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TABLES

Section II
MAINTENANCE

2.1 INTRODUCTION

This section contains information for the maintenance of the Model FM-10CS. Included are Minimum Performance Procedures, Alignment and Adjustment Procedures and Fault Isolation Procedures.

All ac and dc voltages displayed without tolerances on the Schematic Diagrams in Section IV are typical. The dc voltages may vary widely (+100%, −50%) and the ac voltages may vary widely (±6 dB) due to component tolerances and beta ranges of the transistors. This does not imply that instruments in which measured voltages are at the tolerance extremes will not perform to the specifications, since the instrument has been designed to allow for these tolerances.

2.2 PRELIMINARY INFORMATION

2.2.1 Alignment Interval

To ensure instrument accuracy check the Model FM-10CS performance using the Minimum Performance Procedures every 1000 hours of operation, or every six months if used occasionally.

2.2.2 Singer Customer Service

Both Factory and Field Centers provide instrument service and repair. Contact your local Singer representative for additional information.

2.2.3 Minimum Performance Procedures Defined

The performance of the instrument can be checked without removing the covers or performing internal adjustments by the use of the Minimum Performance Procedures (Refer to Paragraph 2.4). These procedures check the overall performance for accuracy and correct operation within allowable tolerances.

2.2.4 Alignment and Adjustment Procedures Defined

The completion of each step of the Alignment and Adjustment Procedure, (Refer to Paragraph 2.5) ensures that the instrument meets the electrical specifications provided in Section II of the Operator's Manual. For best overall instrument performance when performing a complete Alignment and Adjustment Procedure, adjust each trimmer as close as possible to the exact figure, even though the Minimum Performance Procedures indicate that the operation is within the allowable tolerance.

2.3 TEST EQUIPMENT REQUIRED

The test equipment required for the Minimum Performance Procedures, Alignment and Adjustment Procedures, and Fault Isolation Procedures is listed in Table 2-1. Minimum specifications are provided to aid in the selection of equivalent types.

2.4 MINIMUM PERFORMANCE PROCEDURES

The following Minimum Performance Procedures verify that the Model FM-10CS Mainframe is operating within specification. These procedures may be used as part of incoming quality control inspection, as a periodic operational procedure, and a check after repairs or adjustments have been performed. Left-hand and center modules are required for these procedures.

WARNING

High voltages are present throughout the instrument and appropriate precautions should be taken while operating the instrument with cover removed.

CAUTION

The Model FM-10CS is supplied pre-set to 115 V ac for use in North America, unless otherwise indicated by a decal over the AC/DC switch. Power cord supplied is 3-pin for use with 115 V grounded mains supply.

NOTE

The equipment should be checked at a temperature of 25°C ±5°C for best overall performance.

2.4.1 Evaluation of Tone Generator Mode

a. Install the left-hand module and center module into the Mainframe. Set the SWEEP switch to the OFF position.

b. Connect power source to the Mainframe.

c. Rotate PWR switch clockwise.

d. For ac power, set AC/DC switch on back of instrument to AC. (Approximate ac power required is 32 VA.)

For dc power, set AC/DC switch on back of instrument to DC. (2.5A maximum dc current required.)

e. Verify that POWER indicator lights.

f. Set Mainframe controls as follows:

MODE	TONE GEN
VOLUME	Fully cw
Frequency switches	000.0000 MHz
MEASURE MODE AUDIO OUTPUT	BEAT NOTE (IN)
TIMEBASE (Back of instrument)	INT

Table 2-1. Test Equipment Requirements

Instrument	Minimum Specifications	Recommended		Use*
		Manufacturer	Model	
Audio oscillator	Frequency range: 400 Hz to 1 kHz Output level: 0 V to 2 V rms Impedance: 600 ohms	Hewlett-Packard	651	A,M
Signal generator	Frequency range: 1 MHz to 250 MHz Output level: 0.2 mV to 90 mV rms Stability: ±0.004%/5 min. minimum Output impedance: 50 ohm nominal	Singer	FM-2748	A,M
Oscilloscope with 10 X probe and 50 ohm load	Frequency response: 100 MHz Sensitivity: 5 mV/cm	Tektronix	454	A,M
Frequency counter	Frequency response: 50 kHz to 500 MHz Accuracy: 1×10^{-7} Sensitivity: Model RFM-10D: 220 mV rms Model RFM-11A: 22 mVrms Models RFM-10/10A/10B: 2.5 mV rms	Hewlett-Packard	5532A (with 20 dB broadband amplifier Singer Model BBA-1)	A
Ac voltmeter	Frequency response: 50 Hz to 2 MHz Input level: 100 mV to 400 mV rms Input resistance: 1 megohm minimum Input capacitance: 35 pF maximum	Hewlett-Packard	400	A,M
Dc digital voltmeter	Input level: 10 mV to 30 V dc Accuracy: ±1%	Hewlett-Packard	3440A	A
RF voltmeter with 50 ohm load and high impedance probe	Frequency response: 50 kHz to 1.2 GHz Input level: 500 uV to 1 V rms	Hewlett-Packard	3406A/11063A/6064	A,M
Spectrum analyzer	Frequency response: 10 MHz to 1.2 GHZ Dispersion: 10 kHz/div to 100 MHz/div Dynamic range: 60 dB minimum Maximum level measured: +10 dBm	Singer	SPA-3000	A
Sweep generator	Frequency range: 500 MHz to 800 MHz Output level: 0 dBm to –20 dBm	Wavetek	2001	A
RF detector	Frequency response: dc to 800 MHz	Wavetek	D152	A
Speaker/headset	Impedance: 8 ohm/2 kilohm	Not applicable		M
Signal generator	Frequency range: 10 MHz Output level: +5 dBm	Hewlett-Packard	606	A
VOM	Resistance range: 20 ohm to 50 kilohm	Simpson	260	A
Distortion analyzer	Frequency response: 1 kHz Input level: 1 V rms Accuracy: ±0.1%	Hewlett-Packard	333A	A
Amplitude Modulation Meter	Measurement range: 27% to 100%	Singer	FM-2748/0AM-1	A,M

Table 2-1. Test Equipment Requirements (Cont.)

Instrument	Minimum Specifications	Recommended		Use*
		Manufacturer	Model	
Dc power supply	Output level: 12 V at 2.5 Amps	Harrison	6291A	A
Dc power supply	Output level: 0 V to 5 V at 10 mA Regulation: ±5%	Hewlett-Packard	721A	A
Variable transformer	Output level: 0 V to 230 V ac	General Radio	100-R	A
Meter with phone plug	Full-scale deflection: 100-0-100 uA dc	Modutek	25-DUA-1H1 and phone plug	M
Peak Deviation meter	Peak deviation range: 5 kHz Accuracy: ±0.1% Sensitivity: 2.5 mV rms	Singer	FM-10C/ODM-1	A
Oscilloscope deviation monitor module	Mainframe must be tested with this associated plug-in module	Singer	ODM-1	A
Oscilloscope amplitude modulation monitor module	Mainframe must be tested with this associated plug-in module	Singer	OAM-1	A
AM/FM module	Mainframe must be tested with this associated plug-in module	Singer	AFM-2	A
RF module	Mainframe must be tested with this associated plug-in module	Singer	RFM-10A, 10B, 10D or 11A	A,M
FIM module	Mainframe must be tested with this associated plug-in module	Singer	FIM-3	A,M
Extender cables	24 pin connectors 16 pin connectors Coaxial connectors	Singer Singer Singer	PC2652 PC2653 PC2775	A A A
Load resistor	10 ohm, 10 watt ±5% 72 ohm, 1/4 watt ±2% 1000 ohm 1/4 watt ±5%	Ohmite Allen Bradley Allen Bradley	1710 CB CB	A A,M M

* A=Alignment and Adjustment and Fault Isolation M=Minimum Performance

g. Vary 0–100 Hz Frequency control for a BEAT lamp indication on the center module of approximately 1 flash per second.

h. Set VOLUME control to desired level and vary 0–100 Hz Frequency control throughout its range. A 0 to 100 Hz tone should be audible from the internal speaker.

i. Rotate 100 Hz Frequency switch from 0 position to 9 position. Tone frequency should increase at each switch position.

j. Repeat Step i. with the 1 kHz Frequency switch.

k. Plug the speaker or headset into AUDIO/TONE OUTPUT receptacle. Repeat Step j. Tone frequency from remote speaker/headset should increase with each switch position.

l. Set the Model FIM-3 RANGE switch to ZERO.

m. Withdraw the Model FIM-3 part-way out and verify that the meter indicates zero. Adjust mechanical zero on meter face if necessary. Install the Model FIM-3 in the Mainframe and set the meter to zero with the Model FIM-3 ZERO control.

n. Set center module RANGE switch to 1.5 position.

o. Vary the Mainframe 100 Hz and 1 kHz Frequency switches in 100 Hz steps up to 1.5 kHz. The meter indication should deflect to the left in 100 Hz increments.

p. Repeat Steps m. thru o. with the remote 100–0–100 uA dc meter plugged into the REM METER receptacle on the back of the Mainframe.

2.4.2 Evaluation of Frequency Accuracy

a. Refer to Table 2-1 for sensitivity requirements of frequency counter.

b. Connect frequency counter output receptacle to left-hand module RF OUTPUT receptacle.

c. Set RF OUTPUT control of left-hand module to maximum output level.

d. Set Frequency switches to 100.000 MHz and 0–100 Hz Frequency control to OUT position.

e. Frequency counter should indicate 100.000 MHz ±1 ppm.

f. Set 100 MHz Frequency switch to 2, 3, 4, and 5, while verifying frequency accuracy.

g. Reset 100 MHz Frequency switch to 1.

h. Set 10 MHz Frequency switch to 1, 2, 3, 4, 5, 6, 7, 8, and 9 while verifying frequency accuracy.

i. Set 100 MHz Frequency switch to 0 and 10 MHz Frequency switch to 1 and verify frequency accuracy.

j. Check all positions of 100 kHz, 10 kHz, 1 kHz and 100 Hz Frequency switch verifying frequency accuracy.

k. Set Frequency switches to 001.000 MHz and rotate 0–100 Hz Frequency control throughout its range. Verify that frequency is within ±5 Hz of Frequency control indication.

2.4.3 Evaluation of Output Level

NOTE

The following procedure applies only when using Model RFM-10A, or RFM-10B left-hand module. With Model RFM-10D, Step b. level should be 0 dBm, and Steps d. and f. levels should be 224 mV ±3 dB (159 mV to 318 mV). With Model RFM-11A, Step b. level should be −20 dBm, and Steps d. and f. levels should be 22.4 mV ±4 dB (14.1 mV to 35.5 mV).

a. Connect RF voltmeter with 50 ohm termination to RF OUTPUT receptacle of left-hand module.

b. Set RF OUTPUT level to 5 uV.

c. Set Frequency switches to 100.000 MHz and 0–100 Hz Frequency control to OUT position.

d. Verify that RF voltmeter indicates 500 uV ±3 dB (353 uV to 707 uV).

e. Repeat for all frequencies in Steps f. thru k. of Paragraph 2.4.2.

f. Verify that all levels are 500 uV ± dB (353 uV to 707 uV).

2.4.4 Evaluation of 2 MHz IF Outputs

a. With RFM module, Model FIM-3, and Model AFM-2 installed, set the Mainframe MODE switch to MEAS, MEASURE MODE AUDIO OUTPUT switch to BEAT NOTE (IN), GENERATOR MODULATION to OUT-OFF and Frequency switches and control to 150 MHz.

b. Set the RFM module MEASURE MODE BANDWIDTH switch to OUT – WIDE and set the SENSITIVITY as follows:

With Model RFM-10A or RFM-11A: set the MEASURE SENSITIVITY to 0.64 mV (control to fully clockwise, switch to NORMAL).

With Model RFM-10B or RFM-10D: set the MEASURE SENSITIVITY to 64 uV (control to fully clockwise, switch to NORMAL).

c. Connect the signal generator to the RF module MEASURE INPUT receptacle. Set its frequency to 150 MHz and level to sensitivity of Step b.

d. Connect the ac voltmeter to the Mainframe ACC receptacle, J3-A, and the ground terminal to chassis to measure the 2 MHz IF auxiliary output.

e. Connect the 72 ohm load resistor to the 2 MHz IF OUTPUT receptacle of the Model AFM-2.

f. Vary the signal generator slightly to obtain a zero beat indication for exact frequency.

g. Vary the signal generator output level to obtain exactly 2.7 mV rms on the ac voltmeter.

h. Note the signal generator output level. It should be 0.64 mV or 64 uV (Refer to Step b) for a calibrated RFM module.

i. Remove the ac voltmeter from J3-A and connect it to the 72 ohm load at the 2 MHz IF OUTPUT receptacle of the Model AFM-2. The level should be 2.5 mV ±0.1 mV.

j. Vary the signal generator output level to check the Model FIM-3 OPERATE lamp turn-on threshold. With a calibrated Model FIM-3 this should correspond to the level in Step h.

2.4.5 Evaluation of Auxiliary VCO Input

a. Connect the peak deviation meter to the RFM module RF OUTPUT receptacle.

b. Set the Mainframe' Frequency switches to 015.0V00, 0–100 Hz control to 0, MODE switch to TONE GEN and GENERATOR MODULATION switch to OUT–OFF.

c. Connect the audio oscillator and the ac voltmeter to J3-B and H (back panel ACC receptacle). Set the audio oscillator frequency to 1 kHz and output level to 500 mV rms ±5% (475 mV to 525 mV) as indicated on the ac voltmeter.

d. The peak deviation meter should indicate 5 kHz ±15% (4.25 kHz to 5.75 kHz) peak deviation.

e. Set the Mainframe Frequency switches to 014.9V00 and 0–100 Hz control to 10.

f. The peak deviation meter should indicate 5 kHz ±15% (4.25 kHz to 5.75 kHz) peak deviation.

2.4.6 Evaluation of 10 MHz TCXO Output Level

a. Connect the oscilloscope and 1000 ohm load resistor to the Mainframe TIME BASE receptacle. The internal time base 10 MHz waveform should be present. Level should be 0.5 V p-p min.

2.4.7 Evaluation of External Time Base Input

a. Set the TIME BASE switch to EXT.

b. Connect the signal generator to the Mainframe TIME BASE receptacle. Set its frequency to 10 MHz and output level to +4 dBm.

c. Set Mainframe Frequency switches to 000.0000 MHz, 0–100 Hz control to OUT and MODE switch to TONE GEN. Set the VOLUME control to approximately mid-range and rotate the 1 KHz Frequency switch from 0 to 9 and back. A varying tone should be audible from the speaker.

2.4.8 Evaluation of 1 MHz TCXO Output

a. Connect the oscilloscope to the Mainframe ACC receptacle J3-D, ground to chassis.

b. A 1 MHz waveform should be present at a level of 2.5 V p-p typical, 1 V p-p minimum.

2.4.9 Evaluation of +9 V dc Power Output

a. Connect the digital voltmeter to the Mainframe ACC receptacle J3-D, ground to chassis.

b. The digital voltmeter should indicate +9 V dc ±1%.

2.4.10 Evaluation of Amplitude Modulation

a. Set the Mainframe MODE switch to the GEN MOD CAL position.

b. Remove the Model ODM-1 and replace it with the Model OAM-1. Energize the Model OAM-1 and vary INTENSITY and FOCUS for normal trace.

c. Set the Model OAM-1 RANGE switch to the MEAS GEN 100% position.

d. Set the Model OAM-1 VERT MODE switch to the VERT SET position. Vary the VERT POS control so that the trace is positioned exactly on the VERTICAL SET line.

e. Set the Model OAM-1 VERT MODE switch to the CARR SET position. Vary the CARRIER LEVEL control so that the trace is exactly on the CARRIER SET line.

f. Set the Model OAM-1 VERT MODE switch to the MEAS AM position. The Model OAM-1 is now calibrated to measure 100% AM.

g. Set the GENERATOR MODULATION switch on the Mainframe to the ON (IN) position.

h. Set the MOD/AUDIO OUT FREQ switch on the Model OAM-1 to the 1 kHz position and MOD MODE switch to the INT position.

i. Verify that the INT MOD/AUDIO OUT control can be varied to provide 100% AM on the CRT graticule.

2.4.11 Evaluation of Sweep Range

a. Set the Mainframe Frequency switches to 151.V000 MHz, 0–100 Hz control to 5, MODE switch to MEAS, MEASURE MODE AUDIO OUTPUT switch to RECOVERED AUDIO (OUT). Set the left-hand module MEASURE SENSITIVITY switch and control to HIGH and 2 mV. Set the center module RANGE switch to ZERO. Set the right-hand module INT MOD/AUDIO OUT control to fully ccw (not off).

b. Connect the signal generator to the MEASURE INPUT receptacle.

c. Set the signal generator to 151 MHz at a level of –41 dBm (2 mV).

d. Set the Mainframe SWEEP RATE control to the fully ccw position (not off).

e. Rotate the Mainframe SWEEP WIDTH control cw until pulse tone is heard approximately every 1/10 second as the frequency of the Mainframe coincides with 151 MHz from the signal generator.

f. Set the signal generator to 152 MHz.

g. Rotate the Mainframe SWEEP WIDTH control if necessary until a pulse tone is heard as in Step e. except at 152 MHz.

2.5 ALIGNMENT AND ADJUSTMENT PROCEDURES

a. Remove the 11, No. 6-32 X 1/4, Phillips-head screws from the back of the instrument cover.

b. Remove the cover.

c. Position the instrument to make the underside accessible.

d. Remove the 4, No. 4-40 x 1/4, Phillips-head screws from the bottom cover.

e. Remove the cover.

NOTE

The equipment should be aligned at a temperature of 25°C ±5°C for best overall performance. See Figures 2-2 thru 2-4 for assembly locations.

2.5.1 Preliminary Adjustments

a. Measure resistance to ground from TB3-1, 2 and TB3-3, 4. Should be greater than 20 ohms.

b. Measure resistance to ground from the cases of series-pass transistors Q1 and Q2 (mounted on back chassis). Should be greater than 50 kilohms.

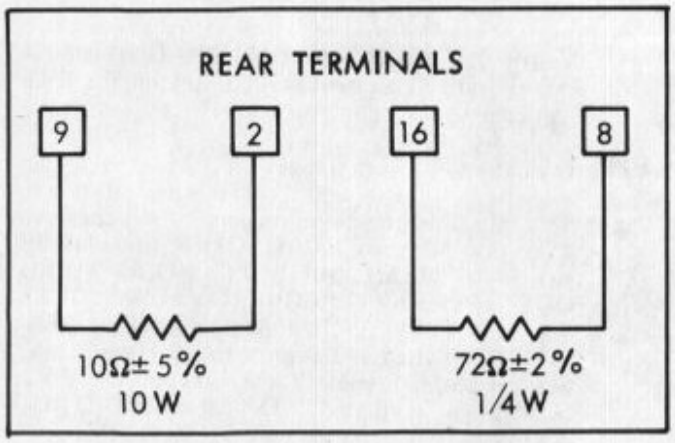


Figure 2-1. Model AFM-2 Modification for Mainframe Tests

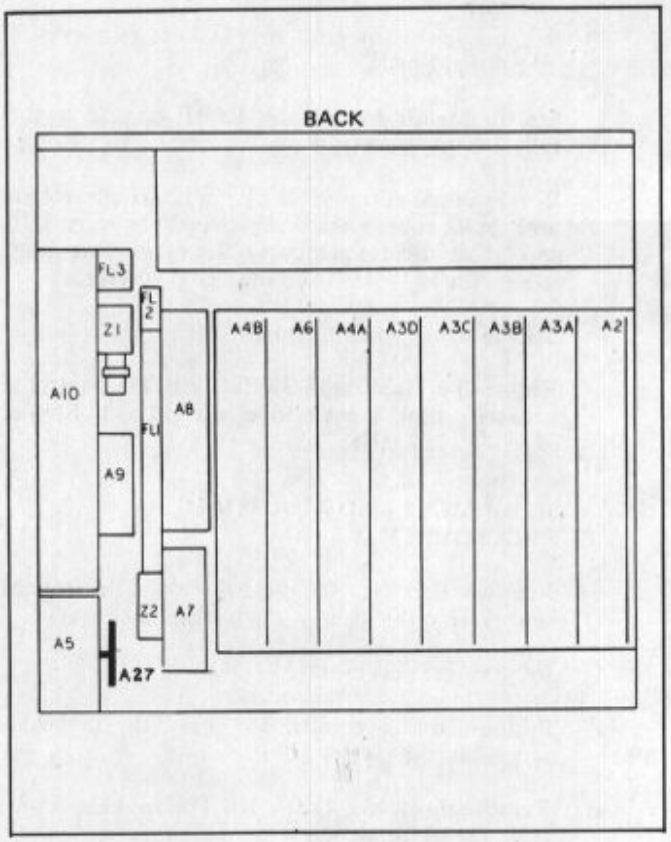


Figure 2-2. Assembly Locations (Top View)

Reverse ohmmeter leads. Should be greater than 20 ohms.

c. Modify the Model AFM-2 as in Figure 2-1 and install the modified Model AFM-2 in the right-hand compartment. Also install an RFM module and a Model FIM-3 in the left-hand and center compartments respectively.

d. Set 115/230 V switch to 115 V and plug power cable into 115 V ac outlet. Set POWER switch on.

e. Connect the oscilloscope to TB3-1, 2 and TB3-3, 4 and verify that the ripple is less than 2.7 mV p-p.

f. Measure unregulated voltage at terminal A1A3-3. Should be approximately +17.5 V.

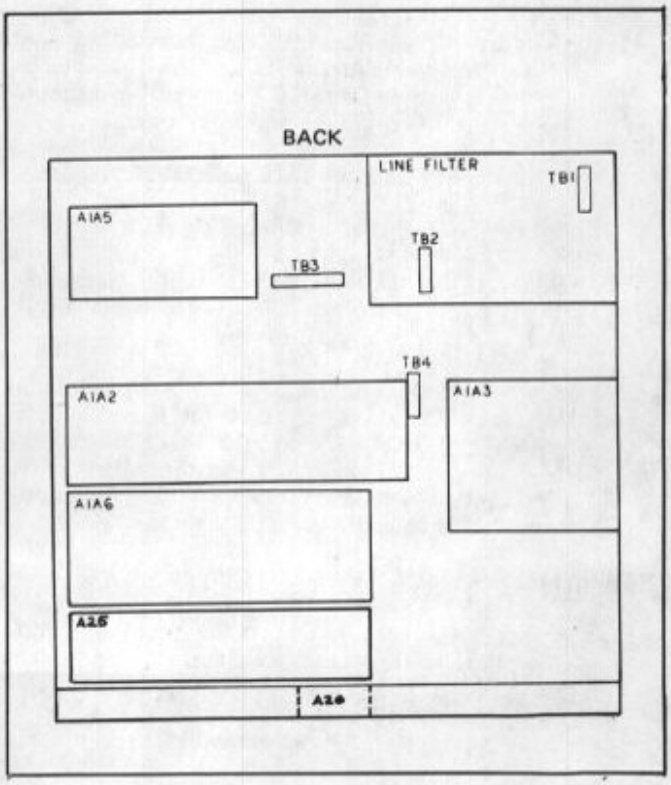


Figure 2-3. Assembly Locations (Bottom View)

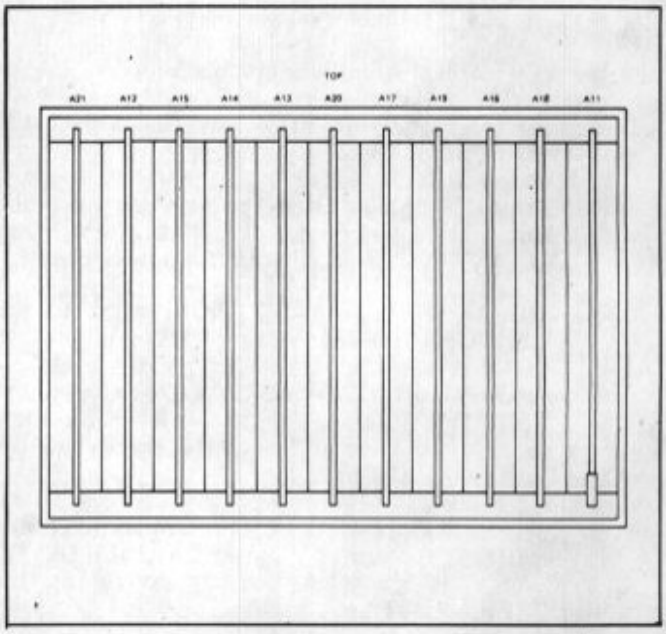


Figure 2-4. Assembly Locations (Rear View)

Measure voltage at TB3-1, 2 and TB3-3, 4. Should be +9 V dc ±0.5% (+8.955 V to +9.045 V). Adjust A1A3R7 and A1A3R16 respectively, if necessary. (See Figure 2-5).

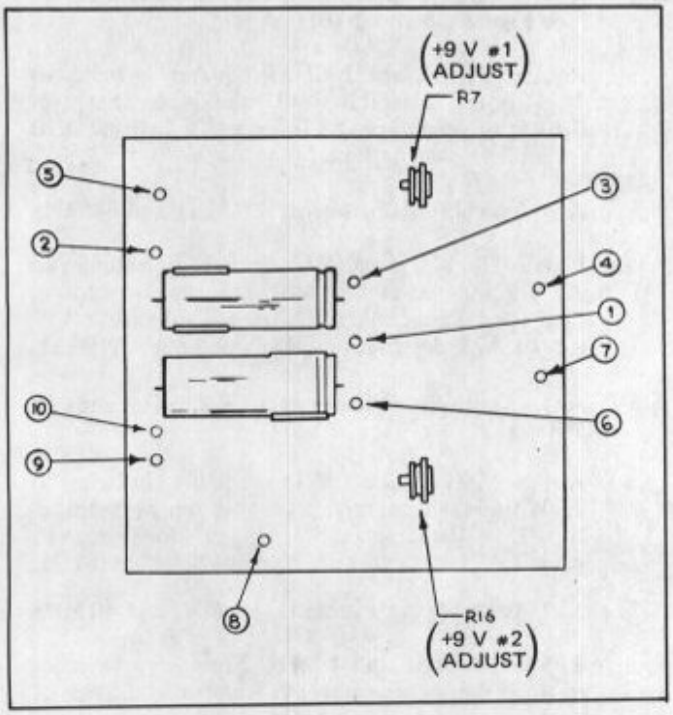


Figure 2-5. Trimmer Locations, Power Supply Assembly, A1A3

g. Measure voltage at A1A3-9, 10. Should be +12 V ±1.2 V, (+10.8 V to +13.2 V).

h. Set POWER switch to OFF. Set 115/230 V switch to 230 V. Plug power cord into 230 V ac source.

i. Set POWER switch on and repeat Steps e. thru g.

j. Set POWER switch to OFF and disconnect power cord from 230 V ac source. Set 115/230 V switch back to 115 V.

k. Set AC/DC switch to DC. Connect the dc power cord to 12 V dc receptacle and to the dc power source.

l. Set POWER switch on. Set dc power source output to 11.5 V dc.

m. Measure the voltage at TB3-1, 2 and TB3-3, 4. Should be +9 V ±0.5%. (+8.955 V to +9.045 V).

n. Set POWER switch to OFF and dc power source off, disconnect dc power cable from instrument; set AC/DC switch to AC, plug ac power cable into 115 V ac outlet and set POWER switch on.

2.5.2 10 MHz Amplifier Adjustment

a. Set the SWEEP switch to the OFF position and withdraw A11 assembly (See Figure 2-6 and Figure 2-7).

b. Connect oscilloscope 10X probe to A11-36. Observe that a 10 MHz waveform of approximately 500 mV p-p is present.

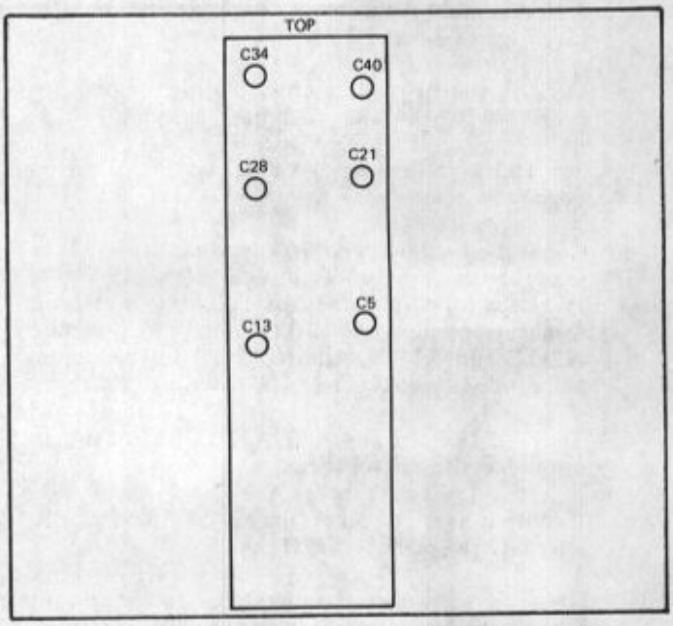


Figure 2-6. Trimmer Access Hole Locations, A11

c. Connect oscilloscope 10X probe to A11-39. Adjust A11L5 for maximum output. It should be approximately 3.2 V p-p.

d. Dress all wires above center of assembly toward top of chassis and all wires below center of assembly toward bottom of chassis. Reinstall A11 assembly

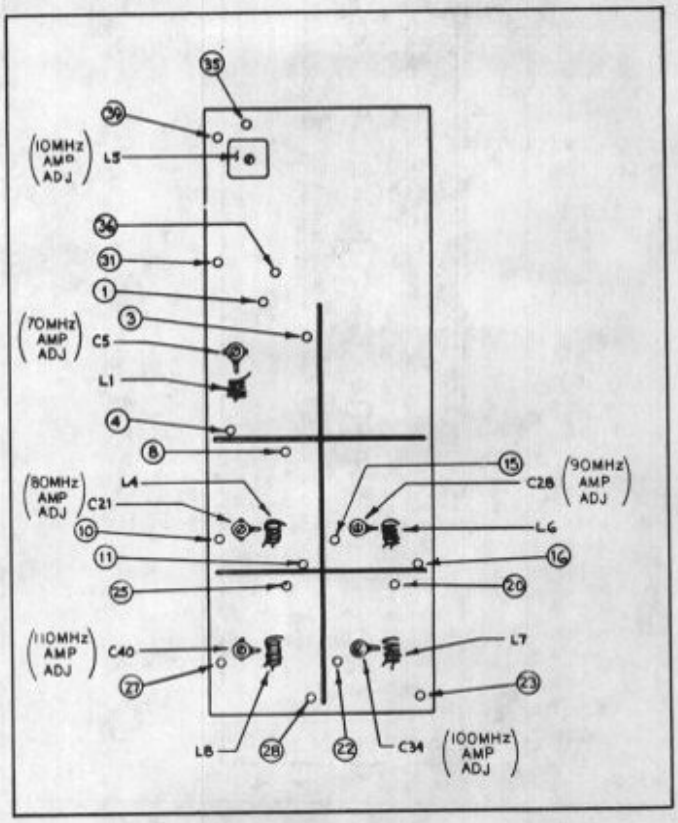


Figure 2-7. Trimmer Locations, Buffer Amplifier Assembly, A11

2.5.3 A21 Assembly Adjustment, 3.6 MHz and 36 MHz (See Figures 2-8 and 2-9)

a. Connect the RF voltmeter with a high impedance probe to A6-14 and withdraw assembly, A21.

b. Set 100 kHz Frequency switch and 1 MHz Frequency switch to 0.

c. Connect oscilloscope 10X probe to A21-6. Observe that a pulse of approximately 1.5 V p-p, at a repetition frequency of 100 kHz, is present. Connect oscilloscope 10X probe to junction A21Y2 and A21C6. Adjust A21L1 for maximum amplitude (approximately 100 mV p-p).

d. Tune A21L3, A21L4 and A21L5 for maximum output on the RF voltmeter.

e. If output level is other than −20 dBm, ±1 dB, select A21R28 and A21C31.

f. Dress all wires above center of assembly toward top of chassis and all wires below center of assembly toward bottom of chassis. Reinstall assembly A21.

2.5.4 A20 Assembly Adjustment, 3.7 MHz and 37 MHz (See Figure 2-8 and 2-10)

a. Rotate 100 kHz and 1 MHz Frequency switches to 1. Withdraw assembly, A20 and repeat Steps c. thru f. of Paragraph 2.5.3, except substitute A20 for all A21 designations.

2.5.5 A19 Assembly Adjustment, 3.8 MHz and 38 MHz

a. Rotate 100 kHz and 1 MHz Frequency switches to 2. Withdraw assembly A19 and repeat Steps c. thru f. of Paragraph 2.5.3, except substitute A19 for all A21 designations. Do not select A19C31.

2.5.6 A18 Assembly Adjustments, 3.9 MHz and 39 MHz

a. Rotate 100 kHz and 1 MHz Frequency switches to 3. Withdraw assembly A18 and repeat Steps c. thru f. of Paragraph 2.5.3, except substitute A18 for all A21 designations. Do not select A18C31.

2.5.7 A17 Assembly Adjustments, 4.0 MHz and 40 MHz

a. Rotate 100 kHz and 1 MHz Frequency switches to 4. Withdraw assembly A17 and repeat Steps c.

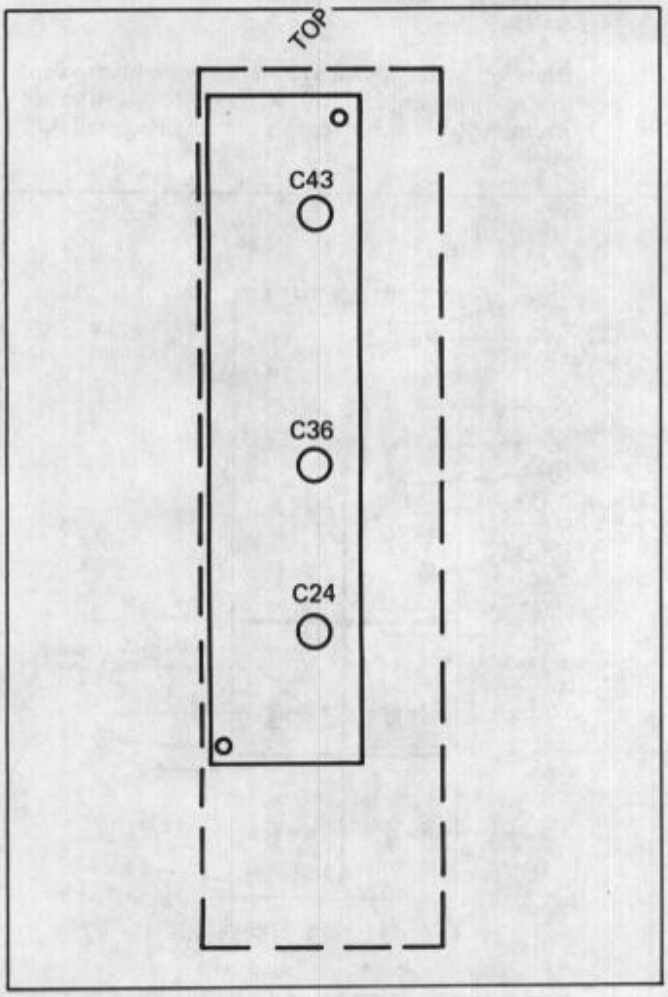


Figure 2-8. Trimmer Access Hole Locations, A12 thru A21

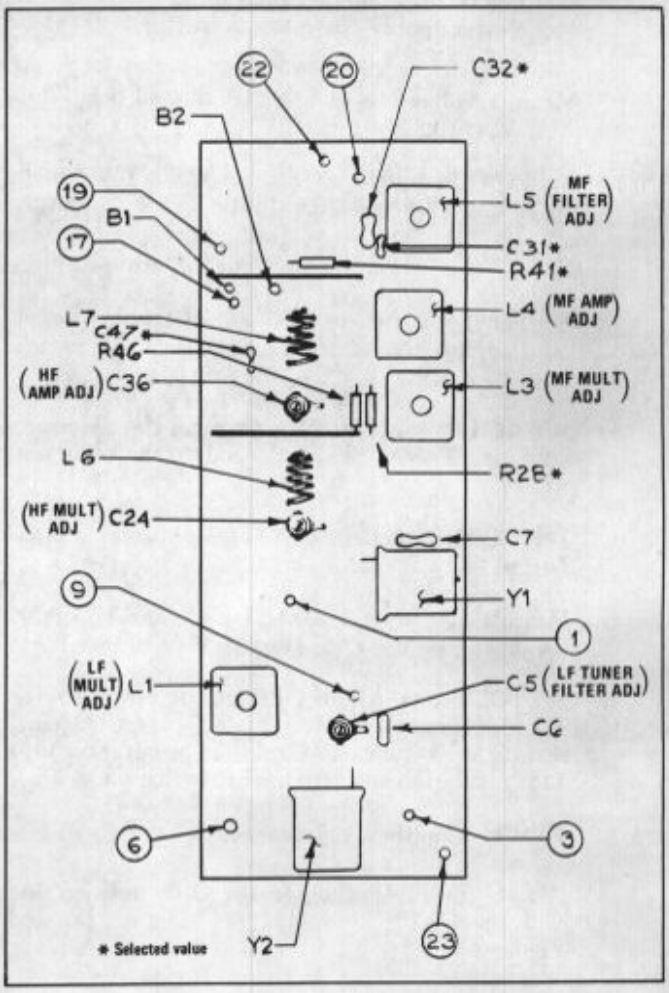


Figure 2-9. Trimmer Locations, Frequency Generator Assembly, A21

thru f. of Paragraph 2.5.3, except substitute A17 for all A21 designations. Do not select A17C31. If A17L4 or A17L3 have insufficient range, select the value of A17C25 or A17C18 respectively.

2.5.8 A16 Assembly Adjustment, 4.1 MHz and 41 MHz

a. Rotate 100 kHz and 1 MHz Frequency switches to 5. Withdraw assembly A16 and repeat Steps c. thru f. of Paragraph 2.5.3, except substitute A16 for all A21 designations. Do not select A16C31. If A16L4 or A16L3 have insufficient range, select the value of A16C25 or A16C18 respectively.

2.5.9 A15 Assembly Adjustment, 4.2 MHz and 42 MHz (See Figure 2-11)

a. Rotate 100 kHz and 1 MHz Frequency switches to 6. Withdraw assembly A15 and repeat Steps c. thru f. of Paragraph 2.5.3, except substitute A15 for all A21 designations. Do not select A15C31.

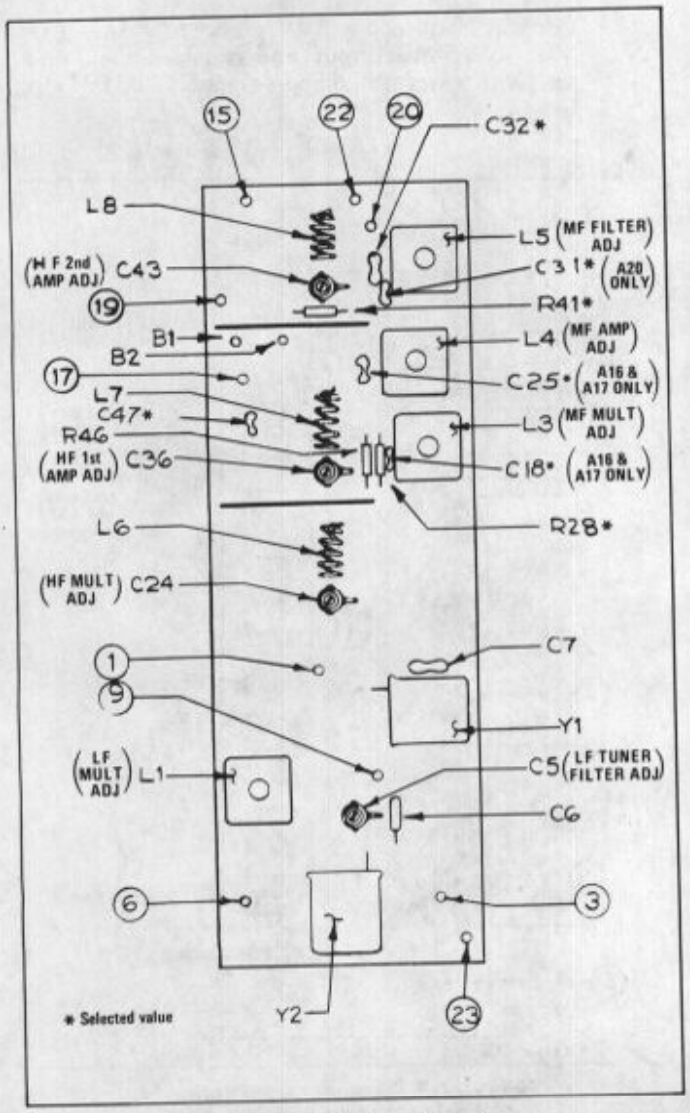


Figure 2-10. Trimmer Locations, Frequency Generator Assemblies, A16 thru A20

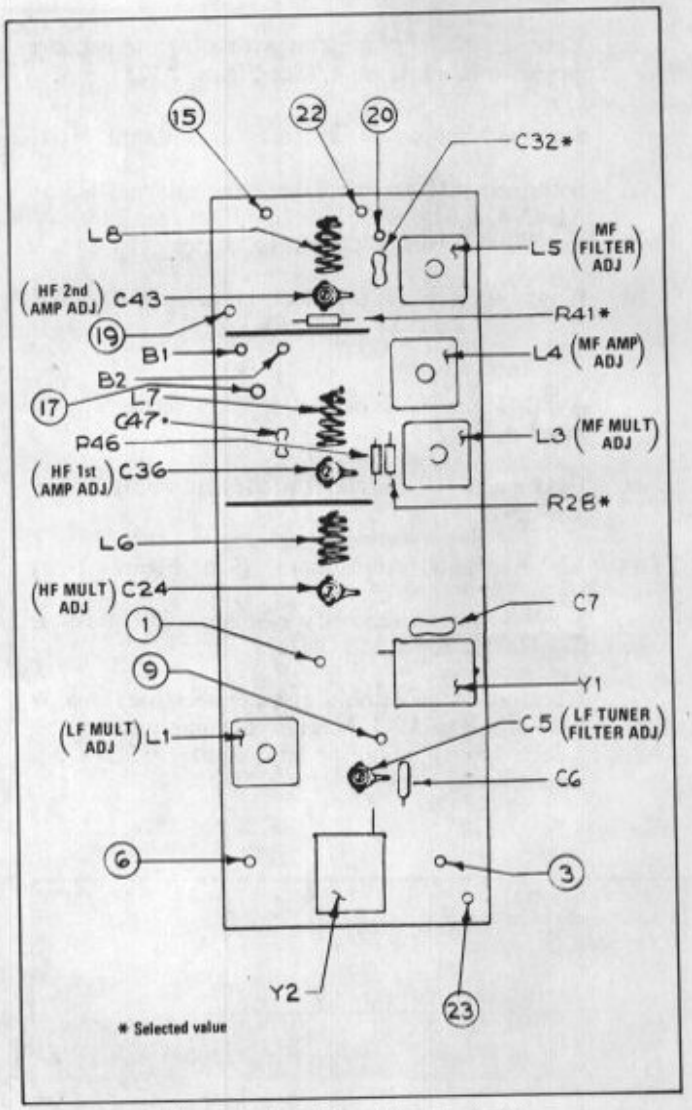


Figure 2-11. Trimmer Locations, Frequency Generator Assemblies, A12 thru A15

2.5.10 A14 Assembly Adjustment, 4.3 MHz and 43 MHz

a. Rotate 100 kHz and 1 MHz Frequency switches to 7. Withdraw assembly A14 and repeat Steps c. thru f. of Paragraph 2.5.3, except substitute A14 for all A21 designations. Do not select A14C31.

2.5.11 A13 Assembly Adjustment, 4.4 MHz and 44 MHz

a. Rotate 100 kHz and 1 MHz Frequency switches to 8. Withdraw assembly A13, and repeat Steps c. thru f. of Paragraph 2.5.3, except substitute A13 for all A21 designations. Do not select A13C31.

2.5.12 A12 Assembly Adjustment, 4.5 MHz and 45 MHz

a. Rotate 100 kHz and 1 MHz Frequency switches to 9. Withdraw assembly A12 and repeat Steps c. thru f. of Paragraph 2.5.3, except substitute A12 for all A21 designations. Do not select A12C31.

2.5.13 90 MHz No. 3 Adjustment

a. Connect the RF voltmeter with a high impedance probe to terminal A6-4. (See Figure 2-12)

b. Set the Frequency switches to 30.000 MHz.

c. Withdraw A18 assembly half-way out and adjust A18C24 and A18C36 to obtain between 200 mV and 250 mV rms on the RF voltmeter.

d. If not within tolerance, select the value of A18C47.

NOTE

A18C47 may cause oscillation if too large in value.

e. Disconnect RF voltmeter probe and reinstall A18 assembly.

2.5.14 A2 Assembly Adjustment (See Figure 2-13)

a. Set Mainframe Frequency switches to "0" positon 0 – 100 Hz control to OUT.

b. Withdraw A2 assembly and connect oscilloscope 10X probe to A2-3. Measure the amplitude of the 1 MHz input. Should be approximately 2.5 V p-p square wave.

c. Connect oscilloscope 10X probe to A2-8, 2 MHz input. Should measure approximately 3.0 V p-p square wave.

d. Connect oscilloscope 10X probe to A2-7. Tune A2L1, A2L2 and A2L3 for 9 MHz maximum output level. Should be 780 mV p-p ±70 mV. If necessary select the valve of A2R13, A2R16 and A2C16 and return A2L2 and A2L3 for 9 MHz maximum output level.

e. Connect oscilloscope 10X probe to A2-9. Tune A2L4 for maximum output level. Should be 2.2 V p-p minimum at 6 MHz.

f. Reinstall A2 assembly.

2.5.15 A3A Assembly Adjustment

a. Withdraw assembly A3A and connect oscilloscope 10X probe to A3A-3 (5 MHz to 6 MHz input) and ground. Voltage should be 2.2 V p-p minimum. (See Figure 2-14)

b. Connect oscilloscope 10X probe to A3A-6 (9 MHz input) and ground. Voltage should be 700 mV p-p minimum.

c. Connect oscilloscope 10X probe to A3A-8 (3.6 MHz to 4.5 MHz input) and ground. Should be a sawtooth waveform of approximately 700 mV p-p.

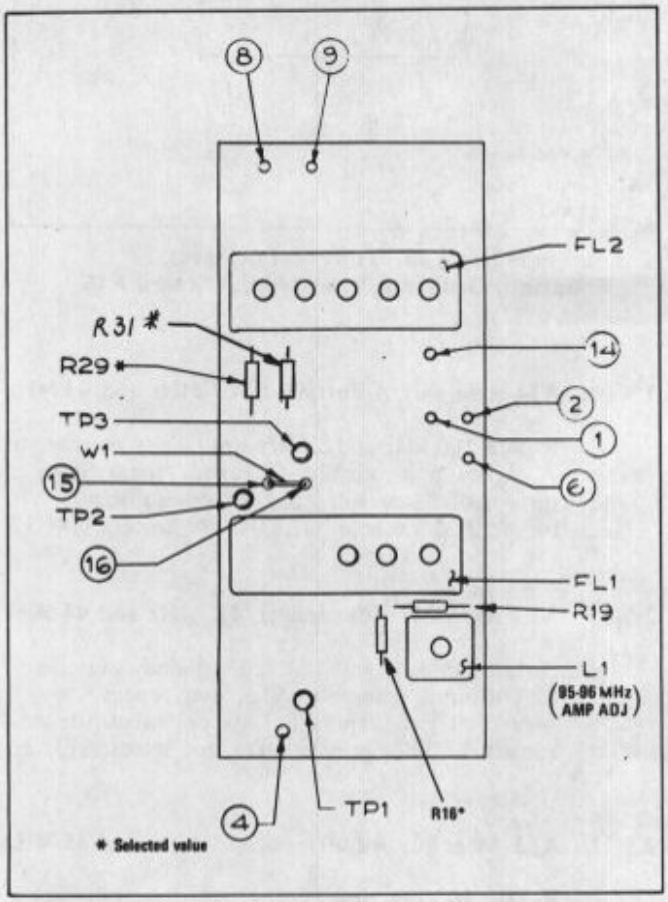


Figure 2-12. Trimmer Locations, 1 MHz Decade Assembly, A6

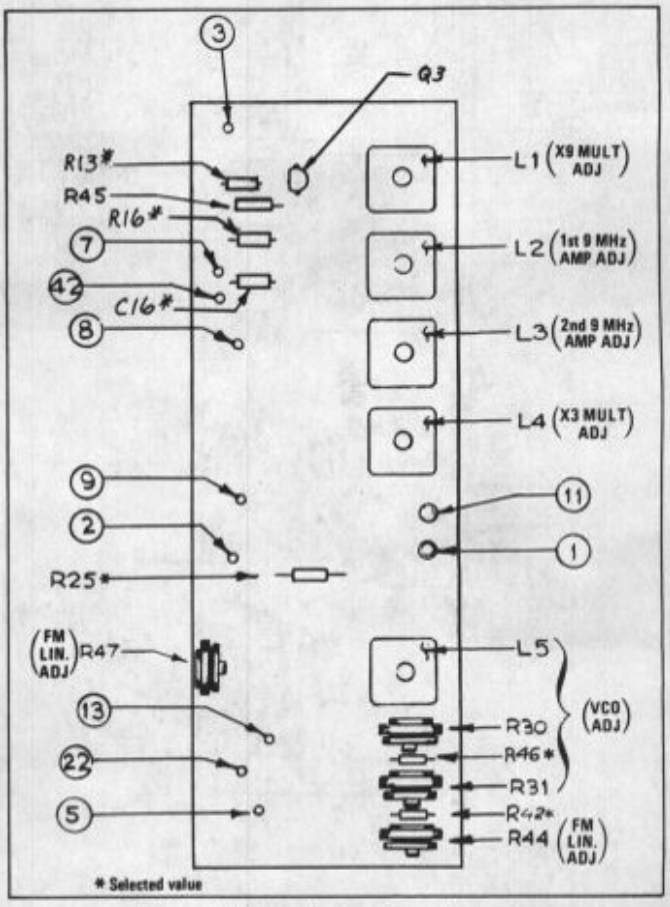


Figure 2-13. Trimmer Locations, VCO, 6 MHz, 9 MHz Assembly, A2

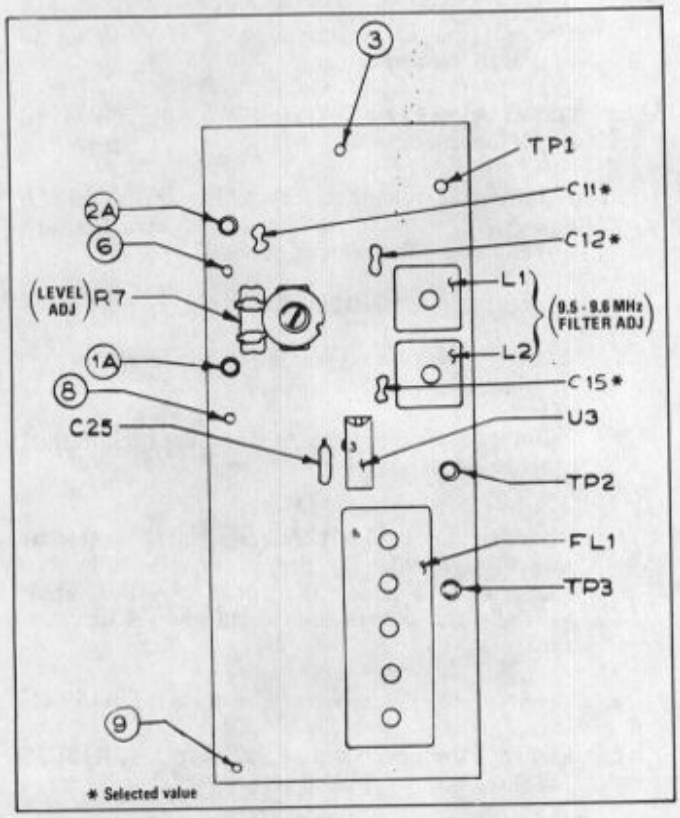


Figure 2-14. Trimmer Locations, 0.1, 1, 10 and 100 kHz Decade Assemblies, A3A thru A3D

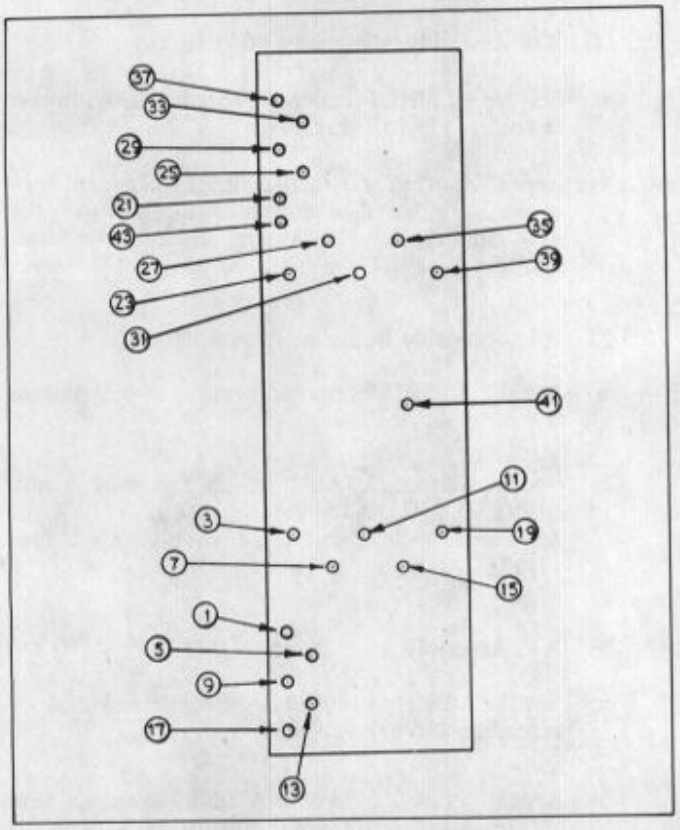


Figure 2-15. Trimmer Locations, 1 MHz and 10 MHz Decade Switching Programming Assemblies, A4A and A4B

d. Connect oscilloscope 10X probe to A3ATP1 (500 kHz to 600 kHz output). Voltage should be approximately 500 mV p-p.

e. Connect the oscilloscope 10X probe to A3ATP2 and set the Mainframe 0–100 Hz control to OUT.

f. Adjust A3AL1 and A3AL2 for maximum voltage and purest sine wave (9.6 MHz). The voltage should be approximately 150 mV p-p. If not enough range in A3AL1 and A3AL2 select the value of A3AC12 and A3AC15 respectively.

g. If the voltage at A3ATP2 is less than 150 mV p-p, increase the value of A3AC11 to obtain 150 mV p-p.

h. Connect the oscilloscope 10X probe to A3ATP3 and set the Mainframe 100 Hz Frequency switch to "5".

i. Adjust A3AR7 for 3 V p-p (5.5 MHz) at A3ATP3.

j. Rotate the 100 Hz Frequency switch between 0 and 9 and observe that the level is 2.2 V p-p minimum in all positions. Return the 100 Hz Frequency switch to "5".

k. Reinstall A3A assembly.

2.5.16 A3B Assembly Adjustment

a. Withdraw assembly A3B and repeat Steps a. thru k. of Paragraph 2.5.15, except substitute A3B for all A3A designations, and 1 kHz Frequency switch for 100 Hz Frequency switch.

2.5.17 A3C Assembly Adjustment

a. Withdraw assembly A3C and repeat Steps a. thru k. of Paragraph 2.5.15, except substitute A3C for all A3A designations and 10 kHz Frequency switch for 100 Hz Frequency switch.

2.5.18 A3D Assembly Adjustment

a. Withdraw assembly A3D and repeat Steps a. thru k. of Paragraph 2.5.15, except substitute A3D for all A3A designations, and 100 kHz Frequency switch for 100 Hz Frequency switch.

2.5.19 A21 Assembly Adjustment, 60 MHz

a. Set the 100 MHz Frequency switch and 10 MHz Frequency switch to 0. Withdraw assembly A21 half-way out.

b. Disconnect the center conductor of the cable at A4B-41 (See Figure 2-15) and solder a BNC test cable center conductor to A4B-41 and shield to A4B-42. Connect the BNC connector to the RF voltmeter (with 50 ohm termination).

c. Adjust A21C24 and A21C36 for –4 dBm ±1 dB on RF voltmeter.

d. If out of tolerance, check the taps on A21L6 and A21L7 (should not be greater than 1/2 turn up) and select the value of A21C47.

NOTE

A21C47 may cause oscillation if too large in value.

e. Reinstall cover and repeak A21C24 and A21C36. Dress all wires above center of assembly toward top of chassis and all wires below center of assembly, toward bottom of chassis. Reinstall assembly back into compartment. Leave RF voltmeter connected as in Step b.

2.5.20 A14 Assembly Adjustment, 130 MHz

a. Set the 10 MHz Frequency switch to 7. Withdraw assembly A14 half-way out.

b. Adjust A14C24, A14C36 and A14C43 for −4 dBm ±1 dB on the RF voltmeter.

c. If the output is too high or low, remove cover and repeak A14C24, A14C36 and A14C43.

d. If output is too high, decrease the value of A14C47 or increase the value of A14R41 until the output is −4 dBm ±1 dB. Repeak A14C24, A14C36 and A14C43, after selecting A14C47 or A14R41.

e. If output is too low, increase the value of A14C47 or decrease the value of A14R41 until the output is −4 dBm ±1 dB. Repeak A14C24, A14C36 and A14C43 after changing A14C47 or A14R41. Check the taps on A14L6, A14L7 and A14L8 (should not be greater than 1/2 turn up).

NOTE

A14C47 may cause oscillation if too large in value.

f. Reinstall cover and repeak A14C24, A14C36 and A14C43. Reinstall the assembly back into compartment; dress all wires above center of assembly toward top of chassis and all wires below center of assembly toward bottom of chassis.

2.5.21 A13 Assembly Adjustment, 140 MHz

a. Set the 10 MHz Frequency switch to 8. Withdraw assembly A13 half-way out.

b. Repeat Steps 2.5.20-b. thru 2.5.20-f, except substitute A13 for A14.

2.5.22 A12 Assembly Adjustment, 150 MHz

a. Set the 10 MHz Frequency switch to 9. Withdraw assembly A12 half-way out.

b. Repeat Steps 2.5.20-b. thru 2.5.20-f., except substitue A12 for A14.

2.5.23 A18 Assembly Adjustment, 90 MHz

a. Set the 10 MHz Frequency switch to 3. Withdraw assembly, A18, half-way out.

b. Unsolder the coaxial cable center conductor from A6-4. Connect the BNC test cable to this cable. Connect the RF voltmeter with 50 ohm termination to the test cable.

c. Adjust A18C24 and A18C36 for −1 dBm ±1 dB on RF voltmeter.

d. If output of tolerance, check the taps on A18L6 and A18L7 (should not be greater than 1/2 turn up) and select the value of A18C47.

NOTE

A18C47 may cause oscillation if too large in value.

e. Unsolder test cable from A6-4. Solder back normal cable to A6-4.

f. Unsolder the center conductor of the cable at A4B-41 and solder the BNC test cable center conductor to A4B-41 and the shield to A4B-42. Peak A18C43. The output level should be −4 dBm ±1 dB.

g. If out of tolerance, select the value of A18R41.

h. Reinstall the cover and repeak A18C24, A18C36 and A18C43.

i. Unsolder the BNC test cable from A4B-41 and A4B-42 and resolder the center conductor of the original cable to A4B-41. Reinstall assembly back into compartment.

2.5.24 A19 Assembly Alignment, 80 MHz

a. Set the 10 MHz Frequency switch to 2. Withdraw assembly A19 half-way out.

b. Repeat Steps 2.5.23-b. thru 2.5.23-i. except substitute A19 for A18 and substitute A19-17 for A6-4 and the level in Step f. should be -1 dBm ±1 dB.

2.5.25 A17 Assembly Adjustment, 100 MHz

a. Set the 10 MHz Frequency switch to 4. Withdraw assembly A17 half-way out.

b. Repeat Steps 2.5.23-b thru 2.5.23-i. except substitute A17 for A18 and substitute A17-17 for A6-4 and the level in Step f. should be −1 dBm ±1 dB.

2.5.26 A16 Assembly Adjustment, 110 MHz

a. Set the 10 MHz Frequency switch to 5. Withdraw assembly A16 half-way out.

b. Repeat Steps 2.5.23-b thru 2.5.23-i. except substitute A16 for A18 and substitute A16-17 for A6-4 and the level in Step f. should be −1 dBm ±1 dB.

2.5.27 A15 Assembly Adjustment, 120 MHz

a. Set the 10 MHz Frequency switch to 6. Withdraw assembly A15 half-way out.

b. Repeat Steps 2.5.23-b. thru 2.5.23-i. except substitute A15 for A18 and substitute A15-17 for A6-4 and the level in Step f. should be −1 dBm ±1 dB.

2.5.28 A20 Assembly Adjustment, 70 MHz

a. Set the 10 MHz Frequency switch to 1. Withdraw assembly A20 half-way out.

b. Repeat Steps 2.5.23-b thru 2.5.23-i. except substitute A20 for A18 and substitute A4B-41 and A20-17 for A18-17 and A4B-41 respectively.

2.5.29 A6 Assembly Adjustment

a. Withdraw assembly A6 and connect oscilloscope 10X probe to A6-6 (5 MHz to 6 MHz input). Voltage should be approximately 2.5 V p-p. (See Figure 2-12)

b. Connect oscilloscope 10X probe to A6-14 (36 MHz to 45 MHz input). Voltage should be approximately 60 mV p-p.

c. Connect oscilloscope 10X probe to A6-4 (90 MHz input). Voltage should be approximately 630 mV p-p at 90 MHz.

d. Set the Mainframe 100 kHz Frequency switch to "5", 10 kHz, 1 kHz and 100 Hz Frequency switches to "0". Connect the oscilloscope 10X probe to A6TP1. The voltage should be 150 mV p-p ±25% (112.5 mV to 187.5 mV p-p). If necessary select the value of A6R3 to obtain 150 mV p-p ±25%.

e. Connect the oscilloscope 10X probe to A6TP2. Adjust A6L1 for maximum output at 95.5 MHz. The voltage should be 220 mV p-p ±25% (165 mV to 275 mV p-p). If necessary, select the value of A6R16 to obtain approximatley 220 mV p-p.

f. Set the Mainframe 10 MHz Frequency switch to "0" and 1 MHz Frequency switch to "5". Connect the oscilloscope 10X probe to A6TP3. The voltage should be approximately 120 mV p-p (55 MHz).

g. Unsolder wire on A6-8. Connect center conductor of a 50 ohm coaxial test cable to A6-8 and connect outer conductor to A6-9.

h. Connect the outer end of test cable to RF voltmeter with 50 ohm termination. Measure voltage level. Level should be −1 dBm ±2 dB. If not within tolerance, select the value of A6R31.

i. Rotate the 100 kHz Frequency switch and 1 MHz Frequency switch throughout their ranges. The output level should be −1 dBm ±2 dB.

j. Disconnect test cable from RF voltmeter and connect test cable to the spectrum analyzer.

k. Rotate the 100 kHz Frequency switch to zero.

l. Set the spectrum analyzer dispersion for 100 kHz/division, frequency dial to 50 MHz and other controls so that signal level is 50 dB above the noise level.

m. Adjust A21C5 for minimum 100 kHz sidebands at least 45 dB down from the carrier.

n. Repeat for all positions of 100 kHz Frequency switch adjusting A20C5, A19C5, etc., as required.

o. Reinstall A6 assembly.

2.5.30 A1A6 Assembly Adjustment (See Figures 2-16 and 2-17)

a. Connect oscilloscope 10X probe to A1A6TP1. Adjust A1A6T1 and A1A6T2 for maximum amplitude at 10 MHz.

b. Connect oscilloscope 10X probe to A1A6-9. Adjust A1A6C21, A1A6C27 and A1A6C33 for maximum amplitude at 70 MHz.

c. Disconnect oscilloscope 10X probe and cable center conductor from A1A6-9. Connect the BNC test cable center conductor to A1A6-9 and shield to ground.

d. Connect RF voltmeter (with 50 ohm termination) to the test cable connector. Output level should be +10 dBm ±1 dB.

e. If out of tolerance, select A1A6R24 and re-adjust A1A6C21, A1A6C27 and A1A6C33.

f. Disconnect RF voltmeter and test cable and reconnect cable center conductor to A1A6-9.

2.5.31 A7 Assembly Adjustment (See Figures 2-18 thru 2-20)

a. Remove mounting screws and lift out assembly A7/A8. Disconnect FL2 from Z2 and connect FL2 to the sweep generator RF output receptacle.

b. Connect A7-6 to the RF detector RF input receptacle and the dc output receptacle of the detector to the sweep generator demodulator input receptacle.

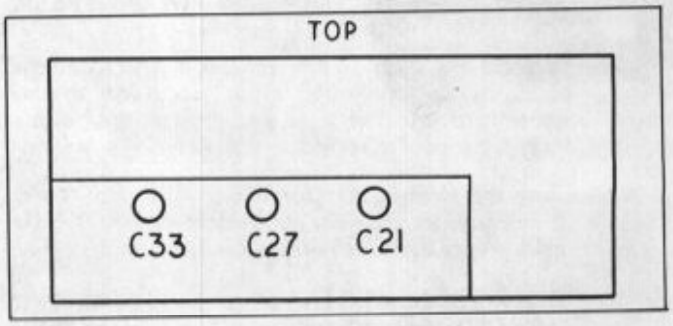


Figure 2-16. Trimmer Access Hole Locations, A1A6

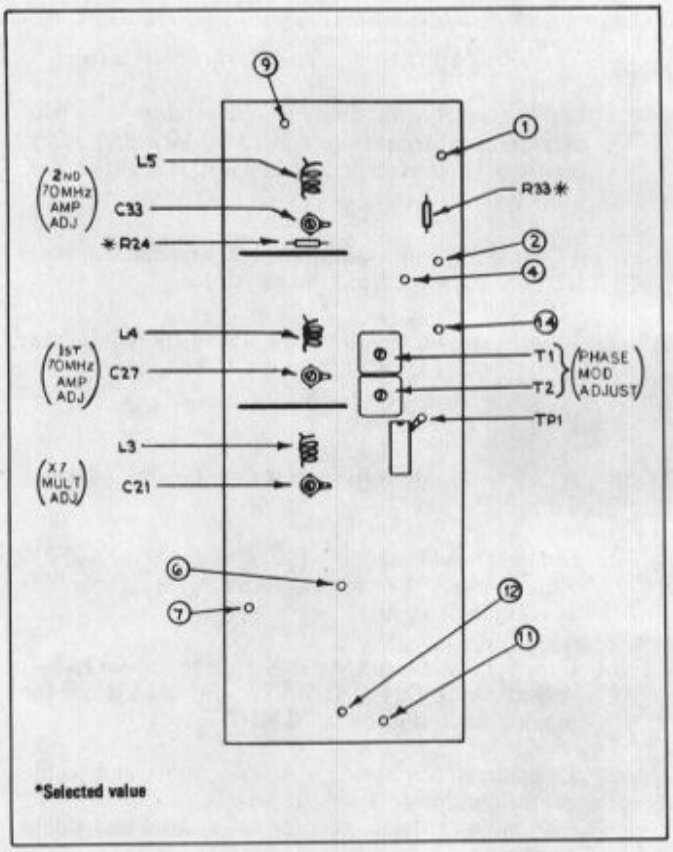


Figure 2-17. Trimmer Locations, Phase Modulator/Audio Assembly, A1A6

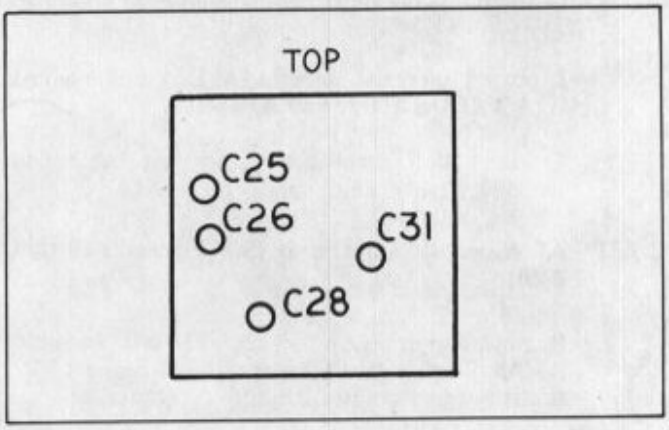


Figure 2-18. Trimmer Access Hole Locations, A7

c. Set the sweep generator output level to –21 dBm (Δf).

d. Connect the oscilloscope vertical input receptacle and external horizontal input receptacle to the sweep generator vertical and horizontal output receptacles respectively.

e. Vary the sweep generator sweep width and center frequency so that the 600 MHz and 700 MHz markers are displayed on the oscilloscope.

f. Disconnect the ALC lead at A7-1 and connect the 0-5 V dc power supply positive lead to A7-1. Connect the negative lead to ground. Set the output voltage to 0 V.

g. Adjust A7C25, A7C26, A7C28 and A7C31 for maximum output and flattest response between 600 MHz and 700 MHz.

h. Disconnect the BNC connector at the RF detector RF input receptacle. Set the sweep generator mode to CW.

i. Connect the RF voltmeter (with 50 ohm termination) to FL2 input and verify that the level at FL2 is –21 dBm. Disconnect the RF voltmeter (with 50 ohm termination) from FL2 and connect it to A7-6. Vary the sweep generator center frequency from 600 MHz to 700 MHz. The output level should not change more than ±2 dB from –12 dBm.

j. Increase the 0-5 V dc power supply connected to A7-1 to +5 V dc. The output level should drop a minimum of 28 dB from the level measured in previous step.

k. Disconnect the test equipment from the assembly and reconnect the cables and wire to their proper locations.

2.5.32 A8 Assembly Adjustment (See Figures 2-21 and 2-22)

a. With oscilloscope 10X probe observe 70 MHz at A8-5. The voltage should be between 1.8 V and 2.2 V p-p. Connect oscilloscope 10X probe to

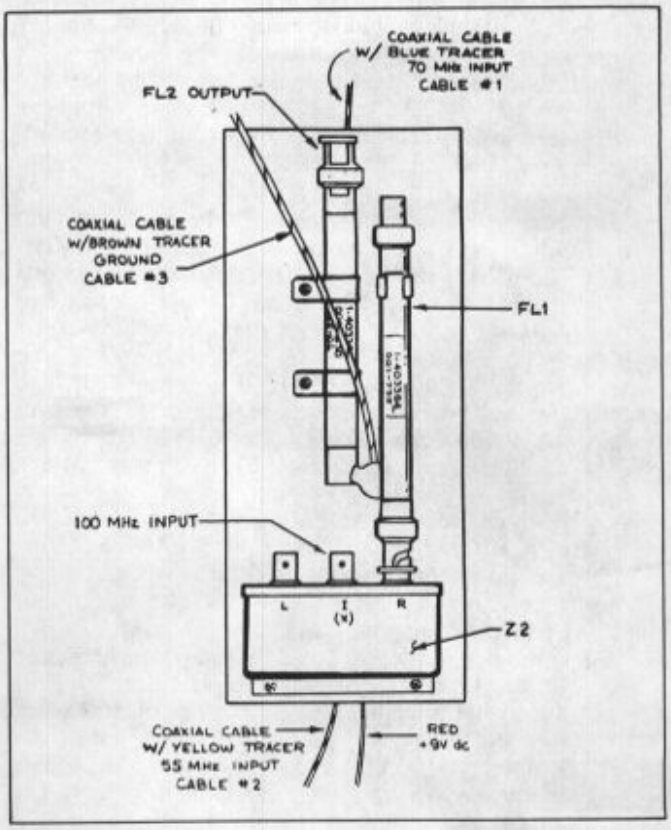


Figure 2-19. Trimmer Locations, Assembly A7/A8

A8-1 and peak A8C28 and A8C30 for maximum output level.

b. Unsolder A8C13 from A8Z1-L and connect the BNC test cable center conductor to A8C13 and shield to ground. Connect the RF voltmeter (with 50 ohm termination) to the BNC connector. Peak A8C3, A8C6, A8C9 and A8C12 for maximum output level on RF voltmeter. Verify that RF voltmeter indicates > + 5 dBm. Disconnect the RF voltmeter and connect spectrum analyzer to the BNC test cable. Observe the 770 MHz spurious response. Should be at least 40 dB down from the 700 MHz level. If not, lower taps on A8L3 and A8L4 and repeak A8C9 and A8C12. Disconnect spectrum analyzer and connect RF voltmeter to the BNC test cable. Repeak A8C9 and A8C12 and verify that output level is +5 dBm. Disconnect RF voltmeter and BNC test cable from A8C13 and reconnect it to A8Z1-L.

c. Rotate 100 kHz Frequency switch and 1 MHz Frequency switch to 4. Disconnect the BNC connector from Z2-R and connect the RF voltmeter (with 50 ohm termination) to filter, FL1.

NOTE

The L and R ports of Z2 are interchangeable and have been factory selected for maximum attenuation of spurious signal outputs.

Peak A8C21, A8C18 and select A8C33 and A8C35 for +5 dBm ±1 dB on the RF voltmeter.

d. Rotate 100 kHz Frequency switch and 1 MHz Frequency switch from 0 to 9. Output should be +5 +5 dBm ±2 dB. If not, select the value of A8C36. (May cause oscillation and must not be greater than 2.9 pF).

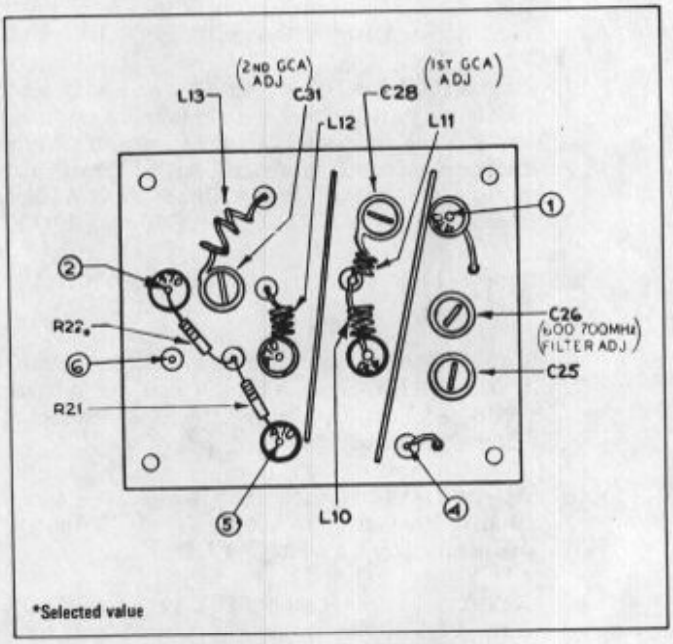


Figure 2-20. Trimmer Locations, GCA/AM Assembly, A7

2.5.33 A9, A10, A11 and A5 Assembly Adjustments (See Figures 2-23 thru 2-26)

a. Set the 100 MHz Frequency switch and 10 MHz Frequency switch to 0.

b. Disconnect the BNC connector from Z1-R and connect the spectrum analyzer input to this cable.

c. Set the spectrum analyzer dispersion to 100 MHz/division with 700 MHz center frequency.

d. Remove cover from A10. Connect the oscilloscope 10X probe to A10-1. Tune A11C5 for maximum output level on the oscilloscope. Remove the oscilloscope probe.

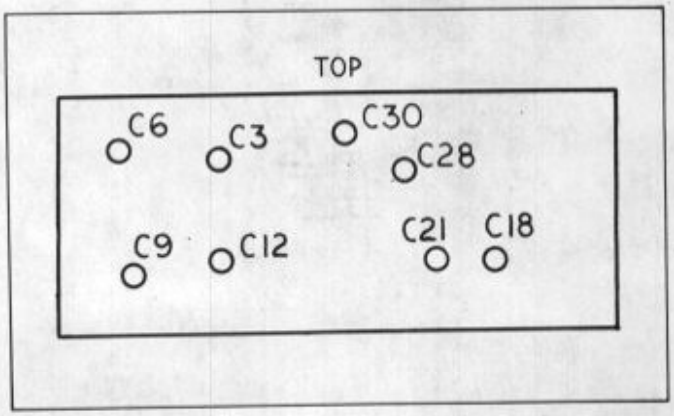


Figure 2-21. Trimmer Access Hole Locations, A8

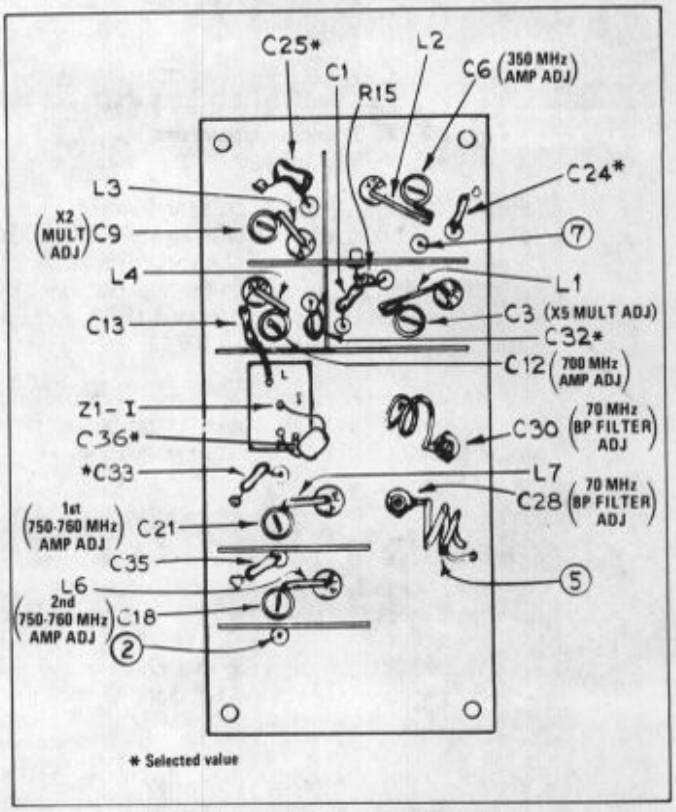


Figure 2-22. Trimmer Locations, 10 MHz Decade Assembly, A8

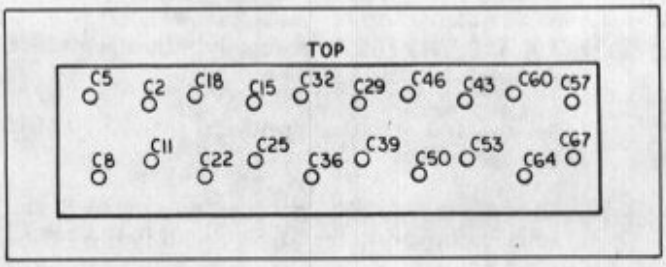


Figure 2-23. Trimmer Access Hole Locations, A10

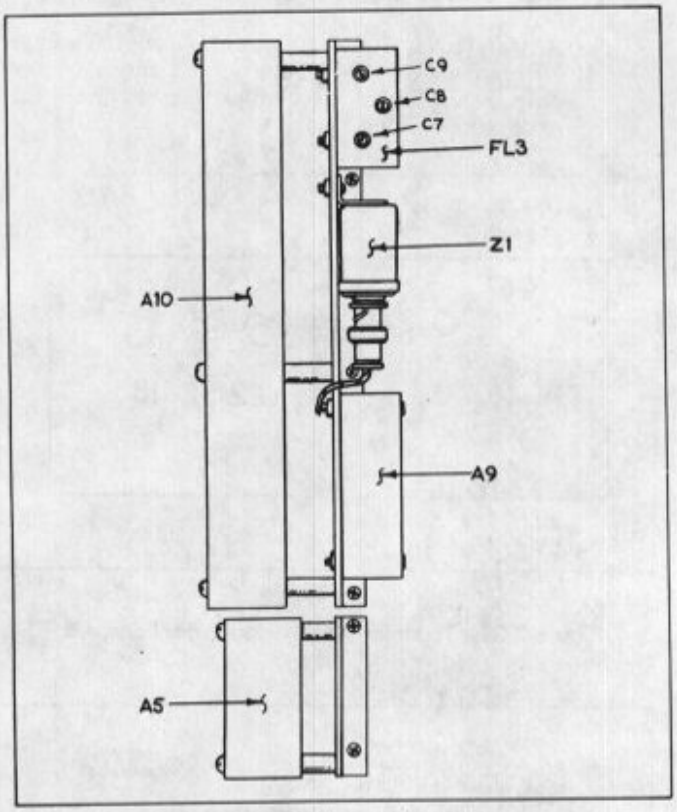


Figure 2-24. Trimmer Locations, Assembly A5, A9 and A10

e. Tune A10C2, A10C5, A10C8 and A10C11 for maximum output level with minimum sidebands, 30 dB down or greater, on the spectrum analyzer. Reduce sideband levels as far as possible by moving taps down on A10L1 thru A10L4. Repeak A10C2, A10C5, A10C8 and A10C11.

f. Disconnect the spectrum analyzer and connect the RF voltmeter (with 50 ohm termination) and repeak A10C11. The output level should be +6 dBm, ±3 dB.

g. If the output is too high or low, select value of A10C71, A10C70 or A10C76 until the output is +6 dBm, ±3 dB. Disconnect RF voltmeter and reconnect spectrum analyzer.

h. Set the 100 MHz Frequency switch to 1 and the 10 MHz Frequency switch to 1. Set the spectrum analyzer center frequency to 800 MHz.

i. Connect the oscilloscope 10X probe to A10-5. Tune A11C21 for maximum output on the oscilloscope. Remove the oscilloscope 10X probe.

j. Tune A10C15, A10C18, A10C22, and A10C25 for maximum-output with minimum sidebands, 30 dB down or greater on the spectrum analyzer. Reduce sideband levels as far as possible by moving down taps on A10L5 thru A10L8. Repeak A10C15, A10C18, A10C22 and A10C25.

k. Repeat Step f., except substitute A10C25 for A10C11.

l. If the output is too high or low, select value of A10C72, A10C21 or A10C77 until the output is +6 dBm, ±3 dB. Disconnect RF voltmeter and reconnect spectrum analyzer.

m. Set the 100 MHz Frequency switch to 2 and the 10 MHz Frequency switch to 2. Set the spectrum analyzer center frequency to 900 MHz.

n. Connect the oscilloscope 10X probe to A10-9. Tune A11C28 for maximum output level on the oscilloscope. Remove the oscilloscope 10X probe.

o. Tune A10C29, A10C32, A10C36 and A10C39 for maximum output level with minimum sidebands, 30 dB down or greater, on the spectrum analyzer. Reduce sideband levels as far as possible by moving taps down on A10L9 thru A10L12. Repeak A10C29, A10C32, A10C36 and A10C39.

p. Repeat Step f., except substitute A10C39 for A10C11.

q. If the output is too high or low, select value of A10C73, A10C35 or A10C78 until the output is +6 dBm ±3 dB. Disconnect the RF voltmeter and reconnect the spectrum analyzer.

r. Set the 100 MHz Frequency switch to 3 and the 10 MHz Frequency switch to 3. Set the spectrum analyzer center frequency to 1 GHz.

s. Connect the oscilloscope 10X probe to A10-13. Tune A11C34 for maximum output level on the oscilloscope. Remove the oscilloscope 10X probe.

t. Tune A10C43, A10C46, A10C50 and A10C53 for maximum output level with minimum sidebands, 40 dB down or greater, on the spectrum analyzer. Reduce sideband levels as far as possible by moving taps down on A10L13 thru A10L16. Repeak A10C43, A10C46, A10C50 and A10C53.

u. Repeat Step f., except substitute A10C43 for A10C11.

v. If the output is too high or low, select value of A10C74, A10C49 or A10C79 until the output is +6 dBm, ±3 dB. Disconnect the RF voltmeter and reconnect the spectrum analyzer.

w. Set the 100 MHz Frequency switch to 4 and the 10 MHz Frequency switch to 4. Set the spectrum analyzer center frequency to 1.1 GHz.

y. Connect the oscilloscope 10X probe to A10-17. Tune A11C40 for maximum output level on the oscilloscope. Remove the oscilloscope 10X probe.

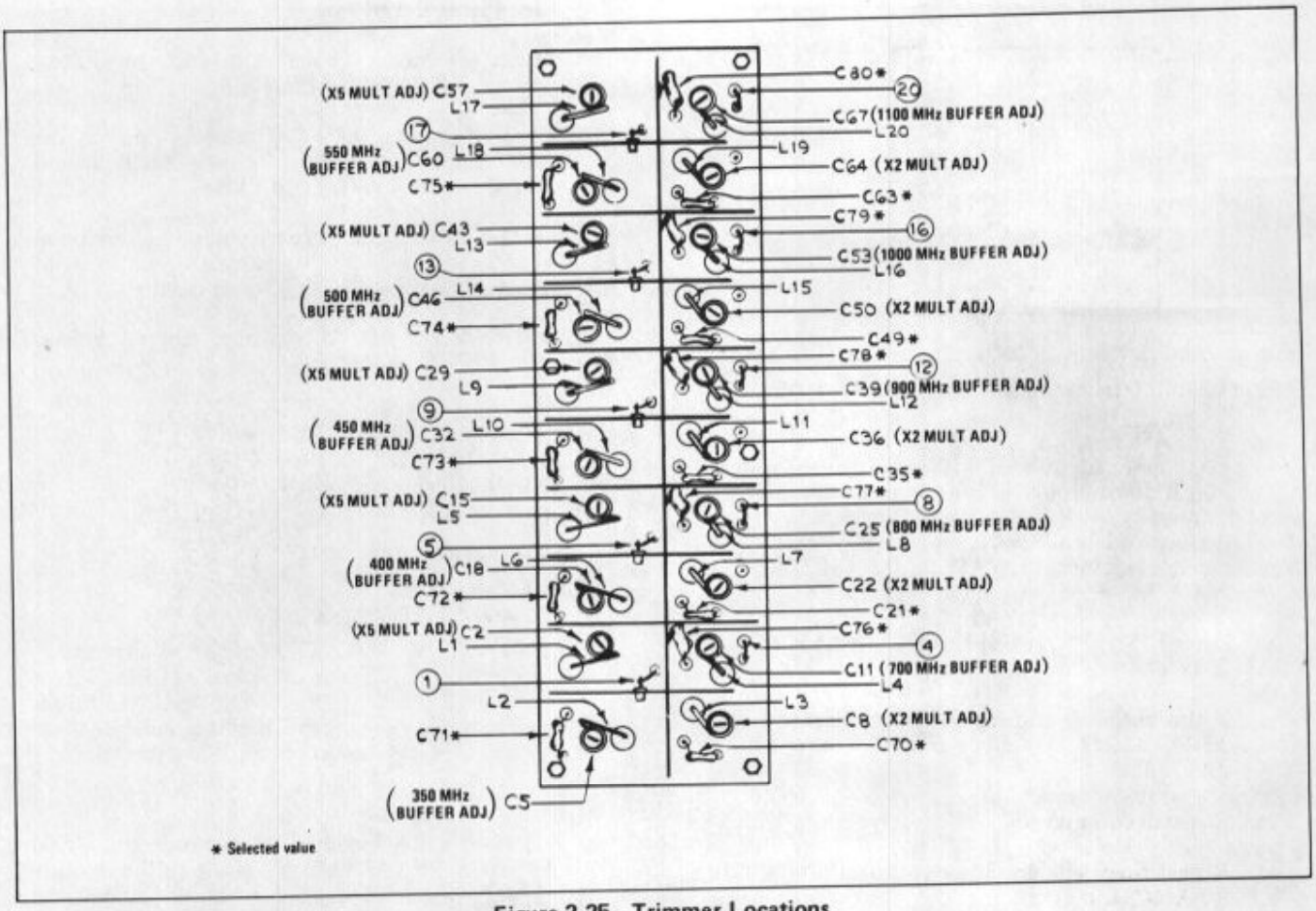


Figure 2-25. Trimmer Locations, 700–1100 MHz Multiplier Assembly, A10

z. Tune A10C57, A10C60, A10C64 and A10C67 for maximum output level with minimum sidebands, 30 dB down or greater, on the spectrum analyzer. Reduce sideband levels as far as possible by moving taps down on A10L17 thru A10L20. Repeak A10C57, A10C60, A10C64 and A10C67.

aa. Repeat Step f., except substitute A10C67 for A10C11.

ab. If the output is too high or low, select value of A10C75, A10C63 or A10C80 until the output is +6 dBm, ±3 dB. Disconnect the RF voltmeter and reconnect the spectrum analyzer.

ac. Reinstall cover on A10 and set the 100 MHz and 10 MHz Frequency switches to 0. Reinstall assembly A11 back into compartment.

ad. Repeat Steps c., e. and f.

ae. Disconnect RF voltmeter and reconnect the spectrum analyzer.

af. Repeat Steps h., j. and f., except substitute A10C25 for A10C11 in Step f.

ag. Disconnect RF voltmeter and reconnect the spectrum analyzer.

ah. Repeat Steps m., o. and f., except substitute A10C39 for A10C11 in Step f.

ai. Disconnect RF voltmeter and reconnect the spectrum analyzer.

aj. Repeat Steps r., t. and f., except substitute A10C53 for A10C11 in Step f.

ak. Disconnect the RF voltmeter and reconnect the spectrum analyzer.

al. Repeat Steps w., z., and f., except substitute A10C67 for A10C11 in Step f.

am. Set 100 MHz and 10 MHz Frequency switches to 5.

an. Disconnect the RF voltmeter and reconnect the spectrum analyzer. Set center frequency to 1.2 GHz.
(See Figure 2-26 and 2-27)

ao. Remove cover from A5. Connect oscilloscope 10X probe to A5-1. Verify that level is between 560 mV and 710 mV p-p. Remove the oscilloscope 10X probe.

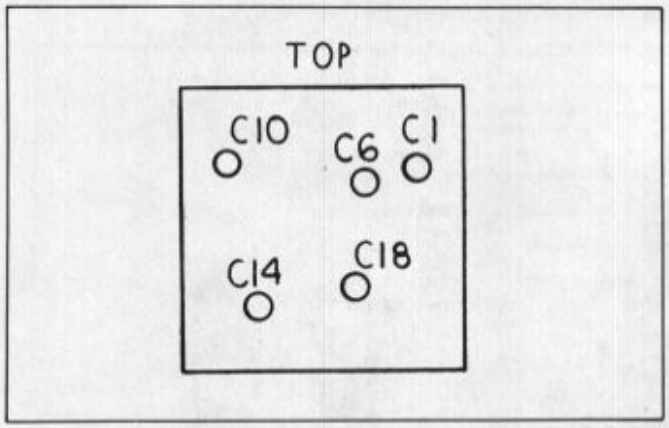


Figure 2-26. Trimmer Access Hole Locations, A5

ap. Tune A5C1, A5C6, A5C10, A5C14 and A5C18 for maximum output level with minimum sidebands, 30 dB down or greater, on the spectrum analyzer.

Reduce sideband levels as far as possible by moving taps down on A5L1 thru A5L5. Repeak A5C1, A5C6, A5C10, A5C14 and A5C18.

aq. Repeat Step f., except substitute A5C18 for A10C11.

ar. If the output is too high or low, select value of A5C9, A5C13 or A5C17 until the output is +6 dBm, ±3 dB.

as. Reinstall cover on A5.

at. Repeat Steps ap. and f., except substitute A5C18 for A10C11 in Step f.

au. Disconnect the RF voltmeter from BNC cable and reconnect the cable to Z1-R.
(Figure 2-28 is displayed for reference)

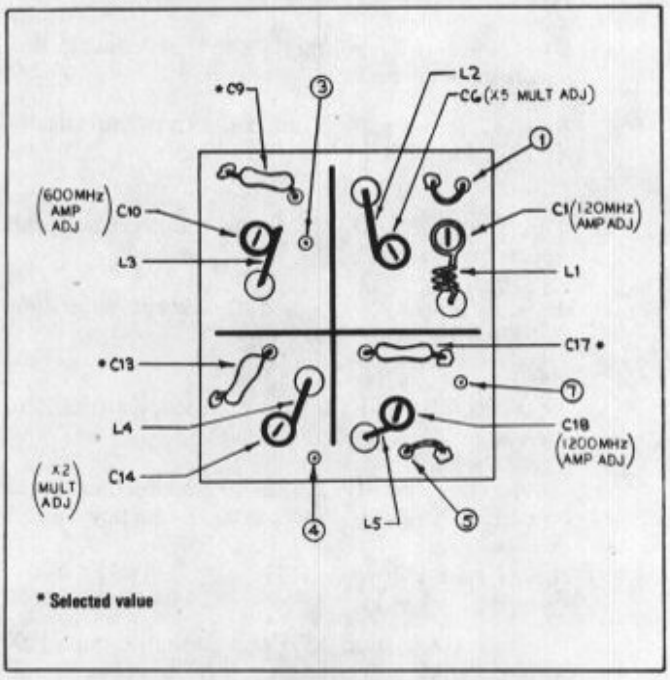


Figure 2-27. Trimmer Locations, 1200 MHz Multiplier Assembly, A5

2.5.34 Amplitude Modulation Adjustment (See Figure 2-29)

a. Install the Model AFM-2 in the right-hand compartment of the Model FM-10CS.

b. Connect one end of a BNC coaxial cable to the audio output receptacle of the audio oscillator and set the output frequency to 1 kHz.

c. Using a BNC-T connector, connect the other end of the cable and the distortion analyzer input to the Model AFM-2 AM MOD receptacle.

d. Set the Model FM-10CS switches and controls as follows:

POWER	on
MODE	GEN
Frequency	003.0000 MHz
0–100 Hz	OUT
GENERATOR MODULATION	ON (IN)
RF OUTPUT	–27 dBm (if the left-hand module does not have –27 dBm output level, the broadband amplifier must be used to obtain –27 dBm level.

e. Connect a BNC coaxial cable from the Model FM-10CS RF OUTPUT receptacle to the measure input receptacle of the amplitude modulation meter.

f. Set the distortion analyzer to the voltmeter mode.

g. Adjust the audio oscillator to obtain 75 mV rms on the distortion analyzer.

h. Unsolder the 60 MHz to 150 MHz input cable at A27-4 and connect it to the RF voltmeter with the 50 ohm lead. The power level should be –4 dBm ±1 dB. Rotate the 10 MHz frequency switch from 0 thru 9. If the output level varies greater than ±1 dB, refer to 60–150 MHz alignment procedures, Paragraph 2.5.19 thru 2.5.29, and readjust as necessary.

i. Resolder the cable to A27-4. Disconnect the BNC connector at mixer Z2-X and connect the RF voltmeter with 50 ohm load to the cable.

j. Adjust A27R1 for an output level of –15 dBm. Disconnect the RF voltmeter and reconnect the cable to Z2-X.

k. Set the AM meter to 30% AM.

l. If necessary, adjust A27R1 to obtain 30% modulation on the AM meter.

m. Change the 10 MHz Frequency switch on the Mainframe from 0 thru 9. (Recalibrate the AM meter before each step.)

n. The modulation should be 27% to 33% at each step. If the modulation is not within these limits, select the value of A27C4. (May be omitted.)

o. Disconnect the distortion analyzer from the Model AFM-2 and connect it to the distortion analyzer receptacle of the AM meter.

p. Check that the distortion is less than 3%.

q. Disconnect the distortion analyzer from the AM meter and reconnect it to the Model AFM-2 AM MOD receptacle.

r. Set the distortion analyzer to the voltmeter mode.

s. Vary the audio oscillator for an indication of 95% modulation on the AM meter.

t. Check the oscillator output level for 238 mVrms ±10% (214.2 mV to 261.8 mV).

u. Disconnect the distortion analyzer from the Model AFM-2 and connect it to the distortion analyzer receptacle of the AM meter.

v. Check that the distortion is less than 10%.

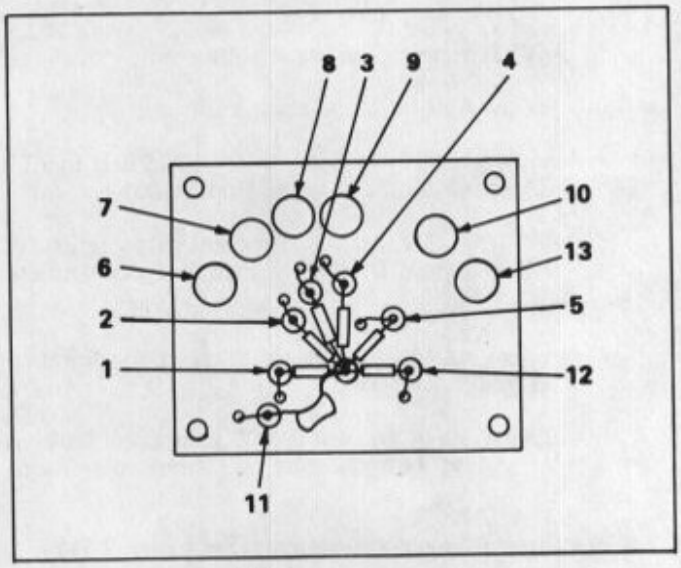


Figure 2-28. Trimmer Locations, Diode Switch Assembly, A9

2.5.35 ALC Adjustment

a. Set the Mainframe POWER switch to OFF position and withdraw RFM module half-way out. Install extender cables Model PC2652 and Model PC2775 and set POWER switch on.

b. Disconnect BNC cable on input variable attenuator and connect RF voltmeter with a 50 ohm termination to the BNC cable (BBA output).

c. Set Mainframe frequency to 250 MHz and adjust A1A2R31 for an output level of 0 dBm on RF voltmeter. (–23 dBm for Model RFM–10 only) (See Figure 2-30)

d. Rotate 100 MHz, 10 MHz and 1 MHz Frequency switches throughout their ranges. Output should not vary more than ±1 dB. Re-adjust A1A2R31 if necessary.

e. Disconnect RF voltmeter and reconnect input to variable attenuator. Remove extender cable and install RFM module.

2.5.36 VCO Adjustment

a. Measure at terminal A2-5 with the oscilloscope with 10X probe. Set the 100 kHz Frequency switch to V position. Set the 0–100 Hz Frequency control to zero. Adjust A2L5 for approximately 6 MHz on the oscilloscope. The level should be 2.3 V p-p ±0.2 V p-p. If not within tolerance, select value of A2R25. Set the 100 kHz Frequency switch to zero. Set the Mainframe Frequency switches to 1.0000 MHz.

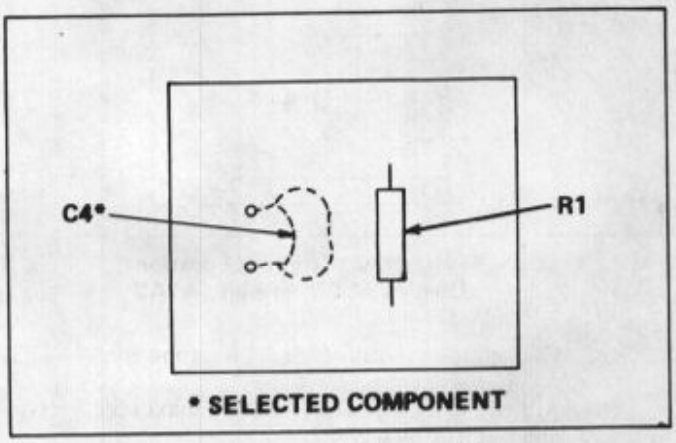


Figure 2-29. Trimmer Location, Amplitude Modulator Assembly, A27

b. Connect the frequency counter input receptacle to left-hand module RF OUTPUT receptacle. Refer to Table 2-1 for sensitivity requirements of frequency counter. Set the RF OUTPUT attenuator of the RFM module to maximum output level.

c. Set the Mainframe 0–100 Hz Frequency control to "0" and adjust A2L5 for exactly 1 MHz on the frequency counter.

d. Set the Mainframe 0–100 Hz Frequency control to "5" and adjust A2R30 for exactly 1.00005 MHz. If insufficient range in A2R30, select the value of A2R46.

e. Set the Mainframe 0–100 Hz Frequency control to "10" and adjust A2R31 for exactly 1.0001 MHz. If insufficient range in A2R31, select the value of A2R42.

f. Repeat Steps c., d. and e. until the frequencies are within ±5 Hz of indication of the 0–100 Hz Frequency control.

g. Set the 0–100 Hz Frequency control to 5 and the Frequency switches to 1.0000 MHz.

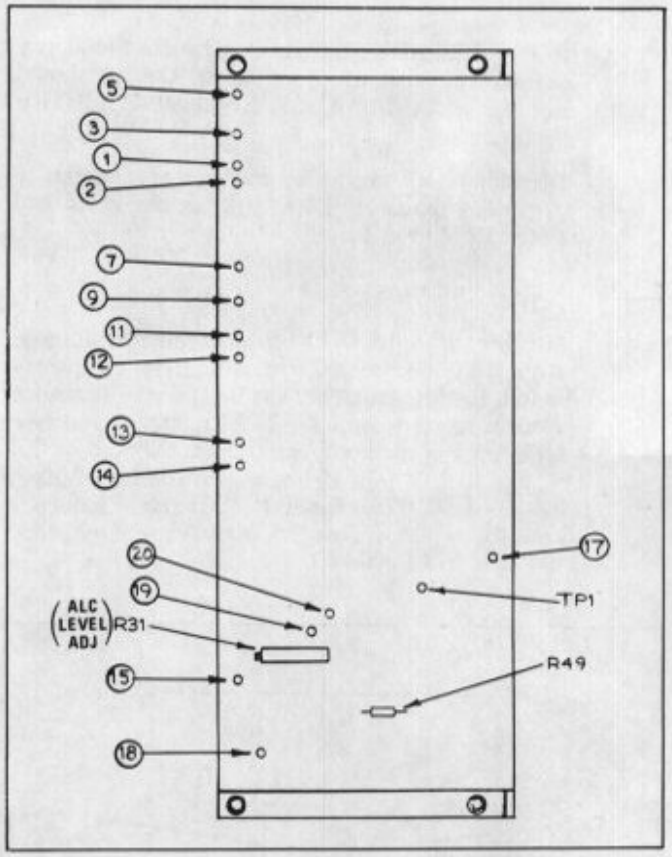


Figure 2-30. Trimmer Locations, Divider/ALC Assembly, A1A2

h. Connect the oscilloscope 10X probe to A3ATP2.

i. Adjust A3AL1 and A3AL2 for maximum voltage and purest sine wave.

2.5.37 Phase Modulation Adjustment

a. Connect the broadband amplifier input receptacle to the RFM module RF OUTPUT receptacle. Set the Mainframe Frequency switches to 15 MHz and the MODE switch to GEN.

b. Connect the broadband amplifier output to the frequency meter/ODM-1 measure input receptacle.

NOTE

If an RFM module with 6 mV rms or greater RF output, such as a Model RFM-11A or Model RFM-10D, is installed in the Mainframe, the broadband amplifier is not necessary.

c. Set the frequency meter frequency to 17.000 MHz 0-1 kHz control "out", audio switch to mod and 10 MHz switch out.

d. Set the Model ODM-1 controls as follows:

deviation range:	5 kHz
vertical input:	internal
modulation mode:	internal combined
vertical center:	for trace at center line of graticule

e. Connect the audio oscillator and ac voltmeter to the Model AFM-2 FM MOD receptacle. Set the audio oscillator frequency to 400 Hz and output level to 100 mV rms ±0.5% (99.5 mV to 100.5 mV) as indicated on the ac voltmeter. Set the Mainframe GENERATOR MODULATION switch to ON (IN).

f. Vary the RFM module variable output attenuator until the Model ODM-1 OPERATE lamp lights.

g. Select A1A6R33 for 5 kHz ±15% (4.25 kHz to 5.75 kHz) deviation on the Model ODM-1.

2.5.38 Frequency Modulation (VCO) Adjustment

a. Repeat Steps 2.5.37-a. thru 2.5.37-d.

b. Set the Mainframe Frequency switches to 015.0V00, 0–100 Hz Frequency control to 0, MODE switch to GEN and GENERATOR MODULATION switch to OFF (OUT).

c. Connect the audio oscillator and the ac voltmeter to J3-B and H (rear panel ACC receptacle). Set the audio oscillator frequency to 1 kHz and output level to 500 mV rms ±0.5% (497.5 mV to 502.5 mV) as indicated on the ac voltmeter.

d. Set the A2R44 to mid-range position.

e. Adjust A2R47 for 5 kHz ±15% (4.25 kHz to 5.75 kHz) peak deviation on the Model ODM-1.

f. Set the Mainframe Frequency switches to 014.9V00 and 0–100 Hz Frequency control to 10.

g. Adjust A2R44 for exactly 5 kHz peak deviation on the Model ODM-1.

h. Repeat Steps b., e., f. and g. because there is interaction between the two trimmer resistors.

2.5.39 Internal Sweep Adjustments (See Figure 2-31)

a. Connect the frequency counter input to the Mainframe HORIZONTAL OUTPUT receptacle with a BNC coaxial cable.

b. Set the Mainframe HORIZONTAL SIZE control to the fully cw position.

c. Set the frequency counter to measure "period". Set the SWEEP RATE control to fully cw. The counter should indicate less than 10 ms. If the sweep rate is 10 ms or greater, decrease the value of A25R1 until the sweep rate is less than 10 ms.

d. Set the Mainframe SWEEP RATE control to fully ccw. The counter should indicate greater than 100 ms. If the sweep rate is 100 ms or less, select the value of A25R1 so that the SWEEP RATE control

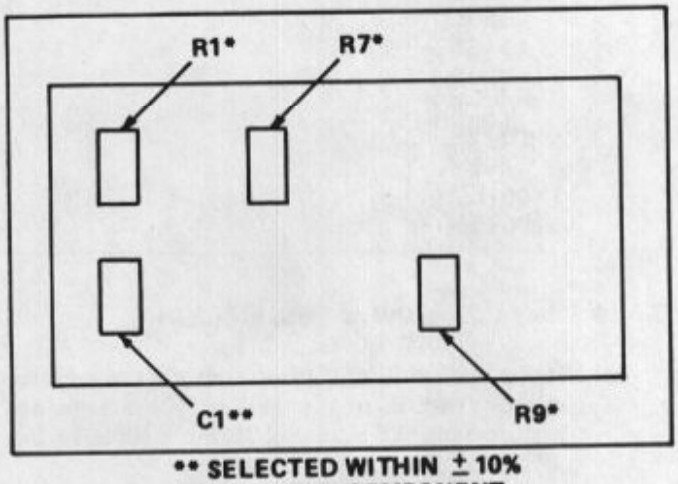
has a range of 100 ms to 10 ms (10 Hz to 100 Hz). If this range cannot be obtained by selecting A25R1, A25C1 may be out of tolerance. Replace A25C1 if necessary and repeat Steps c. and d.

e. Connect the oscilloscope 10 X probe to A25-8. Set the Mainframe SWEEP RATE control to fully cw (100 Hz) and set the SWEEP WIDTH control to fully cw.

f. The waveform on the oscilloscope should be a sawtooth with an amplitude of approximately 8.5 V p-p with no compression (flattened) at the negative peak. If the sawtooth is compressed, select the value of A25R7 to obtain a non-compressed sawtooth waveform on the oscilloscope.

g. If the sawtooth waveform amplitude is less than 8 V p-p, decrease the value of A25R9 until the amplitude is greater than 8 V p-p.

h. Disconnect the frequency counter and oscilloscope 10 X probe from the instrument.



** SELECTED WITHIN ± 10%
* SELECTED COMPONENT

Figure 2-31. Trimmer Locations, Sweep Generator Assembly, A25

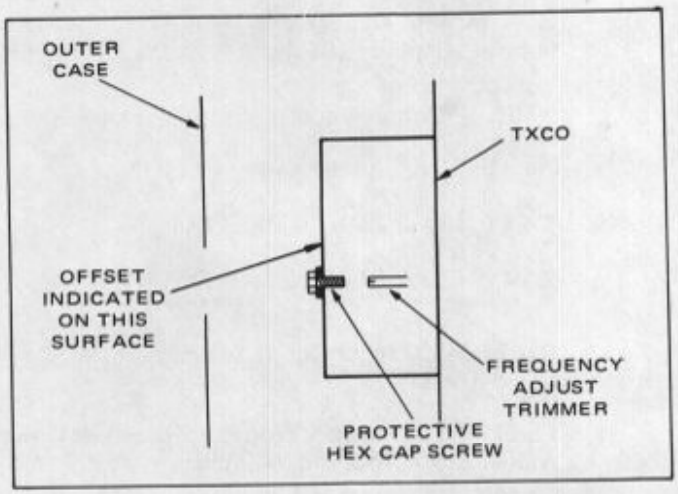


Figure 2-32. Access to TCXO

2.5.40 Calibration of TCXO

a. Mainframe must be turned off and remain in a 25°C ambient for at least 2 hours.

b. Connect the RFM module RF OUTPUT receptacle to input receptacle of the broadband amplifier. Connect output receptacle of the broadband amplifier to the frequency counter (Broadband amplifier not necessary when Model RFM-11A or Model RFM-10D is used.)

c. Set the Mainframe Frequency switches to 10.000 MHz.

d. Remove protective cap screw on TCXO cover (See Figure 2-32).

e. Observe small slotted-head frequency adjustment trimmer behind cap screw and the frequency offset provided on the TCXO housing.

f. Turn instrument on and quickly (within 60 sec) adjust trimmer for 10 MHz ± the offset indicated on the TCXO housing. (Figure 2-33 is displayed for reference.)

2.6 FAULT ISOLATION PROCEDURES

Fault Isolation Procedures are presented to provide a guide in servicing the Model FM-10CS Mainframe. The procedures follow the sequence of the Minimum Performance Procedures, Paragraph 2.4, with each subsection keyed to the Step in Paragraph 2.4 that first indicates a fault. When a fault is noted during Model FM-10CS Mainframe operation, proceed as follows:

a. Perform Minimum Performance Procedures in Paragraph 2.4.

b. Start Fault Isolation Procedures at the point where minimum performance cannot be satisfied.

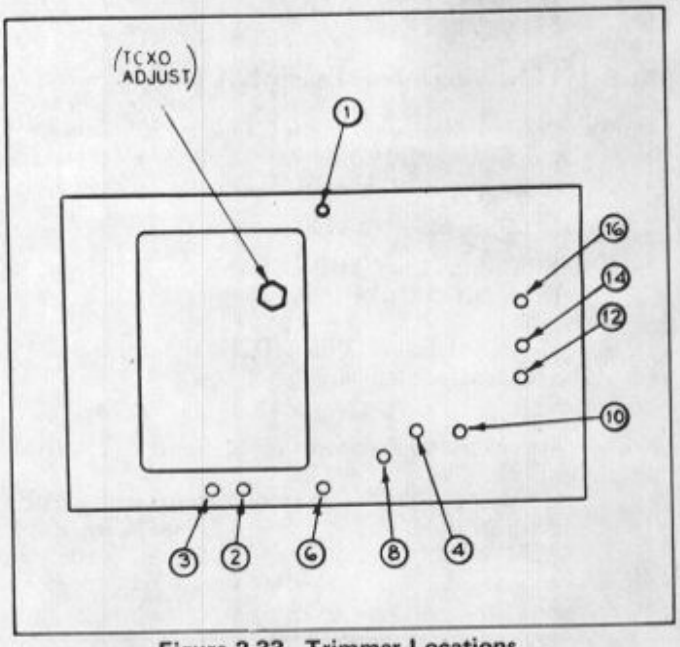


Figure 2-33. Trimmer Locations, TCXO/IF Assembly, A1A5

c. When the fault is isolated to a function, such as the A1A6 assembly, refer to the alignment procedure for that assembly in Paragraph 2.5 and check alignment of that assembly before proceeding with fault isolation.

d. After a fault is repaired, complete the Minimum Performance Procedure to determine if further alignment is necessary.

2.6.1 POWER Indication Failure (2.4.1-d)

a. Refer to Figures 4-2 and 4-21 and check voltages and waveforms.

b. If voltages and waveforms are within tolerance, replace POWER indicator lamp, DS1.

2.6.2 BEAT Indication Failure (2.4.1-f)

a. Check for 2 MHz at J8-16. If 2 MHz is present, check Model FIM-3 as described in Model FIM-3 Maintenance Manual.

b. If 2 MHz is absent, check for 2 MHz at J6-1; if 2 MHz is present, check buffer A1A5Q4.

c. If 2 MHz is absent, check for 11 MHz at the synthesizer input jack, J7. If 11 MHz is present, trouble is in the RFM module. Check the RFM module as described in the RFM module Maintenance Manual.

d. If 11 MHz is absent, check the synthesizer circuitry as described in Paragraph 2.6.9.

2.6.3 0–100 Hz Control Tone Failure (2.4.1-g)

a. Check the VCO circuitry by referring to Figure 4-5 and utilizing the voltages and waveforms indicated.

2.6.4 0–100 Hz Switch Tone Failure (2.4.1-h)

a. Check the appropriate Frequency Generator Assembly, A12, thru A21, and 100 Hz Decade Assembly, A3A, and 100 Hz Frequency switch, S4, wiring.

2.6.5 1 kHz Switch Tone Failure (2.4.1-i)

a. Check the appropriate Frequency Generator Assembly, A12 thru A21, and 1 kHz Decade Assembly, A3B, and 1 kHz Frequency switch, S5, wiring.

2.6.6 No Output from AUDIO/TONE OUTPUT Receptacle (2.4.1-j)

a. Check AUDIO/TONE OUTPUT receptacle, J5, and its associated wiring.

2.6.7 Meter Fails to Zero with ZERO Control (2.4.1-l)

a. If Model FIM-3 meter will zero with ZERO control and remote meter will not zero, check REM METER receptacle, J4, and its associated wiring. Also check Model FIM-3 remote meter wiring.

b. If Model FIM-3 meter will not zero with ZERO control, trouble is in the Model FIM-3. Check as described in Model FIM-3 Maintenance Manual.

2.6.8 Meter Fails to Deflect to the Left in 100 Hz Increments (2.4.1-n)

a. Trouble is in the Model FIM-3. Check Model FIM-3 as described in Model FIM-3 Maintenance Manual.

2.6.9 Frequency Accuracy Out of Tolerance (2.4.2-e thru 2.4.2-k)

a. Check accuracy of TCXO output and calibrate as directed in Paragraph 2.5.39.

b. If all frequencies in a decard are out of tolerance, check as in Table 2-2.

c. If any digit is out of tolerance, check as in Table 2-3.

Table 2-2. Decade Fault Isolation

Decade	Assembly Number
100 MHz	A5,A9,A10,A11
10 MHz	A8
1 MHz	A6
100 kHz	A3D
10 kHz	A3C
1 kHz	A3B
100 Hz	A3A
0-100 Hz	A2

2.6.10 Output Level Out of Tolerance (2.4.4-f)

a. If output level out of tolerance at some frequencies (not all frequencies), use the information in Paragraph 2.6.9 to isolate the trouble to the particular assembly causing the trouble.

b. If output level out of tolerance at all frequencies, verify that the level at J6-3 is −20 mVdc ±3 mV (−17 mV to −23 mVdc). If level is out of tolerance, check RFM module as described in the RFM module Maintenance Manual and the Gain Control Amplifier (GCA), A7, in the Mainframe.

2.6.11 2 MHz IF Output Out of Tolerance (2.4.4-h,i,j)

a. 2.4.4 h: Check 2 MHz buffer A1A5Q2

b. 2.4.4 i: Check 2 MHz buffer A1A5Q3

c. 2.4.4 i: Check 2 MHz buffer A1A5Q4

2.6.12 External VCO Input Out of Tolerance (2.4.5-d and f)

a. Check FM linearity circuitry, R3 and R4 and A2R47 and A2R44 and VCO circuitry, A2.

Table 2-3. Digit Fault Isolation

Digit	100 MHz	10 MHz	1 MHz	100 kHz thru 100 Hz
0	A9,A10 (700 MHz)	A21 (60 MHz)	A21 (36 MHz)	A21 (3.6 MHz)
1	A9,A10 (800 MHz)	A20 (70 MHz)	A20 (37 MHz)	A20 (3.7 MHz)
2	A9,A10 (900 MHz)	A19 (80 MHz)	A19 (38 MHz)	A19 (3.8 MHz)
3	A9,A10 (1000 MHz)	A18 (90 MHz)	A18 (39 MHz)	A18 (3.9 MHz)
4	A9,A10 (1100 MHz)	A17 (100 MHz)	A17 (40 MHz)	A17 (4.0 MHz)
5	A9/A5 (1200 MHz)	A16 (110 MHz)	A16 (41 MHz)	A16 (4.1 MHz)
6		A15 (120 MHz)	A15 (42 MHz)	A15 (4.2 MHz)
7		A14 (130 MHz)	A14 (43 MHz)	A14 (4.3 MHz)
8		A13 (140 MHz)	A13 (44 MHz)	A13 (4.4 MHz)
9		A12 (150 MHz)	A12 (45 MHz)	A12 (4.5 MHz)

2.6.13 10 MHz TCXO Output Out of Tolerance (2.4.6-a)

a. Calibrate TCXO as described in Paragraph 2.5.40.

b. Check TIMEBASE switch, S13, circuitry.

2.6.14 External Timebase Input Inoperative (2.4.7-c)

a. Check TIMEBASE switch, S13, circuitry.

b. Check TIMEBASE receptacle, J2, circuitry.

2.6.15 10 MHz TCXO Output Out of Tolerance (2.4.8-h)

a. Check 1 MHz TCXO OUTPUT receptacle, J3-D, and its associated wiring.

b. Check R7 between TB4-1 and TB4-3.

c. Check for continuity between TB4-1 and A1A2-9.

2.6.16 +9 V dc Output Out of Tolerance (2.4.9-b)

a. Check +9 Vdc output receptacle, J3-E and its associated wiring.

b. Check adjustment of A1A3R16 as described in Paragraph 2.5.1.

2.6.17 100% Amplitude Modulation Cannot be Reached (2.4.10-i)

a. Check the AM Modulator Assembly, A27.

b. Check mixer, Z2

2.6.18 Sweep Width Control Has Insufficient Range (2.4.11-e and g)

a. Check Sweep Generator Assembly, A25.

b. Check SWEEP WIDTH control and associated wiring.

c. Check Sweep switch and associated wiring.

Section III

REPLACEABLE PARTS

3.1 INTRODUCTION

This section contains information for ordering replacement parts. Table 3-1 lists the parts for the Main Assemblies and Chassis. Table 3-2 lists the Miscellaneous parts, Table 3-3 lists the Supplied Accessories and Tables 3-4 thru 3-22 list assembly parts. Parts are listed in an alpha-numeric order of their reference designators and indicate the description, the Singer part number, the typical manufacturer of the part in a five-digit code and the manufacturer's part number. Table 3-23 lists the typical manufacturers in numerical code number order.

Table 3-1. Parts List for Main Assemblies and Chassis

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
A1A1	Not used			
A1A2	Assembly Divider/ALC	4-003078-006	88869	
A1A3	Assembly, Power supply	4-004237-006	88869	
A1A4	Not used			
A1A5	Assembly, TCXO/IF	1-004810-001	88869	
A1A6	Assembly, Phase Modulator and Audio	4-004309-005	88869	
A2	Assembly, VCO/6 and 9 MHz Generator	5-003082-007	88869	
A3A	Assembly, 100 Hz Decade	5-003083-014	88869	
A3B	Assembly, 1 kHz Decade	5-003083-014	88869	
A3C	Assembly, 10 kHz Decade	5-003083-014	88869	
A3D	Assembly, 100 kHz Decade	5-003083-014	88869	
A4A	Assembly, 1 MHz Programming	4-004235-005	88869	
A4B	Assembly 10 MHz Programming	4-004235-008	88869	
A5	Assembly, 1200 MHz Decade	1-004334-002	88869	
A6	Assembly, 1 MHz Decade	4-003084-008	88869	
A7	Assembly, Gain Control Amp/Amplitude Modulator	4-003086-003	88869	
A8	Assembly, 10 MHz Decade	4-003085-004	88869	
A9	Assembly, Diode Switch	4-004296-001	88869	
A10	Assembly, 700 to 1100 MHz Multiplier	4-003081-002	88869	
A11	Assembly, Buffer Amplifier	5-003089-007	88869	
A12	Assembly, 4.5, 45, & 150 MHz Generator	5-003088-038	88869	
A13	Assembly, 4.4, 44, & 140 MHz Generator	5-003088-039	88869	
A14	Assembly, 4.3, 43, & 130 MHz Generator	5-003088-040	88869	
A15	Assembly, 4.2, 42, & 120 MHz Generator	5-003088-041	88869	
A16	Assembly, 4.1, 41, & 110 MHz Generator	5-003088-042	88869	
A17	Assembly, 4.0, 40, & 100 MHz Generator	5-003088-043	88869	
A18	Assembly, 3.9, 39, & 90 MHz Generator	5-003088-044	88869	
A19	Assembly, 3.8, 38, & 80 MHz Generator	5-003088-045	88869	
A20	Assembly, 3.7, 37, & 70 MHz Generator	5-003088-046	88869	
A21	Assembly, 3.6, 36, & 60 MHz Generator	5-003088-047	88869	

Table 3-1. Parts List for Main Assemblies and Chassis (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
A22	Not used			
A23	Not used			
A24	Assembly, 100 Hz to 100 kHz Decade Switching	4-004497-005	88869	
A25	Assembly, Sweep Generator	1-004877-001	88869	
A26	Assembly, Detector	1-004887-001	88869	
A27	Assembly, AM Modulator	1-004873-001	88869	
C1	Not used			
C2	Capacitor, fixed, ceramic, 470 pF, ±20%, 3000 V dc	1-900105-001	56289	30GA-T47
C3	Capacitor, fixed, ceramic, 470 pF, ±20%, 3000 V dc	1-900105-001	56289	30GA-T47
C4	Capacitor, fixed, ceramic, 470 pF, ±20%, 3000 V dc	1-900105-001	56289	30GA-T47
C5	Capacitor, fixed, feed-thru, 1000 pF, ±20%, 1500 V dc	1-900108-001	00656	CF167AGP102K
C6	Capacitor, fixed, plastic, 0.5 uF, ±20%, 200 V dc	1-900006-001	24152	1143
C7	Capacitor, fixed, ceramic, 0.001 uF, +100% −0%, 500 V dc	1-900012-002	72982	861Z5U102P
C8	Capacitor, fixed, feed-thru, 1000 pF, ±20%, 1500 V dc	1-900108-001	00656	CF167AGP102K
C9	Capacitor, fixed, ceramic, 0.001 uF, +100% −0%, 500 V dc	1-900012-002	72982	861Z5U102P
C10	Capacitor, fixed, ceramic, 0.001 uF, +100% −0%, 500 V dc	1-900012-002	72982	861Z5U102P
C11	Capacitor, fixed, ceramic, 0.001 uF, +100% −0%, 500 V dc	1-900012-002	72982	861Z5U102P
C12	Capacitor, fixed, ceramic, 0.001 uF, +100% −0%, 500 V dc	1-900012-002	72982	861Z5U102P
C13	Capacitor, fixed, ceramic 0.001 uF, +100% −0%, 500 V dc	1-900012-002	72982	861Z5U102P
C14	Capacitor, fixed, ceramic, 0.001 uF, +100% −0%, 500 V dc	1-900012-002	72982	861Z5U102P
C15	Capacitor, fixed, ceramic, 0.001 uF, +100% −0%, 500 V dc	1-900012-002	72982	861Z5U102P
C16	Capacitor, fixed, ceramic, 0.001 uF, +100% −0%, 500 V dc	1-900012-002	72982	861Z5U102P

Table 3-1. Parts List for Main Assemblies and Chassis (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C17	Capacitor, fixed, ceramic, 0.001 uF, +100% −0%, 500 V dc	1-900012-002	72982	861Z5U102P
C18	Capacitor, fixed, ceramic, 0.001 uF, +100% −0%, 500 V dc	1-900012-002	72982	861Z5U102P
C19	Capacitor, fixed, ceramic, 0.001 uF, +100% −0%, 500 V dc	1-900012-002	72982	861Z5U102P
C20	Capacitor, fixed, ceramic, 0.001 uF, +100% −00%, 500 V dc	1-900012-002	72982	861Z5U102P
C21	Capacitor, fixed, ceramic, 0.001 uF, +100% −0%, 500 V dc	1-900012-002	72982	861Z5U102P
C22	Capacitor, fixed, ceramic, 0.001 uF, +100% −0%, 500 V dc	1-900012-002	72982	861Z5U102P
CR1	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	IN273
CR2	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	IN273
CR3	Rectifier, bridge, Vr=200 V, If=6 A	1-913025-001	83003	W601
CR4	Diode, silicon, Vr=20 V, If-100 mA	1-913074-001	80795	244
DS1	Indicator lamp assembly, red lens, 10 V, 20 mA	1-925007-003	32539	L10/20
E1	Terminal, Standoff	1-941043-001	71279	2255-3
F1	Fuse, slo-blo, 1 Amp. 250 V (for 115 V operation)	1-924000-019	71400	MDL-1
	0.5 Amp, 250 V (for 230 V operation)	1-924000-014	71400	MDL-1/2
F2	Fuse, slo-blo, 4 Amp, 32 V	1-924000-029	71400	MDL-4
FL1	Filter, bandpass, 750-760 MHz	1-403384-001	88869	
FL2	Filter, bandpass, 600-700 MHz	1-403383-001	88869	
FL3	Filter, lowpass, 600 MHz	2-003116-002	88869	
FL4	Filter, feed-thru, 3000 pF min at 1 kHz, 500 V dc	1-919011-004	72982	1202-051
FL5	Filter, feed-thru, 3000 pF min at 1 kHz, 500 V dc	1-919011-004	72982	1202-051
FL6	Filter, feed-thru, 3000 pF min at 1 kHz, 500 V dc	1-919011-004	72982	1202-051

Table 3-1. Parts List for Main Assemblies and Chassis (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
FL7	Filter, feed-thru, 3000 pF min at 1 kHz, 500 V dc	1-919011-004	72982	1202-051
J1	Connector, jack, 4 pin	1-910179-001	71785	P304DB
J2	Connector, jack, BNC	1-910132-001	11636	UG-1094A
J3	Connector, jack, 7 pin	1-910157-106	02660	126-198
J4	Connector, jack, phone, 3 conductor	1-910152-001	82389	S13B
J5	Connector, jack, phone, 2 conductor	1-910077-001	82389	L112A
J6	Connector, jack, rectangular, 24 pin	1-910072-002	02660	26-190-24
J7	Not used			
J8	Connector, jack, rectangular, 16 pin	1-910072-001	02660	26-190-16
J9	Connector, jack, rectangular, 16 pin	1-910072-001	02660	26-190-16
J10	Connector, jack, bulkhead, BNC	1-910043-001	11636	KC19-68
L1	Inductor, fixed, 3.9 uH, ±10%, 159 mA	1-906002-008	76493	70F396A1
L2	Inductor, fixed, 3.9 uH, ±10%, 159 mA	1-906002-008	76493	70F396A1
L3	Inductor, fixed, 3.9 uH, ±10%, 159 mA	1-906002-008	76493	70F396A1
L4	Inductor, fixed, 1.8 uH min, 5A	1-906009-001	88869	
L5	Inductor, fixed, 10 uH, ±10%, 440 mA	1-906022-005	29525	13-10-10
LS1	Loudspeaker, 0.36 oz. permanent magnet, 1-3/4 in. dia. impedance: 8 ohms.	1-936004-001	07109	T2806
Q1	Transistor, silicon, NPN	1-958039-001	04713	2N3055
Q2	Transistor, silicon, NPN	1-958039-001	04713	2N3055
R1	Resistor, variable, composition, 5 kilohm, ±20%, 5 W (part of S8)			
R2	Resistor, variable, composition, 5 kilohm, ±30%, 2 W (part of S10)			
R3	Resistor, variable, composition, 10 kilohm, ±20%, 5 W (part of S8)			
R4	Resistor, fixed, composition, 3.3 kilohm, ±10%, 1/4 W	1-945000-043	01121	CB3321
R5	Resistor, fixed, composition, 270 ohm, ±10%, 1/4 W	1-945000-030	01121	CB2711

Table 3-1. Parts List for Main Assemblies and Chassis (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R6	Resistor, fixed, composition, 620 ohm, ±5%, 1/4 W	1-945000-157	01121	CB6215
R7	Resistor, fixed, composition, 1 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R8	Resistor, fixed, composition, 2.2 kilohm, ±10%, 1/4 W	1-945000-041	01121	CB2221
R9	Resistor, fixed, composition, 2.2 kilohm, ±10%, 1/4 W	1-945000-041	01121	CB2221
R10	Resistor, fixed, composition, 2.7 kilohm, ±10%, 1/4 W	1-945000-042	01121	CB2721
R11	Resistor, fixed, composition, 220 ohm, ±10%, 1/4 W	1-945000-029	01121	CB2211
R12	Resistor, variable composition, 50 kilohm, ±30%, 1/2 W (Part of S16/R12/R13)			
R13	Resistor, variable, composition, 5 kilohm, ±30%, 1/2 W (Part of S16/R12/R13)			
R14	Resistor, variable, composition, 1 kilohm, ±30%, 1/2 W	1-403633-001	88869	
S1	Switch, rotary, 3 poles, 11 positions	1-403271-001	88869	
S2	Switch, rotary, 4 poles, 10 positions	1-403270-001	88869	
S3	Switch, rotary, 4 poles, 10 positions	1-403269-001	88869	
S4	Not used			
S5	Not used			
S6	Not used			
S7	Not used			
S8/R1/R3	Switch/variable resistor assembly (S8) Switch, rotary, 2 poles, 2 positions	1-004714-001	88869	
S9	Switch, rotary, 8 poles, 4 positions	4-403267-001	88869	
S10/R2	Switch/variable resistor assembly (S10) Switch, rotary, 2 poles, 2 positions	2-403266-001	88869	
S11	Switch, push-push, 2 poles, 2 positions	1-951024-002	88869	
S12	Switch, push-push, 2 poles, 2 positions	1-951024-002	88869	
S13	Switch, slide, 2 poles, 2 positions	1-403280-001	88869	
S14	Switch, slide, 2 poles, 2 positions	1-403280-001	88869	
S15	Switch, slide, 2 poles, 2 positions	1-951003-001	82389	46206LF

Table 3-1. Parts List for Main Assemblies and Chassis (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
S16/R12/R13	Switch/variable resistor assembly (S16) Switch, rotary, 2 pole, 1 position	1-403632-001	88869	
T1	Transformer, power, 115/230 V rms primary, 14 V dc secondary	1-402835-001	88869	
TB1	Terminal strip, 3 lugs, 1 ground	1-941006-001	71785	52A
TB2	Terminal strip, 3 lugs, 1 ground	1-941006-001	71785	52A
TB3	Terminal strip, 4 lugs	1-941003-001	71785	54
TB4	Terminal strip, 3 lugs, 1 ground	1-941006-001	71785	52A
W1	Cable assembly, 7 in., BNC to BNC	1-004712-001	88869	
W2	Cable assembly, 6 in., BNC to BNC	1-003159-002	88869	
W3	Cable assembly, 6 in., BNC to BNC	1-003159-002	88869	
XF1	Fuseholder	1-924007-001	75915	341001
XF2	Fuseholder	1-924007-001	75915	341001
XQ1	Socket, transistor	1-950001-002	04713	MK-15
XQ2	Socket, transistor	1-950001-002	04713	MK-15
Z1	Mixer, doubly balanced	1-403264-001	88869	
Z2	Mixer, doubly balanced	1-403264-001	88869	

Table 3-2. Parts List for Miscellaneous Parts

Qty.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
1	Knob, fluted, 3/4 in. dia. (VOLUME)	1-935003-002	95264	200-1
1	Knob, silkscreened, (MODE)	3-301930-007	88869	
1	Knob, silkscreened, calibrated (0 -100 Hz)	3-302109-001	88869	
4	Knob, silkscreened, (100 kHz, 10 kHz, 1 kHz, 100 Hz)	3-301930-003	88869	
2	Knob, silkscreened, (10 MHz, 1 MHz)	3-301930-002	88869	
1	Knob, silkscreened, (100 MHz)	3-301930-006	88869	
2	Handle	4-103525-001	88869	

Table 3-3. Parts List for Supplied Accessories

Qty.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
1	Attenuator repair kit	RFA-20RK	88869	
1	Connector adapter, BNC to UHF	1-910117-001	11636	UG273/U
2	Attenuator assembly, 20 dB, BNC connector on each end	RFA-20	88869	
1	Connector, plug, 7 pin, includes hood and clamp	1-910157-205	02660	126-195
1	Dc power cable, 12 ft.	2-004414-001	88869	
1	RF cable assembly, 3 ft.	1-003159-001	88869	
1	Antenna, telescoping, BNC connector on one end	2-003408-001	88869	
2	RF cable assemblies, 6 in.	1-003159-002	88869	
1	Operator's manual	1-500783-313	88869	
1	Mainframe maintenance manual	1-500783-314	88869	
1	Spectrum Monitor display cable, 3 ft.	1-005205-001	88869	

Table 3-4. Parts List for Divider/ALC Assembly, A1A2

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C2	Capacitor, fixed, mica, 100 pF, ±5%, 500 V dc	1-900003-030	72136	DM15F101J
C3	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C4	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 V dc	1-900001-009	73445	C280AE,0.047uF
C5	Capacitor, fixed, mica, 47 pF, ±5%, 500 V dc	1-900003-021	72136	DM15E470J
C6	Capacitor, fixed, plastic, 0.47 uF, ±20%, 250 V dc	1-900001-021	73445	C280AE,0.47uF
C7	Not used			
C8	Capacitor, fixed, mica, 100 pF, ±5%, 500 V dc	1-900003-030	72136	DM15F101J
C9	Not used			
C10	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C11	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C12	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C13	Capacitor, fixed, electrolytic, 1000 uF, −10% + 100%, 15 V dc	1-900040-001	72699	977-188
C14	Capacitor, fixed, ceramic, 0.005 uF, −20% +80%, 500 V dc	1-900012-004	72982	801Z5U502Z
C15	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C16	Capacitor, fixed, plastic, 10 uF, ±20%, 100 V dc	1-900026-040	24152	17W
C17	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C18	Not used			
C19	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C20	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C21	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C22	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C23	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C24	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C25	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C26	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF

Table 3-4. Parts List for Divider/ALC Assembly, A1A2 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C27	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
CR1	Diode, zener,	1-913073-001	18041	JZ5B
CR2	Not used			
CR3	Not used			
CR4	Diode, silicon, Vr=75 V, If=10 mA	1-913007-001	24446	1N4148
CR5	Diode, silicon, Vr=75 V, If=10 mA	1-913007-001	24446	1N4148
CR6	Diode, silicon, Vr=75 V, If=10 mA	1-913007-001	24446	1N4148
Q1	Transistor, silicon. NPN	1-958000-001	04713	2N3904
Q2	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q3	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q4	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q5	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q6	Transistor, silicon, NPN	1-958000-001	04713	3N3904
Q7	Transistor, silicon, PNP	1-958000-002	04713	2N3906
Q8	Transistor, silicon, NPN	1-958000-001	04713	2N3904
R1	Resistor, fixed, composition, 1.8 kilohm, ±10%, 1/4 W	1-945000-040	01121	CB1821
R2	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R3	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R4	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R5	Resistor, fixed, composition, 3.3 kilohm, ±10%, 1/4 W	1-945000-043	01121	CB3321
R6	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R7	Resistor, fixed, composition, 4.7 kilohm, ±10%, 1/4 W	1-945000-045	01121	CB4721
R8	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R9	Resistor, fixed, composition, 39 ohm, ±5%, 1/2 W	1-945001-128	01121	EB3905
R10	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011

Table 3-4. Parts List for Divider/ALC Assembly, A1A2 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R11	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R12	Resistor, fixed, composition, 180 ohm, ±10%, 1/4 W	1-945000-028	01121	CB1811
R13	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R14	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R15	Resistor, fixed, composition, 180 ohm, ±10%, 1/4 W	1-945000-028	01121	CB1811
R16	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R17	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R18	Resistor, fixed, compositon, 180 ohm, ±10%, 1/4 W	1-945000-028	01121	CB1811
R19	Resistor, fixed, film, 150 ohm, ±1%, 1/8 W	1-945027-114	14674	NA55D151
R20	Resistor, fixed, film, 12.1 kilohm, ±1%, 1/8 W	1-945016-297	14674	RN60D1212F
R21	Resistor, fixed, film, 2.21 kilohm, ±1%, 1/8 W	1-945016-226	14674	RN60D2211F
R22	Resistor, fixed, film, 2.21 kilohm, ±1%, 1/8 W	1-945016-226	14674	RN60D2211F
R23	Resistor, fixed, film, 5.11 kilohm, ±1%, 1/8 W	1-945016-261	14674	RN60D5111F
R24	Resistor, fixed, film, 13 kilohm, ±1%, 1/8 W	1-945016-300	14674	RN60D1302F
R25	Resistor, fixed, composition, 680 ohm, ±10%, 1/4 W	1-945000-035	01121	CB6811
R26	Resistor, fixed, composition, 47 ohm, ±10%, 1/4 W	1-945000-021	01121	CB4701
R27	Resistor, fixed, film, 4.32 kilohm, ±1%, 1/8 W	1-945016-254	14674	RN60D4321F
R28	Resistor, fixed, composition, 4.7 kilohm, ±10%, 1/4 W	1-945000-045	01121	CB4721
R29	Resistor, fixed, composition, 4.7 kilohm, ±10%, 1/4 W	1-945000-045	01121	CB4721
R30	Not used			

Table 3-4. Parts List for Divider/ALC Assembly, A1A2 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R31	Resistor, variable, cermet, 1.0 kilohm, ±10%, 1/2 W	1-945082-002	71450	190PC102A
R32	Not used			
R33	Resistor, fixed, composition, 22 ohm, ±10%, 1/4 W	1-945000-017	01121	CB2201
R34	Resistor, fixed, composition, 15 kilohm, ±10%, 1/4 W	1-945000-051	01121	CB1531
R35	Not used			
R36	Resistor, fixed, composition, 22 ohm, ±10%, 1/4 W	1-945000-017	01121	CB2201
R37	Resistor, fixed, composition, 4.7 kilohm, ±10%, 1/4 W	1-945000-045	01121	CB4721
R38	Resistor, fixed, composition, 4.7 kilohm, ±10%, 1/4 W	1-945000-045	01121	CB4721
R39	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R40	Resistor, fixed, composition, 1.8 kilohm, ±10%, 1/4 W	1-945000-040	01121	CB1821
R41	Resistor, fixed, film, 5.11 kilohm, ±1%, 1/8 W	1-945016-261	14674	RN60D5111F
R42	Resistor, fixed, film, 4.32 kilohm, ±1%, 1/8 W	1-945016-254	14674	RN60D4321F
R43	Resistor, fixed, film, 12.1 kilohm, ±1%, 1/8 W	1-945016-297	14674	RN60D1212F
U1	Integrated circuit, decade counter	1-926007-014	01295	SN7490
U2	Integrated circuit, decade counter	1-926007-014	01295	SN7490
U3	Not used			
U4	Not used			
U5	Integrated circuit, differential cascode amplifier	1-926005-001	02735	CA3028A
U6	Integrated circuit, differential cascode amplifier	1-926005-001	02735	CA3028A

Table 3-5. Parts List for Power Supply Assembly, A1A3

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, electrolytic, 1500 uF, −10% +100%, 25 V dc	1-900040-002	72699	977-206
C2	Capacitor, fixed, electrolytic, 1500 uF, −10% +100%, 25 V dc	1-900040-002	72699	977-206
C3	Not used			
C4	Capacitor, fixed, electrolytic, 25 uF, −10% +75%, 50 V dc	1-900039-035	72699	984-1654
C5	Not used			
C6	Capacitor, fixed, electrolytic, 25 uF, −10% +75%, 50 V dc	1-900039-035	72699	984-1654
C7	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.1uF
C8	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.1uF
C9	Capacitor, fixed, electrolytic, 25 uF, −10% +75%, 25 V dc	1-900039-001	72699	984-2203
C10	Capacitor, fixed, electrolytic, 200 uF, −10% +75%, 15 V dc	1-900039-002	72699	984-1733
C11	Capacitor, fixed, electrolytic, 25 uF, −10% +75%, 25 V dc	1-900039-001	72699	984-2203
C12	Capacitor, fixed, electrolytic, 200 uF, −10% +75%, 15 V dc	1-900039-002	72699	984-1733
C13	Capacitor, fixed, electrolytic, 200 uF, −10% +75%, 15 V dc	1-900039-002	72699	984-1733
C14	Capacitor, fixed, electrolytic, 25 uF, −10% +75%, 25 V dc	1-900039-001	72699	984-2203
C15	Capacitor, fixed, electrolytic, 25 uF, −10% +75%, 25 V dc	1-900039-001	72699	984-2203
C16	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C17	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
CR1	Not used			
CR2	Not used			
CR3	Not used			
CR4	Diode, zener, 6.2 V, ±10%, 1 W	1-913004-208	29525	JZ6.2A
CR5	Diode, zener, 6.2 V, ±10%, 1 W	1-913004-208	29525	JZ6.2A

Table 3-5. Parts List for Power Supply Assembly, A1A3 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
CR6	Diode, zener, 13 V, ±10%, 1 W	1-913004-216	04713	MZ1000-16
CR7	Diode, silicon, Vr=50 V, If=1 A	1-913001-001	04713	1N4001
Q1	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q2	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q3	Transistor, silicon, NPN	1-958001-002	04713	MJE520
Q4	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q5	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q6	Transistor, silicon, NPN	1-958001-002	04713	MJE520
Q7	Transistor, silicon, NPN	1-958001-002	04713	MJE520
R1	Not used			
R2	Not used			
R3	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R4	Resistor, fixed, composition, 4.7 kilohm, ±10%, 1/4 W	1-945000-045	01121	CB4721
R5	Resistor, fixed, composition, 470 ohm, ±10%, 1/2 W	1-945001-003	01121	EB4711
R6	Resistor, fixed, composition, 390 ohm, ±10%, 1/4 W	1-945000-032	01121	CB3911
R7	Resistor, variable, composition, 1.0 kilohm, ±30%, 1/4 W	1-945007-004	71450	X201
R8	Resistor, fixed, composition, 1.5 kilohm, ±10%, 1/4 W	1-945000-039	01121	CB1521
R9	Resistor, fixed, composition, 220 ohm, ±10%, 1/4 W	1-945000-029	01121	CB2211
R10	Not used			
R11	Not used			
R12	Resistor, fixed, composition, 1 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R13	Resistor, fixed, composition, 4.7 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB4721
R14	Resistor, fixed, composition, 470 ohm, ±10%, 1/2 W	1-945001-033	01121	EB4711
R15	Resistor, fixed, composition, 390 ohm, ±10%, 1/4 W	1-945000-032	01121	CB3911

Table 3-5. Parts List for Power Supply Assembly, A1A3 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R16	Resistor, variable, composition, 1.0 kilohm, ±30%, 1/4 W	1-945007-004	71450	X201
R17	Resistor, fixed, composition, 1.5 kilohm, ±10%, 1/4 W	1-945000-039	01121	CB1521
R18	Resistor, fixed, composition, 220 ohm, ±10%, 1/4 W	1-945000-029	01121	CB2211
R19	Not used			
R20	Resistor, fixed, composition, 470 ohm, ±10%, 1/2 W	1-945001-033	01121	EB4711

Table 3-6. Parts List for TCXO/IF Assembly, A1A5

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
A1	TCXO, 10 MHz	1-402838-003	88869	
C1	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C2	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C3	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C4	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C5	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C6	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C7	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C8	Capacitor, fixed, plastic, 0.1 uF,± 20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C9	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.1uF
Q1	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q2	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q3	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q4	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q5	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
R1	Not used			
R2	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R3	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R4	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R5	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R6	Resistor, fixed, composition, 5.6 kilohm, ±10 %, 1/4 W	1-945000-046	01121	CB5621
R7	Resistor, fixed, composition, 1.5 kilohm, ±10%, 1/4 W	1-945000-039	01121	CB1521
R8	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011

Table 3-6. Parts List for TCXO/IF Assembly, A1A5 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R9	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R10	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R11	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R12	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R13	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R14	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R15	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R16	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R17	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R18	Resistor, fixed, composition, 5.6 kilohm, ±10%, 1/4 W	1-945000-046	01121	CB5621
R19	Resistor, fixed, composition, 4.7 kilohm, ±10%, 1/4 W	1-945000-045	01121	CB4721
R20	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311

Table 3-7. Parts List for Phase Modulator and Audio Assembly, A1A6

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, electrolytic, 25 uF, –10% +75%, 25 V dc	1-900039-001	72699	984-2203
C2	Capacitor, fixed, electrolytic, 200 uF, –10% +75%, 15 V dc	1-900039-002	72699	984-1733
C3	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C4	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE, 0.01 uF
C5	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C6	Capacitor, fixed, mica, 82 pF, ±5%, 500 V dc	1-900003-028	72136	DM15E820J
C7	Capacitor, fixed, mica, 2 pF, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C
C8	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE, 0.1 uF
C9	Capacitor, fixed, mica, 82 pF, ±5%, 500 V dc	1-900003-028	72136	DM15E820J
C10	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C11	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 V dc	1-900001-005	73445	C280AE, 0.022 uF
C12	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 V dc	1-900001-005	73445	C280AE, 0.022 uF
C13	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 V dc	1-900001-005	73445	C280AE, 0.022 uF
C14	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 V dc	1-900001-005	73445	C280AE, 0.022 uF
C15	Capacitor, fixed, plastic, 0.1 uF, ±5%, 500 V dc	1-900003-013	73445	C280AE, 0.1 uF
C16	Capacitor, fixed, mica, 24 pF, ±5%, 500 V dc	1-900003-014	72136	DM15E240J
C17	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1900003-056	72136	DM15F102J
C18	Capacitor, fixed, mica, 12 pF, ±5%, 500 V dc	1-900003-009	72136	DM15C120J
C19	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE, 0.1 uF
C20	Capacitor, fixed, mica, 5 pF, ±10%, 500 V dc	1-900003-004	72136	DM15C050K

Table 3-7. Parts List for Phase Modulator and Audio Assembly, A1A6 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C21	Capacitor, variable, ceramic, 1.7 pF to 11 pF, 250 V dc	1-900113-002	91293	9301
C22	Capacitor, fixed, mica, 56 pF, ±5%, 500 V dc	1-900003-024	72136	DM15E560J
C23	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C24	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C25	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C26	Capacitor, fixed, mica, 56 pF, ±5%, 500 V dc	1-900003-024	72136	DM15E560J
C27	Capacitor, variable, ceramic, 1.7 pF to 11 pF, 250 V dc	1-900113-002	91293	9301
C28	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C29	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C30	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C31	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE, 0.01 uF
C32	Capacitor, fixed, mica, 56 pF, ±5%, 500 V dc	1-900003-024	72136	DM15E560J
C33	Capacitor, variable, ceramic, 1.7 pF to 11 pF, 250 V dc	1-900113-002	91293	9301
C34	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C35	Capacitor, fixed, electrolytic, 1500 uF, –10% +100%, 25 V dc	1-900040-002	72699	977-206
C36	Capacitor, fixed, plastic, 0.47 uF, ±20%, 250 V dc	1-900001-021	73445	C280AE, 0.47 uF
C37	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE, 0.1 uF
C38	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE, 0.1 uF
C39	Capacitor, fixed, electrolytic, 200 uF, –10% +75%, 15 V dc	1-900039-002	72699	984-1733
C40	Capacitor, fixed, electrolytic, 200 uF, –10% +75%, 15 V dc	1-900039-002	72699	984-1733

Table 3-7. Parts List for Phase Modulator and Audio Assembly, A1A6 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C41	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C42	Capacitor, fixed, mica, 82 pF, ±5%, 500 V dc	1-900003-028	72136	DM15E820J
C43	Capacitor, fixed, electrolytic, 25 uF, −10% +75%, 25 V dc	1-900039-001	72699	984-2203
CR1	Diode, silicon, Vr=30 V, If=200 mA	1-913070-001	04713	MV2115
CR2	Diode, silicon, Vr=30 V, If=200 mA	1-913070-001	04713	MV2115
L1	Inductor, fixed, 10 uH, ±10%, 440 mA	1-906022-005	29525	13-10-10
L2	Inductor, fixed, 10 uH, ±10%, 440 mA	1-906022-005	29525	13-10-10
L3	Inductor, fixed, 3-1/2 turns	1-402965-003	88869	
L4	Inductor, fixed, 3-1/2 turns	1-402965-003	88869	
L5	Inductor, fixed, 3-1/2 turns	1-402965-003	88869	
Q1	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q2	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q3	Transistor, silicon, PNP	1-958000-002	04713	2N3906
Q4	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q5	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q6	Transistor, silicon, NPN	1-958018-001	02735	2N5179
R1	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R2	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R3	Resistor, fixed, composition, 6.8 kilohm, ±10%, 1/4 W	1-945000-047	01121	CB6821
R4	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R5	Resistor, fixed, composition, 4.7 kilohm, ±10%, 1/4 W	1-945000-045	01121	CB4721
R6	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011

Table 3-7. Parts List for Phase Modulator and Audio Assembly, A1A6 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R7	Resistor, fixed, composition, 12 kilohm, ±10%, 1/4 W	1-945000-050	01121	CB1231
R8	Resistor, fixed, composition, 12 kilohm, ±10%, 1/4 W	1-945000-050	01121	CB1231
R9	Resistor, fixed, composition, 270 ohm, ±10%, 1/4 W	1-945000-030	01121	CB2711
R10	Resistor, fixed, composition, 270 ohm, ±10%, 1/4 W	1-945000-030	01121	CB2711
R11	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R12	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R13	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R14	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R15	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R16	Resistor, fixed, composition, 15 kilohm, ±10%, 1/4 W	1-945000-051	01121	CB1531
R17	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R18	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R19	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R20	Resistor, fixed, composition, 47 ohm, ±10%, 1/4 W	1-945000-021	01121	CB4701
R21	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R22	Resistor, fixed, composition, 680 ohm, ±10%, 1/4 W	1-945000-035	01121	CB6811
R23	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R24	Resistor, fixed, composition, selected, 180 ohm nominal, ±10%, 1/4 W	1-945000-028	01121	CB1811
R25	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R26	Resistor, fixed, composition, 680 ohm, ±10%, 1/4 W	1-945000-035	01121	CB6811

Table 3-7. Parts List for Phase Modulator and Audio Assembly, A1A6 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R27	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R28	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R29	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R30	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R31	Resistor, fixed, composition, 22 kilohm, ±10%, 1/4 W	1-945000-053	01121	CB2231
R32	Resistor, fixed, composition, 1.5 kilohm, ±10%, 1/4 W	1-945000-039	01121	CB1521
R33	Resistor, fixed, composition, selected, 10 kilohm nominal, ±10%, 1/4 W	1-945000-049	01121	CB1031
R34	Resistor, fixed, composition, 270 ohm, ±10%, 1/4 W	1-945000-030	01121	CB2711
T1	Inductor, variable, 1.3 uH to 1.8 uH	1-906006-006	81564	906006-006
T2	Inductor, variable, 1.3 uH to 1.8 uH	1-906006-006	81564	906006-006
U1	Integrated circuit, IF amplifier	1-926046-001	04713	MC1355P
U2	Integrated circuit, audio amplifier	1-926007-015	01295	SN76001N

Table 3-8. Parts List for VCO, 6 and 9 MHz Generator Assembly, A2

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C2	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 V dc	1-900001-005	73445	C280AE,0.022uF
C3	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 V dc	1-900001-005	73445	C280AE,0.022uF
C4	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 V dc	1-900001-005	73445	C280AE,0.022uF
C5	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C6	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 V dc	1-900001-009	73445	C280AE,0.047uF
C7	Capacitor, fixed, mica, 250 pF, ±5%, 500 V dc	1-900003-040	72136	DM15F251J
C8	Capacitor, fixed, mica, 22 pF, ±5%, 500 V dc	1-900003-013	72136	DM15E220J
C9	Capacitor, fixed, mica, 56 pF, ±5%, 500 V dc	1-900003-024	72136	DM15E560J
C10	Capacitor, fixed, mica, 56 pF, ±5%, 500 V dc	1-900003-024	72136	DM15E560J
C11	Capacitor, fixed, mica, 56 pF, ±5%, 500 V dc	1-900003-024	72136	DM15E560J
C12	Capacitor, fixed, mica, 33 pF, ±5%, 500 V dc	1-900003-017	72136	DM15E330J
C13	Capacitor, fixed, mica, 270 pF, ±5%, 500 V dc	1-900003-041	72136	DM15F271J
C14	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C15	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C16	Capacitor, fixed, mica, selected, 1000 pF nominal, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C17	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F470J
C18	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C19	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C20	Capacitor, fixed, mica, 200 pF, ±5%, 500 V dc	1-900003-037	72136	DM15F201J
C21	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C22	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C23	Capacitor, fixed, electrolytic, 10 pF, N750, 1000 V dc	1-900067-001	72982	831000U2J0100D
C24	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF

Table 3-8. Parts List for VCO, 6 and 9 MHz Generator Assembly, A2 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C25	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C26	Capacitor, fixed, electrolytic, 2 uF, −10% +75%, 25 V dc	1-900023-016	56289	TE1201
C27	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C28	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
CR1	Diode, silicon, Vr=30 V, If=250 mA	1-913029-001	04713	MV840
CR2	Diode, silicon, Vr=30 V, If=250 mA	1-913029-001	04713	MV840
CR3	Diode, silicon, Vr=75 V, If=10 mA	1-913007-001	03508	1N4148
L1	Inductor, variable, 5 uH to 8.5 uH	1-906006-005	88869	
L2	Inductor, variable, 5 uH to 8.5 uH	1-906006-005	88869	
L3	Inductor, variable, 5 uH to 8.5 uH	1-906006-005	88869	
L4	Inductor, variable, 5 uH to 8.5 uH	1-906006-005	88869	
L5	Inductor, variable, 7 uH to 14 uH	1-906006-004	88869	
Q1	Transistor, silicon, PNP	1-958000-002	04713	2N3906
Q2	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q3	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q4	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q5	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q6	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q7	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q8	Transistor, silicon, PNP	1-958000-002	04713	2N3906
Q9	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q10	Transistor, silicon, PNP	1-958046-001	04713	MPS6579
R1	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R2	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R3	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R4	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R5	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R6	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011

Table 3-8. Parts List for VCO, 6 and 9 MHz Generator Assembly, A2 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R7	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R8	Resistor, fixed, composition, 3.3 kilohm, ±10%, 1/4 W	1-945000-043	01121	CB3321
R9	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R10	Resistor, fixed, composition, 150 ohm, ±10%, 1/4 W	1-945000-027	01121	CB1511
R11	Resistor, fixed, composition, 270 ohm, ±10%, 1/4 W	1-945000-030	01121	CB2711
R12	Resistor, fixed, composition, 270 kilohm, ±10%, 1/4 W	1-945000-066	01121	CB2741
R13	Resistor, fixed, composition, selected, 270 ohm nominal, ±10%, 1/4 W	1-945000-030	01121	CB2711
R14	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R15	Resistor, fixed, composition, 270 kilohm, ±10%, 1/4 W	1-945000-066	01121	CB2741
R16	Resistor, fixed, composition, selected, 270 ohm nominal, ±10%, 1/4 W	1-945000-030	01121	CB2711
R17	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R18	Resistor, fixed, composition, 47 ohm, ±10%, 1/4 W	1-945000-021	01121	CB4701
R19	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R20	Resistor, fixed, composition, 2.2 kilohm, ±10%, 1/4 W	1-945000-041	01121	CB2221
R21	Resistor, fixed, composition, 47 ohm, ±10%, 1/4 W	1-945000-021	01121	CB4701
R22	Resistor, fixed, composition, 100 kilohm, ±10%, 1/4 W	1-945000-061	01121	CB1041
R23	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R24	Not used			
R25	Resistor, fixed, composition, selected, 15 kilohm nominal, ±10%, 1/4 W	1-945000-051	01121	CB1531
R26	Resistor, fixed, composition, 180 ohm, ±10%, 1/4 W	1-945000-028	01121	CB1811
R27	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R28	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R29	Resistor, fixed, composition, 4.7 kilohm, ±10%, 1/4 W	1-945000-045	01121	CB4721
R30	Resistor, variable, composition, 2.5 kilohm, ±30%, 1/4 W	1-945007-005	71450	X201

Table 3-8. Parts List for VCO, 6 and 9 MHz Generator Assembly, A2 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R31	Resistor, variable, composition, 1 kilohm, ±30%, 1/4 W	1-945007-004	71450	X201
R32	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R33	Resistor, fixed, composition, 27 kilohm, ±10%, 1/4 W	1-945000-054	01121	CB2731
R34	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R35	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R36	Resistor, fixed, composition, 1.0 megohm, ±10%, 1/4 W	1-945000-073	01121	CB1051
R37	Resistor, fixed, composition, 6.8 kilohm, ±10%, 1/4 W	1-945000-047	01121	CB6821
R38	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R39	Not used			
R40	Resistor, fixed, composition, 15 kilohm, ±10%, 1/4 W	1-945000-051	01121	CB1531
R41	Resistor, fixed, composition, 22 kilohm, ±10%, 1/4 W	1-945000-053	01121	CB2231
R42	Resistor, fixed, composition, selected, 750 ohm nominal, ±5%, 1/4 W	1-945000-159	01121	CB7515
R43	Resistor, fixed, composition, selected, 3.3 kilohm nominal, ±10%, 1/4 W	1-945000-043	01121	CB3321
R44	Resistor, variable, composition, 5 kilohm, ±30%, 1/4 W	1-945007-006	71450	X201
R45	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R46	Resistor, fixed, composition, selected, 2.7 kilohm nominal, ±10%, 1/4 W	1-945000-042	01121	CB2721
R47	Resistor, variable, composition, 100 kilohm, ±30%, 1/4 W	1-945007-010	71450	X201
R48	Resistor, fixed, composition, 100 kilohm, ±10%, 1/4 W	1-945000-061	01121	CB1041

Table 3-9. Parts List for 100 Hz, 1 kHz, 10 kHz and 100 kHz Decade Assembly, A3A, A3B, A3C, A3D

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, mica, 100 pF, ±5%, 500 V dc	1-900003-030	72136	DM15F101J
C2	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C3	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 V dc	1-900001-009	73445	C280AE,0.047uF
C4	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C5	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C6	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C7	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C8	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C9	Capacitor, fixed, ceramic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C10	Capacitor, fixed, ceramic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C11	Capacitor, fixed, mica, selected, 20 pF nominal, ±5%, 500 V dc	1-900003-012	72136	DM15E200K
C12	Capacitor, fixed, mica, selected, 220 pF nominal, ±5%, 500 V dc	1-900003-038	72136	DM15F221J
C13	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C14	Capacitor, fixed, mica, 2 pF, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C
C15	Capacitor, fixed, mica, selected, 220 pF nominal, ±5%, 500 V dc	1-900003-038	72136	DM15F221J
C16	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C17	Capacitor, fixed, mica, 100 pF, ±5%, 500 V dc	1-900003-030	72136	DM15F101J
C18	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C19	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C20	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C21	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C22	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C23	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C24	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF

Table 3-9. Parts List for 100 Hz, 1 kHz, 10 kHz and 100 kHz Decade Assembly, A3A, A3B, A3C, A3D (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C25	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C26	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C27	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C28	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 V dc	1-900001-009	73445	C280AE,0.047uF
C29	Capacitor, fixed, mica, 1500 pF, ±5%, 500 V dc	1-900004-015	72136	DM19F152J
C30	Capacitor, fixed, mica, 2000 pF, ±5%, 500 V dc	1-900004-018	72136	DM19F202J
C31	Capacitor, fixed, mica, 1500 pF, ±5%, 500 V dc	1-900004-015	72136	DM19F152J
CR1	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR2	Diode, zener, 5 V, ±5%	1-913073-001	18041	JZ5B
FL1	Filter, bandpass, 5 MHz to 6 MHz	1-004539-001	88869	
L1	Inductor, variable, 1.3 uH to 1.8 uH	1-906006-006	88869	
L2	Inductor, variable, 1.3 uH to 1.8 uH	1-906006-006	88869	
L3	Inductor, fixed, 10 uH, ±10%, 440 mA	1-906022-005	29525	13-10-10
L4	Inductor, fixed, 1.9 uH, ±10%, 600 mA	1-906022-006	29525	10-1.9-10
L5	Inductor, fixed, 1.9 uH, ±10%, 600 mA	1-906022-006	29525	10-1.9-10
Q1	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q2	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q3	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q4	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q5	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q6	Transistor, silicon, NPN	1-958000-001	04713	2N3904
R1	Not used			
R2	Resistor, fixed, composition, 68 ohm, ±10%, 1/2 W	1-945001-023	01121	EB6801
R3	Resistor, fixed, composition, 4.7 kilohm, ±10%, 1/4 W	1-945000-045	01121	CB4721
R4	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R5	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R6	Resistor, fixed, composition, 390 ohm, ±10%, 1/4 W	1-945000-032	01121	CB3911

Table 3-9. Parts List for 100 Hz, 1 kHz, 10 kHz and 100 kHz Decade Assembly, A3A, A3B, A3C, A3D (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R7	Resistor, variable, composition, 500 ohm, ±30%, 1/4 W	1-945010-003	71450	U201
R8	Resistor, fixed, composition, 4.7 kilohm, ±10%, 1/4 W	1-945000-045	01121	CB4721
R9	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R10	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R11	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R12	Resistor, fixed, composition, 4.7 kilohm, ±10%, 1/4 W	1-945000-045	01121	CB4721
R13	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R14	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R15	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R16	Resistor, fixed, composition, 1.8 kilohm, ±10%, 1/4 W	1-945000-040	01121	CB1821
R17	Resistor, fixed, composition, 62 ohm, ±5%, 1/4 W	1-945000-113	01121	CB6205
R18	Resistor, fixed, composition, 150 kilohm, ±10%, 1/4 W	1-945000-063	01121	CB1541
R19	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R20	Resistor, fixed, composition, 150 ohm, ±10%, 1/4 W	1-945000-027	01121	CB1511
R21	Resistor, fixed, composition, 1 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R22	Resistor, fixed, composition, 47 ohm, ±10%, 1/4 W	1-945000-021	01121	CB4701
R23	Not used			
R24	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
U1	Integrated circuit, decade counter	1-926007-014	01295	SN7490N
U2	Integrated circuit, balanced mixer	1-926007-026	01295	SN76514N
U3	Integrated circuit, balanced mixer	1-926007-026	01295	SN76514N

Table 3-10. Parts List for 1 MHz and 10 MHz Programming Assembly, A4A, A4B

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
K1	Relay, 1 pole, 1 position, Coil: 125 ohm, 288 mW, 4.5 V	1-942014-001	21317	1A6A
K2	Relay, 1 pole, 1 position, Coil: 125 ohm, 288 mW, 4.5 V	1-942014-001	21317	1A6A
K3	Relay, 1 pole, 1 position, Coil: 125 ohm, 288 mW, 4.5 V	1-942014-001	21317	1A6A
K4	Relay, 1 pole, 1 position, Coil: 125 ohm, 288 mW, 4.5 V	1-942014-001	21317	1A6A
K5	Relay, 1 pole, 1 position, Coil: 125 ohm, 288 mW, 4.5 V	1-942014-001	21317	1A6A
K6	Relay, 1 pole, 1 position, Coil: 125 ohm, 288 mW, 4.5 V	1-942014-001	21317	1A6A
K7	Relay, 1 pole, 1 position, Coil: 125 ohm, 288 mW, 4.5 V	1-942014-001	21317	1A6A
K8	Relay, 1 pole, 1 position, Coil: 125 ohm, 288 mW, 4.5 V	1-942014-001	21317	1A6A
K9	Relay, 1 pole, 1 position, Coil: 125 ohm, 288 mW, 4.5 V	1-942014-001	21317	1A6A
K10	Relay, 1 pole, 1 position, Coil: 125 ohm, 288 mW, 4.5 V	1-942014-001	21317	1A6A
R1	Resistor, fixed, composition, 68 ohm, ±10%, 1/2 W	1-945001-023	01121	EB6801
R2	Resistor, fixed, composition, 68 ohm, ±10%, 1/2 W	1-945001-023	01121	EB6801
R3	Resistor, fixed, composition, 68 ohm, ±10%, 1/2 W	1-945001-023	01121	EB6801
R4	Resistor, fixed, composition, 68 ohm, ±10%, 1/2 W	1-945001-023	01121	EB6801
R5	Resistor, fixed, composition, 68 ohm, ±10%, 1/2 W	1-945001-023	01121	EB6801
R6	Resistor, fixed, composition, 68 ohm, ±10%, 1/2 W	1-945001-023	01121	EB6801
R7	Resistor, fixed, composition, 68 ohm, ±10%, 1/2 W	1-945001-023	01121	EB6801
R8	Resistor, fixed, composition, 68 ohm, ±10%, 1/2 W	1-945001-023	01121	EB6801
R9	Resistor, fixed, composition, 68 ohm, ±10%, 1/2 W	1-945001-023	01121	EB6801
R10	Resistor, fixed, composition, 68 ohm, ±10%, 1/2 W	1-945001-023	01121	EB6801

Table 3-11. Parts List for 1200 MHz Decade Assembly, A5

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, variable, glass, 1 pF to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C2	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C3	Capacitor, fixed, mica, 24 pF, ±5%, 500 V dc	1-900003-014	72136	DM15E240J
C4	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C5	Capacitor, fixed, mica, 22 pF, ±5%, 500 V dc	1-900003-013	72136	DM15E220J
C6	Capacitor, variable, glass, 1 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C7	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C8	Capacitor, fixed, mica, 100 pF, ±5%, 500 V dc	1-900003-008	01121	SS5D471W
C9	Capacitor, fixed, mica, selected, 5 pF nominal, ±10%, 500 V dc	1-900003-004	72136	DM15C050C
C10	Capacitor, variable, glass, 1 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C11	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C12	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C13	Capacitor, fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C
C14	Capacitor, variable, glass, 1 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C15	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C16	Capacitor, fixed, mica, 3 pF, ±0.5 pF, 500 V dc	1-900003-003	72136	DM15C030C
C17	Capacitor, fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C
C18	Capacitor, variable, glass, 1 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C19	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C20	Capacitor, fixed, mica, 5 pF, ±10%, 500 V dc	1-900003-004	72136	DM15C050C

Table 3-11. Parts List for 1200 MHz Decade Assembly, A5 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C21	Capacitor, fixed, mica, selected, 10 pF nominal, ±5%, 300 V dc	1-900098-009	04062	DM5CC100J
C22	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
CR1	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR2	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
L1	Inductor, fixed, 3 turns	1-403220-001	88869	
L2	Inductor, fixed, 1 turn	1-201738-001	88869	
L3	Inductor, fixed, 1 turn	1-201738-001	88869	
L4	Inductor, fixed, 1 turn	1-201739-001	88869	
L5	Inductor, fixed, 1 turn	1-201739-001	88869	
Q1	Transistor, silicon, NPN	1-958018-005	02735	2N5179
Q2	Transistor, silicon, NPN	1-958018-004	02735	2N5179
Q3	Transistor, silicon, NPN	1-958018-005	02735	2N5179
Q4	Transistor, silicon, NPN	1-958064-001	73445	A486
Q5	Transistor, silicon, NPN	1-958018-002	02735	2N5179
R1	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R2	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R3	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R4	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R5	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R6	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R7	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R8	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311

Table 3-11. Parts List for 1200 MHz Decade Assembly, A5 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R9	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R10	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3315
R11	Resistor, fixed, composition, selected, 47 ohm nominal, ±10%, 1/4 W	1-945000-021	01121	CB4701

Table 3-12. Parts List for 1 MHz Decade Assembly, A6

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C2	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C3	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C4	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C5	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C6	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C7	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C8	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C9	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C10	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C11	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C12	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C13	Capacitor, fixed, mica, 68 pF, ±5%, 500 V dc	1-900003-026	72136	DM15E680J
C14	Capacitor, fixed, mica, 12 pF, ±5%, 500 V dc	1-900003-009	72136	DM15C120J
C15	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C16	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C17	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C18	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C19	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C20	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C21	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C22	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C23	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C24	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10

Table 3-12. Parts List for 1 MHz Decade Assembly, A6 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C25	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C26	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C27	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C28	Capacitor, fixed, mica, 300 pF, ±5%, 500 V dc	1-900003-042	72136	DM15F301J
C29	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C30	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C31	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
C32	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C33	Capacitor, fixed, mica, 130 pF, ±5%, 500 V dc	1-900003-033	72136	DM15F120J
C34	Capacitor, fixed, mica, 200 pF, ±5%, 500 V dc	1-900003-037	72136	DM15F201J
C35	Capacitor, fixed, mica, 200 pF, ±5%, 500 V dc	1-900003-037	72136	DM15F201J
FL1	Filter, bandpass, 95 MHz to 96 MHz	1-004540-001	88869	
FL2	Filter, bandpass, 50 MHz to 60 MHz	1-004538-001	88869	
L1	Inductor, variable, 0.15 uH to 0.23 uH	1-906006-008	88869	
L2	Inductor, fixed, 0.47 uH, ±10%, 580 mA	1-906022-008	29525	9-0.47-10
L3	Inductor, fixed, 1.5 uH, ±10%, 750 mA	1-906022-007	29525	10-1.5-10
L4	Inductor, fixed, 0.47 uH, ±10%, 580 mA	1-906022-008	29525	9-0.47-10
L5	Inductor, fixed, 0.15 uH, ±10%, 1750 mA	1-906003-003	43543	DD-0.15
L6	Inductor, fixed, 0.15 uH, ±10%, 1750 mA	1-906003-003	43543	DD-0.15
Q1	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q2	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q3	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q4	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q5	Transistor, silicon, NPN	1-958080-001	04713	2N4427
R1	Resistor, fixed, composition, 330 ohm, ±5%, 1/4 W	1-945000-150	01121	CB3315
R2	Not used			
R3	Resistor, fixed, composition, selected, 56 ohm nominal, ±5%, 1/4 W	1-945000-132	01121	CB5605

Table 3-12. Parts List for 1 MHz Decade Assembly, A6 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R4	Resistor, fixed, composition, 150 ohm, ±5%, 1/4 W	1-945000-142	01121	CB1515
R5	Not used			
R6	Resistor, fixed, composition, 68 ohm, ±5%, 1/4 W	1-945000-134	01121	CB6805
R7	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R8	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R9	Resistor, fixed, composition, 7.5 kilohm, ±5%, 1/4 W	1-945000-183	01121	CB7525
R10	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R11	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R12	Not used			
R13	Not used			
R14	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R15	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R16	Resistor, fixed, composition, selected, 10 ohm nominal, ±10%, 1/4 W	1-945000-013	01121	CB1001
R17	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R18	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R19	Resistor, fixed, composition, 47 ohm, ±10%, 1/4 W	1-945000-021	01121	CB4701
R20	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R21	Resistor, fixed, composition, 2 kilohm, ±5%, 1/4 W	1-945000-169	01121	CB2025
R22	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R23	Resistor, fixed, composition, 270 ohm, ±10%, 1/4 W	1-945000-030	01121	CB2711
R24	Resistor, fixed, composition, 6.8 kilohm, ±10%, 1/4 W	1-945000-047	01121	CB6821
R25	Resistor, fixed, composition, 820 ohm, ±10%, 1/4 W	1-945000-036	01121	CB8211
R26	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R27	Resistor, fixed, composition, 2.4 kilohm, ±5%, 1/4 W	1-945000-171	01121	CB2425
R28	Resistor, fixed, composition, 820 ohm, ±10%, 1/4 W	1-945000-036	01121	CB8211

Table 3-12. Parts List for 1 MHz Decade Assembly, A6 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R29	Resistor, fixed, composition, selected, 270 ohm nominal, ±10%, 1/4 W	1-945000-030	01121	CB2711
R30	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R31	Resistor, fixed, composition, selected, 27 ohm nominal, ±10%, 1/4 W	1-945000-018	01121	CB2701
R32	Resistor, fixed, composition, 150 ohm, ±5%, 1/4 W	1-945000-142	01121	CB1515
R33	Resistor, fixed, composition, 39 ohm, ±5%, 1/4 W	1-945000-128	01121	CB3905
R34	Resistor, fixed, composition, 10 ohm, ±5%, 1/4 W	1-945000-114	01121	CB1005
R35	Resistor, fixed, composition, 300 ohm, ±5%, 1/4 W	1-945000-149	01121	CB3015
R36	Resistor, fixed, composition, 16 ohm, ±5%, 1/4 W	1-945000-119	01121	CB1605
R37	Resistor, fixed, composition, 300 ohm, ±5%, 1/4 W	1-945000-149	01121	CB3015
U1	Integrated circuit, balanced mixer	1-926007-026	01295	SN76514N
U2	Integrated circuit, balanced mixer	1-926007-026	01295	SN76514N

Table 3-13. Parts List for Gain Control Amp/Amplitude Modulator Assembly, A7

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Not used			
C2	Not used			
C3	Not used			
C4	Not used			
C5	Not used			
C6	Not used			
C7	Not used			
C8	Not used			
C9	Not used			
C10	Not used			
C11	Not used			
C12	Not used			
C13	Not used			
C14	Not used			
C15	Not used			
C16	Not used			
C17	Not used			
C18	Not used			
C19	Not used			
C20	Not used			
C21	Not used			
C22	Not used			
C23	Not used			
C24	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C25	Capacitor, variable, glass, 1 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C26	Capacitor, variable, glass, 1 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C27	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C28	Capacitor, variable, glass, 1 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C29	Capacitor, fixed, mica, 47 pF, ±5%, 500 V dc	1-900003-021	72136	DM15C470J
C30	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C31	Capacitor, variable, glass, 1 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C32	Not used			
C33	Capacitor, fixed, feed-thru, 470 pF, ±20%, 500 V dc	1-900045-001	01121	FA5C471
C34	Not used			
C35	Not used			

Table 3-13. Parts List for Gain Control Amp/Amplitude Modulator Assembly, A7 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C36	Not used			
C37	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C38	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C39	Not used			
C40	Not used			
C41	Not used			
C42	Not used			
C43	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
L1	Not used			
L2	Not used			
L3	Not used			
L4	Not used			
L5	Not used			
L6	Not used			
L7	Not used			
L8	Not used			
L9	Inductor, fixed, 2 turns	1-402953-001	88869	
L10	Inductor, fixed, 4 turns	1-402953-003	88869	
L11	Inductor, fixed, 3 turns	1-402953-002	88869	
L12	Inductor, fixed, 4 turns	1-402953-003	88869	
L13	Inductor, fixed, 3 turns	1-402953-002	88869	
L14	Not used			
L15	Inductor, fixed, 5 turns	1-945000-025	88869	
L16	Inductor, fixed, 5 turns	1-945000-053	88869	
Q1	Not used			
Q2	Not used			
Q3	Not used			
Q4	Not used			
Q5	Not used			
Q6	Not used			
Q7	Not used			
Q8	Transistor, silicon, NPN	1-958018-001	02735	2N5179

Table 3-13. Parts List for Gain Control Amp/Amplitude Modulator Assembly, A7 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
Q9	Transistor, silicon, NPN	1-958018-001	02735	2N5179
R1	Not used			
R2	Not used			
R3	Not used			
R4	Not used			
R5	Not used			
R6	Not used			
R7	Not used			
R8	Not used			
R9	Not used			
R10	Not used			
R11	Not used			
R12	Not used			
R13	Not used			
R14	Not used			
R15	Not used			
R16	Resistor, fixed, composition, 39 kilohm, ±10%, 1/4 W	1-945000-056	01121	CB3931
R17	Resistor, fixed, composition, 820 ohm, ±10%, 1/4 W	1-945000-036	01121	CB8211
R18	Resistor, fixed, composition, 33 kilohm, ±10%, 1/4 W	1-945000-055	01121	CB3331
R19	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R20	Resistor, fixed, composition, 2.7 ohm, ±10%, 1/4 W	1-945000-006	01121	CB2R71
R21	Resistor, fixed, composition, selected, 22 kilohms nominal, ±10%, 1/4 W	1-945000-053	01121	CB2231
R22	Not used			
R23	Resistor, fixed, composition, 8.2 kilohm, ±10%, 1/4 W	1-945000-048	01121	CB8221
R24	Resistor, fixed, composition, 8.2 kilohm, ±10%, 1/4 W	1-945000-048	01121	CB8221
R25	Not used			
R26	Not used			
R27	Not used			
R28	Resistor, fixed, composition, 300 ohm, ±5%, 1/4 W	1-945000-149	01121	CB3015
R29	Resistor, fixed, composition, 18 ohm, ±5%, 1/4 W	1-945000-120	01121	CB1805
R30	Resistor, fixed, composition, 300 ohm, ±5%, 1/4 W	1-945000-149	01121	CB3015

Table 3-14. Parts List for 10 MHz Decade Assembly, A8

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, mica, 22 pF, ±5%, 500 V dc	1-900003-013	72136	DM15E220J
C2	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C3	Capacitor, variable, glass, 1 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C4	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C5	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C6	Capacitor, variable, glass, 1 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C7	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C8	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C9	Capacitor, variable, glass, 1 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C10	Capacitor, fixed, mica, 3 pF, ±0.5 pF, 500 V dc	1-900003-003	72136	DM15C030C
C11	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C12	Capacitor, variable, glass, 1 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C13	Capacitor, fixed, mica, 3 pF, ±0.5 pF, 500 V dc	1-900003-003	72136	DM15C030C
C14	Not used			
C15	Not used			
C16	Not used			
C17	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C18	Capacitor, variable, glass, 1 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C19	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C20	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C21	Capacitor, variable, glass, 1 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C22	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C23	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C24	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C25	Capacitor, fixed, mica, 5 pF, ±10%, 500 V dc	1-900003-004	72136	DM15C050C
C26	Not used			

Table 3-14. Parts List for 10 MHz Decade Assembly, A8 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C27	Capacitor, fixed, mica, 120 pF, ±5%, 500 V dc	1-900003-032	72136	DM15F121J
C28	Capacitor, variable, ceramic, 2.3 pF to 20 pF, 500 V dc	1-900113-001	91293	9302
C29	Capacitor, fixed, mica, 5 pF, ±10%, 500 Vdc	1-900003-004	72136	DM15C050C
C30	Capacitor, variable, ceramic, 2.3 pF to 20 pF, 500 V dc	1-900113-001	91293	9302
C31	Capacitor, fixed, mica, 120 pF, ±5%, 500 V dc	1-900003-032	72136	DM15F121J
C32	Capacitor, fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C010C
C33	Capacitor, fixed, mica, 3 pF, ±0.5 pF, 500 V dc	1-900003-003	72136	DM15C030C
C34	Capacitor, fixed, mica, 5 pF, ±10%, 500 V dc	1-900003-004	72136	DM15C050C
C35	Capacitor, fixed, mica, selected, 3 pF nominal, ±0.5 pF, 500 V dc	1-900003-003	72136	DM15C030C
C36	Capacitor, fixed, mica, selected, 3 pF nominal, ±0.5 pF, 500 V dc	1-900003-003	72136	DM15C030C
CR1	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR2	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
L1	Inductor, fixed, 1 turn	1-201740-001	88869	
L2	Inductor, fixed, 1 turn	1-201740-001	88869	
L3	Inductor, fixed, 1 turn	1-201741-001	88869	
L4	Inductor, fixed, 1 turn	1-201741-001	88869	
L5	Not used			
L6	Inductor, fixed, 1 turn	1-201741-001	88869	
L7	Inductor, fixed, 1 turn	1-201741-001	88869	
L8	Inductor, fixed, 2 turns	1-402953-001	88869	
L9	Not used			
L10	Not used			
L11	Not used			
L12	Not used			
L13	Not used			
L14	Not used			
L15	Inductor, fixed, 2 turns	1-403042-001	88869	

Table 3-14. Parts List for 10 MHz Decade Assembly, A8 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
L16	Inductor, fixed, 2 turns	1-403042-001	88869	
Q1	Transistor, silicon, NPN	1-958018-007	02735	2N5179
Q2	Transistor, silicon, NPN	1-958018-005	02735	2N5179
Q3	Transistor, silicon, NPN	1-958018-006	02735	2N5179
Q4	Transistor, silicon, NPN	1-948018-004	02735	2N5179
Q5	Not used			
Q6	Transistor, silicon, NPN	1-958018-007	02735	2N5179
Q7	Transistor, silicon, NPN	1-958018-007	02735	2N5179
R1	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R2	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R3	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R4	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R5	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R6	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R7	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R8	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R9	Not used			
R10	Not used			
R11	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R12	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R13	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R14	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R15	Resistor, fixed, composition, 27 ohm, ±10%, 1/4 W	1-945000-018	01121	CB2701
Z1	Singly balance mixer	1-403263-001	88869	

Table 3-15. Parts List for Diode Switch Assembly, A9

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, feed-thru, 470 pF, ±20%, 500 V dc	1-900045-001	01121	FASC
C2	Capacitor, fixed, feed-thru, 470 pF, ±20%, 500 V dc	1-900045-001	01121	FASC
C3	Capacitor, fixed, feed-thru, 470 pF, ±20%, 500 V dc	1-900045-001	01121	FASC
C4	Capacitor, fixed, feed-thru, 470 pF, ±20%, 500 V dc	1-900045-001	01121	FASC
C5	Capacitor, fixed, feed-thru, 470 pF, ±20%, 500 V dc	1-900045-001	01121	FASC
C6	Capacitor, fixed, mica, 5 pF, ±10%, 500 V dc	1-900003-004	72136	DM15C050C
C7	Capacitor, fixed, feed-thru, 470 pF, ±20%, 500 V dc	1-900045-001	01121	FASC
CR1	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR2	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR3	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR4	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR5	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR6	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
L1	Inductor, fixed, 0.47 uH, ±15%	1-906008-002	88869	
L2	Inductor, fixed, 0.47 uH, ±15%	1-906008-002	88869	
L3	Inductor, fixed, 0.47 uH, ±15%	1-906008-002	88869	
L4	Inductor, fixed, 0.47 uH, ±15%	1-906008-002	88869	
L5	Inductor, fixed, 0.47 uH, ±15%	1-906008-002	88869	
L6	Inductor, fixed, 0.47 uH, ±15%	1-906008-002	88869	
L7	Inductor, fixed, 0.47 uH, ±15%	1-906008-002	88869	
R1	Resistor, fixed, composition, 22 kilohm, ±10%, 1/4 W	1-945000-053	01121	CB2231
R2	Resistor, fixed, composition, 22 kilohm, ±10%, 1/4 W	1-945000-053	01121	CB2231
R3	Resistor, fixed, composition, 22 kilohm, ±10%, 1/4 W	1-945000-053	01121	CB2231
R4	Resistor, fixed, composition, 22 kilohm, ±10%, 1/4 W	1-945000-053	01121	CB2231

Table 3-15. Parts List for Diode Switch Assembly, A9 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R5	Resistor, fixed, composition, 22 kilohm, ±10%, 1/4 W	1-945000-053	01121	CB2231
R6	Resistor, fixed, composition, 270 ohm, ±10%, 1/4 W	1-945000-030	01121	CB2711
R7	Resistor, fixed, composition, 22 kilohm, ±10%, 1/4 W	1-945000-053	01121	CB2231

Table 3-16. Parts List for 700 to 1100 MHz Multiplier Assembly, A10

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, mica, 22 pF, ±5%, 500 V dc	1-900003-013	72136	DM15E220J
C2	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C3	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C4	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C5	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C6	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C7	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C8	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C9	Capacitor, fixed, standoff, 470 ohm, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C10	Capacitor, fixed, mica, 3 pF, ±0.5 pF, 500 V dc	1-900003-003	72136	DM15C030C
C11	Capacitor, variable, glass, 1.0 to 10 pF, 500 V dc	1-900063-001	91293	7341A
C12	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C13	Capacitor, fixed, mica, 5 pF, ±10%, 500 V dc	1-900003-004	72136	DM15C050C
C14	Capacitor, fixed, mica, 22 pF, ±5%, 500 V dc	1-900003-013	72136	DM15E220J
C15	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C16	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C17	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C18	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C19	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C20	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C21	Capacitor, fixed, mica, selected, 5 pF nominal, ±10%, 500 V dc	1-900003-004	72136	DM15C050C
C22	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C23	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C24	Capacitor, fixed, mica, 3 pF, ±0.5 pF, 500 V dc	1-900003-003	72136	DM15C030C

Table 3-16. Parts List for 700 to 1100 MHz Multiplier Assembly, A10 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C25	Capacitor, variable, glass, 1.0 to 10 pF, 500 V dc	1-900063-001	91293	7341A
C26	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C27	Capacitor, fixed, mica, 5 pF, ±10%, 500 V dc	1-900003-004	72136	DM15C050C
C28	Capacitor, fixed, mica, 22 pF, ±5%, 500 V dc	1-900003-013	72136	DM15E220J
C29	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C30	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C31	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C32	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C33	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C34	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C35	Capacitor, fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C
C36	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C37	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C38	Capacitor, fixed, mica, 3 pF, ±0.5 pF, 500 V dc	1-900003-003	72136	DM15C030C
C39	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C40	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C41	Capacitor, fixed, mica, 5 pF, ±10%, 500 V dc	1-900003-004	72136	DM15C050C
C42	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C43	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C44	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C45	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C46	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C47	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C48	Capacitor, fixed, mica, 100 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J

Table 3-16. Parts List for 700 to 1100 MHz Multiplier Assembly, A10 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C49	Capacitor, fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C
C50	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C51	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C52	Capacitor, fixed, mica, 3 pF, ±0.5 pF, 500 V dc	1-900003-003	72136	DM15C030C
C53	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C54	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C55	Capacitor, fixed, mica, 5 pF, ±10%, 500 V dc	1-900003-004	72136	DM15C050C
C56	Capacitor, fixed, mica, 22 pF, ±5%, 500 V dc	1-900003-013	72136	DM15E220J
C57	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C58	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C59	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C60	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C61	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D741W
C62	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C63	Capacitor, fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020J
C64	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C65	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C66	Capacitor, fixed, mica, 3 pF, ±0.5 pF, 500 V dc	1-900003-003	72136	DM15C030C
C67	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 V dc	1-900063-001	91293	7341A
C68	Capacitor, fixed, standoff, 470 pF, –0% +100%, 500 V dc	1-900044-001	01121	SS5D471W
C69	Capacitor, fixed, mica, 5 pF, ±10%, 500 V dc	1-900003-004	72136	DM15C050C
C70	Capacitor, fixed, mica, selected, 5 pF nominal, ±10%, 500 V dc	1-900003-004	72136	DM15C050C
C71	Capacitor, fixed, mica, selected 5 pF nominal, ±10%, 500 V dc	1-900003-004	72136	DM15C050C
C72	Capacitor, fixed, mica, selected 5 pF nominal, ±10%, 500 V dc	1-900003-004	72136	DM15C050C

Table 3-16. Parts List for 700 to 1100 MHz Multiplier Assembly, A10 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C73	Capacitor, fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C
C74	Capacitor, fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C
C75	Capacitor, fixed, mica, selected, 9 pF nominal, ±5%, 500 V dc	1-900087-001	00853	D155C090J0
C76	Capacitor, fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C
C77	Capacitor, fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C
C78	Capacitor, fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C
C79	Capacitor, fixed, mica, selected, 1.0 pF nominal, ±0.5 pF, 500 V dc	1-900003-001	72136	DM15C010C
C80	Capacitor, fixed, mica, selected, 1.0 pF nominal, ±0.5 pF, 500 V dc	1-900003-001	72136	DM15C010C
CR1	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR2	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR3	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR4	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR5	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR6	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR7	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR8	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR9	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR10	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
L1	Inductor, fixed, 1 turn	1-201740-001	88869	
L2	Inductor, fixed, 1 turn	1-201741-001	88869	
L3	Inductor, fixed, 1 turn	1-201741-001	88869	
L4	Inductor, fixed, 1 turn	1-201741-001	88869	
L5	Inductor, fixed, 1 turn	1-201740-001	88869	
L6	Inductor, fixed, 1 turn	1-201740-001	88869	

Table 3-16. Parts List for 700 to 1100 MHz Multiplier Assembly, A10 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
L7	Inductor, fixed, 1 turn	1-201741-001	88869	
L8	Inductor, fixed, 1 turn	1-201741-001	88869	
L9	Inductor, fixed, 1 turn	1-201738-001	88869	
L10	Inductor, fixed, 1 turn	1-201738-001	88869	
L11	Inductor, fixed, 1 turn	1-201739-001	88869	
L12	Inductor, fixed, 1 turn	1-201739-001	88869	
L13	Inductor, fixed, 1 turn	1-201738-001	88869	
L14	Inductor, fixed, 1 turn	1-201738-001	88869	
L15	Inductor, fixed, 1 turn	1-201739-001	88869	
L16	Inductor, fixed, 1 turn	1-201739-001	88869	
L17	Inductor, fixed, 1 turn	1-201738-001	88869	
L18	Inductor, fixed, 1 turn	1-201738-001	88869	
L19	Inductor, fixed, 1 turn	1-201739-001	88869	
L20	Inductor, fixed, 1 turn	1-201739-001	88869	
Q1	Transistor, silicon, NPN	1-958018-007	02735	2N5179
Q2	Transistor, silicon, NPN	1-958018-005	02735	2N5179
Q3	Transistor, silicon, NPN	1-958018-006	02735	2N5179
Q4	Transistor, silicon, NPN	1-958018-004	02735	2N5179
Q5	Transistor, silicon, NPN	1-958018-007	02735	2N5179
Q6	Transistor, silicon, NPN	1-958018-005	02735	2N5179
Q7	Transistor, silicon, NPN	1-958018-006	02735	2N5179
Q8	Transistor, silicon, NPN	1-958018-004	02735	2N5179
Q9	Transistor, silicon, NPN	1-958018-007	02735	2N5179
Q10	Transistor, silicon, NPN	1-958018-005	02735	2N5179
Q11	Transistor, silicon, NPN	1-958018-006	02735	2N5179
Q12	Transistor, silicon, NPN	1-958018-004	02735	2N5179
Q13	Transistor, silicon, NPN	1-958018-007	02735	2N5179
Q14	Transistor, silicon, NPN	1-958018-005	02735	2N5179
Q15	Transistor, silicon, NPN	1-958018-006	02735	2N5179
Q16	Transistor, silicon, NPN	1-958018-004	02735	2N5179
Q17	Transistor, silicon, NPN	1-958018-007	02735	2N5179

Table 3-16. Parts List for 700 to 1100 MHz Multiplier Assembly, A10 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
Q18	Transistor, silicon, NPN	1-958018-005	02735	2N5179
Q19	Transistor, silicon, NPN	1-958018-006	02735	2N5179
Q20	Transistor, silicon, NPN	1-958018-004	02735	2N5179
R1	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R2	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R3	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R4	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R5	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R6	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R7	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R8	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R9	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R10	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R11	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R12	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R13	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R14	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R15	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R16	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R17	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R18	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R19	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R20	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R21	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R22	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R23	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731

Table 3-16. Parts List for 700 to 1100 MHz Multiplier Assembly, A10 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R24	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R25	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R26	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R27	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R28	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R29	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R30	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R31	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R32	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R33	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R34	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R35	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R36	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R37	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R38	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R39	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R40	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R41	Resistor, fixed, composition, 27 ohm, ±10%, 1/4 W	1-945000-018	01121	CB2701
R42	Resistor, fixed, composition, 27 ohm, ±10%, 1/4 W	1-945000-018	01121	CB2701
R43	Resistor, fixed, composition, 27 ohm, ±10%, 1/4 W	1-945000-018	01121	CB2701
R44	Resistor, fixed, composition, 27 ohm, ±10%, 1/4 W	1-945000-018	01121	CB2701
R45	Resistor, fixed, composition, 27 ohm, ±10%, 1/4 W	1-945000-018	01121	CB2701

Table 3-17. Parts List for Buffer Amplifier Assembly, A11

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C2	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C3	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C4	Capacitor, fixed, mica, 43 pF, ±5%, 500 V dc	1-900003-020	72136	DM15E430J
C5	Capacitor, variable, ceramic, 1.7 pF to 11 pF, 500 V dc	1-900065-001	74970	187-106-5
C6	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 V dc	1-900001-005	73445	C280AE,0.022uF
C7	Not used			
C8	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C9	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C10	Not used			
C11	Not used			
C12	Not used			
C13	Not used			
C14	Capacitor, fixed, plastic, 0.01 uF, ± 20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C15	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C16	Not used			
C17	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C18	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C19	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C20	Capacitor, fixed, mica, 27 pF, ±5%, 500 V dc	1-900003-015	72136	DM15E270J
C21	Capacitor, variable, ceramic, 1.7 pF to 11 pF, 500 V dc	1-900065-001	74970	187-106-5
C22	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C23	Capacitor, fixed, mica, 18 pF, ±5%, 500 V dc	1-900003-011	72136	DM15C180J
C24	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C25	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C26	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J

Table 3-17. Parts List for Buffer Amplifier Assembly, A11 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C27	Capacitor, fixed, mica, 15 pF, ±5%, 500 V dc	1-900003-010	72136	DM15C150J
C28	Capacitor, variable, ceramic, 1.7 pF to 11 pF, 500 V dc	1-900065-001	74970	187-106-5
C29	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C30	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C31	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C32	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C33	Capacitor, fixed, mica, 15 pF, ±5%, 500 V dc	1-900003-010	72136	DM15C150J
C34	Capacitor, variable, ceramic, 1.7 pF to 11 pF, 500 V dc	1-900065-001	74970	187-106-5
C35	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C36	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C37	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C38	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C39	Capacitor, fixed, mica, 15 pF, ±5%, 500 V dc	1-900003-010	72136	DM15C150J
C40	Capacitor, variable, ceramic, 1.7 pF to 11 pF, 500 V dc	1-900065-001	74970	187-106-5
C41	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C42	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C43	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C44	Not used			
C45	Capacitor, fixed, mica, 1000 pF, ±5%, 100 V dc	1-900003-056	72136	DM15F102J
C46	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
L1	Inductor, fixed, 0.06 uH	1-402965-002	88869	
L2	Not used			
L3	Not used			
L4	Inductor, fixed, 0.06 uH	1-402965-002	88869	
L5	Inductor, variable, 7 uH to 14 uH	1-906006-004	88869	
L6	Inductor, fixed, 0.06 uH	1-402965-002	88869	

Table 3-17. Parts List for Buffer Amplifier Assembly, A11 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
L7	Inductor, fixed, 0.06 uH	1-402965-002	88869	
L8	Inductor, fixed, 0.04 uH	1-402965-003	88869	
Q1	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q2	Not used			
Q3	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q4	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q5	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q6	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q7	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q8	Transistor, silicon, NPN	1-958018-001	02735	2N5179
R1	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R2	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R3	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R4	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R5	Not used			
R6	Not used			
R7	Resistor, fixed, composition, 2.2 kilohm, ±10%, 1/4 W	1-945000-041	01121	CB2221
R8	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R9	Resistor, fixed, composition, 3.3 kilohm, ±10%, 1/4 W	1-945000-043	01121	CB3321
R10	Not used			
R11	Not used			
R12	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R13	Resistor, fixed, composition, 47 ohm, ±10%, 1/4 W	1-945000-021	01121	CB4701
R14	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R15	Resistor, fixed, composition, 1.2 kilohm, ±10%, 1/4 W	1-945000-038	01121	CB1221
R16	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R17	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R18	Resistor, fixed, composition, 22 ohm, ±10%, 1/4 W	1-945000-017	01121	CB2201
R19	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011

Table 3-17. Parts List for Buffer Amplifier Assembly, A11 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R20	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R21	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R22	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R23	Resistor, fixed, composition, 39 ohm, ±10%, 1/4 W	1-945000-020	01121	CB3901
R24	Resistor, fixed, composition, 56 ohm, ±10%, 1/4 W	1-945000-022	01121	CB5601
R25	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R26	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R27	Resistor, fixed, composition, 22 ohm, ±10%, 1/4 W	1-945000-017	01121	CB2201
R28	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R29	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R30	Resistor, fixed, composition, 22 ohm, ±10%, 1/4 W	1-945000-017	01121	CB2201
R31	Resistor, fixed, composition, 1.2 kilohm, ±10%, 1/4 W	1-945000-038	01121	CB1221
R32	Not used			
R33	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R34	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R35	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R36	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R37	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011

Table 3-18. Parts List for Generator Assemblies, A12 thru A21

Ref. Desig.	On Assemblies	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	A12 thru A21	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C2	A12 thru A21	Capacitor, fixed, mica, 22 pF, ±5%, 500 V dc	1-900003-013	72136	DM15C220J
C3	A12 thru A21	Capacitor, fixed, mica, 22 pF, ±5%, 500 V dc	1-900003-013	72136	DM15C220J
C4	A12 thru A21	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C5	A12 thru A21	Capacitor, variable, ceramic, 1.7 pF to 11 pF, 500 V dc	1-900065-001	74970	187-106-5
C6	A12 thru A21	Capacitor, fixed, plastic, 0.01 pF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C7	A12 thru A21	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C8	A12 thru A21	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C9	A12 thru A21	Capacitor, fixed, mica, 43 pF, ±5%, 500 V dc	1-900003-020	72136	DM15C430J
C10	A12 thru A21	Capacitor, fixed, ceramic, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	IGA510
C11	A12 thru A21	Capacitor, fixed, mica, 24 pF, ±5%, 500 V dc	1-900003-014	72136	DM15C240J
C12	A12 thru A21	Capacitor, fixed, mica, 12 pF, ±5%, 500 V dc	1-900003-009	72136	DM15C120J
C13	A12 thru A21	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 V dc	1-900001-005	73445	C280AE,0.022uF
C14	A12 thru A21	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
C15	A12 thru A21	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C16	A12 thru A15	Capacitor, fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C
	A16 thru A21	Capacitor, fixed, mica, 5 pF, ±10%, 500 V dc	1-900003-004	72136	DM15C050C
C17	A12 thru A21	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C18	A12 thru A14	Capacitor, fixed, mica, 82 pF, ±5%, 500 V dc	1-900003-028	72136	DM15F820J
	A15	Capacitor, fixed, mica, 91 pF, ±5%, 500 V dc	1-900003-029	72136	DM15F910J
	A16 and A17	Capacitor, fixed, mica, selected, 56 pF nominal, ±5%, 500 V dc	1-900003-024	72136	DM15E560J
	A18 thru A21	Capacitor, fixed, mica, 68 pF, ±5%, 500 V dc	1-900003-026	72136	DM15F680J
C19	A12 thru A19	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J

Table 3-18. Parts List for Generator Assemblies, A12 thru A21 (Cont.)

Ref. Desig.	On Assemblies	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
	A20 and A21	Capacitor, fixed, mica, 680 pF, ±5%, 500 V dc	1-900003-052	72136	DM15F681J
C20	A12 thru A21	Capacitor, fixed, ceramic, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	IGA510
C21	A12	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
	A13 and A16	Capacitor, fixed, mica, 15 pF, ±5%, 500 V dc	1-900003-010	72136	DM15C150J
	A14	Capacitor, fixed, mica, 18 pF, ±5%, 500 V dc	1-900003-011	72136	DM15C180J
	A15 and A17	Capacitor, fixed, mica, 25 pF, ±5%, 500 V dc	1-900003-014	72136	DM15E240J
	A18	Capacitor, fixed, mica, 33 pF, ±5%, 500 V dc	1-900003-017	72136	DM15E330J
	A19	Capacitor, fixed, mica, 43 pF, ±5%, 500 V dc	1-900003-020	72136	DM15E430J
	A20 and A21	Capacitor, fixed, mica, 56 pF, ±5%, 500 V dc	1-900003-024	72136	DM15E560J
C22	A12 thru A21	Capacitor, fixed, ceramic, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	IGA510
C23	A12 thru A21	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C24	A12 thru A21	Capacitor, variable, ceramic, 1.7 pF to 11 pF, 500 V dc	1-900065-001	74970	187-106-5
C25	A12 thru A14	Capacitor, fixed, mica, 82 pF, ±5%, 500 V dc	1-900003-028	72136	DM15F820J
	A15	Capacitor, fixed, mica, 91 pF, ±5%, 500 V dc	1-900003-029	72136	DM15F910J
	A16 and A17	Capacitor, fixed, mica, selected, 82 pF nominal, ±5%, 500 V dc	1-900003-028	72136	DM15F820J
	A18 thru A21	Capacitor, fixed, mica, 68 pF, ±5%, 500 V dc	1-900003-026	72136	DM15F680J
C26	A12 thru A18	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
	A19 thru A21	Capacitor, fixed, mica, 680 pF, ±5%, 300 V dc	1-900003-052	72136	DM15F681J
C27	A12 thru A21	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C28	A12 thru A21	Capacitor, fixed, mica, 15 pF, ±5%, 500 V dc	1-900003-010	72136	DM15C150J
C29	A12 thru A21	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C30	A12 thru A21	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C31	A12 thru A19	Capacitor, fixed, mica, 2 pF, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C

Table 3-18. Parts List for Generator Assemblies, A12 thru A21 (Cont.)

Ref. Desig.	On Assemblies	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C31 Cont.	A20 and A21	Capacitor fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C
C32	A12 thru A14	Capacitor, fixed, mica, selected, 91 pF nominal, ±5%, 500 V dc	1-900003-029	72136	DM15F910J
	A15	Capacitor, fixed, mica, selected, 100 pF nominal, ±5%, 500 V dc	1-900003-030	72136	DM15F101J
	A16	Capacitor, fixed, mica, 68 pF, ±5%, 500 V dc	1-900003-026	72136	DM15F680J
	A17 thru A21	Capacitor, fixed, mica, selected, 82 pF nominal, ±5%, 500 V dc	1-900003-028	72136	DM15F820J
C33	A12 thru A21	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C34	A12 thru A20	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C35	A12	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
	A13 and A16	Capacitor, fixed, mica, 15 pF, ±5%, 500 V dc	1-900003-010	72136	DM15C150J
	A14	Capacitor, fixed, mica, 18 pF, ±5%, 500 V dc	1-900003-011	72136	DM15C180J
	A15 and A17	Capacitor, fixed, mica, 24 pF, ±5%, 500 V dc	1-900003-014	72136	DM15E240J
	A18	Capacitor, fixed, mica, 33 pF, ±5%, 500 V dc	1-900003-017	72136	DM15E330J
	A19	Capacitor, fixed, mica, 43 pF, ±5%, 500 V dc	1-900003-020	72136	DM15E430J
	A20 and A21	Capacitor, fixed, mica, 56 pF, ±5%, 500 V dc	1-900003-024	72136	DM15E560J
C36	A12 thru A21	Capacitor, variable, ceramic, 1.7 pF to 11 pF, 500 V dc	1-900065-001	74970	187-106-5
C37	A12 thru A20	Capacitor, fixed, ceramic, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	IGA510
C38	A12 thru A21	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 V dc	1-900001-005	73445	C280AE,0.022uF
C39	A12 thru A21	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900002-001	73445	C280AE,0.01uF
C40	A15	Capacitor, fixed, mica, 33 pF, ±5%, 500 V dc	1-900003-017	72136	DM15E330J
	A16 thru A21	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
C41	A15 thru A20	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J

Table 3-18. Parts List for Generator Assemblies, A12 thru A21 (Cont.)

Ref. Desig.	On Assemblies	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C42	A12	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
	A13 and A16	Capacitor, fixed, mica, 15 pF, ±5%, 500 V dc	1-900003-010	72136	DM15C150J
	A14	Capacitor, fixed, mica, 18 pF, ±5%, 500 V dc	1-900003-011	72136	DM15C180J
	A15 and A17	Capacitor, fixed, mica, 24 pF, ±5%, 500 V dc	1-900003-014	72136	DM15E240J
	A18	Capacitor, fixed, mica, 33 pF, ±5%, 500 V dc	1-900003-017	72136	DM15E330J
	A19	Capacitor, fixed, mica, 43 pF, ±5%, 500 V dc	1-900003-020	72136	DM15E430J
	A20	Capacitor, fixed, mica, 56 pF, ±5%, 500 V dc	1-900003-024	72136	DM15E560J
C43	A12 thru A20	Capacitor, variable, ceramic, 1.7 pF to 11 pF, 500 V dc	1-900065-001	74970	187-106-5
C44	A12 thru A21	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	IGA510
C45	A12 thru A20	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	IGA510
C46		Not used			
C47	A14	Capacitor, fixed, mica, selected, 3 pF nominal, ±0.5 pF, 500 V dc	1-900003-003	72136	DM15C030C
	A15 and A16	Capacitor, fixed, mica, selected, 5 pF nominal, ±10%, 500 V dc	1-900003-004	72136	DM15C050C
	A17	Capacitor, fixed, mica, selected, 10 pF nominal, ±5%, 500 V dc	1-900003-008	72136	DM15C100J
	A18 and A19	Capacitor, fixed, mica, selected, 12 pF nominal, ±5%, 500 V dc	1-900003-009	72136	DM15C120J
	A20	Capacitor, fixed, mica, selected, 15 pF nominal, ±5%, 500 V dc	1-900003-010	72136	DM15C150J
	A21	Capacitor, fixed, mica, selected, 27 pF nominal, ±5%, 500 V dc	1-900003-015	72136	DM15C270J
C48		Not used			
C49	A12 thru A21	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
L1	A12 thru A21	Inductor, variable, 30 uH to 60 uH	1-906006-003	88869	

Table 3-18. Parts List for Generator Assemblies, A12 thru A21 (Cont.)

Ref. Desig.	On Assemblies	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
L2	A12 thru A21	Inductor, fixed, 10 uH, 75 mA	1-906002-015	76493	70F105A1
L3	A12 thru A15	Inductor, variable, 0.16 uH to 0.23 uH	1-906006-008	88869	
	A16 thru A21	Inductor, variable, 0.22 uH to 0.34 uH	1-906006-009	88869	
L4	A12 thru A15	Inductor, variable, 0.16 uH to 0.23 uH	1-906006-008	88869	
	A16 thru A21	Inductor, variable, 0.22 uH to 0.34 uH	1-906006-009	88869	
L5	A12 thru A15	Inductor, variable, 0.16 uH to 0.23 uH	1-906006-008	88869	
	A16 thru A21	Inductor, variable, 0.22 uH to 0.34 uH	1-906006-009	88869	
L6	A12 thru A15	Inductor, fixed, 2-1/2 turns	1-402965-001	88869	
	A16 thru A20	Inductor, fixed, 3-1/2 turns	1-402965-003	88869	
	A21	Inductor, fixed, 4-1/2 turns	1-402965-002	88869	
L7	A12 thru A15	Inductor, fixed, 2-1/2 turns	1-402965-001	88869	
	A16 thru A20	Inductor, fixed, 3-1/2 turns	1-402965-003	88869	
	A21	Inductor, fixed, 4-1/2 turns	1-402965-002	88869	
L8	A12 thru A15	Inductor, fixed, 2-1/2 turns	1-402965-001	88869	
	A15 thru A20	Inductor, fixed, 3-1/2 turns	1-402965-003	88869	
Q1	A12 thru A21	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q2	A12 thru A21	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q3	A12 thru A21	Transistor, silicon, PNP	1-958000-002	04713	2N3906
Q4	A12 thru A21	Transistor, silicon, NPN	1-958018-003	02735	2N5179
Q5	A12 thru A21	Transistor, silicon, PNP	1-958000-002	04713	2N3906

Table 3-18. Parts List for Generator Assemblies, A12 thru A21 (Cont.)

Ref. Desig.	On Assemblies	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
Q6	A12 thru A21	Transistor, silicon, NPN	1-958018-003	02735	2N5179
Q7	A12 thru A21	Transistor, silicon, NPN	1-958018-003	02735	2N5179
Q8	A12 thru A21	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q9		Not used			
Q10	A12 thru A21	Transistor, silicon, NPN	1-958018-003	02735	2N5179
Q11	A12 thru A20	Transistor, silicon, NPN	1-958018-003	02735	2N5179
R1	A12 thru A21	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R2	A12 thru A21	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R3	A12 thru A21	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R4	A12 thru A21	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R5	A12 thru A21	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R6	A12 thru A21	Resistor, fixed, composition, 150 ohm, ±10%, 1/4 W	1-945000-027	01121	CB1511
R7	A12 thru A21	Resistor, fixed, composition, 56 kilohm, ±10%, 1/4 W	1-945000-058	01121	CB5631
R8	A12 thru A21	Resistor, fixed, composition, 1.5 kilohm, ±10%, 1/4 W	1-945000-039	01121	CB1521
R9	A12 thru A21	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R10	A12 thru A21	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R11	A12 thru A21	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4731
R12	A12 thru A21	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R13	A12 thru A21	Resistor, fixed, composition, 150 kilohm, ±10%, 1/4 W	1-945000-063	01121	CB1541
R14	A12 thru A21	Resistor, fixed, composition, 220 ohm, ±10%, 1/4 W	1-945000-029	01121	CB2211

Table 3-18. Parts List for Generator Assemblies, A12 thru A21 (Cont.)

Ref. Desig.	On Assemblies	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R15	A12 thru A21	Resistor, fixed, composition, 220 ohm, ±10%, 1/4 W	1-945000-029	01121	CB2211
R16	A12 thru A21	Resistor, fixed, composition, 150 ohm, ±10%, 1/4 W	1-945000-027	01121	CB1511
R17	A12 thru A21	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R18	A12 thru A21	Resistor, fixed, composition, 1.5 kilohm, ±10%, 1/4 W	1-945000-039	01121	CB1521
R19	A12 thru A21	Resistor, fixed, composition, 1.2 kilohm, ±10%, 1/4 W	1-945000-038	01121	CB1221
R20	A12 thru A21	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R21	A12 thru A21	Resistor, fixed, composition, 15 kilohm, ±10%, 1/4 W	1-945000-051	01121	CB1531
R22	A12 thru A21	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R23	A12 thru A21	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R24	A12 thru A21	Resistor, fixed, composition, 15 kilohm, ±10%, 1/4 W	1-945000-051	01121	CB1531
R25	A12 thru A21	Resistor, fixed, composition, 15 kilohm, ±10%, 1/4 W	1-945000-051	01121	CB1531
R26	A12 thru A21	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R27	A12 thru A21	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R28	A12 thru A21	Resistor, fixed, composition, selected, 330 ohm nominal, ±10%, 1/4 W	1-945000-031	01121	CB3311
R29	A12 thru A21	Resistor, fixed, composition, selected, 100 ohm nominal, ±10%, 1/4 W	1-945000-025	01121	CB1011
R30	A12 thru A20	Resistor, fixed, composition, 47 ohm, ±10%, 1/4 W	1-945000-021	01121	CB4701
	A21	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R31	A12 thru A21	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R32	A12 thru A21	Resistor, fixed, composition, 220 ohm, ±10%, 1/4 W	1-945000-029	01121	CB2211
R33	A12 thru A21	Resistor, fixed, composition, 15 ohm, ±10%, 1/4 W	1-945000-015	01121	CB1501

Table 3-18. Parts List for Generator Assemblies, A12 thru A21 (Cont.)

Ref. Desig.	On Assemblies	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R34	A12 thru A21	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R35	A12 thru A21	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R36		Not used			
R37		Not used			
R38		Not used			
R39	A12 thru A21	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
A40	A12 thru A21	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R41	A12 thru A21	Resistor, fixed, composition, selected, 180 ohm nominal, ±10%, 1/4 W	1-945000-028	01121	CB1811
R42	A12 thru A20	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
A43	A12 thru A20	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R44	A12 thru A20	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R45		Not used			
R46	A12 thru A21	Resistor, fixed, composition, 1.2 kilohm, ±10%, 1/4 W	1-945000-038	01121	CB1221
R47		Not used			
R48		Not used			
R49	A12 thru A20	Resistor, fixed, composition, 680 ohm, ±10%, 1/4 W	1-945000-035	01121	CB6811
R50	A12 thru A20	Resistor, fixed, composition, 680 ohm, ±10%, 1/4 W	1-945000-035	01121	CB6811
R51	A21	Resistor, fixed, composition, 56 ohm, ±10%, 1/4 W	1-945000-022	01121	CB5601
U1	A12 thru A21	Integrated circuit, quad 2-input NOR gate	1-926018-010	18324	LU380A
Y1	A12	Crystal, 4.5 MHz	1-912001-010	88869	
	A13	Crystal, 4.4 MHz	1-912001-009	88869	
	A14	Crystal, 4.3 MHz	1-912001-008	88869	
	A15	Crystal, 4.2 MHz	1-912001-007	88869	

Table 3-18. Parts List for Generator Assemblies, A12 thru A21 (Cont.)

Ref. Desig.	On Assemblies	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
Y1 Cont.	A16	Crystal, 4.1 MHz	1-912001-006	88869	
	A17	Crystal, 4.0 MHz	1-912001-005	88869	
	A18	Crystal, 3.9 MHz	1-912001-004	88869	
	A19	Crystal, 3.8 MHz	1-912001-003	88869	
	A20	Crystal, 3.7 MHz	1-912001-002	88869	
	A21	Crystal, 3.6 MHz	1-912001-001	88869	
Y2	A12	Crystal, 4.5 MHz	1-912001-010	88869	
	A13	Crystal, 4.4 MHz	1-912001-009	88869	
	A14	Crystal, 4.3 MHz	1-912001-008	88869	
	A15	Crystal, 4.2 MHz	1-912001-007	88869	
	A16	Crystal, 4.1 MHz	1-912001-006	88869	
	A17	Crystal, 4.0 MHz	1-912001-005	88869	
	A18	Crystal, 3.9 MHz	1-912001-004	88869	
	A19	Crystal, 3.8 MHz	1-912001-003	88869	
	A20	Crystal, 3.7 MHz	1-912001-002	88869	
	A21	Crystal, 3.6 MHz	1-912001-001	88869	

Table 3-19. Parts List for 100 Hz, 1 kHz, 10 kHz, 100 kHz Decade Assembly, A24

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
	Printed circuit board	4-004497-001	88869	
S4	Switch, rotary, 3 pole, 11 position, consisting of the following			
	Detent (1 required)	2-402854-003	88869	
	Wafer (1 required)	2-402975-001	88869	
	Wafer (2 required)	2-403035-001	88869	
S5	Switch, rotary, 3 pole, 11 position, consisting of the following:			
	Detent (1 required)	2-402854-003	88869	
	Wafer (1 required)	2-402975-001	88869	
	Wafer (2 required)	2-403035-001	88869	
S6	Switch, rotary, 3 pole, 11 position, consisting of the following:			
	Detent (1 required)	2-402854-003	88869	
	Wafer (1 required)	2-402975-001	88869	
	Wafer (2 required)	2-403035-001	88869	
S7	Switch, rotary, 3 pole, 11 position, consisting of the following:			
	Detent (1 required)	2-402854-003	88869	
	Wafer (1 required)	2-402975-001	88869	
	Wafer (2 required)	2-403035-001	88869	

Table 3-20. Parts List for Sweep Generator Assembly, A25

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, electrolytic, 2.2 uF, ± 10%, 20 Vdc	1-900057-111	56289	150D225X90 20A2
C2	Capacitor, fixed, electrolytic, 120 uF, ± 20%, 15 Vdc	1-900115-001	12954	D120GS D15M
C3	Capacitor, fixed, electrolytic, 50 uF, ± 30%, 15 Vdc	1-900060-001	76433	904-GN06 31
C4	Capacitor, fixed, electrolytic, 50 uF, ± 30%, 15 Vdc	1-900060-001	76433	904-GN06 31
C5	Capacitor, fixed, electrolytic, 200 uF, -10% + 75%, 15 Vdc	1-900039-002	76433	984-1733
CR1	Diode, zener, 11 V, ± 5%, 1W	1-913004-014	81483	1ZS11A
K1	Relay, 1 pole, 1 position, Coil: 1 kilohm, 12 Vdc	1-942014-004	21317	1A12AH
Q1	Transistor, UJT	1-958050-001	03508	2N2646
Q2	Transistor, N-channel, J-FET	1-958002-002	04713	2N5458
Q3	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q4	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q5	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
R1	Resistor, fixed, composition, selected, 4.3 kilohm nominal, ±5%, 1/4 W	1-945000-177	01121	CB4325
R2	Resistor, fixed, composition, 240 ohm, ± 5%, 1/4W	1-945000-147	01121	CB2415
R3	Resistor, fixed, composition, 5.1 ohm, ± 5%, 1/4W	1-945000-107	01121	CB51G5
R4	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4W	1-945000-186	01121	CB1035
R5	Resistor, fixed, composition, 470 ohm, ± 5%, 1/4W	1-945000-154	01121	CB4715
R6	Resistor, fixed, composition, 27 kilohm, ± 5%, 1/4W	1-945000-196	01121	CB2735
R7	Resistor, fixed, composition, selected, 3.9 kilohm nominal, ± 5%, 1/4W	1-945000-176	01121	CB3925
R8	Resistor, fixed, composition, 1 kilohm, ± 5%, 1/4W	1-945000-162	01121	CB1025
R9	Resistor, fixed, composition, selected, 91 ohm nominal, ± 5%, 1/4W	1-945000-137	01121	CB9105

Table 3-20. Parts List for Sweep Generator Assembly, A25 (Cont)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R10	Resistor, fixed, composition, 470 ohm, ± 5%, 1/4W	1-945000-154	01121	CB4715
R11	Resistor, fixed, composition, 39 ohm, ± 5%, 1/4W	1-945000-128	01121	CB3905
R12	Resistor, fixed, composition, 47 kilohm, ± 5%, 1/4W	1-945000-202	01121	CB4735
R13	Resistor, fixed, composition, 3 kilohm, ± 5%, 1/4W	1-945000-173	01121	CB3025

Table 3-21. Parts List for Detector Assembly, A26

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, plastic, 0.1 uF, ± 20%, 250 Vdc	1-900001-013	73445	C280AE
C2	Capacitor, fixed, plastic, 0.1 uF, ± 20%, 250 Vdc	1-900001-013	73445	C280AE
C3	Capacitor, fixed, standoff, 0.001 uF, 0% +100%, 500 Vdc	1-900044-002	01121	SS5D-102W
CR1	Diode, germanium, Vr=30V, If=100 mA	1-913005-001	03877	1N273
J1	Connector, jack, BNC	1-910005-001	11636	UG-911/U
J2	Connector, jack, BNC	1-910005-001	11636	UG-911/U
R1	Resistor, fixed, composition, 620 ohm, ± 5%, 1/4W	1-945000-157	01121	CB6215
R2	Resistor, fixed, composition, 100 kilohm, ± 10%, 1/4W	1-945000-061	01121	CB1041

Table 3-22. Parts List for AM Modulator Assembly, A27

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
A1	Modulator, AM	1-403717-001	05375	SS-44
C1	Capacitor, fixed, electrolytic, 100 uF, -10% +75%, 25 Vdc	1-900039-004	76433	984-1653
C2	Capacitor, fixed, mica, 250 pF, ± 5%, 500 Vdc	1-900003-040	72136	DM15
C3	Capacitor, fixed, plastic, 1000 pF, ± 5%, 500 Vdc	1-900003-056	72136	DM15
C4	Capacitor, fixed, mica, selected, 22 pF nominal, ± 5%, 500 Vdc	1-900003 013	72136	DM15
R1	Resistor, variable, ceramic, 20 kilohm, ± 10%, 1/2W	1-945082-001	71450	190PC 203A
R2	Resistor, fixed, composition, 4.7 kilohm, ± 10%, 1/4W	1-945000-045	01121	CB4721
R3	Resistor, fixed, composition, 510 ohm, ± 5%, 1/4W	1-945000-155	01121	CB5115
R4	Resistor, fixed, composition, 47 ohm, ± 10%, 1/4W	1-945000-021	01121	CB4701

Table 3-23. Code List of Manufacturers

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbook H4-2.

Code No.	Manufacturer	Address
0000A*	European Electronic Prod.	Culver City, Calif.
0000B*	Southwest Supply Co., Inc.	Los Angeles, Calif.
0000C*	Analog Devices	Norwood, Mass.
00348	Microtran Co. Inc.	Valley Stream, N. Y.
00656	Aerovox Corp.	New Bedford, Mass.
00779	Amp Inc.	Harrisburg, Pa.
00853	Sangamo Electric Co.	Pickens, S. C.
01121	Allen-Bradley Co.	Milwaukee, Wis.
01281	TRW Semiconductors Inc.	Lawndale, Calif.
01295	Texas Instruments, Inc., Transistors Products Div.	Dallas, Texas
01351	Dynamic Gear Co., Inc.	Amityville, N. Y.
01686	RCL Electronics Inc.	Manchester, N. H.
01961	Pulse Engineering	San Diego, Calif.
02114	Ferroxcube Corp.	Saugerties, N. Y.
02660	Amphenol Bunker Ramo Corp, Connector Div.	Broadview, Ill.
02735	RCA Semiconductor and Materials Div.	Sommerville, N. J.
03508	G. E. Semiconductor Prod. Div.	Syracuse, N. Y.
03877	Transitron Electronic Corp.	Wakefield, Mass.
04713	Motorola Inc.	Phoenix, Ariz.
04946	Standard Wire and Cable Co.	Los Angeles, Calif.
04963	Minnesota Mining and Mfg. Co.	St. Paul, Minn.
05574	Viking Industries, Inc.	Chatsworth, Calif.
06650	Bell and Howell Co.	Chicago, Ill.
06676	Aerospace Materials Inc.	Columbus, Ohio
07088	Kelvin Electric Co.	Van Nuys, Calif.
07109	Oaktron Industries	Monroe, Wis.
07263	Fairchild Semiconductor Corp.	Mountain View, Calif.
07397	Sylvania Elect. Prod., Inc.	Mountain View, Calif.
07716	IRC	Burlington, Ind.
08718	ITT Cannon Elect. Co.	Phoenix, Ariz.
08730	Vemaline Products Co. Inc.	Wyckoff, N. J.
09353	C and K Components Inc.	Watertown, Mass.
11350	Penn Resistor Corp.	Lansdale, Pa.
11636	Kings Electronics Co.	Pasadena, Calif.
11783	NY-Glass, Inc.	Paramount, Calif.
12406	Elpac Inc.	Irvine, Calif.
12954	Dickson Electronics Corp.	Scottsdale, Ariz.
13511	Amphenol Cadre	Los Gatos, Calif.
14655	Cornell-Dubilier Elec. Corp.	Newark, N. J.
14674	Corning Glass Works, Electronic Components Dept.	Corning, N. Y.
14752	Electro Cube	San Gabriel, Calif.

*These vendors have no number assigned in the latest supplement to the Federal Supply Code for Manufacturers H4-2.

Table 3-23. Code List of Manufacturers (Cont.)

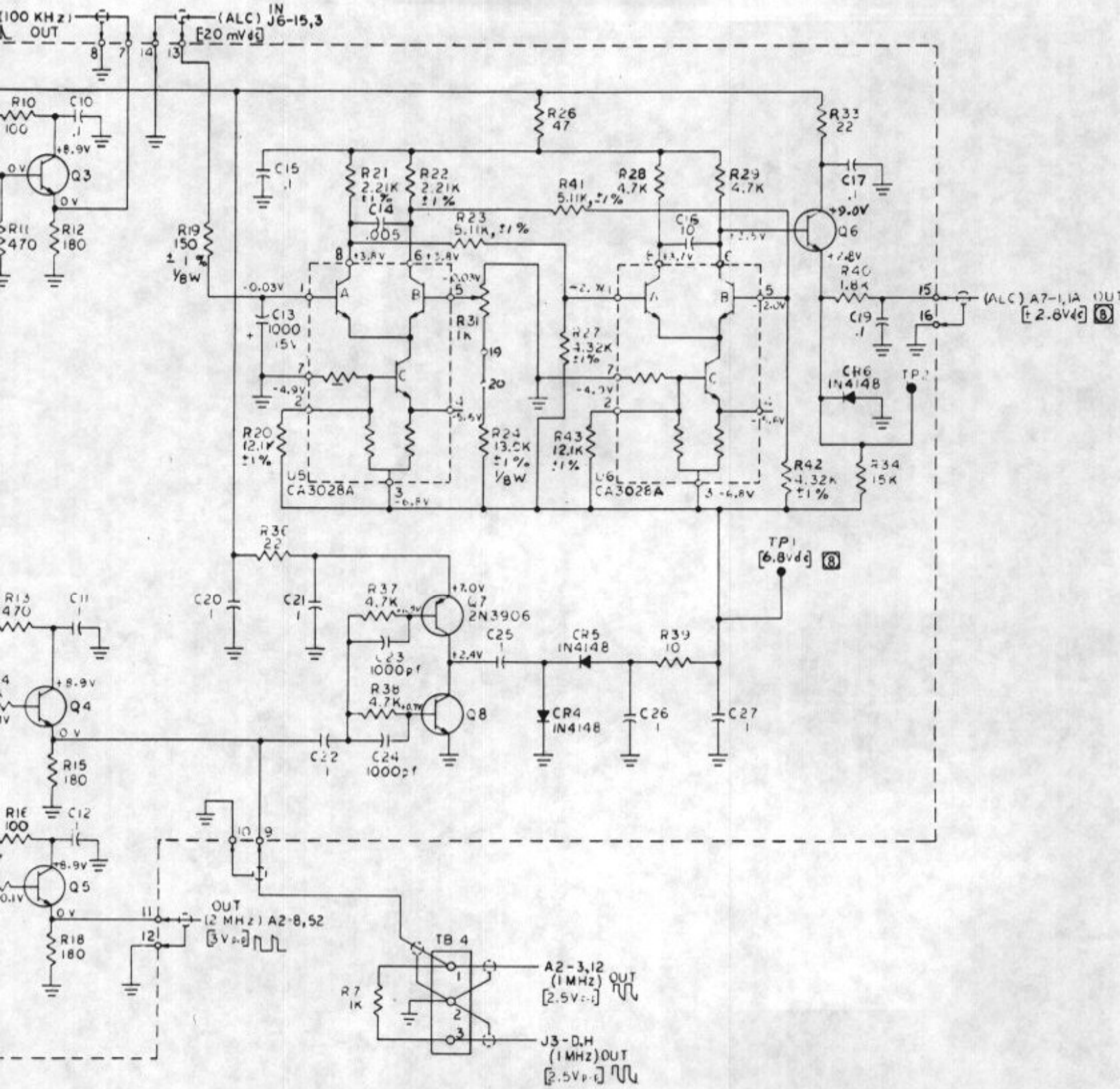
Code No.	Manufacturer	Address
14908	Electronics Instruments and Specialty Corp.	Stoneham, Maine
14949	Trompeter Electronics, Inc.	Chatsworth, Calif.
15636	Elec-trol, Inc.	Saugus, Calif.
15801	Fenwal Electronics	Farmington, Mass.
17235	Control Data Corp.	Westlake Village, Calif.
17856	Siliconix, Inc.	Santa Clara, Calif.
18041	Power Components	Woodland Hills, Calif.
18324	Signetics	Sunnyvale, Calif.
18612	Vishay Resistor Products	Malvern, Pa.
21317	Electronic Applications Co.	So. El Monte, Calif.
21604	Buckeye Stamping Co.	Columbus, Ohio
24152	S and EI Mfg.	Northridge, Calif.
24446	G. E. Corp.	Schenectady, N. Y.
24655	General Radio	Concord, Mass.
24759	Lenox-Fugle Electronics, Inc.	So. Plainfield, N. J.
24796	AMF Inc.	San Juan Capistrano, Calif.
24972	Telefunken Sales Corp.	Long Island, N. Y.
26805	American Microwave Industries Inc.	Waltham, Maine
27014	National Semiconductor Corp.	Santa Clara, Calif.
28480	Hewlett-Packard	Palo Alto, Calif.
29525	Hytronics Corp.	Pinellas Park, Fla.
31951	Triridge Corp.	Pittsburg, Pa.
32171	Modutec	Norwalk, Conn.
32539	Mura Corp.	Great Neck, N. Y.
32997	Bourns, Inc. Trimpot Div.	Riverside, Calif.
34371	Harris Semiconductors, Inc.	Melbourne, Fla.
43543	Nytronics Inc.	Alpha, N. J.
44655	Ohmite Mfg. Co.	Skokie, Ill.
49675	RCA Electronic Prod. Div.	Camden, N. J.
50522	Monsanto Co. Electronic Special Prod.	Cupertino, Calif.
56289	Sprague Electric Co.	North Adams, Mass.
58474	Superior Elect. Co.	Bristol, Conn.
70109	Adams and Westlake Co.	Elkhart, Ind.
70903	Belden Corp.	Chicago, Ill.
71279	Cambridge Thermionic Corp.	Cambridge, Mass.
71400	Bussman Mfg.	St. Louis, Mo.
71450	CTS Corp.	Elkhart, Ind.
71468	ITT Cannon	Santa Ana, Calif.
71590	Centralab Electronics	Milwaukee, Wis.
71785	Cinch Mfg., Div. of United Carr	Chicago, Ill.
72136	Electro-Motive Mfg. Co.	Willimantic, Conn.
72699	General Instrument Corp.	Newark, N. J.
72982	Erie Technological Products Inc.	Erie, Pa.

Table 3-23. Code List of Manufacturers (Cont.)

Code No.	Manufacturer	Address
73445	Amperex Electronics Co.	Hicksville, N. Y.
73559	Carling Electric Inc.	Hartford, Conn.
74970	Johnson, E.F.	Waseca, Minn.
75042	TRW Electronic Components	Philadelphia, Pa.
75915	Littlefuse Inc.	Des Plaines, Ill.
76493	Miller, J. W.	Compton, Calif.
77068	Bendix Corp.	North Hollywood, Calif.
77820	Bendix Corp., Electrical Components Div.	Sidney, N. Y.
77969	Rubbercraft Corp. of Calif.	Torrance, Calif.
77970	Smith, A. O. Corp.	Milwaukee, Wis.
80126	Pacific Electricord Co.	Redondo Beach, Calif.
80294	Bourns, Inc.	Riverside, Calif.
80740	Beckman Instruments Inc.	Fullerton, Calif.
80795	ITT Semiconductors	New York, N. Y.
81073	Garyhill, Inc.	La Grange, Ill.
81095	Triad Transformer Corp.	Venice, Calif.
81483	International Rectifier Corp.	Los Angeles, Calif.
81564	Artted Co. Inc.	Springfield, Mass.
82389	Switchcraft Inc.	Chicago, Ill.
83003	Varo Inc.	Garaland, Texas
83330	Smith, Herman H. Inc.	Brooklyn, N. Y.
88245	Litton Precision Products	Van Nuys, Calif.
88869	Singer Instrumentation	Los Angeles, Calif.
89873	Cortland Industries Inc.	Chicago, Ill.
90201	Mallory Capacitor Co.	Indianapolis, Ind.
91293	Johanson Mfg. Co.	Boonton, N. J.
91506	Augat Inc.	Attleboro, Mass.
91637	Dale Electronics, Inc.	Columbus, Nebr.
91737	Gremar Mfg. Co.	Woburn, Mass.
94375	Plessey Connector Div.	Commack, N. Y.
95121	Quality Components Inc.	St. Marys, Pa.
95264	Microdot	So. Pasadena, Calif.
95691	Arrow-Hart Inc.	Hartford, Conn.
95712	Bendix Corp.	Franklin, Ind.
98003	Nielsen Hardware Corp.	Hartford, Conn.
98291	Sealectro Corp.	Mamaroneck, N. Y.
99515	Marshall Industries Capacitor Div.	Monrovia, Calif.
99800	Delevan Electronics Corp.	East Aurora, N. Y.

Section IV

SCHEMATIC DIAGRAMS

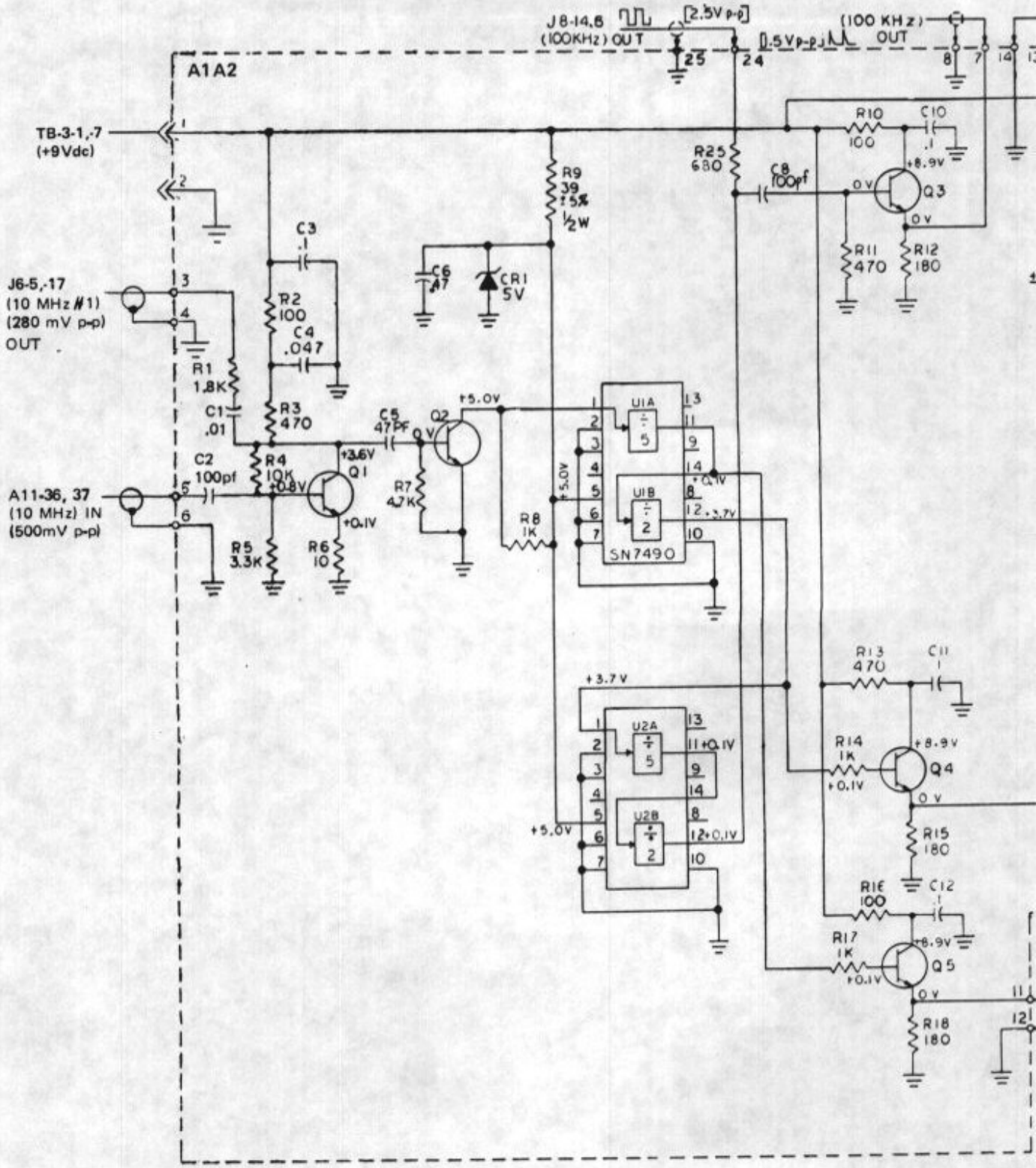


% 1/4 W.
DS.

WN: FOR COMPLETE
A2). EXAMPLE "A1A2C3"
U4 ARE OMITTED
TYPICAL.
APPLIED,

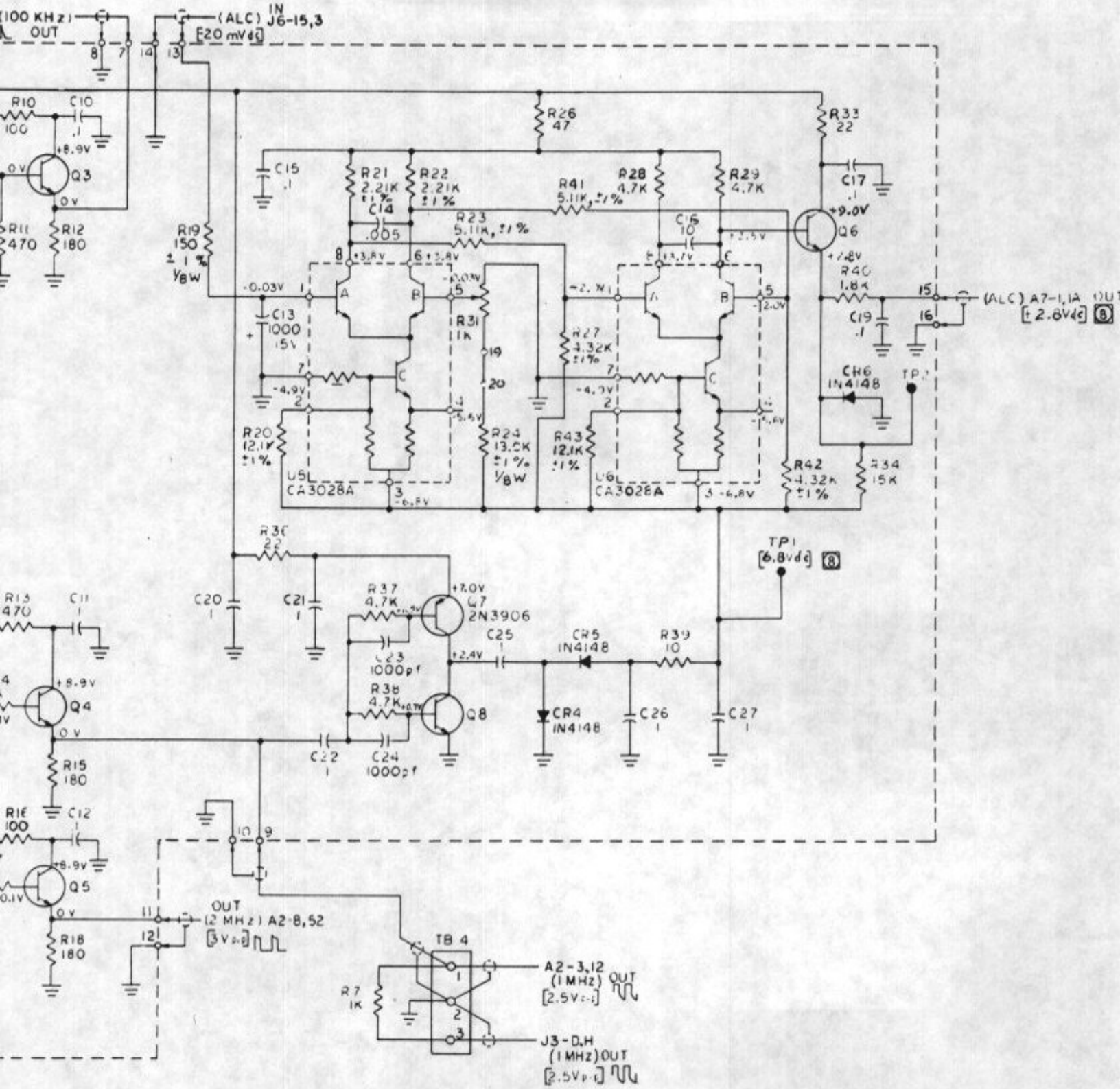
ASE ENABLED AND ALC

Figure 4-1. Schematic Diagram,
Divider/ALC Assembly (A1A2) and TB4, R7
Dwg. No. 4-501176-001(G)



NOTES: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTOR VALUES ARE IN OHMS, ±10% 1/4 W.
2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
3. ALL TRANSISTORS ARE 2N3904.
4. PARTIAL REFERENCE DESIGNATORS ARE SHOWN: FOR COMPLETE DESIGNATION PREFIX WITH ASSY Nº. (A1A2). EXAMPLE "A1A2C
5. C18, C3, CR2, CR3, R30, R32 R36, U3 & U4 ARE OMITTED
6. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
7. ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED, (DISABLE INTERNAL TIME BASE).
8. D.C. VOLTAGES TAKEN WITH INTERNAL TIME BASE ENABLED AND ALC LOOP CLOSED.

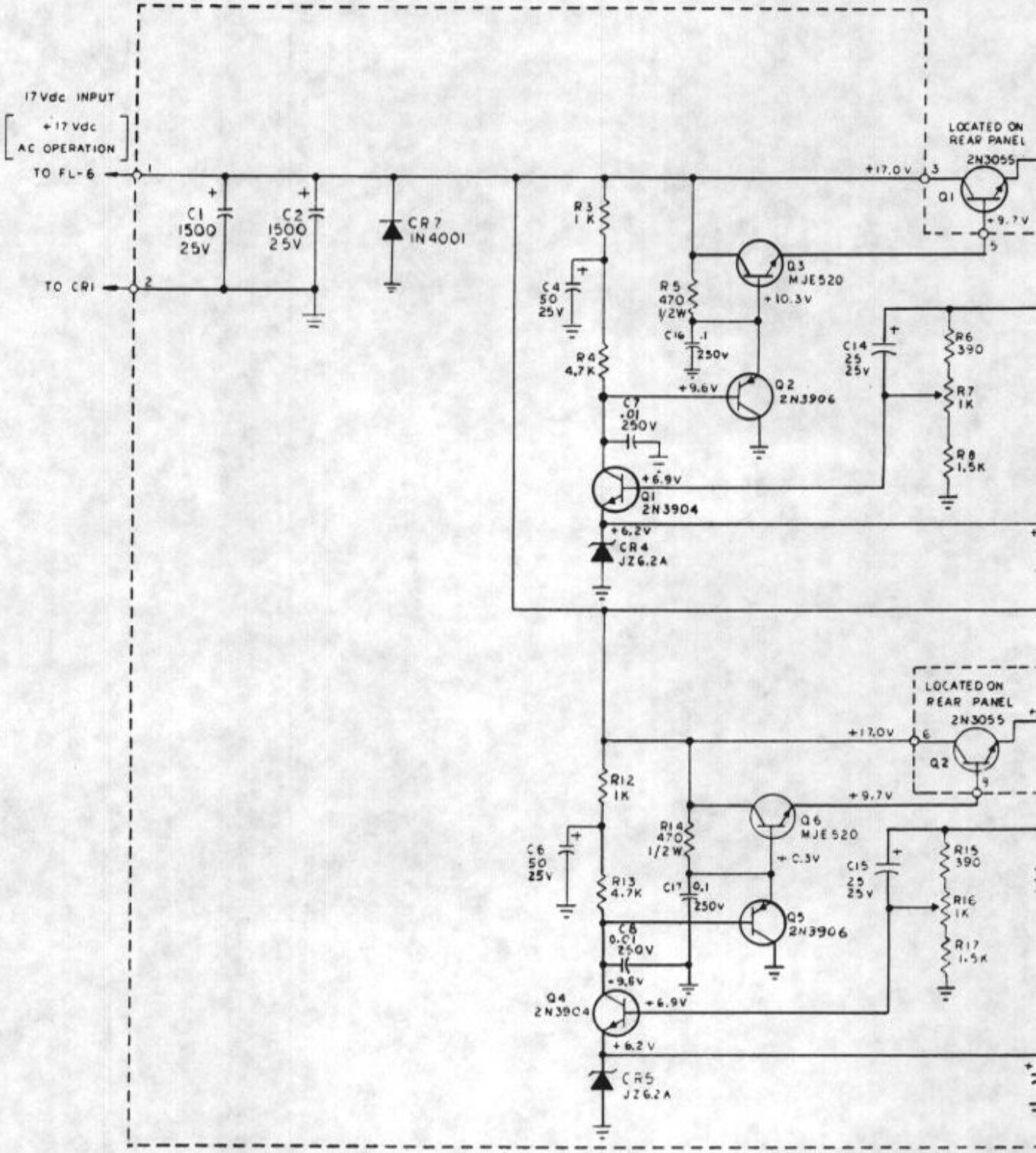


% 1/4 W.
DS.

WN: FOR COMPLETE
A2). EXAMPLE "A1A2C3"
U4 ARE OMITTED
TYPICAL.
APPLIED,

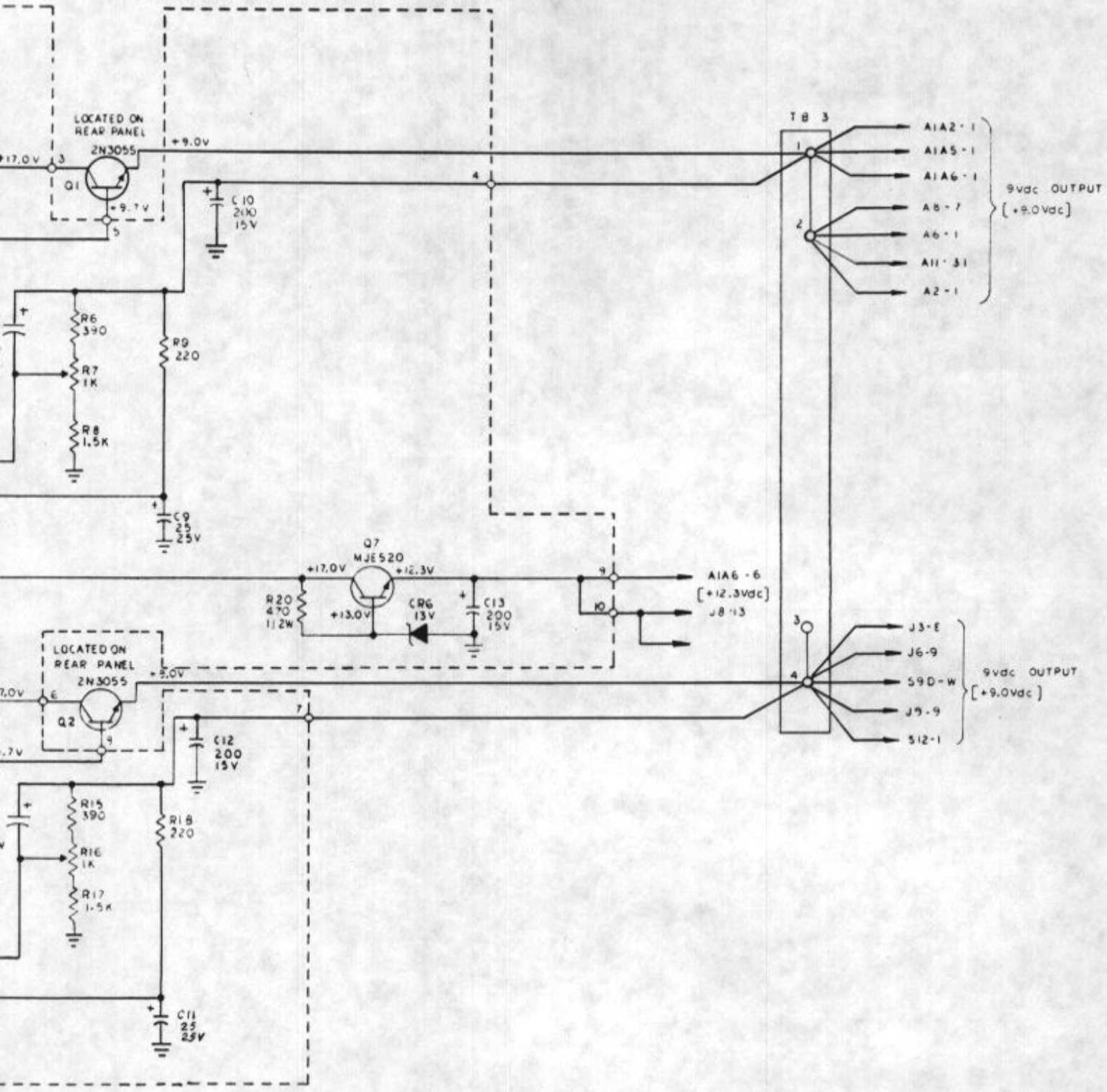
ASE ENABLED AND ALC

Figure 4-1. Schematic Diagram,
Divider/ALC Assembly (A1A2) and TB4, R7
Dwg. No. 4-501176-001(G)



HIGHEST REF DES USED			
C17	CR7	R20	Q7
REF DES NOT USED			
C3	CR1,CR3	R1, R2	
C5	CR2	R10, R11	
		R13	

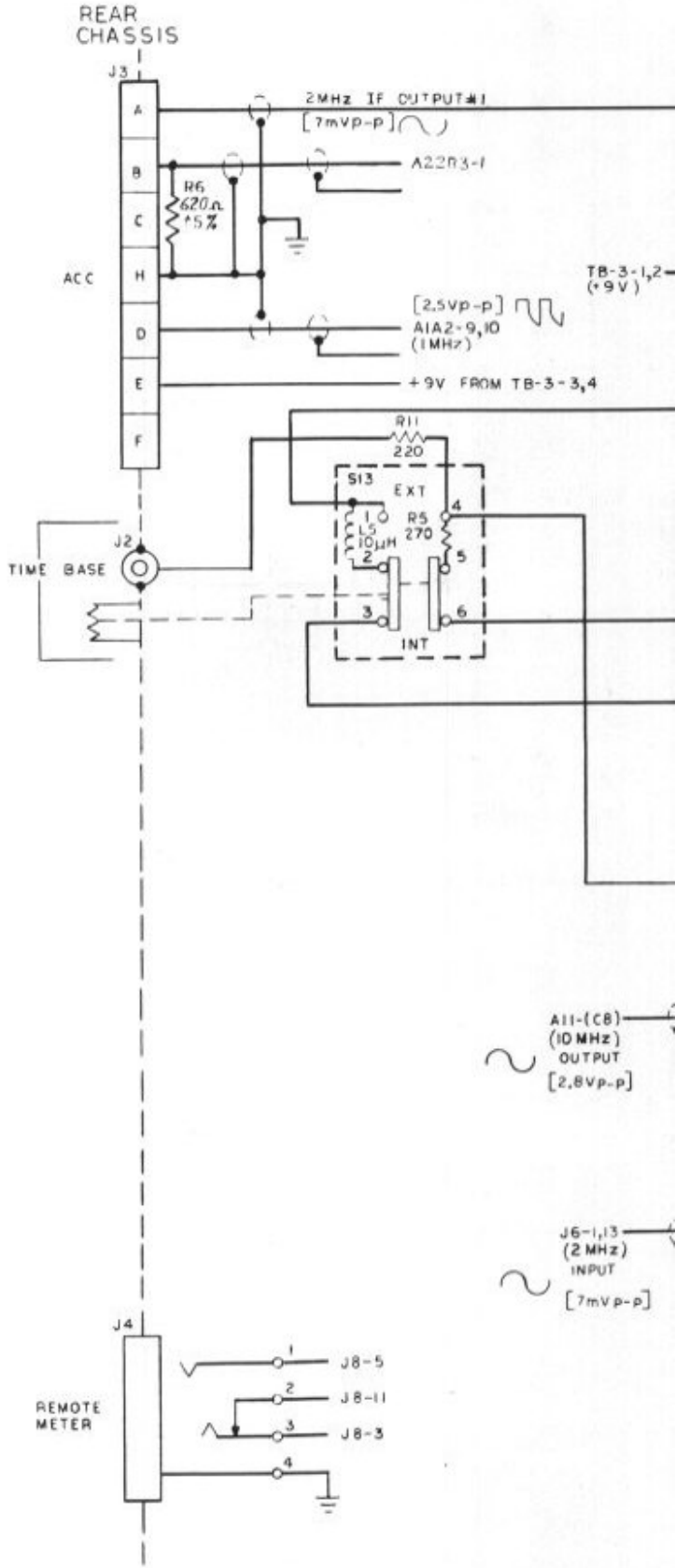
3. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
2. ALL RESISTORS ARE IN OHMS, ±10%, 1/4 W.
1. ALL CAPACITORS ARE IN MICROFARADS.



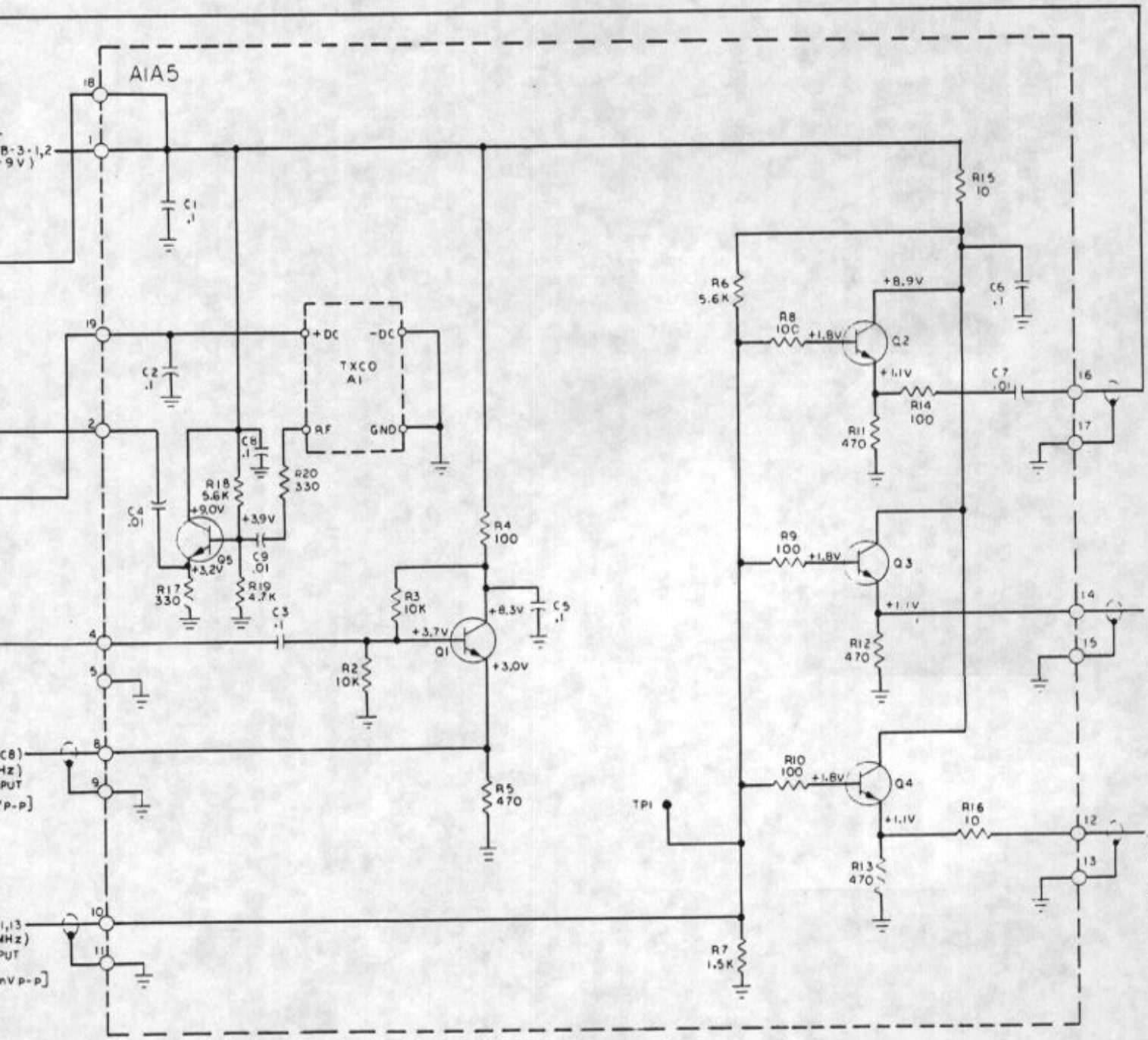
HIGHEST REF DES USED			
	CR7	R20	Q7
REF DES NOT USED			
	CR1,CR3	R1, R2	
	CR2	R10, R11	
		R13	

(For serial numbers 301 and above)

Figure 4-2. Schematic Diagram,
Power Supply Assembly (A1A3) and Q1 and TB3
Dwg. No. 4501351-001



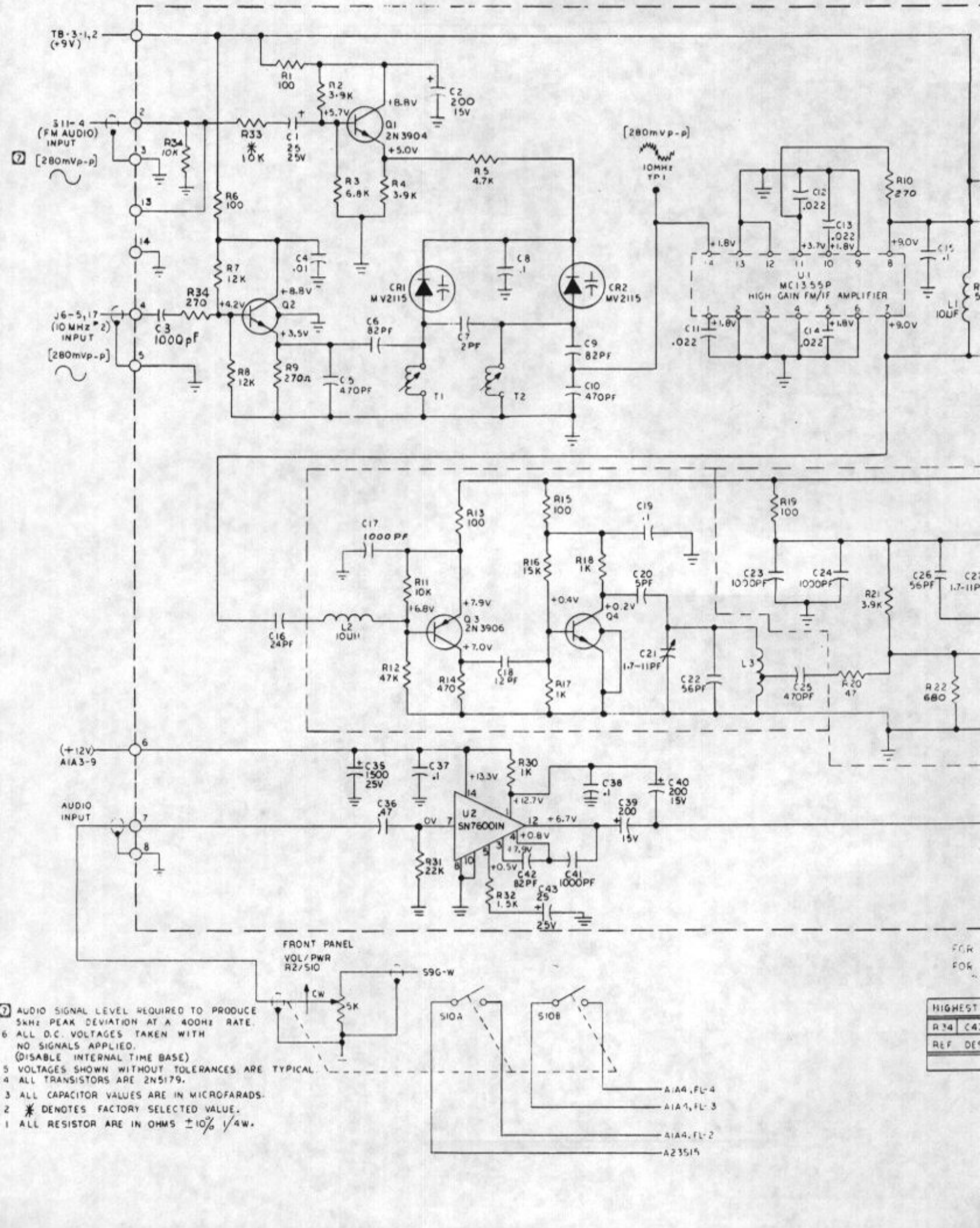
5 ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED. (DISABLE INTERNAL TIME BASE)
4 VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
3 ALL TRANSISTORS ARE 2N3904.
2 ALL CAPACITOR VALUES ARE IN MICROFARADS.
1 ALL RESISTOR VALUES ARE IN OHMS ±10%, 1/4W.



HIGHEST REF DESIGNATIONS USE							
R19	Q5	C9	A1	L5	S13	J4	
REF DESIGNATIONS NOT USED							
J1							

(For serial numbers 601 and above)

Figure 4-3. Schematic Diagram,
TCXO/IF Assembly (A1A5) and J2, J3, J4 and S13
Dwg. No. 4-501337(B)



? AUDIO SIGNAL LEVEL REQUIRED TO PRODUCE 5kHz PEAK DEVIATION AT A 400Hz RATE.

6 ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED. (DISABLE INTERNAL TIME BASE)

5 VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.

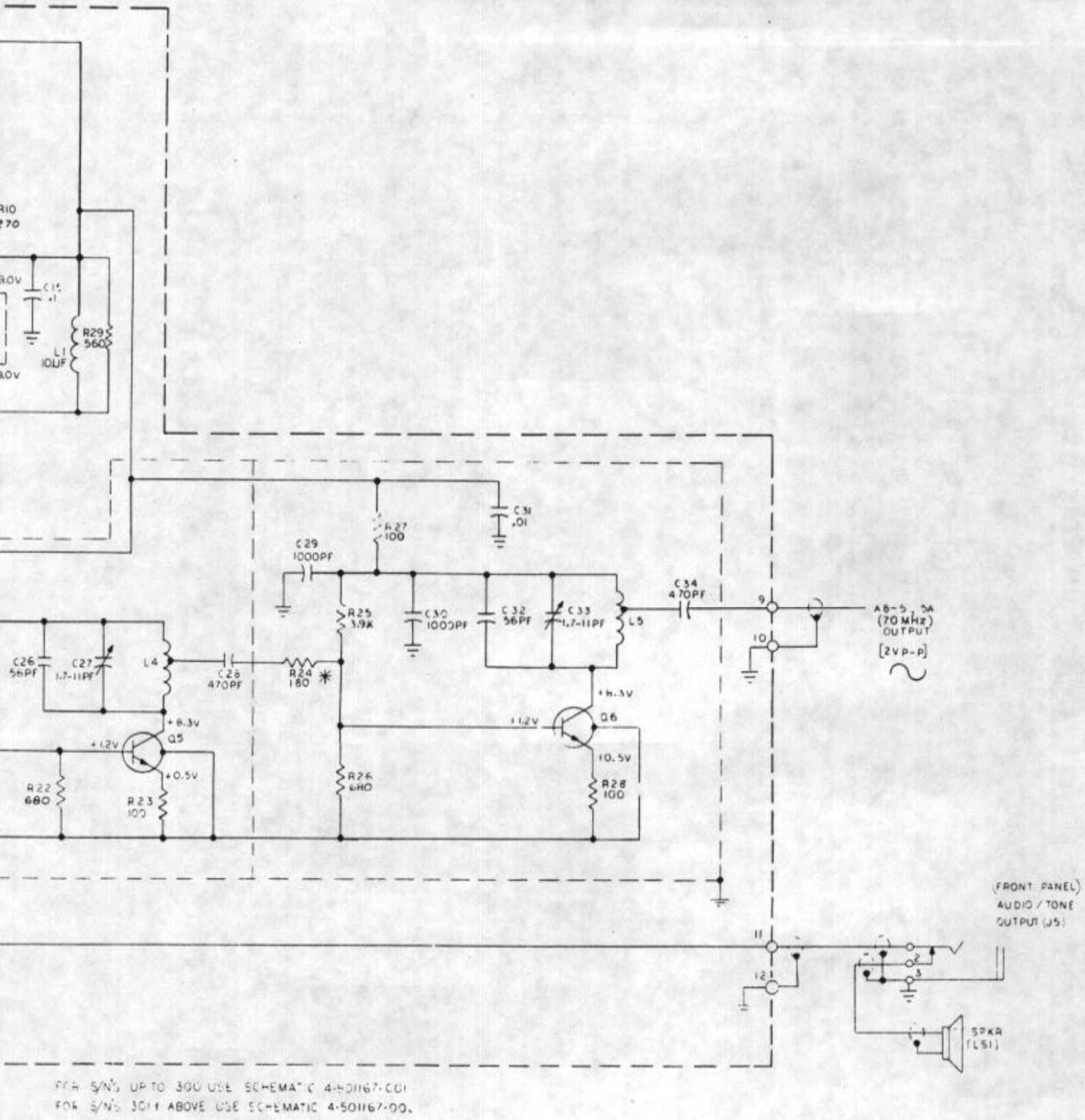
4 ALL TRANSISTORS ARE 2N5179.

3 ALL CAPACITOR VALUES ARE IN MICROFARADS.

2 * DENOTES FACTORY SELECTED VALUE.

1 ALL RESISTOR ARE IN OHMS ±10% 1/4W.

HIGHEST	
R34	C4
REF	DE



HIGHEST REF DESIGNATIONS USED						
R34	C43	Q6	CR2	T2	L5	U2
REF DESIGNATIONS NOT USED						

Figure 4-4. Schematic Diagram,
Phase Modulator/Audio Assembly (A1A6) and
J5, LS1 and R2/S10
Dwg. No. 4-501167-002(H)

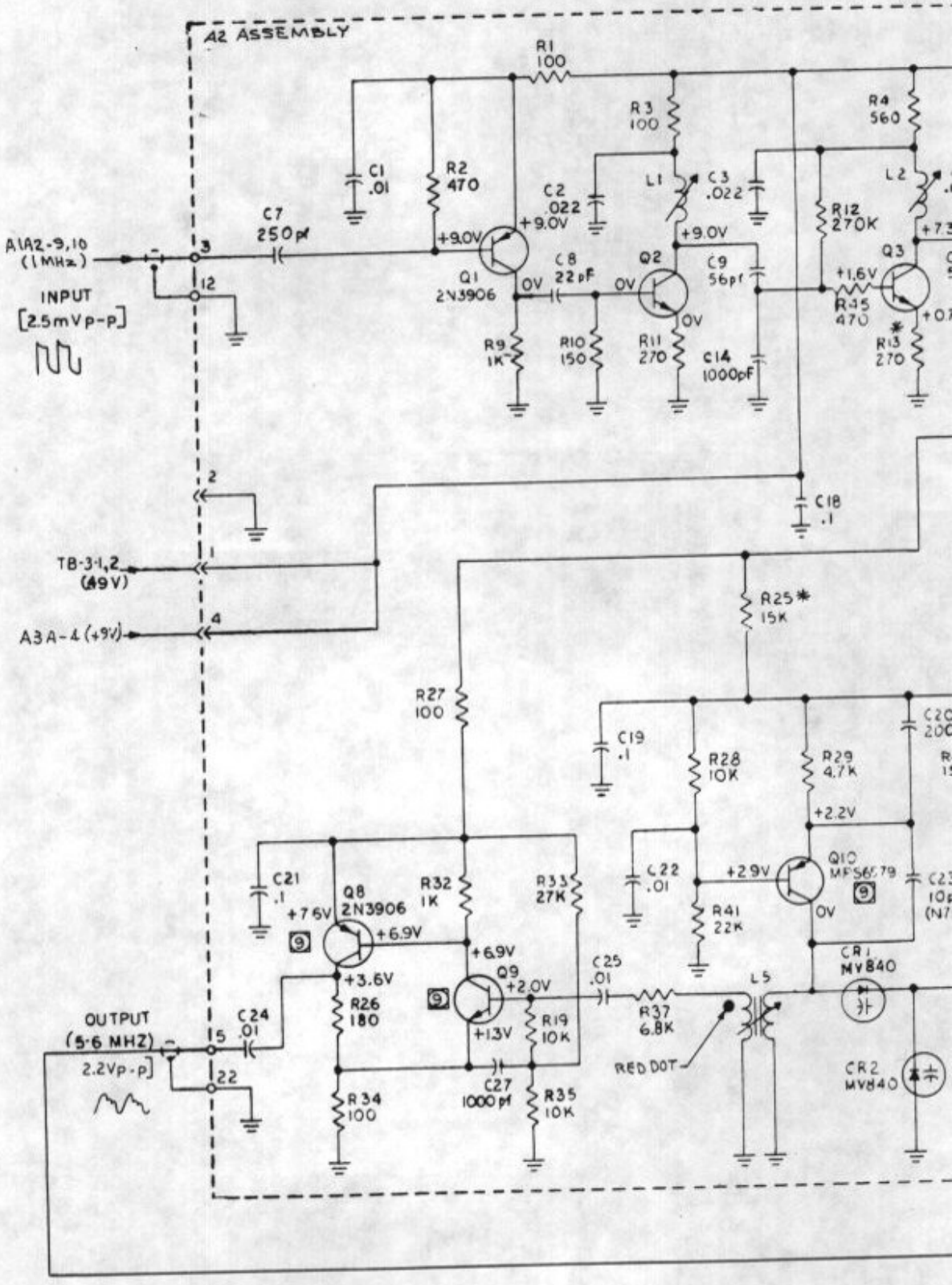
FIED

IN OHMS, ±10%, ¼W.
E IN MICROFARADS.
904.
NATORS ARE SHOWN;
N PREFIX WITH ASSY
".

T TOLERANCES ARE TYPICAL.
WITH NO SIGNALS APPLIED.
ABSE).
LUE.
I VCO SWITCH S8 IN N.O.

UIRED TO PRODUCE 10 kHz
IN 100 kHz SWITCH S7.

EEP OFF SWITCH S16 IS ON.



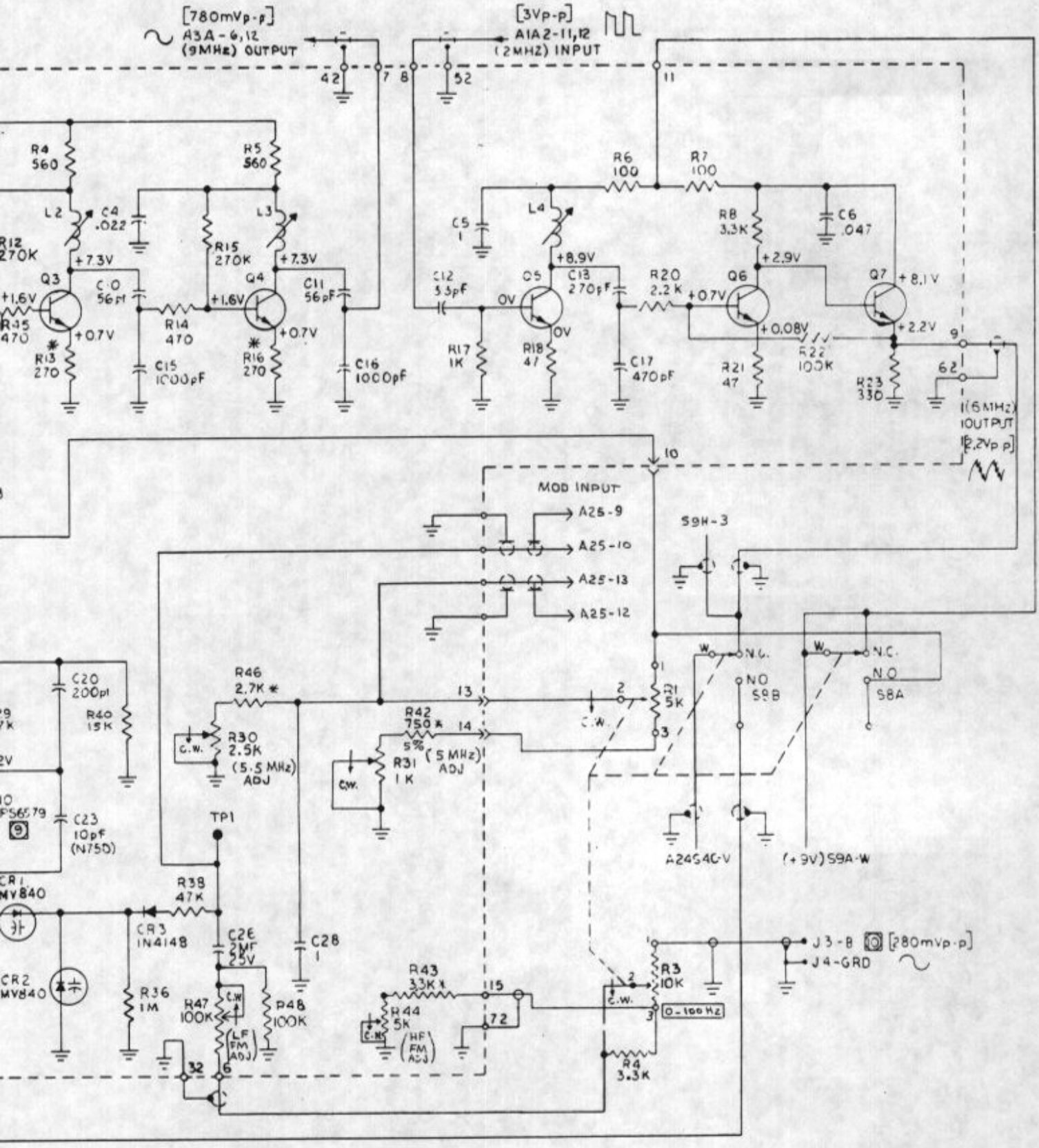
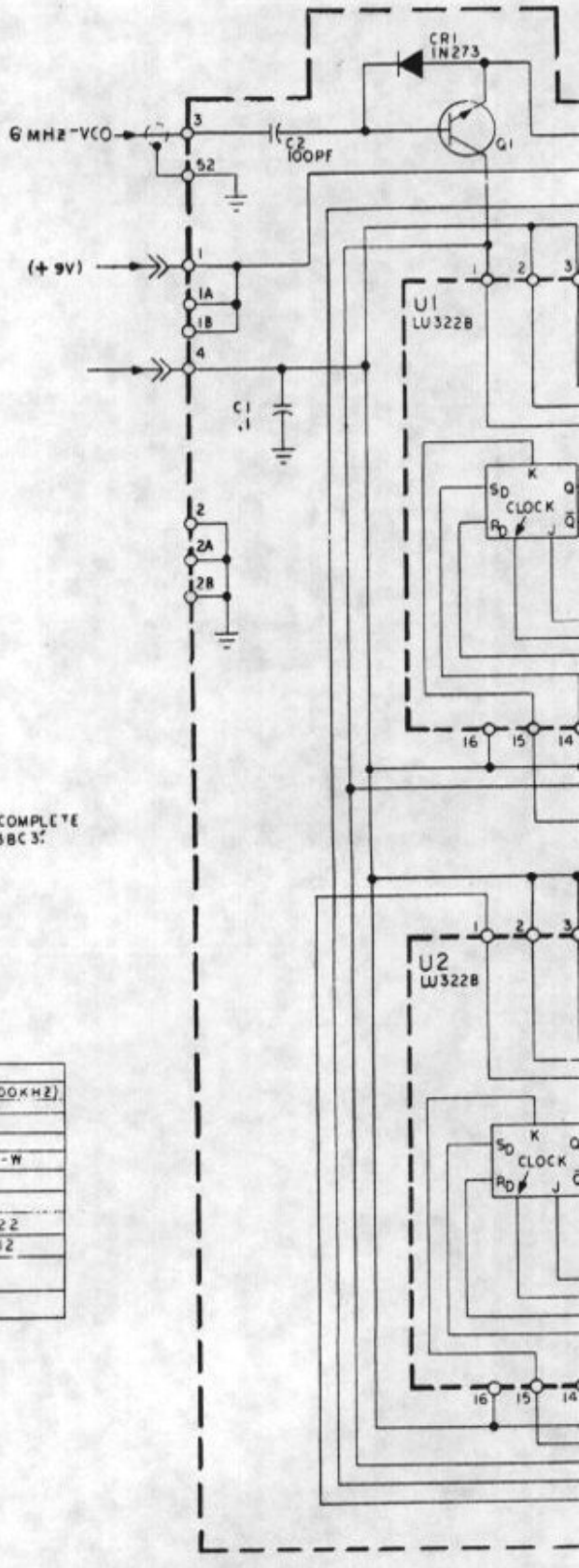


Figure 4-5. Schematic Diagram, VCO, 6, 9 MHz Board (A2) and 0-100 Hz Control Assembly and R4 Dwg. No. 4-501350-001(C)



5 C3 IS OMITTED.

4. PARTIAL REFERENCE DESIGNATORS ARE SHOWN FOR COMPLETE DESIGNATION PREFIX WITH ASSY No (3A8), EXAMPLE "A3BC3".

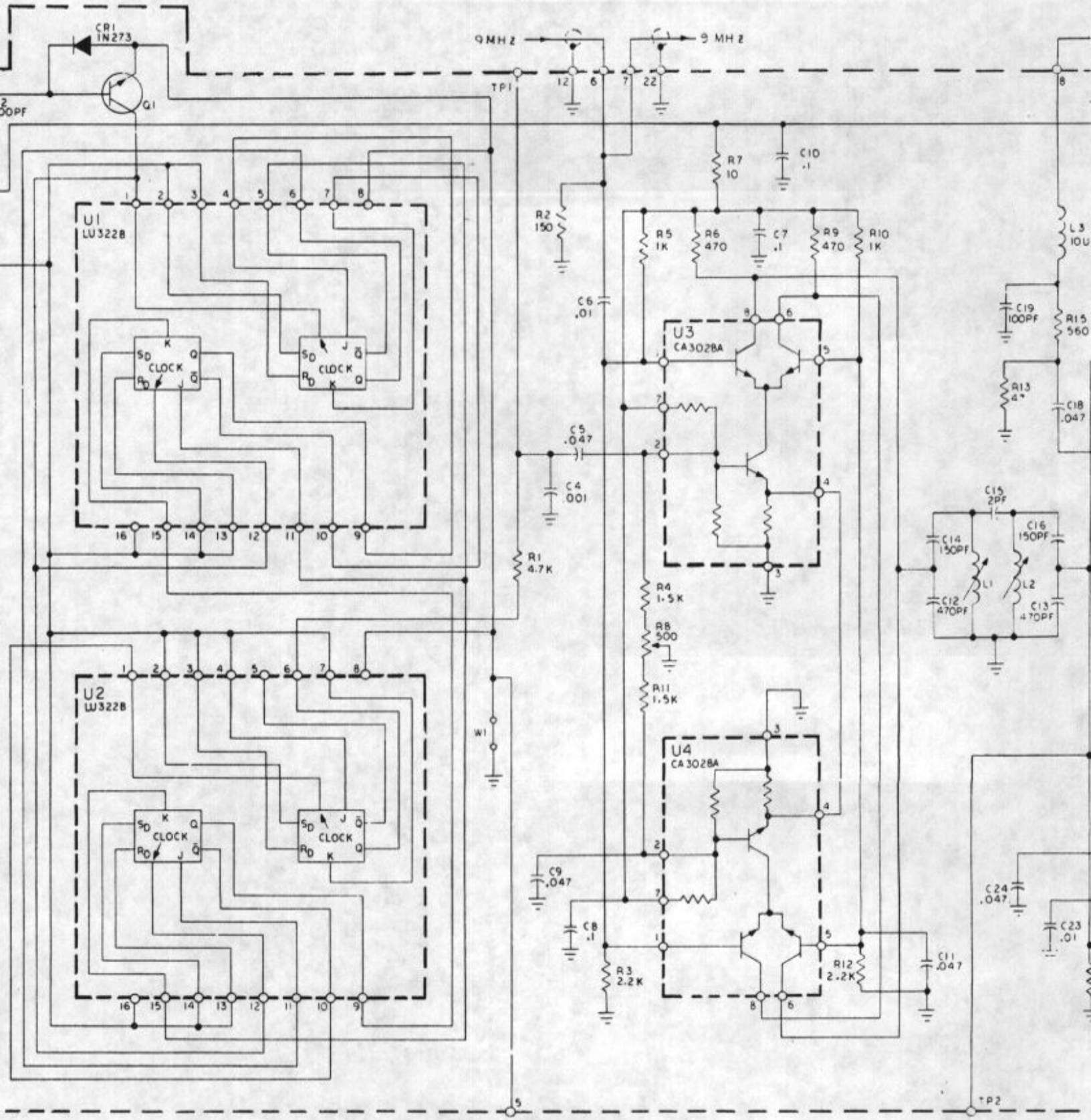
3. ALL TRANSISTORS ARE 2N3904.

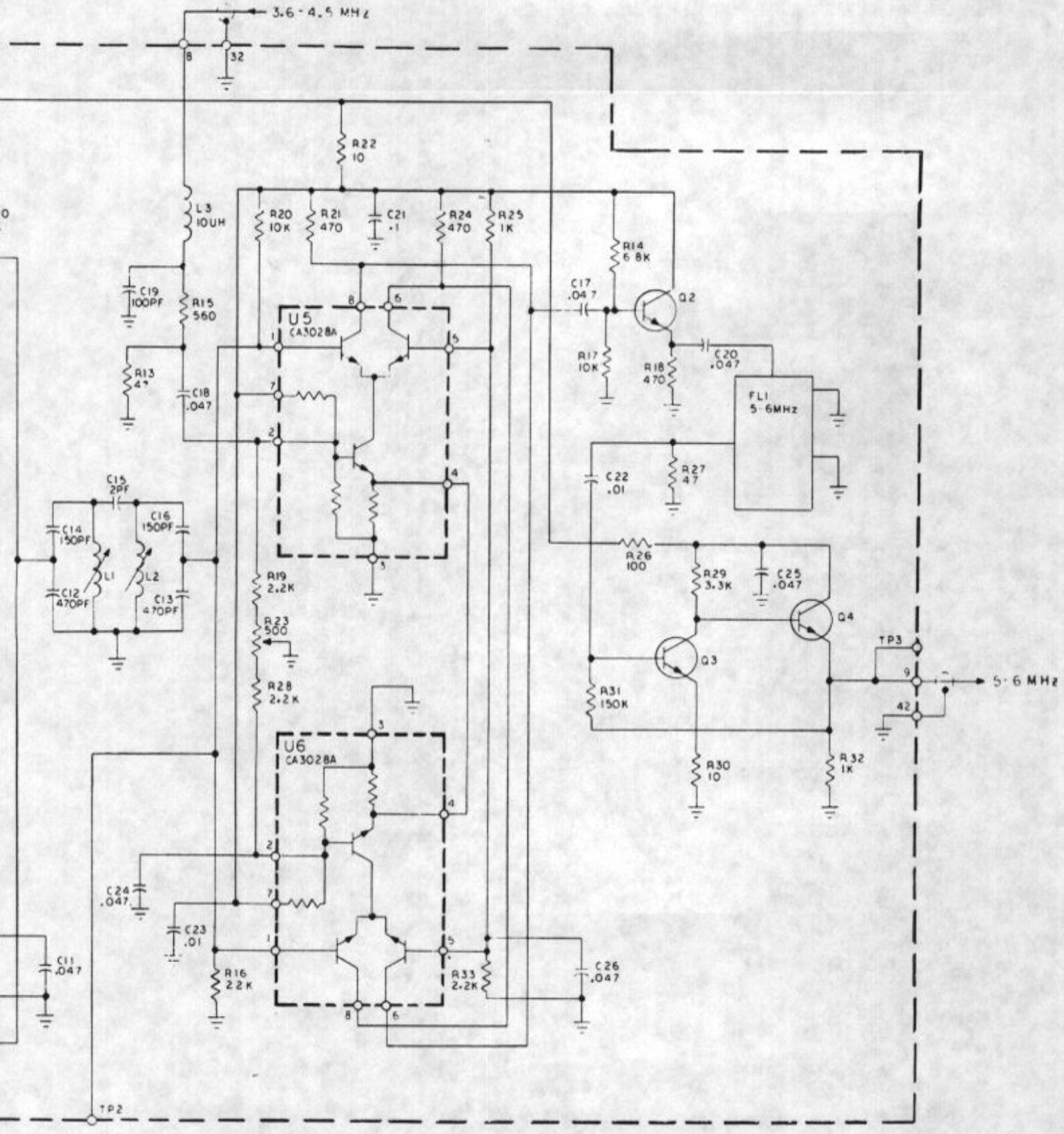
2. ALL CAPACITOR VALUES ARE IN MICROFARADS.

1. ALL RESISTOR VALUES ARE IN OHMS, ±10%, 1/4W.

NOTES: UNLESS OTHERWISE SPECIFIED

	ASSEMBLY			
	A3A (100HZ)	A3B (1KHZ)	A3C (10KHZ)	A3D (100KHZ)
FROM	TO	TO	TO	TO
1	A2454-B	A2455-B	A2456B-D	S7B D
2,2A,2B	GRD	GRD	GRD	GRD
3	S7C-V	A2454C-W	A2455C-W	A2476C-W
4	A2-4	A3A-5	A3D-5	A6-2
5	A3B-4	—	—	A3C-4
6	A2-7, 42	A3A-7, 22	A3B-7, 22	A3C-7, 22
7	A3b 6, 12	A3C-6, 12	A3D 6, 12	J6-24, 12
8	A2454A-W, 24	A2455A W, 23	A2457A-W, 22	S7A-W
9	A2454C-10	A2455C-10	A2456C D	S7C-D


CR1
1N273
Q1
9 MHz
9 MHz
TP1
12
6
7
22
8
R7
10
C10
.1
R2
150
R5
1K
R6
470
C7
.1
R9
470
R10
1K
L3
10u
C6
.01
U3
CA3028A
C19
100PF
R15
560
R13
47
C18
.047
C5
.047
C4
.001
C15
2PF
C14
150PF
C16
150PF
L1
L2
C12
470PF
C13
470PF
R1
4.7K
R4
1.5K
R8
500
R11
1.5K
U1
LM3228
U2
LM3228
CLOCK
W1
U4
CA3028A
C9
.047
C8
.1
R3
2.2K
R12
2.2K
C11
.047
C24
.047
C23
.01
TP2

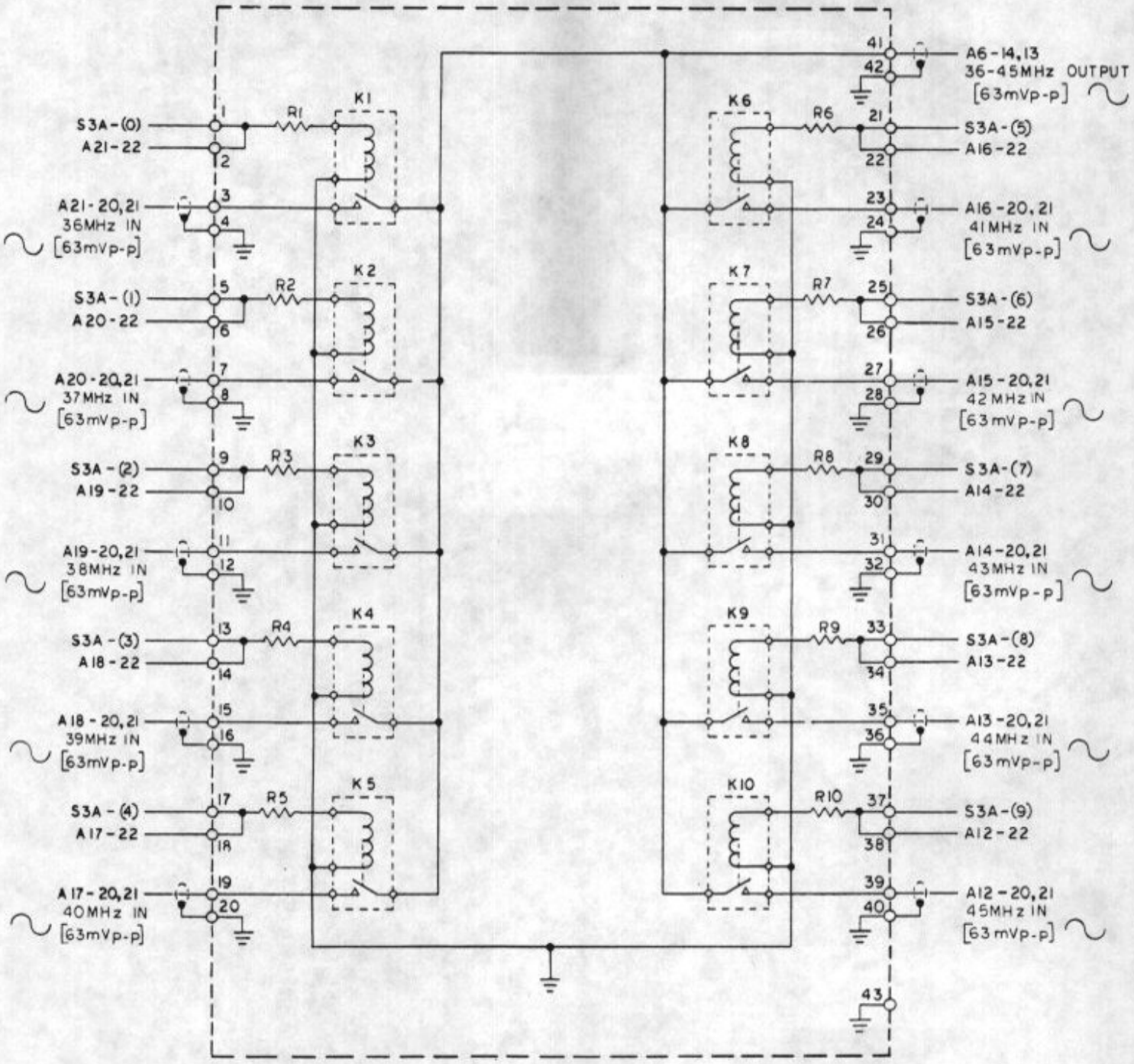


(For serial numbers 301 and above)

Figure 4-6. Schematic Diagram,
.1, 1, 10, 100 kHz Decade Assemblies
(A3A, A3B, A3C, A3D)
Dwg. No. 4-501172-001(G)

NOTES: UNLESS OTHERWISE SPECIFIED

1.
2 ALL RESISTORS ARE 68Ω, ±10%, 1/2W.
3 VOLTAGES SHOWN WITHOUT TOLERANC



RE TYPICAL.

Figure 4-7. Schematic Diagram, 1 MHz Decade Switching Programming Assembly (A4A) Dwg. No. 4-501160-001(A)

NOTES: UNLESS OTHERWISE SPECIFIED

1.

2. ALL RESISTORS ARE 68Ω, ±10%, 1/2W.

3. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.

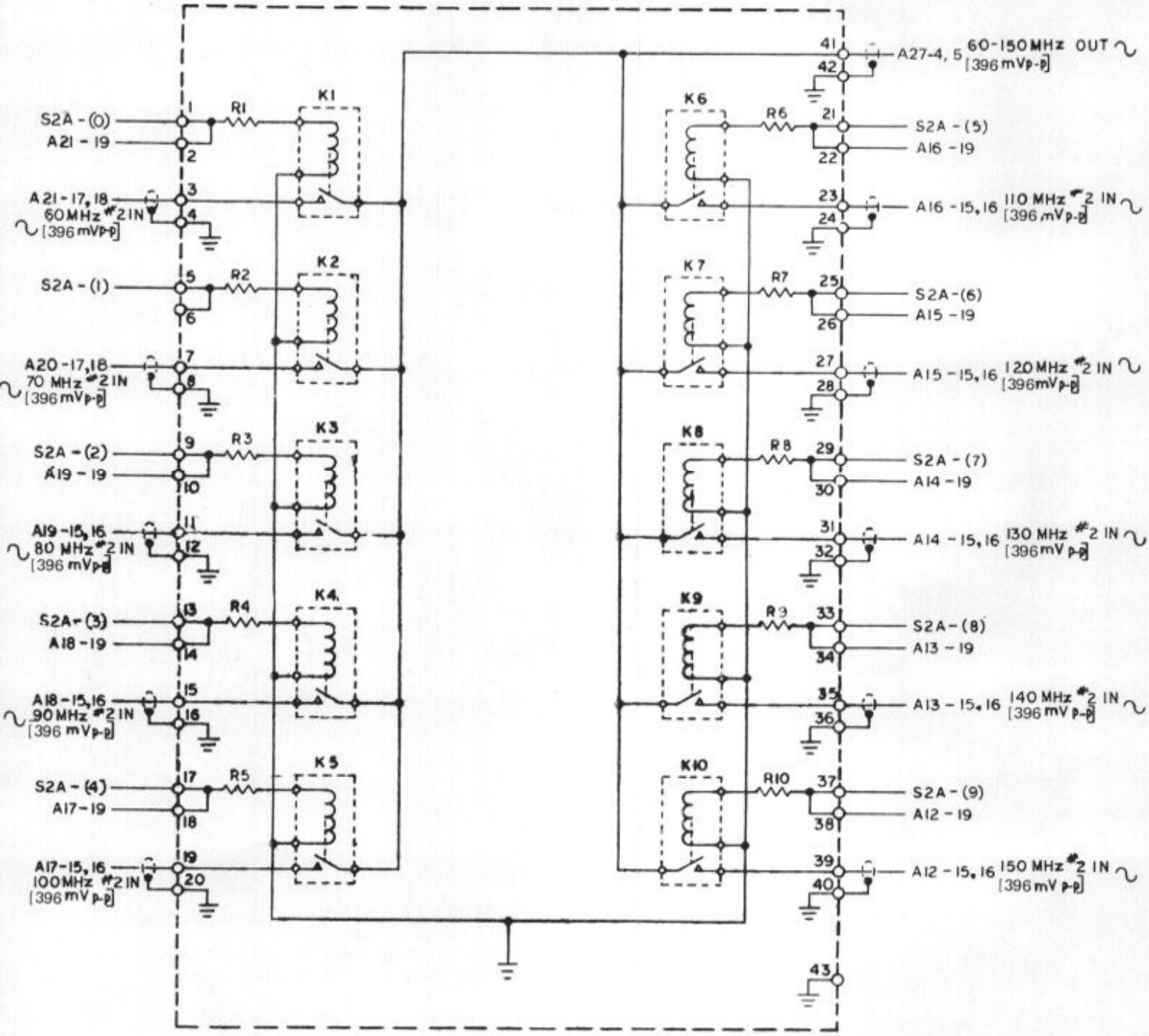
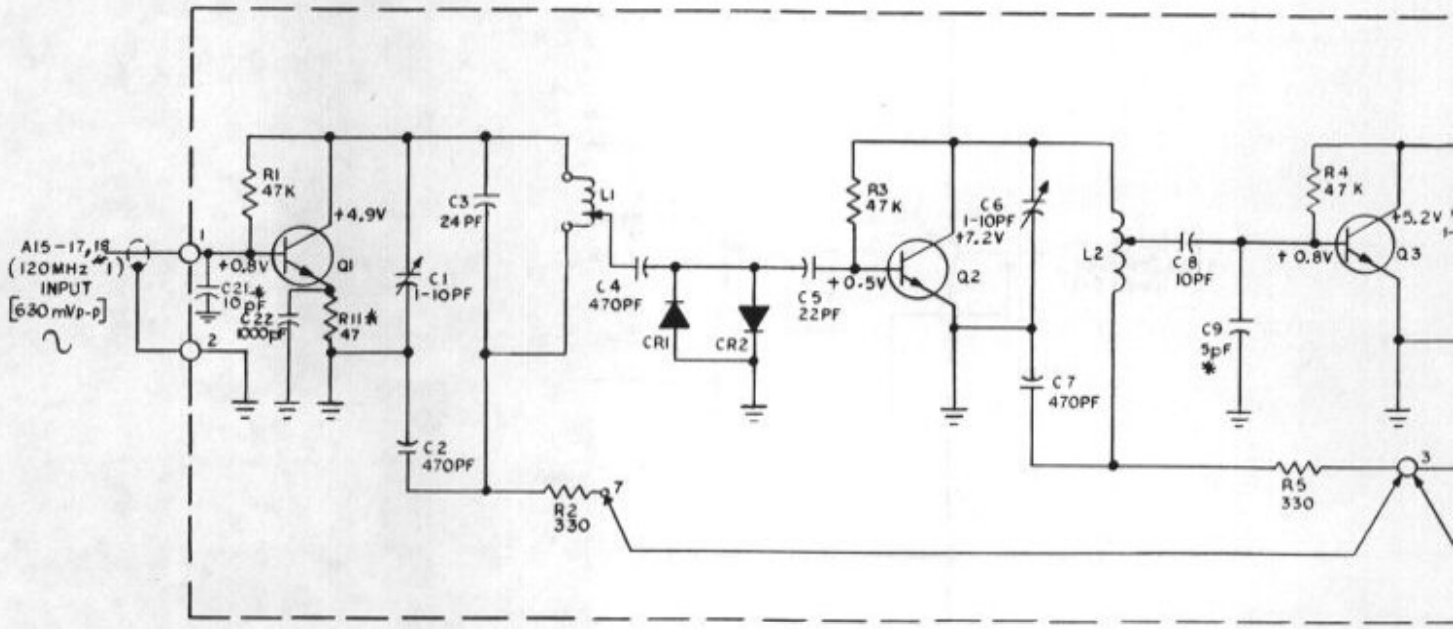


Figure 4-8. Schematic Diagram,
10 MHz Decade Switching
Programming Assembly (A4B)
Dwg. No. 4-501353-001(A)



6 ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED AND 100 MHz SWITCH S1 IN THE "5" POSITION. (DISABLE INTERNAL TIME BASE).

5 VOLTAGES SHOWN WITHOUT TOLERANCES.

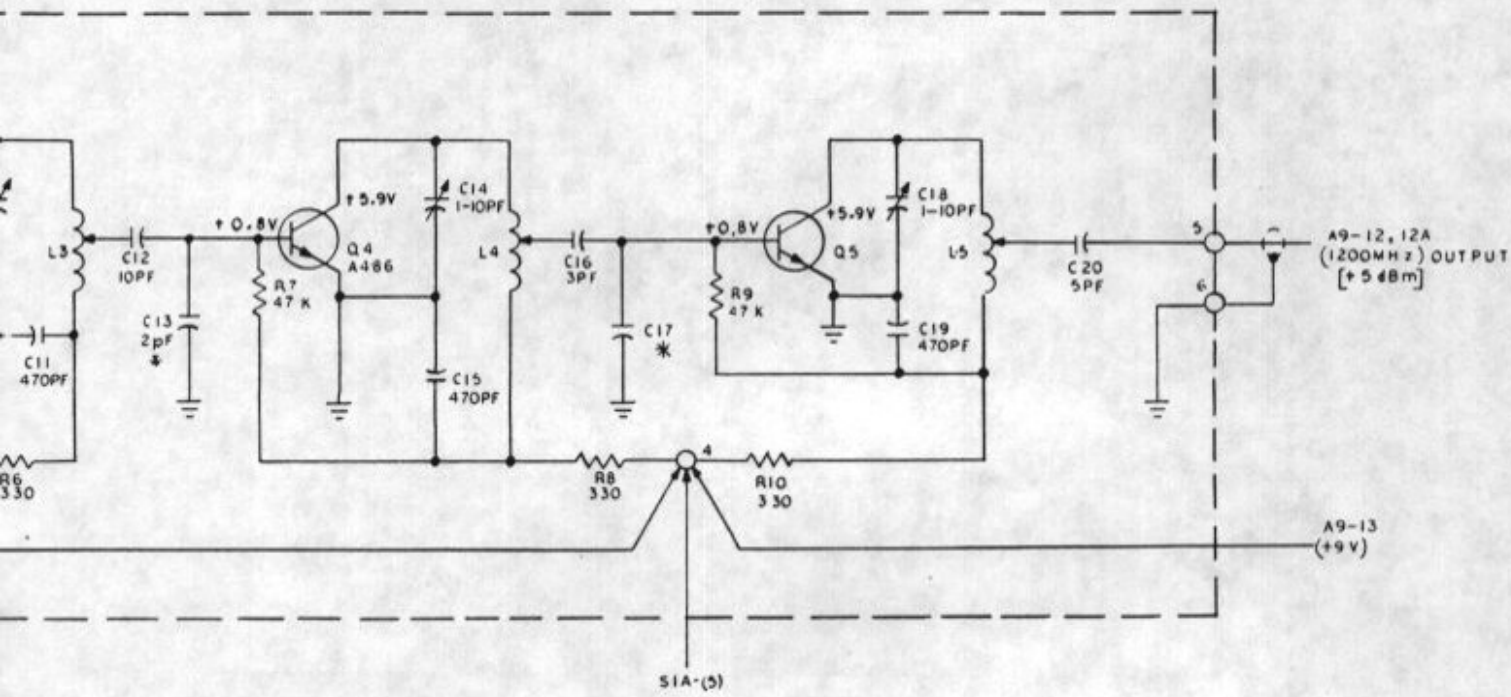
4 * DENOTES FACTORY SELECTED VALUE, MAY BE OMITTED.

3 ALL DIODES ARE IN273.

2 ALL TRANSISTORS ARE 2N5179.

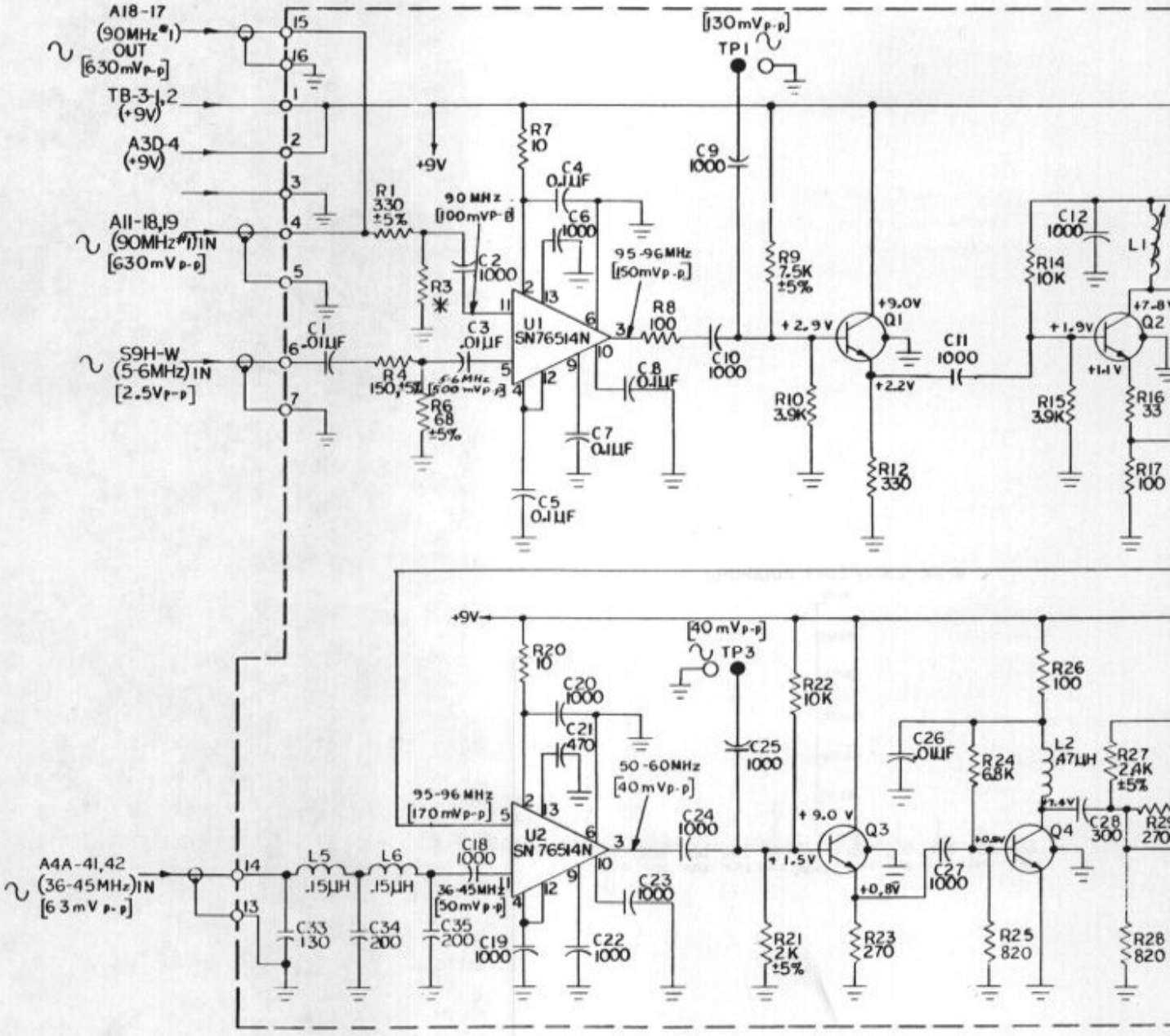
1. ALL RESISTORS ARE IN OHMS ±10%, 1/4W.

NOTES: UNLESS OTHERWISE SPECIFIED



HIGHEST REF DESIGNATIONS USED						
L9	Q5	C22	R11	CR2		
REF DESIGNATIONS NOT USED						

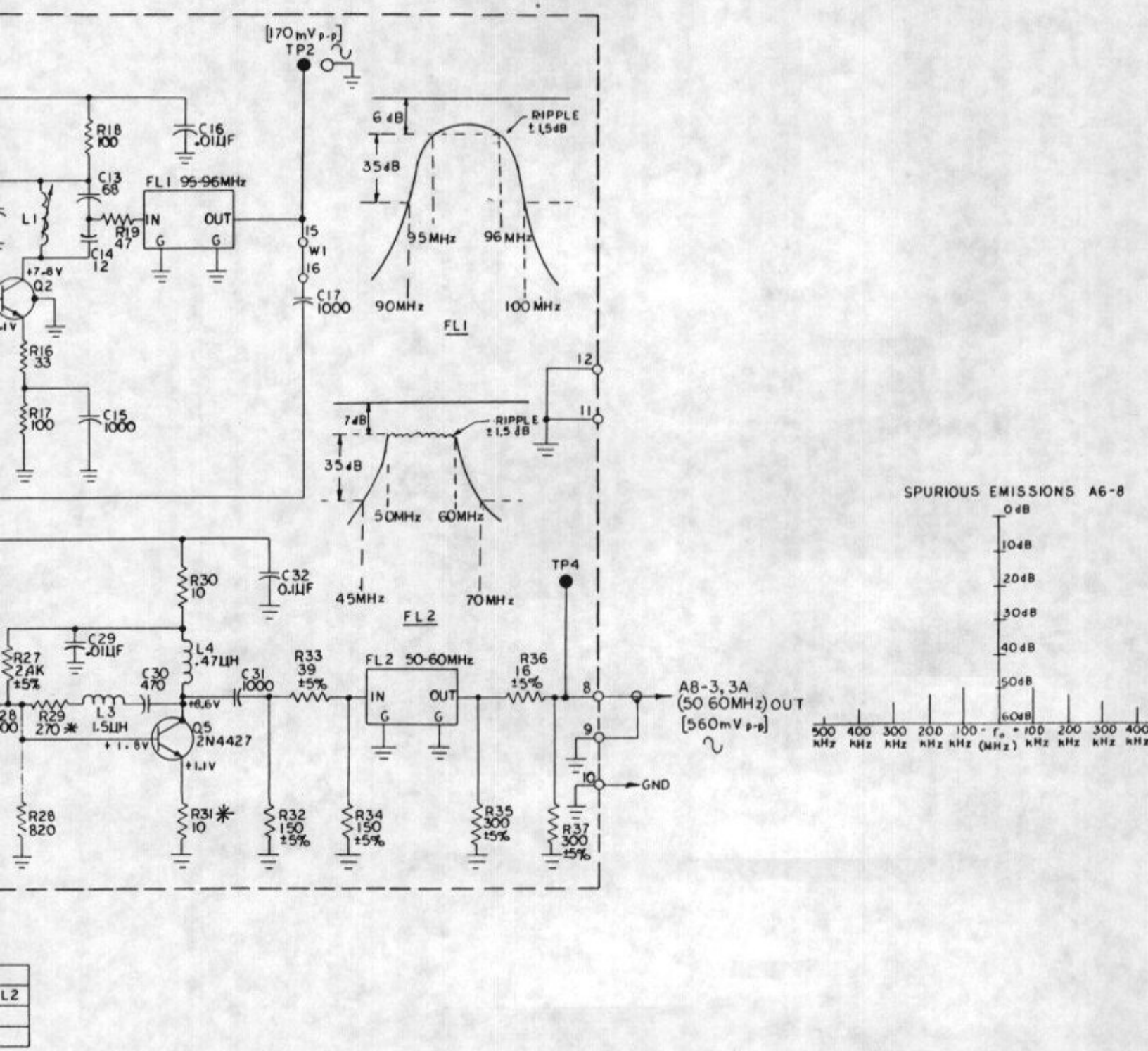
Figure 4-9. Schematic Diagram,
1200 MHz Multiplier Assembly (A5)
Dwg. No. 4-501163-001(B)



HIGHEST REF DES USED					
R37	C35	Q5	L6	U2	FL2
REF DES NOT USED					
R11					
R13					
R5					
R2					

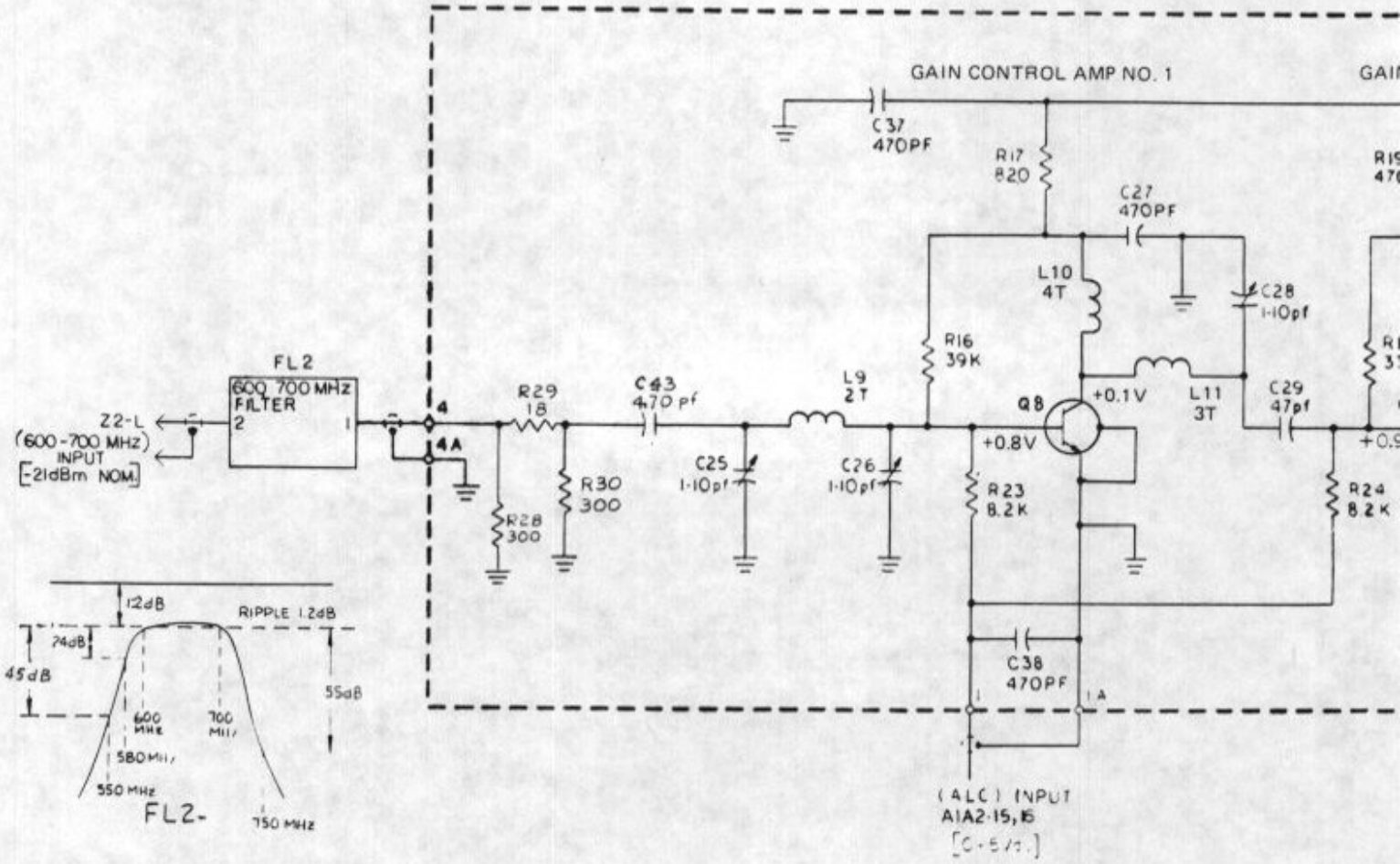
7. ALL DC VOLTAGES TAKEN WITH NO SIGNAL APPLIED, (DISABLE INTERNAL TIME BASE)
6. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL
5. * DENOTES FACTORY SELECTED VALUE
4. PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH ASSY Nº (A6) EXAMPLE: "A6C3"
3. ALL CAPACITOR VALUES ARE IN PICOFARADS
2. ALL TRANSISTORS ARE 2N5179
1. ALL RESISTOR VALUES ARE IN OHMS, ±10%, ¼W

NOTES: UNLESS OTHERWISE SPECIFIED



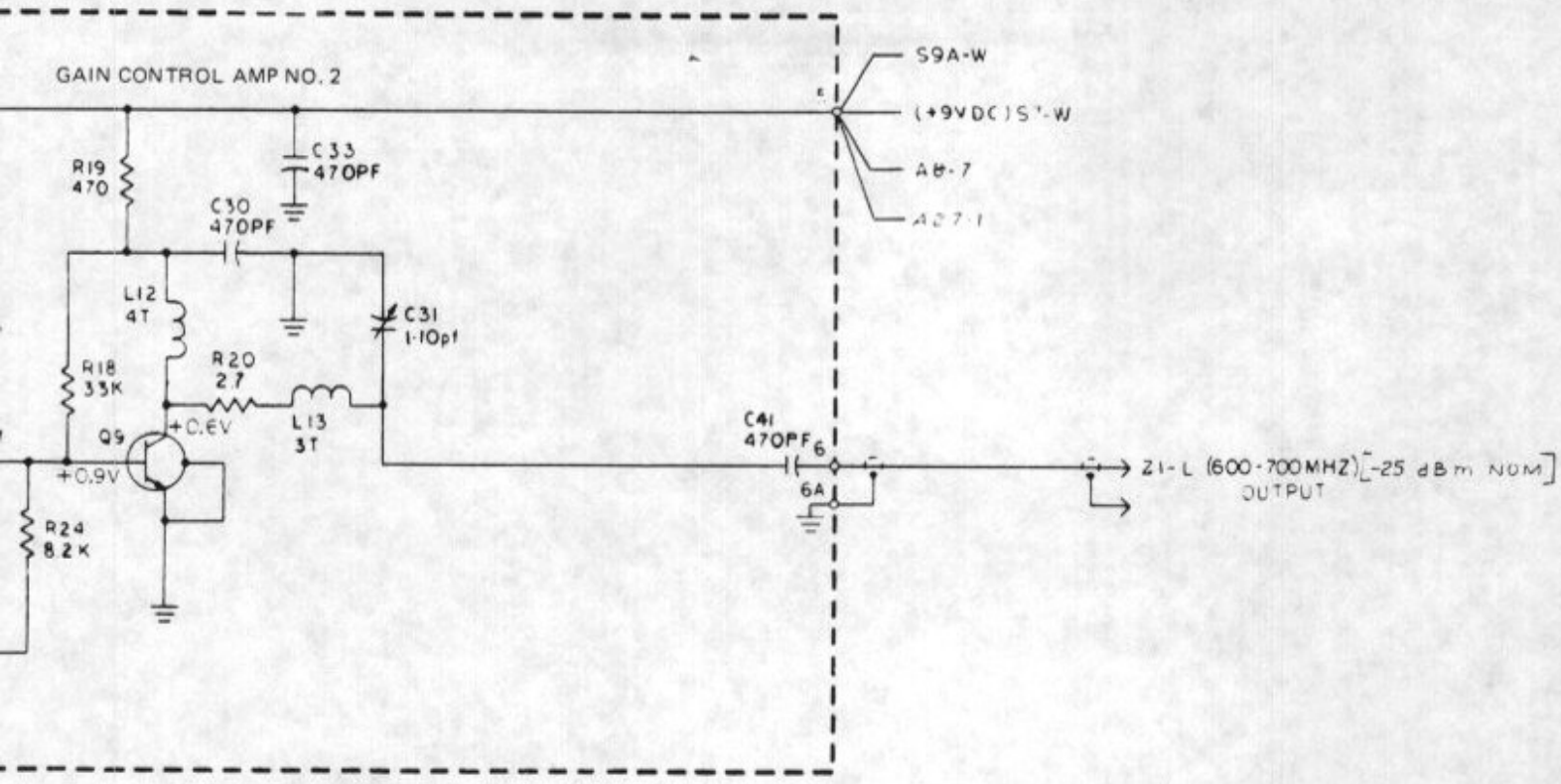
(For serial numbers 301 and above)

Figure 4-10. Schematic Diagram,
1 MHz Decade Assembly (A6)
Dwg. No. 4-501180-002(I)



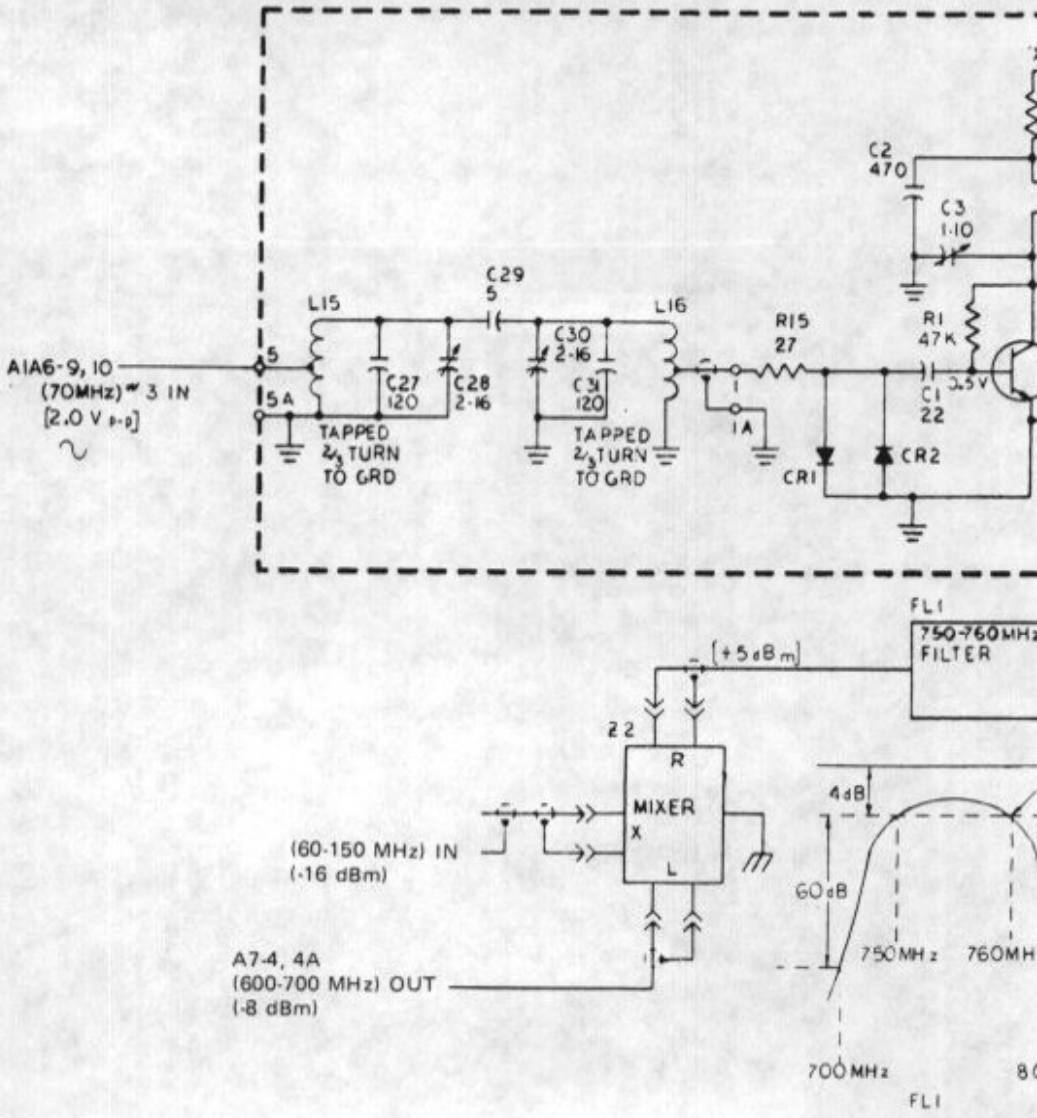
NOTES: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTOR VALUES ARE IN OHMS, ±10%, 1/4W.
2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
3. ALL TRANSISTORS ARE 2N5179.
4. • DENOTES FACTORY SELECTED VALUE.
5. PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO.(A7), EXAMPLE "A7C3"
6. LEVEL REQUIRED FOR 30% MODULATION.
7. VOLTAGES & POWER LEVELS SHOWN WITHOUT TOLERANCES ARE TYPICAL.
8. ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED. (DISABLE INTERNAL TIME BASE)

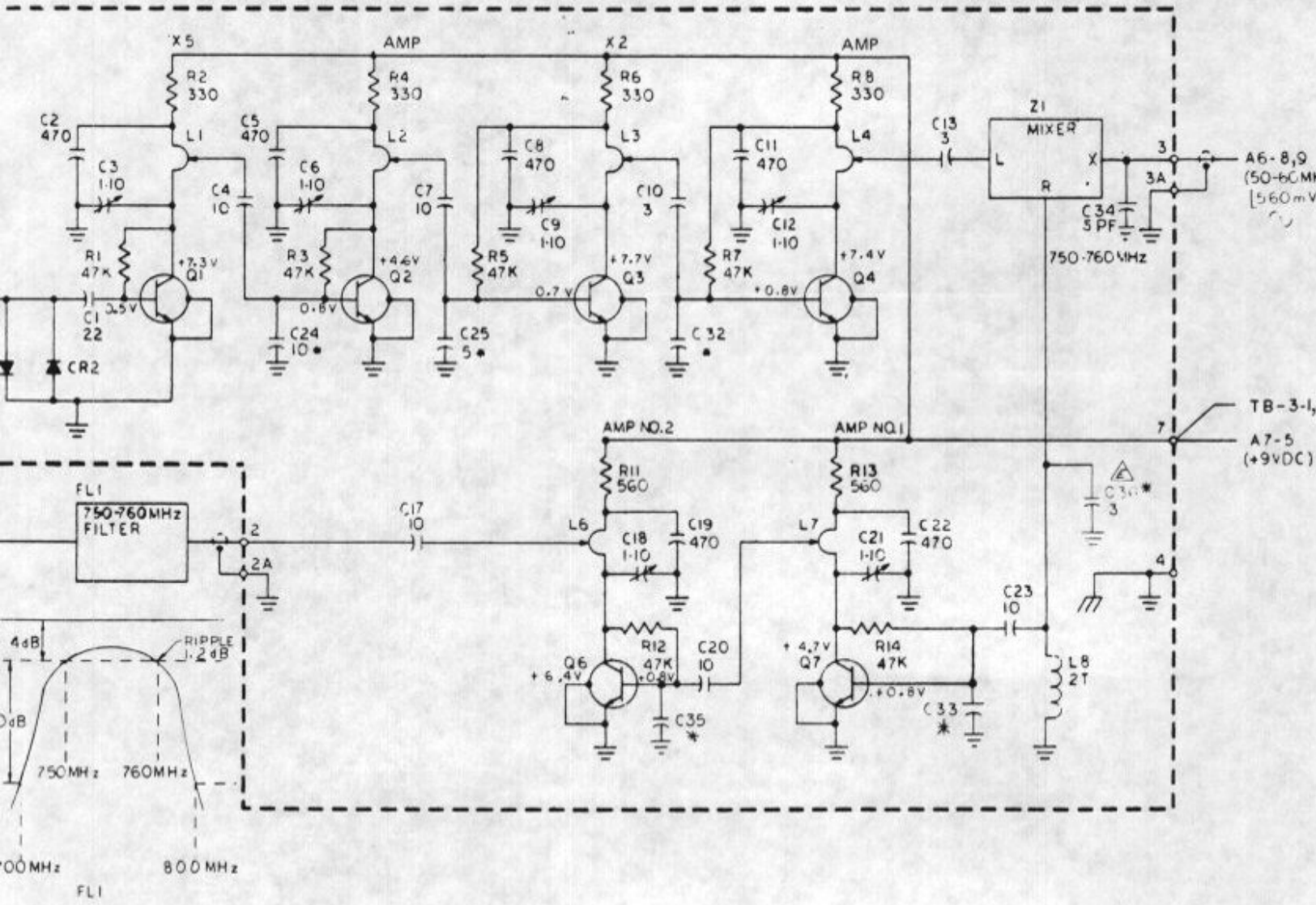


(For use with serial numbers 801 and above)

Figure 4-11. Schematic Diagram,
Gain Control Amp
Assembly (A7) and FL2
Dwg. No. 4-501181-002



NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTOR VALUES ARE IN OHMS, ± 10%, 1/4W
2. ALL CAPACITOR VALUES ARE IN PICOFARADS
3. ALL DIODES ARE 1N273
4. ALL TRANSISTORS ARE 2N5179
5. *DENOTES FACTORY SELECTED VALUE
6. PARTIAL REFERENCE DESIGNATORS ARE SHOWN: F
   DESIGNATION PREFIX WITH ASSY NO. (A8), EXAMPL
7. VOLTAGES AND POWER LEVELS SHOWN WITHOUT T
8. ALL D.C. VOLTAGES TAKEN WITH NO SIGNAL APPL
   TIME BASE)

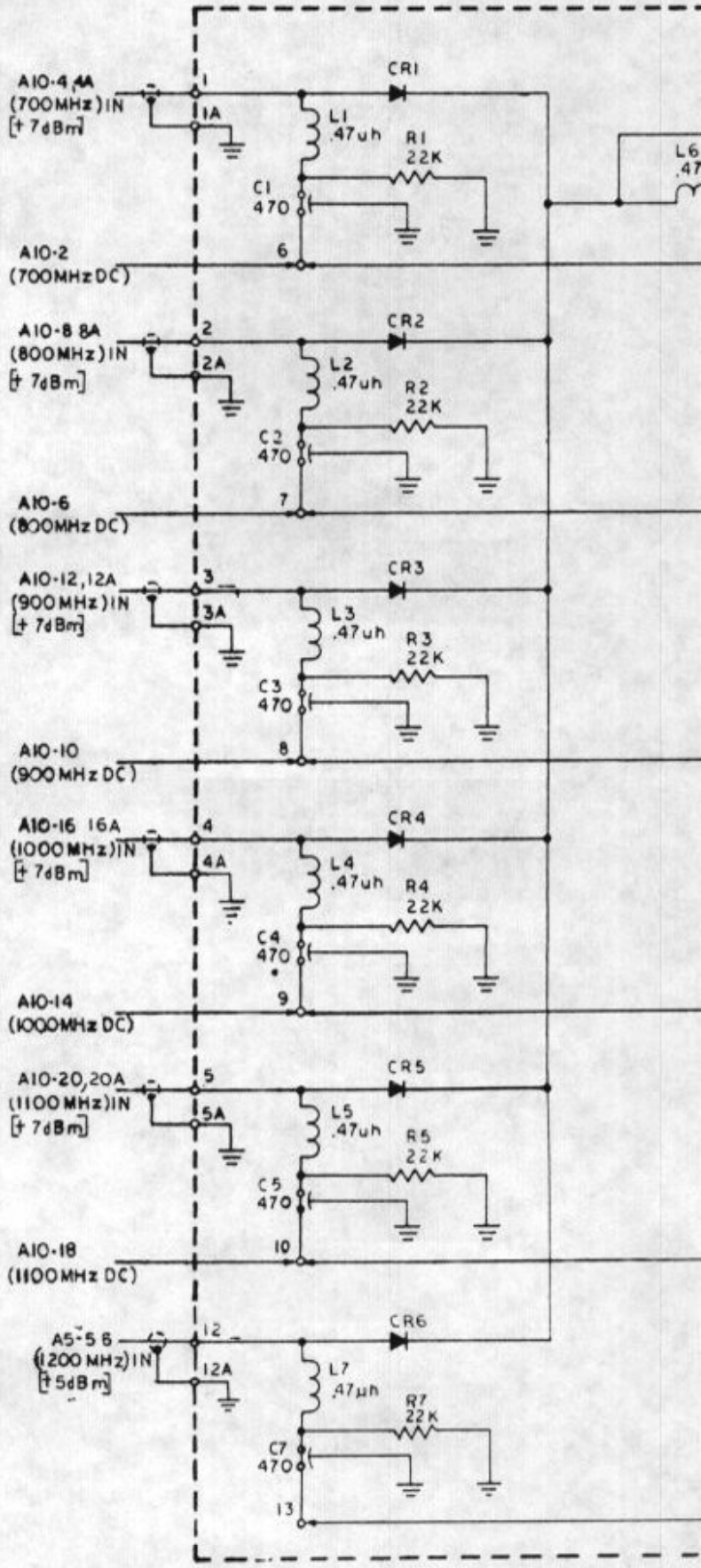


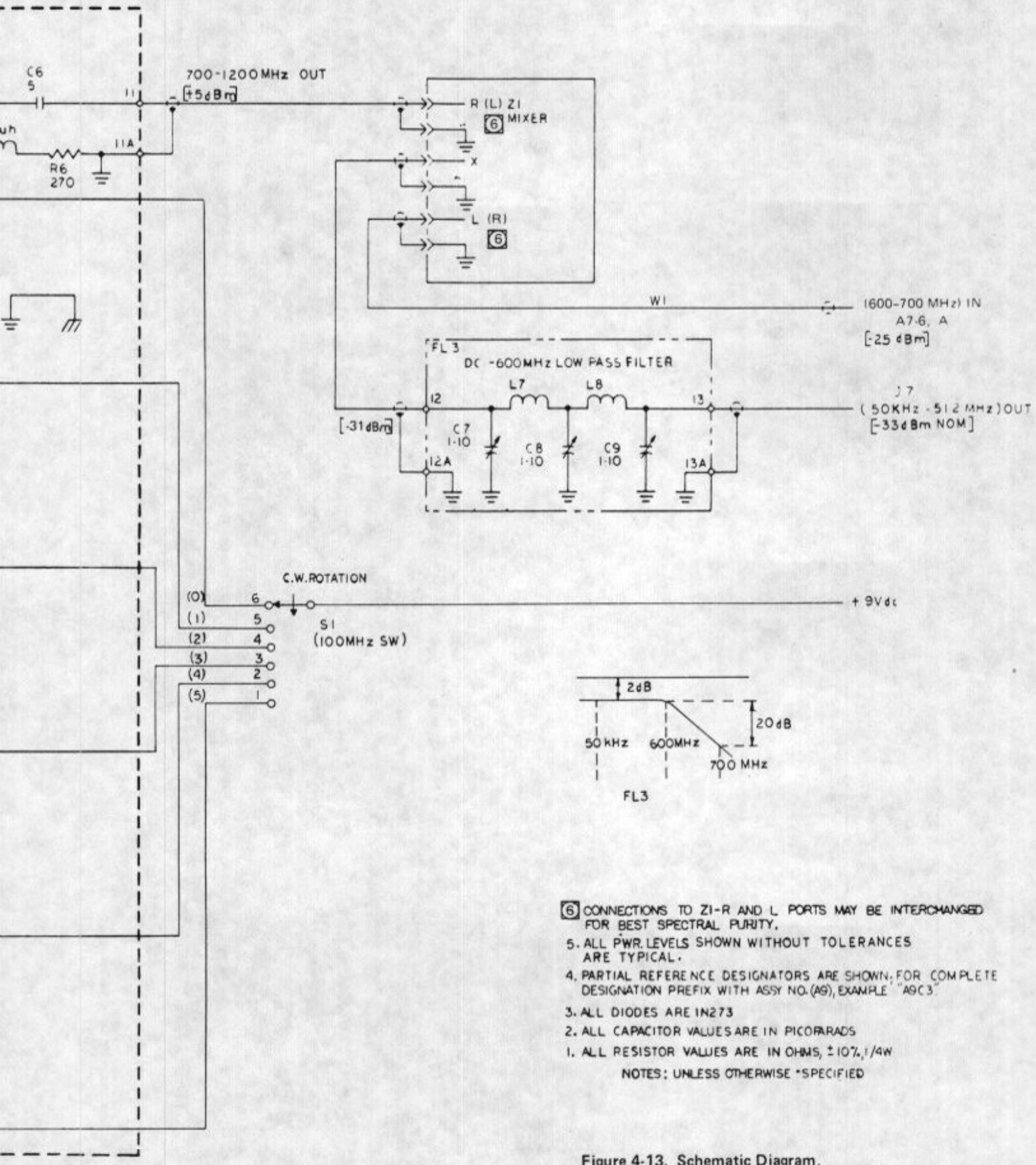
IFIED
OHMS, ± 10%, 1/4W
N PICOFARADS

) VALUE
TORS ARE SHOWN; FOR COMPLETE
SY NO. (A8), EXAMPLE "A8C3"
S SHOWN WITHOUT TOLERANCE ARE TYPICAL
TH NO SIGNAL APPLIED, (DISABLE INTERNAL

Figure 4-12. Schematic Diagram,
10 MHz Decade Assembly (A8) and FL1 and Z2
Dwg. No. 4-501332-001(A)

SPURIOUS EMISSIONS (A9-11)			
	SIDEBANDS (MHz)		
CENTER FREQ MHz	SUB HARM	10th SUB HARM	fo ±10 MHz
700	350	70	690 710
800	400	80	790 810
900	450	90	890 910
1000	500	100	990 1010
1100	550	110	1090 1110
1200	600	120	1190 1210





6 CONNECTIONS TO Z1-R AND L PORTS MAY BE INTERCHANGED FOR BEST SPECTRAL PURITY.

5. ALL PWR. LEVELS SHOWN WITHOUT TOLERANCES ARE TYPICAL.

4. PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO. (A9), EXAMPLE "A9C3."

3. ALL DIODES ARE IN273

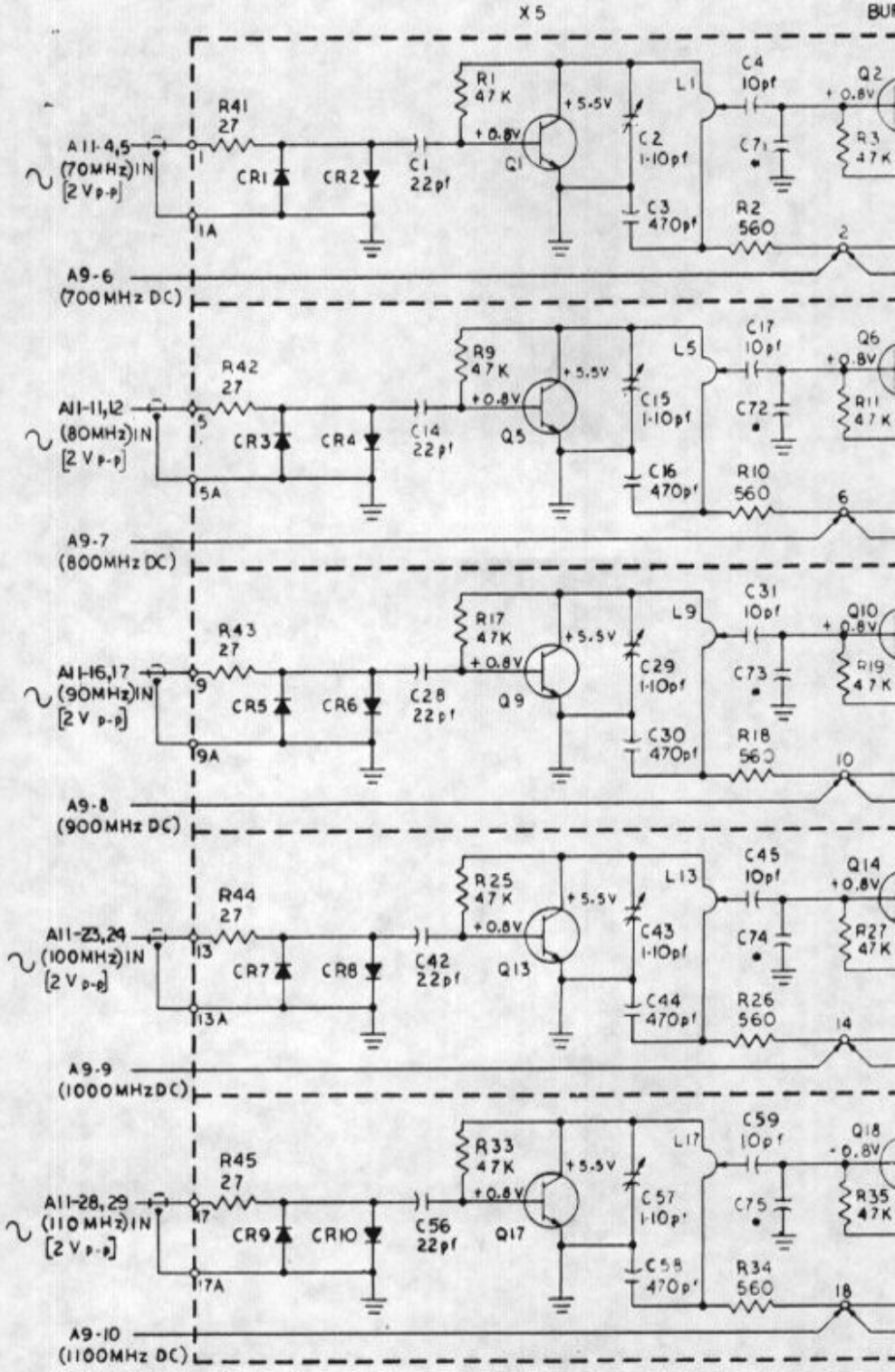
2. ALL CAPACITOR VALUES ARE IN PICOFARADS

1. ALL RESISTOR VALUES ARE IN OHMS, ±10%, 1/4W

NOTES: UNLESS OTHERWISE *SPECIFIED

Figure 4-13. Schematic Diagram, Diode Switch, Mixer, Low Pass Filter Assembly (A9) and Z1, FL3 and S1 Dwg. No. 4-501164-001(D)

LESS OTHERWISE SPECIFIED
ESISTOR VALUES ARE IN OHMS, ±10%, ¼W.
APACITOR VALUES ARE IN MICROFARADS.
RANSISTORS ARE 2N5179
IODES ARE 1N273
OTES FACTORY SELECTED VALUE.
AL REFERENCE DESIGNATORS ARE SHOWN;
OMPLETE DESIGNATION PREFIX WITH ASSY
10). EXAMPLE: "A10C3".
AGES SHOWN WITHOUT TOLERANCES ARE
AL.
C VOLTAGES TAKEN WITH NO SIGNALS
ED, (DISABLE INTERNAL TIME BASE).



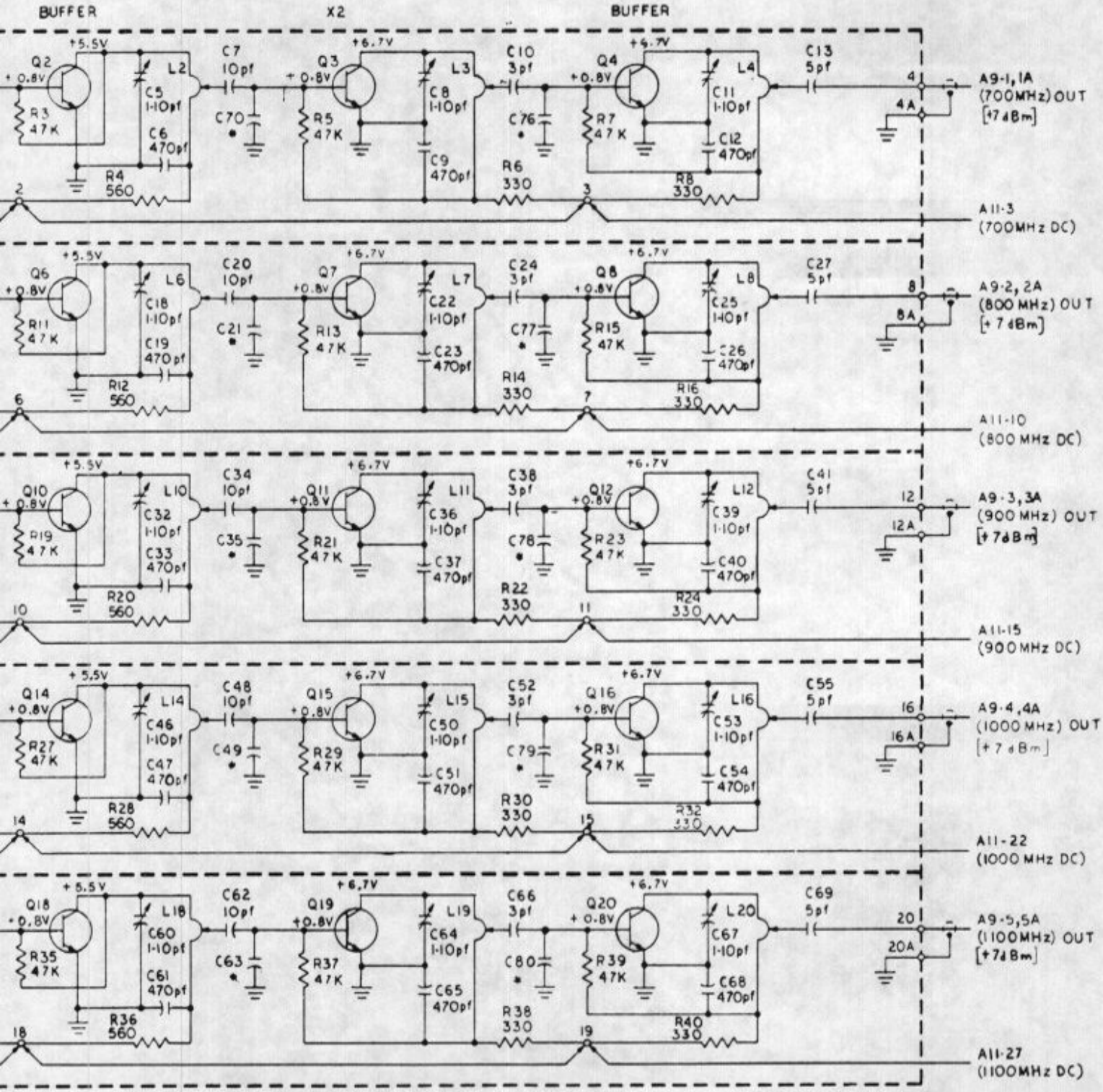
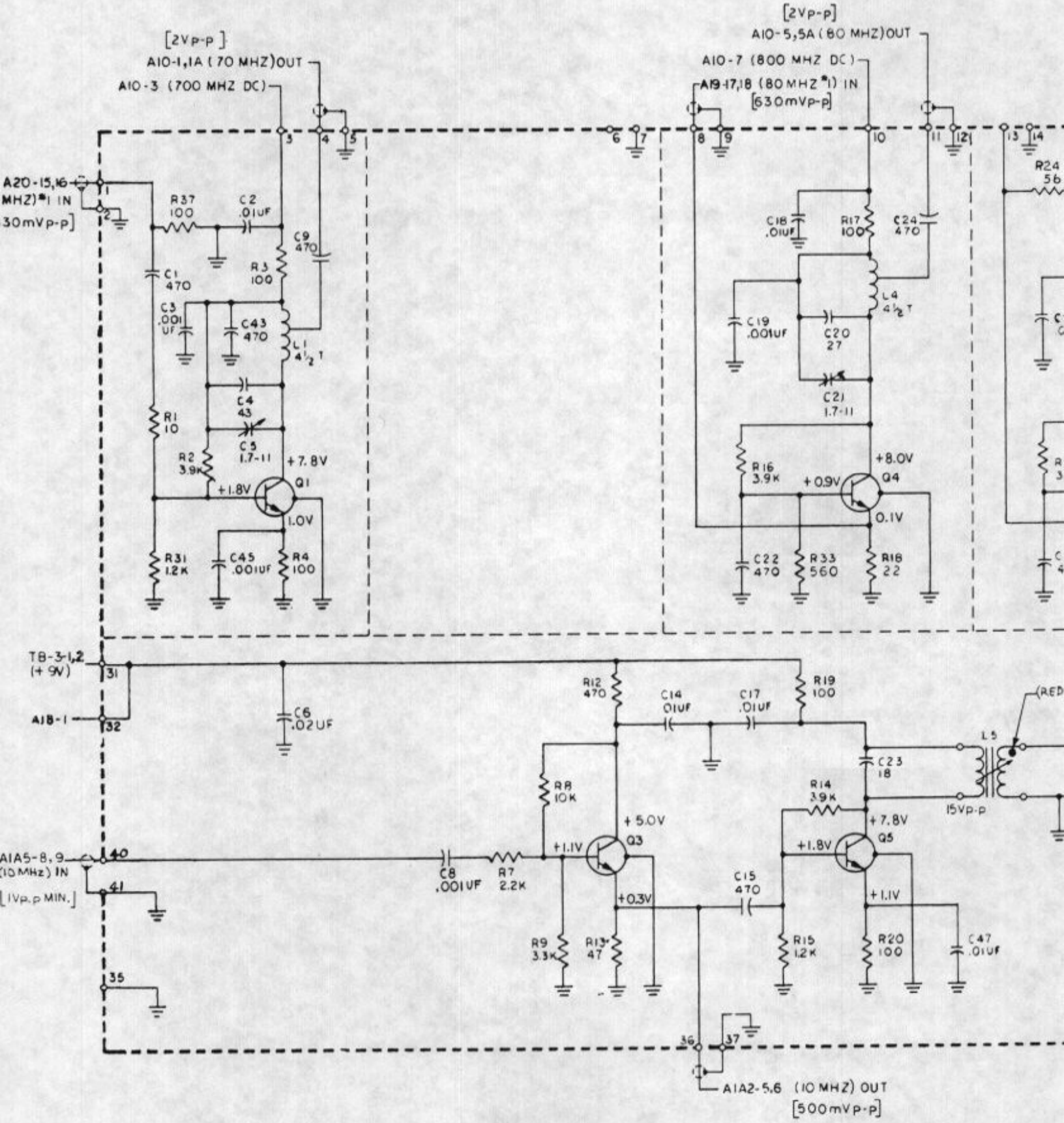
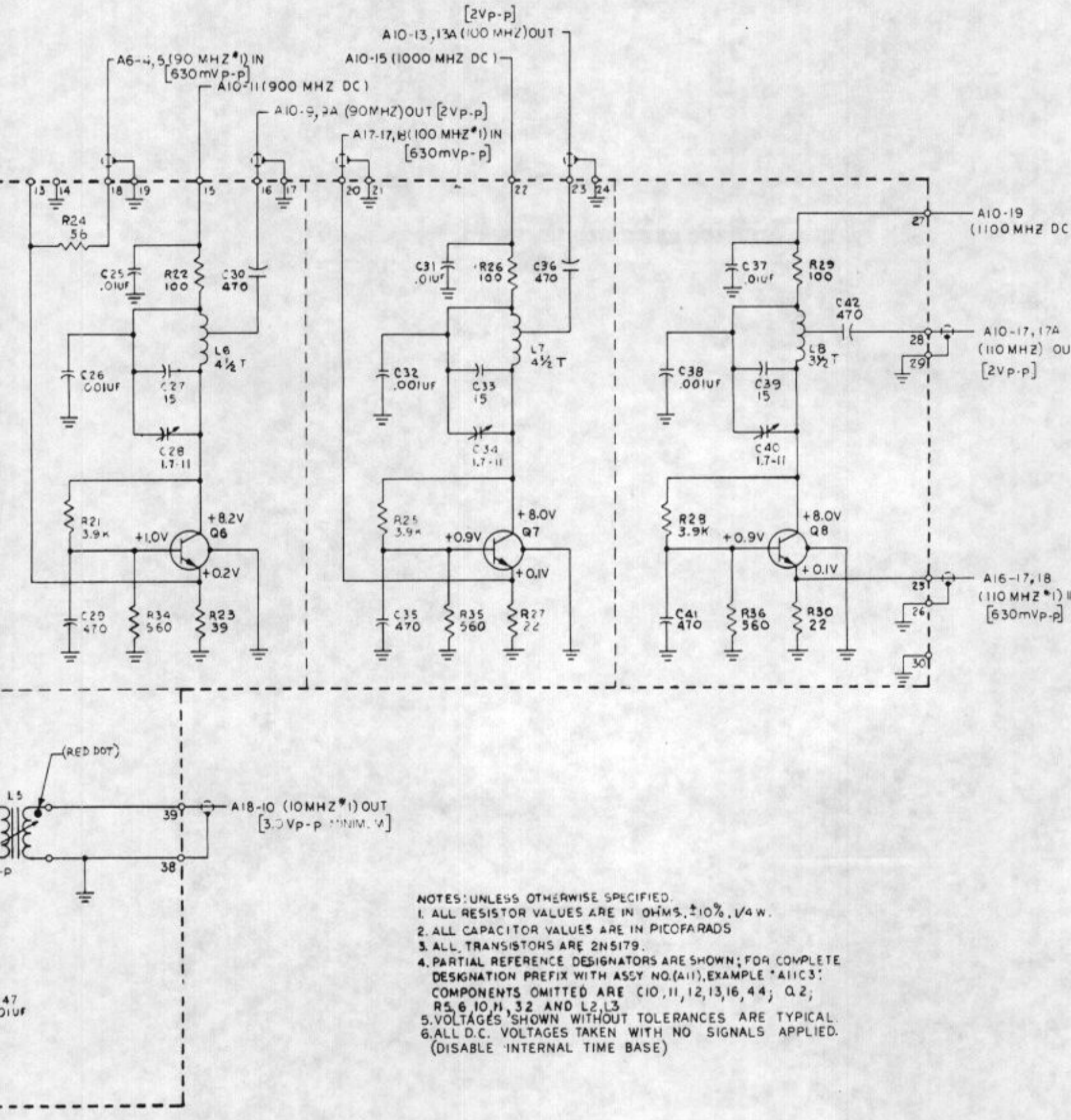


Figure 4-14. Schematic Diagram,
700–1100 MHz Multiplier Assembly (A10)
Dwg. No. 4-501183-001(B)

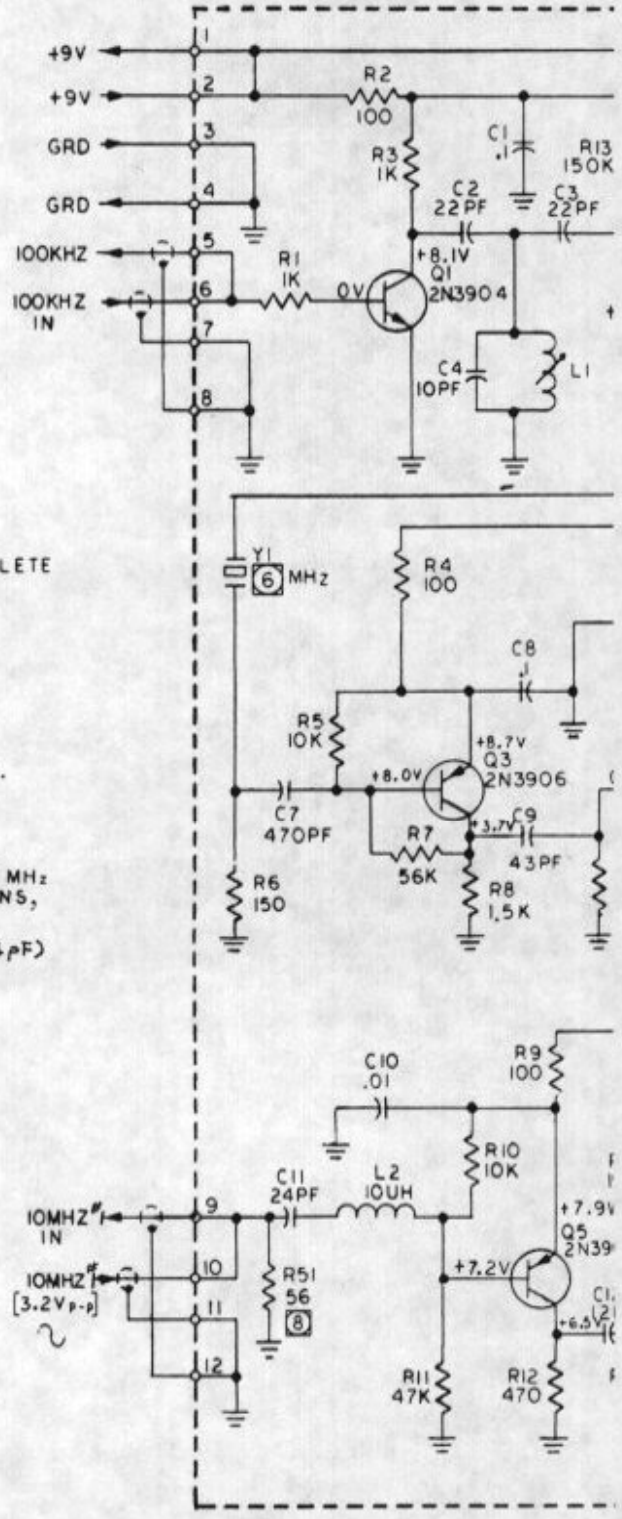

[2Vp-p]
A10-1,1A (70 MHZ) OUT
A10-3 (700 MHZ DC)
A20-15,16 (MHZ)*1 IN
30mVp-p]
R37 100
C2 .01UF
C9 470
R3 100
C1 470
C3 .001 UF
C43 470
L1 4½T
C4 43
C5 1.7-11
R1 10
R2 3.9K
+7.8V
+1.8V
Q1
1.0V
R31 1.2K
C45 .001UF
R4 100
[2Vp-p]
A10-5,5A (80 MHZ) OUT
A10-7 (800 MHZ DC)
A19-17,18 (80 MHZ*1) IN
[630mVp-p]
C18 .01UF
R17 100
C24 470
L4 4½T
C19 .001UF
C20 27
C21 1.7-11
R16 3.9K
+8.0V
+0.9V
Q4
0.1V
C22 470
R33 560
R18 22
R24 56
TB-3-1,2 (+9V)
A18-1
C6 .02UF
R12 470
C14 01UF
C17 .01UF
R19 100
L5
C23 18
15Vp-p
R8 10K
+5.0V
+1.1V
Q3
R14 3.9K
+7.8V
+1.8V
Q5
A1A5-8,9 (10MHz) IN
[1Vp-p MIN.]
C8 .001UF
R7 2.2K
+0.3V
C15 470
+1.1V
R9 3.3K
R13 47
R15 1.2K
R20 100
C47 .01UF
A1A2-5,6 (10 MHZ) OUT
[500mVp-p]



NOTES: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTOR VALUES ARE IN OHMS, ±10%, 1/4 W.
2. ALL CAPACITOR VALUES ARE IN PICOFARADS
3. ALL TRANSISTORS ARE 2N5179.
4. PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO. (A11), EXAMPLE "A11C3". COMPONENTS OMITTED ARE C10, 11, 12, 13, 16, 44; Q2; R5, 6, 10, 11, 32 AND L2, L3.
5. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
6. ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED. (DISABLE INTERNAL TIME BASE)

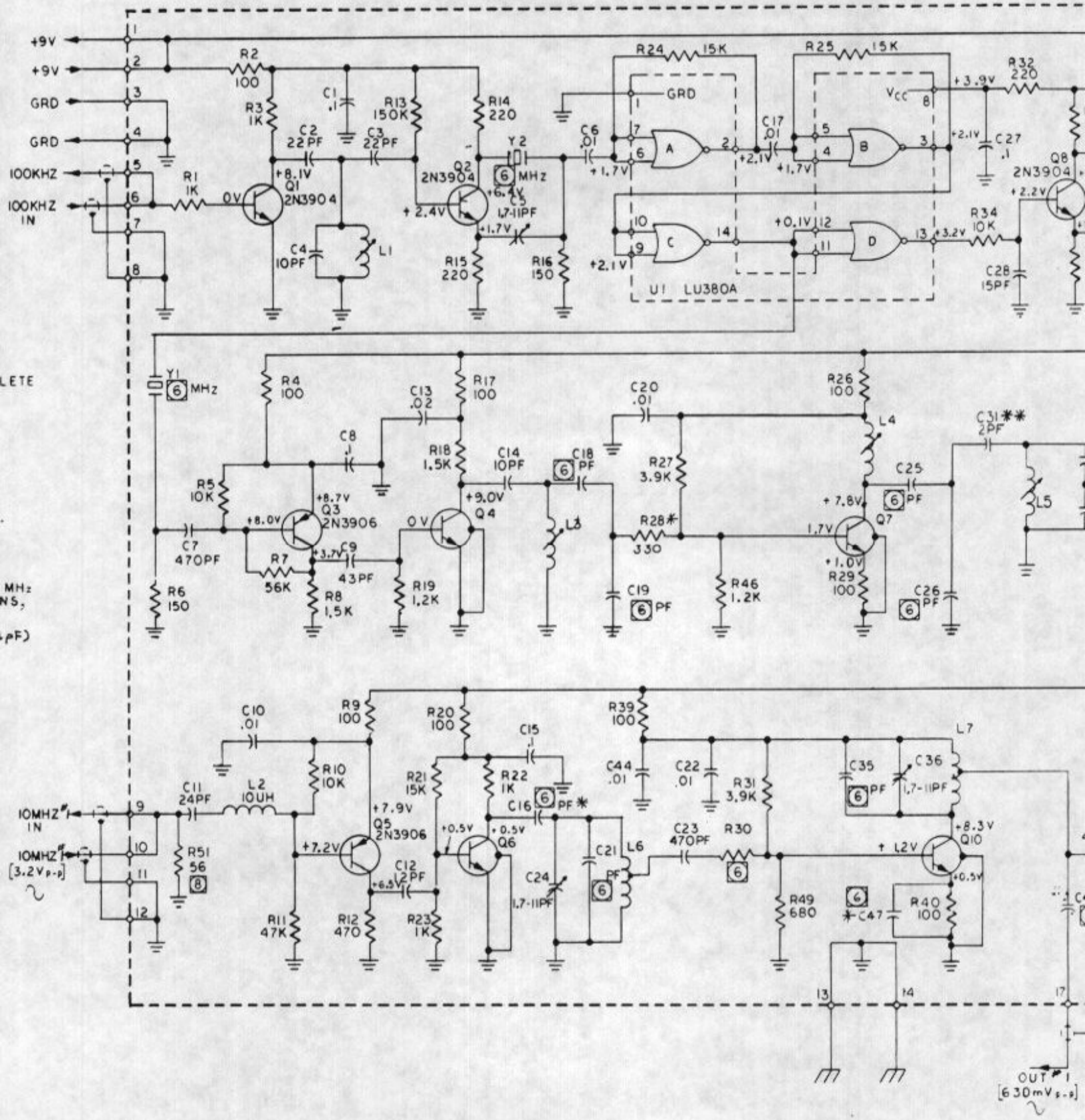
Figure 4-15. Schematic Diagram, Buffer Amplifier Assembly (A11) Dwg. No. 4-501184-001(H)

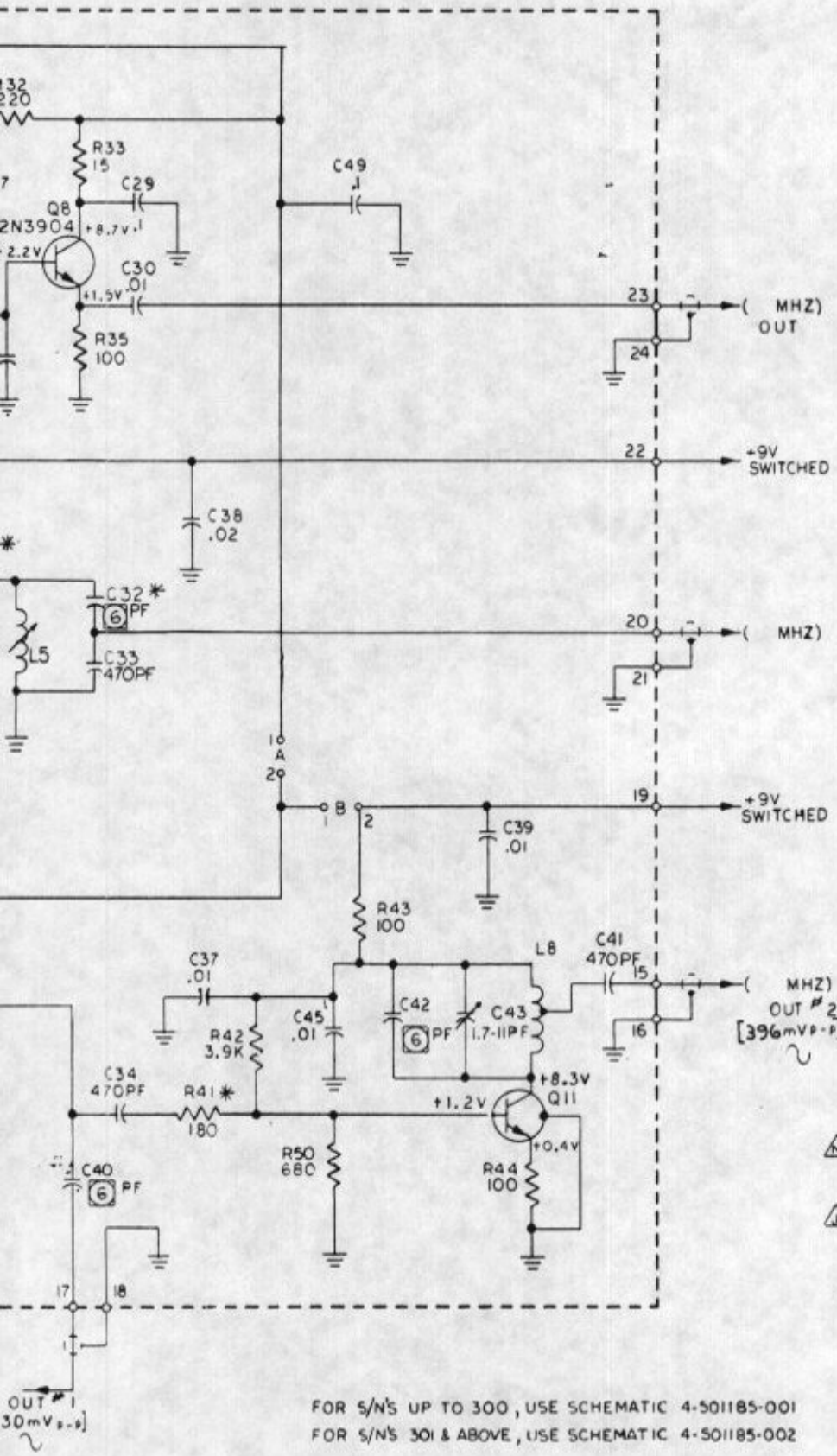


NOTES: UNLESS OTHERWISE SPECIFIED;

1 PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO (A), EXAMPLE A12R1.
2 ALL RESISTORS VALUES ARE IN OHMS, ±10%, 1/4W.
3 ALL CAPACITORS VALUES ARE IN MICROFARADS.
4 ALL TRANSISTORS (Q) ARE 2N5179.
5 ALL DIODES (CR) ARE 1N4148.
(6) FOR COMPONENT VALUES, REFER TO TABLE.
7 * INDICATES FACTORY SELECTED, NOMINAL VALUES SHOWN.
(8) TO BE ADDED ON THE A21 BOARD ONLY AT FINAL ASSY.
9. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
10 ALL D.C VOLTAGES TAKEN WITH NO SIGNALS APPLIED AND 1 MHz SW. S3 AND 10MHz SW. S2 IN THEIR APPROPIATE POSITIONS, (DISABLE INTERNAL TIME BASE)
11. ** INDICATES FACTORY SELECTED FOR A20 AND A21 ONLY (≥ 4 pF)

LAST REF DES USED	REF DES NOT USED
Y2	R36, 37, 38, 45, 47, 48
U1	C46, C48
C49	Q9
L8	
Q11	
R51	


+9V
+9V
GRD
GRD
100KHZ
100KHZ IN
R1 1K
R2 100
R3 1K
C1 .1
C2 22PF
C3 22PF
R13 150K
R14 220
Y2
C6 .01
Q1 2N3904
Q2 2N3904
C5 1.7-11PF
C4 10PF
L1
R15 220
R16 150
R24 15K
R25 15K
R32 220
GRD
Vcc
+3.9V
C17 .01
C27 .1
Q8 2N3904
R34 10K
C28 15PF
U1 LU380A
A
B
C
D
Y1
R4 100
C13 .02
R17 100
C8 .1
R18 1.5K
C14 10PF
C18 PF
R5 10K
Q3 2N3906
Q4
C7 470PF
R7 56K
C9 43PF
R8 1.5K
R19 1.2K
R6 150
L3
C20 .01
R27 3.9K
R28* 330
C19 PF
R46 1.2K
R26 100
L4
C31** 2PF
C25
Q7
R29 100
C26 PF
L5
C10 .01
R9 100
R20 100
C15 .1
R10 10K
C11 24PF
L2 10UH
10MHZ IN
10MHZ [3.2Vp-p]
R51 56
R21 15K
R22 1K
C16 PF*
Q5 2N3906
Q6
C12 12PF
R11 47K
R12 470
R23 1K
C24 1.7-11PF
C21 PF
L6
R39 100
C44 .01
C22 .01
R31 3.9K
C23 470PF
R30
C35 PF
C36 1.7-11PF
L7
Q10
R49 680
C47*
R40 100
OUT [630mVp-p]

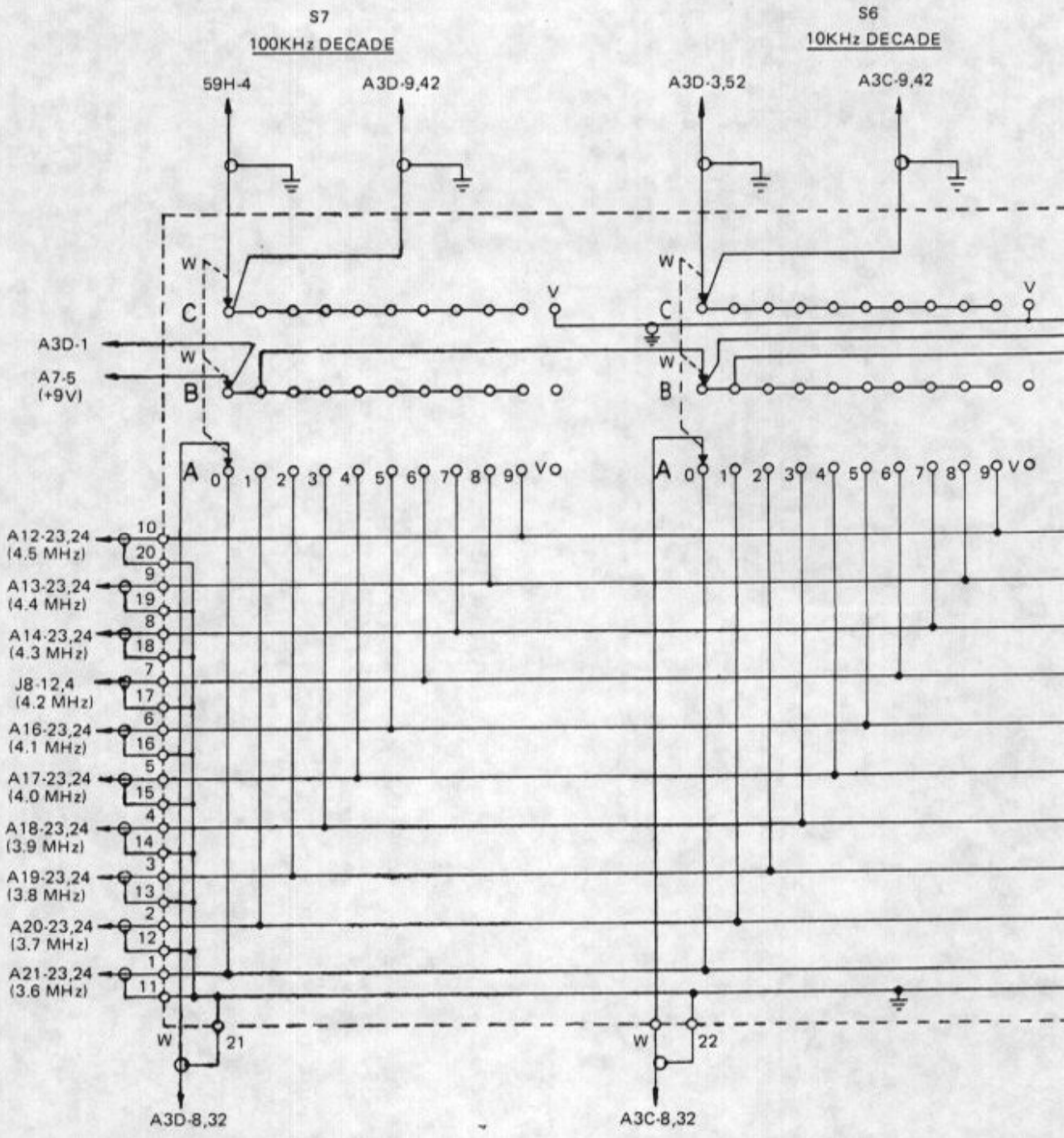


WIRE DESTINATIONS		ASSEMBLY									
		A12	A13	A14	A15	A16	A17	A18	A19	A20	A21
	FROM PIN	TO:	TO:	TO:	TO:	TO:	TO:	TO:	TO:	TO:	TO:
	23	S7A-9 (4,5)	S7A-8 (4,4)	S7A-7 (4,3)	J8-12A (4,2)	S7A-5 (4,1)	S7A-4 (4,0)	S7A-3 (3,9)	S7A-2 (3,8)	S7A-1 (3,7)	S7B-0 (3,6)
	22	A4A-38	A4A-34	A4A-30	A4A-26	A4A-22	A4A-18	A4A-14	A4A-10	A4A-6	A4A-2
	20	A4A-39 (45)	A4A-35 (44)	A4A-31 (43)	A4A-27 (42)	A4A-23 (41)	A4A-19 (40)	A4A-15 (39)	A4A-11 (38)	A4A-7 (37)	A4A-3 (36)
	19	A4B-38	A4B-34	A4B-30	A4B-26	A4B-22	A4B-18	A4B-14	A4B-10	A4B-6	A4B-2
	17	—	—	—	A5-1	A11-25	A11-20	A6-15	A13-8	A4B-7	A4B-3
	15	A4B-39 (150)	A4B-35 (140)	A4B-31 (130)	A4B-27 (120)	A4B-23 (110)	A4B-19 (100)	A4B-15 (90)	A4B-11 (80)	A4B-1 (70)	—
	10	A15-10	A14-10	A13-10	A12-10	A19-10	A20-10	A11-32	A16-10	A17-10	—
	9	A21-9	A20-9	A15-9	A14-9	A18-9	A19-9	A16-9	A17-9	A13-9	A12-9
	6	A15-6	A14-6	A13-6	A12-6	A19-6	A20-6	A11-27	A16-6	A17-6	—
	5	A21-5	A20-5	A15-5	A14-5	A18-5	A19-5	A16-5	A17-5	A13-5	A12-5
COMPONENT VALUES	Y1	4.5 MHz	4.4 MHz	4.3 MHz	4.2 MHz	4.1 MHz	4.0 MHz	3.9 MHz	3.8 MHz	3.7 MHz	3.6 MHz
	Y2	4.5 MHz	4.4 MHz	4.3 MHz	4.2 MHz	4.1 MHz	4.0 MHz	3.9 MHz	3.8 MHz	3.7 MHz	3.6 MHz
	R30	47A	47A	47A	47A	47A	47A	47A	47A	47A	10A
	C18	82 PF	82PF	82PF	91PF	56 PF	56PF	68PF	68PF	68PF	68PF
	C21	10PF	15PF	18PF	24PF	15PF	24PF	33PF	43PF	56PF	56PF
	C25	82PF	82PF	82PF	91PF	56PF	56PF	68PF	68PF	68PF	68PF
	C26	470PF	470PF	470PF	470PF	470PF	470PF	470PF	680PF	680PF	680PF
	C32	91 PF	91PF	91PF	100PF	82PF	82 PF	82PF	82 PF	82 PF	82 PF
	C35	10PF	15PF	18PF	24PF	15PF	24PF	33PF	43PF	56PF	56PF
	C42	10PF	15PF	18PF	24PF	15PF	24PF	33PF	43PF	56PF	—
	C16	2PF	2PF	2PF	2PF	5PF	5PF	5PF	5PF	5PF	5PF
	C19	470PF	470PF	470PF	470PF	470PF	470PF	470PF	470PF	680PF	680PF
	C40	—	—	—	33PF	470PF	470PF	470PF	470PF	470PF	470PF
	W1	B	B	B	A	A	A	A	A	A&B	B
	C47	—	—	3PF	5PF	5PF	10PF	12PF	12PF	15PF	27PF

FOR S/N'S UP TO 300, USE SCHEMATIC 4-501185-001
FOR S/N'S 301 & ABOVE, USE SCHEMATIC 4-501185-002

ON A21, THE FOLLOWING COMPONENTS ARE NOT USED:
R41, 42, 43, 44, 5C
C34, 37, 41, 42, 43, 45
Q11 L8

Figure 4-16. Schematic Diagram,
Frequency Generator Assemblies (A12-A21)
Dwg. No. 4-501185-002(N)



NOTE- PREFIX S4 THRU S7 WITH "A24".

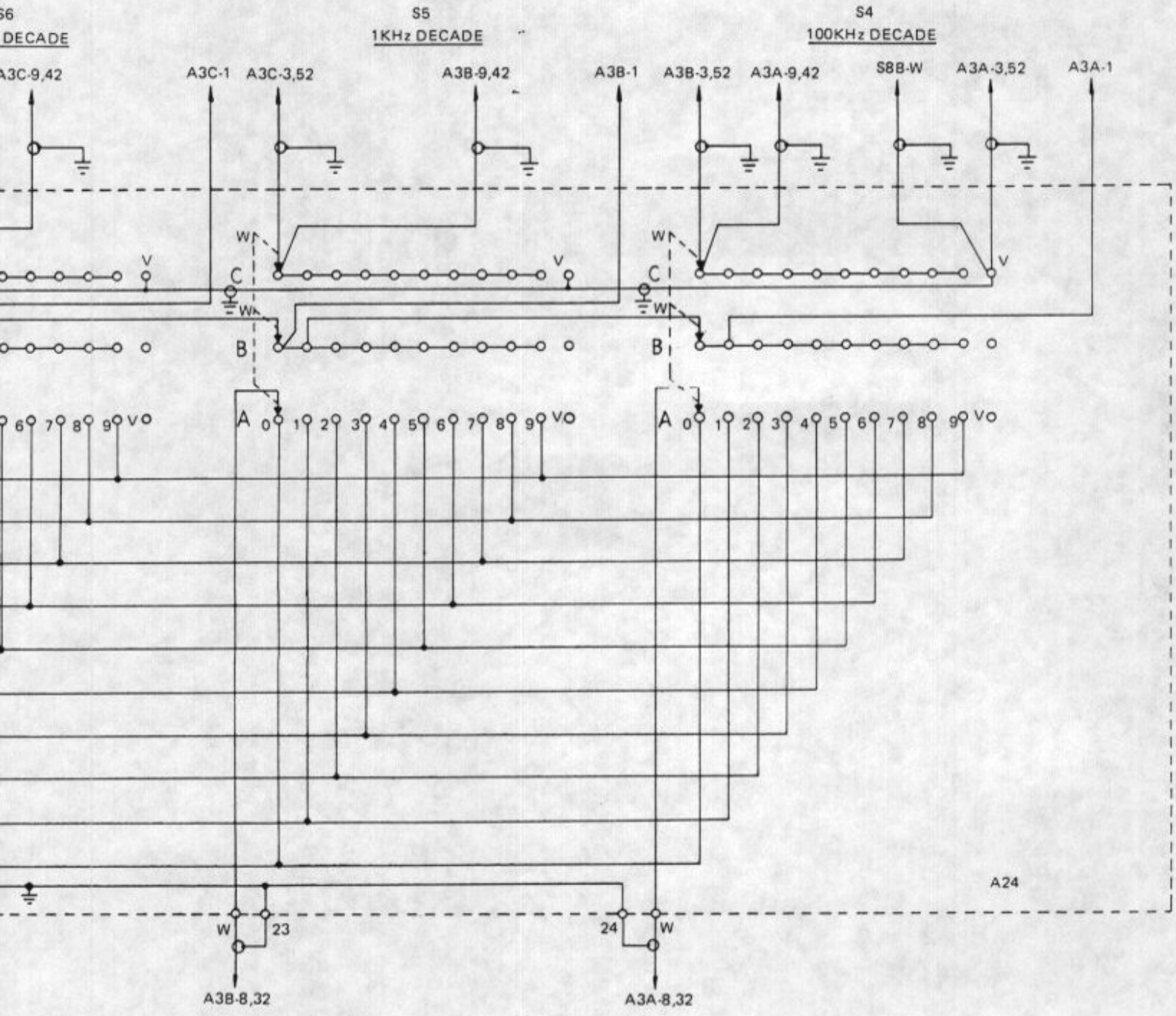
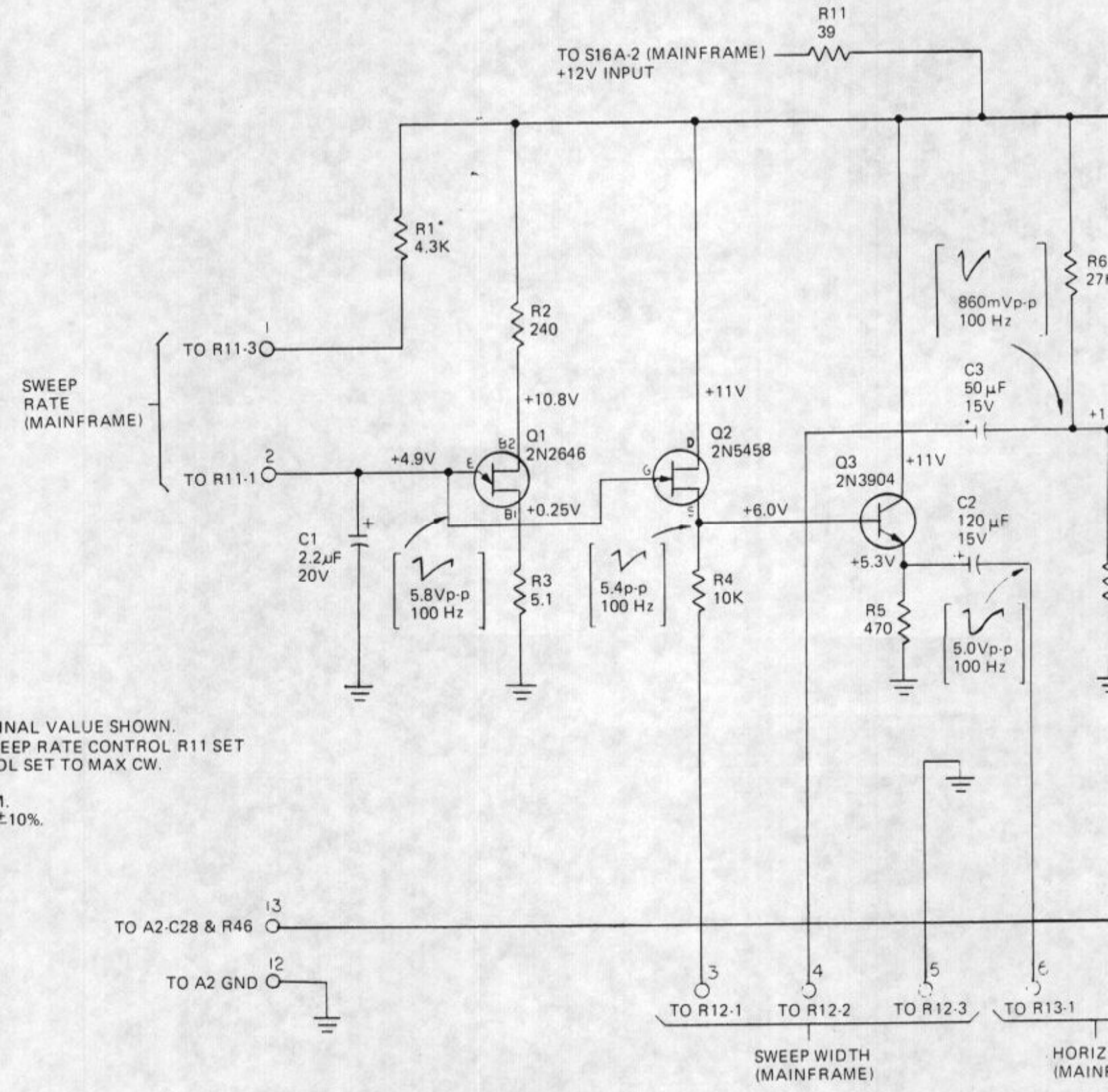


Figure 4-17. Schematic Diagram,
100 Hz, 1 kHz, 10 kHz, 100 kHz Decade
Switching Assembly (A24)
Dwg. No. 4-501223-001(A)


R11
39
TO S16A-2 (MAINFRAME)
+12V INPUT
R1*
4.3K
R2
240
TO R11-3
1
SWEEP
RATE
(MAINFRAME)
2
TO R11-1
+10.8V
+4.9V
Q1
2N2646
B2
B1
E
+0.25V
+11V
Q2
2N5458
D
G
S
+6.0V
Q3
2N3904
+11V
C1
2.2µF
20V
C2
120 µF
15V
+5.3V
C3
50 µF
15V
860mVp-p
100 Hz
5.8Vp-p
100 Hz
5.4p-p
100 Hz
5.0Vp-p
100 Hz
R3
5.1
R4
10K
R5
470
R6
27
INAL VALUE SHOWN.
EEP RATE CONTROL R11 SET
OL SET TO MAX CW.
1.
±10%.
13
TO A2-C28 & R46
12
TO A2 GND
3
4
5
6
TO R12-1
TO R12-2
TO R12-3
TO R13-1
SWEEP WIDTH
(MAINFRAME)
HORIZ
(MAINF

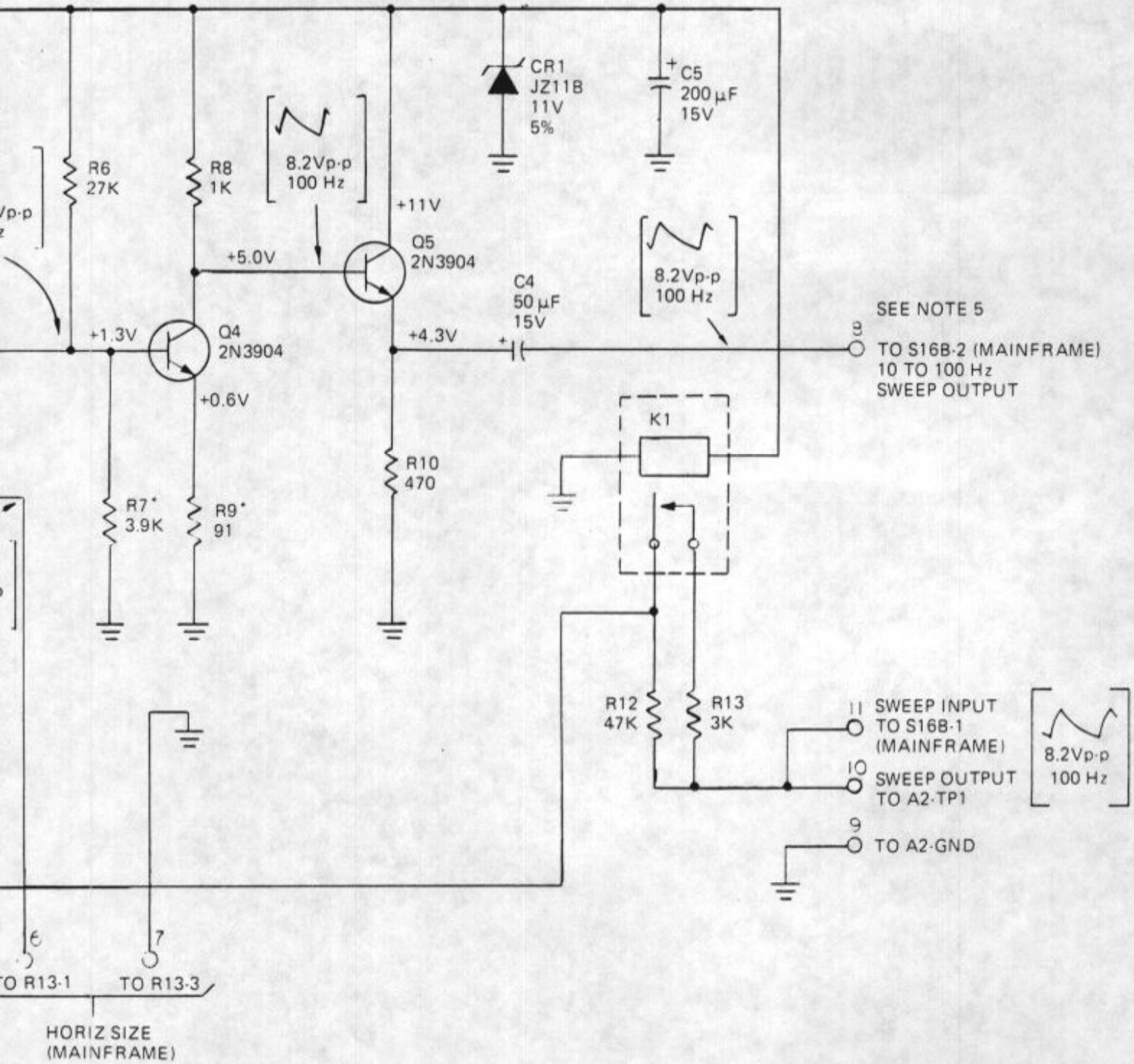


Figure 4-18. Schematic Diagram, Sweep Generator Assembly, A25 Dwg. No. 4-501378-001

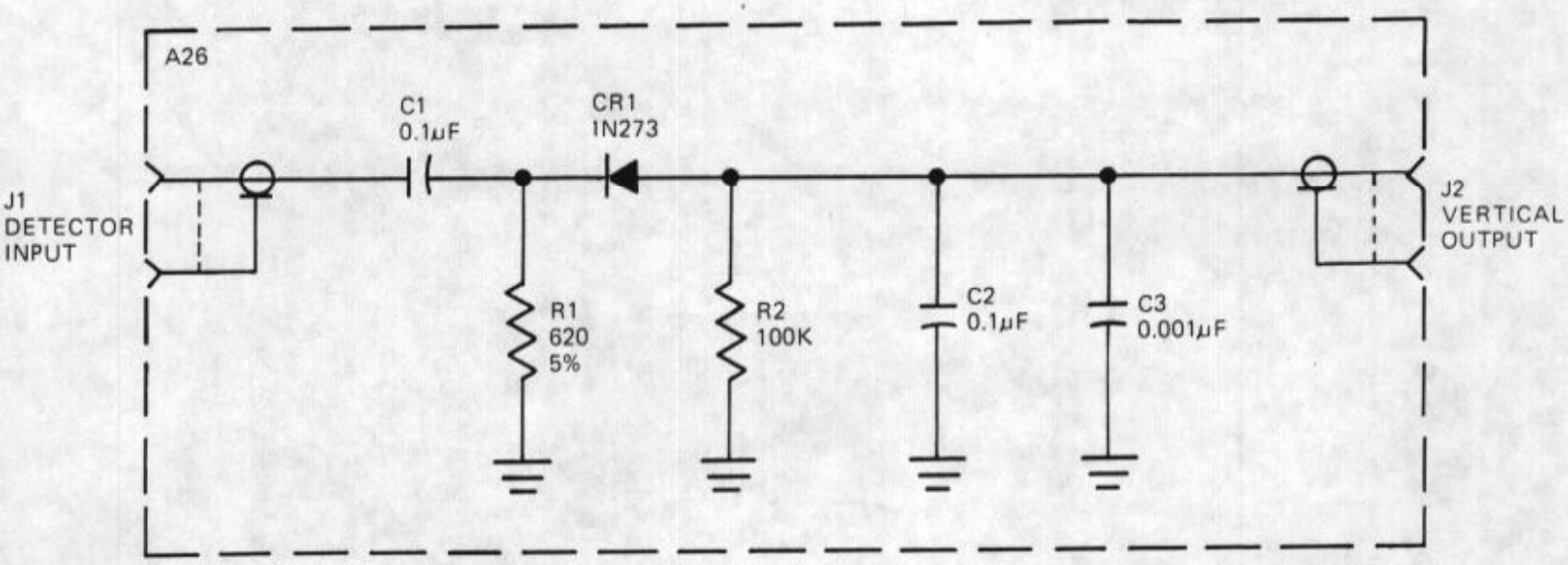
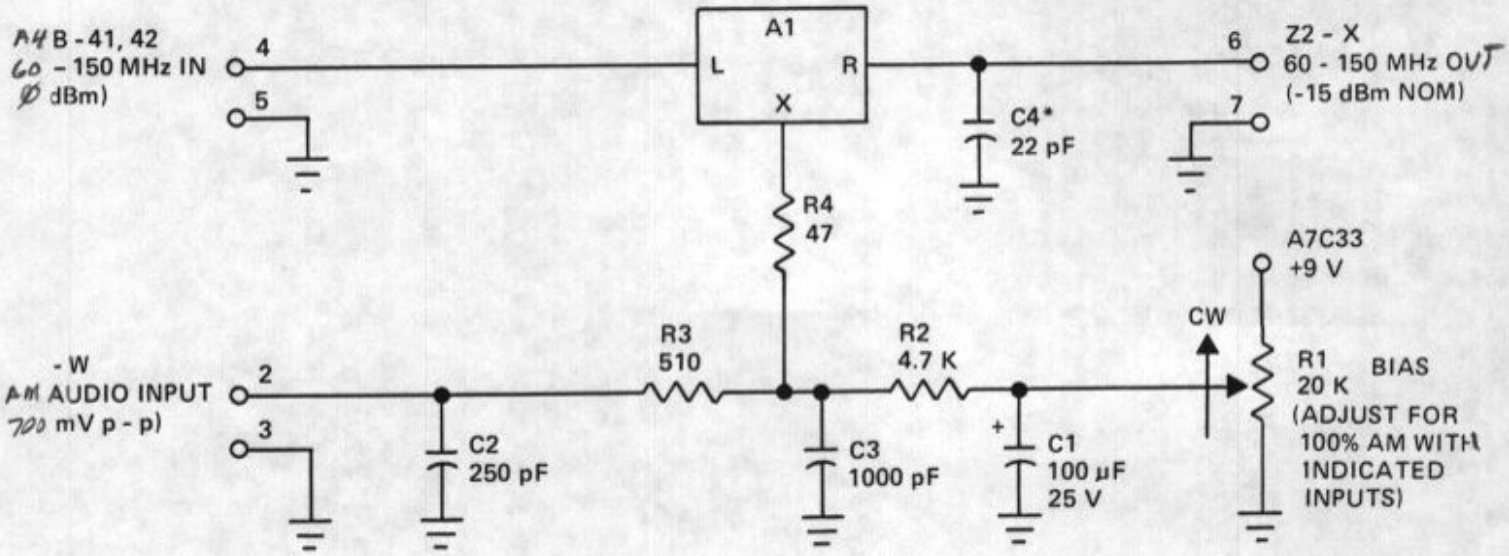


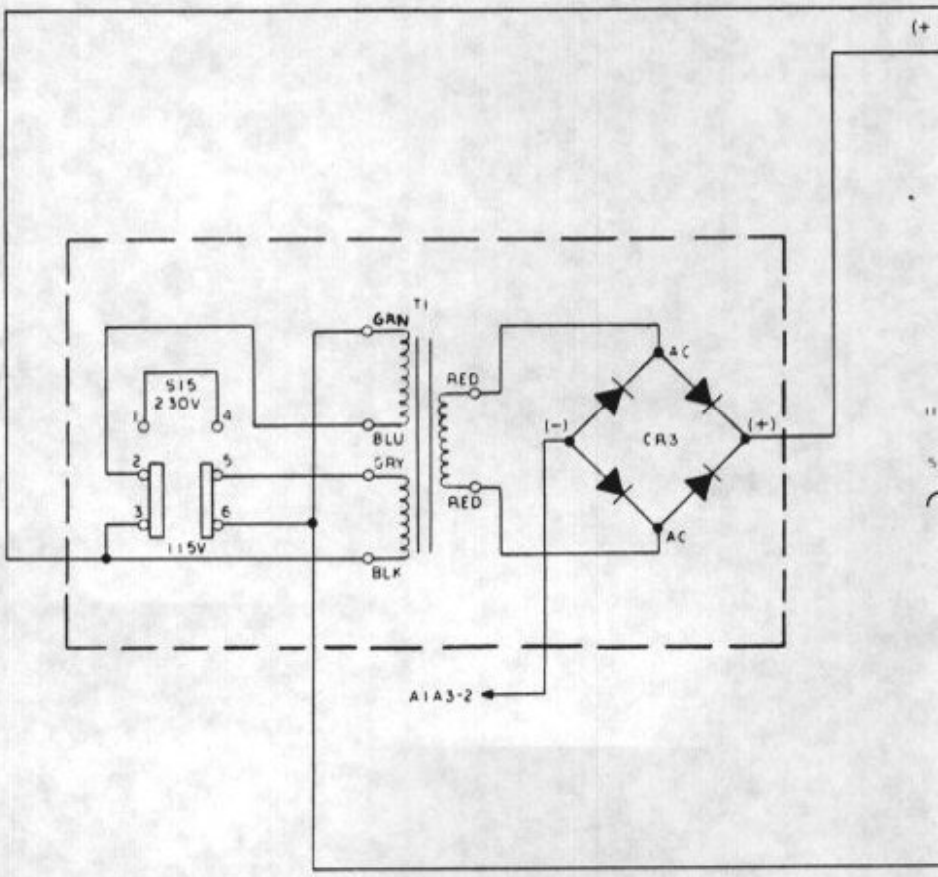
Figure 4-19. Schematic Diagram,
Detector Assembly, A26
Dwg. No. 3-501348-001



NOTE:

1. * INDICATES SELECTED VALUE.

Figure 4-20. Schematic Diagram, AM Modulator Assembly (A27) Dwg. No. 2-501328-001



NOTES: UNLESS OTHERWISE SPECIFIED
1. CAPACITOR VALUES ARE IN PICOFARADS.
2. COMPONENTS SHOWN INSIDE LARGE DASHED LINE BLOCK ARE ACCESSIBLE BY REMOVING CORNER SHIELD COVER ON CHASSIS BOTTOM.
3. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.

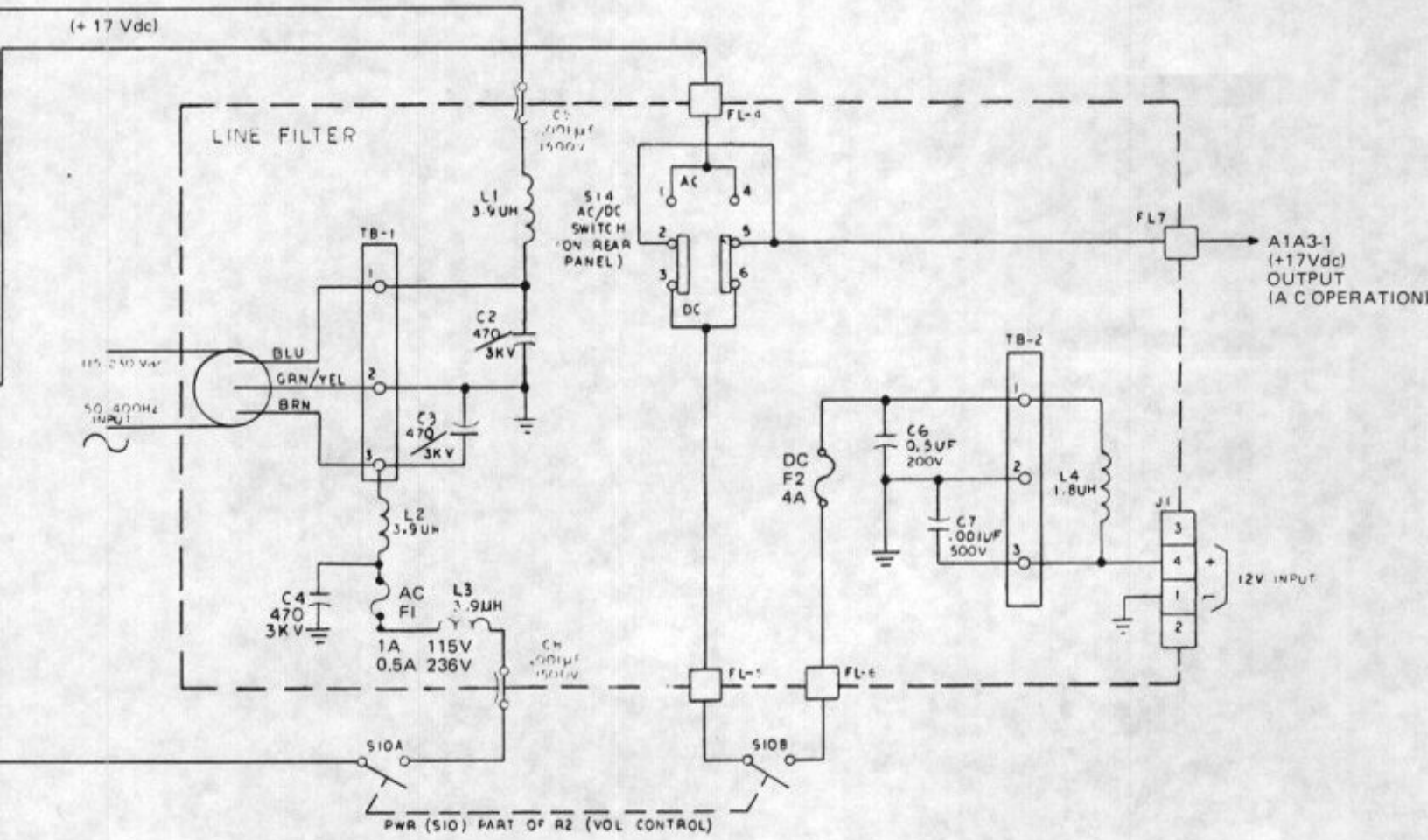
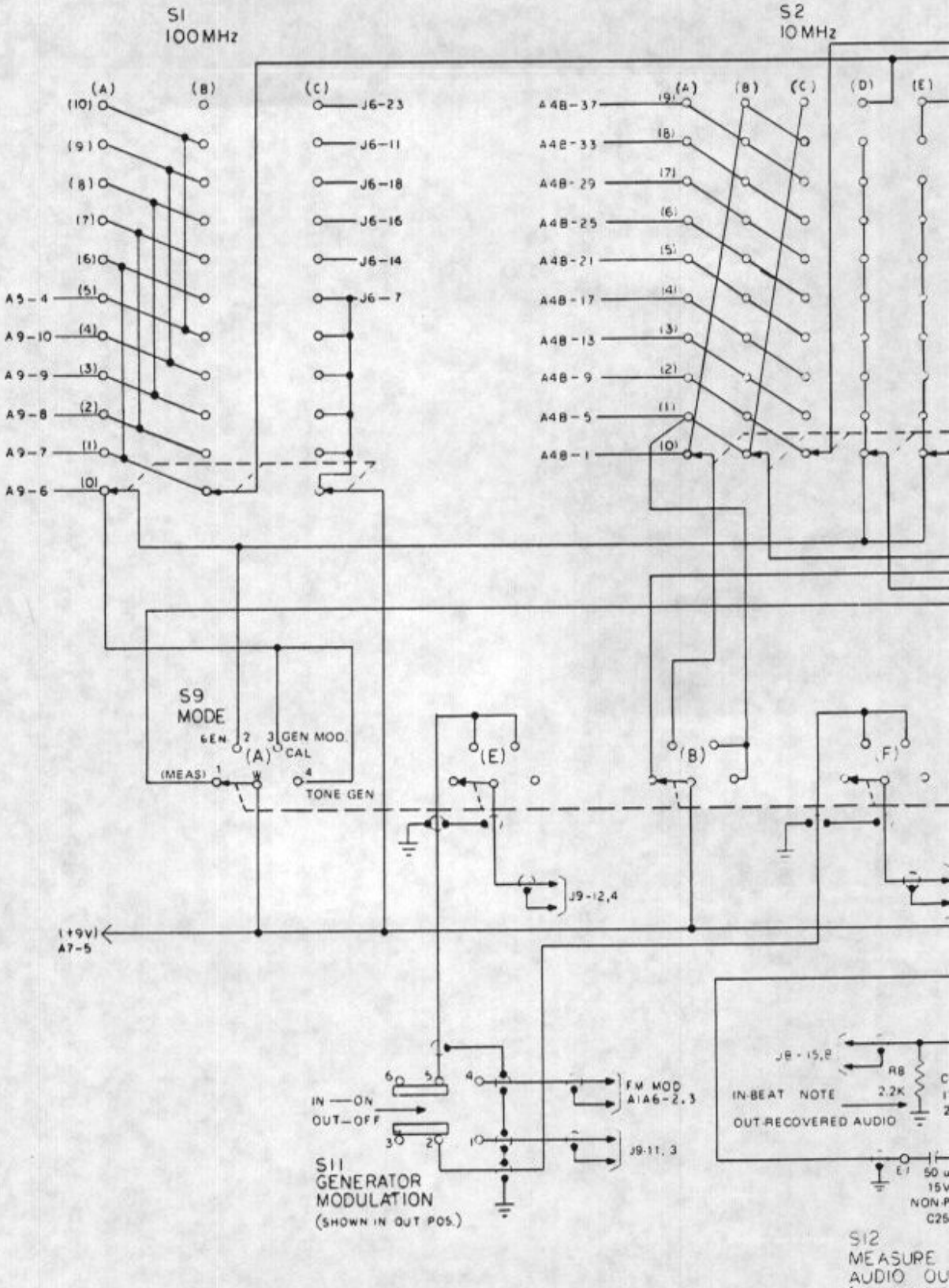


Figure 4-21. Schematic Diagram,
Power Transformer Rectifier, Line Filter and S10
Dwg. No. 4-501190-002(D)


S1
100MHz
S2
10MHz
(A)
(B)
(C)
(D)
(E)
(10)
(9)
(8)
(7)
(6)
(5)
(4)
(3)
(2)
(1)
A5-4
A9-10
A9-9
A9-8
A9-7
A9-6
J6-23
J6-11
J6-18
J6-16
J6-14
J6-7
A48-37
A48-33
A48-29
A48-25
A48-21
A48-17
A48-13
A48-9
A48-5
A48-1
S9
MODE
GEN
(A)
GEN MOD. CAL
(MEAS)
TONE GEN
(E)
(B)
(F)
J9-12,4
(+9V)
A7-5
IN — ON
OUT — OFF
FM MOD
A1A6-2,3
J9-11,3
S11
GENERATOR
MODULATION
(SHOWN IN OUT POS.)
J8-15,8
R8
IN-BEAT NOTE
2.2K
OUT-RECOVERED AUDIO
S12
MEASURE
AUDIO OU
(SHOWN IN OUT

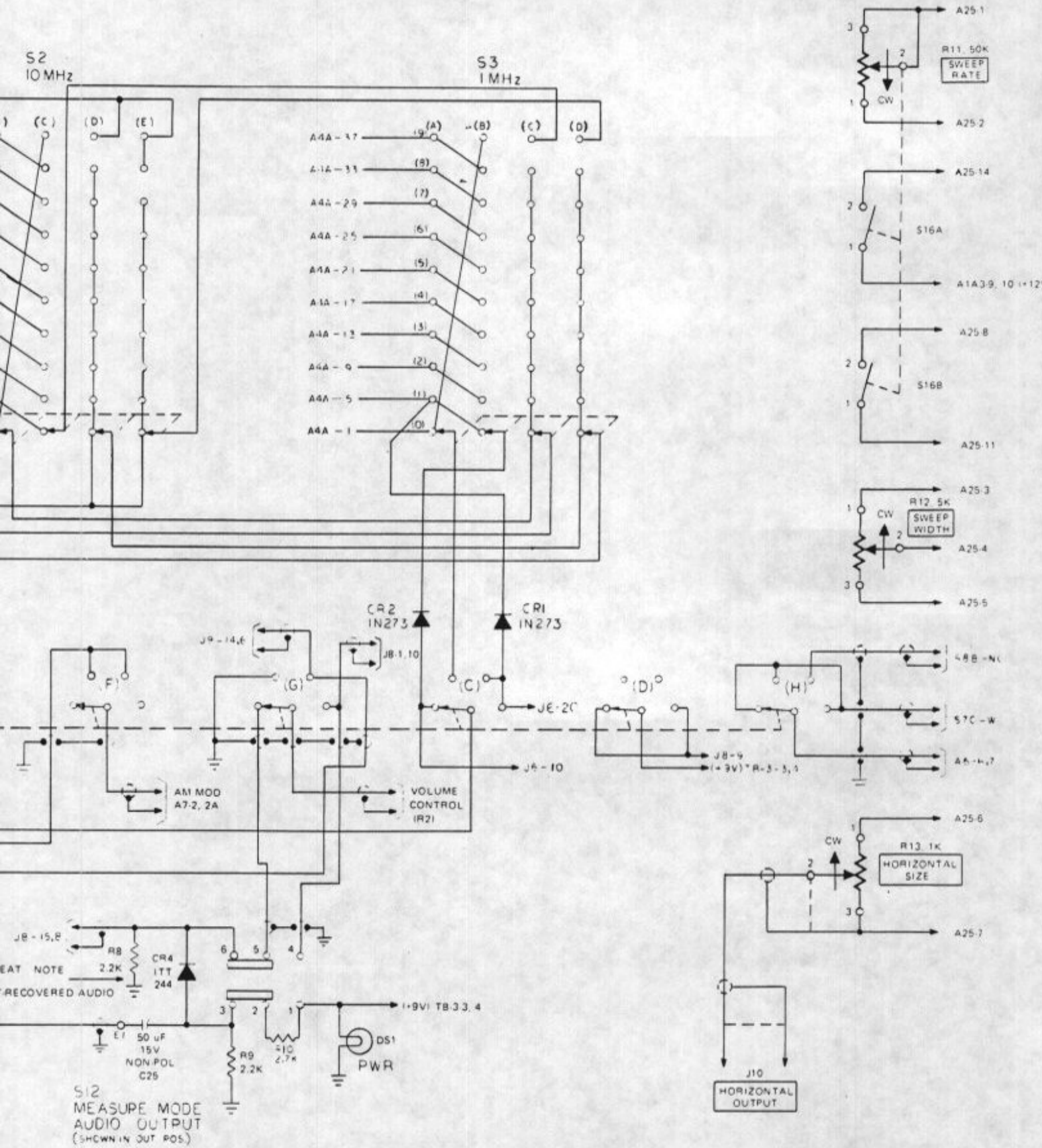
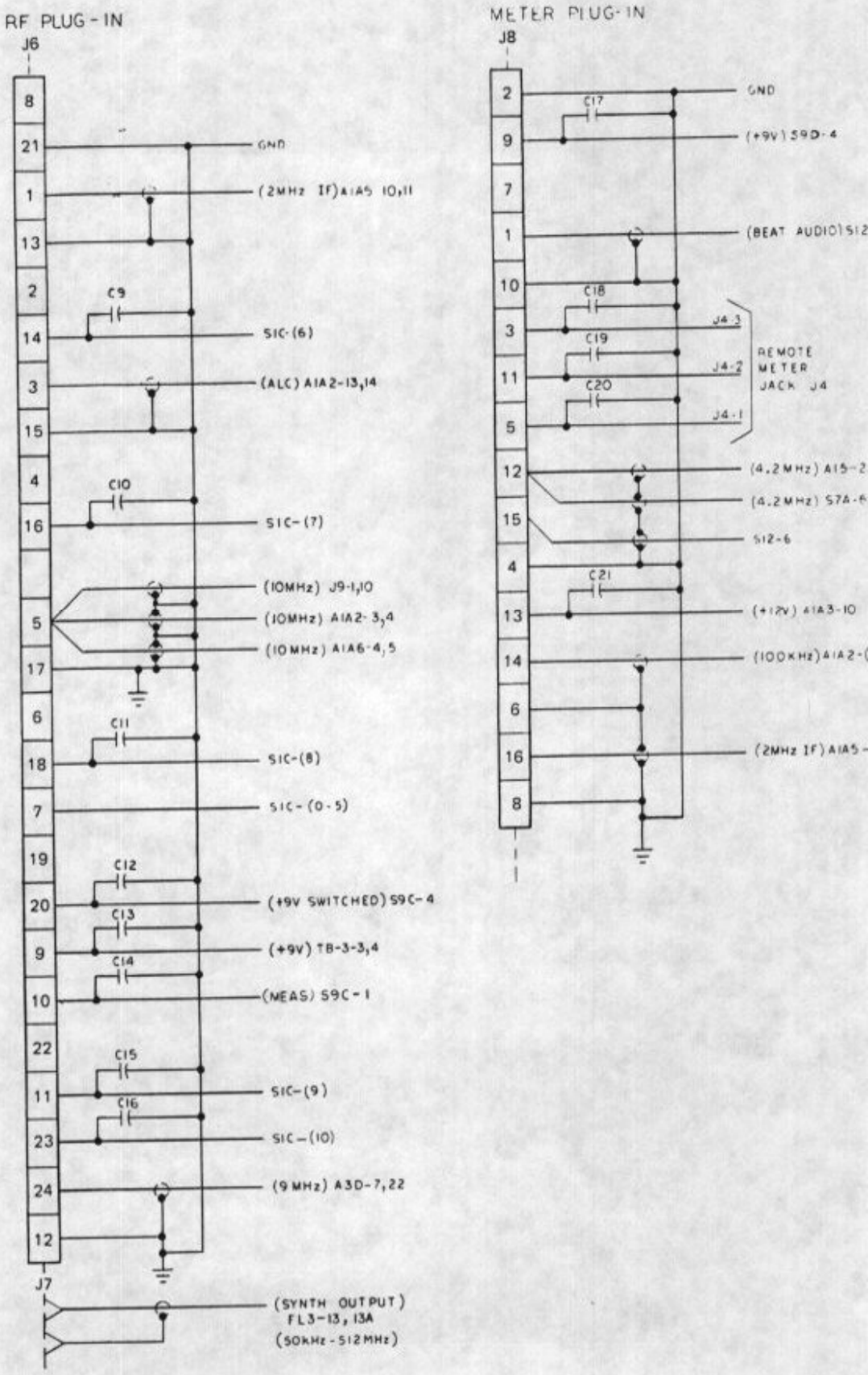
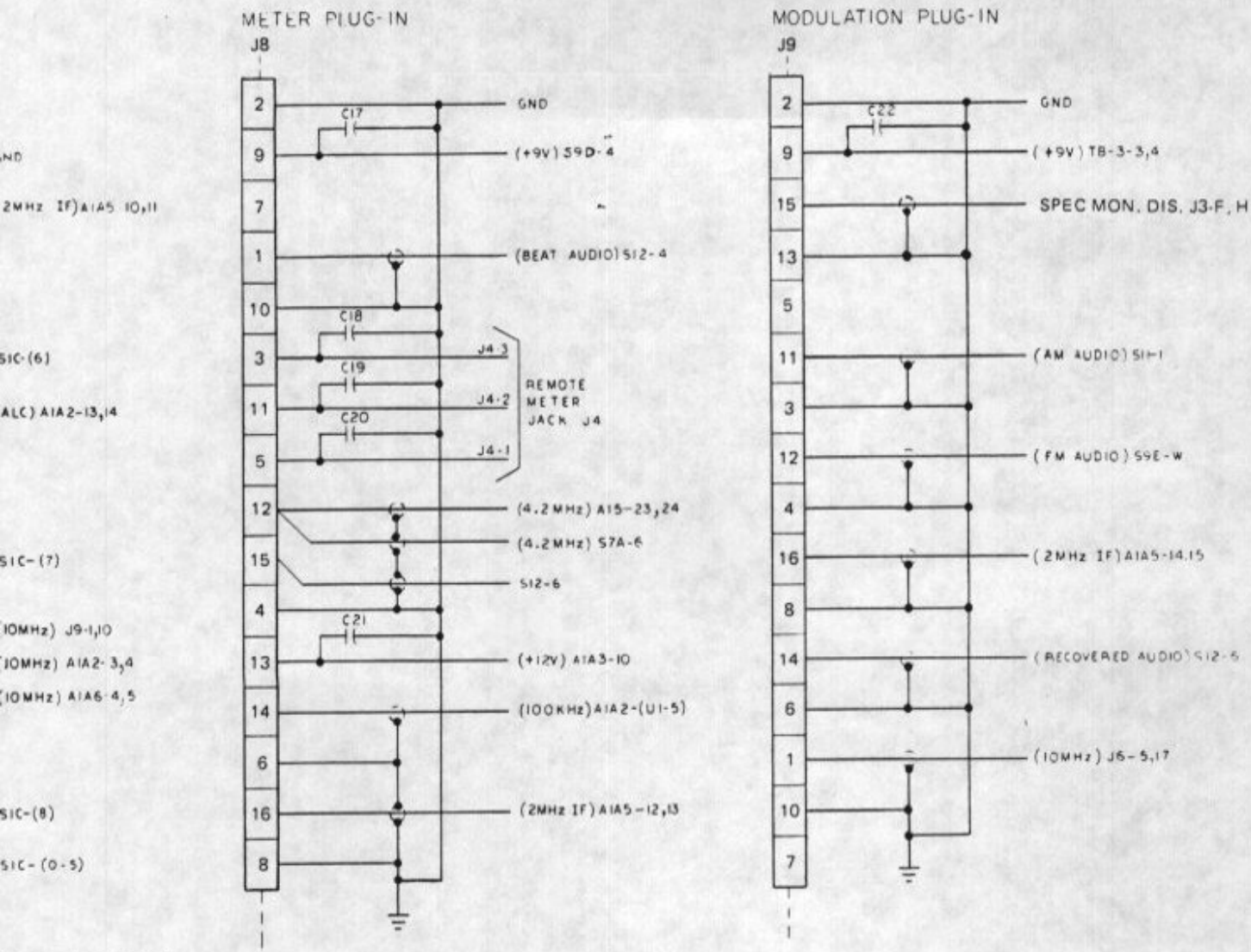


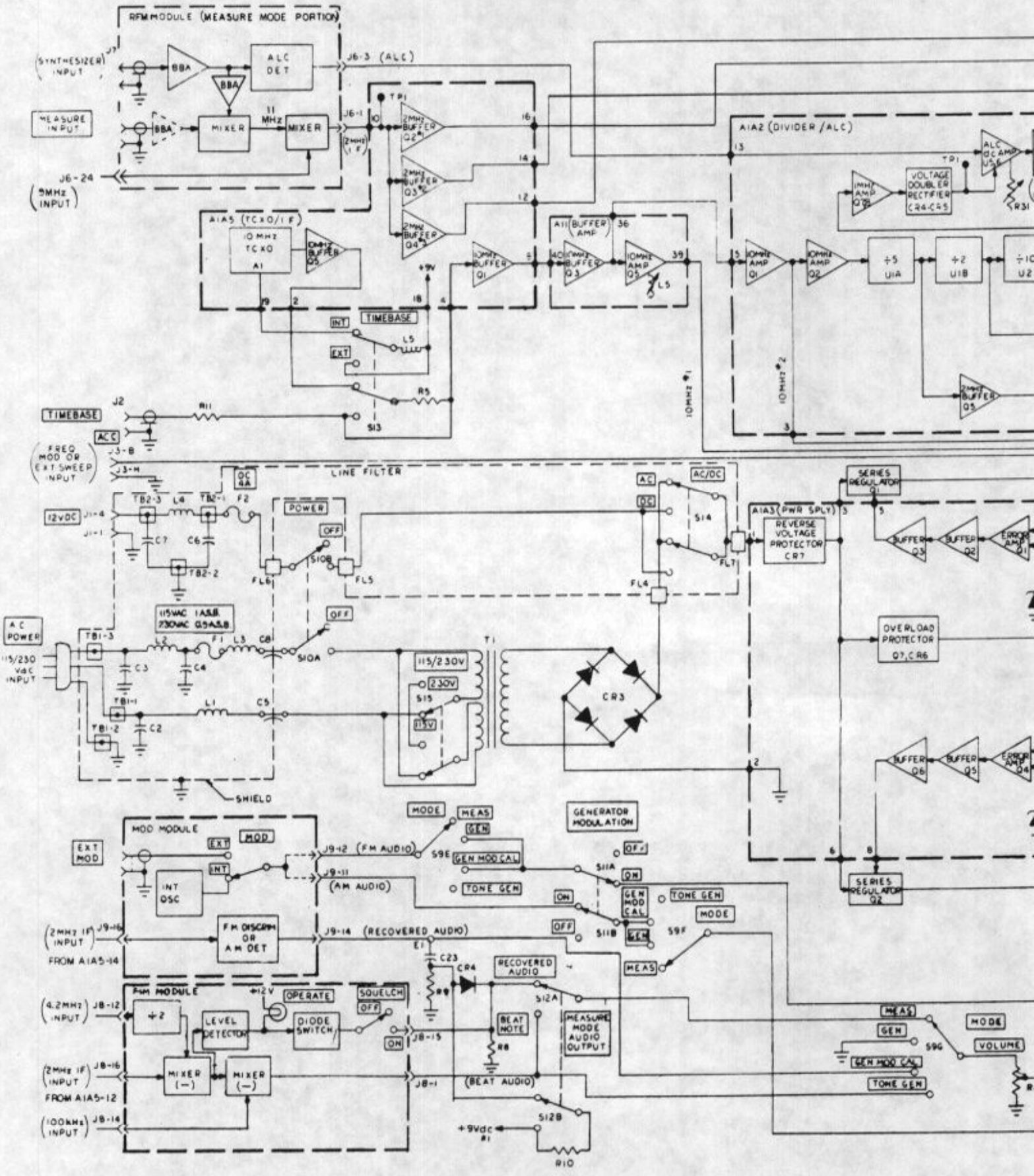
Figure 4-22. Switching Diagram, 100, 10, 1 MHz Decades, Mode, Measure Mode Audio Output, and Generator Modulation. Switching S1, S2, S3, S9, S11, S12, S16 Dwg. No. 4-501352-001(A)

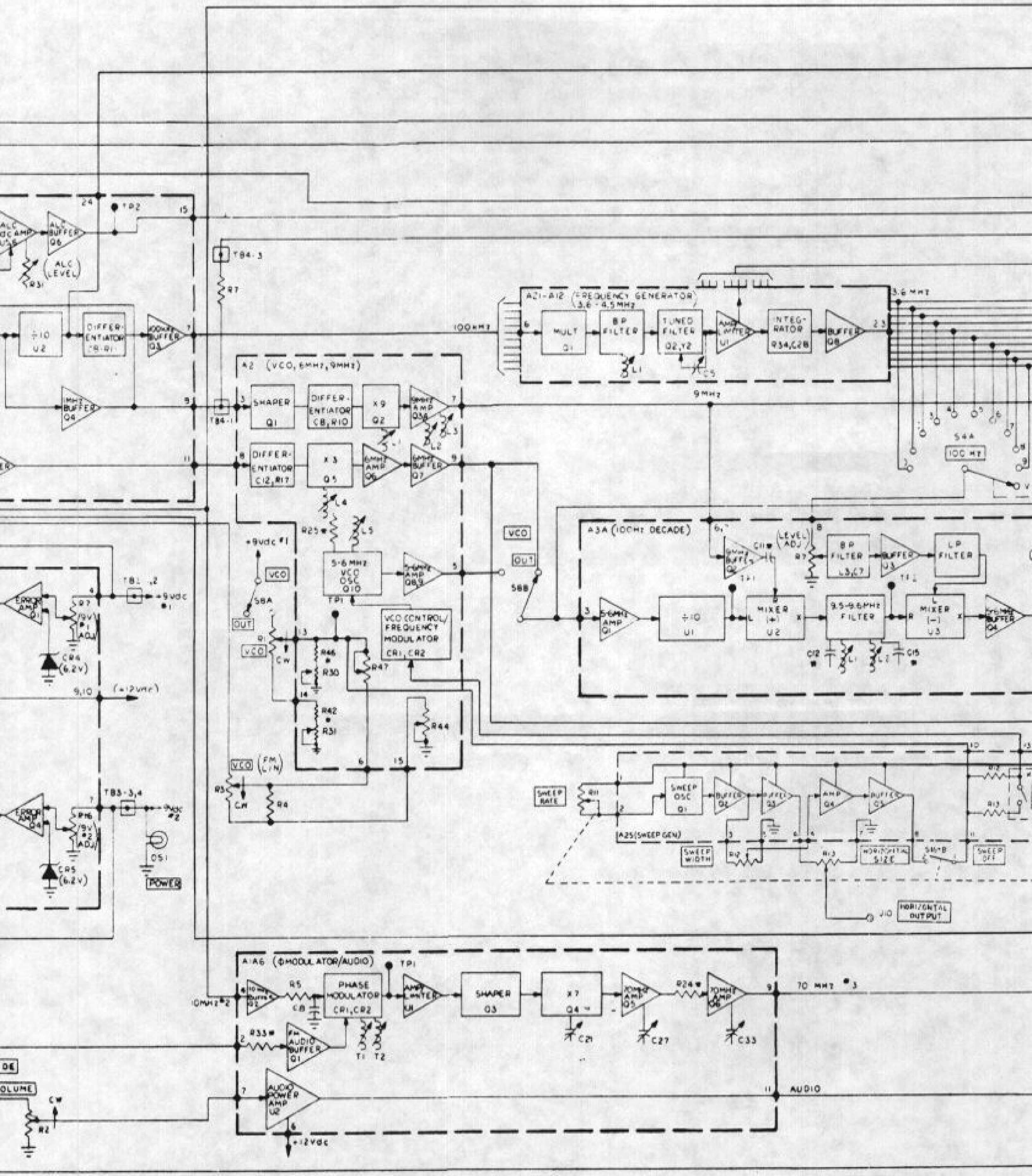

RF PLUG-IN
J6
8
21
1
13
2
14
3
15
4
16
5
17
6
18
7
19
20
9
10
22
11
23
24
12
C9
C10
C11
C12
C13
C14
C15
C16
GND
(2MHz IF) A1A5 10,11
SIC-(6)
(ALC) A1A2-13,14
SIC-(7)
(10MHz) J9-1,10
(10MHz) A1A2-3,4
(10MHz) A1A6-4,5
SIC-(8)
SIC-(0-5)
(+9V SWITCHED) S9C-4
(+9V) TB-3-3,4
(MEAS) S9C-1
SIC-(9)
SIC-(10)
(9MHz) A3D-7,22
J7
(SYNTH OUTPUT)
FL3-13, 13A
(50kHz-512MHz)
METER PLUG-IN
J8
2
9
7
1
10
3
11
5
12
15
4
13
14
6
16
8
C17
C18
C19
C20
C21
GND
(+9V) S9D-4
(BEAT AUDIO) S12
J4-3
J4-2
J4-1
REMOTE
METER
JACK J4
(4.2MHz) A15-2
(4.2MHz) S7A-6
S12-6
(+12V) A1A3-10
(100kHz) A1A2-
(2MHz IF) A1A5-



NOTE : UNLESS OTHERWISE SPECIFIED
ALL CAPACITORS VALUES ARE .001 UF (CK60)

Figure 4-23. Connector Wiring Diagram, RF Plug-in, Meter Plug-in and Modulation Plug-in Connector Wiring, J6, J7, J8, J9 Dwg. No. 4-501193-001(E)


RFM MODULE (MEASURE MODE PORTION)
SYNTHESIZER INPUT
MEASURE INPUT
BBA
ALC DET
MIXER
11 MHz
J6-3 (ALC)
J6-1
J6-24
5MHz INPUT
TP1
2MHz BUFFER Q2
2MHz BUFFER Q3
2MHz BUFFER Q4
(2MHz I F)
A1A5 (TCXO/I F)
10 MHz TCXO A1
10MHz BUFFER Q5
+9V
TIMEBASE
INT
EXT
L5
R5
J2
R11
S13
ACC
A11 BUFFER AMP
10MHz BUFFER Q1
10MHz BUFFER Q3
10MHz AMP Q5
A1A2 (DIVIDER /ALC)
ALC DC AMP U5
1MHz AMP Q3
VOLTAGE DOUBLER RECTIFIER CR4-CR5
R31
10MHz AMP Q1
10MHz AMP Q2
÷5 U1A
÷2 U1B
÷10 U2
10MHz #1
10MHz #2
2MHz BUFFER Q5
FREQ MOD OR EXT SWEEP INPUT
J3-B
J3-H
LINE FILTER
OC 4A
12VDC
J1-4
J1-1
TB2-3
L4
TB2-1
F2
C7
C6
TB2-2
POWER
OFF
S10B
FL6
FL5
AC
DC
AC/DC
S14
FL4
FL7
A1A3 (PWR SPLY)
REVERSE VOLTAGE PROTECTOR CR7
SERIES REGULATOR Q1
BUFFER Q3
BUFFER Q2
ERROR AMP Q1
OVERLOAD PROTECTOR Q7, CR6
BUFFER Q6
BUFFER Q5
ERROR AMP Q4
SERIES REGULATOR Q2
AC POWER
115/230 VAC INPUT
TB1-3
115VAC 1A5B
230VAC 01A5B
L2
F1
L3
C8
S10A
C3
C4
TB1-1
TB1-2
L1
C5
C2
SHIELD
T1
115/230V
230V
S15
115V
CR3
MOD MODULE
EXT MOD
EXT
INT
INT OSC
MOD
J9-12 (FM AUDIO)
J9-11 (AM AUDIO)
MODE
MEAS
GEN
S9E
GEN MOD CAL
TONE GEN
GENERATOR MODULATION
S11A
OFF
ON
S11B
S9F
(2MHz IF INPUT)
J9-16
FROM A1A5-14
FM DISCRM OR AM DET
J9-14 (RECOVERED AUDIO)
E1
C23
CR4
RECOVERED AUDIO
S12A
FM MODULE
(4.2MHz INPUT)
J8-12
+2
+12V
OPERATE
SQUELCH
OFF
ON
LEVEL DETECTION
DIODE SWITCH
J8-15
BEAT NOTE
R8
MEASURE MODE AUDIO OUTPUT
(2MHz IF INPUT)
J8-16
FROM A1A5-12
MIXER (-)
MIXER (-)
J8-1
(BEAT AUDIO)
(100kHz INPUT)
J8-14
+9Vdc #1
S12B
R10
S9G
VOLUME
R



A21-A12 (FREQUENCY GENERATOR) (3.6 - 4.5 MHz)
MULT Q1
BP FILTER
TUNED FILTER Q2,Y2
INTEGRATOR Q34,C28
BUFFER Q8
3.6 MHz
100 KHz
S4A
A2 (VCO, 6MHz, 9MHz)
SHAPER Q1
DIFFERENTIATOR C8,R10
X9 Q2
9MHz AMP Q3
DIFFERENTIATOR C12,R17
X3 Q5
6MHz AMP Q6
6MHz BUFFER Q7
5-6 MHz VCO OSC Q10
VCO CONTROL/ FREQUENCY MODULATOR CR1,CR2
+9vdc #1
S8A
S8B
VCO
OUT
9 MHz
A3A (100Hz DECADE)
LEVEL ADJ
BP FILTER L3,C7
LP FILTER
MIXER (+) U2
9.5-9.6MHz FILTER
MIXER (-) U3
÷10 U1
A25 (SWEEP GEN)
SWEEP OSC Q1
SWEEP RATE
SWEEP WIDTH
HORIZONTAL SIZE
SWEEP OFF
HORIZONTAL OUTPUT
J10
ALC DC AMP
ALC BUFFER Q6
ALC LEVEL
TP2
TB4-3
TB4-1
÷10 U2
DIFFERENTIATOR C9,R11
100KHz BUFFER Q3
1MHz BUFFER Q4
ERROR AMP Q1
ERROR AMP Q4
CR4 (6.2V)
CR5 (6.2V)
(+12vdc)
TB1-1,2
+9vdc #1
TB3-3,4
+9vdc #2
DS1
POWER
A1A6 (ΦMODULATOR/AUDIO)
10MHz #2
PHASE MODULATOR CR1,CR2
AMP LIMITER
SHAPER Q3
X7 Q4
70MHz AMP Q5
70MHz AMP Q6
70 MHz #3
FM AUDIO BUFFER Q1
AUDIO POWER AMP U2
AUDIO
+12Vdc
VOLUME

10 MHz #2

100 kHz

2MHz I F #3

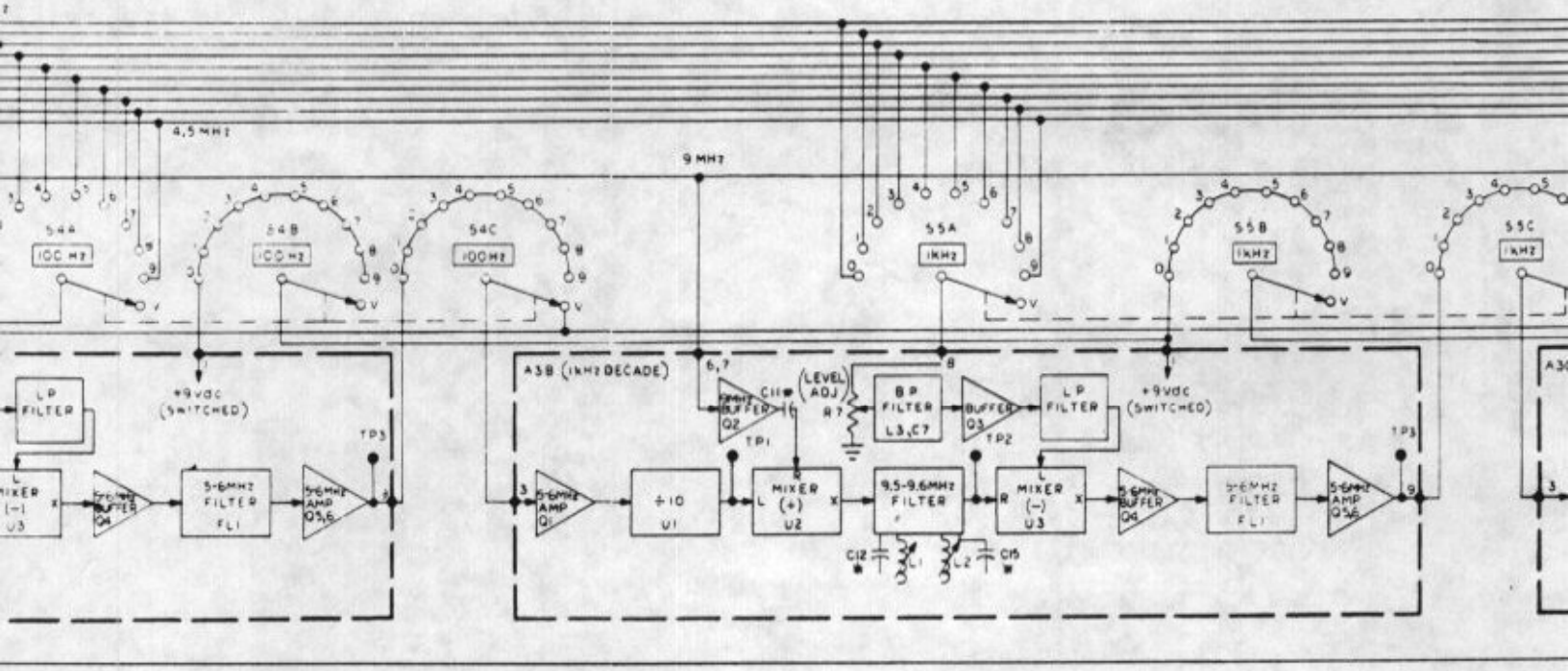
2MHz I F #1

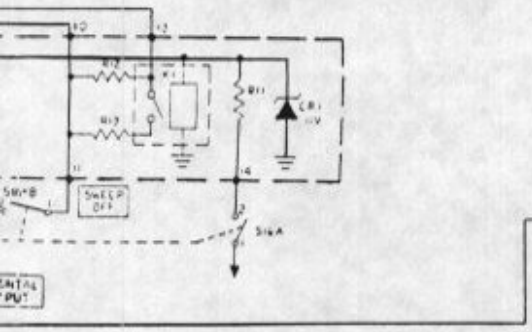
2MHz I F #2

ALC

1MHz

3.6 - 4.5MHz



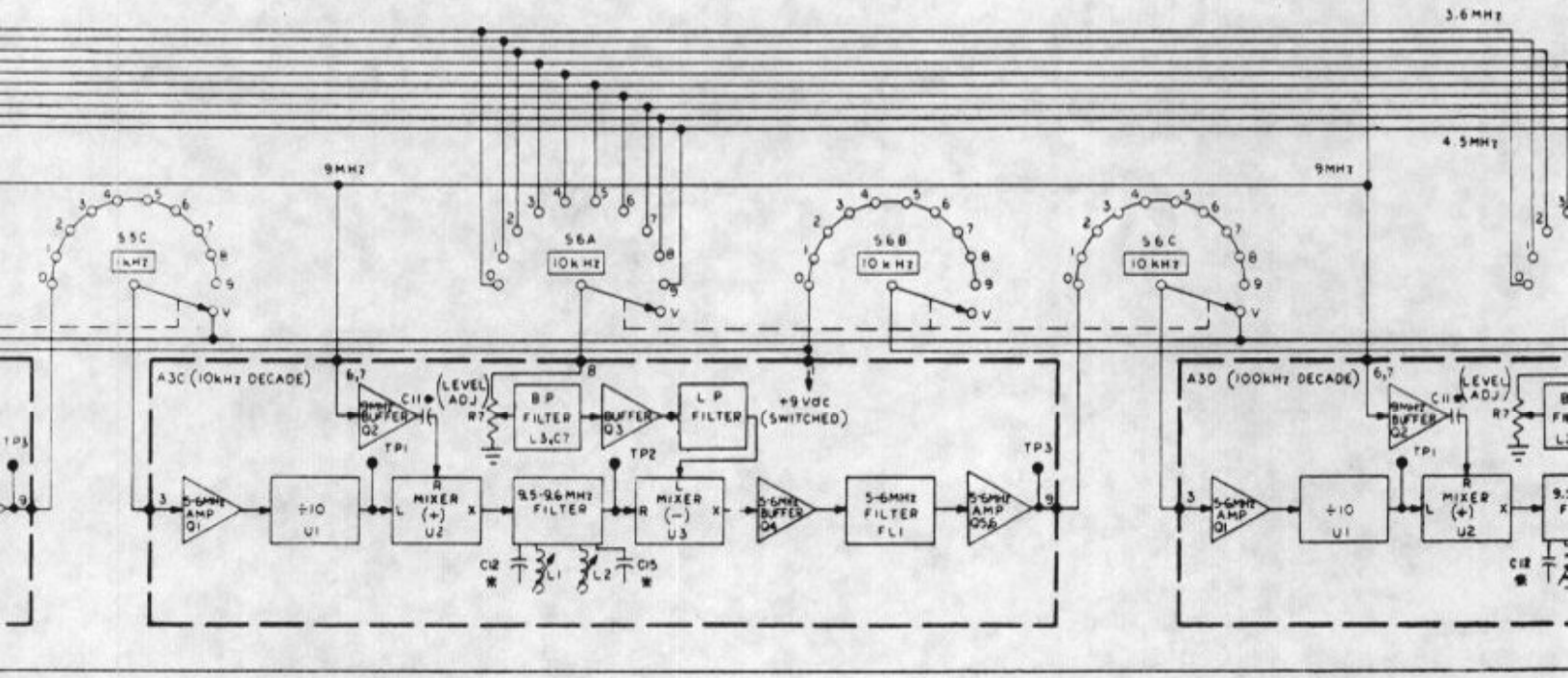


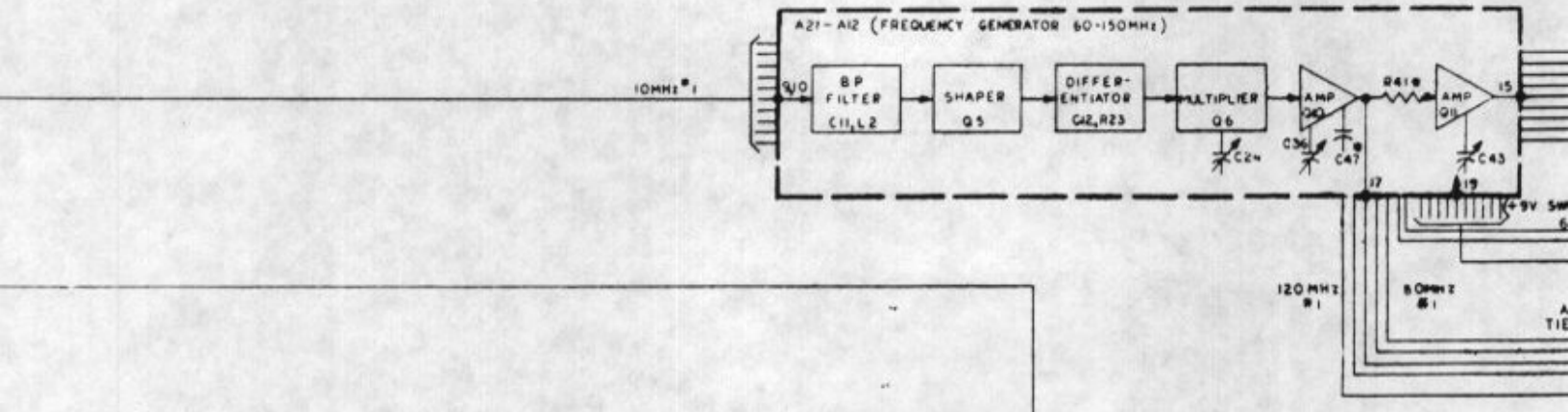
10MHz #1

70MHz #3

AUDIO

AM AUDIO


3.6MHz
4.5MHz
9MHz
9MHz
S5C
1 kHz
S6A
10 kHz
S6B
10 kHz
S6C
10 kHz
A3C (10kHz DECADE)
A3D (100kHz DECADE)
BUFFER Q2
(LEVEL ADJ)
BP FILTER L3,C7
BUFFER Q3
LP FILTER
+9 vdc (SWITCHED)
TP1
TP2
TP3
AMP Q1
÷10 U1
MIXER (+) U2
MIXER (−) U3
9.5-9.6MHz FILTER
5-6MHz BUFFER Q4
5-6MHz FILTER FL1
5-6MHz AMP Q5&6


A21-A12 (FREQUENCY GENERATOR 60-150MHz)
10MHz #1
BP FILTER C11,L2
SHAPER Q5
DIFFER-ENTIATOR C42,R23
MULTIPLIER Q6
AMP Q10
AMP Q11
C24
C36
C47
C43
R41
+9V
120MHz #1
80MHz #1

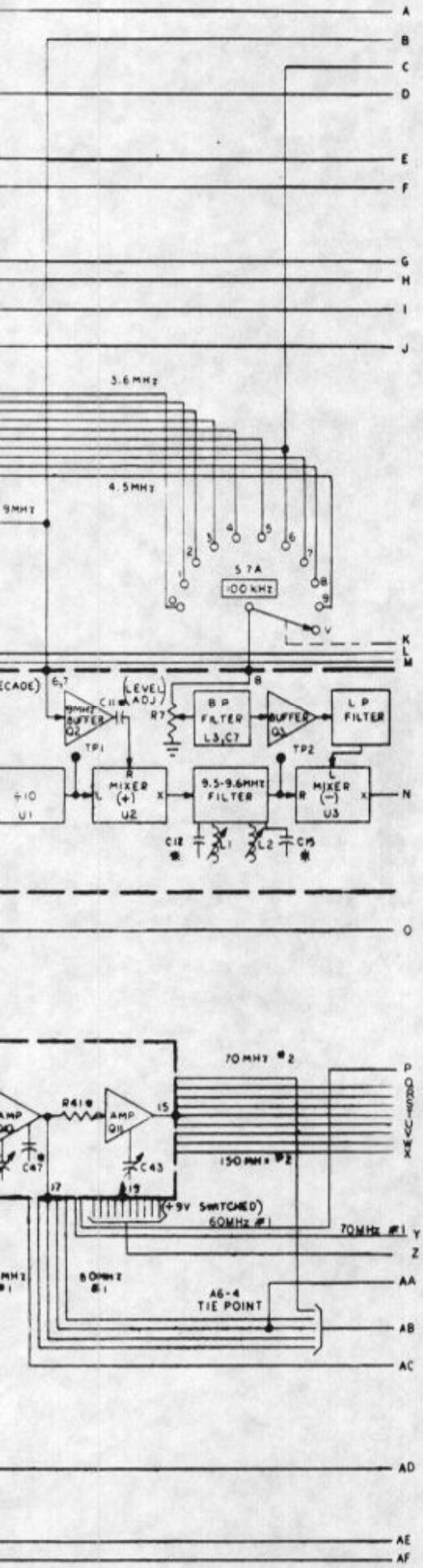
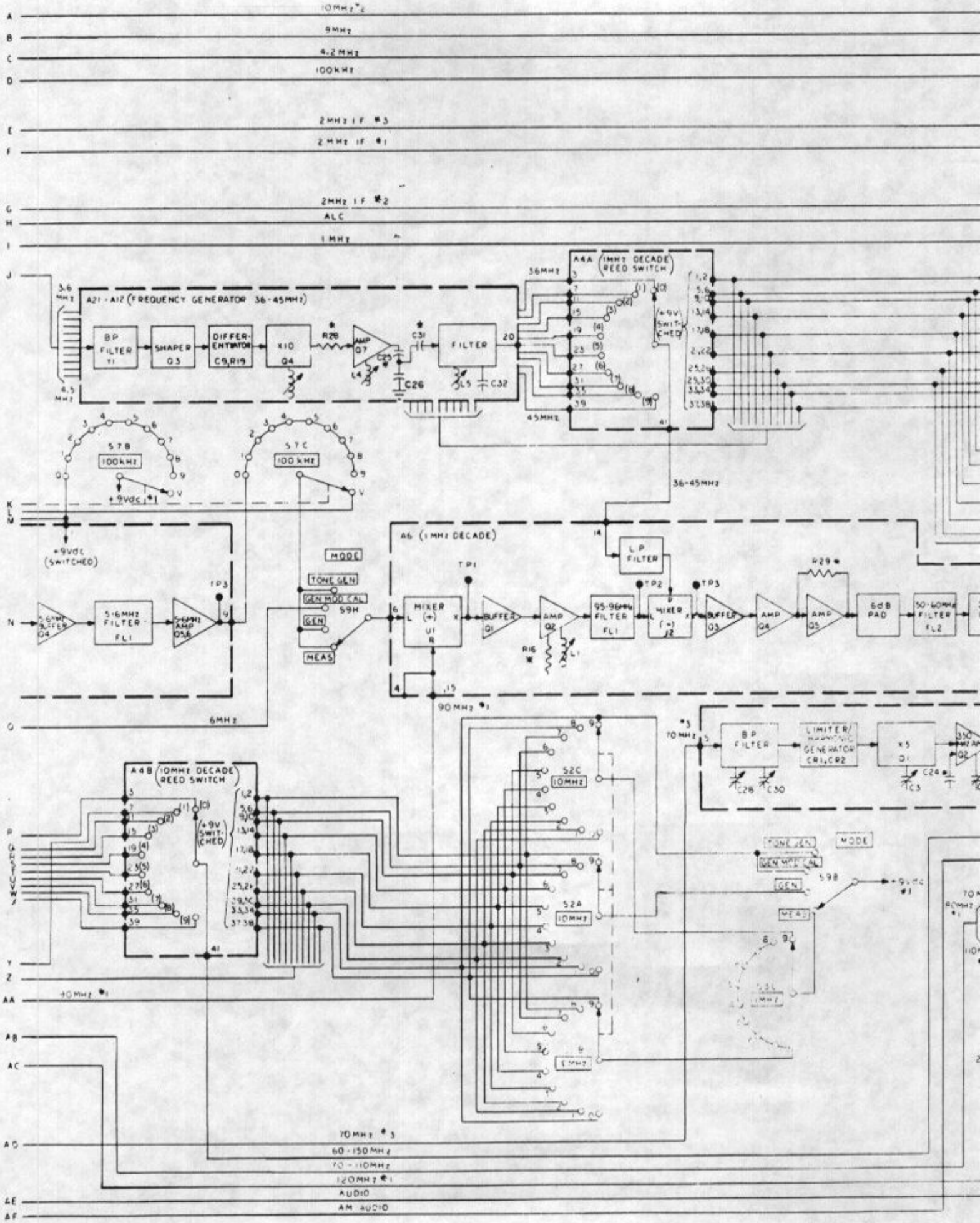
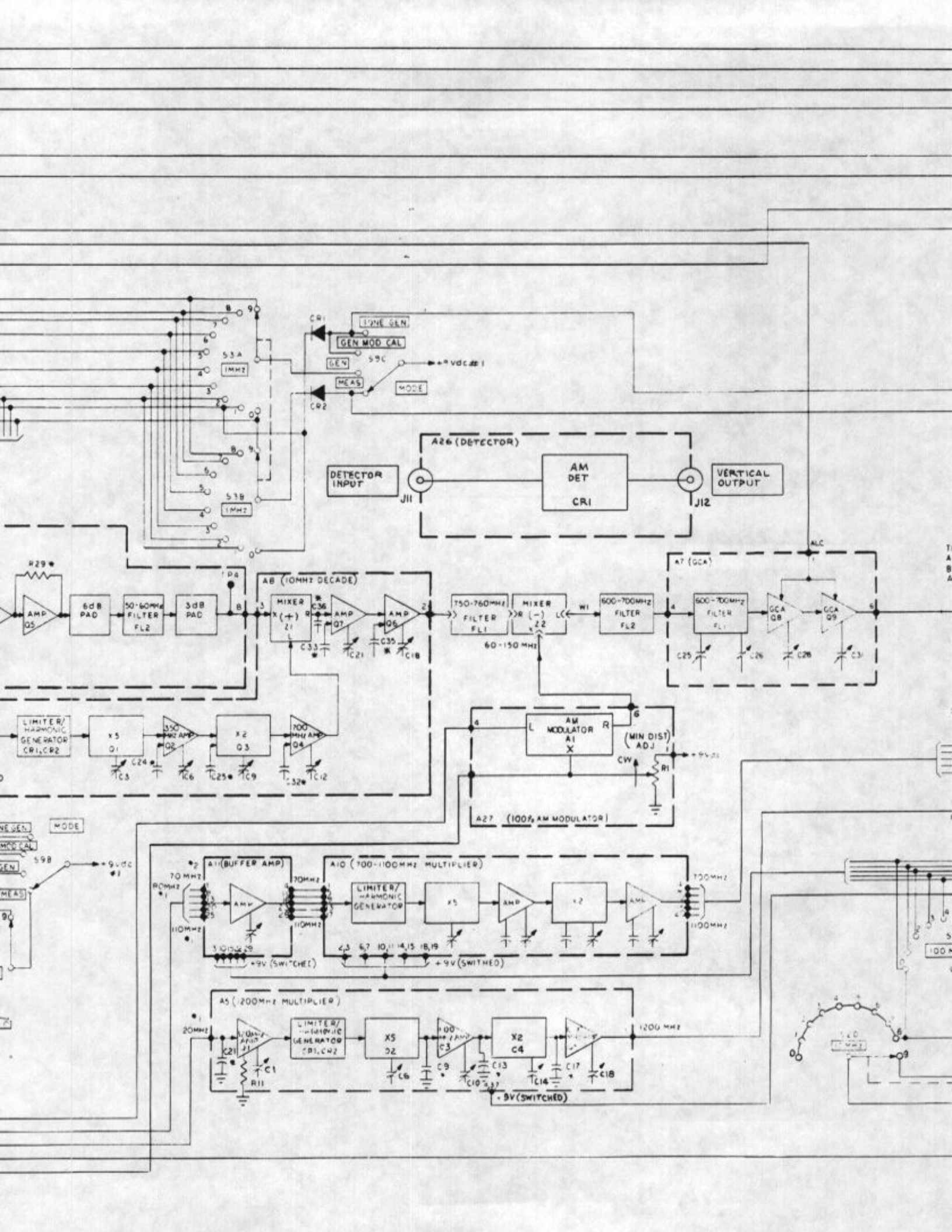
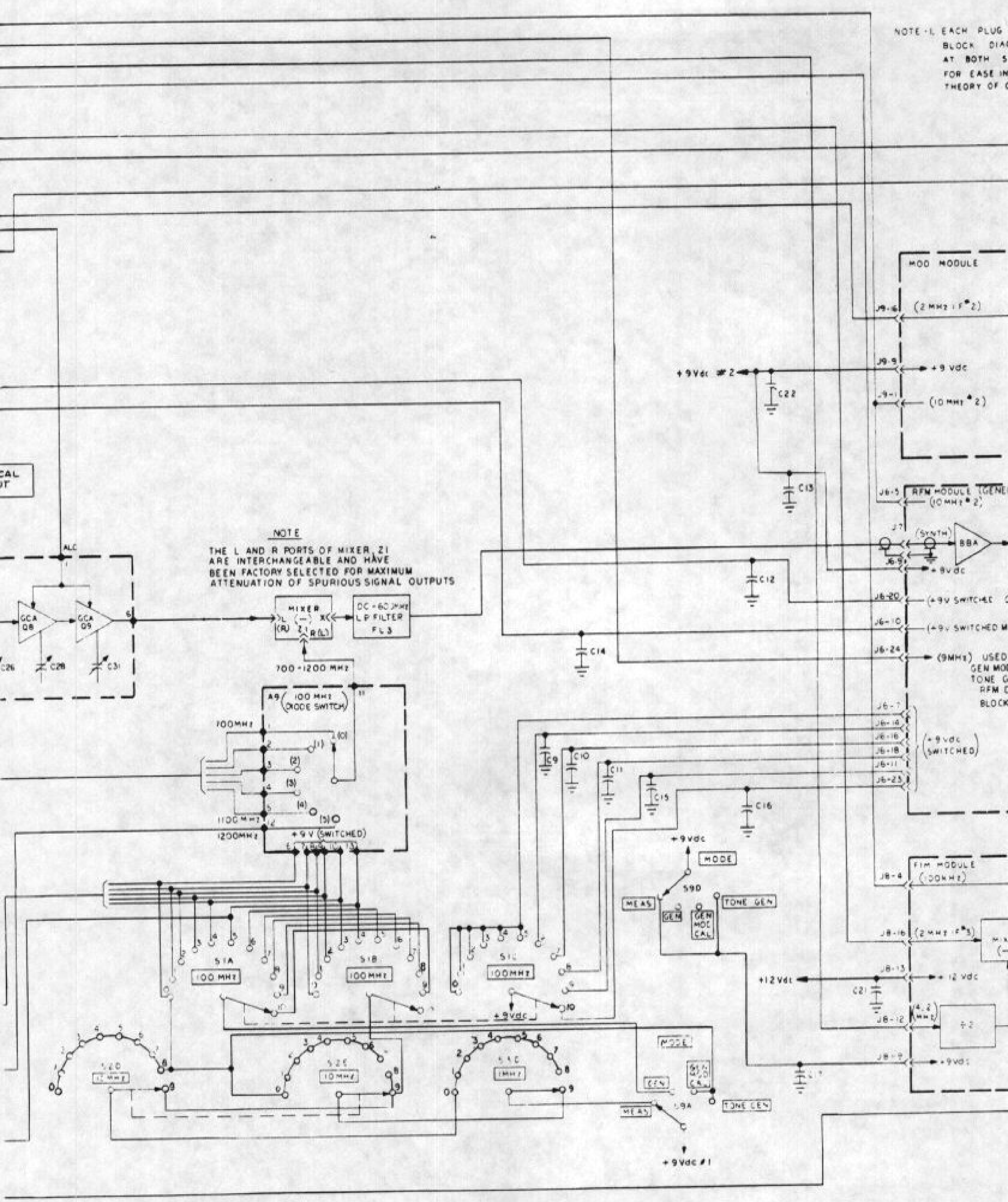


Figure 4-24. Detailed Block Diagram,
Model FM-10CS
Dwg. No. 6-501349-001(C)
(Sheet 1 of 2)


A 10MHz *2
B 9MHz
C 4.2MHz
D 100kHz
E 2MHz IF #3
F 2MHz IF #1
G 2MHz IF #2
H ALC
I 1MHz
J
A21 - A12 (FREQUENCY GENERATOR 36-45MHz)
3.6 MHz
6.5 MHz
BP FILTER Y1
SHAPER Q3
DIFFERENTIATOR C9,R19
X10 Q4
R28 *
AMP Q7
L4
C25 *
C31 *
C26
FILTER
L5
C32
20
A4A (1MHz DECADE REED SWITCH)
56MHz
45MHz
41
(+9V SWITCHED)
S7B
100kHz
+9VDC #1
S7C
100kHz
36-45MHz
K
L
M
+9VDC (SWITCHED)
A6 (1MHz DECADE)
MODE
TONE GEN
GEN MOD CAL
59H
GEN
MEAS
TP1
TP2
TP3
LP FILTER
R29 *
N
5.6MHz BUFFER Q4
5-6MHz FILTER FL1
5-6MHz AMP Q5,6
MIXER (+) U1
BUFFER Q1
AMP Q2
R16 *
L1
95-96MHz FILTER FL1
MIXER (-) U2
BUFFER Q3
AMP Q4
AMP Q5
6dB PAD
50-60MHz FILTER FL2
O
6MHz
90MHz #1
A48 (10MHz DECADE REED SWITCH)
S2C 10MHz
S2A 10MHz
1MHz
*3
70MHz
BP FILTER
LIMITER/HARMONIC GENERATOR CR1,CR2
X5 Q1
C28
C30
C3
C24 *
P
Q
R
S
T
U
V
W
X
Y
Z
AA 10MHz #1
AB
AC
AD
AE
AF
70MHz #3
60-150MHz
70-110MHz
120MHz #1
AUDIO
AM AUDIO


A26 (DETECTOR)
DETECTOR INPUT
J11
AM DET CR1
J12
VERTICAL OUTPUT
TONE GEN
GEN MOD CAL
GEN
MEAS
MODE
CR1
CR2
S3A
S3B
S3C
1MHZ
A8 (10MHZ DECADE)
A7 (GCA)
AMP Q5
6dB PAD
50-60MHz FILTER FL2
3dB PAD
MIXER
AMP Q7
AMP Q6
750-760MHz FILTER FL1
MIXER
600-700MHz FILTER FL2
600-700MHz FILTER FL1
GCA Q8
GCA Q9
ALC
60-150 MHz
LIMITER/ HARMONIC GENERATOR CR1,CR2
X5 Q1
350 MHz AMP Q2
X2 Q3
700 MHz AMP Q4
AM MODULATOR A1
(MIN DIST) ADJ
CW
R1
A27 (100% AM MODULATOR)
A11 (BUFFER AMP)
A10 (700-1100MHz MULTIPLIER)
70 MHz
80MHz
110MHz
LIMITER/ HARMONIC GENERATOR
X5
X2
1100MHz
+9V (SWITCHED)
A5 (200MHz MULTIPLIER)
20MHz
LIMITER/ HARMONIC GENERATOR CR1,CR2
X5 Q2
X2 C4
1200 MHz
-9V (SWITCHED)



NOTE-1. EACH PLUG
BLOCK DIA
AT BOTH S
FOR EASE IN
THEORY OF
MOD MODULE
J9-6 (2 MHz IF 2)
+9 Vdc #2
J9-9 +9 vdc
C22
J9-1 (10 MHz 2)
C13
J6-5 RFM MODULE (GENE
(10 MHz 2)
J7 (SYNTH)
BBA
J6-9 +9 vdc
C12
J6-20 (+9V SWITCHED
J6-10 (+9V SWITCHED M
C14
J6-24 (9MHz) USED
GEN MOD
TONE G
RFM
BLOCK
J6-7
J6-14
J6-16
J6-18
J6-11
J6-23
(+9 vdc SWITCHED)
C9
C10
C11
C15
C16
CAL
ALC
GCA Q8
GCA Q9
C26
C28
C31
NOTE
THE L AND R PORTS OF MIXER, Z1 ARE INTERCHANGEABLE AND HAVE BEEN FACTORY SELECTED FOR MAXIMUM ATTENUATION OF SPURIOUS SIGNAL OUTPUTS
MIXER
DC-60 MHz L.P. FILTER FL3
700-1200 MHz
A9 (100 MHz DIODE SWITCH)
700 MHz
1100 MHz
1200 MHz
+9 V (SWITCHED)
+9 Vdc
MODE
S9D
MEAS
GEN
GEN MOD CAL
TONE GEN
FM MODULE
J8-4 (100 kHz)
J8-16 (2 MHz IF 3)
J8-13 +12 vdc
+12 Vdc
C21
J8-12
÷2
J8-9 +9 vdc
S1A
100 MHz
S1B
100 MHz
S1C
100 MHz
+9 vdc
S2D
1 MHz
S2E
10 MHz
S2C
1 MHz
MODE
GEN
MEAS
S9A
TONE GEN
+9 Vdc #1

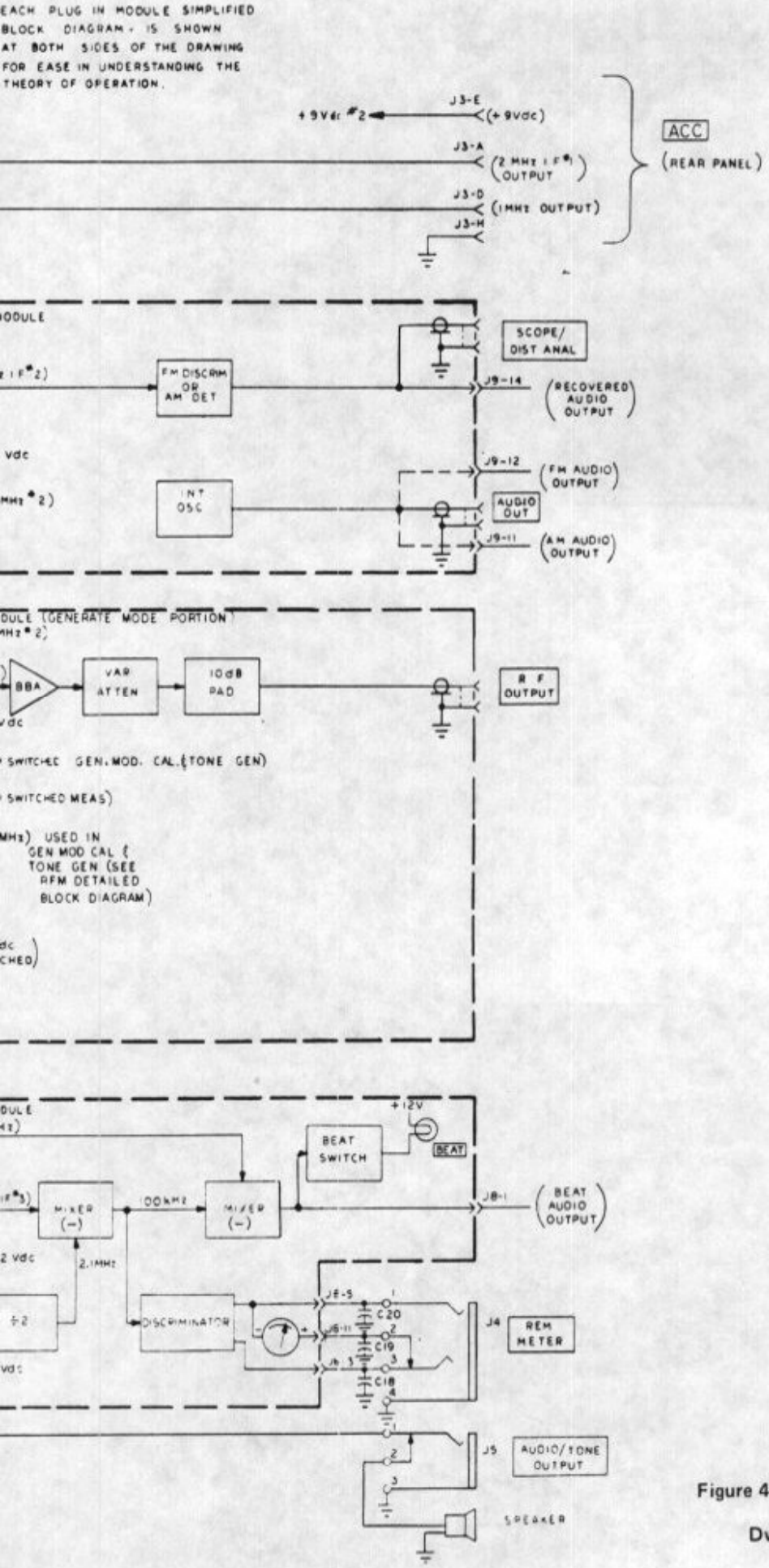


Figure 4-24. Detailed Block Diagram,
Model FM-10CS
Dwg. No. 6-501349-00(C)
(Sheet 2 of 2)

APPENDIX A

BACKDATING INFORMATION

FOR MODEL FM-10CS

Serial Numbers 101 thru instrument serial numbers suffixed with 05278

This manual refers directly to instrument serial numbers suffixed with 05279 and above. The following information is provided to adapt this manual for serial numbers 101 thru serial numbers suffixed with 05278.

Perform the following changes to the manual down to the effective serial number of your instrument.

Effective serial numbers: 101 thru serial numbers suffixed with 05278

Paragraph 1.3.6 Frequency Modulation Circuitry, Delete the last paragraph.

Figure 4-23 Connector Wiring Diagram, Delete the wire from Pin 7 of J9 and delete "J3–F, H".

Figure 4-24 Detailed Block Diagram, Model FM-10CS, Delete the amplifier and wire from the MOD module to J3-F 2 MHz IF #3 output.

Effective serial numbers: 101 thru serial numbers suffixed with 04294

Table 3-18. Parts List for Generator Assemblies, A12 thru A21

Change C16 as follows:

A16 thru A21	Capacitor, fixed, mica, 2 pF, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C

Figure 4-16. Schematic Diagram, Frequency Generator Assemblies, A12 thru A21

Change "Component Valves" Chart A16C16 thru A21C16 to 2 pF

Effective serial numbers: 101 thru serial numbers suffixed with 04276

Table 3-11. Parts List for 1200 MHz Decade Assembly, A5

Change C13 to:	Capacitor, fixed, mica, selected, 5 pF nominal, ±0.5 pF, 500 V dc	1-900003-004	72136	DM15C050

Delete: C22

Delete: C11

Figure 4-9. Schematic Diagram, 1200 MHz Multiplier Assembly, A5

Delete: C22 1000 pF

Delete: R11*47

Effective serial numbers: 101 thru serial numbers suffixed with 04232

Figure 4-15. Schematic Diagram, Buffer Amplifier Assembly, A11

Change output level at pins 40 and 41 to 2.8 mV p-p

Change output level at A11-38 and A11-39 to 3.3 V p-p

Change L5 voltage to 6.5 V p-p

Change Q3 collector voltage to +5.8 V

Effective serial numbers: 101 thru serial numbers suffixed with 04154

Paragraph 2.5.19 A21 Assembly Adjustment, 60 MHz

Change Step b. to: Disconnect the BNC connector on Z2-X (center connector) and connect BNC to the RF voltmeter (with 50 ohm termination).

Paragraph 2.5.28 A20 Assembly Adjustment, 70 MHz

Change Step f. to: Disconnect the BNC connector from Z2-X (center conductor) and connect it to the RF voltmeter (with 50 ohm termination). Peak A20C24, A20C36 and A20C43. The output should be −1 dBm±1 dB.

Paragraph 2.5.31 A7 Assembly Adjustment

Change Step j. to: Verify that the level at A7-4 is −8 dBm. Vary the sweep generator center frequency from 600 MHz to 700 MHz. The output level should not change more than ±2 dB from −18 dBm.

Figure 4-11. Schematic Diagram, Gain Control Amp/Amplitude Modulator Assembly (A7) and FL2

Remove FL2 and the response curve from A7-4, 4A and relocate at A7-6, 6A with A7-6, 6A connected to FL2-1

A7-6 output level, should be: −13 dBm NOM

Figure 4-12. Schematic Diagram, 10 MHz Decade Assembly (A8) and FL1 and Z2

Change Z2-X to: A4B-41, 42 (60-150 MHz) IN 0 dBm

Change Z2-L to: A7-4, 4A (600-700 MHz) OUT −8 dBm

Figure 4-13. Schematic Diagram, Diode Switch, Mixer, Low Pass Filter Assembly, (A9) and A1, FL3 and S1

Change Z1-L routing to: (600-700 MHz) IN FL2-2 −24 dBm

Z1-R, Delete: (L) (6)

Z1-L, Delete: (R) (6)

Delete: Note (6)

Effective serial numbers: 101 thru 850

Table 3-8. Parts List for VCO, 6 and 9 MHz Generator Assembly, A2 (Cont)

Change R46 to:	Resistor, fixed, composition, selected, 3.9 kilohm nominal, ±10%, 1/4 W	1-945000-044	01121	CB3921

Table 3-12. Parts List for 1 MHz Decade Assembly, A6

Change C1, C3, C16, C26, C29 to:	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10
Change C2, C6, C9-C12, C15, C17-C20, C22-C25, C27, C31 to:	Capacitor, fixed, mica, 0.01 uF, ±20%, 100 V dc	1-900077-002	56289	TG-S10

Table 3-12. Parts List for 1 MHz Decade Assembly, A6 (Cont)

Change C34 to:	Capacitor, fixed, mica, 270 pF, ±5%, 500 V dc	1-900003-041	72136	DM15F270J
R25, should be:	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021

Table 3-12. Parts List for 1 MHz Decade Assembly, A6 (Cont)

Change R31 to:	Resistor, fixed, composition, 27 ohm, ±10%, 1/4 W	1-945000-018	01121	CB2701

Figure 4-5. Schematic Diagram, VCO, 6, 9 MHz Assembly (A2) and 0-100 Hz Control Assembly

R46 should be: 3.9 K

Figure 4-10. Schematic Diagram, 1 MHz Decade Assembly (A6)

Change C1-C3, C6, C9-C12, C15-C20, C22-C27, C29, C31 to: 0.01 uF

Change R25 to: 1 K

Change C34 to: 270

Change R31 to: 27

Effective serial numbers: 101 thru 800

Paragraph 2.5.34 Amplitude Modulation Adjustment

Delete: Steps a. thru aa. and replace with the following:

a. Disconnect the BNC cable from FL3 at Z1-X. Connect a 50 ohm termination to the oscilloscope vertical input receptacle. Connect a 50 ohm BNC coaxial cable between the 50 ohm termination and Z1-X.

b. Connect the audio oscillator to the AM MOD receptacle on the Model AFM-2 and the oscilloscope external horizontal input receptacle.

c. Set the Mainframe Frequency switches to 5 MHz. Connect the ac voltmeter to A7-2.

d. Set the audio oscillator frequency to 1.0 kHz and adjust its output level to obtain 75 mV rms at A7-2.

e. Vary the oscilloscope controls to obtain a trapezoid pattern 5 divisions in width and 4 divisions in amplitude for E max. E min. should be between 2.3 and 2.0 divisions (27% to 33% modulation). If E min. is not within 2.3 and 2.0 divisions, select A7R22 for approximately 2.15 divisions (30% modulation). Observe that there is no visible distortion on the oscilloscope. Reconnect the BNC cable back to Z1-X.

Table 3-1. Parts List for Main Assemblies and Chassis (Cont)

A7, Change the Singer Part No. to: 4-003086-002

Table 3-1. Parts List for Main Assemblies and Chassis (Cont)

Delete: A27	Assembly, AM Modulator	1-004873-001	88869	

Table 3-1. Parts List for Main Assemblies and Chassis (Cont)

Change F1 to:	Fuse, slo-blo, 3/4 Amp, 250 V	1-924000-017	71400	MDL-3/4

Table 3-1. Parts List for Main Assemblies and Chassis (Cont)

Delete: L5	Inductor, fixed, 10 uH, 440 mA	1-906022-005	29525	13-10-10

Table 3-9. Parts List for 100 Hz, 1 kHz, 10 kHz and 100 kHz Decade Assembly, A3A, A3B, A3C, A3D

Change C2 to:	Capacitor, fixed, mica, 150 pF, ±5%, 500 V dc	1-900003-034	72136	DM15F151J
Change C11 to:	Capacitor, fixed, mica, selected, 10 pF nominal, ±5%, 500 V dc	1-900003-008	72136	DM15C100K

Table 3-9. Parts List for 100 Hz, 1 kHz, 10 kHz and 100 kHz Decade Assembly, A3A, A3B, A3C, A3D (Cont.)

Below L5, Add: L6	Inductor, fixed, 220 uF	1-906003-041	43543	DD220

Table 3-9. Parts List for 100 Hz, 1 kHz, 10 kHz and 100 kHz Decade Assembly, A3A, A3B, A3C, A3D (Cont)

Delete: R23	Not used			
R24	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711

Table 3-13. Parts List for Gain Control Amp/Amplitude Modulator Assembly, A7

Change C24, C32 to:	Capacitor, fixed, mica, 10 pF, ±5%, 500 V dc	1-900003-008	73136	DM15C100J
Change C39 to:	Capacitor, fixed, standoff, 470 pF, −0% +100%, 500 V dc	1-900044-001	01121	SS5D-471W
Change C40, C42 to:	Capacitor, fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 V dc	1-900003-002	72136	DM15C020C
Delete: C43	Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc	1-900003-047	72136	DM15F471J
Add: CR1, CR2	Diode, germanium V_r=30 V, If=100 mA	1-913005-001	03877	IN273
Below L13, Add: L14	Not used			
L15	Inductor, fixed, 5 turns	1-945000-025	88869	
L16	Inductor, fixed, 5 turns	1-945000-053	88869	
Change R15 to:	Resistor, fixed, composition, 47 ohm, ±10%, 1/4 W	1-945000-021	01121	CB4701
Change R21 to:	Resistor, fixed, composition, selected, 22 kilohm nominal, ±10%, 1/4 W	1-945000-053	01121	CB2231
Change R22 to:	Resistor, fixed, composition, selected, 100 ohm nominal, ±10%, 1/4 W	1-945000-025	01121	CB1011
Change R25 to:	Resistor, fixed, composition, 16 ohm, ±5%, 1/4 W	1-945000-119	01121	CB1605
Change R26, R27 to:	Resistor, fixed, composition, 300 ohm, ±5%, 1/4 W	1-945000-149	01121	CB3015
Delete: R28, R30	Resistor, fixed, composition, 300 ohm, ±5%, 1/4 W	1-945000-149	01121	CB3015
Delete: R29	Resistor, fixed, composition, 18 ohm, ±5%, 1/4 W	1-945000-120	01121	CB1805

Table 3-21. Parts List for AM Modulator Assembly, A27

Delete: R4 and all information

Figure 4-6. Schematic Diagram, .1, 1, 10, 100 kHz Decade Assemblies (A3A, A3B, A3C, A3D)

Change C2 to: 150 pF

Change C11 to: *10 pF

Delete: R24, 470, and replace with an inductor, L6, 220 uH

Figure 4-11. Schematic Diagram, Gain Control Amp/Amplitude Modulator Assembly (A7) and FL2

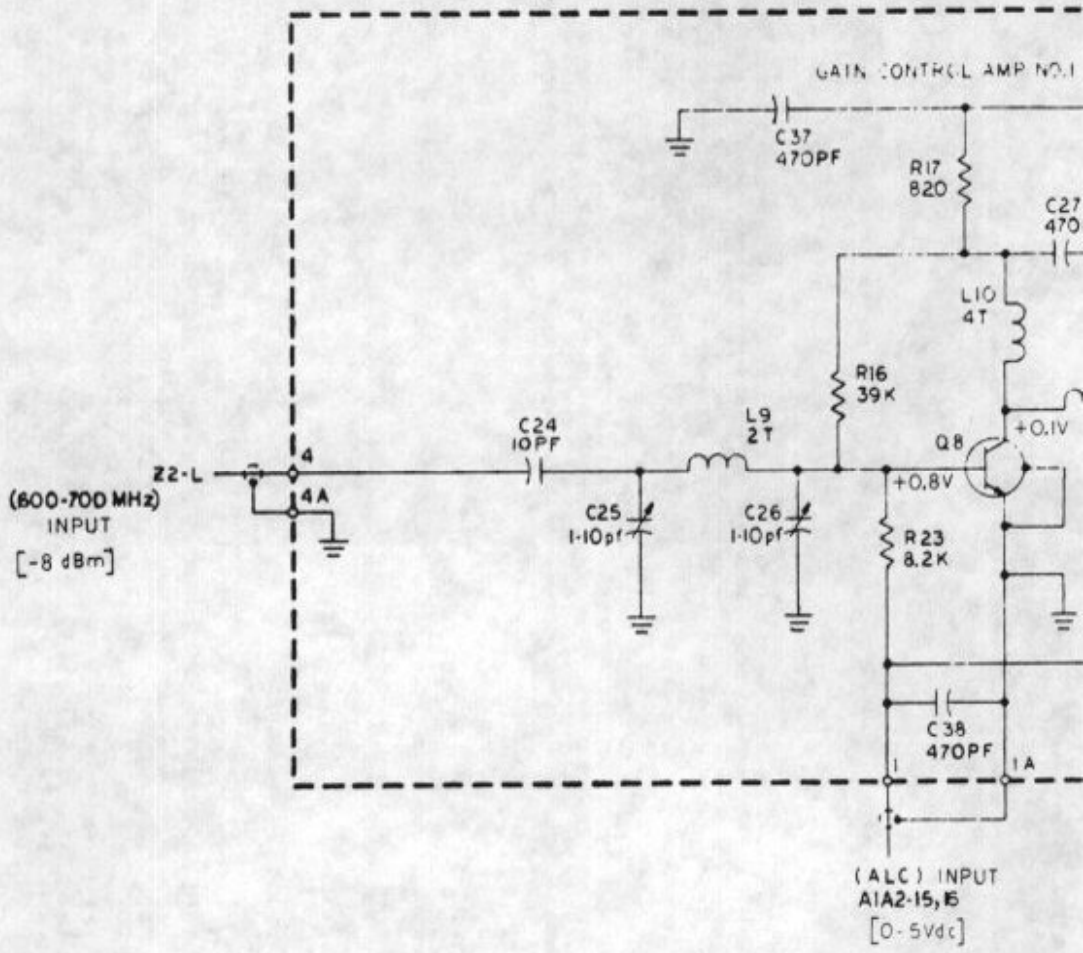
Delete: Entire schematic diagram and replace with attached Figure 4-11.

Figure 4-20. Schematic Diagram, AM Modulator Assembly, A27.

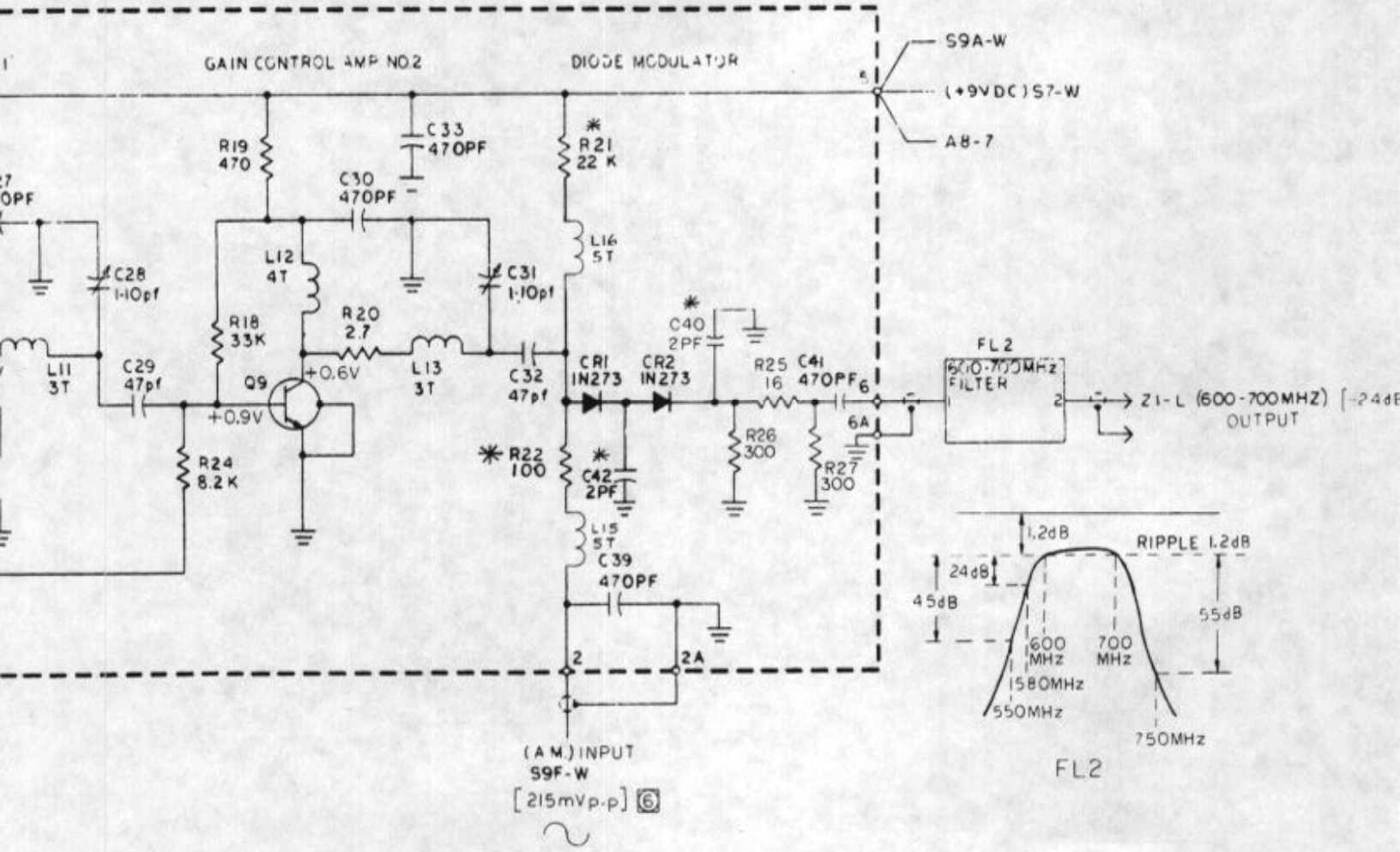
Delete: R4, 47, and replace with a straight line

Figure 4-24. Detailed Block Diagram, Model FM-10CS (Sheet 1 of 2)

Change the 115 VAC fuse designation to: 0.75A



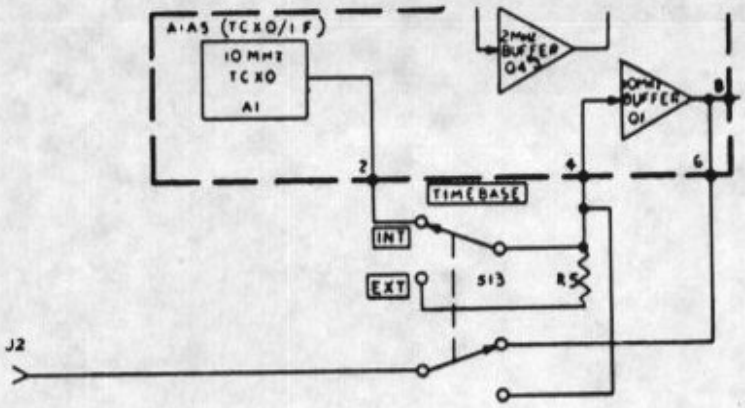
NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTOR VALUES ARE IN OHMS, ±10%, 1/4W.
2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
3. ALL TRANSISTORS ARE 2N5179.
4. • DENOTES FACTORY SELECTED VALUE.
5. PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLE
   DESIGNATION PREFIX WITH ASSY NO.(A7), EXAMPLE "A7C3."
6. LEVEL REQUIRED FOR 30% MODULATION.
7. VOLTAGES & POWER LEVELS SHOWN WITHOUT TOLERANCES ARE TYPICAL.
8. ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED. (DISABLE INTERNAL TIME BASE)



(For use with serial numbers 301 thru 800)

Figure 4-11. Schematic Diagram, Gain Control Amp/Amplitude Modulator Assembly (A7) and FL2 Dwg. No. 4-500181-001

Change the diagram as illustrated below:

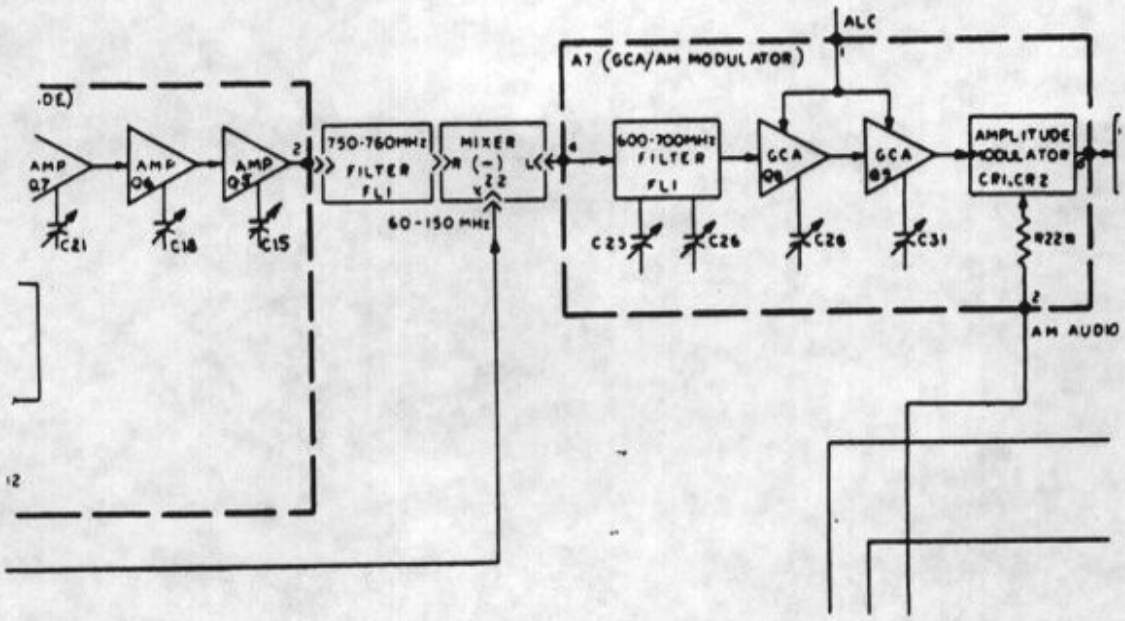


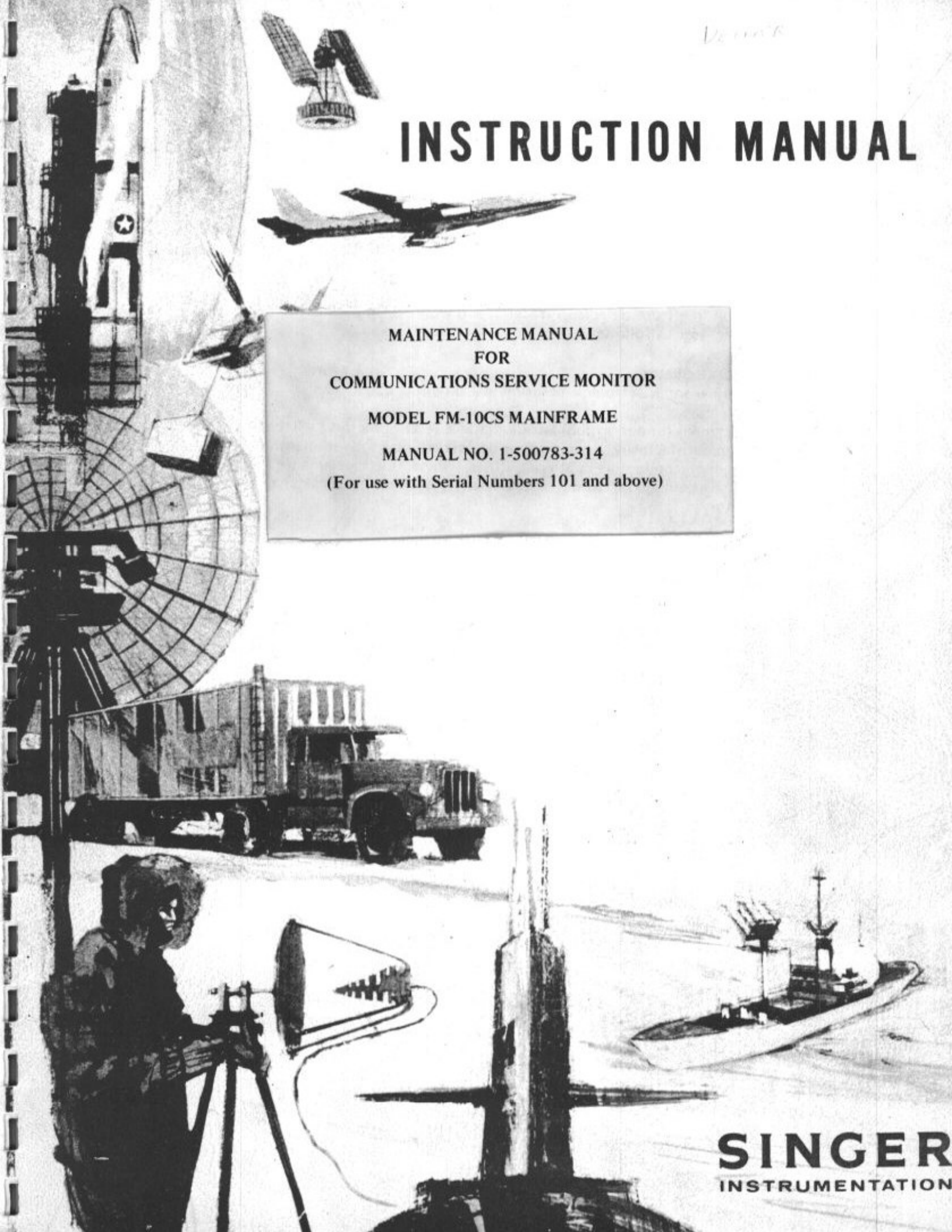
Page 4-47/4-48: Figure 4-24. Detailed Block Diagram, Model FM-10CS (Sheet 2 of 2)

Remove FL2 from A7-4 (input) and replace with a straight line.

Add: FL2 between A7-6 and Z1-L

Change the diagram as illustrated below:





INSTRUCTION MANUAL

MAINTENANCE MANUAL
FOR
COMMUNICATIONS SERVICE MONITOR

MODEL FM-10CS MAINFRAME

MANUAL NO. 1-500783-314

(For use with Serial Numbers 101 and above)

SINGER
INSTRUMENTATION

MAINTENANCE MANUAL
FOR
COMMUNICATIONS SERVICE MONITOR

MODEL FM-10CS MAINFRAME

MANUAL NO. 1-500783-314

(For use with Serial Numbers 101 and above)

This manual refers directly to serial numbers suffixed with 05279 and above.

Appendix A, Manual Backdating Information, adapts this manual to serial number 101 thru serial numbers suffixed with 05278.

For operating instructions refer to Model FM-10CS Operator's Manual No. 1-500783-313.

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SINGER
INSTRUMENTATION

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Section I
THEORY OF OPERATION

1.1 INTRODUCTION

This section contains the circuit description of the Model FM-10CS Mainframe. The information is presented to assist the user in the troubleshooting and maintenance of the instrument. See the Simplified Block Diagram, Figure 1-2, the Detailed Block Diagram, Figure 4-24, and the Schematic Diagrams, Figure 4-1 thru 4-23.

1.2 GENERAL

The Model FM-10CS is a direct synthesizer. The output signal of the frequency synthesizer consists of various frequencies which are derived from the 10 MHz TCXO (temperature compensated crystal oscillator) by a process of frequency division and multiplication. These frequencies are mixed, filtered, and amplified to produce the output signal. Harmonic oscillators and phase lock loops of the indirect synthesizer are eliminated by this method. The residual FM which can result from a loop closure technique is completely eliminated. All of the frequencies are selected by the Frequency switches and each frequency is instantly available at the output receptacle.

Each step in the mixing process is filtered to minimize the spurious responses which are close to the desired frequency.

The internal signal which supplies the reference for the frequency meter also functions as an extremely accurate signal generator.

Precise audio signals may also be generated by means of a special adaptation of the beat-note circuitry and are available at the front panel.

1.3 DETAILED THEORY

1.3.1 TCXO, Primary Dividers and Multipliers (See Figure 4-24)

The output of the temperature-compensated crystal oscillator (TCXO), A1A5A1, is applied to 10 MHz buffer, A1A5Q5, and then to the TIMEBASE switch, S13. When the TIMEBASE switch is at the INT position, +9 V supply is applied to the TCXO and the buffered output is applied to 10 MHz buffer A1A5Q1 and to the TIMEBASE receptacle, J2. With the TIMEBASE switch in the EXT position, an external 10 MHz signal with an accuracy greater than 1 ppm may be applied to the TIMEBASE receptacle to increase the accuracy of the instrument.

The output of the 10 MHz buffer is also applied to the 10 MHz buffer, A11Q3, and is amplified by 10 MHz amplifier, A11Q5. This output is designated "10 MHz #1" and is used to supply the basis for the 60 MHz to 150 MHz frequency generators. The output of A11Q3 is also applied to 10 MHz amplifier, A1A2Q1. The output of this amplifier is designated "10 MHz #2" and is applied to Phase Modulation Assembly, A1A6, and to terminal 1 of the rear connector of the Model OAM-1, ODM-1 or MDM-1 module and to terminal 5 of the back connector of the RFM module.

The output of 10 MHz amplifier A1A2Q1 is also amplified by 10 MHz amplifier, A1A2Q2 and divided by 5 by A1A2U1A. The 2 MHz output is buffered by A1A2Q5 and multiplied by 3 by frequency multiplier, A2Q5. The 6 MHz output is amplified by A2Q6 and buffered by A2Q7. This output is applied to the 1 MHz Decade Assembly, A6, when the MODE switch, S9H, is in the GEN MOD CAL position, and is also applied to the 100 Hz Decade Assembly, A3A, when the VCO switch, S8B, is in the OUT position. When the VCO switch is in the OUT position, the output of A2Q7 is also applied to the 1 kHz Decade Assembly, A3B, the 10 kHz Decade Assemby, A3C, and the 100 kHz Decade Assembly, A3D, when the 100 Hz, 1 kHz and 10 kHz decade switches, respectively, are in the V position. This output (output of A2Q7) is also applied to the 1 MHz Decade Assembly, A6, when the MODE switch, S9H, is in either TONE GEN, GEN or the MEAS position.

The 2 MHz output of A1A2U1A is also divided by 2 by A1A2U1B and the 1 MHz output is buffered by A1A2Q4 and multiplied by 9 by frequency multiplier A2Q2. A2Q3 and A2Q4 amplify the 9 MHz and the amplified output is applied to the 100 Hz, 1 kHz, 10 kHz and 100 kHz Decade Assemblies, A3A, A3B, A3C and A3D respectively. The output of A2Q4 is also applied to terminal 24 of the back connector of the RFM module.

The 1 MHz output of A1A2Q4 is also applied to ACC receptacle, J3-D and to 1 MHz amplifiers, A1A2Q7 and A1A2Q8, where the 1 MHz voltage is rectified and doubled by A1A2CR4 and A1A2CR5 and utilized as a voltage reference for ALC amplifier, A1A2U5 and A1A2U6.

The 1 MHz output of A1A2U1B is also divided by 10 by A1A2U2 and the 100 kHz output is buffered by A1A2Q3 and applied to Frequency Generator Assemblies A12 thru A21. The 100 kHz output of A1A2U2 is applied to terminal 4 of the back connector of the Model FIM-3.

1.3.2 VCO Circuitry

The voltage-controlled oscillator (VCO) A2Q10, which provides the 0–100 Hz component of the final synthesized frequency, is controlled by a +9 V dc voltage varied by the VCO control, R1, when the VCO switch, S8A, is not in the OUT position. R1 is part of the front panel 0–100 Hz control. The dc voltage varies the capacitance of the VCO control/frequency modulator, A2CR1 and A2CR2 (variable-capacitance diodes) which provide a tuning range of 5 MHz to 6 MHz. The output signal of the VCO oscillator circuit is amplified by A2Q9 and A2Q8 and the amplified output signal is applied to the VCO switch, S8B. The 5 MHz to 6 MHz output of the VCO Assembly is switched to the 100 Hz, 1 kHz, 10 kHz or 100 kHz Decade Assemblies when any of these Frequency switches are at the V position. When the 0–100 Hz control, S7, is at the OUT position, the VCO is switched off and the 6 MHz signal supplied from A2 is routed to the 100 Hz Decade Assembly.

1.3.3 Frequency Synthesis Circuitry

a. 100 Hz Decade

The 100 kHz from the 100 kHz buffer, A1A2Q3, is applied to the 3.6 MHz to 4.5 MHz sections of Frequency Generator Assemblies, A21 thru A12 respectively. The 100 kHz is multiplied by Q1, filtered by Y2, and amplified by U1. Q8 is a buffer. The 10 outputs (3.6 MHz to 4.5 MHz) are applied to 100 Hz switch, S4A.

The 6 MHz from A2Q7 or the VCO output of A2Q9 is applied to the 100 Hz Decade Assembly, A3A, depending upon the position of the VCO switch, S8B. This frequency is divided by ten by A3AU1. The 9 MHz from A2Q4 is mixed with this signal at A3AU2 and the sum frequency is applied to mixer A3AU3. The 3.6 MHz to 4.5 MHz frequency selected by 100 Hz Frequency switch, S4A, is also applied to this mixer. The difference frequency is filtered, amplified and then applied to 1 kHz Decade Assembly, A3B, through 100 Hz Frequency switch, S4C.

b. 1 kHz Decade

The 1 kHz Decade Assembly, A3B, is identical in all respects to the 100 Hz Decade Assembly, A3A, except the 1 kHz Frequency switch, S5A, applies the 3.6 MHz to 4.5 MHz frequencies to the mixer A3BU3.

c. 10 kHz Decade

The 10 kHz Decade Assembly, A3C, is identical in all respects to the 100 Hz Decade Assembly, A3A, except the 10 kHz Frequency switch, S6A, applies the 3.6 MHz to 4.5 MHz frequencies to the mixer A3CU3.

d. 100 kHz Decade

The 100 kHz Decade Assembly, A3D, is identical in all respects to the 100 Hz Decade Assembly, A3A, except the 100 kHz Frequency switch, S7A, applies the 3.6 MHz to 4.5 MHz frequencies to the mixer A3DU3.

e. 1 MHz Decade

3.6 MHz to 4.5 MHz is also applied to the 36 MHz to 45 MHz section of A21 thru A12, respectively, from amplifier-limiter U1. The 3.6 MHz to 4.5 MHz signals are multiplied by ten and applied to the 1 MHz Decade Reed Switch Assembly, A4A. The output of the 100 kHz decade, A3D, is applied to the input mixer, A6U1-L, when the 100 kHz Frequency switch is in any position except V and the MODE switch, S9H, is in any position except GEN MOD CAL. (In the GEN MOD CAL position, 6 MHz from the 6 MHz buffer, A2Q7, is applied to the mixer, A6U1-L. 90 MHz #1 derived from the 60 MHz to 150 MHz section of A18 is applied to the mixer A6U1-R; the sum frequency, 96 MHz, is applied to mixer A6U2-L.)

1 MHz Frequency switch, S3A and S3B, selects the 36 MHz to 45 MHz from the A21 thru A12 assemblies, respectively, and applies one of the frequencies to mixer A6U2-R. The difference frequency is applied to mixer A8Z1-X.

f. 10 MHz Decade

700 MHz is applied to mixer A8Z1-L and the sum frequency is applied to mixer Z2-R through amplifiers, A8Q7, A8Q6, and bandpass filter, FL1.

NOTE

The L and R ports of Z2 are interchangeable and have been factory selected for maximum attenuation of spurious signal outputs.

The 60 MHz to 150 MHz sections of the A21 thru A12 Frequency Generator Assemblies derive their frequencies from the 10 MHz #1 signal. This is multiplied by Q6 and amplified by Q10 and Q11. There are two outputs on these sections; 60 MHz to 120 MHz #1 outputs and 70 MHz to 150 MHz #2 outputs.

The 70 MHz to 150 MHz #2 outputs are applied to 10 MHz Decade Reed Switch Assembly, A4B, with the exception of 70 MHz #1. These frequencies are selected by 10 MHz Frequency switch, S2A, S2B and S2C and one frequency is applied to mixer, Z2-X via AM modulator A27A1.

The difference frequency, 600 MHz to 700 MHz, is applied via filter, FL2, to the gain control amplifier (GCA), A7Q8 and A7Q9 where automatic leveling is accomplished.

The output of the GCA is applied to mixer Z1-L.

g. 100 MHz Decade

The 70 MHz #2 signal and the 80 MHz to 110 MHz #1 signals from the 60 MHz to 150 MHz Frequency Generator Assemblies are applied to the buffer amplifiers on Buffer Amplifier Assembly, A11, and the amplified outputs are applied to the 700 MHz to 1100 MHz Multiplier Assembly, A10, where the frequencies are multiplied by five and by two to produce 700 MHz to 1100 MHz frequencies which are applied to the 100 MHz Diode Switch Assembly, A9.

The 120 MHz #1 signal from the Frequency Generator Assembly, A15, is applied to the 1200 MHz Multiplier Assembly, A5, where the 120 MHz is amplified and multiplied by five and by two to provide 1200 MHz which is applied to the 100 MHz Diode Switch Assembly, A9.

The 700 MHz to 1200 MHz signals at the 100 MHz Diode Switch Assembly input are selected by the 100 MHz Frequency switch, S1A and S1B, and one frequency is applied to mixer Z1-R. The difference frequency is applied to the RF OUTPUT receptacle via the RFM module.

h. Programming Circuitry

The 1 MHz Frequency switch, S3, and the 10 MHz

Frequency switch, S2, and the 100 MHz Frequency switch, S1, are interconnected so that when the MODE switch is at the MEAS position, the synthesizer frequency is 11 MHz higher than the Frequency switch positions. In the GEN position, the frequency of the synthesizer is the same as the Frequency switch positions. In the GEN MOD CAL position the synthesizer is at 11 MHz for any frequency switch position.

In the TONE GEN mode the synthesizer frequency is 11 MHz plus any frequency set by the Frequency switches to the right of the 1 MHz Frequency switch.

i. Typical Frequency Synthesis (See Figure 1-1)

An example of frequency synthesis of 123.45678 MHz is as follows:

For this example, the Frequency switches and 0–100 Hz control are set to 123.45678 MHz.

When the 0–100 Hz control is set to 8, the VCO output frequency is 5.2 MHz. This is divided by 10 in the 100 Hz Decade Assembly, A3A, to produce 520 kHz, which is mixed in A3AU2 to produce 9.52 MHz.

When the 100 Hz Frequency switch is set to 7, the generator output frequency selected is 4.3 MHz. The 9.52 MHz is mixed with the 4.3 MHz in mixer, A3AU3 to produce a difference frequency of 5.22 MHz.

The 5.22 MHz is divided by ten by A3BU1 to produce 522 kHz which is mixed with 9 MHz in mixer U3BU2 to produce a sum frequency of 9.522 MHz. The 1 kHz Frequency switch selects 4.2 MHz in the 6 position and mixes with the 9.522 MHz in mixer, A3BU3, to produce a difference frequency of 5.322 MHz.

The 5.322 MHz is divided by ten by A3CU1 to produce 543.22 kHz. This is mixed with 9 MHz in A3CU2 to produce a sum frequency of 9.5322 MHz. With the 10 kHz Frequency switch in the 5 position, 4.1 MHz is selected and mixed with the 9.5322 MHz in mixer, A3CU3, to produce a difference frequency of 5.4322 MHz.

The 5.4322 MHz is divided by ten by A3DU1 to produce 543.22 kHz. This is mixed with 9 MHz in A3DU2 to produce a sum frequency of 9.54322 MHz. With the 100 kHz Frequency switch in the 4 position, 4.0 MHz is selected and mixed with the 9.54322 MHz in mixer, A3DU3, to produce a difference frequency of 5.54322 MHz.

The 5.54322 MHz is mixed with the 90 MHz #1 in mixer, A6U1, to produce a sum frequency of 95.54322 MHz. The 1 MHz Frequency switch selects 39 MHz in the 3 position and mixes with the 95.54322 MHz in mixer, A6U2, to produce a difference frequency of 56.54322 MHz.

The 56.54322 MHz is mixed with 700 MHz in mixer, A8Z1, to produce a sum frequency of 756.54322 MHz. The 10 MHz Frequency switch

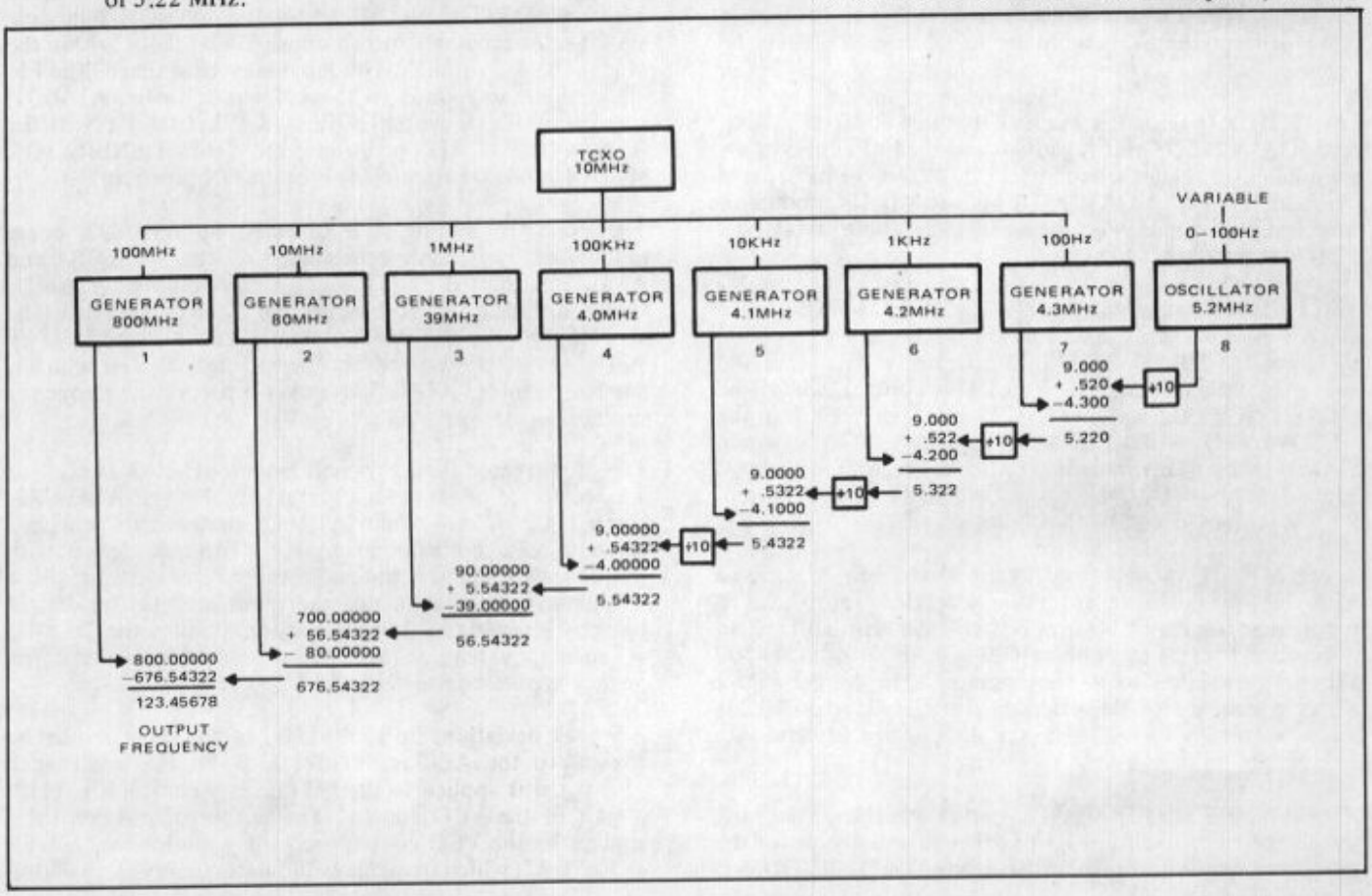


Figure 1-1. Typical Frequency Synthesis

selects 80 MHz in the 2 position and mixes with the 756.54322 MHz in mixer, Z2, to produce a difference frequency of 676.54322 MHz.

The 100 MHz Frequency switch selects 800 MHz in the 1 position which is mixed with the 676.54322 MHz in mixer, Z1, to produce a difference frequency of 123.45678 MHz which is presented to the RF OUTPUT receptacle of the RFM module.

1.3.4 ALC Circuitry

The automatic level control (ALC) detector in the RFM module provides a dc output proportional to the RF level at its input. This dc level is applied to the ALC dc amplifier, A1A2U5 and A1A2U6. The amplified output is buffered by A1A2Q6 and applied to the gain control amplifier (GCA) A7Q8 and A7Q9, which controls the level of synthesizer signal that is applied to the RF OUTPUT receptacle of the RFM module. This signal is continuously monitored by the ALC detector and the output level is continuously corrected. The GCA amplifier has a dynamic range of 28 dB so that the output level will be corrected throughout the temperature range specification of the instrument.

1.3.5 Measure Input Circuitry

The signal applied to the MEASURE INPUT receptacle of the RFM module is mixed with the synthesizer output (offset 11 MHz higher in frequency by the 1 MHz, 10 MHz and 100 MHz programming circuitry) to produce an 11 MHz IF signal when the Model FM-10CS Frequency switches are at the same position as the incoming signal frequency. The 11 MHz IF signal is mixed with the 9 MHz developed on the A2 assembly, to produce a 2 MHz IF signal.

This 2 MHz IF signal is applied to three 2 MHz buffers, A1A5Q2, A1A5Q3 and A1A5Q4, and the buffered outputs are applied to the ACC receptacle, J3-A, on the back panel (#1); to the Model OAM-1, ODM-1 or MDM-1 module to detect any modulation on the signal (#2); and to the Model FIM-3, respectively (#3).

The 2 MHz IF (#2) applied to the Model OAM-1, ODM-1 or MDM-1 module is utilized to demodulate any modulated signals at the MEASURE INPUT receptacle. The recovered audio is applied to the VOLUME control when the MEASURE MODE AUDIO OUTPUT switch, S12, is in the RECOVERED AUDIO position and the MODE switch, S9G, is in the MEAS position. Also the recovered audio is applied to the VOLUME control when the MODE switch, S9G, is in the GEN MOD CAL position.

The 2 MHz IF (#3) applied to the Model FIM-3 is mixed with 2.1 MHz derived from the 4.2 MHz from the A18 Frequency Generator Assembly (which is divided by 2 to produce 2.1 MHz) to derive a 100 kHz IF signal. This 100 kHz IF is applied to a discriminator. The Model FIM-3 meter connected to the discriminator output will indicate any deviation from 100 kHz and display this deviation up to a maximum of ±15 kHz.

A high level 2 MHz IF signal output is available at the back panel ACC receptacle, J3-F, for driving the detector for the spectrum monitor display when using the Model ODM-1. (Factory installed only on serial numbers suffixed with 05229 and above).

A remote meter may be plugged into the REM METER receptacle, J4, if a display is required at a distance from the Model FM-10CS. The Model FIM-3 meter will be disconnected at this time.

Also, the 100 kHz IF is mixed with 100 kHz derived from A1A2U2 and the difference frequency (error frequency) will operate the BEAT lamp at the rate of the error frequency.

Also, the error frequency is applied to the VOLUME control, R2, when the MEASURE MODE switch, S12A, is in the BEAT NOTE position and the MODE switch, S9G, is in the MEAS position.

The output of the VOLUME control is amplified by A1A6U2 and the amplified output is applied to the speaker. Headphones or a remote speaker may be plugged into the AUDIO/TONE OUTPUT receptacle, J5, if desired. The internal speaker will be disconnected at this time.

The Model FIM-3 module is equipped with a SQUELCH switch. When the SQUELCH switch is ON and the OPERATE lamp is lit, the diode switch in the Model FIM-3 is turned off and the diode switch, CR4, in the Mainframe is turned on. This allows the recovered audio from the MOD module to reach the speaker when modulation is being measured by the Model FM-10CS system.

1.3.6 Frequency Modulation Circuitry

For peak deviation up to 18 kHz either an external signal may be applied to the Model ODM-1 or MDM-1 module EXT MOD receptacle or the internal modulator within the Model ODM-1 or MDM-1 module may be utilized. The FM audio signal is applied to the FM audio buffer, A1A6Q1, when the MODE switch, S9E, is in either the GEN or the GEN MOD CAL position and the GENERATOR MODULATION switch, S11, is in the ON position.

The 10 MHz #2 signal is buffered by A1A6Q2, phase modulated by variable capacitance diodes, A1A6CR1 and A1A6CR2, limited by high-gain limiter amplifier A1A6U1, then multiplied by 7 to produce the 70 MHz #3 signal. The 70 MHz #3 signal is further multiplied by 5 and by 2 by A8Q1 and A8Q3 respectively to produce 700 MHz which is applied to mixer A8Z1. This mixer is part of the frequency synthesizer circuitry.

The audio modulating signal from buffer, A1A6Q1, is applied to the phase modulator, A1A6CR1 and A1A6CR2, through the A1A6R5 and A1A6C8 network to provide a response characteristic decreasing 6 dB per octave with frequency throughout the audio range to convert the phase modulator characteristic of the modulator to the desired FM characteristic. This frequency modulates the 70 MHz #3 signal, which in turn frequency modulates the frequency synthesizer signal at A8Z1.

For peak deviations up to 60 kHz, an audio signal must be applied to the ACC receptacle, J3-B, on the back panel. This signal is applied to the FM linearity control R3, which is part of the VCO control. The output of this control is applied to the VCO control/frequency modulator, A2CR1 and A2CR2, which frequency modulates the VCO oscillator,

A2Q10. The VCO oscillator output frequency modulates the synthesizer signal whenever the VCO switch, S8B, is not in the OUT position and one of the 100 Hz, 1 kHz, 10 kHz or 100 kHz Frequency switches is in the V position.

1.3.7 Amplitude Modulation Circuitry

An external audio signal may be applied to the EXT MOD receptacle of the Model OAM-1, module or the internal modulator within the Model OAM-1, module may be utilized. The audio signal is applied to the 100% AM Modulator Assembly, A27, when the GENERATOR MODULATION switch, S11, is in the ON position and the MODE switch, S9F, is in either the GEN or GEN MOD CAL position. The 100% AM Modulator Assembly modulates the synthesizer signal.

1.3.8 Tone Generator Circuitry

The frequency synthesizer is set by the 1 MHz, 10 MHz and 100 MHz programming switches to produce 11 MHz plus any Frequency switch position to the right of the 1 MHz Frequency switch. This frequency is mixed with 9 MHz in the RFM module to produce an IF signal of 2 MHz + which is applied to the 2 MHz IF buffer A1A5Q4. The buffered 2 MHz + is applied to the Model FIM-3 where it is mixed with 2.1 MHz producing a 100 kHz + IF signal which is mixed with 100 kHz to produce the frequency set on the Frequency switches to the right of the 1 MHz Frequency switch. This tone frequency is applied to the VOLUME control when the MODE switch, S9G, is set to the TONE GEN position. The tone frequency is then amplified by A1A6U2 and the amplified output is available at the AUDIO OUTPUT/TONE OUTPUT receptacle J5.

1.3.9 Sweep Circuitry

The SWEEP RATE potentiometer, R11, controls the repetition rate of the sweep oscillator, A25Q1. The sweep output of buffer A25Q2, is applied to the SWEEP WIDTH control, R12, and amplified by A25Q4. It is then applied to the VCO on A2 via the SWEEP switch and relay A25K1. The sweep output of buffer A25Q2 is also applied to the HORIZONTAL SIZE control, R13, and then to the HORIZONTAL OUTPUT receptacle, J10.

The RF detector, A26, is accessible from the front panel by the DETECTOR INPUT receptacle, J11, and the VERTICAL OUTPUT receptacle, J12.

1.3.10 Power Supply Circuitry

Ac operation may be accomplished by connecting the ac power cord to either 115 V rms or 230 V rms and by placing the AC/DC switch, S14, to the AC position and 115/230 V switch, S15, to the appropriate position. When the power switch, S10A, is not in the OFF position, transformer, T1, is energized and bridge rectifier, CR3 rectifies the transformer output voltage and applies approximately +17 V dc to the reverse voltage protector, A1A3CR7.

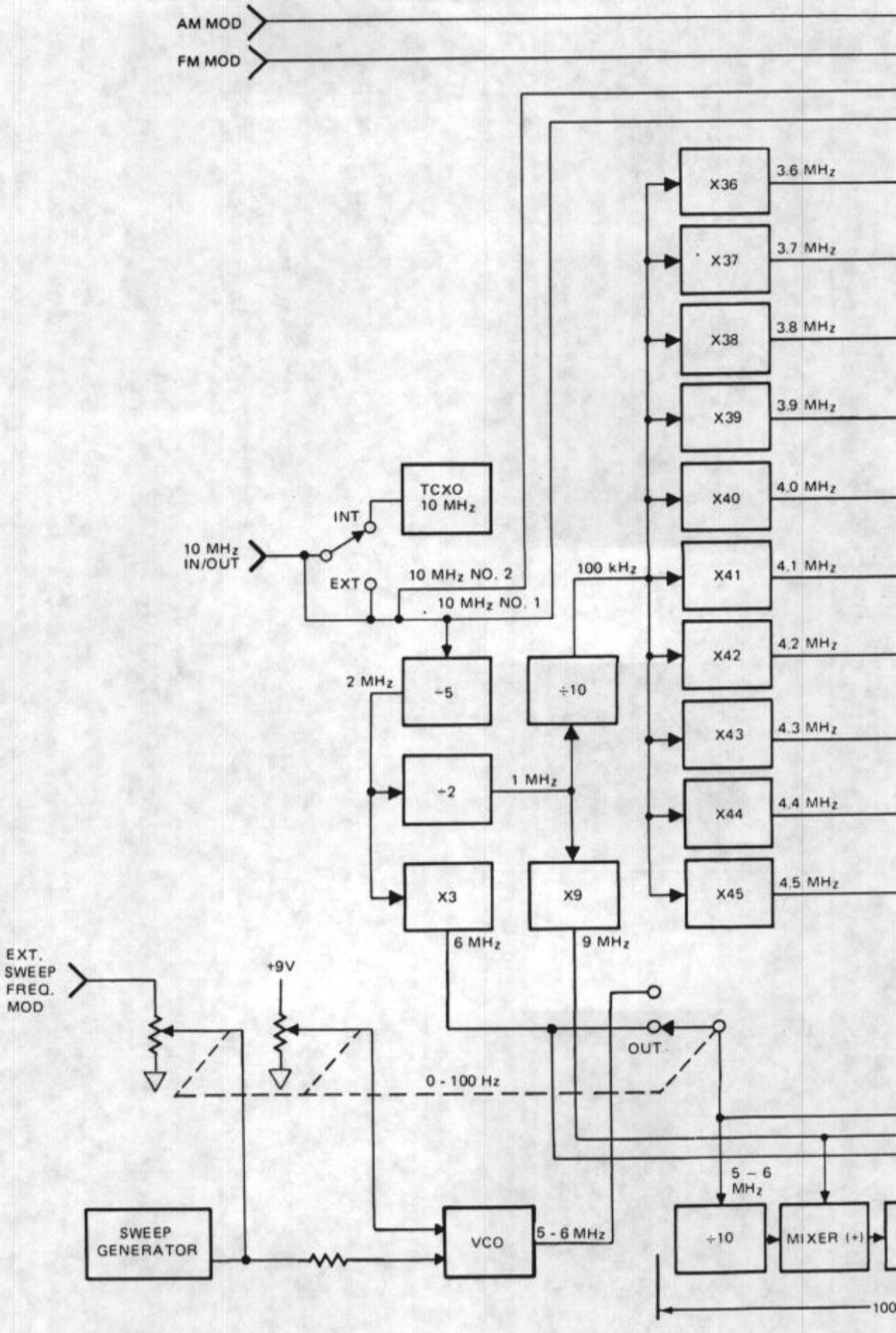
The +9 V dc output #1 at TB3-1, 2 is sampled by +9 V #1 adjustment potentiometer A1A3R7. Error amplifier A1A3Q1 compares this level with the level at the cathode of reference diode A1A3CR4 and amplifies this difference and the buffered output is applied to series regulator, Q1. Q1 regulates the +9 V #1.

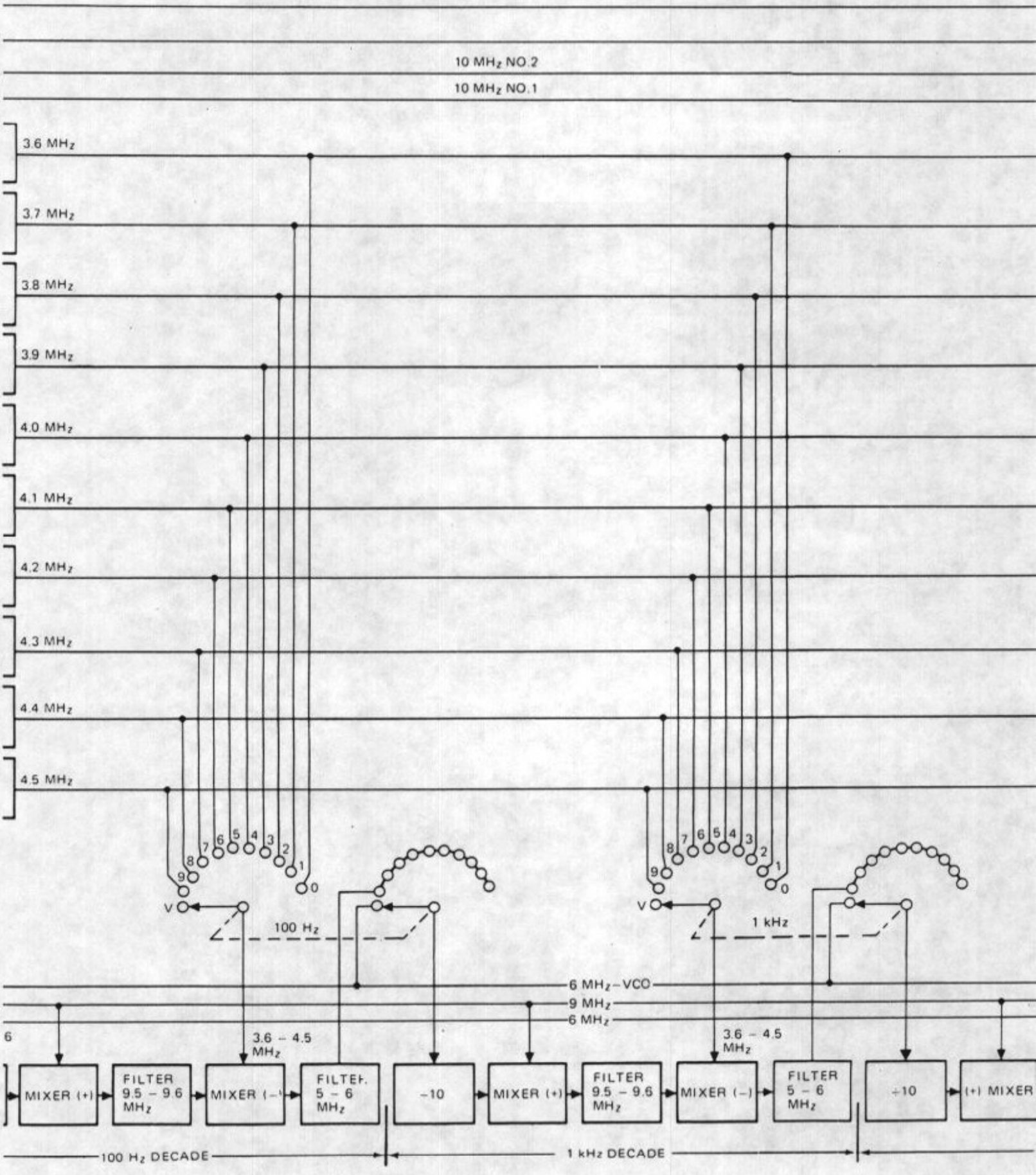
The +9 V dc output #2 circuitry is identical to the +9 V dc output #1 which is explained above.

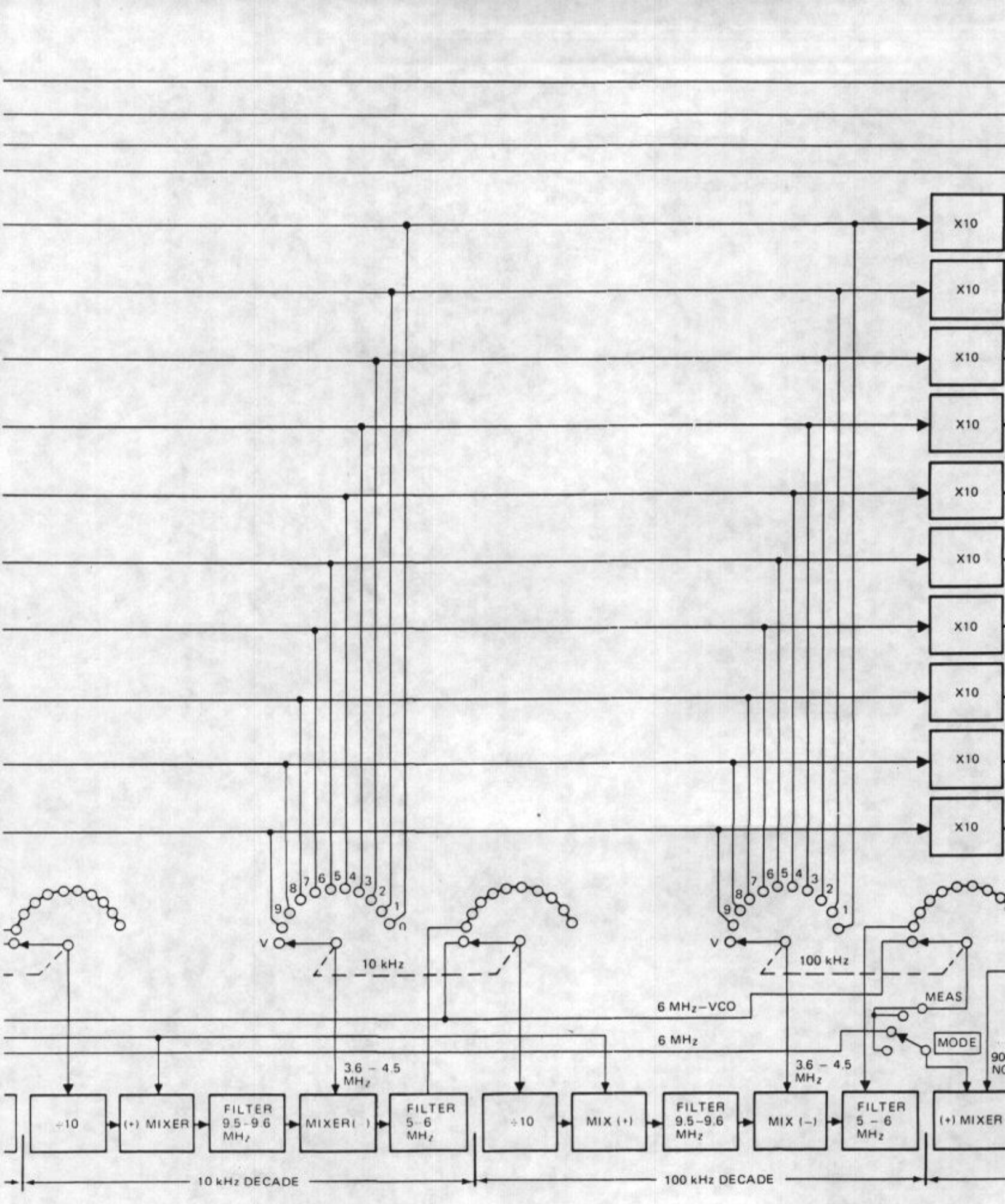
The +9 V dc #2 output operates POWER lamp, DS1, and is applied to ACC receptacle, J3-E, on the back panel, and to the RFM and the Model OAM-1, ODM-1 or MDM-1 modules.

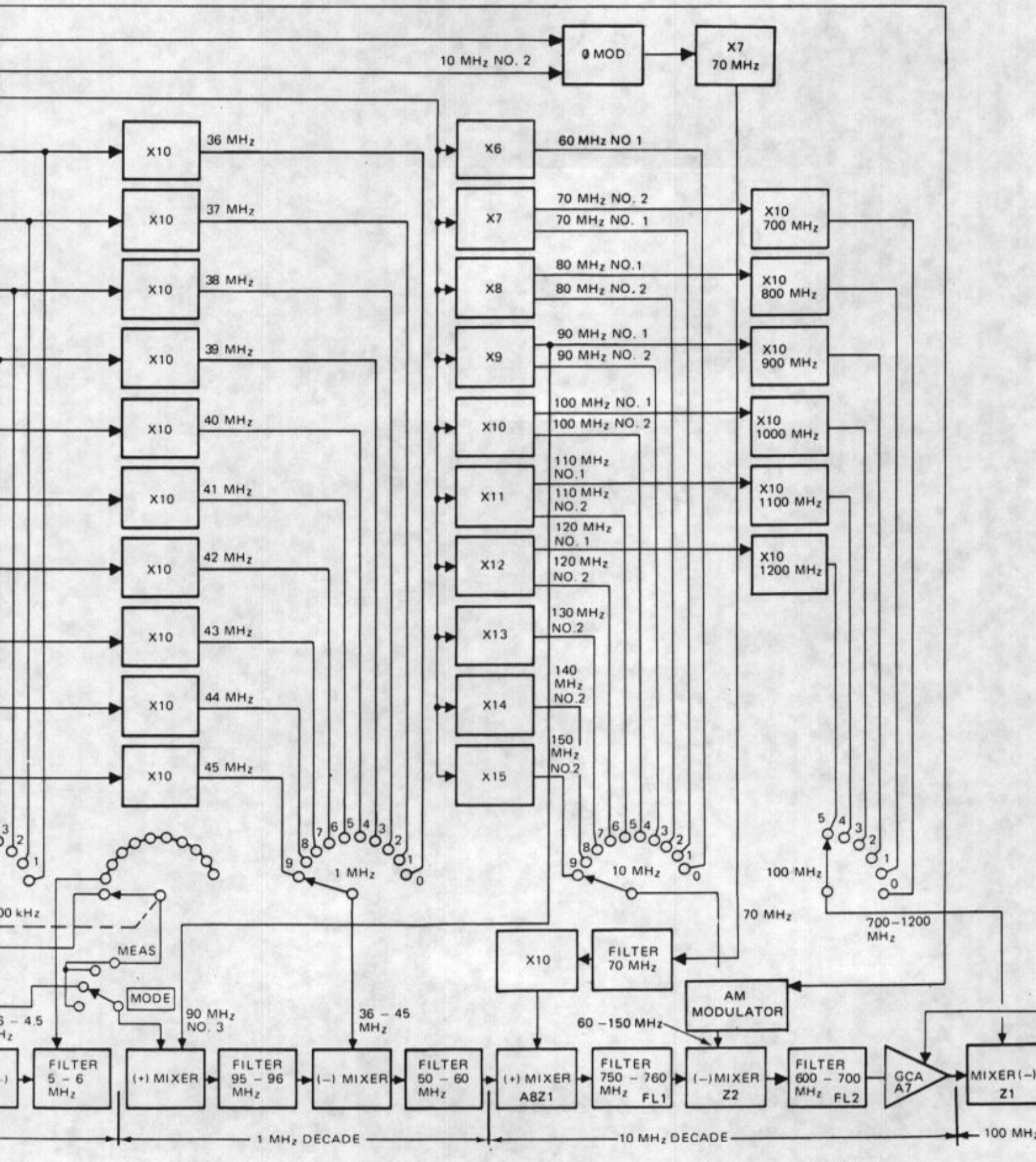
Overload protector, A1A3Q7 and A1A3CR6, prevents the output voltage at terminal A1A3-9, 10 from exceeding approximately +12 V dc. The +12 V dc is applied to A1A6U2 and the Model FIM-3.

12 V dc operation may be accomplished by connecting an external +12 V supply to the 12 VDC receptacle using the 12 V dc power cable provided. When the POWER switch, S10B is not in the OFF position and the AC/DC switch, S14, is in the DC position the +12 V is applied to the Power Supply Assembly, A1A3, and regulated at +9 V as explained in the ac operation above.


AM MOD
FM MOD
X36
3.6 MHz
X37
3.7 MHz
X38
3.8 MHz
X39
3.9 MHz
X40
4.0 MHz
X41
4.1 MHz
X42
4.2 MHz
X43
4.3 MHz
X44
4.4 MHz
X45
4.5 MHz
TCXO
10 MHz
INT
10 MHz
IN/OUT
EXT
10 MHz NO. 2
10 MHz NO. 1
100 kHz
2 MHz
÷5
÷10
÷2
1 MHz
X3
X9
6 MHz
9 MHz
EXT.
SWEEP
FREQ.
MOD
+9V
OUT
0 - 100 Hz
5 – 6
MHz
SWEEP
GENERATOR
VCO
5 - 6 MHz
÷10
MIXER (+)
100


10 MHz NO.2
10 MHz NO.1
3.6 MHz
3.7 MHz
3.8 MHz
3.9 MHz
4.0 MHz
4.1 MHz
4.2 MHz
4.3 MHz
4.4 MHz
4.5 MHz
9 8 7 6 5 4 3 2 1 0
V
100 Hz
1 kHz
6 MHz – VCO
9 MHz
6 MHz
6
3.6 – 4.5 MHz
3.6 – 4.5 MHz
MIXER (+)
FILTER 9.5 – 9.6 MHz
MIXER (–)
FILTER 5 – 6 MHz
÷10
MIXER (+)
FILTER 9.5 – 9.6 MHz
MIXER (–)
FILTER 5 – 6 MHz
÷10
(+) MIXER
100 Hz DECADE
1 kHz DECADE


X10
X10
X10
X10
X10
X10
X10
X10
X10
X10
9 8 7 6 5 4 3 2 1 0
V
10 kHz
100 kHz
6 MHz–VCO
6 MHz
MEAS
MODE
3.6 – 4.5 MHz
÷10
(+) MIXER
FILTER 9.5-9.6 MHz
MIXER( )
FILTER 5-6 MHz
÷10
MIX (+)
FILTER 9.5–9.6 MHz
MIX (–)
FILTER 5 – 6 MHz
(+) MIXER
10 kHz DECADE
100 kHz DECADE


10 MHz NO. 2
Ø MOD
X7
70 MHz
X10
36 MHz
X10
37 MHz
X10
38 MHz
X10
39 MHz
X10
40 MHz
X10
41 MHz
X10
42 MHz
X10
43 MHz
X10
44 MHz
X10
45 MHz
X6
60 MHz NO 1
X7
70 MHz NO. 2
70 MHz NO. 1
X8
80 MHz NO.1
80 MHz NO. 2
X9
90 MHz NO. 1
90 MHz NO. 2
X10
100 MHz NO. 1
100 MHz NO. 2
X11
110 MHz NO.1
110 MHz NO.2
X12
120 MHz NO. 1
120 MHz NO. 2
X13
130 MHz NO.2
X14
140 MHz NO.2
X15
150 MHz NO.2
X10 700 MHz
X10 800 MHz
X10 900 MHz
X10 1000 MHz
X10 1100 MHz
X10 1200 MHz
1 MHz
10 MHz
100 MHz
700–1200 MHz
70 MHz
MEAS
MODE
90 MHz NO. 3
36 – 45 MHz
X10
FILTER 70 MHz
AM MODULATOR
60 –150 MHz
FILTER 5 – 6 MHz
(+) MIXER
FILTER 95 – 96 MHz
(–) MIXER
FILTER 50 – 60 MHz
(+) MIXER A8Z1
FILTER 750 – 760 MHz FL1
(–) MIXER Z2
FILTER 600 – 700 MHz FL2
GCA A7
MIXER (–) Z1
1 MHz DECADE
10 MHz DECADE
100 MHz

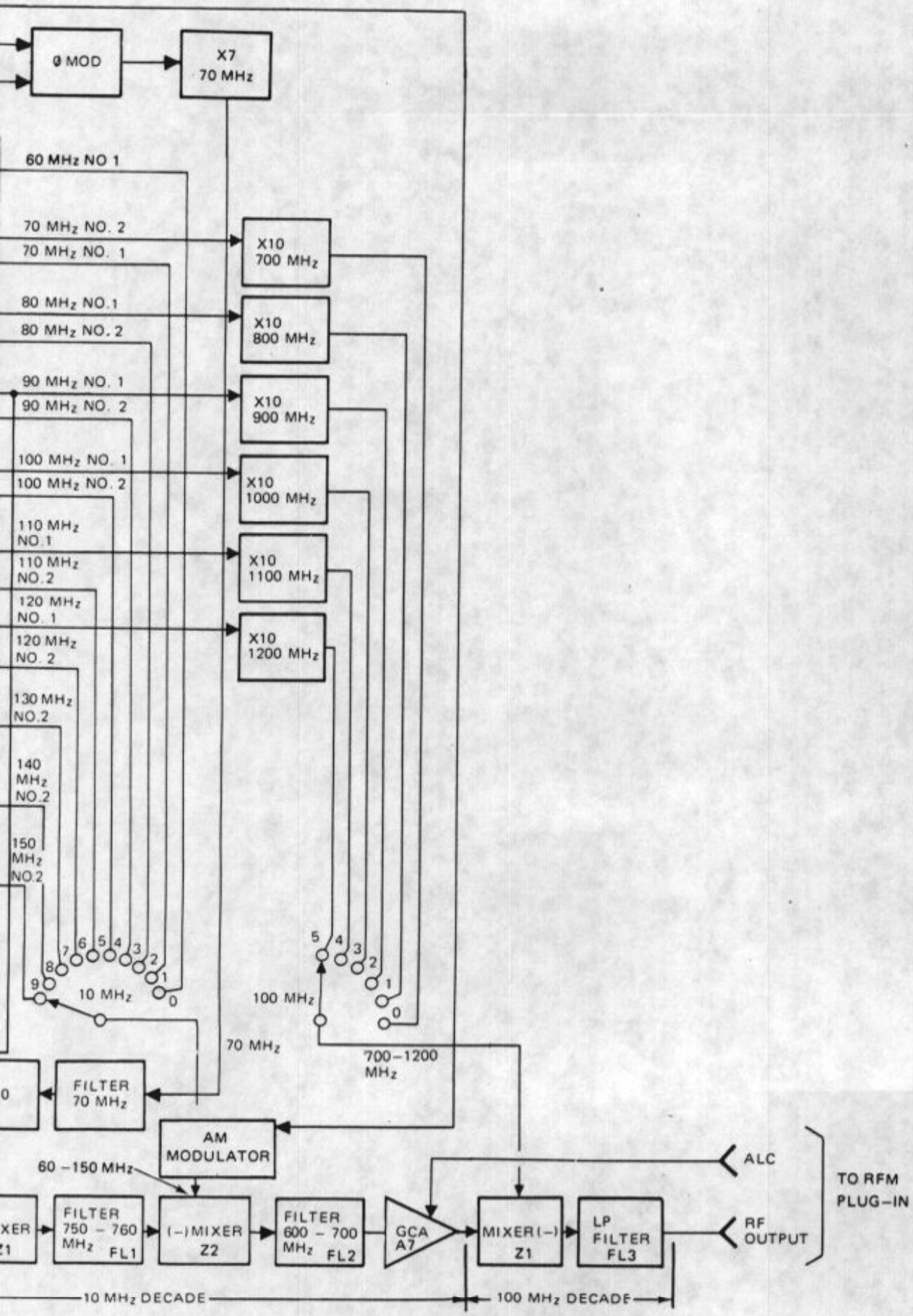


Figure 1-2. Simplified Block Diagram.