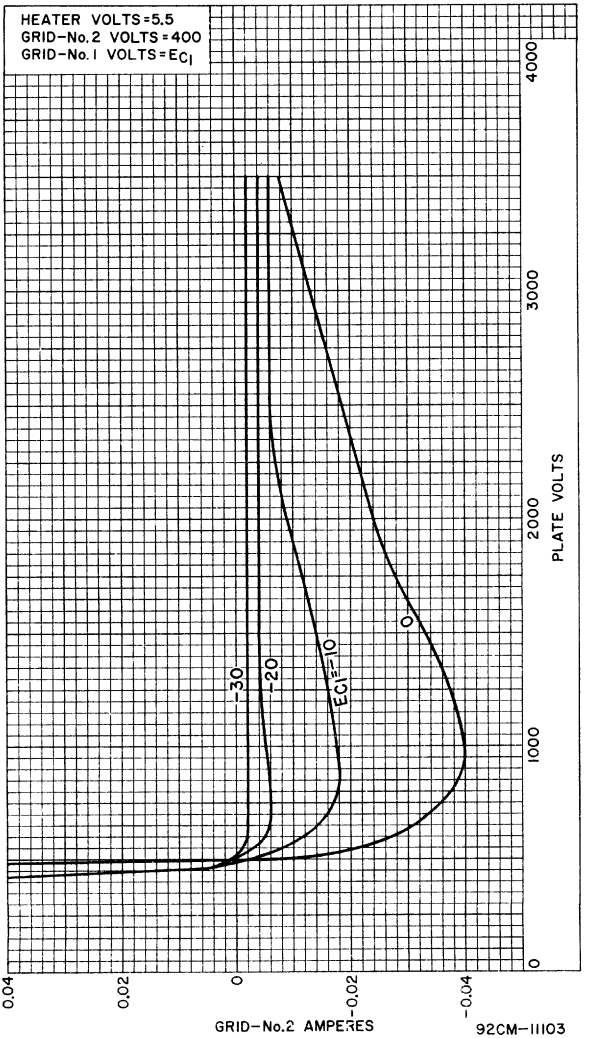
92CM-11100

TYPICAL PLATE CHARACTERISTICS



4600A

TYPICAL CHARACTERISTICS



4604

Beam Power Tube

QUICK-HEATING FILAMENT
90 WATTS CW INPUT (ICAS) UP TO 60 Mc
60 WATTS CW INPUT (ICAS) AT 175 Mc

For Use in Push-to-Talk Mobile and Emergency-Communications Equipment as an RF Power-Amplifier Tube

GENERAL DATA

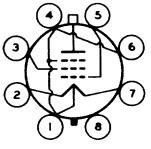
Electrical:

Filament, Coated:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.65	amp
Heating time	1	sec
Transconductance, for plate volts = 200, grid-No.2 volts = 200, and plate ma. = 100	6000	μmhos
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 200, grid-No.2 volts = 200, and plate ma. = 100	4	
Direct Interelectrode Capacitances:		
Grid No.1 to plate	0.24 max.	μμf
Grid No.1 to filament & grid No.3 & internal shield, grid No.2, and base sleeve	11	μμf
Plate to filament & grid No.3 & internal shield, grid No.2, and base sleeve	8.5	μμf

Mechanical:

Operating Position	Vertical, base down or up, or Horizontal with pins 3 and 7 in vertical plane
Maximum Overall Length	3-13/16"
Seated Length	3-1/8" ± 1/8"
Maximum Diameter	1-21/32"
Bulb	T12
Cap	Small (JEDEC No.C1-1)
Socket	Standard Octal 8-Contact
Base	Small Wafer Octal 8-Pin with "770" Sleeve (JEDEC Group 1, No.B8-150)
Basing Designation for BOTTOM VIEW	7CL

Pin 1 - Filament Tap, Grid No.3, Internal Shield
Pin 2 - Filament
Pin 3 - Grid No.2



Pin 4 - Same as Pin 1
Pin 5 - Grid No.1
Pin 6 - Same as Pin 1
Pin 7 - Filament
Pin 8 - Base Sleeve
Cap - Plate

4604

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy▲
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum ICAS● Ratings, *Absolute-Maximum Values:*

	Up to 60 Mc	
DC PLATE VOLTAGE	750 max.	volts
DC GRID-No.2 VOLTAGE	250 max.	volts
DC GRID-No.1 VOLTAGE	-150 max.	volts
DC PLATE CURRENT	150 max.	ma
DC GRID-No.1 CURRENT	4 max.	ma
PLATE INPUT	90 max.	watts
GRID-No.2 INPUT	3 max.	watts
PLATE DISSIPATION	25 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	220 max.	°C

Typical Operation:

	As amplifier at 175 Mc	
DC Plate Voltage	400	volts
DC Grid-No.2 Voltage★	190	volts
From a series resistor of	18000	ohms
DC Grid-No.1 Voltage♦	-60	volts
From a grid resistor of	30000	ohms
DC Plate Current	150	ma
DC Grid-No.2 Current	11	ma
DC Grid-No.1 Current (Approx.)	2	ma
Driving Power (Approx.)	4.5	watts
Power Output (Approx.)	30	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance♦	30000 max.	ohms

▲ Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

● Intermittent Commercial and Amateur Service.

★ Obtained preferably from a separate source, or from the plate supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should be used only when the 4604 is used in a circuit which is not keyed. Grid-No.2 voltage must not exceed 400 volts under key-up conditions.

♦ Obtained from fixed supply, by grid-No.1 resistor, or by combination methods.

♦ When grid No.1 is driven positive and the 4604 is operated at maximum ratings, the total dc grid-No.1-circuit resistance should not exceed the specified value of 30,000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a fixed supply.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Min.	*Max.*	
Filament Current at 6.3 volts ac.	0.59	0.71	amp

Direct Interelectrode Capacitances:			
Grid No.1 to plate	–	0.24	μμf
Grid No.1 to filament & grid No.3 & internal shield, grid No.2, and base sleeve	9.5	12.5	μμf
Plate to filament & grid No.3 & internal shield, grid No.2, and base sleeve	7.3	9.5	μμf
Plate Current♠	46	94	ma
Grid-No.2 Current♠	–	5.5	ma
Useful Power Output♣	47	–	watts

♠ With 6.3 volts ac on filament, dc plate voltage of 300 volts, dc grid-No.2 voltage of 200 volts, and dc grid-No.1 voltage of -29 volts. ◄

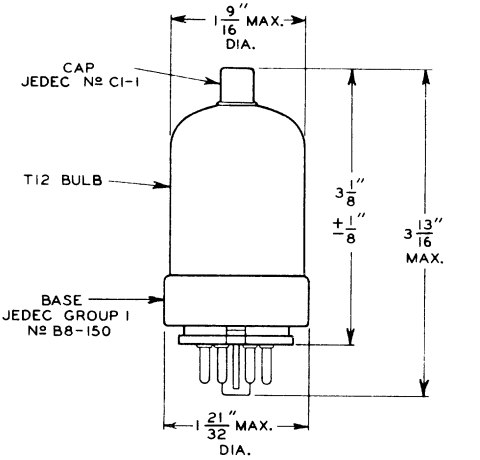
♣ In a single-tube, self-excited-oscillator circuit, and with 6.3 volts ac on filament, dc plate voltage of 600 volts, dc grid-No.2 voltage of 200 volts, grid-No.1 resistor of 30,000 ± 10% ohms, dc plate current of 100 to 112 ma., dc grid-No.1 current of 2 to 2.5 ma., and frequency of 15 Mc.

OPERATING CONSIDERATIONS

The *bulb* becomes hot during operation. To insure adequate cooling, therefore, it is essential that free circulation of air be provided around the 4604.

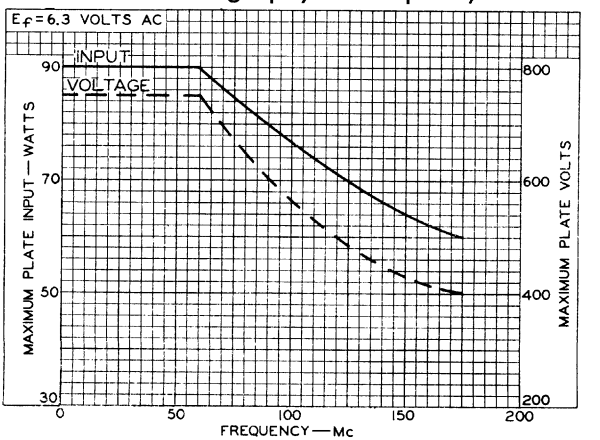
The *plate* shows no color when the 4604 is operated at full ratings under ICAS conditions. Connections to the plate should be made with a flexible lead to prevent any strain on the seal at the cap.

◄ Indicates a change.



92CS-9625R4

RATING CHART
ICAS Class-C Telegraphy or Telephony Service



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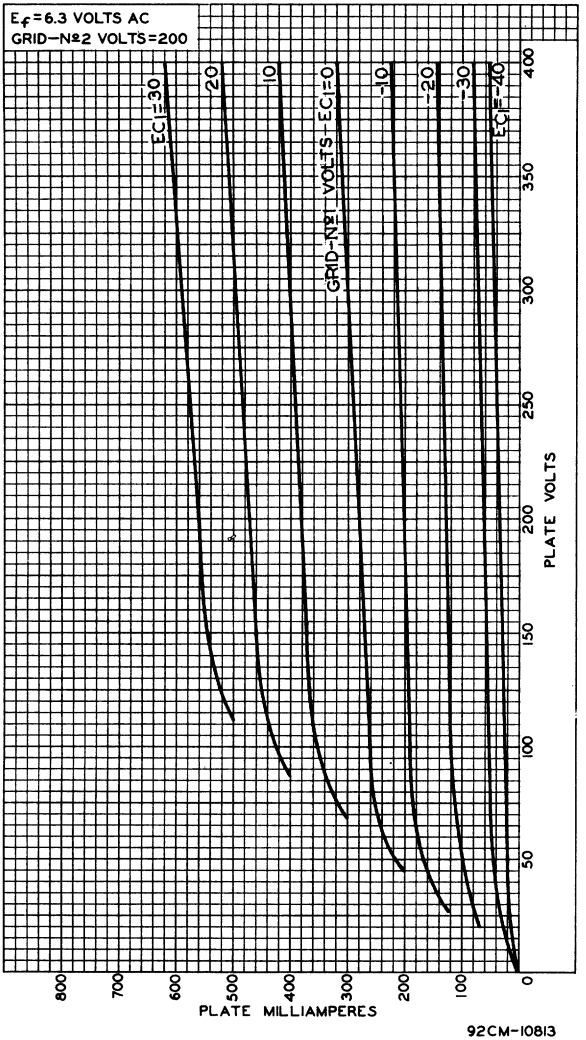
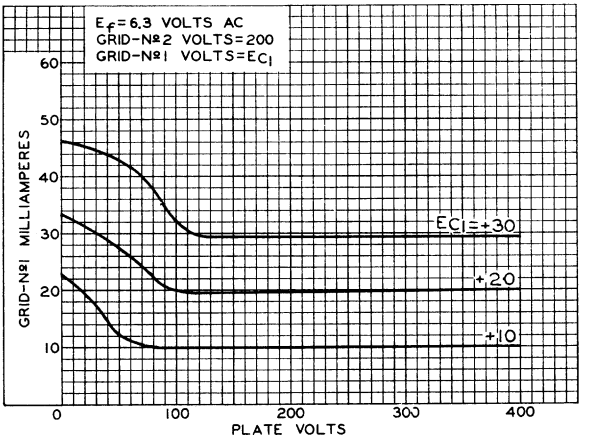
TYPICAL PLATE CHARACTERISTICS



TYPICAL CHARACTERISTICS



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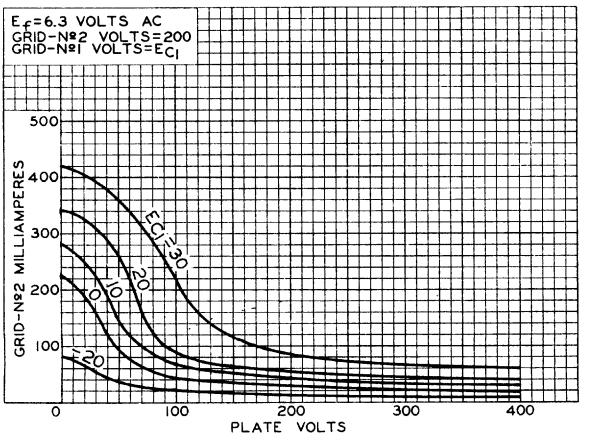


92CS-10816

Super-Power Beam Power Tube

2-MW SHORT-PULSE POWER, 275-kW LONG-PULSE POWER

PULSE LENGTH TO 2500 MICROSECONDS

LOW FILAMENT POWER FOR AIRBORNE USE

WATER COOLED

For RF-Pulse Power Amplifier at Frequencies from 195 to 600 MHz in Search Radar, Telemetry, and Particle Accelerator Service.

ELECTRICAL

Filamentary Cathode, Multistrand, Matrix-Type, Oxide-Coated—		
Voltage: **a,j**		
Maximum, with dc or 60-Hz ac excitation	**1.00**	**V**
Maximum, with 400-Hz ac excitation	**1.05**	**V**
Typical, with dc or 60-Hz ac excitation	**0.95**	**V**
Current:		
Typical operation value at 0.95 volt, with 60-Hz excitation	**495**	**A**
Minimum time to reach operating filament voltage	**30**	**s**
Minimum time at normal operating filament voltage before other voltages are applied	**90**	**s**
Mu-Factor, Grid No.2 to Grid No.1	**7**	
Direct Interelectrode Capacitances		
Grid No.1 to plate	**0.15 max**	**pF**
Grid No.1 to grid No.2 and cathode	**500**	**pF**
Plate to cathode and grid No.2	**30**	**pF**
Grid No.2 to cathode (including bypass capacitors)	**18000 max**	**pF**

MECHANICAL

Operating Position	**Tube axis vertical, either end up**	
Overall Length	**8.62 ± 0.31**	**in**
Maximum Diameter	**11.25**	**in**
Weight (Approx.)	**38**	**lb**
Terminal Connections	**See *Dimensional Outline***	

THERMAL **k,m**

Ceramic-Insulator Temperature	**150 max**	**°C**
Metal-Surface Temperature.	**100 max**	**°C**
Minimum Storage Temperature[k]	**-65 min**	**°C**

Water Flow

	Typ. Flow g/m	*Absolute Min. Flow* g/m	*Max. Pressure Differential for Typ. Flow*[b] psi
Through filament block	**1.2**	**0.8**	**18**
Through dc cathode block	**1.2**	**0.8**	**18**
Through grid-No.1 block	**1.2**	**0.8**	**14**
Through grid.No.2 block	**1.2**	**0.8**	**18**

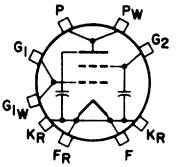
Water Flow (cont'd)

	Typ. Flow g/m	Absolute Min. Flow g/m	Max. Pressure Differential for Typ. Flow[b] psi
Through plate:			
For plated dissipations up to 10 kW (Average) . .	14	12	30
For plate dissipations of 10 kW to 30 kW (Average).	22	20	60

Resistivity of water at 25°C	1 min	MΩ-cm
Water Temperature from any outlet. . . .	70 max	°C
External Gas Pressure[c]	60 max	psi
Water Pressure at an Inlet	100 max	psi

TERMINAL DIAGRAM (Bottom View)

F – Insulated Filament Terminal and Coolant Connection
FR – Uninsulated Filament Terminal for DC Circuit Returns and Coolant Connection
G_1 – RF Grid-No.1 Terminal Contact Surface
G1W – DC Grid-No.1 and Coolant Connection
G_2 – DC Grid-No.2 and Coolant Connection
K_R – RF Cathode Terminal Contact Surface for Circuit Returns
P – RF Plate Terminal Contact Surface
P_W – DC Plate and Coolant Connection



PULSED RF AMPLIFIER[n]

For frequencies from 195 to 600 MHz and a maximum "ON" time as specified in any 25000-microsecond interval

Absolute-Maximum Ratings

	"ON" time	15 μs	2500 μs	
Peak Positive-Pulse Plate Voltage[d]		55	-	kV
DC Plate Voltage[e].		25	25	kV
Peak Positive-Pulse Grid-No.2 Voltage[f,g] . .		2.2	2.2	kV
DC or Peak Negative-Pulse Grid-No.1 Voltage.		400	400	V
Peak Plate Current		80	30	A
Peak Grid-No.2 Current		15	2	A
Peak Rectified Grid-No.1 Current		15	2	A
DC Plate Current		0.32	2.5	A
DC Grid-No.2 Current		0.06	0.2	A
DC Grid-No.1 Current		0.06	0.2	A

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Absolute-Maximum Ratings (cont'd)

	"ON" time	15 μs	2500 μs
Plate Input (Average)		16	70 kW
Plate Dissipation (Average)		8	30 kW

Typical Plate-Pulsed Operation

In Class B service at 425 MHz with a rectangular waveshape pulse of 13 microseconds and a duty factor of 0.004

Peak Positive-Pulse Plate Voltage[d]	50	kV
Peak Positive Pulse Grid-No.2 Voltage[f]	2.1	kV
Peak Negative-Pulse Grid-No.1 Voltage[h]	325	V
Peak Plate Current	75	A
Peak Grid-No.2 Current	8	A
Peak Rectified Grid-No.1 Current	10	A
DC Plate Current	0.3	A
DC Grid-No.2 Current	0.03	A
DC Grid-No.1 Current	0.04	A
Peak Driver Power Output (Approx.)	20	kW
Useful Peak Power Output	2	MW

Typical Grid-Pulsed Operation

In Class B service at the frequencies shown with a rectangular waveshape pulse of 2000 microseconds and a duty factor of 0.06

	At 425 Hz	At 600 Hz	
DC Plate Voltage[e]	20	21	kV
Peak Positive-Pulse Grid-No.2 Voltage[f]	2	2	kV
Peak Negative-Pulse Grid-No.1 Voltage[h]	350	350	V
Peak Plate Current	27	26	A
Peak Grid-No.2 Current	1.6	1.6	A
Peak Rectified Grid-No.1 Current	1.2	1.2	A
DC Plate Current	1.62	1.56	A
DC Grid-No.2 Current	0.096	0.096	A
DC Grid-No.1 Current	0.072	0.072	A
Peak Driver Power Output (Approx.)	2.7	2.7	kW
Useful Peak Power Output	275	250	kW

Maximum Circuit Value

Grid-No.1 Circuit Resistance	500	Ω

[a] Because the filament voltage, when operated near the maximum value, provides emission in excess of any requirements within tube ratings, during life the filament voltage should be reduced to a value that will give adequate but not excessive emission. Careful attention to maintaining the value consistent with adequate emission will result in conserving the life of the tube. The filament voltage should be measured at the respective liquid coolant connections on the tube side of the threads. This procedure is essential for accurate measurement of the filament voltage. At 400 cycles some heating of the filament leads and rf cathode terminal (cathode heater) occurs; this condition is not detrimental to tube operation or tube life.

[b] Measured directly across cooled element for the indicated typical flow.

[c] This pressure is related to the output-cavity pressurization as required to prevent corona or external arc-over.

[d] The magnitude of any spike on the plate voltage pulse should not exceed its peak value by more than 4000 volts, and the duration of any spike when measured at the peak-value level should not exceed 10% of the maximum "ON" time. The output cavity must be pressurized as required to prevent corona or external arc-over at the ceramic insulator.

[e] High speed "fault" protection must be used with all grid-pulsed applications and with all plate-pulsed applications where the pulse length exceeds 20 microseconds.

f The magnitude of any spike on the grid-No.2 voltage pulse should not exceed its peak value by more than 250 volts, and the duration of any spike when measured at the peak-value level should not exceed 10% of the maximum "ON" time.

g A negative dc voltage of 300 volts maximum may be applied to grid No.2 to prevent any tube conduction between pulses.

h The grid-No.1 voltage may be a combination of fixed and self bias obtained from a series grid resistor.

The following footnotes apply to the *RCA Transmitting Tube Operating Considerations* given at front of this section.

j See *Electrical Considerations* - Filament or Heater

k See *Cooling Considerations* - Liquid Cooling

m See *Cooling Considerations* - Forced-Air Cooling

n See *Classes of Service*.

CHARACTERISTICS RANGE VALUES

	Note	*Min*	*Max*	
Filament Current	1	460	530	A
Input Strap-Resonant Frequency	-	230	250	MHz
Output Strap-Resonant Frequency	-	240	260	MHz
Direct Interelectrode Capacitances				
Grid No.1 to plate	2	-	0.15	pF
Grid No.2 to cathode	-	12000	18000	pF

Note 1: At filament voltage of 0.95 volt and ac filament excitation at 60 Hz.

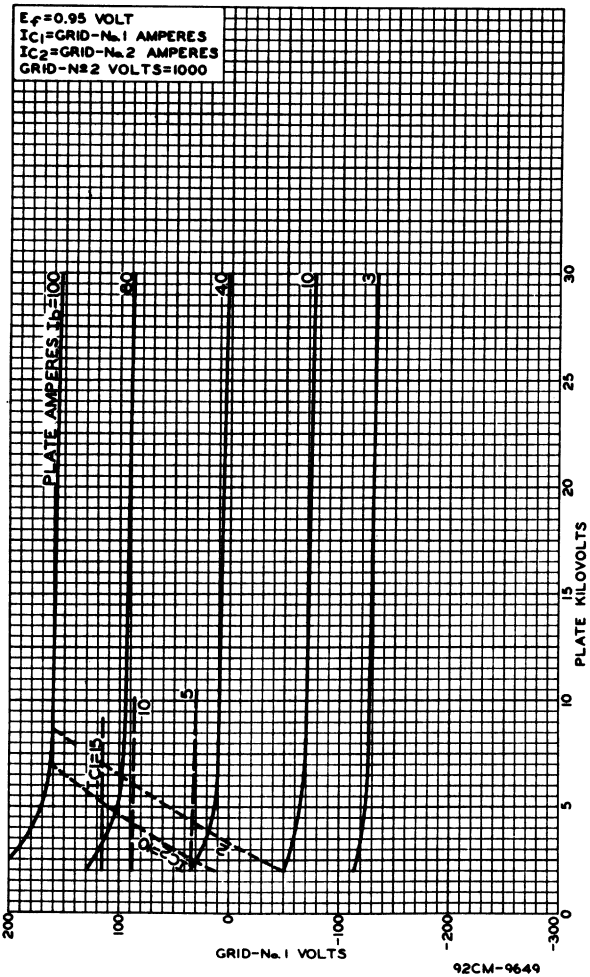
Note 2: Measured with special shield adapter.

FOR ADDITIONAL INFORMATION ON THIS TYPE, WRITE FOR TECHNICAL BULLETIN AND APPLICATION GUIDE FOR RCA SUPER POWER TUBES, ICE-279A AVAILABLE FROM:

Commercial Engineering
Electronic Components and Devices
Radio Corporation of America
Harrison, New Jersey

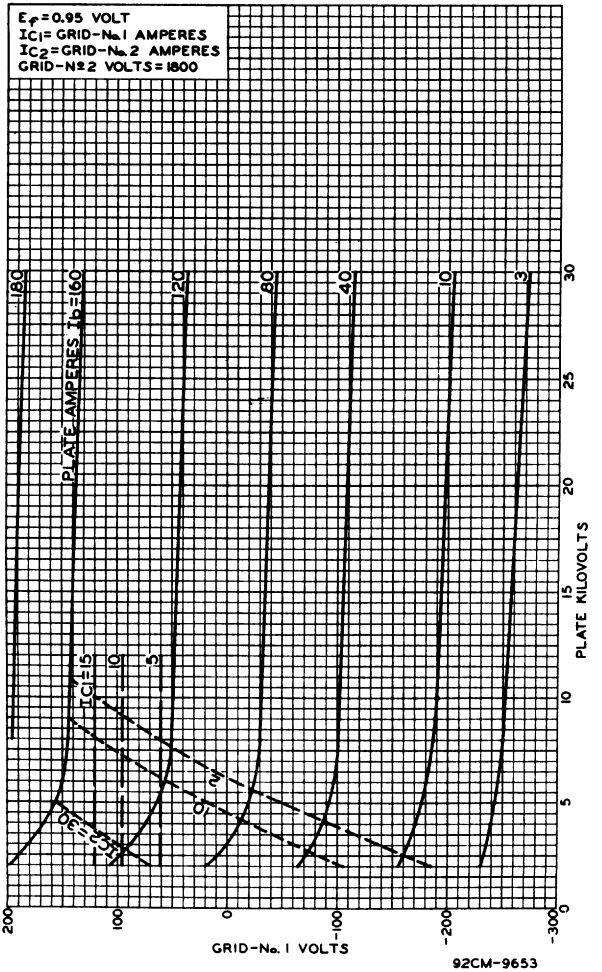
Typical Constant-Current Characteristics

FOR GRID-No.2 VOLTAGE = 1000 VOLTS



Typical Constant-Current Characteristics

FOR GRID-No.2 VOLTAGE = 1800 VOLTS



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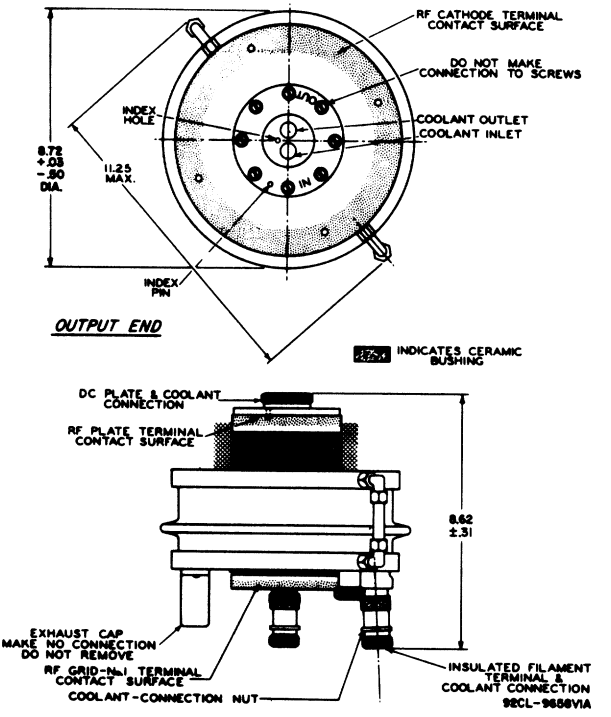
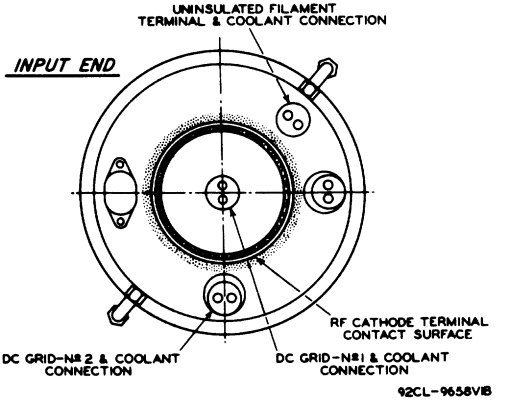
SIMPLIFIED DIMENSIONAL OUTLINE[g]



DIMENSIONS IN INCHES

[g] A detailed Dimensional Outline and associated Gauge Drawings are given in the Technical Bulletin available upon request.

UNINSULATED FILAMENT
TERMINAL & COOLANT CONNECTION



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4616V1

Super-Power Beam Power Tube

2-MW SHORT-PULSE POWER, 275-kW LONG-PULSE POWER
PULSE LENGTH TO 2500 MICROSECONDS

LOW FILAMENT POWER **WATER COOLED** **FOR AIRBORNE USE**

For RF-Pulse Power Amplifier Frequencies from 195 to 600 MHz

The **4616V1** *is the same as the* **4616** *except the* **4616V1** *does not have a water separator.*

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

DATA
6-66

4617

Super-Power Triode

8 MEGAWATTS OF PEAK POWER OUTPUT AT 425 MHz

MATRIX-OXIDE-TYPE CATHODE
LIQUID COOLED

DOUBLE-ENDED TERMINAL CONFIGURATION FOR SYMMETRICAL CIRCUITRY

For RF Power Amplifier in Pulse Service at Frequencies up to 450 MHz

ELECTRICAL

Filamentary Cathode, Multistrand, Matrix-Oxide-Type[k]—		
Current (DC):		
Typical operating value	1800	A
Maximum value[a]	2000	A
Maximum value for starting, even momentarily	2000	A
Minimum time to reach operating current	30	s
Minimum time at normal operating current before plate voltage is applied	60	s
Voltage (DC):[b]		
Typical value required to obtain 1800 amperes	1.5	V
Direct Interelectrode Capacitances		
Grid to plate	160	pF
Grid to cathode	1500	pF
Plate to cathode	Less than 1.0	pF

MECHANICAL

Operating Position	**Tube axis vertical, either end up**
Overall Length	**17 max in**
Maximum Width	**24 max in**
Weight	
Uncrated	190 lb
Crated	355 lb
Terminal Connections	**(See *Dimensional Outline*)**

THERMAL[m,n]

Ceramic-Insulator Temperature	150 max	°C
Metal-Surface Temperature	100 max	°C
Minimum Storage Temperature	-65 min	°C

Water Flow

	Typ. Flow g/m	*Absolute Min. Flow* g/m	*Max. Pressure Differential for Typ. Flow*[c] psi
To plate:			
Total flow for two parallel input and output coolant courses:			
For plate dissipation up to 50 kW (Average)	40	35	4
For plate dissipation of 150 kW (Average)	100	90	25

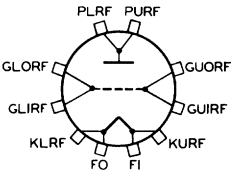
Water Flow (con'd)

	Typ. Flow g/m	*Absolute Min. Flow* g/m	*Max. Pressure Differential for Typ. Flow*[c] psi
To upper grid coolant course	3	2	25
To lower grid coolant course	3	2	25
To grid-cathode coolant course	12	10	6

Resistivity of water at 25°C:		
Through plate and grid coolant courses	1 min	MΩ-cm
Through grid-cathode coolant course	5 min	MΩ-cm
Water temperature from any outlet	70 max	°C
External gas pressure[d,e]	65 max	psig
Maximum watter pressure at any inlet	90 max	psig

TERMINAL DIAGRAM (Bottom View)

FI – Filament Terminal (Inner)
FO – Filament Terminal (Outer)
KURF – Upper RF Cathode Terminal
KLRF – Lower RF Cathode Terminal
GUIRF – Upper RF Grid Input Terminal
GUORF – Upper RF Grid Output Terminal
GLIRF – Lower RF Grid Input Terminal
GLORF – Lower RF Grid Output Terminal
PLRF – Lower RF Plate Terminal
PURF – Upper RF Plate Terminal



PULSED RF AMPLIFIER[p]

Absolute-Maximum Ratings

For a maximum "ON" time of 25 microseconds in any 2500-microsecond interval, for frequencies up to 450 MHz

Peak Positive-Pulse Plate Voltage[f]	40	kV
Peak Negative Grid Voltage	200	V
Peak Plate Current	500	A
Peak Cathode Current[g]	750	A
DC Plate Current	5	A
DC Cathode Current[g]	7.5	A
Plate Input (Average)	200	kW
Plate Dissipation (Average)	150	kW

Typical Plate-Pulsed Operation With Rectangular Wave Shape in Cathode-Drive Circuit

With duty factor of 0.01 and pulse duration of 25 microseconds

	At 425 MHz		
Peak Positive-Pulse Plate-to-Grid Voltage[f,h]	30000	35000	V
Peak Cathode-to-Grid Voltage[h]	60	70	V
Peak Plate Current	310	400	A
Peak Cathode Current[g]	525	680	A
DC Plate Current	3.1	4	A
DC Cathode Current[g]	5.2	6.8	A

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Electronic Components and Devices Harrison, N. J.

Peak Driver Power Output[j]	250	350	kW
Useful Peak Power Output	5	8	MW

[a] The specified maximum filament current is a maximum rating which should not be exceeded, even momentarily, during operation of the tube. The life of the tube can be conserved by operating the filament at the lowest current which will enable the tube to provide the desired power output. Because the filament when operated near the maximum value usually provides emission in excess of any requirements within the tube ratings, the filament current should be reduced to a value that will give adequate but not excessive emission for any particular application. Good regulation of the filament current is, in general, economically advantageous from the viewpoint of tube life.

[b] Measured between KLRF and KURF (See *Terminal Diagram*).

[c] Measured directly across cooled element for the indicated typical flow.

[d] This pressure is related to the output-cavity pressurization when required to prevent corona or external flash-over.

[e] With the gauge located in an area where the maximum pressure external to the gauge is one atmosphere absolute.

[f] The magnitude of any spike on the plate voltage pulse should not exceed its peak value by more than 10%, and the duration of any spike when measured at the peak-value level should not exceed 5% of the pulse duration.

[g] Peak or average cathode current is the total of the peak or average plate current and the peak or average rectified grid current. (Pulses may not be coincident, hence they may not necessarily be added directly).

[h] Preferably obtained from a cathode bias resistor.

[j] The driver stage is required to supply tube losses, rf circuit losses, and rf power added to the plate circuit. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

The following footnotes apply to the *RCA Transmitting Tube Operating Considerations* given at the front of this section.

[k] See *Electrical Considerations* - Filament or Heater.

[m] See *Cooling Considerations* - Forced-Air Cooling.

[n] See *Cooling Considerations* - Liquid Cooling.

[p] See *Classes of Service*.

CHARACTERISTICS RANGE VALUES

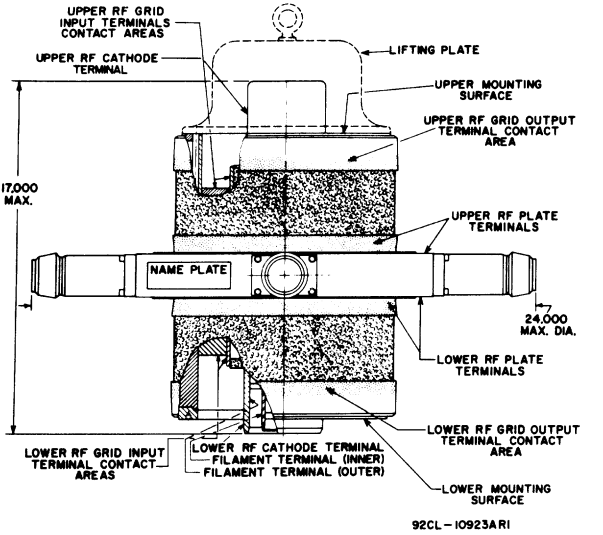
	Note	*Min*	*Max*	
Filament Voltage	1	1	1.8	V
Input Strap-Resonant Frequency	-	90	120	MHz
Output Strap-Resonant Frequency	-	240	280	MHz
Direct Interelectrode Capacitances				
Grid to plate	-	120	180	pF
Grid to cathode	-	1250	1700	pF

Note 1: With 1800 amperes through filament.

FOR ADDITIONAL INFORMATION ON THIS TYPE, WRITE FOR TECHNICAL BULLETIN AND APPLICATION GUIDE FOR RCA SUPER POWER TUBES, ICE-279A AVAILABLE FROM:

Commercial Engineering
Electronic Components and Devices
Radio Corporation of America
Harrison, New Jersey

SIMPLIFIED DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

A detailed Dimensional Outline and associated Gauge Drawings are given in the Technical Bulletin available upon request.

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Electronic Components and Devices Harrison, N. J.

Beam Power Tube

MATRIX-TYPE CATHODE CERMOLOX FORCED-AIR COOLED

1350 Watts CW Power Output at 600 MHz

For Use at Frequencies up to 1215 MHz as a Linear RF Power Amplifier in Single-Sideband Suppressed-Carrier Service, as a Plate-Modulated RF Power Amplifier in Class C Telephony Service, as an RF Power Amplifier and Oscillator in Class C Telegraphy Service, and as an RF Power Amplifier in Class C FM Telephony Service.

ELECTRICAL

Heater, for Matrix-Type Oxide-Coated Unipotential Cathode[d]		
Voltage (AC or DC)	5.5 typ 6.0 max	V V
Current at 5.5 volts	17.3	A
Minimum Heating Time	5	minutes
Mu-Factor, Grid No.2 to Grid No.1 For plate volts = 2500, grid No.2 volts = 600, and plate mA = 600	17	
Direct Interelectrode Capacitances		
Grid No.1 to plate[a]	0.181 max	pF
Grid No.1 to cathode & heater	42	pF
Plate to cathode & heater[a,b]	0.017 max	pF
Grid No.1 to grid No.2	55	pF
Grid No.2 to plate	12	pF
Grid No.2 to cathode & heater[b]	1.4 max	pF

MECHANICAL

Operating Position	Any
Maximum Overall Length	3.34 in
Maximum Diameter	3.75 in
Terminal Connections	See *Dimensional Outline*
Radiator	Integral part of tube
Weight (Approx.)	2 lb

THERMAL

Terminal Temperature Plate, grid No.2, grid No.1, cathode, and heater	250 max	°C
Plate-Seal Temperature	250 max	°C

See *Dimensional Outline* for temperature-measurement points

Forced-Air Cooling[e]

Air Flow:

Through radiator - Adequate air flow to limit the plate-seal temperature to 250°C should be delivered by a blower, such as Rotron[c] AXIMAX 2, KS-408 or equivalent, through the radiator before and during the application of heater, plate, grid-No.2, and grid-No.1 voltages, See graph, Typical Cooling Characteristics.

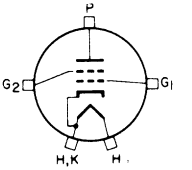
To Plate, Grid-No.2, Grid-No.1, Heater-Cathode, and Heater Terminals - A sufficient quantity of air should be allowed to flow past each of these terminals so that their temperature does not exceed the specified maximum value of 250°C.

During Standby Operation - Cooling air is required to the Heater-Cathode and Heater Terminals when only heater voltage is applied to the tube.

During Shutdown Operation - Air flow should continue for a few minutes after all electrode power is removed.

TERMINAL DIAGRAM (Bottom View)

G_1 - Grid-No.1-Terminal Contact Surface
G_2 - Grid-No.2-Terminal Contact Surface
H - Heater-Terminal Contact Surface
H.K - Heater-& Cathode-Terminal Contact Surface
P - Plate-Terminal Contact Surface



LINEAR RF POWER AMPLIFIER, CLASS AB_1[f]

Single-Sideband Suppressed-Carrier Service

Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2

Maximum CCS Ratings, Absolute Values

	Up to 1215 MHz	
DC Plate Voltage	3000	V
DC Grid-No.2 Voltage	1000	V
Max.-Signal DC Plate Current	1.0	A
Max.-Signal DC Grid-No.1 Current	0.2	A
Max.-Signal Plate Input	2500	W
Max.-Signal Grid-No.2 Input	50	W
Plate Dissipation	1500	W

Maximum Circuit Values

Grid-No.1 Circuit Resistance Under Any Condition
- With fixed bias . . . . . 5000 Ω
- With fixed bias (in Class AB_1 operation) . . . . . Not recommended
- With cathode bias . . . . . Not recommended

Grid-No.2 Circuit Impedance . . . . . See footnote g
Plate Circuit Impedance . . . . . See footnote h

Typical CCS Class AB_1 "Single-Tone" Operation

	Up to 60 MHz		
DC Plate Voltage	2250	2250	V
DC Grid-No.2 Voltage	700	700	V
DC Grid-No.1 Voltage	-50	-50	V
Zero-Signal DC Plate Current	0.2	0.2	A
Zero-Signal DC Grid-No.2 Current	0	0	A
Effective RF Load Resistance	1100	1100	Ω
Max.-Signal DC Plate Current	0.9	1.0	A
Max.-Signal DC Grid-No.2 Current	0.045	0.045	A
Max.-Signal DC Grid-No.1 Current	0	0	A
Max.-Signal Peak RF Grid-No.1 Voltage	50	50	V
Max.-Signal Driving Power (Approx.)	0	0	W
Max.-Signal Power Output (Approx.)	1000	1250	W

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PLATE-MODULATED RF POWER AMP.-Class C Telephony[f]

Carrier conditions per tube for use with max. modulation factor of 1.0

Maximum CCS Ratings, Absolute Values

	Up to 1215 MHz	
DC Plate Voltage	2500	V
DC Grid-No.2 Voltage	1000	V
DC Grid-No.1 Voltage	-300	V
DC Plate Current	0.85	A
DC Grid-No.1 Current	0.2	A
Plate Input	1700	W
Grid-No.2 Input	35	W
Plate Dissipation	1000	W

Maximum Circuit Value

Grid-No.1-Circuit Resistance
Under any condition . . . . . 5000 Ω

Typical CCS Operation

In a Grid-Drive Circuit at 600 MHz

DC Plate Voltage	2500	2500	V
DC Grid-No.2 Voltage	500	500	V
DC Grid-No.1 Voltage	-75	-75	V
DC Plate Current	0.9	1.0	A
DC Grid-No.2 Current	0.02	0.02	A
DC Grid-No.1 Current (Approx.)	0.07	0.07	A
Output Circuit Efficiency (Approx.)	90	90	%
Driver Power Output (Approx.)	70	75	W
Useful Power Output (Approx.)	1050	1350	W

Maximum Circuit Value

Grid-No.1-Circuit Resistance
Under any condition . . . . . 5000 Ω

RF POWER AMPLIFIER & OSC. - Class C Telegraphy[f]
and
RF POWER AMPLIFIER - Class C FM Telephony[f]

Maximum CCS Ratings, Absolute Values

	Up to 1215 MHz	
DC Plate Voltage	3000	V
DC Grid-No,2 Voltage	1000	V
DC Grid-No.1 Voltage	-300	V
DC Plate Current	1.0	A
DC Grid-No.1 Current	0.2	A
Plate Input	2500	W
Grid-No.2 Input	50	W
Plate Dissipation	1500	W

Typical CCS Operation

In a Grid-Drive Circuit at 600 MHz

DC Plate Voltage	1800	2000	V
DC Grid-No.2 Voltage	500	500	V
DC Grid-No.1 Voltage	-75	-75	V
DC Plate Current	0.75	0.83	A
DC Grid-No.2 Current	0.015	0.015	A
DC Grid-No.1 Current (Approx.)	0.04	0.04	A
Driver Power Output (Approx.)	50	55	W
Useful Power Output (Approx.)	650	800	W

Characteristics Range Values

	Note	Min	Max	
1. Heater Current	1	16.3	18.2	A
2. Direct Interelectrode Capacitances				
Grid No.1 to plate	2	-	0.181	pF
Grid No.1 to cathode & heater	-	37	46	pF
Plate to cathode & heater	2,3	-	0.017	pF
Grid No.1 to grid No.2	-	46	62	pF
Grid No.2 to plate	-	9.9	13.1	pF
Grid No.2 to cathode & heater	3	-	1.4	pF
3. Mu-Factor, Grid No.2 to Grid No.1	1,4	8	24	
4. Cutoff Grid-No.1 Voltage	1,5	-	-140	V
5. Grid-No.2 Current	1,6	-28	12	mA
6. Useful Power Output	1,7	1000	-	W
7. Low-Frequency Vibration	1,8	-	500	mV
8. High-Frequency Vibration	9	(See Note 9)		

Note 1: With 5.5 volts ac on heater.

Note 2: With external flat metal shield having diameter of 8", at center hole approximately 3" in diameter provided with spring fingers that connect the shield to grid-No.2 terminal. Shield is located in plane of grid-No.2 terminal perpendicular to the tube axis.

Note 3: With external flat metal shield having diameter of 8", and center hole approximately 2-3/8" in diameter provided with spring fingers that connect the shield to grid-No.1 terminal. Shield is located in plane of grid-No.1 terminal perpendicular to the tube axis.

Note 4: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 600 volts, and dc grid-No.1 voltage adjusted to give a plate current of 0.6 ampere.

Note 5: With dc plate voltage of 3000 volts, dc grid-No.2 voltage of 1000 volts, and dc grid-No.1 voltage adjusted to give a plate current of 20 mA.

Note 6: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 500 volts, and dc grid-No.1 voltage adjusted to give a plate current of 0.6 ampere.

Note 7: In a CW cathode-driven amplifier circuit at 600 MHz and for conditions: dc plate voltage at 2500 volts, dc grid-No.2 voltage of 700 volts, and dc grid-No.1 voltage adjusted to give a plate current of 1.0 ampere.

Note 8: As specified in MIL-E-IE Test Method 1031, and with plate voltage of 450 volts, grid-No.2 voltage of 300 volts, grid-No.1 voltage varied to give a plate current of 10 mA, and plate load resistor of 2000 ohms.

Note 9: As specified in MIL-E-IE Test Method 1031.

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[a] With external metal shield having diameter of 8", and center hole approximately 3" in diameter provided with spring fingers that connect the shield to grid-No.2 terminal. Shield is located in plane of grid-No.2 terminal perpendicular to the tube axis.

[b] With external flat metal shield having diameter of 8", and center hole approximately 2-3/8" in diameter provided with spring fingers that connect the shield to grid-No.1 terminal. Shield is located in plane of grid-No.1 terminal perpendicular to the tube axis.

[c] Rotron Mfg. Co., Inc., Woodstock, N. Y.

The following footnotes apply to the *RCA Transmitting Operation Considerations* given at front of this section.

[d] See *Electrical Considerations* — Filament or Heater.

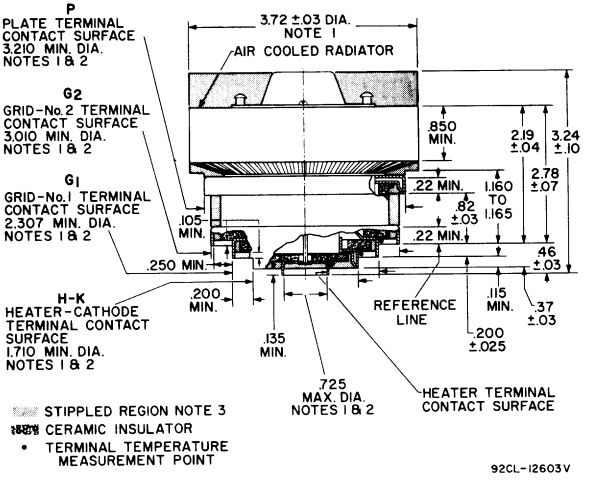
[e] See *Cooling Considerations* — Forced-Air Cooling.

[f] See *Classes of Service.*

[g] See Electrical Considerations - Grid-No.2 Voltage Supply.

[h] See Electrical Considerations - Plate Voltage Supply.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

Note 1: Concentricity between the various diameters is such that the tube will enter a gauge having suitably spaced concentric apertures and posts of the following diameters:

a. Radiator Band - 3.7805

b. Plate Terminal - 3.2605

c. Grid-No.2 Terminal - 3.0605

d. Grid-No.1 Terminal - 2.3375

e. Heater-Cathode Terminal - 1.7445

f. Heater Terminal - 0.6945

Note 2: The diameter of the terminal is held to the indicated value only over the contact surface length. The contact surface length of the heater-cathode and grid-No.1 terminals extends from the edge of its terminal to the plane coincident with the edge of the adjacent larger terminal.

Note 3: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes. Diameters of stippled areas above air-cooled radiator, plate terminal contact surface, and grid-No.2 terminal contact surface shall not be greater than is associated diameter.

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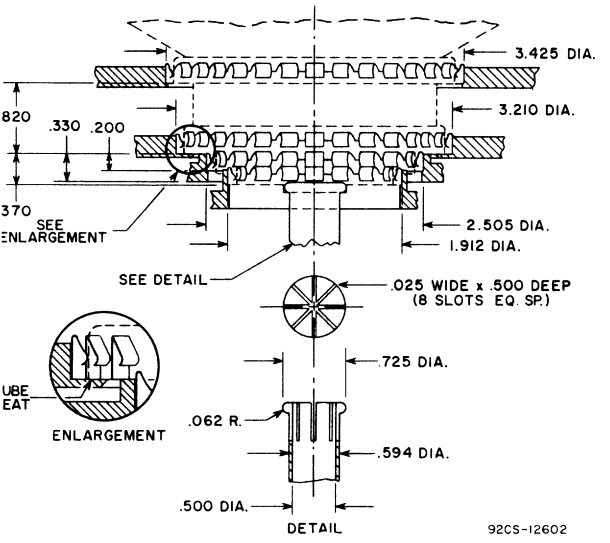
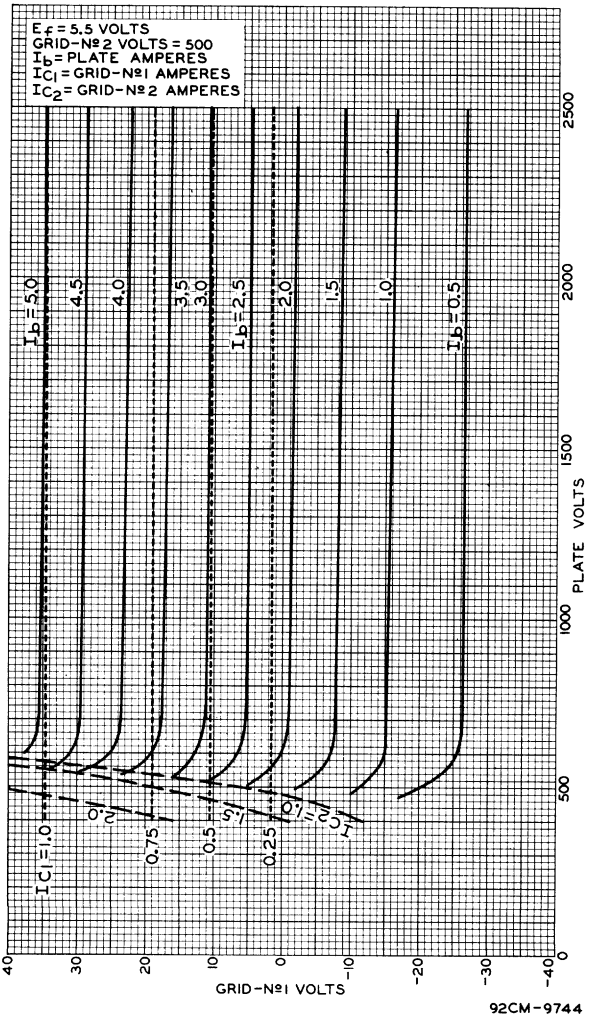
PREFERRED MOUNTING ARRANGEMENT[1]



Only the fixed method of mounting is recommended. The fixed method offers simpler design and construction with resulting lower cost. It especially simplifies the associated hollow-cylinder cavity construction, if used. On the other hand, it requires greater finger stock accommodation. As used here, accommodation is defined as the amount of flexing required by the fingers of the finger contact strip to accept tubes at all the extremes of mechanical variation. Accommodation, which must be provided for in the fixed method, is determined from the *Dimensional Outline* and its associated notes. It may be calculated as the difference between the minimum terminal diameter on the *Dimensional Outline* (maximum finger opening) and the associated concentricity gauge aperture opening in the appropriate note (minimum finger opening).

Typical Constant-Current Characteristics

With Grid-No.2 Volts =500



92CM-9744

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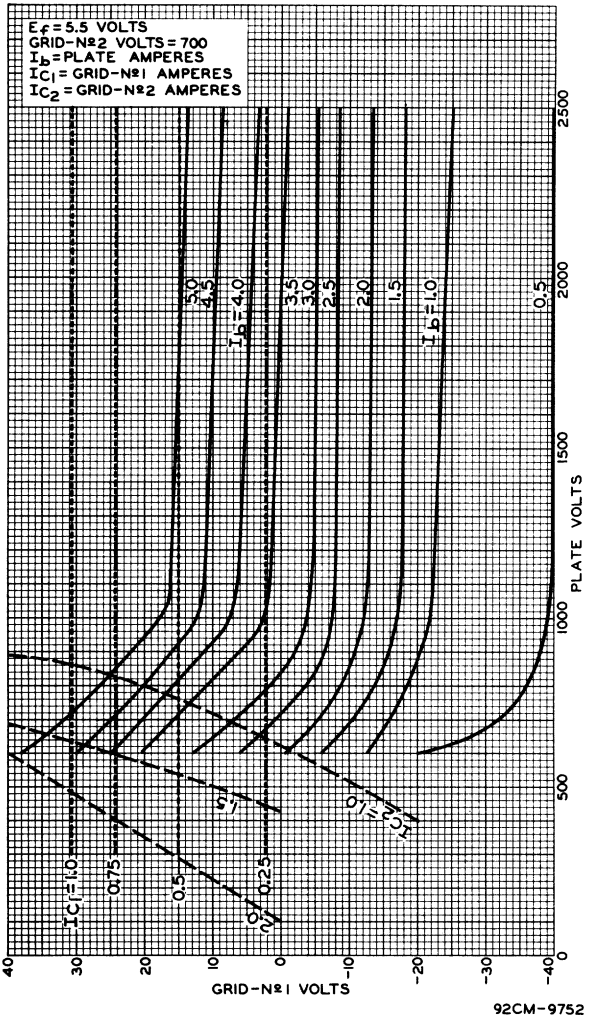
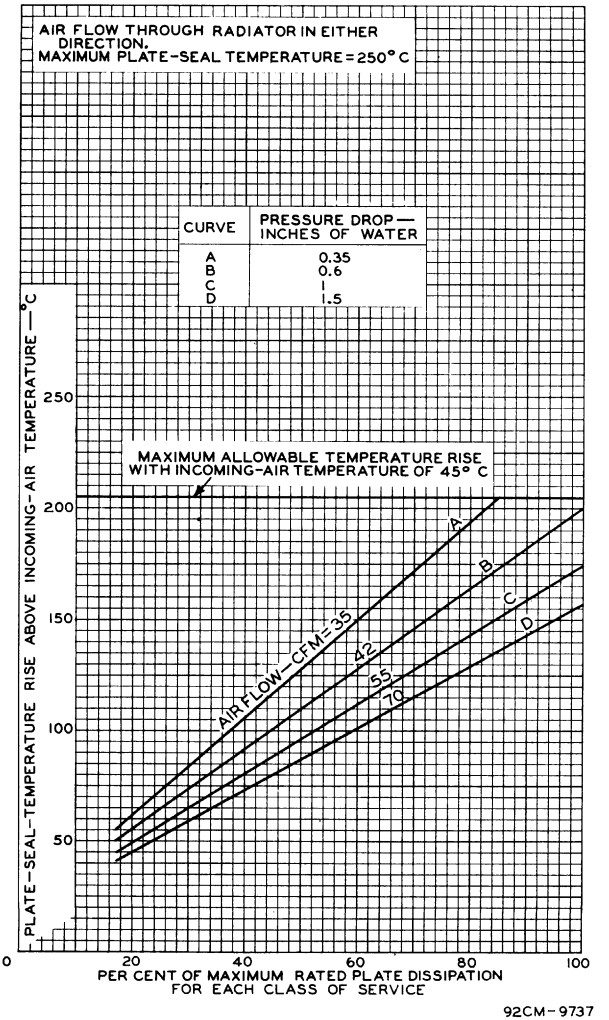
Typical Constant-Current Characteristics

With Grid-No.2 Volts =700



92CM-9752

Typical Cooling Characteristics



92CM-9737

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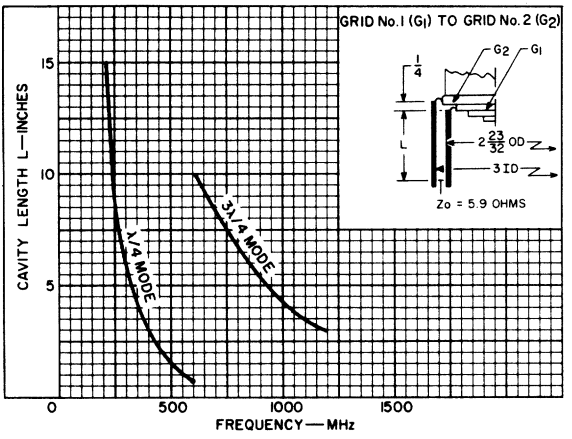
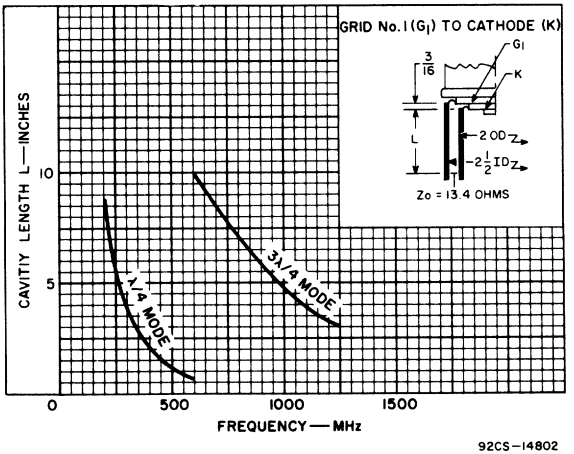
Tuning Characteristics

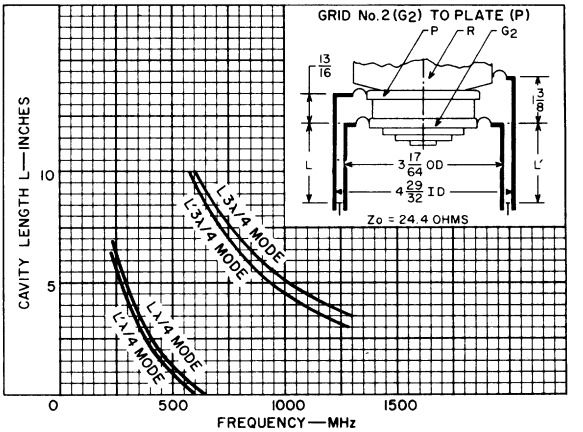


92CS-14801



92CS-14802

Tuning Characteristics



92CS-14803

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4621

Beam Power Tube

CERMOLOX — **17 kW Pulsed RF Output**
Matrix Cathode — **Full Input to 1215 MHz**
Forced-Air Cooled — **UHF Pulsed RF Amplifier**

For Use In Airborne, Shipboard, Mobile, Stationary Equipment

ELECTRICAL

Heater[a]

Type	Matrix, Oxide Coated Unipotential Cathode	
Voltage (ac or dc)	6.3	V
Current at 6.3 V	3.2	A
Minimum heating time	60	s

MAXIMUM RATINGS, Absolute-Maximum Values

For frequencies up to 1215 MHz and for a maximum "ON" time as specified in any 1000-microsecond interval.

Peak Positive-Pulse Plate Voltage	7000	V
DC Plate Voltage	4000	V
DC or Peak Positive-Pulse Grid-No. 2 Voltage	1000	V
Negative Pulse Grid-No. 1 Voltage	200	V
DC Plate Current During Pulse With 5-microsecond "ON" time	6	A
DC Plate Current With 5-microsecond "ON" time	0.050	A
Plate Dissipation (Average)	125	W
Useful Peak Power Output With 5-microsecond "ON" time	17000	W

MECHANICAL

Operating Position	Any	
Weight (Approx.)	2 oz (0.06 kg)	

THERMAL[b]

Seal Temperature	250 max.	°C
Radiator Core	250 max.	°C

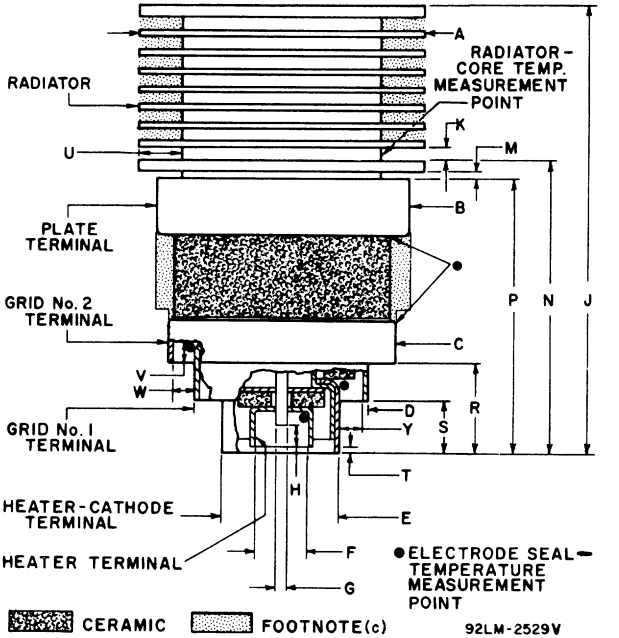
[a]See *Electrical Considerations-Filament or Heater,* under *RCA Transmitting Tube Operating Considerations* given at front of this section.

[b]See *Dimensional Outline* for temperature measurement points.

[c]Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular regions.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, N.J. 07029.

DIMENSIONAL OUTLINE



DIMENSION	INCHES	MILLIMETERS
A Dia.	1.250 ±.015	31.75 ± .38
B Dia.	1.100 ±.015	27.94 ±.38
C Dia.	1.000 ±.015	25.40 ±.38
D Dia.	0.750 ±.015	19.05 ±.38
E Dia.	0.500 $^{+.017}_{-.020}$	12.70 $^{+.43}_{-.50}$
F Dia.	0.250 ±.010	6.35 ±.25
G Dia.	0.070 Max.	1.78 Max.
H	0.054 Min.	1.37 Min.
J	2.080 ±.050	52.8 ±1.2
K	0.050 Min.	1.27 Min.

DIMENSION	INCHES	MILLIMETERS
M	0.035 Min.	0.89 Min.
N	1.335 ±.045	33.91 ±1.14
P	1.230 ±.030	31.22 ±.76
R	0.370 ±.020	9.40 ±.50
S	0.175 ±.015	4.45 ±.38
T	0.025 ±.025	0.64 ±.63
U	0.200 Min.	5.08 Min.
V	0.060 Min.	1.52 Min.
W	0.090 Min.	2.29 Min.
X	0.120 Min.	3.05 Min.
Y	0.095 Min.	2.41 Min.

4624

Beam Power Tube

FORCED-AIR COOLED
INTEGRAL RADIATOR
MATRIX-TYPE CATHODE

UHF GRID-DRIVE OPERATION
300 WATTS UHF TV OUTPUT AT 890 Mc
410 WATTS PEP OUTPUT AT 30 Mc
DISTRIBUTED AMPLIFIER SERVICE TO 500 Mc

For Use as an RF Power Amplifier in Television and Single-Sideband Suppressed-Carrier Service and as a Broadband UHF Amplifier in Mobile and Stationary Equipment.

Electrical:

Unipotential Cathode, Matrix-Type[b]:		
Voltage (AC or DC)	6.3	volts
Current at heater volts = 6.3	3.5	amp
Minimum heating time	60	sec
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 450, grid-No.2 volts = 325 and plate amperes = 1.2	12	
Direct Interelectrode Capacitances:		
Grid No.1 to plate	0.062 max.	pf
Grid No.1 to cathode	20	pf
Plate to cathode	6.2 max.	pf
Grid No.1 to grid No.2	19	pf
Grid No.2 to plate	2.2	pf
Grid No.2 to cathode	590 max.	pf

Mechanical:

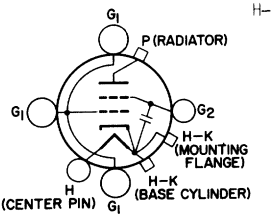
Operating Position	Any
Maximum Overall Length	2.19"
Maximum Diameter	2.262"
Weight (Approx.)	4.5 oz
Radiator	Integral part of tube

Terminal Connections (See *Dimensional Outline*):

G_1 – Grid-No.1–Terminal Contact Surface

G_2 – Grid-No.2–Terminal Contact Surface

H – Heater–Terminal Contact Surface



H-K – Heater- & Cathode–Terminal Contact Surface

P – Plate–Terminal Contact Surface

Thermal:

Terminal Temperature (Plate, grid No.2, grid No.1, cathode-heater, and heater)	250 max.	°C
Plate-Core Temperature	250 max.	°C

Air Flow[c]:

Through radiator — Adequate air flow to limit the radiator core temperature to 250° C should be delivered by a blower through the radiator before and during the application of plate, grid-No.2, and grid-No.1 voltages.

To Plate, Grid-No.2, Grid-No.1, Cathode, and Heater Terminals — A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these terminals so that their temperature does not exceed the specified maximum value of 250° C.

During Standby Operation — Cooling air is required when heater voltage is applied to the tube.

During Shutdown Operation — Air flow should continue for a few minutes after all electrode power is removed.

RF POWER AMPLIFIER — Class B Television Service[d]

Synchronizing-level conditions per tube unless otherwise specified

Maximum CCS Ratings, *Absolute-Maximum Values:*

DC Plate Voltage	2200	volts
DC Grid-No.2 Voltage	400	volts
DC Plate Current	375	ma
DC Grid-No.1 Current	100	ma
Grid-No.2 Input	8	watts
Plate Dissipation	400	watts

Typical CCS Operation in Grid-Drive Circuit:

For frequency of 890 Mc and Bandwidth of 8.5 Mc

DC Plate Voltage	2000	volts
DC Grid-No.2 Voltage	400	volts
DC Grid-No.1 Voltage	−55	volts
DC Plate Current:		
Synchronizing level	350	ma
Pedestal level	260	ma
DC Grid-No.2 Current:		
Synchronizing level	1.3	ma
Pedestal level	1	ma
DC Grid-No.1 Current:		
Synchronizing level	0	ma
Pedestal level	0	ma
Driver Power Output:		
Synchronizing level	30	watts
Pedestal level	17	watts
Output Circuit Efficiency	80	%
Useful Power Output:		
Synchronizing level	300	watts
Pedestal level	170	watts

LINEAR RF POWER AMPLIFIER[d]

Single-Sideband Suppressed-Carrier Service

Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2

Maximum CCS Ratings, *Absolute-Maximum Values:*

DC Plate Voltage	2200	volts
DC Grid-No.2 Voltage	400	volts
DC Grid-No.1 Voltage	−100	volts

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

4626

Beam Power Tube

CERMOLOX **Matrix Cathode** **13 kV, 30 Amp.**
Ruggedized **Pulse Modulator** **Conduction Cooled**

ELECTRICAL

Heater[a] for Matrix Type, Oxide-Coated Unipotential Cathode:		
Voltage (ac or dc)	5.5	V
Current at 5.5 volts	17.3	A
Minimum heating time	180	s
Mu-Factor, grid No. 1 to grid No. 2	16	

MAXIMUM RATINGS, Absolute-Maximum Values

DC Plate Voltage	13	kV
Instantaneous Peak Plate Voltage (Pulse duration < 0.1 s)	17	kV
DC Peak Pulsed-Grid-No. 2 Voltage	1000	V
DC Grid-No. 1 Voltage	−300	V
Peak Positive-Pulse Grid-No. 1 Voltage	100	V
Peak Plate Current	30[c]	A
DC Plate Current	1.5	A
Plate Dissipation (Average)	1.5	kW

MECHANICAL

Operating Position	Any
Weight (Approx.)	1-1/2 lb (0.68 kg)

THERMAL[b]

Terminal Temperature (All Terminals)	250 Max.	°C

[a] See *Electrical Considerations—Filament or Heater*, under *RCA Transmitting Tube Operating Considerations* given at front of this section.

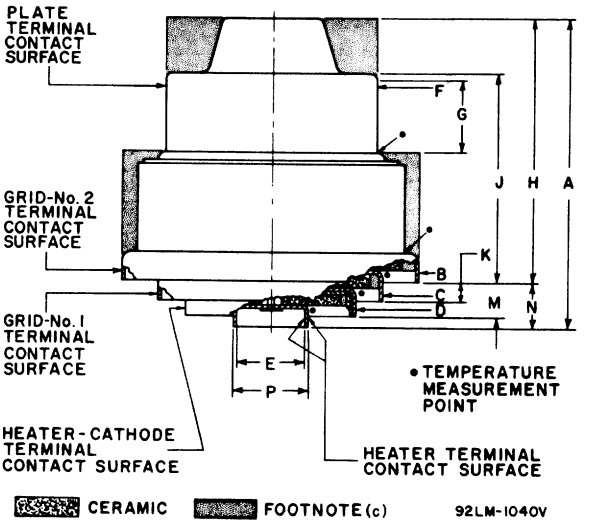
[b] See *dimensional outline* for temperature measurement points.

[c] Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, N.J. 07029.

4626

DIMENSIONAL OUTLINE



DIMENSION	INCHES	MILLIMETERS
A	3.31 Max.	84.1 Max.
B Dia.	3.020 ±.010	76.71 ± .25
C Dia.	2.317 ±.010	58.85 ± .25
D Dia.	1.717 ±.007	43.61 ± .18
E Dia.	0.713 ±.012	18.11 ± .30
F Dia.	2.265 ±.003	57.53 ± .08
G	0.725 Min.	18.42 Min.
H	2.780 ±.040	70.61 ±1.02
J	2.185 ±.030	55.50 ± .76
K	0.200 ±.025	5.08 ± .64
M	0.370 ±.030	9.40 ± .76
N	0.460 ±.030	11.68 ± .64
P Dia.	0.755 ±.010	19.18 ± .25

DC Plate Current at Peak of Envelope	450[a]	ma
DC Grid-No.1 Current	100	ma
Grid-No.2 Input	8	watts
Plate Dissipation	400	watts

Maximum Circuit Values:

Grid-No.1 Circuit Resistance	30000	ohms
Grid-No.2-Circuit Impedance	See *Note* [e]	
Plate-Circuit Impedance	See *Note* [f]	

Typical CCS Operation with "Two-Tone Modulation":

	At 30 Mc	
DC Plate Voltage	2000	volts
DC Grid-No.2 Voltage	400	volts
DC Grid-No.1 Voltage	-44	volts
Zero-Signal DC Plate Current	100	ma
Effective RF Load Resistance	3200	ohms
DC Plate Current at Peak of Envelope	335	ma
Average DC Plate Current	250	ma
DC Grid-No.2 Current at Peak of Envelope	20	ma
Average DC Grid-No.2 Current	13	ma
DC Grid-No.1 Current	0	ma
Peak-of-Envelope Driver Power Output (Approx.)	0.3	watt
Output-Circuit Efficiency (Approx.)	92	%
Distortion Products Level:		
Third order	30	db
Fifth order	34	db
Useful Power Output (Approx.):		
Average	205	watts
Peak of envelope	410	watts

[a] The maximum rating for a signal having a minimum peak-to-average power ratio less than 2, such as is obtained in "Single-Tone" operation, is 300 ma. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 450 ma.

The following footnotes apply to the *RCA Transmitting Tube Operating Considerations* given at front of this section.

[b] See *Electrical Considerations*—Filament or Heater

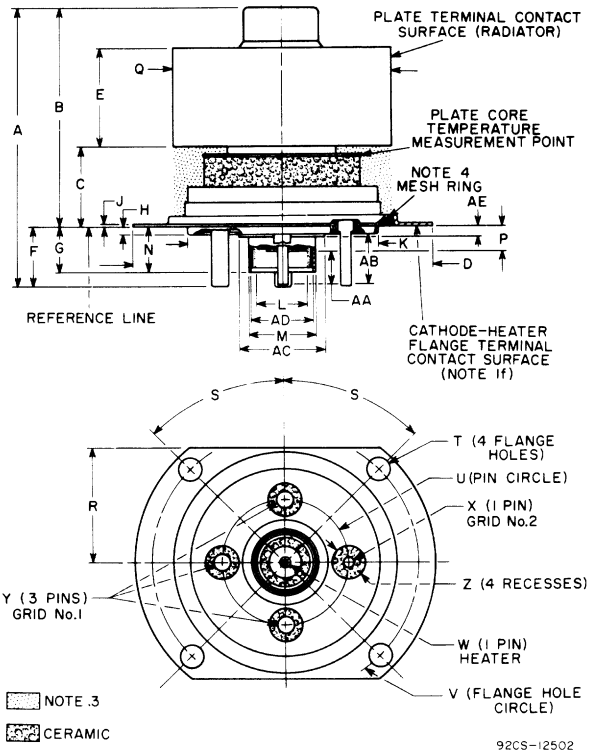
[c] See *Cooling Considerations*—Forced-Air Cooling

[d] See *Classes of Service*

[e] See *Electrical Considerations*—Grid-No.2 Voltage Supply

[f] See *Electrical Considerations*—Plate Voltage Supply

DIMENSIONAL OUTLINE



92CS-12502

DIMENSIONS IN INCHES

A - 2.19 max.
B - 1.660 ± 0.060
C - 0.610 ± 0.040
D - 2.262 max. dia.
E - 0.710 min.
F - 0.470 max.
G - 0.355 max.
H - 0.065 max.
J - 0.024 max.
K - 1.435 max. dia. Note 1a
L - 0.400 min. dia.
M - 0.500 ± 0.010 Note 1d
N - 0.300 max.
P - 0.200 max.
Q - 1.625 ± 0.015 dia. Note 1e
R - 0.885 max.
S - 45° ± 5'
T - 0.175 ± 0.005 dia.
U - 0.939 dia.
V - 2.000 dia.
W - 0.081 ± 0.002 dia. Note 2b
X - 0.081 ± 0.002 dia. Note 2c
Y - 0.126 ± 0.002 dia. Note 2a
Z - 0.245 min. dia.
AA - 0.200 min.
AB - 0.325 min.
AC - Note 1b
AD - Note 1c
AE - 0.085 max.

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Harrison, N. J.

Note 1: Concentricity between the various diameters on the major tube axis is such that the tube will enter a gauge having suitably spaced concentric apertures and posts of the following diameters:

(a) Base seat—1.500

(b) Flared flange of cathode-heater cylinder terminal—0.680

(c) Cathode-heater cylinder terminal (ID)—0.400

(d) Cathode-heater cylinder terminal (OD)—0.525

(e) Radiator—1.660

(f) Cathode-heater flange terminal contact surface—1.760

Note 2: Concentricity of the base pins is such that the tube will enter the gauge in Note 1 having suitably spaced apertures of the following diameters:

(a) Grid-No.1 pins—0.1450

(b) Heater pin—0.0830 (.123 Dia x 82° CSK.)

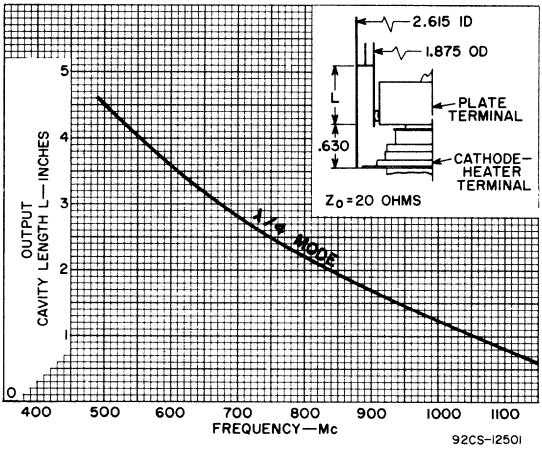
(c) Grid-No.2 pins—0.0930

Note 3: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular regions.

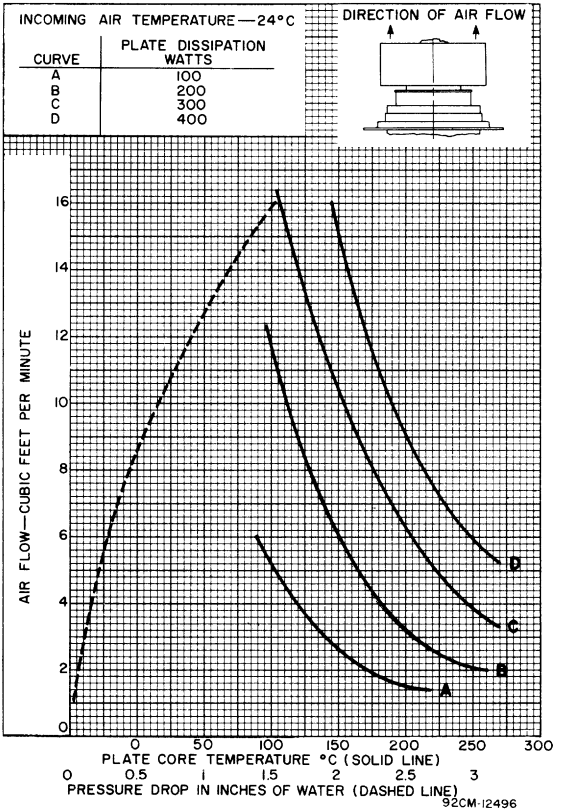
Note 4: RF gasket, such as METEX* No.A2733, or equivalent.

* Metex Electronics Corp., Walnut Ave., Clark, N.J.

TYPICAL OUTPUT CAVITY TUNING CHARACTERISTICS



TYPICAL COOLING CHARACTERISTICS



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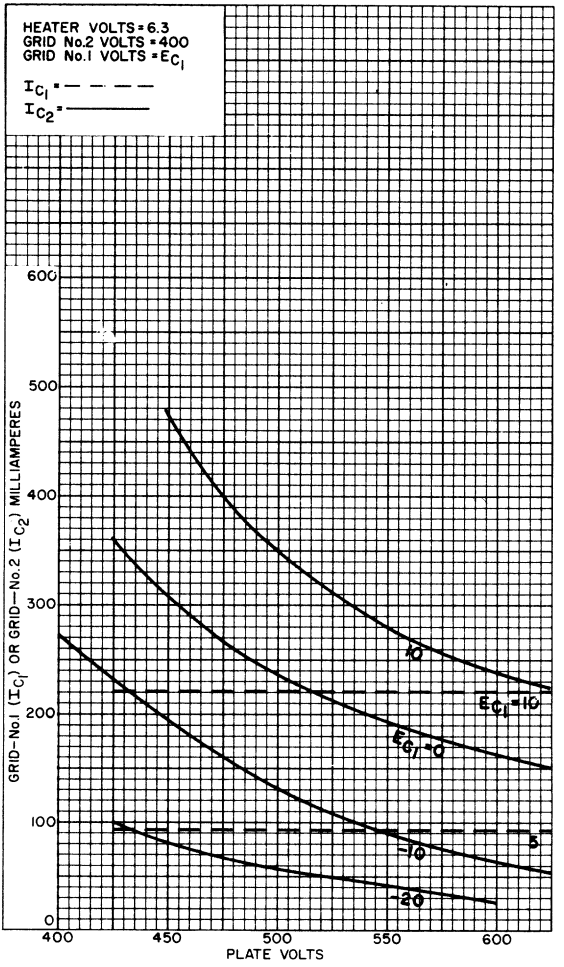
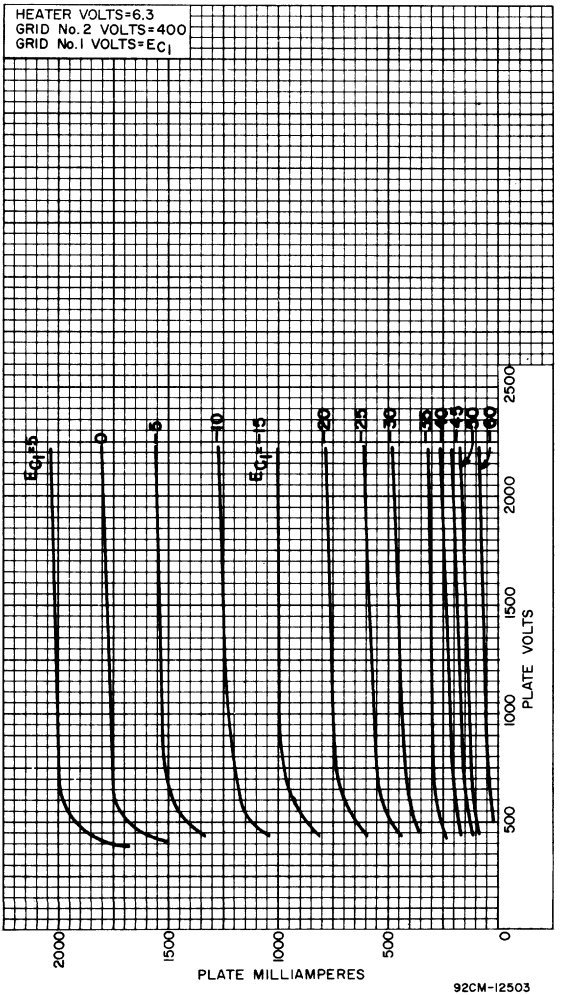
TYPICAL CHARACTERISTICS



92CM-12504

TYPICAL PLATE CHARACTERISTICS



RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

4628

Beam Power Tube

CERMOLOX® — **INTEGRAL LOUVERED-FIN RADIATOR**
THORIATED-TUNGSTEN MESH FILAMENT — **FORCED-AIR COOLED**

For Single-Sideband Service in Stationary and Portable Equipment. Rated as a Linear RF Power Amplifier in Class AB_1 Suppressed Carrier Service. Also Useful as AF Amplifier or Modulator, RF Power Amplifier and Oscillator in Class-C Telephony and Telegraphy and Other Special Services.

ELECTRICAL

Filamentary Cathode, Thoriated-Tungsten Mesh Type		
Voltage (ac or dc)[a]	4.5 to 4.75 typ 5.0 max	V V
Current:		
Typical value at 4.5 V	125	A
Maximum value for starting, even momentarily	300	A
Cold Resistance	0.005	Ω
Minimum heating time	15	s
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 2000, grid-No.2 volts = 1375, and dc plate amperes = 9	10	
Direct Interelectrode Capacitances		
Grid No.1 to plate[b]	0.60 max	pF
Grid No.1 to filament	60	pF
Plate to filament[bc]	0.11 max	pF
Grid No.1 to grid No.2	65	pF
Grid No.2 to plate	13	pF
Grid No.2 to filament[c]	3.3 max	pF

MECHANICAL

Operating Position	**Vertical, either end up**
Maximum Overall Length	**5.65 in**
Maximum Diameter	**6.17 in**
Terminal Connections	See *Dimensional Outline*
Radiator	**Integral part of tube**
Weight (Approx.)	**10 lb**

THERMAL

Terminal Temperature (Plate, grid No.2, grid No.1, cathode-filament and filament)	250 max	°C
Plate-Core Temperature	250 max	°C

See *Dimensional Outline* for temperature-measurement points

Forced-Air Cooling[f]

Air Flow

Through Radiator — Adequate air flow to limit the plate-core temperature to 250° C should be delivered by a blower through the radiator before and during the application of filament, plate, grid-No.2, and grid-No.1 voltages.

Air Flow (Cont'd)

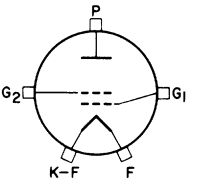
To Plate, Grid-No.2, Grid-No.1, Cathode-Filament, and Filament Terminals — A sufficient quantity of air should be allowed to flow past each of these terminals so that their temperature does not exceed the specified maximum value of 250° C.

During Standby Operation — Cooling air is required when only filament voltage is applied to the tube.

During Shutdown Operation — Air flow should continue for a few minutes after all electrode power is removed.

TERMINAL DIAGRAM (Bottom View)

G_1 – Grid-No.1-Terminal Contact Surface
G_2 – Grid-No.2-Terminal Contact Surface
F – Filament-Terminal Contact Surface
K,F – Cathode-Filament-Terminal Contact Surface
P – Plate-Terminal Contact Surface



LINEAR RF POWER AMPLIFIER[g]

SINGLE-SIDEBAND SUPPRESSED-CARRIER SERVICE

Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2

Maximum CCS Ratings, Absolute-Maximum Values

DC Plate Voltage	7500	V
DC Grid-No.2 Voltage	1650	V
DC Grid-No.1 Voltage	-750	V
DC Plate Current at Peak of Envelope	4.0	A
DC Grid-No.1 Current	500	mA
Grid-No.2 Input[h]	150	W
Plate Dissipation	10	kW

Maximum Circuit Values

Grid-No.1-Circuit Resistance (Under any Condition)		
Fixed bias	5000	Ω
Fixed bias (In Class AB_1 operation)	25,000	Ω
Cathode bias	Not recommended	
Grid-No.2 Circuit Impedance	See footnote[h]	
Plate Circuit Impedance	See footnote[j]	

Typical Class AB_1 CCS Operation with "Two-Tone" Modulation

In a grid-drive circuit, at 30 Mc/s

DC Plate Voltage	7000	V
DC Grid-No.2 Voltage	1500	V
DC Grid-No.1 Voltage	-200	V
Zero-Signal DC Plate Current	0.5	A
Effective RF Load Resistance	1200	Ω
DC Plate Current at Peak of Envelope	3	A
Average DC Plate Current	2.15	A
DC Grid-No.2 Current at Peak of Envelope	0.1	A

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Average DC Grid-No.2 Current	0.07	A
Peak-Envelope Driver Power Output (Approx.)	See footnote[d]	
Output Circuit Efficiency (Approx.)	90	%
Useful Power Output (Approx.)		
Average	5000	W
Peak Envelope	10	kW

LINEAR RF POWER AMPLIFIER[f]

AM TELEPHONY SERVICE

Carrier conditions for use with a maximum modulation factor of 1

Maximum CCS Ratings, Absolute-Maximum Values

DC Plate Voltage	7500	V
DC Grid-No.2 Voltage	1650	V
DC Grid-No.1 Voltage	-750	V
DC Plate Current	2	A
DC Grid-No.1 Current	500	mA
Grid-No.2 Input	150	W
Plate Dissipation	10	kW

Typical Class AB$_1$ CCS Operation

In a cathode drive circuit, at 400 Mc/s

DC Plate Voltage	6500	V
DC Grid-No.2 Voltage	1250	V
DC Grid-No.1 Voltage	-160[e]	V
DC Plate Current	1.4	A
DC Grid-No.2 Current	0.005	A
Driver Power Output	75	W
Output Circuit Efficiency (Approx.)	90	%
Useful Power Output	2000	W

[a] Measured at tube terminals.

[b] With external flat metal shield 8 inches in diameter having a center hole 3 inches in diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2.

[c] With external flat metal shield 8 inches in diameter having a center hole 2-3/8 inches in diameter. Shield is located in plane of the grid-No.1 terminal, perpendicular to the tube axis, and is connected to grid No.1.

[d] Driver power output represents circuit losses and is the actual power measured at input to grid-No.1 circuit. The actual power required depends on the operating frequency and the circuit used. The tube driving power is approximately zero watts.

[e] Typical value for 1 ampere of DC plate current with carrier turned off.

The following footnotes apply to the *RCA Transmitting Tube Operating Considerations* given at front of this section.

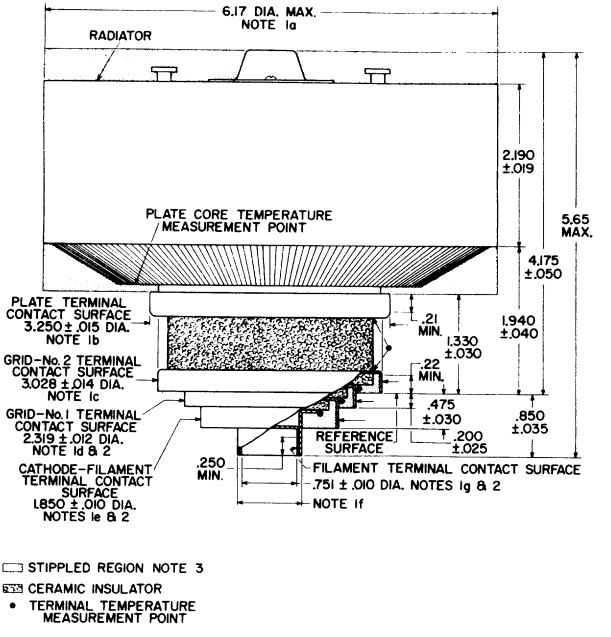
[f] See *Cooling Considerations*—Forced-Air Cooling.

[g] See *Classes of Service*.

[h] See *Electrical Considerations*—Grid-No.2 Voltage Supply

[j] See *Electrical Considerations*—Plate Voltage Supply

DIMENSIONAL OUTLINE



92CL-13039

DIMENSIONS IN INCHES

Note 1: Concentricity between the various diameters is such that the tube will enter a gauge having suitably spaced concentric apertures and posts of the following diameters:

a. Radiator - 6.241
b. Plate Terminal - 3.288
c. Grid-No.2 Terminal - 3.061
d. Grid-No.1 Terminal - 2.338
e. Cathode-Filament Terminal - 1.878
f. Filament Terminal (OD) - 0.908
g. Filament Terminal (ID) - 0.722

Note 2: The diameter of the terminal is held to the indicated value only over the contact surface length. The contact surface length of the cathode-filament and grid-No.1 terminals extends from the edge of its terminal to the plane coincident with the edge of the adjacent larger terminal.

Note 3: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular regions.

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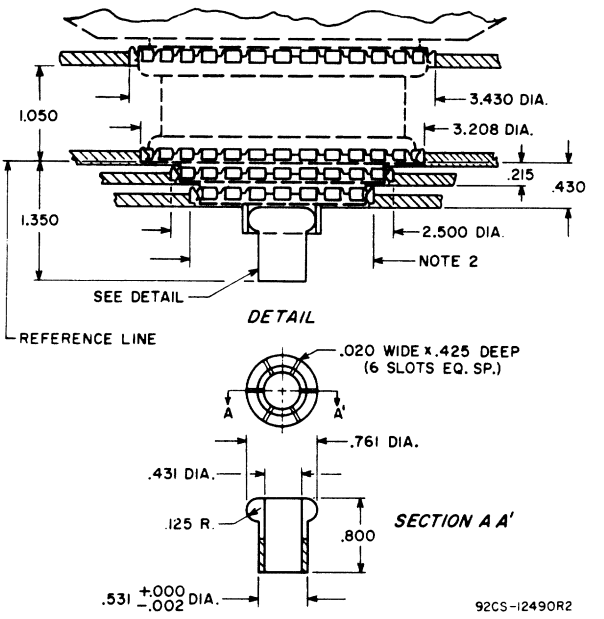
PREFERRED MOUNTING ARRANGEMENT



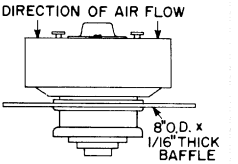
Note 1: Finger stock is No. 97-360 made by Instrument Specialties Co., Little Falls, N.J.

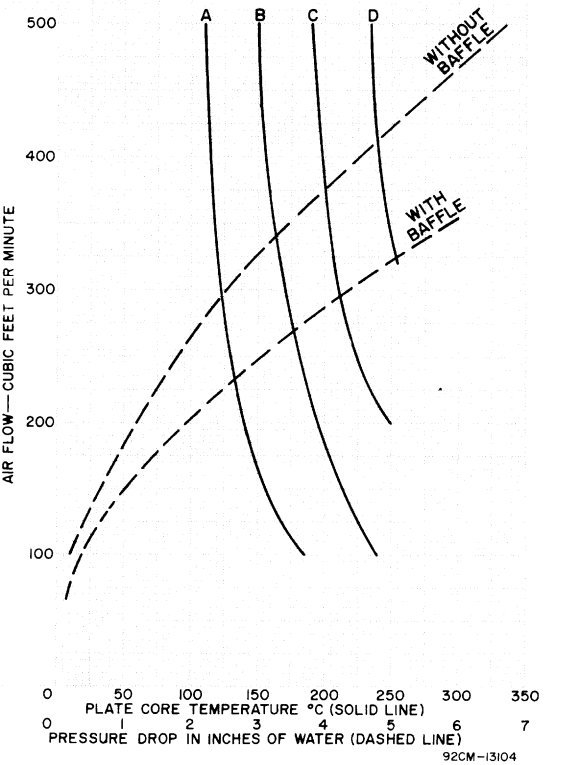
Note 2: Cathode ring dia. is 2.030 inches when using No. 97-360 finger stock or 2.080 inches when using No. 97-135 finger stock. Made by Instrument Specialties Co., Little Falls, N.J.

Typical Cooling Characteristics

INCOMING AIR TEMPERATURE—25° C

CURVE	PLATE DISSIPATION WATTS
A	4000
B	6000
C	8000
D	10000





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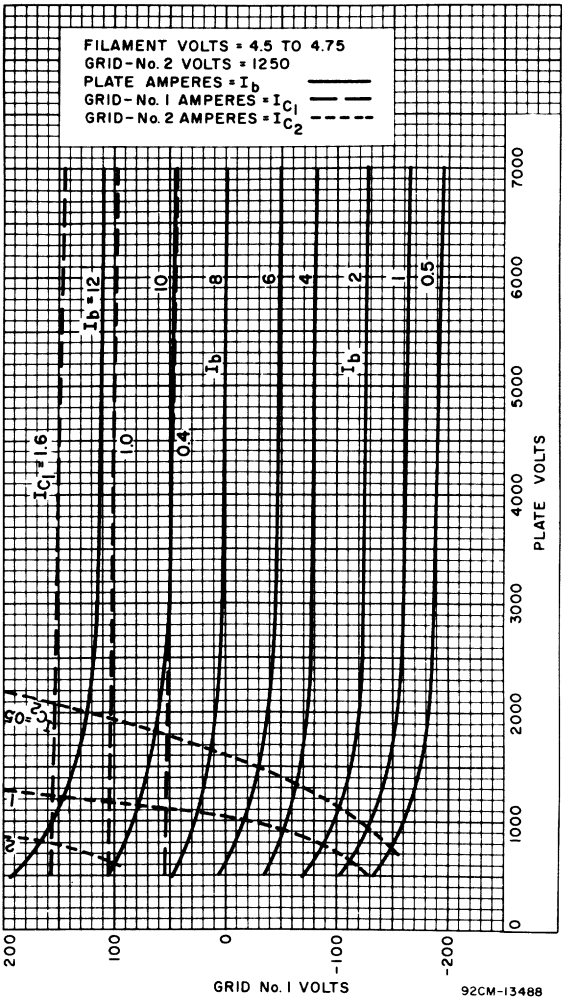
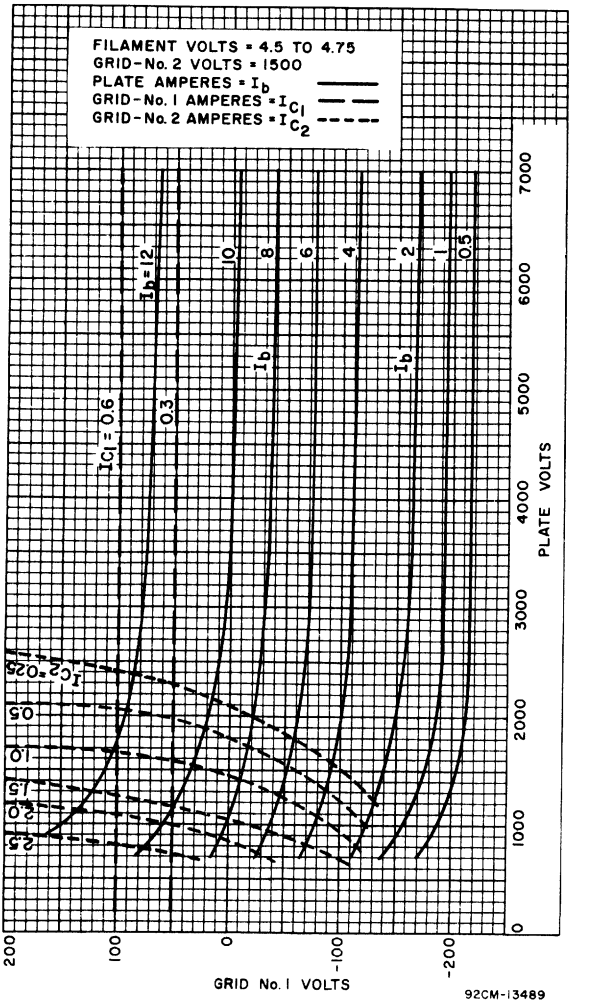
Typical Constant-Current Characteristics

For Grid-No.2 Voltage = 1250 Volts



Typical Constant-Current Characteristics

For Grid-No.2 Voltage = 1500 Volts



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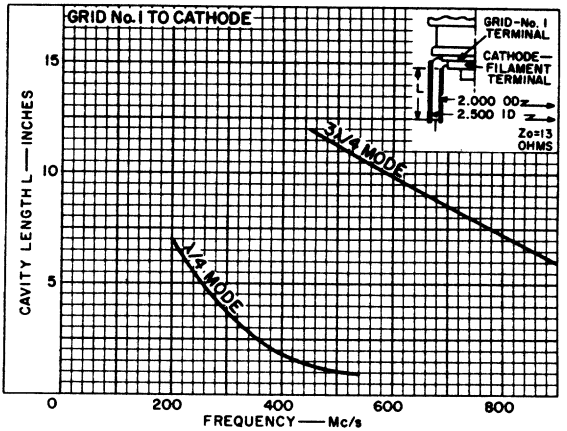
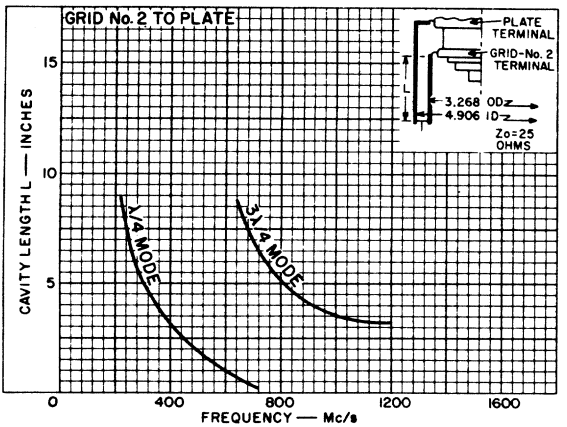
Cavity Tuning Characteristics

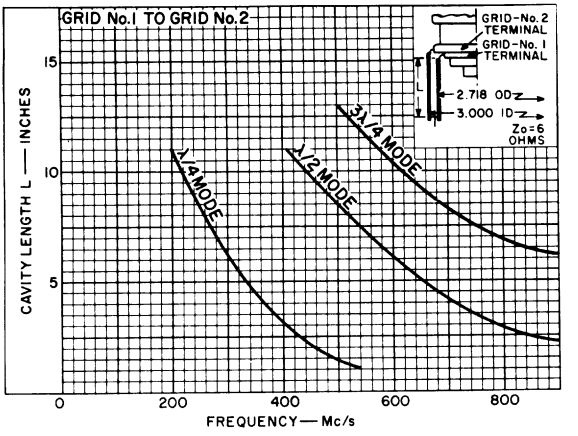


92CS-13708



92CS-13709

Cavity Tuning Characteristics



92CS-13710

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4630

Beam Power Tube

CERMOLOX **17 kV, 40 Amperes** **Ruggedized**
Matrix Cathode **Pulse Modulator** **Conduction Cooled**

ELECTRICAL

Heater[a], for Matrix-Type Oxide-Coated Unipotential Cathode:		
Voltage (ac or dc)	22 ± 2	V
Current at 22 volts	12.6	A
Minimum heating time	180	s
Mu-Factor, grid No.2 to grid No.1	6	

MAXIMUM CSS RATINGS, Absolute-Maximum Values

DC Plate Voltage	17[b]	kV
Instantaneous Peak Plate Voltage (Pulse duration < 0.1 s)	22[b]	kV
DC Peak Pulsed Grid-No.2 Voltage	2000	V
DC Grid No.1 Voltage	-600	V
Peak Positive-Pulse Grid No.1 Voltage	150	V
Peak Plate Current	40[c]	A
DC Plate Current	5	A
Plate Dissipation (Average)	7.5	kW

MECHANICAL

Operating Position	Any
Weight (Approx.)	5 lb (2.3 kg)

THERMAL[b]

Terminal Temperature (All terminals)	250 max.	°C
Plate-Core Temperature	250 max.	°C

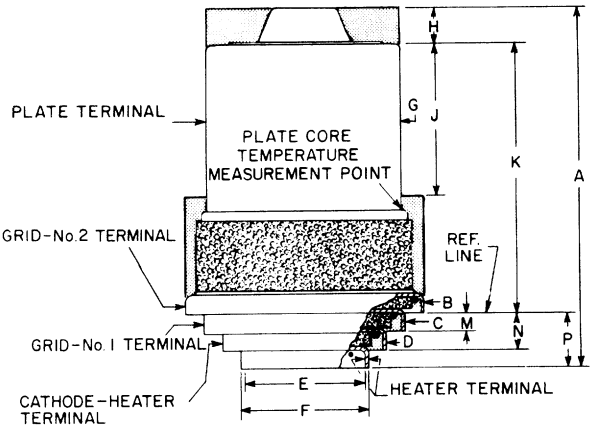
[a] See *Electrical Considerations* — Filament or Heater under RCA *Transmitting Tube Operating Considerations* given at front of this section.

[b] See *dimensional outline* for temperature measurement points.

[c] Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular regions.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, N.J. 07029.

DIMENSIONAL OUTLINE



CERAMIC SEE FOOTNOTE(c) • TEMP. MEASUREMENT POINT

92LM-1052VI

DIMENSION	INCHES	MILLIMETERS
A	6.175 Max.	156.85 Max.
B Dia.	3.905 ± .015	99.19 ± .38
C Dia.	3.305 ± .015	83.95 ± .38
D Dia.	2.695 ± .015	68.45 ± .38
E Dia.	1.973 ± .007	49.21 ± .18
F Dia.	2.095 ± .015	53.21 ± .38
G Dia.	3.201 $^{+.002}_{-.001}$	81.305 $^{+.051}_{-.025}$
H	0.590 ± .010	14.99 ± .25
J	2.593 Min.	65.86 Min.
K	4.470 ± .030	113.54 ± .76
M	0.320 ± .020	8.13 ± .51
N	0.630 ± .020	16.00 ± .51
P	0.940 ± .020	23.88 ± .51

4631

Beam Power Tube

CERMOLOX
Oxide-Coated Cathode
Forced-Air Cooled
Linear RF Power Amplifier

Ruggedized
80 Watts CW Power Output at 400 MHz
40 Watts CW Power Output at 1215 MHz

ELECTRICAL

Heater for Matrix-Type, Oxide-Coated, Unipotential Cathode:

Voltage (ac or dc)	26.5 ± 10%	V
Current at 26.5 volts	0.54	A
Minimum heating time	60	s
Mu-Factor, Grid No.2 to Grid No.1	18	

MAXIMUM CCS RATINGS, Absolute-Maximum Values

	Up to 1215 MHz	
DC Plate Voltage	1000	V
DC Grid-No.2 Voltage	300	V
DC Grid-No.1 Voltage	−100	V
DC Plate Current	200	mA
Plate Dissipation	150	W

MECHANICAL

Operating Position	Any
Weight (Approx.)	(0.06 kg) 2 oz

THERMAL[a]

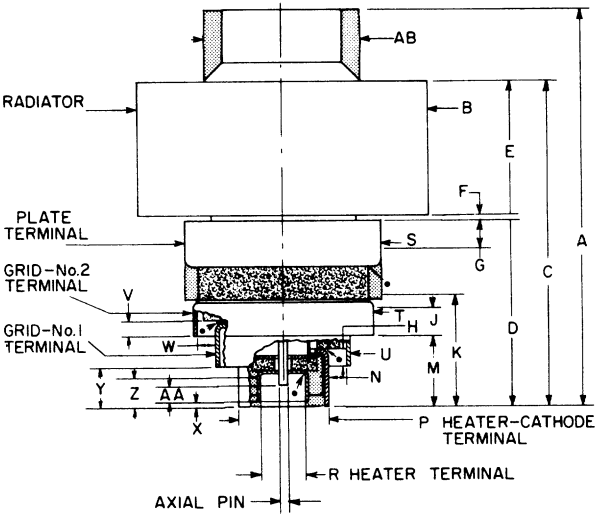
Terminal Temperature (Plate, grid No.2, grid No.1, cathode, and heater)	250 max. °C
Plate-Core Temperature	250 max. °C

a See *Dimensional Outline* for temperature measurement points.

b Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.

DIMENSIONAL OUTLINE



SEE FOOTNOTE (b)

CERAMIC

• TEMPERATURE MEASURMENT POINT

92LM-2327V

DIMENSION	INCHES	MILLIMETERS
A	2.270 Max.	57.66 Max.
B Dia.	1.625±.015 Max.	41.28±.38 Max.
C	1.840 ± .032	46.74 ± .81
D	1.030 ± .030	26.16 ± .76
E	0.750 ± .015	19.05 ± .38
F	0.030 Min.	0.76 Min.
G	0.165 Min.	4.19 Min.
H	0.120 Min.	3.05 Min.
J	0.140 Min.	3.56 Min.
K	0.600 Min.	15.24 Min.
M	0.370 ± .020	9.40 ± .51
N	0.095 Min.	2.14 Min.

DIMENSION	INCHES	MILLIMETERS
P Dia.	0.480 Min.	12.19 Min.
R Dia.	0.260 Max.	6.60 Max.
S Dia.	1.085 Min.	27.56 Min.
T Dia.	0.985 Min.	25.02 Min.
U Dia.	0.735 Min.	18.67 Min.
V	0.060 Min.	1.52 Min.
W	0.090 Min.	2.29 Min.
X	0.025 ± .025	0.64 ± .64
Y	0.175 ± .015	4.45 ± .38
Z	0.100 Min.	2.54 Min.
AA	0.054 Min.	1.37 Min.
AB Dia.	0.85 Max.	21.6 Max.

4632

Beam Power Tube

CERMOLOX

Broadband UHF Operation — **Matrix Cathode**
2300 w CW Output at 890 MHz — **Forced-Air Cooled**

ELECTRICAL

Heater:

Type	Matrix Oxide Coated Unipotential Cathode	
Voltage	5.5 typ. 6.0 max.	V V
Current at 5.5 V	31	A
Instantaneous Starting Current	90 max.	A
Minimum Heating Time	180	s
Mu-factor (Grid No.2 to Grid No.1)	14	

MAXIMUM CCS RATINGS, Absolute-Maximum Values

DC Plate Voltage	7000	V
DC Grid-No.2 Voltage	1000	V
DC Grid-No.1 Voltage	−250	V
DC Plate Current	3	A
Plate Dissipation	5000	W

MECHANICAL

Operating Position	Any
Weight (Approx.)	6 lb (2.7 kg)

THERMAL[a]

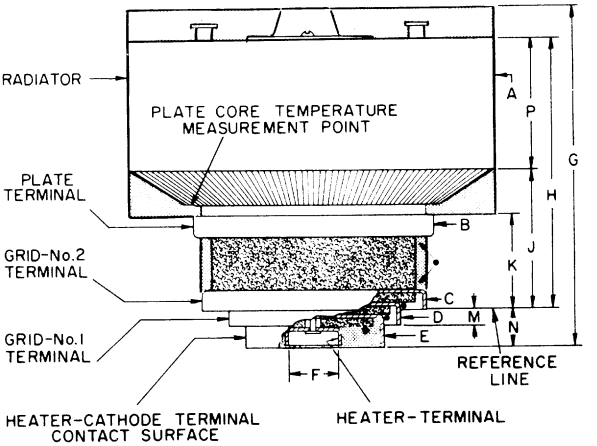
Seal Temperatures (Plate, Grid No.2, Grid No.1 Heater-Cathode, Heater)	250 max.	°C
Plate Core Temperature	250 max.	°C

[a] See *Dimensional Outline* for temperature measurement points.

[b] Keep all stippled regions clear. Do not allow contacts or circuit components to intrude into these annular regions.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.

DIMENSIONAL OUTLINE



SEE FOOTNOTE (b)
CERAMIC
• TEMPERATURE MEASUREMENT POINT

92LM-2522V

DIMENSION	INCHES	MILLIMETERS
A Dia.	4.57 Max.	116.1 Max.
B Dia.	3.250 ±.015	82.55 ±.38
C Dia.	3.028 ±.014	76.91 ±.35
D Dia.	2.319 ±.012	58.90 ±.30
E Dia.	1.850 ±.010	44.99 ±.25
F Dia.	0.725 Max.	18.42 Max.
G	4.70 Max.	119.4 Max.
H	4.140 ±.050	105.2 ±1.2
J	1.620 ±.040	41.15 ±1.01
K	1.330 ±.030	33.78 ±.76
M	0.200 ±.025	5.08 ±.63
N	0.475 ±.030	12.07 ±.76
P	1.945 ±.015	49.40 ±.38

4634

Beam Power Tube

- CERMOLOX®
- Compact, Ruggedized
- Hard Tube Modulator
- 7000 Volts Peak
- 8.0 Amperes Peak
- Nanosecond Switching Time

General Data

Electrical:

Heater for Unipotential Cathode:			
Voltage[a] (AC or DC)	6.0	typ.	V
	6.4	max.	V
Current @ 6.0 volts	7.6		A
Minimum heating time	120		s
Mu-Factor[b] (Grid No.1 to grid No.2)	6.6		
Direct Interelectrode Capacitances:[c]			
Grid No.1 to plate	0.12	max.	pF
Grid No.1 to cathode	30		pF
Plate to cathode	0.011	max.	pF
Grid No.1 to grid No.2	38		pF
Grid No.2 to plate	5.3		pF

Mechanical:

Operating Position			Any
Maximum Overall Length (69.1 mm)	2.72		in
Greatest Diameter (45.3 mm)	1.77		in
Temperature (All seals & plate core)	250	max.	°C
Weight (Approx.) (0.17 kg)	6		oz
Terminal Connections	See Outline Drawing		

Pulse Modulator Service[d]

Maximum CCS Ratings, Absolute-Maximum Values:

Instantaneous Peak Plate Voltage[e] (Pulse duration 0.1 s)	7000	max.	V
DC Plate Voltage	5000	max.	V
DC Grid-No.2 Voltage	1200	max.	V
DC Grid-No.1 Voltage	−250	max.	V
Peak Positive Grid-No.1 Voltage	150	max.	V
Peak Plate Current[f]	8	max.	A
DC Plate Current	.500	max.	A

Grid-No.2 Input (Average)	20	max.	W
Grid-No.1 Input (Average)	8	max.	W
Plate Dissipation (Average)[g]	600	max.	W

Typical Operation:

With rectangular wave shape pulses, duty factor of 0.05 and pulse duration of 2 microseconds.

DC Plate Voltage	3000	V
Instantaneous Peak Plate Voltage	7000	V
DC Grid-No.2 Voltage	800	V
DC Grid-No.1 Voltage	−120	V
Peak Positive Grid-No.1 Voltage	25	V
Peak Plate Current	8	A
DC Plate Current	0.4	A
DC Grid-No.2 Current	0.012	A
DC Grid-No.1 Current	0.050	A
Load Resistance	225	Ω
Plate Dissipation (Average)	480	W
Useful DC Power Output at Peak of Pulse	14,400	W

[a] See V.A.3 of 1CE-300. Heater voltage should be adjusted to the typical value initially, and then reduced to a lower value that will provide satisfactory performance. The life of the cathode can be conserved by adjusting to the lowest heater value that will give the desired performance.

[b] For plate voltage = 500 V, grid-No.2 voltage = 350 V, and plate current = 0.24 A.

[c] Measured with special shield adaptor.

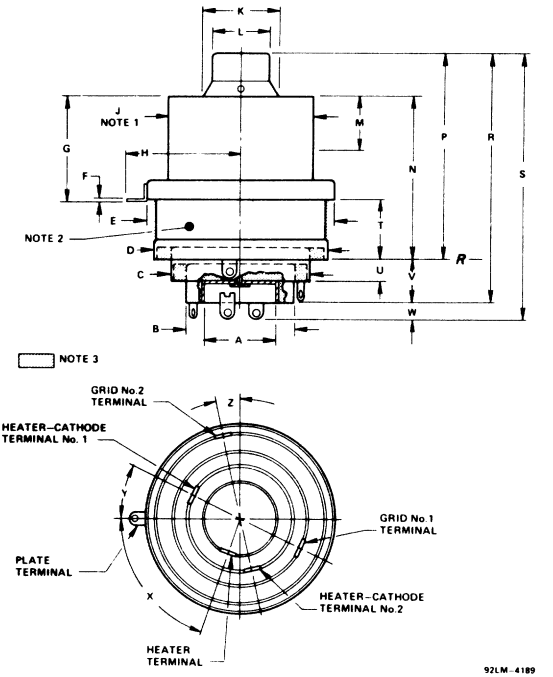
[d] See Section VC of 1CE-300.

[e] An insulating fluid or pressurization may be required to prevent external tube arcing. The insulating fluid must be determined to be compatible with the tube for the particular application.

[f] The value of peak plate current shown applies to duty factors up to 0.05; for higher duty factors, the peak plate current must be reduced as shown in the Peak Plate Current Rating Chart.

[g] Maximum plate dissipation is a function of the maximum plate input efficiency of the class of service, and the effectiveness of the cooling system. The value of maximum plate dissipation shown is a practical value which can be achieved. In all cases of operation, sufficient cooling must be provided to prevent the terminal and plate core temperatures from exceeding their maximum values. When longer life expectancy and more consistent performance are desirable, operation at reduced temperatures is recommended.

Dimensional Outline



Note 1: Dimension "H" is maintained over the distance "M" with a finish of better than 32 microns.

Note 2: Ceramic.

Note 3: Keep all stippled regions clear.

*Dimensions are in inches unless otherwise stated. Metric equivalents in parentheses are given for information only and are based on 1 inch = 25.4 mm.

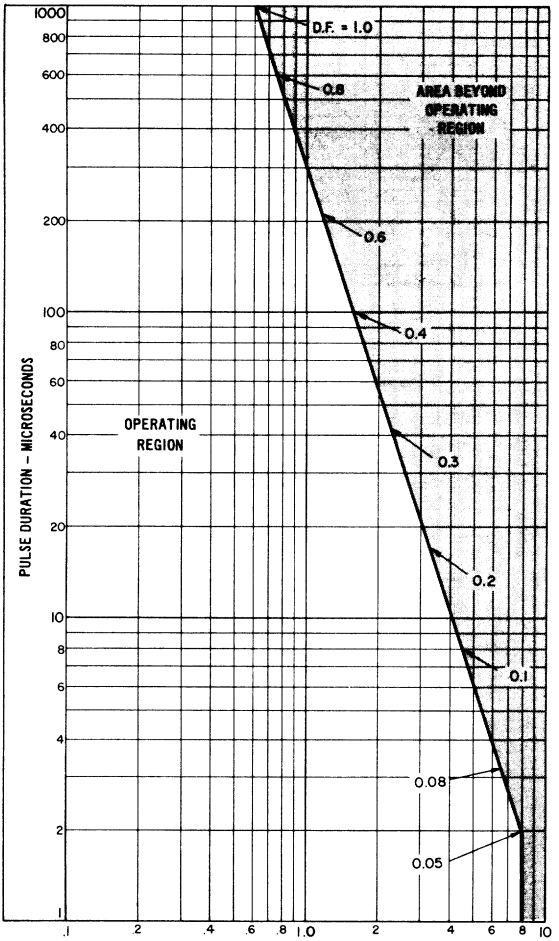
See next page for dimensions.

Dimensional Outline (Continued)

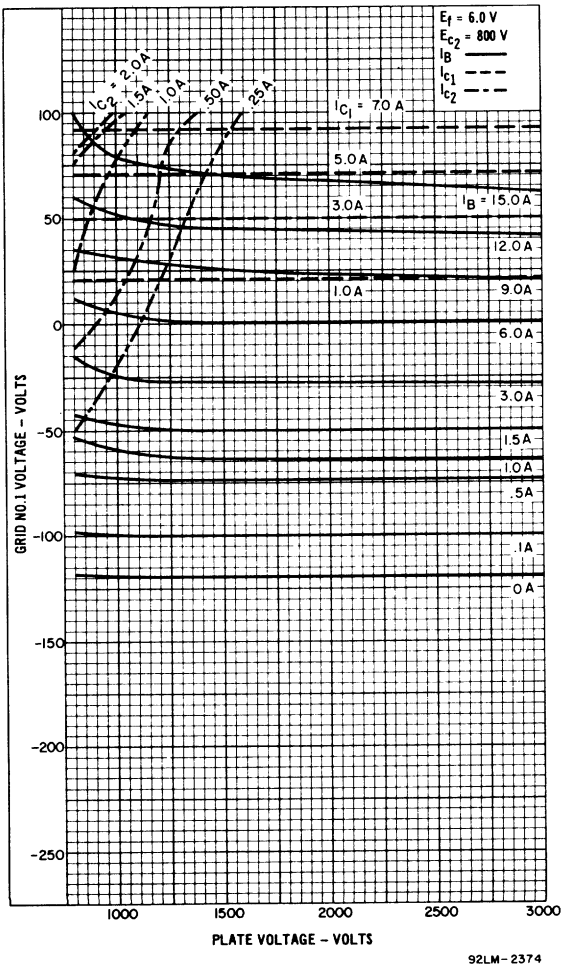
Tabulated Dimensions*

Dimension		
A Dia.	0.660 ± .010	(16.76 ± .25)
B Dia.	1.000 ± .010	(25.40 ± .25)
C Dia.	1.300 ± .010	(33.02 ± .25)
D Dia.	1.600 ± .010	(40.64 ± .25)
E Dia.	1.755 ± .010	(44.58 ± .25)
F	0.020 Ref.	(0.51 Ref.)
G	1.150 Max.	(29.21 Max.)
H Radius	1.130 Max.	(28.70 Max.)
J Dia.	1.300 ± .002	(33.020 ± .051)
K Dia.	0.855 Max.	(21.72 Max.)
L Dia.	0.573 Max.	(14.55 Max.)
M	0.700 Min.	(17.78 Min.)
N	1.595 ± .035	(40.5 ± .9)
P	2.000 ± .045	(50.8 ± 1.1)
R	2.400 Ref.	(60.96 Ref.)
S	2.72 Max.	(69.1 Max.)
T	0.575 ± .025	(14.61 ± .64)
U	0.200 ± .020	(5.08 ± .51)
V	0.400 ± .020	(10.16 ± .51)
W	0.250 Ref.	(6.35 Ref.)
X	60° Ref.	
Y	30° Ref.	
Z	15° Ref.	

Peak Plate Current Rating



Constant Current Characteristics



4635

Beam Power Tube

CERMOLOX

High Gain RF Power Amplifier
Matrix Cathode
Forced-Air Cooled

2500 Watts Carrier Output at 400 MHz
10 kW PEP
16 dB Gain

ELECTRICAL

Heater:

Type	Matrix-Type Oxide Coated Unipotential Cathode	
Voltage (ac or dc)	22 ± 2	V
Current at 22 volts	12.6	A
Minimum heating time	180	s
Mu-Factor (Grid No.2 to Grid No.1)	20	

MAXIMUM CCS RATINGS, Absolute-Maximum Values:

	Up to 500 MHz	
DC Plate Voltage	7000	V
DC Grid-No.2 Voltage	1200	V
DC Plate Current	2.0	A
Plate Dissipation	10	kW

MECHANICAL

Operating Position	Any
Weight (Approx.)	12 lb (5.4 kg)

THERMAL[a]

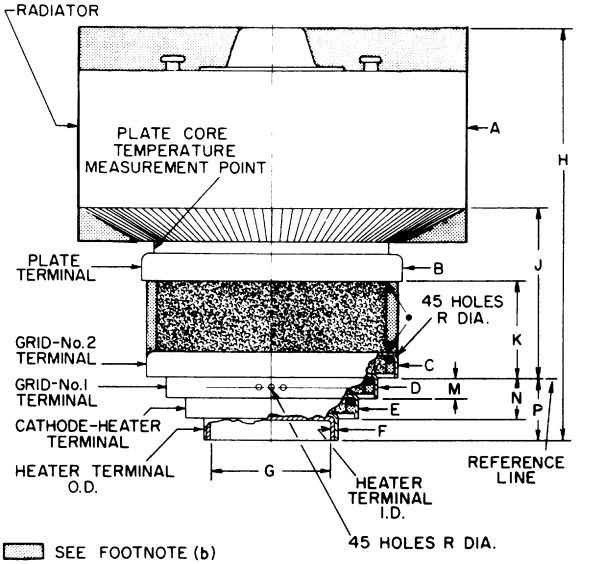
Terminal Temperature (Plate, heater-cathode, and heater)	250 max.	°C
Grid No.2 and Grid No.1	200 max.	°C
Plate-Core Temperature	250 max.	°C

[a] See *Dimensional Outline* for temperature measurement points.

[b] Keep all stippled regions clear. In general do not allow contacts to intrude into these annular regions.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.

DIMENSIONAL OUTLINE



SEE FOOTNOTE (b)
CERAMIC
• TEMPERATURE MEASURMENT POINT

92LM-2497V

DIMENSION	INCHES	MILLIMETERS
A Dia.	6.130 ±.040	55.70 ±1.02
B Dia.	4.190 ±.020	106.43 ±.51
C Dia.	3.915 ±.015	99.44 ±.38
D Dia.	3.315 ±.015	84.20 ±.38
E Dia.	2.700 ±.020	68.58 ±.51
F Dia.	2.100 ±.015	53.34 ±.38
G Dia.	1.975 ±.010	50.17 ±.25
H	6.500 Max.	165.1 Max.
J	2.650 ±.025	67.31 ±.64
K	1.625 ±.025	41.28 ±.64
M	0.340 ±.030	8.64 ±.76
N	0.660 ±.038	6.76 ±.97
P	1.000 ±.030	25.40 ±.76
R Dia.	0.089 Nom.	2.26 Nom.

4636

Beam Power Tube

Matrix-type Unipotential Cathode
Liquid Cooled — 410 Watts PEP Output
UHF Grid-Drive Operation — at 30 MHz
300 Watts UHF TV Output at 890 MHz
Distributed Amplifier Service to 500 MHz

ELECTRICAL

Heater, Unipotential Matrix Type:		
Voltage (ac or dc)	6.3	V
Current at 6.3 volts	3.5	A
Minimum heating time	60	s
Mu-Factor, (grid No.2 to grid No.1)	12	

MECHANICAL

Operating Position	Any
Weight (Approx.)	8 oz (0.23 kg)

THERMAL

Terminal Temperature	250 max.	°C
Cathode-Heater Flange	125 max.	°C
Plate Seal Temperature	250 max.	°C

See *Dimensional Outline* for Temperature Measurement Points

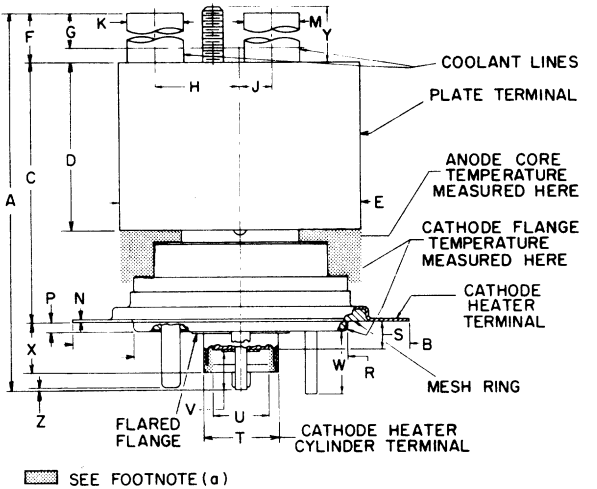
MAXIMUM CCS RATINGS, Absolute-Maximum Values:

DC Plate Voltage	2200	V
DC Grid No.2 Voltage	400	V
DC Grid No.1 Voltage	−100	V
DC Plate Current (Class A Service)	600	mA
Plate Dissipation	1000	W

[a] Keep all stippled regions clear. Do not allow contacts or circuit components to intrude upon these regions.

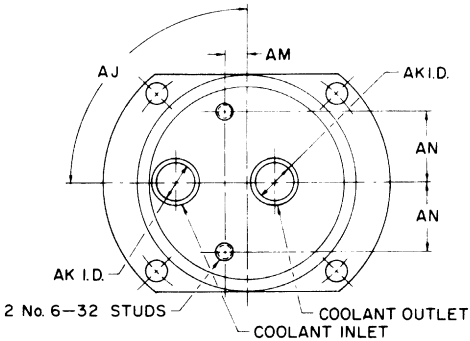
Detailed performance and application information is available through your RCA Sales Office Distributor, or by writing to RCA Commercial Engineering, Harrison, NJ 07029.

DIMENSIONAL OUTLINE (Front View)



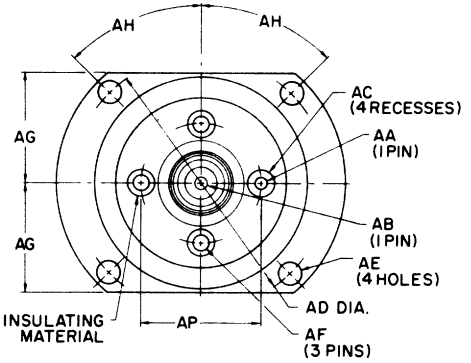
92LM-2512V

DIMENSIONAL OUTLINE (Top View)



92LS-2517V

DIMENSIONAL OUTLINE (Bottom View)



92LS-2518V

DIMENSION	INCHES	MILLIMETERS
A	3.330 Max.	84.6 Max.
B Dia.	2.262 Max.	57.45 Max.
C	1.745 ± .025	44.32 ± .64
D	1.130 ± .010	28.70 ± .25
E Dia.	1.625 ± .015	4.128 ± .38
F	0.437 ± .010	1.11 ± .25
G	0.875 Min.	22.23 Min.
H	0.560 ± .020	14.22 ± .51
J	0.220 ± .020	5.59 ± .51
K Dia.	0.375 Nom.	9.53 Nom.
M Dia.	0.375 Nom.	9.53 Nom.
N	0.022 ± .002	0.56 ± .05
P	0.058 $^{+.007}_{-.008}$	1.47 $^{+.18}_{-.20}$
R Dia.	1.425 ± .010	36.20 ± .25
S	0.200 Max.	5.08 Max.
T Dia.	0.500 ± .010	12.70 ± .25
U Dia.	0.400 Min.	10.16 Min.
V	0.250 Min.	6.35 Min.

DIMENSION	INCHES	MILLIMETERS
W	0.425 Max.	10.80 Max.
X	0.337 $^{+.018}_{-.017}$	8.56 $^{+.46}_{-.43}$
Y	0.380 ± .020	9.65 ± .51
Z	0.060 Max.	1.12 Max.
AA Dia.	0.081 ± .002	2.06 ± .05
AB Dia.	0.081 ± .002	2.06 ± .05
AC Dia.	0.245 Min.	6.22 Min.
AD Dia.	2.000 ± .010	50.8 ± .25
AE Dia.	0.175 ± .005	4.45 ± .13
AF Dia.	0.126 ± .002	3.20 ± .05
AG	0.868 $^{+.017}_{-.018}$	22.05 $^{+.43}_{-.46}$
AH	45° ± 5'	–
AJ	90° ± 3°	–
AK	0.378 ± .003	9.60 ± .08
AM	0.171 ± .010	4.34 ± .25
AN	0.562 ± .010	14.27 ± .25
AP	0.950 ± .011	24.13 ± .28

4637

Beam Power Tube

CERMOLOX
RF Power Amplifier and Oscillator to 1215 MHz
Matrix-Type Cathode
105 Watts CW Power Output at 1215 MHz
340 Watts CW Power Output at 400 MHz
Conduction Cooled

ELECTRICAL

Heater for Matrix-Type Oxide-Coated Unipotential Cathode:		
Voltage (ac or dc)	6.3	V
Current at 6.3 volts	3.2	A
Minimum heating time	60	s
Mu-Factor, Grid No.2 to Grid No.1	18	

MAXIMUM CCS RATINGS, Absolute-Maximum Values:

	Up to 1215 MHz	
DC Plate Voltage	2500	V
DC Grid-No.2 Voltage	400	V
DC Grid-No.1 Voltage	−200	V
DC Plate Current	250	mA
Plate Dissipation	300	W

MECHANICAL

Operating Position	Any
Weight (Approx.)	4 oz (0.1 kg)

THERMAL

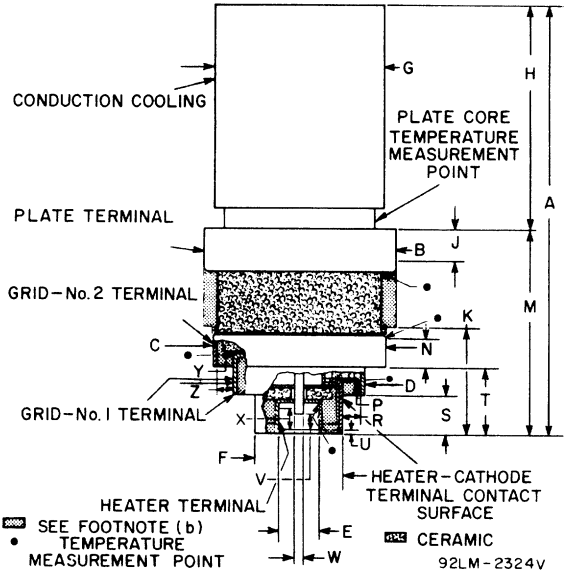
Terminal Temperature (Plate, grid No.2, grid No.1, cathode and heater)	250 max. °C
Plate-Core Temperature	250 max. °C

[a] See *Dimensional Outline* for Temperature Measurement Points.

[b] Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular regions.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.

DIMENSIONAL OUTLINE



DIMENSION	INCHES	MILLIMETERS
A	2.650 ±.090	67.31 ± 2.29
B Dia.	1.085 Min.	27.56 Min.
C Dia.	0.985 Min.	25.02 Min.
D Dia.	0.735 Min.	18.67 Min.
E Dia.	0.260 Max.	6.60 Max.
F Dia.	0.480 Min.	12.19 Min.
G Dia.	0.990 ±.005	25.15 ± .13
H	1.355 Min.	34.42 Min.
J	0.165 Min.	4.19 Min.
K	0.600 Min.	15.24 Min.
M	1.230 ±.030	31.24 ± .76

DIMENSION	INCHES	MILLIMETERS
N	0.140 Min.	3.56 Min.
P	0.120 Min.	3.05 Min.
R	0.095 Min.	2.41 Min.
S	0.175 ±.015	4.45 ± .38
T	0.370 ±.020	9.40 ± .51
U	0.025 ±.025	0.64 ± .64
V	0.054 Min.	1.37 Min.
W	0.070 Max.	1.78 Max.
X	0.100 Min.	2.54 Min.
Y	0.060 Min.	13.24 Min.
Z	0.090 Min.	22.86 Min.

4638

Beam Power Tube

CERMOLOX — **Matrix Cathode**
Ruggedized — **13 kV, 20 Amperes**
Pulse Modulator — **Conduction Cooled**

ELECTRICAL

Heater:

Type	Matrix Oxide-Coated Unipotential Cathode	
Voltage (ac or dc)	5.5 typ. 6.0 max.	V V
Current at 5.5 volts	17.3	A
Minimum heating time	180	s
Mu-Factor, Grid No.2 to Grid No.1	17	

MAXIMUM RATINGS, Absolute-Maximum Values:

DC Plate Voltage	13	kV
Instantaneous Peak Plate Voltage (pulse duration < 0.1 s)	20	kV
DC Grid-No.2 Voltage	1000	V
DC Grid-No.1 Voltage	-300	V
Peak Positive Pulse Grid-No.1 Voltage	100	V
Peak Plate Current	30	A
DC Plate Current	1.5	A
Plate Dissipation (Average)	1.5	kW

MECHANICAL

Operating Position	Any
Weight (Approx.)	2 lb (0.91 kg)

THERMAL

Terminal Temperature (Plate, grid No.2 grid No.1, cathode and heater)	250 max.	°C
Plate-Seal Temperature	250 max.	°C

[a] See *Dimensional Outline* for temperature measurement points.

[b] Keep all stippled clear. Do not allow contacts or circuit components to protrude into these annular volumes.

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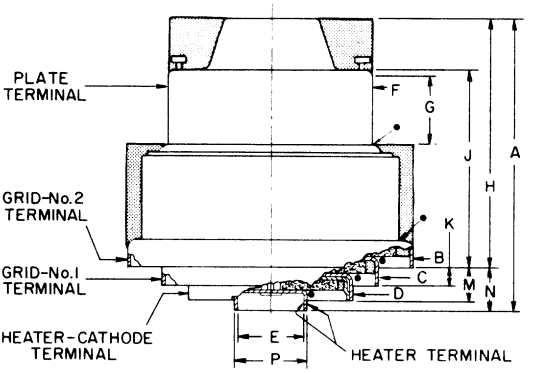
DIMENSIONAL OUTLINE



SEE FOOTNOTE (b)

CERAMIC

• TEMPERATURE MEASUREMENT POINT

92LM-2509V

DIMENSION	INCHES	MILLIMETERS
A	3.31 Max.	84.1 Max.
B Dia.	3.020 ±.010	76.71 ±.25
C Dia.	2.317 ±.010	58.85 ±.25
D Dia.	1.717 ±.007	43.61 ±.18
E Dia.	0.713 ±.012	18.11 ±.30
F Dia.	2.266 ±.001	57.56 ±.03
G	0.725 Min.	18.42 Min.
H	2.780 ±.040	70.61 ±1.02
J	2.185 ±.030	55.50 ±.76
K	0.200 ±.025	5.08 ±.64
M	0.370 ±.030	9.40 ±.76
N	0.460 ±.030	11.68 ±.76
P Dia.	0.755 ±.010	19.18 ±.25

RF Power Amplifier Tetrodes

- **CW Ouput up to 250 kW (4647), 500 kW (4648)**
- **Pulsed Output up to: 500 kW peak (4647)**
  1000 kW peak (4648)
- **Full Input to 1000 MHz (Each Type)**
- **Power Gain up to 28 dB (Each Type)**

General Data

Electrical:

		Type 4647	4648	
Filament[a]				
Type	Multistrand Thoriated Tungsten			
Current, dc operating,	Typ.	840	1600	A
	Max.	860	1640	A
Starting Current (Must never exceed even momentarily)	Max.	1000	2000	A
Voltage at 840 A	Typ.	3.7	3.7	V
Minimum Heating Time to Reach Operating Voltage		60	60	s
Minimum Heating Time at Operating Voltage Before Applying Plate Voltage		60	60	s
Mu-Factor (grid No.2 to grid No.1)		9	9	
Direct Interelectrode Capacitances:				
Grid No.1 to plate		0.3	0.6	pF
Grid No.1 to grid No.2 and cathode		680	1200	pF
Plate to cathode and grid No.2		85	85	pF
Grid No.2 to cathode		130	140	pF
Grid No.2 to grid No.1		425	775	pF
Grid No.1 to cathode		255	425	pF

Mechanical (Each Type)

Operating Attitude	Tube axis vertical, either end up		
Overall Length, Maximum	(470 mm)	18.5	in
Maximum Diameter	(296 mm)	11.65	in
Terminal Connections	See Dimensional Outline		
Weight (approx.) Uncrated	(34.0 kg)	75	lb
Crated	(122.5 kg)	270	lb

Thermal (Each Type)

Maximum Ceramic-Insulator Temperature	150	°C
Maximum Metal-Surface Temperature	100	°C

Minimum Storage Temperature[b] . . . . . −65 °C

Maximum External Gas Pressure[c]
Absolute . . . . . { 60 psi / 4.2 kg/cm^2

Cooling:

It is important that the temperature of the individual parts of the tube not exceed the value specified.

Air Cooling

In general, forced-air cooling of the ceramic insulators and the adjacent contact areas may be required if the tube is used in a confined space without free circulation of air. Under such conditions, provision should be made for blowing an adequate quantity of air across the ceramic insulators and adjacent terminal areas to limit their maximum temperature to the value specified. Interlocking of the air flow with all power supplies is recommended to prevent tube damage in case of failure of adequate air flow.

Liquid Cooling:[d]

Liquid cooling of the filament, filament ground, grid No.1, grid No.2, and plate is required. When the environmental temperature permits, the coolant may be water; the use of distilled water or filtered deionized water is essential. The liquid flow must start before application of any voltages and preferably should continue for several seconds after removal of all voltages. Interlocking of the liquid flow through each of the cooled elements with all power supplies is recommended to prevent tube damage in case of failure of adequate liquid flow.

Liquid Pressure at any inlet,
Maximum Gauge . . . . . 100 lbs/in^2 (7.0 kg/cm^2)

Resistivity of water @ 25° C,
Minimum . . . . . 1.0 megohm-cm

Water Temperature from any outlet,
Maximum . . . . . 70 °C

Pulsed RF Amplifier[f]

For frequencies up to 100 MHz and a maximum "ON" time[g] of 2500 μs in any 40,000-microsecond interval

Maximum Ratings, Absolute-Maximum Values:

	4647	4648	
Peak Positive-Pulse Plate Voltage[h]	32	32	max. kV
Peak Positive-Pulse Grid-No.2 Voltage[i,k] . .	1500	1500	max. V
DC or Peak Negative-Pulse Grid-No.1 Voltage	400	400	max. V
Peak Plate Current	28	55	max. A
Peak Grid-No.2 Current	2.0	4.0	max. A
Peak Rectified Grid-No.1 Current	2.5	5.0	max. A
DC Plate Current	1.7	3.4	max. A

	4647	4648	
DC Grid-No.2 Current	120	250	max. mA
DC Grid-No.1 Current	150	310	max. mA
Plate Dissipation[m] (Average)	20	40	max. kW

Typical Plate-Pulsed Operation:

In Class B service at 425 kHz with a rectangular waveshape pulse at a duty factor[g] of 0.06 and a pulse duration[g] of 2000 microseconds.

	4647	4648	
Peak Positive-Pulse Plate Voltage[h]	30	30	kV
Peak Positive-Pulse Grid-No.2 Voltage[j]	1400	1400	V
Peak Negative-Pulse Grid-No.1 Voltage[n]	225	225	V
Peak Plate Current	25	50	A
Peak Grid-No.2 Current	1.3	2.5	A
Peak Rectified Grid-No.1 Current	2.5	5.0	A
DC Plate Current	1.5	3.0	A
DC Grid-No.2 Current	80	150	mA
DC Grid-No.1 Current	150	300	mA
Peak Driver Power Output (approx.)	750	1500	W
Output Circuit Efficiency (approx.)	95	95	%
Useful Peak Power Output	500	1000	kW

RF Power Amplifier[f] — Class C Telegraphy and RF Power Amplifier[f] — Class C FM Telephony

Maximum CCS Ratings, Absolute-Maximum Values: Up to 100 MHz

	4647	4648	
DC Plate Voltage	22	22	max. kV
DC Grid-No.2 Voltage	1400	1400	max. V
DC Grid-No.1 Voltage	−400	−400	max. V
DC Plate Current	23	45	max. A
Plate Dissipation[m]	125	250	max. kW
Grid-No.2 Dissipation[m]	1.8	3.5	max. kW
Grid-No.1 Dissipation[m]	1.5	3.0	max. kW

Typical CCS Operation: **At 425 kHz**

	4647	4648	
DC Plate Voltage	20	20	kV
DC Grid-No.2 Voltage	1200	1200	V
DC Grid-No.1 Voltage	−225	−225	V
Peak RF Grid-No.1 Voltage	285	285	V
DC Plate Current	19	38	A

	4647	4648	
DC Grid-No.2 Current	0.8	1.3	A
DC Grid-No.1 Current	1.8	3.5	A
Driver Power (approx.)	500	1000	W
Circuit Efficiency (approx.)	95	95	%
Useful Power Output (approx.)	250	500	kW

Plate-Modulated RF Power Amplifier[f] – Class C Telephony

Carrier conditions per tube for use with a max. modulation factor of 1.0 unless otherwise indicated

Maximum CCS Ratings, Absolute-Maximum Values: Up to 100 MHz

	4647	4648	
DC Plate Voltage	16	16	max. kV
DC Grid-No.2 Voltage	1100	1100	max. V
DC Grid-No.1 Voltage	−400	−400	max. V
DC Plate Current	13	25	max. A
Plate Dissipation[m]	75	150	max. kW
Grid-No.2 Dissipation[m]	1.3	2.5	max. kW
Grid-No.1 Dissipation[m]	1.3	2.5	max. kW

Typical Operation — **At 425 kHz**

	4647	4648	
DC Plate Voltage	14	14	kV
DC Grid-No.2 Voltage	1000	1000	V
DC Grid-No.1 Voltage	−250	−250	V
Peak RF Grid-No.1 Voltage	280	280	V
DC Plate Current	11	22	A
DC Grid-No.2 Current	.700	1.3	A
DC Grid-No.1 Current	1.3	2.5	A
Driver Power Output (approx.)	375	750	W
Output-Circuit Efficiency (approx.)	95	95	%
Useful Power Output (approx.)	100	200	kW

[a] The filament, when operated near its maximum current is capable of providing emission in excess of service requirements for which the tube is rated. To extend the filament life, it is recommended that the filament current be reduced to a value that will give adequate but not excessive emission. For accurate measurement it is

essential that the filament voltage be measured at the respective coolant terminals on the tube side of the coupling thread.

b The tube coolant ducts must be free of water before storage or shipment of the tube to prevent damage from freezing.

c The external gas pressure is related to the output cavity pressurization required to prevent corona or external arc-over.

d For additional information on liquid cooling see Section IV of the "Application Guide for RCA Power Tubes" 1CE-279A.

e Measured directly across cooled element for the indicated typical flow.

f See *RCA Transmitting Tube Operating Considerations*, CLASSES OF SERVICE given at front of this section.

g Refer to 1CE-279A for definitions.

h The magnitude of any spike on the plate voltage pulse should not exceed the peak value of the plate voltage pulse by more than 4000 volts, and the duration of any spike when measured at the peak-value level should not exceed 10% of the maximum "ON" time. The output circuit may require pressurization to prevent corona or external arc-over at the ceramic insulator.

j The magnitude of any spike on the grid-No.2 voltage pulse should not exceed the peak value of the grid-No.2 voltage pulse by more than 250 volts, and the duration of any spike when measured at the peak-value level should not exceed 10% of the maximum "ON" time.

k A negative dc voltage of 300 volts maximum may be applied to grid No.2 to prevent any tube conduction between pulses.

m Determined by calorimeter measurements. Power specified includes intercepted power radiated from the filaments.

n The grid-No.1 voltage may be a combination of fixed and self bias obtained from a series grid resistor.

Handling (Each Type)

General information for handling RCA large power tubes is given in Section II-D of RCA's "Application Guide for RCA Power Tubes", 1CE-279A. During shipment the tube is suspended by springs in a crate. An AJ2195 Lifting Adaptor, featuring a 1.0-inch I.D. eyebolt, must be attached to the tube before removing it from the shipping crate. The

use of a hoist capable of lifting a weight of 100 lbs is recommended for the uncrating operation.

Uncrating Instructions (Each Type)

The following is the recommended procedure for removing this tube from its shipping crate.

1. Cut the two metal bands which close the crate. Remove the two "ball" seals. Disengage the two hasps and remove the crate lid.
2. Open the two drop flaps on the sides of the crate.
3. Cut the wires threaded through the four wing nuts that secure the wooden mounting plate for the tube to the spring supported frame. Unscrew and remove the wing nuts and washers. Save the wing nuts and washers for Step 8.
4. Cut open the top of plastic bag enclosing the tube. Attach the AJ2195 Lifting Adaptor to the ground surface ring surrounding the grid-No.1 terminal using four 10-32 bolts.
5. Connect a hoist to the eyebolt of the lifting fixture. Raise the tube and wooden mounting plate from the crate.
6. Remove the wooden mounting plate from the tube by cutting and removing the safety wire and then unscrewing the four cap screws. Do not drop the wooden mounting plate.
7. Remove the plastic bag from the tube.
8. Reattach the wooden mounting plate to the spring supported frame using the washers and wing nuts from Step 3. Replace the crate lid. Retain the crate for future tube shipment or storage.

Tube Mounting (Each Type)

It is recommended that the tube be mounted with the axis vertical and either end up. In either case, support the weight of the tube on or by the indicated mounting surface shown on the tube outline drawing. Eight equally spaced 1/4-28 tapped holes on a 9.25-inch (23.5 mm) dia. bolt circle are provided in this surface for securing the tube in place.

If the tube is to be mounted with the input end up, the tube may be placed directly into the operating position with the hoist setup of Step 7 of the Uncrating Instructions. After mounting, the AJ2195 Lifting Adaptor should be removed from the tube and stored for future use.

If the tube is to be mounted with the output end up special care must be taken when turning it around. The recommended procedure is as follows:

1. Lift tube using the Lifting Adaptor AJ2195.
2. Attach a 15-inch diameter mounting plate to the tube mounting surface. This plate shall have two eye-bolts 180° apart in a horizontal plane. Use all eight mounting holes. See accompanying *Mounting Plate and Lifting Recommendation.*
3. Set tube down resting on mounting plate.
4. Remove the Lifting Adaptor AJ2195.
5. Lift tube using the eye-bolts on the mounting plate. It is important that the tube be held steady while being raised.
6. Carefully turn tube end for end.
7. Set tube down on stand so that it will be suspended from the mounting plate.

Cooling Considerations (Each Type)

Consult Section IV of 1CE-279A for general recommendations on liquid cooling.

The weight of the coolant hoses must be externally supported to insure against applying excessive mechanical stress to the tube.

Anode Coolant Separator (Each Type)

The AJ2196 Plate Coolant Separator was designed as an accesory for this tube and must be ordered as a separate item. Unless ordered, the tube will be delivered without a

water separator. The coolant separator shall be installed in accordance with the following procedure.

1. Visually inspect the coolant separator and tube anode water cavity to assure that they are clean and free of particles. Caution: Do not clean the anode coolant fins mechanically.
2. Place a clean, lubricant-free "O" ring (uniform size No. 237) in the moat on the anode flange.
3. Carefully insert the AJ2196 Plate Coolant Separator into the anode cavity so as not to damage the anode coolant fins along the side of the anode cavity. Note: No force is required to insert the separator. After the coolant separator has been completely inserted rotate it, if necessary, to line up the clearance holes in the separator with the tapped holes in the anode flange.
4. Secure the separator in place with eight 1/4-20 NC x 5/8-inch long stainless steel, binding-head screws.

Coolant Course Inspection (Each Type)

Please consult Section IV-D of 1CE-279A for instructions on "Inspection of Coolant Courses" and Section IV-E for instructions on "Cleaning Coolant Courses." Attention is directed especially to the anode coolant fins which are soft and easily damaged. Do not attempt to clean these fins by mechanical methods.

Electrical Considerations (Each Type)

Please consult 1CE-279A. Attention is directed to Section III-B for the design of electrical connections and to Section VI for general electrical considerations.

Electrical requirements unique to this tube include the following items:

A. Filament

A dc filament supply is required. Filament excitation with an ac supply may generate mechanical resonances in the cathode structure.

The dc electrical filament connections must be made as

follows: the positive lead is connected to the filament terminal and coolant connection on the input end of the tube using the AJ2198 connector. The negative lead is connected to the dc filament ground terminal on the output end of the tube using all eight 1/4-28 tapped holes.

B. RF Driver

The value of drive power given under typical operation represents the approximate drive power required at the specified operating frequency. The driver stage should be designed to provide an excess of power over that indicated to take care of variations in line voltage and initial tube characteristics, changes in components, and tube characteristics during life, and transmission line mismatches.

The input impedance of this tube may vary over a considerable range. The exact range is a function of the grid bias and input rf voltage swing. In instances where the input rf voltage swing exceeds the bias level, the input impedance of the tube will decrease considerably. This change in input drive impedance may limit the input drive voltage unless the circuit designer utilizes a low impedance bias supply and driver circuit. The RF input circuit should be connected between the RF-Grid-No.1 terminal and the RF Input Cathode Terminal. **Caution: The RF Input Cathode terminal is at filament potential and must never be connected directly to the Grid-No.1 terminal or ground.** For drive circuit recommendations, please consult your RCA representative or RCA Large Power Tube Application Engineering, Lancaster, PA 17604.

C. Control Grid and Screen Grid

Due to power radiation from the filament and secondary electron emission, the control and screen grid power dissipation will be higher than that indicated by the voltage-current product for each grid. The actual dissipations must be measured calorimetrically by measuring the electrode inlet and outlet water temperatures and the

coolant flow. For temperatures measured in °C and for water flow in GPM, the dissipation may be calculated using the equation:

Power Dissipation in kW = 0.264 (GPM) ($T_{out} - T_{in}$)

X-Radiation Warning
X-radiation may be produced when operating this tube. For each installation, the X-radiation must be checked and shields provided if the radiation level exceeds safe limits.

Protection Circuitry (Each Type)

Protection circuits serve a three-fold purpose; safety of personnel; protection for the tube in the event of abnormal circuit operation; and protection of the tube circuits in the event of abnormal tube operation.

Large power tubes require protective devices to insure against high voltage shocks, rf radiation, loss of coolant flow, inadequate warm-up, etc. A full treatment of protective requirements is covered in Section VI.B of the "Application Guide for RCA Power Tubes" 1CE-279.

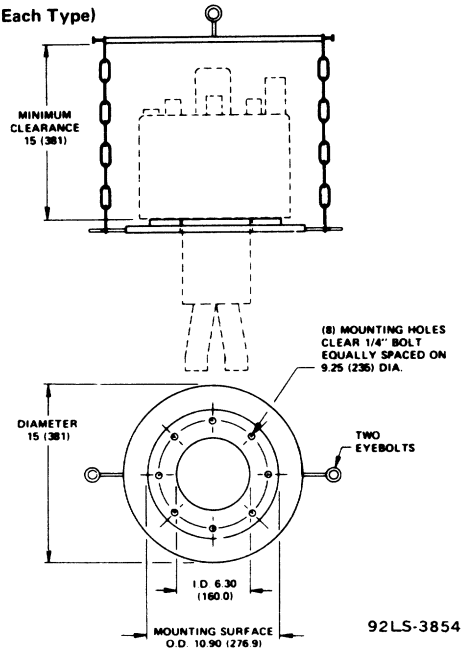
Filament, Grid No. 1 and Grid No. 2 (Type 4647)
Flow and Pressure Drop Characteristics for Water

Coolant Course	Flow				Max. Press. Diff. for typ. flow[e]	
	Abs. min.		Typ. flow			
	gpm	cc/s	gpm	cc/s	psi	kg/cm^2
Filament	1.5	95	2.0	126	15	1.05
Filament Ground	1.5	95	2.0	126	15	1.05
Grid No.1	1.5	95	2.0	126	17	1.19
Grid No.2	1.5	95	2.0	126	15	1.05

Filament, Grid No. 1 and Grid No. 2 (Type 4648)
Flow and Pressure Drop Characteristics for Water

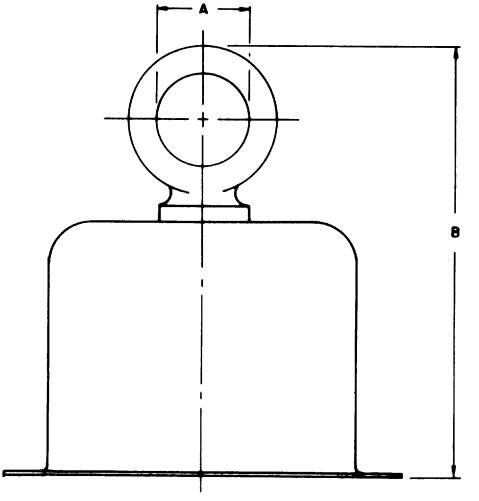
Coolant Course	Flow				Max. Press. Diff. for typ. flow[e]	
	Abs.		Typ. flow			
	gpm	cc/s	gpm	cc/s	psi	kg/cm^2
Filament	2.0	126	2.5	158	20	1.40
Filament Ground	2.0	126	2.5	158	20	1.40
Grid No.1	2.0	126	2.5	158	23	1.61
Grid No.2	2.0	126	2.5	158	20	1.40

MOUNTING PLATE AND LIFTING RECOMMENDATION
(Each Type)



Basic dimensions in inches. Parenthetical dimensions in mm for reference.

LIFTING ADAPTER AJ2195 (Each Type)



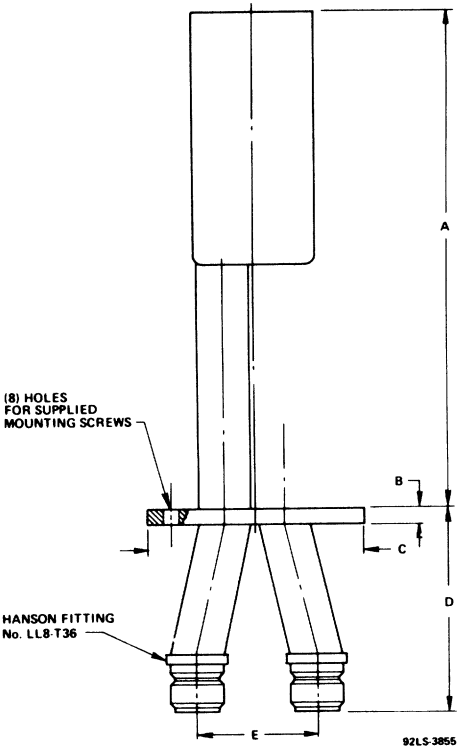
92LS-2638R1

Tabulated Dimensions*

Dimension	Inches	Millimeters
A Dia.	0.88 Min.	22.3 Min.
B	5.0 Max.	127 Max.

*Basic dimensions are in inches. Metric dimensions are derived from the basic inch dimension (1 inch = 25.4 mm)

PLATE COOLANT SEPARATOR AJ2196 (Each Type)

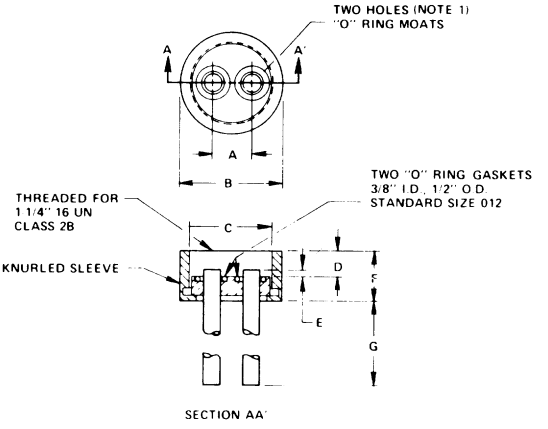


Tabulated Dimensions*

Dimension	Inches	Millimeters
A	10.95 Max.	278.1 Max.
B	0.35 ± .02	8.89 ± .51
C Dia.	5.20 ± .01	32.08 ± .25
D	5.5 Max.	139 Max.
E	2.60 ± .20	66.1 ± 5.1

*Basic dimensions are in inches. Metric dimensions are derived from the basic inch dimension (1 inch = 25.4 mm).

COOLANT CONNECTOR AJ2197 (Each Type)



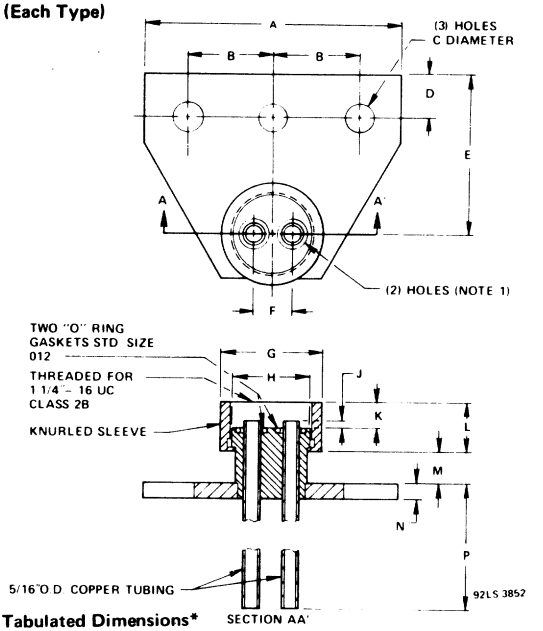
Tabulated Dimensions*

Dimension	Inches	Millimeters
A	0.53	13.5
B Dia.	1.50	38.1
C Dia.	1.15	29.2
D	0.38	9.6
E	0.12	3.0
F	0.69	17.5
G	3.32 Min.	84.3 Min.

Note 1– "O" Ring Moat has an OD of 0.485" (12.32 mm) and a depth of 0.05" (1.3 mm)

*Basic dimensions are in inches. Metric dimensions are derived from the basic inch dimension (1 inch = 25.4 mm).

FILAMENT ELECTRICAL AND COOLANT CONNECTOR AJ2198
(Each Type)

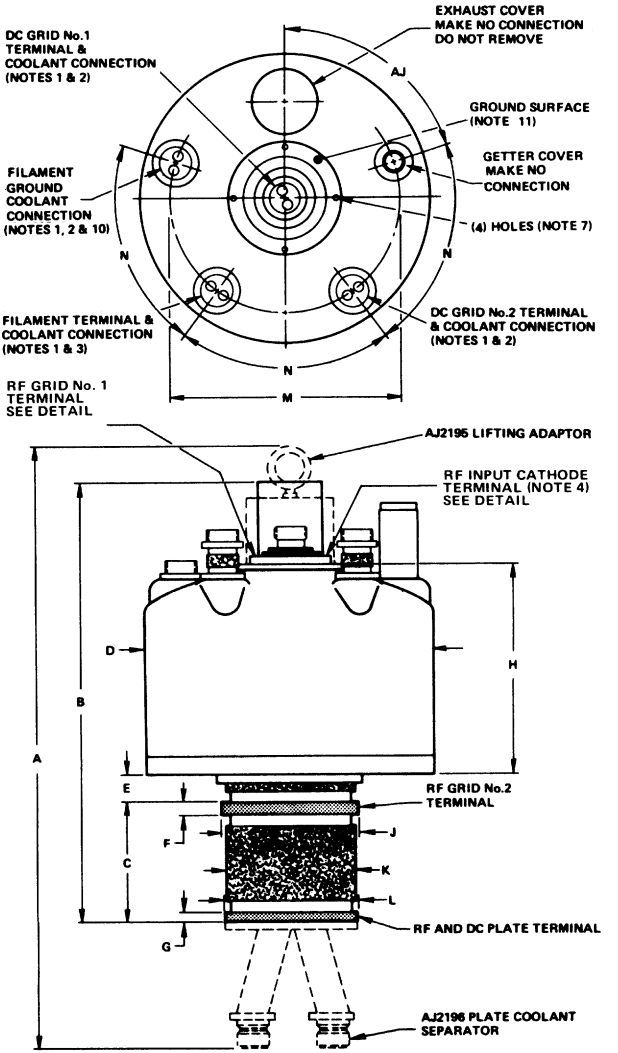


Tabulated Dimensions*

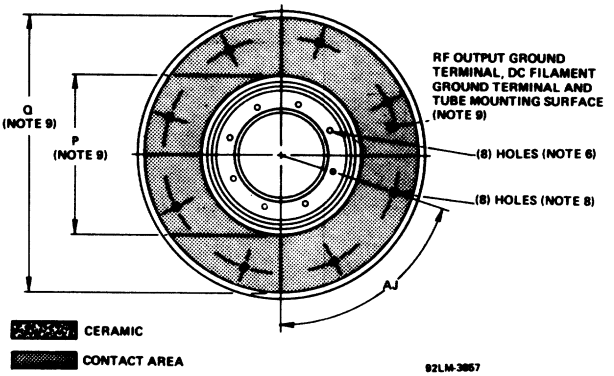
Dimension	Inches	Millimeters
A	3.75	95.3
B	1.25	31.7
C	0.39	9.9
D	0.62	15.7
E	2.37	60.2
F	0.53	13.5
G	1.50	38.1
H	1.15	29.2
J	0.12	3.0
K	0.38	9.6
L	0.69	17.5
M	0.69	17.5
N	0.25	6.4
P	2.62 Min.	66.7 Min.

Note 1— Moat for "O" ring has an OD of 0.485 inch (12.3 mm) and a depth of 0.05 inch (1.3 mm).

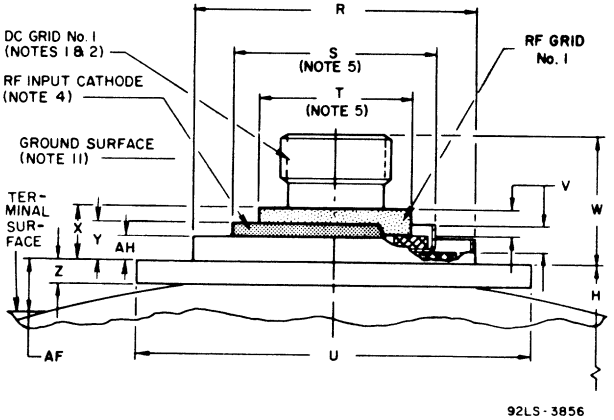
DIMENSIONAL OUTLINE (Each Type)



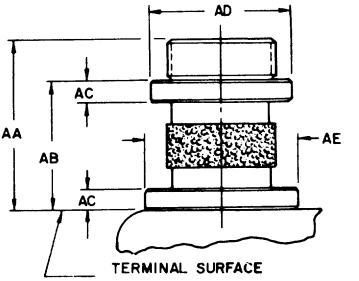
DIMENSIONAL OUTLINE (Bottom View)



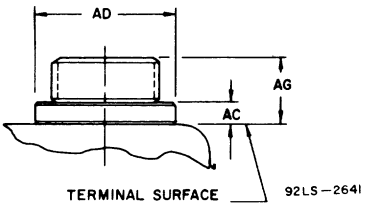
DETAIL OF RF INPUT CATHODE AND RF GRID NO. 1 TERMINAL, CONTACT SURFACES AND DC GRID NO. 1 TERMINAL



Detail of Filament and DC Grid No.2 Terminals



Detail of Filament Ground Terminal



Notes for Dimensional Outline

1. Terminal is 1-1/4" dia. threaded 0.5" (12.7 mm) long with 16 UN class 2A thread. It has two holes 0.312" 0.324" (7.92–8.23 mm) diameter spaced 0.531" (13.49 mm) on centers.
2. Terminal will accept coolant connector AJ2197.
3. Terminal will accept filament electrical and coolant connector AJ2198.
4. The RF Input Cathode Terminal is at filament potential. Do not ground.
5. This diameter dimension is held only over length of V.
6. Eight (8) holes tapped 1/4"-20 NC equally spaced on a 4.20" (106.7 mm) diameter bolt circle.
7. Four (4) holes tapped 10-32 NF to a minimum depth of .20" (5.1 mm) equally spaced on a 4.20" ± .03" (106.68 ± .76 mm) diameter bolt circle.
8. Eight (8) holes, tapped 1/4"-28 NF to a minimum depth of

.30" (7.6 mm) equally spaced on a 9.25" ± .03" (234.95 ± .76 mm) diameter bolt circle.

9. Contact should not be made at a diameter smaller than 6.30" (160.0 mm) nor greater than 10.90" (276.9 mm).

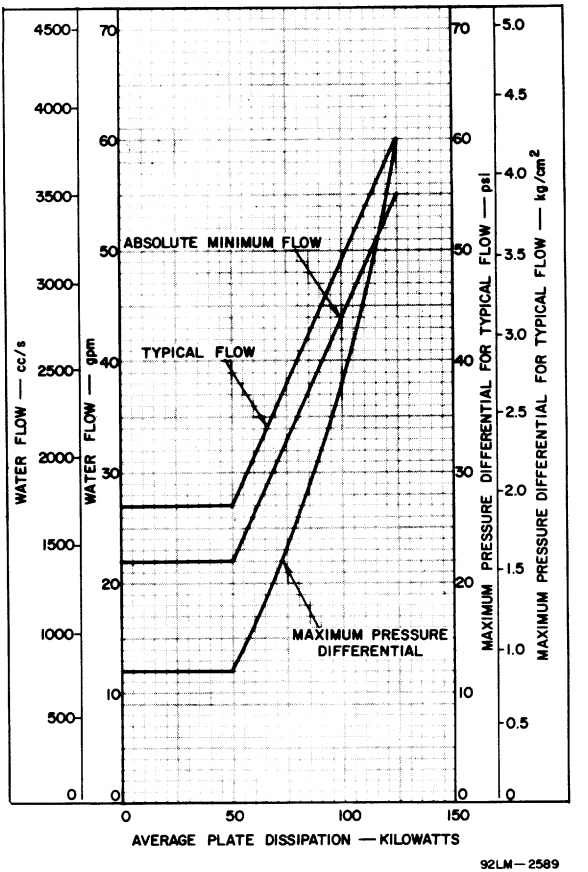
10. Make no electrical connections.

11. Ground surface is used to attach Lifting Adaptor AJ2195 and may be used during operation to support input circuit components at ground potential.

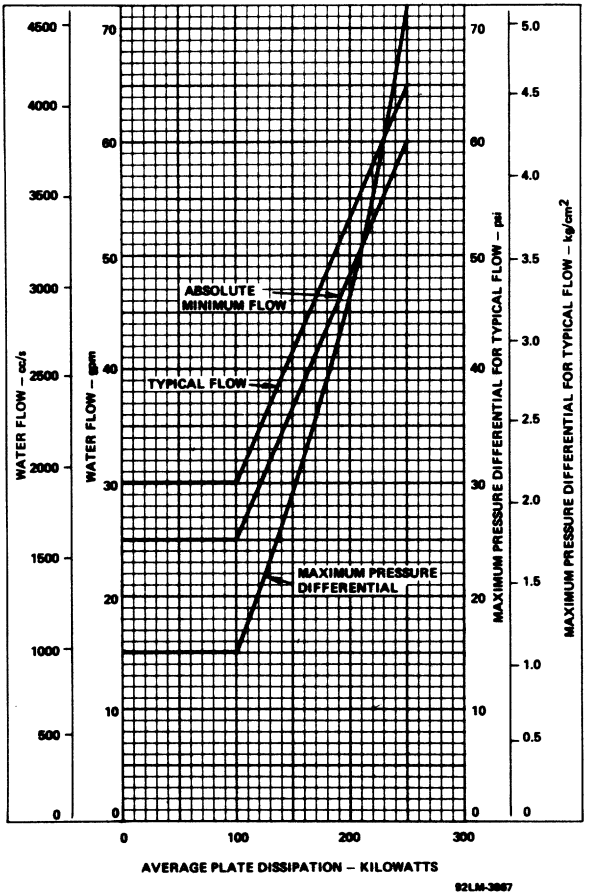
Tabulated Dimensions for Dimensional Outline

Dimension	Inches	Millimeters	Degrees
A	26.0 max.	660 max.	
B	18.5 max.	470 max.	
C	4.84 ± .02	122.94 ± .51	
D Dia.	11.65 max.	295.9 max.	
E	1.07 ± .03	27.18 ± .76	
F	0.52 ± .01	13.21 ± .25	
G	0.42 ± .01	10.67 ± .25	
H	8.35 ± .10	212.1 ± 2.5	
J Dia.	5.50 ± .01	139.70 ± .25	
K Dia.	5.12 ± .10	130.0 ± 2.5	
L Dia.	5.25 ± .01	133.35 ± .25	
M Dia.	9.10 ± .08	231.1 ± 2.0	
N	–	–	72° ± 3°
P Dia.	6.30 max.	160.0 max.	
Q Dia.	10.90 min.	276.9 min.	
R Dia.	3.30 max.	83.9 max.	
S Dia.	2.319 ± .012	58.90 ± .30	
T Dia.	1.725 ± .015	43.82 ± .38	
U	4.50 ± .02	114.30 ± .51	
V	0.24 min.	6.1 min.	
W	1.47 ± .06	37.3 ± 1.5	
X	0.63 ± .06	16.00 ± 1.52	
Y	0.46 ± .06	11.68 ± 1.52	
Z	0.22 ± .02	5.59 ± .51	
AA	2.00 ± .05	50.8 ± 1.3	
AB	1.50 ± .04	38.10 ± 1.02	
AC	0.25 ± .02	6.35 ± .51	
AD Dia.	1.62 ± .02	41.15 ± .51	
AE Dia.	1.74 ± .02	44.20 ± .51	
AF	0.62 ± .10	15.7 ± 2.5	
AG	0.75 ± .05	19.0 ± 1.3	
AH	0.45 max.	11.4 max.	
AJ			72° ± 5°

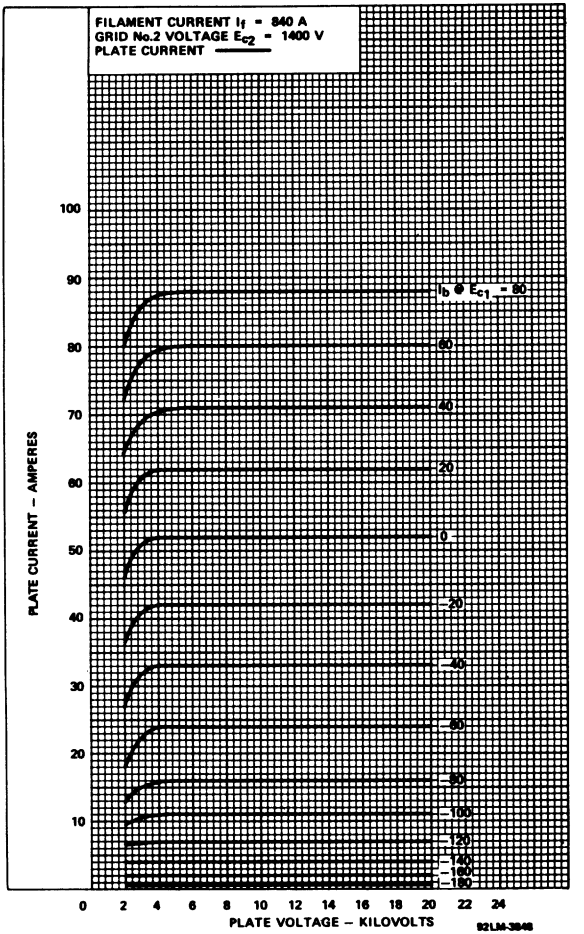
COOLING CHARACTERISTICS (Type 4647)



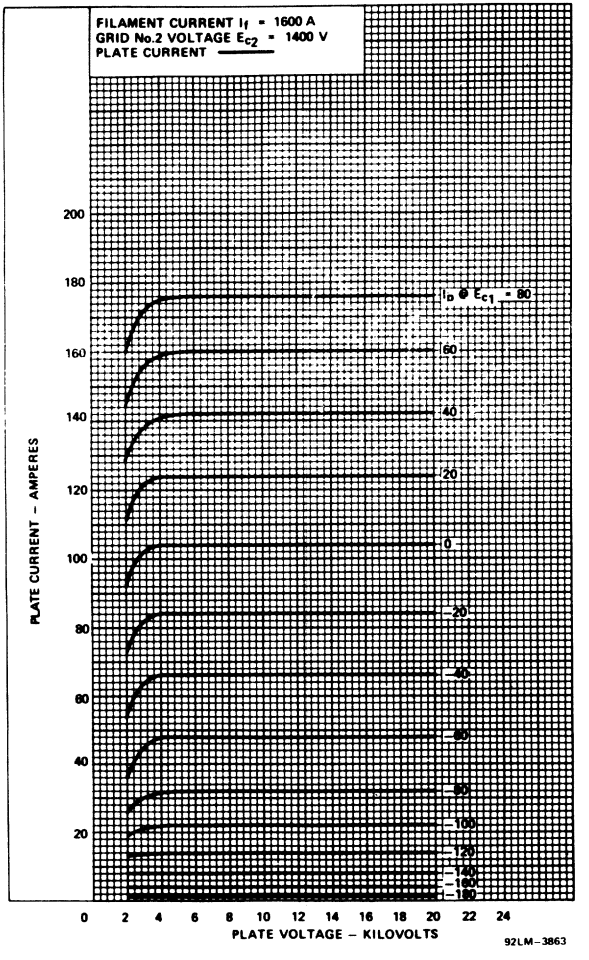
COOLING CHARACTERISTICS (Type 4648)



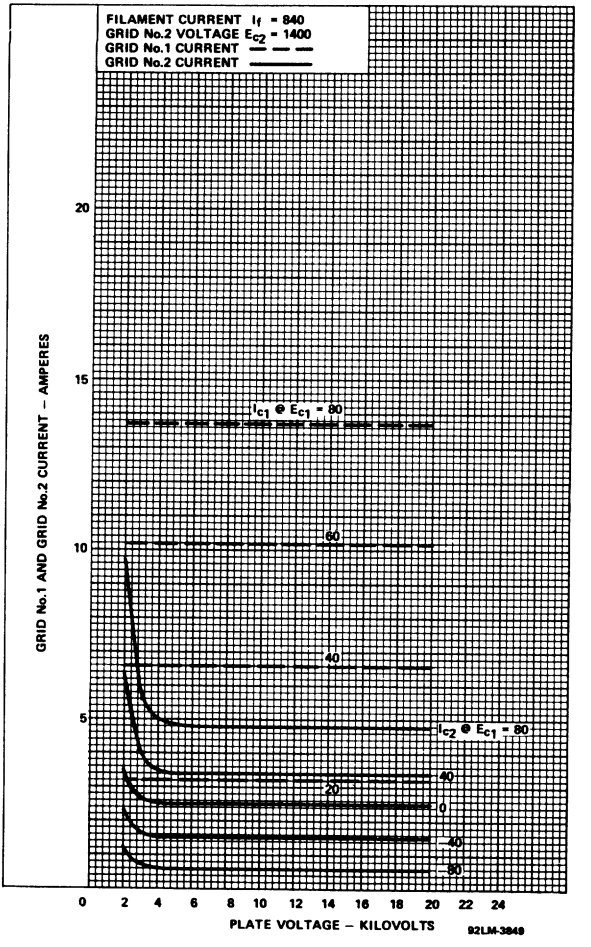
TYPICAL PLATE CHARACTERISTICS (E_{c_2} = 1400 V)
(Type 4647)



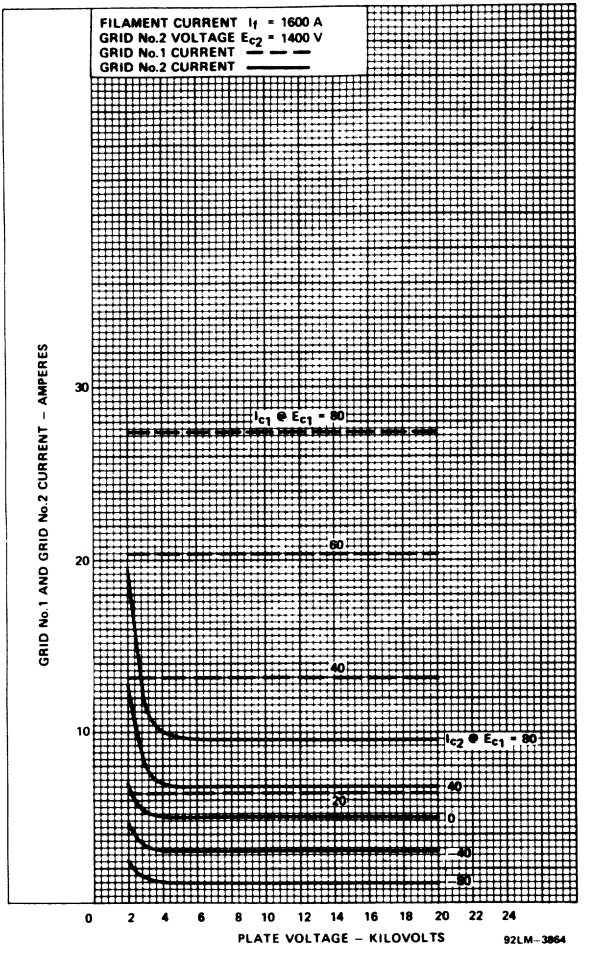
TYPICAL PLATE CHARACTERISTICS (E_{c_2} = 1400 V) (Type 4648)



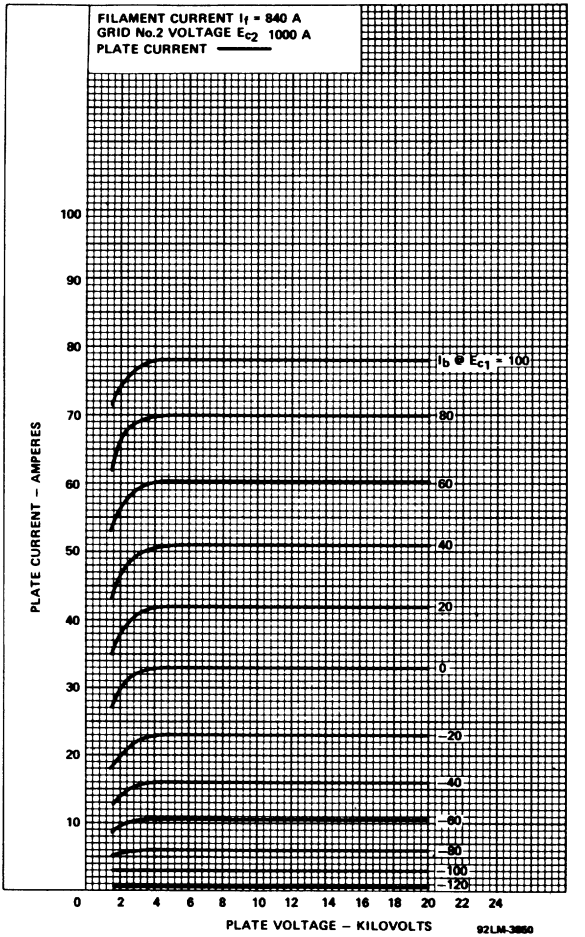
TYPICAL CHARACTERISTICS (E_{c_2} = 1400 V)
(Type 4647)



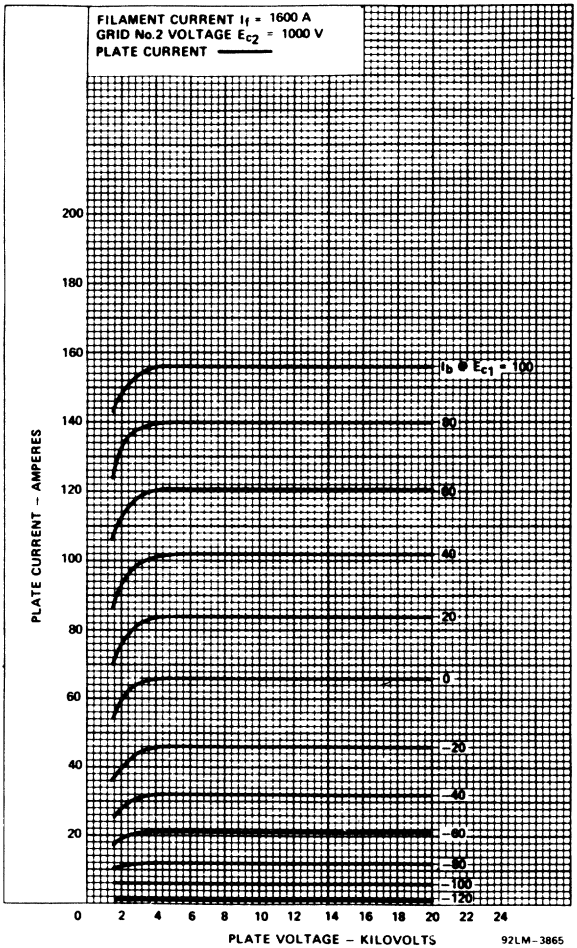
TYPICAL CHARACTERISTICS (E_{c_2} = 1400 V)
(Type 4748)



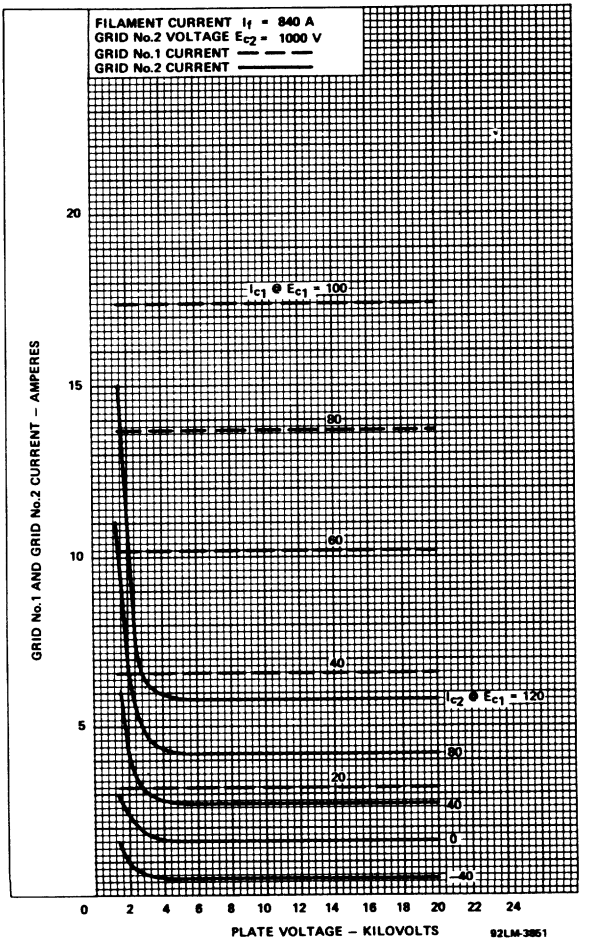
TYPICAL PLATE CHARACTERISTIC (E_{c_2} = 1000 V)
(Type 4647)



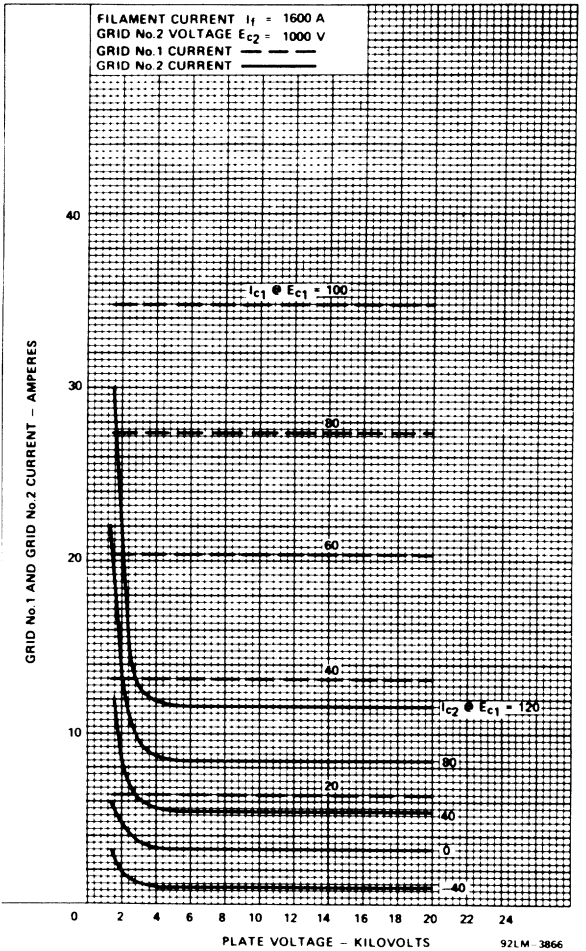
TYPICAL PLATE CHARACTERISTIC (E_{c_2} = 1000 V)
(Type 4648)



TYPICAL CHARACTERISTICS (E_{c_2} = 1000 V)
(Type 4647)



TYPICAL CHARACTERISTICS (E_{c_2} = 1000 V)
(Type 4648)



4651

Beam Power Tube

CERMOLOX

Ruggedized — **Full Input to 400 MHz**

1000 Watts PEP Output — **Matrix Cathode**

37 dB Open-Loop Third Order Distortion

ELECTRICAL

Heater-Cathode:		
Type	Unipotential, Oxide Coated, Matrix	
Voltage (ac or dc)	5.5 typ.-5.8 max.	V
Current at 5.5 V	17.3	A
Surge Current (RMS) (Under any conditions)	50 max.	A
Minimum Heating Time	180	s
Mu Factor (Grid No.1 to Grid No.2)	7	

MAXIMUM CCS RATINGS, Absolute-Maximum Values:

	Up to 400 MHz	
DC Plate Voltage	3500 max.	V
DC Grid-No.2 Voltage	1000 max.	V
DC Plate Current at Peak of Envelope	1.25 max.	A
Grid-No.2 Input	50 max.	W
Plate Dissipation	1.5 max.	kW

MECHANICAL

Operating Position	Any
Weight (Approx.)	2 lb (0.9 kg)

THERMAL[a]

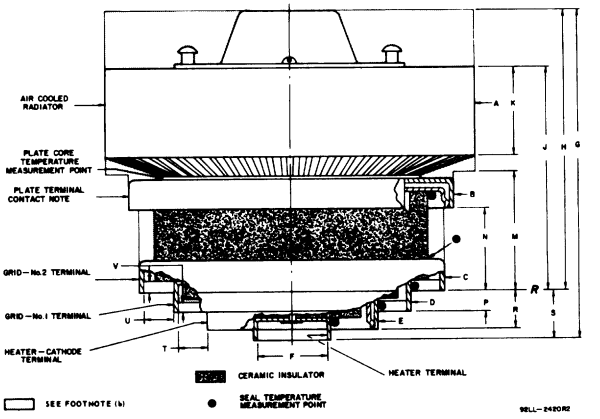
Seal Temperature (Plate, Grid No.1, Grid No.2 Cathode-Heater, and Heater)	250 max.	°C
Plate-Core Temperature	250 max.	°C

[a] See *Dimensional Outline* for temperature measurement points.

[b] Keep all strippled regions clear. Do not allow contacts or circuit components to protrude into these annular regions.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, N.J. 07029.

DIMENSIONAL OUTLINE



DIMENSION	INCHES	MILLIMETERS
A Dia.	3.72 ±.03	94.49 ±.76
B Dia.	3.210 Min.	81.54 Min.
C Dia.	3.010 Min.	76.45 Min.
D Dia.	2.307 Min.	58.60 Min.
E Dia.	1.710 Min.	43.41 Min.
F Dia.	0.725 Max.	18.41 Max.
G	3.24 ±.10	82.3 ±2.5
H	2.78 ±.07	70.61 ±1.78
J	2.19 ±.04	55.63 ±1.02
K	0.85 Min.	21.59 Min.
M	1.160 $^{+.005}_{-.000}$	29.464 $^{+.127}_{-.000}$
N	0.82 ±.03	20.83 ±.76
P	0.200 ±.025	5.08 ±.63
R	0.37 ±.03	9.40 ±.76
S	0.46 ±.03	11.68 ±.76
T	0.200 Min.	5.08 Min.
U	0.250 Min.	6.35 Min.
V	0.105 Min.	2.66 Min.

4652/8042

Beam Power Tube

Quick-Heating Filament **High Power Sensitivity**

90 Watts CW Input (ICAS) up to 60 MHz
60 Watts CW Input (ICAS) at 175 MHz
For use as an rf power amplifier in communications equipment

ELECTRICAL

Filament, Coated:		
Voltage (AC or DC)	1.6 ± 10%	V
Current at 1.6 volts	3.2	A
Heating time	1	s
Transconductance[a]	6000	μmho
Mu-Factor[a], Grid No.2 to Grid No.1	4	
Direct Interelectrode Capacitances:		
Grid No.1 to plate	0.24 max.	pF
Grid No.1 to filament & grid No.3 & internal shield, base sleeve and grid No.2	11	pF
Plate to filament & grid No.3 & internal shield, base sleeve and grid No.2	8.5	pF

MECHANICAL

Operating Position	Vertical, or horizontal with plane of pins 3 and 7 vertical
Maximum Overall Length	3-13/16"
Seated Length	3-1/8" ± 1/8"
Maximum Diameter	1-21/32"
Bulb	T-12
Cap	Small (JEDEC No.C1-1)
Base	Small wafer octal 8-pin with sleeve (JEDEC Group 1, No.B8-150)
Bulb Temperature (At hottest point)	220 max. °C

RF POWER AMPLIFIER & OSC. – CLASS C TELEGRAPHY[b]
AND
RF POWER AMPLIFIER – CLASS C FM TELEGRAPHY

Maximum ICAS Ratings, *Absolute-Maximum Values:*

	Up to 60 MHz	
DC Plate Voltage	750 max.	V
DC Grid-No.2 Voltage	250 max.	V

DC Grid-No.1 Voltage	-150 max.	V
DC Plate Current	150 max.	mA
DC Grid-No.1 Current	4 max.	mA
Plate Input	90 max.	W
Grid-No.2 Input	3 max.	W
Plate Dissipation	25 max.	W

Typical Operation as Amplifier at 175 MHz

DC Plate Voltage	400	V
DC Grid-No.2 Voltage[c]	190	V
From a series resistor of	18000	Ω
DC Grid-No.1 Voltage[d]	-60	V
From a grid resistor of	30000	Ω
DC Plate Current	150	mA
DC Grid-No.2 Current	11	mA
DC Grid-No.1 Current (Approx.)	2	mA
Driving Power (Approx.)	4.5	W
Power Output (Approx.)	30	W

Maximum Circuit Values:

Grid-No.1 Circuit Resistance	30000 max.	Ω

[a] For plate volts = 200 V, grid No.2 volts = 200 V, and plate current = 100 mA.

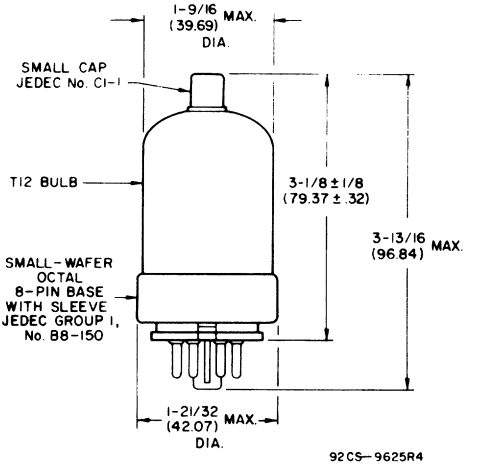
The following footnotes apply to the *RCA Transmitting Tube Operating Considerations* given at front of this section.

[b] See *Classes of Service*.

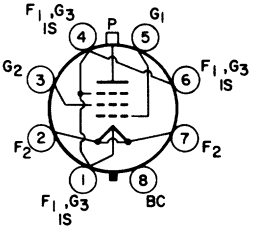
[c] See *Electrical Considerations* - Grid-No.2 Voltage Supply.

[d] See *Electrical Considerations* - Grid-No.1 Voltage Supply.

DIMENSIONAL OUTLINE – Dimensions In Inches (mm)



TERMINAL DIAGRAM (Bottom View)



Pin 1: Filament 1, Grid No.3, Internal Shield
Pin 2: Filament 2
Pin 3: Grid No.2
Pin 4: Same as Pin No.1
Pin 5: Grid No.1
Pin 6: Same as Pin No.1
Pin 7: Filament 2
Pin 8: Base Sleeve
Cap: Plate

4658

C Band Klystron

- Gang Tuned Cavities
- Air Cooled
- High Efficiency
- High Power Gain
- Compact
- Sturdy

Frequency	4.4 to 5.0 GHz

ELECTRICAL

Cathode	Indirectly-heated Tungsten Dispenser Cathode	
Filament:		
Voltage	6.5 ± 0.5	V
Current at 6.5 V	7.6	A
Maximum current	8.2	A
Warmup time (min.)	180	s

MECHANICAL

Mounting Position		Any
Length (max.)	(393 mm) 15.5	in
Width (max.)	(267 mm) 10.5	in
Weight (approx.)	(17.2 kg) 38	lb
In commercial pack	(18.1 kg) 40	lb
In military pack	(22.5 kg) 50	lb

THERMAL

Collector Temperature (max.)	260	°C
Body Temperature (max.)	150	°C
Tuner Fin Temperature (max.)	150	°C
Electron Gun Potting		
Insulation temperature (max.)	250	°C
Storage temperature (min.)	-65	°C

Cooling

Forced air flow across the collector, body, and tuner, is required. Typical air requirements for operation with 20° C ambient air temperature at sea level are:

	Min Req Air Flow lb/min	kg/min	Max Press-Drop in H_2O	cm H_2O
Collector	7.5	3.4	2.0	5.1
Body & Tuners	0.85	0.38	0.75	1.9

PERFORMANCE

Maximum CW Ratings, Absolute-Maximum Values:

DC Beam Voltage	8.5	kV
DC Beam Current	600	mA
DC Body Current	60	mA
Surge Current	25	A
Load VSWR	2.0:1	
Input VSWR	2.0:1	

Typical CW Operation:

High Efficiency Tuned

Frequency	**4.4 GHz**	**5.0 GHz**	
DC Beam Voltage	7.5	7.5	kV
DC Beam Current	490	490	mA

High Efficiency Tuned

Frequency	**4.4 GHz**	**5.0 GHz**	
DC Body Current	10.0	10.0	mA
RF Power Output	1.45	1.30	kW
Bandwidth (3 dB)	8.0	10.0	MHz
Efficiency	39.0	35.0	%
Gain	44.0	44.0	dB
Drive	50.0	50.0	mW
Load VSWR	1.05:1	1.05:1	–
Input VSWR	1.3:1	1.3:1	–

High Gain Tuned

Frequency	**4.4 GHz**	**5.0 GHz**	
DC Beam Voltage	7.5	7.5	kV
DC Beam Current	490	490	mA
DC Body Current	10.0	10.0	mA
RF Power Output	1.30	1.15	kW
Bandwidth (3 dB)	6.0	8.0	MHz
Efficiency	35.0	31.0	%
Gain	51.0	51.0	dB
Drive	10.0	10.0	mW
Load VSWR	1.05:1	1.05:1	–
Input VSWR	1.3:1	1.3:1	–

Broadband Tuned

Frequency	4.4 GHz	5.0 GHz	
DC Beam Voltage	7.5	7.5	kV
DC Beam Current	490	490	mA
DC Body Current	10.0	10.0	mA
RF Power Output	1.35	1.25	kW
Bandwidth (3 dB)	13.0	19.0	MHz
Efficiency	36.0	33.0	%
Gain	41.0	41.0	dB
Drive	100.0	100.0	mW
Load VSWR	1.05:1	1.05:1	–
Input VSWR	1.3:1	1.3:1	–

GENERAL INFORMATION

Installation and Operation

No installation or operation should be attempted without first consulting the Installation and Operating Instructions shipped with each tube or available on request from Super Power Marketing, RCA, Lancaster, PA.

RCA reference publications required for the installation and operation of this device include the following:

Data Sheet – RCA-4658
Application Note AN 4213
Application Guide 1CE-279A

These publications are available as a complete packet – request PWR 543 "Applications Information for the RCA-4658 klystron."

Personnel Safety

The high voltages and microwave radiations from this device can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals shielded.

Packaging

Two types of packaging are available with these tubes; Commercial Pack and Military Pack. The customer specifies the desired type.

The Commercial Pack is made of nesting carboard cartons with the inner carton shock-mounted. The Military Pack complies with MIL-S-4473C for air shipment. It uses a hermetically-sealed metal container which protects the tube and serves to shield the area surrounding the pack from stray magnetic fields set up by the klystron focusing magnet.

In shipment, the tube is enclosed in a polyethylene bag to prevent dust and other particles from collecting in the waveguide or tuning system. It is recommended that the tube be stored in the bag and in the shipping container when not in use. Dust or other unwanted particles in the waveguide can cause arcing during operation and subsequent tube destruction.

Cooling

Air ducts must be provided to connect to the top of the collector and the tuner cooling duct. See Outline Drawing.

Mounting

Four holes are provided in the gun-end of the focusing magnet for mounting purposes. Only non-magnetic studs should be used.

Thermocouple

A thermocouple mounted on the collector provides a signal output for excessive collector temperature. This output is used to operate protective circuitry.

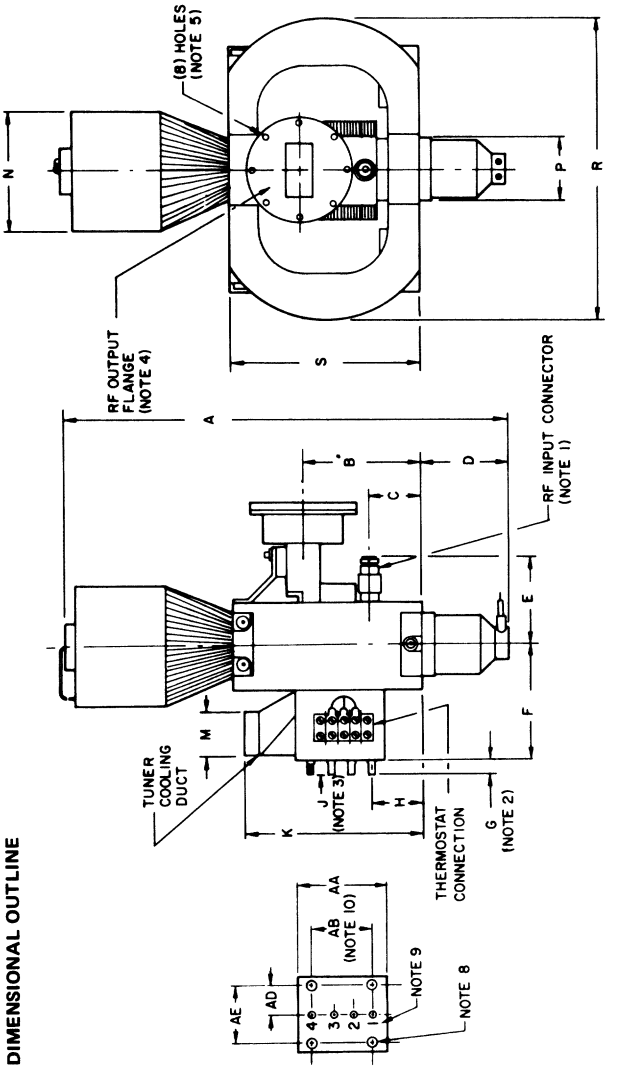
Tuning

Tuning is accomplished by a single knob which "gang-tunes" all four cavities simultaneously. The second, third and output cavities may be individually trimmed for optimizing the tube performance at any frequency within the tube operating band. See Outline Drawing.

Protection Circuits

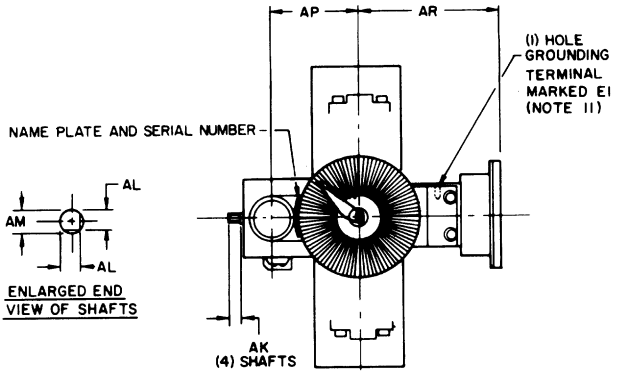
Protection circuits serve a threefold purpose: safety of personnel, protection of the tube and protection of tube circuits. Consult Application Guide 1CE-279A for complete information on protection circuits.

DIMENSIONAL OUTLINE

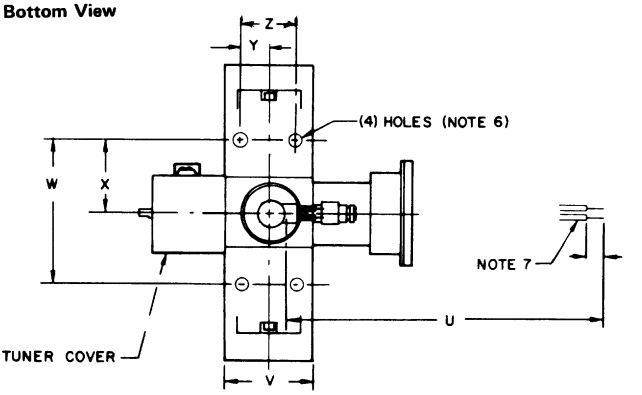


DIMENSIONAL OUTLINE

(Top View)



Bottom View



TABULATED DIMENSIONS for the Outline Drawing

Dimension Reference	Specified Values Inches	Millimeters
A	15.5 max.	393.7 max.
B	4.06 ±.12	103.1 ±3.0
C	1.80 ±.12	45.7 ±3.0
D	3.5 max.	88.9 max.
E	3.00 ±.06	76.2 ±1.5
F	3.80 ±.12	96.5 ±3.0

TABULATED DIMENSIONS (Cont'd)

G	0.68 ± .05	17.3 ± 1.3
H	1.80 ± .09	45.7 ± 2.3
J	0.68 +.15 -.10	17.3 +3.8 -2.5
K	6.25 max.	158.8 max.
M	1.50 ± .03	38.1 ± .8
N Dia.	4.12 ± .03	101.6 ± .8
P Dia.	2.130 ± .015	54.10 ± .38
R	10.5 max.	266.7 max.
S	6.5 ± .5	165.0 ± 13.0
T	0.50 ± .12	12.7 ± 3.0
U	15.00 ± .25	381.0 ± 6.0
V	3.25 max.	82.55 max.
W	5.00 ± .06	127.0 ± 1.5
X	2.50 ± .06	63.5 ± 1.5
Y	1.00 ± .06	25.4 ± 1.5
Z	2.00 ± .06	50.8 ± 1.5
AA	3.00 ± .06	76.2 ± 1.5
AB	2.10 ± .02	53.34 ± .51
AD	1.00 ± .03	25.4 ± .8
AE	2.00 ± .03	50.8 ± .8
AK	0.440 ± .010	11.18 ± .25
AL	0.230 ± .005	5.84 ± .13
AM Dia.	0.249 ± .002	6.325 ± .051
AP	3.00 ± .06	76.2 ± 1.5
AR	4.75 ± .12	120.6 ± 3.0

NOTES FOR OUTLINE DRAWINGS

1. Mates with Type "N" Connector UG-21 B/U or equivalent.
2. Dimension applies to Shaft No.1 only.
3. Dimension applies to Shafts No,'s 2, 3, and 4 only.
4. Mates with UG-149 A/U or equivalent.
5. Holes 10-32 UNF-2B equally spaced on 3.250" ± .032" (82.6 ± .8 mm) dia. circle.
6. Holes 0.437" ± .062" (11.1 ± 1.6 mm) thru (One side only).

7. High-Voltage Lead Designation
   Heater Lead – Yellow
   Heater-Cathode Lead – White

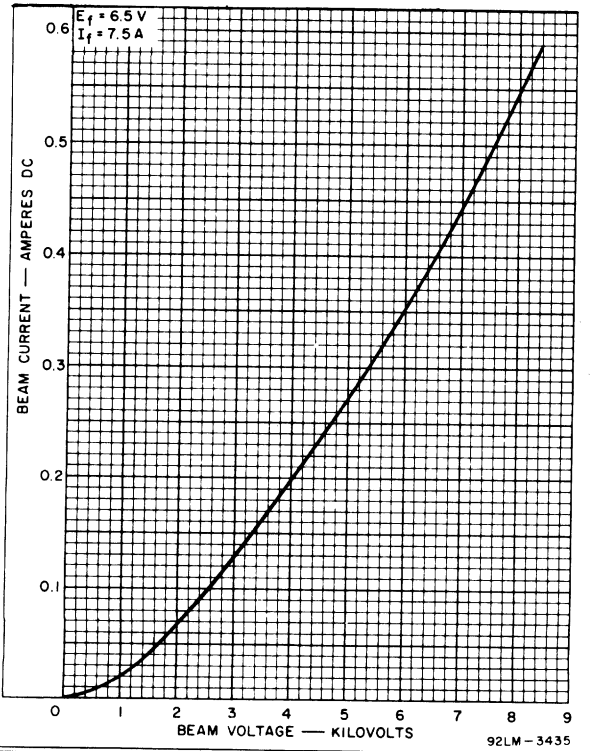
8. Thru-holes checked with gauge.

9. Three spaces between shafts are 0.70" ± .03" (17.8 ± .8 mm) and add to 2.100" (53.34 mm). Shafts are numbered as shown.

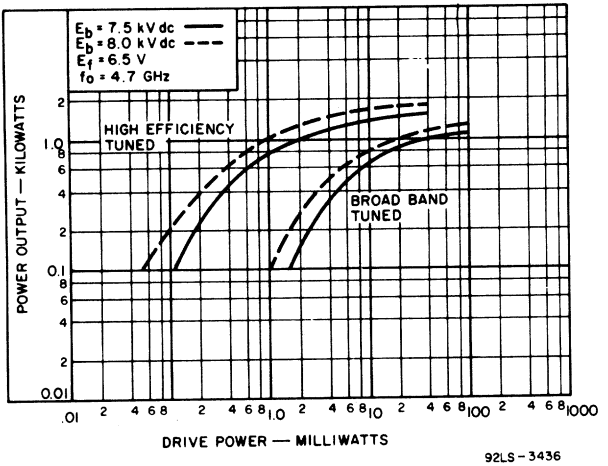
10. Tolerance for this dimension applies to location of four 0.201" (5.11 mm) holes.

11. Hole #6-32 UNC-2B, 0.25" (6.35 mm) minimum depth.

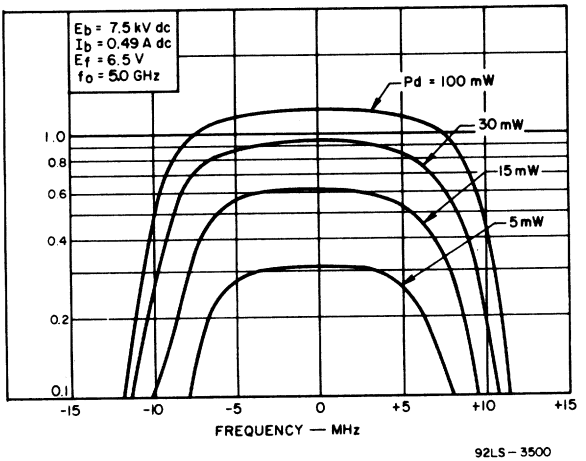
BEAM CURRENT CHARACTERISTIC CURVE



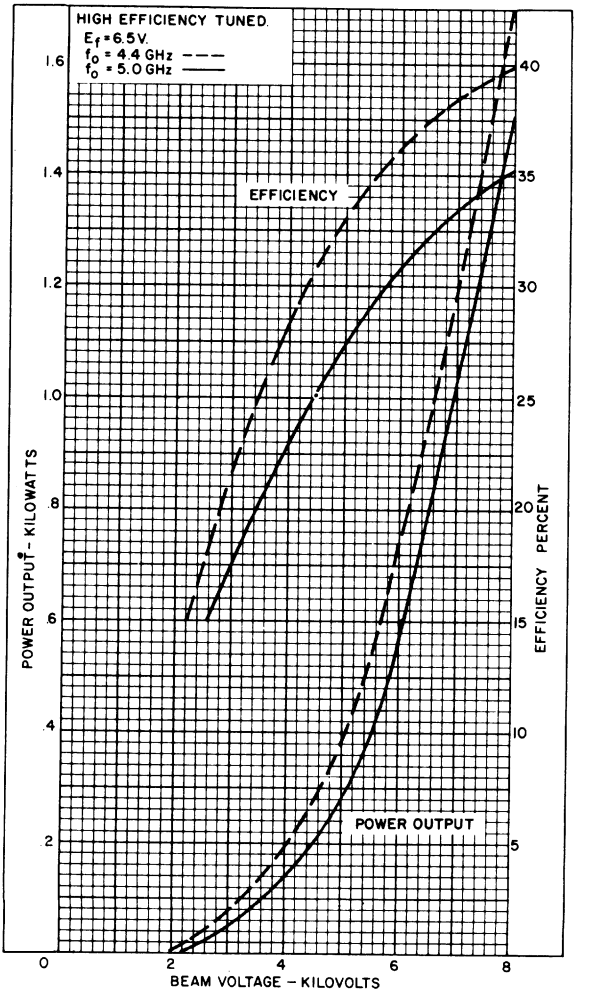
GAIN CHARACTERISTIC CURVE



BANDWIDTH CHARACTERISTIC CURVE



OUTPUT CHARACTERISTIC CURVE



92LM-3357

4659, 4660

C Band Klystrons

5.0 Kilowatts Pulsed Power Output
High Efficiency – High Power Gain
Compact – Sturdy
Gang-Tuned Cavities
Air Cooled

ELECTRICAL

Cathode . . . . . Indirectly-Heated Tungsten Dispenser Cathode

Filament

Voltage	6.5 ± 0.5 V
Current (at 6.5 V)	7.6 A
Current (maximum)	8.2 A
Warm-Up Time	180 s

MECHANICAL

Mounting Position		Any
Length (maximum)	(393 mm)	15.5 in
Width (maximum)	(267 mm)	10.5 in
Weight (approx.)		
Uncrated	(17.2 kg)	38 lb
In commercial pack	(18.1 kg)	40 lb
In military pack	(22.5 kg)	50 lb

THERMAL

Collector Temperature (maximum)	260 °C
Body Temperature (maximum)	150 °C
Tuner Fin Temperature (maximum)	150 °C
Electron Gun Temperature	
Insulation (maximum)	250 °C
Storage (minimum)	-65 °C

Cooling: Forced air flow across the collector, body and tuner is required.
Typical air-flow requirements
(20° C at sea level pressure)

	Min. Air Flow		Max. Press Drop	
	lbs/min.	kg/min.	in H_2O	cm H_2O
Collector . .	7.5	3.4	2.0	5.1
Body and Tuner	0.85	0.38	0.75	1.9

Typical Rating as a Pulsed RF Amplifier

MAXIMUM RATINGS, *Absolute-Maximum Values:*		
Pulsed Beam Voltage	14.0 max.	kV
Pulsed Beam Current	1.6 max.	A
Pulse Width	500	μsec
Duty	0.2	%

TYPICAL PULSED OPERATION		
Frequency	4.7	GHz
Pulsed Beam Voltage	12.0	kV
Pulsed Beam Current	1.4	A
Pulsed Power Output*	5.0	kW
Power Gain	50.0	dB
Efficiency	30.0	%
Pulse Width	5.0	μsec
Duty	0.2	%

*A waveguide transformer was used to optimize the power output at the stated frequency

GENERAL INFORMATION

Installation and Operation

No installation or operation should be attempted prior to consulting the Installation and Operating instructions shipped with each tube or available upon request from Super Power Tube Marketing, RCA Lancaster, PA 17604.

RCA reference publications helpful for installation and operation include the following:

Data Sheet – RCA 4659, RCA 4660
Application Note – AN 4213
Application Guide – 1CE-279

These publications are available as complete packets–
Request PWR-544, "Application Information for the RCA 4569 Klystron."
Request PWR-545, "Application Information for the RCA 4660 Klystron."

Personnel Safety

The high voltages and microwave radiations from these devices can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals shielded.

These devices, in operation, may produce X-Radiation which can constitute a health hazard. Shielding or other precautions may be required.

Packaging

Two types of packaging are available with these tubes; Commercial Pack and Military Pack. The customer specifies the desired type.

The Commercial Pack is made of nesting, cardboard cartons with the inner carton shock-mounted. The Military Pack complies with MIL-S-4473C for air shipment. It uses an hermetically-sealed, metal container which protects the tube and serves to shield the surrounding area from stray magnetic fields set up by the klystron focusing magnet.

During shipment, the tube is enclosed in a polyethylene bag to prevent dust and other particles from collecting in the waveguide or tuning systems. It is recommended that the tube be stored in the bag and in the shipping container when not in use. Dust or other unwanted particles in the waveguide can cause arcing during operation and subsequent tube destruction.

Cooling

Air ducts must be provided to connect to the top of the collector and the tuner cooling duct. See the Outline Drawing.

Mounting

Four holes are provided in the gun end of the focusing magnet for mounting purposes. Only non-magnetic studs should be used.

Thermocouple

A thermocouple, mounted on the collector, provides a signal which will indicate excessive collector temperature. This output can be used to operate protective circuitry.

Tuning

Tuning is accomplished by a single knob which gang tunes all four cavities simultaneously. The second, third and output cavities may be individually trimmed for optimizing the tube performance at any frequency within the tube operating band. See Outline Drawing.

Protection Circuits

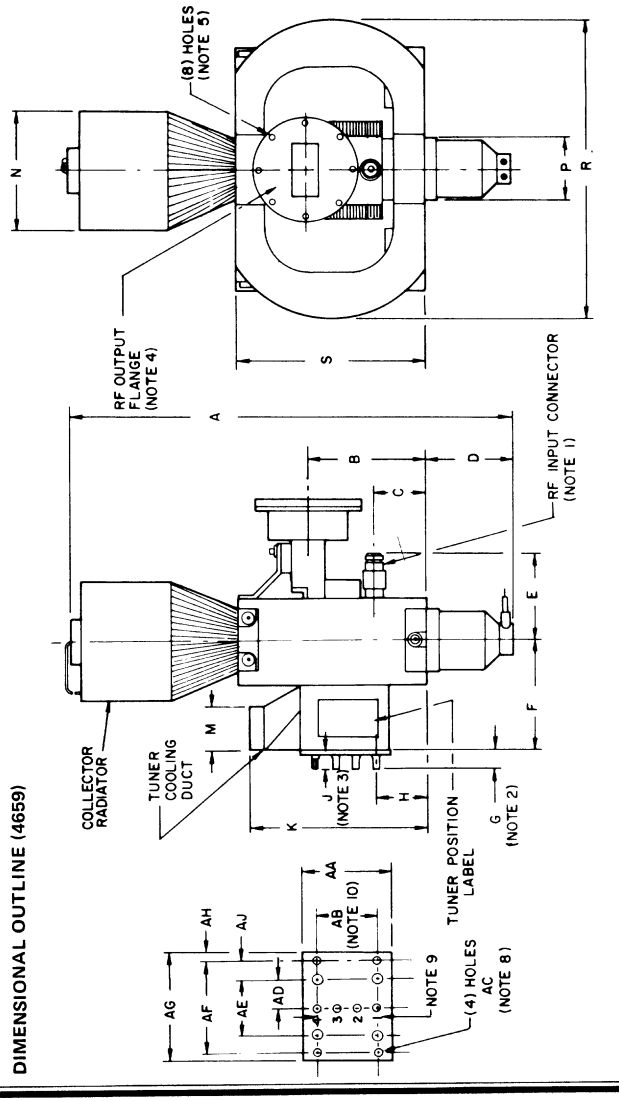
Protection circuits serve a three fold purpose: safety of personnel, protection of the tube, and protection of the circuits. Consult "Application Guide" 1CE-279 for complete information on protection circuits.

NOTES FOR OUTLINE DRAWINGS (BOTH TYPES)

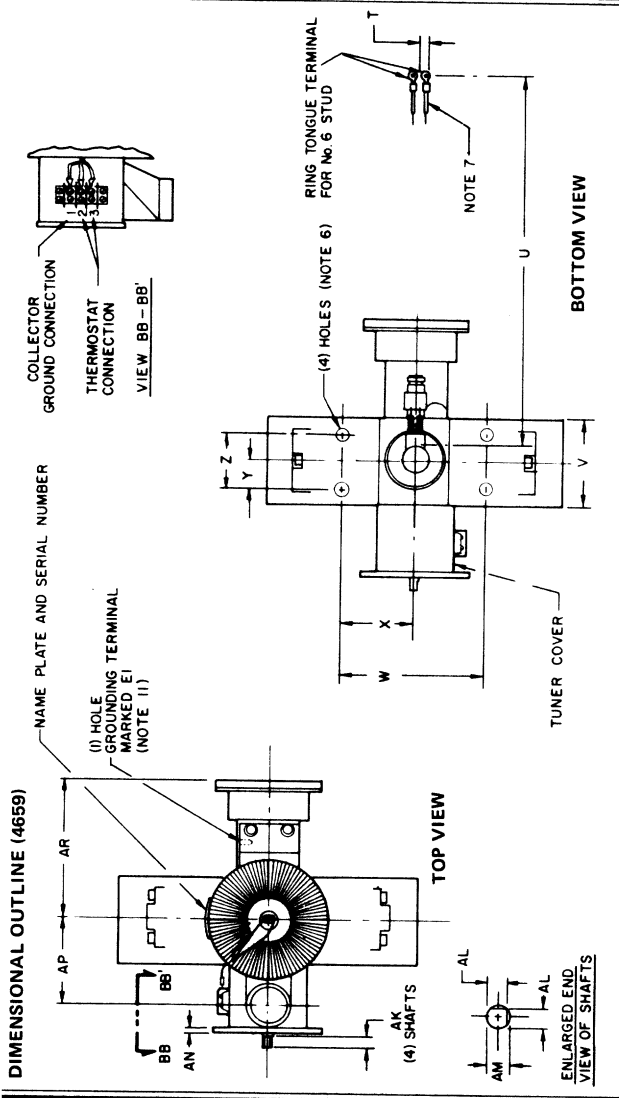
1. Mates with Type "N" Connector UG-21 B/U or equivalent.
2. Dimension applies to Shaft No.1 only.
3. Dimension applies to Shafts No.'s 2, 3, and 4 only.
4. Mates with UG-149 A/U or equivalent.
5. Holes 10-32 UNF-2B equally spaced on 3.250" ± .032" (82.6 ± .8 mm) dia. circle.
6. Holes 0.437" ± .062" (11.1 ± 1.6 mm) thru (One side only).
7. High-Voltage Lead Designation
   Heater Lead – Yellow
   Heater-Cathode Lead – White
8. Thru-holes checked with gauge.
9. Three spaces between shafts are 0.70" ± .03" (17.8 ± .8 mm) and add to 2.100" (53.34 mm). Shafts are numbered as shown.
10. Tolerance for this dimension applies to location of four 0.201" (5.11 mm) holes.
11. Hole #6-32 UNC-2B, 0.25" (6.35 mm) minimum depth.

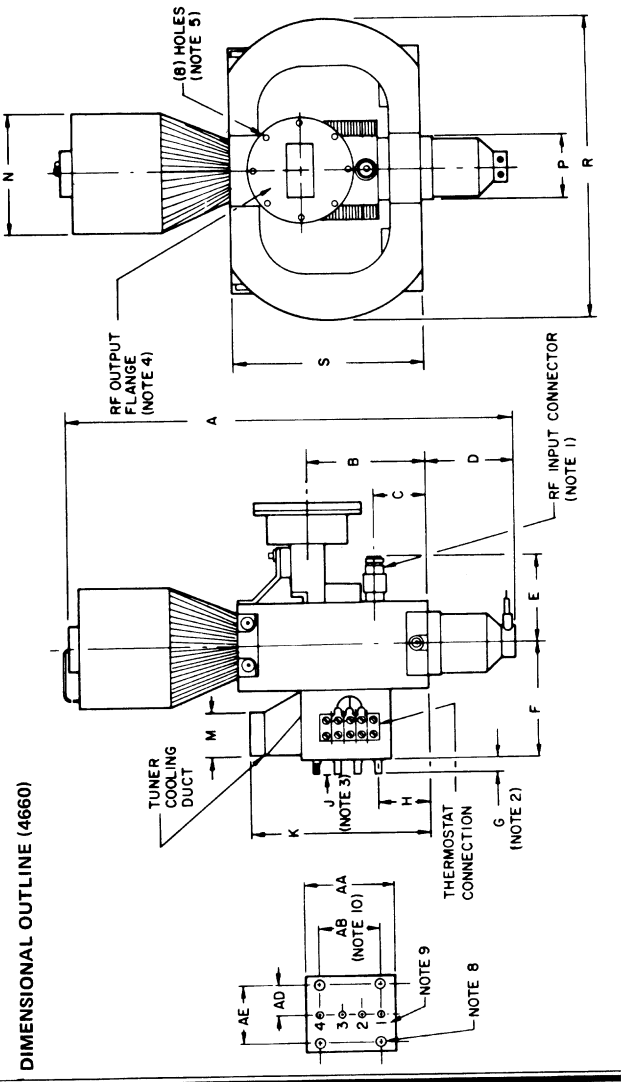
TABULATED DIMENSIONS FOR THE OUTLINE DRAWING (4659)

Dimension Reference	Specified Values Inches	Millimeters
A	15.5 max.	393.7 max.
B	4.06 ± .12	103.1 ± 3.0
C	1.80 ± .12	45.7 ± 3.0
D	3.5 max.	88.9 max.
E	3.00 ± .06	76.2 ± 1.5
F	3.80 ± .12	96.5 ± 3.0
G	0.68 ± .05	17.3 ± 1.3
H	1.80 ± .09	45.7 ± 2.3
J	$0.68^{+.15}_{.10}$	$17.3^{+3.8}_{-2.5}$
K	6.25 max.	158.8 max.
M	1.50 ± .03	38.1 ± .8
N Dia.	4.12 ± .03	101.6 ± .8
P Dia.	2.130 ± .015	54.10 ± .38
R	10.5 max.	266.7 max.
S	6.5 ± .5	165 ± 13.0
T Dia.	0.250 ±.015	6.35 ± .38
U	13.50 ± .25	343.0 ± 6.0
V	3.25 max.	82.55 max.
W	5.00 ± .06	127.0 ± 1.5
X	2.50 ± .06	63.5 ± 1.5
Y	1.00 ± .06	25.4 ± 1.5
Z	2.00 ± .06	50.8 ± 1.5
AA	3.00 ± .06	76.2 ± 1.5
AB	2.10 ± .02	53.34 ± .51
AC	0.201 ± .010	5.11 ± .25
AD	1.00 ± .03	25.4 ± .8
AE	2.00 ± .03	50.8 ± .8
AF	3.25 ± .02	82.55 ± .51
AG	3.75 ± .03	95.3 ± .8
AH	0.25 ± .03	6.4 ± .8
AJ	0.62 ± .03	15.8 ± .8
AK	0.440 ± .010	11.18 ± .25
AL	0.230 ± .005	5.84 ± .13
AM Dia.	0.249 ± .002	6.325 ± .051
AN	0.125 ± .030	3.2 ± .8
AP	3.00 ± .06	76.2 ± 1.5
AR	4.75 ± .12	120.6 ± 3.0

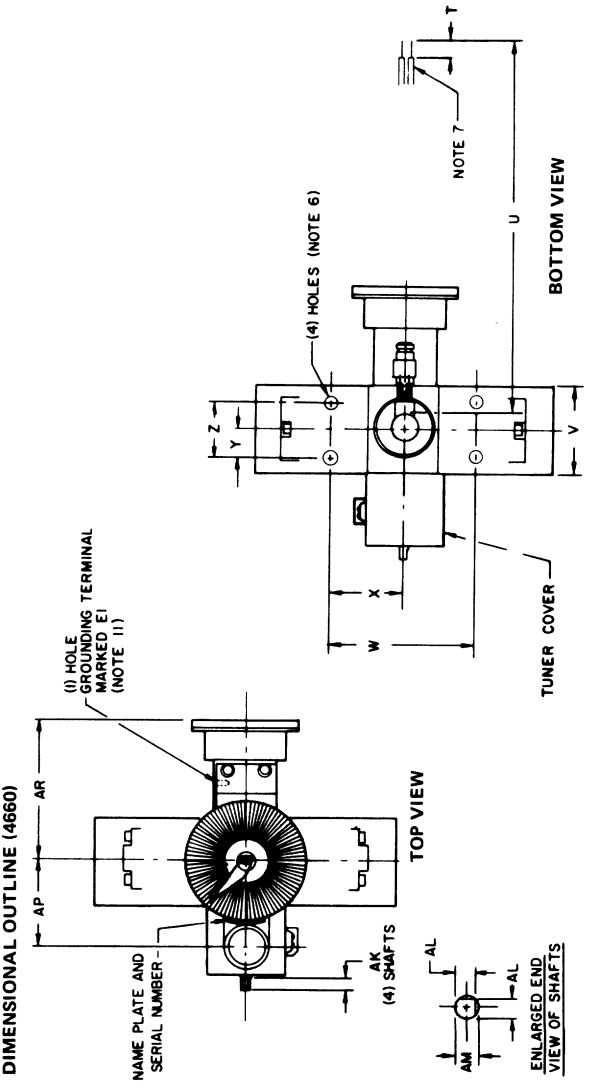


DIMENSIONAL OUTLINE (4659)


DIMENSIONAL OUTLINE (4659)
NAME PLATE AND SERIAL NUMBER
(1) HOLE GROUNDING TERMINAL MARKED E1 (NOTE 11)
AR
AP
BB'
BB
AN
AK
(4) SHAFTS
TOP VIEW
AL
AM
ENLARGED END VIEW OF SHAFTS
COLLECTOR GROUND CONNECTION
THERMOSTAT CONNECTION
VIEW BB-BB'
(4) HOLES (NOTE 6)
RING TONGUE TERMINAL FOR No. 6 STUD
NOTE 7
T
U
Z
Y
V
X
W
TUNER COVER
BOTTOM VIEW



DIMENSIONAL OUTLINE (4660)


DIMENSIONAL OUTLINE (4660)
AR
AP
(1) HOLE GROUNDING TERMINAL MARKED E1 (NOTE 11)
NAME PLATE AND SERIAL NUMBER
AK (4) SHAFTS
TOP VIEW
AL
AM
AL
ENLARGED END VIEW OF SHAFTS
(4) HOLES (NOTE 6)
Z
Y
X
W
U
V
T
NOTE 7
TUNER COVER
BOTTOM VIEW

TABULATED DIMENSIONS FOR THE OUTLINE DRAWING (4660)

Dimension Reference	Specified Values Inches	Millimeters
A	15.5 max.	393.7 max.
B	4.06 ± .12	103.1 ± 3.0
C	1.80 ± .12	45.7 ± 3.0
D	3.5 max.	88.9 max.
E	3.00 ± .06	76.2 ± 1.5
F	3.80 ± .12	96.5 ± 3.0
G	0.68 ± .05	17.3 ± 1.3
H	1.80 ± .09	45.7 ± 2.3
J	$0.68^{+.15}_{-.10}$	$17.3^{+3.8}_{-2.5}$
K	6.25 max.	158.8 max.
M	1.50 ± .03	38.1 ± .8
N Dia.	4.12 ± .03	101.6 ± .8
P Dia.	2.130 ± .015	54.10 ± .38
R	10.5 max.	266.7 max.
S	6.5 ± .5	165 ± 13.0
T	0.50 ± .12	12.7 ± 3.0
U	15.00 ± .25	381.0 ± 6.0
V	3.25 max.	82.55 max.
W	5.00 ± .06	127.0 ± 1.5
X	2.50 ± .06	63.5 ± 1.5
Y	1.00 ± .06	25.4 ± 1.5
Z	2.00 ± .06	50.8 ± 1.5
AA	3.00 ± .06	76.2 ± 1.5
AB	2.10 ± .02	53.34 ± .51
AD	1.00 ± .03	25.4 ± .8
AE	2.00 ± .03	50.8 ± .8
AK	0.440 ± .010	11.18 ± .25
AL	0.230 ± .005	5.84 ± .13
AM Dia.	0.249 ± .002	6.325 ± .051
AP	3.00 ± .06	76.2 ± 1.5
AR	4.75 ± .12	120.6 ± 3.0

5558

HALF-WAVE MERCURY-VAPOR RECTIFIER

GENERAL DATA

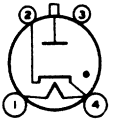
Electrical:

	Min.	Av.	Max.	
Heater, for Unipotential Cathode:				
Voltage	4.75	5.0	5.25	volts
Current at 5 volts	–	4.5	4.9	amp
Cathode:				
Heating Time, before tube conduction	5	–	–	minutes
Tube Voltage Drop	–	15	–	volts
Critical Anode Voltage	–	–	50	volts

Mechanical:

Mounting Position . . . . . Vertical, Base Down
Maximum Overall Length. . . . . 7"
Seated Length . . . . . 6-1/4" ± 1/4"
Maximum Diameter . . . . . 3"
Bulb ST-23
Cap . . . . . Medium (JETEC No. C1-5)
Base . . . . . Medium-Shell Small 4-Pin, Bayonet (JETEC No. A4-10)

BOTTOM VIEW



Pin 1 – Heater
Pin 2 – Cathode (Anode Return)
Pin 3 – No Conn.
Pin 4 – Heater, Cathode
Cap – Anode

Temperature Control:

Heating--When the ambient temperature is so low that the normal rise of condensed-mercury temperature above the ambient temperature will not bring the condensed-mercury temperature up to the minimum value of the operating ranges specified under *Maximum Ratings*, some form of heat-conserving enclosure or auxiliary heater will be required.

Cooling--When the operating conditions are such that the maximum value of the operating condensed-mercury temperature range is exceeded, provision should be made for forced-air cooling sufficient to prevent exceeding the maximum value.

Temperature Rise of Condensed Mercury to Equilibrium Above Ambient Temperature (Approx.):●

No Load	22 °C
Full Load	28 °C

● With heater volts = 4.75 and no heat-conserving enclosure.

←Indicates a change

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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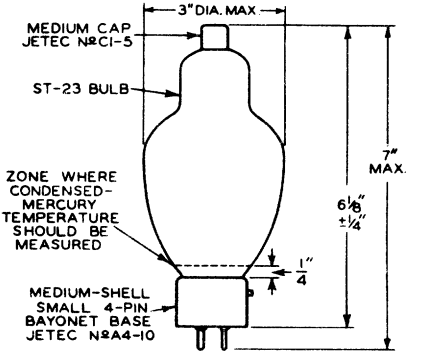
HALF-WAVE MERCURY-VAPOR RECTIFIER

HALF-WAVE RECTIFIER

Maximum Ratings, *Absolute Values: Up to 150 cps*

	Operating Condensed-Mercury Temperature Range		
	30° to 80°C	30° to 60°C	
PEAK INVERSE ANODE VOLTAGE	2000 max.	5000 max.	volts
CATHODE CURRENT:			
Peak	15 max.	15 max.	amp
Average■.	2.5 max.	2.5 max.	amp
Fault, for duration of 0.1 second max.	200 max.	200 max.	amp

■ Averaged over any interval of 15 seconds maximum.



92CS-6701R3

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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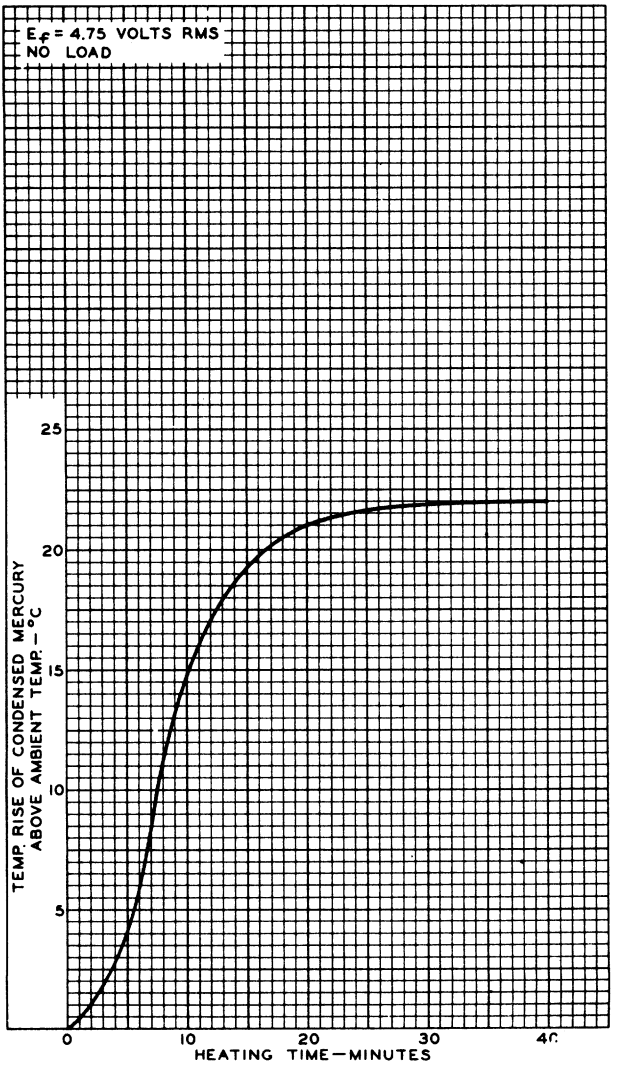
RATE OF RISE OF COND.-MERCURY TEMPERATURE



5561
HALF-WAVE MERCURY-VAPOR RECTIFIER

DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage*.	5	volts
Current	10	amp
Peak Voltage Drop(Approx.)	15	volts

Mechanical:

Mounting Position	Vertical, Base Down
Overall Length.	11" ± 1/4 "
Maximum Diameter.	3-13/16"
Bulb.	ST-30
Cap	3917
Base.	Large Metal-Shell Super-Jumbo 4-Pin, Bayonet

Maximum Ratings, Absolute Values:

	Continuous Service	Welder-Control Service	
PEAK INVERSE ANODE VOLTAGE	3000 max.	10000 max.	volts
INSTANTANEOUS ANODE CURRENT:			
Below 25 Cycles	12.8 max.	8 max.	amp
25 Cycles and Higher. . .	40 max.	16 max.	amp
AVERAGE ANODE CURRENT# . .	6.4 max.	4 max.	amp
SURGE ANODE CURRENT for 0.1 sec. max.	200 max.	80 max.	amp
COND.-MERCURY TEMP. RANGE□	40 - 80	25 - 50	°C

* Heater voltage must be applied at least 5 minutes before anode voltage is applied.

\# Averaged over any 15-second interval.

□ Recommended condensed-mercury temperature 40°C.

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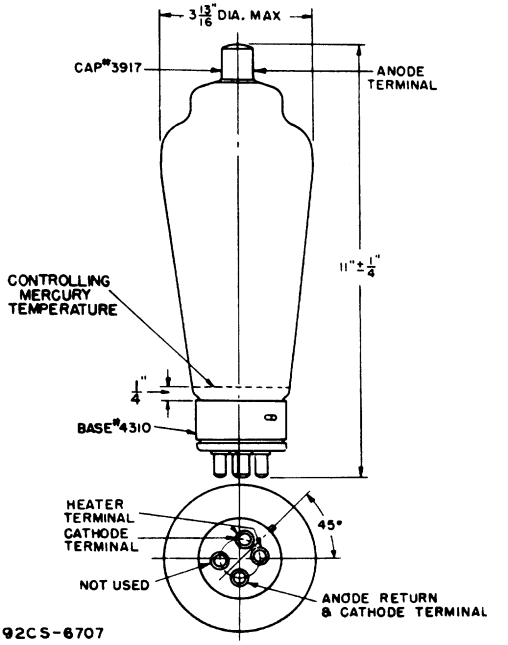
HALF-WAVE MERCURY-VAPOR RECTIFIER



5618
VHF POWER PENTODE

MINIATURE TYPE

GENERAL DATA

Electrical:

Filament, Coated:

Filament Arrangement	*Series**	*Parallel***	
Voltage	6.0 ± 10%	3.0 ± 10%	ac or dc volts
Current	0.23	0.46	amp

Direct Interelectrode Capacitances:°

Grid No.1 to Plate	0.24	μμf
Input	7.0	μμf
Output	5.0	μμf

° With no external shield.

Mechanical:

Mounting Position	Vertical, or Horizontal with pins No.1 & No.5 in a horizontal plane
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length from Base Seat to Bulb Top (excluding tip)	2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin
Basing Designation for BOTTOM VIEW	7CU

Pin 1 - Filament (-)
Pin 2 - Plate
Pin 3 - Grid No.2
Pin 4 - Grid No.3, Int. Shield

Pin 5 - Filament Mid-Tap
Pin 6 - Grid No.1
Pin 7 - Filament (+)

AF POWER AMPLIFIER & MODULATOR—Class A_1

Maximum ICAS•• Ratings, *Absolute Values*:

DC PLATE VOLTAGE	300 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE	125 max.	volts
GRID-No.2 INPUT	2 max.	watts
PLATE DISSIPATION	5 max.	watts

Typical Operation:

Filament Arrangement	*Series**	*Parallel***	
DC Plate Voltage	250	250	volts
DC Grid-No.3 Voltage	0*	0**	volts
DC Grid-No.2 Voltage	75	75	volts
DC Grid-No.1 (Control-Grid) Voltage■	-8	-8	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	8	8	volts

*, **, ••, ■: See next page.

5618
VHF POWER PENTODE

Zero-Signal DC Plate Current . .	16	19	ma
Max.-Signal DC Plate Current . .	17.5	20.5	ma
Zero-Signal DC Grid-No.2 Current	1.5	2.0	ma
Max.-Signal DC Grid-No.2 Current	3.5	4.5	ma
Transconductance	3500	3600	μmhos
Effective Load Resistance (plate to plate). . .	12000	12000	ohms
Total Harmonic Distortion. . . .	10	10	%
Max.-Signal Power Output	1.2	1.4	watts

Circuit Values:

Grid-No.1-Circuit Resistance	5000 min.	ohms
	100000 max.	ohms

RF POWER AMPLIFIER & OSCILLATOR—Class C Telegraphy□□
and
RF POWER AMPLIFIER—Class C FM Telephony

Maximum ICAS●● Ratings, *Absolute Values*:

DC PLATE VOLTAGE	300 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE.	125 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE. . . .	-125 max.	volts
DC PLATE CURRENT	30 max.	ma
DC GRID-No.1 CURRENT	3 max.	ma
PLATE INPUT.	7.5 max.	watts
GRID-No.2 INPUT.	2 max.	watts
PLATE DISSIPATION.	5 max.	watts

Typical Operation:⊕

	Up to 40 Mc	*At 80 Mc*	
DC Plate Voltage	300	300	volts
DC Grid-No.3 Voltage⊕	0	0	volts
DC Grid-No.2 Voltage□	75	75	volts
	32000	32000	ohms
DC Grid-No.1 Voltage■■ ⊕	-45	-45	volts
	30000	30000	ohms
	1400	1400	ohms
Peak RF Grid-No.1 Voltage. . . .	65	65	volts
DC Plate Current	25	25	ma
DC Grid-No.2 Current	7	7	ma
DC Grid-No.1 Current (Approx.) .	1.5	1.5	ma
Driving Power (Approx.).	0.2	0.3	watt
Power Output (Approx.) ♦ . . .	5.4	5.2	watts

Circuit Values:

Grid-No.1-Circuit Resistance	5000 min.	ohms
	100000 max.	ohms

♦ Useful power output is approximately 5.0 watts for 40 Mc and 4.5 watts for 80 Mc.

*, **, ●●, □, □□, ■, ■■, ⊕: See next page.

5618
VHF POWER PENTODE

FREQUENCY MULTIPLIER

Maximum ICAS[●●] Ratings, *Absolute Values:*

DC PLATE VOLTAGE	300 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE	125 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-125 max.	volts
DC PLATE CURRENT	30 max.	ma
DC GRID-No.1 CURRENT	3 max.	ma
PLATE INPUT	7.5 max.	watts
GRID-No.2 INPUT	2 max.	watts
PLATE DISSIPATION	5 max.	watts

Typical Operation:[⊕]	*Doubler to 80 Mc*	*Tripler to 80 Mc*	
DC Plate Voltage	300	300	volts
DC Grid-No.3 Voltage[⊕]	0	0	volts
DC Grid-No.2 Voltage[□]	75	75	volts
	41000	41000	ohms
DC Grid-No.1 Voltage[♦]	-125	-125	volts
	68000	68000	ohms
Peak RF Grid-No.1 Voltage	160	160	volts
DC Plate Current	25	25	ma
DC Grid-No.2 Current	5.5	5.5	ma
DC Grid-No.1 Current (Approx.)	1.85	1.85	ma
Driving Power (Approx.)	0.75	0.75	watt
Power Output (Approx.)[◆◆]	4.2	3.4	watts

Circuit Values:

Grid-No.1-Circuit Resistance	5000 min.	ohms
	100000 max.	ohms

◆◆ useful power output is approximately 3.5 watts for doubler service and 2.7 watts for tripler operation.

* For series filament arrangement, filament voltage is applied between pins No.1 and No.7. The grid-No.1 voltage is referred to pin No.1, and grid-No.3 (pin No.4) is connected to pin No.1.

** For parallel filament arrangement, filament voltage is applied between pin No.5 and pins No.1 and No.7 connected together. The grid-No.1 voltage is referred to pin No.5 and grid No.3 (pin No.4) is connected to pin No.5.

●● Intermittent Commercial and Amateur Service.

■ For dc filament supply.

■■ Obtained from a fixed supply or by a grid-No.1 resistor (30000) or cathode resistor (1400).

□ Obtained from a separate source, or from the plate voltage supply with a voltage divider. Series screen resistor of value shown should be used only where the 5618 is employed as a buffer amplifier and is not keyed.

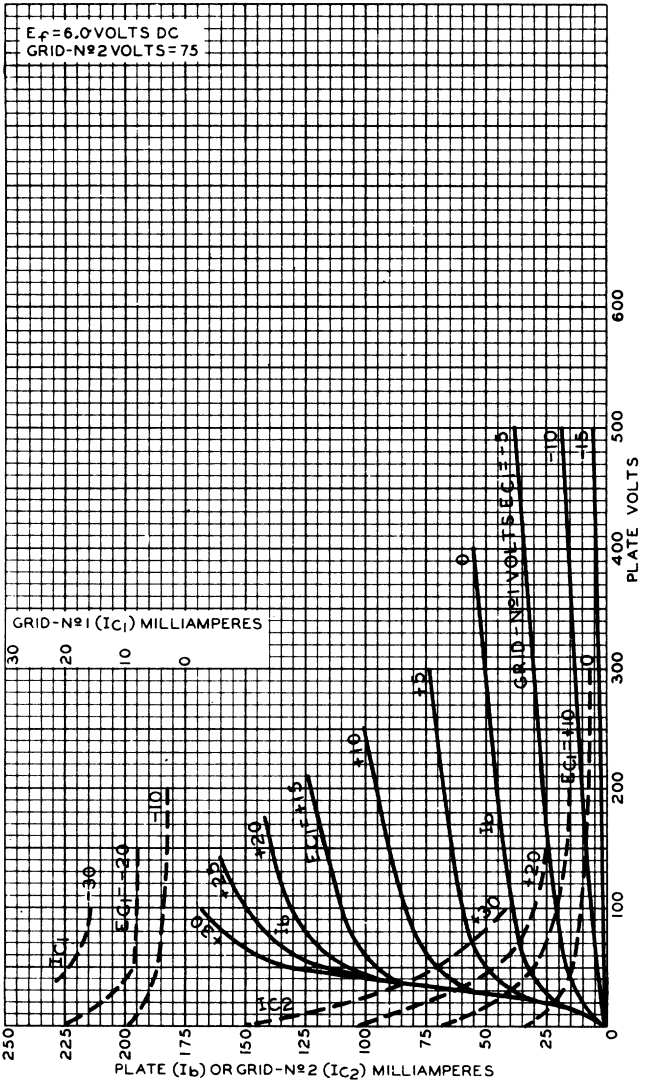
□□ Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

⊕ Filament may be connected in either parallel or series arrangement. With parallel connection, grid No.3 (pin No.4) is connected to pin No.5; for series operation, connect pin No.4 to pin No.1.

♦ Obtained from a fixed supply, or by a grid-No.1 resistor of value shown.

5618

AVERAGE CHARACTERISTICS



AUG. 1, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6881

5618

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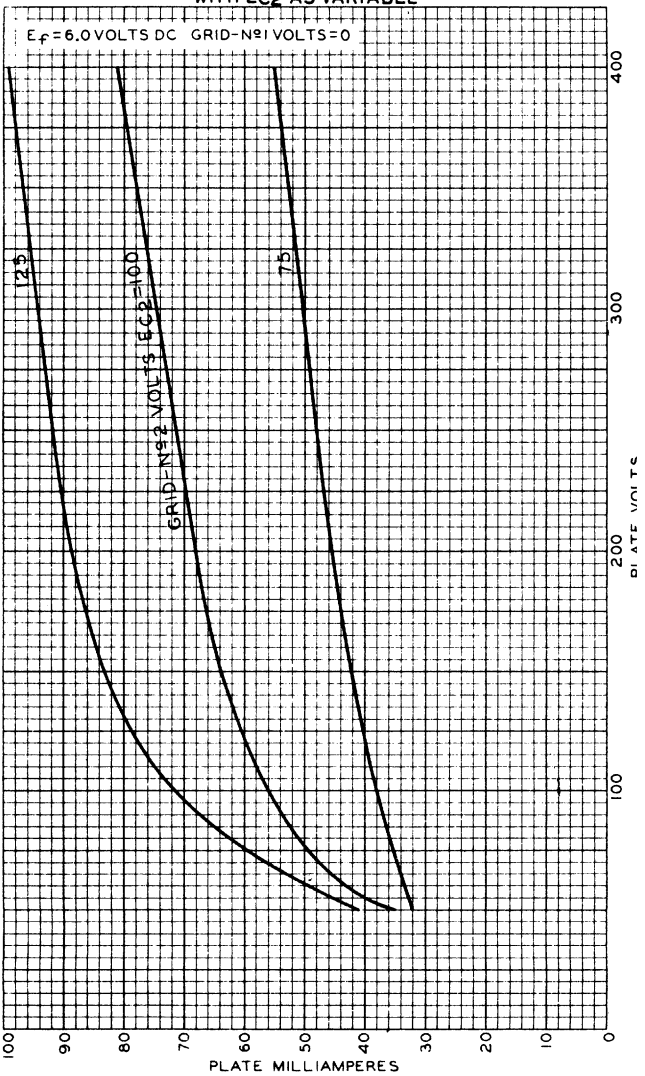
AVERAGE PLATE CHARACTERISTICS
WITH E_{C2} AS VARIABLE



AUG. 12, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6882

5636

SHARP-CUTOFF PENTODE

SUBMINIATURE TYPE

5636 PREMIUM TYPE

Intended for applications at altitudes up to 60,000 feet where dependable performance under shock and vibration is paramount

GENERAL DATA

Electrical:

Heater, Pure Tungsten, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.150	amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield**	
Grid No.1 to plate	0.034 max.	0.02 max.	μμf
Grid No.1 to all other electrodes	4	4	μμf
Grid No.3 to all other electrodes	3.8	4	μμf
Plate to all other electrodes	1.9	3.4	μμf
Grid No.1 to grid No.3	0.17 max.	0.15 max.	μμf
Grid No.3 to plate	1.1 max.	1.1 max.	μμf

Characteristics, Class A_1 Amplifier:

Plate-Supply Voltage	100	100	volts
Grid No.3	♦	–	
Grid-No.3 Supply Voltage	–	-1	volt
Grid-No.2 Supply Voltage	100	100	volts
Cathode Resistor	150	150	ohms
Plate Resistance (Approx.)	0.11	0.05	megohm
Transconductance:			
Grid No.1 to plate	3200	1950	μmhos
Grid No.3 to plate	500	950	μmhos
Plate Current	5.6	4	ma
Grid-No.2 Current	4	5.8	ma
Grid-No.1 Voltage (Approx.) for plate current of 10 μa	-7.5	–	volts
Grid-No.3 Voltage (Approx.) for plate current of 10 μa	–	-8	volts

Mechanical:

Mounting Position	Any
Maximum Length (Excluding flexible leads)	1-3/8"
Length, Bulb Seat to Bulb Top (Excluding tip)	1.075" ± 0.060"
Diameter	0.366" to 0.400"
Dimensional Outline	*See General Section*
Bulb	T3
Leads, Flexible	8
Length	1-1/2" to 1-3/4"
Orientation and diameter	*See Dimensional Outline*

* With external shield having inside diameter of 0.405" connected to lead 8.

♦ Connected to cathode at socket.

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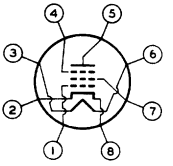
SHARP-CUTOFF PENTODE

BOTTOM VIEW



Lead 1 - Grid No.1
Lead 2 - Cathode
Lead 3 - Heater
Lead 4 - Grid No.3
Lead 5 - Plate
Lead 6 - Heater
Lead 7 - Grid No.2
Lead 8 - Cathode

AMPLIFIER - Class A_1

Maximum Ratings, *Absolute Values:*

For Operation at Altitudes up to 60,000 Feet

PLATE VOLTAGE	165 max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE:		
Positive bias value	30 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	155 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative bias value	55 max.	volts
Positive bias value	0 max.	volts
PLATE CURRENT	11 max.	ma
GRID-No.2 CURRENT	7 max.	ma
GRID-No.2 INPUT	0.7 max.	watt
PLATE DISSIPATION	1.1 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	200 max.	volts
Heater positive with respect to cathode.	200 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250 max.	°C

Characteristics as Mixer:■

Plate-Supply Voltage	100	volts
Grid-No.3 Supply Voltage (RMS)	15	volts
Grid-No.2 Supply Voltage	100	volts
Cathode Resistor	150	ohms
Plate Resistance (Approx.)	0.32	megohm
Conversion Transconductance	1280	μmhos
Plate Current	3.5	ma
Grid-No.2 Current	5.7	ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For cathode-bias operation	1.1 max.	megohms

■ With local oscillator injection to grid No.3. DC grid-No.3-circuit resistance should be kept as low as possible at high frequencies.

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SHARP-CUTOFF PENTODE

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN•

Values are Initial, Unless Otherwise Specified

	Note	Min.	Max.	
Heater Current	1	0.140	0.160	amp
Direct Interelectrode Capacitances:				
Grid No.1 to all other electrodes	2	3.5	4.5	μμf
Grid No.3 to all other electrodes	2	3.5	4.5	μμf
Plate to all other electrodes	2	2.9	3.9	μμf
Plate Current (1)	1,3	3.7	6.9	ma
Plate Current (2)	1,4	-	100	μa
Plate Current (3)	1,5	-	100	μa
Grid-No.2 Current	1,3	2.8	5.4	ma
Transconductance, Grid No.1 to Plate:				
Range with heater volts = 6.3	3	2700	4000	μmhos
Change with heater volts = 5.7	3	-	15	%
Change at end of 500 hours with heater volts = 6.3	3	-	20	%
Change at end of 500 hours with heater volts = 5.7	3	-	15	%
Difference between average transconductance initially, and average after 500 hours, expressed as a percentage of the initial average	1,3	-	15	%
Transconductance, Grid No.3 to Plate	1,6	500	1800	μmhos
Reverse Grid-No.1 Current	1,7	-	0.3	μa
Reverse Grid-No.1 Current at 500 hours	1,7	-	0.9	μa
Grid-No.1 Emission Current	8	-	0.5	μa
Heater-Cathode Leakage Current:				
Heater 100 volts negative with respect to cathode	1,3	-	5	μa
Heater 100 volts positive with respect to cathode	1,3	-	5	μa
Heater-Cathode Leakage Current at 500 hours:				
Heater 100 volts negative with respect to cathode	1,3	-	10	μa

•, Notes 1 to 8: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5636

SHARP-CUTOFF PENTODE

	Note	Min.	Max.	
Heater 100 volts positive with respect to cathode. . . .	1,3	-	10	μa
Leakage Resistance:				
Grid No.1 to all other electrodes	1,9	100	-	megohms
Plate to all other electrodes	1,10	100	-	megohms
Leakage Resistance at 500 hours:				
Grid No.1 to all other electrodes	1,9	50	-	megohms
Plate to all other electrodes	1,10	50	-	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With external shield having inside diameter of 0.405" connected to lead 8.

Note 3: With plate-supply volts = 100, grid No.3 connected to cathode, grid-No.2 supply volts = 100, and cathode resistor (ohms) = 150.

Note 4: With plate volts = 100, grid No.3 connected to cathode, grid-No.2 volts = 100, and grid-No.1 volts = -7.5.

Note 5: With plate-supply volts = 100, grid-No.3 supply volts = -8, grid-No.2 supply volts = 100, and cathode resistor (ohms) = 150.

Note 6: With plate-supply volts = 100, grid-No.3 supply volts = -1, grid-No.2 supply volts = 100, and cathode resistor (ohms) = 150.

Note 7: With plate-supply volts = 100, grid No.3 connected to cathode, grid-No.2 supply volts = 100, cathode resistor (ohms) = 150, and grid-No.1-circuit resistance (megohms) = 1.

Note 8: With ac or dc heater volts = 7.5, plate volts = 100, grid-No.3 volts = 0, grid-No.2 volts = 100, grid-No.1 volts = -7.5, and grid-Nc.1-circuit resistance (megohms) = 1.

Note 9: With grid No.1 100 volts negative with respect to all other electrodes connected together.

Note 10: With plate 300 volts negative with respect to all other electrodes connected together.

• Each tube is stabilized before characteristics testing by continuous operation for at least 45 hours at room temperature and with dissipation values equivalent to life-test conditions.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration. . . . . 450 max. g

This test is performed on a sample lot of tubes from each production run. Tubes are held rigid and are tested in four different positions. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

ELECTRON TUBE DIVISION
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SHARP-CUTOFF PENTODE

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . 60 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 6.3, plate-supply volts = 100, grid No.3 connected to cathode, grid-No.2 supply volts = 100, cathode resistor (ohms) = 150, cathode-bypass capacitor (μf) = 1000, plate-load resistance (ohms) = 10,000, and vibrational acceleration of 15 g at 40 cycles per second.

Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . . 2000 min. cycles

Under the following conditions: heater volts = 7 cycled one minute on and one minute off, heater 140 volts rms with respect to cathode, and all other electrodes connected to ground.

Audio-Frequency Noise and Microphonic Performance:

RMS Output Voltage . . . . . 70 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 6.3, plate-supply volts = 100, grid No.3 connected to cathode, grid-No.2 supply volts = 19, cathode resistor (ohms) = 150, grid-No.1-circuit resistance (megohms) = 0.1, grid-No.2-circuit resistance (ohms) = 1000, plate-load resistance (megohms) = 0.2, and cathode-bypass capacitor (μf) = 1000. The output voltage of a tube, when tapped, will not cause a reading on a vu meter greater than that produced when a calibrating signal of 70 millivolts rms is applied to the plate of the tube.

Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid-No.1 current in excess of 1.0 microampere under the conditions specified in the CHARACTERISTICS RANGE VALUES for reverse grid-No.1 current.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5636

SHARP-CUTOFF PENTODE

1-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are checked for transconductance under conditions specified under 500-Hour Intermittent Life Performance. At the end of 1 hour, the value of transconductance is read. The variation in transconductance from the 0-hour reading will not exceed 15 per cent.

100-Hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run under conditions specified under 500-Hour Intermittent Life Performance to insure a low percentage of early inoperatives. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit or a grid-No.1-to-plate transconductance of less than 2350 micromhos under the conditions specified in CHARACTERISTICS RANGE VALUES.

500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. Life testing is conducted under the following conditions: heater volts = 6.3, plate-supply volts = 100, grid No.3 connected to cathode, grid-No.2 supply volts = 100, heater 200 volts positive with respect to cathode, cathode resistor (ohms) = 150, grid-No.1-circuit resistance (megohms) = 1, and bulb temperature (^{o}C) = 220. At the end of 500 hours, tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass established initial limits of heater current, grid-No.1-to-plate transconductance change, grid-No.3-to-plate transconductance, and 500-hour limits for reverse grid-No.1 current, heater-cathode leakage current, leakage resistance, and the difference in the grid-No.1-to-plate transconductance between the initial value and the average value shown under CHARACTERISTICS RANGE VALUES.

OPERATING CONSIDERATIONS

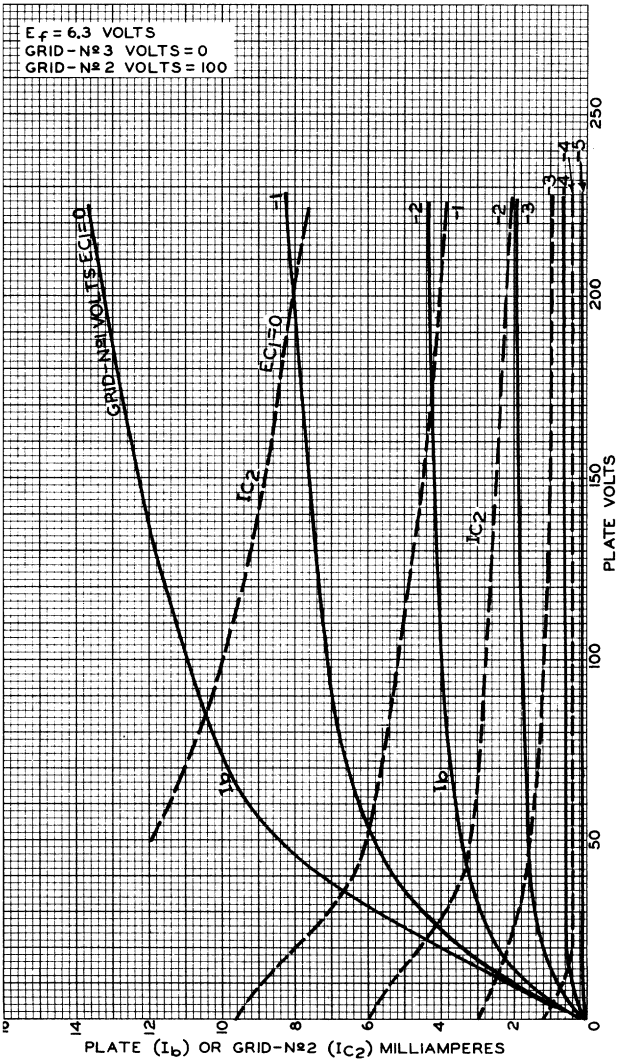
The *heater supply* should be well regulated because life and reliability of the 5636 are adversely affected by departures from the 6.3-volt value. The extent to which life is affected is a function of the amount of these departures and their durations.

The *flexible leads* of the 5636 are usually soldered to the circuit elements. Soldering of the connections should be made as far as possible from the glass button. If this precaution is not followed, the heat of the soldering operation may crack the glass seals of the leads and damage the tube.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5636

AVERAGE CHARACTERISTICS



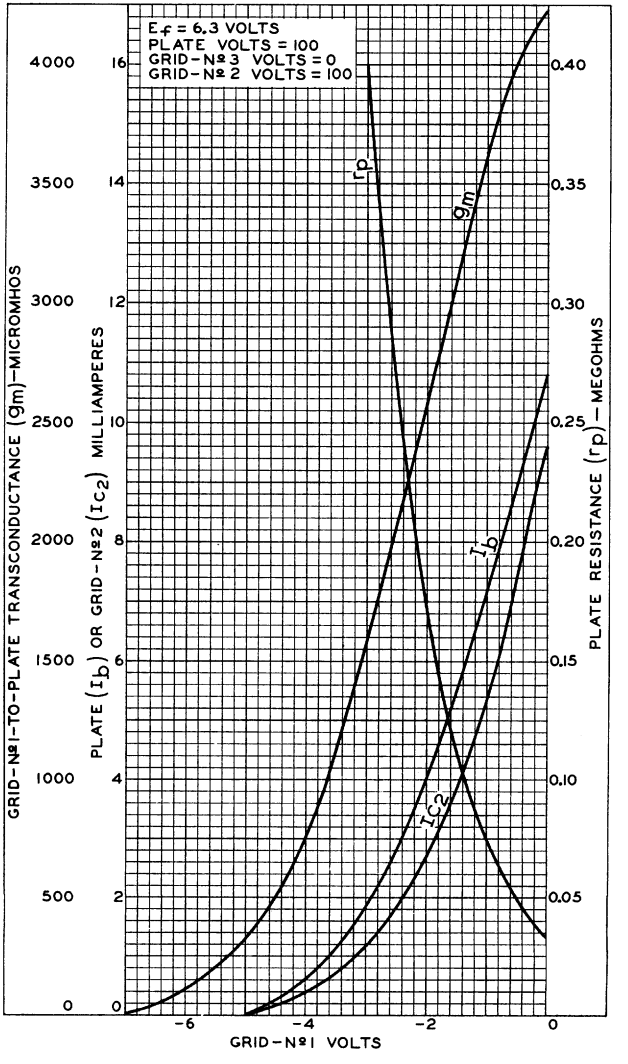
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9212

5636

5636

AVERAGE CHARACTERISTICS

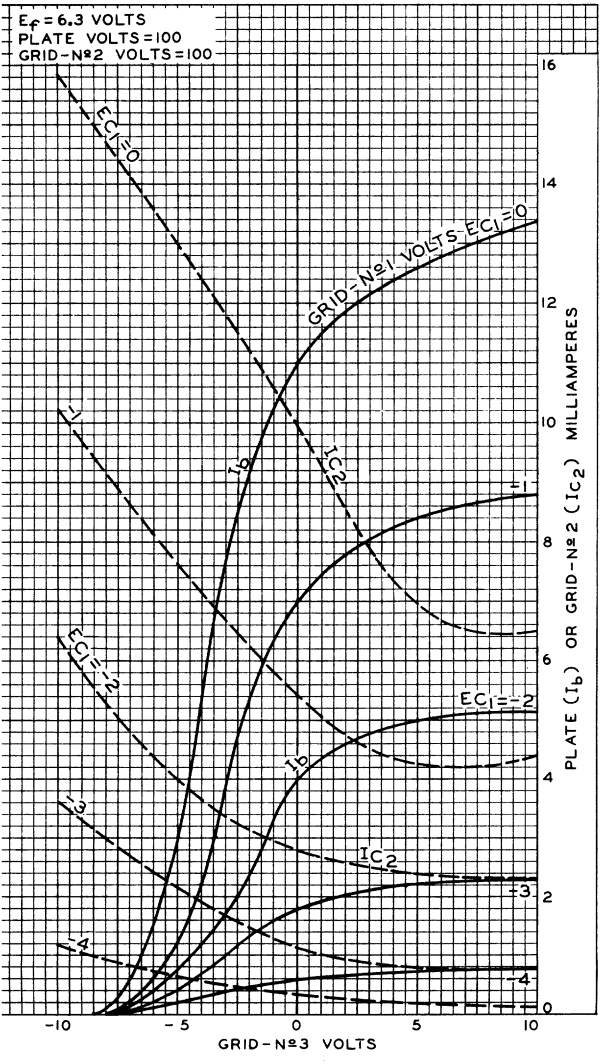


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9207

5636

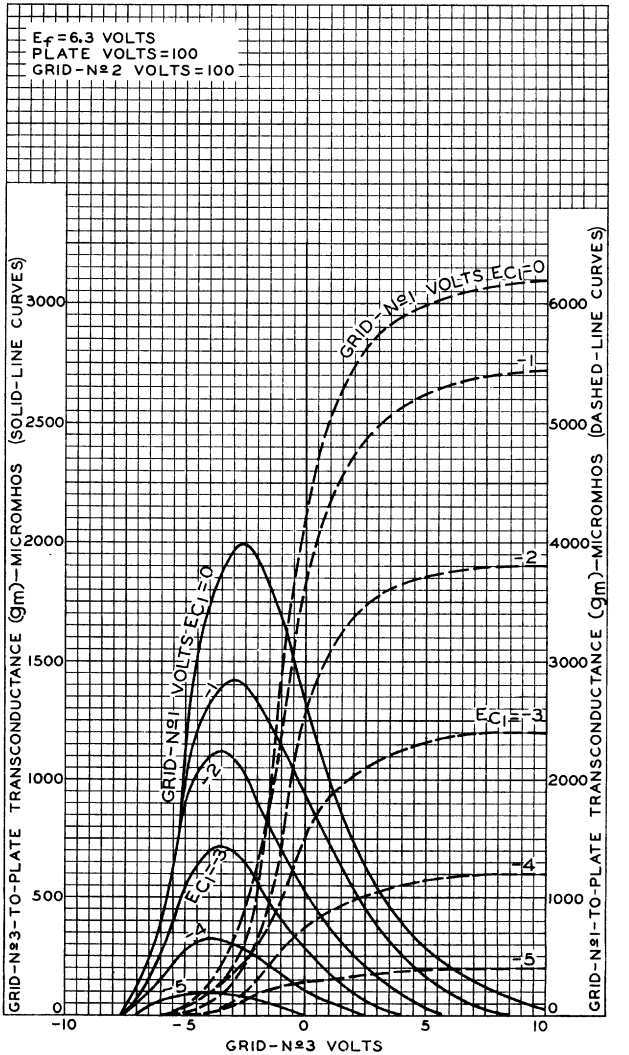
AVERAGE CHARACTERISTICS



5636

5636

AVERAGE CHARACTERISTICS



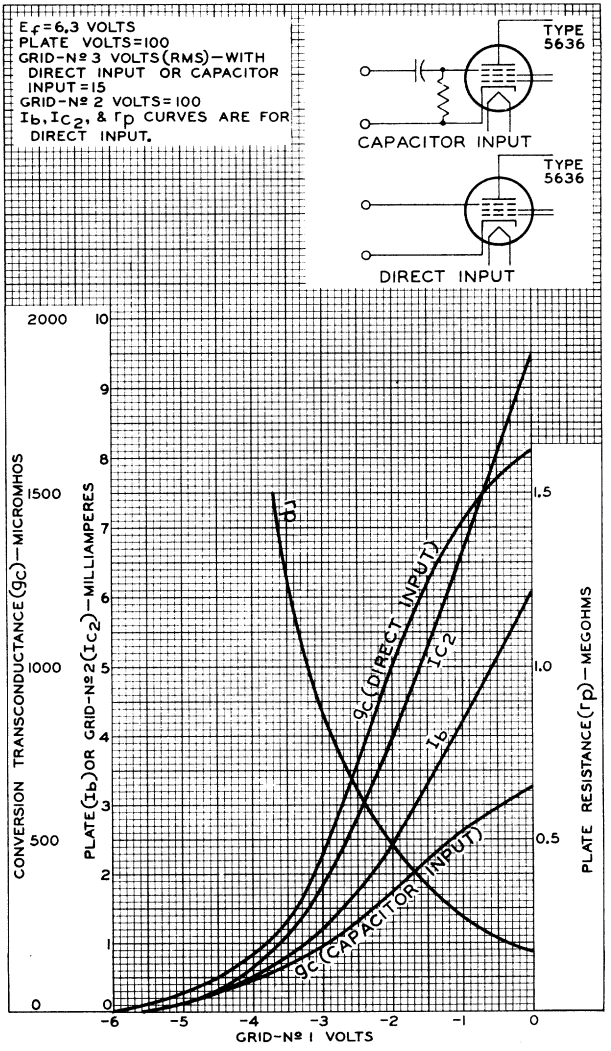
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9214

RCA

5636

AVERAGE CHARACTERISTICS



5642

HALF-WAVE VACUUM RECTIFIER

SUBMINIATURE TYPE

For compact, portable high-voltage-rectifier applications

GENERAL DATA

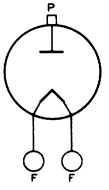
Electrical:

Filament, Coated:		
Voltage	1.25	ac or dc volts
Current	0.2	amp
Direct Interelectrode Capacitance (Approx.):○		
Plate to filament	0.6	μμf

Mechanical:

Operating Position	Any
Maximum Length (Excluding flexible leads)	2.380"
Length, Base Seat to Bulb Top (Excluding tip)	1.700" ± 0.060"
Diameter	0.366" to 0.400"
Bulb	T3
Plate Terminal:	
Minimum length	0.250"
Leads, Flexible, Tinned	2
Minimum length	1.5"
Orientation and diameter	*See Dimensional Outline*
Maximum untinned distance from base seat	0.050"
Base	Special 2-Lead

P – Plate Terminal



F – Filament Lead

PULSED-RECTIFIER SERVICE

Maximum and Minimum Ratings, *Design-Center Values:*

For operation in a 525-line, 30-frame system□

PEAK INVERSE PLATE VOLTAGE	10000 max.	volts
PEAK PLATE CURRENT	5 max.	ma
DC PLATE CURRENT	0.25 max.	ma
FREQUENCY OF SUPPLY VOLTAGE	5 min.	kc

Typical Operation:

Peak-Pulse Plate Voltage⊕	8000	volts
DC Output Voltage (2 tubes)	12000	volts
DC Output Current	0.15	ma

Characteristics:

Plate Current for plate volts = 30	4	ma

○,□,⊕: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

5642

HALF-WAVE VACUUM RECTIFIER

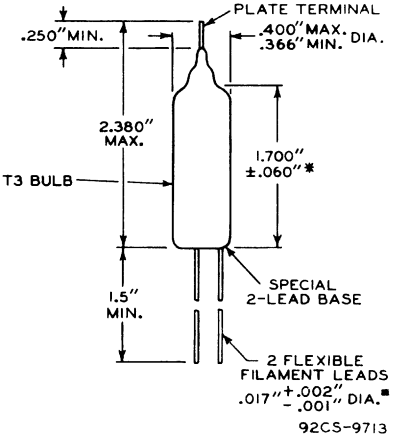
○ Without external shield.

□ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

⊕ The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

OPERATING CONSIDERATIONS

The *flexible leads* of the 5642 are usually soldered to the circuit elements. Soldering of the connections should be made as far as possible from the glass button and the glass tip. If this precaution is not followed, the heat of the soldering operation will crack the glass seals of the leads and damage the tube.



* Measured from base seat to bulb-top line as determined by a ring gauge of 0.210" ± 0.001" inside diameter.

■ The specified lead diameter applies only in the zone between 0.050" and 0.250" from the base seat. Between 0.250" and 1.500", a maximum diameter of 0.021" is held. Outside of these zones, the lead diameter is not controlled.

5654

SHARP-CUTOFF PENTODE

MINIATURE TYPE

5654 PREMIUM TYPE

Intended for RF and IF Broad-Band Applications where dependable performance under shock and vibration are paramount. The 5654 is a "premium" version of the 6AK5.

GENERAL DATA

Electrical:

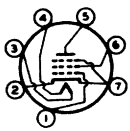
Heater, Pure Tungsten, for Unipotential Cathode:		
Voltage	6.3 ± 10%	ac or dc volts
Current	0.175	amp
Direct Interelectrode Capacitances:▲		
Grid No.1 to Plate	0.020 max.	μμf
Input	4.0	μμf
Output	2.85	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length from Base Seat to Bulb Top (Excluding tip)	1-1/8" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)

BOTTOM VIEW

Pin 1 - Grid No.1
Pin 2 - Cathode, Grid No.3, Int. Shield
Pin 3 - Heater
Pin 4 - Heater



Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Cathode, Grid No.3, Int. Shield

AMPLIFIER - Class A_1

Maximum Ratings, *Absolute Values*:

PLATE VOLTAGE	200 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	155 max.	volts
PLATE DISSIPATION	1.85 max.	watts
GRID-No.2 INPUT	0.55 max.	watt
CATHODE CURRENT	20 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater positive with respect to cathode	100 max.	volts
Heater negative with respect to cathode	100 max.	volts

Typical Operation and Characteristics:

Plate Voltage	120	180	volts
Grid-No.2 Voltage	120	120	volts

▲ According to RTMA Standard ET-109A with external shield No.316.

5654

SHARP-CUTOFF PENTODE

Cathode-Bias Resistor	180	180	ohms
Plate Resistance (Approx.)	0.30	0.50	megohm
Transconductance	5000	5100	μmhos
Plate Current	7.5	7.7	ma
Grid-No.2 Current	2.5	2.4	ma
Grid-No.1 Voltage (Approx.) for plate current of 10 μamp	-8.5	-8.5	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . 0.5 max. megohm

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration . . . . . 500 max. g

Tubes are held rigid in three different positions in a Navy Type, High Impact (flyweight) Shock Machine and are subjected to 500 g impact acceleration.

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours.

Heater Cycling Life Performance:

Cycles of Intermittent Operation . . . 2000 min. cycles

Under the following conditions: With heater voltage of 7.5 volts cycled 1 minute on and 1 minute off, heater positive with respect to cathode by +100 volts dc, and plate, grid-No.2, and grid-No.1 voltage = 0 volts.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.160	0.190	amp
Grid-No.1-to-Plate Capacitance	-	-	0.020	μμf
Input Capacitance	-	3.4	4.6	μμf
Output Capacitance	-	2.45	3.25	μμf
Plate Current	1,2	3.0	12.0	ma
Transconductance	1,2	3500	6500	μmhos
Reverse Grid Current	1,3	-	0.1	μamp

Note 1: With 6.3 volts ac on heater.

Note 2: With plate voltage of 120 volts, grid-No.2 voltage of 120 volts, and grid-No.1 voltage of -2 volts.

Note 3: With plate voltage of 120 volts, grid-No.2 voltage of 120 volts, grid-No.1 voltage of -2 volts, and grid-No.1 resistor of 0.1 megohm.

CURVES
are the same as shown for Type 6AK5
in the Receiving Tube Section

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE
SHOCK AND VIBRATION RATINGS — **LOW MICROPHONISM**
LIFE PERFORMANCE DATA — **RCA DARK HEATER**

"Command" Type for a Wide Variety of Applications Including: Mixers, Oscillators and Amplifiers up through the VHF Region; Multivibrators, Synchronizing Amplifiers and Industrial Control Circuits; and Mobile, Military, and Aircraft Equipment at Altitudes up to 80,000 Feet

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.350	amp
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances:[a]		
Grid to plate (Each unit)	1.1	pf
Grid to cathode and heater (Each unit)	2.2	pf
Plate to cathode and heater (Each unit)	1.0	pf
Plate to plate	0.1 max.	pf

Characteristics, Class A_1 Amplifier (Each Unit):

Plate Supply Voltage	150	volts
Cathode Resistor	240	ohms
Amplification Factor	35	
Plate Resistance (Approx.)	6400	ohms
Transconductance	5500	μmhos
Plate Current	8.2	ma
Grid Voltage (Approx.) for plate μa = 10	-8	volts

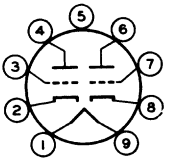
Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/8" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

5670

Basing Designation for BOTTOM VIEW. 8CJ

Pin 1 – Heater
Pin 2 – Cathode of Unit No.2
Pin 3 – Grid of Unit No.2
Pin 4 – Plate of Unit No.2
Pin 5 – Internal Shield[b]



Pin 6 – Plate of Unit No.1
Pin 7 – Grid of Unit No.1
Pin 8 – Cathode of Unit No.1
Pin 9 – Heater

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Absolute-Maximum Values:*

PLATE VOLTAGE	330 max.	volts
GRID VOLTAGE:		
Negative-bias value	55 max.	volts
Positive-bias value	0 max.	volts
CATHODE CURRENT	18 max.	ma
GRID CURRENT	3 max.	ma
PLATE DISSIPATION	1.35 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	165 max.	°C

Maximum Circuit Values:

Grid-Circuit Resistance	0.5 max.	megohm

PUSH-PULL AMPLIFIER — Class AB_1

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

Same as for **AMPLIFIER — Class A_1**

Typical Operation:

Values are for Both Units

Plate Supply Voltage	300	volts
Cathode Resistor (Common to both units)	800	ohms
Peak AF Grid-to-Grid Voltage	19.8	volts
Zero-Signal Plate Current	9.8	ma
Max.-Signal Plate Current	12.6	ma
Effective Load Resistance (Plate-to-plate)	27000	ohms
Total Harmonic Distortion	10	%
Max.-Signal Power Output (Approx.)	1	watt

Maximum Circuit Values:

Grid-Circuit Resistance	0.5 max.	megohm

[a] Without external shield.
[b] Pin 5 should be connected to ground.

CHARACTERISTICS RANGE VALUES

Values are For Each Unit and Are Initial Unless Otherwise Specified

	Note	Min.	Max.	
Heater Current	1	330	370	ma
Heater Current at 500 Hours	1	330	375	ma
Heater Current at 1000 Hours	1	330	380	ma
Direct Interelectrode Capacitances:				
Grid to plate	2	0.8	1.4	pf
Grid to cathode and heater	2	1.7	2.7	pf
Plate to cathode and heater	2	0.7	1.3	pf
Plate to plate	2	-	0.10	pf
Amplification Factor	1,3	26	44	
Plate Current (1)	1,3	5.9	10.5	ma
Plate-Current Difference Between Units	1,3	-	1.8	ma
Plate Current (2)	1,4	-	45	μa
Plate Current (3)	1,11	5	-	μa
Transconductance:				
With heater volts = 6.3	3	4500	6500	μmhos
Change with heater volts = 5.7	3	-	15	%
Change at end of 500 hours with heater volts = 6.3	3	-	20	%
Change at end of 1000 hours with heater volts = 6.3	3	-	25	%
Change at end of 500 hours from heater volts = 6.3 to heater volts = 5.7	3	-	15	%
Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours expressed as a percentage of the initial average	1,3	-	15	%
Reverse Grid Current	1,5	-	0.3	μa
Reverse Grid Current at end of 500 hours	1,5	-	0.3	μa
Reverse Grid Current at end of 1000 hours	1,5	-	0.3	μa
Grid Emission Current	6,7	-	0.5	μa
Heater-Cathode Leakage Current: Heater negative with respect to cathode	1,8	-	7	μa
Heater positive with respect to cathode	1,8	-	7	μa
Heater-Cathode Leakage Current at end of 500 hours: Heater negative with respect to cathode	1,8	-	7	μa
Heater positive with respect to cathode	1,8	-	7	μa

	Note	Min.	Max.	
Heater-Cathode Leakage Current at end of 1000 Hours:				
Heater negative with respect to cathode.	1,8	-	7	μa
Heater positive with respect to cathode.	1,8	-	7	μa
Leakage Resistance:				
Between grid and all other electrodes tied together. .	1,9	100	-	megohms
Between plate and all other electrodes tied together. .	1,10	100	-	megohms
Leakage Resistance at the end of 500 hours:				
Between grid and all other electrodes tied together. .	1,9	50	-	megohms
Between plate and all other electrodes tied together. .	1,10	50	-	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With no external shield.

Note 3: With dc plate supply voltage of 150 volts, cathode resistor of 240 ohms, and cathode bypass capacitor of 1000 μf. Each unit is tested separately. Electrodes of units not under test are grounded.

Note 4: With dc plate voltage of 150 volts, plate load resistance of 0.25 megohm, and dc grid voltage of -10 volts. Each unit is tested separately. Electrodes of unit not under test are grounded.

Note 5: With dc plate supply voltage of 150 volts, grid resistor of 0.5 megohm, cathode resistor of 240 ohms, and cathode bypass capacitor of 1000 μf. Each unit is tested separately. Electrodes of unit under test are grounded.

Note 6: With 7.5 volts ac or dc on heater.

Note 7: With dc plate voltage of 150 volts, grid resistor of 0.5 megohm, and dc grid voltage of -10 volts. Each unit is tested separately. Electrodes of unit not under test are grounded.

Note 8: With 100 volts dc between heater and cathode.

Note 9: With grid 100 volts negative with respect to all other electrodes tied together.

Note 10: With plate 300 volts negative with respect to all other electrodes tied together.

Note 11: With dc plate voltage of 150 volts and dc grid voltage of -4 volts.

SPECIAL TESTS & PERFORMANCE DATA

600-g Shock Test:

This test is performed on a sample lot of tubes from each production run. Tubes are held rigid and are subjected in four different positions to an impact acceleration of 600 g. At the end of this test, tubes will not show permanent or temporary shorts, or open circuits, and are required to meet established limits for low frequency vibration, heater cathode leakage current, transconductance, and reverse grid current.

Fatigue Test:

This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and are subjected to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours in each of three positions. At the end of this test,

tubes will not show permanent or temporary shorts, or open circuits, and are required to meet established limits for low frequency vibration, heater cathode leakage current, transconductance, and reverse grid current.

Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: Plate of unit No.1 tied to plate of unit No.2, grid of unit No.1 tied to grid of unit No.2, ac heater volts = 6.3, plate supply volts = 150, dc grid volts = -3, plate load resistor (ohms) = 2000 and vibrational acceleration = 10 g at 40 cycles per second. The rms output voltage across the plate load resistor as a result of vibration of the tube must not exceed 130 millivolts.

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. Tubes will withstand a minimum of 2000 cycles of intermittent operation under the following conditions: ac heater voltage of 7.5 volts cycled one minute on, one minute off, with heater at a potential of +135 volts with respect to cathode, all other elements disconnected. At the end of this test, tubes will not show open heaters, open cathodes, heater-cathode shorts or excessive heater-cathode leakage.

Audio-Frequency Noise and Microphony Performance:

This test is performed on a sample lot of tubes from each production run, under the following conditions: Plate of unit No.1 tied to plate of unit No.2, grid of unit No.1 to plate of unit No.2, ac heater volts = 6.3, cathode resistor (ohms) = 240, plate supply volts = 250, and plate load resistor (ohms) = 10,000. The output voltage must be less than 200 mv ac when the tube is tapped.

Shorts and Continuity Test (Thyratron-Type Detector Circuit):

This test, in addition to a 100% factory test, is performed on a sample lot of tubes from each production run. A tube is considered inoperative if either unit shows a permanent or temporary short or open circuit or a value of reverse grid current in excess of 1 microampere under the conditions specified in the *Characteristics Range Values* for reverse grid current.

Grid-Pulse Emission Test:

This test is performed on a sample lot of tubes from each production run, under the following conditions: ac heater volts = 6.3, plate volts = 150, grid driven 30 volts positive, from a cutoff bias of -30 volts dc, with a 10 microsecond pulse at a pulse repetition rate of 1000 pulses per second. Tubes must meet a minimum peak current value of 270 milliamperes.

AC Emission Test:

This test is performed on a sample lot of tubes from each production run under the following conditions: ac heater volts = 5.0, plate volts = 100, and grid volts (rms) = 5.0. Tubes must meet a limit dc plate current of 11 milliamperes.

2- and 20-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run, under the following conditions: ac heater volts = 6.3, plate supply volts = 150, cathode resistor each unit (ohms) = 240, grid resistor each unit (megohm) = 0.5, dc heater to cathode voltage of 135 volts (heater positive with respect to cathode), and room temperature. The value of transconductance measured at the end of two and twenty hours, must be within 10 per cent of the initial reading.

100-hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. The conditions are the same as for the two and twenty hour Stability Life Performance except that the heater is switched off once every two hours and the tube cools with electrode potentials applied. A tube is considered inoperative at the end of 100 hours total heater-on time if it shows a permanent short, open circuit, or a value of reverse grid current in excess of 1 microampere measured under the conditions specified in *Characteristics Range Values* for reverse grid current. Tube must also meet minimum gm limit.

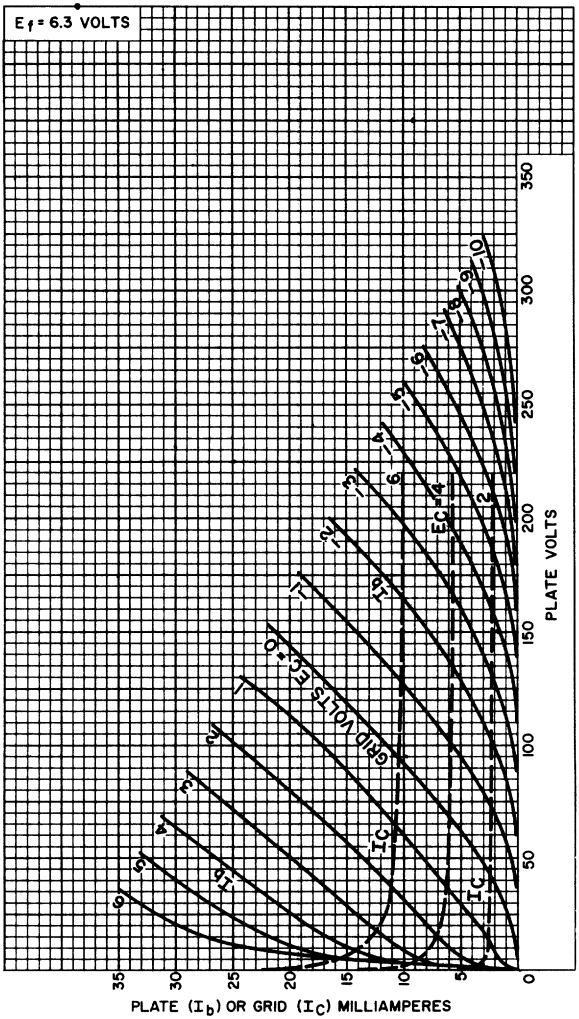
500-hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. The conditions for life test are as given above for the two and twenty hour Stability Life Performance Test except that the bulb temperature is maintained at 165° C. At the end of 500 hours total heater-on time tubes must not show any shorts or open circuits and must pass the established 500 hours limits of heater current, reverse grid current, heater cathode leakage current, transconductance changes and leakage resistance shown under *Characteristics Range Values.*

1000-hour Intermittent Life Performance:

This test is performed on a minimum of one production run per month under the same condition as the 500 hour Intermittent Life Performance. At the end of 1000 hours total heater-on time, tubes must not show permanent or temporary shorts or open circuits and must pass the established 1000-hour limits for heater current, transconductance change, reverse grid current and heater cathode leakage current shown under the *Characteristics Range Values.*

AVERAGE PLATE CHARACTERISTICS
Each Unit



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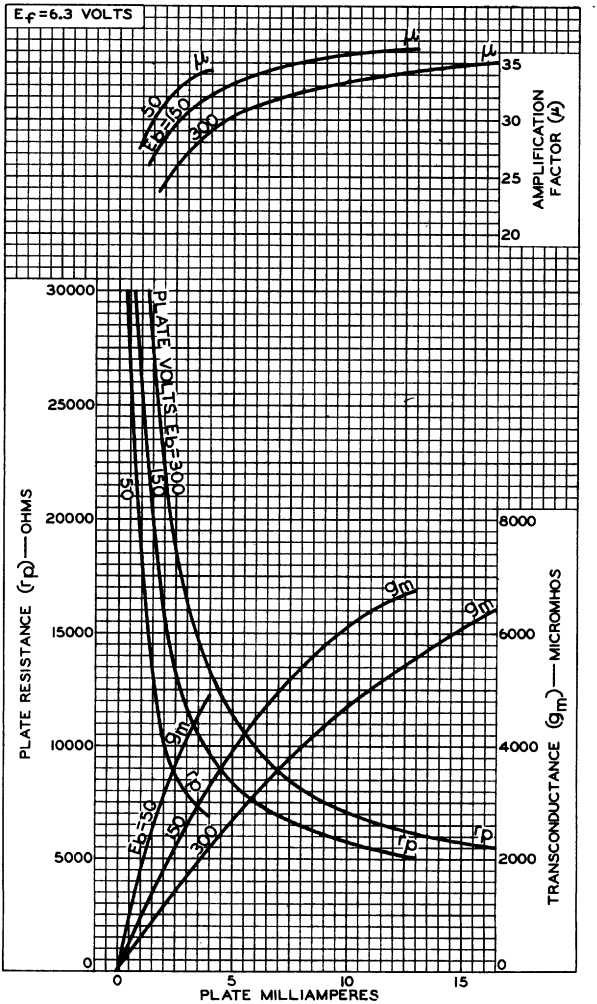
AVERAGE CHARACTERISTICS



92CM-12088

Power Triode

FORCED-AIR COOLED

GENERAL DATA

Electrical:

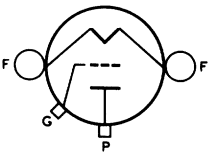
Filament, Multistrand Thoriated Tungsten:		
Excitation	Single-Phase AC or DC	
Voltage[a]	11 ± 5%	volts
Current at heater volts = 11	285	amp
Minimum heating time	15	sec
Amplification Factor for grid volts = −50, plate amperes = 2	40	
Direct Interelectrode Capacitances (Approx.):		
Grid to plate	50	μμf
Grid to filament	90	μμf
Plate to filament	1.5	μμf

Mechanical:

Operating Position	Vertical, filament end up
Maximum Overall Length	25"
Maximum Diameter	17"
Weight (Approx.)	228 pounds
Radiator	Integral part of tube
Air Jacket	RCA-241F1

F – Filament

G – Grid



P – Plate

Thermal:

Air Flow:

Through radiator—The specified air flow for various plate dissipations as indicated below should be delivered by a blower vertically upward through the radiator before and during the application of any voltages. Filament power, plate power, and air may be removed simultaneously.

Plate Dissipation	15	20	25	kw
Air Flow	1100	1450	1800	cfm
Static Pressure	0.85	1.5	2.2	in. of water

To filament seals . . . . . 10 min. cfm

The specified air flow should be directed from a 1-1/4"-diameter nozzle into the filament header before and during the application of any voltages to limit the temperature of the filament seals to the maximum value.

◄ Indicates a change.

Input Air Temperature (To radiator)	45 max.	°C
Radiator Temperature	180 max.	°C
Bulb Temperature	180 max.	°C
Seal Temperature (Filament, grid, and plate)	165 max.	°C

AF POWER AMPLIFIER and MODULATOR — Class B

Maximum CCS[b] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	15000 max.	volts
MAX.-SIGNAL DC PLATE CURRENT[c]	6 max.	amp
MAX.-SIGNAL PLATE INPUT[c]	90 max.	kw
PLATE DISSIPATION[c]	25 max.	kw

Typical Operation:

Values are for 2 tubes

Filament Voltage	10	11	volts
DC Plate Voltage	10200	15000	volts
DC Grid Voltage	-220	-320	volts
Peak AF Grid-to-Grid Voltage	900	1600	volts
Zero-Signal DC Plate Current	0.6	0.6	amp
Max.-Signal DC Plate Current	5.8	10	amp
Effective Load Resistance (Plate to plate)	3600	3320	ohms
Max.-Signal Driving Power (Approx.)[d]	120	600	watts
Max.-Signal Power Output (Approx.)	37	100	kw

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a max. modulation factor of 1

Maximum CCS[b] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	12500 max.	volts
DC GRID VOLTAGE	-2000 max.	volts
DC PLATE CURRENT	4.5 max.	amp
DC GRID CURRENT	1 max.	amp
PLATE INPUT	55 max.	kw
PLATE DISSIPATION	17 max.	kw

Typical Operation:

	At 1.6 Mc		
Filament Voltage	10	11	volts
DC Plate Voltage	10200	12500	volts
DC Grid Voltage:[e]			
From a fixed supply of	-1500	-1500	volts
From a grid resistor of	2100	1500	ohms
Peak RF Grid Voltage	2070	2180	volts
DC Plate Current	3.3	4	amp
DC Grid Current (Approx.)	0.72	1	amp
Driving Power (Approx.)[f]	1350	1960	watts
Power Output (Approx.)	28	40	kw

RF POWER AMPLIFIER and OSCILLATOR — Class C Telegraphy

Key-down conditions per tube without modulation[g]

Maximum CCS[b] **Ratings,** *Absolute-Maximum Values:*

DC PLATE VOLTAGE	15000 max.	volts
DC GRID VOLTAGE	−2000 max.	volts
DC PLATE CURRENT	8 max.	amp
DC GRID CURRENT	1 max.	amp
PLATE INPUT	100 max.	kw
PLATE DISSIPATION	25 max.	kw

Typical Operation:

		At 1.6 Mc	
Filament Voltage	10	11	volts
DC Plate Voltage	12500	15000	volts
DC Grid Voltage:[h]			
From a fixed supply of	−1250	−1500	volts
From a cathode resistor of	190	225	ohms
From a grid resistor of	1300	1500	ohms
Peak RF Grid Voltage	1970	2270	volts
DC Plate Current	5.8	6	amp
DC Grid Current (Approx.)	0.95	1	amp
Driving Power (Approx.)[f]	1700	2040	watts
Power Output (Approx.)	55	70	kw

[a] When the 5671 is operated at less than maximum ratings, the filament voltage may be reduced to 9.75 volts.

[b] CCS Continuous Commercial Service.

[c] Averaged over any audio-frequency cycle of sine-wave form.

[d] The driving stage should have good regulation and should be capable of supplying considerably more than the required driving power.

[e] Obtained from a fixed supply, grid resistor, or a combination of both.

[f] Low Frequency driving power is absorbed by the grid and grid resistor and does not include circuit losses. At higher frequencies the power furnished by the driver must be greater because of increased tube and circuit losses.

[g] Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

[h] Obtained from a fixed supply, a cathode resistor, a grid resistor, or from a combination of a fixed supply and self-bias.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN ←

	Note	Min.	Max.	
Filament Current	1	265	305	amp
Amplification Factor	1,2	35	45	
Direct Interelectrode Capacitances:				
Grid to plate		45	59	μμf
Grid to filament		72	104	μμf
Plate to filament		1.1	1.9	μμf
Plate Voltage	1,3	3200	4200	volts
Plate Voltage	1,4	6700	8700	volts
Grid Voltage	1,5	−310	−490	volts
Grid Voltage	1,6	−	1100	volts

← Indicates a change.

	Note	Min.	Max.	
Peak Cathode Current	7	50	–	amp
Grid Current	1,6	–	9.5	amp
Useful Power Output	1,8	59	–	kw

Note 1: With 11 volts ac on filament.

Note 2: With dc grid voltage of -50 volts and dc plate voltage adjusted to give dc plate current of 2 amperes.

Note 3: With dc grid voltage of 0 volts and dc plate voltage adjusted to give dc plate current of 2 amperes.

Note 4: With dc grid voltage of -100 volts and dc plate voltage adjusted to give dc plate current of 2 amperes.

Note 5: With dc plate voltage of 15000 volts and dc grid voltage adjusted to give dc plate current of 50 ma.

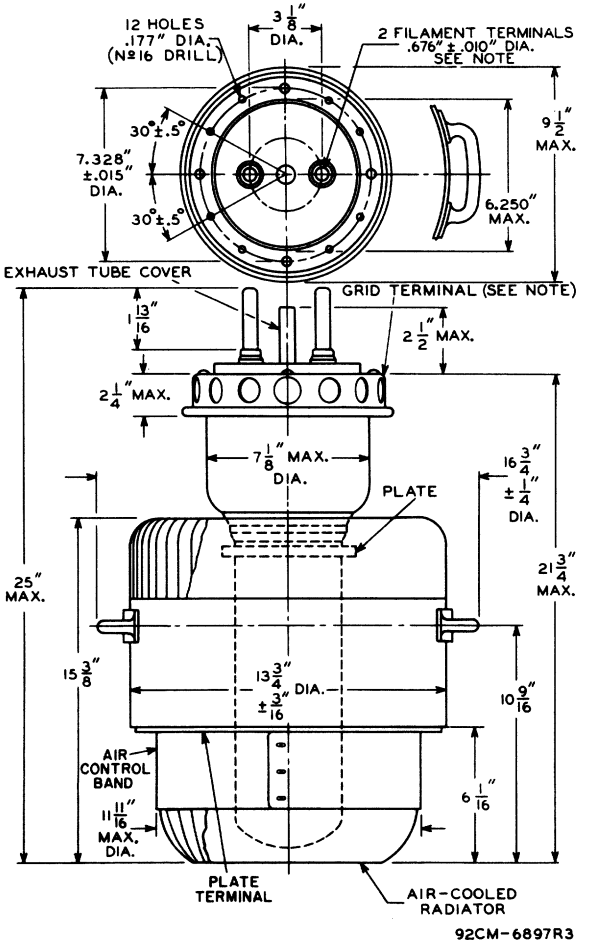
Note 6: With dc plate voltage of 2600 volts and instantaneous grid voltage adjusted to give instantaneous plate current of 35 amperes.

Note 7: Represents the maximum usable cathode current (plate current and grid current) for the tube under any condition of operation.

Note 8: In self-excited oscillator circuit and with dc plate voltage of 15000 volts, dc plate current of 6.6 amperes, dc grid current of 0.8 to 1.0 ampere, grid resistor of 1600 ± 10% ohms, and frequency of 1.6 Mc.

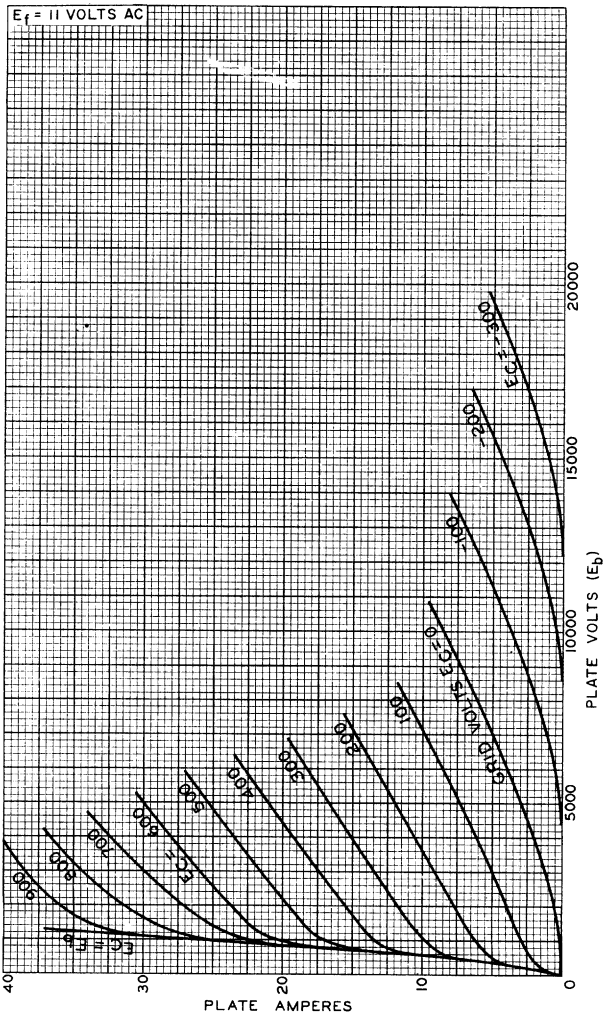
MAXIMUM RATINGS vs OPERATING FREQUENCY

FREQUENCY	10	18	25	Mc
MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM RATED PLATE VOLTAGE AND INPUT:				
Class C Telephony (Plate-Modulated)	100	88	80	%
Class C Telegraphy	100	88	80	%



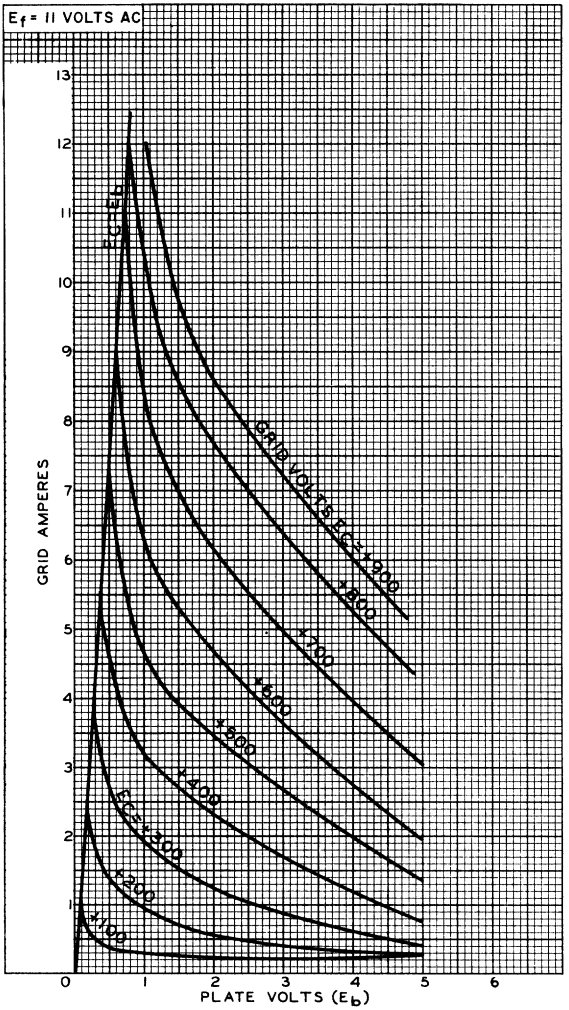
NOTE: FLEXIBLE CONNECTIONS ARE REQUIRED.

TYPICAL PLATE CHARACTERISTICS



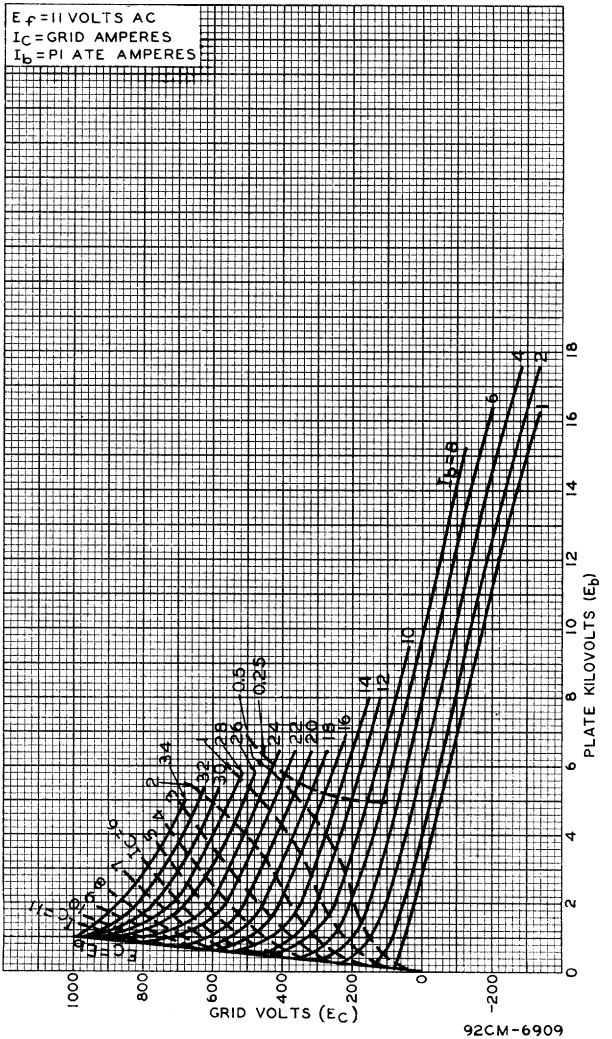
92CM-6899RI

TYPICAL CHARACTERISTICS



92CM-6900

TYPICAL CONSTANT-CURRENT CHARACTERISTICS



5675

Medium-Mu Triode

GLASS-METAL PENCIL TYPE

FAST WARM-UP TIME **STURDY COAXIAL-ELECTRODE STRUCTURE**

For Cathode-Drive Applications with Full Input up to 1700 Mc and with Reduced Input up to 3000 Mc, and at Altitudes up to 100,000 Feet

GENERAL DATA

Electrical:

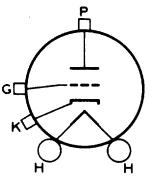
Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at heater volts = 6.3	0.135	amp
Amplification Factor	20	
Transconductance, for dc plate ma. = 24, dc plate volts = 135	6200	μmhos
Direct Interelectrode Capacitances:[a]		
Grid to plate	1.4	pf ←
Grid to cathode	2.4	pf ←
Plate to cathode	0.09 max.	pf

Mechanical:

Operating Position . . . . . Any
Dimensions . . . . . See *Dimensional Outline*
Socket for Heater Pins . . . . . Grayhill No.22-3[b], Cinch 54A16325[c], or equivalent

Terminal Connections (See *Dimensional Outline*):

H – Heater
K – Cathode



G – Grid
P – Plate

Thermal:

Plate-Seal Temperature	175 max.	°C

RF POWER AMPLIFIER AND OSCILLATOR — Class C Telegraphy ←

Key-down conditions per tube without amplitude modulation[d]

Maximum CCS[e] Ratings, *Absolute-Maximum Values:*

For altitudes up to 100,000 feet and frequencies up to 1700 Mc

DC PLATE VOLTAGE	300 max.	volts
DC GRID VOLTAGE	-90 max.	volts
DC CATHODE CURRENT	30 max.	ma

← Indicates a change.

DC GRID CURRENT	8 max.	ma
PLATE INPUT	5 max.	watts
PLATE DISSIPATION[f]	5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Typical CCS[e] Operation:

As oscillator in cathode-drive circuit

At frequency of	*1700*	*3000*	*Mc*
DC Plate-to-Grid Voltage	128	151.5	volts
DC Cathode-to-Grid Voltage	8	1.5	volts
From a grid resistor of	2000	5000	ohms
DC Plate Current	25	29	ma
DC Grid Current (Approx.)	4	0.3	ma
Useful Power Output (Approx.)	475	50	mw

Maximum Circuit Values:

Grid-Circuit Resistance	0.1 max.	megohm

[a] Without external shield.

[b] Grayhill, Inc., 561 Hillgrove Ave., LeGrange, Illinois.

[c] Cinch Manufacturing Company, 1026 South Homan Avenue, Chicago, Illinois.

[d] Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

[e] Continuous Commercial Service.

[f] In applications where the plate dissipation exceeds 2.5 watts, it is important that a large area of contact be provided between the plate cylinder and the connector to provide adequate heat conduction.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.125	0.145	amp
Direct Interelectrode Capacitances:				
Grid to plate	-	1.2	1.6	pf
Grid to cathode	-	2.0	2.6	pf
Plate to cathode	-	-	0.09	pf
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,2	-	100	μa
Heater positive with respect to cathode	1,2	-	100	μa
Leakage Resistance:				
From grid to plate and cathode connected together	1,3	25	-	megohms
From plate to grid and cathode connected together	1,4	25	-	megohms
Reverse Grid Current	1,5	-	1	μa
Emission Voltage	6	-	14	volts
Amplification Factor	1,7	15	25	
Transconductance	1,7	5100	7700	μmhos

Plate Current (1)	1,7	17	31	ma
Plate Current (2)	1,8	-	100	μa
Power Output	1,9	300	-	mw

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With 100 volts dc between heater and cathode.

Note 3: With grid 100 volts negative with respect to plate and cathode which are connected together.

Note 4: With plate 300 volts negative with respect to grid and cathode which are connected together.

Note 5: With dc plate voltage of 150 volts, dc grid voltage of -2 volts, grid resistor of 0.1 megohm.

Note 6: With dc voltage on grid and plate which are connected together adjusted to produce a cathode current of 30 ma. and with 5.5 volts on heater.

Note 7: With dc plate-supply voltage of 135 volts, cathode resistor of 68 ohms, and cathode bypass capacitor of 1000 μf.

Note 8: With dc plate voltage of 120 volts and dc grid voltage of -25 volts.

Note 9: With dc plate voltage of 120 volts, grid resistor adjusted to give a dc plate current of 25 milliamperes in a cavity-type oscillator operating at 1700 ± 5 Mc.

SPECIAL TESTS AND PERFORMANCE DATA

Low-Frequency Vibration Performance:

This test (similar to MIL-E-ID, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions:

Heater voltage of 6.3 volts, dc plate supply voltage of 150 volts, grid voltage of -2.5 volts, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 25 cps at an acceleration of 2.5 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

High-Frequency Vibration Performance:

This test (similar to MIL-E-ID, paragraph 4.9.19.2) is performed on a sample lot of tubes every 90 days. The tube is vibrated perpendicular to its axis, with no voltages applied to the tube. Vibration frequency is 40 to 60 cps and acceleration is 10 g. At the end of this test, tubes will meet the following limits:

Heater-Cathode Leakage Current . . . . . 100 max. μa
For conditions shown under *Characteristics Range Values Notes 1,2.*

Low-Frequency Vibration (rms) . . . . . 100 max. mv
For conditions shown above under *Low-Frequency Vibration Performance.*

Transconductance . . . . . 5100 min. μmhos
For conditions shown under *Characteristics Range Values Notes 1,7.*

Plate Current (2) . . . . . 100 max. μa
For conditions shown under *Characteristics Range Values Notes 1,8.*

Shorts and Continuity Test:

This test (similar to MIL-E-ID, paragraph 4.7.3) is performed on all tubes from each production run. Voltage applied between adjacent elements of the tube under test will be between 20 and 70 volts dc or peak ac. Plate and cathode terminals are tied together and connected to the grid terminal through the shorts test equipment. Tubes are tapped with a rubber tapper three times in each of three mutually perpendicular directions. If a short indication is obtained, the tapping cycle is repeated two times for verification. Acceptance criteria is based on the "Resistance vs. Time Duration" curve shown in paragraph 4.7.7 of MIL-I-D, Amendment 5.

Glass Seal Fracture Tests:

Fracture tests are performed on a sample lot of tubes every 90 days.

1. Tubes are placed on supports spaced 15/16" ± 1/64" apart with the grid flange centered between these supports. Tubes will withstand gradual application, perpendicular to the tube axis, of a force of 30 pounds upon the grid flange without causing fracture of the glass insulation.

2. Tubes are held by clamping to the cathode cylinder. Tubes will withstand gradual application of a torque of 12.5 inch-pounds upon the plate terminal without causing fracture of the glass insulation.

Dynamic Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure high quality of rf performance. Each tube is life-tested in a cavity-type oscillator at 500 ± 15 Mc under the following conditions:

Heater voltage of 6.3 volts, plate-supply voltage of 300 volts, cathode resistor is adjusted to give a dc plate current of 30 ma and value is recorded. At the end of 500 hours, the tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limit:

Power Output. . . . . 0.2 min. watt
For conditions shown under *Characteristics Range Values Notes 1,9.*

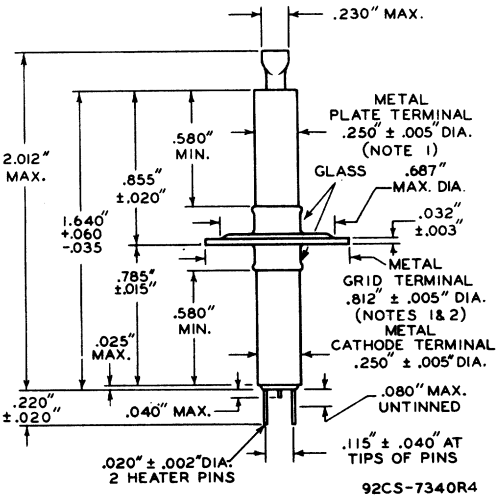
OPERATING CONSIDERATIONS

The *mounting* for this type in coaxial-line, parallel-line, or lumped circuits may support the tube securely by any one of the three terminals. Connections to the other two terminals must be made by contacts with flexible leads.

The *mounting* for this type in cavity-type circuits should preferably support the tube by the grid flange which should make firm contact to the cavity surface.

The *heater* pins of this type should not be soldered to circuit elements. The heat of the soldering operation may crack the glass seals of the heater pins and damage the tube.

The *cathode* should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum-rated values.

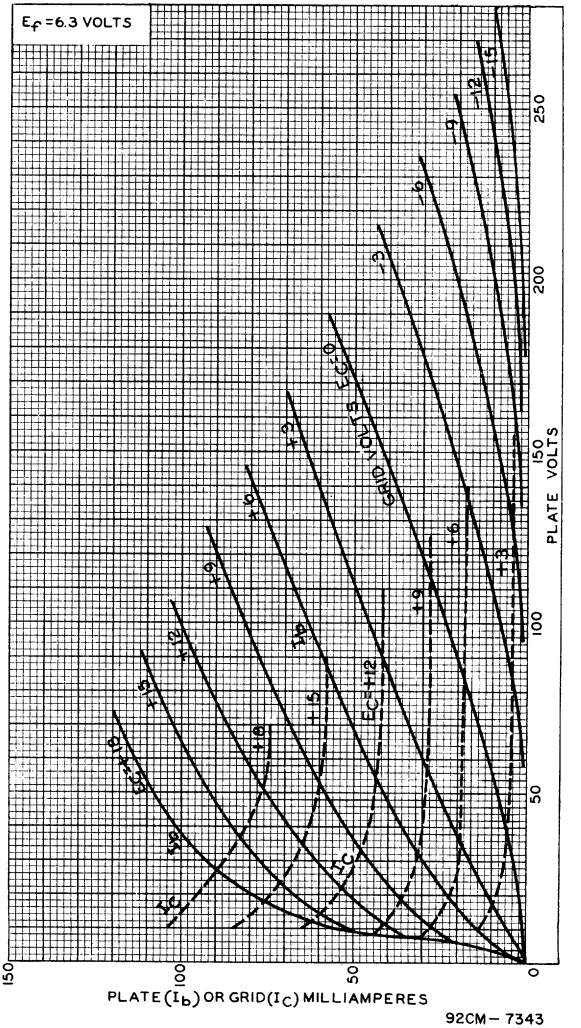


NOTE 1: MAXIMUM ECCENTRICITY OF CENTER LINE (AXIS) OF PLATE TERMINAL OR GRID-TERMINAL FLANGE WITH RESPECT TO THE CENTER LINE (AXIS) OF THE CATHODE TERMINAL IS 0.010".

NOTE 2: TILT OF GRID-TERMINAL FLANGE WITH RESPECT TO ROTATIONAL AXIS OF CATHODE TERMINAL IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE GRID-TERMINAL FLANGE PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM ITS EDGE FOR ONE COMPLETE ROTATION. THE TOTAL TRAVEL DISTANCE WILL NOT EXCEED 0.020".

5675

AVERAGE CHARACTERISTICS



92CM-7343

RCA

5686

5686 PREMIUM TYPE

BEAM POWER TUBE

9-PIN MINIATURE TYPE

For af or rf power-amplifier applications at frequencies up to 160 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.35	amp

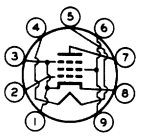
Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield°*	
Grid No.1 to plate	0.11 max.	0.08 max.	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater.	6.4	6.5	μμf
Plate to cathode & grid No.3, grid No.2, and heater.	4	8.5	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	.1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9G

Pin 1 - Cathode, Grid No.3
Pin 2 - Grid No.1
Pin 3 - Cathode, Grid No.3
Pin 4 - Heater



Pin 5 - Heater
Pin 6 - Grid No.2
Pin 7 - Plate
Pin 8 - Cathode, Grid No.3
Pin 9 - Grid No.2

AUDIO-FREQUENCY POWER AMPLIFIER — Class A_1

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	275 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	275 max.	volts
GRID-No.2 INPUT	3.3 max.	watts
PLATE DISSIPATION	8.25 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	100 max.	volts
Heater positive with respect to cathode.	100 max.	volts

Typical Operation and Characteristics:

Plate Voltage	250	volts
Grid-No.2 Voltage	250	volts

°: See next page.

RCA

5686

BEAM POWER TUBE

Grid-No.1 (Control-Grid) Voltage.	-12.5	volts
Peak AF Grid-No.1 Voltage	12.5	volts
Zero-Signal Plate Current	27	ma
Zero-Signal Grid-No.2 Current	3	ma
Plate Resistance (Approx.).	45000	ohms
Transconductance.	3100	μmhos
Load Resistance	9000	ohms
Max.-Signal Power Output.	2.7	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation.	0.1 max.	megohm
For cathode-bias operation.	0.5 max.	megohm

RADIO-FREQUENCY POWER AMPLIFIER — Class C

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	275 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	275 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE.	-165 max.	volts
PLATE CURRENT	44 max.	ma
GRID-No.2 CURRENT	16.5 max.	ma
GRID-No.1 CURRENT	3.3 max.	ma
PLATE INPUT	11 max.	watts
GRID-No.2 INPUT	3.3 max.	watts
PLATE DISSIPATION	8.25 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	100 max.	volts
Heater positive with respect to cathode.	100 max.	volts

Typical Operation:

	At frequencies up to 160 Mc		
Plate Voltage	250	250	volts
Grid-No.2 Voltage	180	250	volts
Grid-No.1 Voltage	-30	-50	volts
From grid-No.1 resistor of. . .	15000	25000	ohms
Peak RF Grid-No.1 Voltage	50	75	volts
Plate Current	30	40	ma
Grid-No.2 Current (Approx.) . . .	6.5	10.5	ma
Grid-No.1 Current (Approx.) . . .	2	2	ma
RF Grid-No.1 Driving Power (Approx.)	0.1	0.15	watt
Power Output (Approx.).	5	6.5	watts
Useful Power Output at 125 Mc . .	-	5.25	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance. . .	50000 max.	ohms

° With external shield JEDEC No.315 connected to cathode & grid No.3.

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BEAM POWER TUBE

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

This test is performed on a sample lot of tubes from each production run. Tubes are held rigid and are subjected in four different positions to an impact acceleration of 450 g.

Fatigue Rating:

This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected to 2.5 g vibrational acceleration at a fixed frequency of 25 cycles per second for 100 hours in each of three positions.

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. Tubes will withstand a minimum of 2000 cycles of intermittent operation under the following conditions: heater volts = 7.5 cycled one minute on and one minute off, heater 100 volts positive with respect to cathode, and all other elements connected to ground.

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MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Heater arrangement	*Series*	*Parallel*	
Voltage	12.6	6.3	ac or dc volts
Current	0.45	0.9	amp
Direct Interelectrode Capacitances (Approx.):[o]			
Grid to plate (Each unit)		4	μμf
Grid to cathode and heater (Each unit)		4	μμf
Plate to cathode and heater:			
Unit No.1		0.6	μμf
Unit No.2		0.5	μμf
Heater to cathode (Each unit)		7	μμf
Grid to grid		0.025	μμf
Plate to plate		0.75	μμf

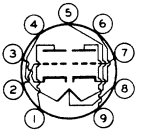
Characteristics, Class A_1 Amplifier (Each Unit):

Plate Voltage	120	180	250	volts
Grid Voltage	-2	-7	-12.5	volts
Amplification Factor	18	17	16	
Plate Resistance (Approx.)	1560	2000	3000	ohms
Transconductance	11500	8500	5400	μmhos
Plate Current	36	23	12	ma
Grid Voltage (Approx.) for plate μa = 100	-9	-14	-19	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9H

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pins 4 & 8 - Heater of Unit No.2
Pins 5 & 8 - Heater of Unit No.1



Pin 6 - Cathode of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Heater Mid-Tap
Pin 9 - Plate of Unit No.1

[o]: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

5687

MEDIUM-MU TWIN TRIODE

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	330 max.	volts
GRID CURRENT	6.6 max.	ma
PLATE DISSIPATION:		
Either plate	4.2 max.	watts
Both plates (Both units operating)	7.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	100 max.	volts
Heater positive with respect to cathode.	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	220 max.	°C

Maximum Circuit Values:

Grid-Circuit Resistance	1 max.	megohm

° Without external shield.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

RCA

5691

HIGH-MU TWIN TRIODE

5691 SPECIAL RED TUBE

Intended for critical industrial applications where 10,000-hour life, extreme uniformity, rigid construction, and exceptional stability are paramount. Within its ratings, the 5691 may be used to replace its receiving-tube counterpart, type 6SL7-GT, where heater transformer will carry increased current.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage	6.3 ± 5%*	ac or dc volts
Current	0.6	amp

Direct Interelectrode Capacitances:°

	Min.	Av.	Max.	
Triode No.1:				
Grid to Plate	3.1	3.6	4.1	μμf
Grid to Cathode	1.9	2.4	2.9	μμf
Plate to Cathode	1.8	2.3	2.8	μμf
Triode No.2:				
Grid to Plate	3.1	3.6	4.1	μμf
Grid to Cathode	2.2	2.7	3.2	μμf
Plate to Cathode	2.1	2.6	3.1	μμf
Plate of Triode No.1 to Plate of Triode No.2	0.27	0.32	0.37	μμf

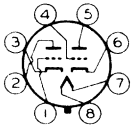
* May deviate ±10% from rated value provided such deviation occurs for less than 2% of the operating time.

° With no external shield.

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-7/8"
Maximum Seated Length	2-5/16"
Maximum Diameter	1-9/32"
Bulb	T-9
Base	Short Intermediate-Shell Octal 8-Pin, Non-Hygroscopic
Basing Designation for BOTTOM VIEW	8BD

Pin 1 - Grid of Triode No.2
Pin 2 - Plate of Triode No.2
Pin 3 - Cathode of Triode No.2
Pin 4 - Grid of Triode No.1



Pin 5 - Plate of Triode No.1
Pin 6 - Cathode of Triode No.1
Pin 7 - Heater
Pin 8 - Heater

(continued on next page)

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5691
HIGH-MU TWIN TRIODE

INDUSTRIAL SERVICE

Includes applications such as dc and audio amplifiers

Values are for each unit

Maximum Ratings, *Absolute Values*:

DC PLATE VOLTAGE	275 max.	volts
DC PLATE-SUPPLY VOLTAGE	330 max.	volts
GRID VOLTAGE:		
Negative bias range	1● min. to 100 max.	volts
Negative peak value	200 max.	volts
DC GRID CURRENT	2 max.	ma
DC CATHODE CURRENT	10 max.	ma
PLATE DISSIPATION	1 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
AMBIENT TEMPERATURE RANGE	-55 to +90	°C

● For resistance-coupled amplifier applications, the negative bias may be as low as 0.5 volt.

Maximum Circuit Value (for any operating condition):

Grid-Circuit Resistance	2 max.	megohms

Characteristics and Range Values:

Heater Volts, 6.3; Plate Volts, 250; Grid Volts, -2

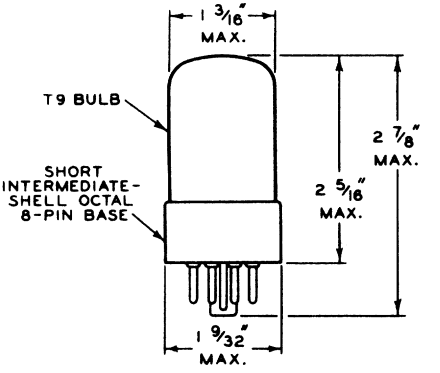
	Min.	*Av.*	*Max.*	
Heater Current	0.55	0.6	0.65	amp
Heater-Cathode Current with heater-cathode voltage of ± 100 volts	–	–	5	μamp
Plate Current	1.7	2.3	2.9	ma
Difference in Plate Current between triode units	–	–	0.9	ma
Plate Current for grid voltage of -5.5 volts	–	–	15	μamp
Reverse Grid Current	–	–	0.2	μamp
Amplification Factor	60	70	80	
Plate Resistance	–	44000	–	ohms
Transconductance	1300	1600	1900	μmhos

Typical Operation as Resistance-Coupled Amplifier (Each Unit)

See RESISTANCE-COUPLED AMPLIFIER CHART No.7 at front of Receiving Tube Section.

5691

HIGH-MU TWIN TRIODE



5691

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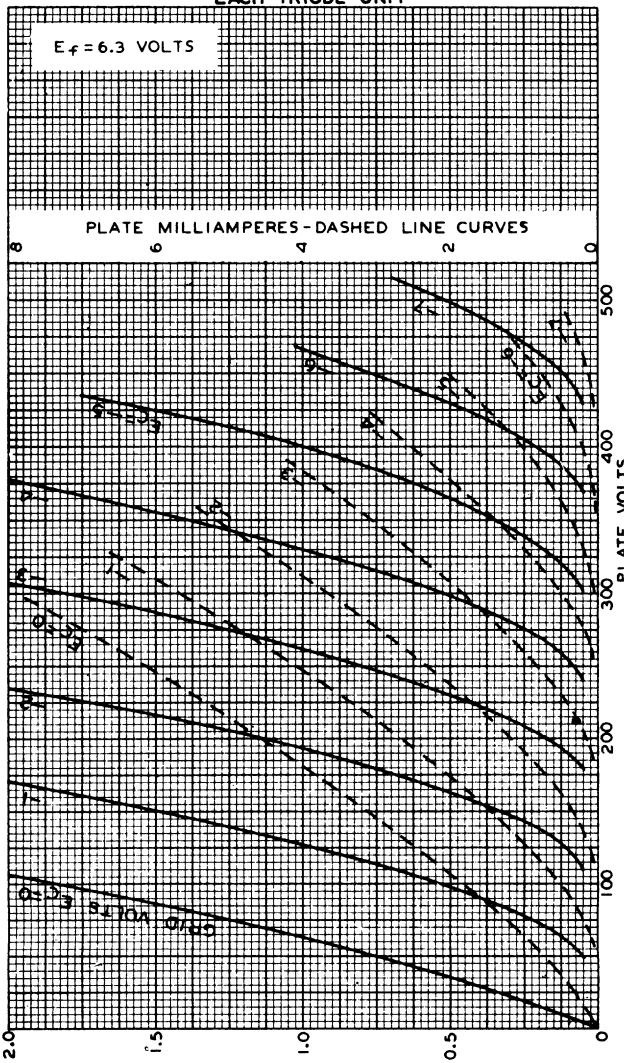
AVERAGE PLATE CHARACTERISTICS
EACH TRIODE UNIT



JUNE 16, 1941 TUBE DEPARTMENT 92C-6298

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RCA

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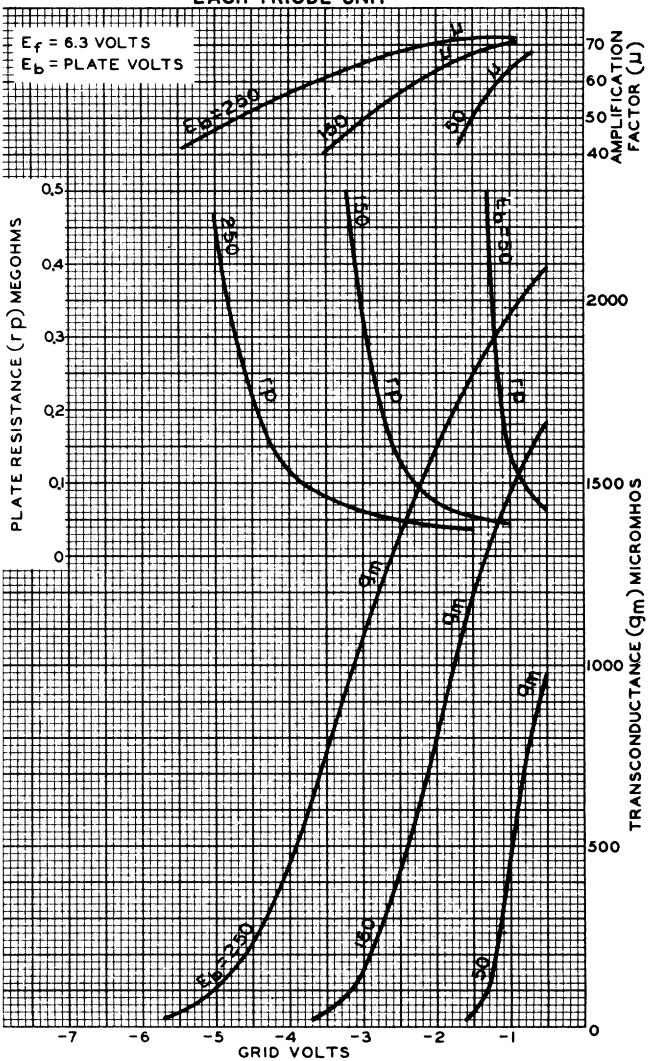
AVERAGE CHARACTERISTICS
EACH TRIODE UNIT



5692

MEDIUM-MU TWIN TRIODE

5692 SPECIAL RED TUBE

Intended for critical industrial applications where 10,000-hour life, extreme uniformity, rigid construction, and exceptional stability are paramount. Within its ratings, the 5692 may be used to replace its receiving-tube counterpart, type 6SN7-GT.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage	6.3 ± 5%*	ac or dc volts
Current	0.6	amp

Direct Interelectrode Capacitances:°

	Min.	Av.	Max.	
Triode No.1:				
Grid to Plate	3.0	3.5	4.0	μμf
Grid to Cathode	1.8	2.3	2.8	μμf
Plate to Cathode	2.0	2.5	3.0	μμf
Triode No.2:				
Grid to Plate	2.8	3.3	3.8	μμf
Grid to Cathode	2.1	2.6	3.1	μμf
Plate to Cathode	2.2	2.7	3.2	μμf
Plate of Triode No.1 to Plate of Triode No.2	0.27	0.32	0.37	μμf

* Heater voltage may deviate ± 10% from rated value, provided such deviation occurs for less than 2% of the operating time.

° With no external shield.

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-7/8"
Maximum Seated Length	2-5/16"
Maximum Diameter	1-9/32"
Bulb	T-9
Base	Short Intermediate-Shell Octal 8-Pin, Non-Hygroscopic
Basing Designation for BOTTOM VIEW	8BD

Pin 1 - Grid of Triode No.2
Pin 2 - Plate of Triode No.2
Pin 3 - Cathode of Triode No.2
Pin 4 - Grid of Triode No.1

Pin 5 - Plate of Triode No.1
Pin 6 - Cathode of Triode No.1
Pin 7 - Heater
Pin 8 - Heater

(continued on next page)

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5692
MEDIUM-MU TWIN TRIODE

INDUSTRIAL SERVICE

Including applications such as dc amplifiers, audio amplifiers, and relaxation oscillators.

Values are for each unit

Maximum Ratings, *Absolute Values*:

DC PLATE VOLTAGE	275 max.	volts
DC PLATE-SUPPLY VOLTAGE	330 max.	volts
GRID VOLTAGE:		
Negative bias range	1● min. to 100 max.	volts
Negative peak value	200 max.	volts
DC GRID CURRENT	2 max.	ma
DC CATHODE CURRENT	15 max.	ma
PLATE DISSIPATION	1.75 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
AMBIENT TEMPERATURE RANGE	−55 to +90	°C

● For resistance-coupled amplifier applications, the negative bias may be as low as 0.5 volt.

Maximum Circuit Value (for any operating condition):

Grid-Circuit Resistance	2 max.	megohms

Characteristics and Range Values:

Heater Volts, 6.3; Plate Volts, 250; Grid Volts, -8

	Min.	*Av.*	*Max.*	
Heater Current	0.55	0.6	0.65	amp
Heater-Cathode Current with heater-cathode voltage of ± 100 volts	–	–	5	μamp
Plate Current	4.8	6.5	8.2	ma
Difference in Plate Current between triode units	–	–	2.0	ma
Plate Current for grid voltage of -24 volts	–	–	15	μamp
Reverse Grid Current	–	–	0.2	μamp
Amplification Factor	18	20	22	
Plate Resistance	–	9100	–	ohms
Transconductance	1825	2200	2575	μmhos

Typical Operation as Resistance-Coupled Amplifier (Each Unit)

See RESISTANCE-COUPLED AMPLIFIER CHART No. 13 at front of Receiving Tube Section.

OUTLINE DIMENSIONS for the 5692 are the same as those shown for type 5691

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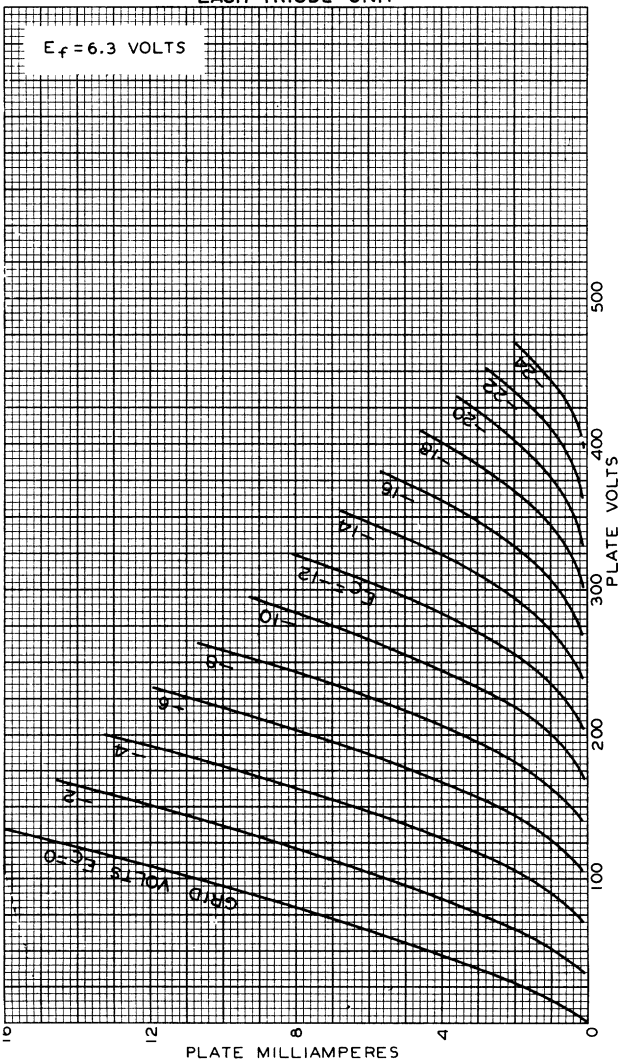
AVERAGE PLATE CHARACTERISTICS
EACH TRIODE UNIT



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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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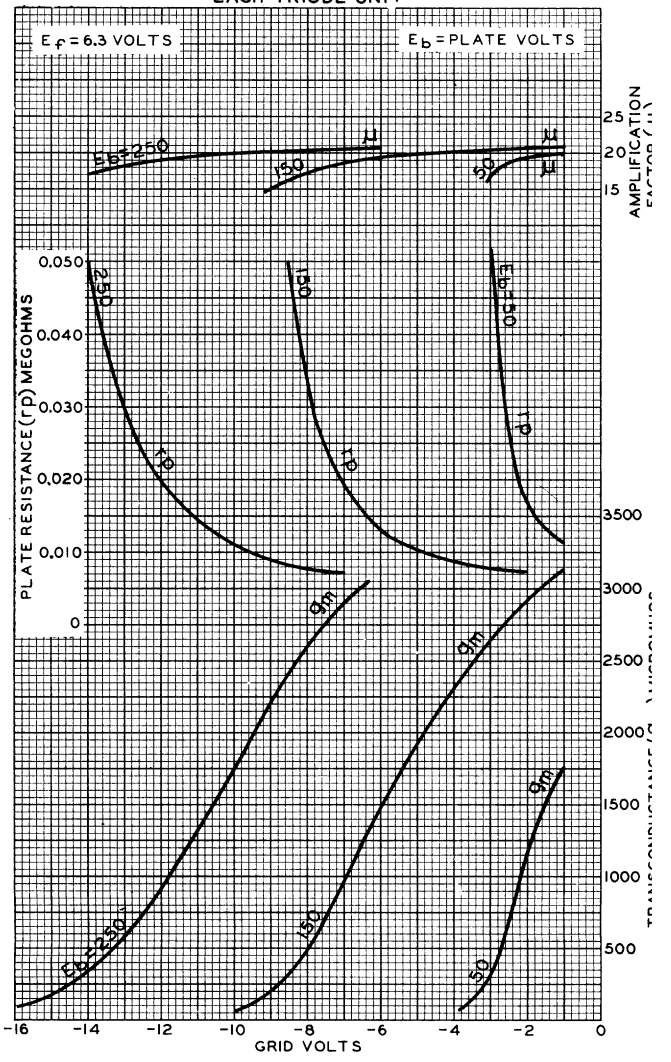
AVERAGE CHARACTERISTICS

EACH TRIODE UNIT



NOV. 10, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6914

5693

SHARP-CUTOFF PENTODE

5693 SPECIAL RED TUBE

Intended for critical industrial applications where 10,000-hour life, extreme uniformity, rigid construction, and exceptional stability are paramount. Within its ratings, the 5693 may be used to replace its receiving-tube counterpart, type 6SJ7.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3 ± 5%*	ac or dc volts
Current	0.3	amp

Direct Interelectrode Capacitances:°

	Min.	Av.	Max.	
Grid to Plate	–	–	0.005	μμf
Input	4.8	5.3	5.8	μμf
Output	5.6	6.2	6.8	μμf

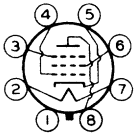
* May deviate ± 10% from rated value provided such deviation occurs for less than 2% of the operating time.

° With shell connected to cathode.

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-5/8"
Seated Length	1-31/32" ± 3/32"
Maximum Diameter	1-5/16"
Bulb	Metal Shell MT-8
Base	Small-Wafer Octal 8-Pin, Non-Hygroscopic
Basing Designation for BOTTOM VIEW	8N

Pin 1 – Shell
Pin 2 – Heater
Pin 3 – Grid No.3
Pin 4 – Grid No.1



Pin 5 – Cathode
Pin 6 – Grid No.2
Pin 7 – Heater
Pin 8 – Plate

INDUSTRIAL SERVICE

Includes applications such as dc and resistance-coupled amplifiers

Maximum Ratings, *Absolute Values*:

DC PLATE VOLTAGE	300 max.	volts
DC PLATE-SUPPLY VOLTAGE	330 max.	volts
DC GRID-No.3 (SUPPRESSOR) VOLTAGE:		
Negative bias value	0 min.	volts
	-100 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE▲	125 max.	volts
DC GRID-No.2-SUPPLY VOLTAGE	330 max.	volts

▲: See next page.

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SHARP-CUTOFF PENTODE

GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative bias range.	-1■ min. to -50 max.	volts
Negative peak value.	-50 max.	volts
DC CATHODE CURRENT	10 max.	ma
PLATE DISSIPATION.	2 max.	watts
GRID-No.2 DISSIPATION.	0.3 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	100 max.	volts
Heater positive with respect to cathode.	100 max.	volts
AMBIENT TEMPERATURE RANGE.	-55 to +90	°C

Maximum Circuit Value:

See curve on a following page giving maximum values of the grid-No.1 resistor.

Characteristics and Range Values:

Heater volts, 6.3; Plate Volts, 250; Grid-No.3 Volts, 0; Grid-No.2 Volts, 100; Grid-No.1 Volts, -3.

	Min.	Av.	Max.	
Heater Current	0.275	0.300	0.325	amp
Heater-Cathode Current with heater-cathode voltage of ± 100 volts	–	–	5	μamp
Plate Current.	2.3	3.0	3.7	ma
Plate Current for grid-No.1 voltage of -7.5 volts. . .	2	30	80	μamp
Plate Current for grid-No.3 voltage of -70 volts . . .	150	450	750	μamp
Grid-No.2 Current.	0.60	0.85	1.10	ma
Reverse Grid-No.1 Current. .	–	–	0.1	μamp
Plate Resistance	1.0	–	–	megohm
Transconductance	1400	1650	1900	μmhos

Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED AMPLIFIER CHART No.20 at front of Receiving Tube Section.

▲ The 5693 may be operated at a grid-No.2 voltage as high as the rated grid-No.2 supply voltage when the grid-No.2 dissipation rating is not exceeded for any signal condition and when a resistor is used in series with grid-No.2 and its supply voltage.

■ For resistance-coupled amplifier applications, the grid-No.1 negative bias may be as low as -0.5 volt.

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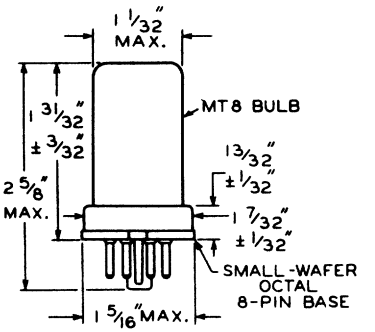
SHARP-CUTOFF PENTODE



5693

RCA

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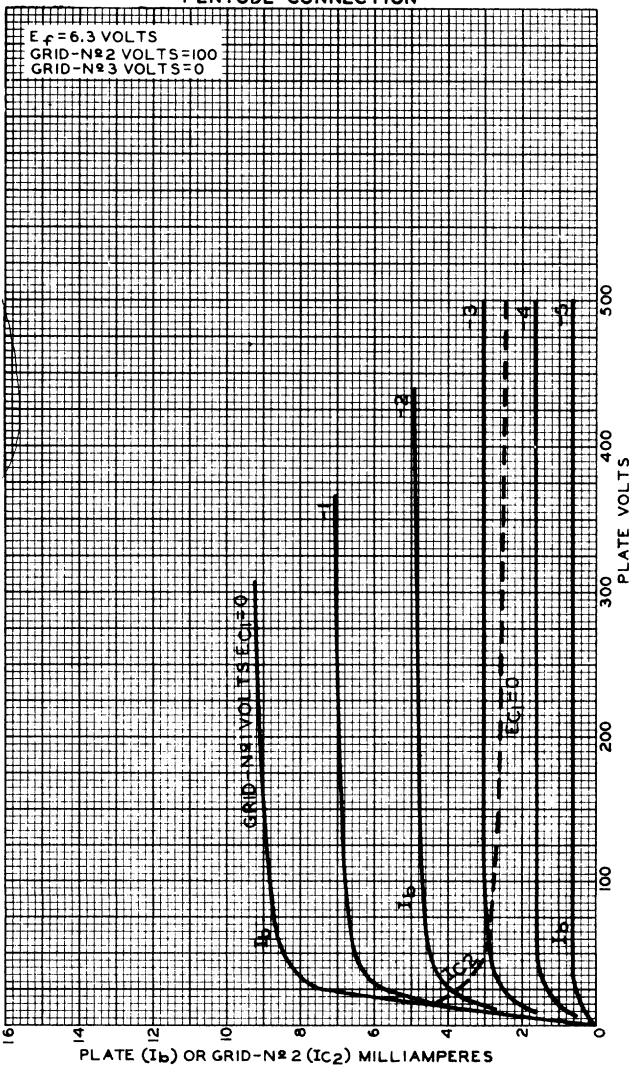
AVERAGE PLATE CHARACTERISTICS

PENTODE CONNECTION



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OPERATION CHARACTERISTICS

E_f = 6.3 VOLTS PLATE VOLTS = 300 GRID-№3 VOLTS = 0

CURVE	GRID-№2 RESISTOR	GRID-№2 SUPPLY VOLTS
1	0 MEG.	100
2	0.25 MEG.	300
3	0.5 MEG.	300
4	0.75 MEG.	300

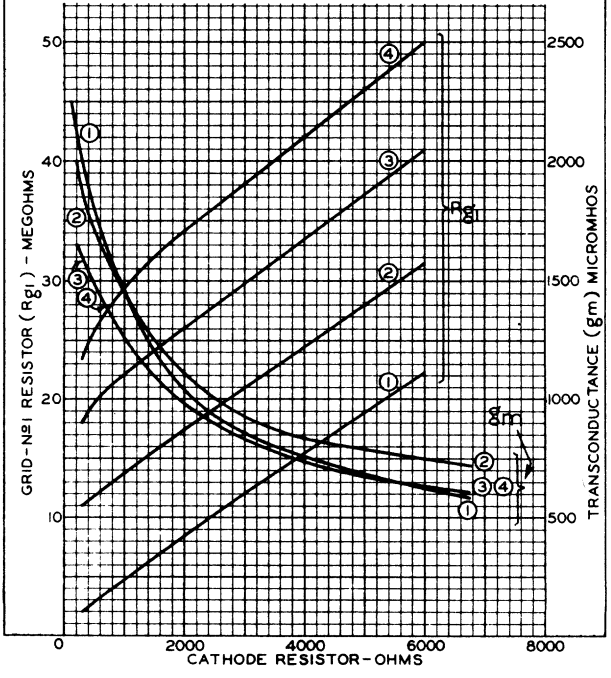
THESE CURVES ARE BASED ON THE FOLLOWING VALUES: ΔI_K=300μAMP, ΔI_{g_1}=0.1μAMP

EXPRESSING THESE VALUES AS A RATIO, WE HAVE:

$$\frac{\Delta I_K}{\Delta I_{g_1}} = \frac{300}{0.1} \text{ OR } 3000$$

FOR THOSE APPLICATIONS PERMITTING OTHER VALUES OF ΔI_K, A NEW RATIO OF $\Delta I_K/\Delta I_{g_1}$ CAN BE CALCULATED. THE VALUES OF R_{g_1} AS READ FROM THE CURVE MUST BE MULTIPLIED BY A FACTOR WHICH IS THE QUOTIENT OF THE NEW RATIO DIVIDED BY THE OLD RATIO. FOR EXAMPLE, IF THE NEW RATIO IS 6000 THE MULTIPLYING FACTOR IS 6000/3000, OR 2, AND VALUES OF R_{g_1} AS READ FROM THE CURVE ARE THEREFORE MULTIPLIED BY 2.

NOTE: TRANSCONDUCTANCE CURVES WERE OBTAINED WITH GRID-№2 RESISTOR AND CATHODE RESISTOR SUITABLY BYPASSED.



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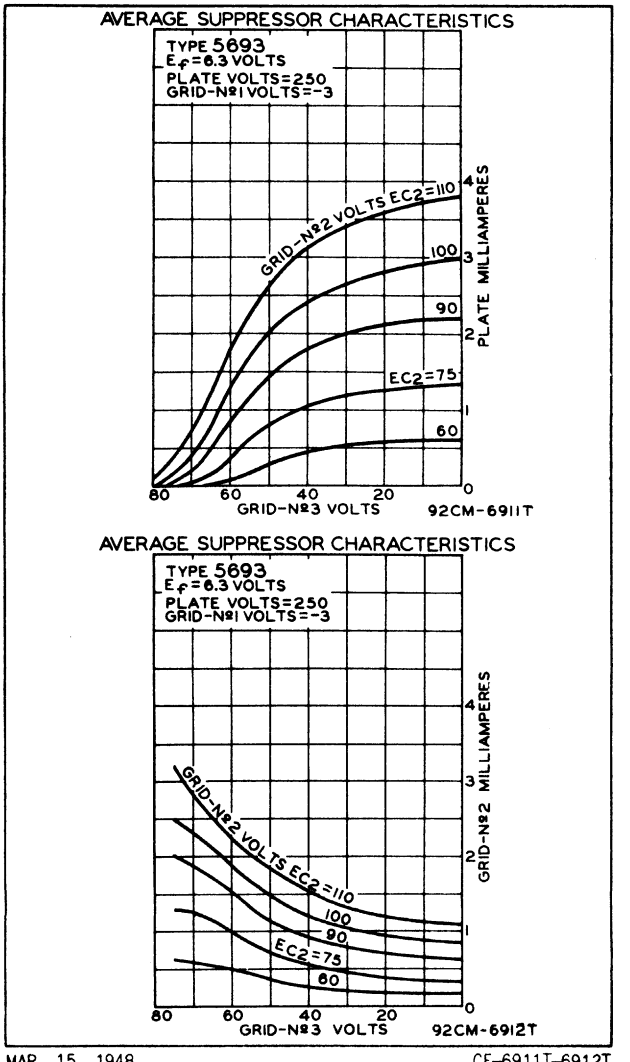
5693
SHARP-CUTOFF PENTODE



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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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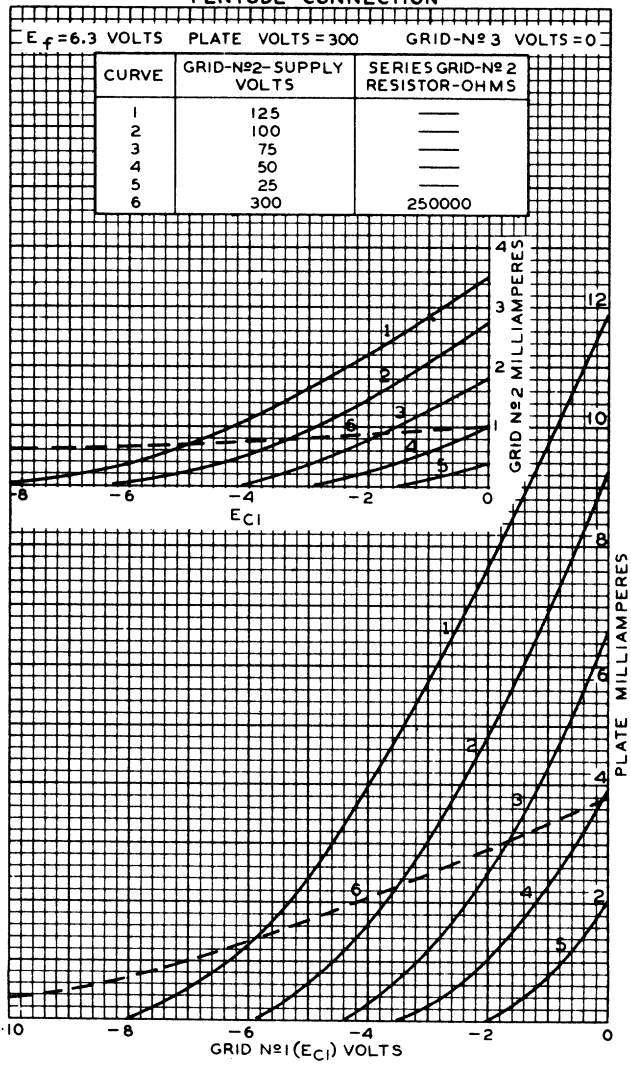
AVERAGE CHARACTERISTICS
PENTODE CONNECTION



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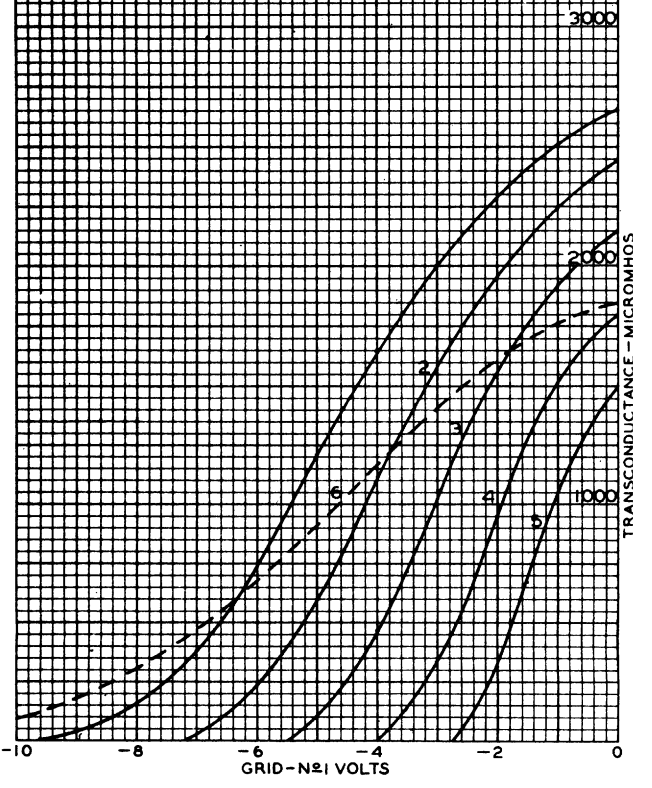
AVERAGE CHARACTERISTICS
PENTODE CONNECTION

E_f=6.3 VOLTS PLATE VOLTS=300 GRID-№3 VOLTS=0

CURVE	GRID-№2-SUPPLY VOLTS	SERIES GRID-№2 RESISTOR-OHMS
1	125	——
2	100	——
3	75	——
4	50	——
5	25	——
6	300	250000



RCA

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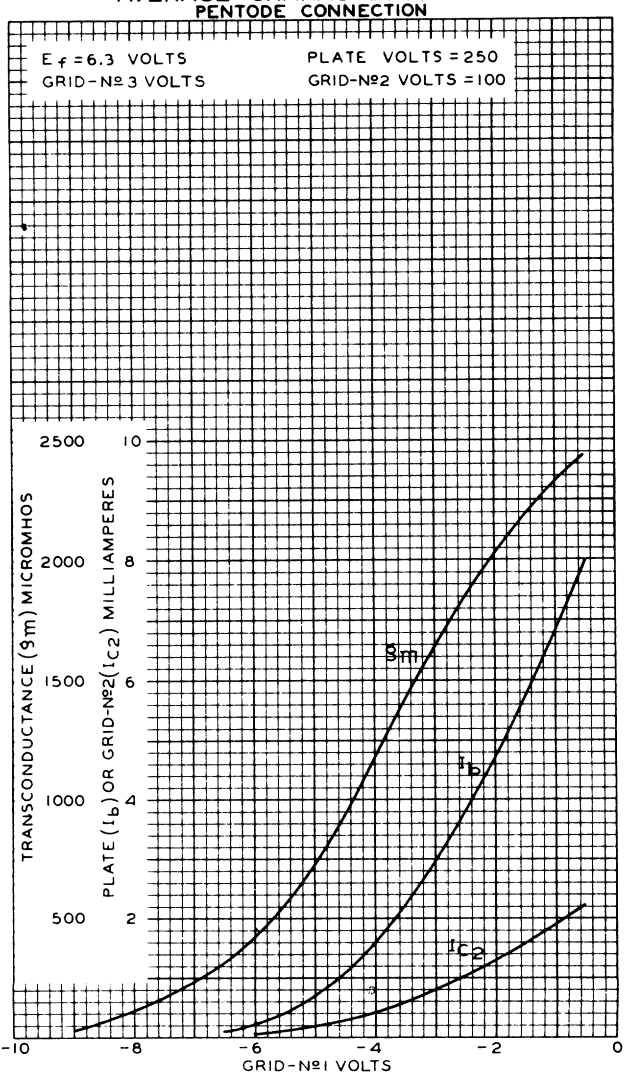
AVERAGE CHARACTERISTICS
PENTODE CONNECTION



5718

MEDIUM-MU TRIODE

SUBMINIATURE TYPE

5718 PREMIUM TYPE

Intended for applications where dependable performance under shock and vibration is paramount.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3 ± 5%	ac or dc volts
Current	0.150	amp

Direct Interelectrode Capacitances:

	With External Shield[o]	*Without External Shield*	
Grid to Plate	1.3	1.4	μμf
Input	2.4	2.2	μμf
Output	2.4	0.7	μμf

[o] Having inside diameter of 0.405" and connected to lead No.5.

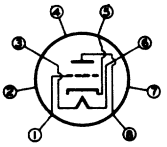
Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	100	150	volts
Cathode Resistor	150	180	ohms
Amplification Factor	27	27	
Plate Resistance	4650	4150	ohms
Transconductance	5800	6500	μmhos
Plate Current	8.5	13.0	ma
Grid Volts (Approx.) for plate current of 10 μamp	-7	-11	volts

Mechanical:

Operating Position	Any
Maximum Bulb Length	1-3/8"
Length from Button Seal to Bulb Top (Excluding tip)	1.075" ± 0.060"
Diameter	0.383" ± 0.017"
Bulb	T-3
Leads, Flexible	8
Length	1-1/2" to 1-3/4"
Orientation and Diameter	See Dimensional Outline

BOTTOM VIEW



Lead No.1 – Grid
Lead No.2 – No Conn.
Lead No.3 – Heater
Lead No.4 – No Conn.
Lead No.5 – Cathode
Lead No.6 – Heater
Lead No.7 – No Conn.
Lead No.8 – Anode

AMPLIFIER - Class A_1

Maximum Ratings, *Absolute Values*:

DC PLATE VOLTAGE	165 max.	volts

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MEDIUM-MU TRIODE

PLATE DISSIPATION	3.3 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250 max.	°C

Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED AMPLIFIER CHART at end of tabulated data for this type

Maximum Circuit Values:

Grid-Circuit Resistance:
- For cathode-bias operation . . . . . 1.2 max. megohms
- For fixed-bias operation . . . . . Not recommended

Cathode-Bias Resistance - An adequate value of cathode-bias resistor should be used to protect the tube in event of temporary failure of excitation and resultant loss in developed bias.

RF AMPLIFIER and OSCILLATOR - Class C

Operation with full input is permissible up to 1000 Mc.

Maximum Ratings, *Absolute Values*:

DC PLATE VOLTAGE	165 max.	volts
DC GRID VOLTAGE	-55 max.	volts
DC PLATE CURRENT	22 max.	ma
DC GRID CURRENT	5.5 max.	ma
PLATE DISSIPATION	3.3 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250 max.	°C

Maximum Circuit Values:

Grid-Circuit Resistance:
- For cathode-bias operation . . . . . 1.2 max. megohms
- For fixed-bias operation . . . . . Not recommended

Cathode-Bias Resistance - An adequate value of cathode-bias resistor should be used to protect the tube in event of temporary failure of excitation and resultant loss in developed bias.

TUBE DEPARTMENT
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MEDIUM-MU TRIODE

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN*

	Note	Min.	Max.	
Heater Current	1	0.138	0.162	amp
Grid-to-Plate Capacitance	2	1.1	1.8	μμf
Input Capacitance	2	1.6	2.8	μμf
Output Capacitance	2	0.5	0.9	μμf
Amplification Factor	1,3	23	31	
Plate Current	1,3	6.0	11.0	ma
Plate Current	1,4	–	100	μamp
Transconductance	1,3	4800	6800	μmhos
Transconductance	5,3	4500	–	μmhos
Grid Current	1,6	–	±0.4	μamp
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,7	–	7.0	μamp
Heater positive with respect to cathode	1,7	–	7.0	μamp
Leakage Resistance:				
Between Grid and All Other Electrodes Tied	1,8	100	–	megohms
Between Plate and All Other Electrodes Tied	1,9	100	–	megohms
Useful Power Output	1,10	600	–	mw

* Each tube is stabilized before characteristics testing by continuous operation for at least 45 hours at room temperature and with dissipation values equivalent to life test conditions.

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With external shield.

Note 3: With dc plate supply voltage of 100 volts, cathode resistor of 150 ohms, and cathode bypass capacitor of 1000 microfarads.

Note 4: With dc plate voltage of 100 volts, and dc grid voltage of −7 volts.

Note 5: With 5.5 volts ac or dc on heater.

Note 6: With dc plate supply voltage of 100 volts, cathode resistor of 150 ohms, and grid resistor of 0.5 megohm.

Note 7: With 100 volts dc between heater and cathode.

Note 8: With grid 100 volts negative with respect to all other electrodes tied together.

Note 9: With plate 300 volts negative with respect to all other electrodes tied together.

Note 10: In self-excited oscillator with dc plate voltage of 150 volts, grid resistor and feedback optimized to give useful power output at a plate current of 20 ma. and frequency of 500 MC.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration . . . . . 450 max. g

Tubes are held rigid in three different positions in a Navy Type, High Impact (flyweight) Shock Machine and are subjected to 450 g impact acceleration.

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MEDIUM-MU TRIODE

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours.

Uniform Acceleration Rating . . . . . 1000 max. g

Tubes are subjected in each of three positions to a gradually applied uniform acceleration up to 1000 g.

High-Frequency Vibration Performance:

RMS Output Voltage . . . . . 60 max. mv

Under the following conditions: A 100-volt plate and grid-No.2 voltage supply having an impedance not exceeding that of a 40-μf capacitor, plate load resistance of 10000 ohms, grid-No.1 resistor of 0.1 megohm, cathode resistor of 150 ohms, cathode bypass capacitor of 1000 μf, and vibrational acceleration of 15 g at 40 cps.

Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . 2500 max. cycles

Under the following conditions: With heater voltage of 7.0 volts cycled 1 minute on and 4 minutes off, heater-cathode voltage of 140 volts (rms), and plate, grid-No.2, and grid-No.1 voltage = 0 volts.

Average Life Performance:

The average life performance based on a 500-hour test at 175°C ambient temperature is not less than 450 hours. This life test is made on sample lot of tubes with heater voltage of 6.3 volts; plate supply voltage of 100 volts; grid-No.2 supply voltage of 100 volts; dc heater-cathode voltage (heater positive with respect to cathode) of 200 volts; cathode resistor of 150 ohms; and grid-No.1 resistor of 1 megohm.

The 500-hour end-point limits for the 5840 with heater voltage of 6.3 volts, plate supply voltage of 100 volts, grid-No.2 supply voltage of 100 volts, cathode resistor of 150 ohms bypassed by capacitor having a maximum reactance of 3 ohms, and dc heater-cathode voltage of 100 volts with heater either positive or negative with respect to cathode are: transconductance, 3250 micromhos minimum; heater-cathode leakage current, 20 microamperes maximum; and grid-No.1 current, +0.9 microampere maximum or −0.9 microampere maximum.

TUBE DEPARTMENT
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MEDIUM-MU TRIODE

OPERATING CONDITIONS AS RESISTANCE-COUPLED AMPLIFIER

Plate-Supply Voltage	100						volts
Plate Load Resistor	0.047		0.10		0.27		meg
Grid-No.1 Resistor[o]	0.10	0.27	0.27	0.47	0.27	0.47	meg
Cathode Resistor	1000	1200	2200	2700	6800	8200	ohms
Sig. Input Volt. (rms)	0.5	0.5	0.5	0.5	0.5	0.5	volt
Output Voltage (rms)	8.2	8.5	8.2	8.2	7.3	7.4	volts
Voltage Gain[▲]	16.4	17.0	16.4	16.4	4.6	14.8	
Distortion	3.9	3.2	3.0	2.71	3.4	2.8	%
Sig. Input Volt. (rms)[*]	0.59	0.70	0.67	0.81	0.75	0.86	volt
Output Voltage (rms)	9.7	11.75	11.0	13.1	11.0	12.7	volts
Voltage Gain[▲]	16.4	16.8	16.4	16.2	14.6	14.8	
Distortion	4.5	4.7	4.1	4.6	5.0	5.0	%

Plate-Supply Voltage	200						volts
Plate Load Resistor	0.047		0.10		0.27		meg
Grid-No.1 Resistor[o]	0.10	0.27	0.27	0.47	0.27	0.47	meg
Cathode Resistor	820	1000	1800	2200	4700	5600	ohms
Sig. Input Volt. (rms)	1.0	1.0	1.0	1.0	1.0	1.0	volt
Output Voltage (rms)	19.0	19.5	18.6	18.1	16.2	16.2	volts
Voltage Gain[▲]	19.0	19.5	18.6	18.1	16.2	16.2	
Distortion	4.0	3.3	3.2	3.1	3.8	3.2	%
Sig. Input Volt. (rms)[*]	1.23	1.45	1.43	1.56	1.34	1.58	volts
Output Voltage (rms)	23.4	28.0	26.0	28.2	21.6	25.0	volts
Voltage Gain[▲]	19.0	19.3	18.2	18.1	16.1	15.8	
Distortion	5.0	5.0	4.9	5.0	5.1	5.1	%

[o] of following stage.

[▲] Ratio of signal output to signal input.

[*] Maximum value to swing the grid of resistance-coupled amplifier tube to the point where its grid No.1 starts to draw current.

Note: Coupling capacitors should be selected to give desired frequency response. Cathode resistors should be adequately bypassed.

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RCA

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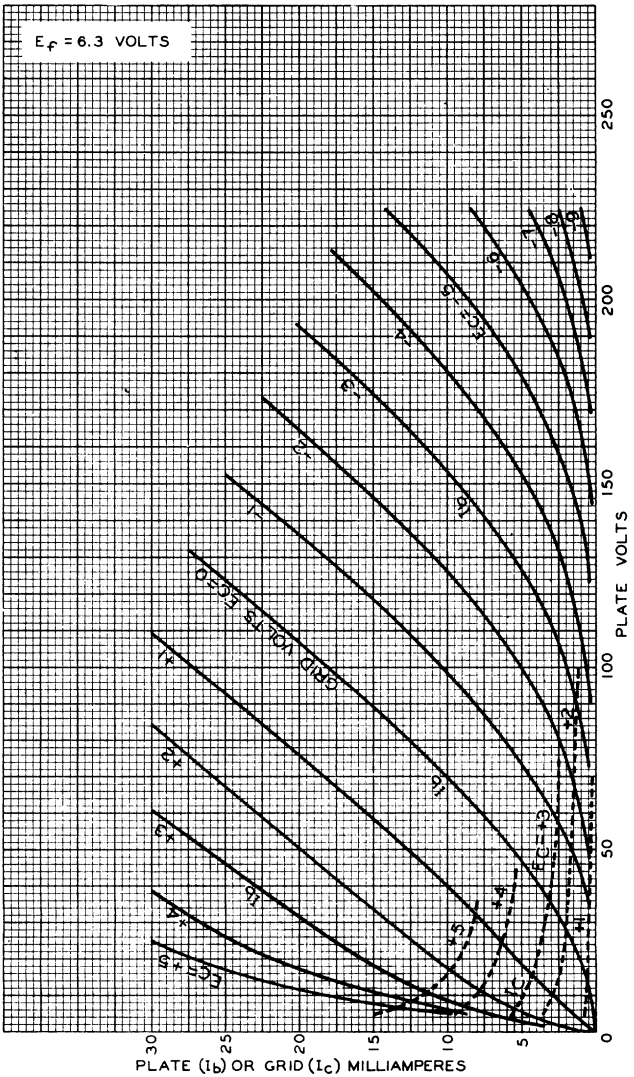
AVERAGE PLATE CHARACTERISTICS



SEPT. 23, 1952

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7848

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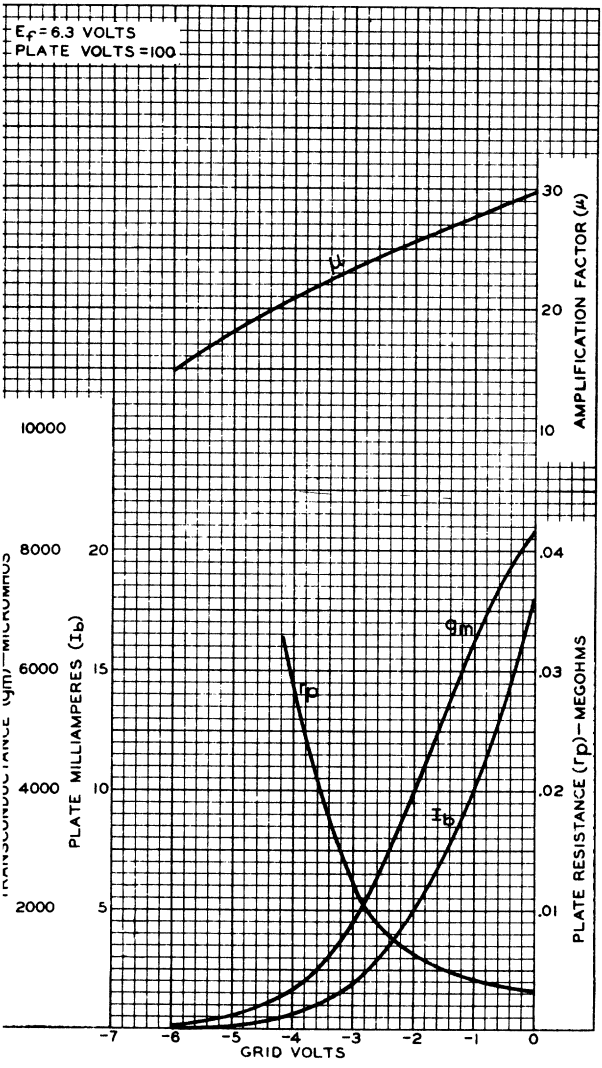
AVERAGE CHARACTERISTICS



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7850

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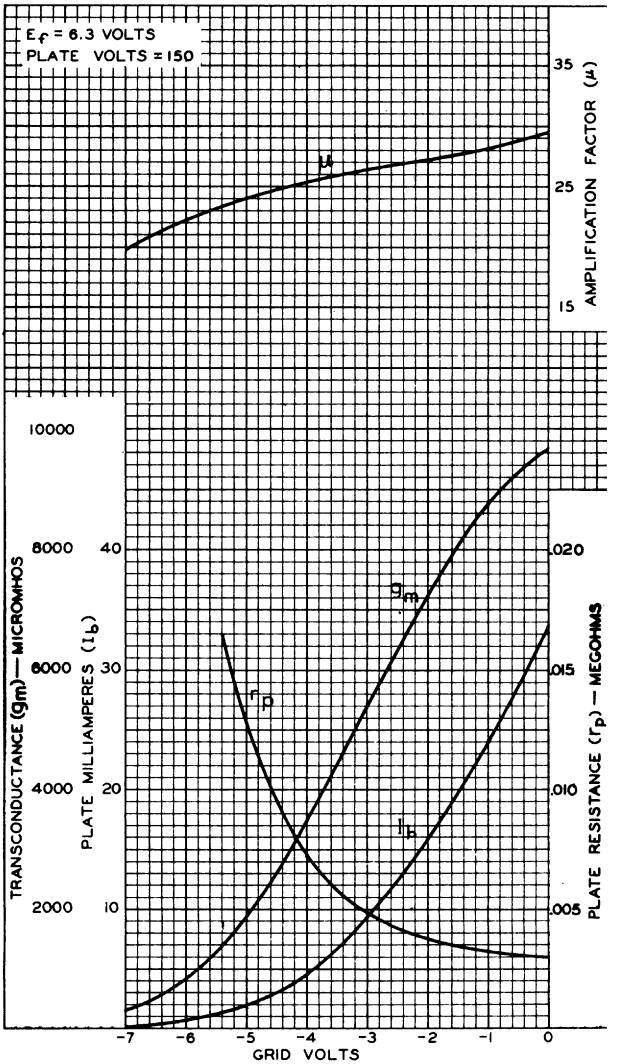
AVERAGE CHARACTERISTICS



RCA

5719

PREMIUM TYPE 5719

HIGH-MU TRIODE

SUBMINIATURE TYPE

Intended for applications where dependable performance under shock and vibration is paramount.

GENERAL DATA

lectrical:

eater, for Unipotential Cathode:

Voltage	6.3 ± 5%	. . . ac or dc	volts
Current	0.150	. . . . .	amp

irect Interelectrode Capacitances:

	With External Shield[a]	*Without External Shield*	
Grid to Plate	0.8	0.8	μμf
Input	1.9	1.7	μμf
Output	2.2	0.6	μμf

[a] Having inside diameter of 0.405" and connected to cathode.

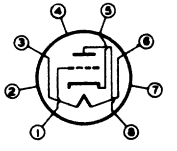
haracteristics, Class A_1 Amplifier:

late Supply Voltage	100	150	volts
athode Resistor	1500	680	ohms
mplification Factor	70	70	
late Resistance	41000	30500	ohms
ransconductance	1700	2300	μmhos
late Current	0.73	1.85	ma
rid volts (Approx.) for plate current of 10 μamp	-2.5	-3.8	volts

lechanical:

perating Position	Any
laximum Bulb Length	1-3/8"
ength from Button Seal to Bulb Top (Excluding tip)	1.075" ± 0.060"
iameter	0.383" ± 0.017"
ulb	T-3
eads, Flexible	8
Length	1-1/2" to 1-3/4"
Orientation and Diameter	See Dimensional Outline In GENERAL SECTION

BOTTOM VIEW



Lead No.1 – Grid
Lead No.2 – No Conn.
Lead No.3 – Heater
Lead No.4 – No Conn.
Lead No.5 – Cathode
Lead No.6 – Heater
Lead No.7 – No Conn.
Lead No.8 – Plate

AMPLIFIER – Class A_1

laximum Ratings, *Absolute Values:*

LATE VOLTAGE	165 max.	volts

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HIGH-MU TRIODE

GRID VOLTAGE	-55 max.	volts
PLATE CURRENT	3.3 max.	ma
PLATE DISSIPATION	0.55 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250 max.	°C

Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED AMPLIFIER CHART at end of tabulated data for this type

Maximum Circuit Values:

Grid-Circuit Resistance:		
For cathode-bias operation	1.2 max.	megohms
For fixed-bias operation	Not recommended	

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN*

	Note	*Min.*	*Max.*	
Heater Current	1	0.138	0.162	amp
Grid-to-Plate Capacitance	2	0.6	1.0	μμf
Input Capacitance	2	1.2	2.2	μμf
Output Capacitance	2	0.4	0.8	μμf
Amplification Factor	1,3	60	80	
Plate Current	1,3	0.5	0.9	ma
Plate Current	1,4	-	50	μamp
Transconductance	1,3	1400	2000	μmhos
Transconductance	5,3	1300	-	μmhos
Grid Current	1,6	-	±0.3	μamp
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,7	-	7.0	μamp
Heater positive with respect to cathode	1,7	-	7.0	μamp
Leakage Resistance:				
Between Grid and All Other Electrodes Tied Together	1,8	100	-	megohms
Between Plate and All Other Electrodes Tied Together	1,9	100	-	megohms

* Each tube is stabilized before characteristics testing by continuous operation for at least 45 hours at room temperature and with dissipation values equivalent to life test conditions.

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Without external shield.

Note 3: With plate supply voltage of 100 volts, cathode resistor of 150 ohms, and cathode bypass capacitor of 1000 microfarads.

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HIGH-MU TRIODE

Note 4: With dc plate voltage of 100 volts, and dc grid voltage of -2.5 volts.

Note 5: With 5.7 volts ac or dc on heater.

Note 6: With plate supply voltage of 100 volts, cathode resistor of 1500 ohms, cathode bypass capacitor of 1000 microfarads and grid resistor of 0.1 megohm.

Note 7: With 100 volts dc between heater and cathode.

Note 8: With grid 100 volts negative with respect to all other electrodes tied together.

Note 9: With plate 300 volts negative with respect to all other electrodes tied togetner.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration . . . . . 450 max. g

Tubes are held rigid in three different positions in a Navy Type, High Impact (flyweight) Shock Machine and are subjected to 450 g impact acceleration.

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours.

Uniform Acceleration Rating:. . . . . 1000 max. g

Tubes are subjected in each of three positions to a gradually applied uniform acceleration up to 1000 g.

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . 25 max. mv

Under the following conditions: A 150-volt plate voltage supply having an impedance not exceeding that of a 40 μf capacitor, plate load resistance of 10000 ohms, grid resistor of 0.1 megohm, cathode resistor of 1500 ohms, cathode bypass capacitor of 1000 μf, and vibrational acceleration of 15 g at 40 cps.

Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . . . 2500 min. cycles

Under the following conditions: With heater voltage of 7.0 volts cycled 1 minute on and 4 minutes off, heater-cathode voltage of 140 volts (rms), and plate and grid voltage = 0 volts.

Average Life Performance:

The average life performance based on a 500-hour test at 175°C ambient temperature is not less than 450 hours. This life test is made on sample lot of tubes with heater voltage of 6.3 volts; plate supply voltage of 100 volts; dc heater-cathode voltage (heater positive with respect to cathode) of 200 volts; cathode resistor of 1500 ohms; and grid resistor of 1 megohm.

The 500-hour end-point limits for the 5719 with heater voltage of 6.3 volts, plate supply voltage of 100 volts, cathode resistor of 680 ohms bypassed by capacitor having a maximum reactance of 3 ohms, and dc heater-cathode voltage of 100 volts with heater either positive or negative with respect to cathode are: transconductance, 1000 micromhos minimum; heater-cathode leakage current, 20 microamperes maximum; and grid current, +0.9 microampere maximum or -0.9 microampere maximum.

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HIGH-MU TRIODE

OPERATING CONDITIONS AS RE-

Cathode-Bias

Plate Supply Voltage	100				
Plate Load Resistor	0.1	0.1	0.27	0.27	0.47
Grid Resistor[o]	0.27	0.47	0.47	1.0	0.47
Cathode Resistor	2700	2700	5600	6800	10000
Signal Input Volts (rms)	0.1	0.1	0.1	0.1	0.1
Output Volts (rms)	3.7	3.9	4.1	4.2	3.95
Gain[▲]	37	39	41	42	39.5
Distortion	2.4	2.1	2.1	1.8	2.4
Signal Input Volts (rms)*	0.20	0.20	0.20	0.26	0.20
Output Volts (rms)	7.3	7.7	8.1	10.7	7.8
Gain[▲]	36.5	38.5	40.5	41.2	39
Distortion	5.0	4.5	4.3	4.9	5.0

Zero-Bias

Plate-Supply Voltage	100				
Plate Load Resistor	0.1	0.1	0.27	0.27	0.47
Grid Resistor[o]	0.27	0.47	0.47	1.0	0.47
Signal Input Volts (rms)	0.1	0.1	0.1	0.1	0.1
Output Volts (rms)	3.8	4.0	4.3	4.55	4.2
Gain[▲]	38	40	43	45.5	42
Distortion	2.2	2.0	1.9	1.6	2.1
Signal Input Volts (rms)*	0.2	0.21	0.22	0.26	0.2
Output Volts (rms)	7.25	7.9	8.95	11	7.9
Gain[▲]	36.2	37.6	40.6	42.4	39.5
Distortion	5.0	4.8	4.9	4.8	4.8

Note 1: Coupling capacitors should be selected to give desired frequency response. Cathode resistor should be adequately bypassed.

[o] of following stage.

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HIGH-MU TRIODE

RESISTANCE-COUPLED AMPLIFIER

Operation

	200						volts
0.47	0.1	0.1	0.27	0.27	0.47	0.47	megohm
1.0	0.27	0.47	0.47	1.0	0.47	1.0	megohm
10000	1500	1800	3300	3900	5600	6800	ohms
0.1	0.1	0.1	0.1	0.1	0.1	0.1	volt
4.3	4.4	4.6	4.9	5.0	4.8	5.0	volts
43	44	46	49	50	48	50	
1.7	0.7	0.7	0.9	0.7	0.9	0.7	per cent
0.25	0.51	0.61	0.50	0.59	0.49	0.64	volt
10.7	22	27	24.2	29	23.2	31.6	volts
42.8	43.1	44.3	48.4	49.2	47.3	49.4	
4.5	3.9	5.0	4.5	4.5	5.0	5.0	per cent

Operation

	200						volts
0.47	0.1	0.1	0.27	0.27	0.47	0.47	megohm
1.0	0.27	0.47	0.47	1.0	0.47	1.0	megohm
0.1	0.1	0.1	0.1	0.1	0.1	0.1	volt
4.55	4.7	4.9	5.35	5.4	5.2	5.4	volts
45.5	47	49	53.5	54	52	54	
1.6	0.4	0.4	0.8	0.7	0.9	0.7	per cent
0.27	0.59	0.63	0.54	0.65	0.5	0.63	volt
11.3	25	27.7	25.8	31.5	23.5	30.5	volts
41.8	42.4	43.9	47.7	48.5	47	48.4	
5.0	4.9	5.0	4.9	5.0	5.0	4.8	per cent

* Maximum value to swing the grid of resistance-coupled amplifier tube to the point where its grid starts to draw current.

▲ Ratio of signal output to signal input.

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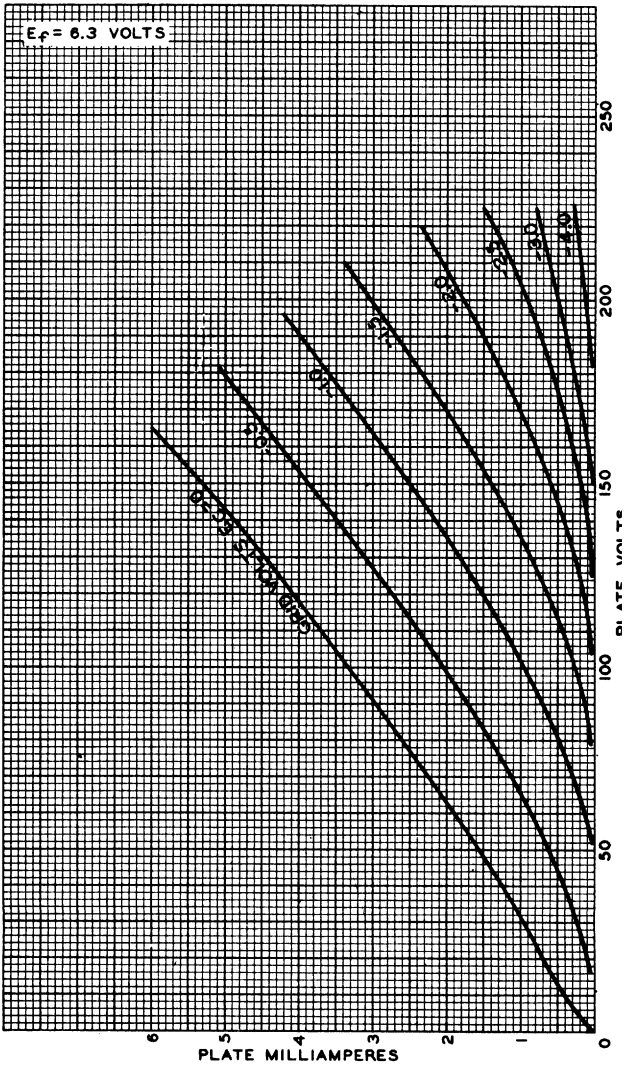
5719

AVERAGE PLATE CHARACTERISTICS



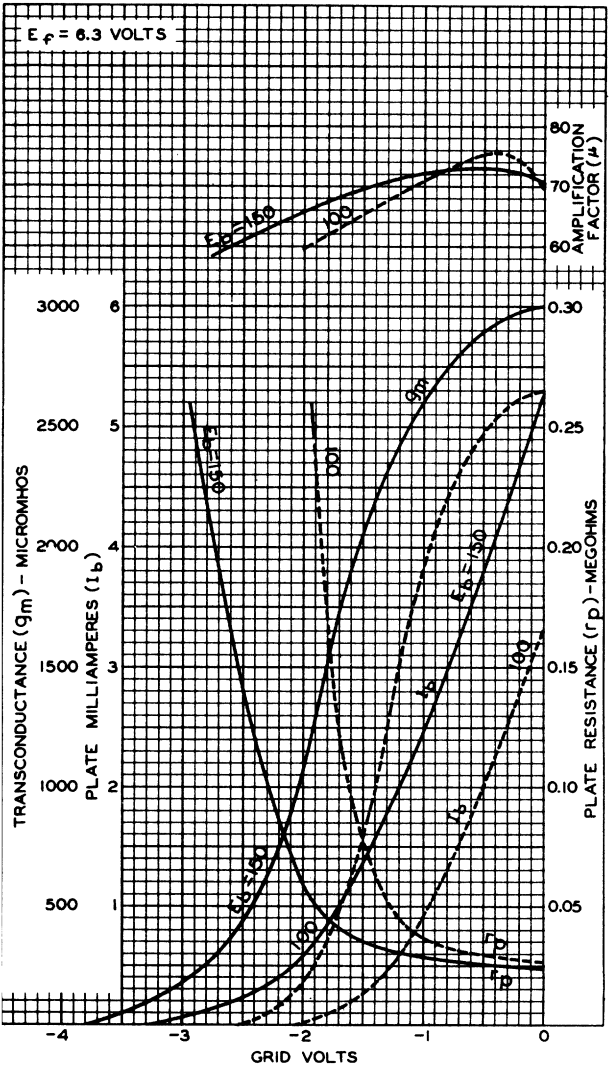
FEB. 16, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7925

RCA
5719

AVERAGE CHARACTERISTICS



RCA

5725

5725 PREMIUM TYPE

SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

Intended for applications where dependable performance under shock and vibration is paramount. This "premium" type is similar to the 6AS6.

GENERAL DATA

Electrical:

Heater, Pure Tungsten, for Unipotential Cathode:		
Voltage	6.3 ± 10%	ac or dc volts
Current	0.175	amp
Direct Interelectrode Capacitances:[1]		
Grid No.1 to plate	0.02 max.	μμf
Grid No.1 to cathode & internal shield, grid No.3, grid No.2, and heater	3.9	μμf
Plate to cathode & internal shield, grid No.3, grid No.2, and heater	3	μμf
Grid No.1 to grid No.3	0.15 max.	μμf

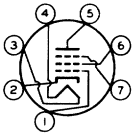
Characteristics, Class A_1 Amplifier:

Plate Voltage	120	volts
Grid-No.3 (Suppressor-Grid) Voltage	0	volts
Grid-No.2 (Screen-Grid) Voltage	120	volts
Grid-No.1 (Control-Grid) Voltage	-2	volts
Transconductance:		
Grid No.1 to plate	3200	μmhos
Grid No.3 to plate	470	μmhos
Plate Current	5.2	ma
Grid-No.2 Current	3.5	ma

Mechanical:

Mounting Position	Any
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/8" ± 3/32"
Maximum Diameter	3/4"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CM

Pin 1 - Grid No.1
Pin 2 - Cathode, Internal Shield
Pin 3 - Heater



Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Grid No.3

AMPLIFIER - Class A_1

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	200 max.	volts

[1] With external shield JETEC No.316 connected to cathode.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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SHARP-CUTOFF PENTODE

GRID-No.3 (SUPPRESSOR-GRID VOLTAGE):			
Positive bias value		30 max.	volts
Negative bias value		55 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE		155 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive bias value		0 max.	volts
Negative bias value		55 max.	volts
GRID-No.3 CURRENT		0.2 max.	ma
CATHODE CURRENT		20 max.	ma
GRID-No.2 INPUT		0.55 max.	watt
PLATE DISSIPATION		1.65 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode		100 max.	volts
Heater positive with respect to cathode		100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)		165 max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance		0.1 max.	megohm

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN•

Values are Initial, Unless Otherwise Specified

	Note	Min.	Max.	
Heater Current	1	160	190	ma
Direct Interelectrode Capacitances:				
Grid No.1 to cathode & internal shield, grid No.3, grid No.2, and heater	2	3.5	4.5	μμf
Plate to cathode & internal shield, grid No.3, grid No.2, and heater	2	2.6	3.4	μμf
Plate Current (1)	1,3	2.5	9	ma
Plate Current (2)	1,4	–	200	μa
Plate Current (3)	1,5	5	–	μa
Plate Current (4)	1,6	–	200	μa
Plate Current (5)	1,7	5	–	μa
Grid-No.2 Current	1,3	1.5	5.5	ma
Transconductance (1), Grid No.1 to Plate	1,3	2500	4500	μmhos
Transconductance (1), at 500 hours	1,3	2200	4500	μmhos
Transconductance (2), Grid No.1 to Plate	1,8	700	1700	μmhos
Transconductance (3), Grid No.3 to Plate	1,9	400	1150	μmhos
Transconductance Change	10	–	15	%

• Each tube is stabilized before characteristics testing by continuous operation for at least 45 hours at room temperature and with dissipation values equivalent to life test conditions.

Notes 1 to 10: See next page.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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SHARP-CUTOFF PENTODE

	Note	Min.	Max.	
Transconductance Change at 500 hours.	10	–	15	%
Reverse Grid Current.	1,11	–	0.1	μa
Reverse Grid Current at 500 hours.	1,11	0	0.1	μa
Grid Emission Current	12	–	1	μa
Heater–Cathode Leakage Current:				
Heater 100 volts negative with respect to cathode . .	1	–	10	μa
Heater 100 volts positive with respect to cathode . .	1	–	10	μa
Heater–Cathode Leakage Current at 500 hours:				
Heater 100 volts negative with respect to cathode . .	1	–	10	μa
Heater 100 volts positive with respect to cathode . .	1	–	10	μa
Leakage Resistance:				
Between grid No.1 and all other electrodes tied together.	1,13	100	–	megohms
Between grid No.3 and all other electrodes tied together.	1,14	100	–	megohms
Between plate and all other electrodes tied together.	1,15	100	–	megohms
Leakage Resistance at 500 hours:				
Between grid No.1 and all other electrodes tied together.	1,13	50	–	megohms
Between grid No.3 and all other electrodes tied together.	1,14	50	–	megohms
Between plate and all other electrodes tied together.	1,15	50	–	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With external shield JETEC No.316 connected to cathode.

Note 3: With plate volts = 120, grid–No.3 volts = 0, grid–No.2 volts = 120, and grid–No.1 volts = –2.

Note 4: With plate volts = 120, grid–No.3 volts = –10, grid–No.2 volts = 120, and grid–No.1 volts = –3.

Note 5: With plate volts = 120, grid–No.3 volts = –6, grid–No.2 volts = 120, and grid–No.1 volts = –3.

Note 6: With plate volts = 120, grid–No.3 volts = 0, grid–No.2 volts = 120, and grid–No.1 volts = –8.

Note 7: With plate volts = 120, grid–No.3 volts = 0, grid–No.2 volts = 120, and grid–No.1 volts = –6.

Notes 8 to 15: See next page.

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SHARP-CUTOFF PENTODE

Note 8: With plate volts = 120, grid-No.3 volts = -5, grid-No.2 volts = 120, and grid-No.1 volts = -2.

Note 9: With plate volts = 120, grid-No.3 volts = -3, grid-No.2 volts = 120, and grid-No.1 volts = -2.

Note 10: With 5.7 volts ac or dc on heater, plate volts = 120, grid-No.3 volts = 0, grid-No.2 volts = 120, and grid-No.1 volts = -2.

Note 11: With plate volts = 120, grid-No.3 volts = 0, grid-No.2 volts = 120, grid-No.1 volts = -2, and grid-No.1-circuit resistance (megohms) = 0.1.

Note 12: With 7.5 volts ac or dc on heater, plate volts = 120, grid-No.3 volts = 0, grid-No.2 volts = 120, grid-No.1 volts = -10, and grid-No.1-circuit resistance (megohms) = 0.1.

Note 13: With grid-No.1 volts = -100, and all other electrodes connected to ground.

Note 14: With grid-No.3 volts = -100, and all other electrodes connected to ground.

Note 15: With plate volts = -300, and all other electrodes connected to ground.

SPECIAL RATINGS AND PERFORMANCE DATA

Shock Rating:

Impact Acceleration . . . . . 450 max. g

This test is performed on a sample lot of tubes from each production run. Tubes are held rigid and are tested in four different positions. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance.

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for reverse grid current, low-frequency vibration, heater-cathode leakage current, and transconductance.

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . 150 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: heater voltage of 6.3 volts ac or dc, plate volts = 120, grid-No. 3 volts = 0, grid-No.2 volts = 120, grid-No.1 volts = -2, plate load resistance (ohms) = 10,000, and vibrational acceleration of 2.5 g at 25 cycles per second.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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SHARP-CUTOFF PENTODE

Heater-Cycling Life Performance:

Cycles of Intermittent Operation. . . . 2000 min. cycles
Under the following conditions: heater voltage of 7.5 volts cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other electrodes connected to ground.

Audio-Frequency Noise and Microphonic Performance:

RMS Output Voltage. . . . . 175 max. mv
This test is performed on a sample lot of tubes from each production run under the following conditions: heater voltage of 6.3 volts ac or dc, plate-supply volts = 200, grid-No.3 supply volts = 0, grid-No.2 supply volts = 200, grid-No.1 volts = 0, plate load resistance (megohms) = 0.1, grid-No.2-circuit resistance (megohms) = 0.5, cathode resistor (ohms) = 1000, grid-No.2 bypass capacitor (μf) = 2, and cathode bypass capacitor (μf) = 1000. The output voltage of a tube, when tapped, will not cause a reading on a VU output meter greater than that produced when a calibrating signal of 175 millivolts RMS is applied to the plate of the tube.

Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1 microampere under the conditions specified in the CHARACTERISTICS RANGE VALUES for reverse grid current.

1-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are checked for transconductance under conditions of maximum rated plate dissipation. At the end of 1 hour, the value of transconductance is read. The variation in transconductance from the 0-hour reading will not exceed 10 per cent.

100-Hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run under conditions of maximum rated plate dissipation to insure a low percentage of early inoperatives. At the end of 100 hours, a tube is considered inoperative it it shows a permanent or temporary short or open circuit, a value of reverse grid current in excess of 1 microampere, or a transconductance (1) value of less than 2200 micromhos under the conditions specified in CHARACTERISTICS RANGE VALUES.

5725

SHARP-CUTOFF PENTODE

500-Hour Intermittent Life Performance:

This test is made on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. Life testing is conducted under the following conditions: heater voltage of 6.3 volts ac or dc, plate-supply volts = 180, grid-No.3 supply volts = 0, grid-No.2 supply volts = 125, grid-No.1 volts = 0, grid-No.1-circuit resistance (megohms) = 0.1, cathode resistor (ohms) = 130, heater 135 volts positive with respect to cathode, and bulb temperature (°C) = 165. At the end of 500 hours, tubes will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass the established initial limits for heater current, reverse grid current and heater-cathode leakage current, and 500-hour limits for transconductance (11), transconductance change, and leakage resistance as shown under CHARACTERISTICS RANGE VALUES.

Curves shown under Type 6AS6 also apply to the 5725

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5726

PREMIUM TYPE 5726

TWIN DIODE

MINIATURE TYPE

Intended for applications where dependable performance under shock and vibration is paramount. The 5726 is a "premium" version of the 6AL5W.

GENERAL DATA

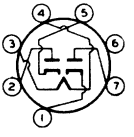
Electrical:

Heater, for Unipotential Cathodes:		
Voltage	6.3 ± 10%	ac or dc volts
Current	0.3	amp
Resonant Frequency (Each unit, approx.)	700	Mc
Direct Interelectrode Capacitances (With external shield JETEC No.316):		
Unit No.1:		
Plate to Cathode + External Shield, Heater, and Internal Shield	3.2	μμf
Cathode to Plate + External Shield, Heater, and Internal Shield	3.9	μμf
Unit No.2:		
Plate to Cathode + External Shield, Heater, and Internal Shield	3.2	μμf
Cathode to Plate + External Shield, Heater, and Internal Shield	3.9	μμf
Plate of Unit No.1 to Plate of Unit No.2●	0.026 max.	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/8" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)

BOTTOM VIEW



Pin 1 – Cathode of Diode Unit No.1
Pin 2 – Plate of Diode Unit No.2
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Cathode of Diode Unit No.2
Pin 6 – Internal Shield
Pin 7 – Plate of Diode Unit No.1

HALF-WAVE RECTIFIER

Maximum Ratings, *Absolute Values*:

PEAK INVERSE PLATE VOLTAGE	360 max.	volts
PEAK PLATE CURRENT PER PLATE	60 max.	ma

● With external and internal shield connected to ground.

5726

5726

TWIN DIODE

HOT-SWITCHING TRANSIENT PLATE CURRENT		
For duration of 0.2 second maximum . . .	350 max.	ma
DC OUTPUT CURRENT PER PLATE	10 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	360 max.	volts
Heater positive with respect to cathode	360 max.	volts

Typical Operation:

The two units may be used separately or in parallel

AC Plate-Supply Voltage Per Plate (RMS)	117	volts
Minimum Total Effective Plate-Supply Impedance Per Plate	300	ohms
DC Output Current Per Plate	9	ma

Shock and Vibration Tests:

These tests are made as indicated in the JAN Specifications: JAN 1-A for Electron Tubes, May 1946 under the section as follows:

Section F6b (9e) Shock Test:		
Instantaneous Impact Acceleration . .	700 max.	g
Section F6b (9f) Vibration Test:		
Vibrational Acceleration	2.5 max.	g

Heater Cycling Life Test:

This test is made as indicated in the JAN Specifications JAN 1-A for Electron Tubes for type 5726/6AL5W.

Cycles of Intermittent Operation:		
At a heater voltage of 7.5 volts . . .	2000 min.	cycles

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.275	0.325	amp
Direct Interelectrode Capacitances (With external shield JETEC No.316):				
Unit No.1:				
Plate to Cathode + External Shield, Heater, and Internal Shield	-	2.4	4.0	μμf
Cathode to Plate + External Shield, Heater, and Internal Shield	-	2.8	4.4	μμf
Unit No.2:				
Plate to Cathode + External Shield, Heater, and Internal Shield	-	2.4	4.0	μμf
Cathode to Plate + External Shield, Heater, and Internal Shield	-	2.8	4.4	μμf

5726

TWIN DIODE

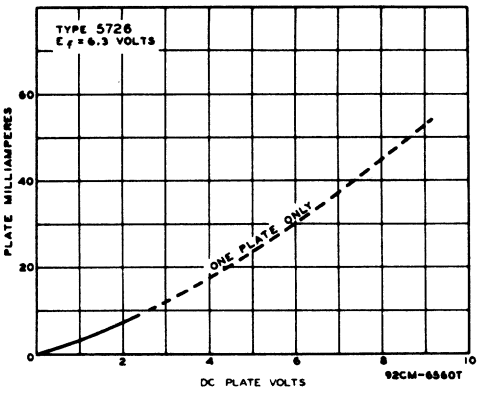
	Note	Min.	Max.	
Plate of Unit No.1 to Plate of Unit No.2	2	–	0.026	μμf
Plate Current (Per Plate) . . .	1,3	40	–	ma

Note 1: With 6.3 volts ac on heater.

Note 2: With external and internal shield connected to ground.

Note 3: With dc plate voltage = 10 volts. Each unit tested separately with electrodes of opposite unit grounded.

AVERAGE PLATE CHARACTERISTIC



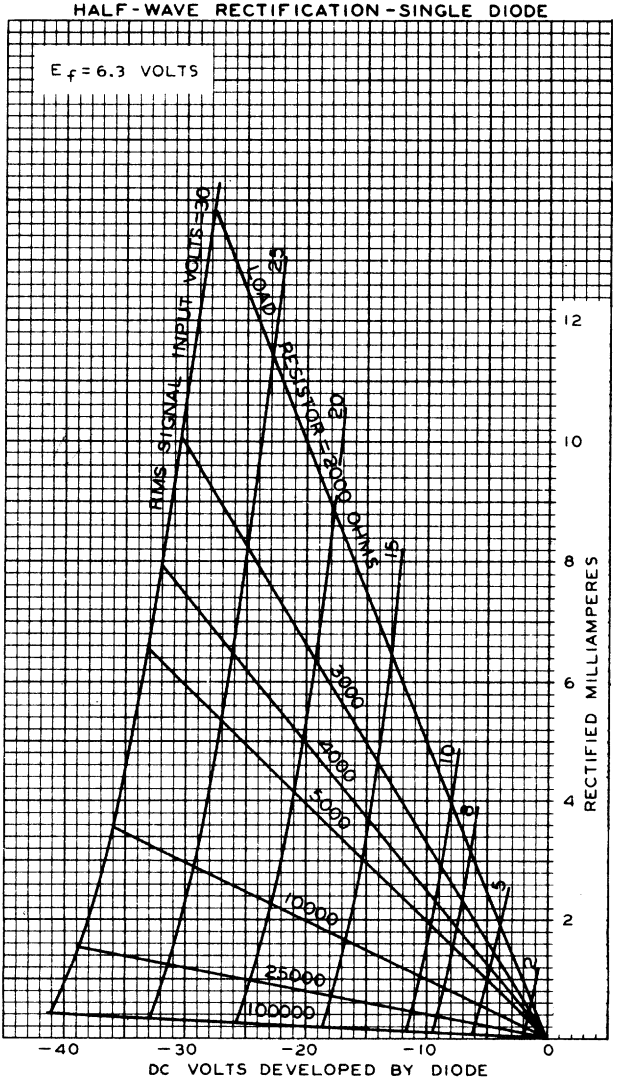
5726

RCA

5726

AVERAGE CHARACTERISTICS

HALF-WAVE RECTIFICATION - SINGLE DIODE



JUNE 7, 1944

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6561

5734
MECHANO-ELECTRONIC TRANSDUCER

TRIODE TYPE

GENERAL DATA

Electrical:

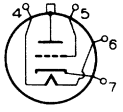
Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.15	amp

Mechanical:

Mounting Position	Any
Maximum Angular Deflection of Plate Shaft	±0.5 degree
Maximum Overall Length (Excluding flexible leads)	1.300"
Maximum Diameter	0.328"
Envelope	Metal Shell MT-2-1/4

Terminal Connections, BOTTOM VIEW

Lead 4 – Heater
Lead 5 – Grid
Lead 6 – Heater



Lead 7 – Cathode, Internal Shield
Shell – Plate

Maximum Ratings, *Design-Center Values*:

DC PLATE-SUPPLY VOLTAGE	300	max.	volts
DC PLATE CURRENT	5	max.	ma
PLATE DISSIPATION	0.4	max.	watt
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	90	max.	volts
Heater positive with respect to cathode	90	max.	volts

Typical Operation:

DC Plate-Supply Voltage	300	volts
DC Grid Voltage	0	volts
Amplification Factor▲	20	
Plate Resistance▲	72000	ohms
Transconductance▲	275	micromhos
DC Plate Current▲	1.5	ma
Load Resistance	75000	ohms
Deflection Sensitivity◆	40 2300	volts/degree volts/radian
Moment of Inertia of Plate●	3.4	milligram cm^2
Rotational Compliance of Diaphragm●	0.0013×10^{-3} 0.075	radian/dyne cm degree/gram cm

▲ For plate shaft in undeflected position.

◆ Average change in voltage across 75000-ohm plate-load resistor when the plate shaft is deflected from −0.5 to +0.5 degree. The plane of deflection of the plate shaft must coincide with the plane through terminal No.5 and the axis of the tube.

● Based on external plate-shaft length of 1/8" and the center of the diaphragm as pivot.

5734

RCA

5734

MECHANO-ELECTRONIC TRANSDUCER

OPERATING PRINCIPLES

The plate shaft extends through the center of a thin metal diaphragm. Angular displacement of the plate shaft changes the distance between the fixed grid and the plate and results in a change in the plate current. The plane of deflection of the plate shaft coincides with the plane through terminal No.5 and the axis of the tube.

The part of the plate shaft within the tube has a minimum free cantilever resonance of 12000 cycles per second permitting, with suitable mechanical coupling to the external end of the plate shaft, measurements of vibration up to 12000 cycles per second.

OPERATING NOTES

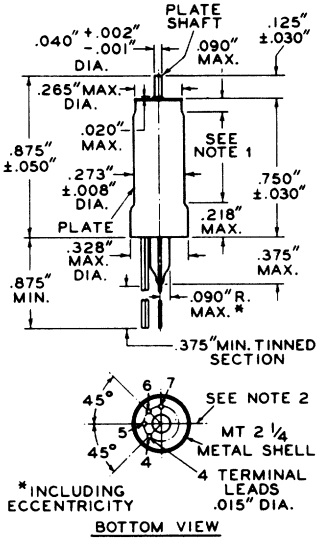
The 5734 may be mounted by means of a supporting clamp which should firmly grip the metal shell of the tube within the designated clamping space indicated on the Outline Drawing. It is essential, however, that the pressure exerted on the shell by the clamp be held to a minimum to prevent possible fracture of the seals.

Under no circumstances should the plate shaft be displaced from its normal position by more than 0.5 degree. A larger displacement of the plate shaft will distort the flexible diaphragm and may damage the tube electrodes.

A non-corrosive flux must be used in soldering the actuating stylus to the plate shaft. Unless this precaution is observed, the plate shaft and the diaphragm will be damaged.

5734

MECHANO-ELECTRONIC TRANSDUCER



NOTE 1: TUBE SUPPORTING CLAMP ON METAL SHELL MUST BE WITHIN THIS SPACE, AND SHOULD BE FASTENED ONLY TIGHT ENOUGH TO INSURE GOOD CONTACT FOR THE PLATE CONNECTION.

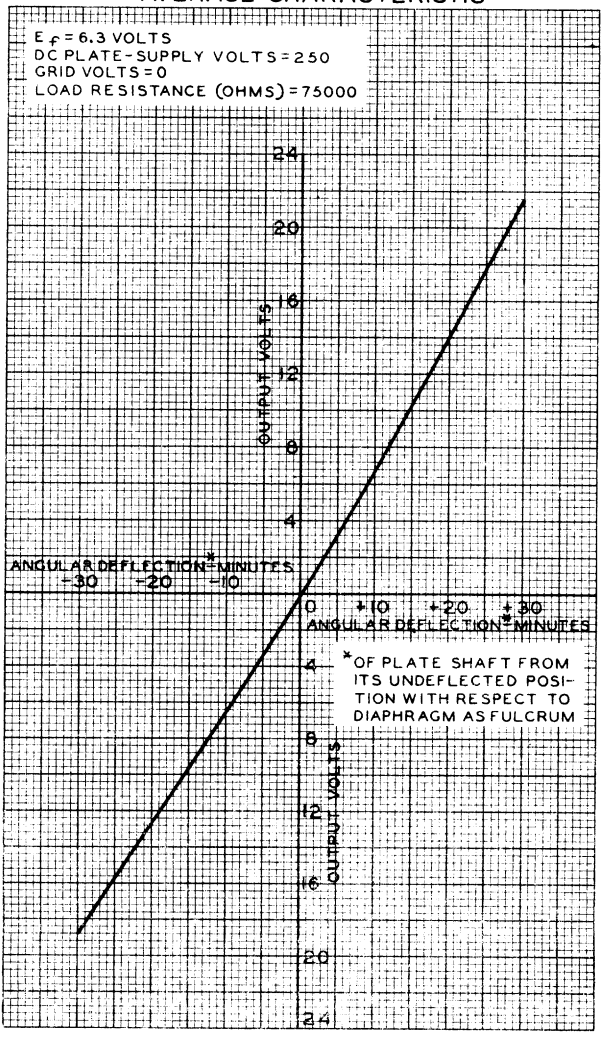
NOTE 2: THE PLANE OF DEFLECTION OF THE PLATE SHAFT WILL COINCIDE WITH THE PLANE THROUGH TERMINAL LEAD No. 5 AND THE AXIS OF THE TUBE.

92CS-7036

5734

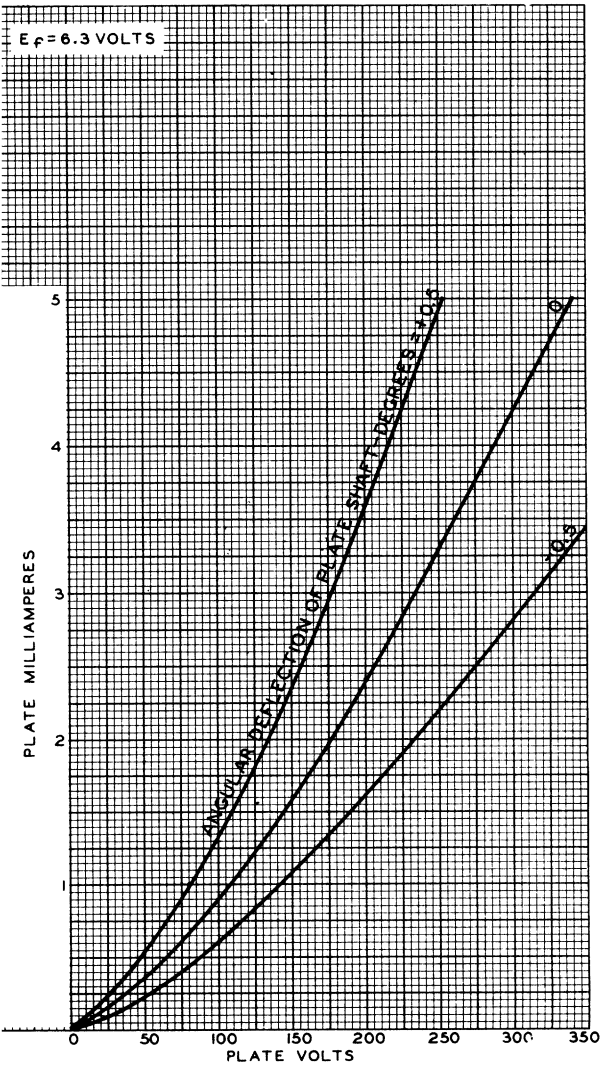
5734

AVERAGE CHARACTERISTIC



5734

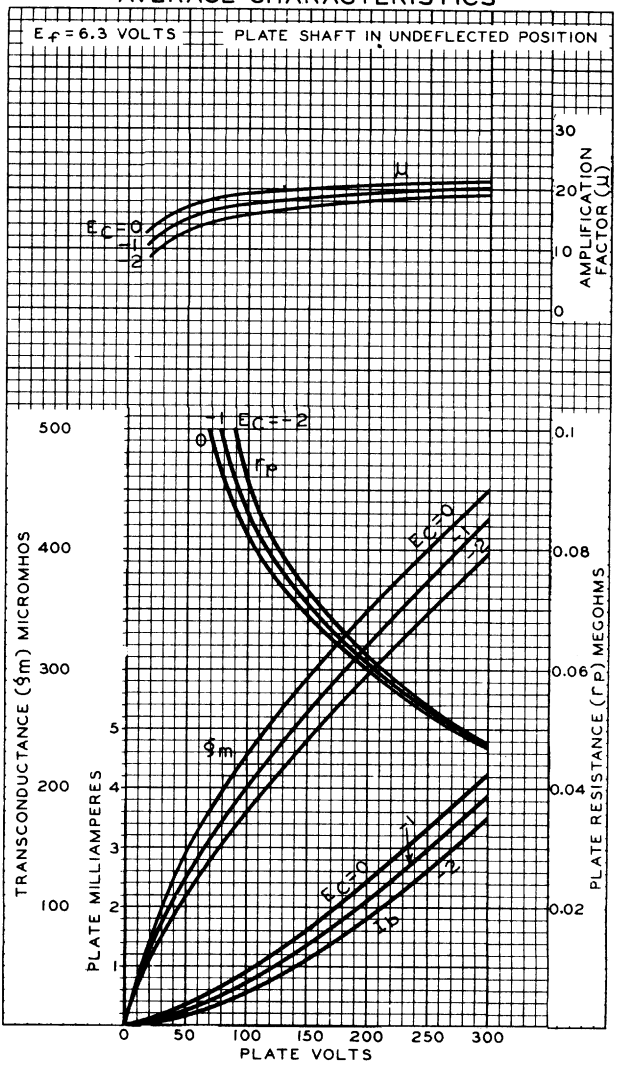
AVERAGE CHARACTERISTICS



5734

5734

AVERAGE CHARACTERISTICS



AUG. 17, 1948

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7057

5750

5750 PREMIUM TYPE

PENTAGRID CONVERTER

7-PIN MINIATURE TYPE

For use as a combined mixer and oscillator tube particularly in mobile and aircraft communications receivers in which dependability is paramount. This "premium" type is similar to the 6BE6.

GENERAL DATA

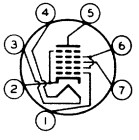
Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.3	amp
Direct Interelectrode Capacitances:[o]		
Grid No.3 to all other electrodes (RF input)	7.1	μμf
Plate to all other electrodes (Mixer input)	7.6	μμf
Grid No.1 to all other electrodes (Oscillator input)	5.5	μμf
Grid No.3 to plate	0.3 max.	μμf
Grid No.3 to grid No.1	0.15 max.	μμf
Grid No.1 to cathode & grid No.5	3	μμf
Cathode & grid No.5 to all other electrodes except grid No.1	15	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CH

Pin 1 - Grid No.1
Pin 2 - Cathode, Grid No.5
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2, Grid No.4
Pin 7 - Grid No.3



CONVERTER

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	330 max.	volts
GRID-No.3 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	55 max.	volts
Positive-bias value	0 max.	volts
GRIDS-No.2 & No.4 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts

[o]: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5750

PENTAGRID CONVERTER

GRIDS-No.2 & No.4 VOLTAGE	110 max.	volts
TOTAL CATHODE CURRENT	15.5 max.	ma
GRIDS-No.2 & No.4 INPUT	1.1 max.	watts
PLATE DISSIPATION	1.1 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	165 max.	°C

Characteristics:

*With Separate Excitation**

Plate Voltage	100	250	volts
Grids-No.2 & No.4 Voltage	100	100	volts
Grid-No.3 Voltage	-1.5	-1.5	volts
RMS Grid-No.1 (Oscillator-grid) Voltage	10	10	volts
Grid-No.1 Resistor	20000	20000	ohms
Plate Resistance (Approx.)	0.4	1	megohm
Conversion Transconductance	455	475	μmhos
Plate Current	2.6	2.6	ma
Grids-No.2 & No.4 Current	7.5	7.5	ma
Grid-No.1 Current	0.5	0.5	ma
Total Cathode Current	10.6	10.6	ma
Grid-No.3 Voltage (Approx.) for conversion transconductance of:			
10 μmhos	-30	-30	volts
100 μmhos	-6	-6	volts

Oscillator Characteristics (Not Oscillating):■

Plate & Grids-No.2 & No.4 Voltage	100	volts
Grid-No.3 Voltage	0	volts
Grid-No.1 Voltage	0	volts
Amplification Factor§	22.5	
Oscillator Transconductance§	7800	μmhos
Cathode Current	25	ma
Grid-No.1 Voltage (Approx.) for plate μa. = 10	-11	volts

° Without external shield.

* The characteristics shown with separate excitation correspond very closely with those obtained in a self-excited oscillator circuit operating with zero bias.

■ With grids No.2 & No.4 connected to plate.

§ Between grid No.1 and grids No.2 & No.4 connected to plate.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration	450 max.	g

This test is performed in a Navy-Type, High-Impact (fly-

5750

PENTAGRID CONVERTER

weight) Shock Machine.

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g
This test is performed for a period of 100 hours minimum at a frequency of 25 cycles per second.

Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . . . 2000 min. cycles
Under the following conditions: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground.

CURVES
shown under Type 6BE6 in the Receiving-Tube Section also apply to the 5750

RCA

5751

5751 PREMIUM TYPE

HIGH-MU TWIN TRIODE

9-PIN MINIATURE TYPE

Intended for applications where dependable performance under shock and vibration is paramount

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Heater Arrangement	*Series*	*Parallel*	
Voltage (AC or DC)	12.6 ± 10%	6.3 ± 10%	volts
Current	0.175	0.35	amp

Characteristics, Class A_1 Amplifier:

Plate Voltage	100	250	volts
Grid Voltage	-1	-3	volts
Amplification Factor	70	70	
Plate Resistance	58000	58000	ohms
Transconductance	1200	1200	μmhos
Plate Current	0.9	1.0	ma

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Maximum Diameter	7/8"
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)

BOTTOM VIEW

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Heater Mid-Tap

AMPLIFIER - Class A_1

Values are for each unit

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	330 max.	volts
GRID VOLTAGE:		
Negative bias value	55 max.	volts
Positive bias value	0 max.	volts
PLATE DISSIPATION	0.8 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	165 max.	°C

5751

5751

HIGH-MU TWIN TRIODE

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN*

	Note	Min.	Max.	
Heater Current	1	0.160	0.190	amp
Amplification Factor	1,2	55	85	
Plate Current	1,2	0.4	1.8	ma
Plate Current	1,3	-	10.5	μamp
Transconductance	1,2	900	1600	μmhos
Reverse Grid Current	1,4	-	0.4	μamp
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,5	-	10	μamp
Heater positive with respect to cathode	1,5	-	10	μamp
Leakage Resistance:				
Between Grid and All Other Electrodes Tied Together	1,6	500	-	megohms
Between Plate and All Other Electrodes Tied Together	1,7	500	-	megohms

* Each tube is stabilized before characteristics testing by continuous operation for at least 45 hours at room temperature and with dissipation values equivalent to life test conditions.

Note 1: With 12.6 volts ac or dc on heater (series connected).

Note 2: With dc plate voltage of 250 volts and dc grid voltage of -3 volts. Each unit is tested separately. Electrodes of unit not under test are grounded.

Note 3: With dc plate voltage of 250 volts, plate load resistance of 0.1 megohm, and dc grid voltage of -10.5 volts. Each unit is tested separately. Electrodes of unit not under test are grounded.

Note 4: With dc plate voltage of 250 volts, grid resistor of 1.0 megohm, and dc grid voltage of -3 volts. Each unit is tested separately. Electrodes of unit not under test are grounded.

Note 5: With 100 volts dc between heater and cathode, and units connected in parallel.

Note 6: With grid 100 volts negative with respect to all other electrodes tied together.

Note 7: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration . . . . . 600 max. g

Tubes are held rigid in three different positions in a Navy Type, High Impact (flyweight) Shock Machine and are subjected to 600 g impact acceleration.

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours.

5751

HIGH-MU TWIN TRIODE

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . 100 max. mv
Under the following conditions and with units connected in parallel; heater voltage of 12.6 volts (series connected), dc plate voltage of 250 volts, dc grid voltage of -3 volts, plate load resistance of 2000 ohms, and vibrational acceleration of 2.5 g at 25 cycles per second.

Heater-Cycling Life Performance:

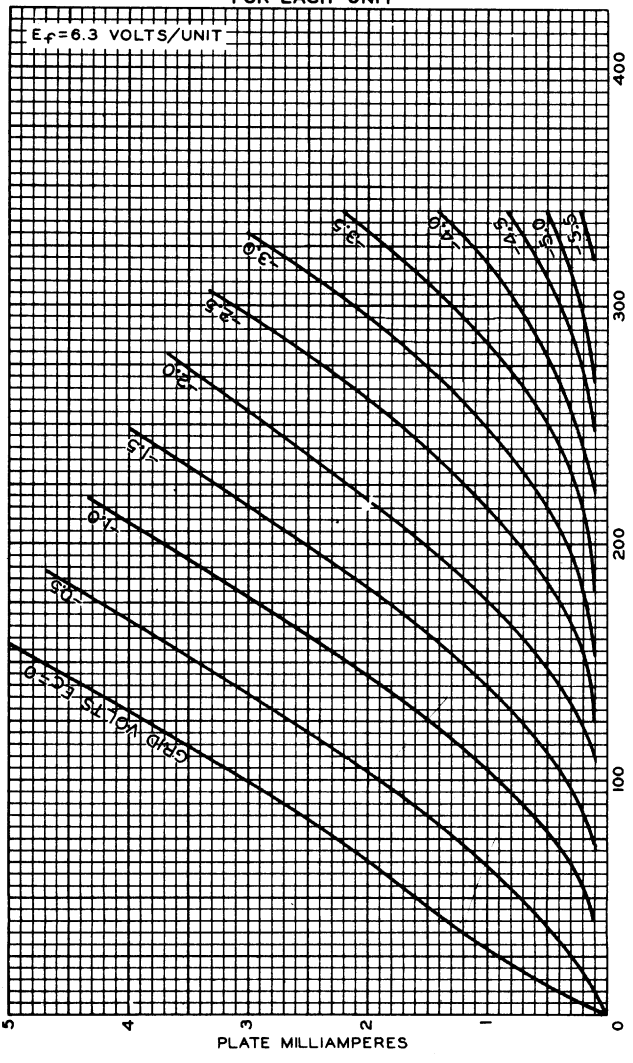
Cycles of Intermittent Operation . . . . . 2000 min. cycles
Under the following conditions and with parallel heater arrangement: heater voltage of 7.5 volts cycled one minute on and one minute off, heater 100 volts positive with respect to cathode, and plate and grid voltage = 0 volts.

5751

5751

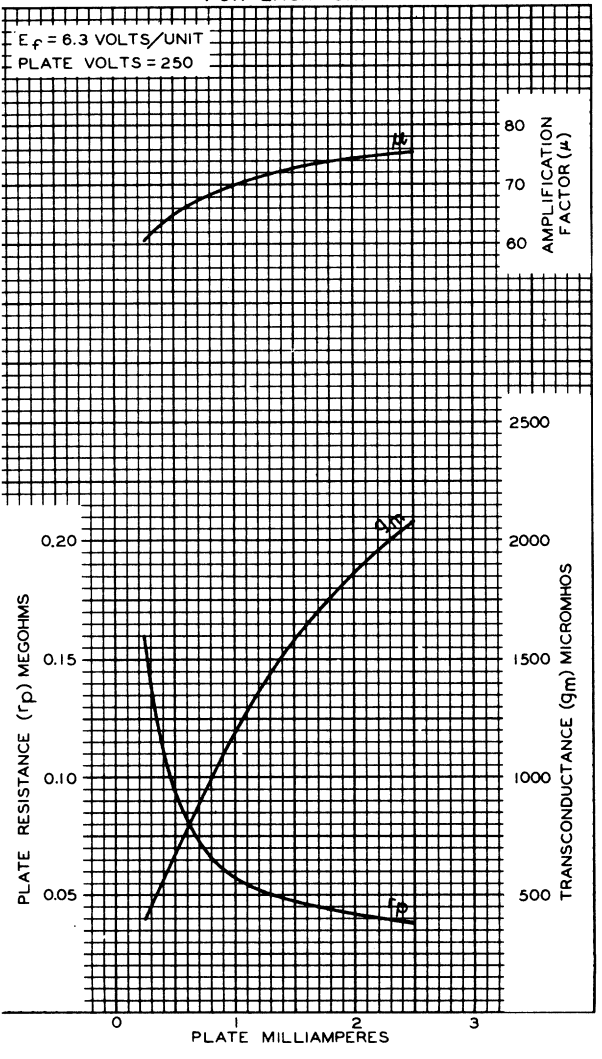
AVERAGE PLATE CHARACTERISTICS

FOR EACH UNIT



5751

AVERAGE CHARACTERISTICS
FOR EACH UNIT



5762/7C24

Power Triode

VHF GRID-DRIVE OR CATHODE-DRIVE OPERATION

INTEGRAL RADIATOR
FORCED-AIR COOLED
THORIATED-TUNGSTEN FILAMENT

4000 WATTS CW OUTPUT AT 220 Mc/s
7000 WATTS CW OUTPUT AT 30 Mc/s
6350 WATTS VHF TV OUTPUT AT 216 Mc/s

For Use In VHF Television and CW Service in Stationary and Portable Equipment

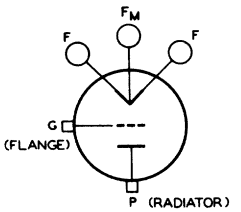
ELECTRICAL

Filamentary Cathode, Thoriated-Tungsten Type[g]		
Voltage (AC or DC)	12.6 typ 13.2 max	V V
Current:		
Typical value at 12.6 volts	29	A
For starting, even momentarily	175 max	A
Cold Resistance	0.052	Ω
Heating Time	15 min	s
Amplification Factor	29	
Direct Interelectrode Capacitances		
Grid to plate	18	pF
Grid to filament	19	pF
Plate to filament	0.5	pF

MECHANICAL

Operating Position . . . . . Vertical, either end up
Maximum Overall Length . . . . . 7.12 in
Maximum Diameter (See *Dimensional Outline*) . . . . . 4.68 in
Weight (Approx.) . . . . . 6-1/4 lbs
Radiator . . . . . Integral part of tube
Terminal Connections (See *Dimensional Outline*)

F – Filament
F_M – Filament Mid-Tap
G – Grid Terminal (Flange)
P – Plate Terminal (Radiator)



THERMAL

Air Flow[h]

Through Radiator—Adequate air flow to limit the plate-core temperature to 180° C should be delivered by a blower through the radiator before and during the application of all voltages. The flow of incoming air at temperatures up to 45° C are given for various plate dissipations indicated in the following tabulation:

Percentage of maximum rated plate dissipation for each class of service	100	80	60	per cent
→ Minimum air flow	300	214	125	cfm
→ Static pressure	2.9	1.47	0.58	in of water

To grid and Filament terminals . . . . . 10 min cfm

The specified air flow from a 1"-diameter nozzle should be directed into the filament header before and during the application of any voltages in order to limit the temperature of the filament and grid terminals to the specified maximum value.

During standby operation—Cooling air is required when heater voltage is applied to the tube.

Terminal Temperature (Filament, grid, and plate)	180 max	°C
Plate Core Temperature (See *Dimensional Outline*)	180 max	°C
Bulb Temperature (At hottest part)	180 max	°C

AF POWER AMPLIFIER & MODULATOR — CLASS B[j]

Maximum CCS Ratings, Absolute-Maximum Values

DC Plate Voltage	6200	V
Max.-Signal DC Plate Current	1.5	A
Max.-Signal Plate Input	8700	W
→ Plate Dissipation	4000	W

Typical Operation

Values are for 2 tubes

DC Plate Voltage	4700	V
DC Grid Voltage	-200	V
Peak AF Grid-to-Grid Voltage	900	V
Zero-Signal DC Plate Current	0.3	A
Max.-Signal DC Plate Current	2.8	A
Effective Load Resistance (Plate to plate)	3640	Ω
Max.-Signal Driving Power (Approx.)	195	W
Max.-Signal Power Output (Approx.)	8800	W

→ RF POWER AMPLIFIER — CLASS B TELEVISION SERVICE[j]

Synchronizing-level conditions per tube unless otherwise specified at frequency of 54 to 216 Mc/s

Maximum CCS Ratings, Absolute-Maximum Values

DC Plate Voltage	4500	V
DC Plate Current	2	A
DC Grid Current (Pedestal level)	0.325	A
Plate Input	9000	W
Plate Dissipation	4000	W

Typical Operation in Cathode-Drive Circuit

	Bandwidth of 10	8.5	6	*Mc/s*
DC Plate Voltage	3000	3200	4300	V
DC Grid Voltage	-105	-110	-150	V
Peak RF Grid Voltage				
Synchronizing level	380	435	500	V
Pedestal level	290	310	355	V

→ Indicates a change.

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	Bandwidth of 10	8.5	6.0 Mc/s	
DC Plate Current				
Synchronizing level	1.8	1.8	2	A
Pedestal level	1.36	1.35	1.5	A
DC Grid Current				
Synchronizing level	0.265	0.400	0.439	A
Pedestal level	0.115	0.130	0.118	A
Driving Power (Approx.)				
Synchronizing level	625	770	983	W
Power Output (Approx.)				
Synchronizing level	3150	4000	6350	W
Pedestal level	1800	2300	3590	W

GRID-MODULATED RF POWER AMPLIFIER[j]
CLASS C TELEVISION SERVICE

Synchronizing-level conditions per tube unless otherwise specified. At frequency of 54 to 216 Mc/s

Maximum CCS Ratings, Absolute-Maximum Values

DC Plate Voltage	3700	V
DC Grid Voltage (White level)	-800	V
DC Plate Current	1.9	A
DC Grid Current (Pedestal level)	0.225	A
Plate Input	6500	W
Plate Dissipation	4000	W

Typical Operation in Cathode-Drive Circuit

	Bandwidth of 8.5	Mc/s	
DC Plate Voltage	3200		V
DC Grid Voltage			
Synchronizing level	-110		V
Pedestal level	-220		V
White level	-520		V
Peak RF Grid Voltage	435		V
DC Plate Current			
Synchronizing level	1.8		A
Pedestal level	1.25		A
DC Grid Current (Approx.)			
Synchronizing level	0.400		A
Pedestal level	0.130		A
Driving Power (Approx.)			
Synchronizing level	770		W
Power Output (Approx.)			
Synchronizing level	4000		W
Pedestal level	2300		W

PLATE-MODULATED RF POWER AMPLIFIER — CLASS C TELEPHONY[j]

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS Ratings, Absolute-Maximum Values

DC Plate Voltage	5000	V
DC Grid Voltage	-1000	V
DC Plate Current	1	A
DC Grid Current	0.3	A
Plate Input	5000	W
Plate Dissipation	2700	W

Typical Operation in Grid-Drive Circuit

	Up to 30 Mc/s	*At 110 Mc/s*	
DC Plate Voltage	4700	4000	V
DC Grid Voltage	-400	-350	V
From a grid resistor of	1425	1460	Ω
Peak RF Grid Voltage[a]	675	600	V
DC Plate Current	0.96	0.93	A
DC Grid Current (Approx.)	0.28	0.24	A
Driving Power (Approx.)	170	130	W
Power Output (Approx.)	3700	2800	W

Typical Operation in Cathode-Drive Circuit

	Up to 30 Mc/s	*At 110 Mc/s*	
DC Plate Voltage	4700	4000	V
DC Grid Voltage	-400	-350	V
From a grid resistor of	1425	1460	Ω
Peak RF Grid Voltage	675	600	V
DC Plate Current	0.96	0.93	A
DC Grid Current (Approx.)	0.28	0.24	A
Driving Power (Approx.)[b]	720	600	W
Power Output (Approx.)	4200	3200	W

RF POWER AMPLIFIER & OSCILLATOR — CLASS C TELEGRAPHY[j]
AND
RF POWER AMPLIFIER — CLASS C FM TELEPHONY

Maximum CCS Ratings, Absolute-Maximum Values

DC Plate Voltage	6200	V
DC Grid Voltage	-1000	V
DC Plate Current	1.4	A
DC Grid Current	0.3	A
Plate Input	8700	W
→ **Plate Dissipation**	4000	W

Typical Operation in Grid-Drive Circuit

	Up to 30 Mc/s	
DC Plate Voltage	6000	V
DC Grid Voltage		
From a fixed supply of	-550	V
From a grid resistor of	1900	Ω
From a cathode resistor of	360	Ω
Peak RF Grid Voltage	875	V
DC Plate Current	1.25	A
DC Grid Current (Approx.)	0.290	A
Driving Power (Approx.)	225	W
Power Output (Approx.)	6000	W

→ **Typical Operation in Cathode-Drive Circuit**

	Up to 30 Mc/s	*At 110 Mc/s*	*At 220 Mc/s*	
DC Plate Voltage	6000	5000	4300	V

→ Indicates a change.

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	Up to 30 Mc/s	At 110 Mc/s	At 220 Mc/s	
DC Grid Voltage				
From a fixed supply of . . .	-550	-1000	-200	V
From a grid resistor of. . .	1900	4100	807	Ω
From a cathode resistor of .	360	740	134	Ω
Peak RF Grid Voltage	875	1350	432	V
DC Plate Current	1.25	1.1	1.25	A
DC Grid Current (Approx.). . .	0.290	0.245	0.25	A
Driving Power (Approx.). . . .	1225	1680	542	W
Power Output (Approx.)	7000	5500	4000	W

SELF-RECTIFYING OSCILLATOR OR AMPLIFIER — CLASS C[J]

Maximum CCS Ratings, Absolute-Maximum Values

AC Plate Voltage (RMS)	7000	V
DC Grid Voltage.	-300	V
DC Plate Current	0.635	A
DC Grid Current.	0.135	A
Plate Input[c]	4900	W
Plate Dissipation.	4000	W ←

Typical Operation

AC Plate Voltage (RMS)	6600	V
DC Grid Voltage.	-127	V
DC Plate Current	0.625	A
DC Grid Current (Approx.).	0.105	A
Driving Power (Approx.)[d]	60	W
Power Output (Approx.)	3350	W

AMPLIFIER OR OSCILLATOR — CLASS C[J]

With separate, rectified, unfiltered, single-phase, full-wave plate supply

Maximum CCS Ratings, Absolute-Maximum Values

DC Plate Voltage	5600	V
DC Grid Voltage.	-600	V
DC Plate Current	1.25	A
DC Grid Current.	0.270	A
Plate Input[e]	8600	W
Plate Dissipation.	4000	W ←

Typical Operation

DC Plate Voltage	5000	V
DC Grid Voltage.	-260	V
DC Plate Current	1.2	A
DC Grid Current (Approx.).	0.260	A
Driving Power (Approx.)[f]	150	W
Power Output (Approx.)	5650	W

[a] Driver modulated approximately 30%.

[b] Carrier power of driver modulated 100%.

[c] Plate input is 1.11 times the product of the ac voltage (rms) and the dc plate current.

[d] From a self-rectified driver.

← Indicates a change.

[e] Plate input is 1.23 times the product of the dc plate voltage and the dc plate current.

[f] From a driver with a rectified, unfiltered, single-phase, full-wave plate supply.

The following footnotes apply to the *RCA Transmitting Tube Operating Considerations* given at front of this section.

[g] See Electrical Considerations-Filament or Heater.

[h] See Cooling Considerations-Forced-Air Cooling.

[j] See Classes of Service.

RATINGS VS FREQUENCY

FREQUENCY	30	110	220		Mc/s
Maximum Permissible Percentage of Maximum Rated Plate Voltage and Plate Input					
Class B Television Service	Full Ratings—54 to 216 Mc/s				
Class C Television Service	Full Ratings—54 to 216 Mc/s				
Class C Telephony, Plate-Modulated	100	84	72		%
Class C Telegraphy and FM Telephony	100	84	72		%
Class C Amplifier or Oscillator, Self-Rectifying	100	84	72		%
Class C Amplifier or Oscillator with Separate, Rectified, Unfiltered Plate Supply	100	84	72		%
Maximum Permissible Percentage of Maximum Rated DC Grid Voltage and DC Grid Current					
Class B Television Service	Full Ratings—54 to 216 Mc/s				
Class C Television Service	Full Ratings—54 to 216 Mc/s				
			Volt.	*Cur.*	
Class C Telephony, Plate-Modulated	100	100	60	83	%
Class C Telegraphy and FM Telephony	100	100	60	83	%
Class C Amplifier or Oscillator, Self-Rectifying	100	100	60	83	%
Class C Amplifier or Oscillator with Separate, Rectified, Unfiltered Plate Supply	100	100	60	83	%

CHARACTERISTICS RANGE VALUES

	Note	*Min*	*Max*	
Filament Current	1	27	31	A
Amplification Factor	1,2	25	33	
Direct Interelectrode Capacitances				
Grid to plate	-	16.5	20.5	pF
Grid to filament	-	15.5	22.5	pF
Plate to filament	-	0.38	0.62	pF

→ Indicates a change.

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	Note	Min	Max	
Grid Voltage	1,3	-125	-190	V
Plate Voltage	1,4	1350	1750	V
Plate Voltage	1,5	2600	3400	V
Useful Power Output	1,6	3	-	kW

Note 1: With 12.6 volts rms on filament.

Note 2: With dc grid voltage of -25 volts measured from center-tap of filament supply, and dc plate voltage adjusted to give dc plate current of 0.5 ampere.

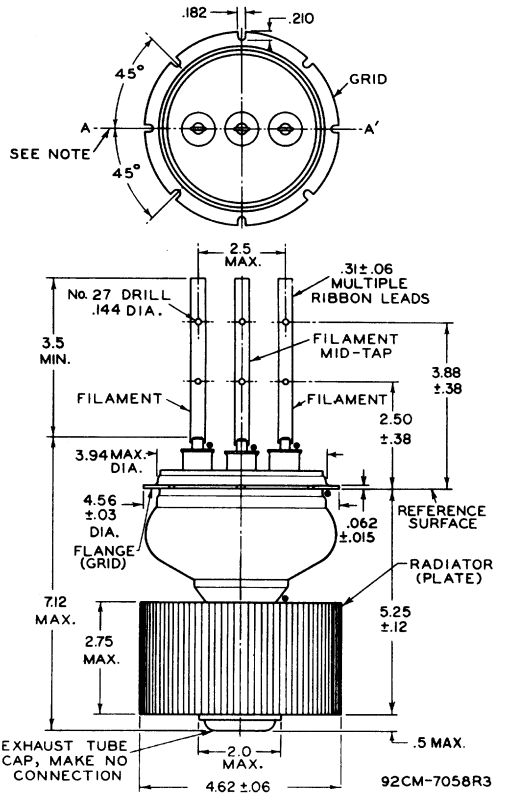
Note 3: With dc plate voltage of 4000 volts, and dc grid voltage adjusted to give dc plate current of 0.05 ampere.

Note 4: With dc grid voltage of 0 volts measured from center-tap of filament supply, and dc plate voltage adjusted to give dc plate current of 0.5 ampere.

Note 5: With dc grid voltage of -50 volts measured from center-tap of filament supply, and dc plate voltage adjusted to give dc plate current of 0.5 ampere.

Note 6: In a self-excited, coaxial, oscillator circuit and with dc plate voltage of 5000 volts, dc plate current of 1.1 amperes, grid resistor of 1500 ± 10% ohms, dc grid current of 0.250 to 0.300 ampere, and frequency of 110 Mc/s.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

• Temperature Measurement Point.

Note: Plane of filament leads will not deviate more than 3-1/2° from plane passing through AA' normal to grid flange.

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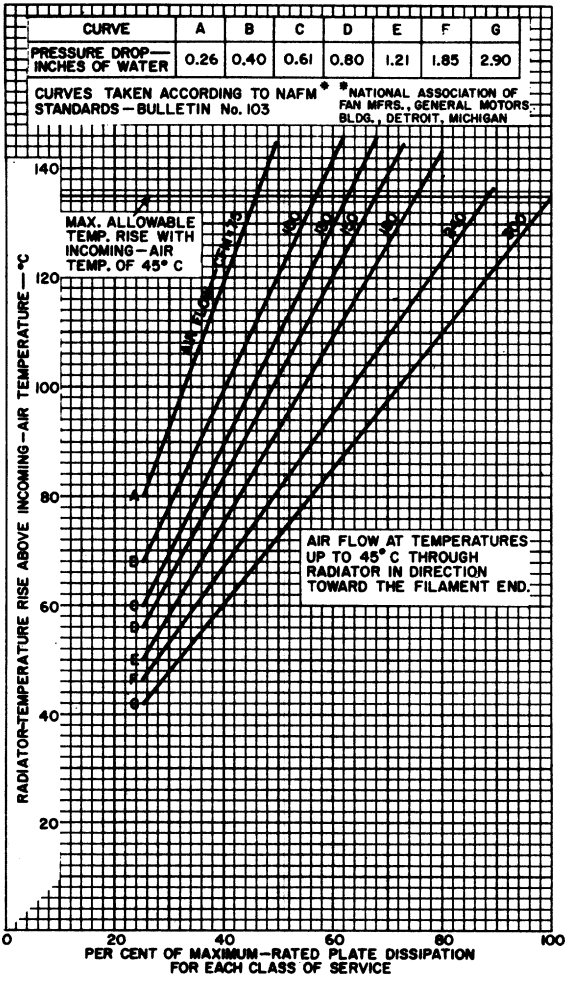
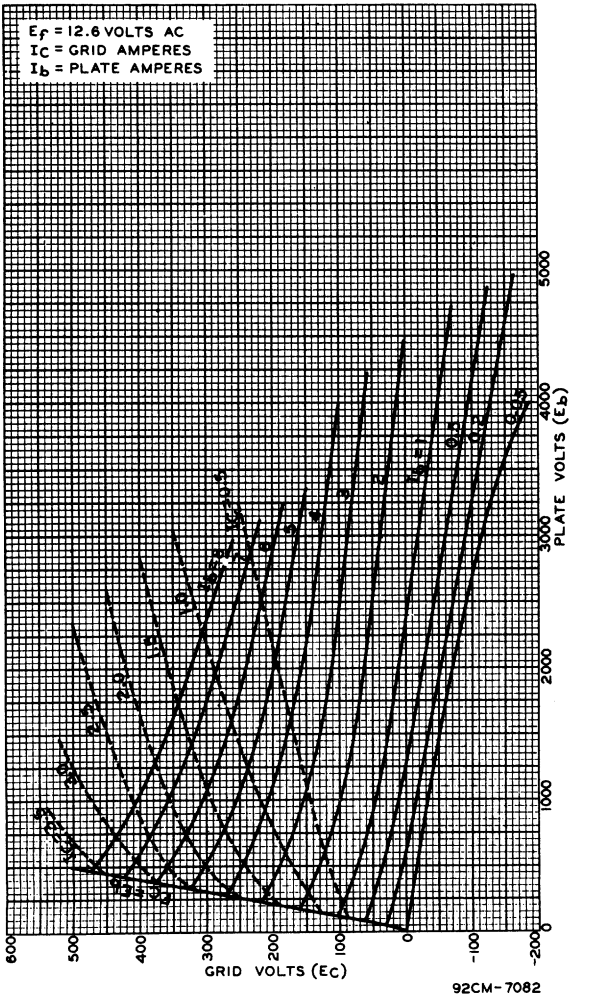
Electronic Components and Devices Harrison, N. J.

Typical Cooling Characteristics



Typical Constant-Current Characteristics



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5763

VHF BEAM POWER TUBE

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.0 ± 10%	ac or dc volts
Current	0.75	amp
Transconductance for plate current of 45 ma.	7000	μmhos
Mu-Factor, Grid No.2 to Grid No.1	16	
Direct Interelectrode Capacitances:°		
Grid No.1 to Plate	0.3 max.	μμf
Input	9.5	μμf
Output	4.5	μμf

° With no external shield.

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (excluding tip)	2" ± 3/32"
Maximum Diameter	7/8"
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9K

Pin 1 - Plate
Pin 2 - No Connection
Pin 3 - Grid No.3
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid No.2
Pin 7 - Cathode
Pin 8 - Grid No.1
Pin 9 - Grid No.1

PLATE-MODULATED RF POWER AMPLIFIER--Class C Telephony

Carrier conditions per tube for use with a max. modulation factor of 1.0

Maximum Ratings, *Absolute Values:*	*CCS*●	*ICAS*●●	
DC PLATE VOLTAGE	250 max.	300 max.	volts
DC GRID-No.3 (SUPPRESSOR) VOLTAGE	0 max.	0 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE	250 max.	250 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-125 max.	-125 max.	volts
DC PLATE CURRENT	40 max.	50 max.	ma
DC GRID-No.2 CURRENT	15 max.	15 max.	ma
DC GRID-No.1 CURRENT	5 max.	5 max.	ma
PLATE INPUT	10 max.	15 max.	watts
GRID-No.2 INPUT	1.5 max.	1.5 max.	watts
PLATE DISSIPATION	8 max.	12 max.	watts

●,●●: See next page.

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VHF BEAM POWER TUBE

	CCS●	*ICAS*●●	
PEAK HEATER–CATHODE VOLTAGE:			
Heater negative with respect to cathode	100 max.	100 max.	volts
Heater positive with respect to cathode	100 max.	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250 max.	250 max.	°C
Typical Operation up to 30 Mc:			
DC Plate Voltage	250	300	
Grid No.3	Connected to cathode at socket		
DC Grid–No.2 Voltage●	250	250	volts
DC Grid–No.1 Voltage★	−39	−42.5	volts
From a grid resistor of	39000	18000	ohms
Peak RF Grid–No.1 Voltage	46.5	53.5	volts
DC Plate Current	40	50	ma
DC Grid–No.2 Current	5.6	6	ma
DC Grid–No.1 Current (Approx.)	1	2.4	ma
Driving Power (Approx.)	0.05	0.15	watt
→ Useful Power Output (Approx.)	6.4■	10■	watts
Maximum Circuit Values (CCS or ICAS Conditions):			
Grid–No.1–Circuit Resistance	0.1 max.		megohm

RF POWER AMPLIFIER & OSCILLATOR--Class C Telegraphy□ and RF POWER AMPLIFIER--Class C FM Telephony

Maximum Ratings, *Absolute Values:*	*CCS*●	*ICAS*●●	
DC PLATE VOLTAGE	300 max.	350 max.	volts
DC GRID–No.3 (SUPPRESSOR) VOLTAGE	0 max.	0 max.	volts
DC GRID–No.2 (SCREEN) VOLTAGE	250 max.	250 max.	volts
DC GRID–No.1 (CONTROL-GRID) VOLTAGE	−125 max.	−125 max.	volts
DC PLATE CURRENT	50 max.	50 max.	ma
DC GRID–No.2 CURRENT	15 max.	15 max.	ma
DC GRID–No.1 CURRENT	5 max.	5 max.	ma
PLATE INPUT	15 max.	17 max.	watts

● Obtained preferably from a separate source modulated with the plate supply, or from the modulated plate supply through a series resistor.

★ Obtained from grid–No.1 resistor or from a combination of grid–No.1 resistor with either fixed supply or cathode resistor.

□ Key down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

●, ●●, ■: See next page. → Indicates a change

TUBE DIVISION
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VHF BEAM POWER TUBE

	CCS●	*ICAS*●●	
GRID-No.2 INPUT	2 max.	2 max.	watts
PLATE DISSIPATION	12 max.	13.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode . . .	100 max.	100 max.	volts
Heater positive with respect to cathode . . .	100 max.	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface). .	250 max.	250 max.	°C
Typical Operation up to 30 Mc:			
DC Plate Voltage	300	350	volts
Grid No.3	Connected to cathode at socket		
DC Grid-No.2 Voltage	250	250	volts
DC Grid-No.1 Voltage●	-28.5	-28.5	volts
From a grid resistor of . .	18000	18000	ohms
Peak RF Grid-No.1 Voltage . .	37.5	37	volts
DC Plate Current	50	48.5	ma
DC Grid-No.2 Current	6.6	6.2	ma
DC Grid-No.1 Current (Approx.)	1.6	1.6	ma
Driving Power (Approx.) . . .	0.1	0.1	watt
Useful Power Output (Approx.)	10.3■	12■	watts ←
Typical Operation at 50 Mc:			
DC Plate Voltage	300	-	volts
Grid No.3	Connected to cathode at socket		
DC Grid-No.2 Voltage	250	-	volts
DC Grid-No.1 Voltage●	-60	-	volts
From a grid resistor of . .	22000	-	ohms
Peak RF Grid-No.1 Voltage . .	80	-	volts
DC Plate Current	50	-	ma
DC Grid-No.2 Current	5	-	ma
DC Grid-No.1 Current (Approx.)	3	-	ma
Driving Power (Approx.) . . .	0.35	-	watt
Useful Power Output (Approx.)	7■	-	watts ←
Maximum Circuit Values (CCS or ICAS Conditions):			
Grid-No.1-Circuit Resistance	0.1 max.		megohm

FREQUENCY MULTIPLIER

Maximum CCS● Ratings, *Absolute Values:*

DC PLATE VOLTAGE	300 max.	volts
DC GRID-No.3 (SUPPRESSOR) VOLTAGE	0 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE	250 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE . . .	-125 max.	volts
DC PLATE CURRENT	50 max.	ma

● Continuous Commercial Service.
●● Intermittent Commercial and Amateur Service.
●,■: See next page.
← Indicates a change

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VHF BEAM POWER TUBE

DC GRID-No.2 CURRENT	15 max.	ma
DC GRID-No.1 CURRENT	5 max.	ma
PLATE INPUT	15 max.	watts
GRID-No.2 INPUT	2 max.	watts
PLATE DISSIPATION	12 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250 max.	°C

Typical Operation:	*Doubler to 175 Mc*	*Tripler to 175 Mc*	
DC Plate Voltage	300	300	volts
Grid No.3	Connected to cathode at socket		
DC Grid-No.2 Voltage	*	*	volts
DC Grid-No.1 Voltage●	-75	-100	volts
From grid resistor of	75000	100000	ohms
Peak RF Grid-No.1 Voltage	95	120	volts
DC Plate Current	40	35	ma
DC Grid-No.2 Current	4	5	ma
DC Grid-No.1 Current (Approx.)	1	1	ma
Driving Power (Approx.)	0.6	0.6	watt
Useful Power Output (Approx.)	2.1■	1.3■	watts

Maximum Circuit Values (For maximum rated conditions):

→ Grid-No.1-Circuit Resistance	0.1 max.	megohm

→ **CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN**

	Note	*Min.*	*Max.*	
Heater Current	1	0.69	0.81	amp
Grid No.1-Plate Capacitance	2	-	0.3	μμf
Input Capacitance	2	8.0	11.0	μμf
Output Capacitance	2	3.8	5.2	μμf
Transconductance	1,3	5100	8900	μmhos
Plate Current	1,3	33	57	ma
Grid-No.2 Current	1,3	-	10	ma
Reverse Grid-No.1 Current	1,4	-	2	μamp

NOTE 1: With 6 volts ac or dc on heater.

NOTE 2: With no external shield.

NOTE 3: With dc plate voltage of 250 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage of -7.5 volts.

NOTE 4: With dc plate voltage of 250 volts, dc grid-No.2 voltage of 250 volts, dc grid-No.1 voltage of -7.5 volts, and grid-No.1-circuit resistance of 0.1 megohm.

● Obtained from a fixed supply, or by a grid-No.1 resistor of value shown.

■ This value of useful power is measured at load of output circuit.

Data on Operating Frequencies for the 5763 are given on the sheet TRANS. TUBE RATINGS vs FREQUENCY

→ Indicates a change

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

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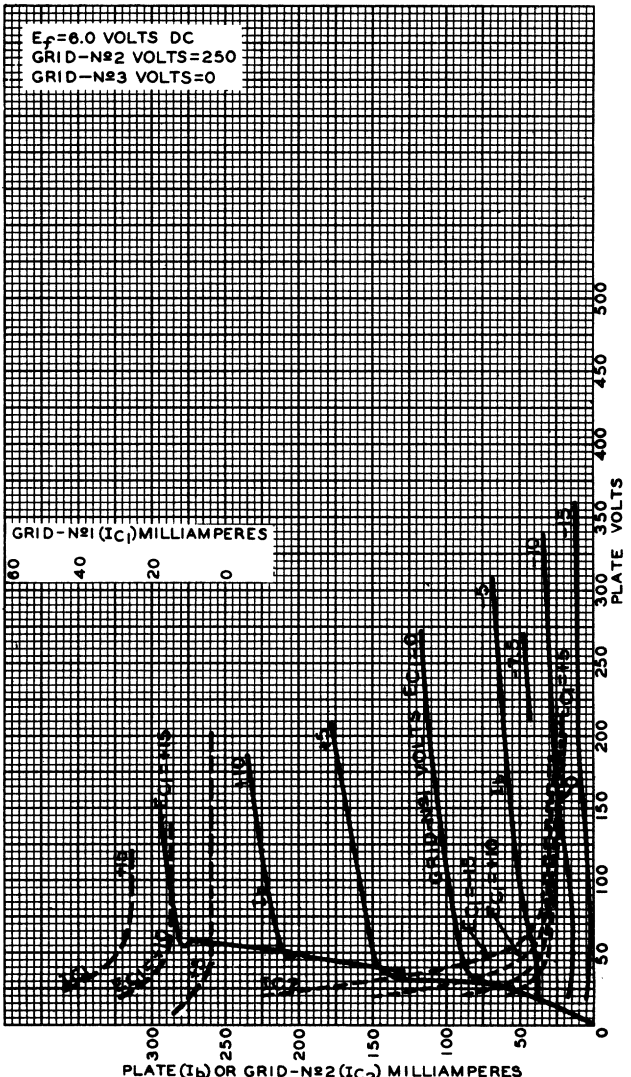
AVERAGE CHARACTERISTICS



JAN.12,1949

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7160

5763

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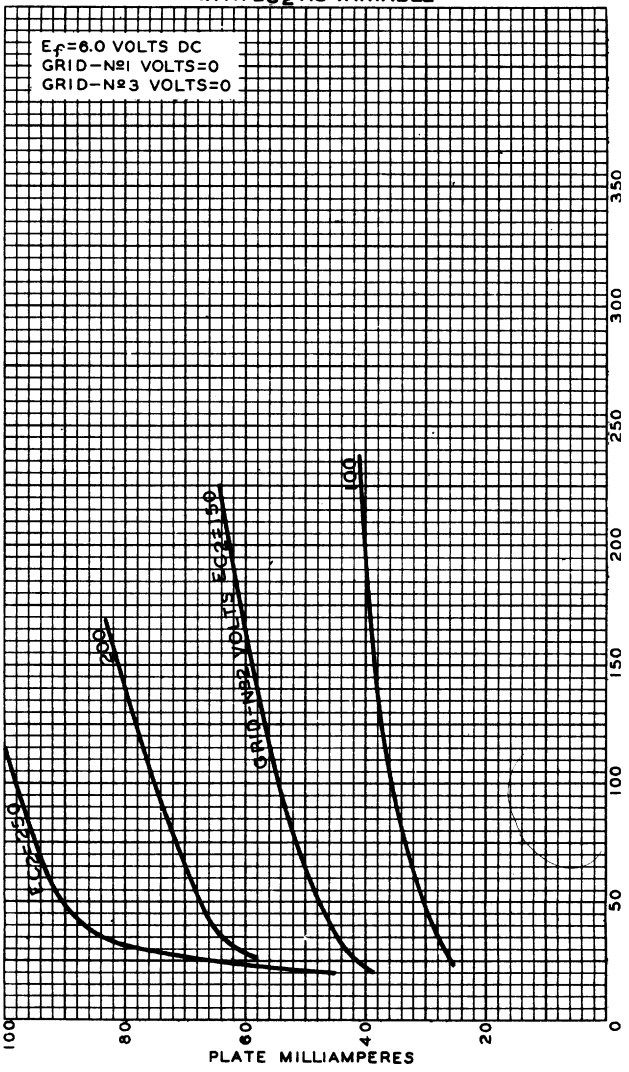
AVERAGE PLATE CHARACTERISTICS
WITH E_{C2} AS VARIABLE



JAN.10,1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7159

Power Triode

ATER AND FORCED-AIR COOLED **GROUNDED-GRID TYPE**

GENERAL DATA

lectrical:

ilament, Multistrand Thoriated-Tungsten:

Voltage (AC or DC)	11 ± 0.6	volts
Current at filament volts = 11.	285	amp
Starting Current:	It is not necessary to provide means for limiting filament starting current on this type. Full rated filament voltage can be applied safely to the cold filament.	
Minimum Heating Time	15	sec
mplification Factor	40	←

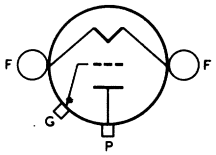
irect Interelectrode Capacitances (Approx.):

Grid to plate	53	pf
Grid to filament	89	pf
Plate to filament	1.2	pf

echanical:

perating Position. . . . . Vertical, filament end up
laximum Overall Length. . . . . 24-1/2"
laximum Diameter. . . . . 9-1/2"
erminal Diagram (See *Dimensional Outline*):

F – Filament
G – Grid



P – Plate

hermal:

ater Flow. . . . . 20 to 25 gpm
The specified water flow must start before the application of any voltages, and may be removed simultaneously with the filament and plate power.

ir Flow:
To plate seal and bulb:
At frequencies below 1.7 Mc . . . . . Natural
At frequencies above 1.7 Mc . . . . . Up to 250 cfm
Adequate forced-air cooling should be provided to limit the temperature of the plate seal and bulb to their specified maximum values. The amount of air flow required will increase with the operating frequency. The cooling air should start before the application of any voltages and should be distributed uniformly around the plate seal by means of a suitable air manifold and an air deflector. The airflow may be removed simultaneously with filament and plate power.

← Indicates a change.

To filament seals and grid seal	10 min.	cfm
The specified air flow should be directed vertically from a 1-1/4" diameter nozzle into the filament heater before and during the application of any voltages. It may be removed simultaneously with filament and plate power.		
Outlet Water Temperature.	70 max.	°C
Bulb Temperature.	180 max.	°C
Seal Temperature (Filament, grid, and plate) .	165 max.	°C

AF POWER AMPLIFIER & MODULATOR — Class B

Maximum CCS[a] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE.	15000 max.	volts
MAX.-SIGNAL DC PLATE CURRENT[b]	6 max.	amp
Max.-SIGNAL PLATE INPUT[b].	90 max.	kw
PLATE DISSIPATION[b].	50 max.	kw

Typical Push-Pull Operation:

Values are for 2 tubes

DC Plate Voltage.	10200	15000	volts
DC Grid Voltage	-220	-320	volts
Peak AF Grid-to-Grid Voltage.	900	1560	volts
Zero-Signal DC Plate Current.	0.6	0.6	amp
Max.-Signal DC Plate Current.	5.8	12	amp
Effective Load Resistance (Plate to plate).	3600	2640	ohms
Max.-Sig. Driving Power (Approx.)[c]. .	120	688	watts
Max.-Sig. Power Output (Approx.). . .	37	117	kw

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE.	12500 max.	volts
DC GRID VOLTAGE	-2000 max.	volts
DC PLATE CURRENT.	5.0 max.	amp
DC GRID CURRENT..	1.25 max.	amp
PLATE INPUT	60 max.	kw
PLATE DISSIPATION	33 max.	kw

Typical Operation:

DC Plate Voltage.	10200	12500	volts
DC Grid Voltage:[d]			
From a fixed-supply	-1500	-1500	volts
From a grid resistor of 2100 ohms. .	-1500	-	volts
From a grid resistor of 1400 ohms. .	-	-1500	volts
Peak RF Grid Voltage.	2070	2180	volts
DC Plate Current.	3.3	4.5	amp
DC Grid Current (Approx.)[e].	0.72	1.1	amp
Driving Power (Approx.)[e].	1350	2160	watts
Power Output (Approx.).	28	45	kw

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[f]

Maximum CCS Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	17000 max.	volts
DC GRID VOLTAGE	-2000 max.	volts
DC PLATE CURRENT	9 max.	amp
DC GRID CURRENT	1.25 max.	amp
PLATE INPUT	150 max.	kw
PLATE DISSIPATION	50 max.	kw

Typical Operation in Grounded-Filament Circuit:

DC Plate Voltage	14000	17000	volts
DC Grid Voltage:[g]			
From a fixed supply	-900	-1450	volts
From a cathode resistor of 125 ohms.	-900	-	volts
From a cathode resistor of 150 ohms.	-	-1450	volts
From a grid resistor of 750 ohms.	-900	-	volts
From a grid resistor of 1320 ohms	-	-1450	volts
Peak RF Grid Voltage	1600	2375	volts
DC Plate Current	6	8.5	amp
DC Grid Current (Approx.)[e]	1.2	1.1	amp
Driving Power (Approx.)[e]	1700	2300	watts
Power Output (Approx.)[e]	65	105	kw

Typical Operation in Grounded-Grid Circuit:

Same values as for Grounded-Filament Circuit with the following exceptions:

Driving Power (Approx.)[e]	6250	11200	watts
Power Output	70	114	kw

[f] Continuous Commercial Service.

[g] Averaged over any audio-frequency cycle of sine-wave form.

The driving stage should have good regulation and should be capable of supplying considerably more than the specified driving power.

Obtained from a fixed supply, grid resistor, or a combination of both.

For effect of load resistance on grid current and driving power, refer to TUBE RATINGS-*Grid Current and Driving Power* in the General Section.

Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

Obtained from a fixed supply, a cathode resistor, a grid resistor, or from a combination of a fixed supply and self-bias.

CHARACTERISTICS RANGE VALUES

	Note	*Min.*	*Max.*	
Filament Current	1	265	305	amp
Amplification Factor	1,2	35	45	←
Grid-Plate Capacitance	-	47	59	pf
Grid-Filament Capacitance	-	74	104	pf
Plate-Filament Capacitance	-	0.8	1.6	pf
Grid Voltage	1,3	-310	-490	volts
Plate Voltage	1,4	7100	9100	volts ←
Plate Voltage	1,5	3600	4600	volts
Peak Cathode Current	1,6	50	-	amp
Useful Power Output	1,7	80	-	kw ←

← Indicates a change.

Note 1: With 11 volts ac on filament.

Note 2: With dc grid voltage of -50 volts, and with plate voltage adjusted to give dc plate current of 2 amperes.

Note 3: With dc plate voltage of 15000 volts, and with grid voltage adjusted to give dc plate current of 0.05 ampere.

Note 4: With dc grid voltage of -100 volts, and with plate voltage adjusted to give a dc plate current of 2 amperes.

Note 5: With dc grid voltage of 0 volts, and with plate voltage adjusted to give dc plate current of 2 amperes.

Note 6: Represents the maximum usable cathode current (plate current and grid current) for the tube under any condition of operation.

→ Note 7: With dc plate voltage of 17000 volts, dc plate current of 8.8 amperes, dc grid current of 1.05 to 1.25 amperes, grid resistor of 1600 ± 10% ohms, and frequency of 1.6 Mc.

MAXIMUM RATINGS vs OPERATING FREQUENCY

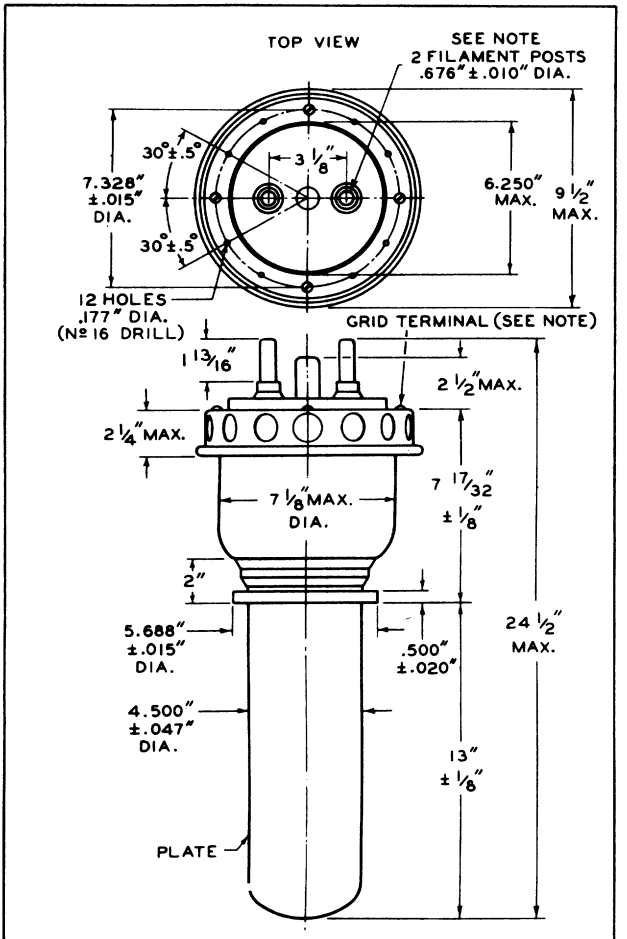
OPERATING FREQUENCY Mc	MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM-RATED PLATE VOLTAGE & PLATE INPUT	
	TELEPHONY	TELEGRAPHY
	Class C Plate-Modulated	Class C Unmodulated
20	100	100
27	88	88
35	77	77

CURVES
shown under Type 5671
also apply to the 5770

→ Indicates a change.

5770

POWER TRIODE



5771

POWER TRIODE

WATER & FORCED-AIR COOLED

GENERAL DATA

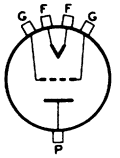
Electrical:

Filament, Multistrand Thoriated-Tungsten:		
Excitation	Single Phase AC or DC	
Voltage	7.5 ± 0.4	ac or dc volts
Current	170	amp
Starting Current: The filament current should never exceed 800 amperes, even momentarily.		
Cold Resistance	0.0055	ohm
Minimum Heating Time	15	seconds
Amplification Factor	20	
Direct Interlectrode Capacitances (Approx.):		
Grid to Plate	24.5	μμf
Grid to Filament	47	μμf
Plate to Filament	3	μμf

Mechanical:

Terminal Connections:

F - Filament
G - Grid
P - Water-Cooled Plate



Grid terminals are spaced diametrically wider than filament terminals.

Mounting Position	Vertical, Filament End Up	
Maximum Overall Length	11-5/16"	
Maximum Diameter	7"	
Water Flow	12 to 20	gpm
The specified water flow must start before application of any voltages, and may be removed simultaneously with the filament and plate power.		
Air Flow	20 min.	cfm
The specified air flow should be directed vertically from a 3"-diameter nozzle onto the top portion of the bulb before and during the application of any voltages.		
Outlet Water Temperature	70 max.	°C
Bulb Temperature	180 max.	°C
Seal Temperature (Filament, grid, plate)	165 max.	°C

Components:

Water Jacket	RCA MI-19461
Jacket Wrench	RCA MI-19436
Gasket	RCA MI-7441
Terminal-Post Chuck Connector (4 required)	RCA MI-19466
Chuck Wrench (2 required)	RCA MI-19424
Filament Transformer	RCA-203T1

AF POWER AMPLIFIER & MODULATOR - Class B

Maximum CCS• Ratings, ***Absolute Values*****:**

DC PLATE VOLTAGE	12500 max.	volts

•: See next page.

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POWER TRIODE

MAX.-SIGNAL DC PLATE CURRENT*	5 max.	amp
MAX.-SIGNAL PLATE INPUT*	45 max.	kw
PLATE DISSIPATION*	22.5 max.	kw

Typical Operation:

Values are for 2 tubes

DC Plate Voltage	12500	volts
DC Grid Voltage	-600	volts
Peak AF Grid-to-Grid Voltage	1900	volts
Zero-Signal DC Plate Current	1	amp
Max.-Signal DC Plate Current	6.4	amp
Effective Load Resistance (Plate-to-plate)	4400	ohms
Max.-Signal Driving Power (Approx.)#	430	watts
Max.-Signal Power Output (Approx.)	55	kw

* Averaged over any audio-frequency cycle of sine-wave form.

\# The driving stage should have good regulation and should be capable of supplying considerably more than the specified driving power.

RF POWER AMPLIFIER - Class B Telephony

Carrier conditions per tube for use with a max. modulation factor of 1.0

Maximum CCS• Ratings, *Absolute Values*:

DC PLATE VOLTAGE	12500 max.	volts
DC PLATE CURRENT	4 max.	amp
PLATE INPUT	33 max.	kw
PLATE DISSIPATION	22.5 max.	kw

Typical Operation:

DC Plate Voltage	12500	volts
DC Grid Voltage	-625	volts
Peak RF Grid Voltage	625	volts
DC Plate Current	2.4	amp
DC Grid Current□	0	amp
Driving Power (Approx.)■□	1070	watts
Power Output (Approx.)	12	kw

■ At crest of audio-frequency cycle with modulation factor of 1.0.

PLATE-MODULATED RF POWER AMPLIFIER - Class C Telephony

Carrier conditions per tube for use with a max. modulation factor of 1.0

Maximum CCS• Ratings, *Absolute Values*:

DC PLATE VOLTAGE	10000 max.	volts
DC GRID VOLTAGE	-1600 max.	volts
DC PLATE CURRENT	4 max.	amp
DC GRID CURRENT	0.8 max.	amp
PLATE INPUT	40 max.	kw
PLATE DISSIPATION	15 max.	kw

•,□: See next page.

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POWER TRIODE

Typical Operation:

DC Plate Voltage	10000	volts
DC Grid Voltage●	−840	volts
	1075	ohms
Peak RF Grid Voltage	1440	volts
DC Plate Current	3.8	amp
DC Grid Current (Approx.)□	0.78	amp
Driving Power (Approx.)□	1010	watts
Power Output (Approx.)	29	kw

● Obtained by grid resistor of value shown or by partial self-bias methods.

RF POWER AMPLIFIER & OSCILLATOR – Class C Telegraphy

Key-down conditions per tube without modulation□□

Maximum CCS● Ratings, *Absolute Values*:

	1.6 to 25 Mc	*Below 1.6 Mc*	
DC PLATE VOLTAGE	12500 max.	15000 max.	volts
DC GRID VOLTAGE	−1600 max.	−1600 max.	volts
DC PLATE CURRENT	6 max.	6 max.	amp
DC GRID CURRENT	0.8 max.	0.8 max.	amp
PLATE INPUT	60 max.	67.5 max.	kw
PLATE DISSIPATION	22.5 max.	22.5 max.	kw

Typical Operation:

DC Plate Voltage	10000	10000	12500	15000	volts
DC Grid Voltage▲▲	−720	−770	−630	−990	volts
	140	115	115	185	ohms
	1040	1000	840	1240	ohms
Peak RF Grid Voltage	1290	1440	1230	1620	volts
DC Plate Current	4.5	6	4.8	4.5	amp
DC Grid Current (Approx.)□	0.69	0.77	0.75	0.8	amp
Driving Power (Approx.)□	800	1000	1050	1160	watts
Power Output (Approx.)	33	40	44	53	kw

● Continuous Commercial Service.

□□ Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

□ For effect of load resistance on grid current and driving power, refer to TUBE RATINGS—*Grid Current and Driving Power* in the General Section.

▲▲ Obtained from cathode resistor (140, 115, 115, 185), or grid resistor (1040, 1000, 840, 1240) or by partial self-bias methods.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Filament Current	1	160	180	amp
Amplification Factor	1,2	17	23	

← Indicates a change.

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POWER TRIODE

	Note	Min.	Max.	
Grid-Plate Capacitance	–	20	28	μμf
Grid-Filament Capacitance. . .	–	39	55	μμf
Plate-Filament Capacitance . .	–	2.3	3.7	μμf
Plate Voltage.	1,3	5300	7900	volts
Plate Voltage.	1,4	2100	3100	volts
Peak Cathode Current	1,5	35	–	amp
Useful Power Output.	1,6	33	–	kw

Note 1: With 7.5 volts ac on filament.

Note 2: With dc grid voltage of – 100 volts, and with plate voltage adjusted to give dc plate current of 2 amperes.

Note 3: With dc grid voltage of – 200 volts, and with plate voltage adjusted to give dc plate current of 2 amperes.

Note 4: With dc grid voltage of 0 volts, and with plate voltage adjusted to give dc plate current of 2 amperes.

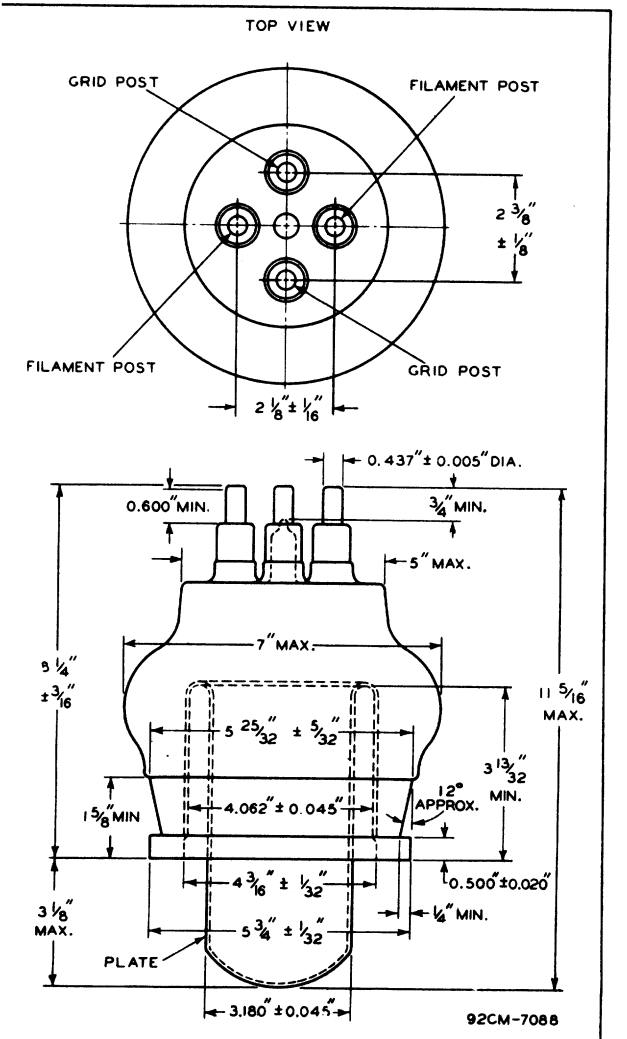
Note 5: Represents the maximum usable cathode current (plate current and grid current) for the tube under any condition of operation.

Note 6: With dc plate voltage of 12500 volts, dc plate current of 4.8 amperes, dc grid current of 0.6 to 0.9 ampere, grid resistor of 1600 ± 10% ohms, and frequency of 22 Mc.

Data on operating frequencies for the 5771 are given on the sheet TRANS. TUBE RATINGS vs FREQUENCY.

5771

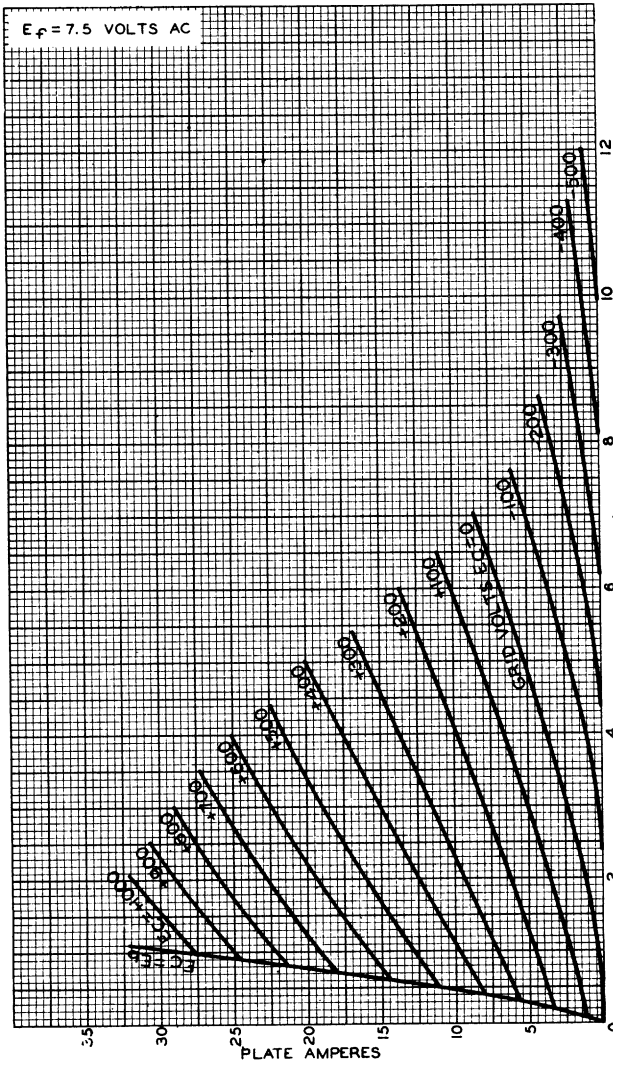
POWER TRIODE



5771

5771

AVERAGE PLATE CHARACTERISTICS



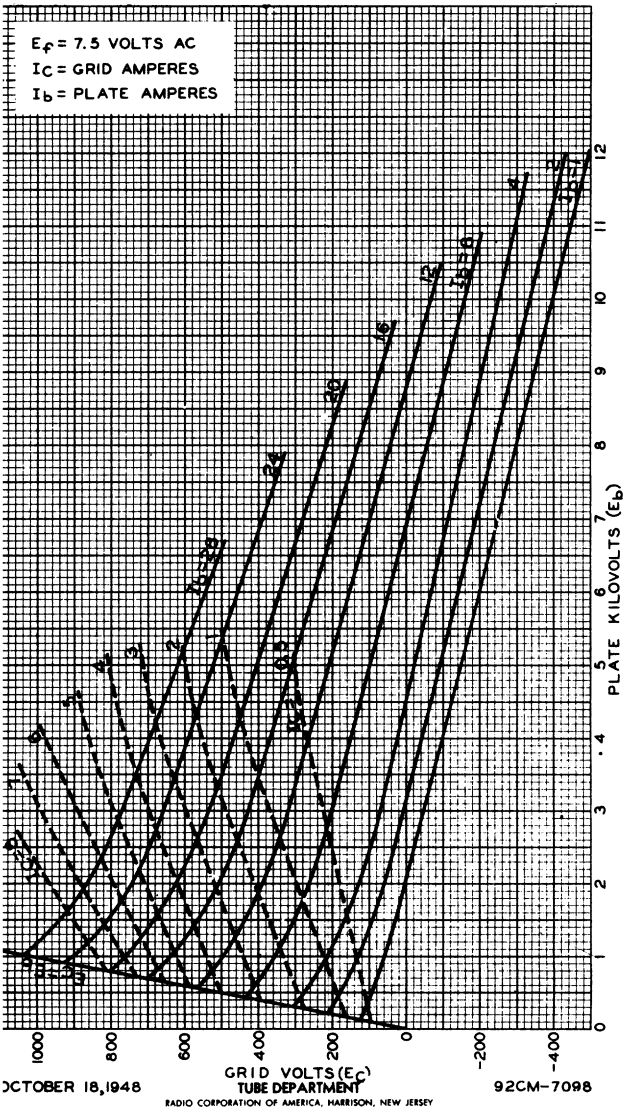
OCTOBER 28,1948

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7106

5771

AVERAGE CONSTANT-CURRENT CHARACTERISTICS



OCTOBER 18, 1948

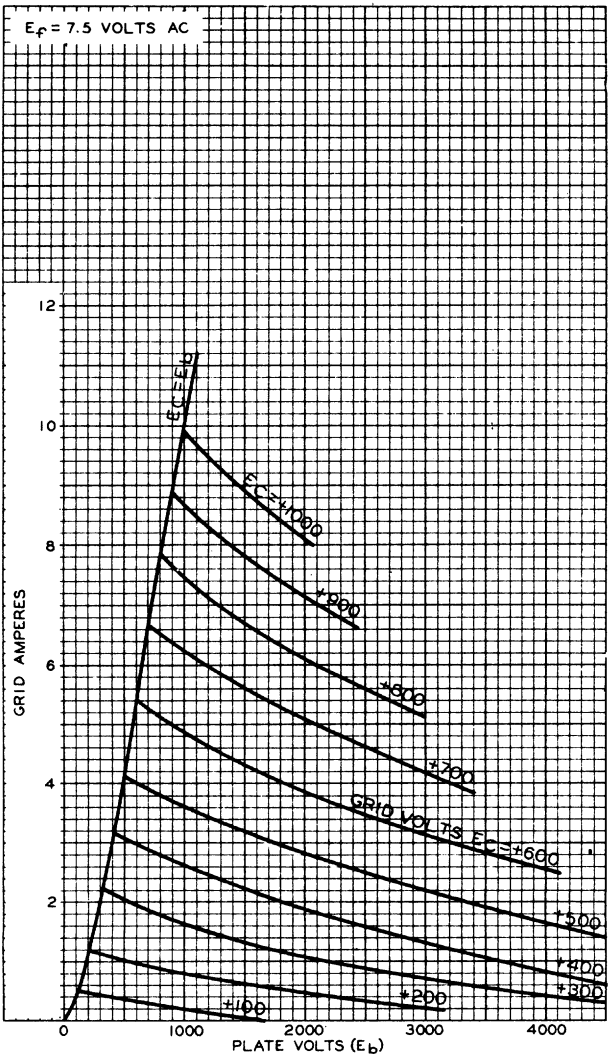
TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7098

5771

TYPICAL CHARACTERISTICS



5814-A

MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

5814-A PREMIUM TYPE

Intended for applications where dependable performance under shock and vibration is paramount. The 5814-A, a "premium" version of the 12AU7, supersedes type 5814.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Heater arrangement	*Series*	*Parallel*	
Voltage	12.6 ± 10%	6.3 ± 10%	ac or dc volts
Current	0.175	0.35	amp

Direct Interelectrode Capacitances (Approx.):°

	Unit No. 1	*Unit No. 2*	
Grid to plate	1.5	1.5	μμf
Grid to cathode and heater	1.6	1.6	μμf
Plate to cathode and heater	0.5	0.4	μμf

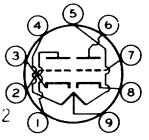
Characteristics, Class A_1 Amplifier (Each Unit):

Plate Voltage	100	250	volts
Grid Voltage	0	-8.5	volts
Amplification Factor	19.5	17	
Plate Resistance (Approx.)	6250	7700	ohms
Transconductance	3100	2200	μmhos
Plate Current	11.8	10.5	ma
Grid Voltage (Approx.) for plate current of 10 μamp	-	-22	volts

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Maximum Diameter	7/8"
Dimensional Outline	*See General Section*
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin (JETEC No. E9-1)
Basing Designation for BOTTOM VIEW	9A

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pins 4 & 9 - Heater of Unit No.2
Pins 5 & 9 - Heater of Unit No.1



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Heater Mid-Tap

AMPLIFIER - Class A_1

Values are for Each Unit

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	330 max.	volts

° Without external shield.

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5814-A

MEDIUM-MU TWIN TRIODE

CATHODE CURRENT	22 max.	ma
PLATE DISSIPATION	3 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	100 max.	volts
Heater positive with respect to cathode.	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	165 max.	°C

Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED AMPLIFIER CHART at end of tabulated data for this type

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	1.0 max.	megohm

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN•

Values are for Each Unit and are Initial, Unless Otherwise Specified

	Note	Min.	Max.	
Heater Current	1	0.160	0.190	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	1.2	1.8	μμf
Grid to cathode and heater	2	1.25	1.95	μμf
Plate to cathode and heater (Unit No.1)	2	0.3	0.7	μμf
Plate to cathode and heater (Unit No.2)	2	0.2	0.6	μμf
Amplification Factor	1,3	15.5	18.5	
Plate Current (1)	1,3	6.5	14.5	ma
Plate-Current Difference Between Units	1,3	–	3.5	ma
Plate Current (2)	1,4	–	20	μamp
Transconductance (1)	1,3	1750	2650	μmhos
Transconductance (2)	1,5	2500	3700	μmhos
Transconductance (2) at 500 hours	1,5	2000	3700	μmhos
Transconductance (3)	5,6	2250	–	μmhos
Transconductance Change: Difference between average transconductance (2) initially, and average after 500 hours, expressed as a percentage of the initial average	1,5	–	15	%

•, Notes 1 to 6: See next page.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5814-A

MEDIUM-MU TWIN TRIODE

	Note	Min.	Max.	
Reverse Grid Current	1,7	–	0.5	μamp
Grid Emission Current	8,9	–	1.5	μamp
Heater–Cathode				
Leakage Current:				
Heater negative with respect to cathode	1,10	–	10	μamp
Heater positive with respect to cathode	1,10	–	10	μamp
Leakage Resistance:				
Between grid and all other electrodes tied together	1,11	–	500	megohms
Between plate and all other electrodes tied together	1,12	–	500	megohms
Leakage Resistance at 500 hours:				
Between grid and all other electrodes tied together	1,11	–	250	megohms
Between plate and all other electrodes tied together	1,12	–	250	megohms

Note 1: With 12.6 volts ac or dc on heater (series connection).

Note 2: Without external shield and with unit not under test connected to ground.

Note 3: With dc plate volts = 250, and dc grid volts = −8.5. Each unit tested separately. Unit not under test connected to ground.

Note 4: With dc plate-supply volts = 250, plate load resistance (megohms) = 0.5, and dc grid volts = −30. Each unit tested separately. Unit not under test connected to ground.

Note 5: With dc plate volts = 100, and dc grid volts = 0. Each unit tested separately. Unit not under test connected to ground.

Note 6: With 11.0 volts ac or dc on heater (series connection).

Note 7: With dc plate volts = 250, grid-circuit resistance (megohms) = 0.5, and dc grid volts = −8.5. Each unit tested separately. Unit not under test connected to ground.

Note 8: With 15.0 volts ac or dc on heater (series connection).

Note 9: With dc plate volts = 250, grid-circuit resistance (megohms) = 0.5, and dc grid volts = −30. Each unit tested separately. Unit not under test connected to ground.

Note 10: With 100 volts dc between heater and cathode and units connected in parallel.

Note 11: With grid 100 volts negative with respect to all other electrodes tied together.

Note 12: With plate 300 volts negative with respect to all other electrodes tied together.

• Each tube is stabilized before characteristics testing by continuous operation for at least 45 hours at room temperature and with dissipation values equivalent to life test conditions.

5814-A

MEDIUM-MU TWIN TRIODE

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration. . . . . 600 max. g

This test is performed on a sample lot of tubes from each production run in a Navy Type, High-Impact (flyweight) Shock Machine. Tubes are held rigid in four different positions and are subjected to 20 blows at the specified maximum impact acceleration. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for vibrational acceleration, heater-cathode leakage current, and transconductance.

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for impact acceleration, heater-cathode leakage current, and transconductance (1).

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . 100 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: plate of unit No.1 tied to plate of unit No.2, grid of unit No. 1 tied to grid of unit No.2, heater volts = 12.6, dc plate volts = 250, dc grid volts = -8.5, plate load resistance (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cycles per second.

Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . . 2000 min. cycles

Under the following conditions and with the heaters of unit No.1 and unit No.2 connected in parallel: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and plate and grid volts = 0.

Audio-Frequency Noise and Microphonic Performance:

RMS Output Voltage . . . . . 100 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: plate of unit No.1 tied to plate of unit No.2, grid of unit No.1 tied to grid of unit No.2, dc heater volts = 12.6, plate-supply volts = 300, cathode resistor (ohms) = 1500 common to both units, and plate load resistance (ohms) = 50,000.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5814-A
MEDIUM-MU TWIN TRIODE

Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1.0 microampere under the conditions specified in the CHARACTERISTICS RANGE VALUES for reverse grid current.

1-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. With both units operating, each unit is checked for variation in transconductance (1) under conditions of maximum rated plate dissipation. At the end of 1 hour, the value of transconductance is read. The variation in transconductance from the 0-hour reading will not exceed 10 per cent.

100-Hour Life Performance:

This test is performed on a sample lot of tubes from each production run under the conditions of maximum rated plate dissipation to insure a low percentage of early inoperatives. At the end of 100 hours a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1.0 microampere under the conditions specified in CHARACTERISTICS RANGE VALUES for reverse grid current.

500-Hour Average Life Performance:

This 500-hour test is made on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. With both units operating, each unit is life tested separately at room temperature under the following conditions: heater volts = 12.6 ac or dc (series connection), plate volts = 250, grid volts = -8.5, grid-circuit resistance (megohms) = 0.5, heater 135 volts positive with respect to cathode, and bulb temperature (^{o}C) = 165. At the end of 500 hours, tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass the established initial limits for heater current, reverse grid current, heater-cathode leakage current, and 500-hour limits for transconductance (2), transconductance change, and leakage resistance are shown under CHARACTERISTICS RANGE VALUES.

5814-A

MEDIUM-MU TWIN TRIODE

OPERATING CONDITIONS AS RESISTANCE-COUPLED AMPLIFIER (Each Unit)

Plate-Supply Voltage	90			volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage)	0.24	0.51	1	megohm
Cathode Resistor	3400	9400	22000	ohms
Peak Output Voltage	16	19	20	volts
Voltage Gain▲	12	12	12	
Plate-Supply Voltage	180			volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage)	0.24	0.51	1	megohm
Cathode Resistor	2800	8400	20000	ohms
Peak Output Voltage	32	37	42	volts
Voltage Gain▲	13	13	13	
Plate-Supply Voltage	300			volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage)	0.24	0.51	1	megohm
Cathode Resistor	2600	7000	18000	ohms
Peak Output Voltage	44	52	58	volts
Voltage Gain▲	14	13	13	

▲ At 2 volts (rms) output.

Note: Coupling capacitors should be selected to give desired frequency response. Cathode resistors should be adequately bypassed.

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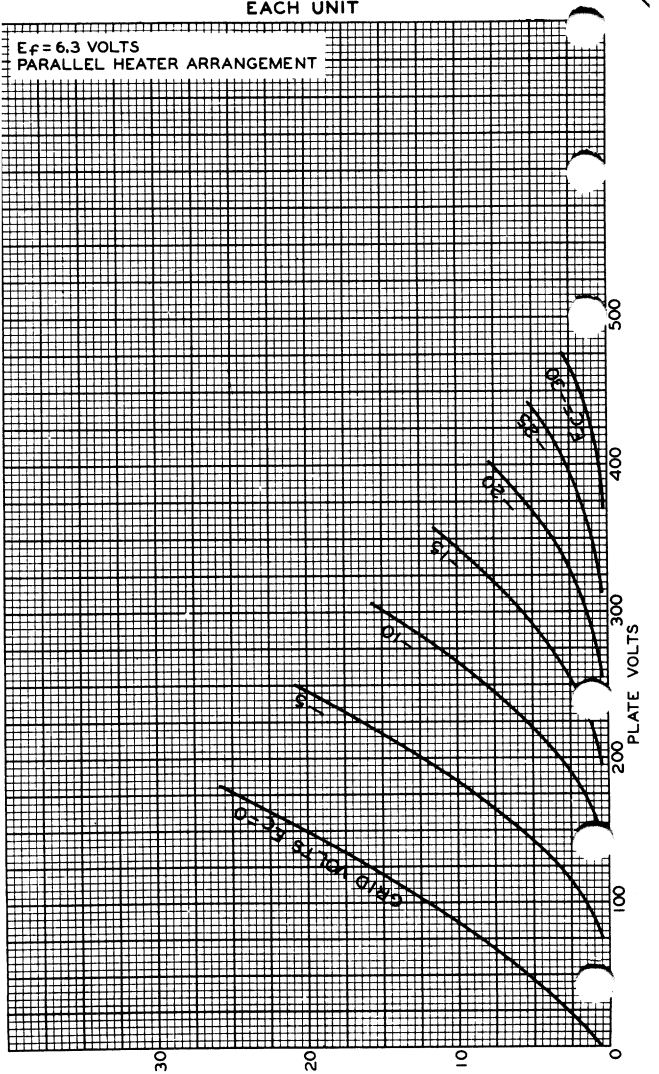
5814-A

AVERAGE PLATE CHARACTERISTICS

EACH UNIT

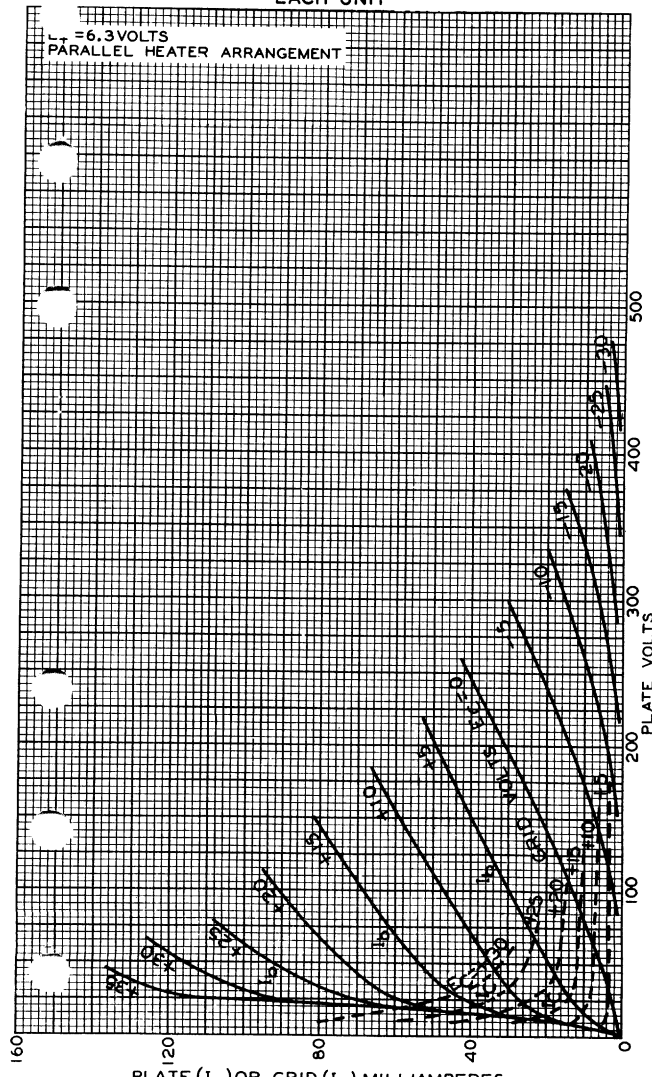


TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7939

5814-A

5814-A
AVERAGE CHARACTERISTICS
EACH UNIT



TUBE DIVISION
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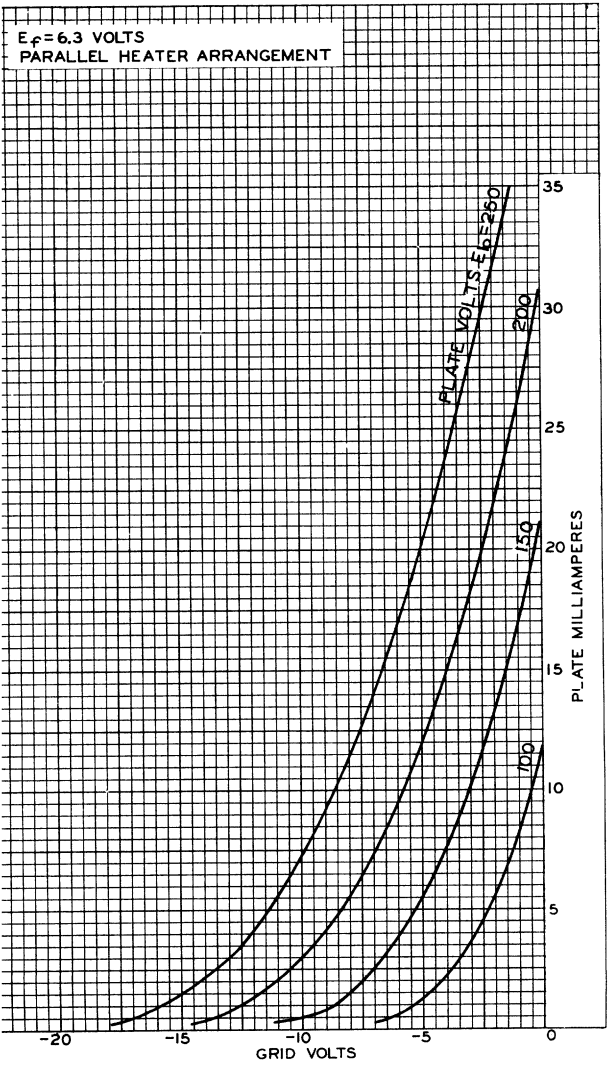
92CM-7938RI

5814-A
AVERAGE CHARACTERISTICS
EACH UNIT



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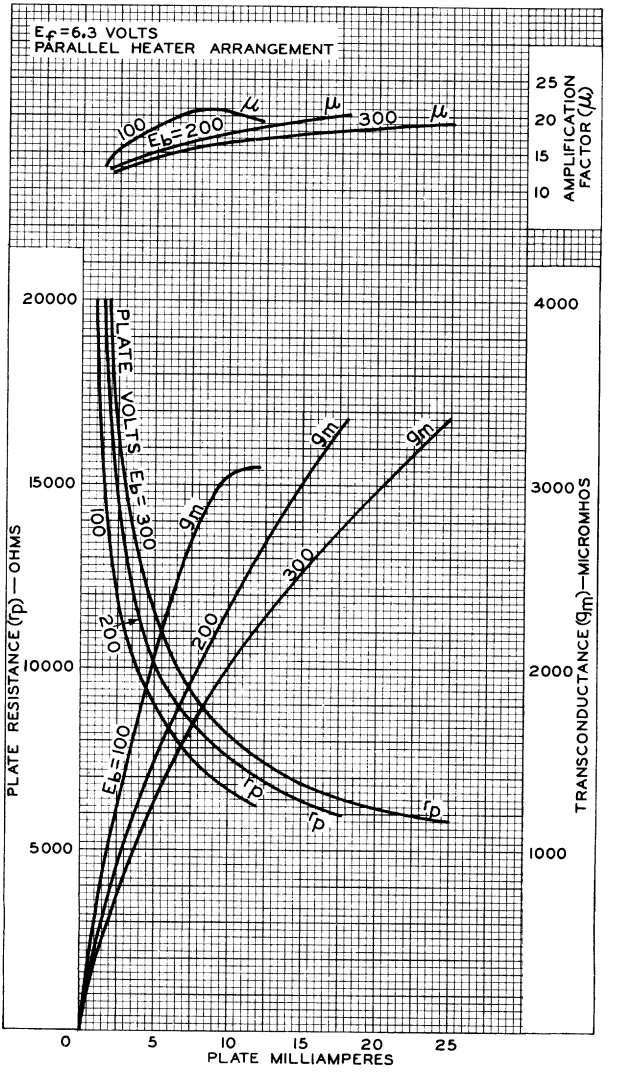
5814-A

5814-A
AVERAGE CHARACTERISTICS
EACH UNIT



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9096

5825

HALF-WAVE VACUUM RECTIFIER

GENERAL DATA

Electrical:

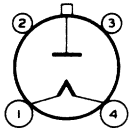
Filament, Thoriated Tungsten:		
Voltage	1.6	ac volts
Current	1.25	amp
Direct Interelectrode Capacitance:[o]		
Plate to Filament	2.2	μμf
Tube Voltage Drop at maximum peak plate current	1750	volts

[o] With no external shield.

Mechanical:

Mounting Position	Any
Overall Length	5-11/16" ± 5/32"
Seated Length	5-1/6" ± 5/32"
Maximum Diameter	2-1/16"
Bulb	ST-16
Cap	Medium
Base	Medium-Shell Small 4-Pin
Basing Designation for BOTTOM VIEW	4P

Pin 1 – Filament
Pin 2 – No Connection
Pin 3 – No Connection



Pin 4 – Filament, Internal Shield
Cap – Plate

HALF-WAVE RECTIFIER

Maximum Ratings, ***Absolute Values*****:**

For supply frequencies up to 250 kc

PEAK INVERSE PLATE VOLTAGE	60000 max.	volts
PEAK PLATE CURRENT	40 max.	ma
AVERAGE PLATE CURRENT	2 max.	ma
HOT-SWITCHING TRANSIENT CURRENT for duration of 0.1 sec. max.	100 max.	ma
PLATE DISSIPATION	3.5 max.	watts
BULB TEMPERATURE	80 max.	°C

Typical Operation at 70 kc in Half-Wave Circuit with Capacitor-Input to Filter:

AC Plate-Supply Voltage (RMS)	21200	volts
Filter-Input Capacitor	350	μμf
Effective Plate-Supply Impedance	120000	ohms
DC Output Current	2	ma
DC Output Voltage at Input to Filter (Approx.):		
At half-load current (1 ma)	28000	volts
At full-load current (2 ma)	26700	volts
Voltage Regulation (Approx.):		
Half-load to full-load current	1300	volts

5825

5825

HALF-WAVE VACUUM RECTIFIER

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Filament Current	1	1.15	1.35	amp
Plate-Filament Capacitance	-	2.14	2.26	μμf

Note: With 1.6 volts dc on filament.

OPERATING NOTES

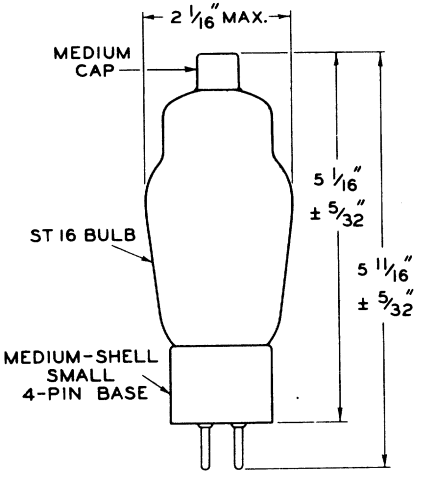
When the filament is supplied from an rf power source which is at a high dc potential above ground, adjustment of the filament voltage by direct measurement is usually impractical. However, a simple method utilizing visual comparison of filament temperatures can be used for adjustment of filament power. The color temperature of the filament operating from an rf power source may be checked visually by observing in a darkened room the reflection of the incandescent filament upon the surface of the internal shield. A visual comparison of this color temperature with that obtained when the filament of another 5825 is operated from a dc or low-frequency ac supply of 1.6 volts, provides a convenient means for adjusting the amount of rf excitation to produce 1.6 volts (rms) at the filament terminals.

The filament must never under any condition of operation be allowed to reach a temperature higher than that caused by operating the filament on dc or low-frequency ac at a voltage of 1.68 volts. Operation at higher temperatures will cause impaired performance of the tube. During circuit adjustment, however, it is permissible to allow the filament voltage to rise to 2 volts for the brief interval required to make the adjustment.

Soft x-rays are produced when the 5825 is operated at a plate voltage above approximately 20000 volts. These rays can constitute a health hazard unless the tube is adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

5825

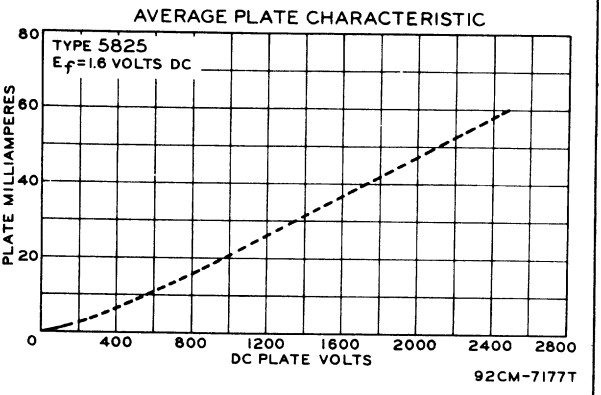
HALF-WAVE VACUUM RECTIFIER



92CS-7176

5825

5825
HALF-WAVE VACUUM RECTIFIER



5840

SHARP-CUTOFF PENTODE

SUBMINIATURE TYPE

5840 PREMIUM TYPE

Intended for applications where dependable performance under shock and vibration is paramount.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3 ± 5%	ac or dc volts
Current	0.150	amp

Direct Interelectrode Capacitances:

	With External Shield[o]	*Without External Shield*	
Grid No.1 to Plate	0.015 max.	0.03 max.	μμf
Input	4.2	4.0	μμf
Output	3.4	1.9	μμf

[o] Having inside diameter of 0.405" and connected to cathode.

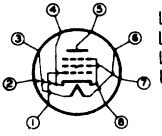
Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	100	volts
Grid-No.2 Supply Voltage	100	volts
Cathode Resistor	150	ohms
Plate Resistance	260000	ohms
Transconductance	5000	μmhos
Plate Current	7.5	ma
Grid-No.2 Current	2.4	ma
Grid-No.1 Volts (Approx.) for plate current of 10 μamp	-9	volts

Mechanical:

Operating Position	Any
Maximum Bulb Length	1-3/8"
Length from Button Seal to Bulb Top (Excluding tip)	1.075" ± 0.060"
Diameter	0.383" ± 0.017"
Bulb	T-3
Leads, Flexible	8
Length	1-1/2" to 1-3/4"
Orientation and Diameter	See Dimensional Outline in GENERAL SECTION

BOTTOM VIEW



Lead No.1 – Grid No.1
Lead No.2 – Cathode, Grid No.3
Lead No.3 – Heater
Lead No.4 – Cathode, Grid No.3
Lead No.5 – Plate
Lead No.6 – Heater
Lead No.7 – Grid No.2
Lead No.8 – Cathode, Grid No.3

AMPLIFIER – Class A_1

Maximum Ratings, *Absolute Values*:

DC PLATE VOLTAGE	165 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	155 max.	volts

5840

5840

SHARP-CUTOFF PENTODE

GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative bias value	55 max.	volts
PLATE DISSIPATION	1.1 max.	watts
GRID-No.2 INPUT	0.55 max.	watt
DC CATHODE CURRENT	16.5 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250 max.	°C

Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED AMPLIFIER CHART at end of tabulated data for this type

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For cathode-bias operation	1.2 max.	megohms
For fixed-bias operation	Not recommended	

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN*

	Note	Min.	Max.	
Heater Current	1	0.138	0.162	amp
Grid-No.1-to-Plate Capacitance	2	-	0.015	μμf
Input Capacitance	2	3.5	4.9	μμf
Output Capacitance	2	2.9	3.9	μμf
Plate Current	1,3	5.5	9.5	ma
Plate Current	1,4	-	50	μamp
Transconductance	1,3	4100	5900	μmhos
Transconductance	5,3	3750	-	μmhos
Grid-No.1 Current	1,6	-	±0.3	μamp
Grid-No.2 Current	1,3	0.5	3.5	ma
Plate Resistance	1,7	0.175	-	megohm
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,8	-	7.0	μamp
Heater positive with respect to cathode	1,8	-	7.0	μamp
Leakage Resistance:				
Between Grid No.1 and All Other Electrodes Tied Together	1,9	100	-	megohms
Between Plate and All Other Electrodes Tied Together	1,10	100	-	megohms

* See next page.

5840

SHARP-CUTOFF PENTODE

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With external shield having inside diameter of 0.405" and connected to cathode.

Note 3: With plate supply voltage of 100 volts, grid-No.2 supply voltage of 100 volts, cathode resistor of 150 ohms, and cathode bypass capacitor of 1000 microfarads.

Note 4: With dc plate voltage of 100 volts, dc grid-No.2 voltage of 100 volts, and dc grid-No.1 voltage of -9 volts.

Note 5: With 5.7 volts ac or dc on heater.

Note 6: With plate supply voltage of 100 volts, grid-No.2 supply voltage of 100 volts, cathode resistor of 150 ohms, cathode bypass capacitor of 1000 microfarads, and grid-No.1 resistor of 0.1 megohm.

Note 7: With plate supply voltage of 100 volts, grid-No.2 supply voltage of 100 volts, cathode resistor of 150 ohms bypassed by capacitor having a maximum reactance of 3 ohms.

Note 8: With 100 volts dc between heater and cathode.

Note 9: With grid No.1 100 volts negative with respect to all other electrodes tied together.

Note 10: With plate 300 volts negative with respect to all other electrodes tied together.

* Each tube is stabilized before characteristics testing by continuous operation for at least 45 hours at room temperature and with dissipation values equivalent to life test conditions.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration . . . . . 450 max. g

Tubes are held rigid in three different positions in a Navy Type, High Impact (flyweight) Shock Machine and are subjected to 450 g impact acceleration.

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours.

Uniform Acceleration Rating . . . . . 1000 max. g

Tubes are subjected in each of three positions to a gradually applied uniform acceleration up to 1000 g.

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . 60 max. mv

Under the following conditions: A 100-volt plate and grid-No.2 voltage supply having an impedance not exceeding that of a 40-μf capacitor, plate load resistance of 10000 ohms, grid-No.1 resistor of 0.1 megohm, cathode resistor of 150 ohms, cathode bypass capacitor of 1000 μf, and vibrational acceleration of 15 g at 40 cps.

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SHARP-CUTOFF PENTODE

Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . 2500 min. cycles
Under the following conditions: With heater voltage of 7.0 volts cycled 1 minute on and 4 minutes off, heater-cathode voltage of 140 volts (rms), and plate, grid-No.2, and grid-No.1 voltage = 0 volts.

Average Life Performance:

The average life performance based on a 500-hour test at 175°C ambient temperature is not less than 450 hours. This life test is made on sample lot of tubes with heater voltage of 6.3 volts; plate supply voltage of 100 volts; grid-No.2 supply voltage of 100 volts; dc heater-cathode voltage (heater positive with respect to cathode) of 200 volts; cathode resistor of 150 ohms; and grid-No.1 resistor of 1 megohm.

The 500-hour end-point limits for the 5840 with heater voltage of 6.3 volts, plate supply voltage of 100 volts, grid-No.2 supply voltage of 100 volts, cathode resistor of 150 ohms bypassed by capacitor having a maximum reactance of 3 ohms, and dc heater-cathode voltage of 100 volts with heater either positive or negative with respect to cathode are: transconductance, 3250 micromhos minimum; heater-cathode leakage current, 20 microamperes maximum; and grid-No.1 current, +0.9 microampere maximum or −0.9 microampere maximum.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5840

SHARP-CUTOFF PENTODE

OPERATING CONDITIONS AS RESISTANCE-COUPLED AMPLIFIER

Plate-Supply Voltage	100						volts
Plate Load Resistor	0.10	0.10	0.27	0.27	0.47	0.47	meg
Grid-No.2 Resistor	0.22	0.22	0.68	0.68	1.2	1.2	meg
Grid-No.1 Resistor°	0.27	0.47	0.47	1.0	0.47	1.0	meg
Cathode Resistor	820	820	2200	2200	3300	3300	ohms
Sig. Input Volt. (rms)	0.1	0.1	0.1	0.1	0.1	0.1	volt
Output Voltage (rms)	8.2	9.0	9.5	11.8	9.2	11.7	volts
Voltage Gain▲	82	90	95	118	92	117	
Distortion	2.8	3.8	2.5	3.0	3.1	2.3	%
Sig. Input Volt. (rms)*	0.23	0.22	0.15	0.16	0.12	0.14	volt
Output Voltage (rms)	17.7	18.6	13.6	17	11	16	volts
Voltage Gain▲	77	85	91	106	92	114	
Distortion	4.9	4.8	4.7	4.4	4.8	5.0	%

Plate-Supply Voltage	150						volts
Plate Load Resistor	0.10	0.10	0.27	0.27	0.47	0.47	meg
Grid-No.2 Resistor	0.27	0.27	0.82	0.82	1.5	1.5	meg
Grid-No.1 Resistor°	0.27	0.47	0.47	1.0	0.47	1.0	meg
Cathode Resistor	560	560	1500	1500	2200	2200	ohms
Sig. Input Volts. (rms)	0.1	0.1	0.1	0.1	0.1	0.1	volt
Output Voltage (rms)	11.5	12.5	13.2	15.5	13	16.7	volts
Voltage Gain▲	115	125	132	155	130	167	
Distortion	1.5	2.2	2.4	2.4	3.7	3.0	%
Sig. Input Volt. (rms)*	0.20	0.18	0.16	0.16	0.11	0.14	volt
Output Voltage (rms)	21.7	21.7	20.5	24	14	22.2	volts
Voltage Gain▲	109	120	128	150	127	159	
Distortion	4.8	5.0	4.9	4.8	4.2	4.8	%

° of following stage.

▲ Ratio of signal output to signal input.

* Maximum value to swing the grid of resistance-coupled amplifier tube to the point where its grid No.1 starts to draw current.

Note: Coupling capacitors should be selected to give desired frequency response. Cathode resistors should be adequately bypassed.

5840

RCA

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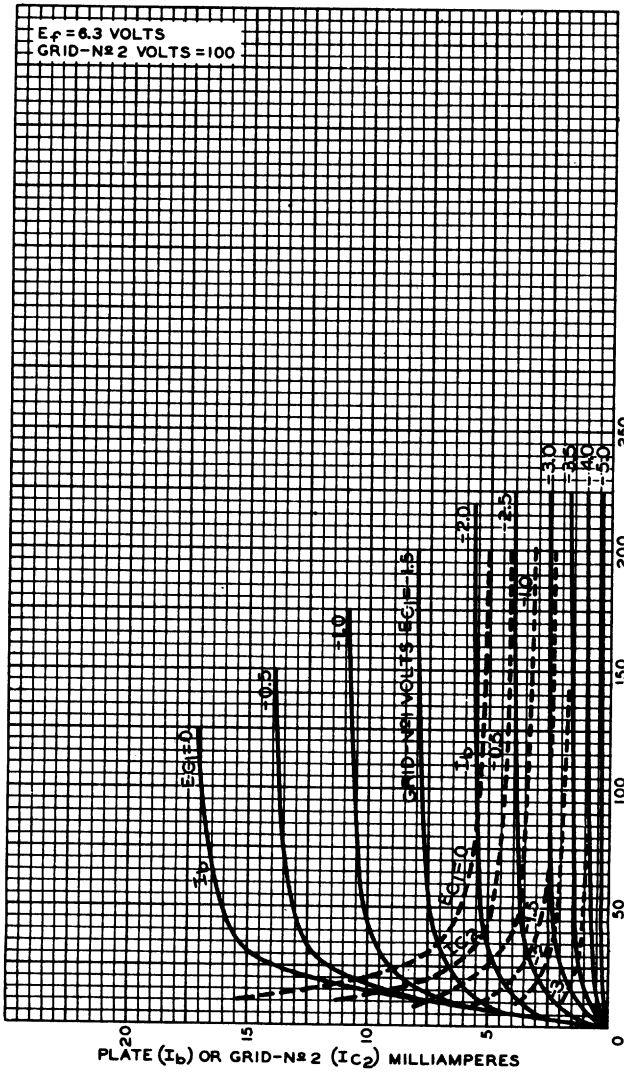
AVERAGE PLATE CHARACTERISTICS



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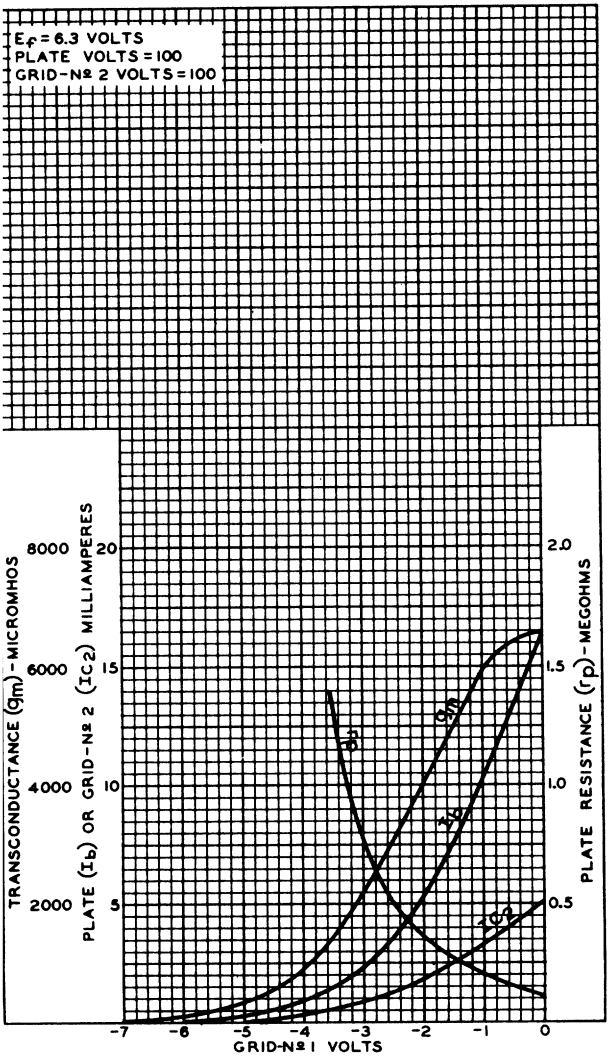
AVERAGE CHARACTERISTICS



5842/417A

Medium-Mu Triode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Absolute-Maximum Values):*			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	0.300		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	55 max.		volts
Heater positive with respect to cathode	55 max.		volts
Direct Interelectrode Capacitances (Approx.):[a]			
Plate to cathode and heater	0.55		μμf
Cathode to grid and heater	9		μμf
Plate to grid and heater	1.8		μμf

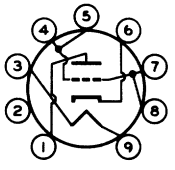
Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	130	150	volts
Grid Voltage[b]	9	-	volts
Cathode Resistor	360	60	ohms
Amplification Factor	43	43	
Plate Resistance (Approx.)	1600	1700	ohms
Transconductance	27000	25000	μmhos
Plate Current	27	25	ma

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/8" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No. E9-1)
Basing Designation for BOTTOM VIEW	9V

Pin 1 - Plate
Pin 2 - No Internal Connection
Pin 3 - Heater
Pin 4 - Grid



Pin 5 - Grid
Pin 6 - Cathode
Pin 7 - Grid
Pin 8 - Grid
Pin 9 - Heater

AMPLIFIER — Class A_1

Maximum Ratings, *Absolute-Maximum Values:*

PLATE VOLTAGE	200 max.	volts
CATHODE CURRENT	38 max.	ma

PLATE DISSIPATION	4.5 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	160 max.	°C

[a] Without external shield.
[b] Measured with respect to the negative end of the cathode resistor.

5847/404A

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Absolute-Maximum Values):*			
Voltage (AC or DC)		6.3 ± 0.6	volts
Current at heater volts = 6.3		0.300	amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode		55 max.	volts
Heater positive with respect to cathode		55 max.	volts
Direct Interelectrode Capacitances:	*Without External Shield*	*With External Shield*[a]	
Grid No.1 to plate	0.05 max.	0.04 max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	7	7.1	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	2.5	2.9	μμf
Characteristics, Class A_1 Amplifier:		[b]	
Plate Supply Voltage	150	160	volts
Grid-No.2 Supply Voltage	150	160	volts
Grid-No.1 Voltage	–	8.5	volts
Cathode Resistor	110	600	ohms
Transconductance	12500	12500	μmhos
Plate Current	13	13	ma
Grid-No.2 Current	4.5	4.5	ma

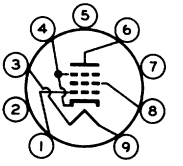
Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/8" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2

5847/404A

Base. . . . . .Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9X

Pin 1 – Grid No.1
Pin 2 – No Internal Connection
Pin 3 – Heater
Pin 4 – Cathode, Grid No.3, Internal Shield



Pin 5 – No Internal Connection
Pin 6 – Plate
Pin 7 – No Internal Connection
Pin 8 – Grid No.2
Pin 9 – Heater

AMPLIFIER — Class A_1

Maximum Ratings, *Absolute-Maximum Values:*

PLATE VOLTAGE	200 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	165 max.	volts
CATHODE CURRENT	40 max.	ma
GRID-No.2 INPUT	0.85 max.	watt
PLATE DISSIPATION	3.3 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance.	0.1 max.	megohm

[a] With external shield JEDEC No.315 connected to cathode.
[b] Operating conditions to minimize gain variations due to supply-voltage fluctuations.

5876A

High-Mu Triode

GLASS-METAL PENCIL TYPE

FAST WARM-UP TIME **STURDY COAXIAL-ELECTRODE STRUCTURE**

For Use in Cathode-Drive Service at Frequencies up to 3000 Mc. The 5876A is Unilaterally Interchangeable with Type 5876.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.135	amp
Amplification Factor	56	
Transconductance, for dc plate ma. = 18, dc plate volts = 250	6500	μmhos
Direct Interelectrode Capacitances:[a]		
Grid to plate	1.4	μμf
Grid to cathode	2.4	μμf
Plate to cathode	0.035 max.	μμf

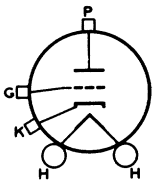
Mechanical:

Operating Position . . . . . Any

Dimensions and Terminal Connections . . . . . See *Dimensional Outline*

Socket for Heater Pins. . Grayhill No.22-3[b], Cinch 54A16325[c], or equivalent

Terminal Connections (See *Dimensional Outline*):



H - Heater
K - Cathode

G - Grid
P - Plate

Thermal:

Plate-Seal Temperature (Measured on plate seal) . . . . . 175 max. °C

RF AMPLIFIER — Class A_1

Maximum CCS[d] Ratings, *Absolute-Maximum Values:*

For altitudes up to 100,000 feet and frequencies up to 1700 Mc

DC PLATE VOLTAGE	300 max.	volts
DC GRID VOLTAGE	-100 max.	volts
DC PLATE CURRENT	25 max.	ma
PLATE DISSIPATION[e]	6.25 max.	watts

PEAK HEATER–CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	0.5 max.	megohm

RF POWER AMPLIFIER AND OSCILLATOR — Class C Telegraphy

Key-down conditions per tube without amplitude modulation[f]

Maximum CCS[d] **Ratings,** *Absolute-Maximum Values:*

For altitudes up to 100,000 feet and frequencies up to 1700 Mc

DC PLATE VOLTAGE	360 max.	volts
DC GRID VOLTAGE	−100 max.	volts
DC PLATE CURRENT	25 max.	ma
DC GRID CURRENT	8 max.	ma
PLATE INPUT	9 max.	watts
PLATE DISSIPATION[e]	6.25 max.	watts
PEAK HEATER–CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Typical Operation in Cathode-Drive Circuit:

As oscillator

At frequency of	*500*	*1700*	*3000*	*Mc*
DC Plate-to-Grid Voltage	262	252	252	volts
DC Cathode-to-Grid Voltage[g]	12	2	2	volts
DC Plate Current	23	23	25	ma
DC Grid Current (Approx.)	6	3	4	ma
Useful Power Output (Approx.)	3	0.75	0.1	watts

As rf power amplifier at 500 Mc

DC Plate-to-Grid Voltage	326	volts
DC Cathode-to-Grid Voltage[g]	51	volts
DC Plate Current	23	ma
DC Grid Current (Approx.)	7	ma
Driver Power Output (Approx.)	2	watts
Useful Power Output (Approx.)	5	watts

Maximum Circuit Values:

Grid-Circuit Resistance	0.1 max.	megohm

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS[d] Ratings, *Absolute-Maximum Values:*

For altitudes up to 100,000 feet and frequencies up to 1700 Mc

DC PLATE VOLTAGE	275 max.	volts
DC GRID VOLTAGE	-100 max.	volts
DC PLATE CURRENT	22 max.	ma
DC GRID CURRENT	8 max.	ma
PLATE INPUT	6 max.	watts
PLATE DISSIPATION[e]	4.25 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	0.1 max.	megohm

FREQUENCY MULTIPLIER

Maximum CCS[d] Ratings, *Absolute-Maximum Values:*

For altitudes up to 100,000 feet and frequencies up to 1700 Mc

DC PLATE VOLTAGE	330 max.	volts
DC GRID VOLTAGE	-100 max.	volts
DC PLATE CURRENT	22 max.	ma
DC GRID CURRENT	8 max.	ma
PLATE INPUT	7.5 max.	watts
PLATE DISSIPATION	6.25 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Typical CCS Operation in Cathode-Drive Circuit:

	Tripler to 480 Mc	*Doubler to 960 Mc*	
DC Plate-to-Grid Voltage	390	370	volts
DC Cathode-to-Grid Voltage[g]	90	70	volts
DC Plate Current	18	17.3	ma
DC Grid Current (Approx.)	6	7	ma
Driver Power Output (Approx.)	2.1	2	watts
Useful Power Output (Approx.)	2.1	2	watts

Maximum Circuit Values:

Grid-Circuit Resistance	0.1 max.	0.1 max.	megohm

[a] Without external shield.

[b] Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.

[c] Cinch Manufacturing Company, 1026 South Homan Avenue, Chicago, Illinois.

[d] Continuous Commercial Service.

[e] In applications where the plate dissipation exceeds 2.5 watts, it is important that a large area of contact be provided between the plate cylinder and the connector to provide adequate heat conduction.

[f] Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

[g] Obtained from grid resistor.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.127	0.143	amp
Direct Interelectrode Capacitances:				
Grid to plate	-	1.2	1.6	μμf
Grid to cathode	-	2.1	2.7	μμf
Plate to cathode	-	-	0.035	μμf
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,2	-	50	μa
Heater positive with respect to cathode	1,2	-	50	μa
Leakage Resistance:				
From grid to plate and cathode connected together	1,3	25	-	megohms
From plate to grid and cathode connected together	1,4	25	-	megohms
Reverse Grid Current	1,5	-	1	μa
Emission Voltage	6	-	10	volts
Amplification Factor	1,7	41	71	
Transconductance	1,7	5150	7850	μmhos
Plate Current (1)	1,7	12.5	23.5	ma
Plate Current (2)	1,8	-	55	μa
Plate Current (3)	1,9	0.5	-	ma
Power Output	1,10	0.285	-	watt

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With 100 volts dc between heater and cathode.

Note 3: With grid 100 volts negative with respect to plate and cathode which are connected together.

Note 4: With plate 300 volts negative with respect to grid and cathode which are connected together.

Note 5: With dc plate voltage of 250 volts, dc grid voltage of -2.5 volts, grid resistor of 0.5 megohm.

Note 6: With dc voltage on grid and plate which are connected together adjusted to produce a cathode current of 30 ma., and with 5.5 volts on heater.

Note 7: With dc plate-supply voltage of 250 volts, cathode resistor of 75 ohms, and cathode bypass capacitor of 1000 μf.

Note 8: With dc plate voltage of 250 volts and dc grid voltage of -12 volts.

Note 9: With dc plate voltage of 250 volts and dc grid voltage of -5 volts.

Note 10: With dc plate voltage of 200 volts, grid resistor adjusted to give a dc plate current of 18 milliamperes in a cavity-type oscillator operating at 1700 ± 15 Mc.

SPECIAL TESTS & PERFORMANCE DATA

Low-Pressure Voltage Breakdown Test:

This test (similar to MIL-E-ID, paragraph 4.9.12.1) is performed on a sample lot of tubes from each production run. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 100,000 feet. Breakdown will not occur when a 60-cycle rms voltage of 500 volts is applied between the plate cylinder and grid flange.

Low-Frequency Vibration Performance:

This test (similar to MIL-E-ID, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions:

Heater voltage of 6.3 volts, dc plate supply voltage of 250 volts, grid voltage of -2.5 volts, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 25 cps at an acceleration of 2.5 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

High-Frequency Vibration Performance:

This test (similar to MIL-E-ID, paragraph 4.9.19.2) is performed on a sample lot of tubes from each production run. The tube is vibrated perpendicular to its axis, with no voltages applied to the tube. Vibration frequency is 40 to 60 cps and acceleration is 10 g. At the end of this test, tubes will not show temporary or permanent shorts or open circuits and will meet the following limits:

Heater-Cathode Leakage Current. . . . . For conditions shown under *Characteristics Range Values Notes 1,2.*	50 max.	μa
Low-Frequency Vibration (rms) . . . . . For conditions shown above under *Low-Frequency Vibration Performance.*	100 max.	mv
Transconductance. . . . . For conditions shown under *Characteristics Range Values Notes 1,7.*	5150-min.	μmhos
Plate Current (2) . . . . . For conditions shown under *Characteristics Range Values Notes 1,8.*	55 max.	μa

Shorts and Continuity Test:

This test (similar to MIL-E-ID, paragraph 4.7.3) is performed on all tubes from each production run. Voltage applied between adjacent elements of the tube under test will be between 20 and 70 volts dc or peak ac. Plate and cathode terminals are tied together and connected to the grid terminal through the shorts test equipment. Tubes are tapped with a rubber tapper three times in each of three mutually perpendicular directions. If a short indication is obtained, the

tapping cycle is repeated two times for verification. Acceptance criteria is based on the "Resistance vs. Time Duration" curve shown in paragraph 4.7.7 of MIL-I-D, Amendment 5.

Glass-Seal-Fracture Test:

This test is performed on a sample lot of tubes from each production run. Tubes are placed on supports spaced 15/16" ± 1/64" apart with the grid flange centered between these supports. Tubes will withstand gradual application, perpendicular to tube axis, of a force of 30 pounds upon the grid flange without causing fracture of the glass insulation.

Heater Cycling Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.7) is performed on a sample lot of tubes from each production run. With 6.3 volts on heater and no voltage on plate and grid, the heater is cycled three minutes on and three minutes off for at least 2000 cycles. At the end of this test, tubes will not show temporary or permanent shorts or open circuits, and will meet the following limits:

Grid-Plate and Cathode Leakage Resistance. . . . . 25 min. megohms
For conditions shown under *Characteristics Range Values Notes 1,3.*

Heater-Cathode Leakage Current. . . . . 100 max. μa
For conditions shown under *Characteristics Range Values Notes 1,2.*

1-Hour Stability Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.1.a) is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are operated under the following conditions:

Heater voltage of 6.3 volts, plate dissipation of 2 to 2.5 watts. At the end of 1 hour, the change in transconductance value for each tube, referred to its initial transconductance reading, will not exceed 15% of the initial value, for conditions shown under *Characteristics Range Values Notes 1,7.*

50-Hour Survival Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.1.b) is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified for *1-Hour Stability Life Performance* except that all voltages are cycled at the rate of 110 minutes on and 10 minutes off. At the end of 50 hours, the tubes are required to meet the following limits:

Power Output . . . . . 0.2 min. watt
For conditions shown under *Characteristics Range Values Notes 1,10.*

Plate Current (2) . . . . . 100 max. μa
For conditions shown under *Characteristics Range Values Notes 1,8.*

Shorts and Continuity Test specified above.

Intermittent Dynamic Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure high quality of rf performance. Each tube is life-tested in a cavity-type oscillator at 500 ± 15 Mc under the following conditions:

Heater voltage of 6.3 volts, plate supply voltage of 300 volts, cathode resistor is adjusted to give a dc plate current of 25 ma. and value is recorded, plate-circuit load resistance of zero ohms, heater positive with respect to cathode by 100 volts, and plate-seal temperature of 175° C minimum. Heater voltage is cycled at a rate of 110 minutes on and 10 minutes off. At the end of 500 hours, the tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limits:

Power Output. . . . . 0.2 min. watt
For conditions shown under *Characteristics Range Values Notes 1,10.*

Plate Current (2) . . . . . 150 max. μa
For conditions shown under *Characteristics Range Values Notes 1,8.*

Shorts and Continuity Test specified above.

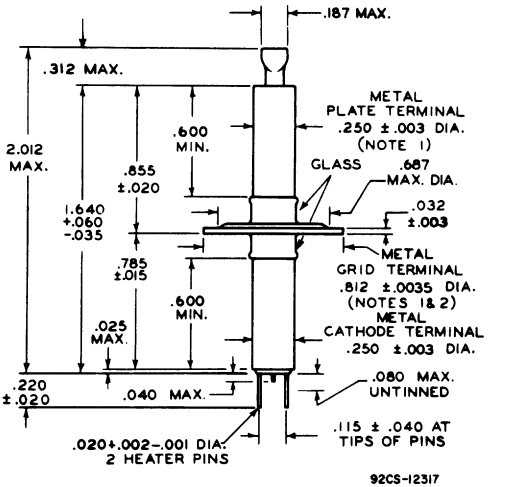
OPERATING CONSIDERATIONS

The *mounting* for this type in coaxial-line, parallel-line, or lumped circuits may support the tube securely by any one of the three terminals. Connections to the other two terminals must be made by contacts with flexible leads.

The *mounting* for this type in cavity-type circuits should preferably support the tube by the grid flange which should make firm contact to the cavity surface.

The *heater* pins of this type should not be soldered to circuit elements. The heat of the soldering operation may crack the glass seals of the heater pins and damage the tube.

The *cathode* should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum values shown in the tabulated data.



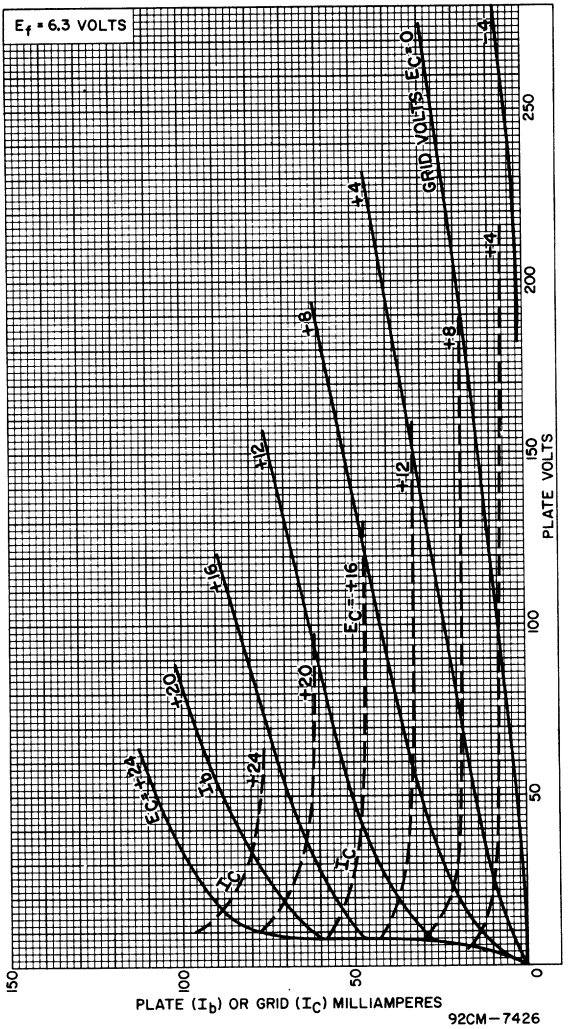
DIMENSIONS IN INCHES

NOTE 1: MAXIMUM ECCENTRICITY OF CENTER LINE (AXIS) OF PLATE TERMINAL OR GRID-TERMINAL FLANGE WITH RESPECT TO THE CENTER LINE (AXIS) OF THE CATHODE TERMINAL IS 0.008".

NOTE 2: TILT OF GRID-TERMINAL FLANGE WITH RESPECT TO ROTATIONAL AXIS OF CATHODE TERMINAL IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE GRID-TERMINAL FLANGE PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM ITS EDGE FOR ONE COMPLETE ROTATION. THE TOTAL DISTANCE WILL NOT EXCEED 0.020".

→Indicates a change.

AVERAGE CHARACTERISTICS



Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

For Audio-Amplifier Applications Critical as to Microphonism, Leakage Noise, and Hum

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.15	amp
Direct Interelectrode Capacitances:[a]		
Pentode Connection:		
Grid No.1 to plate	0.11 max.	μμf
Grid No.1 to cathode, grid No.3, grid No.2, heater, and pins 2 and 6	2.7	μμf
Plate to cathode, grid No.3, grid No.2, heater, and pins 2 and 6	2.4	μμf
Triode Connection:[b]		
Grid No.1 to plate	1.4	μμf
Grid No.1 to cathode	1.4	μμf
Plate to cathode	0.85	μμf

Characteristics, Class A_1 Amplifier:

	Triode Connection[b]		*Pentode Connection*	
Plate Voltage	100	250	250	volts
Grid No.3	-	-	*Connected to cathode at socket*	
Grid-No.2 Voltage	-	-	100	volts
Grid-No.1 Voltage	-3	-8	-3	volts
Amplification Factor	21	21	-	
Plate Resistance (Approx.)	0.017	0.0137	2	megohms
Transconductance	1240	1530	1000	μmhos
Plate Current	2.2	5.5	1.8	ma
Grid-No.2 Current	-	-	0.4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-	-	-8	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

← Indicates a change.

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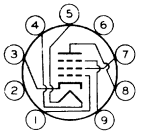
Basing Designation for BOTTOM VIEW. 9AD

Pin 1 – Grid No.1
Pin 2 – No Connection
Pin 3 – Cathode
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – No Connection
Pin 7 – Grid No.2
Pin 8 – Plate
Pin 9 – Grid No.3

AMPLIFIER — Class A_1

→**Maximum Ratings,** *Design-Maximum Values:*

	Triode Connection[b]	*Pentode Connection*	
PLATE VOLTAGE.	275 max.	330 max.	volts
GRID No.3 (SUPPRESSOR GRID).	–	*Connect to cathode at socket*	
GRID-No.2 (SCREEN) VOLTAGE:			
SUPPLY VOLTAGE.	–	330 max.	volts
GRID-No.2 VOLTAGE.	–	*See Grid No.2 Input Rating Chart* at front of receiving tube section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Negative-bias value. . . .	55 max.	55 max.	volts
Positive-bias value. . . .	0 max.	0 max.	volts
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 165 volts.	–	0.75 max.	watt
For grid-No.2 voltage between 165 and 330 volts.	–	*See Grid No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION.	1.7 max.	1.25 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode . . .	100 max.	100 max.	volts
Heater positive with respect to cathode . . .	100 max.	100 max.	volts

Typical Operation as Resistance-Coupled Amplifier:

See *RESISTANCE-COUPLED-AMPLIFIER CHARTS No.26 & No.27* at front of this Section

Maximum Circuit Values:

	Triode Connection[b]	*Pentode Connection*	
Grid-No.1-Circuit Resistance	2.2 max.	2.2 max.	megohms

[a] Without external shield.
[b] Grid No.3 and grid No.2 connected to plate.

→Indicates a change.

OPERATING CONSIDERATIONS ←

It is recommended that pins 2 and 6 be grounded in all applications. Grounding of these pins will effectively shield grid No.1 and plate from heater and help to reduce hum level when an ac heater supply is used.

←Indicates a change.

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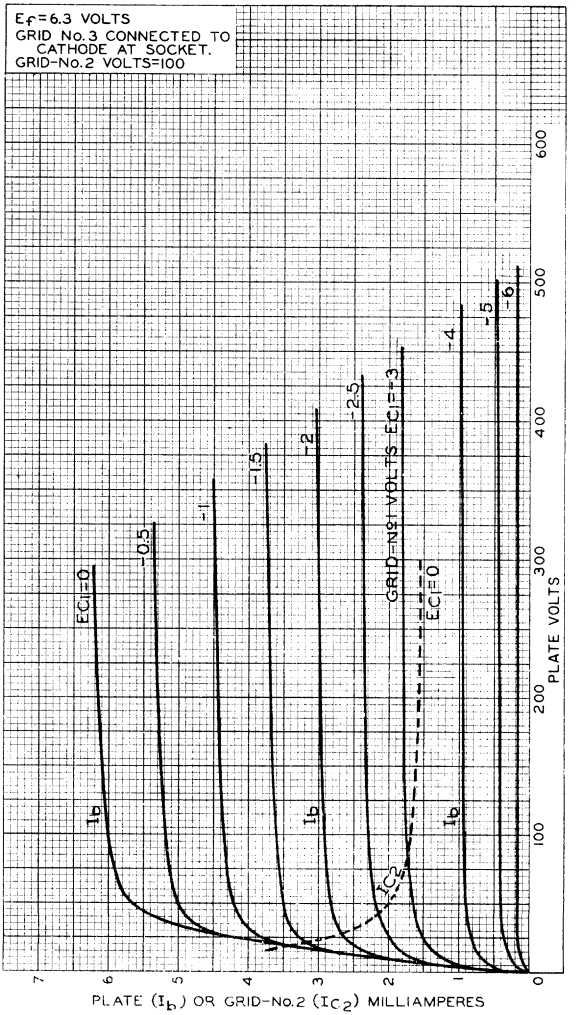
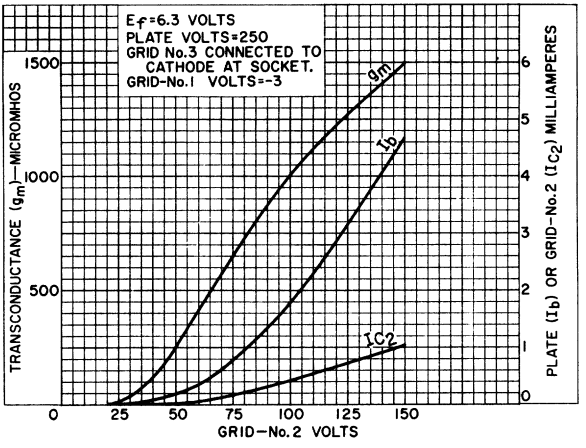
AVERAGE CHARACTERISTICS
Pentode Connection

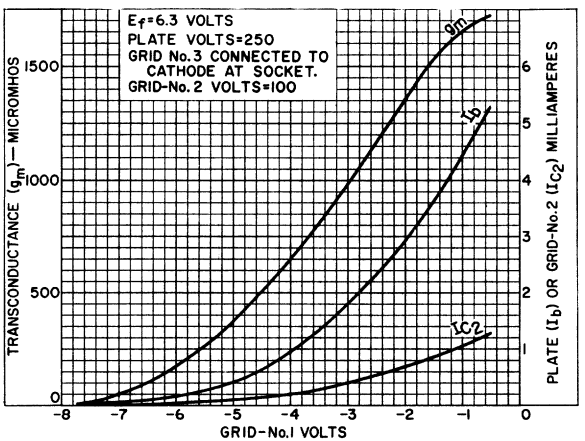


92CM-7439RI

AVERAGE CHARACTERISTICS
Pentode Connection



92CS-11053



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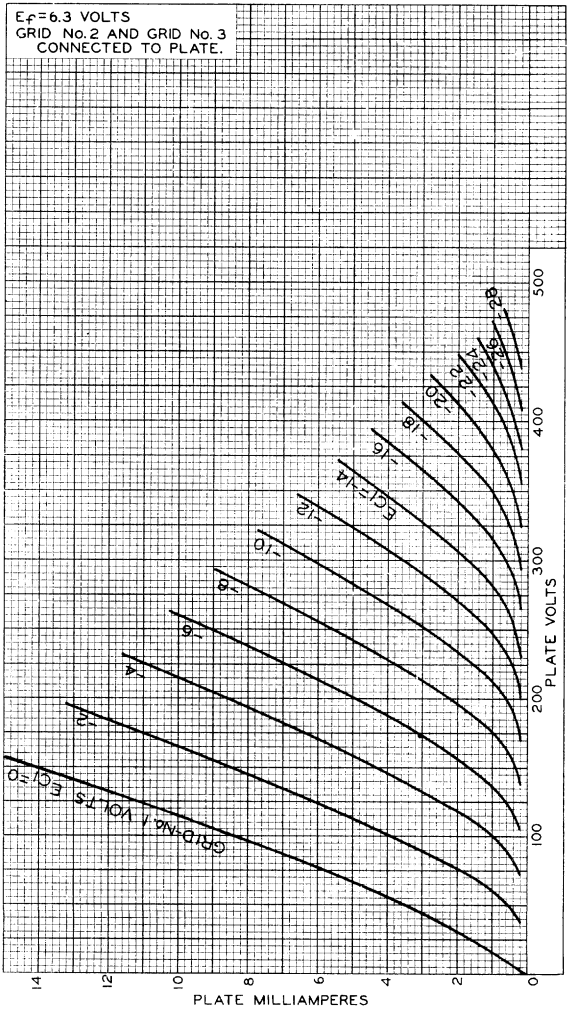
AVERAGE PLATE CHARACTERISTICS
Triode Connection



92CM-7446

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Medium-Mu Triode

GLASS-METAL PENCIL TYPE

FAST WARM-UP TIME **STURDY COAXIAL-ELECTRODE STRUCTURE**

For Use in Cathode-Drive Service at Frequencies up to 4000 Mc

GENERAL DATA

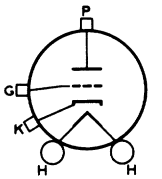
Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC):			
Under transmitting conditions	6.0	+5% −10%	volts
Under standby conditions	6.3	max.	volts
Current at 6.0 volts	0.280		amp
Amplification Factor	27		
Transconductance, for dc plate ma. = 25, dc plate volts = 200	6000		μmhos
Direct Interelectrode Capacitances:[a]			
Grid to plate	1.7		μμf
Grid to cathode	2.4		μμf
Plate to cathode	0.07	max.	μμf

Mechanical:

Operating Position	Any
Dimensions and Terminal Connections	See *Dimensional Outline*
Socket for Heater Pins	Grayhill No.22-3[b], Cinch 54A16325[c], or equivalent

Terminal Connections (See *Dimensional Outline*):



H – Heater
K – Cathode

G – Grid
P – Plate

Thermal:

Plate-Seal Temperature (Measured on plate seal)	175 max.	°C

RF AMPLIFIER — Class A_1

Maximum CCS[d] Ratings, *Absolute-Maximum Values:*

For altitudes up to 100,000 feet and frequencies up to 2000 Mc

DC PLATE VOLTAGE	330 max.	volts
DC GRID VOLTAGE	−100 max.	volts

← Indicates a change.

DC PLATE CURRENT	35 max.	ma
PLATE DISSIPATION[e]	7 max.	watts
PEAK HEATER–CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	0.5 max.	megohm

PLATE-PULSED OSCILLATOR[f] — Class C

Maximum CCS[d] Ratings, *Absolute-Maximum Values:*

For altitudes up to 100,000 feet, frequencies up to 4000 Mc, and for a maximum "ON" time[g] of 5 microseconds in any 5000-microsecond interval

PEAK POSITIVE-PULSE PLATE-SUPPLY VOLTAGE[h]	1750 max.	volts
PEAK NEGATIVE-PULSE GRID-BIAS VOLTAGE	150 max.	volts
PEAK PLATE CURRENT FROM PULSE SUPPLY	3 max.	amp
PEAK RECTIFIED GRID CURRENT	1.3 max.	amp
DC PLATE CURRENT	0.003 max.	amp
DC GRID CURRENT	0.0013 max.	amp
PLATE DISSIPATION[e]	6 max.	watts
PULSE DURATION	1.5 max.	μsec

Typical Operation:

In cathode-drive circuit with rectangular wave shape at 3300 Mc, with duty factor[j] of 0.001, and pulse duration of 1 microsecond

Peak Positive-Pulse Plate-Supply Voltage[h]	1750	volts
Peak Negative-Pulse Grid-Bias Voltage	110	volts
From grid resistor of	100	ohms
Peak Plate Current from Pulse Supply	3	amp
Peak Rectified Grid Current	1.1	amp
DC Plate Current	0.003	amp
DC Grid Current	0.0011	amp
Useful Power Output at Peak of Pulse[k] (Approx.)	1200	watts

RF POWER AMPLIFIER AND OSCILLATOR — Class C Telegraphy

Key down conditions per tube without amplitude modulation[m]

Maximum Ratings, *Absolute-Maximum Values:*

For altitudes up to 100,000 feet and frequencies up to 2000 Mc

	CCS[d]	*ICAS*[n]	
DC PLATE VOLTAGE	320 max.	400 max.	volts
DC GRID VOLTAGE	-100 max.	-100 max.	volts

DC PLATE CURRENT	35 max.	40 max.	ma
DC GRID CURRENT	15 max.	15 max.	ma
PLATE INPUT	11 max.	16 max.	watts
PLATE DISSIPATION[e]	7 max.	8 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	90 max.	90 max.	volts
Heater positive with respect to cathode	90 max.	90 max.	volts

Typical Operation: ←

As rf power amplifier in cathode-drive circuit

	At 500 Mc		*At 1000 Mc*		
DC Plate-to-Grid Voltage	347	401	330	383	volts
DC Cathode-to-Grid Voltage[p]	47	51	30	33	volts
DC Plate Current	33	35	33	35	ma
DC Grid Current (Approx.)	13	13	12	13	ma
Driver Power Output (Approx.)	2	2.5	1.9	2.4	watts
Useful Power Output (Approx.)	7.5	8.5	5.5	6.5	watts

As oscillator in cathode-drive circuit ←

	At 500 Mc		
DC Plate-to-Grid Voltage	347	401	volts
DC Cathode-to-Grid Voltage[p]	47	51	volts
DC Plate Current	33	35	ma
DC Grid Current (Approx.)	13	13	ma
Useful Power Output (Approx.)	5	6	watts

Maximum Circuit Values:

Grid-Circuit Resistance	0.1 max.	0.1 max.	megohm

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum Ratings, *Absolute-Maximum Values:*

For altitudes up to 100,000 feet and frequencies up to 2000 Mc

	CCS[d]	*ICAS*[n]	
DC PLATE VOLTAGE	260 max.	320 max.	volts
DC GRID VOLTAGE	-100 max.	-100 max.	volts
DC PLATE CURRENT	33 max.	33 max.	ma
DC GRID CURRENT	15 max.	15 max.	ma
PLATE INPUT	8.5 max.	10.5 max.	watts
PLATE DISSIPATION[e]	5 max.	5.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	90 max.	90 max.	volts
Heater positive with respect to cathode	90 max.	90 max.	volts

← Indicates a change.

→Typical Operation:

In cathode-drive circuit at 500 Mc

DC Plate-to-Grid Voltage	286	345	volts
DC Cathode-to-Grid Voltage[p]	36	45	volts
DC Plate Current	30	30	ma
DC Grid Current (Approx.)	11	12	ma
Driver Power Output (Approx.)	1.8	2	watts
Useful Power Output (Approx.)	5.5	6.5	watts

Maximum Circuit Values:

Grid-Circuit Resistance	0.1 max.	0.1 max.	megohm

FREQUENCY DOUBLER

Maximum Ratings, *Absolute-Maximum Values:*

For altitudes up to 100,000 feet and frequencies up to 2000 Mc

	CCS[d]	*ICAS*[n]	
DC PLATE VOLTAGE	260 max.	320 max.	volts
DC GRID VOLTAGE	-100 max.	-100 max.	volts
DC PLATE CURRENT	33 max.	33 max.	ma
DC GRID CURRENT	12 max.	12 max.	ma
PLATE INPUT	8.5 max.	10.5 max.	watts
PLATE DISSIPATION[e]	6 max.	7.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	90 max.	90 max.	volts
Heater positive with respect to cathode	90 max.	90 max.	volts

→Typical Operation:

In cathode-drive circuit up to 1000 Mc

DC Plate-to-Grid Voltage	290	350	volts
DC Cathode-to-Grid Voltage[p]	40	50	volts
DC Plate Current	33	33	ma
DC Grid Current (Approx.)	7	8	ma
Driver Power Output (Approx.)	3.2	3.5	watts
Useful Power Output (Approx.)	2.75	3	watts

Maximum Circuit Values:

Grid-Circuit Resistance	0.1 max.	0.1 max.	megohm

[a] Without external shield.

[b] Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.

[c] Cinch Manufacturing Company, 1026 South Homan Avenue, Chicago, Illinois.

[d] Continuous Commercial Service.

[e] In applications where the plate dissipation exceeds 2.5 watts, it is important that a large area of contact be provided between the plate cylinder and the connector in order to provide adequate heat conduction.

[f] In this class of service, the heater should be allowed to warm up for a minimum of 60 seconds before plate voltage is applied.

→Indicates a change.

"ON" time is defined as the sum of the duration of all individual pulses which occur during the indicated interval. *Pulse duration* is defined as the time interval between the two points on the pulse at which the instantaneous value is 70% of the peak power value. The *peak value* is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

The magnitude of any spike on the plate voltage pulse should not exceed a value of 2000 volts with respect to cathode and its duration should not exceed 0.01 microsecond measured at the peak-pulse-value level.

Duty factor is the product of pulse duration and repetition rate. For variable pulse durations and pulse repetition rates, the duty factor is defined as the ratio of time "ON" to total elapsed time in any 5000-microsecond interval.

The power output at peak of pulse is obtained from the average power output using the duty factor of the peak pulse. This procedure is necessary since the power output pulse duty factor may be less than the applied voltage pulse duty factor because of a delay in the start of rf power output.

Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

Intermittent Commercial and Amateur Service. No operating or "ON" period exceeds 5 minutes and every "ON" period is followed by an "OFF" or stand by period of at least the same or greater duration.

Obtained from grid resistor.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN ←

	Note	Min.	Max.	
Heater Current	1	0.260	0.300	amp
Direct Interelectrode Capacitances:				
Grid to plate	-	1.30	1.80	μμf
Grid to cathode	-	2.05	2.95	μμf
Plate to cathode	-	-	0.07	μμf
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,2	-	200	μa
Heater positive with respect to cathode	1,2	-	500	μa
Leakage Resistance:				
From grid to plate and cathode tied together	1,3	25	-	megohms
From plate to grid and cathode tied together	1,4	25	-	megohms
Reverse Grid Current	1,5	-	1	μa
Emission Voltage	6	-	14	volts
Peak Emission Current	1,7	2.75	-	amp
Amplification Factor	1,8	18	36	
Transconductance	1,8	4800	7200	μmhos
Plate Current (1)	1,8	16	34	ma
Plate Current (2)	1,9	-	55	μa
Power Output	1,10	4.5	-	watts
Power Output at Peak of Pulse	1,11	750	-	watts
Change in Output Frequency	12	-	3	Mc

Note 1: With 6.0 volts ac or dc on heater.

Note 2: With 100 volts dc between heater and cathode.

Note 3: With grid 100 volts negative with respect to plate and cathode which are tied together.

Note 4: With plate 300 volts negative with respect to grid and cathode which are tied together.

← Indicates a change.

Note 5: With dc plate voltage of 200 volts, dc grid voltage of -2.5 volts, grid resistor of 0.1 megohm.

Note 6: With dc voltage on grid and plate which are tied together adjusted to produce a cathode current of 30 ma, and with 5.4 volts on heater.

Note 7: With 150 volts on grid and plate which are connected together, duty factor of 0.001, and pulse duration of 1 microsecond.

Note 8: With dc plate voltage of 200 volts, cathode resistor of 100 ± 10% ohms, and cathode bypass capacitor of 1000 μf.

Note 9: With dc plate voltage of 200 volts, dc grid voltage of -20 volts.

Note 10: With dc plate voltage of 350 volts, cathode resistor adjusted to give a dc plate current of 33 milliamperes in a cavity-type oscillator operating at 500 ± 15 Mc.

Note 11: With peak positive-pulse plate supply voltage of 1750 volts, grid resistor varied to give dc plate current of 3 ma, dc grid current of approximately 1.3 ma, duty factor of 0.001, pulse duration of 1 microsecond, and frequency of 3300 ± 100 Mc.

Note 12: At end of Peak Power Output test, reduce heater voltage to 5.4 volts and note change in output frequency, then increase heater voltage to 6.3 volts and note change in output frequency.

SPECIAL TESTS & PERFORMANCE DATA

Low-Pressure Voltage Breakdown Test:

This test (similar to MIL-E-ID, paragraph 4.9.12.1) is performed on a sample lot of tubes from each production run. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 100,000 feet. Breakdown will not occur when a 60-cycle rms voltage of 400 volts is applied between the plate cylinder and grid flange.

Low-Frequency Vibration Performance:

This test (similar to MIL-E-ID, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions:

Heater voltage of 6.0 volts, dc plate supply voltage of 200 volts, grid voltage of -2.5 volts, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 25 cycles per second at an acceleration of 2.5 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

High-Frequency Vibration Performance:

This test (similar to MIL-E-ID, paragraph 4.9.19.2) is performed on a sample lot of tubes from each production run. The tube is vibrated perpendicular to its axis, with no voltages applied to the tube. Vibration frequency is 40 to 60 cps and acceleration is 10 g. At the end of this test, tubes will not show permanent shorts or open circuits.

Shorts and Continuity Test:

This test (similar to MIL-E-ID, paragraph 4.7.3) is performed on all tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, an air leak, or reverse grid current in excess of 1 microampere for the conditions shown under *Characteristics Range Values, Notes 1,5.*

Glass Seal Fracture Tests:

Fracture tests are performed on sample lots of tubes from each production run.

1. Tubes are placed on supports spaced 15/16" ± 1/64" apart with the grid flange centered between these supports. Tubes will withstand gradual application, perpendicular to the tube axis, of a force of 50 pounds upon the grid flange without causing fracture of the glass insulation.

2. Tubes are held by clamping to the cathode terminal. Tubes will withstand gradual application of a torque of 15 inch-pounds upon the plate terminal without causing fracture of the glass insulation.

100-Hour Dynamic Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure high quality of rf performance. Each tube is life-tested in a cavity-type oscillator at 3300 ± 100 Mc under the following conditions.

Heater voltage of 6.0 volts, peak positive-pulse plate supply voltage of 1750 volts, grid resistor is adjusted to give a dc plate current of 3 ma., dc grid current of approximately 1.3 ma., duty factor of 0.001, and pulse duration of 1 microsecond.

At the end of 100 hours, the tubes will have a minimum peak pulse power output of 600 watts.

500-Hour Dynamic Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure high quality of rf performance. Each tube is life-tested in a cavity-type oscillator at 500 ± 15 Mc under the following conditions:

Heater voltage of 6.0 volts, plate supply voltage of 350 volts, cathode resistor is adjusted to give a dc plate current of 33 ma.

At the end of 500 hours, the tubes will have a minimum power output of 3.5 watts.

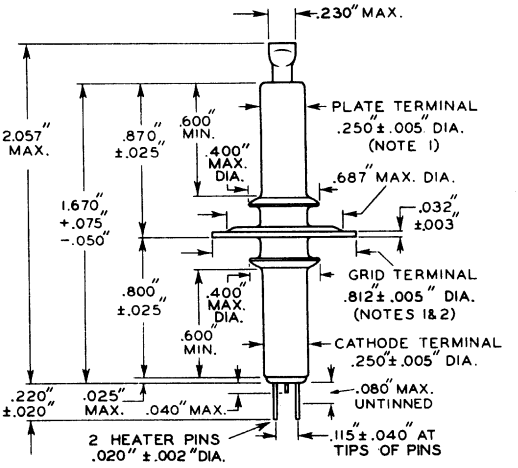
OPERATING CONSIDERATIONS

The *mounting* for this type in coaxial-line, parallel-line, or lumped circuits may support the tube securely by any one of the three terminals. Connections to the other two terminals must be made by contacts with flexible leads.

The *mounting* for this type in cavity-type circuits should preferably support the tube by the grid flange which should make firm contact to the cavity surface.

The *heater pins* of this type should not be soldered to circuit elements. The heat of the soldering operation may crack the glass seals of the heater pins and damage the tube.

The *cathode* should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum values shown in the tabulated data.



92CS-7419R3

NOTE 1: MAXIMUM ECCENTRICITY OF CENTER LINE (AXIS) OF PLATE TERMINAL OR GRID-TERMINAL FLANGE WITH RESPECT TO THE CENTER LINE (AXIS) OF THE CATHODE TERMINAL IS 0.010".

NOTE 2: TILT OF GRID-TERMINAL FLANGE WITH RESPECT TO ROTATIONAL AXIS OF CATHODE TERMINAL IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE GRID-TERMINAL FLANGE PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM ITS EDGE FOR ONE COMPLETE ROTATION. THE TOTAL TRAVEL DISTANCE WILL NOT EXCEED 0.020".

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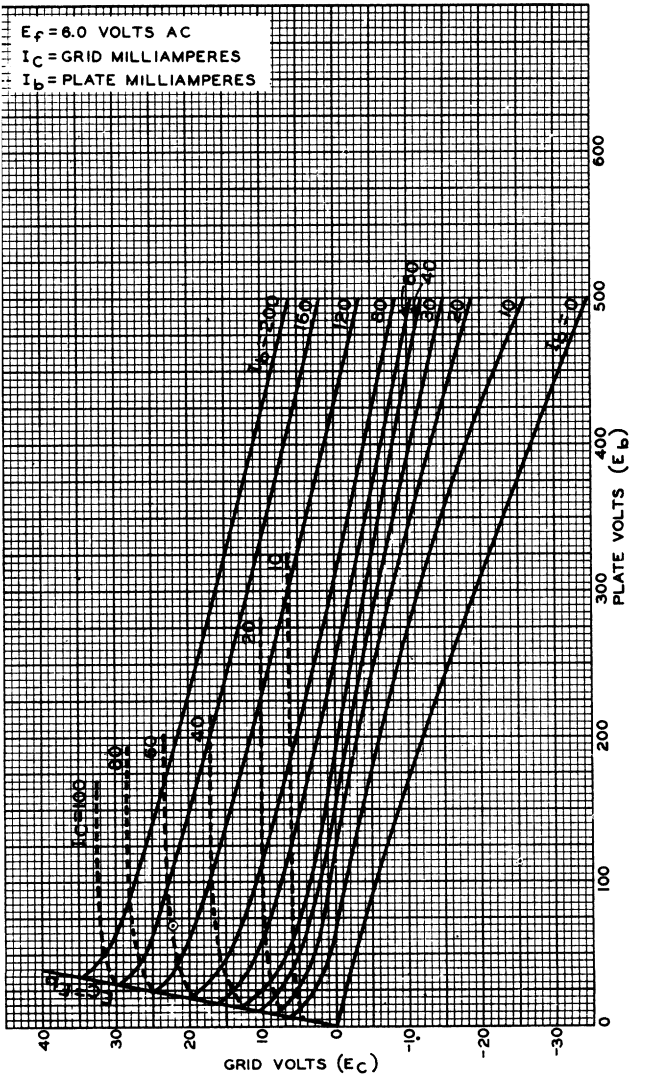
VERAGE CONSTANT-CURRENT CHARACTERISTICS



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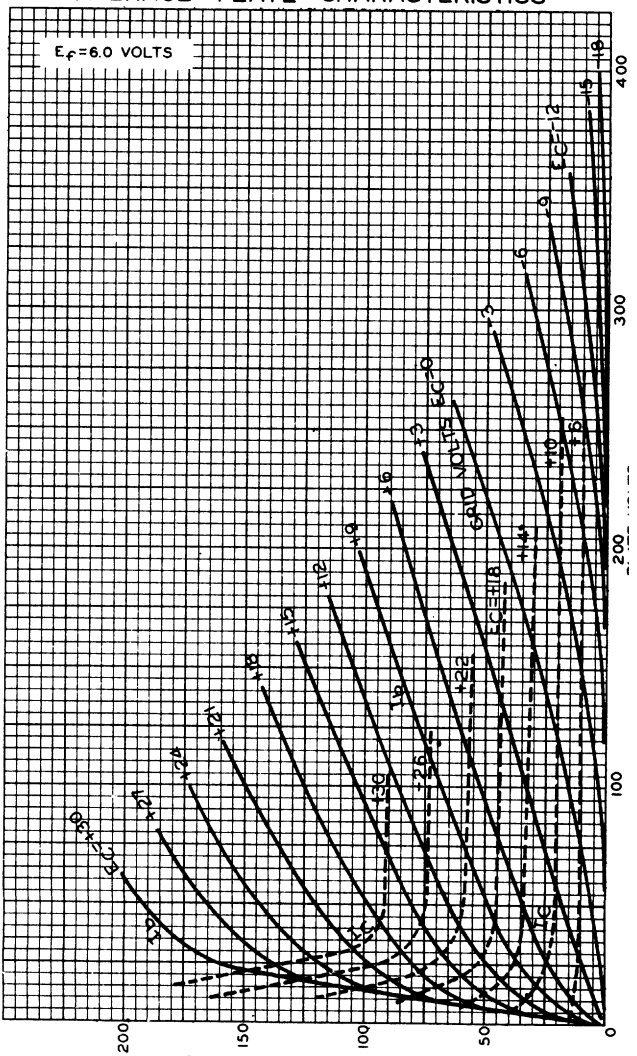
AVERAGE PLATE CHARACTERISTICS



JUNE 13, 1951

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7610

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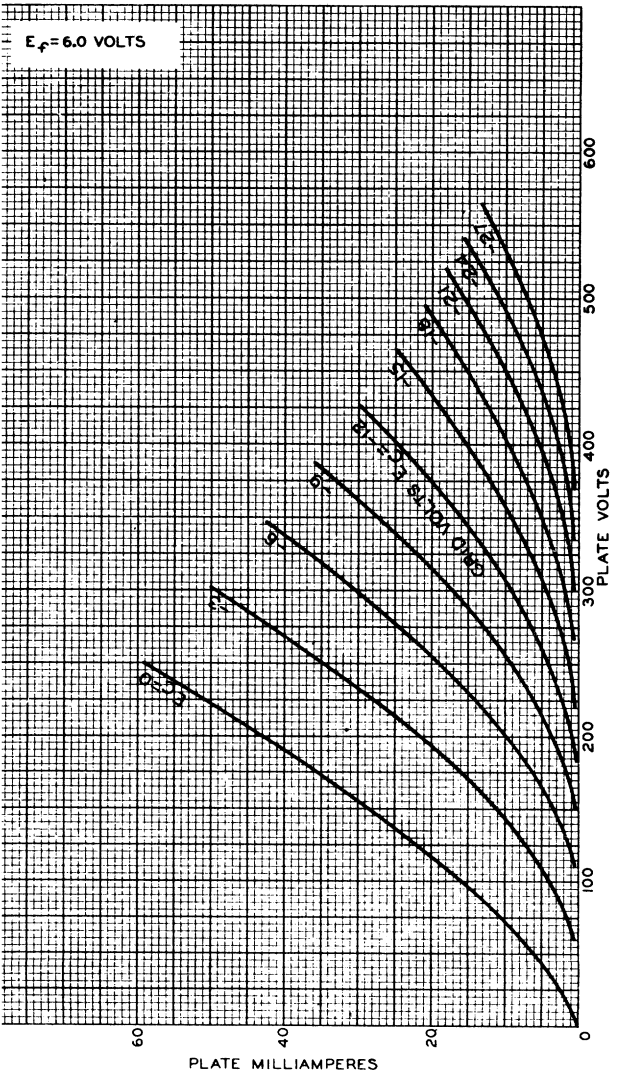
AVERAGE PLATE CHARACTERISTICS



JNE 13, 1951

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92CM-7483

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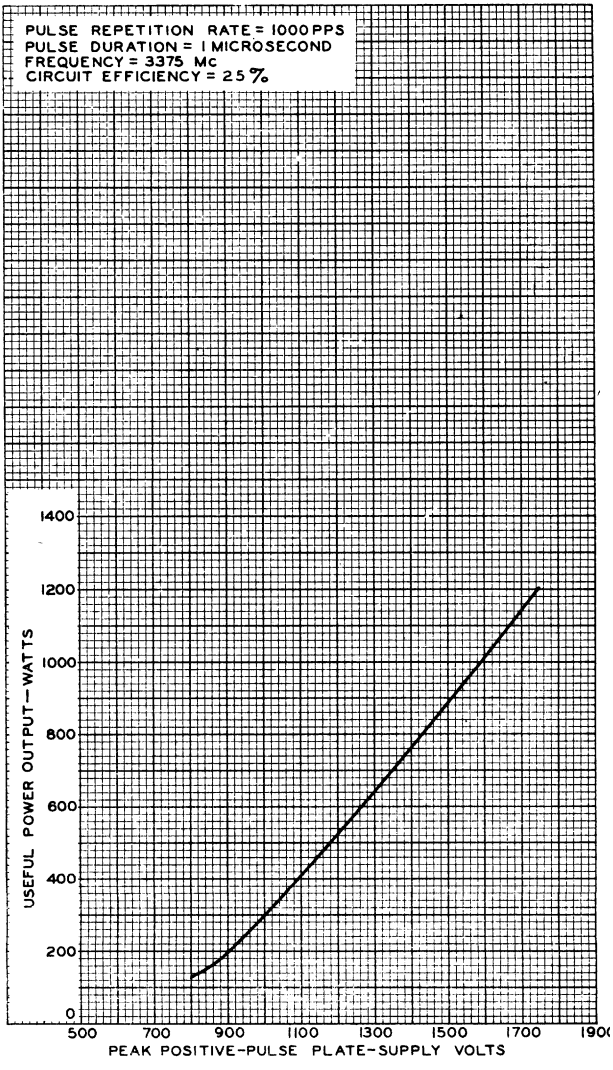
AVERAGE PERFORMANCE CHARACTERISTIC



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5915

PENTAGRID AMPLIFIER

FOR "ON-OFF" CONTROL APPLICATIONS INVOLVING
LONG PERIODS OF OPERATION UNDER CUTOFF CONDITIONS

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3 ± 10%	ac or dc volts
Current	0.3	amp
Microphonism		Not Tested
Direct Interelectrode Capacitances (Approx.):[o]		
Grid No.1 to Plate	0.08 max.	μμf
Grid No.3 to Plate	0.35 max.	μμf
Grid No.1 to Grid No.3	0.15 max.	μμf
Grid No.1 to All Other Electrodes and Heater	5.4	μμf
Grid No.3 to All Other Electrodes and Heater	6.9	μμf
Plate to All Other Electrodes and Heater	7.6	μμf

[o] With no external shield.

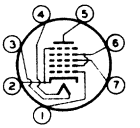
Characteristics, Class A Amplifier:

Plate Voltage	67.5	67.5	volts
Grids-No.2 and No.4 Voltage	67.5	67.5	volts
Grid-No.3 Voltage	0	-4	volts
Grid-No.1 Voltage	0	0	volts
Grid-No.1-to-Plate Transconductance	2000	-	μmhos
Grid-No.3-to-Plate Transconductance	-	1100	μmhos

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin
Basing Designation for BOTTOM VIEW	7CH

Pin 1 - Grid No.1
Pin 2 - Cathode, Grid No.5
Pin 3 - Heater
Pin 4 - Heater



Pin 5 - Plate
Pin 6 - Grid No.2, Grid No.4
Pin 7 - Grid No.3

GATED AMPLIFIER IN COMPUTER SERVICE & "ON-OFF" CONTROL SERVICE

Maximum Ratings, *Absolute Values*:

PLATE VOLTAGE	250 max.	volts

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PENTAGRID AMPLIFIER

GRIDS–No.2 and No.4 VOLTAGE	See Curve	
GRIDS–No.2 and No.4 SUPPLY VOLTAGE	250 max.	volts
GRID–No.3 SUPPLY VOLTAGE:		
Negative bias value	100 max.	volts
Positive bias value	0 max.	volts
Peak negative value	200 max.	volts
Peak positive value	90 max.	volts
GRID–No.1 SUPPLY VOLTAGE:		
Negative bias value	100 max.	volts
Positive bias value	0 max.	volts
Peak negative value	200 max.	volts
Peak positive value: Limited in any application by the peak cathode current and the grid–No.1 input		
PLATE DISSIPATION	1 max.	watt
GRID–No.3 INPUT	0.5 max.	watt
GRIDS–No.2 and No.4 INPUT	1 max.	watt
GRID–No.1 INPUT	0.5 max.	watt
DC CATHODE CURRENT	20 max.	ma
PEAK CATHODE CURRENT	70 max.	ma
PEAK HEATER–CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	120 max.	°C

Typical Operation:

	CUTOFF CONDITION		*ZERO-BIAS CONDITION*	
	Grid–No.1 Control	*Grid–No.3 Control*		
Plate–Supply Voltage	150	150	150	volts
Grid–No.3 Supply Voltage	0	−10	0	volts
Grids–No.2 & No.4 Supply Voltage	75	75	75	volts
Grid–No.1 Supply Voltage	−10	0	0	volts
Plate–Circuit Resistance	20000	20000	20000	ohms
Grid–No.3–Circuit Resistance	47000	47000	47000	ohms
Grids–No.2 & No.4 Series Resistor	470	470	470	ohms
Grid–No.1–Circuit Resistance	47000	47000	47000	ohms
Plate Current	0	0	5.8	ma
Grids–No.2 & No.4 Current	0	14	9	ma

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PENTAGRID AMPLIFIER

Maximum Circuit Values:

Grid-No.1 or Grid-No.3-Circuit Resistance:
For fixed-bias operation . . . . . 0.5 max. megohm
For cathode-bias operation . . . . . 1.0 max. megohm

RANGE VALUES FOR EQUIPMENT DESIGN

Cutoff Condition	*Note*	*Min.*	*Max.*	
Plate Current. . . .	1a and 1b	-	0.2	ma
Zero-Bias Condition				
Plate Current. . . .	2	5.0	6.5	ma

Note 1a: For conditions with grid No.1 as control electrode: 6.3 volts on heater, plate-supply volts = 150, grid-No.3 supply volts = 0, grids-No.2 & No.4 supply volts = 75, grid-No.1 supply volts = -10, plate-circuit resistance (ohms) = 20000, grid-No.3 circuit resistance (ohms) = 47000, grids-No.2 & No.4 series resistor (ohms) = 470, and grid No.1-circuit resistance (ohms) = 47000.

Note 1b: For conditions with grid No.3 as control electrode: values are same as for Note 1a except that grid-No.3 supply volts = -10 and grid-No.1 supply volts = 0.

Note 2: For conditions with 6.3 volts on heater, plate-supply volts = 150, grids-No.2 and No.4 supply volts = 75, grid-No.3 supply volts = 0, grid No.1 supply volts = 0, plate-circuit resistance (ohms) = 20000, grid-No.3-circuit resistance (ohms) = 47000, grids-No.2 and No.4 series resistor (ohms) = 470, and grid-No.1-circuit resistance (ohms) = 47000.

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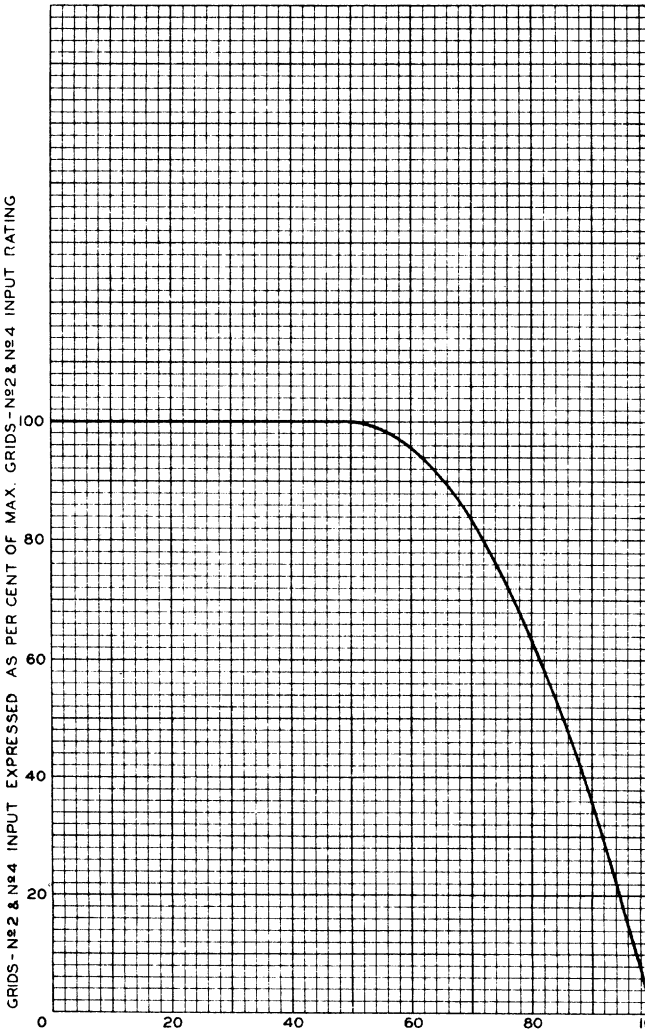
GRIDS – Nº 2 & Nº 4 INPUT RATING CURVE



JUNE 8, 1950

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM – 750

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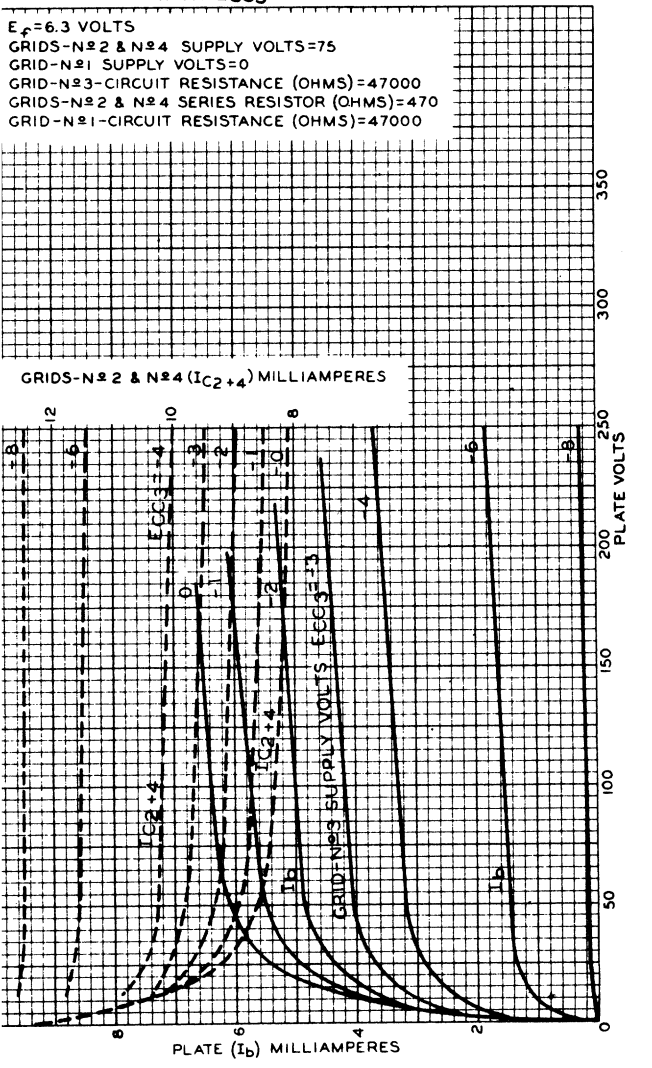
AVERAGE OPERATION CHARACTERISTICS
WITH E_{CC3} AS VARIABLE

E_f=6.3 VOLTS
GRIDS-№2 & №4 SUPPLY VOLTS=75
GRID-№1 SUPPLY VOLTS=0
GRID-№3-CIRCUIT RESISTANCE (OHMS)=47000
GRIDS-№2 & №4 SERIES RESISTOR (OHMS)=470
GRID-№1-CIRCUIT RESISTANCE (OHMS)=47000



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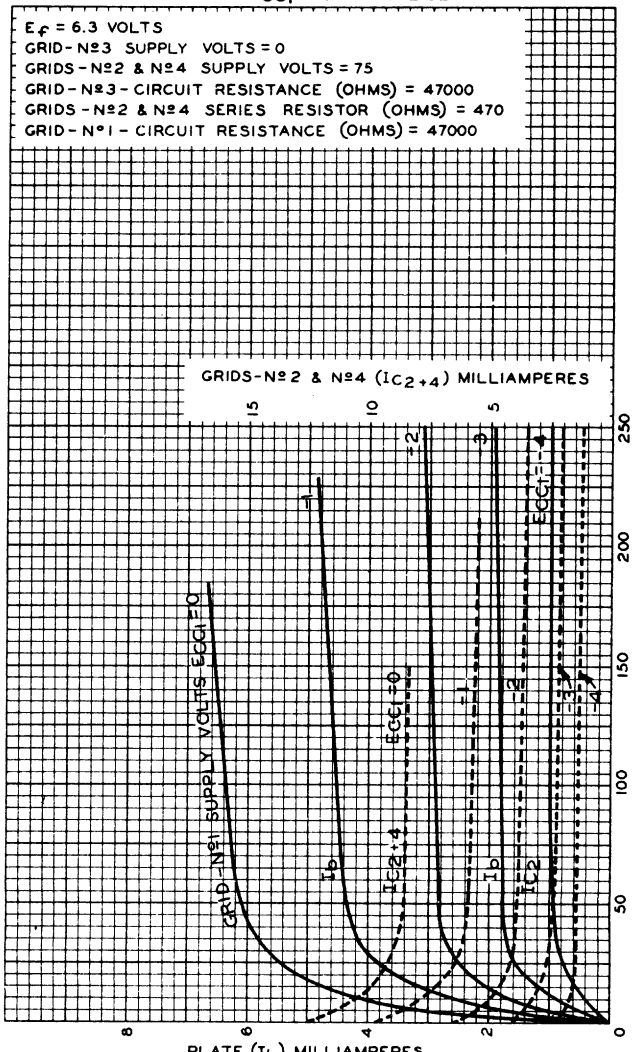
AVERAGE OPERATION CHARACTERISTICS

WITH E_{CC1} AS VARIABLE

E_f = 6.3 VOLTS
GRID-Nº3 SUPPLY VOLTS = 0
GRIDS-Nº2 & Nº4 SUPPLY VOLTS = 75
GRID-Nº3-CIRCUIT RESISTANCE (OHMS) = 47000
GRIDS-Nº2 & Nº4 SERIES RESISTOR (OHMS) = 470
GRID-Nº1-CIRCUIT RESISTANCE (OHMS) = 47000



5946

Power Triode

FORCED-AIR COOLED **GROUNDED-GRID TYPE**

For UHF Plate-Pulsed Oscillator and Amplifier Service

GENERAL DATA

Electrical: ←

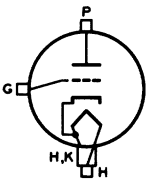
Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	3.4	amp
Minimum heating time	1	minute
Amplification Factor	25	
Direct Interelectrode Capacitances:		
Grid to plate	6.0	pf
Grid to cathode	11.0	pf
Plate to cathode[a]	0.19 max.	pf

Mechanical:

Operating Position	Any
Overall Length	3-5/16" ± 3/32"
Diameter	1.750" ± 0.010"
Weight (Approx.)	8 oz ←
Radiator	Integral part of tube
Mounting	Special

Terminal Diagram (See *Dimensional Outline*):

P – Plate
G – Grid



K – Cathode
H – Heater

Thermal:

Air Flow:

The specified air flow for various plate dissipations, as indicated in the tabulation below, should be delivered by a blower onto the respective terminals and seals, and through the radiator before and during the application of any voltages. Heater power, plate power, and air may be removed simultaneously.

Plate Dissipation	150	200	250	watts
Min. Air Flow	5.7	10	16	cfm
Static Pressure	0.16	0.4	0.85	in. of water

The above flow and pressure values are for condition with radiator temperature held constant at 135° C rise above ambient temperature. The air flow must be adequate to limit the temperature of the radiator, grid terminal, cathode terminal, and seals to their respective maximum values.

Radiator Temperature (Measured on core at end adjacent to plate ring)	180 max.	°C
Grid-Terminal Temperature	150 max.	°C

← Indicates a change.

Cathode-Terminal Temperature	150 max.	°C
Seal Temperature (Plate, grid, and cathode)	150 max.	°C

PLATE-PULSED OSCILLATOR & AMPLIFIER — Class C

Maximum Ratings, *Absolute-Maximum Values:*

For maximum "on" time[b] *of*	*10 μsec*	*100 μsec*	
PEAK POSITIVE-PULSE PLATE-SUPPLY VOLTAGE	7500 max.	7500 max.	volts
PEAK NEGATIVE-PULSE GRID-BIAS VOLTAGE	600 max.	600 max.	volts
PEAK PLATE CURRENT FROM PULSE SUPPLY	4.5 max.	3.5 max.	amp
PEAK RECTIFIED GRID CURRENT	1 max.	0.75 max.	amp
DC PLATE CURRENT	0.045 max.	0.250 max.	amp
DC GRID CURRENT	0.010 max.	0.070 max.	amp
→ PLATE INPUT	340 max.	340 max.	watts
PLATE DISSIPATION	250 max.	250 max.	watts

Typical Operation with Rectangular Wave Shape in Oscillator Circuit at 1250 Mc:

With duty factor[c] *of 0.01*

Peak Positive-Pulse Plate-Supply Voltage	5500	7500	volts
Peak Negative-Pulse Grid-Bias Voltage	375	500	volts
Cathode Resistor[d]	100	100	ohms
Peak RF Grid Voltage	625	850	volts
Peak Plate Current From Pulse Supply	3.5	4.5	amp
Peak Rectified Grid Current	0.25	0.5	amp
DC Plate Current	0.035	0.045	amp
DC Grid Current	0.0025	0.005	amp
Useful Power Output at Peak of Pulse[e] (Approx.)	8000	14000	watts

[a] With external shield connected to grid.

[b] *"ON" time* is defined as the sum of the durations of all the individual pulses which occur during the interval of 1000 microseconds. *Pulse duration* is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 per cent of the peak value. The *peak value* is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

[c] Duty factor is the product of pulse duration and repetition rate. For variable pulse durations and pulse repetition rates, the duty factor is defined as the ratio of time "on" to total elapsed time in any 500-microsecond interval.

[d] It is recommended that the entire bias be obtained from a cathode resistor. In certain applications, partial grid-resistor bias may be used.

[e] The power output at peak of pulse is obtained from the average power output using the duty factor of the peak power output pulse. This procedure is necessary since the power output pulse duty factor may be less than the applied voltage pulse duty factor because of a delay in the start of rf power output.

→ Indicates a change.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	3.05	3.75	amp
Amplification Factor	1,2	18	32	
Grid-Plate Capacitance	-	5.6	6.6	pf
Grid-Cathode Capacitance	-	10.5	12.5	pf
Plate-Cathode Capacitance	3	0.12	0.26	pf
Plate Voltage	1,4	500	850	volts
Plate Voltage	1,5	690	1140	volts
Grid Voltage	1,6	-	-165	volts
Peak Cathode Current	1,7	12	-	amp
Useful Power Output at Peak of Pulse	1,8	12	-	kw

Note 1: With 6.3 volts on heater.

Note 2: With dc grid voltage of -15 volts, and dc plate voltage adjusted to give dc plate current of 250 milliamperes.

Note 3: With external shield connected to grid terminal.

Note 4: With dc grid voltage of -10 volts, and dc plate voltage adjusted to give dc plate current of 250 milliamperes.

Note 5: With dc grid voltage of -20 volts, and dc plate voltage adjusted to give dc plate current of 250 milliamperes.

Note 6: With dc plate voltage of 1600 volts, and dc grid voltage adjusted to give dc plate current of 1 milliampere.

Note 7: Represents the maximum value of cathode current (Plate current and grid current) for the tube under any condition of operation.

Note 8: With peak positive-pulse plate-supply voltage of 7500 volts, cathode-bias resistor of 100 ± 10 per cent ohms, peak plate current from pulse supply of 4.5 amperes, peak rectified grid current of 0.5 ampere, duty factor of 0.01, and frequency of 1250 Mc.

MAXIMUM RATINGS vs OPERATING FREQUENCY

OPERATING FREQUENCY Mc	MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM RATED PLATE VOLTAGE & PLATE INPUT
	Plate-Pulsed Oscillator and Amplifier Service
1300	100
2000	75

DIMENSIONAL OUTLINE and MOUNTING ARRANGEMENT shown under Type 6161 also apply to the 5946

OPERATING NOTES

Rated heater voltage should be applied for at least one minute to allow the cathode to reach normal operating temperature before voltages are applied to the other electrodes. In circuits where the plate is grounded and the negative pulse is applied to the cathode, the heater supply must be insulated to withstand the peak-positive-pulse plate-supply voltage, and it should also present a minimum amount of capacitance loading to the pulse-supply source.

← Indicates a change.

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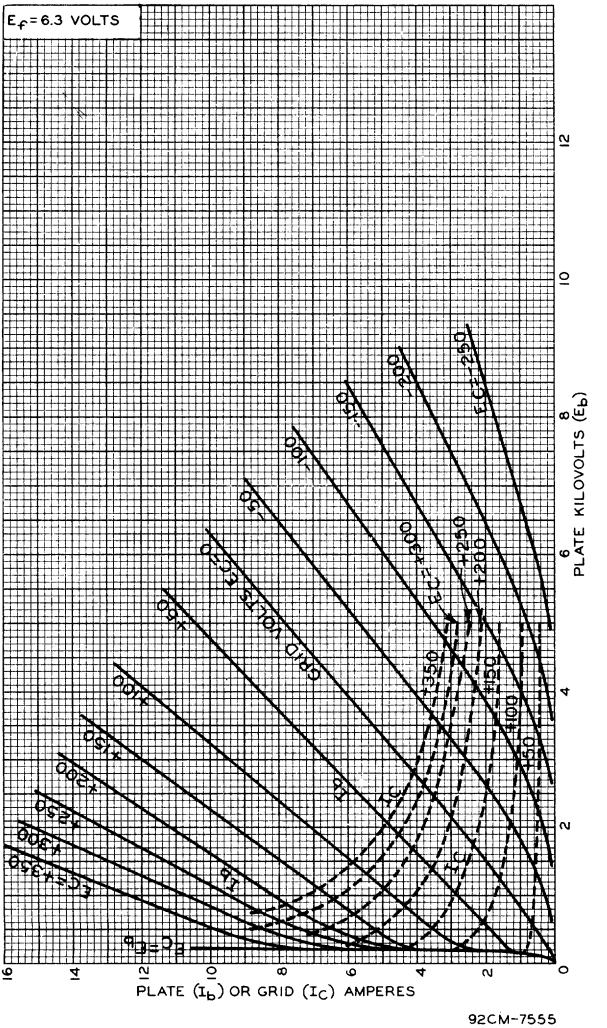
AVERAGE CHARACTERISTICS



92CM-7555

5963

MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For "on-off" control applications involving long periods of operation under cutoff conditions

GENERAL DATA

Electrical:

Heater, Pure Tungsten, for Unipotential Cathodes:

Heater arrangment	*Series*	*Parallel*	
Voltage	12.6 ± 10%	6.3 ± 10%	ac or dc volts
Current	0.15	0.3	amp

Microphonism . . . . . Not Tested

Direct Interelectrode Capacitances (Approx.):[o]

	Unit No.1	*Unit No.2*	
Grid to plate	1.5	1.5	μμf
Grid to cathode and heater	1.9	1.9	μμf
Plate to cathode and heater	0.5	0.35	μμf
Grid of unit No.1 to grid of unit No.2	0.1 max.		μμf

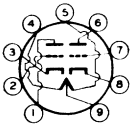
Characteristics, Class A_1 Amplifier (Each Unit):

Plate Voltage	67.5	volts
Grid Voltage	0	volts
Amplification Factor	21	
Plate Resistance (Approx.)	6600	ohms
Transconductance	3200	μmhos
Plate Current	8.5	ma

Mechanical:

Mounting Position . . . . . Any
Maximum Overall Length . . . . . 2-3/16"
Maximum Seated Length . . . . . 1-5/16"
Length, Base Seat to Bulb Top (Excluding tip) 1-9/16" ±3/32"
Maximum Diameter . . . . . 7/8"
Dimensional Outline . . . . . *See General Section*
Bulb T-6-1/2
Base . . . . . Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW 9A

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pins 4 & 9 - Heater of Unit No.2
Pins 5 & 9 - Heater of Unit No.1



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Heater Mid-Tap

[o] Without external shield.

← Indicates a change.

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MEDIUM-MU TWIN TRIODE

FREQUENCY DIVIDER IN COMPUTER SERVICE and "ON-OFF" CONTROL SERVICE

Values are for Each Unit

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	250 max.	volts
GRID VOLTAGE:		
Negative bias value	100 max.	volts
Positive bias value	0 max.	volts
Peak negative value	200 max.	volts
PLATE DISSIPATION	2.5 max.	watts
GRID INPUT	0.5 max.	watt
CATHODE CURRENT:		
Peak	100 max.	ma
DC	20 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	120 max.	°C

Typical Operation as Frequency Halfer:

	Cutoff Condition	*Zero-Bias Condition*	
Plate-Supply Voltage	150	150	volts
Grid Voltage	-15	0	volts
Plate-Circuit Resistance	20000	20000	ohms
Grid-Circuit Resistance	47000	47000	ohms
Plate Current	0	5.1	ma

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation	0.5 max.	megohm
For cathode-bias operation	1.0 max.	megohm

→ **CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN**

	Note	*Min.*	*Max.*	
Cutoff Condition				
Plate Current	1	-	50	μamp
Difference in Plate Current Between Units	-	-	50	μamp
Zero-Bias Condition				
Plate Current	2	4.6	5.4	ma
Difference in Plate Current Between Units	-	-	0.8	ma

Note 1: For conditions with 12.6 volts on heater, plate-supply volts = 150, grid-supply volts = -15, plate-circuit resistance (ohms) = 20000, and grid-circuit resistance (ohms) = 47000.

Note 2: Conditions are same as for Note 1 except that grid-supply volts = 0.

→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

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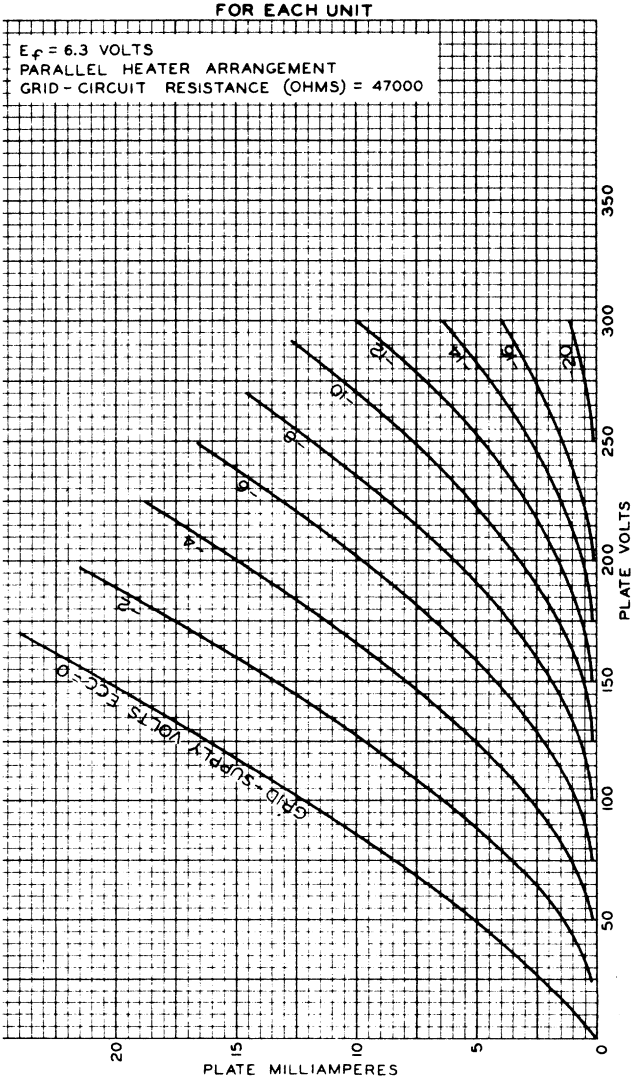
AVERAGE OPERATION CHARACTERISTICS
FOR EACH UNIT



5964

MEDIUM-MU TWIN TRIODE

FOR "ON-OFF" CONTROL APPLICATIONS INVOLVING
LONG PERIODS OF OPERATION UNDER CUTOFF CONDITIONS

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3 ± 10%	ac or dc volts
Current	0.45	amp
Microphonism		Not Tested
Direct Interelectrode Capacitances (Approx.):[o]		
Each Unit:		
Grid to Plate	1.3	μμf
Grid to Cathode and Heater	2.1	μμf
Plate to Cathode and Heater	0.4	μμf
Grid of Unit No.1 to Grid of Unit No.2	0.4 max.	μμf

[o] With no external shielding.

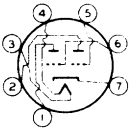
Characteristics, Class A Amplifier (Each Unit, with both units operating):

Plate Voltage	100	volts
Cathode-Bias Resistor●	50	ohms
Amplification Factor	39	
Plate Resistance	6500	ohms
Transconductance	6000	μmhos
Plate Current	9.5	ma

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin
Basing Designation for BOTTOM VIEW	7BF

Pin 1 - Plate of Triode No.2
Pin 2 - Plate of Triode No.1
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Grid of Triode No.1
Pin 6 - Grid of Triode No.2
Pin 7 - Cathode



FREQUENCY DIVIDER IN COMPUTER SERVICE & "ON-OFF" CONTROL SERVICE

Values are for each unit

Maximum Ratings, *Absolute Values*:

PLATE VOLTAGE	250 max.	volts

● Common to both units.

5964

5964
MEDIUM-MU TWIN TRIODE

GRID VOLTAGE:		
Negative bias value	100 max.	volts
Positive bias value	0 max.	volts
Peak negative value	200 max.	volts
PLATE DISSIPATION	1.5 max.	watts
GRID INPUT	0.1 max.	watt
DC CATHODE CURRENT*	15 max.	ma
PEAK CATHODE CURRENT*	75 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	150 max.	°C

Typical Operation as Frequency Halfer (Each Unit):

	Cutoff Condition	*Zero-Bias Condition*	
Plate-Supply Voltage	150	150	volts
Plate-Circuit Resistance	20000	20000	ohms
Grid-Supply Voltage	-10	0	volts
Grid-Circuit Resistance	47000	47000	ohms
Plate Current	0	5	ma

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation	0.5 max.	megohm
For cathode-bias operation	1.0 max.	megohm

RANGE VALUES FOR EQUIPMENT DESIGN

Cutoff Condition	*Note*	*Min.*	*Max.*	
Plate Current (Each Unit)	1	-	0.2	ma
Difference in Plate Current Between Units	-	-	0.2	ma
Zero-Bias Condition				
Plate Current (Each Unit)	2	4.3	5.7	ma
Difference in Plate Current Between Units	-	-	1.4	ma

Note 1: For conditions with 6.3 volts on heater, plate-supply volts = 150, plate-circuit resistance (ohms) = 20000, grid-supply volts = -10, and grid-circuit resistance (ohms) = 47000.

Note 2: Conditions are same as for Note 1 except that grid-supply volts = 0.

* With both units operating, the dc cathode current should not exceed 30 milliamperes, and the peak cathode current should not exceed 150 milliamperes.

RCA

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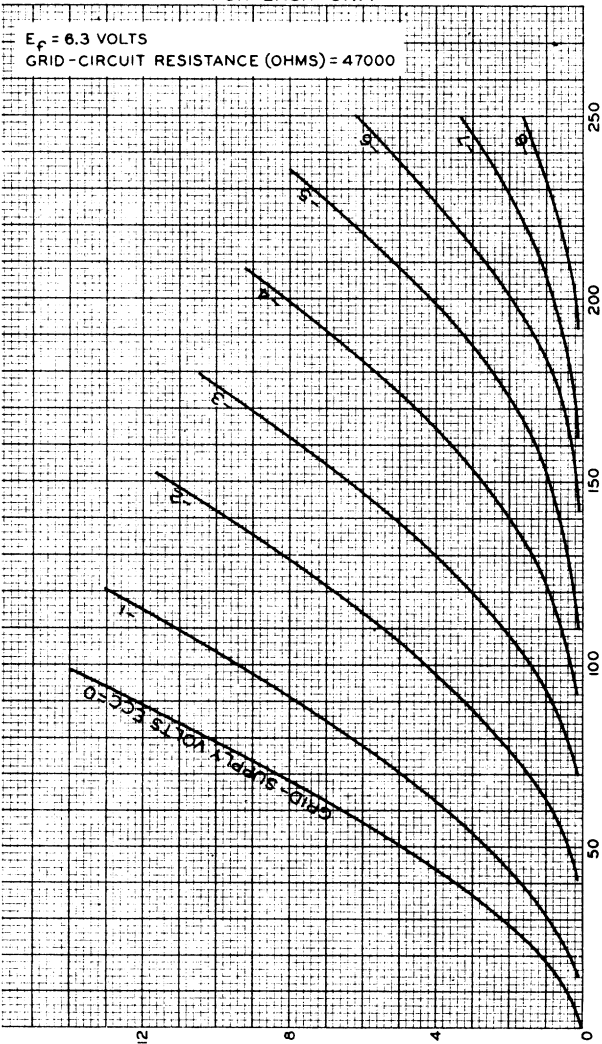
AVERAGE OPERATION CHARACTERISTICS
FOR EACH UNIT



5965

MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For "on-off" control applications involving long periods of operation under cutoff conditions.

GENERAL DATA

Electrical:

	Series	Parallel	
Heater, for Unipotential Cathodes:			
Heater arrangement			
Voltage (AC or DC)	12.6 ± 5%	6.3 ± 5%	volts
Current	0.225	0.45	amp
Direct Interelectrode Capacitances (Approx.):*			
Grid to plate (Each unit)		3.0	μμf
Grid to cathode and heater (Each unit)		3.8	μμf
Plate to cathode and heater (Unit No.1)		0.5	μμf
Plate to cathode and heater (Unit No.2)		0.38	μμf
Plate of unit No.1 to plate of unit No.2		0.5	μμf

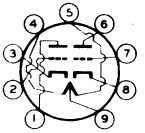
Characteristics, Class A_1 Amplifier (Each Unit):

Plate Supply Voltage	150	volts
Cathode-Bias Resistor	220	ohms
Amplification Factor	47	
Plate Resistance	7250	ohms
Transconductance	6500	μmhos
Plate Current	8.2	ma
Grid Voltage (Approx.) for plate current of 150 μamp	-5.5	volts

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length from Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Maximum Diameter	7/8"
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9A

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4,9 - Heater of Unit No.2
Pin 5,9 - Heater of Unit No.1



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Heater Mid-Tap

* Without external shield.

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MEDIUM-MU TWIN TRIODE

FREQUENCY DIVIDER IN COMPUTER SERVICE and "ON-OFF" CONTROL SERVICE

Values are for Each Unit

Maximum Ratings, *Absolute Values*:

PLATE VOLTAGE	330 max.	volts
GRID VOLTAGE:		
Negative bias value	150 max.	volts
PLATE DISSIPATION	2.4 max.	watts
Total for both units	4.4 max.	watts
DC CATHODE CURRENT	16.5 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200# max.	volts
Heater positive with respect to cathode	200# max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	165 max.	°C

Typical Operation in Computer Service:

	Cutoff Condition	*Conduction Condition*	
Plate Supply Voltage	150	150	volts
Plate Load Resistor	7200	7200	ohms
Plate Current	–	10.5	ma
Grid Voltage (Approx.) for grid current of 140 μamp	–	less than 1 volt	
Grid Voltage (Approx.) for plate current of 150 μamp	-5.5	–	volts
Difference in Grid Voltage Between Units (For plate current of 150 μamp per unit)	1.5	–	volts

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.207	0.243	amp
Amplification Factor (Each Unit)	1,2	39	55	
Grid Voltage for plate current of 150 μamp (Each Unit)	1,3	–	-7.5	volts
Difference in Grid Voltage Between Units (For plate current of 150 μamp per unit)	–	–	1.5	volts
Plate Current 1 (Each Unit)	1,2	6	10.4	ma

The dc component must not exceed 100 volts.

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MEDIUM-MU TWIN TRIODE

	Note	Min.	Max.	
Plate Current 2 (Each Unit) . .	1,4	9.75	–	ma
Reverse Grid Current (Each Unit)	1,5	–	1	μamp
Heater–Cathode Leakage Current:				
Heater negative with respect to cathode	1,6	–	20	μamp
Heater positive with respect to cathode	1,6	–	20	μamp
Transconductance	1,2	5100	7900	μmhos

Note 1: With 12.6 volts ac or dc on heater (series connected).

Note 2: With plate supply voltage of 150 volts and cathode resistor for each cathode of 220 ohms adequately bypassed for a signal frequency of 60 cps. Each unit tested separately. Unit not under test biased to cutoff.

Note 3: With plate supply voltage of 150 volts, grid supply voltage adjusted to give dc plate current of 150 microamperes, and plate load resistor of 7200 ohms. Each unit tested separately. Unit not under test biased to cutoff.

Note 4: With plate supply voltage of 150 volts, grid supply voltage adjusted to give dc grid current of 140 microamperes, and plate load resistor of 7200 ohms. Each unit tested separately. Unit not under test biased to cutoff.

Note 5: With plate supply voltage of 150 volts, cathode resistor for each cathode of 220 ohms, and grid-circuit resistance of 0.5 megohm. Each unit tested separately. Unit not under test biased to cutoff.

Note 6: With 100 volts dc between heater and cathode and units connected in parallel.

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RCA

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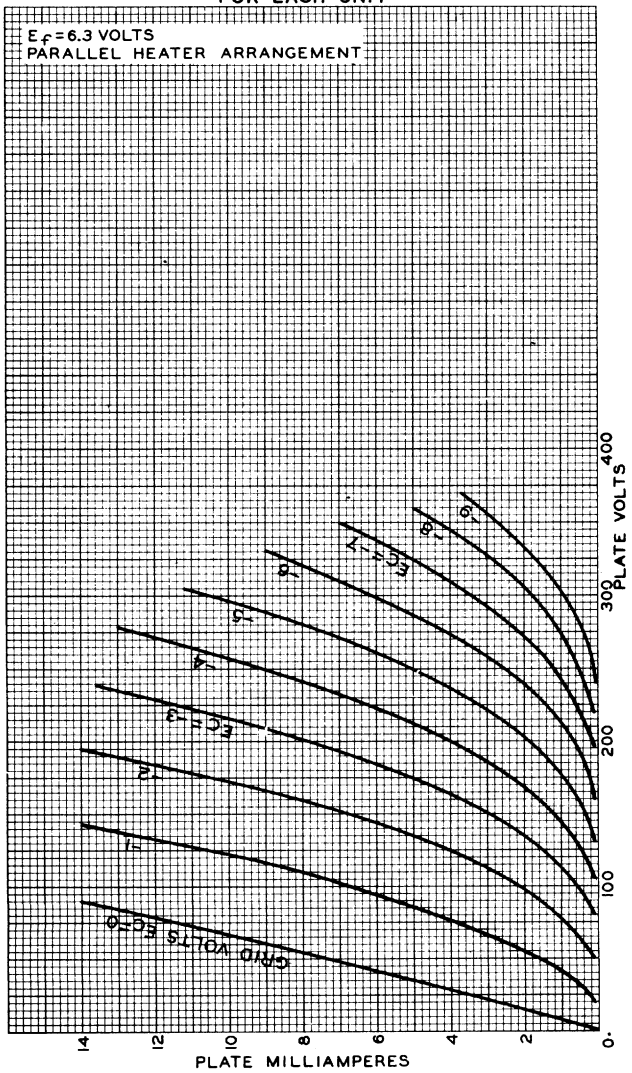
AVERAGE PLATE CHARACTERISTICS
FOR EACH UNIT



MAR. 4, 1954

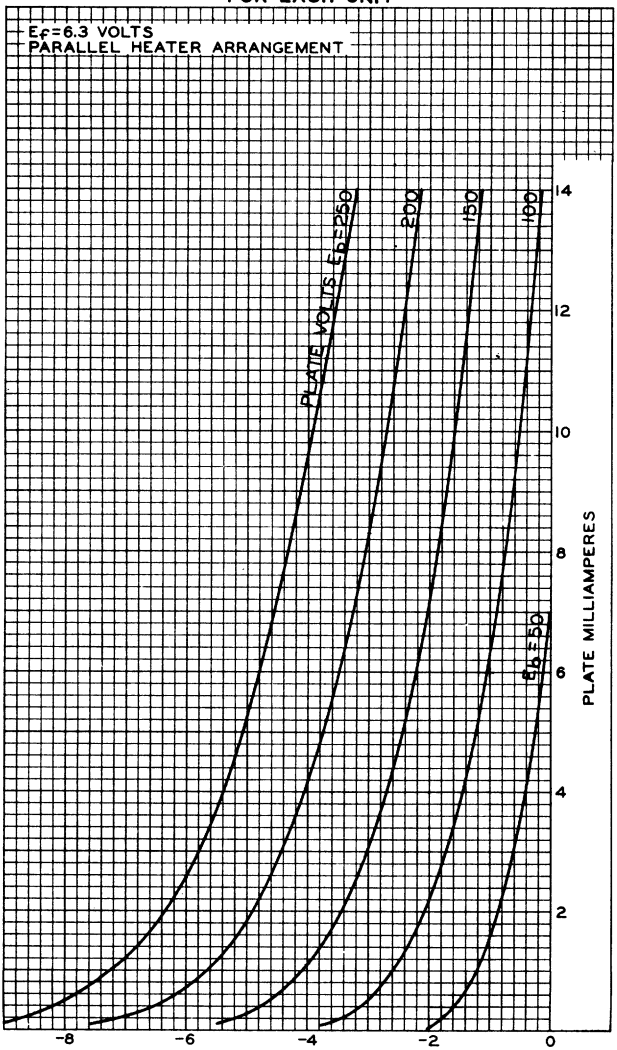
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8261

RCA

5965

AVERAGE CHARACTERISTICS
FOR EACH UNIT



MAR.5,1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

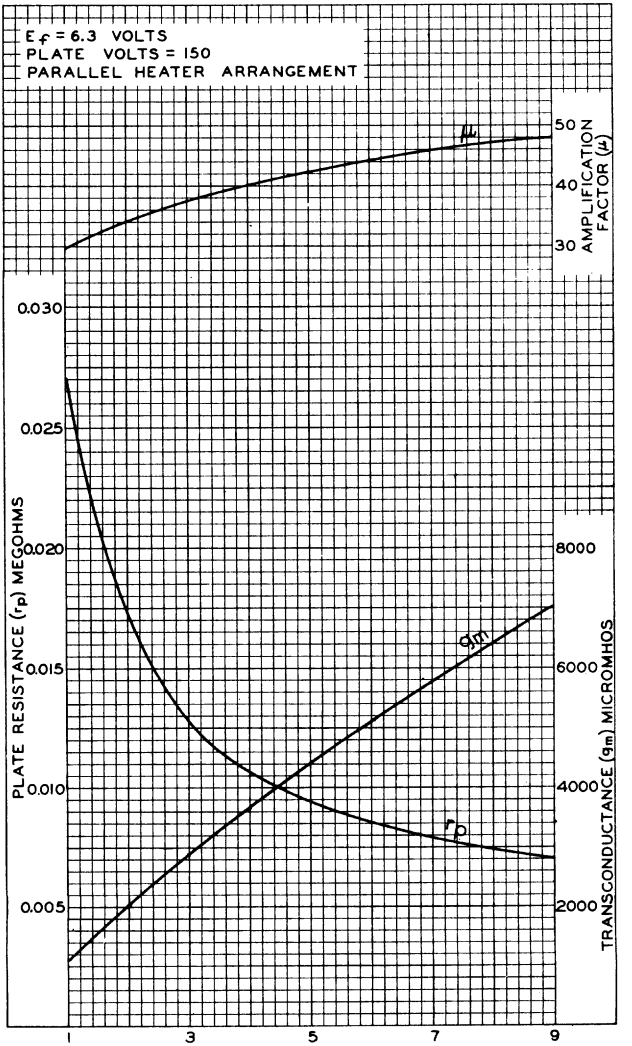
92CM-8262

5965

RCA

5965

AVERAGE CHARACTERISTICS
FOR EACH UNIT



MAR. 8, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8265

6021

MEDIUM-MU TWIN TRIODE

SUBMINIATURE TYPE

6021 PREMIUM TYPE

Intended for applications at altitudes up to 60,000 feet where dependable performance under shock and vibration is paramount

GENERAL DATA

Electrical:

Heater, Pure Tungsten, for Unipotential Cathodes:

Voltage	6.3	ac or dc volts
Current	0.3	amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield°*	
Grid to plate (Each unit)	1.5	1.4	μμf
Grid to cathode and heater (Each unit)	2.4	2.1	μμf
Plate to cathode and heater (Unit No.1)	0.28	1.3	μμf
Plate to cathode and heater (Unit No.2)	0.32	1.4	μμf
Grid to grid	0.013 max.	0.011 max.	μμf
Plate to plate	0.52 max.	0.33 max.	μμf

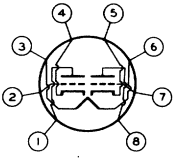
Characteristics, Class A_1 Amplifier (Each Unit):

Plate-Supply Voltage	100	volts
Cathode Resistor	150	ohms
Amplification Factor	35	
Plate Resistance (Approx.)	6500	ohms
Transconductance	5400	μmhos
Plate Current	6.5	ma
Grid Voltage (Approx.) for plate current of 10 μa	-6.5	volts

Mechanical:

Operating Position	Any
Maximum Length (Excluding flexible leads)	1-3/8"
Length, Bulb Seat to Bulb Top (Excluding tip)	1.075" ± 0.060"
Diameter	0.366" to 0.400"
Dimensional Outline	*See General Section*
Bulb	T3
Leads, Flexible	8
Length	1-1/2" to 1-3/4"
Orientation and diameter	*See Dimensional Outline*

BOTTOM VIEW



Lead 1 - Plate of Unit No.2
Lead 2 - Grid of Unit No.2
Lead 3 - Heater
Lead 4 - Cathode of Unit No.2
Lead 5 - Cathode of Unit No.1
Lead 6 - Heater
Lead 7 - Grid of Unit No.1
Lead 8 - Plate of Unit No.1

°: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6021

MEDIUM-MU TWIN TRIODE

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Absolute Values:*

For Operation at Altitudes up to 60,000 Feet

PLATE VOLTAGE	165 max.	volts
GRID VOLTAGE:		
Positive bias value	0 max.	volts
Negative bias value	55 max.	volts
PLATE CURRENT	22 max.	ma
GRID CURRENT	5.5 max.	ma
PLATE DISSIPATION	1.1 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	220 max.	°C

Maximum Circuit Values:

Grid-Circuit Resistance:		
For cathode-bias operation	1.1 max.	megohms

° With external shield having inside diameter of 0.405" connected to cathode of unit under test.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Values are for Each Unit (Other unit connected to ground) and are Initial, Unless Otherwise Indicated

	Note	*Min.*	*Max.*	
Heater Current	1	0.28	0.32	amp
Heater Current at 500 hours	1	0.276	0.328	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	1.2	1.8	μμf
Grid to cathode and heater	2	1.8	3	μμf
Plate to cathode and heater (Unit No.1)	2	0.2	0.36	μμf
Plate to cathode and heater (Unit No.2)	2	0.22	0.42	μμf
Grid to grid	3	–	0.013	μμf
Plate to plate	3	–	0.52	μμf
Amplification Factor	1,4	30	40	
Plate Current (1)	1,4	4.5	8.5	ma
Plate-Current Difference Between Units	1,4	–	1.6	ma
Plate Current (2)	1,5	–	100	μa
Transconductance (1)	1,4	4450	6350	μmhos

Notes 1 to 5: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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MEDIUM-MU TWIN TRIODE

	Note	Min.	Max.	
Transconductance (1) Change:				
With heater voltage reduced to 5.7 volts. .	4	–	15	%
Individual at 500 hours .	1,4	–	25	%
Average at 500 hours. . .	1,4	–	15	%
Average at 500 hours: With heater voltage reduced to 5.7 volts. .	4	–	15	%
Reverse Grid Current. . . .	1,6	–	0.3	μa
Reverse Grid Current at 500 hours	1,6	–	0.9	μa
Grid Emission Current . . .	7	–	-0.5	μa
Heater-Cathode Leakage Current:				
Heater 100 volts negative with respect to cathode.	1	–	5	μa
Heater 100 volts positive with respect to cathode.	1	–	5	μa
Heater-Cathode Leakage Current at 500 hours:				
Heater 100 volts negative with respect to cathode.	1	–	10	μa
Heater 100 volts positive with respect to cathode.	1	–	10	μa
Leakage Resistance:				
Between grid and all other electrodes tied together.	1,3,8	100	–	megohms
Between plate and all other electrodes tied together.	1,3,9	100	–	megohms
Leakage Resistance at 500 hours:				
Between grid and all other electrodes tied together.	1,3,8	50	–	megohms
Between plate and all other electrodes tied together.	1,3,9	50	–	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Without external shield.

Note 3: Other electrodes connected to ground.

Note 4: With dc plate-supply voltage of 100 volts, cathode resistor of 150 ohms, and cathode-resistor bypass capacitor of 1000 μf.

Note 5: With dc plate voltage of 100 volts and grid voltage of -6.5 volts.

Note 6: With dc plate-supply voltage of 150 volts, cathode resistor of 300 ohms, and grid resistor of 1 megohm.

Note 7: With ac or dc heater voltage of 7.5 volts, dc plate voltage of 150 volts, grid voltage of -7.5 volts, and grid resistor of 1 megohm.

Note 8: With grid voltage of -100 volts.

Note 9: With dc plate voltage of -300 volts.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6021

MEDIUM-MU TWIN TRIODE

SPECIAL RATINGS AND PERFORMANCE DATA

Shock Rating:

Impact Acceleration . . . . . 450 max. g

This test is performed on a sample lot of tubes from each production run. Tubes are held rigid and are tested in four different positions. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

Fatigue Ratings:

Vibrational Acceleration . . . . . 2.5 max. g

This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

Variable-Frequency Vibration Performance:

This test is performed on a sample lot from each production run. Tubes are vibrated over the frequency range of 5 to 50 cps at a total excursion of 0.08" for 3 minutes. At the end of this test, tubes are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . 50 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: Heater voltage of 6.3 volts, plate-supply voltage of 100 volts, cathode resistor of 150 ohms, plate load resistor of 10000 ohms and vibrational acceleration of 15 g at 40 cps.

Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . . 2000 min. cycles

Under the following conditions: Heater voltage of 7.0 volts cycled one minute on and four minutes off, heater 140 volts rms with respect to both cathodes tied together.

Audio-Frequency Noise and Microphonic Performance:

RMS Output Voltage . . . . . 65 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: Heater voltage of 6.3 volts, plate-supply voltage of 100 volts, cathode resistor of 75 ohms, grid-No.1 resistor of 0.1

megohm, plate load resistor of 0.01 megohm, and cathode-bypass capacitor of 1000 μf. Units are connected in parallel. The output voltage of a tube, when tapped, will not cause a reading on a vu meter greater than that produced when a calibrating signal of 65 millivolts rms is applied to the plates of the tube.

Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1.0 microampere under the conditions specified in the Characteristics Range Values for reverse grid current.

1-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Conditions of life testing are specified under 500-Hour Intermittent Life Performance, except test run at room temperature. Tubes are initially read for transconductance (1). At the end of 1 hour, the value of transconductance (1) is read. The variation in transconductance (1) from the 0-hour reading will not exceed 15 per cent under the conditions specified in Characteristics Range Values.

100-Hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Conditions of life testing are specified under 500-Hour Intermittent Life Performance, except test run at room temperature. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, reverse grid current in excess of 1.0 microampere, or a transconductance (1) of less than 4000 micromhos under the conditions specified in Characteristics Range Values.

500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. Life testing is conducted under the following conditions: Heater voltage of 6.3 volts, plate-supply voltage of 100 volts, heater-cathode voltage of 200 volts (heater positive with respect to cathode), cathode resistor of 150 ohms, grid resistor of 1 megohm and bulb temperature of 220° C. At the end of 500 hours, tube will not show permanent shorts or open circuits and will be criticized for the total number of

6021

MEDIUM-MU TWIN TRIODE

defects in the sample lot and for the number of tubes failing to pass established initial limits of heater current, individual, average, and 5.7-heater-voltage transconductance change, reverse grid current and heater-cathode leakage current shown under Characteristics Range Values.

OPERATING CONSIDERATIONS

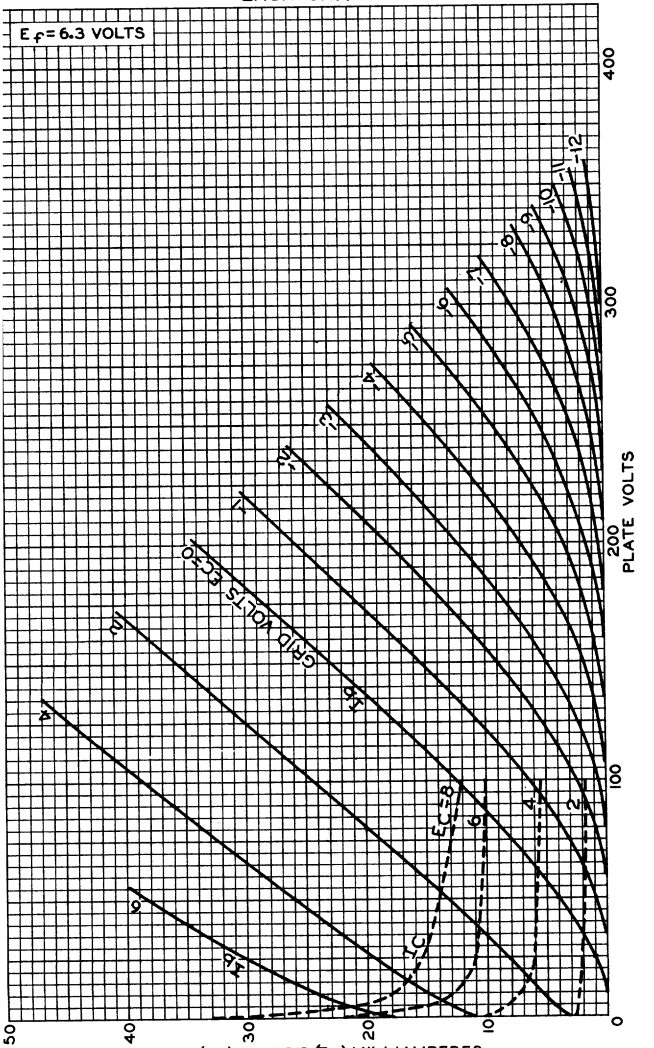
The *heater supply* should be well regulated because life and reliability of the 6021 are adversely affected by departures from the 6.3-volt value. The extent to which life is affected is a function of the amount of these departures and their durations.

The *flexible leads* of the 6021 are usually soldered to the circuit elements. Soldering of the connections should be made as far as possible from the glass button. If this precaution is not followed, the heat of the soldering operation may crack the glass seals of the leads and damage the tube.

RCA

6021

AVERAGE CHARACTERISTICS
EACH UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

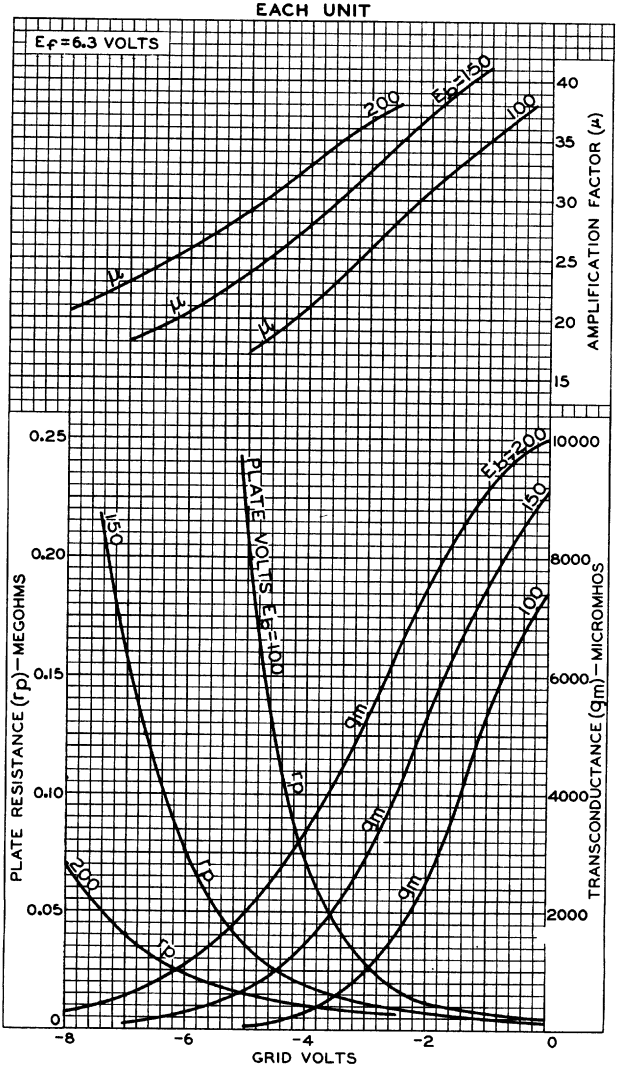
92CM-9439

6021

6021

AVERAGE CHARACTERISTICS

EACH UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9440

6026
OSCILLATOR TRIODE

SUBMINIATURE TYPE

For radiosonde service at 400 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage range*	5.2 to 6.6	ac or dc volts
Current at 6.3 volts	0.2	amp
Direct Interelectrode Capacitances (Approx.):°		
Grid to plate	1.3	μμf
Grid to cathode and heater	2	μμf ←
Plate to cathode and heater	0.42	μμf ←

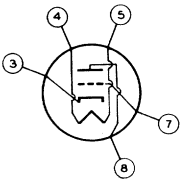
Characteristics, Class A_1 Amplifier:

Plate-Supply Voltage	120	volts
Cathode Resistor	220	ohms
Amplification Factor	24	
Plate Resistance (Approx.)	4000	ohms
Transconductance	5900	μmhos
Plate Current	12	ma

Mechanical:

Mounting Position	Any
Maximum Length (Excluding flexible leads)	1-1/2"
Length, Bulb Seat to Bulb Top(Excluding tip)	1.200" ± 0.060" ←
Maximum Diameter	0.400"
Dimensional Outline	*See General Section*
Bulb	T-3
Leads, Flexible	5
Length	1-1/2" to 1-3/4"
Orientation and diameter	*See Dimensional Outline* ←

BOTTOM VIEW



Lead 3 – Cathode
Lead 4 – Heater
Lead 5 – Heater
Lead 7 – Grid
Lead 8 – Plate

OSCILLATOR – Class C Telegraphy

Maximum Ratings*, *Absolute Values:*

DC PLATE VOLTAGE	150 max.	volts
DC GRID VOLTAGE	−50 max.	volts
TOTAL CATHODE CURRENT	40 max.	ma

* Heater-voltage range and maximum ratings are established on basis that tube heater will be supplied from batteries in radiosonde and similar applications utilizing equipment designed for extreme compactness and light weight and requiring tube life of only a few hours.

° Without external shield.

← Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

6026

OSCILLATOR TRIODE

DC GRID CURRENT	10 max.	ma
PLATE INPUT	3.3 max.	watts
PLATE DISSIPATION	3 max.	watts
PEAK HEATER-CATHODE VOLTAGE	0 max.	volts

Typical Operation as Oscillator at 400 Mc:

DC Plate Voltage	135	volts
Grid Resistor	1300	ohms
DC Plate Current	20	ma
DC Grid Current (Approx.)	9.5	ma
Useful Power Output	1.25	watts

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current:				
With 5.2 volts ac on heater	-	0.176	-	amp
With 6.6 volts ac on heater	-	-	0.225	amp
Direct Interelectrode Capacitances:				
Grid to plate	1	1.05	1.55	μμf
→ Grid to cathode and heater	1	1.55	2.45	μμf
→ Plate to cathode and heater	1	0.345	0.495	μμf
Amplification Factor	2	17	31	
Transconductance	3	4200	7600	μmhos
Transconductance	4	4600	8000	μmhos
Plate Current	3	8	16	ma
Plate Current	4	9.5	18.5	ma
Plate Current	5	-	300	μamp

Note 1: Without external shield.

Note 2: With 5.2 or 6.3 volts ac on heater, dc plate-supply volts = 120, and cathode resistor (ohms) = 220.

Note 3: With 5.2 volts ac on heater, dc plate-supply volts = 120, and cathode resistor (ohms) = 220.

Note 4: With 6.3 volts ac on heater, dc plate-supply volts = 120, and cathode resistor (ohms) = 220.

Note 5: With 5.2 volts ac on heater, dc plate-supply volts = 120, dc grid volts = -12, and cathode resistor (ohms) = 220.

OPERATING CONSIDERATIONS

→ It is recommended that the cathode of the 6026 be connected directly to the heater.

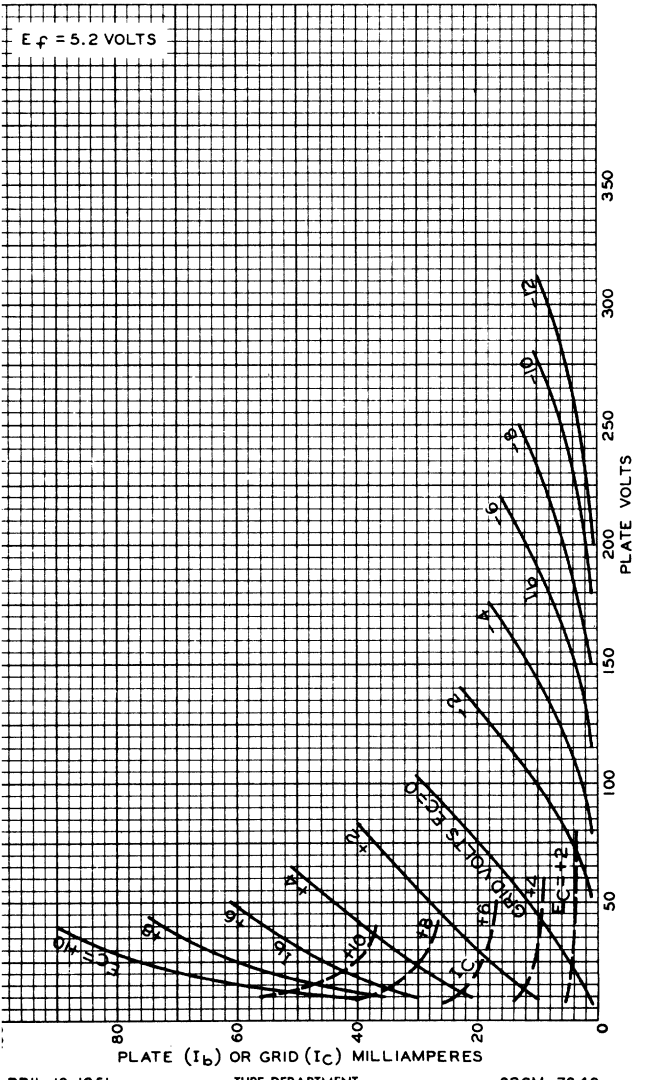
The *flexible leads* of the 6026 are usually soldered to the circuit elements. Soldering of the connections should be made as far as possible from the glass button. If this precaution is not followed, the heat of the soldering operation may crack the glass seals and damage the tube.

→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6026

AVERAGE PLATE CHARACTERISTICS



RCA

6072

6072 PREMIUM TYPE

MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For use in industrial and military applications critical as to microphonics and in which dependability is paramount. Characteristics are similar to those of the 12AY7.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Heater arrangement	*Series*	*Parallel*	
Voltage	12.6	6.3	ac or dc volts
Current	0.175	0.35	amp

Direct Interelectrode Capacitances (Approx.):°		
Grid to plate (Each unit)	1.4	μμf
Grid to cathode and heater (Each unit)	1.5	μμf
Plate to cathode and heater:		
Unit No.1	0.5	μμf
Unit No.2	0.38	μμf

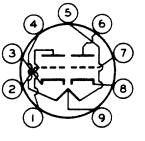
Characteristics, Class A_1 Amplifier (Each Unit):

Plate Voltage	250	volts
Grid Voltage	−4	volts
Amplification Factor	44	
Plate Resistance (Approx.)	25000	ohms
Transconductance	1750	μmhos
Plate Current	3	ma
Grid Voltage (Approx.) for plate μa = 10	−8	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9A

Pin 1 – Plate of Unit No.2
Pin 2 – Grid of Unit No.2
Pin 3 – Cathode of Unit No.2
Pins 4 & 9 – Heater of Unit No.2
Pins 5 & 9 – Heater of Unit No.1



Pin 6 – Plate of Unit No.1
Pin 7 – Grid of Unit No.1
Pin 8 – Cathode of Unit No.1
Pin 9 – Heater Mid-Tap

° Without external shield.

ELECTRON TUBE DIVISION
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TENTATIVE DATA 1

6072

MEDIUM-MU TWIN TRIODE

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	330 max.	volts
GRID VOLTAGE:		
Positive-bias value	0 max.	volts
PLATE DISSIPATION	1.65 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	165 max.	°C

Typical Operation:

In low-level stages of high-gain af amplifier with parallel-heater arrangement

Plate-Supply Voltage	150	volts
Plate-Load Resistor	20000	ohms
Grid Resistor	0.1	megohm
Cathode Resistor	2700	ohms
Cathode Capacitor	40	μf
Voltage Gain	12.5	

Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED AMPLIFIER CHART at end of tabulated data for this type

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration . . . . . 600 max. g

Tubes are held rigid in four different positions in a Navy-Type, High-Impact (flyweight) Shock Machine and are subjected to 20 blows at a hammer angle of 42° (equivalent to the specified maximum impact acceleration).

Fatigue Rating:

Vibrational Acceleration. . . . . 2.5 max. g

This test is performed for a period of 100 hours minimum at a frequency of 25 cycles per second.

Heater-Cycling Life Performance:

Cycles of Intermittent Operation. . . . 2000 min. cycles

Under the following conditions: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground.

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MEDIUM-MU TWIN TRIODE

OPERATING CONDITIONS AS RESISTANCE-COUPLED AMPLIFIER (Each Unit)

With Effective Source Impedance of 200 ohms (Approx.)

Plate-Supply Voltage	90			volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage)	0.24	0.51	1	megohm
Cathode Resistor	2100	4800	10000	ohms
Peak Output Voltage	14	16	16	volts
Voltage Gain▲	25	27	27	
Plate-Supply Voltage	180			volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage)	0.24	0.51	1	megohm
Cathode Resistor	1500	3100	7200	ohms
Peak Output Voltage	34	35	35	volts
Voltage Gain▲	28	28	29	
Plate-Supply Voltage	300			volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage)	0.24	0.51	1	megohm
Cathode Resistor	1300	2700	6000	ohms
Peak Output Voltage	64	64	64	volts
Voltage Gain▲	29	31	31	

With Effective Source Impedance of 0.1 Megohm (Approx.)

Plate-Supply Voltage	90			volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage)	0.24	0.51	1	megohm
Cathode Resistor	3000	6200	12000	ohms
Peak Output Voltage	17	18	20	volts
Voltage Gain▲	23	25	26	
Plate-Supply Voltage	180			volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage)	0.24	0.51	1	megohm
Cathode Resistor	1900	4100	8100	ohms
Peak Output Voltage	38	41	44	volts
Voltage Gain▲	27	28	29	

▲ At 2 volts (rms) output.

Note: Coupling capacitors should be selected to give desired frequency response. Cathode resistors should be adequately bypassed.

6072

MEDIUM-MU TWIN TRIODE

Plate-Supply Voltage	300			volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage)	0.24	0.51	1	megohm
Cathode Resistor	1600	3400	6700	ohms
Peak Output Voltage	68	72	76	volts
Voltage Gain▲	28	30	30	

▲ At 2 volts (rms) output.

Note: Coupling capacitors should be selected to give desired frequency response. Cathode resistors should be adequately bypassed.

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LOW-MU TWIN POWER TRIODE

GENERAL DATA

Heater, for Unipotential Cathodes:		
Voltage	6.3 ± 10%	ac or dc volts
Current	2.5	amp
Direct Interelectrode Capacitances (Approx.):		←
(Each Unit, without external shield)		
Grid to Plate	8	μμf
Input	6	μμf
Output	2.2	μμf
Heater to Cathode:		
Triode Unit No.1	6.5	μμf
Triode Unit No.2	6	μμf
Grid of Unit No.1 to Grid of Unit No.2	0.5	μμf
Plate of Unit No.1 to Plate of Unit No.2	2	μμf

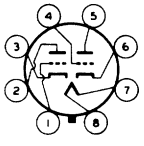
Characteristics, Amplifier Class A_1 (Each Unit):

Plate-Supply Voltage	135	volts
Cathode-Bias Resistor	250	ohms
Amplification Factor	2	
Plate Resistance	280	ohms
Transconductance	7000	μmhos
Plate Current	125	ma

Mechanical:

Mounting Position	Any
Maximum Overall Length	4-1/16" ←
Maximum Seated Length	3-1/2" ←
Maximum Diameter	1-23/32"
Bulb	T-12
Base	Large-Wafer Octal 8-Pin with Sleeve and External Barriers (JETEC No.B8-98) ←
Basing Designation for BOTTOM VIEW	8BD

Pin 1 – Grid of Unit No.2
Pin 2 – Plate of Unit No.2
Pin 3 – Cathode of Unit No.2
Pin 4 – Grid of Unit No.1



Pin 5 – Plate of Unit No.1
Pin 6 – Cathode of Unit No.1
Pin 7 – Heater
Pin 8 – Heater

DC AMPLIFIER

Values are for Each Unit

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	250 max.	volts
PLATE CURRENT	125 max.	ma
PLATE DISSIPATION	13 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	300 max.	volts
Heater positive with respect to cathode	300 max.	volts

← Indicates a change

6080

LOW-MU TWIN POWER TRIODE

BULB TEMPERATURE[●]	200 max.	°C

Maximum Circuit Values:

Grid-Circuit Resistance:		
For cathode-bias operation	1.0 max.	megohm
For fixed-bias operation[□]	0.1 max.	megohm
For combined fixed and cathode-bias operation[★]	0.1 max.	megohm

BOOSTER SCANNING SERVICE

Values are for Each Unit

Maximum Ratings, ***Absolute Values*****:**

For operation in a 525-line, 30-frame system[▲]

PEAK NEGATIVE-PULSE PLATE VOLTAGE[●]	3000 max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	2300 max.	volts
DC PLATE CURRENT	125 max.	ma
PLATE DISSIPATION	13 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode[●]	300 max.	volts
Heater positive with respect to cathode.	300 max.	volts
BULB TEMPERATURE[●]	200 max.	°C

Maximum Circuit Values (For maximum rated conditions):

Grid-Circuit Resistance:		
For cathode-bias operation	1.0 max.	megohm
For fixed-bias operation	not recommended	

→ **CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN**

	Note	*Min.*	*Max.*	
Heater Current	1	2.26	2.74	amp
Amplification Factor (Each Unit)	1,2	1.4	2.6	
Plate Current (Each Unit)	1,2	100	150	ma
Transconductance (Each Unit)	1,2	5800	8200	μmhos
Reverse Grid Current (Units in Parallel)	1,3	–	4	μamp

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With plate-supply voltage of 135 volts, and cathode-bias resistor of 250 ohms in each cathode (both triode units operating).

Note 3: With plate-supply voltage of 135 volts, grid resistor of 1 megohm in each grid and cathode-bias resistor of 250 ohms in each cathode (both triode units operating).

[●] At hottest point on bulb surface.

[□] When fixed bias is used, the plate circuit should contain a protective resistance to provide a minimum drop of 15 volts dc at the normal operating conditions.

★,▲,●,❋: See next page. →Indicates a change

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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LOW-MU TWIN POWER TRIODE

★ When combined fixed- and cathode-bias is used, the cathode-bias portion should have a minimum value of 7.5 volts dc at the normal operating conditions.

▲ As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

● The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

♣ Operation of this tube is not recommended with a damper pulse between heater and cathode.

SPECIAL RATINGS & PERFORMANCE DATA ←

Shock Rating:

Impact Acceleration . . . . . 450 max. g

Tubes are held rigid in four different positions in a Navy Type, High Impact (flyweight) Shock Machine and are subjected to 450 g impact acceleration.

Fatigue Rating:

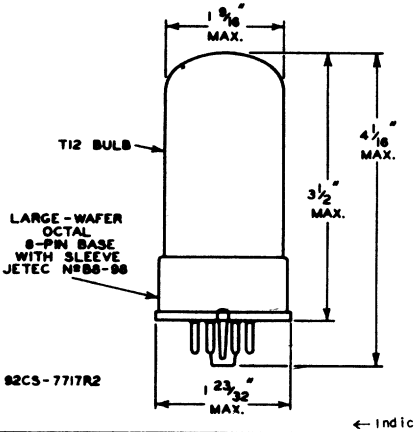
Vibrational Acceleration . . . . . 2.5 max. g

Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours.

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . 200 max. mv

Under the following conditions and with units connected in parallel: Heater voltage of 6.3 volts, plate voltage supply of 135 volts, dc grid voltage of −7 volts, plate load resistance of 2000 ohms, and vibrational acceleration of 2.5 g at 25 cycles per second.



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6080

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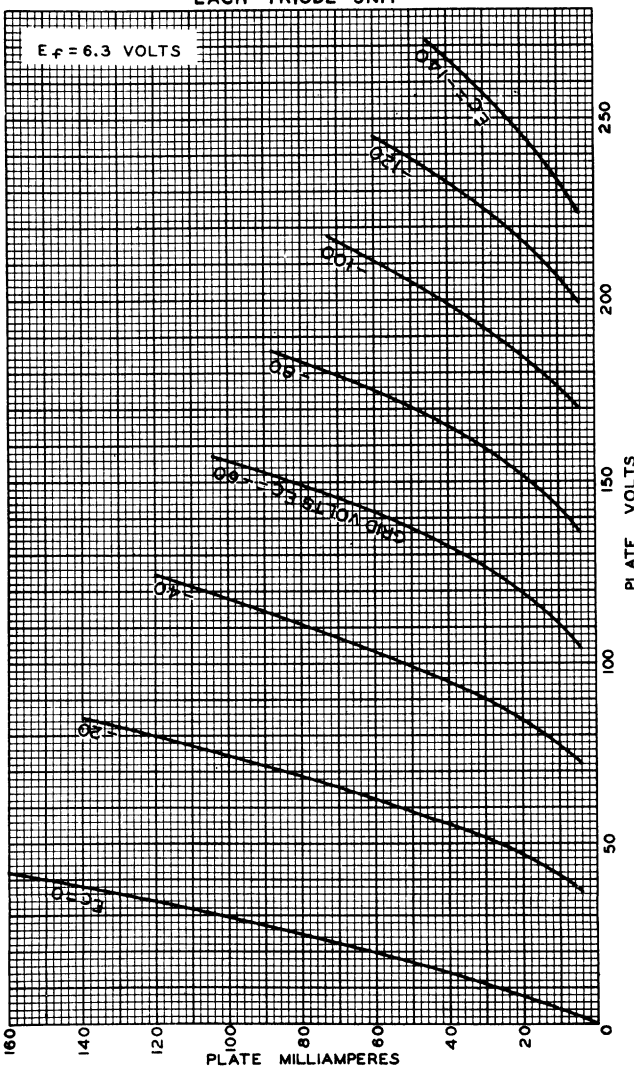
AVERAGE PLATE CHARACTERISTICS

EACH TRIODE UNIT



OCT. 19, 1951

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7695

6082

LOW-MU TWIN POWER TRIODE

GENERAL DATA

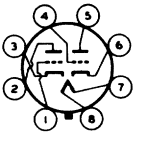
Heater, for Unipotential Cathodes:		
Voltage	26.5 ± 10%	ac or dc volts
Current	0.6	amp
Direct Interelectrode Capacitances (Approx.):		
(Each Unit, without external shield)		
Grid to Plate	8	μμf
Input	6	μμf
Output	2.2	μμf
Heater to Cathode:		
Triode Unit No.1	13	μμf
Triode Unit No.2	13	μμf
Grid of Unit No.1 to Grid of Unit No.2	0.5	μμf
Plate of Unit No.1 to Plate of Unit No.2	2	μμf

Characteristics, Amplifier Class A_1 (Each Unit):

Plate-Supply Voltage	135	volts
Cathode-Bias Resistor	250	ohms
Amplification Factor	2	
Plate Resistance	280	ohms
Transconductance	7000	μmhos
Plate Current	125	ma

Mechanical:

Mounting Position	Any
Maximum Overall Length	4-1/16" ←
Maximum Seated Length	3-1/2" ←
Maximum Diameter	1-23/32"
Bulb	T-12
Base	Large-Wafer Octal 8-Pin with Sleeve and External Barriers (JETEC No.B8-98) ←
Basing Designation for BOTTOM VIEW	8BD



Pin 1 - Grid of Unit No.2
Pin 2 - Plate of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Grid of Unit No.1
Pin 5 - Plate Unit No.1
Pin 6 - Cathode of Unit No.1
Pin 7 - Heater
Pin 8 - Heater

DC AMPLIFIER

Values are for Each Unit

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	250 max.	volts
PLATE CURRENT	125 max.	ma
PLATE DISSIPATION	13 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	300 max.	volts
Heater positive with respect to cathode	300 max.	volts

← Indicates a change

6082

LOW-MU TWIN POWER TRIODE

BULB TEMPERATURE⊕		200 max.	°C

Maximum Circuit Values:

Grid-Circuit Resistance:

For cathode-bias operation	1.0 max.	megohm
For fixed-bias operation□	0.1 max.	megohm
For combined fixed- and cathode-bias operation*	0.1 max.	megohm

→ **CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN**

	Note	Min.	Max.	
Heater Current	1	0.55	0.65	amp
Amplification Factor (Each Unit)	1,2	1.4	2.6	
Plate Current (Each Unit) . . .	1,2	100	150	ma
Transconductance (Each Unit)	1,2	5800	8200	μmhos
Reverse Grid Current (Units in Parallel).	1,3	-	4	μamp

Note 1: With 26.5 volts ac or dc on heater.

Note 2: With plate-supply voltage of 135 volts, and cathode-bias resistor of 250 ohms in each cathode (both triode units operating).

Note 3: With plate-supply voltage of 135 volts, grid resistor of 1 megohm in each grid and cathode-bias resistor of 250 ohms in each cathode (both triode units operating).

⊕ At hottest point on bulb surface.

□ When fixed bias is used, the plate circuit should contain a protective resistance to provide a minimum drop of 15 volts dc at the normal operating conditions.

* When combined fixed- and cathode-bias is used, the cathode-bias portion should have a minimum value of 7.5 volts dc at the normal operating conditions.

→ **SPECIAL RATINGS & PERFORMANCE DATA**

Shock Rating:

Impact Acceleration . . . . . 450 max. g

Tubes are held rigid in four different positions in a Navy Type, High Impact (flyweight) Shock Machine and are subjected to 450 g impact acceleration.

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours.

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . 200 max. mv

Under the following conditions and with units connected in parallel: Heater voltage of 26.5 volts, plate voltage

→ Indicates a change

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LOW-MU TWIN POWER TRIODE

supply of 135 volts, dc grid voltage of -7 volts, plate load resistance of 2000 ohms, and vibrational acceleration of 2.5 g at 25 cycles per second.

Outline Drawing and
Average Plate Characteristics Curve
for the 6082 are the same as
shown for Type 6080

RCA

6101

PREMIUM TYPE 6101

MEDIUM-MU TWIN TRIODE

MINIATURE TYPE

Intended for applications at altitudes up to 55000 feet and where dependable performance under shock and vibration is paramount.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3 ± 10%	ac or dc volts
Current	0.45	amp
Direct Interelectrode Capacitances (Each Unit, approx.)*:		
Grid to Plate	1.5	μμf
Input	2.0	μμf
Output	0.4	μμf
Heater to Cathode	6.0	μμf

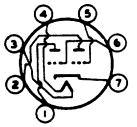
Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	100	volts
Cathode-Bias Resistor	50#	ohms
Amplification Factor	38	
Plate Resistance	6300	ohms
Transconductance	6000	μmhos
Plate Current	8.5	ma

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)

BOTTOM VIEW



Pin 1 – Plate of Unit No.2
Pin 2 – Plate of Unit No.1
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Grid of Unit No.1
Pin 6 – Grid of Unit No.2
Pin 7 – Cathode

AMPLIFIER - Class A_1

Values are for each unit

Maximum Ratings, *Absolute Values:*

	*For Pressures Down to 55 ± 5 mm of Hg***
PLATE VOLTAGE	330 max. volts

* With no external shield.

** Corresponds to altitude of about 55000 feet.

Value is common to both units operating at the specified conditions.

RCA

6101

MEDIUM-MU TWIN TRIODE

PLATE DISSIPATION	0.85 max.	watt
PEAK HEATER–CATHODE VOLTAGE:		
Heater negative with respect to cathode	180 max.	volts
Heater positive with respect to cathode	180 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	165 max.	°C

Maximum Circuit Values (For maximum rated conditions):

Grid–Circuit Resistance:		
For fixed–bias operation	Not recommended	
For cathode–bias operation	0.5 max.	megohm

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.420	0.480	amp
Grid–to–Plate Capacitance (Each Unit)	2	1.2	1.8	μμf
Grid–to–Cathode Capacitance (Each Unit)	2	1.4	2.8	μμf
Plate–to–Cathode Capacitance (Unit No.1)	2	0.25	0.65	μμf
Plate–to–Cathode Capacitance (Unit No.2)	2	0.25	0.55	μμf
Heater–to–Cathode Capacitance	2	4.0	8.0	μμf
Amplification Factor	1,3	28	48	
Plate Current (1)	1,4	6.5	11.5	ma
Plate Current (2)	1,5	–	200	μamp
Plate Current (3)	1,7	5	–	μamp
Transconductance (1)	1,4	4500	7500	μmhos
Transconductance (2)	6,4	▲	–	μmhos
Reverse Grid Current (1)	1,8	–	0.5	μamp
Reverse Grid Current (2)	9,10	–	1.0	μamp
Heater–Cathode Leakage Current:				
Heater negative with respect to cathode	1,11	–	10	μamp
Heater positive with respect to cathode	1,11	–	10	μamp
Leakage Resistance Per Unit:				
Between Grid and All Other Electrodes Tied Together	1,12	100	–	megohms
Between Plate and All Other Electrodes Tied Together	1,13	100	–	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With no external shield.

Note 3: With plate supply voltage of 100 volts, cathode–bias resistor of 50 ohms common to both units, and a cathode bypass capacitor of 1000 μf. Each unit tested separately and with both units operating.

Note 4: With plate supply voltage of 100 volts and cathode–bias resistor of 50 ohms common to both units. Each unit tested separately and with both units operating.

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MEDIUM-MU TWIN TRIODE

Note 5: With dc plate voltage of 250 volts, and dc grid voltage of −14.5 volts. Each unit tested separately and with both units operating.

Note 6: With 5.7 volts ac or dc on heater.

Note 7: With plate supply voltage of 250 volts and dc grid voltage of −10.5 volts. Each unit tested separately and with both units operating.

Note 8: With plate supply voltage of 250 volts, grid-circuit resistance of 1.0 megohm common to both units, and cathode-bias resistor of 500 ohms common to both units. Plate of unit No.1 tied to plate of unit No.2; grid of unit No.1 tied to grid of unit No.2.

Note 9: With 7.0 volts ac or dc on heater.

Note 10: With plate supply voltage of 100 volts, grid-circuit resistance of 1 megohm common to both units and cathode-bias resistor of 50 ohms common to both units. Plate of unit No.1 tied to plate of unit No.2; grid of unit No.1 tied to grid of unit No.2.

Note 11: With 100 volts dc between heater and cathode.

Note 12: With grid 100 volts negative with respect to all other electrodes tied together.

Note 13: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration . . . . . 500 max. g

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-Impact (flyweight) Shock Machine and are subjected to 20 blows at a hammer angle of 30° (equivalent to the specified maximum impact acceleration). At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for vibration, heater-cathode leakage current, and transconductance.

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified vibrational acceleration. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for fatigue, heater-cathode leakage current, and transconductance.

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . 25 max. millivolts

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand low-frequency vibration of its elements with consequent

6101

MEDIUM-MU TWIN TRIODE

generation of audio noise as determined by the measured rms output voltage. Plate of unit No.1 tied to plate of unit No.2 and grid of unit No.1 tied to grid of unit No.2; dc plate voltage of 250 volts, dc grid voltage of -8 volts, plate load resistance of 20000 ohms, and vibrational acceleration of 2.5 g at 25 cps.

Audio-Frequency Noise and Microphonic Performance:

RMS Output Voltage . . . . . 70 max. millivolts

This test is performed on a sample lot of tubes from each production run to determine susceptibility of tube to movement of its elements when tapped and consequent generation of audio noise as determined by the measured rms output voltage. Plate of unit No.1 tied to plate of unit No.2, grid of unit No.1 tied to grid of unit No.2, plate supply voltage of 100 volts, grid-circuit resistance of 0.1 megohm common to both units, cathode-bias resistor of 50 ohms common to both units, and plate load resistance of 10000 ohms.

Glass Strain Test:

This test is performed on a sample lot of tubes from each production run to check for tubes which may have been improperly processed. Tubes are completely submerged in boiling water (97°C to 100°C) for a period of 15 seconds and then immediately submerged in ice water (0°C to 3°C). Tubes will withstand this treatment without loss of vacuum.

Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1.0 microampere under the conditions specified in the CHARACTERISTICS RANGE VALUES for reverse grid current (1).

1-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. With both units operating, each unit is checked for variation in transconductance under conditions of maximum rated plate dissipation. At the end of 1 hour, the value of transconductance of each unit is read. The variation in transconductance from the 0-hour reading will not exceed 12 per cent.

100-Hour Life Performance:

This test is performed on a sample lot of tubes from each production run under conditions of maximum rated plate dissipation to insure a low percentage of early inopera-

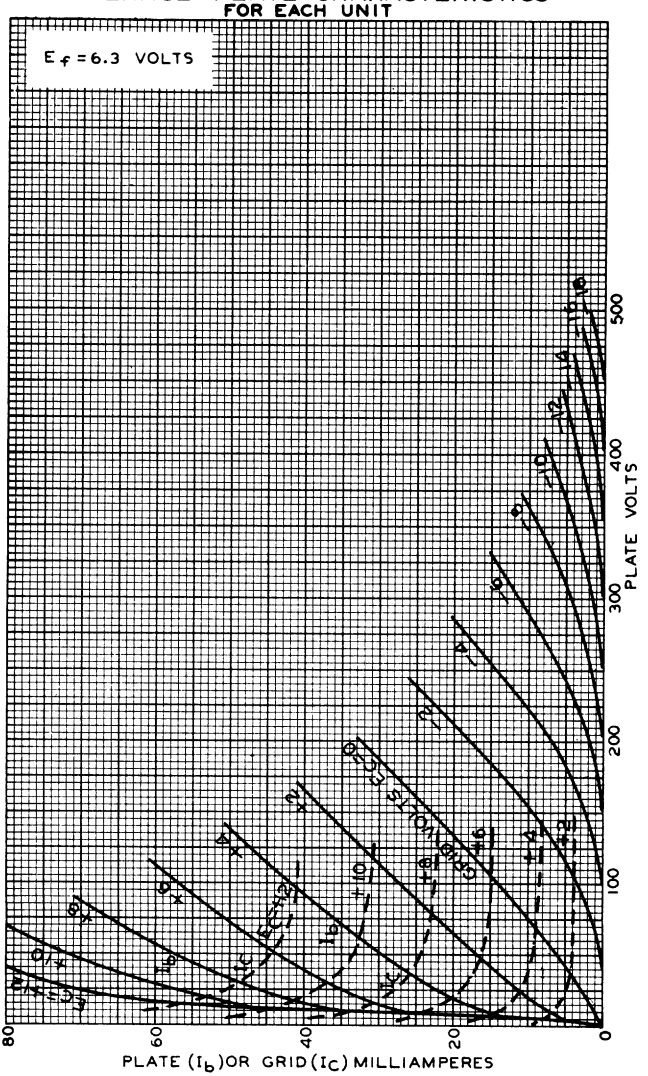
tives. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1.0 microampere under the conditions specified in CHARACTERISTICS RANGE VALUES for reverse grid current (1).

500-Hour Average Life Performance:

This 500-hour test is made on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. With both units operating, each unit is life tested separately at room temperature under the following conditions: heater voltage of 6.3 volts ac or dc, plate supply voltage of 100 volts, dc heater-cathode voltage (heater positive with respect to cathode) of 180 volts, and cathode bias resistor (common to both units) of 50 ohms. At the end of 500 hours, the tubes will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass the established limits of heater current, transconductance with 6.3 volts ac or dc on heater, transconductance with 5.7 volts ac or dc on heater, plate current (1), reverse grid current (2), heater-cathode leakage current, and leakage resistance per unit.

6101

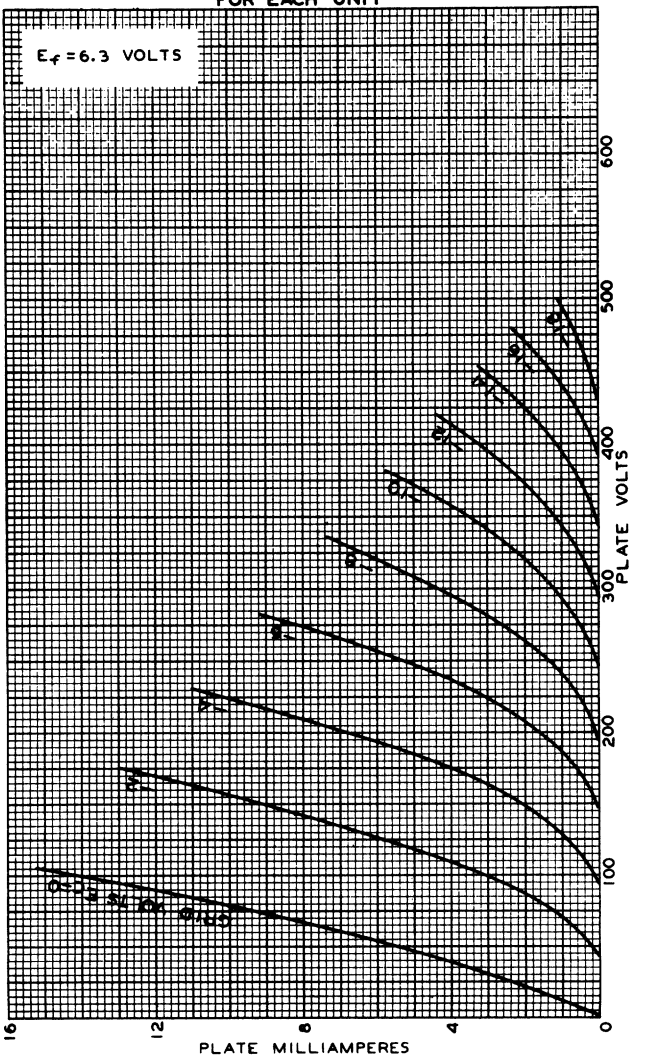
AVERAGE PLATE CHARACTERISTICS
FOR EACH UNIT



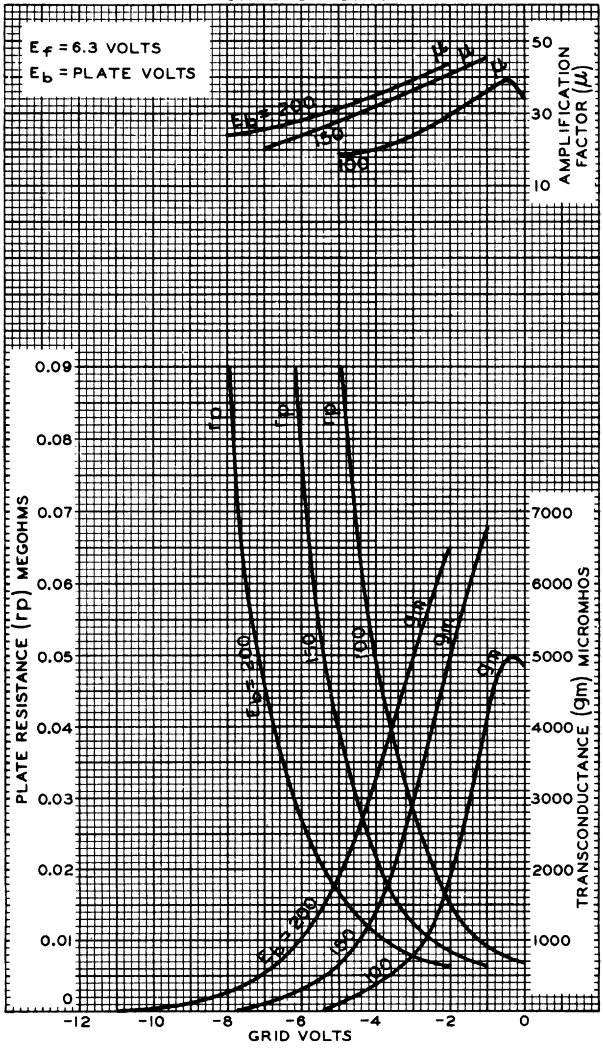
JULY 13, 1953
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-8034

6101

AVERAGE PLATE CHARACTERISTICS FOR EACH UNIT



6101
AVERAGE CHARACTERISTICS
FOR EACH UNIT



6111

MEDIUM-MU TWIN TRIODE

SUBMINIATURE TYPE

Intended for applications at altitudes up to 60,000 feet where dependable performance under shock and vibration is paramount

GENERAL DATA

Electrical:

Heater, Pure Tungsten, for Unipotential Cathodes:

Voltage	6.3	ac or dc volts
Current	0.3	amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield**	
Grid to plate (Each unit)	1.5	1.4	μμf
Grid to cathode and heater (Each unit)	1.9	2.1	μμf
Plate to cathode and heater (Unit No.1)	0.28	1.3	μμf
Plate to cathode and heater (Unit No.2)	0.32	1.4	μμf
Grid of unit No.1 to grid of unit No.2	0.011 max.	0.01 max.	μμf
Plate of unit No.1 to plate of unit No.2	0.5 max.	0.3 max.	μμf

Characteristics, Class A_1 Amplifier (Each Unit):

Plate-Supply Voltage	100	volts
Cathode Resistor	220	ohms
Amplification Factor	20	
Plate Resistance (Approx.)	4000	ohms
Transconductance	5000	μmhos
Plate Current	8.5	ma
Grid Voltage (Approx.) for plate current of 10 μa	-9	volts

Mechanical:

Operating Position	Any
Maximum Length (Excluding flexible leads)	1-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	1.075" ± 0.060"
Diameter	0.366" to 0.400"
Dimensional Outline	*See General Section*
Bulb	T3
Leads, Flexible, Tinned	8
Minimum length	1.5"
Orientation and diameter	*See Dimensional Outline*
Maximum untinned distance from base seat	0.050"

*: See next Page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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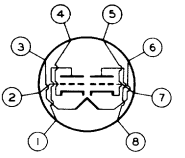
MEDIUM-MU TWIN TRIODE

Base. . . . . .JETEC No.E8-10

BOTTOM VIEW



Lead 1 - Plate of Unit No.2
Lead 2 - Grid of Unit No.2
Lead 3 - Heater
Lead 4 - Cathode of Unit No.2
Lead 5 - Cathode of Unit No.1
Lead 6 - Heater
Lead 7 - Grid of Unit No.1
Lead 8 - Plate of Unit No.1

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Absolute Values:*

For operation at altitudes up to 60,000 feet

PLATE VOLTAGE	165 max.	volts
GRID VOLTAGE:		
Positive bias value	0 max.	volts
Negative bias value	55 max.	volts
PLATE DISSIPATION	1.1 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode .	200 max.	volts
Heater positive with respect to cathode .	200 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface).	220 max.	°C

Maximum Circuit Values:

Grid-Circuit Resistance:		
For cathode-bias operation.	1.2 max.	megohms

* With external shield having inside diameter of 0.405" connected to cathode of unit under test.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Values are for Each Unit and are Initial, Unless Otherwise Specified

	Note	*Min.*	*Max.*	
Heater Current.	1	280	320	ma
Direct Interelectrode Capacitances:				
Grid to plate	2	1.2	1.8	μμf
Grid to cathode and heater. . .	2	1.4	2.4	μμf
Plate to cathode and heater (Unit No.1)	2	0.2	0.36	μμf
Plate to cathode and heater (Unit No.2)	2	0.22	0.42	μμf
Grid of unit No.1 to grid of unit No.2	2	-	0.011	μμf

Notes 1 and 2: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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MEDIUM-MU TWIN TRIODE

	Note	Min.	Max.	
Plate of unit No.1 to plate of unit No.2	2	-	0.5	μμf
Amplification Factor	1,3	17	23	
Plate Current (1)	1,3	6	11	ma
Plate-Current Difference Between Units	1,3	-	2	ma
Plate Current (2)	1,4	-	100	μa
Transconductance:				
With heater volts = 6.3	3	4100	5900	μmhos
Individual change from 0 to 500 hours	1,3	-	20	%
Individual change at end of 500-hour life test with heater voltage reduced to 5.7 volts	3	-	15	%
Difference between average transconductance initially, and average after 500-hours, expressed as a percentage of the initial average	1,3	-	15	%
Reverse Grid Current	1,5	-	0.3	μa
Grid-Emission Current	6,7	-	-0.5	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,8	-	5	μa
Heater positive with respect to cathode	1,8	-	5	μa
Heater-Cathode Leakage Current at 500 hours:				
Heater negative with respect to cathode	1,8	-	10	μa
Heater positive with respect to cathode	1,8	-	10	μa
Leakage Resistance:				
Grid to all other electrodes tied together	1,9	100	-	megohms
Plate to all other electrodes tied together	1,10	100	-	megohms
Leakage Resistance at 500 hours:				
Grid to all other electrodes tied together	1,9	50	-	megohms
Plate to all other electrodes tied together	1,10	50	-	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Without external shield.

Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor (μf) = 1000. Each unit tested separately. Unit not under test connected to ground.

Notes 4 to 10: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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MEDIUM-MU TWIN TRIODE

Note 4: With plate volts = 100 and grid volts = −9. Each unit tested separately. Unit not under test connected to ground.

Note 5: With plate volts = 100, grid resistor (megohms) = 1, and cathode resistor (ohms) = 200. Each unit tested separately. Unit not under test connected to ground.

Note 6: With 7.5 volts dc on heater.

Note 7: With plate volts = 100, grid resistor (megohms) = 1, and grid volts = −9. Preheated prior to testing for 5 minutes at heater volts = 7.5 ac or dc, plate volts = 100, grid resistor (megohms) = 1, and cathode resistor (ohms) = 220.

Note 8: With 100 volts between heater and cathode. Each unit tested separately. Unit not under test connected to ground.

Note 9: With grid 100 volts negative with respect to all other electrodes tied together.

Note 10: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS AND PERFORMANCE DATA

Values are for Each Unit, Unless Otherwise Specified

Shock Rating:

Impact Acceleration . . . . . 450 max. g

This test is performed on a sample lot of tubes from each production run. Tubes are held rigid and are tested in four different positions. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . 100 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: Heater volts = 6.3, plate-supply volts = 100, cathode resistor (ohms) = 220, cathode-bypass capacitor (μf) = 1000, plate load resistor (ohms) = 10,000, and vibrational acceleration of 15 g at 40 cps.

Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . . . 2000 min. cycles

Under the following conditions: Heater volts = 7 cycled one minute on and four minutes off, heater 140 volts

rms with respect to cathode, and all other elements connected to ground. At the end of this test, tubes will not show heater-cathode shorts or open circuits.

Audio-Frequency Noise and Microphonic Performance:

RMS Output Voltage. . . . . 65 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: Units connected in parallel, heater volts = 6.3, plate-supply volts = 100, cathode resistor (ohms) = 100, plate load resistor (megohms) = 0.01, and cathode-bypass capacitor (μf) = 1000. The output voltage of a tube, when tapped, will not cause a reading on a vu meter greater than that produced when a calibrating signal of 65 millivolts rms is applied to the plates of the tube.

Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1 microampere under the conditions specified in the CHARACTERISTICS RANGE VALUES for reverse grid current.

1-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Life-test conditions are the same as those specified under 500-Hour Intermittent Life Performance, except that the test run at room temperature. At the end of 1 hour, the value of transconductance is read. The variation in transconductance from the 0-hour reading will not exceed 10 per cent.

100-Hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life test conditions are the same as those specified under 500-Hour Intermittent Life Performance, except that the test run at room temperature. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit or a value of reverse grid current in excess of 1 microampere under the conditions specified in CHARACTERISTICS RANGE VALUES.

500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. Life testing is conducted under the following conditions: Heater volts = 6.3, plate-supply volts = 100, heater-cathode volts = 200 (heater positive with

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MEDIUM-MU TWIN TRIODE

respect to cathode), cathode resistor (ohms) = 220, grid resistor (megohms) = 1, and bulb temperature (°C) = 220. At the end of 500 hours, tube will not show permanent shorts or open circuits, and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass established initial limits of heater current, individual transconductance change, transconductance change with heater volts = 5.7, and 500-hour limits for reverse grid current, heater-cathode leakage current, leakage resistance, and the difference in transconductance between the initial value and average value shown under CHARACTERISTICS RANGE VALUES.

OPERATING CONSIDERATIONS

The *heater supply* should be well regulated because life and reliability of the 6111 are adversely affected by departures from the 6.3-volt value. The extent to which life is affected is a function of the amount of these departures and their durations.

The *flexible leads* of the 6111 are usually soldered to the circuit elements. Soldering of the connections should be made as far as possible from the glass button. If this precaution is not followed, the heat of the soldering operation will crack the glass seals of the leads and damage the tube.

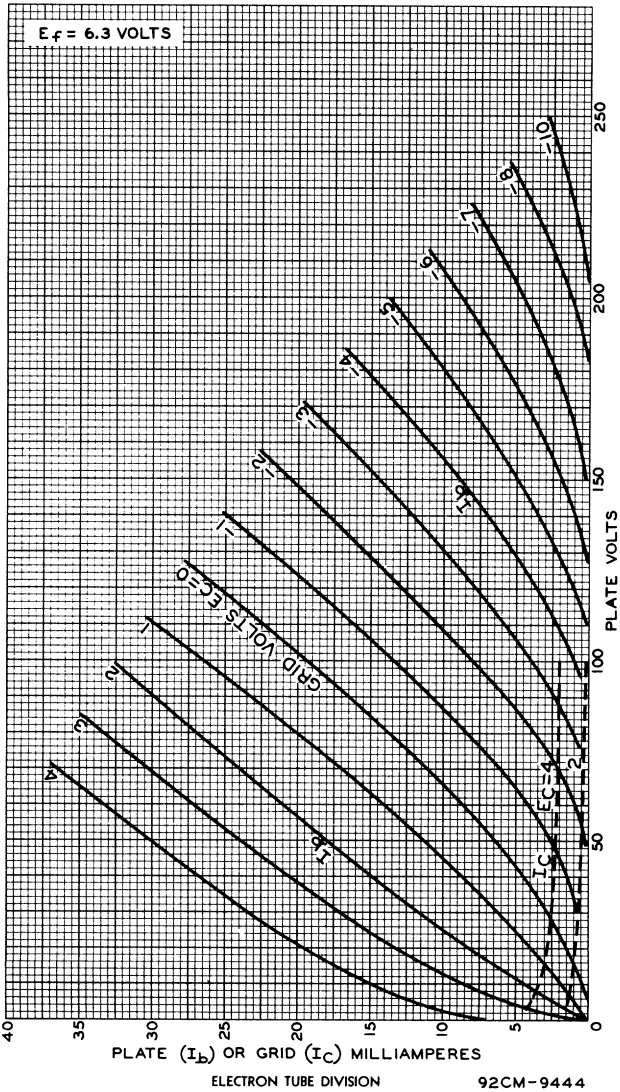
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

6111

AVERAGE CHARACTERISTICS

EACH UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

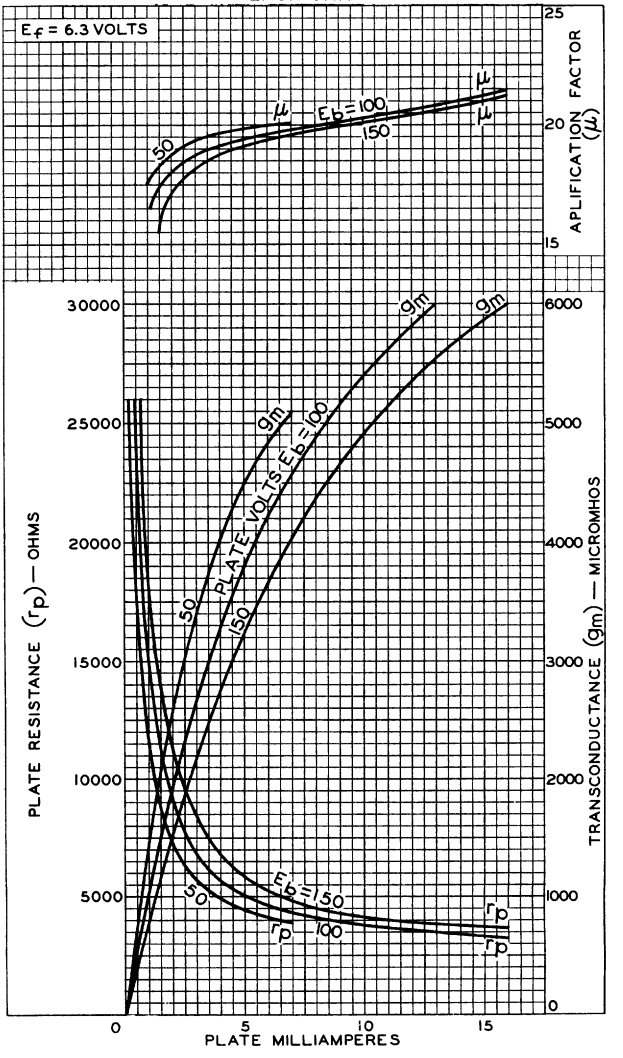
92CM-9444

6111

6111

AVERAGE CHARACTERISTICS

EACH UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9443

RCA

6136

6136 PREMIUM TYPE

SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

Intended for applications where dependable performance under shock and vibration is paramount. This "premium" type is similar to the 6AU6

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage	6.3 ± 10%		ac or dc volts
Current	0.3		amp
Direct Interelectrode Capacitances:°			
Grid No.1 to plate	0.0035 max.		μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	6		μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	5		μμf

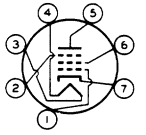
Characteristics, Class A_1 Amplifier:

Plate-Supply Voltage	100	250	volts
Grid No.3 (Suppressor Grid)	♦	♦	
Grid-No.2 (Screen-Grid) Supply Voltage	100	150	volts
Cathode Resistor	150	68	ohms
Plate Resistance (Approx.)	0.5	1	megohm
Transconductance	3900	5200	μmhos
Plate Current	5	10.6	ma
Grid-No.2 Current	2.1	4.3	ma
Grid-No.1 (Control-Grid) Voltage (Approx.) for plate current of 10 μa	-4.2	-6.5	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BK

Pin 1 - Grid No.1
Pin 2 - Grid No.3, Internal Shield
Pin 3 - Heater



Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Cathode

AMPLIFIER — Class A_1

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	330 max.	volts

°,♦: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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SHARP-CUTOFF PENTODE

GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE	0 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	165 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive bias value	0 max.	volts
GRID-No.2 INPUT	0.7 max.	watt
PLATE DISSIPATION	3.3 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	165 max.	°C

Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED AMPLIFIER CHART at end of tabulated data for this type

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	0.5 max.	megohm

° Without external shield.
♦ Connected to cathode at socket.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Values are Initial, Unless Otherwise Specified

	Note	Min.	Max.	
Heater Current	1	0.275	0.325	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	–	0.0035	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	2	4.8	7.2	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	2	3.9	5.9	μμf
Plate Current (1)	1,3	8	13.5	ma
Plate Current (2)	1,4	–	35	μa
Grid-No.2 Current	1,3	2.6	6	ma
Transconductance, Grid No.1 to Plate:				
With heater volts = 6.3	3	4150	6250	μmhos
With heater volts = 5.5	3	3900	–	μmhos
At 500 hours with heater volts = 6.3	3	3600	6250	μmhos

Notes 1 to 4: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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SHARP-CUTOFF PENTODE

	Note	Min.	Max.	
Difference between average transconductance initially, and average after 500 hours, expressed as a percentage of the initial average	1,3	–	17	%
Reverse Grid-No.1 Current.	1,5	–	1	μa
Reverse Grid-No.1 Current at 500 hours.	1,5	–	1	μa
Grid-No.1-Emission Current	6	–	-2	μa
Heater-Cathode Leakage Current:				
Heater 100 volts negative with respect to cathode. . . .	1	–	10	μa
Heater 100 volts positive with respect to cathode. . . .	1	–	10	μa
Heater-Cathode Leakage Current at 500 hours:				
Heater 100 volts negative with respect to cathode. . . .	1	–	10	μa
Heater 100 volts positive with respect to cathode. . . .	1	–	10	μa
Leakage Resistance:				
Grid No.1 to all other electrodes	1,7	100	–	megohms
Plate to all other electrodes. .	1,8	100	–	megohms
Leakage Resistance at 500 hours:				
Grid No.1 to all other electrodes	1,7	50	–	megohms
Plate to all other electrodes. .	1,8	50	–	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Without external shield.

Note 3: With plate-supply voltage of 250 volts, grid-No.2 supply voltage of 150 volts, cathode resistor of 68 ohms, cathode-bypass capacitor of 1000 μf, and grid No.3 tied to cathode.

Note 4: With plate voltage of 250 volts, grid-No.2 voltage of 150 volts, grid-No.1 voltage of -9 volts, plate load resistor of 0.1 megohm, and grid No.3 tied to cathode.

Note 5: With plate voltage of 250 volts, grid-No.3 voltage of 0 volts, grid-No.2 voltage of 150 volts, grid-No.1 voltage of -1 volt, and grid-No.1 resistor of 0.25 megohm.

Note 6: With 7.5 volts ac or dc on heater, plate voltage of 250 volts, grid-No.3 voltage of 0 volts, grid-No.2 voltage of 150 volts, grid-No.1 voltage of -10 volts, and grid-No.1 resistor of 0.25 megohm.

Note 7: With grid No.1 100 volts negative with respect to all other electrodes tied together.

Note 8: With plate 300 volts negative with respect to all other electrodes tied together.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6136

SHARP-CUTOFF PENTODE

SPECIAL RATINGS AND PERFORMANCE DATA

Shock Rating:

Impact Acceleration. . . . . 450 max. g

This test is performed on a sample lot of tubes from each production run. Tubes are held rigid and are tested in four different positions. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, reverse grid-No.1 current and transconductance.

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, reverse grid-No.1 current, and transconductance.

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . 300 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: Heater voltage of 6.3 volts, plate-supply voltage of 250 volts, grid No.3 tied to cathode, grid-No.2 supply voltage of 150 volts, cathode resistor of 68 ohms, cathode-bypass capacitor of 1000 μf, plate load resistor of 2000 ohms and vibrational acceleration of 2.5 g at 25 cps.

Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . . 2000 min. cycles

Under the following conditions: Heater voltage of 7.5 volts cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground.

Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid-No.1 current in excess of 1.0 microampere under the conditions specified in the Characteristics Range Values for reverse grid-No.1 current.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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SHARP-CUTOFF PENTODE

1-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are checked for transconductance under conditions specified under 500-Hour Intermittent Life Performance. At the end of 1 hour, the value of transconductance is read. The variation in transconductance from the 0-hour reading will not exceed 10 per cent.

100-Hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run under conditions specified under 500-Hour Intermittent Life Performance to insure a low percentage of early inoperatives. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit or a value of reverse grid-No.1 current in excess of 1.0 microampere under the conditions specified in Characteristics Range Values.

500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. Life testing is conducted under the following conditions: Heater voltage of 6.3 volts, plate-supply voltage of 300 volts, grid No.3 tied to cathode, grid-No.2 supply voltage of 150 volts, heater-cathode voltage of 135 volts (heater positive with respect to cathode), cathode resistor of 80 ohms and grid-No.1 resistor of 0.5 megohm. At the end of 500 hours, tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass established initial limits of heater current, and 500 hour limits for reverse grid-No.1 current, heater-cathode leakage current, leakage resistance, transconductance range, and the difference in transconductance between the initial value and average value shown under Characteristics Range Values.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6136

SHARP-CUTOFF PENTODE

OPERATING CONDITIONS AS RESISTANCE-COUPLED AMPLIFIER				
Plate-Supply Voltage	90			volts
Plate Load Resistor	0.1	0.22	0.47	megohm
Grid-No.2 Resistor	0.09	0.26	0.75	megohm
Grid-No.1 Resistor (Of following stage)	0.22	0.47	1	megohm
Cathode Resistor	2100	3200	6500	ohms
Peak Output Voltage●	32	32	32	volts
Voltage Gain■	72	99	126	
Plate-Supply Voltage	180			volts
Plate Load Resistor	0.1	0.22	0.47	megohm
Grid-No.2 Resistor	0.15	0.43	1	megohm
Grid-No.1 Resistor (Of following stage)	0.22	0.47	1	megohm
Cathode Resistor	900	1700	3400	ohms
Peak Output Voltage●	82	67	65	volts
Voltage Gain■	116	171	232	
Plate-Supply Voltage	300			volts
Plate Load Resistor	0.1	0.22	0.47	megohm
Grid-No.2 Resistor	0.24	0.5	1.1	megohm
Grid-No.1 Resistor (Of following stage)	0.22	0.47	1	megohm
Cathode Resistor	600	1000	1900	ohms
Peak Output Voltage●	103	108	105	volts
Voltage Gain■	145	230	318	

● Obtained across grid-No.1 resistor of following stage and is for the condition where the signal level is adequate to swing the grid-No.1 of the resistance-coupled amplifier tube to the point where its grid-No.1 starts to draw current.

■ At 5 volts (RMS) output.

Note: Coupling capacitors should be selected to give desired frequency response. Cathode and grid-No.2 resistors should be adequately bypassed.

ELECTRON TUBE DIVISION
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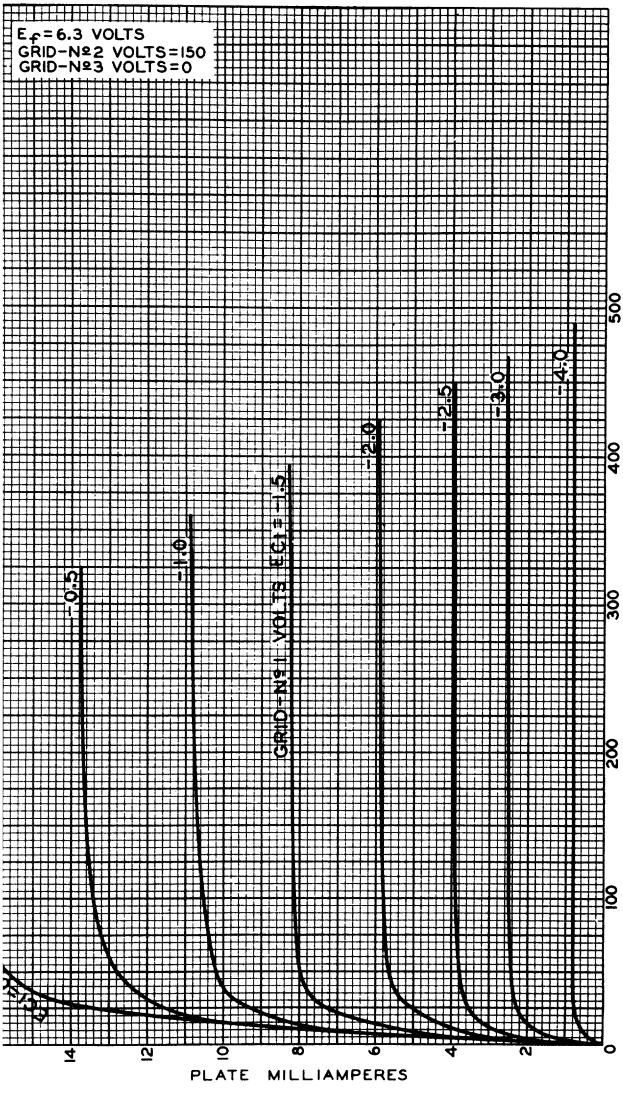
6136

AVERAGE PLATE CHARACTERISTICS



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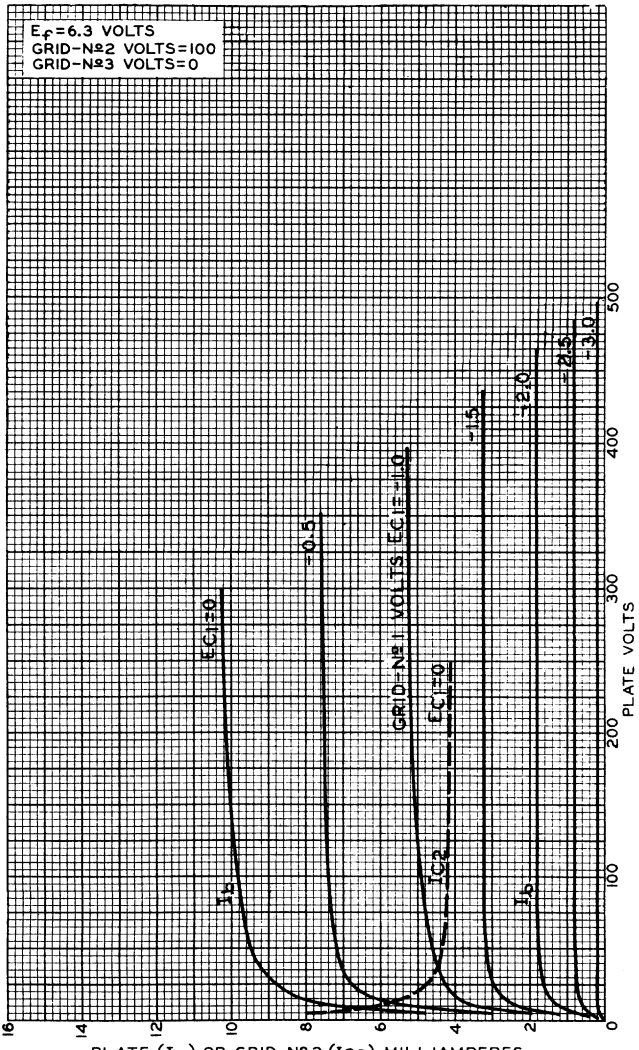
6136

6136

AVERAGE CHARACTERISTICS



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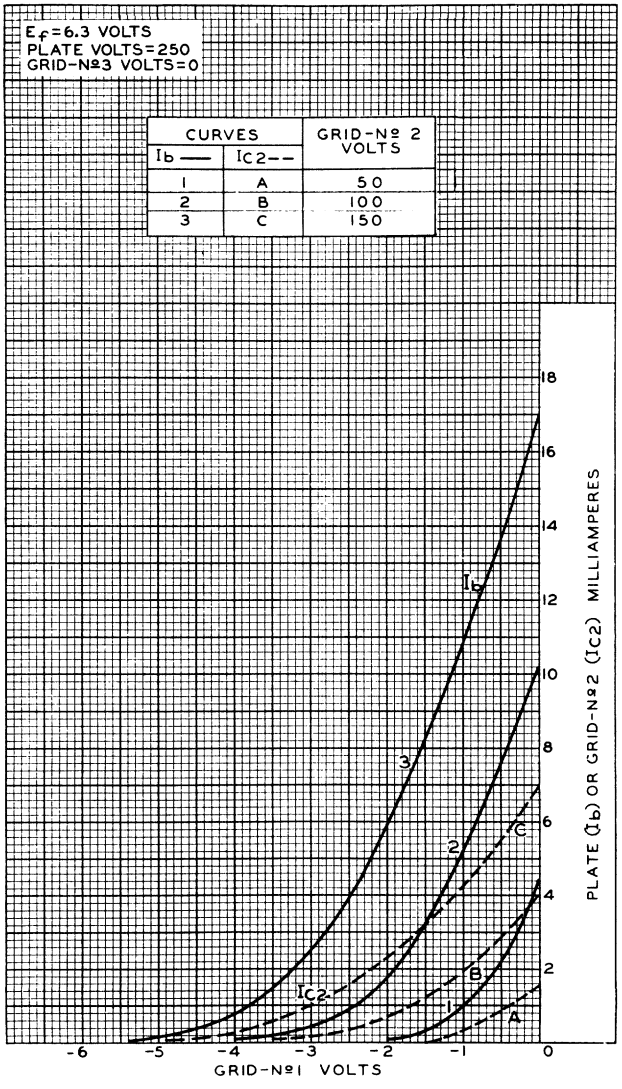
92CM-6611

6136

AVERAGE CHARACTERISTICS



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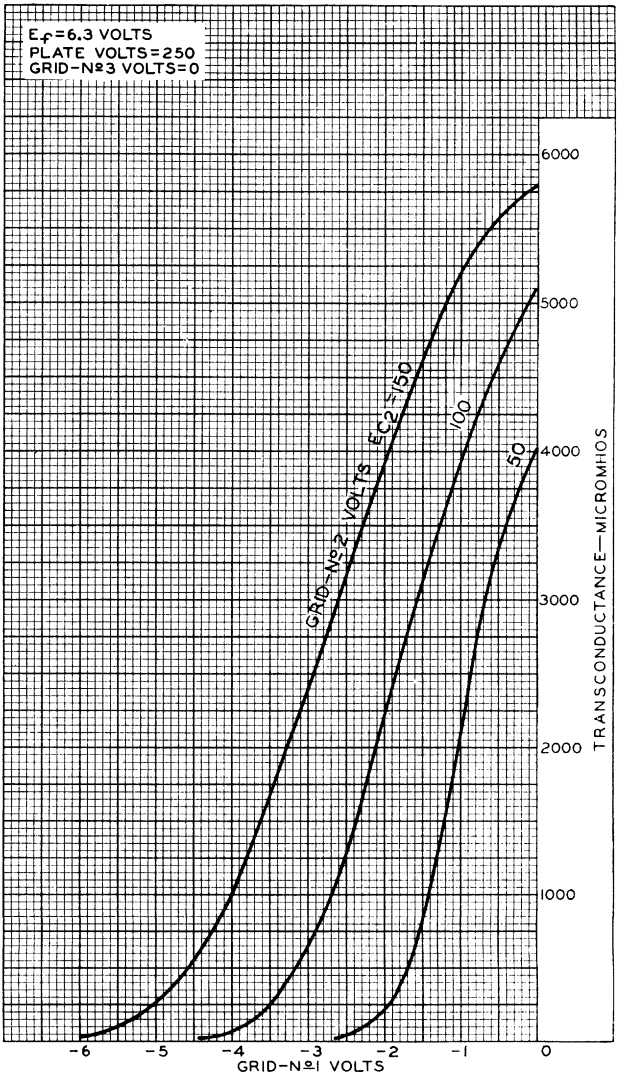
AVERAGE CHARACTERISTICS



6146B/8298A

Beam Power Tube

HIGH POWER SENSITIVITY
RCA "DARK HEATER" WITH 5- TO 8-VOLT RANGE

85 WATTS CW INPUT (ICAS) UP TO 60 Mc CONTROLLED ZERO-BIAS PLATE CURRENT

50 WATTS CW INPUT (ICAS) AT 175 Mc CONTROLLED POWER OUTPUT AT REDUCED HEATER VOLTAGE

For RF Power Amplifier and Oscillator Service and as an AF Power Amplifier and Modulator in Both Mobile and Fixed Equipment. The 6146B/8298A is Unilaterally Interchangeable with types 6146, 6146A, and 8298.

Electrical:

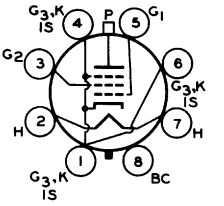
Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current at heater volts = 6.3	1.125	amp
Minimum heating time	60	sec
(See *Special Performance Data* for heater operation in stationary and mobile equipment)		
Transconductance, for plate volts = 200, grid-No.2 volts = 200, and plate ma. = 100	7000	μmhos
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 200, grid-No.2 volts = 200, and plate ma. = 100	4.5	
Direct Interelectrode Capacitances:[a]		
Grid No.1 to plate	0.22 max.	pf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, base sleeve, and heater	13.0	pf
Plate to cathode & grid No.3 & internal shield, grid No.2, base sleeve, and heater	8.5	pf

Mechanical:

Operating Position	Any
Maximum Overall Length	3-13/16"
Seated Length	3-1/8" ± 1/8"
Maximum Diameter	1-21/32"
Weight (Approx.)	2.3 oz
Bulb	T12
Cap	Small (JEDEC No.C1-1)
Bases (Alternates):	
Small-Wafer Octal with Sleeve:	
8-Pin (JEDEC Group 1, No.B8-150)	
Small-Wafer Octal with External Barriers and Sleeve:	
8-Pin (JEDEC Group 1, No.B9-159)	

Basing Designation for BOTTOM VIEW. 7CK

Pin 1 – Cathode, Grid No.3, Internal Shield
Pin 2 – Heater
Pin 3 – Grid No.2
Pin 4 – Same as Pin 1
Pin 5 – Grid No.1
Pin 6 – Same as Pin 1
Pin 7 – Heater
Pin 8 – Base Sleeve
Cap – Plate



Bulb Temperature (At hottest point on bulb surface). . . . . 260 max. °C

AF POWER AMPLIFIER & MODULATOR — Class AB_1[b]

	CCS[c]	*ICAS*[d]	
Maximum Ratings, *Absolute-Maximum Values:*			
DC Plate Voltage	600 max.	750 max.	volts
DC Grid-No.2 Voltage	250 max.	250 max.	volts
Max.-Signal DC Plate Current[e].	175 max.	220 max.	ma
Max.-Signal Plate Input[e] . . .	90 max.	120 max.	watts
Max.-Signal Grid-No.2 Input[e] .	3 max.	3 max.	watts
Plate Dissipation[e]	27 max.	35 max.	watts
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	135 max.	135 max.	volts
Heater positive with respect to cathode	135 max.	135 max.	volts
Typical Push-Pull Operation:			
Values are for 2 tubes			
DC Plate Voltage	600	750	volts
DC Grid-No.2 Voltage[f].	200	200	volts
DC Grid-No.1 Voltage:			
With fixed-bias source . . .	-47	-48	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage[g]	94	96	volts
Zero-Signal DC Plate Current .	48	50	ma
Max.-Signal DC Plate Current .	250	250	ma
Max.-Signal DC Grid No.2 Current.	14.8	12.6	ma
Effective Load Resistance (Plate to plate)	5600	7200	ohms
Max.-Signal Driving Power (Approx.).	0	0	watts
Max.-Signal Power Output (Approx.)	96	124	watts

Maximum Circuit Values (CCS or ICAS):

Grid-No.1-Circuit Resistance under Any Condition:[h]		
With fixed bias	0.1 max.	megohm
With cathode bias	Not recommended	

AF POWER AMPLIFIER & MODULATOR — Class AB_2[j]

	CCS	ICAS	
Maximum Ratings, *Absolute-Maximum Values:*			
DC Plate Voltage	600 max.	750 max.	volts
DC Grid-No.2 Voltage	250 max.	250 max.	volts
Max.-Signal DC Plate Current[e]	175 max.	220 max.	ma
Max.-Signal Plate Input[e]	90 max.	120 max.	watts
Max.-Signal Grid-No.2 Input[e]	3 max.	3 max.	watts
Plate Dissipation[e]	27 max.	35 max.	watts
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	135 max.	135 max.	volts
Heater positive with respect to cathode	135 max.	135 max.	volts

Typical Push-Pull Operation:

	Values are for 2 tubes				
DC Plate Voltage	500	600	600	750	volts
DC Grid-No.2 Voltage[f]	200	200	200	150	volts
DC Grid-No.1 Voltage: From fixed-bias source	-46	-48	-47	-39	volts
Peak AF Grid-No.1-to-Grid No.1 Voltage	108	106	114	110	volts
Zero-Signal DC Plate Current	50	40	50	40	ma
Max.-Signal DC Plate Current	308	270	328	294	ma
Max.-Signal DC Grid No.2 Current	26	27	26	28	ma
Max.-Signal DC Grid No.1 Current	2.7	1.3	3.4	7.6	ma
Effective Load Resistance (Plate to plate)	3620	5200	4160	6050	ohms
Max.-Signal Driving Power (Approx.)[k]	0.2	0.7	0.2	0.5	watt
Max.-Signal Power Output (Approx.)	100	110	130	148	watts

Maximum Circuit Values (CCS or ICAS):

Grid-No.1-Circuit Resistance:[m]		
With fixed bias	30000 max.	ohms
With cathode bias	Not recommended	

LINEAR RF POWER AMPLIFIER — Class AB_1
Single-Sideband Suppressed-Carrier Service

Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2

	CCS	ICAS	
Maximum Ratings, *Absolute-Maximum Values:*			
DC Plate Voltage	600 max.	750 max.	volts
DC Grid-No.2 Voltage	250 max.	250 max.	volts
DC Plate Current at Peak of Envelope	175 max.	220 max.	ma
Plate Dissipation	27 max.	35 max.	watts
Grid-No.2 Dissipation	3 max.	3 max.	watts
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	135 max.	135 max.	volts
Heater positive with respect to cathode	135 max.	135 max.	volts

Typical Operation with "Two-Tone Modulation":

	At 30 Mc		
DC Plate Voltage	600	750	volts
DC Grid-No.2 Voltage[n]	200	200	volts
DC Grid-No.1 Voltage[n]	-47	-48	volts
Zero-Signal DC Plate Current	24	25	ma
Effective RF Load Resistance	2800	3600	ohms
DC Plate Current at Peak of Envelope	125	125	ma
Average DC Plate Current	86	86	ma
DC Grid-No.2 Current at Peak of Envelope	7.4	6.3	ma
Average DC Grid-No.2 Current	5	3.9	ma
Distortion Products Level:[p]			
Third order	24	26	db
Fifth order	30	31	db
Useful Power Output (Approx.):			
Average	24.5	30.5	watts
Peak envelope	49	61	watts

Maximum Circuit Values:

Grid-No.1 Circuit Resistance under Any Condition:		
With fixed bias	30000 max.	ohms

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1; at frequencies up to 60 Mc

	CCS	ICAS	
Maximum Ratings, *Absolute-Maximum Values:*			
For maximum plate voltage and maximum plate input above 60 Mc, see Rating Chart I			
DC Plate Voltage	480 max.	600 max.	volts
DC Grid-No.2 Voltage	250 max.	250 max.	volts

	CCS	ICAS	
DC Grid-No.1 Voltage.	-150 max.	-150 max.	volts
DC Plate Current.	145 max.	180 max.	ma
DC Grid-No.1 Current.	3.5 max.	4 max.	ma
Plate Input	60 max.	85 max.	watts
Grid-No.2 Input	2 max.	2 max.	watts
Plate Dissipation	18 max.	23 max.	watts
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode. . . .	135 max.	135 max.	volts
Heater positive with respect to cathode. . . .	135 max.	135 max.	volts
Typical Operation:			
DC Plate Voltage.	475	600	volts
DC Grid-No.2 Voltage[q]	165	175	volts
DC Grid-No.1 Voltage:[r]			
From a grid-No.1 resistor of:			
26000 ohms.	-86	-	volts
27000 ohms.	-	-92	volts
Peak RF Grid-No.1 Voltage . .	106	114	volts
DC Plate Current.	125	140	ma
DC Grid-No.2 Current.	8.5	9.5	ma
DC Grid-No.1 Current (Approx.)	3.3	3.4	ma
Driving Power (Approx.) . . .	0.4	0.5	watt
Power Output (Approx.). . . .	42	62	watts

Maximum Circuit Values (CCS or ICAS):

Grid-No.1-Circuit Resistance[s] . . . 30000 max. ohms

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy and RF POWER AMPLIFIER — Class C FM Telephony

	CCS	ICAS	
Maximum Ratings, *Absolute-Maximum Values:*			
At frequencies up to 60 Mc. For maximum plate voltage and maximum plate input above 60 Mc, see Rating Chart II			
DC Plate Voltage.	600 max.	750 max.	volts
DC Grid-No.2 Voltage.	250 max.	250 max.	volts
DC Grid-No.1 Voltage.	-150 max.	-150 max.	volts
DC Plate Current.	175 max.	220 max.	ma
DC Grid-No.1 Current.	3.5 max.	4 max.	ma
Plate Input	90 max.	120 max.	watts
Grid-No.2 Input	3 max.	3 max.	watts
Plate Dissipation	27 max.	35 max.	watts
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode.	135 max.	135 max.	volts
Heater positive with respect to cathode.	135 max.	135 max.	volts

Typical Operation:

	CCS	ICAS	
As amplifier up to 60 Mc			
DC Plate Voltage	600	750	volts
DC Grid-No.2 Voltage[t]	200	200	volts
DC Grid-No.1 Voltage:[u]			
From a grid-No.1 resistor of:			
24000 ohms	-70	-	volts
28000 ohms	-	-77	volts
Peak RF Grid-No.1 Voltage	90	95	volts
DC Plate Current	150	160	ma
DC Grid-No.2 Current	10	10	ma
DC Grid-No.1 Current (Approx.)	2.8	2.7	ma
Driving Power (Approx.)	0.3	0.3	watt
Power Output (Approx.)	63	85	watts

Typical Operation:

As amplifier up to 175 Mc				
DC Plate Voltage	320	400	435	volts
DC Grid-No.2 Voltage[t]	210	220	230	volts
DC Grid-No.1 Voltage:[u]				
From a grid-No.1 resistor of:				
26000 ohms	-52	-	-	volts
30000 ohms	-	-55	-	volts
24000 ohms	-	-	-56	volts
Peak RF Grid-No.1 Voltage	65	67	73	volts
DC Plate Current	170	180	210	ma
DC Grid-No.2 Current	12	12	11	ma
DC Grid-No.1 Current (Approx.)	2	1.9	2.3	ma
Driving Power (Approx.)	2	2	3	watts
Power Output (Approx.)	29	40	50	watts

Maximum Circuit Values (CCS or ICAS):

Grid-No.1-Circuit Resistance[s]	30000 max.	ohms

[a] With no external shield.

[b] Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.

[c] Continuous Commercial Service

[d] Intermittent Commercial and Amateur Service.

[e] Averaged over any audio-frequency cycle of sine-wave form.

[f] Obtained preferably from a separate source or from the plate voltage supply with a voltage divider.

[g] The driver stage should be capable of supplying the No.1 grids of the class AB_1 stage with the specified driving voltage at low distortion.

[h] The type of input coupling network used should not introduce too much resistance in the grid-No.1 circuit. Transformer or impedance coupling devices are recommended.

[j] Subscript 2 indicates that grid-No.1 current flows during some part of the input cycle.

[k] Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the AB_2 stage.

[m] To minimize distortion, the effective resistance per grid-No.1 circuit of the AB_2 stage should be held at a low value. For this purpose the use of transformer coupling is recommended. In no case, however, should the total dc grid-No.1-circuit resistance exceed 30,000 ohms when the tube is operated at maximum ratings. For operation at less than maximum ratings, the dc grid-No.1-circuit resistance may be as high as 100,000 ohms.

[n] Obtained preferably from a separate, well-regulated source.

[p] Referenced to either of the two tones and without the use of feedback to enhance linearity.

[q] Obtained preferably from a separate source modulated with the plate supply, or from the modulated plate supply through a series resistor.

[r] Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

[s] When grid No.1 is driven positive and the tube is operated at maximum ratings, the total dc grid-No.1-circuit resistance should not exceed the specified value of 30,000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply. For operation at less than maximum ratings, the dc grid-No.1-circuit resistance may be as high as 100,000 ohms.

[t] Obtained preferably from separate source, or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should be used only when the tube is used in a circuit which is not keyed. Grid-No.2 voltage must not exceed 435 volts under key-up conditions.

[u] Obtained from fixed-supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

CHARACTERISTICS RANGE VALUES

Test No.		*Note*	*Min.*	*Max.*	
1.	Direct Interelectrode Capacitances:				
	Grid No.1 to plate	1	-	0.22	pf
	Grid No.1 to cathode & grid No.3 & internal shield, base sleeve, grid No.2, and heater. .	1	12.0	15.0	pf
	Plate to cathode & grid No.3 & internal shield, base sleeve, grid No.2, and heater	1	7.3	9.5	pf
2.	Plate Current.	2	46	94	ma
3.	Zero-Bias Plate Current. . .	3	330	-	ma
4.	Grid-No.2 Current.	2	-	5.5	ma

Note 1: With no external shield.

Note 2: With heater voltage of 6.75 volts, dc plate voltage of 400 volts, dc grid-No.2 voltage of 200 volts, and dc grid-No.1 voltage of -34 volts.

Note 3: With heater voltage of 6.75 volts, dc plate voltage of 100 volts, dc grid-No.2 voltage of 200 volts, and dc grid-No.1 voltage of -100 volts. Grid No.1 is square-wave pulsed at 1000 kc to zero volts. Limit value is peak-pulse current.

SPECIAL PERFORMANCE DATA

Stationary Equipment Operation:

	Min.	*Design Center*	*Max.*	
Heater, for Unipotential Cathode:				
Voltage (AC or DC)[v]	-	6.3	-	volts
Current at 6.3 volts.	1.050	-	1.200	amp
Dynamic Grid-No.2 Current[w]. . .	-	-	15	ma
Useful Power Output[w].	59	-	-	watts

[v] It is recommended that the design-center heater voltage be 6.3 volts; the heater power supply should not fluctuate more than 10% to insure long life.

[w] In a single-tube, self-excited oscillator circuit, and with ac heater voltage of 6.3 volts, dc plate voltage of 600 volts, dc grid-No.2 voltage of 200 volts, grid-No.1 resistor of 24,000 ± 10% ohms, dc plate current of 150 max. ma., dc grid-No.1 current of 2.5 to 3 ma., and frequency of 15 Mc.

Mobile Equipment Operation:

	Min.	*Design Range*	*Max.*	
Heater, for Unipotential Cathode:				
Voltage (AC or DC)[x]	–	6.0–7.5	–	volts
Current at 6.75 volts	1.100	–	1.230	amp
Dynamic Grid-No.2 Current[y]	–	–	15	ma
Useful Power Output I[y]	59			watts
Useful Power Output II		See *Note Z*		

Overvoltage Heater Life Tests:

Continuous heater life tests are performed periodically on sample lots of tubes with 8 volts on the heater, all other electrodes "floating". Intermittent heater life tests are performed periodically on sample lots of tubes with 11 volts on the heater, a cycle of 1 minute "ON" and 4 minutes "OFF". After 1000 hours of the continuous heater life test and after 48 hours of the intermittent heater life test, the following tests are performed:

With heater voltage of 6.75 volts and ± 100 dc volts between cathode and heater, the heater-cathode leakage current will not exceed 100 microamperes.

With ac or dc heater voltage of 6.75 volts, grid-No.1 volts = -200 and cathode, grid No.2, and plate grounded, the minimum grid-No.1 leakage resistance will be 10 megohms.

With ac or dc heater voltage of 6.75 volts, plate volts = -200, and cathode grid No.1 and grid No.2 grounded, the minimum plate leakage resistance will be 10 megohms.

[x] It is recommended that the heater voltage operate within the range of 6.0 to 7.5 volts and within excursions from 5 to 8 volts in battery operation. See *Useful Power Output Test II* and *Overvoltage Tests*.

[y] In a single-tube, self-excited oscillator circuit, and with ac heater voltage of 6.3 volts, dc plate voltage of 600 volts, dc grid-No.2 voltage of 200 volts, grid-No.1 resistor of 24,000 ± 10% ohms, dc plate current of 150 max. ma., dc grid-No.1 current of 2.5 to 3 ma., and frecuency of 15 Mc.

[z] With conditions in note (y) above, reduce heater voltage to 5 volts. Useful power output will be at least 90% of the power output at heater voltage of 6.3 volts.

OPERATING CONSIDERATIONS

The maximum bulb temperature of 260° C is a tube rating and is to be observed in the same manner as other ratings. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. The latter is made by the Tempil Corporation, 132 W. 22nd Street, New York 11, N.Y.

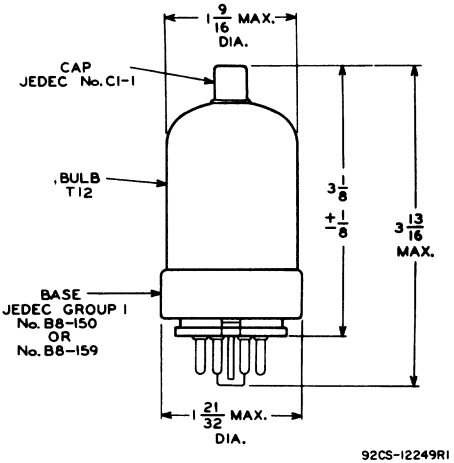
To insure adequate cooling it is essential that free circulation of air be provided around the tube. In most cases, no additional air is required.

The plate shows no color when the 6146B/8298A is operated at full ratings under either CCS or ICAS conditions.

Connections to the plate should be made with a flexible lead to prevent any strain on the seal at the cap.

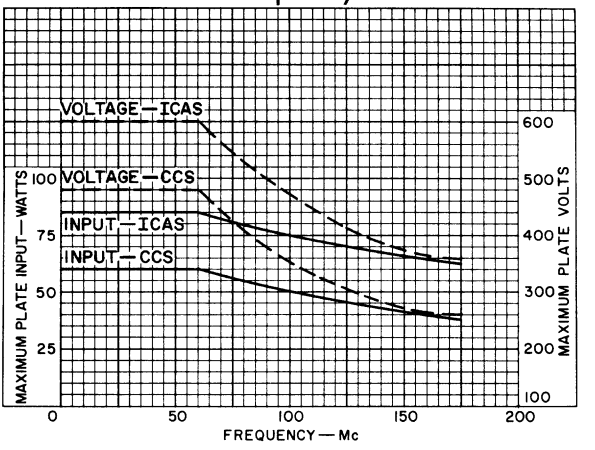
During standby periods in intermittent operation, it is recommended that the heater voltage be maintained at normal operating value when the period is less than 15 minutes, and that it be reduced to 80 per cent of normal when the period is between 15 minutes and 2 hours. For longer periods, the heater voltage should be turned off.

The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.



DIMENSIONS IN INCHES

RATING CHART I
Class C Telephony Service



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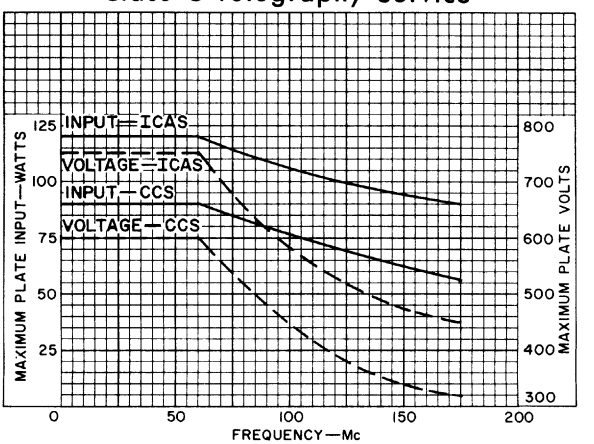
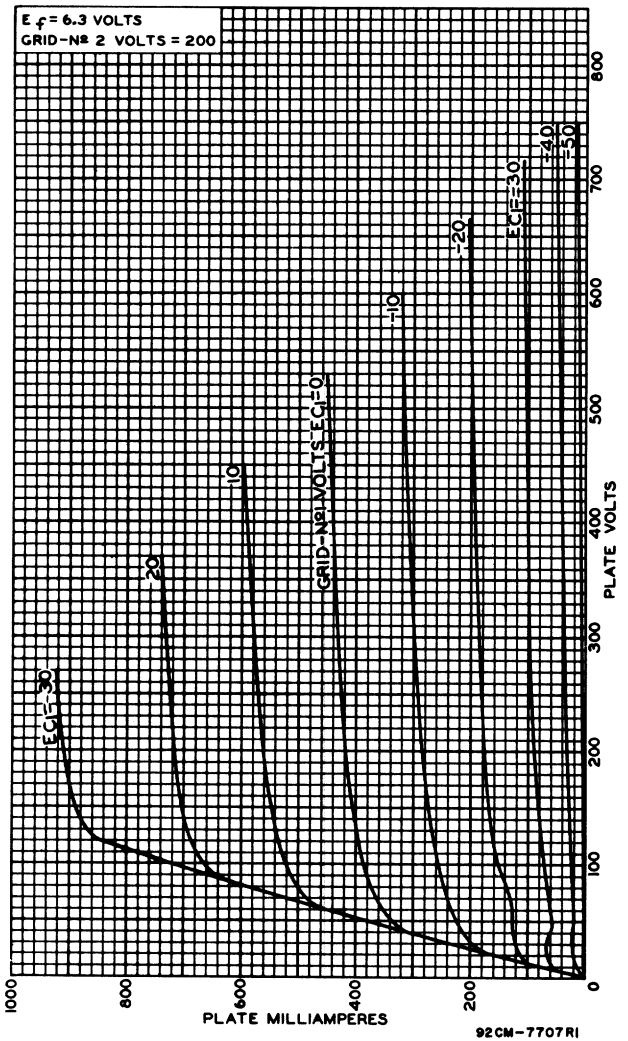
RATING CHART II
Class C Telegraphy Service



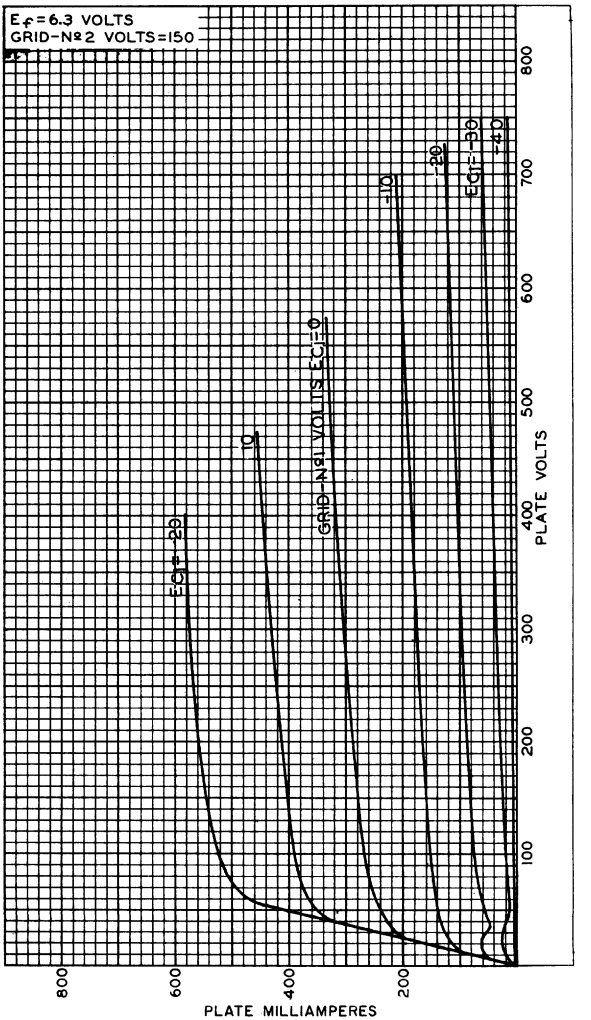
92CS-12243

TYPICAL PLATE CHARACTERISTICS



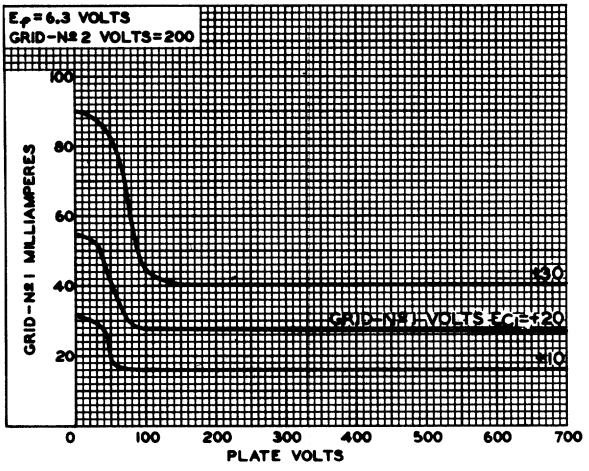
6146B/8298A

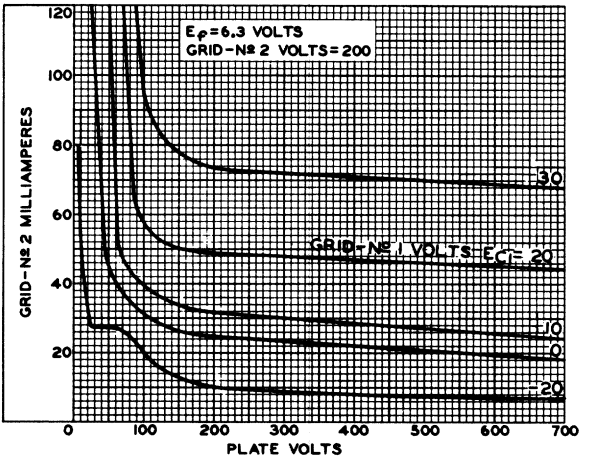
TYPICAL PLATE CHARACTERISTICS



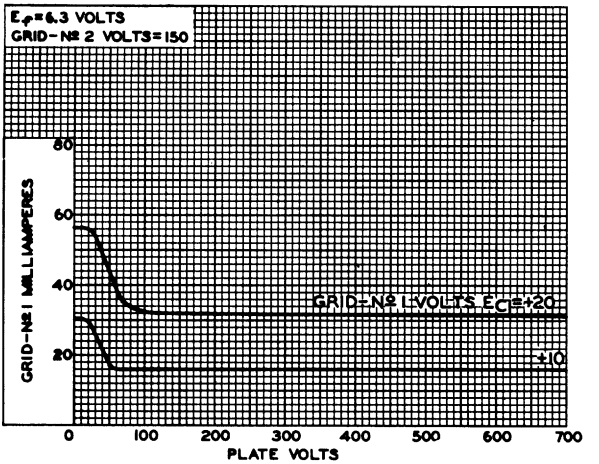
92CM-8145

TYPICAL CHARACTERISTICS

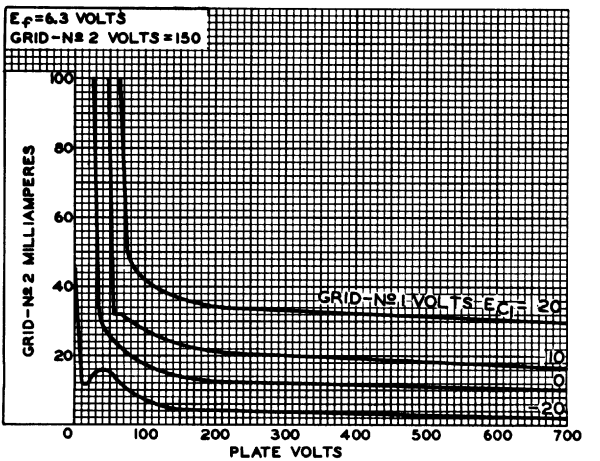




TYPICAL CHARACTERISTICS



92CS-9619



92CS-9620

Beam Power Tube

HIGH POWER SENSITIVITY
RCA "DARK HEATER" WITH 21- TO 31-VOLT RANGE
85 WATTS CW INPUT (ICAS) UP TO 60 Mc
50 WATTS CW INPUT (ICAS) AT 175 Mc
CONTROLLED ZERO-BIAS PLATE CURRENT
CONTROLLED POWER OUTPUT AT REDUCED HEATER VOLTAGE

For RF Power Amplifier and Oscillator Service and as an AF Power Amplifier and Modulator in Both Mobile and Fixed Equipment. The 6159B is Unilaterally Interchangeable with Types 6159, 6159A.

The 6159B is the same as the 6146B/8298A except for the following items:

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	26.5	volts
Current at heater volts = 26.5	0.3	amp
Minimum heating time	60	sec
Direct Interelectrode Capacitances:[a]		
Grid No.1 to plate	0.24 max.	pf

[a] With no external shield.

CHARACTERISTICS RANGE VALUES

Test No.		*Note*	*Min.*	*Max.*	
1	Direct Interelectrode Capacitances: Grid-No.1 to plate	1	–	0.24	pf

Note 1: With no external shield.

SPECIAL PERFORMANCE DATA

Stationary Equipment Operation:

	Min.	*Design Center*	*Max.*	
Heater, for Unipotential Cathode:				
Voltage (AC or DC)[v]	–	26.5	–	volts
Current at 26.5 volts	0.28	–	0.32	amp
Useful Power Output[w]	59	–	–	watts

[v] It is recommended that the design-center heater voltage be 26.5 volts; the heater power supply should not fluctuate more than 10% to insure long life.

[w] In a single-tube, self-excited oscillator circuit, and with ac heater voltage of 26.5 volts, dc plate voltage of 600 volts, dc grid-No.2 voltage of 200 volts, grid-No.1 resistor of 24,000 ± 10% ohms, dc plate current of 150 max. ma., dc grid-No.1 current of 2.5 to 3 ma., and frequency of 15 Mc.

Mobile Equipment Operation:

	Min.	*Design Range*	*Max.*	
Heater, for Unipotential Cathode:				
Voltage (AC or DC)[x]	–	24 to 29	–	volts
Current at 26.5 volts	0.28	–	0.32	amp
Useful Power Output I[y]	59	–	–	watts
Useful Power Output II		See *Note Z*		

[x] It is recommended that the heater voltage operate within the range of 24 to 29 volts and within excursions from 21 to 31 volts in battery operation. See *Useful Power Output II* and *Overvoltage Tests*.

[y] In a single-tube, self-excited oscillator circuit, and with ac heater voltage of 26.5 volts, dc plate voltage of 600 volts, dc grid-No.2 voltage of 200 volts, grid-No.1 resistor of 24,000 ± 10% ohms, dc plate current of 150 max. ma., dc grid-No.1 current of 2.5 to 3 ma., and frequency of 15 Mc.

[z] With conditions in note (y) above, reduce heater voltage to 21 volts. Useful power output will be at least 90% of the power output at heater voltage of 26.5 volts.

Overvoltage Heater Life Tests:

Continuous heater life tests are performed periodically on sample lots of tubes with 31 volts on the heater, all other electrodes "floating". Intermittent heater life tests are performed periodically on sample lots of tubes with 43 volts on the heater, a cycle of 1 minute "ON" and 4 minutes "OFF". After 1000 hours of the continuous heater life test and after 48 hours of the intermittent heater life test, the following tests are performed:

With heater voltage of 26.5 volts and ± 100 dc volts between cathode and heater, the heater-cathode leakage current will not exceed 150 microamperes.

With ac or dc heater voltage of 26.5 volts, grid-No.1 volts = −200 and cathode, grid No.2, and plate grounded, the minimum grid-No.1 leakage resistance will be 10 megohms.

With ac or dc heater voltage of 26.5 volts, plate volts = −200, and cathode grid No.1 and grid No.2 grounded, the minimum plate leakage will be 10 megohms.

Beam Power Tube

HIGH POWER SENSITIVITY
RCA "DARK HEATER" WITH 21- TO 31-VOLT RANGE
85 WATTS CW INPUT (ICAS) UP TO 60 Mc
50 WATTS CW INPUT (ICAS) AT 175 Mc
CONTROLLED ZERO-BIAS PLATE CURRENT
CONTROLLED POWER OUTPUT AT REDUCED HEATER VOLTAGE

For RF Power Amplifier and Oscillator Service and as an AF Power Amplifier and Modulator in Both Mobile and Fixed Equipment. The 6159B is Unilaterally Interchangeable with Types 6159, 6159A.

The 6159B is the same as the 6146B/8298A except for the following items:

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	26.5	volts
Current at heater volts = 26.5	0.3	amp
Minimum heating time	60	sec
Direct Interelectrode Capacitances:[a]		
Grid No.1 to plate	0.24 max.	pf

[a] With no external shield.

CHARACTERISTICS RANGE VALUES

Test No.		*Note*	*Min.*	*Max.*	
1	Direct Interelectrode Capacitances: Grid-No.1 to plate	1	-	0.24	pf

Note 1: With no external shield.

SPECIAL PERFORMANCE DATA

Stationary Equipment Operation:

	Min.	*Design Center*	*Max.*	
Heater, for Unipotential Cathode:				
Voltage (AC or DC)[v]	-	26.5	-	volts
Current at 26.5 volts	0.28	-	0.32	amp
Useful Power Output[w]	59	-	-	watts

[v] It is recommended that the design-center heater voltage be 26.5 volts; the heater power supply should not fluctuate more than 10% to insure long life.

[w] In a single-tube, self-excited oscillator circuit, and with ac heater voltage of 26.5 volts, dc plate voltage of 600 volts, dc grid-No.2 voltage of 200 volts, grid-No.1 resistor of 24,000 ± 10% ohms, dc plate current of 150 max. ma., dc grid-No.1 current of 2.5 to 3 ma., and frequency of 15 Mc.

Mobile Equipment Operation:

	Min.	*Design Range*	*Max.*	
Heater, for Unipotential Cathode:				
Voltage (AC or DC)[x]	–	24 to 29	–	volts
Current at 26.5 volts	0.28	–	0.32	amp
Useful Power Output I[y]	59	–	–	watts
Useful Power Output II		See *Note Z*		

[x] It is recommended that the heater voltage operate within the range of 24 to 29 volts and within excursions from 21 to 31 volts in battery operation. See *Useful Power Output II* and *Overvoltage Tests*.

[y] In a single-tube, self-excited oscillator circuit, and with ac heater voltage of 26.5 volts, dc plate voltage of 600 volts, dc grid-No.2 voltage of 200 volts, grid-No.1 resistor of 24,000 ± 10% ohms, dc plate current of 150 max. ma., dc grid-No.1 current of 2.5 to 3 ma., and frequency of 15 Mc.

[z] With conditions in note (y) above, reduce heater voltage to 21 volts. Useful power output will be at least 90% of the power output at heater voltage of 26.5 volts.

Overvoltage Heater Life Tests:

Continuous heater life tests are performed periodically on sample lots of tubes with 31 volts on the heater, all other electrodes "floating". Intermittent heater life tests are performed periodically on sample lots of tubes with 43 volts on the heater, a cycle of 1 minute "ON" and 4 minutes "OFF". After 1000 hours of the continuous heater life test and after 48 hours of the intermittent heater life test, the following tests are performed:

With heater voltage of 26.5 volts and ± 100 dc volts between cathode and heater, the heater-cathode leakage current will not exceed 150 microamperes.

With ac or dc heater voltage of 26.5 volts, grid-No.1 volts = −200 and cathode, grid No.2, and plate grounded, the minimum grid-No.1 leakage resistance will be 10 megohms.

With ac or dc heater voltage of 26.5 volts, plate volts = −200, and cathode grid No.1 and grid No.2 grounded, the minimum plate leakage will be 10 megohms.

6159W/7357

Beam Power Tube

HIGH POWER SENSITIVITY

90 WATTS CW INPUT (ICAS) UP TO 60 Mc
60 WATTS CW INPUT (ICAS) AT 175 Mc

For Use Under Severe Shock and Vibration

The 6159W/7357 is the same as the 6146W/7212 except for the following items:

Heater, for Unipotential Cathode:		
Voltage (AC or DC).	26.5 ± 10%	volts
Current at heater volts = 26.5. . . .	0.3	amp

CHARACTERISTICS RANGE VALUES

	Note	*Min.*	*Max.*	
Heater Current.	1	0.280	0.320	amp

Note 1: With 26.5 volts ac on heater.

6161
POWER TRIODE

FORCED-AIR COOLED

Useful with full input up to 900 Mc
and with reduced input up to 2000 Mc

The 6161 supersedes type 5588 for new equipment design.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage*	6.3 av.	ac or dc volts
	6.9 max.	ac or dc volts
Current at 6.3 volts	3.4	amp
Minimum heating time at 6.3 volts	1	minute
Amplification Factor for grid volts = −15, and plate ma. = 250	25	
Direct Interelectrode Capacitances:		
Grid to plate§	6	μμf
Grid to cathode and heater§	11	μμf
Plate to cathode and heater°	0.19	μμf

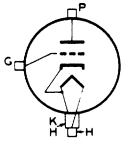
Mechanical:

Operating Position	Any
Overall Length	3-5/16" ± 3/32"
Greatest Diameter	1.750" ± 0.010"
Weight (Approx.)	8 oz
Radiator	Integral part of tube
Mounting	Special

Terminal Connections *(See Dimensional Outline)*:

G – Grid

H – Heater



K – Cathode

P – Plate

Air Flow:

The specified air flow for various plate dissipations, as indicated in the tabulation below, should be delivered by a blower onto the respective terminals and seals, and through the radiator before and during the application of any voltages. Heater power, plate power, and air may be removed simultaneously.

Percentage of maximum-rated plate dissipation for each class of service	100	80	60	%
Minimum air flow	16	10	5.7	cfm
Static pressure	0.85	0.4	0.16	in. of water

*,§,°: See next page.

◄ Indicates a change.

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POWER TRIODE

The above flow and pressure values are for condition with radiator temperature held constant at 135° C rise above incoming-air temperature. The air flow must be adequate to limit the temperature of the radiator, grid terminal, cathode terminal, and seals to their respective maximum values.

Radiator Temperature (Measured on core at end adjacent to plate flange)	180 max.	°C
Grid-Terminal Temperature	150 max.	°C
Cathode-Terminal Temperature	150 max.	°C
Seal Temperature (Plate, grid, and cathode)	150 max.	°C

RF POWER AMPLIFIER — Class B Television Service

Synchronizing-level conditions per tube unless otherwise specified

Maximum CCS• Ratings, *Absolute Values:*

DC PLATE VOLTAGE	1600 max.	volts
DC PLATE CURRENT	0.350 max.	amp
→ DC GRID CURRENT:		
Negative value	0.010 max.	amp
Positive value	0.100 max.	amp
PLATE INPUT	560 max.	watts
PLATE DISSIPATION	250 max.	watts

Typical Operation in Cathode-Drive Circuit at 600 Mc:

	Bandwidth♦ of 6 Mc	
DC Plate-to-Grid Voltage	1600	volts
DC Cathode-to-Grid Voltage	100	volts
Peak RF Cathode-to-Grid Voltage:		
Synchronizing level	130	volts
Pedestal level	117	volts
DC Plate Current:		
Synchronizing level	0.350	amp
Pedestal level	0.285	amp
DC Grid Current (Approx.):		
Synchronizing level	0.040	amp
Pedestal level	0.013	amp
Driver Power Output (Approx.):♣		
Synchronizing level	65#	watts
Pedestal level	40	watts
Output-Circuit Efficiency (Approx.)	89	%
Useful Power Output (Approx.):		
Synchronizing level	325••	watts
Pedestal level	195••	watts

Typical Operation in Cathode-Drive Circuit at 900 Mc:

	Bandwidth♦ of 6 Mc	
DC Plate-to-Grid Voltage	1600	volts
DC Cathode-to-Grid Voltage	100	volts

*, §, °, •, ♦, ♣, #, ••: See next page.

→ Indicates a change.

6161
POWER TRIODE

Peak RF Cathode-to-Grid Voltage:		
Synchronizing level	135	volts
Pedestal level	120	volts
DC Plate Current:		
Synchronizing level	0.350	amp
Pedestal level	0.280	amp
DC Grid Current (Approx.):		
Synchronizing level	0.030	amp
Pedestal level	0.010	amp
Driver Power Output (Approx.):♣		
Synchronizing level	75⊕	watts
Pedestal level	45	watts
Output-Circuit Efficiency (Approx.)	65	%
Useful Power Output (Approx.):		
Synchronizing level	230●●	watts
Pedestal level	135●●	watts

BIAS-MODULATED RF POWER AMPLIFIER
Class C Television Service

Synchronizing-level conditions per tube unless otherwise specified

Maximum CCS● Ratings, *Absolute Values:*

DC PLATE VOLTAGE	1600 max.	volts
DC GRID VOLTAGE (White level)	-300 max.	volts
DC PLATE CURRENT	0.350 max.	amp
DC GRID CURRENT:		
Negative value	0.010 max.	amp
Positive value	0.100 max.	amp
PLATE INPUT	560 max.	watts
PLATE DISSIPATION	250 max.	watts

Typical Operation in Cathode-Drive Circuit at 600 Mc:

	Bandwidth♦ of 6 Mc	
DC Plate-to-Grid Voltage	1600	volts
DC Cathode-to-Grid Voltage:		
Synchronizing level	100	volts
Pedestal level	150	volts
White level	230	volts
Peak RF Cathode-to-Grid Voltage	130	volts
DC Plate Current:		
Synchronizing level	0.350	amp
Pedestal level	0.250	amp
DC Grid Current (Approx.):		
Synchronizing level	0.040	amp
Pedestal level	0.013	amp
Driver Power Output (Approx.):♣		
Synchronizing level	65#	watts
Output-Circuit Efficiency (Approx.)	89	%
Useful Power Output (Approx.):		
Synchronizing level	325●●	watts
Pedestal level	195●●	watts

*,§,o,●,♦,♣,#,●●,⊕: See next page. ← Indicates a change.

RCA

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POWER TRIODE

Typical Operation in Cathode-Drive Circuit at 900 Mc:

	Bandwidth♦ of 6 Mc	
DC Plate-to-Grid Voltage	1600	volts
DC Cathode-to-Grid Voltage:		
Synchronizing level	100	volts
Pedestal level	150	volts
White level	230	volts
Peak RF Cathode-to-Grid Voltage	135	volts
DC Plate Current:		
Synchronizing level	0.350	amp
Pedestal level	0.250	amp
DC Grid Current (Approx.):		
Synchronizing level	0.030	amp
Pedestal level	0.010	amp
Driver Power Output (Approx.):♣		
Synchronizing level	75⊕	watts
Output-Circuit Efficiency (Approx.)	65	%
Useful Power Output (Approx.):		
Synchronizing level	230●●	watts
Pedestal level	135●●	watts

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a max. modulation factor of 1.0

Maximum CCS● Ratings, *Absolute Values:*

DC PLATE VOLTAGE	1300 max.	volts
DC GRID VOLTAGE	−300 max.	volts
DC PLATE CURRENT	0.210 max.	amp
→ DC GRID CURRENT	*See Rating Chart*	
PLATE INPUT	270 max.	watts
PLATE DISSIPATION	167 max.	watts

Typical Operation in Cathode-Drive Circuit at 600 Mc:

DC Plate-to-Grid Voltage	1400	volts
DC Cathode-to-Grid Voltage	150	volts
Peak RF Cathode-to-Grid Voltage	200	volts
DC Plate Current	0.210	amp
DC Grid Current (Approx.)	0.070	amp
Driver Power Output (Approx.)♣■	70**	watts
Output-Circuit Efficiency (Approx.)	80	%
Useful Power Output (Approx.)	180●●	watts

Typical Operation in Cathode-Drive Circuit at 900 Mc:

DC Plate-to-Grid Voltage	1400	volts
DC Cathode-to-Grid Voltage	150	volts
Peak RF Cathode-to-Grid Voltage	200	volts
DC Plate Current	0.210	amp
DC Grid Current (Approx.)	0.070	amp
Driver Power Output (Approx.)♣■	75⊕	watts

*,§,○,●,♦,♣,#,●●,⊕,■,**,⊕: See next page. → Indicates a change.

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POWER TRIODE

Output-Circuit Efficiency (Approx.)	60	%
Useful Power Output (Approx.)	120●●	watts

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy□
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS● Ratings, *Absolute Values:*

DC PLATE VOLTAGE	1600 max.	volts
DC GRID VOLTAGE	-300 max.	volts
DC PLATE CURRENT	0.250 max.	amp
DC GRID CURRENT	*See Rating Chart*	←
PLATE INPUT	400 max.	watts
PLATE DISSIPATION	250 max.	watts

Typical Operation as Amplifier in Cathode-Drive Circuit at 600 Mc:

DC Plate-to-Grid Voltage	1650	volts
DC Cathode-to-Grid Voltage:		
From fixed supply of	150	volts
From cathode resistor of	500	ohms
Peak RF Cathode-to-Grid Voltage	200	volts
DC Plate Current	0.250	amp
DC Grid Current (Approx.)	0.050	amp
Driver Power Output (Approx.)♣	75▲	watts
Output-Circuit Efficiency (Approx.)	82	%
Useful Power Output (Approx.)	270●●	watts

Typical Operation as Amplifier in Cathode-Drive Circuit at 900 Mc:

DC Plate-to-Grid-Voltage	1650	volts
DC Cathode-to-Grid Voltage:		
From fixed supply of	150	volts
From cathode resistor of	575	ohms
Peak RF Cathode-to-Grid Voltage	200	volts
DC Plate Current	0.250	amp
DC Grid Current (Approx.)	0.010	amp
Driver Power Output (Approx.)♣	80†	watts
Output-Circuit Efficiency (Approx.)	60	%
Useful Power Output (Approx.)	180●●	watts

FREQUENCY MULTIPLIER — Class C

Maximum CCS● Ratings, *Absolute Values:*

DC PLATE VOLTAGE	1600 max.	volts
DC GRID VOLTAGE	-300 max.	volts
DC PLATE CURRENT	0.250 max.	amp
DC GRID CURRENT	*See Rating Chart*	←
PLATE INPUT	400 max.	watts
PLATE DISSIPATION	250 max.	watts

*,§,○,●,♦,♣,#,●●,⊕,■,**,❋,□,▲,†: See next page. ← Indicates a change.

RCA

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POWER TRIODE

Typical Operation in Cathode-Drive Circuit:

	Doubler to 600 Mc	*Doubler to 900 Mc*	
DC Plate-to-Grid Voltage. .	1760	1675	volts
DC Cathode-to-Grid Voltage:			
From fixed supply of. . .	260	175	volts
From cathode resistor of.	860	645	ohms
Peak RF Cathode-to-Grid Voltage.	300	300	volts
DC Plate Current.	0.250	0.250	amp
DC Grid Current (Approx.) .	0.050	0.021	amp
Driver Power Output (Approx.)♣.	125	100	watts
Output-Circuit Efficiency (Approx.)	90	80	%
Useful Power Output (Approx.)	180●●	140●●	watts

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current.	1	3.05	3.75	amp
Amplification Factor.	1,2	18	32	
Direct Interelectrode Capacitances:				
Grid to plate	-	5.6	6.6	μμf
Grid to cathode and heater. . .	-	10.5	12.5	μμf
Plate to cathode and heater . .	3	0.12	0.26	μμf
Plate Voltage	1,4	500	850	volts
Plate Voltage	1,5	690	1140	volts
Grid Voltage.	1,6	-	-165	volts
Peak Cathode Current.	1,7	3.2	-	amp
Useful Power Output	1,8	225	-	watts

Note 1: With 6.3 volts ac on heater.

Note 2: With dc grid volts = -15, and dc plate voltage adjusted to give dc plate current of 250 ma.

Note 3: With external shield, as described under (○), connected to grid terminal.

Note 4: With dc grid volts = -10, and dc plate voltage adjusted to give dc plate current of 250 ma.

Note 5: With dc grid volts = -20, and dc plate voltage adjusted to give dc plate current of 250 ma.

Note 6: With dc plate volts = 1600, and dc grid voltage adjusted to give dc plate current of 1 ma.

Note 7: Designers should limit the maximum useable cathode current (plate current and grid current) to this value under any condition of operation.

Note 8: In a self-excited oscillator circuit with dc plate volts = 1600, dc plate ma. = 250, dc grid ma. = 50 to 75, grid resistor (ohms) = 2000 ± 10%, and frequency (Mc) = 15.

*,§,○,●,♦,♣,#,●●,⊕,■,**,❋,□,▲,†: See next page. →Indicates a change.

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

POWER TRIODE

* Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

§ Without external shield.

○ With external flat shield 7-1/2" min. diameter located in plane of the grid terminal and perpendicular to axis of tube. Shield is connected to grid terminal.

● Continuous Commercial Service.

♦ Computed between half-power points and based on tube output capacitance only.

♣ The driver stage is required to supply tube losses, rf-circuit losses, and rf power added to plate input. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

\# This value includes 24 watts of circuit loss and 36 watts added to plate input.

●● This value of useful power is measured at load of output circuit having indicated efficiency.

⊕ This value includes 28 watts of circuit loss and 40 watts added to plate input.

■ In cathode-drive, plate-modulated class C rf power amplifier service, the 6161 can be modulated 100% if the rf driver stage is also modulated 100% simultaneously. Care should be taken to insure that the driver-modulation and amplifier-modulation voltages are exactly in phase.

** This value includes 18 watts of circuit loss and 40 watts added to plate input.

⊕ This value includes 23 watts of circuit loss and 40 watts added to plate input.

□ Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

▲ This value includes 18 watts of circuit loss and 45 watts added to plate input.

† This value includes 23 watts of circuit loss and 45 watts added to plate input.

MAXIMUM RATINGS vs OPERATING FREQUENCY

FREQUENCY	900	1200	1400	1650	2000	Mc
MAX.-PERMISSIBLE PERCENTAGE OF MAX.-RATED PLATE VOLTAGE AND PLATE INPUT:						
Class B television	100	80	71	62.5	62.5	%
Class C television, biased-modulated	100	80	71	62.5	62.5	%
Class C telephony, plate-modulated	100	80	71	62.5	62.5	%
Class C telegraphy	100	80	71	62.5	62.5	%
Class C FM telephony	100	80	71	62.5	62.5	%

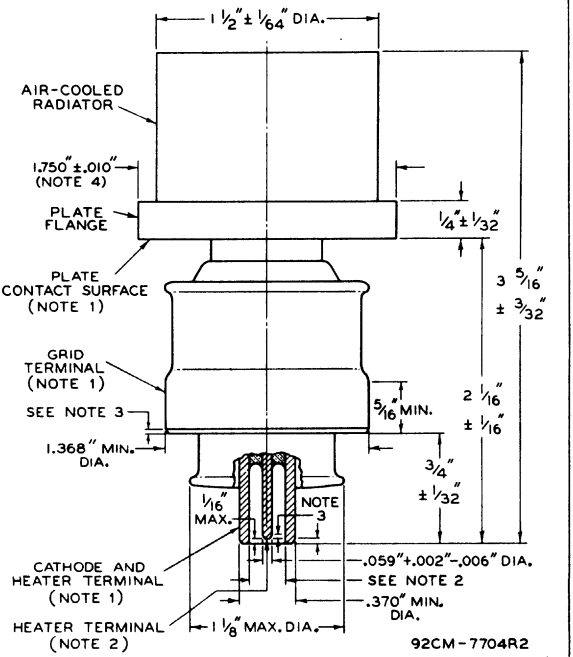
6161

POWER TRIODE

OPERATING CONSIDERATIONS

In *tuning a cathode-drive rf amplifier*, it must be remembered that variations in the load on the output stage will produce corresponding variations in the load on the driving stage. This effect will be noticed by the simultaneous increase in plate currents of both the output and driving stages.

During *standby periods* of less than 15 minutes, it is recommended that the heater voltage be reduced to 80% of normal to conserve life; for longer standby periods, the heater power should be turned off.



→ Indicates a change.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6161

POWER TRIODE

NOTE 1: WITH THE CYLINDRICAL SURFACES OF ITS GRID AND CATHODE TERMINALS CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G_1. THE FOUR CYLINDRICAL HOLES H_1, H_2, H_3, and H_4 HAVE AXES COINCIDENT WITHIN 0.0005", LENGTHS DETERMINED FROM THE DIMENSIONAL OUTLINE, AND SUCCESSIVELY SMALLER DIAMETERS AS SHOWN IN THE SKETCH.

THE PLATE FLANGE WILL BE ENTIRELY ENGAGED BY HOLE H_1, AND THE CONTACT SURFACE OF THE PLATE FLANGE WILL SEAT ON THE SHOULDER BETWEEN HOLES H_1 AND H_2. THE PLANE SURFACE OF THIS SHOULDER IS $90^\circ \pm 2'$ TO THE AXES OF THE HOLES. SEATING IS DETERMINED BY FAILURE OF A 0.005"-THICKNESS GAUGE, 1/8" WIDE, TO ENTER MORE THAN 1/16" BETWEEN THE SHOULDER SURFACE AND THE PLATE CONTACT SURFACE.

WITH THE TUBE PROPERLY SEATED AS DESCRIBED ABOVE, THE GRID TERMINAL WILL BE ENTIRELY ENGAGED BY HOLE H_3, AND THE CATHODE TERMINAL WILL BE ENGAGED BY HOLE H_4 TO A DEPTH OF AT LEAST 1/4".

NOTE 2: CONCENTRICITY OF THE HEATER TERMINAL WITH RESPECT TO THE CATHODE TERMINAL IS DETERMINED BY A GAUGE AS SHOWN IN SKETCH G_2. THE CYLINDRICAL HOLE H_5 AND THE ANNULAR HOLE H_6 HAVE AXES COINCIDENT WITHIN 0.0005". THE CATHODE TERMINAL AND THE HEATER TERMINAL WILL ENTER THIS GAUGE TO A DEPTH OF 3/8".

NOTE 3: MAY BE ROUNDED OR BEVELED NOT TO EXCEED 1/16".

NOTE 4: THE AVERAGE OF THE MINIMUM DIAMETER AND THAT MEASURED 90° FROM THE MINIMUM WILL BE WITHIN THE SPECIFIED RANGE, AND THE DIFFERENCE BETWEEN THESE TWO MEASUREMENTS WILL NOT EXCEED .010".

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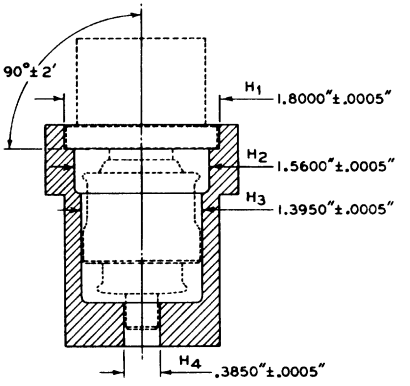
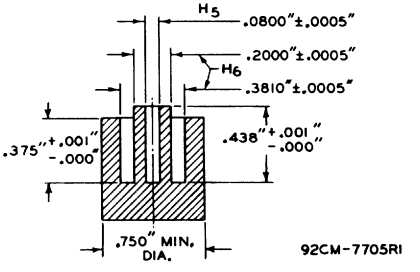
POWER TRIODE

SKETCH G_1



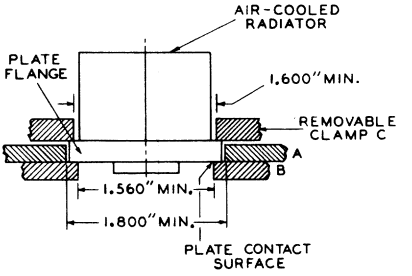
SKETCH G_2



6161

POWER TRIODE

MOUNTING ARRANGEMENT FOR USE WITH COAXIAL-LINE-OR CAVITY CIRCUITS



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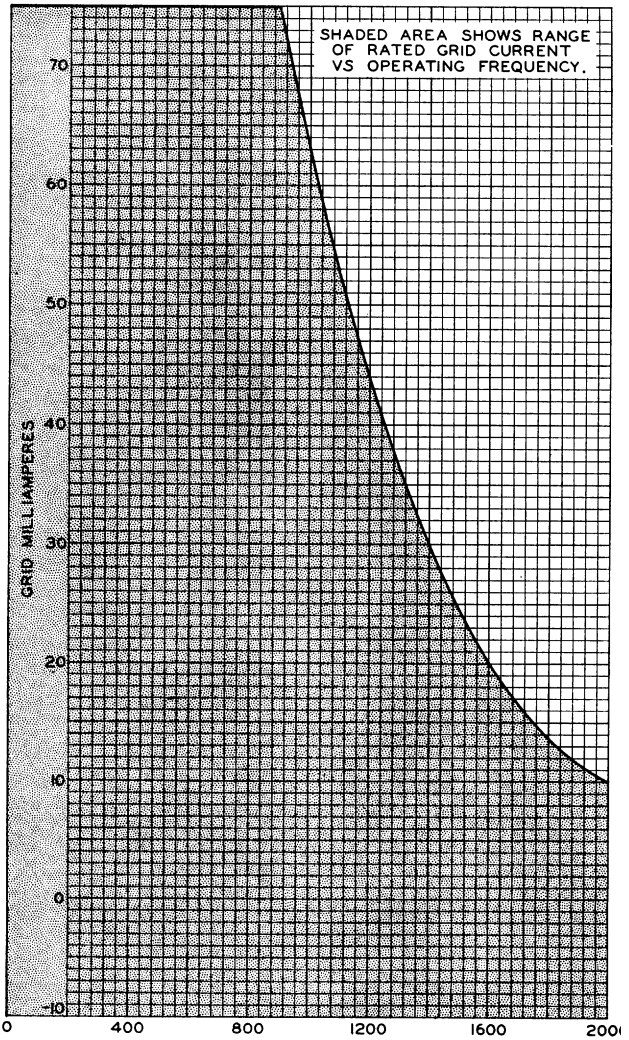
RATING CHART



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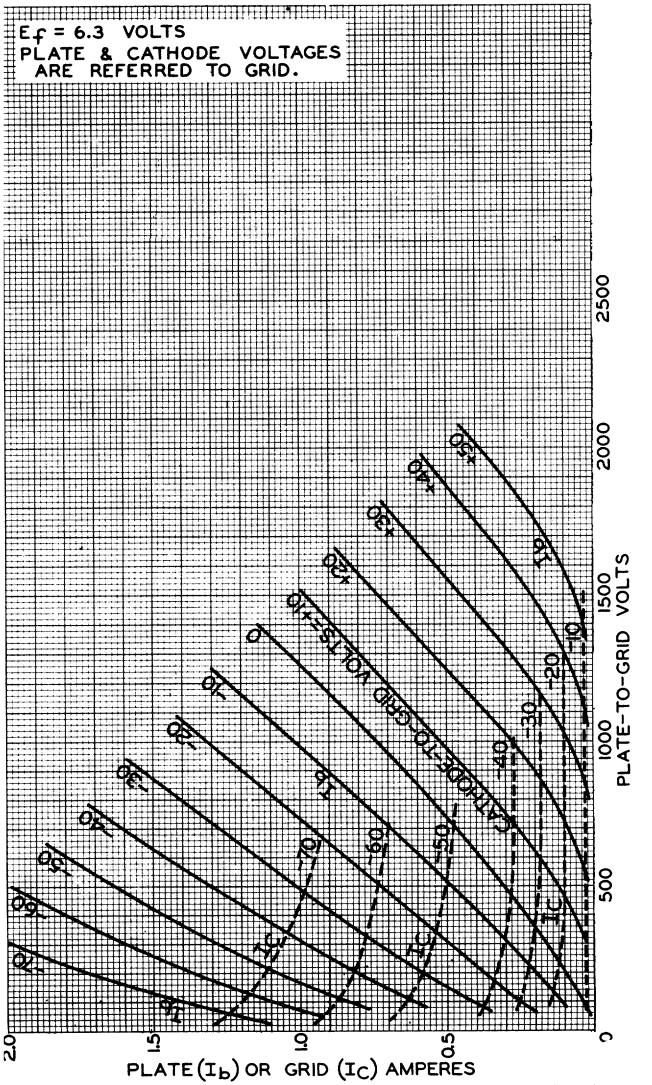
92CM-8321

6161

AVERAGE CHARACTERISTICS



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ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6166

Beam Power Tube

FORCED-AIR COOLED **COAXIAL-ELECTRODE STRUCTURE**
THORIATED-TUNGSTEN FILAMENT **INTEGRAL RADIATOR**
10-KW PLATE DISSIPATION IN CW OR TV SERVICE UP TO 220 Mc

GENERAL DATA

Electrical:

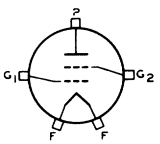
Filament, Multistrand Thoriated Tungsten:		
Voltage (AC or DC)[a]	5 ± 5%	volts
Current at 5 volts	181	amp
Minimum heating time	15	sec
Cold resistance	0.0038	ohm
Mu Factor, Grid No.2 to Grid No.1 for plate volts = 2000, grid-No.2 volts = 1000, and plate amperes = 2	10	
Direct Interelectrode Capacitances:		
Grid No.1 to plate[b]	0.6 max.	μμf
Grid No.1 to filament	42	μμf
Plate to filament[b]	0.08 max.	μμf
Grid No.1 to grid No.2	60	μμf
Grid No.2 to plate	24	μμf

Mechanical:

Operating Position	Vertical, filament end up or down
Maximum Overall Length	11.63"
Maximum Diameter	6.38"
Weight (Approx.)	15 lbs
Radiator	Integral part of tube

Terminal Connections (See *Dimensional Outline*):

G_1 – Grid No.1
G_2 – Grid No.2



P – Plate
F – Filament

Air Flow:

Through radiator—The specified flow of incoming air at a temperature of 45° C for various plate dissipations, as indicated in the tabulation below, should be delivered by a blower through the radiator before and during the application of any voltages. The air should enter the radiator at its plate-terminal end (See *Dimensional Outline*). Filament power, plate power, grid-No.2 power, and air flow may be removed simultaneously.

Percentage of maximum-rated plate dissipation for each class of service	100	80	60	%
Minimum air flow	350	270	200	cfm
Static pressure	3	2.1	1.3	in. of water

← Indicates a change.

To grid-No.2 terminal	50 min.	cfm
To grid-No.1 terminal and filament terminals	50 min.	cfm
Incoming-Air Temperature	45 max.	°C
Radiator Temperature (Measured on the core at end away from incoming air)	180 max.	°C
Glass Temperature (At hottest point)	180 max.	°C
Seal Temperature: Filament, grid No.1, grid No.2, and plate	180 max.	°C

RF POWER AMPLIFIER — Class B Television Service

Synchronizing-level conditions per tube unless otherwise specified

(Voltages are referred to cathode unless otherwise specified)

Maximum CCS[c] Ratings, *Absolute-Maximum Values:*

	54 to 216 Mc	
DC PLATE VOLTAGE	6000[d] max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	2000 max.	volts
DC PLATE CURRENT	4 max.	amp
PLATE INPUT	22000[d] max.	watts
GRID-No.2 INPUT	400 max.	watts
PLATE DISSIPATION	10000 max.	watts
GRID-No.1 (CONTROL-GRID) DISSIPATION	300 max.	watts

→ **Typical Operation in Grid-Drive Circuit at 216 Mc:**

	Bandwidth[e] of 8.5 Mc	
DC Plate Voltage	5800	volts
DC Grid-No.2 Voltage	1200	volts
DC Grid-No.1 Voltage	−130	volts
Peak RF Grid-No.1 Voltage:		
Synchronizing level	375	volts
Pedestal level	290	volts
DC Plate Current:		
Synchronizing level	3.45	amp
Pedestal level	2.6	amp
DC Grid-No.2 Current (Pedestal level)	0.207	amp
DC Grid-No.1 Current (Approx.):		
Synchronizing level	0.175	amp
Pedestal level	0.085	amp
Driver Power Output (Approx.):[f]		
Synchronizing level	800[g]	watts
Pedestal level	450	watts
Useful Power Output (Approx.):		
Synchronizing level	12000	watts
Pedestal level	6800	watts

→ **Typical Operation in Cathode-Drive Circuit at 216 Mc:**

	Bandwidth[e] of 8.5 Mc	
DC Plate-to-Grid-No.1 Voltage	5885	volts
DC Grid-No.2-to-Grid-No.1 Voltage	885	volts

→ Indicates a change.

DC Cathode-to-Grid-No.1 Voltage	85	volts
Peak RF Cathode-to-Grid-No.1 Voltage:		
Synchronizing level	330	volts
Pedestal level	260	volts
DC Plate Current:		
Synchronizing level	3.45	amp
Pedestal level	2.6	amp
DC Grid-No.2 Current (Pedestal level)	0.152	amp
DC Grid-No.1 Current (Approx.):		
Synchronizing level	0.202	amp
Pedestal level	0.11	amp
Driver Power Output (Approx.):[h]		
Synchronizing level	1300[j]	watts
Pedestal level	700	watts
Useful Power Output (Approx.):		
Synchronizing level	12000	watts
Pedestal level	6800	watts

GRID-MODULATED RF POWER AMPLIFIER
Class C Television Service

Synchronizing-level conditions per tube unless otherwise specified

Maximum CCS[c] Ratings, *Absolute-Maximum Values:*

	54 to 216 Mc		
DC PLATE VOLTAGE	6000	max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	2000	max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE (White level)	-1000	max.	volts
DC PLATE CURRENT	4	max.	amp
PLATE INPUT	22000	max.	watts
GRID-No.2 INPUT	400	max.	watts
PLATE DISSIPATION	10000	max.	watts
GRID-No.1 DISSIPATION	300	max.	watts

Typical Operation in Grid-Drive Circuit at 216 Mc: ←

	Bandwidth[e] of 8.5 Mc	
DC Plate Voltage	5800	volts
DC Grid-No.2 Voltage	1200	volts
DC Grid-No.1 Voltage:		
Synchronizing level	-130	volts
Pedestal level	-195	volts
White level	-350	volts
Peak RF Grid-No.1 Voltage	375	volts
DC Plate Current:		
Synchronizing level	3.45	amp
Pedestal level	2.42	amp
DC Grid-No.2 Current (Pedestal level)	0.148	amp
DC Grid-No.1 Current (Approx.):		
Synchronizing level	0.175	amp
Pedestal level	0.095	amp

← Indicates a change.

	Bandwidth[e] *of 8.5 Mc*	
Driver Power Output (Approx.):[f]		
Synchronizing level	800[g]	watts
Pedestal level	425	watts
Useful Power Output (Approx.):		
Synchronizing level	12000	watts
Pedestal level	6800	watts

LINEAR RF POWER AMPLIFIER

Single-Sideband Suppressed-Carrier Service

Maximum CCS[c] Ratings, *Absolute-Maximum Values:*

	Up to 60 Mc		
DC PLATE VOLTAGE	6900	max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	2000	max.	volts
MAX.-SIGNAL DC PLATE CURRENT	2.75	max.	amp
MAX.-SIGNAL DC GRID-No.1 (CONTROL-GRID) CURRENT	0.6	max.	amp
MAX.-SIGNAL PLATE INPUT	18000	max.	watts
MAX.-SIGNAL GRID-No.2 INPUT	400	max.	watts
PLATE DISSIPATION	10000	max.	watts

Typical CCS Class AB_1 and AB_2 "Single-Tone" Operation at 60 Mc:[k]

	Class AB_1	*Class* AB_2	
DC Plate Voltage	6900	6500	volts
DC Grid-No.2 Voltage	1200	1200	volts
DC Grid-No.1 Voltage[m]	-125	-125	volts
Zero-Signal DC Plate Current	0.2	0.2	amp
Zero-Signal DC Grid-No.2 Current	0	0	amp
Effective RF Load Resistance	5400	1200	ohms
Max.-Signal DC Plate Current	0.675	2.75	amp
Max.-Signal DC Grid-No.2 Current	0.035	0.26	amp
Max.-Signal DC Grid-No.1 Current	0	0.08	amp
Max.-Signal Peak RF Grid-No.1 Voltage	125	305	volts
Max.-Signal Driving Power (Approx.)	0	25	watts
Max.-Signal Power Output (Approx.)	2920	10600	watts

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS[c] Ratings, *Absolute-Maximum Values:*[n]

DC PLATE VOLTAGE	5000	max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	2000	max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-1000	max.	volts
DC PLATE CURRENT	2	max.	amp
DC GRID-No.1 CURRENT	0.6	max.	amp
PLATE INPUT	10000	max.	watts
GRID-No.2 INPUT	270	max.	watts
PLATE DISSIPATION	6600	max.	watts

→ Indicates a change.

Typical Operation in Grid-Drive Circuit: ←

	Up to 60 Mc	
DC Plate Voltage	4700	volts
DC Grid-No.2 Voltage (Modulated 100%)[p]	800	volts
DC Grid-No.1 Voltage[r]	-280	volts
Peak RF Grid-No.1 Voltage	485	volts
DC Plate Current	1.56	amp
DC Grid-No.2 Current	0.217	amp
DC Grid-No.1 Current (Approx.)	0.15	amp
Driver Power Output (Approx.)[f]	180[s]	watts
Useful Power Output (Approx.)	5500	watts

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[t]
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS[c] Ratings, *Absolute-Maximum Values:*[n] ←

DC PLATE VOLTAGE	6900	max.	volts
DC GRID-No.2 VOLTAGE	2000	max.	volts
DC GRID-No.1 VOLTAGE	-1000	max.	volts
DC PLATE CURRENT	2.75	max.	amp
DC GRID-No.1 CURRENT	0.6	max.	amp
PLATE INPUT	18000	max.	watts
GRID-No.2 INPUT	400	max.	watts
PLATE DISSIPATION	10000	max.	watts

Typical Operation in Grid-Drive Circuit: ←

	Up to 60 Mc	*At 216 Mc*		
DC Plate Voltage	6400	5800	5800	volts
DC Grid-No.2 Voltage[u]	1200	1200	1200	volts
DC Grid-No.1 Voltage[v]	-310	-130	-175	volts
Peak RF Grid-No.1 Voltage	560	230	370	volts
DC Plate Current	2.75	1.8	2.6	amp
DC Grid-No.2 Current	0.3	0.1	0.267	amp
DC Grid-No.1 Current (Approx.)	0.14	0.05	0.11	amp
Driver Power Output (Approx.)[f]	75	300[w]	750[x]	watts
Useful Power Output (Approx.)	11600	6000	9000	watts

[a] Full rated filament voltage can be applied safely to the cold filament. It is not necessary to provide means for limiting the filament starting current.

[b] With external, flat, metal shield 12" square having center hole 4-5/16" diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2.

[c] Continuous Commercial Service.

[d] For operation on VHF television channels 2 through 6, DC plate voltage may be increased to 6400 max. volts and plate input may be increased to 24000 maximum watts provided all other ratings are net.

[e] Computed between half-power points and based on tube output capacitance only.

[f] The driver stage is required to supply tube losses and rf circuit losses. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

[g] This value includes 700 watts of rf circuit loss at 216 Mc.

← Indicates a change.

h The driver stage is required to supply tube losses, rf circuit losses, and rf power added to plate circuit. The driver stage should be designed as indicated under (f).

j This value includes 300 watts of rf circuit loss at 216 Mc, and 900 watts added to plate circuit.

k "Single-Tone Modulation" operation refers to that class of amplifier service in which the grid-No.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.

m Adjusted to give indicated zero-signal plate current.

n These ratings hold for operation up to 60 Mc; for ratings at higher frequencies, see *Maximum Ratings vs Operating Frequency* table.

p Obtained preferably from a separate source.

r Obtained preferably from a combination of 365-ohm grid-No.1 resistor and -170-volt fixed bias.

s This value includes 50 watts of rf circuit loss at 30 Mc.

t Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

u Obtained preferably from a separate source, or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should not be used if the 6166 or a preceding stage is keyed. In this case, the regulation of the source should be sufficient to prevent the grid-No.2 voltage from rising above 2000 volts under key-up conditions; and additional fixed grid-No.1 bias must be provided to limit the plate current.

v Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

w This value includes 270 watts of rf circuit loss.

x This value includes 675 watts of rf circuit loss.

→ CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Filament Current.	1	172	190	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate.	2	-	0.6	μμf
Grid No.1 to filament	3	39	47	μμf
Grid No.1 to grid No.2.	3	52	64	μμf
Grid No.2 to plate.	3	21.2	25.8	μμf
Plate to filament	2	-	0.08	μμf
DC Grid-No.1 Voltage.	1,4	-	-225	volts
Peak Grid-No.1 Current.	1,5	-	1.5	amp
Peak Grid-No.1 Voltage.	1,5	-	315	volts

Note 1: With 5 volts ac or dc on filament.

Note 2: With external, flat, metal shield 12" square having center hole 4-5/16" diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2. All other electrodes are grounded.

Note 3: Without shield and all other electrodes grounded.

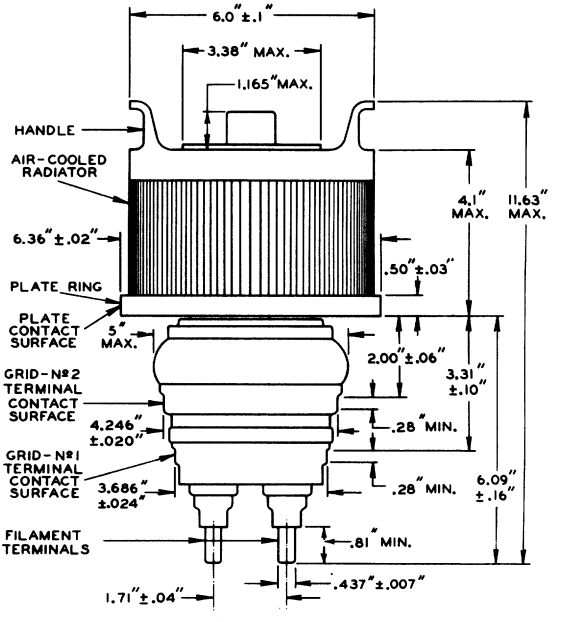
Note 4: With dc plate voltage of 6000 volts, dc grid-No.2 voltage of 1200 volts, and dc plate current of 20 ma.

Note 5: With dc plate voltage of 1500 volts, dc grid-No.2 voltage of 1200 volts, and instantaneous grid-No.1 voltage adjusted to give peak plate current of 11 amp.

→ Indicates a change.

MAXIMUM RATINGS vs OPERATING FREQUENCY ←

FREQUENCY	60	220	Mc
MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM-RATED PLATE VOLTAGE AND PLATE INPUT:			
Class AB Single-Sideband Suppressed-Carrier Service	100	90	%
Class B Television Service	Full Ratings—54 to 216 Mc		
Class C Television Service (1)	Full Ratings—54 to 216 Mc		
Class C Telephony, Plate-Modulated	100	90	%
Class C Telegraphy and FM Telephony	100	90	%



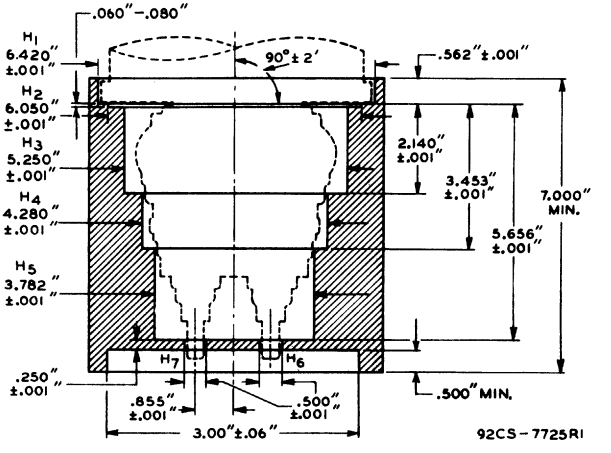
92CM-7716R2

← Indicates a change.

WITH THE CYLINDRICAL SURFACES OF THE GRID-No.2 TERMINAL, GRID-No.1 TERMINAL AND THE FILAMENT TERMINALS CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G_1. THE FIVE CYLINDRICAL HOLES H_1, H_2, H_3, H_4, AND H_5 HAVE AXES THAT ARE COINCIDENT WITHIN 0.001" AND HAVE SUCCESSIVELY SMALLER DIAMETERS AS SHOWN. THE CENTER HOLES H_6 AND H_7 ARE LOCATED ON A DIAMETER WITHIN ± 0.001" AND THEIR AXES ARE PARALLEL TO THE AXES OF H_1, H_2, H_3, H_4, AND H_5 WITHIN 0° ± 2'.

THE PLATE RING WILL BE ENTIRELY ENGAGED BY HOLE H_1 AND WILL SEAT ON THE SHOULDER BETWEEN H_1 AND H_2. THE PLANE SURFACE OF THIS SHOULDER IS AT RIGHT ANGLES TO THE AXES OF THE HOLES WITHIN 0° ± 2'. SEATING IS DETERMINED BY FAILURE OF A 0.020" THICKNESS GAUGE TO ENTER MORE THAN 1/16" BETWEEN SHOULDER SURFACE AND PLATE RING. SLOTS ARE PROVIDED TO PERMIT THIS MEASUREMENT.

SKETCH G_1



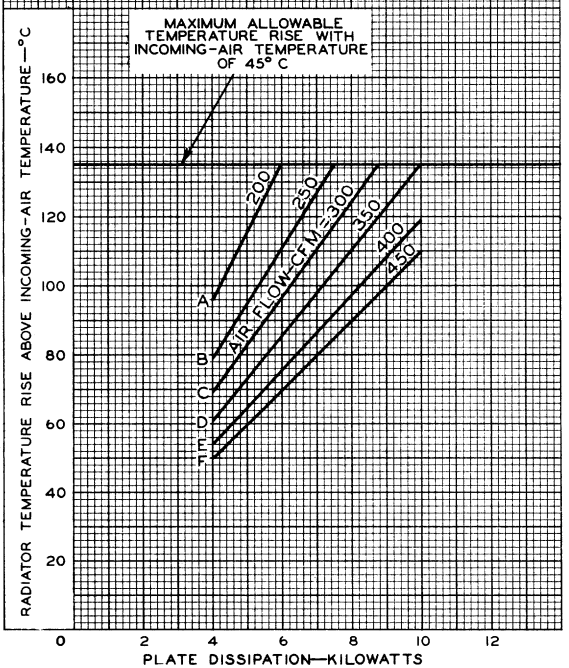
COOLING REQUIREMENTS

E_f = 5 VOLTS AC
MAXIMUM RADIATOR TEMPERATURE=180° C

CURVE	PRESSURE DROP—INCHES OF WATER
A	1.3
B	1.8
C	2.4
D	3
E	3.7
F	4.5

CURVES TAKEN ACCORDING TO NAFM* STANDARDS — BULLETIN Nº 103

*NATIONAL ASSOCIATION OF FAN MFGS., GENERAL MOTORS BLDG., DETROIT, MICH.



92CM-7728

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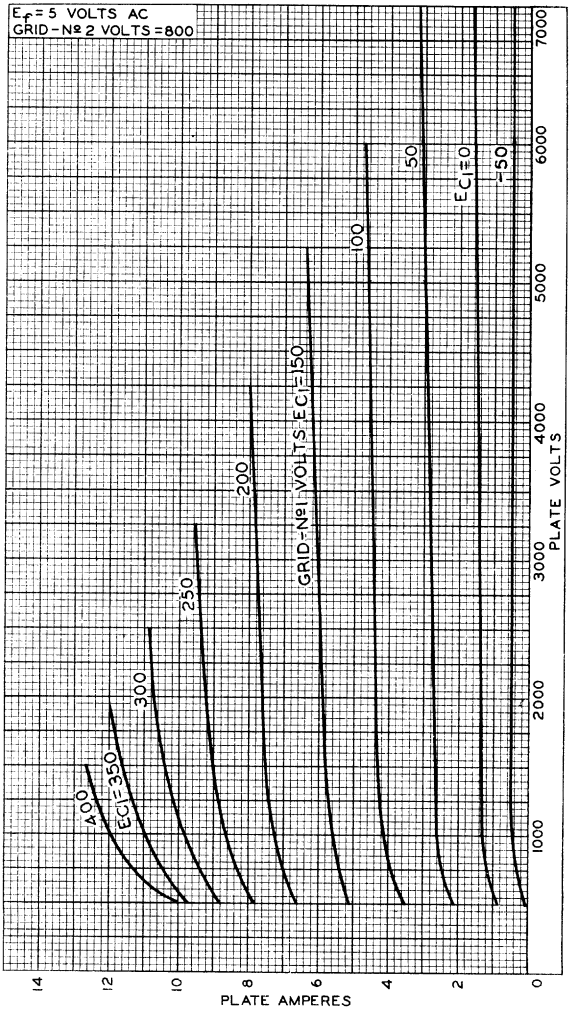
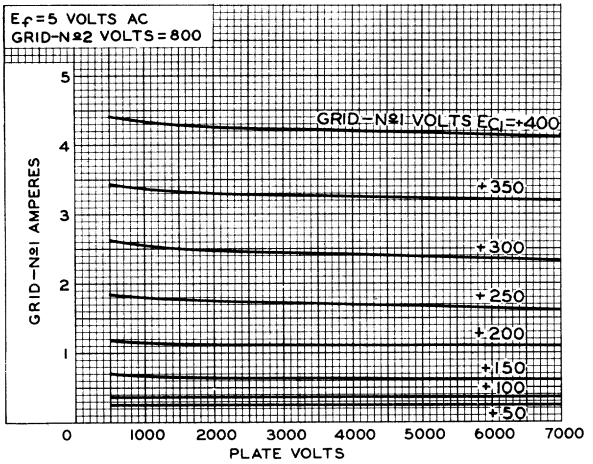
AVERAGE PLATE CHARACTERISTICS

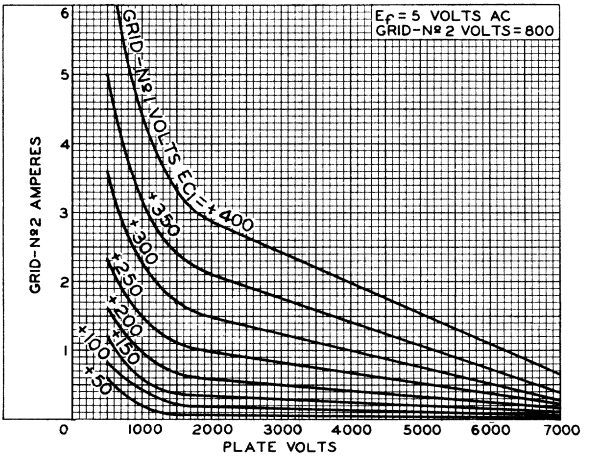


92CM-7736RI

AVERAGE CHARACTERISTICS



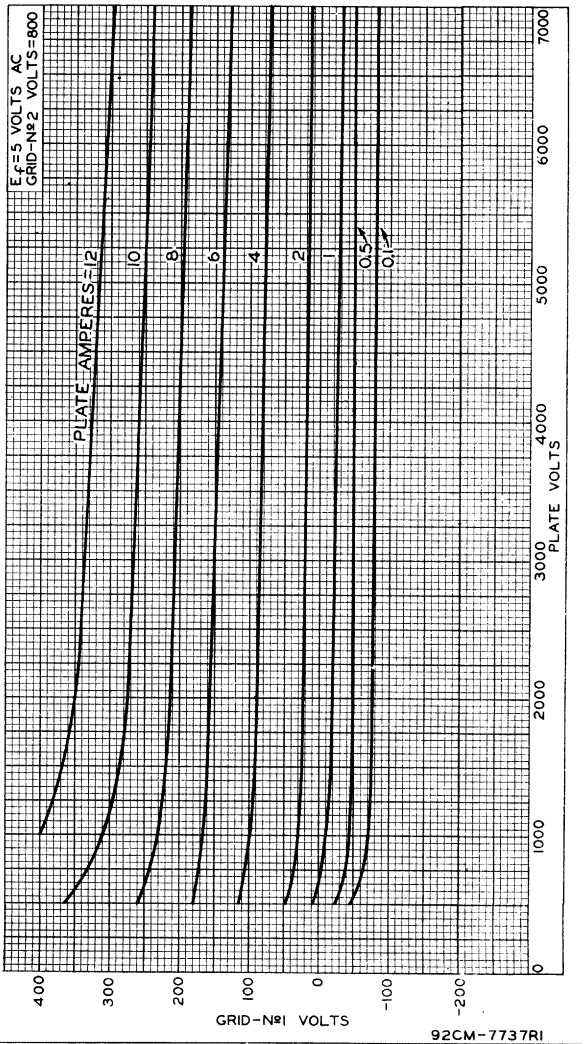
92CS-7744RI



92CS-7743RI

6166

AVERAGE CONSTANT-CURRENT CHARACTERISTICS

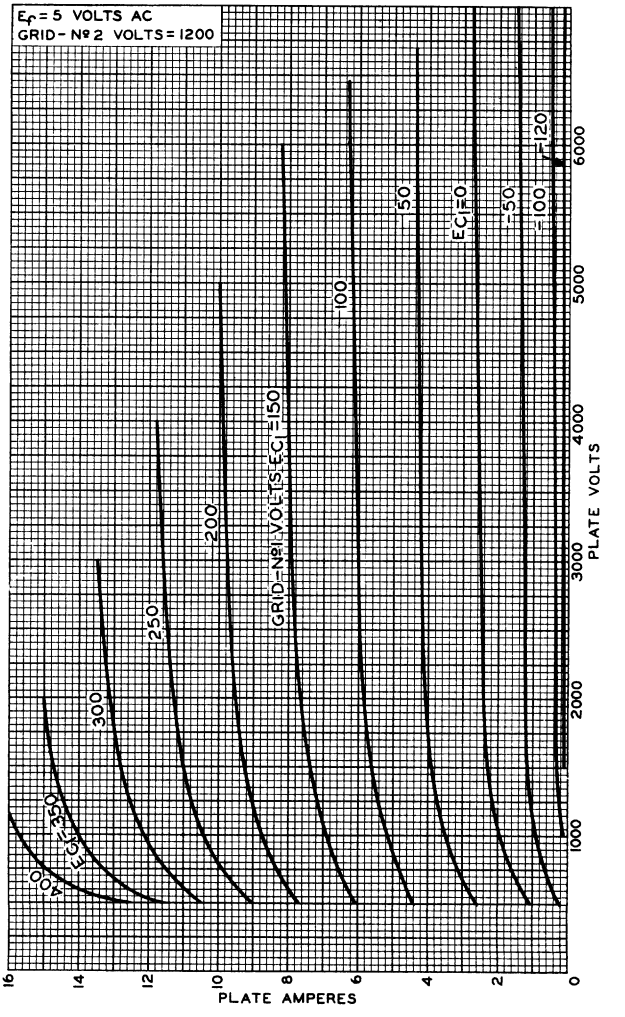


92CM-7737RI

AVERAGE CONSTANT-CURRENT CHARACTERISTICS

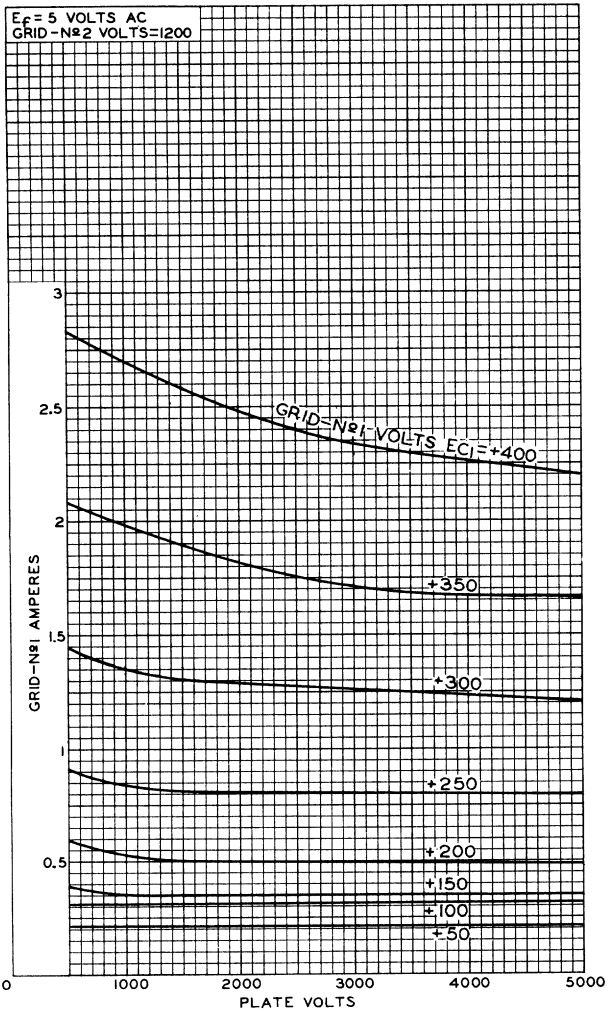
6166

AVERAGE PLATE CHARACTERISTICS



92CM-7735RI

AVERAGE CHARACTERISTICS



92CM-7740R2

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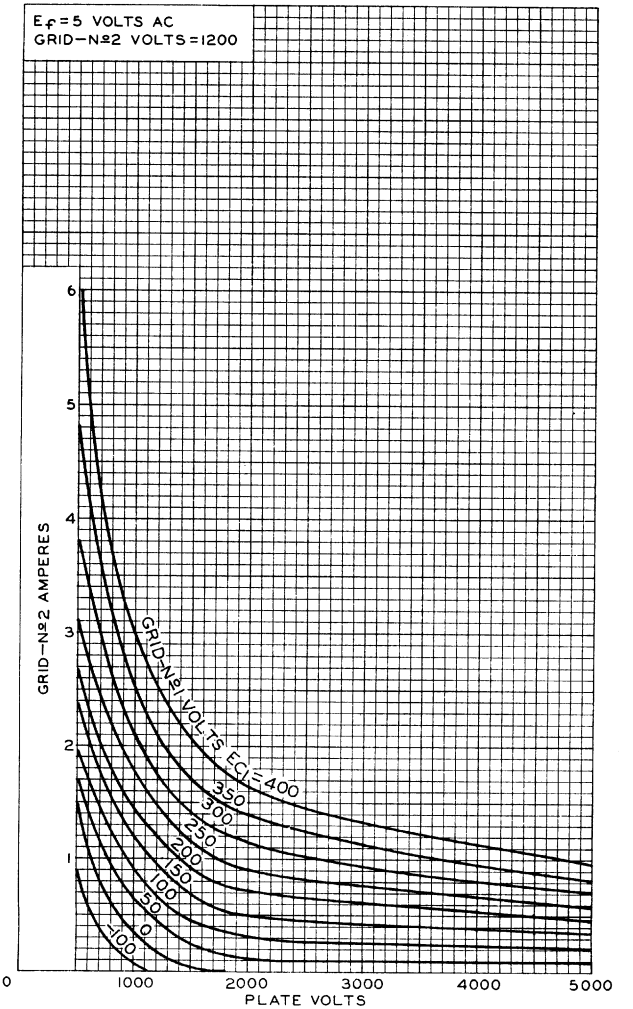

92CM—7739R1

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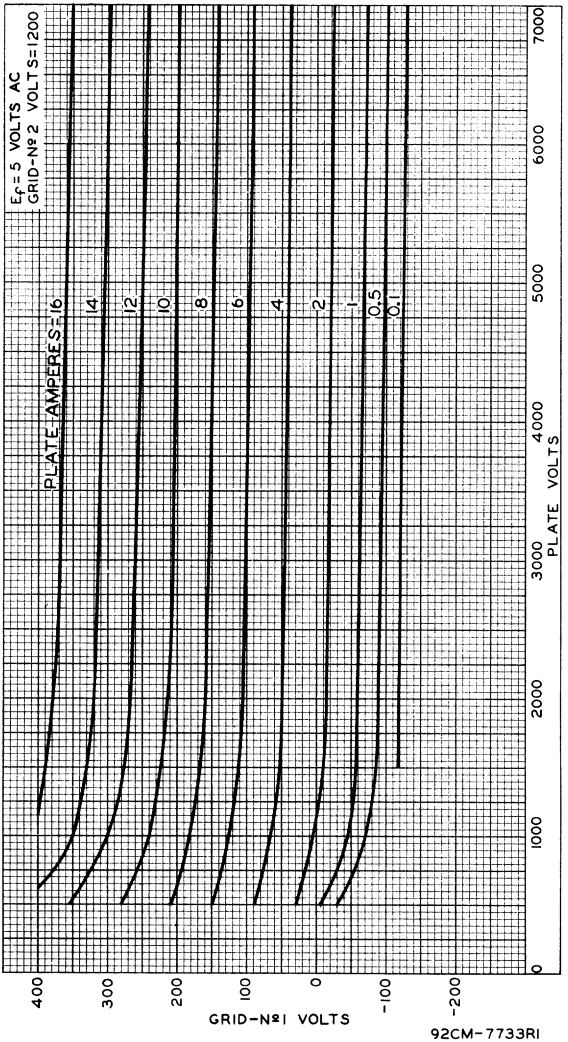

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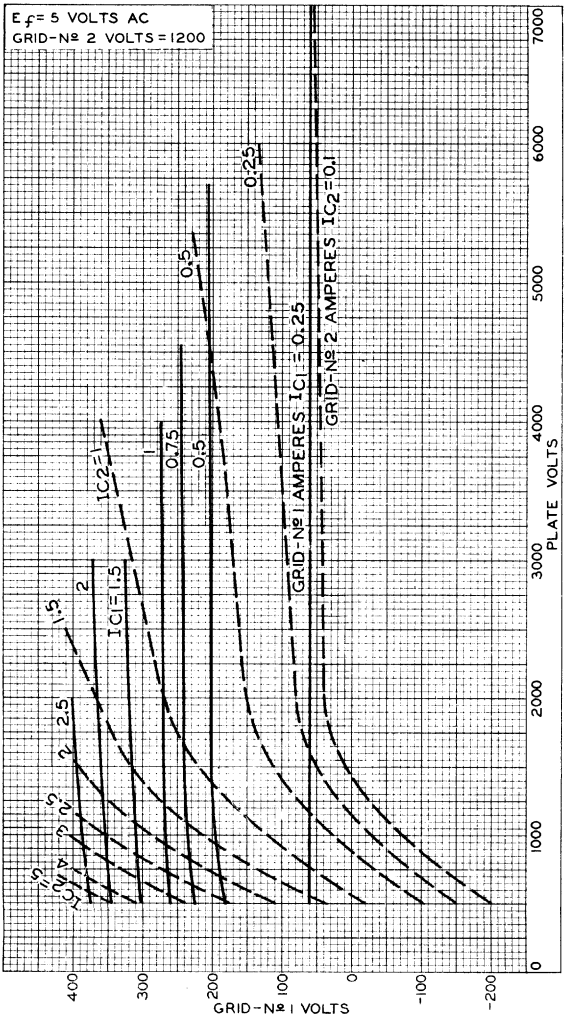
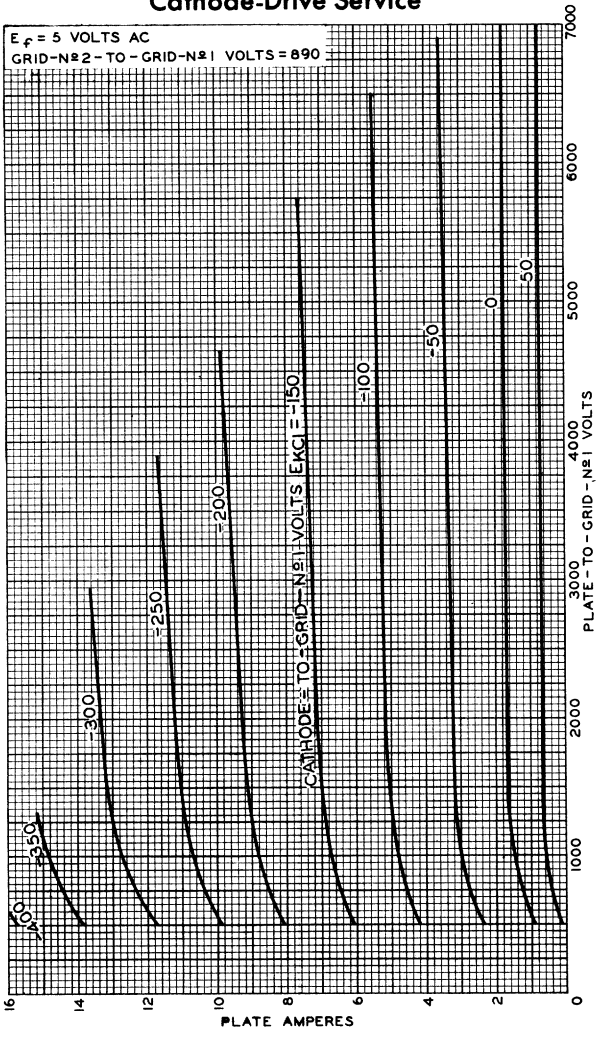


92CM-7730R2

AVERAGE PLATE CHARACTERISTICS
Cathode-Drive Service



92CM-7750RI

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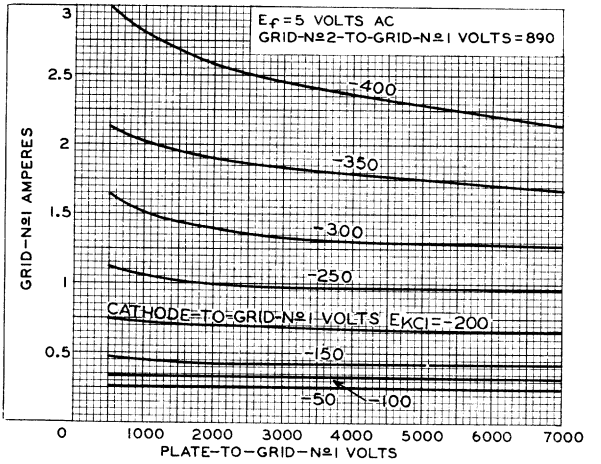
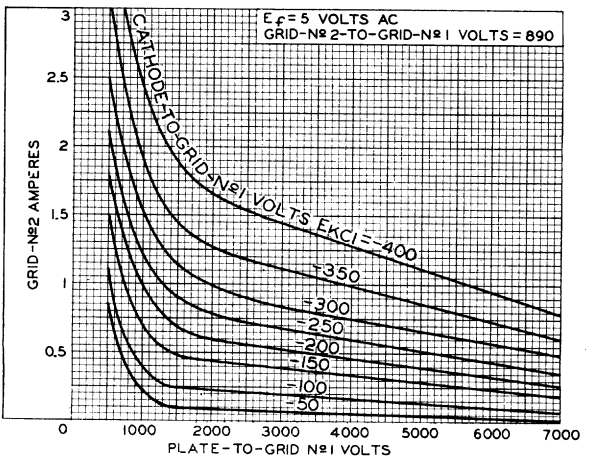
Cathode-Drive Service

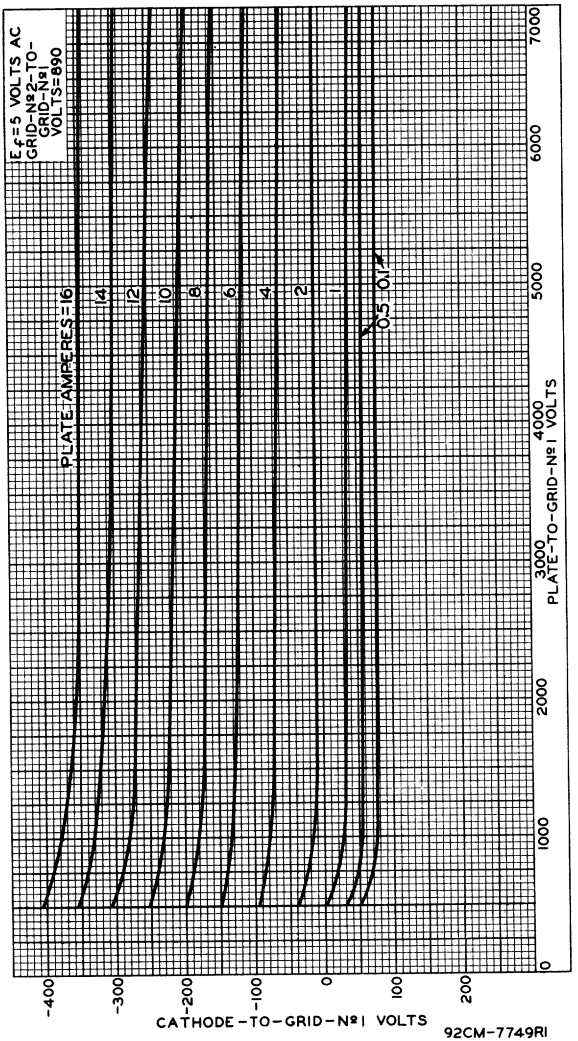


92CS-7746R1



92CS-7752R3

VERAGE CONSTANT-CURRENT CHARACTERISTICS
Cathode-Drive Service



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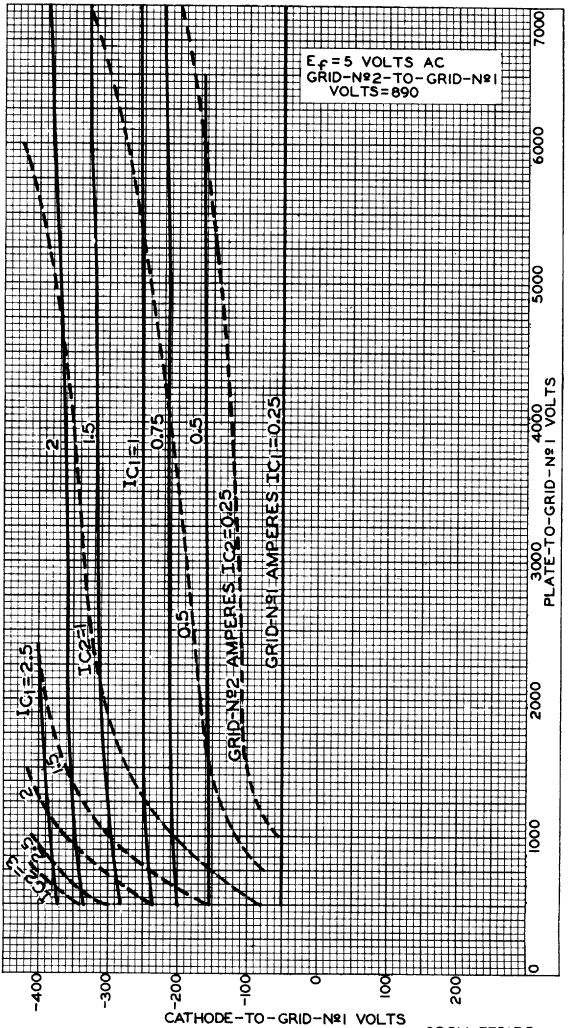
AVERAGE CONSTANT-CURRENT CHARACTERISTI
Cathode-Drive Service



92CM-7751R2

6166A/7007

Beam Power Tube

FORCED-AIR COOLED
CERAMIC-METAL SEALS — COAXIAL-ELECTRODE STRUCTURE
THORIATED-TUNGSTEN FILAMENT — INTEGRAL RADIATOR
12-KW PLATE DISSIPATION IN CW OR TV SERVICE UP TO 220 Mc

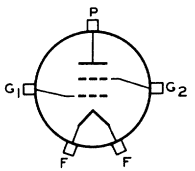
Electrical:

Filament, Multistrand Thoriated Tungsten:		
Voltage (AC or DC)▲	5 ± 5%	volts
Current at heater volts = 5	168	amp ←
Minimum heating time	15	sec
Cold resistance	0.0038	ohm
Mu Factor, Grid No.2 to Grid No.1 for plate volts = 2000, grid-No.2 volts = 1000, and plate amperes = 2	10	
Direct Interelectrode Capacitances:		
Grid No.1 to plate●	0.6 max.	pf
Grid No.1 to filament	42	pf
Plate to filament●	0.08 max.	pf
Grid No.1 to grid No.2	65	pf ←
Grid No.2 to plate	22	pf ←

Mechanical:

Operating Position	Vertical, filament end up or down
Maximum Overall Length	11.50"
Maximum Diameter	6.38"
Weight (Approx.)	15 lbs
Radiator	Integral part of tube

Terminal Diagram (See *Dimensional Outline*):



G_1 – Grid No.1
G_2 – Grid No.2

P – Plate
F – Filament

Thermal:

Air Flow:

Through radiator—The specified flow of incoming air at a temperature of 45° C for various plate dissipations, as indicated in the tabulation below, should be delivered by a blower through the radiator before and during the application of any voltages. The air should enter the radiator at its plate-terminal end (See *Dimensional Outline*). Filament power, plate power, grid-No.2 power, and air flow may be removed simultaneously.

Percentage of maximum-rated plate dissipation for each class of service	100	83	67	50	%
Minimum air flow	550	350	230	175	cfm
Static pressure	6.6	3	1.6	1	in. of water

← Indicates a change.

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DATA I
9-65

To grid-No.2 terminal	50 min.	cfm
To grid-No.1 terminal and filament terminals	50 min.	cfm
Incoming-Air Temperature	50 max.	°C
Radiator Temperature (Measured on the core at end away from incoming air)	180 max.	°C
Terminal Temperature: Filament, grid No.1, grid No.2, and plate	180 max.	°C

RF POWER AMPLIFIER — Class B Television Service

Synchronizing-level conditions per tube unless otherwise specified

(Voltages are referred to cathode unless otherwise specified)

Maximum CCS* Ratings, *Absolute-Maximum Values:*

	Up to 220 Mc	
DC PLATE VOLTAGE	7500 max.	volts
DC GRID-No.2 VOLTAGE	2000 max.	volts
DC PLATE CURRENT	4 max.	amp
PLATE INPUT	24000 max.	watts
GRID-No.2 INPUT	400 max.	watts
PLATE DISSIPATION	12000 max.	watts
GRID-No.1 DISSIPATION	300 max.	watts

Typical Operation in Grid-Drive Circuit at 216 Mc:

	Bandwidth♦ of 8.5 Mc	
DC Plate Voltage	5800	volts
DC Grid-No.2 Voltage	1200	volts
DC Grid-No.1 Voltage	-130	volts
Peak RF Grid-No.1 Voltage:		
Synchronizing level	375	volts
Pedestal level	290	volts
DC Plate Current:		
Synchronizing level	3.45	amp
Pedestal level	2.6	amp
DC Grid-No.2 Current (Pedestal Level)	0.207	amp
DC Grid-No.1 Current (Approx.):		
Synchronizing level	0.175	amp
Pedestal level	0.085	amp
Driver Power Output (Approx.):♦		
Synchronizing level	800♠	watts
Pedestal level	450	watts
Useful Power Output (Approx.):		
Synchronizing level	12000	watts
Pedestal level	6800	watts

Typical Operation in Cathode-Drive Circuit at 216 Mc:

	Bandwidth♦ of 8.5 Mc	
DC Plate-to-Grid-No.1 Voltage	6400	volts
DC Grid-No.2-to-Grid-No.1 Voltage	800	volts
DC Cathode-to-Grid-No.1 Voltage	90	volts

Peak RF Cathode-to-Grid-No.1 Voltage:		
Synchronizing level	360	volts
Pedestal level	285	volts
DC Plate Current:		
Synchronizing level	3.65	amp
Pedestal level	2.75	amp
DC Grid-No.2 Current (Pedestal Level)	0.175	amp
DC Grid-No.1 Current (Approx.):		
Synchronizing level	0.24	amp
Pedestal level	0.16	amp
Driver Power Output (Approx.)♣:		
Synchronizing level	1500⊕	watts
Pedestal level	850	watts
Useful Power Output (Approx.):		
Synchronizing level	14000	watts
Pedestal level	7900	watts

GRID-MODULATED RF POWER AMPLIFIER
Class C Television Service

Synchronizing-level conditions per tube unless otherwise specified

Maximum CCS★ Ratings, *Absolute-Maximum Values:*

	Up to 220 Mc	
DC PLATE VOLTAGE	7500 max.	volts
DC GRID-No.2 VOLTAGE	2000 max.	volts
DC GRID-No.1 VOLTAGE (White Level)	-1000 max.	volts
DC PLATE CURRENT	4 max.	amp
PLATE INPUT	24000 max.	watts
GRID-No.2 INPUT	400 max.	watts
PLATE DISSIPATION	12000 max.	watts
GRID-No.1 DISSIPATION	300 max.	watts

Typical Operation in Grid-Drive Circuit at 216 Mc:

	Bandwidth♦ of 8.5 Mc	
DC Plate Voltage	5800	volts
DC Grid-No.2 Voltage	1200	volts
DC Grid-No.1 Voltage:		
Synchronizing level	-130	volts
Pedestal level	-195	volts
White level	-350	volts
Peak RF Grid-No.1 Voltage	375	volts
DC Plate Current:		
Synchronizing level	3.45	amp
Pedestal level	2.42	amp
DC Grid-No.2 Current (Pedestal Level)	0.148	amp
DC Grid-No.1 Current (Approx.):		
Synchronizing level	0.175	amp
Pedestal level	0.095	amp
Driver Power Output (Approx.)♦:		
Synchronizing level	800♠	watts
Pedestal level	425	watts

Bandwidth♦ of 8.5 Mc

Useful Power Output (Approx.):		
Synchronizing level	12000	watts
Pedestal level	6800	watts

LINEAR RF POWER AMPLIFIER

Single-Sideband Suppressed-Carrier Service

Maximum CCS★ Ratings, *Absolute-Maximum Values:*

	Up to 220 Mc	
DC PLATE VOLTAGE	7500 max.	volts
DC GRID-No.2 VOLTAGE	2000 max.	volts
MAX.-SIGNAL DC PLATE CURRENT	2.8 max.	amp
MAX.-SIGNAL DC GRID-No.1 CURRENT	0.6 max.	amp
MAX.-SIGNAL PLATE INPUT	20000 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT	400 max.	watts
PLATE DISSIPATION	12000 max.	watts

Typical CCS Class AB_2 "Single-Tone" Operation at 60 Mc:#

DC Plate Voltage	7000	volts
DC Grid-No.2 Voltage	1200	volts
DC Grid-No.1 Voltage*	-125	volts
Zero-Signal DC Plate Current	0.200	amp
Zero-Signal DC Grid-No.2 Current	0	amp
Effective RF Load Resistance	1350	ohms
Max.-Signal DC Plate Current	2.750	amp
Max.-Signal DC Grid-No.2 Current	0.26	amp
Max.-Signal DC Grid-No.1 Current	0.080	amp
Max.-Signal Peak RF Grid-No.1 Voltage	305	volts
Max.-Signal Driving Power (Approx.)	25	watts
Max.-Signal Power Output (Approx.)	12000	watts

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS★ Ratings, *Absolute-Maximum Values:*

	Up to 220 Mc	
DC PLATE VOLTAGE	5500 max.	volts
DC GRID-No.2 VOLTAGE	2000 max.	volts
DC GRID-No.1 VOLTAGE	-1000 max.	volts
DC PLATE CURRENT	2 max.	amp
DC GRID-No.1 CURRENT	0.6 max.	amp
PLATE INPUT	10000 max.	watts
GRID-No.2 INPUT	270 max.	watts
PLATE DISSIPATION	8000 max.	watts

Typical Operation in Grid-Drive Circuit:

	At 60 Mc	
DC Plate Voltage	4800	volts
DC Grid-No.2 Voltage (Modulated 100%)♣	800	volts
DC Grid-No.1 Voltage†	-300	volts

Peak RF Grid-No.1 Voltage	550	volts
DC Plate Current	1.8	amp
DC Grid-No.2 Current	0.16	amp
DC Grid-No.1 Current (Approx.)	0.18	amp
Driver Power Output (Approx.)♦	125‡	watts
Useful Power Output (Approx.)	6000	watts

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy§ and RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS★ Ratings, *Absolute-Maximum Values:*

	Up to 220 Mc	
DC PLATE VOLTAGE	7500 max.	volts
DC GRID-No.2 VOLTAGE	2000 max.	volts
DC GRID-No.1 VOLTAGE	-1000 max.	volts
DC PLATE CURRENT	3 max.	amp
DC GRID-No.1 CURRENT	0.6 max.	amp
PLATE INPUT	20000 max.	watts
GRID-No.2 INPUT	400 max.	watts
PLATE DISSIPATION	12000 max.	watts

Typical Operation in Grid-Drive Circuit:

	At 60 Mc	*At 216 Mc*	
DC Plate Voltage	6600	7000	volts
DC Grid-No.2 Voltage□	1200	1200	volts
DC Grid-No.1 Voltage◊	-310	-310	volts
Peak RF Grid-No.1 Voltage	560	560	volts
DC Plate Current	2.75	2.75	amp
DC Grid-No.2 Current	0.3	0.3	amp
DC Grid-No.1 Current (Approx.)	0.14	0.14	amp
Driver Power Output (Approx.)♦	95▽	750▲▲	watts
Useful Power Output (Approx.)	12000	10000	watts

▲ Full rated filament voltage can be applied safely to the cold filament. It is not necessary to provide means for limiting the filament starting current.

● With external flat metal shield 12" square having center hole 4-5/16" diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2.

★ Continuous Commercial Service.

♦ Computed between half-power points and based on tube output capacitance only.

♦ The driver stage is required to supply tube losses and rf-circuit losses. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line-voltages, in components, in initial tube characteristics, and in tube characteristics during life.

♠ This value includes 700 watts of rf-circuit loss at 216 Mc.

♣ The driver stage is required to supply tube losses, rf-circuit losses, and rf power added to plate circuit. The driver stage should be designed as indicated in footnote (♦).

● This value includes 470 watts of rf-circuit loss at 216 Mc and 1030 watts added to plate circuit.

"Single-Tone" operation refers to that class of amplifier service in which the grid-No.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.

* Adjusted to give indicated zero-signal plate current.

⊕ Obtained preferably from a separate source.

† Obtained preferably from a combination of 365-ohm grid-No.1 resistor and -170-volt fixed bias.

‡ This value includes 25 watts of rf-circuit loss.

§ Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

□ Obtained preferably from a separate source, or from the plate supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should not be used if the 6166A/7007 or a preceding stage is keyed. In this case, the regulation of the source should be sufficient to prevent the grid-No.2 voltage from rising above 2000 volts under key-up conditions; and additional fixed grid-No.1 bias must be provided to limit the plate current.

◇ Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

▽ This value includes 20 watts of rf-circuit loss.

▲▲ This value includes 675 watts of rf-circuit loss.

CHARACTERISTICS RANGE VALUES

	Note	Min.	Max.	
→ Filament Current.	1	165	183	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate.	2	–	0.6	pf
Grid No.1 to filament	3	39	47	pf
→ Grid No.1 to grid No.2.	3	61.4	73.4	pf
→ Grid No.2 to plate.	3	21.0	23.0	pf
Plate to filament	2	–	0.08	pf
DC Grid-No.1 Voltage.	1,4	–	-225	volts
Peak Grid-No.1 Current.	1,5	–	1.5	amp
Peak Grid-No.1 Voltage.	1,5	–	315	volts

Note 1: With 5 volts ac or dc on filament.

Note 2: With external, flat, metal shield 12" square having center hole 4-5/16" diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid-No.2. All other electrodes are grounded.

Note 3: Without shield and all other electrodes grounded.

Note 4: With dc plate voltage of 6000 volts, dc grid-No.2 voltage of 1200 volts, and dc plate current of 20 ma.

Note 5: With dc plate voltage of 1500 volts, dc grid-No.2 voltage of 1200 volts, and instantaneous grid-No.1 voltage adjusted to give peak plate current of 11 amp.

→ Indicates a change.

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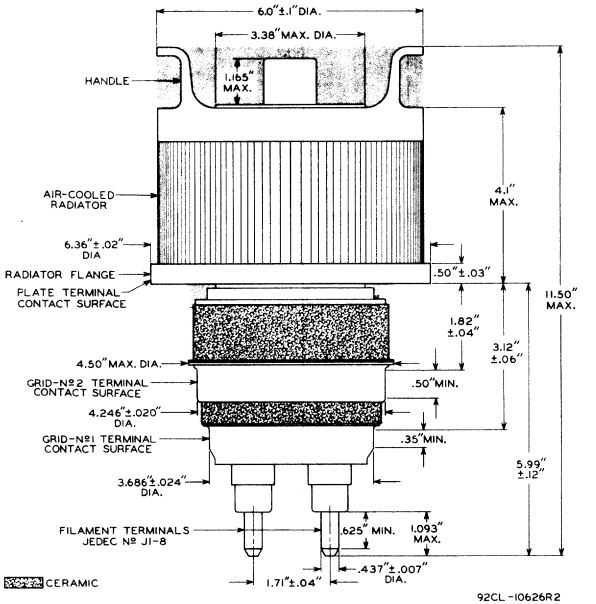
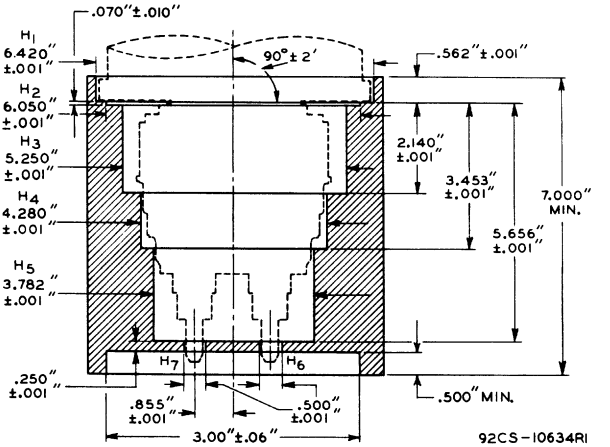


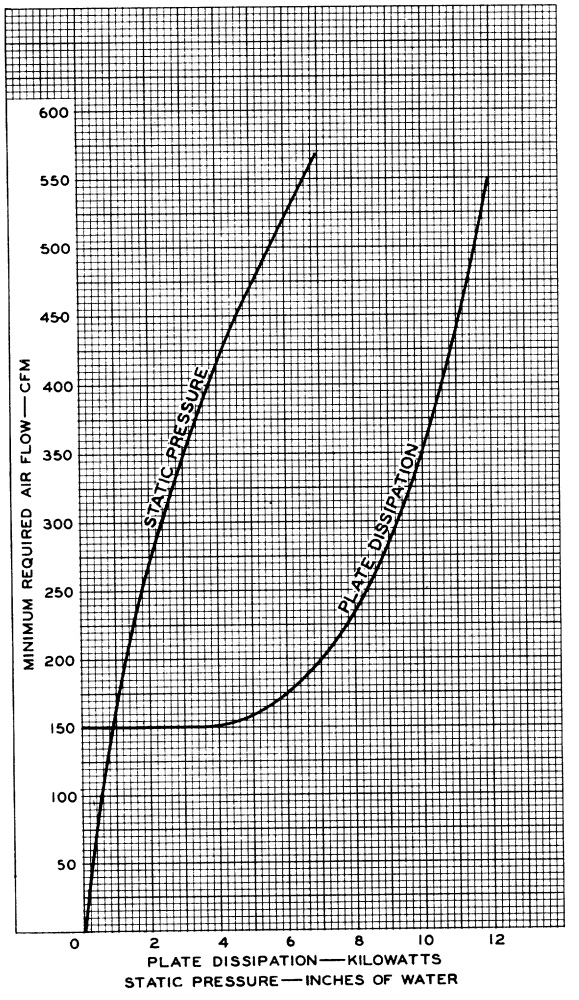
NOTE: WITH THE CYLINDRICAL SURFACES OF THE PLATE TERMINAL, GRID-No.2 TERMINAL, GRID-No.1 TERMINAL, AND FILAMENT TERMINALS CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G_1. PROPER ENTRY OF THE TUBE IN THE GAUGE IS OBTAINED WHEN THE PLATE TERMINAL IS ENTIRELY ENGAGED BY HOLE H_1 AND WILL SEAT ON THE SHOULDER BETWEEN H_1 AND H_2. THE PLANE SURFACE OF THIS SHOULDER IS AT RIGHT ANGLES TO THE AXES OF THE HOLES WITHIN $0^{o} \pm 2'$. SEATING IS DETERMINED BY FAILURE OF A 0.020"-THICKNESS GAUGE TO ENTER MORE THAN 1/16" BETWEEN SHOULDER SURFACE AND PLATE TERMINAL. SLOTS ARE PROVIDED TO PERMIT THIS MEASUREMENT. KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.

SKETCH G_1



NOTE: THE FIVE CYLINDRICAL HOLES H_1, H_2, H_3, H_4 AND H_5 HAVE AXES COINCIDENT WITHIN 0.001". THE HOLES H_6 AND H_7 HAVE AXES PARALLEL TO THE AXES OF H_1, H_2, H_3, H_4 AND H_5 WITHIN $0^{\circ} \pm 2'$.

COOLING REQUIREMENTS



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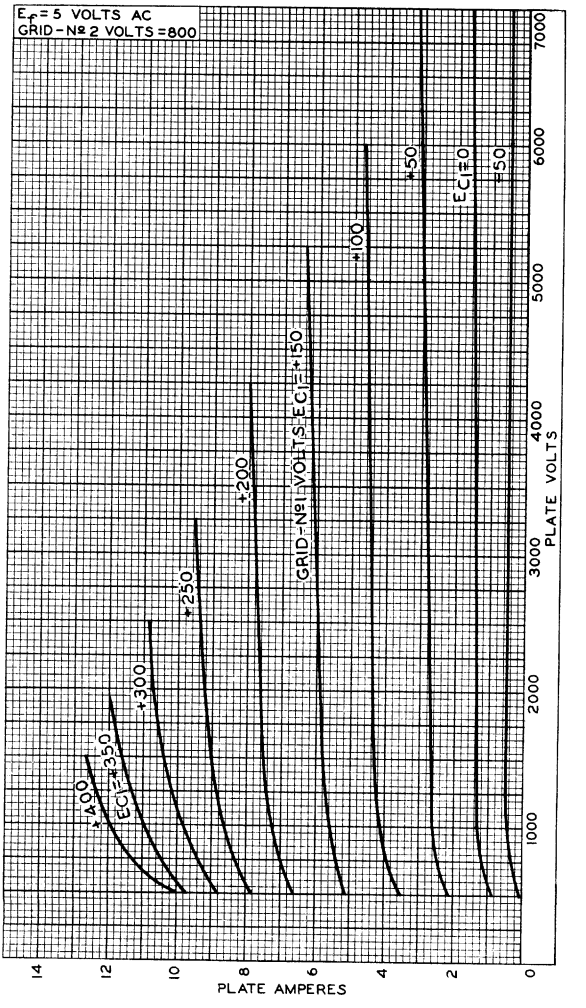
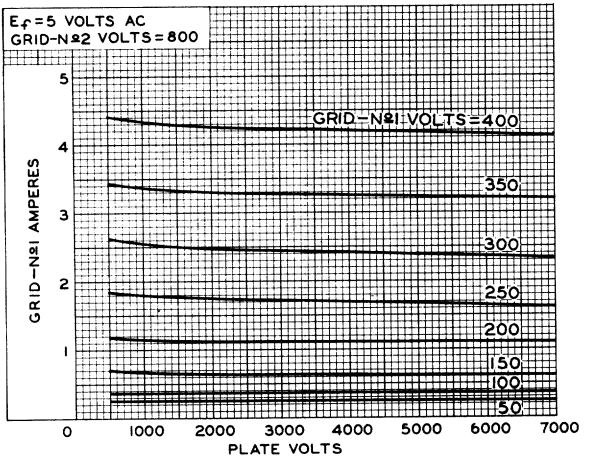
AVERAGE PLATE CHARACTERISTICS

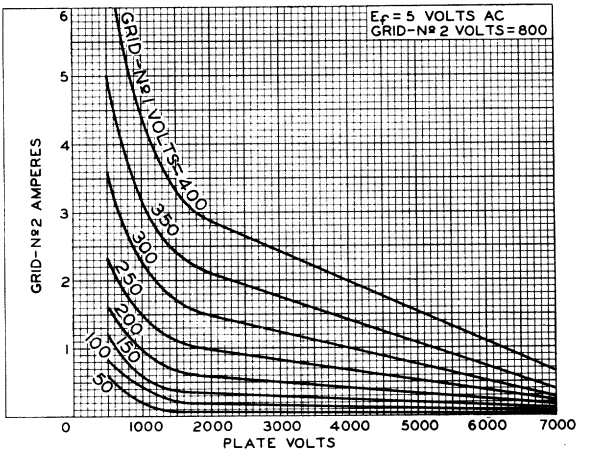


92CM-7736RI

AVERAGE CHARACTERISTICS



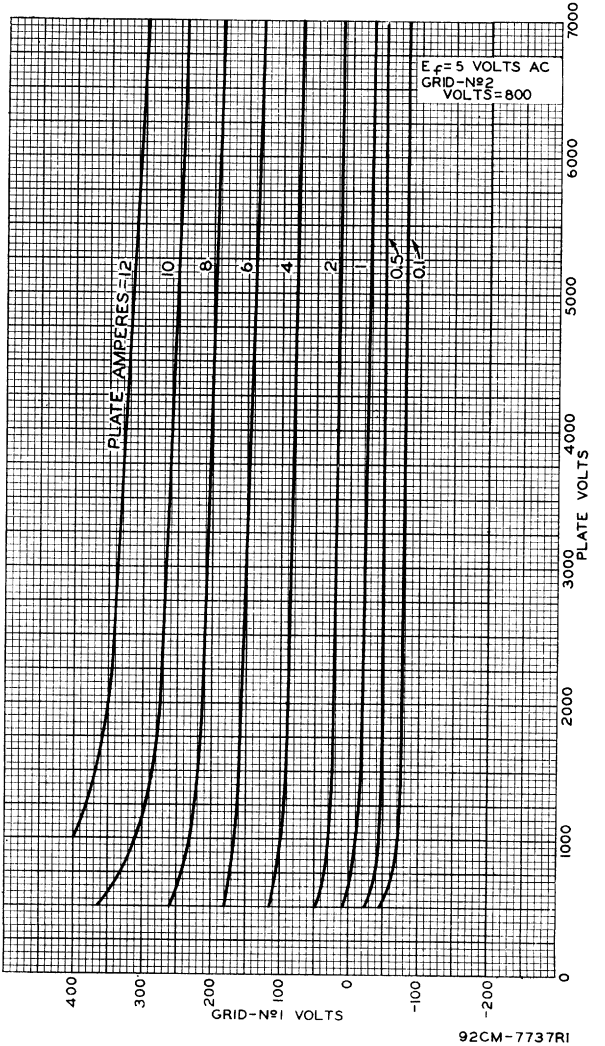
92CS-7744RI



92CS-7743RI

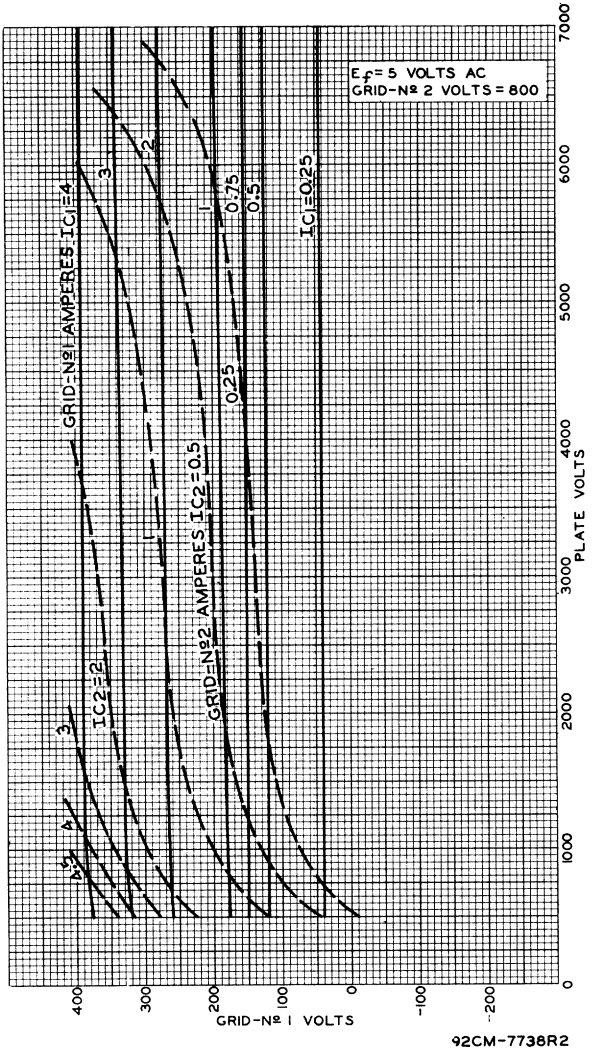
6166-A/7007

AVERAGE CONSTANT-CURRENT CHARACTERISTICS



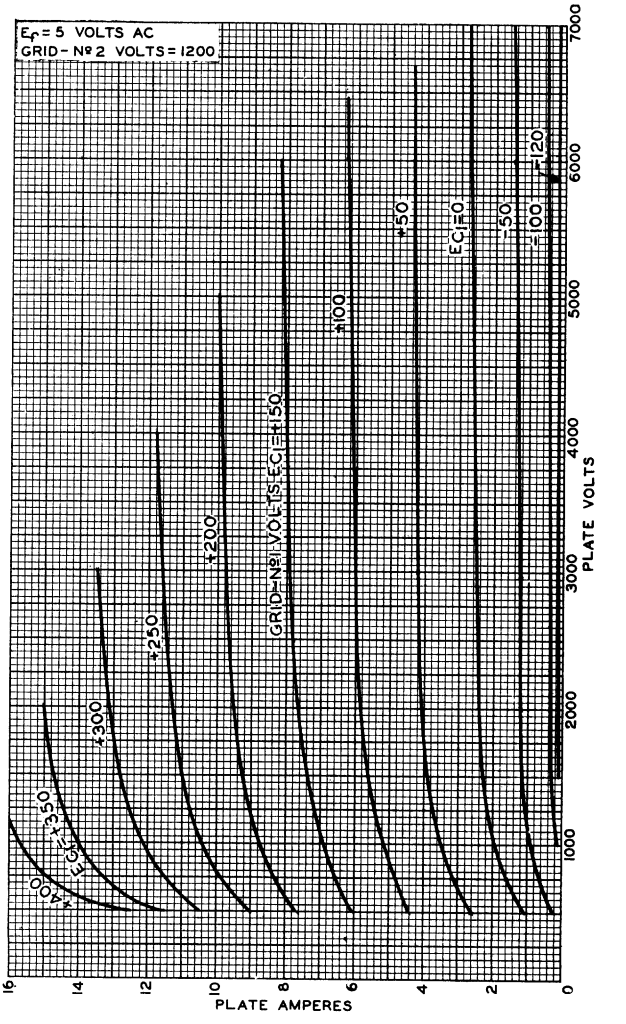
92CM-7737RI

AVERAGE CONSTANT-CURRENT CHARACTERISTICS



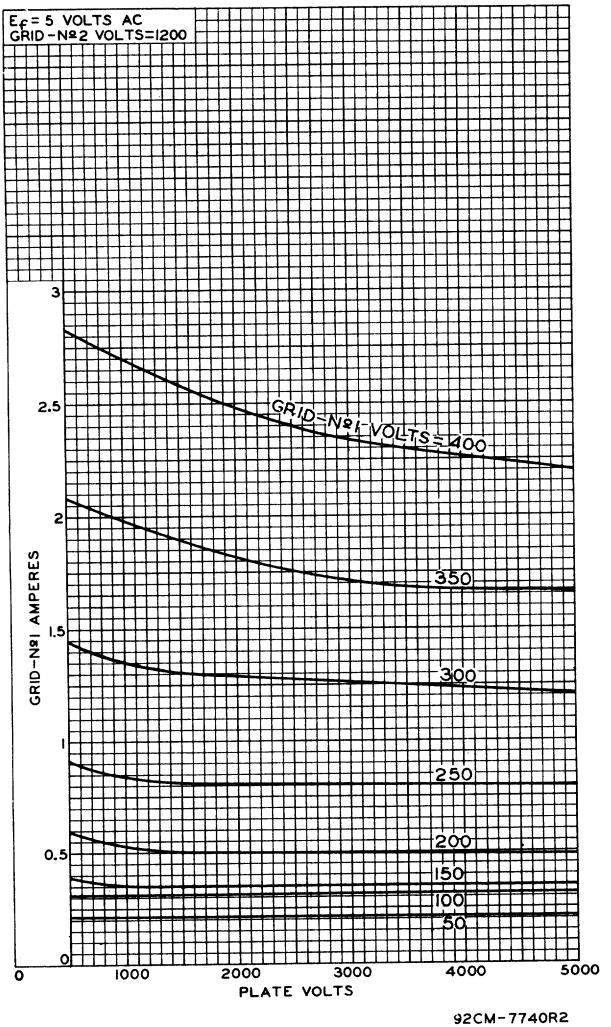
6166-A/7007

AVERAGE PLATE CHARACTERISTICS



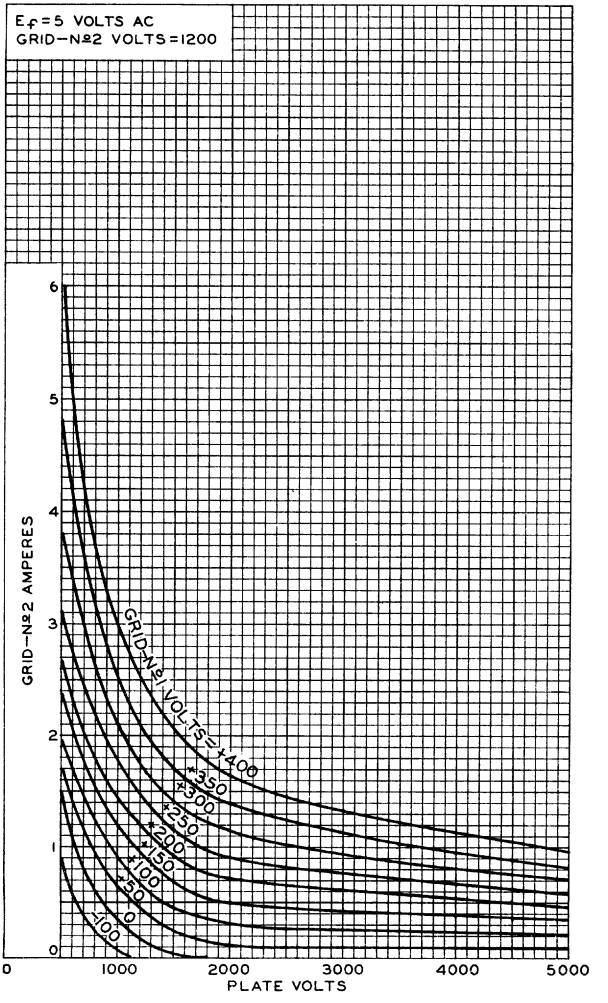
92CM-7735RI

AVERAGE CHARACTERISTICS



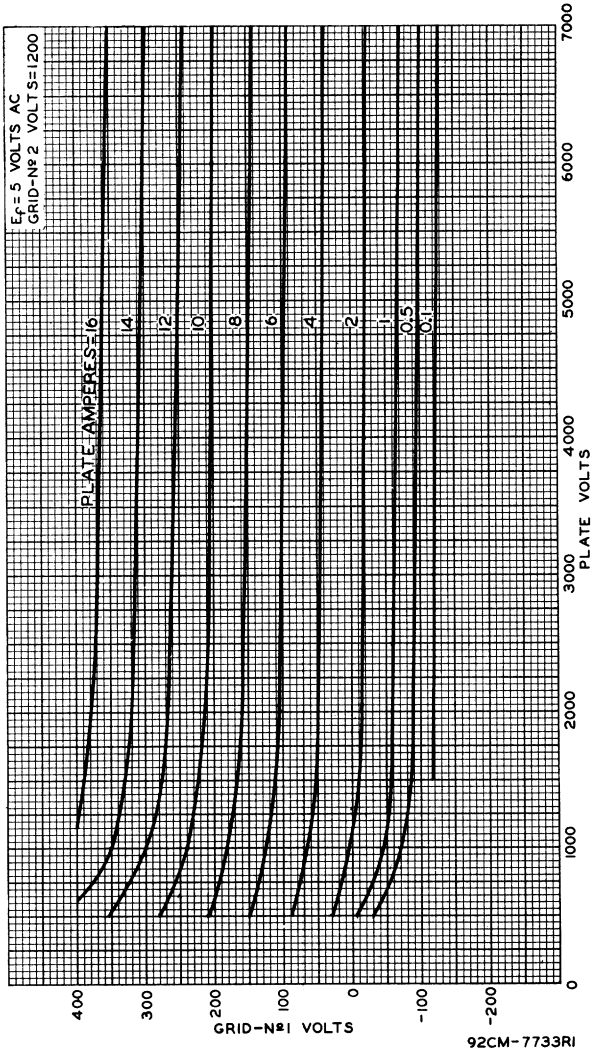
92CM-7740R2

AVERAGE CHARACTERISTICS



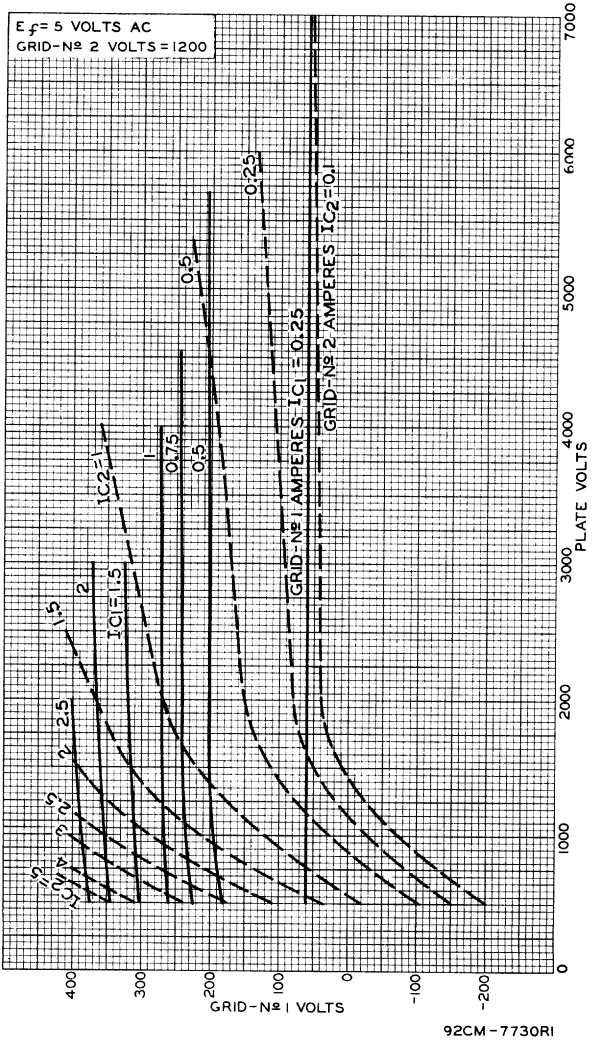
92CM—7739RI

AVERAGE CONSTANT-CURRENT CHARACTERISTICS



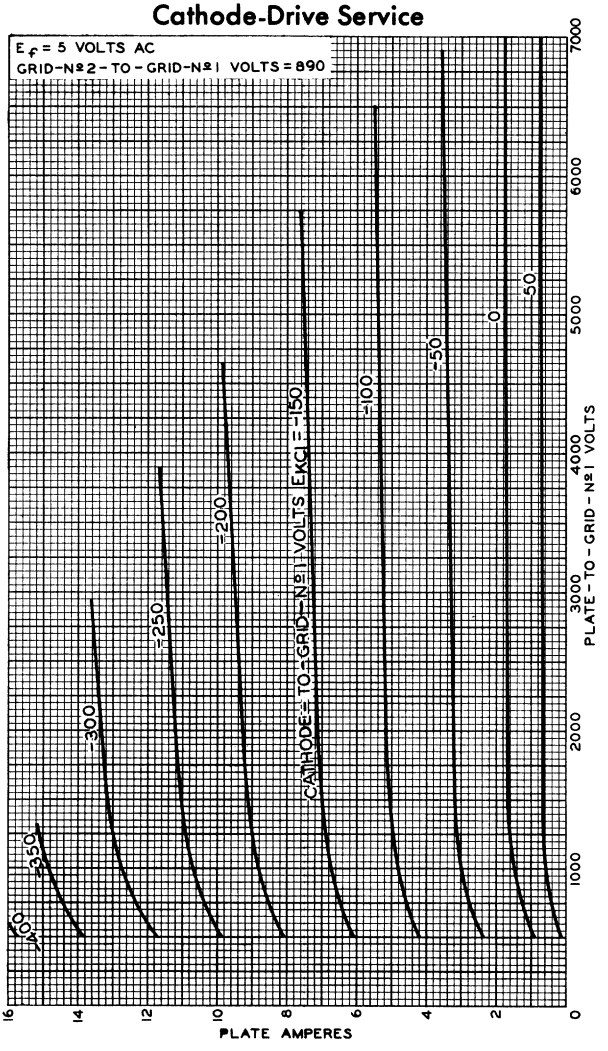
6166-A/7007

AVERAGE CONSTANT-CURRENT CHARACTERISTICS



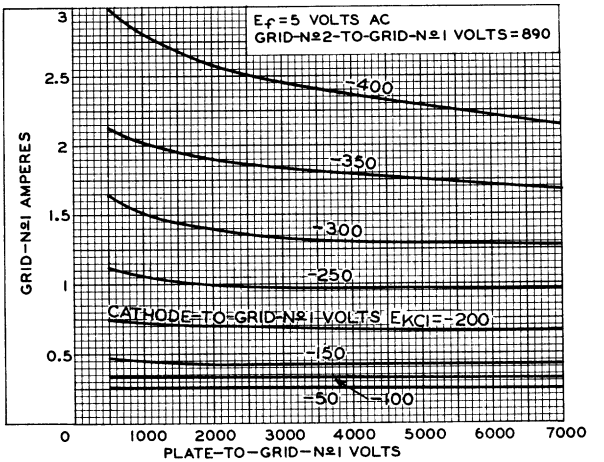
92CM-7730RI

AVERAGE PLATE CHARACTERISTICS
Cathode-Drive Service

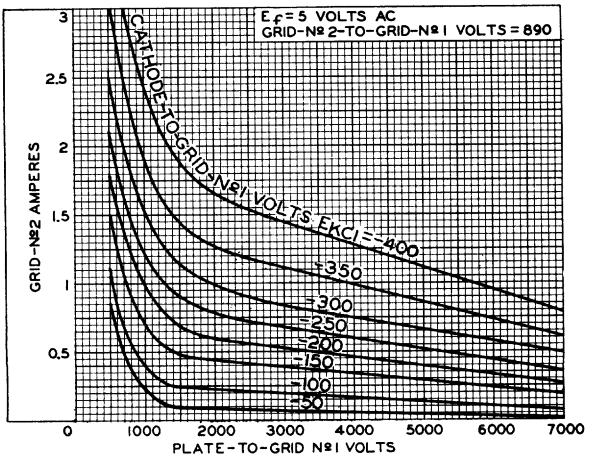


92CM-7750RI

AVERAGE CHARACTERISTICS
Cathode-Drive Service



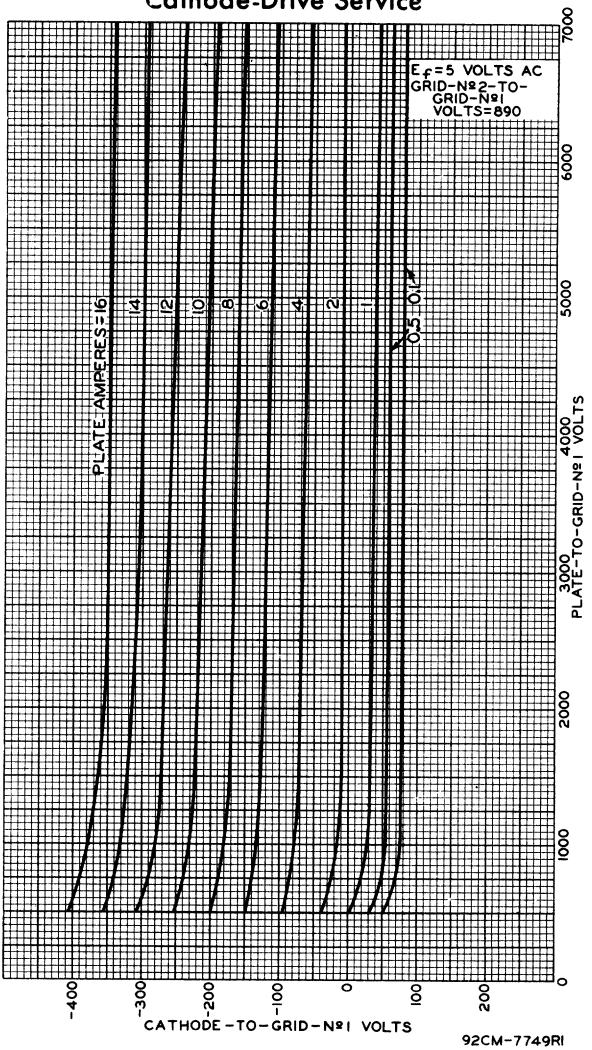
92CS-7746R1



92CS-7752R3

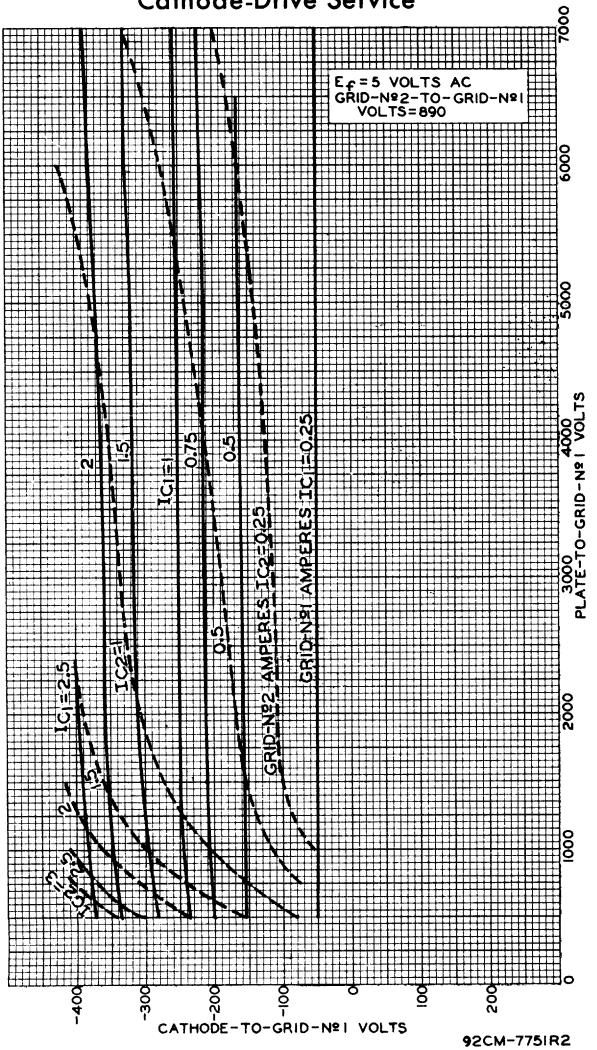
6166-A/7007

AVERAGE CONSTANT-CURRENT CHARACTERISTICS
Cathode-Drive Service



6166-A/7007

AVERAGE CONSTANT-CURRENT CHARACTERISTICS
Cathode-Drive Service



92CM-7751R2

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

6173
UHF DIODE

"PENCIL" TYPE

For use in pulse-detection and pulse-power-measuring service at frequencies up to 3300 Mc

GENERAL DATA

Electrical:

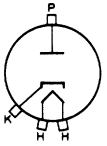
Heater, for Unipotential Cathode:		
Voltage	6.3 ± 10%	ac or dc volts
Current	0.135	amp
Resonant Frequency (Approx.)	1600	Mc
Direct Interelectrode Capacitance (Approx.):[o]		
Plate to cathode	1.1	μμf

Mechanical:

Operating Position	Any
Dimensions	*See Dimensional Outline*
Socket	Cinch No.54A16325, or equivalent
Terminal Connections *(See Dimensional Outline)*:	

H – Heater Leads

P – Plate Terminal (Adjacent to pinch-off)



K – Cathode Terminal (Adjacent to heater leads)

PULSE-DETECTION and PULSE-POWER-MEASURING SERVICE[▲]

Maximum Ratings, *Absolute Values:*

PEAK INVERSE PLATE VOLTAGE	1000 max.	volts
PEAK PULSE PLATE VOLTAGE	150 max.	volts
PEAK PULSE PLATE CURRENT	1 max.	amp
DC PLATE CURRENT	1 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 max.	volts
Heater positive with respect to cathode	90 max.	volts
SEAL TEMPERATURE (Plate or cathode)	175 max.	°C

HALF-WAVE RECTIFIER

Maximum Ratings, *Absolute Values:*

PEAK INVERSE PLATE VOLTAGE	375 max.	volts
PEAK PLATE CURRENT	50 max.	ma
HOT-SWITCHING TRANSIENT PLATE CURRENT:[●]		
For duration of 0.2 second maximum	250 max.	ma
DC OUTPUT CURRENT	5.5 max.	ma

[o],[▲],[●]: See next page.

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UHF DIODE

PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode .	90 max.	volts
Heater positive with respect to cathode .	90 max.	volts
SEAL TEMPERATURE (Plate or cathode)	175 max.	°C

° Without external shield.

▲ In this class of service, the heater should be allowed to warm up for a minimum of 60 seconds before plate voltage is applied in order to allow the cathode to reach normal operating temperature and to be able to supply the high peak plate currents encountered in this class of service.

● A minimum plate-load impedance (including the source impedance) of 300 ohms is required to limit the hot-switching transient plate current and thereby prevent damage to the tube when the plate voltage is applied.

→ CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current.	1	0.127	0.143	amp
Direct Interelectrode Capacitance:				
Plate to cathode.	2	0.8	1.4	μμf
Tube Voltage Drop	1,3	-	15	volts

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Without external shield.

Note 3: With peak plate current of 50 milliamperes provided by an applied dc voltage. Tube drop is measured by a voltmeter connected between plate and cathode.

OPERATING CONSIDERATIONS

Connections to the cathode terminal and the plate terminal should be made by flexible spring contacts only. The connectors must make firm, large-surface contact, yet must be sufficiently flexible so that no part of the tube is subjected to strain. Unless this recommendation is observed, the glass-to-metal seals may be damaged.

The *heater leads* should not be soldered to the circuit elements. The heat of the soldering operation may crack the glass seals of the heater leads and damage the tube.

The accompanying *Pulse Rating Chart* represents graphically the relationships between pulse duration, pulse-repetition rate, and peak-pulse plate current. This Chart gives the equipment designer a wide choice of operating parameters within the tube's ratings.

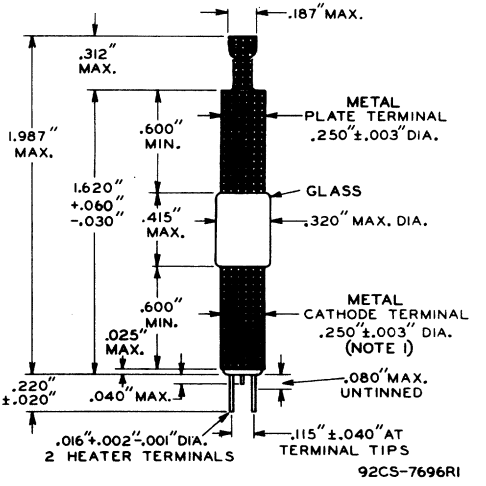
Dotted boundary line "ABC" is the locus of the maximum peak-pulse-plate-current values for various pulse durations. In most applications, two of the three parameters shown in the Pulse Rating Chart are known. Knowing any two parameters, the equipment designer can select from the Chart the maximum allowable value of the third parameter. For example, if an application requires a 1-microsecond pulse and a pulse-repetition rate of 1000 pulses per second, the maximum allowable peak-pulse plate current is 1 ampere. Since the pulse-repetition rate of 1000 is a maximum value for a pulse duration

→ Indicates a change.

6173
UHF DIODE

of 1 microsecond, it follows that any pulse-repetition rate up to 1000 may be used under these conditions. If a longer pulse duration is required, e.g., 1.5 microseconds, and the same pulse-repetition rate of 1000 is required, the maximum allowable peak-pulse plate current is 0.67 ampere.

In applications where groups of pulses are employed, the equipment designer can total the pulse duration of the individual pulses in any one group and then treat the pulse duration of the group as a single wide pulse.



NOTE 1: THE MAXIMUM ECCENTRICITY OF THE CATHODE TERMINAL WITH RESPECT TO THE PLATE TERMINAL IS 0.008". ECCENTRICITY IS MEASURED BY CHUCKING THE PLATE TERMINAL 0.050" TO 0.100" FROM THE GLASS MID-SECTION, ROTATING THE TUBE, AND MEASURING ONE-HALF THE TOTAL TRAVEL DISTANCE OF THE CATHODE TERMINAL AT A POINT 0.080" FROM THE FREE END OF THE CATHODE TERMINAL.

RCA

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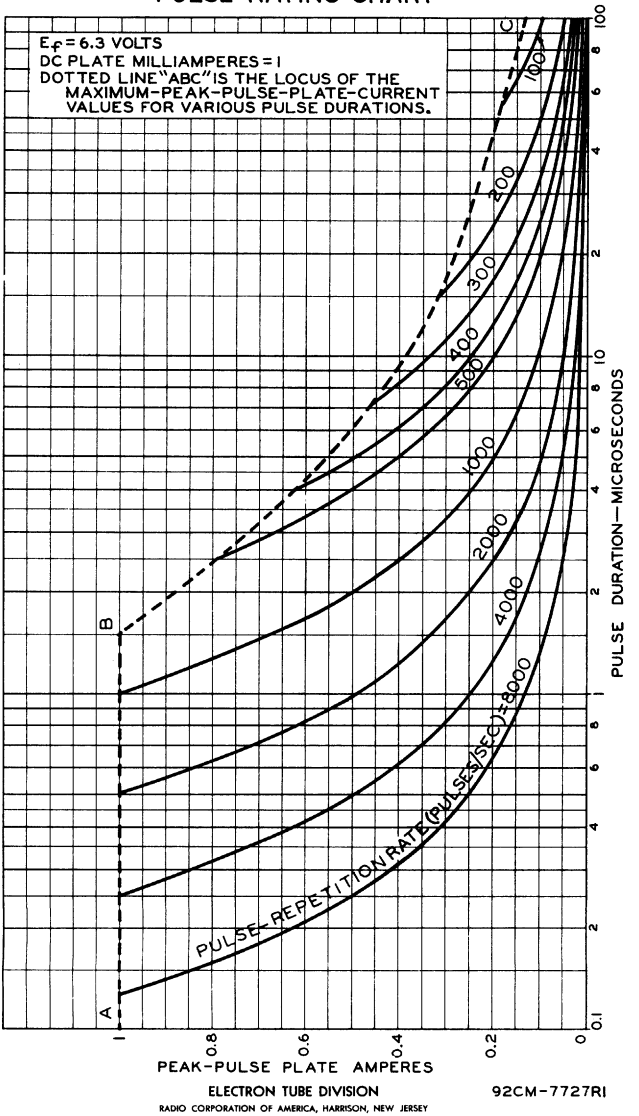
PULSE RATING CHART



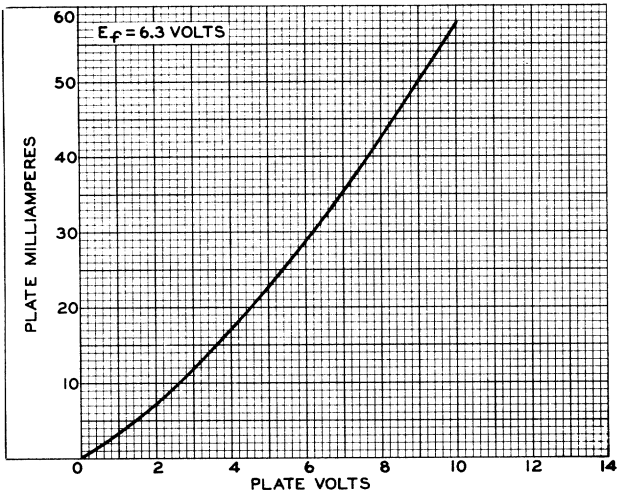
ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

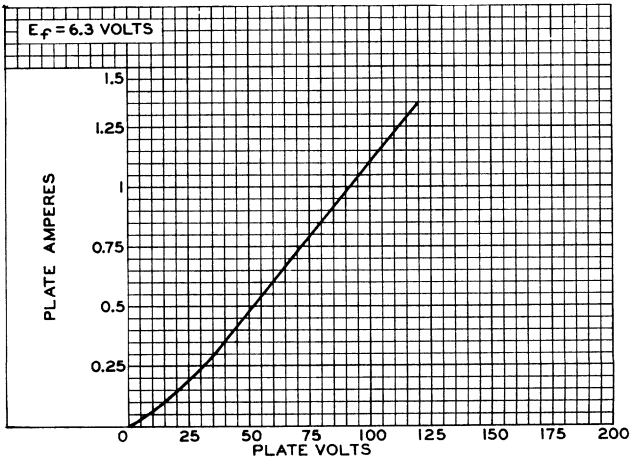
92CM-7727RI

6173

AVERAGE PLATE CHARACTERISTICS



92CS-9638



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CS-9637

RCA

6197

POWER PENTODE

FOR "ON-OFF" CONTROL APPLICATIONS INVOLVING
LONG PERIODS OF OPERATION UNDER CUTOFF CONDITIONS

GENERAL DATA

Electrical:

Heater, Pure Tungsten, for Unipotential Cathode:		
Voltage	6.3 ± 5%	ac or dc volts
Current at 6.3 volts	0.65	amp
Direct Interelectrode Capacitances (Approx. with no external shield):		
Grid No.1 to Plate	0.125	μμf
Grid No.1 to Cathode and Heater	11.5	μμf
Plate to Cathode and Heater	5.0	μμf
Heater to Cathode	8.5	μμf

Characteristics, Class A_1 Amplifier:

Heater Voltage	6.3	volts
Plate Voltage	250	volts
Grid No.3	Connected to Cathode at Socket	
Grid-No.2 Voltage	150	volts
Grid-No.1 Voltage	-3	volts
Mu-Factor, Grid No.2 to Grid No.1	22	
Plate Resistance	90000	ohms
Transconductance	11000	μmhos
Plate Current	30	ma
Grid-No.2 Current	7	ma
Maximum Plate Current for grid-No.1 voltage of -12 volts	100	μamp

Mechanical:

Mounting Position	Vertical; Horizontal operation permitted if pins No.3 and No.8 are in a vertical plane
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Maximum Diameter	7/8"
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)

BOTTOM VIEW

Pin 1: Cathode
Pin 2: Grid No.1
Pin 3: Grid No.2
Pin 4: Heater
Pin 5: Heater
Pin 6: Plate
Pin 7: Grid No.3, Int. Shield
Pin 8: Grid No.2
Pin 9: Grid No.1

FREQUENCY DIVIDER IN COMPUTER SERVICE and "ON-OFF" CONTROL SERVICE

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	300 max.	volts
GRID-No.3 (SUPPRESSOR) VOLTAGE	0 max.	volts

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POWER PENTODE

GRID-No.2 (SCREEN) VOLTAGE	250 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE	-50 max.	volts
PLATE DISSIPATION	7.5 max.	watts
GRID-No.2 INPUT	2.5 max.	watts
CATHODE CURRENT	50 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	180• max.	volts
Heater positive with respect to cathode	180• max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	200 max.	°C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.61	0.69	amp
Mu-Factor, Grid No.2 to Grid No.1	1,2	19	25	
Plate Current (1)	1,3	26	46	ma
Plate Current (2)	1,4	20	40	ma
Plate Current (3)	1,5	-	100	μamp
Grid-No.2 Current	1,4	5	9	ma
Reverse Grid-No.1 Current	1,6	-	2	μamp
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,7	-	40	μamp
Heater positive with respect to cathode	1,7	-	40	μamp
Transconductance	1,4	9000	13000	μmhos

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With grid No.3 tied to cathode, grid No.2 tied to plate, plate voltage of 150 volts, grid-No.2 voltage of 150 volts, and grid-No.1 voltage of -3 volts.

Note 3: With plate voltage of 50 volts, grid No.3 tied to cathode, grid No.2 voltage of 100 volts, and grid-No.1 voltage of 0 volts.

Note 4: With plate voltage of 250 volts, grid No.3 connected to cathode, grid-No.2 voltage of 150 volts, and grid-No.1 voltage of -3 volts.

Note 5: With plate voltage of 250 volts, grid No.3 connected to cathode, grid-No.2 voltage of 150 volts, and grid-No.1 voltage of -12 volts.

Note 6: With plate voltage of 250 volts, grid No.3 connected to cathode, grid-No.2 voltage of 150 volts, grid-No.1 supply voltage of -3 volts, and grid-No.1 resistor of 0.25 megohm.

Note 7: With 90 volts dc between heater and cathode.

• DC component must not exceed 90 volts.

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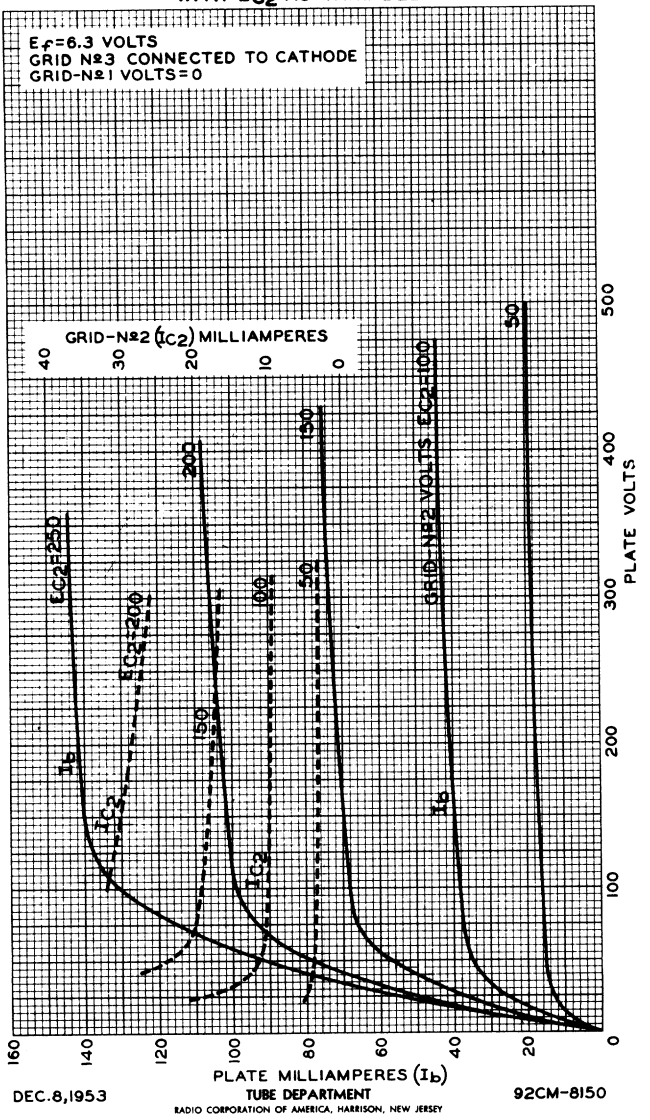
AVERAGE PLATE CHARACTERISTICS
WITH E_{C2} AS VARIABLE



DEC. 8, 1953

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

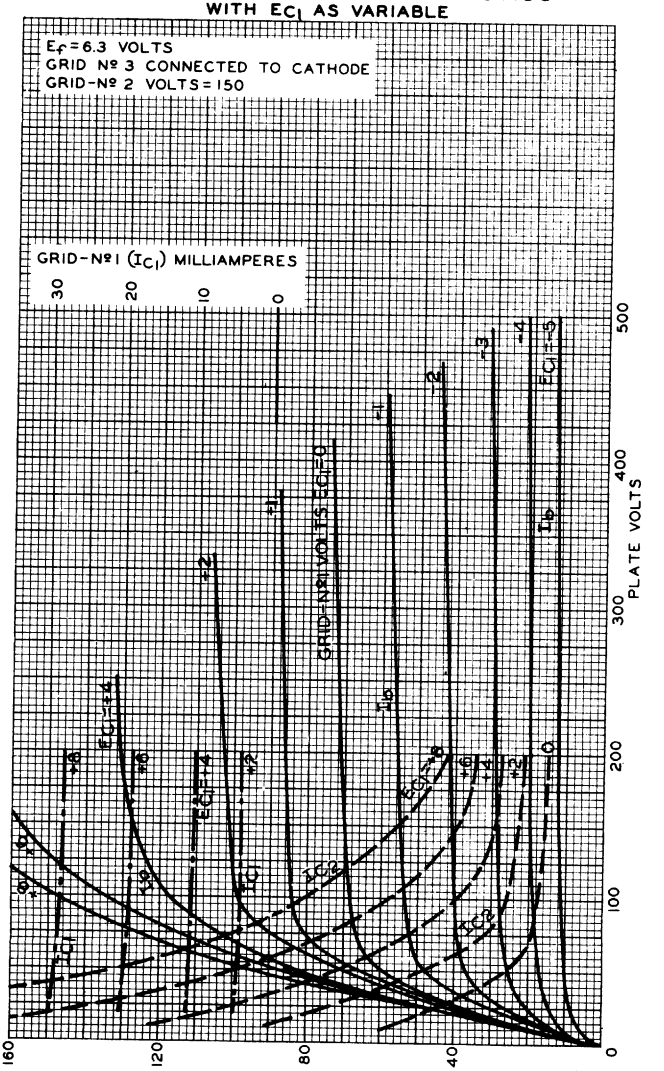
92CM-8150

6197

RCA

6197

AVERAGE PLATE CHARACTERISTICS
WITH E_{C1} AS VARIABLE



DEC. 4, 1953

TUBE DEPARTMENT

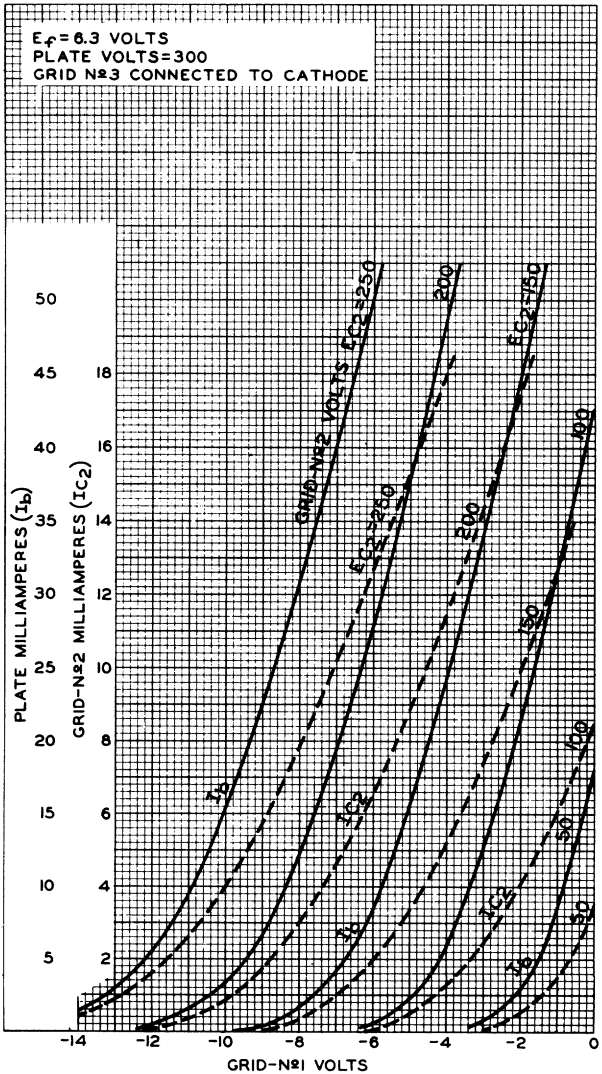
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8285

RCA

6197

AVERAGE CHARACTERISTICS



TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6197

RCA

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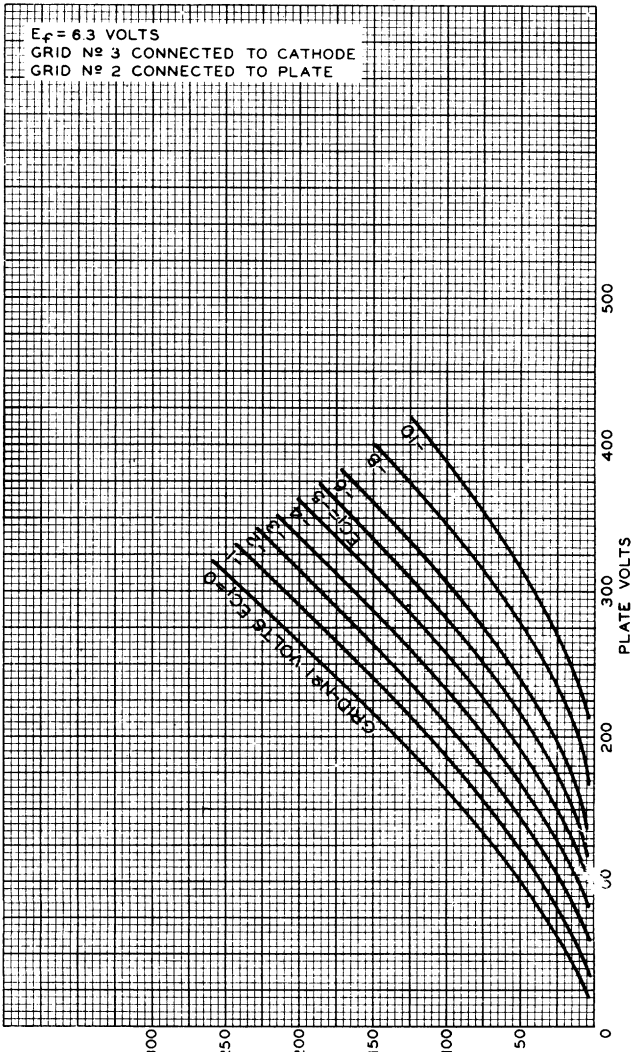
AVERAGE PLATE CHARACTERISTICS

TRIODE CONNECTION



DEC. 4, 1953

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8286

6201

HIGH-MU TWIN TRIODE

9-PIN MINIATURE TYPE

Intended for applications where dependable performance under shock and vibration is paramount, and for "on-off" control applications involving long periods of operation under cutoff conditions. The 6201, a "premium" version of the 12AT7, may be used at frequencies up to 300 Mc.

GENERAL DATA

Electrical:

Heater, Pure Tungsten, for Unipotential Cathodes:

	Series	*Parallel*	
Heater arrangement			
Voltage	12.6 ± 10%	6.3 ± 10%	ac or dc volts
Current	0.15	0.3	amp

Direct Interelectrode Capacitances (Approx.):

Grid-Drive Operation:	*Without External Shield*	*With External Shield**	
Grid to plate (Each unit)	1.6	1.6	μμf
Grid to cathode and heater (Each unit)	2.5	2.5	μμf
Plate to cathode and heater (Unit No.1)	0.45	1.2	μμf
Plate to cathode and heater (Unit No.2)	0.38	1.3	μμf
Heater to cathode (Each unit)	2.8	2.8	μμf
Plate to plate	0.24	-	μμf
Cathode-Drive Operation:	*Without External Shield*	*With External Shield●*	
Plate to cathode (Unit No.1)	0.2	0.18	μμf
Plate to cathode (Unit No.2)	0.24	0.2	μμf
Cathode to grid and heater (Each unit)	5	5	μμf
Plate to grid and heater (Unit No.1)	1.9	2.7	μμf
Plate to grid and heater (Unit No.2)	1.8	2.7	μμf

Characteristics, Class A_1 Amplifier (Each Unit):

Plate-Supply Voltage	100	250	volts
Cathode Resistor	270	200	ohms
Amplification Factor	57	60	
Plate Resistance (Approx.)	14300	10900	ohms
Transconductance	4000	5500	μmhos
Plate Current	3.3	10	ma
Grid Voltage (Approx.) for plate current of 10 μamp	-5	-12	volts

*,●: See next page.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6201

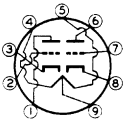
6201

HIGH-MU TWIN TRIODE

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Maximum Diameter	7/8"
Dimensional Outline	*See General Section*
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9A

Pin 1 – Plate of Unit No.2
Pin 2 – Grid of Unit No.2
Pin 3 – Cathode of Unit No.2
Pins 4 & 9 – Heater of Unit No.2
Pins 5 & 9 – Heater of Unit No.1



Pin 6 – Plate of Unit No.1
Pin 7 – Grid of Unit No.1
Pin 8 – Cathode of Unit No.1
Pin 9 – Heater Mid-Tap

AMPLIFIER - Class A_1

Values are for Each Unit

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	330 max.	volts
GRID VOLTAGE:		
Negative bias value	55 max.	volts
Positive bias value	0 max.	volts
PLATE DISSIPATION	2.75 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	180 max.	°C

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	1.0 max.	megohm

Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED AMPLIFIER CHART at end of tabulated data for this type

* With external shield JETEC No.315 connected to cathode of unit under test.

● With external shield JETEC No.315 connected to grid of unit under test.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6201

HIGH-MU TWIN TRIODE

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN•

Values Are For Each Unit and are Initial, Unless Otherwise Specified

	Note	Min.	Max.	
Heater Current	1	0.138	0.162	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	1.3	1.9	μμf
Grid to cathode and heater	2	2	3	μμf
Plate to cathode and heater (Unit No.1)	2	0.2	0.7	μμf
Plate to cathode and heater (Unit No.2)	2	0.16	0.6	μμf
Heater to cathode	2	2.1	3.5	μμf
Plate to plate	3	0.15	0.33	μμf
Amplification Factor	1,4	50	70	
Plate Current (1)	1,4	7	14	ma
Plate-Current Difference Between Units	1,4	-	3.2	ma
Plate Current (2)	1,5	-	100	μamp
Transconductance (1)	1,4	4500	6500	μmhos
Transconductance (1) at 500 Hours	1,4	3800	6500	μmhos
Transconductance (2)	3,6	4100	-	μmhos
Transconductance Change: Difference between average transconductance (1) initially, and average after 500 hours, expressed as a percentage of the initial average	1,4	-	15	%
Reverse Grid Current	1,7	-	0.7	μamp
Grid Emission Current	8,9	-	1.5	μamp
Heater-Cathode Leakage Current: Heater negative with respect to cathode	1,10	-	10	μamp
Heater positive with respect to cathode	1,10	-	10	μamp
Leakage Resistance: Between grid and all other electrodes tied together	1,11	100	-	megohms

• Each tube is stabilized before characteristics testing by continous operation for at least 45 hours at room temperature and with dissipation values equivalent to life test conditions.

Notes 1 to 11: See next page.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6201
HIGH-MU TWIN TRIODE

	Note	Min.	Max.	
Leakage Resistance:				
Between plate and all other electrodes tied together.	1,12	100	-	megohms
Leakage Resistance at 500 Hours:				
Between grid and all other electrodes tied together.	1,11	50	-	megohms
Between plate and all other electrodes tied together.	1,12	50	-	megohms

Note 1: With 12.6 volts ac or dc on heater (series connection).

Note 2: Without external shield and with unit not under test connected to ground.

Note 3: Without external shield.

Note 4: With dc plate-supply volts = 250, cathode resistor (ohms) = 200, and cathode bypass capacitor of 1000 μf. Each unit tested separately. Unit not under test connected to ground.

Note 5: With dc plate-supply volts = 250, plate load resistance (megohms) = 0.1, and dc grid volts = −20. Each unit tested separately. Unit not under test connected to ground.

Note 6: With 11.0 volts ac or dc on heater (series connection).

Note 7: With dc plate-supply volts = 250, grid-circuit resistance (megohms) = 0.5, cathode resistor (ohms) = 200, and cathode bypass capacitor of 1000 μf. Each unit tested separately. Unit not under test connected to ground.

Note 8: With 15.0 volts ac or dc on heater (series connection).

Note 9: With dc plate volts = 250, grid-circuit resistance (megohms) = 0.5, and dc grid volts = −20. Each unit tested separately.

Note 10: With 100 volts dc between heater and cathode and units connected in parallel.

Note 11: With grid 100 volts negative with respect to all other electrodes tied together.

Note 12: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration. . . . . 600 max. g

This test is performed on a sample lot of tubes from each production run in a Navy Type, High-Impact (flyweight) Shock Machine. Tubes are held rigid in four different positions and are subjected to 20 blows at the specified maximum impact acceleration. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for vibrational acceleration, heater-cathode leakage current, and transconductance.

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

This test is performed on a sample lot of tubes from each

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HIGH-MU TWIN TRIODE

production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for impact acceleration, heater-cathode leakage current, and transconductance.

Low-Frequency Vibration Performance:

RMS Output Voltage. . . . . 100 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: plate of unit No.1 tied to plate of unit No.2, grid of unit No. 1 tied to grid of unit No.2, heater volts = 12.6, dc plate volts = 250, dc grid volts = -3, plate load resistance (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cycles per second.

Heater-Cycling Life Performance:

Cycles of Intermittent Operation. . . . . 2000 min. cycles

Under the following conditions and with the heaters of unit No.1 and unit No.2 connected in parallel: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and plate and grid volts = 0.

Audio-Frequency Noise and Microphonic Performance:

RMS Output Voltage. . . . . 100 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: plate of unit No.1 tied to plate of unit No.2, grid of unit No.1 tied to grid of unit No.2, dc heater volts = 12.6, plate-supply volts = 300, cathode resistor (ohms) = 200 common to both units, and plate load resistance (ohms) = 10,000.

Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1.4 microamperes under the conditions specified in the CHARACTERISTICS RANGE VALUES for reverse grid current.

1-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. With both units operating, each unit is checked for variation in transconductance under conditions of maximum rated plate dissipation. At the end of 1 hour, the value of transconductance is read. The variation in transconductance from the 0-hour reading will not exceed 10 per cent.

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100-Hour Life Performance:

This test is performed on a sample lot of tubes from each production run under the conditions of maximum rated plate dissipation to insure a low percentage of early inoperatives. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1.4 microamperes under the conditions specified in CHARACTERISTICS RANGE VALUES for reverse grid current.

500-Hour Average Life Performance:

This 500-hour test is made on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. With both units operating, each unit is life tested separately at room temperature under the following conditions: heater volts = 12.6 ac or dc (series connection), plate-supply volts = 250, cathode resistor (ohms) = 200, grid-circuit resistance (megohms) = 0.5, heater 135 volts positive with respect to cathode, and bulb temperature (^{o}C) = 180. At the end of 500 hours, tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass the established initial limits for heater current, reverse grid current, heater-cathode leakage current, and 500-hour limits for transconductance (1), transconductance change, and leakage resistance as shown under CHARACTERISTICS RANGE VALUES.

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HIGH-MU TWIN TRIODE

OPERATING CONSIDERATIONS AS RESISTANCE-COUPLED AMPLIFIER (Each Unit)

Plate-Supply Voltage	90			volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage)	0.24	0.51	1	megohm
Cathode Resistor	2400	5300	11000	ohms
Peak Output Voltage	13	15	16	volts
Voltage Gain▲	27	28	28	
Plate-Supply Voltage	180			volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage)	0.24	0.51	1	megohm
Cathode Resistor	1400	3600	7100	ohms
Peak Output Voltage	28	31	33	volts
Voltage Gain▲	33	33	32	
Plate-Supply Voltage	300			volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage)	0.24	0.51	1	megohm
Cathode Resistor	1200	2900	6400	ohms
Peak Output Voltage	47	52	55	volts
Voltage Gain▲	33	34	34	

▲ At 2 volts (rms) output.

Note: Coupling capacitors should be selected to give desired frequency response. Cathode resistors should be adequately bypassed.

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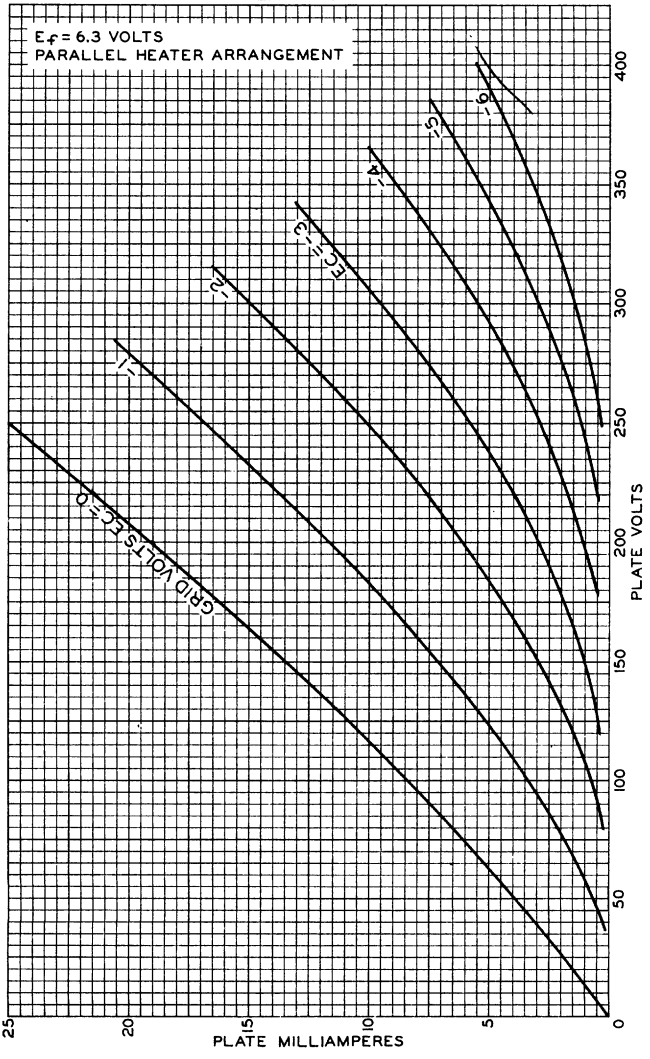
AVERAGE PLATE CHARACTERISTICS

EACH UNIT



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92CM-9020

RCA

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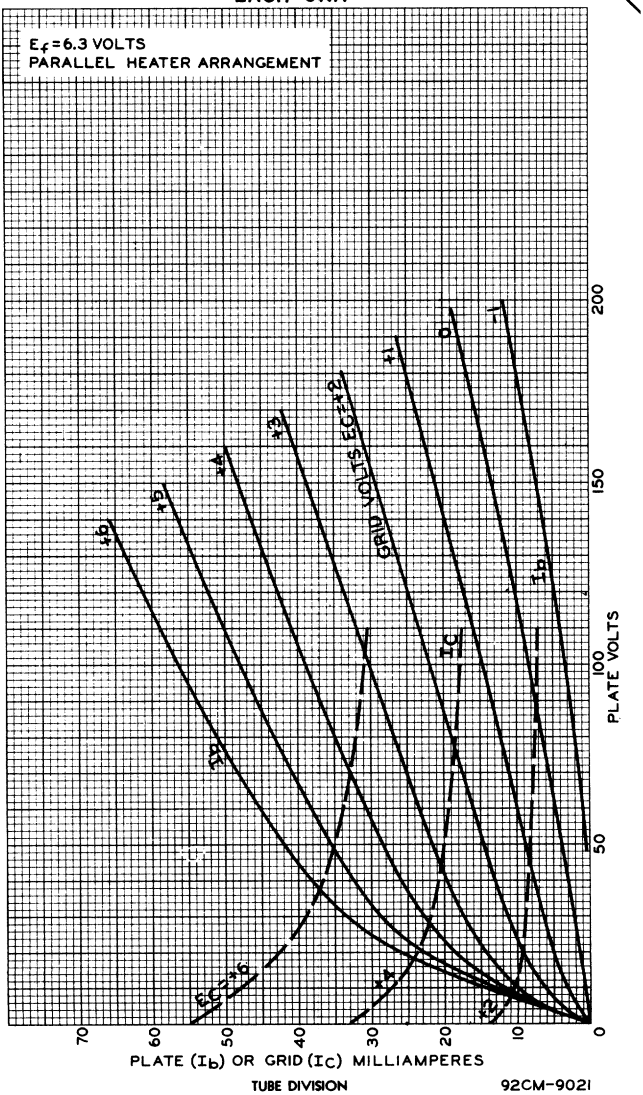
AVERAGE CHARACTERISTICS
EACH UNIT



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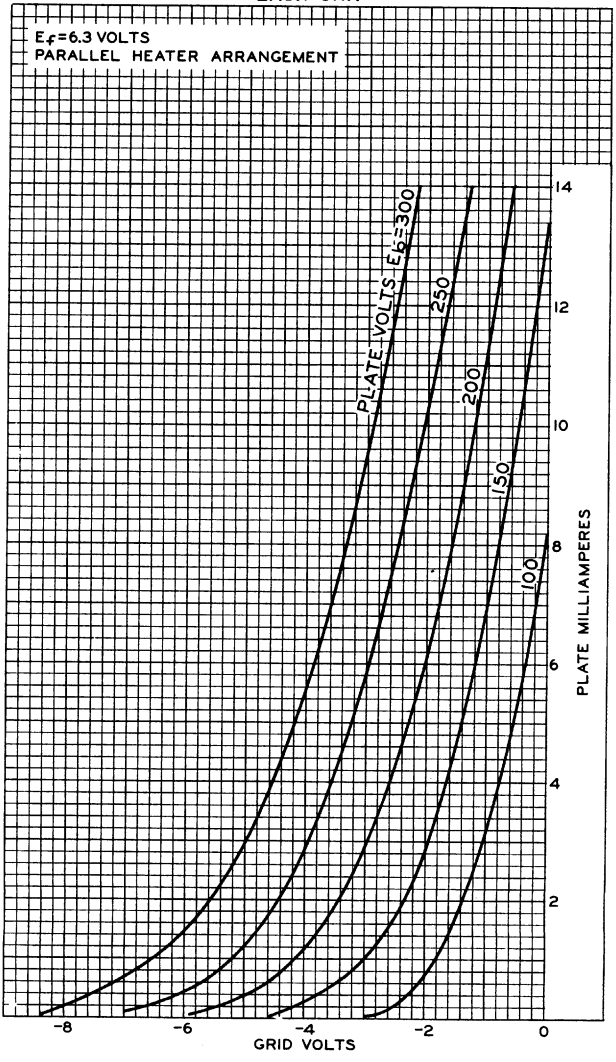
AVERAGE CHARACTERISTICS
EACH UNIT



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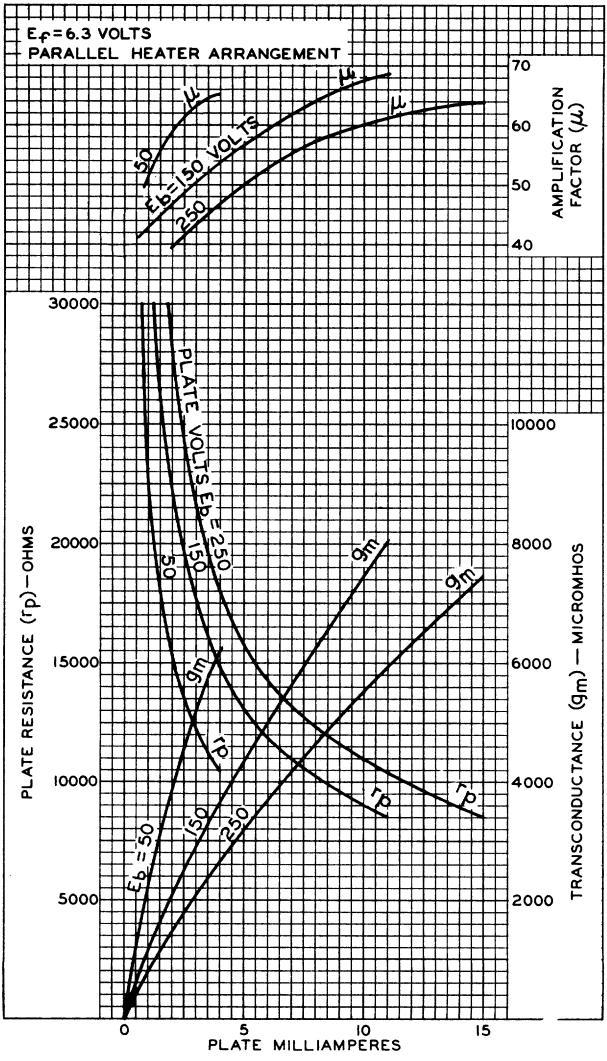
AVERAGE CHARACTERISTICS

EACH UNIT



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MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For "on-off" control applications involving long periods of operation under cutoff conditions

GENERAL DATA

Electrical:

Heater, Pure Tungsten, for Unipotential Cathodes:

	Series	*Parallel*	
Heater arrangement			
Voltage	12.6 ± 5%	6.3 ± 5%	ac or dc volts
Current	0.15	0.3	amp

Direct Interelectrode Capacitances:[o]

	Unit No.1	*Unit No.2*	
Grid to plate	2.22	2.22	μμf
Grid to cathode and heater	2.90	2.90	μμf
Plate to cathode and heater	0.54	0.46	μμf
Heater to cathode	3.25	3.25	μμf ←
Plate of unit No.1 to plate of unit No.2	0.56		μμf
Grid of unit No.1 to grid of unit No.2	0.06 max.		μμf

Characteristics, Class A$_1$ Amplifier (Each Unit):

Plate-Supply Voltage	100	volts
Cathode Resistor	470	ohms
Amplification Factor	27	
Plate Resistance (Approx.)	7500	ohms
Transconductance	3600	μmhos
Plate Current	4.6	ma
Grid Voltage (Approx.) for plate voltage of 150 volts and plate current of 100 μamp	-8	volts ←

Mechanical:

Mounting Position . . . . . Vertical, base up or down, ← or Horizontal with pins 1 and 5 in vertical plane

Maximum Overall Length . . . . . 2-3/16"

Maximum Seated Length . . . . . 1-5/16"

Length, Base Seat to Bulb Top (Excluding tip) . 1-9/16" ± 3/32"

Maximum Diameter . . . . . 7/8"

Dimensional Outline . . . . . *See General Section*

Bulb T-6-1/2

Base . . . . . Small-Button Noval 9-Pin (JETEC No.E9-1)

Basing Designation for BOTTOM VIEW 9A

Pin 1 – Plate of Unit No.2
Pin 2 – Grid Unit No.2
Pin 3 – Cathode of Unit No.2
Pins 4 & 9 – Heater of Unit No.2
Pins 5 & 9 – Heater of Unit No.1
Pin 6 – Plate of Unit No.1
Pin 7 – Grid of Unit No.1
Pin 8 – Cathode of Unit No.1
Pin 9 – Heater Mid-Tap

o Without external shield.

← Indicates a change.

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MEDIUM-MU TWIN TRIODE

FREQUENCY DIVIDER IN COMPUTER SERVICE and "ON-OFF" CONTROL SERVICE

Values are for Each Unit

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	200 max.	volts
GRID VOLTAGE:		
Negative bias value	100 max.	volts
→ Positive bias value	1 max.	volt
→ DC POSITIVE GRID CURRENT	2 max.	ma
→ DC CATHODE CURRENT	16 max.	ma
PLATE DISSIPATION	1 max.	watt
→ PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	180 max.	volts
Heater positive with respect to cathode	180▲max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	120 max.	°C

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

→ **CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN**

	Note	*Min.*	*Max.*	
Heater Current	1	0.138	0.162	amp
Plate Current (Each unit)	1,2	4.8	5.5	ma
Plate Current (Each unit)	1,3	3.6	5.6	ma
Plate Current (Each unit)	1,2,4	–	100	μamp
Transconductance	1,2,3	2700	4500	μmhos
Reverse Grid Current (Units in parallel)	1,5	–	1	μamp
Leakage Resistance (Each unit):				
Between grid and all other electrodes	1,6	100	–	megohms
Between plate and all other electrodes	1,7	100	–	megohms
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,8	–	20	μamp
Heater positive with respect to cathode	1,8	–	20	μamp
Difference in Grid Voltage Between Units	1,2,9	–	1	volt
Contact Potential	1,10	–	1	volt
Amplification Factor (Each unit)	1,2	23	31	

Note 1: With 12.6 volts ac or dc on heater (series arrangement).

▲ The dc component must not exceed 90 volts.

→ Indicates a change.

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MEDIUM-MU TWIN TRIODE

Note 2: With plate-supply volts = 150, plate-circuit resistance (ohms) = 20,000, and grid-circuit resistance (ohms) = 47,000. Each unit tested separately. Unit not under test connected to ground.

Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 470, and cathode bypass capacitor of 1000 μf. Each unit tested separately. Unit not under test connected to ground.

Note 4: With grid volts = −10.

Note 5: With plate-supply volts = 150, cathode resistor (ohms) = 470, and grid-circuit resistance (megohm) = 0.5.

Note 6: With grid 100 volts negative with respect to all other electrodes tied together.

Note 7: With plate 300 volts negative with respect to all other electrodes tied together.

Note 8: With 100 volts dc between heater and cathode and units connected in parallel.

Note 9: With grid voltage adjusted for plate current of 100 μamp.

Note 10: With plate volts = 100, grid current (μamp) = 0.1, and grid-circuit resistance (megohm) = 0.1. Each unit tested separately. Unit not under test connected to ground.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

Cycles of Intermittent Operation. . . . . 2000 min. cycles

For conditions: Series heater arrangement, heater volts = 17, cycled 1 minute on and 4 minutes off, heater positive with respect to cathode by +100 volts dc, plate volts = 0, and grid volts = 0.

← Indicates a change.

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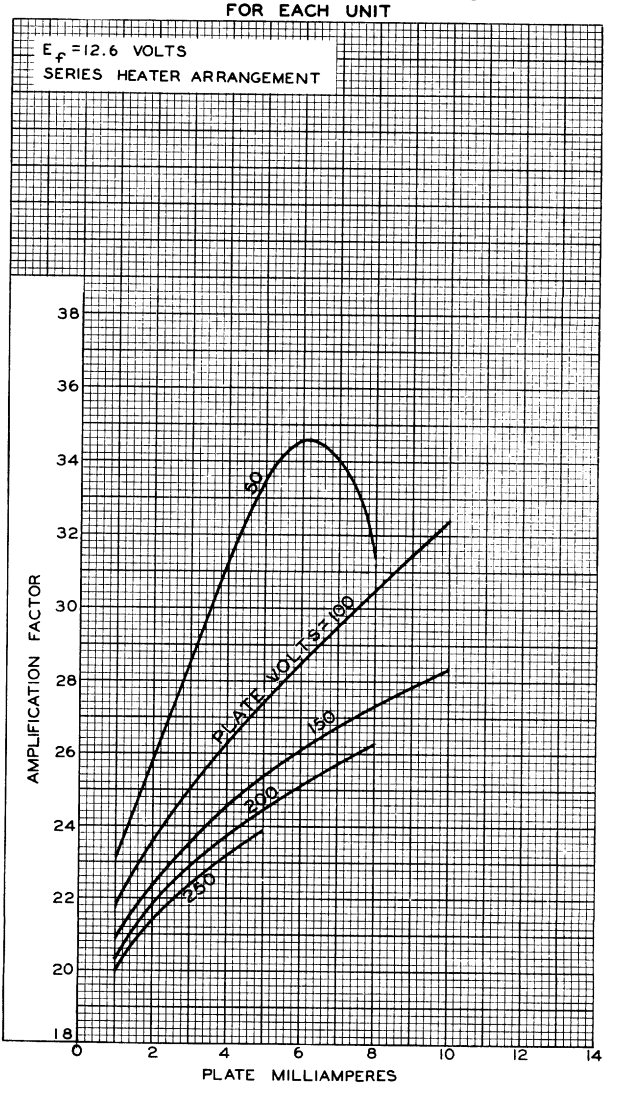
AVERAGE CHARACTERISTICS
FOR EACH UNIT



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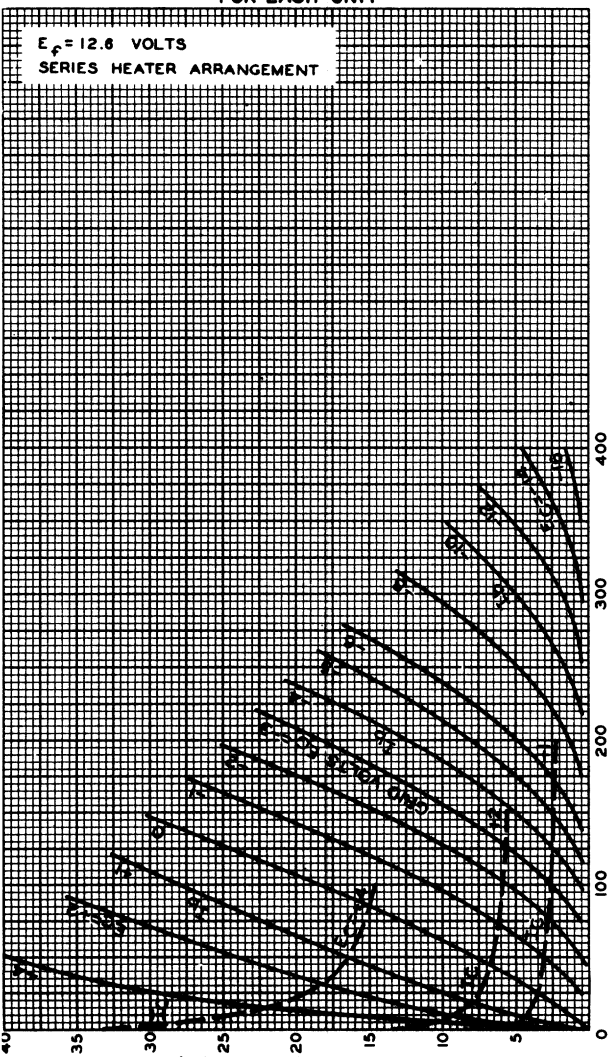
AVERAGE PLATE CHARACTERISTICS
FOR EACH UNIT



JULY 9, 1952 TUBE DEPARTMENT 92CM-7822

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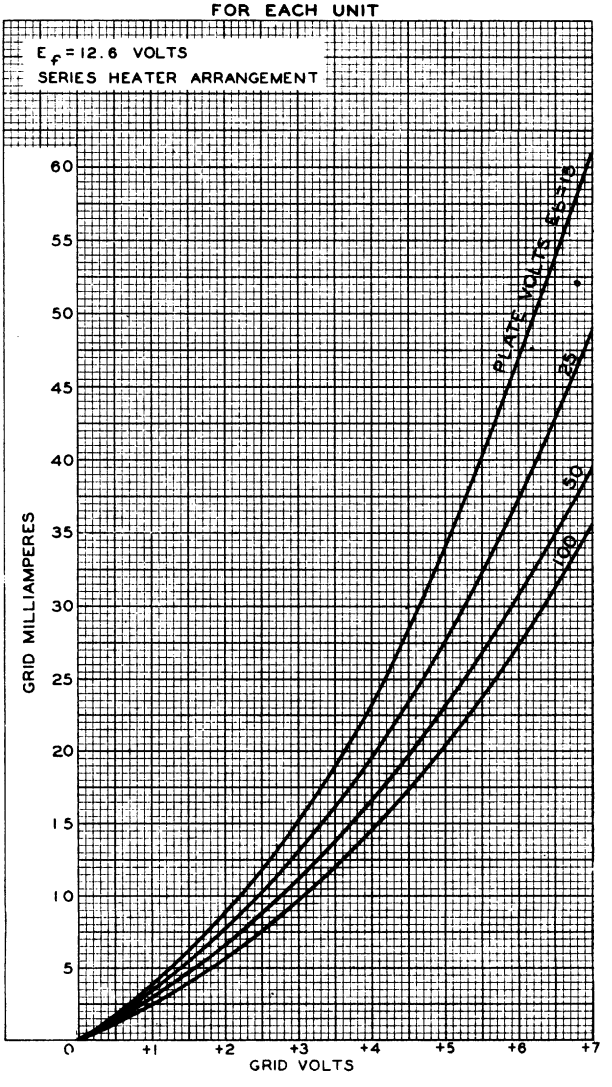
AVERAGE CHARACTERISTICS

FOR EACH UNIT



6263A

Medium-Mu Triode

GLASS-METAL PENCIL TYPE

FAST WARM-UP TIME **INTEGRAL PLATE RADIATOR**

For Mobile or Aircraft Applications as a RF-Power Amplifier or Oscillator Tube with Full Input up to 500 Mc and with Reduced Input up to 1700 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC):		
Under transmitting conditions	6.0 ± 10%	volts
Under standby conditions.	6.3 max.	volts
Current at 6 volts.	0.280	amp
Amplification Factor.	27	
Transconductance, for dc plate ma. = 27 and dc plate volts = 200.	7000	μmhos

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*[a]	
Grid to plate	1.7	1.5	μμf
Grid to cathode	2.8	-	μμf
Plate to cathode.	0.08 max.	-	μμf

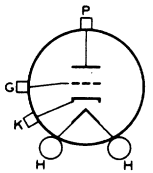
Mechanical:

Operating Position.	Any
Dimensions and Terminal Connections	See *Dimensional Outline*
Radiator.	Integral part of tube

Terminal Connections (See *Dimensional Outline*):

H - Heater

K - Cathode



G - Grid

P - Plate

Cooling:

In many applications, the 6263A does not require forced-air cooling. The radiator in combination with a connector having adequate heat conduction capability will generally provide adequate cooling under conditions of free circulation of air. The cooling must be sufficient to limit the plate-seal temperature to 175° C. When conditions do not provide adequate circulation of air, provision should be made to direct a blast of cooling air from a small blower through the radiator fins. The quantity of air should be sufficient to limit the plate-seal temperature to 175° C. See *Curves*.

Incoming-Air Temperature.	40 max.	°C
Plate-Seal Temperature (Measured on plate seal)	175 max.	°C
Weight (Approx.).	24 grams (0.85 oz)	
Socket for Heater Pins.	Grayhill No. 22-3[b], Cinch No. 54A16325[c], or equivalent	

RF POWER AMPLIFIER AND OSCILLATOR — Class C Telegraphy

Key-down conditions per tube without amplitude modulation[d]

Maximum Ratings, *Absolute-Maximum Values:*

For altitudes up to 60,000 feet

	CCS[e]	ICAS[f]	
DC PLATE VOLTAGE.	330 max.	400 max.	volts
DC GRID VOLTAGE	-100 max.	-100 max.	volts
DC PLATE CURRENT.	40 max.	55 max.	ma
DC GRID CURRENT	25 max.	25 max.	ma
DC CATHODE CURRENT.	55 max.	70 max.	ma
PLATE INPUT	13.2 max.	22 max.	watts
PLATE DISSIPATION	8 max.	13 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode. . . .	50 max.	50 max.	volts
Heater positive with respect to cathode. . . .	50 max.	50 max.	volts

Typical Operation as Oscillator in Cathode-Drive Circuit:

	At 500 Mc		
	CCS[e]	ICAS[f]	
DC Plate-to-Grid Voltage. . .	330	385	volts
DC Cathode-to-Grid Voltage[g] .	30	35	volts
DC Plate Current.	35	40	ma
DC Grid Current (Approx.) . .	11	14	ma
Useful Power Output (Approx.)	5[h]	7[h]	watts

	At 1700 Mc	
	CCS[e]	
DC Plate-to-Grid Voltage. . .	270	volts
DC Cathode-to-Grid Voltage[g] .	20	volts
DC Plate Current.	40	ma
DC Grid Current (Approx.) . .	9	ma
Useful Power Output (Approx.)	0.9[h]	watt

Typical Operation as RF Power Amplifier in Cathode-Drive Circuit at 500 Mc:

	CCS[e]	ICAS[f]	
DC Plate-to-Grid Voltage. . .	348	408	volts
DC Cathode-to-Grid Voltage[g] .	48	58	volts
DC Plate Current.	35	40	ma
DC Grid Current (Approx.) . .	13	15	ma
Driver Power Output (Approx.)	2.2	3	watts
Useful Power Output (Approx.)	7[h]	10[h]	watts

Maximum Circuit Values:

Grid-Circuit Resistance . . .	0.1 max.	0.1 max.	megohm

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with maximum modulation factor of 1

Maximum Ratings, *Absolute-Maximum Values:*

For altitudes up to 60,000 feet

	CCS[e]	*ICAS*[f]	
DC PLATE VOLTAGE.	275 max.	330 max.	volts
DC GRID VOLTAGE	-100 max.	-100 max.	volts
DC PLATE CURRENT.	33 max.	46 max.	ma
DC GRID CURRENT	25 max.	25 max.	ma
DC CATHODE CURRENT.	50 max.	60 max.	ma
PLATE INPUT	9 max.	15 max.	watts
PLATE DISSIPATION	5.5 max.	9 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode. . . .	50 max.	50 max.	volts
Heater positive with respect to cathode. . . .	50 max.	50 max.	volts

Typical Operation in Cathode-Drive Circuit at 500 Mc:

	CCS[e]	*ICAS*[f]	
DC Plate-to-Grid Voltage. . .	317	372	volts
DC Cathode-to-Grid Voltage[g] .	42	52	volts
DC Plate Current.	35	35	ma
DC Grid Current (Approx.) . .	13	12	ma
Driver Power Output (Approx.)	2	2.4	watts
Useful Power Output (Approx.)	6.7[h]	8[h]	watts

Maximum Circuit Values:

Grid-Circuit Resistance . . .	0.1 max.	0.1 max.	megohm

[a] A flat plate shield 1-1/4" diameter located parallel to the plane of the grid flange and midway between the grid flange and the radiator plate terminal. The shield is tied to the cathode.

[b] Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.

[c] Cinch Manufacturing Company, 1026 South Homan Avenue, Chicago, Illinois.

[d] Modulation, essentially negative, may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

[e] Continuous Commercial Service.

[f] Intermittent Commercial and Amateur Service. No Operating or "ON" period exceeds 5 minutes and every "ON" period is followed by an "OFF" or standby period of at least the same or greater duration.

[g] From a grid resistor, or from a suitable combination of grid resistor and fixed supply or grid resistor and cathode resistor.

[h] This value of useful power is measured at load of output circuit having an efficiency of about 75 per cent.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.265	0.295	amp
Direct Interelectrode Capacitances:				
Grid to plate	-	1.45	1.95	μμf
Grid to cathode	-	2.45	3.35	μμf
Plate to cathode	-	-	0.08	μμf
Reverse Grid Current	1,2	-	0.5	μa
Plate Current (1)	1,3	18	36	ma
Plate Current (2)	1,4	-	55	μa
Amplification Factor	1,3	20	34	
Transconductance	1,3	5600	8400	μmhos
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,5	-	100	μa
Heater positive with respect to cathode	1,6	-	100	μa
Emission Voltage	1,7	-	10	volts
Leakage Resistance:				
From grid to plate and cathode tied together	1,8	25	-	megohms
From plate to grid and cathode tied together	1,9	25	-	megohms
Power Output	1,10	6.5	-	watts
Change in Power Output	11	-	0.5	watt

Note 1: With 6.0 volts ac or dc on heater.

Note 2: With dc plate voltage of 200 volts, dc grid voltage of −2.5 volts, grid resistor of 0.5 megohm.

Note 3: With dc plate supply voltage of 200 volts, cathode resistor of 100 ± 1% ohms, and cathode bypass capacitor of 1000 μf.

Note 4: With dc plate voltage of 200 volts, dc grid voltage of −20 volts.

Note 5: With 50 volts dc between heater and cathode, heater negative with respect to cathode.

Note 6: With 50 volts dc between heater and cathode, heater positive with respect to cathode.

Note 7: With dc voltage on grid and plate which are tied together adjusted to produce a cathode current of 30 ma.

Note 8: With grid 100 volts negative with respect to plate and cathode which are tied together.

Note 9: With plate 300 volts negative with respect to grid and cathode which are tied together.

Note 10: With dc plate voltage of 350 volts, grid resistor adjusted to give a dc plate current of 50 milliamperes in a cavity-type oscillator operating at 500 ± 15 Mc and having an efficiency of approximately 75 per cent.

Note 11: At end of Power-Output test, reduce heater voltage to 5.0 volts and note change in power output.

SPECIAL TESTS & PERFORMANCE DATA

Low-Pressure Voltage Breakdown Test:

This test (similar to MIL-E-1D, paragraph 4.9.12.1) is performed on a sample lot of tubes from each production run. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 60,000 feet. Breakdown will not occur

when a 60 cycle rms voltage of 500 volts is applied between the plate cylinder and grid flange.

Low-Frequency Vibration Performance:

This test (MIL-E-ID, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions:

Heater voltage of 6.0 volts, dc plate supply voltage of 200 volts, grid voltage of -3 volts, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 25 cycles per second at an acceleration of 2.5 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

High-Frequency Vibration Performance:

This test (similar to MIL-E-ID, paragraph 4.9.19.2) is performed on a sample lot of tubes from each production run. The tube is vibrated perpendicular to its axis, with no voltages applied to the tube. Vibration frequency is 40 to 60 cps and acceleration is 10 g. At the end of this test, tubes will not show temporary or permanent shorts or open circuits and will meet the following limits:

Heater-Cathode Leakage Current. . . . . 100 max. μa
For conditions shown under *Characteristics Range Values Notes 1,5 and 1,6.*

Low-Frequency Vibration (rms) . . . . . 100 max. mv
For conditions shown above under *Low-Frequency Vibration Performance.*

Plate Current (2) . . . . . 55 max. μa
For conditions shown under *Characteristics Range Values Notes 1,4.*

Shorts and Continuity Test:

This test (MIL-E-ID, paragraph 4.7.5) is performed on all tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, an air leak, or reverse grid current in excess of 1 microampere for the conditions shown under *Characteristics Range Values, Notes 1,2.*

Glass-Seal Fracture Test:

This test is performed on a sample lot of tubes from each production run. Tubes are placed on supports spaced 15/16" ± 1/64" apart with cathode cylinder resting on one support and plate cylinder resting on the other support at a point between the radiator fins and the plate flange. Tubes will withstand gradual application, perpendicular to tube axis, of a force of 60 pounds upon the grid flange without causing fracture of the glass insulation.

Heater Cycling Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.7) is performed on a sample lot of tubes from each production run. With 6.0 volts on heater and no voltage on plate and grid, the heater is cycled three minutes on and three minutes off for at least 2000 cycles. At the end of this test, tubes will not show temporary or permanent shorts or open circuits, and are required to meet the following limits:

Grid-Plate and Cathode Leakage Resistance. 25 min. megohms
For conditions shown under *Characteristics Range Values Notes 1,8.*

Heater-Cathode Leakage Current. . . . . 150 max. μa
For conditions shown under *Characteristics Range Values Notes 1,5.*

1-Hour Stability Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.1.a) is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are operated under the following conditions: heater voltage of 6.0 volts, plate dissipation of 2.5 to 3 watts. At the end of 1 hour, the change in transconductance value for each tube, referred to its initial transconductance reading, will not exceed 15% of the initial value, for conditions shown under *Characteristics Range Values, Notes 1,3.*

50-Hour Survival Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.1.a) is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified for *1-Hour Stability Life Performance* except that all voltages are cycled at the rate of 110 minutes on and 10 minutes off. At the end of 50 hours, the tubes are required to meet the following limits:

Power Output. . . . . 5 min. watts
For conditions shown under *Characteristics Range Values Notes 1,10.*

Plate Current (2) . . . . . 100 max. μa
For conditions shown under *Characteristics Range Values Notes 1,4.*

Shorts and Continuity Test specified above.

Intermittent Dynamic Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure high quality of rf performance. Each tube is life-tested in a cavity-type oscillator at 500 ± 15 Mc under the following conditions:

Heater voltage of 6.0 volts, plate supply voltage of 400 volts, grid resistor is adjusted to give a dc plate current of 40 ma. and value is recorded, cathode resistor of 0 ohms, plate-circuit load resistance of 100 ± 5 ohms, heater positive with respect to cathode by 50 volts, and plate-

seal temperature of 175° C min. Heater voltage is cycled at a rate of 110 minutes on and 10 minutes off.

At the end of 500 hours, the tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limits:

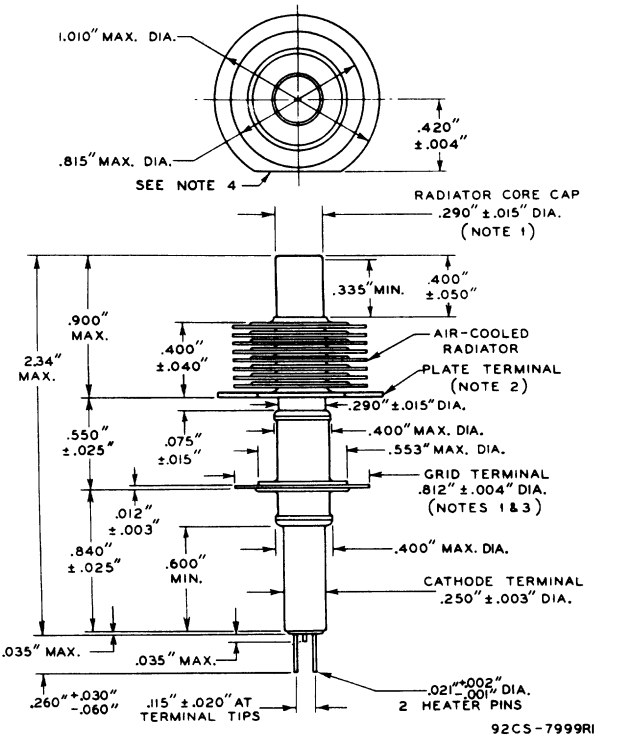
Reverse Grid Current. . . . . 1 max. μa
For conditions shown under *Characteristics Range Values Notes 1, 2.*

Power Output. . . . . 5 min. watts
For conditions shown under *Characteristics Range Values Notes 1, 10.*

OPERATING CONSIDERATIONS

The *heater* leads of the 6263A should not be soldered to circuit elements. The heat of the soldering operation may crack the glass seals of the heater pins and damage the tube.

The *cathode* should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum values shown in the tabulated data.


1.010" MAX. DIA.
.420" ±.004"
.815" MAX. DIA.
SEE NOTE 4
RADIATOR CORE CAP .290" ±.015" DIA. (NOTE 1)
.335" MIN.
.400" ±.050"
.900" MAX.
2.34" MAX.
.400" ±.040"
AIR-COOLED RADIATOR
PLATE TERMINAL (NOTE 2)
.290" ±.015" DIA.
.550" ±.025"
.075" ±.015"
.400" MAX. DIA.
.553" MAX. DIA.
GRID TERMINAL .812" ±.004" DIA. (NOTES 1 & 3)
.012" ±.003"
.840" ±.025"
.600" MIN.
.400" MAX. DIA.
CATHODE TERMINAL .250" ±.003" DIA.
.035" MAX.
.035" MAX.
.021" +.002" -.001" DIA.
2 HEATER PINS
.260" +.030" -.060"
.115" ±.020" AT TERMINAL TIPS
92CS-7999RI

NOTE 1: ECCENTRICITY OF RADIATOR-CORE CAP WITH RESPECT TO THE CATHODE TERMINAL IS ONE-HALF THE TOTAL RUN-OUT DETERMINED BY CHUCKING THE CATHODE TERMINAL 0.050" TO 0.100" FROM CATHODE FLANGE, ROTATING THE TUBE, AND GAUGING THE TOTAL RUN-OUT AT A POINT 0.125" FROM THE END OF THE RADIATOR-CORE CAP. THE ECCENTRICITY WILL NOT EXCEED 0.030".

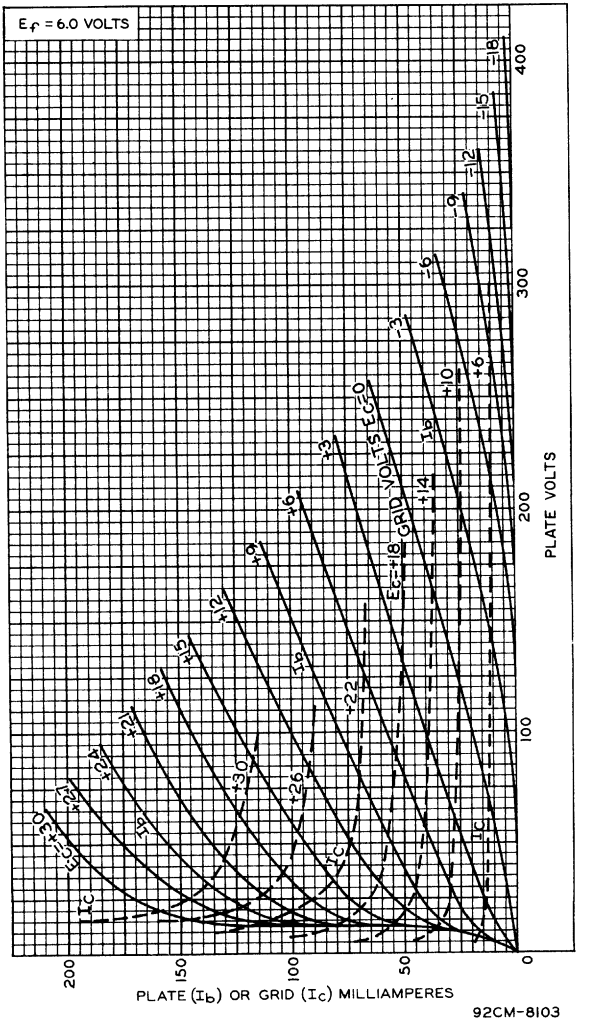
NOTE 2: TILT OF PLATE-TERMINAL FIN OF RADIATOR WITH RESPECT TO ROTATIONAL AXIS OF CATHODE CYLINDER IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE PLATE-TERMINAL FIN PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM THE STRAIGHT EDGE OF THE PLATE-TERMINAL FIN FOR ONE COMPLETE ROTATION. THE TOTAL TRAVEL DISTANCE WILL NOT EXCEED 0.025".

NOTE 3: TILT OF GRID-TERMINAL FLANGE WITH RESPECT TO ROTATIONAL AXIS OF CATHODE TERMINAL IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE GRID-TERMINAL FLANGE PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM ITS EDGE FOR ONE COMPLETE ROTATION. THE TOTAL TRAVEL DISTANCE WILL NOT EXCEED 0.025".

NOTE 4: THE STRAIGHT EDGE ON THE PERIMETER OF THE LARGE FIN (PLATE TERMINAL) IS PARALLEL TO A PLANE THROUGH THE CENTERS OF THE HEATER PINS AT THEIR SEALS WITHIN 15°.

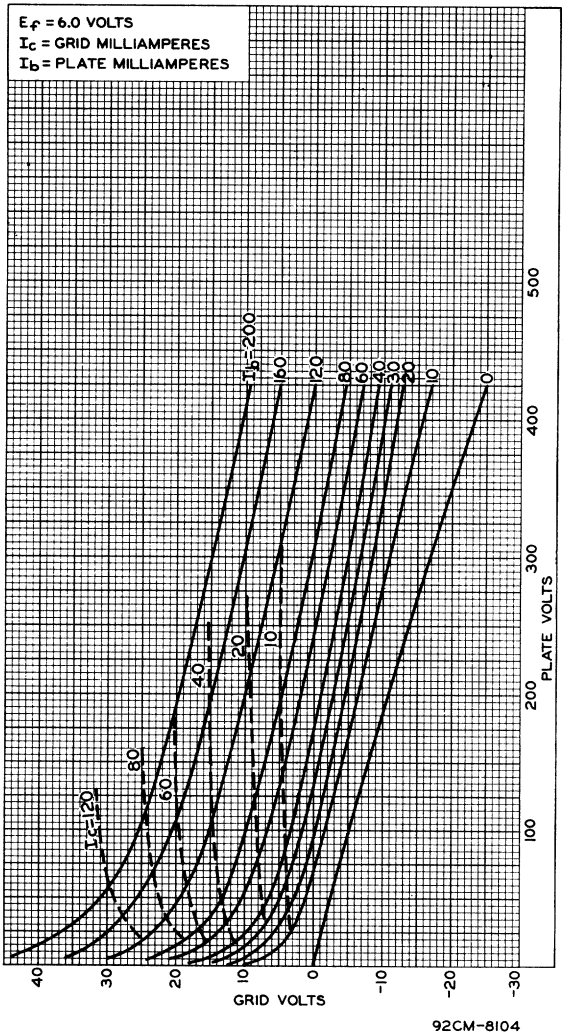
6263A

AVERAGE CHARACTERISTICS

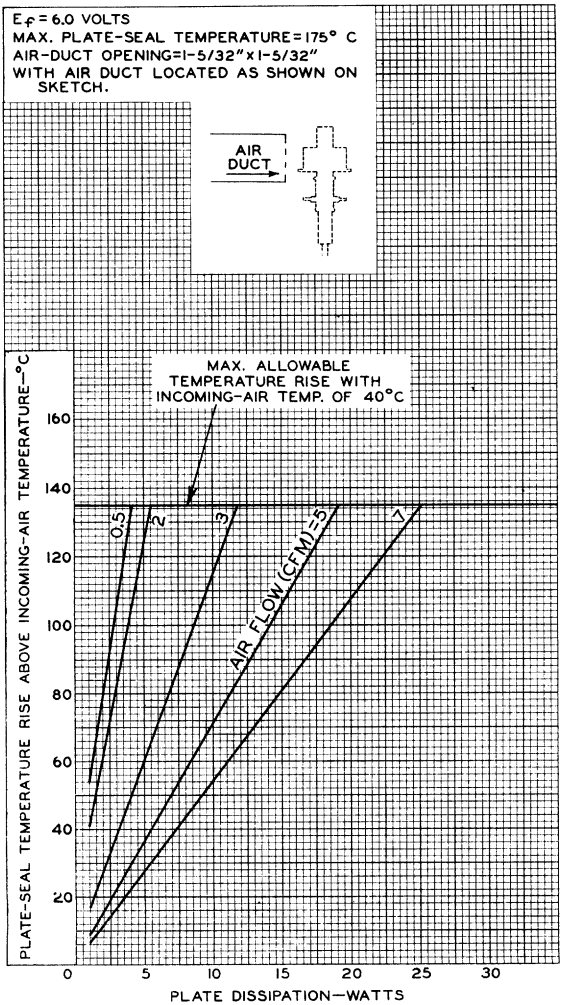


92CM-8103

AVERAGE CONSTANT-CURRENT CHARACTERISTICS



COOLING REQUIREMENTS



92CM-8120RI

6264-A

Medium-Mu Triode

GLASS-METAL PENCIL TYPE
FAST WARM-UP TIME — INTEGRAL PLATE RADIATOR
STURDY COAXIAL-ELECTRODE STRUCTURE

For Mobile or Aircraft Applications as a Frequency-Multiplier, RF-Power-Amplifier, or Oscillator Tube

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC):		
Under transmitting conditions	6 ± 10%	volts
Under standby conditions	6.3 max.	volts
Current at 6 volts	0.28	amp
Amplification Factor	40	
Transconductance, for dc plate ma. = 18.5 and dc plate volts = 200	6800	μmhos

Direct Interelectrode Capacitances:

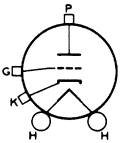
	Without External Shield	*With External Shield*▲	
Grid to plate	1.75	1.5	μμf
Grid to cathode	2.95	-	μμf
Plate to cathode	0.07 max.	-	μμf

Mechanical:

Terminal Connections (See *Dimensional Outline*):

H – Heater

K – Cathode



G – Grid

P – Plate

Operating Position . . . . . Any
Dimensions and Terminal Connections . . . . . See *Dimensional Outline*
Radiator . . . . . Integral part of tube
Cooling:

In many applications, the 6264-A does not require forced-air cooling. The radiator in combination with a connector having adequate heat conduction capability will generally provide adequate cooling under conditions of free circulation of air. The cooling must be sufficient to limit the plate-seal temperature to 175° C. When conditions do not provide adequate circulation of air, provision should be made to direct a blast of cooling air from a small blower through the radiator fins. The quantity of air should be sufficient to limit the plate-seal temperature to 175° C. See *Curves*.

Incoming-Air Temperature . . . . . 40 max. °C

Plate-Seal Temperature (Measured on plate seal)	175 max.	°C
Weight (Approx.)	24 grams (0.85 oz)	
Socket for Heater Pins, Grayhill No. 2[illegible]-3, Cinch No. 54A16375, or equivalent		

RF POWER AMPLIFIER AND OSCILLATOR — Class C Telegraphy

Key-down conditions per tube without amplitude modulation•

Maximum Ratings, *Absolute-Maximum Values:*

For Altitudes up to 60,000 ft

	CCS★	ICAS♦	
DC PLATE VOLTAGE	330 max.	400 max.	volts
DC GRID VOLTAGE	−100 max.	−100 max.	volts
DC PLATE CURRENT	40 max.	55 max.	ma
DC GRID CURRENT	25 max.	25 max.	ma
DC CATHODE CURRENT	55 max.	70 max.	ma
PLATE INPUT	13.2 max.	22 max.	watts
PLATE DISSIPATION	8 max.	13 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	[illegible] max.	[illegible] max.	volts
Heater positive with respect to cathode	50 max.	50 max.	volts

Typical Operation as Oscillator in Cathode-Drive Circuit:

At 500 Mc

	CCS★	ICAS♦	
DC Plate-to-Grid Voltage	[illegible]	[illegible]	volts
DC Cathode-to-Grid Voltage♦	[illegible]	[illegible]	volts
DC Plate Current	[illegible]	35	ma
DC Grid Current (Approx.)	11	1[illegible]	ma
Useful Power Output (Approx.)	[illegible]♠	[illegible]♠	watts

At 1700 Mc

	CCS★	
DC Plate-to-Grid Voltage	263	volts
DC Cathode-to-Grid Voltage♦	13	volts
DC Plate Current	40	ma
DC Grid Current (Approx.)	13	ma
Useful Power Output (Approx.)	1♠	watt

Typical Operation as RF Power Amplifier in Cathode-Drive Circuit at 500 Mc:

	CCS★	ICAS♦	
DC Plate-to-Grid Voltage	342	395	volts
DC Cathode-to-Grid Voltage♦	42	45	volts
DC Plate Current	35	40	ma
DC Grid Current (Approx.)	13	15	ma
Driver Power Output (Approx.)	2.4	3	watts
Useful Power Output (Approx.)	7.5♠	10♠	watts

Maximum Circuit Values:

Grid-Circuit Resistance. . . .	0.1 max.	0.1 max.	megohm

FREQUENCY MULTIPLIER

Maximum Ratings, *Absolute-Maximum Values:*

For Altitudes up to 60,000 ft

	CCS★	*ICAS*♦	
DC PLATE VOLTAGE	300 max.	350 max.	volts
DC GRID VOLTAGE.	-125 max.	-140 max.	volts
DC PLATE CURRENT	33 max.	45 max.	ma
DC GRID CURRENT.	25 max.	25 max.	ma
DC CATHODE CURRENT	45 max.	55 max.	ma
PLATE INPUT.	9.9 max.	15.9 max.	watts
PLATE DISSIPATION.	6 max.	9.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	50 max.	50 max.	volts
Heater positive with respect to cathode	50 max.	50 max.	volts

Typical Operation as Tripler to 510 Mc in Cathode-Drive Circuit:

	CCS★	*ICAS*♦	
DC Plate-to-Grid Voltage . . .	410	472	volts
DC Cathode-to-Grid Voltage●. .	110	122	volts
DC Plate Current	26	36.5	ma
DC Grid Current (Approx.). . .	4.1	5.8	ma
Driver Power Output (Approx.).	2.75	4.5	watts
Useful Power Output (Approx.).	2.1	3.4	watts

Maximum Circuit Values:

Grid-Circuit Resistance. . . .	0.1 max.	0.1 max.	megohm

▲ A flat plate shield 1-1/4" diameter located parallel to the plane of the grid flange and midway between the grid flange and the radiator plate terminal. The shield is tied to the cathode.

● Modulation, essentially negative, may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

★ Continuous Commercial Service.

♦ Intermittent Commercial and Amateur Service.

! From a grid resistor, or from a suitable combination of grid resistor and fixed supply or grid resistor and cathode resistor.

♠ This value of useful power is measured at load of output circuit having an efficiency of about 75%.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.265	0.295	ma
Grid-to-Plate Capacitance. . . .	-	1.5	2	μμf
Grid-to-Cathode Capacitance. . .	-	2.5	3.4	μμf
Plate-to-Cathode Capacitance . .	-	-	0.07	μμf
Reverse Grid Current	1,2	-	0.5	μa

	Note	Min.	Max.	
Plate Current (1)	1,3	13	24	ma
Plate Current (2)	1,4	–	55	μa
Amplification Factor	1,3	30	50	
Transconductance	1,3	5400	8200	μmhos
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,5	–	100	μa
Heater positive with respect to cathode	1,6	–	100	μa
Emission Voltage	1,7	–	10	volts
Leakage Resistance:				
From grid to plate and cathode tied together	1,8	25	–	megohms
From plate to grid and cathode tied together	1,9	25	–	megohms
Power Output	1,10	6.5	–	watts
Change in Power Output	11	–	0.5	watt

Note 1: With 6 volts ac or dc on heater.

Note 2: With dc plate voltage of 200 volts, dc grid voltage of −2 volts, grid resistor of 0.5 megohm.

Note 3: With dc plate supply voltage of 200 volts, cathode resistor of 100 ± 1% ohms, and cathode bypass capacitor of 1000 μf.

Note 4: With dc plate voltage of 200 volts, dc grid voltage of −12 volts, cathode resistor of 0 ohms.

Note 5: With 50 volts dc between heater and cathode, heater negative with respect to cathode.

Note 6: With 50 volts dc between heater and cathode, heater positive with respect to cathode.

Note 7: With dc voltage on grid and plate which are tied together adjusted to produce a cathode current of 30 ma.

Note 8: With grid 100 volts negative with respect to plate and cathode which are tied together.

Note 9: With plate 300 volts negative with respect to grid and cathode which are tied together.

Note 10: With dc plate voltage of 350 volts, grid resistor adjusted to give a dc plate current of 50 milliamperes in a cavity-type oscillator operating at 500 Mc and having an efficiency of approximately 75 per cent.

Note 11: At end of Power-Oscillation test, reduce heater voltage to 5 volts and note change in power output.

SPECIAL TESTS & PERFORMANCE DATA

Low-Pressure Voltage Breakdown Test:

This test is performed on a sample lot of tubes from each production run. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 60,000 feet. Breakdown will not occur when an rms voltage of 500 volts is applied between the plate cylinder and grid flange.

Low-Frequency Vibration Performance:

This test (MIL-E-1D, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions:

Heater voltage of 6 volts, dc plate supply voltage of 200 volts, grid voltage of -2 volts, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 25 cycles per second at an acceleration of 2.5 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

High-Frequency Vibration Performance:

This test (similar to MIL-E-1D, paragraph 4.9.19.2) is performed on a sample lot of tubes from each production run. The tube is vibrated perpendicular to its axis, with no voltages applied to the tube. Vibration frequency is 40 to 60 cps and acceleration is 10 g. At the end of this test, tubes will not show temporary or permanent shorts or open circuits and will meet the following limits:

Heater-Cathode Leakage Current. . . . . 100 max. μa
For conditions shown under *Characteristics Range Values Notes 1,5 and 1,6.*

Low-Frequency Vibration (rms) . . . . . 100 max. mv
For conditions shown above under *Low-Frequency Vibration Performance.*

Plate Current (2) . . . . . 55 max. μa
For conditions shown under *Characteristics Range Values Notes 1,4.*

Shorts and Continuity Test:

This test (MIL-E-1D, paragraph 4.7.5) is performed on all tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, an air leak, or reverse grid current in excess of 1 microampere for the conditions shown under *Characteristics Range Values, Notes 1,2.*

Heater Cycling Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.7) is performed on a sample lot of tubes from each production run. With 6 volts on heater and no voltage on plate and grid, the heater is cycled three minutes on and three minutes off for at least 2000 cycles. At the end of this test, tubes will not show temporary or permanent shorts or opens, and are required to meet the following limits:

Grid-Plate and Cathode Leakage Resistance . 25 min. megohms
For conditions shown under *Characteristics Range Values Notes 1,8.*

Heater-Cathode Leakage Current. . . . . 150 max. μa
For conditions shown under *Characteristics Range Values Notes 1,5.*

1-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are operated under the following conditions: heater voltage of 6 volts, plate dissipation of 2.5

to 3 watts. At the end of 1 hour, the change in transconductance value for each tube, referred to its initial transconductance reading, will not exceed 15% of the initial value, for conditions shown under *Characteristics Range Values, Notes 1,2.*

50-Hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified for *1-Hour Stability Life Performance* except that all voltages are cycled at the rate of 110 minutes on and 10 minutes off. At the end of 50 hours, the tubes are required to meet the following limits:

Power Output . . . . . 5 min. watts
For conditions shown under *Characteristics Range Values Notes 1,7.*

Plate Current (2). . . . . 100 max. μa
For conditions shown under *Characteristics Range Values Notes 1,3.*

Shorts and Continuity Test specified above.

Intermittent Dynamic Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of rf performance. Each tube is life-tested in a cavity-type oscillator at 500 ± 15 Mc under the following conditions:

Heater voltage of 6 volts, plate supply voltage of 400 volts, grid resistor is adjusted to give a dc plate current of 40 ma. and value is recorded, cathode resistor of 0 ohms, plate-circuit load resistance of 100 ± 5 ohms, heater positive with respect to cathode by 50 volts, and plate-seal temperature of 175° C min. Heater voltage is cycled at a rate of 110 minutes on and 10 minutes off.

At the end of 500 hours, the tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limits:

Reverse Grid Current . . . . . 1 max. μa
For conditions shown under *Characteristics Range Values Notes 1,2.*

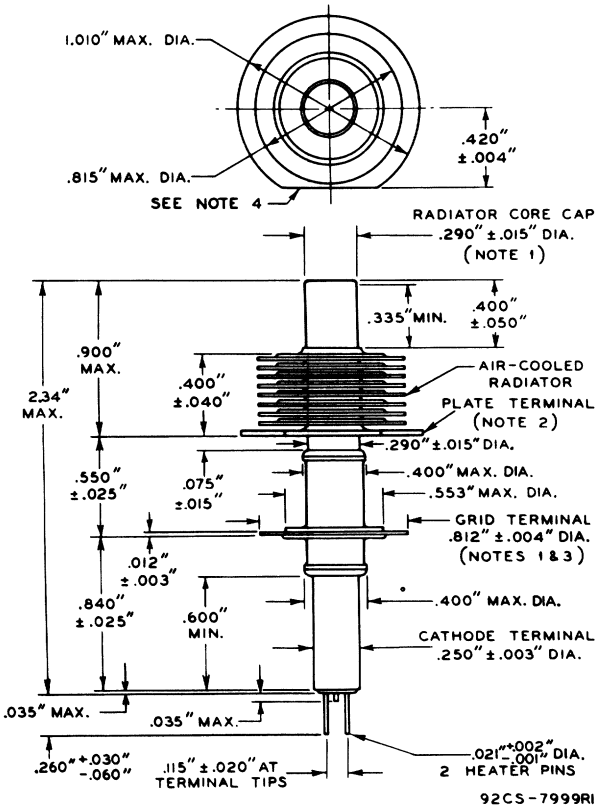
Power Output . . . . . 5 min. watts
For conditions shown under *Characteristics Range Values Notes 1,7.*

OPERATING CONSIDERATIONS

The *heater* leads of the 6264-A should not be soldered to circuit elements. The heat of the soldering operation may crack the glass seals of the heater pins and damage the tube.

The *cathode* should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not

connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum values shown in the tabulated data.



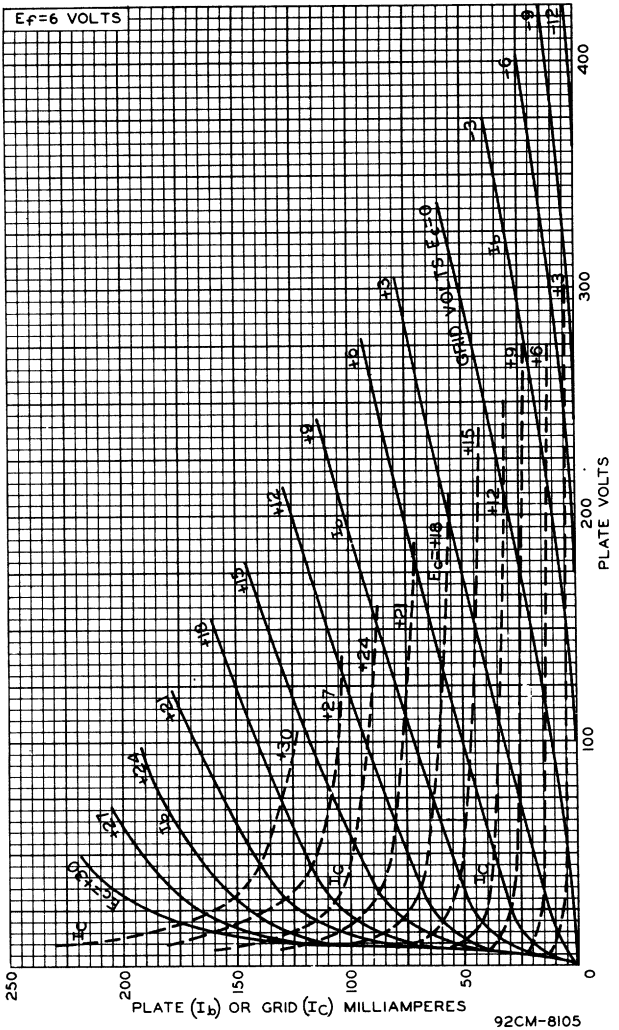
NOTE 1: [illegible] RADIATOR-CORE CAP [illegible] PLANE [illegible] CENTER LINE [illegible] TERMINAL [illegible].

NOTE 2: TILT OF PLATE-TERMINAL FIN OF RADIATOR WITH RESPECT TO ROTATIONAL AXIS OF CATHODE TERMINAL IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE PLATE-TERMINAL FIN PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM THE STRAIGHT EDGE OF THE PLATE-TERMINAL FIN FOR ONE COMPLETE ROTATION. THE TOTAL TRAVEL DISTANCE WILL NOT EXCEED 0.025".

NOTE 3: TILT OF GRID-TERMINAL FLANGE WITH RESPECT TO ROTATIONAL AXIS OF CATHODE TERMINAL IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE GRID-TERMINAL FLANGE PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM ITS EDGE FOR ONE COMPLETE ROTATION. THE TOTAL TRAVEL DISTANCE WILL NOT EXCEED 0.025".

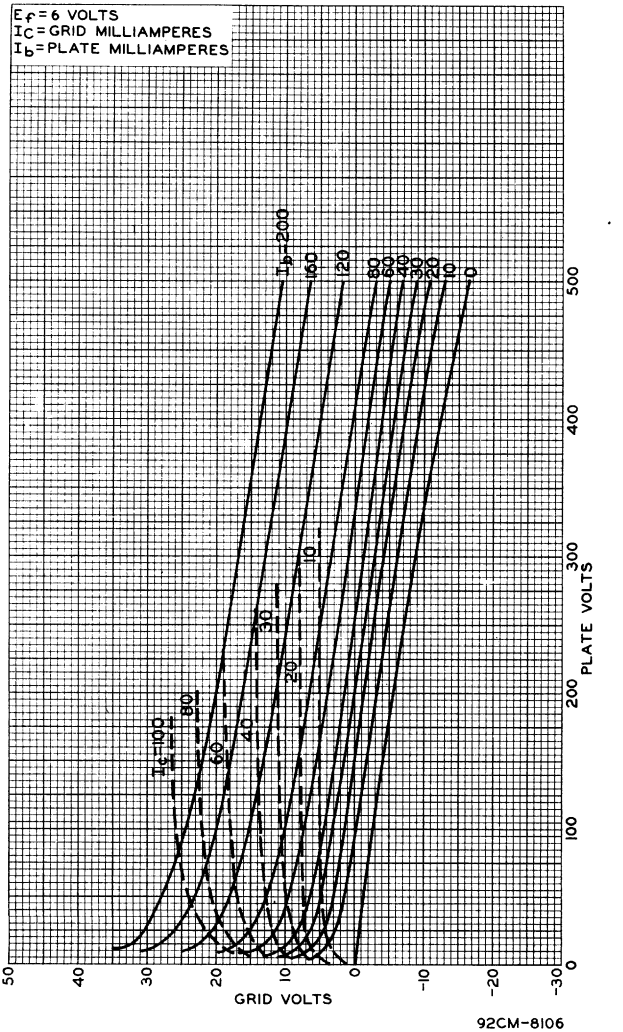
NOTE 4: THE STRAIGHT EDGE ON THE PERIMETER OF THE LARGE FIN (PLATE TERMINAL) IS PARALLEL TO A PLANE THROUGH THE CENTERS OF THE HEATER PINS AT THEIR SEALS WITHIN 15°.

AVERAGE CHARACTERISTICS



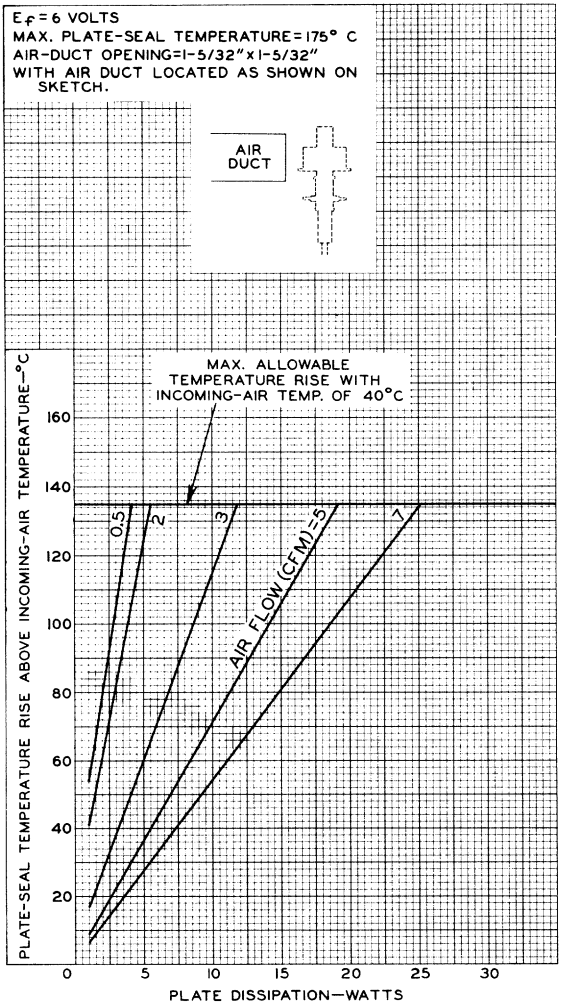
6264-A

AVERAGE CONSTANT-CURRENT CHARACTERISTICS



92CM-8106

COOLING REQUIREMENTS



92CM-8120RI

6293

Beam Power Tube

For Pulse-Modulator Service

GENERAL DATA

Electrical:

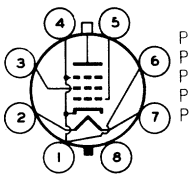
Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at heater volts = 6.3	1.25	amp
Transconductance, for plate volts = 200, grid-No.2 volts = 200, and plate ma. = 100	7000	μmhos
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 200, grid-No.2 volts = 200, and plate ma. = 100	4.5	
Direct Interelectrode Capacitances:[a]		
Grid No.1 to plate	0.24 max.	pf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, base sleeve, and heater	13.0	pf
Plate to cathode & grid No.3 & internal shield, grid No.2, base sleeve, and heater	8.5	pf

Mechanical:

Operating Position	Any
Overall Length	3-13/16" ± 1/8"
Seated Length	3-1/8" ± 1/8"
Maximum Diameter	1-23/32"
Weight (Approx.)	2.3 oz
Bulb	T12
Cap	Small (JEDEC No.C1-1)

Bases (Alternates):
- Large-Wafer Octal with Sleeve:
  8-Pin Micanol (JEDEC Group 1, No.B8-86)
- Large-Wafer Octal with External Barriers and Sleeve:
  8-Pin Micanol (JEDEC Group 1, No.B8-98)
- Basing Designation for BOTTOM VIEW 7CK

Pin 1 – Cathode, Grid No.3, Internal Shield
Pin 2 – Heater
Pin 3 – Grid No.2



Pin 4 – Same as Pin 1
Pin 5 – Grid No.1
Pin 6 – Same as Pin 1
Pin 7 – Heater
Pin 8 – Base Sleeve
Cap – Plate

MODULATOR — Rectangular-Wave Modulation

Maximum and Minimum CCS[b] Ratings, *Absolute-Maximum Values:*

For Duty Factor[c] between 0.001 and 1 and maximum averaging time of 10,000 μsec in any interval

DC PLATE SUPPLY VOLTAGE[d] . . . . . See *Rating Chart I*

← Indicates a change.

6293

INSTANTANEOUS PLATE VOLTAGE	125% of DC Plate Supply Volt	
DC GRID-No.2 SUPPLY VOLTAGE[d]	400 max.	volts
→ DC GRID-No.1 SUPPLY VOLTAGE[d]	−300 max.	volts
	Minimum—See *Rating Chart I*	
GRID-No.1 VOLTAGE:		
Instantaneous-negative value	400 max.	volts
Peak-positive value	100 max.	volts
PEAK PLATE CURRENT	See *Rating Chart II*	
PEAK GRID-No.2 CURRENT	0.75 max.	amp
PEAK GRID-No.1 CURRENT	0.5 max.	amp
PLATE INPUT	20 max.	watts
GRID-No.2 INPUT	1.75 max.	watts
GRID-No.1 INPUT	0.5 max.	watt
PLATE DISSIPATION[e]	See *Rating Chart I*	
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	135 max.	volts
Heater positive with respect to cathode	135 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	200 max.	°C

Typical Operation:

DC Plate Supply Voltage	3000	volts
DC Grid-No.2 Supply Voltage	300	volts
DC Grid-No.1 Supply Voltage	−175	volts
Peak Positive Grid-No.1 Voltage	65	volts
Plate Current:		
Peak	1.2	amp
Average	0.015	amp
DC Grid-No.2 Current	0.004	amp
DC Grid-No.1 Current	0.0025	amp
Load Resistance (R_L), 100 watts, non-inductive	1500 ± 5%	ohms

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	30000 max.	ohms

[a] Without external shield and base sleeve connected to ground.

[b] Continuous Commercial Service.

[c] *Duty Factor* for the 6293 is defined as the "on" time in microseconds divided by 10,000 microseconds.

"On" Time is defined as the sum of the durations of all the individual pulses which occur during any 10,000-microsecond interval.

"Pulse Duration" is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 per cent of the peak value. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

[d] For tube protection, it is essential that sufficient resistance be used in the plate supply circuit, the grid-No.2 supply circuit, and the grid-No.1 supply circuit so that the short-circuit current is limited to 0.5 ampere in each circuit.

[e] Averaged over any interval not exceeding 10,000 microseconds. Care should be used in determining the plate dissipation. A calculated value based on rectangular pulses can be considerably in error when the actual pulses have a finite rise and fall time. Plate dissipation should preferably be determined by measuring the bulb temperature under actual operating conditions; then, with the tube in the same socket and under the same ambient-temperature conditions, apply to the tube sufficient dc input to obtain the same bulb temperature. This value of dc input is a measure of the plate dissipation. → Indicates a change.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	1.175	1.325	amp
Grid No.1 to plate	2	–	0.24	pf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, base sleeve, and heater	2	12.0	15.0	pf
Plate to cathode & grid No.3 & internal shield, grid No.2, base sleeve, and heater	2	7.3	9.5	pf
Plate Current	3	46	94	ma
Grid-No.2 Current	3	0	5.5	ma
Peak Plate Current	1,4	2.4	–	amp

Note 1: With 6.3 volts ac on heater.

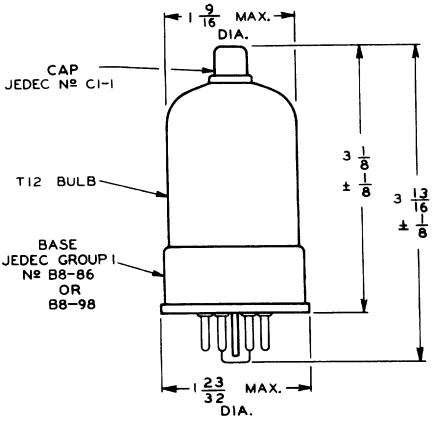
Note 2: With no external shield. Base sleeve (pin No.8) is grounded.

Note 3: With 6.3 volts ac on heater, dc plate voltage of 300 volts, dc grid-No.2 voltage of 200 volts, and dc grid-No.1 voltage of -33 volts.

Note 4: With the tube in the test circuit (below) under the following conditions: rectangular-wave modulation applied to grid No.1 pulse duration of 1 microsecond approx.; pulse repetition rate of 3000 cps approx.; dc plate supply voltage of 2000 volts; dc grid No.2 supply voltage of 500 volts; dc grid-No.1 supply voltage of -300 volts; peak positive grid-No.1 swing of 100 volts; and load resistance (R_L) of 375 ± 5% ohms, 50 watts, non-inductive.

OPERATING CONSIDERATIONS

Plate shows no color when tube is operated at maximum CCS ratings.

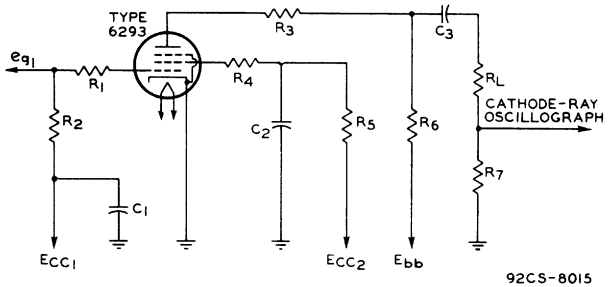


92CS-7700R5

ALL DIMENSIONS IN INCHES.

6293

TEST CIRCUIT



C_1: 0.1 μf, 600 v dc
C_2: 2 μf, 600 v dc
C_3: 0.25 μf, 5000 v dc
E_{cc1}: Grid-No.1 Supply Volt.
E_{cc2}: Grid-No.2 Supply Volt.
E_{bb}: Plate Supply Voltage
E_{g1}: Rectangular-Wave Signal Voltage
R_1: 20 ohms, 1 watt, non-inductive
R_2: 3000 ohms, 1 watt
R_3: 10 ohms, 5 watts, non-inductive
R_4: 25 ohms, 1 watt, non-inductive
R_5: 1000 ohms, 1 watt
R_6: 10000 ohms, 50 watts
R_7: 30 ± 1% ohms, non-inductive
R_L: For values, see Typical Operation and Characteristics Range Values (Note 4)

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RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.

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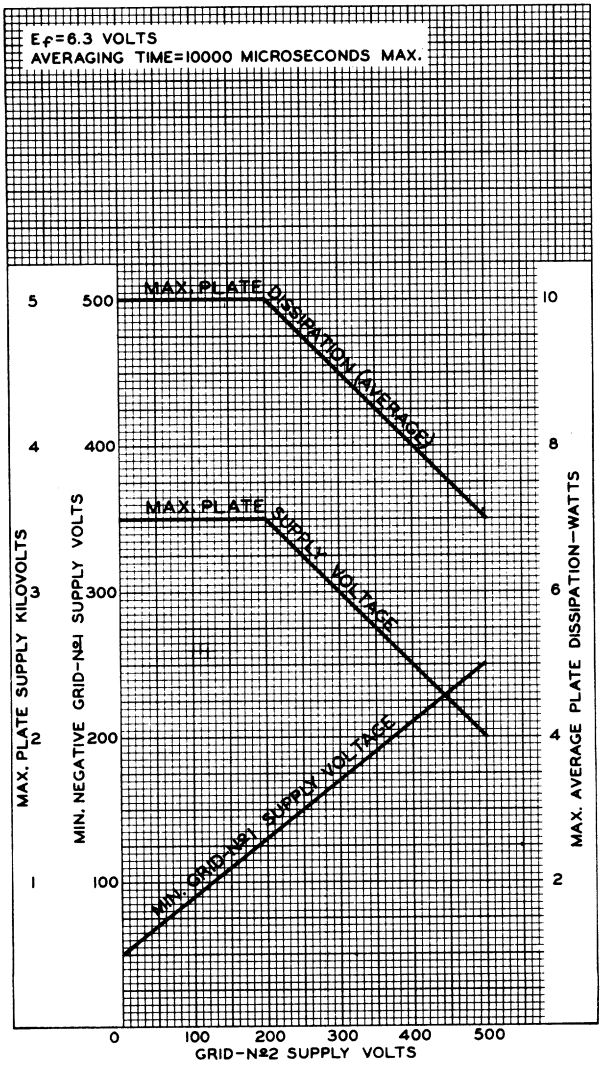
RATING CHART I



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RCA

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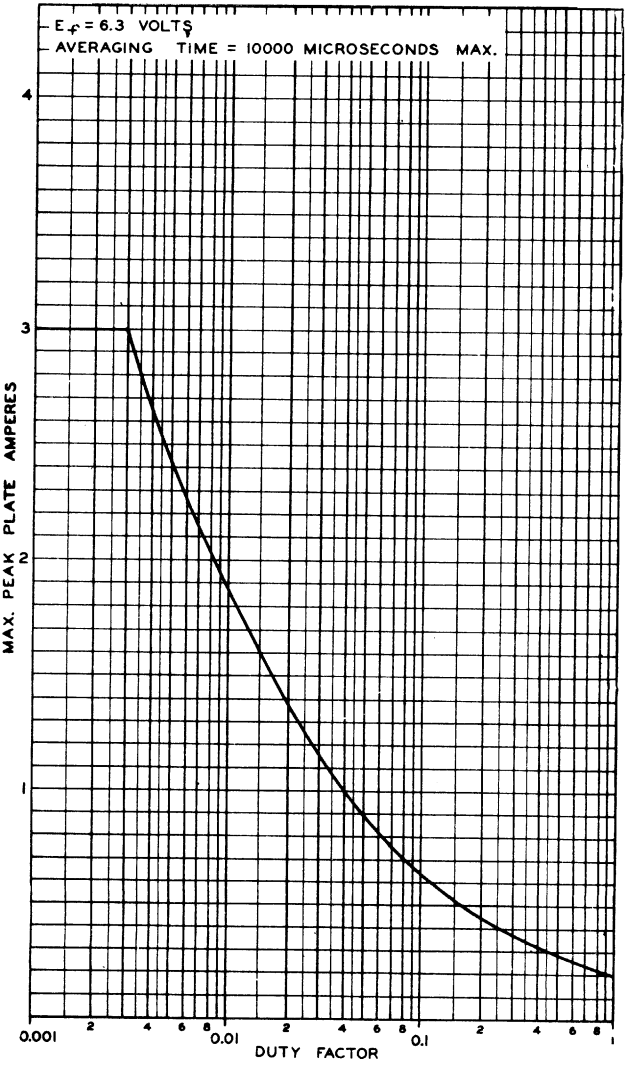
RATING CHART II

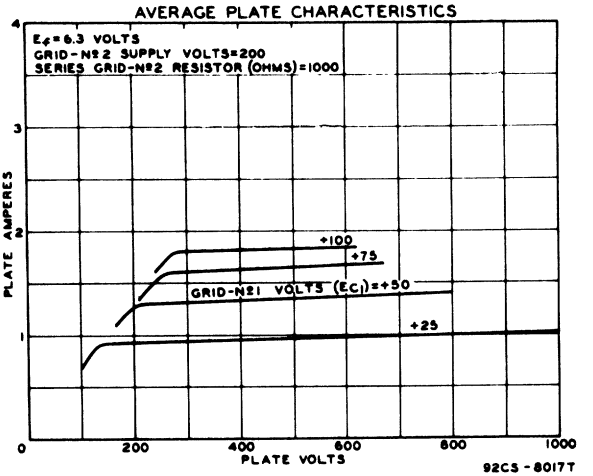


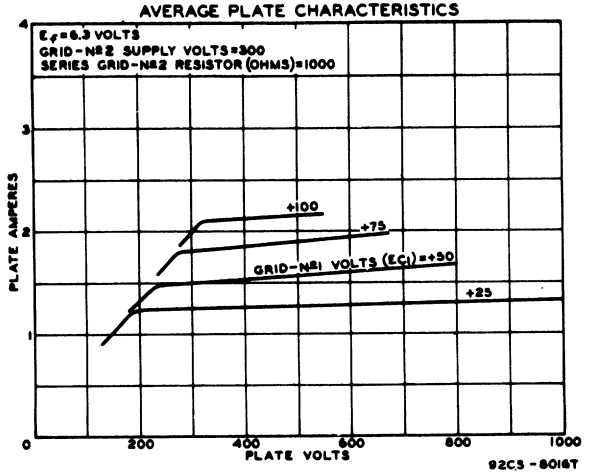
JUN. 8, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM - 8014

6293
BEAM POWER AMPLIFIER





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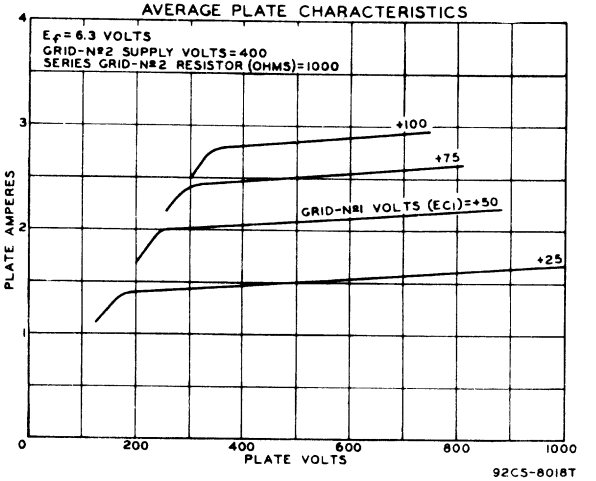
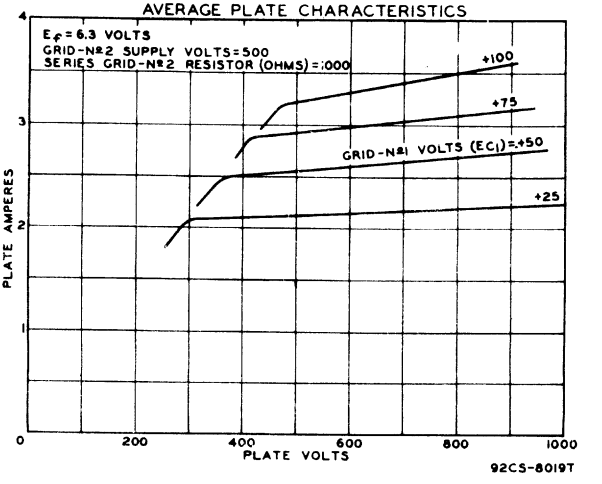
BEAM POWER AMPLIFIER





6336A

Low-Mu Twin Triode

For Use as a Series-Regulator Tube in Regulated DC Power Supplies

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Absolute-Maximum Values):*		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	5.000	amp
Peak heater-cathode voltage (Each Unit):		
Heater negative with respect to cathode	300 max.	volts
Heater positive with respect to cathode	300 max.	volts
Cathode Warm-Up Time (Minimum)	30	sec
Direct Interelectrode Capacitances:		
Grid to plate (Each Unit)	21.8	μμf
Grid to cathode (Each Unit)	16.7	μμf
Plate to cathode (Each Unit)	3.8	μμf
Heater to cathode (Each Unit)	15	μμf
Plate to plate	0.6	μμf

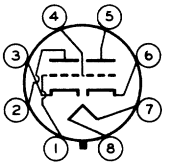
Characteristics, Class A_1 Amplifier (Each Unit):

Plate Supply Voltage	190	volts
Cathode Resistor	200	ohms
Amplification Factor	2.7	
Plate Resistance (Approx.)	200	ohms
Transconductance	13500	μmhos

Mechanical:

Operating Position . . . . . Vertical, base down or up, or Horizontal with pins 1 and 4 in vertical plane
Type of Cathodes . . . . . Coated Unipotential
Maximum Overall Length . . . . . 4.750"
Maximum Seated Length . . . . . 4.188"
Maximum Diameter . . . . . 2.070"
Bulb T16
Base . . . . . Large-Wafer Octal 8-Pin with External Barriers and Sleeve (JEDEC Group 7, No.B8-98)
Basing Designation for BOTTOM VIEW 8BD

Pin 1 - Grid of Unit No.2
Pin 2 - Plate of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Grid of Unit No.1



Pin 5 - Plate of Unit No.1
Pin 6 - Cathode of Unit No.1
Pin 7 - Heater
Pin 8 - Heater

SERIES-REGULATOR SERVICE

Values are for Each Unit

Maximum Ratings, *Absolute-Maximum Values:*

For operation at altitudes up to 60,000 feet[a]

PLATE VOLTAGE	400 max.	volts
GRID VOLTAGE:		
Negative-bias value	300 max.	volts
Positive-bias value	0 max.	volts
PLATE CURRENT	400 max.	ma
PLATE DISSIPATION	30 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	250 max.	°C

Maximum Circuit Values:

Grid-Circuit Resistance:[b]		
For fixed-bias operation	0.2 max.	megohm
For cathode-bias operation	0.5 max.	megohm

[a] Cooling must be provided to keep bulb temperature within ratings at altitudes above 10,000 feet.

[b] Minimum resistance per cathode should be 27 ohms or that resistance necessary to provide 10 per cent of the grid bias voltage, whichever is greater.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	4.75	5.25	amp
Amplification Factor (Each Unit)	1,2	2	3.4	
Plate Current (Each Unit)	1,2	165	200	ma
Plate Current (Each Unit)	1,3	0	10	ma
Transconductance (Each Unit)	1,2	11000	16000	μmhos

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With plate supply voltage of 190 volts, grid resistor of 500 ohms (each grid), and cathode resistor of 200 ohms (each cathode), both triode units operating.

Note 3: With plate voltage of 200 volts, and a grid-No.1 voltage of -100 volts (both triode units operating).

SPECIAL RATINGS AND PERFORMANCE DATA

Shock Rating:

Impact Acceleration	720 max.	g

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-Impact (Flyweight) Shock Machine and are subjected to 20 blows at a hammer angle of 48°. At the end of this test, tubes will be considered inoperative if they do not have a minimum plate current per unit of 150 milliamperes, a minimum transconductance per unit of 9000 micromhos, a maximum heater-to-cathode leakage current (both units) of 100 microamperes, and a maximum reverse grid current (both units) of 8 microamperes.

Variable-Frequency-Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: Heater voltage of 6.3 volts, plate supply voltage of 190 volts, grid resistor of 500 ohms in each grid, cathode resistor of 200 ohms in each cathode (both units operating), and a plate load resistance of 2000 ohms per unit. During operation, tubes are vibrated through the frequency range from 10 to 50 cycles per second with a constant vibrational acceleration of 10 g. During the test, tubes will not show an rms output voltage across the plate load resistor in excess of 200 millivolts.

1000-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. Life testing is conducted under the following conditions: Heater voltage of 6.3 volts, plate supply voltage of 190 volts, grid resistor of 500 ohms in each grid, and cathode resistor of 200 ohms in each cathode (both units operating).

At the end of 1000 hours, tubes will be considered inoperative if they do not have a minimum plate current per unit of 150 milliamperes, a minimum transconductance per unit of 9000 micromhos, a maximum heater-to-cathode leakage current (both units) of 100 microamperes, and a maximum reverse grid current (both units) of 8 microamperes.

OPERATING CONSIDERATIONS

Operating conditions for the 6336A should be selected to assure that there is always some voltage drop across the tube. In addition, bias voltage provided by the drop across the plate load resistor of the amplifier tube should not be less than 5 volts to allow for variations in the characteristics of individual 6336A's. A grid resistor of approximately 1000 ohms should be used to prevent parasitic oscillations.

6350

MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For "on-off" control applications involving long periods of operation under cutoff conditions

GENERAL DATA

Electrical:

Heater, Pure Tungsten, for Unipotential Cathodes:

Heater arrangement	*Series*	*Parallel*	
Voltage	12.6 ± 5%	6.3 ± 5%	ac or dc volts
Current	0.3	0.6	amp

Direct Interelectrode Capacitances:[o]

Grid to plate (Each unit)	3.2	μμf
Grid to cathode and heater (Each unit)	3.6	μμf
Plate to cathode and heater (Each unit)	0.6	μμf
Heater to cathode (Each unit)	4.6	μμf
Grid to grid	0.042 max.	μμf
Plate to plate	1 max.	μμf

Characteristics, Class A_1 Amplifier (Each Unit):

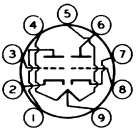
Plate Voltage	150	volts
Grid Voltage	-5	volts
Amplification Factor	18	
Plate Resistance (Approx.)	3900	ohms
Transconductance	4600	μmhos
Plate Current	11	ma
Grid Voltage (Approx.) for plate voltage of 150 volts and plate current of 100 μa	-11	volts
Grid Voltage (Approx.) for plate voltage of 200 volts and plate current of 1 ma	-12	volts

Mechanical:

Operating Position . . . .Any, but for the utmost in service, tube should be Vertical with base up or down, or Horizontal with pins 6 and 9 in vertical plane

Maximum Overall Length . . . . . 2-5/8"
Maximum Seated Length. . . . . 2-3/8"
Length, Base Seat to Bulb Top (Excluding tip) . . . 2" ± 3/32"
Maximum Diameter . . . . . 7/8"
Dimensional Outline. . . . . *See General Section*
Bulb T6-1/2
Base . . . . . Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW 9CZ

Pin 1 - Plate of Unit No.2
Pin 2 - Cathode of Unit No.2
Pin 3 - Grid of Unit No.2
Pins 4 & 9 - Heater of Unit No.2
Pins 5 & 9 - Heater of Unit No.1



Pin 6 - Plate of Unit No.1
Pin 7 - Cathode of Unit No.1
Pin 8 - Grid of Unit No.1
Pin 9 - Heater Mid-Tap

[o] Without external shield.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6350

MEDIUM-MU TWIN TRIODE

COMPUTER SERVICE and "ON-OFF" CONTROL SERVICE

Unless Otherwise Specified, Values are for Each Unit

Maximum Ratings, *Absolute Values:*

DC PLATE VOLTAGE	330	max.	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE*	1000	max.	volts
DC GRID VOLTAGE:			
Negative bias value	80	max.	volts
Positive bias value	4	max.	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE*	440	max.	volts
PEAK POSITIVE-PULSE GRID VOLTAGE*	14	max.	volts
DC GRID CURRENT	5.5	max.	ma
PEAK GRID CURRENT*	110	max.	ma
DC CATHODE CURRENT	45	max.	ma
PEAK CATHODE CURRENT*	350	max.	ma
PLATE DISSIPATION:			
Either plate	4	max.	watts
Both plates (Both units operating)	7	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	220	max.	volts
Heater positive with respect to cathode	220▲	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	120	max.	°C

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation	0.1	max.	megohm
For cathode-bias operation	0.5	max.	megohm

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Unless Otherwise Specified, Values are for Each Unit

	Note	*Min.*	*Max.*	
Heater Current	1	0.275	0.325	amp
Plate Current (1)	1,2	6	16	ma
Plate Current (2)	1,3	–	1	ma
Plate Current (3)	1,4	–	100	μa
Transconductance	1,2	3200	6000	μmhos
Amplification Factor	1,2	15	21	
Reverse Grid Current (Units in parallel)	1,5	–	2.5	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,6	–	15	μa
Heater positive with respect to cathode	1,6	–	15	μa

* Under the following conditions: rectangular pulse; pulse duration, 0.08 microsecond; pulse-repetition rate, 1 x 10⁶ pps; and duty factor, 0.08.

▲ The dc component must not exceed 110 volts.

Notes 1 to 6: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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MEDIUM-MU TWIN TRIODE

	Note	Min.	Max.	
Grid-Voltage Difference Between Units	1,7	-	2.5	volts
Leakage Resistance:				
Between grid and all other electrodes tied together	1,8	100	-	megohms
Between plate and all other electrodes tied together	1,9	100	-	megohms

Note 1: With 12.6 volts ac or dc on heater (series arrangement).

Note 2: With plate volts = 150 and grid volts = -5. Each unit tested separately. Unit not under test connected to ground.

Note 3: With plate volts = 200 and grid volts = -15. Each unit tested separately. Unit not under test connected to ground.

Note 4: With plate volts = 150 and grid volts = -15. Each unit tested separately. Unit not under test connected to ground.

Note 5: With plate volts = 180, grid volts = -5, and grid-circuit resistance (megohms) = 0.1.

Note 6: With 100 volts dc between heater and cathode.

Note 7: With plate volts = 200 and grid voltage adjusted for plate current of 1 milliampere.

Note 8: With grid 100 volts negative with respect to all other electrodes tied together.

Note 9: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . . 2000 min. cycles
Under the following conditions: heater volts = 7.5 cycled one minute on and four minutes off, heater 180 volts positive with respect to cathode, and all other elements connected to ground.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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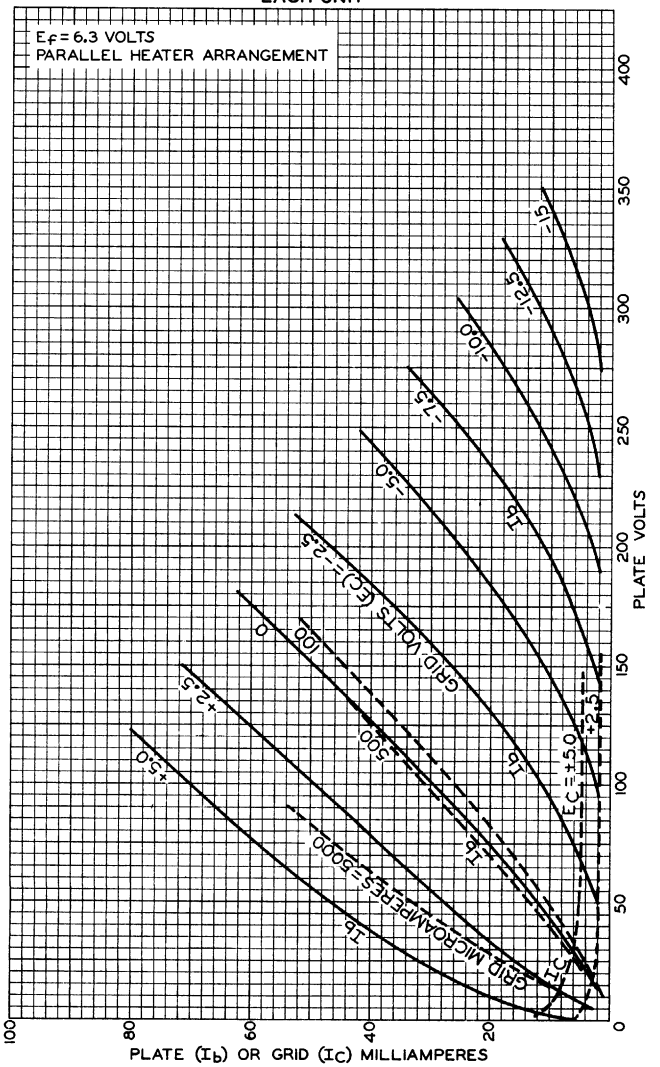
AVERAGE CHARACTERISTICS

EACH UNIT



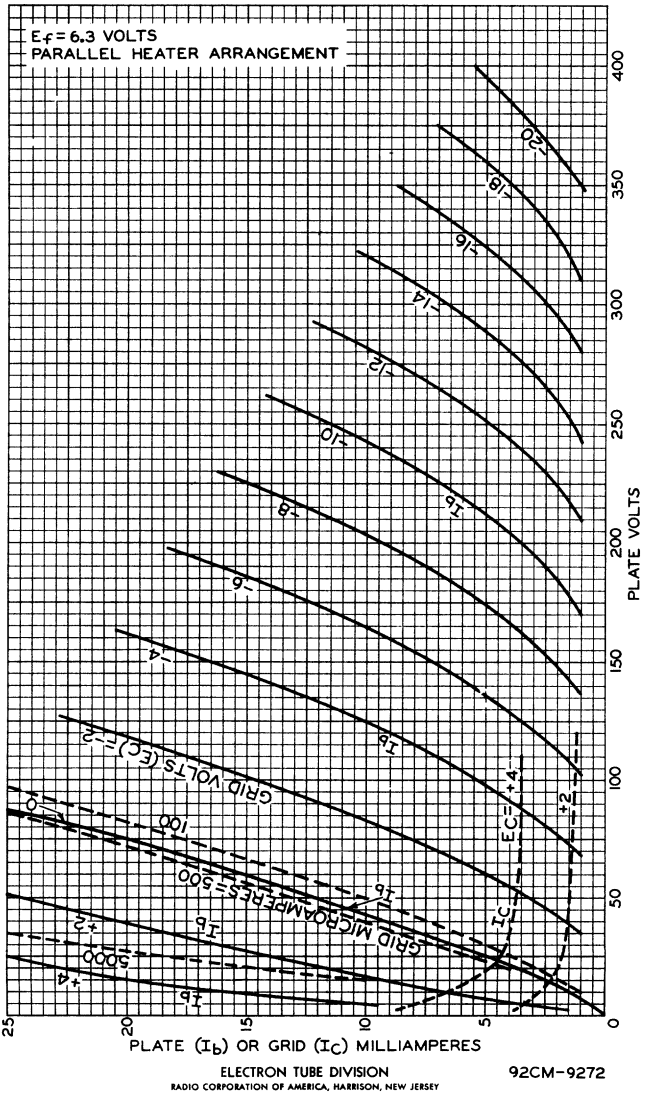
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9273

6350

AVERAGE CHARACTERISTICS

EACH UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

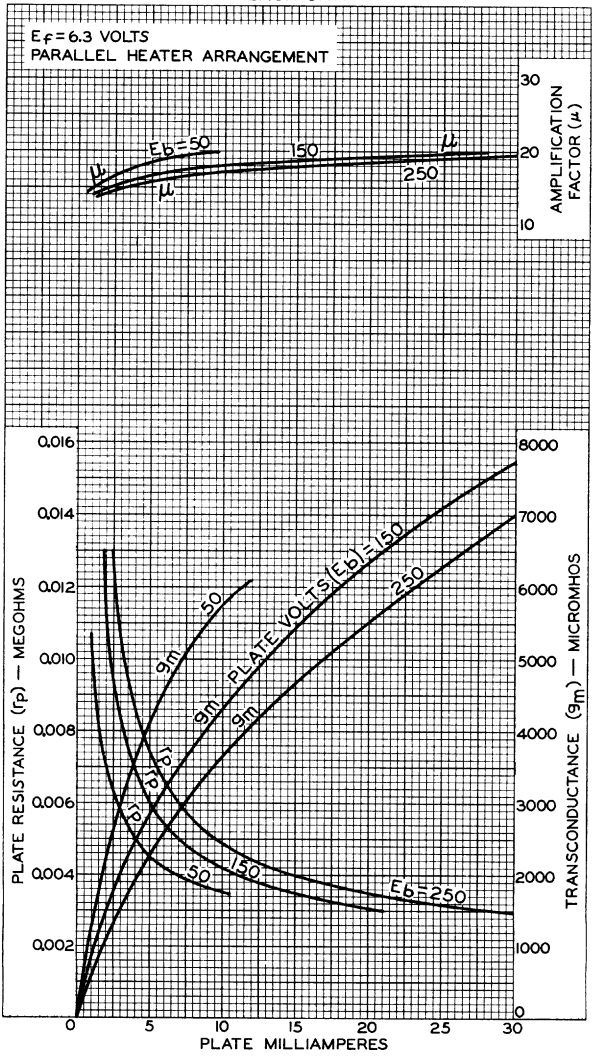
92CM-9272

6350

RCA

6350

AVERAGE CHARACTERISTICS
EACH UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9271

6417

VHF BEAM POWER TUBE

9 PIN MINIATURE TYPE

Heater, for Unipotential Cathode:		
Voltage	12.6 ± 10%	ac or dc volts
Current	0.375	amp

Except for heater rating, the 6417 is the same as the 5763.

With 12.6 volts on heater of the 6417, the minimum heater current is 0.345 ampere and the maximum heater current is 0.405 ampere.

6448

UHF BEAM POWER TUBE

WATER-COOLED ELECTRODES

GENERAL DATA

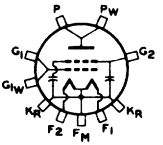
Electrical:

Filament*, 2-Section Multi-strand Thoriated Tungsten:		
Voltage per section (AC or DC)	1.35 av. / 1.50 max.	volts
Current per section at 1.35 volts	1000	amp
Starting current per section	Must never exceed 1500 amperes, even momentarily	
Cold resistance per section	0.0002	ohm
Minimum heating time	10	seconds
Supply circuits	See Circuits	
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 3000, grid-No.2 volts = 800, and plate amperes = 4	6	
Direct Interelectrode Capacitances:		
Grid No.1 to plate	0.1 max.	μμf
Input	335	μμf
Output	30	μμf
Internal Bypass Capacitors between Grid No.2 and Cathode (Total)	15000	μμf

Mechanical:

Terminal Connections:

F_1 – Fil. Sect. No.1 & Water Conn.
F_2 – Fil. Sect. No.2 & Water Conn.
G_1 – RF Grid-No.1 Term. Contact Surface
G_{1W} – DC Grid-No.1 & Water Conn.
G_2 – DC Grid-No.2 & Water Conn.



For location of respective terminals, see Dimensional Outline

K_R – RF Cath. Term. Contact Surface For Circuit Returns
F_M – Common Point of Fil. Sections & Water Conn.
P – RF Plate Term. Contact Surface
P_W – DC Plate & Water Conn.

Mounting Position	Tube axis vertical, with plate terminal either up or down
Overall Length	7-11/32" + 3/8" – 1/2"
Maximum Diameter	11-3/8"

Air Cooling:

Forced-air cooling of the ceramic bushing at the grid-No.1 seal and at the plate seal is required only if the temperature of the ceramic bushing at either seal exceeds the specified maximum value of 150°C. Under such conditions, provision should be made for blowing air at the ceramic bushings through suitable openings in the coaxial-cylinder cavity circuit.

*: See Operating Notes on conserving filament life.

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UHF BEAM POWER TUBE

Water Cooling:

Water cooling of the filament-section blocks, rf cathode terminals, grid-No.1 block, grid-No.2 block, and plate is required. The water flow must start before application of any voltage and preferably should continue for several seconds after removal of all voltages. Interlocking of the water flow through each of the cooled elements with all power supplies is recommended to prevent tube damage in case of failure of adequate water flow.

Water Flow:

	Min. gpm	*Typical* gpm	*Pressure Drop*● psi
To Filament-Section-No.1 Block	0.5	0.5	2
		1.2	11
To Filament-Section-No.2 Block	0.5	0.5	2
		1.2	11
To Filament Mid-Tap Block	0.5	0.5	2
		1.2	10
To Grid-No.1 Block	0.5	0.5	1
		1.2	6
To Grid-No.2 Block	0.5	0.5	3
		1.2	15
To Plate:			
For plate dissipation of 10 kw	4.5	–	3.5
For plate dissipation of 15 kw	7.5	–	8.5
For plate dissipation of 20 kw	11	–	16
For plate dissipation of 26 kw	14	–	25

Gauge Pressure at Any Inlet	70 max.	psi
Ceramic Bushing Temperature	150 max.	°C
Outlet Water Temperature (Any outlet)	70 max.	°C
Weight (Approx.)	25	lbs

RF POWER AMPLIFIER--Class B Television Service

Synchronizing-level conditions per tube unless otherwise indicated

Maximum CCS● Ratings, *Absolute Values:*

	Up to 1000 Mc	
DC PLATE VOLTAGE	7000 max.	volts
DC PLATE-SUPPLY VOLTAGE	8000 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE	1000 max.	volts
DC GRID-No.2-SUPPLY VOLTAGE	1100 max.	volts

● Directly across cooled element for the indicated flow.

●: See next page.

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UHF BEAM POWER TUBE

DC PLATE CURRENT		7 max.	amp
DC GRID-No.1 (CONTROL-GRID) CURRENT		0.5 max.	amp
PLATE INPUT		49000 max.	watts
GRID-No.2 INPUT (Pedestal Level)		600 max.	watts
PLATE DISSIPATION		26000 max.	watts

Typical Operation:	*At 500 Mc*	*At 900 Mc*	
Bandwidth▲ of	7	7	*Mc*
DC Plate Voltage	6000	6500	volts
DC Grid-No.2 Voltage	950	950	volts
DC Grid-No.1 Voltage	-140	-140	volts
Peak RF Grid-No.1 Voltage:			
Synchronizing level	160	160	volts
Pedestal level	100	100	volts
DC Plate Current:			
Synchronizing level	6.9	6.8	amp
Pedestal level	5.3	5.2	amp
DC Grid-No.2 Current:			
Synchronizing level	0.75	0.6	amp
Pedestal level	0.35	0.3	amp
DC Grid-No.1 Current (Approx.):			
Synchronizing level	0.13	0.1	amp
Pedestal level	0	0	amp
Driver Power Output (Approx.):♣			
Synchronizing level	600	1000	watts
Pedestal level	350	560	watts
Output-Circuit Efficiency (Approx.)	85	80	per cent
Useful Power Output (Approx.):			
Synchronizing level	15000●●	12000●●	watts
Pedestal level	8400●●	6700●●	watts

PLATE-MODULATED RF POWER AMP.--Class C Telephony

Carrier conditions per tube for use with a max. modulation factor of 1.0

Maximum CCS● Ratings, *Absolute Values:*

	Up to 1000 Mc	
DC PLATE VOLTAGE	4500 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE	1000 max.	volts
PEAK GRID-No.2 VOLTAGE (DC + AC Component)	1200 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-300 max.	volts
DC PLATE CURRENT	4.5 max.	amp
DC GRID-No.1 CURRENT	1 max.	amp
PLATE INPUT	22500 max.	watts

▲ Between the half-power points as measured in the output circuit.

●, ♣, ●●: See next page.

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UHF BEAM POWER TUBE

GRID-No.2 INPUT		400 max.	volts
PLATE DISSIPATION		16500 max.	watts

Typical Operation:	*At 400 Mc*	*At 900 Mc*	
DC Plate Voltage	4000	4250	volts
DC Grid-No.2 Voltage●	600	600	volts
DC Grid-No.1 Voltage	-200	-200	volts
Peak RF Grid-No.1 Voltage	210	210	volts
DC Plate Current	4.25	4	amp
DC Grid-No.2 Current	0.65	0.6	amp
DC Grid-No.1 Current (Approx.)	0.3	0.2	amp
Driver Power Output (Approx.)♣	700	1000	watts
Output-Circuit Efficiency (Approx.)	80	75	per cent
Useful Power Output (Approx.)	7250●●	4500●●	watts

RF POWER AMPLIFIER--Class C Telegraphy□ and RF POWER AMPLIFIER--Class C FM Telephony

Maximum CCS● Ratings, *Absolute Values:*

	Up to 1000 Mc	
DC PLATE VOLTAGE	7000 max.	volts
DC PLATE-SUPPLY VOLTAGE	8000 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE	1000 max.	volts
DC GRID-No.2-SUPPLY VOLTAGE	1100 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-300 max.	volts
DC PLATE CURRENT	6.5 max.	amp
DC GRID-No.1 CURRENT	0.5 max.	amp
PLATE INPUT	45500 max.	watts
GRID-No.2 INPUT	600 max.	watts
PLATE DISSIPATION	26000 max.	watts

Typical Operation:	*At 400 Mc*	*At 900 Mc*	
DC Plate Voltage	6500	6500	volts
DC Grid-No.2 Voltage†	800	800	volts
DC Grid-No.1 Voltage††	-140	-140	volts
Peak RF Grid-No.1 Voltage	160	160	volts
DC Plate Current	6	6.3	amp
DC Grid-No.2 Current	0.5	0.4	amp
DC Grid-No.1 Current (Approx.)	0.2	0.15	amp
Driver Power Output (Approx.)♣	400	800	watts
Output- Circuit Efficiency (Approx.)	85	77	per cent
Useful Power Output (Approx.)	14000●●	11000●●	watts

● Continuous Commercial Service.

♣ Obtained preferably from a separate source.

□,●●,♣,†,††: See next page.

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UHF BEAM POWER TUBE

□ Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

♣ The driver stage is required to supply tube losses and rf circuit losses. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

●● This value of useful power is measured at load of output circuit having indicated efficiency.

† Obtained preferably from a separate source, or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should not be used if the 6448 or a preceding stage is keyed. In this case, the regulation of the source should be sufficient to prevent the grid-No.2 voltage from rising above 1100 volts under key-up conditions; and additional fixed grid-No.1 bias must be provided to limit the plate current.

†† Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Filament Current per Section	1	900	1100	amp
Filament Current per Section	2	960	1160	amp
Grid-No.1 Voltage	1,3	–	-160	volts
Useful Power Output	1,4	11000	–	watts
Power Gain	1,4,5	10	–	

Note 1: With 1.35 volts ac per section.

Note 2: With 1.5 volts ac per section.

Note 3: With 2-phase excitation of the filament sections, dc plate voltage of 6500 volts, dc grid-No.2 voltage of 800 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 0.5 ampere.

Note 4: With 2-phase excitation of the filament sections. In rf power amplifier circuit having bandwidth of 7 Mc as defined by the half-power points and with dc plate voltage of 7000 volts, dc grid-No.2 voltage of 800 volts, dc grid-No.1 voltage of -130 volts, drive adjusted to give dc plate current of 6.75 amperes, and frequency of 900 Mc.

Note 5: With driving power measured at input to input-cavity circuit fed by transmission line having voltage-standing-wave ratio not greater than 2. Power gain is ratio of useful power output to driving power.

OPERATING NOTES

Instructions for conserving filament life of the 6448 and for the use of high-speed electronic protective devices with it are given in the technical bulletin. A copy of the technical bulletin for the 6448 will be supplied on request to Commercial Engineering, RCA, Harrison, N.J.

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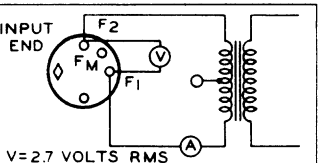
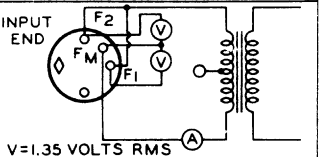
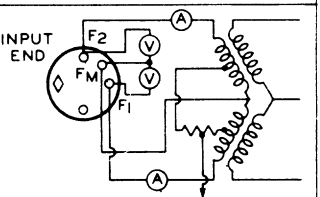
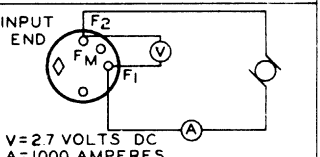
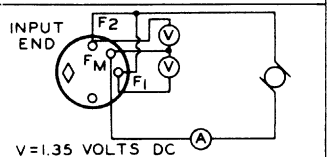
FILAMENT-SUPPLY CIRCUITS

WITH SINGLE-PHASE AC EXCITATION	SECTIONS IN SERIES	 V=2.7 VOLTS RMS A=1000 AMPERES
	SECTIONS IN PARALLEL	 V=1.35 VOLTS RMS A=2000 AMPERES
WITH TWO-PHASE (QUARTER PHASE) AC EXCITATION		 Center Tap For Circuit Returns V=1.35 VOLTS RMS A=1000 AMPERES
WITH DC EXCITATION	SECTIONS IN SERIES	 V=2.7 VOLTS DC A=1000 AMPERES
	SECTIONS IN PARALLEL	 V=1.35 VOLTS DC A=2000 AMPERES

F_1 = FILAMENT SECTION Nº1
F_2 = FILAMENT SECTION Nº2
F_M = COMMON POINT OF FILAMENT SECTIONS

92CM-8249

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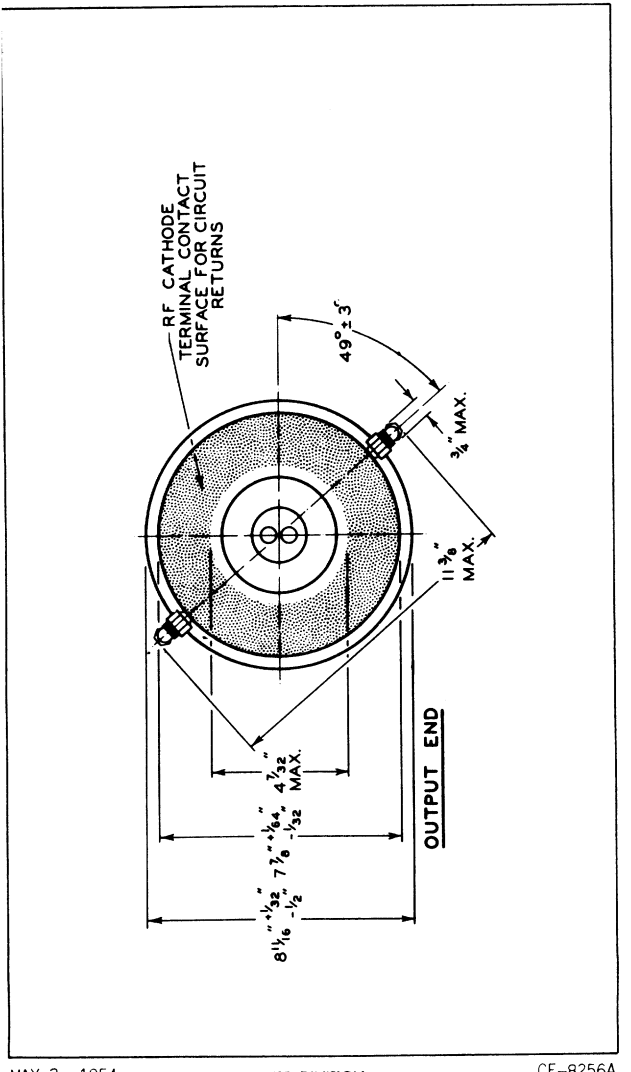
UHF BEAM POWER TUBE



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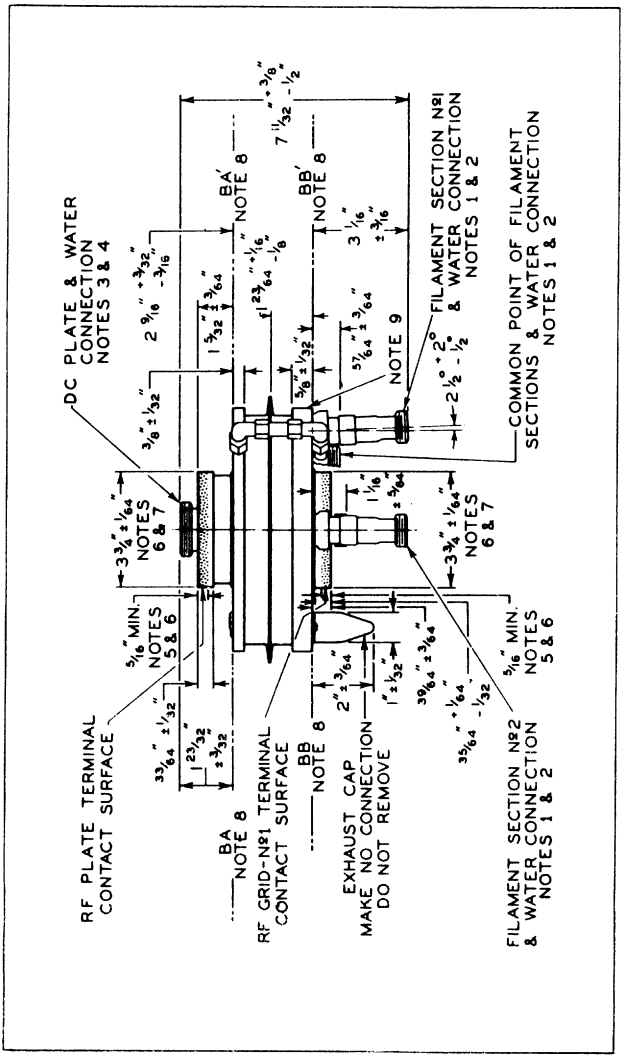
UHF BEAM POWER TUBE



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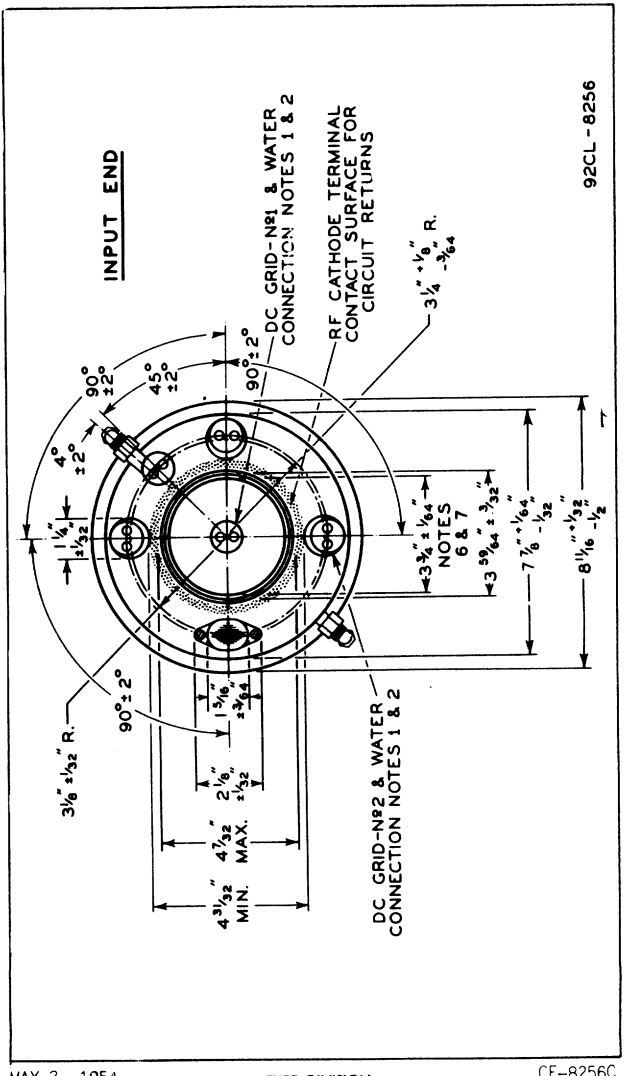
6448

UHF BEAM POWER TUBE



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UHF BEAM POWER TUBE

NOTE 1: WATER CONNECTIONS FOR FILAMENT SECTIONS No.1 AND No.2, COMMON POINT OF FILAMENT SECTIONS, GRID No.1, AND GRID No.2 HAVE 1" -16 AMERICAN STANDARD THREAD, FREE FIT (CLASS 2), 3/8" LONG, AND 2 HOLES 0.257" - 0.270" DIAMETER SPACED 7/16" ON CENTERS.

NOTE 2: THE HOLES IN THE INDICATED WATER CONNECTIONS OF NOTE 1 WILL ACCEPT THE PINS OF THE PLUG-AND-CYLINDER COMBINATION GAUGE SHOWN IN SKETCH G_1.

NOTE 3: WATER CONNECTION FOR THE PLATE HAS 1-3/4"-16 AMERICAN STANDARD THREAD, FREE FIT (CLASS 2), 3/8" LONG, AND 2 HOLES 0.508"-0.522" DIAMETER SPACED 11/16" ON CENTERS.

NOTE 4: THE HOLES IN THE PLATE WATER CONNECTION WILL ACCEPT THE PINS OF THE PLUG-AND-CYLINDER COMBINATION GAUGE SHOWN IN SKETCH G_2.

NOTE 5: CONTACT LENGTH OF CIRCUIT CONNECTOR IS 5/16" MAX.

NOTE 6: THIS DIAMETER DIMENSION IS HELD ONLY OVER A LENGTH OF 5/16"; OVER REMAINDER OF LENGTH, THE DIAMETER MAY INCREASE TO 3-7/8" MAX.

NOTE 7: THE AXIS OF THE RF PLATE CONTACT SURFACE IS COINCIDENT WITH THE AXIS OF THE RF GRID-No.1 CONTACT SURFACE WITHIN 3/32".

NOTE 8: THE CONTACT SURFACES BA-BA' AND BB-BB' ARE PARALLEL WITHIN 1/16".

NOTE 9: SERIAL NUMBER IS LOCATED ON THIS SURFACE BETWEEN DC GRID-NO.2 AND FILAMENT SECTION No.1 CONNECTIONS.

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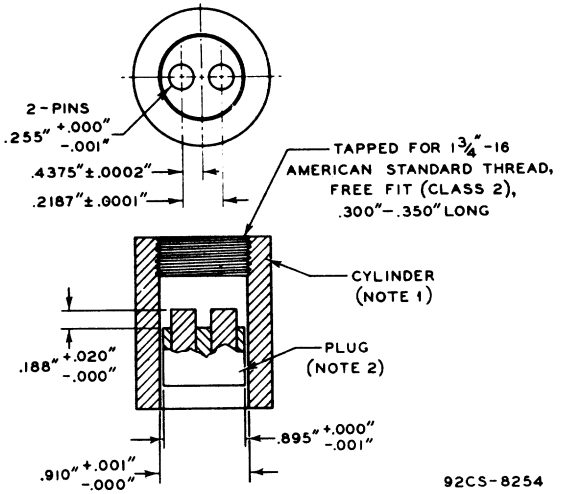
UHF BEAM POWER TUBE

GAUGE SKETCH G_1



NOTE 1: TAPPED SECTION OF CYLINDER MUST BE CONCENTRIC WITH UNTAPPED SECTION OF CYLINDER WITHIN .002".

NOTE 2: PLUG SIDES & PIN SIDES MUST BE PARALLEL WITHIN .001".

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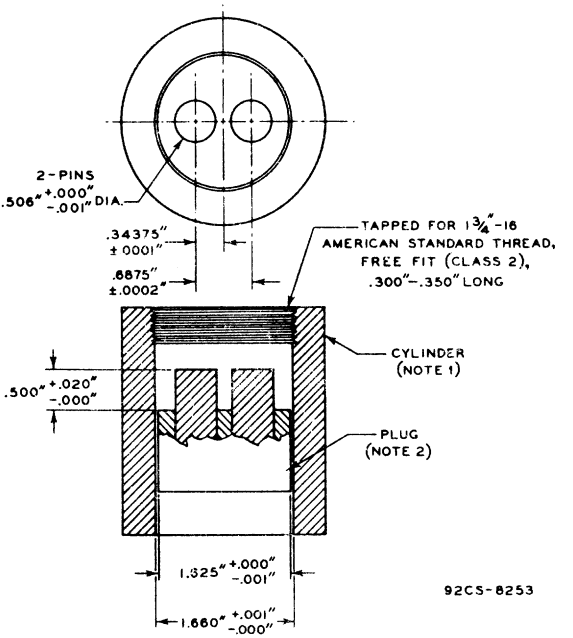
UHF BEAM POWER TUBE

GAUGE SKETCH G_2



NOTE 1: TAPPED SECTION OF CYLINDER MUST BE CONCENTRIC WITH UNTAPPED SECTION OF CYLINDER WITHIN .002".

NOTE 2: PLUG SIDES & PIN SIDES MUST BE PARALLEL WITHIN .001".

TUBE DIVISION
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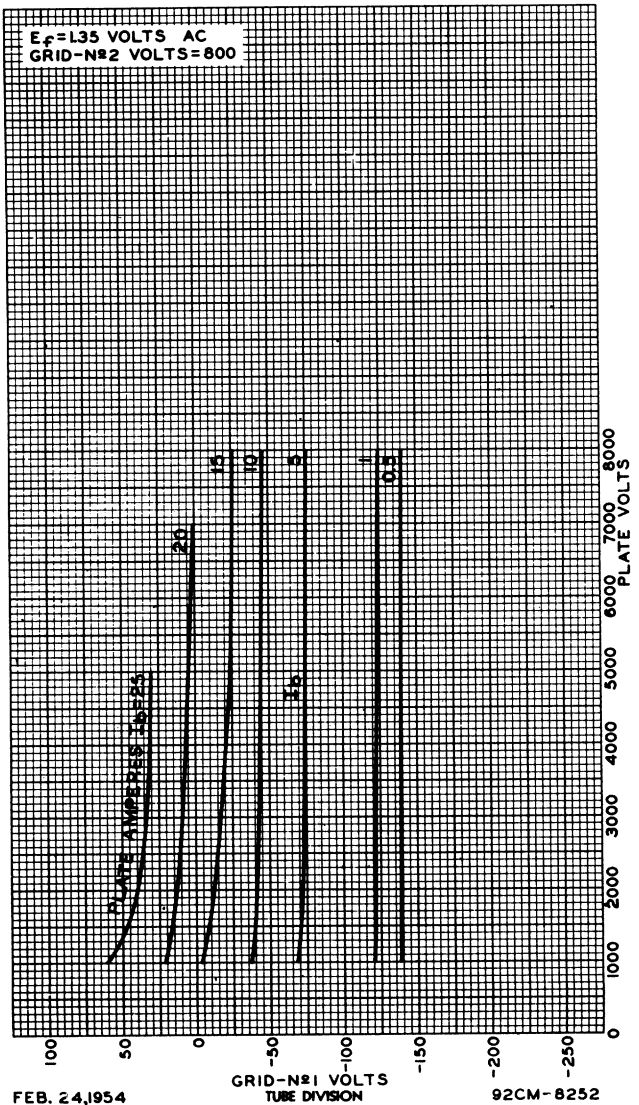
AVERAGE CONSTANT-CURRENT CHARACTERISTICS



FEB. 24,1954

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92CM-8252

RCA

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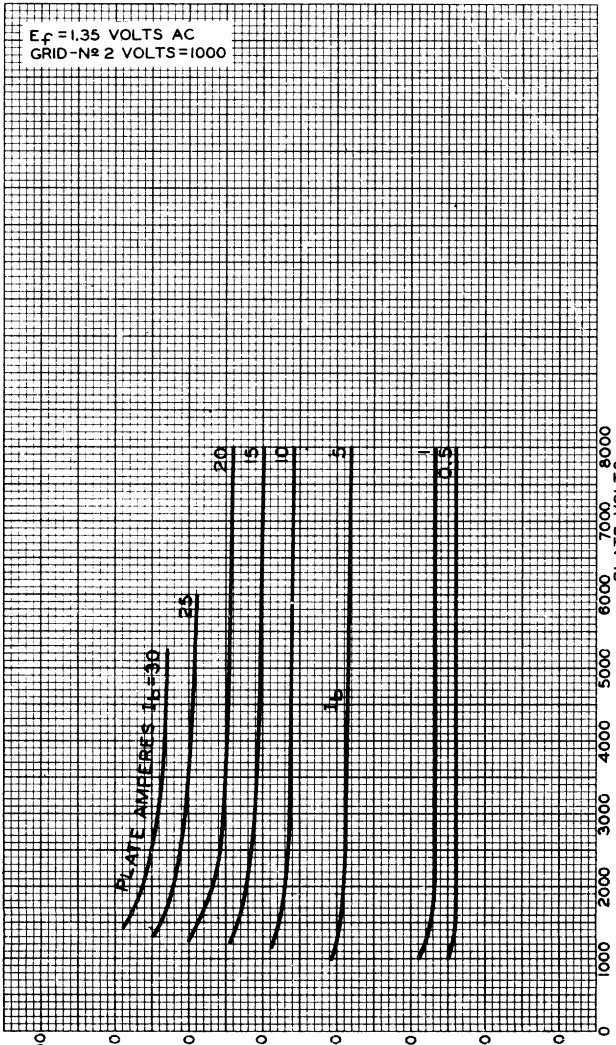
AVERAGE CONSTANT-CURRENT CHARACTERISTICS



FEB. 24, 1954

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8255

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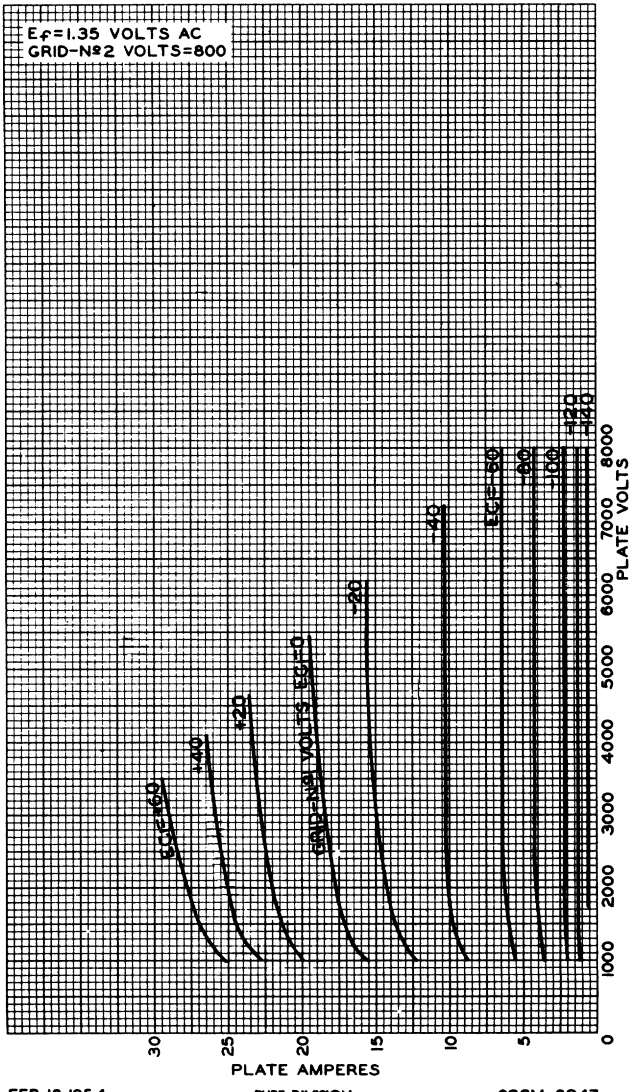
AVERAGE PLATE CHARACTERISTICS



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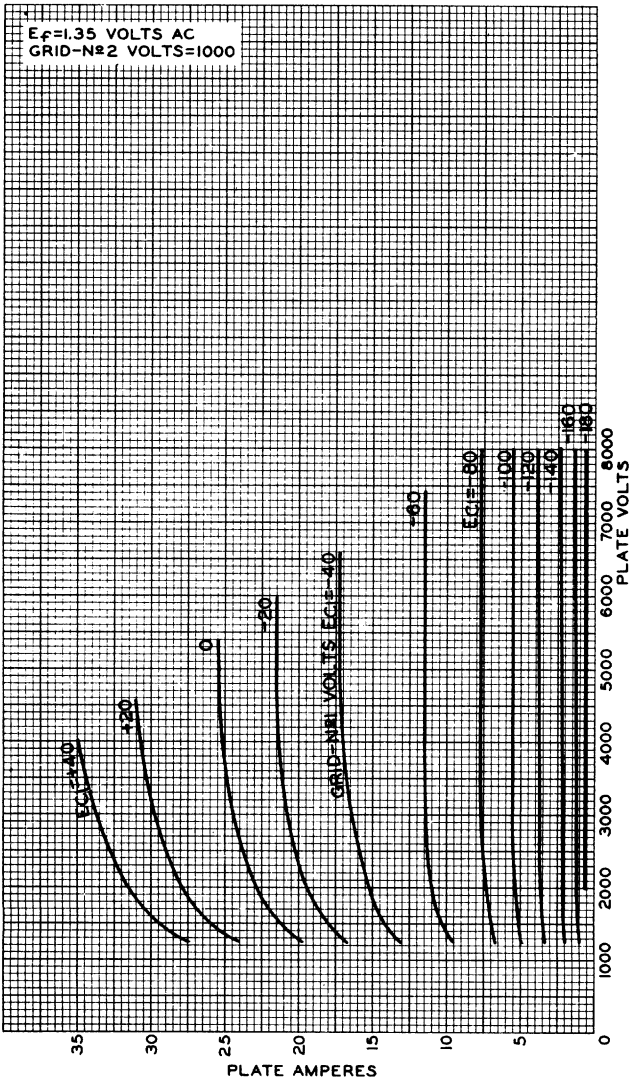
AVERAGE PLATE CHARACTERISTICS



FEB.19,1954

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92CM-8248

RCA

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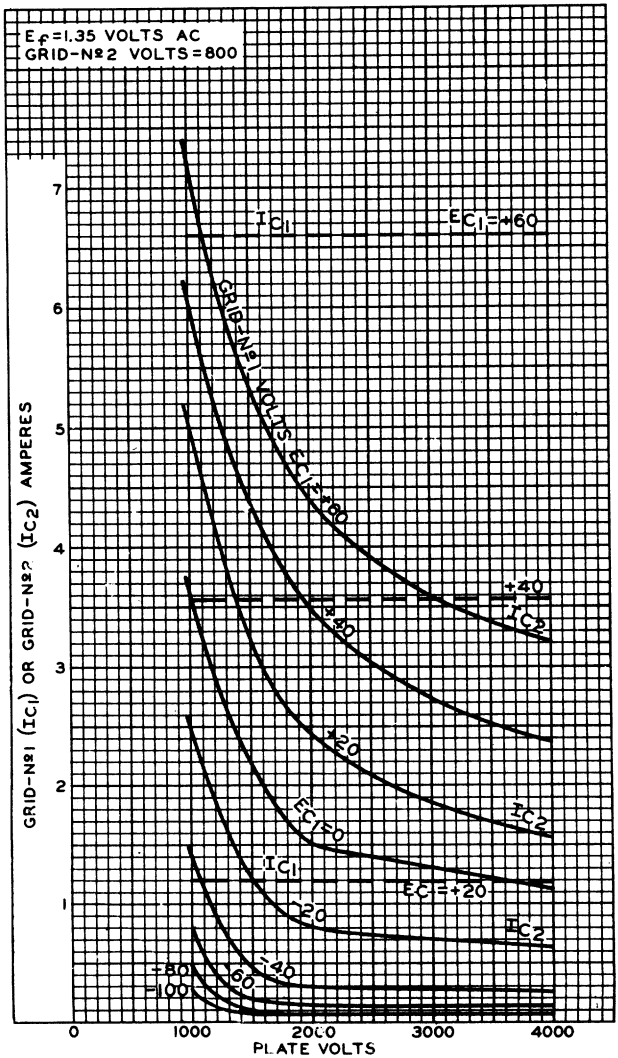
AVERAGE CHARACTERISTICS



FEB. 17, 1954

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92CM-8245

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RCA

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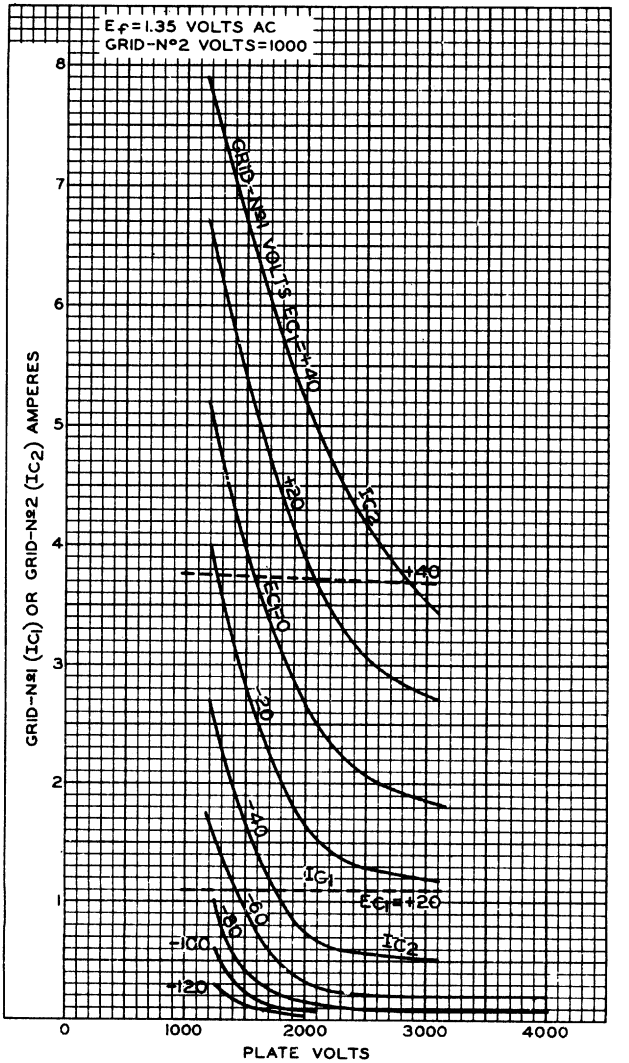
AVERAGE CHARACTERISTICS



6521

MAGNETRON

FORCED-AIR COOLED

Fixed Frequency: 5400 ± 20 Mc

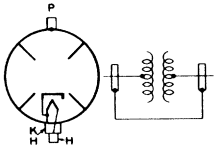
GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	10 ± 10%	ac or dc volts
Current	3.2	amp
Starting current: The maximum instantaneous starting current must never exceed 12 amperes, even momentarily.		
Minimum Cathode Heating Time	5	minutes
Frequency	5400 ± 20	Mc
Maximum Frequency Pulling at VSWR of 1.5/1	10	Mc
Maximum Frequency Change with Anode Temperature Change (After warmup)	0.15	Mc/°C

Mechanical:

Dimensions and Terminal Connections: *See Dimensional Outline*



H – Heater
K – Cathode
P – Anode

Connector (For heater terminal and heater-cathode terminal) . . . Ucinite* No. 115364 with built-in capacitor, or equivalent

Mounting Position . . . . . Any

Air Flow:

To Fins—An air stream should be directed along the cooling fins toward the body of the tube. The stream may be obtained from a rectangular nozzle about 3" x 1-1/2" located so that the plane through the 3" side is parallel with the plane of a cooling fin and so that the nozzle is centered on the body of the tube. Adequate flow should be provided so that the temperature of the anode block does not exceed 150°C.

To Heater-Cathode Terminal—Adequate flow should be provided to maintain the temperature of the heater-cathode terminal below 165°C.

Weight (Approx.) . . . . . 11-1/2 lbs

PULSED OSCILLATOR SERVICE

Maximum and Minimum Ratings, *Absolute Values*:

For Duty Cycle of 0.001 max.

PEAK ANODE VOLTAGE	16 max.	kv
PEAK ANODE CURRENT	16 max.	amp
	10 min.	amp
PEAK POWER INPUT●	256 max.	kw

* Manufactured by Ucinite Division of United-Carr Fastener Corporation, Newtonville 60, Massachusetts.

● For atmospheric pressures greater than 40 centimeters of mercury at 25°C. Operation at pressures lower than 40 centimeters of mercury (altitudes higher than 16000 feet) may result in arcover with consequent damage to the tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6521

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MAGNETRON

AVERAGE POWER INPUT	0.256 max.	kw
PULSE DURATION	2.2 max.	μsec
OPERATION TIME IN ANY 100-MICROSECOND INTERVAL	5 max.	μsec
RATE OF RISE OF VOLTAGE PULSE	120 max.	kv/μsec
	80 min.	kv/μsec
ANODE BLOCK TEMPERATURE	150 max.	°C
HEATER-CATHODE TERMINAL TEMPERATURE	165 max.	°C
LOAD VOLTAGE STANDING-WAVE RATIO	1.5 max.	

Typical Operation▲ with Load Voltage Standing-Wave Ratio Equal To or Less Than 1.05

With Duty Cycle of 0.0008

Heater Voltage	*See Operating Considerations*	
Magnetic Field	Supplied by permanent magnet integral with tube	
Peak Anode Voltage (Approx.)	15	kv
Peak Anode Current	13.5	amp
Pulse Repetition Rate	400	cps
Pulse Duration	2	μsec
Maximum RF Bandwidth	1.5	Mc
Peak Power Output	85	kw

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	2.8	3.6	amp
Peak Anode Voltage	2	14	16	kv
Peak Power Output	2,3	75	–	kw
Pulses Missing From Total	2,4	–	0.25	%

Note 1: With 10.0 volts ac on heater.

Note 2: With peak anode current of 13.5 amperes, and heater voltage reduced to 9.1 volts.

Note 3: With peak anode voltage of approximately 15 kilovolts, anode block temperature of approximately 100°C, and maximum VSWR equal to or less than 1.05.

Note 4: Pulses are considered to be missing if the energy level at the operating frequency is less than 70 per cent of the normal value at a VSWR of 1.5, and with VSWR phase adjusted to produce maximum instability.

OPERATING CONSIDERATIONS

The *waveguide output flange* is designed for use with a standard 1" x 2" rectangular waveguide such as that designated by RETMA as WR 187, or that having the JAN designation RG-49/U, and mates with flanges such as Airtron■ No. B54626 or equivalent.

▲ It is essential that the input circuit be designed so that if arcing occurs the energy per pulse delivered to the tube cannot greatly exceed the normal energy per pulse. To satisfy this requirement, it is recommended that pulsers of the discharging-network type be used.

■ Manufactured by Airtron, Inc., Linden, N. J.

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6521

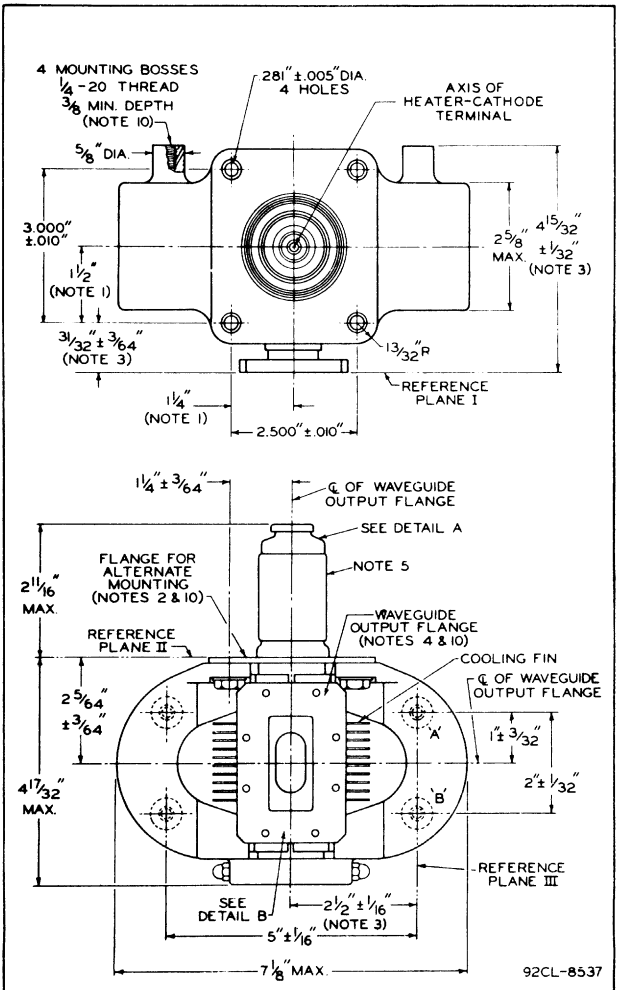
MAGNETRON

As soon as the 6521 begins to oscillate, the *heater voltage* should be reduced to 9.1 volts when it is operated under the typical operating conditions shown in the tabulated data. For other operating conditions, the heater voltage (E_f) should be reduced depending on the average power input (P_i) to the tube as follows:

P_i (watts)	E_f (volts)
up to 90	10.0
90 to 130	9.9
130 to 180	9.5
180 to 220	9.1
220 to 256	8.9

6521

6521
MAGNETRON



MAY 1, 1955

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TUBE DIVISION
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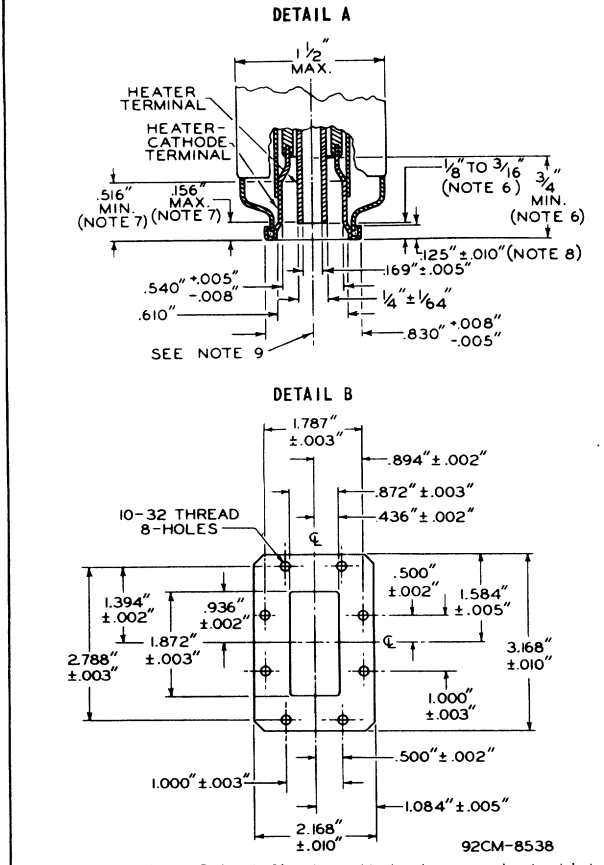
6521

MAGNETRON



Reference plane *I* is defined as that plane against which the waveguide output flange abuts.

Reference plane *II* is defined as that plane perpendicular to reference plane *I* and touching the surface of the flange for alternate mounting.

Reference plane *III* is defined as that plane perpendicular to reference plane *I* and passing through the exact centers of holes 'A' and 'B'.

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MAGNETRON

NOTE 1: The axis of the heater-cathode terminal will be within the confines of a cylinder whose radius is 3/64" and whose axis is perpendicular to reference plane *II* at the specified location.

NOTE 2: When resting on a smooth surface, this flange surface shall have a flatness such that a 0.050" thickness gauge 1/8" wide shall not enter between the two surfaces, and it shall be perpendicular to reference plane *I* within ± 2°.

NOTE 3: The tolerances include angular as well as lateral deviations.

NOTE 4: With the waveguide output flange resting on a plane surface, a 0.005" thickness gauge 1/8" wide shall not enter between the two surfaces.

NOTE 5: No part of the tube support fastened to the flange for alternate mounting should extend within the surface of a cylinder whose radius is 3/4" and whose axis is perpendicular to reference plane *II* at the specified location.

NOTE 6: These dimensions define extremities of the 0.169" internal diameter of the cylindrical heater terminal.

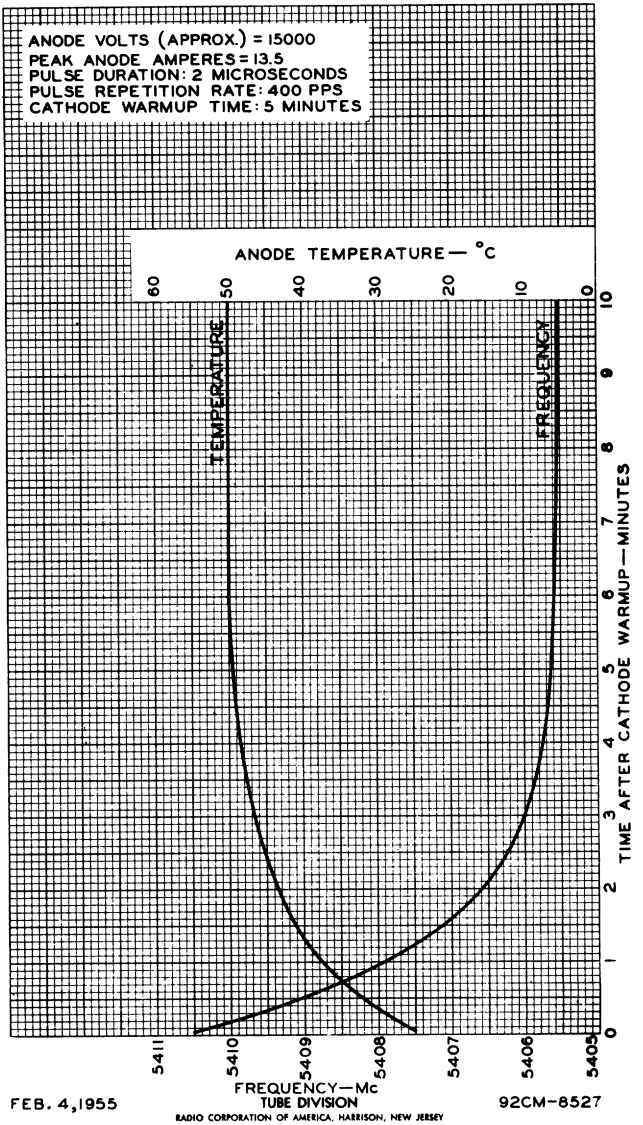
NOTE 7: These dimensions define extremities of the 0.540" internal diameter of the cylindrical heater-cathode terminal.

NOTE 8: No part of the connector device for the heater and heater-cathode terminals should bear against the underside of this lip.

NOTE 9: The heater terminal and heater-cathode terminal are concentric within 0.010".

NOTE 10: Connection to the anode may be made through the mounting bosses, the flange for alternate mounting, or the waveguide output flange.

TYPICAL STABILIZATION CHARACTERISTICS



FEB. 4, 1955

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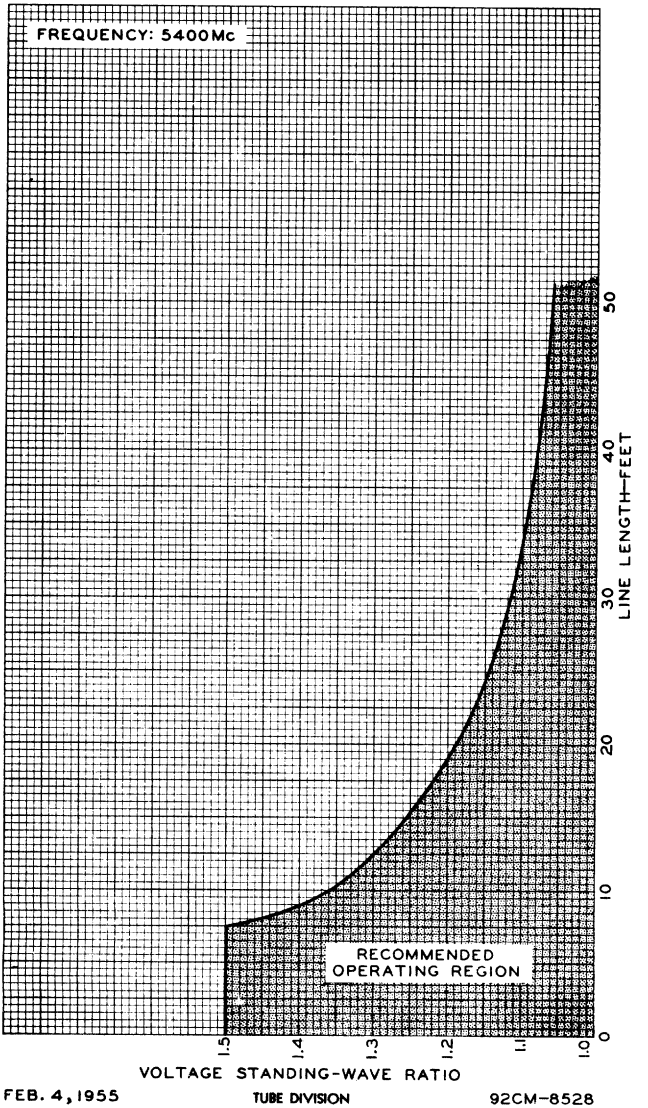
92CM-8527

6521

RCA

6521

OPERATING REGION



FEB. 4, 1955

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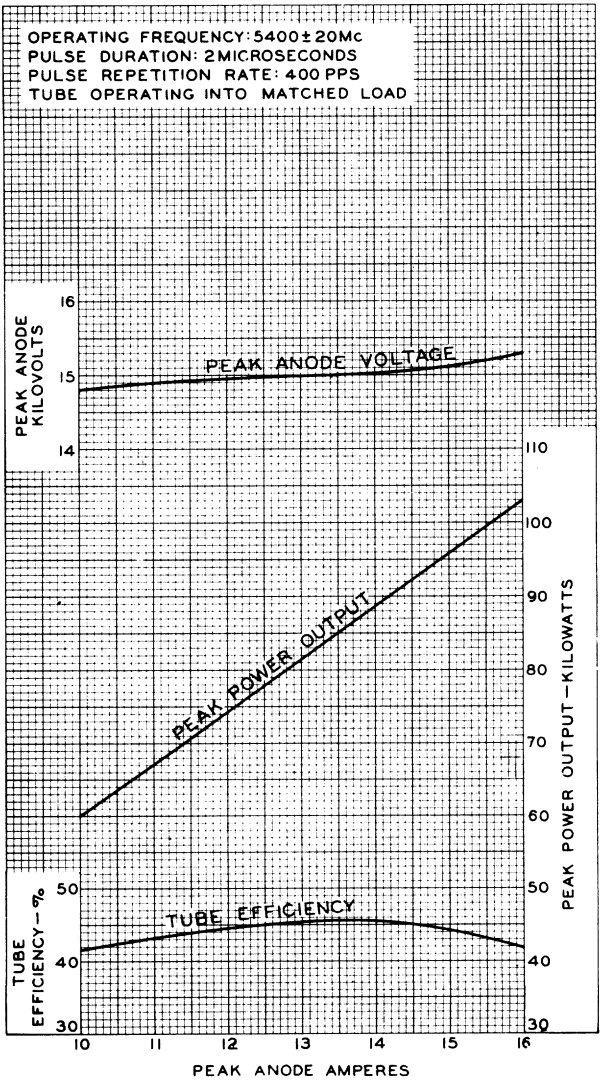
PERFORMANCE CHART



FEB. 8, 1955

TUBE DIVISION
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92CM-8533

6524

TWIN BEAM POWER TUBE

Useful at frequencies up to 470 Mc

Unless Otherwise Specified, Values are on a Per-Tube Basis

GENERAL DATA

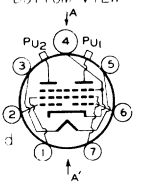
Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3 ± 10%	ac or dc volts
Current	1.25	amp
Transconductance▲ for dc plate volts = 200, dc grid-No.2 volts = 200, and dc plate ma. = 50	4500	μmhos
Mu-Factor, Grid No.2 to Grid No.1▲ for dc plate volts = 200, dc grid-No.2 volts = 200, and dc plate ma. = 50	8.5	
Direct Interelectrode Capacitances:▲*		
Grid No.1 to plate	0.11 max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2 (pins 1 & 7), and heater	7	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2 (pins 1 & 7), and heater	3.4	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	3-9/16"
Seated Length	3" ± 1/8"
Maximum Diameter	1-11/16" ←
Bulb	*See Dimensional Outline* ←
Bulb Terminals (Two)	*See Dimensional Outline*
Weight (Approx.)	3 oz
Base	Medium-Button Septar 7-Pin (JETEC No.E7-20)

BOTTOM VIEW



Pin 1 – Grid No.2
Pin 2 – Grid No.1 of Unit No.2
Pin 3 – Heater
Pin 4 – Cathode, Grid No.3, Internal Shield
Pin 5 – Heater
Pin 6 – Grid No.1 of Unit No.1
Pin 7 – Grid No.2
PU_1 – Plate of Unit No.1
PU_2 – Plate of Unit No.2

PLANE OF ELECTRODES OF EACH UNIT IS PARALLEL TO PLANE THROUGH AXIS OF TUBE AND AA'

Bulb Temperature (At hottest point)	210 max.	°C

Cooling: Free circulation of air around the tube is required. In addition, some forced-air cooling will generally be required to prevent exceeding the specified maximum bulb temperature.

▲ Each unit.

* With no external shield.

← Indicates a change.

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TWIN BEAM POWER TUBE

AF POWER AMPLIFIER & MODULATOR — Class AB_2†

	CCS°	*ICAS*°°	
Maximum Ratings, *Absolute Values:*			
DC PLATE VOLTAGE	500 max.	600 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.2 SUPPLY VOLTAGE	400 max.	400 max.	volts
MAX.-SIGNAL DC PLATE CURRENT**	150 max.	150 max.	ma
MAX.-SIGNAL PLATE INPUT**	70 max.	85 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT**	3 max.	3 max.	watts
PLATE DISSIPATION**	20 max.	25 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	135 max.	135 max.	volts
Heater positive with respect to cathode	135 max.	135 max.	volts
Typical CCS Operation:			
DC Plate Voltage	400	500	volts
DC Grid-No.2 Voltage▲▲	200	200	volts
DC Grid-No.1 (Control-Grid) Voltage:			
From fixed-bias source	-23	-26	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	72	70	volts
DC Plate Current:			
Zero-signal value	25	20	ma
Max.-signal value	145	116	ma
DC Grid-No.2 Current:			
Zero-signal value	0.1	0.1	ma
Max.-signal value	10	10	ma
DC Grid-No.1 Current:			
Max.-signal value	2.4	2.6	ma
Effective Load Resistance (Plate to plate)	7100	11100	ohms
Max.-Signal Driving Power (Approx.)◆	0.1	0.1	watt
Max.-Signal Power Output (Approx.)	39	40	watts
Typical ICAS Operation:			
DC Plate Voltage	500	600	volts
DC Grid-No.2 Voltage▲▲	200	200	volts
DC Grid-No.1 (Control-Grid) Voltage:			
From fixed-bias source	-25	-28	volts

† Subscript 2 indicates that grid-No.1 current flows during some part of the input cycle.

** Averaged over any audio-frequency cycle of sine-wave form.

°, °°, ▲▲, ◆: See next page.

TWIN BEAM POWER TUBE

Typical ICAS Operation (Cont'd):

Peak AF Grid-No.1-to-Grid-No.1 Voltage	76	76	volts
DC Plate Current:			
Zero-signal value	25	21	ma
Max.-Signal value	145	135	ma
DC Grid-No.2 Current:			
Zero-signal value	0.1	0.1	ma
Max.-signal value	10	13	ma
DC Grid-No.1 Current:			
Max.-signal value	2.9	3.3	ma
Effective Load Resistance (Plate to plate)	8900	11400	ohms
Max.-Signal Driving Power (Approx.)♦	0.1	0.1	watt
Max.-Signal Power Output (Approx.)	50	57	watts

Maximum Circuit Values (CCS or ICAS):

Grid-No.1-Circuit Resistance:♦

With fixed bias . . . . . 30000 max. ohms

With cathode bias . . . . . Not recommended

PLATE-MODULATED PUSH-PULL RF POWER AMP. — Class C Telephony

Carrier conditions per tube for use with a max. modulation factor of 1.0

	CCS°	*ICAS°°*	
Maximum Ratings, *Absolute Values:*			
For max. plate voltage and max. plate input above 100 Mc, see Rating Chart I			
DC PLATE VOLTAGE	400 max.	500 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.2 SUPPLY VOLTAGE	400 max.	400 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-200 max.	-200 max.	volts
DC PLATE CURRENT	125 max.	125 max.	ma
DC GRID-No.1 CURRENT	4 max.	4 max.	ma
PLATE INPUT	45 max.	55 max.	watts
GRID-No.2 INPUT	2 max.	2 max.	watts
PLATE DISSIPATION	13.5 max.	16.7 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	135 max.	135 max.	volts
Heater positive with respect to cathode	135 max.	135 max.	volts

▲▲ Preferably obtained from a separate source or from the plate-voltage supply with a voltage divider.

♦ Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the AB_2 stage. To minimize distortion, the effective resistance per grid-No.1 circuit of the AB_2 stage should be held at a low value. For this purpose, the use of transformer coupling is recommended. In no case, however, should the total dc grid-No.1-circuit resistance exceed 30000 ohms.

°,°°: See next page.

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TWIN BEAM POWER TUBE

	CCS°	ICAS°°	
Typical Operation up to 100 Mc:			
DC Plate Voltage	400	500	volts
DC Grid-No.2 Voltage (Approx.)♦	200	200	volts
From an adjustable series resistor having max. value of	45000	45000◤	ohms
DC Grid-No.1 Voltage★	-61	-61	volts
From combination employing grid resistor of	6200	6200	ohms
with fixed bias of	-45	-45	volts
DC Plate Current	100	100	ma
DC Grid-No.2 Current (Approx.)	7	7	ma
DC Grid-No.1 Current (Approx.)	2.5	2.5	ma
Driving Power (Approx.)	0.2	0.2	watt
Power Output (Approx.)⊕	31	40	watts
Typical Operation at 462 Mc:			
DC Plate Voltage	300	300	volts
DC Grid-No.2 Voltage (Approx.)♦	200	240	volts
From an adjustable series resistor having max. value of	45000	25000	ohms
DC Grid-No.1 Voltage★	-60	-60	volts
From combination employing grid resistor of	15000	15000	ohms
with fixed bias of	-45	-45	volts
DC Plate Current	75	95	ma
DC Grid-No.2 Current (Approx.)	4	5.5	ma
DC Grid-No.1 Current (Approx.)	1	1	ma
Driver Power Output (Approx.)	7	7	watts
Useful Power Output (Approx.)●●	9	12	watts
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance‡	30000 max.	30000 max.	ohms

PUSH-PULL RF POWER AMP. & OSCILLATOR--Class C Telegraphy□
and
PUSH-PULL RF POWER AMPLIFIER--Class C FM Telephony

Maximum Ratings, *Absolute Values*:	CCS°	ICAS°°	
For max. plate voltage and max. plate input above 100 Mc, see Rating Chart II			
DC PLATE VOLTAGE	500 max.	600 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE	300 max.	300 max.	volts

♦ Obtained preferably from a separate source modulated along with the plate supply, or from the modulated plate supply through a series resistor. It is recommended that this resistor be adjustable to permit obtaining the desired operating plate current after initial tuning adjustments are completed.

★ Obtained from a combination of grid-No.1 resistor with either fixed supply or cathode resistor. The combination of grid-No.1 resistor and fixed supply has the advantage of not only protecting the tube from damage through loss of excitation but also of minimizing distortion by bias-supply compensation.

°, °°, ◤, ⊕, ●●, ‡, □: See next page.

TUBE DIVISION
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TWIN BEAM POWER TUBE

	CCS°	ICAS°°	
DC GRID-No.2 SUPPLY VOLTAGE . .	400 max.	400 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-200 max.	-200 max.	volts
DC PLATE CURRENT	150 max.	150 max.	ma
DC GRID-No.1 CURRENT	4 max.	4 max.	ma
PLATE INPUT	70 max.	85 max.	watts
GRID-No.2 INPUT	3 max.	3 max.	watts
PLATE DISSIPATION	20 max.	25 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	135 max.	135 max.	volts
Heater positive with respect to cathode	135 max.	135 max.	volts
Typical Operation up to 100 Mc:			
DC Plate Voltage	500	600	volts
DC Grid-No.2 Voltage (Approx.)⊕.	200	200	volts
From an adjustable series resistor having max. value of . .	40000◢	40000◢	ohms
DC Grid-No.1 Voltage■.	-44	-44	volts
From grid resistor of	12000	12000	ohms
From cathode resistor of . . .	330	330	ohms
DC Plate Current	120	120	ma
DC Grid-No.2 Current (Approx.) .	8	8	ma
DC Grid-No.1 Current (Approx.) .	3.7	3.7	ma
Driving Power (Approx.)	0.2	0.2	watt
Power Output (Approx.)⊕⊕	46	56	watts
Typical Operation as Amplifier at 462 Mc:●			
DC Plate Voltage	300	300	volts
DC Grid-No.2 Voltage (Approx.)⊕.	200	250	volts
From an adjustable series resistor having max. value of .	60000	20000	ohms
DC Grid-No.1 Voltage■	-31	-38	volts
From grid resistor of	12000	12000	ohms
From cathode resistor of . . .	240	240	ohms
DC Plate Current	120	150	ma
DC Grid-No.2 Current (Approx.) .	3	6	ma
DC Grid-No.1 Current (Approx.) .	2.6	3.2	ma

⊕ At 100 Mc, useful power output measured at load of output circuit is approximately 29 watts CCS and 36 watts ICAS.

□ Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

◢ Connected to a 400-volt tap on suitable voltage divider across the plate-supply voltage.

⊕⊕ At 100 Mc, useful power output measured at load of output circuit is approximately 43 watts CCS and 52 watts ICAS.

● Typical operation as an oscillator at 462 Mc is the same as that shown for amplifier service except that the useful power output measured at load of output circuit is approximately 9 watts CCS and 13 watts ICAS.

°, °°, ‡, ●●, ⊕, ■: See next page.

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TWIN BEAM POWER TUBE

	CCS°	ICAS°°	
Driver Power Output (Approx.) . .	7	7	watts
Useful Power Output (Approx.)●●.	15	20	watts
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance‡. .	30000	30000 max.	ohms

FREQUENCY TRIPLER — Class C

	CCS°	ICAS°°	
Maximum Ratings, *Absolute Values:*			
For max. plate voltage and max. plate input above 100 Mc, see Rating Chart III			
DC PLATE VOLTAGE	400 max.	400 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE .	300 max.	300 max.	volts
DC GRID-No.2 SUPPLY VOLTAGE . .	400 max.	400 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-200 max.	-200 max.	volts
DC PLATE CURRENT	100 max.	115 max.	ma
DC GRID-No.1 CURRENT	4 max.	4 max.	ma
PLATE INPUT	36 max.	45 max.	watts
GRID-No.2 INPUT	3 max.	3 max.	watts
PLATE DISSIPATION	20 max.	25 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	135 max.	135 max.	volts
Heater positive with respect to cathode	135 max.	135 max.	volts
Typical Operation as Tripler to 462 Mc:			
DC Plate Voltage	300	300	volts
DC Grid-No.2 Voltage (Approx.)⊕.	220	250	volts
From an adjustable series resistor having max. value of .	30000	20000	ohms
DC Grid-No.1 Voltage■.	-148	-148	volts
From grid resistor of	51000	51000	ohms
DC Plate Current	90	110	ma
DC Grid-No.2 Current (Approx.) .	5	6.5	ma
DC Grid-No.1 Current (Approx.)	2.9	2.9	ma

‡ When grid No.1 is driven positive, the total dc grid-No.1-circuit resistance should not exceed the specified value of 30000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.

⊕ Obtained preferably from a separate source, or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should be used only when the 6524 is used in a circuit which is not keyed. It is recommended that this resistor be adjustable to permit obtaining the desired operating plate current after initial tuning adjustments are completed. Grid-No.2 voltage must not exceed 400 volts under key-up conditions.

■ Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

°, °°, ●●: See next page.

6524

TWIN BEAM POWER TUBE

	CCS[o]	ICAS[oo]	
Driver Power Output (Approx.)	4	4	watts
Useful Power Output (Approx.)[●●]	7	8.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance[‡‡]	60000 max.	60000 max.	ohms

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	1.175	1.325	amp
Mu-Factor, Grid No.2 to Grid No.1 (Each Unit)	1,2	7	10	
Direct Interelectrode Capacitances (Each Unit):				
Grid No.1 to plate	3	-	0.11	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2 (pins 1 & 7), and heater	3	5.8	8.2	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2 (pins 1 & 7), and heater	3	2.6	4.2	μμf

Note 1: With 6.3 volts ac on heater.

Note 2: With dc plate voltage of 200 volts, dc grid-No.2 voltage of 200 volts, and dc plate current of 50 ma.

Note 3: With no external shield.

[o] Continuous Commercial Service.

[oo] Intermittent Commercial and Amateur Service.

[●●] This value of useful power is measured at load of output circuit.

[‡‡] When grid No.1 is driven positive, the total dc grid-No.1-circuit resistance should not exceed the specified value of 60000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.

OPERATING CONSIDERATIONS

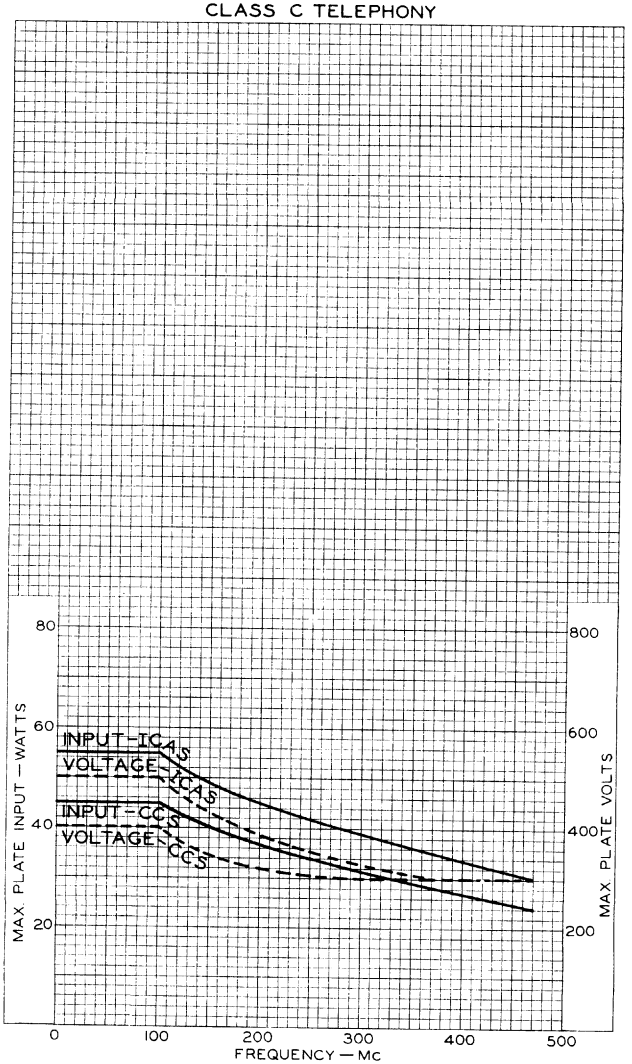
Shielding of the 6524 in rf service is required for stable operation. A convenient method of shielding is to mount the socket approximately 5/8" beneath a hole in the chassis plate so that when the 6524 is inserted in the socket, the internal shield (see *Dimensional Outline*) of the tube will be close to the edge of the hole and in the same plane as the chassis plate. This arrangement provides an effective shield to isolate the grid-No.1 circuits from the plate circuits.

← Indicates a change.

6524

6524

RATING CHART I
CLASS C TELEPHONY



TUBE DIVISION
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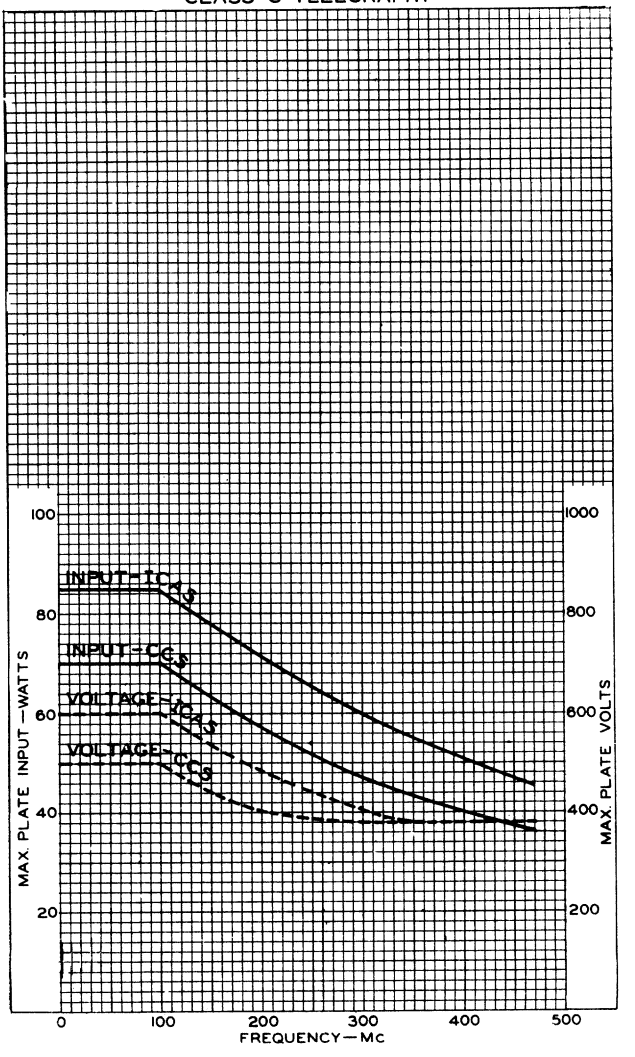
92CM-8347

RCA

6524

RATING CHART II

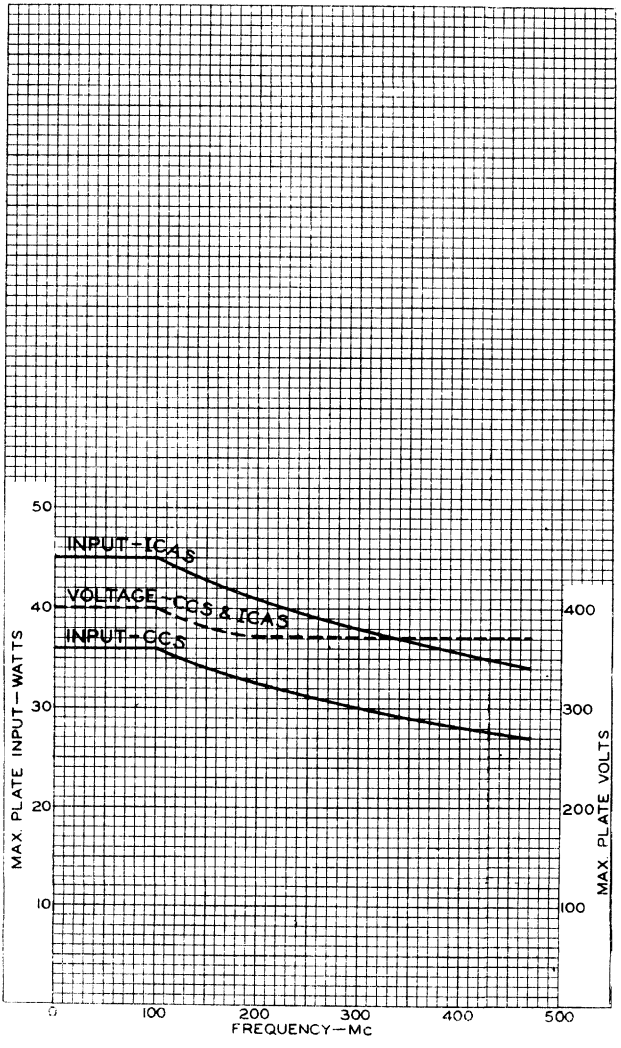
CLASS C TELEGRAPHY



6524

RATING CHART III

CLASS C TRIPLER



JULY 13, 1954

TUBE DIVISION
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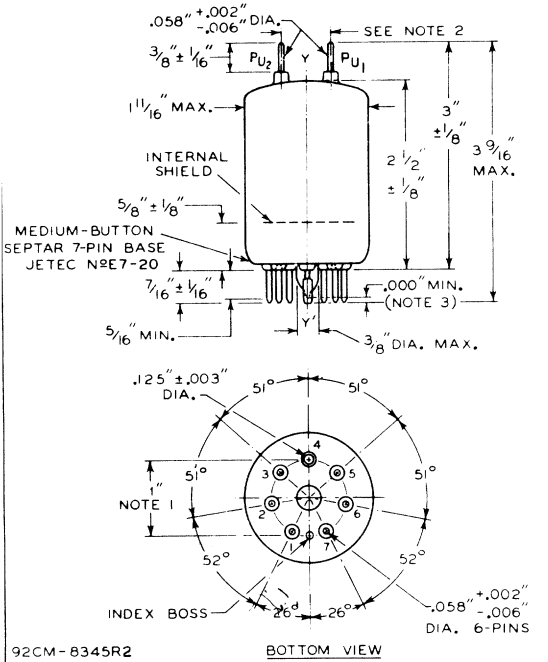
92CM-8349

6524

TWIN BEAM POWER TUBE



THE REFERENCE AXIS YY' IS DEFINED AS THE AXIS OF THE BASE-PIN GAUGE DESCRIBED IN NOTE 1.

For Notes, see next page.

6524

RCA

6524

TWIN BEAM POWER TUBE

NOTE 1: ANGULAR VARIATIONS BETWEEN PINS AND VARIATION IN PIN-CIRCLE DIAMETER ARE HELD TO TOLERANCES SUCH THAT PINS WILL ENTER TO A DISTANCE OF 0.375" A FLAT-PLATE BASE-PIN GAUGE HAVING SIX HOLES 0.0800" ± 0.0005" AND ONE HOLE 0.1450" ± 0.0005" ARRANGED ON A 1.0000" ± 0.0005" CIRCLE AT SPECIFIED ANGLES WITH TOLERANCE OF ± 5' FOR EACH ANGLE. GAUGE IS ALSO PROVIDED WITH A HOLE 0.500" ± 0.010" CONCENTRIC WITH PIN CIRCLE WHOSE CENTER IS ON THE AXIS YY'.

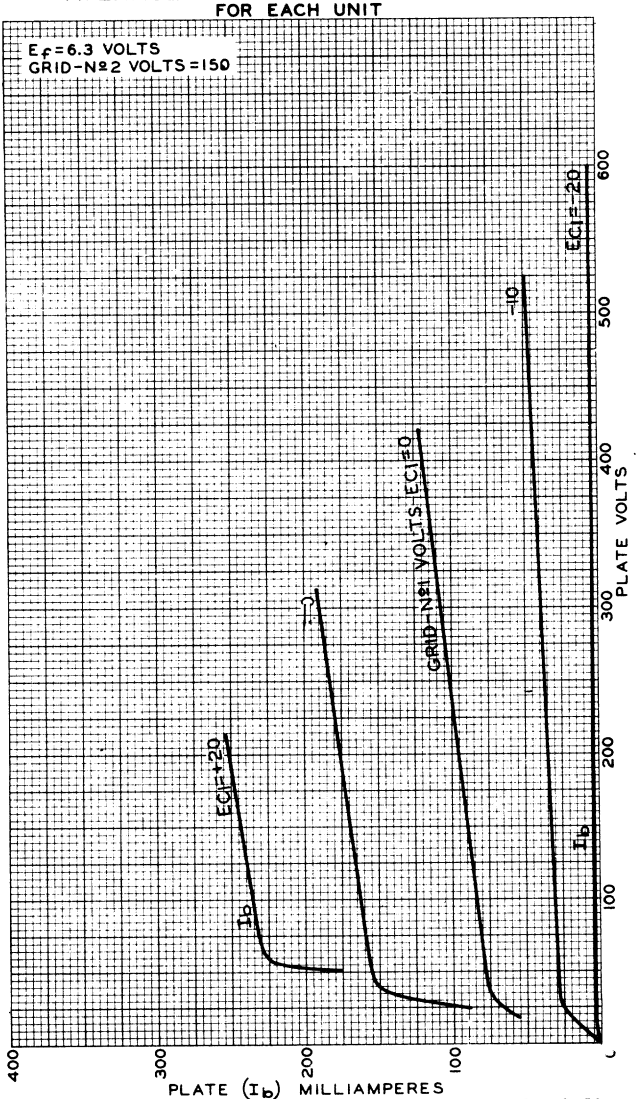
NOTE 2: THE PLATE LEADS WILL ENTER A FLAT-PLATE PLATE-LEAD GAUGE HAVING MINIMUM THICKNESS OF 0.375" AND HAVING TWO HOLES 0.1200" ± 0.0005" WHOSE CENTERS ARE LOCATED AT A DISTANCE OF 0.343" ± 0.001" FROM THE AXIS YY' AND WHOSE AXES ARE PARALLEL TO YY'. THE PLANE THROUGH THESE AXES WILL BE 90° ± 5' FROM THE PLANE THROUGH YY' AND PIN No.4.

NOTE 3: EXHAUST TIP WILL NOT EXTEND BEYOND THE PLANE WHICH PASSES THROUGH THE ENDS OF THE THREE LONGEST PINS.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-8345R2S

AVERAGE PLATE CHARACTERISTICS
FOR EACH UNIT



JULY 15, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

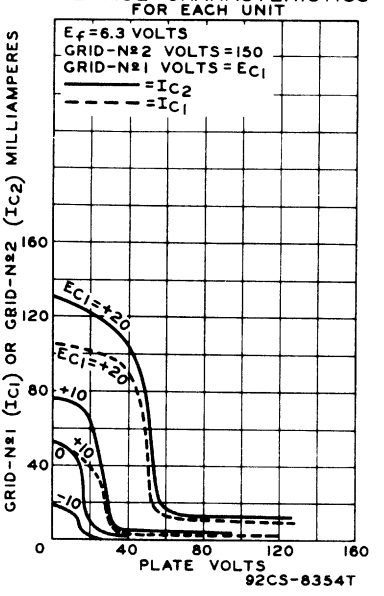
92CM-8350

6524

6524

CHARACTERISTICS CURVES

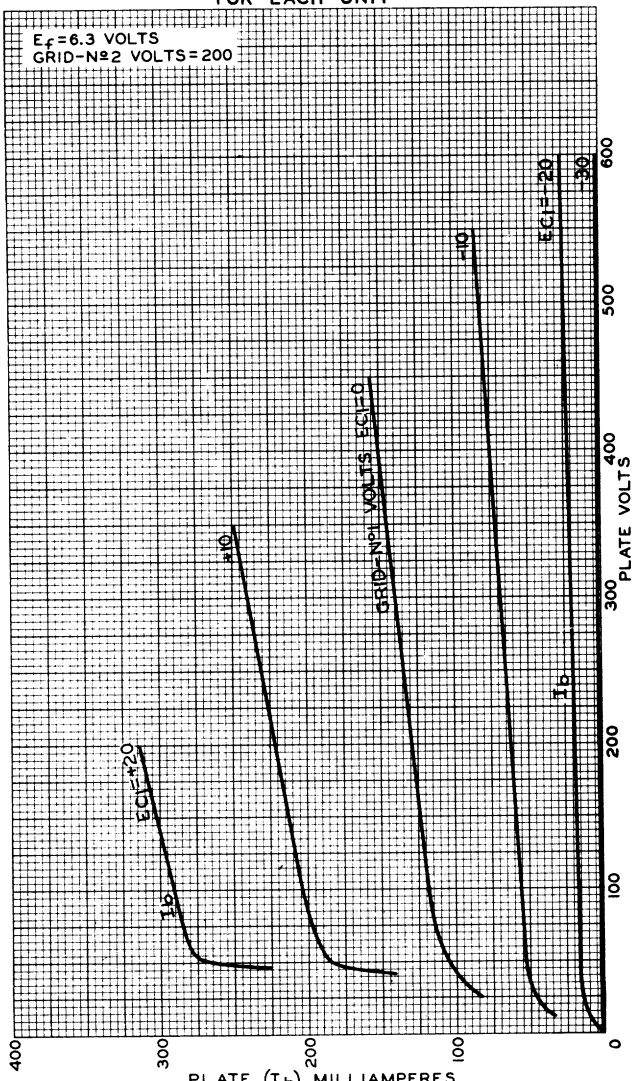
AVERAGE CHARACTERISTICS
FOR EACH UNIT



RCA

6524

AVERAGE PLATE CHARACTERISTICS
FOR EACH UNIT



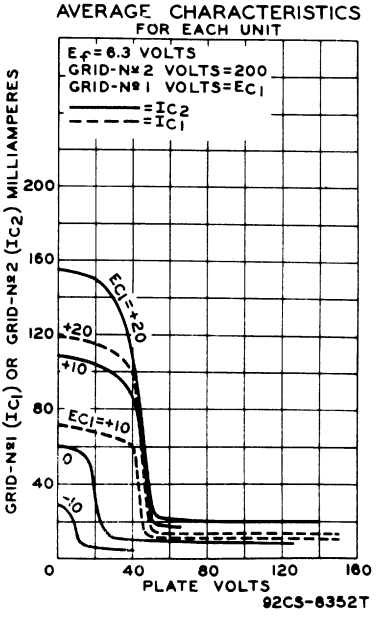
JULY 12, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8346

6524

CHARACTERISTICS CURVES

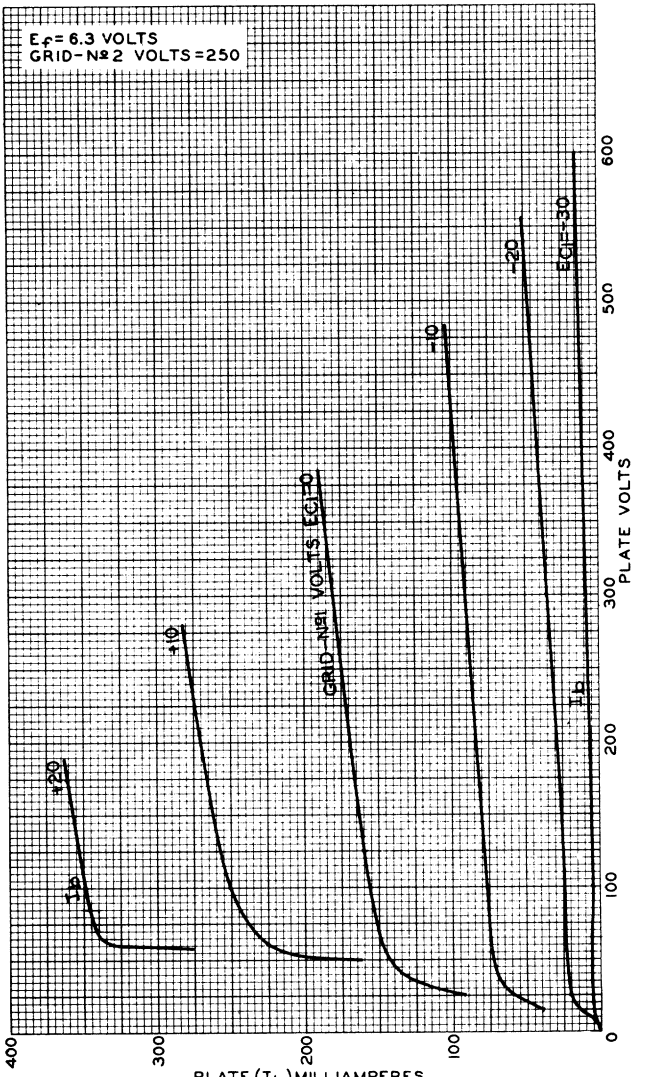


TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

6524

AVERAGE PLATE CHARACTERISTICS
FOR EACH UNIT



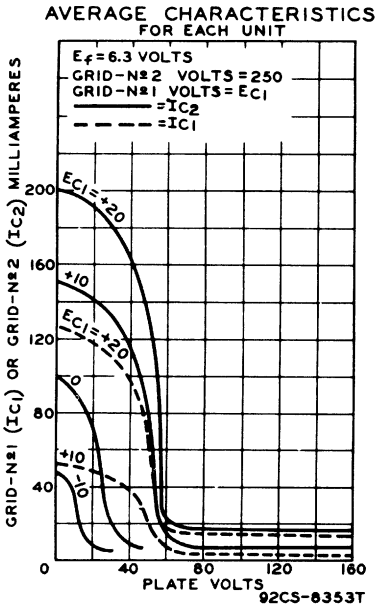
JULY 15, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6351

6524

CHARACTERISTICS CURVES



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6550

Beam Power Tube

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Center Values)*:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	1.600	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	300[a] max.	volts
Heater positive with respect to cathode	200[b] max.	volts
Direct Interelectrode Capacitances (Approx.):[c]		
Grid No.1 to plate	0.85	μμf
Grid No.1 to cathode & grid No.3, grid No.2, base sleeve, and heater	14.0	μμf
Plate to cathode & grid No.3, grid No.2, base sleeve, and heater	12.0	μμf

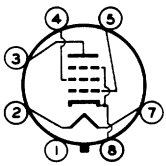
Characteristics, Class A_1 Amplifier:

	Triode Connection[d]			
Plate Voltage	250	450	400	volts
Grid-No.2 Voltage	250	450	225	volts
Grid-No.1 Voltage	-14	-46	-16.5	volts
Amplification Factor	8	7.5	-	
Plate Resistance (Approx.)	12000	-	27000	ohms
Transconductance	11000	-	9000	μmhos
Plate Current	140	150	87	ma
Grid-No.2 Current	12	-	4	ma
Grid-No.1 Voltage (Approx.) for plate ma. = 1	-40	-	-35	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	4-3/4"
Maximum Seated Length	4-3/16"
Maximum Diameter	2-1/16"
Bulb	ST16
Base	Large-Wafer Octal 8-Pin with Sleeve (JEDEC Group 1, No.B8-86)
Basing Designation for BOTTOM VIEW	7S

Pin 1 - Base Sleeve
Pin 2 - Heater
Pin 3 - Plate
Pin 4 - Grid No.2
Pin 5 - Grid No.1



Pin 6 - No Internal Connection
Pin 7 - Heater
Pin 8 - Cathode, Grid No.3

AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	600 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	400 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	300 max.	volts
Positive-bias value	0 max.	volts
CATHODE CURRENT	175 max.	ma
GRID-No.2 INPUT	6 max.	watts
PLATE DISSIPATION	35 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	250 max.	°C

Typical Operation and Characteristics:

Plate Voltage	250	400	volts
Grid-No.2 Voltage	250	225	volts
Grid-No.1 Voltage	-14	-16.5	volts
Peak AF Grid-No.1 Voltage	14	16.5	volts
Zero-Signal Plate Current	140	87	ma
Max.-Signal Plate Current	150	105	ma
Zero-Signal Grid-No.2 Current	12	4	ma
Max.-Signal Grid-No.2 Current	28	18	ma
Plate Resistance (Approx.)	12000	27000	ohms
Transconductance	11000	9000	μmhos
Load Resistance	1500	3000	ohms
Total Harmonic Distortion	7	13.5	%
Max.-Signal Power Output	12.5	20	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.05 max.	megohm
For cathode-bias operation	0.25 max.	megohm

PUSH-PULL AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

Same as for AF POWER AMPLIFIER — Class A_1

Typical Operation and Characteristics:

Values are for 2 tubes

	Fixed Bias		*Cathode Bias*	
Plate Supply Voltage	400	600	400	volts
Grid-No.2 Supply Voltage	275	300	300	volts
Grid-No.1 Voltage	-23	-31	-	volts
Cathode Resistor	-	-	140	ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage	46	62	53	volts
Zero-Signal Plate Current	180	115	166	ma
Max.-Signal Plate Current	270	273	190	ma
Zero-Signal Grid-No.2 Current	9	4	7.5	ma
Max.-Signal Grid-No.2 Current	44	41	39	ma
Effective Load Resistance (Plate to plate)	3500	5000	4500	ohms

Total Harmonic Distortion	3	2.5	4	%
Max.-Signal Power Output	55	100	41	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.05 max.	megohm
For cathode-bias operation	0.25 max.	megohm

PUSH-PULL AF POWER AMPLIFIER — Class A1

Triode Connection[d]

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	495 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	440 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	330 max.	volts
Positive-bias value	0 max.	volts
CATHODE CURRENT	192.5 max.	ma
GRID-No.2 INPUT	6.6 max.	watts
PLATE DISSIPATION	44 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	250 max.	°C

Typical Operation and Characteristics:

Values are for 2 tubes

Plate Voltage	450	volts
Grid No.1 Voltage	-46	volts
Peak AF Grid-No.1-to-Grid-No.1-Voltage	92	volts
Zero-Signal Plate Current	150	ma
Max.-Signal Plate Current	220	ma
Effective Load Resistance (Plate to plate)	4000	ohms
Total Harmonic Distortion	2.5	%
Max.-Signal Power Output	28	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.05 max.	megohm
For cathode-bias operation	0.25 max.	megohm

[a] The dc component must not exceed 300 volts.
[b] The dc component must not exceed 100 volts
[c] Without external shield.
[d] Grid No.2 connected to plate.

6562/5794A

Fixed-Tuned Oscillator Triode

PENCIL TYPE WITH INTEGRAL RESONATORS
For Radiosonde Service at 1680 Mc

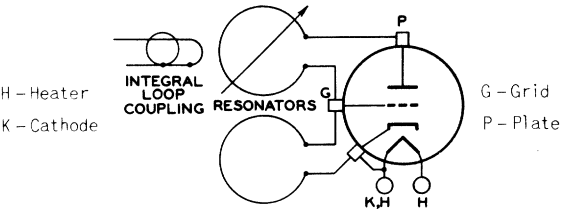
GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage range (AC or DC)	5.2 to 6.6[a]	volts
Current at heater volts = 6.0	0.160	amp
Frequency (Approx.)	1680	Mc
Frequency Adjustment Range	±12[b]	Mc
RF Coaxial Output Terminal:		
Characteristic impedance (Approx.)	50	ohms

Mechanical:

Operating Position . . . . . Any
Dimensions . . . . . See *Dimensional Outline*
Resonators (Two) . . . . . Integral Part of Tube
Terminal Connections (See *Dimensional Outline*):



FIXED-TUNED OSCILLATOR SERVICE

Maximum and Minimum Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	120 max.	volts
DC PLATE CURRENT	34 max.	ma
DC GRID CURRENT	8 max.	ma
PLATE INPUT	4 max.	watts
PLATE DISSIPATION	3.6 max.	watts
AMBIENT-TEMPERATURE RANGE	−55 to +75	°C

Operating Frequency Drift:

Maximum Frequency Drift: For heater voltage range of 5.2 to 6.6 volts, plate voltage range of 95 to 117 volts, and ambient-temperature range of +22° to −40° C	+4 to −1	Mc

[a] This range of heater voltage is for radiosonde applications in which the heater is supplied from batteries and in which the equipment design requirements of minimum size, light weight, and high efficiency are the primary considerations even though the average life expectancy of the 6562/5794A in such service is only a few hours.

[b] As supplied, tubes are adjusted to 1680 ± 4 megacycles.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Av.	Max.	
Heater Current.	1	0.135	0.148	0.157	amp
Power Output.	2,4	–	600	–	mw
Power Output.	3,4	300	–	–	mw

Note 1: With 5.2 volts ac on heater.

Note 2: With ac heater voltage of 6.6 volts, dc plate voltage of 117 volts, frequency of 1680 Mc, and grid resistor having resistance value within the range of 1300 to 2400 ohms, such that the dc plate current will not exceed 34 milliamperes. The value used for any individual tube is stamped on the tube and is one of the following standard values: 1300, 1500, 1800, 2200, or 2400 ohms.

Note 3: With ac heater voltage of 5.2 volts, dc plate voltage of 95 volts, frequency of 1680 Mc, and grid-resistor value specified in Note 2 above. When this value of resistance is used, the dc plate current will not exceed 34 milliamperes under the specified operating conditions.

Note 4: Measured with a coaxial-type load having an impedance of approximately 50 ohms and adjusted for a maximum voltage standing wave ratio of 1.1.

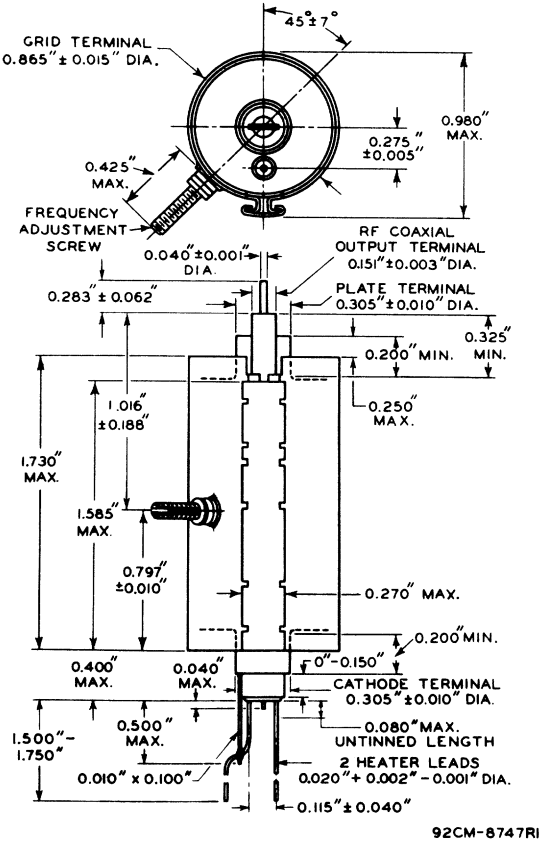
OPERATING CONSIDERATIONS

The *flexible heater leads* of the 6562/5794A are usually soldered to the circuit elements. Soldering of these connections should not be made closer than 3/4" from the end of the tube (excluding cathode tab). If this precaution is not followed, the heat of the soldering operation may crack the glass seals of the leads and damage the tube. Under no circumstances should any of the electrodes be soldered to the circuit elements. Connections to the electrodes should be made by spring contact only.

The 6562/5794A should be supported by a suitable clamp around the metal shell either above or below the frequency-adjustment screw. It is essential, however, that the pressure exerted on the shell by the clamp be held to a minimum because excessive pressure can distort the resonators and result in a change of frequency.

The *plate connection* should have a flexible lead which will accommodate variations in the relative position of the plate terminal in individual tubes.

The 6562/5794A may be mechanically tuned by adjustment of the frequency-adjustment screw located on the metal shell of the tube. A clockwise rotation of the frequency-adjustment screw will decrease the frequency, while a counter-clockwise rotation will increase the frequency. The range of adjustment provided by the screw is ± 12 Mc.


45°±7°
GRID TERMINAL
0.865"±0.015" DIA.
0.980"
MAX.
0.275"
±0.005"
0.425"
MAX.
FREQUENCY
ADJUSTMENT
SCREW
0.040"±0.001"
DIA.
RF COAXIAL
OUTPUT TERMINAL
0.151"±0.003"DIA.
0.283"±0.062"
PLATE TERMINAL
0.305"±0.010" DIA.
0.325"
MIN.
0.200" MIN.
0.250"
MAX.
1.016"
±0.188"
1.730"
MAX.
1.585"
MAX.
0.797"
±0.010"
0.270" MAX.
0.200"MIN.
0.400"
MAX.
0.040"
MAX.
0"-0.150"
CATHODE TERMINAL
0.305"±0.010" DIA.
0.500"
MAX.
1.500"-
1.750"
0.080"MAX.
UNTINNED LENGTH
2 HEATER LEADS
0.020"+0.002"-0.001" DIA.
0.010" x 0.100"
0.115"±0.040"

92CM-8747RI

6660/6BA6

REMOTE-CUTOFF PENTODE

7-PIN MINIATURE TYPE

For use in mobile communications equipment

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:
Voltage . . . . . 6.3 ± 20%* . . . ac or dc volts
Current at 6.3 volts . . 0.3 . . . . . amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield°*	
Grid No.1 to plate	0.0035 max.	0.0035 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater. . .	5.5	5.5	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	5	5.5	μμf

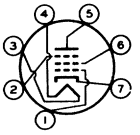
Characteristics, Class A_1 Amplifier:

Heater Voltage.	6.3	6.3	volts
Plate Supply Voltage.	100	250	volts
Grid No.3	*Connected to cathode at socket*		
Grid-No.2 Supply Voltage.	100	100	volts
Cathode Resistor.	68	68	ohms
Plate Resistance (Approx.).	0.25	1	megohm
Transconductance.	4300	4400	μmhos
Plate Current	10.8	11	ma
Grid-No.2 Current	4.4	4.2	ma
Grid-No.1 Voltage (Approx.) for transconductance = 40 μmhos	-20	-20	volts

Mechanical:

Operating Position. . . . . Any
Maximum Overall Length. . . . . 2-1/8"
Maximum Seated Length . . . . . 1-7/8"
Length, Base Seat to Bulb Top (Excluding tip) 1-1/2" ± 3/32"
Diameter. . . . . 0.650" to 0.750"
Dimensional Outline . . . . . *See General Section*
Bulb. T5-1/2
Base. . . . . Small-Button Miniature 7-Pin (JEDEC No. E7-1)
Basing Designation for BOTTOM VIEW. 7BK

Pin 1 - Grid No.1
Pin 2 - Grid No.3 Internal Shield
Pin 3 - Heater



Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Cathode

6660/6BA6

REMOTE-CUTOFF PENTODE

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	55 max.	volts
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 165 volts	0.65 max.	watt
For grid-No.2 voltages between 165 and 330 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	3.3 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

* When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

° With external shield JEDEC No.316 connected to cathode.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Transconductance at Reduced Heater Voltage:

Average Value	3500	μmhos

With heater volts = 5, plate supply volts = 250, grid No.3 connected to cathode at socket, grid-No.2 supply volts = 100, and cathode resistor (ohms) bypassed = 68.

6661/6BH6

SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

For use in mobile communications equipment

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3 ± 20%*	ac or dc volts
Current at 6.3 volts	0.15	amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield°*	
Grid No.1 to plate	0.0035 max.	0.0035 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	5.4	5.4	μμf
Plate to cathode, grid No.3 & internal shield, grid No. 2, and heater	4.4	4.4	μμf

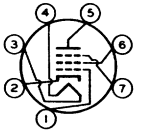
Characteristics, Class A_1 Amplifier:

Heater Voltage	6.3	volts
Plate Supply Voltage	250	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Supply Voltage	150	volts
Cathode Resistor	100	ohms
Plate Resistance (Approx.)	1.4	megohms
Transconductance	4600	μmhos
Plate Current	7.4	ma
Grid-No.2 Current	2.6	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-7.7	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No. E7-1)
Basing Designation for BOTTOM VIEW	7CM

Pin 1 - Grid No.1
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate



Pin 6 - Grid No.2
Pin 7 - Grid No.3, Internal Shield

6661/6BH6

SHARP-CUTOFF PENTODE

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	55 max.	volts
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 165 volts	0.55 max.	watt
For grid-No.2 voltages between 165 and 330 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	3.3 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

* When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

° With external shield JEDEC No.316 connected to cathode.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Transconductance at Reduced Heater Voltage:

Average Value . . . . . 3600 μmhos

With heater volts = 5, plate supply volts = 250, grid No.3 connected to cathode at socket, grid-No.2 supply volts = 150, and cathode resistor (ohms) bypassed = 100.

6662/6BJ6

REMOTE-CUTOFF PENTODE

7-PIN MINIATURE TYPE

For use in mobile communications equipment

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage	6.3 ± 20%*	ac or dc volts
Current at 6.3 volts	0.15	amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield°*	
Grid No.1 to plate	0.0035 max.	0.0035 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	4.5	4.5	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	5.5	5.5	μμf

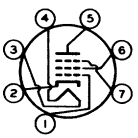
Characteristics, Class A_1 Amplifier:

Heater Voltage	6.3	6.3	volts
Plate Supply Voltage	100	250	volts
Grid No.3	*Connected to cathode at socket*		
Grid-No.2 Supply Voltage	100	100	volts
Cathode Resistor	80	80	ohms
Plate Resistance (Approx.)	0.25	1.3	megohms
Transconductance	3650	3600	μmhos
Plate Current	9	9.2	ma
Grid-No.2 Current	3.5	3.3	ma
Grid-No.1 Voltage (Approx.) for transconductance = 10 μmhos	-20	-20	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No. E7-1)
Basing Designation for BOTTOM VIEW	7CM

Pin 1 - Grid No.1
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate



Pin 6 - Grid No.2
Pin 7 - Grid No.3 Internal Shield

6662

6662/6BJ6

REMOTE-CUTOFF PENTODE

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	55 max.	volts
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 165 volts	0.65 max.	watt
For grid-No.2 voltages between 165 and 330 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	3.3 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

* When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

° With external shield JEDEC No.316 connected to cathode.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Transconductance at Reduced Heater Voltage:

Average Value . . . . . 2900 μmhos

With heater volts = 5, plate supply volts = 250, grid No.3 connected to cathode at socket, grid-No.2 supply volts = 100, and cathode resistor (ohms) bypassed = 80.

6663/6AL5
TWIN DIODE

7-PIN MINIATURE TYPE

For use in mobile communications equipment

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:
Voltage. . . . . 6.3 ± 20%* . . . ac or dc volts
Current at 6.3 volts . . 0.3 . . . . . amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield°*	
Plate to cathode, internal shield, and heater (Each unit).	2.5	3.2	μμf
Cathode to plate, internal shield, and heater (Each unit).	3.4	3.6	μμf
Plate of unit No. 1 to plate of unit No. 2	0.068 max.	0.026 max.	μμf

Mechanical:

Operating Position. . . . . Any
Maximum Overall Length. . . . . 1-3/4"
Maximum Seated Length . . . . . 1-1/2"
Length, Base Seat to Bulb Top (Excluding tip). . 1-1/8" ± 3/32"
Diameter. . . . . 0.650" to 0.750"
Dimensional Outline . . . . . *See General Section*
Bulb. T5-1/2
Base. . . . . Small-Button Miniature 7-Pin (JEDEC No. E7-1)
Basing Designation for BOTTOM VIEW. 6BT

Pin 1 - Cathode of Unit No. 1
Pin 2 - Plate of Unit No. 2
Pin 3 - Heater
Pin 4 - Heater

Pin 5 - Cathode of Unit No. 2
Pin 6 - Internal Shield
Pin 7 - Plate of Unit No. 1

RECTIFIER

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PEAK INVERSE PLATE VOLTAGE.	275 max.	volts
PEAK PLATE CURRENT.	60 max.	ma
PEAK PLATE CURRENT (For pulse duration of 0.1 second maximum).	350 max.	ma
DC PLATE CURRENT.	10 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode .	275 max.	volts
Heater positive with respect to cathode .	100 max.	volts

6663/6AL5
TWIN DIODE

Characteristics:

Heater Voltage	6.3	volts
Plate Voltage	10	volts
Plate Current	60	ma

* When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

o With external shield JEDEC No.316 connected to pin 6.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

6664/6AB4

High-Mu Triode

7-PIN MINIATURE TYPE

For Mobile-Communications Equipment

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Absolute-Maximum Values):*

Voltage (AC or DC)	6.3[a]		volts
Current at heater volts = 6.3	0.150		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	100	max.	volts
Heater positive with respect to cathode	100	max.	volts

Direct Interelectrode Capacitances (Approx.):

	Without External Shield	*With External Shield*[b]	
Grid to plate	1.5	1.5	μμf
Grid to cathode and heater	2.2	2.2	μμf
Plate to cathode and heater	0.5	1.4	μμf
Cathode to plate	0.24	0.20[c]	μμf
Cathode to grid and heater	5.0	5.2[d]	μμf
Plate to grid and heater	1.7	2.6[d]	μμf
Heater to cathode	2.9	2.9[c]	μμf

Characteristics, Class A_1 Amplifier:

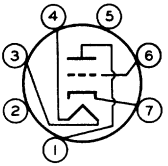
Plate Supply Voltage	100	250	volts
Cathode Resistor	270	200	ohms
Amplification Factor	60	60	
Plate Resistance (Approx.)	15000	10900	ohms
Transconductance	4000	5500	μmhos
Plate Current	3.7	10	ma
Grid Voltage (Approx.) for plate μa = 10	-5	-12	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)

6664/6AB4

Basing Designation for BOTTOM VIEW. 5CE



Pin 1 - Plate
Pin 2 - No Internal Connection
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - No Internal Connection
Pin 6 - Grid
Pin 7 - Cathode

AMPLIFIER — Class A_1

Maximum Ratings, *Absolute-Maximum Values:*

PLATE VOLTAGE.	330 max.	volts
GRID VOLTAGE:		
Negative-bias value.	55 max.	volts
Positive-bias value.	0 max.	volts
PLATE DISSIPATION.	2.9 max.	watts

[a] When operated from storage-battery systems, the heater may be subjected to voltage variations as great as ± 20 per cent. Although such extremes in heater voltage may be tolerated for short periods, increased equipment reliability can be achieved with improved supply-voltage regulation.

[b] With external shield JEDEC No.316 connected to cathode except as noted.

[c] With external shield JEDEC No.316 connected to ground.

[d] With external shield JEDEC No.316 connected to grid.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling:

Cycles of Intermittent Operation . . . . . 2000 min. cycles

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Transconductance at Reduced Heater Voltage:

Average Value. . . . . 3200 μmhos

With heater volts = 5.0, plate supply volts = 250, and cathode resistor (ohms) bypassed = 200.

6669/6AQ5-A

BEAM POWER TUBE

7-PIN MINIATURE TYPE

For use in mobile communications equipment

GENERAL DATA

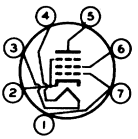
Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3 ± 20%*	ac or dc volts
Current at 6.3 volts	0.45	amp
Direct Interelectrode Capacitances (Approx.):[o]		
Grid No.1 to plate	0.4	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	8	μμf
Plate to cathode & grid No.3, grid No.2, and heater	8.5	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BZ

Pin 1 – Grid No.1
Pin 2 – Cathode, Grid No.3
Pin 3 – Heater



Pin 4 – Heater
Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Grid No.1

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	250 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	250 max.	volts
GRID-No.2 INPUT	2 max.	watts
PLATE DISSIPATION	12 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	100 max.	volts
Heater positive with respect to cathode.	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	225 max.	°C

Typical Operation and Characteristics:

Heater Voltage	6.3	volts
Plate Voltage	250	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 (Control-grid) Voltage	-12.5	volts
Peak AF Grid-No.1 Voltage	12.5	volts

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6669/6AQ5-A

BEAM POWER TUBE

Zero-Signal Plate Current	45	ma
Max.-Signal Plate Current	47	ma
Zero-Signal Grid-No.2 Current	4.5	ma
Max.-Signal Grid-No.2 Current	7	ma
Plate Resistance (Approx.)	52000	ohms
Transconductance	4100	μmhos
Load Resistance	5000	ohms
Total Harmonic Distortion	8	%
Max.-Signal Power Output	4.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

AMPLIFIER — Class AB$_1$

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	250 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	250 max.	volts
GRID-No.2 INPUT	2 max.	watts
PLATE DISSIPATION	12 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	225 max.	°C

Typical Push-Pull Operation:

Unless otherwise specified, values are for 2 tubes

Heater Voltage	6.3	volts
Plate Voltage	250	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 (Control-grid) Voltage	−15	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	30	volts
Zero-Signal Plate Current	70	ma
Max.-Signal Plate Current	79	ma
Zero-Signal Grid-No.2 Current	5	ma
Max.-Signal Grid-No.2 Current	13	ma
Effective Load Resistance (Plate to plate)	10000	ohms
Total Harmonic Distortion	5	%
Max.-Signal Power Output	10	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

* When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

6669/6AQ5-A

BEAM POWER TUBE

[o] Without external shield.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Power Output at Reduced Heater Voltage:

Average Value. . . . . 4.1 watts

With heater volts = 5, plate volts = 250, grid-No.2 volts = 250, grid-No.1 volts = -12.5, rms signal volts = 8.8, and load resistance (ohms) = 5000.

6676/6CB6A

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

For Mobile-Communications Equipment

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Absolute-Maximum Values):*			
Voltage (AC or DC)	6.3[a]		volts
Current at heater volts = 6.3	0.300		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*[c]	
Grid No.1 to plate	0.025 max.	0.015 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	6.5	6.5	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	2.0	3.0	μμf

Characteristics, Class A$_1$ Amplifier:

Plate Supply Voltage	125	125	volts
Grid No.3	*Connected to cathode at socket*		
Grid-No.2 Supply Voltage	125	125	volts
Grid-No.1 Voltage	-3	-	volts
Cathode Resistor	-	56	ohms
Plate Resistance (Approx.)	-	0.28	megohm
Transconductance	-	8000	μmhos
Plate Current	2.8	13	ma
Grid-No.2 Current	-	3.7	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-	-6.5	volts

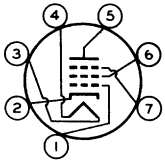
Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)

6676/6CB6A

Basing Designation for BOTTOM VIEW. 7CM

Pin 1 - Grid No.1
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate



Pin 6 - Grid No.2
Pin 7 - Grid No.3
Internal
Shield

AMPLIFIER — Class A_1

Maximum Ratings, *Absolute-Maximum Values:*

PLATE VOLTAGE	330 max. volts
GRID No.3 (SUPPRESSOR GRID)	*Connect to cathode at socket*
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max. volts
GRID-No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section
GRID-No.1 (CONTROL-GRID) VOLTAGE:	
Positive-bias value	0 max. volts
GRID-No.2 INPUT:	
For grid-No.2 voltages up to 165 volts	0.55 max. watt
For grid-No.2 voltages between 165 and 330 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section
PLATE DISSIPATION	2.3 max. watts

[a] When operated from storage-battery systems, the heater may be subjected to voltage variations as great as ± 20 per cent. Although such extremes in heater voltage may be tolerated for short periods, increased equipment reliability can be achieved with improved supply-voltage regulation.

[b] The dc component must not exceed 100 volts.

[c] With external shield JEDEC No.316 connected to cathode.

SPECIAL RATINGS & PERFORMANCE DATA

Heater Cycling:

Cycles of Intermittent Operation. . . . . 2000 min. cycles

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Transconductance at Reduced Heater Voltage:

Average Value . . . . . 7100 μmhos

With heater volts = 5.0, plate supply volts = 125, grid-No.3 connected to cathode at socket, grid-No.2 supply volts = 125, and cathode resistor (ohms) bypassed = 56.

6677/6CL6
POWER PENTODE

9-PIN MINIATURE TYPE

For use in mobile communications equipment

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	6.3 ± 20%*	ac or dc volts
Current at 6.3 volts	0.65	amp
Direct Interelectrode Capacitances:°		
Grid No.1 to plate	0.12 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	11	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	5.5	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9BV

Pin 1 - Cathode
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Plate

Pin 7 - Grid No.3, Internal Shield
Pin 8 - Grid No.2
Pin 9 - Grid No.1

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330 max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE	0 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	50 max.	volts
Positive-bias value	0 max.	volts
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 165 volts	2 max.	watts
For grid-No.2 voltages between 165 and 330 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	

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6677/6CL6

POWER PENTODE

PLATE DISSIPATION	8.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	210 max.	°C

Typical Operation and Characteristics:

Heater Voltage	6.3	volts
Plate Voltage	250	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Voltage	150	volts
Grid-No.1 Voltage	-3	volts
Peak AF Grid-No.1 Voltage	3	volts
Zero-Signal Plate Current	30	ma
Max.-Signal Plate Current	31	ma
Zero-Signal Grid-No.2 Current	7	ma
Max.-Signal Grid-No.2 Current	7.2	ma
Plate Resistance (Approx.)	0.15	megohm
Transconductance	11000	μmhos
Load Resistance	7500	ohms
Total Harmonic Distortion	8	%
Max.-Signal Power Output	2.8	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

* When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

° Without external shield.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Transconductance at Reduced Heater Voltage:

Average Value . . . . . 8800 μmhos

With heater volts = 5, plate volts = 250, grid No.3 connected to cathode at socket, grid-No.2 volts = 150, and grid-No. 1 volts = -3.

6678/6U8-A
MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

For use in mobile communications equipment

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage	6.3 ± 20%*	ac or dc volts
Current at 6.3 volts	0.45	amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield°*	
Triode Unit:			
Grid to plate	1.8	1.8	μμf
Grid to cathode and heater	2.5	2.5	μμf
Plate to cathode and heater	0.4	1	μμf
Pentode Unit:			
Grid No.1 to plate	0.01 max.	0.006 max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater	5	5	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	2.6	3.5	μμf
Heater to cathode (Each unit)	3	3•	μμf

Characteristics, Class A_1 Amplifier:

With heater voltage of 6.3 volts

	Triode Unit	*Pentode Unit*	
Plate Supply Voltage	150	250	volts
Grid-No.2 (Screen-grid) Supply Voltage	–	110	volts
Cathode Resistor	56	68	ohms
Amplification Factor	40	–	
Plate Resistance (Approx.)	5000	400000	ohms
Transconductance	8500	5200	μmhos
Plate Current	18	10	ma
Grid-No.2 Current	–	3.5	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	−12	−10	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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6678/6U8-A

MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

Dimensional Outline. . . . . .*See General Section*
Bulb T6-1/2
Base . . . . . Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW 9AE

Pin 1- Triode Plate
Pin 2- Pentode Grid No.1
Pin 3- Pentode Grid No.2
Pin 4- Heater
Pin 5- Heater
Pin 6- Pentode Plate

Pin 7- Pentode Cathode, Pentode Grid No.3, Internal Shield
Pin 8- Triode Cathode
Pin 9- Triode Grid

CONVERTER SERVICE

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit as Osc.		*Pentode Unit as Mixer*		
PLATE VOLTAGE.	330	max.	330	max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	-		330	max.	volts
GRID-No.2 VOLTAGE.	-		*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value. . . .	0	max.	0	max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts	-		0.55	max.	watt
For grid-No.2 voltages between 165 and 330 volts.	-		*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*		
PLATE DISSIPATION.	3	max.	3	max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode . . .	200	max.	200	max.	volts
Heater positive with respect to cathode . . .	200▲	max.	200▲	max.	volts

* When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

o With external shield JEDEC No.316 connected to cathode of unit under test except as noted.

● With external shield JEDEC No.315 connected to ground.

▲ The dc component must not exceed 100 volts.

6678/6U8-A

MEDIUM-MU TRIODE—SHARP-CUTOFF PENTODE

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Transconductance at Reduced Heater Voltage:

Triode Unit:

Average value. . . . . 6800 μmhos

With heater volts = 5, plate supply volts = 150, and cathode resistor (ohms) bypassed = 56.

Pentode Unit:

Average value. . . . . 4100 μmhos

With heater volts = 5, plate supply volts = 250, grid-No. 2 supply volts = 110, and cathode resistor (ohms) bypassed = 68.

6679/12AT7

HIGH-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For use in mobile communications equipment

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Heater arrangement	*Series*	*Parallel*	
Voltage	12.6 ± 20%*	6.3 ± 20%*	ac or dc volts
Current:			
At 12.6 volts	0.15	–	amp
At 6.3 volts	–	0.3	amp

Direct Interelectrode Capacitances (Approx.):	*Without External Shield*	*With External Shield°*	
Grid-Drive Operation:			
Grid to plate (Each unit)	1.5	1.5	μμf
Grid to cathode and heater (Each unit)	2.2	2.2	μμf
Plate to cathode and heater:			
Unit No.1	0.5	1.2	μμf
Unit No.2	0.4	1.5	μμf
Cathode-Drive Operation:			
Plate to cathode (Each unit)	0.2	0.2	μμf
Cathode to grid and heater (Each unit)	4.6	4.6	μμf
Plate to grid and heater (Each unit)	1.8	2.6	μμf
Heater to cathode (Each unit)	2.4	2.4●	μμf

Characteristics, Class A₁ Amplifier (Each Unit):

Heater Voltage:		
For series connection	12.6	volts
For parallel connection	6.3	volts
Plate Supply Voltage	250	volts
Cathode Resistor	200	ohms
Amplification Factor	60	
Plate Resistance (Approx.)	10900	ohms
Transconductance	5500	μmhos
Plate Current	10	ma
Grid Voltage (Approx.) for plate μa = 10	−12	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

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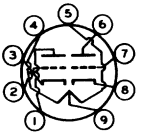
6679/12AT7

HIGH-MU TWIN TRIODE

Basing Designation for BOTTOM VIEW 9A

Pin 1 – Plate of Unit No.2
Pin 2 – Grid of Unit No.2
Pin 3 – Cathode of Unit No.2
Pins 4 & 9 – Heater of Unit No.2
Pins 5 & 9 – Heater of Unit No.1
Pin 6 – Plate of Unit No.1
Pin 7 – Grid of Unit No.1
Pin 8 – Cathode of Unit No.1
Pin 9 – Heater Mid-Tap



AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE.	330 max.	volts
GRID VOLTAGE:		
Negative-bias value.	55 max.	volts
Positive-bias value.	0 max.	volts
PLATE DISSIPATION.	2.8 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

* When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

o With external shield JEDEC No.315 connected to heater except as noted.

• With external shield JEDEC No.315 connected to ground.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 15 (Series connection) cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Transconductance at Reduced Heater Voltage:

Average Value (Each unit). . . . . 4200 μmhos

With heater volts = 10 (Series connection), plate supply volts = 250, and cathode resistor (ohms) bypassed = 200

6680/12AU7-A

MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For use in mobile communications equipment

GENERAL DATA

Electrical:

	Series	*Parallel*	
Heater, for Unipotential Cathodes:			
Heater arrangement			
Voltage	12.6 ± 20%*	6.3 ± 20%*	ac or dc volts
Current:			
At 12.6 volts	0.15	–	amp
At 6.3 volts	–	0.3	amp

Direct Interelectrode Capacitances (Approx.):

	Without External Shield	*With External Shield°*	
Grid to plate (Each unit)	1.5	1.5	μμf
Grid to cathode and heater (Each unit)	1.6	1.8	μμf
Plate to cathode and heater:			
Unit No.1	0.4	2	μμf
Unit No.2	0.32	2	μμf

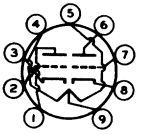
Characteristics, Class A$_1$ Amplifier (Each Unit):

Heater Voltage:			
For series connection	12.6	12.6	volts
For parallel connection	6.3	6.3	volts
Plate Voltage	100	250	volts
Grid Voltage	0	-8.5	volts
Amplification Factor	20	17	
Plate Resistance (Approx.)	6500	7700	ohms
Transconductance	3100	2200	μmhos
Plate Current	11.8	10.5	ma
Grid Voltage (Approx.) for plate μa = 10.	–	-24	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9A

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pins 4 & 9 - Heater of Unit No.2
Pins 5 & 9 - Heater of Unit No.1



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Heater Mid-Tap

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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6680/12AU7-A

MEDIUM-MU TWIN TRIODE

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
GRID VOLTAGE:			
Positive-bias value	0	max.	volts
PLATE DISSIPATION	3	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation	0.25	max.	megohm
For cathode-bias operation	1	max.	megohm

* When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

○ With external shield JEDEC No. 315 connected to cathode of unit under test.

▲ The dc component must not exceed 100 volts.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 15 (Series connection) cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Transconductance at Reduced Heater Voltage:

Average Value (Each unit) . . . . . 1750 μmhos

With heater volts = 10 (Series connection), plate volts = 250, and grid volts = -8.5.

6681/12AX7
HIGH-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For use in mobile communications equipment

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Heater arrangement	*Series*	*Parallel*	
Voltage	12.6 ± 20%*	6.3 ± 20%*	ac or dc volts
Current:			
At 12.6 volts	0.15	–	amp
At 6.3 volts	–	0.3	amp

Direct Interelectrode Capacitances (Approx.):

	Without External Shield	*With External Shield°*	
Grid to plate (Each unit)	1.7	1.7	μμf
Grid to cathode and heater (Each unit)	1.6	1.8	μμf
Plate to cathode and heater:			
Unit No.1	0.46	1.9	μμf
Unit No.2	0.34	1.9	μμf

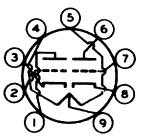
Characteristics, Class A_1 Amplifier (Each Unit):

Heater Voltage:			
For series connection	12.6	12.6	volts
For parallel connection	6.3	6.3	volts
Plate Voltage	100	250	volts
Grid Voltage	-1	-2	volts
Amplification Factor	100	100	
Plate Resistance (Approx.)	0.08	0.0625	megohm
Transconductance	1250	1600	μmhos
Plate Current	0.5	1.2	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9A

Pin 1 – Plate of Unit No.2
Pin 2 – Grid of Unit No.2
Pin 3 – Cathode of Unit No.2
Pins 4 & 9 – Heater of Unit No.2
Pins 5 & 9 – Heater of Unit No.1



Pin 6 – Plate of Unit No.1
Pin 7 – Grid of Unit No.1
Pin 8 – Cathode of Unit No.1
Pin 9 – Heater Mid-Tap

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6681/12AX7

HIGH-MU TWIN TRIODE

AMPLIFIER — Class A1

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
GRID VOLTAGE:			
Negative-bias value	55	max.	volts
Positive-bias value	0	max.	volts
PLATE DISSIPATION	1.1	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

* When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

○ With external shield JEDEC No. 315 connected to cathode of unit under test.

▲ The dc component must not exceed 100 volts.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 15 (Series connection) cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

6806

BEAM POWER TUBE

COAXIAL-ELECTRODE STRUCTURE — WATER-COOLED ELECTRODES
CERAMIC-METAL SEALS — INTEGRAL WATER DUCTS
LOW DRIVE REQUIREMENTS — 28-KW TV OUTPUT AT 550 Mc

For use at frequencies from 225 to 1000 Mc

GENERAL DATA

Electrical:

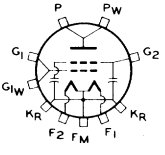
Filament, 2-Section Multistrand Thoriated Tungsten:		
Voltage★ per section (AC or DC). . .	1.25 min.°	volts
	1.35 typical	volts
	1.50 max.	volts
Current per section at 1.35 volts. .	1000	amp
Starting current per section	Must never exceed 1200 amperes, even momentarily	
Cold resistance per section.	0.00025	ohm
Minimum heating time	30	sec
Mu-Factor, Grid No.2 to Grid No.1 (Approx.) for plate volts = 9300, grid-No.2 volts = 950, and plate amperes = 4.3.	8	
Direct Interelectrode Capacitances:		
Grid No.1 to plate	0.1 max.	μμf
Grid No.1 to filament and grid No.2.	365	μμf
Plate to filament and grid No.2. . .	30	μμf
Internal Bypass Capacitors between Grid No.2 and Cathode (Approx., total)	18000	μμf

Mechanical:

Operating Position	Tube axis vertical, with plate terminal either up or down
Overall Length	7.59" + 0.38" − 0.50"
Maximum Diameter	11.38"
Weight (Approx.)	28 lbs

Terminal Connections *(See Dimensional Outline)*:

F_1 – Fil. Sect. No.1 & Water Conn.
F_2 – Fil. Sect. No.2 & Water Conn.
G_1 – RF Grid-No.1 Term. Contact Surface
G_{1W} – DC Grid-No.1 & Water Conn.
G_2 – DC Grid-No.2 & Water Conn.
K_R – RF Cath. Term. Contact Surface For RF Circuit Returns



F_M – Common Point of Fil. Sections for DC Circuit Returns, Ground, & Water Conn.
P – RF Plate Term. Contact Surface
P_W – DC Plate & Water Conn.

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BEAM POWER TUBE

Air Cooling:

Forced-air cooling of the ceramic bushing at the grid-No.1 seal and at the plate seal may be required in order to limit the temperature of the ceramic bushing at either seal to the specified maximum value of 150° C. Under such conditions, provision should be made for blowing air at the ceramic bushings through suitable openings in the coaxial-cylinder cavity circuit.

Water Cooling:

Water cooling of the filament-section blocks, rf cathode terminals, grid-No.1 block, grid-No.2 block, and plate is required. The water flow must start before application of any voltages and preferably should continue for several seconds after removal of all voltages. Interlocking of the water flow through each of the cooled elements with all power supplies is recommended to prevent tube damage in case of failure of adequate water flow.

Water Flow:

	Absolute Min. Flow	*Typical Flow*	*Pressure⊕ Differential for Typical Flow*
	gpm	*gpm*	*psi*
Through filament-section-No.1 block	0.5	1.2	17 max.
Through filament-section-No.2 block	0.5	1.2	17 max.
Through filament-common-point connection	0.5	1.2	11 max.
Through grid-No.1 block	0.5	1.2	9 max.
Through grid-No.2 block	0.5	1.2	17 max.
Through plate in direction shown on *Dimensional Outline:*			
For plate dissipation up to 16 kw	12	14	25 av. 31 max.
For plate dissipation of 20 kw	14	16	32 av. 40 max.
For plate dissipation of 32 kw	20	22	60 av. 75 max.

Gauge Pressure at Any Inlet Except Plate Inlet	70 max.	psi
Gauge Pressure at Plate Inlet	100 max.	psi
Ceramic-Bushing Temperature	150 max.	°C
Outlet-Water Temperature (Any outlet)	70 max.	°C
Min. Plate-Water-Column Resistance	4 megohms per kv of dc plate voltage at 25° C	

°,★,⊕: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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BEAM POWER TUBE

LINEAR RF POWER AMPLIFIER
Class AB Single-Sideband Suppressed-Carrier Service

Crest of modulation conditions

Maximum CCS● Ratings, *Absolute Values:*§

	225 to 1000 Mc	
DC PLATE VOLTAGE	9000 max.	volts
DC PLATE-SUPPLY VOLTAGE	10000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	1250 max.	volts
DC GRID-No.2 SUPPLY VOLTAGE	1350 max.	volts
MAX.-SIGNAL DC PLATE CURRENT	7 max.	amp
MAX.-SIGNAL PLATE INPUT	60000 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT	750 max.	watts
PLATE DISSIPATION	35000 max.	watts

Typical CCS Operation:

	At 550 Mc⊕	
DC Plate Voltage	8000	volts
DC Grid-No.2 Voltage♦	1200	volts
DC Grid-No.1 (Control-grid) Voltage	-115	volts
Zero-Signal DC Plate Current	2.5	amp
Max.-Signal DC Plate Current	6	amp
Zero-Signal DC Grid-No.2 Current (Approx.)	0.15	amp
Max.-Signal DC Grid-No.2 Current (Approx.)	0.35	amp
Max.-Signal DC Grid-No.1 Current (Approx.)	0	amp
Max.-Signal Driver Power Output (Approx.)♣	90	watts
Output-Circuit Efficiency (Approx.)	90	%
Max.-Signal Useful Power Output (Approx.)	15000●●	watts

RF POWER AMPLIFIER — Class B Television Service

Synchronizing-level conditions per tube unless otherwise indicated

Maximum CCS● Ratings, *Absolute Values:*§

	225 to 1000 Mc	
DC PLATE VOLTAGE	9000 max.	volts
DC PLATE-SUPPLY VOLTAGE	10000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	1100 max.	volts
DC GRID-No.2-SUPPLY VOLTAGE	1200 max.	volts
DC PLATE CURRENT	8.25 max.	amp
DC GRID-No.1 (CONTROL-GRID) CURRENT	0.5 max.	amp

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BEAM POWER TUBE

	225 to 1000 Mc	
PLATE INPUT	70000 max.	watts
GRID-No.2 INPUT (For black picture)*	750 max.	watts
PLATE DISSIPATION (For black picture)*	36000 max.	watts

→ **Typical CCS Operation:**	*At 550 Mc*●	*At 800 Mc*	
Bandwidth▲ of	7	7	*Mc*
DC Plate Voltage	8500	8000	volts
DC Grid-No.2 Voltage	1000	1000	volts
DC Grid-No.1 Voltage	-140	-140	volts
Peak RF Grid-No.1 Voltage:			
Synchronizing level	180	180	volts
Blanking level	140	140	volts
DC Plate Current:			
Synchronizing level	8	7.8	amp
Blanking level	5.8	5.6	amp
DC Grid-No.2 Current (Approx.):			
Synchronizing level	0.75	0.75	amp
Blanking level	0.55	0.55	amp
DC Grid-No.1 Current (Approx.):			
Synchronizing level	0.4	0.35	amp
Blanking level	0.15	0.13	amp
Driver Power Output (Approx.):♣			
Synchronizing level	800#	1000##	watts
Blanking level	450	550	watts
Output-Circuit Efficiency (Approx.)	90	85	%
Useful Power Output (Approx.):			
→ Synchronizing level	28000●●	19000●●	watts
→ Blanking level	17000●●	11500●●	watts

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1 unless otherwise indicated

Maximum CCS● Ratings, *Absolute Values:*§

→	*225 to 1000 Mc*	
DC PLATE VOLTAGE	5500 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	1000 max.	volts
PEAK GRID-No.2 VOLTAGE (DC + max. modulation swing)	1350 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-250 max.	volts

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6806

BEAM POWER TUBE

	225 to 1000 Mc	
DC PLATE CURRENT	4.5 max.	amp
DC GRID-No.1 CURRENT	1 max.	amp
PLATE INPUT	25000 max.	watts
GRID-No.2 INPUT	500 max.	watts
PLATE DISSIPATION	17000 max.	watts

Typical CCS Operation:▲▲

	At 400 Mc	
DC Plate Voltage	5000	volts
DC Grid-No.2 Voltage♦	800	volts
DC Grid-No.1 Voltage	-180	volts
Peak RF Grid-No.1 Voltage	210	volts
DC Plate Current	4.25	amp
DC Grid-No.2 Current (Approx.)	0.4	amp
DC Grid-No.1 Current (Approx.)♣♣	0.1	amp
Driver Power Output (Approx.)##	300	watts
Output-Circuit Efficiency (Approx.)	90	%
Useful Power Output (Approx.)	10000●●	watts

RF POWER AMPLIFIER — Class C Telegraphy□

and

RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS● Ratings, *Absolute Values:*§

	225 to 1000 Mc	
DC PLATE VOLTAGE	9000 max.	volts
DC PLATE-SUPPLY VOLTAGE	10000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	1100 max.	volts
DC GRID-No.2 SUPPLY VOLTAGE	1200 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-250 max.	volts
DC PLATE CURRENT	7 max.	amp
DC GRID-No.1 CURRENT	0.5 max.	amp
PLATE INPUT	60000 max.	watts
GRID-No.2 INPUT	750 max.	watts
PLATE DISSIPATION	35000 max.	watts

Typical CCS Operation:

	At 400 Mc	*At 900 Mc*	
DC Plate Voltage	8500	7500	volts
DC Grid-No.2 Voltage†	1000	1000	volts
DC Grid-No.1 Voltage††	-175	-175	volts
Peak RF Grid-No.1 Voltage	215	235	volts
DC Plate Current	6.75	6.8	amp
DC Grid-No.2 Current (Approx.)	0.5	0.55	amp

← Indicates a change.

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BEAM POWER TUBE

	At 400 Mc	At 900 Mc	
DC Grid-No.1 Current (Approx.)	0.2	0.25	amp
Driver Power Output (Approx.)♣♣	300	750	watts
Output-Circuit Efficiency (Approx.)	90	80	%
Useful Power Output (Approx.)	25000●●	13500●●	watts

★ To avoid undue thermal stresses in the filament, it is essential that the filament voltage be raised gradually to operating value in not less than 30 seconds. When the filament voltage is removed, it should be reduced gradually from the normal operating value to zero voltage in not less than 30 seconds.

○ Minimum operating value. The life of the tube can be conserved by operating the filament at the lowest power, within the operating filament-voltage range, which will enable the tube to provide the desired power output. Because the filament when operated near the maximum value provides emission in excess of any requirements within the tube ratings, the filament power must be reduced to a value that will give adequate but not excessive emission for any particular application. Good regulation of the filament power supply is in general economically advantageous from the viewpoint of tube life. During standbys, the filament may be operated at 1.08 volts.

⊕ Directly across cooled element at water connection for the indicated typical flow.

● Continuous Commercial Service.

§ Maximum voltage ratings apply for pressures down to 25 inches of mercury (altitudes up to 5000 feet) at 25° C.

⊕ In the vicinity of 550 Mc, it may be necessary to provide means for balancing out a circumferential $TE_{1,1}$ mode.

♦ Obtained preferably from a separate source.

♣ The driver stage is required to supply tube losses, rf-circuit losses, and rf "swamping-power" losses. "Swamping" may be required in practical circuit design to obtain the desired input-circuit bandwidth. The driver stage should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

●● This value of useful power is measured at load with output circuit having indicated efficiency.

* Continuous blanking level + sync pulses.

▲ Between the half-power points as measured in the output circuit.

This value includes 300 watts of rf "swamping power".

This value includes 100 watts of rf "swamping power".

▲▲ For 100% modulation of plate voltage, and 50% modulation of grid-No.2 voltage.

♣♣ The driver stage is required to supply tube losses and rf-circuit losses. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

□ Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

† Obtained preferably from a separate source or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should not be used if the 6806 or a preceding stage is keyed. In this case, the regulation of the source should be sufficient to prevent the grid-No.2 voltage from rising above 1200 volts under key-up conditions; and additional fixed grid-No.1 bias must be provided to limit the plate current.

†† Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

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BEAM POWER TUBE

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Filament Current per Section. .	1	950	1050	amp
Filament Current per Section. .	2	985	1095	amp
Filament-Current Differential Between Sections.	1	–	30	amp
Filament-Voltage Differential Between Sections.	3	–	0.075	volt
Grid-No.1 Voltage	1,4	–	-180	volts
Useful Power Output:				
Class B Television Service— Synchronizing-level conditions.	1,5	27000	–	watts
Class C Telegraphy— Key-down conditions	1,6	22000	–	watts
Power Gain.	1,5,6,7	40	–	

Note 1: With 1.35 volts rms per filament section.

Note 2: With 1.5 volts rms per filament section.

Note 3: With 1000 amperes per filament section.

Note 4: With 2-phase excitation of the filament sections, dc plate volts = 8500, dc grid-No.2 volts = 1000, and dc grid-No.1 voltage adjusted to give a dc plate current of 0.25 ampere.

Note 5: With 2-phase excitation of the filament sections. In rf power amplifier circuit having a bandwidth of 7 Mc as defined by the half-power points and with dc plate volts = 8750, dc grid-No.2 volts = 1000, dc grid-No.1 voltage adjusted to give a zero-signal dc plate current of 0.25 ampere, drive adjusted to give synchronizing-level dc plate current of 8 amperes, and frequency (Mc) = 550.

Note 6: With 2-phase excitation of the filament sections. In rf power amplifier circuit, and with dc plate volts = 8500, dc grid-No.2 volts = 1000, dc grid-No.1 voltage adjusted to give a zero-signal dc plate current of 0.25 ampere, drive adjusted to give dc plate current of 7 amperes, and frequency (Mc) = 550.

Note 7: With driving power measured at input to input-cavity circuit fed by transmission line having voltage-standing-wave ratio not greater than 1.5. Power gain is ratio of useful power output to driving power.

← Indicates a change.

RCA

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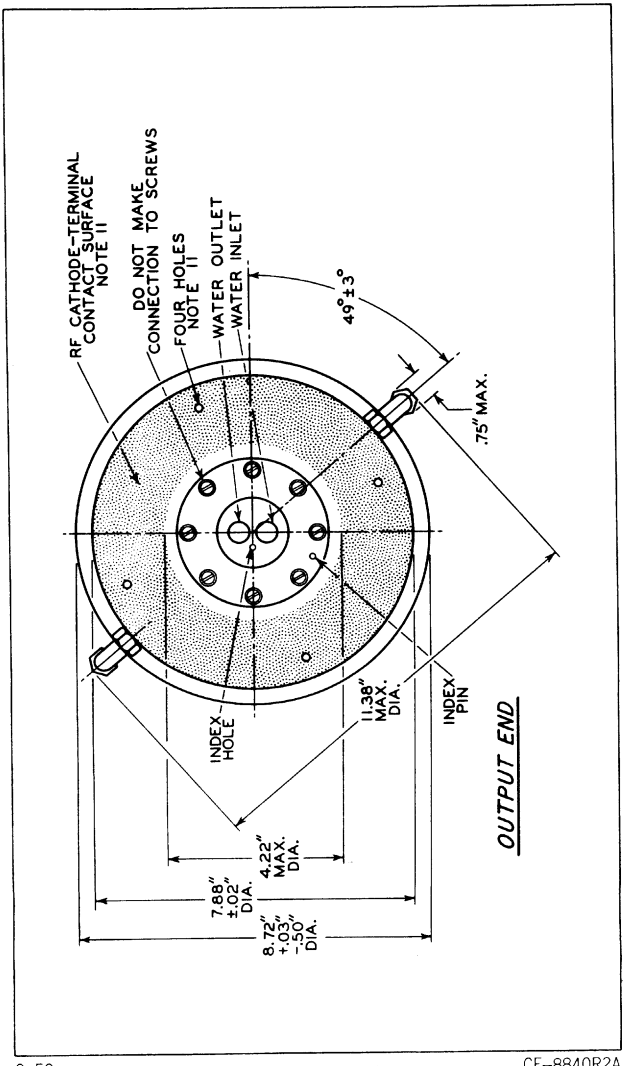
BEAM POWER TUBE



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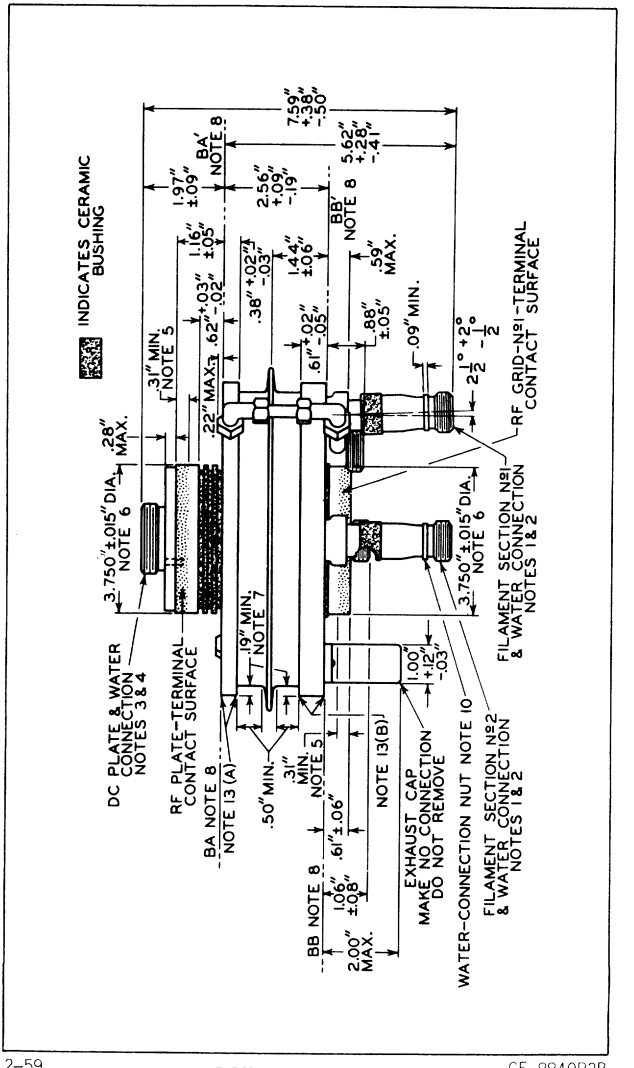
BEAM POWER TUBE



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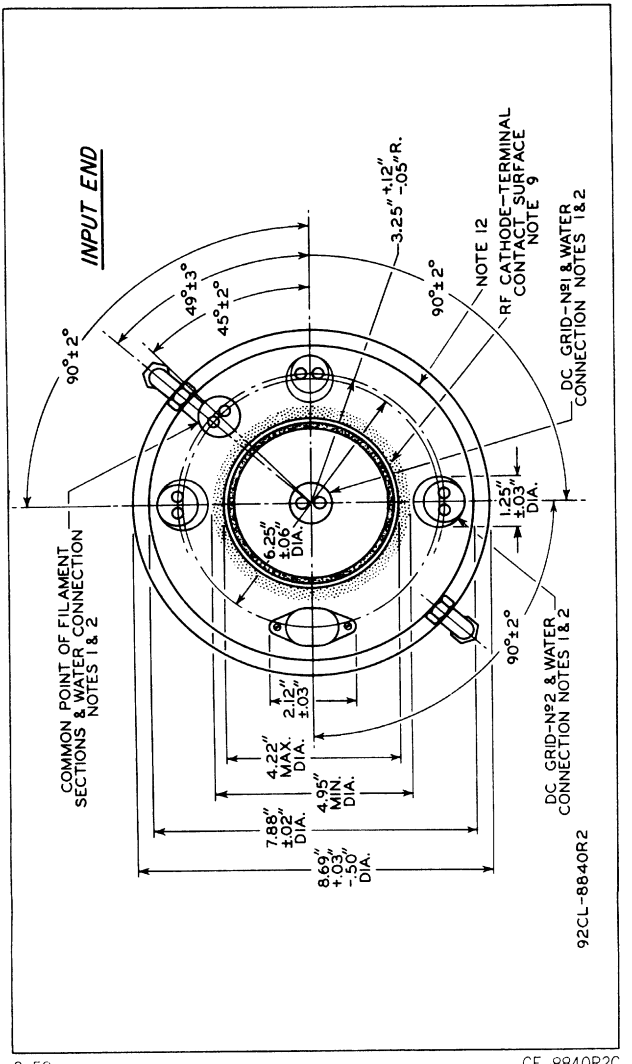
BEAM POWER TUBE



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BEAM POWER TUBE

NOTE 1: TERMINAL HAS 1" - 16 UNIFIED THREAD CLASS 2A FIT, 0.38" LONG AND 2 HOLES 0.258" - 0.270" DIAMETER SPACED 0.438" ON CENTERS.

NOTE 2: THE HOLES IN THE FILAMENT, GRID-No.1, AND GRID-No.2 WATER-TERMINAL CONNECTIONS WILL ACCEPT THE PINS OF THE PLUG-AND-CYLINDER COMBINATION GAUGE G_1.

NOTE 3: THE WATER CONNECTION FOR THE PLATE HAS 1-3/4" - 16 UNIFIED EXTRA FINE THREAD, CLASS 2A FIT, 0.38" LONG, 2 HOLES 0.508" - 0.522" DIAMETER SPACED 0.688" ON CENTERS AND AN INDEX HOLE 0.160" MAX. DIAMETER SPACED 0.344" FROM THE CENTER OF THE TERMINAL.

NOTE 4: THE HOLES IN THE PLATE WATER CONNECTION WILL ACCEPT THE PINS OF THE PLUG-AND-CYLINDER COMBINATION GAUGE G_2.

NOTE 5: PRESSURE FROM CIRCUIT CONTACTS SHOULD BE EXERTED ONLY OVER 0.31" MAX. LENGTH OF DESIGNATED CONTACT AREAS OF THE PLATE OR GRID-No.1 TERMINALS.

NOTE 6: THE DIAMETER DIMENSION IS HELD ONLY OVER A LENGTH OF 0.31" MIN.

NOTE 7: THIS DIMENSION APPLIES OVER A LENGTH OF 0.50" MIN. AS INDICATED.

NOTE 8: THE CONTACT SURFACES, BA-BA' AND BB-BB', ARE PARALLEL WITHIN 0.06".

NOTE 9: CONTACT OF THE INPUT-END RF CATHODE TERMINAL SHOULD NOT BE MADE AT A DIAMETER SMALLER THAN 4.22".

NOTE 10: TO PREVENT EXCESSIVE STRESS ON THE CERAMIC SEAL, A 15/16" OPEN-END WRENCH MUST BE USED TO PERMIT GRIPPING THE TERMINAL WHEN REMOVING OR TIGHTENING THE WATER CONNECTORS.

NOTE 11: CONTACT OF THE OUTPUT-END RF CATHODE TERMINAL SHOULD NOT BE MADE AT A DIAMETER SMALLER THAN 4.22". THE PRESSURE EXERTED FOR THIS RF CONTACT SHOULD BE LIMITED TO THAT NECESSARY FOR GOOD ELECTRICAL CONTACT. THE MECHANICAL FORCE FOR THE CAVITY SUPPORT SHOULD BE MADE AT A DIAMETER NOT LESS THAN 4.22". ON THE OUTPUT-END RF CATHODE TERMINAL, THERE ARE FOUR EQUALLY SPACED 0.188"-DIAMETER HOLES ON A CIRCLE HAVING DIAMETER OF 6.75". THESE HOLES ARE FOR TUBE MANUFACTURING PURPOSES ONLY. ATTENTION IS CALLED TO THE EXISTENCE OF THESE HOLES SO THAT EQUIPMENT DESIGNERS CAN AVOID MAKING ELECTRICAL CONTACT AT POINTS WHICH ARE COINCIDENT WITH THESE HOLES. MECHANICAL CLAMPING DEVICES FOR THE OUTPUT CAVITY SHOULD BE DESIGNED SO AS TO EXERT THEIR CLAMPING FORCE ACROSS THE OUTER EDGE OF THE OUTPUT-HEADER FLANGE.

NOTE 12: SERIAL NUMBER IS LOCATED ON THIS SURFACE BETWEEN DC GRID-No.2 AND FILAMENT-SECTION-No.1 CONNECTIONS.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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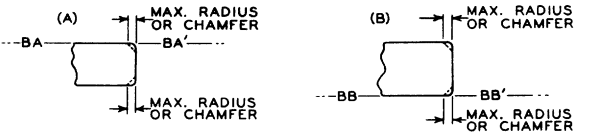
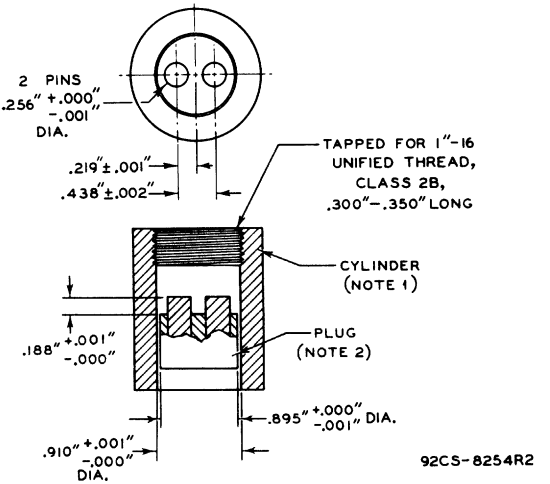
BEAM POWER TUBE

NOTE 13: CORNERS MAY BE ROUNDED OR CHAMFERED, AS INDICATED IN (A) AND (B), NOT TO EXCEED 0.05".



GAUGE G_1



NOTE 1: TAPPED SECTION OF CYLINDER MUST BE CONCENTRIC WITH UNTAPPED SECTION OF CYLINDER WITHIN .002".

NOTE 2: PLUG SIDES & PIN SIDES MUST BE PARALLEL WITHIN .001".

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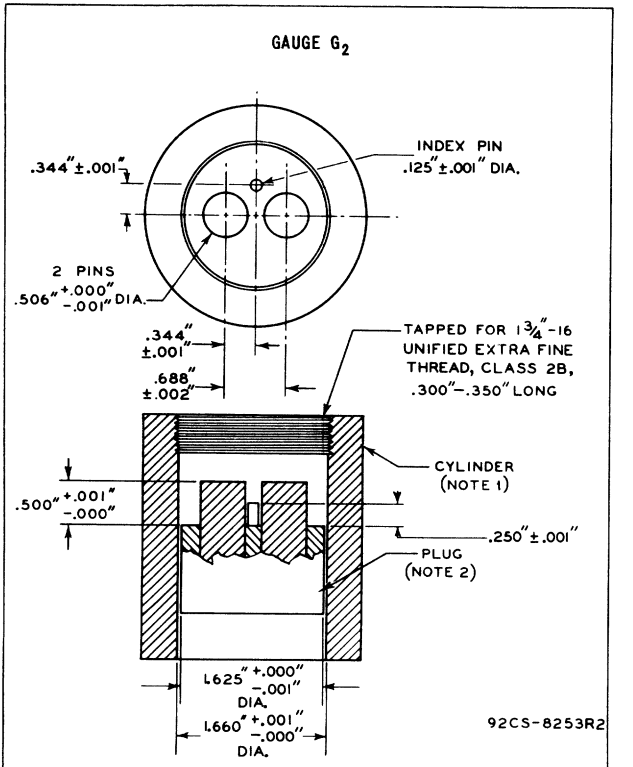
BEAM POWER TUBE



NOTE 1: TAPPED SECTION OF CYLINDER MUST BE CONCENTRIC WITH UNTAPPED SECTION OF CYLINDER WITHIN .002".

NOTE 2: PLUG SIDES & PIN SIDES MUST BE PARALLEL WITHIN .001".

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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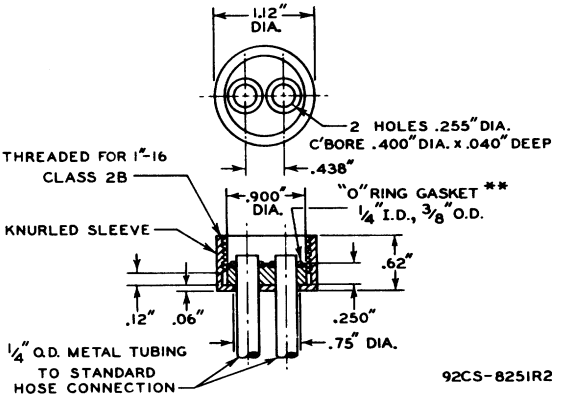
BEAM POWER TUBE

TYPICAL FITTING LAYOUT FOR ALL WATER CONNECTIONS
OTHER THAN THAT FOR PLATE



** DWG. Nº 24849-5, GARLOCK PACKING CO., PALMYRA, N.Y.

For essential design tolerances, see Gauge G_1

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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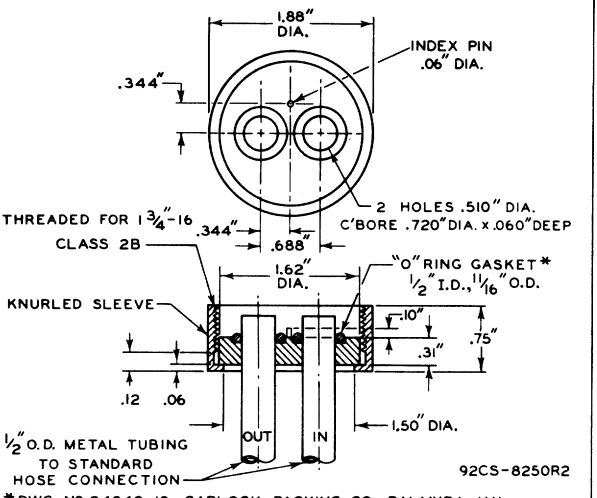
BEAM POWER TUBE

TYPICAL FITTING LAYOUT FOR PLATE WATER CONNECTION

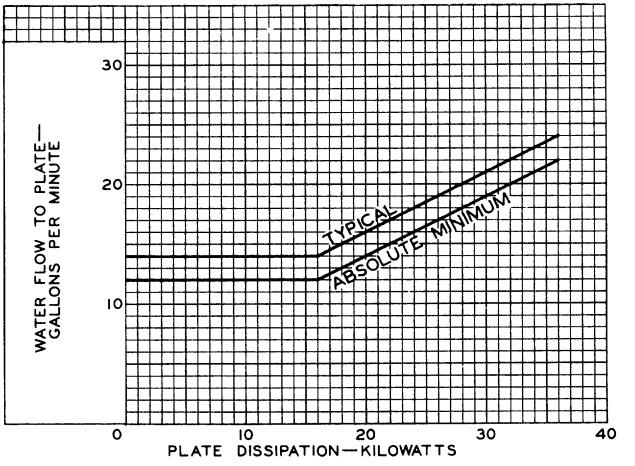


*DWG. Nº 24849-10, GARLOCK PACKING CO., PALMYRA, N.Y.

For essential design tolerances, see Gauge G_2

6806

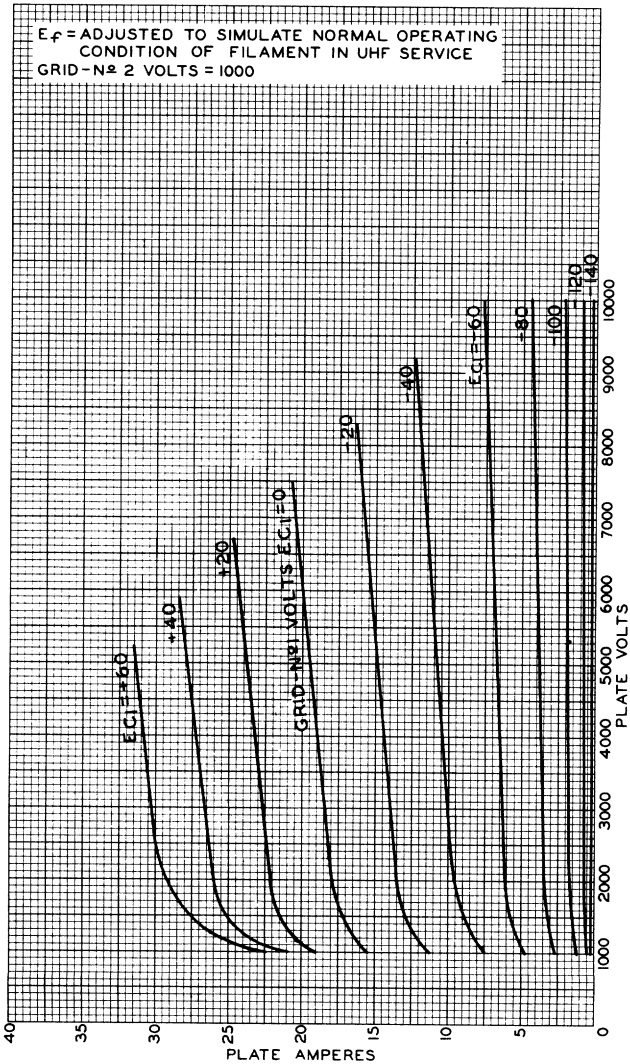
PLATE COOLING REQUIREMENTS



92CS-8929

6806

TYPICAL PLATE CHARACTERISTICS



ELECTRON TUBE DIVISION
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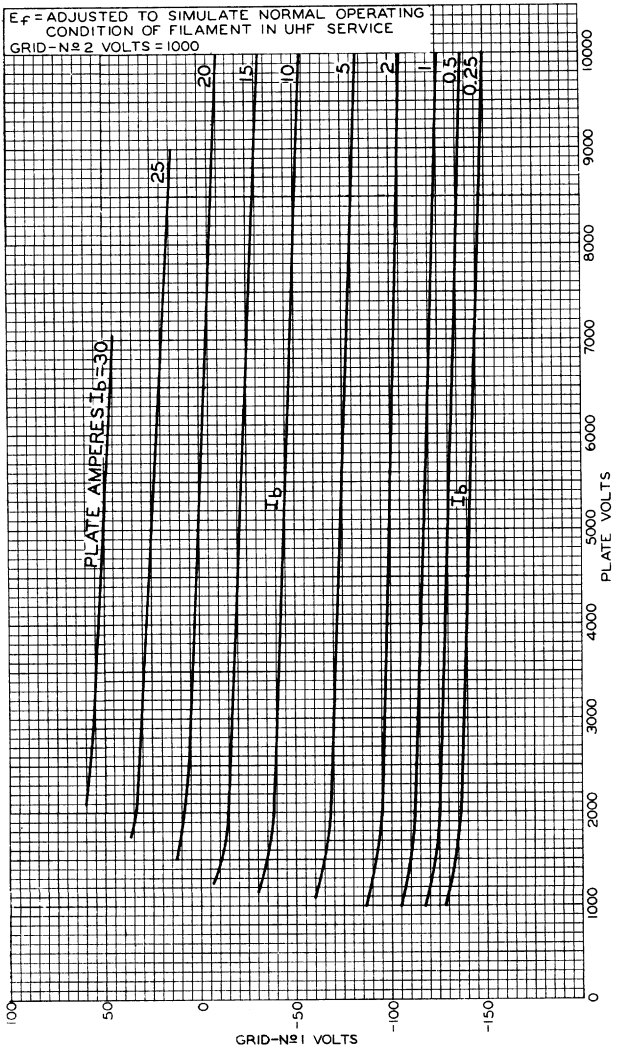
92CM-8899

6806

6806

TYPICAL CONSTANT-CURRENT CHARACTERISTICS

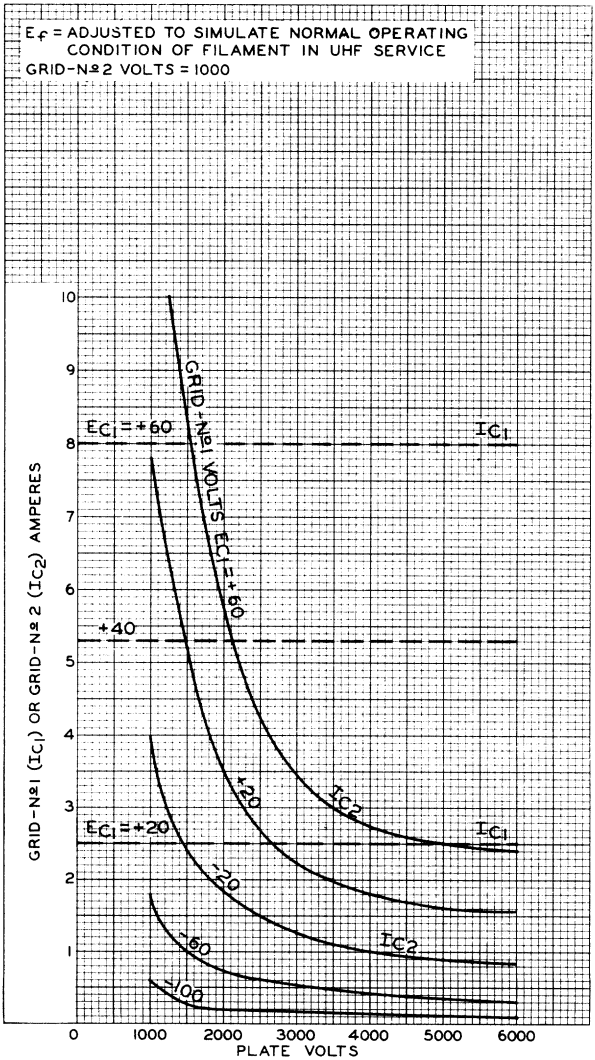


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-8901

6806

TYPICAL CHARACTERISTICS



6816

Beam Power Tube

CERMOLOX TYPE

OXIDE-COATED CATHODE
80 WATTS CW POWER OUTPUT
AT 400 MHz

FORCED-AIR COOLED
40 WATTS CW POWER OUTPUT
AT 1215 MHz

For Use in Compact Aircraft, Mobile, and Stationary Equipment

ELECTRICAL

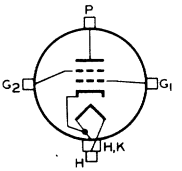
Heater, for Unipotential Cathode[g]		
Voltage (AC or DC)	6.3 typ 6.9 max	V V
Current at heater volts = 6.3	2.1	A
Minimum heating time	60	s
Mu-Factor, Grid No.2 to Grid No.1	18	
Direct Interelectrode Capacitances[a]		
Grid No.1 to plate	0.065 max	pF
Grid No.1 to cathode & heater	13.0	pF
Plate to cathode & heater	0.013 max	pF
Grid No.1 to grid No.2	18.0	pF
Grid No.2 to plate	4.8	pF
Grid No.2 to cathode & heater	0.45 max	pF

MECHANICAL

Operating Position . . . . . Any
Overall Length . . . . . 1.93 max in
Greatest Diameter . . . . . 1.265 max in
Weight (Approx.) . . . . . 2 oz
Radiator . . . . . Integral part of tube
For operation up to 400 MHz
Socket including Grid-No.2 Bypass Capacitor . . . . . Erie[b] 2948-000, E.F. Johnson[c] DN124-152-1 Jettron[d] 89-001, or equivalent
Grid-No.2 Bypass Capacitor . . . . Erie[b] 2926-000, 2929-001, or equivalent
For operation at high frequencies
See *Preferred Mounting Arrangement*

TERMINAL DIAGRAM (See *Dimensional Outline*)

G1 - Grid No.1-Terminal Contact Surface
G2 - Grid No.2-Terminal Contact Surface
H - Heater-Terminal Contact Surface
H,K - Heater-& Cathode-Terminal Contact Surface
P - Plate Terminal Contact Surface



← Indicates a change.

THERMAL

Terminal Temperature (Plate, Grid No.2, Grid No.1, cathode, and heater)	250 max	°C
Plate-Core Temperature	250 max	°C
See Dimensional Outline for temperature-measurement points		
Air Flow[h] (See Typical Cooling Requirements)		

AF POWER AMPLIFIER & MODULATOR—Class AB_1[j]

Maximum CCS Ratings, Absolute-Maximum Values

DC plate voltage	1000	V
DC grid-No.2 (screen-grid) voltage	300	V
Max.-signal dc plate current	180	mA
Max.-signal plate input	180	W
Max.-signal grid-No.2 input	4.5	W
Plate dissipation	115	W

Typical CCS Operation

Values are for 2 tubes

DC Plate Voltage	650	850	V
DC Grid-No.2 Voltage	300	300	V
DC Grid-No.1 (Control-Grid) Voltage	-15	-15	V
From fixed-bias source			
Peak AF Grid-No.1-to-Grid-No.1 Voltage	30	30	V
Zero-Signal DC Plate Current	80	80	mA
Max.-Signal DC Plate Current	200	200	mA
Zero-Signal DC Grid-No.2 Current	0	0	mA
Max.-Signal DC Grid-No.2 Current	20	20	mA
Effective Load Resistance	4330	7000	Ω
Plate to plate			
Max.-Signal Driving Power (Approx.)	0	0	W
Max.-Signal Power Output (Approx.)	50	80	W

Maximum Circuit Values

Grid-No.1-Circuit Resistance Under Any Condition		
With fixed-bias	30000	Ω
With cathode-bias	Not recommended	

AF POWER AMPLIFIER & MODULATOR — Class AB_2[j]

Maximum CCS Ratings, Absolute-Maximum Values

DC plate voltage	1000	V
DC grid-No.2 (screen-grid) voltage	300	V
Max.-signal dc plate current	180	mA
Max.-signal dc grid-No.1 (control grid) current	30	mA
Max.-signal plate input	180	W
Max.-signal grid-No.2 input	4.5	W
Plate dissipation	115	W

Typical CCS Operation

Values are for 2 tubes

DC Plate Voltage	650	850	V
DC Grid-No.2 Voltage	300	300	V
DC Grid-No.1 Voltage	-15	-15	V
From fixed-bias source			

Peak AF Grid-No.1-to-Grid-No.1 Voltage	46	46	V
Zero-Signal DC Plate Current	80	80	mA
Max.-Signal DC Plate Current	355	355	mA
Zero-Signal DC Grid-No.2 Current	0	0	mA
Max.-Signal DC Grid-No.2 Current	25	25	mA
Max.-Signal DC Grid-No.1 Current	15	15	mA
Effective Load Resistance, Plate to plate	2450	3960	Ω
Max.-Signal Driving Power (Approx.)	0.3	0.3	W
Max.-Signal Power Output (Approx.)	85	140	W

LINEAR RF POWER AMPLIFIER, Class AB_1[j]

Single-Sideband Suppressed-Carrier Service

Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2

Maximum CCS Ratings, Absolute-Maximum Values

	Up to 1215 MHz	
DC plate voltage	1000	V
DC grid-No.2 voltage	300	V
DC grid-No.1 voltage	100	V
DC plate current at peak of envelope	350[e]	mA
DC grid-No.1 current	30	mA
Plate input	180	W
Grid-No.2 Input	4.5	W
Plate dissipation	115	W

Typical CCS Operation with "Two-Tone" Modulation

	At 30 MHz		
DC Plate Voltage	650	850	V
DC Grid-No.2 Voltage	300	300	V
DC Grid-No.1 Voltage	-18.5	-18.5	V
Zero-Signal DC Plate Current	40	40	mA
Effective RF Load Resistance	2200	3500	Ω
DC Plate Current at Peak of Envelope	100	100	mA
Average DC Plate Current	75	75	mA
DC Grid-No.2 Current at Peak of Envelope	8.2	4.2	mA
Average DC Grid-No.2 Current	3.6	1.7	mA
Peak-Envelope Driver Power Output (Approx.)	0.5	0.5	W
Output-Circuit Efficiency (Approx.)	90	90	%
Distortion Products Level			
Third Order	35	30	dB
Fifth Order	40	36	dB
Useful Power Output (Approx.)			
Average	12.5	20	W
Peak envelope	25	40	W

Maximum Circuit Values

Grid-No.1-Circuit Resistance		
Under Any Condition		
With fixed bias	25000	Ω
With fixed bias (In Class AB_1 operation)	100000	Ω
With cathode bias	Not recommended	
Grid-No.2 Circuit Impedance	See Footnote[k]	
Plate Circuit Impedance	See Footnote[m]	

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony[j]

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS Ratings, Absolute-Maximum Values

	Up to 1215 MHz	
DC plate voltage	800	V
DC grid-No.2 (screen-grid) voltage	300	V
DC grid-No.1 (control-grid) voltage	-100	V
DC plate current	150	mA
DC grid-No.1 current	30	mA
Plate input	120	W
Grid-No.2 input	3	W
Plate dissipation	75	W

Typical CCS Operation

	At 400 MHz		
DC Plate Voltage	400	700	V
DC Grid-No.2 Voltage	200	250	V
DC Grid-No.1 Voltage	-20	-50	V
DC Plate Current	100	130	mA
DC Grid-No.2 Current	5	10	mA
DC Grid-No.1 Current	5	10	mA
Driver Power Output (Approx.)	2	3	W
Useful Power Output (Approx.)	16	45	W

Maximum Circuit Values

Grid-No.1-Circuit Resistance Under Any Condition	30000	Ω

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy and RF POWER AMPLIFIER — Class C FM Telephony[j]

Maximum CCS Ratings, Absolute-Maximum Values

	Up to 1215 MHz	
DC plate voltage	1000	V
DC grid-No.2 voltage	300	V
DC grid-No.1 voltage	-100	V
DC plate current	180	mA
DC grid-No.1 current	30[f]	mA
Plate input	180	W
Grid-No.2 input	4.5	W
Plate dissipation	115	W

Typical CCS Operation

	At 400 MHz		*At 1215 MHz*	
DC Plate Voltage	400	900	900	V
DC Grid-No.2 Voltage	200	300	300	V
DC Grid-No.1 Voltage	-35	-30	-22	V
DC Plate Current	150	170	170	mA
DC Grid-No.2 Current	5	1	1	mA
DC Grid-No.1 Current	3	10	4	mA
Driver Power Output (Approx.)	3	3	5	W
Useful Power Output (Approx.)	23	80	40	W

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Maximum Circuit Value

Grid-No.1-Circuit Resistance
Under Any Condition . . . . . **30000** Ω

[a] Measured with special shield adapter.

[b] Erie Technological Products, Inc., 2206 West 15th Street, Erie, Pennsylvania.

[c] E. F. Johnson Co., 299 10th Ave., S.W., Waseca, Minn.

[d] Jettron Products, Inc., 56 Rt. 10, Hanover, N.J.

[e] The maximum rating for a signal having a minimum peak-to-average power ratio less than 2, such as is obtained in "Single-Tone" operation, is 180 mA. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 250 mA.

[f] In applications where the frequency is less than 80 MHz and the bias is less than −50 volts, the maximum value is 40 mA.

The following footnotes apply to the *RCA Transmitting Tube Operating Considerations* given at front of this section.

[g] See *Electrical Considerations* — Filament or Heater.

[h] See *Cooling Considerations* — Forced-Air Cooling.

[j] See *Classes of Service*.

[k] See *Electrical Considerations* — Grid-No.2 Voltage Supply.

[m] See *Electrical Considerations* — Plate Voltage Supply.

CHARACTERISTICS RANGE VALUES

	Note	*Min*	*Max*	
1. Heater Current	1	1.84	2.26	A
2. Direct Interelectrode Capacitances				
Grid No.1 to plate	2	-	0.065	pF
Grid No.1 to cathode & heater	2	11.0	15.0	pF
Plate to cathode & heater	2	-	0.013	pF
Grid No.1 to grid No.2	2	15.0	20.0	pF
Grid No.2 to plate	2	4.2	5.2	pF
Grid No.2 to cathode & heater	2	0.20	0.45	pF
3. Grid-No.1 Voltage	1,3	-6	-15	V
4. Grid-No.1 Cutoff Voltage	1,4	-	-48	V
5. Grid-No.1 Current	1,5	6	-	mA
6. Reverse Grid-No.1 Current	1,3	-	8	μA
7. Grid-No.2 Current	1,3	-8	+2.0	mA
8. Peak Emission	1,6	-	300	peak
9. Interelectrode Leakage Resistance	7	1.0	-	MΩ
10. Useful Power Output	8	80	-	W

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 115 mA.

Note 4: With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 1 mA.

Note 5: With plate and grid-No.2 floating and dc grid-No.1 voltage of +2 volts.

Note 6: With grid No.1, grid No.2, and plate tied together; and pulse voltage source connected between plate and cathode. Pulse

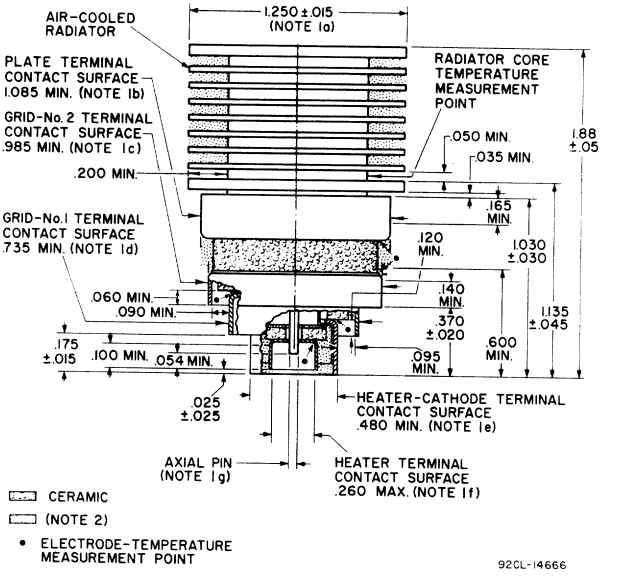
duration is 2 microseconds, pulse repetition frequency is 60 pps, and duty factor is 0.00012. The voltage-pulse amplitude is adjusted until a peak cathode current of 10 amperes is obtained. After 1 minute at this value, the voltage-pulse amplitude will not exceed 300 volts (peak).

Note 7: With tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two adjacent electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1.0 megohm, will be 1.0 megohm.

Note 8: In a single-tube, grid-drive coaxial-cavity class C amplifier circuit at 400 MHz and for conditions with 5.7 volts ac or dc on heater, dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, grid-No.1 resistor adjustable between zero and 10000 ohms, dc plate current of 180 mA maximum, dc grid-No.1 current of 30 mA maximum and driver power output of 3 watts.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

DIMENSIONAL OUTLINE

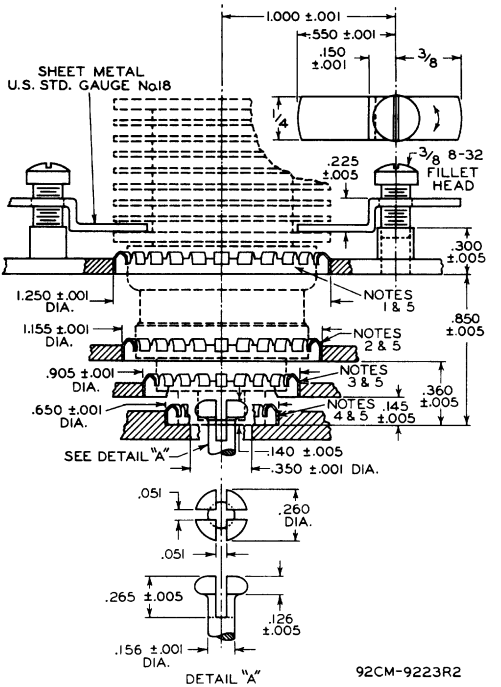


Note 1: The following diametrical space requirements accommodate the concentricity of the cylindrical surfaces of the radiator fins, axial pin, and each electrode terminal:

a. Radiator Band - 1.316"
b. Plate Terminal - 1.119"
c. Grid-No.2 Terminal - 1.019"
d. Grid-No.1 Terminal - 0.764"
e. Heater-Cathode Terminal - 0.519"
f. Heater Terminal - 0.240"
g. Axial Pin - 0.071"

Note 2: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

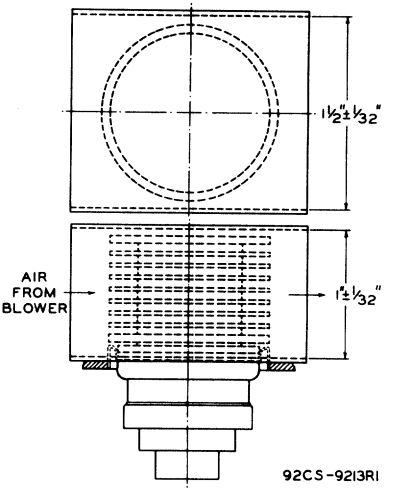
PREFERRED MOUNTING ARRANGEMENT



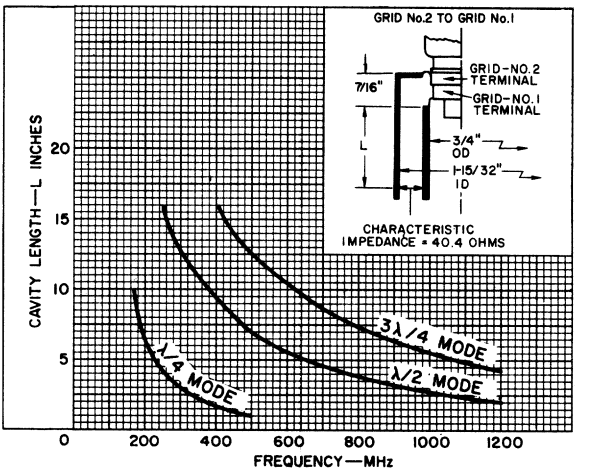
Note 1: Contact ring No.97-252 or finger stock No.97-380.
Note 2: Contact ring No.97-253 or finger stock No.97-380.
Note 3: Contact ring No.97-254 or finger stock No.97-380.
Note 4: Contact ring No.97-255 or finger stock No.97-380.
Note 5: The specified contact ring of preformed finger stock and finger stock No.97-380 provide adequate electrical contact, but the finger stock No.97-380 is less susceptible to breakage than the specified contact ring. Both types are made by Instruments Specialties Co., Little Falls, N.J.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

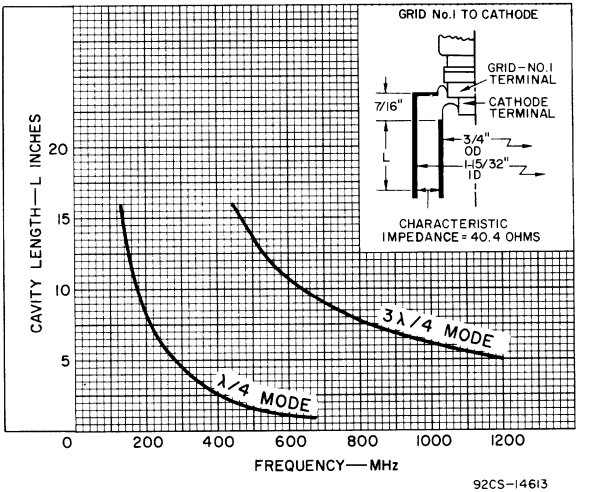
RECOMMENDED COWLING
FOR DIRECTING AIR FLOW THROUGH RADIATOR



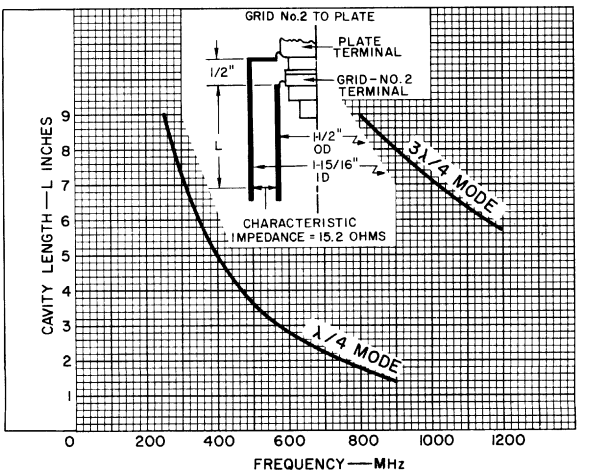
Tuning Characteristics



Tuning Characteristics



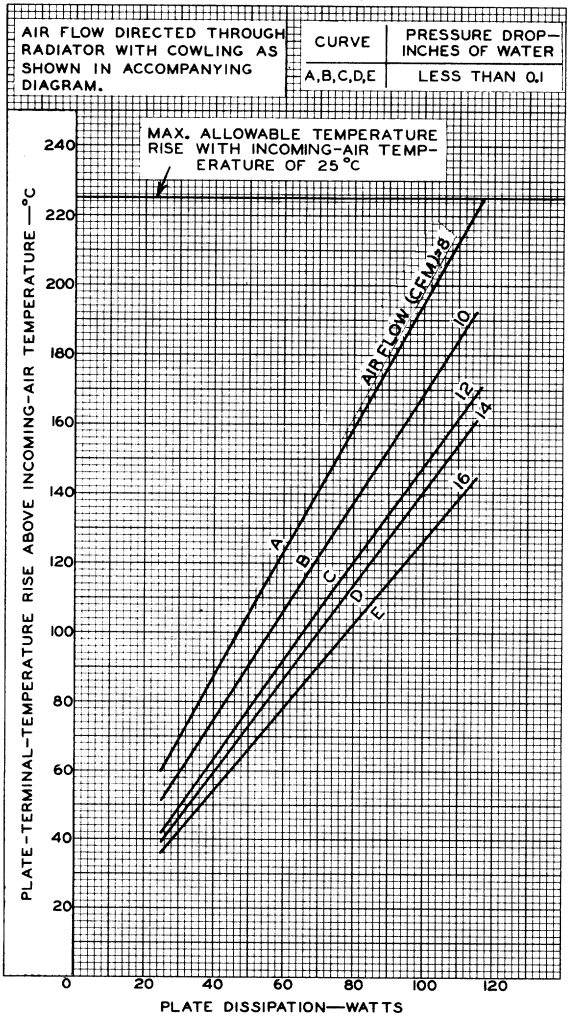
92CS-14613



92CS-14615

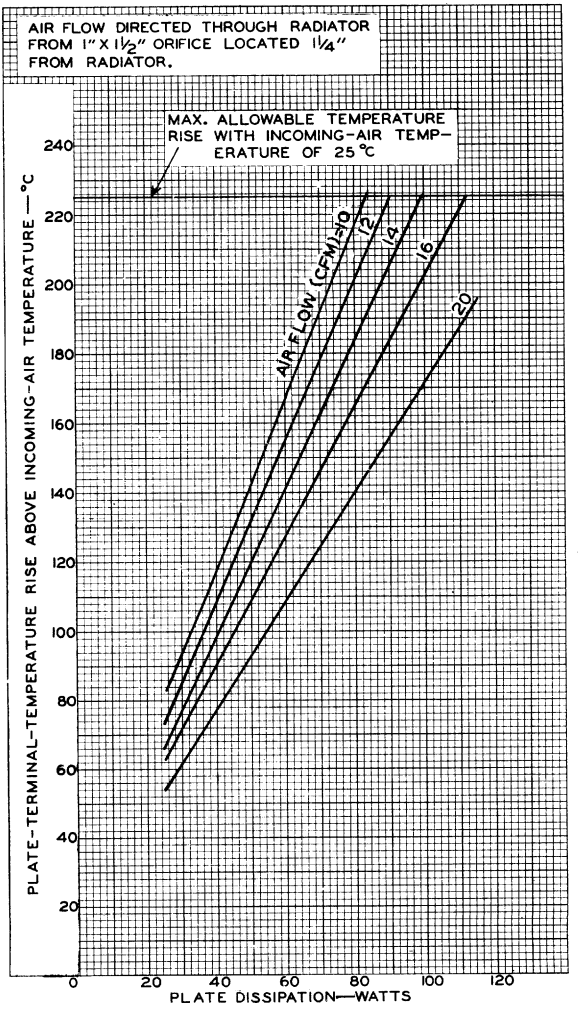
RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

TYPICAL COOLING REQUIREMENTS
With Cowling



92CM-9219R1

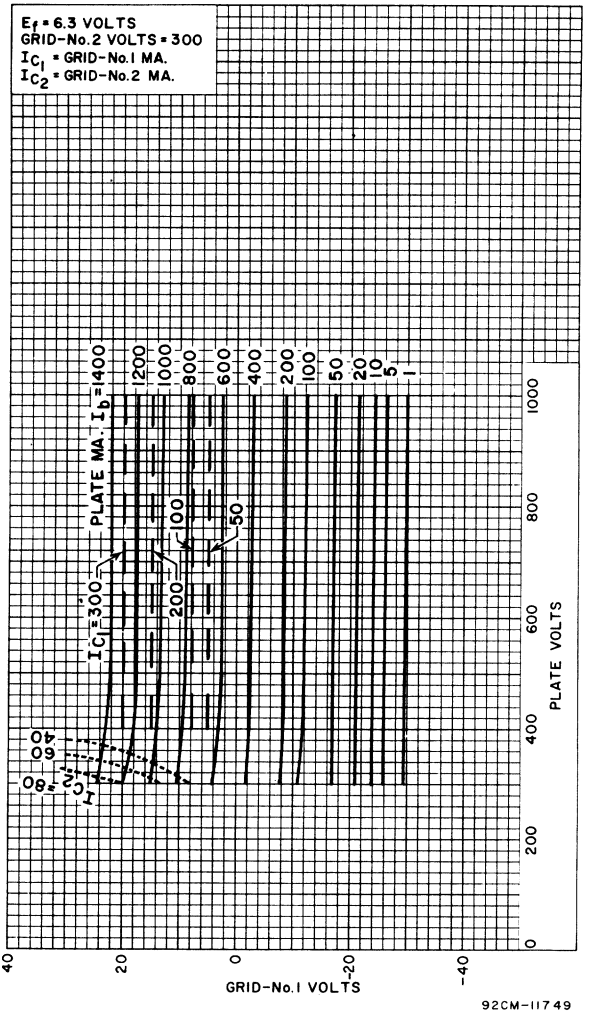
TYPICAL COOLING REQUIREMENTS
Without Cowling



92CM-9220RI

Typical Constant-Current Characteristics

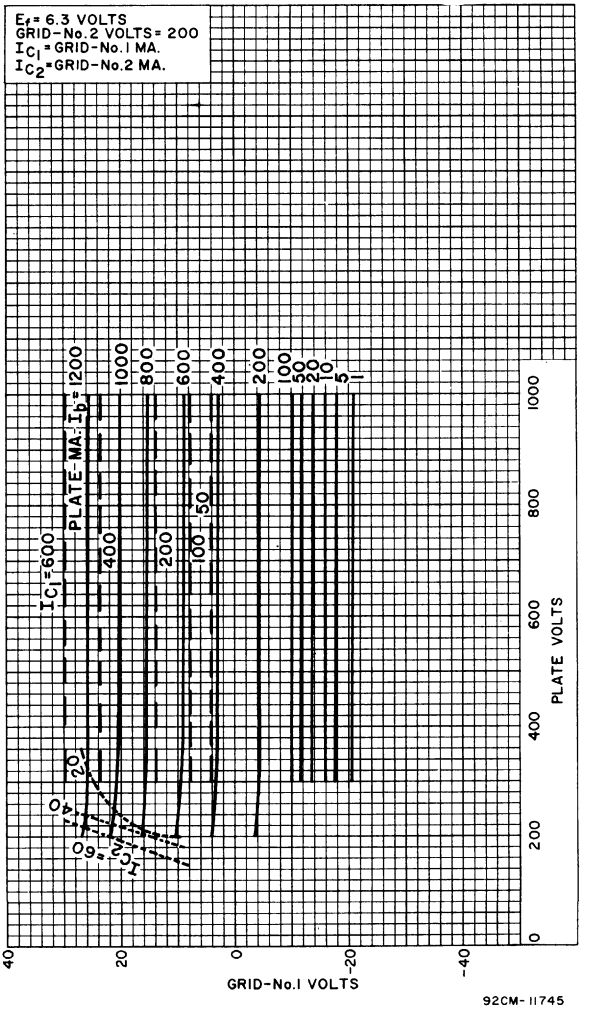
With Grid-No. Volts = 300



92CM-11749

Typical Constant-Current Characteristics

With Grid-No.2 Volts = 200



92CM-11745

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

6850

TWIN BEAM POWER TUBE

Useful at frequencies up to 470 Mc

The 6850 is the same as the 6524 except for the following items:

Heater, for Unipotential Cathode:

Voltage	12.6 ± 10%	ac or dc volts
Current	0.625	amp

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.588	0.663	amp

Note 1: With 12.6 volts ac on heater.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6861

TRAVELING-WAVE TUBE

LOW-NOISE AMPLIFIER TYPE

Useful over frequency range of 2700 to 3500 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:
- Voltage . . . . . 5 . . . . . .ac or dc volts
- Current at 5 volts. . . . 0.65 . . . . . amp
- Starting current: The maximum instantaneous starting current must never exceed 4 amperes, even momentarily.

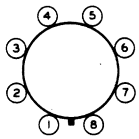
Minimum Cathode Heating Time. . . . . 1 minute
Frequency Range . . . . . 2700 to 3500 Mc
Cold Insertion Loss . . . . . 80 db

Mechanical:

Operating Position. . . . . Any
Cooling . . . . . Natural ←
Maximum Overall Length. . . . . 19-3/8"
Metal-Shell Diameter. . . . . 1.375" ± 0.005"
Weight (Approx.). . . . . 1-1/2 lbs
Collector-Terminal Connector. . . Birnbach No.403 Banana Jack ←
RF Connectors:
- Input terminal. . . . . .Type N UG-18B/U Plug ←
- Output terminal . . . . . .Type N UG-18B/U Plug ←

Base. . . . . Octal 8-Pin

BOTTOM VIEW



Pin 1 - Grid No.1
Pin 2 - No Connection
Pin 3 - Helix
Pin 4 - Grid No.4
Pin 5 - Grid No.3
Pin 6 - Grid No.2
Pin 7 - Heater
Pin 8 - Heater, Cathode

Maximum and Minimum Ratings, *Absolute Values:*

DC COLLECTOR VOLTAGE.	500 max.	volts
DC HELIX VOLTAGE.	500 max.	volts
DC GRID-No.4 VOLTAGE.	500 max.	volts
DC GRID-No.3 VOLTAGE.	300 max.	volts
DC GRID-No.2 VOLTAGE.	75 max.	volts
DC GRID-No.1 VOLTAGE.	20 max.	volts
DC COLLECTOR CURRENT.	500 max.	μa ←
DC HELIX CURRENT.	5 max.▲	μa ←
MAGNETIC FIELD STRENGTH	400 min.●	gausses
PEAK RF POWER INPUT	100 max.	watts ←
AVERAGE RF POWER INPUT.	0.4 max.	watt ←
METAL-SHELL TEMPERATURE (At hottest point).	175 max.	°C

▲ During alignment of the tube in the magnetic-focusing field, the helix current may exceed this value for short periods, but should never exceed 25 μa. ←

●: See next page.

←Indicates a change.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6861

TRAVELING-WAVE TUBE

Typical Operation at 3100 Mc:

DC Collector Voltage	400	volts
DC Helix Voltage	375	volts
DC Grid-No.4 Voltage	200	volts
DC Grid-No.3 Voltage	40	volts
DC Grid-No.2 Voltage (Approx.)	20	volts
DC Grid-No.1 Voltage	0	volts
DC Collector Current	150	μa
DC Helix Current	0.5	μa
DC Grid-No.4 Current DC Grid-No.3 Current DC Grid-No.2 Current DC Grid-No.1 Current	each less than 1	μa
Magnetic-Field Strength†	525 ± 5%	gausses
Gain (Low level)	25	db
Power Output (Saturated)	1	mw
Noise Figure	6.5	db

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.45	0.85	amp
Input VSWR (Non-operating)	2	–	1.7	
Output VSWR (Non-operating)	2	–	2	
DC Helix Voltage	3	350	390	volts
→ DC Grid-No.4 Voltage	3	160	275	volts
→ DC Grid-No.3 Voltage	3	20	50	volts
Saturated Power Output	3	0.25	–	mw
Gain	3	20	–	db
Noise Figure	3	–	7	db

Note 1: With heater voltage of 5 volts.

Note 2: Measured at specified connector over the frequency range of 2700 to 3500 Mc.

Note 3: Adjusted for optimum noise figure with a magnetic field of 525 gausses, signal frequency of 3100 Mc, and heater voltage of 5 volts.

OPERATING CONSIDERATIONS

The *magnetic field* required for focusing the electron beam of the 6861 may be obtained from a solenoid or permanent magnet capable of providing a uniform field of 525 gausses over the length of the tube axis starting 2 inches from the groove near the base end of the metal shell and continuing for at least 9 inches along the tube axis.

• This value of field strength will focus the electron beam, but noise figure will not be optimum.

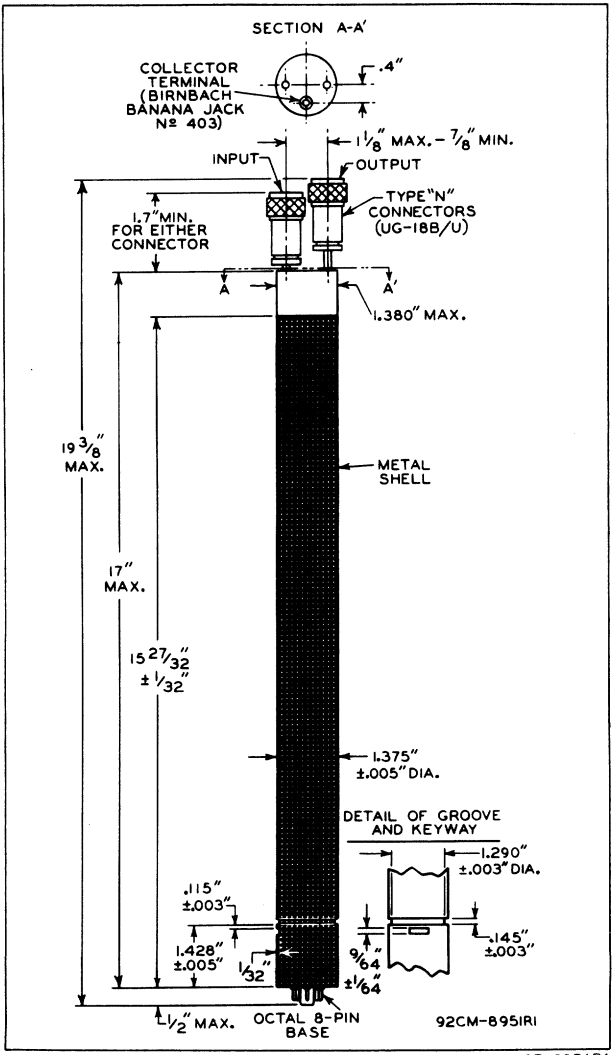
† For RCA Solenoid Type MW-4900.

→Indicates a change.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6861

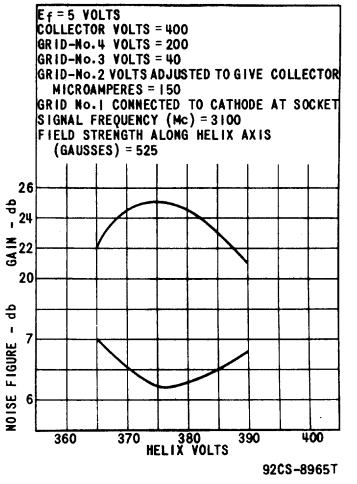
TRAVELING-WAVE TUBE

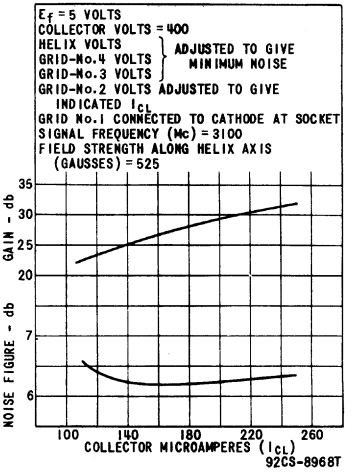


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6861

NOISE-FIGURE CHARACTERISTICS



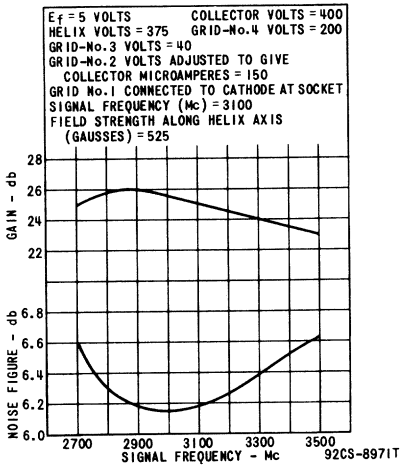


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

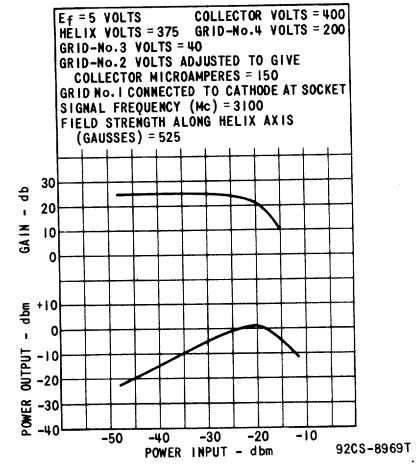
6861

TRAVELING-WAVE TUBE

NOISE-FIGURE CHARACTERISTICS

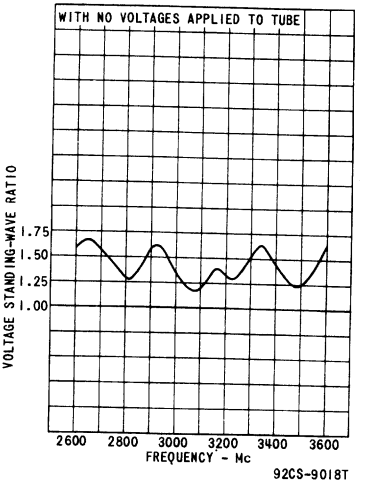


SATURATION CHARACTERISTICS



6861

INPUT-MATCHING CHARACTERISTIC



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6883B/8032A/8552

Beam Power Tube

HIGH POWER SENSITIVITY
RCA "DARK HEATER" WITH 12- TO 15-VOLT RANGE
85 WATTS CW INPUT (ICAS) UP TO 60 Mc
CONTROLLED ZERO-BIAS PLATE CURRENT
50 WATTS CW INPUT (ICAS) AT 175 Mc
CONTROLLED POWER OUTPUT AT REDUCED HEATER VOLTAGE

For RF Power Amplifier and Oscillator Service and as an AF Power Amplifier and Modulator in Both Mobile and Fixed Equipment. The 6883B/8032A/8552 is Unilaterally Interchangeable with types 6883, 6883A, and 8032.

The 6883B/8032A/8552 is the same as the 6146B/8298A except for the following items:

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	12.6	volts
Current at heater volts = 12.6	0.562	amp
Minimum heating time	60	sec
Direct Interelectrode Capacitances:[a]		
Grid No.1 to plate	0.24 max.	pf

[a] With no external shield.

CHARACTERISTICS RANGE VALUES

Test No.		*Note*	*Min.*	*Max.*	
1	Direct Interelectrode Capacitances: Grid No.1 to plate	1	–	0.24	pf

Note 1: With no external shield.

SPECIAL PERFORMANCE DATA

Stationary Equipment Operation:

	Min.	*Design Center*	*Max.*	
Heater, for Unipotential Cathode:				
Voltage (AC or DC)[v]	–	12.6	–	volts
Current at 12.6 volts	0.525	–	0.600	amp ←
Useful Power Output[w]	59	–	–	watts

[v] It is recommended that the design-center heater voltage be 12.6 volts; the heater power supply should not fluctuate more than 10% to insure long life.

[w] In a single-tube, self-excited oscillator circuit, and with ac heater voltage of 12.6 volts, dc plate voltage of 600 volts, dc grid-No.2 voltage of 200 volts, grid-No.1 resistor of 24,000 ± 10% ohms, dc plate current of 150 max. ma., dc grid-No.1 current of 2.5 to 3 ma., and frequency of 15 Mc.

← Indicates a change.

Mobile Equipment Operation:

	Min.	Design Range	Max.	
Heater, for Unipotential Cathode:				
Voltage (AC or DC)[x]	–	12-15	–	volts
→ Current at 13.5 volts	0.550	–	0.620	amp
Useful Power Output I[y]	59	–	–	watts
Useful Power Output II		See *Note Z*		

[x] It is recommended that the heater voltage operate within the range of 12.0 to 15.0 volts and within excursions from 10 to 15 volts in battery operation. See *Useful Power Output Test II* and *Overvoltage Tests*.

[y] In a single-tube, self-excited oscillator circuit, and with ac heater voltage of 12.6 volts, dc plate voltage of 600 volts, dc grid-No.2 voltage of 200 volts, grid-No.1 resistor of 24,000 ± 10% ohms, dc plate current of 150 max. ma., dc grid-No.1 current of 2.5 to 3 ma., and frequency of 15 Mc.

[z] With conditions in note (y) above, reduce heater voltage to 10 volts. Useful power output will be at least 90% of the power output at heater voltage of 12.6 volts.

Overvoltage Heater Life Tests:

Continuous heater life tests are performed periodically on sample lots of tubes with 16 volts on the heater, all other electrodes "floating". Intermittent heater life tests are performed periodically on sample lots of tubes with 22 volts on the heater, a cycle of 1 minute "ON" and 4 minutes "OFF". After 1000 hours of the continuous heater life test and after 48 hours of the intermittent heater life test, the following tests are performed:

With heater voltage of 13.5 volts and ± 100 dc volts between cathode and heater, the heater-cathode leakage current will not exceed 100 microamperes.

With ac or dc heater voltage of 13.5 volts, grid-No.1 volts = -200 and cathode, grid No.2, and plate grounded, the minimum grid-No.1 leakage resistance will be 10 megohms.

With ac or dc heater voltage of 13.5 volts, plate volts = -200, and cathode grid No.1 and grid No.2 grounded, the minimum plate leakage will be 10 megohms.

→ Indicates a change.

Beam Power Tube

CERMOLOX TYPE

OXIDE-COATED CATHODE
80 WATTS CW POWER OUTPUT
AT 400 MHz

FORCED-AIR COOLED
40 WATTS CW POWER OUTPUT
AT 1215 MHz

For Use in Compact Aircraft, Mobile, and Stationary Equipment

The 6884 is the same as the 6816 except for the following items:

Heater, for Unipotential Cathode

Voltage (AC or DC)	26.5 typ 29.2 max	V V
Current at heater volts = 26.5	0.54	A ←

CHARACTERISTICS RANGE VALUES

	Note	*Min.*	*Max.*	
Heater Current	1	0.48	0.60	A ←
Useful Power Output	8	80	-	W

Note 1: With 26.5 volts ac or dc on heater.

Note 8: In a single-tube, grid-driven coaxial-cavity class C amplifier circuit at 400 MHz and for conditions with 24.0 volts ac or dc on heater, dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, grid-No.1 resistor adjustable between zero and 10,000 ohms, dc plate current of 180 mA maximum, dc ← grid-No.1 current of 30 mA maximum, and driver power output of ← 3 watts.

←Indicates a change.

6887

TWIN DIODE

7-PIN MINIATURE TYPE

For switching applications in electronic computers

GENERAL DATA

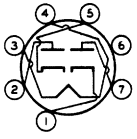
Electrical:

Heater, Pure Tungsten, for Unipotential Cathodes:		
Voltage	6.3	ac or dc volts
Current	0.2	amp
Direct Interelectrode Capacitances (Each unit, approx.):[o]		
Plate to cathode	1.4	μμf
Plate to cathode, internal shield, and heater	2.2	μμf
Cathode to plate, internal shield, and heater	3.5	μμf
Heater to cathode	2.1	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	1-5/8"
Maximum Seated Length	1-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	1" ± 3/32"
Maximum Diameter	3/4"
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	6BT

Pin 1 – Cathode of Unit No.1
Pin 2 – Plate of Unit No.2
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Cathode of Unit No.2
Pin 6 – Internal Shield
Pin 7 – Plate of Unit No.1



SWITCHING SERVICE

Values are for Each Unit

Maximum Ratings, *Absolute Values:*

PEAK INVERSE PLATE VOLTAGE	360 max.	volts
PEAK PLATE CURRENT■	30 max.	ma
DC PLATE CURRENT	10 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	150 max.	volts
Heater positive with respect to cathode.	150 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	120 max.	°C

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	180	220	ma

Note 1: With 6.3 volts ac or dc on heater.

[o] Without external shield.

■: See next page.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

6887

6887

TWIN DIODE

	Note	Min.	Max.	
Direct Interelectrode Capacitance (Each unit):				
Plate to cathode.	2	–	2	μμf
Plate Current (Each unit)	1,3	3	9	ma
Heater–Cathode Leakage Current (Each unit):				
Heater negative with respect to cathode.	1,4	–	20	μa
Heater positive with respect to cathode.	1,4	–	20	μa
Leakage Resistance between plate and all other electrodes tied together (Each unit)	1,5	100	–	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Without external shield and with electrodes of unit not under test connected to ground.

Note 3: With dc plate volts = 1.2. Electrodes of unit not under test connected to ground.

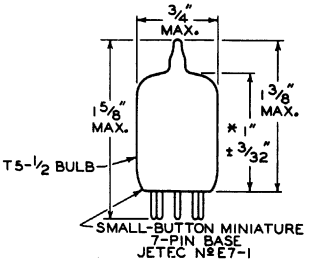
Note 4: With 150 volts dc between heater and cathode.

Note 5: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

Cycles of Intermittent Operation. . . . 2000 min. cycles
Under the following conditions: heater volts = 7.5 cycled one minute on and four minutes off, heater 180 positive with respect to cathode, and plate volts = 0.



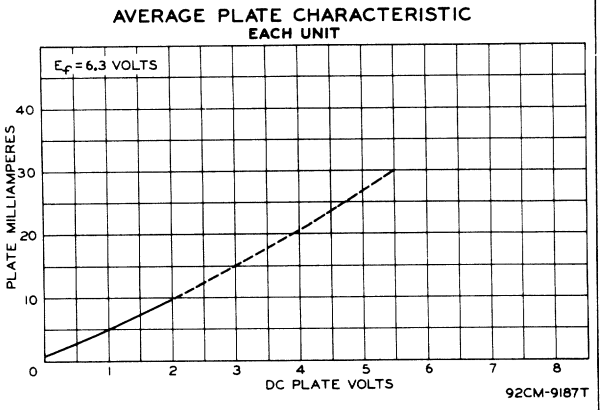
■ Under the following conditions: rectangular pulse; pulse duration, 10 microseconds; pulse-repetition rate, 1000 pps; duty factor, 0.01 ± 0.1 per cent; rise time, less than 1 microsecond; fall time, less than 2 microseconds; overshoot, less than 5 per cent; and droop, less than 10 per cent.

* Measured from base seat to bulb-top line as determined by ring gauge of 7/16" I.D.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6887

TWIN DIODE



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

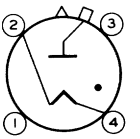
Half-Wave Mercury-Vapor Rectifier

The 6894 is the same as the 6895 except for the following items:

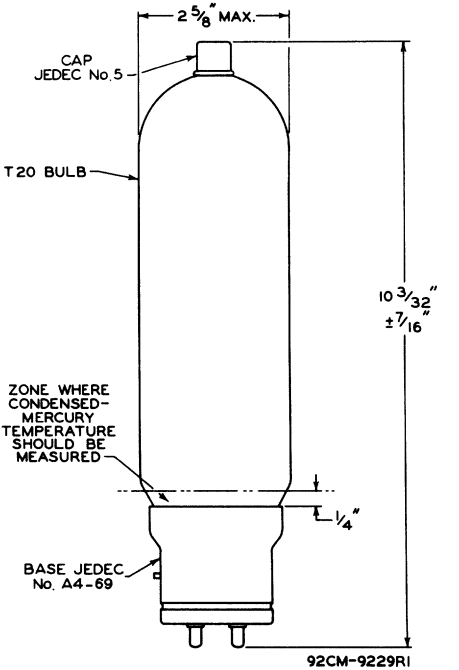
Mechanical:

Overall Length. . . . . 10-3/32" ± 7/16"
Socket. . . . . Johnson No.123-211, or equivalent
Base. . . . . .Skirted Medium-Metal-Shell Jumbo 4-Pin with Bayonet (JEDEC No.A4-69)
Basing Designation on BOTTOM VIEW. 4AT

Pin 1 - No Internal Connection
Pin 2 - Filament, Cathode Shield



Pin 3 - No Internal Connection
Pin 4 - Filament Cap - Anode



◄ Indicates a change.

Half-Wave Mercury-Vapor Rectifier

GENERAL DATA

Electrical:

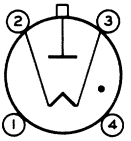
Filament, Coated:
- Voltage (AC). . . . . 5.0 ± 5% volts
- Current at filament volts = 5.0 . . . . . 10 amp
- Minimum heating time at rated voltage . . . 30 sec

Peak Tube Voltage Drop. . . .See *Characteristics Range Values*

Mechanical:

Operating Position. . . . . Vertical, base down
Maximum Overall Length. . . . . 10-13/32"
Seated Length . . . . . 9-7/32" ± 7/16"
Maximum Diameter. . . . . 2-5/8"
Weight (Approx.). . . . . 9 oz
Bulb. T20
Cap . . . . . .Medium (JEDEC No.C1-5) ←
Cap Connector . . . . . .Millen No.36011, or equivalent
Socket. . . . . Johnson No.123-206, or equivalent
Base. . . . . Large-Shell Super-Jumbo 4-Pin with Bayonet (JEDEC No.A4-88), or Large-Metal-Shell Super-Jumbo 4-Pin with Bayonet (JEDEC No.A4-18)
Basing Designation for BOTTOM VIEW. 2P

Pin 1 - No Internal Connection
Pin 2 - Filament, Cathode Shield



Pin 3 - Filament
Pin 4 - No Internal Connection
Cap - Anode

Temperature Control:

Heating—When the ambient temperature is so low that the normal rise of condensed-mercury temperature above the ambient temperature will not bring the condensed-mercury temperature up to the minimum value of the operating ranges specified under *Maximum Ratings*, some form of heat-conserving enclosure or auxiliary heater will be required.

Cooling—When the operating conditions are such that the maximum value of the operating condensed-mercury-temperature range is exceeded, provision should be made for forced-air cooling sufficient to prevent exceeding the maximum value.

Temperature Rise of Condensed Mercury to Equilibrium Above Ambient Temperature (Approx.):
- No load[a]. . . . . 13 °C
- Full load[b]. . . . . 18.5 °C

← Indicates a change.

HALF-WAVE RECTIFIER — In Phase Operation[c]

Maximum Ratings, *Absolute-Maximum Values:*

For supply frequency of 60 cps

	Operating Condensed-Mercury-Temperature Range			
	20 to 60 °C	20 to 55 °C	20 to 50 °C	
PEAK INVERSE ANODE VOLTAGE. .	10000 max.	15000 max.	20000 max.	volts
ANODE CURRENT:				
Peak	8.3 max.	8.3 max.	8.3 max.	amp
Average[d]	1.8 max.	1.8 max.	1.8 max.	amp
Fault, for duration of 0.1 second max.	100 max.	100 max.	100 max.	amp

HALF-WAVE RECTIFIER — Quadrature Operation[e]

Maximum Ratings, *Absolute-Maximum Values:*

For supply frequency of 60 cps

	Operating Condensed-Mercury-Temperature Range			
	20 to 60 °C	20 to 55 °C	20 to 50 °C	
PEAK INVERSE ANODE VOLTAGE. .	10000 max.	15000 max.	20000 max.	volts
ANODE CURRENT:				
Peak	11.5 max.	11.5 max.	11.5 max.	amp
Average[d]	2.5 max.	2.5 max.	2.5 max.	amp
Fault, for duration of 0.1 second max.	100 max.	100 max.	100 max..	amp

[a] With 4.75 volts rms on filament, and no heat-conserving enclosure.

[b] With 5.25 volts rms on filament, quadrature operation, average anode amperes = 2.5, and no heat-conserving enclosure.

[c] Filament voltage in phase with anode voltage.

[d] Averaged over any period of 20 seconds maximum.

[e] Filament voltage out of phase (60° to 120°) with anode voltage.

CHARACTERISTICS RANGE VALUES[f] FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Filament Current.	1	9	11	amp
Critical Anode Voltage.	2	10	100	volts
Peak Tube Voltage Drop.	3	–	25	volts

Note 1: With 5 volts rms on filament.

Note 2: With 5 volts rms on filament, and condensed-mercury temperature of 20° C.

Note 3: With 5 volts rms on filament, condensed-mercury temperature of 35 ± 5° C, peak anode current of 11.5 amperes provided by half-cycle pulse from a 60-cps sine wave and recurring approximately once per second. Tube drop is measured by an oscilloscope connected between anode and center-tap of filament transformer.

[f] Throughout tube life.

For Circuit Figures, see Front of this Section

CIRCUIT	MAX. TRANS. SEC. VOLTS (RMS) E	APPROX. DC OUTPUT VOLTS TO FILTER E_{av}	MAX. DC OUTPUT AMPERES I_{av}	MAX. DC OUTPUT KW TO FILTER P_{dc}
Fig. 1 **Half-Wave** **Single-Phase** In-Phase Operation	14000[g]	6300	1.8	11.5
	10600[h]	4700	1.8	8.5
	7000[j]	3200	1.8	5.5
Fig. 2 **Full-Wave** **Single-Phase** In-Phase Operation	7000[g]	6300	3.6	23
	5300[h]	4700	3.6	17
	3500[j]	3200	3.6	11
Fig. 3 **Series** **Single-Phase** In-Phase Operation	14000[g]	12700	3.6	46
	10600[h]	9500	3.6	34
	7000[j]	6300	3.6	22
Fig. 4 **Half-Wave** **Three-Phase** In-Phase Operation	8100[g]	9500	5.4	51
	6100[h]	7100	5.4	38
	4000[j]	4700	5.4	25
Fig. 5 **Parallel** **Three-Phase** Quadrature Operation	8100[g]	9500	15.0	143
	6100[h]	7100	15.0	106
	4000[j]	4700	15.0	71
Fig. 6 **Series** **Three-Phase** Quadrature Operation	8100[g]	19000	7.5	143
	6100[h]	14200	7.5	106
	4000[j]	9500	7.5	71
Fig. 7 **Half-Wave** **Four-Phase** Quadrature Operation			*Resistive Load* / *Inductive Load*	*Resistive Load* / *Inductive Load*
	7000[g]	9000	10 / 10	90 / 90
	5300[h]	6700	10 / 10	67 / 67
	3500[j]	4500	10 / 10	45 / 45
Fig. 8 **Half-Wave** **Six-Phase** Quadrature Operation			*Resistive Load* / *Inductive Load*	*Resistive Load* / *Inductive Load*
	7000[g]	9500	11 / 11.5	105 / 110
	5300[h]	7100	11 / 11.5	78 / 81
	3500[j]	4700	11 / 11.5	52 / 55

[g] For maximum peak inverse anode voltage of 20000 volts, and condensed-mercury-temperature range of 20 to 50° C.

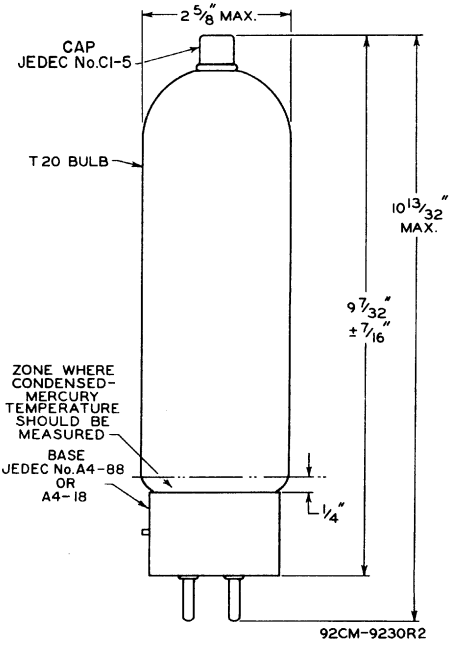
[h] For maximum peak inverse anode voltage of 15000 volts, and condensed-mercury-temperature range of 20 to 55° C.

[j] For maximum peak inverse anode voltage of 10000 volts, and condensed-mercury-temperature range of 20 to 60° C.

OPERATING CONSIDERATIONS

X rays are produced when the 6895 is operated with a peak inverse anode voltage above 16,000 volts (absolute value). These rays can constitute a health hazard unless the tube is adequately shielded for X-ray radiation. Although relatively simple shielding should prove adequate, make sure that it provides the required protection to the operator.

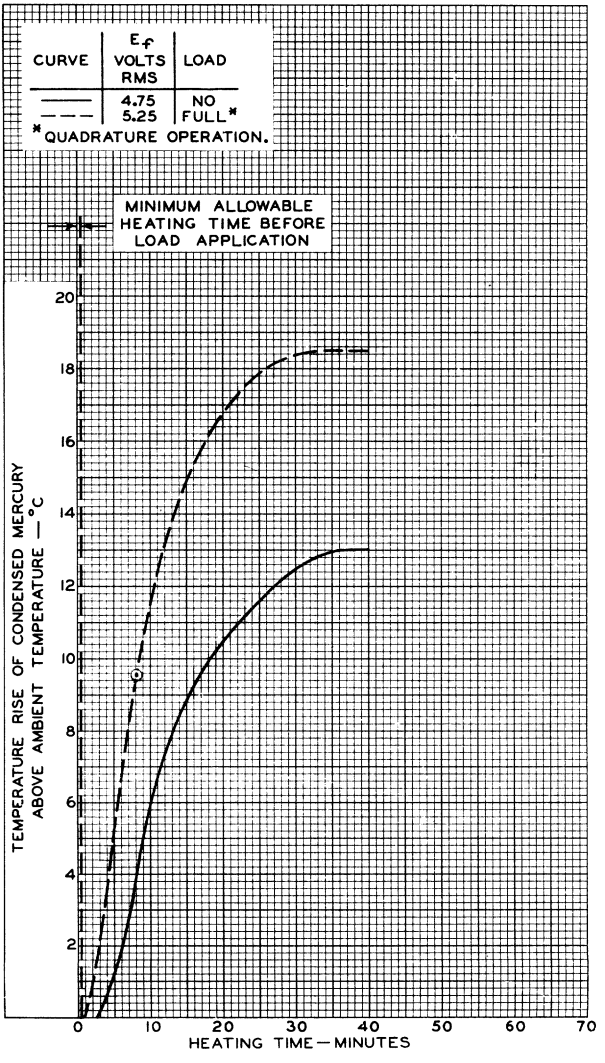
Shields and rf filter circuits should be provided for the 6895 if it is subjected to extraneous high-frequency fields during operation. These fields tend to produce breakdown effects in mercury vapor and are detrimental to tube life and performance. When shields are used, special attention must be given to providing adequate ventilation and to maintaining normal condensed-mercury temperature. Radio-frequency filters are employed to prevent damage caused by rf currents which might otherwise be fed back into the rectifier tubes.



RCA

6895

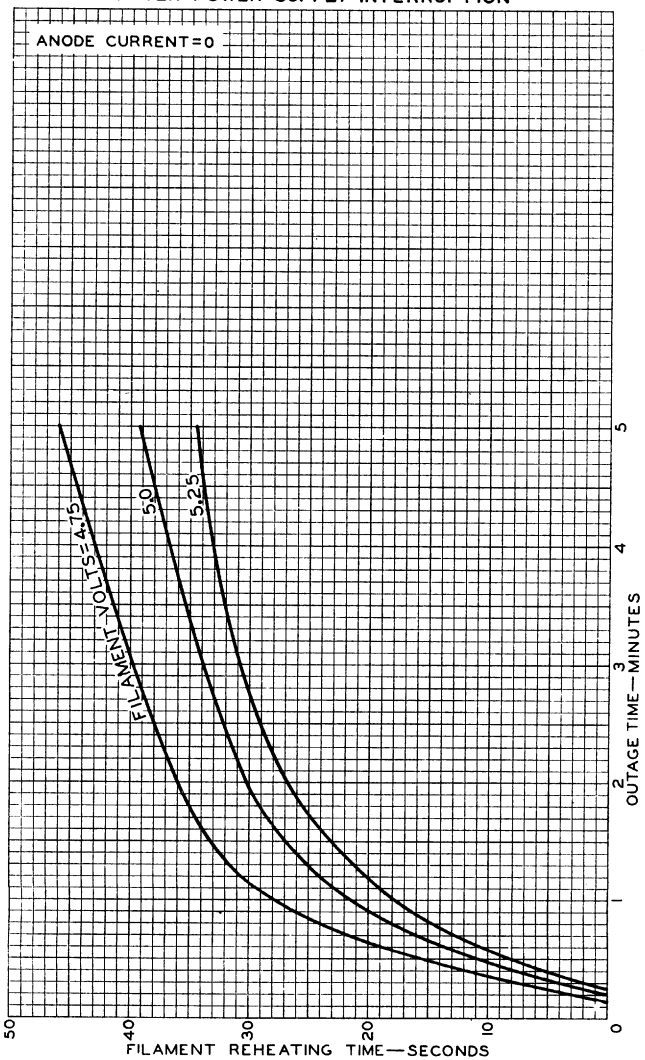
RATE OF RISE OF COND.-MERCURY TEMPERATURE



6895

6895

FILAMENT REHEATING TIME REQUIRED
AFTER POWER-SUPPLY INTERRUPTION



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8300

6922

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Center Values):*		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.300	amp
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	60 max.	volts
Heater positive with respect to cathode	120 max.	volts

Direct Interelectrode Capacitances:[a]

	Unit No.1	*Unit No.2*	
Grid to plate	1.4	1.4	μμf
Grid to cathode, internal shield, and heater	3.1	3.1	μμf
Plate to cathode, internal shield, and heater	1.75	1.65	μμf
Heater to cathode	2.6	2.7	μμf

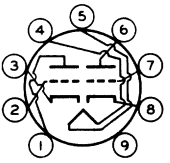
Characteristics, Class A$_1$ Amplifier (Each Unit):[b]

Plate Supply Voltage	100	90	volts
Grid Supply Voltage	9	0	volts
Cathode Resistor	680	120	ohms
Amplification Factor	33	–	
Transconductance	12500	11500	μmhos
Plate Current	15	12	ma

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9AJ

Pin 1 – Plate of Unit No.2
Pin 2 – Grid of Unit No.2
Pin 3 – Cathode of Unit No.2
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Plate of Unit No.1
Pin 7 – Grid of Unit No.1
Pin 8 – Cathode of Unit No.1
Pin 9 – Internal Shield

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE:		
With plate dissipation = 0.8 watt or greater	220 max.	volts
With plate dissipation less than 0.8 watt	250 max.	volts
With plate ma. = 0.	400 max.	volts
With cathode ma. = 0.	550 max.	volts
GRID VOLTAGE:		
Negative-bias value	100 max.	volts
Peak-negative value[c]	200 max.	volts
CATHODE CURRENT:		
Peak[c]	100 max.	ma
Average	20 max.	ma
GRID INPUT	0.03 max.	watt
PLATE DISSIPATION:		
Either plate	1.5 max.	watts
Both plates (Both units operating)	2 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	170 max.	°C

Maximum Circuit Values:

Grid-Circuit Resistance:	
For fixed-bias operation	Permitted only when plate ma. < 5
For cathode-bias operation	1 max. megohm

[a] Without external shield.

[b] Operation under conditions listed in left-hand column is recommended because of the small spread in characteristics.

[c] Pulse duration (microseconds) = 200 max., duty factor = 0.10 max.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration	500 max.	g

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-impact (Flyweight) Shock Machine and are subjected to 5 blows at a hammer angle of 30°.

Fatigue Rating:

Vibrational Acceleration	2.5 max.	g

This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified vibrational acceleration. Tubes are rigidly mounted and are subjected for 32 hours to 2.5-g vibrational acceleration at 50 cycles per second in each of three directions.

6939

Twin Power Pentode

9-PIN MINIATURE TYPE
INTERNALLY NEUTRALIZED FOR PUSH-PULL AMPLIFIER SERVICE
14 WATTS CW INPUT (ICAS) UP TO 500 Mc

For Communications Equipment Operating at Frequencies up to 500 Mc as a Push-Pull RF-Power-Amplifier or as a Frequency-Multiplier Tube

GENERAL DATA

Electrical:

	Series	*Parallel*	
Heater, for Unipotential Cathode:			
Heater arrangement			
Voltage (AC or DC)	12.6 ± 10%	6.3 ± 10%	volts
Current	0.3	0.6	amp
Transconductance (Each Unit) for dc plate volts = 150, dc grid-No.2 volts = 150, and dc plate ma. = 25	10500		μmhos
Mu-Factor, Grid No.2 to Grid No.1 (Each Unit) for dc plate volts = 150, dc grid No.2 volts = 150, and dc plate ma. = 25	31		
Direct Interelectrode Capacitances (Approx., Each Unit):▲			
Grid No.1 to plate	0.15		μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	6.4		μμf
Plate to cathode & grid No.3, grid No.2, and heater	1.6		μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9HL

Pin 1 - Grid No.1 of Unit No.2
Pin 2 - Cathode, Grid No.3
Pin 3 - Grid No.1 of Unit No.1
Pin 4 - Heater

Pin 5 - Heater
Pin 6 - Plate of Unit No.2
Pin 7 - Grid No.2
Pin 8 - Plate of Unit No.1
Pin 9 - Heater Tap

6939

PUSH-PULL RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy•
and
PUSH-PULL RF POWER AMPLIFIER — Class C FM Telephony

Values are on a per-tube basis unless otherwise specified

Maximum Ratings, *Absolute-Maximum Values:*

	Up to 500 Mc		
	CCS★	*ICAS♦*	
DC PLATE VOLTAGE	250 max.	250 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	200 max.	200 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-100 max.	-100 max.	volts
DC PLATE CURRENT	90 max.	100 max.	ma
DC GRID-No.1 CURRENT	6 max.	8 max.	ma
DC CATHODE CURRENT	100 max.	120 max.	ma
PLATE INPUT	12 max.	14 max.	watts
GRID-No.2 INPUT	3 max.	3.5 max.	watts
GRID-No.1 INPUT	0.2 max.	0.24 max.	watt
PLATE DISSIPATION	6 max.	7.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	100 max.	100 max.	volts
Heater positive with respect to cathode	100 max.	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	225 max.	225 max.	°C

Typical Operation:

	At 500 Mc		
DC Plate Voltage	180	200	volts
DC Grid-No.2 Voltage	180	200	volts
DC Grid-No.1 Voltage	-20	-20	volts
From grid resistor for each grid No.1 of	27000	27000	ohms
Peak-to-Peak RF Grid-No.1 Voltage	50	50	volts
DC Plate Current	55	60	ma
DC Grid-No.2 Current	12.5	14	ma
DC Grid-No.1 Current	1.5	1.5	ma
Driver Power Output (Approx.)	1.2	1.2	watts
Useful Power Output (Approx.)♦	5	6	watts

PLATE-MODULATED PUSH-PULL RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Values are on a per-tube basis

Maximum Ratings, *Absolute-Maximum Values:*

	Up to 500 Mc		
	CCS★	*ICAS*♦	
DC PLATE VOLTAGE	200 max.	200 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	200 max.	200 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-100 max.	-100 max.	volts
DC PLATE CURRENT	64 max.	80 max.	ma
DC GRID-No.1 CURRENT	6 max.	8 max.	ma
DC CATHODE CURRENT	80 max.	96 max.	ma
PLATE INPUT	8 max.	10 max.	watts
GRID-No.2 INPUT	2 max.	2.3 max.	watts
GRID-No.1 INPUT	0.2 max.	0.24 max.	watt
PLATE DISSIPATION	4 max.	5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	100 max.	100 max.	volts
Heater positive with respect to cathode	100 max.	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	225 max.	225 max.	°C

Typical Operation:

	At 500 Mc		
DC Plate Voltage	180	180	volts
DC Grid-No.2 Voltage	180	180	volts
DC Grid-No.1 Voltage	-20	-20	volts
From grid resistor for each grid No.1 of	68000	27000	ohms
Peak-to-Peak RF Grid-No.1 Voltage	45	50	volts
DC Plate Current	40	55	ma
DC Grid-No.2 Current	9.5	12.5	ma
DC Grid-No.1 Current	0.6	1.5	ma
Driver Power Output (Approx.)	1	1.2	watts
Useful Power Output (Approx.)♦	3.5	5	watts

FREQUENCY TRIPLER — Class C

Values are on a per-tube basis

Maximum Ratings, *Absolute-Maximum Values:*

	Up to 500 Mc		
	CCS★	*ICAS*♦	
DC PLATE VOLTAGE	250 max.	250 max.	volts

	CCS★	ICAS♦	
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	200 max.	200 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-100 max.	-100 max.	volts
DC PLATE CURRENT	60 max.	80 max.	ma
DC GRID-No.1 CURRENT	6 max.	8 max.	ma
DC CATHODE CURRENT	70 max.	80 max.	ma
PLATE INPUT	8 max.	10 max.	watts
GRID-No.2 INPUT	3 max.	3.5 max.	watts
GRID-No.1 INPUT	0.2 max.	0.24 max.	watt
PLATE DISSIPATION	6 max.	7.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	100 max.	100 max.	volts
Heater positive with respect to cathode	100 max.	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	225 max.	225 max.	°C

Typical Operation:

	Up to 500 Mc		
DC Plate Voltage	180	200	volts
DC Grid-No.2 Voltage (Approx.)	180	190	volts
Through resistor of	1200	1200	ohms
DC Grid-No.1 Voltage	-74	-74	volts
From grid resistor for each grid No.1 of	82000	82000	ohms
Peak-to-Peak RF Grid-No.1 Voltage	165	165	volts
DC Plate Current	40	46	ma
DC Grid-No.2 Current	9.7	11	ma
DC Grid-No.1 Current	1.8	1.8	ma
Driver Power Output (Approx.)	1.1	1.1	watts
Useful Power Output (Approx.)♦	1.8	2.2	watts

▲ Without external shield.

● Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

★ Continuous Commercial Service.

♦ Intermittent Commercial and Amateur Service.

♦ This value of useful power is measured at load of output circuit.

OPERATING CONSIDERATIONS

Shielding of the 6939 in "straight-through" rf-amplifier service may be required for stable operation. To minimize external feedback from the plate to grid No.1, a grounded shield crossing the terminal end of the tube socket through the space between pins 4 and 5 and the space between pins 1 and 9, is generally adequate for this purpose.

The *heater may be effectively bypassed* by grounding one heater pin at the tube socket and bypassing the other heater pin to ground with a low inductance capacitor. If further isolation of the ungrounded heater pin is required a suitable rf choke followed by another low inductance bypass capacitor, is recommended.

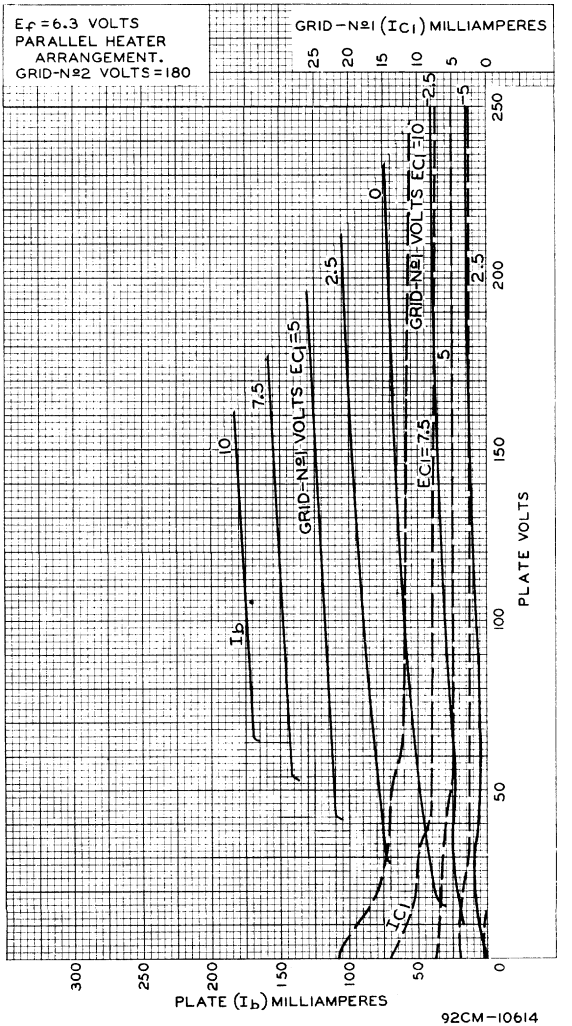
The *cathode* of the 6939 should be grounded by means of the shortest possible connection to reduce the effect of cathode-lead inductance.

The *rf impedance between grid No.2 and the cathode* must be kept low, usually by means of a suitable bypass capacitor. In telephony service when grid No.2 is modulated, a smaller bypass capacitor than is used for telegraphy service may be required in order to avoid excessive af bypassing. However, if the capacitance value is too small, rf feedback may occur between plate and grid No.1, depending on the circuit layout, operating frequency, and power gain of the stage. AF bypassing difficulties can usually be eliminated if the grid-No.2 bypass capacitor is replaced by a series-resonant circuit which is tuned to resonate at the operating frequency. This circuit presents a high impedance to audio frequencies but a very low impedance to its resonant frequency.

To *prevent generation of parasitic oscillations*, it is recommended that a 100-ohm resistor be connected in series with grid No.2 as close to the socket as possible.

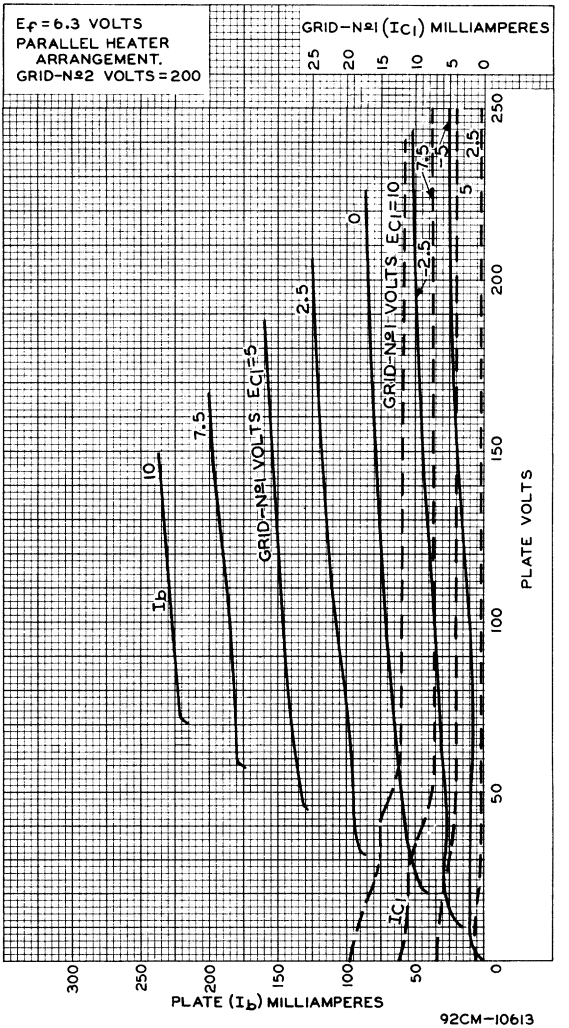
6939

AVERAGE CHARACTERISTICS
Each Unit



92CM-10614

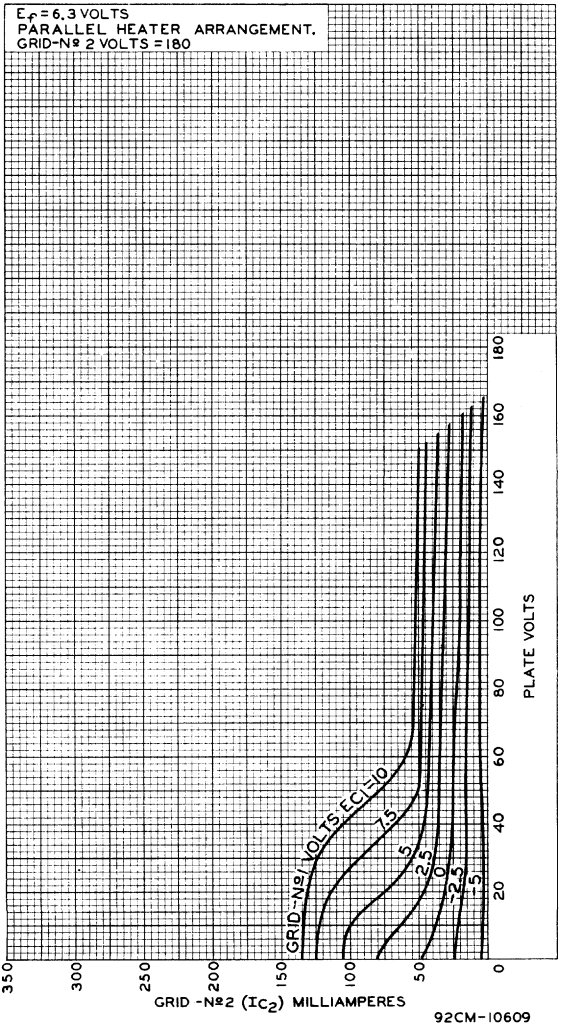
AVERAGE CHARACTERISTICS
Each Unit



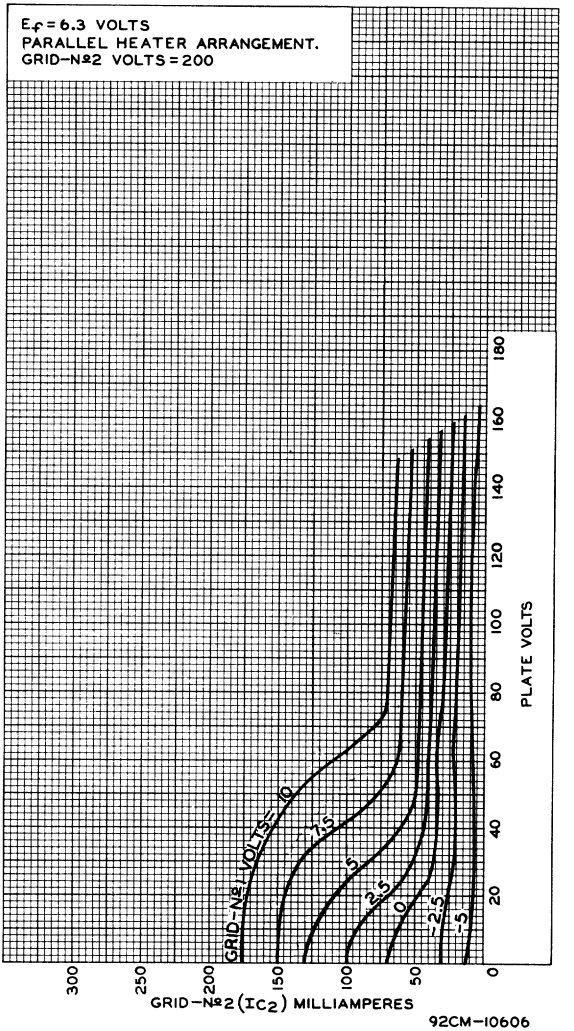
92CM-10613

6939

AVERAGE CHARACTERISTICS
Each Unit

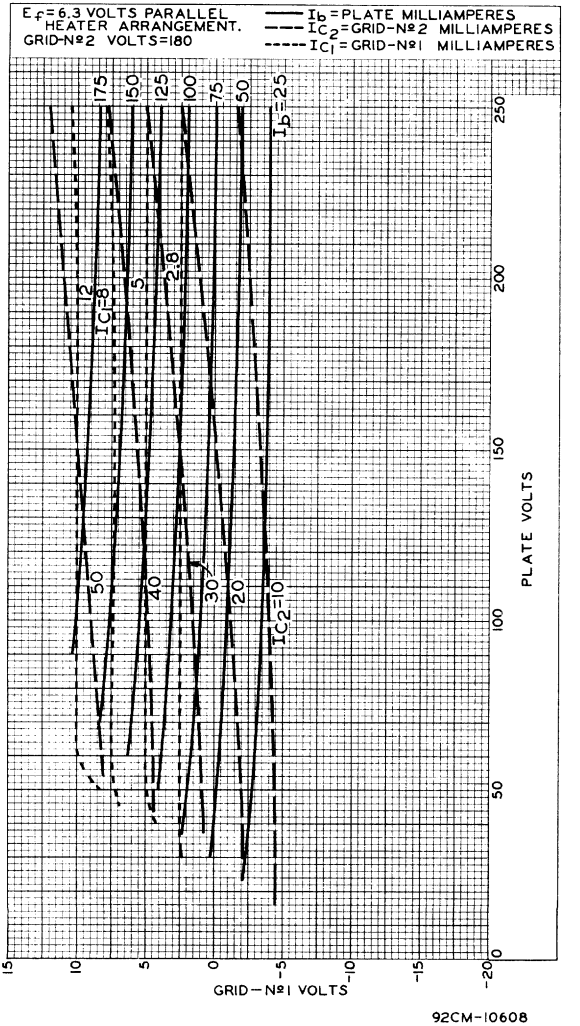


AVERAGE CHARACTERISTICS
Each Unit



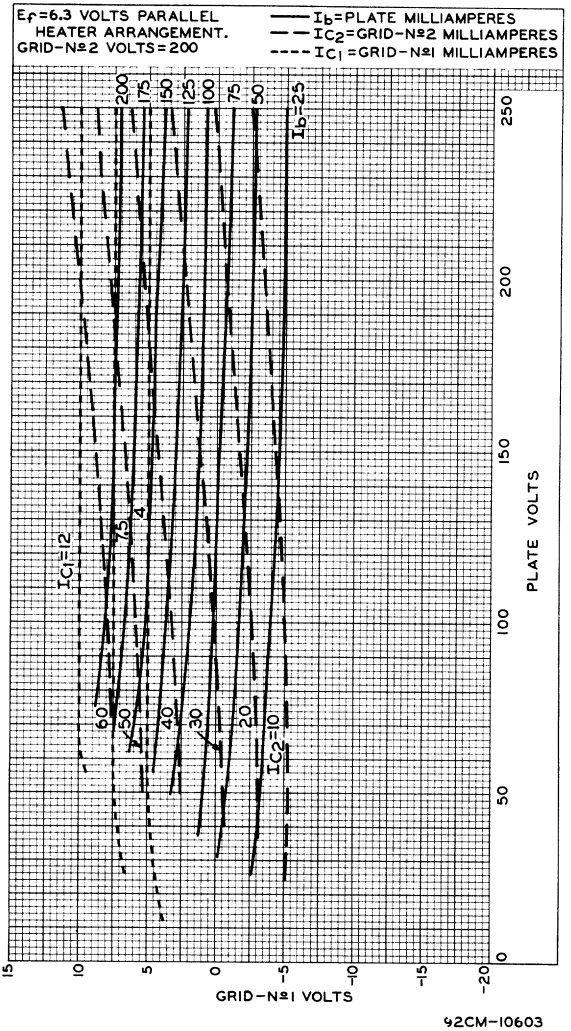
6939

AVERAGE CONSTANT-CURRENT CHARACTERISTICS
Each Unit



92CM-10608

AVERAGE CONSTANT-CURRENT CHARACTERISTICS
Each Unit



92CM-10603

6949

SUPER-POWER SHIELDED-GRID BEAM TRIODE

COAXIAL-ELECTRODE STRUCTURE WATER-COOLED ELECTRODES
500-KW CW POWER OUTPUT INTEGRAL WATER DUCTS

Useful with full input up to 75 Mc

GENERAL DATA

Electrical:

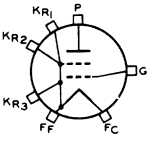
Filament, Multistrand Thoriated Tungsten:		
Voltage (Single-phase AC or DC)	7.3 min. 7.8 max.	volts volts
Current at 7.3 volts	1040	amp
Current at 7.8 volts	1130	amp
Starting current	Must never exceed 1700 amperes, even momentarily	
Cold resistance	0.0013	ohm
Minimum heating time	60	seconds
Amplification Factor, for dc grid volts = -50 and dc plate voltage adjusted to give dc plate current of 10 amperes	60	
Direct Interelectrode Capacitances:		
Grid to plate	12	μμf
Grid to filament	1300	μμf
Plate to filament	160	μμf

Mechanical:

Operating Position	Vertical, with lifting ring up
Maximum Overall Length	40"
Maximum Diameter	10.06"
Weight (Approx.)	140 lbs

Terminal Connections *(See Dimensional Outline):*

F_C – Filament Cylindrical Terminal
F_F – Filament Flange Terminal
K_{R_1} – Output-Circuit-Return Terminal
P – Plate Terminal



K_{R_2} – Flange Input-Circuit-Return Terminal
K_{R_3} – Cylindrical Input-Circuit-Return Terminal
G – Grid Terminal

Air Cooling:

It is important that the temperature of any external part of the tube should not exceed 150° C. In general, forced-air cooling of the ceramic bushings will not be required unless the 6949 is used in cavity-type circuits or in a confined space without free circulation of air. Under such conditions, provision should be made for blowing an adequate quantity of air at the ceramic bushings to limit their temperature to 150° C. Forced-air cooling of the output-

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SUPER-POWER SHIELDED-GRID BEAM TRIODE

circuit-return terminal (K_{R_1}) and the flange input-circuit-return terminal (K_{R_2}) may be necessary to prevent exceeding the maximum temperature rating of 150° C, particularly at vhf frequencies.

Water Cooling:

Water cooling of the beam-forming cylinder, grid-terminal, and the plate is required. The water flow must start before application of any voltages and preferably should continue for several minutes after removal of all voltages. Interlocking of the water flow for each of the cooled elements with all power supplies is recommended to prevent tube damage in case of failure of adequate water flow. The use of distilled water is essential.

Water Flow:

	Absolute Min. Flow gpm	*Typical Flow* gpm	*Pressure Drop*[#] *for Typical Flow* psi	*Max. Gauge Pressure*[□] psi
To plate (In direction shown on *Dimensional Outline*):				
For plate dissipation up to 125 kw. . . .	40	44	18	100
For plate dissipation of 260 kw	60	66	35	100
For plate dissipation of 330 kw	70	77	48	100
For plate dissipation of 400 kw	80	88	65	100
To grid-terminal connector	1	–	–	–
To beam-forming cylinder.	7	8	9	50

Outlet Water Temperature (Any outlet) . .	70 max.	°C
Minimum Plate-Water-Column Resistance .	1/2 megohm per kv of dc plate voltage	
Ceramic-Bushing Temperature	150 max.	°C
Metal-Surface Temperature	150 max.	°C

Fittings:

Fittings for the plate and beam-forming-cylinder water connections may be obtained from the Breco Division, Perfecting Service Co., 332 Atando Ave., Charlotte 6, North Carolina, USA.

#,□: See next page.

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SUPER-POWER SHIELDED-GRID BEAM TRIODE

LINEAR RF POWER AMPLIFIER
Single-Sideband Suppressed-Carrier Service

Crest of modulation conditions

Maximum CCS• Ratings, *Absolute Values:*

For altitudes up to 5,000 feet and frequencies up to 75 Mc

DC PLATE VOLTAGE	20000 max.	volts
MAX.-SIGNAL DC PLATE CURRENT	60 max.	amp
MAX.-SIGNAL PLATE INPUT	1100000 max.	watts
MAX.-SIGNAL DC GRID CURRENT	1.5 max.	amp
PLATE DISSIPATION (Average)	400000 max.	watts

Typical CCS Class B Operation at 10 Mc:

DC Plate Voltage	18000	volts
DC Grid Voltage (Approx.)*	-300	volts
Zero-Signal DC Plate Current	5	amp
Effective RF Load Resistance	170	ohms
"Single-Tone" Operation:⊕		
Max.-signal dc plate current	57	amp
Max.-signal dc grid current	0.35	amp
Max.-signal peak rf grid voltage	1900	volts
Max.-signal driving power (Approx.)	10000**	watts
Max.-signal power output (Approx.)	600000	watts
"Two-Tone" Operation:♦♦		
Average dc plate current	37	amp
Average dc grid current	0.22	amp
Peak envelope rf grid voltage	1900	volts
Average power output (Approx.)	300000	watts
Peak envelope power output (Approx.)	600000	watts

RF POWER AMPLIFIER — Class C Telegraphy##
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS• Ratings, *Absolute Values:*

For altitudes up to 5,000 feet and frequencies up to 75 Mc

DC PLATE VOLTAGE	20000 max.	volts
DC GRID VOLTAGE	-1000 max.	volts
DC PLATE CURRENT	50 max.	amp
DC GRID CURRENT	1.5 max.	amp
PLATE INPUT	1000000 max.	watts
PLATE DISSIPATION	400000 max.	watts

Typical CCS Operation at 425 Kc:

DC Plate Voltage	17500	volts
DC Grid Voltage▲	-625	volts
Peak RF Grid Voltage	2000	volts
DC Plate Current	40	amp
DC Grid Current	1	amp

⊕,□,•,*,⊕,**,♦♦,##,▲: See next page.

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SUPER-POWER SHIELDED-GRID BEAM TRIODE

Driving Power (Approx.)‡	2000	watts
Useful Power Output (Approx.) . . .	500000	watts

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Filament Current.	1	870	1100	amp
Amplification Factor.	1,2	48	74	
Direct Interelectrode Capacitances:				
Grid to plate	–	–	20	μμf
Grid to filament.	–	1150	1550	μμf
Plate to filament	–	140	170	μμf

Note 1: With 7.3 volts ac on filament.

Note 2: For dc grid volts = −50 and dc plate voltage adjusted to give dc plate current of 10 amperes.

‡ Directly across cooled element for the indicated typical flow.

□ At tube inlets.

● Continuous Commercial Service.

* Obtained from a fixed supply. Value should be adjusted to give indicated value of zero-signal plate current.

⊕ "Single-Tone" operation refers to that class of amplifier service in which the grid-No.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.

** Includes tube losses, circuit losses, and "swamping power" losses.

‡‡ "Two-Tone" operation refers to the simultaneous amplification of the two equal-amplitude, radio-frequency signals resulting from modulation of a single-sideband, suppressed-carrier transmitter by two audio-frequency signals of equal amplitude. The data shown for "Two-Tone" modulation refer to the case in which the peak amplitude of the resultant rf grid signal is equal to the "Max.-Signal Peak RF Grid-No.1 Voltage" as specified under "Single-Tone" modulation.

Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

▲ Obtained from fixed supply.

‡ Additional driving power is required at frequencies where circuit losses become significant.

OPERATING CONSIDERATIONS

A *high-speed, electronic protective device* must be used to remove the plate voltage within a few microseconds in the event of abnormal operation such as internal arcing. The protective device employed to remove the plate voltage in any installation must be approved by the RCA Electron Tube Division. In addition, the grid circuit should be provided with overload relays which will act to remove within a period of 0.1 second all grid power in the event of excessive grid-current flow. Inquiries concerning a high-speed, electronic protective device for removal of plate voltage from the 6949 may be addressed to Commercial Engineering, Electron Tube Division, RCA, Harrison, N.J.

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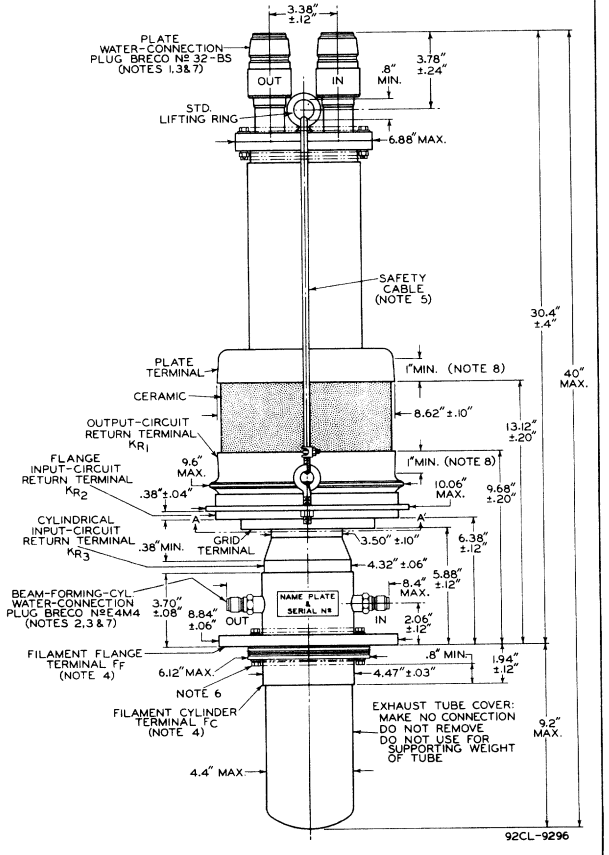
SUPER-POWER SHIELDED-GRID BEAM TRIODE

The 6949 can be operated with maximum ratings at frequencies up to 75 Mc and with reduced ratings to higher frequencies. The capabilities of the 6949 for operation at higher frequencies and at higher powers have not yet been determined but requests for information on specific applications will be welcomed.



Notes 1 to 8: See next page.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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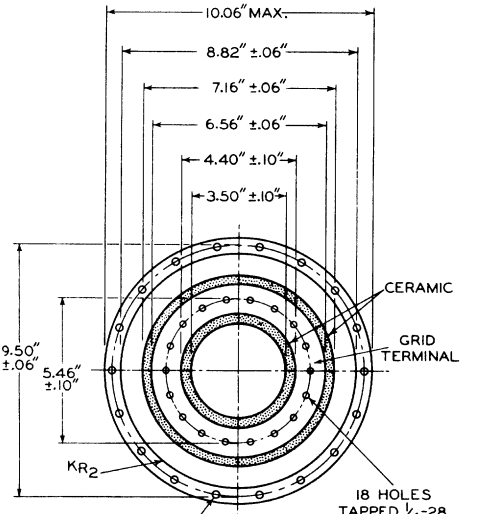

NOTE 1: SOCKET No.412-BS 1-1/2" FOR THIS PLUG MAY BE OBTAINED FROM BRECO DIVISION, PERFECTING SERVICE CO., 332 ATANDO AVE., CHARLOTTE 6, N.C.

NOTE 2: SOCKET No.4EF4 1/2" (WITH FEMALE PIPE-THREAD CONNECTION) OR SOCKET No.4EM4 1/2" (WITH MALE PIPE-THREAD CONNECTION) MAY BE OBTAINED FROM SUPPLIER INDICATED IN NOTE 1.

NOTE 3: DIRECTION OF WATER FLOW THROUGH TUBE MUST BE IN DIRECTION INDICATED BY MARKINGS AT WATER CONNECTIONS.

NOTE 4: USE FOR FILAMENT POWER ONLY. INPUT-CIRCUIT RETURN SHOULD BE MADE TO BOTH INPUT-CIRCUIT-RETURN TERMINALS (K_{R_2} & K_{R_3}); OUTPUT-CIRCUIT RETURN SHOULD BE MADE TO OUTPUT-CIRCUIT-RETURN TERMINAL (K_{R_1}).

NOTE 5: REMOVE THIS CABLE BEFORE OPERATING TUBE AND KEEP CABLE FOR FUTURE TUBE HANDLING.

NOTE 6: DO NOT TAMPER WITH THESE BOLTS.

Notes 7 & 8: See next page.

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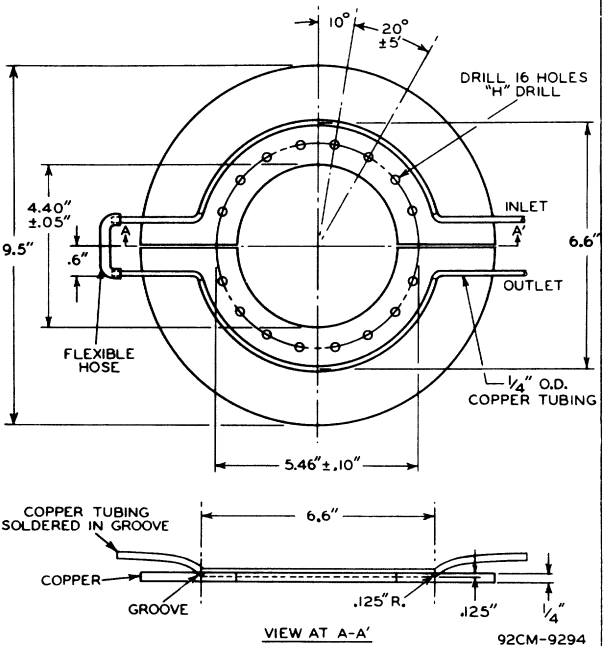
SUPER-POWER SHIELDED-GRID BEAM TRIODE

NOTE 7: INLET WATER CONNECTIONS (IN) ARE BOTH ON SAME SIDE OF TUBE AND TO THE RIGHT WHEN TUBE IS VIEWED WITH NAME PLATE TOWARD OBSERVER.

NOTE 8: THIS AREA IS SUBJECT TO A MAXIMUM TAPER OF 0.060" TOTHE INCH. THE MAXIMUM DIAMETER ALONG THIS TAPER WILL BE ON THE END TOWARD THE CERAMIC.

DETAILS OF SUGGESTED WATER-COOLED GRID-TERMINAL CONNECTOR



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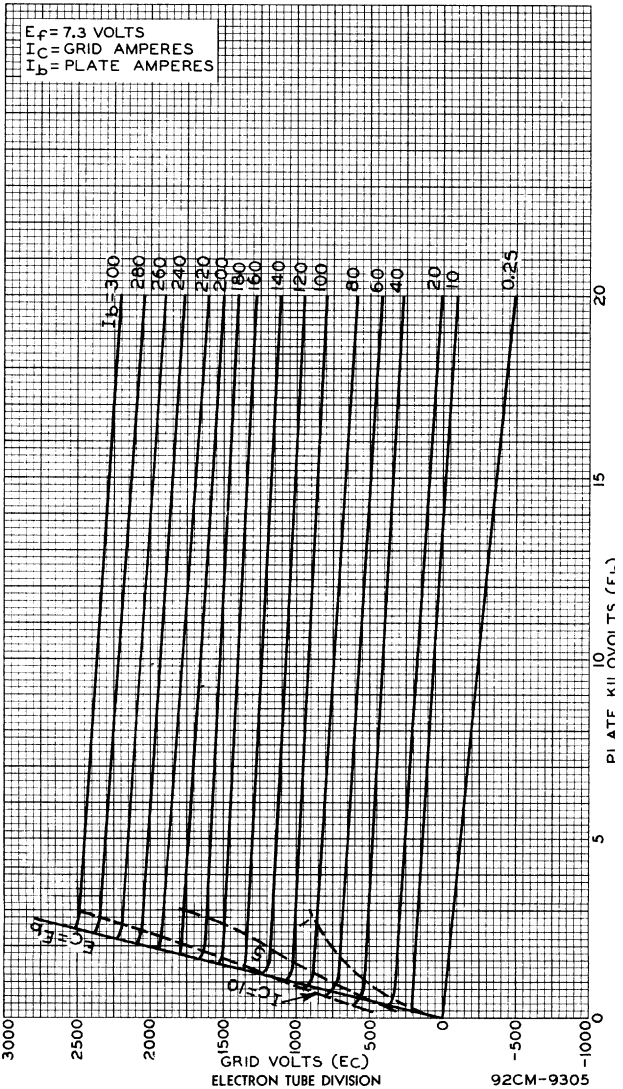
TYPICAL CONSTANT-CURRENT CHARACTERISTICS



ELECTRON TUBE DIVISION

92CM-9305

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6952

Beam Power Tube

2 MEGAWATTS PEAK POWER OUTPUT IN SHORT-PULSE SERVICE AT 425 Mc

PULSE LENGTH TO 15 MICROSECONDS

LOW FILAMENT POWER FOR AIRBORNE USE

LIQUID COOLED

For Grid-Driven, Plate-Pulsed Amplifier Applications at Frequencies from 174 to 600 Mc

Electrical:

Filamentary Cathode, Multistrand, Matrix-Type, Oxide-Coated:		
Voltage:[a]		
Maximum, with dc or 60 cps ac excitation	1.00	volt
Maximum, with 400 cps ac excitation	1.05	volts
Typical, with dc or 60 cps ac excitation	0.95	volt
Current:		
Typical operation value at 0.95 volt, with 60 cps excitation	495	amp
Minimum time to reach operating filament voltage	30	seconds
Minimum time at normal operating filament voltage before other voltages are applied	90	seconds
Mu-Factor, Grid No.2 to Grid No.1	7	
Direct Interelectrode Capacitances:		
Grid No.1 to plate	0.15 max.	pf
Grid No.1 to grid No.2 and cathode	500	pf
Plate to cathode and grid No.2	30	pf
Grid No.2 to cathode (Including bypass capacitors)	18000 max.	pf

Mechanical:

Operating Position	Tube axis vertical, either end up
Overall Length	8.62" ± 0.31"
Maximum Diameter	11.25"
Weight (Approx.)	38 lbs

Terminal Connections (See *Dimensional Outline*):

F – Insulated Filament Terminal and Coolant Connection

F_R – Uninsulated Filament Terminal for DC Circuit Returns and Coolant Connection

G_1 – RF Grid-No.1 Terminal Contact Surface

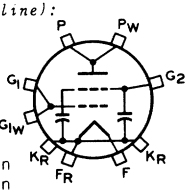
G_{1W} – DC Grid-No.1 and Coolant Connection

G_2 – DC Grid-No.2 and Coolant Connection

K_R – RF Cathode Terminal Contact Surface for Circuit Returns

P – RF Plate Terminal Contact Surface

P_W – DC Plate and Coolant Connection



← Indicates a change.

Thermal:

Ceramic-Insulator Temperature	150 max.	°C
Metal-Surface Temperature	100 max.	°C
Minimum Storage Temperature, without cooling liquid in coolant ducts	-65 min.	°C
External Gas Pressure[b]	60 max.	psia

Air Cooling for Insulators and Contact Areas:

It is important that the temperature of any external part of the tube not exceed the value specified. In general, forced-air cooling of the *ceramic insulators and the adjacent contact areas* may be required if the tube is used in a confined space without free circulation of air. Under such conditions, provision should be made for blowing an adequate quantity of air across the ceramic insulators and adjacent terminal areas to limit their maximum temperature to the value specified.

Liquid Cooling:

Liquid cooling of the filament block, dc cathode block, grid-No.1 block, grid-No.2 block, and plate is required. When tube operation under low ambient temperatures is required, the recommended coolant is inert liquid FC75 (Made by the Fluorochemical Division, Minnesota Mining and Manufacturing Co., 900 Bush Avenue, St. Paul 6, Minnesota) but ethylene glycol mixed with water in the proportion of 60% ethylene glycol to 40% water by weight can be used. When the environmental temperature permits, the coolant may be water; the use of distilled water or filtered deionized water is essential. The liquid flow must start before application of any voltages and preferably should continue for several seconds after removal of all voltages. Interlocking of the liquid flow through each of the cooled elements with all power supplies is recommended to prevent tube damage in case of failure of adequate liquid flow.

Flow:

Liquid Pressure at any outlet	100 max.	psi

Water Flow:

	Absolute Min. Flow	*Typical Flow*	*Max. Pressure Differential for Typical Flow*[c]
	gpm	*gpm*	*psi*
Through Filament block	0.5	0.8	8
Through dc cathode block	0.5	0.8	8
Through grid-No.1 block	0.5	0.8	6
Through grid-No.2 block	0.5	0.8	8
Through plate:			
For plate dissipations up to 5 kw (Av.)	5	7	5
For plate dissipations of 5kw to 8 kw (Av.)	8	10	10
Resistivity of Water at 25° C	1 min.	megohm-cm	

	Absolute Min. Flow	*Typical Flow*	*Max. Pressure Differential for Typical Flow*[c]	
	gpm	*gpm*	*psi*	
Water Temperature from any outlet			70 max.	°C
Storage Temperature			See *footnote* **d**	
FC75 Flow:				
Through filament block	1.0	1.2	20	
Through dc cathode block	1.0	1.2	20	
Through grid-No.1 block	1.0	1.2	14	
Through grid-No.2 block	1.0	1.2	20	
Through plate:				
For plate dissipation up to 5 kw (Average)	10	12	20	
For plate dissipations of 5 kw to 8 kw (Average)	20	24	80	
Outlet-Liquid FC75 Temperature from any outlet			70 max.	°C
Storage Temperature with liquid FC75 in Coolant Courses			-65 min.	°C
Liquid FC75 Temperature for Tube Operation			-25 min.	°C
Ethylene-Glycol-Water Solution Flow:				
Through filament block	1.0	1.2	18	
Through dc cathode block	1.0	1.2	18	
Through grid-No.1 block	1.0	1.2	12	
Through grid-No.2 block	1.0	1.2	18	
Through plate in direction shown on *Dimensional Outline:*				
For plate dissipation up to 5 kw (Average)	6	8	7	
For plate dissipations of 5 kw to 8 kw (Average)	16	18	40	
Outlet-Solution Temperature from any outlet			60 max.	°C
Min. Plate-Solution-Column Resistance at 25° C			10 min.	megohms
Storage Temperature with Solution in Coolant Courses			-45 min.	°C
Solution Temperature for Tube Operation			-20 min.	°C

PULSED RF AMPLIFIER

For frequencies from 174 to 600 Mc, and a maximum "ON" time as specified in any 3000-microsecond interval.

Maximum Ratings, *Absolute-Maximum Values:*

	"ON" Time	*15 μsec*	*70 μsec*	
Peak Positive-Pulse Plate Voltage[e]		55000 max.	30000 max.	volts

"ON" Time	*15 μsec*	*70 μsec*	
Peak Positive-Pulse Grid-No.2 Voltage[f,g]	2200 max.	2200 max.	volts
DC or Peak Negative-Pulse Grid-No.1 Voltage	400 max.	400 max.	volts
Peak Plate Current	80 max.	30 max.	amp
Peak Grid-No.2 Current	15 max.	3 max.	amp
Peak-Rectified Grid-No.1 Current	15 max.	3 max.	amp
DC Plate Current	0.320 max.	0.500 max.	amp
DC Grid-No.2 Current	0.060 max.	0.060 max.	amp
DC Grid-No.1 Current	0.060 max.	0.060 max.	amp
Plate Input (Average)	16000 max.	9000 max.	watts
Plate Dissipation (Average)	8000 max.	5000 max.	watts

Typical Plate-Pulsed Operation:

In Class B service at 425 Mc with a rectangular waveshape pulse.

Pulse width / *Duty factor*	*13 μsec* / *0.004*	*60 μsec* / *0.018*	
Peak Positive-Pulse Plate Voltage[e]	50000	19000	volts
Peak Positive-Pulse Grid-No.2 Voltage[f]	1800	1700	volts
Peak Negative-Pulse Grid-No.1 Voltage[h]	325	250	volts
Peak Plate Current	75	25	amp
Peak Grid-No.2 Current	8	1	amp
Peak Rectified Grid-No.1 Current	10	0.5	amp
DC Plate Current	0.3	0.45	amp
DC Grid-No.2 Current	0.03	0.02	amp
DC Grid-No.1 Current	0.04	0.01	amp
Peak Driver Power Output (Approx.)	20000	2000	watts
Useful Peak Power Output	2000000	225000	watts

[a] Because the filament, when operated near the maximum voltage value, provides emission in excess of any requirements within tube ratings, during operation of the tube, the filament voltage should be reduced to a value that will give adequate but not excessive emission. Careful attention to maintaining the value of filament voltage consistent with adequate emission will conserve tube life. The filament voltage should be measured at the filament liquid coolant connections on the tube side of the threads. This procedure is essential for accurate measurement of the filament voltage. At 400 cycles some heating of the filament leads and rf cathode terminal (cathode header) occurs; this condition is not detrimental to tube operation or tube life.

[b] This pressure is related to the output-cavity pressurization as required to prevent corona or external arc-over.

[c] Measured directly across cooled element for the indicated typical flow.

[d] The tube coolant ducts must be free of water before storage or shipment of the tube to prevent damage from freezing.

[e] The magnitude of any spike on the plate voltage pulse should not exceed its peak value by more than 4000 volts, and the duration of any spike when measured at the peak-value level should not exceed 10% of the maximum "ON" time. The output cavity must be pressurized as required to prevent corona or external arc-over at the ceramic insulator.

[f] The magnitude of any spike on the grid-No.2 voltage pulse should not exceed its peak value by more than 250 volts, and the duration of any spike when measured at the peak-value level should not exceed 10% of the maximum "ON" time.

[g] A negative dc voltage of 300 volts maximum may be applied to grid No.2 to prevent any tube conduction between pulses.

[h] The grid-No.1 voltage may be a combination of fixed and self bias obtained from a series grid resistor.

CHARACTERISTICS RANGE VALUES

	Note	*Min.*	*Max.*	
Filament Current.	j	460	530	amp
Input Strap-Resonant Frequency. . . .	k	222	250	Mc
Output Strap-Resonant Frequency . . .	k	230	250	Mc
Direct Interelectrode Capacitances:				
Grid No.1 to plate.	m	-	0.15	pf
Grid No.2 to cathode.	-	10000	18000	pf

[j] At filament voltage of 0.95 volt and ac filament excitation at 60 cps.

[k] The frequency range of the sweep generator is varied to produce the resonance curve observed on the oscilloscope and the UHF Marker Oscillator frequency is varied so that the pip is observed at the peak of the resonance curve. The resonant frequency is read on the frequency meter.

[m] Measured with special shield adapter.

COOLING CONSIDERATIONS

System

The liquid-cooling system consists, in general, of a source of cooling liquid, a liquid regeneration loop, a heat exchanger, a feed-pipe system which carries the liquid to the filament section blocks, to the filament common-point connection, to the grid-No.1 block, to the grid-No.2 block, and to the plate connections of the tube, and provision for interlocking the liquid flow through each of the cooling courses with the power supplies.

It is essential that the insulating tubing between the cooling-system piping and each of the cooling courses have good insulating qualities and be of sufficient length to minimize leakage currents and/or electrolysis effects. The minimum plate liquid column resistance should be 10 megohms at 25° C.

The piping system must be arranged so that direction of coolant flow through the plate coolant connection is in accord with the markings on the plate coolant connection (see *Dimensional Outline*) to insure adequate cooling. Through each of the other coolant connections, the liquid flow may be in either direction. Series or parallel arrangement of the coolant ducts is permissible so long as the specified flow, pressure, and outlet temperature ratings are observed. *Caution: The feed-pipe system should be so designed that all of the cooling liquid indicated by the flow meter at each outlet passes through the associated coolant duct within the tube, and is not shunted inadvertently by any other path.*

A test as to proper design and functioning of the feed-pipe system can be made by plugging the inlet and outlet holes of the fitting at each cooling connection.

Under these conditions, and with all voltages removed from the tube, no liquid flow should be indicated by the flow meter for any connection when the coolant valve is fully opened.

Precautions

Proper functioning of the coolant system is of the utmost importance. Even a momentary failure of the liquid flow will damage the tube. In fact, without coolant, the heat of the filament alone is sufficient to cause serious harm. It is, therefore, necessary to provide a method of preventing operation of the tube in case the coolant supply should fail. This may be done by the use of coolant-flow interlocks which open the power supplies when the flow through any element is insufficient or ceases. The coolant flow must start before application of any voltages and preferably should continue for several seconds after removal of all voltages.

The absolute minimum coolant flow required through the filament section blocks, the filament common-point connections, the grid-No.1 block the grid-No.2 block, and to the plate together with pressure differentials across the cooled elements, is given in the tabulated data. The use of an outlet coolant thermometer and a coolant flow meter at each of the outlets is recommended. Under no circumstances should the temperature of the coolant from any outlet ever exceed the maximum value given for the coolant in the tabulated data.

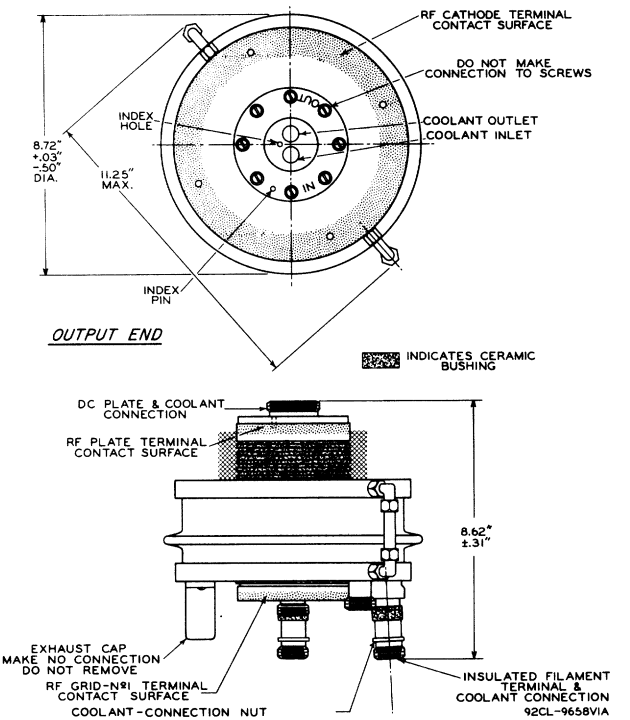
In spite of the usual precautions taken to eliminate contamination of the coolant by oil, dust, etc., some impurities are likely to enter the fluid. The use of a strainer with at least 60-mesh screen is recommended in the coolant supply line as near to the tube as possible to trap any foreign particles likely to impair the coolant flow through the tube ducts. Also, a regeneration loop followed by a submicron filter should be employed. For example, a regeneration loop having a 10-to-20-gallon-per-hour capacity will ordinarily be adequate for use with a cooling system containing about 20 gallons.

When the tube is used in equipment under conditions such that the ambient temperature is below 0° C, precautions should be taken to prevent freezing of the water in the tube ducts.

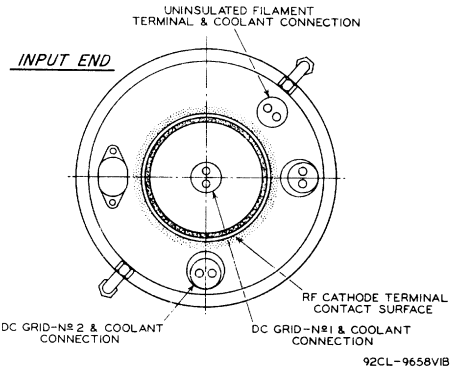
FOR ADDITIONAL INFORMATION ON THIS TYPE INCLUDING INPUT AND OUTPUT CAVITY DRAWINGS, WRITE FOR TECHNICAL BULLETIN AVAILABLE FROM:

Commercial Engineering
Electronic Components and Devices
Radio Corporation of America
Harrison, New Jersey

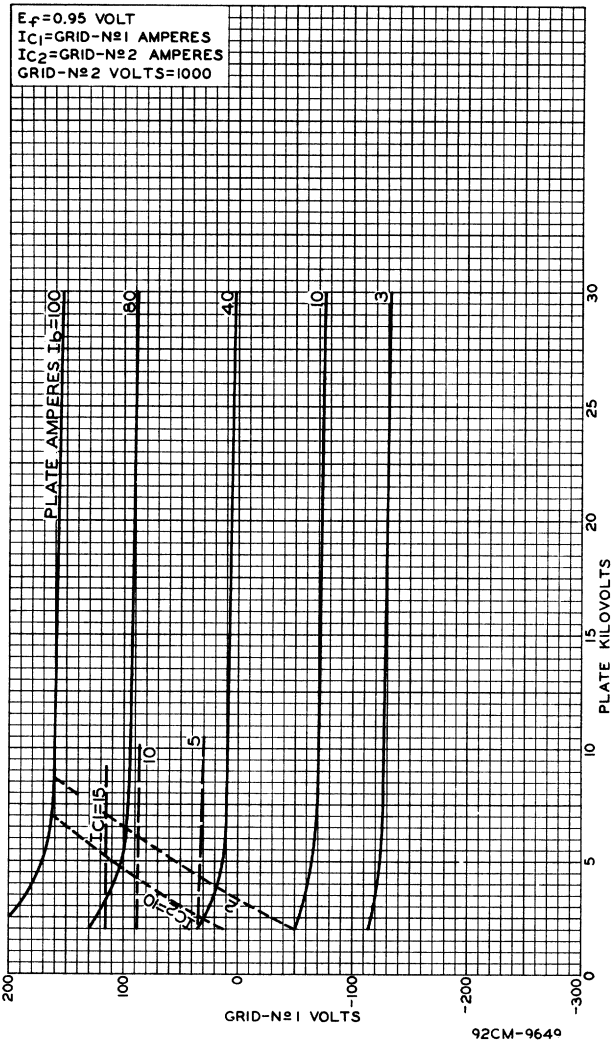
SIMPLIFIED DIMENSIONAL OUTLINE[r]



[r] A detailed Dimensional Outline and associated Gauge Drawings are given in the Technical Bulletin available upon request.


UNINSULATED FILAMENT
TERMINAL & COOLANT CONNECTION
INPUT END
RF CATHODE TERMINAL
CONTACT SURFACE
DC GRID-№2 & COOLANT
CONNECTION
DC GRID-№1 & COOLANT
CONNECTION
92CL-9658VIB

TYPICAL
CONSTANT-CURRENT CHARACTERISTICS



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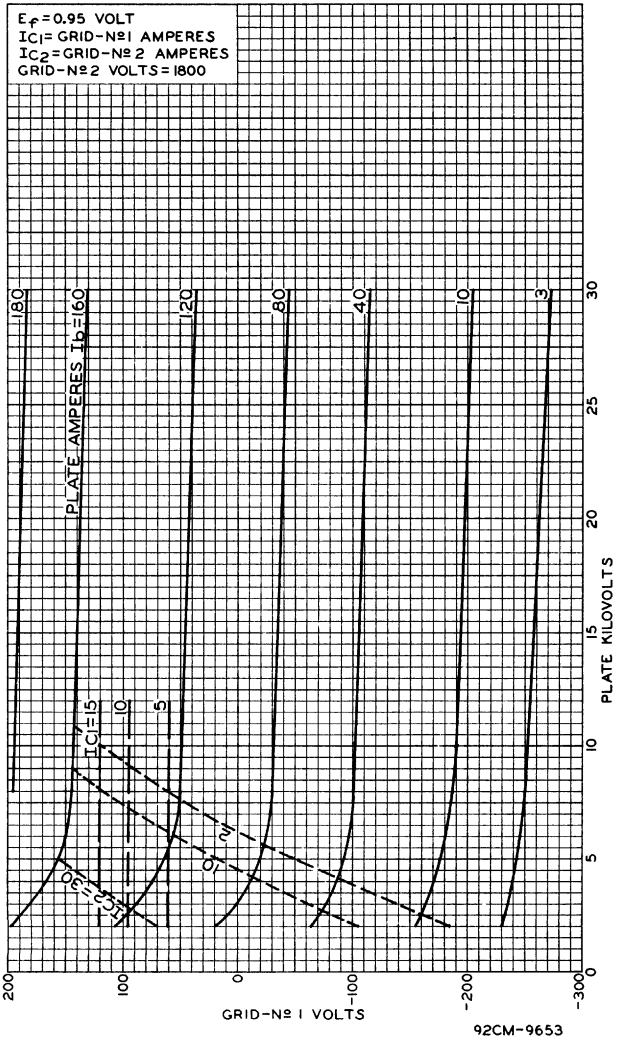
TYPICAL
CONSTANT-CURRENT CHARACTERISTICS



92CM-9653

6973

Beam Power Tube

9-PIN MINIATURE TYPE

For High-Fidelity Audio-Amplifier Applications

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)	6.3 ± 10%		volts
Current at 6.3 volts	0.45		amp
Direct Interelectrode Capacitances:[o]			
Grid No.1 to plate	0.4	max.	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	9		μμf
Plate to cathode & grid No.3, grid No.2, and heater	6		μμf

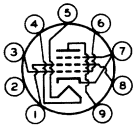
Characteristics, Class A_1 Amplifier:

Plate Voltage	250	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 Voltage	-15	volts
Plate Resistance (Approx.)	73000	ohms
Transconductance	4800	μmhos
Plate Current	46	ma
Grid-No.2 Current	3.5	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	-40	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	3-1/16"
Maximum Seated Length	2-13/16"
Length, Base Seat to Bulb Top (Excluding tip)	2-7/16" ± 3/32"
Maximum Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9EU

Pin 1 - Grid No.2
Pin 2 - No Connection
Pin 3 - Grid No.1
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Grid No.1
Pin 7 - Grid No.3, Cathode
Pin 8 - Grid No.2
Pin 9 - Plate

PUSH-PULL AF POWER AMPLIFIER — Class AB_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	440	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	330	max.	volts

◄ Indicates a change.

GRID-No.2 INPUT	2 max.		watts
PLATE DISSIPATION	12 max.		watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200 max.		volts
Heater positive with respect to cathode	200▲ max.		volts
BULB TEMPERATURE (At hottest point on bulb surface)	250 max.		°C

Typical Operation with Fixed Bias:

Values are for 2 tubes

Plate Voltage	250	350	400	volts
Grid-No.2 Voltage	250	280	290	volts
Grid-No.1 (Control-Grid) Voltage●	−15	−22	−25	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	30	44	50	volts
Zero-Signal Plate Current	92	58	50	ma
Max.-Signal Plate Current	105	106	107	ma
Zero-Signal Grid-No.2 Current	7	3.5	2.5	ma
Max.-Signal Grid-No.2 Current	16	14	13.7	ma
Effective Load Resistance (Plate to plate)	8000	7500	8000	ohms
Total Harmonic Distortion	2	1.5	2	%
Max.-Signal Power Output	12.5	20	24	watts

Typical Operation with Cathode Bias:

Values are for 2 tubes

Plate Supply Voltage	300	310	volts
Grid-No.2 Supply Voltage	300	310	volts
Cathode Resistor	230	270	ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage	48	55	volts
Zero-Signal Plate Current	80	77	ma
Max.-Signal Plate Current	96	92	ma
Zero-Signal Grid-No.2 Current	6	5	ma
Max.-Signal Grid-No.2 Current	14	14	ma
Effective Load Resistance (Plate to plate)	5500	6000	ohms
Total Harmonic Distortion	2	4	%
Max.-Signal Power Output	15	17	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:●		
For fixed-bias operation	0.5 max.	megohm
For cathode-bias operation	1 max.	megohm

PUSH-PULL AF POWER AMPLIFIER — Class AB_1

Grid No.2 of each tube connected to tap on plate winding of output transformer

→**Maximum Ratings,** *Design-Maximum Values:*

PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	410 max.	volts

→ Indicates a change.

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BEAM POWER TUBE

GRID-No.2 INPUT	1.75	max.	watts
PLATE DISSIPATION	12	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250	max.	°C

Typical Operation:

Values are for 2 tubes

	Fixed Bias	*Cathode Bias*	
Plate-Supply Voltage	375	370	volts
Grid-No.2 Supply Voltage	*	#	volts
Grid-No.1 (Control-Grid) Voltage●	-33.5	-	volts
Cathode Resistor	-	355	ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage	67	62	volts
Zero-Signal Cathode Current	62	74	ma
Max.-Signal Cathode Current	95	84	ma
Effective Load Resistance (Plate to plate)	12500	13000	ohms
Total Harmonic Distortion	1.5	1.2	%
Max.-Signal Power Output	18.5	15	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:●			
For fixed-bias operation	0.5	max.	megohm
For cathode-bias operation	1	max.	megohm

▷ Without external shield.

▲ The dc component must not exceed 100 volts.

● The type of input coupling network used should not introduce too much resistance in the grid-No.1 circuit. Transformer- or impedance-coupling devices are recommended.

* Obtained from taps on the primary winding of the output transformer. The taps are located on each side of the center tap (B+) so as to apply 50 per cent of the plate signal voltage to grid No.2 of each output tube.

\# Obtained from taps on the primary winding of the output transformer. The taps are located on each side of the center tap (B+) so as to supply 43 per cent of the plate signal voltage to grid No.2 of each output tube.

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AVERAGE PLATE CHARACTERISTICS

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM – 9380

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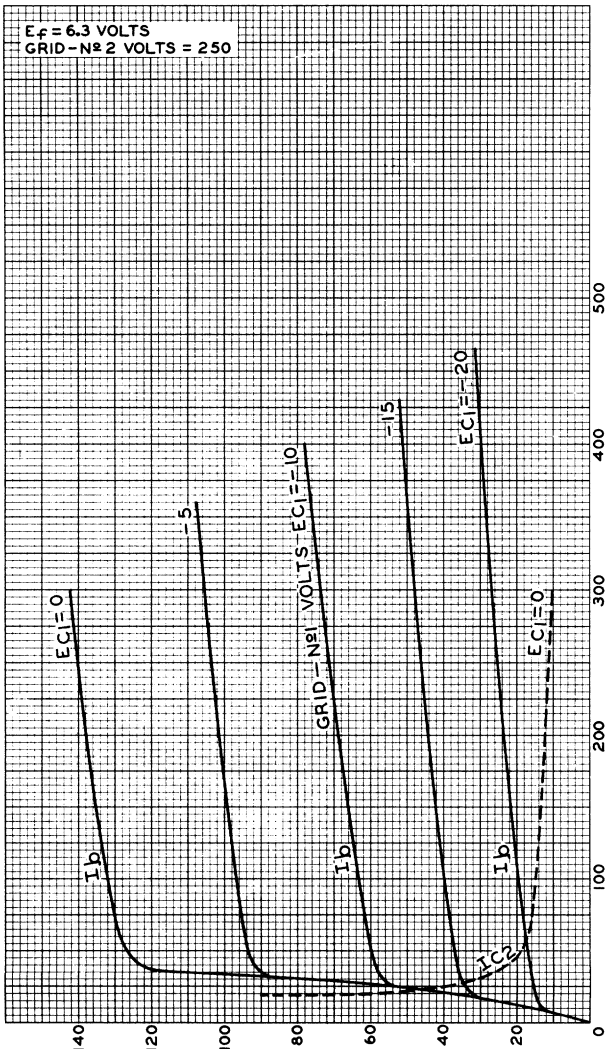
AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION 92CM-9389

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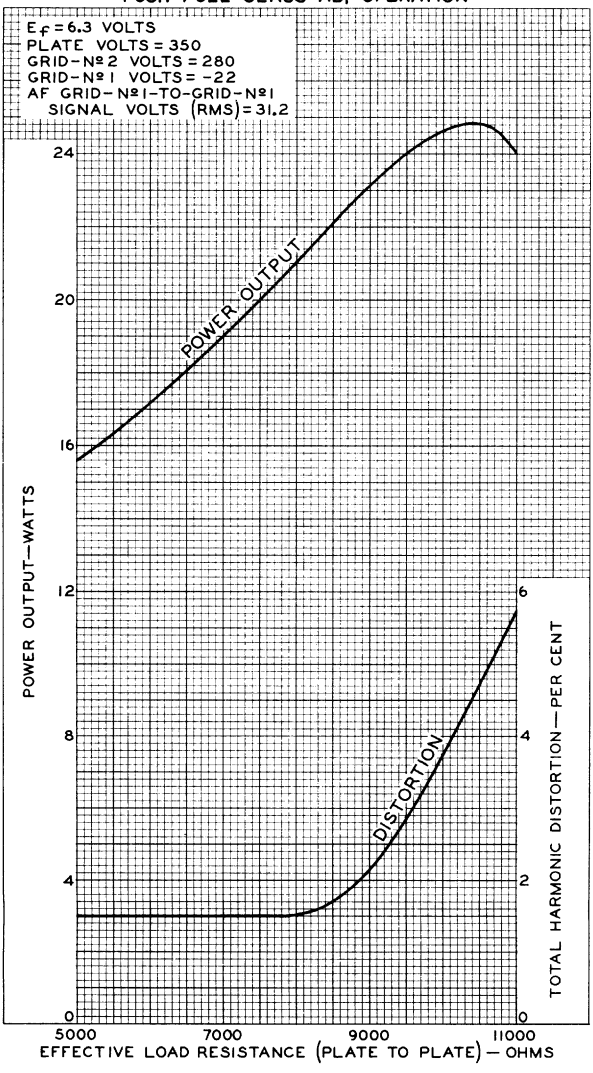
OPERATION CHARACTERISTICS

PUSH-PULL CLASS AB1 OPERATION



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9381

7008
MAGNETRON

SERVO-TUNABLE TYPE

FORCED-AIR COOLED — INTEGRAL MAGNET

For use as a pulsed oscillator at frequencies between 8500 and 9600 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage	13.75 ± 10%	ac or dc volts
Current at 13.75 volts	3.15	amp
Starting current	The maximum instantaneous starting current must never exceed 12 amperes, even momentarily	
Minimum Cathode Heating Time	2.5	minutes
Frequency	8500 to 9600	Mc
Maximum Frequency Pulling at VSWR of 1.5	15	Mc

Mechanical:

Operating Position	Any
Dimensions	*See Dimensional Outline*
Air Flow:	
Through Ducts--An air stream should be directed through each of the cooling ducts provided on the tube. Adequate flow should be provided so that the temperature of the anode block does not exceed 150° C.	
To Heater-Cathode Terminal--Adequate flow should be provided to maintain the temperature of the heater-cathode terminal below 165° C.	
Waveguide Output Flange	Mates with Modified JAN UG-52A/U Flange
Servo-Drive Shaft with Associated Calibrated Indicator:	
Revolutions (Approx.) to cover full range of 8500 to 9600 Mc	160
Maximum Torque (Absolute) at tuning-range stops	192 oz-in.
Typical Torque between -55° and +150° C (Approx.)	6 oz-in.
Weight (Approx.)	13 lbs

PULSED-OSCILLATOR SERVICE

Maximum and Minimum Ratings, *Absolute Values:*

For duty cycle up to 0.0011 maximum

PEAK ANODE VOLTAGE	23 max.	kv
PEAK ANODE CURRENT	27.5 max.	amp
PEAK POWER INPUT●	630 max.	kw
AVERAGE POWER INPUT	0.63 max.	kw
PULSE DURATION	2.75 max.	μsec

●: See next page.

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MAGNETRON

RATE OF RISE OF VOLTAGE PULSE:		
For pulse duration of 1 μsec or less	225 max.	kv/μsec
	70 min.	kv/μsec
For pulse duration greater than 1 μsec.	200 max.	kv/μsec
	70 min.	kv/μsec
ANODE-BLOCK TEMPERATURE.	150 max.	°C
HEATER-CATHODE-TERMINAL TEMPERATURE.	165 max.	°C
LOAD-VOLTAGE STANDING-WAVE RATIO	1.5 max.	

Typical Operation# with Load-Voltage Standing-Wave Ratio Equal to or Less than 1.05, Except as Noted:

With duty cycle of 0.001

Heater Voltage	*See Operating Considerations*		
Peak Anode Voltage	22	22	kv
Peak Anode Current	27.5	27.5	amp
Pulse-Repetition Rate	400	4000	cps
Pulse Duration	2.5	0.25	μsec
RF Bandwidth with worst phasing of 1.5 VSWR.	0.5	5	Mc
Side Lobes with worst phasing of 1.5 VSWR.	8	10	db
Pulling Figure at VSWR of 1.5.	10	10	Mc
Pushing Figure	0.2	0.2	Mc/amp
Thermal Factor for any 30° range of anode-block temperature between -55° C and 150° C.	0.2	0.2	Mc/°C
Servo-Drive-Shaft Torque	6	6	oz-in.
Frequency Deviation due to tuning backlash.	8	8	Mc
Peak Power Output (Approx.).	220	220	kw

• For atmospheric pressure greater than 600 millimeters of mercury in the vicinity of the heater-cathode stem. Operation at pressures lower than 600 millimeters of mercury may result in arc-over across the stem with consequent damage to the tube. The waveguide must always be pressurized to a minimum of 15 psi absolute to prevent arcing, especially when there is a mismatched load. Arcing in the waveguide due to lack of pressure can damage the tube.

It is essential that the input circuit be designed so that if arcing occurs the energy per pulse delivered to the tube cannot greatly exceed the normal energy per pulse. To satisfy this requirement, it is recommended that pulsers of the discharging-network type be used.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	2.8	3.5	amp
Peak Anode Voltage	2	20	23	kv
Peak Power Output.	3	180	-	kw
Pulses Missing from Total.	4,5	-	0.25	%

Notes 1 to 5: See next page.

Note 1: With 13.75 volts ac or dc on heater.

Note 2: With peak anode current of 27.5 amperes. For heater voltage, *see Operating Considerations.*

Note 3: With peak anode current of 27.5 amperes corresponding to a peak anode voltage in the order of 22 kv, anode-block temperature of 115° C approx., pulse duration of 2.5 microseconds, and maximum load-voltage standing-wave ratio equal to or less than 1.05. For heater voltage, *see Operating Considerations.*

Note 4: Pulses are considered to be missing if the energy level at the operating frequency is less than 70 per cent of the normal value.

Note 5: With peak anode current of 27.5 amperes corresponding to a peak anode voltage in the order of 22 kv, anode-block temperature of 115° C approx., pulse duration of 0.25 microsecond, load-voltage standing-wave ratio of 1.5 adjusted in phase to produce maximum instability. For heater voltage, *see Operating Considerations.*

DEFINITIONS

Smooth Peak Value. The maximum value of a smooth curve drawn through the average of the fluctuation over the top of a voltage or current pulse.

Pulse Width. The time interval between the two points of the current pulse at which the current is 50 per cent of the smooth peak value.

Rate of Rise of Voltage Pulse. The steepest slope of the voltage-pulse leading edge above 50 per cent of the smooth peak value. Measurement of the rate of rise of voltage should be made using a capacitance divider with an input capacitance not exceeding 6 $\mu\mu f$. An oscilloscope of sufficient bandpass, such as the Tektronix 517 or equivalent, should be used.

OPERATING CONSIDERATIONS

Mounting of the 7008 should be accomplished by means of the mounting flange which may be positioned to operate the tube in any orientation. This flange is made to permit use of the 7008 in applications requiring a pressure seal. Care should be taken by the equipment designer to insure that the tube is mounted on a surface having adequate flatness so as to avoid possible distortion of the mounting flange when it is bolted to the mounting surface. Captive 1/4" – 20 bolts are provided at the corners of the mounting flange for mounting the magnetron. These four mounting bolts are held in position during shipment of the 7008 by plastic sleeving which also serves to protect the bolt threads.

Fastening the JAN RG-51/U waveguide to the waveguide output flange of the tube is accomplished in the following manner. A JAN UG-52A/U choke flange or equivalent should be modified by drilling out the screw threads from the four mounting holes in the choke flange using a No. 15 drill. This operation will permit four size 8-32 bolts inserted through the flange mounting holes, to engage the threaded waveguide output flange of the tube. It is recommended that the choke flange be sufficiently tight to avoid arcing and other contact effects. Before the choke flange is fastened to the waveguide output flange of the tube, the user should make certain that the waveguide window is entirely free of dust to prevent possible arcing with consequent damage to the tube

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7008

MAGNETRON

A conduit should be attached to each of the inlet-air duct flanges provided on the tube. The conduits should be made of flexilbe, non-magnetic material. Rubber hose or stainless-steel hose is suitable. Fastening of the conduits requires two non-magnetic 6-32 screws at each duct. Adequate flow of cooling air should be provided through the ducts to maintain the temperature of the anode block below 150° C under any condition of operation. Failure to provide adequate cooling will impair tube life. Cooling of the heater-cathode terminal may be required under some conditions to maintain the temperature of this terminal below 165° C.

A mechanical drive may be connected to the drive shaft of the 7008 by using a flexible coupling drilled for a 3/16"-diameter shaft and held in place by a setscrew. When the magnetron is installed in radar equipment which has a frequency index dependent upon rotation of the drive shaft, both the index and the 7008 tuner indicator should be adjusted to the same frequency before the drive coupling is connected to the drive shaft.

The *heater terminal and the heater-cathode terminal require the use of a connector with flexible leads* such as the Ucinite* No. 115364 with built-in capacitor, or equivalent. Unless flexible leads are used, the heater and heater-cathode seals may be damaged.

A *heater starter* should be used to raise the voltage gradually and to limit the instantaneous starting current through the heater when the circuit is first closed. The starter may be either a system of time-delay relays cutting resistance out of the circuit, a high-reactance heater transformer, or a simple rheostat. Regardless of the method of control, it is important that the maximum instantaneous starting current never exceed, even momentarily, a value of 12 amperes. Exceeding this value may damage the heater.

After the heater voltage is raised to its rated value of 13.75 volts, allow the cathode to warm up for at least 2-1/2 minutes to make sure that the cathode reaches operating temperature. When the cathode has reached full operating temperature, high-voltage pulses, negative with respect to anode (ground), can be applied to the heater-cathode terminal. As soon as the 7008 begins to oscillate, the heater voltage (Ef) should be reduced in accordance with the following formulas, depending on the average power input (Pi) to the tube:

$$P_i \text{ up to } 450 \text{ watts: } E_f = 13.75 \left(1 - \frac{P_i}{450}\right) \text{ volts}$$

$$P_i \text{ greater than } 450 \text{ watts: } E_f = 0 \text{ volts}$$

When the 7008 is oscillating, the cathode is subjected to considerable electron bombardment which raises the temperature of the cathode. The magnitude of such heating is a

* Manufactured by Ucinite Division of United-Carr Fastener Corporation, Newtonville 60, Massachusetts.

function of the total dissipation and must be compensated by reduction of heater voltage in order to prevent overheating of the cathode. Failure to start the tube at rated heater voltage and to reduce the heater voltage as soon as oscillation starts may adversely affect tube life.

The heater should be protected against input pulse power by placing a suitable capacitor in shunt with the heater leads as near the heater-cathode stem as possible in order to limit the magnitude of the transient voltages which may develop across the heater. This capacitor may be incorporated in the design of the connector for the heater terminal and heater-cathode terminal.

The *anode-circuit return* should be made to the *heater-cathode terminal.* If the anode-circuit return is made to the heater terminal, all of the anode current will flow through the heater and may cause heater burnout.

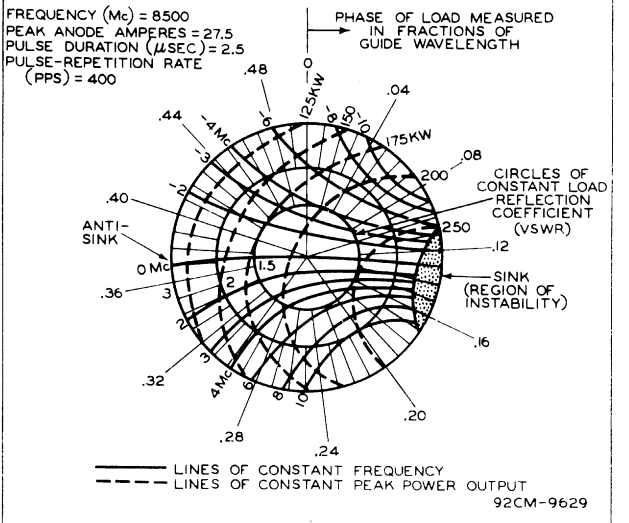
The *frequency of the 7008 may be preset* by turning the drive shaft until the setting of the indicator is reached corresponding to the desired frequency. For precise tuning adjustment, the final indicator setting should be approached using a counterclockwise direction of rotation which is the direction of increasing frequency.

Revolutions of the servo-drive shaft are not indicated directly by the indicator. Approximately 160 revolutions of the drive shaft are required to tune through the 8500-to-9600-Mc range. A tuning rate of 200 megacycles per second can be achieved. Typical servo-drive-shaft torque is 6 ounce-inches throughout the temperature range of -55° to 150° C. Mechanical stops are provided at each end of the tuning range. Torque applied to these stops and the starting torque must not exceed 192 ounce-inches (1 foot-pound) including inertial effects.

Our engineers are ready to assist you in circuit applications of the RCA-7008. For further information, write to Commercial Engineering, RCA, Harrison, New Jersey, giving complete details as to the proposed service.

7008
MAGNETRON

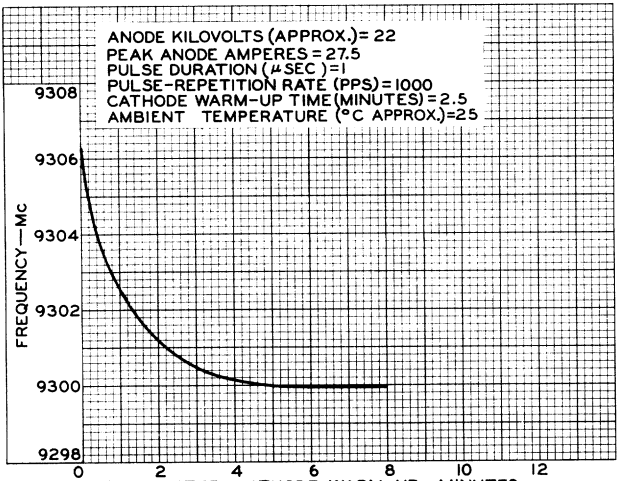
RIEKE DIAGRAM



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

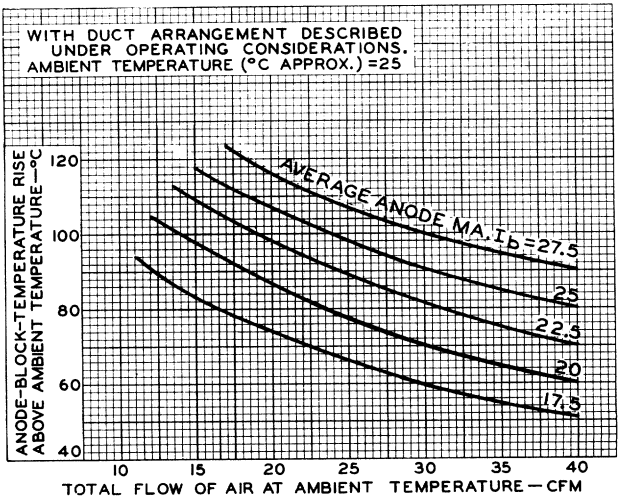
7008

TYPICAL STABILIZATION CHARACTERISTIC



92CS-8941RI

TYPICAL COOLING REQUIREMENTS



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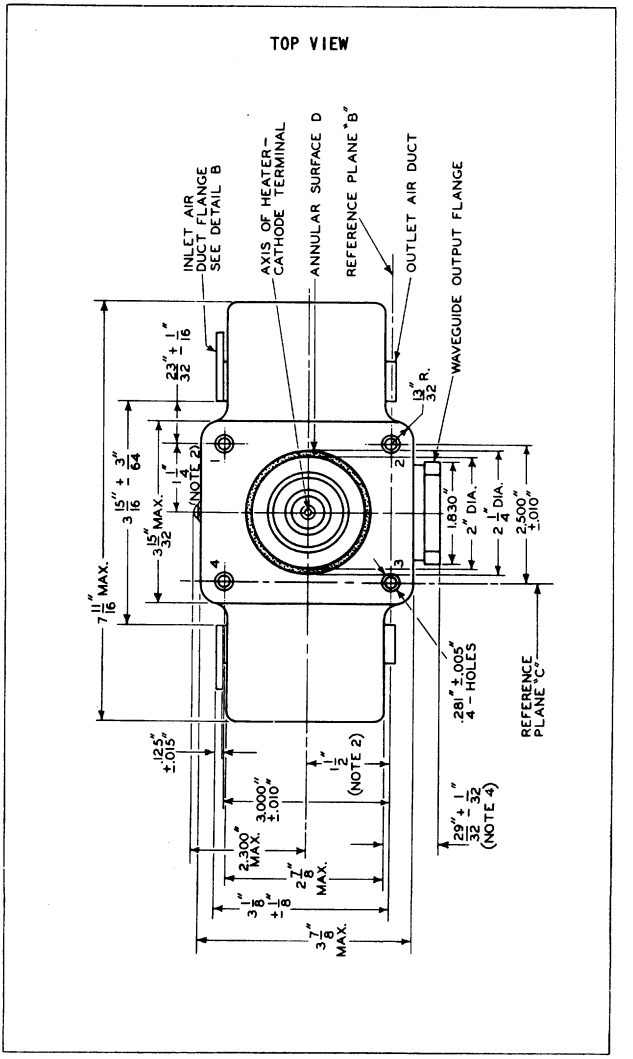
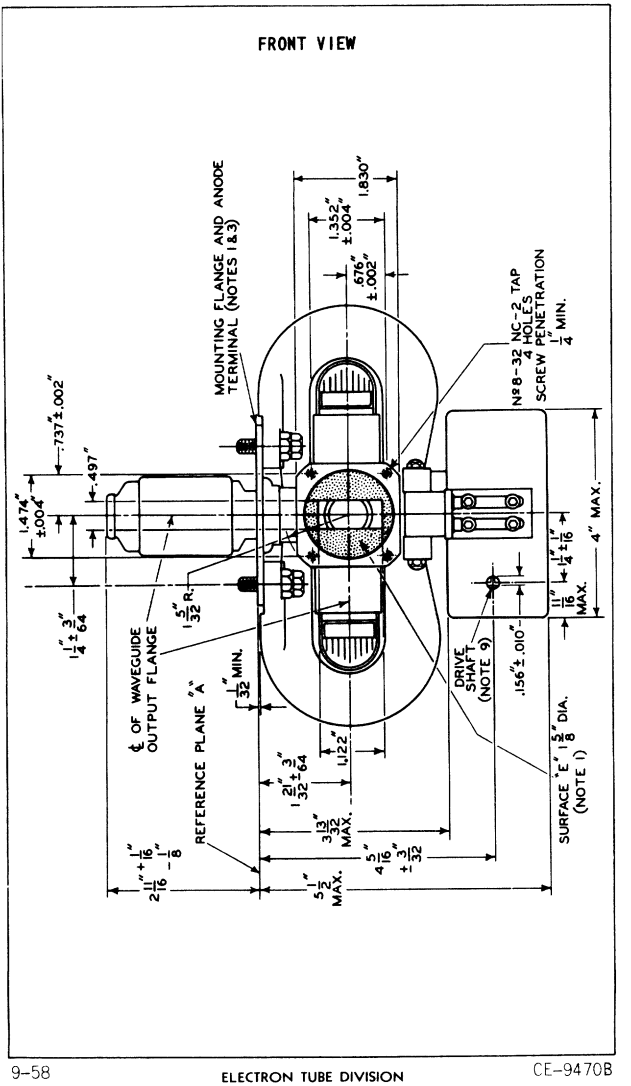
7008
MAGNETRON



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7008

MAGNETRON

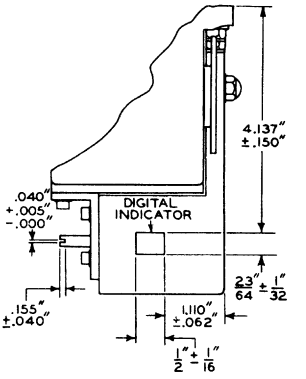


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

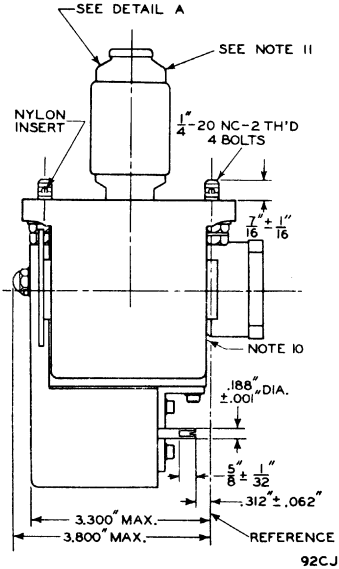
7008

MAGNETRON

PARTIAL RIGHT-SIDE VIEW



LEFT-SIDE VIEW



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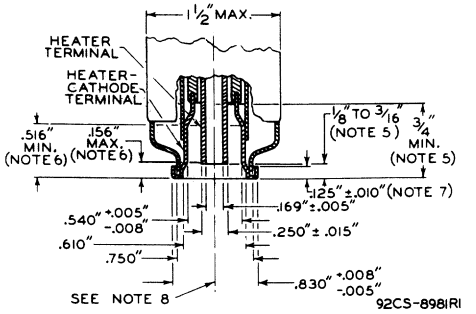
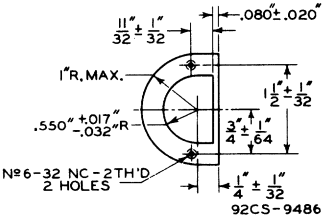
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7008
MAGNETRON

DETAIL A



DETAIL B



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7008
MAGNETRON

REFERENCE PLANE A IS DEFINED AS THE PLANE THROUGH THAT PORTION OF THE MOUNTING FLANGE DESIGNATED AS ANNULAR SURFACE D.

REFERENCE PLANE B IS DEFINED AS THE PLANE WHICH IS PERPENDICULAR TO PLANE A AND PASSES THROUGH THE EXACT CENTERS OF MOUNTING-FLANGE HOLES No.2 & No.3 WHICH HAVE THE SPECIFIED BOLTS INSERTED THROUGH THEM.

REFERENCE PLANE C IS DEFINED AS THE PLANE WHICH IS PERPENDICULAR TO PLANE A & PLANE B AND PASSES THROUGH THE EXACT CENTER OF MOUNTING-FLANGE HOLES No.3 & No.4 WHICH HAVE THE SPECIFIED BOLTS INSERTED THROUGH THEM.

NOTE 1: SURFACE E OF THE WAVEGUIDE OUTPUT FLANGE, AND THE ENTIRE MOUNTING FLANGE ARE MADE SO THAT THEY MAY BE USED TO PROVIDE A HERMETIC SEAL.

NOTE 2: THE AXIS OF THE HEATER-CATHODE TERMINAL WILL BE WITHIN THE CONFINES OF A CYLINDER WHOSE RADIUS IS 3/64" AND WHOSE AXIS IS PERPENDICULAR TO REFERENCE PLANE A AT THE SPECIFIED LOCATION.

NOTE 3: ALL POINTS ON MOUNTING FLANGE WILL LIE WITHIN 0.015" ABOVE OR BELOW REFERENCE PLANE A.

NOTE 4: THE LIMITS INCLUDE ANNULAR AS WELL AS LATERAL DEVIATIONS.

NOTE 5: THESE DIMENSIONS DEFINE EXTREMITIES OF THE 0.169" INTERNAL DIAMETER OF THE CYLINDRICAL HEATER TERMINAL.

NOTE 6: THESE DIMENSIONS DEFINE EXTREMITIES OF THE 0.540" INTERNAL DIAMETER OF THE CYLINDRICAL HEATER-CATHODE TERMINAL.

NOTE 7: NO PART OF THE CONNECTOR DEVICE FOR THE HEATER AND HEATER-CATHODE TERMINALS SHOULD BEAR AGAINST THE UNDERSIDE OF THIS LIP.

NOTE 8: THE HEATER TERMINAL AND THE HEATER-CATHODE TERMINAL ARE CONCENTRIC WITH 0.010".

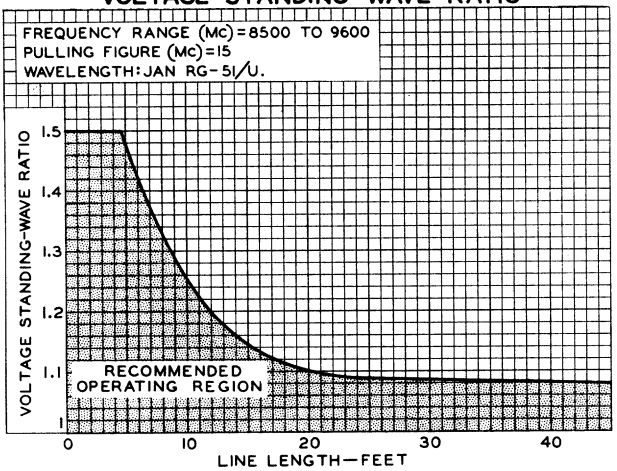
NOTE 9: CLOCKWISE ROTATION OF DRIVE SHAFT DECREASES FREQUENCY.

NOTE 10: ANODE TEMPERATURE MEASURED AT JUNCTION OF WAVEGUIDE AND ANODE BLOCK.

NOTE 11: TEMPERATURE OF HEATER-CATHODE TERMINAL MEASURED HERE.

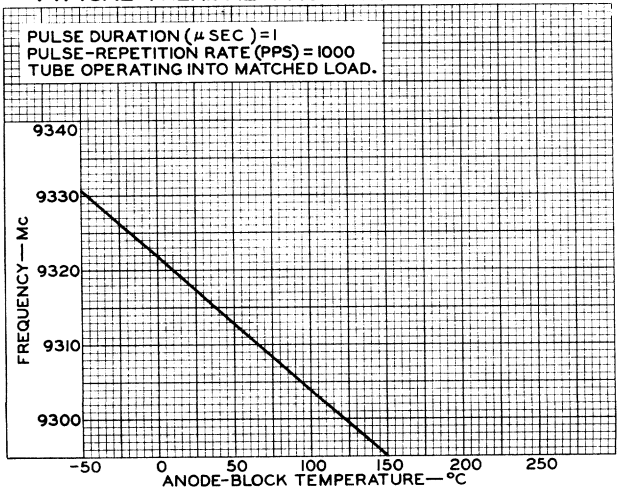
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
CE-9470D

EFFECT OF LENGTH OF TRANSMISSION LINE BETWEEN OUTPUT FLANGE AND LOAD ON ALLOWABLE VOLTAGE STANDING-WAVE RATIO



92CS-9469RI

TYPICAL THERMAL-FACTOR CHARACTERISTIC

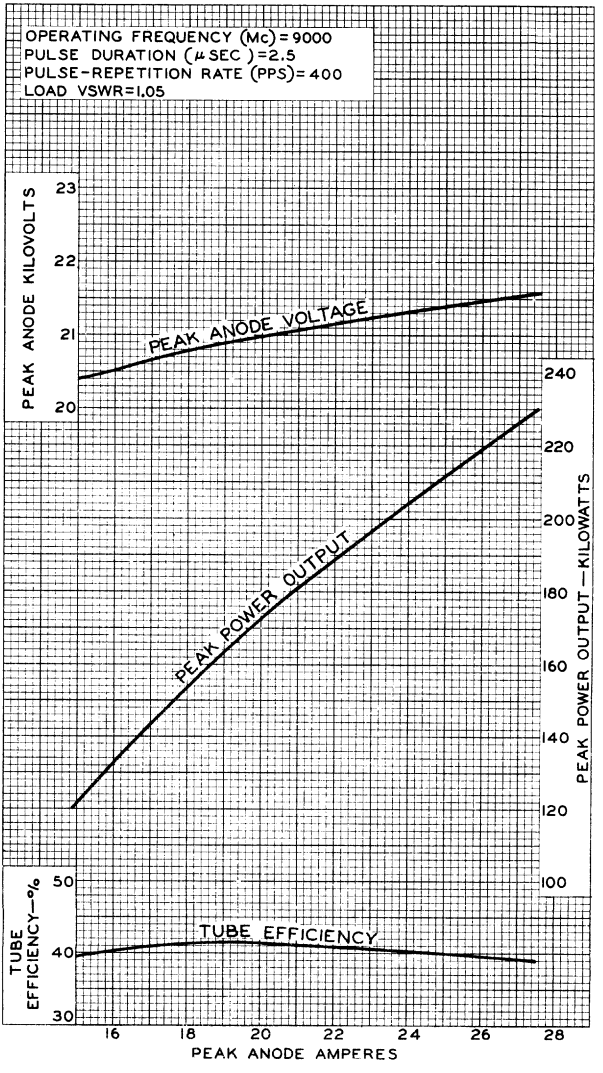


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CS-9285RI

7008

TYPICAL PERFORMANCE CURVES

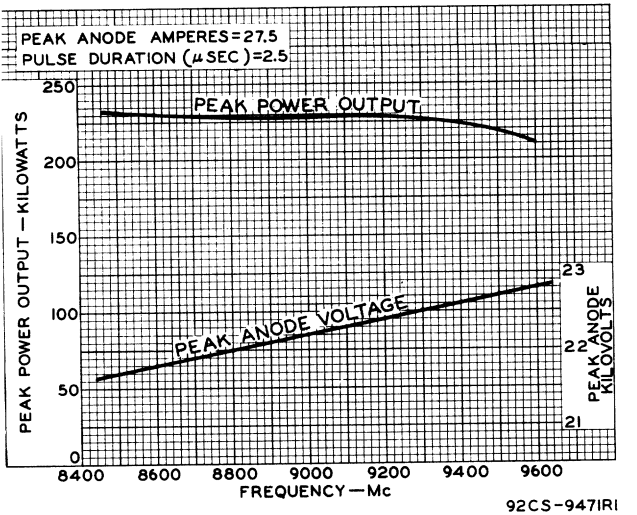


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9468RI

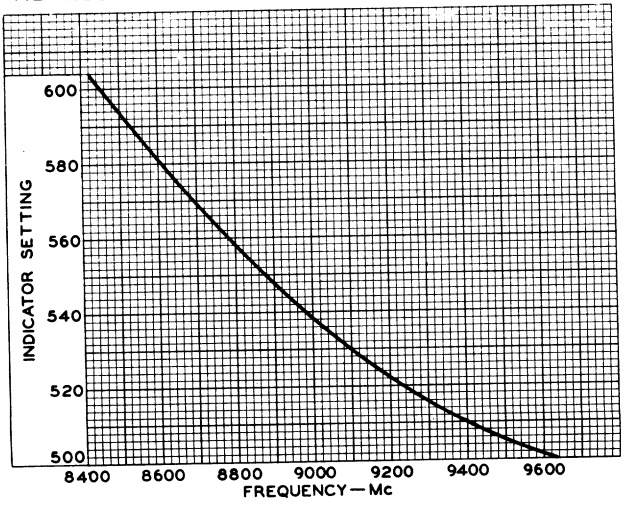
7008

TYPICAL PERFORMANCE CURVES



92CS-9471RI

REPRESENTATIVE TUNING CHARACTERISTIC



92CS-9466

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7025

HIGH-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For high-fidelity audio-amplifier applications critical as to noise and hum. In other respects, the 7025 is similar to the 12AX7.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

	Series	*Parallel*	
Heater arrangement			
Voltage	12.6	6.3	ac or dc volts
Current	0.15	0.3	amp

Direct Interelectrode Capacitances (Approx.):[o]

	Unit No.1	*Unit No.2*	
Grid to plate	1.7	1.7	μμf
Grid to cathode and heater	1.6	1.6	μμf
Plate to cathode and heater	0.46	0.34	μμf

Equivalent-Noise and Hum Voltage (Referenced to Grid):

Values are for Each Unit

Average Value (RMS) . . . . . 1.8 microvolts

Measured in "true rms" units under the following conditions: heater volts = 6.3 ac (parallel connection), center-tap of heater transformer connected to ground, dc plate-supply volts = 250, plate load resistor (megohms) = 0.1, cathode resistor (ohms) = 2700, cathode-bypass capacitor (μf) = 100, grid resistor (ohms) = 0, and amplifier covering frequency range between 25 and 10,000 cps.

Maximum Value (RMS) . . . . . 7 microvolts

Measured in "true rms" units under the same conditions as for "Average Value" except that the cathode resistor is unbypassed, and grid resistor (megohms) = 0.05.

Characteristics, Class A_1 Amplifier (Each Unit):

Plate Voltage	100	250	volts
Grid Voltage	−1	−2	volts
Amplification Factor	100	100	
Plate Resistance (Approx.)	80000	62500	ohms
Transconductance	1250	1600	μmhos
Plate Current	0.5	1.2	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2

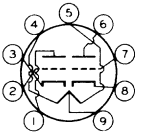
[o]: See next page.

7025

HIGH-MU TWIN TRIODE

Base . . . . . Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW 9A

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pins 4 & 9 - Heater of Unit No.2
Pins 5 & 9 - Heater of Unit No.1
Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Heater Mid-Tap



AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	330	max.	volts
GRID VOLTAGE:			
Negative-bias value	55	max.	volts
Positive-bias value	0	max.	volts
PLATE DISSIPATION	1.2	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

Typical Operation as Resistance-Coupled Amplifier (Each Unit):

See RESISTANCE-COUPLED AMPLIFIER CHART No.25 at front of Receiving Tube Section

○ Without external shield.
▲ The dc component must not exceed 100 volts.

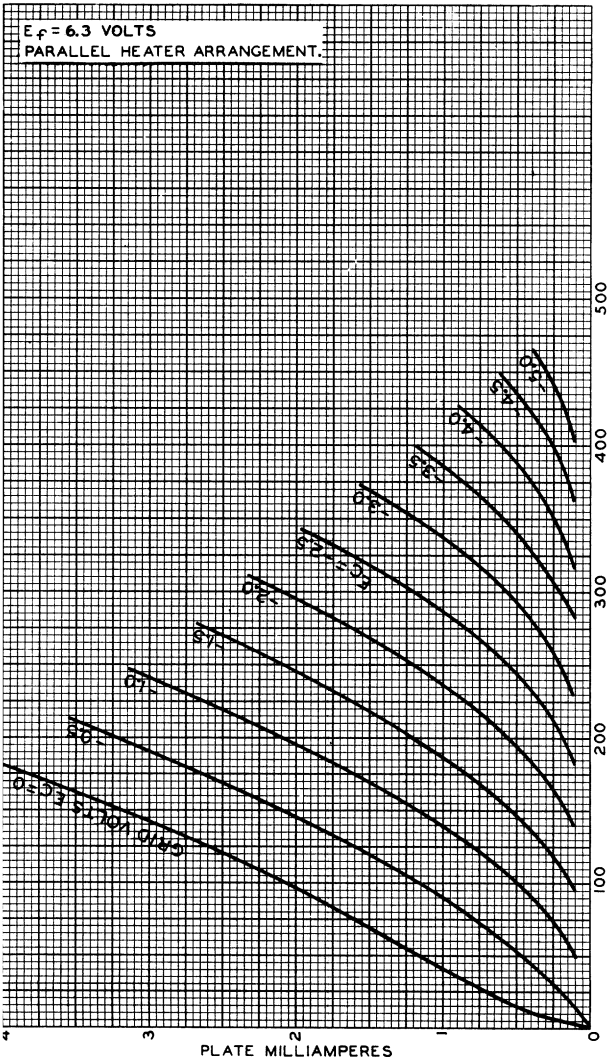
OPERATING CONSIDERATIONS

Parallel heater arrangement is recommended for use in high-gain, resistance-coupled-amplifier applications such as in the preamplifier stages of phonographs, microphones, and tape recorders. With closely paired, electrostatically shielded heater leads, a hum-balance control is unnecessary when the center-tap of the heater transformer is connected to ground. In applications where the heater-transformer winding does not have a center-tap, a 100-ohm hum-balancing potentiometer should be connected across the heater leads with the slider connected to ground.

7025

AVERAGE PLATE CHARACTERISTICS

EACH UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSE

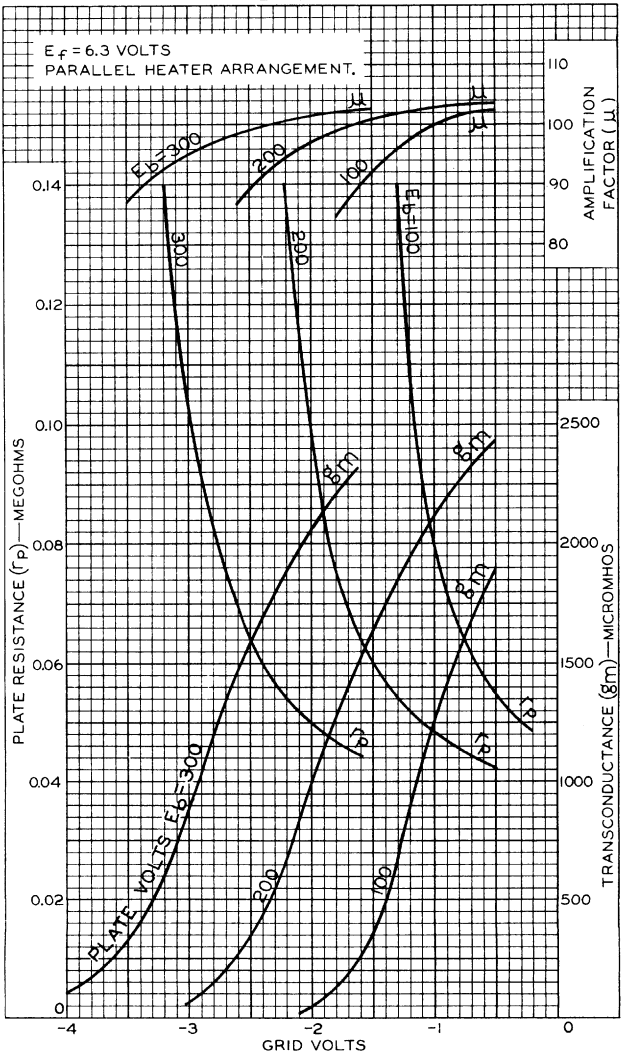
92CM-6879

7025

7025

AVERAGE CHARACTERISTICS

EACH UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6880

7027-A
BEAM POWER TUBE

For high-fidelity audio-amplifier applications

Supersedes Type 7027

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.9	amp
Direct Interelectrode Capacitances:[o]		
Grid No.1 to plate	1.5	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	10	μμf
Plate to cathode & grid No.3, grid No.2, and heater	7.5	μμf

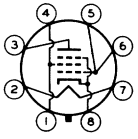
Characteristics, Class A_1 Amplifier:

Plate Voltage	250	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 Voltage	-14	volts
Plate Resistance (Approx.)	22500	ohms
Transconductance	6000	μmhos
Plate Current	72	ma
Grid-No.2 Current	5	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	4.62"
Maximum Seated Length	4.06"
Maximum Diameter	1 63"
Bulb	T12
Base	Small-Wafer Octal 8-Pin with "950" Sleeve (JEDEC Group 1, No.B8-191)
Basing Designation for BOTTOM VIEW	8HY

Pin 1 - Grid No.2
Pin 2 - Heater
Pin 3 - Plate
Pin 4 - Grid No.2
Pin 5 - Grid No.1



Pin 6 - Grid No.1
Pin 7 - Heater
Pin 8 - Cathode, Grid No.3

PUSH-PULL AF POWER AMPLIFIER — Class AB_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	600	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	500	max.	volts
GRID-No.2 INPUT	5	max.	watts
PLATE DISSIPATION	35	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7027-A

7027-A

BEAM POWER TUBE

Typical Operation with Fixed Bias:

Values are for 2 tubes

Plate Voltage	400	450	540	volts
Grid-No.2 Voltage	300	350	400	volts
Grid-No.1 (Control-Grid) Voltage●	-25	-30	-38	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	50	60	76	volts
Zero-Signal Plate Current	102	95	100	ma
Max.-Signal Plate Current	152	194	220	ma
Zero-Signal Grid-No.2 Current	6	3.4	5	ma
Max.-Signal Grid-No.2 Current	17	19.2	21.4	ma
Effective Load Resistance (Plate to plate)	6600	6000	6500	ohms
Total Harmonic Distortion	2	1.5	2	%
Max.-Signal Power Output	34	50	76	watts

Typical Operation with Cathode Bias:

Values are for 2 tubes

Plate Supply Voltage	400	380	425	volts
Grid-No.2 Supply Voltage	300	380	425	volts
Cathode Resistor	200	180	200	ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage	57	68.5	86	volts
Zero-Signal Plate Current	112	138	150	ma
Max.-Signal Plate Current	128	170	196	ma
Zero-Signal Grid-No.2 Current	7	5.6	8	ma
Max.-Signal Grid-No.2 Current	16	20	20	ma
Effective Load Resistance (Plate to plate)	6600	4500	3800	ohms
Total Harmonic Distortion	2	3.5	4	%
Max.-Signal Power Output	32	36	44	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:●		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

PUSH-PULL AF POWER AMPLIFIER — Class AB_1

Grid No.2 of each tube connected to tap on plate winding of output transformer

Maximum Ratings, *Design-Maximum Values:*

PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	600	max.	volts
GRID-No.2 INPUT	4.5	max.	watts
PLATE DISSIPATION	35	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200▲	max.	volts

7027-A

BEAM POWER TUBE

Typical Operation:

Values are for 2 tubes

Plate Supply Voltage	410	volts
Grid-No.2 Supply Voltage	*	volts
Cathode Resistor	220	ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage	68	volts
Zero-Signal Cathode Current	134	ma
Max.-Signal Cathode Current	155	ma
Effective Load Resistance (Plate to plate)	8000	ohms
Total Harmonic Distortion	1.6	%
Max.-Signal Power Output	24	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:●		
For cathode-bias operation	0.5 max.	megohm

o Without external shield.

▲ The dc component must not exceed 100 volts.

● The type of input coupling network used should not introduce too much resistance in the grid-No.1 circuit. Transformer- or impedance-coupling devices are recommended.

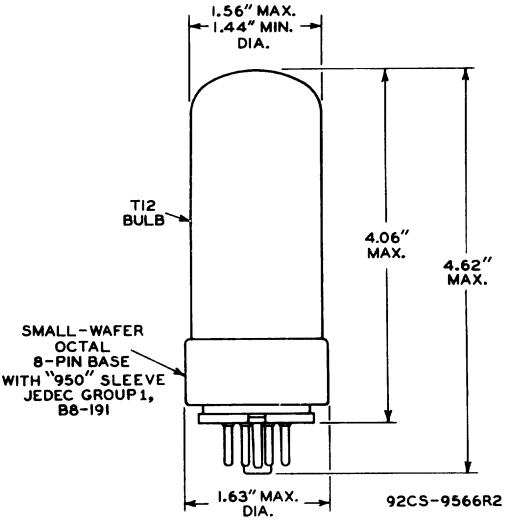
* Obtained from taps on the primary winding of the output transformer. The taps are located on each side of the center-tap (B+) so as to apply 43 per cent of the plate signal voltage to grid No.2 of each output tube.

OPERATING CONSIDERATIONS

The *bulb* becomes hot during operation. To insure adequate cooling, therefore, it is essential that free circulation of air be provided around the 7027-A.

7027-A

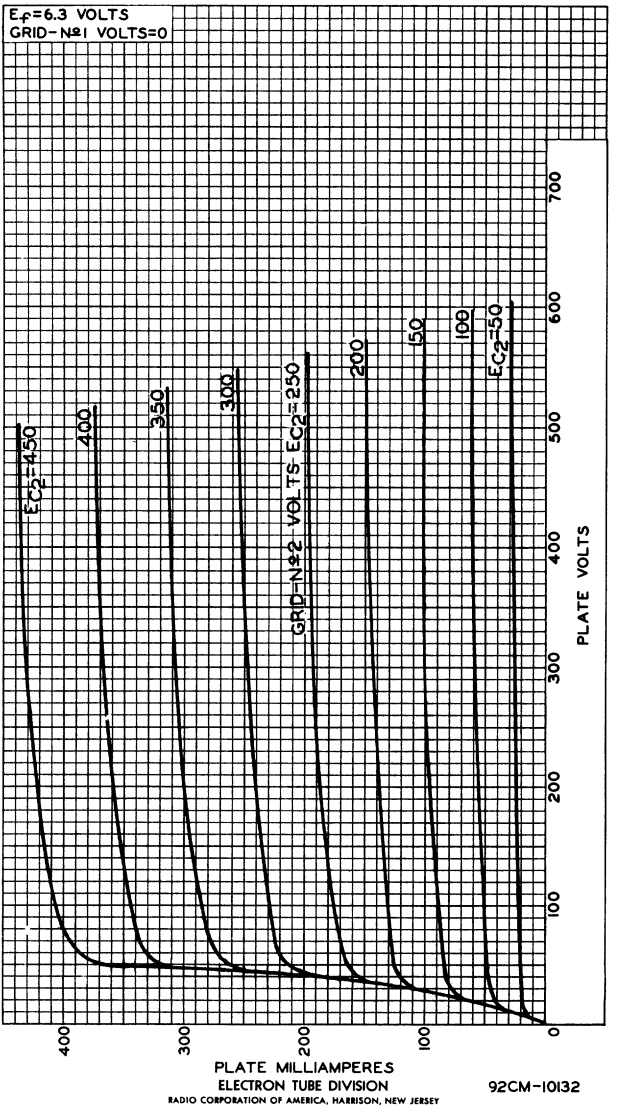
BEAM POWER TUBE



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7027-A

AVERAGE PLATE CHARACTERISTICS



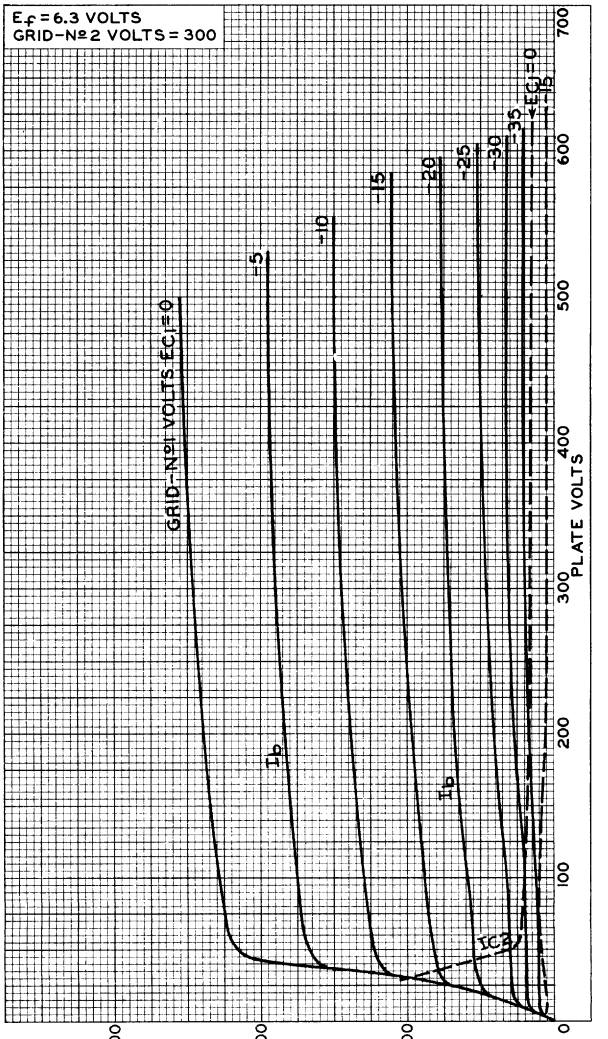
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10132

7027-A

7027-A

AVERAGE CHARACTERISTICS

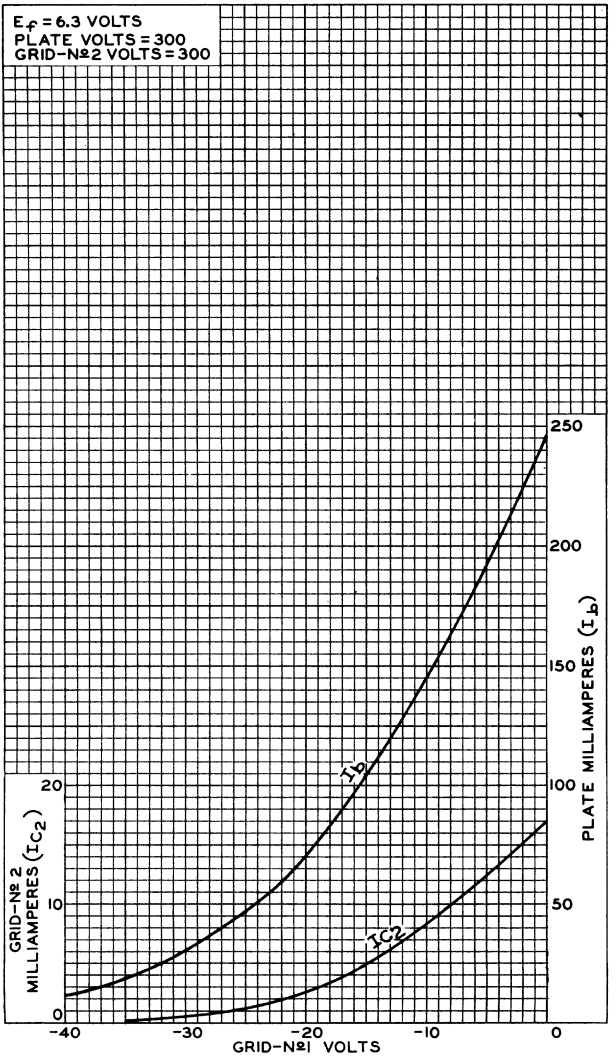


ELECTRON TUBE DIVISION 92CM-10133

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7027-A

AVERAGE CHARACTERISTICS

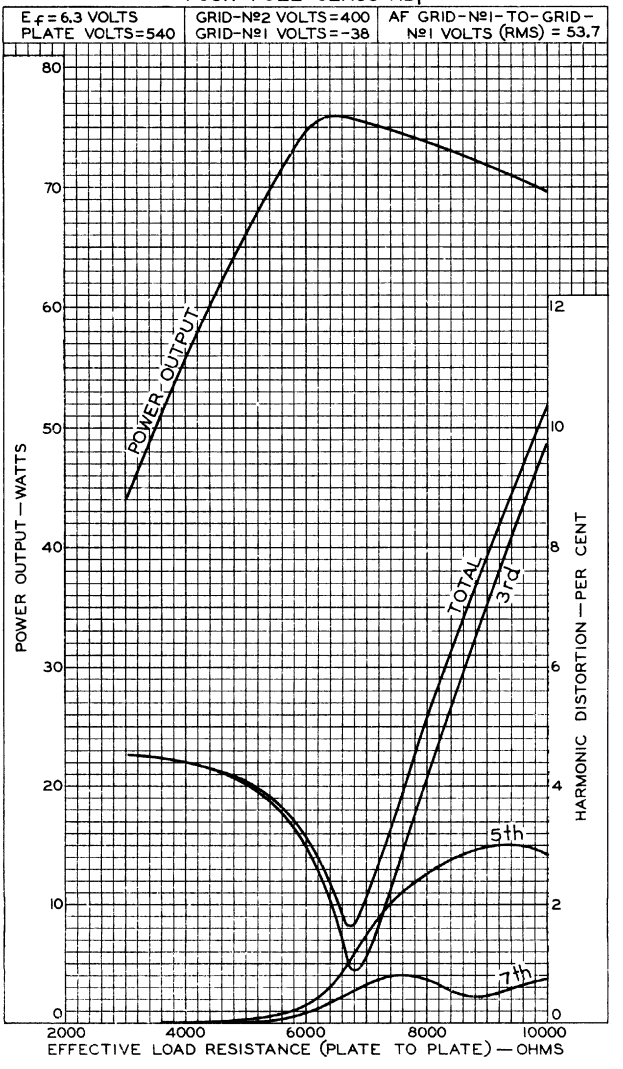


7027-A

7027-A

OPERATION CHARACTERISTICS

PUSH-PULL CLASS AB_1



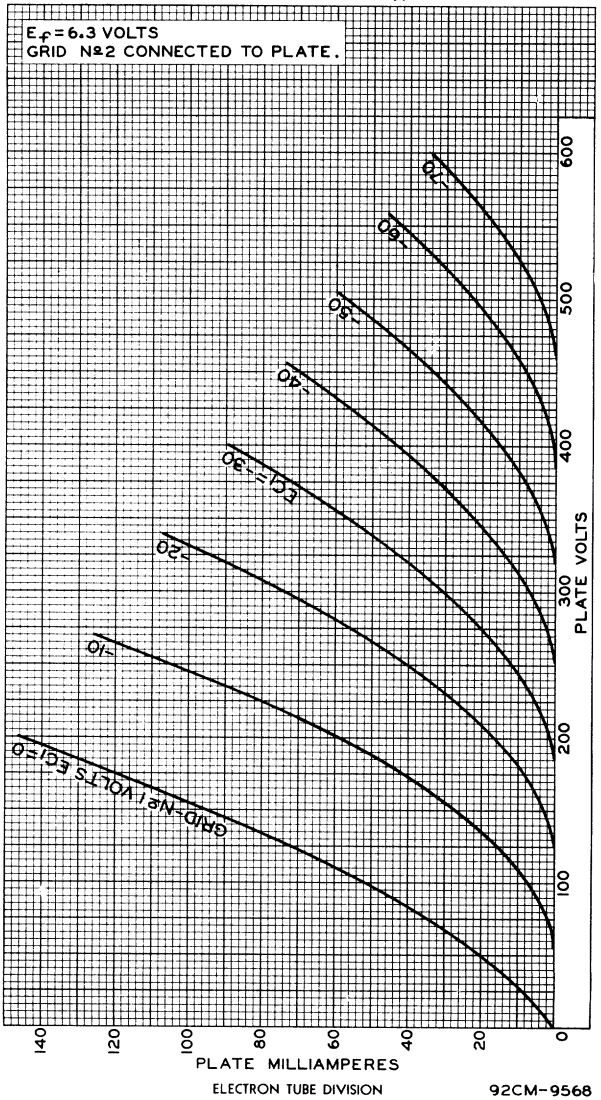
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10128

7027-A

AVERAGE PLATE CHARACTERISTICS

TRIODE CONNECTION



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-9568

7034/4X150A

Beam Power Tube

FORCED-AIR COOLED
COAXIAL-ELECTRODE STRUCTURE — 370 WATTS CW OUTPUT UP TO 150 Mc
UNIPOTENTIAL CATHODE — 140 WATTS CW OUTPUT AT 500 Mc
COMPACT DESIGN — INTEGRAL RADIATOR

For Use at Frequencies up to 500 Mc

GENERAL DATA

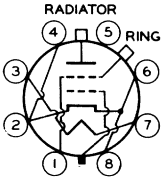
Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)[a]	6.0 ± 10%	volts
Current at heater volts = 6.0	2.6	amp
Minimum heating time	30	sec
Mu-Factor, Grid No.2 to Grid No.1, for grid-No.2 volts = 300 and grid-No.2 ma. = 50	5	
Direct Interelectrode Capacitances:[b]		
Grid No.1 to plate	0.03	μμf
Grid No.1 to cathode, grid No.2, and heater	16	μμf
Plate to cathode, grid No.2, and heater	4.4	μμf

Mechanical: ←

Operating Position	Any
Maximum Overall Length	2.404"
Maximum Seated Length	1.850"
Maximum Diameter	1.640"
Weight (Approx.)	4 oz
Radiator	Integral part of tube
Socket	Air-System Socket, such as Johnson No.124-110-1[c] (Supplied with Air Chimney)
Base	Special 8-Pin

BOTTOM VIEW



Pin 1 - Grid No.2[d]
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Cathode
Pin 5 - Do Not Use
Pin 6 - Cathode
Pin 7 - Heater

Pin 8 - Cathode
Base Index Plug - Grid No.1
Radiator - Plate
Ring Terminal[e] - Grid No.2

Air Flow:

Through indicated air-system socket—This fitting directs the air over the base seals; past the grid-No.2 seal, glass envelope, and plate seal; and through the radiator to provide effective cooling with minimum air flow. When the tube is operated at maximum plate dissipation for each class of service, a minimum air flow of 5.6 cfm

← Indicates a change.

through the system is required. The corresponding pressure drop is 0.45 inch of water. These requirements are for operation at sea level and at an ambient temperature of 20° C. At higher altitudes and ambient temperatures, the air flow must be increased to maintain the respective seal temperatures and the plate temperature within maximum ratings.

Without air-system socket—If an air-system socket is not used, it is essential that adequate cooling air be directed over the base seals, past the envelope, and through the radiator. Under these conditions and with the tube operating at maximum plate dissipation for each class of service, a minimum air flow of 5.3 cfm must pass through the radiator. The corresponding pressure drop is 0.28 inch of water. These requirements are for operation at sea level and at an ambient temperature of 20° C. At higher altitudes and ambient temperatures, the air flow must be increased to maintain the respective seal temperatures and the plate temperature within maximum ratings.

Plate Temperature (Measured on base end of plate surface at junction with fins)	250 max.	°C
Temperature of Plate Seal	200 max.	°C
Temperature of Base Seals and Grid-No.2 Seal	175 max.	°C

AF POWER AMPLIFIER & MODULATOR — Class AB$_1$[f]

Maximum CCS[g] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	2000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	400 max.	volts
MAX.-SIGNAL DC PLATE CURRENT[h]	250 max.	ma
GRID-No.2 INPUT[h]	12 max.	watts
PLATE DISSIPATION[h]	250 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

Typical CCS Operation:

Values are for 2 tubes

DC Plate Voltage	800	1000	1500	2000	volts
DC Grid-No.2 Voltage	300	300	300	300	volts
DC Grid-No.1 (Control-Grid) Voltage	-40	-43	-50	-50	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	80	86	100	100	volts
Zero-Signal DC Plate Current	210	165	100	100	ma
Max.-Signal DC Plate Current	435	450	456	470	ma
Zero-Signal DC Grid-No.2 Current	0	0	0	0	ma
Max.-Signal DC Grid-No.2 Current	76	52	42	36	ma

Effective Load Resistance (Plate to plate)	4400	4250	6570	8760	ohms
Max.-Signal Driving Power (Approx.)	0	0	0	0	watts
Max.-Signal Power Output (Approx.)	170	230	400	580	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance (Per tube)	0.1 max.	megohm

AF POWER AMPLIFIER & MODULATOR — Class AB_2[j]

Maximum CCS[g] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	2000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	400 max.	volts
MAX.-SIGNAL DC PLATE CURRENT[h]	250 max.	ma
GRID-No.2 INPUT[h]	12 max.	watts
PLATE DISSIPATION[h]	250 max.	watts
GRID-No.1 (CONTROL-GRID) INPUT	2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

Typical CCS Operation:

Values are for 2 tubes

DC Plate Voltage	800	1000	1500	2000	volts
DC Grid-No.2 Voltage	300	300	300	300	volts
DC Grid-No.1 Voltage	-40	-45	-50	-50	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	90	98	106	106	volts
Zero-Signal DC Plate Current	210	166	100	100	ma
Max.-Signal DC Plate Current	500	493	500	500	ma
Zero-Signal DC Grid-No.2 Current	0	0	0	0	ma
Max.-Signal DC Grid-No.2 Current	80	58	46	36	ma
Effective Load Resistance (Plate to plate)	3140	3950	5970	8100	ohms
Max.-Signal Driving Power (Approx.)	0.15	0.15	0.2	0.2	watt
Max.-Signal Power Output (Approx.)	215	270	440	630	watts

RF POWER AMPLIFIER — Class B Television Service

Synchronizing-level conditions per tube unless otherwise specified

Maximum CCS[g] Ratings, *Absolute-Maximum Values:*

	54 to 216 Mc	
DC PLATE VOLTAGE	1250 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	400 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-250 max.	volts
DC PLATE CURRENT (AVERAGE)[k]	250 max.	ma

GRID-No.2 INPUT	12 max.		watts
GRID-No.1 INPUT	2 max.		watts
PLATE DISSIPATION	250 max.		watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	150 max.		volts
Heater positive with respect to cathode.	150 max.		volts

Typical CCS Operation:

With bandwidth of 5 Mc

DC Plate Voltage	750	1000	1250	volts
DC Grid-No.2 Voltage	300	300	300	volts
DC Grid-No.1 Voltage	-60	-65	-70	volts
Peak RF Grid-No.1 Voltage:				
Synchronizing level	85	95	100	volts
Pedestal level	65	70	75	volts
DC Plate Current:				
Synchronizing level	335	330	305	ma
Pedestal level	245	240	230	ma
DC Grid-No.2 Current:				
Synchronizing level	50	45	45	ma
Pedestal level	20	15	10	ma
DC Grid-No.1 Current:				
Synchronizing level	15	20	25	ma
Pedestal level	4	4	4	ma
Driver Power Output (Approx.):[1]				
Synchronizing level	7	8	9	watts
Pedestal level	4.25	4.7	5.5	watts
Useful Power Output (Approx.):				
Synchronizing level	135	200	250	watts
Pedestal level	75	110	140	watts

LINEAR RF POWER AMPLIFIER

Single-Sideband Suppressed-Carrier Service

Maximum Ratings, *Absolute-Maximum Values:*

	Up to 150 Mc		*Up to 500 Mc*	
	CCS[g]	*ICAS*[m]	*CCS*[g]	
DC PLATE VOLTAGE	2000 max.	2250 max.	1250 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	400 max.	400 max.	400 max.	volts
MAX.-SIGNAL DC PLATE CURRENT	250 max.	280 max.	250 max.	ma
GRID-No.2 INPUT	12 max.	12 max.	12 max.	watts
PLATE DISSIPATION	250 max.	250 max.	300 max.	watts
PEAK HEATER-CATHODE VOLTAGE:				
Heater negative with respect to cathode	150 max.	150 max.	150 max.	volts
Heater positive with respect to cathode	150 max.	150 max.	150 max.	volts

→ Indicates a change.

Typical Class AB_1 "Single-Tone" Operation up to 150 Mc:[n] ←

	CCS[g]			ICAS[a]	
DC Plate Voltage	1000	1500	1800	2000	volts
DC Grid-No.2 Voltage[p]	300	300	300	300	volts
DC Grid-No.1 (Control-Grid) Voltage	-50	-50	-50	-48	volts
Zero-Signal DC Plate Current	50	50	50	60	ma
Zero-Signal DC Grid-No.2 Current	0	0	0	0	ma
Effective RF Load Resistance	1860	3280	4140	4270	ohms
Max.-Signal DC Plate Current	225	225	225	250	ma
Max.-Signal DC Grid-No.2 Current	11	11	11	9	ma
Max.-Signal Peak RF Grid-No.1 Voltage	50	50	50	48	volts
Max.-Signal Driving Power (Approx.)	0	0	0	0	watts
Max.-Signal Power Output (Approx.)	115	200	250	290	watts

Maximum Circuit Values (CCS or ICAS):

Grid-No.1-Circuit Resistance under Any Condition:
- With fixed bias . . . . . 25000 max. ohms
- With cathode bias . . . . . Not recommended

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a max. modulation factor of 1

Maximum CCS[g] Ratings, *Absolute-Maximum Values:*

	Up to 150 Mc	*150 to 500 Mc*	
DC PLATE VOLTAGE	1600 max.	1000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-250 max.	-250 max.	volts
DC PLATE CURRENT	200 max.	200 max.	ma
GRID-No.2 INPUT	10 max.	10 max.	watts
GRID-No.1 INPUT	2 max.	2 max.	watts
PLATE DISSIPATION	165 max.	165 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	150 max.	150 max.	volts
Heater positive with respect to cathode	150 max.	150 max.	volts

Typical CCS Operation:

	Up to 150 Mc	
DC Plate Voltage	1200	1600 volts
DC Grid-No.2 Voltage (Modulated approx. 55%)[q]	250	250 volts

← Indicates a change.

DC Grid-No.1 Voltage[r]	-118			-118	volts
Peak AF Grid-No.2 Voltage (For 100% modulation)	180			200	volts
Peak RF Grid-No.1 Voltage	136			136	volts
DC Plate Current	200			200	ma
DC Grid-No.2 Current	23			23	ma
DC Grid-No.1 Current (Approx.)	5			5	ma
Driving Power (Approx.)	2			3	watts
Power Output (Approx.)	150			230	watts

At 165 Mc

DC Plate Voltage	400	600	800	1000	volts
DC Grid-No.2 Voltage (Modulated approx. 55%)[q]	250	250	250	250	volts
DC Grid-No.1 Voltage	-90	-95	-100	-105	volts
Peak AF Grid-No.2 Voltage (For 100% modulation)	140	150	160	170	volts
Peak RF Grid-No.1 Voltage	110	120	120	125	volts
DC Plate Current	200	200	200	200	ma
DC Grid-No.2 Current	40	35	25	20	ma
DC Grid-No.1 Current (Approx.)	7	8	10	15	ma
Driving Power (Approx.)	1	1	1.5	2	ma
Power Output (Approx.)	55	80	100	140	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under Any Condition	25000 max.	ohms

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[s]
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS[g] Ratings, *Absolute-Maximum Values:*

	Up to 150 Mc	*150 to 500 Mc*	
DC PLATE VOLTAGE	2000 max.	1250 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-250 max.	-250 max.	volts
DC PLATE CURRENT	250 max.	250 max.	ma
GRID-No.2 INPUT	12 max.	12 max.	watts
GRID-No.1 INPUT	2 max.	2 max.	watts
PLATE DISSIPATION	250 max.	250 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	150 max.	150 max.	volts
Heater positive with respect to cathode	150 max.	150 max.	volts

Typical CCS Operation:

Up to 150 Mc

DC Plate Voltage	1500	2000	volts
DC Grid-No.2 Voltage	250	250	volts

DC Grid-No.1 Voltage	-88	-88	volts
Peak RF Grid-No.1 Voltage	110	110	volts
DC Plate Current	250	250	ma
DC Grid-No.2 Current	24	24	ma
DC Grid-No.1 Current (Approx.)	8	8	ma
Driving Power (Approx.)	1.5	2.5	watts
Power Output (Approx.)	260	370	watts

At 165 Mc

DC Plate Voltage	600	750	1000	1250	volts
DC Grid-No.2 Voltage	250	250	250	250	volts
DC Grid-No.1 Voltage	-75	-80	-80	-90	volts
Peak RF Grid-No.1 Voltage	91	96	95	106	volts
DC Plate Current	200	200	200	200	ma
DC Grid-No.2 Current	37	37	31	20	ma
DC Grid-No.1 Current (Approx.)	11	11	10	11	ma
Driving Power (Approx.)	1	1	1	1.2	watts
Power Output (Approx.)	85	110	150	195	watts

At 500 Mc with coaxial cavity

DC Plate Voltage	600	800	1000	1250	volts
DC Grid-No.2 Voltage	250	250	250	280	volts
DC Grid-No.1 Voltage	-110	-110	-110	-115	volts
DC Plate Current	170	200	200	200	ma
DC Grid-No.2 Current	6	7	7	5	ma
DC Grid-No.1 Current (Approx.)[f]	6	10	10	10	ma
Driver Power Output (Approx.)[l]	15	20	25	30	watts
Useful Power Output (Approx.)	50	95	120	140	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under Any Condition	25000 max.	ohms

[a] Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

[b] With cylindrical shield JEDEC No.320 surrounding radiator; and with a cylindrical shield JEDEC No.321 surrounding the grid-No.2 ring terminal. Both shields are connected to ground.

[c] Available from E.F. Johnson Co., Waseca, Minn.

[d] For use at lower frequencies.

[e] For use at higher frequencies.

[f] Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.

[g] Continuous Commercial Service.

[h] Averaged over any audio-frequency cycle of sine-wave form.

[j] Subscript 2 indicates that grid-No.1 current flows during some part of the input cycle.

[k] Averaged over any frame.

[l] The driver stage is required to supply tube losses and rf-circuit losses. The driver stage should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

[m] Intermittent Commercial and Amateur Service.

[n] "Single-Tone" operation refers to that class of amplifier service in which the grid-No.2 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.

[p] Preferably obtained from a fixed supply.

[q] The dc grid-No.2 voltage must be modulated approximately 55% in phase with the plate modulation in order to obtain 100% modulation of the 7034/4X150A. The use of a series grid-No.2 resistor or reactor may not give satisfactory performance and is therefore not recommended.

[r] Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or catnode resistor.

[s] Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

→ CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	2.3	2.9	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	-	0.05	μμf
Grid No.1 to cathode, grid No.2, and heater	2	14.5	17.0	μμf
Plate to cathode, grid No.2, and heater	2	4.0	4.8	μμf
Grid-No.1 Voltage	1,3,4,5	-32	-46	volts
Grid-No.2 Current	1,3,4,5	-5	3	ma
Power Output	4,5,6	100	-	watts

Note 1: With 6.0 volts on heater.

Note 2: With cylindrical shield JEDEC No.320 surrounding radiator; and with a cylindrical shield JEDEC No.321 surrounding the grid-No.2 ring terminal. Both shields are connected to ground.

Note 3: With dc plate volts = 1000, dc grid-No.2 volts = 300, and grid-No.1 voltage adjusted to give plate current of 150 milliamperes.

Note 4: With forced-air cooling as specified under GENERAL DATA for *Air-System Socket*.

Note 5: Heater voltage must be applied for at least 30 seconds before application of other voltages.

Note 6: With heater volts = 5.5, dc plate volts = 1000, dc grid-No.2 volts = 250, dc grid-No.1 volts = -90, maximum dc grid-No.1 milliamperes = 20, grid-No.1 signal voltage adjusted to give dc plate current of 200 milliamperes, and a frequency of 475 Mc.

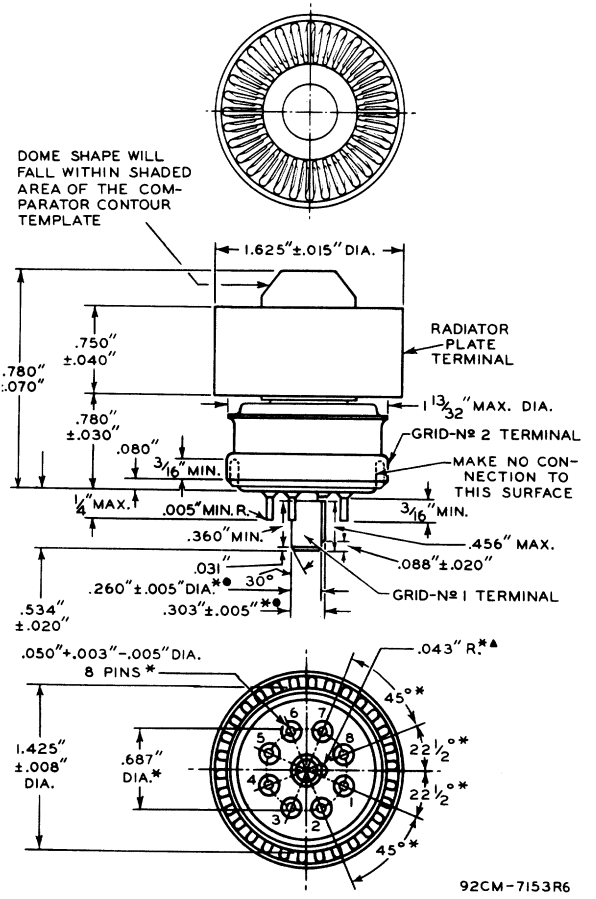
SPECIAL PERFORMANCE DATA

Interelectrode Leakage:

This test is destructive and is performed on a sample lot of tubes from each production run under the following conditions: ac heater volts = 6.6, no voltage on other elements, and specified forced-air cooling for *Air-System Socket*. At the end of 500 hours, with tube at 25° C, and with no voltage applied to heater, the minimum resistance between indicated electrodes as measured with a 500-volt Megger-type ohmmeter having an internal impedance of 2.5 megohms, will be:

Grid No.1 and Grid No.2	10 min.	megohms
Grid No.1 and Cathode	10 min.	megohms
Grid No.2 and Cathode	10 min.	megohms

→ Indicates a change.



GRID-No. 1 PLUG DIMENSIONS ARE MEASURED BY THE USE OF THE SERIES OF GAUGES SHOWN IN SKETCHES G_1 AND G_2. IN THE FOLLOWING INSTRUCTIONS FOR THE USE OF THESE GAUGES, "GO" INDICATES THAT THE ENTIRE GRID-No. 1 PLUG KEY WILL ENTER THE GAUGE; AND "NO-GO" INDICATES THAT THE GRID-No. 1 PLUG KEY WILL NOT ENTER THE GAUGE MORE THAN 1/16". INSTRUCTIONS FOR THE USE OF THE GAUGES FOLLOW:

▲, ●, *: See next page.

▲ GAUGES G_1-1, G_1-2, G_1-3, AND G_1-4:

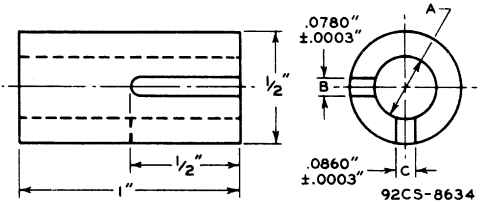
USING ONLY SLOT C, TRY THESE GAUGES IN NUMERICAL ORDER UNTIL ONE IS FOUND THAT WILL ACCEPT THE ENTIRE GRID-No.1 PLUG. USING THE FIRST GAUGE THUS FOUND, IT WILL NOT BE POSSIBLE TO INSERT THE GRID-No.1 PLUG IN SLOT B.

● GAUGES G_2-1, G_2-2, AND G_3-3:

THE GRID-No.1 PLUG WILL BE REJECTED BY GAUGES G_2-1 AND G_2-2, BUT WILL BE ACCEPTED BY GAUGE G_2-3.

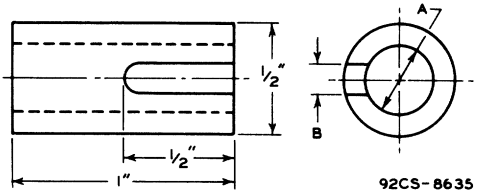
* BASE-PIN POSITIONS ARE HELD TO TOLERANCES SUCH THAT THE ENTIRE LENGTH OF THE PINS WILL, WITHOUT UNDUE FORCE, PASS INTO AND DISENGAGE FROM THE FLAT-PLATE GAUGE SHOWN IN SKETCH G_3.

GAUGE SKETCH G_1



Gauge	Dimension A
G_1-1	.2575" + .0000" − .0005"
G_1-2	.2600" + .0000" − .0005"
G_1-3	.2625" + .0000" − .0005"
G_1-4	.2650" + .0000" − .0005"

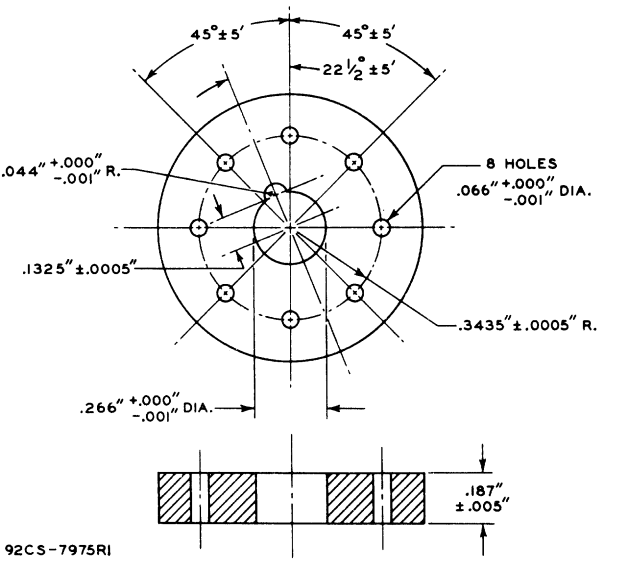
GAUGE SKETCH G_2



92CS-8635

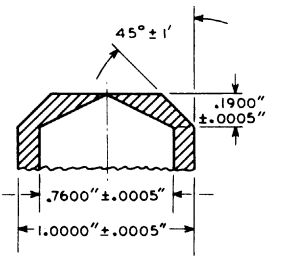
Gauge	Dimension	
	A	B
G_2-1	.2550" $^{+\ .0000"}_{-\ .0005"}$	.125"
G_2-2	.2980" $^{+\ .0000"}_{-\ .0005"}$	none
G_2-3	.3080" $^{+\ .0000"}_{-\ .0005"}$	none

GAUGE SKETCH G_3

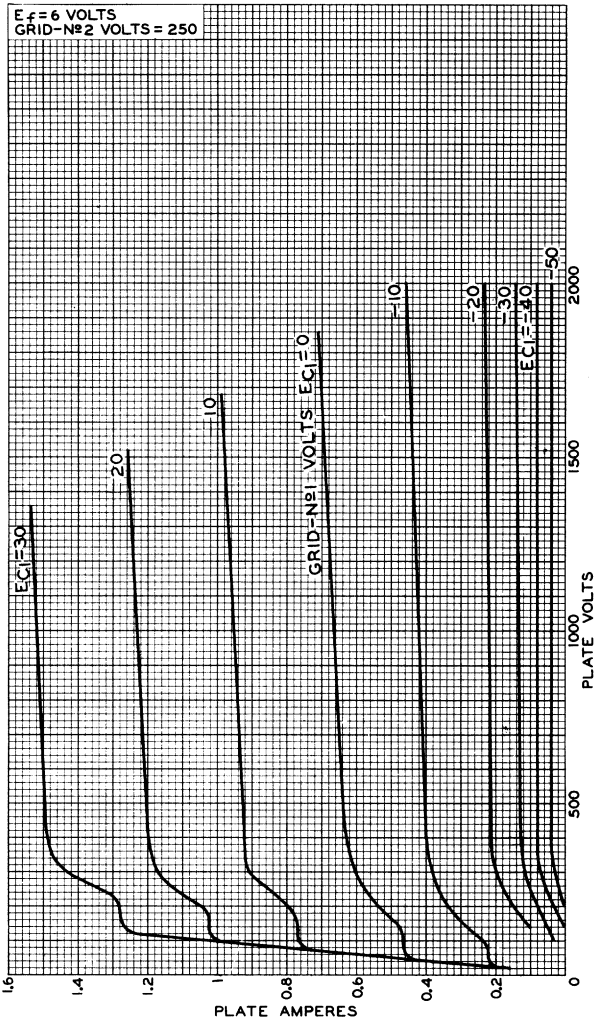


TOLERANCES ARE NOT CUMULATIVE

COMPARATOR CONTOUR TEMPLATE

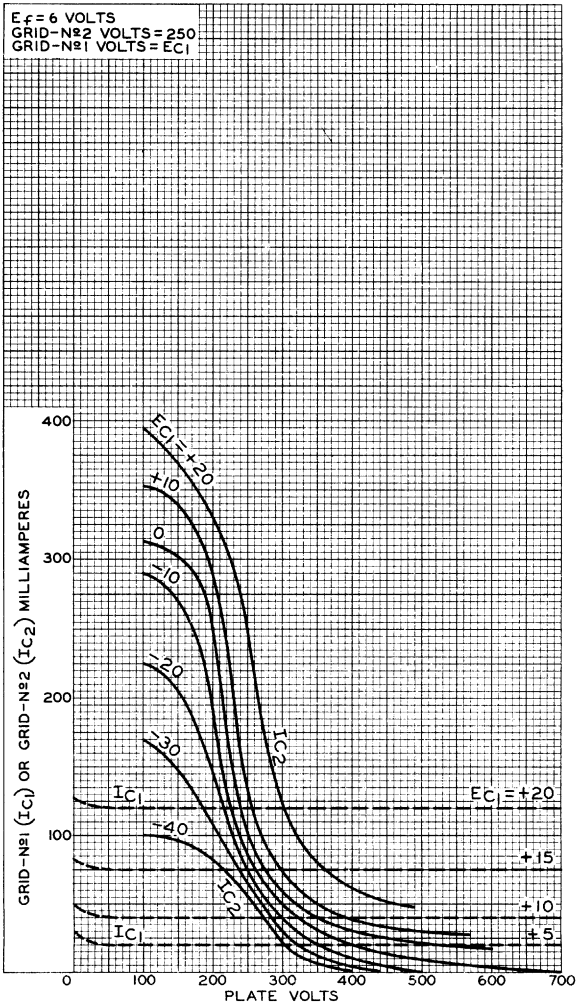


TYPICAL PLATE CHARACTERISTICS



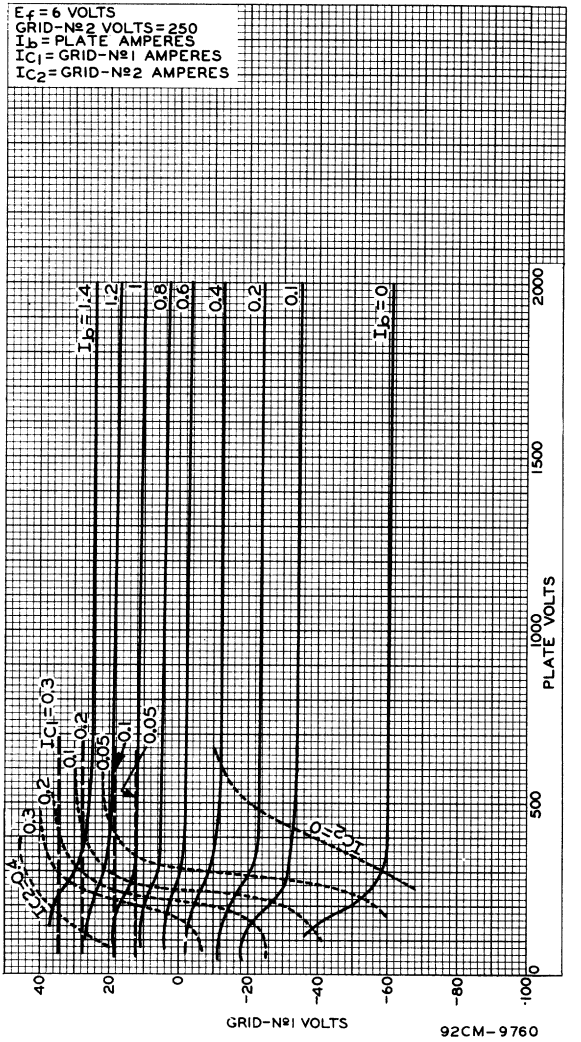
92CM-9755

TYPICAL CHARACTERISTICS

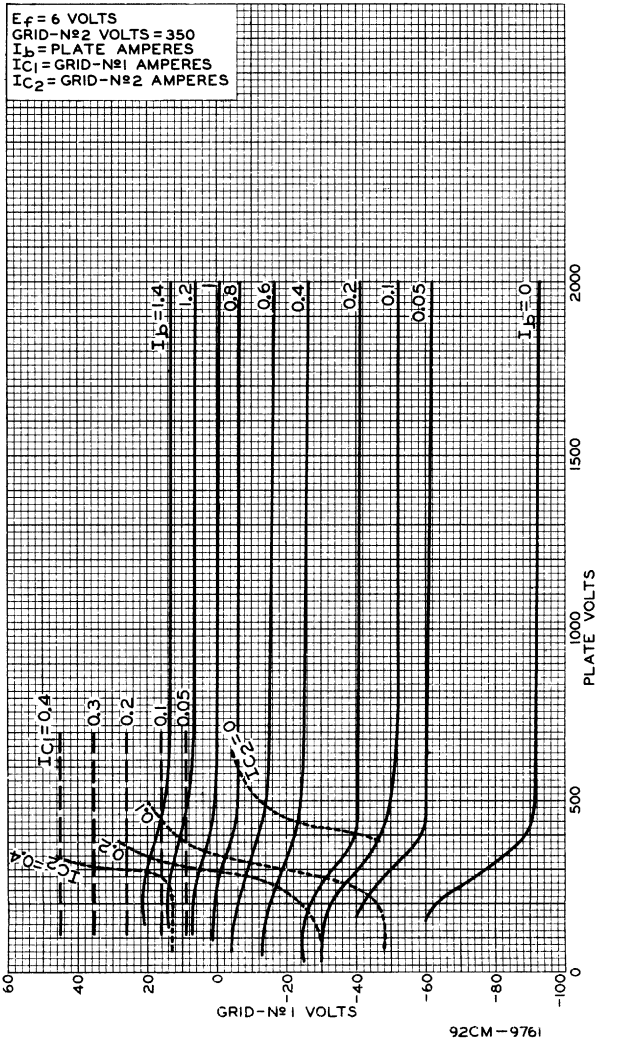


92CM-9756

TYPICAL CONSTANT-CURRENT CHARACTERISTICS



TYPICAL CONSTANT-CURRENT CHARACTERISTICS



92CM-9761

7035/4X150D

Beam Power Tube

FORCED-AIR COOLED
COAXIAL-ELECTRODE STRUCTURE — **370 WATTS CW OUTPUT UP TO 150 Mc**
UNIPOTENTIAL CATHODE — **140 WATTS CW OUTPUT AT 500 Mc**
COMPACT DESIGN — **INTEGRAL RADIATOR**

For Use at Frequencies up to 500 Mc

The 7035/4X150D is the same as the 7034/4X150A except for the following items:

Heater, for Unipotential Cathode:

Voltage (AC or DC)[a]	26.5 ± 10%	volts
Current at heater volts = 26.5	0.58	amp

[a] Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN ←

	Note	*Min.*	*Max.*	
Heater Current	1	0.50	0.62	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	–	0.05	μμf
Grid No.1 to cathode, grid No.2, and heater	2	14.5	17.0	μμf
Plate to cathode, grid No.2, and heater	2	4.0	4.8	μμf
Grid-No.1 Voltage	1,3,4,5	-32	-46	volts
Grid-No.2 Current	1,3,4,5	-5	3	ma
Power Output	4,5,6	100	–	watts

Note 1: With 26.5 volts on heater.

Note 2: With cylindrical shield having inside diameter of 1-13/16" completely surrounding radiator, and insulated from the top and sides of it by a 1/16" thickness of insulating material; and with a cylindrical shield having inside diameter of 1.460" and length of 5/16" surrounding the grid-No.2 ring terminal and insulated from it. Both shields are connected to ground.

Note 3: With dc plate volts = 1000, dc grid-No.2 volts = 300, and grid-No.1 voltage adjusted to give plate current of 150 milliamperes.

Note 4: With forced-air cooling as specified under GENERAL DATA for *Air-System Socket*.

Note 5: Heater voltage must be applied for at least 30 seconds before application of other voltages.

Note 6: With heater volts = 24.5, dc plate volts = 1000, dc grid-No.2 volts = 250, dc grid-No.1 volts = -90, maximum dc grid-No.1 milliamperes = 20, grid-No.1 signal voltage adjusted to give dc plate current of 200 milliamperes, and a frequency of 475 Mc.

SPECIAL PERFORMANCE DATA

Interelectrode Leakage:

This test is destructive and is performed on a sample lot of tubes from each production run under the following conditions: ac heater volts = 29.1, no voltage on other elements,

← Indicates a change.

and specified forced-air cooling for *Air-System Socket*. At the end of 500 hours, with tube at 25° C, and with no voltage applied to heater, the minimum resistance between indicated electrodes as measured with a 500-volt Megger-type ohmmeter having an internal impedance of 2.5 megohms, will be:

Grid No.1 and grid No.2	10 min.	megohms
Grid No.1 and cathode	10 min.	megohms
Grid No.2 and cathode	10 min.	megohms

4X 150 G

2,5 V - 6,25A

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

For Computer and other "On-Off" Control Applications Involving Long Periods of Operation under Cutoff Conditions

GENERAL DATA

Electrical:

	Series	*Parallel*	
Heater, for Unipotential Cathodes:			
Heater arrangement			
Voltage (AC or DC)	12.6 ± 5%	6.3 ± 5%	volts
Current	0.45	0.9	amp
Direct Interelectrode Capacitances (Approx.):[a]			
Grid to plate (Each unit)		6	μμf
Grid to cathode and heater (Each unit)		4.8	μμf
Plate to cathode and heater (Unit No.1)		0.65	μμf
Plate to cathode and heater (Unit No.2)		0.55	μμf
Grid to grid		0.1	μμf
Plate to plate		1.4	μμf
Heater to cathode (Each unit)		6	μμf

Characteristics (Each Unit): ←

Plate Voltage	90	120	volts
Grid Voltage	[b]	−2	volts
Amplification Factor	−	21	
Plate Resistance (Approx.)	−	1750	ohms
Transconductance	−	12000	μmhos
Plate Current	47	36	ma
Grid Current	250	−	μa
Grid Voltage (Approx.) for plate volts = 150 and plate μa = 200	−	−11	volts

Mechanical:

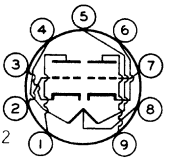
Operating Position . . . Any, but for the utmost in service, tube should be vertical with base down or up, or horizontal with pins 5 and 9 in vertical plane
Maximum Overall Length . . . . . 2-5/8"
Maximum Seated Length . . . . . 2-3/8"
Length, Base Seat to Bulb Top (Excluding tip) . . . 2" ± 3/32"
Diameter . . . . . 0.750" to 0.875"
Dimensional Outline . . . . . See *General Section*
Bulb T6-1/2
Base . . . . . Small-Button Noval 9-Pin (JEDEC No.E9-1)

← Indicates a change.

7044

Basing Designation for BOTTOM VIEW. 9H

Pin 1 – Plate of Unit No.2
Pin 2 – Grid of Unit No.2
Pin 3 – Cathode of Unit No.2
Pins 4 & 8 – Heater of Unit No.2
Pins 5 & 8 – Heater of Unit No.1



Pin 6 – Cathode of Unit No.1
Pin 7 – Grid of Unit No.1
Pin 8 – Heater Mid-Tap
Pin 9 – Plate of Unit No.1

COMPUTER SERVICE and "ON-OFF" CONTROL SERVICE

Unless Otherwise Specified, Values are for Each Unit

Maximum Ratings, *Absolute-Maximum Values:*

PLATE VOLTAGE:			
Average	300	max.	volts
Peak positive-pulse[c]	600	max.	volts
GRID VOLTAGE:			
DC negative	100	max.	volts
DC positive	1	max.	volt
Peak negative-pulse[c]	300	max.	volts
Peak positive-pulse[c]	30	max.	volts
GRID CURRENT:			
Average	5	max.	ma
Peak[c]	200	max.	ma
CATHODE CURRENT:			
Average	50	max.	ma
Peak[c]	400	max.	ma
PLATE DISSIPATION:			
Either plate	4.5	max.	watts
Both plates (Both units operating)	8	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200[d]	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	160	max.	°C

Maximum Circuit Values:

Grid-Circuit Resistance:			
For fixed-bias operation	0.1	max.	megohm
For cathode-bias operation	0.5	max.	megohm

[a] Without external shield.

[b] Adjusted for indicated grid current.

[c] Under the following conditions: rectangular pulse; pulse duration, 10 microseconds; pulse-repetition rate, 1 x 10^3 pps; and duty factor, 0.010 ± 0.001. The rise time shall be less than 1 microsecond, fall time less than 2 microseconds, overshoot less than 5 per cent and droop less than 10 per cent.

[d] The dc component must not exceed 100 volts.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Unless Otherwise Specified, Values are for Each Unit

	Note	Min.	Max.	
Heater Current	1	0.41	0.49	amp
Plate Current (1)	1,2	26	45	ma
Plate Current (2)	1,3	34	60	ma ←
Plate Current (3)	1,4	–	200	μa
Reverse Grid Current	1,2	–	-1.5	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,5	–	30	μa
Heater positive with respect to cathode	1,5	–	30	μa
Leakage Resistance:				
Between plate and all other electrodes tied together	1,6	50	–	megohms
Between grid and all other electrodes tied together	1,7	50	–	megohms

Note 1: With heater volts = 12.6 ac or dc (Series arrangement).

Note 2: With plate volts = 120 and grid volts = -2. Each unit tested separately. Unit not under test connected to ground.

Note 3: With plate volts = 90 and grid voltage adjusted for grid μa = 250. Each unit tested separately. Unit not under test connected to ground.

Note 4: With plate volts = 150 and grid volts = -14. Each unit tested separately. Unit not under test connected to ground.

Note 5: With 100 volts dc between heater and cathode.

Note 6: With plate volts = -500.

Note 7: With grid volts = -300.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 15 (Series heater arrangement) cycled one minute on and four minutes off, heater 180 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

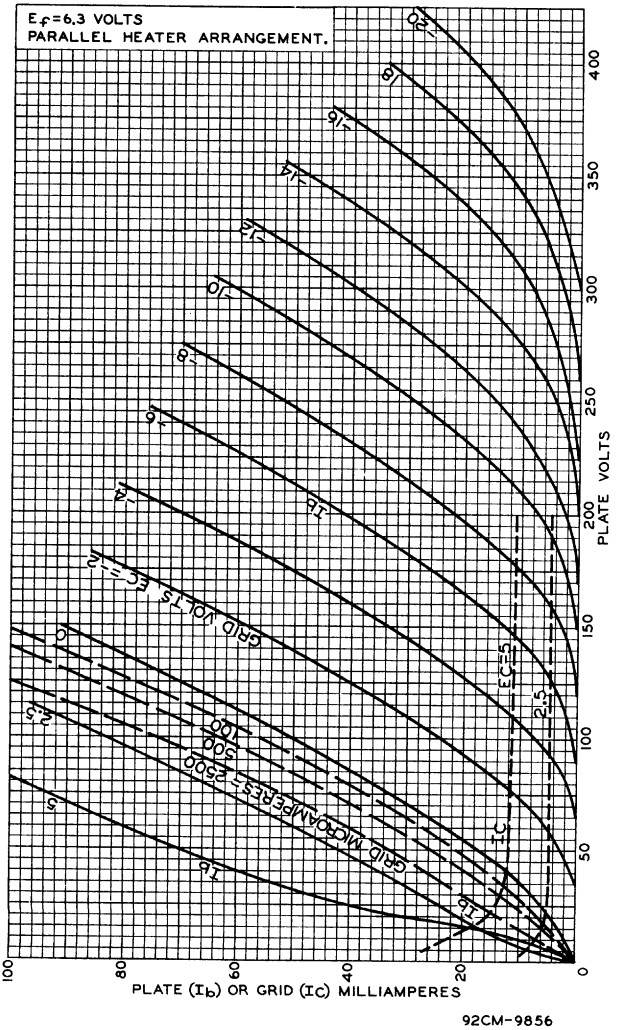
Cathode-Interface-Resistance Life Test: ←

A sample lot of tubes from each production run is life tested at heater volts = 12.6 (Series heater arrangement) and with zero cathode current. At the end of 1000 hours, tubes will not show a cathode-interface resistance in excess of 25 ohms when measured in accordance with Method B, the Complementary Network Method, of ASTM Standard F 300-57T at heater volts = 11.4, plate volts = 75, plate current adjusted to 6.5 milliamperes, and 50-kc, square-wave signal voltage of 0.2 volt.

← Indicates a change.

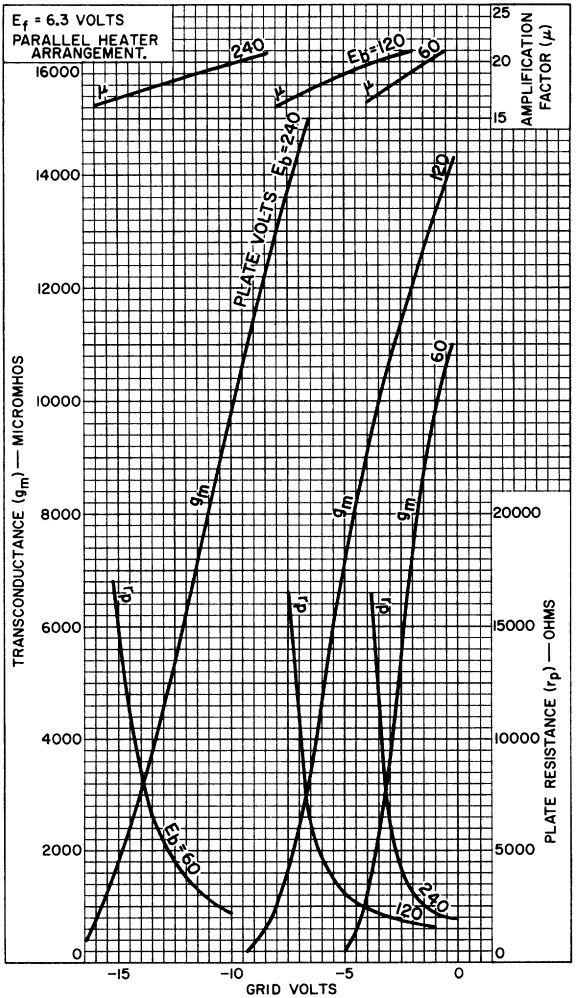
7044

AVERAGE CHARACTERISTICS
Each Unit



92CM-9856

AVERAGE CHARACTERISTICS
Each Unit



92CM-9857RI

7054

Power Pentode

9-PIN MINIATURE TYPE

For Mobile-Communications Equipment Operating from 6-Cell Storage-Battery Systems. Useful as a Class-C RF-Power-Amplifier, Oscillator, and Frequency-Multiplier Tube up to 40 Mc, and as a Modulator and AF-Power-Amplifier Tube.

The 7054 is the same as the 8077/7054 except for the following items:

Mechanical:

Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"

7055

TWIN DIODE

7-PIN MINIATURE TYPE

For use in mobile communications equipment operating from 6-cell storage-battery systems. Useful as a detector in AM and FM receivers, as a full-wave rectifier in power supplies having low dc requirements, and in speech-clipper applications.

GENERAL DATA

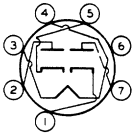
Electrical:

Heater, for Unipotential Cathodes:		
Voltage range	12 to 15	ac or dc volts
Current (Approx.) at 13.5 volts	0.155	amp
Direct Interelectrode Capacitances (Approx.):[o]		
Plate to cathode, internal shield, and heater (Each unit)	3.2	μμf
Cathode to plate, internal shield, and heater (Each unit)	3.6	μμf
Plate of unit No.1 to plate of unit No.2	0.026	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/8" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	6BT

Pin 1 – Cathode of Unit No.1
Pin 2 – Plate of Unit No.2
Pin 3 – Heater
Pin 4 – Heater



Pin 5 – Cathode of Unit No.2
Pin 6 – Internal Shield
Pin 7 – Plate of Unit No.1

RECTIFIER

Maximum Ratings, *Absolute Values:*

PEAK INVERSE PLATE VOLTAGE	350 max.	volts
PEAK PLATE CURRENT PER PLATE	60 max.	ma
DC OUTPUT CURRENT PER PLATE	10 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	120 max.	volts
Heater positive with respect to cathode	120 max.	volts

Typical Operation:

The two units may be used separately or in parallel

Heater Voltage	13.5	volts

[o]: See next page.

7055

TWIN DIODE

AC Plate Voltage per Plate (RMS).	117	volts
Minimum Total Effective Plate-Supply Impedance per Plate	300	ohms
DC Output Current per Plate	9	ma

° With external shield JETEC No.316 connected to cathode of unit under test.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current.	1	0.143	0.167	amp
Plate Current per Plate	1,2	15	-	ma
Heater-Cathode Leakage Current (Each unit):				
Heater negative with respect to cathode.	1,3	-	5	μa
Heater positive with respect to cathode.	1,3	-	5	μa
Leakage Resistance:				
Plate to all other electrodes of both units tied together. .	1,4	50	-	megohms

Note 1: With ac or dc heater volts = 13.5.

Note 2: With plate volts = 5 and electrodes of unit not under test connected to ground.

Note 3: With 100 volts dc between heater and cathode.

Note 4: With plate 300 volts negative with respect to all other electrodes of both units tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 17 cycled one-minute on and four minutes off, heater 135 volts negative with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures. Life testing is conducted under the following conditions: heater volts = 15 and maximum-rated plate current.

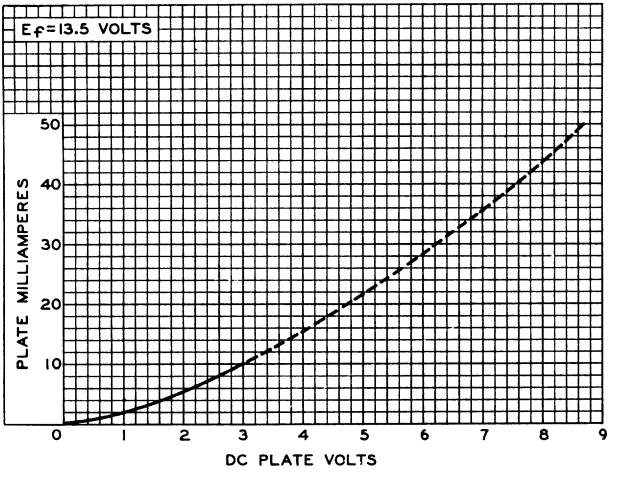
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

7055

AVERAGE PLATE CHARACTERISTIC

EACH UNIT



92CS-9774

7056

SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

For use in mobile communications equipment operating from 6-cell storage-battery systems. Useful as if or rf amplifier at frequencies up to 45 Mc.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage range	12 to 15		ac or dc volts
Current (Approx.) at 13.5 volts	0.15		amp
Direct Interelectrode Capacitances:	*Without External Shield*	*With External Shield*[o]	
Grid No.1 to plate	0.02 max.	0.01 max.	μμf
Grid No.1 to all other electrodes except plate	6.5	6.5	μμf
Plate to all other electrodes except grid No.1	2	3	μμf

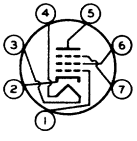
Characteristics, Class A_1 Amplifier:

Heater Voltage	13.5	volts
Plate-Supply Voltage	200	volts
Grid No.3 (Suppressor Grid)	*Connected to cathode at socket*	
Grid-No.2 (Screen-Grid) Supply Voltage	150	volts
Cathode Resistor	180	ohms
Plate Resistance (Approx.)	0.6	megohm
Transconductance	6200	μmhos
Plate Current	9.5	ma
Grid-No.2 Current	2.8	ma
Grid-No.1 (Control-Grid) Voltage (Approx.) for plate μa = 100	-7	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	*See General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)
Basing Designation for BOTTOM VIEW	7CM

Pin 1 - Grid No.1
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Grid No.3, Internal Shield



[o] With external shield JETEC No.316 connected to cathode.

7056

SHARP-CUTOFF PENTODE

AMPLIFIER — Class A_1

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts
GRID-No.2 VOLTAGE	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 165 volts	0.5 max.	watt
For grid-No.2 voltages between 165 volts and 330 volts	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	120 max.	volts
Heater positive with respect to cathode	120 max.	volts

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.138	0.164	amp
Transconductance	1,2	5000	7400	μmhos
Plate Current	1,3	6.5	12.5	ma
Grid-No.2 Current	1,3	1.6	4	ma
Reverse Grid-No.1 Current	1,4	–	-1	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,5	–	20	μa
Heater positive with respect to cathode	1,5	–	20	μa
Leakage Resistance:				
Between grid-No.1 and all other electrodes tied together	1,6	50	–	megohms
Between plate and all other electrodes tied together	1,7	50	–	megohms

Note 1: With ac or dc heater volts = 13.5.

Note 2: With dc plate-supply volts = 200, grid-No.2 supply volts = 150, grid No.3 connected to cathode at socket, cathode resistor (ohms) = 180, and cathode-bypass capacitor (μf) = 1000.

Note 3: With dc plate-supply volts = 200, grid-No.2 supply volts = 150, grid No.3 connected to cathode at socket, and cathode resistor (ohms) = 180.

Note 4: With dc plate volts = 200, grid-No.2 volts = 150, grid No.3 connected to cathode at socket, and grid-No.1 volts = -1.5.

Note 5: With 100 volts dc between heater and cathode.

Note 6: With grid-No.1 100 volts negative with respect to all other electrodes tied together.

Note 7: With plate 300 volts negative with respect to all other electrodes tied together.

7056

SHARP-CUTOFF PENTODE

SPECIAL TESTS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 17 cycled one minute on and four minutes off, heater 135 volts negative with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 13.5, plate-supply volts = 200, grid No.3 connected to cathode, grid-No.2 volts = 150, grid-No.1 volts = -2, plate load resistor (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 250 millivolts.

500-Hour Intermittent Life Performance:

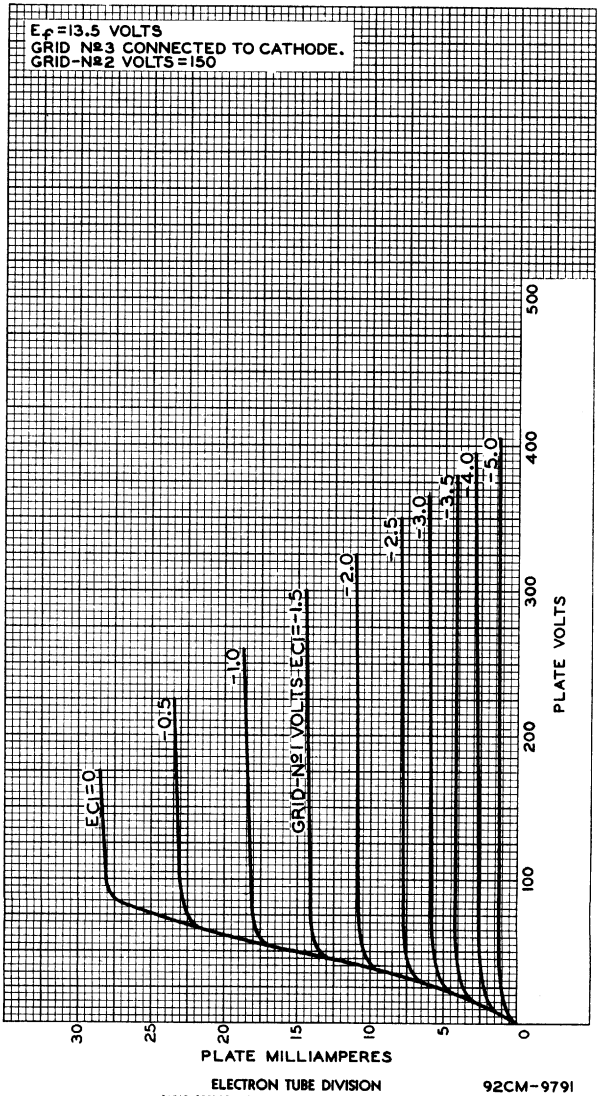
This test is made on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures. Life testing is conducted under the following conditions: heater volts = 15 and maximum-rated plate dissipation and grid-No.2 input.

7056

RCA

7056

AVERAGE PLATE CHARACTERISTICS



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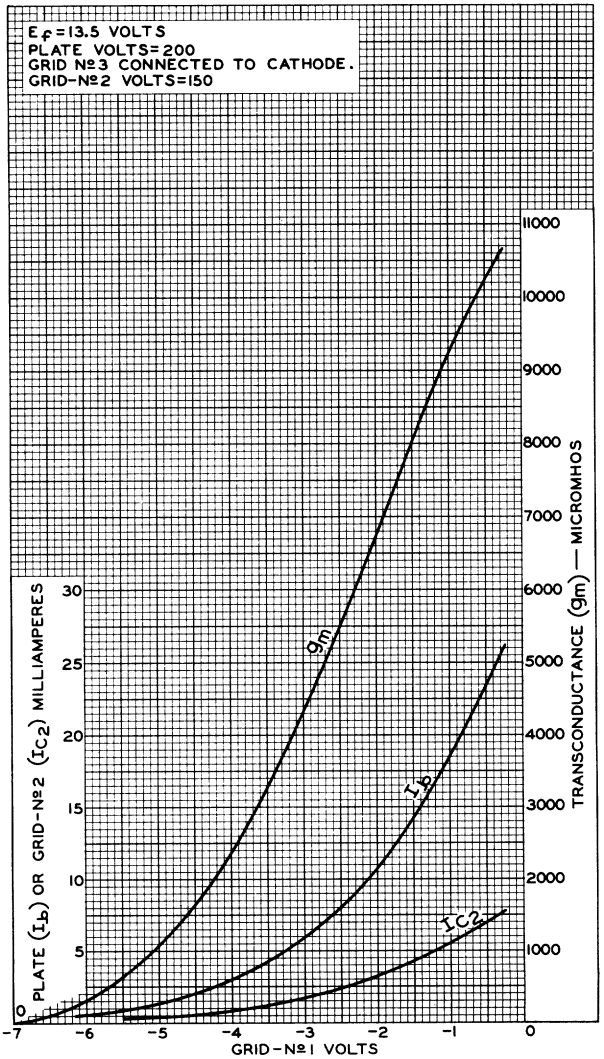
92CM-9791

7056

AVERAGE CHARACTERISTICS



7057

MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For use in mobile communications equipment operating from 6-cell storage-battery systems. Useful as an rf amplifier in direct-coupled cathode-drive circuits at frequencies up to 200 Mc.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:			
Voltage range	12 to 15		ac or dc volts
Current (Approx.) at 13.5 volts	0.18		amp
Direct Interelectrode Capacitances:[o]	*Unit No.1*	*Unit No.2*	
Grid to plate	1.2	1.2	μμf
Grid to cathode, internal shield, and heater	2.6	–	μμf
Plate to cathode, internal shield, and heater	1.2	–	μμf
Plate to cathode	0.12	0.12	μμf
Cathode to heater	2.6	2.7	μμf
Cathode to grid, internal shield, and heater	–	5	μμf
Plate to grid, internal shield, and heater	–	2.2	μμf
Plate of unit No.1 to plate of unit No.2	0.01 max.		μμf
Plate of unit No.2 to plate and grid of unit No.1	0.024 max.		μμf

Characteristics, Class A_1 Amplifier (Each Unit):

Heater Voltage	13.5	volts
Plate-Supply Voltage	150	volts
Cathode Resistor	220	ohms
Amplification Factor	36	
Plate Resistance (Approx.)	5300	ohms
Transconductance	6800	μmhos
Plate Current	10	ma
Grid Voltage (Approx.) for plate μa = 10.	-12	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	.1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2

[o] With external shield JETEC No.315 connected to pin 9.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

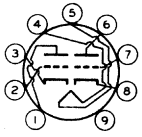
7057

7057

MEDIUM-MU TWIN TRIODE

Base. . . . . .Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9AJ

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Internal Shield

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	275 max.	volts
PLATE DISSIPATION	2.2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode .	150 max.	volts
Heater positive with respect to cathode .	150 max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance	0.5 max.	megohm

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Values are for Each Unit Unless Otherwise Specified

	Note	Min.	Max.	
Heater Current.	1	0.165	0.195	amp
Direct Interelectrode Capacitances:				
Grid to cathode, internal shield, and heater (Unit No.1)	2	2.05	3.15	μμf
Cathode to grid, internal shield, and heater (Unit No.2)	2	4.1	5.9	μμf
Plate to grid, internal shield, and heater (Unit No.2)	2	1.9	2.5	μμf
Amplification Factor.	1,3	26	46	
Plate Current	1,4	7	13	ma
Transconductance.	1,3	5800	7800	μmhos
Reverse Grid Current (Total—both units)	1,5	–	-2	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode.	1,6	–	20	μa
Heater positive with respect to cathode.	1,6	–	20	μa

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA 1

7057

MEDIUM-MU TWIN TRIODE

	Note	Min.	Max.	
Leakage Resistance:				
Between grid and all other electrodes of both units tied together.	1,7	50	–	megohms
Between plate and all other electrodes of both units tied together.	1,8	50	–	megohms

Note 1: With ac or dc heater volts = 13.5.

Note 2: With external shield JETEC No.315 connected to pin 9.

Note 3: With dc plate-supply volts = 150, cathode resistor (ohms) = 220, and cathode-bypass capacitor (μf) = 1000. Each unit tested separately. Electrodes of unit not under test are connected to ground.

Note 4: With dc plate-supply volts = 150, and cathode resistor (ohms) = 220. Each unit tested separately. Electrodes of unit not under test are connected to ground.

Note 5: With dc plate-supply volts = 250, cathode resistor (ohms) = 250, and grid resistor (megohms) = 0.5. Units are tested in parallel with cathode and grid resistors common to both units.

Note 6: With 150 volts dc between heater and cathode.

Note 7: With grid 100 volts negative with respect to all other electrodes of both units tied together.

Note 8: With plate 300 volts negative with respect to all other electrodes of both units tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 17 cycled one minute on and four minutes off, heater 180 volts negative with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: units connected in parallel, heater volts = 13.5, plate-supply volts = 250, grid volts = -8, plate load resistor (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 150 millivolts.

500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures. Life testing is conducted under the following conditions: heater volts = 15 and maximum-rated plate dissipation.

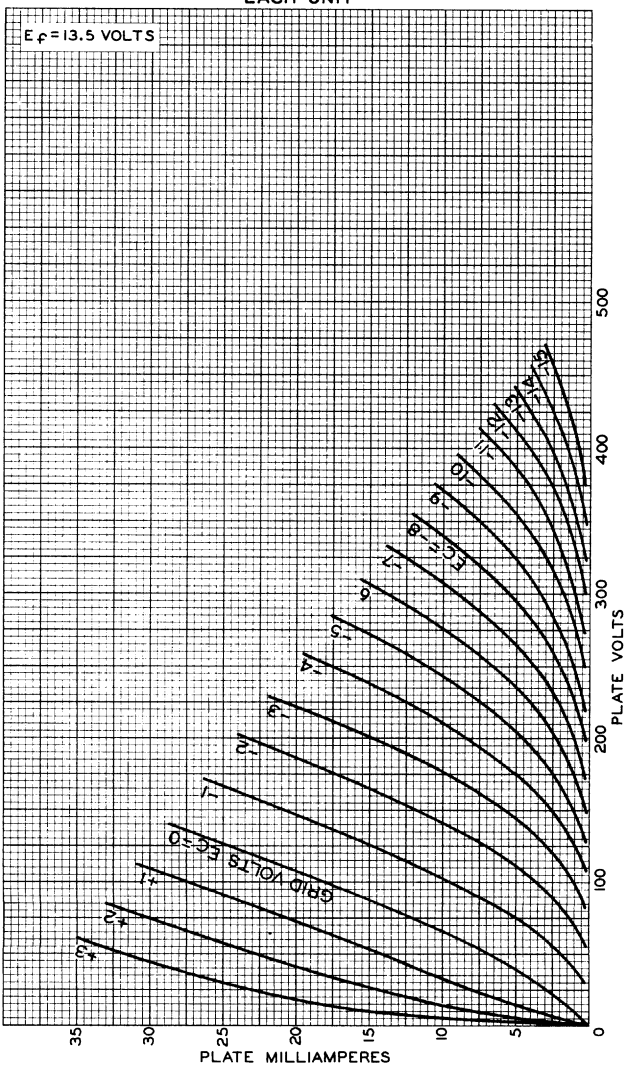
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

7057

7057

AVERAGE PLATE CHARACTERISTICS

EACH UNIT



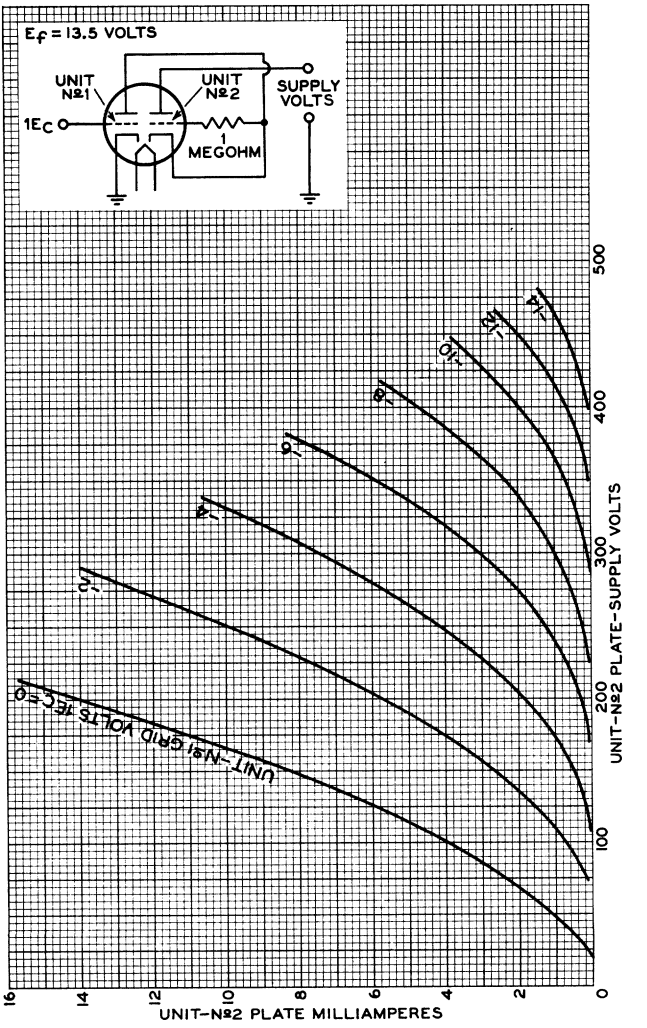
ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9816

7057

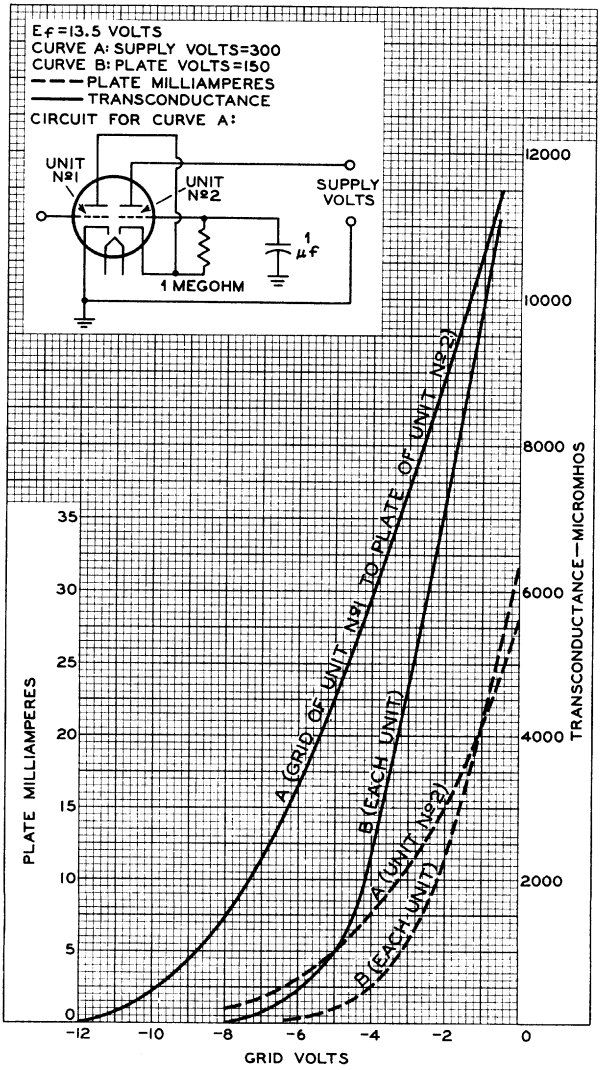
AVERAGE PLATE CHARACTERISTICS
DIRECT-COUPLED DRIVEN RF AMPLIFIER IN CATHODE-DRIVE CIRCUIT



7057

7057

AVERAGE CHARACTERISTICS



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92CM-9790

7058

HIGH-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For use in mobile communications equipment operating from 6-cell storage-battery systems. Useful in phase-inverter, resistance-coupled-amplifier, and low-frequency-oscillator applications.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:
- Voltage range . . . . . 12 to 15 . . . . . ac or dc volts
- Current (Approx.) at 13.5 volts . . . . . 0.155 . . . . . amp

Direct Interelectrode Capacitances:[o]

	Unit No.1	Unit No.2	
Grid to plate	1.7	1.7	μμf
Grid to cathode and heater	1.6	1.6	μμf
Plate to cathode and heater	0.46	0.34	μμf

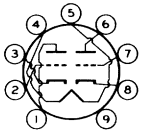
Characteristics, Class A_1 Amplifier (Each Unit):

Heater Voltage	13.5	volts
Plate Voltage	250	volts
Grid Voltage	-2	volts
Amplification Factor	100	
Plate Resistance (Approx.)	61000	ohms
Transconductance	1650	μmhos
Plate Current	1.25	ma
Grid Voltage (Approx.) for plate μa = 10	-5	volts

Mechanical:

Operating Position . . . . . Any
Maximum Overall Length . . . . . 2-3/16"
Maximum Seated Length . . . . . 1-15/16"
Length, Base Seat to Bulb Top (Excluding tip) . . . . . 1-9/16" ± 3/32"
Diameter . . . . . 0.750" to 0.875"
Dimensional Outline . . . . . *See General Section*
Bulb T6-1/2
Base . . . . . Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW 9EP

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Internal Connection—Do Not Use



[o]: See next page.

7058

HIGH-MU TWIN TRIODE

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	330 max.	volts
GRID VOLTAGE:		
Positive-bias value	0 max.	volts
Negative-bias value	55 max.	volts
PLATE DISSIPATION	1 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	120 max.	volts
Heater positive with respect to cathode.	120 max.	volts

Typical Operation as Resistance-Coupled Amplifier (Each Unit):

See RESISTANCE-COUPLED AMPLIFIER CHART No. 25 at front of Receiving Tube Section

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation.	0.5 max.	megohm
For cathode-bias operation.	1 max.	megohm

[o] Without external shield.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Values are for Each Unit Unless Otherwise Specified

	Note	Min.	Max.	
Heater Current	1	0.143	0.167	amp
Amplification Factor	1,2	85	115	
Plate Current	1,2	0.9	1.75	ma
Transconductance	1,2	1360	2100	μmhos
Reverse Grid Current (Total—both units)	1,3	–	-1	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode.	1,4	–	20	μa
Heater positive with respect to cathode.	1,4	–	20	μa
Leakage Resistance:				
Between grid and all other electrodes of both units tied together	1,5	50	–	megohms
Between plate and all other electrodes of both units tied together	1,6	50	–	megohms

Note 1: With ac or dc heater volts = 13.5.

Note 2: With dc plate volts = 250, and dc grid volts = -2. Each unit tested separately. Electrodes of unit not under test are connected to ground.

Note 3: With dc plate volts = 250, grid resistor (megohms) = 1 common to both units, and dc grid volts = -2. Units are tested in parallel.

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HIGH-MU TWIN TRIODE

Note 4: With 100 volts dc between heater and cathode.

Note 5: With grid 100 volts negative with respect to all other electrodes of both units tied together.

Note 6: With plate 300 volts negative with respect to all other electrodes of both units tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 17 cycled one minute on and four minutes off, heater 135 volts negative with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: units connected in parallel, heater volts = 13.5, plate-supply volts = 250, grid volts = -2, plate load resistor (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 150 millivolts.

500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures. Life testing is conducted under the following conditions: heater volts = 15 and maximum-rated plate dissipation.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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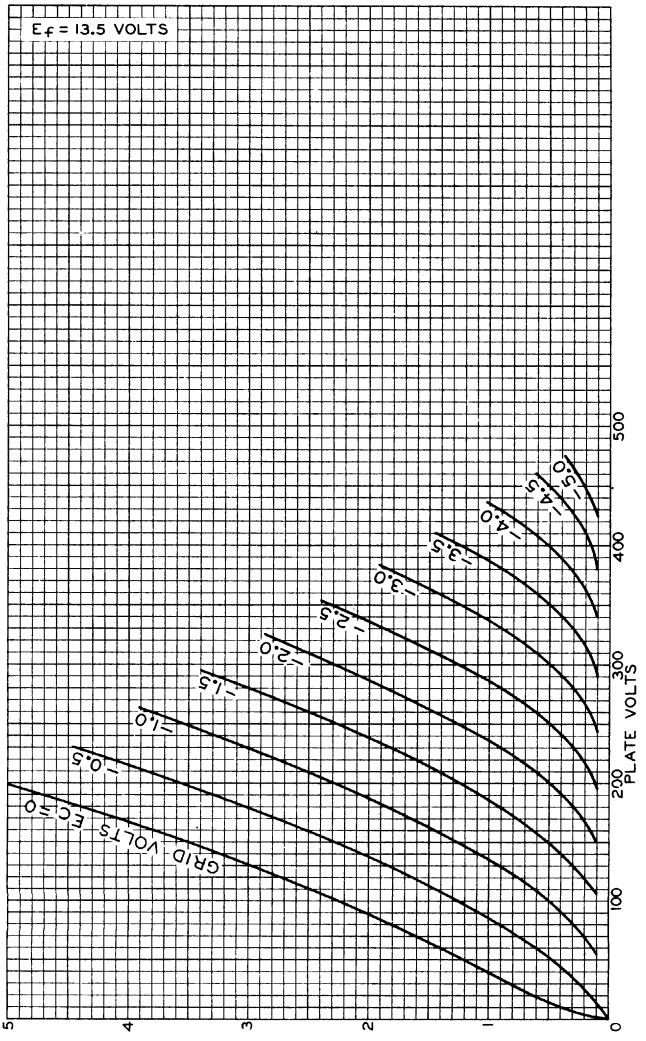
AVERAGE PLATE CHARACTERISTICS

EACH UNIT

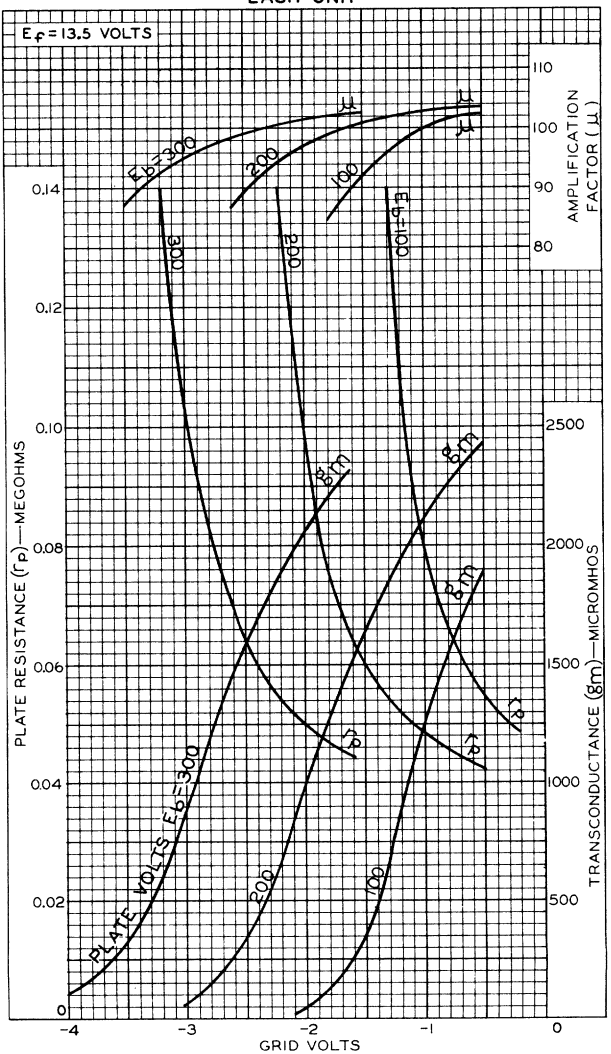


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM – 9793

7058

AVERAGE CHARACTERISTICS

EACH UNIT



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9805

7059

MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

For use in mobile communications equipment operating from 6-cell storage-battery systems

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:

Voltage range	12 to 15	ac or dc volts
Current (Approx.) at 13.5 volts	0.195	amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield°*	
Triode Unit:			
Grid to plate	1.7	1.7	μμf
Grid to cathode and heater	2.7	2.7	μμf
Plate to cathode and heater	0.4	1	μμf
Pentode Unit:			
Grid No.1 to plate	0.01 max.	0.006 max.	μμf
Grid No.1 to all other electrodes except plate	5	5	μμf
Plate to all other electrodes except grid No.1	2.5	3.4	μμf
Heater to cathode (Each unit)	3	3●	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*	
Heater Voltage	13.5	13.5	volts
Plate-Supply Voltage	150	250	volts
Grid-No.2 (Screen-Grid) Supply Voltage	–	110	volts
Cathode Resistor	56	68	ohms
Amplification Factor	40	–	
Plate Resistance (Approx.)	4700	400000	ohms
Transconductance	8500	5200	μmhos
Plate Current	18	10	ma
Grid-No.2 Current	–	3.5	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-12	-10	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	.1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*

°,●: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7059

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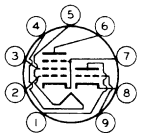
MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

Bulb. T6-1/2
Base. . . . . .Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9AE

Pin 1 – Triode Plate
Pin 2 – Pentode Grid No.1
Pin 3 – Pentode Grid No.2
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Pentode Plate
Pin 7 – Pentode Cathode, Pentode Grid No.3, Internal Shield
Pin 8 – Triode Cathode
Pin 9 – Triode Grid



AMPLIFIER — Class A_1

Maximum Ratings, *Absolute Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	300 max.	300 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE.	–	300 max.	volts
GRID-No.2 VOLTAGE	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 150 volts	–	0.5 max.	watt
For grid-No.2 voltages between 150 and 300 volts .	–	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	2.5 max.	2.8 max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode.	120 max.	120 max.	volts
Heater positive with respect to cathode.	120 max.	120 max.	volts

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance:			
For fixed-bias operation. . .	0.5 max.	0.5 max.	megohm
For cathode-bias operation. .	1 max.	1 max.	megohm

° With external shield JETEC No.315 connected to cathode of unit under test except as noted.

• With external shield JETEC No.315 connected to ground.

7059

MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.179	0.211	amp
Transconductance (Triode unit)	1,2	6800	10200	μmhos
Plate Current (Triode unit)	1,3	12.7	23.3	ma
Transconductance (Pentode unit)	1,4	3900	6500	μmhos
Plate Current (Pentode unit)	1,5	7.5	12.5	ma
Grid-No.2 Current (Pentode unit)	1,5	2.2	4.8	ma
Reverse Grid-No.1 Current (Total—both units)	1,6	-	-1.5	μa
Heater-Cathode Leakage Current (Each unit):				
Heater negative with respect to cathode	1,7	-	5	μa
Heater positive with respect to cathode	1,7	-	5	μa
Leakage Resistance (Each unit):				
Between grid No.1 and all other electrodes of both units tied together	1,8	50	-	megohms
Between plate and all other electrodes of both units tied together	1,9	50	-	megohms

Note 1: With ac or dc heater volts = 13.5.

Note 2: With dc plate-supply volts = 150, cathode resistor (ohms) = 56, and cathode-bypass capacitor (μf) = 1000.

Note 3: With dc plate-supply volts = 150, and cathode resistor (ohms) = 56.

Note 4: With dc plate-supply volts = 250, grid-No.2 supply volts = 110, cathode resistor (ohms) = 68, and cathode-bypass capacitor (μf) = 1000.

Note 5: With dc plate-supply volts = 250, grid-No.2 supply volts = 110, and cathode resistor (ohms) = 68.

Note 6: With triode dc plate volts = 150, pentode dc plate volts = 250, grid-No.2 volts = 110, grid-No.1 volts = -1.5 on both units, and grid-No.1 resistor (megohms) = 0.5 for each unit.

Note 7: With 50 volts dc between heater and cathode.

Note 8: With grid No.1 100 volts negative with respect to all other electrodes of both units tied together.

Note 9: With plate 300 volts negative with respect to all other electrodes of both units tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 17 cycled one minute on and four minutes off, heater 135 volts negative with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

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MEDIUM-MU TRIODE—
SHARP-CUTOFF PENTODE

Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions:

Triode Unit:

Heater volts = 13.5, plate-supply volts = 150, grid volts = −1.5, plate load resistor (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 150 millivolts.

Pentode Unit:

Heater volts = 13.5, plate-supply volts = 250, grid-No.2 volts = 110, grid-No.1 volts = −1.5, plate load resistor (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 250 millivolts.

500-Hour Intermittent Life Performance:

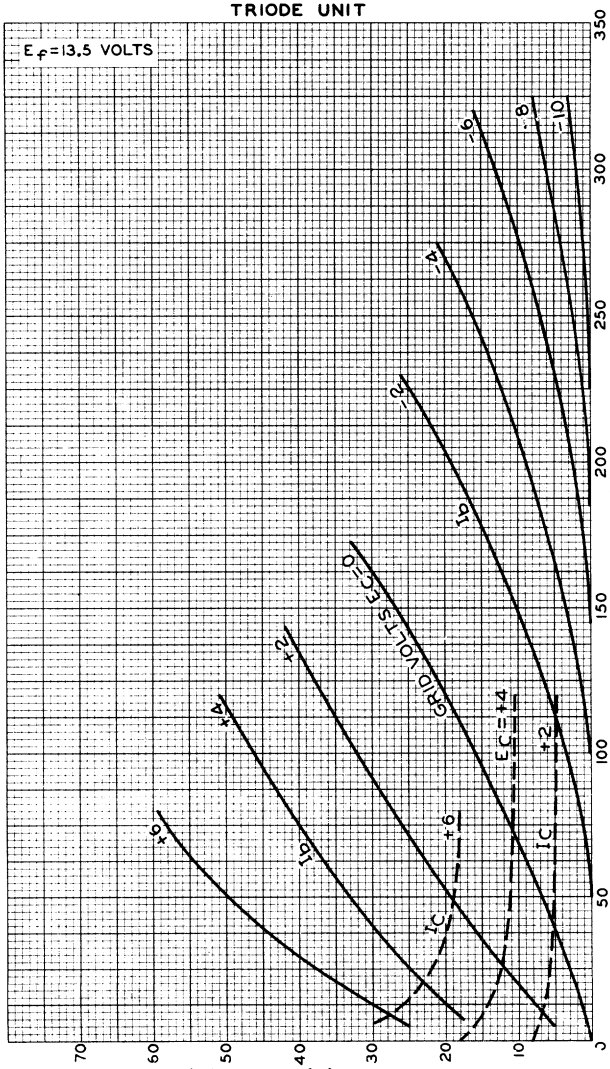
This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures. Life testing is conducted under the following conditions: heater volts = 15 and maximum-rated plate dissipation and grid-No.2 input.

RCA

7059

AVERAGE CHARACTERISTICS

TRIODE UNIT



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

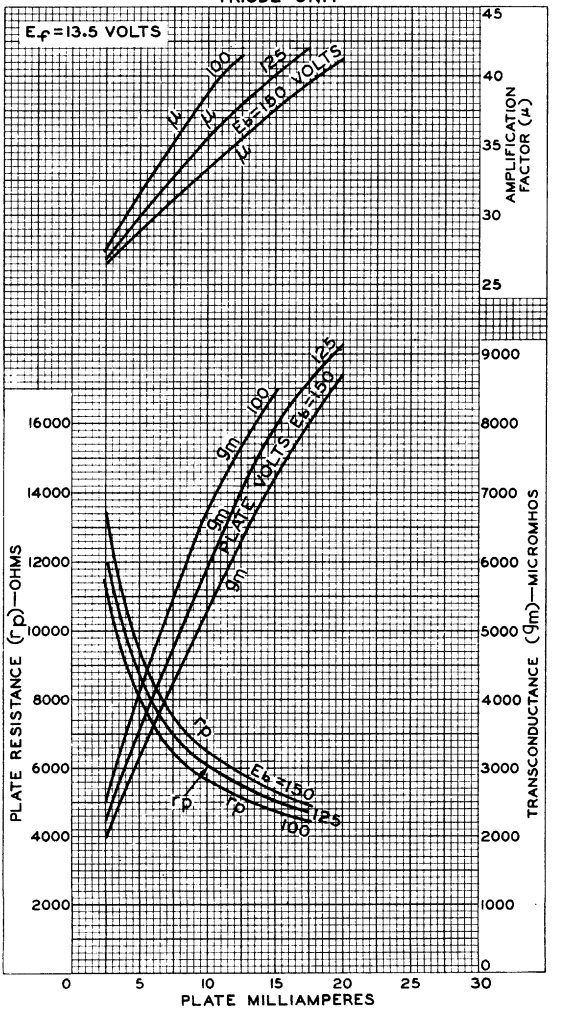
92CM-9810

7059

7059

AVERAGE CHARACTERISTICS

TRIODE UNIT



ELECTRON TUBE DIVISION

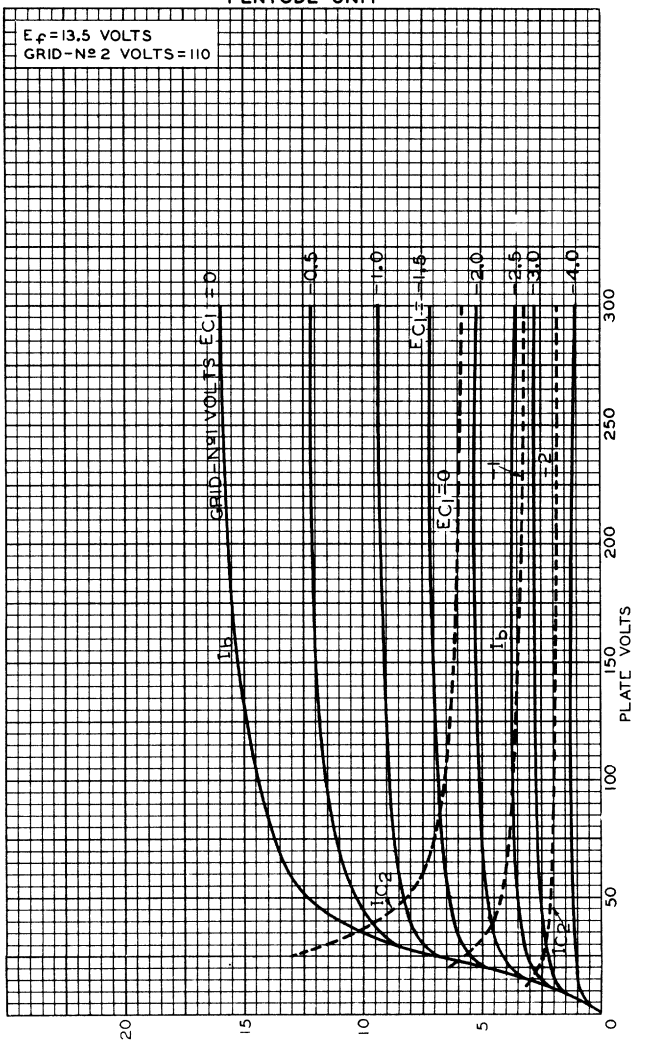
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9812

7059

AVERAGE CHARACTERISTICS

PENTODE UNIT



ELECTRON TUBE DIVISION 92CM-9809

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7060

MEDIUM-MU TRIODE—POWER PENTODE

9-PIN MINIATURE TYPE

For use in mobile communications equipment operating from 6-cell storage-battery systems. The pentode unit is useful in class-C-amplifier and frequency-multiplier applications at frequencies up to 40 Mc. The triode unit is useful as a reactance modulator.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage range	12 to 15	ac or dc volts
Current (Approx.) at 13.5 volts	0.28	amp
Direct Interelectrode Capacitances:[o]		
Triode Unit:		
Grid to plate	2.2	μμf
Grid to cathode and heater	2.4	μμf
Plate to cathode and heater	0.22	μμf
Pentode Unit:		
Grid No.1 to plate	0.044	μμf
Grid No.1 to all other electrodes except plate	7.1	μμf
Plate to all other electrodes except grid No.1	2.5	μμf
Triode grid to pentode plate	0.022 max.	μμf
Pentode grid No.1 to triode plate	0.015 max.	μμf
Pentode plate to triode plate	0.16 max.	μμf

Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*	
Heater Voltage	13.5	13.5	volts
Plate-Supply Voltage	150	200	volts
Grid-No.2 (Screen-Grid) Supply Voltage	–	125	volts
Cathode Resistor	150	82	ohms
Amplification Factor	40	–	
Plate Resistance (Approx.)	8200	150000	ohms
Transconductance	4900	7000	μmhos
Plate Current	9	15	ma
Grid-No.2 Current	–	3.4	ma
Grid-No.1 Voltage (Approx.) for plate μa = 100	-6.5	-8	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2

[o]: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7060

MEDIUM-MU TRIODE—POWER PENTODE

Base. . . . . .Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW. 9DA

Pin 1 - Triode Plate
Pin 2 - Triode Grid
Pin 3 - Triode Cathode
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Pentode Plate
Pin 7 - Pentode Grid No.2

Pin 8 - Pentode Grid No.1
Pin 9 - Pentode Grid No.3, Pentode Cathode, Internal Shield

AMPLIFIER — Class A_1

Maximum Ratings, *Absolute Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	300 max.	300 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE.	-	300 max.	volts
GRID-No.2 VOLTAGE	-	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max.	volts
GRID-No.2 INPUT: For grid-No.2 voltages up to 150 volts	-	1 max.	watt
For grid-No.2 voltages between 150 and 300 volts .	-	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
PLATE DISSIPATION	2.5 max.	3 max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode.	120 max.	120 max.	volts
Heater positive with respect to cathode.	120 max.	120 max.	volts

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance: For fixed-bias operation. . .	0.5 max.	0.25 max.	megohm
For cathode-bias operation. .	1 max.	1 max.	megohm

°: See next page.

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MEDIUM-MU TRIODE—POWER PENTODE

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy■
and
RF POWER AMPLIFIER — Class C FM Telephony

Pentode Unit

Maximum CCS● Ratings, *Absolute Values:*

DC PLATE VOLTAGE	300 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	150 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	50 max.	volts
Positive-bias value	0 max.	volts
DC PLATE CURRENT	20 max.	ma
DC GRID-No.2 CURRENT	7 max.	ma
DC GRID-No.1 CURRENT	3 max.	ma
GRID-No.2 INPUT	0.8 max.	watt
PLATE DISSIPATION	2.75 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	120 max.	volts
Heater positive wmth respect to cathode	120 max.	volts

Typical Operation:

At frequencies up to 40 Mc

Heater Voltage	13.5	13.5	13.5	volts
DC Plate Voltage	200	250	300	volts
DC Grid-No.2 Voltage	85	105	125	volts
DC Grid-No.1 Voltage	-7	-9	-11	volts
DC Plate Current	11	15	20	ma
DC Grid-No.2 Current	3.2	4.5	6	ma
DC Grid-No.1 Current (Approx.)	0.9	1.2	1.6	ma
Driving Power (Approx.)	9	15	25	mw
Power Output	1.3	2.1	3.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	megohm

o Without external shield.

■ Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative maybe used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

● Continuous Commercial Service.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.26	0.3	amp
Amplification Factor (Triode unit)	1,2	32	48	
Transconductance (Triode unit)	1,2	3800	6000	μmhos
Plate Current (Triode unit)	1,3	6.5	11.5	ma
Transconductance (Pentode unit)	1,4	5200	8800	μmhos

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MEDIUM-MU TRIODE—POWER PENTODE

	Note	Min.	Max.	
Plate Current (Pentode unit) . .	1,5	11.2	22.8	ma
Grid-No.2 Current (Pentode unit).	1,5	2.2	4.6	ma
Direct Interelectrode Capacitance:				
Grid No.1 to plate (Pentode unit).	6	0.035	0.053	μμf
Reverse Grid-No.1 Current (Total—both units)	1,7	–	-2	μa
Heater-Cathode Leakage Current (Each unit):				
Heater negative with respect to cathode.	1,8	–	30	μa
Heater positive with respect to cathode.	1,8	–	30	μa
Leakage Resistance (Each unit):				
Between grid No.1 and all other electrodes of both units tied together	1,9	50	–	megohms
Between plate and all other electrodes of both units tied together	1,10	50	–	megohms

Note 1: With ac or dc heater volts = 13.5.

Note 2: With dc plate-supply volts = 150, cathode resistor (ohms) = 150, and cathode-bypass capacitor (μf) = 1000.

Note 3: With dc plate-supply volts = 150, and cathode resistor (ohms) = 150.

Note 4: With dc plate-supply volts = 200, grid-No.2 supply volts = 125, cathode resistor (ohms) = 82, and cathode-bypass capacitor (μf) = 1000.

Note 5: With dc plate-supply volts = 200, grid-No.2 supply volts = 125, and cathode resistor (ohms) = 82.

Note 6: Without external shield.

Note 7: With pentode dc plate-supply volts = 150, grid-No.2 supply volts = 180, pentode cathode resistor (ohms) = 120, pentode grid-No.1 resistor (megohms) = 1, triode dc plate-supply volts = 180, triode cathode resistor (ohms) = 75, and triode grid resistor (megohms) = 0.5.

Note 8: With 100 volts dc between heater and cathode.

Note 9: With grid No.1 100 volts negative with respect to all other electrodes of both units tied together.

Note 10: With plate 300 volts negative with respect to all other electrodes of both units tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 17 cycled one minute on and four minutes off, heater 135 volts negative with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

MEDIUM-MU TRIODE—POWER PENTODE

Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions:

Triode Unit:
Heater volts = 13.5, plate-supply volts = 150, grid volts = −1.5, plate load resistor (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 150 millivolts.

Pentode Unit:
Heater volts = 13.5, plate-supply volts = 200, grid-No.2 volts = 125, grid-No.1 volts = −2, plate load resistor (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 250 millivolts.

500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against eqidemic failures. Life testing is conducted under the following conditions: heater volts = 15 and maximum-rated plate dissipation and grid-No.2 input.

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AVERAGE CHARACTERISTICS
TRIODE UNIT

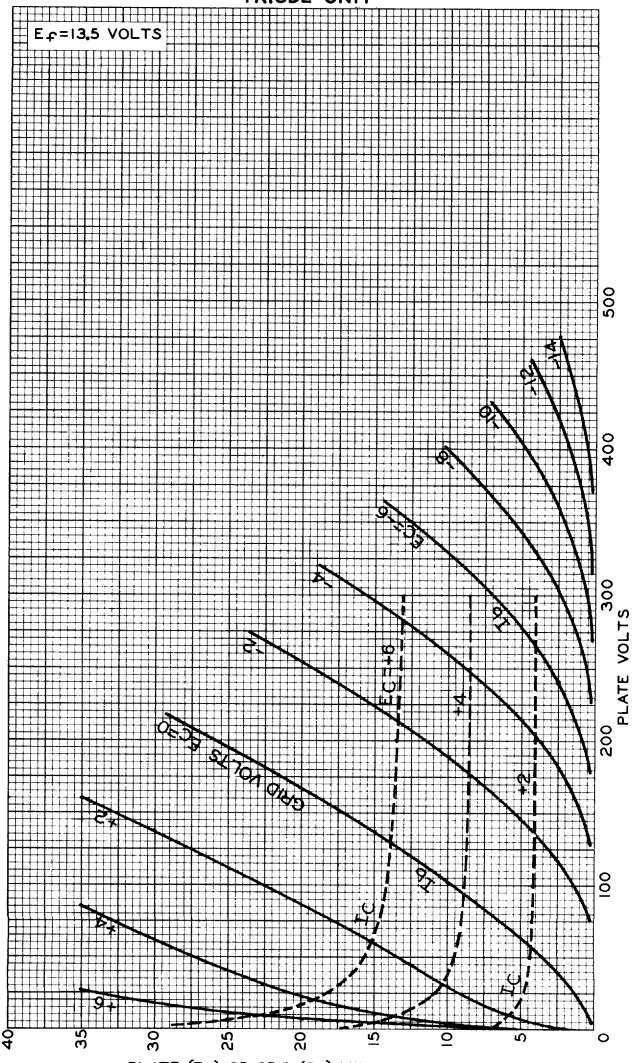


PLATE (I_b) OR GRID (I_c) MILLIAMPERES

ELECTRON TUBE DIVISION

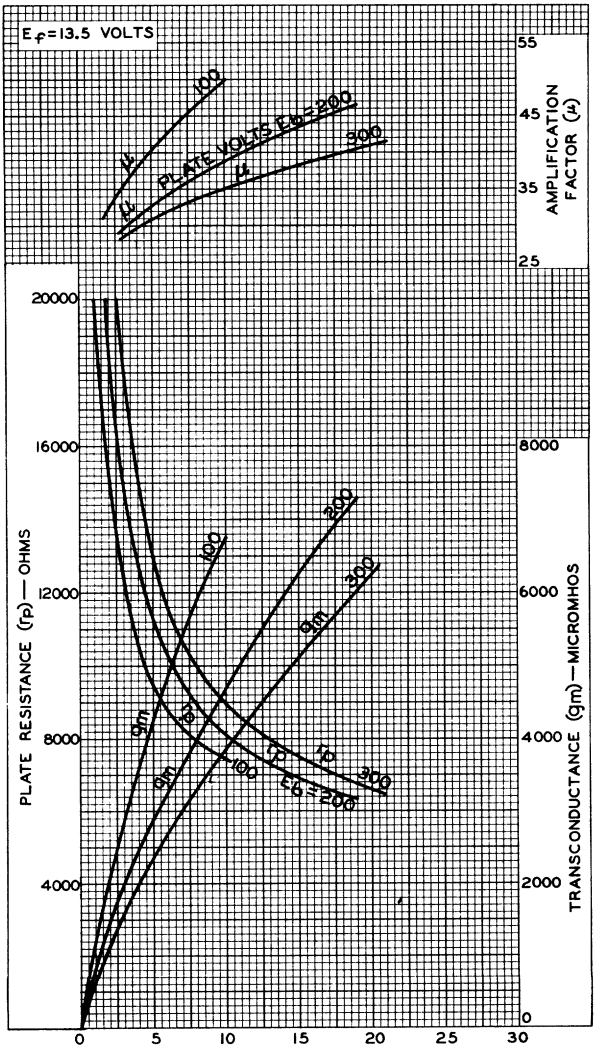
92CM-9807

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7060

AVERAGE CHARACTERISTICS

TRIODE UNIT

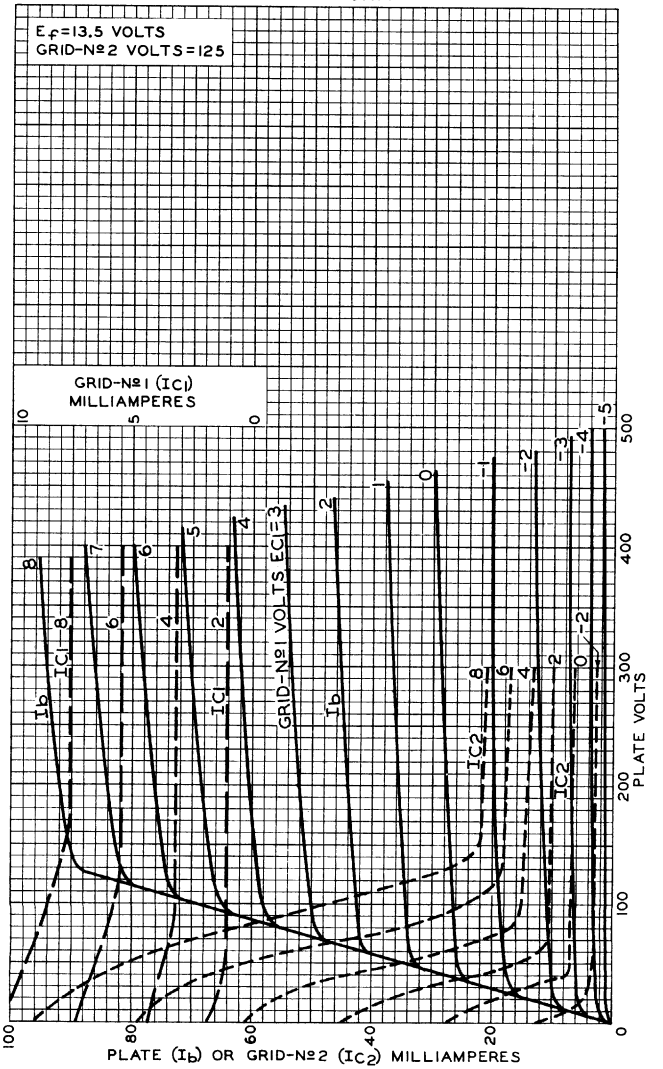


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9806

7060

AVERAGE CHARACTERISTICS
PENTODE UNIT

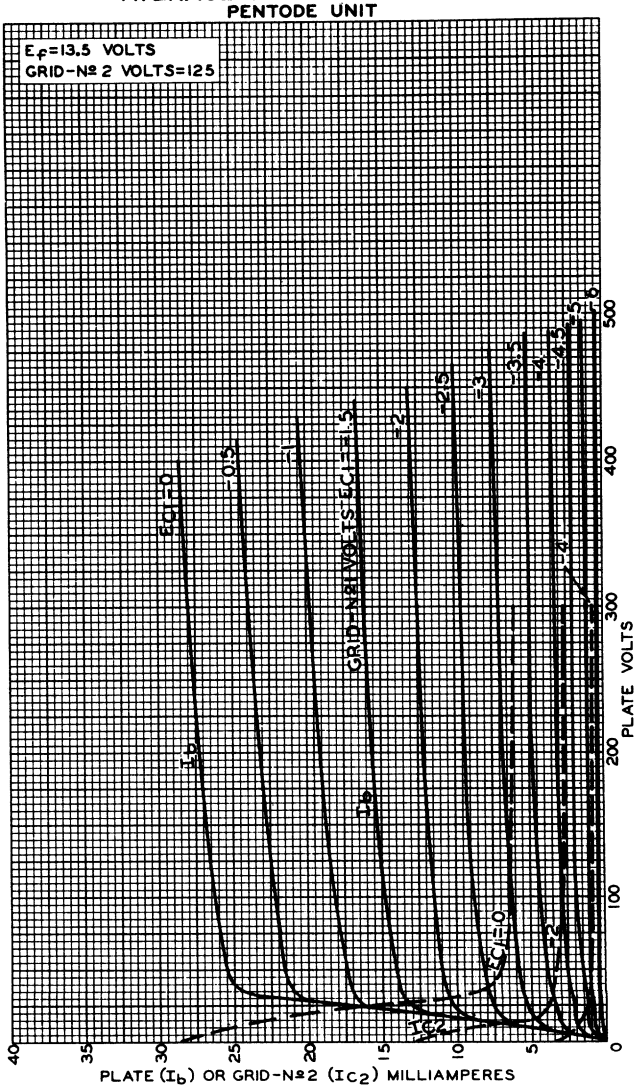


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9815

7060

AVERAGE CHARACTERISTICS
PENTODE UNIT



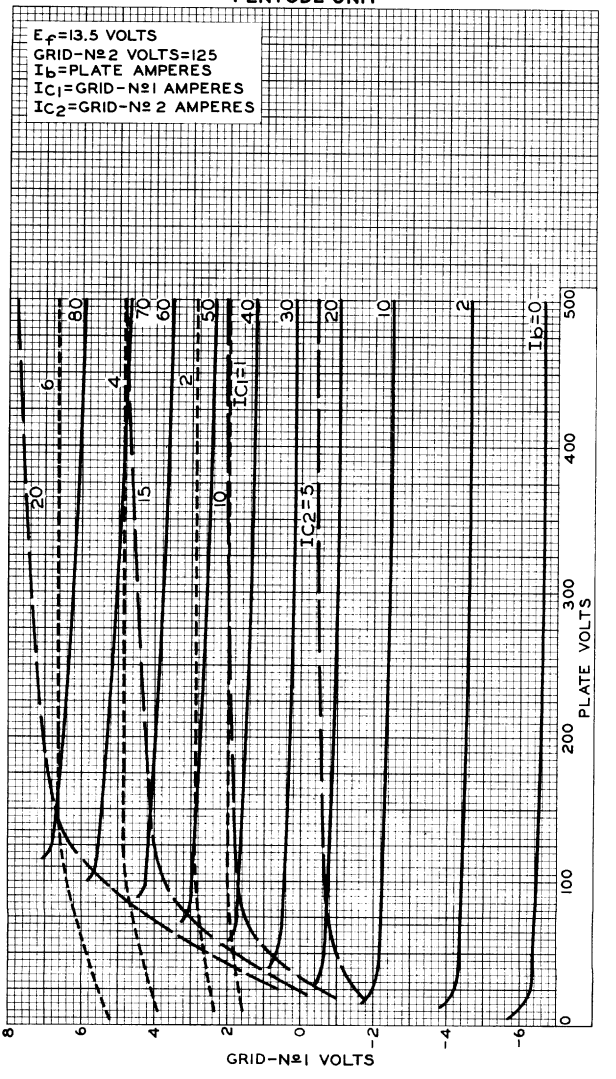
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9811

7060

AVERAGE CONSTANT-CURRENT CHARACTERISTICS

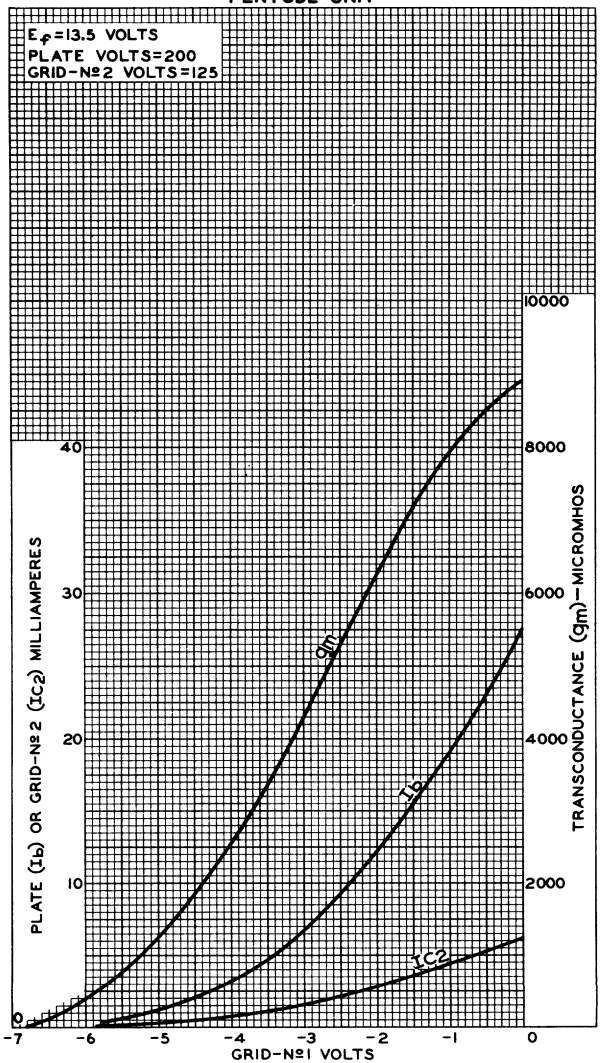
PENTODE UNIT



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7060

AVERAGE CHARACTERISTICS
PENTODE UNIT



7061

BEAM POWER TUBE

9-PIN MINIATURE TYPE

For use in mobile communications equipment operating from 6-cell storage-battery systems

GENERAL DATA

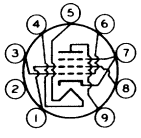
Electrical:

Heater, for Unipotential Cathode:		
Voltage range	12 to 15	ac or dc volts
Current (Approx.) at 13.5 volts	0.21	amp
Direct Interelectrode Capacitances:[o]		
Grid No.1 to plate	0.7 max.	μμf
Grid No.1 to all other electrodes except plate	8	μμf
Plate to all other electrodes except grid No.1	8.5	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9EU

Pin 1 - Grid No.2
Pin 2 - No Connection
Pin 3 - Grid No.1
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Grid No 1
Pin 7 - Cathode, Grid No.3
Pin 8 - Grid No.2
Pin 9 - Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	345 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	310 max.	volts
GRID-No.2 INPUT	2 max.	watts
PLATE DISSIPATION	9 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	120 max.	volts
Heater positive with respect to cathode	120 max.	volts

Typical Operation and Characteristics:

Heater Voltage	13.5	volts
Plate Voltage	200	volts
Grid-No.2 Voltage	200	volts
Grid-No.1 (Control-Grid) Voltage	-10	volts

[o] Without external shield.

7061

BEAM POWER TUBE

Peak AF Grid-No.1 Voltage	10	volts
Zero-Signal Plate Current	35.5	ma
Max.-Signal Plate Current	38	ma
Zero-Signal Grid-No.2 Current	9	ma
Max.-Signal Grid-No.2 Current	7.5	ma
Plate Resistance (Approx.)	60000	ohms
Transconductance	4200	μmhos
Load Resistance	5000	ohms
Total Harmonic Distortion	7	%
Max.-Signal Power Output	3	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.19	0.23	amp
Transconductance	1,2	3100	5800	μmhos
Plate Current	1,2	26	45	ma
Grid-No.2 Current	1,2	–	6.5	ma
Reverse Grid-No.1 Current	1,3	–	-2	μa
Power Output	1,4	2.4	–	watts
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,5	–	50	μa
Heater positive with respect to cathode	1,5	–	50	μa
Leakage Resistance:				
Between grid No.1 and all other electrodes tied together	1,6	50	–	megohms
Between plate and all other electrodes tied together	1,7	50	–	megohms

Note 1: With ac or dc heater volts = 13.5.

Note 2: With dc plate volts = 200, grid-No.2 volts = 200, grid-No.1 volts = -10, and grid No.3 connected to cathode.

Note 3: With grid-No.1 resistor (megohms) = 0.1.

Note 4: With load resistor (ohms) = 5000, and rms signal volts = 7.1.

Note 5: With 100 volts dc between heater and cathode.

Note 6: With grid No.1 100 volts negative with respect to all other electrodes tied together.

Note 7: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent

operation is applied under the following conditions: heater volts = 17 cycled one minute on and four minutes off, heater 135 volts negative with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 13.5, plate volts = 200, grid-No.2 volts = 200, grid-No.1 volts = -10, plate load resistor (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 500 millivolts.

500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures. Life testing is conducted under the following conditions: heater volts = 15, and maximum-rated plate dissipation and grid-No.2 input.

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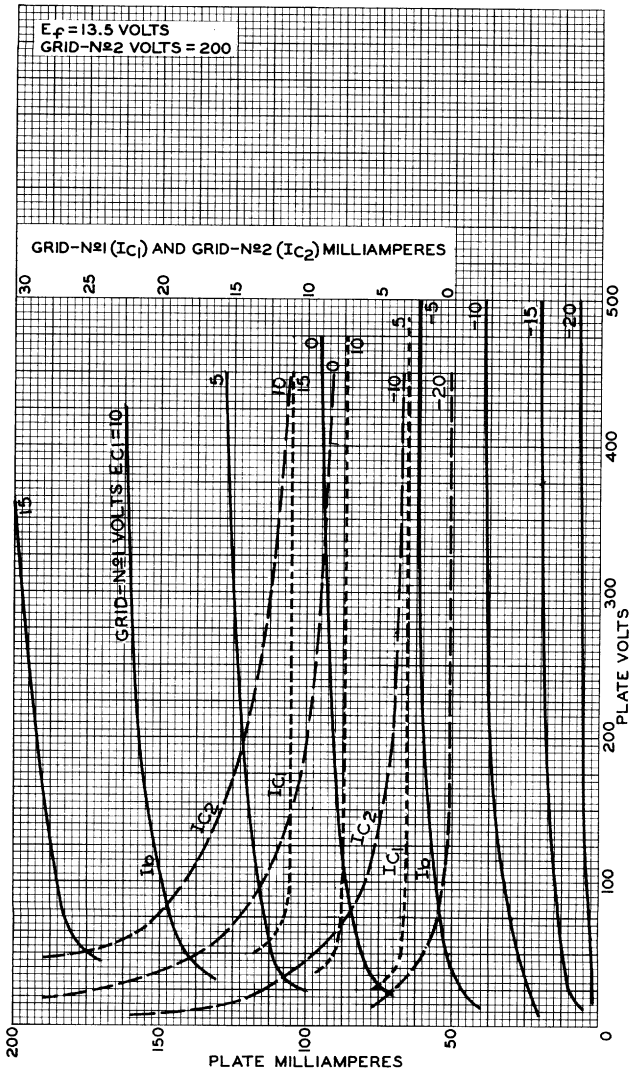
AVERAGE CHARACTERISTICS

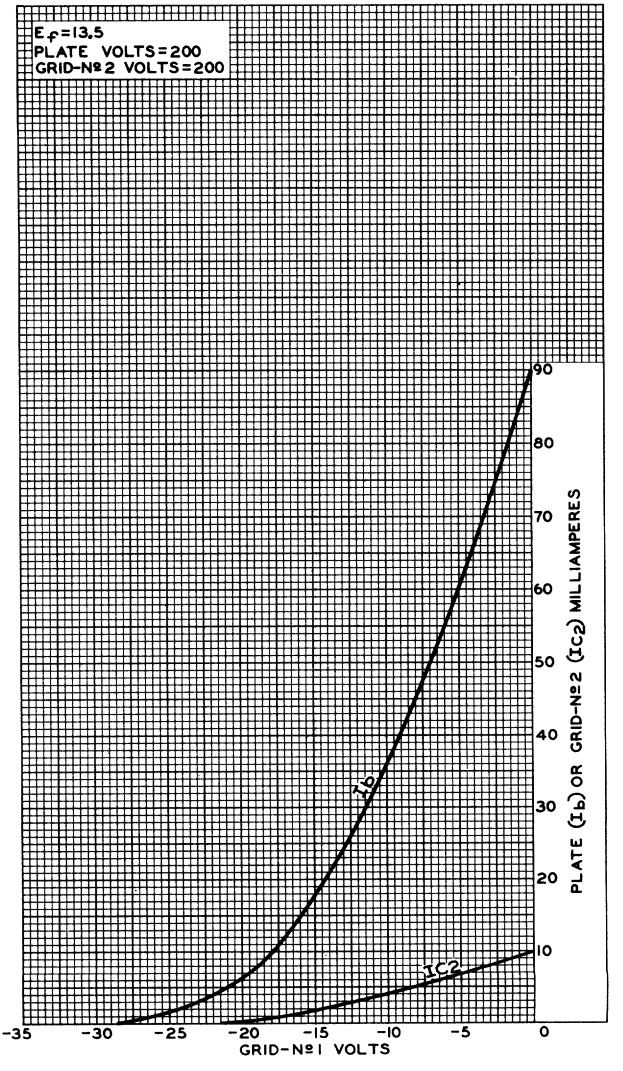


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9802

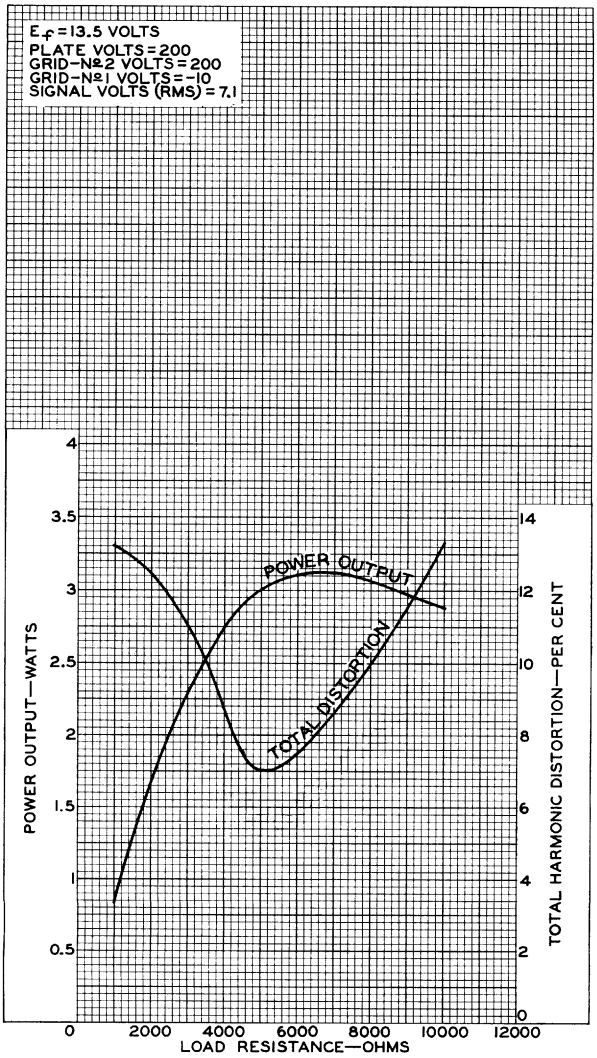
7061

AVERAGE CHARACTERISTICS



7061

OPERATION CHARACTERISTICS

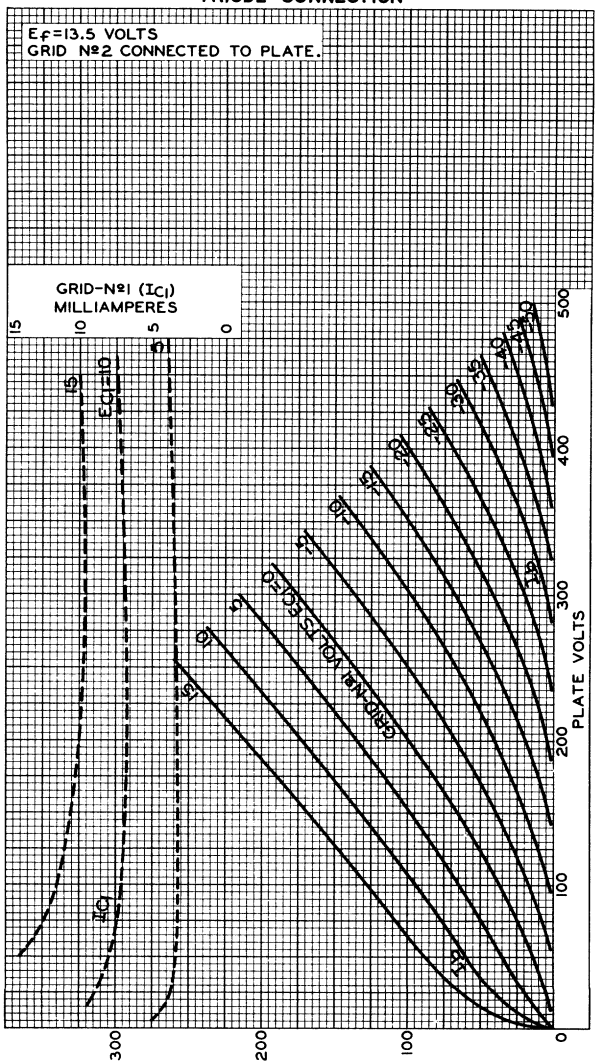


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9814

7061

AVERAGE CHARACTERISTICS
TRIODE CONNECTION



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9801

7094

Beam Power Tube

FORCED-AIR COOLED AT MAXIMUM RATINGS
500 WATTS CW INPUT (ICAS) UP TO 60 Mc
335 WATTS CW INPUT (ICAS) UP TO 175 Mc

GENERAL DATA

Electrical:

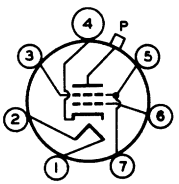
Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	2.85	amp
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 300, grid-No.2 volts = 300, and plate ma = 150.	7	
Direct Interelectrode Capacitances (Approx.):[a]		
Grid No.1 to plate	0.6	μμf
Grid No.1 to grid No.2 & internal shield	11	μμf
Grid No.1 to cathode and heater	8.5	μμf
Grid No.2 & internal shield to plate	9.5	μμf
Grid No.2 & internal shield to cathode and heater	2.0	μμf
Plate to cathode and heater	0.2	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	5"
Seated Length	4.44" ± 0.08"
Maximum Diameter	2.56"
Weight (Approx.)	6 oz
Bulb	T20
Socket	Johnson Nos.122-247[b] or 122-248[b], or equivalent
Base	Jumbo-Button Septar 7-Pin (JEDEC No.E7-46)

BOTTOM VIEW

Pin 1 - Heater
Pin 2 - Heater
Pin 3 - Grid No.2, Internal Shield
Pin 4 - Cathode



Pin 5 - Grid No.2, Internal Shield
Pin 6 - Grid No.1
Pin 7 - Grid No.2, Internal Shield
P - Plate

Thermal:

Cooling--Free circulation of air around the tube is required. Under operating conditions at maximum ratings, some forced-air cooling will be required from a small fan to prevent exceeding the specified maximum bulb temperature.

Bulb Temperature (At hottest point on bulb surface)	250 max.	°C

Indicates a change.

AF POWER AMPLIFIER & MODULATOR — Class AB_1[c]

	CCS[d]	ICAS[e]	
Maximum Ratings, *Absolute-Maximum Values:*			
DC PLATE VOLTAGE	1500 max.	2000 max.	volts
DC GRID-No.2 VOLTAGE	400 max.	400 max.	volts
MAX.-SIGNAL DC PLATE CURRENT[f]	350 max.	350 max.	ma
MAX.-SIGNAL PLATE INPUT[f]	300 max.	400 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT[f]	20 max.	20 max.	watts
PLATE DISSIPATION[f]	100 max.	125 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	135 max.	135 max.	volts
Heater positive with respect to cathode	135 max.	135 max.	volts
Typical Operation:			
Values are for 2 tubes			
DC Plate Voltage	1500	2000	volts
DC Grid-No.2 Voltage[g]	400	400	volts
DC Grid-No.1 Voltage[h]	-65	-65	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	120	120	volts
Zero-Signal DC Plate Current	60	60	ma
Max.-Signal DC Plate Current	400	400	ma
Max.-Signal DC Grid-No.2 Current	70	70	ma
Effective Load Resistance (Plate to plate)	8700	12000	ohms
Max.-Signal Driving Power (Approx.)	0	0	watts
Max.-Signal Power Output (Approx.)	410	560	watts

LINEAR RF POWER AMPLIFIER — Class AB_1[c]
Single-Sideband Suppressed-Carrier Service

	CCS[d]	ICAS[e]	
Maximum Ratings, *Absolute-Maximum Values:*			
Up to 60 Mc			
DC PLATE VOLTAGE	1500 max.	2000 max.	volts
DC GRID-No.2 VOLTAGE	400 max.	400 max.	volts
MAX.-SIGNAL DC PLATE CURRENT	350 max.	350 max.	ma
MSX.-SIGNAL PLATE INPUT	300 max.	400 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT	20 max.	20 max.	watts
PLATE DISSIPATION	100 max.	125 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	135 max.	135 max.	volts
Heater positive with respect to cathode	135 max.	135 max.	volts

Typical Operation for "Single-Tone Modulation":[j]

	At 60 Mc		
DC Plate Voltage	1500	2000	volts
DC Grid-No.2 Voltage[g]	400	400	volts
DC Grid-No.1 Voltage[h]	-65	-65	volts
Max.-Signal Peak RF Grid-No.1 Voltage	60	60	volts
Zero-Signal DC Plate Current	30	30	ma
Max.-Signal DC Plate Current	200	200	ma
Max.-Signal Grid-No.2 Current	35	35	ma
Effective RF Load Resistance	4350	6000	ohms
Max.-Signal Driver Power Output (Approx.)	4	4	watts
Output-Circuit Efficiency (Approx.)	90	90	%
Max.-Signal Useful Power Output (Approx.)	185[k]	250[k]	watts

LINEAR RF POWER AMPLIFIER — Class B
Single-Sideband Suppressed-Carrier Service

High-Mu Triode Connection[m]

Maximum Ratings, *Absolute-Maximum Values:*

	CCS[d]	ICAS[e]	
	Up to 60 Mc		
DC PLATE VOLTAGE	1500 max.	2000 max.	volts
MAX. SIGNAL DC PLATE CURRENT	350 max.	350 max.	ma
MAX.-SIGNAL DC GRID CURRENT (Combined Grids No.1 & No.2)	200 max.	200 max.	ma
MAX.-SIGNAL PLATE INPUT	300 max.	450 max.	watts
PLATE DISSIPATION	100 max.	125 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	135 max.	135 max.	volts
Heater positive with respect to cathode	135 max.	135 max.	volts

Typical Operation:

	In cathode-drive circuit at 60 Mc with "Single-Tone Modulation"[j]		
DC Plate-to-Grids No.1 & No.2 Voltage	1350	1750	volts
DC Grids No.1 & No.2 Voltage	0	0	volts
Zero-Signal DC Plate Current	30	44	ma
Effective RF Load Resistance	3800	5100	ohms
Max.-Signal DC Plate Current	200	200	ma

← Indicates a change.

Max.-Signal DC Grid Current (Combined Grids No.1 & No.2).	140	140	ma
Max.-Signal Peak RF Cathode-to-Grids-No.1 & No.2 Voltage.	50	50	volts
Max.-Signal Driver Power Output (Approx.)[h].	15	15	watts
Output-Circuit Efficiency (Approx.).	90	90	%
Max.-Signal Useful Power Output (Approx.)	160[k]	210[k]	watts

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

	CCS[d]	ICAS[e]	
Maximum Ratings, *Absolute-Maximum Values:*			
For maximum plate voltage and maximum plate input above 60 Mc see Rating Chart I			
DC PLATE VOLTAGE	1000 max.	1200 max.	volts
DC GRID-No.2 VOLTAGE	400 max.	400 max.	volts
DC GRID-No.1 VOLTAGE	-300 max.	-300 max.	volts
DC PLATE CURRENT	280 max.	280 max.	ma
DC GRID-No.1 CURRENT	25 max.	30 max.	ma
PLATE INPUT.	250 max.	335 max.	watts
GRID-No.2 INPUT.	13.5 max.	13.5 max.	watts
PLATE DISSIPATION.	67 max.	83 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	135 max.	135 max.	volts
Heater positive with respect to cathode	135 max.	135 max.	volts
Typical Operation:			
At 60 Mc			
DC Plate Voltage	1000	1200	volts
DC Grid-No.2 Voltage[p].	400	400	volts
DC Grid-No.1 Voltage[q]	-130	-130	volts
Peak RF Grid-No.1 Voltage. . .	145	150	volts
DC Plate Current	250	275	ma
DC Grid-No.2 Current	20	20	ma
DC Grid-No.1 Current (Approx.)	5	5	ma
Driver Power Output (Approx.)[n,r]	5	5	watts
Output-Circuit Efficiency (Approx.).	90	90	%
Useful Power Output (Approx.).	165[k]	240[k]	watts
At 175 Mc			
DC Plate Voltage	700	820	volts
DC Grid-No.2 Voltage[p].	400	400	volts
DC Grid-No.1 Voltage[q].	-130	-130	volts
DC Plate Current	250	275	ma
DC Grid-No.2 Current	8	8	ma

DC Grid-No.1 Current (Approx.).	6	6	ma
Driver Power Output (Approx.)[n,r]	8	8	watts
Output-Circuit Efficiency (Approx.).	85	85	%
Useful Power Output (Approx.).	105[k]	135[k]	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance[s].	30000 max.	30000 max.	ohms

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[t] and RF POWER AMPLIFIER — Class C FM Telephony

	CCS[d]	*ICAS*[e]	
Maximum Ratings, *Absolute-Maximum Values:*			
For maximum plate voltage and maximum plate input above 60 Mc, see Rating Chart II			
DC PLATE VOLTAGE	1250 max.	1500 max.	volts
DC GRID-No.2 VOLTAGE	400 max.	400 max.	volts
DC GRID-No.1 VOLTAGE	-300 max.	-300 max.	volts
DC PLATE CURRENT	340 max.	340 max.	ma
DC GRID-No.1 CURRENT	25 max.	30 max.	ma
PLATE INPUT.	375 max.	500 max.	watts
GRID-No.2 INPUT.	20 max.	20 max.	watts
PLATE DISSIPATION.	100 max.	125 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	135 max.	135 max.	volts
Heater positive with respect to cathode	135 max.	135 max.	volts

Typical Operation:

At 60 Mc				
	CCS[d]		*ICAS*[e]	
DC Plate Voltage	1000	1250	1500	volts
DC Grid-No.2 Voltage[y].	400	400	400	volts
DC Grid-No.1 Voltage[v].	-100	-100	-100	volts
Peak RF Grid-No.1 Voltage. . .	125	120	125	volts
DC Plate Current	330	300	330	ma
DC Grid-No.2 Current	20	18	20	ma
DC Grid-No.1 Current (Approx.).	5	5	5	ma
Driver Power Output (Approx.)[n,r]	4	4	4	watts
Output-Circuit Efficiency (Approx.).	90	90	90	%
Useful Power Output (Approx.).	215[k]	255[k]	340[k]	watts
At 175 Mc				
DC Plate Voltage	665	875	1000	volts
DC Grid-No.2 Voltage[y].	400	400	400	volts

DC Grid-No.1 Voltage[v]	-100	-100	-100	volts
DC Plate Current	335	300	335	ma
DC Grid-No.2 Current	8	7	8	ma
DC Grid-No.1 Current (Approx.)	5	5	5	ma
Driver Power Output (Approx.)[n]	8	7	8	watts
Output-Circuit Efficiency (Approx.)	85	85	85	%
Useful Power Output (Approx.)	130[k]	170[k]	215[k]	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance[s]	30000 max.	ohms

[a] Without external shield.

[b] E.F. Johnson Company, Waseca, Minnesota. The separate shield rings furnished with these sockets should be discarded since these rings do not accommodate the 7094.

[c] Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.

[d] Continuous Commercial Service.

[e] Intermittent Commercial and Amateur Service.

[f] Averaged over any audio-frequency cycle of sine-wave form.

[g] Obtained preferably from a fixed supply.

[h] Obtained from a fixed supply.

[j] "Single-Tone Modulation" operation refers to that class of amplifier service in which the grid-No.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-side-band suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.

[k] This value of useful power is measured at load of output circuit having indicated efficiency.

[m] Grids No.1 and No.2 connected together.

[n] Driver stage is required to supply tube losses and rf circuit losses. The driver stage should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

[p] Obtained preferably from a separate source modulated along with the plate supply, or from the modulated plate supply through a series resistor. It is recommended that this resistor be adjustable to permit obtaining the desired operating plate current after initial tuning adjustments are made.

[q] Obtained from a grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor. The combination of grid resistor and fixed supply has the advantage of not only protecting the tube from damage through loss of excitation but also of minimizing distortion by bias-supply compensation.

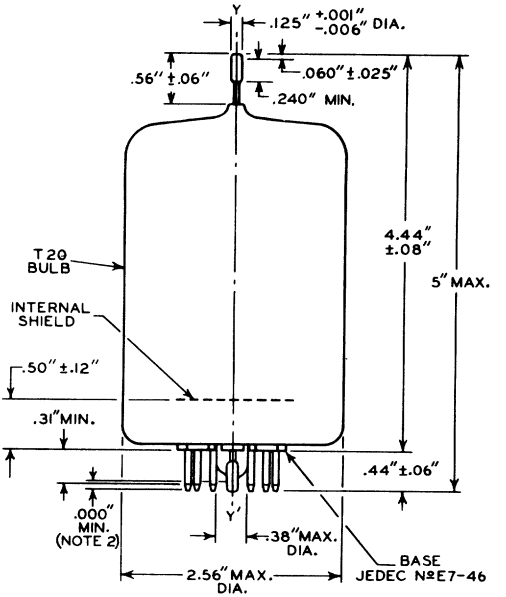
[r] Indicated values are for operation at 60 Mc. Less driver power output is required at frequencies below 60 Mc.

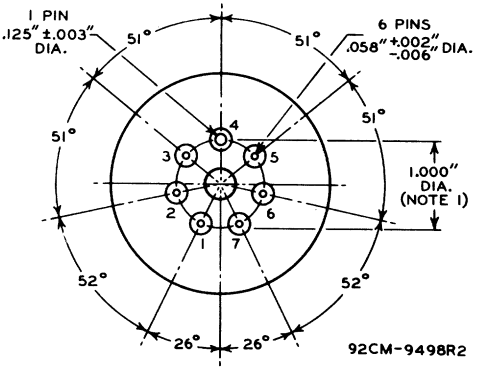
[s] When grid No.1 is driven positive the total dc grid-No.1-circuit resistance should not exceed the specified maximum value of 30000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.

[t] Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

[u] Obtained preferably from a separate source or from the plate-voltage supply with a voltage divider. If a series resistor is used, it should be adjustable to permit obtaining the desired operating plate current after initial tuning adjustments are completed. Grid-No.2 voltage must not exceed 500 volts under key-up conditions.

[v] Obtained from a grid-No.1 resistor, or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.


Y
.125" +.001" -.006" DIA.
.56" ±.06"
.060" ±.025"
.240" MIN.
4.44" ±.08"
5" MAX.
T20 BULB
INTERNAL SHIELD
.50" ±.12"
.31" MIN.
.44" ±.06"
.000" MIN. (NOTE 2)
Y'
.38" MAX. DIA.
BASE JEDEC NºE7-46
2.56" MAX. DIA.

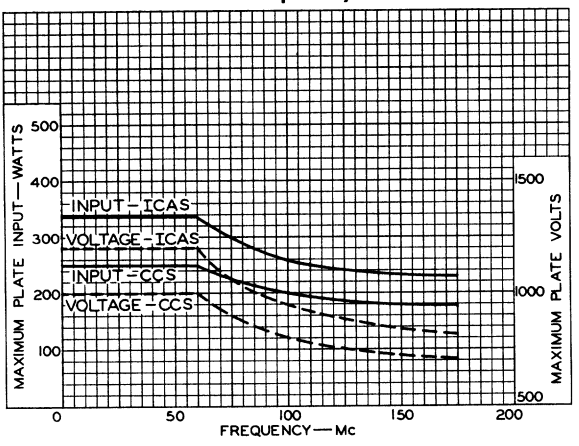

1 PIN .125" ±.003" DIA.
6 PINS .058" +.002" -.006" DIA.
51°
51°
51°
51°
1.000" DIA. (NOTE 1)
1
2
3
4
5
6
7
52°
52°
26°
26°
92CM-9498R2

THE REFERENCE AXIS Y-Y' IS DEFINED AS THE AXIS OF THE BASE PIN GAUGE DESCRIBED IN NOTE 1:

NOTE 1: ANGULAR VARIATIONS BETWEEN PINS AND VARIATION IN PIN-CIRCLE DIAMETER ARE HELD TO TOLERANCES SUCH THAT PINS WILL ENTER TO A DISTANCE OF 0.375" A FLAT-PLATE BASE-PIN GAUGE HAVING SIX HOLES 0.0800" ± 0.0005" AND ONE HOLE 0.1450" ± 0.0005" ARRANGED ON A 1.0000" ± 0.0005" DIAMETER CIRCLE AT SPECIFIED ANGLES WITH TOLERANCE OF ± 5' FOR EACH ANGLE. GAUGE IS ALSO PROVIDED WITH A HOLE 0.500" ± 0.010" CONCENTRIC WITH PIN CIRCLE WHOSE CENTER IS ON THE AXIS Y-Y'.

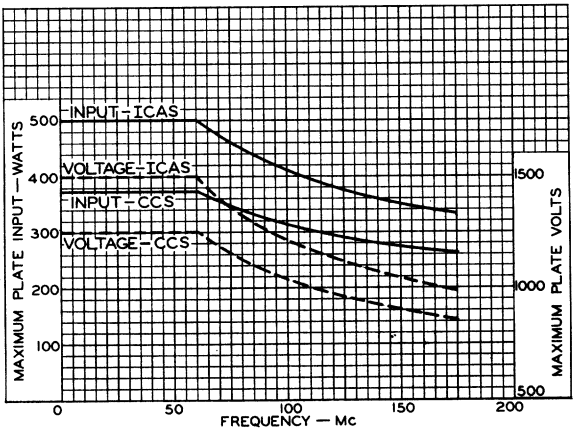
NOTE 2: EXHAUST TIP WILL NOT EXTEND BEYOND THE PLANE WHICH PASSES THROUGH THE ENDS OF THE THREE LONGEST PINS.

RATING CHART I
Class C Telephony Service



92CS-9492

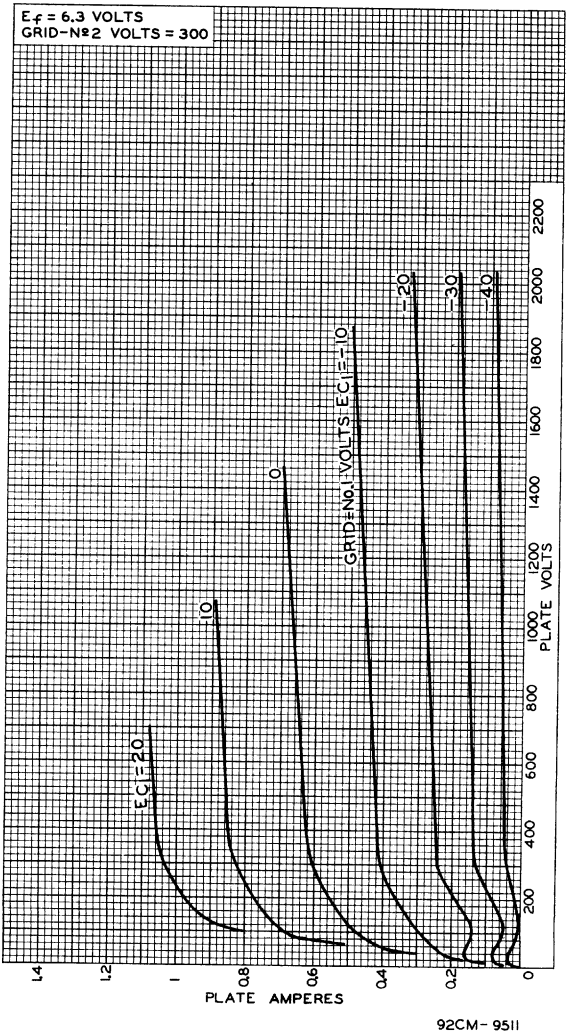
RATING CHART II
Class C Telegraphy Service



92CS-9491

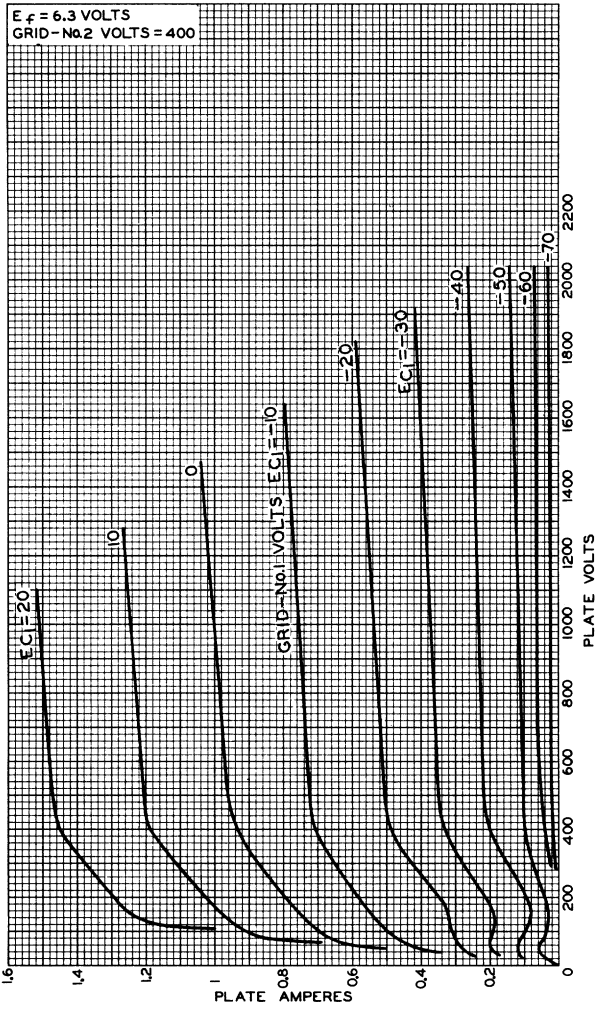
7094

TYPICAL PLATE CHARACTERISTICS



92CM-9511

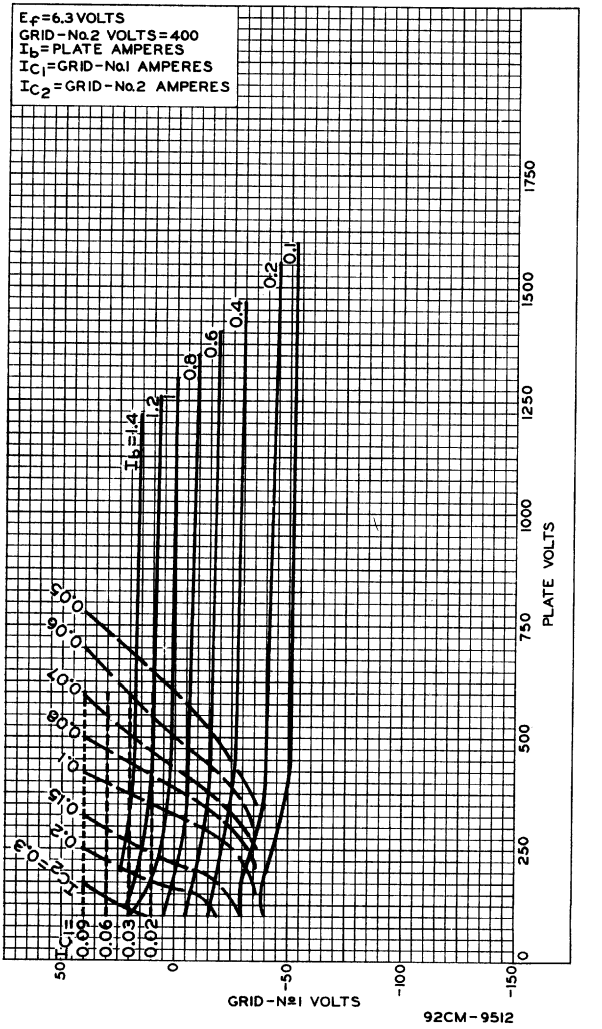
TYPICAL PLATE CHARACTERISTICS



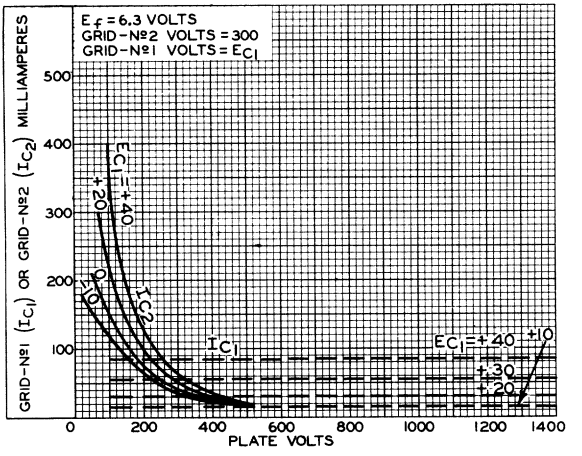
92CM-9502RI

7094

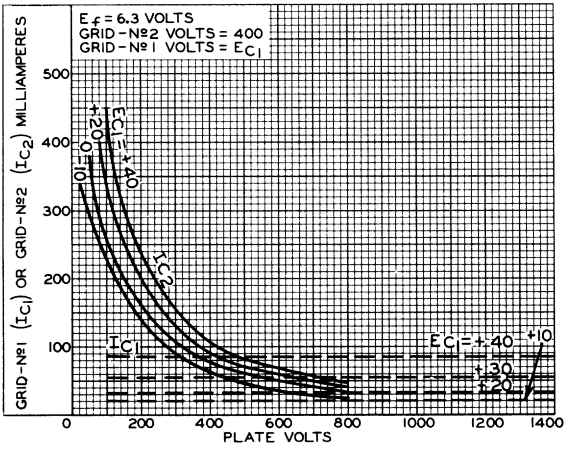
AVERAGE CONSTANT-CURRENT CHARACTERISTICS



TYPICAL CHARACTERISTICS



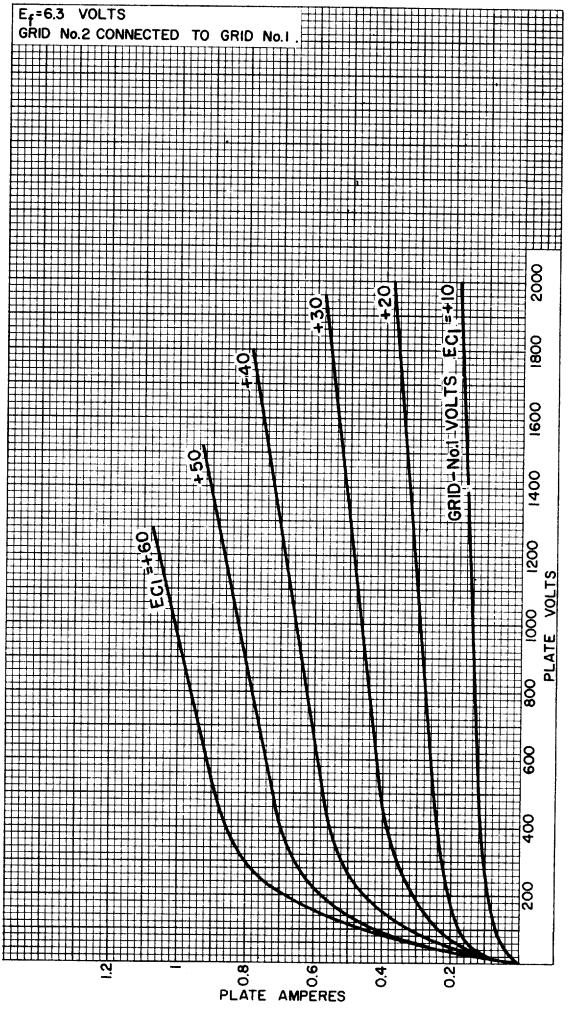
92CS-9501RI



92CS-9500RI

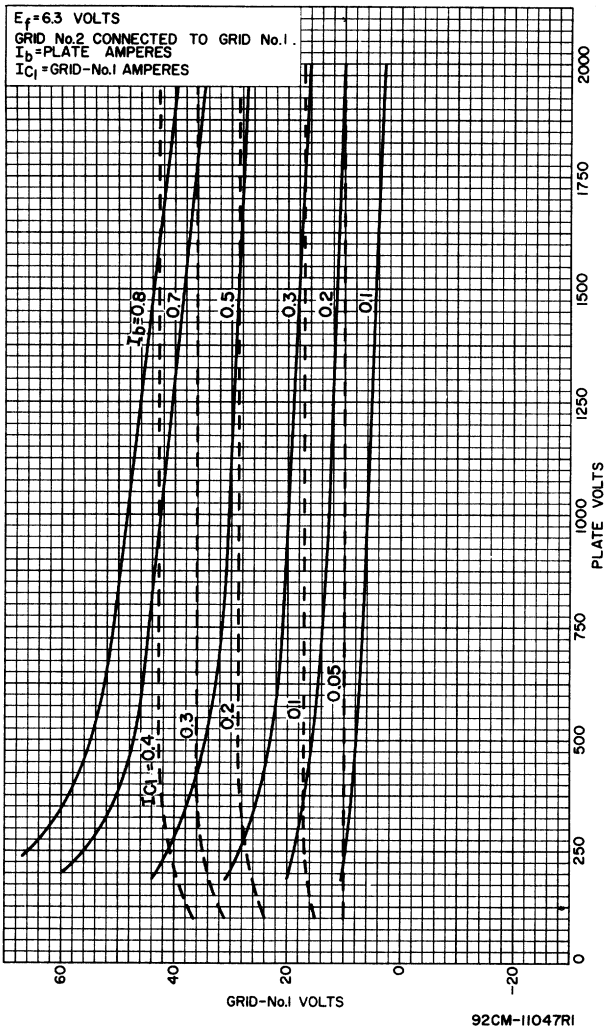
7094

TYPICAL PLATE CHARACTERISTICS
Triode Connection

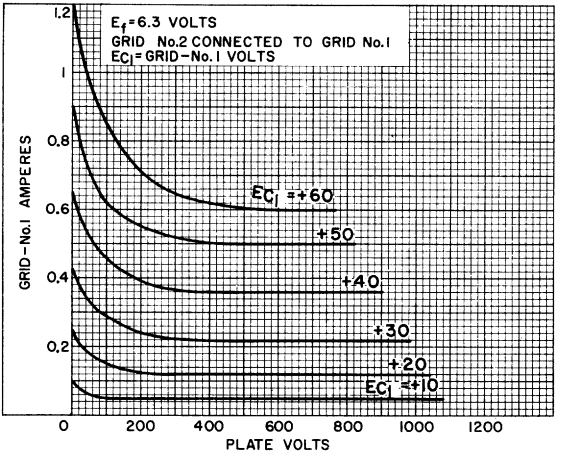


92CM-11045RI

TYPICAL CONSTANT-CURRENT CHARACTERISTICS
Triode Connection



TYPICAL CHARACTERISTICS
Triode Connection



92CS-11046RI

Magnetron

TUNABLE TYPE

FORCED-AIR COOLED **INTEGRAL MAGNET**

For Pulsed-Oscillator Applications at Frequencies between 8500 and 9600 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	13.75 ± 10%	volts
Current at heater volts = 13.75	3.15	amp
Starting current	Must never exceed 12 amperes, even momentarily	
Minimum Cathode Heating Time	2.5	minutes
Frequency	8500 to 9600	Mc
Maximum Frequency Pulling at VSWR of 1.5	15	Mc

Mechanical:

Operating Position . . . . . Any

Dimensions . . . . . See *Dimensional Outline*

Air Flow:

To Fins--An air stream should be directed along the cooling fins toward the body of the tube. Adequate flow should be provided so that the temperature of the anode block does not exceed 150° C.

To Heater-Cathode Terminal--Adequate flow should be provided to maintain the temperature of the heater-cathode terminal below 165° C.

Waveguide Output Flange . . . . . Mates with Modified JAN UG-52A/U Flange

Heater & Heater-Cathode Connector with built-in capacitor . . . . . Jettron No.9000-C[a] or Ucinite No.115364[b]

Tuning Shaft with Associated Calibrated Indicator:

Revolutions (Approx.) to cover full range of 8500 to 9600 Mc 8-1/2

Maximum torque (Absolute) at tuning-range stops . . . . . 200 oz-in.

Typical torque between -55° and +150° C (Approx.) . . . . . 50 oz-in.

Weight (Approx.) . . . . . 12 lbs

PULSED OSCILLATOR

Maximum and Minimum Ratings, *Absolute-Maximum Values:*

For duty factor up to 0.0011 maximum

PEAK ANODE VOLTAGE	23 max.	kv
PEAK ANODE CURRENT	27.5 max.	amp
PEAK POWER INPUT[c]	630 max.	kw
AVERAGE POWER INPUT	0.63 max.	kw
PULSE DURATION	2.6 max.	μsec

RATE OF RISE OF VOLTAGE PULSE	200 max. 70 min.	kv/μsec kv/μsec
ANODE-BLOCK TEMPERATURE	150 max.	°C
HEATER-CATHODE-TERMINAL TEMPERATURE	165 max.	°C
LOAD-VOLTAGE STANDING-WAVE RATIO	1.5 max.	

Typical Operation:[d]

With load-voltage standing-wave ratio equal to or less than 1.05, except as noted, and with duty factor of 0.001

Heater Voltage	See *Operating Considerations*		
Peak Anode Voltage	22	22	kv
Peak Anode Current	27.5	27.5	amp
Pulse-Repetition Rate	400	4000	pps
Pulse Duration	2.5	0.25	μsec
RF Bandwidth with worst phasing of 1.5 VSWR	0.5	5	Mc
Side Lobes with worst phasing of 1.5 VSWR	8	10	db
Pulling Figure at VSWR of 1.5	10	10	Mc
Pushing Figure	0.2	0.2	Mc/amp
Thermal Factor for any 30° range of anode-block temperature between −55° C and 150° C	0.2	0.2	Mc/°C
Servo-Drive-Shaft Torque	6	6	oz-in.
Frequency Deviation due to tuning backlash	8	8	Mc
Peak Power Output (Approx.)	230	230	kw

[a] Manufactured by Jettron Products, Hanover, New Jersey.

[b] Manufactured by Ucinite Division of United-Carr Fastener Corporation, Newtonville 60, Massachusetts.

[c] For atmospheric pressure greater than 600 millimeters of mercury in the vicinity of the heater-cathode stem. Operation at pressures lower than 600 millimeters of mercury may result in arc-over across the stem with consequent damage to the tube. The waveguide must always be pressurized to a minimum of 15 psi absolute to prevent arcing, especially when there is a mismatched load. Arcing in the waveguide due to lack of pressure can damage the tube.

[d] It is essential that the input circuit be designed so that if arcing occurs the energy per pulse delivered to the tube cannot greatly exceed the normal energy per pulse. To satisfy this requirement, it is recommended that pulsers of the discharging-network type be used.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	2.9	3.3	amp
Peak Anode Voltage	2	20	23	kv
Peak Power Output	3	200	–	kw
Pulses Missing from Total	4,5	–	0.25	%

Note 1: With 13.75 volts ac or dc on heater.

Note 2: With peak anode current of 27.5 amperes. For heater voltage, see *Operating Considerations*.

Note 3: With peak anode current of 27.5 amperes corresponding to a peak anode voltage in the order of 22 kv, anode-block temperature of 115° C approx., pulse duration of 2.5 microseconds, and maximum load-voltage standing-wave ratio equal to or less than 1.05. For heater voltage, see *Operating Considerations*.

Note 4: Pulses are considered to be missing if the energy level at the operating frequency is less than 70 per cent of the normal value.

Note 5: With peak anode current of 27.5 amperes corresponding to a peak anode voltage in the order of 22 kv, anode-block temperature of 115° C approx., pulse duration of 0.25 microsecond, and load-voltage standing-wave ratio of 1.5 adjusted in phase to produce maximum instability. For heater voltage, see *Operating Considerations.*

OPERATING CONSIDERATIONS

The *high voltage at which the 7111 is operated is very dangerous.* Great care should be taken in the design of apparatus to prevent the operator from coming in contact with the high voltage. Precautions include the enclosing of high-potential terminals and the use of interlocking switches to break the primary circuit of the power supply when access to the equipment is required.

Fastening the JAN RG-51/U waveguide to the waveguide output flange of the tube is accomplished in the following manner. A JAN UG-52A/U choke flange or equivalent should be modified by drilling out the screw threads from the four mounting holes in the choke flange using a No. 15 drill. This operation will permit four size 8-32 bolts inserted through the flange mounting holes to engage the threaded waveguide output flange of the tube.

Cooling of the anode block is accomplished by directing a separate stream of clean air through each set of cooling fins toward the anode block. The two streams are provided from two 3/4"-diameter ducts placed 1/2" to 3/4" from the fins.

After the *heater voltage* is raised gradually to its rated value of 13.75 volts, allow the cathode to warm up for at least 2-1/2 minutes to make sure that the cathode reaches operating temperature. When the cathode has reached full operating temperature, high-voltage pulses, negative with respect to anode (ground), can be applied to the heater-cathode terminal. As soon as the high-voltage pulses are applied, the heater voltage (E_f) should preferably be reduced in accordance with the following formula, depending on the average power input (P_i) to the tube:

$$P_i \text{ up to } 450 \text{ watts: } E_f = 13.75 \left(1 - \frac{P_i}{450}\right) \text{ volts}$$

$$P_i \text{ greater than } 450 \text{ watts: } E_f = 0 \text{ volts}$$

In those cases where this type is used as replacement for the fixed-frequency type 4J50, it is permissible to apply the following formula which is specified for reducing the heater voltage on the 4J50.

$$P_i \text{ up to } 100 \text{ watts: } E_f = 13.75 \text{ volts}$$

$$P_i \text{ greater than } 100 \text{ watts: } E_f = 14 \left(1 - \frac{P_i}{1120}\right) \text{ volts}$$

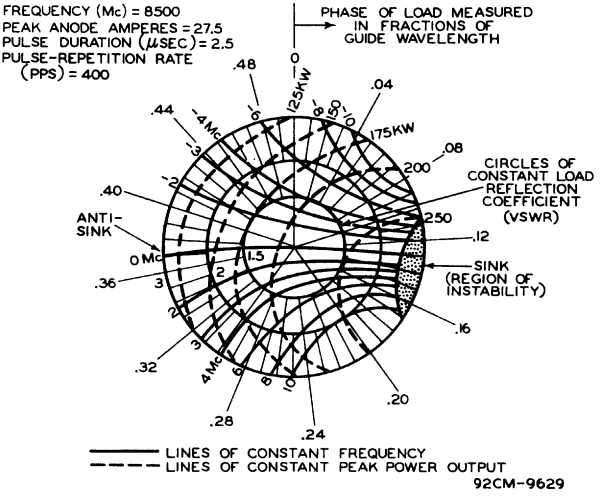
For *standby operation*, during which the high-voltage pulses are not applied to the tube, the heater voltage should be restored to 13.75 volts.

Tuning is accomplished by pushing in on the knurled tuning knob and turning it until the desired setting of the calibrated indicator is reached. Releasing the knob allows a spring to disengage it from the tuning mechanism. The design of the 7111 provides an essentially constant operating frequency without requiring a positive mechanical lock even though the tube is subjected to vibration.

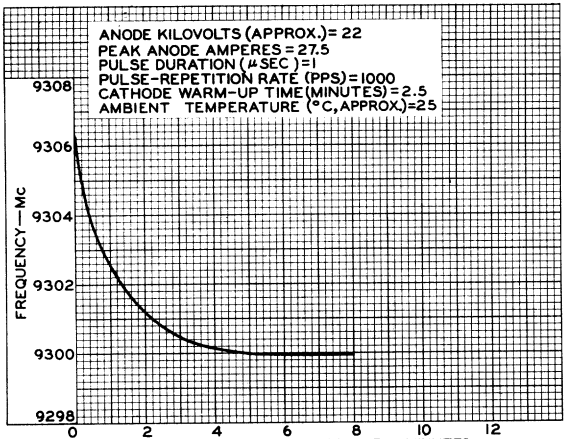
For precise tuning adjustment, the final indicator setting should be approached using the same direction of rotation of the tuning shaft. There is little frequency drift after changing tuner setting.

Our engineers are ready to assist you in circuit applications of the RCA-7111. For further information, write to Commercial Engineering, RCA, Harrison, New Jersey, giving complete details as to the proposed service.

RIEKE DIAGRAM

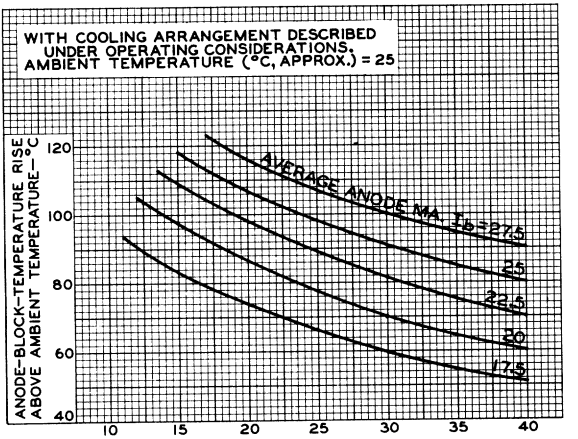


TYPICAL STABILIZATION CHARACTERISTIC

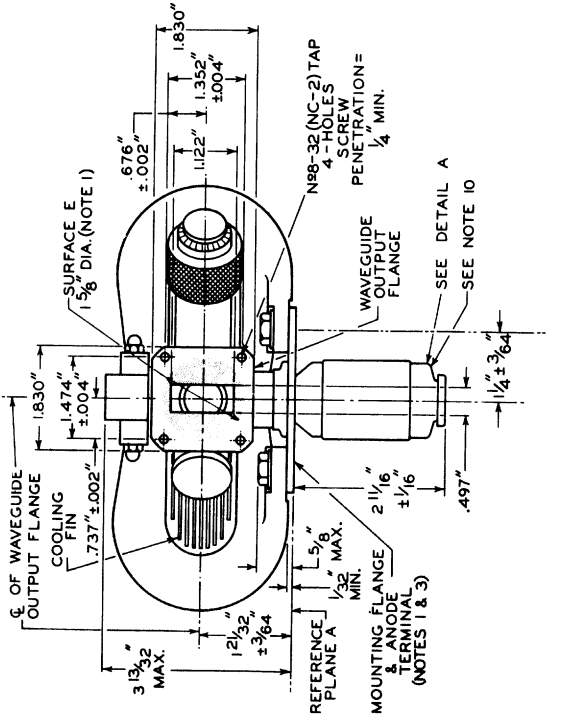


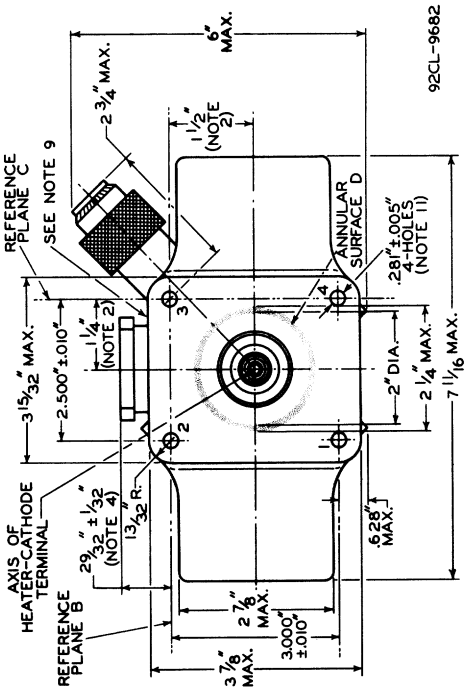
92CS-8941RI

TYPICAL COOLING REQUIREMENTS

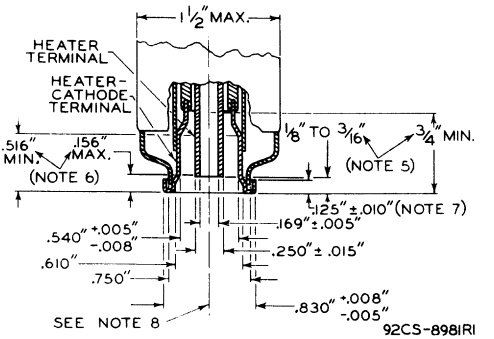


92CS-9688RI


1.830"
1.352" ±.004"
.676" ±.002"
1.122"
SURFACE E
1 5/8" DIA. (NOTE 1)
№8-32 (NC-2) TAP
4-HOLES
SCREW
PENETRATION=
1/4" MIN.
WAVEGUIDE
OUTPUT
FLANGE
SEE DETAIL A
SEE NOTE 10
1 1/4" ± 3/64"
1.830"
1.474" ±.004"
.737" ±.002"
℄ OF WAVEGUIDE
OUTPUT FLANGE
COOLING
FIN
2 1/16" ± 1/16"
.497"
5/8" MAX.
1/32" MIN.
1 21/32" ± 3/64"
3 13/32" MAX.
REFERENCE
PLANE A
MOUNTING FLANGE
& ANODE
TERMINAL
(NOTES 1 & 3)


92CL-9682
6" MAX.
2 3/4" MAX.
1 1/2" (NOTE 2)
REFERENCE PLANE C
SEE NOTE 9
ANNULAR SURFACE D
.281"±.005" 4-HOLES (NOTE 11)
3 15/32" MAX.
2.500"±.010"
1/4" (NOTE 2)
2" DIA.
2 1/4" MAX.
7 11/16 MAX.
AXIS OF HEATER-CATHODE TERMINAL
29/32" ± 1/32" (NOTE 4)
13/32" R.
.628" MAX.
REFERENCE PLANE B
2 7/8" MAX.
3.000"±.010"
3 7/8" MAX.
1
2
3
4

DETAIL A



REFERENCE PLANE A IS DEFINED AS THE PLANE THROUGH THAT PORTION OF THE MOUNTING FLANGE DESIGNATED AS ANNULAR SURFACE D.

REFERENCE PLANE B IS DEFINED AS THE PLANE WHICH IS PERPENDICULAR TO PLANE A AND PASSES THROUGH THE EXACT CENTERS OF MOUNTING-FLANGE HOLES 2 AND 3.

REFERENCE PLANE C IS DEFINED AS THE PLANE WHICH IS PERPENDICULAR TO PLANE A AND PLANE B AND PASSES THROUGH THE EXACT CENTERS OF MOUNTING-FLANGE HOLES 3 AND 4.

NOTE 1: SURFACE E OF THE WAVEGUIDE OUTPUT FLANGE AND THE ENTIRE SURFACE OF THE MOUNTING FLANGE ARE MADE SO THAT THEY MAY BE USED TO PROVIDE A HERMETIC SEAL.

NOTE 2: THE AXIS OF THE HEATER-CATHODE TERMINAL WILL BE WITHIN THE CONFINES OF A CYLINDER WHOSE RADIUS IS 3/64" AND WHOSE AXIS IS PERPENDICULAR TO REFERENCE PLANE A AT THE SPECIFIED LOCATION.

NOTE 3: ALL POINTS ON THE MOUNTING FLANGE WILL LIE WITHIN 0.015" ABOVE OR BELOW REFERENCE PLANE A.

NOTE 4: THE LIMITS INCLUDE ANGULAR AS WELL AS LATERAL DEVIATIONS.

NOTE 5: THESE DIMENSIONS DEFINE EXTREMITIES OF THE 0.169" INTERNAL DIAMETER OF THE CYLINDRICAL HEATER TERMINAL.

NOTE 6: THESE DIMENSIONS DEFINE EXTREMITIES OF THE 0.540" INTERNAL DIAMETER OF THE CYLINDRICAL HEATER-CATHODE TERMINAL.

NOTE 7: NO PART OF THE CONNECTOR DEVICE FOR THE HEATER AND HEATER-CATHODE TERMINALS SHOULD BEAR AGAINST THE UNDERSIDE OF THIS LIP.

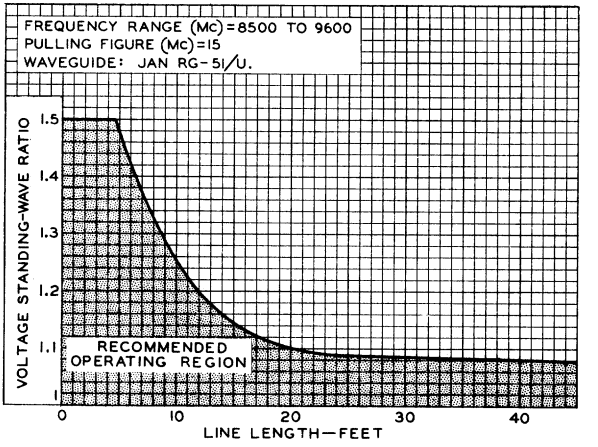
NOTE 8: THE HEATER TERMINAL AND THE HEATER-CATHODE TERMINAL ARE CONCENTRIC WITHIN 0.010".

NOTE 9: ANODE TEMPERATURE MEASURED AT JUNCTION OF WAVEGUIDE AND ANODE BLOCK.

NOTE 10: CATHODE TEMPERATURE MEASURED HERE.

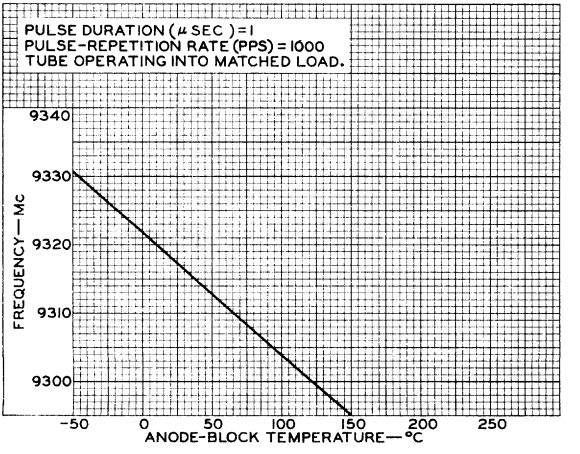
NOTE 11: THE ENDS OF THE MOUNTING STUDS MUST NOT PENETRATE THROUGH THE MOUNTING HOLES MORE THAN 1-3/32" FROM THE MOUNTING-FLANGE SURFACE.

EFFECT OF LENGTH OF TRANSMISSION LINE BETWEEN OUTPUT FLANGE AND LOAD ON ALLOWABLE VOLTAGE STANDING-WAVE RATIO



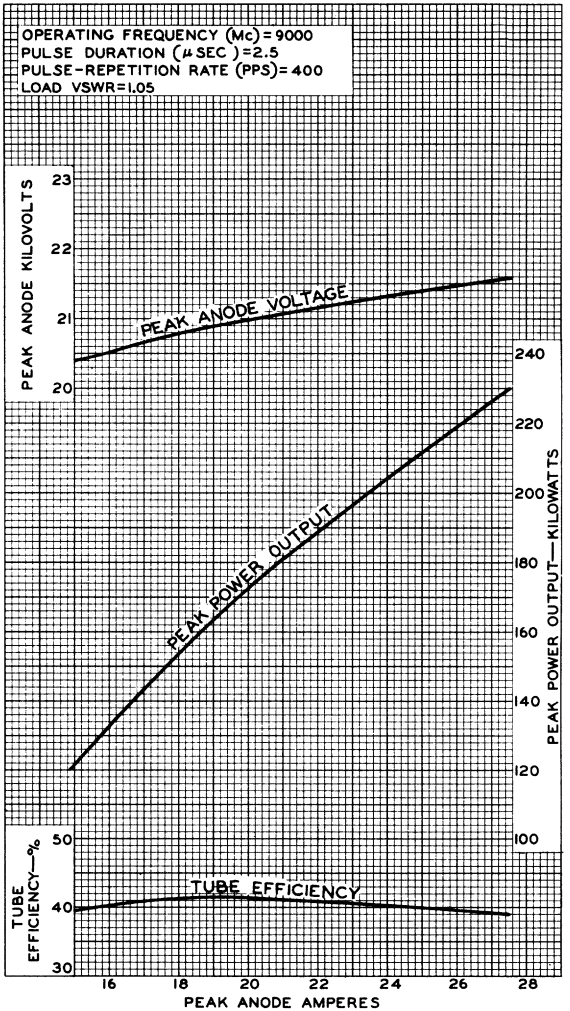
92CS-9469RI

TYPICAL THERMAL-FACTOR CHARACTERISTIC



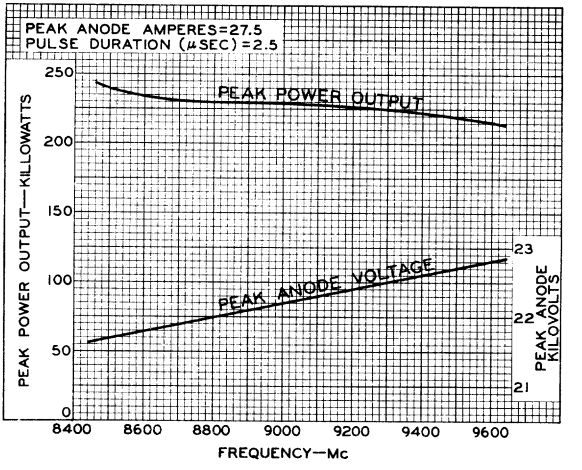
92CS-9285RI

TYPICAL PERFORMANCE CHARACTERISTICS



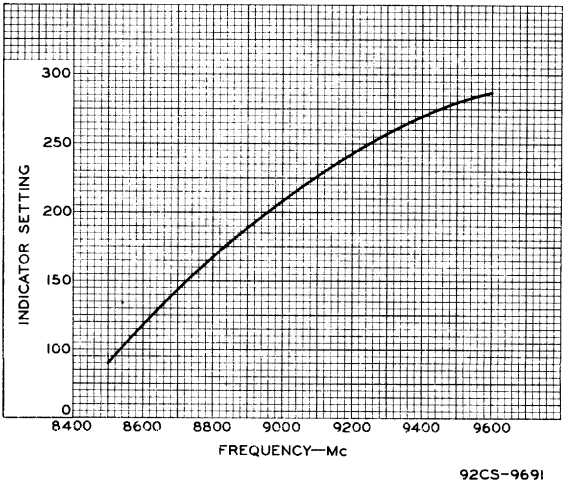
92CM-9468RI

TYPICAL PERFORMANCE CHARACTERISTICS



92CS-9690

REPRESENTATIVE TUNING CHARACTERISTIC



92CS-9691

7189

Power Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.76	amp
Direct Interelectrode Capacitances (Approx.):[a]		
Grid No.1 to plate	0.5	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	10.8	μμf
Plate to cathode & grid No.3, grid No.2, and heater	6.5	μμf
Grid No.1 to heater	0.25	μμf

Characteristics, Class A_1 Amplifier:

Plate Voltage	250	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 Voltage	-7.3	volts
Mu-Factor, Grid No.2 to Grid No.1	19.5	
Plate Resistance (Approx.)	40000	ohms
Transconductance	11300	μmhos
Plate Current	48	ma
Grid-No.2 Current	5.5	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	3-1/16"
Maximum Seated Length	2-13/16"
Length, Base Seat to Bulb Top (Excluding tip)	2-7/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9CV

Pin 1 - Internal Connection—Do Not Use
Pin 2 - Grid No.1
Pin 3 - Cathode, Grid No.3

Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Same as Pin 1
Pin 7 - Plate
Pin 8 - Same as Pin 1
Pin 9 - Grid No.2

PUSH-PULL AF POWER AMPLIFIER — Class AB_1

Maximum Ratings, *Design-Center Values:*

PLATE VOLTAGE	400 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	volts
CATHODE CURRENT	65 max.	ma
PLATE DISSIPATION	12 max.	watts
ZERO-SIGNAL GRID-No.2 INPUT	2 max.	watts

MAX.-SIGNAL GRID-No.2 INPUT	4 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Typical Operation:

Values are for 2 tubes

Plate Voltage	400	volts
Grid-No.2 Voltage	300	volts
Grid-No.1 Voltage	-15	volts
Peak AF Grid-No.1 Voltage	14.8	volts
Zero-Signal Plate Current	15	ma
Max.-Signal Plate Current	105	ma
Zero-Signal Grid-No.2 Current	1.6	ma
Max.-Signal Grid-No.2 Current	25	ma
Effective Load Resistance (Plate to plate)	8000	ohms
Total Harmonic Distortion	4	%
Max.-Signal Power Output	24	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.3 max.	megohm

PUSH-PULL AF POWER AMPLIFIER — Class AB_1

Grid No.2 of each tube connected to tap on plate winding of output transformer

Maximum Ratings, *Design-Center Values:*

→ PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	375 max.	volts
CATHODE CURRENT	65 max.	ma
PLATE DISSIPATION	12 max.	watts
ZERO-SIGNAL GRID-No.2 INPUT	2 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT	4 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Typical Operation:

Values are for 2 tubes

Plate Supply Voltage	375	volts
Grid-No.2 Supply Voltage	[b]	
Cathode Resistor	220	ohms
Peak AF Grid-No.1 Voltage	17.7	volts
→ Zero-Signal Cathode Current	70	ma
→ Max.-Signal Cathode Current	81	ma
Effective Load Resistance (Plate to plate)	11000	ohms
Total Harmonic Distortion	3	%
Max.-Signal Power Output	16.5	watts

→ Indicates a change.

Maximum Circuit Values:

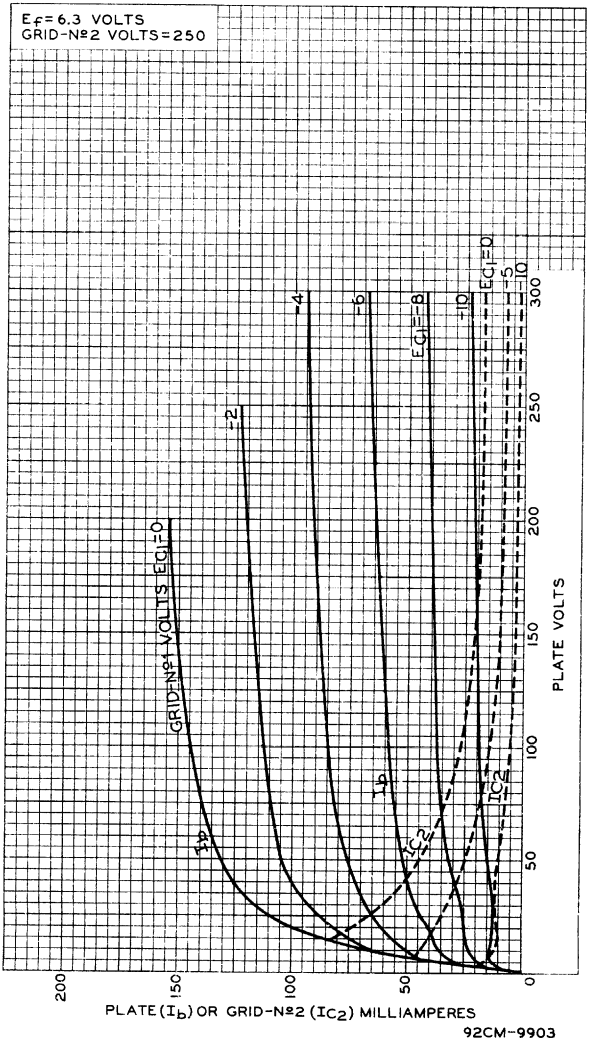
Grid-No.1-Circuit Resistance:
For cathode-bias operation. . . . . 1 max. megohm

[a] Without external shield.

[b] Obtained from taps on the primary winding of the output transformer. The taps are located on each side of the center-tap (B+) so as to supply 43 per cent of the plate signal voltage to grid No.2 of each output tube.

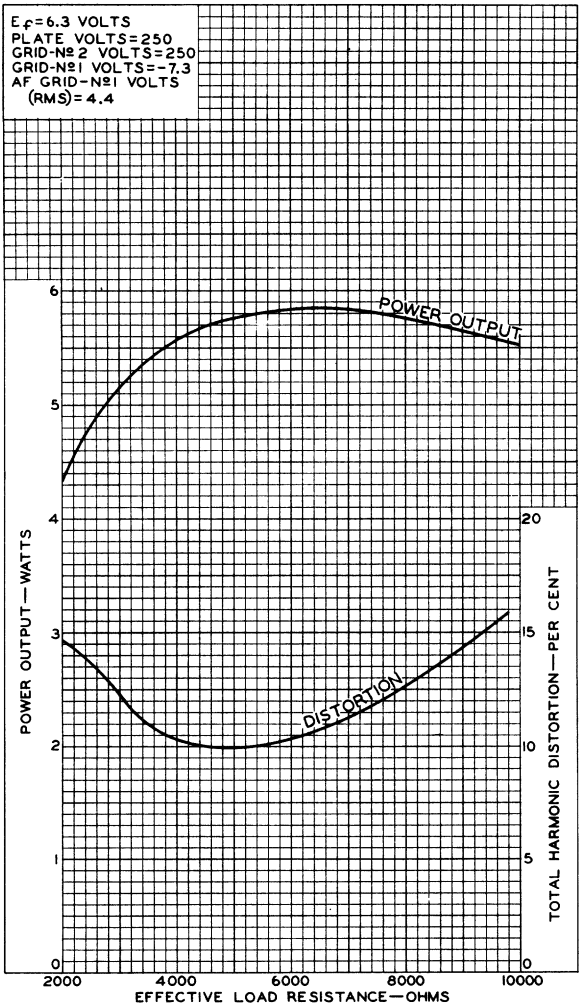
7189

AVERAGE CHARACTERISTICS



92CM-9903

OPERATION CHARACTERISTICS



92CM-9902

Medium-Mu Triode—Sharp-Cutoff Pentode

9-PIN MINIATURE-TYPE

For High-Fidelity Audio-Amplifier Applications Critical as to Noise and Hum

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:			
Voltage (AC or DC)	6.3 ± 0.6		volts
Current at heater volts = 6.3	0.450		amp
Peak heater-cathode voltage (Each Unit):			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[a]	max.	volts
Direct Interelectrode Capacitances:[b]			
Triode Unit:			
Grid to plate	2		pf
Grid to cathode and heater	2.3		pf
Plate to cathode and heater	0.3		pf
Pentode Unit:			
Grid No.1 to plate	0.06	max.	pf
Grid No.1 to cathode & internal shield & grid No.3, grid No.2, and heater	5		pf
Plate to cathode & internal shield & grid No.3, grid No.2, and heater	2		pf

Equivalent-Hum and Noise Voltage (Referenced to Grid): ←

Triode Unit

Average Value (RMS)	10	microvolts
Maximum Value (RMS)	50	microvolts

Measured in "true rms" units under the following conditions: heater volts = 6.3 ac, center-tap of heater transformer connected to ground, plate-supply volts = 250, plate load resistor (megohms) = 0.1, cathode resistor (ohms) unbypassed = 1500, grid resistor (megohms) = 0.05, and amplifier covering frequency range between 25 and 10,000 cps.

Pentode Unit

Average Value (RMS)	15	microvolts
Maximum Value (RMS)	35	microvolts

Measured in "true rms" units under the following conditions: heater volts = 6.3 ac, center-tap of heater transformer connected to ground, plate-supply volts = 250, plate-load resistor (megohms) = 0.22, grid-No.2 supply volts = 250; grid No.2 voltage divider: resistor (megohm) from grid No.2 to B+ = 0.68, resistor (megohm) from grid-No.2 to ground = 0.33; bypass ca-

← Indicates a change.

pacitor (μf) from grid No.2 to cathode = 0.1; cathode resistor (ohms unbypassed) = 680; grid No.1 resistor (megohm) = 0.27; and amplifier covering frequency range between 25 and 10,000 cps.

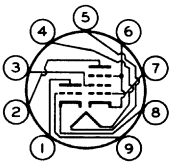
Characteristics, Class A_1 Amplifier:

	Triode Unit	*Pentode Unit*		
Plate-Supply Voltage	215	100	220	volts
Grid-No.2 Supply Voltage	-	50	130	volts
Grid-No.1 Voltage	-8.5	-	-	volts
Cathode Resistor	-	1000	62	ohms
Amplification Factor	17	-	-	
Plate Resistance (Approx.)	0.0081	1	0.4	megohm
Transconductance	2100	1500	7000	μmhos
Plate Current	9	1.1	12.5	ma
Grid-No.2 Current	-	0.35	3.5	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-40	-4	-	volts

Mechanical:

Operating Position . . . . . Any
Type of Cathodes . . . . . Coated Unipotential
Maximum Overall Length . . . . . 2-3/16"
Maximum Seated Length . . . . . 1-15/16"
Length, Base Seat to Bulb Top (Excluding tip) . . 1-9/16" ± 3/32"
Diameter . . . . . 0.750" to 0.875"
Dimensional Outline . . . . . See *General Section*
Bulb T6-1/2
Base . . . . . Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW 9JT

Pin 1 - Triode Plate
Pin 2 - Pentode Plate
Pin 3 - Pentode Grid No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Pentode Cathode, Grid No.3, Internal Shield
Pin 7 - Pentode Grid No.1
Pin 8 - Triode Cathode
Pin 9 - Triode Grid

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

	Triode Unit	*Pentode Unit*	
PLATE VOLTAGE	330 max.	330 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	-	330 max.	volts
GRID-No.2 VOLTAGE	-	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value	0 max.	0 max.	volts

	Triode Unit	*Pentode Unit*	
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 165 volts	–	0.6 max.	watt
For grid-No.2 voltages between 165 and 330 volts	–	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	2.4 max.	3 max.	watts

Maximum Circuit Values:

	Triode Unit	*Pentode Unit*	
Grid-No.1-Circuit Resistance:[c]			
For fixed-bias operation	0.5 max.	0.25 max.	megohm
For cathode-bias operation	1 max.	1 max.	megohm

[a] The dc component must not exceed 100 volts.

[b] Without external shield.

[c] If either unit is operated at maximum rated conditions, grid-No.1-circuit resistances for both units should not exceed the stated values.

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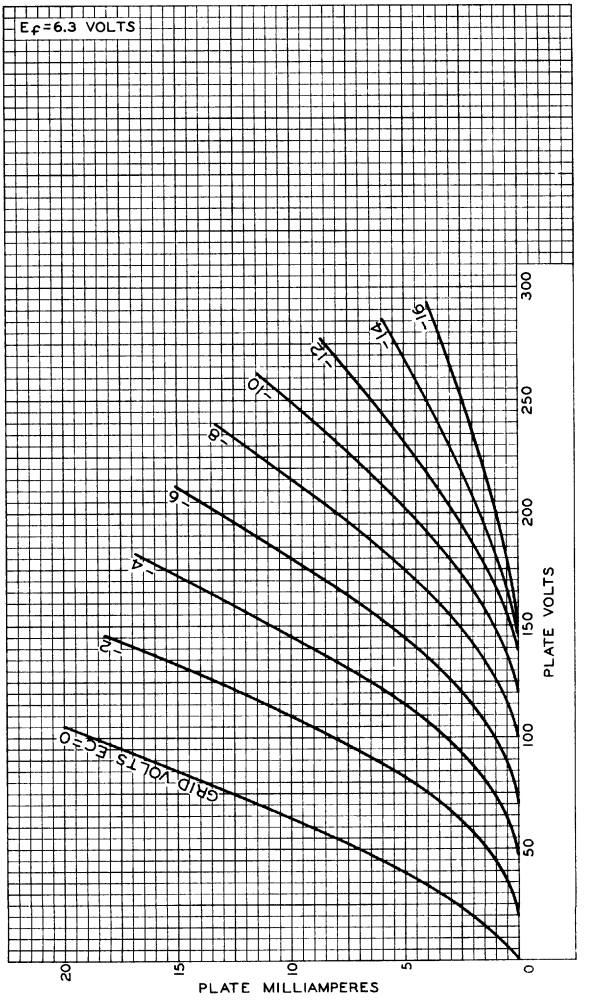
AVERAGE PLATE CHARACTERISTICS
Triode Unit



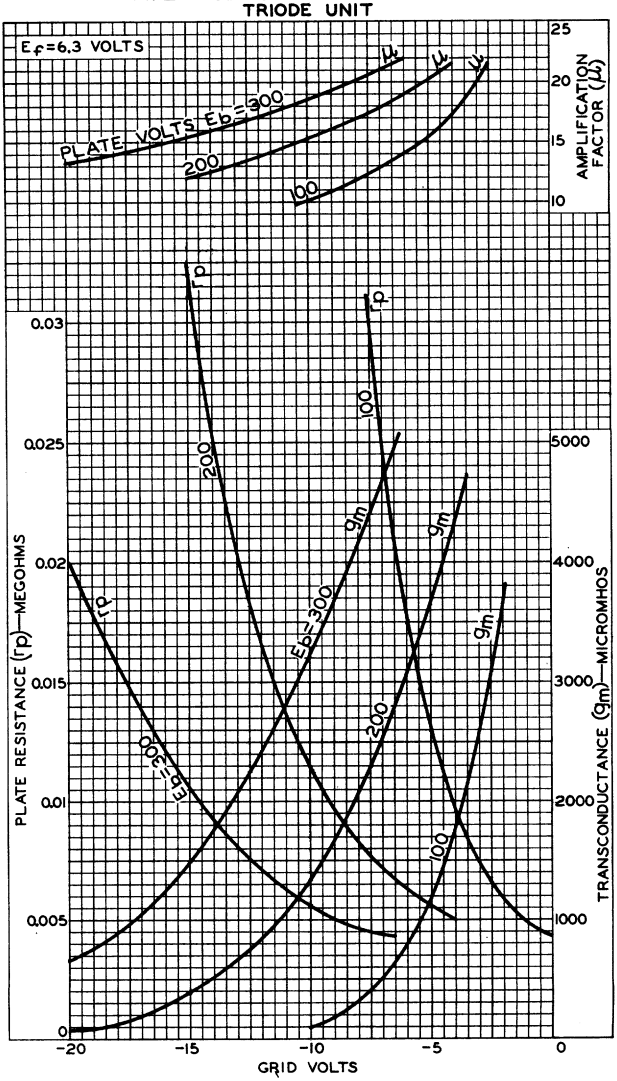
92CM-9693

RCA

7199

AVERAGE CHARACTERISTICS

TRIODE UNIT

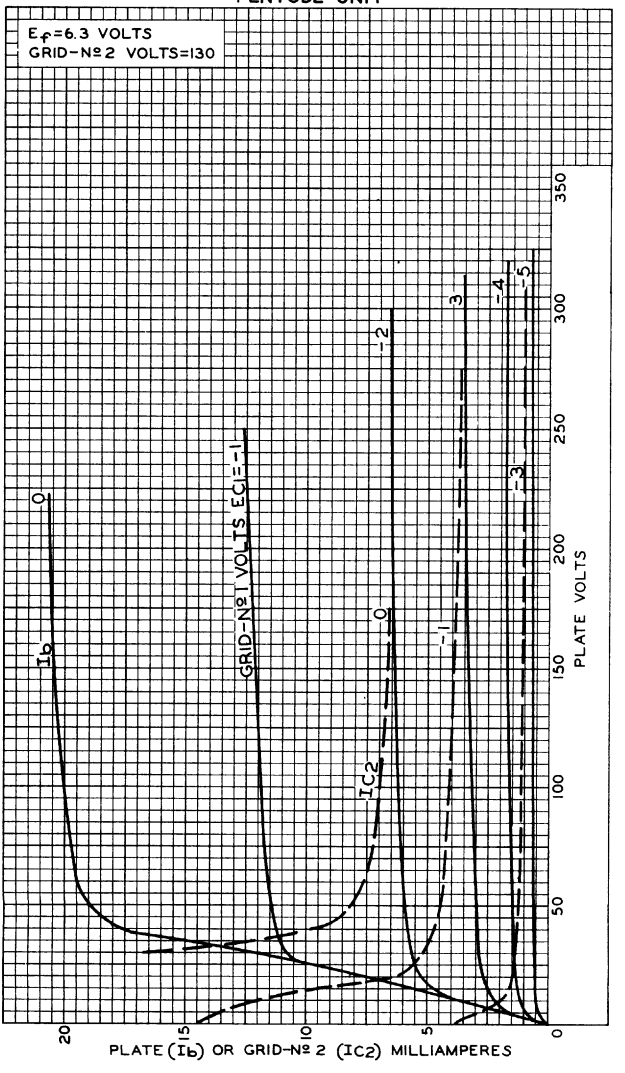


7199

7199

AVERAGE CHARACTERISTICS

PENTODE UNIT

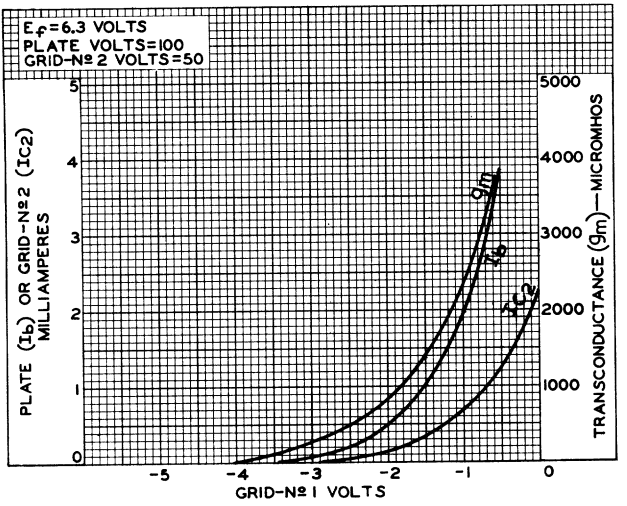


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

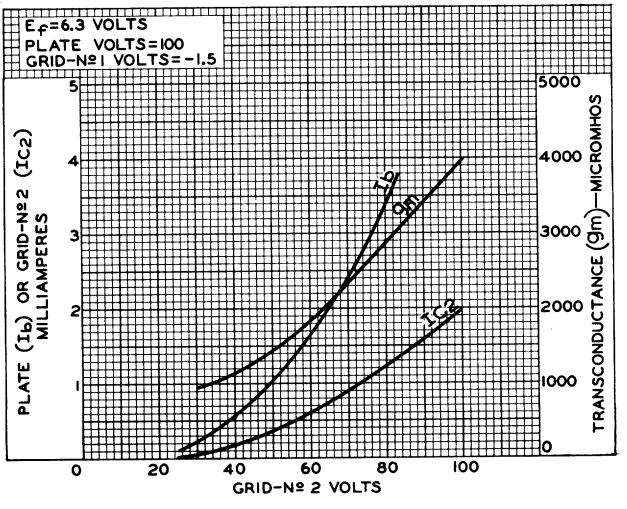
92CM-9701

7199

AVERAGE CHARACTERISTICS
PENTODE UNIT



92CS-9702



92CS-9703

7203/4CX250B

Beam Power Tube

FORCED-AIR COOLED

CERAMIC-METAL SEALS — **400 WATTS CW OUTPUT TO 175 Mc**
COAXIAL-ELECTRODE STRUCTURE — **250 WATTS CW OUTPUT AT 500 Mc**
COMPACT DESIGN — **INTEGRAL RADIATOR**

For Use at Frequencies up to 500 Mc

The 7203 is unilaterally interchangeable with the 4X250B and bilaterally interchangeable with the 4CX250B.

GENERAL DATA

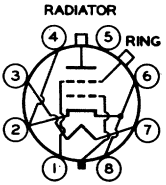
Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)[a]	6.0 ± 10%	volts
Current at heater volts = 6.0	2.6	amp
Minimum heating time	30	sec
Mu-Factor, Grid No.2 to Grid No.1, for grid-No.2 volts = 300 and grid-No.2 ma. = 50.	5.0	←
Direct Interelectrode Capacitances:[b]		
Grid No.1 to plate	0.03	μμf
Grid No.1 to cathode, grid No.2, and heater	16.0	μμf
Plate to cathode, grid No.2, and heater	4.4	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2.464"
Maximum Seated Length	1.91" ←
Maximum Diameter	1.640"
Weight (Approx.)	4 oz
Radiator	Integral part of tube
Socket	Air-System Socket, such as SK-600[c] and SK-606 Air Chimney[c]; or 124-110-1[d] (Supplied with Air Chimney)
Base	Special 8-Pin

BOTTOM VIEW



Pin 1 - Grid No.2[e]
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Cathode
Pin 5 - Do Not Use
Pin 6 - Cathode
Pin 7 - Heater
Pin 8 - Cathode
Base Index Plug - Grid No.1
Radiator - Plate
Ring Terminal[f] - Grid No.2

Air Flow:
Through indicated air-system socket—This fitting directs the air over the base seals; past the grid-No.2 seal, envelope, and plate seal; and through the radiator to

← Indicates a change.

provide effective cooling with minimum air flow. When the tube is operated at maximum plate dissipation for each class of service, a minimum air flow of 3.8 cfm through the system is required. The corresponding pressure drop is approximately 0.3 inch of water. These requirements are for operation at sea level and at an ambient temperature of 20° C. At higher altitudes and ambient temperatures, the air flow must be increased to maintain the respective seal temperatures and the plate temperature within maximum ratings.

Without air-system socket— If an air-system socket is not used, it is essential that adequate cooling air be directed over the base seals, past the envelope, and through the radiator. Under these conditions and with the tube operating at maximum plate dissipation for each class of service, a minimum air flow of 3.6 cfm must pass through the radiator. The corresponding pressure drop is approximately 0.1 inch of water. These requirements are for operation at sea level and at an ambient temperature of 20° C. At higher altitudes and ambient temperatures, the air flow must be increased to maintain the respective seal temperatures and the plate temperature within maximum ratings.

Plate Temperature (Measured on base end of plate surface at junction with fins)	250 max.	°C
Temperature of Plate Seal, Grid-No.2 Seal, and Base Seals	250 max.	°C

AF POWER AMPLIFIER & MODULATOR — Class AB_1[g]

Maximum CCS[h] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	2000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	400 max.	volts
MAX.-SIGNAL DC PLATE CURRENT[j]	250 max.	ma
GRID-No.2 INPUT[j]	12 max.	watts
PLATE DISSIPATION[j]	250 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

Typical CCS Operation:

Values are for 2 tubes

DC Plate Voltage	1000	1500	2000	volts
DC Grid-No.2 Voltage	350	350	350	volts
DC Grid-No.1 (Control-grid) Voltage	-55	-55	-55	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	94	94	94	volts
Zero-Signal DC Plate Current	166	166	166	ma
Max.-Signal DC Plate Current	500	500	500	ma

Zero-Signal DC Grid-No.2 Current	0	0	0	ma
Max.-Signal DC Grid-No.2 Current (Approx.)	10	8	8	ma
Effective Load Resistance (Plate to plate)	3300	6000	8700	ohms
Max.-Signal Driving Power (Approx.)	0	0	0	watts
Max.-Signal Power Output (Approx.)	220	400	590	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance (Per tube)	0.1 max.	megohm

RF POWER AMPLIFIER — Class B Television Service

Synchronizing-level conditions per tube unless otherwise specified

Maximum CCS[h] Ratings, *Absolute-Maximum Values:*

	54 to 216 Mc	
DC PLATE VOLTAGE	2000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	400 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-250 max.	volts
DC PLATE CURRENT (AVERAGE)[k]	250 max.	ma
GRID-No.2 INPUT	12 max.	watts
GRID-No.1 INPUT	2 max.	watts
PLATE DISSIPATION	250 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

Typical CCS Operation:

With bandwidth of 5 Mc

DC Plate Voltage	1000	1500	2000	volts
DC Grid-No.2 Voltage	350	350	350	volts
DC Grid-No.1 Voltage	-60	-65	-70	volts
Peak RF Grid-No.1 Voltage:				
Synchronizing level	65	71	76	volts
Pedestal level	52	57	62	volts
DC Plate Current:				
Synchronizing level	355	360	360	ma
Pedestal level	250	250	250	ma
DC Grid-No.2 Current:				
Synchronizing level	27	29	29	ma
Pedestal level	4	0	0	ma
DC Grid-No.1 Current:				
Synchronizing level	2	5	5	ma
Pedestal level	0	0	0	ma
Driving Power (Approx.):[l]				
Synchronizing level	0.4	1.2	1.2	watts
Pedestal level	0	0	0	watts
Power Output (Approx.):				
Synchronizing level	160	300	440	watts
Pedestal level	90	170	250	watts

LINEAR RF POWER AMPLIFIER
Single-Sideband Suppressed-Carrier Service

Maximum CCS[h] Ratings, *Absolute-Maximum Values:*

	Up to 500 Mc	
DC PLATE VOLTAGE	2000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	400 max.	volts
MAX.-SIGNAL DC PLATE CURRENT	250 max.	ma
GRID-No.2 INPUT	12 max.	watts
PLATE DISSIPATION	250 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	150 max.	volts
Heater positive with respect to cathode.	150 max.	volts

Typical CCS Class AB_1 "Single-Tone" Operation:[m]

	At frequencies up to 175 Mc			
DC Plate Voltage	1000	1500	2000	volts
DC Grid-No.2 Voltage[n]	350	350	350	volts
DC Grid-No.1 (Control-grid) Voltage	-55	-55	-55	volts
Zero-Signal DC Plate Current	83	83	83	ma
Zero-Signal DC Grid-No.2 Current	0	0	0	ma
Effective RF Load Resistance	1650	3000	4350	ohms
Max.-Signal DC Plate Current	250	250	250	ma
Max.-Signal DC Grid-No.2 Current	5	4	4	ma
Max.-Signal Peak RF Grid-No.1 Voltage	47	47	47	volts
Max.-Signal Driving Power (Approx.)	0	0	0	watts
Max.-Signal Power Output (Approx.)	110	200	295	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition:		
For fixed-bias operation	25000 max.	ohms
For cathode-bias operation	Not recommended	

→**Typical CCS Operation with "Two-Tone Modulation":[p]**

	At 30 Mc			
DC Plate Voltage	1000	1500	2000	volts
DC Grid-No.2 Voltage[n]	350	350	350	volts
DC Grid-No.1 Voltage[q]	-55	-55	-55	volts
Zero-Signal DC Plate Current	83	83	83	ma
Effective RF Load Resistance	1650	3000	4350	ohms
DC Plate Current at Peak of Envelope	250	250	250	ma
Average DC Plate Current	175	175	175	ma
DC Grid-No.2 Current at Peak of Envelope	30	30	30	ma

→Indicates a change.

Average DC Grid-No.2 Current. . . .	6	9.5	15	ma
Average DC Grid-No.1 Current. . . .	0	0	0	ma
Peak-Envelope Driver Power (Approx.)	1	1	1	watt
Output-Circuit Efficiency (Approx.)	95	95	95	%
Distortion Products Level:[r]				
Third Order	29	29	30	db
Fifth Order	40	38	35	db
Useful Power Output (Approx.):[s]				
Average	55	100	147.5	watts
Peak Envelope	110	200	295	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition:
For fixed-bias operation. . . . . 25000 max. ohms
For cathode-bias operation. . . . . Not recommended

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS[f] Ratings, *Absolute-Maximum Values:*

	Up to 500 Mc	
DC PLATE VOLTAGE.	1500 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE. . . .	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE . . .	-250 max.	volts
DC PLATE CURRENT.	200 max.	ma
GRID-No.2 INPUT	8 max.	watts
GRID-No.1 INPUT	2 max.	watts
PLATE DISSIPATION	165 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode .	150 max.	volts
Heater positive with respect to cathode .	150 max.	volts

Typical CCS Operation:

At frequencies up to 175 Mc

DC Plate Voltage.	500	1000	1500	volts
DC Grid-No.2 Voltage (Modulated approx. 55%)[t]	250	250	250	volts
DC Grid-No.1 Voltage[u]	-100	-100	-100	volts
Peak RF Grid-No.1 Voltage	113	113	113	volts
DC Plate Current.	200	200	200	ma
DC Grid-No.2 Current.	32	31	31	ma
DC Grid-No.1 Current (Approx.). . .	6	6	6	ma
Driving Power (Approx.)[l].	0.7	0.7	0.7	watt
Power Output (Approx.).	50	140	235	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition . . . . . 25000 max. ohms

7203/4CX250B

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[v]
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS[f] Ratings, *Absolute-Maximum Values:*

	Up to 500 Mc	
DC PLATE VOLTAGE	2000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	−250 max.	volts
DC PLATE CURRENT	250 max.	ma
GRID-No.2 INPUT	12 max.	watts
GRID-No.1 INPUT	2 max.	watts
PLATE DISSIPATION	250 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

Typical CCS Operation:

At frequencies up to 175 Mc

DC Plate Voltage	500	1000	1500	2000	volts
DC Grid-No.2 Voltage	250	250	250	250	volts
DC Grid-No.1 Voltage	−90	−90	−90	−90	volts
Peak RF Grid-No.1 Voltage	109	109	109	109	volts
DC Plate Current	250	250	250	250	ma
DC Grid-No.2 Current	48	45	36	30	ma
DC Grid-No.1 Current (Approx.)	12	12	11	11	ma
Driving Power (Approx.)	1	1	1	1	watt
Power Output (Approx.)	65	180	290	400	watts

At frequency of 500 Mc with coaxial cavity

DC Plate Voltage	2000	volts
DC Grid-No.2 Voltage	300	volts
DC Grid-No.1 Voltage	−90	volts
DC Plate Current	250	ma
DC Grid-No.2 Current	10	ma
DC Grid-No.1 Current (Approx.)	25	ma
Driver Power Output (Approx.)[1]	18	watts
Useful Power Output (Approx.)	250	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition	25000 max.	ohms

[a] Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

[b] With cylindrical shield JEDEC No.320 surrounding radiator; and with a cylindrical shield JEDEC No.321 surrounding the grid-No.2 ring terminal. Both shields are connected to ground.

[c] Available from Eitel-McCullough, Inc., San Bruno, California.

[d] Available from E. F. Johnson Co., Waseca, Minnesota.

[e] For use at lower frequencies.

[f] For use at higher frequencies.

[g] Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.

[h] Continuous Commercial Service.

j Averaged over any audio-frequency cycle of sine-wave form.

k Averaged over any frame.

l The driver stage is required to supply tube losses and rf-circuit losses. The driver stage should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

m "Single-Tone" operation refers to that class of amplifier service in which the grid-No.2 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.

n Preferably obtained from a fixed supply.

p "Two-Tone Modulation" operation refers to that class of amplifier service in which the input consists of two equal monofrequency rf signals having constant amplitude. These signals are produced in a single-sideband suppressed-carrier system when two equal-and-constant-amplitude audio frequencies are applied to the input of the system.

q Obtained from a fixed supply.

r Without the use of feedback to enhance linerity.

s Measured at load of output circuit having indicated efficiency.

t The dc grid-No.2 voltage must be modulated approximately 55% in phase with the plate modulation in order to obtain 100% modulation of the 7203. The use of a series grid-No.2 resistor or reactor may not give satisfactory performance and is therefore not recommended.

u Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

v Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current.	1	2.3	2.9	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate.	2	-	0.06	μμf ←
Grid No.1 to cathode, grid No.2, and heater	2	14.2	17.2	μμf
Plate to cathode, grid No.2, and heater.	2	4.0	4.8	μμf
Grid-No.1 Voltage	1,3,4,5	-32	-46	volts
Grid-No.2 Current	1,3,4,5	-7	3	ma
Useful Power Output	4,5,6	225	-	watts

Note 1: With 6.0 volts on heater.

Note 2: With cylindrical shield JEDEC No.320 surrounding radiator; and with a cylindrical shield JEDEC No.321 surrounding the grid-No.2 ring terminal. Both shields are connected to ground.

Note 3: With dc plate volts = 1000, dc grid-No.2 volts = 300, and grid-No.1 voltage adjusted to give plate current of 150 ma.

Note 4: With Forced-Air Cooling as specified under GENERAL DATA—*Air-System Socket*.

Note 5: Heater-voltage must be applied for at least 30 seconds before application of other voltages.

Note 6: With heater volts = 5.5, dc plate volts = 2000, dc grid-No.2 volts = 300, dc grid-No.1 volts = -90, dc grid-No.1 ma. = 25 maximum, grid-No.1 signal voltage adjusted to produce dc plate current of 250 ma., and coaxial-cavity amplifier-circuit operating frequency (Mc) = 475.

← Indicates a change.

SPECIAL TESTS & PERFORMANCE DATA

Interelectrode Leakage:

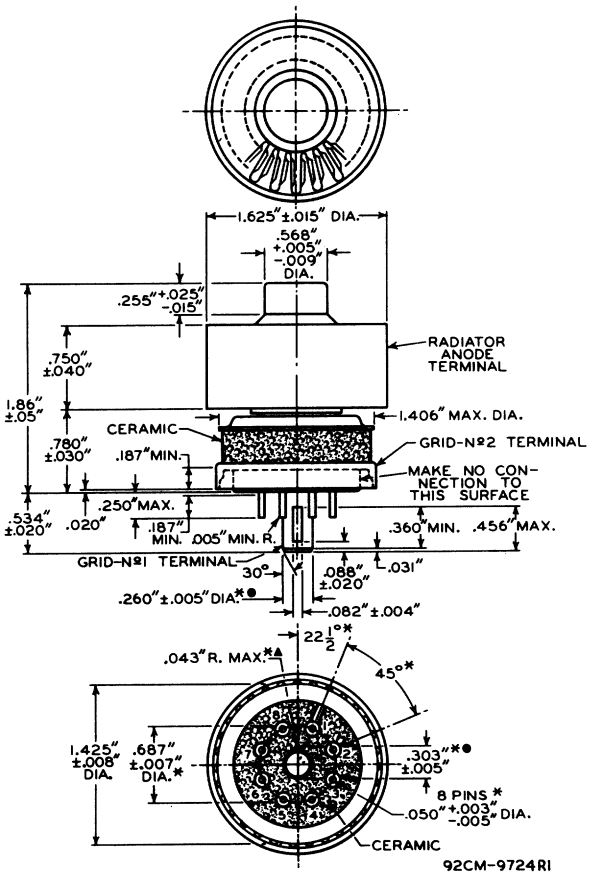
This test is destructive and is performed on a sample lot of tubes from each production run under the following conditions: ac heater volts = 6.6, no voltage on other elements, and specified forced-air cooling for *Air-System Socket*. At the end of 500 hours, with tube at 25° C, and with no voltage applied to heater, the minimum resistance between indicated electrodes as measured with a 500-volt Megger-type ohmmeter having an internal impedance of 2.5 megohms, will be:

Grid No.1 and grid No.2	10 min.	megohms
Grid No.1 and cathode	10 min.	megohms
Grid No.2 and cathode	10 min.	megohms

OPERATING CONSIDERATIONS

The *socket* for the 7203 should be of a type (such as is indicated in the tabulated data) which permits adequate air-cooling of the tube. Although the base will fit a conventional lock-in socket, the latter does not permit adequate cooling and its use is therefore not recommended.

The *plate connection* is made by means of a metal band or spring contacts to the cylindrical surface of the radiator. It is essential that the contact areas be kept clean to minimize rf losses especially at the higher frequencies.



GRID-No. 1-PLUG DIMENSIONS ARE MEASURED BY THE USE OF THE SERIES OF GAUGES SHOWN IN SKETCHES G_1 AND G_2. IN THE FOLLOWING INSTRUCTIONS FOR THE USE OF THESE GAUGES "GO" INDICATES THAT THE ENTIRE GRID-No. 1-PLUG KEY WILL ENTER THE GAUGE; AND "NO-GO" INDICATES THAT THE GRID-No. 1-PLUG KEY WILL NOT ENTER THE GAUGE MORE THAN 1/16". INSTRUCTIONS FOR THE USE OF THE GAUGES FOLLOW:

▲,●,*: See next page.

▲ GAUGES G_1-1, G_1-2, G_1-3, AND G_1-4:

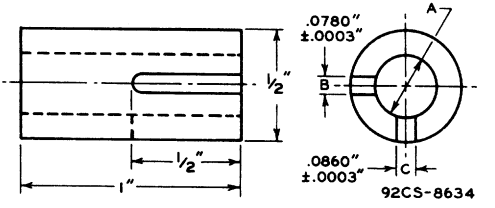
USING ONLY SLOT C, TRY THESE GAUGES IN NUMERICAL ORDER UNTIL ONE IS FOUND THAT WILL ACCEPT THE ENTIRE GRID-No.1 PLUG. USING THE FIRST GAUGE THUS FOUND, IT WILL NOT BE POSSIBLE TO INSERT THE GRID-No.1 PLUG IN SLOT B.

● GAUGES G_2-1, G_2-2, AND G_2-3:

THE GRID-No.1 PLUG WILL BE REJECTED BY GAUGES G_2-1 AND G_2-2, BUT WILL BE ACCEPTED BY GAUGE G_2-3.

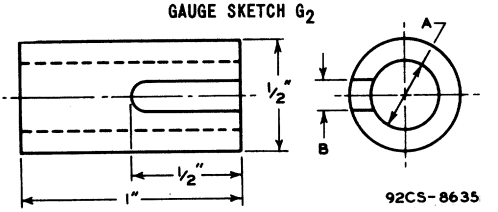
* BASE-PIN POSITIONS ARE HELD TO TOLERANCES SUCH THAT THE ENTIRE LENGTH OF THE PINS WILL, WITHOUT UNDUE FORCE, PASS INTO AND DISENGAGE FROM THE FLAT-PLATE GAUGE SHOWN IN SKETCH G_3.

GAUGE SKETCH G_1



Gauge	Dimension A
G_1-1	.2575" + .0000" − .0005"
G_1-2	.2600" + .0000" − .0005"
G_1-3	.2625" + .0000" − .0005"
G_1-4	.2650" + .0000" − .0005"

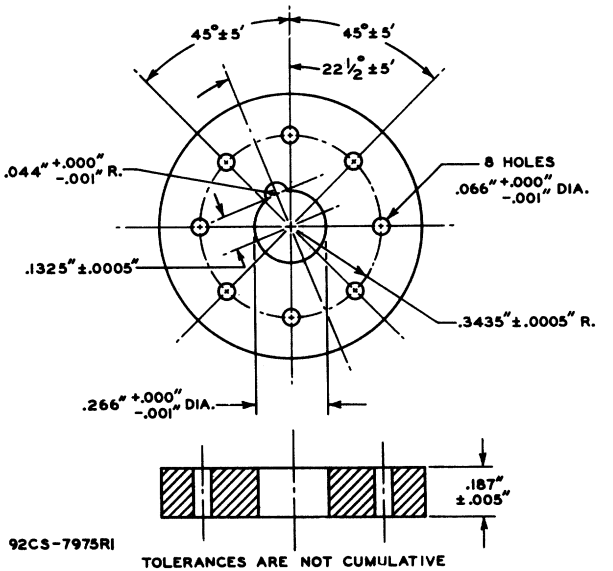
GAUGE SKETCH G_2



92CS-8635

Gauge	Dimension	
	A	B
G_2-1	.2550" + .0000" − .0005"	.125"
G_2-2	.2980" + .0000" − .0005"	none
G_2-3	.3080" + .0000" − .0005"	none

GAUGE SKETCH G_3

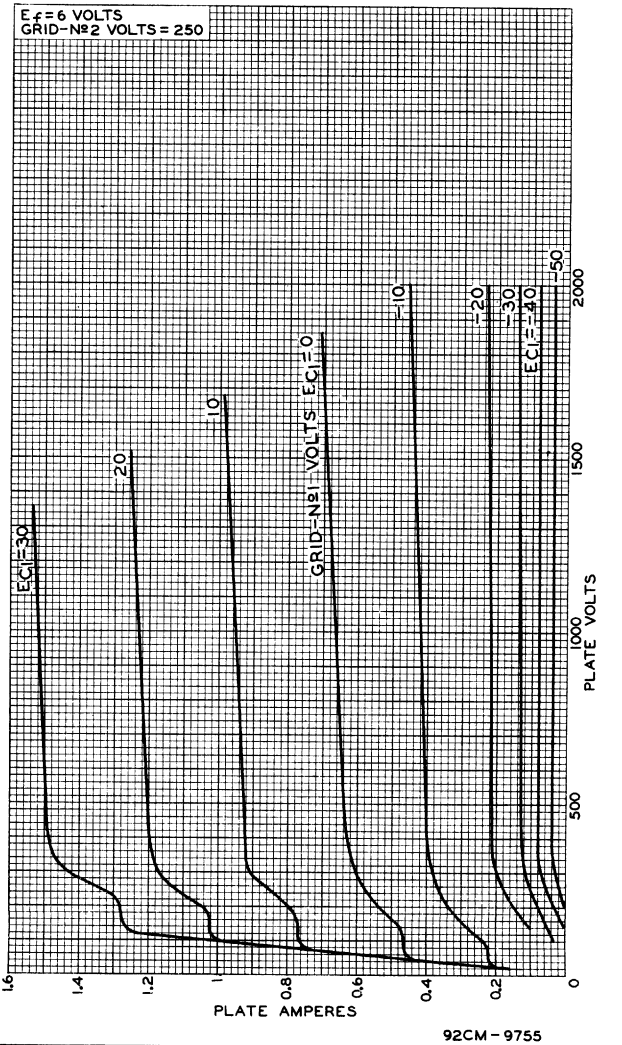


92CS-7975RI

TOLERANCES ARE NOT CUMULATIVE

7203/4CX250B

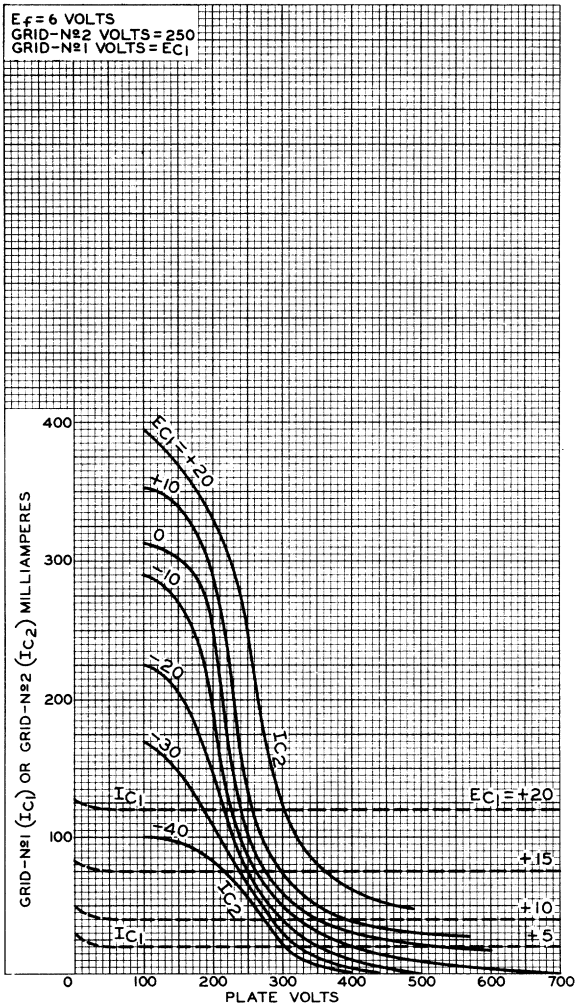
TYPICAL PLATE CHARACTERISTICS



92CM-9755

RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.

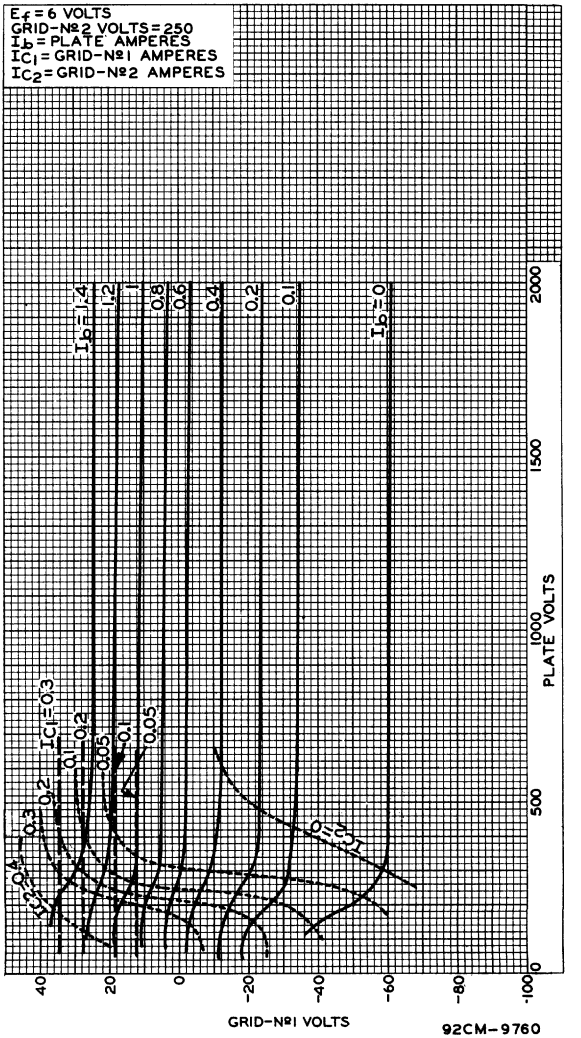
TYPICAL CHARACTERISTICS



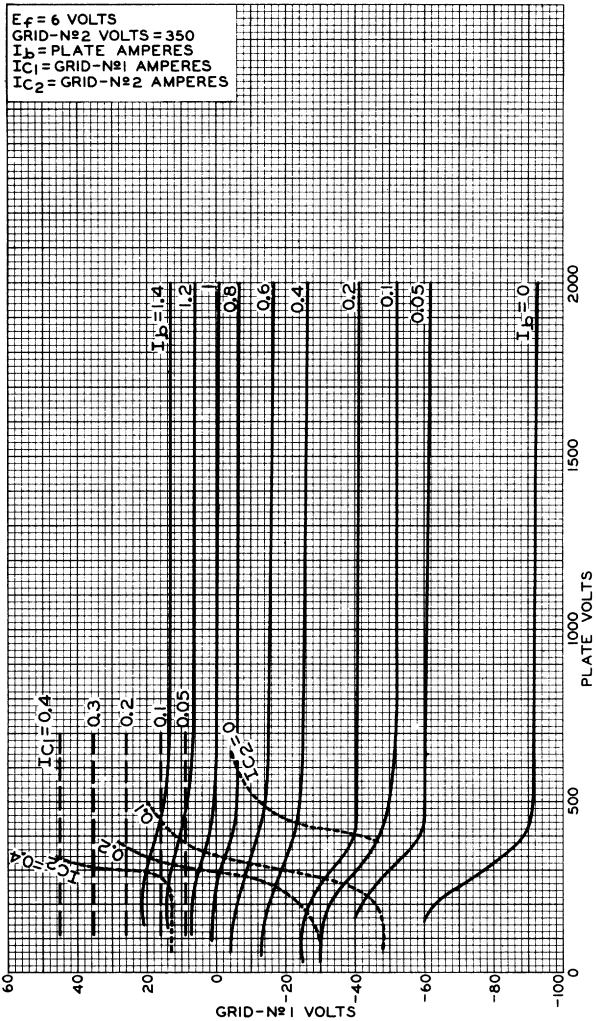
92CM-9756

7203/4CX250B

TYPICAL CONSTANT-CURRENT CHARACTERISTICS



TYPICAL CONSTANT-CURRENT CHARACTERISTICS



92CM-9761

7204/4CX250F

Beam Power Tube

FORCED-AIR COOLED

CERAMIC-METAL SEALS — **400 WATTS CW OUTPUT TO 175 Mc**
COAXIAL-ELECTRODE STRUCTURE — **250 WATTS CW OUTPUT AT 500 Mc**
COMPACT DESIGN — **INTEGRAL RADIATOR**

For Use at Frequencies up to 500 Mc

The 7204 is unilaterally interchangeable with the 4X250F and bilaterally interchangeable with the 4CX250F. ←

The 7204 is the same as the 7203/4CX250B except for the following items:

Heater, for Unipotential Cathode:

Voltage (AC or DC)[a]	26.5 ± 10%	volts
Current at heater volts = 26.5	0.58	amp

[a] Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.50	0.62	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	–	0.06	μμf ←
Grid No.1 to cathode, grid No.2, and heater	2	14.2	17.2	μμf
Plate to cathode, grid No.2, and heater	2	4.0	4.8	μμf
Grid-No.1 Voltage	1,3,4,5	-32	-46	volts
Grid-No.2 Current	1,3,4,5	-7	3	ma
Useful Power Output	4,5,6	225	–	watts

Note 1: With 26.5 volts on heater.

Note 2: With cylindrical shield JEDEC No.320 surrounding radiator; and with a cylindrical shield JEDEC No.321 surrounding the grid-No.2 ring terminal. Both shields are connected to ground.

Note 3: With dc plate volts = 1000, dc grid-No.2 volts = 300, and grid-No.1 voltage adjusted to give plate current of 150 ma.

Note 4: With Forced-Air Cooling as specified under GENERAL DATA — *Air-System Socket.*

Note 5: Heater voltage must be applied for at least 30 seconds before application of other voltages.

Note 6: With heater volts = 24.3, dc plate volts = 2000, dc grid-No.2 volts = 300, dc grid-No.1 volts = -90, dc grid-No.1 ma. = 25 maximum, grid-No.1 signal voltage adjusted to produce dc plate current of 250 ma., and coaxial-cavity amplifier-circuit operating frequency (Mc) = 475.

SPECIAL TESTS & PERFORMANCE DATA

Interelectrode Leakage:

This test is destructive and is performed on a sample lot of tubes from each production run under the following condi-

← Indicates a change.

tions; ac heater volts = 29.1, no voltage on other elements, and specified forced-air cooling for *Air-System Socket*. At the end of 500 hours, with tube at 25° C, and with no voltage applied to heater, the minimum resistance between indicated electrodes as measured with a 500-volt Megger-type ohmmeter having an internal impedance of 2.5 megohms, will be:

Grid No.1 and grid No.2	10 min.	megohms
Grid No.1 and cathode	10 min.	megohms
Grid No.2 and cathode	10 min.	megohms

7213

Beam Power Tube

CERAMIC-METAL SEALS — **COAXIAL-ELECTRODE STRUCTURE**
UNITIZED-ELECTRODE DESIGN — **INTEGRAL RADIATOR**
FORCED-AIR COOLED — **2500 WATTS CW INPUT**
MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE

Useful with Full Ratings at Frequencies up to 1215 Mc

GENERAL DATA

Electrical:

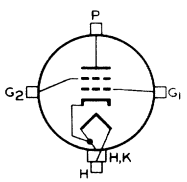
Heater, for Matrix-Type, Oxide-Coated, Unipotential Cathode:		
Voltage (AC or DC)[a]	5.5 typical 6 max.	volts volts
Current at heater volts = 5.5	17.3	amp ←
Minimum heating time at heater volts = 5.5	5	minutes
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 2500, grid-No.2 volts = 600, and plate ma. = 600	17	
Direct Interelectrode Capacitances:		
Grid No.1 to plate[b]	0.17 max.	μμf
Grid No.1 to cathode & heater	42	μμf
Plate to cathode & heater[bc]	0.017 max.	μμf ←
Grid No.1 to grid No.2	55	μμf
Grid No.2 to plate	16	μμf
Grid No.2 to cathode & heater[c]	1.4 max.	μμf

Mechanical:

Operating Position	Any
Overall Length	3.24" ± 0.10"
Greatest Diameter (See *Dimensional Outline*)	3.72" ± 0.03" ←
Weight (Approx.)	2 lbs
Radiator	Integral part of tube

Terminal Connections (See *Dimensional Outline*):

G_1 – Grid-No.1–Terminal Contact Surface
G_2 – Grid-No.2–Terminal Contact Surface
H – Heater–Terminal Contact Surface



H,K – Heater- & Cathode–Terminal Contact Surface
P – Plate–Terminal Contact Surface

Thermal:

Air Flow:

Through radiator—Adequate air flow to limit the plate-seal temperature to 250° C should be delivered by a blower

← Indicates a change.

through the radiator before and during the application of heater, plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator versus percentage of maximum rated plate dissipation for each class of service are shown in accompanying *Typical-Cooling-Requirements* curves. Plate power, grid-No.2 power, heater power, and air flow may be removed simultaneously.

To grid-No.2, grid-No.1, cathode, and heater seals—A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these seals so that its temperature does not exceed the specified maximum value of 250° C. An air flow of 10 cfm is usually adequate.

Seal Temperature (Plate, grid No.2, grid No.1, cathode, and heater)	250 max.	°C

LINEAR RF POWER AMPLIFIER
Single-Sideband Suppressed-Carrier Service

Maximum CCS[d] Ratings, *Absolute-Maximum Values:*

	Up to 1215 Mc	
DC PLATE VOLTAGE	2500 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	1000 max.	volts
MAX.-SIGNAL DC PLATE CURRENT	1 max.	amp
MAX.-SIGNAL DC GRID-No.1 (CONTROL-GRID) CURRENT	0.2 max.	amp
MAX.-SIGNAL PLATE INPUT	2500 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT	50 max.	watts
PLATE DISSIPATION	1500 max.	watts

Typical CCS Class AB_1 "Single-Tone" Operation:[e]

	Up to 60 Mc		
DC Plate Voltage	2250	2500	volts
DC Grid-No.2 Voltage[f]	700	700	volts
DC Grid-No.1 Voltage	-50	-50	volts
Zero-Signal DC Plate Current	0.2	0.2	amp
Zero-Signal DC Grid-No.2 Current	0	0	amp
Effective RF Load Resistance	1100	1100	ohms
Max.-Signal DC Plate Current	0.9	1	amp
→ Max.-Signal DC Grid-No.2 Current	0.045	0.045	amp
Max.-Signal DC Grid-No.1 Current	0	0	amp
Max.-Signal Peak RF Grid-No.1 Voltage	50	50	volts
Max.-Signal Driving Power (Approx.)	0	0	watts
Max.-Signal Power Output (Approx.)	1000	1250	watts

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with maximum modulation factor of 1

Maximum CCS[d] Ratings, *Absolute-Maximum Values:*

	Up to 1215 Mc	
DC PLATE VOLTAGE	2000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	1000 max.	volts

→ Indicates a change.

DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-300 max.	volts
DC PLATE CURRENT	0.85 max.	amp
DC GRID-No.1 CURRENT	0.2 max.	amp
PLATE INPUT	1700 max.	watts
GRID-No.2 INPUT	35 max.	watts
PLATE DISSIPATION	1000 max.	watts

Typical CCS Operation:

In grid-drive circuit at 600 Mc

DC Plate Voltage	1800	2000	volts
DC Grid-No.2 Voltage[g]	500	500	volts
DC Grid-No.1 Voltage[h]	-30	-30	volts
DC Plate Current	0.75	0.83	amp
DC Grid-No.2 Current	0.015	0.015	amp
DC Grid-No.1 Current (Approx.)	0.04	0.04	amp
Driver Power Output (Approx.)[j]	50	55	watts
Useful Power Output (Approx.)	650[k]	800[k]	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition	5000[l] max.	ohms

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[m] and RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS[d] Ratings, *Absolute-Maximum Values:*

	Up to 1215 Mc	
DC PLATE VOLTAGE	2500 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	1000 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-300 max.	volts
DC PLATE CURRENT	1 max.	amp
DC GRID-No.1 CURRENT	0.2 max.	amp
PLATE INPUT	2500 max.	watts
GRID-No.2 INPUT	50 max.	watts
PLATE DISSIPATION	1500 max.	watts

Typical CCS Operation:

In grid-drive circuit at 600 Mc

DC Plate Voltage	2250	2500	volts
DC Grid-No.2 Voltage[n]	500	500	volts
DC Grid-No.1 Voltage[p]	-30	-30	volts
DC Plate Current	0.9	1	amp
DC Grid-No.2 Current	0.02	0.02	amp
DC Grid-No.1 Current (Approx.)	0.07	0.07	amp
Driver Power Output (Approx.)[j]	70	75	watts
Useful Power Output (Approx.)	1050[k]	1350[k]	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition	5000[k] max.	ohms

[a] Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

[b] With external, flat, metal shield having diameter of 8" and center hole approximately 3" in diameter provided with spring fingers that connect the shield to grid-No.2 terminal. Shield is located in plane of grid-No.2 terminal perpendicular to the tube axis.

[c] With external, flat, metal shield having diameter of 8" and center hole approximately 2-3/8" in diameter provided with spring fingers that connect the shield to grid-No.1 terminal. Shield is located in plane of grid-No.1 terminal perpendicular to the tube axis.

[d] Continuous Commercial Service.

[e] "Single-Tone" operation refers to that class of amplifier service in which the grid-No.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.

[f] Preferably obtained from a fixed supply.

[g] Obtained preferably from a separate source modulated along with the plate supply.

[h] Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

[j] The driver stage is required to supply tube losses and rf-circuit losses. It should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

[k] This value of useful power is measured in load of output circuit.

[l] If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.

[m] Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

[n] Obtained preferably from a fixed supply, or from the plate-supply voltage with a voltage divider.

[p] Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

SPECIAL TESTS & PERFORMANCE DATA

Design samples of the 7213 have been subjected to the following tests without adverse effects.

Variable-Frequency Vibration Performance:

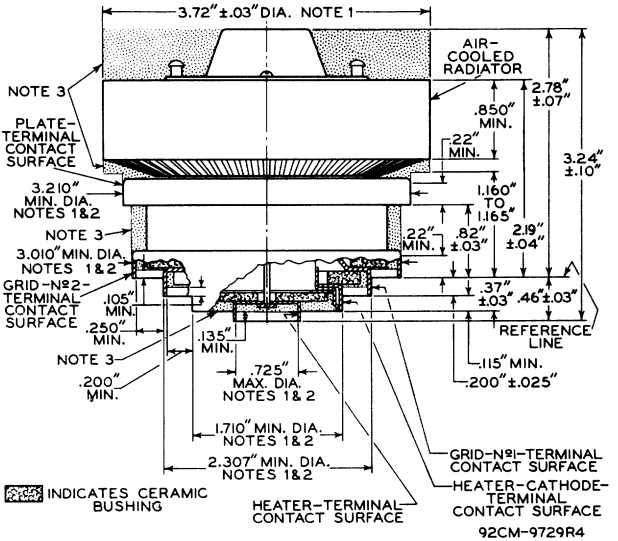
This test was performed (per MIL-E-1C[q], paragraph 4.9.20.3) under the following conditions: heater volts = 5.5, plate-supply volts = 450, grid-No.2 volts = 300, grid-No.1 voltage varied to give a plate current of 10 milliamperes, and plate load resistor (ohms) = 2000. The tubes were vibrated in each of 3 positions through frequency range from 10 to 50 to 10 cycles per second. The vibrating frequency had a fixed amplitude of 0.040 inch (total excursion of 0.080 inch). During the test, the tubes did not show an rms output voltage across the plate load resistor in excess of 500 millivolts. ← At the end of this test, the tubes did not show tap or permanent interelectrode shorts or defects that would cause the tubes to be inoperable. The tubes exhibited no pronounced mechanical resonance during this test.

[q] Military Specification, Electron Tubes and Crystal Rectifiers, 3 October 1955.

← Indicates a change.

Fatigue Performance:

In this test (per MIL-E-IC, paragraph 4.9.20.6), the tubes were rigidly mounted and subjected to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours in each of three positions with heater volts = 5.5. At the end of this test, the tubes did not show permanent or temporary shorts or open circuits, and passed all electrical tests.

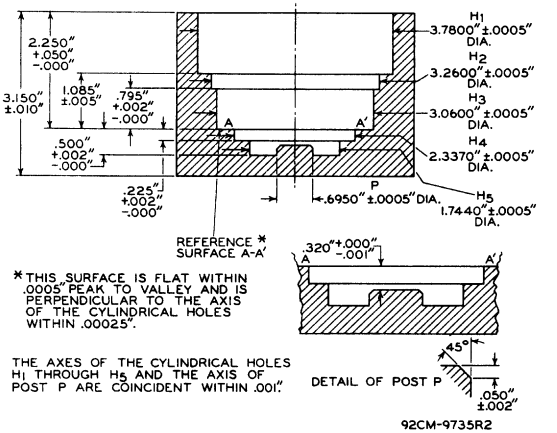


NOTE 1: WITH THE CYLINDRICAL SURFACES OF THE RADIATOR BAND, PLATE TERMINAL, GRID-No.2 TERMINAL, GRID-No.1 TERMINAL, HEATER-CATHODE TERMINAL, AND HEATER TERMINAL CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G1. PROPER ENTRY OF THE TUBE IS OBTAINED WHEN THE GRID-No.2 TERMINAL IS SEATED ON THE SHOULDER A-A'. THE TUBE IS PROPERLY SEATED ON THE SHOULDER WHEN A 0.010"-THICKNESS GAUGE 1/8" WIDE WILL NOT ENTER MORE THAN 1/16" BETWEEN THE SHOULDER SURFACE AND THE GRID-No.2 TERMINAL. THE GAUGE IS PROVIDED WITH SLOTS TO PERMIT MAKING MEASUREMENT OF SEATING OF GRID-No.2 TERMINAL ON SHOULDER A-A'.

NOTE 2: THE DIAMETER OF EACH TERMINAL IS HELD TO INDICATED VALUES ONLY OVER THE INDICATED MINIMUM LENGTH OF ITS CONTACT SURFACE.

NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.

GAUGE SKETCH G_1



*THIS SURFACE IS FLAT WITHIN .0005" PEAK TO VALLEY AND IS PERPENDICULAR TO THE AXIS OF THE CYLINDRICAL HOLES WITHIN .00025".

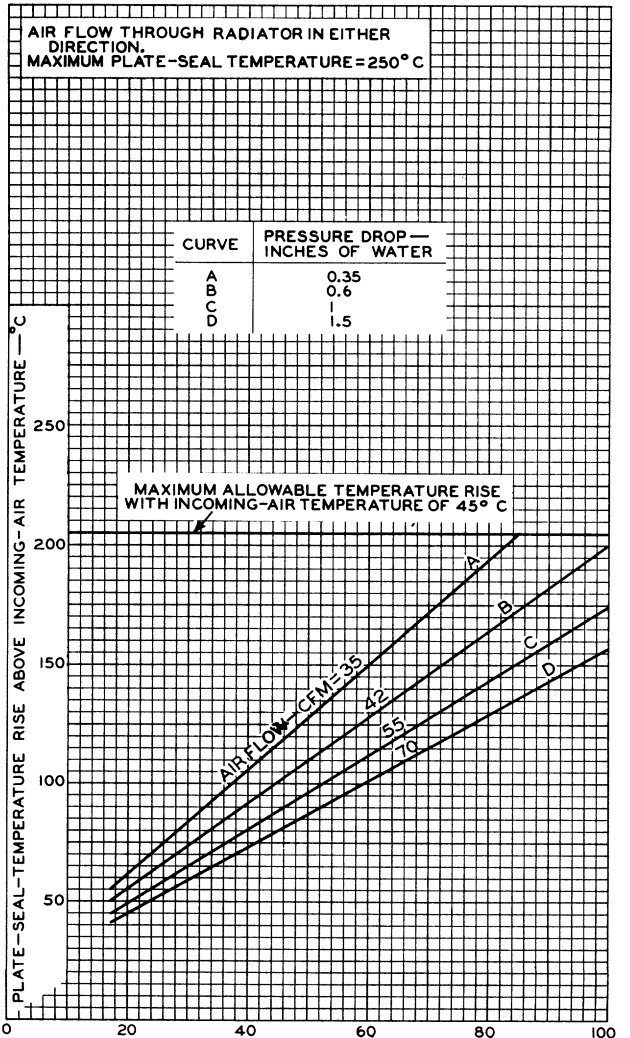
THE AXES OF THE CYLINDRICAL HOLES H_1 THROUGH H_5 AND THE AXIS OF POST P ARE COINCIDENT WITHIN .001".

92CM-9735R2

RCA

7213

TYPICAL COOLING REQUIREMENTS



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

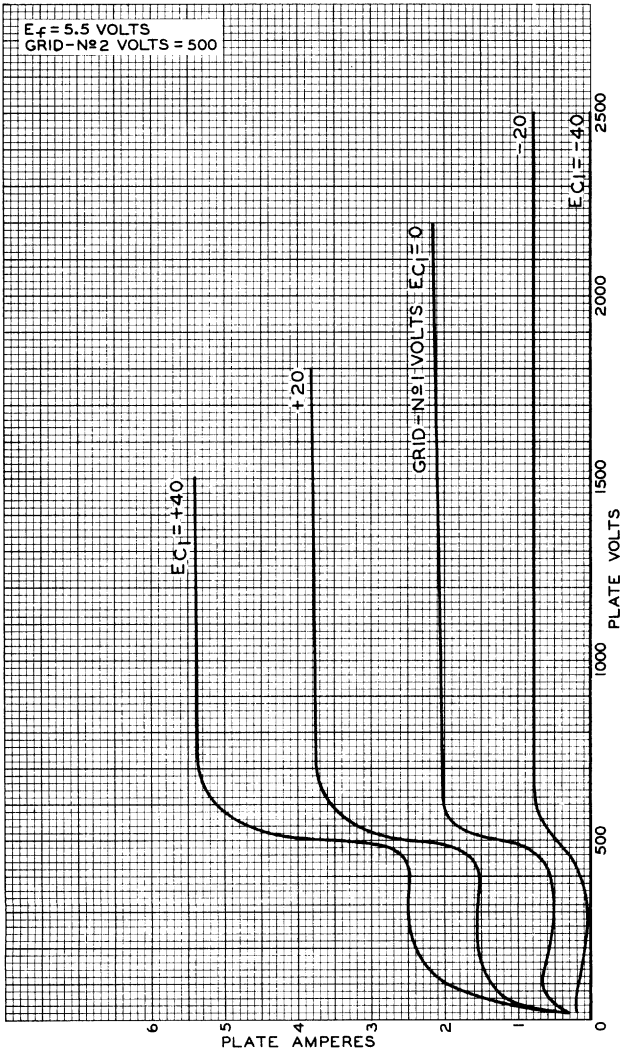
92CM-9737

7213

RCA

7213

TYPICAL PLATE CHARACTERISTICS



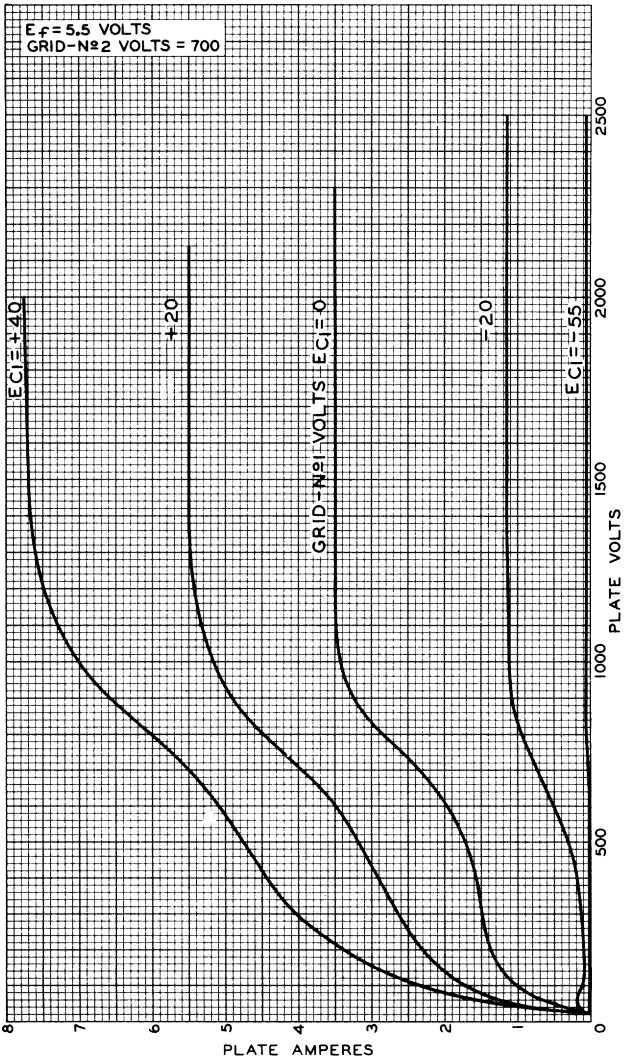
ELECTRON TUBE DIVISION 92CM-9738

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

7213

TYPICAL PLATE CHARACTERISTICS



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9753

7213

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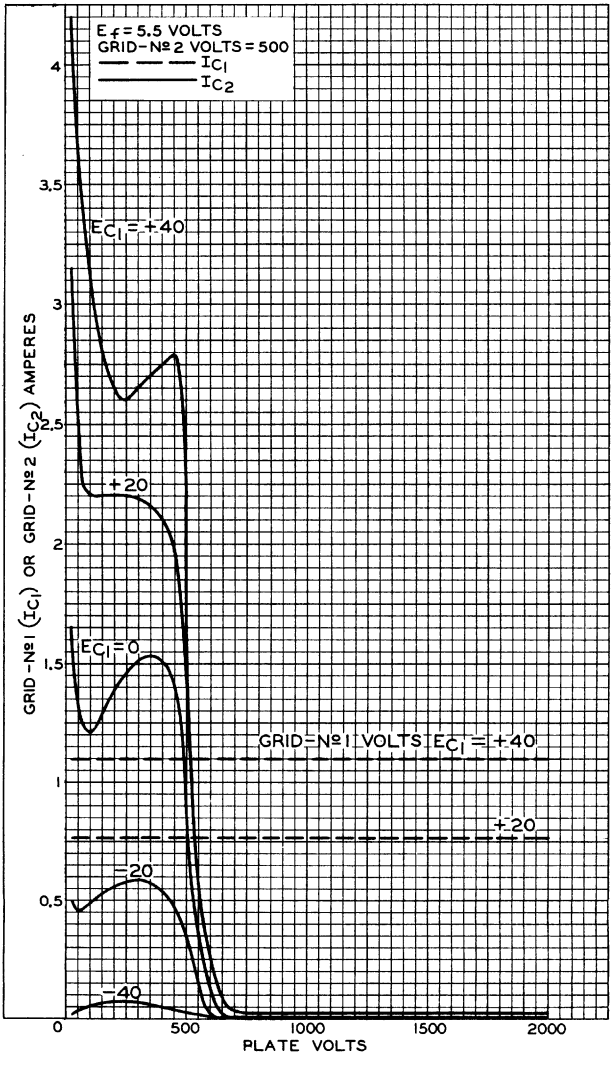
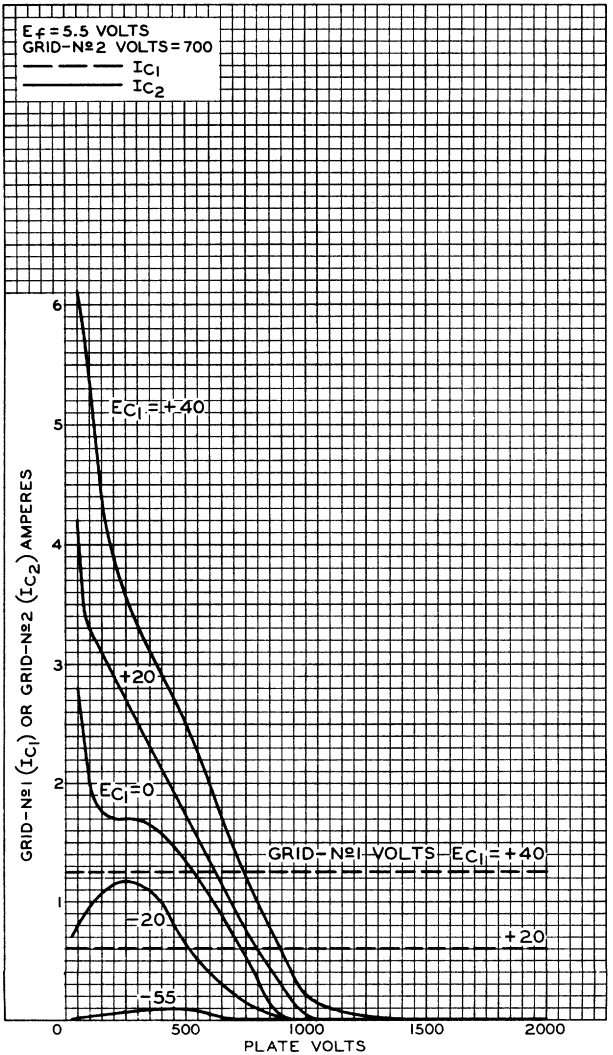
TYPICAL CHARACTERISTICS



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-9740

7213

TYPICAL CHARACTERISTICS

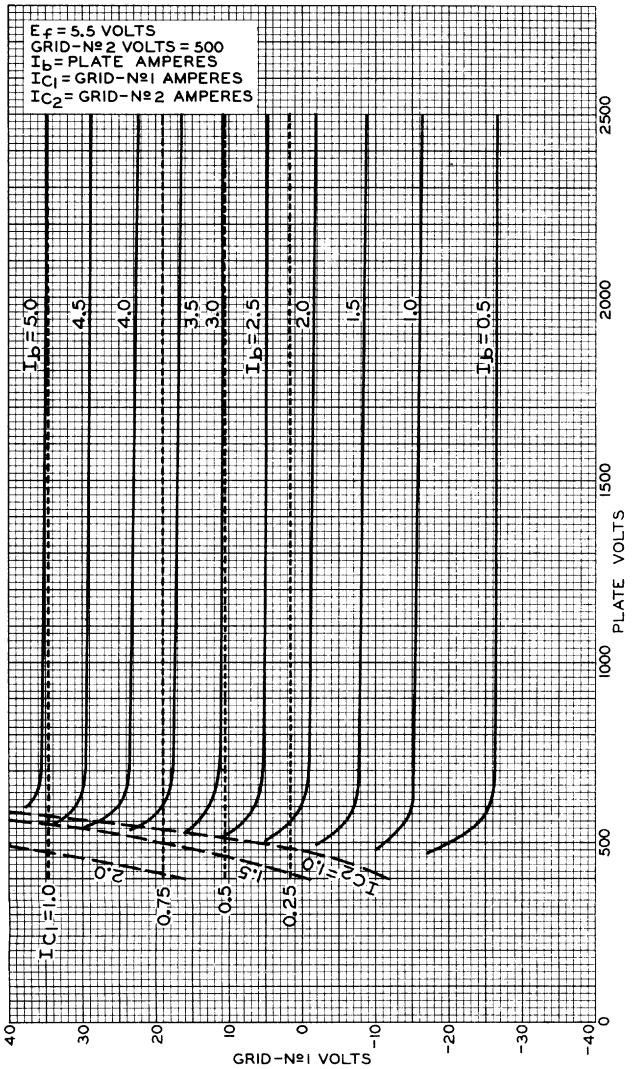


7213

RCA

7213

TYPICAL CONSTANT-CURRENT CHARACTERISTICS

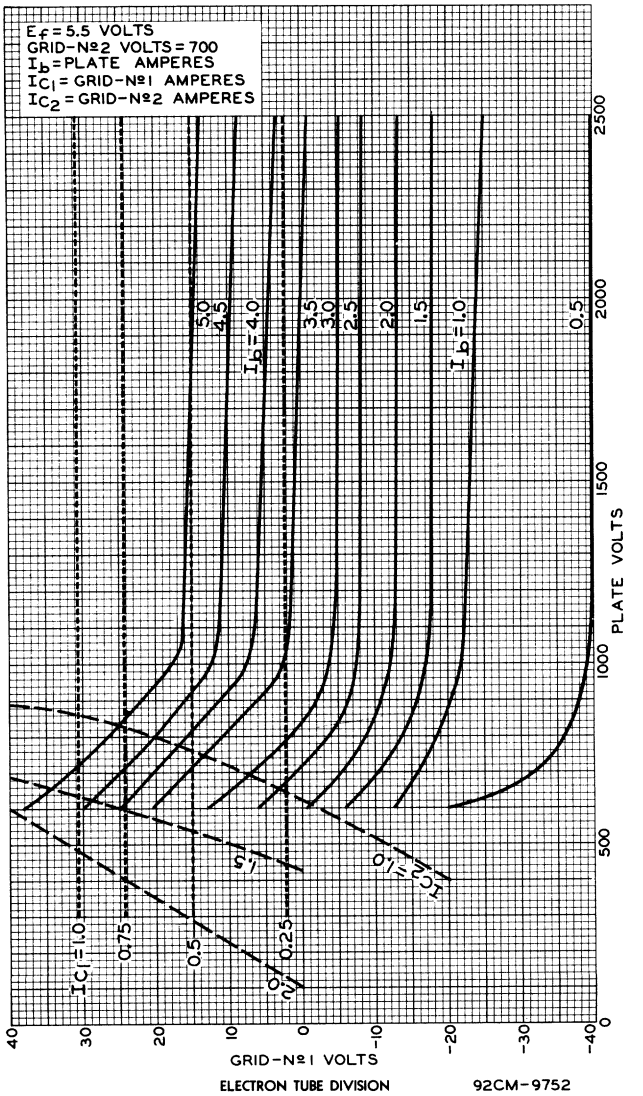


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9744

7213

TYPICAL CONSTANT-CURRENT CHARACTERISTICS



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9752

7214

Beam Power Tube

CERAMIC METAL SEALS
UNITIZED-ELECTRODE DESIGN
FORCED-AIR COOLED
COAXIAL-ELECTRODE STRUCTURE
INTEGRAL RADIATOR
180 KW PEAK-PULSE POWER
MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE

For Pulsed RF Amplifier Service with Full Ratings at Frequencies up to 1215 Mc

GENERAL DATA

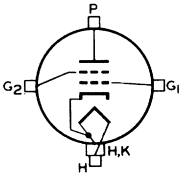
Electrical:

Heater, for Matrix-Type, Oxide-Coated, Unipotential Cathode:		
Voltage (AC or DC)[a]	5.5 typical 6 max.	volts volts
Current at heater volts = 5.5	17.3	amp
Minimum heating time at heater volts = 5.5	5	minutes
Mu-Factor, Grid-No.2 to Grid No.1 for plate volts = 2500, grid-No.2 volts = 600, and plate ma. = 600.	19	
Direct Interelectrode Capacitances:		
Grid No.1 to plate[b]	0.17 max.	μμf
Grid No.1 to cathode & heater	42	μμf
Plate to cathode & heater[b,c]	0.017 max.	μμf
Grid No.1 to grid No.2.	55	μμf
Grid No.2 to plate.	16	μμf
Grid No.2 to cathode & heater[c]	1.4 max.	μμf

Mechanical:

Operating Position. . . . . Any
Overall Length. . . . . 3.24" ± 0.10"
Greatest Diameter (See *Dimensional Outline*) . . 3.72" ± 0.03"
Weight (Approx.). . . . . 2 lbs
Radiator. . . . . Integral part of tube
Terminal Connections (See *Dimensional Outline*):

G_1 - Grid-No.1- Terminal Contact Surface
G_2 - Grid-No.2- Terminal Contact Surface
H - Heater- Terminal Contact Surface



H,K - Heater- & Cathode- Terminal Contact Surface
P - Plate- Terminal Contact Surface

← Indicates a change.

Thermal:

Air Flow:

Through radiator—Adequate air flow to limit the plate seal temperature to 250° C should be delivered by a blower through the radiator before and during the application of heater, plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator versus percentage of maximum rated plate dissipation for each class of service are shown in accompanying *Typical Cooling-Requirements* curves. Plate power, grid-No.2 power, heater power, and air flow may be removed simultaneously.

To grid-No.2, grid-No.1, cathode, and heater seals—A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these seals so that its temperature does not exceed the specified maximum value of 250° C. An air flow of 10 cfm is usually adequate.

Seal Temperature (Plate, grid No.2, grid No.1, cathode, and heater)	250 max.	°C

GRID-PULSED RF AMPLIFIER

Maximum CCS[d] Ratings, *Absolute-Maximum Values:*

For maximum "on" time[e] of 10 microseconds

	Up to 1215 Mc	
DC PLATE VOLTAGE.	5000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE.	1200 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-300 max.	volts
DC PLATE CURRENT DURING PULSE	18 max.	amp
DC PLATE CURRENT.	0.2 max.	amp
GRID-No.2 INPUT (Average)	50 max.	watts
GRID-No.1 INPUT (Average)	30 max.	watts
PLATE DISSIPATION (Average)	1500 max.	watts

Typical Operation:

In class C cathode-drive circuit with rectangular-wave pulses at 1215 Mc and with duty factor[f] of 0.01

DC Plate Voltage.	4500	volts
DC Grid-No.2 Voltage.	1000	volts
DC Grid-No.1 Voltage.	-80	volts
DC Plate Current during pulse	11	amp
DC Plate Current.	0.11	amp
DC Grid-No.2 Current.	0.005	amp
DC Grid-No.1 Current.	0.01	amp
Driver Power Output at peak of pulse (Approx.)[g]	4.5	kw
Useful Power Output at peak of pulse (Approx.).	20	kw

PLATE- AND SCREEN-PULSED RF AMPLIFIER

Maximum CCS[d] Ratings, *Absolute-Maximum Values:*

For maximum "on" time[e] of 10 microseconds

	Up to 1215 Mc	
PEAK POSITIVE-PULSE PLATE VOLTAGE	10000 max.	volts
PEAK POSITIVE-PULSE GRID-No.2 (SCREEN-GRID) VOLTAGE	1200 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-300 max.	volts
DC PLATE CURRENT DURING PULSE	18 max.	amp
DC PLATE CURRENT	0.2 max.	amp
GRID-No.2 INPUT (Average)	50 max.	watts
GRID-No.1 INPUT (Average)	30 max.	watts
PLATE DISSIPATION (Average)	1500 max.	watts

Typical Operation:

In class C cathode-drive circuit with rectangular-wave pulses at 1215 Mc and with duty factor[f] of 0.01

Peak Positive-Pulse Plate Voltage	9000	10000	volts
Peak Positive-Pulse Grid-No.2 Voltage	1000	1000	volts
DC Grid-No.1 Voltage	-80	-80	volts
DC Plate Current during pulse	16	18	amp
DC Plate Current	0.16	0.18	amp
DC Grid-No.2 Current	0.008	0.009	amp
DC Grid-No.1 Current	0.014	0.016	amp
Driver Power Output at peak of pulse (Approx.)[g]	10	11	kw
Useful Power Output at peak of pulse (Approx.)	50	65	kw

[a] Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

[b] With external, flat, metal shield having diameter of 8", and center hole approximately 3" in diameter provided with spring fingers that connect the shield to grid-No.2 terminal. Shield is located in plane of grid-No.2 terminal perpendicular to the tube axis.

[c] With external, flat, metal shield having diameter of 8", and center hole approximately 2-3/8" in diameter provided with spring fingers that connect the shield to grid-No.1 terminal. Shield is located in plane of grid-No.1 termmnal perpendicular to the tube axis.

[d] Continuous Commercial Service.

[e] *"On" time* is defined as the sum of the durations of the individual pulses which occur during any 1000-microsecond interval.

Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 per cent of the peak value. The *peak value* is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

[f] *Duty factor* for the 7214 is defined as the "on" time in microseconds divided by 1000 microseconds.

[g] The driver stage is required to supply tube losses, rf-circuit losses, and in cathode-drive circuits, the rf power added to the plate input. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

SPECIAL TESTS & PERFORMANCE DATA

Design samples of the 7214 have been subjected to the following tests without adverse effects.

Variable-Frequency Vibration Performance:

This test was performed (per MIL-E-ID[h], paragraph 4.9.20.3) under the following conditions: Heater voltage of 5.5 volts, plate supply voltage of 450 volts, grid-No.2 voltage of 300 volts, grid-No.1 voltage varied to give a plate current of 10 milliamperes, and plate load resistor of 2000 ohms. The tubes were vibrated in each of 3 positions through frequency range from 10 to 50 cycles per second and back to 10 cycles per second. The vibrating frequency had a fixed amplitude of 0.040 inch (total excursion of 0.080 inch). During the test, the tubes did not show an rms output voltage across the plate → load resistor in excess of 500 millivolts.

At the end of this test, the tubes did not show tap or permanent interelectrode shorts or defects that would cause the tubes to be inoperable. The tubes exhibited no pronounced mechanical resonance during this test.

Fatigue Test:

In this test (per MIL-E-ID, paragraph 4.9.20.6), the tubes were rigidly mounted and subjected to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours in each of three positions with 5.5 volts applied to the heater. At the end of this test, the tubes did not show permanent or temporary shorts or open circuits, and passed all electrical tests.

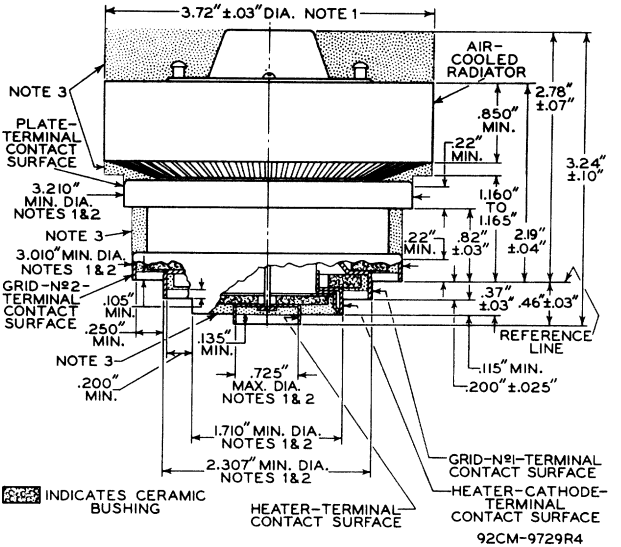
OPERATING CONSIDERATIONS

The *maximum seal temperature* of 250° C is a tube rating and is to be observed in the same manner as other ratings. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. The latter is made by the Tempil Corporation, 132 W. 22nd Street, New York 11, New York in the form of liquid and stick.

The rated plate and grid-No.2 voltages of this tube are extremely dangerous to the user. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.

[h] 31 March 1958, Military Specification, Electron Tubes and Crystal Rectifiers.

→ Indicates a change.

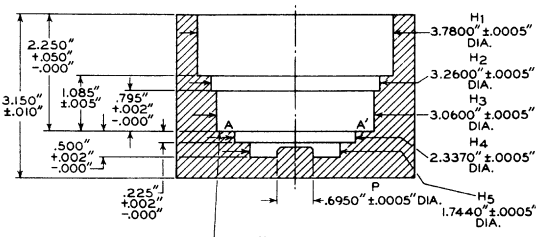


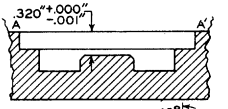
NOTE 1: WITH THE CYLINDRICAL SURFACES OF THE RADIATOR BAND, PLATE TERMINAL, GRID-No.2 TERMINAL, GRID-No.1 TERMINAL, HEATER-CATHODE TERMINAL, AND HEATER TERMINAL CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G_1. PROPER ENTRY OF THE TUBE IS OBTAINED WHEN THE GRID-No.2 TERMINAL IS SEATED ON THE SHOULDER A-A'. THE TUBE IS PROPERLY SEATED ON THE SHOULDER WHEN A 0.010"-THICKNESS GAUGE 1/8" WIDE WILL NOT ENTER MORE THAN 1/16" BETWEEN THE SHOULDER SURFACE AND THE GRID-No.2 TERMINAL. THE GAUGE IS PROVIDED WITH SLOTS TO PERMIT MAKING MEASUREMENT OF SEATING OF GRID-No.2 TERMINAL ON SHOULDER A-A'.

NOTE 2: THE DIAMETER OF EACH TERMINAL IS HELD TO INDICATED VALUES ONLY OVER THE INDICATED MINIMUM LENGTH OF ITS CONTACT SURFACE.

NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.

GAUGE SKETCH G_1





* THIS SURFACE IS FLAT WITHIN .0005" PEAK TO VALLEY AND IS PERPENDICULAR TO THE AXIS OF THE CYLINDRICAL HOLES WITHIN .00025".

THE AXES OF THE CYLINDRICAL HOLES H_1 THROUGH H_5 AND THE AXIS OF POST P ARE COINCIDENT WITHIN .001".

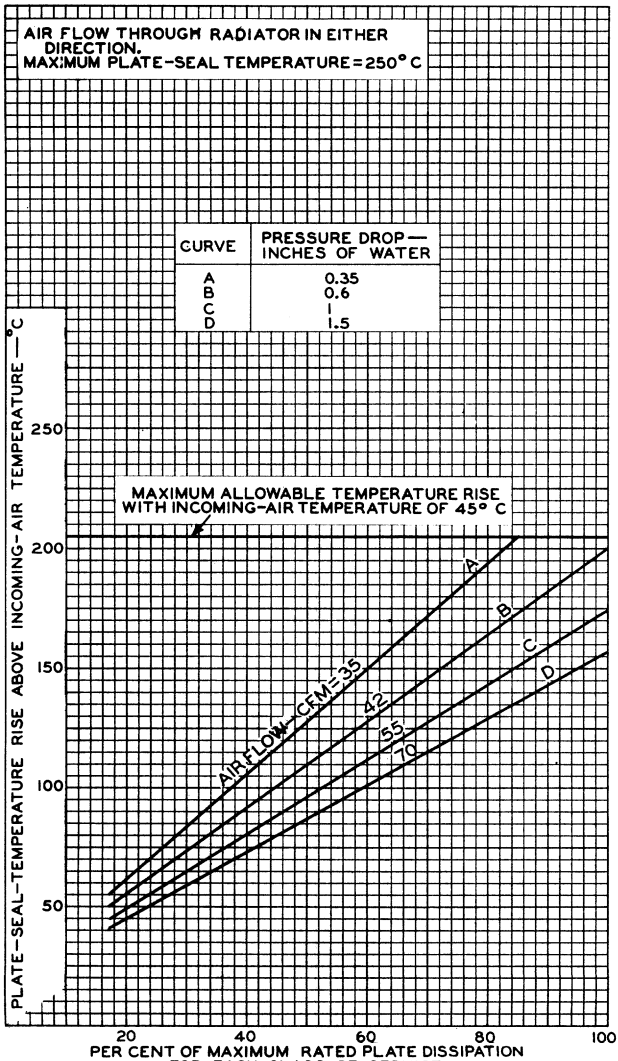
DETAIL OF POST P

92CM-9735R2

RCA

7214

TYPICAL COOLING REQUIREMENTS



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

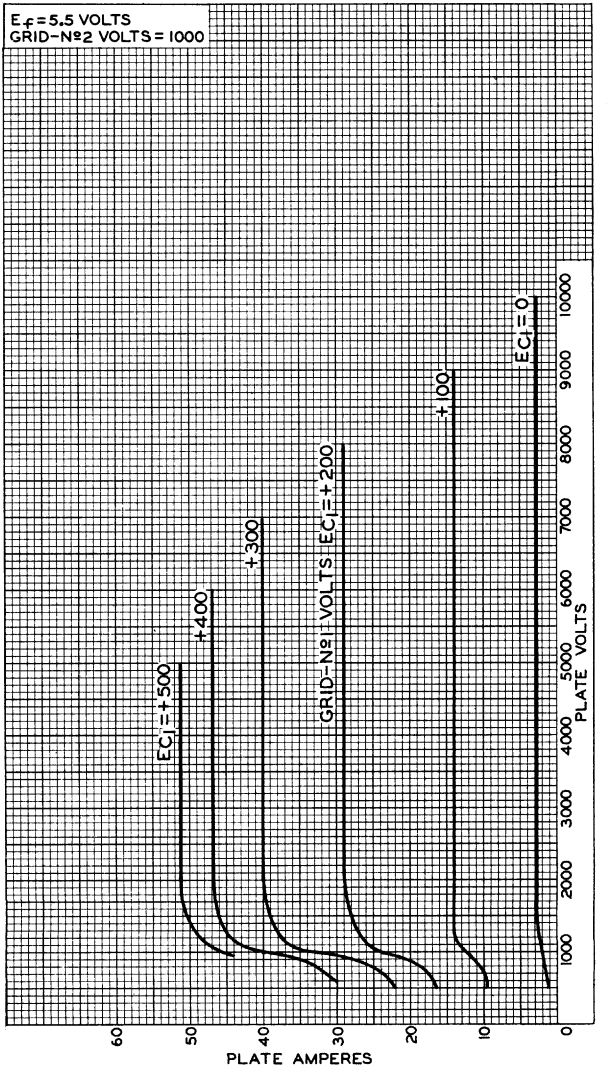
92CM-9737

7214

RCA

7214

TYPICAL PLATE CHARACTERISTICS

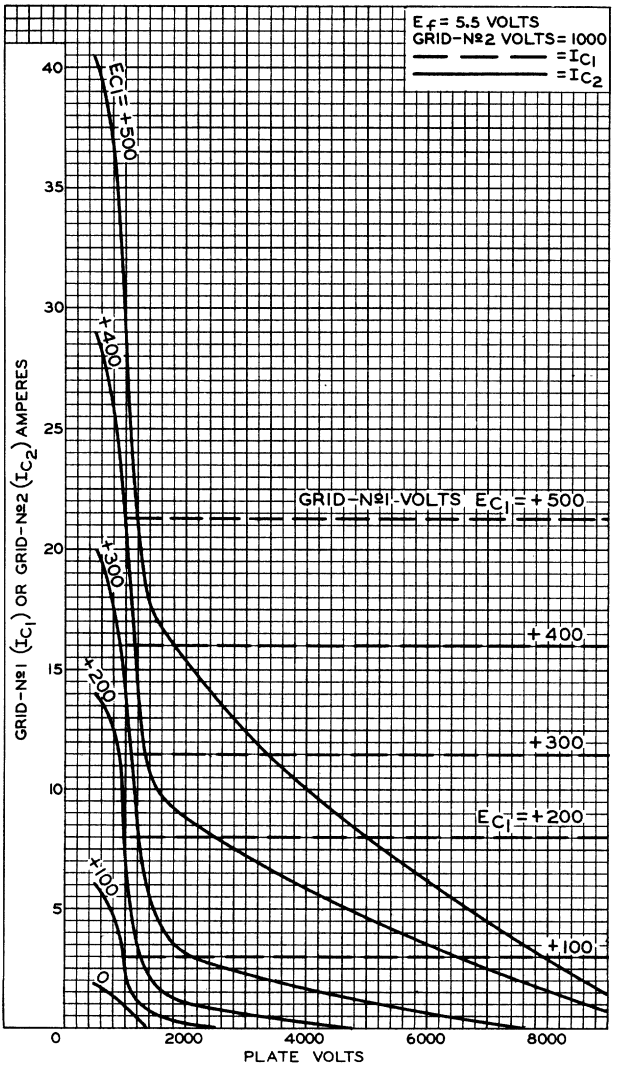


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10186

7214

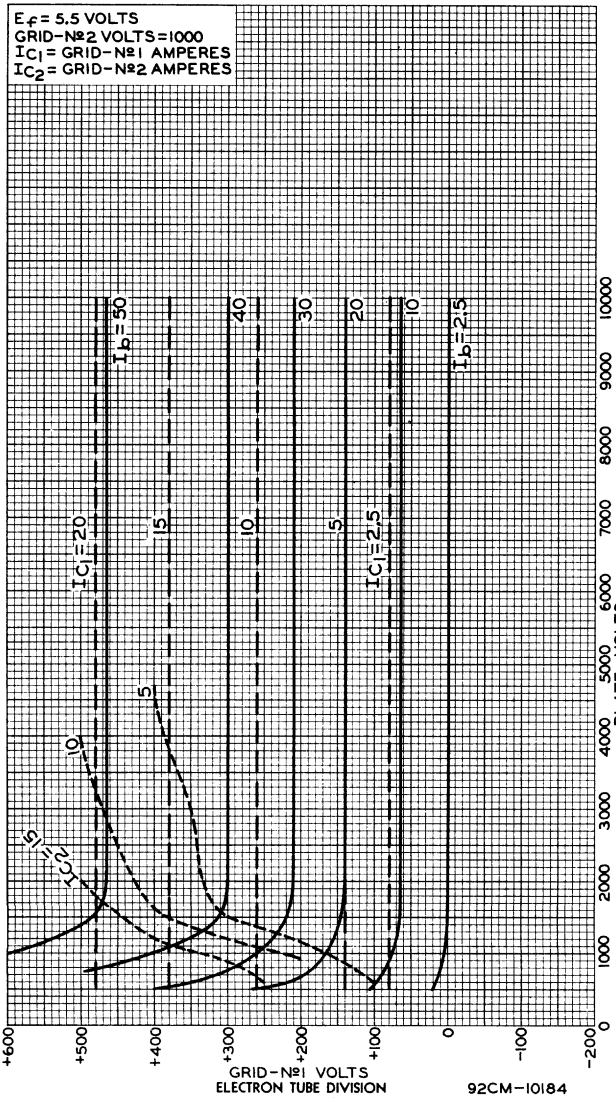
TYPICAL CHARACTERISTICS



7214

7214

TYPICAL CONSTANT-CURRENT CHARACTERISTICS



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10184

7360

Beam-Deflection Tube

9-PIN MINIATURE TYPE

For Use in Balanced-Modulator, Balanced Mixer, and Frequency-Converter Applications in Single- and Double-Sideband, Suppressed-Carrier Communication Equipment Operating at Frequencies up to 100 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current	0.35	amp
Direct Interelectrode Capacitances (Approx.):[a]		
Grid No.1 to all other electrodes except plate	7.5	μμf
Grid No.1 to deflecting electrode No.1	0.015	μμf
Grid No.1 to deflecting electrode No.2	0.015	μμf
Grid-No.1 to plate No.1	0.003	μμf
Grid No.1 to plate No.2	0.003	μμf
Plate No.1 to all other electrodes except deflecting electrode No.1	0.8	μμf
Plate No.2 to all other electrodes except deflecting electrode No.2	0.8	μμf
Plate No.1 to plate No.2	0.3	μμf
Deflecting electrode No.1 to all other electrodes except plate No.1	4.6	μμf
Deflecting electrode No.2 to all other electrodes except plate No.2	4.6	μμf
Deflecting electrode No.1 to plate No.1	4	μμf ←
Deflecting electrode No.2 to plate No.2	4	μμf ←
Deflecting electrode No.1 to deflecting electrode No.2	1.4	μμf

Characteristics, Class A_1 Amplifier:

Plate-No.1 Supply Voltage	150	volts
Plate-No.2 Supply Voltage	150	volts
Deflecting-Electrode-No.1 Supply Voltage	25	volts
Deflecting-Electrode-No.2 Supply Voltage	25	volts
Grid-No.2 Supply Voltage	175	volts
Cathode Resistor	150	ohms
Total Beam Current (Plate-No.1 current plus plate-No.2 current)	8.5	ma ←
Grid-No.2 Current	2.1	ma ←

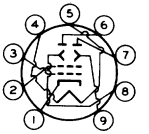
← Indicates a change.

Transconductance:		
Grid No.1 to both plates connected together	5400	μmhos
→ Deflecting electrode No.1 to plate No.1[b]	800	μmhos
Deflecting electrode No.2 to plate No.2[b]	800	μmhos
Switching Voltage[c]	11	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9KS

Pin 1 – Cathode, Internal Shield
Pin 2 – Grid No.2
Pin 3 – Grid No.1
Pin 4 – Heater
Pin 5 – Heater
Pin 6 – Plate No.2
Pin 7 – Plate No.1
Pin 8 – Deflecting Electrode No.2
Pin 9 – Deflecting Electrode No.1



BALANCED MODULATOR

Maximum Ratings, *Absolute-Maximum Values:*

PLATE-No.1 VOLTAGE	300	max.	volts
PLATE-No.2 VOLTAGE	300	max.	volts
DEFLECTING-ELECTRODE-No.1 VOLTAGE	±100	max.	volts
DEFLECTING-ELECTRODE-No.2 VOLTAGE	±100	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	250	max.	volts
GRID-No.2 INPUT	0.5	max.	watt
PLATE-No.1 DISSIPATION	1.5	max.	watts
PLATE-No.2 DISSIPATION	1.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	180	max.	volts
Heater positive with respect to cathode	180[d]	max.	volts

Typical Operation:

In accompanying balanced-modulator circuit utilizing separate excitation[e]

Plate Voltage (Each plate)	150	volts
Deflecting-Electrode Voltage (Approx., each electrode)	25	volts
Grid-No.2 Voltage	175	volts

→ Indicates a change.

Cathode Resistor	1200		ohms
Peak-to-Peak AF Deflecting-Electrode Voltage[f]	2.8		volts
Peak-to-Peak RF Grid-No.1 Voltage	10		volts
Plate Current (Each plate)	1.5		ma
Grid-No.2 Current	0.75		ma
Plate-to-Plate Load Impedance (Approx.)	5000		ohms
Push-Pull, Peak-to-Peak Double-Sideband Output Voltage	4		volts
Carrier Suppression[g]	60		db ←
Third-Order Distortion[g]	-47		db
Fourth-Order Distortion[g]	-45		db

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5	max.	megohm
For cathode-bias operation	2.2	max.	megohms
Deflecting-Electrode-Circuit Resistance (Per deflecting electrode)	0.05	max.	megohm

BALANCED MIXER

Maximum Ratings, *Absolute-Maximum Values:*

PLATE-No.1 VOLTAGE	300	max.	volts
PLATE-No.2 VOLTAGE	300	max.	volts
DEFLECTING-ELECTRODE-No.1 VOLTAGE	±100	max.	volts
DEFLECTING-ELECTRODE-No.2 VOLTAGE	±100	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	250	max.	volts
GRID-No.2 INPUT	0.5	max.	watt
PLATE-No.1 DISSIPATION	1.5	max.	watts
PLATE-No.2 DISSIPATION	1.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	180	max.	volts
Heater positive with respect to cathode	180[d]	max.	volts

Typical Operation:

In accompanying balanced-mixer circuit utilizing separate excitation[e]

Plate Voltage (Each plate)	150	volts
Deflecting-Electrode Voltage (Approx., each electrode)	25	volts
Grid-No.2 Voltage	175	volts
Cathode Resistor	1200	ohms
Peak-to-Peak Single-Sideband Deflecting-Electrode Voltage[f]	8	volts
Peak-to-Peak RF Grid-No.1 Voltage	10	volts
Plate Current (Each plate)	1.5	ma
Grid-No.2 Current	0.75	ma

← Indicates a change.

Plate-to-Plate Load Impedance (Approx.)	10000		ohms
Push-Pull, Peak-to-Peak Single-Sideband Output Voltage	40		volts
Oscillator Rejection[g]	-40		db
Third-Order Distortion[g]	-40		db
Fourth-Order Distortion[g]	-39		db

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5	max.	megohm
For cathode-bias operation	2.2	max.	megohms
Deflecting-Electrode-Circuit Resistance (Per deflecting electrode)	0.05	max.	megohm

[a] Without external shield.

[b] Defined as the partial derivative of the plate current with respect to the difference between the deflecting-electrode voltages, evaluated about the point of equal plate currents.

[c] Defined as the sum of (a) the absolute value of the difference between the deflecting-electrode voltages when the current to one plate is equal to 90% of the total beam current and (b) the absolute value of the difference between the deflecting-electrode voltages when the current to the same plate is equal to 10% of the total beam current. This sum, expressed in terms of signal voltage, corresponds to the peak-to-peak value of signal voltage that is required between the deflecting electrodes to produce peak-to-peak signal current at either plate equal to 80% of the total beam current.

[d] The dc component must not exceed 100 volts.

[e] Operation with self-excitation and cathode resistor of 300 ohms is similar to operation with separate excitation.

[f] To either deflecting electrode. The other deflecting electrode is bypassed.

[g] Referred to single-sideband output voltage.

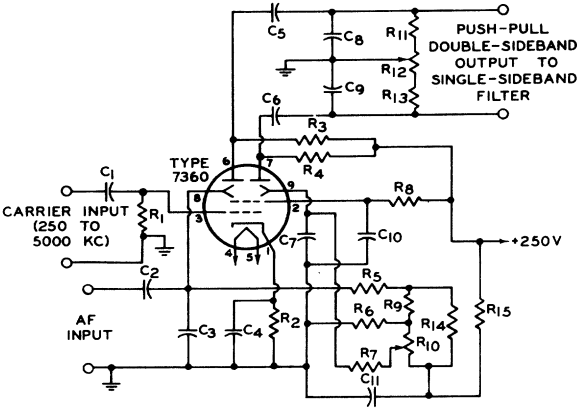
OPERATING CONSIDERATIONS

Deflecting-electrode-circuit resistance should be kept below 0.05 megohm to prevent nonlinear tube operation. The resistances of the two deflecting-electrode circuits should be approximately equal to minimize unbalance. The current drawn by each *deflecting-electrode* is in the order of 40 microamperes.

Magnetic fields adversely affect the intrinsic operating plate-current balance of the 7360. Although this tube is internally shielded to minimize this effect, the tube should be mounted as far as possible from all devices producing extraneous magnetic fields such as transformers, chokes, motors, or similar components. It is recommended that an external shield be used in those applications critical for balance.

Chassis layout should be such that all components and wiring associated with the plates and deflecting electrodes is symmetrical. This consideration is particularly important in rf applications where very small differences in stray capacitance can result in unbalance. Chassis layouts which permit heat or vibration to affect the components associated with one deflecting-electrode circuit or plate circuit more than the other, should be avoided. All components should be rigidly mounted.

BALANCED-MODULATOR CIRCUIT
With Separate Excitation



C_1: 0.001 μf
C_2: 0.22 μf
C_3: 0.001 μf
C_4: 0.01 μf
C_5 C_6: 0.0033 μf
C_7: 0.1 μf
C_8 C_9: Sufficient to resonate input of SSB filter
C_{10}: 0.22 μf
C_{11}: 0.47 μf
R_1: 0.47 megohm
R_2: 1200 ohms
R_3 R_4: 68000 ohms
R_5: 47000 ohms
R_6: 12000 ohms
R_7: 47000 ohms
R_8: 0.1 megohm
R_9: 2700 ohms
R_{10}: Carrier-Balance Potentiometer, 5000 ohms
R_{11}: 2700 ohms
R_{12}: Quadrature-Balance Potentiometer, 2500 ohms
R_{13} R_{14}: 2700 ohms
R_{15}: 0.1 megohm
NOTE: All resistors 1/2 watt, ± 10% unless specified. All capacitors 400 volts.

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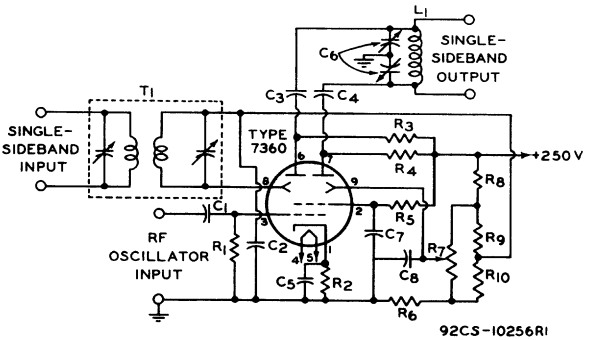
7360

BALANCED-MIXER CIRCUIT
With Separate Excitation



C_1: 0.001 μf
C_2: 0.04 μf
C_3, C_4: 0.001 μf
C_5: 0.04 μf
C_6: Split-Stator Tuning Capacitor to Resonate with L_1
C_7, C_8: 0.04 μf
L_1: Inductor
R_1: 0.47 megohm
R_2: 1200 ohms
R_3, R_4: 68000 ohms
R_5: 0.1 megohm
R_6: 12000 ohms
R_7: Oscillator-Rejection Potentiometer, 5000 ohms
R_8: 0.1 megohm
R_9, R_{10}: 2700 ohms
T_1: Tuned Input Transformer
NOTE: All resistors 1/2 watt, ±10%, unless specified. All capacitors 400 volts.

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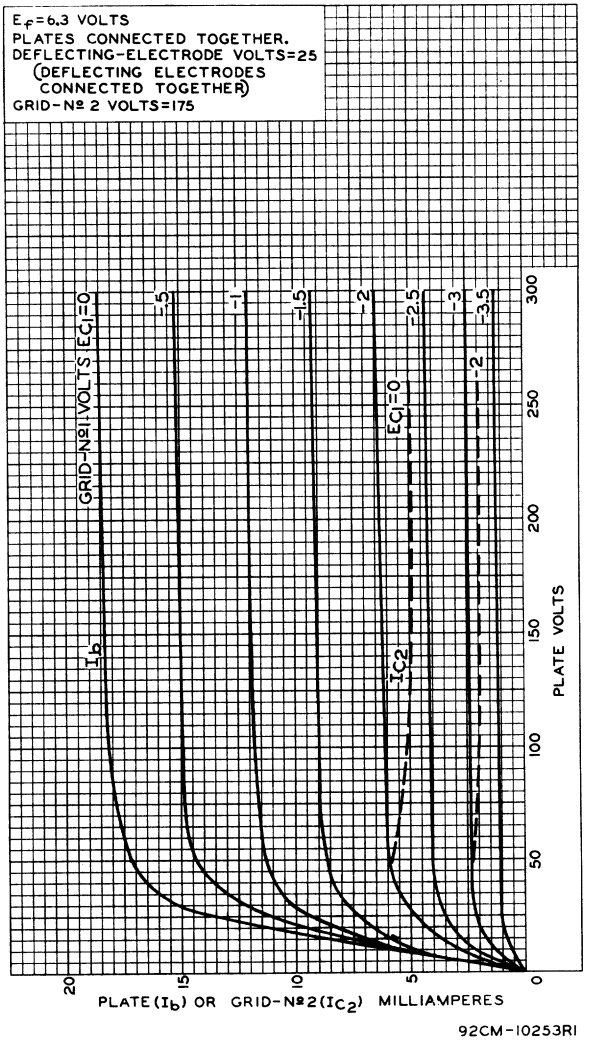
RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.

AVERAGE CHARACTERISTICS



92CM-10253RI

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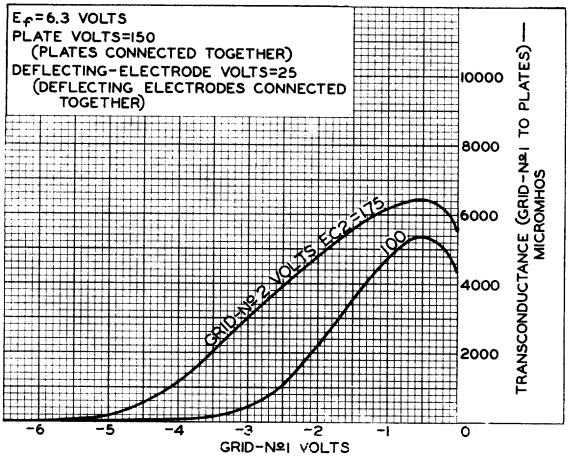

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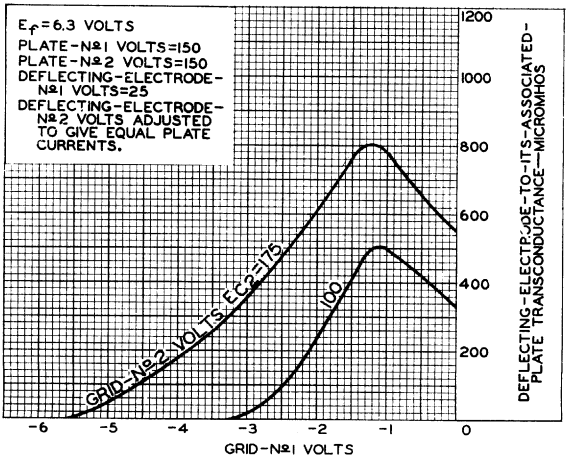
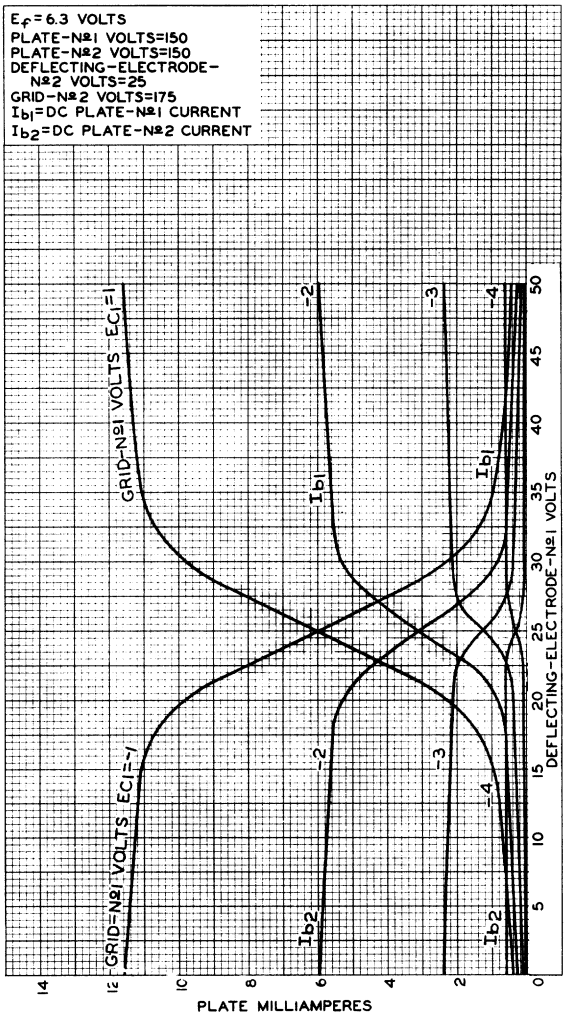


92CS-10249R1

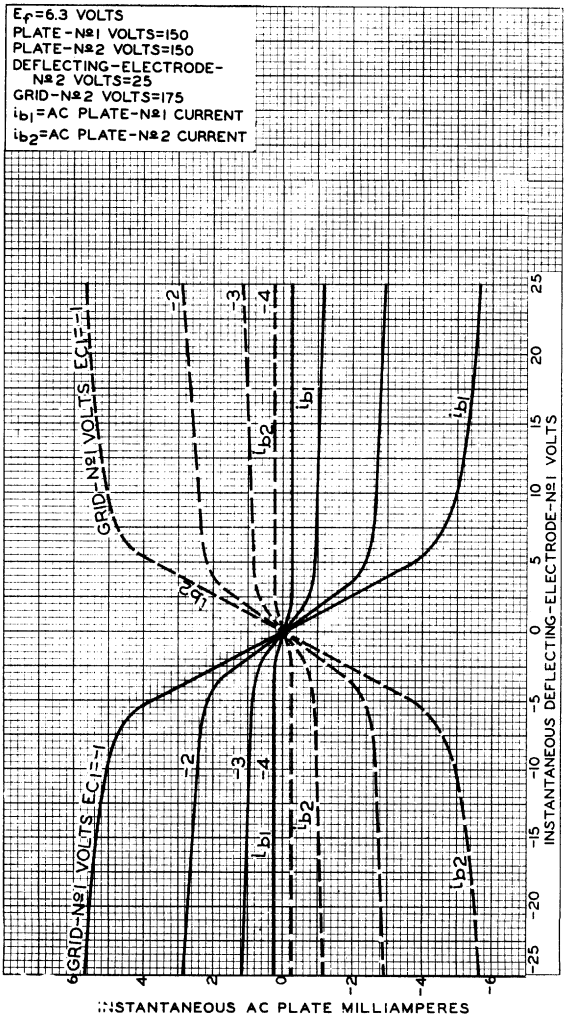
AVERAGE CHARACTERISTICS



92CM-10252R2

7360

OPERATION CHARACTERISTICS



92CM-10264R2

7408

Beam Power Tube

GENERAL DATA

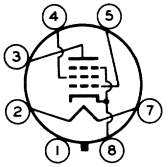
Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values)*:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.450	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	200 max.	volts
Heater positive with respect to cathode	200[a] max.	volts
Direct Interelectrode Capacitances (Approx.):[b]		
Grid No.1 to plate	0.7	μμf
Grid No.1 to cathode & grid No.3, grid No.2, and heater	9	μμf
Plate to cathode & grid No.3, grid No.2, and heater	7.5	μμf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3-5/16"
Maximum Seated Length	2-3/4"
Maximum Diameter	1-9/32"
Dimensional Outline	See *General Section*
Bulb	T9
Bases (Alternates):	
Intermediate-Shell Octal: 7-Pin, Arrangement 1 (JEDEC Group 1, No.B7-7)	
Short Intermediate-Shell Octal with External Barriers: 7-Pin, Arrangement 1 (JEDEC Group 1, No.B7-59)	
Basing Designation for BOTTOM VIEW	7S

Pin 1 – No Internal Connection
Pin 2 – Heater
Pin 3 – Plate
Pin 4 – Grid No.2



Pin 5 – Grid No.1
Pin 7 – Heater
Pin 8 – Cathode, Grid No.3

AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	350 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	315 max.	volts
GRID-No.2 INPUT	2.2 max.	watts
PLATE DISSIPATION	14 max.	watts

Typical Operation and Characteristics:

Plate Voltage	60	250	volts
Grid-No.2 Voltage	250	250	volts
Grid-No.1 (Control-Grid) Voltage	0	-12.5	volts
Peak AF Grid-No.1 Voltage	–	12.5	volts

Zero-Signal Plate Current	100[c]	45	ma
Max.-Signal Plate Current	–	47	ma
Zero-Signal Grid-No.2 Current	22[c]	4.5	ma
Max.-Signal Grid-No.2 Current	–	7	ma
Plate Resistance (Approx.)	–	50000	ohms
Transconductance	–	4100	μmhos
Load Resistance	–	5000	ohms
Total Harmonic Distortion	–	7	%
Max.-Signal Power Output	–	4.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

[a] The dc component must not exceed 100 volts.

[b] Without external shield.

[c] This value can be measured by a method involving a recurrent wave form such that the maximum ratings of the tube will not be exceeded.

7457

Beam Power Tube

Cermolox **Ruggedized**
Forced-Air Cooled **Integral Radiator**

80 Watts CW Power Output at 400 MHz
40 Watts CW Power Output at 1215 MHz

For Applications in Which Dependable Performance Under Severe Shock and Vibration is Essential

ELECTRICAL

Heater for Matrix-Type Oxide-Coated Unipotential Cathode:[g]		
Voltage (ac or dc)	6.3 ± 10%	V
Current at 6.3 volts	3.2	A
Minimum heating time	1	minute
Mu-Factor, Grid No.2 to Grid No.1	18	
Direct Interelectrode Capacitances[a]:		
Grid No.1 to plate	0.065 max.	pF
Grid No.1 to cathode & heater	14	pF
Plate to cathode & heater	0.019	pF
Grid No.1 to grid No.2	19	pF
Grid No.2 to plate	4.5	pF
Grid No.2 to cathode & heater	1.30	pF

MECHANICAL

Operating Position . . . . . Any
Overall Length . . . . . 1.880" ± .050"
Greatest Diameter . . . . . 1.265" max.
Terminal Connections . . . . . See *Dimensional Outline*

For operation up to 400 MHz

Socket, including Grid-No.2 Bypass Capacitor . . . . . Erie[b] 2948-000, E.F. Johnson[c] DN124-152-1, Jettron[d] 89-001, or equivalent

Grid-No.2 Bypass Capacitor . . . . . Erie[b] 2926-000, 2929-001, or equivalent

For operation at high frequencies

See Accompanying Preferred Mounting Arrangement
Radiator . . . . . Integral part of tube
Weight (Approx.) . . . . . 2 oz.

THERMAL

Terminal Temperature (Plate, grid No.2, grid No.1, cathode, and heater)	250 max.	°C
Plate-Core Temperature	250 max.	°C

Air Flow:[h]

Through radiator — Adequate air flow to limit the radiator core temperature to 250° C should be delivered by a blower across the radiator before and during the application of plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed across the radiator versus plate dissipation are shown in two graphs under *Typical Cooling Requirements*.

To Plate, Grid-No.2, Grid-No.1, Cathode, and Heater Terminals — A sufficient quantity of air should flow across each of these terminals so that their temperature does not exceed the specified maximum value of 250° C.

During Standby Operation — Cooling air is not normally required when only heater voltage is applied to the tube.

Plate power, grid-No.2 power, heater power, and air flow may be removed simultaneously.

At sea level cooling requirements with air flow directed across the radiator with cowling as indicated may be met by use of blowers and associated motors manufactured by Rotron Mfg. Co., Inc., Woodstock, N.Y., or equivalent.

AF POWER AMPLIFIER & MODULATOR – Class AB_1[i]

Maximum CCS Ratings, *Absolute-Maximum Values:*

DC Plate Voltage	1000 max.	volts
DC Grid-No.2 Voltage	300 max.	volts
Max.-Signal DC Plate Current	180 max.	mA
Max.-Signal Plate Input	180 max.	watts
Max.-Signal Grid-No.2 Input	4.5 max.	watts
Plate Dissipation	115 max.	watts

Typical CCS Operation:

Values are for 2 tubes			
DC Plate Voltage	650	850	volts
DC Grid-No.2 Voltage	300	300	volts
DC Grid-No.1 Voltage:			
From fixed-bias source	−15	−15	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	30	30	volts

Zero-Signal DC Plate Current	80	80	mA
Max.-Signal DC Plate Current	200	200	mA
Zero-Signal DC Grid-No.2 Current	0	0	mA
Max.-Signal DC Grid-No.2 Current	20	20	mA
Effective Load Resistance (Plate to plate)	4330	7000	ohms
Max.-Signal Driving Power (Approx.)	0	0	watt
Max.-Signal Power Output (Approx.)	50	80	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under Any Condition:

With fixed bias	30,000 max. ohms
With cathode bias	Not recommended

AF POWER AMPLIFIER & MODULATOR – Class AB_2 [i]

Maximum CCS Ratings, *Absolute-Maximum Values:*

DC Plate Voltage	1000 max.	volts
DC Grid-No.2 Voltage	300 max.	volts
Max.-Signal DC Plate Current	180 max.	mA
Max.-Signal DC Grid-No.1 Current	30 max.	mA
Max.-Signal Plate Input	180 max.	watts
Max.-Signal Grid-No.2 Input	4.5 max.	watts
Plate Dissipation	115 max.	watts

Typical CCS Operation:

Values are for 2 tubes

DC Plate Voltage	650	850	volts
DC Grid-No.2 Voltage	300	300	volts
DC Grid-No.1 Voltage: From fixed-bias source	−15	−15	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	46	46	volts
Zero-Signal DC Plate Current	80	80	mA
Max.-Signal DC Plate Current	355	355	mA
Zero-Signal DC Grid-No.2 Current	0	0	mA
Max.-Signal DC Grid-No.2 Current	25	25	mA
Max.-Signal DC Grid-No.1 Current	15	15	mA
Effective Load Resistance (Plate to plate)	2450	3960	ohms
Max.-Signal Driving Power (Approx.)	0.3	0.3	watt
Max.-Signal Power Output (Approx.)	85	140	watts

PLATE-MODULATED RF POWER AMPLIFIER – Class C Telephony[i]

Carrier conditions per tube for use with a max. modulation factor of 1.0

Maximum CCS Ratings, *Absolute-Maximum Values*

	Up to 1215 MHz:	
DC Plate Voltage	800 max.	volts
DC Grid-No.2 Voltage	300 max.	volts
DC Grid-No.1 Voltage	−100 max.	volts
DC Plate Current	150 max.	mA
DC Grid-No.1 Current	30 max.	mA
Plate Input	120 max.	watts
Grid-No.2 Input	3 max.	watts
Plate Dissipation	75 max.	watts

Typical CCS Operation:

	At 400 MHz:		
DC Plate Voltage	400	700	volts
DC Grid-No.2 Voltage	200	250	volts
DC Grid-No.1 Voltage	−20	−50	volts
DC Plate Current	100	130	mA
DC Grid-No.2 Current	5	10	mA
DC Grid-No.1 Current	5	10	mA
Driver Power Output (Approx.)	2	3	watts
Useful Power Output (Approx.)	16	45	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under Any Condition	30,000 max.	ohms

RF POWER AMPLIFIER & OSCILLATOR – Class C Telegraphy[i]

and

RF POWER AMPLIFIER – Class C FM Telephony

Maximum CCS Ratings, *Absolute-Maximum Values:*

	Up to 1215 MHz:	
DC Plate Voltage	1000 max.	volts
DC Grid-No.2 Voltage	300 max.	volts
DC Grid-No.1 Voltage	−100 max.	volts
DC Plate Current	180 max.	mA
DC Grid-No.1 Current	30[c] max.	mA
Plate Input	180 max.	watts
Grid-No.2 Input	4.5 max.	watts
Plate Dissipation	115 max.	watts

Typical CCS Operation:

	At 400 MHz		*At 1215 MHz*	
DC Plate Voltage	400	900	900	volts
DC Grid-No.2 Voltage	200	300	300	volts
DC Grid-No.1 Voltage	−35	−30	−22	volts
DC Plate Current	150	170	170	mA
DC Grid-No.2 Current	5	1	1	mA
DC Grid-No.1 Current	3	10	4	mA
Driver Power Output (Approx.)	3	3	5	watts
Useful Power Output (Approx.)	23	80	40	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under Any Condition	30,000 max.	ohms

LINEAR RF POWER AMPLIFIER,[i]
Single-Sideband Suppressed-Carrier Service

Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2

Maximum CCS Ratings, *Absolute-Maximum Values:*

	Up to 1215 MHz		
DC Plate Voltage	1000	max.	volts
DC Grid-No.2 Voltage	300	max.	volts
DC Grid-No.1 Voltage	−100	max.	volts
DC Plate Current at Peak of Envelope	250[c]	max.	mA
DC Grid-No.1 Current	30	max.	mA
Plate Input	180	max.	watts
Grid-No.2 Input	4.5	max.	watts
Plate Dissipation	115	max.	watts

Typical CCS Operation with "Two-Tone" Modulation:

	At 30 MHz		
DC Plate Voltage	650	850	volts
DC Grid-No.2 Voltage	300	300	volts
DC Grid-No.1 Voltage	−18.5	−18.5	volts
Zero-Signal DC Plate Current	40	40	mA
Effective RF Load Resistance	2200	3500	ohms
DC Plate Current at Peak of Envelope	100	100	mA
Average DC Plate Current	75	75	mA
DC Grid-No.2 Current at Peak of Envelope	8.2	4.2	mA
Average DC Grid-No.2 Current	3.6	1.7	mA
Peak-Envelope Driver Power Output (Approx.)	0.5	0.5	watt

Output-Circuit Efficiency (Approx.)	90	90	%
Distortion Products Level:			
Third Order	35	30	dB
Fifth Order	40	36	dB
Useful Power Output (Approx.):			
Average	12.5	20	watts
Peak envelope	25	40	watts
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance			
Under Any Condition:			
With fixed bias	25000	max.	ohms
With fixed bias (In Class AB_1 operation)	100000	max.	ohms
With cathode bias	Not recommended		
Grid-No.2 Circuit Impedance[k]	10000	max.	ohms

[a] Measured with special shield adapter.

[b] Erie Technological Products, Inc., 2206 West 15th Street, Erie, Pennsylvania

[c] E.F. Johnson Co., 299 10th Ave., S.W., Waseca, Minn.

[d] Jettron Products, Inc., 56 Rt. 10, Hanover, N.J.

[e] The maximum dc plate current at peak of envelope is 250 mA dc for a signal having a minimum peak-to-average power ratio of 2. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 250 mA. The maximum rating for a signal having a minimum peak-to-average power ratio less than 2, such as is obtained in Single-Tone operation, is 180 mA.

[f] In applications where the frequency is less than 80 MHz and the bias is less than –50 volts, the maximum value is 40 mA.

The following footnotes apply to the RCA *Transmitting Tube Operating Considerations* given at front of this section.

[g] See *Electrical Considerations*—Filament or Heater.

[h] See *Cooling Considerations*—Forced Air Cooling.

[i] See *Classes of Service*.

[k] See *Electrical Considerations*—Grid No.2 Voltage Supply.

CHARACTERISTICS RANGE VALUES

	Note	Min.	Max.	
1. Heater Current	1	2.90	3.55	A
2. Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	–	0.065	pF
Grid No.1 to cathode & heater	2	11.8	15.2	pF
Plate to cathode & heater	2	–	0.019	pF
Grid No.1 to grid No.2	2	17.3	21.9	pF
Grid No.2 to plate	2	4	5.1	pF
Grid No.2 to cathode & heater	2	–	1.30	pF
3. Grid-No.1 Voltage	1,3	–6	–18	volts
4. Reverse Grid-No.1 Current	1,3	–	–20	μA
5. Grid-No.2 Current	1,3	–8	+2.0	mA
6. Peak Emission	1,4	–	300	peak volts
7. Interelectrode Leakage Resistance	5	1.0	–	megohm
8. Useful Power Output	6	85	–	watts

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 115 mA.

Note 4: With grid No.1, grid No.2, and plate tied together; and pulse voltage source connected between plate and cathode. Pulse duration is 2 microseconds, pulse repetition frequency is 60 pps, and duty factor is 0.00012. The voltage-pulse amplitude is adjusted until a peak cathode current of 10 amperes is obtained. After 1 minute at this value, the voltage-pulse amplitude will not exceed the value specified.

Note 5: With tube at 20° to 30°C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two adjacent electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1.0 megohm, will exceed the value specified.

Note 6: In a single-tube, grid-driven coaxial-tuned amplifier circuit at 400 MHz and for conditions with 5.7 volts ac or dc on heater, dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, grid-No.1 voltage adjustable for dc plate current of 180 mA maximum, dc grid-No.1 current of 30 mA maximum and driver power output of 3 watts maximum.

SPECIAL TESTS AND PERFORMANCE DATA

The environmental conditions shown for the tests below are those applied directly to the tube. Extreme care must be used in the design of the mountings to minimize mounting resonances.

50g, 11-Millisecond Shock Test:

This test is performed on samples of tubes to determine the ability of the tube to withstand the specified long-duration impact acceleration. Tubes are held rigid in six different positions in a medium impact shock machine and are subjected to three blows in each position.

At the end of this test, tubes are required to meet the limits for items 3 and 4 under *Characteristics Range Values*.

500g, Nominal 3/4-Millisecond Shock Test:

This test is performed on samples of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a high-impact shock machine and are subjected to five blows in each positions.

At the end of this test, tubes are required to meet the limits for items 3 and 4 under *Characteristics Range Values*.

5-2000 Hz Variable Frequency Vibration Test:

This test is performed on samples of tubes to determine the ability of the tube to withstand variable frequency vibration. With heater voltage of 6.3 volts ac or dc, dc plate supply voltage of 300 volts, dc grid-No.2 voltage of 250 volts, grid-No.1 voltage adjusted to give dc plate current of 10 mA, and plate load resistor of 2000

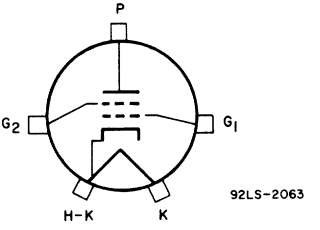
ohms. This tube is vibrated along each of three mutually perpendicular axes over an 8-minute sweep consisting of:

a. 5-10 Hz with fixed double amplitude of 0.080 inch ±10%.
b. 10-15 Hz at fixed acceleration of 0.41 g ± 10%.
c. 15-75 Hz with fixed double amplitude of 0.036 inch ± 10%.
d. 75-2000 Hz at fixed acceleration of 0 g ± 10%.

During the above vibration tests, tubes will show an rms output voltage in excess of 15 volts across the plate load resistor in the 5-2000 hertz range.

At the end of this test, tubes are required to meet the limits for items 3 and 4 under *Characteristics Range Values*.

TERMINAL DIAGRAM

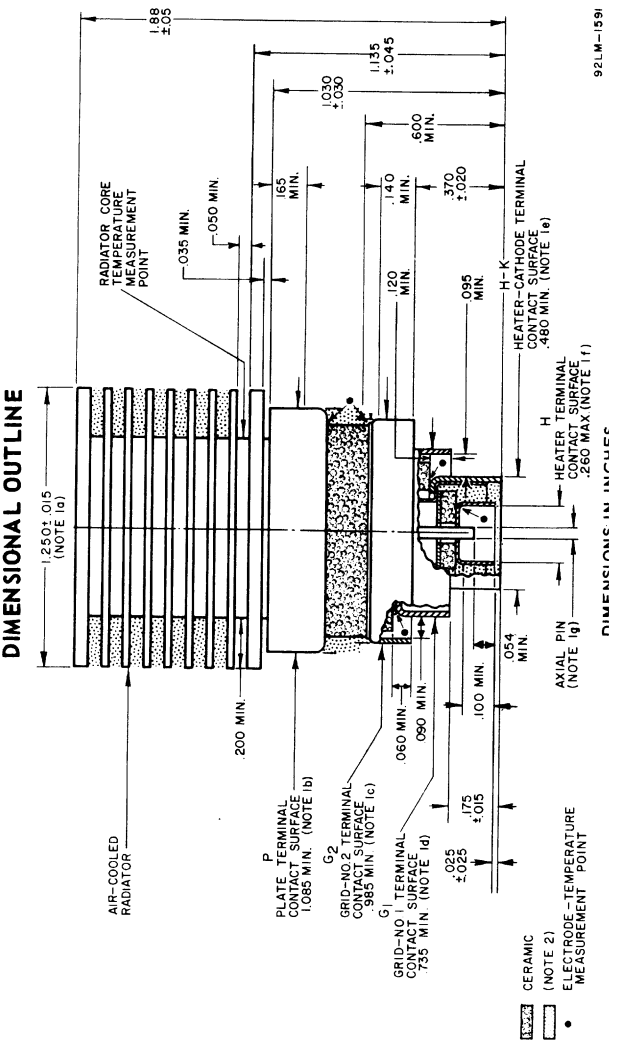


NOTES FOR DIMENSIONAL OUTLINE

Note 1: The following diametrical space requirements accommodate the concentricity of the cylindrical surfaces of the radiator fins, axial pin, and each electrode terminal:

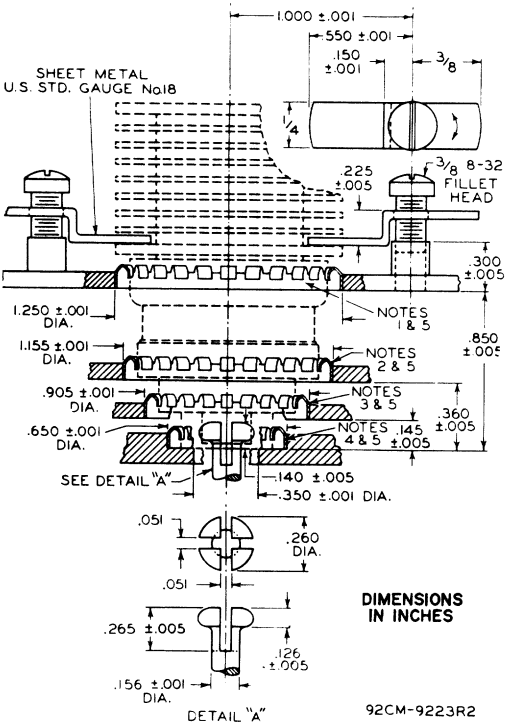
a. Radiator Band – 1.316"
b. Plate Terminal – 1.120"
c. Grid-No.2 Terminal – 1.020"
d. Grid-No.1 Terminal – 0.765"
e. Heater-Cathode Terminal – 0.520"
f. Heater Terminal – 0.240"
g. Axial Pin – 0.072"

Note 2: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.



DIMENSIONS IN INCHES

PREFERRED MOUNTING ARRANGEMENT



Note 1: Contact ring No.97-252 or finger stock No.97-380.

Note 2: Contact ring No.97-253 or finger stock No.97-380.

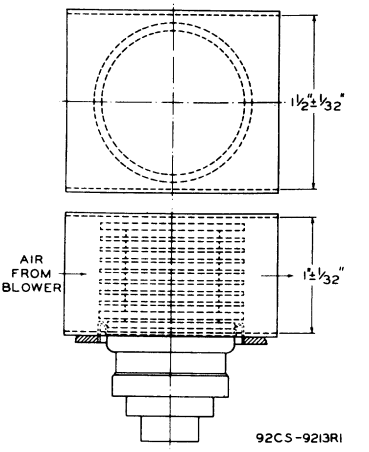
Note 3: Contact ring No.97-254 or finger stock No.97-380.

Note 4: Contact ring No.97-255 or finger stock No.97-380.

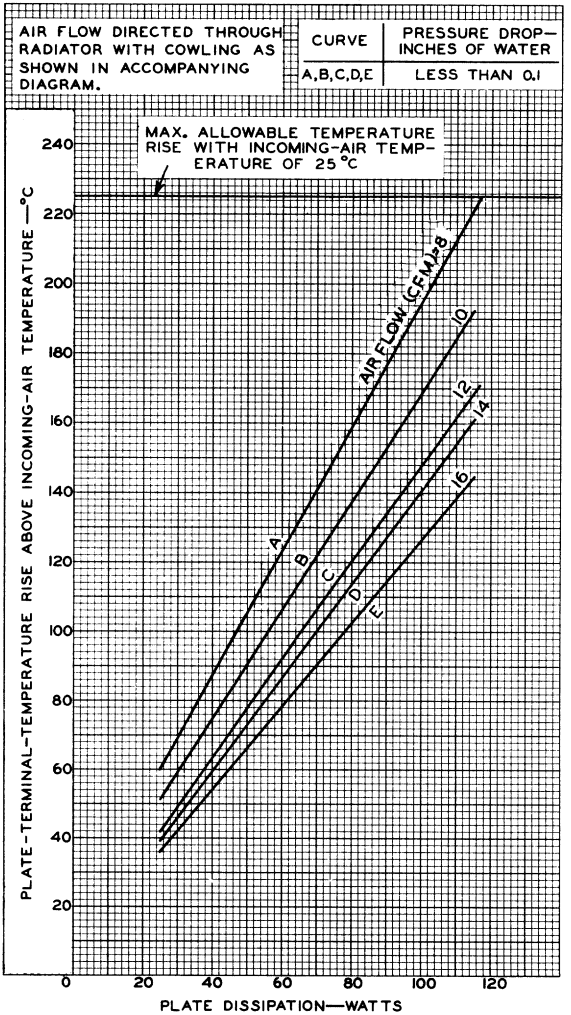
Note 5: The specified contact ring of preformed finger stock and finger stock No.97-380 provide adequate electrical contact, but the finger stock No.97-380 is less susceptible to breakage than the specified contact ring. Both types are made by Instruments Specialties Co., Little Falls, N.J.

RECOMMENDED COWLING

For Directing Air Flow Through Radiator

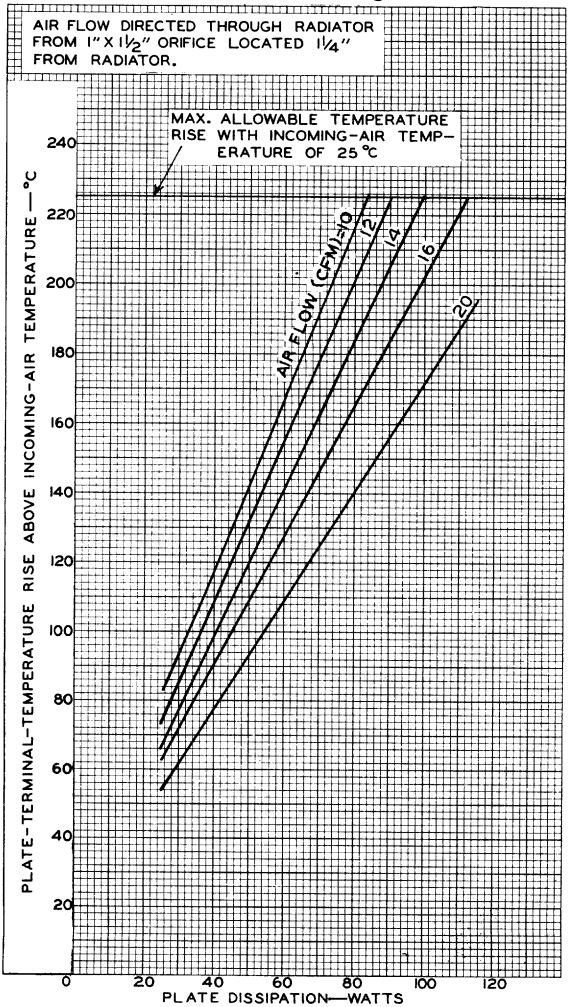


TYPICAL COOLING REQUIREMENTS
With Cowling



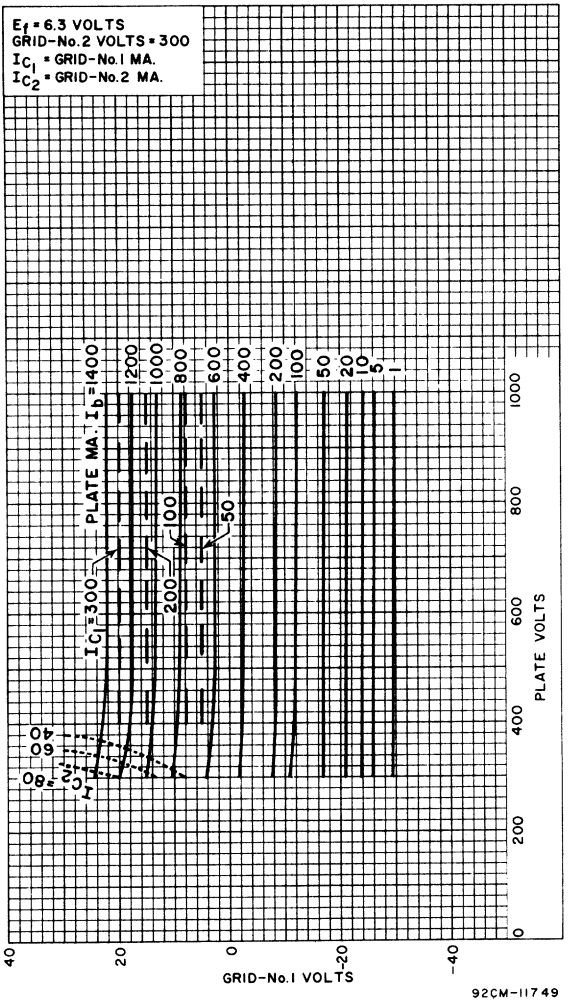
92CM-9219RI

TYPICAL COOLING REQUIREMENTS
Without Cowling



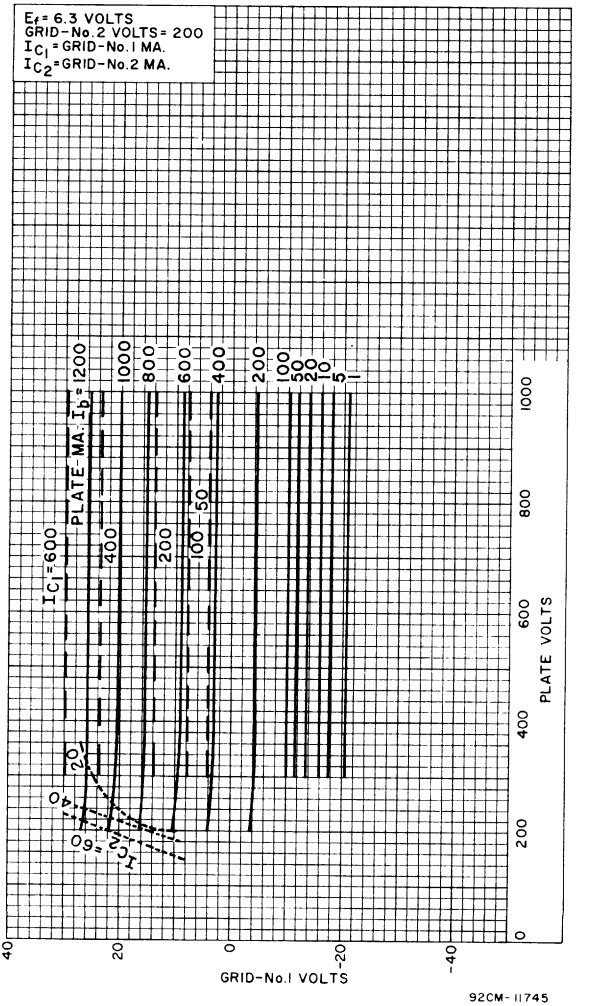
92CM-9220RI

TYPICAL COOLING REQUIREMENTS

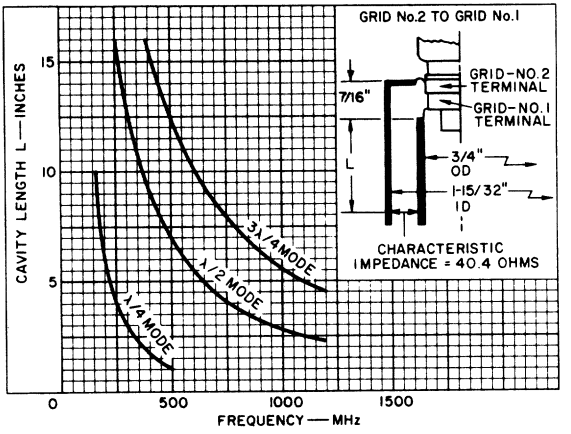


92CM-11749

TYPICAL COOLING REQUIREMENTS



TUNING CHARACTERISTICS



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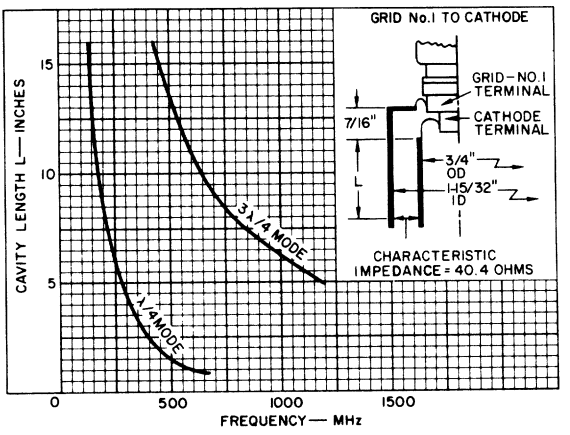

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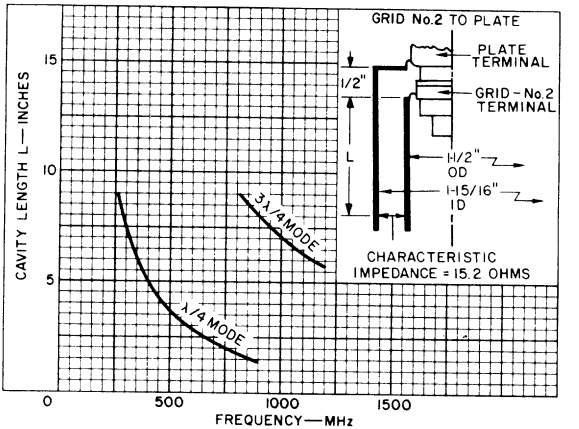
TUNING CHARACTERISTICS



92CS-14835

7533

Tunable Oscillator Triode

PENCIL TYPE WITH INTEGRAL RESONATORS

For Radiosonde Service at Frequencies between 1660 and 1700 Mc

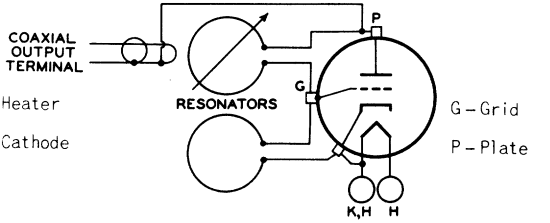
GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage range (AC or DC)	5.2 to 6.6▲	volts
Current at 6 volts	0.16	amp
Frequency (Approx.)	1680●	Mc
Tuning Range	1660 to 1700	Mc
RF Coaxial Output Terminal:		
Characteristic impedance (Approx.)	50	ohms
Tuning Screws (2):		
Maximum Torque (Absolute) at tuning-range stops	6.5	oz-in.

Mechanical:

Operating Position . . . . . Any
Dimensions . . . . . See *Dimensional Outline*
Tunable Resonators (2) . . . . . Integral part of tube
Weight (Approx.) . . . . . 0.8 oz
Terminal Connections (See *Dimensional Outline*):



UHF OSCILLATOR — Class C

Maximum and Minimum Ratings, *Absolute-Maximum Values:*

At frequencies between 1660 and 1700 Mc and altitudes up to 100,000 feet

DC PLATE-TO-GRID VOLTAGE	130 max.	volts
DC PLATE CURRENT	34 max.	ma
DC GRID CURRENT	8 max.	ma
PLATE INPUT	4 max.	watts
PLATE DISSIPATION	3.6 max.	watts
AMBIENT-TEMPERATURE RANGE	-55 to +75	°C

Typical Operation as Cathode-Driven Oscillator:

At frequency of	*1660*	*1680*	*1700*	*Mc*
Heater Voltage	6	6	6	volts
DC Plate-to-Grid Voltage	124.5	124	123	volts

At frequency of	1660	1680	1700	Mc
DC Cathode-to-Grid Voltage	7.5	6.75	6	volts
From grid resistor of	1500	1500	1500	ohms
DC Cathode Current	35	31.5	32	ma
DC Grid Current	5	4.5	6	ma
Useful Power Output (Approx.)	575	575	475	mw

Circuit Values:

Grid-Circuit Resistance	2400 max.	ohms
	1300 min.	ohms

▲ This range of heater voltage is for radiosonde applications in which the heater is supplied from batteries and in which the equipment design requirements of minimum size, light weight, and high efficiency are the primary considerations even though the average life expectancy of the 7533 in such service is only a few hours.

● As supplied, tubes are adjusted to 1680 ± 4 Mc.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.135	0.157	amp
Grid Resistor	2	1300	2400	ohms
Useful Power Output (1)	3	250	–	mw
Plate Current (1)	4	–	34	ma
Useful Power Output (2)	5	250	–	mw
Plate Current (2)	6	–	34	ma
Useful Power Output (3)	7	270	–	mw

Note 1: With 5.2 volts on heater.

Note 2: With heater voltage of 6.6 volts, dc plate supply voltage of 117 volts, plate load resistor of 50 ohms, frequency adjusted to 1660 +3 −1 Mc., output VSWR of 1.1 maximum, and grid resistor adjusted to give plate current as close as possible to, but not exceeding 33 ma. Record Grid-Resistor value.

Note 3: With frequency and grid-resistor value of Note 2, decrease heater voltage and plate supply voltage to 5.2 volts and 95 volts, respectively, and measure Useful Power Output.

Note 4: With heater voltage of 6.6 volts, plate supply voltage of 117 volts, plate load resistor of 50 ohms, using same value of grid resistor as determined in Note 2, frequency adjusted to 1700 +1 −3 Mc., and output VSWR of 1.1 maximum.

Note 5: Same as Note 4, except heater voltage and plate supply voltage are 5.2 volts and 95 volts, respectively.

Note 6: Same as Note 4, except frequency is adjusted to 1680 ± 4 Mc with VSWR of 1.1 maximum.

Note 7: Same as Note 6, except heater voltage and plate supply voltage values are 5.2 volts and 95 volts, respectively.

SPECIAL TESTS & PERFORMANCE DATA

Low-Pressure Voltage Breakdown Test:

This test (similar to MIL-E-1D, paragraph 4.9.12.1) is performed on a sample lot of tubes from each production run. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 100,000 feet. Arcing will not occur when an rms voltage of 200 volts is applied between the plate terminal and the grid terminal and heater-cathode terminal tied together.

High-Frequency Vibration Performance:

This test (similar to MIL-E-1D, paragraph 4.9.19.2) is performed on a sample lot of tubes from each production run. The tube is vibrated in two planes, parallel and perpendicular respectively to its axis, with no voltages applied to the tube. Vibration frequency is 50-to-60 cps and acceleration is 10 g. At the end of this test, tubes will not show temporary or permanent shorts or open circuits.

Shorts and Continuity Test:

This test (similar to MIL-E-1D, paragraph 4.7.5) is performed on all tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit.

Temperature-Frequency Performance:

This test is performed on a sample lot of tubes from each production run to determine the ability of this tube type to maintain the oscillator frequency without significant change when ambient temperature and operating voltages are reduced gradually during a given time interval. Tube under test is operated with a heater voltage of 6.6 volts, dc plate supply voltage of 117 volts, plate load resistor of 50 ohms, oscillator frequency of 1680 ± 4 Mc, output VSWR of 1.1 maximum, dc plate current of not more than 34 ma. obtained by adjusting the value of the grid resistor between 1300 and 2400 ohms, and at an ambient temperature of approximately 22° C for a period of 5 minutes. Record Oscillator Frequency. The ambient temperature is then gradually reduced to -40° C during a 30-minute operating period. Both the heater voltage and plate supply voltage are reduced simultaneously so that during the final 15-minute interval of this test period the heater voltage is 5.2 volts and the plate supply voltage is 95 volts. Any change in frequency will not be more than +4 Mc or -1 Mc from the recorded initial test value. The rate of frequency change during this test will not exceed 2 Mc in any 15-second interval.

5-Hour Radiosonde Life Performance:

This test is performed on a sample lot of tubes from each production run under conditions of maximum-rated plate dissipation to insure excellent performance in radiosonde applications. Each tube tested is operated for 5 hours under the following conditions: heater voltage of 6.6 volts, dc plate supply voltage of 117 volts, plate load resistor of 50 ohms, dc plate current of 34 ma., obtained by adjusting the grid-resistor value between 1300 and 2400 ohms, oscillator frequency of 1680 ± 4 Mc and output VSWR of 1.1 maximum. At the end of 5 hours, the tubes will not show permanent shorts or open circuits, and will meet the following limits:

Useful Power Output (3) . . . . . 210 min. mw

For conditions shown under *Characteristics Range Values, Notes 6,7.*

Change in Useful Power
Output (3) From Initial Value . . . . . 30 max. %
For conditions shown under *Characteristics Range Values, Notes 6,7.*

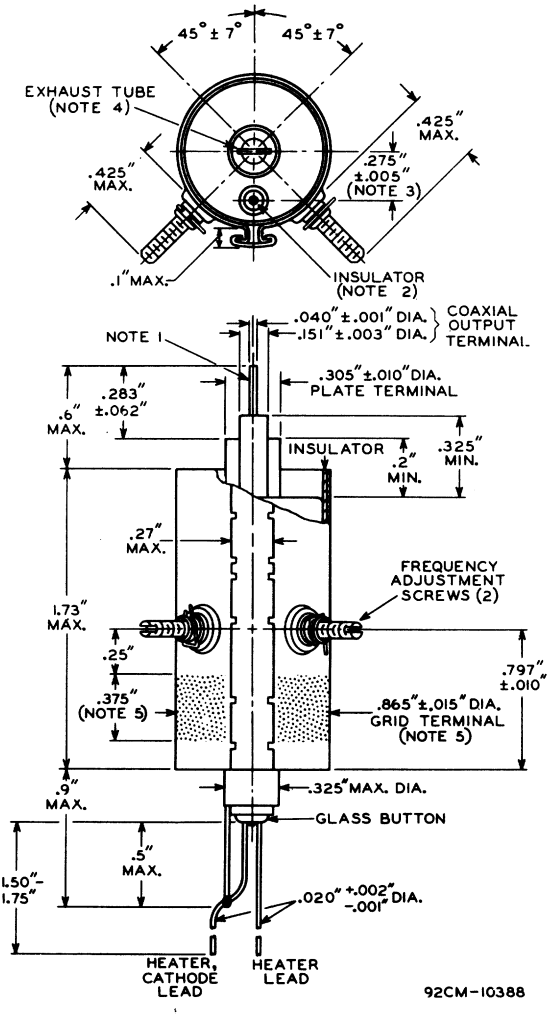
OPERATING CONSIDERATIONS

The *flexible heater leads* of the 7533 may be soldered to the circuit elements, but not closer than 3/4" from the surface of the glass button. Otherwise the heat of the soldering operation may crack the glass button and damage the tube.

Support for the 7533 should be provided by a suitable clamp around the metal shell of the tube, preferably in the indicated zone shown on the *Dimensional Outline.* Care must be taken to avoid clamping so tightly as to cause distortion of the resonator cavity with resultant change in operating frequency.

Connections to the grid terminal and to the plate terminal should be made by means of spring contacts only. Under no circumstances should connections be soldered to these terminals.

Accurate frequency adjustment in the 1660-to-1700-Mc operating range together with minimum frequency drift, may be obtained by using both tuning screws. Alternately turn each tuning screw not more than one-half turn at a time, in a clockwise direction to lower the frequency. Repeat this procedure until the desired lower frequency adjustment is reached. To reach a higher frequency, follow the same procedure except that the tuning screws are turned in a counterclockwise direction.


45° ± 7°
45° ± 7°
EXHAUST TUBE (NOTE 4)
.425" MAX.
.425" MAX.
.275" ±.005" (NOTE 3)
.1" MAX.
INSULATOR (NOTE 2)
.040" ±.001" DIA.
.151" ±.003" DIA.
COAXIAL OUTPUT TERMINAL
NOTE 1
.305" ±.010" DIA. PLATE TERMINAL
.283" ±.062"
.6" MAX.
INSULATOR
.2" MIN.
.325" MIN.
.27" MAX.
FREQUENCY ADJUSTMENT SCREWS (2)
1.73" MAX.
.25"
.375" (NOTE 5)
.797" ±.010"
.865" ±.015" DIA. GRID TERMINAL (NOTE 5)
.9" MAX.
.325" MAX. DIA.
GLASS BUTTON
.5" MAX.
1.50" - 1.75"
.020" +.002" -.001" DIA.
HEATER, CATHODE LEAD
HEATER LEAD
92CM-10388

NOTE 1: THE AXES OF THE INNER AND OUTER CONDUCTORS OF THE COAXIAL OUTPUT TERMINAL COINCIDE WITHIN 0.010".

NOTE 2: THE END OF THE INSULATOR IN THE COAXIAL OUTPUT TERMINAL ALIGNS WITH THE EDGE OF THE OUTER CONDUCTOR (0.151" ± 0.003" DIAMETER) WITHIN 0.005".

NOTE 3: DISTANCE BETWEEN CENTER LINE OF PLATE TERMINAL AND CENTER LINE OF INNER CONDUCTOR (0.040" ± 0.001" DIAMETER).

NOTE 4: ORIENTATION OF PINCH-OFF IS NOT CONTROLLED.

NOTE 5: STIPPLED REGION (WHICH EXTENDS AROUND TUBE) INDICATES RECOMMENDED CLAMPING AND CONTACT AREA.

7543

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

For High-Gain, Resistance-Coupled-Amplifier Applications Critical as to Hum and Microphonism

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage (AC or DC)	6.3	volts
Current	0.3	amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*▲	
Pentode Connection:			
Grid No.1 to plate	0.0035 max.	0.0035 max.	μμf
Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	5.5	5.5	μμf
Plate to cathode, grid No.3 & internal shield, grid No.2, and heater	5	5	μμf
Triode Connection:●			
Grid No.1 to plate, grid No.3 & internal shield, and grid No.2	2.6	2.6	μμf
Grid No.1 to cathode and heater	3.2	3.2	μμf
Plate, grid No.3 & internal shield, and grid No.2 to cathode and heater	1.2	8.5	μμf

Hum Output Voltage:

Average Value (RMS, Cathode Bypassed) . . . . 1.2 millivolts

Measured in "true rms" units under the following conditions: heater volts = 6.3; center-tap of heater transformer connected to ground; plate and grid-No.2 supply volts = 250; plate load resistor (megohms) = 0.27; grid No.3 and internal shield connected to cathode at socket; grid-No.2 resistor (megohms) = 0.68; grid-No.1 resistor (megohms) = 0.1; cathode resistor (ohms) = 1000; grid resistor of following stage (megohms) = 10; and stage gain of 340.

Average Value (RMS, Cathode Unbypassed) . . . 0.9 millivolt

Measured in "true rms" units under the same conditions as for "Average Value" except that the cathode resistor is unbypassed, and the stage gain is 110.

Characteristics, Class A_1 Amplifier:

	Pentode Connection		
Plate Supply Voltage	100	250	250 volts
Grid No.3 & Internal Shield	*Connected to cathode at socket*		

7543

Grid-No.2 Supply Voltage	100	125	150	volts
Cathode Resistor	150	100	68	ohms
Plate Resistance (Approx.)	0.5	1.5	1	megohms
Transconductance	3900	4500	5200	μmhos
Plate Current	5	7.6	10.6	ma
Grid-No.2 Current	2.1	3	4.3	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-4.2	-5.5	-6.5	volts

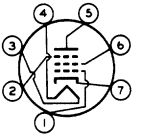
Triode Connection●

Plate Supply Voltage	250	volts
Cathode Resistor	330	ohms
Amplification Factor	36	
Plate Resistance (Approx.)	7500	ohms
Transconductance	4800	μmhos
Plate Current	12.2	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BK

Pin 1 - Grid No.1
Pin 2 - Grid No.3, Internal Shield
Pin 3 - Heater



Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Cathode

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Center Values:*

	Triode Connection●	*Pentode Connection*	
PLATE VOLTAGE	250 max.	300 max.	volts
GRID No.3 (SUPPRESSOR GRID)	-	*Connect to cathode at socket*	
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	-	300 max.	volts
GRID-No.2 VOLTAGE	-	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Positive-bias value	0 max.	0 max.	volts
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 150 volts	-	0.65 max.	watt
For grid-No.2 voltages between 150 and 300 volts	-	*See Grid-No.2 Input Rating Chart at front of Receiving Tube Section*	

PLATE DISSIPATION.	3.2 max.	3 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200 max.	200 max.	volts
Heater positive with respect to cathode	200★ max.	200★ max.	volts

Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED-AMPLIFIER CHART No.8 at front of this Section

▲ With external shield JEDEC No.316 connected to cathode.
● Grid No.3 & internal shield and grid No.2 connected to plate.
★ The dc component must not exceed 100 volts.

CURVES

For the 7543, within its ratings, are the same as those shown for Type 6AU6

7551

Beam Power Tube

9-PIN MINIATURE TYPE

For Use in Communications Equipment Operating from 6-Cell Storage-Battery Systems

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:		
Voltage range	12 to 15	volts
Current at heater volts = 13.5	0.360	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances:[o]		
Grid No.1 to plate	0.15 max.	pf
Grid No.1 to cathode, grid No.3, grid No.2, and heater	10.0	pf
Plate to cathode, grid No.3, grid No.2, and heater	5.5	pf

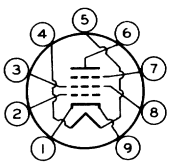
Characteristics, Class A_1 Amplifier:

Heater Voltage	13.5	volts
Plate Voltage	250	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Voltage	250	volts
Grid-No.1 Voltage	-18	volts
Mu-Factor, Grid No.2 to Grid No.1	8.7	
Transconductance	5300	μmhos
Plate Current	40	ma
Grid-No.2 Current	3	ma

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9LK

Pin 1 - Cathode
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Plate
Pin 7 - Grid No.3
Pin 8 - Grid No.2
Pin 9 - Cathode

Bulb Temperature (At hottest point on bulb surface)	225 max.	°C

→ AF POWER AMPLIFIER & MODULATOR — Class AB_1♦

Maximum CCS● Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	375 max.	volts
GRID No.3 (SUPPRESSOR GRID)	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	volts
MAX.-SIGNAL DC PLATE CURRENT■	70 max.	ma
MAX.-SIGNAL PLATE INPUT■	21 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT■	2 max.	watts
PLATE DISSIPATION■	10 max.	watts

Typical CCS Push-Pull Operation:

Values are for 2 tubes

Heater Voltage	13.5	volts
DC Plate Voltage	300	volts
Grid No.3	*Connected to cathode at socket*	
DC Grid-No.2 Voltage§	250	volts
DC Grid-No.1 Voltage§	-21	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	40	volts
Zero-Signal DC Plate Current	40	ma
Max.-Signal DC Plate Current	125	ma
Zero-Signal DC Grid-No.2 Current	2	ma
Max.-Signal DC Grid-No.2 Current	14	ma
Effective Load Resistance (Plate to plate)	5000	ohms
Max.-Signal Driving Power	0	watts
Total Harmonic Distortion	5	%
Max.-Signal Power Output (Approx.)	20.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	megohm

→ RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy† and RF POWER AMPLIFIER — Class C FM Telephony

Maximum Ratings, *Absolute-Maximum Values:*

	Up to 175 Mc		
	CCS●	*ICAS*●●	
DC PLATE VOLTAGE	375 max.	375 max.	volts
GRID No.3 (SUPPRESSOR GRID)	0 max.	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-125 max.	-125 max.	volts
DC PLATE CURRENT	70 max.	80 max.	ma
DC GRID-No.2 CURRENT	15 max.	15 max.	ma
DC GRID-No.1 CURRENT	5 max.	5 max.	ma
PLATE INPUT	21 max.	24 max.	watts
GRID-No.2 INPUT	2 max.	2 max.	watts
PLATE DISSIPATION	10 max.	12 max.	watts

→ Indicates a change.

Typical Operation:

As amplifier at 175 Mc

	CCS		ICAS	
Heater Voltage	13.5	13.5	13.5	volts
DC Plate Voltage	250	300	300	volts
Grid No.3	*Connected to cathode at socket*			
DC Grid-No.2 Voltage[FF]	200	200	250	volts
DC Grid-No.1 Voltage[⊕⊕]	-40	-42	-55	volts
Peak RF Grid-No.1 Voltage	47	52	62	volts
DC Plate Current	60	70	80	ma
DC Grid-No.2 Current	3.7	3.7	5.1	ma
DC Grid-No.1 Current (Approx.)	1.5	2.1	1.6	ma
Driver Power Output (Approx.)[▲▲]	1	1	1.5	watts
Useful Power Output (Approx.)*	6.5	8.5	10	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	0.1 max.	megohm

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony ←

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum Ratings, *Absolute-Maximum Values:*

Up to 175 Mc

	CCS	ICAS	
DC PLATE VOLTAGE	300 max.	300 max.	volts
GRID No.3 (SUPPRESSOR GRID)	0 max.	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-125 max.	-125 max.	volts
DC PLATE CURRENT	60 max.	70 max.	ma
DC GRID-No.2 CURRENT	10 max.	10 max.	ma
DC GRID-No.1 CURRENT	5 max.	5 max.	ma
PLATE INPUT	15 max.	17.5 max.	watts
GRID-No.2 INPUT	1.4 max.	1.4 max.	watts
PLATE DISSIPATION	7 max.	8 max.	watts

Typical Operation:

At 175 Mc

Heater Voltage	13.5	13.5	volts
DC Plate Voltage	250	250	volts
Grid No.3	*Connected to cathode at socket*		
DC Grid-No.2 Voltage[▲]	250	250	volts
DC Grid-No.1 Voltage[★]	-70	-75	volts
From a grid-No.1 resistor of	33000	33000	ohms
RF Grid-No.1 Voltage	75	80	volts
DC Plate Current	60	70	ma
DC Grid-No.2 Current	2.5	3	ma
DC Grid-No.1 Current (Approx.)	2.1	2.3	ma
Driving Power (Approx.)[▲▲]	1	1	watt
Useful Power Output*	6.5	7.5	watts

← Indicates a change.

	CCS	ICAS	
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance. .	0.1 max.	0.1 max.	megohm

FREQUENCY MULTIPLIER

Maximum Ratings, *Absolute-Maximum Values:*

	CCS	ICAS	
DC PLATE VOLTAGE.	375 max.	375 max.	volts
GRID No.3 (SUPPRESSOR GRID) . .	0 max.	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-125 max.	-125 max.	volts
DC PLATE CURRENT.	50 max.	60 max.	ma
DC GRID-No.2 CURRENT.	15 max.	15 max.	ma
DC GRID-No.1 CURRENT.	5 max.	5 max.	ma
PLATE INPUT	13 max.	15 max.	watts
GRID-No.2 INPUT	2 max.	2 max.	watts
PLATE DISSIPATION	10 max.	12 max.	watts

Typical Operation:

As doubler to 175 Mc

Heater Voltage.	13.5	13.5	volts
DC Plate Voltage.	250	250	volts
Grid No.3	*Connected to cathode at socket*		
DC Grid-No.2 Voltage.	200	250	volts

→ Indicates a change.

7551

BEAM POWER TUBE

DC Grid-No.1 Voltage⊕⊕	-53	-66	volts
From a grid-No.1 resistor of	53000	44000	ohms
Peak RF Grid-No.1 Voltage	60	74	volts
DC Plate Current	50	60	ma
DC Grid-No.2 Current	2.6	3.5	ma
DC Grid-No.1 Current (Approx.)	1	1.5	ma
Driving Power (Approx.)▲▲	0.4	0.6	watt
Useful Power Output*	3	4.5	watts
As tripler to 175 Mc			
Heater Voltage	13.5	13.5	volts
DC Plate Voltage	200	250	volts
Grid No.3	*Connected to cathode at socket*		
DC Grid-No.2 Voltage	200	250	volts
DC Grid-No.1 Voltage⊕⊕	-90	-120	volts
From a grid-No.1 resistor of	50000	70000	ohms
Peak RF Grid-No.1 Voltage	105	130	volts
DC Plate Current	50	60	ma
DC Grid-No.2 Current	3	3.9	ma
DC Grid-No.1 Current (Approx.)	1.85	1.7	ma
Driving Power (Approx.)▲▲	0.4	0.6	watt
Useful Power Output*	1.4	2.3	watts
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance	0.1 max.	0.1 max.	megohm

o Without external shield.

♦ Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.

● Continuous Commercial Service.

■ Averaged over any audio-frequency cycle of sine-wave form.

§ Obtained preferably from a fixed supply.

† Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

●● Intermittent Commercial and Amateur Service.

□□ Obtained preferably from a separate source or from the plate-voltage supply with a voltage divider. If a series resistor is used, it should be adjustable to obtain the desired operating plate current after initial tuning adjustments are completed.

⊕⊕ Obtained from a grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

▲▲ Driver stage is required to supply tube losses and rf-circuit losses. The driver stage should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, components, initial tube characteristics, and tube characteristics during life.

* Measured at load.

▲ Obtained preferably from a separate source modulated along with the plate supply, or from the modulated plate supply through a series resistor. It is recommended that this resistor be adjustable to obtain the desired operating plate current after initial tuning adjustments are made.

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BEAM POWER TUBE

★ Obtained from a grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor. The combination of grid-No.1 resistor and fixed supply has the advantage of not only protecting the tube from damage through loss of excitation but also of minimizing distortion by bias-supply compensation.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.33	0.39	amp
Transconductance	1,2	4200	6400	μmhos
Plate Current	1,2	30	50	ma
Plate Current	1,3	–	50	μa
Grid-No.2 Current	1,2	–	7.5	ma
Reverse Grid-No.1 Current	1,4	–	2	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,5	–	20	μa
Heater positive with respect to cathode	1,5	–	20	μa
Leakage Resistance:				
Between grid No.1 and all other electrodes tied together	1,6	100	–	megohms
Between plate and all other electrodes tied together	1,7	100	–	megohms

Note 1: With 13.5 volts ac or dc on heater.

Note 2: With plate voltage of 250 volts, grid No.3 connected to cathode, grid-No.2 voltage of 250 volts, and grid-No.1 voltage of −18 volts.

Note 3: With plate voltage of 250 volts, grid No.3 connected to cathode, grid-No.2 voltage of 250 volts, and grid-No.1 voltage of −48 volts.

Note 4: With plate voltage of 180 volts, grid No.3 connected to cathode, grid-No.2 voltage of 250 volts, grid-No.1 resistor of 0.1 megohm, and cathode resistor of 170 ohms.

Note 5: With 100 volts dc between heater and cathode.

Note 6: With grid No.1 100 volts negative with respect to all other electrodes tied together.

Note 7: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: Heater voltage of 17 volts cycled one minute on and two minutes off, heater = 135 volts negative with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: Heater

voltage of 13.5 volts, plate voltage of 250 volts, grid-No.2 voltage of 250 volts, grid-No.1 voltage of -18 volts, plate load resistor of 2000 ohms, and vibrational acceleration of 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 200 millivolts.

500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures. Life testing is conducted under the following conditions: Heater voltage of 15 volts and at maximum rated plate dissipation and grid-No.2 input.

CURVES
shown under Type 7558 also apply for the 7551 with the exception that E_f = 13.5 volts

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High-Mu Triode

CERAMIC-METAL PENCIL TYPE
FAST WARM-UP TIME — STURDY COAXIAL-ELECTRODE STRUCTURE

For Use as a Low-Noise-Amplifier Tube in Receiver Applications up to 1500 Mc under Severe Shock and Vibration

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at heater volts = 6.3	0.225	amp
Cathode Warm-Up Time (Average) to reach 80% of operating plate current for dc plate-supply volts = 80, dc grid volts = 0, cathode resistor (ohms) = 0, load resistor (ohms) = 10, and heater volts = 6.3	10	sec
Amplification Factor	80	
Transconductance for dc plate ma. = 13, dc plate volts = 125, and cathode resistor (ohms) = 50	13500	μmhos
Direct Interelectrode Capacitances:[a]		
Grid to plate	2.4	μμf
Grid to cathode and heater	4.4	μμf
Plate to cathode and heater	0.04 max.	μμf
Heater to cathode	2.6	μμf
Cathode to plate	0.04 max.	μμf
Cathode to grid and heater	7.0	μμf
Plate to grid and heater	2.0	μμf

Mechanical:

Operating Position	Any
Dimensions	See *Dimensional Outline*
Weight (Approx.)	0.3 oz
Sockets:	
Heater-terminals connector	Amerac[b] No.1018-88[c], Grayhill[d] No.22-5, or equivalent
Socket for operation up to about 550 Mc (Including heater-terminals connector)	Jettron[e] No.CD7010, or equivalent
Cavities (Including heater-terminals connector)	J-V-M[f] No.D-7980 Series, Resdel[g] No.10 Series, or equivalent

← Indicates a change.

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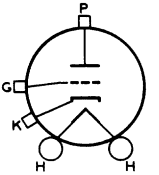
Terminal Connections (See *Dimensional Outline*):

H – Heater
K – Cathode



G – Grid
P – Plate

→ RADIO-FREQUENCY AMPLIFIER — Class A_1

Maximum CCS[h] Ratings, *Absolute-Maximum Values:*

For altitudes up to 100,000 feet and frequencies up to 1500 Mc

DC PLATE VOLTAGE	250 max.	volts
DC GRID VOLTAGE	−50 max.	volts
DC PLATE CURRENT	25 max.	ma
PLATE DISSIPATION	2.5 max.	watts
PEAK HEATER–CATHODE VOLTAGE:		
Heater negative with respect to cathode	50 max.	volts
Heater positive with respect to cathode	50 max.	volts
PLATE-SEAL TEMPERATURE	225 max.	°C

Typical CCS[h] Operation in Cathode-Drive Circuit:

	At 550 Mc	*At 800 Mc*	*At 1100 Mc*	
DC Plate-to-Grid Voltage	125	125	150	volts
Cathode Resistor	50	50	50	ohms
Input-Signal-Level Range	−70 to −20	−70 to −20	−70 to −20	dbm
DC Plate Current	13	13	13.5	ma
Power Gain	16.5	18	16	db
Bandwidth	5	5	10	Mc
Noise Figure	6.5	8.5	12.5	db

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation	Not recommended	
For cathode-bias operation	0.25 max.	megohm

[a] Without external shield.
[b] Amerac, Inc., Dunham Road, Beverly, Massachusetts.
[c] For use with cavities.
[d] Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.
[e] Jettron Products, Inc., 56 Route 10, Hanover, N.J.
[f] J-V-M Microwave Co., 9300 W. 47th St., Brookfield, Illinois. Indicated No. applies to a series of cavities covering range from 220 up to 1000 Mc and above.
[g] Resdel Engineering Corp., 330 South Fair Oaks Avenue, Pasadena, California. This series of cavities covers the range from 215 to 2325 Mc.
[h] Continuous Commercial Service.

→ Indicates a change.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.205	0.245	amp
Direct Interelectrode Capacitances:				
Grid to plate	-	2.0	2.7	μμf
Grid to cathode	-	3.7	4.9	μμf
Plate to cathode	-	-	0.04	μμf
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,2	-	30	μa
Heater positive with respect to cathode	1,3	-	30	μa
Leakage Resistance:				
From grid to plate and cathode connected together	1,4	100	-	megohms
From plate to grid and cathode connected together	1,5	100	-	megohms
Reverse Grid Current	1,6	-	0.3	μa
Emission Voltage	7	-	4	volts
Amplification Factor	1,8	60	100	
Transconductance	1,8	10000	17000	μmhos
Plate Current (1)	1,8	8.5	17.5	ma
Plate Current (2)	1,9	-	50	μa
Plate Current (3)	1,10	100	-	μa
Power Gain	1,11	13	-	db
Noise Figure	1,11	-	7.5	db
Change in Power Gain	11,12	-	-1	db
Change in Noise Figure	11,12	-	0.5	db
Change in Transconductance	11,12	-	15	%

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With 60 volts dc between heater and cathode, heater negative with respect to cathode.

Note 3: With 60 volts dc between heater and cathode, heater positive with respect to cathode.

Note 4: With grid 100 volts negative with respect to plate and cathode which are connected together.

Note 5: With plate 300 volts negative with respect to grid and cathode which are connected together.

Note 6: With dc plate voltage of 200 volts, dc grid voltage of -2 volts, grid resistor of 0.5 megohm.

Note 7: With dc voltage on grid and plate which are connected together adjusted to produce a cathode current of 30 ma., and with 5.5 volts on heater.

Note 8: With dc plate supply voltage of 125 volts, cathode resistor of 50 ohms, and cathode bypass capacitor of 1000 μf.

Note 9: With dc plate voltage of 125 volts and dc grid voltage of -5 volts.

Note 10: With dc plate voltage of 125 volts and dc grid voltage of -2.5 volts.

Note 11: With dc plate supply voltage of 125 volts and cathode resistor of 50 ohms in a single-tube rf amplifier of the cavity type having a bandwidth of 5 ± 0.5 Mc, signal input of -70 dbm, and operating frequency of 550 ± 10 Mc.

Note 12: Reduce heater voltage to 5.7 volts. Change in Power Gain, Noise Figure, and Transconductance values from those obtained with 6.3 volts on heater will not exceed indicated values.

← Indicates a change.

→ SPECIAL TESTS & PERFORMANCE DATA

Low-Pressure Voltage-Breakdown Test:

This test (similar to MIL-E-1D, paragraph 4.9.12.1) is performed on a sample lot of tubes every 90 days. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 100,000 feet. Breakdown will not occur when a 60-cycle rms voltage of 300 volts is applied between the plate cylinder and grid flange.

Low-Frequency Vibration Performance:

This test (similar to MIL-E-1D, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions: Heater voltage of 6.3 volts, dc plate-supply voltage of 125 volts, cathode resistor of 50 ohms, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 40 cycles per second at an acceleration of 10 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following test limit:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

Variable-Frequency Vibration Performance:

This test (similar to MIL-E-1D, paragraph 4.9.20.3) is performed on a sample lot of tubes from each production run. Tube operating conditions are the same as for *Low-Frequency Vibration Performance.* The tubes are vibrated perpendicular to the major axis through a frequency range from 5 to 1000 cps and back. From 5 to 50 cps, the tubes are vibrated at a constant displacement of 0.0400 ± 0.0025 inch. From 50 to 1000 cps, the tubes are vibrated at a constant acceleration of 10 ± 2 g. Total time to complete a sweep cycle is 10 ± 5 minutes. During the test, the tubes will not show an rms output voltage across the plate load resistor in excess of 150 millivolts. Each tube is vibrated for 60 seconds at the frequency which gives maximum vibrational noise output. If, at the end of 60 seconds the vibrational noise output is still increasing, the test shall continue until there is no further increase.

The rms output voltage across the plate load resistor as a result of the vibration of the tube will not exceed the specified limit at any time during the test.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Heater-Cathode Leakage Current. . . .	60 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,3.*		

→ Indicates a change.

Shock Test:

This test (similar to MIL-E-ID, paragraph 4.9.20.5) is performed on a sample lot of tubes from each production run. Tubes are held rigid and are subjected in three different positions to an impact acceleration of 500 g, 5 blows in each position.

At the end of this test, tubes will not show permanent shorts or open circuits and will meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Heater-Cathode Leakage Current. . . .	60 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,3.*		
Low-Frequency Vibration Output. . . .	200 max.	mv
For conditions shown above under *Low-Frequency Vibration Performance.*		
Change in Transconductance.	-20 max.	%
From initial value for conditions shown under *Characteristics Range Values, Notes 1,8.*		

Fatigue Vibration Test:

This test (similar to MIL-E-ID, paragraph 4.9.20.6) is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected to 2.5 g vibrational acceleration in two positions (X1, Y1) for 32 hours each. At the end of this test, tubes will meet the limits specified for the *Shock Test.*

Shorts and Continuity Test:

This test (similar to MIL-E-ID, paragraph 4.7.3) is performed on all tubes from each production run. Voltage applied between adjacent elements of the tube under test will be between 20 and 70 volts dc or peak ac. Plate and cathode terminals are tied together and connected to the grid terminal through the shorts test equipment. Tubes are tapped with a rubber tapper three times in each of three mutually perpendicular directions. If a short indication is obtained, the tapping cycle is repeated two times for verification. Acceptance criteria is based on the "Resistance vs. Time Duration" curve shown in paragraph 4.7.7 of MIL-E-ID, Amendment 5.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following limit:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

eramic-Seal-Fracture Test:

This test is performed on a sample lot of tubes every 90 ays. With the cathode- and plate-cylinder-supports spaced 5/16" ± 1/64", and with the grid flange centered between these upports, the tubes will withstand gradual application of a orce of 30 pounds, perpendicular to the axis of the tubes,

upon the grid flange without causing fracture of the ceramic insulation.

Seal Strain Test:

This test (similar to MIL-E-ID, paragraph 4.9.6.3) is performed on a sample lot of tubes every 90 days. Tubes are tested by first immersing in water, having a temperature of at least 97° C for at least 15 seconds, and then immersing immediately in water at not more than 5° C for 5 seconds. After drying for 48 hours at room temperature, the tubes will meet the following test limit:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

Heater-Cycling Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.7) is performed on a sample lot of tubes from each production run. With 6.3 volts on heater and no voltage on plate or grid, the heater is cycled three minutes on and three minutes off for at least 2000 cycles.

At the end of this test, tubes will not show permanent shorts or open circuits and will meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Heater-to-Cathode Leakage Current . .	60 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,3.*		
Grid-to-Cathode Leakage Resistance. .	50 min.	megohms
For conditions shown under *Characteristics Range Values, Notes 1,4.*		

1-Hour Stability Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.1.a) is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Types are operated under the following conditions: Heater voltage of 6.3 volts, plate-supply voltage of 215 volts, and cathode resistor of 150 ohms.

At the end of 1 hour, the change in transconductance value for each tube, referred to its initial transconductance reading, will not exceed 15% of the initial value for conditions shown under *Characteristics Range Values, Notes 1,8.*

In addition, the tubes will not show permanent shorts or open circuits and will meet the following limit:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

100-Hour Survival Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.1.b) is performed on a sample lot of tubes from each production run

to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified for *1-Hour Stability Life Performance* except that all voltages are cycled at the rate of 110 minutes on and 10 minutes off.

At the end of 100 hours, the tubes will meet the following limits:

Transconductance.	8000 min.	μmhos
For conditions shown under *Characteristics Range Values, Notes 1,8.*		
Plate Current (2).	50 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,9.*		

In addition, the tubes will not show permanent shorts or open circuits, and will meet the following limit:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

500- and 1000-Hour Average Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure excellent overall performance and to guard against epidemic failures of tubes to meet any of the characteristics indicated below.

Each tube is life tested under the following conditions: Heater voltage of 6.3 volts; plate-supply voltage of 215 volts; cathode resistor of 150 ohms; heater positive with respect to cathode by 67.5 volts; and plate-seal temperature of 225° C. Heater voltage is cycled at a rate of 110 minutes on and 10 minutes off.

At the end of 500 hours, the tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Leakage Resistance:		
From grid to plate and cathode connected together.	60 min.	megohms
From plate to grid and cathode connected together.	60 min.	megohms
For conditions shown under *Characteristics Range Values, Notes 1,4, and 1,5.*		
Power Gain.	12 min.	db
For conditions shown under *Characteristics Range Values, Notes 1,11.*		
Noise Figure.	8.5 max.	db
For conditions shown under *Characteristics Range Values, Notes 1,11.*		
Change in Power Gain.	-1	db
For conditions shown under *Characteristics Range Values, Notes 1,11,12.*		

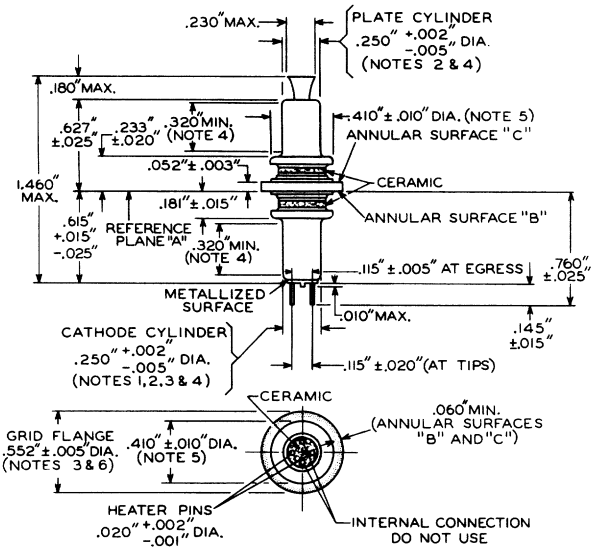
At the end of 1000 hours, the tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limits:

Heater Current	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Power Gain	11 min.	db
For conditions shown under *Characteristics Range Values, Notes 1, 11.*		
Noise Figure	9.5 max.	db
For conditions shown under *Characteristics Range Values, Notes 1, 11.*		

OPERATING CONSIDERATIONS

Connections to the cathode cylinder, grid flange, and plate cylinder should be made by flexible spring contacts. The connectors should make firm, large-surface contact, yet must be sufficiently flexible to insure that no part of the tube is subjected to excessive strain.

The *cathode* should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum-rated values shown in the tabulated data.



92CM-10274RI

REFERENCE PLANE "A" IS DEFINED AS THAT PLANE AGAINST WHICH ANNULAR SURFACE "B" OF THE GRID FLANGE ABUTS.

ANNULAR SURFACE "B" IS ON THE SIDE OF THE GRID FLANGE TOWARD THE CATHODE CYLINDER.

ANNULAR SURFACE "C" IS ON THE SIDE OF THE GRID FLANGE TOWARD THE PLATE CYLINDER.

NOTE 1: WITH ANNULAR SURFACE "B" RESTING ON REFERENCE PLANE "A", THE AXIS OF THE CATHODE CYLINDER WILL BE WITHIN 2° OF A LINE PERPENDICULAR TO REFERENCE PLANE "A".

NOTE 2: THE AXES OF THE PLATE CYLINDER AND CATHODE CYLINDER WILL COINCIDE WITHIN 0.010".

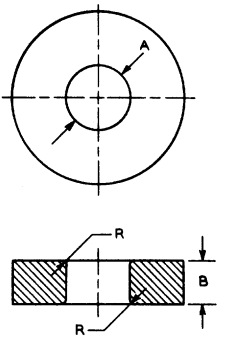
NOTE 3: THE AXES OF THE CATHODE CYLINDER AND GRID FLANGE WILL COINCIDE WITHIN 0.005".

NOTE 4: THE DIAMETER ALONG THE 0.320" MINIMUM LENGTH IS MEASURED WITH "GO" AND "NO-GO" RING GAUGES G_1-1 AND G_1-2, RESPECTIVELY.

NOTE 5: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G_2-1 AND G_2-2, RESPECTIVELY.

NOTE 6: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G_3-1 AND G_3-2, RESPECTIVELY.

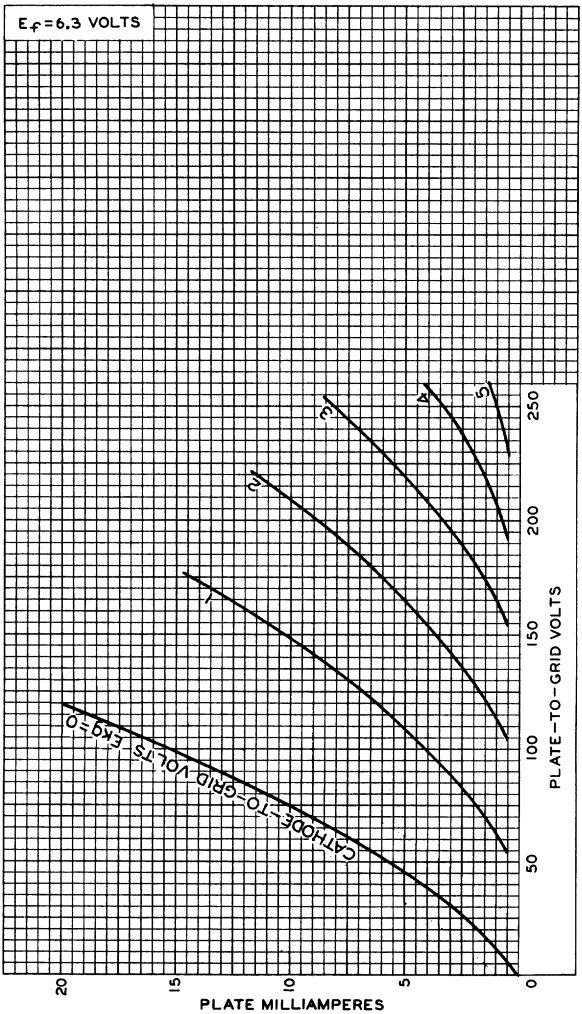
GAUGES



92CS-10370

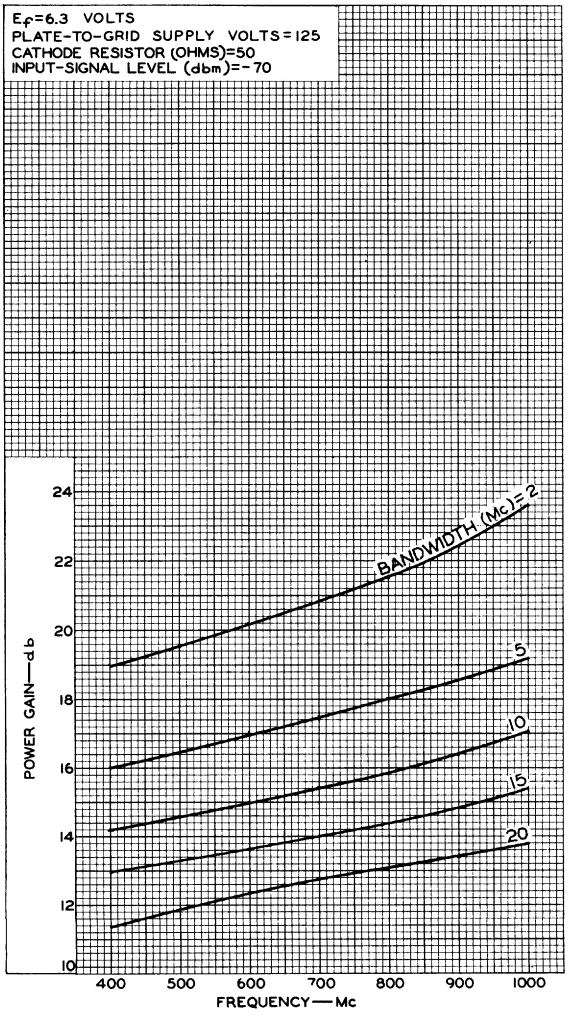
Gauge	Type	Dimension		
		Diameter A	Thickness B	Radius R
G_1-1	GO	$0.25200"^{+0.00000"}_{-0.00007"}$	$0.320"^{+0.001"}_{-0.000"}$	0.003" MAX.
G_1-2	NO-GO	$0.24500"^{+0.00007"}_{-0.00000"}$	–	–
G_2-1	GO	$0.42000"^{+0.00000"}_{-0.00007"}$	–	–
G_2-2	NO-GO	$0.40000"^{+0.00007"}_{-0.00000"}$	–	–
G_3-1	GO	$0.55700"^{+0.00000"}_{-0.00007"}$	–	–
G_3-2	NO-GO	$0.54700"^{+0.00007"}_{-0.00000"}$	–	–

AVERAGE PLATE CHARACTERISTICS
Cathode-Drive Service



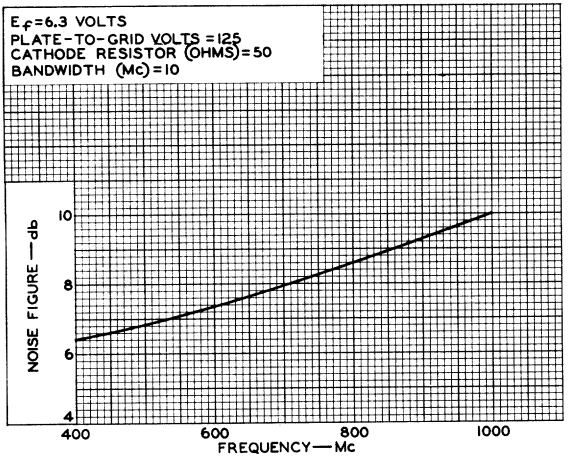
92CM-10458

POWER-GAIN CHARACTERISTICS
Cathode-Drive Service

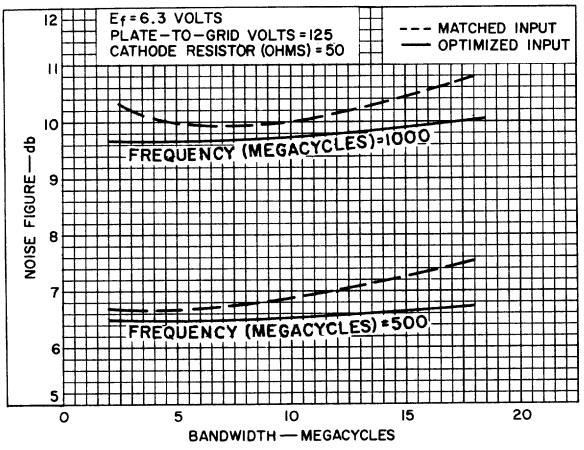


92CM-10271RI

NOISE-FIGURE CHARACTERISTICS
Cathode-Drive Service

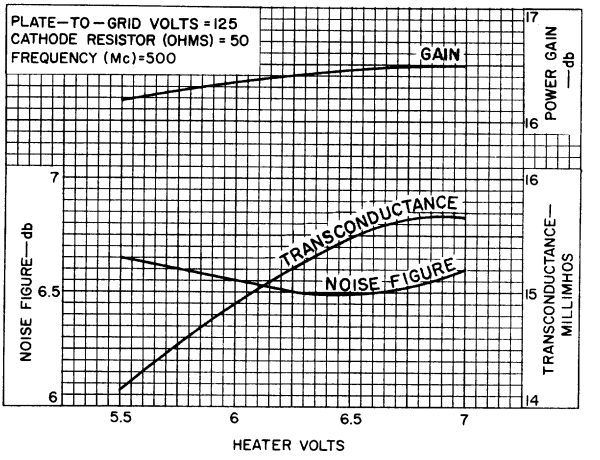


92CS-10270R3



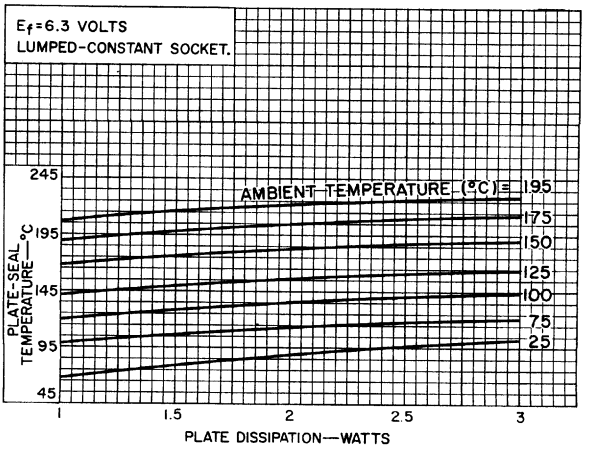
92CS-11497RI

CHARACTERISTICS
Cathode-Drive Service



92CS-1149IRI

PLATE-SEAL-TEMPERATURE CHARACTERISTICS



92CS-11488

7553

High-Mu Triode

CERAMIC-METAL PENCIL TYPE
FAST WARM-UP TIME — STURDY COAXIAL-ELECTRODE STRUCTURE

For Use as a Low-Noise-Amplifier Tube in Receiver Applications up to 1500 Mc under Severe Shock and Vibration ←

GENERAL DATA

Electrical: ←

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at heater volts = 6.3	0.225	amp
Cathode Warm-Up Time (Average) to reach 80% of operating plate current for dc plate-supply volts = 80, dc grid volts = 0, cathode resistor (ohms) = 0, load resistor (ohms) = 10, and heater volts = 6.3	10	sec
Amplification Factor	80	
Transconductance for dc plate ma. = 12.5, dc plate volts = 125, and cathode resistor (ohms) = 50.	13000	μmhos
Direct Interelectrode Capacitances:[a]		
Grid to plate	2.4	μμf
Grid to cathode and heater	4.4	μμf
Plate to cathode and heater	0.03 max.	μμf
Heater to cathode	2.6	μμf
Cathode to plate	0.03 max.	μμf
Cathode to grid and heater	7	μμf
Plate to grid and heater	2.4	μμf

Mechanical:

Operating Position	Any
Dimensions	See *Dimensional Outline*
Weight (Approx.)	0.3 oz
Sockets:	
Heater-terminals connector	Amerac[b] No.1018-88,[c] Grayhill[d] No.22-5, or equivalent
Socket for operation up to about 550 Mc (Including heater-terminals connector) ←	Jettron[e] No.CD7010, or equivalent
Cavities (Including heater-terminals connector) ←	J-V-M[f] No.D-7980 Series, Resdel[g] No.10 Series, or equivalent

←Indicates a change.

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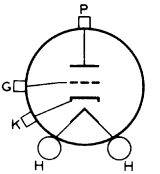
Terminal Connections (See *Dimensional Outline*):

H – Heater
K – Cathode



G – Grid
P – Plate

→ RADIO-FREQUENCY AMPLIFIER — Class A_1

Maximum CCS[h] Ratings, *Absolute-Maximum Values:*

For altitudes up to 100,000 feet and frequencies up to 1500 Mc

DC PLATE VOLTAGE	250 max.	volts
DC GRID VOLTAGE	-50 max.	volts
DC PLATE CURRENT	25 max.	ma
PLATE DISSIPATION	2.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	50 max.	volts
Heater positive with respect to cathode	50 max.	volts
PLATE-SEAL TEMPERATURE	225 max.	°C

Typical CCS[h] Operation in Cathode-Drive Circuit:

	At 550 Mc	*At 700 Mc*	
DC Plate-to-Grid Voltage	125	125	volts
Cathode Resistor	50	50	ohms
Input-Signal-Level Range	-70 to -20	-70 to -20	dbm
DC Plate Current	12.5	12.5	ma
Power Gain for a bandwidth of 5 Mc	16.5	17	db
Noise Figure	6.5	7	db

	At 1100 Mc	
DC Plate-to-Grid Voltage	150	volts
Cathode Resistor	50	ohms
Input-Signal-Level Range	-70 to -20	dbm
DC Plate Current	14	ma
Power Gain for a bandwidth of:		
4 Mc	20	db
8 Mc	18	db
Noise Figure	11.5	db

Maximum Circuit Values:

Grid-Circuit Resistance:

For fixed-bias operation	Not recommended	
For cathode-bias operation	0.25 max.	megohm

→ Indicates a change.

[a] Without external shield.

[b] Amerac, Inc., Dunham Road, Beverly, Massachusetts.

[c] For use with cavities.

[d] Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.

[e] Jettron Products, Inc., 56 Route 10, Hanover, N.J.

[f] J-V-M Microwave Co., 9300 W. 47th St., Brookfield, Illinois. Indicated No. applies to a series of cavities covering range from 220 up to 1000 Mc and above.

[g] Resdel Engineering Corp., 330 South Fair Oaks Avenue, Pasadena, California. This series of cavities covers the range from 215 up to 2325 Mc.

[h] Continuous Commercial Service.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN ←

	Note	*Min.*	*Max.*	
Heater Current	1	0.205	0.245	amp
Direct Interelectrode Capacitances:				
Grid to plate	-	2.1	2.8	μμf
Grid to cathode	-	3.8	4.8	μμf
Plate to cathode	-	-	0.03	μμf
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,2	-	30	μa
Heater positive with respect to cathode	1,3	-	30	μa
Leakage Resistance:				
From grid to plate and cathode connected together	1,4	100	-	megohms
From plate to grid and cathode connected together	1,5	100	-	megohms
Reverse Grid Current	1,6	-	0.3	μa
Emission Voltage	7	-	3	volts
Amplification Factor	1,8	60	100	
Transconductance	1,8	10000	16000	μmhos
Plate Current (1)	1,8	8.5	16.5	ma
Plate Current (2)	1,9	-	50	μa
Plate Current (3)	1,10	100	-	μa
Power Gain	1,11	14	-	db
Noise Figure	1,11	-	7	db
Change in Power Gain	11,12	-	-1	db
Change in Noise Figure	11,12	-	+0.5	db
Change in Transconductance	11,12	-	15	%

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With 60 volts dc between heater and cathode, heater negative with respect to cathode.

Note 3: With 60 volts dc between heater and cathode, heater positive with respect to cathode.

Note 4: With grid 100 volts negative with respect to plate and cathode which are connected together.

Note 5: With plate 300 volts negative with respect to grid and cathode which are connected together.

Note 6: With dc plate voltage of 200 volts, dc grid voltage of -2 volts, grid resistor of 0.5 megohm.

←Indicates a change.

Note 7: With dc voltage on grid and plate which are connected together adjusted to produce a cathode current of 30 ma., and with 5.5 volts on heater.

Note 8: With dc plate-supply voltage of 125 volts, cathode resistor of 50 ohms, and cathode bypass capacitor of 1000 μf.

Note 9: With dc plate voltage of 125 volts and dc grid voltage of −5 volts.

Note 10: With dc plate voltage of 125 volts and dc grid voltage of −2.5 volts.

Note 11: With dc plate-supply voltage of 125 volts and cathode resistor of 50 ohms in a single-tube rf amplifier of the cavity type having a bandwidth of 5 ± 0.5 Mc, signal input of −70 dbm, and operating frequency of 550 ± 10 Mc.

Note 12: Reduce heater voltage to 5.7 volts. Change in Power Gain, Noise Figure, and Transconductance values from those obtained with 6.3 volts on heater will not exceed indicated values.

SPECIAL TESTS & PERFORMANCE DATA

Low-Pressure Voltage-Breakdown Test:

This test (similar to MIL-E-1D, paragraph 4.9.12.1) is performed on a sample lot of tubes every 90 days. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 100,000 feet. Breakdown will not occur when a 60-cycle rms voltage of 300 volts is applied between the plate cylinder and grid flange.

Low-Frequency Vibration Performance:

This test (similar to MIL-E-1D, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions: heater voltage of 6.3 volts, dc plate-supply voltage of 125 volts, cathode resistor of 50 ohms, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 40 cycles per second at an acceleration of 10 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following test limit:

Heater Current.	300 max.	ma

For conditions shown under *Characteristics Range Values, Note 1.*

Variable-Frequency Vibration Performance:

This test (similar to MIL-E-1D, paragraph 4.9.20.3) is performed on a sample lot of tubes from each production run. Tube operating conditions are the same as for *Low-Frequency Vibration Performance.* The tubes are vibrated perpendicular to the major tube axis through a frequency range from 5 to 2000 cps and back. From 5 to 50 cps, the tubes are vibrated at a constant displacement of 0.0400 ± 0.0025 inch. From 50 to 2000 cps, the tubes are vibrated at a constant acceleration of 10 ± 2 g. Total time to complete a sweep cycle is 10 ± 5 minutes. During the test, the tubes will not show an rms output voltage across the plate load resistor in excess of 50 millivolts. Each tube is vibrated for 60 seconds at the frequency which

→ Indicates a change.

gives maximum vibrational noise output. If, at the end of 60 seconds the vibrational noise output is still increasing, the test is continued until there is no further increase.

The rms output voltage across the plate load resistor as a result of the vibration of the tube will not exceed the specified limit at any time during the test.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Heater-Cathode Leakage Current. . . .	60 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,3.*		

Shock Test:

This test (similar to MIL-E-ID, paragraph 4.9.20.5) is performed on a sample lot of tubes from each production run. Tubes are held rigid and are subjected in three different positions to an impact acceleration of 500 g, 5 blows in each position.

At the end of this test, tubes will not show permanent shorts or open circuits and will meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Heater-Cathode Leakage Current. . . .	60 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,3.*		
Low-Frequency Vibration Output. . . .	200 max.	mv
For conditions shown above under *Low-Frequency Vibration Performance.*		
Change in Transconductance.	−20 max.	%
From initial value for conditions shown under *Characteristics Range Values, Notes 1,8.*		

Fatigue Vibration Test:

This test (similar to MIL-E-ID, paragraph 4.9.20.6) is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected to 2.5 g vibrational acceleration in two positions (XI, YI) for 32 hours each. At the end of this test, tubes will meet the limits specified for the *Shock Test.*

Shorts and Continuity Test:

This test (similar to MIL-E-ID, paragraph 4.7.3) is performed on all tubes from each production run. Voltage applied between adjacent elements of the tube under test will be between 20 and 70 volts dc or peak ac. Plate and cathode terminals are tied together and connected to the grid terminal through the shorts test equipment. Tubes are tapped with a rubber tapper three times in each of three mutually perpendicular directions. If a short indication is obtained, the

tapping cycle is repeated two times for verification. Acceptance criteria is based on the "Resistance vs. Time Duration" curve shown in paragraph 4.7.7 of MIL-E-ID, Amendment 5.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following limit:

Heater Current. . . . . 300 max. ma
For conditions shown under *Characteristics Range Values, Note 1.*

Ceramic-Seal-Fracture Test:

This test is performed on a sample lot of tubes every 90 days. With the cathode- and plate-cylinder-supports spaced 15/16" ± 1/64", and with the grid flange centered between these supports, the tubes will withstand gradual application of a force of 30 pounds, perpendicular to the axis of the tubes, upon the grid flange, without causing fracture of the ceramic insulation.

Seal Strain Test:

This test (similar to MIL-E-ID, paragraph 4.9.6.3) is performed on a sample lot of tubes every 90 days. Tubes are tested by first immersing in water having a temperature of at least 97° C for at least 15 seconds and then immersing immediately in water at not more than 5° C for 5 seconds. After drying for 48 hours at room temperature, the tubes will meet the following test limit:

Heater Current. . . . . 300 max. ma
For conditions shown under *Characteristics Range Values, Note 1.*

Grid Blackout:

This test is performed as follows on a sample lot of tubes from each production run:

Signal-output voltage is measured under conditions with heater voltage of 6.3 volts, dc plate-supply voltage of 200 volts, plate load resistor of 10,000 ohms, grid resistor of 15 ohms, and a sine-wave voltage having a frequency of 100 kc and a peak-to-peak value of 0.1 volt applied between the grid and cathode. Then, in addition to the above conditions, a pulse signal with repetition rate of 2000 pps, peak-to-peak voltage of 5 volts, and pulse duration of 0.25 μsec is applied between the grid and cathode. Next, measurement of signal-output voltage is made 0.8 μsec after the leading edge of a pulse. This value of signal-output voltage referred to the initial value will not show a change in excess of −5 db.

Heater-Cycling Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.7) is performed on a sample lot of tubes from each production run. With 6.3 volts on heater and no voltage on plate or grid, the heater is cycled three minutes on and three minutes off for at least 2000 cycles.

At the end of this test, tubes will not show temporary or permanent shorts or open circuits and will meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Heater-to-Cathode Leakage Current . .	60 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,3.*		
Grid-to-Cathode Leakage Resistance. .	50 min.	megohms
For conditions shown under *Characteristics Range Values, Notes 1,4.*		

1-Hour Stability Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.1.a) is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are operated under the following conditions:

Heater voltage of 6.3 volts, plate-supply voltage of 215 volts, and cathode resistor of 150 ohms.

At the end of 1 hour, the change in transconductance value for each tube, referred to its initial transconductance reading, will not exceed 15% of the initial value for conditions shown under *Characteristics Range Values, Notes 1,8.*

In addition, the tubes will not show permanent shorts or open circuits and will meet the following limit:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

44-Hour Grid-Emission Life Performance:

This test is performed on a sample lot of tubes from each production run to insure excellent over-all performance and to guard against epidemic failures of tubes to meet this test requirement. Tubes are operated under the following conditions:

Heater voltage of 7.5 volts, dc plate voltage of 215 volts, grid voltage of -2 volts, and grid resistor of 0.5 megohm.

At the end of 44 hours, the reverse grid current will not exceed 2 microamperes when grid resistor is shorted and grid voltage is increased to -5 volts, other conditions remaining unchanged from the above values.

100-Hour Survival Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.1.b) is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified for *1-Hour Stability Life Performance* except that all voltages are cycled at the rate of 110 minutes on and 10 minutes off.

At the end of 100 hours, the tubes will not show permanent shorts or open circuits and will meet the following limits:

Heater Current	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Transconductance	8000 min.	μmhos
For conditions shown under *Characteristics Range Values, Notes 1,8.*		
Plate Current (2)	50 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,9.*		

500- and 1000-Hour Average Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure excellent over-all performance and to guard against epidemic failures of tubes to meet any of the characteristics indicated below. Each tube is life-tested under the following conditions:

Heater voltage of 6.3 volts, plate-supply voltage of 215 volts, cathode resistor of 150 ohms, heater positive with respect to cathode by 67.5 volts, and plate-seal temperature of 225° C. Heater voltage is cycled at a rate of 110 minutes on and 10 minutes off.

At the end of 500 hours, the tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limits:

Heater Current	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Leakage Resistance:		
From grid to plate and cathode connected together	60 min.	megohms
From plate to grid and cathode connected together	60 min.	megohms
For conditions shown under *Characteristics Range Values, Notes 1,4 and 1,5.*		
Power Gain	13 min.	db
For conditions shown under *Characteristics Range Values, Notes 1,11.*		
Noise Figure	8 max.	db
For conditions shown under *Characteristics Range Values, Notes 1,11.*		
Change in Power Gain	-1 max.	db
For conditions shown under *Characteristics Range Values, Notes 1,11,12.*		

At the end of 1000 hours, the tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limits:

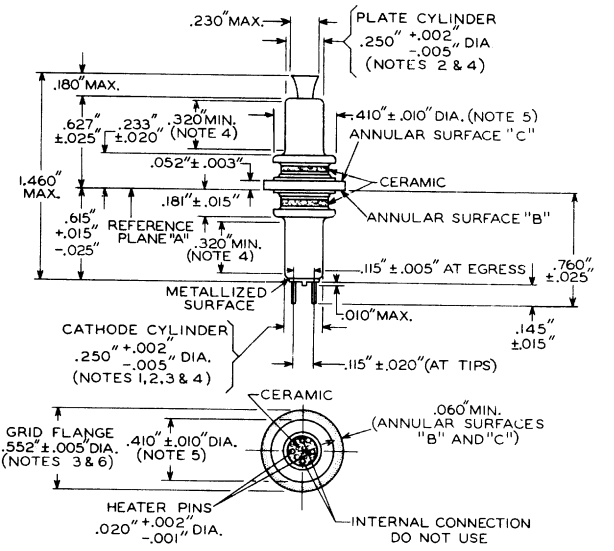
Heater Current	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

Power Gain.	12 min.	db
For conditions shown under *Characteristics Range Values, Notes 1, 11.*		
Noise Figure.	9.5 max.	db
For conditions shown under *Characteristics Range Values, Notes 1, 11.*		

OPERATING CONSIDERATIONS

Connections to the cathode cylinder, grid flange, and plate cylinder should be made by flexible spring contacts. The connectors should make firm, large-surface contact, yet must be sufficiently flexible to insure that no part of the tube is subjected to excessive strain.

The *cathode* should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum-rated values shown in the tabulated data.



92CM-10274RI

REFERENCE PLANE "A" IS DEFINED AS THAT PLANE AGAINST WHICH ANNULAR SURFACE "B" OF THE GRID FLANGE ABUTS.

ANNULAR SURFACE "B" IS ON THE SIDE OF THE GRID FLANGE TOWARD THE CATHODE CYLINDER.

ANNULAR SURFACE "C" IS ON THE SIDE OF THE GRID FLANGE TOWARD THE PLATE CYLINDER.

NOTE 1: WITH ANNULAR SURFACE "B" RESTING ON REFERENCE PLANE "A", THE AXIS OF THE CATHODE CYLINDER WILL BE WITHIN 2° OF A LINE PERPENDICULAR TO REFERENCE PLANE "A".

NOTE 2: THE AXES OF THE PLATE CYLINDER AND CATHODE CYLINDER WILL COINCIDE WITHIN 0.010".

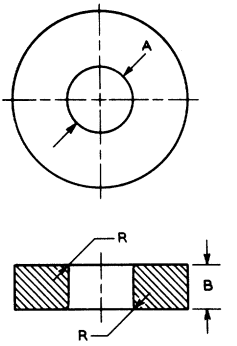
NOTE 3: THE AXES OF THE CATHODE CYLINDER AND GRID FLANGE WILL COINCIDE WITHIN 0.005".

NOTE 4: THE DIAMETER ALONG THE 0.320" MINIMUM LENGTH IS MEASURED WITH "GO" AND "NO-GO" RING GAUGES G_1-1 AND G_1-2, RESPECTIVELY.

NOTE 5: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G_2-1 AND G_2-2, RESPECTIVELY.

NOTE 6: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G_3-1 AND G_3-2, RESPECTIVELY.

GAUGES



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Gauge	Type	Dimension		
		Diameter A	Thickness B	Radius R
G_1-1	GO	$0.25200"^{+0.00000"}_{-0.00007"}$	$0.320"^{+0.001"}_{-0.000"}$	0.003" MAX.
G_1-2	NO-GO	$0.24500"^{+0.00007"}_{-0.00000"}$	-	-
G_2-1	GO	$0.42000"^{+0.00000"}_{-0.00007"}$	-	-
G_2-2	NO-GO	$0.40000"^{+0.00007"}_{-0.00000"}$	-	-
G_3-1	GO	$0.55700"^{+0.00000"}_{-0.00007"}$	-	-
G_3-2	NO-GO	$0.54700"^{+0.00007"}_{-0.00000"}$	-	-

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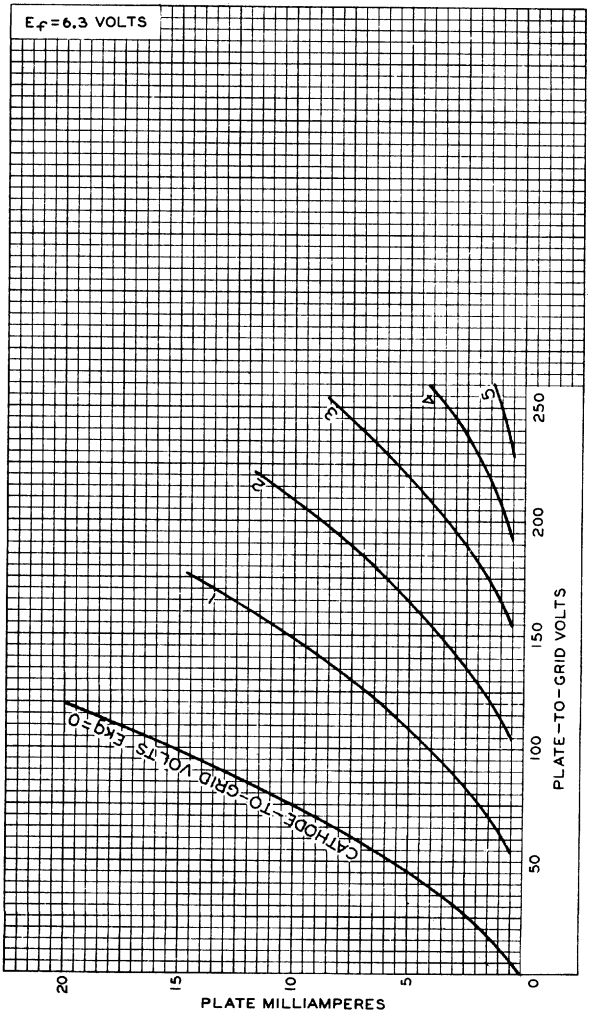
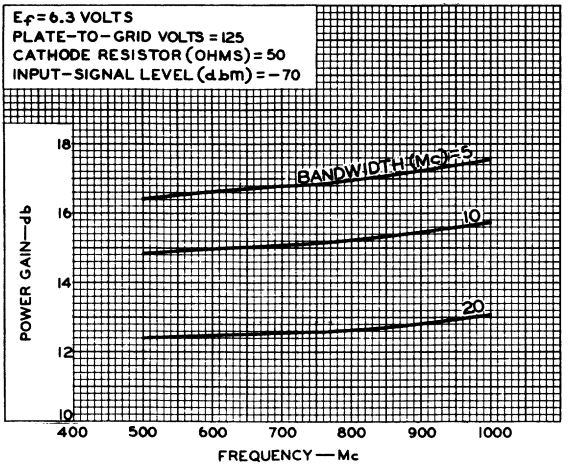
AVERAGE PLATE CHARACTERISTICS
Cathode-Drive Service



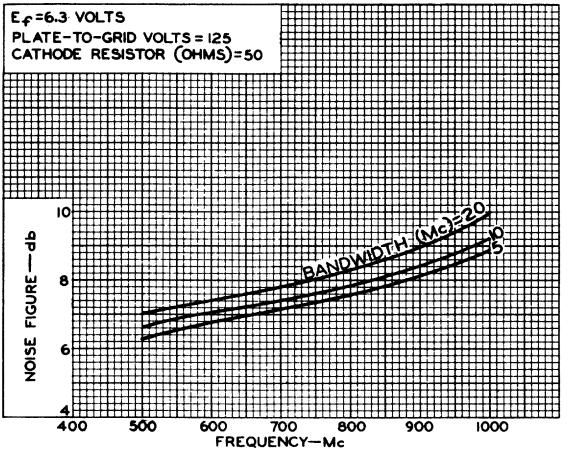
92CM-10458

POWER-GAIN CHARACTERISTICS
Cathode-Drive Service



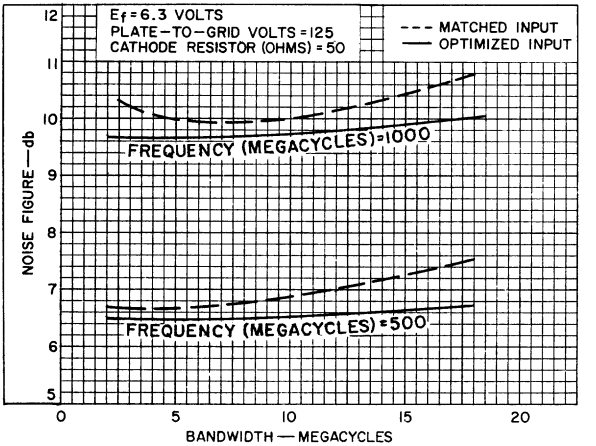
92CS-10456RI

NOISE-FIGURE CHARACTERISTICS
Cathode-Drive Service

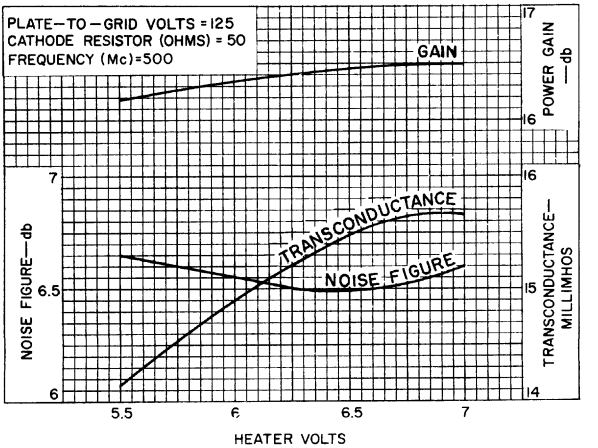


92CS-10455R2

CHARACTERISTICS
Cathode-Drive Service

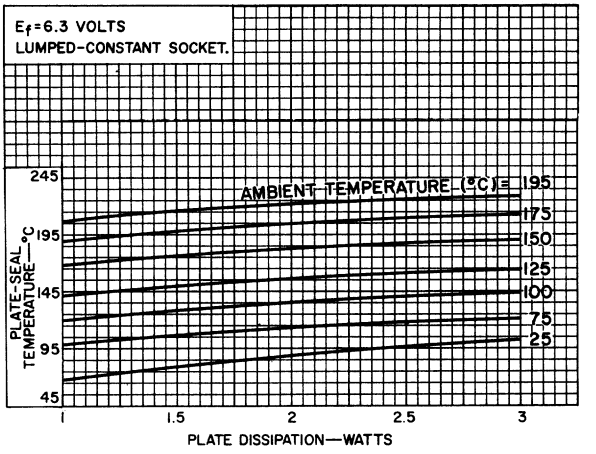


92CS—11497RI



92CS—11491RI

PLATE-SEAL-TEMPERATURE CHARACTERISTICS



92CS-11488

High-Mu Triode

CERAMIC-METAL PENCIL TYPE
FAST WARM-UP TIME — STURDY COAXIAL-ELECTRODE STRUCTURE

For Use at Frequencies up to 5000 Mc in Cathode-Drive Circuits under Severe Shock and Vibration

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at heater volts = 6.3	0.225	amp
Cathode Warm-Up Time (Average) to reach 80% of operating plate current for dc plate supply volts = 80, grid volts = 0, cathode resistor (ohms) = 0, load resistor (ohms) = 10, heater volts = 6.3	10	sec
Amplification Factor	70	
Transconductance for dc plate ma. = 14, dc plate volts = 125, and cathode resistor (ohms) = 50	16000	μmhos
Direct Interelectrode Capacitances:[a]		
Grid to plate	2.4	μμf
Grid to cathode and heater	4.4	μμf
Plate to cathode and heater	0.04 max.	μμf
Heater to cathode	2.6	μμf
Cathode to plate	0.04 max.	μμf
Cathode to grid and heater	7.0	μμf
Plate to grid and heater	2.4	μμf

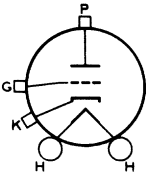
Mechanical:

Operating Position	Any
Dimensions	See *Dimensional Outline*
Weight (Approx.)	0.3 oz
Sockets:	
Heater-terminals connector	Amerac[b] No.1018-88[c], Grayhill[d] No.22-5, or equivalent
Socket for operation up to about 550 Mc (Including heater-terminals connector)	Jettron[e] No.CD7010, or equivalent
Cavities (Including heater-terminals connector)	Amerac No.1718 (for 4150 Mc), J-V-M[f] No.D-7980 Series, Resdel[g] No.10 Series, or equivalent

← Indicates a change.

Terminal Connections (See *Dimensional Outline*):

H – Heater
K – Cathode



G – Grid
P – Plate

→ **RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[h]**
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS[j] Ratings, *Absolute-Maximum Values:*

At frequencies up to 5000 Mc and altitudes:

	Up to 80,000 feet	*Between 80,000 and 100,000 feet*	
DC PLATE VOLTAGE	250 max.	200 max.	volts
DC GRID VOLTAGE	-50 max.	-50 max.	volts
DC CATHODE CURRENT	25 max.	25 max.	ma
DC GRID CURRENT	6 max.	6 max.	ma
PLATE DISSIPATION	2.5 max.	2.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	50 max.	50 max.	volts
Heater positive with respect to cathode	50 max.	50 max.	volts
PLATE-SEAL TEMPERATURE	225 max.	225 max.	°C

Typical CCS[j] Operation in Cathode-Drive Circuit:

As oscillator

	At 500 Mc	*At 1000 Mc*	*At 2000 Mc*	*At 3000 Mc*	*At 4150 Mc*	*At 5000 Mc*	
DC Plate-to-Grid Voltage	205	203	151	125	200	200	volts
DC Cathode-to-Grid Voltage	5	3	1	0.1	0.26	–	volts
From a grid resistor of	1000	600	250	500	130	100	ohms
DC Cathode Current	21	24	24	20	23	25	ma
DC Grid Current	5	5	4	0.2	2	–	ma
Useful Power Output (Approx.)	1.6	1.3	0.5	0.15	0.1	0.03	watts

→ Indicates a change.

As amplifier

	At 500 Mc	At 1000 Mc	
DC Plate-to-Grid Voltage.	204	185	volts
DC Cathode-to-Grid Voltage.	4	10	volts
From a grid resistor of	800	2000	ohms
DC Cathode Current.	21	24	ma
DC Grid Current	5	5	ma
Driver Power Output (Approx.)	0.2	0.2	watt
Useful Power Output (Approx.)	2.2	1.4	watts

Maximum Circuit Values:

Grid-Circuit Resistance	0.25 max.	megohm

FREQUENCY DOUBLER — Class C ←

Maximum CCS[j] Ratings, *Absolute-Maximum Values:*

At frequencies up to 2000 Mc and altitudes:

	Up to 80,000 feet	Between 80,000 and 100,000 feet	
DC PLATE VOLTAGE.	250 max.	200 max.	volts
DC GRID VOLTAGE	-50 max.	-50 max.	volts
DC CATHODE CURRENT.	22 max.	22 max.	ma
DC GRID CURRENT	6 max.	6 max.	ma
PLATE DISSIPATION	2.5 max.	2.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode. . . .	50 max.	50 max.	volts
Heater positive with respect to cathode. . . .	50 max.	50 max.	volts
PLATE-SEAL TEMPERATURE. . . .	225 max.	225 max.	°C

Typical CCS[j] Operation in Cathode-Drive Circuit:

	Up to 550 Mc		Up to 1000 Mc		
DC Plate-to-Grid Voltage. . .	193	207	218	181	volts
DC Cathode-to-Grid Voltage. .	18	7	18	6	volts
From a grid resistor of . .	3600	2300	3600	2000	ohms
DC Cathode Current.	20	18	21	19	ma
DC Grid Current	5	3	5	3	ma
Driver Power Output (Approx.)	0.8	0.2	0.8	0.2	watt
Useful Power Output (Approx.)	1.3	0.75	0.9	0.4	watts

Maximum Circuit Values:

Grid-Circuit Resistance	0.25 max.	megohm

← Indicates a change.

FREQUENCY TRIPLER — Class C

Maximum CCS[j] Ratings, *Absolute-Maximum Values:*

At frequencies up to 2000 Mc and altitudes:

	Up to 80,000 feet	*Between 80,000 and 100,000 feet*	
DC PLATE VOLTAGE	250 max.	200 max.	volts
DC GRID VOLTAGE	−50 max.	−50 max.	volts
DC CATHODE CURRENT	20 max.	20 max.	ma
DC GRID CURRENT	6 max.	6 max.	ma
PLATE DISSIPATION	2.5 max.	2.5 max.	watts
PEAK HEATER–CATHODE VOLTAGE:			
Heater negative with respect to cathode	50 max.	50 max.	volts
Heater positive with respect to cathode	50 max.	50 max.	volts
PLATE-SEAL TEMPERATURE	225 max.	225 max.	°C

Typical CCS[j] Operation in Cathode-Drive Circuit:

Up to 645 Mc

DC Plate-to-Grid Voltage	202	240	volts
DC Cathode-to-Grid Voltage	27	15	volts
From a grid resistor of	9000	25000	ohms
DC Cathode Current	19	13	ma
DC Grid Current	3	0.6	ma
Driver Power Output (Approx.)	0.6	0.2	watt
Useful Power Output (Approx.)	0.7	0.4	watt

Up to 1000 Mc

DC Plate-to-Grid Voltage	205	185	volts
DC Cathode-to-Grid Voltage	30	10	volts
From a grid resistor of	10000	14000	ohms
DC Cathode Current	19	12	ma
DC Grid Current	3	0.7	ma
Driver Power Output (Approx.)	0.6	0.2	watt
Useful Power Output (Approx.)	0.4	0.15	watt

Maximum Circuit Values:

Grid-Circuit Resistance	0.25 max.	megohm

[a] Without external shield.

[b] Amerac, Inc., Dunham Road, Beverly, Massachusetts.

[c] For use with cavities.

[d] Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.

[e] Jettron Products, Inc., 56 Route 10, Hanover, N.J.

[f] J-V-M Microwave Co., 9300 W. 47th St., Brookfield, Illinois. Indicated No. applies to a series of cavities covering range from 220 to 3500 Mc.

[g] Resdel Engineering Corp., 330 South Fair Oaks Avenue, Pasadena, California. This series of cavities covers the range from 215 to 2325 Mc.

[h] Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio frequency envelope does not exceed 115 per cent of the carrier conditions.

[j] Continuous Commercial Service.

→ Indicates a change.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN ←

	Note	Min.	Max.	
Heater Current	1	0.205	0.245	amp
Direct Interelectrode Capacitances:				
Grid to plate	-	1.5	2.7	μμf
Grid to cathode	-	3.6	5.0	μμf
Plate to cathode	-	-	0.04	μμf
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,2	-	30	μa
Heater positive with respect to cathode	1,3	-	30	μa
Leakage Resistance:				
From grid to plate and cathode connected together	1,4	100	-	megohms
From plate to grid and cathode connected together	1,5	100	-	megohms
Reverse Grid Current	1,6	-	0.3	μa
Emission Voltage	7	-	4	volts
Amplification Factor	1,8	55	85	
Transconductance	1,8	12500	19500	μmhos
Plate Current (1)	1,8	9	19	ma
Plate Current (2)	1,9	-	50	μa
Power Output	1,10	1.7	-	watts
Change in Power Output	1,11	-	0.2	watt

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With 60 volts dc between heater and cathode, heater negative with respect to cathode.

Note 3: With 60 volts dc between heater and cathode, heater positive with respect to cathode.

Note 4: With grid 100 volts negative with respect to plate and cathode which are connected together.

Note 5: With plate 300 volts negative with respect to grid and cathode which are connected together.

Note 6: With dc plate voltage of 200 volts, dc grid voltage of -2 volts, grid resistor of 0.5 megohm.

Note 7: With dc voltage on grid and plate which are connected together adjusted to produce a cathode current of 30 ma., and with 5.5 volts on heater.

Note 8: With dc plate supply voltage of 125 volts, cathode resistor of 50 ohms, and cathode bypass capacitor of 1000 μf.

Note 9: With dc plate voltage of 125 volts and dc grid voltage of -5 volts.

Note 10: In a single-tube, cathode-drive amplifier circuit operating at a frequency of approx. 550 ± 10 Mc, and with dc plate to cathode voltage of 250 volts, input-signal power of 0.2 watt, and dc grid voltage adjusted to produce a dc plate current of 20 ma.

Note 11: Reduce heater voltage to 5.7 volts. Change in Power-Output value from that obtained with 6.3 volts on heater will not exceed indicated value.

← Indicates a change.

SPECIAL TESTS & PERFORMANCE DATA

Low-Pressure Voltage-Breakdown Test:

This test (similar to MIL-E-ID, paragraph 4.9.12.1) is performed on a sample lot of tubes every 90 days. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 100,000 feet. Breakdown will not occur when a 60-cycle rms voltage of 300 volts is applied between the plate cylinder and grid flange.

Low-Frequency Vibration Performance:

This test (similar to MIL-E-ID, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions: Heater voltage of 6.3 volts, dc plate supply voltage of 125 volts, cathode resistor of 50 ohms, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 40 cycles per second at an acceleration of 10 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following test limit:

Heater Current.	300 max.	ma

For conditions shown under *Characteristics Range Values, Note 1.*

Variable-Frequency Vibration Performance:

This test (similar to MIL-E-ID, paragraph 4.9.20.3) is performed on a sample lot of tubes from each production run. Tube operating conditions are the same as for *Low-Frequency Vibration Performance.* The tubes are vibrated perpendicular to the major axis through a frequency range from 5 to 500 cps and back. From 5 to 50 cps, the tubes are vibrated at a constant displacement of 0.0400 ± 0.0025 inch. From 50 to 500 cps, the tubes are vibrated at a constant acceleration of 10 ± 2 g. Total time to complete a sweep cycle is 10 ± 5 minutes. During the test, the tubes will not show an rms output voltage across the plate load resistor in excess of 150 millivolts.

Each tube is vibrated for 60 seconds at the frequency which gives maximum vibrational noise output. If, at the end of 60 seconds, the vibrational noise output is still increasing, the test is continued until there is no further increase.

The rms output voltage across the plate load resistor as a result of the vibration of the tube will not exceed the specified limit at any time during the test.

At the end of the test, the tubes will not show permanent shorts or open circuits and will meet the following test limit:

Heater Current.	300 max.	ma

For conditions shown under *Characteristics Range Values, Note 1.*

→ Indicates a change.

Shock Test:

This test (similar to MIL-E-1D, paragraph 4.9.20.5) is performed on a sample lot of tubes from each production run. Tubes are held rigid and are subjected in three different positions to an impact acceleration of 500 g, 5 blows in each position.

At the end of this test, tubes will not show permanent shorts or open circuits and will meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Heater-Cathode Leakage Current. . . .	60 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,3.*		
Low-Frequency Vibration Output. . . .	200 max.	mv
For conditions shown above under *Low-Frequency Vibration Performance.*		
Change in Transconductance.	-20 max.	%
From initial value for conditions shown under *Characteristics Range Values, Notes 1,8.*		

Fatigue Vibration Test:

This test (similar to MIL-E-1D, paragraph 4.9.20.6) is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected to 2.5 g vibrational acceleration in two positions (X1, Y1) for 32 hours each. At the end of this test, tubes are required to meet the limits specified for the *Shock Test.*

Shorts and Continuity Test:

This test (similar to MIL-E-1D, paragraph 4.7.3) is performed on all tubes from each production run. Voltage applied between adjacent elements of the tube under test will be between 20 and 70 volts dc or peak ac. Plate and cathode terminals are tied together and connected to the grid terminal through the shorts test equipment. Tubes are tapped with a rubber tapper three times in each of three mutually perpendicular directions. If a short indication is obtained, the tapping cycle is repeated two times for verification. Acceptance criteria is based on the "Resistance vs. Time Duration" curve shown in paragraph 4.7.7 of MIL-E-1D, Amendment 5.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following limit:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

Ceramic-Seal-Fracture Test:

This test is performed on a sample lot of tubes every 90 days. With cathode- and plate-cylinder-supports spaced 15/16" ± 1/64", and with the grid flange centered between these supports, the tubes will withstand the gradual application of a force of 30 pounds, perpendicular to the axis of the tubes,

upon the grid flange, without causing fracture of the ceramic insulation.

Seal Strain Test:

This test (similar to MIL-E-ID, paragraph 4.9.6.3) is performed on a sample lot of tubes every 90 days. Tubes are tested by first immersing in water having a temperature of at least 97° C for at least 15 seconds and then immersing immediately in water at not more than 5° C for 5 seconds. After drying for 48 hours at room temperature, the tubes will meet the following test limit:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

Heater-Cycling Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.7) is performed on a sample lot of tubes from each production run. With 6.3 volts on heater and no voltage on plate or grid, the heater is cycled three minutes on and three minutes off for at least 2000 cycles.

At the end of this test, tubes will not show permanent shorts or open circuits and are required to meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Heater-to-Cathode Leakage Current . .	60 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,3.*		
Grid-to-Cathode Leakage Resistance. .	50 min.	megohms
For conditions shown under *Characteristics Range Values, Notes 1,4.*		

1-Hour Stability Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.1a) is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are operated under the following conditions:

Heater voltage of 6.3 volts, plate supply voltage of 215 volts, and cathode resistor of 150 ohms.

At the end of 1 hour, the change in transconductance value for each tube, referred to its initial transconductance reading, will not exceed 15% of the initial value, for conditions shown under *Characteristics Range Values, Notes 1,8.*

In addition, the tubes will not show permanent shorts or open circuits and will meet the following limit:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

100-Hour Survival Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.1b) is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified for *1-Hour Stability Life Performance* except that all voltages are cycled at the rate of 110 minutes on and 10 minutes off.

At the end of 100 hours, the tubes will not show permanent shorts or open circuits and will meet the following limits:

Heater Current	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Transconductance	9000 min.	μmhos
For conditions shown under *Characteristics Range Values, Notes 1,8.*		
Plate Current (2)	50 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,9.*		

500- and 1000-Hour Dynamic Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure high-quality rf performance. Each tube is life-tested as a class C amplifier in special cavity at 550 ± 10 Mc under the following conditions: Heater voltage of 6.3 volts; plate supply voltage of 250 volts; cathode resistor adjusted to give plate current of 25 ma.; and grid-circuit resistance adjusted to give grid current of 6 ma., heater positive with respect to cathode by 67.5 volts, and plate-seal temperature of 225° C. Heater voltage is cycled at a rate of 110 minutes on and 10 minutes off.

At the end of 500 hours, the tubes will not show permanent shorts or open circuits, and will be criticized for total number of tubes failing to pass the following limits:

Heater Current	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Leakage Resistance:		
From grid to plate and cathode connected together	60 min.	megohms
From plate to grid and cathode connected together	60 min.	megohms
For conditions shown under *Characteristics Range Values, Notes 1,4, and 1,5.*		
Power Output	1.5 min.	watts
For conditions shown under *Characteristics Range Values, Notes 1,10.*		

At the end of 1000 hours, the tubes will not show permanent shorts or open circuits and will be criticized for total number of tubes failing to pass the following limits:

Heater Current	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

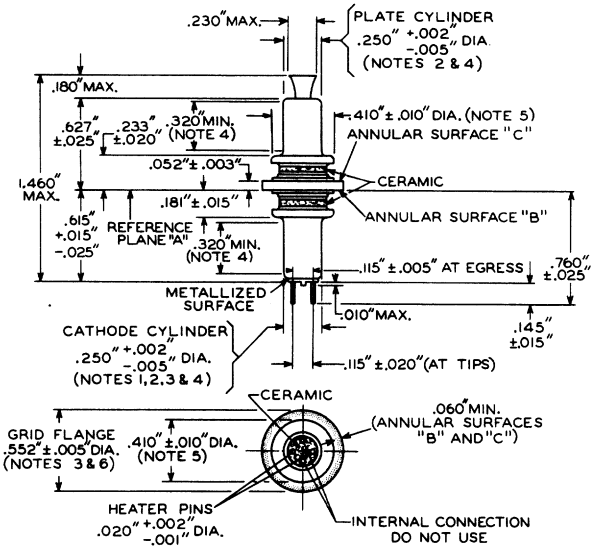
Power Output.	1.3 min.	watts

For conditions shown under *Characteristics Range Values, Notes 1, 10.*

OPERATING CONSIDERATIONS

Connections to the cathode cylinder, grid flange, and plate cylinder should be made by flexible spring contacts. The connectors should make firm, large-surface contact, yet must be sufficiently flexible to insure that no part of the tube is subjected to excessive strain.

The *cathode* should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum-rated values shown in the tabulated data.



92CM-10274RI

REFERENCE PLANE "A" IS DEFINED AS THAT PLANE AGAINST WHICH ANNULAR SURFACE "B" OF THE GRID FLANGE ABUTS.

ANNULAR SURFACE "B" IS ON THE SIDE OF THE GRID FLANGE TOWARD THE CATHODE CYLINDER.

ANNULAR SURFACE "C" IS ON THE SIDE OF THE GRID FLANGE TOWARD THE PLATE CYLINDER.

NOTE 1: WITH ANNULAR SURFACE "B" RESTING ON REFERENCE PLANE "A". THE AXIS OF THE CATHODE CYLINDER WILL BE WITHIN 2° OF A LINE PERPENDICULAR TO REFERENCE PLANE "A".

NOTE 2: THE AXES OF THE PLATE CYLINDER AND CATHODE CYLINDER WILL COINCIDE WITHIN 0.010".

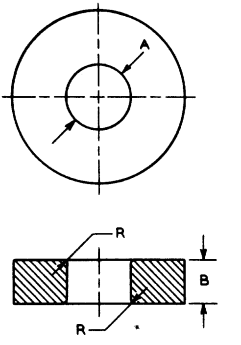
NOTE 3: THE AXES OF THE CATHODE CYLINDER AND GRID FLANGE WILL COINCIDE WITHIN 0.005".

NOTE 4: THE DIAMETER ALONG THE 0.320" MINIMUM LENGTH IS MEASURED WITH "GO" AND "NO-GO" RING GAUGES G_1-1 AND G_1-2, RESPECTIVELY.

NOTE 5: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G_2-1 AND G_2-2, RESPECTIVELY.

NOTE 6: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G_3-1 AND G_3-2, RESPECTIVELY.

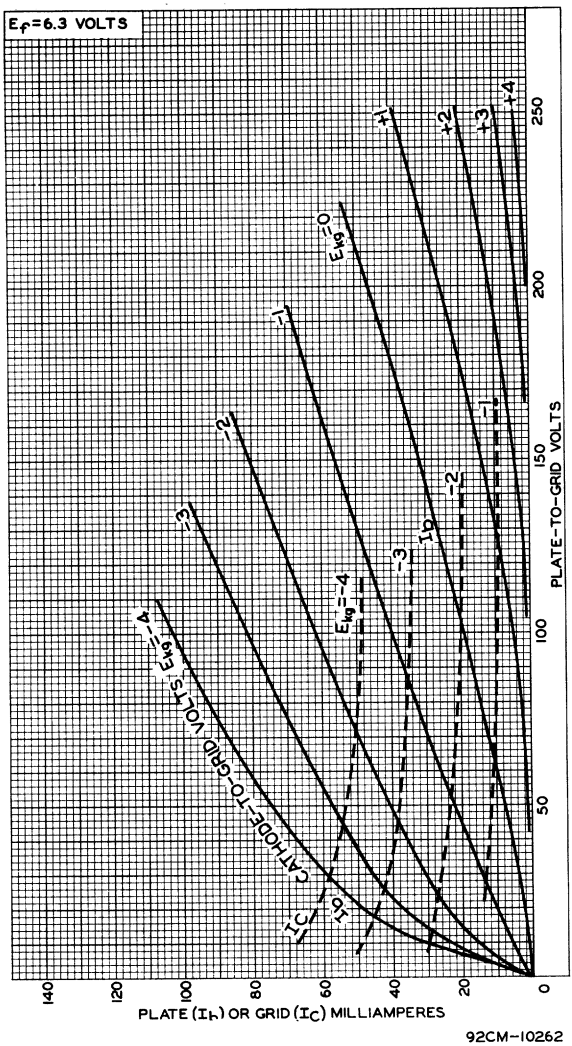
GAUGES



92CS-10370

Gauge	Type	Dimension		
		Diameter A	Thickness B	Radius R
G_1-1	GO	0.25200" $^{+0.00000"}_{-0.00007"}$	0.320" $^{+0.001"}_{-0.000"}$	0.003" MAX.
G_1-2	NO-GO	0.24500" $^{+0.00007"}_{-0.00000"}$	–	–
G_2-1	GO	0.42000" $^{+0.00000"}_{-0.00007"}$	–	–
G_2-2	NO-GO	0.40000" $^{+0.00007"}_{-0.00000"}$	–	–
G_3-1	GO	0.55700" $^{+0.00000"}_{-0.00007"}$	–	–
G_3-2	NO-GO	0.54700" $^{+0.00007"}_{-0.00000"}$	–	–

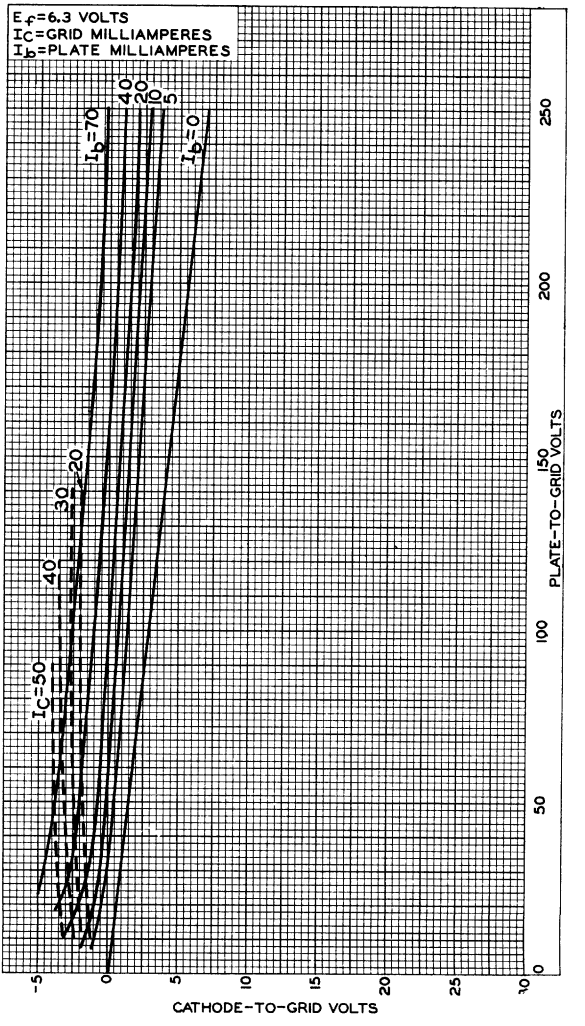
AVERAGE CHARACTERISTICS
Cathode-Drive Service



92CM-10262

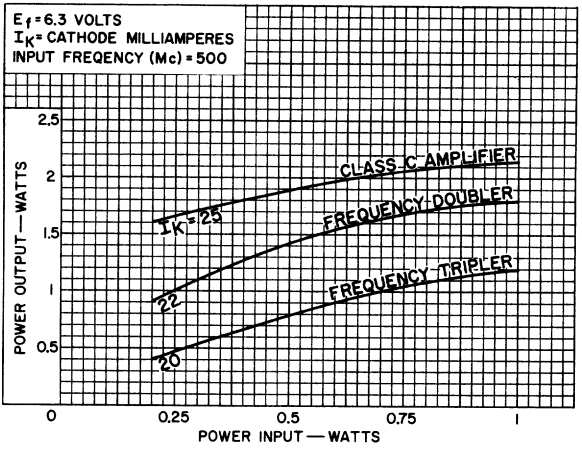
7554

AVERAGE CONSTANT-CURRENT CHARACTERISTICS
Cathode-Drive Service

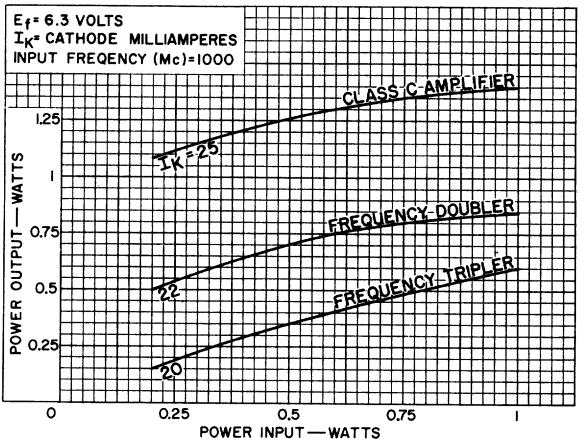


92CM-10263RI

TYPICAL POWER-OUTPUT CHARACTERISTICS
Cathode-Drive Service

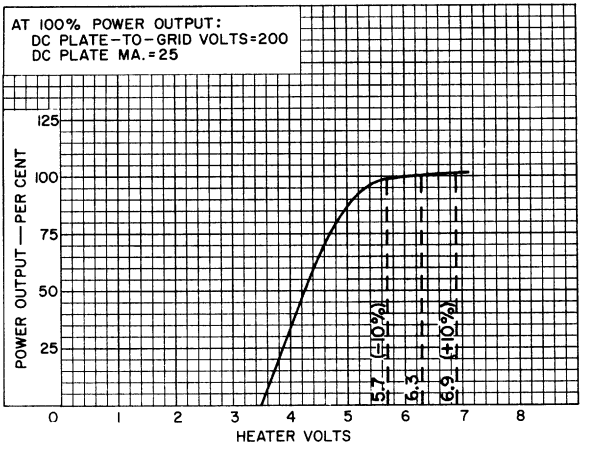


92CS-11625RI



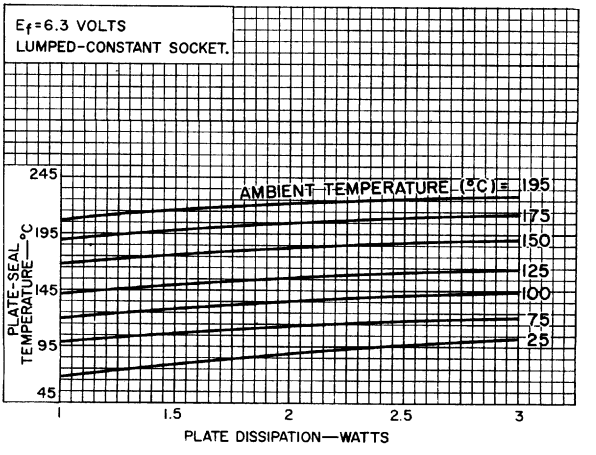
92CS-11626RI

TYPICAL POWER-OUTPUT CHARACTERISTICS
With Variation in Heater Voltage
Cathode-Drive Service



92CS-11624RI

PLATE-SEAL-TEMPERATURE CHARACTERISTICS



92CS-11488

7558

Beam Power Tube

For Use in Communications Equipment at Frequencies Up to 175 Mc.

9-PIN MINIATURE TYPE

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 5%	volts
Current	0.800	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances:[o]		
Grid No.1 to plate	0.15	pf
Grid No.1 to cathode, grid No.3, grid No.2, and heater	10.0	pf
Plate to cathode, grid No.3, grid No.2, and heater	5.5	pf

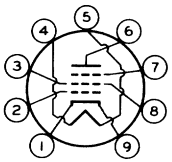
Characteristics, Class A_1 Amplifier:

Plate Voltage	250	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Voltage	250	volts
Grid-No.1 Voltage	-18	volts
Mu-Factor, Grid No.2 to Grid No.1	8.7	
Transconductance	5300	μmhos
Plate Current	40	ma
Grid-No.2 Current	3	ma

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ±3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9LK

Pin 1 - Cathode
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Plate
Pin 7 - Grid No.3
Pin 8 - Grid No.2
Pin 9 - Cathode

Bulb Temperature (At hottest point on bulb surface)	225 max.	°C

→ AF POWER AMPLIFIER & MODULATOR — Class AB_1 ♦

Maximum CCS● Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	375 max.	volts
GRID No.3 (SUPPRESSOR GRID)	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	volts
MAX.-SIGNAL DC PLATE CURRENT■	70 max.	ma
MAX.-SIGNAL PLATE INPUT■	21 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT■	2 max.	watts
PLATE DISSIPATION■	10 max.	watts

Typical CCS Push-Pull Operation:

Values are for 2 tubes

DC Plate Voltage	300	volts
Grid No.3	*Connected to cathode at socket*	
DC Grid-No.2 Voltage§	250	volts
DC Grid-No.1 Voltage§	−21	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	40	volts
Zero-Signal DC Plate Current	40	ma
Max.-Signal DC Plate Current	125	ma
Zero-Signal DC Grid-No.2 Current	2	ma
Max.-Signal DC Grid-No.2 Current	14	ma
Effective Load Resistance (Plate to plate)	5000	ohms
Max.-Signal Driving Power	0	watts
Total Harmonic Distortion	5	%
Max.-Signal Power Output (Approx.)	20.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	megohm

→ RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy† and RF POWER AMPLIFIER — Class C FM Telephony

Maximum Ratings, *Absolute-Maximum Values:*

	Up to 175 Mc		
	CCS●	*ICAS*●●	
DC PLATE VOLTAGE	375 max.	375 max.	volts
GRID No.3 (SUPPRESSOR GRID)	0 max.	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	−125 max.	−125 max.	volts
DC PLATE CURRENT	70 max.	80 max.	ma
DC GRID-No.2 CURRENT	15 max.	15 max.	ma
DC GRID-No.1 CURRENT	5 max.	5 max.	ma
PLATE INPUT	21 max.	24 max.	watts
GRID-No.2 INPUT	2 max.	2 max.	watts
PLATE DISSIPATION	10 max.	12 max.	watts

→ Indicates a change.

Typical Operation:

As amplifier at 175 Mc

	CCS	ICAS		
DC Plate Voltage	250	300	300	volts
Grid No.3	*Connected to cathode at socket*			
DC Grid-No.2 Voltage[□□]	200	200	250	volts
DC Grid-No.1 Voltage[⊕⊕]	-40	-42	-55	volts
Peak RF Grid-No.1 Voltage	47	52	62	volts
DC Plate Current	60	70	80	ma
DC Grid-No.2 Current	3.7	3.7	5.1	ma
DC Grid-No.1 Current (Approx.)	1.5	2.1	1.6	ma
Driver Power Output (Approx.)[▲▲]	1	1	1.5	watts
Useful Power Output (Approx.)[*]	6.5	8.5	10	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	0.1 max.	megohm

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony ←

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum Ratings, *Absolute-Maximum Values:*

	Up to 175 Mc		
	CCS	ICAS	
DC PLATE VOLTAGE	300 max.	300 max.	volts
GRID No.3 (SUPPRESSOR GRID)	0 max.	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-125 max.	-125 max.	volts
DC PLATE CURRENT	60 max.	70 max.	ma
DC GRID-No.2 CURRENT	10 max.	10 max.	ma
DC GRID-No.1 CURRENT	5 max.	5 max.	ma
PLATE INPUT	15 max.	17.5 max.	watts
GRID-No.2 INPUT	1.4 max.	1.4 max.	watts
PLATE DISSIPATION	7 max.	8 max.	watts

Typical Operation:

	At 175 Mc		
DC Plate Voltage	250	250	volts
Grid No.3	*Connected to cathode at socket*		
DC Grid-No.2 Voltage[▲]	250	250	volts
DC Grid-No.1 Voltage[★]	-70	-75	volts
From a grid-No.2 resistor of	33000	33000	ohms
RF Grid-No.1 Voltage	75	80	volts
DC Plate Current	60	70	ma
DC Grid-No.2 Current	2.5	3	ma
DC Grid-No.1 Current (Approx.)	2.1	2.3	ma
Driving Power (Approx.)[▲▲]	1	1	watt
Useful Power Output[*]	6.5	7.5	watts

← Indicates a change.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	0.1 max.	megohm

FREQUENCY MULTIPLIER

Maximum Ratings, *Absolute-Maximum Values:*

	CCS	*ICAS*	
DC PLATE VOLTAGE	375 max.	375 max.	volts
GRID No.3 (SUPPRESSOR GRID)	0 max.	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-125 max.	-125 max.	volts
DC PLATE CURRENT	50 max.	60 max.	ma
DC GRID-No.2 CURRENT	15 max.	15 max.	ma
DC GRID-No.1 CURRENT	5 max.	5 max.	ma
PLATE INPUT	13 max.	15 max.	watts
GRID-No.2 INPUT	2 max.	2 max.	watts
PLATE DISSIPATION	10 max.	12 max.	watts

Typical Operation:

	As doubler to 175 Mc		
DC Plate Voltage	250	250	volts
Grid No.3	*Connected to cathode at socket*		
DC Grid-No.2 Voltage	200	250	volts
DC Grid-No.1 Voltage[@@]	-53	-66	volts
From a grid-No.1 resistor of	53000	44000	ohms

→ Indicates a change.

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BEAM POWER TUBE

Peak RF Grid-No.1 Voltage	60	74	volts
DC Plate Current	50	60	ma
DC Grid-No.2 Current	2.6	3.5	ma
DC Grid-No.1 Current (Approx.)	1	1.5	ma
Driving Power (Approx.)▲▲	0.4	0.6	watt
Useful Power Output*	3	4.5	watts
As tripler at 175 Mc			
DC Plate Voltage	200	250	volts
Grid No.3	*Connected to cathode at socket*		
DC Grid-No.2 Voltage	200	250	volts
DC Grid-No.1 Voltage⊕⊕	-90	-120	volts
From a grid-No.1 resistor of	50000	70000	ohms
Peak RF Grid-No.1 Voltage	105	130	volts
DC Plate Current	50	60	ma
DC Grid-No.2 Current	3	3.9	ma
DC Grid-No.1 Current (Approx.)	1.85	1.7	ma
Driving Power (Approx.)▲▲	0.4	0.6	watt
Useful Power Output*	1.4	2.3	watts
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance	0.1 max.	0.1 max.	megohm

o Without external shield.

♦ Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.

● Continuous Commercial Service.

■ Averaged over any audio-frequency cycle of sine-wave form.

§ Obtained preferably from a fixed supply.

† Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of of the audio-frequency envelope does not exceed 115% of the carrier conditions.

●● Intermittent Commercial and Amateur Service.

□□ Obtained preferably from a separate source or from the plate-voltage supply with a voltage divider. If a series resistor is used, it should be adjustable to obtain the desired operating plate current after initial tuning adjustments are completed.

⊕⊕ Obtained from a grid-No.1 resistor, or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

▲▲ Driver stage is required to supply tube losses and rf-circuit losses. The driver stage should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, components, initial tube characteristics, and tube characteristics during life.

* Measured at load.

▲ Obtained preferably from a separate source modulated along with the plate supply, or from the modulated plate supply through a series resistor. It is recommended that this resistor be adjustable to obtain the desired operating plate current after initial tuning adjustments are made.

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BEAM POWER TUBE

★ Obtained from a grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor. The combination of grid-No.1 resistor and fixed supply has the advantage of not only protecting the tube from damage through loss of excitation but also of minimizing distortion by bias-supply compensation.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.745	0.855	amp
Transconductance	1,2	4200	6400	μmhos
Plate Current	1,2	30	50	ma
Plate Current	1,3	–	50	μa
Grid-No.2 Current	1,2	–	7.5	ma
Reverse Grid-No.1 Current	1,4	–	2	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,5	–	20	μa
Heater positive with respect to cathode	1,5	–	20	μa
Leakage Resistance:				
Between grid-No.1 and all other electrodes tied together	1,6	100	–	megohms
Between plate and all other electrodes tied together	1,7	100	–	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With plate voltage of 250 volts, grid No.3 connected to cathode, grid-No.2 voltage of 250 volts, and grid-No.1 voltage of -18 volts.

Note 3: With plate voltage of 250 volts, grid No.3 connected to cathode, grid-No.2 voltage of 250 volts, and grid-No.1 voltage of -48 volts.

Note 4: With plate voltage of 180 volts, grid No.3 connected to cathode, grid-No.2 voltage of 250 volts, grid-No.1 resistor of 0.1 megohm, and cathode resistor of 170 ohms.

Note 5: With 100 volts dc between heater and cathode.

Note 6: With grid No.1 100 volts negative with respect to all other electrodes tied together.

Note 7: With plate 300 volts negative with respect to all other electrodes tied together.

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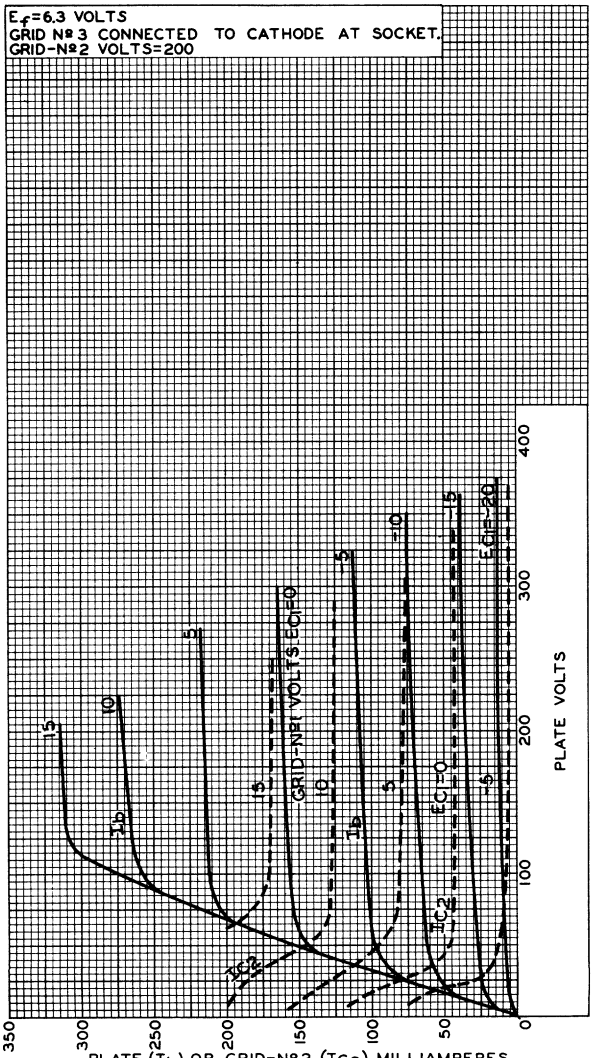
AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION 92CM-10305RI
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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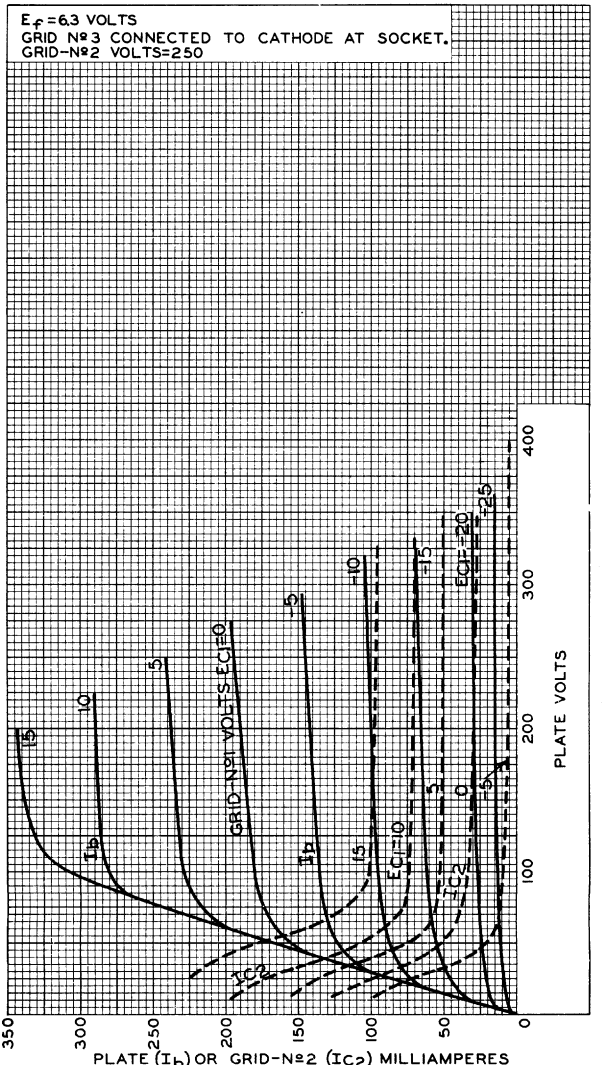
AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION 92CM-10304R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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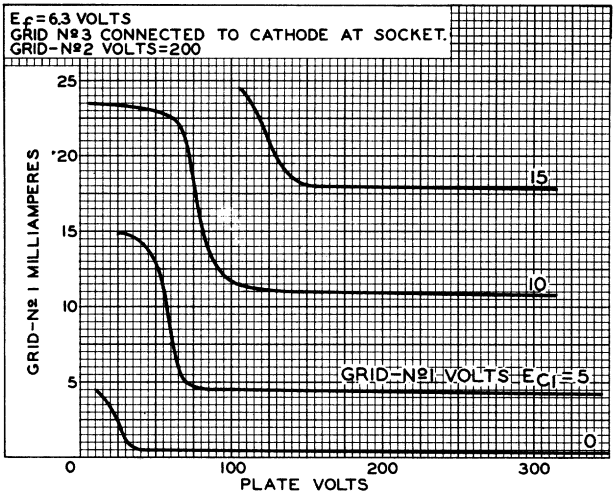
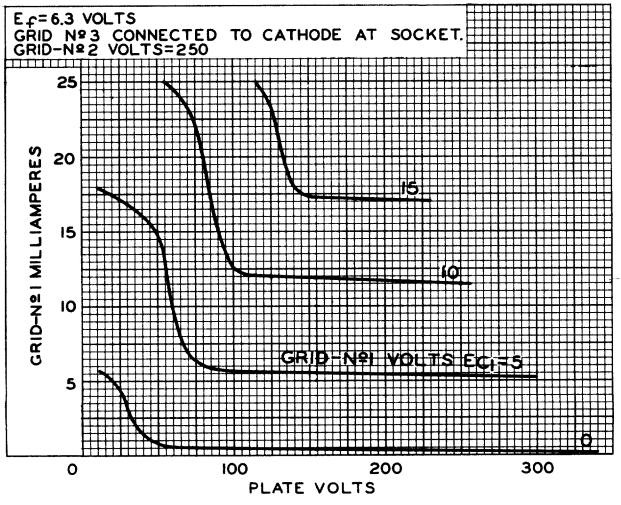
AVERAGE CHARACTERISTICS



92CS-10306RI



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CS-10307RI

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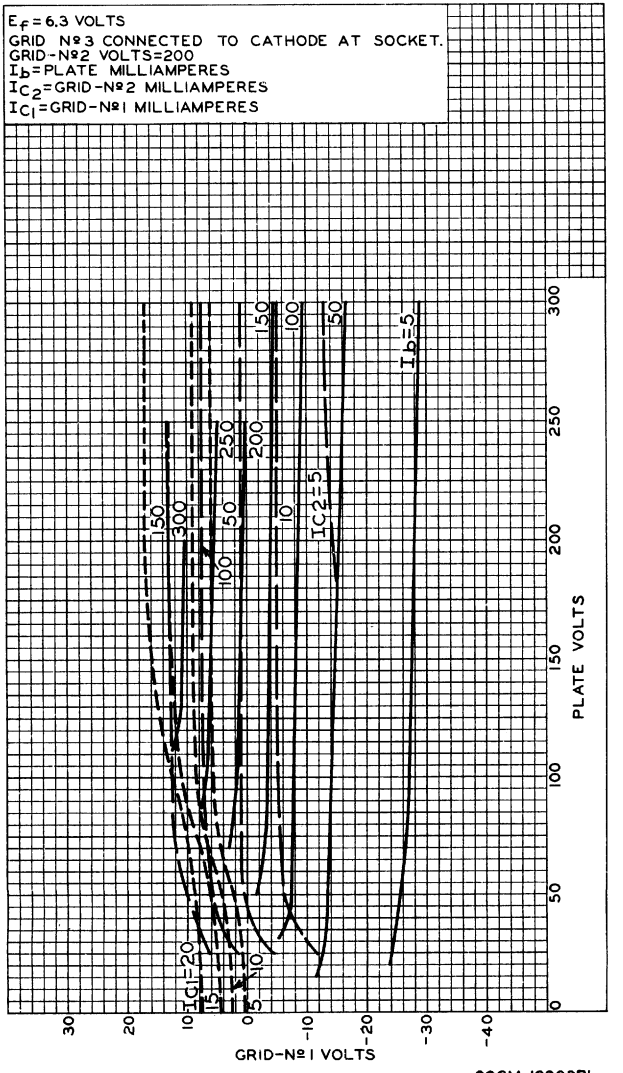
AVERAGE CONSTANT—CURRENT CHARACTERISTICS



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10303RI

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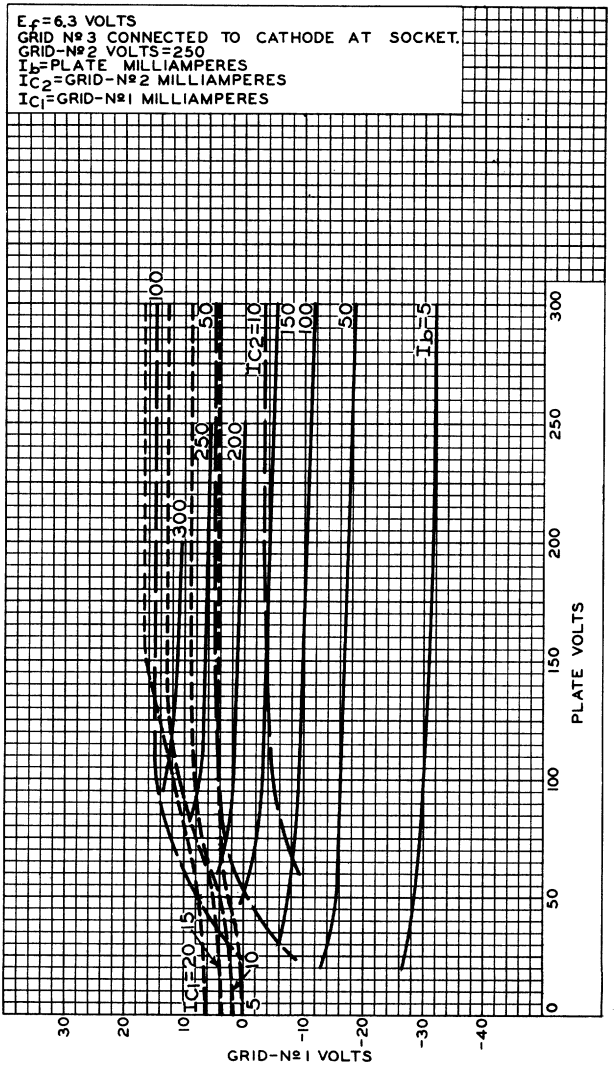
AVERAGE CONSTANT-CURRENT CHARACTERISTICS



ELECTRON TUBE DIVISION

92CM-10308RI

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7580

BEAM POWER TUBE

FORCED-AIR COOLED

CERAMIC-METAL SEALS — 400 WATTS PEP* OUTPUT AT 30 Mc
COAXIAL-ELECTRODE STRUCTURE — 360 WATTS PEP OUTPUT AT 500 Mc
COMPACT DESIGN — INTEGRAL RADIATOR

Useful at frequencies up to 500 Mc

GENERAL DATA

Electrical:

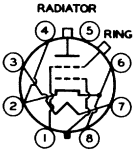
Heater, for Unipotential Cathode:		
Voltage (AC or DC)§	6 ± 10%	volts
Current at 6 volts	2.6	amp
Minimum heating time	30	sec
Mu-Factor, Grid No.2 to Grid No.1, for grid-No.2 volts = 300 and grid-No.2 ma. = 50	4	
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to plate	0.03	μμf
Grid No.1 to cathode, grid No.2, and heater	17	μμf
Plate to cathode, grid No.2, and heater	4.5	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2.464"
Maximum Seated Length	1.910"
Maximum Diameter	1.640"
Weight (Approx.)	4 oz
Radiator	Integral part of tube
Socket	Air-System Socket, such as Johnson No.124-110-1●● (Supplied with Air Chimney)
Base	Special 8-Pin

BOTTOM VIEW

Pin 1 - Grid No.2★
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Cathode
Pin 5 - Internal Connection—Do Not Use
Pin 6 - Cathode



Pin 7 - Heater
Pin 8 - Cathode
Base Index Plug-Grid No.1
Radiator-Plate Ring Terminal■-Grid No.2

Air Flow:

Through indicated air-system socket—This fitting directs the air over the base seals; past the grid-No.2 seal, envelope, and plate seal; and through the radiator to provide effective cooling with minimum air flow. When the tube is operated at maximum plate dissipation for each class of service, a minimum air flow of 3.8 cfm through the system is required. The corresponding pressure drop is approximately 0.3 inch of water. These requirements are for operation at sea level and at an

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BEAM POWER TUBE

ambient temperature of 20° C. At higher altitudes and ambient temperatures, the air flow must be increased to maintain the respective seal temperatures and the plate temperature within maximum ratings.

Without air-system socket—if an air-system socket is not used, it is essential that adequate cooling air be directed over the base seals, past the envelope, and through the radiator. Under these conditions and with the tube operating at maximum plate dissipation for each class of service, a minimum air flow of 3.6 cfm must pass through the radiator. The corresponding pressure drop is approximately 0.1 inch of water. These requirements are for operation at sea level and at an ambient temperature of 20° C. At higher altitudes and ambient temperatures, the air flow must be increased to maintain the respective seal temperatures and the plate temperature within maximum ratings.

Plate Temperature (Measured on base end of plate surface at junction with fins)	250 max.	°C
Temperature of Plate Seal, Grid-No.2 Seal, and Base Seals	250 max.	°C

LINEAR RF POWER AMPLIFIER
Single-Sideband Suppressed-Carrier Service

Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2

Maximum CCS● Ratings, *Absolute-Maximum Values:*

For altitudes up to 20,000 feet and frequencies up to 500 Mc

DC PLATE VOLTAGE	2000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	500 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-250 max.	volts
DC PLATE CURRENT AT PEAK OF ENVELOPE	350 max.†	ma
PLATE DISSIPATION	250 max.	watts
GRID-No.2 DISSIPATION	12 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

Typical CCS Operation with "Two-Tone Modulation":▲

	At 30 Mc	*At 500 Mc*	
DC Plate Voltage	2000	2000	volts
DC Grid-No.2 Voltage‡	400	400	volts
DC Grid-No.1 Voltage:			
With fixed-bias source	-77	-77	volts
Zero-Signal DC Plate Current	70	70	ma
Effective RF Load Resistance	3050	3050	ohms

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BEAM POWER TUBE

	At 30 Mc	*At 500 Mc*	
DC Plate Current:			
Peak envelope	350	350	ma
Average	225	225	ma
DC Grid-No.2 Current:			
Peak envelope	35	25	ma
Average	16	10	ma
Average DC Grid-No.1 Current	0.05⊕	0.05⊕	ma
Peak-Envelope Driver Power Output (Approx.)○○	1	12	watts
Output-Circuit Efficiency (Approx.)	95	85	%
Distortion Products Level:●			
Third order	21	-	db
Fifth order	29	-	db
Useful Power Output (Approx.):			
Peak envelope	400✚	360✚	watts
Average	200✚	180✚	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition:		
With fixed bias	25000 max.	ohms
With cathode bias	Not recommended	

LINEAR RF POWER AMPLIFIER — AM Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS● Ratings, *Absolute-Maximum Values:*

For altitudes up to 20,000 feet and frequencies up to 500 Mc

DC PLATE VOLTAGE	2000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	500 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-250 max.	volts
DC PLATE CURRENT	180 max.	ma
PLATE DISSIPATION	250 max.	watts
GRID-No.2 DISSIPATION	12 max.	watts
GRID-No.1 DISSIPATION	2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

Typical CCS Operation:

	At 30 Mc	*At 500 Mc*	
DC Plate Voltage	2000	2000	volts
DC Grid-No.2 Voltage‡	400	400	volts
DC Grid-No.1 Voltage:			
With fixed-bias source	-77	-77	volts
DC Plate Current	175	175	ma
DC Grid-No.2 Current	6	4	ma

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BEAM POWER TUBE

	At 30 Mc	At 500 Mc	
Effective RF Load Resistance. .	3050	3050	ohms
Driver Power Output (Approx.)oo	0.25	3	watts
Output-Circuit Efficiency (Approx.)	95	85	%
Useful Power Output (Approx.) .	100♣	90♣	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition:		
With fixed bias	25000 max.	ohms
With cathode bias	Not recommended	

* Peak-envelope power.

§ Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

o With cylindrical shield JEDEC No.320 surrounding radiator, and with a cylindrical shield JEDEC No.321 surrounding the grid-No.2 ring terminal. Both shields are connected to ground.

●● Available from E.F. Johnson Co., Waseca, Minnesota.

★ For use at lower frequencies.

■ For use at higher frequencies.

● Continuous Commercial Service.

† The maximum rating for a signal having a minimum peak-to-average power ratio less than 2, such as is obtained in "Single-Tone" operation, is 250 ma. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 350 ma.

▲ *Two-Tone Modulation* operation refers to that class of amplifier service in which the input consists of two equal monofrequency rf signals having constant amplitude. These signals are produced in a single-sideband suppressed-carrier system when two equal-and-constant amplitude audio frequencies are applied to the input of the system.

‡ Obtained preferably from a fixed supply.

⊕ This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid No.1 is driven to zero volts at maximum signal.

oo Driver power output represents circuit losses and is the actual power measured at input to grid-No.1 circuit of the 7580. The actual power required depends on the operating frequency and the circuit used. The tube driving power is approximately zero watts.

♦ Without the use of feedback to enhance linearity.

♣ This value of useful power is measured at load of output circuit having indicated efficiency.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current.	1	2.3	2.9	amp
Direct Interelectrode Capacitances:o				
Grid No.1 to plate. . . .	-	-	0.06	μμf
Grid No.1 to cathode, grid No.2, and heater .	-	16	18.5	μμf
Plate to cathode, grid No.2, and heater. . . .	-	4	5	μμf

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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	Note	Min.	Max.	
Grid-No.1 Voltage:				
Negative.	1,2,5,6	55	100	volts
Positive.	1,5,6,7	3	12	volts
Grid-No.2 Current (1) . . .	1,3,5,6	-7	+3	ma
Grid-No.2 Current (2) . . .	1,5,6,7	-	260	ma
Grid-No.1 Current	1,5,6,7	-	150	ma
Useful Power Output	4,5,6	225	-	watts

Note 1: With 6 volts on heater.

Note 2: With dc plate voltage of 2000 volts, dc grid-No.2 voltage of 400 volts, and grid-No.1 voltage adjusted to give plate current of 67 ma.

Note 3: With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and grid-No.1 voltage adjusted to give plate current of 150 ma.

Note 4: With heater voltage of 5.5 volts, dc plate voltage of 2000 volts, dc grid-No.2 voltage of 300 volts, dc grid-No.1 bias of -90 volts, dc grid-No.1 current of 25 ma. maximum, grid-No.1 signal voltage adjusted to produce dc plate current of 250 ma., and coaxial-cavity amplifier circuit operating at a frequency of 475 Mc.

Note 5: With Forced-Air Cooling as specified under GENERAL DATA—*Air System Socket.*

Note 6: Heater voltage must be applied for at least 30 seconds before application of other voltages.

Note 7: With dc plate voltage of 250 volts, dc grid-No.2 voltage of 250 volts, and grid-No.1 voltage adjusted to give peak plate current of 1 ampere. This test is performed using pulse technique to prevent tube damage. Square pulses of 4500 μs duration at a repetition rate of 11 ± 1 pps are used.

SPECIAL PERFORMANCE DATA

Interelectrode Leakage:

This test is destructive and is performed on a sample lot of tubes from each production run under the following conditions: ac heater volts = 6.6, no voltage on other elements, and specified forced-air cooling for *Air System Socket.* At the end of 500 hours, with tube at 25° C, and with no voltage applied to heater, the minimum resistance between indicated electrodes as measured with a 500-volt Megger-type ohmmeter having an internal impedance of 2.5 megohms, will be:

Grid No.1 and grid No.2	10 min.	megohms
Grid No.1 and cathode	10 min.	megohms
Grid No.2 and cathode	10 min.	megohms

OPERATING CONSIDERATIONS

The *socket* for the 7580 should be of a type (such as that indicated in the tabulated data) which permits adequate air-cooling of the tube. Although the base will fit a conventional lock-in socket, the latter does not permit adequate cooling and its use is therefore not recommended.

The *plate connection* is made by a metal band or spring contacts to the cylindrical surface of the radiator. It is essential that the contact areas be kept clean to minimize rf losses especially at the higher frequencies.

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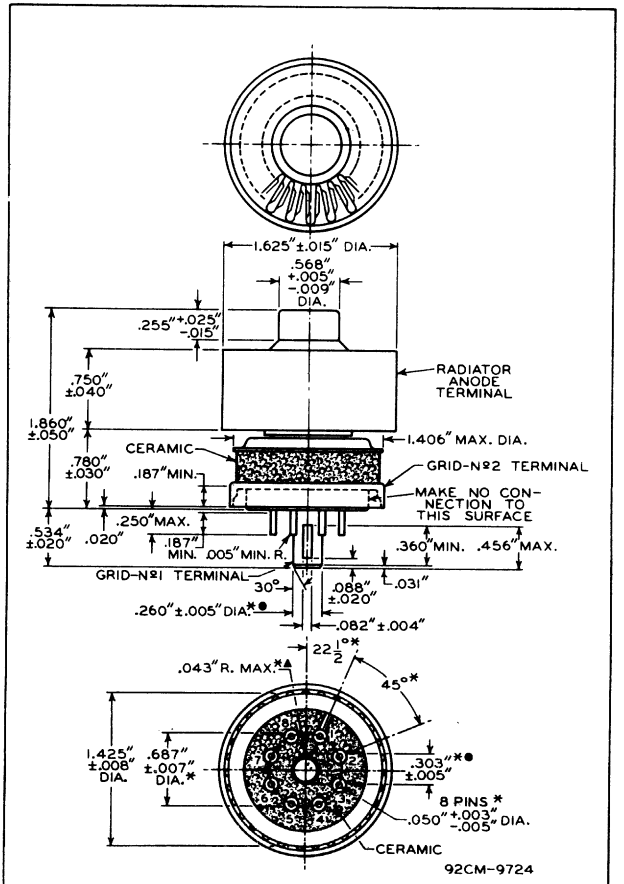
BEAM POWER TUBE



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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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BEAM POWER TUBE

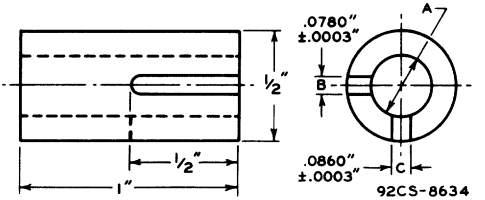
GRID-No.1-PLUG DIMENSIONS ARE MEASURED BY GAUGES G_1 AND G_2. IN THE FOLLOWING INSTRUCTIONS FOR THE USE OF THESE GAUGES, "GO" INDICATES THAT THE ENTIRE GRID-No.1-PLUG KEY WILL ENTER THE GAUGE; AND "NO-GO" INDICATES THAT THE GRID-No.1-PLUG KEY WILL NOT ENTER THE GAUGE MORE THAN 1/16". INSTRUCTIONS FOR THE USE OF THE GAUGES FOLLOW:

▲ GAUGES G_1-1, G_1-2, G_1-3, AND G_1-4:
USING ONLY SLOT C, TRY THESE GAUGES IN NUMERICAL ORDER UNTIL ONE IS FOUND THAT WILL ACCEPT THE ENTIRE GRID-No.1 PLUG. USING THE FIRST GAUGE THUS FOUND, IT WILL NOT BE POSSIBLE TO INSERT THE GRID-No.1 PLUG IN SLOT B.

● GAUGES G_2-1, G_2-2, AND G_2-3:
THE GRID-No.1 PLUG WILL BE REJECTED BY GAUGES G_2-1 AND G_2-2, BUT WILL BE ACCEPTED BY GAUGE G_2-3.

* BASE-PIN POSITIONS ARE HELD TO TOLERANCES SUCH THAT THE ENTIRE LENGTH OF THE PINS WILL, WITHOUT UNDUE FORCE, PASS INTO AND DISENGAGE FROM THE FLAT-PLATE GAUGE G_3.

GAUGE G_1



Gauge	Dimension A
G_1 - 1	.2575" + .0000" − .0005"
G_1 - 2	.2600" + .0000" − .0005"
G_1 - 3	.2625" + .0000" − .0005"
G_1 - 4	.2650" + .0000" − .0005"

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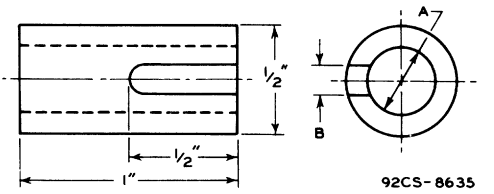
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7580

BEAM POWER TUBE

GAUGE G_2



92CS-8635

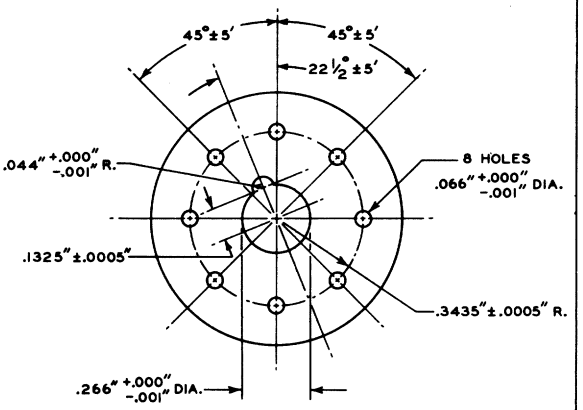
Gauge	Dimension	
	A	B
G_2 - 1	.2550" + .0000" − .0005"	.125"
G_2 - 2	.2980" + .0000" − .0005"	none
G_2 - 3	.3080" + .0000" − .0005"	none

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7580

BEAM POWER TUBE

GAUGE G_3



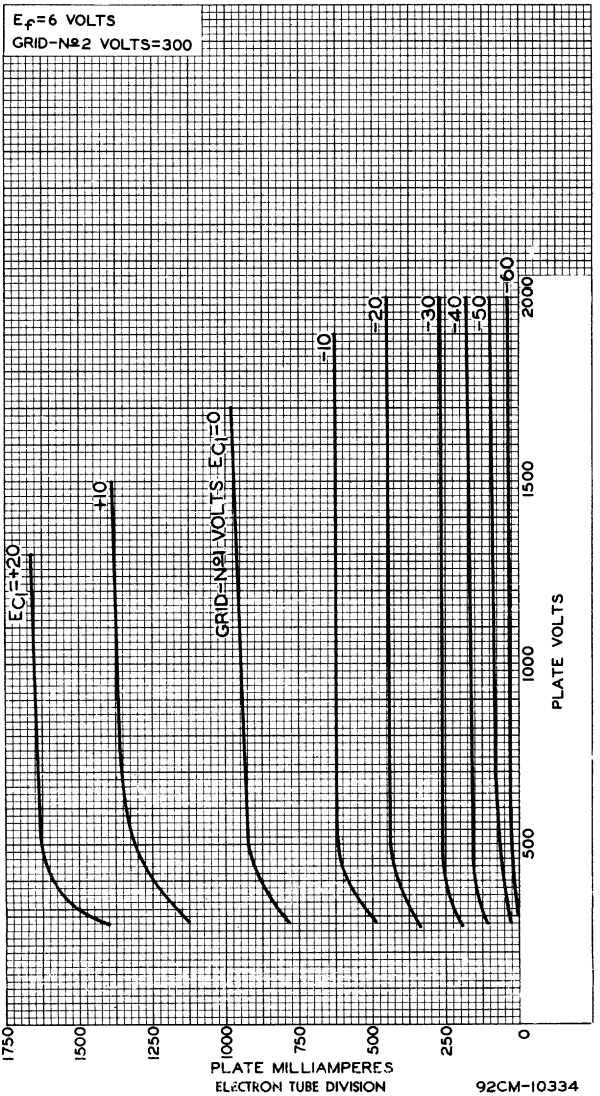
TOLERANCES ARE NOT CUMULATIVE

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7580

7580

TYPICAL PLATE CHARACTERISTICS

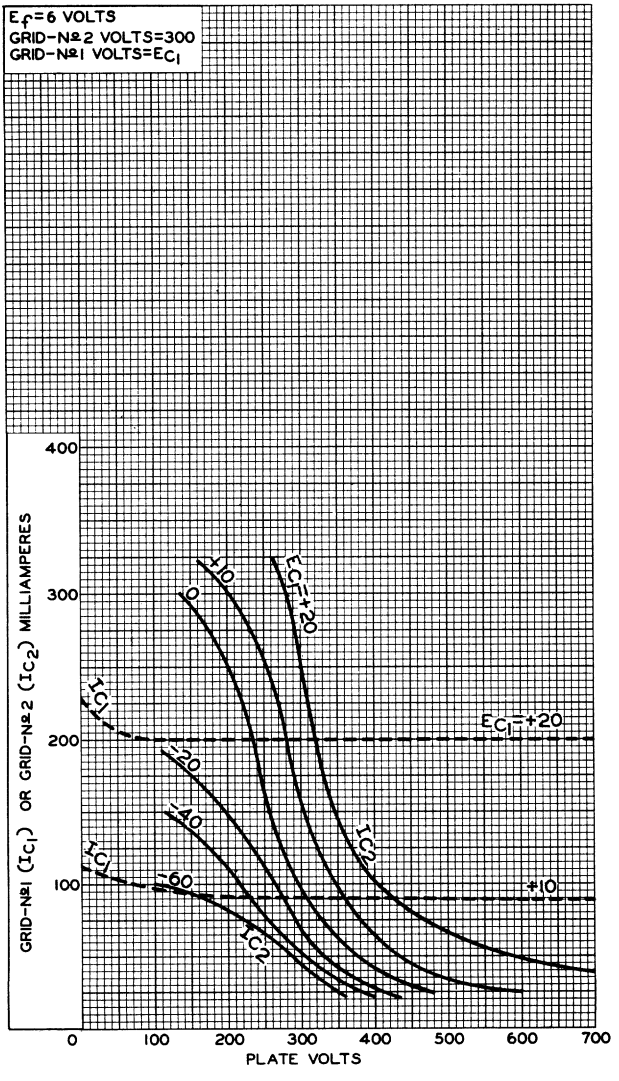


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10334

7580

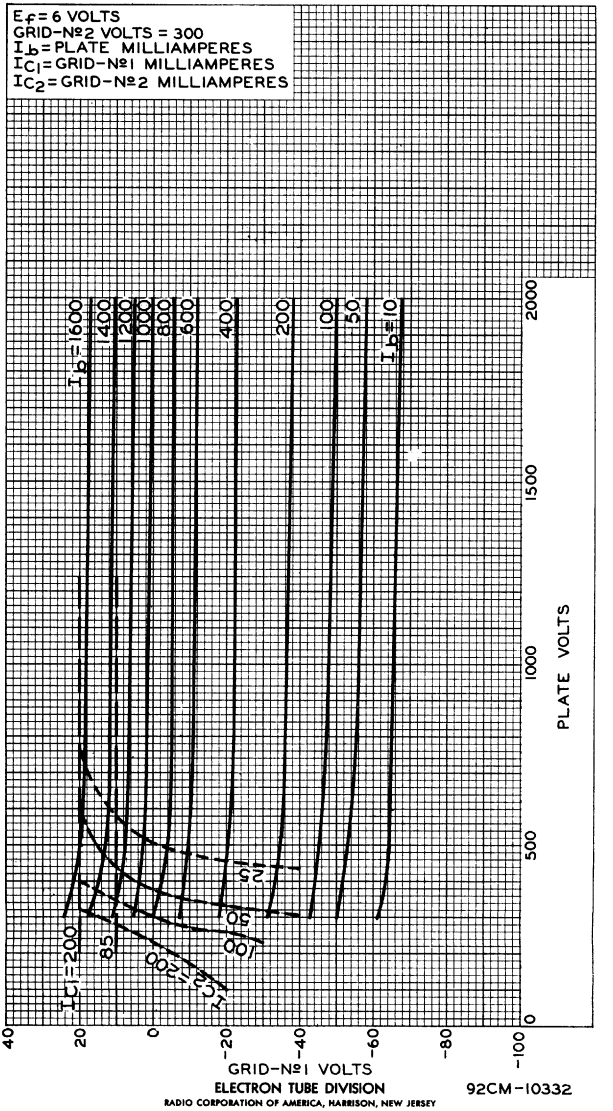
TYPICAL CHARACTERISTICS



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-10331

7580

TYPICAL CONSTANT-CURRENT CHARACTERISTICS

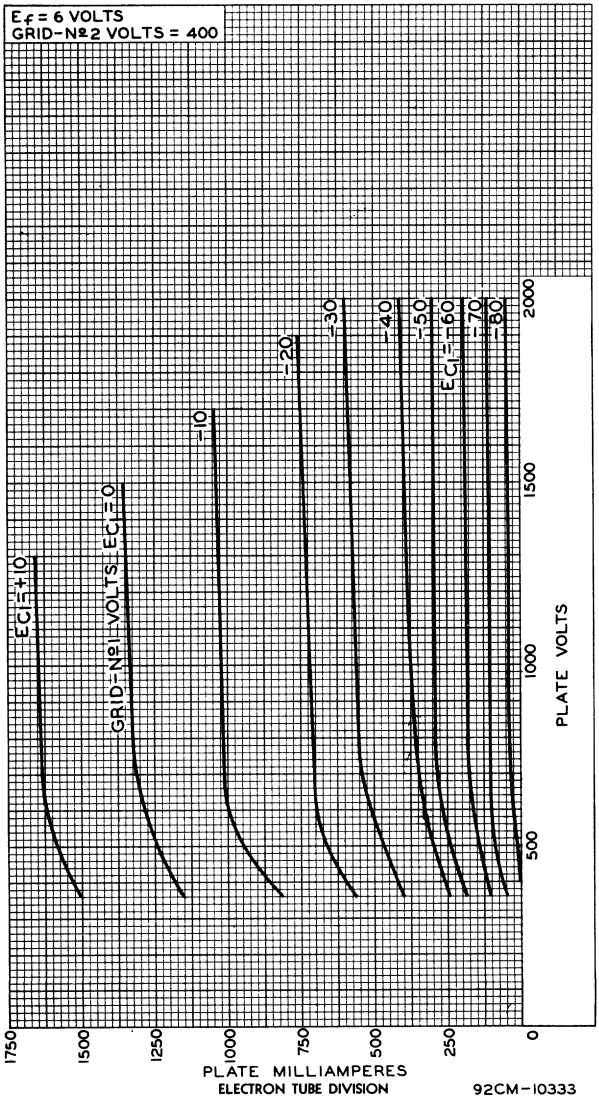


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10332

7580

TYPICAL PLATE CHARACTERISTICS



7580

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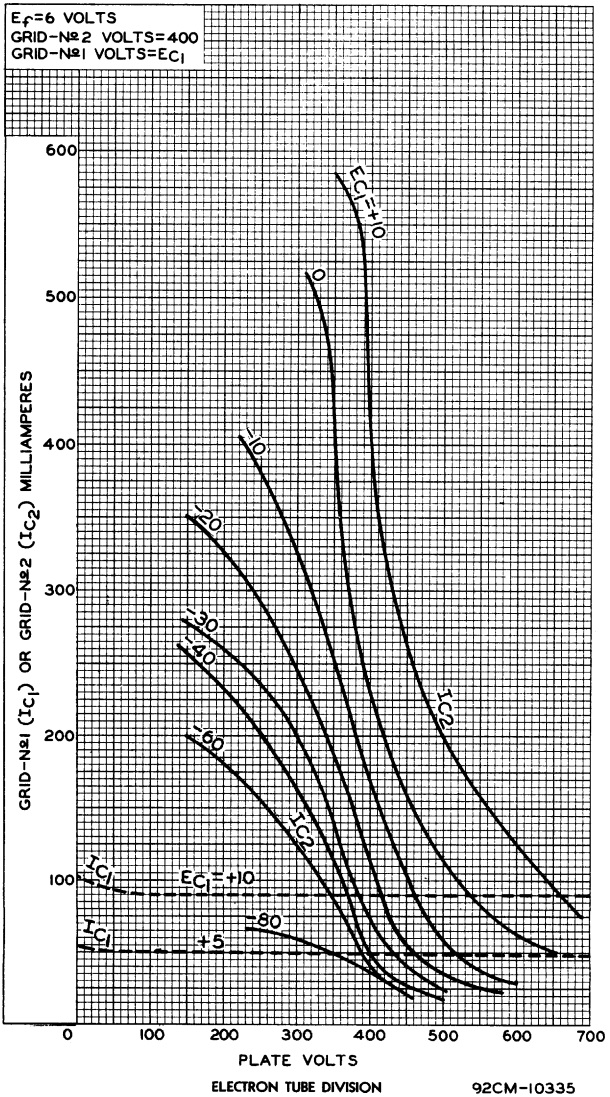
TYPICAL CHARACTERISTICS

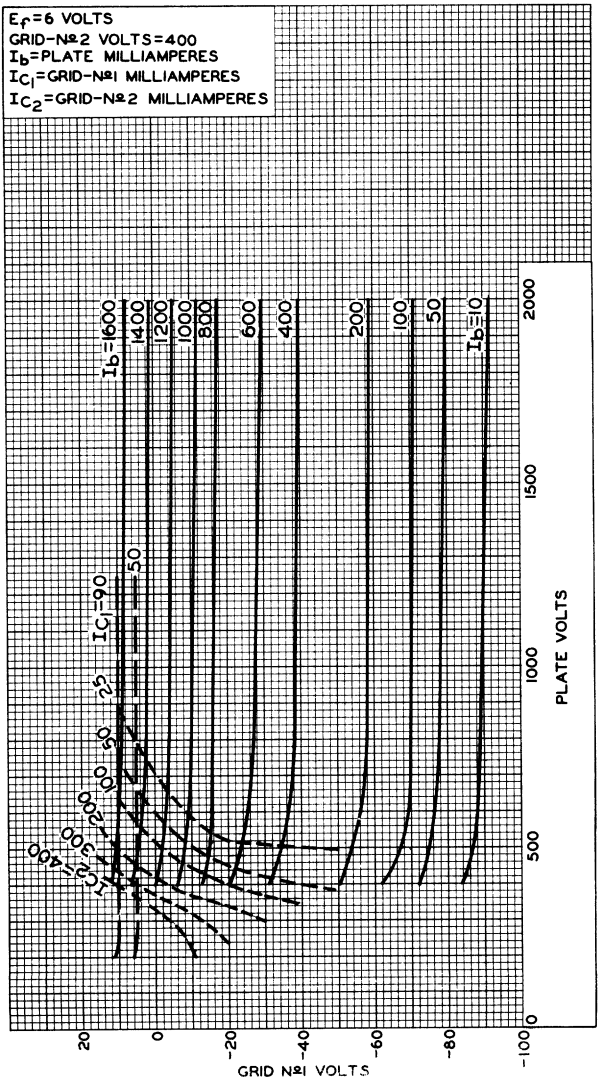


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10335

7580

TYPICAL CONSTANT-CURRENT CHARACTERISTICS



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10336

7586

Medium-Mu Triode

NUVISTOR TYPE

ALL-CERAMIC-AND-METAL CONSTRUCTION

Designed to Withstand Severe Mechanical Shock and Vibration in Industrial Applications, the 7586 is a General-Purpose Tube for Use in Amplifier and Oscillator Service at Frequencies Extending into the UHF Region.

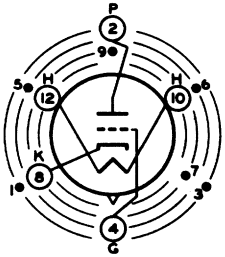
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.135	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode.	100 max.	volts
Heater positive with respect to cathode.	100 max.	volts
Direct Interelectrode Capacitances (Approx.):		
Grid to plate	2.2	pf
Input: G to (K,S,H)	4.2	pf
Output: P to (K,S,H)	1.6	pf
Cathode to plate	0.26	pf
Heater to cathode	1.4	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	0.800"
Maximum Seated Length	0.625"
Maximum Diameter	0.440"
Weight (Approx.)	1.9 grams
Envelope	Metal Shell MT4
Socket	See *Socket & Connector Information for RCA Nuvistor Tubes* at front of this Section
Base. . . Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)	
Basing Designation for BOTTOM VIEW	12AQ

Pin 1[a] – Do Not Use
Pin 2 – Plate
Pin 3[a] – Do Not Use
Pin 4 – Grid
Pin 5[a] – Do Not Use
Pin 6[a] – Do Not Use
Pin 7[a] – Do Not Use
Pin 8 – Cathode
Pin 9[a] – Do Not Use
Pin 10 – Heater
Pin 12 – Heater



INDEX=LARGE LUG
●=SHORT PIN; IC—DO NOT USE

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	–	–	75	volts
Plate Voltage	26.5	40	–	volts

←Indicates a change.

Grid Supply Voltage	0	0	0	volts
Cathode Resistor	–	–	100	ohms
Amplification Factor	31	35	35	
Grid Resistor	0.5	0.5	–	megohm
Plate Resistance (Approx.)	4400	3000	3000	ohms
Transconductance	7000	11500	11500	μmhos
Plate Current	2.8	7.5	10.5	ma
Grid Voltage (Approx.) for plate μa = 10	–	–	-7	volts

INDUSTRIAL SERVICE

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

Plate Supply Voltage	330	volts
Plate Voltage	110	volts
Grid Voltage:		
Negative-bias value	55	volts
Peak-positive value	4	volts
Grid Current	2	ma
Cathode Current	15	ma
Plate Dissipation	1	watt

Maximum Circuit Values:

Grid-Circuit Resistance:[b]		
For fixed-bias operation	0.5	megohm
For cathode-bias operation	1	megohm

[a] Pin is cut off close to ceramic wafer.

→ [b] For operation at metal-shell temperature of 150° C. For operation at other metal-shell temperatures, see *Grid-Circuit Resistance Rating Chart.* Metal-shell temperatures are measured in Zone "A" (See accompanying *Dimensional Outline).*

CHARACTERISTICS RANGE VALUES

	Note	*Min.*	*Max.*	
Heater Current	1	0.125	0.145	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	1.8	2.6	pf
Input: G to (K,S,H)	2	3.8	4.6	pf
Output: P to (K,S,H)	2	1.4	1.8	pf
Heater to cathode	2	1.1	1.7	pf
Cathode to plate	2	0.20	0.32	pf
Plate Current (1)	1,3	9	12.5	ma
Plate Current (2)	1,4	–	50	μa
Transconductance (1)	1,3	10000	13000	μmhos
Transconductance (2)	3,5	9000	–	μmhos
Transconductance Change: Difference between Transconductance (1) and Transconductance (2), expressed in per cent of Transconductance (1)	–	–	15	%
Reverse Grid Current	1,6	–	0.1	μa
→ Amplification Factor	1,3	28	42	

→ Indicates a change.

Heater–Cathode Leakage Current:				
Heater negative with respect to cathode.	1,7	–	5	μa
Heater positive with respect to cathode.	1,7	–	5	μa
Leakage Resistance:				
Between grid and all other electrodes tied together.	1,8	1000	–	megohms
Between plate and all other electrodes tied together.	1,9	1000	–	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Measured in accordance with EIA Standard RS-191-A.

Note 3: With dc plate supply volts = 75, dc grid supply volts = 0, cathode resistor = 100 ohms, cathode-bypass capacitor = 1000 μf, and metal shell connected to ground. ←

Note 4: With dc plate volts = 75, dc grid volts = -7, and metal shell connected to ground.

Note 5: With 5.7 volts ac or dc on heater.

Note 6: With dc plate volts = 80, grid supply volts = -1.2, grid resistor = 0.5 megohm, and metal shell connected to ground.

Note 7: With 100 volts dc applied between heater and cathode.

Note 8: With grid 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground. ←

Note 9: With plate 300 volts negative with respect to all other electrodes tied together, and metal shell connected to ground. ←

SPECIAL RATINGS & PERFORMANCE DATA ←

Shock Rating:

Peak Impact Acceleration. . . . . 1000 g

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in four different positions (X_1, X_2, Y_1, Y_2) in a Navy Type, High-impact (flyweight) Shock Machine, and with tube electrodes applied, are subjected to 20 blows (5 in each position) at the specified Peak Impact Acceleration. At the end of this test, tubes are criticized for change in transconductance, reverse grid current, and heater-cathode leakage current, and are then subjected to the Variable-Frequency Vibration Test described below.

Fatigue Rating:

Peak Vibrational Acceleration. . . . . 2.5 max. g

This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified Peak Vibrational Acceleration. Tubes are rigidly mounted, supplied with center heater voltage only, and subjected for 48 hours to 2.5-g Peak Vibrational Acceleration at 60 cycles per second in the X1 position. At the end of this test, tubes are criticized for the same characteristics and end-point values as in the Shock Rating Test described above.

Variable-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run. The tube is operated under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate-load resistor of 2000 ohms.

← Indicates a change.

During operation, tube is vibrated in the X_1 position through the frequency range from 50 to 15,000 cycles per second with a constant vibrational acceleration of 1g. During the test, tube must not show an rms output voltage across the plate-load resistor in excess of:

25 millivolts over the frequency range of 3000 to 6000 cps
500 millivolts over the frequency range of 6000 to 15000 cps

Post-Impact and Post-Fatigue Vibration Limits:

35 millivolts over the frequency range of 3000 to 6000 cps
700 millivolts over the frequency range of 6000 to 15000 cps

Low-Pressure Voltage-Breakdown Test:

This test is performed on a sample lot of tubes to determine the ability of the tube to withstand high-altitude (low-air-pressure) conditions. Tubes are operated with 250 rms volts applied between plate and all other electrodes and metal shell connected together and will not break down or show evidence of corona when subjected to air pressures equivalent to altitudes of up to 100,000 feet (8.0 ± 0.5 mm Hg.)

Heater Cycling:

Cycles of Intermittent Operation. . . . . 2000 cycles

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts= 8.5 cycled one minute on and two minutes off; heater 180 volts negative with respect to cathode; grid, plate, and metal shell connected to ground. At the end of this test, tubes are tested for open heaters and heater-cathode shorts, open cathode circuits, and heater-cathode leakage currents.

Shorts and Continuity:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-1D, Amendment 2, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper[c]. See accompanying Shorts-Test Acceptance-Limits curve. Tubes are criticized for permanent or temporary shorts and open circuits.

Early-Hour Stability Life Performance (20 hours):

This test is performed on a sample lot of tubes from each production run to insure that tubes are properly stabilized. Tubes are operated at center heater voltage for 20 hours at maximum-rated plate dissipation. After 2 hours of operation and again after 20 hours of operation, tubes are checked for transconductance under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1). A tube is rejected if its transconductance after 2 or 20 hours of operation has changed more than 10 per cent from the 0-hour value.

Survival-Rate Life (100 hours):

This test is performed on a sample lot of tubes from each production run to assure a minimum of early-hour inoperatives. Tubes are operated with center heater voltage cycled 100 minutes on and 20 minutes off for 100 hours at maximum-rated plate

[c] Specification for tapper supplied on request.

dissipation, and then subjected to the Shorts and Continuity Test Transconductance (1), and Reverse Grid Current. Tubes must then show a transconductance of not less than 8300 micromhos and reverse grid current no greater than 0.2 microampere.

Intermittent Conduction Life (1000 hours):

This test is performed on a sample lot of tubes from each production run to assure the high quality of individual tubes and to prevent epidemic failures due to excessive changes in tube characteristics. Tubes are operated with center heater voltage cycled 110 minutes on and 10 minutes off, and maximum rated plate dissipation, at a shell temperature of 150° C.

Tubes are criticized at 500 and 1000 hours for Inoperatives,[d] reverse grid current, heater-cathode leakage current, and leakage resistance. In addition, a tube is rejected if its Transconductance (1) after 500 hours has changed more than 20 per cent or after 1000 hours has changed more than 25 per cent from the 0-hour value. The average change in Transconductance (1) of the lot from the 0-hour value must not exceed 15 per cent at 500 hours and 20-per cent at 1000 hours.

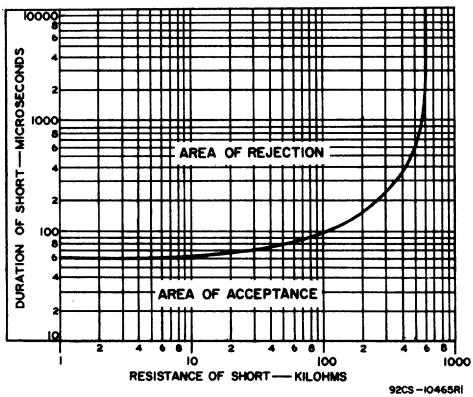
Standby Life (1000 hours):

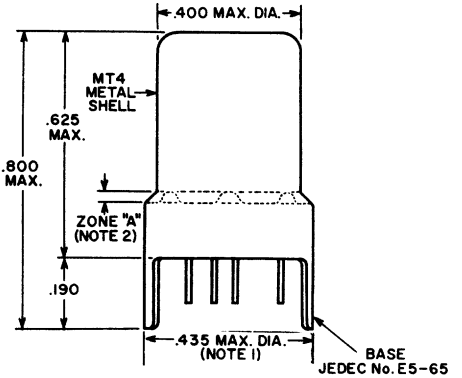
This test is performed on a sample lot of tubes from each production run. Tubes are operated with only the center heater voltage applied.

At 500 and 1000 hours the tubes are criticized for leakage resistance, reverse grid current, the change in Transconductance (1) of individual tubes from the 0-hour values, and for cathode interface resistance greater than 25 ohms. Interface resistance is measured by Method B of ASTM specification F300-61T.

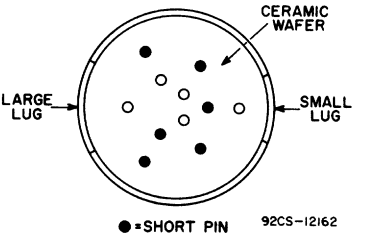
[d] An inoperative is defined as a tube having a discontinuity, permanent short, or air leak.

SHORTS-TEST ACCEPTANCE LIMITS

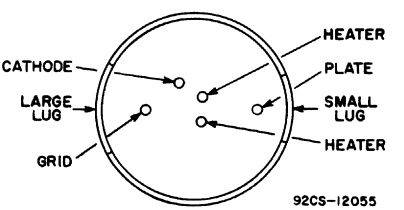




BOTTOM VIEW
Showing Arrangement of All 11 Base Pins



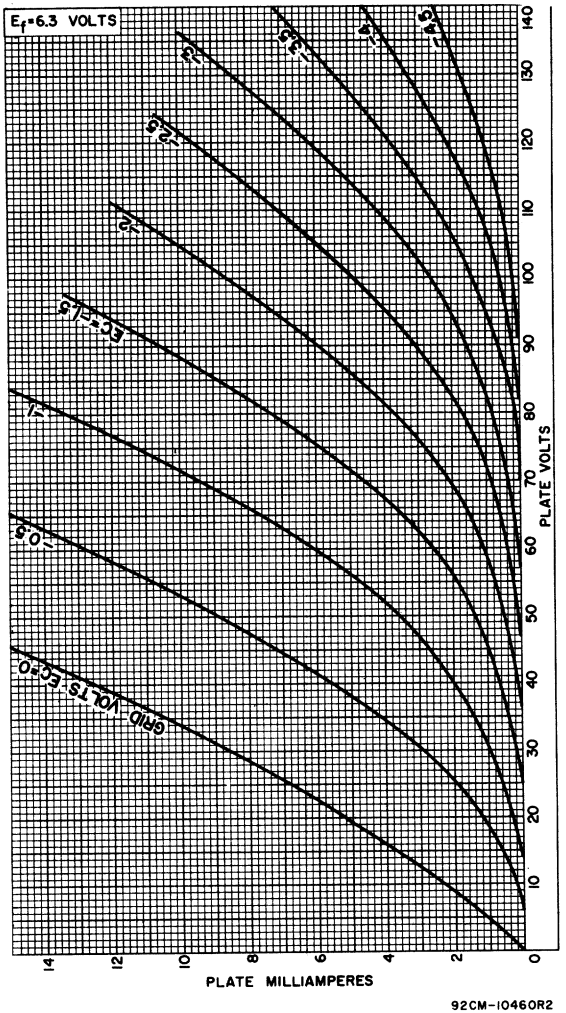
MODIFIED BOTTOM VIEW
With Element Connections Indicated
and Short Pins Not Shown



Note 1: Maximum outside diameter of 0.440" is permitted along 0.190" lug length.

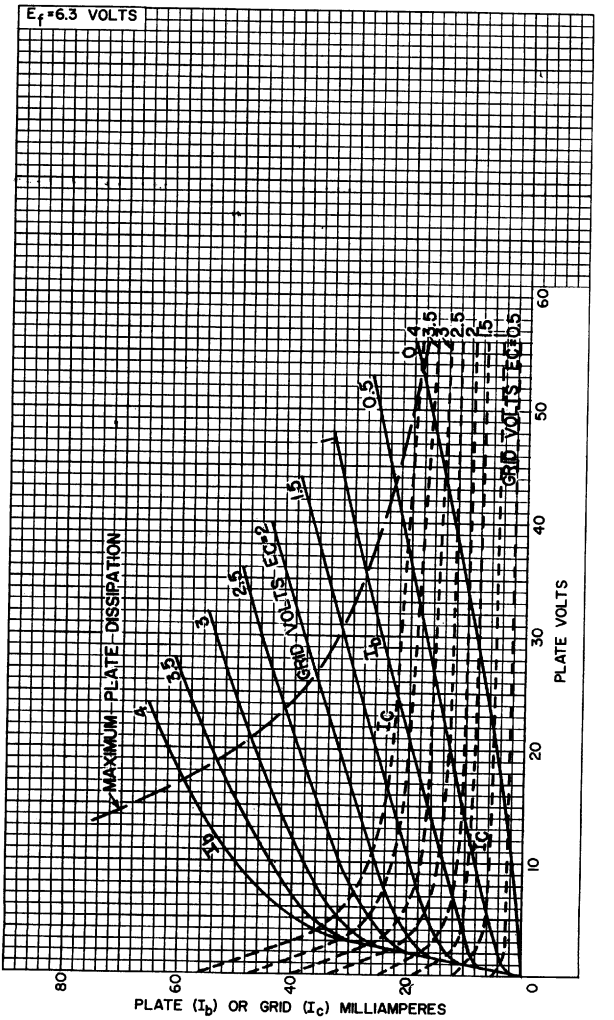
Note 2: Metal-shell temperature should be measured in Zone "A".

AVERAGE PLATE CHARACTERISTICS



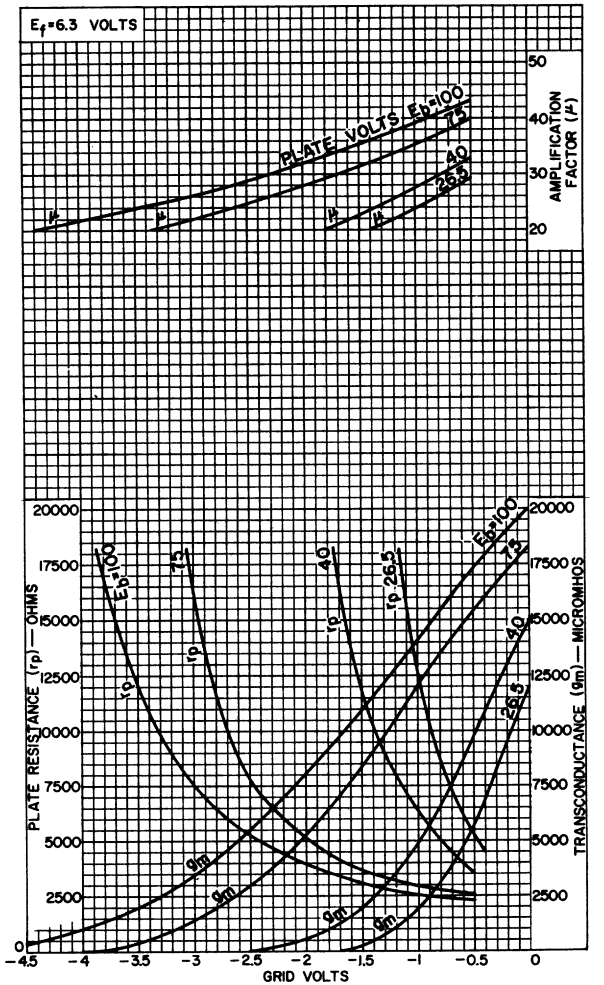
92CM-10460R2

AVERAGE CHARACTERISTICS



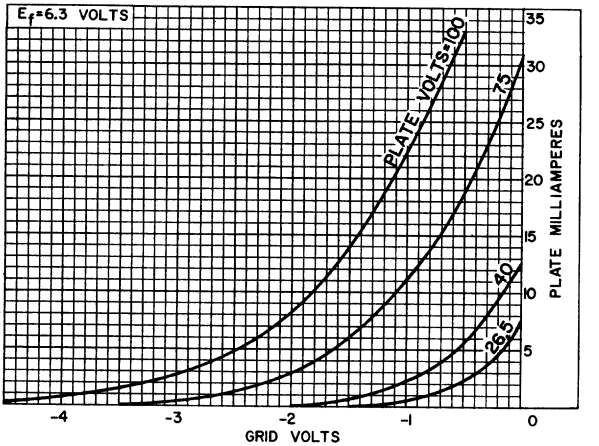
92CM-10464RI

AVERAGE CHARACTERISTICS



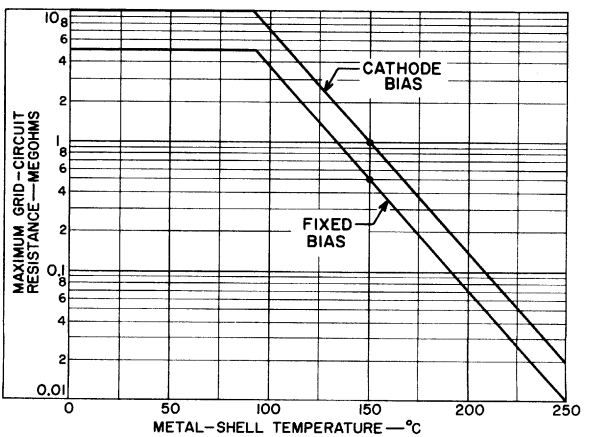
92CM-10964

AVERAGE CHARACTERISTICS



92CS-1046IRI

GRID-CIRCUIT-RESISTANCE RATING CHART



92CS-11911

Sharp-Cutoff Tetrode

NUVISTOR TYPE

For Industrial Applications

GENERAL DATA

Electrical: ←

Heater Characteristics and Ratings *(Absolute-Maximum Values):*		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.150	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances:		
Grid No.1 to plate	0.015 max.	pf
Grid No.1 to cathode, grid No.2, shell, and heater	7.0	pf
Plate to cathode, grid No.2, shell, and heater	1.4	pf
Heater to cathode	1.4	pf

Characteristics, Class A$_1$ Amplifier:

Plate Supply Voltage	125	volts
Grid-No.2 Supply Voltage	50	volts
Cathode Resistor	68	ohms
Plate Resistance (Approx.)	0.2	megohm
Transconductance	10600	μmhos
Plate Current	10	ma
Grid-No.2 Current	2.7	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-4.5	volts

Mechanical:

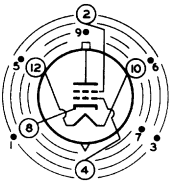
Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	1.050"
Maximum Seated Length	0.840"
Maximum Diameter	0.440"
Weight (Approx.)	1/10 oz
Envelope	Metal Shell MT4 and Ceramic Cylinder
Cap	Skirted Miniature (JEDEC No.C1-44)
Socket	Cinch Mfg. Corp. No.133 65 10 001, or equivalent
Base	Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)

← Indicates a change.

7587

Basing Designation for BOTTOM VIEW. 12AS

Pin 1[a] – Do Not Use
Pin 2 – Grid No.2
Pin 3 – Same as Pin 1
Pin 4 – Grid No.1
Pin 5 – Same as Pin 1
Pin 6 – Same as Pin 1



INDEX = LARGE LUG
● = SHORT PIN

Pin 7 – Same as Pin 1
Pin 8 – Cathode
Pin 9 – Same as Pin 1
Pin 10 – Heater
Pin 12 – Heater
Cap – Plate

INDUSTRIAL SERVICE

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

PLATE SUPPLY VOLTAGE	330 max.	volts
PLATE VOLTAGE	250 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max.	volts
GRID-No.2 VOLTAGE	110 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	55 max.	volts
Peak-positive value	2 max.	volts
CATHODE CURRENT	20 max.	ma
GRID-No.1 CURRENT	2 max.	ma
GRID-No.2 INPUT	0.2 max.	watt
PLATE DISSIPATION	2.2 max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance:[b]		
For fixed-bias operation	0.5 max.	megohm
For cathode-bias operation	1 max.	megohm

[a] Pin is of a length such that its end does not touch the socket insertion plane.
[b] For operation at metal-shell temperatures up to 150° C.

→ CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.140	0.160	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	–	0.015	pf
Grid No.1 to cathode, grid No.2, shell, and heater	2	6.0	8.0	pf
Plate to cathode, grid No.2, shell, and heater	2	1.2	1.6	pf
Heater to cathode	2	1.1	1.7	pf
Plate Current (1)	1,3	8.5	11.5	ma
Plate Current (2)	1,4	–	50	μa
Grid-No.2 Current	1,3	–	3.6	ma
Transconductance (1)	1,3	9000	12000	μmhos

→ Indicates a change.

Transconductance (2).	3,5	8000	–	μmhos
Transconductance Change:				
Difference between Transconductance (1) and Transconductance (2), expressed in per cent of Transconductance (1).	–	–	20	%
Reverse Grid Current.	1,6	–	0.1	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode.	1,8	–	5	μa
Heater positive with respect to cathode.	1,8	–	5	μa
Leakage Resistance:				
Between grid No.2 and all other electrodes tied together. . . .	1,7	500	–	megohms
Between grid No.1 and all other electrodes tied together. . . .	1,9	500	–	megohms
Between plate and all other electrodes tied together. . . .	1,10	500	–	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Measured in accordance with EIA Standard RS-191-A.

Note 3: With dc plate supply volts = 125, grid-No.2 supply volts = 50, cathode resistor = 68 ohms, and cathode-bypass capacitor = 1000 μf.

Note 4: With dc plate volts = 125, dc grid-No.2 volts = 50, dc grid-No.1 volts = -6, and metal shell connected to ground.

Note 5: With 5.7 volts ac or dc on heater.

Note 6: With dc plate volts = 200, dc grid-No.2 volts = 70, dc grid-No.1 supply volts = -1.6, grid-No.1 resistor = 0.5 megohm, and metal shell connected to ground.

Note 7: With grid No.2 100 volts negative with respect to all other electrodes tied together.

Note 8: With 100 volts dc applied between heater and cathode.

Note 9: With grid No.1 100 volts negative with respect to all other electrodes tied together.

Note 10: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration . . . . . 1000 max. g

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-impact (flyweight) Shock Machine and are subjected to 20 blows at the specified maximum impact acceleration. At the end of this test, tubes are criticized for change in transconductance, reverse grid current, and heater-cathode leakage current, and are then subjected to the Variable-Frequency Vibration Test described below.

Fatigue Rating:

Vibrational Acceleration. . . . . 2.5 max. g

This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified vibrational acceleration. Tubes are rigidly mounted, supplied with rated heater voltage only, and subjected for 48 hours to 2.5-g vibrational acceleration at 60 cycles per second in a direction perpendicular to the longitudinal axis of the tube. At the end of this test, tubes are criticized for the same characteristics and end-point values as in the Shock Rating Test described above.

Variable-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run. The tube is operated under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate-load resistor of 2000 ohms. During operation, tube is vibrated in a direction perpendicular to the longitudinal axis of the tube through the frequency range from 50 to 15,000 cycles per second with a constant vibrational acceleration of 1 g. During the test, tube will not show an rms output voltage across the plate-load resistor in excess of: (1) 35 millivolts from 50 to 6000 cps, (2) 500 millivolts from 6000 to 15,000 cps.

Low-Pressure Voltage-Breakdown Test:

The test is performed on a sample lot of tubes from each production run. In this test, tubes are operated with 240 rms volts applied between plate and all other electrodes and will not break down or show evidence of corona when subjected to air pressures equivalent to altitudes of up to 100,000 feet.

Heater Cycling:

Cycles of Intermittent Operation. . . . . 2000 min. cycles

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 7.5 cycled one minute on and two minutes off; heater 100 volts negative with respect to cathode; grid No.1, grid No.2, plate, and metal shell connected to ground. At the end of this test, tubes are tested for open heaters and heater-cathode shorts.

Shorts and Continuity:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-1D, Ammendent 2, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper[c]. See accompanying *Shorts-Test Acceptance-Limits* curve. Tubes are criticized for permanent or temporary shorts and open circuits.

Early-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that tubes are properly stabilized. In this test, tubes are operated for 20 hours at maximum-rated plate dissipation. After 2 hours of operation and again after 20 hours of operation, tubes are checked for transconductance under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1). A tube is rejected if its transconductance after 2 or 20 hours of operation has changed more than 10 per cent from the 0-hour value.

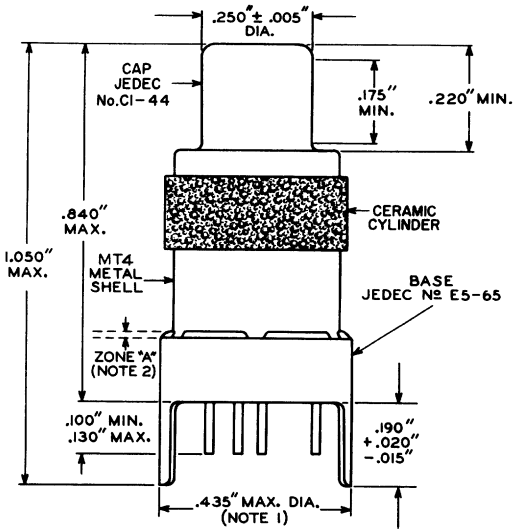
100-Hour Life Performance:

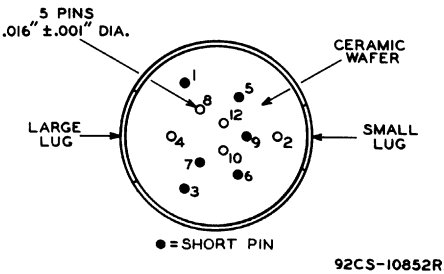
This test is performed on a sample lot of tubes from each production run to insure a low percentage of early-hour inoperatives. Tubes are operated for 100 hours at maximum-rated plate dissipation, and then subjected to the *Shorts and Continuity* Test previously described. Tubes must then show a transconductance of not less than 7500 micromhos under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1).

1000-Hour Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and guard against epidemic failures due to excessive changes in any of the characteristics indicated below. In this test, tubes are operated for 1000 hours at maximum-rated plate dissipation, and then criticized for inoperatives, reverse grid current, heater-cathode leakage current, and leakage resistance. In addition, the average change in transconductance of the lot from the 0-hour value for Transconductance (1) specified in CHARACTERISTICS RANGE VALUES, must not exceed 20 per cent at 500 hours, and 25 per cent at 1000 hours.

[c] Specifications for tapper supplied on request.



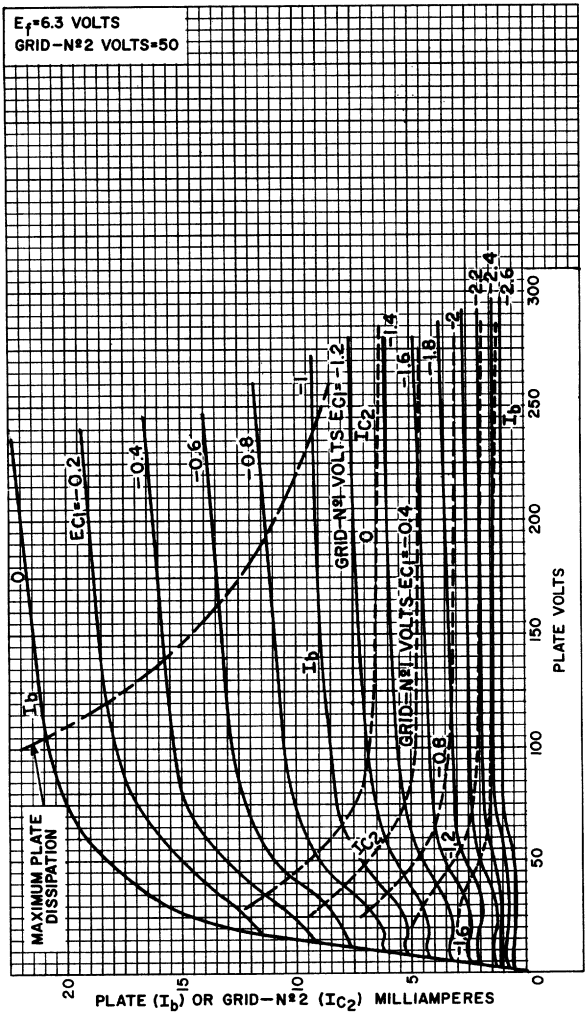


92CS-10852R2

NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

NOTE 2: SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A" BETWEEN BROKEN LINES.

AVERAGE CHARACTERISTICS



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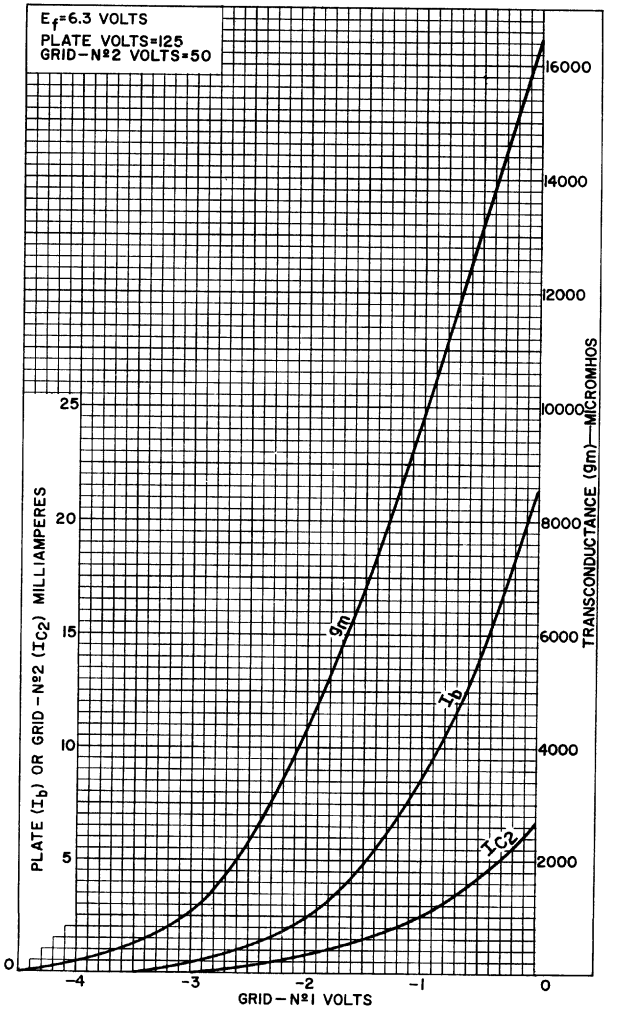
AVERAGE CHARACTERISTICS



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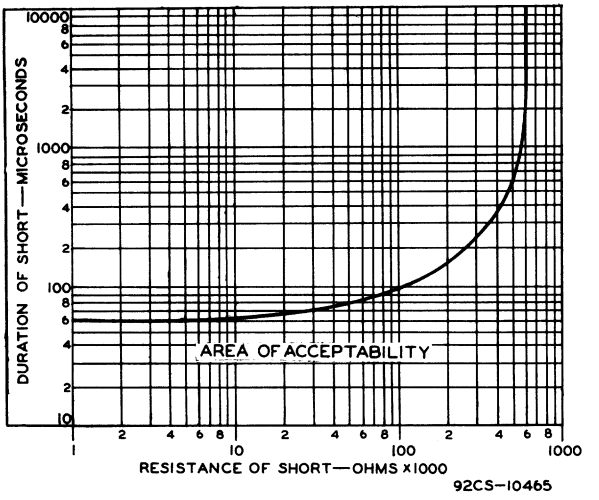
SHORTS-TEST ACCEPTANCE LIMITS



7642

Traveling-Wave Tube

HELIX-TRANSMISSION-LINE TYPE
FREQUENCY RANGE
1700-2300 Mc (S-Band)
INTEGRAL PERIODIC-PERMANENT-MAGNET TYPE

For Use as an Output Amplifier in Radio Relay Systems

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 5%	volts
Current at heater volts = 6.3	1.75	amp
Starting Current	Must never exceed 4 amperes, even momentarily	
Minimum Cathode Heating Time	3	minutes
Frequency Range	1700 to 2300	Mc
Cold Insertion Loss	60	db
Thermostatic Switch:		
Current rating:		
At 125 volts ac	6	amp
At 240 volts ac	3	amp

Mechanical:

Operating Position	Any
Operating Altitude	10000 feet
Maximum Overall Length	20-1/2"
Maximum Height	3-7/8"
Maximum Width	3-1/8"
Maximum Shell Diameter	1-5/8"
Weight (Approx.)	6-1/2 pounds
Connectors:	
RF Input	Type N Plug (UG-18 B/U)
RF Output	Type N Plug (UG-18 B/U)
Terminal Leads	Spade Lugs (Amphenol[a] No.32419, or equivalent)

Thermal:

Collector Temperature[b]	225 max.	°C
Ambient Temperature	-30 to +70	°C
Air Flow into Radiator	25 min.	cfm

RF POWER AMPLIFIER

Maximum Ratings, *Absolute-Maximum Values:*

DC Collector Voltage	3000 max.	volts
DC Helix Voltage	2500 max.	volts
DC Grid-No.2 Voltage	1700 max.	volts
DC Collector Current	80 max.	ma
DC Helix Current	3 max.	ma
DC Grid-No.2 Current	0.2 max.	ma
RF Power Input	5 max.	watts

Typical Operation at 2000 Mc:

DC Collector Voltage	2000	volts
DC Helix Voltage	2250	volts

DC Grid-No.2 Voltage	1450	volts
DC Collector Current	70	ma
DC Helix Current	0.8	ma
DC Grid-No.2 Current	0.1	ma
Input VSWR	1.2:1	
Output VSWR	1.4:1	
RF Power Input	30	mw
Saturated Power Output	20	watts

[a] Amphenol Electronics Corporation, 1830 South 54th Avenue, Chicago 50, Illinois.

[b] The thermostatic switch will open when collector temperature exceeds 225° C.

CHARACTERISTICS RANGE VALUES

	Note	*Min.*	*Max.*	
Heater Current	1	–	2	amp
DC Collector Voltage	2,3	1650	2400	volts
DC Helix Voltage	3	1900	2400	volts
DC Grid-No.2 Voltage	3	1150	1600	volts
DC Collector Current	3	60	75	ma
DC Helix Current	3	–	1.1	ma
DC Grid-No.2 Current	–	–	0.2	ma
Input VSWR	–	–	1.4:1	
Output VSWR	–	–	1.5:1	
Saturated Power Output	–	18	–	watts

Note 1: With heater volts = 6.3.

Note 2: Normally the collector voltage is 250 volts below the helix voltage, but may be equal to the helix voltage or any value between these points.

Note 3: Specific operating value is supplied with each tube.

OPERATING CONSIDERATIONS

The *magnetic field* required to focus the electron beam in the 7642 is supplied by integral periodic permanent magnets. Although the periodic-magnet structure is difficult to demagnetize and has little stray field, care should be taken to prevent the presence of any appreciable external transverse magnetic field which might cause defocusing of the electron beam within the tube. Magnetic material should be kept at least eight inches away from the tube.

Impedance match between the 7642 rf power output and the load should have a voltage standing wave ratio (VSWR) no greater than 2:1. With VSWR's in excess of this value, oscillations may occur causing permanent damage to the tube. Tubes should not be operated without a termination.

Forced-air cooling of the collector is necessary whenever collector current is flowing. Failure to observe this precaution may result in permanent damage to the tube. It is recommended that the forced-air cooling be applied when the heater power is applied.

A thermostatic switch is mounted on the collector of the 7642 which opens when the collector temperature exceeds

a safe limit. It is recommended that the thermostatic switch be used in an interlock circuit in the power supply for the collector, helix, and grid-No.2 voltages. The thermostatic switch will carry 6 amperes at 125 volts ac or 3 amperes at 240 volts ac.

The power supply should incorporate a helix-current overload protective device to prevent damage to the tube in the event of loss of collector voltage. Such a condition would cause the entire electron beam current to flow to the helix and thereby overheat that electrode. If it is desired to remove all voltages by a single control, the time-constant values of the power supply should be chosen so that the helix voltage decays faster than the collector voltage.

As the grid-No.2 voltage increases from zero to the operating value, the helix current may reach as high as 10 ma in the vicinity of 200 to 600 volts on grid No.2, then will fall below 2 ma at the proper operating grid-No.2 voltage. The helix supply should have adequate regulation to handle this transient during the turn-on procedure. In order to protect the tube, the helix supply should also have an interlock to open the circuit if the helix current exceeds 3 ma longer than a few milliseconds.

Mounting. The 7642 may be mounted in any position by means of bolts through either set of holes in the two mounting blocks.

Electrical connections are made to the 7642 by means of the seven leads with spade type lugs. These color-coded, flexible, insulated leads are identified on the *Dimensional Outline.* RF input and output connections are made to type N plugs (UG-18 B/U) on the tube (see *Dimensional Outline*). The collector is connected to the capsule and is normally grounded.

The rated values for collector voltage, helix voltage, and grid-No.2 voltage are high enough to be dangerous to the user. Care should be taken during adjustment of circuits, especially when exposed circuit parts are at a high dc potential.

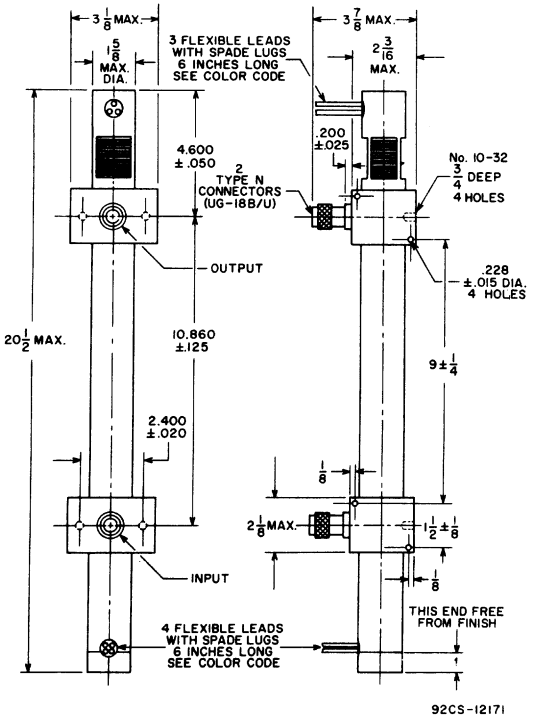
STARTING PROCEDURE

Voltages should be applied to the 7642 in the following sequence: Apply the heater voltage and allow tube to warm-up for 3 minutes minimum. Then apply the collector voltage as specified on the tube label. Next, apply the helix voltage as specified on the tube label. Finally, increase the grid-No.2 voltage in a few milliseconds to obtain the collector current specified on the tube label. The three power supplies can be controlled by one switch provided there is a sufficient delay in application of the grid-No.2 voltage to allow the collector and helix voltages to stabilize first.

TURN-OFF PROCEDURE

To turn off the tube, remove the electrode voltages in the following sequence. First reduce the grid-No.2 voltage, then remove the helix voltage, collector voltage, and heater voltage

in that order. The three power supplies can be controlled by one switch provided the grid-No.2 voltage decays faster than the collector and helix voltages.



DIMENSIONS IN INCHES

COLOR CODE OF LEADS

HEATER	Brown
HEATER, CATHODE, GRID No.1	Yellow
HELIX	Orange
GRID No.2	Blue
COLLECTOR, SHELL	Black
THERMOSTATIC SWITCH (2)	White

7650

Beam Power Tube

CERAMIC-METAL SEALS — **COAXIAL-ELECTRODE STRUCTURE**
"ONE-PIECE" ELECTRODE DESIGN — **INTEGRAL RADIATOR**
FORCED-AIR COOLED — **1250-WATTS CW INPUT UP TO 1215 Mc**
MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE

For Use under Severe Shock and Vibration

GENERAL DATA

Electrical:

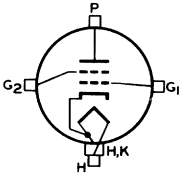
Heater, for Matrix-Type, Oxide-Coated, Unipotential Cathode:		
Voltage (AC or DC)[a]	6.3 ± 10%	volts
Current at heater volts = 6.3	7.85	amp
Minimum heating time	120	sec
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 225, grid-No.2 volts = 225, and plate ma. = 100	13	
Direct Interelectrode Capacitances:[b]		
Grid No.1 to plate	0.11 max.	μμf
Grid No.1 to cathode & heater	29	μμf
Plate to cathode & heater	0.011 max.	μμf
Grid No.1 to grid No.2	37	μμf
Grid No.2 to plate	5.3	μμf
Grid No.2 to cathode & heater	1.1 max.	μμf

Mechanical:

Operating Position	Any
Overall Length	2.34" ± 0.06"
Greatest Diameter (See *Dimensional Outline*)	2.06" ± 0.03"
Weight (Approx.)	3/4 lb
Radiator	Integral part of tube

Terminal Connections (See *Dimensional Outline*):

G_1 – Grid-No.1–Terminal Contact Surface
G_2 – Grid-No.2–Terminal Contact Surface
H – Heater–Terminal Contact Surface



H,K – Heater- & Cathode–Terminal Contact Surface
P – Plate–Terminal Contact Surface

Air Flow:

Air flow may be removed simultaneously with all voltages.

Through radiator—Adequate air flow to limit the plate-core temperature to 250° C should be delivered by a blower through the radiator during the application of plate, grid-No.2, and grid-No.1 voltages. Typical values

◄ Indicates a change.

of air flow directed through the radiator to maintain the plate core (See *Dimensional Outline*) at 250° C with an incoming air temperature of 25° C and with no restrictions at the plate-contact flange are:

Plate Dissipation (watts)	Air Flow (cubic ft/min)	Static Pressure (inches of water)
100	2	0.04
300	4	0.14
600	11	0.66
700	16	0.96

To grid-No.2, grid-No.1, cathode, and heater terminals— A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these terminals so that no terminal temperature exceeds the specified maximum value of 250° C. An air flow of 2.5 cfm is usually adequate. Forced-air cooling of heater and cathode terminals is usually required during stand-by (heater only) operation.

Plate-Core Temperature	250 max.	°C
Terminal Temperature (Plate, Grid No.2, Grid No.1, Cathode, and Heater)	250 max.	°C

AF POWER AMPLIFIER & MODULATOR

Maximum CCS[c] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	3000 max.	volts
DC GRID-No.2 VOLTAGE	1200 max.	volts
MAX.-SIGNAL DC PLATE CURRENT[d]	500 max.	ma
MAX.-SIGNAL GRID-No.1 CURRENT[d]	100 max.	ma
MAX.-SIGNAL PLATE INPUT[d]	1500 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT[d]	25 max.	watts
PLATE DISSIPATION[d]	600 max.	watts

Typical CCS Push-Pull Operation:

Values are for 2 tubes

DC Plate Voltage	2700	3000	volts
DC Grid-No.2 Voltage[e]	450	450	volts
DC Grid-No.1 Voltage from fixed-bias source	−40	−40	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	80	80	volts
Zero-Signal DC Plate Current	200	200	ma
Max.-Signal DC Plate Current	900	1000	ma
Zero-Signal DC Grid-No.2 Current	0	0	ma
Max.-Signal DC Grid-No.2 Current	6	5	ma
Effective Load Resistance (Plate to plate)	6000	6400	ohms
Max.-Signal Driving Power (Approx.)	0	0	watts
Max.-Signal Power Output (Approx.)	1400	1600	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition:	
With fixed bias	15000 max. ohms
With cathode bias	Not recommended

LINEAR RF POWER AMPLIFIER
Single-Sideband Suppressed-Carrier Service

Maximum CCS[c] Ratings, *Absolute-Maximum Values:*

	Up to 1215 Mc	
DC PLATE VOLTAGE	2500 max.	volts
DC GRID-No.2 VOLTAGE	1200 max.	volts
MAX.-SIGNAL DC PLATE CURRENT	500 max.	ma
MAX.-SIGNAL DC GRID-No.1 CURRENT	100 max.	ma
MAX.-SIGNAL PLATE INPUT	1250 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT	25 max.	watts
PLATE DISSIPATION	600 max.	watts

Typical CCS "Single-Tone"[f] Operation: ◄

In grid-drive circuit at 30 Mc

DC Plate Voltage	2250	2500	volts
DC Grid-No.2 Voltage[c]	450	450	volts
DC Grid-No.1 Voltage[c]	37	37	volts
Zero-Signal DC Plate Current	160	160	ma
Zero-Signal DC Grid-No.2 Current	0	0	ma
Effective RF Load Resistance	2500	2700	ohms
Max.-Signal DC Plate Current	450	500	ma
Max.-Signal DC Grid-No.2 Current	4	4	ma
Max.-Signal DC Grid-No.1 Current[g]	0.05	0.05	ma
Output-Circuit Efficiency (Approx.)	90	90	%
Max.-Signal Driver Power Output[h] (Approx.)	1	1	watt
Max.-Signal Useful Power Output (Approx.)	580[j]	680[j]	watts

Typical CCS Operation with "Two-Tone Modulation"[k] ◄

In grid-drive circuit at 30 Mc

DC Plate Voltage	2250	2500	volts
DC Grid-No.2 Voltage[c]	450	450	volts
DC Grid-No.1 Voltage[c]	-37	-37	volts
Zero-Signal DC Plate Current	160	160	ma
Effective RF Load Resistance	2500	2700	ohms
DC Plate Current at peak of envelope	450	500	ma
Average DC Plate Current	315	350	ma
DC Grid-No.2 Current at peak of envelope	3	4	ma
Average DC Grid-No.2 Current	1.8	2.5	ma
Average DC Grid-No.1 Current	0.005	0.05	ma
Peak-Envelope Driver Power (Approx.)	1	1	watt
Output-Circuit Efficiency (Approx.)	90	90	%
Distortion Products Level:[l]			
Third Order	-31	-31	db
Fifth Order	-36	-36	db
Useful Power Output (Approx.):			
Average	290	340	watts
Peak Envelope	580[j]	680[j]	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition:	
For fixed-bias operation	15000 max. ohms
For cathode-bias operation	Not recommended

◄ Indicates a change.

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS[c] Ratings, *Absolute-Maximum Values:*

	Up to 1215 Mc	
DC PLATE VOLTAGE	2000 max.	volts
DC GRID-No.2 VOLTAGE	1200 max.	volts
DC GRID-No.1 VOLTAGE	−250 max.	volts
DC PLATE CURRENT	500 max.	ma
DC GRID-No.1 CURRENT	100 max.	ma
PLATE INPUT	1000 max.	watts
GRID-No.2 INPUT	17 max.	watts
PLATE DISSIPATION	400 max.	watts

Typical CCS Operation:

In cathode-drive[m] circuit at 400 Mc

DC Plate Voltage	1800	2000	volts
DC Grid-No.2 Voltage[n]	400	400	volts
DC Grid-No.1 Voltage[p]	−45	−35	volts
DC Plate Current	450	500	ma
DC Grid-No.2 Current	6	8	ma
DC Grid-No.1 Current (Approx.)	15	12	ma
Output-Circuit Efficiency (Approx.)	80	80	%
Driver Power Output (Approx.) [q]	35	35	watts
Useful Power Output (Approx.)	500[j]	600[j]	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition	15000 max.	ohms

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[r] and RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS[c] Ratings, *Absolute-Maximum Values:*

	Up to 1215 Mc	
DC PLATE VOLTAGE	2500 max.	volts
DC GRID-No.2 VOLTAGE	1200 max.	volts
DC GRID-No.1 VOLTAGE	−250 max.	volts
DC PLATE CURRENT	500 max.	ma
DC GRID-No.1 CURRENT	100 max.	ma
PLATE INPUT	1250 max.	watts
GRID-No.2 INPUT	25 max.	watts
PLATE DISSIPATION	700 max.	watts

Typical CCS Operation:

In cathode-drive[m] circuit at 400 Mc

DC Plate Voltage	2250	2500	volts
DC Grid-No.2 Voltage[s]	400	400	volts
DC Grid-No.1 Voltage	−45	−35	volts
DC Plate Current	450	500	ma
DC Grid-No.2 Current	7	8	ma

DC Grid-No.1 Current (Approx.)	10	12	ma
Output-Circuit Efficiency (Approx.)	80	80	%
Driver Power Output (Approx.)[q]	30	35	watts
Useful Power Output (Approx.)	650[j]	800[j]	watts

In cathode-drive[m] circuit at 1215 Mc

DC Plate Voltage	2500	volts
DC Grid-No.2 Voltage[s]	400	volts
DC Grid-No.1 Voltage	-50	volts
DC Plate Current	500	ma
DC Grid-No.2 Current	6	ma
DC Grid-No.1 Current (Approx.)	10	ma
Output-Circuit Efficiency (Approx.)	70	%
Driver Power Output (Approx.)[q]	80	watts
Useful Power Output (Approx.)	375[j]	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition:
For fixed-bias operation . . . . . 15000 max. ohms
For cathode-bias operation . . . . . Not recommended

[a] Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

[b] Measured with special shield adapter.

[c] Continuous Commercial Service.

[d] Averaged over any audio-frequency cycle of sine-wave form.

[e] Preferably obtained from a fixed supply.

[f] "Single-Tone" operation refers to that class of amplifier service in which the grid-No.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.

[g] This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid No.1 is driven to zero volts at maximum signal.

[h] Driver power output represents circuit losses and is actual power measured at the input to grid-No.1 circuit used. The tube driving power is zero watts.

[j] This value of useful power is measured in load of output circuit.

[k] "Two-Tone-Modulation" operation refers to that class of amplifier service in which the input consists of two monofrequency rf signals having equal peak amplitude.

[l] With maximum signal output used as a reference, and without the use of feedback to enhance linearity.

[m] Cathode is at dc ground potential.

[n] Obtained preferably from a separate source modulated along with the plate supply.

[p] Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

[q] Driver power output includes circuit losses and feed-through power. It is the actual power measured at input to drive circuit.

[r] Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

[s] Obtained preferably from a fixed supply, or from the plate supply voltage with a voltage divider.

→ CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	7.4	8.3	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	–	0.11	μμf
Grid No.1 to cathode & heater	2	26	32	μμf
Plate to cathode & heater	2	–	0.011	μμf
Grid No.1 to grid No.2	2	34	41	μμf
Grid No.2 to plate	2	4.3	6.3	μμf
Grid No.2 to cathode & heater	2	–	1.1	μμf
Reverse Grid-No.1 Current	1,3	–	-50	μa
Peak Emission Current	1,4	80	–	amp
Interelectrode Leakage Resistance	5	8	–	megohms
Grid-No.1 Cutoff Voltage	1,6	–	-87	volts

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 240 ma.

Note 4: For conditions with 6.3 volts on heater; grid No.1, grid No.2 and plate tied together; and pulse-voltage source of 850 peak volts connected between plate and cathode. Pulse duration is 2 microseconds, pulse-repetition frequency is 60 pps, and duty factor is 0.00012. Read peak emission current after 1 minute.

Note 5: Under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 8 megohms.

Note 6: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 5 ma.

SPECIAL TESTS & PERFORMANCE DATA

Resonances in the tube mountings used in the following tests can cause the specified environmental conditions to produce greatly amplified effects. Extreme care must, therefore, be used in the design of the mountings to minimize resonances. Design details of mountings used by the RCA Electron Tube Division to perform these tests may be obtained from RCA Commercial Engineering, Harrison, N.J., on request.

50-g, 11-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified long-duration impact acceleration. Tubes are held rigid in six different positions in a Medium-Impact Shock Machine and are subjected to three blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

500-g, Nominal 3/4-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different

→ Indicates a change.

positions in a High-Impact Shock Machine and are subjected to five blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

5-to-2000 cps Vibration Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable-frequency vibration. With heater voltage of 6.3 volts ac or dc, dc plate supply voltage of 300 volts, dc grid-No.2 voltage adjusted to give dc plate current of 10 ma., and plate load resistor of 2000 ohms, the tube is vibrated along each of three mutually perpendicular axes over an 8-minute cycle consisting of:

a. 5-to-10 cps with fixed double amplitude of 0.080 inch ± 10%.

b. 10-to-15 cps at fixed acceleration of 0.41 g ± 10%.

c. 15-to-105 cps with fixed double amplitude of 0.036 inch ± 10%.

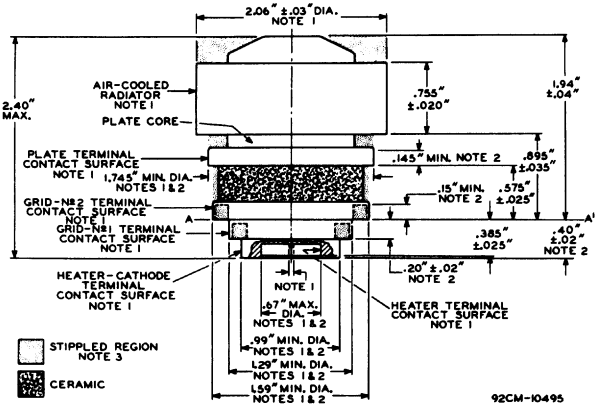
d. 105-to-2000 cps at fixed acceleration of 20 g ± 10%.

At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

OPERATING CONSIDERATIONS

A suggested *mounting arrangement* for the 7650 is shown in the accompanying drawing along with a layout of the associated contacts. Flexible connectors are required for the plate, grid-No.2, grid-No.1, cathode, and heater contact surfaces.

The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.

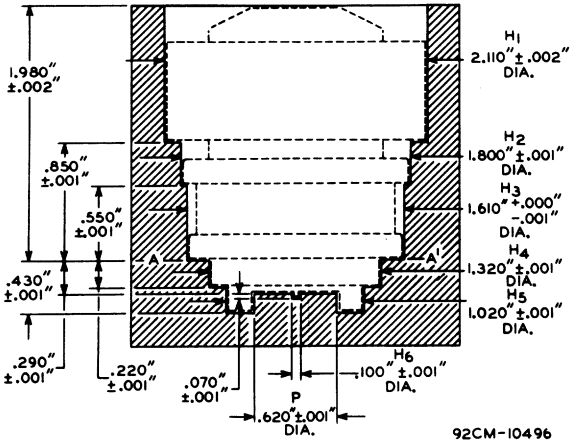


NOTE 1: WITH THE CYLINDRICAL SURFACES OF THE RADIATOR BAND, PLATE TERMINAL, GRID-No.2 TERMINAL, GRID-No.1 TERMINAL, HEATER-CATHODE TERMINAL, AND HEATER TERMINAL CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G_1. PROPER ENTRY OF THE TUBE IS OBTAINED WHEN THE GRID-No.2 TERMINAL IS SEATED ON THE SHOULDER A-A'. THE TUBE IS PROPERLY SEATED ON THE SHOULDER WHEN A 0.010" THICKNESS GAUGE 1/8" WIDE WILL NOT ENTER MORE THAN 1/16" BETWEEN THE SHOULDER SURFACE AND THE GRID-No.2 TERMINAL. THE GAUGE IS PROVIDED WITH SLOTS TO PERMIT MAKING MEASUREMENT OF SEATING OF GRID-No.2 TERMINAL ON SHOULDER A-A'.

NOTE 2: THE DIAMETER OF EACH TERMINAL IS HELD TO INDICATED VALUES ONLY OVER THE INDICATED MINIMUM LENGTH OF ITS CONTACT SURFACE.

NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES. DIAMETERS OF STIPPLED AREAS ABOVE AIR-COOLED RADIATOR, PLATE-TERMINAL CONTACT SURFACE, AND GRID-No.2-TERMINAL CONTACT SURFACE SHALL NOT BE GREATER THAN ITS ASSOCIATED DIAMETER.

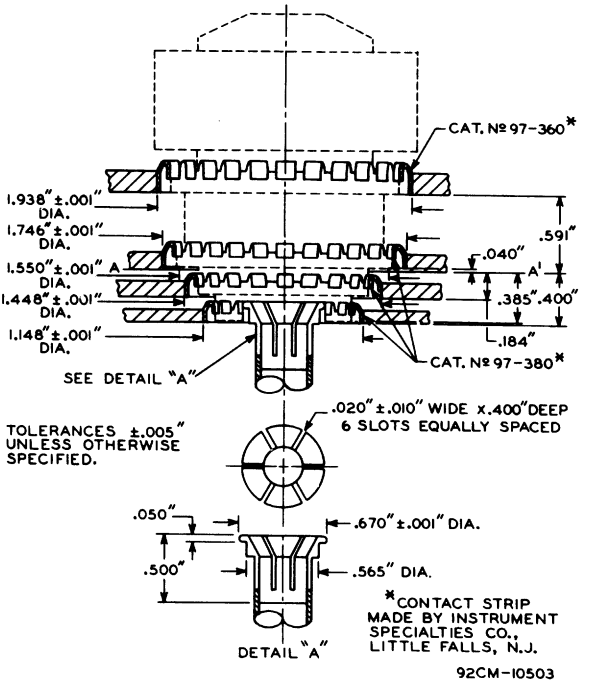
SKETCH G_1



SURFACE A-A' IS FLAT WITHIN 0.0005" PEAK TO VALLEY AND IS PERPENDICULAR TO THE AXIS OF THE CYLINDRICAL HOLES WITHIN 0.00025".

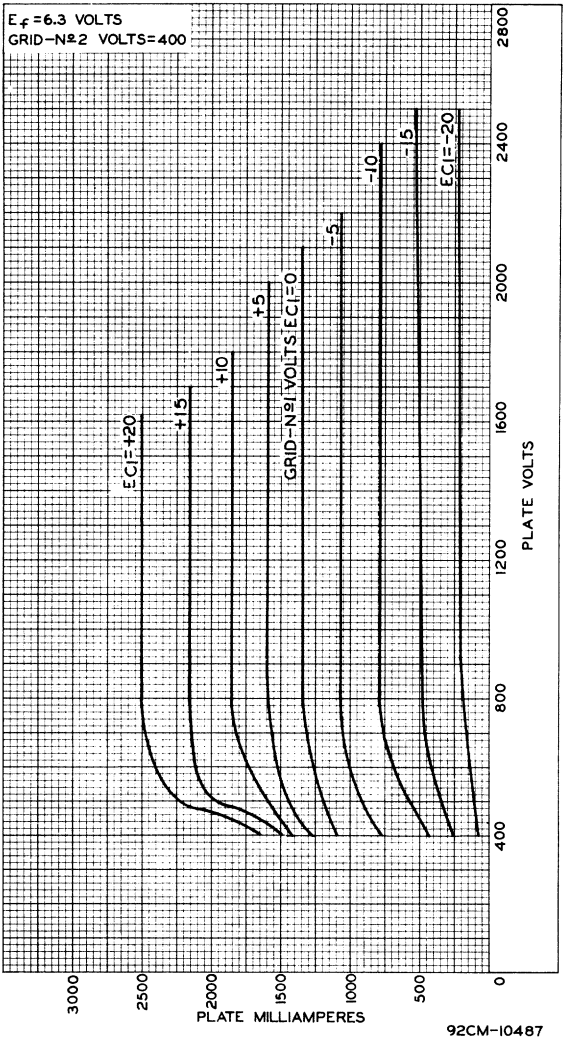
THE AXES OF THE CYLINDRICAL HOLES H_1 THROUGH H_6 AND THE AXIS OF POST P ARE COINCIDENT WITHIN 0.001".

SUGGESTED MOUNTING ARRANGEMENT
& LAYOUT OF ASSOCIATED CONTACTS

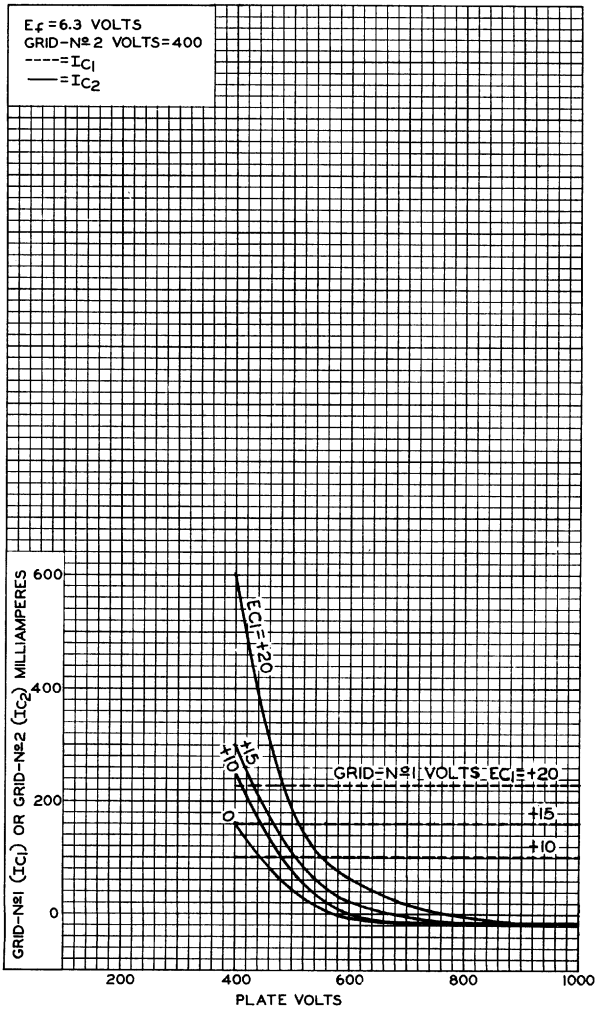


92CM-10503

TYPICAL PLATE CHARACTERISTICS

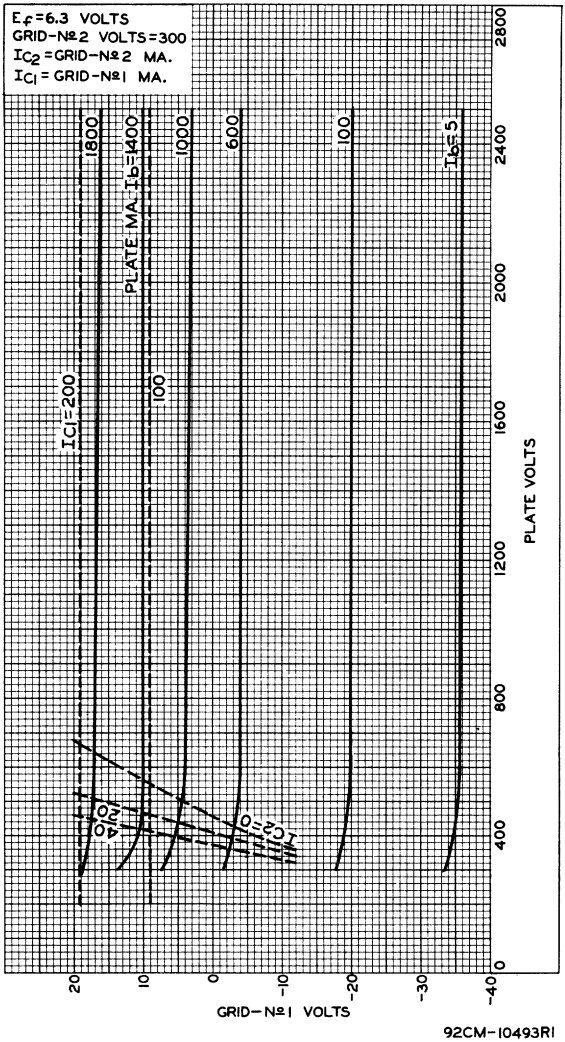


TYPICAL CHARACTERISTICS



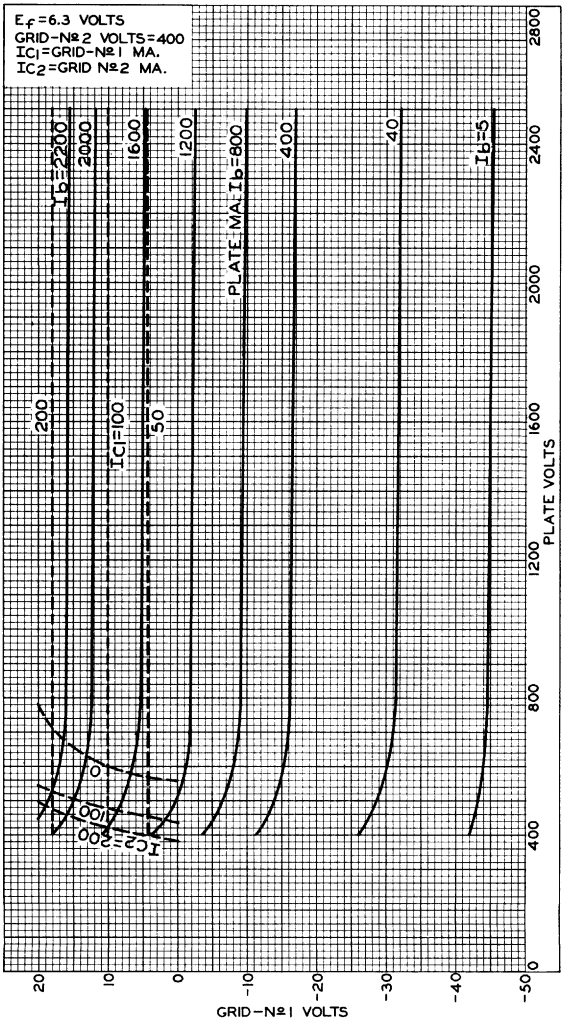
92CM-10488

TYPICAL CONSTANT-CURRENT CHARACTERISTICS



92CM-10493RI

TYPICAL CONSTANT-CURRENT CHARACTERISTICS



7651

Beam Power Tube

CERAMIC-METAL SEALS **COAXIAL-ELECTRODE STRUCTURE**
"ONE-PIECE" ELECTRODE DESIGN **INTEGRAL RADIATOR**
FORCED-AIR COOLED **27-KW PEAK-PULSE POWER INPUT UP TO 1215 Mc**
MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE

For Use under Severe Shock and Vibration

GENERAL DATA

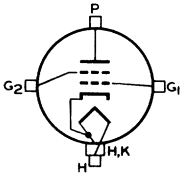
Electrical:

Heater, for Matrix-Type, Oxide-Coated, Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at heater volts = 6.3	7.5	amp
Minimum heating time	120	sec
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 225, grid-No.2 volts = 225, and plate ma. = 100	13	
Direct Interelectrode Capacitances:[a]		
Grid No.1 to plate	0.13 max.	μμf
Grid No.1 to cathode & heater	29	μμf
Plate to cathode & heater	0.01 max.	μμf
Grid No.1 to grid No.2	38	μμf
Grid No.2 to plate	6.5	μμf
Grid No.2 to cathode & heater	0.8 max.	μμf

Mechanical:

Operating Position . . . . . Any
Overall Length . . . . . 2.34" ± 0.06"
Greatest Diameter (See *Dimensional Outline*) . . 2.06" ± 0.03"
Weight (Approx.) . . . . . 3/4 lb
Radiator . . . . . Integral part of tube
Terminal Connections (See *Dimensional Outline*):

G_1 – Grid-No.1-Terminal Contact Surface
G_2 – Grid-No.2-Terminal Contact Surface
H – Heater-Terminal Contact Surface



H,K – Heater- & Cathode-Terminal Contact Surface
P – Plate-Terminal Contact Surface

Air Flow:

Air flow may be removed simultaneously with all voltages.

Through radiator—Adequate air flow to limit the plate-core temperature to 250° C should be delivered by a blower through the radiator during the application of heater, plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator to maintain the

plate core (See *Dimensional Outline*) at 250° C with an incoming air temperature of 25° C and with no restrictions at the plate-contact flange are:

Plate Dissipation (watts)	Air Flow (cubic ft/min)	Static Pressure (inches of water)
100	2	0.04
300	4	0.14
600	11	0.66

To Grid-No.2, Grid-No.1, Cathode, and Heater Terminals— A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these terminals so that no terminal temperature exceeds the specified maximum value of 250° C. An air flow of 2.5 cfm is usually adequate. Forced-air cooling of heater and cathode terminals is usually required during standby (heater only) operation.

Plate-Core Temperature.	250 max.	°C
Terminal Temperature (Plate, Grid No.2, Grid No.1, Cathode, and Heater)	250 max.	°C

GRID-PULSED RF AMPLIFIER and GRID-AND-SCREEN-PULSED RF AMPLIFIER

Maximum CCS[b] Ratings, *Absolute-Maximum Values:*

For maximum "on" time[c] of 10 microseconds

	Up to 1215 Mc	
→DC PLATE VOLTAGE.	5000 max.	volts
DC GRID-No.2 VOLTAGE.	1200 max.	volts
DC GRID-No.1 VOLTAGE.	-250 max.	volts
DC PLATE CURRENT DURING PULSE	9 max.	amp
DC PLATE CURRENT.	0.5 max.	amp
GRID-No.2 INPUT (Average)	25 max.	watts
GRID-No.1 INPUT (Average)	10 max.	watts
PLATE DISSIPATION (Average)	600 max.	watts

Typical Operation:

In grid-pulsed cathode-drive[d] circuit with rectangular-wave pulse at 1215 Mc and with duty factor[e] of 0.01

DC Plate Voltage.	3600	4000	volts
→Peak-Positive Grid-No.2 Voltage	800	1000	volts
DC Grid-No.1 Voltage.	-100	-120	volts
DC Plate Current during pulse	8	9	amp
DC Plate Current.	0.19	0.2	amp
DC Grid-No.2 Current.	0.005	0.006	amp
DC Grid-No.1 Current.	0.02	0.02	amp
Output-Circuit Efficiency (Approx.) . .	80	80	%
Driver Power Output at peak of pulse (Approx.)[f]	5.2	6.3	kw
Useful Power Output at peak of pulse (Approx.).	15[g]	20[g]	kw

→Indicates a change.

In grid-and-screen-pulsed cathode-drive[d] circuit with rectangular-wave pulses at 1215 Mc with duty factor[e] of 0.01

DC Plate Voltage	3600	4000	volts
Peak Positive-Pulse Grid-No.2 Voltage	800	1000	volts
DC Grid-No.1 Voltage	0	0	volts
DC Plate Current during pulse	8	9	amp
DC Plate Current	0.145	0.165	amp
DC Grid-No.2 Current	0.003	0.006	amp
DC Grid-No.1 Current	0.017	0.017	amp
Output-Circuit Efficiency (Approx.)	80	80	%
Driver Power Output at peak of pulse (Approx.)[f]	2.4	2.9	kw
Useful Power Output at peak of pulse (Approx.)	11[g]	15[g]	kw

PLATE-AND-SCREEN-PULSED RF AMPLIFIER

Maximum CCS[b] Ratings, *Absolute-Maximum Values:*

For maximum "on" time[c] of 10 microseconds

	Up to 1215 Mc	
PEAK POSITIVE-PULSE PLATE VOLTAGE	8000 max.	volts
PEAK POSITIVE-PULSE GRID-No.2 VOLTAGE	1200 max.	volts
DC GRID-No.1 VOLTAGE	-250 max.	volts
DC PLATE CURRENT DURING PULSE	9 max.	amp
DC PLATE CURRENT	0.12 max.	amp
GRID-No.2 INPUT (Average)	25 max.	watts
GRID-No.1 INPUT (Average)	10 max.	watts
PLATE DISSIPATION (Average)	600 max.	watts

Typical Operation:

In cathode-drive[d] circuit with rectangular-wave pulses at 1215 Mc and with duty factor[e] of 0.01

Peak Positive-Pulse Plate Voltage	7200	8000	7200	8000	volts
Peak Positive-Pulse Grid-No.2 Voltage	800	1000	800	1000	volts
DC Grid-No.1 Voltage	0	0	-75	-80	volts
DC Plate Current during pulse	8	9	8	9	amp
DC Plate Current	0.09	0.1	0.09	0.1	amp
DC Grid-No.2 Current	0.003	0.008	0.003	0.004	amp
DC Grid-No.1 Current	0.015	0.016	0.019	0.02	amp
Output-Circuit Efficiency (Approx.)	80	80	80	80	%
Driver Power Output at peak of pulse (Approx.)[f]	1.8	2.2	4.5	5.3	kw
Useful Power Output at peak of pulse (Approx.)	22[g]	28[g]	30[g]	39[g]	kw

[a] Measured with special shield adapter.

[b] Continuous Commercial Service.

[c] "On" time is defined as the sum of the durations of all the individual pulses which occur during any 1000-microsecond interval. An increase in

dc plate current during the pulse may be permissible at shorter *"on"* times, and a decrease is usually required at longer *"on"* times.

Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 per cent of the peak value. The *peak value* is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

d Cathode is at dc ground potential.

e *Duty factor* is defined as the ratio of "on" time to total elapsed time in any 1000-microsecond interval.

f Driver power output includes circuit losses and feed-through power. It is actual power measured at input to tube drive circuit. It will vary with frequency of operation and driver circuitry.

g This value of useful power is measured in load of output circuit.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current.	1	6.9	8.3	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate.	2	-	0.13	μμf
Grid No.1 to cathode & heater . .	2	26	32	μμf
Plate to cathode & heater	2	-	0.01	μμf
Grid No.1 to grid No.2.	2	35	42	μμf
Grid No.2 to plate.	2	5.5	7.5	μμf
Grid No.2 to cathode & heater . .	2	-	0.8	μμf
Reverse Grid-No.1 Current	1,3	-	-50	μa
Peak Emission Voltage	1,4	-	850	volts
Interelectrode Leakage Resistance .	5	8	-	megohms
→ Grid-No.1 Cutoff Voltage.	1,6	-	-170	volts

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 240 ma.

Note 4: For conditions with 6.3 volts on heater; grid No.1, grid No.2, and plate tied together; and pulse-voltage source connected between plate and cathode. Pulse duration is 2 microseconds, pulse-repetition frequency is 60 pps, and duty factor is 0.00012. The voltage-pulse amplitude is adjusted until a peak cathode current of 80 amperes is obtained. After 1 minute at this value, the voltage-pulse amplitude will not exceed 850 volts (peak).

Note 5: Under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 8 megohms.

Note 6: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and a dc grid-No.1 voltage adjusted to give a dc plate current of 5 ma.

SPECIAL TESTS & PERFORMANCE DATA

Resonances in the tube mountings used in the following tests can cause the specified environmental conditions to produce greatly amplified effects. Extreme care must, therefore, be used in the design of the mountings to minimize resonances. Design details of mountings used by the RCA Electron Tube Division to perform these tests may be obtained from RCA Commercial Engineering, Harrison, N. J., on request.

→ Indicates a change.

50-g, 11-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified long-duration impact acceleration. Tubes are held rigid in six different positions in a Medium-Impact Shock Machine and are subjected to three blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

500-g, Nominal 3/4-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a High-Impact Shock Machine and are subjected to five blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

5-to-2000 cps Vibration Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable-frequency vibration. With heater voltage of 6.3 volts ac or dc, dc plate supply voltage of 300 volts, dc grid-No.2 voltage adjusted ← to give dc plate current of 10 ma., and plate load resistor of 2000 ohms. The tube is vibrated along each of three mutually perpendicular axes over an 8-minute cycle consisting of:

a. 5-to-10 cps with fixed double amplitude of 0.08 inch ± 10%.

b. 10-to-15 cps at fixed acceleration of 0.41 g ± 10%.

c. 15-to-105 cps with fixed double amplitude of 0.036 inch ± 10%.

d. 105-to-2000 cps at fixed acceleration of 20 g ± 10%.

At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

OPERATING CONSIDERATIONS

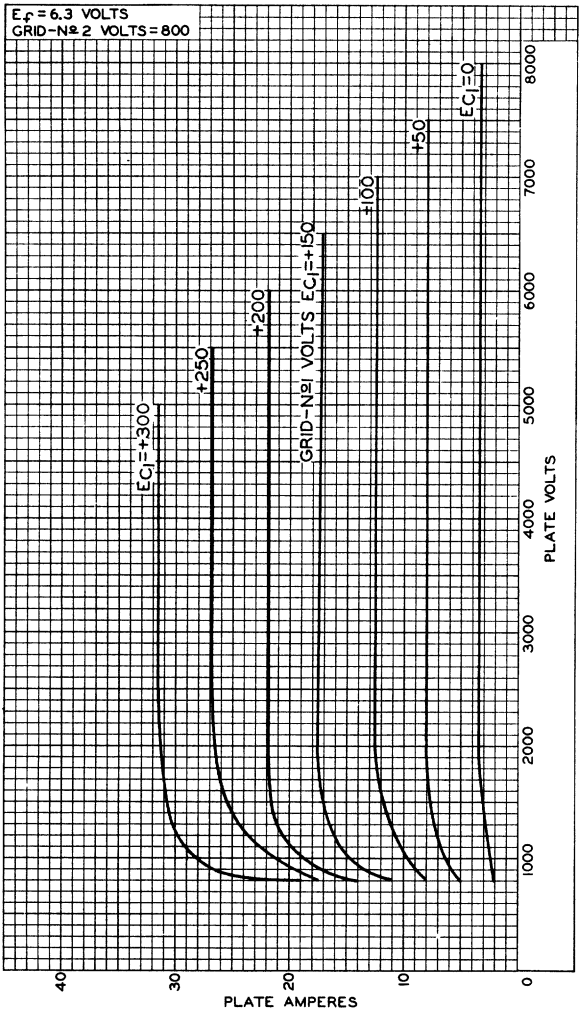
A suggested *mounting arrangement* for the 7651 is shown in the accompanying drawing along with a layout of the associated contacts. Flexible connectors are required for the plate, grid-No.2, grid-No.1, cathode, and heater contact surfaces.

The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.

← Indicates a change.

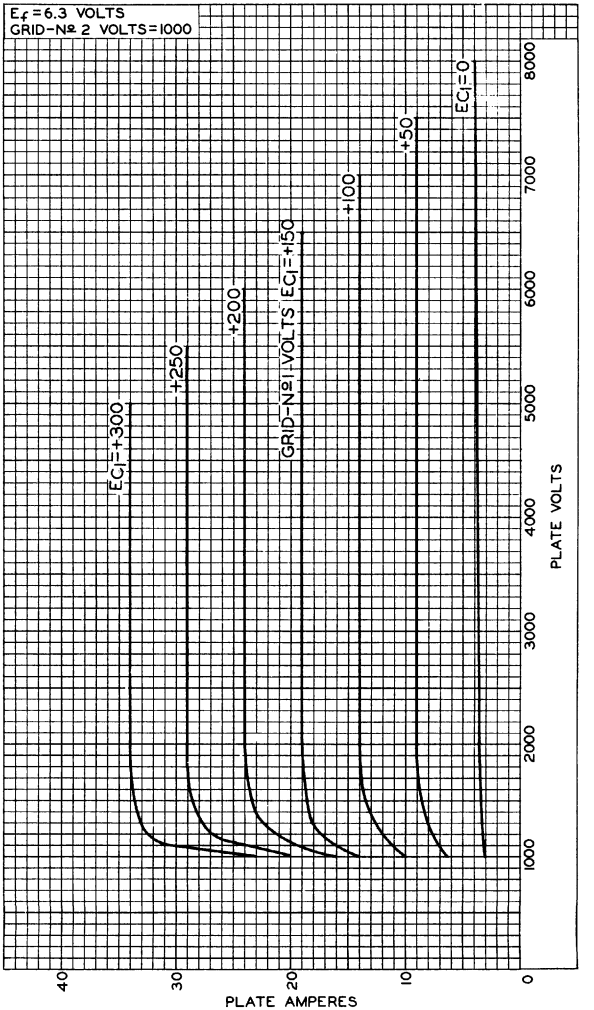
DIMENSIONAL OUTLINE,
GAUGE DRAWING, and
SUGGESTED MOUNTING ARRANGEMENT
& LAYOUT OF ASSOCIATED CONTACTS
shown under Type 7650 also apply to the 7651

TYPICAL PLATE CHARACTERISTICS



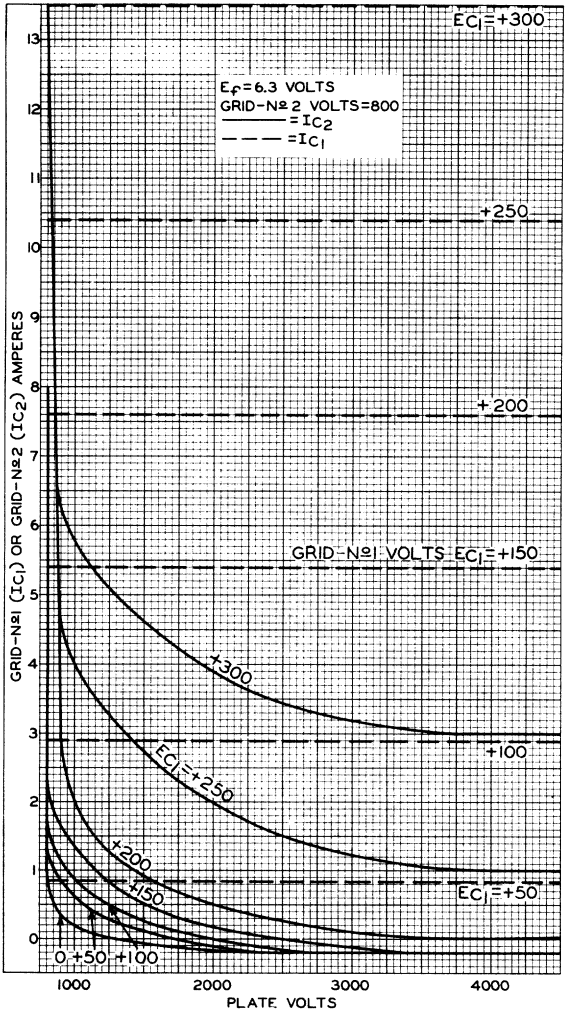
92CM-10492

TYPICAL PLATE CHARACTERISTICS



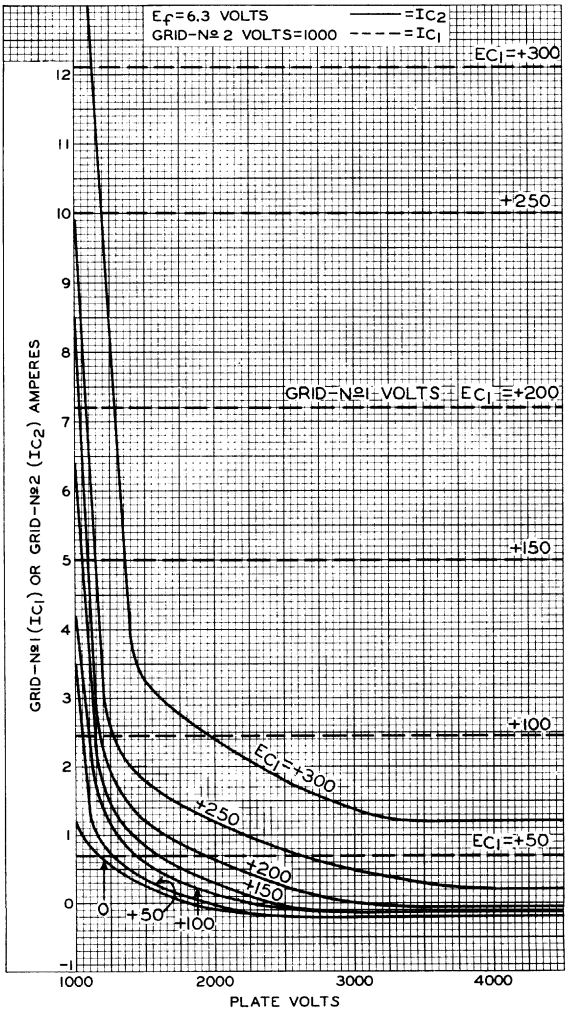
92CM-10491

TYPICAL CHARACTERISTICS



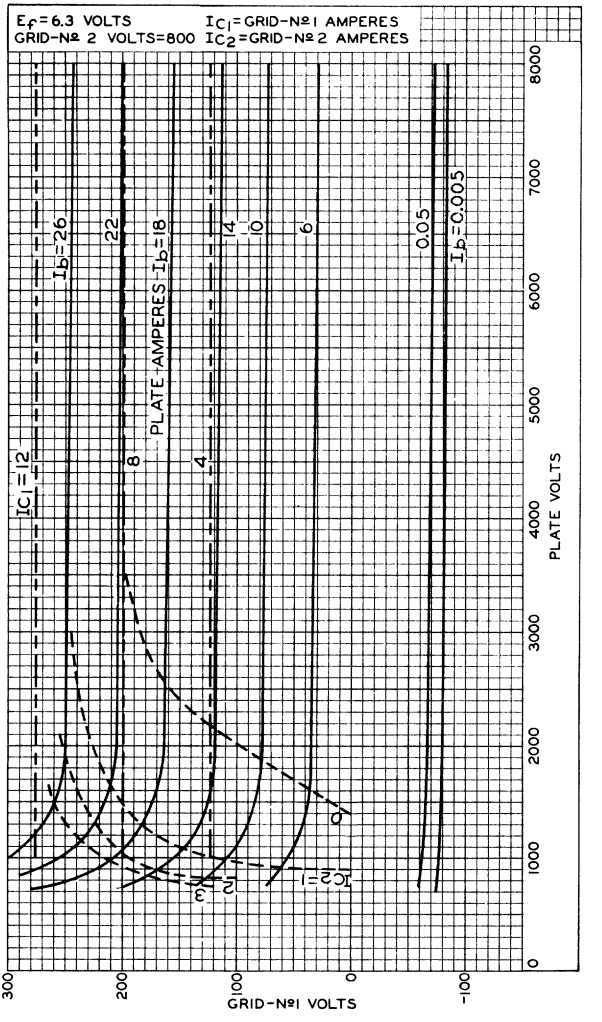
92CM-10502

TYPICAL CHARACTERISTICS



92CM-10501RI

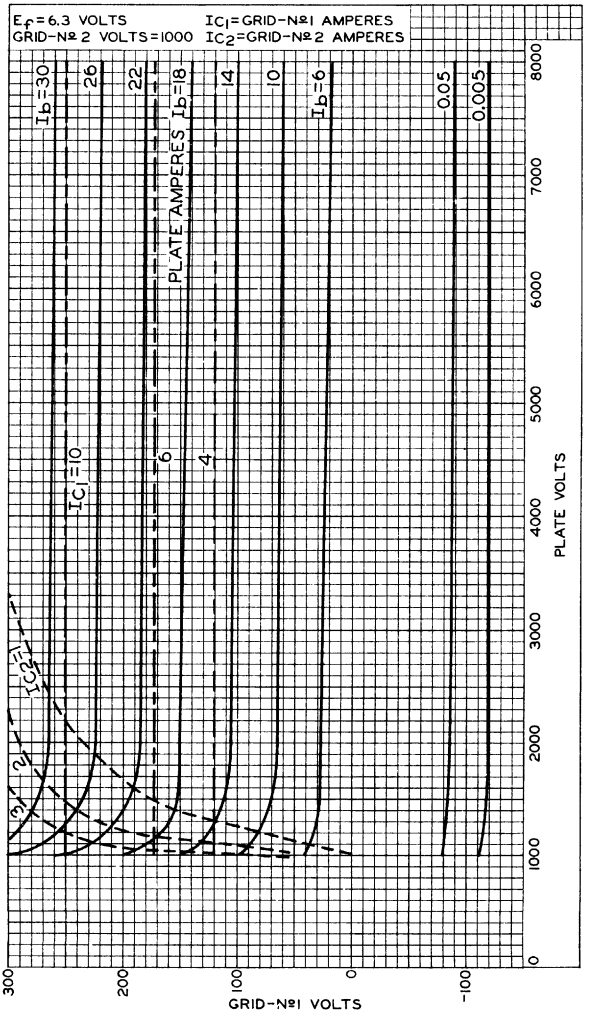
TYPICAL CONSTANT-CURRENT CHARACTERISTICS



92CM-10490RI

7651

TYPICAL CONSTANT-CURRENT CHARACTERISTICS



92CM-10489RI

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

7717/6CY5

Sharp-Cutoff Tetrode

7-PIN MINIATURE TYPE

For Mobile-Communications Equipment

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*

Voltage (AC or DC)	$6.3^{+1.2}_{-0.3}$		volts
Current at heater volts = 6.3	0.200		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	100	max.	volts
Heater positive with respect to cathode	100[a]	max.	volts
Direct Interelectrode Capacitances:[b]			
Grid No.1 to plate	0.03	max.	μμf
Grid No.1 to cathode & internal shield, grid No.2, and heater	4.4		μμf
Plate to cathode & internal shield, grid No.2, and heater	2.74		μμf

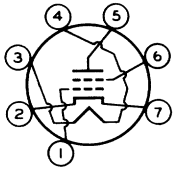
Characteristics, Class A_1 Amplifier:

Plate Voltage	125	volts
Grid-No.2 Voltage	80	volts
Grid-No.1 Voltage	-1	volt
Plate Resistance (Approx.)	0.125	megohm
Transconductance	8000	μmhos
Plate Current	10	ma
Grid-No.2 Current	1.4	ma
Grid-No.1 Voltage (Approx.) for transconductance (μmhos) = 100	-5	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7EW

Pin 1 – Grid No.1
Pin 2 – Cathode, Internal Shield
Pin 3 – Heater
Pin 4 – Heater



Pin 5 – Plate
Pin 6 – Grid No.2
Pin 7 – Cathode, Internal Shield

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
DATA
5-62

AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	180 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	180 max.	volts
GRID-No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
CATHODE CURRENT	20 max.	ma
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 90 volts	0.5 max.	watt
For grid-No.2 voltages between 90 and 180 volts	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	2 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.5 max.	megohm

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling:

Cycles of Intermittent Operation	2000 min.	cycles

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Transconductance at Reduced Heater Voltage:

Average Value	5900	μmhos

With heater volts = 5.0, plate volts = 125, grid-No.2 volts = 80, grid-No.1 volts = -1.

[a] The dc component must not exceed 50 volts.
[b] With external shield JEDEC No.316 connected to cathode.

7724/14GT8

Twin Diode—High-Mu Triode

9-PIN MINIATURE TYPE

For Mobile-Communications Equipment

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values)*:			
Voltage (AC or DC)	14.0[a]		volts
Current at heater volts = 14.0	0.150		amp
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts
Direct Interelectrode Capacitances:[c]			
Triode Unit:			
Grid to plate	1.8		μμf
Grid to cathode and heater	1.6		μμf
Plate to cathode and heater	0.24		μμf
Diode Units:			
Diode-No.1 plate to triode grid	0.09	max.	μμf
Diode-No.2 plate to triode grid	0.07	max.	μμf
Either diode cathode to all other tube electrodes	6.5		μμf
Diode plate to cathode and heater (Each unit)	2.4		μμf

Characteristics, Class A_1 Amplifier (Triode Unit):

Plate Voltage	250	volts
Grid Voltage	-3	volts
Amplification Factor	72	
Plate Resistance (Approx.)	72000	ohms
Transconductance	1000	μmhos
Plate Current	0.7	ma

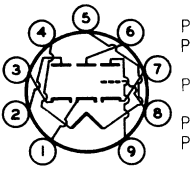
Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

7724/14GT8

Basing Designation for BOTTOM VIEW. 9KR

Pin 1 – Diode-No.2 Cathode
Pin 2 – Diode-No.1 Plate
Pin 3 – Diode-No.1 Cathode
Pin 4 – Heater



Pin 5 – Heater
Pin 6 – Diode-No.2 Plate
Pin 7 – Triode Cathode
Pin 8 – Triode Grid
Pin 9 – Triode Plate

TRIODE UNIT — AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE.	330 max.	volts
GRID VOLTAGE:		
Positive-bias value.	0 max.	volts
PLATE DISSIPATION.	1.1 max.	watts

DIODE UNITS — Two

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE CURRENT.	5 max.	ma

Characteristics, Instantaneous Value:

Plate Current for plate volts = 5.	18	ma

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling:

Cycles of Intermittent Operation . . . . . 2000 min. cycles

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 18.9 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Transconductance at Reduced Heater Voltage (Triode Unit):

Average Value. . . . . 900 μmhos

With heater volts = 10.8, plate volts = 250, and grid volts = -3.

[a] For satisfactory operation, it is recommended that the heater be operated within the voltage range of 12.0 to 15.0 volts.
[b] The dc component must not exceed 100 volts.
[c] Without external shield.

7801

Beam Power Tube

CERAMIC-METAL SEALS	52.5-WATTS CW INPUT
"ONE-PIECE" ELECTRODE DESIGN	27-WATTS CW OUTPUT AT 400 Mc
CONDUCTION COOLED	15-WATTS CW OUTPUT AT 1200 Mc
COAXIAL-ELECTRODE STRUCTURE	3.2-WATTS CW OUTPUT AT 3000 Mc

UNIPOTENTIAL CATHODE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)[a]	12.6 ± 10%	volts
Current at 12.6 volts	0.5	amp
Minimum heating time	40	sec
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 250, grid-No.2 volts = 250, and plate ma. = 35.	30	
Direct Interelectrode Capacitances:[b]		
Grid No.1 to plate	0.025 max.	μμf
Grid No.1 to cathode & heater	9.5	μμf
Plate to cathode & heater	0.004 max.	μμf
Grid No.1 to grid No.2	17	μμf
Grid No.2 to plate	2.2	μμf
Grid No.2 to cathode & heater	0.18 max.	μμf

Mechanical:

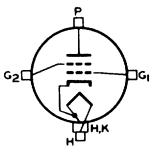
Operating Position	Any
Maximum Overall Length	1.195"
Greatest Diameter (See *Dimensional Outline*)	0.740"
Weight (Approx.)	0.5 oz

Terminal Connections (See *Dimensional Outline*):

G_1 - Grid-No.1-Terminal Contact Surface

G_2 - Grid-No.2-Terminal Contact Surface

H - Heater-Terminal Contact Surface



H,K - Heater- & Cathode-Terminal Contact Surface

P - Plate-Terminal Contact Surface

Thermal:

Terminal Temperature (Plate, grid No.2, grid No.1, cathode, and heater)	250 max.	°C

Cooling, Conduction:

The plate terminal must be thermally coupled to a constant-temperature device (heat sink—solid or liquid) to limit the plate terminal to the specified maximum value of 250° C. The grid-No.2, grid-No.1, cathode, and heater terminals may also require coupling to the heat sink to limit their respective terminal temperature to the specified maximum value of 250° C.

7801

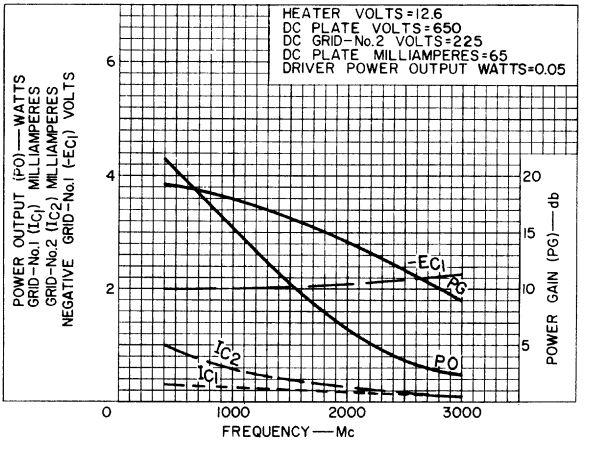
RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS[c] Ratings, *Absolute-Maximum Values:*

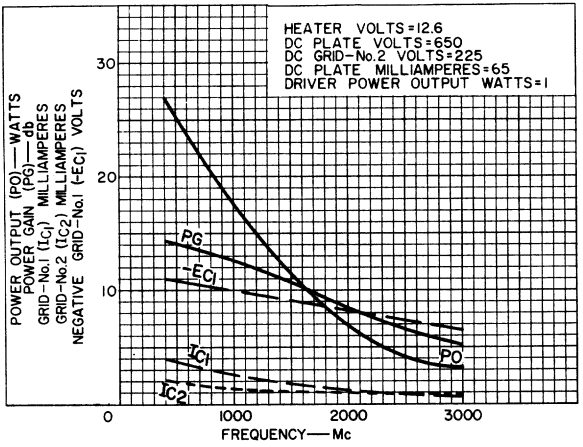
DC PLATE VOLTAGE	750	max.	volts
DC GRID-No.2 VOLTAGE	250	max.	volts
DC GRID-No.1 VOLTAGE	-100	max.	volts
DC PLATE CURRENT	70	max.	ma
DC GRID-No.1 CURRENT	15	max.	ma
PLATE INPUT	52.5	max.	watts
GRID-No.2 INPUT	2	max.	watts
PLATE DISSIPATION	[d]		

Typical CCS Operation in Cathode-Drive Circuit:

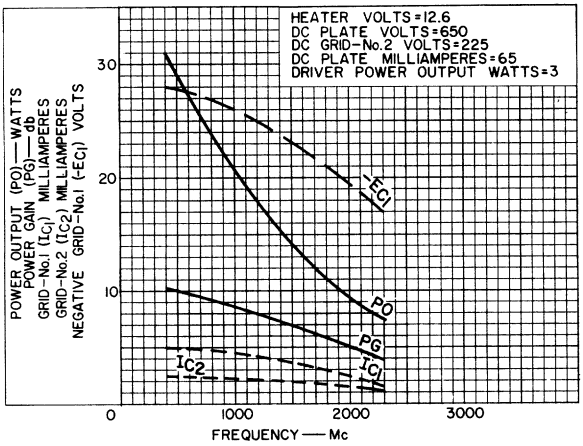
Shown Graphically in the following three Charts 92CS-10945, -10944, and -10942



92CS-10945



92CS-10944



92CS-10942

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

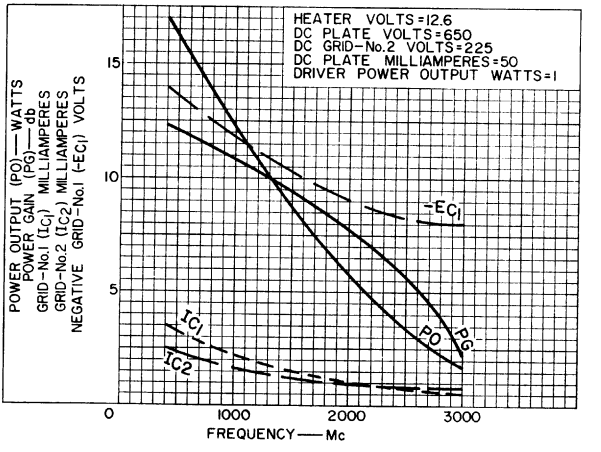
Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS[c] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	750	max.	volts
DC GRID-No.2 VOLTAGE	250	max.	volts
DC GRID-No.1 VOLTAGE	-100	max.	volts
DC PLATE CURRENT	60	max.	ma
DC GRID-No.1 CURRENT	15	max.	ma
PLATE INPUT	45	max.	watts
GRID-No.2 INPUT	2	max.	watts
PLATE DISSIPATION[d]			

Typical CCS Operation in Cathode-Drive Circuit:

Shown Graphically in the following Chart 92CS-10943



92CS-10943

AF POWER AMPLIFIER & MODULATOR and LINEAR RF POWER AMPLIFIER Single-Sideband Suppressed-Carrier Service

Maximum CCS[c] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	750	max.	volts
DC GRID-No.2 VOLTAGE	250	max.	volts
MAX.-SIGNAL DC PLATE CURRENT[e]	70	max.	ma
MAX.-SIGNAL DC GRID-No.1 CURRENT[e]	15	max.	ma
MAX.-SIGNAL PLATE INPUT[e]	52.5	max.	watts

MAX.-SIGNAL GRID-No.2 INPUT[e]	2	max.	watts
PLATE DISSIPATION[e]	[d]		

RF POWER AMPLIFIER — Class B Telephony

Maximum CCS[c] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	750	max.	volts
DC GRID-No.2 VOLTAGE	250	max.	volts
DC PLATE CURRENT	35	max.	ma
DC GRID-No.1 CURRENT	8	max.	ma
PLATE INPUT	52.5	max.	watts
GRID-No.2 INPUT	2	max.	watts
PLATE DISSIPATION	[d]		

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition	30000	max.[f]	ohms

[a] Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

[b] Measured with special shield adapter.

[c] Continuous Commercial Service.

[d] Maximum plate dissipation is a function of the maximum plate input, efficiency of the class of service, and the effectiveness of the cooling system. See *Cooling, Conduction* under *General Data*, and also *Cooling Considerations.*

[e] Averaged over any audio-frequency cycle of sine-wave form for *AF Power Amplifier & Modulator Service.*

[f] If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.44	0.54	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	–	0.025	μμf
Grid No.1 to cathode & heater	2	8.5	10.3	μμf
Plate to cathode & heater	2	–	0.004	μμf
Grid No.1 to grid No.2	2	14	20.6	μμf
Grid No.2 to plate	2	2.1	2.5	μμf
Grid No.2 to cathode & heater	2	–	0.18	μμf
Grid-No.1 Voltage	1,3	-1	-10	volts
Grid-No.1 Cutoff Voltage	1,4	–	-25	volts
Grid-No.2 Current	1,3	-3	2	ma
Positive Grid-No.1 Voltage	1,5	0	14	volts
Transconductance	1,6	7500	–	μmhos

Note 1: With 12.6 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage of 750 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 35 ma.

Note 4: With dc plate voltage of 750 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 1 ma.

Note 5: With dc plate voltage of 300 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage of -100 volts. Rectangular pulses, pulse duration of 4500 to 5000 microseconds and pulse-repetition frequency of 10 to 12 pps. The positive-pulse grid-No.1 voltage is adjusted to give a plate current of 300 ma. at leading edge of pulse.

Note 6: With dc plate voltage of 300 volts, dc grid-No.2 voltage of 150 volts, dc grid-No.1 voltage adjusted to give a dc plate current of 35 ma.

COOLING CONSIDERATIONS

The conduction-cooling system consists, in general, of a constant-temperature device (heat sink) and suitable heat-flow path (coupling) between the heat sink and tube. Careful consideration should be given to the design of a heat-flow path through a coupling device having high thermal conductivity.

Thermal conductivity[g] may be calculated from the equation:

$$K = \frac{W}{A \frac{(T_2 - T_1)}{L}} \qquad (1)$$

where:

K = thermal conductivity of the material

W = power transfer in watts

A = area measured at right angles to the direction of the flow of heat in square inches

T_1, T_2 = temperature in degrees Centigrade of planes or surfaces under consideration

L = length of heat path in inches through coupling material to produce temperature gradient

[g] Thermal conductivity is defined as the time rate of transfer of heat by conduction, through unit thickness, across unit area for unit difference of temperature. It is measured in watts per square inch for a thickness of one inch and a difference of temperature of 1° C.

For a given system Equation (1) must be integrated to consider changes in area (A) dependent on the coupling configuration and changes in thermal conductivity (K) dependent on various coupling materials and interfaces. Equation (1) may now be reduced to the following:

$$K_S = \frac{W_P}{T_2 - T_1} \qquad (2)$$

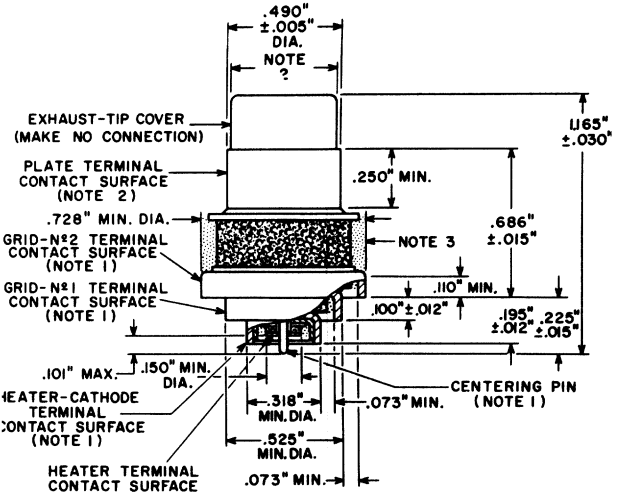
where:

K_S = thermal conductance of the system

W_P = maximum permissible plate dissipation in watts

T_2 = temperature in degrees Centigrade at tube terminal

T_1 = temperature in degrees Centigrade of heat sink

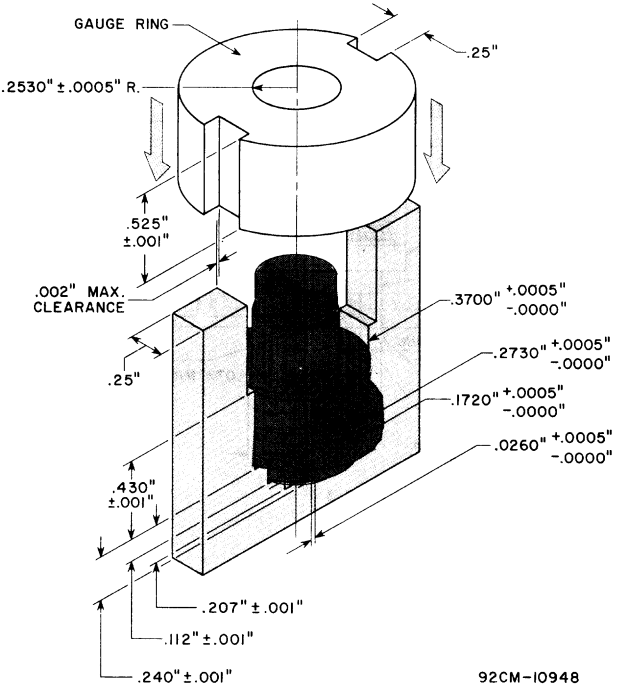


NOTE 1: WITH THE CYLINDRICAL SURFACES OF THE GRID-No.2 TERMINAL, GRID-No.1 TERMINAL, HEATER-CATHODE TERMINAL, AND CENTERING PIN CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G_1.

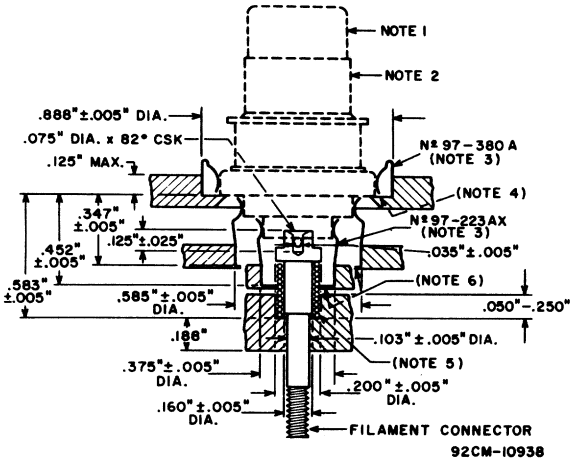
NOTE 2: WITH THE TUBE SEATED IN GAUGE AND WITH THE PLATE TERMINAL CLEAN, SMOOTH, AND FREE OF BURRS, THE GAUGE RING WILL SLIP OVER PLATE TERMINAL SHOWN IN SKETCH G_1 AND NOT EXTEND ABOVE GAUGE. THE TUBE WILL ROTATE 360° FREELY AND WILL NOT EXTEND ABOVE GAUGE RING.

NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.

SKETCH G_1


GAUGE RING
.25"
.2530" ±.0005" R.
.525" ±.001"
.002" MAX. CLEARANCE
.3700" +.0005" -.0000"
.25"
.2730" +.0005" -.0000"
.1720" +.0005" -.0000"
.0260" +.0005" -.0000"
.430" ±.001"
.207" ±.001"
.112" ±.001"
.240" ±.001"
92CM-10948

SUGGESTED MOUNTING ARRANGEMENT & LAYOUT OF ASSOCIATED CONTACTS



NOTE 1: MAKE NO CONNECTION.

NOTE 2: IF A CLAMP IS USED, IT MUST BE ADJUSTABLE IN A PLANE NORMAL TO THE MAJOR TUBE AXIS TO COMPENSATE FOR VARIATIONS IN CONCENTRICITY BETWEEN THE PLATE TERMINAL AND THE REMAINING CONTACT TERMINALS.

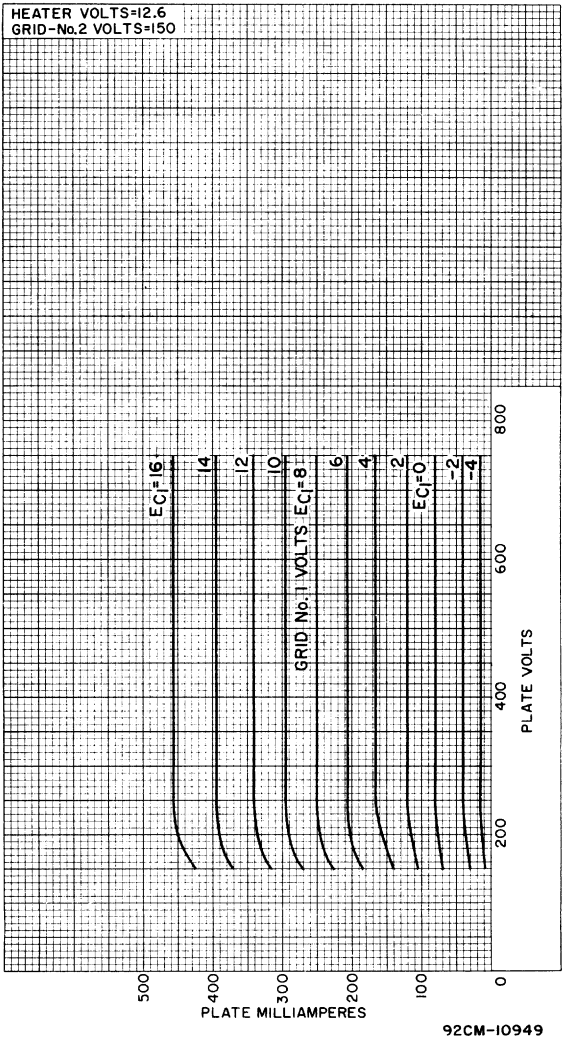
NOTE 3: MADE BY INSTRUMENTS SPECIALTIES COMPANY, LITTLE FALLS, NEW JERSEY.

NOTE 4: SEAT TUBE SUCH THAT GRID-No.2 TERMINAL EDGE MAKES A POSITIVE STOP ON SHOULDER.

NOTE 5: SPRING IS 0.600 INCH IN LENGTH AND 30 TURNS PER INCH OF 0.015-INCH-DIAMETER STEEL MUSIC WIRE.

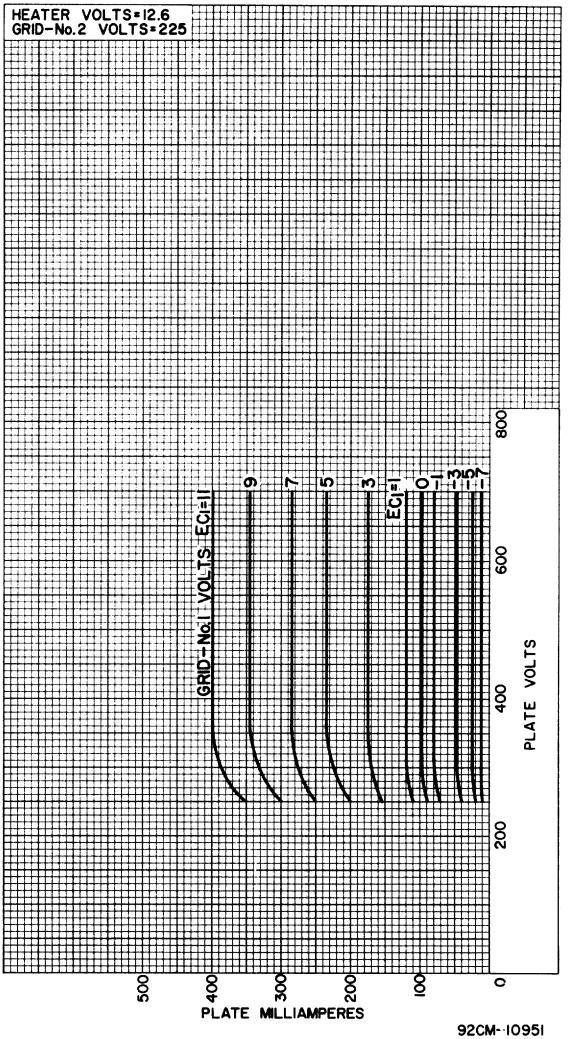
NOTE 6: FINGER STOCK TO SEAT ON 0.013-INCH LIP.

TYPICAL PLATE CHARACTERISTICS



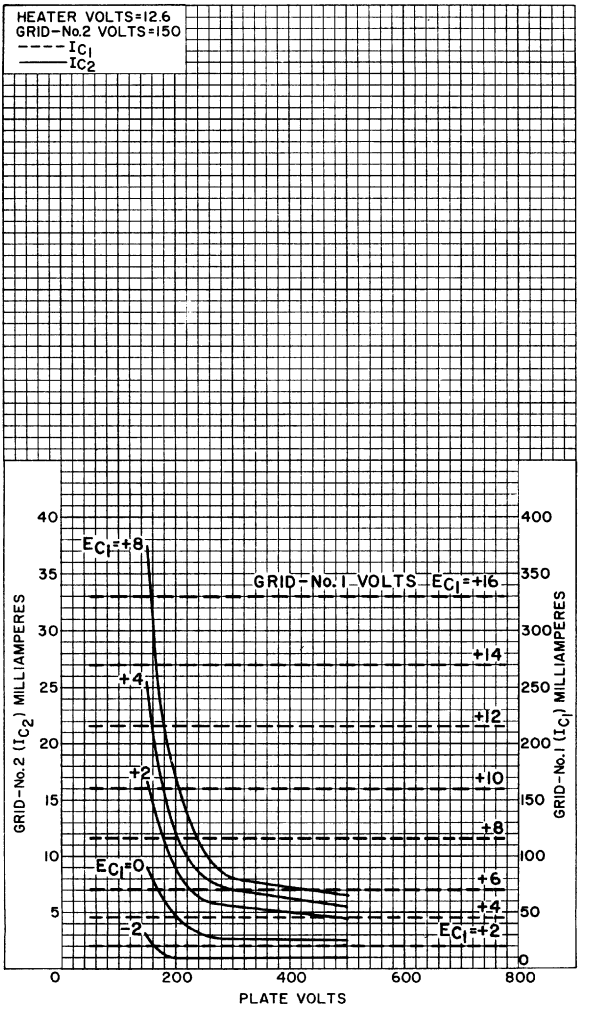
92CM-10949

TYPICAL PLATE CHARACTERISTICS



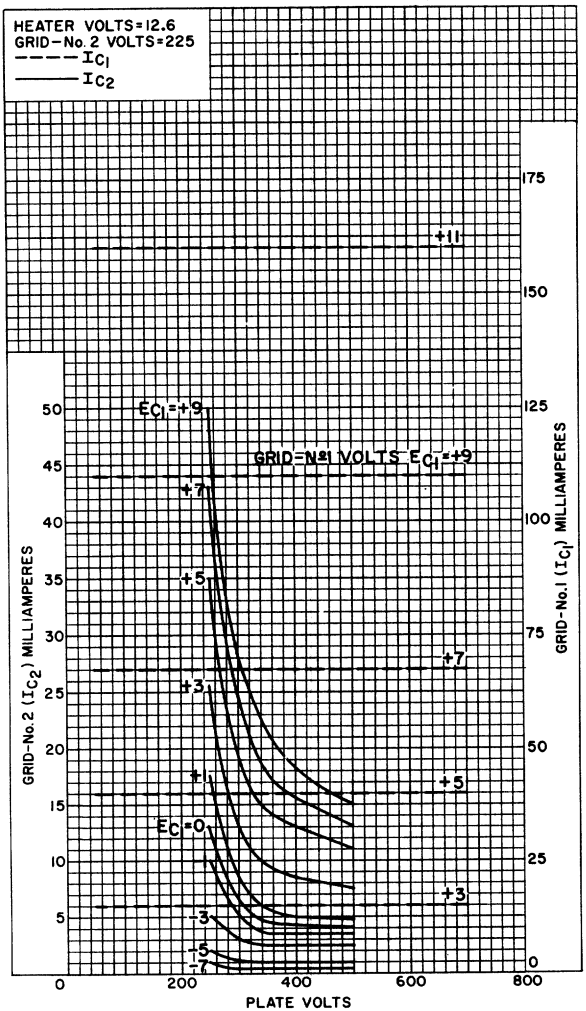
92CM-10951

TYPICAL CHARACTERISTICS



92CM-10950

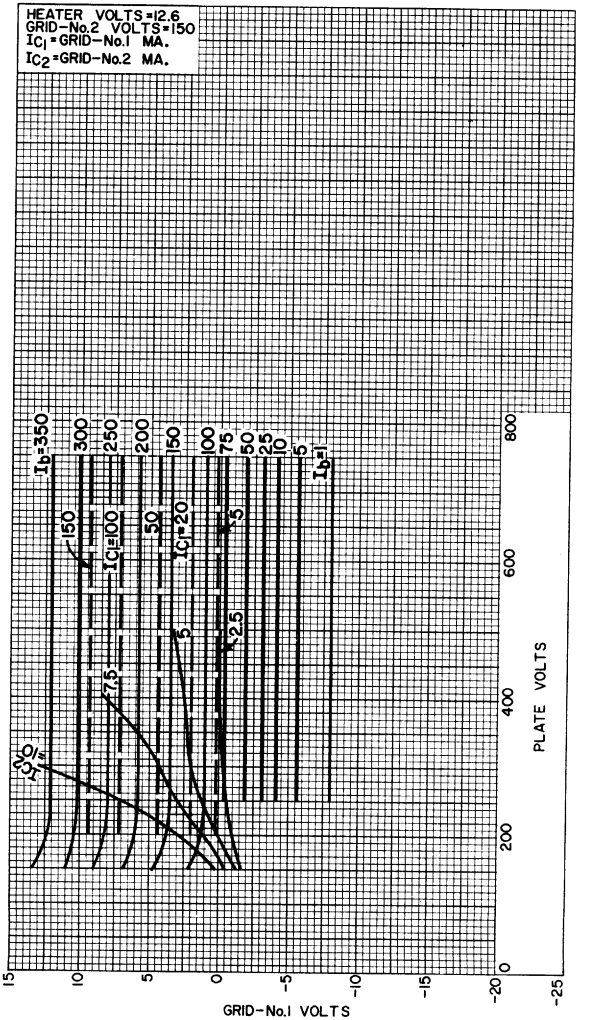
TYPICAL CHARACTERISTICS



92CM-10954

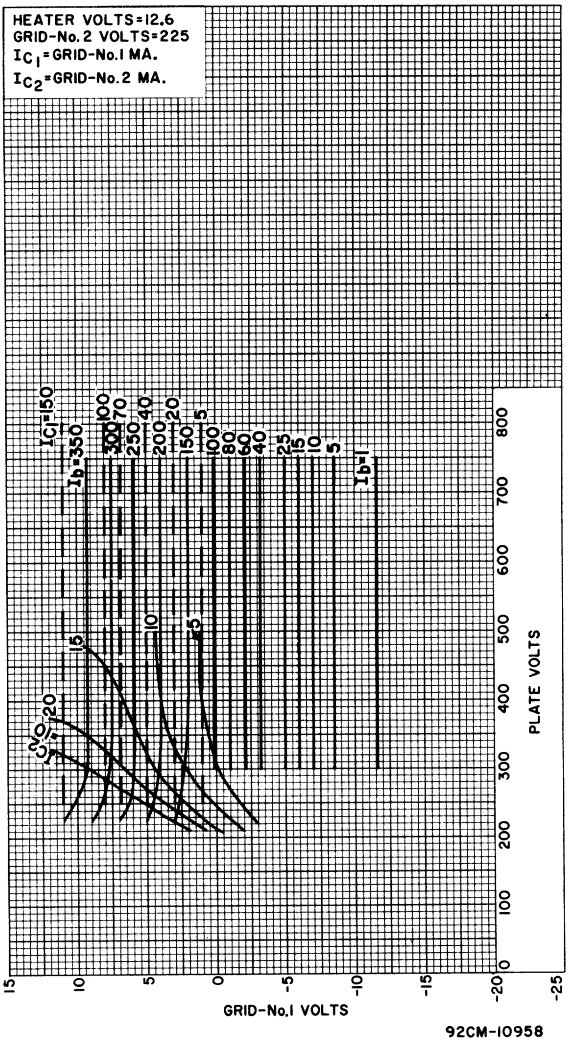
7801

TYPICAL CONSTANT-CURRENT CHARACTERISTICS



92CM-10952

TYPICAL CONSTANT-CURRENT CHARACTERISTICS



92CM-10958

7835

Super-Power Triode

10 MW SHORT-PULSE POWER, 5 MW LONG-PULSE POWER

CERAMIC-METAL SEALS — **INTEGRAL WATER DUCTS**
DOUBLE-ENDED CONSTRUCTION — **17.00 INCHES MAX. LENGTH**
COAXIAL-ELECTRODE STRUCTURE — **24.00 INCHES MAX. DIAMETER**

WATER COOLED

For Use as a Plate-Pulsed Amplifier at Frequencies up to 300 MHz, for Long Range Search Radar, Pulsed Transmission in Communications Service, and Particle Accelerator Service.

ELECTRICAL

Filamentary Cathode Multistrand Thoriated Tungsten[m]—		
Current (DC):		
Typical operating value	6600[a]	A
Maximum value	7000[a]	A
Maximum value for starting even momentarily	2000	A
Minimum time to reach operating current	30	s
Minimum time at normal operating current before plate voltage is supplied	60	s
Voltage (DC):[b]		
Typical range value for prescribed operating current	3.1 to 4.2	V
Maximum value under any condition	4.65	V
Direct Interelectrode Capacitances		
Grid to plate	150	pF
Grid to cathode	1600	pF
Plate to cathode	less than 1.0	pF

MECHANICAL

Operating Position	Tube axis vertical, either end up	
Overall Length	17.00 max	in
Maximum Diameter	24.00 max	in
Terminal Connections	See *Dimensional Outline*	
Weight		
Uncrated	190	lb
Crated	355	lb

THERMAL[n,p]

Ceramic-Bushing Temperature	150 max	°C
Metal-Surface Temperature	150 max	°C
Minimum Storage Temperature	-65 min	°C

Water Flow

	Typ. Flow g/m	*Absolute Min. Flow* g/m	*Pressure Differential for Typ. Flow*[c] psi
To plate, total flow for two parallel input and output coolant courses:			
For plate dissipation up to 50 kW (Average)	40	35	5
For plate dissipation of 150 kW (Average)	100	90	30

Water Flow (cont'd)

	Typ. Flow g/m	Absolute Min. Flow g/m	Pressure Differential for Typ. Flow[c] psi
For plate dissipation of 300 kW (Average)	160	150	45
To upper grid coolant course	3	2	25 max
To lower grid coolant course	3	2	25 max
To grid-cathode coolant course	35	30	30 max

Resistivity of water at 25° C:		
Plate and grid water	1 min	MΩ-cm
Grid-cathode water	5 min	MΩ-cm
Water temperature from any outlet	70 max	°C
External gas pressure[d]	65 max	psig
Gauge pressure at an inlet[d]	90 max	psig

TERMINAL DIAGRAM (Bottom View)

GUORF – Upper RF Grid Output Terminal
GLIRF – Lower RF Grid Input Terminal
GLORF – Lower RF Grid Output Terminal
PLRF – Lower RF Plate Terminal
PURF – Upper RF Plate Terminal
FI – Filament Terminal (Inner)
FO – Filament Terminal (Outer)
KURF – Upper RF Cathode Terminal
KLRF – Lower RF Cathode Terminal
GUIRF – Upper RF Grid Input Terminal

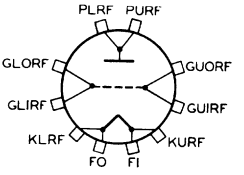


PLATE-PULSED AMPLIFIER—Class B[g]

For frequencies up to 300 MHz, and a maximum "ON" time[e] of 2200 microseconds in any 34000-microsecond interval

Absolute-Maximum Ratings

Peak Positive-Pulse Plate Voltage[f]	40	kV
Peak Negative Grid Voltage	250	V
Peak Plate Current	300	A
Peak Cathode Current[g]	600	A
DC Plate Current	19.5	A
DC Cathode Current[g]	39	A
Plate Input (Average)	487	kW
Plate Dissipation (Average)	300	kW

Typical Operation

In a cathode drive circuit, with rectangular-waveshape pulses, with duty factor[h] of 0.06 pulse duration of 2000 microseconds, and at a frequency of 250 MHz

Peak Positive-Pulse Plate-to-Grid Voltage[f]	34	kV
Peak Cathode-to-Grid Voltage[j]	100	V
Peak Plate Current	265	A

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Peak Cathode Current[g]	400	A
DC Plate Current	15.6	A
DC Cathode Current[g]	25	A
Peak Driver Power Output[k]	150	kW
Useful Power Output at Peak of Pulse (Approx.)	5	MW

Absolute-Maximum Ratings

For frequencies up to 300 MHz and a maximum "ON" time[e] of 25 microseconds in any 2500-microsecond interval

Peak Positive-Pulse Plate Voltage[f]	65	kV
Peak Negative Grid Voltage	500	V
Peak Plate Current	325	A
Peak Cathode Current[g]	500	A
DC Plate Current	3.25	A
DC Cathode Current[g]	5.5	A
Plate Input (Average)	212	kW
Plate Dissipation (Average)	150	kW

Typical Operation

In a cathode-drive circuit, with rectangular-waveshape pulses, at 250 MHz with duty factor[h] of 0.006, and pulse of 25 microseconds

Peak Positive-Pulse Plate-to-Grid Voltage[f]	60	34	kV
Peak Cathode-to-Grid Voltage[j]	300	100	V
Peak Plate Current	280	260	A
Peak Cathode Current[g]	430	400	A
DC Plate Current	2.8	2.6	A
DC Cathode Current[g]	5	4.5	A
Peak Driver Power Output[k]	200	150	kW
Useful Power Output at Peak of Pulse (Approx.)	10	5	MW

CHARACTERISTICS RANGE VALUES

	Min	*Max*	
Input Strap-Resonant Frequency	90	140	MHz
Output Strap-Resonant Frequency	240	280	MHz

[a] The specified maximum filament current is a maximum rating which should not be exceeded, even momentarily, during operation of the tube. The life of the tube can be conserved by operating the filament at the lowest current which will enable the tube to provide the desired power output. Because the filament when operated near the maximum value usually provides emission in excess of any requirements within the tube ratings, the filament current should be reduced to a value that will give adequate but not excessive emission for any particular application. Good regulation of the filament current is, in general, economically advantageous from the viewpoint of the tube life.

[b] Measured between KLRF and KURF (See *Terminal Diagram*).

[c] Measured directly across cooled element for the indicated typical flow.

[d] With the gauge located in an area where the maximum pressure external to the gauge is one atmosphere absolute.

[e] "ON" time is defined as the sum of the duration of all individual pulses which occur during the indicated interval. *Pulse duration* is defined as the time interval between the two points on the pulse at which the instantaneous value is 50% of the peak power value. The *peak value* is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

[f] The magnitude of any spike on the plate voltage pulse should not exceed its peak value by more than 10%, and the duration of any spike when measured at the peak-value level should not exceed 5% of the pulse duration as defined in note(e). The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

g Peak or average cathode current is the total of the peak or average plate current and the peak or average rectified grid current. (Pulses are not coincident, hence they cannot be added arithmetically).

h Duty factor is the product of the pulse duration and repetition rate.

j Preferably obtained from a cathode bias resistor.

k The driver stage is required to supply tube losses, rf circuit losses, and rf power added to the plate circuit. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

The following footnotes apply to the *RCA Transmitting Tube Operating Considerations* given at the front of this section.

m See *Electrical Considerations* - Filament or Heater.

n See *Cooling Considerations* - Forced-Air Cooling.

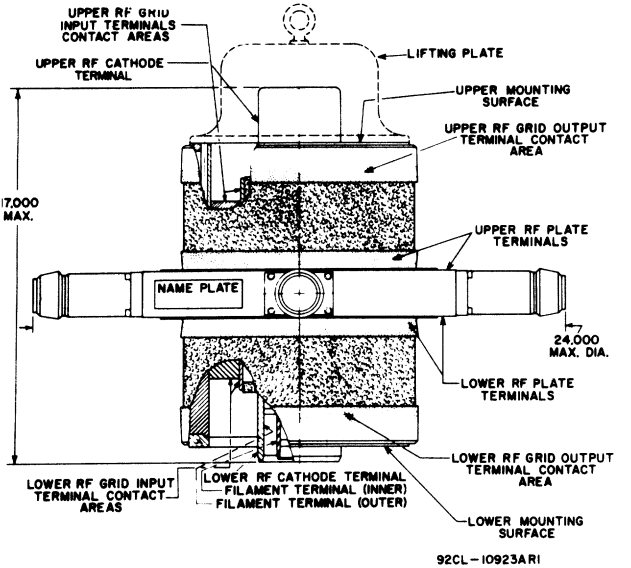
p See *Cooling Considerations* - Liquid Cooling.

q See *Classes of Service*.

FOR ADDITIONAL INFORMATION ON THIS TYPE, WRITE FOR TECHNICAL BULLETIN AND APPLICATION GUIDE FOR RCA SUPER POWER TUBES, ICE-279A AVAILABLE FROM:

Commercial Engineering
Electronic Components and Devices
Radio Corporation of America
Harrison, New Jersey

SIMPLIFIED DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

A detailed Dimensional Outline and associated Gauge Drawings are given in the Technical Bulletin available upon request.

7842

Beam Power Tube

CERMOLOX
Matrix-Type Cathode
Conduction Cooled
Linear RF Power Amplifier

Ruggedized
80 Watts CW Power Output at 400 MHz
40 Watts CW Power Output at 1215 MHz

ELECTRICAL

Heater for Matrix-Type, Oxide-Coated, Unipotential Cathode:		
Voltage (ac or dc)	6.3 ± 10%	V
Current at 26.5 volts	3.2	A
Minimum heating time	60	s
Mu-Factor, Grid No.2 to Grid No.1	18	

MAXIMUM CCS RATINGS, Absolute-Maximum Values

	Up to 1215 MHz	
DC Plate Voltage	1000	V
DC Grid-No.2 Voltage	300	V
DC Grid-No.1 Voltage	−100	V
DC Plate Current	180	mA
Plate Dissipation	115	W

MECHANICAL

Operating Position	Any
Weight (Approx.)	2 oz (0.06 kg)

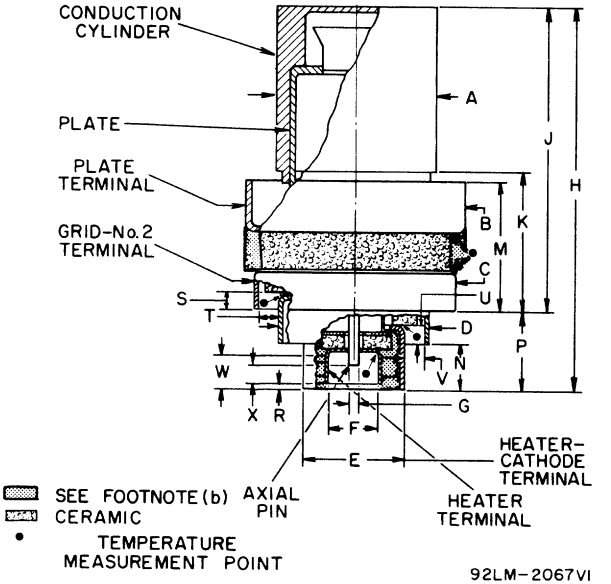
THERMAL[a]

Terminal Temperature (Plate, grid No.2, grid No.1, cathode, and heater)	250 max.	°C
Plate-Core Temperature	250 max.	°C

[a] See *Dimensional Outline* for temperature-measurement points.
[b] Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.

DIMENSIONAL OUTLINE



DIMENSION	INCHES	MILLIMETERS
A	0.900 ± .005	22.86 ± .1
B	1.085 Min.	27.56 Min.
C	0.985 Min.	25.02 Min.
D	0.735 Min.	18.67 Min.
E	0.480 Min.	12.32 Min.
F	0.260 Max.	6.60 Max.
G	0.062 Max.	1.57 Max.
H	1.88 ± .05	47.75 ± 1.27
J	1.51 ± .03	38.35 ± .76
K	0.730 ± .02	18.54 ± .51

DIMENSION	INCHES	MILLIMETERS
M	0.66 ± .02	16.76 ± .51
N	0.175 ± .015	4.45 ± .38
P	0.37 ± .02	9.40 ± .51
R	0.025 ± .025	0.64 ± .64
S	0.06 Min.	1.52 Min.
T	0.09 Min.	2.29 Min.
U	0.12 Min.	3.05 Min.
V	0.095 Min.	2.41 Min.
W	0.10 Min.	2.54 Min.
X	0.054 Min.	1.37 Min.

7843

Beam Power Tube

CERMOLOX

Oxide-Coated Cathode
Conduction Cooled

Linear RF Power Amplifier

80 Watts CW Power Output at 400 MHz

40 Watts CW Power Output at 1215 MHz

ELECTRICAL

Heater for Oxide-Coated Unipotential Cathode:	
Voltage (ac or dc)	26.5 ± 10%
Current at 26.5 volts	0.5 A
Minimum heating time	60 s
Mu-Factor, Grid No.2 to Grid No.1	18

MAXIMUM CCS RATINGS, Absolute-Maximum Values

	Up to 1215 MHz:	
DC Plate Voltage	1000	V
DC Grid-No.2 Voltage	300	V
DC Grid-No.1 Voltage	-100	V
DC Plate Current	180	mA
Plate Dissipation	115	W

MECHANICAL

Operating Position	Any
Weight (Approx.)	2 oz (0.06 kg)

THERMAL[a]

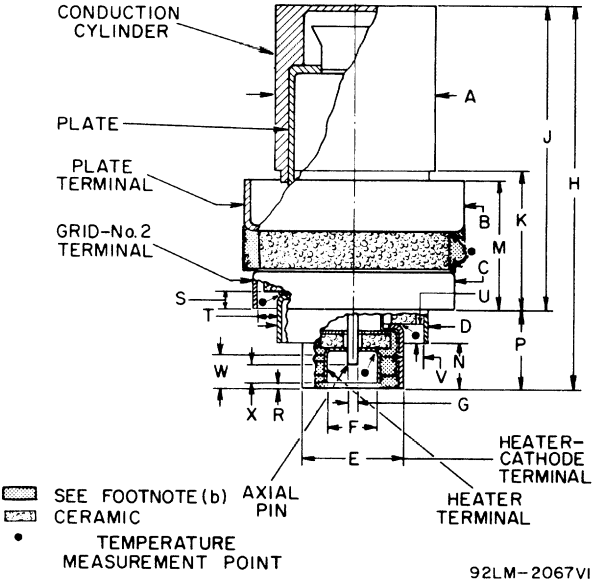
Terminal Temperature (Plate, grid No.2, grid No.1, cathode, and heater)	250 max. °C
Plate-Core Temperature	250 max. °C

[a] See *Dimensional Outline* for temperature measurement points.

[b] Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.

DIMENSIONAL OUTLINE



DIMENSION	INCHES	MILLIMETERS
A	0.900 ± .005	22.86 ± .1
B	1.085 Min.	27.56 Min.
C	0.985 Min.	25.02 Min.
D	0.735 Min.	18.67 Min.
E	0.480 Min.	12.32 Min.
F	0.260 Max.	6.60 Max.
G	0.062 Max.	1.57 Max.
H	1.88 ± .05	47.75 ± 1.27
J	1.51 ± .03	38.35 ± .76
K	0.730 ± .02	18.54 ± .51

DIMENSION	INCHES	MILLIMETERS
M	0.66 ± .02	16.76 ± .51
N	0.175 ± .015	4.45 ± .38
P	0.37 ± .02	9.40 ± .51
R	0.025 ± .025	0.64 ± .64
S	0.06 Min.	1.52 Min.
T	0.09 Min.	2.29 Min.
U	0.12 Min.	3.05 Min.
V	0.095 Min.	2.41 Min.
W	0.10 Min.	2.54 Min.
X	0.054 Min.	1.37 Min.

7868

Power Pentode

NOVAR TYPE

For Output Stages of High Fidelity Audio-Amplifiers and Radio Receivers

ELECTRICAL

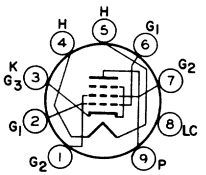
Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.800	amp
Maximum Heater-Cathode Voltage:		
Heater negative with respect to cathode.	200	volts
Heater positive with respect to cathode		
Peak	200	volts
DC component	100	volts
Direct Interelectrode Capacitances (Approx.):[a]		
Grid No.1 to plate	0.15	pf
Input: G1 to (K + G3, G2, H)	11.0	pf
Output: P to (K + G3, G2, H)	4.4	pf

MECHANICAL

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.110 in
Maximum Seated Length	2.730 in
Diameter	1.062 to 1.188 in
Bulb	T9
Dimensional Outline	See *General Section*
Bases (Alternates):	
Small-Button Novar 9-Pin	(JEDEC No.E9-75)
Small-Button Novar 9-Pin with Exhaust Tip	(JEDEC No.E9-89)

BASING DESIGNATION (Bottom View) ←

Pin 1 - Grid No.2
Pin 2 - Grid No.1
Pin 3 - Cathode, Grid No.3
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid No.1
Pin 7 - Grid No.2
Pin 8 - LC - See *Note*
Pin 9 - Plate



9RW

Note: May be used as tie point for components operating at or near the DC voltage of either the grid No.2 or plate, or between these voltages. Otherwise, do not use.

AF POWER AMPLIFIER — Class A1

Maximum Ratings, *Design-Maximum Values:*

Plate Voltage	550	volts
Grid-No.2 (Screen-Grid) Voltage	440	volts
Cathode Current	90	ma
Grid-No.2 Input	3.3[b]	watts
Plate Dissipation	19	watts
Bulb Temperature (At hottest point on bulb surface)	240	°C

← Indicates a change.

Typical Operation and Characteristics:

Plate Voltage	300	volts
Grid-No.2 Voltage	300	volts
Grid-No.1 (Control-Grid) Voltage	-10	volts
Peak AF Grid-No.1 Voltage	10	volts
Zero-Signal Plate Current	60	ma
Max.-Signal Plate Current	75	ma
Zero-Signal Grid-No.2 Current	8	ma
Max.-Signal Grid-No.2 Current	15	ma
Plate Resistance (Approx.)	29000	ohms
Transconductance	10200	μmhos
Effective Load Resistance	3000	ohms
Total Harmonic Distortion	13	%
Max.-Signal Power Output	11	watts

Maximum-Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.3	megohm
For cathode-bias operation	1	megohm

PUSH-PULL AF POWER AMPLIFIER — Class AB_1

Maximum Ratings, *Design-Maximum Values:*

Plate Voltage	550	volts
Grid-No.2 (Screen-Grid) Voltage	440	volts
Cathode Current	90	ma
Grid-No.2 Input	3.3[b]	watts
Plate Dissipation	19	watts
Bulb Temperature (At hottest point on bulb surface)	240	°C

Typical Operation:

Values are for 2 tubes

	Fixed Bias					Cathode Bias	
Plate Supply Voltage	300	350	400	450	450	450	volts
Grid-No.2 Supply Voltage	300	350	350	350	400	400	volts
Grid-No.1 Voltage	-12.5	-15.5	-16	-16.5	-21	[c]	volts
Cathode Resistor (Common to both cathodes)	-	-	-	-	-	170	ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage	25	31	32	33	42	31	volts
Zero-Signal Plate Current	74	72	64	60	40	86	ma
Max.-Signal Plate Current	116	130	135	142	145	94	ma
Zero-Signal Grid-No.2 Current	10	9.5	8	7.2	5	10	ma
Max.-Signal Grid-No.2 Current	28	32	28	26	30	20	ma

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	Fixed Bias					Cathode Bias	
Effective Load Resistance (Plate to plate)	6600	6600	6600	6600	6600	10000	ohms
Total Haromonic Distortion	5	2.5	2	2.5	5	2	%
Max.-Signal Power Output	24	30	34	38	44	28	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.3	megohm
For cathode-bias operation	1	megohm

PUSH-PULL AF POWER AMPLIFIER — Class AB_1

Grid No.2 of each tube connected to tap on plate winding of output transformer

Maximum Ratings, *Design-Maximum Values:*

Plate and Grid-No.2 (Screen-Grid) Supply Voltage	440	volts
DC Cathode Current	90	ma
Grid-No.2 Input	3.3[b]	watts
Plate Dissipation	19	watts
Bulb Temperature (At hottest point on bulb surface)	240	°C

Typical Operation:

Values are for 2 tubes

	Fixed Bias	Cathode Bias	
Plate Supply Voltage	400	425	volts
Grid-No.2 Supply Voltage	**d**	**d**	volts
Grid-No.1 Voltage	-20.5	**c**	volts
Cathode Resistor (Common to both cathodes)	-	185	ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage	41	42	volts
Zero-Signal Plate Current	60	88	ma
Max.-Signal Plate Current	115	100	ma
Zero-Signal Grid-No.2 Current	8	12	ma
Max.-Signal Grid-No.2 Current	18	16	ma
Effective Load Resistance (Plate to plate)	6600	6600	ohms
Total Harmonic Distortion	2.5	3.5	%
Max.-Signal Power Output	23	21	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.3	megohm
For cathode-bias operation	1	megohm

[a] Without external shield.

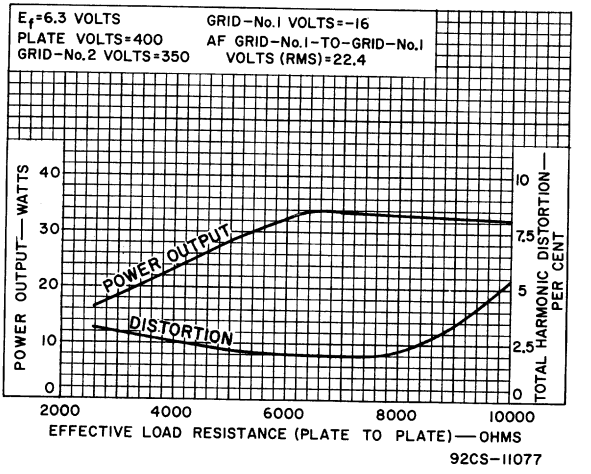
[b] Grid-No. 2 input may reach 6 watts during peak levels of speech and music signals.

[c] Connected to negative end of cathode resistor.

[d] Obtained from taps on the primary winding of the output transformer. The taps are located on each side of the center-tap (B+) so as to supply 50 per cent of the plate signal voltage to the grid No. 2 of each output tube.

Operation Characteristics

Push-Pull Class AB_1



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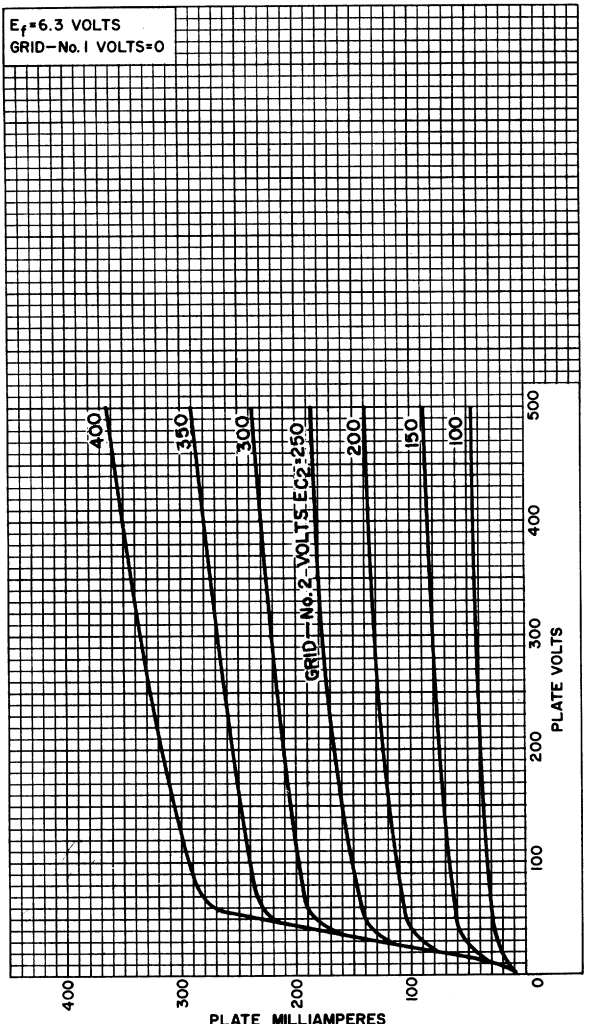
AVERAGE PLATE CHARACTERISTICS



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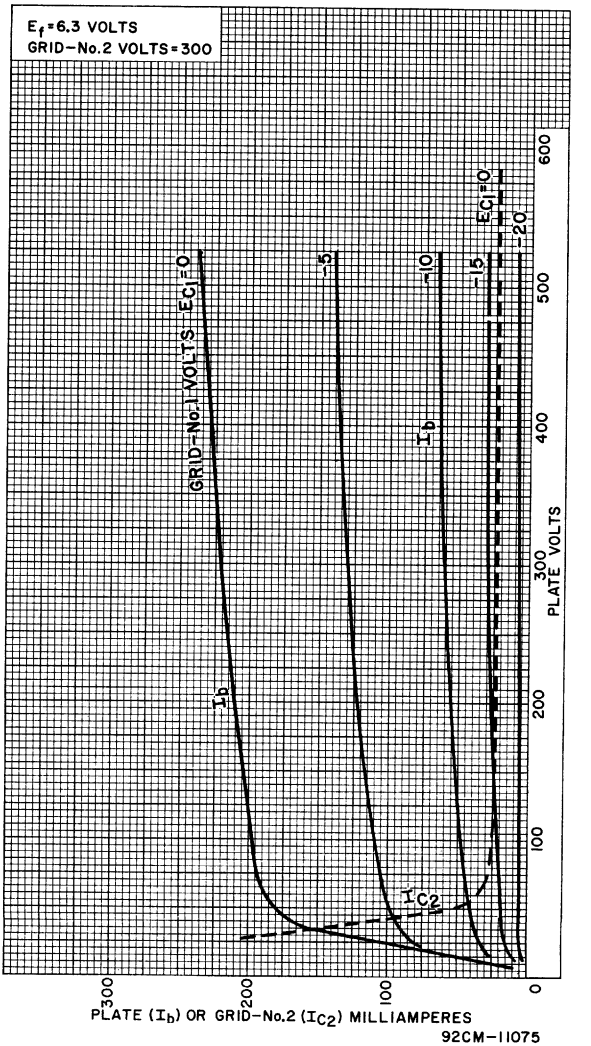
AVERAGE CHARACTERISTICS



92CM-11075

7870

Beam Power Tube

CERAMIC-METAL SEALS
"ONE-PIECE" ELECTRODE DESIGN
CONDUCTION COOLED
COAXIAL-ELECTRODE STRUCTURE

52.5-WATTS CW INPUT
27-WATTS CW OUTPUT AT 400 Mc
15-WATTS CW OUTPUT AT 1200 Mc
3.2-WATTS CW OUTPUT AT 3000 Mc

UNIPOTENTIAL CATHODE

The 7870 is the same as the 7801 except for the following items:

Heater, for Unipotential Cathode:

Voltage (AC or DC)[a]	6.3 ± 10%	volts
Current at heater volts = 6.3	1	amp

[a] Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.88	1.1	amp ◄
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	-	0.025	μμf
Grid No.1 to cathode & heater	2	8.5	10.3	μμf
Plate to cathode & heater	2	-	0.004	μμf
Grid No.1 to grid No.2	2	14	20.6	μμf
Grid No.2 to plate	2	2.1	2.5	μμf
Grid No.2 to cathode & heater	2	-	0.18	μμf
Grid-No.1 Voltage	1,3	-1	-10	volts
Grid-No.1 Cutoff Voltage	1,4	-	-25	volts
Grid-No.2 Current	1,3	-3	2	ma
Positive Grid-No.1 Voltage	1,5	0	14	volts
Transconductance	1,6	7500	-	μmhos

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage of 750 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 35 ma.

Note 4: With dc plate voltage of 750 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 1 ma.

Note 5: With dc plate voltage of 300 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage of -100 volts. Rectangular pulses, pulse duration of 4500 to 5000 microseconds and pulse-repetition frequency of 10 to 12 pps. The positive-pulse grid-No.1 voltage is adjusted to give a plate current of 300 ma. at leading edge of pulse.

Note 6: With dc plate voltage of 300 volts, dc grid-No.2 voltage of 150 volts, dc grid-No.1 voltage adjusted to give a dc plate current of 35 ma.

◄ Indicates a change.

7895

High-Mu Triode

NUVISTOR TYPE

For Industrial Applications

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.135	amp
Direct Interelectrode Capacitances (Approx.):		
Grid to plate	0.9	μμf
Grid to cathode, shell, and heater	4.2	μμf
Plate to cathode, shell, and heater	1.7	μμf
Plate to cathode	0.22	μμf
Heater to cathode	1.3	μμf

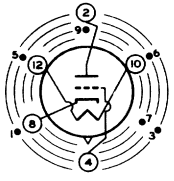
Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	110	volts
Grid Supply Voltage	0	volts
Cathode Resistor	150	ohms
Amplification Factor	64	
Plate Resistance (Approx.)	6800	ohms
Transconductance	9400	μmhos
Plate Current	7	ma
Grid Voltage (Approx.) for plate μa = 10	-4	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	0.800"
Maximum Seated Length	0.625"
Maximum Diameter	0.440"
Weight (Approx.)	1/15 oz
Envelope	Metal Shell
Socket	.Cinch Mfg. Corp. No.133 65 10 001, or equivalent
Base	.Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)
Basing Designation for BOTTOM VIEW	12AQ

Pin 1[a] - Internal Connection—Do Not Use
Pin 2 - Plate
Pin 3 - Same as Pin 1
Pin 4 - Grid
Pin 5 - Same as Pin 1
Pin 6 - Same as Pin 1
Pin 7 - Same as Pin 1
Pin 8 - Cathode
Pin 9 - Same as Pin 1
Pin 10 - Heater
Pin 12 - Heater



INDEX = LARGE LUG
● = PIN CUT OFF

INDUSTRIAL SERVICE

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

PLATE SUPPLY VOLTAGE	330 max.	volts
PLATE VOLTAGE	110 max.	volts
GRID VOLTAGE:		
Negative-bias value	55 max.	volts
Peak-positive value	2 max.	volts
GRID CURRENT	2 max.	ma
PLATE CURRENT	20 max.	ma
CATHODE CURRENT	15 max.	ma
PLATE DISSIPATION	1 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:[b]		
For fixed-bias operation	0.5 max.	megohm
For cathode-bias operation	1 max.	megohm

[a] Pin is cut off close to ceramic wafer.

[b] For operation at metal-shell temperatures up to 150° C.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.125	0.145	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	0.8	1	μμf
Grid to cathode, shell, and heater	2	3.4	5	μμf
Plate to cathode, shell, and heater	2	1.3	2.1	μμf
Heater to cathode	2	1	1.6	μμf
Plate to cathode	2	0.16	0.28	μμf
Plate Current (1)	1,3	5.5	8.8	ma
Plate Current (2)	1,4	–	50	μa
Transconductance (1)	1,3	7900	10900	μmhos
Transconductance (2)	3,5	6900	–	μmhos
Transconductance Change: Difference between Transconductance (1) and Transconductance (2), expressed in per cent of Transconductance (1)	–	–	15	%
Reverse Grid Current	1,6	–	0.1	μa
Amplification Factor	1,3	54	74	
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,7	–	5	μa
Heater positive with respect to cathode	1,7	–	5	μa

Leakage Resistance:				
Between grid and all other electrodes tied together	1,8	1000	–	megohms
Between plate and all other electrodes tied together	1,9	1000	–	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Measured in accordance with EIA Standard RS-191-A.

Note 3: With dc plate supply volts = 110, cathode resistor = 150 ohms, and cathode-bypass capacitor = 1000 μf.

Note 4: With dc plate volts = 110, dc grid volts = -5, and metal shell connected to ground.

Note 5: With 5.7 volts ac or dc on heater.

Note 6: With dc plate volts = 150, grid supply volts = -1.7, grid resistor = 0.5 megohm, and metal shell connected to ground.

Note 7: With 100 volts dc applied between heater and cathode.

Note 8: With grid 100 volts negative with respect to all other electrodes tied together.

Note 9: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration. . . . . 1000 max. g

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-impact (flyweight) Shock Machine and are subjected to 20 blows at the specified maximum impact acceleration. At the end of this test, tubes are criticized for change in transconductance, reverse grid current, and heater-cathode leakage current, and are then subjected to the Variable-Frequency Vibration Test described below.

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified vibrational acceleration. Tubes are rigidly mounted, supplied with normal heater voltage only, and subjected for 48 hours to 2.5-g vibrational acceleration at 60 cycles per second in a direction perpendicular to the longitudinal axis of the tube. At the end of this test, tubes are criticized for the same characteristics and end-point values as in the Shock Rating Test described above.

Variable-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run. The tube is operated under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate-load resistor of 2000 ohms. During operation, tube is vibrated in a direction perpendicular to the longitudinal axis of the tube through the frequency range from 50 to 15,000 cycles per second under the following conditions: a sweep rate of one octave per 30 seconds from

50 to 3000 cps, a 7-second sweep from 3000 to 15,000 cps, and a constant vibrational acceleration of 1 g. During the test, tube must not show an rms output voltage in excess of: (1) 35 millivolts from 50 to 3000 cps, (2) 60 millivolts from 3000 to 6000 cps, and (3) 500 millivolts from 6000 to 15,000 cps.

Low-Pressure Voltage-Breakdown Test:

This test is performed on a sample lot of tubes from each production run. In this test, tubes are operated with 240 rms volts applied between plate and all other electrodes and will not break down or show evidence of corona when subjected to air pressures equivalent to altitudes of up to 100,000 feet.

Heater Cycling:

Cycles of Intermittent Operation . . . . . 2000 min. cycles

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 7.5 cycled one minute on and two minutes off; heater 100 volts negative with respect to cathode; grid, plate, and metal shell connected to ground. At the end of this test, tubes are tested for open heaters, heater-cathode shorts, and heater-cathode leakage current.

Shorts and Continuity:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-ID, Amendment 2, paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper[c]. See accompanying *Shorts-Test Acceptance-Limits* curve. Tubes are criticized for permanent or temporary shorts and open circuits.

Early-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that tubes are properly stabilized. In this test, tubes are operated for 20 hours at maximum-rated plate dissipation. After 2 hours of operation and again after 20 hours of operation, tubes are checked for transconductance under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1). A tube is rejected if its transconductance after two or 20 hours of operation has changed more than 10 per cent from the 0-hour value.

100-Hour Life Performance:

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early-hour inoperatives. Tubes are operated for 100 hours at maximum-rated plate dissipation, and then subjected to the Shorts and Continuity test previously described. Tubes must show a value not less than 6200 micromhos for Transconductance (1), and a value not greater than 0.2 microamperes for reverse grid current under conditions specified in CHARACTERISTICS RANGE VALUES.

1000-Hour Conduction Life Performance:

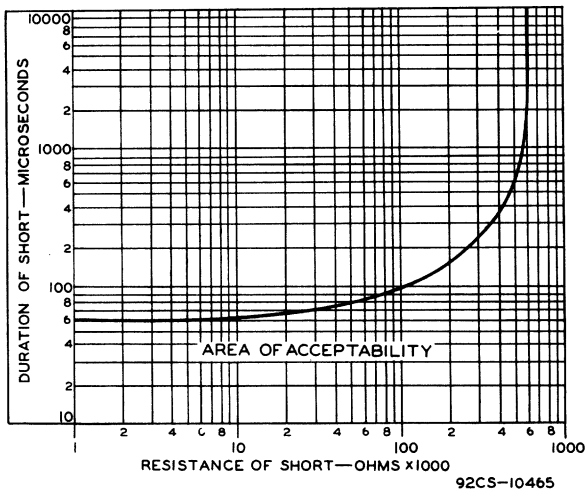
This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and guard against epidemic failures due to excessive changes in any of the characteristics indicated below. In this test, tubes are operated for 1000 hours at maximum-rated plate dissipation, and then criticized for inoperatives, reverse grid current, heater-cathode leakage current, and leakage resistance. In addition, the average change in transconductance of the lot from the 0-hour value for Transconductance (1) specified in CHARACTERISTICS RANGE VALUES, must not exceed 15 per cent at 500 hours, and 20 per cent at 1000 hours.

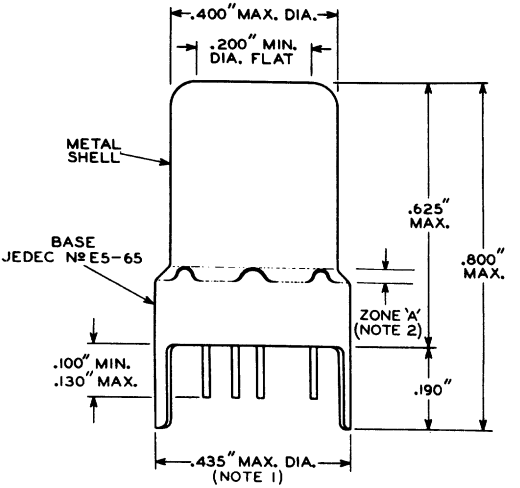
1000-Hour Standby Life Performance:

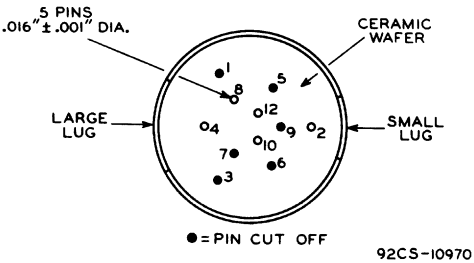
This test is performed on a sample lot of tubes from each production run. The tubes are operated for 1000 hours with only normal heater voltage applied. Tubes are criticized for inter-electrode leakage, reverse grid current, change in trans-conductance of individual tubes from values at 0-hours and cathode interface resistance greater than 25 ohms. Interface resistance is measured by Method B of ASTM specification F300-57T.

[c] Specifications for tapper supplied on request.

SHORTS-TEST ACCEPTANCE LIMITS





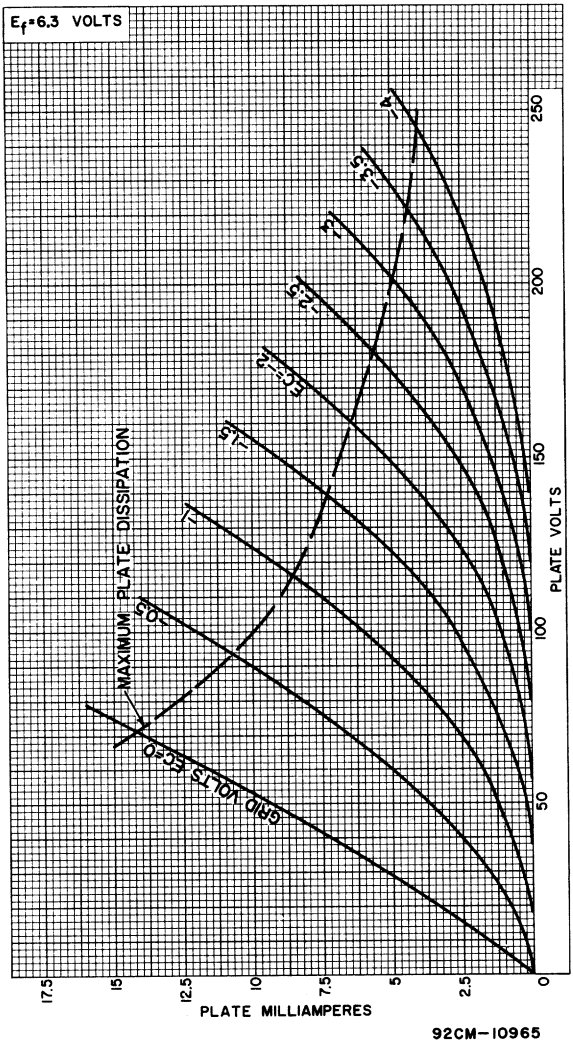


92CS-10970

NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

NOTE 2: SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A" BETWEEN BROKEN LINES.

AVERAGE PLATE CHARACTERISTICS



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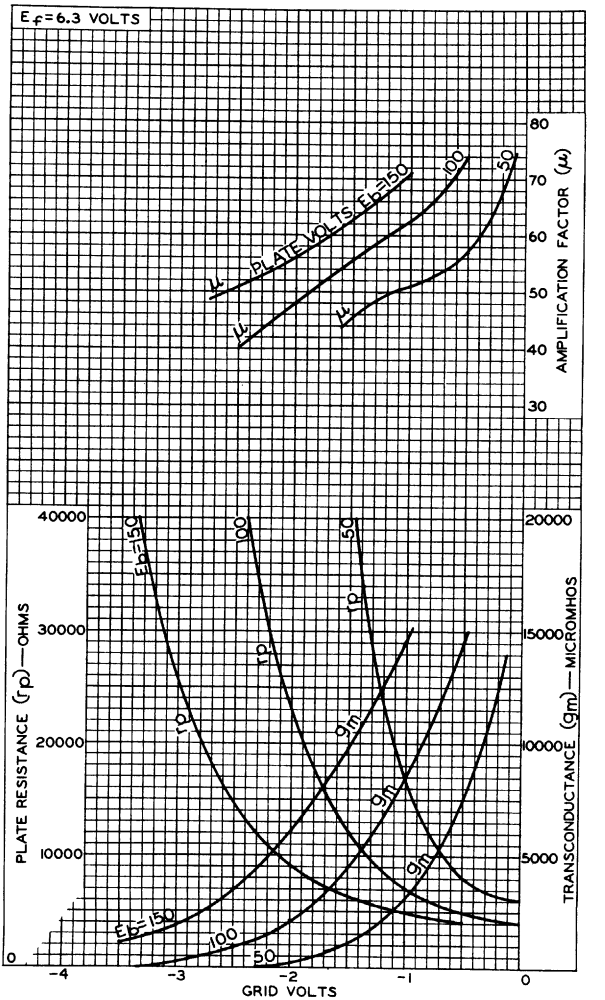
AVERAGE CHARACTERISTICS



92CM-10967

7898

High-Mu Twin Triode

9-PIN MINIATURE TYPE

For Use in Mobile-Communications Equipment Operating from 6-Cell Storage-Battery Systems

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Absolute-Maximum Values):*		
Voltage (AC or DC)[a]	13.5 ± 1.5	volts
Current at heater volts = 13.5	0.150	amp
Peak heater-cathode voltage (Each unit):		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Direct Interelectrode Capacitances (Approx.):

	Without External Shield	*With External Shield*[b]	
Grid-Drive Operation:			
Grid to plate (Each unit)	1.6	1.6	μμf
Grid to cathode and heater (Each unit)	2.5	2.5	μμf
Plate to cathode and heater (Unit No.1)	0.45	1.2	μμf
Plate to cathode and heater (Unit No.2)	0.38	1.3	μμf
Cathode-Drive Operation:			
Cathode to plate (Unit No.1)	0.2	0.18[d]	μμf
Cathode to plate (Unit No.2)	0.24	0.2[d]	μμf
Cathode to grid and heater (Each unit)	5	5[d]	μμf
Plate to grid and heater (Unit No.1)	1.9	2.7[d]	μμf
Plate to grid and heater (Unit No.2)	1.8	2.7[d]	μμf
Heater to cathode (Each unit)	2.8	2.8[c]	μμf
Plate to plate	0.24	-	μμf

Characteristics, Class A_1 Amplifier (Each Unit):

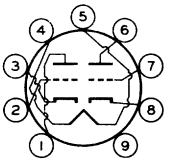
Heater Voltage	13.5	volts
Plate Supply Voltage	250	volts
Cathode Resistor	200	ohms
Amplification Factor	60	
Plate Resistance (Approx.)	10900	ohms
Transconductance	5500	μmhos
Plate Current	10	ma
Grid Voltage (Approx.) for plate μa = 10	-12	volts

7898

Mechanical:

Operating Position . . . . . .Any
Type of Cathodes . . . . . .Coated Unipotential
Maximum Overall Length . . . . . 2-3/16"
Maximum Seated Length. . . . . 1-15/16"
Length, Base Seat to Bulb Top (Excluding tip). 1-9/16" ±3/32"
Diameter . . . . . 0.750" to 0.875"
Dimensional Outline. . . . . .See *General Section*
Bulb T6-1/2
Base . . . . . Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW 9EP

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Do Not Use

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Absolute-Maximum Values:*

PLATE VOLTAGE.	330 max.	volts
GRID VOLTAGE:		
Negative-bias value.	55 max.	volts
Positive-bias value.	0 max.	volts
PLATE DISSIPATION.	2.75 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	180 max.	°C

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation	0.25 max.	megohm
For cathode-bias operation	1 max.	megohm

[a] Heater will withstand momentary excursions from 11.0 to 16.0 volts.
[b] With external shield JEDEC No.315 connected to cathode of unit under test except as noted.
[c] With external shield JEDEC No.315 connected to ground.
[d] With external shield JEDEC No.315 connected to grid of unit under test.

SPECIAL RATINGS AND PERFORMANCE DATA

Heater-Cycling:

Cycles of Intermittent Operation . . . . . 1160 min. cycles

This test is performed on a sample lot of tubes from each production run under the following conditions: Heater volts = 19.5 cycled one minute on and two minutes off; heater 135 volts negative with respect to cathode; all other elements

connected to ground. At the end of this test, tubes are tested for heater-cathode shorts and open circuits.

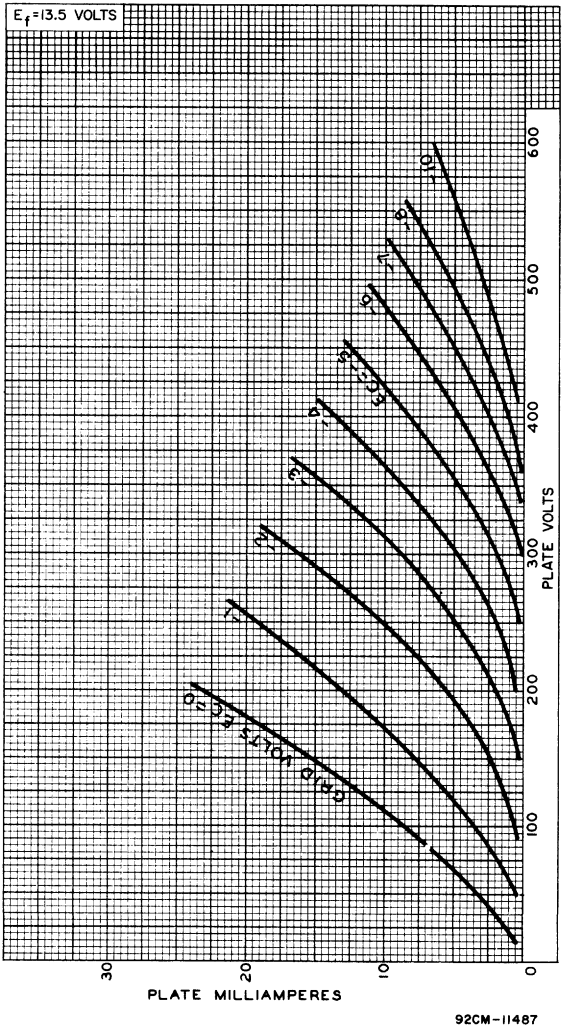
Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: Units connected in parallel, heater volts = 13.5, plate-supply volts = 250, grid volts = -3, plate load resistor (ohms) = 2000, and vibrational acceleration = 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 150 millivolts.

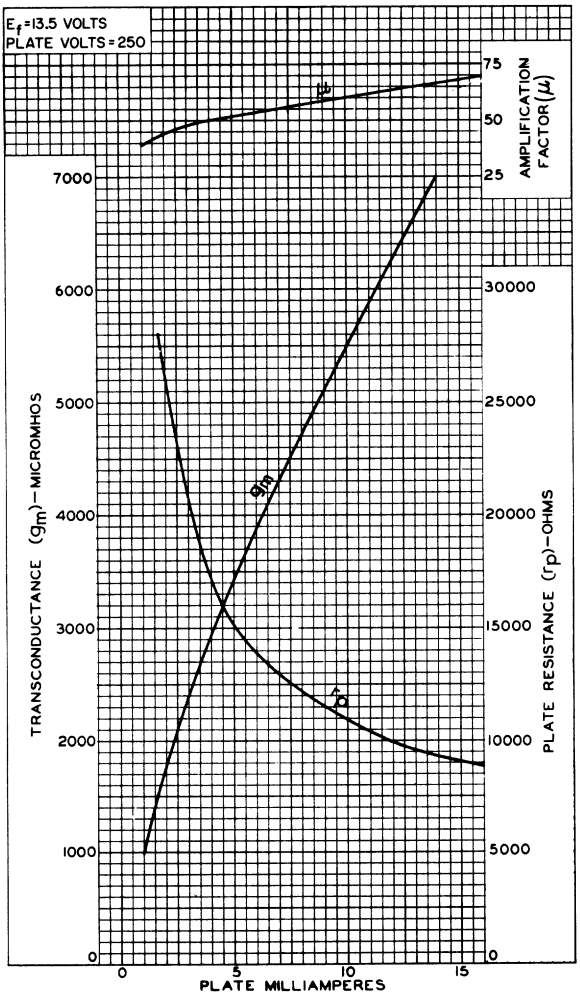
500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures. Life testing is conducted under the following conditions: Heater volts = 15.0 and maximum-rated plate dissipation.

AVERAGE PLATE CHARACTERISTICS



AVERAGE CHARACTERISTICS



92CM-11486

7905

Beam Power Tube

9-PIN MINIATURE TYPE

Quick-Heating-Filament Type for Mobile-Communications Equipment

GENERAL DATA

Electrical:

Filament, Coated:		
Voltage (AC or DC)	6.3 ± 10%	volts
When operated from storage-battery systems, the filament may be subjected to voltage variations as great as ± 20 per cent. Although such extremes in filament voltage may be tolerated for short periods, increased equipment reliability can be achieved with improved supply-voltage regulation.		
Current at 6.3 volts	0.65	amp
Heating time	Less than 1 second	
Direct Interelectrode Capacitances:[a]		
Grid No.1 to plate	0.14 max.	pf
Grid No.1 to filament, grid No.3, and grid No.2	8.5	pf
Plate to filament, grid No.3, and grid No.2	5.5	pf

Characteristics, Class A_1 Amplifier:

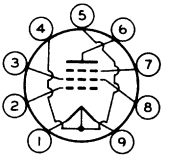
Plate Voltage	200	volts
Grid No.3	*Connected to pin 1 at socket*	
Grid-No.2 Voltage	185	volts
Grid-No.1 Voltage	-6	volts
Mu-Factor, Grid No.2 to Grid No.1	11.5	
Transconductance	6700	μmhos
Plate Current	36	ma
Grid-No.2 Current	2.5	ma

Mechanical:

Operating Position	Vertical, base up or down, or Horizontal with pins 2 and 8 in vertical plane
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

7905

Basing Designation for BOTTOM VIEW. 9PB



Pin 1 – Filament (–)
Pin 2 – Grid No.1
Pin 3 – Grid No.2
Pin 4 – LC (See NOTE)
Pin 5 – LC (See NOTE)
Pin 6 – Plate
Pin 7 – Grid No.3
Pin 8 – Grid No.2
Pin 9 – Filament (+)

NOTE: May be used only under conditions specified in *Operating Considerations.*

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[b] and RF POWER AMPLIFIER — Class C FM Telephony

Maximum ICAS[c] Ratings, *Absolute-Maximum Values:*

	Up to 175 Mc	
DC PLATE VOLTAGE	300 max.	volts
GRID No.3 (SUPPRESSOR GRID)	*Connect to pin 1 at socket*	
DC GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	300 max.	volts
DC GRID-No.2 VOLTAGE	250 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-125 max.	volts
DC PLATE CURRENT	60 max.	ma
DC GRID-No.2 CURRENT	10 max.	ma
DC GRID-No.1 CURRENT	5 max.	ma
PLATE INPUT	18 max.	watts
GRID-No.2 INPUT	1.5 max.	watts
PLATE DISSIPATION	10 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	225 max.	°C

Typical ICAS[c] Operation:[d]

	As amplifier at 175 Mc		
DC Plate Voltage	300	300	volts
Grid No.3	*Connected to pin 1 at socket*		
DC Grid-No.2 Voltage[e]	160	185	volts
DC Grid-No.1 Voltage[f] from a grid-No.1 resistor of 18,000 ohms	-36	-39	volts
Peak RF Grid-No.1 Voltage	41	43	volts
DC Plate Current	50	60	ma
DC Grid-No.2 Current	2.5	4	ma
DC Grid-No.1 Current (Approx.)	2	2.2	ma
Driving Power[g] (Approx.)	1	1	watt
Useful Power Output[h] (Approx.)	5.5	7	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	megohm

PLATE MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum ICAS[c] Ratings, *Absolute-Maximum Values:*

	Up to 175 Mc	
DC PLATE VOLTAGE	250 max.	volts
GRID No.3	*Connect to pin 1 at socket*	
DC GRID-No.2 VOLTAGE	250 max.	volts
DC GRID-No.1 VOLTAGE	-125 max.	volts
DC PLATE CURRENT	60 max.	ma
DC GRID-No.2 CURRENT	10 max.	ma
DC GRID-No.1 CURRENT	5 max.	ma
PLATE INPUT	15 max.	watts
GRID-No.2 INPUT	1.4 max.	watts
PLATE DISSIPATION	7 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	225 max.	°C

Typical ICAS[c] Operation:[d]

	At 175 Mc	
DC Plate Voltage	250	volts
Grid No.3	*Connected to pin 1 at socket*	
DC Grid-No.2 Voltage[j]	250	volts
DC Grid-No.1 Voltage[f] from a grid-No.1 resistor of 33,000 ohms	-70	volts
Peak RF Grid-No.1 Voltage	75	volts
DC Plate Current	60	ma
DC Grid-No.2 Current	2.5	ma
DC Grid-No.1 Current (Approx.)	2.1	ma
Driving Power[g] (Approx.)	1	watt
Useful Power Output[h] (Approx.)	6.5	w ts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	megohm

FREQUENCY MULTIPLIER

Maximum ICAS[c] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	300 max.	volts
GRID No.3	*Connect to pin 1 at socket*	
DC GRID-No.2 SUPPLY VOLTAGE	300 max.	volts
DC GRID-No.2 VOLTAGE	250 max.	volts
DC GRID-No.1 VOLTAGE	-125 max.	volts
DC PLATE CURRENT	50 max.	ma
DC GRID-No.2 CURRENT	10 max.	ma
DC GRID-No.1 CURRENT	5 max.	ma
PLATE INPUT	15 max.	watts
GRID-No.2 INPUT	1.5 max.	watts
PLATE DISSIPATION	10 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	225 max.	°C

Typical ICAS[c] Operation:

As doubler to 175 Mc			
DC Plate Voltage	250	300	volts
Grid No.3	*Connected to pin 1 at socket*		
DC Grid-No.2 Voltage[e]	200	215	volts
DC Grid-No.1 Voltage[f] from a grid-No.1 resistor of 53,000 ohms	-53	-80	volts
Peak RF Grid-No.1 Voltage	60	87	volts
DC Plate Current	45	50	ma
DC Grid-No.2 Current	3.4	3.4	ma
DC Grid-No.1 Current (Approx.)	1	1.5	ma
Driving Power[g] (Approx.)	0.4	0.5	watt
Useful Power Output[j] (Approx.)	2.5	3.5	watts
As tripler to 175 Mc			
DC Plate Voltage	250	250	volts
Grid No.3	*Connected to pin 1 at socket*		
DC Grid-No.2 Voltage[e]	180	225	volts
DC Grid-No.1 Voltage[g] from a grid-No.1 resistor of:			
50,000 ohms	-90	-	volts
60,000 ohms	-	-108	volts
Peak RF Grid-No.1 Voltage	105	118	volts
DC Plate Current	40	50	ma
DC Grid-No.2 Current	2.5	3.4	ma
DC Grid-No.1 Current (Approx.)	1.8	1.8	ma
Driving Power[g] (Approx.)	0.4	0.6	watt
Useful Power Output[h] (Approx.)	1.4	2	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	megohm

[a] Without external shield.

[b] Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

[c] Intermittent Commercial and Amateur Service.

[d] Pins 4 and 5 at rf ground.

[e] Obtained preferably from a separate source or from the plate-voltage supply with a voltage divider. If a series resistor is used, it should be adjustable to permit obtaining the desired operating plate current after initial tuning adjustments are completed.

[f] Obtained from a grid-No.1 resistor, or from a combination of grid-No.1 resistor and either fixed supply or cathode resistor. The combination of grid-No.1 resistor and fixed supply has the advantage of not only protecting the tube from damage through loss of excitation but also of minimizing distortion by bias-supply compensation.

[g] Driving power includes circuit losses and is the actual power measured at the input to the grid circuit.

[h] Measured at load.

[j] Obtained preferably from a separate source modulated along with the plate supply, or from the modulated plate supply through a series resistor. It is recommended that this resistor be adjustable to permit obtaining the desired operating plate current after initial tuning adjustments are made.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Filament Current	1	0.59	0.71	amp
Transconductance	1,2	5700	-	μmhos
Plate Current	1,2	27	52	ma
Plate Current	1,3	-	75	μa
Grid-No.2 Current	1,2	-	5	ma
Reverse Grid-No.1 Current	1,4	-	1	μa
Leakage Resistance:				
Between grid No.1 and all other electrodes tied together.	1,5	100	-	megohms
Between plate and all other electrodes tied together.	1,6	100	-	megohms

Note 1: With 6.3 volts dc on filament.

Note 2: With dc plate volts = 200, grid No.3 connected to pin 1 at socket, dc grid-No.2 volts = 185, and dc grid-No.1 volts = -6.

Note 3: With dc plate volts = 200, grid No.3 connected to pin 1 at socket, dc grid-No.2 volts = 185, and dc grid-No.1 volts = -36.

Note 4: With dc plate volts = 215, grid No.3 connected to pin 1 at socket, dc grid-No.2 volts = 215, and dc grid-No.1 resistor = 0.1 megohm.

Note 5: With grid No.1 100 volts negative with respect to all other electrodes tied together.

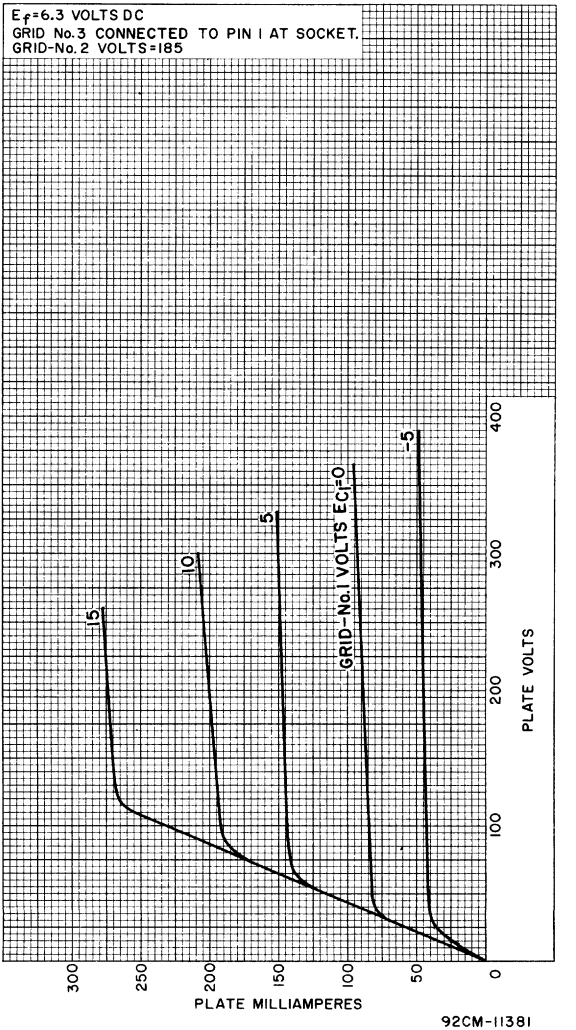
Note 6: With plate 300 volts negative with respect to all other electrodes tied together.

OPERATING CONSIDERATIONS

The socket connections to pins 4 and 5, which are designated LC on the basing diagram, may be used to minimize the absorption of rf power in the filament circuit by connecting pins 4 and 5 to ground through a capacitor, close to the socket. Pin 1 is directly grounded and pin 9 is bypassed by using a feedthrough capacitor when bringing this filament lead through the chassis.

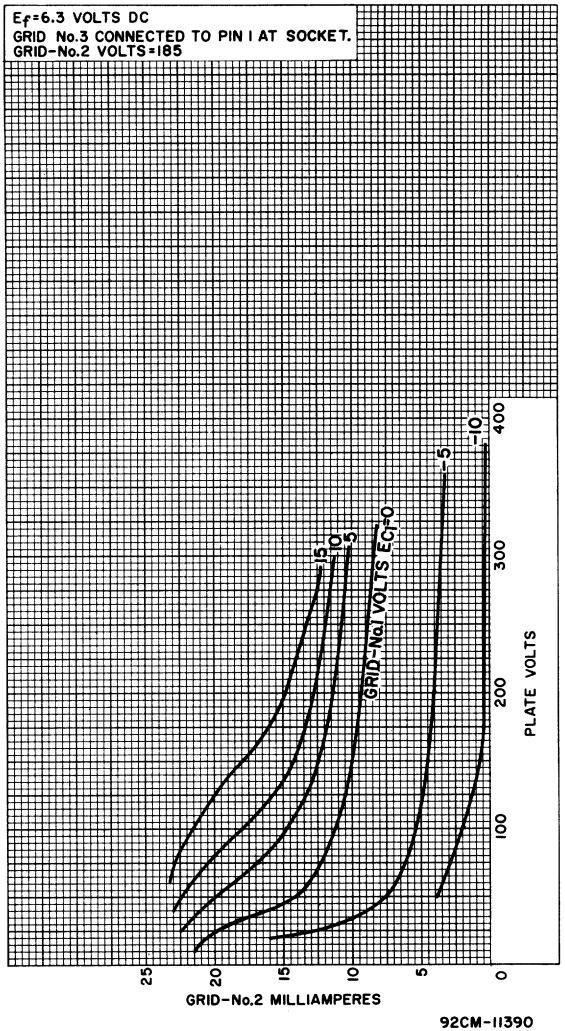
Shielding of the 7905 may be used in "straight-through" rf amplifier service to minimize external feedback from the plate to grid No.1. A grounded shield crossing the terminal end of the tube socket through the space between pins 2 and 3 and the space between pins 8 and 9, is generally adequate for this purpose. No shielding is necessary for either frequency doubler or tripler operation.

AVERAGE PLATE CHARACTERISTICS

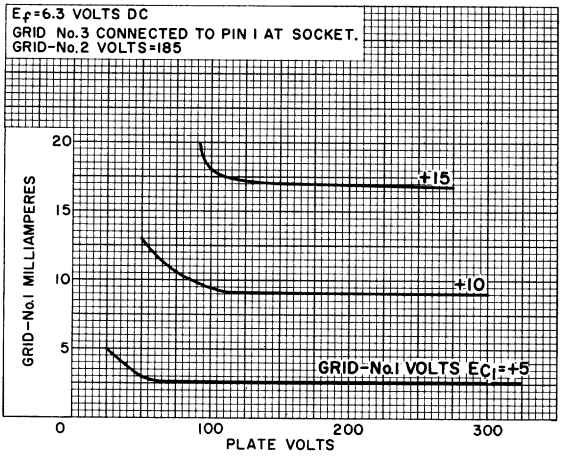


92CM-11381

AVERAGE CHARACTERISTICS



AVERAGE CHARACTERISTICS



92CS-11383

8008

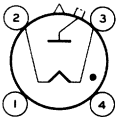
HALF-WAVE MERCURY-VAPOR RECTIFIER

The 8008 is the same as the 872-A except for the following items:

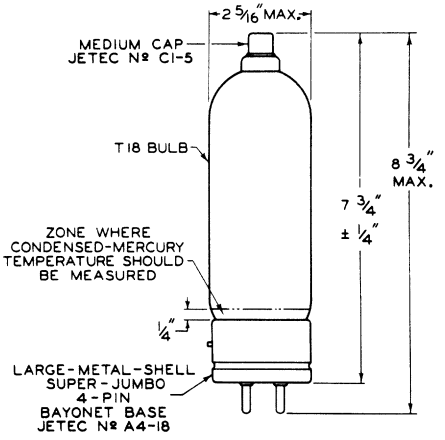
Mechanical:

Maximum Overall Length	8-3/4"
Seated Length	7-3/4" ± 1/4" ←
Weight (Approx.)	6.8 oz ←
Base	Large-Metal-Shell Super-Jumbo 4-Pin with Bayonet (JETEC No. A4-18) ←
Basing Designation for BOTTOM VIEW	2P ←

Pin 1 – No Connection
Pin 2 – Filament, Cathode Shield



Pin 3 – Filament
Pin 4 – No Connection
Cap – Anode



← Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

8013-A

HALF-WAVE VACUUM RECTIFIER

GENERAL DATA

Electrical:

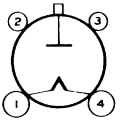
Filament, Thoriated Tungsten:

	Min.	Av.	Max.	
Voltage	2.37	2.50	2.63	ac volts
Current at 2.50 volts	4.7	5.0	5.3	amp

Mechanical:

Mounting Position . . Any, preferably vertical with base down
Maximum Overall Length . . . . . 6-1/16"
Seated Length . . . . . 5-9/32" ± 5/32"
Maximum Diameter . . . . . 2-1/16"
Weight (Approx.) . . . . . 2.9 oz
Bulb ST-16
Cap . . . . Skirted Medium with Rolled Edge (JETEC No. C1-19)
Base . . . . . Medium-Shell Small 4-Pin (JETEC No. A4-9)
Basing Designation for BOTTOM VIEW 4P

Pin 1 - Filament
Pin 2 - No Connection
Pin 3 - No Connection
Pin 4 - Filament
Cap - Plate



HALF-WAVE RECTIFIER

Maximum Ratings, *Absolute Values:*

PEAK PLATE VOLTAGE:			
Forward	40000▲	max.	volts
Inverse	40000▲	max.	volts
PLATE CURRENT:			
Peak	150	max.	ma
Average	20	max.	ma
Fault	500	max.	ma
PLATE DISSIPATION	12	max.	watts

OPERATING CONSIDERATIONS

Filament and *plate voltage* may be applied simultaneously to the 8013-A.

The *bulb* of the 8013-A should be cleaned regularly. Accumulation of dust or other foreign matter on the bulb will cause leakage and, as a result, probably tube failure.

X-rays are produced during normal operation of the 8013-A. These rays can constitute a health hazard unless the tube is adequately shielded for X-ray radiation. Although relatively simple shielding should prove adequate, make sure it provides the required protection to the operator.

▲This value may be increased to 55000 volts when the 8013-A is immersed in oil.

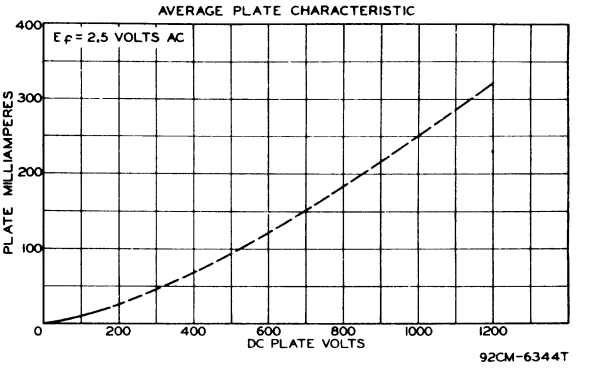
← Indicates a change.

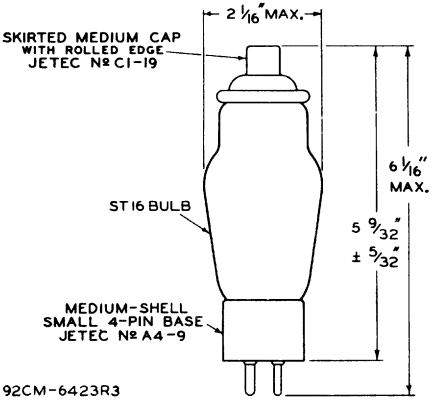
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

8013-A

8013-A

HALF-WAVE VACUUM RECTIFIER





RCA

8020

HALF-WAVE HIGH-VACUUM RECTIFIER

DATA

Electrical:

Filament, Thoriated Tungsten:		
Voltage	5	volts
Current	5.5-6.5	amp
Direct Interelectrode Capacitance:		
Anode to Filament	1.4	μμf
Tube Voltage Drop at 100 ma.	200	volts

Mechanical:

Mounting Position	Vertical, Base Down
Overall Length	7-1/2" ± 1/2"
Maximum Diameter	2-5/16"
Bulb	T-18
Cap	Medium
Base	Medium 4-Pin, Bayonet

RECTIFIER SERVICE

Maximum Ratings, Absolute Values:

PEAK INVERSE ANODE VOLTAGE	40000 max.	volts
PEAK ANODE CURRENT	750 max.	ma.
AVERAGE ANODE CURRENT	100 max.	ma.

SURGE-LIMITING DIODE SERVICE

Maximum Ratings, Absolute Values:

FILAMENT VOLTAGE	5.8 max.	volts
PEAK FORWARD ANODE VOLTAGE	12500 max.	volts
AVERAGE ANODE DISSIPATION	75 max.	watts

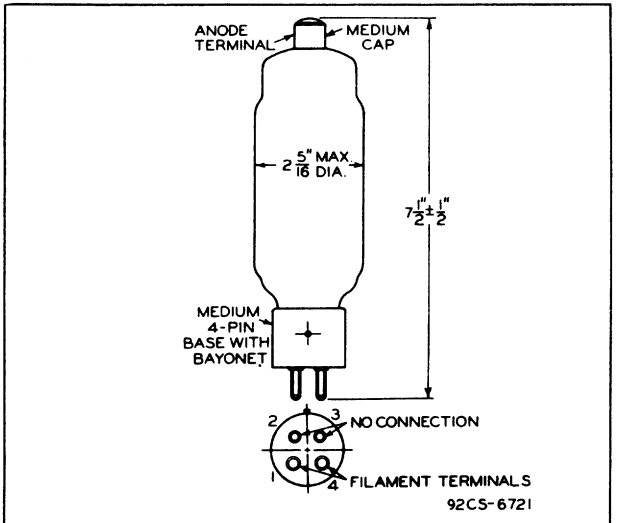
Typical Operation:

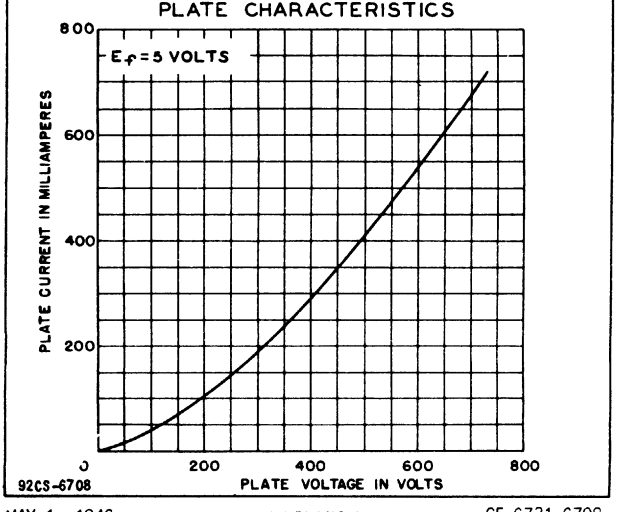
Filament Voltage	5.5	volts
Peak Forward Anode Voltage	10000	volts
Minimum Peak Anode Current	2	amp

8020

8020

HALF-WAVE HIGH-VACUUM RECTIFIER





TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

8056

Medium-Mu Triode

NUVISTOR TYPE

For Use with Low-Voltage Power Supplies in Industrial and Military Applications

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3±0.6	volts
Current at heater volts = 6.3	0.135	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances (Approx.):		
Grid to plate	2.1	pf
Grid to cathode, shell, and heater	4.0	pf
Plate to cathode, shell, and heater	1.7	pf
Plate to cathode	0.34	pf
Heater to cathode	1.4	pf

Characteristics, Class A$_1$ Amplifier: ←

Plate Supply Voltage	24	volts
Grid	Connected to negative end of cathode resistor	
Cathode Resistor	100	ohms
Amplification Factor	11.5	
Plate Resistance (Approx.)	1530	ohms
Transconductance	7500	μmhos
Plate Current	8.7	ma
Grid Voltage (Approx.) for plate μa = 50	-5	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	0.800"
Maximum Seated Length	0.625"
Maximum Diameter	0.440"
Weight (Approx.)	1.9 grams
Envelope	Metal Shell MT4

Socket:

Crimp Mounting —

Cinch Mfg.,Co., 1026 South Homan Ave., Chicago 24, Ill., No.133 65 10 001.

Industrial Electronic Hardware Corp., 109 Prince Street, New York 12, N.Y., No.MSN 0905-1, MSN 0905-2, MSN 0905-3; or equivalent.

Flange Mounting —

Cinch Mfg. Co., No.133 65 10 003, or equivalent.

Printed Board (Stand-off) —

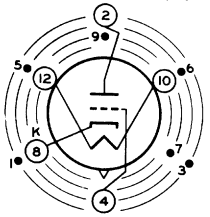
Cinch Mfg. Co., No.133 65 10 041, or equivalent.

← Indicates a change.

8056

Base. . . Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)
Basing Designation for BOTTOM VIEW. 12AQ

Pin 1[a] - Do Not Use
Pin 2 - Plate
Pin 3 - Same as Pin 1
Pin 4 - Grid
Pin 5 - Same as Pin 1
Pin 6 - Same as Pin 1
Pin 7 - Same as Pin 1
Pin 8 - Cathode
Pin 9 - Same as Pin 1
Pin 10 - Heater
Pin 12 - Heater



INDEX=LARGE LUG
●=SHORT PIN; IC—DO NOT USE

INDUSTRIAL SERVICE

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

PLATE VOLTAGE	50 max.	volts
GRID VOLTAGE:		
Negative-bias value	55 max.	volts
Peak-positive value	2 max.	volts
GRID CURRENT	2 max.	ma
CATHODE CURRENT	15 max.	ma
PLATE DISSIPATION	0.45 max.	watt

→Typical Operation:

Plate Supply Voltage	12	24	volts
Grid Supply Voltage	-	0.7	volt
Grid Resistor	33000	-	ohms
Amplification Factor	12	12	
Plate Resistance (Approx.)	1500	1500	ohms
Transconductance	8000	8000	μmhos
Plate Current	5.5	9.5	ma

Maximum Circuit Values:

Grid-Circuit Resistance:[b]

For fixed-bias operation	10 max.	megohms
For cathode-bias operation	10 max.	megohms

→ [a] Pin is of a length such that its end does not touch the socket insertion plane.

[b] For operation at metal-shell temperatures up to 150° C., metal-shell temperatures are measured in zone "A" (See *Dimensional Outline*). For temperatures above 150° C., see accompanying *Grid-Circuit-Resistance Rating Chart*.

→ **CHARACTERISTICS RANGE VALUES**

	Note	*Min.*	*Max.*	
Heater Current	1	0.125	0.145	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	1.8	2.4	pf

→Indicates a change.

	Note	Min.	Max.	
Grid to cathode, shell, and heater	2	3.4	4.6	pf
Plate to cathode, shell, and heater	2	1.4	2.0	pf
Heater to cathode	2	1.1	1.7	pf
Plate to cathode	2	0.26	0.42	pf
Plate Current (1)	1,3	6.7	10.7	ma
Plate Current (2)	1,4	-	50	μa
Transconductance (1)	1,3	6500	8500	μmhos
Transconductance (2)	3,5	5700	-	μmhos
Transconductance Change: Difference between transconductance (1) and transconductance (2), expressed in per cent of transconductance (1)	-	-	15	%
Reverse Grid Current	1,6	-	0.05	μa
Amplification Factor	1,3	9	14	
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,7	-	5	μa
Heater positive with respect to cathode	1,7	-	5	μa
Leakage Resistance:				
Between grid and all other electrodes tied together	1,8	1000	-	megohms
Between plate and all other electrodes tied together	1,9	1000	-	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Measured in accordance with EIA Standard RS-191-A.

Note 3: With dc plate supply volts = 24, cathode resistor = 100 ohms, and cathode-bypass capacitor = 1000 μf.

Note 4: With dc plate volts = 24, dc grid volts = -10, and metal shell connected to ground.

Note 5: With 5.7 volts ac or dc on heater.

Note 6: With dc plate volts = 40, grid supply volts = -2, grid resistor = 1 megohm, and metal shell connected to ground.

Note 7: With 100 volts dc applied between heater and cathode.

Note 8: With grid 100 volts negative with respect to all other electrodes tied together.

Note 9: With plate 100 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration . . . . . 1000 max. g

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-impact (flyweight) Shock Machine and are subjected to 20 blows at the specified maximum impact acceleration. At the end of this test, tubes are criticized for change in transconductance, reverse grid

current, and heater-cathode leakage current, and are then subjected to the Variable-Frequency Test described below.

Fatigue Rating:

Vibrational Acceleration. . . . . 2.5 max. g

This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified vibrational acceleration. Tubes are rigidly mounted, supplied with nominal heater voltage only, and subjected for 48 hours to 2.5-g vibrational acceleration at 60 cycles per second in the X_1 position. At the end of this test, tubes are criticized for the same characteristics and end-point values as in the Shock Rating Test described above.

Variable-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run. The tube is operated under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate-load resistor of 2000 ohms. During operation, tube is vibrated in the X_1 position through the frequency range from 50 to 15,000 cycles per second under the following conditions: a sweep rate of one octave per 30 seconds from 50 to 3000 cps, a 7-second sweep from 3000 to 15,000 cps, and a constant vibrational acceleration of 4 g. During the test, tube must not show an output voltage across the plate-load resistor in excess of: (1) 20 rms millivolts from 50 to 3000 cps, (2) 50 peak millivolts from 3000 to 6000 cps, and (3) 500 peak millivolts from 6000 to 15,000 cps.

Low-Pressure Voltage-Breakdown Test:

This test is performed on a sample lot of tubes from each production run. In this test, tubes are operated with 250 rms volts applied between plate and all other electrodes and will not break or show evidence of corona when subjected to air pressures equivalent to altitudes of up to 100,000 feet.

Heater Cycling Life Performance:

Cycles of Intermittent Operation. . . . . 2000 min. cycles

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 8.5 cycled one minute on and two minutes off; heater 180 volts negative with respect to cathode; grid, plate, and metal shell connected to ground. At the end of this test, tubes are tested for open heaters and heater-cathode shorts.

Shorts and Continuity:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-1D, Amendment 2, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper[c]. See accompanying *Shorts-Test Acceptance-Limits* curve. Tubes are criticized for permanent or temporary shorts and open circuits.

Early-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that tubes are properly stabilized. In this test, tubes are operated for 20 hours at maximum-rated plate dissipation. After 2 hours of operation and again after 20 hours of operation, tubes are checked for transconductance under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1). A tube is rejected if its transconductance after 2 or 20 hours of operation has changed more than 10 per cent from the 0-hour value.

100-Hour Life Performance:

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early-hour inoperatives. Tubes are operated for 100 hours at maximum-rated plate dissipation, and then subjected to the Shorts and Continuity Test previously described. Tubes must then show a transconductance of not less than 5500 μmhos under the ◄ conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1).

1000-Hour Conduction Life Performance:

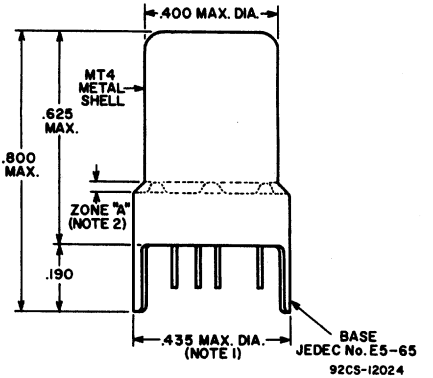
This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and guard against epidemic failures due to excessive changes in any of the characteristics indicated below. In this test, tubes are operated for 1000 hours at maximum-rated plate dissipation[d], and then criticized for inoperatives, reverse grid current, heater-cathode leakage current, and leakage resistance. In addition, the average change in transconductance of the lot from the 0-hour value for Transconductance (1) specified in CHARACTERISTICS RANGE VALUES, must not exceed 15 per cent at 500 hours, and 20 per cent at 1000 hours.

1000-Hour Standby Life Performance:

This test is performed on a sample lot of tubes from each production run. The tubes are operated for 1000 hours with only heater voltage applied. Tubes are criticized for interelectrode leakage, reverse grid current, and for cathode interface resistance greater than 25 ohms. Interface resistance is measured by Method B of ASTM specification F300-57T. ◄

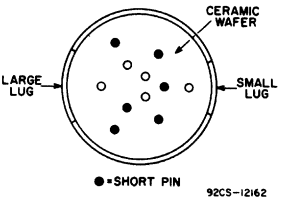
[c] Specifications for tapper supplied on request.
[d] At metal-shell temperature of 150° C.

◄ Indicates a change.

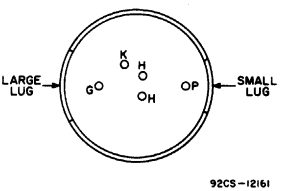


DIMENSIONS IN INCHES

BOTTOM VIEW
Showing Arrangement for All 11 Base Pins



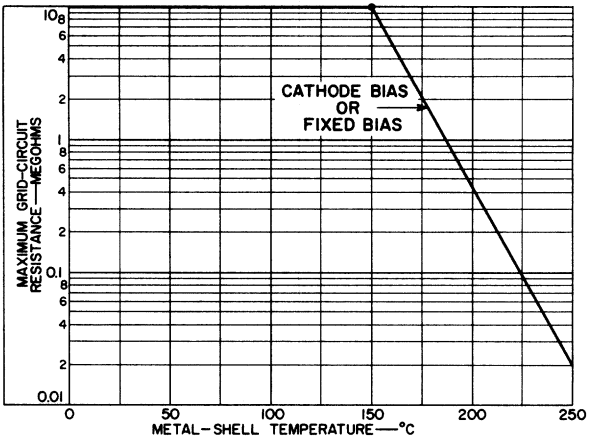
MODIFIED BOTTOM VIEW
With Element Connections Indicated
and Short Pins Not Shown



NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

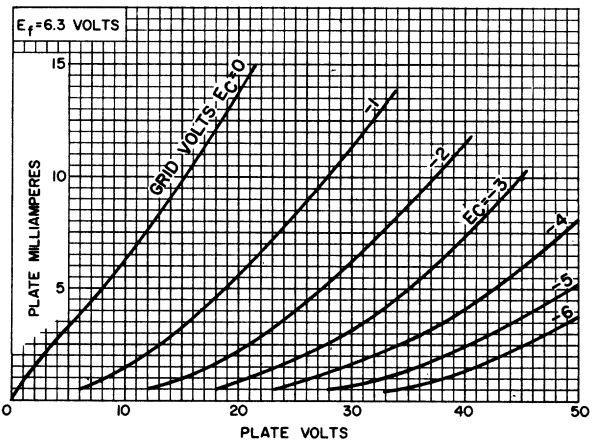
NOTE 2: METAL-SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A".

GRID-CIRCUIT-RESISTANCE RATING CHART



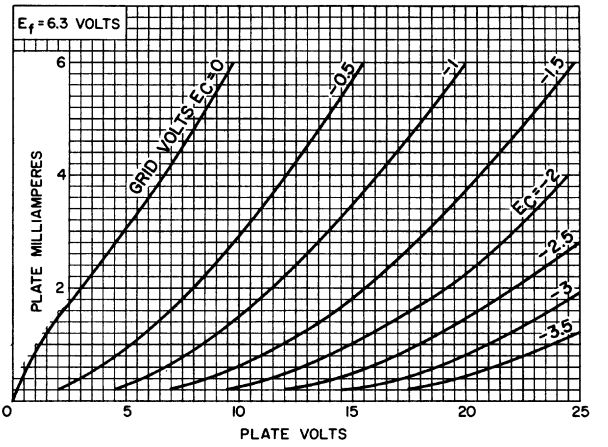
92CS-11479RI

AVERAGE PLATE CHARACTERISTICS



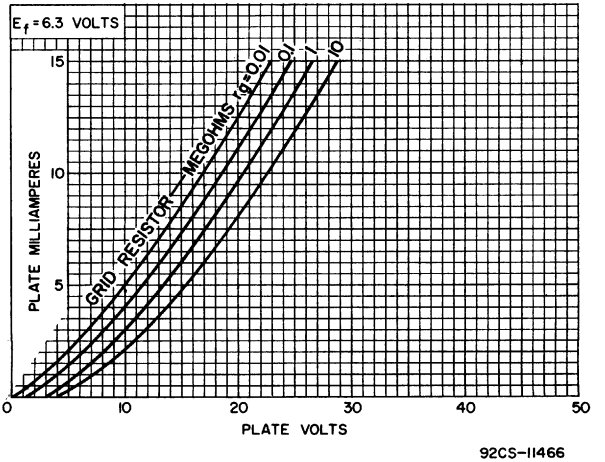
92CS-11469RI

AVERAGE PLATE CHARACTERISTICS



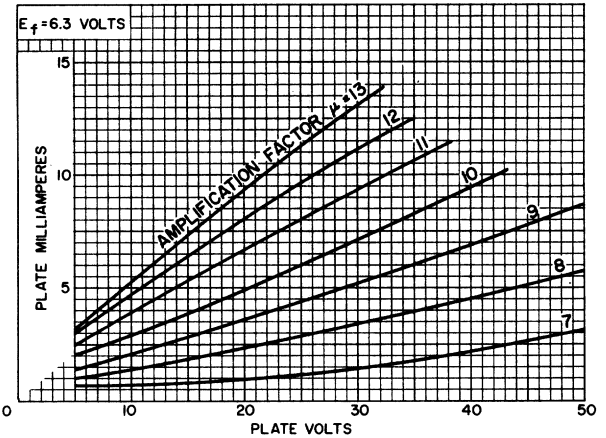
92CS-11467

AVERAGE PLATE CHARACTERISTICS
With Grid Resistor as Variable



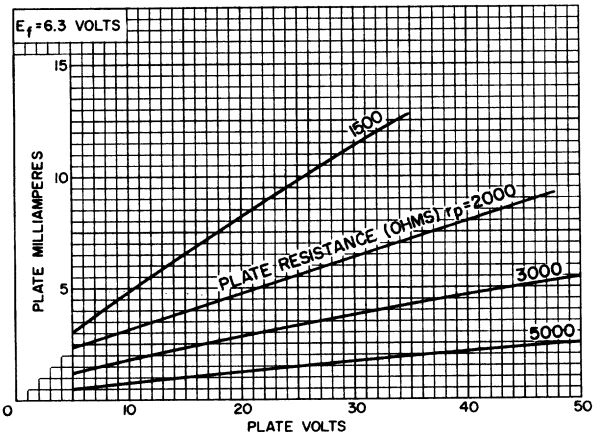
92CS-11466

AVERAGE PLATE CHARACTERISTICS
With Amplification Factor as Variable



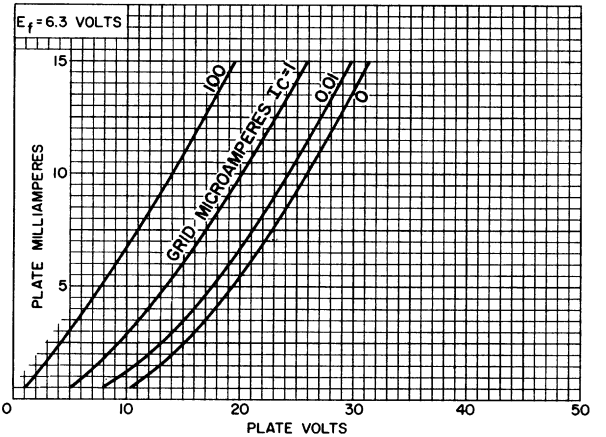
92CS-11471R1

AVERAGE PLATE CHARACTERISTICS
With Plate Resistance as Variable



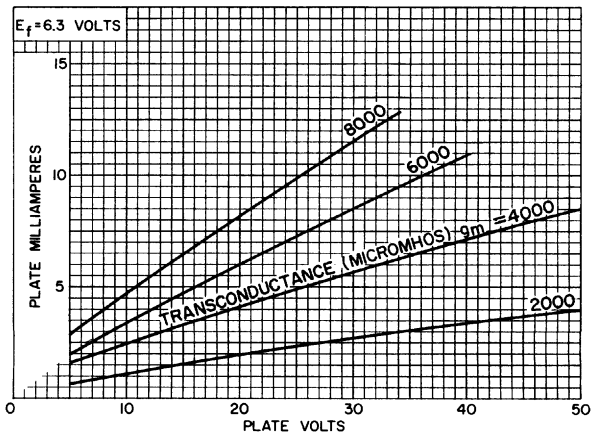
92CS-11465R2

AVERAGE PLATE CHARACTERISTICS
With Grid Current as Variable



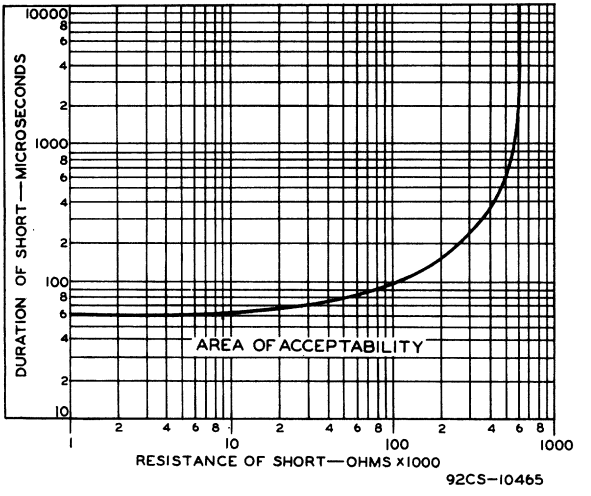
92CS-11468

AVERAGE PLATE CHARACTERISTICS
With Transconductance as Variable



92CS-11470R2

SHORTS-TEST ACCEPTANCE LIMITS



8058

High-Mu Triode

NUVISTOR TYPE

For Cathode-Drive-Amplifier Applications at Frequencies Up to 1200 MHz and as an Oscillator Tube having Excellent Stability Over a Wide Range of Frequencies

ELECTRICAL CHARACTERISTICS

Bogey Values

Heater Voltage, AC or DC	E_h	6.3	V
Heater Current at E_h = 6.3 V	I_h	135	mA
Direct Interelectrode Capacitances			
Input: K to (G, S, H)	c_i	6.0	pF
Output: P to (G, S, H)	c_o	1.3	pF
Cathode to plate	c_{kp}	0.046 max	pF
Heater to cathode	c_{hk}	1.4	pF

CLASS A$_1$ AMPLIFIER

For Following Characteristics see Conditions

Amplification Factor	μ	70	
Plate Resistance (Approx.)	r_p	5600	Ω
Transconductance	g_m	12400	μmho
DC Plate Current	I_b	10	mA
Cutoff DC Grid Voltage for I_b = 10 μA	$E_{c(co)}$	-5	V

Conditions

Heater Voltage	E_h	6.3	V
Plate Supply Voltage	E_{bb}	110	V
Grid Supply Voltage	E_{cc}	0	V
Cathode Resistor	R_k	47	Ω

ABSOLUTE-MAXIMUM RATINGS

For operation at any altitude

Plate Supply Voltage	E_{bb}	330	V
DC Plate Voltage	E_b	150	V
Grid Voltage			
DC positive value	E_c	0	V
DC negative value	E_c	-55	V
Peak Heater-Cathode Voltage	e_{hkm}	±100	V
Heater Voltage, AC or DC	E_h	5.7 to 6.9	
Average Cathode Current	$I_{k(av)}$	15	mA
Plate Dissipation	P_b	1.5	W

MAXIMUM CIRCUIT VALUES

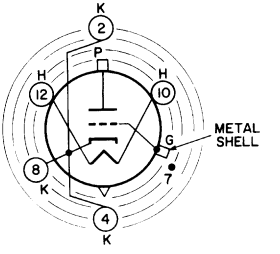
Grid-Circuit Resistance[a]			
For fixed-bias operation	$R_{g(ckt)}$	0.5	MΩ
For cathode-bias operation	$R_{g(ckt)}$	1	MΩ

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length (l_m)	0.985 in
Maximum Seated Length (l_{sm})	0.780 in
Maximum Diameter (d_m)	0.440 in
Weight (Approx.)	2.2 g
Dimensional Outline	JEDEC No.4-6
Envelope	JEDEC MT4
Base	Medium-Ceramic-Wafer Twelvar 5-Pin (JEDEC E5-79)

→ BASING DIAGRAM (Bottom View)

Pin 2 – Cathode
Pin 4 – Cathode
Pin 7[b] – Do Not Use
Pin 8 – Cathode
Pin 10 – Heater
Pin 12 – Heater
Metal Shell–Grid
Top Cap – Plate



INDEX = LARGE LUG
● = SHORT PIN—IC

12CT

TYPICAL OPERATION

As Cathode-Drive RF Amplifier

Frequency	f	450	700	1200	MHz
Heater Voltage	E_h	6.3	6.3	6.3	V
Plate Supply Voltage	E_{bb}	110	110	110	V
Cathode Resistor	R_k	47	47	47	Ω
Average Plate Current	$I_{b(av)}$	10	10	10	mA
Bandwidth	-	6	12	12	MHz
Power Gain	-	16.5	12.5	10.5	dB
Noise Factor[c]	NF	6.5	9.5	12.2	dB

→ [a] For operation at metal-shell temperature of 150 °C. For operation at other metal-shell temperatures, see *Grid-Circuit Resistance Chart*. Metal-shell temperature are measured in zone "A" (See *Dimensional Outline*).

[b] Pin 7 is of such a length such that its end does not touch the socket insertion plane.

[c] Argon noise source. Input is tuned for optimum value.

→ Indicates a change.

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INITIAL CHARACTERISTICS LIMITS

		Note	Min	Max	
Heater Current	I_h	1	0.125	0.145	A
Direct Interelectrode Capacitances					
Cathode to plate	c_{kp}	2	-	0.046	pF
Cathode to grid & shell and heater	c_i	2	5	7	pF
Plate to grid & shell and heater	c_o	2	1.1	1.5	pF
Heater to cathode	c_{hk}	2	1.1	1.7	pF
Plate Current (1)	1 I_b	1,3	7.8	13.2	mA
Plate Current (2)	2 I_b	1,4	-	50	μA
Transconductance (1)	1 g_m	1,3	10000	14800	μmho
Transconductance (2)	2 g_m	3,5	8700	-	μmho
Reverse Grid Current	$-I_c$	1,6	-	0.1	μA
Amplification Factor	μ	1,3	54	86	
Heater-Cathode Leakage Current	I_{hk}	1,7	-	±5	μA
Leakage Resistance:					
Between grid and all other electrodes tied together	r_g-all	1,8	5000	-	MΩ
Between plate and all other electrodes tied together	r_p-all	1,9	10000	-	MΩ

Note 1: With E_f = 6.3 V.

Note 2: Measured without external shield in accordance with the current issue of EIA Standard RS-191.

Note 3: With E_{bb} = 110 V, R_k = 47 Ω, C_k = 1000 μF.

Note 4: With E_b = 110 V, E_c = -5 V.

Note 5: With E_f = 5.7 V.

Note 6: With E_b = 150 V, E_c = -1.3 V, R_g = 0.5 MΩ.

Note 7: With E_{hk} = ±100 V.

Note 8: With E_g-all = -100 V.

Note 9: With E_p-all = -300 V.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating

Impact Acceleration . . . . . 1000 max g ←

This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-impact (flyweight) Shock Machine and are subjected to 20 blows at the specified maximum impact acceleration. At the end of this test, tubes are criticized for change in transconductance, reverse grid current, and heater-cathode leakage current, and are then subjected to the Variable-Frequency Vibration Test described below.

← Indicates a change.

Variable-Frequency Vibration Performance

This test is performed on a sample lot of tubes from each production run. The tube is operated under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate-load resistor of 2000 ohms. During operation, tube is vibrated in a direction perpendicular to the logitudinal axis of the tube through the frequency range from 50 to 15,000 c/s per second under the following conditions: a sweep rate of one octave per 30 seconds from 50 to 3000 c/s, a 7-second sweep from 3000 to 15,000 c/s, and a constant vibrational acceleration of 1 g. During the test, tube must not show an output voltage in excess of: (1) 35 millivolts rms from 50 to 3000 c/s, (2) 80 millivolts peak from 3000 to 6000 c/s, and (3) 700 millivolts peak from 6000 to 15,000 c/s.

Low-Pressure Voltage-Breakdown Test

This test is performed on a sample lot of tubes. In this test, tubes are operated with 250 volts rms applied between plate and all other electrodes and will not break down or show evidence of corona when subjected to air pressures equivalent to altitudes of up to 100,000 feet.

Heater Cycling

Cycles of Intermittent Operation . . . . . 2000 min cycles

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 7.5 cycled one minute on and two minutes off; heater 100 volts negative with respect to cathode; grid & metal shell and plate connected to ground. At the end of this test, tubes are tested for open heaters, heater-cathode shorts, and heater-cathode leakage current.

Shorts and Continuity

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-ID, Amendment 2, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper[d]. See accompanying Shorts-Test Acceptance-Limits curve. Tubes are criticized for permanent or temporary shorts and open circuits.

1000-Hour Conduction Life Performance

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and guard against epidemic failures due to excessive changes in any of the characteristics indicated below. In this test, tubes are operated for 1000 hours at maximum-rated plate dissipation and with a metal-shell temperature of 150 °C; then criticized for inoperatives, reverse grid current, heater-cathode leakage current, and leakage resistance. In addition, the average change in transconductance of the lot from the 0-hour value for Transconductance (1) specified in CHARACTERISTICS RANGE VALUES, must not exceed 15 per cent of 500 hours, and 20 per cent at 1000 hours.

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Interelectrode Leakage

Leakage Resistance between plate and all other electrodes tied together . . . 10000 min megohms

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts (ac or dc) = 6.3, plate volts = 300 negative with respect to all other electrodes tied together.

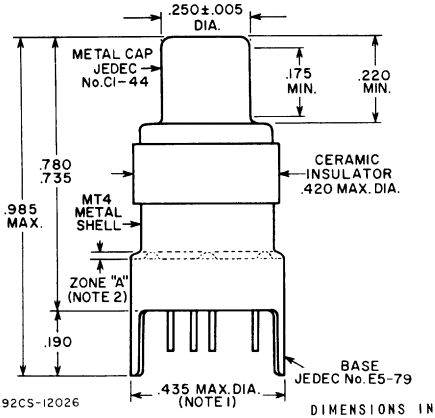
Leakage Resistance between grid and all other electrodes tied together . . . 5000 min megohms

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts (ac or dc) = 6.3, grid volts = 100 negative with respect to all other electrodes tied together.

[d] Specification for tapper will be supplied on request.

DIMENSIONAL OUTLINE

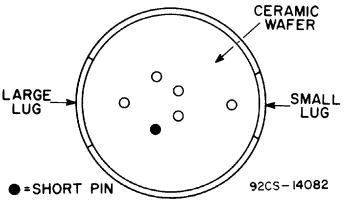
JEDEC No. 4-6



DIMENSIONS IN INCHES

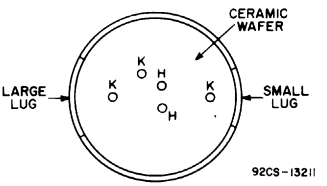
BOTTOM VIEW

Showing Arrangement of All 6 Base Pins



MODIFIED BOTTOM VIEW

With Element Connections Indicated and Short Pin Not Shown



DIMENSIONS IN INCHES

Note 1: Maximum outside diameter of 0.440 inch is permitted along 0.190" lug length.

Note 2: Metal-shell temperature should be measured in zone "A".

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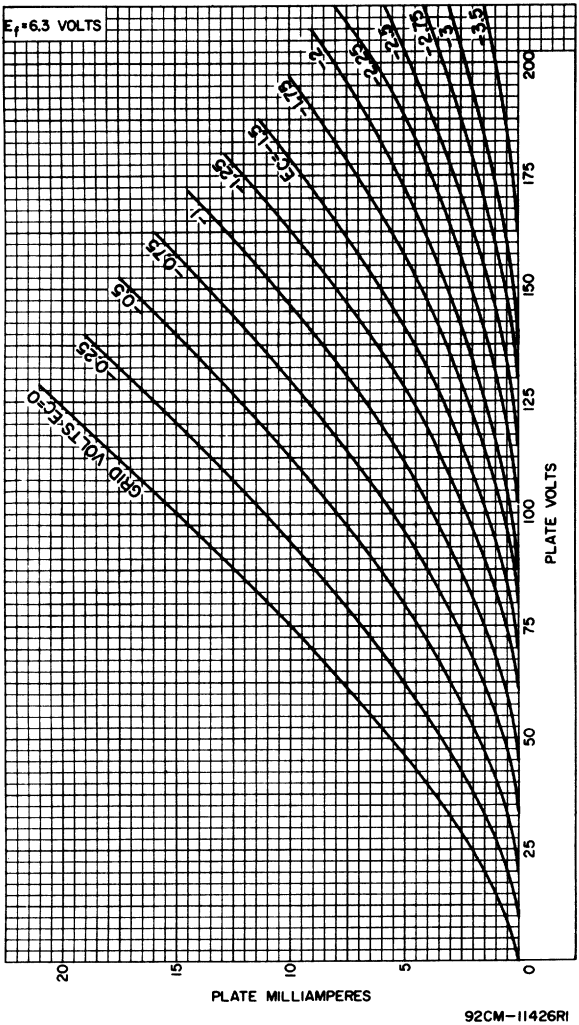
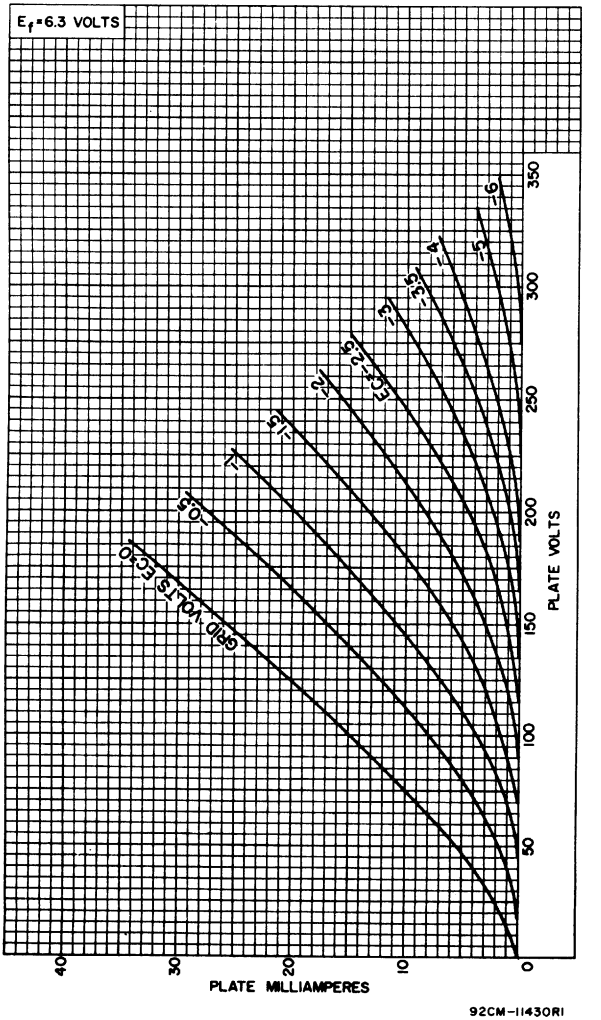
Average Plate Characteristics



92CM-11426R1

Average Plate Characteristics



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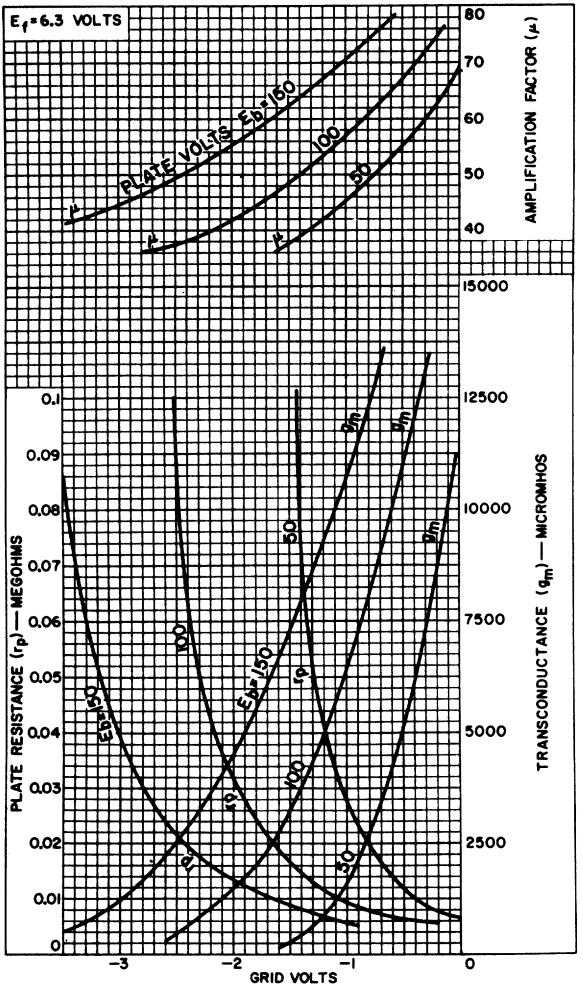
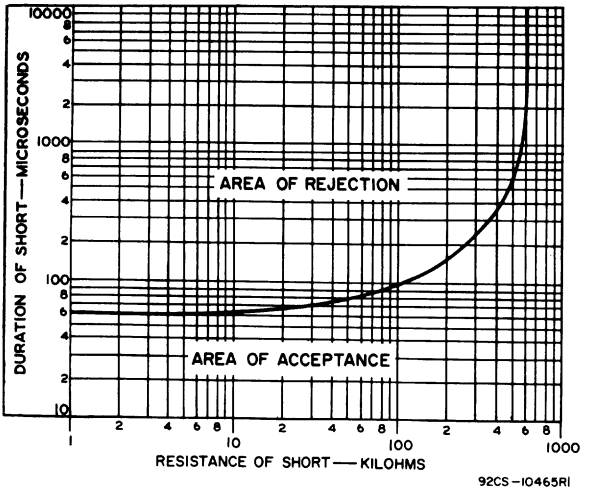
Average Characteristics



Shorts-Test Acceptance Limits



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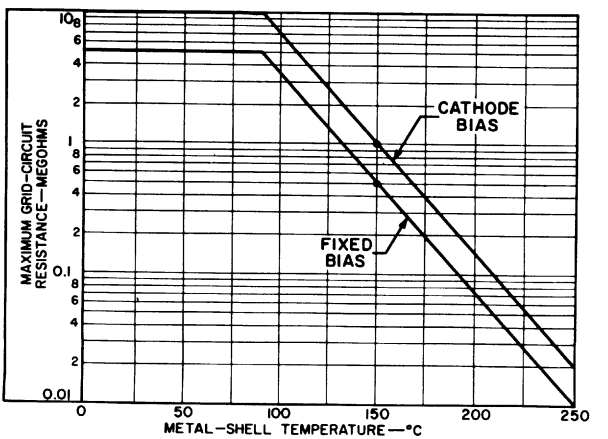
Grid-Circuit-Resistance Chart



92CS-12022

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8072

Beam Power Tube

CERAMIC-METAL SEALS
CONDUCTION COOLED

COAXIAL-ELECTRODE STRUCTURE
UNIPOTENTIAL CATHODE

For Use in Low-Voltage Mobile Equipment at Frequencies up to 500 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage range (AC or DC)[a]	12.0 to 15.0	volts
Current (Approx.) at 13.5 volts	1.3	amp
Minimum heating time	60	sec
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 250, grid-No.2 volts = 200, plate amperes = 1.2	11	
Direct Interelectrode Capacitances:[b]		
Grid No.1 to plate	0.13 max.	μμf
Grid No.1 to cathode	16	μμf
Plate to cathode	0.011	μμf
Grid No.1 to grid No.2	22	μμf
Grid No.2 to plate	6.5	μμf
Grid No.2 to cathode	3.2	μμf
Cathode to heater	3.4	μμf

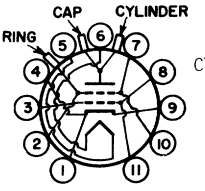
Mechanical:

Operating Position	Any
Maximum Overall Length	2.26"
Seated Length	1.920" ± 0.065"
Diameter	1.426" ± 0.010"
Weight (Approx.)	2 oz
Socket	Mycalex[c] No.CP464-2, or equivalent
Base	Large-Wafer Elevenar 11-Pin with Ring (JEDEC No.E11-81)

Terminal Connections (See *Dimensional Outline*):

BOTTOM VIEW

Pin 1 – Cathode
Pin 2 – Grid No.2
Pin 3 – Grid No.1
Pin 4 – Cathode
Pin 5 – Heater
Pin 6 – Heater
Pin 7 – Grid No.2
Pin 8 – Grid No.1
Pin 9 – Cathode
Pin 10 – Grid No.2
Pin 11 – Grid No.1



CAP – Plate-Terminal Connection
CYLINDER – Plate-Terminal Contact Surface
RING[d] – Grid-No.2 Terminal Contact Surface

Thermal:

Terminal Temperature (All terminals)	250 max.	°C
Plate Core Temperature (See *Dimensional Outline*)	250 max.	°C

Cooling, Conduction:

The plate-terminal (cylinder) must be thermally coupled to a constant temperature device (heat-sink—solid or liquid) to limit the plate terminal to the specified maximum value of 250° C. The grid No.2, grid No.1, cathode, and heater terminals may also require coupling to the heat sink to limit their respective terminal temperature to the specified maximum value of 250° C.

LINEAR RF POWER AMPLIFIER

Single-Sideband Suppressed-Carrier Service

Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2

Maximum CCS Ratings, *Absolute-Maximum Values:*

	Up to 500 Mc		
DC PLATE VOLTAGE	2200	max.	volts
DC GRID-No.2 VOLTAGE	400	max.	volts
DC GRID-No.1 VOLTAGE	-100	max.	volts
DC PLATE CURRENT AT PEAK OF ENVELOPE	450[e]	max.	ma
DC GRID-No.1 CURRENT	100	max.	ma
PLATE DISSIPATION	100[f]	max.	watts
GRID-No.2 DISSIPATION	8	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	150	max.	volts
Heater positive with respect to cathode	150	max.	volts

Typical CCS Operation with "Two-Tone Modulation":

	At 30 Mc	
DC Plate Voltage	700	volts
DC Grid-No.2 Voltage[g]	250	volts
DC Grid-No.1 Voltage[g]	-20	volts
Zero-Signal DC Plate Current	100	ma
Effective RF Load Resistance	1420	ohms
DC Plate Current:		
Peak of envelope	205	ma
Average	150	ma
DC Grid-No.2 Current:		
Peak of envelope	16	ma
Average	10	ma
Average DC Grid-No.1 Current	1[h]	ma
Peak-of-Envelope Driver Power Output (Approx.)[j]	0.3	watt
Output-Circuit Efficiency (Approx.)	95	%
Distortion Products Level:[k]		
Third order	30	db
Fifth order	35	db
Useful Power Output (Approx.):		
Peak of envelope	80[m]	watts
Average	40[m]	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition:		
With fixed bias	25000 max.	ohms
With fixed bias (In Class-AB$_1$ operation)	100000 max.	ohms
With cathode bias	Not recommended	
Grid-No.2-Circuit Impedance	10000	ohms
Plate-Circuit Impedance	[n]	

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy and RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS Ratings, *Absolute-Maximum Values:*

	Up to 500 Mc	
DC PLATE VOLTAGE	2200 max.	volts
DC GRID-No.2 VOLTAGE	400 max.	volts
DC GRID-No.1 VOLTAGE	-100 max.	volts
DC PLATE CURRENT	300 max.	ma
DC GRID-No.1 CURRENT	100 max.	ma
GRID-No.2 DISSIPATION	8 max.	watts
PLATE DISSIPATION	100[f] max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

Typical CCS Operation:

In grid-drive circuit at frequency of	*50*		*175*		*470*	*Mc*
DC Plate Voltage	500	700	500	700	700	volts
DC Grid-No.2 Voltage	160	175	200	200	200	volts
DC Grid-No.1 Voltage	-10	-10	-30	-30	-30	volts
DC Plate Current	300	300	300	300	300	ma
DC Grid-No.2 Current	25	25	30	20	10	ma
DC Grid-No.1 Current	50	50	40	40	20	ma
Driver Power Output (Approx.)[p]	1.2	1.2	3	3	5	watts
Useful Power Output:						
Typical	85[m]	110[m]	70[m]	105[m]	85[m]	watts
For minimum useful-power output see *Characteristics Range Values, Test*	*No.8*		*No.9*		*No.10*	

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition:		
With fixed bias	25000 max.	ohms
Grid-No.2-Circuit Impedance	10000 max.	ohms
Plate-Circuit Impedance	[n]	

[a] Because the cathode is subjected to back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should, for optimum life, be reduced to a value such that at the heater voltage obtained at minimum supply voltage conditions (all other voltages constant) the tube performance just starts to show some degradation; e.g., at 470 Mc, heater volts = 12.5 (Approx.).

[b] Measured with special shield adapter.

[c] Mycalex Corporation of America, 125 Clifton Boulevard, Clifton, New Jersey.

[d] For use at higher frequencies.

[e] The maximum rating for a signal having a minimum peak-to-average power ratio less than 2, such as is obtained in "Single-Tone" operation, is 300 ma. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 450 ma.

[f] Maximum plate dissipation is limited by the maximum plate core temperature and the cooling system to maintain tube operation below the specified maximum plate core temperature. With simple low-cost cooling techniques, maximum plate dissipation may be only about 100 watts; with more sophisticated cooling techniques, maximum plate dissipation may be as high as 300 watts.

[g] Obtained preferably from a separate, well-regulated source.

[h] This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid No.1 is driven to zero volts at maximum signal.

[j] Driver power output represents circuit losses and is the actual power measured at input to grid-No.1 circuit. The actual power required depends on the operating frequency and the circuit used. The tube driving power is approximately zero watts.

[k] With maximum signal output used as a reference, and without the use of feedback to enhance linearity.

[m] The value of useful power is measured at load of output circuit.

[n] The tube should see an effective plate supply impedance which limits the peak current through the tube under surge conditions to 15 amperes.

[p] Driver power output includes circuit losses and is the actual power measured at the input to the grid circuit. It will vary depending upon the frequency of operation and the circuit used.

CHARACTERISTICS RANGE VALUES

Test No.		*Note*	*Min.*	*Max.*	
1.	Heater Current	1	1.15	1.45	amp
2.	Direct Interelectrode Capacitances:	2			
	Grid No.1 to plate . .	–	–	0.13	μμf
	Grid No.1 to cathode .	–	14.3	17.7	μμf
	Plate to cathode . . .	–	0.0065	0.0155	μμf
	Grid No.1 to grid No.2	–	19.8	24.2	μμf
	Grid No.2 to plate . .	–	5.7	7.1	μμf
	Grid No.2 to cathode .	–	2.6	3.6	μμf
	Cathode to heater. . .	–	2.5	4.1	μμf
3.	Grid-No.1 Voltage. . . .	1,3	-8	-19	volts
4.	Reverse Grid-No.1 Current.	1,3	–	-25	μa
5.	Grid-No.2 Current. . . .	1,3	-7	+6	ma
6.	Peak Emission.	1,4	13	–	peak amp
7.	Interelectrode Leakage Resistance	5	1	–	megohm
8.	Useful Power Output. . .	1,6	90	–	watts
9.	Useful Power Output. . .	1,7	85	–	watts
10.	Useful Power Output. . .	1,8	75	–	watts
11.	Cutoff Grid-No.1 Voltage	1,9	–	-44	volts

Note 1: With 13.5 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage of 700 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 185 ma.

Note 4: For conditions with grid No.1, grid No.2, and plate tied together; and pulse voltage source connected between plate and cathode. Pulse duration is 2.5 microseconds and pulse repetition frequency is 60 pps. The voltage-pulse amplitude is 200 volts peak. After 1 minute at this value, the current-pulse amplitude will not be less than the value specified.

Note 5: Under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 1 megohm.

Note 6: In a CW grid-driven, conduction-cooled amplifier circuit at 50 Mc and for conditions: dc plate voltage of 700 volts, grid-No.1 voltage of -10 volts, driver power output of 1.2 watts, and grid-No.2 voltage varied to obtain a plate current of 300 ma.

Note 7: In a CW grid-driven, conduction-cooled amplifier circuit at 175 Mc and for conditions: dc plate voltage of 700 volts, grid-No.1 voltage of -30 volts, driver power output of 3 watts, and grid-No.2 voltage varied to obtain a plate current of 300 ma.

Note 8: In a CW grid-driven, conduction-cooled amplifier circuit at 470 Mc and for conditions: dc plate voltage of 700 volts, grid-No.1 voltage of -30 volts, driver power output of 5 watts, and grid-No.2 voltage varied to obtain a plate current of 300 ma.

Note 9: With dc plate voltage of 700 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage varied to obtain a plate current of 5 ma.

COOLING CONSIDERATIONS

The conduction-cooling system consists, in general, of a constant temperature device (heat sink) and suitable heat-flow path (coupling device) between the heat sink and tube. Primary consideration of the system should be given to the design of a heat-flow path (coupling device) with high thermal conductivity.

Thermal conductivity[q] may be calculated from the equation:

$$K = \frac{W}{A \frac{(T_2 - T_1)}{L}} \qquad (1)$$

where;

K = thermal conductivity of the material

W = power transfer in watts

A = area measured at right angles to the direction of the flow of heat in square inches

T_1, T_2 = temperature in degrees Centigrade of planes or surfaces under consideration

L = length of heat path in inches through coupling material to produce temperature gradient

[q] Thermal conductivity is defined as the time rate of transfer of heat by conduction, through unit thickness, across unit area for unit difference of temperature. It is measured in watts per square inch for a thickness of one inch and a difference of temperature of 1° C.

For a given system Equation (1) must be integrated to consider changes in area (A) dependent on the coupling configuration and changes in thermal conductivity (K) dependent on various coupling materials and interfaces. Equation (1) may now be reduced to the following:

$$K_S = \frac{W_P}{T_2 - T_1} \qquad (2)$$

where;

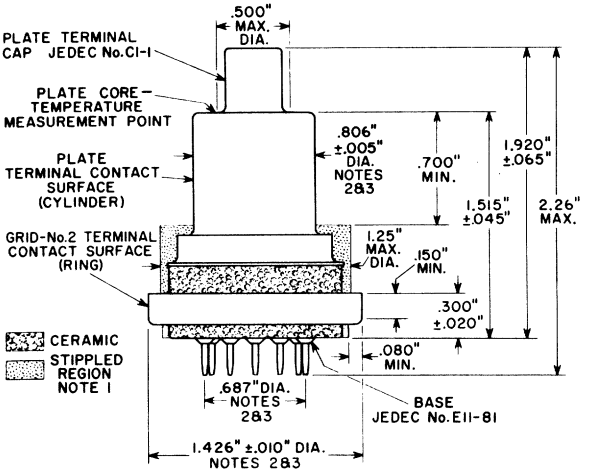
K_S = thermal conductance of the system

W_P = maximum permissible plate dissipation in watts

T_2 = temperature in degrees Centigrade at tube terminal

Note: *This value may never exceed the specified maximum rating for terminal temperature.*

T_1 = temperature in degrees Centigrade of heat sink



NOTE 1: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.

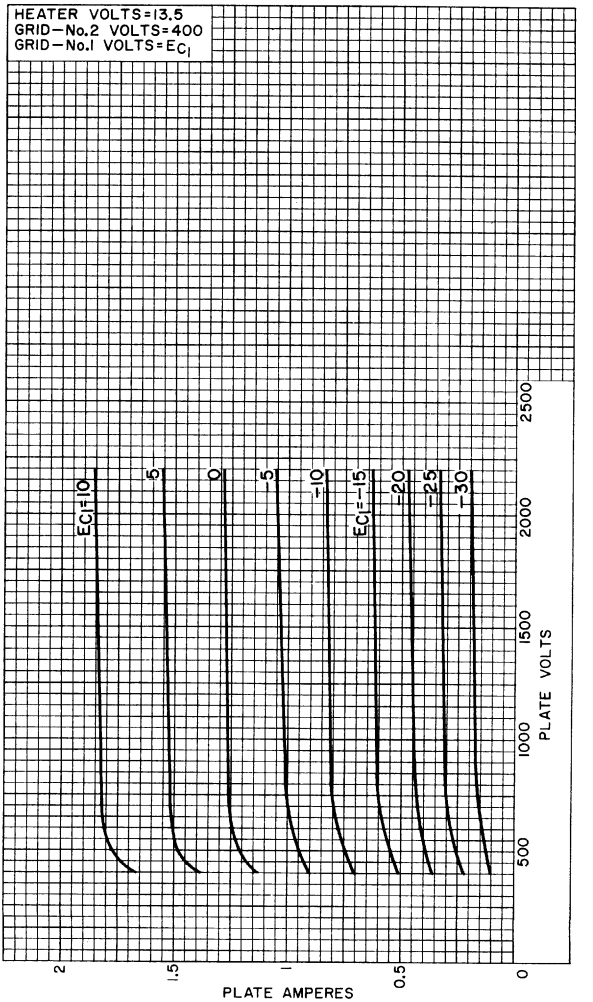
NOTE 2: THE DIAMETERS OF THE PLATE TERMINAL CONTACT SURFACE, GRID-No.2 TERMINAL CONTACT SURFACE, AND PIN CIRCLE TO BE CONCENTRIC WITHIN THE FOLLOWING VALUES OF MAXIMUM FULL INDICATOR READING:

Plate Terminal Contact Surface
to Grid-No.2 Terminal Contact Surface. . . . . 0.030"
Plate Terminal Contact Surface
to Pin Circle. . . . . 0.040"
Grid-No.2 Terminal Contact Surface
to Pin Circle. . . . . 0.030"

NOTE 3: THE FULL INDICATOR READING IS THE MAXIMUM DEVIATION IN RADIAL POSITION OF A SURFACE WHEN THE TUBE IS COMPLETELY ROTATED ABOUT THE CENTER OF THE REFERENCE SURFACE. IT IS A MEASURE OF THE TOTAL EFFECT OF RUN-OUT AND ELLIPTICITY.

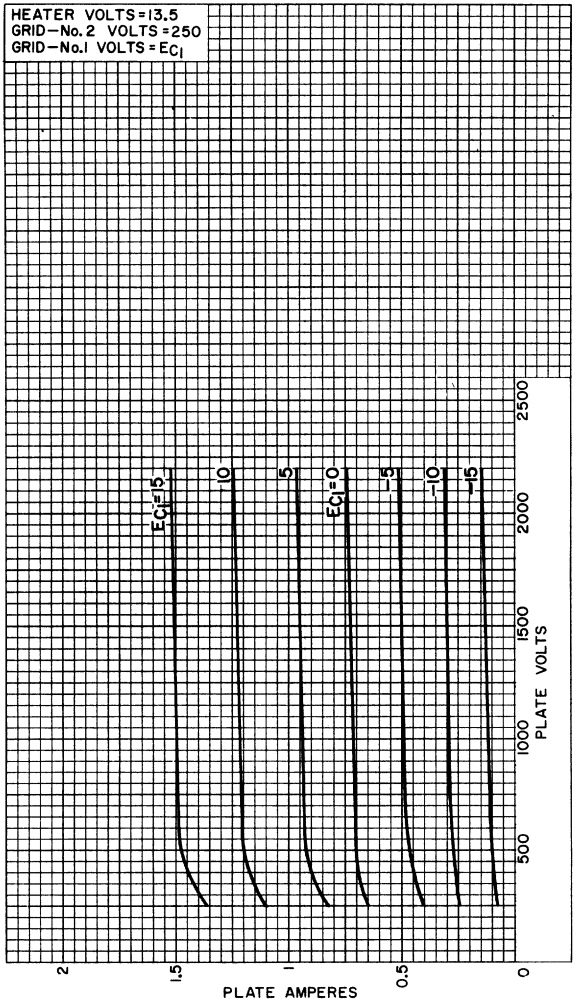
8072

TYPICAL PLATE CHARACTERISTICS



92CM—11290

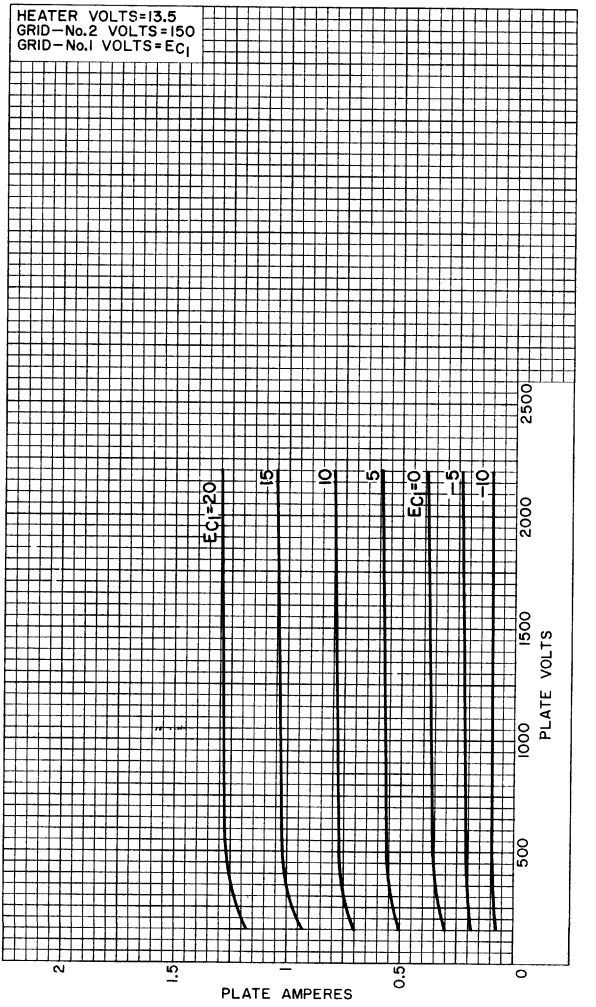
TYPICAL PLATE CHARACTERISTICS



92CM-11288

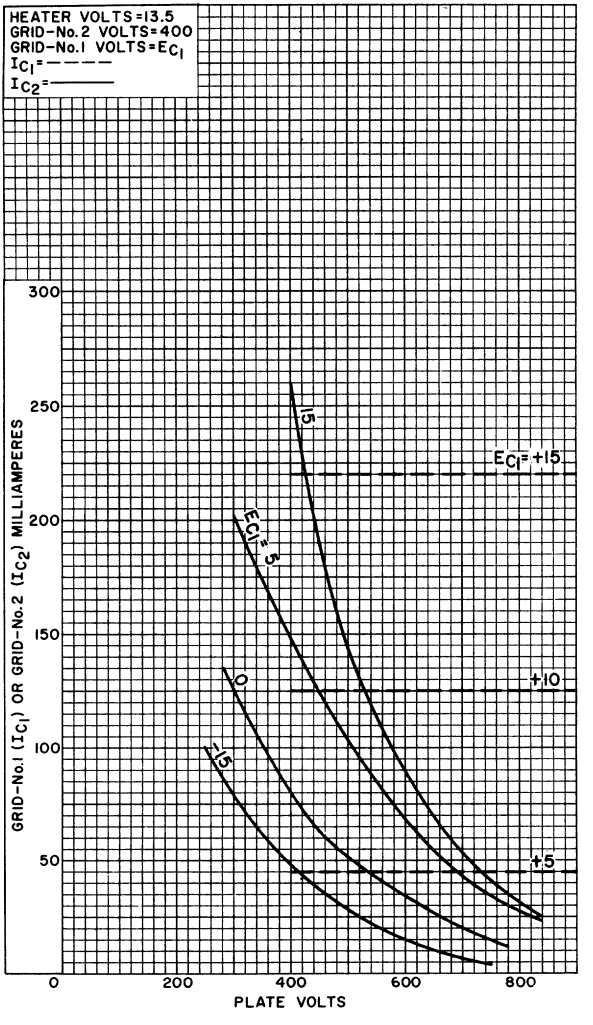
8072

TYPICAL PLATE CHARACTERISTICS



92CM—11289

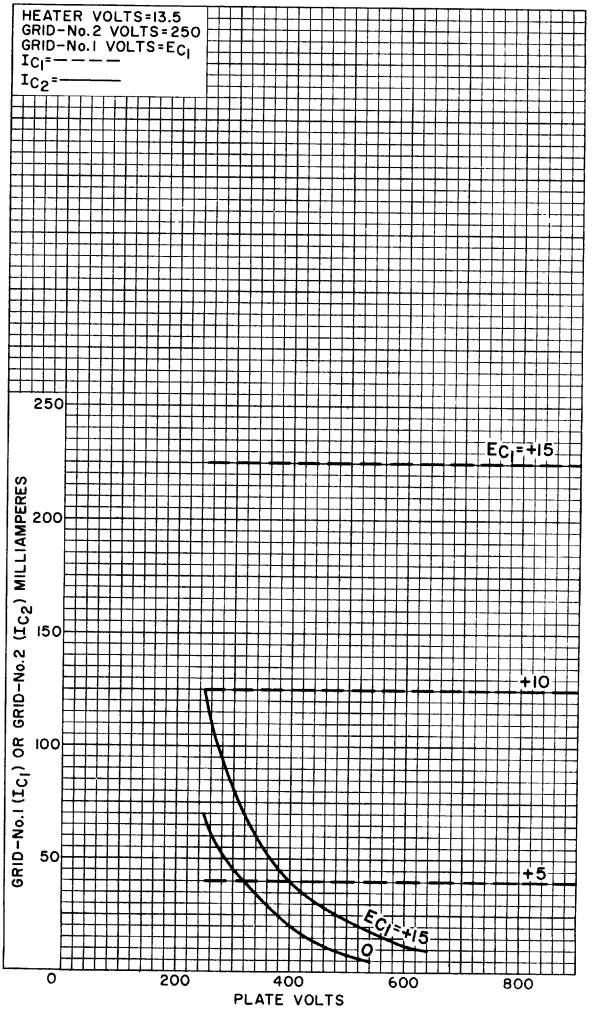
TYPICAL CHARACTERISTICS



92CM-11293RI

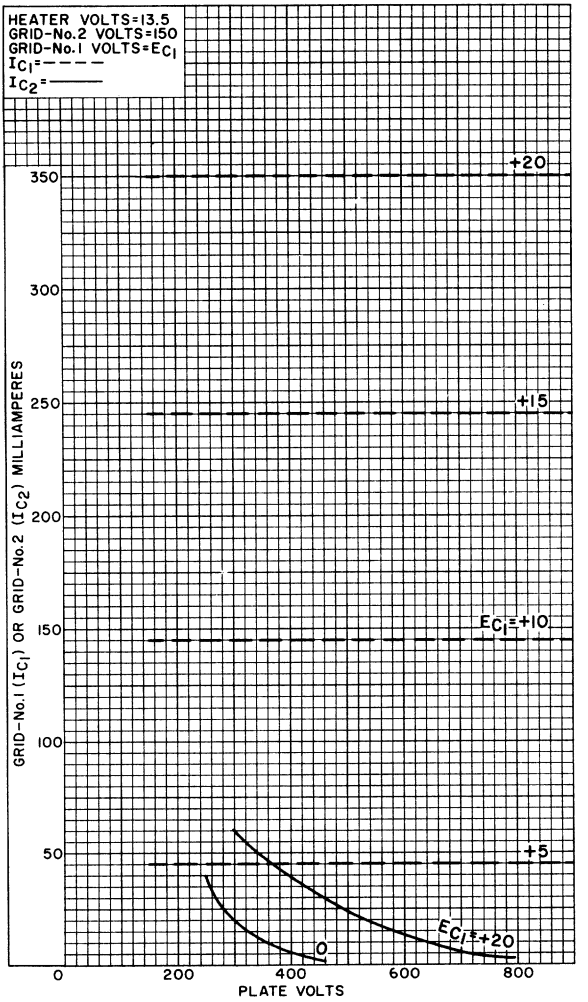
8072

TYPICAL CHARACTERISTICS



92CM-11291

TYPICAL CHARACTERISTICS



92CM-11292

8077/7054

Power Pentode

9-PIN MINIATURE TYPE

For Mobile-Communications Equipment Operating from 6-Cell Storage-Battery Systems. Useful as a Class-C RF-Power-Amplifier, Oscillator, and Frequency-Multiplier Tube up to 40 Mc, and as a Modulator and AF-Power-Amplifier Tube.

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Absolute-Maximum Values)*:		
Voltage (AC or DC)[a]	13.5 ± 1.5	volts
Current at heater volts = 13.5	0.275	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	120 max.	volts
Heater positive with respect to cathode	120 max.	volts
Direct Interelectrode Capacitances (Approx.):[b]		
Grid No.1 to plate	0.063	μμf
Grid No.1 to all other electrodes except plate	10.2	μμf
Plate to all other electrodes except grid No.1	3.5	μμf

Characteristics, Class A1 Amplifier:

Heater Voltage	13.5	volts
Plate Supply Voltage	250	volts
Grid No.3	*Connected to cathode at socket*	
Grid No.2 Supply Voltage	150	volts
Cathode Resistor	120	ohms
Plate Resistance (Approx.)	0.1	megohm
Transconductance	11500	μmhos
Plate Current	19	ma
Grid-No.2 Current	3.5	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	-10	volts

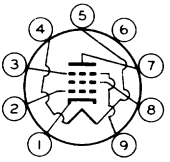
Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

8077/7054

Basing Designation for BOTTOM VIEW. 9GK

Pin 1 – Cathode
Pin 2 – Grid No.1
Pin 3 – Grid No.3, Internal Shield
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – No Internal Connection
Pin 7 – Plate
Pin 8 – Grid No.2
Pin 9 – Grid No.3, Internal Shield

AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Absolute-Maximum Values:*

PLATE VOLTAGE	330 max.	volts
GRID No.3 (SUPPRESSOR GRID)	*Connect to cathode at socket*	
GRID-No.2 (SCREEN-GRID) VOLTAGE	180 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	55 max.	volts
Positive-bias value	0 max.	volts
GRID-No.2 INPUT	1 max.	watt
PLATE DISSIPATION	5 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.25 max.	megohm

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[c] and RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS[d] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	300 max.	volts
DC GRID No.3 (SUPPRESSOR GRID)	*Connect to cathode at socket*	
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	175 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	50 max.	volts
DC PLATE CURRENT	33 max.	ma
DC GRID-No.2 CURRENT	5.5 max.	ma
DC GRID-No.1 CURRENT	3 max.	ma
GRID-No.2 INPUT	1 max.	watt
PLATE DISSIPATION	5 max.	watts

Typical Operation:

At frequencies up to 40 Mc

Heater Voltage	13.5	13.5	13.5	volts
DC Plate Voltage	200	250	300	volts
Grid No.3	*Connected to cathode at socket*			
DC Grid-No.2 Voltage	115	145	175	volts
DC Grid-No.1 Voltage	-7	-9	-12	volts
Peak RF Grid-No.1 Voltage	9	11	16	volts
DC Plate Current	14.5	20	26	ma
DC Grid-No.2 Current	3	4.1	5.5	ma
DC Grid-No.1 Current (Approx.)	0.6	0.85	1	ma

Driving Power (Approx.)	10	12	15	mw
Power Output (Approx.)	1.5	2.7	4	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	megohm

FREQUENCY MULTIPLIER

Maximum CCS[d] Ratings, *Absolute-Maximum Values:*

Same as for RF POWER AMPLIFIER & OSCILLATOR

Typical Operation:

As doubler up to 40 Mc

DC Plate Voltage	200	250	300	volts
Grid No.3	*Connected to cathode at socket*			
DC Grid-No.2 Voltage	115	145	175	volts
DC Grid-No.1 Voltage	-16	-20	-25	volts
Peak RF Grid-No.1 Voltage	19	24	31	volts
DC Plate Current	11	15	20	ma
DC Grid-No.2 Current	2	3	4	ma
DC Grid-No.1 Current (Approx.)	0.3	0.45	0.6	ma
Driving Power (Approx.)	5	9	13	mw
Useful Power Output (Approx.)	1.4	1.9	2.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	megohm

[a] The heater will take momentary excursions of 11.0 to 16.0 volts.

[b] Without external shield.

[c] Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

[d] Continuous Commercial Service.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.260	0.290	amp
Transconductance	1,2	8500	14500	μmhos
Plate Current	1,3	13	25	ma
Grid-No.2 Current	1,3	2	5	ma
Reverse Grid-No.1 Current	1,4	-	1.5	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,5	-	20	μa
Heater positive with respect to cathode	1,5	-	20	μa
Leakage Resistance:				
Between grid-No.1 and all other electrodes tied together	1,6	50	-	megohms
Between plate and all other electrodes tied together	1,7	50	-	megohms

Note 1: With ac or dc heater volts = 13.5.

Note 2: With dc-plate-supply volts = 250, grid-No.2 volts = 150, grid No.3 connected to cathode at socket, cathode resistor (ohms) = 120, and cathode-bypass capacitor (μf) = 1000.

Note 3: With dc plate-supply volts = 250, grid-No.2 supply volts = 150, grid No.3 connected to cathode at socket, and cathode resistor (ohms) = 120.

Note 4: With dc plate-supply volts = 250, grid-No.2 supply volts = 150, grid No.3 connected to cathode at socket, cathode resistor (ohms) = 120, and grid-No.1 resistor (megohms) = 1.

Note 5: With 100 volts dc between heater and cathode.

Note 6: With grid No.1 100 volts negative with respect to all other electrodes tied together.

Note 7: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 19.5 cycled one minute on and two minutes off, heater 135 volts negative with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

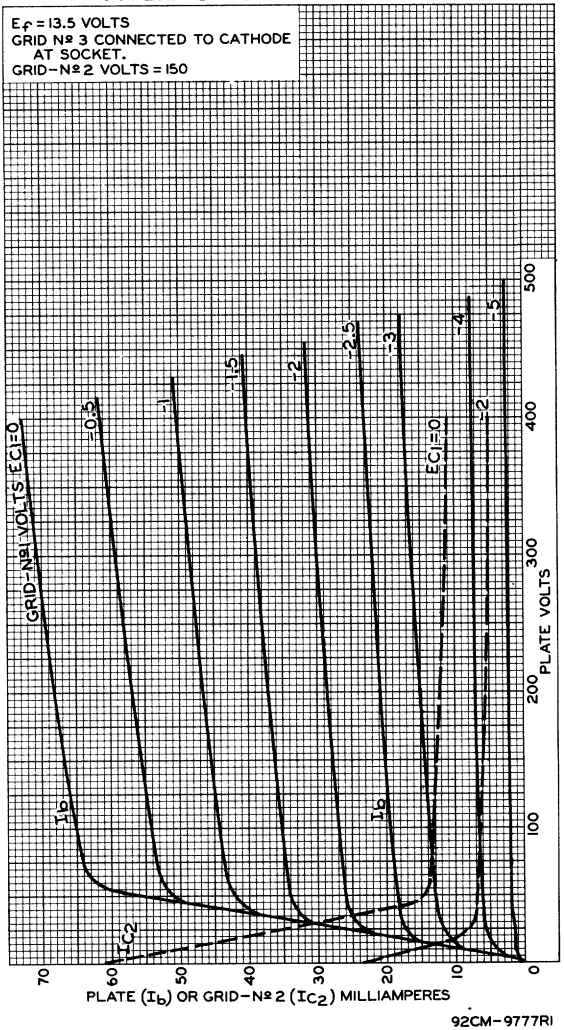
Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 13.5, plate-supply volts = 250, grid No.3 connected to cathode, grid-No.2 supply volts = 150, cathode resistor (ohms) = 120, cathode-bypass capacitor (μf) = 1000, plate load resistor (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 150 millivolts.

500-Hour Intermittent Life Performance:

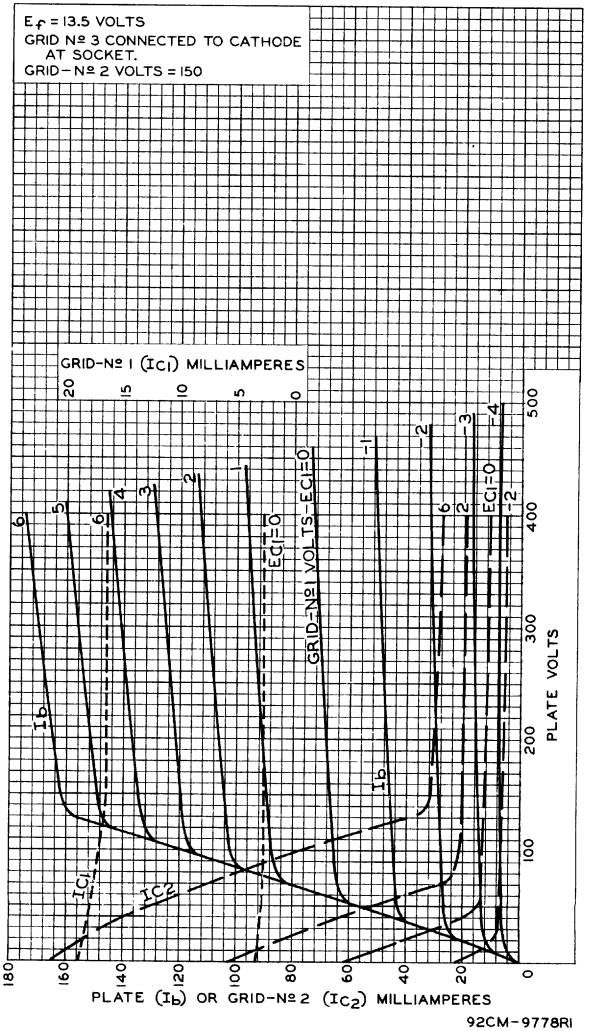
This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures. Life testing is conducted under the following conditions: heater volts = 15 and maximum-rated plate dissipation and grid-No.2 input.

AVERAGE CHARACTERISTICS



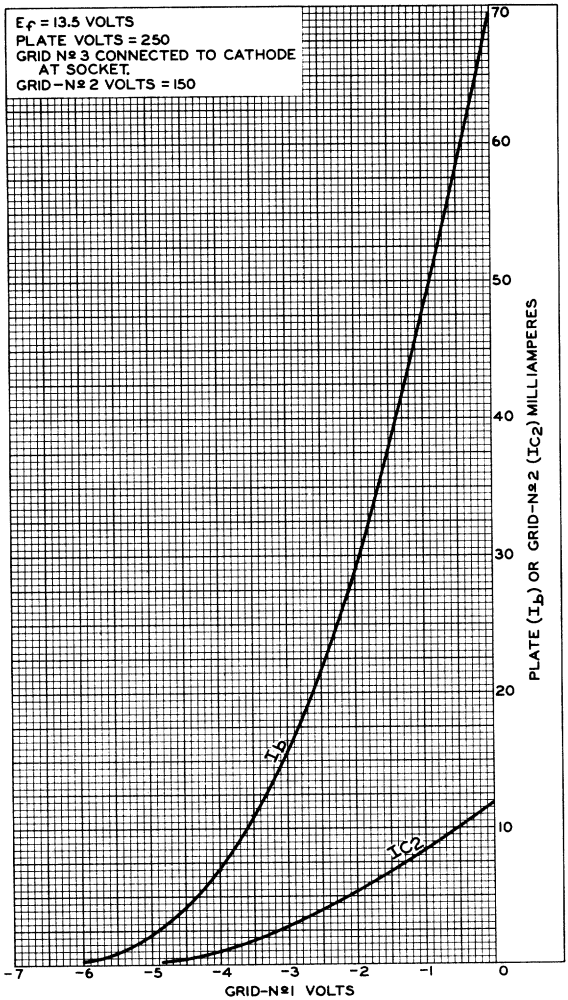
92CM-9777RI

AVERAGE CHARACTERISTICS



92CM-9778RI

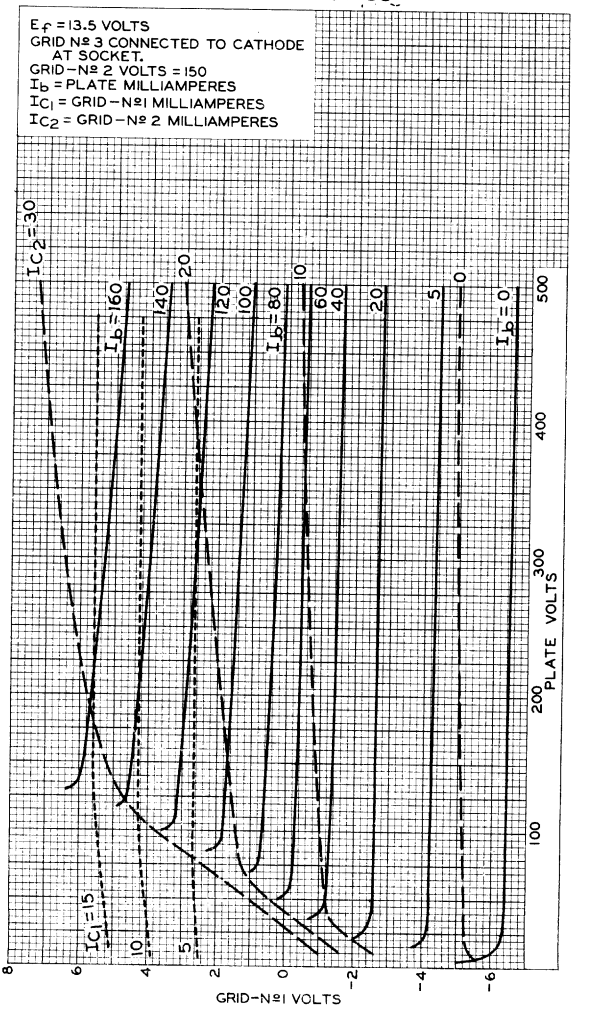
AVERAGE CHARACTERISTICS



92CM-9775RI

8077/7054

AVERAGE CONSTANT-CURRENT CHARACTERISTICS



92CM–9776Ri

RADIO CORPORATION OF AMERICA
Semiconductor & Materials Division Somerville, N. J.

8121

Beam Power Tube

FORCED-AIR COOLED

CERAMIC-METAL SEALS — 170 WATTS PEP OUTPUT AT 30 MHz
COAXIAL-ELECTRODE STRUCTURE — 235 WATTS CW OUTPUT AT 470 MHz
UNIPOTENTIAL CATHODE — INTEGRAL RADIATOR

Full Ratings up to 500 MHz

ELECTRICAL

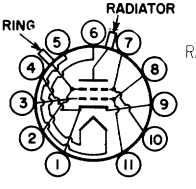
Heater, for Unipotential Cathode		
Voltage (AC or DC)[a]	13.5 ± 10%	V
Current at 13.5 volts	1.3	A
Minimum heating time	60	s
Mu-Factor, Grid No.2 to Grid No.1	12	
Plate volts = 450, grid No.2 volts = 325, plate A = 1.2		
Direct Interelectrode Capacitances[b]		
Grid No.1 to plate	0.13 max	pF
Grid No.1 to cathode	16	pF
Plate to cathode	0.011	pF
Grid No.1 to grid No.2	24	pF ←
Grid No.2 to plate	6.5	pF
Grid No.2 to cathode	2.6	pF ←
Cathode to heater	3.4	pF

MECHANICAL

Operating Position	Any
Maximum Overall Length	2.196 in
Seated Length	1.850 ± 0.065 in
Greatest Diameter	1.460 ± 0.015 in ←
Weight (Approx.)	3 oz
Socket	Mycalex[c] No.CP464-2, or equivalent
Base	Large-Wafer Elevenar 11-Pin with Ring (JEDEC No.E11-81)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Cathode
Pin 2 – Grid No.2
Pin 3 – Grid No.1
Pin 4 – Cathode
Pin 5 – Heater
Pin 6 – Heater
Pin 7 – Grid No.2
Pin 8 – Grid No.1
Pin 9 – Cathode



Pin 10 – Grid No.2
Pin 11 – Grid No.1
RADIATOR – Plate Terminal
RING[d] – Grid-No.2 Terminal Contact Surface

THERMAL

Terminal Temperature (All Terminals)	250	°C
Radiator Core Temperature		
See *Dimensional Outline*	250	°C

Air Flow

See accompanying *Typical Cooling Requirements* curve.

← Indicates a change.

8121

LINEAR RF POWER AMPLIFIER

Single-Sideband Suppressed-Carrier Service

Peak envelope conditions for a single having a minimum peak-to-average power ratio of 2

Maximum CCS Ratings, Absolute-Maximum Values

	Up to 500 MHz	
DC Plate Voltage	2200	V
DC Grid-No.2 Voltage	400	V
DC Grid-No.1 Voltage	-100	V
DC Plate Current at Peak of Envelope	450[e]	mA
DC Grid-No.1 Current	100	mA
Plate Dissipation	150	W
Grid-No.2 Dissipation	8	W
Peak Heater-Cathode Voltage		
Heater negative with respect to cathode	150	V
Heater positive with respect to cathode	150	V

Typical CCS Operation with "Two-Tone Modulation"

	At 30 MHz		
DC Plate Voltage	1000	1500	V
DC Grid-No.2 Voltage[f]	250	250	V
DC Grid-No.1 Voltage[f]	-20	-20	V
Zero-Signal DC Plate Current	100	100	mA
Effective RF Load Resistance	2270	3800	Ω
DC Plate Current			
Peak of envelope	210	210	mA
Average	160	160	mA
DC Grid-No.2 Current			
Peak of envelope	10	10	mA
Average	7	7	mA
Average DC Grid-No.1 Current	0.05[g]	0.05[g]	mA
Peak-of-Envelope Driver Power Output (Approx.)[h]	0.3	0.3	W
Output-Circuit Efficiency (Approx.)	90	85	%
Distortion Products Level[j]			
Third order	35	35	dB
Fifth order	40	40	dB
Useful Power Output (Approx.)			
Peak of envelope	110[k]	170[k]	W
Average	55[k]	85[k]	W

Maximum Circuit Values

Grid-No.1-Circuit Resistance Under Any Condition		
With fixed bias	25000	Ω
With fixed bias (In Class AB_1 operation)	100000	Ω
With cathode bias	Not recommended	
Grid-No.2-Circuit Impedance	10000	Ω
Plate-Circuit Impedance	m	

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS Ratings, Absolute-Maximum Values

	Up to 500 MHz	
→ DC Plate Voltage	1800	V
DC Grid-No.2 Voltage	400	V
DC Grid-No.1 Voltage	-100	V
→ DC Plate Current	250	mA
DC Grid-No.1 Current	100	mA
→ Grid-No.2 Input	5	W
→ Plate Dissipation	105	W
Peak Heater-Cathode Voltage		
Heater negative with respect to cathode	150	V
Heater positive with respect to cathode	150	V

Typical CCS Operation

In grid-drive circuit at frequency of	*50*			*470*			*MHz*
DC Plate Voltage	700	1000	1500	700	1000	1500	V
DC Grid-No.2 Voltage	175	200	200	200	200	200	V
DC Grid-No.1 Voltage	-10	-30	-30	-30	-30	-30	V
DC Plate Current	300	300	300	300	300	300	mA
DC Grid-No.2 Current	25	20	20	10	10	5	mA
DC Grid-No.1 Current	50	40	40	30	30	30	mA
Driver Power Output (Approx.)[f]	1.2	2	2	5	5	5	W
Useful Power Output	120[k]	175[k]	275[k]	100[p]	165[p]	235[p]	W

Maximum Circuit Values

Grid-No.1-Ciruit Resistance Under Any Condition		
With fixed bias	25000 max	Ω
Grid-No.2-Circuit Impedance	10000 max	Ω
Plate-Circuit Impedance	m	

[a] Because the cathode is subjected to back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should, for optimum life, be reduced to a value such that at the heater voltage obtained at minimum supply voltage conditions (all other voltages constant) the tube performance just starts to show some degradation; e.g., at 470 MHz, heater volts = 12.5 (Approx.).

[b] Measured with special shield adapter.

[c] Mycalex Corporation of America, 125 Clifton Boulevard, Clifton, New Jersey.

[d] For use at higher frequencies.

[e] The maximum rating for a signal having a minimum peak-to-average power ratio less than 2, such as is obtained in "Single-Tone" operation, is 300 mA. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 450 mA.

[f] Obtained preferably from a separate, well regulated source.

[g] This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid No.1 is driven to zero volts at maximum signal.

[h] Driver power output represents circuit losses and is the actual power measured at input to grid-No.1 circuit. The actual power required depends on the operating frequency and the circuit used. The tube driving power is approximately zero watts.

[j] With maximum signal output used as a reference, and without the use of feedback to enhance linearity.

[k] This value of useful power is measured at load of output circuit.

→ Indicates a change.

[m] The tube should see an effective plate supply impedance which limits the peak current through the tube under surge conditions to 15 amperes.

[n] Driver power output includes circuit losses and is the actual power measured as the input to the grid circuit. It will vary depending upon the frequency of operation and the circuit used.

[p] Measured in a typical coaxial-cavity circuit.

CHARACTERISTICS RANGE VALUES

Test No.	*Note*	*Min*	*Max*	
1. Heater Current	1	1.15	1.45	A
2. Direct Interelectrode Capacitances	2			
Grid No.1 to plate	-	-	0.13	pF
Grid No.1 to cathode	-	14.3	17.7	pF
Plate to cathode	-	0.0065	0.0155	pF
Grid No.1 to grid No.2	-	20.8	25.2	pF
Grid No.2 to plate	-	5.7	7.1	pF
Grid No.2 to cathode	-	2.0	3.0	pF
Cathode to heater	-	2.5	4.1	pF
3. Grid-No.1 Voltage	1,3	-8	-19	V
4. Reverse Grid-No.1 Current	1,3	-	-25	μA
5. Grid-No.2 Current	1,3	-7	+6	mA
6. Peak Emission	1,4	13	-	peak A
7. Interelectrode Leakage Resistance	5	1	-	MΩ

Note 1: With 13.5 volts ac or dc on heater.

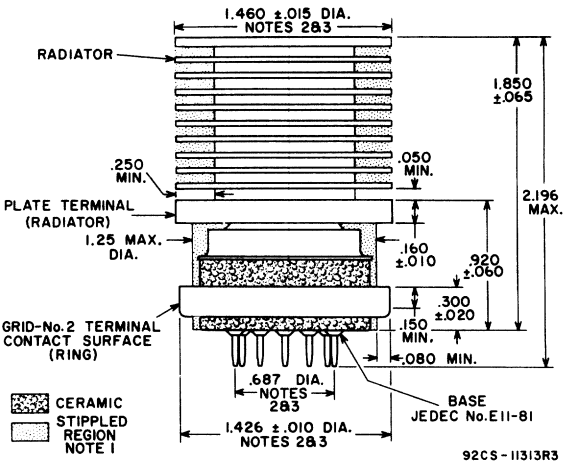
Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage at 700 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 185 mA.

Note 4: For conditions with grid No.1, grid No.2, and plate tied together; and pulse voltage source connected between plate and cathode. Pulse duration is 2.5 microseconds and pulse repetition frequency is 60 p/s. The voltage-pulse amplitude is 200 volts peak. After 1 minute at this value, the current-pulse amplitude will not be less than the value specified.

Note 5: Under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 1 megohm.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

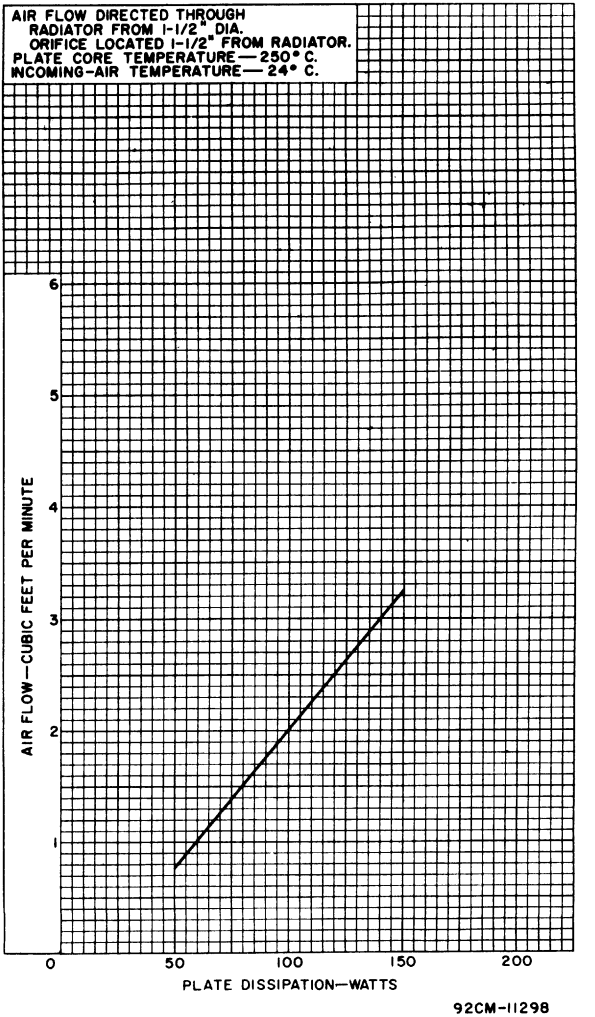
Note 1: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

Note 2: The diameters of the radiator, grid-No. 2 terminal contact surface, and pin circle to be concentric within the following values of maximum full indicator reading:

Radiator to Grid-No. 2 Terminal Contact Surface	0.030 inch max
Radiator to Pin Circle	0.040 inch max
Grid-No. 2 Terminal Contact Surface to Pin Circle	0.030 inch max

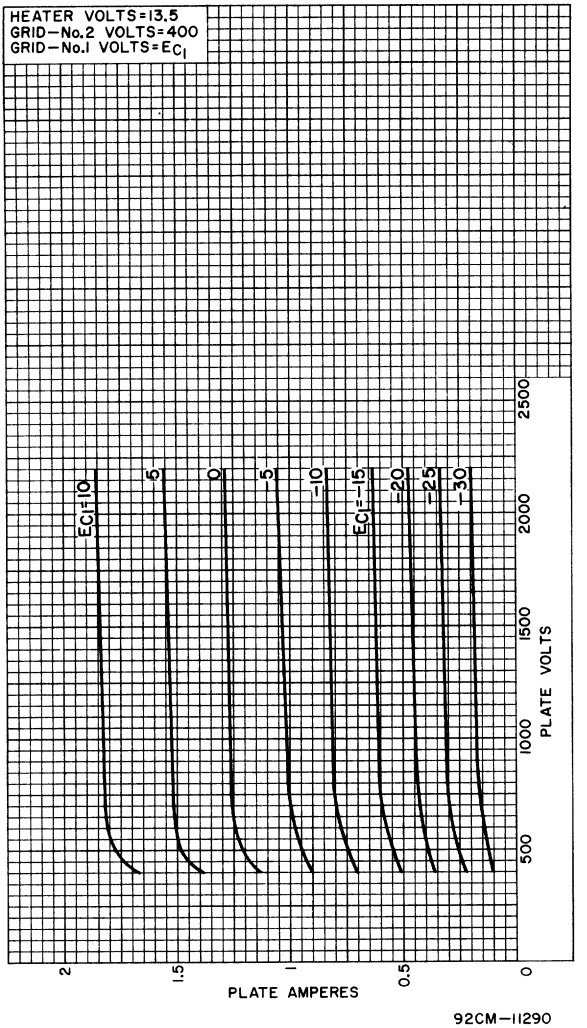
Note 3: The full indicator reading is the maximum deviation in radial position of a surface when the tube is completely rotated about the center of the reference surface. It is a measure of the total effect of run-out and ellipticity.

TYPICAL COOLING REQUIREMENTS



RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

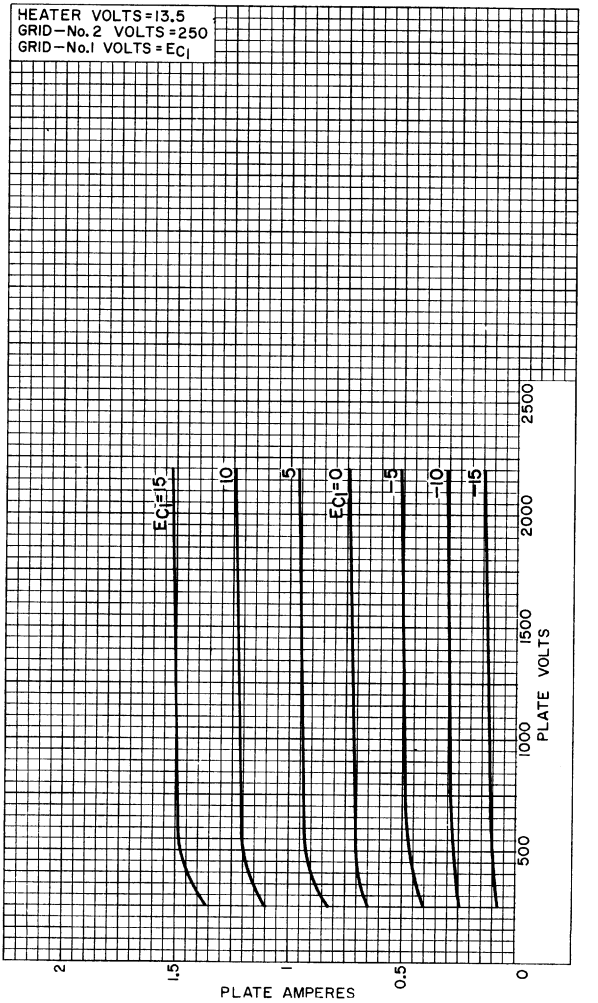
TYPICAL PLATE CHARACTERISTICS



92CM—11290

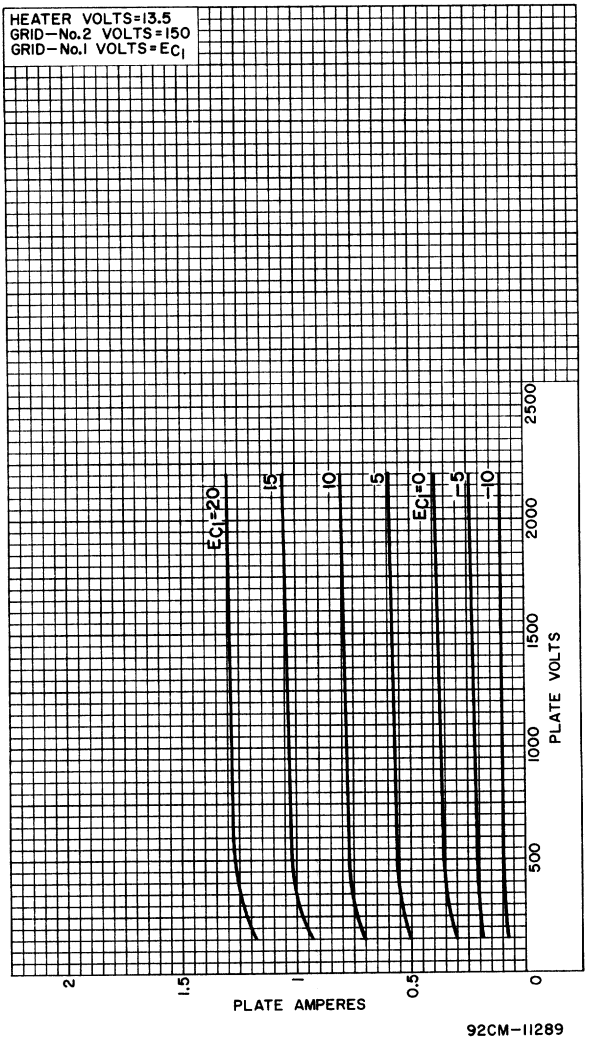
8121

TYPICAL PLATE CHARACTERISTICS



92CM-11288

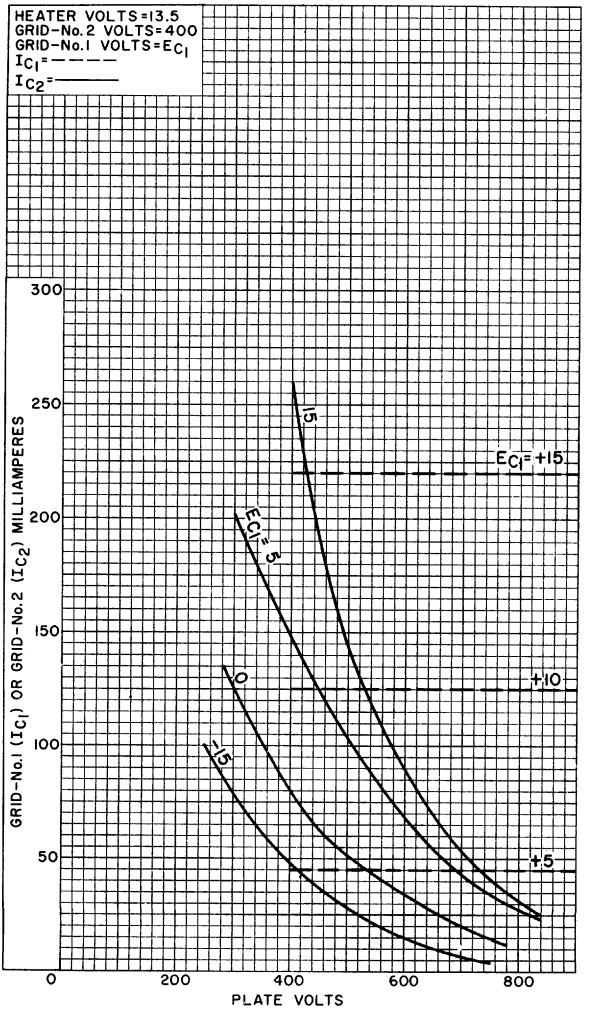
TYPICAL PLATE CHARACTERISTICS



92CM—11289

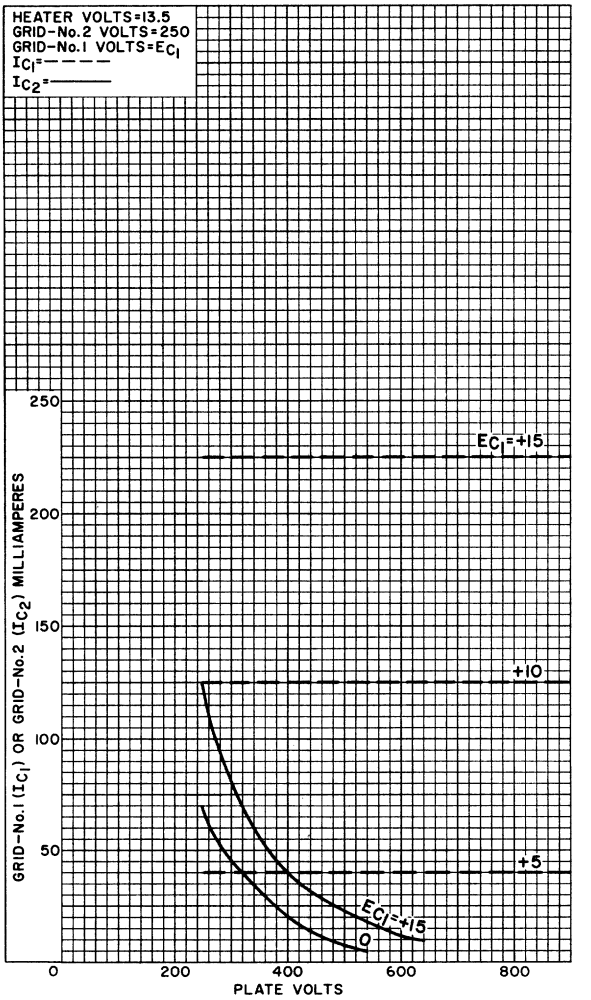
8122

TYPICAL CHARACTERISTICS



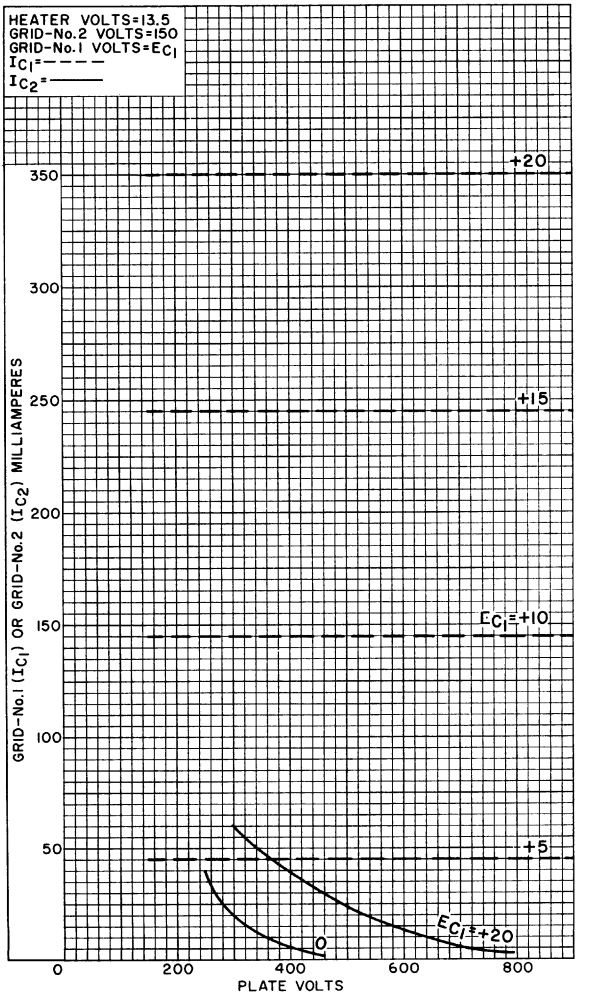
92CM-11293RI

TYPICAL CHARACTERISTICS



92CM-11291

TYPICAL CHARACTERISTICS



92CM-11292

Beam Power Tube

FORCED-AIR COOLED
CERAMIC-METAL SEALS
COAXIAL ELECTRODE STRUCTURE
UNIPOTENTIAL CATHODE

INTEGRAL RADIATOR
380 WATTS PEP OUTPUT AT 30 MHz AB_1
570 WATTS PEP OUTPUT AT 30 MHz AB_2
300 WATTS CW OUTPUT AT 470 MHz

For Use as an RF Power Amplifier, Oscillator, Regulator, Distributed Amplifier or Linear RF Power Amplifier in Mobile or Fixed Equipment

ELECTRICAL

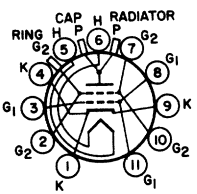
Heater, for Unipotential Cathode[p]		
Voltage (AC or DC)[a]	13.5 ± 10%	V
Current at 13.5 volts	1.3	A
Minimum heating time	60	s
Mu-Factor, Grid No.2 to Grid No.1	12	
Plate volts = 450, grid-No.2 volts = 325, plate amperes = 1.2		
Direct Interelectrode Capacitances[b]		
Grid No.1 to plate	0.13 max	pF
Grid No.1 to cathode	16	pF
Plate to cathode	0.011	pF
Grid No.1 to grid No.2	24	pF
Grid No.2 to plate	7	pF
Grid No.2 to cathode	2.6	pF
Cathode to heater	3.4	pF

MECHANICAL

Operating Position . . . . . Any
Maximum Overall Length . . . . . 2.26 in
Seated Length . . . . . 1.920 ± 0.065 in
Diameter . . . . . 1.625 ± 0.015 in
Weight (Approx.) . . . . . 3.5 oz
Socket . . . . . Erie[c] No.9802-000 and 9804-000, Johnson[d] No.124-311-110, Mycalex[e] No.CP464-2, or equivalent
Grid No.2 Bypass Capacitor . . . . Erie[c] No.2943-002, Johnson[d] No.124-121, or equivalent
Base . . Large-Wafer Elevenar 11-Pin with Ring (JEDEC No.E11-81)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Cathode
Pin 2 – Grid No.2
Pin 3 – Grid No.1
Pin 4 – Cathode
Pin 5 – Heater
Pin 6 – Heater
Pin 7 – Grid No.2
Pin 8 – Grid No.1
Pin 9 – Cathode
Pin 10 – Grid No.2



Pin 11 – Grid No.1
CAP – Plate Terminal
RADIATOR – Plate Terminal
RING – Grid-No.2 Terminal Contact Surface (For use at higher frequencies)

THERMAL

Terminal Temperature (All Terminals) . . . . . 250 max °C
Radiator Core Temperature
See *Dimensional Outline*. . . . . 250 max °C
Air Flow[q] (See accompaying *Typical Cooling Requirements* curve).

LINEAR RF POWER AMPLIFIER[r]

Single-Sideband Suppressed-Carrier Service

Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2

Maximum CCS Ratings, Absolute-Maximum Values

→ DC Plate Voltage		
Up to 30 MHz	3000[f]	V
Up to 500 MHz	2200	V
	Up to 500 MHz	
DC Grid-No.2 Voltage	400	V
DC Grid-No.1 Voltage	-100	V
DC Plate Current at Peak of Envelope	450[g]	mA
DC Grid-No.1 Current	100	mA
Plate Dissipation	400	W
Grid-No.2 Dissipation	8	W
Peak Heater-Cathode Voltage	±150	V

Typical CCS Operation at 30 MHz with "Two-Tone Modulation"

	AB1	*AB2*	
DC Plate Voltage	2000	2500	V
DC Grid-No.2 Voltage	400	400	V
DC Grid-No.1 Voltage	-35	-35	V
Zero-Signal DC Plate Current	100	115	mA
Effective RF Load Resistance	3050	3500	Ω
DC Plate Current			
Peak of envelope	335	400	mA
Average	250	275	mA
DC Grid-No.2 Current			
Peak of envelope	10	6	mA
Average	7	4	mA
Average DC Grid-No.1 Current	0.05[h]	3	mA
Peak-of-Envelope Driver Power Output (Approx.)	0.3	0.5	W
Output-Circuit Efficiency (Approx.)	90	90	%
Distortion Products Level			
Third order	29[j]	28	dB
Fifth order	32	32	dB
Useful Power Output (Approx.)			
Peak of envelope	380	570	W
Average	190	285	W

Maximum Circuit Values

Grid-No.1 Circuit Resistance Under Any Condition[k]		
With fixed bias	25000	Ω
With fixed bias (In Class-AB1 operation)	100000	Ω
With cathode bias	Not recommended	
Grid-No.2-Circuit Impedance[m]	10000	Ω
Plate-Circuit Impedance[f]	[n]	

PLATE-MODULATED RF POWER AMPLIFIER - Class C Telephony[r]

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS Ratings, Absolute-Maximum Values

	Up to 500 MHz	
DC Plate Voltage	1800	V
DC Grid-No.2 Voltage	400	V
DC Grid-No.1 Voltage	-100	V

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DC Plate Current	250	mA
DC Grid-No.1 Current	100	mA
Grid-No.2 Input	5	W
Plate Dissipation	280	W

RF POWER AMPLIFIER & OSCILLATOR - Class C Telegraphy[r]
and
RF POWER AMPLIFIER - Class C FM Telephony[r]

Maximum CCS Ratings, Absolute-Maximum Values

	Up to 500 MHz	
DC Plate Voltage	2200	V
DC Grid-No.2 Voltage	400	V
DC Grid-No.1 Voltage	-100	V
DC Plate Current	300	mA
DC Grid-No.1 Current	100	mA
Grid-No.2 Dissipation	8	W
Plate Dissipation	400	W
Peak Heater-Cathode Voltage	±150	V

Typical CCS Operation

In grid-drive circuit at 50 MHz

DC Plate Voltage	700	1000	1500	2000	V
DC Grid-No.2 Voltage	175	200	200	200	V
DC Grid-No.1 Voltage	-10	-30	-30	-30	V
DC Plate Current	300	300	300	300	mA
DC Grid-No.2 Current	25	20	20	20	mA
DC Grid-No.1 Current	50	40	40	30	mA
Driver Power Output (Approx.)	1.2	2	2	2	W
Useful Power Output	120	175	275	375	W

In grid-drive circuit at 470 MHz

DC Plate Voltage	700	1000	1500	2000	V
DC Grid-No.2 Voltage	200	200	200	200	V
DC Grid-No.1 Voltage	-30	-30	-30	-30	V
DC Plate Current	300	300	300	300	mA
DC Grid-No.2 Current	10	10	5	5	mA
DC Grid-No.1 Current	30	30	30	30	mA
Driver Power Output (Approx.)	5	5	5	5	W
Useful Power Output	100	165	235	300	W

Maximum Circuit Values

Grid-No.1 Circuit Resistance Under Any Condition		
With fixed bias	25000	Ω
Grid-No.2-Circuit Impedance	10000	Ω
Plate-Circuit Impedance	n	

[a] Because the cathode is subjected to back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should, for optimum life, be reduced to a value such that at the heater voltage obtained at minimum supply voltage conditions (all other voltages constant) the tube performance just starts to show some degradation; e.g., at 470 MHz, heater volts = 12.5 (approx.).

[b] Measured with special shield adapter.

[c] Erie Technological Products, Inc., 645 West 12th Street, Erie, Pa.

[d] E. F. Johnson Co., 1921 10th Ave. S.W. Waseca, Minn.

[e] Mycalex Corporation of America, 775 Clifton Boulevard, Clifton.

[f] For operation above 2200 plate volts, the tube shall see an effective plate-supply impedance of no less than 750 ohms. A fault current

limiting resistor of no less than 15 ohms is to be used between the output filter capacitance and the tube plate. The plate-supply-output-filter capacitance is to be no greater than 10 μF.

g The maximum rating for a signal having a minimum peak-to-average power ratio less than 2, such as is obtained in "Single-Tone" operation, is 300 mA. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 450 mA.

h This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid No.1 is driven to zero volts at maximum signal.

j The value of third order distortion product level shown may be improved by approximately 5 dB by utilizing an unbypassed, non-inductive 20-ohm resistor between the cathode and ground; a slight increase in drive power will be required.

k A fault current limiting resistor of no less than 20 ohms is to be used between the bias supply output filter capacitance and the tube grid-No.1. The bias supply output filter capacitance is to be no greater than 150 μF.

m A fault current limiting resistor of no less than 320 ohms is to be used between the screen output filter capacitance and the tube screen. The screen supply output filter capacitance is to be no greater than 80 μF.

n The tube should see an effective plate supply impedance which limits the peak current through the tube under surge conditions to 15 amperes.

The following footnotes apply to the *RCA Transmitting Tube Operating Considerations* given at front of this section.

p See *Electrical Considerations* - Filament or Heater.

q See *Cooling Considerations* - Forced-Air Cooling.

r See *Classes of Service*.

CHARACTERISTICS RANGE VALUES

Test No.	*Note*	*Min*	*Max*	
1. Heater Current	1	1.15	1.45	A
2. Direct Interelectrode Capacitances				
Grid No.1 to plate	2	-	0.13	pF
Grid No.1 to cathode	2	14.3	17.7	pF
Plate to cathode	2	0.0065	0.0155	pF
Grid No.1 to grid No.2	2	20.8	25.2	pF
Grid No.2 to plate	2	5.7	7.1	pF
Grid No.2 to cathode	2	2.0	3.0	pF
Cathode to heater	2	2.5	4.1	pF
3. Grid-No.1 Voltage	1,3	-8	-19	V
4. Reverse Grid-No.1 Current	1,3	-	-25	μA
→ 5. Grid-No.2 Current	1,3	-7	+6	mA
6. Peak Emission	1,4	13	-	peak A
→ 7. Interelectrode Leakage Resistance	5	50	-	MΩ
→ 8. Zero Bias Plate Current	1,6	1	1.8	A

Note 1: With 13.5 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage at 700 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 185 mA.

Note 4: For conditions with grid No.1, grid No.2, and plate tied together; and pulse voltage source connected between plate and cathode. Pulse duration is 2.5 microseconds and pulse repetition frequency is 60 p.p.s. The voltage-pulse amplitude is 200 volts peak. After 1 minute at this value, the current-pulse amplitude will not be less than the value specified.

Note 5: Under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be no less than the value specified.

Note 6: With dc plate voltage of 450 volts, dc grid No.2 voltage of 400 volts, dc grid No.1 voltage of - 100 volts, griddrive voltage to zero. With pulse duration of 4500 to 5000 μs and pulse repetition frequency is 10 to 12 p.p.s.

→ Indicates a change.

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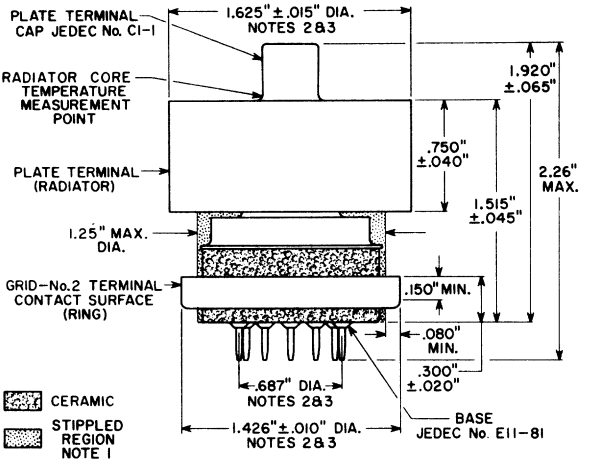


NOTE 1: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.

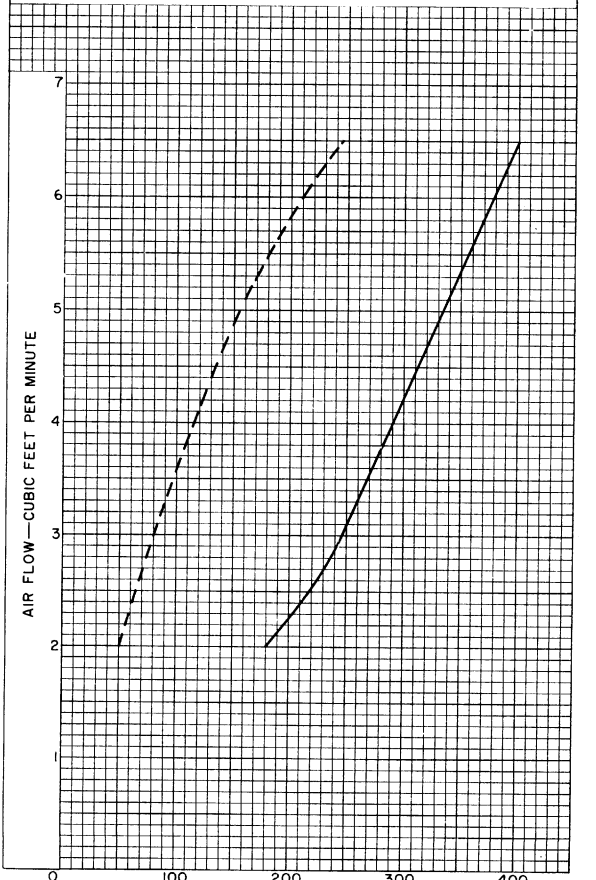
NOTE 2: THE DIAMETERS OF THE RADIATOR, GRID-No.2 TERMINAL CONTACT SURFACE, AND PIN CIRCLE TO BE CONCENTRIC WITHIN THE FOLLOWING VALUES OF MAXIMUM FULL INDICATOR READING:

Radiator to Grid-No.2 Terminal Contact Surface.	0.030" max.
Radiator to Pin Circle.	0.040" max.
Grid-No.2 Terminal Contact Surface to Pin Circle	0.030" max.

NOTE 3: THE FULL INDICATOR READING IS THE MAXIMUM DEVIATION IN RADIAL POSITION OF A SURFACE WHEN THE TUBE IS COMPLETELY ROTATED ABOUT THE CENTER OF THE REFERENCE SURFACE. IT IS A MEASURE OF THE TOTAL EFFECT OF RUN-OUT AND ELLIPTICITY.

TYPICAL COOLING REQUIREMENTS

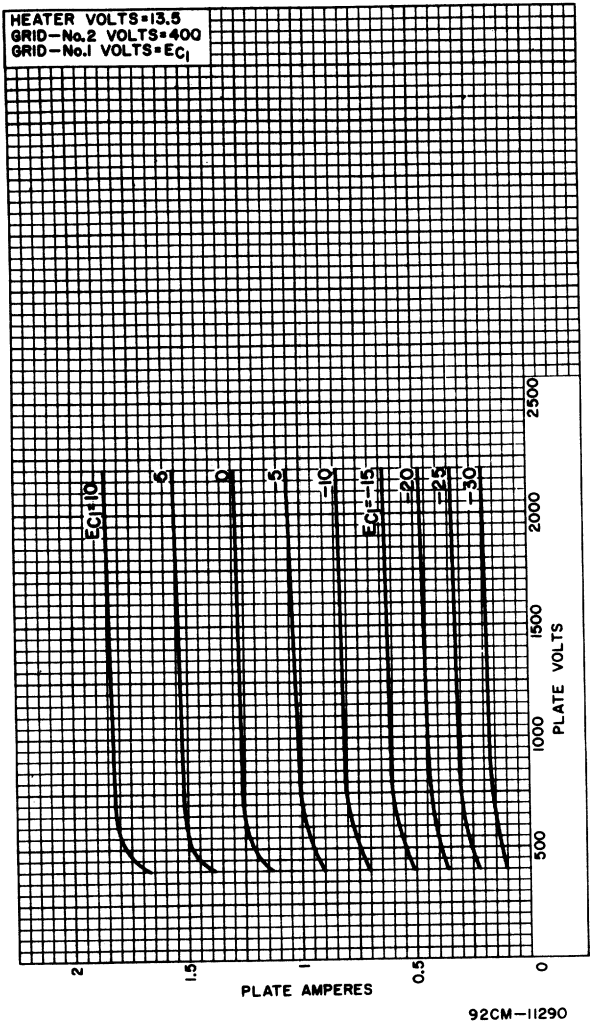
AIR FLOW DIRECTED THROUGH RADIATOR WITH AIR CHIMNEY SK-606 (EITEL-McCULLOUGH INC.), AND SOCKET CD464-2 (MYCALEX CORP. OF AMERICA), AND BY-PASS CAPACITOR (E.F. JOHNSON CO.)
PLATE-CORE TEMPERATURE — 250° C.
INCOMING-AIR TEMPERATURE — 24° C.



92CM-11299

TYPICAL PLATE CHARACTERISTICS

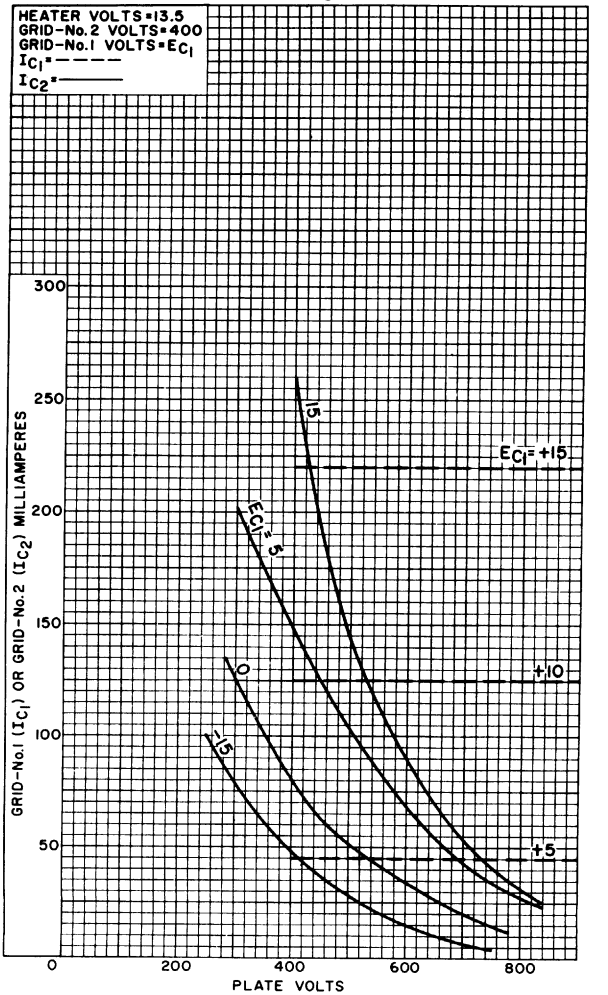
For Grid-No.2 Voltage = 400 Volts



92CM—11290

TYPICAL CHARACTERISTICS

For Grid-No.2 Voltage = 400 Volts



92CM-11293RI

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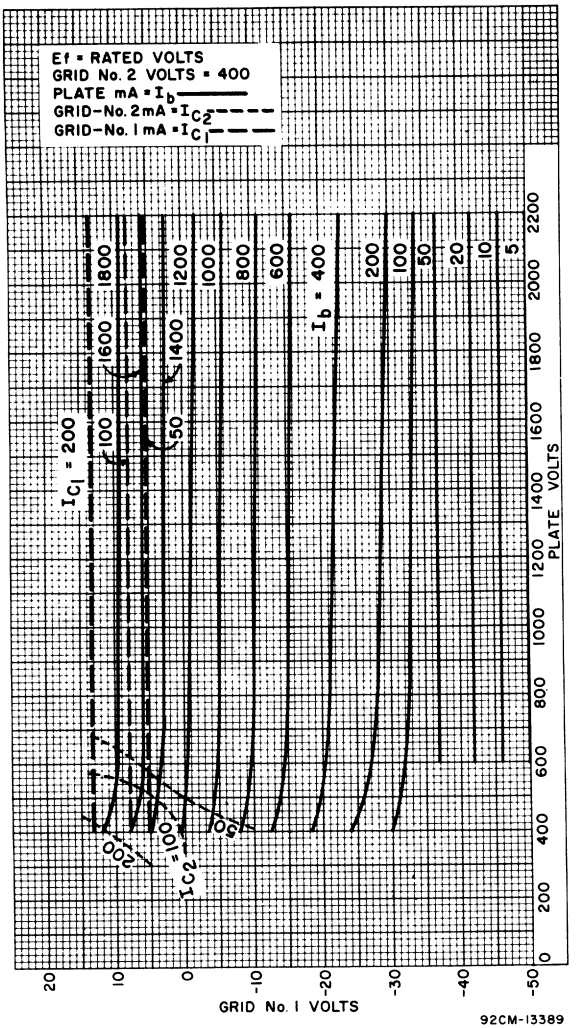
TYPICAL CONSTANT-CURRENT CHARACTERISTICS

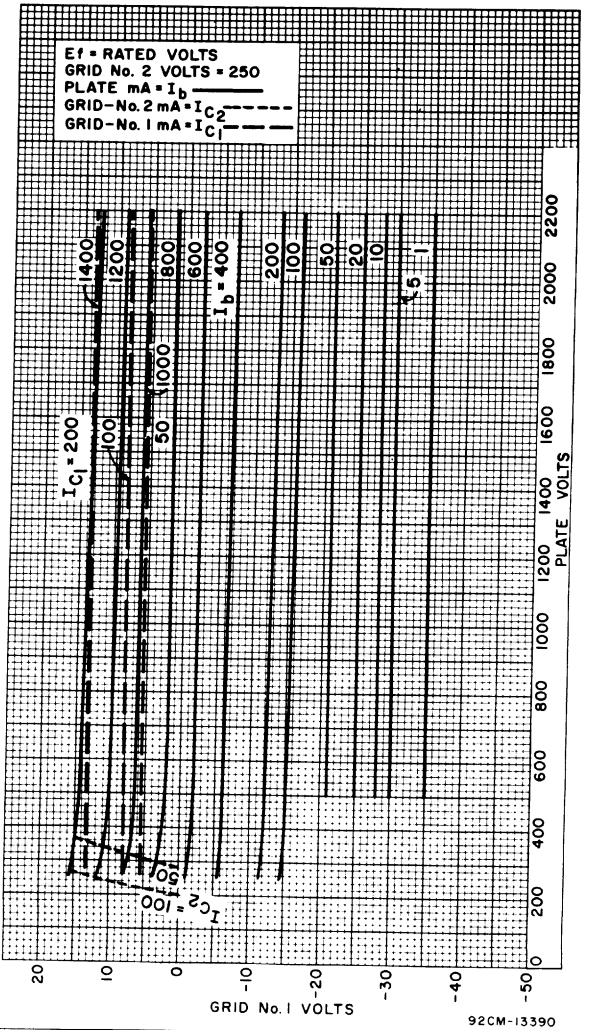
For Grid-No.2 Voltage = 400 Volts



8122

TYPICAL CONSTANT-CURRENT CHARACTERISTICS

For Grid-No.2 Voltage = 250 Volts



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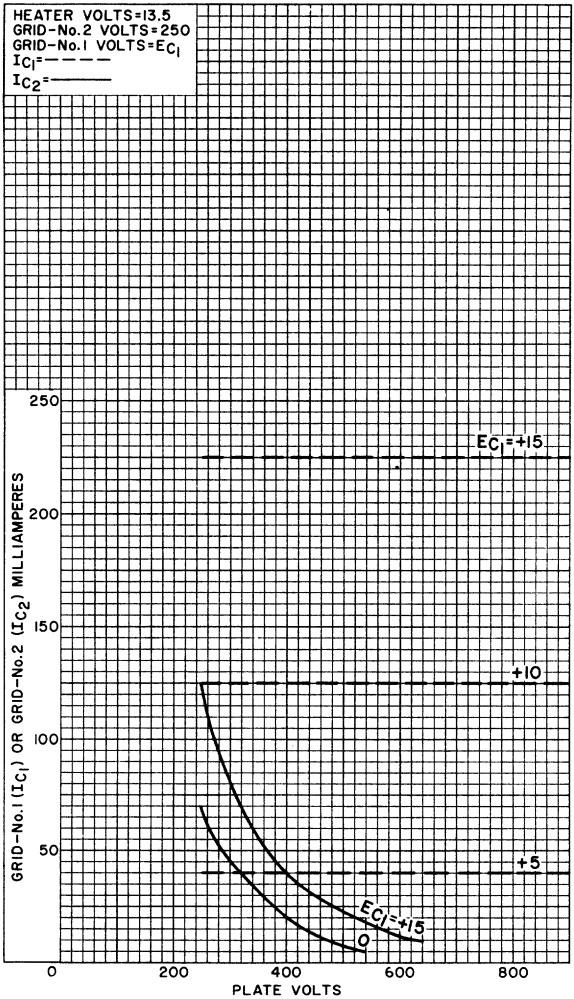
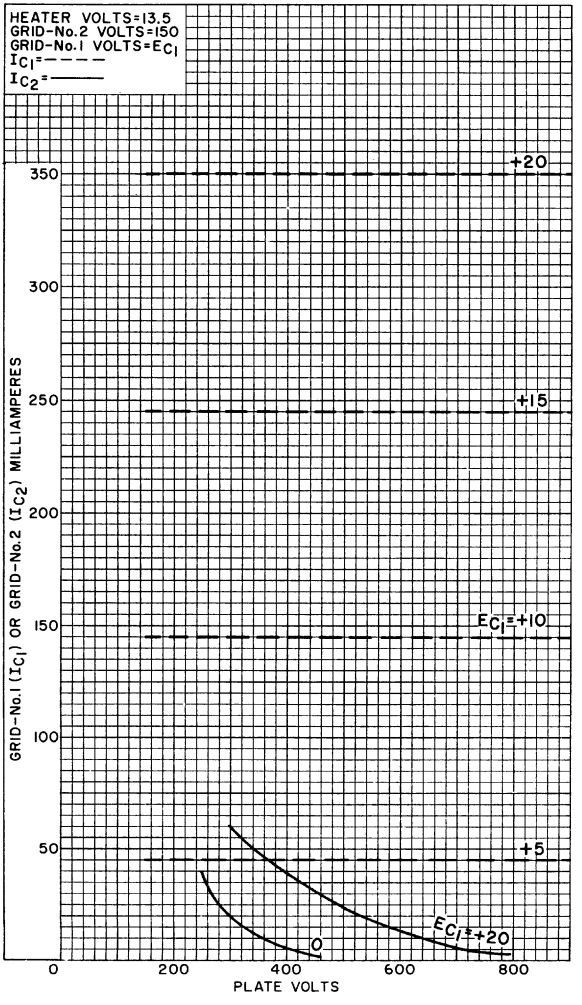
TYPICAL CHARACTERISTICS



92CM-11291

TYPICAL CHARACTERISTICS



92CM-11292

Beam Power Tube

CERAMIC-METAL SEALS
"ONE-PIECE" ELECTRODE DESIGN

COAXIAL-ELECTRODE STRUCTURE
INTEGRAL RADIATOR

2 MEGAWATT MAXIMUM PEAK POWER INPUT UP TO 500 Mc
MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE

For use at Frequencies up to 500 Mc

GENERAL DATA

Electrical:

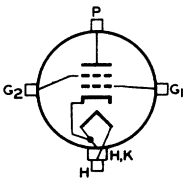
Heater, for Matrix-Type, Oxide-Coated, Unipotential Cathode[a]

	Typical	*Maximum*	
Voltage (AC or DC)	22	23	volts
Current at heater volts = 22	12.6		amp
Minimum heating time	5		minutes
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 5000, grid-No.2 volts = 1400, and plate ma. = 500	25		
Direct Interelectrode Capacitances:			
Grid No.1 to plate[b]	0.3	max.	pf
Grid No.1 to cathode & heater	100		pf
Plate to cathode & heater[b,c]	0.03	max.	pf
Grid No.1 to grid No.2	110		pf
Grid No.2 to plate	24		pf
Grid No.2 to cathode & heater[c]	1.5	max.	pf

Mechanical:

Operating Position . . . . . Any
Maximum Overall Length . . . . . 7.24"
Maximum Diameter . . . . . 5.56"
Weight (Approx.) . . . . . 8.5 lbs
Radiator . . . . . Integral part of tube
Terminal Connections (See *Dimensional Outline*):

G_1 - Grid-No-1- Terminal Contact Surface
G_2 - Grid-No.2- Terminal Contact Surface
H - Heater- Terminal Contact Surface



H,K - Heater- & Cathode- Terminal Contact Surface
P - Plate- Terminal Contact Surface

Thermal:

Air Flow:

Through radiator—Adequate air flow to limit the plate-core temperature to 250° C should be delivered by a blower through the radiator before and during the application of heater, plate, grid-No.2, and grid-No.1 voltages. Typical

values of air flow directed through the radiator versus plate dissipation are shown in accompanying *Typical-Cooling-Requirements* curve.

To Plate, Grid-No.2, Grid-No.1, Cathode, and Heater Terminals—A sufficient quantity of air should be allowed to flow past each of these terminals to prevent their temperature from exceeding the specified maximum value of 250° C.

Plate power, grid-No.2 power, heater power, and the forced-air flow may be removed simultaneously.

Terminal Temperature[d] (Plate, grid No.2, grid No.1, cathode, and heater)	250 max.	°C
Plate Core Temperature[d]	250 max.	°C

PULSED RF AMPLIFIER

Maximum CCS[e] Ratings, *Absolute-Maximum Values:*

For maximum "on" time[f] of 10 microseconds in any 2000-microsecond interval and frequencies up to 500 Mc

PEAK POSITIVE PULSE PLATE VOLTAGE[g]	25000 max.	volts
DC PLATE VOLTAGE[g]	15000 max.	volts
POSITIVE-PULSE GRID-No.2 VOLTAGE:		
Peak	2500 max.	volts
DC	2500 max.	volts
NEGATIVE-PULSE GRID-No.1 VOLTAGE:		
Peak	500 max.	volts
DC	500 max.	volts
DC-PULSE PLATE CURRENT	80 max.	amps
DC PLATE CURRENT	0.5 max.	amp
GRID-No.2 INPUT (Average)	150 max.	watts
GRID-No.1 INPUT (Average)	100 max.	watts
PLATE DISSIPATION (Average)	10000 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition	2000 max.	ohms

[a] See *Operating Considerations*.

[b] With external flat metal shield 8" diameter having center hole 4" diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2 and ground.

[c] With external flat metal shield 8" diameter having center hole 3-3/8" diameter. Shield is located in plane of the grid-No.1 terminal, perpendicular to the tube axis, and is connected to grid No.1 and ground.

[d] See *Operating Considerations* and also *Dimensional Outline* for temperature-measurement points.

[e] Continuous Commercial Service.

[f] *"On" time* is defined as the sum of the durations of all the individual pulses which occur during the interval. An increase in dc plate current during the pulse may be permissible at shorter "on" times, and a decrease is usually required at longer "on" times. *Pulse duration* is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 per cent of the peak value. *Peak value* is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

Duty factor is defined as the ratio of "on" time to total elapsed time in any interval.

[g] Pressurization may be required when the tube is used at high altitudes and plate voltages near the maximum rating to prevent flash-over at the tube seals.

CHARACTERISTICS RANGE VALUES

	Note	Min.	Max.	
Heater Current	1	11.7	13.5	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	–	0.3	pf
Grid No.1 to cathode & heater		91	113	pf
Plate to cathode & heater	2,3	–	0.03	pf
Grid No.1 to grid No.2		99	121	pf
Grid No.2 to plate		21	26	pf
Grid No.2 to cathode & heater	3	–	1.5	pf
Grid-No.1 Voltage	1,4	-27	-61	volts
Grid-No.1 Cutoff Voltage	1,5	–	-95	volts

Note 1: With 22 volts ac or dc on heater.

Note 2: With external flat metal shield 8" diameter having center hole 4" diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2 and ground.

Note 3: With external flat metal shield 8" diameter having center hole 3-3/8" diameter. Shield is located in plane of the grid-No.1 terminal, perpendicular to the tube axis, and is connected to grid No.1 and ground.

Note 4: With dc plate voltage of 5000 volts, dc grid-No.2 voltage of 1500 volts, and dc grid-No.1 voltage adjusted to give a plate current of 500 ma.

Note 5: With dc plate voltage of 5000 volts, dc grid-No.2 voltage of 1500 volts, and dc grid-No.1 voltage adjusted to give a plate current of 20 ma.

OPERATING CONSIDERATIONS

Heater

The heater of the 8184 should be operated at constant voltage rather than constant current. The rated heater voltage of 22 volts should be applied for 5 minutes to allow the cathode to reach normal operating temperature before voltages are applied to the other electrodes. Good regulation of the heater voltage is in general economically advantageous from the viewpoint of tube life; in no case should the voltage fluctuations be more than 5%.

Temperature

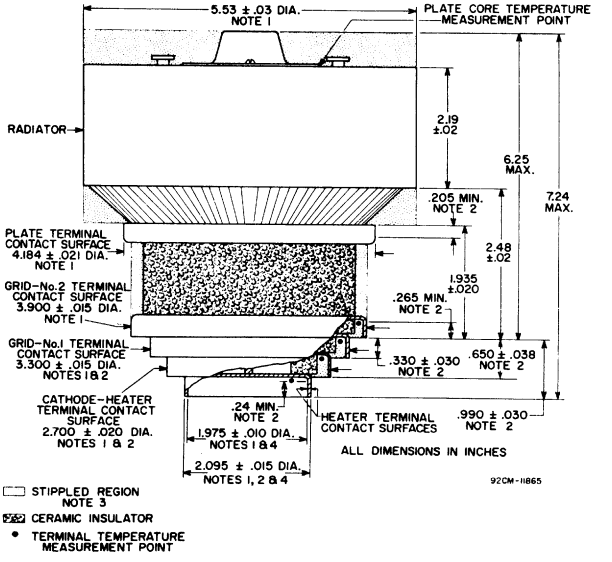
The maximum terminal temperature of 250° C is a tube rating and is to be observed in the same manner as other ratings. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. The latter is made in the form of liquid and stick by the Tempil Corporation, 132 West 22nd Street, New York 11, N.Y.

Standby Operation

During long or frequent standby periods, the 8184 may be operated at decreased heater voltage to conserve life. It is recommended that the heater voltage be reduced to 80% of normal during standby periods up to 2 hours. For longer periods, the heater voltage should be turned off.

Precautions

The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.



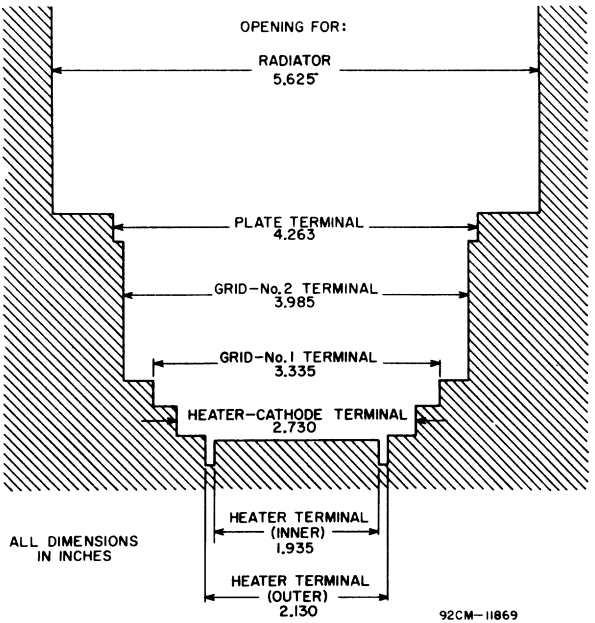
NOTE 1: SEE SKETCH G1 FOR THE MAXIMUM DIAMETRICAL SPACE REQUIRED BY THE 8184 BASED UPON THE DIAMETER AND ECCENTRICITY OF RADIATOR BAND AND OF EACH RING TERMINAL.

NOTE 2: THE DIAMETER OF THE TERMINAL IS HELD TO THE INDICATED VALUE ONLY OVER THE CONTACT SURFACE LENGTH. THE CONTACT SURFACE LENGTH OF THE HEATER, HEATER-CATHODE, AND GRID-No.1 TERMINALS EXTENDS FROM THE EDGE OF ITS TERMINAL TO THE PLANE COINCIDENT WITH THE EDGE OF THE ADJACENT LARGER TERMINAL.

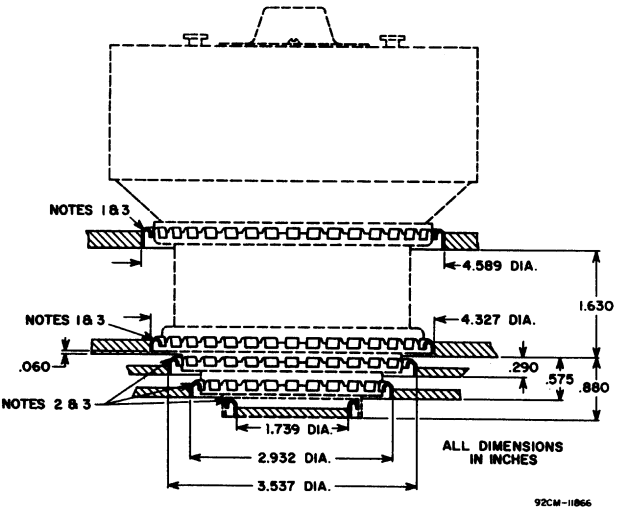
NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR REGIONS.

NOTE 4: THE HEATER TERMINAL IS DIMENSIONED FOR INSIDE DIAMETER AND OUTSIDE DIAMETER TO PROVIDE A CHOICE OF CONTACT MOUNTING; THE DIMENSIONS SHALL NOT BE CONSIDERED CONCURRENTLY.

SKETCH G1



SUGGESTED MOUNTING ARRANGEMENT
& LAYOUT OF ASSOCIATED CONTACTS

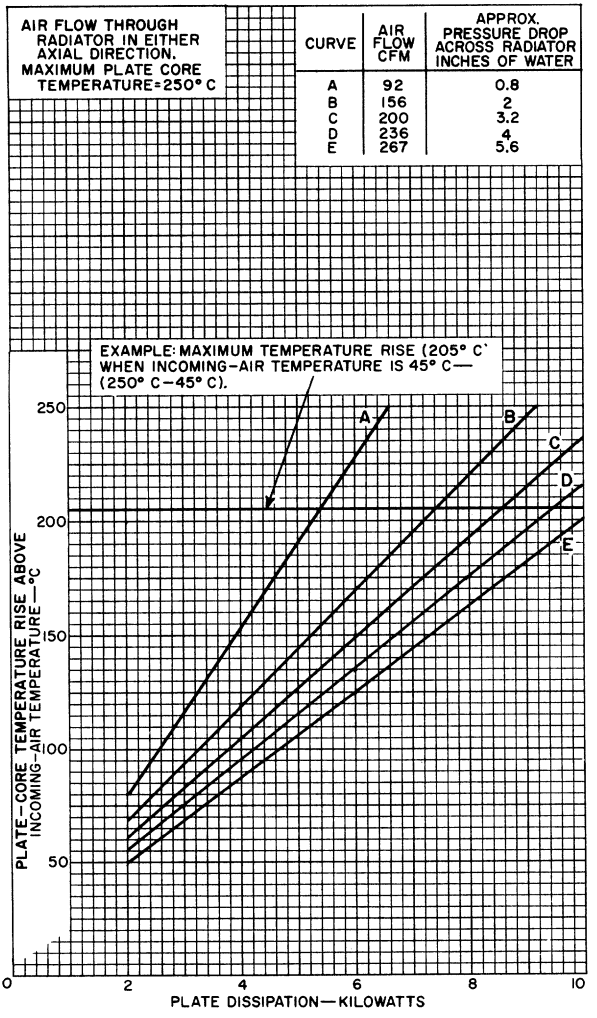


NOTE 1: FINGER STOCK NO.97-310.

NOTE 2: FINGER STOCK NO.97-139.

NOTE 3: SPECIFIED FINGER STOCK IS MADE BY INSTRUMENT SPECIALITIES COMPANY, LITTLE FALLS, NEW JERSEY.

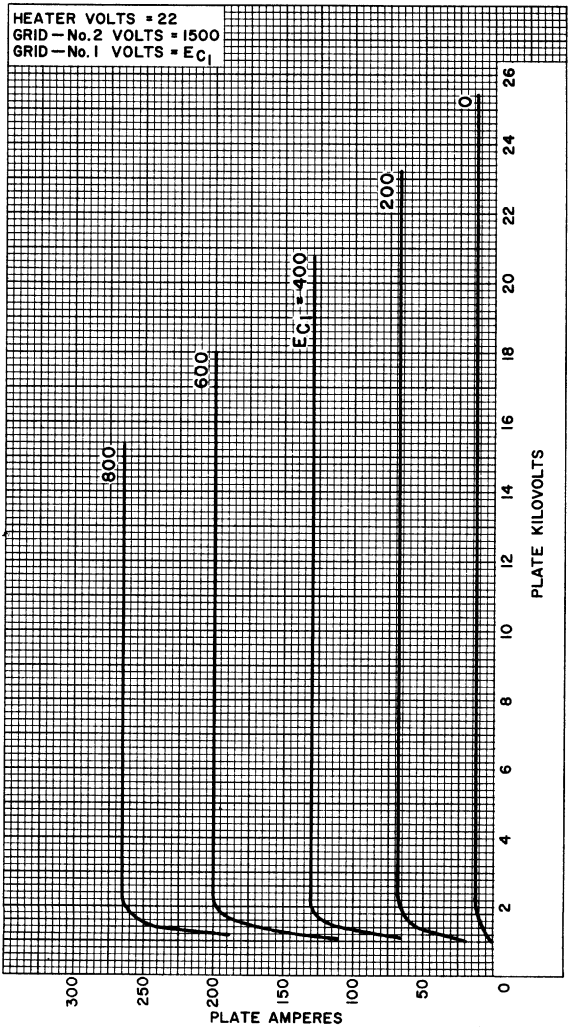
TYPICAL COOLING REQUIREMENTS



92CM-11861

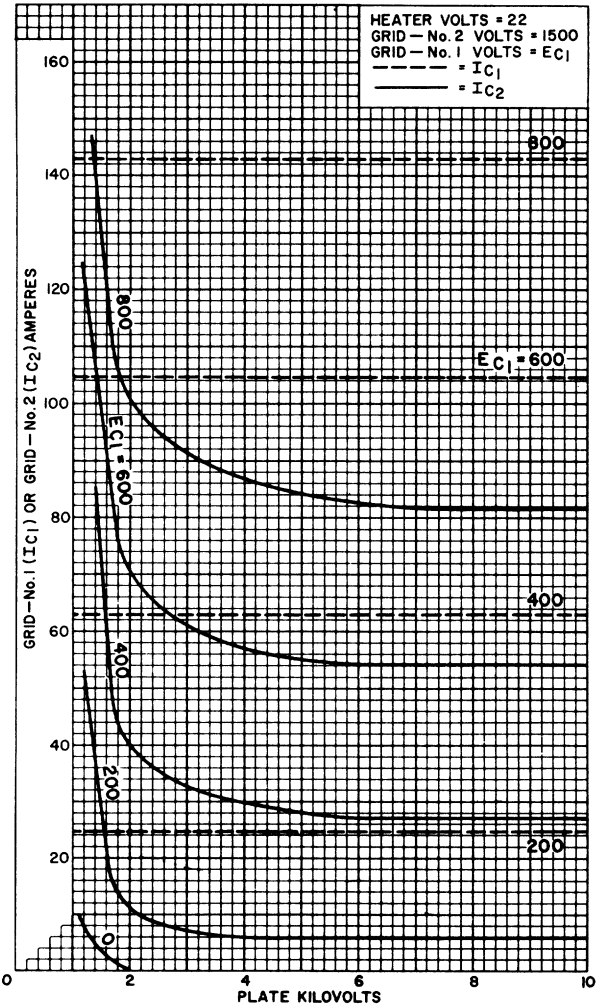
8184

TYPICAL PLATE CHARACTERISTICS



92CM—11862

TYPICAL CHARACTERISTICS



92CM-11864

8203

Power Triode

NUVISTOR TYPE

ALL-CERAMIC-AND-METAL CONSTRUCTION

For Class C RF Power Amplifier and Oscillator Service, DC Pulse-Amplifier and Frequency-Multiplier Tube Applications, Including Use in Equipment in which Ability to Withstand Severe Mechanical Shock and Vibration, Compactness, and Exceptional Uniformity of Characteristics are Primary Requirements.

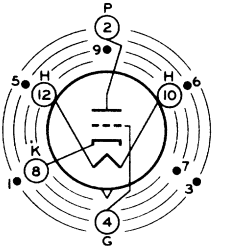
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at 6.3 volts	0.160	amp
Peak heater-cathode voltage (CCS[a] or ICAS[b] conditions):		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances (Approx.):		
Grid to plate	2.2	pf
Input: G to (K,S,H)	4.2	pf
Output: P to (K,S,H)	1.6	pf
Cathode to plate	0.26	pf
Heater to cathode	1.5	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	0.800"
Maximum Seated Length	0.625"
Maximum Diameter	0.440"
Weight (Approx.)	1.9 grams
Envelope	Metal Shell MT4
Socket	See *Socket & Connector Information for RCA Nuvistor Tubes* at front of this Section
Base	Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)
Basing Designation for BOTTOM VIEW	12AQ

Pin 1[c] – Do Not Use
Pin 2 – Plate
Pin 3[c] – Do Not Use
Pin 4 – Grid
Pin 5[c] – Do Not Use
Pin 6[c] – Do Not Use
Pin 7[c] – Do Not Use
Pin 8 – Cathode
Pin 9[c] – Do Not Use
Pin 10 – Heater
Pin 11 – Omitted
Pin 12 – Heater



INDEX=LARGE LUG
●=SHORT PIN; IC—DO NOT USE

Characteristics, Class A_1 Amplifier:

DC Plate Supply Voltage	75	150	volts
Grid Supply Voltage	0	0	volts
Cathode Resistor	100	560	ohms
Amplification Factor	35	30	
Plate Resistance (Approx.)	2700	5000	ohms
Transconductance	13000	6000	μmhos
Plate Current	11.5	7	ma
Grid Voltage (Approx.) for plate μa = 10.	-6.5	-15	volts

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[d]

and

RF POWER AMPLIFIER — Class C FM Telephony

Maximum Ratings, *Absolute-Maximum Values:*

For operation at frequencies up to 250 Mc

	CCS	*ICAS*	
DC Plate Supply Voltage	400[e] max.	400[e] max.	volts
DC Plate Voltage	250[e] max.	300[e] max.	volts
DC Grid Voltage:			
Negative-bias value	100 max.	100 max.	volts
Positive-bias value	0 max.	0 max.	volts
Peak-Positive Grid Voltage	5 max.	5 max.	volts
DC Cathode Current	25 max.	30 max.	ma
DC Grid Current	5 max.	6 max.	ma
Plate Dissipation	1.5 max.	1.8 max.	watts

Typical CCS Operation:

As rf power amplifier in cathode-drive circuit at 160 Mc

DC Plate-to-Grid Voltage	155	volts
DC Cathode-to-Grid Voltage	14	volts
From a grid resistor of	2700	ohms
DC Cathode Current	21	ma
DC Grid Current	5	ma
Driver Power Output (Approx.)	0.4	watt
Useful Power Output (Approx.)	1.55[f]	watts

As rf oscillator at 160 Mc

DC Plate Voltage	100	volts
DC Grid Voltage	-3.4	volts
From a grid resistor of	1500	ohms
DC Cathode Current	18	ma
DC Grid Current	2.5	ma
Useful Power Output (Approx.)	0.8[f]	watt

Maximum Circuit Values:

Grid-Circuit Resistance (CCS or ICAS conditions):[g]

For fixed-bias or cathode-bias operation . . 50000 max. ohms

FREQUENCY MULTIPLIER

Maximum Ratings, *Absolute-Maximum Values:*

For operation at frequencies up to 250 Mc

	CCS		ICAS		
DC Plate Supply Voltage	400[e]	max.	400[e]	max.	volts
DC Plate Voltage	250[e]	max.	250[e]	max.	volts
DC Grid Voltage:					
Negative-bias value	200	max.	200	max.	volts
Positive-bias value	0	max.	0	max.	volts
Peak-Positive Grid Voltage	5	max.	5	max.	volts
DC Cathode Current	20	max.	24	max.	ma
DC Grid Current	3	max.	4	max.	ma
Plate Dissipation	1.3	max.	1.5	max.	watts

Typical CCS Operation:

As a doubler from 80 to 160 Mc

DC Plate Voltage	125	volts
DC Grid Voltage	-70	volts
From a grid resistor of	18000	ohms
DC Cathode Current	22	ma
DC Grid Current	4	ma
Driver Power Output (Approx.)	0.25	watt
Useful Power Output (Approx.)	0.85[f]	watt

Maximum Circuit Values:

Grid-Circuit Resistance (CCS or ICAS conditions):[g]

For fixed bias or cathode-bias operation	50000	max.	ohms

DC PULSE AMPLIFIER

Maximum Ratings, *Absolute-Maximum Values:*

Peak Positive-Pulse Plate Voltage	500[e]	max.	volts
DC Plate Voltage	250[e]	max.	volts
DC Grid Voltage:			
Negative-bias value	100	max.	volts
Positive-bias value	0	max.	volts
Peak Positive Grid Voltage	5	max.	volts
DC Grid Current	5	max.	ma
DC Cathode Current	18	max.	ma
Peak Cathode Current:			
For duty factors up to 1 per cent	250	max.	ma
For duty factors between 1 and 50 per cent	See *Pulse Rating Chart*		
Plate Dissipation	1	max.	watt

Maximum Circuit Values:

Grid-Circuit Resistance:[g]

For fixed-bias operation	0.5	max.	megohm
For cathode-bias operation	1	max.	megohm

[a] Continuous Commercial Service.

[b] Intermittent Commercial and Amateur Service. No operating or "ON" period exceeds 5 minutes and every "ON" period is followed by an "OFF" or stand-by period of the same or greater duration.

[c] Pins 1,3,5,6,7, and 9 are of a length such that their ends do not touch the socket insertion plane.

d Key-down conditions per tube without amplitude modulation. Modulation, essentially negative, may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

e Under no circumstances should this absolute-maximum value be exceeded. For high-altitude operation the maximum permissible plate supply voltage and plate voltage for the 8203 are dependent on atmospheric pressure. See accompanying graph of *Low-Pressure Voltage-Breakdown Characteristics of Nuvistor Triode Base.*

f Measured at load of output circuit.

g For operation at metal-shell temperature of 150° C. For operation at other metal-shell temperatures, see accompanying *Grid-Circuit Resistance Rating Chart.* Metal-shell temperatures are measured in Zone "A" as shown on accompanying *Dimensional Outline.*

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.150	0.170	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	1.8	2.6	pf
Input: G to (K,S,H)	2	3.8	4.6	pf
Output: P to (K,S,H)	2	1.4	1.8	pf
Cathode to plate	2	0.20	0.32	pf
Heater to cathode	2	1.2	1.8	pf
Plate Current (1)	1,3	5.0	9.5	ma
Plate Current (2)	1,4	-	50	μa
Transconductance	1,3	4000	8000	μmhos
Reverse Grid Current	1,5	-	0.1	μa
AC Emission	6,7	10	-	ma
Amplification Factor	1,3	20	40	
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,8	-	5	μa
Heater positive with respect to cathode	1,8	-	5	μa
Leakage Resistance:				
Between grid and all other electrodes tied together	1,9	1000	-	megohms
Between plate and all other electrodes tied together	1,10	1000	-	megohms
Useful Power Output	1,11	0.9	-	watt
Peak Cathode Emission Current (Pulsed)	1,12	250	-	ma

Note 1: With ac or dc heater volts = 6.3.

Note 2: Measured in accordance with EIA Standard RS-191-A.

Note 3: With dc plate supply volts = 150, dc grid supply volts = 0, cathode resistor (ohms) = 560, cathode-bypass capacitor (μf) = 1000, and metal shell connected to ground.

Note 4: With dc plate volts = 150, dc grid volts = -15, and metal shell connected to ground.

Note 5: With dc plate supply volts = 100, dc grid supply volts = 1.7, grid-circuit resistance (megohm) ≤ 1 (the internal resistance of the current meter used for this measurement), and metal shell connected to ground.

Note 6: With ac or dc heater volts = 5.5.

Note 7: With dc plate supply volts = 50, dc grid supply volts = -5.7, 60-cps grid-signal volts (rms) = 7.5, dc resistance of transformer secondary winding in grid circuit ≤ 2 ohms, grid-voltage-supply bypass capacitor (μf) = 1000, and metal shell connected to ground. AC emission is measured as the dc component of plate current at these conditions.

Note 8: With dc heater-cathode volts = 100.

Note 9: With grid 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

Note 10: With plate 300 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

Note 11: Measured at load in 250-Mc rf amplifier circuit with dc plate supply volts = 150, grid resistor (ohms) = 4700, driver power output (milliwatts) = 350, and plate milliamperes = 20.

Note 12: With dc plate supply volts = 250 and dc grid supply volts = -20. The grid is driven with pulse voltage, as follows: peak volts between grid and negative end of cathode resistor = 5, pulse repetition rate = 1000, pulse duration = 10 μs, pulse rise time ≤ 1 μs, and time of fall ≤ 1 μs. Peak cathode current is measured with a high impedance oscilloscope or equivalent device connected across a 1-ohm cathode resistor.

SPECIAL TESTS

Shock:

Peak Impact Acceleration. . . . . 1000 g

This test is performed on a sample lot of tubes to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of four positions (X_1, X_2, Y_1, and Y_2) in a Navy-Type, High-Impact (Flyweight) Shock Machine, and, with tube electrode voltages applied, are subjected to 20 blows (5 in each position) at the specified Peak Impact Acceleration.

At the end of this test, tubes are criticized for Shorts and Continuity, Change in Transconductance, Reverse Grid Current, Heater-Cathode Leakage Current, and Variable-Frequency Vibration.

Variable-Frequency Vibration:

This test is performed on a sample lot of tubes operated under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance, with the addition of a plate-load resistor of 2000 ohms. During operation, tube is vibrated in the X_1 position through the frequency range of 3000 to 15000 cycles per second with a constant vibrational acceleration of 1g. During the test, tube must not show an rms output voltage across the plate-load resistor in excess of:

25 millivolts over the frequency range of 3000 to 6000 cps
500 millivolts over the frequency range of 6000 to 15000 cps

Post-Impact and Post-Sweep-Frequency Fatigue Vibration limits:

35 millivolts over the frequency range of 3000 to 6000 cps
700 millivolts over the frequency range of 6000 to 15000 cps

Sweep-Frequency Fatigue Vibration:

This test is performed on a sample lot of tubes with only heater voltage of 6.3 volts applied. During operation, the tube is rigidly mounted and is vibrated through the frequency range of 5 to 500 cps and back to 5 cps. One such vibration sweep cycle takes approximately 15 minutes. The tubes are vibrated for a period of 3 hours along each of 3 mutually perpendicular axes for a total of 9 hours. The longitudinal axis of the tube is coincident with one of the 3 axes. The vibrations are applied as follows:

a From 5 to 50 cps with a constant peak-to-peak displacement of 0.080 inch.
b From 50 to 500 cps with a constant acceleration of 10 g.
c From 500 to 50 cps and then to 5 cps follows the procedure shown in *a* and *b*, but in reverse.

At the end of this test, tubes are criticized for Shorts and Continuity, Change in Transconductance, Reverse Grid Current, Heater-Cathode Leakage Current, and Vibration-Frequency-Vibration.

Low-Pressure Voltage Breakdown:

This test is performed on a sample lot of tubes to determine the ability of the tube to withstand high-altitude (low-air-pressure) conditions. Tubes are operated with 250 rms volts applied between the plate and all other electrodes and metal shell connected together. The tubes must not break down or show evidence of corona when subjected to air pressure equivalent to an altitude of 100,000 feet (8.0 ± 0.5 mm Hg).

Shorts and Continuity:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-1D, Amendment 2, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper (Specifications for this tapper will be supplied on request). The areas of acceptance and rejection for this test are shown in the accompanying graph, *Shorts-Test Acceptance Limits*. Tubes are criticized for permanent or temporary shorts and open circuits.

Intermittent Conduction Life (1000 hours):

This test is performed on a sample lot of tubes from each production run to assure the high quality of individual tubes and to prevent epidemic failures due to excessive changes in tube characteristics. Tubes are operated with heater voltage of 6.3 volts cycled 110 minutes on and 10 minutes off, and plate dissipation = 1.5 watts (approx.), at a shell temperature of 150° C.

Tubes are criticized at 2 hours, 20 hours, and 100 hours for Inoperatives[h] and Transconductance, and at 500 hours and 1000 hours for Inoperatives[h] and Useful Power Output at 250 Mc.

Oscillator Life (1000 hours):

This test is performed on a sample lot of tubes to assure satisfactory operation of the tube as a 250-Mc oscillator. Tubes are operated with heater volts = 6.3 and plate dissipation = 1.4 watts.

Tubes are criticized at 500 and 1000 hours for Inoperatives[h] and Useful Power Output at 250 Mc.

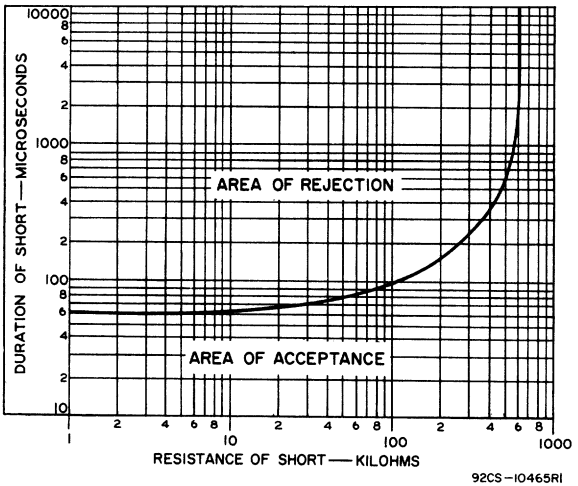
Grid Pulse Life (1000 hours):

This test is performed on a sample lot of tubes from each production lot. Tubes are operated with heater voltage of 6.3 volts cycled 110 minutes on and 10 minutes off, dc plate supply volts = 300, dc grid supply volts = −20, grid resistor (ohms) = 47, and plate-load resistor (ohms) = 330. The grid is driven with pulse voltage, as follows: peak grid-to-cathode volts = 5, pulse repetition rate = 1000, pulse duration = 10 μs, pulse rise time $\leq$ 1 μs, and time of fall $\leq$ 2 μs.

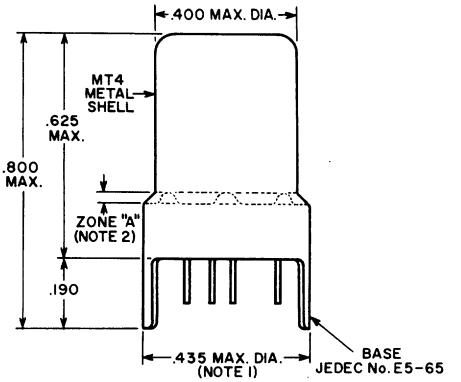
Tubes are tested at 500 hours and 1000 hours for Inoperatives[h] and Peak Cathode Emission Current (Pulsed).

[h] An inoperative is defined as a tube having a discontinuity, permanent short, or air leak.

SHORTS-TEST ACCEPTANCE LIMITS



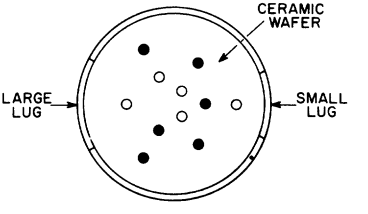
92CS-10465RI



DIMENSIONS IN INCHES

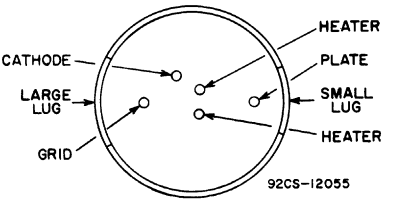
92CS-12024

BOTTOM VIEW
Showing Arrangement of All 11 Base Pins



92CS-12162

MODIFIED BOTTOM VIEW
With Element Connections Indicated
and Short Pins Not Shown

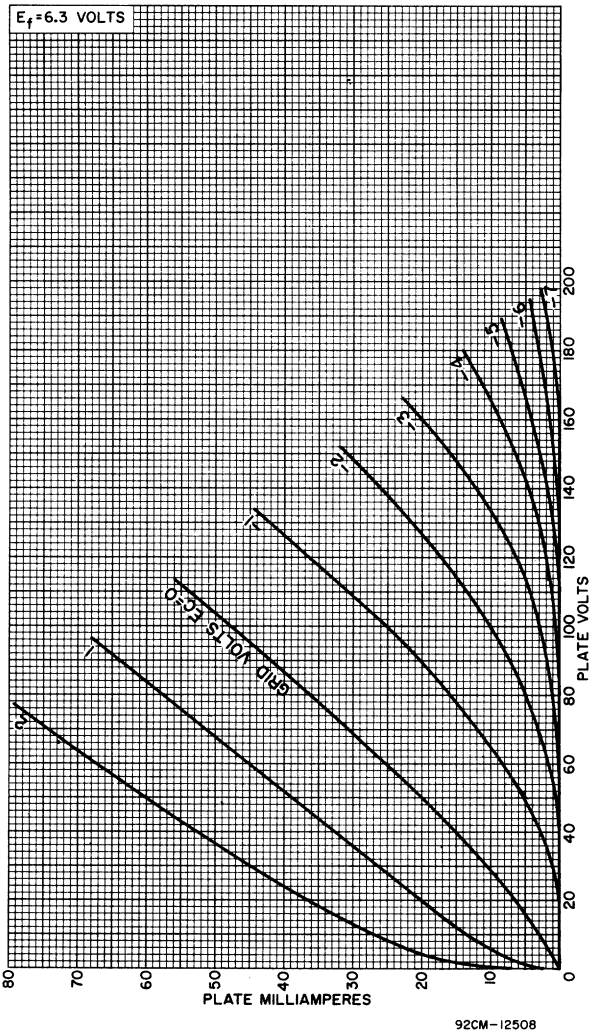


92CS-12055

Note 1: Maximum outside diameter of 0.440" is permitted along 0.190" lug length.

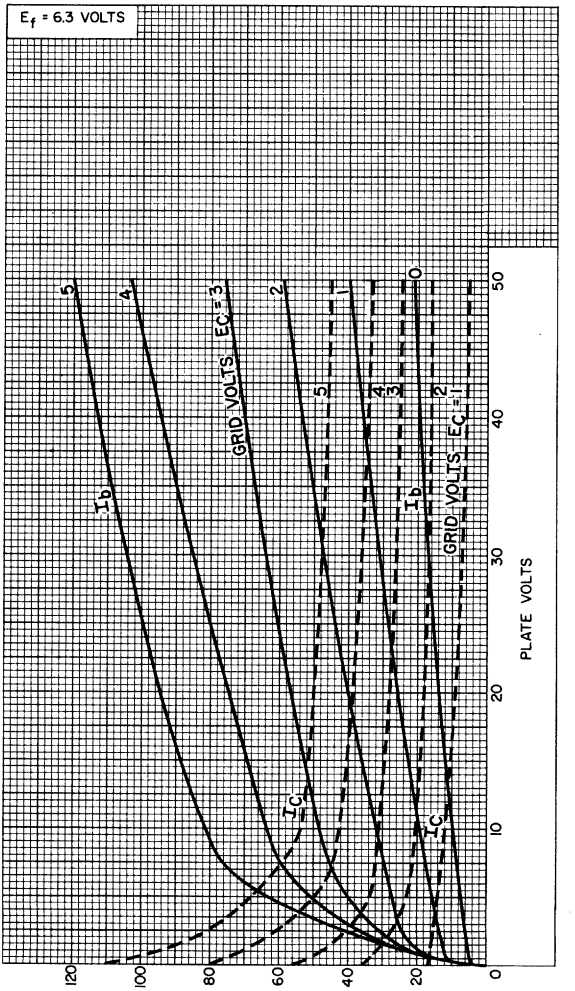
Note 2: Metal-shell temperature should be measured in zone "A".

AVERAGE PLATE CHARACTERISTICS

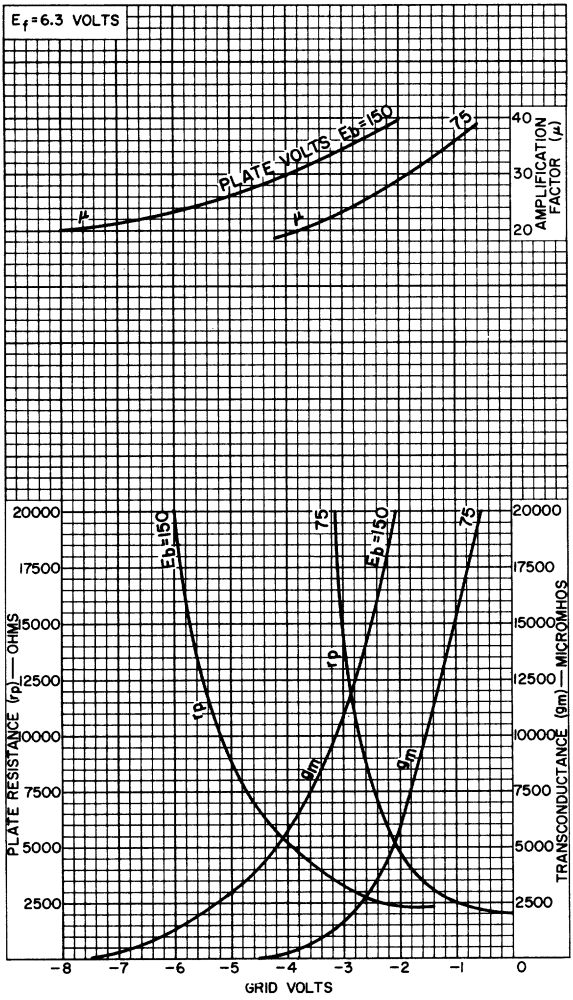


92CM-12508

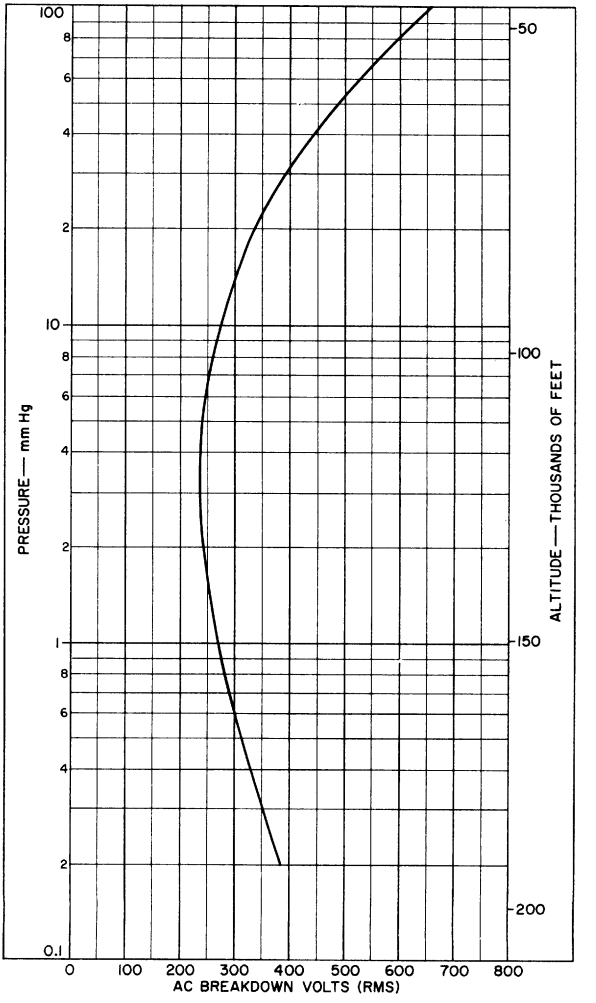
AVERAGE CHARACTERISTICS



AVERAGE CHARACTERISTICS

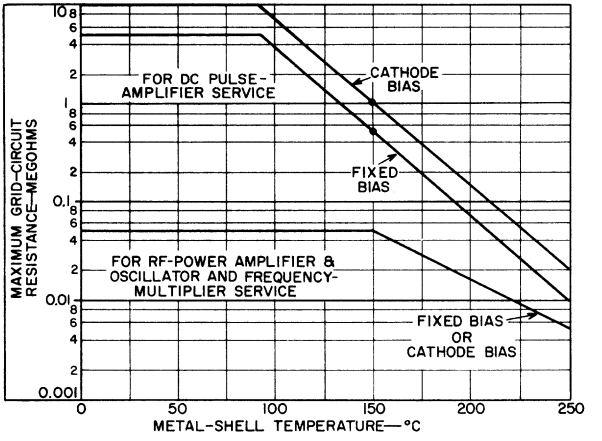


LOW-PRESSURE VOLTAGE-BREAKDOWN CHARACTERISTICS OF NUVISTOR TRIODE BASE



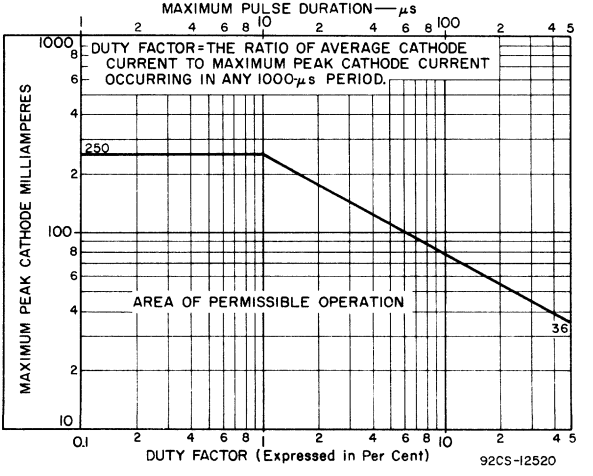
92CM-12509

GRID-CIRCUIT-RESISTANCE RATING CHART



92CS-12521

PULSE RATING CHART



92CS-12520

8226

Beam Power Tube

CERMOLOX®

FORCED-AIR COOLED
INTEGRAL RADIATOR
MATRIX-TYPE CATHODE

HIGH GAIN-BANDWIDTH PRODUCTS
340 WATTS CW POWER OUTPUT AT 400 Mc
105 WATTS CW POWER OUTPUT AT 1215 Mc

For Compact Aircraft, Mobile, and Stationary Equipment Applications in the UHF Frequency Range

GENERAL DATA

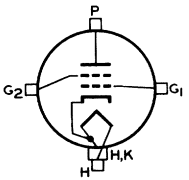
Electrical:

Heater, for Matrix-Type, Oxide-Coated, Unipotential Cathode:		
Voltage (AC or DC)[a]	6.3	volts
Current at heater volts = 6.3	3.2	amp
Minimum heating time	60	sec
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 250, grid-No.2 volts = 250, and plate ma. = 100	18	
Direct Interelectrode Capacitances:[b]		
Grid No.1 to plate	0.065 max.	pf
Grid No.1 to cathode & heater	15	pf
Plate to cathode & heater	0.019 max.	pf
Grid No.1 to grid No.2	20	pf
Grid No.2 to plate	3.2	pf
Grid No.2 to cathode & heater	1.30 max.	pf

Mechanical:

Operating Position . . . . . Any
Overall Length . . . . . 2.620" ± 0.090"
Greatest Diameter (See *Dimensional Outline*) . 1.625" ± 0.015"
Weight (Approx.) . . . . . 4 oz
Radiator . . . . . Integral part of tube
Terminal Connections (See *Dimensional Outline*):

G_1 – Grid-No.1-Terminal Contact Surface
G_2 – Grid-No.2-Terminal Contact Surface
H – Heater-Terminal Contact Surface



H,K – Heater- & Cathode-Terminal Contact Surface
P – Plate-Terminal Contact Surface

Thermal:

Plate, Grid No.2, Grid No.1, Cathode, and Heater Temperature[c]	250 max.	°C
Radiator Core Temperature[c]	250 max.	°C

Air Flow:

Through radiator — Adequate air flow to limit the radiator core temperature to 250° C should be delivered by a blower through the radiator before and during the application of plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator versus plate dissipation are shown in accompanying *Typical-Cooling-Requirements* curve.

To Plate, Grid-No.2, Grid-No.1, Cathode, and Heater Terminals — A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these terminals so that their temperature does not exceed the specified maximum value of 250° C.

During Standby Operation — Cooling air is not usually required when only heater voltage is applied to the tube.

Plate Power, Grid-No.2 Power, Heater Power, and Air Flow — These may be removed simultaneously.

At Sea Level — Cooling requirements, with air flow directed through the radiator as shown in accompanying *Typical-Cooling-Requirements* curve, may be met by use of the following blowers and associated motors manufactured by Rotron Manufacturing Company Incorporated, Woodstock, New York, or equivalent:

For 100% Plate Dissipation:				
Blower Model No.	KS-2501	AS-2501	AXIMAX 1	AXIMAX 1
Motor Model No.	165AS	323JS	464YS	499JS
Phase (ϕ)	1	3	1	3
Frequency (cps)	60	60	400	400
Voltage (v)	115	220	115	200
For 80% Plate Dissipation:				
Blower Model No.	KS-201	AS-201	AXIMAX 1	AXIMAX 1
Motor Model No.	92AS	323JS	464YS	499JS
Phase (ϕ)	1	3	1	3
Frequency (cps)	60	60	400	400
Voltage (v)	115	220	115	200
For 60% Plate Dissipation:				
Blower Model No.	KS-1504	AS-1504	AXIMAX 1	AXIMAX 1
Motor Model No.	92AS	323JS	464YS	499JS
Phase (ϕ)	1	3	1	3
Frequency (cps)	60	60	400	400
Voltage (v)	115	220	115	200

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS[d] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	2500 max.	volts
DC GRID-No.2 VOLTAGE	400 max.	volts
DC GRID-No.1 VOLTAGE	-200 max.	volts
DC PLATE CURRENT	250 max.	ma
DC GRID-No.1 CURRENT	30 max.	ma
GRID-No.2 INPUT[e]	10 max.	watts
PLATE DISSIPATION	300 max.	watts

Typical CCS Operation:

In cathode-drive circuit

Frequency	*400*	*1215*	*Mc*
DC Plate Voltage	2500	1250	volts
DC Grid-No.2 Voltage	250	300	volts
DC Grid-No.1 Voltage[f]	-15	-30	volts
DC Plate Current	250	250	ma
DC Grid-No.2 Current	2	1	ma
DC Grid-No.1 Current	15	7	ma
Driver Power Output (Approx.)[g]	5	10	watts
Output-Circuit Efficiency	90	60	%
Useful Power Output[h]	340[j]	105	watts

Maximum Circuit Values:

Grid-No.1 Circuit Resistance	30000 max.	ohms
Grid-No.2 Circuit Impedance	10000 max.	ohms
Plate Circuit Impedance	[k]	

[a] See *Operating Considerations under Heater.*

[b] Measured with special shield adapter.

[c] See *Operating Considerations under Temperature* and also *Dimensional Outline* for temperature measurement points.

[d] Continuous Commercial Service.

[e] See *Operating Considerations under Grid No.2.*

[f] Obtained preferably from fixed supply and grid-No.1 resistor. Sufficient voltage should be provided from fixed supply to protect the tube in case of drive loss.

[g] Driver power output includes circuit losses and is the actual power measured at the input to the grid circuit. It will vary depending upon the frequency of operation and the circuit used.

[h] Measured in a typical coaxial-cavity circuit.

[j] For Minimum Useful Power Output value, see *Characteristics Range Values, Test No.8.*

[k] See *Operating Considerations under Precautions.*

CHARACTERISTICS RANGE VALUES

Test No.	*Note*	*Min.*	*Max.*	
1. Heater Current	1	2.90	3.55	amp
2. Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	-	0.065	pf
Grid No.1 to cathode & heater	2	13.5	16.5	pf
Plate to cathode & heater	2	-	0.019	pf
Grid No.1 to grid No.2	2	16.8	22.2	pf
Grid No.2 to plate	2	2.7	3.7	pf
Grid No.2 to cathode & heater	2	-	1.30	pf
3. Grid-No.1 Voltage	1,3	-6.5	-20.5	volts
4. Grid-No.1 Cutoff Voltage	1,4	-	-65	volts
5. Reverse Grid-No.1 Current	1,3	-	-20	μa
6. Grid-No.2 Current	1,3	-8	+2	ma

Test No.	*Note*	*Min.*	*Max.*	
7. Interelectrode Leakage Resistance:				
Between plate and all other electrodes	5	10	-	megohms
Between any two electrodes except plate. . .	5	1	-	megohm
8. Useful Power Output.	6	300	-	watts

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 120 ma.

Note 4: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 2.5 ma.

Note 5: Under conditions with tube at 20° to 30° C without any voltages applied to the tube, the resistance between the two electrodes is measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1.0 megohm.

Note 6: In a single-tube, cathode-driven coaxial-cavity class C amplifier circuit at 400 Mc and for conditions with 5.7 volts ac or dc on heater, dc plate voltage of 2500 volts and driver power output of 5 watts, dc grid-No.2 voltage of 250 volts, grid-No.1 voltage and tuning circuit are adjusted for maximum power output with plate current not to exceed 250 ma and grid-No.1 current not to exceed 20 ma.

OPERATING CONSIDERATIONS

Heater

The heater of the 8226 should be operated at constant voltage rather than constant current. The rated heater voltage of 6.3 volts should be applied for 60 seconds to allow the cathode to reach normal operating temperature before voltages are applied to other electrodes.

The life of the cathode can be conserved by operating at the lowest heater supply voltage which will give the desired performance. Good regulation of the heater supply voltage is, in general, economically advantageous from the viewpoint of tube life; in no case should the voltage fluctuations be more than 5%. This recommendation is particularly applicable at the higher operating frequencies.

Temperature

The maximum radiator core or electrode temperature of 250° C is a tube rating and is to be observed in the same manner as other ratings. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. This paint is manufactured in the form of liquid or stick by the Tempil Corporation, 132 West 22nd Street, New York 11, N.Y.

Grid No.2

Grid-No.2 current is composed of a positive-current component resulting from cathode emission to grid No.2 and a negative-current component resulting from secondary emission phenomena. Because it is the net result of these component

currents which is read on a meter in the grid-No.2 circuit, grid-No.2 dissipation cannot be accurately determined. Operation similar to conditions given under *Typical Operation* in the tabulated data section will minimize the possibility of exceeding maximum grid-No.2 input rating.

The grid-No.2 circuit must be capable of maintaining the proper grid-No.2 voltage in the presence of moderate negative dc current as well as normal values of positive current. Complete protection can be achieved by the use of a well-regulated power supply, a grid-No.2-to-ground impedance that is low enough to prevent gradual build-up of grid-No.2 voltage and/or catastrophic build-up (runaway) under negative current conditions, and a current overload relay to protect the grid No.2 against positive or negative currents of the order of one-tenth the required plate current.

Standby Operation

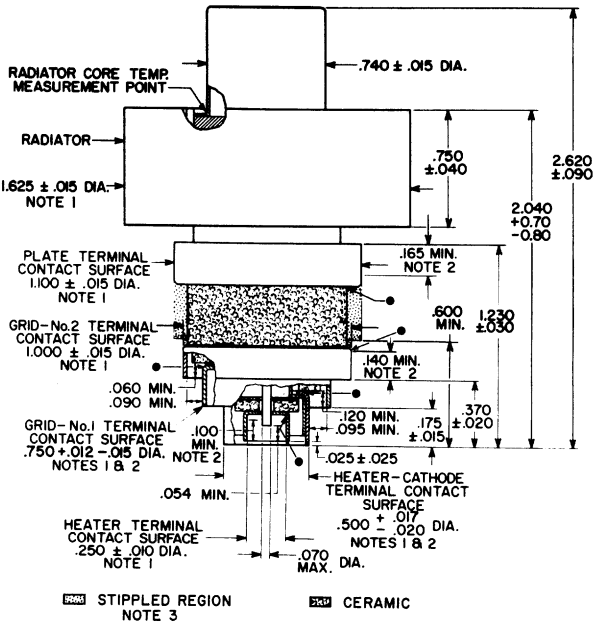
During long or frequent standby periods, the 8226 may be operated at decreased heater voltage to conserve life. It is recommended that the heater voltage be reduced to 80% of normal during standby periods up to 2 hours. For longer periods, the heater voltage should be turned off.

Precautions

In beam power tubes with closely spaced electrodes, such as the 8226, extremely high voltage gradients occur even with moderate tube operating voltages. Any arc-over between electrodes may be destructive. A series impedance in the plate lead is recommended. The resultant plate impedance giving a plate-voltage-supply regulation of no better than 10% is usually sufficient.

Protective devices should be used to protect not only the plate but also grid No.2 against overload. In order to prevent excessive plate current flow and resultant overheating of the tube, the common ground lead of the plate circuit should be connected in series with the coil of an instantaneous overload relay. This relay should be adjusted to remove the dc plate voltage and dc grid-No.2 voltage when the average value of plate current reaches a value slightly higher than normal plate current. A protective device in the grid-No.2 supply should remove the grid-No.2 voltage when the dc grid-No.2 current reaches a value slightly higher than normal.

The rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock device should function to break the primary circuit of the high-voltage supplies when any gate or door of the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.



92CM-12011

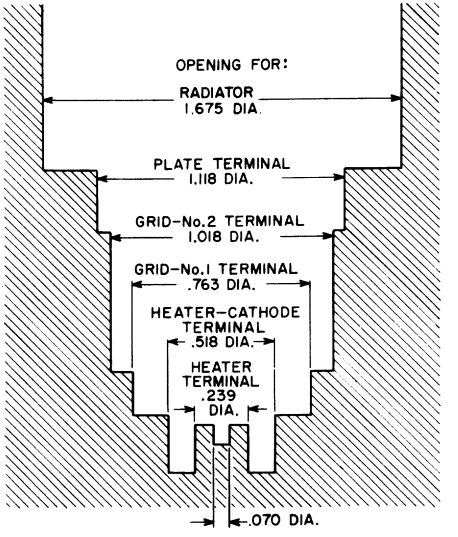
ALL DIMENSIONS IN INCHES

NOTE 1: SEE *SKETCH G1* FOR THE MAXIMUM DIAMETRICAL SPACE REQUIRED BY THE 8226 BASED UPON THE DIAMETER AND ECCENTRICITY OF RADIATOR BAND AND OF EACH RING TERMINAL.

NOTE 2: THE DIAMETER OF THE TERMINAL IS HELD TO THE INDICATED VALUE ONLY OVER THE CONTACT SURFACE LENGTH. THE CONTACT SURFACE LENGTH OF THE HEATER-CATHODE AND GRID-No. 1 TERMINALS EXTENDS FROM THE EDGE OF ITS TERMINAL TO THE PLANE COINCIDENT WITH THE EDGE OF THE ADJACENT LARGER TERMINAL.

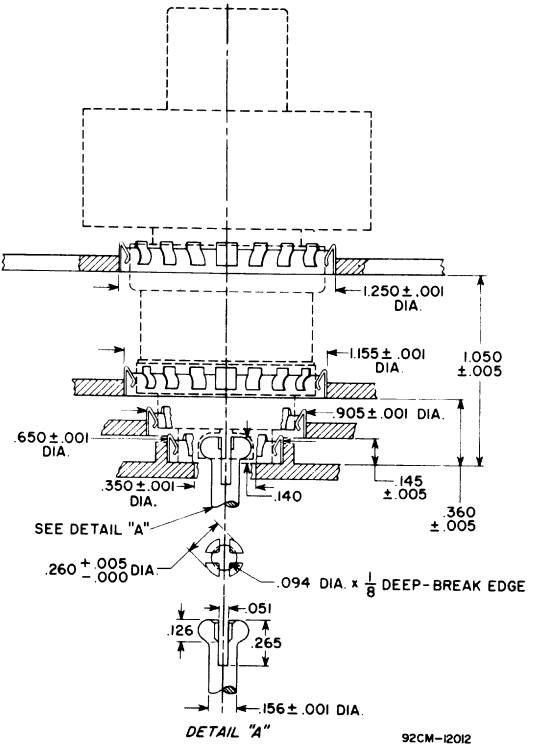
NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR REGIONS.

SKETCH G1



ALL DIMENSIONS IN INCHES

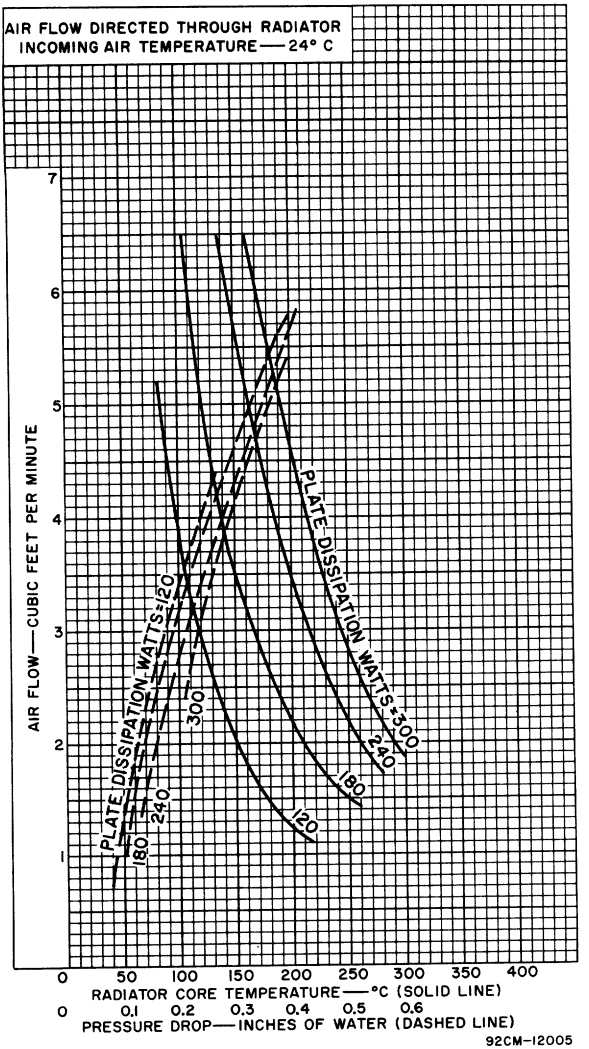
PREFERRED MOUNTING ARRANGEMENT
& LAYOUT OF ASSOCIATED CONTACTS



ALL DIMENSIONS IN INCHES

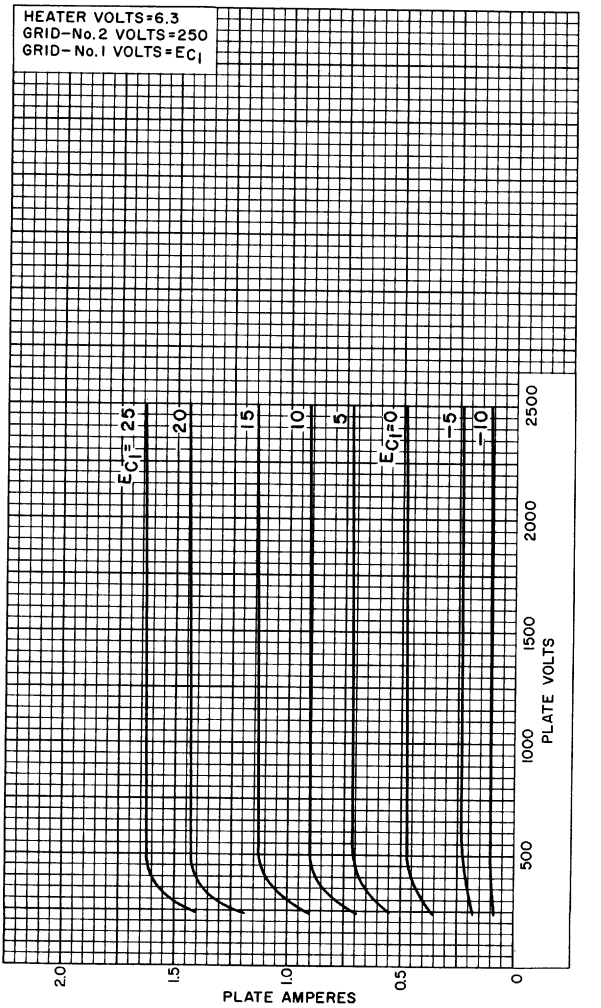
NOTE: ALL FINGER STOCK (No.97-380) MADE BY INSTRUMENT SPECIALTIES COMPANY, LITTLE FALLS, NEW JERSEY.

TYPICAL COOLING REQUIREMENTS



8226

TYPICAL PLATE CHARACTERISTICS



92CM-12006

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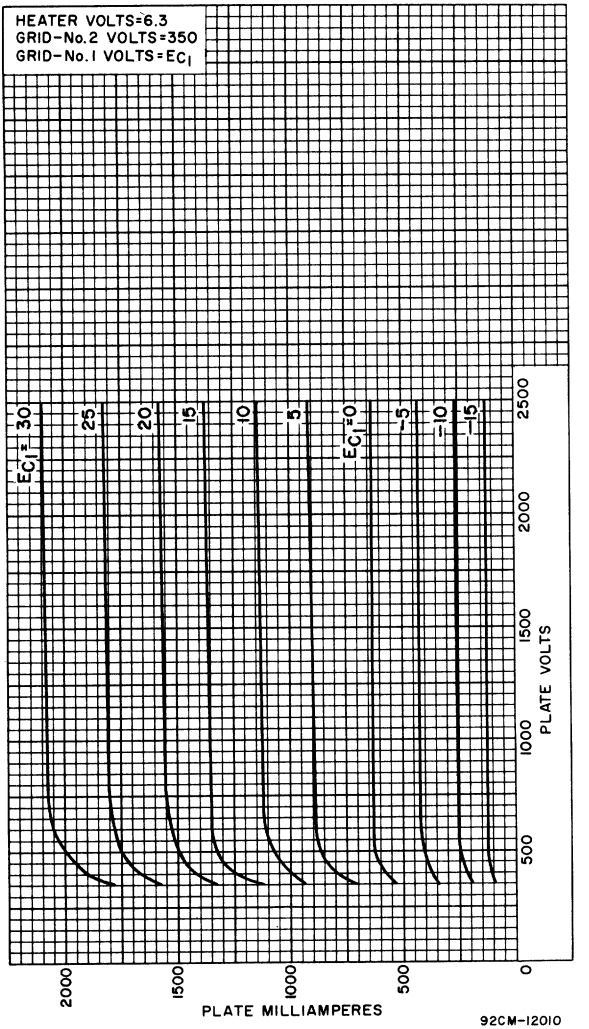
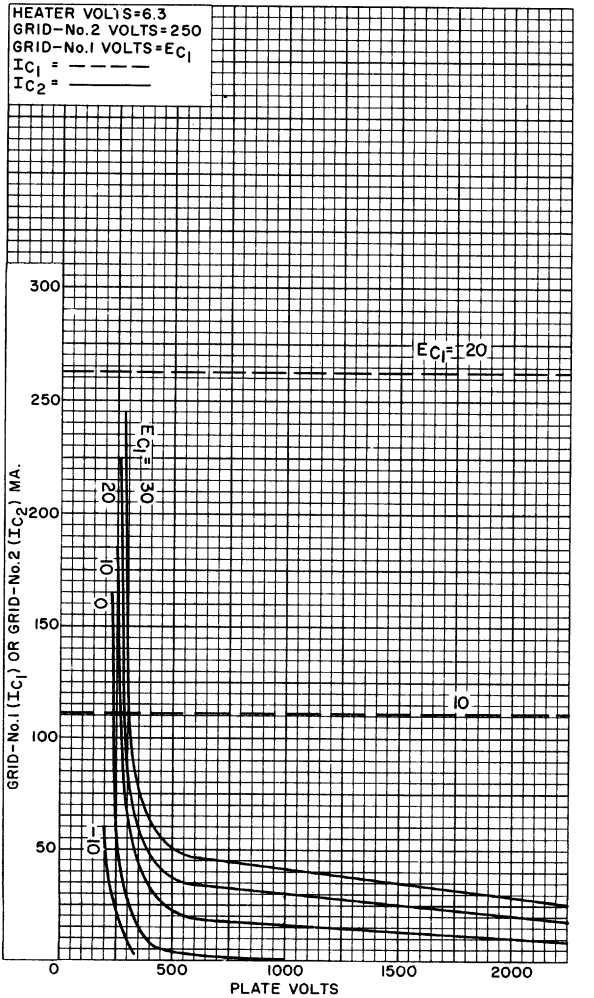
Electron Tube Division
Harrison, N. J.

TYPICAL PLATE CHARACTERISTICS

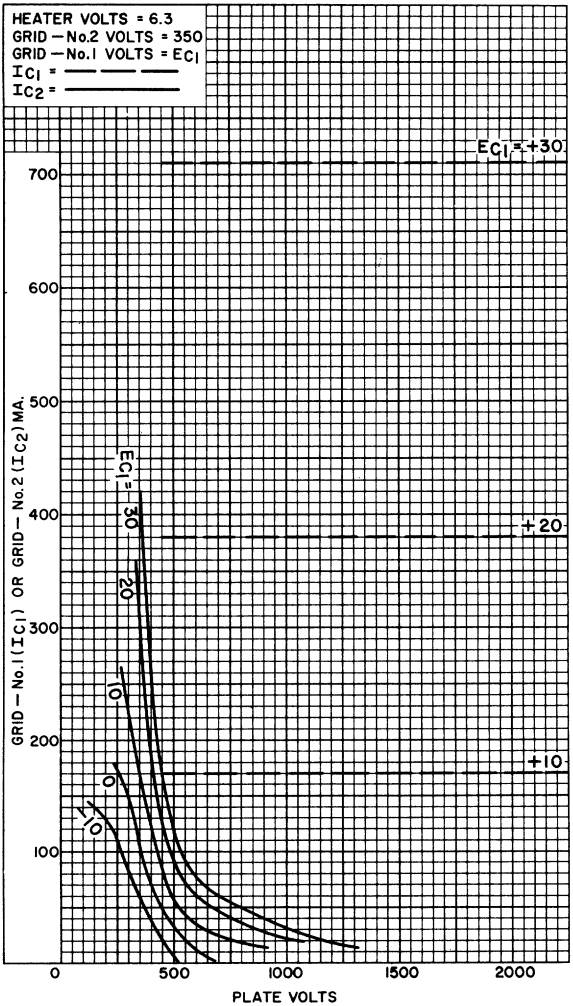


TYPICAL CHARACTERISTICS



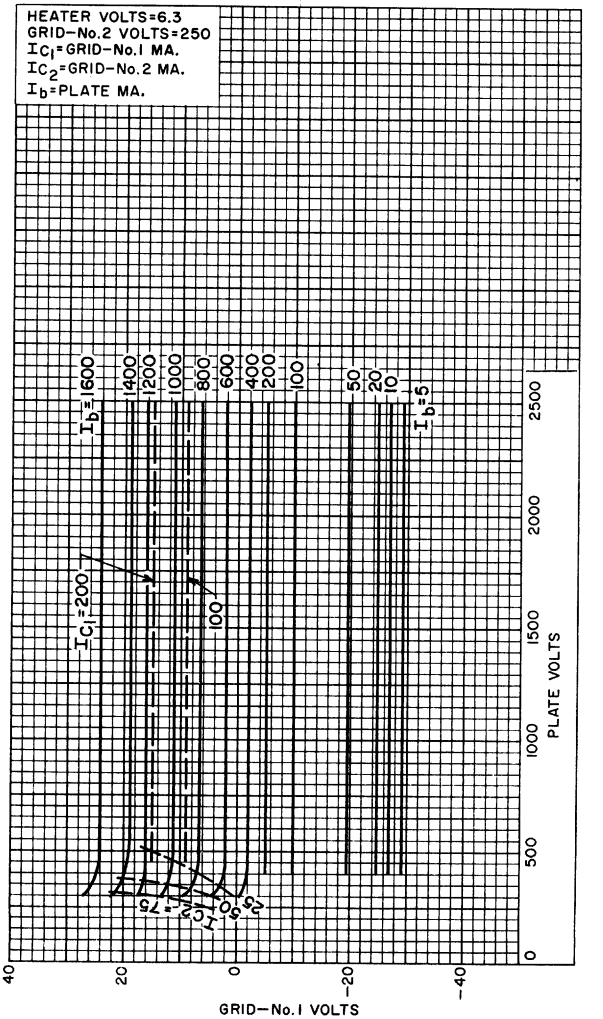
92CM-12016

TYPICAL CHARACTERISTICS

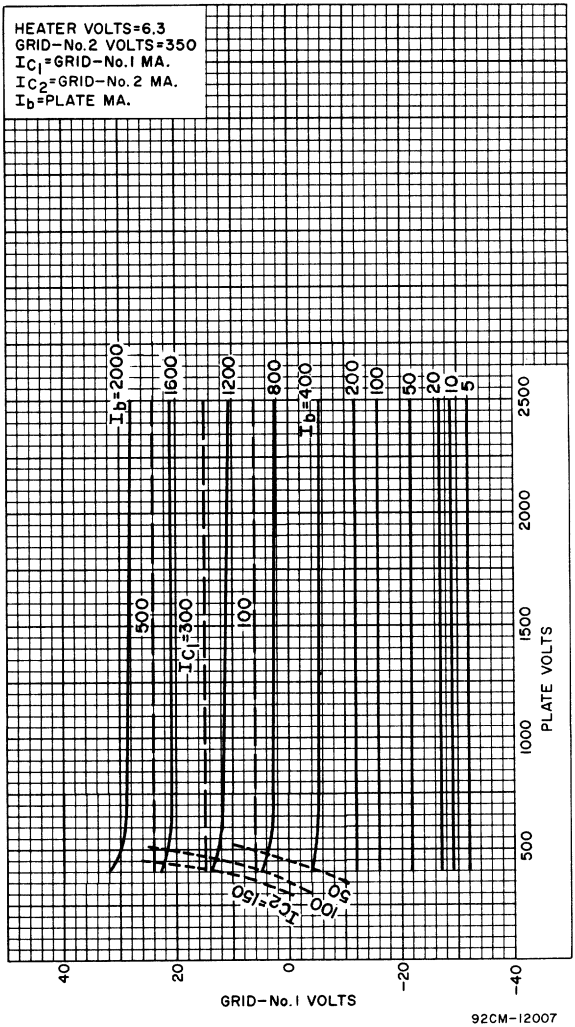


92CM—12013

TYPICAL CONSTANT-CURRENT CHARACTERISTICS



TYPICAL CONSTANT-CURRENT CHARACTERISTICS



8379

Traveling-Wave Tube

HELIX-TRANSMISSION-LINE TYPE — **NF = 4.5 db**
FREQUENCY RANGE, 2320-2680 Mc — **31-db GAIN**
LOW-NOISE AMPLIFIER TYPE — **SOLENOID FOCUSING**

For Use in Input Stage of Radar, Scatter Propagation, and Other Microwave Receivers, and in IF Amplifiers

Electrical:

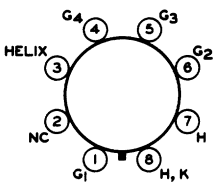
Heater, for Unipotential Cathode:		
Voltage (AC or DC)	5.0 ± 5%	volts
Current at heater volts = 5.0	0.65	amp
Starting current	Must never exceed 4 amperes, even momentarily	
Minimum cathode heating time	1	minute
Frequency range	2320 to 2680	Mc
Minimum cold insertion loss	60	db

Mechanical:

Operating Position	Any
Cooling	Natural
Maximum Overall Length	19.50"
Shell Diameter	1.375" ± 0.005"
Weight	1.5 lbs
Collector-Terminal Connector[a]	Special Banana Jack
RF Connectors:[b]	
Input terminal	Type N UG-18B/U Plug
Output terminal	Type N UG-18B/U Plug
Base	Octal 8-Pin

BOTTOM VIEW

Pin 1 - Grid No.1
Pin 2 - No Connection
Pin 3 - Helix
Pin 4 - Grid No.4
Pin 5 - Grid No.3
Pin 6 - Grid No.2
Pin 7 - Heater
Pin 8 - Heater, Cathode



Maximum and Minimum Ratings, *Absolute-Maximum Values:*

DC Collector Voltage	800	max.	volts
DC Helix Voltage	500	max.	volts
DC Grid-No.4 Voltage	500	max.	volts
DC Grid-No.3 Voltage	300	max.	volts
DC Grid-No.2 Voltage	75	max.	volts
DC Grid-No.1 Voltage	20	max.	volts
DC Collector Current	500	max.	μa
DC Helix Current	5[c]	max.	μa
DC Cathode Current	500	max.	μa
Magnetic Field Strength	650[d]	min.	gauss

RF Power Input:			
Peak	500	max.	watts
Average	1.0	max.	watts
Metal-Shell Temperature (At hottest point)	175	max.	°C

Typical Operation at 2500 Mc:

DC Collector Voltage	600	volts
DC Helix Voltage	375	volts
DC Grid-No.4 Voltage	325	volts
DC Grid-No.3 Voltage	70	volts
DC Grid-No.2 Voltage (Approx.)	10	volts
DC Grid-No.1 Voltage	10	volts
DC Collector Current	150	μa
DC Helix Current	0.5	μa
DC Grid-No.4 Current, DC Grid-No.3 Current, DC Grid-No.2 Current, DC Grid-No.1 Current	each less than 1	μa
Magnetic Field Strength	850[e]	gauss
Gain (Low level)	31	db
Power Output (Saturated)	1.0	mw
Noise Figure	4.5	db

[a] Connection to the collector terminal may be made with a banana-type plug similar to a Raytheon Test Jack 27-1594G21 fitted with an insulator from HH Smith Type 211 banana plug.

[b] Both rf-input and rf-output terminals employ semi-rigid 50-ohm coaxial lines.

[c] During alignment of the tube in the magnetic focusing field, the helix current may exceed this value for short periods, but should never exceed 10 μa.

[d] This value of field strength will focus the electron beam, but noise figure will not be optimum.

[e] Typical peak value for RCA Solenoid, Type MW4901 (See *Characteristics of RCA-MW4901 Solenoid*).

CHARACTERISTICS RANGE VALUES

	Note	*Min.*	*Max.*	
Heater Current	1	0.45	0.85	amp
Input VSWR:				
Non-operating	2,3	–	1.3	
Operating	1,4	–	1.5	
Output VSWR:				
Non-operating	2	–	1.5	
Operating	1,4	–	3	
DC Helix Voltage	1,4	335	405	volts
DC Grid-No.4 Voltage	1,4	150	400	volts
DC Grid-No.3 Voltage	1,4	25	100	volts
Saturated Power Output	1,4	1.0	–	mw
Small-Signal Gain	1,4	28	34	db
Noise Figure	1,4	–	5.0	db

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Note 1: With heater voltage of 5.0 volts.

Note 2: With no electrode voltages applied.

Note 3: Any tube having a non-operating input VSWR higher than 1.3 but less than 1.5 may be considered acceptable if the operating VSWR is less than 1.5.

Note 4: With electrode voltages and magnetic focusing field adjusted for minimum noise figure at 2500 Mc.

OPERATING CONSIDERATIONS

The *rated values for collector voltage, helix voltage, grid-No.4 voltage, and grid-No.3 voltage are high enough to be dangerous to the user.* Care should be taken during adjustment of circuits, especially when exposed circuit parts are at high dc potential.

The *power supply* for the 8379 should be capable of holding ripple voltage sufficiently low to prevent phase distortion, and should have adequate regulation to prevent a change in operating conditions which might increase the noise figure. Provision should be made for monitoring helix current, collector current, and cathode current.

The rated *heater voltage* of 5.0 volts should be applied for at least 1 minute to allow the cathode to reach normal operating temperature before voltages are applied to the other electrodes.

The *magnetic field* required for focusing the electron beam of the 8379 may be obtained from a solenoid such as the RCA-MW4901 or equivalent. The field must have a distribution as shown in *Characteristics of RCA-MW4901 Solenoid.* A uniform field provided by a solenoid or permanent magnet of at least 800 gauss starting 2 inches from the groove near the base end of the metal shell and continuing for at least nine inches along the tube axis can provide equivalent focusing.

Initial Alignment Procedure

Apply rated heater voltage to the 8379 for one minute. Then connect operating voltages as shown under *Typical Operation* to all other tube electrodes except grid No.2. Grid-No.2 voltage may then be applied, and increased until cathode current reaches approximately 50 microamperes.

If the tube is incorrectly aligned within the magnetic field, some of the beam current will be drawn to the helix and increase the helix current. The axial alignment of the 8379 within the magnetic focusing field should then be adjusted to produce a minimum value of helix current. Grid-No.2 voltage should then be increased until collector current is approximately 150 microamperes. Readjust alignment of the tube and magnetic focusing field until a minimum value of helix current is again obtained. Helix current of the 8379 when properly aligned in the magnetic focusing field is usually less than

one microampere. Collector current should be checked to see if it is essentially the same as cathode current. Such a condition is another indication that the tube is properly aligned in the magnetic field. If a solenoid is used to supply the magnetic focusing field, check the solenoid current and readjust it, if necessary, to obtain the specified field-strength value.

The above alignment procedure need not be repeated so long as the adjustments are not disturbed.

Lowest-Noise-Figure Adjustment Procedure

In order to operate the 8379 at the lowest noise figure, it is necessary to adjust the electrode voltages as follows: With the 8379 connected in its circuit, and with either noise input or signal input, adjust the helix voltage to give maximum output at the operating frequency. This value of helix voltage simultaneously produces optimum tube gain and lowest noise figure. Next, with no input signal, vary dc grid-No.1, grid-No.3, and grid-No.4 supply voltages alternately until the receiver output reaches a minimum value. The voltages are now adjusted to operate the 8379 at its lowest noise figure for the particular frequency to which the equipment is tuned. If the strength of the magnetic focusing field changes, it will be necessary to repeat the above adjustment procedure with regard to grid-No.1, grid-No.3, and grid-No.4 voltage.

Preamplifier in Radar Receivers

In the usual type of radar system, a portion of the transmitter pulse leaks through the TR tube to the crystal mixer in the receiver, overloads the crystal, and gradually impairs its performance. If, however, the crystal is preceded by the 8379 in a preamplifier stage, the traveling-wave tube serves as a crystal-protection device because of its saturation characteristic. See accompanying *Saturation Characteristics* curve. From this curve, it will be noted that the saturated power output of the 8379 is about 1 milliwatt which will not harm the crystal. Therefore, the spike-leakage limit of the TR tube can be eased and thus eliminate the need for supplying "keep-alive" voltage to the TR tube. Furthermore, the ability of the 8379 to withstand an rf peak power input of as much as 500 watts or an average power input of as much as 1 watt makes it possible to employ a TR tube with lower attenuation.

Additional advantages offered by the 8379 in a preamplifier stage include: (1) reduction of the overall noise figure of the radar receiver; (2) improved receiver recovery time; (3) better TR tube life, and (4) reduction of local oscillator radiation. All of these advantages contribute to improved radar-system operation.

Phase-Sensitive Applications

When the 8379 is used in phase-sensitive radar system or in a microwave relay system where frequency-modulated information is amplified, even a small amount of phase distortion

can adversely affect performance. The following table shows for each tube electrode the values of rms ripple voltage which will cause a peak-to-peak change in rf phase of approximately 1 degree.

Tube Electrode	Typical Operating DC Volts	Approx. RMS Ripple Volts For Peak-to-Peak Phase Shift of 1°
Grid No.1	10	0.1
Grid No.2	10	0.1
Grid No.3	70	0.5
Grid No.4	325	3.5
Helix	375	0.024
Collector	600	6.7

For the RCA Solenoid Type MW4901 operated at 90 volts dc, a peak-to-peak change in rf phase of approximately 1° will be caused by an rms ripple voltage of 7.7 volts.

Input Matching Considerations

In general, the *voltage standing wave ratio* (VSWR) will increase as the electron-beam current of the tube is increased. This "hot VSWR" is a direct function of gain and can be attributed to reflections of the amplified wave at a discontinuity along the slow-wave structure. In contrast, the VSWR with no voltages applied to the tube, is referred to as the "cold VSWR". This "cold VSWR" determines the transfer of input signal energy to the helix and, therefore, the noise figure of the 8379 is not degraded by the "hot VSWR". In general, it will be found that when the input to the 8379 is adjusted for optimum matching under "cold" conditions, the same adjustment will provide optimum matching under "hot" conditions. A typical input matching characteristic is given in the accompanying curve for the 8379 under "cold" conditions.

Notes On Associated Microwave Circuitry.

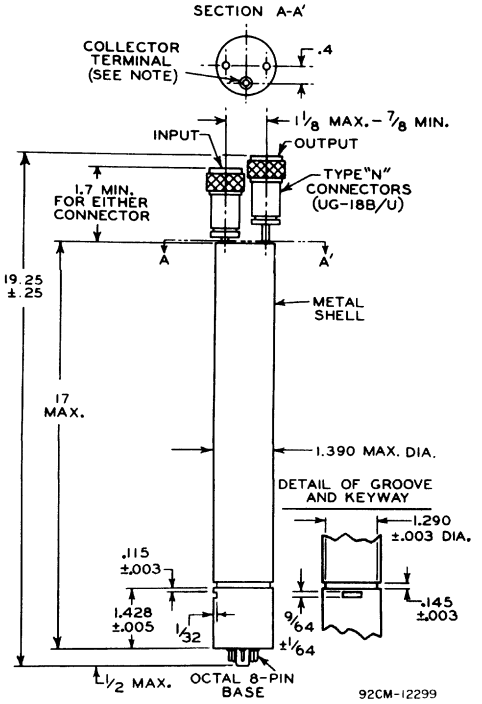
A low-noise traveling-wave tube used in a superheterodyne circuit will cause a 3 db degradation in noise figure unless a filter is used at the output of the traveling-wave tube to remove noise generated at the image frequency.

Whenever the output of the 8379 is connected to a filter, signals in the reject band of the filter are reflected back into the tube. As these signals travel back through the tube, they suffer little attenuation until they are absorbed by the attenuator. Should there be appreciable reflection from the attenuator or another discontinuity inside the traveling-wave tube, oscillations may occur, depending on the gain within the tube from the attenuator or discontinuity to the output end of the tube.

The 8379 is designed to be short-circuit stable, i.e., the power reflected from a short-circuited output termination will be insufficient to cause oscillation when the 8379 is operating at a normal value of beam current. If the beam current is increased sufficiently above this value, the gain of the tube will increase until oscillation takes place.

When a high-gain microwave amplifier tube such as the traveling-wave tube is employed, special care must be taken to prevent distortion of oscillations resulting from feedback through circuitry external to the tube. Some types of filters may show satisfactory attenuation characteristics in and near the frequency band of interest. However, oscillations can still occur due to "holes" in the filter characteristic at frequencies outside the band of interest. Attenuation of filters should therefore be checked over wide bands and the holes, if any, can be filled by supplementary, simple filters.

DIMENSIONAL OUTLINE

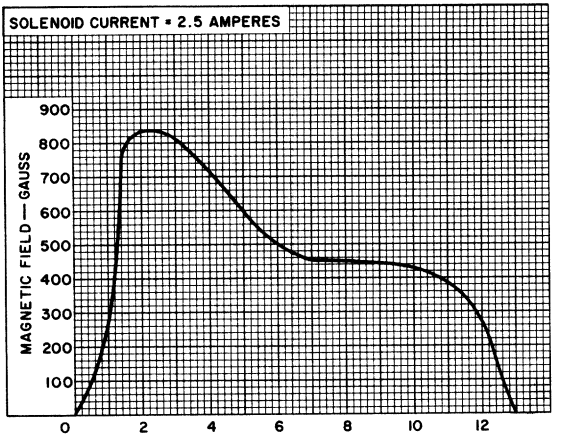


DIMENSIONS IN INCHES

Note: Special Banana Jack--Mates with Raytheon Test Jack 27-1594G21 fitted with an insulator from an HH Smith Type 211 Banana Plug.

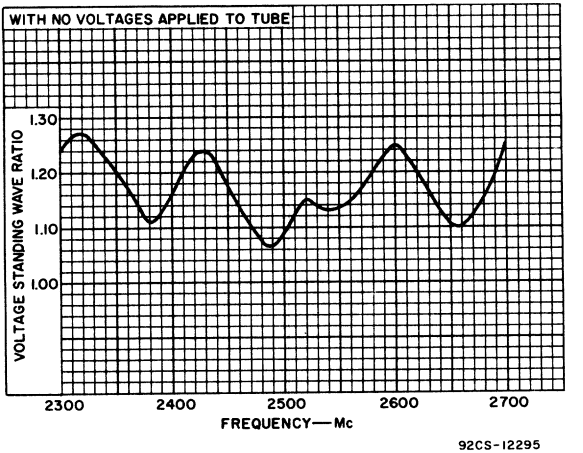
RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Characteristics of RCA-MW4901 Solenoid



92CS-12298

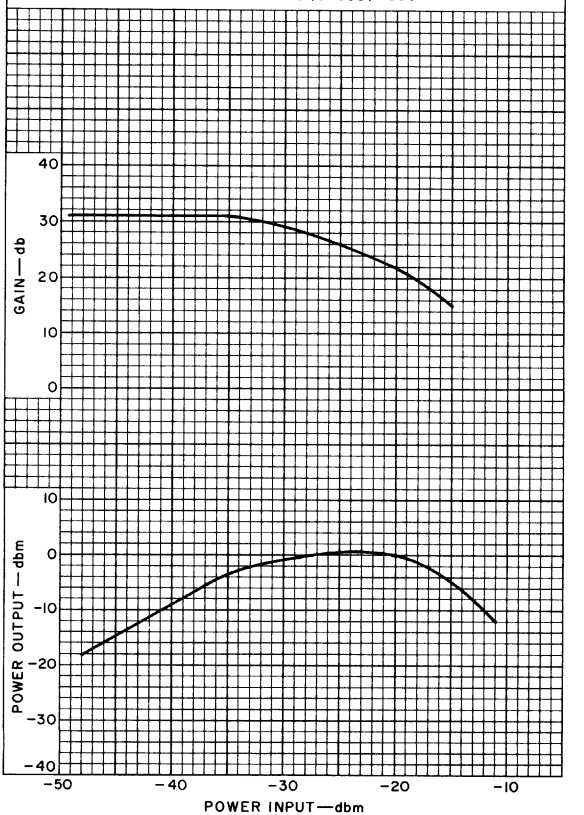
Input-Matching Characteristic



92CS-12295

Saturation Characteristics

E_f = 5 VOLTS
COLLECTOR VOLTS = 600
HELIX VOLTS = 375
GRID-No. 4 VOLTS = 325
GRID-No. 3 VOLTS = 70
GRID-No. 2 VOLTS ADJUSTED TO GIVE COLLECTOR MICROAMPERES = 150
GRID-No. 1 VOLTS = 10
SIGNAL FREQUENCY (Mc) = 2500
FIELD STRENGTH ALONG HELIX AXIS (GAUSS) = 850



92CM-12296

RADIO CORPORATION OF AMERICA
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8380

Power Tetrode

NUVISTOR TYPE

Heater Designed to Operate from Battery Supplies Used in Sonobuoy and Other Expendable Equipment

Electrical:

Heater Characteristics and Ratings:		
Voltage (DC). . . . .Tubes will be supplied with the heater designed to operate within ±10% of any specified center heater voltage between 6.0 and 8.5 volts to meet specific battery-supply requirements in sonobuoy and other expendable equipment.		
Input	1.1	watts
Peak heater-cathode voltage:		
Heater negative with respect to cathode.	100 max.	volts
Heater positive with respect to cathode.	100 max.	volts
Direct Interelectrode Capacitances:		
Grid No.1 to plate.	0.015 max.	pf
Grid No.1 to cathode, grid No.2, shell, and heater.	7.0	pf
Plate to cathode, grid No.2, shell, and heater.	1.4	pf
Heater to cathode	1.4	pf

Characteristics, Class A_1 Amplifier:

Heater Voltage. . . . . .Specified center value		
Plate Supply Voltage.	100	volts
Grid-No.2 Supply Voltage.	50	volts
Grid No.1 . . . . Connected to negative end of cathode resistor		
Cathode Resistor.	68	ohms
Transconductance.	11000	μmhos
Plate Current	11	ma
Grid-No.2 Current	2.9	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-7	volts

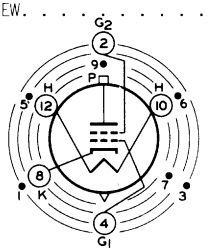
Mechanical:

Operating Position.	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length.	1.050"
Seated Length	0.790" to 0.840"
Maximum Diameter.	0.440"
Weight (Approx.).	2.4 grams
Envelope. . . . . .Metal Shell MT4 with Ceramic Insulator	
Socket and Connector . . . .See *Socket & Connector Information for RCA Nuvistor Tubes* at front of this Section	
Cap . . . . . .Skirted Miniature (JEDEC No.C1-44)	
Base. . . Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)	

8380

Basing Designation for BOTTOM VIEW. 12AS

Pin 1[a] – Do Not Use
Pin 2 – Grid No.2
Pin 3[a] – Do Not Use
Pin 4 – Grid No.1
Pin 5[a] – Do Not Use
Pin 6[a] – Do Not Use
Pin 7[a] – Do Not Use
Pin 8 – Cathode
Pin 9[a] – Do Not Use
Pin 10 – Heater
Pin 12 – Heater
Top Cap – Plate



INDEX • LARGE LUG
• = SHORT PIN; IC—DO NOT USE

AMPLIFIER — Class A

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

Plate Supply Voltage.	300 max.	volts
Plate Voltage	250 max.	volts
Grid-No.2 (Screen-Grid) Supply Voltage. .	300 max.	volts
Grid-No.2 Voltage	100 max.	volts
Grid-No.1 (Control-Grid) Voltage:		
Negative-bias value	55 max.	volts
Positive-bias value	0 max.	volts
Cathode Current	25 max.	ma
Grid-No.2 Input	0.2 max.	watt
Plate Dissipation	1.6 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:[b]		
For fixed-bias operation.	0.5 max.	megohm
For cathode-bias operation.	1 max.	megohm

COMBINED RF OSCILLATOR and FREQUENCY DOUBLER — Class C

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

	Up to 80 Mc	
Plate Supply Voltage.	300 max.	volts
Plate Voltage	250 max.	volts
Grid-No.2 (Screen-Grid) Supply Voltage. .	300 max.	volts
Grid-No.2 Voltage	100 max.	volts
Grid-No.1 (Control-Grid) Voltage:		
Negative-bias value	55 max.	volts
Peak-positive value	3 max.	volts
Cathode Current	25 max.	ma
Grid-No.1 Current	3 max.	ma
Grid-No.2 Input	0.5 max.	watt
Plate Dissipation	1.6 max.	watts
Metal-Shell Temperature (Measured in Zone "A" as shown on *Dimensional Outline*) . .	150 max.	°C

Typical Operation:[c]

Heater Voltage	Specified center value		
Plate Supply Voltage	80	150	volts
Grid-No.2 Supply Voltage	80	150	volts
Grid-No.2 Resistor	–	12000	ohms
Grid-No.1 Resistor	27000	10000	ohms
Plate Current	7.5	10	ma
Grid-No.2 Current	6	6	ma
Useful Power Output at 80 Mc[d]	260	650	mw

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.05 max.	megohm

[a] Pins 1, 3, 5, 6, 7, and 9 are of a length such that their ends do not touch the socket insertion plane.

[b] For operation at metal-shell temperature of 150° C measured in Zone "A" as shown on *Dimensional Outline*. For operation at other metal-shell temperatures, see *Grid-No.1-Circuit-Resistance Rating Chart*.

[c] Cathode, grid No.1, and grid No.2 are operated as a 40-Mc, Colpitts-type, electron-coupled oscillator with grid No.2 functioning as the "plate" of the oscillator, and the plate circuit tuned to 80 Mc.

[d] Measured at load.

CHARACTERISTICS RANGE VALUES

	Note	*Min.*	*Max.*	
Heater Current	1	$0.95\left[\frac{1.1}{E_{f(ctr)}}\right]$	$1.05\left[\frac{1.1}{E_{f(ctr)}}\right]$	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	–	0.015	pf
Grid No.1 to cathode, grid No.2, shell, and heater	2	6.0	8.0	pf
Plate to cathode, grid No.2, shell, and heater	2	1.2	1.6	pf
Heater to cathode	2	1.1	1.7	pf
Plate Current (1)	1,3	9	13	ma
Plate Current (2)	1,4	–	50	μa
Grid-No.2 Current	1,3	–	4	ma
Transconductance (1)	1,3	9000	13000	μmhos
Transconductance, Grid No.1 to Grid No.2	1,3	2000	–	μmhos
Useful Power Output (1)	1,5	0.550	–	watt
Useful Power Output (2)	5,6	0.500	–	watt
Reverse Grid-No.1 Current	1,7	–	0.3	μa
AC Emission	1,8	15	–	ma
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,9	–	10	μa
Heater positive with respect to cathode	1,9	–	10	μa

	Note	Min.	Max.	
Leakage Resistance:				
Between grid No.1 and all other electrodes tied together.	1,10	5000	–	megohms
Between grid No.2 and all other electrodes tied together.	1,11	5000	–	megohms
Between plate and all other electrodes tied together.	1,12	10000	–	megohms

Note 1: With dc heater volts = specified center value, E_f(ctr).

Note 2: Measured in accordance with EIA Standard RS-191-A.

Note 3: With dc plate supply volts = 100, dc grid-No.2 supply volts = 50, grid No.1 and metal shell connected to negative end of cathode resistor, cathode resistor (ohms) = 68, and cathode-bypass capacitor (μf) = 1000.

Note 4: With dc plate volts = 100, dc grid-No.2 volts = 50, dc grid-No.1 volts = -7, and metal shell connected to ground.

Note 5: Measured at load in 40-Mc oscillator-80-Mc doubler circuit with dc plate supply volts = 150, dc grid-No.2 supply volts = 150, grid-No.2 resistor (ohms) = 12000, and grid-No.1 resistor (ohms) = 10000.

Note 6: With dc heater volts = 0.9 specified center value.

Note 7: With dc plate supply volts = 125, dc grid-No.2 supply volts = 60, dc grid-No.1 supply volts = -1.5, grid-No.1-circuit resistance (megohms) $\leq$ 1 (the internal resistance of the current meter used for this measurement), and metal shell connected to ground.

Note 8: With dc plate supply volts = 100, dc grid-No.2 supply volts = 50, dc grid-No.1 supply volts = -6.5, rms 60-cps ac grid-No.1 signal volts = 7.5, dc grid-No.1-circuit resistance (ohms) $\leq$ 2, plate- and grid-No.1-voltage supplies each bypassed with capacitor (μf) $\geq$ 500, and metal shell connected to ground. "AC Emission" is measured as the dc component of current in the plate circuit.

Note 9: With dc heater-cathode volts = 100.

Note 10: With grid No.1 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

Note 11: With grid No.2 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

Note 12: With plate 300 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

SPECIAL TESTS

Short-Duration Shock (1):

Peak Impact Acceleration . . . . . 1000 g

This test is performed on a sample lot of tubes to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of four different positions (X_1, X_2, Y_1, and Y_2) in a Navy-Type High-Impact (Flyweight) Shock Machine and, with tube-electrode voltages applied, are subjected to 20 blows (5 in each position) at the specified Peak Impact Acceleration.

At the end of this test, tubes are criticized for Continuity and Shorts, Useful Power Output (1), Reverse Grid-No.1 Current, and Heater-Cathode Leakage Current.

Long-Duration Shock (2):

Peak Impact Acceleration . . . . . 50 g

This test is performed, using a half-sine-wave, 11-millisecond, mechanical shock pulse, on a sample lot of tubes from each production run to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of two positions in three mutually perpendicular axes on a free-fall table. The longitudinal axis of the tube is coincident with one of the three axes. The table is dropped a total of 18 times to a horizontal surface from a height sufficient to produce the specified Peak Impact Acceleration. The material of the horizontal surface is such that the duration of the half-sine-wave shock pulse is 11 milliseconds. No tube-electrode voltages are applied during this test.

At the end of this test, tubes are criticized for Continuity and Shorts, Useful Power Output (1), Reverse Grid-No.1 Current, and Heater-Cathode Leakage Current.

Sweep-Frequency Fatigue Vibration:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand the Sweep-Frequency Fatigue Vibration specified below. Tubes are held rigid and operated with dc heater-cathode volts = 100. During operation, the tube is vibrated through the frequency range from 5 to 500 cps and back to 5 cps. One such vibration sweep cycle takes approximately 15 minutes. This cycle is repeated for a period of 3 hours along each of three mutually perpendicular axes for a total of 9 hours. The longitudinal axis of the tube is coincident with one of the three axes. The vibrations are applied as follows:

a. The vibration from 5 to 50 cps is applied with a constant peak amplitude of 0.040 inch (0.080 inch peak-to-peak)

b. The vibration from 50 to 500 cps is applied with a constant acceleration of 10 g.

c. The vibration from 500 to 50 cps and then to 5 cps follows the same procedure, but in reverse.

At the end of this test, tubes are criticized for Continuity and Shorts, Useful Power Output (1), Reverse Grid-No.1 Current, and Heater-Cathode Leakage Current.

Low-Pressure Voltage Breakdown:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand high-altitude (low-air-pressure) conditions. Tubes are operated with 250 volts rms (60-cycle, ac) applied between plate and all other electrodes and metal shell connected together. Tubes must not break down or show evidence of corona when subjected to an air pressure (8.0 ± 0.5 mm Hg) corresponding to an altitude of 100,000 feet.

Continuity and Shorts:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-ID, Amendment 5, Paragraph 4. 7.7, except that tapping is done by hand with a soft rubber tapper (Specifications for this tapper will be supplied upon request). The areas of acceptance and rejection for this test are shown in the accompanying *Shorts-Test Acceptance-Limits* graph. In this test, tubes are criticized for permanent or temporary shorts and open circuits.

Reliability Life (20 Hours):

This test is performed on a sample size (minimum of 80 tubes/lot for a 5-lot sampling plan or a minimum of 400 tubes for a single-lot sampling plan) designed to assure a process average AFR (Acceptable Failure Rate) of 0.5 per cent for Inoperatives and 2.1 per cent for Total Defectives and a process average RFR (Rejectable Failure Rate) of 2.0 per cent for Inoperatives and 4.7 per cent for Total Defectives.

During this test, tubes are operated at maximum-rated plate dissipation.

At the end of this test, tubes are criticized for Useful Power Output (2), Inoperatives, and Total Defectives. A tube is considered Inoperative if Useful Power Output (2) is less than 0.200 watt.

Heater-Cycling Life (100 Hours):

Intermittent Operation . . . . . 2000 cycles

This test is performed on a sample lot of tubes from each production run with heater volts = 1.35x specified center value cycled 1 minute ON and 2 minutes OFF, dc heater-cathode volts = -100, all other tube electrodes and metal shell connected to ground.

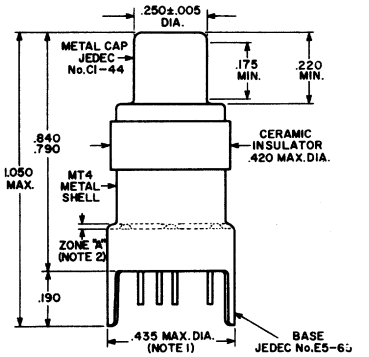
At the end of this test, tubes are criticized for Heater-Cathode Leakage Current, Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

Combined Oscillator-Doubler Life (100 Hours):

This test is performed on a sample lot of tubes from each production run.

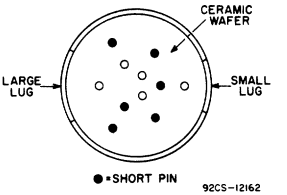
During this test, tubes are operated as a combined oscillator and frequency doubler at maximum-rated plate dissipation.

At the end of this test, tubes are criticized for Useful Power Output (2), Reverse Grid-No.1 Current, Inoperatives, and Total Defectives. A tube is considered Inoperative if Useful Power Output (2) is less than 0.200 watt.

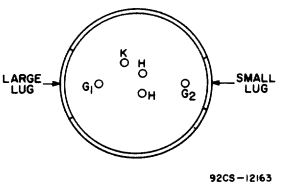


Dimensions in Inches

BOTTOM VIEW
Showing Arrangement of All 11 Base Pins



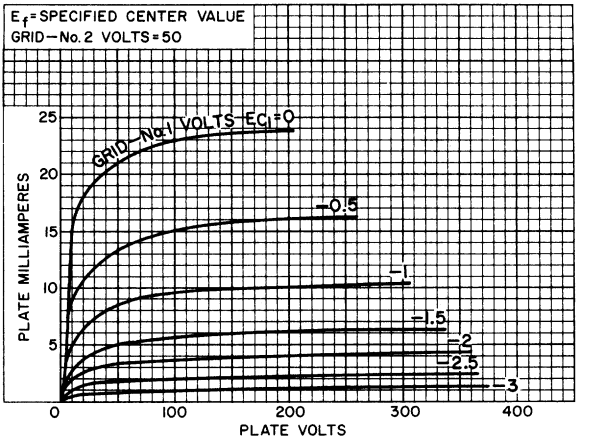
MODIFIED BOTTOM VIEW
With Element Connections Indicated
and Short Pins Not Shown



NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

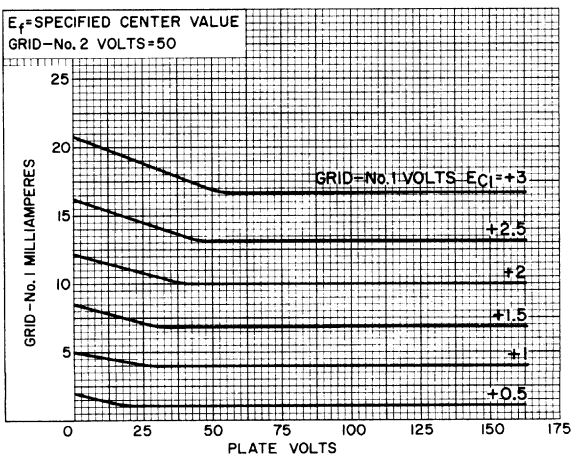
NOTE 2: METAL-SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A".

AVERAGE PLATE CHARACTERISTICS



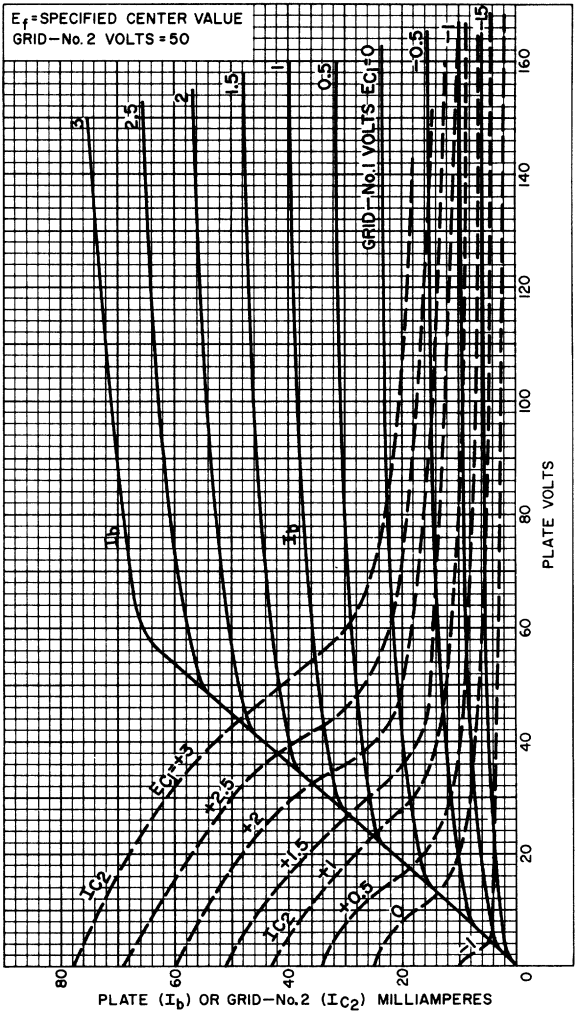
92CS-12173

AVERAGE CHARACTERISTICS



92CS-12172

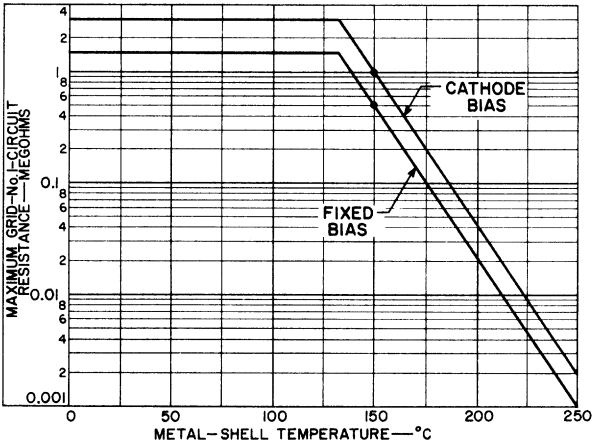
AVERAGE CHARACTERISTICS



92CM-12175

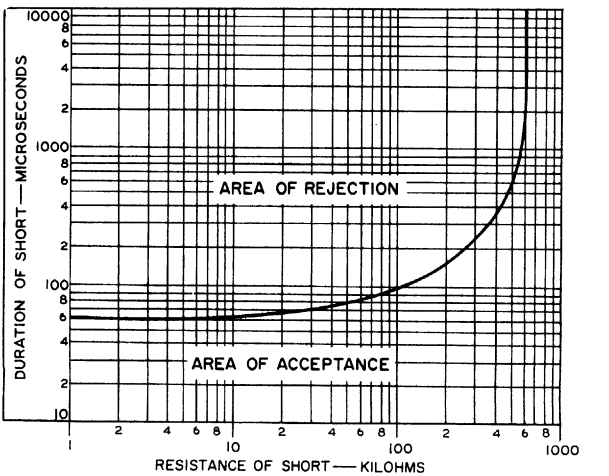
8380

GRID-No.1-CIRCUIT-RESISTANCE RATING CHART
Class A Amplifier



92CS-11896

SHORTS-TEST ACCEPTANCE LIMITS



92CS-10465RI

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

8382

Power Triode

NUVISTOR TYPE

Heater Designed to Operate from Battery Supplies Used in Sonobuoy and Other Expendable Equipment

Electrical:

Heater Characteristics and Ratings:		
Voltage (DC) . . . . Tubes will be supplied with the heater designed to operate within ±10% of any specified center heater voltage between 6.0 and 8.5 volts to meet specific battery-supply requirements in sonobuoy and other expendable equipment.		
Input.	0.85	watt
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances (Approx.):		
Grid to plate.	2.2	pf
Grid to cathode, shell, and heater	4.2	pf
Plate to cathode, shell, and heater	1.6	pf
Plate to cathode	0.26	pf
Heater to cathode.	1.4	pf

Characteristics, Class A_1 Amplifier:

Heater Voltage	Specified center value	
Plate Supply Voltage	75	volts
Grid . . . . . .Connected to negative end of cathode resistor		
Cathode Resistor	100	ohms
Amplification Factor	28	
Plate Resistance (Approx.)	2200	ohms
Transconductance	12800	μmhos
Plate Current.	15	ma
Grid Voltage (Approx.) for plate μa = 10	-8	volts

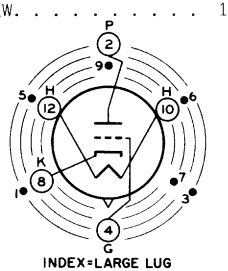
Mechanical:

Operating Position	.Any
Type of Cathode.	.Coated Unipotential
Maximum Overall Length	0.800"
Maximum Seated Length.	0.625"
Maximum Diameter	0.440"
Weight (Approx.)	1.9 grams
Envelope	Metal Shell MT4
Socket	See *Socket & Connector Information* for *RCA Nuvistor Tubes* at front of this section
Base . . .Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)	

8382

Basing Designation for BOTTOM VIEW. 12AQ

Pin 1[a] – Do Not Use
Pin 2 – Plate
Pin 3[a] – Do Not Use
Pin 4 – Grid
Pin 5[a] – Do Not Use
Pin 6[a] – Do Not Use
Pin 7[a] – Do Not Use
Pin 8 – Cathode
Pin 9[a] – Do Not Use
Pin 10 – Heater
Pin 12 – Heater



INDEX=LARGE LUG
●=SHORT PIN; IC—DO NOT USE

RF AMPLIFIER or OSCILLATOR — Class C

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

	Up to 175 Mc	
Plate Supply Voltage	300 max.	volts
Plate Voltage	250 max.	volts
Grid Voltage:		
Negative-bias value	55 max.	volts
Peak-positive value	4 max.	volts
Grid Current	5 max.	ma
Cathode Current	25 max.	ma
Plate Dissipation	2 max.	watts
Metal-Shell Temperature (Measured in Zone "A" as shown on *Dimensional Outline*)	150 max.	°C

Typical Operation:

As cathode-drive rf amplifier

	At 175 Mc	
Heater Voltage	Specified center value	
Plate Supply Voltage	150	volts
Grid Resistor	4700	ohms
Driver Power Output	250	mw
Useful Power Output[b]	1.6	watts

As oscillator

	At 175 Mc	
Heater Voltage	Specified center value	
Plate Supply Voltage	170	volts
Grid Resistor	4700	ohms
Plate Input	3	watts
Useful Power Output[b]	1.5	watts

Maximum Circuit Values:

Grid-Circuit Resistance	0.05 max.	megohm

FREQUENCY DOUBLER — Class C

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

	Up to 175 Mc	
Plate Supply Voltage	300 max.	volts
Plate Voltage	250 max.	volts
Grid Voltage:		
Negative-bias value	200 max.	volts
Peak-positive value	4 max.	volts
Grid Current	5 max.	ma
Cathode Current	22 max.	ma
Plate Dissipation	2 max.	watts
Metal-Shell Temperature (Measured in Zone "A" as shown on *Dimensional Outline*)	150 max.	°C

Typical Operation:

	80-to-160 Mc	
Heater Voltage	Specified center value	
Plate Supply Voltage	135	volts
Grid Resistor	30000	ohms
Driver Power Output	150	mw
Useful Power Output[b]	800	mw

Maximum Circuit Values:

Grid-Circuit Resistance	0.05 max.	megohm

[a] Pins 1, 3, 5, 6, 7, and 9 are of a length such that their ends do not touch the socket insertion plane.

[b] Measured at load.

CHARACTERISTICS RANGE VALUES

	Note	*Min.*	*Max.*	
Heater Current	1	$0.95\left[\frac{0.85}{E_{f(ctr)}}\right]$	$1.05\left[\frac{0.85}{E_{f(ctr)}}\right]$	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	1.8	2.6	pf
Grid to cathode, shell, and heater	2	3.8	4.6	pf
Plate to cathode, shell, and heater	2	1.4	1.8	pf
Plate to cathode	2	0.20	0.32	pf
Heater to cathode	2	1.1	1.7	pf
Plate Current (1)	1,3	11	19	ma
Plate Current (2)	1,4	-	100	μa
Transconductance (1)	1,3	11400	14200	μmhos
Useful Power Output (1)	1,5	1.4	-	watts
Useful Power Output (2)	5,6	1.3	-	watts
Reverse Grid Current	1,7	-	0.3	μa
AC Emission	1,8	20	-	ma
Amplification Factor	1,3	22	34	

	Note	Min.	Max.	
Heater-Cathode				
Leakage Current:				
Heater negative with respect to cathode.	1,9	–	5	μa
Heater positive with respect to cathode.	1,9	–	5	μa
Leakage Resistance:				
Between grid and all other electrodes tied together	1,10	5000	–	megohms
Between plate and all other electrodes tied together	1,11	10000	–	megohms

Note 1: With dc heater volts = specified center value, E_f(ctr).

Note 2: Measured in accordance with EIA Standard RS-191-A.

Note 3: With dc plate supply volts = 75, grid and metal shell connected to negative end of cathode resistor, cathode resistor (ohms) = 100, and cathode-bypass capacitor (μf) = 1000.

Note 4: With dc plate volts = 75, dc grid volts = -9, and metal shell connected to ground.

Note 5: Measured at load in 175-Mc, cathode-drive, rf-amplifier circuit with dc plate supply volts = 150, grid resistor (ohms) = 2500, and driver power output (milliwatts) = 250.

Note 6: With dc heater volts = 0.9 specified center value.

Note 7: With dc plate supply volts = 80, dc grid supply volts = -1.2, grid-circuit resistance (megohms) $\cong$ 1 (the internal resistance of the current meter used for this measurement), and metal shell connected to ground.

Note 8: With dc plate supply volts = 40, dc grid supply volts = -6.5, rms 60-cps ac grid signal volts = 8, dc grid-circuit resistance (ohms) $\leq$ 2, plate- and grid-voltage supplies each bypassed with capacitor (μf) $\geq$ 500, and metal shell connected to ground. "AC Emission" is measured as the dc component of current in the plate circuit.

Note 9: With dc heater-cathode volts = 100.

Note 10: With grid 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

Note 11: With plate 300 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

SPECIAL TESTS

Short-Duration Shock (1):

Peak Impact Acceleration	1000	g

This test is performed on a sample lot of tubes to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of four different positions (X_1, X_2, Y_1, and Y_2) in a Navy-Type High-Impact (Flyweight) Shock Machine and, with tube-electrode voltages applied, are subjected to 20 blows (5 in each position) at the specified Peak Impact Acceleration.

At the end of this test, tubes are criticized for Continuity and Shorts, Useful Power Output (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Long-Duration Shock (2):

Peak Impact Acceleration . . . . . 50 g

This test is performed, using a half-sine-wave, 11-millisecond, mechanical shock pulse, on a sample lot of tubes from each production run to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of two positions in three mutually perpendicular axes on a free-fall table. The longitudinal axis of the tube is coincident with one of the three axes. The table is dropped a total of 18 times to a horizontal surface from a height sufficient to produce the specified Peak Impact Acceleration. The material of the horizontal surface is such that the duration of the half-sine-wave shock pulse is 11 milliseconds. No tube-electrode voltages are applied during this test.

At the end of this test, tubes are criticized for Continuity and Shorts, Useful Power Output (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Sweep-Frequency Fatigue Vibration:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand the Sweep-Frequency Fatigue Vibration specified below. Tubes are held rigid and operated with dc heater-cathode volts = 100. During operation, the tube is vibrated through the frequency range from 5 to 500 cps and back to 5 cps. One such vibration sweep cycle takes approximately 15 minutes. This cycle is repeated for a period of 3 hours along each of three mutually perpendicular axes for a total of 9 hours. The longitudinal axis of the tube is coincident with one of the three axis. The vibrations are applied as follows:

a. The vibration from 5 to 50 cps is applied with a constant peak amplitude of 0.040 inch (0.080 inch peak-to-peak).

b. The vibration from 50 to 500 cps is applied with a constant acceleration of 10 g.

c. The vibration from 500 to 50 cps and then to 5 cps follows the same procedure, but in reverse.

At the end of this test, tubes are criticized for Continuity and Shorts, Useful Power Output (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Low-Pressure Voltage Breakdown:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand high-altitude (low-air-pressure) conditions. Tubes are operated with 250 volts rms (60-cycle, ac) applied between plate and all other electrodes and metal shell connected together. Tubes must not break down or show evidence of corona when subjected to an air pressure (8.0 ± 0.5 mm Hg) corresponding to an altitude of 100,000 feet.

Continuity and Shorts:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-ID, Amendment 5, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper (Specifications for this tapper will be supplied upon request). The areas of acceptance and rejection for this test are shown in the accompanying *Shorts-Test Acceptance-Limits* graph. In this test, tubes are criticized for permanent or temporary shorts and open circuits.

Reliability Life (20 Hours):

This test is performed on a sample size (minimum of 80 tubes/lot for a 5-lot sampling plan or a minimum of 400 tubes for a single-lot sampling plan) designed to assure a process average AFR (Acceptable Failure Rate) of 0.5 per cent for Inoperatives and 2.1 per cent for Total Defectives and a process average RFR (Rejectable Failure Rate) of 2.0 per cent for Inoperatives and 4.7 per cent for Total Defectives.

During this test, tubes are operated at maximum-rated plate dissipation.

At the end of this test, tubes are criticized for Useful Power Output (2), Inoperatives, and Total Defectives. A tube is considered Inoperative if Useful Power Output (2) is less than 0.700 watt.

Heater-Cycling Life (100 Hours):

Intermittent Operation . . . . . 2000 cycles

This test is performed on a sample lot of tubes from each production run with heater volts = 1.35x specified center value cycled 1 minute ON and 2 minutes OFF, dc heater-cathode volts = -100, all other tube electrodes and metal shell connected to ground.

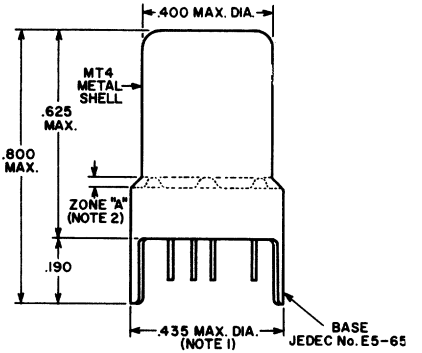
At the end of this test, tubes are criticized for Heater-Cathode Leakage Current, Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

Oscillator Life (100 Hours):

This test is performed on a sample lot of tubes from each production run.

During this test, tubes are operated as 175-Mc oscillator at maximum-rated plate dissipation.

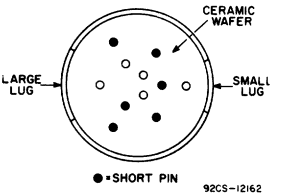
At the end of this test, tubes are criticized for Useful Power Output (2), Reverse Grid Current, Inoperatives, and Total Defectives. A tube is considered Inoperative if Useful Power Output (2) is less than 0.700 watt.



Dimensions in Inches

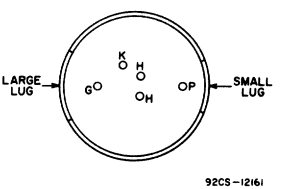
BOTTOM VIEW

Showing Arrangement of All 11 Base Pins



MODIFIED BOTTOM VIEW

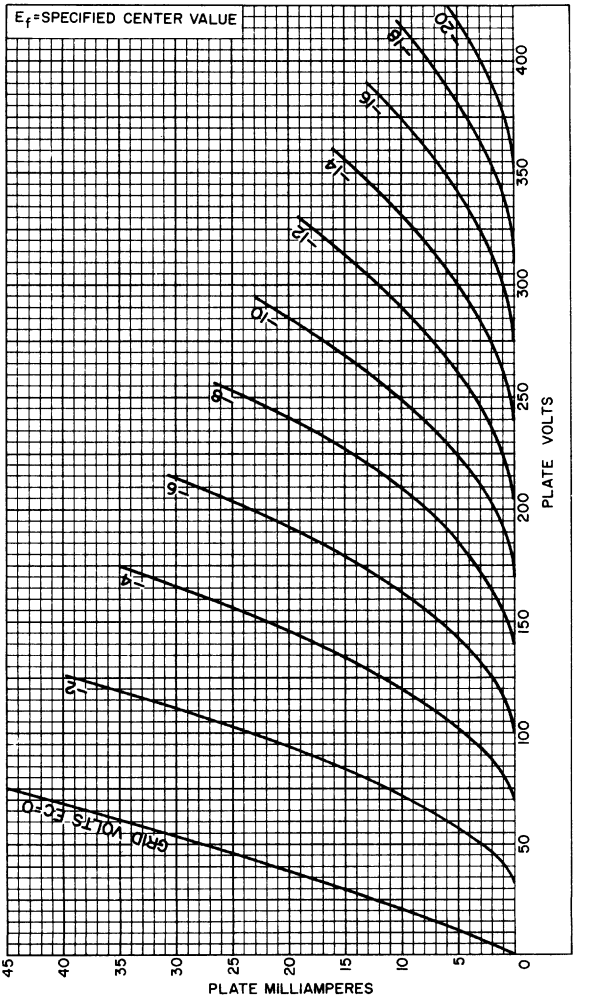
With Element Connections Indicated and Short Pins Not Shown



NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

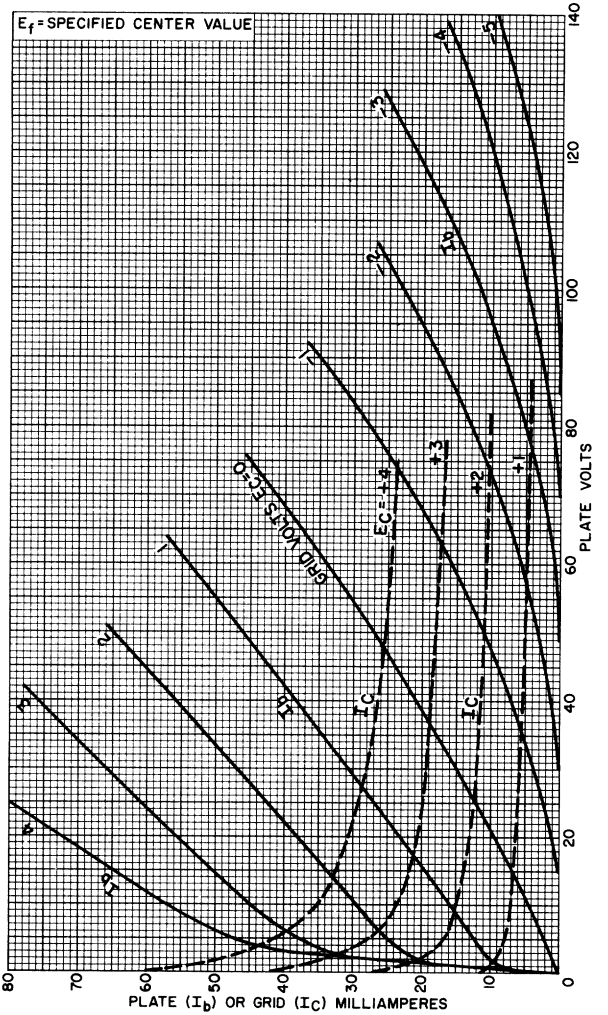
NOTE 2: METAL-SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A".

AVERAGE PLATE CHARACTERISTICS



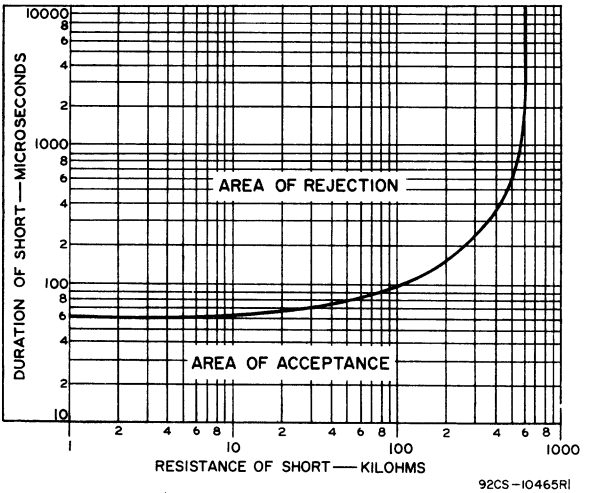
92CM-12169

AVERAGE CHARACTERISTICS



92CM-12174

SHORT-TEST ACCEPTANCE LIMITS



8393

Medium-Mu Triode

NUVISTOR TYPE

ALL-CERAMIC-AND-METAL CONSTRUCTION

Designed to Withstand Severe Mechanical Shock and Vibration in Industrial Applications, the 8393 is a General-Purpose Tube for Use in Amplifier and Oscillator Service at Frequencies Extending into the UHF Region

The 8393 is the same as the 7586 except for the following items:

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	13.5 ± 1.4	volts
Current at heater volts = 13.5	0.060	amp
Direct Interelectrode Capacitances (Approx.):		
Grid to plate	2.4	pf
Input: G to (K,S,H)	4.4	pf
Heater to cathode	1.7	pf

CHARACTERISTICS RANGE VALUES

	Note[a]	*Min.*	*Max.*	
Heater Current	10	0.055	0.065	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	2.0	2.8	pf
Input: G to (K,S,H)	2	4.0	4.8	pf
Heater to cathode	2	1.4	2.0	pf
Transconductance (2)	11	9000	–	μmhos

Note 10: With 13.5 volts ac or dc on heater.
Note 11: With 12.0 volts ac or dc on heater.

SPECIAL RATINGS & PERFORMANCE DATA

Heater Cycling:
Heater volts = 18.0

[a] Notes 1 and 5 shown in 7586 data sheets are to be substituted by Notes 10 and 11 respectively for type 8393.

8437

Beam Power Tube

CERMOLOX®

FORCED-AIR COOLED
INTEGRAL RADIATOR
THORIATED-TUNGSTEN MESH FILAMENT

HIGH GAIN-BANDWIDTH PRODUCTS
10000 WATTS CW POWER OUTPUT
AT 400 Mc

For Compact Aircraft, Mobile, and Stationary Equipment Applications in the UHF Frequency Range

Electrical:

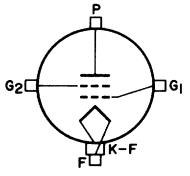
Filamentary Cathode, Thoriated-Tungsten Cylindrical-Mesh Type:		
Voltage (AC or DC)	8.5 typ. / 9.0 max.	volts / volts
Current:		
Typical value at 8.5 volts	88	amp
Maximum value for starting, even momentarily	300	amp
Minimum heating time	15	sec
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 7000, grid-No.2 volts = 1350, and plate ma. = 500	30	
Direct Interelectrode Capacitances:		
Grid No.1 to plate[a]	0.4 max.	pf
Grid No.1 to filament	86	pf
Plate to filament[a]	0.07 max.	pf
Grid No.1 to grid No.2	88	pf
Grid No.2 to plate	20	pf
Grid No.2 to filament[a]	1.5 max.	pf

Mechanical:

Operating Position	Any
Maximum Overall Length	6.188"
Maximum Diameter (See *Dimensional Outline*)	6.170"
Weight (Approx.)	12 lbs.
Radiator	Integral part of tube

Terminal Connections (See *Dimensional Outline*):

G_1 - Grid-No.1-Terminal Contact Surface
G_2 - Grid-No.2-Terminal Contact Surface
F - Filament-Terminal Contact Surface



K-F - Cathode-Filament Terminal Contact Surface
P - Plate-Terminal Contact Surface

Thermal:

Terminal Temperature (Plate, grid No.2, grid No.1, cathode-filament, and filament)	250 max.	°C
Plate-Core Temperature	250 max.	°C

Air Flow.

Through radiator — Adequate air flow to limit the plate-core temperature to 250° C should be delivered by a blower through the radiator before and during the application of filament, plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator are shown in accompanying *Typical-Cooling-Requirements* curve as a function of plate dissipation.

To Plate, Grid-No.2, Grid-No.1, Cathode-Filament, and Filament Terminals — A sufficient quantity of air should be allowed to flow past each of these terminals so that their temperature does not exceed the specified maximum value of 250° C.

During Standby Operation — Cooling air is required to the Cathode-Filament and Filament Terminals when only filament voltage is applied to the tube.

During Shutdown Operation — Air flow should continue for a few minutes after all electrode power is removed.

At Sea Level — Cooling requirements as shown in accompanying *Typical-Cooling-Requirements* curve, may be met by use of the following blowers and associated motors manufactured by Rotron Mfg. Co., Inc., Woodstock, N.Y., or equivalent:

For 100% Plate Dissipation:				
Blower Model No.	AS-704	KS-704	-	PS-606
Motor Model No.	255JS	452AS	-	209JS
Phase (ϕ)	3	1	-	3
Frequency (cps)	60	60	-	400
Voltage (v)	208	115	-	115
For 80% Plate Dissipation:				
Blower Model No.	AS-601	KS-601	PS-4502	PS-4502
Motor Model No.	266JS	413AS	358AS	209JS
Phase (ϕ)	3	1	1	3
Frequency (cps)	60	60	400	400
Voltage (v)	208	115	115	115
For 60% Plate Dissipation:				
Blower Model No.	AS-4506	KS-4506	PS-3503	NS-301
Motor Model No.	130JS	364AS	450AS	587JS
Phase (ϕ)	3	1	1	3
Frequency (cps)	60	60	400	400
Voltage (v)	208	115	115	115

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS[b] Ratings, *Absolute-Maximum Values:*

For frequencies up to 500 Mc

DC Plate Voltage	7000 max.	volts
DC Grid-No.2 Voltage	1500 max.	volts

DC Grid-No.1 Voltage	-150 max.	volts
DC Plate Current	4 max.	amp
DC Grid-No.1 Current	1.2 max.	amp
Grid-No.1 Input[c]	150 max.	watts
Grid-No.2 Input[c]	300 max.	watts
Plate Dissipation	10000 max.	watts

Typical CCS Operation:

In Cathode-Drive Circuit at 400 Mc

DC Plate Voltage	6500	volts
DC Grid-No.2 Voltage[d]	1200	volts
DC Grid-No.1 Voltage[e]	-30	volts
DC Plate Current	3.5	amp
DC Grid-No.2 Current	0.05	amp
DC Grid-No.1 Current	0.53	amp
Driver Power Output[f] (Approx.)	600	watts
Output-Circuit Efficiency	78	%
Useful Power Output	10000	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	5000 max.	ohms
Grid-No.2-Circuit Impedance	[g]	
Plate-Circuit Impedance	[h]	

[a] See *Characteristics Range Values, Test No.2.*

[b] Continuous Commercial Service.

[c] Grid input represents the power dissipated in the grid electrode. The grid input is not necessarily the product of the dc grid voltage and the "metered" grid current. For example, see *Grid No.2* under *Operating Considerations.*

[d] Obtained from a fixed supply.

[e] Obtained from a grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

[f] The driver stage is required to supply tube losses and rf circuit losses. It should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, components, initial tube characteristics, and tube characteristics during life.

[g] See *Grid No.2* under *Operating Considerations.*

[h] See *Plate* under *Operating Considerations.*

CHARACTERISTICS RANGE VALUES

Test No.	*Note*	*Min.*	*Max.*	
1. Filament Current	1	84	92	amp
2. Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	-	0.4	pf
Grid No.1 to filament	-	78	94	pf
Plate to filament	2,3	-	0.07	pf
Grid No.1 to grid No.2	-	80	96	pf
Grid No.2 to plate	-	18	22	pf
Grid No.2 to filament	3	-	1.5	pf
3. Peak Grid-No.1 Voltage	1,4	-	125	volts

Note 1: With 8.5 ac volts on filament.

Note 2: With external flat metal shield 8" in diameter having a center hole 4" in diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2.

Note 3: With external flat metal shield 8" in diameter having a center hole 3-3/8" in diameter. Shield is located in plane of the grid-No.1 terminal, perpendicular to the tube axis, and is connected to grid No.1.

Note 4: With dc plate voltage of 1750 volts, dc grid-No.2 voltage of 1200 volts, and instantaneous grid-No.1 voltage adjusted to give peak plate current of 10 amperes.

OPERATING CONSIDERATIONS

Filament

The rated filament voltage of 8.5 volts should be applied for 15 seconds to allow the cathode to reach normal operating temperature before voltages are applied to other electrodes.

The life of the cathode can then be conserved by adjusting to the lowest nominal filament supply voltage which will give the desired performance. Good regulation of the filament supply voltage about this value is, in general, economically advantageous from the view-point of tube life. The supply regulation should not exceed ± 5%. This recommendation is particularly applicable at the higher operating frequencies.

Temperature

The maximum plate core or terminal temperature of 250° C is a tube rating and is to be observed in the same manner as other ratings. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. This paint is manufactured in the form of liquid or stick by the Tempil Corporation, 132 W. 22nd Street, New York 11, N.Y.

Grid No.2

Grid-No.2 current is composed of a positive-current component resulting from cathode emission to grid No.2 and a negative-current component resulting from secondary-emission phenomena. Because it is the net result of these component currents which is read on a meter in the grid-No.2 circuit, grid-No.2 dissipation can not be accurately determined. Operation similar to conditions given under *Typical Operation* in in the tabulated data section will minimize the possibility of exceeding maximum grid-No.2 input rating.

The grid-No.2 circuit must be capable of maintaining the proper grid-No.2 voltage in the presence of moderate negative dc current as well as normal values of positive current. Complete protection can be achieved by the use of a well-regulated power supply, a grid-No.2-to-ground impedance that is low enough to prevent gradual build-up of grid-No.2 voltage and/or catastrophic build-up (runaway) under negative-current conditions, and a current-overload relay to protect the grid No.2 against positive or negative currents of the order of one-tenth the required plate current.

Plate

In beam power tubes with closely spaced electrodes, such as the 8437, extremely high voltage gradients occur even with moderate tube operating voltages. Any arc-over between elec-

trodes may be destructive. A series impedance in the plate lead is recommended. The resultant plate impedance giving a plate-voltage-supply regulation of no better than 10% is usually sufficient.

Standby Operation

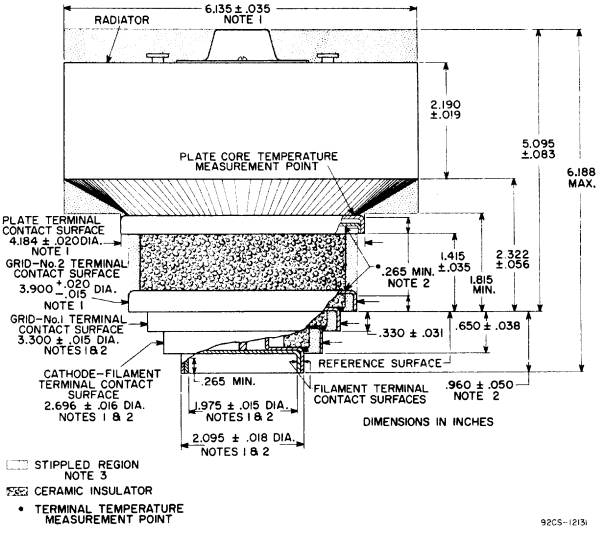
During long or frequent standby periods, the 8437 may be operated at decreased filament voltage to conserve life. It is recommended that the filament voltage be reduced to 80% of normal during standby periods up to 2 hours. For longer periods, the filament voltage should be turned off.

Precautions

Protective devices should be used to protect the plate and grid No.2 against overload. Excessive plate-current flow and resultant over-heating of the tube can be prevented by connection of the common ground lead of the plate circuit in series with the coil of an instantaneous overload relay. This relay should be adjusted to remove the dc plate voltage and dc grid-No.2 voltage when the average value of plate current reaches a value slightly higher than normal plate current. A protective device in the grid-No.2 supply should remove the grid-No.2 voltage when the dc grid-No.2 current reaches a value slightly higher than normal.

The rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock device should function to break the primary circuit of the high-voltage supplies when any gate or door of the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.

8437

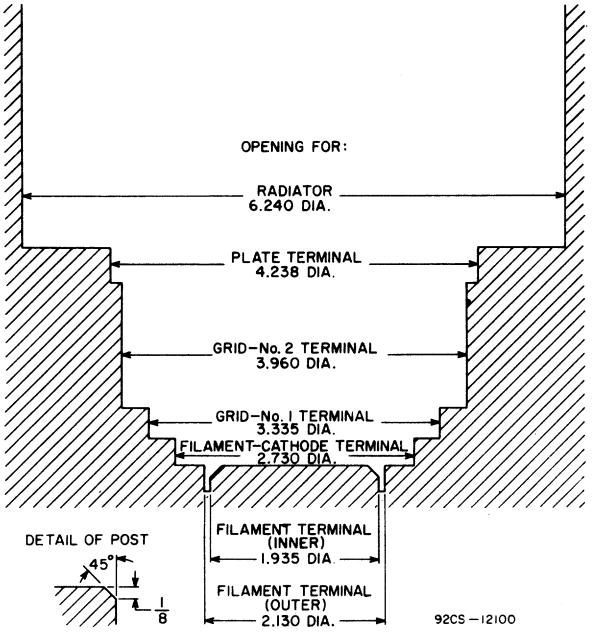


NOTE 1: SEE *SKETCH G1* FOR THE MAXIMUM DIAMETRICAL SPACE REQUIRED BY THE 8437 BASED UPON THE DIAMETER AND ECCENTRICITY OF RADIATOR BAND AND OF EACH RING TERMINAL.

NOTE 2: THE DIAMETER OF THE TERMINAL IS HELD TO THE INDICATED VALUE ONLY OVER THE CONTACT SURFACE LENGTH. THE CONTACT SURFACE LENGTH OF THE FILAMENT, CATHODE-FILAMENT, AND GRID-No.1 TERMINALS EXTENDS FROM THE EDGE OF ITS TERMINAL TO THE PLANE COINCIDENT WITH THE EDGE OF THE ADJACENT LARGER TERMINAL.

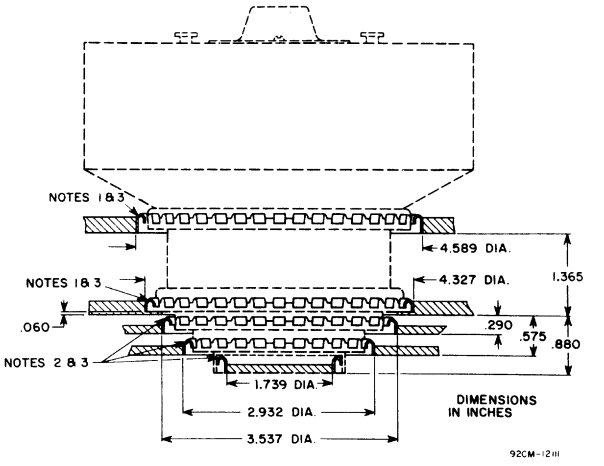
NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR REGIONS.

SKETCH G1



DIMENSIONS IN INCHES

PREFERRED MOUNTING ARRANGEMENT
& LAYOUT OF ASSOCIATED CONTACTS

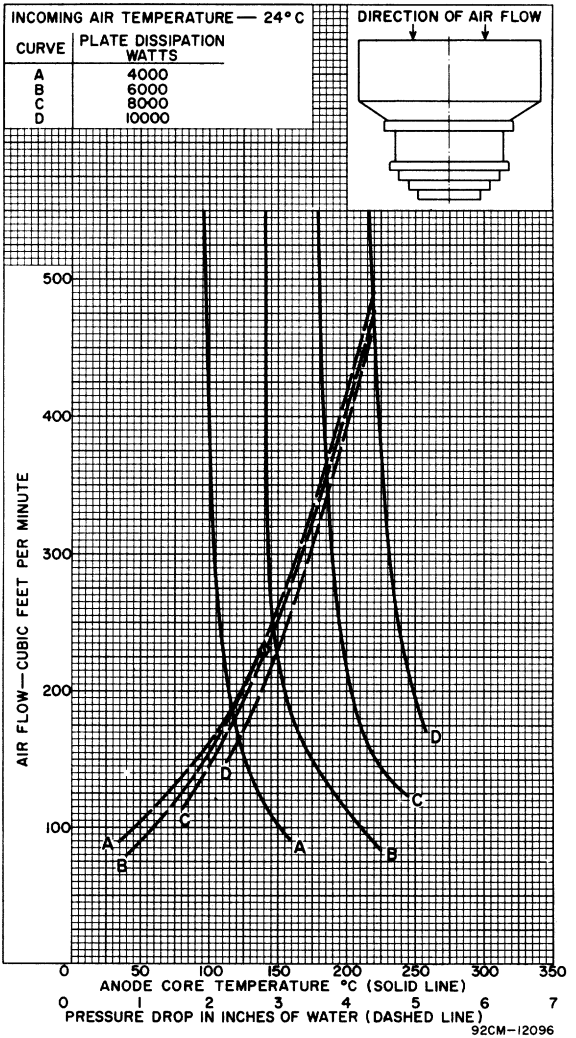


NOTE 1: FINGER STOCK No.97-310.

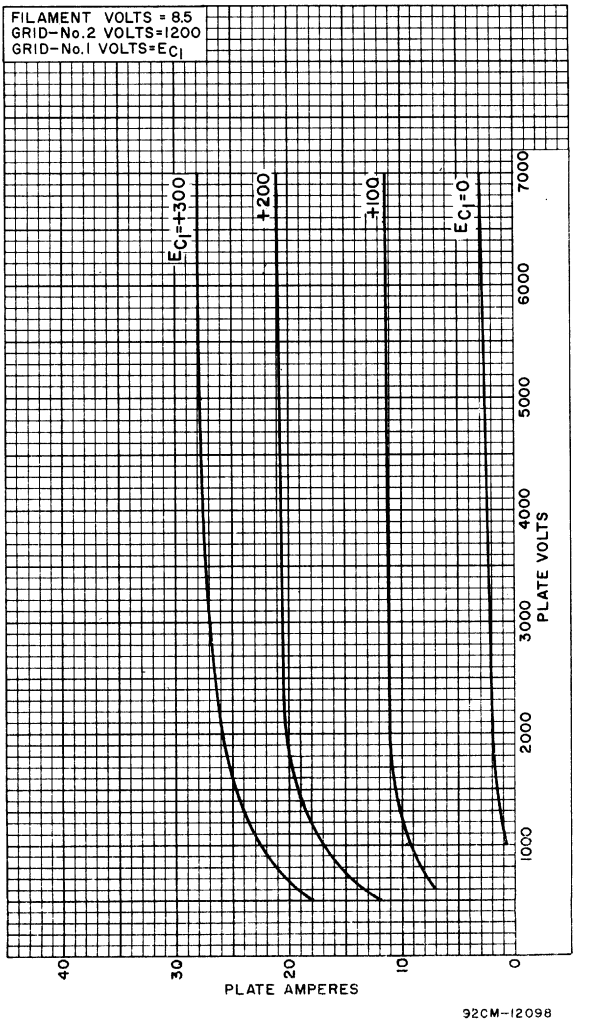
NOTE 2: FINGER STOCK No.97-139.

NOTE 3: SPECIFIED FINGER STOCK IS MADE BY INSTRUMENT SPECIALTIES CO., LITTLE FALLS, N.J.

TYPICAL COOLING REQUIREMENTS

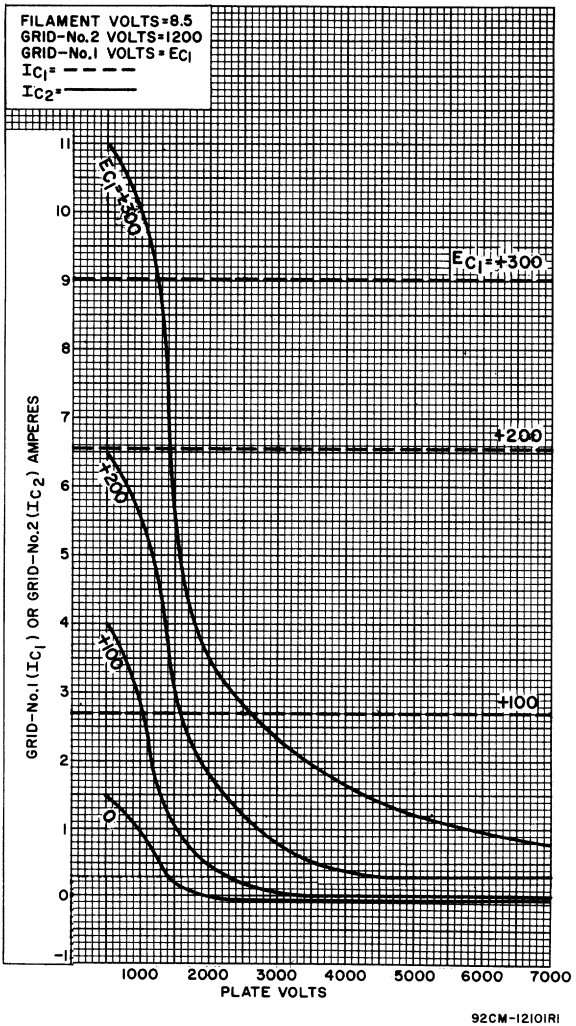


TYPICAL PLATE CHARACTERISTICS



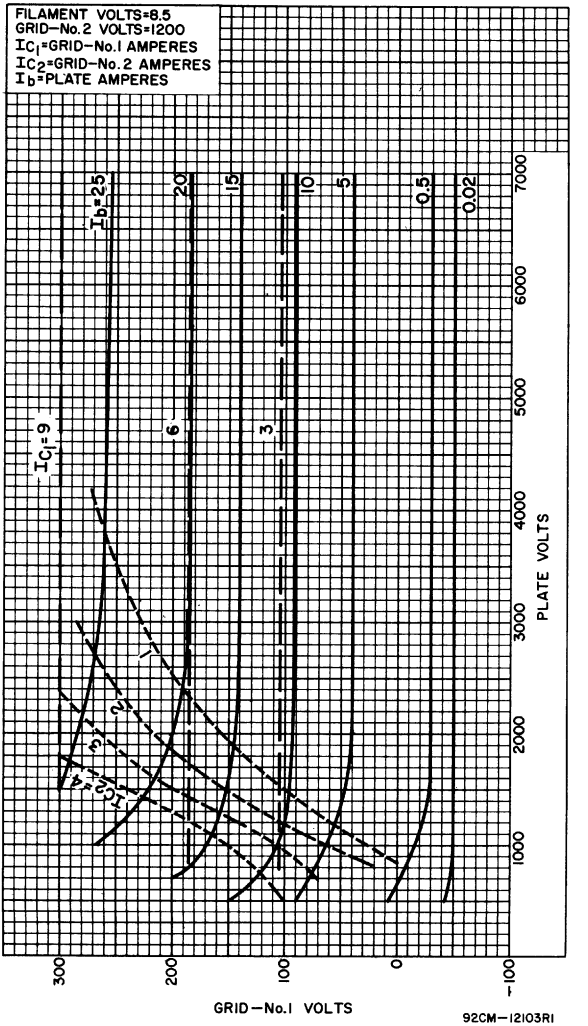
92CM-12098

TYPICAL CHARACTERISTICS



92CM-12101RI

TYPICAL CONSTANT-CURRENT CHARACTERISTICS



8441

High-Mu Triode

NUVISTOR TYPE

Heater Designed to Operate from Battery Supplies Used in Sonobuoy and Other Expendable Equipment

Electrical:

Heater Characteristics and Ratings:		
Voltage (DC). . . .Tubes will be supplied with the heater designed to operate within ±10% of any specified center heater voltage between 6.0 and 8.5 volts to meet specific battery-supply requirements in sonobuoy and other expendable equipment.		
Input.	0.85	watt
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances (Approx.):		
Grid to plate.	0.9	pf
Grid to cathode, shell, and heater	4.2	pf
Plate to cathode, shell, and heater	1.7	pf
Plate to cathode	0.22	pf
Heater to cathode.	1.3	pf

Characteristics, Class A_1 Amplifier:

Heater Voltage	Specified center value	
Plate Supply Voltage	110	volts
Grid . . . . . .Connected to negative end of cathode resistor		
Cathode Resistor	150	ohms
Amplification Factor	64	
Plate Resistance (Approx.)	6800	ohms
Transconductance	9400	μmhos
Plate Current.	7	ma
Grid Voltage (Approx.) for plate μa = 10.	-4	volts

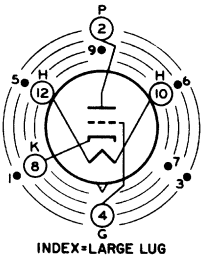
Mechanical:

Operating Position	.Any
Type of Cathode.	.Coated Unipotential
Maximum Overall Length	0.800"
Maximum Seated Length.	0.625"
Maximum Diameter	0.440"
Weight (Approx.)	1.9 grams
Envelope	.Metal Shell MT4
Socket	See *Socket & Connector Information for RCA Nuvistor Tubes* at front of this Section
Base. . . .Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)	

8441

Basing Designation for BOTTOM VIEW. 12AQ

Pin 1[a] - Do Not Use
Pin 2 - Plate
Pin 3[a] - Do Not Use
Pin 4 - Grid
Pin 5[a] - Do Not Use
Pin 6[a] - Do Not Use
Pin 7[a] - Do Not Use
Pin 8 - Cathode
Pin 9[a] - Do Not Use
Pin 10 - Heater
Pin 12 - Heater



INDEX=LARGE LUG
●=SHORT PIN; IC—DO NOT USE

AMPLIFIER — Class A

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

	Rating 1	*Rating 2*[b]	
Plate Supply Voltage.	300 max.	300 max.	volts
Plate Voltage	250 max.	250 max.	volts
Grid Voltage:			
Negative-bias value	55 max.	55 max.	volts
Positive-bias value	–	0 max.	volts
Peak-positive value	2 max.	–	volts
Cathode Current	15 max.	2.5 max.	ma
Plate Dissipation	1 max.	0.2 max.	watt

Maximum Circuit Values:

	Rating 1	*Rating 2*[b]	
Grid-Circuit Resistance:			
For fixed-bias operation	0.5[c] max.	40 max.	megohms
For cathode-bias operation	1[c] max.	40 max.	megohms

[a] Pins 1, 3, 5, 6, 7, and 9 are of a length such that their ends do not touch the socket insertion plane.

[b] For high-reliability, 20-hour-life applications.

[c] For operation at metal-shell temperature of 150° C measured in Zone "A" as shown on *Dimensional Outline*. For operation at other metal-shell temperatures, see *Grid-Circuit-Resistance Rating Chart*.

CHARACTERISTICS RANGE VALUES

	Note	*Min.*	*Max.*	
Heater Current.	1	$0.95\left[\frac{0.85}{E_f(ctr)}\right]$	$1.05\left[\frac{0.85}{E_f(ctr)}\right]$	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	0.8	1.0	pf
Grid to cathode, shell, and heater .	2	3.4	5.0	pf

	Note	Min.	Max.	
Plate to cathode, shell, and heater.	2	1.3	2.1	pf
Plate to cathode	2	0.16	0.28	pf
Heater to cathode.	2	1.0	1.6	pf
Plate Current (1).	1,3	5.5	8.8	ma
Plate Current (2).	1,4	–	50	μa
Transconductance (1)	1,3	7900	10900	μmhos
Transconductance (2)	3,5	6700	–	μmhos
Reverse Grid Current	1,6	–	0.05	μa
Amplification Factor	1,3	54	74	
Heater–Cathode				
Leakage Current:				
Heater negative with respect to cathode	1,7	–	5	μa
Heater positive with respect to cathode	1,7	–	5	μa
Leakage Resistance:				
Between grid and all other electrodes tied together.	1,8	5000	–	megohms
Between plate and all other electrodes tied together.	1,9	10000	–	megohms

Note 1: With dc heater volts = specified center value, E_f(ctr).

Note 2: Measured in accordance with EIA Standard RS-191-A.

Note 3: With dc plate supply volts = 110, grid and metal shell connected to negative end of cathode resistor, cathode resistor (ohms) = 150, and cathode-bypass capacitor (μf) = 1000.

Note 4: With dc plate volts = 110, dc grid volts = -5, and metal shell connected to ground.

Note 5: With dc heater volts = 0.9 specified center value.

Note 6: With dc plate supply volts = 150, dc grid supply volts = -1.7, grid-circuit resistance (megohms) $\leq$ 1 (the internal resistance of the current meter used for this measurement), and metal shell connected to ground.

Note 7: With dc heater–cathode volts = 100.

Note 8: With grid 100 volts negative with respect to all other electrodes tied together.

Note 9: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL TESTS

Short-Duration Shock (1):

Peak Impact Acceleration	1000	g

This test is performed on a sample lot of tubes to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of four different positions (X_1, X_2, Y_1, and Y_2) in a Navy-Type High-Impact (Flyweight) Shock Machine and, with tube-electrode voltages applied, are subjected to 20 blows (5 in each position) at the specified Peak Impact Acceleration.

At the end of this test, tubes are criticized for continuity and Shorts, Transconductance (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Long-Duration Shock (2):

Peak Impact Acceleration . . . . . 50 g

This test is performed, using a half-sine-wave, 11-millisecond, mechanical shock pulse, on a sample lot of tubes from each production run to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of two positions in three mutually perpendicular axes on a free-fall table. The longitudinal axis of the tube is coincident with one of the three axes. The table is dropped a total of 18 times to a horizontal surface from a height sufficient to produce the specified Peak Impact Acceleration. The material of the horizontal surface is such that the duration of the half-sine-wave shock pulse is 11 milliseconds. No tube-electrode voltages are applied during this test.

At the end of this test, tubes are criticized for Continuity and Shorts, Transconductance (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Sweep-Frequency Fatigue Vibration:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand the Sweep-Frequency Fatigue Vibration specified below. Tubes are held rigid and operated with dc heater-cathode volts = 100. During operation, the tube is vibrated through the frequency range from 5 to 500 cps and back to 5 cps. One such vibration sweep cycle takes approximately 15 minutes. This cycle is repeated for a period of 3 hours along each of three mutually perpendicular axes for a total of 9 hours. The longitudinal axis of the tube is coincident with one of the three axes. The vibrations are applied as follows:

a. The vibration from 5 to 50 cps is applied with a constant peak amplitude of 0.040 inch (0.080 inch peak-to-peak).
b. The vibration from 50 to 500 cps is applied with a constant acceleration of 10 g.
c. The vibration from 500 to 50 cps and then to 5 cps follows the same procedure, but in reverse.

At the end of this test, tubes are criticized for Continuity and Shorts, Transconductance (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Low-Pressure Voltage Breakdown:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand high-altitude (low-air-pressure) conditions. Tubes are operated with 250 volts rms (60-cycle, ac) applied between plate and all other electrodes and metal shell connected together. Tubes must not break down or show evidence of corona when subjected to an air pressure (8.0 ± 0.5 mm Hg) corresponding to an altitude of 100,000 feet.

Continuity and Shorts:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type

Shorts Test described in MIL-E-ID, Amendment 5, Paragraph 4. 7.7, except that tapping is done by hand with a soft rubber tapper (Specifications for this tapper will be supplied upon request). The areas of acceptance and rejection for this test are shown in the accompanying *Shorts-Test Acceptance-Limits* graph. In this test, tubes are criticized for permanent or temporary shorts and open circuits.

Reliability Life (20 Hours):

This test is performed on a sample size (minimum of 80 tubes/lot for a 5-lot sampling plan or a minimum of 400 tubes for a single-lot sampling plan) designed to assure a process average AFR (Acceptable Failure Rate) of 0.5 per cent for Inoperatives and 2.1 per cent for Total Defectives and a process average RFR (Rejectable Failure Rate) of 2.0 per cent for Inoperatives and 4.7 per cent for Total Defectives.

During this test, tubes are operated at maximum rated plate dissipation (*Rating 2*—0.2 watt).

At the end of this test, tubes are criticized for Change in Transconductance (1), Inoperatives, and Total Defectives. A tube is considered Inoperative if it has a discontinuity, permanent short, or air leak.

Heater-Cycling Life (100 Hours):

Intermittent Operation . . . . . 2000 cycles

This test is performed on a sample lot of tubes from each production run with heater volts = 1.35x specified center value cycled 1 minute ON and 2 minutes OFF, dc heater-cathode volts = -100, all other tube electrodes and metal shell connected to ground.

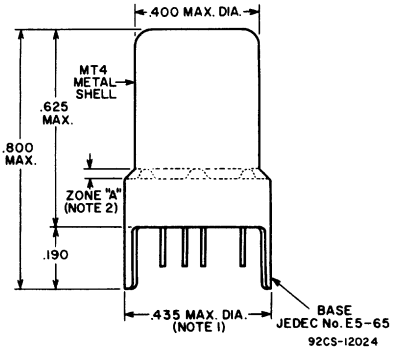
At the end of this test, tubes are criticized for Heater-Cathode Leakage Current, Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

Intermittent Life (100 Hours):

This test is performed on a sample lot of tubes from each production run.

During this test, tubes are operated at maximum rated plate dissipation (*Rating 1*—1 watt).

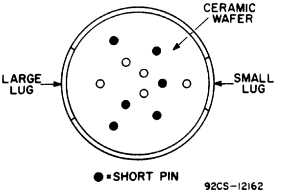
At the end of this test, tubes are criticized for Transconductance (1), Reverse Grid Current, Inoperatives, and Total Defectives. A tube is considered Inoperative if it has a discontinuity, permanent short, or air leak.



DIMENSIONS IN INCHES

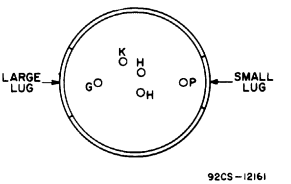
BOTTOM VIEW

Showing Arrangement of All 11 Base Pins



MODIFIED BOTTOM VIEW

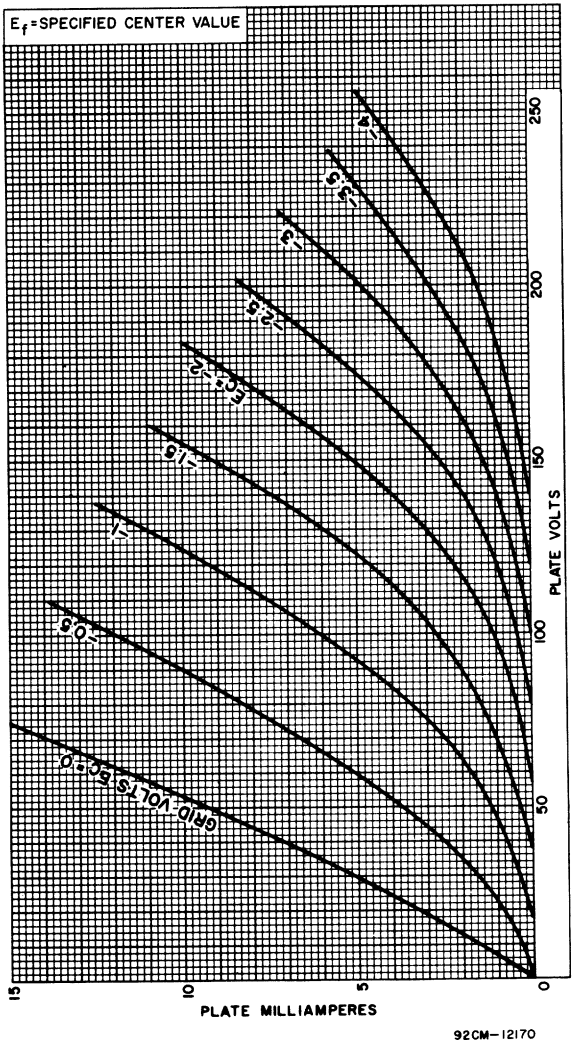
With Element Connections Indicated
and Short Pins Not Shown



NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

NOTE 2: METAL-SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A".

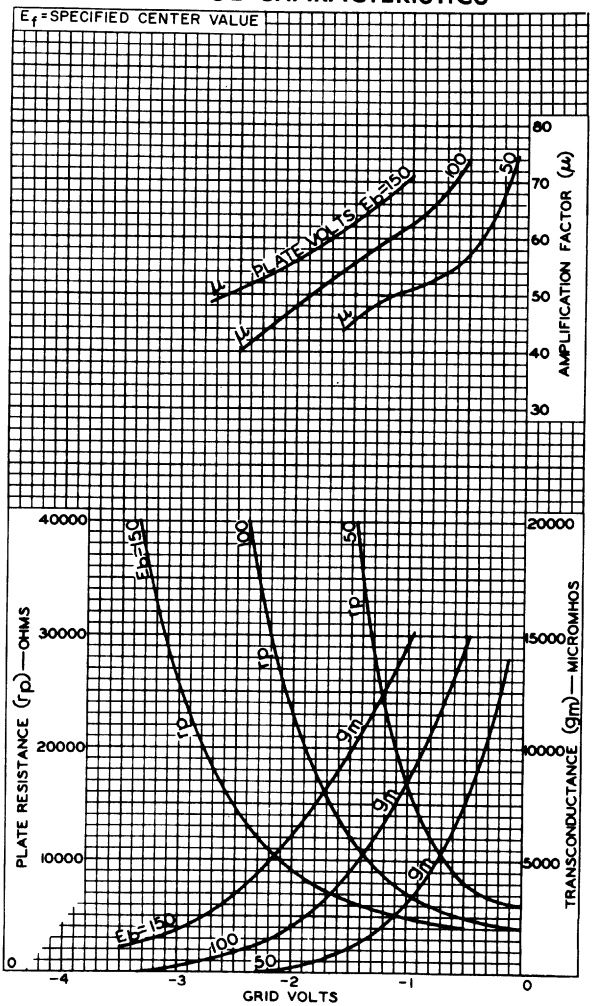
AVERAGE PLATE CHARACTERISTICS



92CM-12170

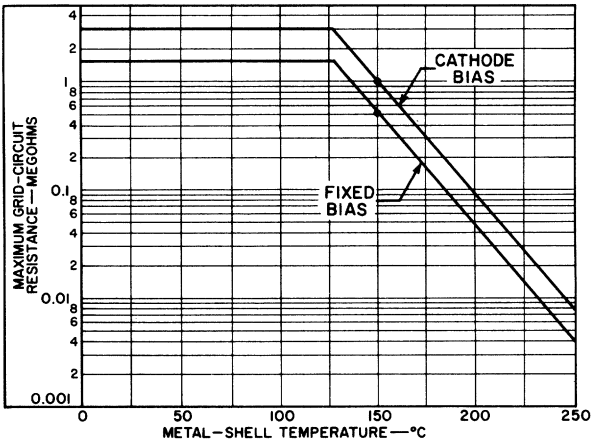
8441

AVERAGE CHARACTERISTICS



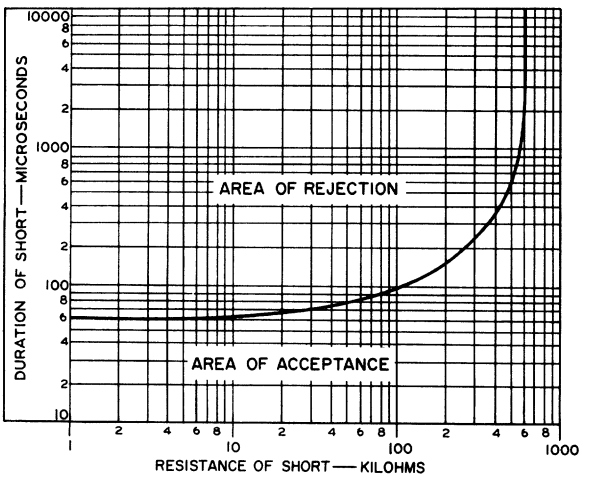
92CM-12168

GRID-CIRCUIT-RESISTANCE RATING CHART
Class A Amplifier—Rating 1



92CS-12023

SHORTS TEST ACCEPTANCE LIMITS



92CS-10465RI

8456

Medium-Mu Triode

NUVISTOR TYPE

Heater Designed to Operate from Battery Supplies Used in Sonobuoy and Other Expendable Equipment

Electrical:

Heater Characteristics and Ratings:		
Voltage (DC). . . . .Tubes will be supplied with the heater designed to operate within ± 10% of any specified center heater voltage between 6.0 and 8.5 volts to meet specific battery-supply requirements in sonobuoy and other expendable equipment.		
Input	0.85	watt
Peak heater-cathode voltage:		
Heater negative with respect to cathode.	100 max.	volts
Heater positive with respect to cathode.	100 max.	volts
Direct Interelectrode Capacitances (Approx.):		
Grid to plate	2.1	pf
Grid to cathode, shell, and heater. . .	4.0	pf
Plate to cathode, shell, and heater . .	1.7	pf
Plate to cathode.	0.34	pf
Heater to cathode	1.4	pf

Characteristics, Class A_1 Amplifier:

Heater Voltage.	Specified center value	
Plate Supply Voltage.	24	volts
Grid.	Connected to negative end of cathode resistor	
Cathode Resistor.	100	ohms
Amplification Factor.	11.5	
Plate Resistance (Approx.).	1530	ohms
Transconductance.	7500	μmhos
Plate Current	8.7	ma
Grid Voltage (Approx.) for plate μa = 50	-5	volts

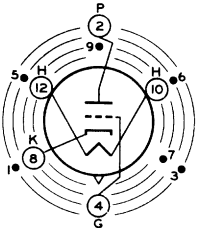
Mechanical:

Operating Position.	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length.	0.800"
Maximum Seated Length	0.625"
Maximum Diameter.	0.440"
Weight (Approx.).	1.9 grams
Envelope.	Metal Shell MT4
Socket.	See *Socket & Connector Information for RCA Nuvistor Tubes* at front of this Section
Base. . .	Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)

8456

Basing Designation for BOTTOM VIEW 12AQ

Pin 1[a] – Do Not Use
Pin 2 – Plate
Pin 3[a] – Do Not Use
Pin 4 – Grid
Pin 5[a] – Do Not Use
Pin 6[a] – Do Not Use
Pin 7[a] – Do Not Use
Pin 8 – Cathode
Pin 9[a] – Do Not Use
Pin 10 – Heater
Pin 12 – Heater



INDEX=LARGE LUG
●=SHORT PIN; IC—DO NOT USE

AMPLIFIER — Class A

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

Plate Voltage	50 max.	volts
Grid Voltage:		
Negative-bias value	55 max.	volts
Peak-positive value	2 max.	volts
Grid Current	2 max.	ma
Cathode Current	15 max.	ma
Plate Dissipation	0.45 max.	watt

Typical Operation:

Heater Voltage	Specified center value		
Plate Supply Voltage	12	24	volts
Grid Voltage	–	-0.7	volt
Grid Resistor	33000	–	ohms
Amplification Factor	12	12	
Plate Resistance (Approx.)	1500	1500	ohms
Transconductance	8000	8000	μmhos
Plate Current	5.5	9.5	ma

Maximum Circuit Values:

Grid-Circuit Resistance:[b]		
For fixed-bias operation	10 max.	megohms
For cathode-bias operation	10 max.	megohms

[a] Pins 1, 3, 5, 6, 7, and 9 are of a length such that their ends do not touch the socket insertion plane.

[b] For operation at metal-shell temperatures up to 150° C, measured in Zone "A" as shown on *Dimensional Outline*. For operation at metal-shell temperatures above 150° C, see accompanying *Grid-Circuit-Resistance Rating Chart*.

CHARACTERISTICS RANGE VALUES

	Note	Min.	Max.	
Heater Current . . .	1	$0.95\left[\frac{0.85}{E_f(ctr)}\right]$	$1.05\left[\frac{0.85}{E_f(ctr)}\right]$	amp
Direct Interelectrode Capacitances:				
Grid to plate. . .	2	1.8	2.4	pf
Grid to cathode, shell, and heater	2	3.4	4.6	pf
Plate to cathode, shell, and heater	2	1.4	2.0	pf
Plate to cathode .	2	0.26	0.42	pf
Heater to cathode.	2	1.1	1.7	pf
Plate Current (1). .	1,3	6.7	10.7	ma
Plate Current (2). .	1,4	-	50	μa
Transconductance (1)	1,3	6500	8500	μmhos
Transconductance (2)	3,5	5700	-	μmhos
Reverse Grid Current	1,6	-	0.05	μa
Amplification Factor	1,3	9	14	
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode.	1,7	-	5	μa
Heater positive with respect to cathode.	1,7	-	5	μa
Leakage Resistance:				
Between grid and all other electrodes tied together	1,8	5000	-	megohms
Between plate and all other electrodes tied together	1,9	10000	-	megohms

Note 1: With dc heater volts = specified center value, $E_f(ctr)$.

Note 2: Measured in accordance with EIA Standard RS-191-A.

Note 3: With dc plate supply volts = 24, grid and metal shell connected to negative end of cathode resistor, cathode resistor (ohms) = 100, and cathode-bypass capacitor (μf) = 1000.

Note 4: With dc plate volts = 24, dc grid volts = -10, and metal shell connected to ground.

Note 5: With dc heater volts = 0.9 specified center value.

Note 6: With dc plate supply volts = 40, dc grid supply volts = -2, grid circuit resistance (megohms) ≦ 1 (the internal resistance of the current meter used for this measurement), and metal shell connected to ground.

Note 7: With dc heater-cathode volts = 100.

Note 8: With grid 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

Note 9: With plate 300 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

SPECIAL TESTS

Short-Duration Shock (1):

Peak Impact Acceleration. . . . . 1000 g

This test is performed on a sample lot of tubes to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of four different positions (X_1, X_2, Y_1, and Y_2) in a Navy-Type High-Impact (Flyweight) Shock Machine and, with tube-electrode voltages applied, are subjected to 20 blows (5 in each position) at the specified Peak Impact Acceleration.

At the end of this test, tubes are criticized for Continuity and Shorts, Transconductance (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Long-Duration Shock (2):

Peak Impact Acceleration. . . . . 50 g

This test is performed, using a half-sine-wave, 11-millisecond, mechanical shock pulse, on a sample lot of tubes from each production run to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of two positions in three mutually perpendicular axes on a free-fall table. The longitudinal axis of the tube is coincident with one of the three axes. The table is dropped a total of 18 times to a horizontal surface from a height sufficient to produce the specified Peak Impact Acceleration. The material of the horizontal surface is such that the duration of the half-sine-wave shock pulse is 11-milliseconds. No tube-electrode voltages are applied during this test.

At the end of this test, tubes are criticized for Continuity and Shorts, Transconductance (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Sweep-Frequency Fatigue Vibration:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand the Sweep-Frequency Fatigue Vibration specified below. Tubes are held rigid and operated with dc heater-cathode volts = 100. During operation, the tube is vibrated through the frequency range from 5 to 500 cps and back to 5 cps. One such vibration sweep cycle takes approximately 15 minutes. This cycle is repeated for a period of 3 hours along each of three mutually perpendicular axes for a total of 9 hours. The longtudinal axis of the tube is coincident with one of the three axes. The vibrations are applied as follows:

a. The vibration from 5 to 50 cps is applied with a constant peak amplitude of 0.040 inch (0.080 inch peak-to-peak).

b. The vibration from 50 to 500 cps is applied with a constant acceleration of 10 g.

c. The vibration from 500 to 50 cps and then to 5 cps follows the same procedure, but in reverse.

At the end of this test, tubes are criticized for Continuity

and Shorts, Transconductance (I), Reverse Grid Current, and Heater-Cathode Leakage Current.

Low-Pressure Voltage Breakdown:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand high-altitude (low-air-pressure) conditions. Tubes are operated with 250 volts rms (60-cycle, ac) applied between plate and all other electrodes and metal shell connected together. Tubes must not break down or show evidence of corona when subjected to an air pressure (8.0 ± 0.5 mm Hg) corresponding to an altitude of 100,000 feet.

Continuity and Shorts:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-1D, Amendment 5, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper (Specifications for this tapper will be supplied upon request). The areas of acceptance and rejection for this test are shown in the accompanying *Shorts-Test Acceptance-Limits* graph. In this test, tubes are criticized for permanent or temporary shorts and open circuits.

Reliability Life (20 Hours):

This test is performed on a sample size (minimum of 80 tubes/lot for a 5-lot sampling plan or a minimum of 400 tubes for a single-lot sampling plan) designed to assure a process average AFR (Acceptable Failure Rate) of 0.5 per cent for Inoperatives and 2.1 per cent for Total Defectives and a process average RFR (Rejectable Failure Rate) of 2.0 per cent for Inoperatives and 4.7 per cent for Total Defectives.

During this test, tubes are operated at maximum-rated plate dissipation.

At the end of this test, tubes are criticized for Change in Transconductance (I), Inoperatives, and Total Defectives. A tube is considered Inoperative if it has a discontinuity, permanent short, or air leak.

Heater-Cycling Life (100 Hours)

Intermittent Operation . . . . . 2000 cycles

This test is performed on a sample lot of tubes from each production run with heater volts = 1.35x specified center value cycled 1 minute ON and 2 minutes OFF, dc heater-cathode volts = -100, all other tube electrodes and metal shell connected to ground.

At the end of this test, tubes are criticized for Heater-Cathode Leakage Current, Open Heaters, Open Cathode Circuits and Heater-Cathode Shorts.

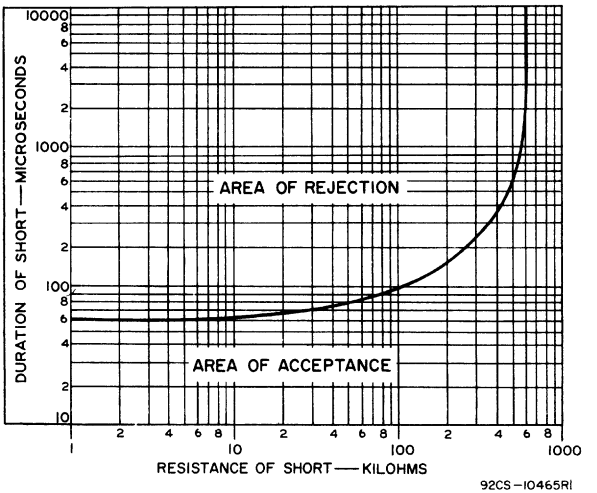
Intermittent Life (100 Hours):

This test is performed on a sample lot of tubes from each production run.

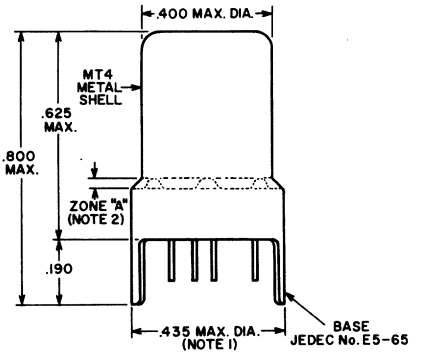
During this test, tubes are operated at maximum-rated plate dissipation.

At the end of this test, tubes are criticized for Transconductance (1), Reverse Grid Current, Inoperatives, and Total Defectives. A tube is considered Inoperative if it has a discontinuity, permanent short, or air leak.

SHORTS-TEST ACCEPTANCE LIMITS

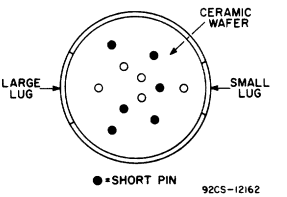


92CS-10465RI

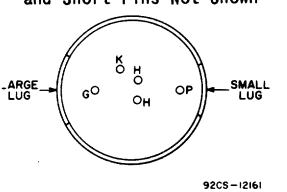


Dimensions in Inches

BOTTOM VIEW
Showing Arrangement of All 11 Base Pins



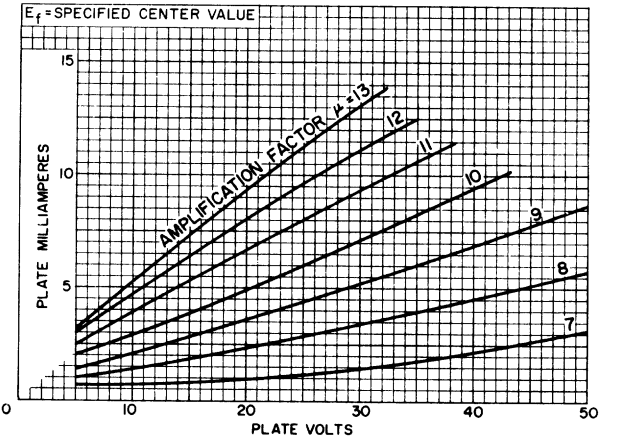
MODIFIED BOTTOM VIEW
With Element Connections Indicated
and Short Pins Not Shown



NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

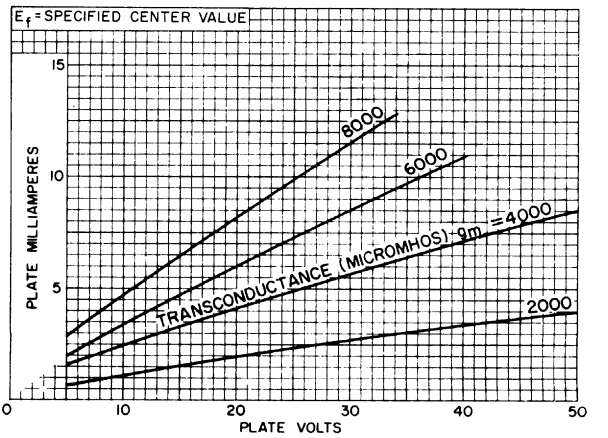
NOTE 2: METAL-SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A".

AVERAGE PLATE CHARACTERISTICS
With Amplification Factor as Variable



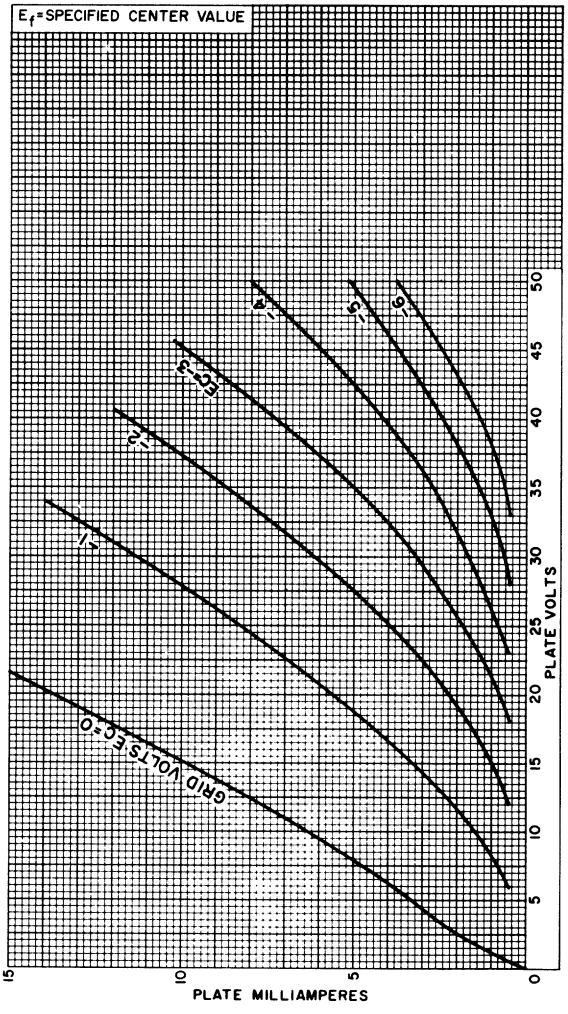
92CS-12165

AVERAGE PLATE CHARACTERISTICS
With Transconductance as Variable

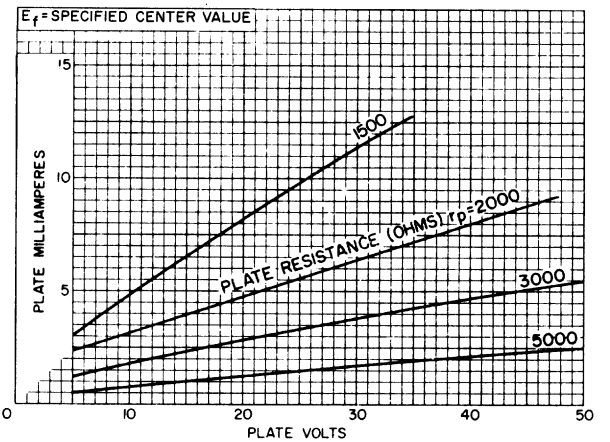


92CS-12166

AVERAGE PLATE CHARACTERISTICS

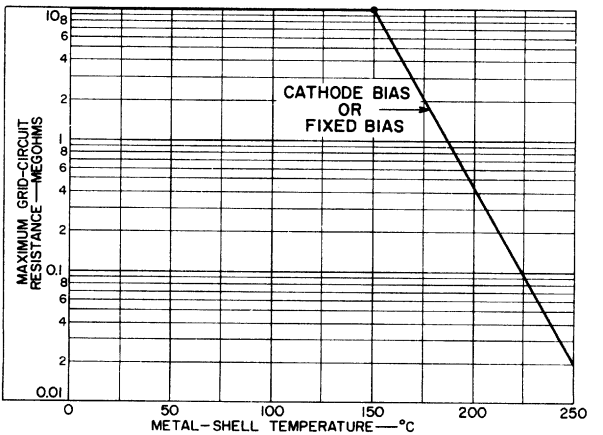


AVERAGE PLATE CHARACTERISTICS
With Plate Resistance as Variable



92CS-12164

GRID-CIRCUIT-RESISTANCE RATING CHART



92CS-11479RI

8462

Beam Power Tube

LESS THAN 1-SECOND WARM-UP
FOR USE IN LOW-VOLTAGE MOBILE EQUIPMENT UP TO 500 Mc

COAXIAL-ELECTRODE STRUCTURE
CERAMIC-METAL SEALS
CONDUCTION COOLED

For Use as an RF Power Amplifier, Oscillator, Regulator, Distributed Amplifier, or Linear RF Power Amplifier in Mobile or Stationary Equipment

Electrical:

Filamentary Cathode, Woven-Wire-Mesh Type, Oxide-Coated:		
Voltage (AC or DC)	2.9	volts
Current at 2.9 volts	4.6	amp
Minimum heating time	less than 1[a]	sec
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 250, grid-No.2 volts = 200, and plate amperes = 1.2	11	
Direct Interelectrode Capacitances:[b]		
Grid No.1 to plate	0.13 max.	pf
Grid No.1 to cathode	16	pf
Plate to cathode	0.03 max.	pf
Grid No.1 to grid No.2	22	pf
Grid No.2 to plate	7	pf
Grid No.2 to cathode	3	pf

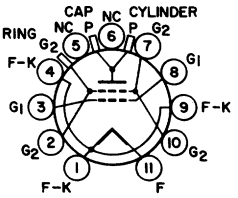
Mechanical:

Operating Position	Any
Maximum Overall Length	2.26"
Seated Length	1.920" ± 0.065"
Diameter	1.426" ± 0.010"
Weight (Approx.)	2 oz
Socket	E. F. Johnson Co.[c] No.124-311-100, Mycalex[d] No.CP464-2, or equivalent
Grid-No.2 Bypass Capacitor	E. F. Johnson Co.[c] No.124-113-1, or equivalent
Base	Large-Wafer Elevenar 11-Pin with Ring (JEDEC No.E11-81)

Terminal Connections *(See Dimensional Outline)*:

BOTTOM VIEW

Pin 1 - Filament-Cathode
Pin 2 - Grid No.2
Pin 3 - Grid No.1
Pin 4 - Same as Pin 1
Pin 5 - No Internal Connection
Pin 6 - No Internal Connection
Pin 7 - Grid No.2
Pin 8 - Grid No.1
Pin 9 - Same as Pin 1
Pin 10 - Grid No.2
Pin 11 - Filament
Cap - Plate-Terminal Connection
Cylinder - Plate-Terminal Contact Surface
Ring[e] - Grid No.2 Terminal Contact Surface



Thermal:

Terminal Temperature (All Terminals)	250 max.	°C
Plate Core Temperature (See *Dimensional Outline*)	250 max.	°C

Cooling, Conduction:

The plate terminal must be thermally coupled to a constant temperature device (heat sink—solid or liquid) to limit the plate terminal temperature to the specified maximum value of 250° C. The grid-No.2, grid-No.1, and filament terminals may also require coupling to the heat sink to limit their respective terminal temperature to the specified maximum value of 250° C.

LINEAR RF POWER AMPLIFIER
Single-Sideband Suppressed-Carrier Service

Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2

Maximum CCS Ratings, *Absolute-Maximum Values:*

	Up to 500 Mc	
DC Plate Voltage	2200 max.	volts
DC Grid-No.2 Voltage	400 max.	volts
DC Grid-No.1 Voltage	−100 max.	volts
DC Plate Current at Peak of Envelope	450[f] max.	ma
DC Grid-No.1 Current	100 max.	ma
Plate Dissipation	100[g] max.	watts
Grid No.2 Input	8 max.	watts

Typical CCS Operation with "Two-Tone Modulation":

	At 30 Mc	
DC Plate Voltage	700	volts
DC Grid-No.2 Voltage[h]	250	volts
DC Grid-No.1 Voltage[h]	−20	volts
Zero-Signal DC Plate Current	100	ma
Effective RF Load Resistance	1420	ohms
DC Plate Current at Peak of Envelope	205	ma
Average DC Plate Current	150	ma
DC Grid-No.2 Current at Peak of Envelope	16	ma
Average DC Grid-No.2 Current	10	ma
Average DC Grid-No.1 Current	1.0[j]	ma
Peak-Envelope Driver Power Output (Approx.)[k]	0.3	watt
Output-Circuit Efficiency (Approx.)	95	%
Distortion Products Level:[m]		
Third order	30	db
Fifth order	35	db
Useful Power Output (Approx.):		
Average	40[n]	watts
Peak envelope	80[n]	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance		
Under Any Condition:		
With fixed bias	25000 max.	ohms
With fixed bias (In Class AB_1 operation)	100000 max.	ohms
With cathode bias	Not recommended	
Grid-No.2 Circuit Impedance	10000	ohms
Plate Circuit Impedance	[p]	

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS Ratings, *Absolute-Maximum Values:*

	Up to 500 Mc	
DC Plate Voltage	2200 max.	volts
DC Grid-No.2 Voltage	400 max.	volts
DC Grid-No.1 Voltage	-100 max.	volts
DC Plate Current	300 max.	ma
DC Grid-No.1 Current	100 max.	ma
Grid-No.2 Input	8 max.	watts
Plate Dissipation	100[g] max.	watts

Typical CCS Operation:

In Grid-Drive Circuit at 50 Mc

DC Plate Voltage	500	700	volts
DC Grid-No.2 Voltage	160	175	volts
DC Grid-No.1 Voltage	-10	-10	volts
DC Plate Current	300	300	ma
DC Grid-No.2 Current	25	25	ma
DC Grid-No.1 Current	50	50	ma
Driver Power Output (Approx.)[q]	1.2	1.2	watts
Useful Power Output	85[n]	110[n]	watts

In Grid-Drive Circuit at 175 Mc

DC Plate Voltage	500	700	volts
DC Grid-No.2 Voltage	200	200	volts
DC Grid-No.1 Voltage	-30	-30	volts
DC Plate Current	300	300	ma
DC Grid-No.2 Current	30	20	ma
DC Grid-No.1 Current	40	40	ma
Driver Power Output (Approx.)[q]	3	3	watts
Useful Power Output	70[n]	105[n]	watts

In Grid-Drive Circuit at 470 Mc

DC Plate Voltage	700	volts
DC Grid-No.2 Voltage	200	volts
DC Grid-No.1 Voltage	-30	volts
DC Plate Current	300	ma
DC Grid-No.2 Current	10	ma
DC Grid-No.1 Current	20	ma

In Grid-Drive Circuit at 470 Mc

Driver Power Output (Approx.)[q]	5	watts
Useful Power Output	85[n]	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance Under Any Condition: With fixed bias	25000 max.	ohms
Grid-No.2 Circuit Impedance	10000 max.	ohms
Plate Circuit Impedance	[p]	

[a] The heating time required for adequate cathode emission is a function of the filament voltage and the impedance of the filament-voltage supply. It may be drastically reduced by employing a suitably designed overvoltage control circuit.

[b] Measured with special shield adapter.

[c] E.F.Johnson Co., 1921 10th Ave. S.W., Waseka, Minnesota.

[d] Mycalex Corp. of America, 125 Clifton Blvd. Clifton, N.J.

[e] For use at higher frequencies.

[f] The maximum rating for a signal having a minimum peak-to-average power ratio less than 2, such as is obtained in "Single-Tone" operation, is 300 ma. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 450 ma.

[g] Maximum plate dissipation is limited by the maximum plate core temperature and the cooling system to maintain tube operation below the specified maximum plate core temperature. With simple low-cost cooling techniques, maximum plate dissipation may be only about 100 watts; with more sophisticated cooling techniques, maximum plate dissipation may be as high as 300 watts.

[h] Obtained preferably from a separate well-regulated source.

[j] This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid-No.1 is driven to zero volts at maximum signal.

[k] Driver power output represents circuit losses and is the actual power measured at input to grid-No.1 circuit. The actual power required depends on the operating frequency and the circuit used. The tube driving power is approximately zero watts.

[m] Referenced to either of the two tones, and without the use of feedback to enhance linearity.

[n] This value of useful power is measured at load of output circuit.

[p] The tube should see an effective plate supply impedance which limits the peak-current through the tube under surge conditions to 15 amperes.

[q] Driver power output includes circuit losses and is the actual power measured at the input to the grid circuit. It will vary depending upon the frequency of operation and the circuit used.

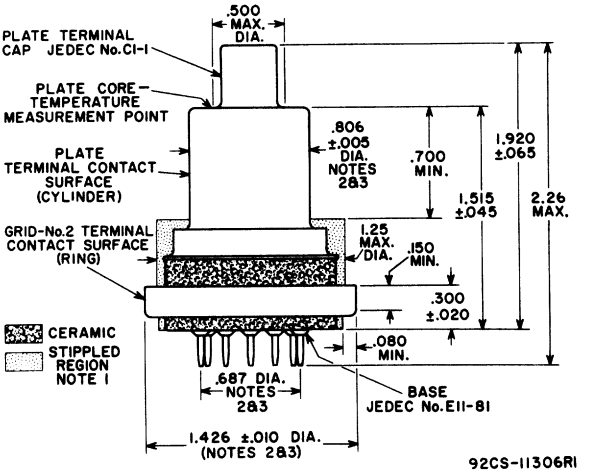
CHARACTERISTICS RANGE VALUES

	Note	*Min.*	*Max.*	
1. Filament Current	1	3.6	5.6	amp
2. Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	–	0.13	pf
Grid No.1 to cathode	2	14	18.5	pf
Plate to cathode	2	–	0.03	pf
Grid No.1 to grid No.2	2	18	24	pf
Grid No.2 to plate	2	5.7	8.0	pf
Grid No.2 to cathode	2	2.0	4.0	pf
3. Grid-No.1 Voltage	1,3	-6	-24	volts
4. Grid-No.2 Current	1,3	-7	+8	ma

Note 1: With 2.9 volts (AC or DC) on filament.

Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage of 700 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 185 ma.



92CS-11306R1

DIMENSIONS IN INCHES

Note 1: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

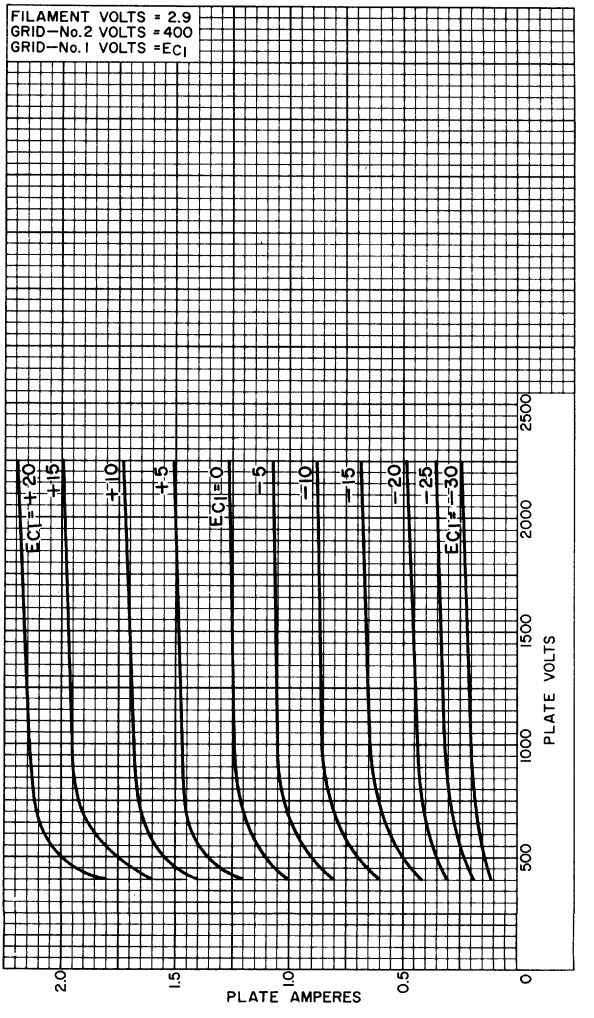
Note 2: The diameters of the plate terminal contact surface, grid-No.2 terminal contact surface, and pin circle to be concentric within the following values of maximum full indicator reading:

Plate terminal contact surface
to grid-No.2 terminal contact surface. . . . . 0.030"
Plate terminal contact surface
to pin circle. . . . . 0.040"
Grid-No.2 terminal contact surface
to pin circle. . . . . 0.030"

Note 3: The full indicator reading is the maximum deviation in radial position of a surface when the tube is completely rotated about the center of the reference surface. It is a measure of the total effect of run-out and ellipticity.

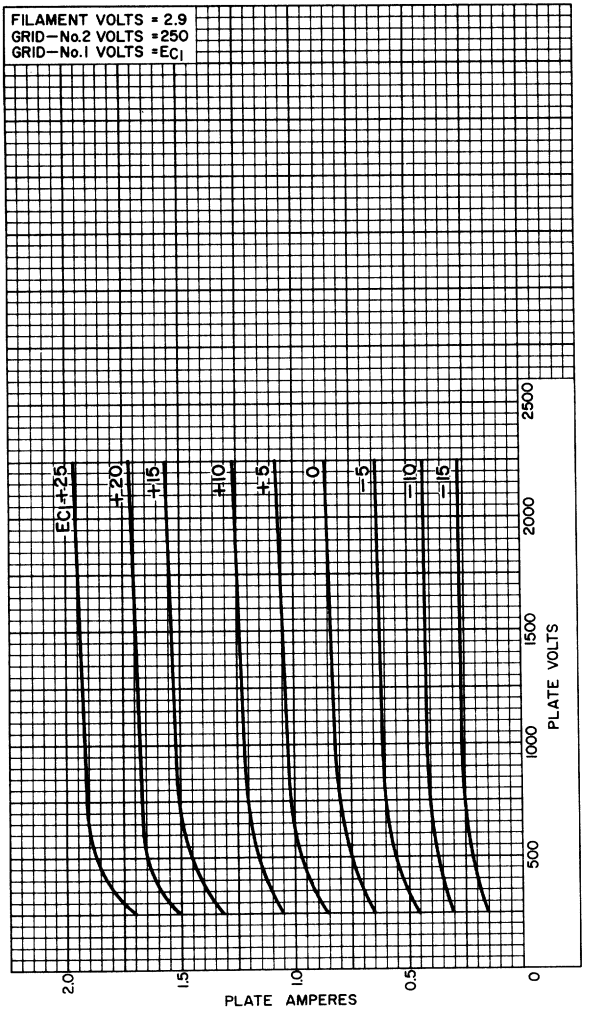
8462

TYPICAL PLATE CHARACTERISTICS
At a Constant Grid-No.2 Voltage of 400 Volts



92CM—12225

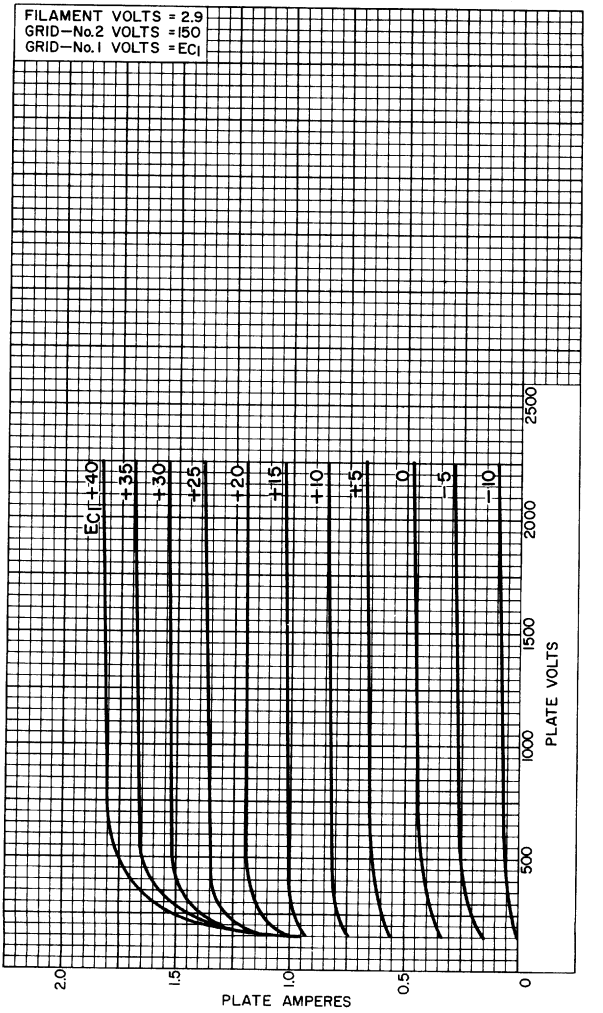
TYPICAL PLATE CHARACTERISTICS
At a Constant Grid-No.2 Voltage of 250 Volts



92CM-12228

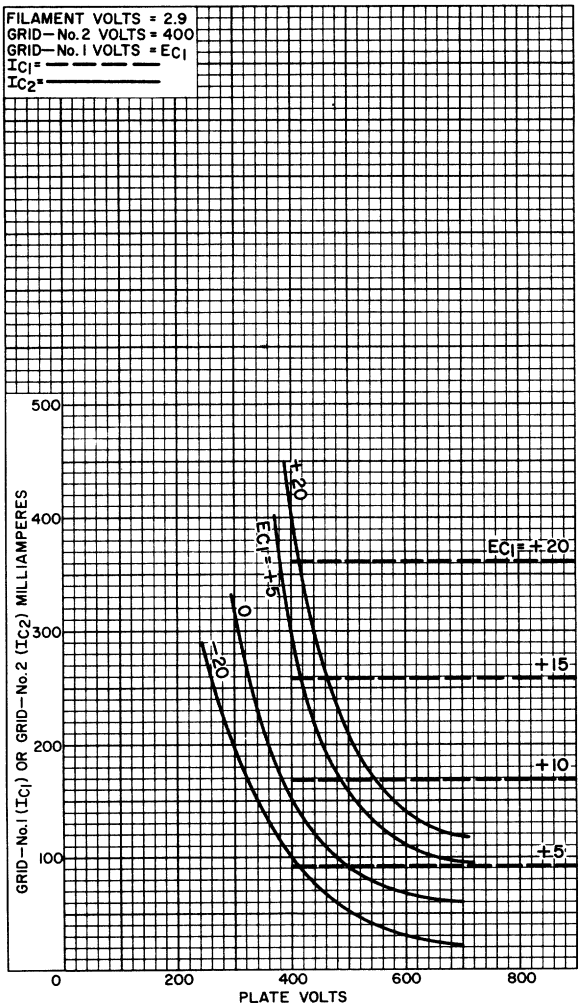
8462

TYPICAL PLATE CHARACTERISTICS
At a Constant Grid-No.2 Voltage of 150 Volts



92CM—12234

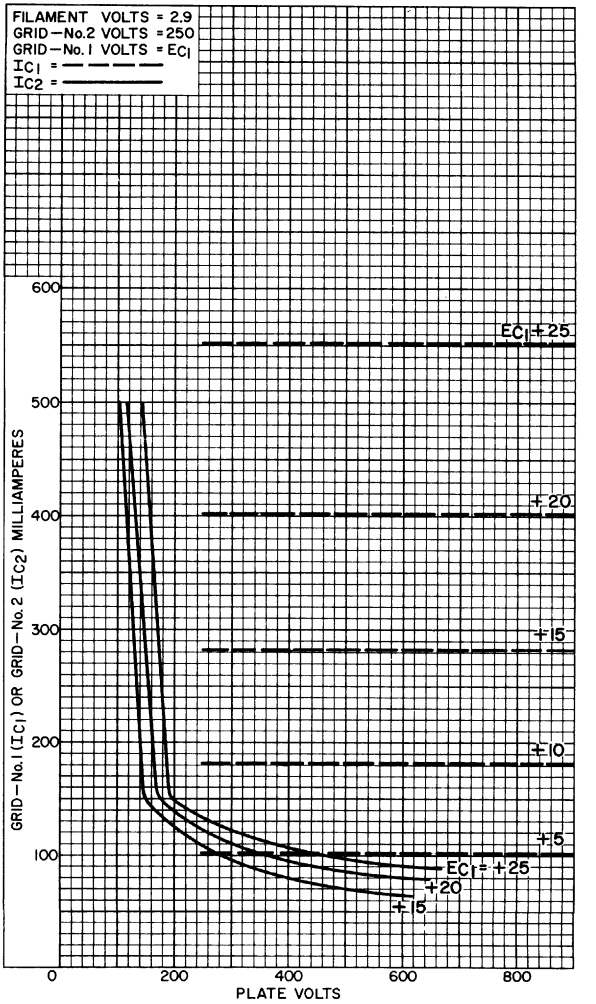
TYPICAL CHARACTERISTICS
At a Constant Grid-No.2 Voltage of 400 Volts



92CM—12226

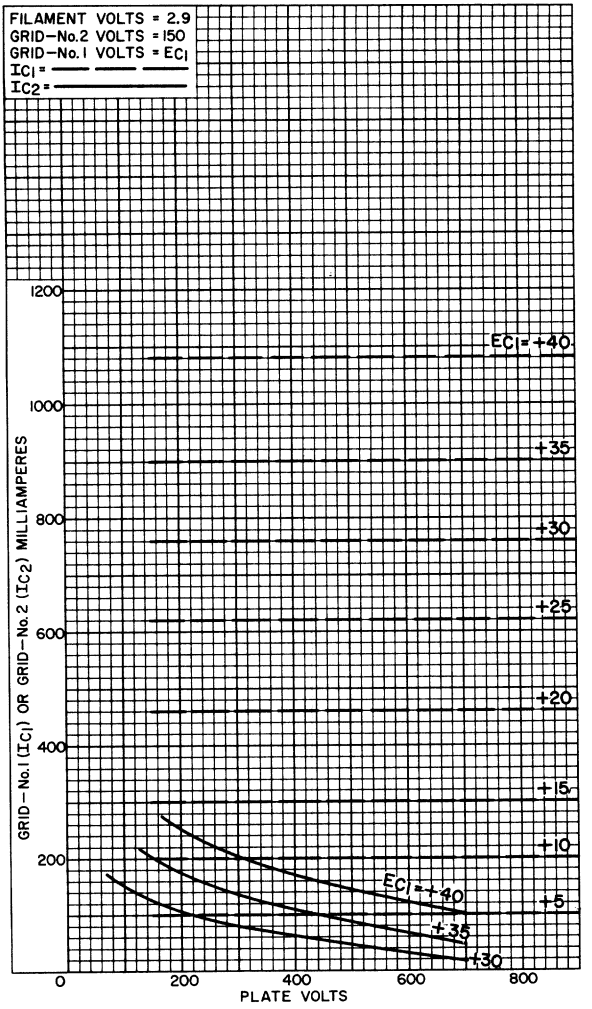
8462

TYPICAL CHARACTERISTICS
At a Constant Grid-No.2 Voltage of 250 Volts



92CM—12229

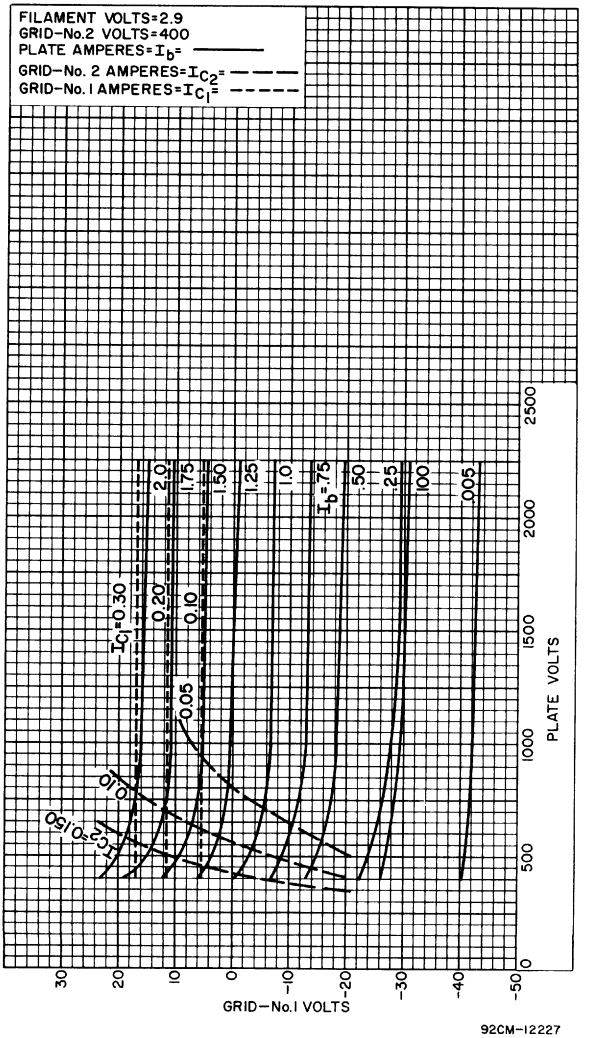
TYPICAL CHARACTERISTICS
At a Constant Grid-No.2 Voltage of 150 Volts



92CM-12241

8462

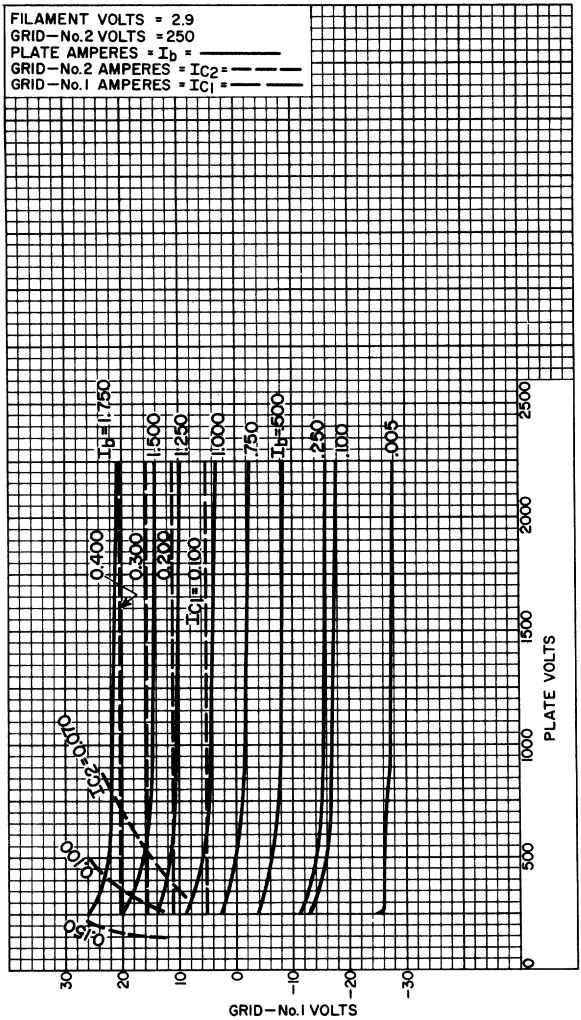
TYPICAL CONSTANT-CURRENT CHARACTERISTICS
At a Constant Grid-No.2 Voltage of 400 Volts



92CM-12227

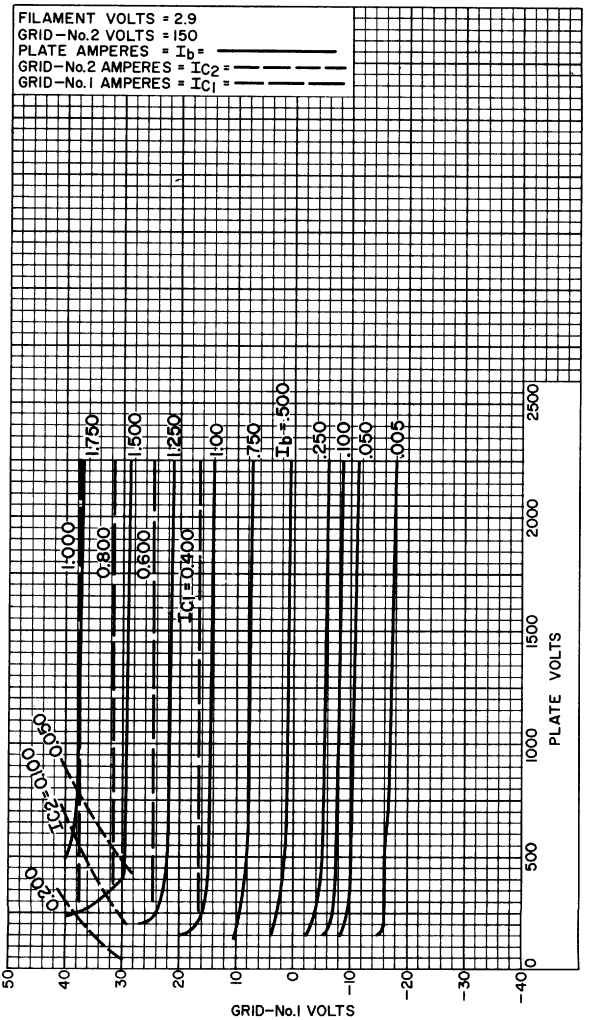
RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

TYPICAL CONSTANT-CURRENT CHARACTERISTICS
At a Constant Grid-No.2 Voltage of 250 Volts



8462

TYPICAL CONSTANT-CURRENT CHARACTERISTICS
At a Constant Grid-No.2 Voltage of 150 Volts



8501

Beam Power Tube

CERMOLOX® — **THORIATED-TUNGSTEN MESH FILAMENT**
INTEGRAL LOUVERED-FIN RADIATOR — **FORCED-AIR COOLED**

5500 WATTS UHF TV OUTPUT AT 890 Mc
5500 WATTS CW OUTPUT AT 900 Mc

Also Useful in Applications Intended for UHF TV Service in Stationary and Portable Equipment, such as AF Power Amplifiers or Modulators, Plate-Modulated RF Power Amplifiers in Class-C Telephony Service, AM or Single-Sideband Linear RF Power Amplifiers, Hard-Tube Modulators, Pulsed-RF Amplifiers, Requlators, or other Special Services

Electrical:

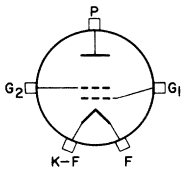
Filamentary Cathode, Thoriated Tungsten Mesh Type:[c]		
Voltage (AC or DC)	4.5 typ. / 5.0 max.	volts
Current:		
At 4.5 volts	125 typ.	amp
For starting, even momentarily	300 max.	amp
Cold resistance	0.005	ohm
Minimum heating time	15	sec
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 1200, grid-No.2 volts = 900, and plate amperes = 8	16	
Direct Interelectrode Capacitances:		
Grid No.1 to plate[a]	0.32 max.	pf
Grid No.1 to filament	65	pf
Plate to filament[a,b]	0.040 max.	pf
Grid No.1 to grid No.2	70	pf
Grid No.2 to plate	13	pf
Grid No.2 to filament[b]	2.0 max.	pf

Mechanical:

Operating Position	Vertical, either end up
Maximum Overall Length	5.65"
Maximum Diameter (See *Dimensional Outline*)	6.17"
Weight (Approx.)	10 lbs
Radiator	Integral part of tube

Terminal Connections (See *Dimensional Outline*):

G_1 – Grid-No.1 – Terminal Contact Surface
G_2 – Grid-No.2 – Terminal Contact Surface
F – Filament – Terminal Contact Surface
K-F – Cathode – Filament Terminal Contact Surface
P – Plate – Terminal Contact Surface



Thermal:

Terminal Temperature (Plate, grid No.2, grid No.1, cathode-filament and filament)	250 max.	°C
Plate-Core Temperature	250 max.	°C

Air Flow:[d]

Through radiator — Adequate air flow to limit the plate-core temperature to 250° C should be delivered by a blower through the radiator before and during the application of filament, plate, grid-No.2, and grid-No.1 voltages.

To Plate, Grid-No.2, Grid-No.1, Cathode-Filament, and Filament Terminals — A sufficient quantity of air should be allowed to flow past each of these terminals so that their temperature does not exceed the specified maximum value of 250° C.

During Standby Operation — Cooling air is required when only filament voltage is applied to the tube.

During Shutdown Operation — Air flow should continue for a few minutes after all electrode power is removed.

RF POWER AMPLIFIER — Class B Television Service[c]

Synchronizing-level conditions per tube unless otherwise specified

Maximum CCS Ratings, *Absolute-Maximum Values:*

DC Plate Voltage	7000	volts
DC Grid-No.2 Voltage	1500	volts
DC Plate Current	4	amp
Plate Dissipation	10000	watts
Grid-No.2 Input	150	watts
Grid-No.1 Input	100	watts

Typical CCS Operation:

In a cathode-drive circuit at 890 Mc and bandwidth of 8.5 Mc

DC Plate Voltage	5700	volts
DC Grid-No.2 Voltage	1000	volts
DC Grid-No.1 Voltage	-40	volts
DC Plate Current:		
Synchronizing level	2.9	amp
Pedestal level	2.2	amp
DC Grid-No.2 Current:		
Synchronizing level	0.015	amp
Pedestal level	0.011	amp
DC Grid-No.1 Current:		
Synchronizing level	0.375	amp
Pedestal level	0.275	amp
Driver Power Output:		
Synchronizing level	600	watts
Pedestal level	335	watts
Output Circuit Efficiency	80	%

Useful Power Output:		
Synchronizing level	5500	watts
Pedestal level	3100	watts

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[e] and RF POWER AMPLIFIER — Class C FM Telephony[e]

Maximum CCS Ratings, *Absolute-Maximum Values:*

DC Plate Voltage	7000	volts
DC Grid-No.2 Voltage	1500	volts
DC Grid-No.1 Voltage	-100	volts
DC Plate Current	3	amp
DC Grid-No.1 Current	0.65	amp
Grid-No.1 Input[f]	100	watts
Grid-No.2 Input[g]	150	watts
Plate Dissipation	10000	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	5000	ohms
Grid-No.2-Circuit Impedance	See Note g	
Plate-Circuit Impedance	See Note h	

Typical CCS Operation:

In Cathode-Drive Circuit at 900 Mc

DC Plate Voltage	5700	volts
DC Grid-No.2 Voltage	1000	volts
DC Grid-No.1 Voltage	-85	volts
DC Plate Current	2.7	amp
DC Grid-No.2 Current	0.025	amp
DC Grid-No.1 Current	0.200	amp
Driver Power Output	900	watts
Output-Circuit Efficiency	72	%
Useful Power Output	5500	watts

[a] With external flat metal shield 8" in diameter having a center hole 3" in diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2.

[b] With external flat metal shield 8" in diameter having a center hole 2-3/8" in diameter. Shield is located in plate of the grid-No.1 terminal, perpendicular to the tube axis, and is connected to grid No.1.

The following footnotes apply to the *RCA Transmitting Tube Operating Considerations* given at front of this section.

[c] See *Electrical Considerations* — Filament or Heater.

[d] See *Cooling Considerations* — Forced-Air Cooling.

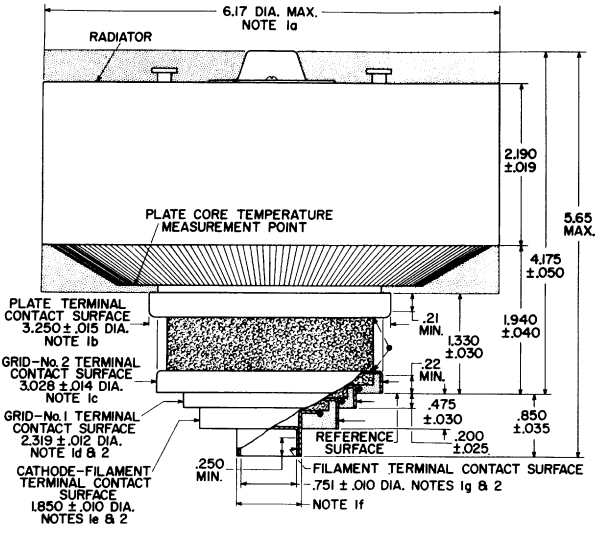
[e] See *Classes of Service.*

[f] See *Electrical Considerations* — Grid-No.1 Voltage Supply.

[g] See *Electrical Considerations* — Grid-No.2 Voltage Supply.

[h] See *Electrical Considerations* — Plate Voltage Supply.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

Note 1: Concentricity between the various diameters is such that the tube will enter a gauge having suitably spaced concentric apertures and posts of the following diameters:

a. Radiator - 6.240
b. Plate Terminal - 3.288
c. Grid-No.2 Terminal - 3.061
d. Grid-No.1 Terminal - 2.338
e. Cathode-Filament Terminal - 1.878
f. Filament Terminal (OD) - 0.908
g. Filament Terminal (ID) - 0.722

Note 2: The diameter of the terminal is held to the indicated value only over the contact surface length. The contact surface length of the filament, cathode-filament, and grid-No.1 terminals extends from the edge of its terminal to the plane coincident with the edge of the adjacent larger terminal.

Note 3: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular regions.

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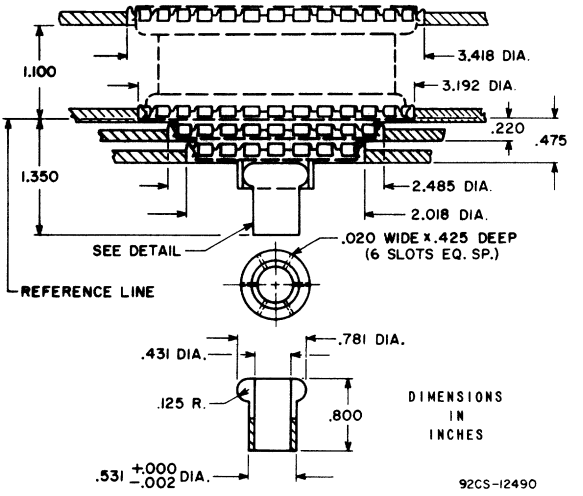
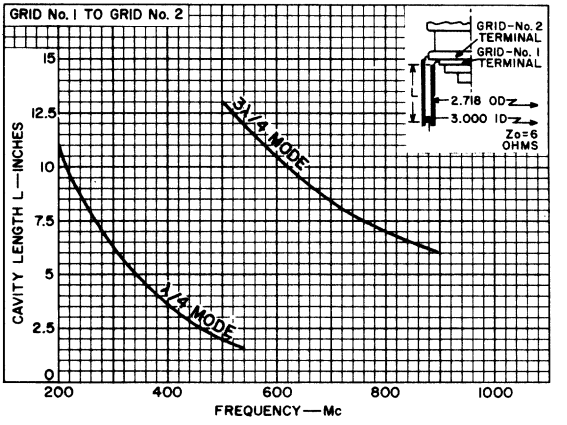
Electronic Components and Devices Harrison, N. J.

PREFERRED MOUNTING ARRANGEMENT

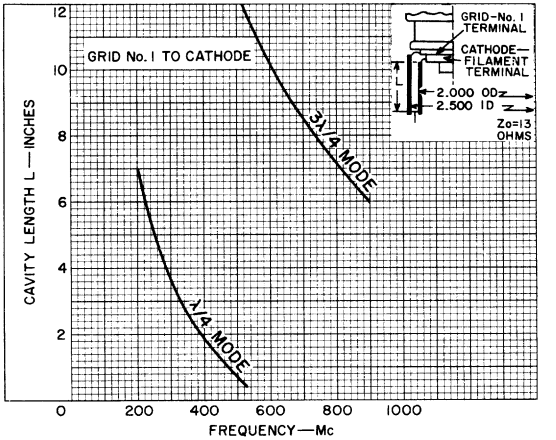


Note: All finger stock No.97-380, made by Instrument Specialties Co., Little Falls, N.J.

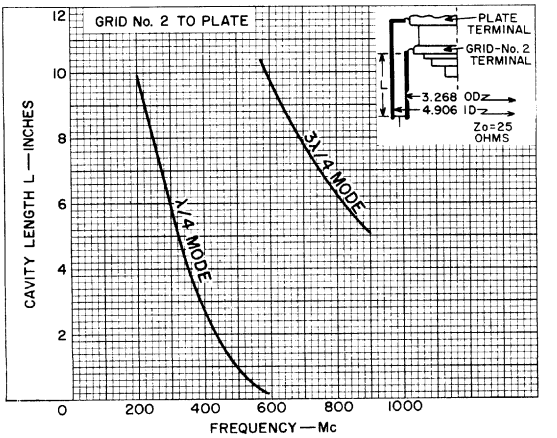
CAVITY TUNING CHARACTERISTICS



CAVITY TUNING CHARACTERISTICS



92CS-13033



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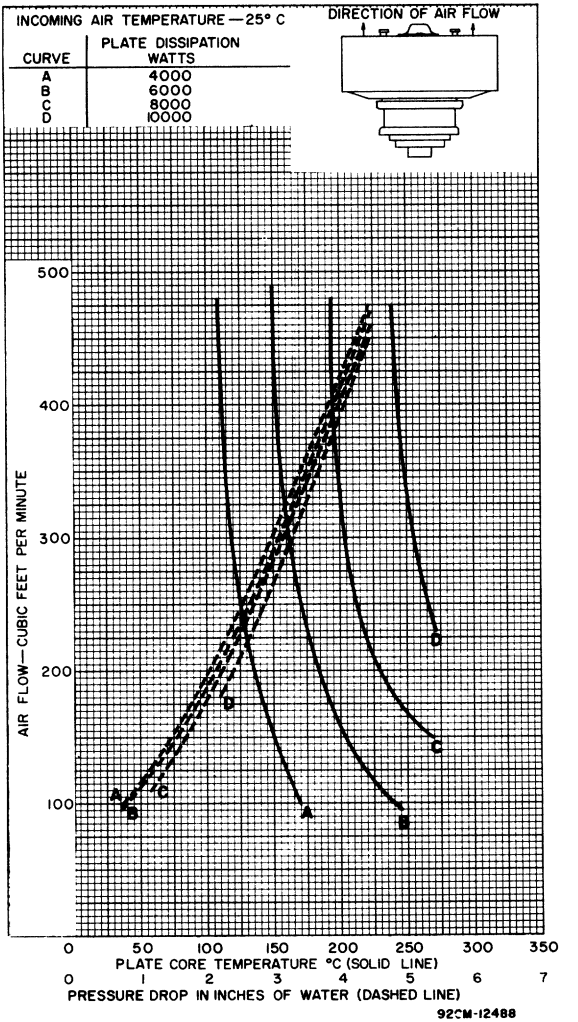
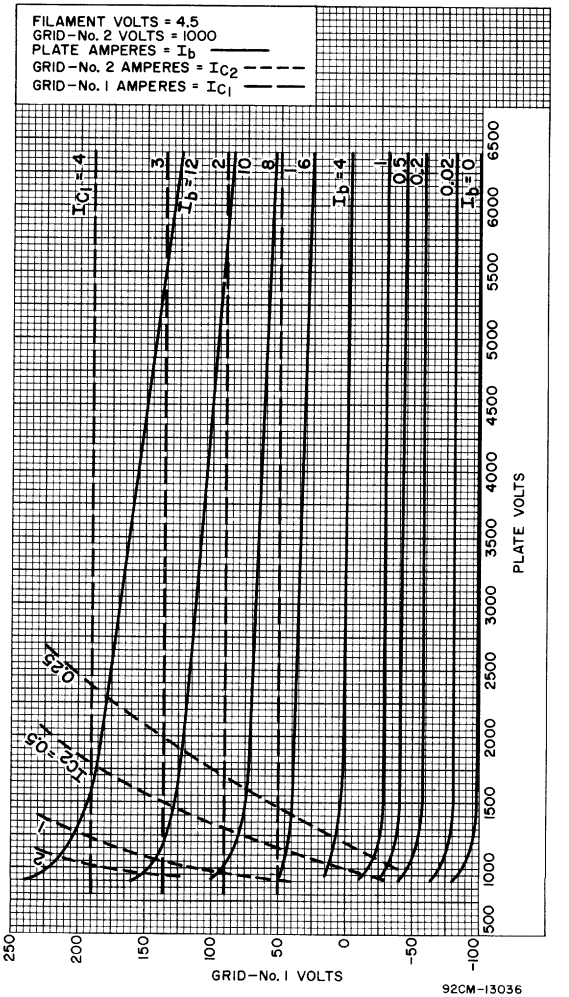
TYPICAL COOLING CHARACTERISTICS



TYPICAL CONSTANT-CURRENT CHARACTERISTICS



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Electronic Components and Devices
Harrison, N. J.

8532/6J4WA

High-Mu Triode

7-PIN MINIATURE TYPE

FRAME-GRID CONSTRUCTION **"PREMIUM" VERSION OF 6J4**

For Cathode-Drive UHF Amplifier Applications (up to 500 Mc) in Equipment Requiring Exceptional Stability and Reliability under Severe Environmental Conditions

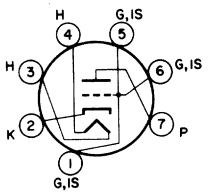
Electrical:

Heater Ratings and Characteristics:		
Voltage (AC or DC)	6.3 ± 0.3	volts
Current at heater volts = 6.3	0.400	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances:[a]		
Cathode to plate	0.2 max.	pf
Input (Cathode-drive operation):		
K to (G + IS, H)[b]	7.5	pf
Output (Cathode-drive operation):		
P to (G + IS, H)[b]	5.0 max.	pf
Grid and internal shield to plate	2.8	pf
Heater to cathode	2.8	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline (JEDEC No.5-2)	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BQ

Pin 1 – Grid, Internal Shield
Pin 2 – Cathode
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Same as Pin 1
Pin 6 – Same as Pin 1
Pin 7 – Plate



Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	150	volts
Grid	Connected to negative end of cathode resistor	
Cathode Resistor	100	ohms
Amplification Factor	52.5	
Plate Resistance (Approx.)	4800	ohms
Transconductance	11000	μmhos

Tubes are then criticized for changes in Transconductance (1), Reverse Grid Current, and Heater-Cathode Leakage Current under the conditions specified in the CHARACTERISTICS RANGE VALUES and are subjected to the Constant-Frequency Vibration Test and the Continuity and Shorts Test described below.

Constant-Frequency Vibration:

Peak Vibrational Acceleration	10	g
Vibration Frequency	40	cps
RMS Voltage across plate load resistor	150 max.	mv

This test is performed on sample tubes from each production lot to determine if loose parts or mechanical resonance are present at the specified acceleration and vibration frequency. Tubes are rigidly mounted on a platform vibrating with simple harmonic motion at a constant frequency of 40 cps and, with the tubes operating under the conditions specified in the CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate load resistor of 2000 ohms, are subjected to the specified acceleration. During this test, the rms voltage across the plate load resistor must not exceed 150 millivolts.

Variable-Frequency Vibration:

Peak Vibrational Acceleration	10	g
Vibration-Frequency Range	50 to 500	cps
RMS Voltage across plate load resistor	100 max.	mv

This test is performed periodically on sample tubes to determine if mechanical resonance is present at the specified acceleration over the specified frequency range. Tubes are rigidly mounted on a platform vibrating with simple harmonic motion over a frequency range of 50 to 500 cps and, with the tubes operating under the conditions specified in the CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate load resistor of 2000 ohms, are subjected to the specified acceleration in each of two different positions, X_1 and X_2. The acceleration over the frequency range is within ±20 per cent of the reference acceleration at 100 cps. The frequency is increased from 50 to 500 cps with approximately logarithmic progression and 4 to 5 minutes are required to traverse the frequency range. During this test, the rms voltage across the plate load resistor must not exceed 100 millivolts.

High-Altitude Voltage Breakdown:

Effective Altitude	80000	ft
Air Pressure	21 ± 2	mm Hg
Ambient Temperature	25 ± 5	°C
RMS Voltage between plate base pin and adjacent pins	500	volts

This test is performed periodically on sample tubes from each production lot to determine the ability of the tubes to withstand high-altitude (low-air-pressure) conditions. In this test at an ambient temperature of 25° ± 5° C, while the tubes

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Electronic Components and Devices Harrison, N. J.

are subjected to a reduced air pressure of 21 ± 2 mm Hg corresponding to an altitude of 80,000 feet, a 60-cps, ac rms voltage of 500 volts is applied between the plate base pin and adjacent pins. Tubes must not break down (arc over) or show evidence of corona.

Continuity and Shorts:

This test is performed periodically on sample tubes from each production lot to determine the presence of open circuits, temporary or permanent shorts, or air leaks. Tubes are subjected to the Thyratron-Type Shorts Test described in Military Specification MIL-E-1E, method 1201.

Heater-Cycling Life:

Duration of Test. . . . . 2000 cycles

This test is performed on sample tubes from each production lot with heater volts = 7.0 cycled 1 minute ON and 4 minutes OFF for 2000 cycles, dc heater-cathode volts = 100 continuously ON, and no voltages applied to the plate or grid. After 2000 cycles, tubes are criticized for changes in Heater-Cathode Leakage Current and Leakage Resistance, and for Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

Stability Life (20 Hours):

This test is performed at room temperature on sample tubes from each production lot to determine if the tubes are stable. After 2 hours and again after 20 hours of operation under the conditions specified in the CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a grid resistor of 0.25 megohm and with dc heater-cathode volts = 100, tubes are criticized for the change in Transconductance (1).

Early-Hour Survival-Rate Life (100 Hours):

This test is performed on sample tubes from each production lot to assure a high early-hour survival rate. After 100 hours of operation under the conditions specified for the Stability Life Test above, tubes are criticized for the change in Transconductance (1) and are then subjected to the Continuity and Shorts Test.

Intermittent-Conduction Life (1000 Hours):

This test is performed on sample tubes from each production lot to assure the high quality of individual tubes and to guard against epidemic failures due to excessive transconductance change in any of the characteristics specified below. After 500 hours of operation under the conditions specified for the Stability Life Test above and, in addition, with heater voltage cycled 110 minutes ON and 10 minutes OFF, and bulb temperature = 120° C, tubes are criticized for changes in Heater Current, Transconductance (1), Transconductance (2), Reverse Grid Current, Heater-Cathode Leakage Current, Leakage Resistance, and for Open Circuits, Permanent Shorts, Air Leaks, and Total Defectives. After 1000 hours of operation, tubes are again criticized for all of the preceding defects with the exception of the change in Transconductance (2).

8568

Super-Power Klystron

FIVE-RESONATOR, FIXED-TUNED, MAGNETICALLY-FOCUSED
WATER-COOLED TYPE
21-MEGAWATT PEAK PULSE OUTPUT AT 2856 Mc/s

For RF-Pulsed Amplifier in S-Band Linear Accelerator Service

ELECTRICAL

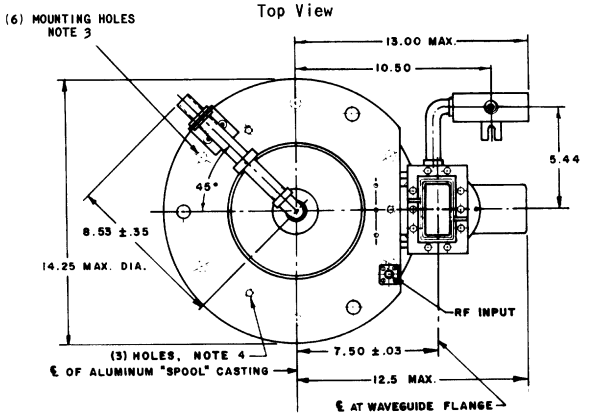
Heater, for Matrix-Type Oxide-Coated Unipotential Cathode		
Voltage (AC or DC)	15	V
See accompanying *Electrical Considerations*		
Current:		
Typical value at 15 volts	14	A
Starting value, even momentarily	30 max	A
Cold resistance	0.15	Ω
Heating time (Minimum)	20	min
At normal operating current before applying beam voltage		
Pump	Sputter Ion Type	
See accompanying *Electrical Considerations*		
Direct Interelectrode Capacitances		
Anode to cathode	42	pF
Anode to cathode	50	pF
With corona shield and in permanent magnet		
Frequency (Center)	2856	Mc/s
Phase Sensitivity to Beam Voltage	6 deg/per cent of beam-voltage change	

MECHANICAL

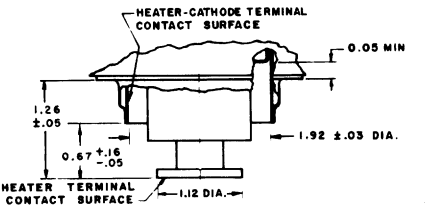
Operating Position	**Vertical, cathode end down**
Maximum Overall Length	**49.7 in**
Maximum Diameter	**See accompanying *Dimensional Outline***
Cooling Connections	
Inlet	1/2 in — 14MPT
Outlet	1/2 in — 14MPT
Circuit Connections	
Beam and heater voltage terminals	**See accompanying *Dimensional Outline***
RF input	**Mates with UG-573/U male**
RF output	**Mates to Waveguide WR284 with RCA-AJ2121 Male Waveguide Flange**
Sputter ion pump voltage	**Mates with No.924-0715[a] High Voltage Connector**
Weight (Approx.)	
Without magnets	150 lb
With electromagnet and lead X-radiation shields attached	1100 lb
With permanent magnet and lead X-radiation shields attached	1625 lb

DIMENSIONAL OUTLINE

Top View



Detail A



DIMENSIONS IN INCHES

Note 1: Recommended diameter of O-ring sealing surface.

Note 2: 1/2-14 external American Standard taper pipe thread (Male).

Note 3: Six (6) mounting holes, 9/16 inch diameter through the 13.00-inch diameter flange. Equally spaced on a bolt circle of 11.56 inch diameter.

Note 4: Three (3) holes, 1/2-13 NC, equally spaced on a bolt circle of 10.00 inches for lifting eyebolts.

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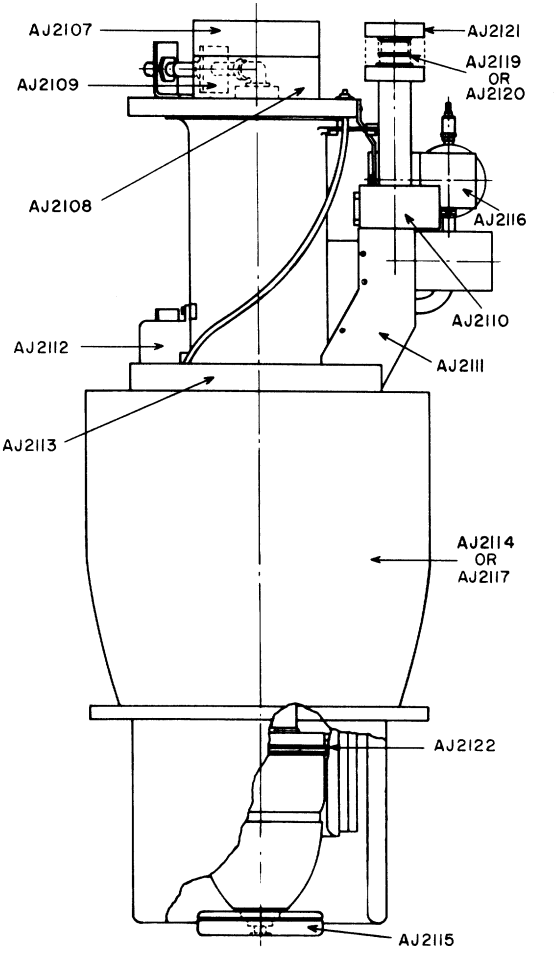
ASSEMBLY DRAWING



Super-Power Beam Power Tube

2 MEGAWATTS PEAK POWER OUTPUT IN SHORT-PULSE SERVICE AT 425 MHz

PULSE LENGTH TO 15 MICROSECONDS

LOW FILAMENT POWER FOR AIRBORNE USE

LIQUID COOLED

For Grid-Driven, Plate-Pulsed Amplifier Applications at Frequencies from 174 to 600 MHz in Long-Range Search Radar and in Pulsed Communications Applications

The 8587 is the same as the 6952 except for the following items:

MECHANICAL

Overall Length. . . . . 9.19 ± 0.31 in

COOLING CONSIDERATIONS[a]

To inspect the plate coolant course: (1) Remove the 8 screws from the plate terminal. Lift the plate-terminal assembly carefully out of the tube. This assembly should come out easily. (2) Remove the O-ring from the moat. (3) Inspect the internal structure of the plate coolant course with the aid of a convenient light source.

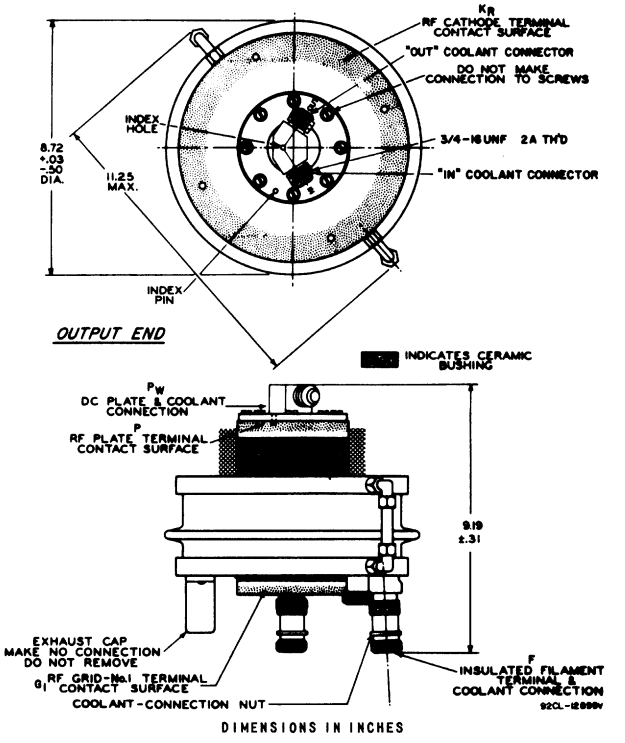
(a) When water or ethylene-glycol-water solution is used, the plate-terminal assembly may stick in (1) above due to excessive deposit build-up. If so, clean the plate coolant course before further attempting to remove the assembly. In (3) above determine if there is a flaky or adherent deposit on the structure. If a deposit is observed, it should be removed. Such a deposit generally consists of copper oxide (usually black) which can be removed by cleaning as above.

(b) When liquid coolant FC75 is used, determine if there are any particles. Remove any particles. In general, the metal surface of the coolant course should not exhibit any heavy deposits or oxide coatings.

(4) Replace the O-ring in the moat. Orient the plate-terminal assembly so that it is in its original position (refer to the index pin of the tube for orientation) and then seat it. Replace the 8 screws. Tighten the screws in succession until snug.

[a] See *Cooling Considerations-Liquid Cooling*, under *RCA Transmitting Tube Operating Considerations* given at front of this section.

SIMPLIFIED DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

A detailed Dimensional Outline and associated Gauge Drawings are given in the Technical Bulletin available upon request.

FOR ADDITIONAL INFORMATION ON THIS TYPE INCLUDING INPUT AND OUTPUT CAVITY DRAWINGS, WRITE FOR TECHNICAL BULLETIN AND APPLICATION GUIDE FOR RCA SUPER POWER TUBES, ICE-279A, AVAILABLE FROM:

Commercial Engineering
Electronic Components and Devices
Radio Corporation of America
Harrison, New Jersey

8587/4605V2

Super-Power Beam Power Tube

2 MEGAWATTS PEAK POWER OUTPUT IN SHORT-PULSE SERVICE AT 425 Mc/s

PULSE LENGTH TO 15 MICROSECONDS

LOW FILAMENT POWER FOR AIRBORNE USE

LIQUID COOLED

For Grid-Driven, Plate-Pulsed Amplifier Applications at Frequencies from 174 to 600 Mc/s in Long-Range Search Radar and in Pulsed Communications Applications

The 8587/4605V2 is the same as the 6952 except for the following items:

MECHANICAL

Overall Length. . . . . 9.19 ± 0.31 in

COOLING CONSIDERATIONS[a]

To inspect the plate coolant course: (1) Remove the 8 screws from the plate terminal. Lift the plate-terminal assembly carefully out of the tube. This assembly should come out easily. (2) Remove the O-ring from the moat. (3) Inspect the internal structure of the plate coolant course with the aid of a convenient light source.

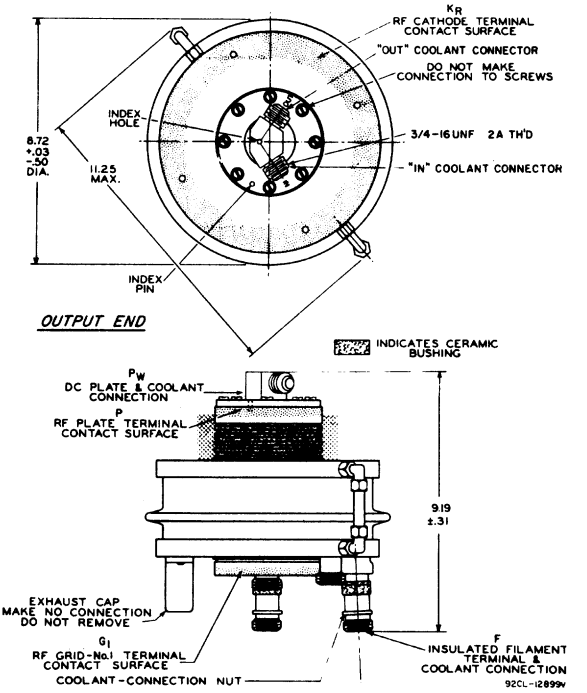
(a) When water or ethylene-glycol-water solution is used, the plate-terminal assembly may stick in (1) above due to excessive deposit build-up. If so, clean the plate coolant course before further attempting to remove the assembly. In (3) above determine if there is a flaky or adherent deposit on the structure. If a deposit is observed, it should be removed. Such a deposit generally consists of copper oxide (usually black) which can be removed by cleaning as above.

(b) When liquid coolant FC75 is used, determine if there are any particles. Remove any particles. In general, the metal surface of the coolant course should not exhibit any heavy deposits or oxide coatings.

(4) Replace the O-ring in the moat. Orient the plate-terminal assembly so that it is in its original position (refer to the index pin of the tube for orientation) and then seat it. Replace the 8 screws. Tighten the screws in succession until snug.

[a] See *Cooling Considerations-Liquid Cooling*, under *RCA Transmitting Tube Operating Considerations* given at front of this section.

SIMPLIFIED DIMENSIONAL OUTLINE[r]



DIMENSIONS IN INCHES

[r] A detailed Dimensional Outline and associated Gauge Drawings are given in the Technical Bulletin available upon request.

FOR ADDITIONAL INFORMATION ON THIS TYPE INCLUDING INPUT AND OUTPUT CAVITY DRAWINGS, WRITE FOR TECHNICAL BULLETIN AND APPLICATION GUIDE FOR RCA SUPER POWER TUBES, ICE-279A, AVAILABLE FROM:

Commercial Engineering
Electronic Components and Devices
Radio Corporation of America
Harrison, New Jersey

8596

Beam Power Tube

CERMOLOX® RUGGEDIZED TYPE — **INTEGRAL RADIATOR**
FORCED-AIR COOLED — **40 WATTS CW POWER OUTPUT AT 1215 Mc/s**
MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE

For Use in Compact Aircraft, Mobile, and Stationary Equipment

The 8596 is the same as the 7457 except for the following items:

MECHANICAL

Maximum Overall Length	2.036 in
Maximum Diameter	1.327 in

THERMAL

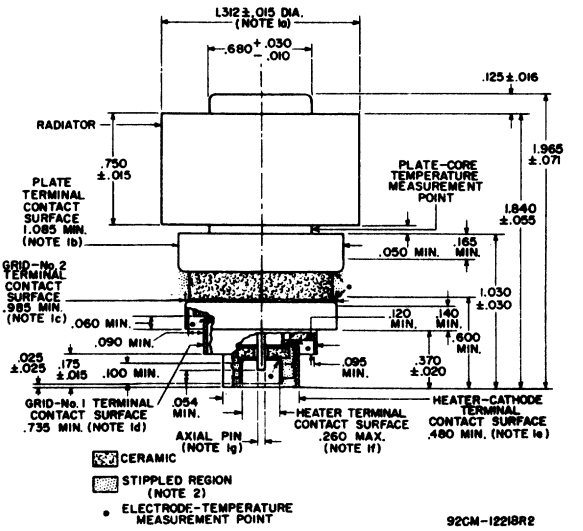
Plate, Grid No.2, Grid No.1, Cathode, and Heater Temperature	250 max	°C
Plate-Core Temperature	250 max	°C

CHARACTERISTICS RANGE VALUES

	Note	Min	Max	
Zero Bias Plate Current	1,7	390	-	mA

NOTE 7: With dc plate volts = 300, dc grid-No.2 volts = 150, dc grid No.1 volts = 0.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

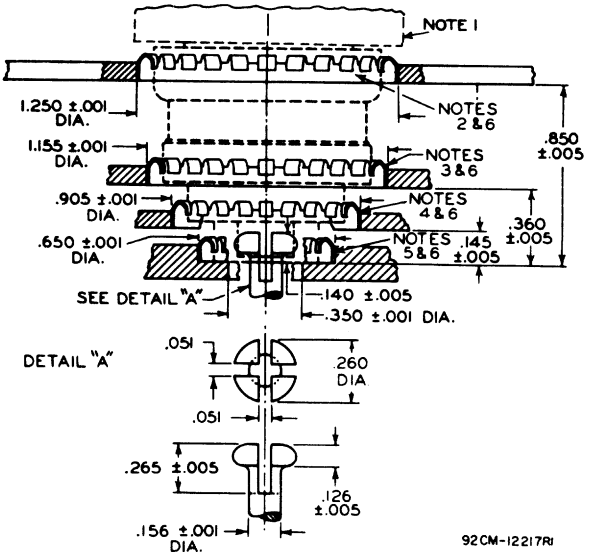
For notes, see next page.

NOTE 1: The following diametrical space requirements accommodate the concentricity of the cylindrical surfaces of the radiator band, axial pin, and each electrode terminal:

a. Radiator Band - 1.376 inch
b. Plate Terminal - 1.119 inch
c. Grid-No.2 Terminal - 1.019 inch
d. Grid-No.1 Terminal - 0.764 inch
e. Heater-Cathode Terminal - 0.519 inch
f. Heater Terminal - 0.238 inch
g. Axial Pin - 0.071 inch

NOTE 2: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

PREFERRED MOUNTING ARRANGEMENT
and Layout of Associated Contacts



DIMENSIONS IN INCHES

NOTE 1: If a clamp is used, it must be adjustable in a plane normal to the major tube axis to compensate for variations in concentricity between the radiator cylinder and the contact terminals.

NOTE 2: Contact ring No.97-252 or finger stock No.97-380.

NOTE 3: Contact ring No.97-253 or finger stock No.97-380.

NOTE 4: Contact ring No.97-254 or finger stock No.97-380.

NOTE 5: Contact ring No.97-255 or finger stock No.97-380.

NOTE 6: The specified contact ring of preformed finger stock and finger stock No.97-380 provide adequate electrical contact, but the finger stock No.97-380 is less susceptible to breakage than the specified contact ring. Both types are made by instruments specialties Co., Little Falls, N. J.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

8627

Power Triode

NUVISTOR TYPE

ENVIRONMENTAL TESTS **LIFE TEST**

For Cathode-Drive, Low-Level Class-C RF-Power-Amplifier, Oscillator, or Frequency-Multiplier Applications to 1.2 Gc/s in Aircraft, Industrial, Military, and Other Equipment Operating Under Conditions of Severe Shock and Vibration.

ELECTRICAL CHARACTERISTICS

Bogey Values

Heater Voltage (AC or DC)	E_f	6.3	V
Heater Current at Ef = 6.3 V.	I_f	150	mA
Heater Input	P_f	0.95	W
Direct Interelectrode Capacitances			
Without external shield			
Input: K to (G,S,H)	c_i	6.0	pF
Output: P to (G,S,H)	c_o	1.2	pF
Heater to cathode	c_{hk}	1.4	pF

Class A_1 Amplifier

For following characteristics, see Conditions				
Amplification Factor	μ	60	70	
Plate Resistance (Approx.)	r_p	6300	5400	Ω
Transconductance	g_m	9500	13000	μmho
DC Plate Current	I_b	9	11.5	mA
Cutoff DC Grid Voltage for I_b = 10 μA	$E_{c(co)}$	-	-5	V

Conditions

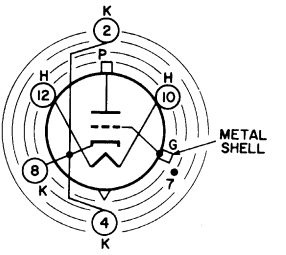
Heater Voltage	E_f	6.3	6.3	V
Plate Supply Voltage	E_{bb}	150	110	V
Grid Supply Voltage	E_{cc}	0	0	V
Cathode Resistor	R_k	150	47	Ω

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Minimum Overall Length (l_m)	0.985 in
Maximum Seated Length (l_{sm})	0.780 in
Maximum Diameter (d_m)	0.440 in
Weight (Approx.)	2.2 g
Dimensional Outline	JEDEC No.4-6
Envelope	JEDEC MT4
Top Cap[a]	Small (JEDEC C1-44)
Base[b]	Medium-Ceramic-Wafer Twelvar 5-Pin (JEDEC E5-79)

Basing Designation for BOTTOM VIEW. 12CT

Pin 2 – Cathode
Pin 4 – Cathode
Pin 7[c] – Do Not Use
Pin 8 – Cathode
Pin 10 – Heater
Pin 12 – Heater
Metal Shell – Grid
Top Cap – Plate



INDEX = LARGE LUG
• = SHORT PIN—IC

ABSOLUTE MAXIMUM RATINGS

For Low-Level Class-C RF-Power-Amplifier, Oscillator, or Frequency-Multiplier Tube Operation at frequencies up to 1.2 Gc/s

		CCS[d]	*ICAS*[e]	
Plate Supply Voltage	E_{bb}	500	500	V
DC Plate Voltage	E_b	250	300	V
Grid Voltage				
Peak positive value	e_{cm}	4	5	V
DC positive value	E_c	0	0	V
DC negative value	E_c	-100	-100	V
Peak Heater-Cathode Voltage	e_{hkm}	±100	±100	V
Heater Voltage, AC or DC	E_f	5.7 to 6.9	5.7 to 6.9	V
Instantaneous Voltage Between top cap or base pins and metal shell		See *Breakdown-Voltage Characteristics* Curve		
Average Grid Current	$I_{c(av)}$	5	6	mA
Average Cathode Current	$I_{k(av)}$	25	30	mA
Plate Dissipation	P_b	2.5	2.7	W
Envelope Temperature	T_E	200	200	°C

MAXIMUM CIRCUIT VALUES

		CCS	*ICAS*	
Grid-Circuit Resistance For fixed-bias or cathode-bias operation:	$R_{g(ckt)}$			
For $T_E \leq 150°$ C		50	50	kΩ
For $T_E > 150°$ C		See *Grid-Circuit-Resistance Rating Chart*		

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TYPICAL OPERATION — CCS

As Cathode-Drive RF Power Amplifier

Frequency	f	1	1.2	Gc/s
Heater Voltage	E_f	6.3	6.3	V
DC Plate-to-Grid Voltage	E_{bg}	180	180	V
DC Cathode-to-Grid Voltage	E_{kg}	5.5	5.5	V
From grid resistor of	R_g	1200	1200	Ω
Average Plate Current	$I_{b(av)}$	20	20	mA
Average Grid Current	$I_{c(av)}$	4.5	4	mA
Driving Power (Approx.)	P_g	150	250	mW
Useful Power Output (Approx.)[g]	P_o	1.4	1.2	W

As RF Oscillator

Frequency	f	1	Gc/s
Heater Voltage	E_f	6.3	V
DC Plate Voltage	E_b	180	V
DC Grid Voltage	E_c	-5.5	V
From grid resistor of	R_g	1200	Ω
Average Plate Current	$I_{b(av)}$	21	mA
Average Grid Current	$I_{c(av)}$	4.5	mA
Useful Power Output (Approx.)[g]	P_o	1.25	W

As Cathode-Drive Frequency Doubler

Output Frequency	f_o	1	Gc/s
Heater Voltage	E_f	6.3	V
DC Plate-to-Grid Voltage	E_{bg}	180	V
DC Cathode-to-Grid Voltage	E_{kg}	8.5	V
From grid resistor of	R_g	1200	Ω
Average Plate Current	$I_{b(av)}$	18.5	mA
Average Grid Current	$I_{c(av)}$	3	mA
Driving Power (Approx.)	P_g	300	mW
Useful Power Output (Approx.)[g]	P_o	0.7	W

[a] Designed to mate with "1/4-inch" connector generally available from your local RCA Distributor.

[b] Designed to mate with Cinch Mfg. Co. socket No.133 65 10 041, Cinch-Jones Sales-Division Distributor socket Designation 5NS-3, or equivalent.

[c] Pin 7 is of a length such that its end does not touch the socket insertion plane.

[d] Continuous Commercial Service.

[e] Intermittent Commercial and Amateur Service. No operating or ON period exceeds 5 minutes and every ON period is followed by an OFF or standby period of the same or greater duration.

[f] Measured on metal shell in Zone "A" (See *Dimensional Outline*).

[g] Measured at load.

INITIAL CHARACTERISTICS LIMITS

	Note	*Min*	*Max*	
Heater Current	1	140	160	mA
Direct Interelectrode Capacitances	2			
Cathode to plate	-	-	0.046	pF
Input: K to (G,S,H)	-	5.0	7.0	pF
Output: P to (G,S,H)	-	0.9	1.5	pF
Heater to cathode	-	1.1	1.7	pF
Amplification Factor	3	50	90	

	Note	Min	Max	
Transconductance (1)	4	7500	11500	μmho
Transconductance (2)	3	10500	15500	μmho
Plate Current (1)	4	6.5	11.5	mA
Plate Current (2)	3	8.5	14.5	mA
Cutoff Plate Current	5	-	50	μA
Useful Power Output	6	1.1	-	W
Total Grid Current	7	-	-0.1	μA
Heater-Cathode Leakage Current	8	-	±5	μA
Leakage Resistance				
Between grid and all other electrodes connected together	9	5	-	GΩ
Between plate and all other electrodes connected together	10	10	-	GΩ
Inoperatives	11		✓	

Note 1: With E_f = 6.3 V.

Note 2: Measured without external shield.

Note 3: With E_f = 6.3 V, E_{bb} = 110 V, E_{cc} = 0 V, R_k = 47 Ω, C_k = 1000 μf.

Note 4: With E_f = 6.3 V, E_{bb} = 150 V, E_{cc} = 0 V, R_k = 150 Ω, C_k = 1000 μf.

Note 5: With E_f = 6.3 V, E_b = 150 V, E_c = -7 V.

Note 6: Measured at load in cathode-drive rf-power-amplifier circuit with f = 1 Gc/s, E_f = 6.3 V, E_{bg} = 175 V, E_{kg} = 6 V from R_g = 1200 Ω, $I_{b(av)}$ = 23 mA max, $I_{c(av)}$ = 5 mA max, P_g = 150 mW, circuit tuned for maximum $P_{o(useful)}$.

Note 7: With E_f = 6.3 V, E_b = 150 V, E_{cc} = -1.3 V, R_g = 0 Ω.

Note 8: With E_f = 6.3 V, E_{hk} = ±100 V.

Note 9: With E_f = 6.3 V, $E_{g\text{-}all}$ = -100 V.

Note 10: With E_f = 6.3 V, $E_{p\text{-}all}$ = -300 V.

Note 11: Tubes are criticized for Shorts, Discontinuities, and Air Leaks.

ENVIRONMENTAL TESTS

High-Impact, Short-Duration Shock

	Min	Max	
Peak Impact Acceleration		1000	g
Duration of approximate half-sine-wave mechanical-shock pulse		0.8 ± 0.2	ms
Operating Conditions during Test			
E_f = 6.3 V, E_{bb} = 150 V, E_{cc} = -1.3 V, R_g = 50 kΩ, E_{hk} = 100 V			
Post-Shock Limits and Rejection Criteria	Min	Max	
$\Delta 1_{gm}$	-	±15	%
I_c	-	-0.1	μA
I_{hk}	-	±10	μA
ER_{pm} (Variable-Frequency-Vibration Test Limits) over vibration-frequency range of:			
3 to 6 kc/s	-	100	mV
6 to 15 kc/s	-	1000	mV
Tap and Permanent Shorts, and Discontinuities	✓		

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Low-Impact, Long-Duration Shock

Peak Impact Acceleration	50	g
Duration of approximate half-sine-wave mechanical-shock pulse	11 ± 2	ms

Condition during Test
No tube-element voltages are applied.

Post-Shock Limits and Rejection Criteria
Same as those specified above for the High-Impact, Short-Duration Shock Test

Sweep-Frequency-Vibration Fatigue

Vibration-Frequency Range (Overall)	5 to 500 to 5	c/s
Peak Displacement (5 to 50 and 50 to 5 c/s)	0.040	in
Peak-to-peak value	0.080	in
Peak Vibrational Acceleration (50 to 500 to 50 c/s)	10	g
Period of 1 sweep cycle (Approx.) (5 to 500 to 5 c/s)	15	m
Duration of Test (Overall)	9	h
Along each of 3 mutually perpendicular axes	3	h

Operating Condition during Test
E_f = 6.3 V

Post-Sweep-Frequency-Vibration-Fatigue Limits and Rejection Criteria
Same as those specified above for the High-Impact, Short-Duration Shock Test

Variable-Frequency Vibration

Vibration-Frequency Range (Overall)	3 to 15	kc/s
Peak Vibrational Acceleration in X_1 position	1	g
Period of 1 sweep cycle (3 to 15 kc/s)	7	s

Operating Conditions during Test
E_f = 6.3 V, E_{bb} = 150 V, E_{cc} = 0 V, R_k = 150 Ω, R_p = 2 kΩ

Limits	*Min*	*Max*	
ER_{pm} over vibration-frequency range of:			
3 to 6 kc/s	-	80	mV
6 to 15 kc/s	-	700	mV

LIFE TESTS

Heater Cycling

Duration of Test	2000	cycles

Operating Conditions
E_f = 8.5 V cycled 1 minute ON and 2 minutes OFF, E_{hk} = −180 V continuously ON

Rejection Criteria
Heater-cathode shorts, and heater and cathode discontinuities

Intermittent Operation (2, 20, 100, 500, and 1000 Hours)

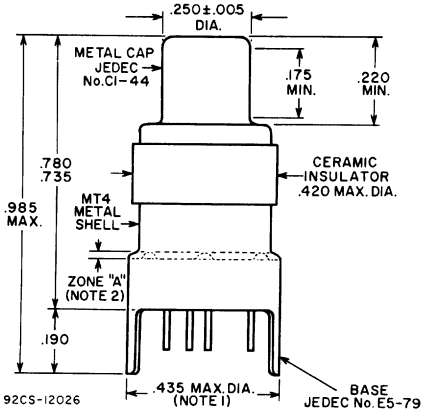
Operating Conditions

E_f = 6.3 cycled 110 minutes ON and 10 minutes OFF,
E_{bb} = 150 V, E_{cc} = 0 V, R_g = 50 kΩ, P_b = 2.4 W,
T_E = 150° C min

End-Point Limits At	2 and 20		100		500		1000		h
	Min	Max	Min	Max	Min	Max	Min	Max	
$1g_m$	-	-	6700	-	-	-	-	-	μmho
$\Delta 1g_m/t$.	-	±10	-	-	-	-	-	-	%
P_o(useful). . .	-	-	-	-	1.0	-	0.9	-	W
I_c.	-	-	-	-0.2	-	-	-	-	μA

DIMENSIONAL OUTLINE

JEDEC No.4-6



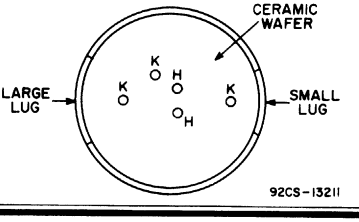
DIMENSIONS IN INCHES

Note 1: Maximum outside diameter of 0.440" is permitted along 0.190" lug length.

Note 2: Envelope temperature should be measured in zone "A".

MODIFIED BOTTOM VIEW

With Element Connections Indicated and Short Pin Not Shown



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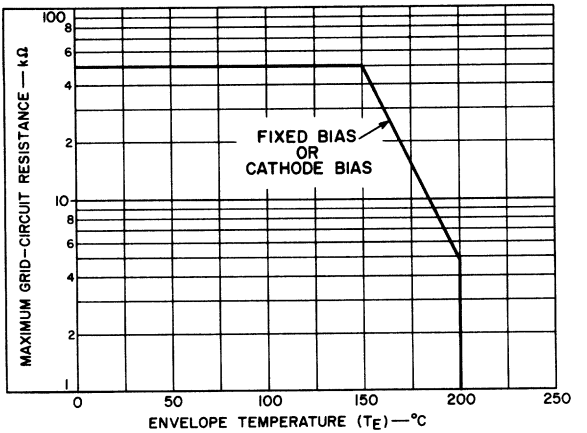
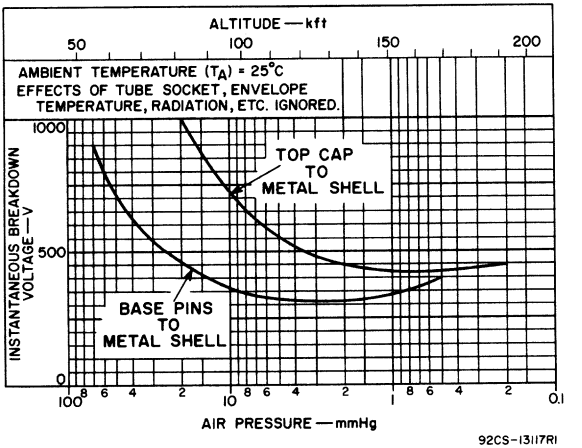
Grid-Circuit-Resistance Rating Chart



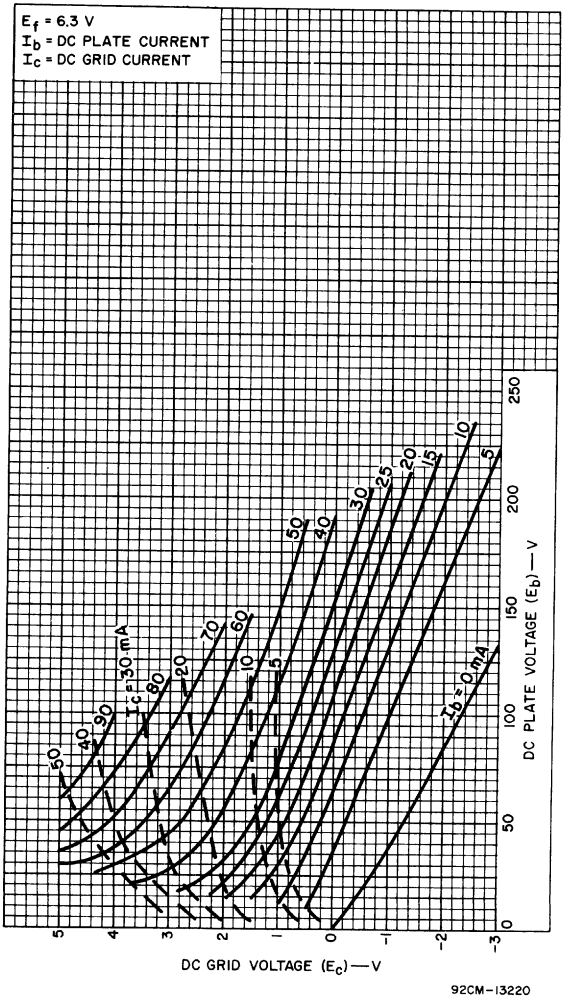
92CS-13119RI

Breakdown-Voltage Characteristics



92CS-13117RI

Typical Constant-Current Characteristics



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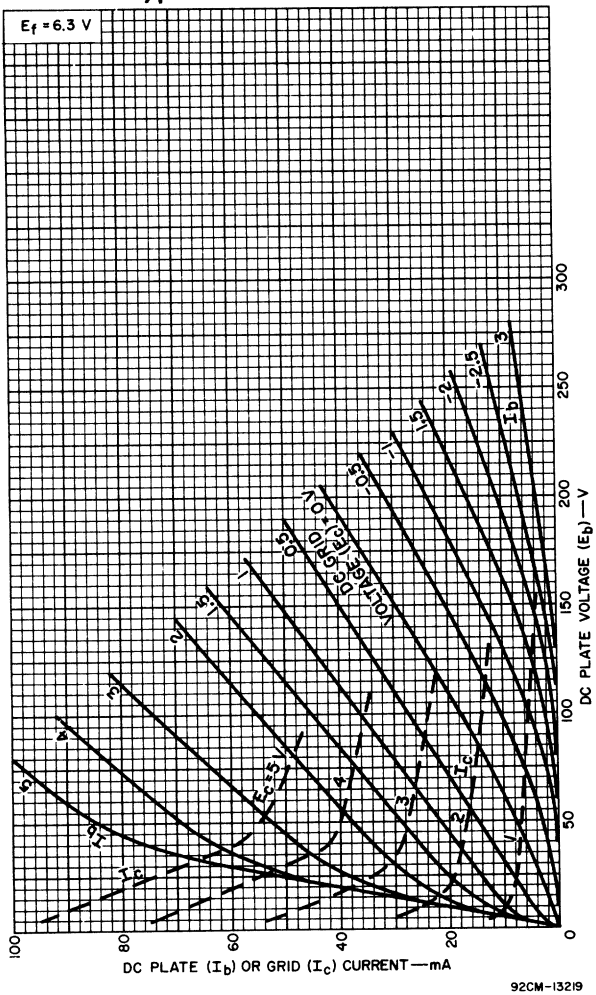
Typical Characteristics



92CM-13219

8628

High-Mu Triode

NUVISTOR TYPE

ENVIRONMENTAL TESTS **LIFE TESTS**

For Condenser-Microphone Preamplifiers, Piezoelectric- and Ceramic-Pickup Preamplifiers, and Other Voltage Amplifier Applications Requiring Amplification of Extremely Small Signals at DC to 200 kc/s

ELECTRICAL CHARACTERISTICS

Bogey Values

Heater Voltage, (DC or AC)	E_f	6.3	V
Heater Current at E_f = 6.3 V	I_f	100	mA
Heater Input	P_f	0.63	W
Direct Interelectrode Capacitances			
Without external shield			
Input: G to (K, S, H)	c_i	3.4	pF
Output: P to (K, S, H)	c_o	1.7	pF
Plate to cathode	c_{pk}	0.20	pF
Grid to cathode	c_{gk}	2.6	pF
Heater to cathode	c_{hk}	1.0	pF

CLASS A_1 AMPLIFIER

For Following Characteristics see **Conditions**

Amplification Factor	μ	127	
Plate Resistance (Approx.)	r_p	41	kΩ
Transconductance	g_m	3100	μmho
DC Plate Current	I_b	1.5	mA
Cutoff DC Grid Voltage for I_b = 10 μA	$E_{c(co)}$	-1.7	V

Conditions

Heater Voltage	E_f	6.3	V
Plate Supply Voltage	E_{bb}	120	V
Grid Supply Voltage	E_{cc}	0	V
Cathode Resistor	R_k	200	Ω
Metal Shell		**Connected to system ground**	

ABSOLUTE MAXIMUM RATINGS

For operation as a Class-A_1 Amplifier Tube at frequencies up to 200 kc/s

Plate Supply Voltage	E_{bb}	330	V
DC Plate Voltage	E_b	250	V
Grid Voltage			
Peak positive value	e_{cm}	0	V
DC positive value	E_c	0	V
DC negative value	E_c	-55	V
Peak Heater-Cathode Voltage	e_{hkm}	±100	V
Heater Voltage, DC or AC	E_f	5.7 to 6.9	V
Instantaneous Voltage		**See** *Breakdown-Voltage Characteristics Curve*	
Between base pins and metal shell			
Average Cathode Current	$I_{k(av)}$	2	mA
Plate Dissipation	P_b	0.3	W
Envelope Temperature[c]	T_E	150	°C

MAXIMUM CIRCUIT VALUES

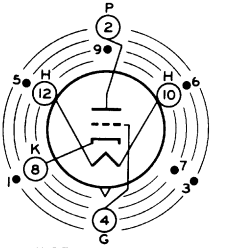
Grid-Circuit Resistance

For fixed-bias operation	$R_{g(ckt)}$	50	MΩ
For cathode-bias operation	$R_{g(ckt)}$	100	MΩ

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length (l_m)	0.800 in
Maximum Seated Length (l_{sm})	0.625 in
Maximum Diameter (d_m)	0.440 in
Weight (Approx.)	1.9 g
Dimensional Outline	JEDEC No.4-4
Envelope	JEDEC Designation MT4
Base[a]	Medium-Ceramic-Wafer Twelvar 5-Pin (JEDEC E5-65)
Basing Designation for BOTTOM VIEW	12AQ

Pin 1[b] – Do Not Use
Pin 2 – Plate
Pin 3[b] – Do Not Use
Pin 4 – Grid
Pin 5[b] – Do Not Use
Pin 6[b] – Do Not Use
Pin 7[b] – Do Not Use
Pin 8 – Cathode
Pin 9[b] – Do Not Use
Pin 10 – Heater
Pin 11 – Omitted
Pin 12 – Heater



INDEX=LARGE LUG
●=SHORT PIN—IC

TYPICAL OPERATION

In High-Input-Impedance, Cathode-Follower Circuit

Heater Voltage	E_f	6.3	V
Plate Supply Voltage	E_{bb}	150	V
Cathode Bias Resistor (Bypassed)	$R_{k(bias)}$	3.3	kΩ
Cathode Load Resistor	$R_{k(load)}$	15	kΩ
Grid Resistor	R_g	100	MΩ
Input Resistance (Approx.)	R_i	1	GΩ
Output Resistance (Approx.)			
Source resistance (R_S) = 1 GΩ	R_o	7	kΩ
Average Grid Current	$I_{c(av)}$	-0.1	nA
Average Plate Current	$I_{b(av)}$	0.3	mA

[a] Designed to mate with Cinch Mfg. Co. Socket No. 133 65 92 025, 133 65 91 034, or equivalent.

[b] Pins 1, 3, 5, 6, 7, and 9 are of a length such that their ends do not touch the socket insertion plane.

[c] Measured on metal shell in Zone "A" (See *Dimensional Outline*).

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INITIAL CHARACTERISTICS LIMITS

	Note	Min	Max	
Heater Current	1	90	110	mA
Direct Interelectrode Capacitances				
Grid to plate	2	-	0.7	pF
Input: G to (K, S, H)	2	3.0	3.8	pF
Output: P to (K, S, H)	2	1.5	1.9	pF
Plate to cathode	2	0.17	0.23	pF
Grid to cathode	2	2.2	3.0	pF
Heater to cathode	2	0.8	1.2	pF
Amplification Factor	3	95	160	
Transconductance	3	2200	4000	μmho
Plate Current	3	0.7	2.3	mA
Cutoff Plate Current	4	-	200	μA
AC Voltage Amplification	5	7	-	V
Total Grid Current	6	-	-0.05	μA
Heater-Cathode Leakage Current	7	-	±5	μA
Leakage Resistance				
Between grid and all other electrodes connected together	8	50	-	GΩ
Between plate and all other electrodes connected together	9	100	-	GΩ
Inoperatives	10		✓	

Note 1: With E_f = 6.3 V.

Note 2: Measured without external shield.

Note 3: With E_f = 6.3 V, E_{bb} = 120 V, E_{cc} = 0 V, R_k = 200 Ω, C_k = 1000 μF, metal shell grounded.

Note 4: With E_f = 6.3 V, E_b = 120 V, E_c = -1.7 V, metal shell grounded.

Note 5: With E_f = 6.3 V, E_{bb} = 120 V, E_{cc} = 0 V, R_g = 10 MΩ, $C_{c(in)}$ = 0.1 μF, grid-signal-source internal impedance < 2500 Ω, E_g = 0.2 V (rms, 60 c/s, sinewave), R_p = 0.5 MΩ, $C_{c(out)}$ = 0.5 μF. RMS voltage component measured across the series plate resistor with a 5 MΩ (min.) input impedance vacuum-tube voltmeter.

Note 6: With E_f = 6.3 V, E_b = 200 V, E_{cc} = -1 V, R_g = 1 MΩ, metal shell grounded.

Note 7: With E_f = 6.3 V, E_{hk} = ±100 V.

Note 8: With E_f = 6.3 V, $E_{g\text{-}all}$ = -100 V, metal shell grounded.

Note 9: With E_f = 6.3 V, $E_{p\text{-}all}$ = -300 V, metal shell grounded.

Note 10: Tubes are criticized for Shorts, Discontinuities, and Air Leaks.

ENVIRONMENTAL TESTS

High-Impact, Short-Duration Shock

Peak Impact Acceleration	1000	g
Duration of Approximate Half-Sine-Wave Mechanical-Shock Pulse	0.8 ± 0.2	ms

Operating Conditions during Test

E_f = 6.3 V, E_{bb} = 120 V, E_{cc} = 0 V, R_k = 200 Ω, R_g = 1 MΩ, E_{hk} = 100 V.

	Min	Max	
Post-Shock Limits and Rejection Criteria			
E_{Rp} (AC Voltage Amplification)	6	-	V
I_c	-	-0.1	μA
I_{hk}	-	±10	μA
E_{Rpm} (Variable-Frequency-Vibration Test Limits) over Vibration-Frequency Range of:			
3 to 6 kc/s	-	50	mV
6 to 15 kc/s	-	1000	mV
Tap and Permanent Shorts, and Discontinuities	✓		

Low-Impact, Long-Duration Shock

Peak Impact Acceleration	50	g
Duration of Approximate Half-Sine-Wave Mechanical-Shock Pulse	11 ± 2	ms

Condition during Test
No tube-element voltages are applied.

Post-Shock Limits and Rejection Criteria
Same as those specified above for the High-Impact, Short-Duration Shock Test.

Sweep-Frequency-Vibration Fatigue

Vibration-Frequency Range (Overall)	5 to 500 to 5	c/s
Peak Displacement		
5 to 50 & 50 to 5 c/s	0.040	in
Peak-to-peak value	0.080	in
Peak Vibrational Acceleration	10	g
50 to 500 to 50 c/s		
Period of 1 Sweep Cycle (Approx.)	15	m
5 to 500 to 5 c/s		
Duration of Test (Overall)	9	h
Along each of 3 mutually perpendicular axes	3	h

Operating Condition during Test
E_f = 6.3 V

Post-Sweep-Frequency-Vibration-Fatigue Limits and Rejection Criteria
Same as those specified above for the High-Impact-Short-Duration Shock Test.

Variable-Frequency Vibration

Vibration-Frequency Range (Overall)	3 to 15	kc/s
Peak Vibrational Acceleration	1	g
In X_1 position		
Period of 1 Sweep Cycle (3 to 15 kc/s)	7	s

Operating Conditions during Test
E_f = 6.3 V, E_{bb} = 120 V, E_{cc} = 0 V, R_k = 200 Ω, R_p = 2 kΩ.

Limits	Min	Max	
E_{Rpm} over Vibration-Frequency Range of:			
3 to 6 kc/s	-	35	mV
6 to 15 kc/s	-	700	mV

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LIFE TESTS

Heater Cycling

Duration of Test . . . . . **2000 cycles**

Operating Conditions

E_f = 8.5 V cycled 1 minute ON and 2 minutes OFF, E_{hk} = −180 V continuously ON.

Rejection Criteria

Heater–Cathode Shorts, and Heater and Cathode Discontinuities.

Intermittent Operation (2, 20, 100, 500, and 1000 Hours)

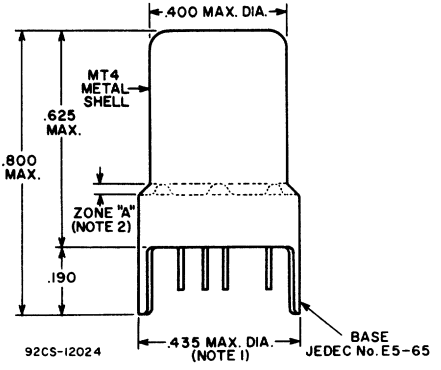
Operating Conditions

E_f = 6.3 V cycled 110 minutes ON and 10 minutes OFF, E_b = 120 V, E_{cc} = −1 V, E_{hk} = 100 V, R_k = 0 Ω, R_g = 1 MΩ, P_b = 0.3 W (approx.), T_E = 150°C min.

End-Point Limits *At*	*2 and 20*		*100*		*500*		*1000*		*h*
	Min	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*	
g_m	–	–	2000	–	–	–	–	–	μmho
$\Delta g_m/t$	–	±10	–	–	–	–	–	–	%
$\Delta E_{Rp}/t$	–	–	–	–	–	±10	–	±15	%
Avg $\lvert\Delta E_{Rp}/t\rvert$	–	–	–	–	–	7	–	10	%
I_c	–	–	–	−0.05	–	−0.1	–	−0.1	μA
I_{hk}	–	–	–	–	–	±10	–	±10	μA

DIMENSIONAL OUTLINE

JEDEC No. 4-4

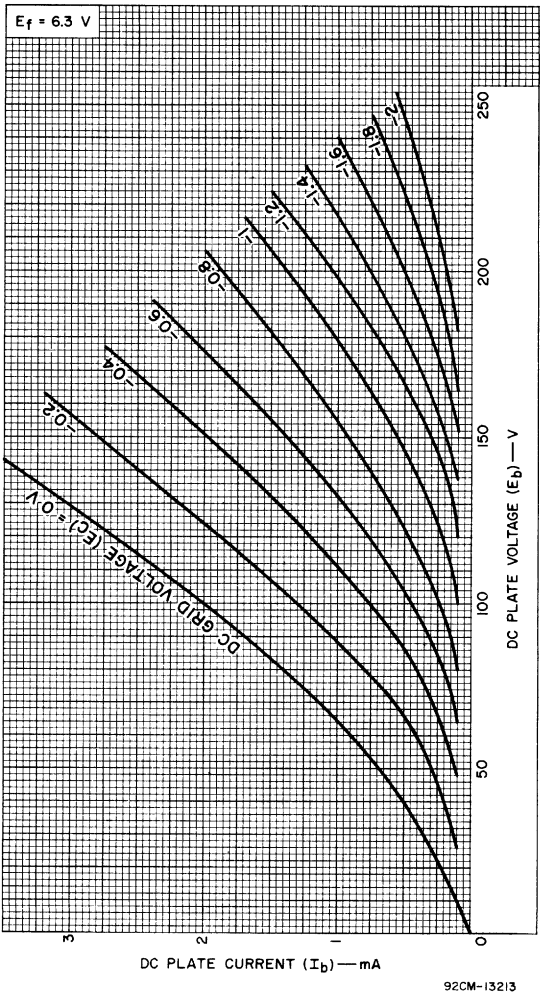


DIMENSIONS IN INCHES

Note 1: Maximum outside diameter of 0.440" is permitted along 0.190" lug length.

Note 2: Envelope temperature should be measured in zone "A".

Typical Plate Characteristics



92CM-13213

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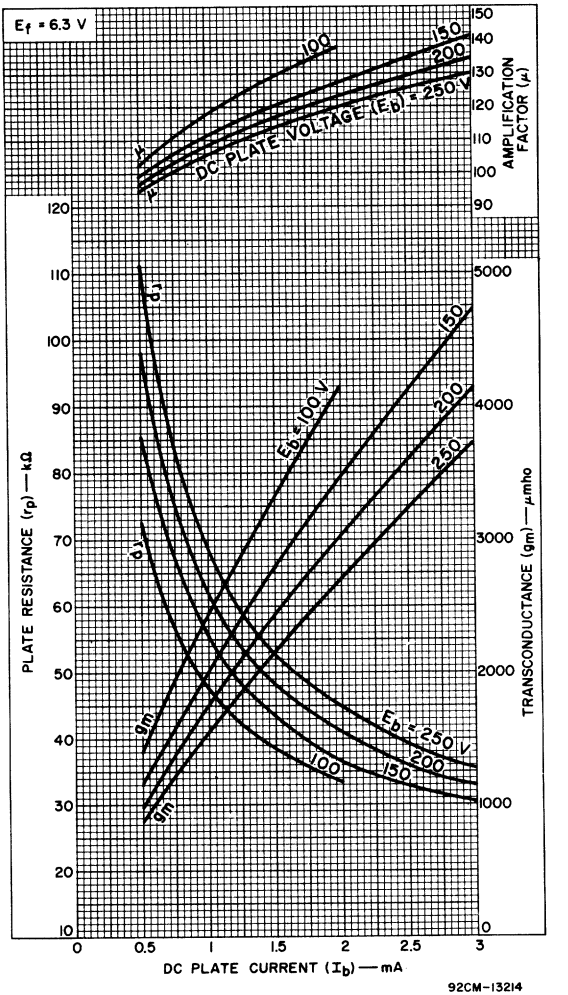
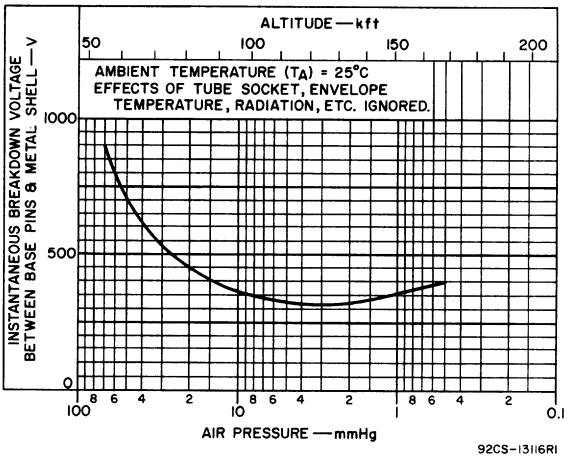
Typical Characteristics



Breakdown-Voltage Characteristic



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High Power Magnetron

Ceramic-Metal Construction

CW Oscillator
30 Kilowatts at 915 MHz

80% Efficiency
Liquid Cooled

MAGNETRON

ELECTRICAL

Filament, Tungsten Coil

AC Supply Voltage	12.5 V
Current[a] at 12.5 volts	115 A
Starting Current	Must never exceed 250 amperes, even momentarily
Cold resistance	0.010 Ω
Minimum heating time at normal filament voltage before anode voltage is applied	10 s
Center Frequency	915 ± 15 MHz
Focusing[b]	Electromagnet, using AJ2134, AJ2134V1, or equivalent

MECHANICAL

Operating Position	Vertical, either end up
Maximum Overall Length	18.25"
Maximum Diameter	4.94"
Terminal Connections	See *Dimensional Outline*
Weight (Approx.)	16 lbs

THERMAL

Ceramic-Insulator Temperature	150 max.	°C
Metal-Surface Temperature	100 max.	°C

Air Cooling

It is important that the temperature of any external part of the tube should not exceed the specified values. Uniform forced-air cooling of the output ceramic dome is required; with an RCA-AJ2134 or -AJ2134V1 Waveguide Adapter, approximately 20 cfm at 2.5 inches of water is adequate. Forced-air cooling of filament-terminal stem is also required. Approximately 5 cfm at 2 inches of water is required when using the RCA-AJ2137 Filament Connector. The air flow must start before application of the filament voltage and preferably should continue for several minutes after removal of the voltage. Interlocking of the air flow with the filament power supply is recommended to prevent tube damage in case of failure of adequate air flow.

Liquid Cooling

Liquid cooling of the anode is required. The liquid flow must start before application of the filament voltage and preferably

should continue for several minutes after removal of the voltage. Interlocking of the liquid flow with the filament power supply is recommended to prevent tube damage in case of failure of adequate liquid flow. When the liquid is water, the use of distilled or filtered deionized water is essential.

For information on the cooling system and quality of water, see *Cooling Considerations* under *RCA Transmitting Tube Operating Considerations* at front of this section.

Typical Water Flow to tube for 6 kW Anode Dissipation	3 gpm
Pressure Drop, at 3 gpm	25 psi
Maximum Outlet Water Temperature	70 °C
Maximum Inlet Water Pressure	100 psig

CW OSCILLATOR

Absolute-Maximum Ratings

DC ANODE VOLTAGE[c]	14 kV
ANODE CURRENT	3 A
ANODE DISSIPATION	15 kW
LOAD VSWR[d]	
At a Power Output of 30 kW.	1.1:1
At a Power Output of 25 kW.	2.5:1
At a Power Output of 20 kW.	3.0:1

Typical Operation at 915 MHz

AC Filament Voltage	11.7	11.4	11.4	V
Filament Current[a]	105	100	100	A
DC Anode Voltage	7.0	12.5	12.6	kV
Anode Current	2.0	2.4	2.8	A
DC Electromagnet Current	1.8	3.1	3.1	A
Useful Power Output[e]	10	25	30	kW
Efficiency	78	84	86	%

[a]The filament is subjected to back bombardment during operation. This will increase the filament temperature and shorten tube life if left uncorrected. Therefore, the filament current should be reduced under operating conditions to a value that will give the same "hot filament resistance" as when no rf power is being generated. The operating filament current must be established in the following manner:

(1) With no anode voltage applied, set the filament current to 115 amperes without exceeding the starting current of 250 amperes. Calculate the "hot filament resistance" after the filament has stabilized (approximately 5 minutes) by dividing the applied filament voltage by the filament current.

(2) Apply power to the electromagnet (See *Magnetron Operating Considerations*, **Electromagnet Operation**), and then apply the desired anode voltage.

(3) Reduce the filament current in approximate 5-ampere steps until the "hot filament resistance" is the same as that calculated in Step 1. See *Typical Operation* data for approximate operating current.

(4) To restart the magnetron after the anode voltage has been removed, reset the filament current to 115 amperes, apply anode voltage and after the tube is generating power, reduce the filament current to the operating value determined in Step 3.

[b] The magnetic field must be turned "on" before application of the anode voltage and turned "off" only after removal of the anode voltage. For further details, see *Waveguide Adapter.*

[c] The anode is normally grounded.

[d] Refer to *Typical Rieke Diagram* for the effects of load VSWR on power output and frequency.

[e] At a load VSWR not exceeding 1.1:1.

MAGNETRON OPERATING CONSIDERATIONS

For considerations common to all RCA super-power tubes, see *Application Guide for RCA Super Power Tubes, ICE-279A.* **Additional considerations specifically for the 8684 are given below.**

Use of RF-Gasket

The rf connection between the magnetron and waveguide adapter is made by an rf gasket, RCA-AJ2138 or equivalent.

Harmonic Radiation Shielding

Harmonic energy may be radiated through the high-voltage and filament insulators. An rf shielded enclosure or suitable absorbing material may be required to reduce the harmonic radiation to acceptable levels.

Electromagnet Operation

To establish the electromagnet coil current when a tube is first installed, it is recommended that the electromagnet coil current be set at a value that will keep the magnetron anode current cut off when the anode voltage is applied. The typical electromagnet coil current necessary to achieve anode current cutoff with various anode potentials is shown in Fig.2. In no case should the coil current exceed 4.0 amperes. After the anode voltage has been applied, the electromagnet coil current should be gradually reduced to give the required magnetron rf power output. The magnetron anode current and rf power output will increase slowly as the magnet coil current is gradually reduced.

When the tube is restarted after it has been shut down, the electromagnet coil current may be reset at the value determined above provided the coil is not connected in series with the magnetron anode supply. See *Wave-Guide Adapter,* **Operating Considerations** for electromagnet and tube operation with the coil connected in series with the magnetron anode supply.

RF-RADIATION WARNING

Because the 8684 is designed to generate high rf power levels at high frequencies, care must be taken to protect personnel from possible injury due to rf-radiation leakage.

Care must be exercised by the equipment designer and tube operator to insure that the rf seals obtained between the tube RF Output Terminal Contact Surface (See *Dimensional Outline*) and *Waveguide Adapter*, between waveguide flanges, and between the waveguide and rf probes are adequate to limit the rf leakage radiation to safe values.

CONNECTORS

RCA-AJ2137 is a connector for contacting the **filament** terminal of the magnetron. It contains a duct to permit forced-air cooling of the filament terminal, filament insulator, and the filament-cathode connector. This connector includes a 10-inch long braided lead with connector lug for 3/8-inch bolt.

RCA-AJ2136 is a connector for contacting the **filament-cathode** terminal of the magnetron. This connector includes a 10-inch long braided lead with connector lug for 3/8-inch bolt.

RCA-AJ2136V1 is a variant of the AJ2136 described above. It features a molded material which suppresses spurious radiation from the high-voltage insulator area of the magnetron.

AJ2137		
AC or DC Current (typical)	115	A
Pressure Drop, at air flow of 5 ft ^{3}/min	2	inches of water
AJ2136		
AC or DC Current (typical)	115	A
AJ2136V1		
AC or DC Current (typical)	115	A
Spurious Radiation Attenuation:		
Minimum	10	dB
Typical	12	dB

WAVEGUIDE ADAPTER

RCA–AJ2134 and AJ2134V1 Waveguide Adapters include the necessary electromagnet and rf circuitry for coupling rf energy from the 8684 to WR975 waveguide. The AJ2134 and the AJ2134V1 are identical except for the waveguide connector flange.

ELECTRICAL

DC Coil Voltage	39 V
Coil Current at 39 volts	3.0 A
Voltage Transients Across Electromagnet	Must never exceed 500 volts, even momentarily

MECHANICAL

Maximum Overall Length	23.4"
Maximum Height	16.62"
Maximum Width	13.50"
Mounting Bracket	See *Assembly Outline*
Electromagnet Electrical Terminal Connection	See *Assembly Outline*
Electromagnet Coolant Connections	See *Assembly Outline*
Weight (Approx.)	145 lbs.

THERMAL

Liquid Cooling

Liquid Cooling of the electromagnet coil is required. The liquid flow must start before application of the electromagnet voltage and preferably should continue for several minutes after removal of the voltage. Interlocking of the liquid flow with the electromagnet and the magnetron high voltage supply is recommended to prevent damage to the electromagnet and/or tube in case of failure of adequate liquid flow.

Typical Water Flow for coil dissipation of 140 watts	0.25 gpm
Maximum Pressure Drop, at 0.25 gpm	10 psi
Maximum Outlet Water Temperature	70 °C
Maximum Inlet Water Pressure	100 psig

Absolute-Maximum Ratings

DC Electromagnet Voltage [f]	50 V
DC Electromagnet Power	190 watts

[f] A shunt protection circuit such as provided by a thyrite is recommended for protecting the electromagnet from high voltage transients.

WAVEGUIDE ADAPTER OPERATING CONSIDERATIONS

See RCA-8684 Ratings for Typical Operation and Magnetron Operating Considerations. The electromagnet may be operated with a separate current-regulated power supply or it may be connected in series with the anode of the RCA-8684 magnetron, as shown in Fig.1, to minimize the sensitivity of the rf power output to anode voltage variations. In the series connected mode a separate power supply must also be connected to the electromagnet to (1) allow setting the coil current to the level required for proper tube operation (2) allow slight compensation for changes in the electromagnet coil resistance due to heat, and (3) permit the application and interruption of the magnetron anode voltage without creating excessive transient voltages across unprotected electromagnet coils.

To prevent damage to a non-protected electromagnet in the series connected mode, the magnetron anode voltage must neither be applied nor removed without first increasing the electromagnet coil current to a level that will keep the magnetron anode current cut off. The typical electromagnet coil current necessary to achieve anode current cutoff with various anode potentials is shown in Fig.2. Once the anode voltage is applied, the electromagnet coil current may be reduced to the required level by adjusting the output of the electromagnet supply. The magnetron anode current and rf power output will increase slowly as the coil current is gradually reduced.

SERIES CONNECTED POWER SUPPLY FOR ELECTROMAGNET OPERATION

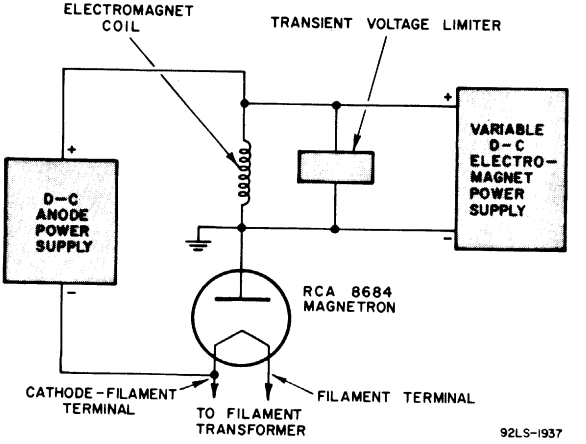
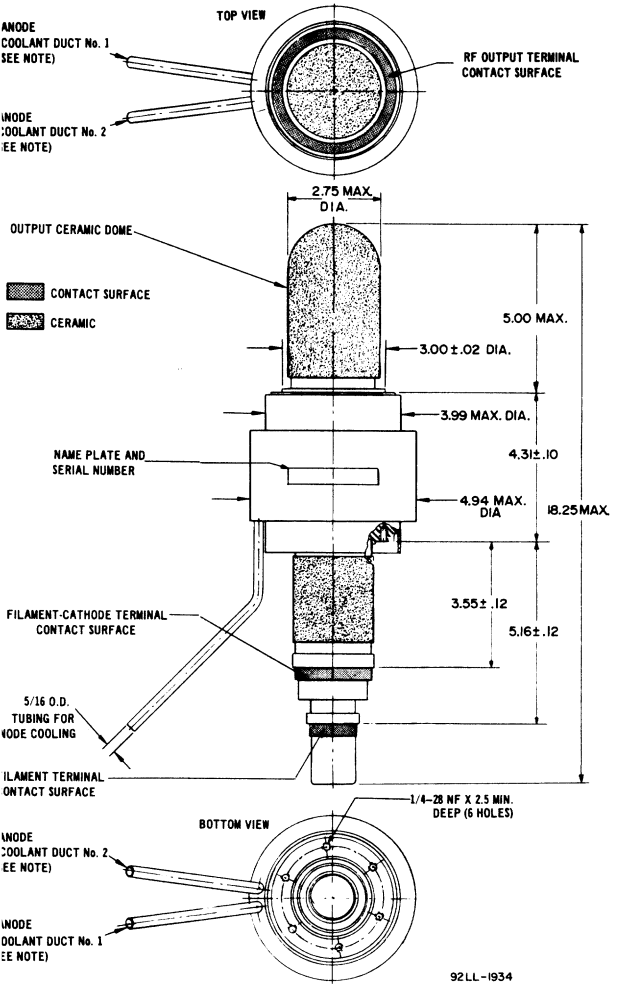


Fig.1

DIMENSIONAL OUTLINE



NOTE: Recommended direction of anode coolant flow: Duct #1 is "IN" and Duct #2 is "OUT" when tube is operated with Output Ceramic Dome UP. With Output Ceramic Dome DOWN, the flow should be reversed.

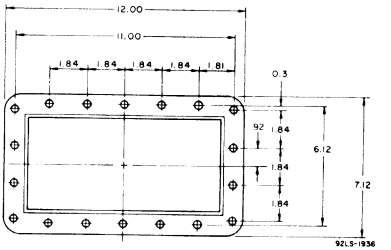
ACCESSORIES

RCA Type No.	Description
AJ2134	Waveguide Adapter; mates with EIA Standard CRP975F(WR975) Waveguide Flange.
AJ2134V1	Waveguide Adapter; mates with Alternate Waveguide Flange (See Flange on Assembly Outline.)
AJ2135	Magnetic Pole Piece
AJ2136	Filament-Cathode Connector
AJ2136V1	Filament-Cathode Connector with Molding
AJ2137	Filament Connector
AJ2138	RF Gasket
AJ2140	Accessory Kit including -AJ2135, -AJ2136, -AJ2137
AJ2141	Accessory Kit including -AJ2135, -AJ2136V1, -AJ2137

AJ2134 Waveguide Adapter flange mates with EIA standard CRP975F (WR975) waveguide flange

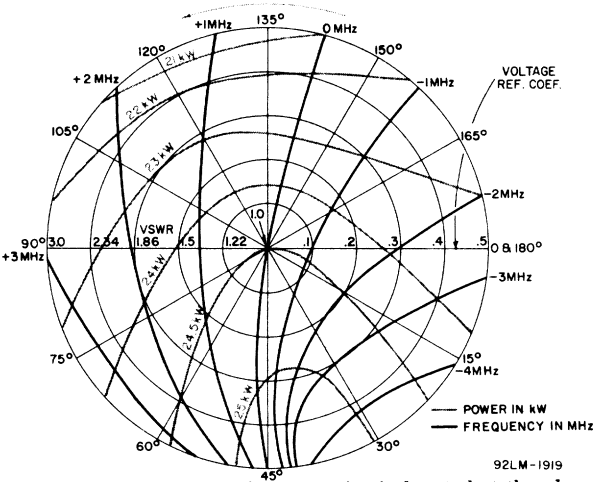
or

AJ2134V1 Waveguide Adapter flange mates with alternate flange shown below



TYPICAL RIEKE DIAGRAM

ANGULAR WAVELENGTH TOWARD LOAD



Note: The zero degree reference point is located at the plane of the waveguide connector flange on RCA-AJ2134 or -AJ2134V1 Waveguide Adapter.

COIL CURRENT vs. ANODE VOLTAGE

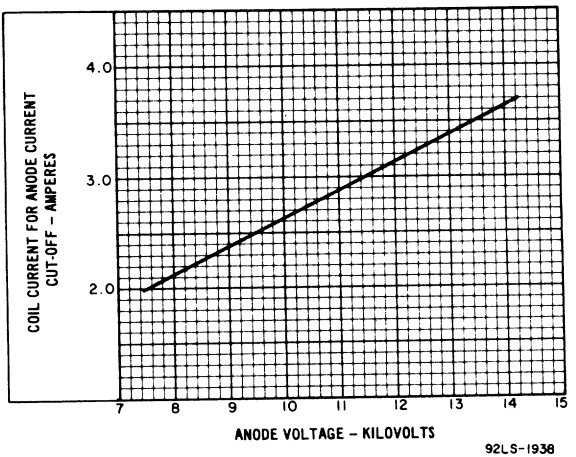
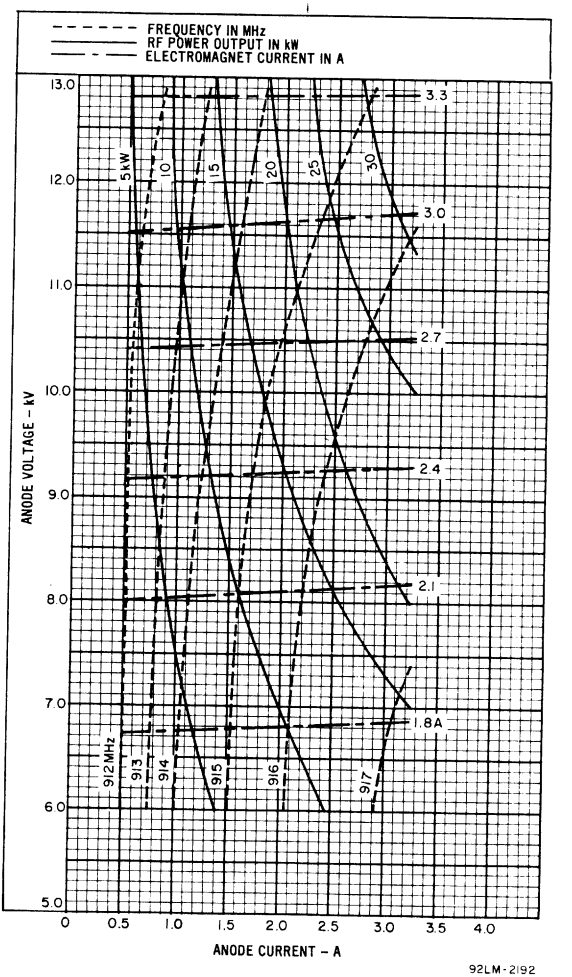


Fig.2

TYPICAL PERFORMANCE CHARACTERISTICS



92LM-2192

8791

Beam Power Tube

CERMOLOX

1.0 kW VHF-TV
Ruggedized
Forced-Air Cooled

38 dB 3rd Order Distortion
500 W PEP SSB up to 400 MHz
Matrix Oxide Cathode

ELECTRICAL

Heater-Cathode:

Type	Unipotential, Oxide Coated, Matrix Type	
Voltage (ac or dc)	6.3 ± 5%	V
Current at 6.3 V	7.5	A
Heating Time	120 min.	s
Mu-Factor (Grid No.2 to Grid No.1)	13	

MAXIMUM CCS RATINGS, Absolute-Maximum Values

DC Plate Voltage	3000	V
DC Grid No.2 Voltage	750	V
DC Plate Current	500	mA
Grid No.2 Input	25	W
Plate Dissipation	1000	W

MECHANICAL

Operating Position:	Any
Weight (Approx.)	12 oz (0.3 kg)

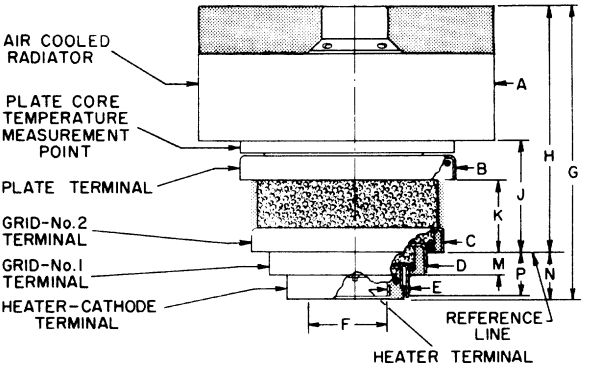
THERMAL[a]

Seal Temperature	250 max.	°C
Plate-Core Temperature	250 max.	°C

[a] See *Dimensional Outline* for temperature measurement points.
[b] Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.

DIMENSIONAL OUTLINE



DIMENSION	INCHES	MILLIMETERS
A Dia.	2.52 Max.	64.0 Max.
B Dia.	1.745 Min.	44.32 Min.
C Dia.	1.590 Min.	40.38 Min.
D Dia.	1.290 Min.	32.76 Min.
E Dia.	0.99 Min.	25.14 Min.
F Dia.	0.67 Max.	17.02 Max.
G	2.40 Max.	60.96 Max.
H	1.94 ±.04	49.28 ±1.01
J	0.895 ±.035	22.73 ± .88
K	0.575 ±.025	14.61 ± .63
M	0.20 ±.02	6.08 ± .50
N	0.40 ±.020	10.16 ± .50
P	0.385 ±.025	9.78 ± .63

VHF-TV Amplifier Tube

1000W Peak Sync. Output in VHF-TV Service

CERMOLOX®

Ruggedized, Reliable — **Full Input to 400 MHz**

Forced-Air Cooled — **Matrix Oxide Cathode**

ELECTRICAL

Heater-Cathode:

Type	Unipotential, Oxide Coated, Matrix Type	
Voltage (ac or dc)	6.3 typ. 6.6 max.	V V
Current at 6.3 volts	7.5	A
Minimum Heating Time	120	s
Mu-Factor, (Grid No.2 to Grid No.1)	13	

GRID-MODULATED RF POWER AMPLIFIER— CLASS C TELEVISION SERVICE

Maximum CCS Ratings, Absolute-Maximum Values	Up to 216 MHz	
DC Plate Voltage	3000	V
DC Grid No. 2 Voltage	750	V
DC Grid No. 1 Voltage (white level)	−250	V
DC Plate Current	750	mA
Grid No. 2 Input	25	W
Plate Dissipation	1000	W
Grid No. 1 Current	100	mA

MECHANICAL

Operating Position	Any	
Weight (Approx.)	3/4 lb	(0.3 kg)

THERMAL[a]

Seal Temperature[c] (Plate, Grid No.2, Grid No.1, Cathode-Heater and Heater)	250 max.	°C
Plate-Core Temperature	250 max.	°C

[a] See *Dimensional Outline* for temperature measurement points.
[b] Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

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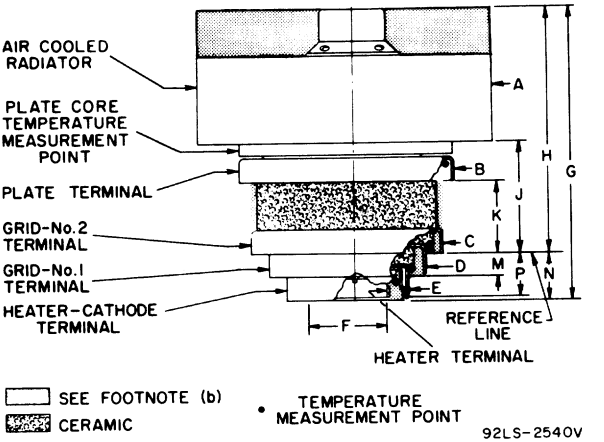
DIMENSIONAL OUTLINE



DIMENSION	INCHES	MILLIMETERS
A Max.	2.52	(64.0) Dia.
B Min.	1.745	(44.32) Dia.
C Min.	1.590	(40.38) Dia.
D Min.	1.290	(32.76) Dia.
E Min.	0.99	(25.14) Dia.
F Max.	0.67	(17.02) Dia.
G Max.	2.44	(62.0)
H	1.98 ± .04	(50.29 ± 1.01)
J	0.830 ± .035	(21.08 ± .88)
K	0.575 ± .025	(14.61 ± .63)
M	0.20 ± .02	(5.08 ± .51)
N	0.40 ± .02	(10.16 ± .51)
P	0.385 ± .025	(9.78 ± .63)

8792

Beam Power Tube

CERMOLOX

1000 Watts PEP Output — **Full Input to 400 MHz**
Sturdy, Reliable — **Matrix Oxide Cathode**
37 dB Open Loop Third Order Distortion

ELECTRICAL

Heater-Cathode:		
Type	Unipotential, Oxide Coated, Matrix Type	
Voltage (ac or dc)	5.5 typ.-5.8 max.	V
Current at 5.5 V	17.3	A
Minimum heating time	180	s
Mu-Factor (Grid No.1 to Grid No.2)	6.5	

MAXIMUM CCS RATINGS, Absolute-Maximum Values:

	Up to 400 MHz	
DC Plate Voltages	3500	V
DC Grid-No.2 Voltage	1000	V
DC Plate Current	1.25	A
Grid-No.2 Input	50	W
Plate Dissipation	1.5	kW

MECHANICAL

Operating Position	Any
Weight (Approx.)	2 lb (0.9 kg)

THERMAL[a]

Seal Temperature	250 max. °C
Plate-Core Temperature	250 max. °C

[a] See *Dimensional Outline* for temperature measurement points.
[b] Keep all stippled regions clear. In general do not allow contacts to protrude into these annular regions. If special connectors are required which may intrude on these regions, contact RCA Power Tube Application Engineering, Lancaster, Pa., for guidance.

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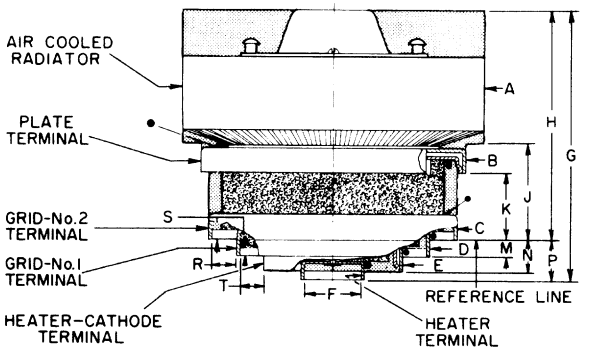
DIMENSIONAL OUTLINE



SEE FOOTNOTE (b) CERAMIC • TEMPERATURE MEASUREMENT POINT

92LL-2420V

DIMENSION	INCHES	MILLIMETERS
A Dia.	3.72 ± .03	94.49 ± .76
B Dia.	3.210 Min.	81.54 Min.
C Dia.	3.010 Min.	76.45 Min.
D Dia.	2.307 Min.	58.60 Min.
E Dia.	1.710 Min.	43.44 Min
F Dia.	0.725 Max.	18.41 Max.
G	3.24 ± .10	82.3 ±2.5
H	2.78 ± .07	70.61 ±1.78
J	1.160 $^{+.005}_{-.000}$	29.464 $^{+.127}_{-.000}$
K	0.82 ± .03	20.83 ± .76
M	0.200 ± .025	5.08 ± .63
N	0.37 ± .03	9.40 ± .76
P	0.46 ± .03	11.68 ± .76
R	0.250 Min.	6.35 Min.
S	0.105 Min.	2.66 Min.
T	0.200 Min.	5.08 Min

VHF-TV Amplifier Tube

1350W Peak Sync. Output in VHF-TV Service

CERMOLOX® — **Full Input to 400 MHz**

Sturdy, Reliable — **Matrix Oxide Cathode**

ELECTRICAL

Heater-Cathode:

Type	Unipotential, Oxide Coated, Matrix Type		
Voltage[a] (ac or dc)	5.5	typ.	V
	5.8	max.	V
Current (@ 5.5 V)	17.3		A
Minimum heating time	180		s
Mu Factor[b] (Grid No.1 to Grid No.2)	6.5		

GRID-MODULATED RF POWER AMPLIFIER— CLASS C TELEVISION SERVICE

MAXIMUM CCS RATINGS, Absolute-Maximum Values:

	Up to 400 MHz	
DC Plate Voltages	3500	V
DC Grid-No. 2 Voltages	1000	V
DC Plate Current	1.25	A
Grid-No. 2 Input	50	W
Plate Dissipation	1500	W
Grid-No. 1 Current	200	mA

MECHANICAL

Operating Position	Any	
Weight (Approx.)	2 lbs	(0.9 kg)

THERMAL[a]

Seal Temperature	250	max.	°C
Plate Core Temperature	250	max.	°C

[a] See *Dimensional Outline* for temperature measurement points.

[b] Keep all stippled regions clear. In general do not allow contacts to protrude into these annular regions. If special connectors are required which may intrude on these regions, contact RCA Power Tube Application Engineering, Lancaster, Pa., for guidance.

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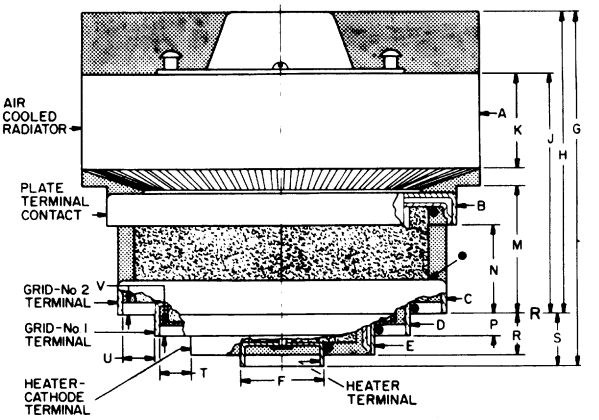


NOTE 2

CERAMIC INSULATOR

TEMPERATURE
MEASUREMENT POINT

92CS-17684

DIMENSION	INCHES	MILLIMETERS
A	3.72 ± .03	(94.49 ± .76) Dia.
B Min.	3.210	(81.54) Dia.
C Min.	3.010	(76.45) Dia.
D Min.	2.307	(58.60) Dia.
E Min.	1.710	(43.41) Dia.
F Max.	0.725	(18.41) Dia.
G	3.24 ± .10	(82.3 ± 2.5)
H	2.78 ± .07	(70.61 ± 1.78)
J	2.19 ± .04	(55.63 ± 1.02)
K Min.	0.85	(21.59)
M	$1.160^{+.005}_{.000}$	$(29.464^{+.127}_{-.000})$
N	0.82 ± .03	(20.83 ± .76)
P	0.200 ± .025	(5.08 ± .63)
R	0.37 ± .03	(9.40 ± .76)
S	0.46 ± .03	(11.68 ± .76)
T Min.	0.200	(5.08)
U Min.	0.250	(6.35)
V Min.	0.105	(2.66)

8793

Beam Power Tube

CERMOLOX

5,000 Watts PEP Output **10,000 Watts Output**
Full Input to 400 MHz **Telegraphy or FM Telephony**
Sturdy, Reliable, Thoriated Tungsten, Mesh Filaments

ELECTRICAL

Filamentary Cathode:		
Type	Thoriated-Tungsten Mesh	
Voltage (ac or dc)	5.7 typ-6.0 max.	V
Current:		
Typical value at 5.7 volts	125	A
Maximum value for starting even momentarily	300	A
Cold Resistance	0.005	Ω
Minimum heating time	15	s
Mu-Factor (Grid No.2 to Grid No.1)	10	

MAXIMUM CCS RATINGS, Absolute-Maximum Values:

	Up to 400 MHz	
DC Plate Voltage	7000	V
DC Grid-No.2 Voltage	1500	V
DC Plate Current at Peak of Envelope	40	A
Plate Dissipation	5.0	kW

MECHANICAL

Operating Position	Vertical, either end up
Weight (Approx.)	6 lb (2.7 kg)

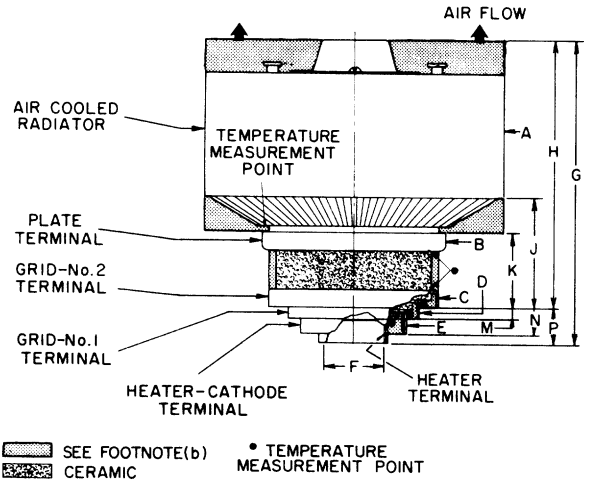
THERMAL [a]

Seal Temperature	250 max. °C
Plate-Core Temperature	250 max. °C

[a] See *Dimensional Outline* for temperature measurement points.
[b] Keep all stippled regions clear. Do not allow contact or circuit components to intrude into these annular volumes.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.

DIMENSIONAL OUTLINE



DIMENSION	INCHES	MILLIMETERS
A Dia.	4.570 Max.	116.07 Max.
B Dia.	3.235 Min.	82.17 Min.
C Dia.	3.014 Min.	76.52 Min.
D Dia.	2.307 Min.	58.60 Min.
E Dia.	1.840 Min.	46.74 Min.
F Dia.	1.210 Max.	30.73 Max.
G	4.795 ± .080	121.79 ± 2.03
H	4.140 ± .050	105.16 ± 1.27
J	1.940 ± .040	49.28 ± .101
K	1.330 ± .030	33.78 ± .76
M	0.200 ± .025	5.08 ± .63
N	0.475 ± .035	12.06 ± .88
P	0.650 ± .030	16.51 ± .76

8794

Beam Power Tube

CERMOLOX

10,000 Watts PEP Output — 15,000 Watts Output
Full Input to 400 MHz — Telegraphy or FM Telephony
Sturdy, Reliable, Thoriated Tungsten, Mesh Filaments

ELECTRICAL

Filamentary Cathode:

Type	Thoriated-Tungsten Mesh	
Voltage (AC or DC)	5.7 typ.–6.0 max.	V
Current:		
Typical value at 5.7 volts	125	A
Maximum value for starting even momentarily	300	A
Cold Resistance	0.005	Ω
Minimum heating time	15	s
Mu-Factor, (Grid-No.2 to Grid-No.1)	10	

MAXIMUM CCS RATINGS, Absolute-Maximum Values:

	Up to 400 MHz	
DC Plate Voltage	8000	V
DC Grid-No.2 Voltage	1650	V
DC Plate Current at Peak of Envelope	4.0	A
Plate Dissipation	12.5	kW

MECHANICAL

Operating Position	Vertical, either end up
Weight (Approx.)	10 lb (4.54 kg)

THERMAL[a]

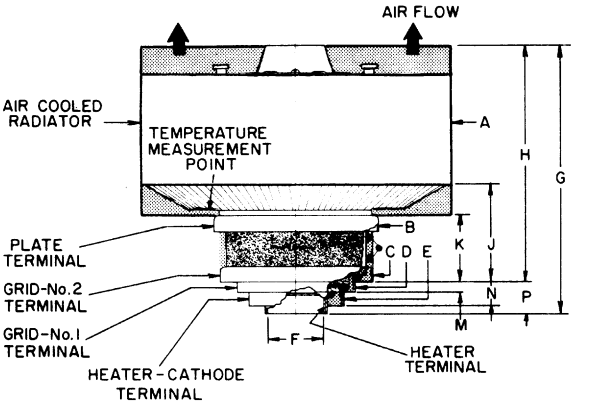
Seal Temperature (Plate, grid No.2, grid No.1, cathode heater, 2nd heater)	250 max.	°C
Plate-Core Temperature	250 max.	°C

[a] See *Dimensional Outline* for temperature measurement points.

[b] Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes. Diameters of stippled areas above air-cooled radiator, plate terminal contact surface, and grid-No.2 terminal contact surface shall not be greater than its associated diameter.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.

DIMENSIONAL OUTLINE



92LM-2544V

DIMENSION	INCHES	MILLIMETERS
A Dia.	6.135 ±.035	155.83 ±.88
B Dia.	3.235 Min.	82.17 Min.
C Dia.	3.014 Min.	76.56 Min.
D Dia.	2.307 Min.	58.60 Min.
E Dia.	1.840 Min.	46.74 Min.
F Dia.	1.210 Max.	30.73 Max.
G	5.370 ±.080	136.4 ±2.0
H	4.715 ±.050	119.7 ±1.2
J	1.940 ±.040	49.28 ±1.01
K	1.330 ±.030	33.78 ±.76
M	0.200 ±.025	5.08 ±.63
N	0.475 ±.030	12.06 ±.76
P	0.650 ±.030	16.51 ±.76

8806

Beam Power Tube

CERMOLOX — **12.5 kW Peak Sync Output**
Full Input to 400 MHz — **thru VHF-TV High Band**
2.5 kW Carrier for Linear Operation

ELECTRICAL

Filamentary Cathode:

Type	Thoriated-Tungsten Mesh	
Voltage (ac or dc)	5.7 typ.-6.0 max.	V
Current:		
Typical value at 5.7 volts	125	A
Maximum value for starting even momentarily	300	A
Cold Resistance	0.005	Ω
Minimum heating time	15	s
Mu-Factor (Grid No.2 to Grid No.1)	20	

MAXIMUM CCS RATINGS, Absolute-Maximum Values

	Up to 400 MHz	
DC Plate Voltage	8000 max.	V
DC Grid-No.2 Voltage	1650 max.	V
DC Grid-No.1 Voltage	−450 max.	V
DC Plate Current	4.0 max.	A
Grid-No.1 Input	150 max.	W
Grid-No.2 Input	250 max.	W
Plate Dissipation	12500 max.	W

MECHANICAL

Operating Position	Vertical, either end up
Weight (Approx.)	10 lb (4.54 kg)

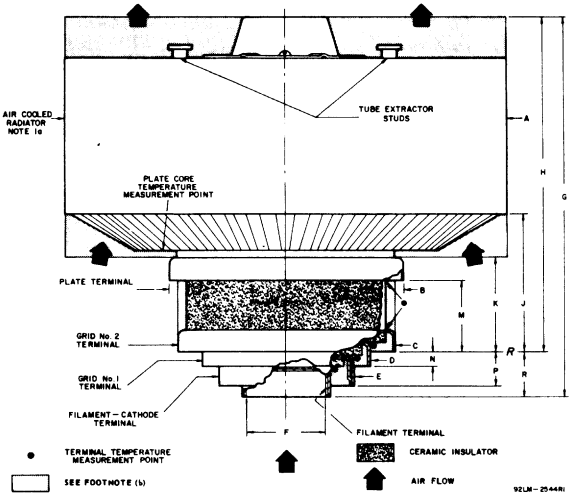
THERMAL[a]

Seal Temperature (Plate, grid No.2, grid No.1, filament-cathode and filament)	250 max.	°C
Plate-Core Temperature	250 max.	°C

[a] See *Dimensional Outline* for temperature measurement points.
[b] Keep all strippled regions clear. Do not allow contacts or circuit components to protrude into these annular regions.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, N.J. 07029.

DIMENSIONAL OUTLINE



DIMENSION	INCHES	MILLIMETERS
A Dia.	6.135 ±.035	155.83 ±.88
B Dia.	3.235 Min.	82.17 Min.
C Dia.	3.014 Min.	76.56 Min.
D Dia.	2.307 Min.	58.60 Min.
E Dia.	1.840 Min.	46.74 Min.
F Dia.	1.210 Max.	30.73 Max.
G	5.370 ±.080	136.4 ±2.0
H	4.715 ±.050	119.7 ±1.2
J	1.940 ±.040	49.28 ±1.01
K	1.330 ±.030	33.78 ±.76
M	1.005 ±.020	25.53 ±.51
N	0.200 ±.025	5.08 ±.63
P	0.475 ±.030	12.06 ±.76
R	0.650 ±.030	16.51 ±.76

8807

Beam Power Tube

CERMOLOX — **20 kW Peak Sync Output**
Full Input to 400 MHz — **Forced-Air-Cooled**
3.75 kW Carrier for Linear Operation

ELECTRICAL

Filamentary Cathode, Thoriated-Tungsten Mesh Type:

Voltage (ac or dc)	9.5 typ. 10.0 max.	V V
Current:		
Typical value at 9.5 volts	145	A
Maximum value for starting, even momentarily	300	A
Cold Resistance	0.01	Ω
Minimum heating time	15	s
Mu-Factor (Grid No.2 to Grid No.1)	10	

MAXIMUM CCS RATINGS, Absolute-Maximum Values

	Up to 400 MHz	
DC Plate Voltage	10,000 max.	V
DC Grid-No.2 Voltage	2000 max.	V
DC Plate Current at Peak of Envelope	6.0 max.	A
DC Grid-No.1 Current	500 max.	mA
Grid-No.2 Input	450 max.	W
Plate Dissipation	15 max.	kW

MECHANICAL

Operating Position	Vertical, either end up
Weight (Approx.)	12 lb (5.5 kg)

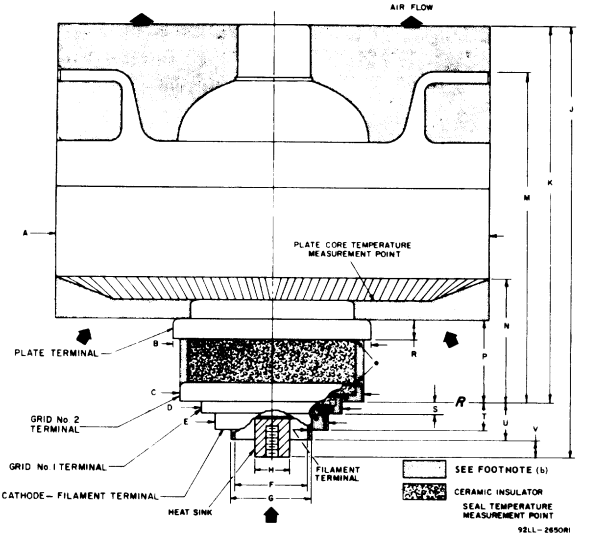
THERMAL[a]

Seal Temperature (Plate, Grid No.2, Grid No.1. Cathode-Filament, and Filament)	250 max.	°C
Plate-Core Temperature	250 max.	°C

[a] See *Dimensional Outline* for temperature measurement points.
[b] Keep all strippled regions clear. Do not allow contacts or circuit components to protrude into these annular regions.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, N.J. 07029.

DIMENSIONAL OUTLINE



DIMENSION	INCHES	MILLIMETERS
A Dia.	7.075 ±.035	179.71 ±.89
B Dia.	3.235 Min.	82.17 Min.
C Dia.	3.014 Min.	76.56 Min.
D Dia.	2.307 Min.	58.60 Min.
E Dia.	1.840 Min.	46.74 Min.
F Dia.	1.210 Max.	30.73 Max.
G Dia.	1.314 Min.	33.38 Min.
H Dia.	0.620 Max.	15.75 Max.
J	7.345 Max.	186.56 Max.
K	6.30 Max.	160.0 Max.
M	5.50 Ref.	139.7 Ref.
N	2.04 ±.04	51.8 ±1.0
P	1.33 ±.03	33.8 ±.8
R	0.325 Ref.	8.26 Ref.
S	0.200 ±.025	5.08 ±.63
T	0.50 ±.03	12.7 ±.8
U	0.76 ±.04	19.3 ±1.0
V	0.25 Ref.	6.4 Ref.

8808

High-Mu Triode

NUVISTOR TYPE

For Cathode-Drive, Low-Level Class-C RF-Power-Amplifier, Oscillator, or Frequency-Multiplier Applications to 1.2 GHz

ELECTRICAL CHARACTERISTICS - Bogey Values

Heater Voltage, dc or ac	E_h	6.3	V
Heater Current at E_h = 6.3 V.	I_h	340	mA
Direct Interelectrode Capacitances:			
Without external shield			
Input: K to (G, S, H)	c_i	9.6	pF
Output: P to (G, S, H).....	c_o	2.7	pF
Heater to cathode	c_{hk}	2.6	pF
Plate to cathode.....	c_{pk}	0.050	pF
For the following characteristics, see Conditions below:			
Amplification Factor	μ	100	
Plate Resistance (Approx.) ..	r_p	6400	Ω
Transconductance.....	g_m	18000	μmho
DC Plate Current.....	I_b	15	mA
Cutoff DC Grid Voltage for I_b = 10 μA	$E_{c(co)}$	-5	V
Conditions			
Heater Voltage.....	E_h	6.3	V
Plate Supply Voltage	E_{bb}	200	V
Grid Supply Voltage	E_{cc}	0	V
Cathode Resistor.....	R_k	68	Ω

MECHANICAL CHARACTERISTICS

Dimensional Outline.....	See Outline Drawing
Maximum Overall Length (l_m)	0.985 in
Maximum Seated Length (l_{sm}).....	0.780 in
Maximum Diameter (d_m)	0.440 in
Envelope	JEDEC Designation MT4
Top Cap[a]	Small (JEDEC Designation C1-46)

Base[a] ..... Medium-Ceramic-Wafer Twelvar 6-Pin (JEDEC Designation E6-93)

Type of Cathode ..... Coated Unipotential

Operating Position ..... Any

Cooling ..... Conduction

MAXIMUM RATINGS - Absolute-Maximum Values[b]

For operation as a low-level class-C rf-power-amplifier, oscillator, or frequency-multiplier tube at frequencies up to 1.2 GHz

		ICAS[c]	
Plate Supply Voltage (E_{bb})			
Up to 50,000 feet		1000[d]	V
Above 50,000 feet	See *Breakdown-Voltage Characteristics*		
DC Plate Voltage	E_b	1000	V
Grid Voltage:			
Peak	e_c	30	V
DC	E_c	+0	V
		-100	V
Peak Heater-Cathode Voltage	e_{hk}	±100	V
Heater Voltage, dc or ac	E_h	5.7 to 6.9	V
Peak Cathode Current	i_k	1000	mA
		See *Pulse-Rating Chart*	
Average Cathode Current	I_k	75	mA
Plate Dissipation	P_b	6[e]	W
Grid Dissipation	P_g	200	mW
		See *Grid-Dissipation Rating Chart*	
Envelope Temperature[f]	T_E	200	°C

MAXIMUM CIRCUIT VALUES

		ICAS	
Grid-Circuit Resistance:	R_g		
For fixed-bias or cathode-bias operation:		50	kΩ
		See *Grid-Circuit-Resistance Rating Chart*	

TYPICAL OPERATION - CCS[g]

As cathode-drive rf power amplifier

Frequency	f	1	GHz
Heater Voltage	E_h	6.3	V
DC Plate-to-Grid Voltage	E_{bg}	206	V

DC Cathode-to-Grid Voltage ..	E_{kg}	5.8	V
From grid resistor of	R_g	300	Ω
Average Plate Current	I_b	50	mA
Average Grid Current	I_c	19	mA
Driving Power (Approx.)	P_g	1.0	mW
Useful Power Output (Approx.)	P_o	5	W
As cathode-drive frequency doubler			
Output Frequency	f_o	1.2	GHz
Heater Voltage	E_h	6.3	V
DC Plate-to-Grid Voltage.....	E_{bg}	200	V
DC Cathode-to-Grid Voltage.	E_{kg}	11	V
From grid resistor of	R_g	1000	Ω
Average Plate Current	I_b	38	mA
Average Grid Current	I_c	10.5	mA
Driving Power (Approx.)	P_g	1	W
Useful Power Output (Approx.).	P_o	2	W

TYPICAL OPERATION

As pulsed cathode-drive class-C amplifier

Output Frequency	f_o	1	1	GHz
DC Plate-to-Grid Voltage	E_{bg}	500	1000	V
DC Cathode-to-Grid Voltage ...	E_{kg}	16	20	V
Average Plate Current	I_b	9	4.75	mA
Average Grid Current	I_c	5.5	1.4	mA
Duty Factor	-	2.5	1	%
Pulse Length	-	5	5	μs
Peak Driving Power	-	30	50	W
Average Driving Power	-	0.75	0.5	W
Peak Useful Power Output (Approx.)	-	105	240	W
Average Power Output	-	2.5	2.4	W
Plate Dissipation (Approx.) ..	-	2.4	2.7	W
Gain.....	-	5.4	6.8	dB

[a] See *Socket and Connector Information.*

[b] As defined in the current issue of EIA Standard RS-239.

[c] Intermittent Commercial and Amateur Service.

[d] Under no circumstances should this absolute-maximum value be exceeded. For high-altitude operation, the maxi-

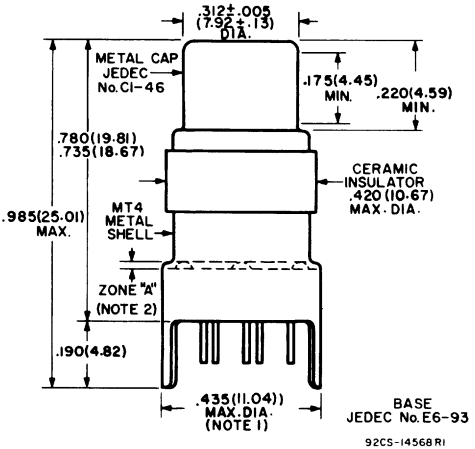
mum permissible plate voltage is dependent on atmospheric pressure.

[e] This rating applies when the plate-seal temperature is maintained below 200°C by means of an external heat sink such as the center conductor of a coaxial resonator. If no provision is made for additional heat removal, the maximum seal temperature of 200°C will not be exceeded with 4 watts of plate dissipation and a chassis temperature of 25°C.

[f] Measured on metal shell in Zone "A" (See *Dimensional Outline*).

[g] Continuous Commercial Service.

DIMENSIONAL OUTLINE - Dimensions in Inches (mm)

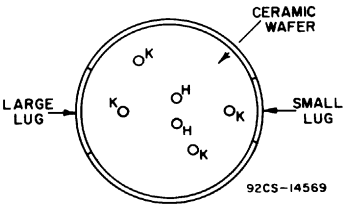


Note 1: Maximum outside diameter of 0.440" (11.17 mm) is permitted along 0.190" (4.83 mm) lug length.

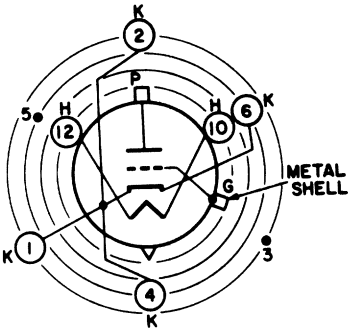
Note 2: Envelope temperature should be measured in zone "A".

MODIFIED BOTTOM VIEW

With Element Connections Indicated and Short Pins Not Shown



TERMINAL DIAGRAM (Bottom View)



INDEX = LARGE LUG
● = SHORT PIN—IC

Pin 1 - Cathode	Pin 6 - Cathode
Pin 2 - Cathode	Pin 10 - Heater
Pin 3* - Do Not Use	Pin 12 - Heater
Pin 4 - Cathode	Metal Shell - Grid
Pin 5* - Do Not Use	Top Cap - Plate

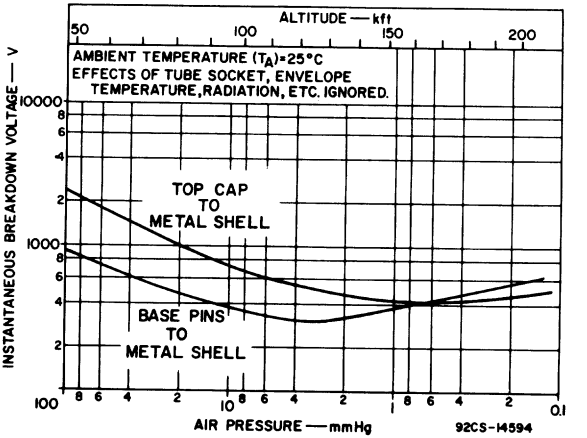
* Pin is of a length such that its end does not touch the socket insertion plane.

TYPE 8808 SOCKET AND CONNECTOR INFORMATION

SOCKET			
Mounting	**Body Material**	**Cinch Mfg. Co.▲ No.**	**Cinch-Jones Sales-Division Distributor No.**
Crimp	HALON□	133 67 90 040§	5NS-4
TOP-CAP CONNECTOR			
For Distributed-Constant Circuit	International Electronic Research Corp⊕ Therma-Link Retainer Part No. TXBE-032-031G, or equivalent		
For Lumped-Constant Circuit	Wakefield Engineering, Inc.● Semiconductor Cooler Type NF207, or equivalent		

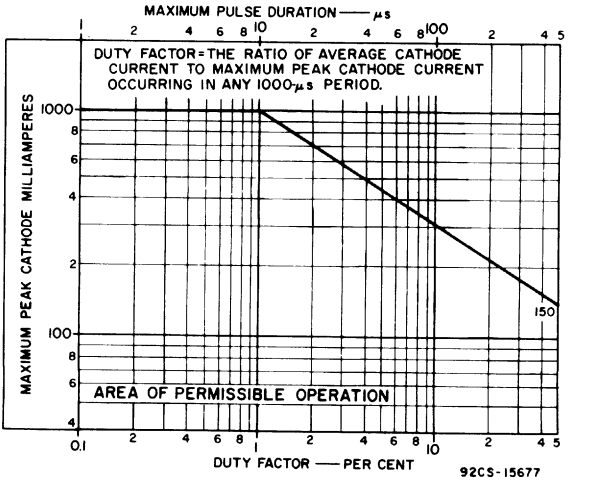
▲ 1026 South Homan Ave., Chicago, Illinois 60624.
□ TRADE MARK: Allied Chemical Corp., Morristown, N. J.
⊕ 135 West Magnolia Blvd., Burbank, Calif. 91502.
● 139 Foundry St., Wakefield, Mass. 01880.
§ This UHF heat-dissipating socket, or equivalent, is recommended to insure adequate electrical and thermal connection to the index rim.

BREAKDOWN-VOLTAGE CHARACTERISTICS

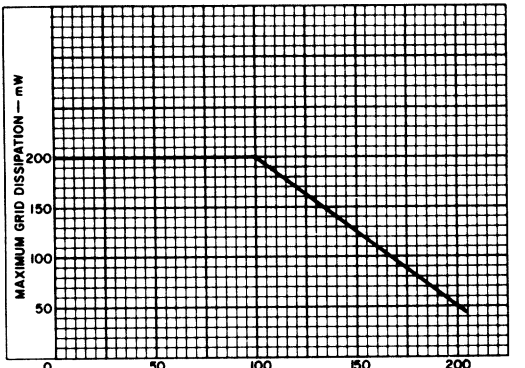


PULSE RATING CHART

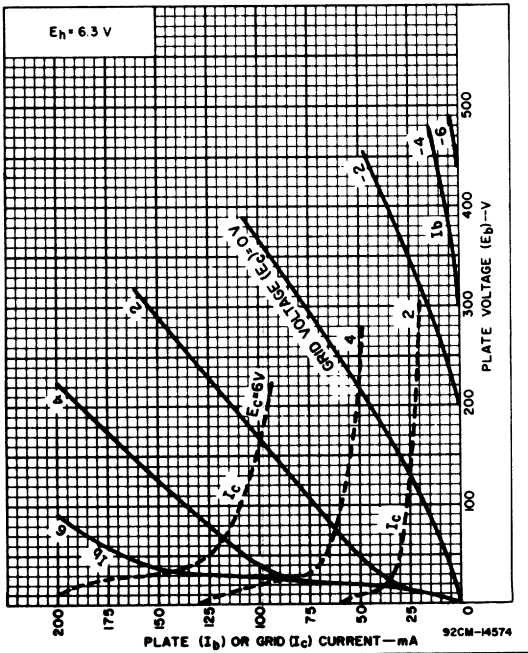
The peak cathode current is for a duty factor of up to 1% or pulse duration up to 10 μs, whichever is greater.



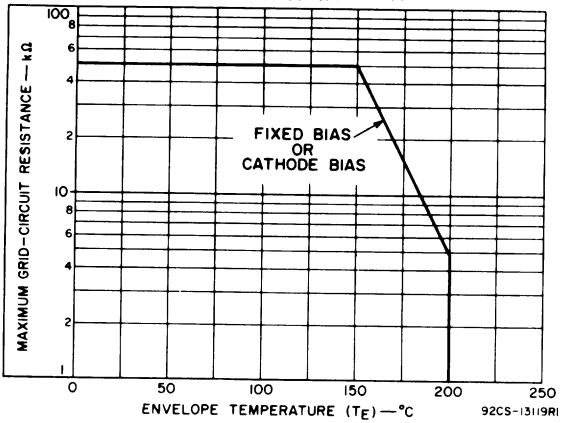
GRID-DISSIPATION RATING CHART



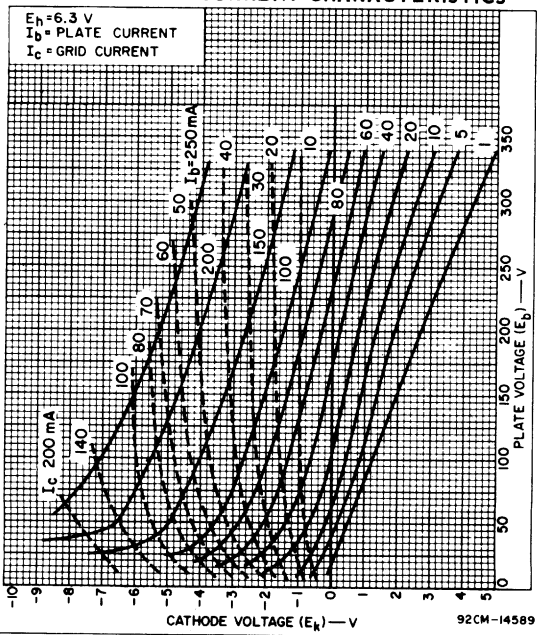
TYPICAL CHARACTERISTICS



GRID-CIRCUIT-RESISTANCE RATING CHART



TYPICAL CONSTANT-CURRENT CHARACTERISTICS



8811

C Band Klystron

- Gang Tuned Cavities
- Air Cooled
- High Efficiency
- High Power Gain
- Compact
- Sturdy

Frequency . . . . . 4.4 to 5.0 GHz

Electrical:

Cathode . . . . . Indirectly-heated Tungsten Dispenser Cathode

Filament:

Voltage	6.5 ± 0.5	V
Current at 6.5 V	7.6	A
Maximum current	8.2	A
Warmup time (min.)	180	s

Mechanical:

Mounting Position		Any	
Length (max.)	(393 mm)	15.5	in
Width (max.)	(267 mm)	10.5	in
Weight (approx.)	(17.2 kg)	38	lb
In commercial pack	(18.1 kg)	40	lb
In military pack	(22.5 kg)	50	lb

Thermal:

Collector Temperature (max.)	260	°C
Body Temperature (max.)	150	°C
Tuner Fin Temperature (max.)	150	°C
Electron Gun Potting		
Insulation temperature (max.)	250	°C
Storage temperature (min.)	-65	°C

Cooling

Forced air flow across the collector, body, and tuner, is required.

Typical air requirements for operation with 20° C ambient air temperature at sea level are:

	Min Reg Air Flow lb/min	kg/min	Max Press-Drop in H_2O	cm H_2O
Collector	7.5	3.4	2.0	5.1
Body & Tuners	0.85	0.38	0.75	1.9

Performance

Maximum CW Ratings, Absolute-Maximum Values:

DC Beam Voltage	8.5	kV
DC Beam Current	600	mA
DC Body Current	60	mA
Surge Current	25	A
Load VSWR	2.0:1	
Input VSWR	2.0:1	

Typical CW Operation:

High Efficiency Tuned

Frequency	**4.4 GHz**	**5.0 GHz**	
DC Beam Voltage	8.0	8.0	kV
DC Beam Current	520.0	520.0	mA

Typical CW Operation (cont'd.)

High Efficiency Tuned

Frequency	**4.4 GHz**	**5.0 GHz**	
DC Body Current	10.0	10.0	mA
RF Power Output	1.60	1.45	kW
Bandwidth (3 dB)	8.0	10.0	MHz
Efficiency	39.0	35.0	%
Gain	45.0	45.0	dB
Drive	50.0	50.0	mW
Load VSWR	1.05:1	1.05:1	–
Input VSWR	1.3:1	1.3:1	–

High Gain Tuned

Frequency	**4.4 GHz**	**5.0 GHz**	
DC Beam Voltage	8.0	8.0	kV
DC Beam Current	520.0	520.0	mA
DC Body Current	10.0	10.0	mA
RF Power Output	1.45	1.30	kW
Bandwidth (3 dB)	6.0	8.0	MHz
Efficiency	35.0	31.0	%
Gain	52.0	52.0	dB
Drive	10.0	10.0	mW
Load VSWR	1.05:1	1.05:1	–
Input VSWR	1.3:1	1.3:1	–

Broadband Tuned Frequency	4.4 GHz	5.0 GHz	
DC Beam Voltage	8.0	8.0	kV
DC Beam Current	520.0	520.0	mA
DC Body Current	10.0	10.0	mA
RF Power Output	1.5	1.4	kW
Bandwidth (3 dB)	13.0	19.0	MHz
Efficiency	36.0	33.0	%
Gain	42.0	42.0	dB
Drive	100.0	100.0	mW
Load VSWR	1.05:1	1.05:1	–
Input VSWR	1.3:1	1.3:1	–

General Information

Installation and Operation

No installation or operation should be attempted without first consulting the Installation and Operating Instructions shipped with each tube or available on request from Super Power Marketing, RCA, Lancaster, PA.

RCA reference publications required for the installation and operation of this device include the following:

Data Sheet – RCA-8811
Application Note AN 4213
Application Guide 1CE-279A

These publications are available as a complete packet – request PWR 542 "Applications Information for the RCA-8811 klystron."

Personnel Safety

The high voltages and microwave radiations from this device can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals shielded.

Packaging

Two types of packaging are available with these tubes; Commercial Pack and Military Pack. The customer specifies the desired type.

The Commercial Pack is made of nesting carboard cartons with the inner carton shock-mounted. The Military Pack complies with MIL-S-4473C for air shipment. It uses a hermetically-sealed metal container which protects the tube and serves to shield the area surrounding the pack from stray magnetic fields set up by the klystron focusing magnet.

In shipment, the tube is enclosed in a polyethylene bag to prevent dust and other particles from collecting in the waveguide or tuning system. It is recommended that the tube be stored in the bag and in the shipping container when not in use. Dust or other unwanted particles in the waveguide can cause arcing during operation and subsequent tube destruction.

Cooling

Air ducts must be provided to connect to the top of the collector and the tuner cooling duct. See Outline Drawing.

Mounting

Four holes are provided in the gun-end of the focusing magnet for mounting purposes. Only non-magnetic studs should be used.

Thermocouple

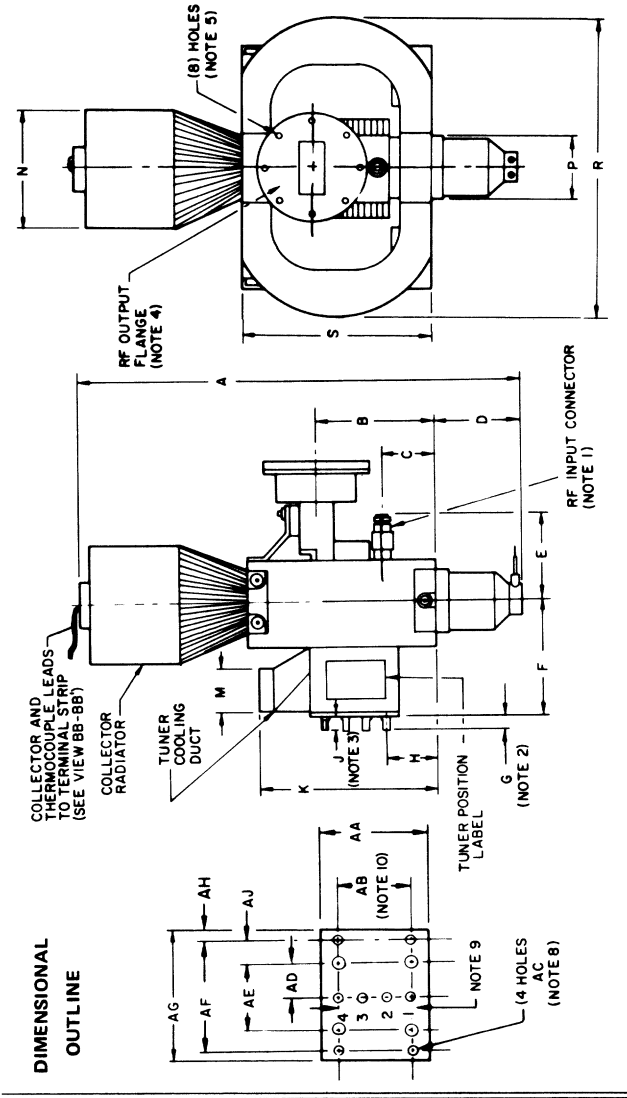
A thermocouple mounted on the collector provides a signal output for excessive collector temperature. This output is used to operate protective circuitry.

Tuning

Tuning is accomplished by a single knob which "gang-tunes" all four cavities simultaneously. The second, third and output cavities may be individually trimmed for optimizing the tube performance at any frequency within the tube operating band. See Outline Drawing.

Protection Circuits

Protection circuits serve a threefold purpose: safety of personnel, protection of the tube and protection of tube circuits. Consult Application Guide 1CE-279A for complete information on protection circuits.


DIMENSIONAL OUTLINE
(8) HOLES (NOTE 5)
RF OUTPUT FLANGE (NOTE 4)
RF INPUT CONNECTOR (NOTE 1)
COLLECTOR AND THERMOCOUPLE LEADS TO TERMINAL STRIP (SEE VIEW BB-BB')
COLLECTOR RADIATOR
TUNER COOLING DUCT
TUNER POSITION LABEL
(4 HOLES AC (NOTE 8)
NOTE 9
(NOTE 10)
(NOTE 3)
(NOTE 2)
A
B
C
D
E
F
G
H
J
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AA
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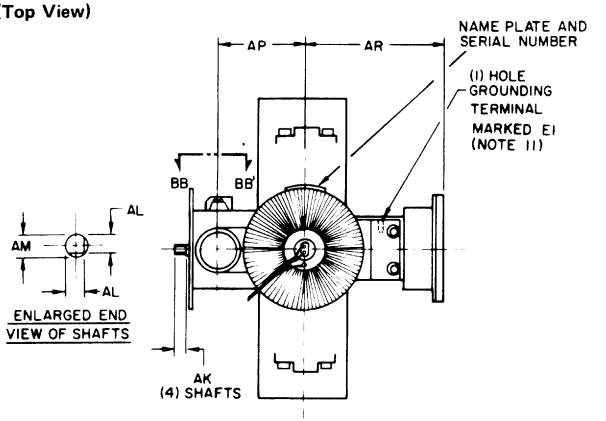
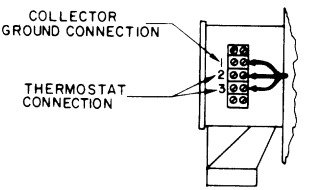
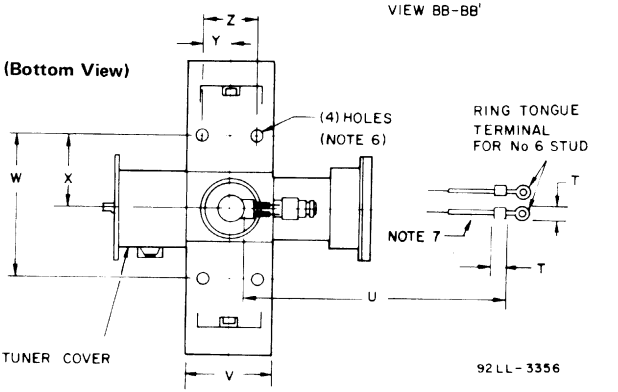
DIMENSIONAL OUTLINE

(Top View)





(Bottom View)



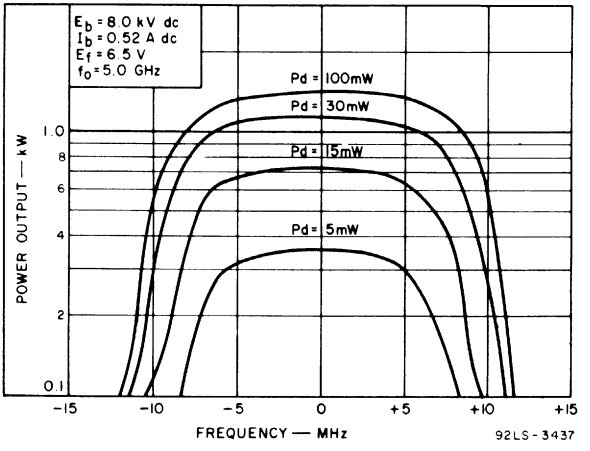
Tabulated Dimensions for the Dimensional Outline

Dimension Reference	Specified Values	
	Inches	Millimeters
A	15.5 max.	393.7 max.
B	4.06 ±.12	103.1 ±3.0
C	1.80 ±.12	45.7 ±3.0
D	3.5 max.	88.9 max.
E	3.00 ±.06	76.2 ±1.5
F	3.80 ±.12	96.5 ±3.0
G	0.68 ±.05	17.3 ±1.3
H	1.80 ± .09	45.7 ±2.3
J	0.68 +.15 -.10	17.3 +3.8 -2.5
K	6.25 max.	158.8 max.
M	1.50 ±.03	38.1 ± .8
N Dia.	4.12 ±.03	101.6 ± .8
P Dia.	2.130 ±.015	54.10 ± .38
R	10.5 max.	266.7 max.
S	6.5 ±.5	165.0 ±13.0
T Dia.	0.250 ±.015	6.35 ± .38
U	13.50 ±.25	343.0 ± 6.0
V	3.25 max.	82.55 max.
W	5.00 ±.06	127.0 ±1.5
X	2.50 ±.06	63.5 ±1.5
Y	1.00 ±.06	25.4 ±1.5
Z	2.00 ±.06	50.8 ±1.5
AA	3.00 ±.06	76.2 ±1.5
AB	2.10 ±.02	53.34 ± .51
AC	0.201 ±.010	5.11 ± .25
AD	1.00 ±.03	25.4 ± .8
AE	2.00 ±.03	50.8 ± .8
AF	3.25 ±.02	82.55 ± .51
AG	3.75 ±.03	95.3 ± .8
AH	0.25 ±.03	6.4 ± .8
AJ	0.62 ±.03	15.8 ± .8
AK	0.440 ±.010	11.18 ±.25
AL	0.230 ±.005	5.84 ±.13
AM Dia.	0.249 ±.002	6.325 ±.051
AN	0.125 ±.030	3.2 ±.8
AP	3.00 ±.06	76.2 ±1.5
AR	4.75 ±.12	120.6 ±3.0

Notes for Dimensional Outline

1. Mates with Type "N" Connector UG-21 B/U or equivalent.
2. Dimension applies to Shaft No.1 only.
3. Dimension applies to Shafts No,'s 2, 3, and 4 only.
4. Mates with UG-149 A/U or equivalent.
5. Holes 10-32 UNF-2B equally spaced on 3.250 ±.032 (82.6 ± .8 mm) dia. circle.
6. Holes 0.437 ± .062 (11.1 ± 1.6 mm) thru (One side only).
7. High-Voltage Lead Designation : Heater Lead – Yellow
   Heater-Cathode Lead – White
8. Thru-holes checked with gauge.
9. Three spaces between shafts are 0.70 ± .03 (17.8 ± .8 mm) and add to 2.100 (53.34 mm). Shafts are numbered as shown. (1) Gang tuner, (2) Cavity two, (3) Cavity three, (4) Output cavity.
10. Tolerance for this dimension applies to location of four 0.201 (5.11 mm) holes.
11. Hole No.6-32 UNC-2B, 0.25 (6.35 mm) minimum depth.

BANDWIDTH CHARACTERISTIC CURVE



The *Beam Current Characteristic, Gain Characteristic, and Output Characteristic* curves shown under Type 4658 also apply to Type 8811.

8824

CW Klystron Amplifier

High Power Output
Very High Gain
Long Life, High Reliability
Integral Cavity Construction
Water/Vapor Cooled
Electromagnet Focusing

Easy to Install and Operate
Modulating Anode – permits both visual and aural application with a single beam supply

Electrical

Frequency Range	470-566 MHz
Cathode Type	Indirectly heated, tungsten dispenser cathode
Heater (dc or 50-60 Hz):	
Voltage[a]	6.0 ± 0.5 V
Current @ 6.0 V, typical	16.4 A
Surge current, maximum	30.0 A
Warm-up time, minimum	180 sec
Focusing	RCA-AJ2166 Electromagnet

Mechanical

Mounting Position	Vertical, cathode down
Dimensions, Maximum:	
Height	(1485.9 mm) 58.5 in
Width	(381.0 mm) 15.0 in
Weight, Approximate:	
Uncrated	(90.7 kg) 200 lbs
Crated	(213.1 kg) 470 lbs
Inlet Coolant Connector	Mates with Hansen B2-H16
Outlet Coolant Connector	Mates with Hansen LL3-H21
Steam Outlet	See Dimensional Outline

Electrical Connections

RF Input	UG-22B/U jack mates with UG-21D/U plug
RF Output	See Dimensional Outline
Collector[b]	Pins F and G, Cannon Rec.[c]
Thermocouple:	
Chromel	Pin H Cannon Rec.[c]
Alumel	Pin J Cannon Rec.[c]
Body	Pin E Cannon Rec.[c]

Modulating Anode	See Dimensional Outline
Heater-Cathode	See Dimensional Outline
Heater	See Dimensional Outline
Interlock #1	Pins A and B, Cannon Rec.[c]
Interlock #2	Pins C and D, Cannon Rec.[c]

Thermal

Collector Temperature	145	max.	°C
Body Temperature	100	max.	°C
Electron Gun Insulator Temperature	250	max.	°C
Storage Temperature	-65	min.	°C

Coolant Requirements

Collector and Body			
Water flow (7.5 l/m)	2.0	min.	gpm
Inlet water temperature	70	max.	°C
Electron Gun			
Forced air flow (24 l/s)	50	min.	cfm
Water Pressure Differential for Typical Flow of 2.1 gpm (3.5 kg/cm^2)	50	max.	psi
Water Pressure at any Inlet (4.2 kg/cm^2)	60	max.	psi

Maximum Ratings, *Absolute-Maximum Values*

Beam Voltage, DC	20	max.	kV
Beam Current, DC	5.5	max.	A
Body Current, DC	250	max.	mA
Modulating Anode Voltage, DC	20	max.	kV
Load VSWR	1.5:1.0		

Typical Operation, UHF Television Service (Visual 471.25 MHz, Aural 475.75 MHz)

	Visual	Aural	
Collector Voltage, DC[f]	0	0	V
Body Voltage, DC	0	0	V
Beam Current, DC	4.7	2.4	A
Body Current, DC[g]	70	15	mA

Modulating Anode Voltage, DC	0	-6	kV
Modulating Anode Current, DC	1.5	1.0	mA
Cathode Voltage, DC	-18	-18	kV
Focusing Current, DC (Typical with RCA-AJ2166 Electromagnet)	28	28	A
Load VSWR	1.1:1	1.1:1	—
Drive Power, for Visual Peak-of-Sync or Aural CW	10	1.1	W
Output, for Visual Peak-of-Sync or Aural CW	31	12	kW
Gain	35	40	dB
Efficiency	37	28	%

a Careful attention to maintaining the minimum value of filament voltage consistent with adequate emission will result in conserving the life of the tube.

b Pins F and G must always be used in parallel.

c Type CA22365-2729 Cannon Receptacle.

d All water must be removed from the water course during storage.

e Cooling air blower must be directed toward the electron gun and located within a distance of 24 inches.

f A DC ammeter make the connection between the collector and ground.

g The body is connected directly to ground. Body current is measured in the ground leg of the beam power supply.

General Information

Cooling

The electron gun is cooled by forced-air directed at the cathode-seal area. Air flow must be at least 50 cfm. (24.0 l/sec) The remainder of the tube is cooled by water/vapor system with water cooling the resonators and drift-tube sections and vapor cooling the collector.

The use of distilled water is essential. The liquid flow must start before application of any voltages and preferably should continue for five minutes after removal of voltages. Interlocking of the liquid flow through each of the cooled elements with the beam supply is recommended to prevent damage in case of cooling failure.

A steam exhaust sleeve must be provided for the top of the klystron boiler. A flexible, neoprene type is recommended. The sleeve is placed over the lip provided at the top of the boiler (see Dimensional Outline) and clamped securely in place for a water-tight connection.

Electrical Connections to Tube Terminals

Connections to the Heater, Heater-Cathode and Modulating Anode Terminals (see Dimensional Outline) are made with preformed finger stock or knife blade type fuse clips. Care should be taken when making these connections not to place excessive stress on the ceramic-to-metal seals.

Protection Circuits

Protection circuits serve a threefold purpose: safety of personnel, protection of the tube and protection of tube circuits. Consult Application Note AN4206 for complete information on protection circuits required.

RF Output Coaxial Adapter

The RF output coaxial adapter shown in the klystron Outline Drawing is shipped as a separate item within the tube crate. It must be screwed on after the tube is installed within the electromagnet.

Installation and Operation

RCA reference publications required for the installation and operation of this device include the following:

Data Sheet – RCA-8824
Application Note AN4206
Application Guide 1CE-279A

These publications are available as a complete packet – request PWR-537, "Applications Information for the RCA-8824 Super-Power Klystron,"

Personnel Safety

The high voltages and microwave radiations from this device can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals adequately shielded.

This device, in operation, may produce X-radiation which can constitute a health hazard. Shielding or other precautions may be required.

Packaging

The klystron is shipped in a specially designed shipping crate featuring steel tracks for receiving the rollers on the tube sides. Unpacking instructions are attached to the crate.

RCA AJ2166 Electromagnet

The RCA 8824 klystron is designed to be mounted in and its beam focused by the water-cooled, single-coil electromagnet, RCA-AJ2166. The exposed surfaces of the electromagnet are treated by painting or plating to resist corrosion.

General Data

Voltage, DC	125 max. V
Current, DC	30 max. A
Dimensions	See Outline Drawing
Weight (approx.)	(158.7 kg) 350 lbs
Cooling:	
Water flow, minimum	(3.8 l/m) 1 gpm
Inlet temperature, maximum	70° C
Maximum water pressure differential for typical flow	(3.5 kg/cm^2) 50 psig
Maximum water pressure at any inlet	(4.2 kg/cm^2) 60 psig

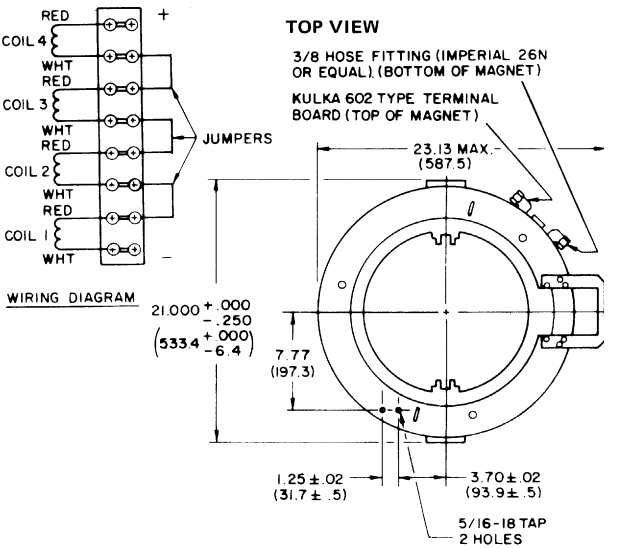
Operating Considerations

Typical operating coil currents are noted under "Typical Operation" data section.

It is recommended that the coil coolant flow start before the application of any coil voltage and preferably continue for five minutes after the removal of voltages. Interlocking of the coolant flow with the klystron beam and modulating-anode voltages and coil voltages is highly recommended to prevent tube and coil damage in the event of inadequate coolant flow.

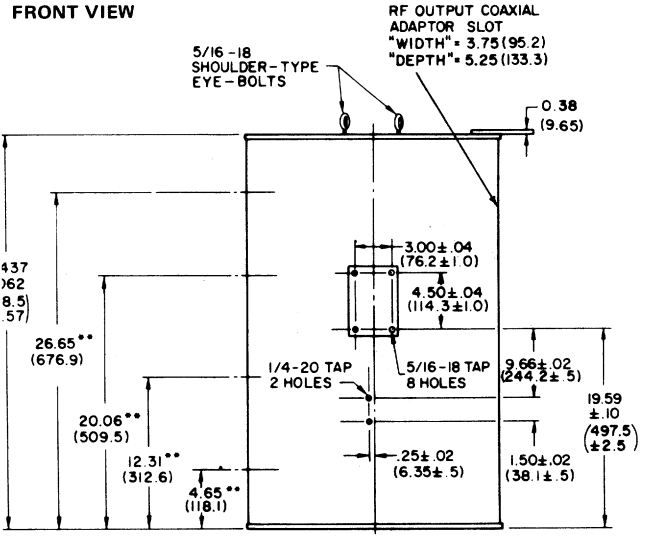
The use of a solid-state diode connected in parallel with the electromagnet is recommended to prevent excessive transient voltage build-up in the event of coil current interruptions. Connections should be made so the coil current will flow through the diode when the polarity of the normal coil voltage becomes reversed.

ELECTROMAGNET DIMENSIONAL OUTLINE



ELECTROMAGNET DIMENSIONAL OUTLINE

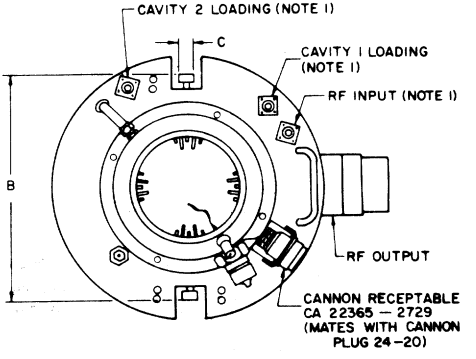
FRONT VIEW



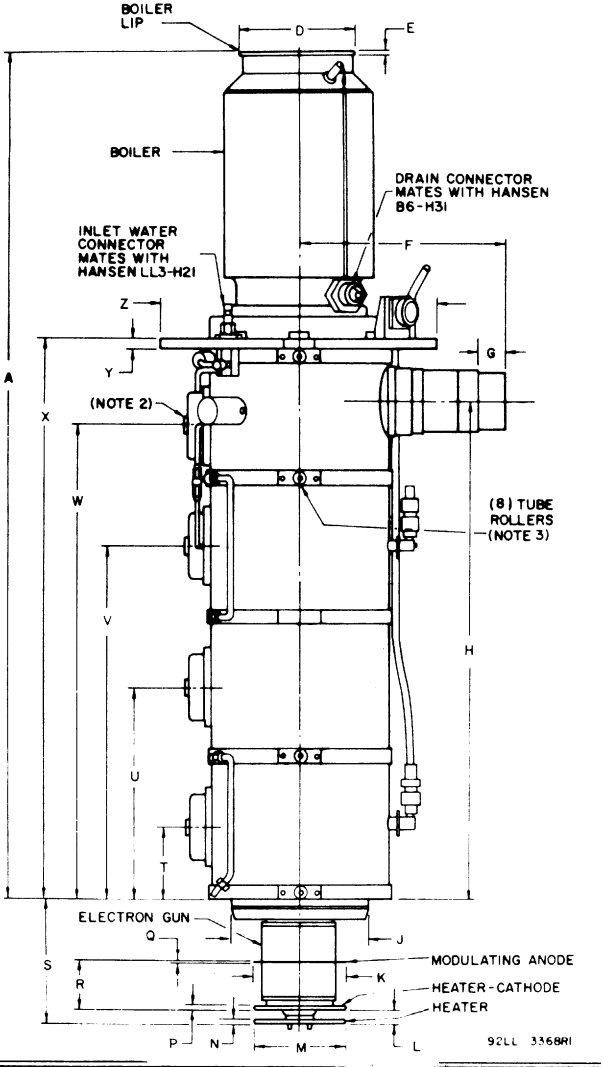
**LOCATION OF 1" DIAMETER TUNING PORTS

KLYSTRON DIMENSIONAL OUTLINE

TOP VIEW



KLYSTRON DIMENSIONAL OUTLINE (Cont'd)



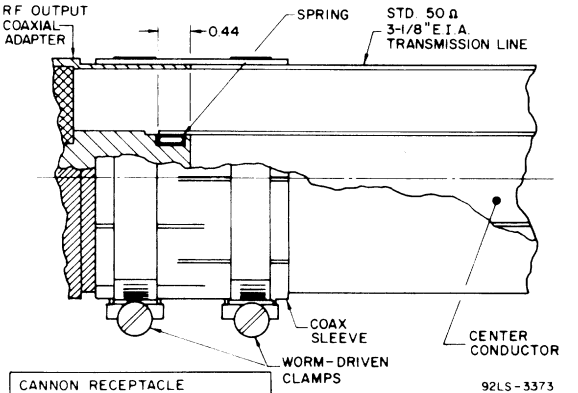
KLYSTRON OUTLINE DIMENSIONS

Ref.	Inches	Millimeters
A	50.83 ± 0.25	1290.0 ± 6.3
B	12.40 Max.	314.9 Max.
C Dia.	0.75 Ref.	19.05
D Dia.	6.40 ± 0.04	162.56 ± 1.0
E	0.23 ± 0.04	5.84 ± 1.0
F	11.00 ± 0.12	279.4 ± 3.0
G	1.51 ± 0.01	38.35 ± 0.25
H	27.52 ± 0.06	699.0 ± 1.5
J Dia.	7.50 Max.	190.5 Max.
K Dia.	5.00 ± 0.01	127.00 ± 0.25
L	0.69 ± 0.05	17.53 ± 1.2
M Dia.	5.00 ± 0.03	127.00 ± 0.76
N	0.19 ± 0.01	4.82 ± 0.25
P	0.19 ± 0.01	4.82 ± 0.25
Q	0.04	1.0
R	2.79 ± 0.05	70.86 ± 1.2
S	6.89 ± 0.07	175.0 ± 1.7
T	4.16 ± 0.03	105.66 ± 0.76
U	11.80 ± 0.04	299.72 ± 1.0
V	19.60 ± 0.05	497.8 ± 1.3
W	26.20 ±0.06	665.5 ± 1.5
X	30.82 ± 0.09	782.8 ± 2.2
Y	0.50 ± 0.02	12.70 ± 0.5
Z Dia.	15.00 Max.	381.0 Max.

Notes:

1. UG-22 B/U jack mates with UG-21 D/U
2. Channel tuning screws 5/16" hex socket head.
3. Tube rollers mate with RCA AJ2166 electromagnet.

DETAIL RF OUTPUT CONNECTOR



CANNON RECEPTACLE CA 22365 – 2729	
PIN CONNECTIONS	
A, B	JUMPER, #16 AWG
C, D	JUMPER, #16 AWG
E	BODY (GROUND)
F	COLLECTOR *
G	COLLECTOR
H	CHROMEL, THERMOCOUPLE
J	ALUMEL, CONNECTIONS

*ALWAYS USE PINS F AND G IN PARALLEL

More complete information covering the handling, installation, safety and operation of this type may be obtained through an RCA Field Representative or by writing RCA Super Power Tube Marketing, Lancaster, PA. 17604.

8825

CW Klystron Amplifier

High Power Output

Very High Gain

Long Life, High Reliability

Integral Cavity Construction

Water/Vapor Cooled

Electromagnet Focusing

Easy to Install and Operate

Modulating Anode – permits both visual and aural application with a single beam supply

Electrical

Frequency Range . . . . . 566-698 MHz

Cathode Type . . . . . Indirectly heated, tungsten dispenser cathode

Heater (dc or 50-60 Hz):

- Voltage[a] . . . . . 6.0 ± 0.5 V
- Current @ 6.0 V, typical . . . . . 16.4 A
- Surge current, maximum . . . . . 30.0 A
- Warm-up time, minimum . . . . . 180 sec

Focusing . . . . . RCA-AJ2167 Electromagnet

Mechanical

Mounting Position . . . . . Vertical, cathode down

Dimensions, Maximum:

- Height . . . . . (1346 mm) 53 in
- Width (excluding output connector) . . . (381.0 mm) 15.0 in

Weight, Approximate:

- Uncrated . . . . . (90.7 kg) 200 lbs
- Crated . . . . . (213.1 kg) 470 lbs

Inlet Coolant Connector . . . . . Mates with Hansen B2-H16

Outlet Coolant Connector . . . . . Mates with Hansen LL3-H21

Steam Outlet . . . . . See Dimensional Outline

Electrical Connections

RF Input . . . . . UG-22B/U jack mates with UG-21D/U plug

RF Output . . . . . See Dimensional Outline

Collector[b] . . . . . Pins F and G, Cannon Rec.[c]

Thermocouple:

- Chromel . . . . . Pin H Cannon Rec.[c]
- Alumel . . . . . Pin J Cannon Rec.[c]

Body . . . . . Pin E Cannon Rec.[c]

Modulating Anode	See Dimensional Outline
Heater-Cathode	See Dimensional Outline
Heater	See Dimensional Outline
Interlock #1	Pins A and B, Cannon Rec.[c]
Interlock #2	Pins C and D, Cannon Rec.[c]

Thermal

Collector Temperature	145	max.	°C
Body Temperature	100	max.	°C
Electron Gun Insulator Temperature	250	max.	°C
Storage Temperature	-65	min.	°C

Coolant Requirements

Collector and Body			
Water flow (7.5 l/m)	2.0	min.	gpm
Inlet water temperature	70	max.	°C
Electron Gun			
Forced air flow (24 l/s)	50	min.	cfm
Water Pressure Differential for Typical Flow of 2.1 gpm (3.5 kg/cm^2)	50	max.	psi
Water Pressure at any Inlet (4.2 kg/cm^2)	60	max.	psi

Maximum Ratings, *Absolute-Maximum Values*

Beam Voltage, DC	20	max.	kV
Beam Current, DC	5.5	max.	A
Body Current, DC	250	max.	mA
Modulating Anode Voltage, DC	20	max.	kV
Load VSWR	1.5:1.0		

Typical Operation, UHF Television Service (Visual 627.25 MHz, Aural 631.75 MHz)

	Visual	Aural	
Collector Voltage, DC[f]	0	0	V
Body Voltage, DC	0	0	V
Beam Current, DC	4.7	2.4	A
Body Current, DC[g]	70	15	mA

Modulating Anode Voltage, DC	0	-6	kV
Modulating Anode Current, DC	1.5	1.0	mA
Cathode Voltage, DC	-18	-18	kV
Focusing Current, DC (Typical with RCA-AJ2167 Electromagnet)	28	28	A
Load VSWR	1.1:1	1.1:1	—
Drive Power, for Visual Peak-of-Sync or Aural CW	10	1.1	W
Output, for Visual Peak-of-Sync or Aural CW	31	12	kW
Gain	35	40	dB
Efficiency	37	28	%

[a] Careful attention to maintaining the minimum value of filament voltage consistent with adequate emission will result in conserving the life of the tube.

[b] Pins F and G must always be used in parallel.

[c] Type CA22365-2729 Cannon Receptacle.

[d] All water must be removed from the water course during storage.

[e] Cooling air blower must be directed toward the electron gun and located within a distance of 24 inches.

[f] A DC ammeter make the connection between the collector and ground.

[g] The body is connected directly to ground. Body current is measured in the ground leg of the beam power supply.

GENERAL INFORMATION

Cooling

The electron gun is cooled by forced-air directed at the cathode-seal area. Air flow must be at least 50 cfm. (24.0 l/sec) The remainder of the tube is cooled by water/vapor system with water cooling the resonators and drift-tube sections and vapor cooling the collector.

The use of distilled water is essential. The liquid flow must start before application of any voltages and preferably should continue for five minutes after removal of voltages. Interlocking of the liquid flow through each of the cooled elements with the beam supply is recommended to prevent damage in case of cooling failure.

A steam exhaust sleeve must be provided for the top of the klystron boiler. A flexible, neoprene type is recommended. The sleeve is placed over the lip provided at the top of the boiler (see Dimensional Outline) and clamped securely in place for a water-tight connection.

Electrical Connections to Tube Terminals

Connections to the Heater, Heater-Cathode and Modulating Anode Terminals (see Dimensional Outline) are made with preformed finger stock or knife blade type fuse clips. Care should be taken when making these connections not to place excessive stress on the ceramic-to-metal seals.

Protection Circuits

Protection circuits serve a threefold purpose: safety of personnel, protection of the tube and protection of tube circuits. Consult Application Note AN4206 for complete information on protection circuits required.

RF Output Coaxial Adapter

The RF output coaxial adapter shown in the klystron Outline Drawing is shipped as a separate item within the tube crate. It must be screwed on after the tube is installed within the electromagnet.

Installation and Operation

RCA reference publications required for the installation and operation of this device include the following:

Data Sheet – RCA-8825
Application Note AN4206
Application Guide 1CE-279A

These publications are available as a complete packet – request PWR-538, "Applications Information for the RCA-8825 Super-Power Klystron,"

Personnel Safety

The high voltages and microwave radiations from this device can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals adequately shielded.

This device, in operation, may produce X-radiation which can constitute a health hazard. Shielding or other precautions may be required.

Packaging

The klystron is shipped in a specially designed shipping crate featuring steel tracks for receiving the rollers on the tube sides. Unpacking instructions are attached to the crate.

RCA AJ2167 Electromagnet

The RCA 8825 klystron is designed to be mounted in and its beam focused by the water-cooled, single-coil electromagnet, RCA-AJ2167. The exposed surfaces of the electromagnet are treated by painting or plating to resist corrosion.

General Data

Voltage, DC	125 max. V
Current, DC	30 max. A
Dimensions	See Outline Drawing
Weight (approx.) (158.7 kg)	350 lbs
Cooling:	
Water flow, minimum	(3.8 l/m) 1 gpm
Inlet temperature, maximum	70° C
Maximum water pressure differential for typical flow	(3.5 kg/cm^2) 50 psig
Maximum water pressure at any inlet	(4.2 kg/cm^2) 60 psig

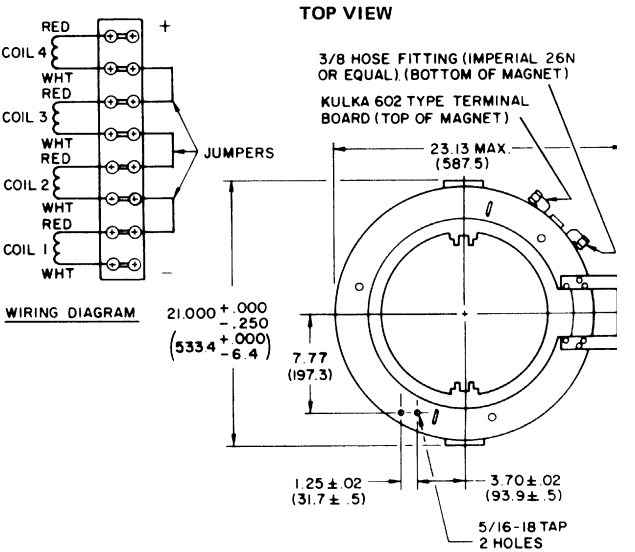
Operating Considerations

Typical operating coil currents are noted under "Typical Operation" data section.

It is recommended that the coil coolant flow start before the application of any coil voltage and preferably continue for five minutes after the removal of voltages. Interlocking of the coolant flow with the klystron beam and modulating-anode voltages and coil voltages is highly recommended to prevent tube and coil damage in the event of inadequate coolant flow.

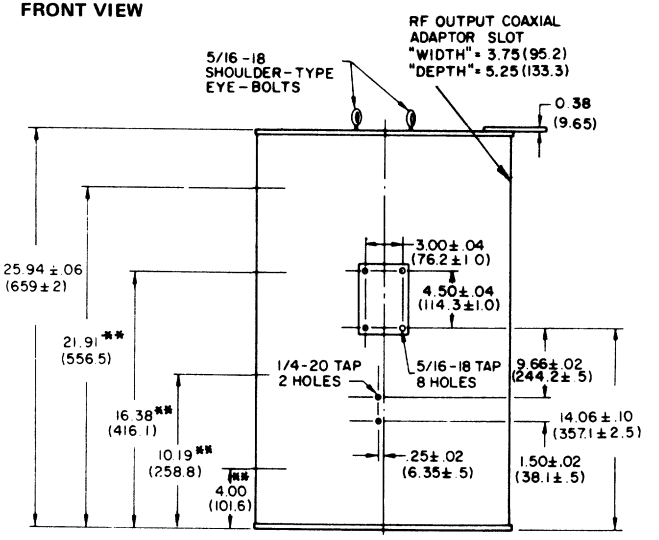
The use of a solid-state diode connected in parallel with the electromagnet is recommended to prevent excessive transient voltage build-up in the event of coil current interruptions. Connections should be made so the coil current will flow through the diode when the polarity of the normal coil voltage becomes reversed.

ELECTROMAGNET DIMENSIONAL OUTLINE



ELECTROMAGNET DIMENSIONAL OUTLINE

FRONT VIEW

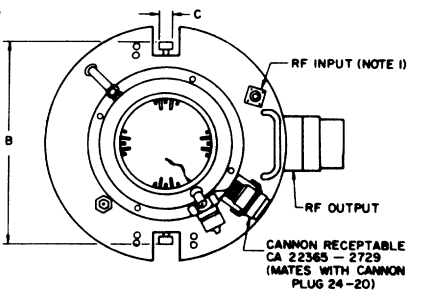


** LOCATION OF 1" DIAMETER TUNING PORTS

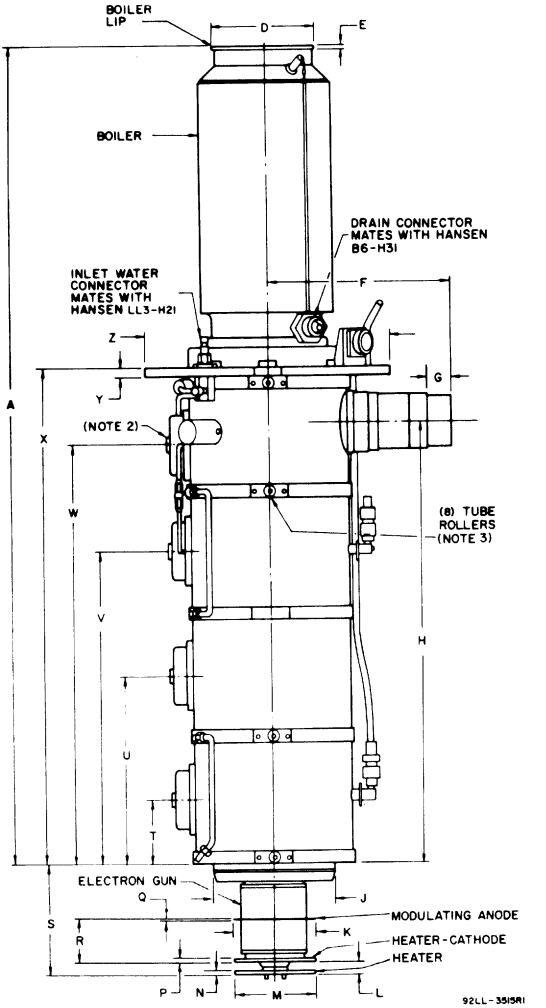
92LL-3514

KLYSTRON DIMENSIONAL OUTLINE

TOP VIEW



KLYSTRON DIMENSIONAL OUTLINE (Cont'd)



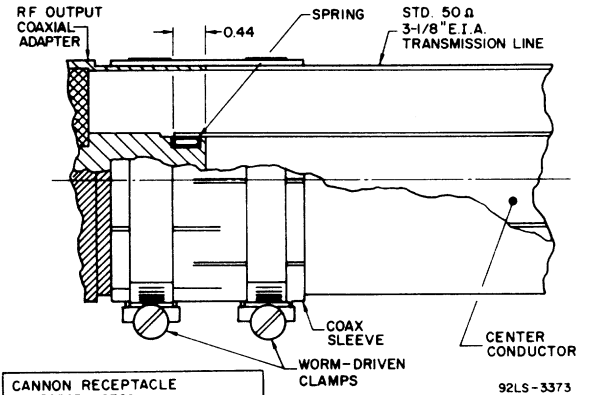
KLYSTRON OUTLINE DIMENSIONS

Ref.	Inches	Millimeters
A	45.77 ± 0.25	1162.6 ± 6.3
B	12.40 Max.	314.9 Max.
C Dia.	0.75 Ref.	19.05 Ref.
D Dia.	6.40 ± 0.04	162.6 ± 1.0
E	0.23 ± 0.04	5.8 ± 1.0
F	11.00 ± 0.12	279.4 ± 3.0
G	1.51 ± 0.01	38.35 ± 0.25
H	21.97 ± 0.06	558.0 ± 1.5
J Dia.	7.50 Max.	190.5 Max.
K Dia.	5.00 ± 0.01	127.00 ± 0.25
L	0.69 ± 0.05	17.53 ± 1.3
M Dia.	5.00 ± 0.03	127.00 ± 0.76
N	0.19 ± 0.01	4.82 ± 0.25
P	0.19 ± 0.01	4.82 ± 0.25
Q	0.04 Ref.	1.0 Ref.
R	2.79 ± 0.05	70.86 ± 1.3
S	6.89 ± 0.07	175.0 ± 1.7
T	3.45 ± 0.03	87.63 ± 0.76
U	9.65 ± 0.04	245.1 ± 1.0
V	15.85 ± 0.05	402.6 ± 1.3
W	21.37 ±0.06	542.8 ± 1.5
X	25.26 ± 0.09	641.6 ± 2.2
Y	0.50 ± 0.02	12.70 ± 0.5
Z Dia.	15.00 Max.	381.0 Max.

Notes:

1. UG-22 B/U jack mates with UG-21 D/U
2. Channel tuning screws 5/16" hex socket head.
3. Tube rollers mate with RCA AJ2167 electromagnet.

DETAIL RF OUTPUT CONNECTOR



CANNON RECEPTACLE CA 22365 - 2729	
PIN CONNECTIONS	
A, B	JUMPER, # 16 AWG
C, D	JUMPER, # 16 AWG
E	BODY (GROUND)
F	COLLECTOR *
G	COLLECTOR
H	CHROMEL — THERMOCOUPLE
J	ALUMEL — CONNECTIONS

*ALWAYS USE PINS F AND G IN PARALLEL

More complete information covering the handling, installation, safety and operation of this type may be obtained through an RCA Field Representative or by writing RCA Super Power Tube Marketing, Lancaster, PA. 17604.

8826

UHF TV Klystron Amplifier

- **Water/Vapor Cooled**
- **High Power Output**
- **Electromagnet Focusing**
- **Very High Gain**
- **Easy to Install and Operate**
- **Long Life, High Reliability**
- **Modulating Anode — permits both visual and aural application with a single beam supply**
- **Integral Cavity Construction**

General Data

Electrical:

Frequency Range	698-890 MHz	
Cathode Type	Indirectly heated, tungsten-dispenser cathode	
Heater (dc or 50-60 Hz):		
Voltage[a]	6.0 ± 0.5	V
Current @ 6.0 V, typical	16.4	A
Surge current, maximum	30.0	A
Warm-up time, minimum	180	sec
Focusing	RCA-AJ2168 Electromagnet	

Mechanical:

Mounting Position	Vertical, cathode down
Dimensions, Maximum:	
Height	(1165 mm) 45.9 in
Width (excluding output connector)	(330 mm) 13.0 in
Weight, Approximate:	
Uncrated	(81.6 kg) 180 lbs
Crated	(204 kg) 450 lbs
Inlet Coolant Connector	Mates with Hansen LL3-H21
Outlet Coolant Connector	Mates with Hansen LL6-H31
Steam Outlet	See Dimensional Outline

Electrical Connections:

RF Input	UG-22B/U jack mates with UG-21D/U plug
RF Output	See Dimensional Outline
Collector[b]	Pins F and G, Cannon Rec.[c]
Thermocouple:	
Chromel	Pin H Cannon Rec.[c]
Alumel	Pin J Cannon Rec.[c]

Body	Pin E Cannon Rec.[c]
Modulating Anode	See Dimensional Outline
Heater-Cathode	See Dimensional Outline
Heater	See Dimensional Outline
Interlock No.1	Pins A and B, Cannon Rec.[c]
Interlock No.2	Pins C and D, Cannon Rec.[c]

Thermal:

Collector Temp. (max.)	145	°C
Body Temperature (max.)	100	°C
Electron Gun Insulator Temp. (max.)	250	°C
Storage Temp.[d] (min.)	−65	°C

Coolant Requirements:

Collector and Body		
Water flow (min.)	(0.125 l/s) 2.0	gpm
Inlet water temperature (max.)	70	°C
Electron Gun		
Forced air flow[e] (min.)	(24 l/s) 50	cfm
Water Pressure Differential for Typical Flow of 2.1 gpm (max.)	3.5	kg/cm^2
	50	psi
Water Pressure at any Inlet (max.)	4.2	kg/cm^2
	60	psi

Maximum Ratings, Absolute-Maximum Values

Beam Voltage, DC	20	max.	kV
Beam Current, DC	5.5	max.	A
Body Current, DC	250	max.	mA
Modulating Anode Voltage, DC	20	max.	kV
Load VSWR	1.5:1.0		

Typical Operation, UHF Television Service (Visual 699.25 MHz, Aural 703.75 MHz)

	Visual	Aural	
Collector Voltage, DC[f]	0	0	V
Body Voltage, DC	0	0	V
Beam Current, DC	4.7	2.4	A
Body Current, DC[g]	70	15	mA
Modulating Anode Voltage, DC	0	−6	kV
Modulating Anode Current, DC	1.5	1.0	mA
Cathode Voltage, DC	−18	−18	kV

Focusing Current, DC (Typical With RCA-AJ2168 Electromagnet)	28	28	A
Load VSWR	1.1:1	1.1:1	–
Drive Power for Visual Peak-of-Sync or Aural CW	10	1.1	W
Output, for Visual Peak-of-Sync or Aural CW	31	12	kW
Gain	35	40	dB
Efficiency	37	28	%

[a] Careful attention to maintaining the minimum value of filament voltage consistent with adequate emission will result in conserving the life of the tube.

[b] Pins F and G must always be used in parallel.

[c] Type CA22365-2729 Cannon Receptacle.

[d] All water must be removed from the coolant course during storage and shipping.

[e] Cooling-air blower must be directed toward the electron gun and located within a distance of 24 inches.

[f] A dc ammeter makes the connection between the collector and ground.

[g] The body is connected directly to ground. Body current is measured in the ground leg of the beam power supply.

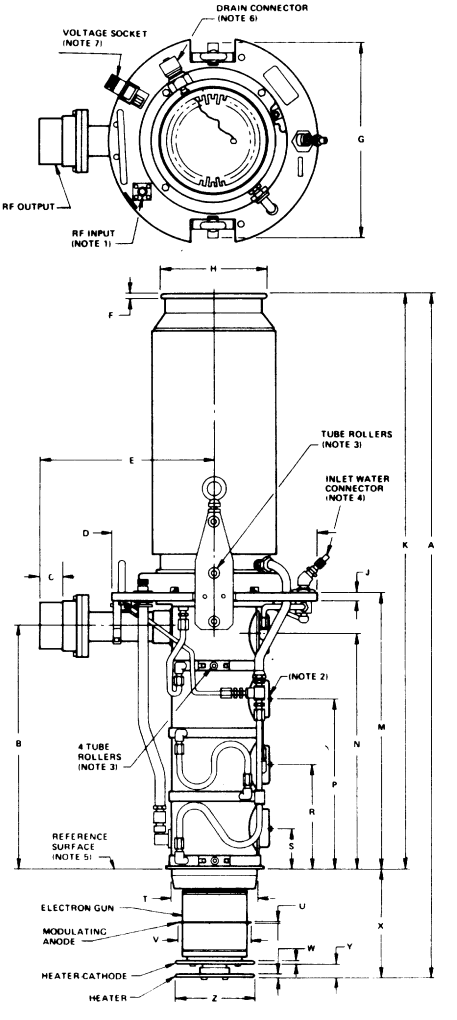
Operating Considerations

Typical operating coil currents are noted under "Typical Operation" data section in this data sheet.

It is recommended that the coil coolant flow start before the application of any coil voltage and preferably continue for five minutes after the removal of voltages. Interlocking of the coolant flow with the klystron beam and modulating-anode voltages and coil voltages is highly recommended to prevent tube and coil damage in the event of inadequate coolant flow.

The use of a solid-state diode connected in parallel with the electromagnet is recommended to prevent excessive transient voltage build-up in the event of coil current interruptions. Connections should be made so the coil current will flow through the diode when the polarity of the normal coil voltage becomes reversed.

Dimensional Outline – Klystron



Pin Connections – Voltage Socket

A, B } Jumpered
C, D } Jumpered
E Body (Ground)
F Collector*
G Collector*
H Thermocouple (Chromel)
J Thermocouple (Alumel)

*Always use pins F and G in parallel.

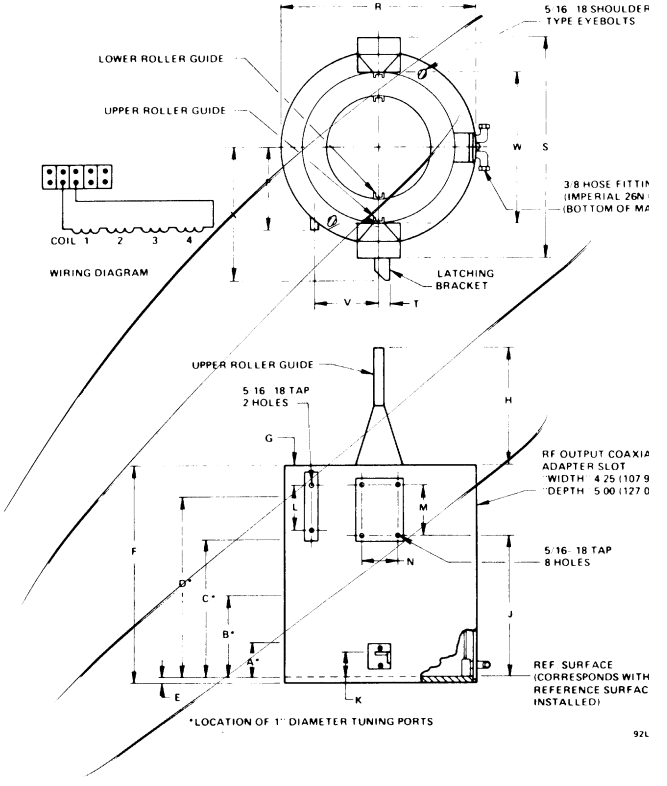
Tabulated Dimensions for Klystron

Dim.	Value – Inches	Value – Millimeters
A	45.56 ± .32	1157 ± 8
B	16.33 ± .06	414.8 ± 1.5
C	1.50 ± .01	38.10 ± .25
D	13.00 Max.	330.2 Max.
E	11.00 ± .12	279.4 ± 3.0
F	0.23 ± .04	5.8 ± 1.0
G	12.40 Max.	315.0 Max.
H	6.40 ± .04	162.6 ± 1.0
J	0.50 ± .02	12.70 ± .51
K	38.67 ± .25	982.2 ± 6.4
M	18.66 ± .08	474.0 ± 2.0
N	15.74 ± .06	399.8 ± 1.5
P	11.50 ± .05	292.1 ± 1.3
R	7.15 ± .04	181.6 ± 1.0
S	2.82 ± .03	72.4 ± .8
T	5.76 Max.	14.63 Max.
U	0.04 Ref.	1.0 Ref.
V	5.00 ± .01	127.00 ± .25
W	0.19 ± .01	4.83 ± .25
X	6.89 ± .07	175.0 ± 1.8
Y	0.69 ± .05	17.5 ± 1.3
Z	5.00 ± .03	127.0 ± .8

Notes:

1. RF Input Jack, UG-22 B/U mates with UG-21 D/U.
2. Channel tuning screws. These screws have a 5/16 inch hex socket head.
3. Tube rollers mate with roller guides in the RCA AJ2168 Electromagnet.
4. Inlet Water Connector mates with Hansen LL3-H21 Connector.
5. Reference Surface corresponds with electromagnet reference surface when installed.
6. Drain Connector mates with Hansen LL6-H32 Connector.
7. Cannon Receptacle CA22365-2729. Mates with Cannon Plug 24-20.

Dimensional Outline — Electromagnet



Personnel Safety

The high voltages and microwave radiations from this device can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals adequately shielded. This device, in operation, may produce X-radiation which can constitute a health hazard. Shielding or other precautions may be required.

Tabulated Dimensions for Electromagnet

Dim.	Value – Inches	Value – Millimeters
A	2.87 ± .03	72.9 ± .8
B	7.25 ± .03	184.2 ± .8
C	11.60 ± .03	294.6 ± .8
D	15.79 ± .03	401.1 ± .8
E	0.50 ± .02	12.7 ± .5
F	19.28 ± .05	489.7 ± 1.3
G	1.76 ± .06	44.7 ± 1.5
H	10.00 ± .03	254.0 ± .8
J	12.79 ± .03	324.9 ± .8
K	3.16 ± .06	80.3 ± 1.5
L	4.00 ± .03	101.6 ± .8
M	4.50 ± .03	114.3 ± .8
N	3.00 ± .03	76.2 ± .8
P	7.00 ± .03	177.8 ± .8
R	16.00 ± .03	406.4 ± .8
S	17.00 Max.	431.8 Max.
T	1.00 ± .03	25.4 ± .8
V	5.60 ± .03	142.2 ± .8
W	12.80 ± .05	325.1 ± 1.3
X	10.68 ± .05	271.3 ± 1.3

General Information

Cooling

The electron gun is cooled by forced air directed at the cathode-seal area. Air flow must be at least 50 cfm. (24.0 l/sec). The remainder of the tube is cooled by water/vapor system with water cooling the resonators and drift-tube sections and vapor cooling the collector.

The use of distilled water is essential. The liquid flow must start before application of any voltages and preferably should continue for five minutes after removal of voltages. It is recommended that the liquid flow through each of the cooled elements be interlocked with the beam supply to prevent damage to the tube in case of cooling failure.

A steam exhaust sleeve must be provided for the top of the klystron boiler. A flexible, neoprene type is recommended.

The sleeve is placed over the lip provided at the top of the boiler (see Dimensional Outline) and clamped securely in place for a water-tight connection.

Electrical Connections to Tube Terminals

Connections to the Heater, Heater-Cathode and Modulating Anode Terminals (see Dimensional Outline) are made with preformed finger stock or knife blade type fuse clips. Care should be taken when making these connections not to place excessive stress on the ceramic-to-metal seals.

Protection Circuits

Protection circuits serve a threefold purpose: safety of personnel, protection of the tube and protection of tube circuits. Consult Application Note AN4206 for complete information on protection circuits required.

A means of protecting the klystron against damage which would result from failure of the collector vapor cooling system is provided by an integral chromel-alumel thermocouple with terminals at the Cannon Receptacle.

RCA AJ2168 Electromagnet

The RCA 8826 klystron is designed to be mounted in and its beam focused by the water-cooled, single-coil electromagnet, RCA-AJ2168. The exposed surfaces of the electromagnet are treated by painting or plating to resist corrosion.

General Data

Voltage, DC (max.)		35	V
Current, DC (max.)		30	A
Dimensions		See Dimensional Outline	
Weight (Approx.)	Uncrated (104 kg)	230	lbs
	Crated (145 kg)	320	lbs
Cooling:			
Water flow, minimum	(0.063 l/s)	1	gpm
Inlet temperature, maximum		70°	C
Maximum water pressure differential for typical flow (gauge)	(3.5 kg/cm^2)	50	psi
Maximum water pressure at any inlet (gauge)	(4.2 kg/cm^2)	60	psi

8840

S-Band High Power Klystron

- Pulse Amplifier Service
- Factory Fixed Tuned
- Water Cooled
- 28 Megawatts Peak Pulse Output at 2856 MHz
- Power Gain — 53 dB

General Data

Electrical:

Heater		
Type	Matrix Type, Oxide Coated, Unipotential Cathode	
Voltage (AC or DC)	17	V
Current (at 17 V)	15.5	A
Warm up time (at 15.5 A)	20	min.
Direct Interelectrode Capacitance		
Anode to cathode	42	pF
Anode to cathode with corona shield and in electromagnet	50	pF
Operating Frequency	2856	MHz

Mechanical:

Operating Attitude	Vertical, Heater-Cathode end down		
Coolant Connection Pair			
Inlet water connection	1/2-14 NPT External*		
Outlet water connection	1/2-14 NPT External*		
Electrical Connections			
Beam voltage, heater and heater-cathode connections	See Dimensional Outline		
RF input	Mates with Male Connector UG-573/U		
RF output	Mates with Male Waveguide Flange AJ2121, to WR 284 Waveguide		
Uncrated Weight (Approx.)			
Klystron	(68 kg)	150	lb
Electromagnet	(305 kg)	670	lb
X-radiation shielding	(127 kg)	280	lb
Total Weight, Installed with Electro-Magnet and X-Radiation Shielding	(500 kg)	1100	lb

Thermal:

(See Dimensional Outline for temperature measurement points)

Metal Surface Temperature			
At O-ring on cathode cylinder	100	max.	°C
At all other metal surfaces	150	max.	°C
Ambient Oil Temperature			
(Electron-gun-assembly bath)	100	max.	°C
Window Band Temp. through 10-32 NF Tapped Hole in Window Cover to Accommodate Thermocouple	90	max.	°C

Cooling

Immersion of the electron-gun assembly in the oil-bath is required, to the level indicated on the Dimensional Outline. Transformer oil with high insulating properties such as GE 10 C (Mfg. by GE Company) or equivalent, must be used. The oil-bath must be of sufficient volume to limit the surface of the electron gun assembly to a maximum temperature of 100° C.

Water Cooling of the Internal Structure is Required

Water flow	13	typ.	gal/min.
Maximum water pressure at inlet	100	max.	psi
Maximum pressure differential	30	max.	psi
Outlet water temperature	70	max.	°C
Resistivity of coolant water	1.0	min.	meghom-cm

Pulsed RF Amplifier Ratings

Maximum Ratings, Absolute-Maximum Values:

For a maximum dc rectangular pulse "ON" time of 3.2 microseconds in any 2700-microsecond interval, and a rf load vacuum of 10^{-7} Torr.

Peak Pulsed DC Beam Voltage[a]	270	max.	kV
Peak Inverse Beam Voltage	55	max.	kV
Peak Pulsed DC Beam Current	298	max.	A
Peak Pulsed Input Beam Power	80	max.	MW
Average Input Beam Power	94	max.	kW
Load VSWR (Maximum)	1.5:1		

Typical Operation:

With rectangular waveshape rf-pulse having a duty factor of 0.0009 and a duration of 2.5 microseconds centered within a dc pulse duration of 3.2 microseconds, and at a frequency of 2856 MHz.

Peak Pulsed DC Beam Voltage	270	250	225	kV
Peak Pulsed DC Beam Current	280	250	213	A

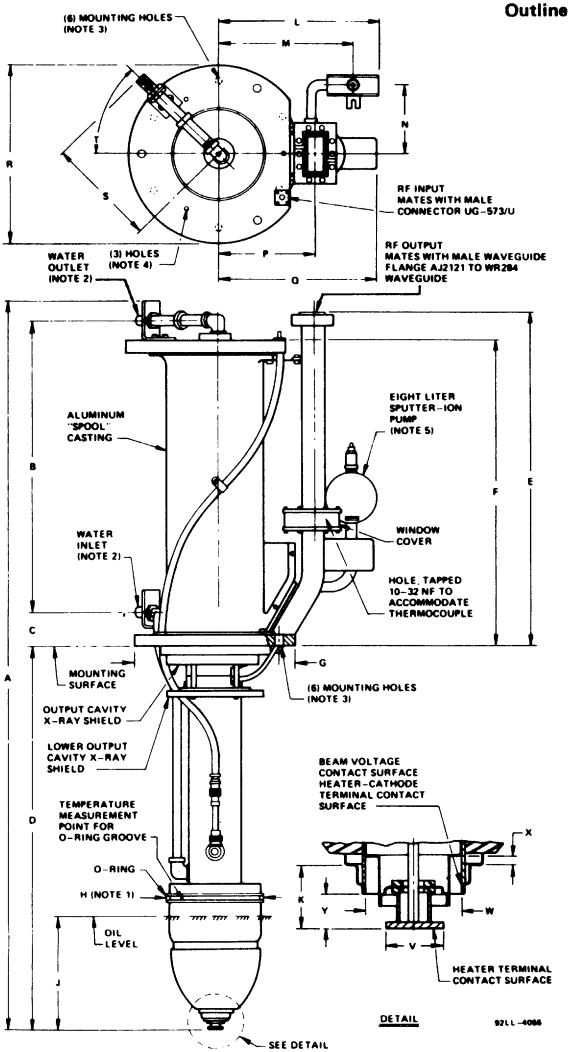
Driving Power Input at Peak of Pulse (Input VSWR <1.5:1) . . .	120	145	170	W
Useful Power Output at Peak of Pulse (Load VSWR <1.2:1) . . .	28	23	16	MW
Power Gain.	53	52	48	dB
Phase Modulation, by Heater Magnetic Field	0.14	0.12	0.10	deg
Phase Modulation, by Change in Beam Voltage.	6.0	6.0	6.0	deg/percent
Amplitude Modulation, by Noise and Heater Magnetic Field	0.12	0.10	0.08	percent

Accessories necessary for rated operation of the 8840 are available from RCA and include X-radiation shields, electromagnets for beam focusing, a sputter-ion-pump magnet assembly, a corona shield, an "O" ring and a mating waveguide flange with its associated gasket and hardware.

Description	RCA Type No.
Set of X-Radiation Shields	AJ2171
Upper Collector Shield	AJ2107
Lower Collector Shield	AJ2173
Outlet Water Pipe Shield	AJ2109
Window Shield	AJ2110
Waveguide Shield	AJ2111
Inlet Water Pipe Shield	AJ2112
Aluminum Spool Shield	AJ2113
Focusing Magnet (One required)	
Electromagnet, Multi Coil	AJ2117V2
Electromagnet Single Coil	AJ2117V3
Corona Shield	AJ2115
Sputter Ion Pump Magnet & Bracket	AJ2170
Oil Tank Sealant O-Ring	AJ2122
Male Waveguide Flange	AJ2121
Waveguide Flange Hardware (Ten sets, bolts, nuts, washers)	AJ2123
Waveguide Flange Gasket (One required)	
Aluminum Gasket	AJ2119
Copper Gasket	AJ2120

Amer. Std. Pipe Thd. (Tapered)

Dimensional Outline



Tabulated Dimensions

Dimensions	Inches	Millimeters
A	57.6 max.	1463 max.
B	22.9 ± 0.3	582 ± 8
C	2.66 ± 0.12	67.6 ± 3.0
D	30.2 ± 0.2	767 ± 5
E	26.03 ± 0.09	661.2 ± 2.3
F	24.00 ± 0.03	609.6 ± 0.8
G Dia.	$13.00^{+0.15}_{-0.05}$	$330.2^{+3.8}_{-1.3}$
H Dia.	7.84 ref.	199.1 ref.
J	9.3 ± 1.0	236 ± 25
K	1.26 ± 0.05	32.0 ± 1.3
L	13.0 max.	330 max.
M	10.50 ref.	266.7 ref.
N	5.44 ref.	138.2 ref.
P	7.50 ± 0.03	190.5 ± 0.8
Q	12.5 max.	317 max.
R Dia.	14.2 max.	361 max.
S	8.53 ± 0.35	216.7 ± 8.9
T	45° ref.	45° ref.
V Dia.	1.12 ref.	28.5 ref.
W Dia.	1.92 ± 0.03	48.8 ± 0.8
X	0.05 min.	1.3 min.
Y	$0.67^{+0.16}_{-0.05}$	$17.0^{+4.1}_{-1.3}$

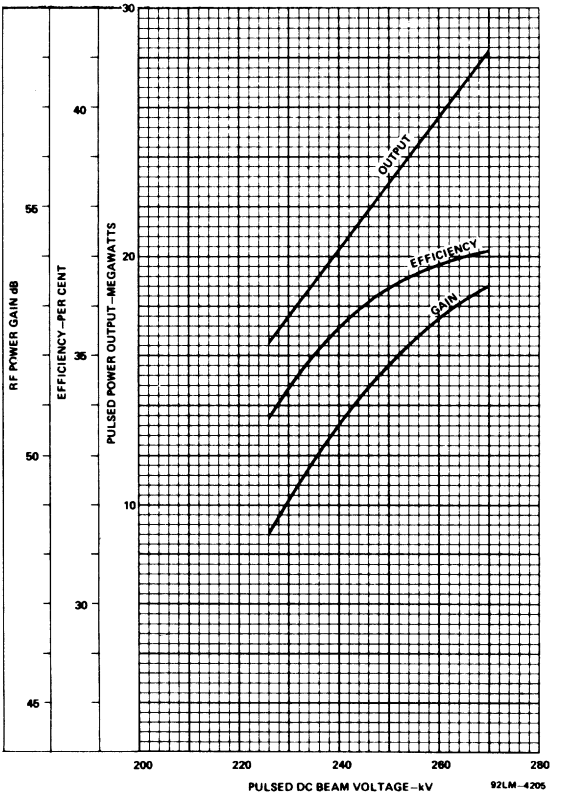
Notes

1. Recommended diameter of O-ring sealing surface.
2. American Standard Taper Pipe Thread (Male) 1/2-14.
3. Mounting holes, six, 9/16 inch diameter equally spaced on a 11.56 in diameter circle.
4. Holes for lifting eye bolts tapped 1/2-13 NC equally spaced on a 10.0 inch diameter circle.
5. A vacuum pump control unit 921-0062 (Varian Vacuum Div., Palo Alto, Calif.) or equivalent is required to operate the sputter ion pump.

X-Radiation Warning

This device in operation may produce X-Radiation which can constitute a health hazard. Shielding or other precautions may be required.

Typical 8840 Performance with Flux Plot "D" Electromagnet Focusing



More detailed information in the form of an application packet PWR-555, is available upon request from your RCA Field Representative or RCA Large Power Tube Application Engineering, Lancaster, PA 17604.

8890

Linear Beam Power Tube

CERMOLOX® **Full Input to 400 MHz**

7000 W Peak Sync. Output through VHF-TV Band with 16 dB Gain

ELECTRICAL

Filamentary Cathode:

Type	Thoriated-Tungsten Mesh	
Voltage[a] (ac or dc)	5.7 typ.	V
	6.0 max.	V
Current:		
Typical value at 5.7 volts	125	A
Maximum value for starting even momentarily	300	A
Cold Resistance	0.005	Ω
Minimum heating time	15	s
Mu-Factor[b]		
(Grid No.2 to Grid No.1)	20	
Direct Interelectrode Capacitances:		
Grid No.1 to plate[c]	0.40 max.	pF
Grid No.1 to filament	70	pF
Plate to filament[c,d]	0.05 max.	pF
Grid No.1 to grid No.2	95	pF
Grid No.2 to plate	12	pF
Grid No.2 to filament[d]	2.5 max.	pF

MECHANICAL

Operating Position	Vertical, either end up
Overall Length	(127.3 mm) 5.01 max. in
Greatest Diameter	(116.1 mm) 4.57 max. in
Terminal Connections	See Dimensional Outline
Sockets	See footnote p
Radiator	Integral part of tube
Weight (Approx.)	(2.7 kg) 6.0 lb

THERMAL

Seal Temperature[e] (Plate, grid No.2, grid No.1, filament-cathode and filament)	250 max.	°C
Plate-Core Temperature[e]	250 max.	°C

RF Power Amplifier or Oscillator — Class C Telegraphy or Class C FM Telephony[f]

MAXIMUM CCS RATINGS, Absolute-Maximum Values

	Up to 400 MHz	
DC Plate Voltage	8000 max.	V
DC Grid-No.2 Voltage[g]	1650 max.	V
DC Grid-No.1 Voltage[h]	-450 max.	V
DC Plate Current	4.0 max.	A
DC Grid-No.1 Current	500 max.	mA
Grid-No.1 Input[h]	150 max.	W
Grid-No.2 Input[g]	250 max.	W
Plate Dissipation	5000 max.	W

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance Under Any Conditions:

With fixed bias	5000 max.	Ω
With cathode bias	Not recommended	
Grid-No.2 Circuit Impedance	See note g	
Plate Circuit Impedance	See note j	

CALCULATED CCS OPERATION

In a grid-drive circuit at 108 MHz

DC Plate Voltage	6500	V
DC Grid-No.2 Voltage	1000	V
DC Grid-No.1 Voltage	-50	V
DC Plate Current	2.35	A
DC Grid-No.2 Current	85	mA
DC Grid-No.1 Current	143	mA
Driver Power Output	60	W
Output Circuit Efficiency	95	%
Useful Power Output	10,000	W

In a cathode-drive circuit at 216 MHz

DC Plate Voltage	6300	V
DC Grid-No.2 Voltage	1000	V
DC Grid-No.1 Voltage	-34	V
DC Plate Current	1.31	A
DC Grid-No.2 Current	40	mA

DC Grid-No.1 Current	40	mA
Driver Power Output (Approx.)	50	W
Output Circuit Efficiency	95	%
Useful Power Output	4500	W

RF Power Amplifier — Class B Television Service[f]

Synchronizing-level conditions per tube unless otherwise specified

MAXIMUM CCS RATINGS, Absolute-Maximum Values

DC Plate Voltage[j]	8000 max.	V
DC Grid-No.2 Voltage[g]	1650 max.	V
DC Grid-No.1 Voltage[h]	-450 max.	V
DC Plate Current	5 max.	A
Plate Dissipation	5000 max.	W
Grid-No.2 Input	250 max.	W
Grid-No.1 Input	150 max.	W

CALCULATED CCS OPERATION

In a cathode-drive circuit at 216 MHz and a bandwidth of 6.3 MHz[m]

DC Plate Voltage	5030	V
DC Grid-No.2 Voltage	1000	V
DC Grid-No.1 Voltage[n]	-30	V
DC Plate Current		
Synchronizing level	2.35	A
Blanking level	1.80	A
DC Grid-No.2 Current		
Synchronizing level	47	mA
Blanking level	27	mA
DC Grid-No.1 Current		
Synchronizing level	135	mA
Blanking level	81	mA
Input Circuit Efficiency	95	%
Driver Power Output		
Synchronizing level	145	W
Blanking level	80	W
Plate Dissipation		
Blanking level	5000	W

Output Circuit Efficiency	95	%
Useful Power Output		
Synchronizing level	7000	W
Blanking level	3940	W

a Measured at tube terminals. The filament may be subjected to rf heating as the frequency of operation is increased. It is recommended that the filament voltage be operated at the lowest voltage that will give stable performance.

b For plate voltage = 2000 V, Grid No.2 voltage = 1375 V, Peak plate current = 6.0 A.

c With external flat metal shield 8" (200 mm) in diameter having a center hole 3" (76 mm) in diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2.

d With external flat metal shield 8" (200 mm) in diameter having a center hole 2-3/8" (60 mm) in diameter. Shield is located in plane of the grid-No.1 terminal, perpendicular to the tube axis, and is connected to grid No.1.

e See Dimensional Outline for temperature measurement points.

m Calculated at the -1.0 dB power point of a double-tuned output circuit using two times tube output capacity.

n Adjusted for I_{bo} = 650 mA.

p Fully engineered sockets for the 8890 tube type are available in limited quantities from RCA (Type J15283), are in production quantities from Jettron Products Inc., 56 Route 10, Hanover, NJ 07936 (Type CD89 085). For effective cooling, it is recommended that the RCA "Heat Pipe" Dev. No.J15304 be used in conjunction with these sockets.

The following footnotes apply to the RCA Transmitting Tube Operating Considerations given at the front of this section.

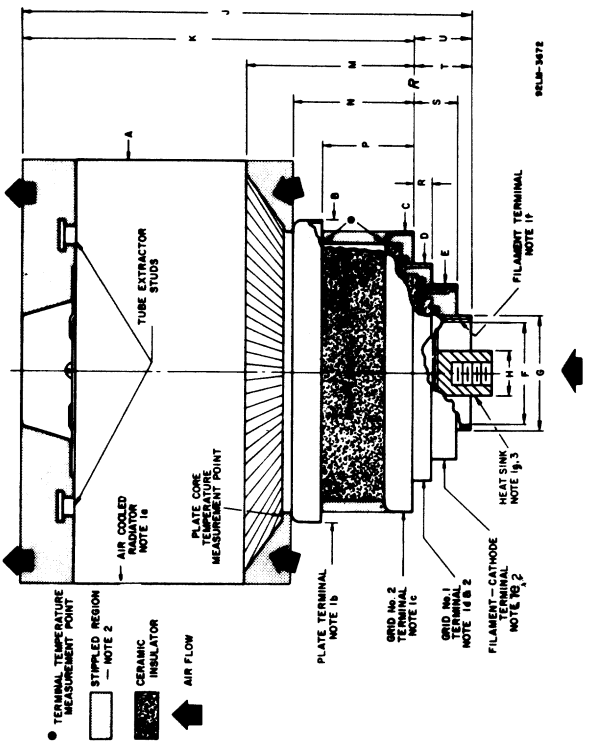
f See Classes of Service.

g See Electrical Considerations - Grid-No.2 Voltage Supply.

h See Electrical Considerations - Grid-No.1 Voltage Supply.

j See Electrical Considerations - Power Supplies and Plate Voltage Supply.

DIMENSIONAL OUTLINE



DIMENSIONAL OUTLINE

Tabulated Dimensions*

Dimension	Value	
A Dia.	4.570 max.	(116.1 max.)
B Dia.	3.235 min.	(82.17 min.)
C Dia.	3.014 min.	(76.56 min.)
D Dia.	2.307 min.	(58.60 min.)
E Dia.	1.840 min.	(46.74 min.)
F Dia.	1.210 max.	(30.73 max.)
G Dia.	1.314 min.	(33.38 min.)
H Dia.	0.620 max.	(15.75 max.)
J	4.930 ± .080	(125.2 ± 2.0)
K	4.300 ± .050	(109.2 ± 1.2)
M	1.790 ± .040	(45.47 ± 1.01)
N	1.330 ± .030	(33.78 ± .76)
P	1.005 ± .020	(25.53 ± .51)
R	0.200 ± .025	(5.08 ± .63)
S	0.475 ± .030	(12.06 ± .76)
T	0.650 ± .030	(16.51 ± .76)
U	0.800 ref.	(20.3 ref)

Note 1 – The contact distance* listed is the uniform indicated length as measured from the edge of the terminal.

		Contact Distance*
1.a	Radiator	1.930 (49.02) min.
1.b	Plate Terminal	0.210 (5.33) min.
1.c	Grid No.2 Terminal	0.200 (5.08) min.
1.d	Grid No.1 Terminal	0.175 (4.45) min.
1.e	Cathode-Filament Terminal	0.220 (5.59) min.
1.f	Filament Terminal ID	0.250 (6.35) max.
1.g	Heat Sink Terminal	0.375 (9.52) max.

Note 2 – Keep all stippled regions clear. In general, do not allow contacts to protrude into these annular regions. If special connectors are required which may intrude on these regions contact RCA Power Tube Application Engineering, Lancaster, PA.

Note 3 – Tapped 1/4-20 NC x 0.5 inch (12.7 mm) deep.

FORCED-AIR COOLING

AIR FLOW

Through radiator – Adequate air flow to limit the plate-core temperature to 250° C should be delivered by a blower through the radiator before and during the application of filament, plate, grid-No.2, and grid No.1 voltages.

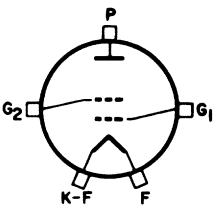
For a plate dissipation of 5000 watts and an incoming air temperature of 50° C, and air flow of 105 cfm is required in accordance with the Typical Cooling Characteristics.

To Plate, Grid-No.2, Grid-No.1, Filament-Cathode, and Filament Terminals – A sufficient quantity of air should be allowed to flow past each of these terminals so that their temperature does not exceed the specified maximum value of 250° C. In normal operation this value is approximately 40 cfm (18.8×10^3 cc/s).

During Standby Operation – Cooling air is required when filament voltage is applied to the tube.

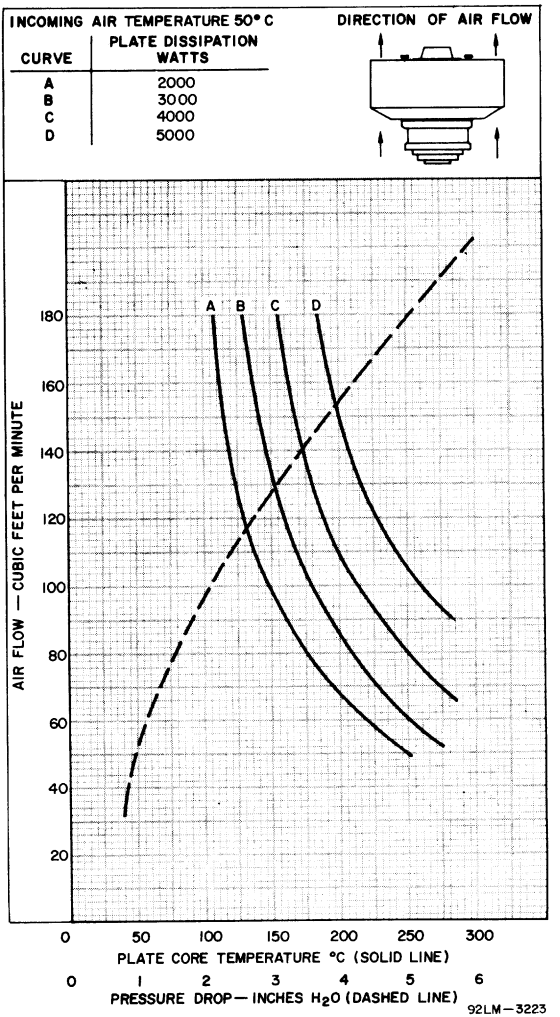
During Shutdown Operation – Air flow should continue for a few minutes after all electrode power is removed.

TERMINAL DIAGRAM

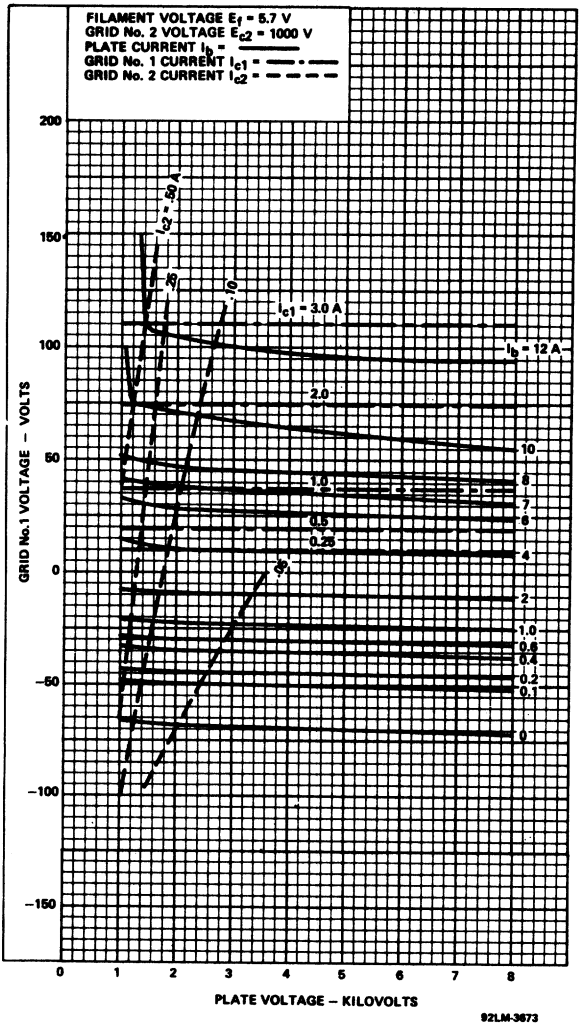


P – Plate Terminal
G_1 – Grid No.1 Terminal
G_2 – Grid No.2 Terminal
K-F – Cathode-Filament Terminal
F – Filament Terminal

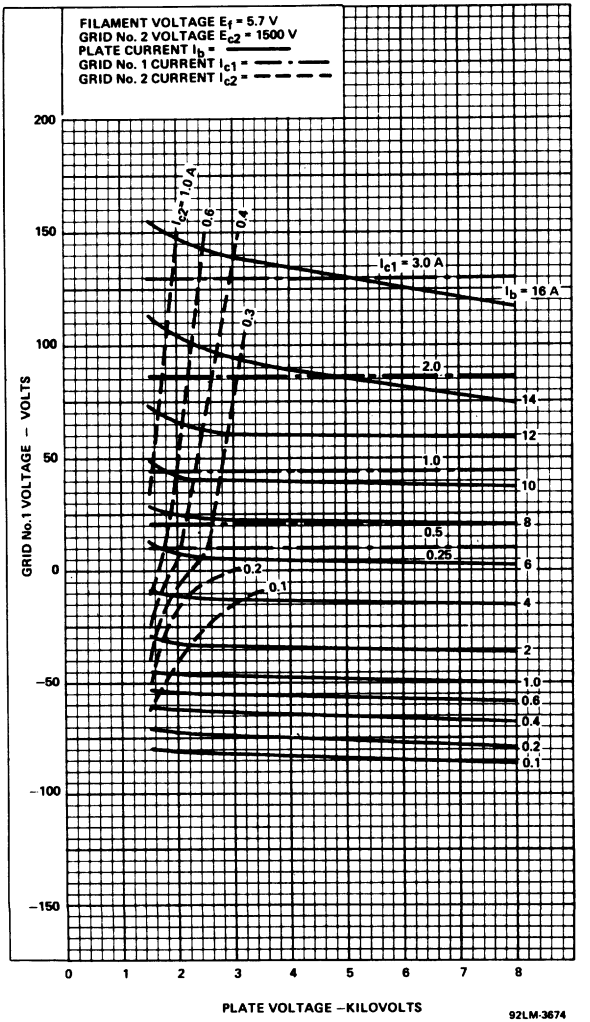
TYPICAL COOLING CHARACTERISTICS



TYPICAL CONSTANT CURRENT CHARACTERISTICS



TYPICAL CONSTANT CURRENT CHARACTERISTICS



8891

Beam Power Tube

CERMOLOX® **Full Input to 400 MHz**

20.0 Kilowatt Peak Sync. Output Through VHF-TV Band at 13 dB Gain

ELECTRICAL

Filamentary Cathode, Thoriated-Tungsten Mesh Type			
Voltage[a] (AC or DC)	9.5 10.0	typ. max.	V V
Current			
Typical value at 9.5 V	153		A
Maximum value for starting even momentarily	300		A
Cold resistance	0.01		Ω
Minimum heating time	15		s
Mu Factor[b] (Grid No.2 to Grid No.1)	12.5		
Direct Interelectrode Capacitances:			
Grid No.1 to plate[c]	0.4	max.	pF
Grid No.1 to filament	100		pF
Plate to filament[c,d]	0.15	max.	pF
Grid No.1 to grid No.2	85		pF
Grid No.2 to plate	20		pF
Grid No.2 to filament[d]	4.0	max.	pF

MECHANICAL

Operating Position	Vertical, either end up		
Overall Length	(180.3 mm)	7.100 max.	in
Greatest Diameter	(210.4 mm)	8.285 max.	in
Radiator	Integral part of tube		
Weight (Approx.)	(10.0 kg)	22	lb

THERMAL

Seal Temperature[e]	250	max.	°C
(Plate, grid No.2, grid No.1, cathode-filament, and filament)			
Plate Core Temperature[e]	250	max.	°C

RF Power Amplifier
Class B Television Service[f,p]

Synchronizing level conditions per tube unless otherwise specified.

MAXIMUM CCS RATINGS, Absolute-Maximum Values:

DC Plate Voltage[g]	9,000 max.	V
DC Grid No.2 Voltage[h]	2,000 max.	V
DC Grid No.1 Voltage[j]	−600 max.	V
DC Plate Current	6.0 max.	A
Grid No.2 Input	450 max.	W
Grid No.1 Input	250 max.	W
Plate Dissipation	See Note m	

Calculated CCS Operation:

In a cathode-drive circuit at 216 MHz and a bandwidth of 6.0 MHz[k]

DC Plate Voltage	6,580	V
DC Grid No.2 Voltage	1,000	V
DC Grid No.1 Voltage	−115	V
Zero Signal DC Plate Current	1.0	A
Effective RF Load Resistance	660	Ω
DC Plate Current:		
Synchronizing level	4.82	A
Blanking level	3.68	A
DC Grid No.2 Current:		
Synchronizing level	137	mA
Blanking level	33	mA
DC Grid No.1 Current:		
Synchronizing level	437	mA
Blanking level	131	mA
Input Circuit Efficiency (Approx.)	92.5	%
Driver Power Output:		
Synchronizing level	865	W
Blanking level	504	W
Output Circuit Efficiency (Approx.)	92.5	%
Useful Power Output:		
Synchronizing level	18.8	kW
Blanking level	10.6	kW

Linear RF Power Amplifier[f,p]

Single-Sideband Suppressed-Carrier Service

Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2.

MAXIMUM CCS RATINGS, Absolute-Maximum Values

	Up to 400 MHz		
DC Plate Voltage[g]	10,000	max.	V
DC Grid-No.2 Voltage[h]	2,000	max.	V
DC Plate Current at Peak of Envelope	6.0	max.	A
DC Grid-No.1 Current	500	max.	mA
Grid-No.2 Input	450	max.	W
Plate Dissipation	15	max.	kW

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance Under Any Conditions:			
With fixed bias	5,000	max.	Ω
With fixed bias (In Class AB_1 operation).	25,000	max.	Ω
With cathode bias	Not recommended		
Grid-No.2 Circuit Impedance	See Note h		
Plate Circuit Impedance	See Note g		

Calculated Class AB_1 CCS Operation with "Two-Tone" Modulation

In a grid-drive circuit at 7 MHz

DC Plate Voltage	8,000	V
DC Grid-No.2 Voltage	1,500	V
DC Grid-No.1 Voltage	−191	V
Zero-Signal DC Plate Current	1.0	A
Effective RF Load Resistance	978.5	Ω
DC Plate Current (At peak of envelope)	3.91	A
Average DC Plate Current	2.49	A
DC Grid-No.2 Current (At peak of envelope)	137	mA
Average DC Grid-No.2 Current	53	mA
Peak Envelope Drive Power	See Note n	
Output Circuit Efficiency (Approx.)	95	%
Useful Power Output (Approx.)		
Average	8,750	W
Peak envelope	17,500	W

Linear RF Power Amplifier[f,p]
Class AB or Class B Telephony

Carrier conditions for use with a maximum modulation factor of 1.0.

MAXIMUM CCS RATINGS, Absolute-Maximum Values

DC Plate Voltage[g]	10,000	max.	V
DC Grid-No.2 Voltage[h]	2,000	max.	V
DC Plate Current	3.0	max.	A
Grid-No.2 Input	300	max.	W
Plate Dissipation	See Note m		

Calculated CCS Operation

In a cathode drive circuit at 400 MHz.

DC Plate Voltage	8,000	V
DC Grid-No.2 Voltage	1,500	V
DC Grid-No.1 Voltage[r]	−235	V
DC Plate Current	2.47	A
DC Grid-No.1 Current	0	mA
DC Grid-No.2 Current	24	mA
Driver Power Output	500	W
Output Circuit Efficiency (Approx.)	80	%
Useful Power Output	5,000	W

[a] Measured at the tube terminals. The filament may be subjected to rf heating as the frequency of operation is increased. It is recommended that the filament power be regulated at the lowest value that will give stable performance. For those applications where hum is a critical consideration, dc filament operation or hum bucking circuits are recommended.

[b] For plate voltage = 2000 V, grid No.2 voltage = 1250 V, and plate current = 15 A.

[c] With external flat metal shield 8" (200 mm) in diameter having a center hole 3" (76 mm) in diameter. Shield is located in plane of the grid No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2.

[d] With external flat metal shield 8" (200 mm) in diameter having a center hole 2-3/8" (60 mm) in diameter. Shield is located in plane on the grid No.1 terminal, perpendicular to the tube axis, and is connected to grid No.1.

[e] See Dimensional Outline for Temperature Measurement Points.

k The bandwidth of 6.0 MHz is calculated at the −1.0 dB power points of a double tuned output circuit using two times the tube capacity and a damping factor of $\sqrt{1.5}$.

m Permitted plate dissipation is a function of cooling. For specific ratings see Forced Air Cooling information.

n Driver power output represents circuit losses and is the actual power measured at the input to the grid No.1 circuit. The actual power required depends on the operating frequency and the circuit used. The tube driving power is approximately zero watts.

p The maximum voltage and air flow rates must be modified to obtain adequate holdoff voltage and cooling at temperatures in excess of 35° C and altitudes above 7000 feet.

r Obtained from a fixed supply with an internal impedance of 695 ohms to provide necessary increase in bias at crest of modulating signal.

The following footnotes apply to the RCA Transmitting Tube Operating Considerations given at the front of this section.

f See Section Class of Service.

g See Section Electrical Considerations - Power Supplies and Plate Voltage Supply.

h See Section Electrical Considerations - Grid-No.2 Voltage Supply.

j See Section Electrical Considerations - Grid-No.1 Voltage Supply.

DIMENSIONAL OUTLINE NOTES

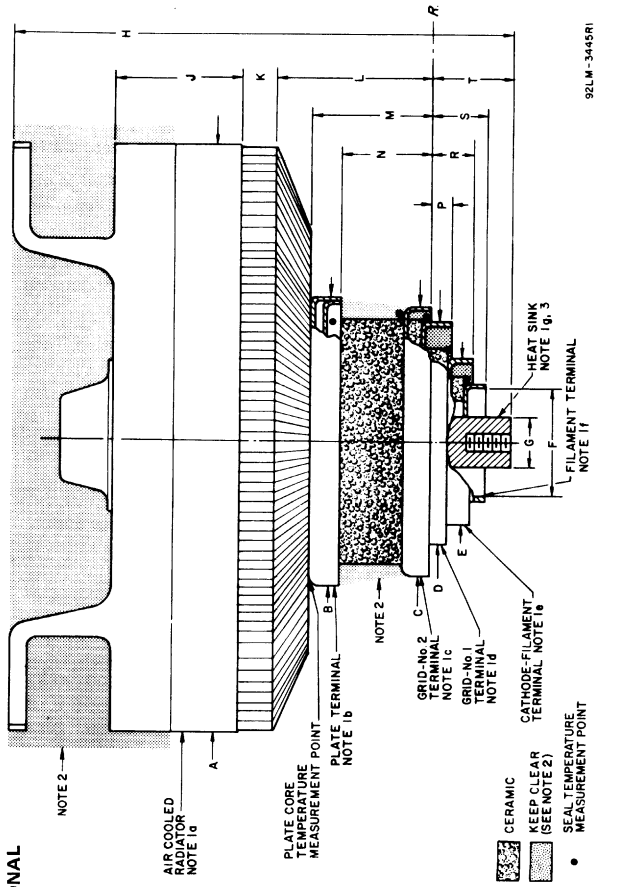
Note 1: The contact distance listed is the minimum, uniform, indicated length as measured from the edge of the terminal.

	Contact Distance inch (mm)
1a. Radiator	0.800 (20.32)
1b. Plate Terminal	0.265 (6.73)
1c. Grid No.2 Terminal	0.265 (6.73)
1d. Grid No.1 Terminal	0.265 (6.73)
1e. Cathode-Filament Terminal	0.250 (6.35)
1f. Filament Terminal	0.265 (6.73)
1g. Heat Sink (post)	0.450 (11.43)

Note 2: Keep all stippled regions clear. In general do not allow contacts to protrude into these annular regions. If special connectors are required which may intrude on these regions, contact RCA Power Tube Application Engineering, Lancaster, PA 17604.

Note 3: Tapped 1/4-20 NC x 0.5 in (12.7 mm) deep.

DIMENSIONAL OUTLINE



DIMENSIONAL OUTLINE

TABULATED DIMENSIONS

Dimensions	Value Inches	Value Millimeters
A Dia.	8.250 ± .035	(209.5 ± .9)
B Dia.	4.188 ± .020	(106.58 ± .51)
C Dia.	3.915 ± .015	(99.44 ± .38)
D Dia.	3.315 ± .015	(84.20 ± .38)
E Dia.	2.696 ± .015	(68.48 ± .38)
F Dia.	1.960 ± .015	(49.78 ± .38)
G Dia.	0.810 max.	(20.57 max.)
H	7.10 max.	(180.3 max.)
J	1.750 ± .030	(44.5 ± .8)
K	0.500 ref.	(12.7 ref.)
L	2.150 ± .050	(54.6 ± 1.3)
M	1.775 min.	(45.1 min.)
N	1.420 ± .030	(36.1 ± .8)
P	0.330 ± .030	(8.4 ± .8)
R	0.650 ± .038	(16.5 ± 1.0)
S	0.960 ± .050	(24.4 ± 1.3)
T	1.200 ref.	(30.5 ref.)

FORCED-AIR COOLING

AIR-FLOW

Through radiator – Adequate air flow to limit the plate-core temperature to 250° C should be delivered by a blower through the radiator before and during the application of filament, plate, grid-No.2, and grid-No.1 voltages.

For typical operation, the required air flow is as follows:

Plate Dissipation	Air Flow	Pressure Drop
Kilowatts	CFM	Inches H_2O
12.5	350	1.75
15.0	425	2.50
17.5	550	3.50

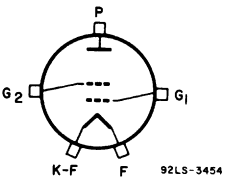
To Plate, Grid-No.2, Grid-No.1, Cathode-Filament, and Filament Terminals – A sufficient quantity of air should be

allowed to flow past each of these terminals so that its temperature does not exceed the specified maximum value of 250° C.

During Standby Operation – Cooling air is required when only filament voltage is applied to the tube.

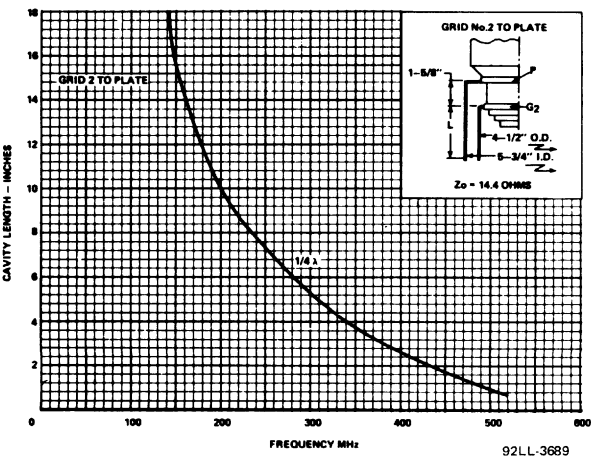
During Shutdown Operation – Air flow should continue for a few minutes after all electrode power is removed.

TERMINAL DIAGRAM

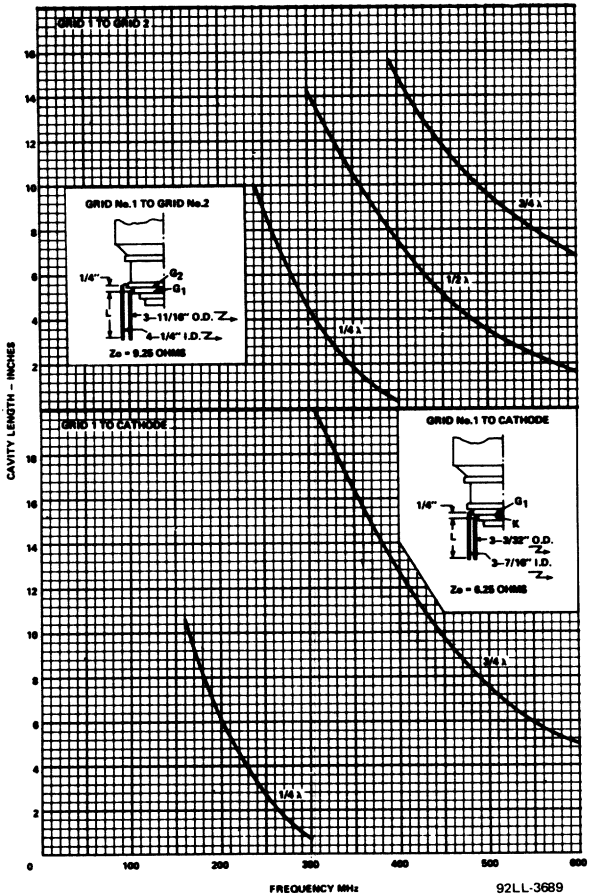


P – Plate Terminal
G_2 – Grid-No.2 Terminal
G_1 – Grid-No.1 Terminal
K-F – Cathode Filament Terminal
F – Filament Terminal

ELECTRODE CAVITY TUNING CHARACTERISTICS



ELECTRODE CAVITY TUNING CHARACTERISTICS (Cont'd.)



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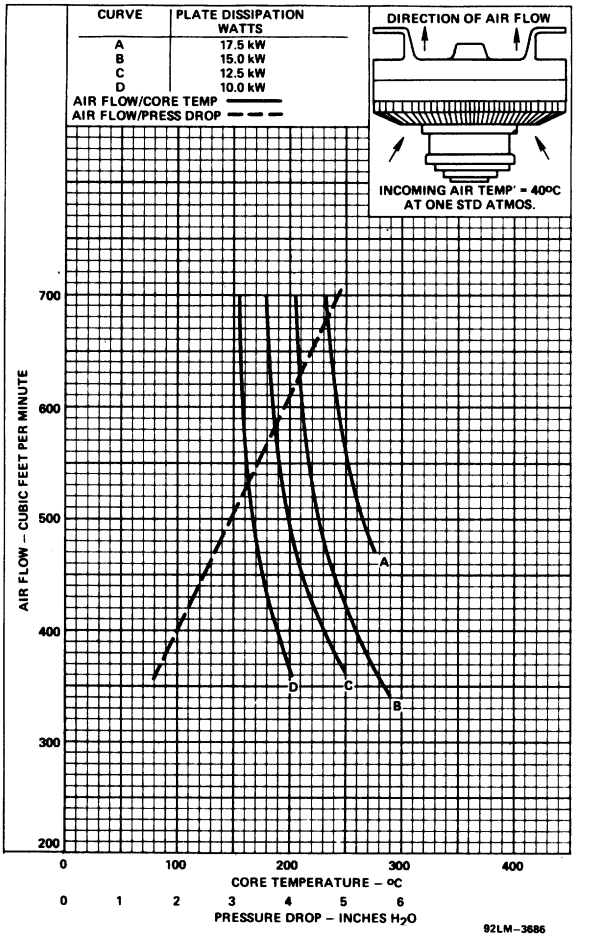
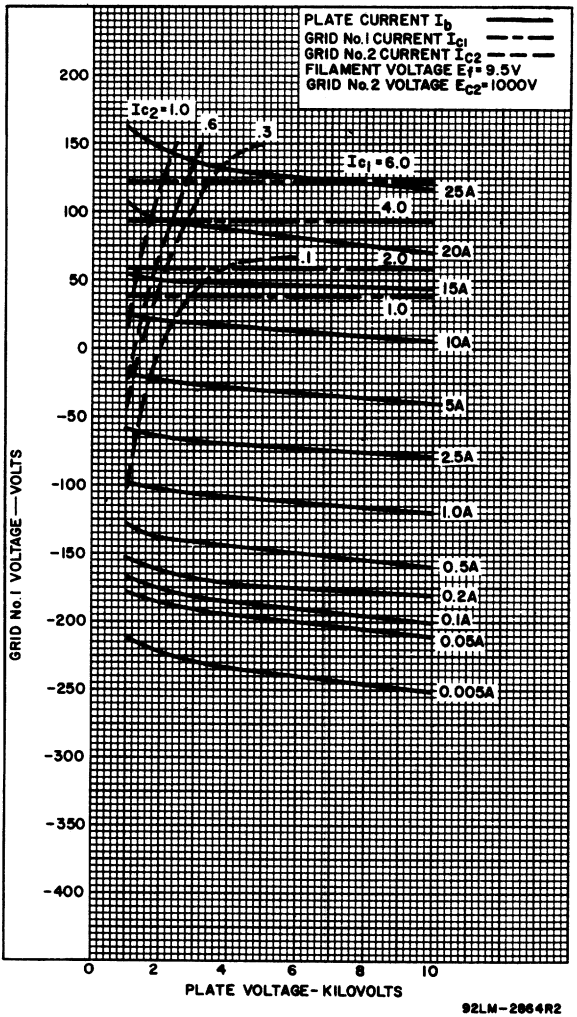
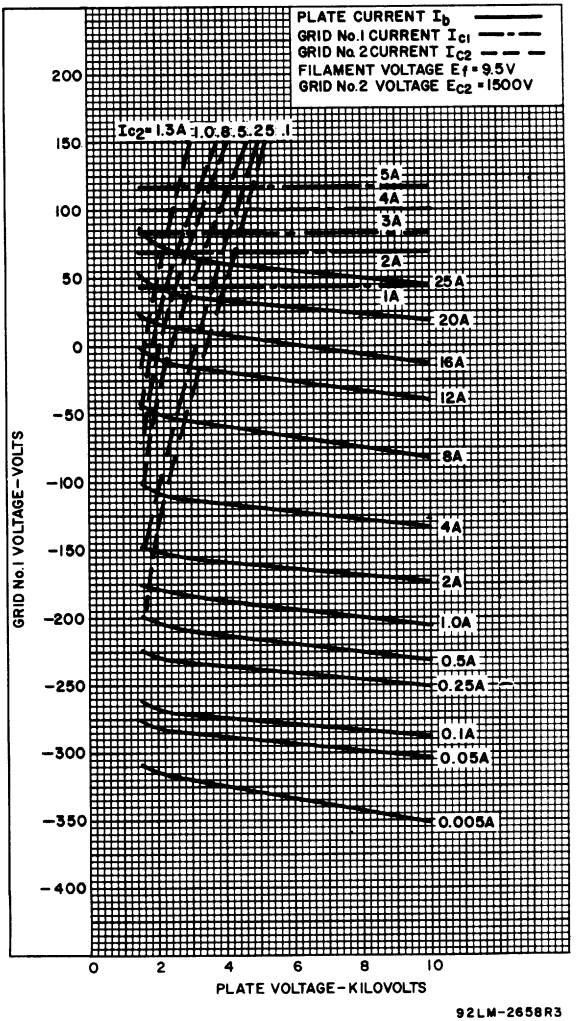
TYPICAL COOLING CHARACTERISTICS



TYPICAL CONSTANT CURRENT CHARACTERISTICS



TYPICAL CONSTANT CURRENT CHARACTERISTICS



8916

VHF Linear Power Amplifier Tube

27.5 Kilowatt Peak Sync. Output thru VHF-TV Band

- **CERMOLOX® Construction**
- **13 dB Gain**
- **Efficient Forced-Air Cooling**
- **High Gain-Bandwidth Products**
- **Full Input to 400 MHz**

ELECTRICAL

Filamentary Cathode, Thoriated-Tungsten Mesh Type

Voltage[a] (ac or dc)	9.5	typ.	V
	10.0	max.	V
Current:			
Typical value at 9.5 volts	153		A
Maximum value for starting, even momentarily	300		A
Cold resistance	0.01		Ω
Minimum heating time	15		s
Mu-Factor[b], (Grid No.2 to Grid No.1)	12.5		
Direct Interelectrode Capacitances:			
Grid No.1 to plate[c]	0.4	max.	pF
Grid No.1 to filament	100		pF
Plate to filament[c,d]	0.15	max.	pF
Grid No.1 to grid No.2	85		pF
Grid No.2 to plate	20		pF
Grid No.2 to filament[d]	4.0	max.	pF

MECHANICAL

Operating Position	Vertical, either end up
Overall Length (max.)	(180.3 mm) 7.10 in
Greatest Diameter	(210.4 mm) 8.285 in
Radiator	Integral part of tube
Weight (Approx.)	(10.0 kg) 22 lbs

THERMAL

Seal Temperature[e] (Plate, Grid No.2, Grid-No.1, Cathode-Filament, and Filament)	250 max. °C
Plate-Core Temperature[e,f]	275 max. °C

RF Power Amplifier
Class B Television Service[g,h]

Synchronizing-level conditions per tube unless otherwise specified.

MAXIMUM CCS RATINGS, Absolute-Maximum Values

DC Plate Voltage[i]	10,000	max.	V
DC Grid No.2 Voltage[k]	2000	max.	V
DC Grid No.1 Voltage[m]	−600	max.	V
DC Plate Current	6.0	max.	A
Grid No.2 Input	450	max.	W
Grid No.1 Input	250	max.	W
Plate Dissipation	See notes f & p		

TYPICAL CCS OPERATION

In a cathode-drive circuit at 216 MHz and a bandwidth of 6.3 MHz[n]

DC Plate Voltage	7800	8300	V
DC Grid No.2 Voltage	1000	1500	V
DC Grid No.1 Voltage	−110	−190	V
Zero Signal DC Plate Current	1.25	1.25	A
Effective RF Load Resistance	670	670	Ω
DC Plate Current			
Synchronizing level	5.8	5.75	A
Blanking level	4.4	4.40	A
DC Grid No.2 Current			
Synchronizing level	120	190	mA
Blanking level	20	100	mA
DC Grid No.1 Current			
Synchronizing level	700	140	mA
Blanking level	250	10	mA
Input Circuit Efficiency (Approx.)	85	85	%
Driver Power Output			
Synchronizing level	1240	1300	W
Blanking level	700	790	W
Output Circuit Efficiency (Approx.)	95	95	%
Useful Power Output			
Synchronizing level	27,500	27,500	W
Blanking level	15,500	15,500	W

Linear RF Power Amplifier[g,h]
Single-Sideband Suppressed-Carrier Service

Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2.

MAXIMUM CCS RATINGS, Absolute-Maximum Values

	Up to 400 MHz		
DC Plate Voltage[j]	10,000	max.	V
DC Grid-No.2 Voltage[k]	2,000	max.	V
DC Plate Current at Peak of Envelope	6.0	max.	A
DC Grid-No.1 Current	500	max.	mA
Grid-No.2 Input	450	max.	W
Plate Dissipation	See Notes f & p		

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance Under Any Conditions:			
With fixed bias	5.000	max.	Ω
With fixed bias (in Class AB_1 operation)	25,000	max.	Ω
With cathode bias	Not recommended		
Grid-No.2 Circuit Impedance	See Note k		
Plate Circuit Impedance	See Note j		

CALCULATED CLASS AB_1 OPERATION WITH "TWO-TONE" MODULATION

In a grid-drive circuit at 7 MHz

DC Plate Voltage	8,000	V
DC Grid-No.2 Voltage	1,500	V
DC Grid-No.1 Voltage	−190	V
Zero-Signal DC Plate Current	1.0	A
Effective RF Load Resistance	978.5	Ω
DC Plate Current (At peak of envelope)	3.90	A
Average DC Plate Current	2.50	A
DC Grid-No.2 Current (At peak of envelope)	140	mA
Average DC Grid-No.2 Current	55	mA
Peak Envelope Drive Power	See Note r	
Output Circuit Efficiency (Approx.)	95	%
Useful Power Output (Approx.)		
Average	8,750	W
Peak envelope	17,500	W

Linear RF Power Amplifier[g,h]
Class AB or Class B Telephony

Carrier conditions for use with a maximum modulation factor of 1.0

MAXIMUM CCS RATINGS, Absolute-Maximum Values

DC Plate Voltage[j]	10,000	max.	V
DC Grid-No.2 Voltage[k]	2,000	max.	V
DC Plate Current	3.0	max.	A
Grid-No.2 Input	300	max.	W
Plate Dissipation	See Notes f &p		

CALCULATED CCS OPERATION

In a cathode drive circuit at 400 MHz

DC Plate Voltage	8,000	V
DC Grid-No.2 Voltage	1,500	V
DC Grid-No.1 Voltage[s]	−235	V
DC Plate Current	2.50	A
DC Grid-No.1 Current	0	mA
DC Grid-No.2 Current	25	mA
Driver Power Output	500	W
Output Circuit Efficiency (Approx.)	80	%
Useful Power Output	5,000	W

a Measured at the tube terminals. The filament may be subjected to rf heating as the frequency of operation is increased. It is recommended that the filament power be regulated at the lowest value that will give stable performance. For those applications where hum is a critical consideration, dc filament operation or hum bucking circuits are recommended.

b For plate voltage = 2000 V, grid No.2 voltage = 1250 V, and plate current = 15 A.

c With external flat metal shield 8" (200 mm) in diameter having a center hole 3" (76 mm) in diameter. Shield is located in plane of the grid No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2.

d With external flat metal shield 8" (200 mm) in diameter having a center hole 2-3/8" (60 mm) in diameter. Shield is located in plane of the grid No.1 terminal, perpendicular to the tube axis, and is connected to grid No.1.

e See Dimensional Outline for Temperature Measurement Points.

f The value of 275° C is the average of three readings taken 120° apart around the periphery of the anode core. No one reading may exceed 300° C.

h The maximum voltage and air flow rates must be modified to obtain adequate holdoff voltage and cooling at temperatures in excess of 35° C and altitudes above 7000 feet.

n The bandwidth of 6.3 MHz is calculated at the −0.72 dB power points of a double tuned output circuit using two times the tube output capacity and a damping factor of $\sqrt{1.5}$ as shown in BANDWITH CALCULATION below.

p Permitted plate dissipation is a function of cooling. For specific ratings see Forced Air Cooling information

r Driver power output represents circuit losses and is the actual power measured at the input to the grid No.1 circuit. The actual power required depends on the operating frequency and the circuits used. The tube driving power is approximately zero watts.

s Obtained from a fixed supply with an internal impedance of 695 ohms to provide necessary increase in bias at crest of modulating signal.

The following footnotes apply to the RCA Transmitting Tube operating considerations given at the front of this section.

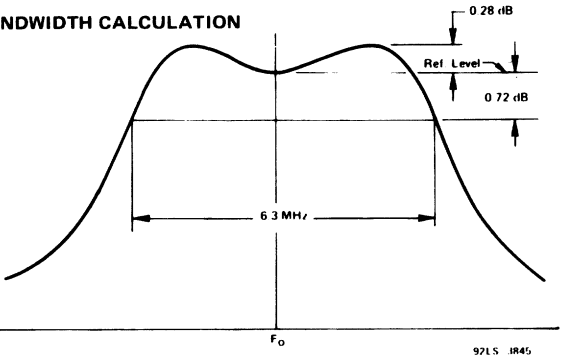
g See Classes of Service.

j See Plate Voltage Supply.

k See Grid-No. 2 Voltage Supply.

m See Grid-No. 1 Voltage Supply.

BANDWIDTH CALCULATION



FORCED-AIR COOLING

Air Flow:

Through radiator-adequate air flow to limit the plate-core temperature to 275° C should be delivered by a blower through the radiator before and during the application of filament, plate, grid-No.2, and grid-No.1 voltages.

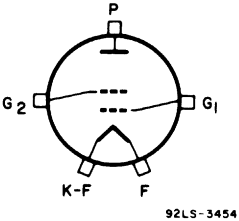
For typical operation, the required air flow, related to sea level and at a temperature of 35° C, is as follows:

Plate Dissipation	Air Flow	Pressure Drop
Kilowatts	**CFM**	**Inches H_2O**
18.0	520	3.75
20.0	600	4.50
22.0	800	6.30

To Plate, Grid-No.2, Grid-No.1, Cathode-Filament, and Filament Terminals – A sufficient quantity of air should be allowed to flow past each of these terminals so that its temperature does not exceed the specified maximum value of 250° C.

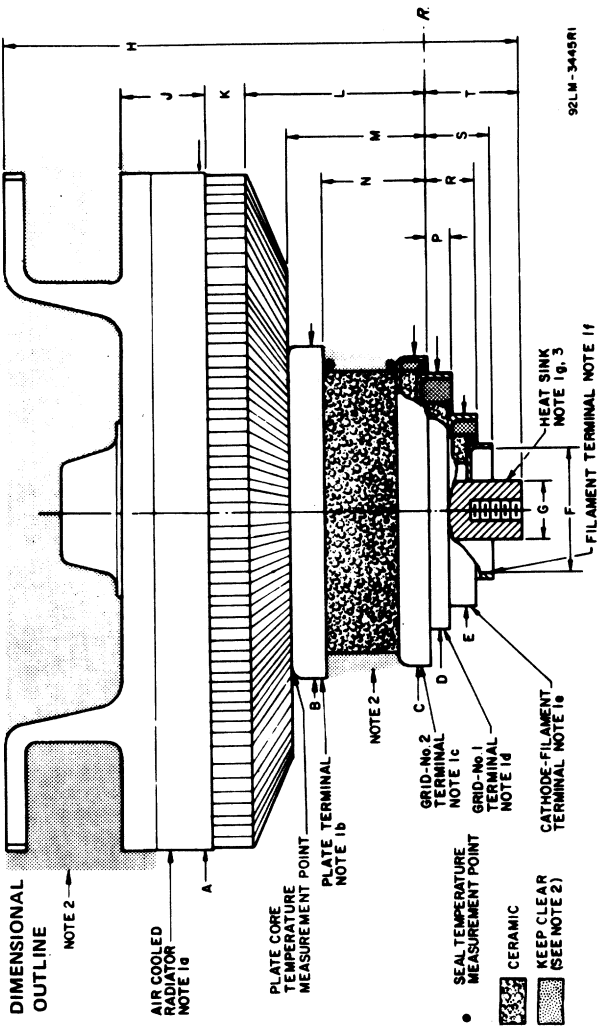
During Standby Operation – Cooling air is required when only filament voltage is applied to the tube.

During Shutdown Operation – Air flow should continue for a few minutes after all electrode power is removed.



92LS-3454

P – Plate Terminal
G_2 – Grid-No.2 Terminal
G_1 – Grid-No.1 Terminal
K-F – Cathode-Filament Terminal
F – Filament Terminal


DIMENSIONAL OUTLINE
NOTE 2
AIR COOLED RADIATOR NOTE 1a
A
PLATE CORE TEMPERATURE MEASUREMENT POINT
B
PLATE TERMINAL NOTE 1b
NOTE 2
C
GRID-No.2 TERMINAL NOTE 1c
D
GRID-No.1 TERMINAL NOTE 1d
E
CATHODE-FILAMENT TERMINAL NOTE 1e
SEAL TEMPERATURE MEASUREMENT POINT
CERAMIC
KEEP CLEAR (SEE NOTE 2)
HEAT SINK NOTE 1g, 3
FILAMENT TERMINAL NOTE 1f
G
F
H
J
K
L
M
N
P
R
S
T
R
92LM-3445R1

TABULATED DIMENSIONS*

Dimensions	Value	Value
A Dia.	8.250 ± .035	(209.5 ± .9)
B Dia.	4.188 ± .020	(106.58 ± .51)
C Dia.	3.915 ± .015	(99.44 ± .38)
D Dia.	3.315 ± .015	(84.20 ± .38)
E Dia.	2.696 ± .015	(68.48 ± .38)
F Dia.	1.960 ± .015	(49.78 ± .38)
G Dia.	0.810 max.	(20.57 max.)
H	7.10 max.	(180.3 max.)
J	1.750 ± .030	(44.5 ± .8)
K	0.500 ref.	(12.7 ref.)
L	2.150 ± .050	(54.6 ± 1.3)
M	1.775 min.	(45.1 min.)
N	1.420 ± .030	(36.1 ± .8)
P	0.330 ± .030	(8.4 ± .8)
R	0.650 ± .038	(16.5 ± 1.0)
S	0.960 ± .050	(24.4 ± 1.3)
T	1.200 ref.	(30.5 ref.)

Note 1 – The contact distance* listed is the minimum, uniform, indicated length as measured from the edge of the terminal.

	Contact Distance
1a. Radiator	0.800 (20.32)
1b. Plate Terminal	0.265 (6.73)
1c. Grid No.2 Terminal	0.265 (6.73)
1d. Grid No.1 Terminal	0.265 (6.73)
1e. Cathode-Filament Terminal	0.250 (6.35)
1f. Filament Terminal	0.265 (6.73)
1g. Heat Sink (post)	0.450 (11.43)

Note 2 – Keep all stippled regions clear. In general do not allow contacts to protrude into these annular regions. If special connectors are required which may intrude on these regions, contact RCA Power Tube Application Engineering, Lancaster, PA 17604.

Note 3 – Tapped 1/4-20 NC x 0.5 in (12.7 mm) deep.

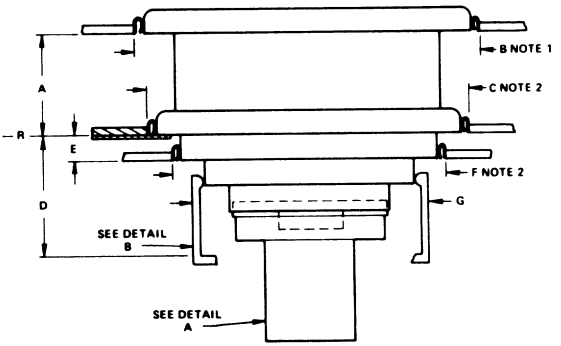
*Dimensions are in inches unless otherwise stated. Dimensions in parentheses are in millimeters and are derived from the basic inch dimension (1 inch = 25.4 mm).

MOUNTING

The preferred mounting arrangement is depicted below. Other arrangements, such as cavity-type mounting, for multiple-ring terminal tubes may be constructed using either fixed or adjustable contact rings in the transverse plane,

Ready-made sockets may be obtained, in limited quantities, from RCA as the J15293, or in production quantities as the CD 89-094, from Jettron Products Inc., 56 Route 10, Hanover, NJ 07936.

PREFERRED MOUNTING ARRANGMENT



PREFERRED MOUNTING
ARRANGEMENT (CONT' D)
8 SLOTS EQUALLY SPACED
0.050" (1.26mm) WIDE
0.500" (12.7mm) DEEP
NOTE 3
NOTE 3
DETAIL A
DETAIL B
(16) SLOTS
AM WIDE X AN DEEP
EQUALLY SPACED
(16) HOLES
AK DIA.
EQUALLY SPACED
AJ
AH
AG
AF
AA
AP
AB
AE
AD
AC
92LM-3688

MOUNTING ARRANGEMENT
TABULATED DIMENSIONS

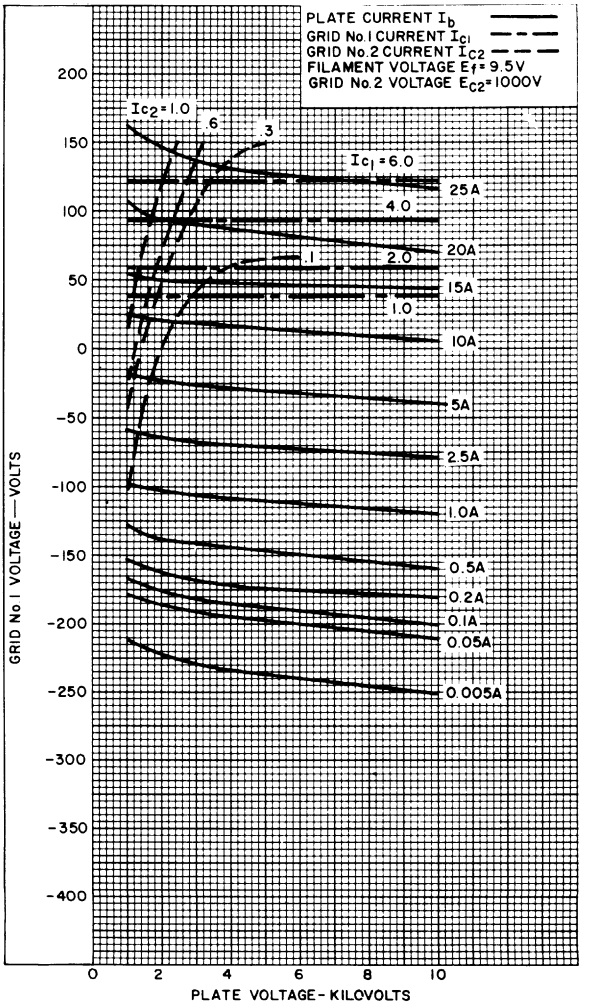
Dimension	Inches	Millimeters
A	1.320	(33.53)
B Dia.	4.440	(112.78)
C Dia.	4.095	(104.02)
D	1.713	(43.51)
E	0.330	(8.38)
F Dia.	3.495	(88.77)
G Dia.	3.000	(76.20)
H Dia.	$1.975\ ^{+0.002}_{-0.000}$	$(\ 50.17\ ^{+0.05}_{-0.00})$
J Dia.	0.810	(20.57)
K	0.250	(6.35)
L	0.312	(7.92)
M	1.812	(49.98)
N	0.625	(15.88)
P	0.250	(6.35)
R Dia.	0.261	(6.63)
S Dia.	0.700	(17.78)
T Dia.	0.918	(23.32)
U Dia.	1.135	(28.83)
V Dia.	1.737	(44.11)
W	1.125	(28.58)
AA Dia.	2.625	(66.68)
AB	45°	
AC	1.25	(31.75)
AD	1.00	(25.40)
AE	0.40	(10.16)
AF Dia.	$2.681 \pm .002$	$(\ 68.10 \pm .05)$
AG Dia.	2.840	(72.14)
AH Dia.	3.00	(76.20)
AJ	22-1/2°	
AK Dia.	0.281	(7.14)
AM	0.125	(3.18)
AN	1.000	(25.40)
AP Radius	0.125	(3.18)

Note 1 – Finger stock is 97-139 made by Instrument Specialties Co., Little Falls, NJ.

Note 2 – Finger stock is 97-360 made by Instrument Specialties Co., Little Falls, NJ.

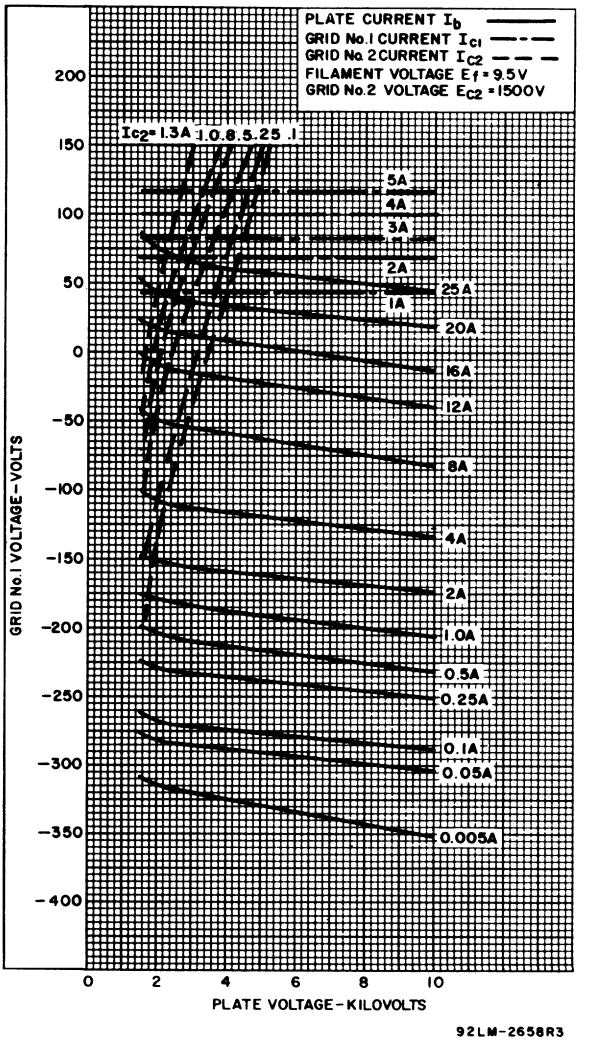
Note 3 – Round all corners.

TYPICAL CONSTANT CURRENT CHARACTERISTICS

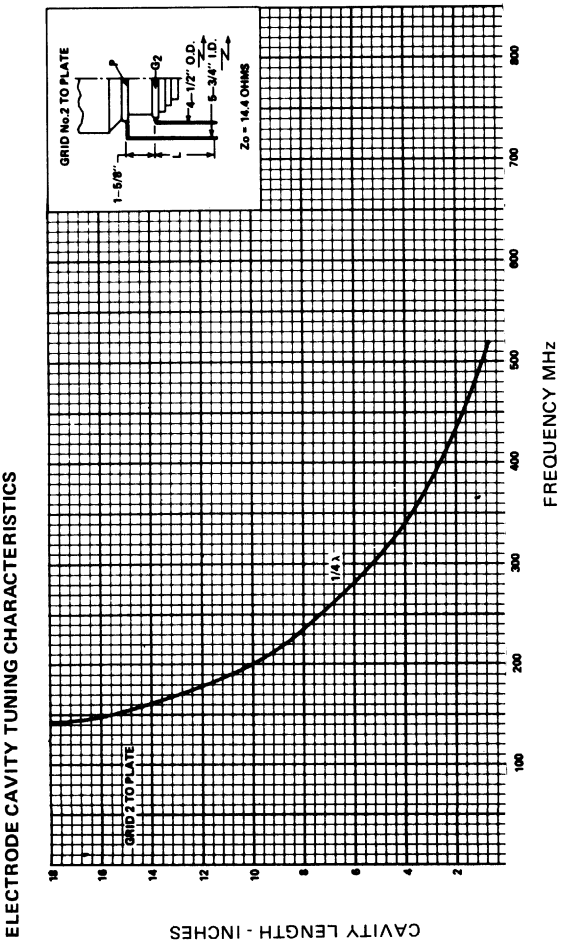


92LM-2864R2

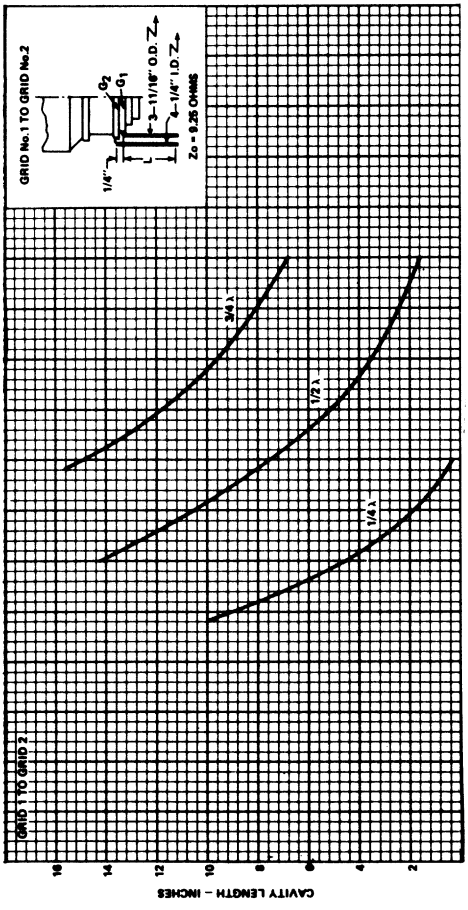
TYPICAL CONSTANT CURRENT CHARACTERISTICS



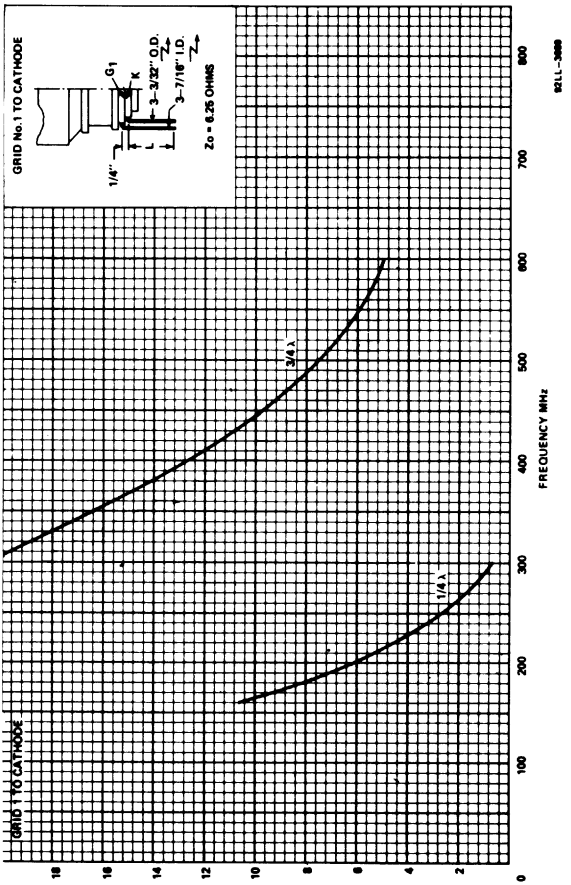
92LM-2658R3


ELECTRODE CAVITY TUNING CHARACTERISTICS
GRID No.2 TO PLATE
1-5/8"
L
G2
4-1/2" O.D.
5-3/4" I.D.
Z0 = 14.4 OHMS
GRID 2 TO PLATE
1/4λ
CAVITY LENGTH - INCHES
FREQUENCY MHz
18
16
14
12
10
8
6
4
2
100
200
300
400
500
600
700
800

ELECTRODE CAVITY TUNING CHARACTERISTICS



ELECTRODE CAVITY TUNING CHARACTERISTICS

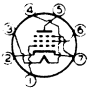


9001

DETECTOR AMPLIFIER PENTODE

MIDGET TYPE

Heater ■	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.15	amp.
Direct Interelectrode Capacitances:		
Grid to Plate	0.01 max.	μμf
Input	3.6	μμf
Output	3.0	μμf
Maximum Overall Length		1-13/16"
Maximum Seated Height		1-9/16"
Length from Base Seat to Bulb Top (excluding tip)		1-3/16" ± 3/32"* ←
Maximum Diameter		3/4"
Bulb		T-5-1/2
Base▲		Miniature Button 7-Pin
Pin 1 - Grid		Pin 5 - Plate
Pin 2 - Cathode		Pin 6 - Screen
Pin 3 - Heater		Pin 7 - Cathode, Grid No. 3, internal Shield
Pin 4 - Heater		
RCA Socket		Stock No. 9914 ←
Mounting Position	BOTTOM VIEW	Any



Maximum and Minimum Ratings Are Design-Center Values

AMPLIFIER

Plate Voltage	250 max.	volts
Screen Voltage	100 max.	volts
Grid Voltage	-3 min.	volts
Plate Dissipation	0.5	watt ←
Screen Dissipation	0.1	watt ←

Typical Operation and Characteristics - Class A_1 Amplifier:

Plate Voltage	90	250	volts
Screen Voltage	90	100	volts
Grid Voltage	-3	-3	volts
Plate Resistance	1.0	•	approx. megohm
Transconductance	1100	1400	μmhos
Plate Current	1.2	2.0	ma.
Screen Current	0.5	0.7	ma.

Typical Operation as Mixer in Superheterodyne Circuit:

Plate Voltage	100	250	volts
Screen Voltage	100	100	volts
Grid Voltage #	-5	-5	approx. volts
Conversion Transconductance	-	550	approx. μmhos

Shielding and *r-f by-passing* of each r-f amplifier stage may be required in order to prevent interstage coupling and to provide the shortest possible circuit returns when the tube is operated at the ultra-high frequencies. R-f by-passing can be accomplished by the use of small condensers having short leads placed close to the tube terminals. It may also be advisable in some applications to supplement the action of the by-pass condensers by r-f chokes close to the condensers in the return or supply leads for the grid, screen,

■, ▲, • #: See next page. *Temporary minimum length = 1-1/16".

← Indicates a change.

9001

DETECTOR AMPLIFIER PENTODE

(continued from preceding page)

plate and heater. The 9001 has two cathode leads in order that the plate and screen r-f circuits may be completed with a minimum of circuit inductance in common with the grid circuit. The grid return may be connected to one cathode terminal and the plate and screen returns may be connected to the other cathode terminal.

■ The cathode of the 9001, when operated from a transformer, should preferably be connected to the heater circuit. In the case of d-c operation of the heater from a storage battery, the cathode circuit is tied in either directly or through bias resistors to the negative battery terminal. In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.

● Greater than 1.0 megohm.

The grid bias is minimum for an oscillator peak voltage of 4 volts. These values are optimum.

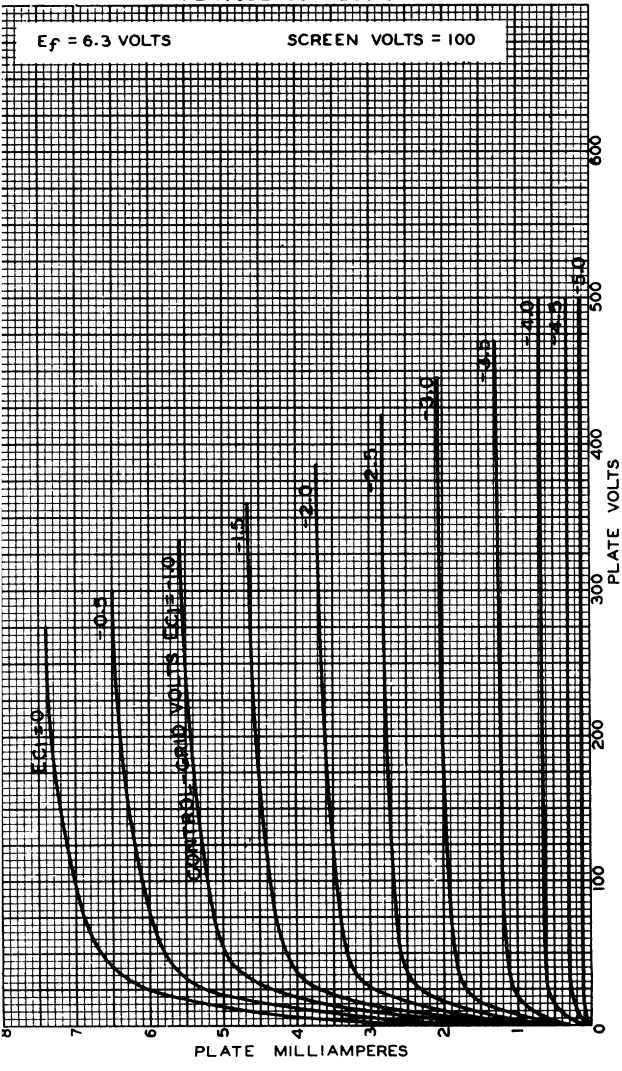
▲ *The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole.*

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

9001

AVERAGE PLATE CHARACTERISTICS

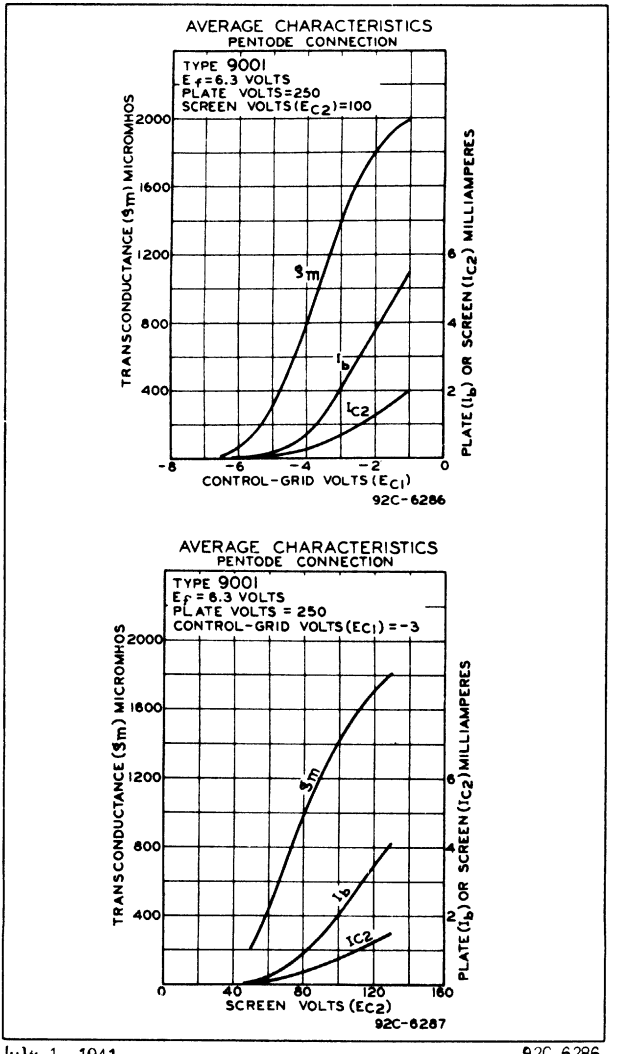
PENTODE CONNECTION



9001

9001

DETECTOR AMPLIFIER PENTODE



July 1, 1941

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

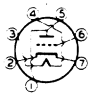
92C-6286
92C-6287

9002

DETECTOR, AMPLIFIER, OSCILLATOR

MIDGET TYPE

Heater ■	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.15	amp.
Direct Interelectrode Capacitances:		
Grid to Plate	1.4	μμf
Grid to Cathode	1.2	μμf
Plate to Cathode	1.1	μμf
Maximum Overall Length		1-13/16"
Maximum Seated Height		1-9/16"
Length from Base Seat to Bulb Top (excluding tip)		1-3/16" ± 3/32"* ◄
Maximum Diameter		3/4"
Bulb		T-5-1/2
Base ▲		Miniature Button 7-Pin
Pin 1 - Plate		Pin 5 - Plate
Pin 2 - Cathode		Pin 6 - Grid
Pin 3 - Heater		Pin 7 - Cathode
Pin 4 - Heater		
RCA Socket		Stock No. 9914 ◄
Mounting Position	BOTTOM VIEW	Any



Maximum Ratings Are Design-Center Values

AMPLIFIER

Plate Voltage	250 max. volts
Plate Dissipation	1.6 max. watts ◄

Typical Operation and Characteristics - Class A_1 Amplifier:

Plate	90	135	180	250	volts
Grid	-2.5	-3.75	-5	-7	volts
Amp. Fact.	25	25	25	25	
Plate Res.	14700	13200	12500	11400	ohms
Transcond.	1700	1900	2000	2200	μmhos
Plate Cur.	2.5	3.5	4.5	6.3	ma.

■ The cathode of the 9002, when operated from a transformer, should preferably be connected to the heater circuit. In the case of d-c operation of the heater from a storage battery, the cathode circuit is tied in either directly or through bias resistors to the negative battery terminal. In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.

▲ *The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole.*

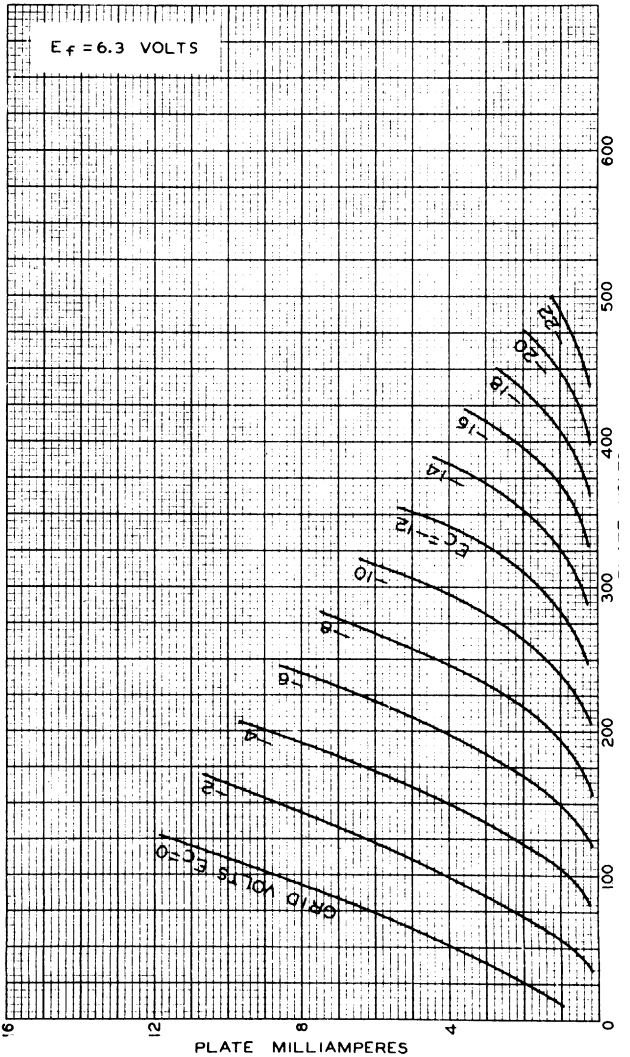
*Temporary minimum length = 1-1/16".

◄ Indicates a change.

9002

9002

AVERAGE PLATE CHARACTERISTICS

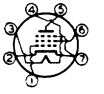


9003

SUPER-CONTROL R-F AMPLIFIER PENTODE

MIDGET TYPE

Heater	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.15	amp.
Direct Interelectrode Capacitances:		
Grid to Plate	0.01 max.	μμf
Input	3.4	μμf
Output	3.0	μμf
Maximum Overall Length		1-13/16"
Maximum Seated Height		1-9/16"
Length from Base Seat to Bulb Top (excluding tip)		1-3/16" ± 3/32"* ←
Maximum Diameter		3/4"
Bulb		T-5-1/2
Base▲		Miniature Button 7-Pin
Pin 1 - Grid		Pin 5 - Plate
Pin 2 - Cathode		Pin 6 - Screen
Pin 3 - Heater		Pin 7 - Cathode, Grid No. 3, Internal Shield
Pin 4 - Heater		
RCA Socket		Stock No. 9914 ←
Mounting Position	BOTTOM VIEW	Any



Maximum and Minimum Ratings Are Design-Center Values

AMPLIFIER		
Plate Voltage	250 max.	volts
Screen Voltage	100 max.	volts
Grid Voltage	-3 min.	volts
Plate Dissipation	1.7 max.	watts ←
Screen Dissipation	0.3 max.	watt ←
Typical Operation and Characteristics - Class A_1 Amplifier:		
Plate Voltage	250	volts
Screen Voltage	100	volts
Grid Voltage	-3	volts
Plate Resistance	0.7	approx. megohm
Transconductance	1800	μmhos
Grid Bias for Transcond. of 15 μmhos	-35	volts
Grid Bias for Transcond. of 2 μmhos	-45	volts
Plate Current	6.7	ma.
Screen Current	2.7	ma.

Typical Operation as Mixer in Superheterodyne Circuit:			
Plate Voltage	100	250	volts
Screen Voltage	100	100	volts
Grid Voltage #	-10	-10	approx. volts
Conversion Transconductance	-	600	approx. μmhos

The grid bias is minimum for an oscillator peak voltage of 9 volts. These values are optimum.

▲ *The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole.*

Shielding Considerations & Heater-Cathode Connections for the 9003 are the same as for Type 9001.

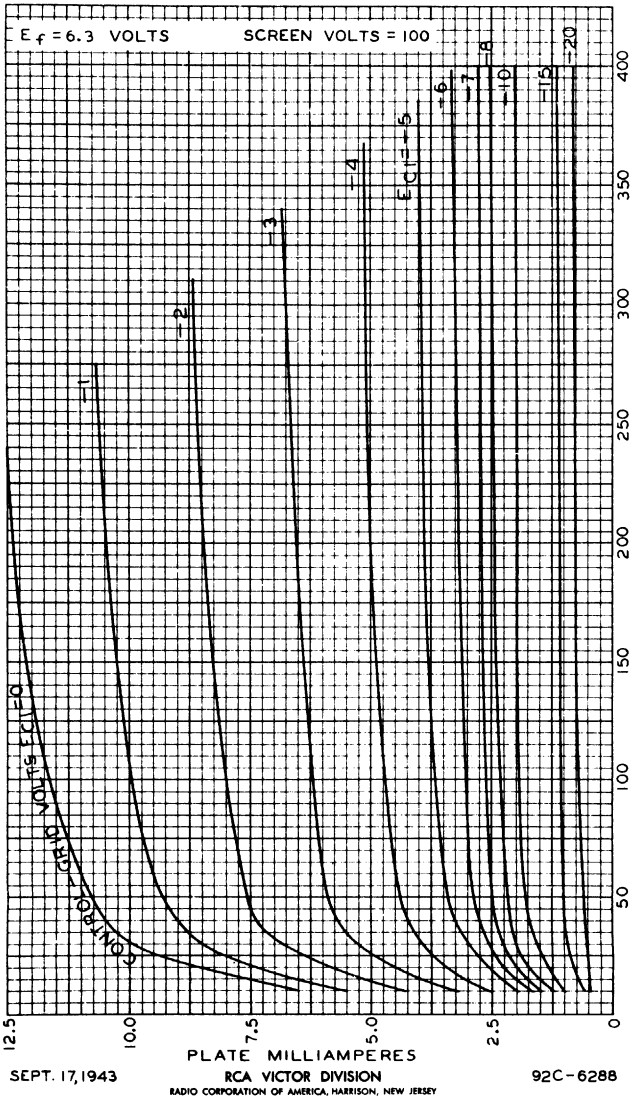
← Indicates a change. *Temporary minimum length = 1-1/16".

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

9003

9003

AVERAGE PLATE CHARACTERISTICS



SEPT. 17, 1943

RCA VICTOR DIVISION

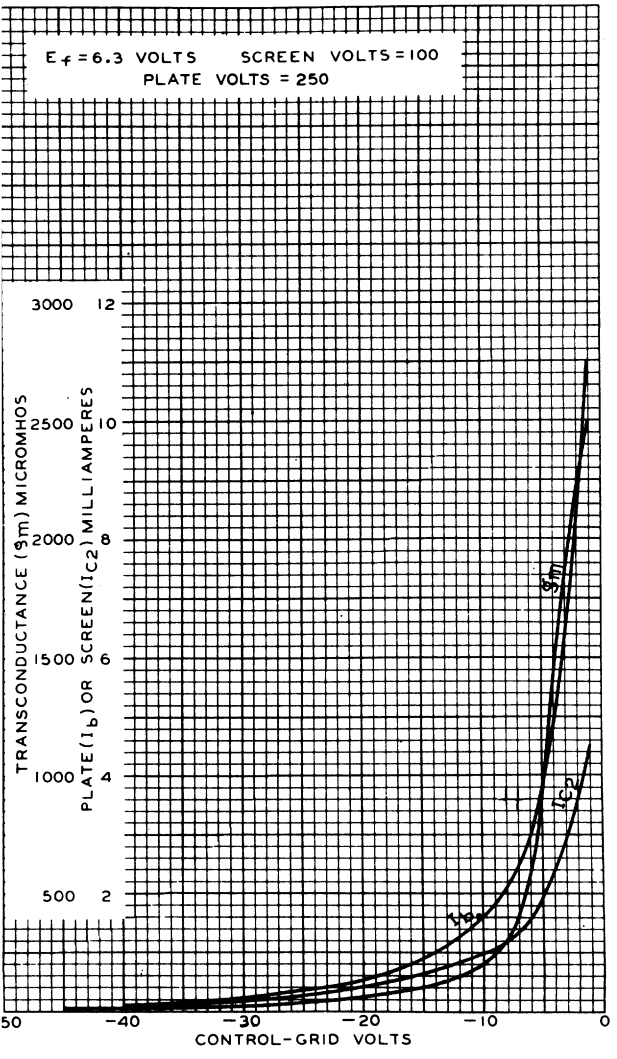
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92C-6288

RCA

9003

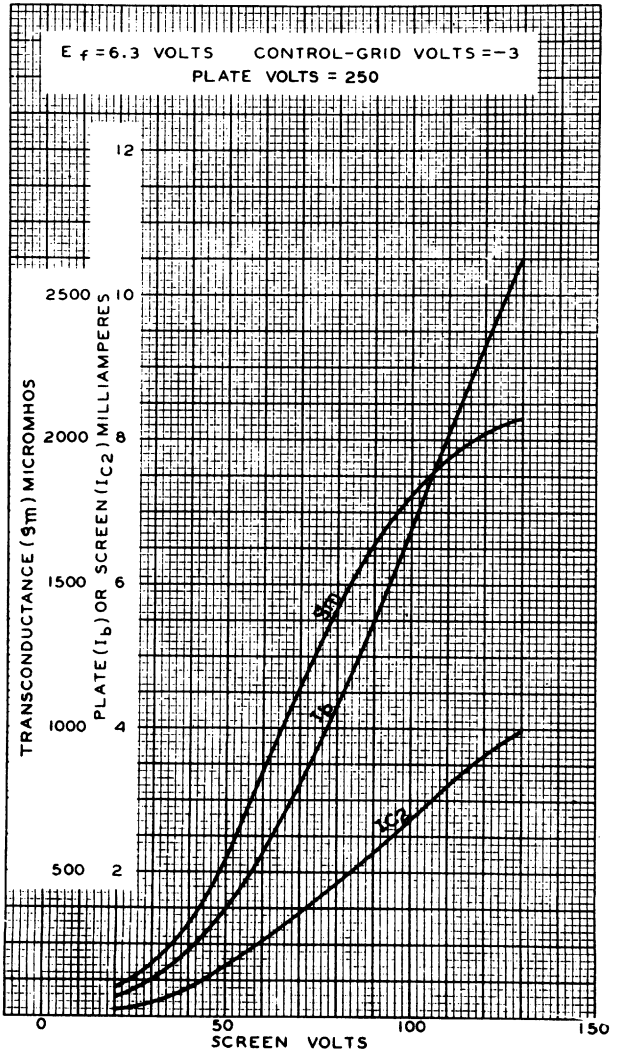
AVERAGE CHARACTERISTICS



9003

9003

AVERAGE CHARACTERISTICS



MAY 29, 1941

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-6290

9005

U-H-F DIODE

ACORN TYPE

Heater	Coated Unipotential Cathode	
Voltage	3.6	a-c or d-c volts
Current	0.165	amp.
Direct Interelectrode Capacitances:°		
Plate to Cathode	0.8	μμf
Plate to Heater	0.2 approx.	μμf
Heater to Cathode	1.1 approx.	μμf
Overall Length		1-7/32" ±5/32"
Overall Diameter		1-3/32" ±1/16"
Bulb		T-4½
RCA Socket		Stock No.9925
Mounting Position		Any

Maximum Ratings are Design-Center Values

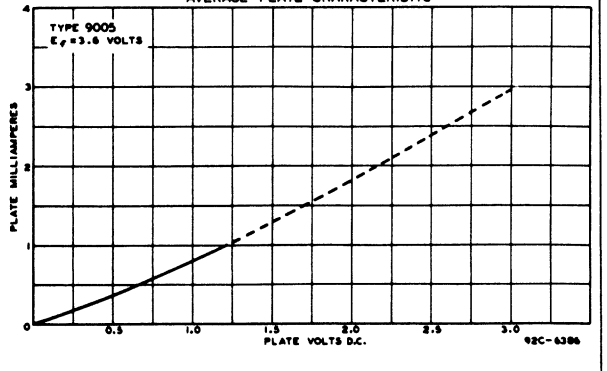
RECTIFIER

A-C Plate Voltage (RMS)	117 max. volts
D-C Output Current	1.0 max. ma.

The resonant frequency of the 9005 is approximately 1500 Mc.

°With no external shield.

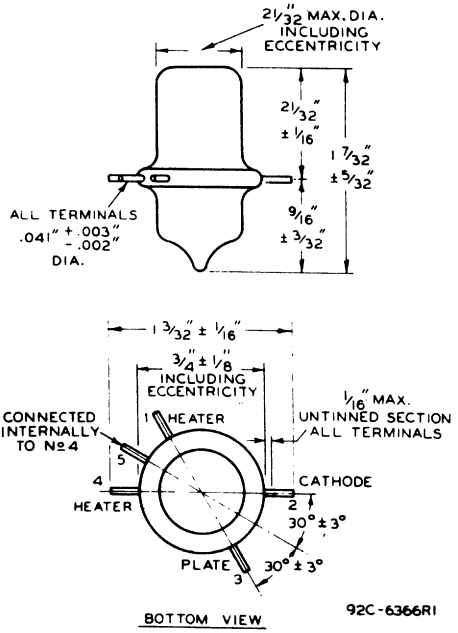
AVERAGE PLATE CHARACTERISTIC



9005

9005

U-H-F DIODE

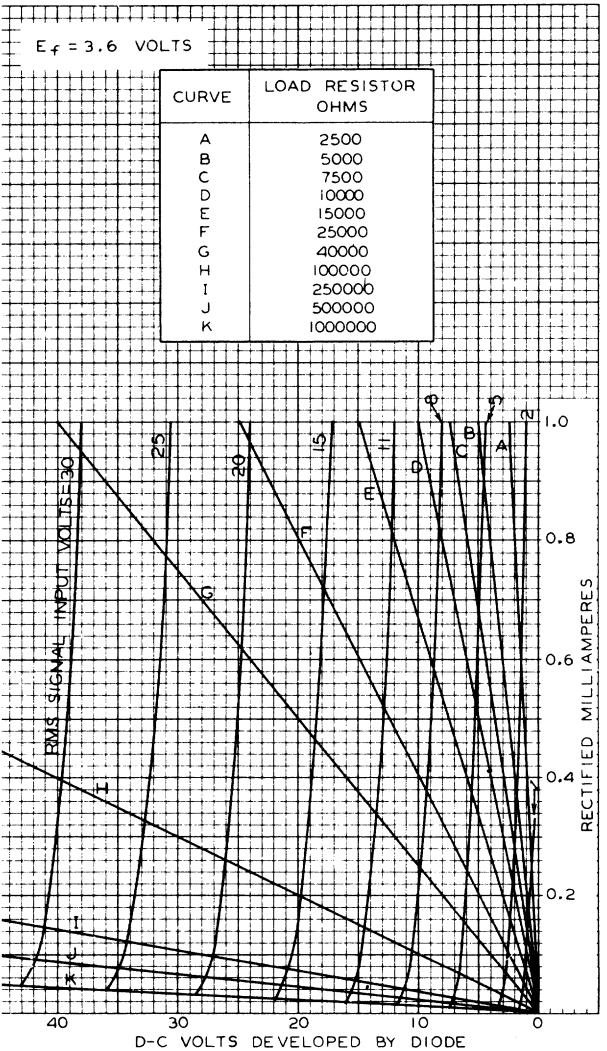


→ Indicates a change.

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY INC

9005

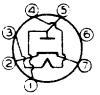
AVERAGE CHARACTERISTICS



9006

U-H-F DIODE
MIDGET TYPE

Heater	Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.15	amp.
Direct Interelectrode Capacitances:♦		
Plate to Cathode	1.4	μμf
Plate to Heater	0.2	μμf
Cathode to Heater	2.2	μμf
Maximum Overall Length		1-13/16"
Maximum Seated Height		1-9/16"
Length from Base Seat to Bulb Top (excluding tip)		1-3/16 ± 3/32"*
Maximum Diameter		3/4"
Bulb		T-5-1/2
Base▲		Miniature Button 7-Pin
Pin 1 - Plate		Pin 5 - Plate
Pin 2 - Cathode		Pin 6 - No Connection
Pin 3 - Heater		Pin 7 - Cathode
Pin 4 - Heater		
RCA Socket		Stock No. 9914
Mounting Position	BOTTOM VIEW (6BH)	Any



Maximum Ratings Are Design-Center Values

RECTIFIER

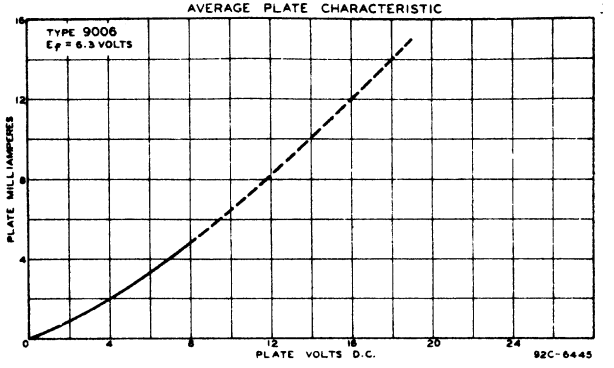
Peak Inverse Plate Voltage	750 max.	volts
Peak Plate Current	15 max.	ma.
D-C Output Current	5 max.	ma.
D-C Heater-Cathode Potential	100 max.	volts
Typical Operation as Rectifier:		
A-C Plate Supply Voltage (RMS)	270	volts
Min. Total Effective Plate-Supply Impedance	100	ohms
D-C Output Current	5	ma.

♦ With no external shield.

The resonant frequency of the 9006 is 700 megacycles(approx).

▲ *The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole.*

*Temporary minimum length = 1-1/16".

9006

U-H-F DIODE