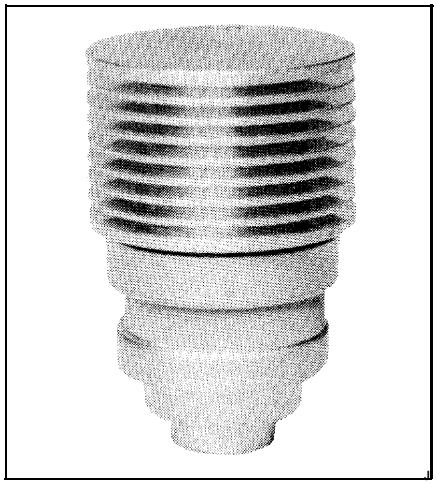
7457
Power Tube



Beam Power Tube

- CERMOLOX®
- Ruggedized
- Matrix-type Cathode
- Forced-Air Cooled
- 80 Watts CW Power Output at 400 MHz
- 40 Watts CW Power Output at 1215 MHz

BURLE 7457 is a compact, forced-air cooled UHF beam power tube designed for applications requiring dependable performance under severe shock and vibration. For that reason, the tube is built with an axial ceramic pin which rigidly holds grid No.1, grid No.2, and cathode in fixed positions with respect to each other. The tube features Cermolox construction, a unipotential, oxide-coated matrix cathode, and an integral radiator.

The tube is rated as an AF power amplifier and modulator, and up to 1215 MHz as a linear RF power amplifier, an anode-modulated RF power amplifier in Class C telephony service, an RF power amplifier and oscillator in Class C telegraphy service, and an RF power amplifier in Class C FM telephony service. The 7457 may also be useful in a variety of other applications such as frequency multipliers, linear RF power amplifiers (AM or television), pulse modulators, pulsed RF amplifiers, regulators, or other special services.

This data sheet gives application information unique to the BURLE 7457. Information contained in the following publications will help to assure longer tube life and safer operation:

TP-105 Application Guide for BURLE Power Tubes

TP-118 Application Guide for Forced-Air Cooling of BURLE Power Tubes

TP-122 Screen-Grid Current, Loading and Bleeder Considerations

For copies of these publications, contact your BURLE representative or write BURLE INDUSTRIES, INC., Tube Products Division, 1000 New Holland Avenue, Lancaster, PA 17601-5688.

General Data

Eiectrical

Heater for Matrix-Type Oxide-Coated Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	V
Current at 6.3 volts	3.2	A
Minimum Heating Time	2	minutes
Mu-Factor, Grid No.2 to Grid No.1	18	
Direct Interelectrode Capacitances'		
Grid No.1 to anode	0.065 max.	pF
Grid No.1 to cathode & heater	13.5	pF
Anode to cathode & heater	0.019 max.	pF
Grid No.1 to grid No.2	19.6	pF
Grid No.2 to anode	4.6	pF
Grid No.2 to cathode & heater..	0.60	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* 2948-000, 9819-000, or equivalent
Grid-No.2 Bypass Capacitor	Erie* *2929-001, or equivalent

For Operation at High Frequencies:

See Preferred Mounting Arrangement..	Figure 3
Weight (Approx.)	2 oz

Thermal

Terminal Temperature (Anode, grid No.2, grid No.1, cathode, and heater)	250 max.	°C
Anode-Core Temperature	250 max	°C

See Dimensional Outline for temperature-measurement points.

* Erie Specialty Products, Inc., 645 W. 11th Street, Erie, PA 16512.

BURLE Electron Tubes

AF Power Amplifier & Modulator - Class AB_1

Maximum CCS Ratings, Absolute-Maximum Values

DC Anode Voltage	1000	V
DC Grid-No.2 Voltage	300	V
Max.-Signal DC Anode Current	180	mA
Max.-Signal Anode Input	180	W
Max.-Signal Grid-No.2 Input	4.5	W
Anode Dissipation	115	W

Maximum Circuit Values

Grid-No.1 Circuit Resistance Under Any Condition:

With fixed bias	30,000	ohms
With cathode bias	Not recommended	

Typical **CCS Operation**

	Values are for 2 tubes		
DC Anode Voltage	650	850	V
DC Grid-No.2 Voltage	300	300	V
DC Grid-No.1 Voltage:			
From fixed-bias source	-15	-15	V
Peak AF Grid-No. 1 -to-Grid-No. 1 Voltage	30	30	V
Zero-Signal DC Anode Current	80	80	mA
Max.-Signal DC Anode 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 (Anode to anode)	4330	7000	ohms
Max.-Signal Driving Power (Approx.)	0	0	W
Max.-Signal Power Output (Approx.)	50	80	W

AF Power Amplifier & Modulator - Class AB_2

Maximum CCS Ratings, Absolute-Maximum Values

DC Anode Voltage	1000	V
DC Grid-No.2 Voltage	300	V
Max.-Signal DC Anode Current	180	mA
Max.-Signal DC Grid-No.1 Current	30	mA
Max.-Signal Anode Input	180	W
Max.-Signal Grid-No.2 Input	4.5	W
Anode Dissipation	115	W

Typical CCS Operation

	Values are for 2 tubes		
DC Anode Voltage	650	850	V
DC Grid-No.2 Voltage	300	300	V
DC Grid-No. 1 Voltage:			
From fixed-bias source	-15	-15	V
Peak AF Grid-No.l-to-Grid-No.1 Voltage	46	46	V
Zero-Signal DC Anode Current	80	80	mA
Max.-Signal DC Anode 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 (Anode to anode)	2450	3960	ohms
Max.-Signal Driving Power (Approx.)	.0.3	0.3	W
Max.-Signal Power Output (Approx.)	85	140	W

Anode-Modulated RF Power Amplifier - Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1.0.

Maximum CCS Ratings, Absolute-Maximum Values

	Up to 1215 MHz	
DC Anode Voltage	800	V
DC Grid-No.2 Voltage	300	V
DC Grid-No.1 Voltage	-100	V
DC Anode Current	150	mA
DC Grid-No.1 Current	30	mA
Anode Input	120	W
Grid-No.2 Input	3	W
Anode Dissipation	75	W

Typical CCS Operation

	At 400 MHz		
DC Anode Voltage	400	700	V
DC Grid-No.2 Voltage	200	250	V
DC Grid-No.1 Voltage	-20	-50	V
DC Anode 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 . . 30,000 ohms

RF Power Amplifier & Oscillator - Class C Telegraphy and RF Power Amplifier - Class C FM Telephony

Maximum CCS Ratings, Absolute-Maximum Values

	Up to 1215 MHz	
DC Anode Voltage	1000	V
DC Grid-No.2 Voltage	300	V
DC Grid-No. 1 Voltage	-100	V
DC Anode Current	180	mA
DC Grid-No.1 Current	30^2	mA
Anode Input..	180	W
Grid-No.2 Input	4.5	W
Anode Dissipation	115	W

Typical CCS Operation

	At 400 MHz		At 1215 MHz	
DC Anode Voltage	400	900	900	V
DC Grid-No.2 Voltage	200	300	300	V
DC Grid-No.1 Voltage	-35	-30	-22	V
DC Anode 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

Maximum Circuit Values

Grid-No.1 Circuit Resistance Under Any Condition . . 30,000 ohms

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 1215 MHz	
DC Anode Voltage	1000	V
DC Grid-No.2 Voltage	300	V
DC Grid-No.1 Voltage	-100	V
DC Anode Current at Peak of Envelope	250[3]	mA
DC Grid-No.1 Current	30	mA
Anode Input	180	W
Grid-No.2 Input	4.5	W
Anode Dissipation	115	W

Maximum Circuit Values

Grid-No.1 Circuit Resistance Under Any Condition:		
With fixed bias	25,000	ohms
With fixed bias (In Class AB_1 operation)	100,000	ohms
With cathode bias	Not recommended	
Grid-No.2 Circuit Impedance[4]	10,000	ohms

Typical CCS Operation with "Two-Tone" Modulation

		At 30 MHz	
DC Anode 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 Anode Current	40	40	mA
Effective RF Load Resistance	2200	3500	ohms
DC Anode Current at Peak Of Envelope	100	100	mA
Average DC Anode 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

Characteristics Range Values

	Min.	Max.	
Heater Current[5]	2.90	3.55	A
Direct Interelectrode Capacitances:			
Grid No.1 to anode[1]	-	0.065	pF
Grid No.1 to cathode & heater[1]	11 .8	15.2	pF
Anode to cathode & heater[1]	-	0.019	pF
Grid No.1 to grid No.2[1]	17.3	21.9	pF
Grid No.2 to anode[1]	4	5.1	pF
Grid No.2 to cathode & heater[1]	-	1.30	pF
Grid-No.1 Voltage[5,6]	-6	-18	V
Reverse Grid-No. 1 Current[5,6]	-	-20	uA
Grid-No.2 Current[5,6]	-8	+2.0	mA
Peak Emission[5,7]	-	300	peak V
Interelectrode Leakage Resistance[8]	1 .0	-	Mohm
Useful Power Output[9]	80	-	W

1. Measured with special shield adapter.
2. In applications where the frequency is less than 80 MHz and the bias is less than -50 volts, the maximum value is 40 mA.
3. The maximum DC anode 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 anode 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.
4. See TP-105.
5. With 6.3 volts AC or DC on heater.
6. With DC anode voltage of 1000 volts, DC grid-No.2 voltage of 300 volts, and DC grid-No.1 voltage adjusted to give a DC anode current of 115 mA.
7. With grid No.1, grid No.2, and anode tied together; and pulse voltage source connected between anode 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.
8. 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.
9. 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 anode voltage of 1000 volts, DC grid-No.2 voltage of 300 volts, grid-No.1 voltage adjustablefor DC anode currentof 180mAmaximum, DC grid-No.1 current of 30 mA maximum and driver power output of 3.3 watts maximum.

Special Tests and Performance Data

The environmental conditions shown for the tests below are those applied directlyto the tube. Extreme care must be used in the design of the mountings to minimize mounting resonances.

50 g, 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 Grid-No.1 Voltage and Reverse Grid-No.1 Current 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 anode supply voltage of 300 volts, DC grid-No.2 voltage of 250 volts, grid-No. 1 voltage adjusted to give DC anode current of 10 mA, and anode 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%.

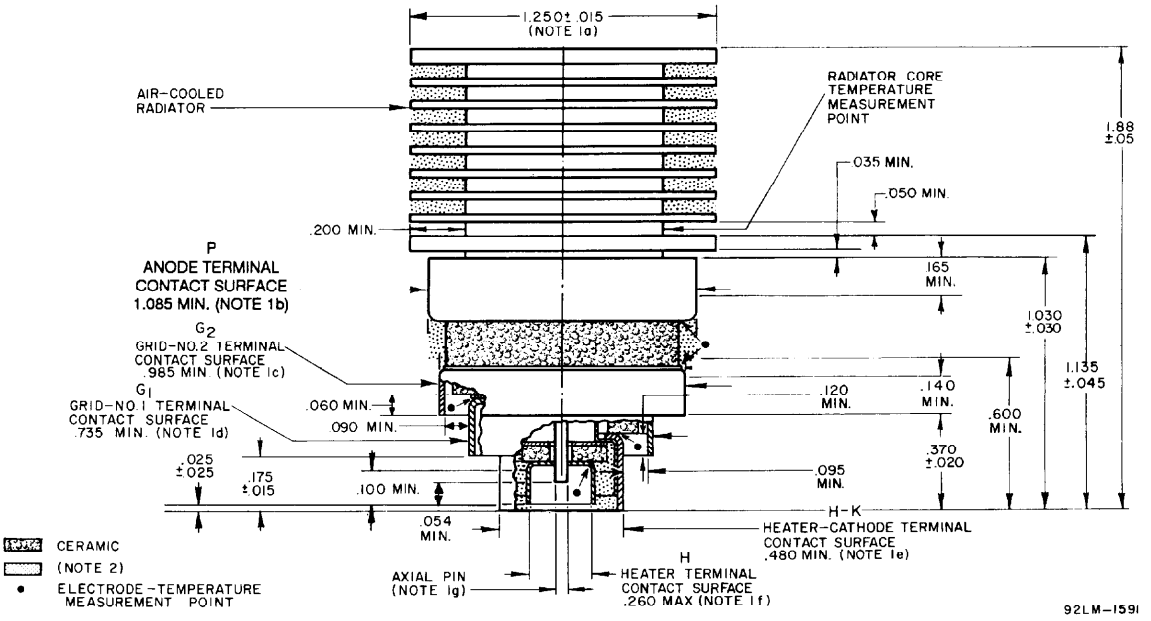
b. 10-l5 Hz at fixed acceleration of 0.41 g ± 10%.

c. 15-75 Hz with fixed double amplitude of 0.036 inch ± 10%.

d. 75-2000 Hz at fixed acceleration of 10g ± 10%.

During the above vibration tests, tubes will show an rms output voltage not in excess of 15 volts across the anode load resistor in the 5-2000 hertz range.

At the end of this test, tubes are required to meet the limits for Grid-No.1 Voltage and Reverse Grid-No.1 Current under **Characteristics Range Values.**



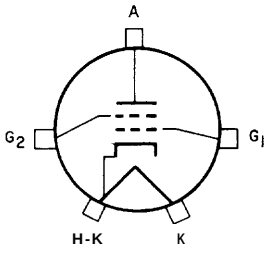
DIMENSIONS IN INCHES

Figure 1 - 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 - 1.317”
b. Anode 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 - 0.238”
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.



See Dimensional Outline for Terminal Connections

Figure 2 - Terminal Diagram

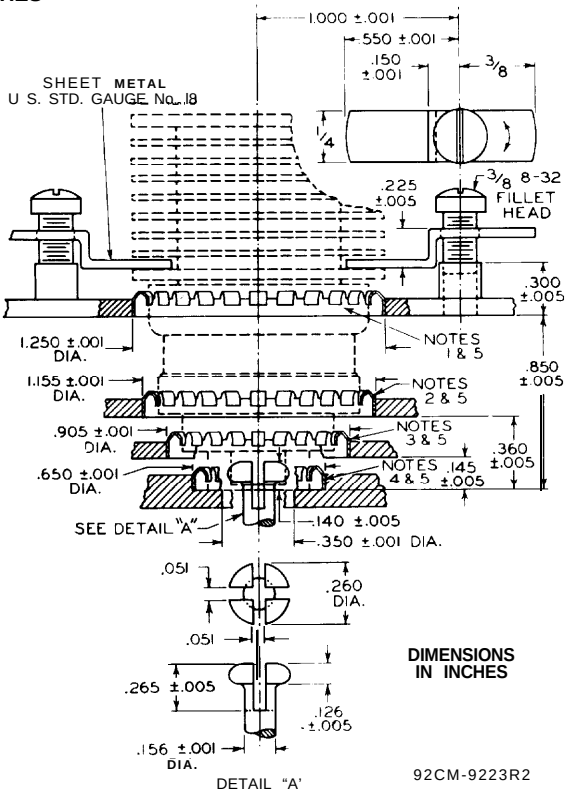


Figure 3 - Preferred Mounting Arrangement

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: Either the specified contact ring of preformed finger stock or 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 Instrument Specialties Co., P.O. Box A, Delaware Water Gap, PA 18327.

Warning - Personal Safety Hazards

Electrical Shock - Operating voltages applied to this device present a shock hazard.

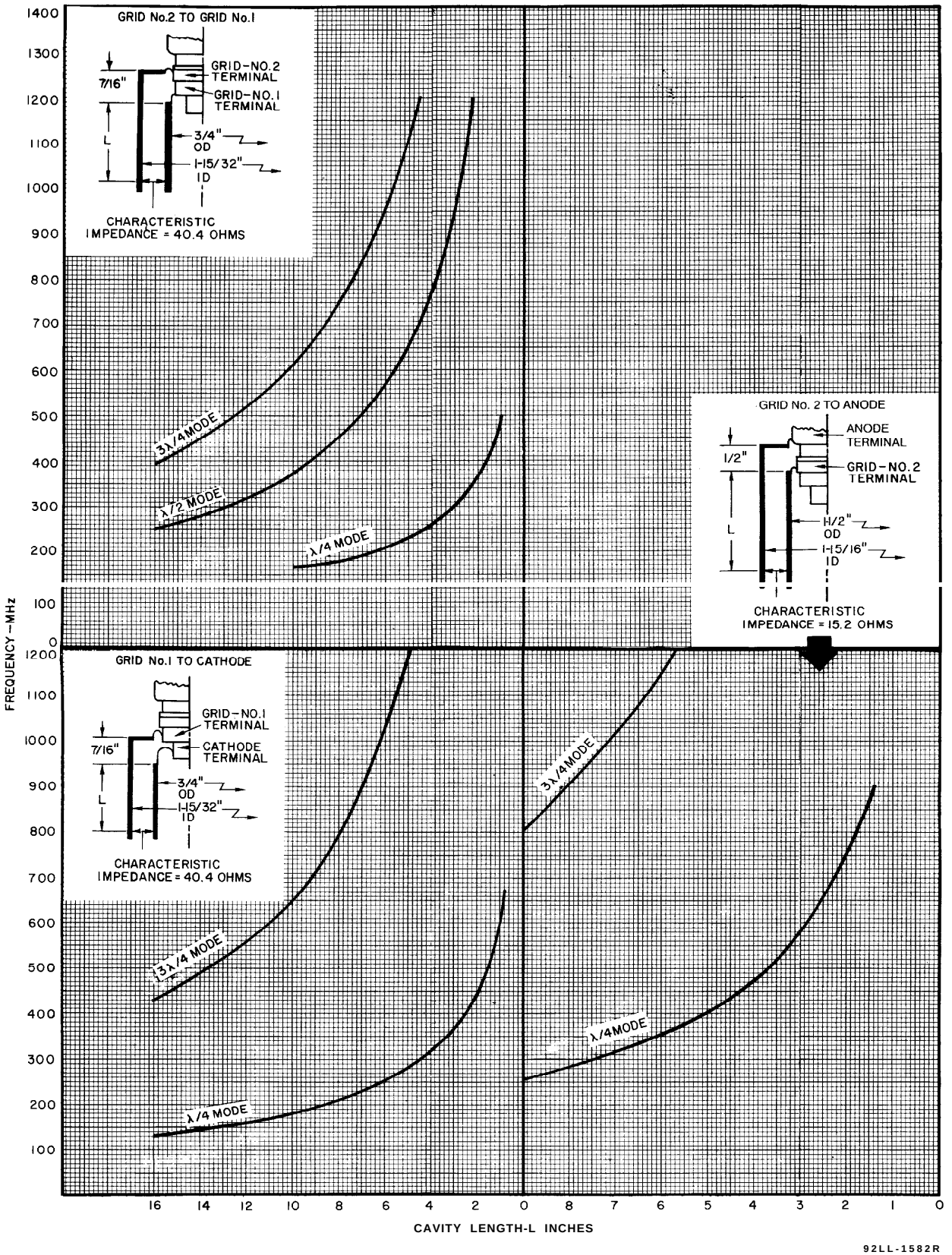


Figure 4 - Tuning Characteristics

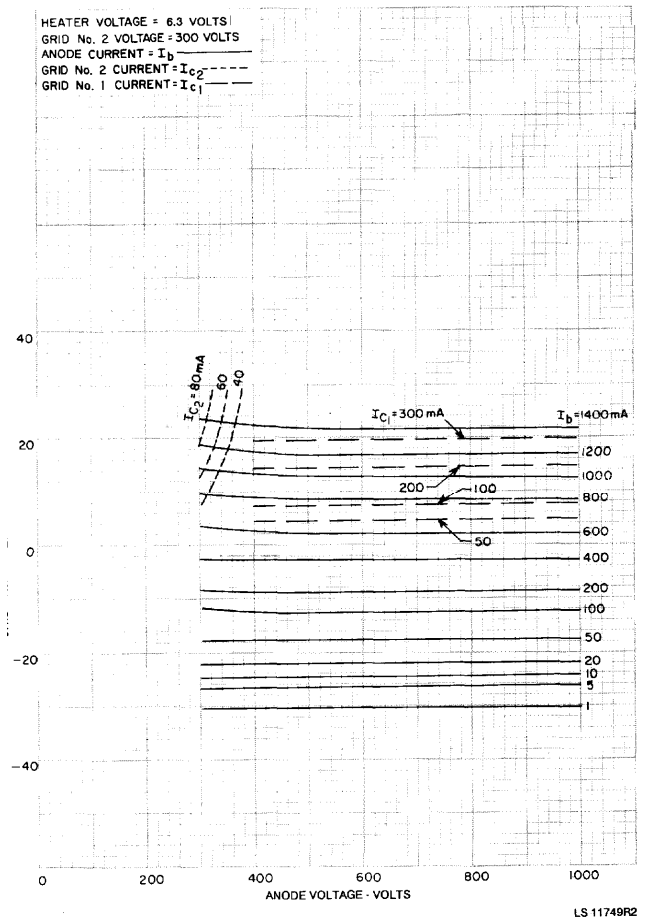


Figure 5 - Typical Constant-Current Characteristics With Grid No.2 Volts = 300

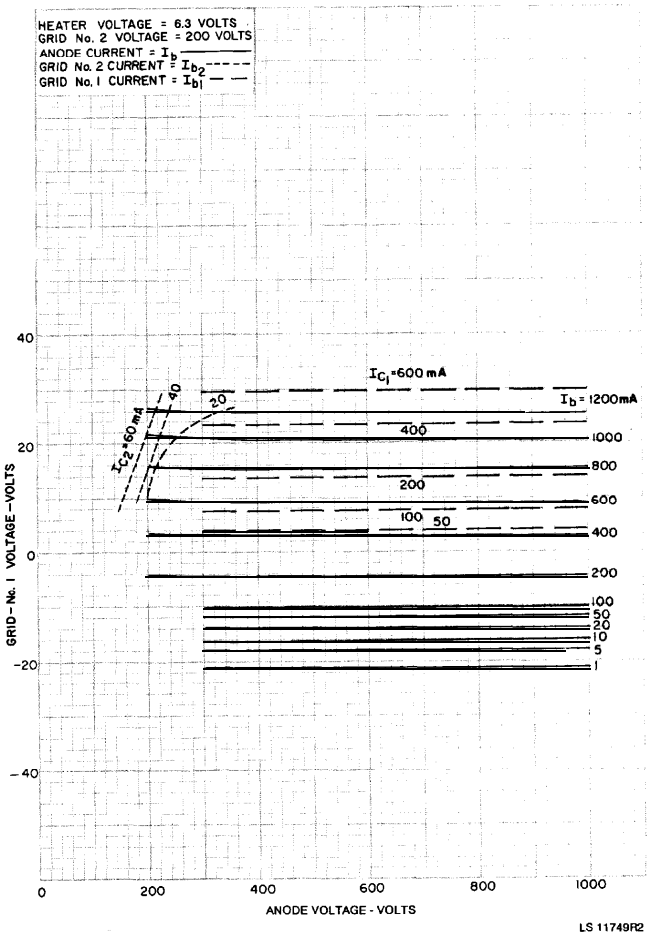


Figure 6 - Typical Constant-Current Characteristics With Grid No.2 Volts = 200

Forced-Air Cooling

Flow:

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 anode, grid-No.2, and grid-No.1 voltages. Typical values of airflow directed across the radiator versus anode dissipation are shown in two graphs under **Typical Cooling Requirements.**

To Anode, 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.

Anode 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, NY, or equivalent.

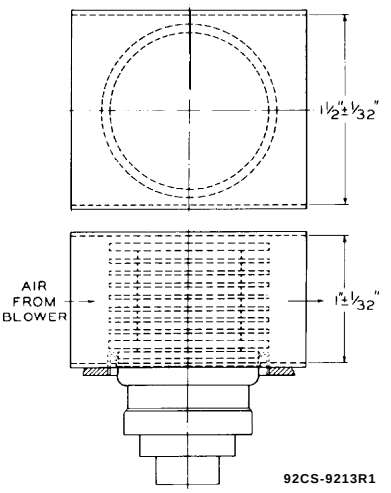


Figure 7 - Recommended Cowling For Directing Air Flow Through Radiator

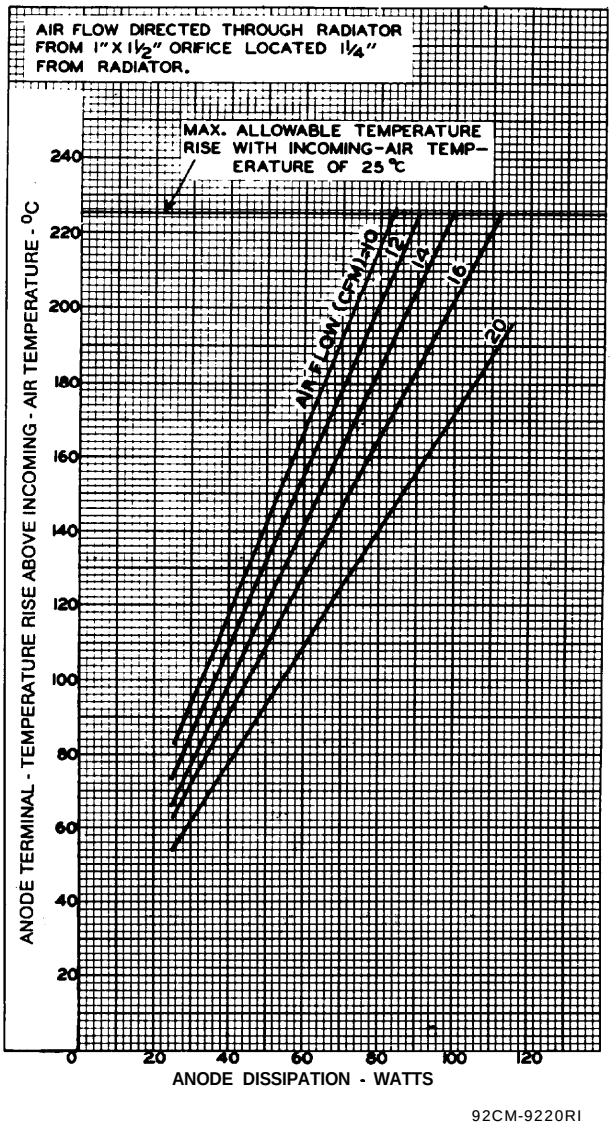


Figure 8 - Typical Cooling Requirements

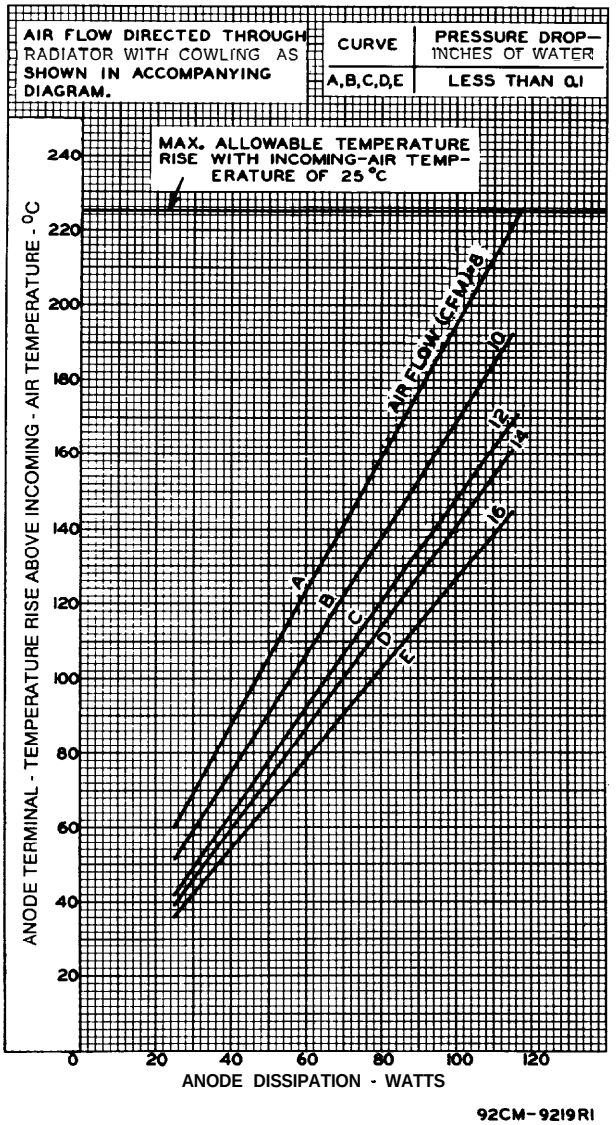


Figure 9 - Typical Cooling Requirements

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