WJ-8617B / WJ-8618B Supplement Manuals

A	SMO	Spectrum Monitor Output	A
B	FE FEX	Frequency Extender	B
C	DRD	Digitally Refreshed Display	C
D	488	IEEE-488 Remote Control Interface	D
E	ASO	Audio Scan Output	E
F	WBO	Wide Band Output	F
G	SSB	Single Sideband Demodulator	G
H	NRT	Noise Riding Threshold	H
I	LOGV	60 dB Log Video	I
J	RLOG	Record Logging	J
K	HFE/LFE	High/Low Frequency Extender	K
L	BITE	Built In Test Equipment	L
M	RTC	Real Time Clock	M
N	DFC	Direction Finder Control	N
O	VBFO	Variable Beat Frequency Oscillator	O
P	ISB	Independent Sideband	P
Q	PKC	Pluggable Keyboard Control	Q
R	232	RS-232 Remote Control	R
S	IF Amplifier and Demod Bandwidth Options		S
T	PSM	Panoramic/Sector Marker Display	T
U	Fan Attachment/Chassis Slides Options		U

WJ-861X RECEIVER

APPENDIX A

SIGNAL MONITOR OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX A

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (Continued)

APPENDIX A

SIGNAL MONITOR OPTION

A.1 GENERAL DESCRIPTION

The Signal Monitor accepts 21.4 ±2 MHz signals and provides a visual display of signal activity across a sweepwidth of 0 to 4 MHz, continuously variable by a front panel SWEEP WIDTH control. Resolution is fixed at 10 kHz. The signal widths may be displayed either linearly or logarithmically, selected by the LIN/LOG front panel control. The MARKER/ON control establishes a 21.4 MHz center frequency pip. Other front panel controls include SWEEP RATE, FOCUS and INTENSITY of the electron beam, center frequency (CENTER FREQ) and GAIN setting of the signal pips.

A.2 INSTALLATION

The Signal Monitor is connected to the receiver front panel and bezel by the retaining nuts of the control knobs. If Type 38275-1 bezel is in place it must be removed to install the Signal Monitor. Two spring loaded screws hold the signal monitor to the receiver. Three connections are necessary: multipin connector P1 plugs into J19 on the receiver, the cable from P22 on the receiver connects at A2A3J2, and the cable from P20 on the receiver connects at A2A1J1.

A.3 OPERATION

All Signal Monitor controls are located on the front panel.

A.3.1 CONTROLS

The operation of all front panel controls is as follows:

a. MARKER/ON - When set to ON a marker appears on the CRT if sweep width is greater than 200 kHz. The marker indicates a frequency of 21.4 MHz.

b. LIN/LOG - The linear/logarithmic switch establishes the gain mode for the Signal Monitor. In the LIN mode, the range is about 20 dB with any one gain setting. In the LOG mode, signals displayed have a range of 40 dB.

c. SWEEP RATE - Controls rate in which signal sweep crosses CRT. Adjustable from 15 Hz fully counterclockwise to 25 Hz fully clockwise.

d. SWEEP WIDTH - Establishes how far on either side of center frequency the Signal Monitor displays signals. Total control range is from 0 to 4 MHz, equally divided above and below 21.4 MHz.

e. CENTER FREQ - The center frequency control shifts the signals right and left on the CRT. This control is used to align the 21.4 MHz marker behind the center graticule line.

f. GAIN - Provides at least 60 dB of control on incoming signals.

g. FOCUS - Maintains sharpness of the trace. Allows adjustment to maximum detail of the trace.

h. INTENSITY - Establishes brightness of the trace. Can be set for level required by the ambient light conditions.

A.4 FUNCTIONAL DESCRIPTION

A 21.4 MHz IF signal from the receiver is applied to Input Amplifier (A2A1A1). Shaping amplifier Q1 drives balanced mixer U1. Overall gain of the shaping amplifier is controlled by the front panel GAIN control in conjunction with AGC amplifier Q2. The 21.4 MHz signal from the shaping amplifier is combined with the sweep-oscillator signal in balanced mixer U1 to produce a 12.7 MHz IF signal. Output from the mixer is amplified by Q4 and sent to the 8 kHz Bandwidth IF Amplifier (A2A1A2). This subassembly passes only signals within 4 kHz of 12.7 MHz, for a bandwidth of 8 kHz. Overall gain for the subassembly is set by the gain control potentiometer in stage Q1. The 12.7 MHz signal from (A2A1A2) is applied to two series, gain controlled amplifier stages, Q1 and Q2 of Output Amplifier (A2A1A3). Gain of these stages is controlled by logarithmic amplifier U2. With LIN/LOG front panel switch in the LIN position, the input to amplifier U2 is grounded and Q1 and Q2 operate at nominal gain in a linear mode. When the switch is in LOG position, amplifier U2 is grounded and the gain of the two gain-controlled stages becomes logarithmic. Output from Q2 is coupled to IF amplifier U1. Amplified IF signals from U1 are detected by CR8 and applied to the non-inverting input of U3. The output of U3 is applied to vertical deflection circuits on Control Board A2A2.

Sweep Oscillator (A2A3A1) operates from a center frequency of 34.1 MHz with a maximum deviation of ±2 MHz. A sawtooth waveform from Control Board (A2A2) is coupled to a varactor-diode frequency modulator in the sweep oscillator circuit. A rising ramp of the sawtooth causes the oscillator to increase from 32.6 MHz to 35.6 MHz. When the ramp voltage suddenly drops to begin another cycle, the oscillator follows and returns to 32.6 MHz. For an inverted sawtooth, the ramp drives the oscillator high-to-low, then quickly high again. Output from the sweep oscillator is amplified and buffered by Q2 and Q3 to drive mixer U1 on IF Amplifier (A2A1A1). As the oscillator is swept across its frequency range it mixes with the output of (A2A1A1) amplifier Q1 to produce a 12.7 MHz output from the mixer. When an input to (A2A1A1) mixer U1 is 12.7 MHz below the oscillator frequency, an output from the IF amplifier assembly is produced. Reference Marker (A2A3A2) also inputs a 21.4 MHz signal to mixer U1 on IF Amplifier (A2A1A1) when the front panel MARKER switch is ON.

Control Board (A2A2) contains circuits to provide horizontal and vertical deflection, and biasing for the CRT. The control board uses a differential amplifier to supply the required signal gain and push-pull type drive. Bias voltages applied to the two vertical deflection plates establish a baseline near the bottom of the CRT, any signal voltages from the IF amplifier will cause a vertical deflection to indicate the presence of signals. Horizontal deflection circuits supply a recurring sawtooth voltage to the horizontal deflection plates to drive the electron beam across the face of the CRT. This same sawtooth voltage must be applied to sweep oscillator (A2A3A1) to maintain synchronization for converting 21.4 MHz input signals to vertical deflection voltage for the CRT. A recurring ramp voltage is directed to two places: to the

Sweep Oscillator, in this path the SWEEP WIDTH potentiometer controls the ramp voltage, which determines the excursion of the sweep oscillator above and below 34.1 MHz. The other path for the ramp voltage ultimately provides driving voltage for the horizontal deflection plates.

The calibrate adjustment determines the peak-to-peak excursion of the sawtooth voltage. The balance adjustment maintains equal peak levels of the sawtooth above and below zero volts.

The control board mounts a string of divider resistors containing the front panel FOCUS and INTENSITY controls. This divider receives 1500 Vdc from DC-DC Converter (A2A5). Voltage from these two controls is applied to the appropriate CRT elements to control the electron beam.

The DC-DC converter receives +15 Vdc and -15 Vdc inputs from the receiver power supply and converts them in transformer T1 to the high dc voltages required by the CRT.

A.5 DETAILED CIRCUIT DESCRIPTIONS

Refer to the schematic diagrams when reading these circuit descriptions. The main chassis schematic diagram is **Figure A-30.**

A.5.1 TYPE 724005-1 IF AMPLIFIER ASSEMBLY (A2A1)

Refer to **Figure A-21** for the schematic diagram. This assembly receives 21.4 MHz signals at IF input J1 and provides a detected output at E3 which, after amplification, is used to drive the vertical deflection plates of the CRT. Three subassemblies contained within the IF amplifier assembly perform the actual circuit operations. Input Amplifier (A2A1A1) receives the 21.4 MHz signals and converts them to 12.7 MHz. These signals couple to 8 kHz Bandwidth IF Amplifier (A2A1A2) which only passes signals within 4 kHz of the 12.7 MHz center frequency. These signals are coupled to Output Amplifier (A2A1A3) where detection occurs. A2A1A3 also contains a logarithmic AGC amplifier that can be selected from a front panel LIN/LOG switch. The IF amplifier assembly also has a 12.7 MHz trap on IF input jack J1, and a low-pass filter on the output at E3.

A.5.2 PART 18106-2 INPUT AMPLIFIER (A2A1A1)

Refer to **Figure A-22** for the schematic diagram of this circuit. Shaping amplifier Q1 is a dual insulated-gate field-effect transistor (IGFET). Gain of this stage is controlled by applying a negative-going voltage to gate 2 of the transistor. Gain-control voltage is derived from both the manual gain input at E2 and AGC amplifier Q2.

With little or no signal present at input E1 (signal strength at the cathode of CR2 less than 400 mV) dual IGFET Q1 will be operating at maximum gain. As the signal strength increases, diode CR2 rectifies a portion of the output of Q1 and feeds it to the base of AGC amplifier Q2 through resistor R11. When Q2 begins to conduct, the voltage at gate 2 of Q1 begins to go in the negative direction resulting in a reduction in the gain of the stage. Manual gain voltage to E2 provides approximately 60 dB of range in the gain of the shaping amplifier. Diode CR1 prevents the junction of R2 and R7 from ever exceeding +0.6 V. The AGC loop provides 20 dB of gain control when the manual gain voltage applied to E2 is set for maximum gain.

The signal from Q1 is coupled to a single-tuned impedance-matching circuit for balanced mixer U1 consisting of variable inductor L4 and capacitors C8 and C11. A ±1.5 dB flat response over a 4 MHz bandwidth centered at 21.4 MHz is present at the input of U1. This is a result of the combination of the shaping amplifier output and the peaked response of pi-network L4, C8, and C11. Balanced mixer U1 heterodynes this signal with an LO input signal from E4. This LO input signal is centered on 34.1 MHz and continually sweeps from 32.6 MHz to 35.6 MHz when maximum sweep width is desired. The two input signals combine in the mixer to produce 55.5 MHz sum signals and 12.7 MHz difference signals. The two input frequencies are attenuated in the mixer and appear at the mixer output at the low level. Only the difference signals receive amplification by FET amplifier Q4, which has a drain circuit tuned to 12.7 MHz by C21. The IF output is taken from a tap on transformer T1.

A.5.3 PART 18107-1 8 kHz BW IF AMPLIFIER (A2A1A2)

Refer to **Figure A-23** for the schematic diagram of this circuit board. The 12.7 MHz signals from E1 enter the filter and are restricted to a bandwidth of 8 kHz. Transistor Q1 works into a 12.7 MHz tank circuit made up of L1 and C4. Gain is established by potentiometer R8 in the emitter circuit of the transistor. The amplified signals from the tank circuit couple to the base of Q2 for further amplification. Inductor L2 and capacitor C8 resonate the collector stage of this amplifier. The 8 kHz bandwidth, 12.7 MHz signals are routed out of the board at E3.

A.5.4 PART 15801-3 OUTPUT AMPLIFIER (A2A1A3)

Refer to **Figure A-24** for the schematic diagram of this circuit board. Signal flow from pin E1 to gate 1 (pin 3) of Q1 is through dc-blocking capacitor C2. Transistor Q1 is the first of two gain-controlled stages. Both semiconductors are dual IGFETs. Gain of each stage is controlled by applying a negative-going voltage to gate 2 of the IGFET.

When the output amplifier is to operate in the linear mode, the input to AGC amplifier U2 is grounded. Transistors Q1 and Q2 then operate at nominal gain. In this mode, the voltage on gate 2 is derived from the voltage drop across R5 (R13), R3 (R14), and CR1 (CR2). When the amplifier is to be operated in the logarithmic mode, the control input at E7 is removed from ground and connected through external switching to the output of U3 at E8. Then AGC amplifier U2 provides a logarithmic AGC characteristic. Integrated circuit U2 is utilized as a dc amplifier. Resistors R29 and R35 control the initial negative feedback for the AGC amplifier. As the output from U2 reaches -1.8 V, diodes CR3, CR4, and CR5 conduct and insert R21 and R28 into the feedback determining network. It is at this point that the gain curve becomes logarithmic. Potentiometer R28 is used to calibrate the overall LOG range of the entire IF amplifier. Resistor R31 returns the non-inverting input (pin 3) of U2 to ground to balance current flow through both IC inputs.

Drain load for stage Q2 is a single-tuned resonant circuit consisting of variable inductor L1 and capacitors C9 and C10. Resistor R20 is a parasitic suppressor. IF output signals from the capacitive voltage divider are applied to linear IF amplifier U1. There are two gain-calibration networks associated with U1. The logarithmic gain calibration circuit consists of diode CR6, capacitor C12, and potentiometer R24. Diode CR7, capacitor C17, and potentiometer R25 make up the linear-gain calibration network. These circuits are energized, respectively, when front panel switch S2 is placed in either the LOG or LIN position. The operation of the gain calibration circuits is identical. The LOG network will be explained as an example. With front panel switch S2 in the LOG position the cathode (pin E3) of CR6 is grounded; therefore, the +18 V through resistor R18 forward biases diode CR6. The gain circuit is now coupled through dc-blocking capacitor C18 to pin 2 of U1 which is the emitter of the input amplifier transistor of the IC. Emitter bias is provided through resistor R33 from the negative supply voltage. With R24 in its extreme clockwise position, capacitors C18 and C12 provide almost a short circuit ac path to ground which causes maximum gain of the input transistor in U1. As potentiometer R24 is rotated counterclockwise, series resistance is added to the emitter ac ground path which increases the emitter degeneration. This reduces the gain of the stage. A single-tuned circuit, L2 and C22, is the load for the output of U1.

The 12.7 MHz IF output from U1 is coupled to detector CR8 by dc-blocking capacitor C23. Signals from the detector are coupled to the non-inverting input (pin 3) of output amplifier U3. A matching network consisting of resistors R36, R39, R40, and R41, and diode CR9 is connected to the inverting input (pin 2) of U3. This network provides the same amount of current flow through diode CR9 as there is through detector CR8 during periods of no signal input (noise only). Therefore, U3, which is a differential amplifier, will produce a zero volt output for a zero volt input. The detected output from CR8 is amplified by integrated circuit U3 and applied to output level set potentiometer R47 (pin E9).

A.5.5 TYPE 824002 CONTROL BOARD (A2A2)

Refer to **Figure A-25** for the schematic diagram of this board. Three major functional groups of circuits appear on this board: a ramp voltage generator and associated inverter stage, an amplifier stage for driving vertical deflection plates of the CRT, and a horizontal amplifier stage for driving the horizontal deflection plates of the CRT. Vertical amplifiers consist of transistors Q6, Q7, Q8, and Q9. They make up a differential amplifier supplying the vertical deflection plates of the CRT with a pair of balanced voltages to maintain the electron beam at the desired vertical location. R34 establishes the exact location of the electron beam in the vertical plane. A recurring voltage applied to a pair of horizontal deflection plates causes the electron beam to sweep across the tube thereby producing a horizontal base line on the tube.

Signals are made to appear on the CRT face when the vertical deflection plates move the electron beam up and then back down to its base line position as the electron beam is moving across the face of the tube. This produces the characteristic pip used to indicate signals. The dc signal voltage used to unbalance the steady state condition of the vertical deflection plates appears at vertical input E10. This voltage couples through vertical gain potentiometer R27 to the base of transistor Q6. As the signal voltage goes positive, Q6 increases conduction causing its collector voltage to decrease. This reduces the conduction of Q7, and its collector voltage increases. Thus vertical output E13 receives an increasing vertical deflection voltage for an increasing signal input at E10.

Bias current for Q6 flows through resistor R35, which is also shared with the other half of the differential amplifier. When Q6 draws more current because of the signal input, R35 must supply the current. Directly related to an increase in current flow through R35 is an increase in voltage developed. The emitter of Q9 reacts to this attempted increase in voltage by lowering the conduction of the transistor. That is, as the voltage on the emitter of Q9 attempts to increase, a corresponding decrease in current flow occurs that just maintains a state of equilibrium for total current through R35.

With the conduction of Q9 reduced, its collector voltage rises which in turn reduces the collector voltage of vertical output transistor Q8. For the same vertical input signal at E10, vertical output E13 provides an increased voltage, and vertical output E14 provides a decreased vertical output voltage. This push-pull arrangement provides the required deflection for the electron beam to indicate the presence of signals.

The base of Q9 receives a signal from a resistive divider connected between the two horizontal deflection outputs at E8 and E9. This additional input to the differential amplifier at the base of Q9, provides a "tilt" control for making the base line horizontal behind the graticule base line. Potentiometer R52 establishes balance and level of the horizontal deflection voltage coupled to the input of the vertical deflection amplifier at Q9.

The ramp voltage for driving the horizontal deflection plates and the sweep oscillator originates with Q1 and Q2. Transistor Q2 provides a constant current, as determined by R54, to charge capacitor C1. This capacitor charges until the firing voltage of unijunction Q1 is reached, then the capacitor is suddenly discharged through Q1, and the recharge cycle begins again. This recurring ramp voltage (sawtooth) couples to the non-inverting input of operational amplifier U1 which acts as a buffer and amplifier. Sweep calibration potentiometer R9 establishes the slope of the ramp voltage applied to the horizontal width control and the sweep output at E5.

Differential amplifier Q3-Q4 maintains a dynamic voltage to keep the electron beam on the face of the CRT in the presence of the ramp voltage which drives the electron beam across the CRT. Horizontal position potentiometer R25 balances the two voltages and shifts the sweep range, determined by the horizontal width control, left or right. This action will align the center of the sweep range to the center of the screen.

The ramp voltage applied to the base of Q3 appears at the collector, amplified and inverted. Transistor Q4 receives its driving signal on the emitter so no inversion occurs with the amplified signal at the collector. Constant current source Q5 provides common mode rejection to maintain stability of the horizontal trace.

Sweep output E5 routes through the front panel sweep width potentiometer and couples back into the board at sweep inverter input E11. After processing in operational amplifier U2, this ramp voltage is applied to a varactor in Sweep Oscillator (A2A3A1), and the frequency is made to change slowly as the ramp voltage increases. Then, when the ramp voltage suddenly returns to its initial level, the oscillator follows to its initial frequency and begins to track the ramp voltage again. Either a positive-going or a negative-going ramp voltage can be applied to the oscillator, depending on the direction which the frequency must track. This tracking depends on the mixer conversion involved with tuners and IF converters in units external to the signal monitor. If the total conversion process has inverted the order of the signals applied to the signal monitor, reversing the sweep effectively restores their position in the spectrum.

Sweep inverter U2 receives the ramp voltage on both input resistors. FET Q10 pulls the signal applied to the non-inverting input to ground when the ramp voltage is to be inverted. Under this condition, resistors R43 and R46 establish unity gain for the ramp voltage. Diodes CR3 and CR4 provide a breakpoint for the sawtooth voltage developed across the series output resistor.

When Q10 does not pull the non-inverting input to ground, the ramp voltage applied to the inputs appears at the output with an identical level and slope. With the ramp voltage applied to both inputs, as in this situation, the effect is to oppose each other. However, the non-inverting input of an operational amplifier in this configuration maintains a gain equal to the gain of the inverting input (the ratio of R43 and R46) plus one. For this circuit, R43 and R46 establish unity gain; so the non-inverting input has a gain of two. With both inputs receiving the same signal, the unity gain of the inverting input opposes the gain-of-2 associated with the non-inverting input. The net effect is a gain-of-1 for the output ramp, and it is in phase with the input ramp. The ramp from the sweep inverter output at E15 is applied to Sweep Oscillator (A2A3A1).

A.5.6 TYPE 774007-1 OSCILLATOR ASSEMBLY (A2A3)

Refer to **Figure A-26** for the schematic diagram of this assembly. Two printed circuit boards are contained within this assembly. Marker Oscillator (A2A3A2) provides an output signal at 21.4 MHz when 15 Vdc is applied to input C12. Sweep oscillator (A2A3A1) maintains an output frequency of 34.1 ±1.5 MHz at sweep oscillator output J1. This frequency is controlled by a center frequency voltage applied to C5 and a sweep (ramp) voltage applied to C4. All power and sweep voltage leads are filtered to prevent oscillator signals from leaving the assembly.

A.5.7 PART 270521-1 REFERENCE MARKER (A2A3A2)

Refer to **Figure A-26** for the schematic diagram of this assembly. With front panel MARKER switch off, diode CR2 is forward biased in the Reference Marker circuit and CR1 is reverse biased and will not pass the input from J2. When the MARKER switch is ON CR2 becomes reverse biased and CR1 forward biased, this allows the 10.7 MHz reference signal to pass to crystal Y1 from J2. Y1 passes the second harmonic at 21.4 MHz. C14 couples the signal to output connector J3.

A.5.8 PART 280915-1 SWEEP OSCILLATOR (A2A3A1)

Refer to **Figure A-27** for the schematic diagram of this circuit. Sweep oscillator Q1 is basically a Clapp circuit that has its output frequency swept across a maximum range of 4 MHz. The oscillator center frequency is 34.1 MHz. The tuned frequency is controlled by voltage-variable capacitor (varactor) CR1 whose capacitance varies inversely with the reverse voltage applied across its terminals. Thus, as the voltage across CR1 increases, its capacitance decreases; a decrease in voltage increases the capacitance. The varactor diode is connected in parallel with the oscillator tank circuit. Inductor L1 and CR1 form the basic tuning elements of the oscillator tank. Capacitor C7 is a padder and C14 is a trimmer. These two components shape the oscillator output frequency. Inductors L2 and L3 are RF chokes. They, in conjunction with the associated capacitors, prevent leakage of oscillator frequencies through the varactor bias circuits. Feedback to sustain oscillation is taken from the emitter of Q1 and coupled to the junction of C3 and C4 through R5. Capacitors C3 and C4 provide the necessary impedance step-up to sustain oscillation. Bias voltage for the varactor (applied through pin E4) is obtained from the front-panel CENTER FREQ control. This control is used to set the oscillator center frequency to 34.1 MHz. The ramp voltage applied to the anode of the varactor diode is a modified sawtooth waveform to compensate for the non-linear changes in capacity of the varactor with respect to the applied voltage. The applied non-linear sawtooth voltage linearly varies the sweep oscillator frequency. The shaping network displays signals of 19.3 MHz and 23.4 MHz (4-MHz bandwidth) equidistant from the center frequency of 21.4 MHz with the SWEEP WIDTH control fully clockwise. As the SWEEP WIDTH control is rotated counterclockwise, the ramp voltage amplitude applied to E3 decreases. This reduces the voltage variations on the anode of varactor diode CR1, thus reducing the sweep width. Output of the sweep oscillator is taken at the junction of capacitors C5 and C7, and coupled through R7 to the base of emitter-follower Q2.

The sweep signal couples from emitter follower Q2 to the base of buffer amplifier Q3. Collector load for Q3 is a single-tuned circuit consisting of variable capacitor C16 and transformer T1. This circuit is broadly tuned to the oscillator center frequency of 34.1 MHz.

A.5.9. TYPE 794099-1 FOCUS AND INTENSITY CONTROL (A2A4)

Refer to **Figure A-28** for the schematic diagram of this assembly. High voltage appearing at E3 originates at the front panel INTENSITY control. High voltage input E1 receives -1500 Vdc which connects to a resistive divider containing the INTENSITY and FOCUS controls.

A.5.10 TYPE 764006-1 DC-DC CONVERTER

Refer to **Figure A-29** for the schematic diagram of this assembly. Transistors Q1 and Q2 act as a multivibrator to create an oscillating current in the primary windings of transformer T1. Input from E2 turns Q2 on to produce high current in the windings between pins 6 and 3. Q2 saturates and the feedback loop creates a positive voltage causing Q1 to turn on and Q2 to turn off. When Q1 is conducting it produces a high current in the windings between pins 6 and 1. The high current saturates Q1 and the feedback loop creates a positive voltage at Q2 to once again turn on Q2. The cycle repeats. Diodes CR6, CR7, CR8 and CR9 prevent inductive kickback.

The changing current in the primary windings of T1 produces an ac voltage in the secondary windings. Doubler rectifier CR2 and CR3 increase the voltage and C5, C6, and R6 filter the ripple to output -1500 Vdc at E3. Full wave rectifier CR10 and CR11 changes the ac output from T1 to a positive going dc with C7 smoothing the 200 Vdc output at E4.

A.5.11 TYPE 794103-1 SIGNAL MONITOR MAIN CHASSIS ASSEMBLY (A2)

Refer to **Figure A-30** for the schematic diagram of the main chassis wiring. All power and a sweep reverse voltage enter the Signal Monitor from connector P1. IF input J2 receives 21.4 MHz signals from the receiver. These signals are routed to the IF amplifier assembly at J1. Also supplied to the IF amplifier assembly are a swept frequency centered on 34.1 MHz and a marker centered on 21.4 MHz. These two signal inputs originate in the oscillator assembly, and enter the IF amplifier at J3 and J1 respectively. The IF amplifier processes these various inputs and provides a detected output at E3 which routes to the control board for amplification.

Front panel CENTER FREQ control provides for shifting the sweep response to center the trace behind the graticule. When the front panel MARKER switch applies 15 Vdc to the oscillator assembly, a marker appears at 21.4 MHz. LOG-LIN switch S2 establishes the gain mode for the IF amplifier assembly.

Oscillator Assembly (A2A3) receives a sawtooth voltage at C4 to sweep the oscillator to either side of its 34.1 MHz center frequency. This voltage originates in the Control Board (A2A2). The center frequency voltage applied to the oscillator assembly originates with the 15 Vdc supply. Diode VR1 and heat sensitive resistor RT1 act to stabilize the center frequency voltage applied to A2A3C5.

Control board A2 supplies the CRT with bias voltages and signals which maintain the electron beam on the screen. The trace is made to deflect horizontally by push-pull sawtooth outputs E8 and E9. For vertical deflection, signals entering at E10 receive amplification, before being applied to outputs E13 and E14, also push-pull voltages. Output E6 supplies 100 Vdc derived from the 200 Vdc line.

A.6 MAINTENANCE

The Signal Monitor has been conservatively designed to operate for extended periods of time with little or no routine maintenance. An occasional cleaning and inspection are the only preventive maintenance operations recommended. Intervals for the operations should be based on the operating environment. Should trouble occur, repair time will be minimized if the maintenance technician is familiar with **Section A.5** of this manual, in which the circuits are described; and with the schematic diagrams. Reference should also be made to the troubleshooting and maintenance procedures contained in this section. A complete parts list and illustrations showing parts locations can be found in **Section A.7.** Figure numbers are given at some steps in the procedures.

A.6.1 CLEANING AND LUBRICATION

The unit should be kept free of dust, moisture, grease, and other foreign matter to ensure trouble-free operation. If available, use low-pressure compressed air to remove accumulated dust from the exterior and interior. A clean dry cloth, a soft bristled brush, or a cloth saturated with cleaning solution may also be used.

A.6.2 INSPECTION FOR DAMAGE OR WEAR

Many potential or existing troubles can be detected by a visual inspection of the unit. For this reason, a complete visual inspection should be made for indications of mechanical and electrical defects on a periodic basis, or whenever the unit is being checked for a reported trouble. Electronic components that show signs of deterioration should be checked and a thorough investigation of the associated circuitry should be made to verify proper operation. Mechanical parts should be inspected for excessive wear, looseness, misalignment, corrosion, and other signs of deterioration.

A.6.3 TEST EQUIPMENT REQUIRED

A table of recommended test equipment appears in this section **(Table A-1)**, the equipment recommended have been chosen for their wide availability and general knowledge of their operating characteristics. For a more exact indication of the required operating characteristics, rely on the required characteristics column. These specifications do not reflect the actual characteristics of the recommended equipment, but instead are the minimum requirements needed to perform the maintenance. Procedures have been written so that substitutions of test equipment may be made with a minimum of trouble to the maintenance technician.

Table A-1. Signal Monitor Test Equipment

Item	Equipment Type	Required Characteristics	Recommended Equipment
1	Digital Multimeter	Input voltage: 0-250 Vdc 0-10 Vac	Fluke Model 8100A
2	Frequency Counter	Input frequency: 10-40 MHz Sensitivity: 50 mV	Hewlett-Packard Model 5381A
3	Oscilloscope	Bandwidth: dc-500 kHz Vert. Sens.: 3 mV/cm Horiz. input: for sweep sawtooth	Tektronix Models: 5403 Mainframe D40 Display Unit 5A15N Vert. Amp. 5B10N Horiz. Amp.
4	Signal Generator	Output Freq.: 12-35 MHz Output level: 5 µV-500 mV Modulation: cw only	Hewlett-Packard Model 608E
5	Sweep Generator	Output Freq.: 10-25 MHz Output level: -70 dBm to -10 dBm	Hewlett-Packard Models: 8690B Mainframe 8698B Plug-in
6	High Voltage Probe	Input voltage: 500-1500 Vdc	Fluke Model 80F-5
7	System Interconnection	Compatible with WJ-8618B	
8	Assorted Test Cables and Connectors	Depends on the test equipment used for maintenance	As required

A.6.4 SIGNAL MONITOR TROUBLESHOOTING

Table A-2 provides Signal Monitor troubleshooting procedures.

Table A-2. Signal Monitor Troubleshooting

Symptom	Probable Cause	Isolation Procedure
No trace on CRT	INTENSITY control	Rotate clockwise
	Power circuits	See **paragraph A.6.5.1**
	Vertical deflection amplifiers	See **paragraph A.6.6.1**
	Horizontal deflection amplifiers	See **paragraph A.6.6.1**
	Sawtooth generator	Test for sawtooth at A2A2U1.
No signal pips on CRT screen	Input Amplifier A2A1A2	Inject 12.7 MHz cw signal into A2A1A2. Baseline should move vertically.
	Sweep oscillator	Turn marker on and inject 34.1 MHz signal into A2A1J3. Base line should move vertically.
	IF Amplifier A2A1A2	Inject 12.7 MHz cw signal into A2A1A3. Baseline should move vertically.
	Output Amplifier A2A1A3	Inject 1 Vdc into A2A2E10. Baseline should move vertically to about full scale.
		Turn marker on and inject 34.1 MHz signal into A2A1J3. Base line should move vertically.
No horizontal trace on CRT, but single dot present which deflects vertically in presence of signals	No sawtooth to A2A2Q3	Use oscilloscope to test for sawtooth at base of A2A2Q3.
No marker pips on CRT, switch ON	MARKER switch S1	Check for 15 Vdc at A2A3A2C1.

Table A-2. Signal Monitor Troubleshooting (Continued)

Symptom	Probable Cause	Isolation Procedure
Center frequency drifts	Thermal resistor RT1 defective	Replace.
	Voltage regulator diode VR1 defective	Replace.
	Sweep Oscillator A3A2A1 defective	Substitute tank circuit components; replace sweep oscillator assembly.
Overloads on strong signals	AGC circuits on A2A1A1	Check A2A1A1Q1 for AGC voltage at pin 2 high level signal input to signal monitor.
Spurious signals on CRT	Poor IF rejection	Check tuning of 12.7 MHz IF trap on input of IF Amplifier A2A1A1 (L1, C1, C3).
Only LOG mode defective	A2A1A3U2 defective or not receiving an input; A2A1C13 not being grounded	Check for input signal at A2A1C15; verify ground at A2A1C13 in LOG mode; replace A2A1A3U2.
Only LIN mode defective	A2A1C14 not being grounded	Verify ground at A2A1C14 in LIN mode.

A.6.5 SIGNAL MONITOR PERFORMANCE TESTS

These tests can be used to determine if the Signal Monitor operates properly as part of regularly scheduled maintenance or when a problem is thought to exist. If the performance tests are being used to isolate a problem, also refer to the troubleshooting information to obtain additional guides.

Tests in this sequence include sweep width, sweep linearity, marker oscillator frequency, and resolution. Proceed as follows:

(1) Connect the equipment as shown in Figure A-1.

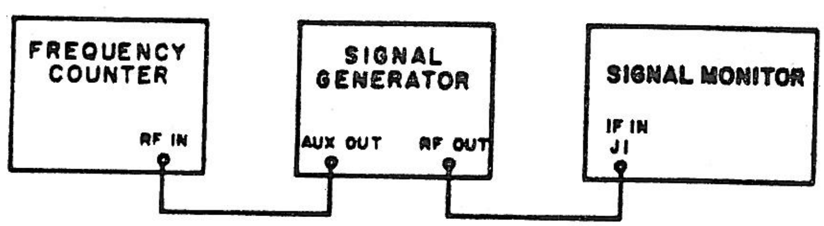

Figure A-1. Test Setup, Signal Monitor Performance Tests

(2) Set the signal generator controls for a 21.4 MHz cw output. Set the output level to approximately -81 dBm (20 µV).

(3) Set the Signal Monitor controls as follows:

a. SWEEP WIDTH: maximum clockwise
b. LOG-LIN: to LIN
c. GAIN: maximum counterclockwise
d. MARKER: ON
e. INTENSITY: for a visible trace
f. FOCUS: for a sharp trace
g. SWEEP RATE: maximum clockwise

(4) Use the CENTER FREQ control to position the marker under the center graticule mark.

(5) Turn the MARKER switch off.

(6) Adjust the GAIN control for a full-scale deflection of the input signal.

(7) Decrease the signal generator output frequency until the pip on the CRT is centered behind the graticule mark to the extreme left of the CRT. Record the frequency counter indication.

(8) Increase the output frequency until the pip is centered behind the graticule mark to the extreme right of the CRT. Record the frequency counter indication.

(9) Subtract the frequency recorded in **step 7** from the frequency recorded in **step 8** to determine the maximum sweep width. The frequency difference should be in the range of 4.0 MHz to 4.4 MHz.

(10) To verify the proper sweep linearity, the frequency recorded in **step 7** should be in the range of 19.200 MHz to 19.600 MHz; in **step 8** it should be in the range of 23.200 MHz to 23.600 MHz.

(11) Turn the signal monitor GAIN control maximum counterclockwise. Turn the MARKER switch ON.

(12) Use the CENTER FREQ control to align the marker pip behind the middle graticule mark.

(13) Use the SWEEP WIDTH control to expand the base of the marker pip until it is two divisions wide.

(14) Rotate the signal monitor GAIN control clockwise until the signal generator pip is the same height as the marker pip. Turn the marker off and then on again to observe the two heights.

(15) Adjust the signal generator frequency for a zero beat with the marker.

(16) The indication on the frequency counter at zero beat should be 21.4 MHz ±3 kHz. This assures that the marker oscillator frequency is within tolerance. Record the frequency for use in **steps 17** and **19.**

(17) With the 21.4 MHz marker two divisions wide at the base, tune the signal generator frequency until the dip between the 21.4 MHz marker and the signal generator signal is 0.5 of the peak signals as shown in **Figure A-2.**

(18) Record the frequency counter indication.

(19) Subtract the frequency recorded in **step 16** and the frequency recorded in **step 17.** This difference should be less than 10 kHz to assure that the signal monitor has proper resolution.

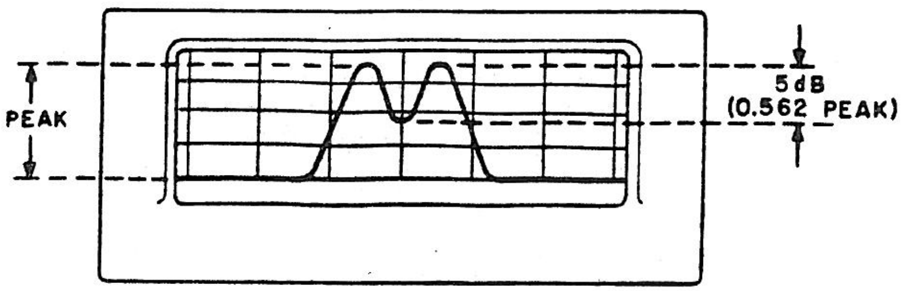

Figure A-2. Typical Response, Signal Monitor Resolution Test

(20) Perform **steps 21** through **28** to determine if Signal Monitor gain and response flatness are within specification.

(21) Set the SWEEP WIDTH and SWEEP RATE maximum clockwise, the LOG/LIN switch to LIN, the MARKER switch off, and the GAIN maximum clockwise.

(22) Set the signal generator output level for a pip that is about 3/4 height on the screen.

(23) Tune the signal generator through the range of 19.4 MHz to 23.4 MHz while observing for minimum and maximum heights of the pip.

(24) Set the signal generator frequency so the pip is at the maximum height point noted. Adjust the output level for full scale deflection of the pip and record the signal generator level in dB.

(25) Set the signal generator output frequency so the pip is at the minimum level noted in **step 23.** Adjust the signal generator output level so the pip is at full scale.

(26) The output level established in **step 25** should be a maximum of 3 dB greater than the level recorded in **step 24.**

(27) Set the front panel switch to LOG and repeat **steps 22** through **26** except that the maximum difference should be no greater than 4 dB.

(28) Return the LOG/LIN switch to LIN, set the signal generator to -81 dBm (20 µV) and observe that the pip is at full scale or greater. This completes the Signal Monitor tests.

A.6.6 SIGNAL MONITOR ALIGNMENT

These procedures assume that the signal monitor requires a complete alignment. If this is true, the trace may not be present on the CRT because the horizontal and vertical deflection amplifiers are misadjusted. As a starting point, the alignment procedure begins by obtaining a trace on the CRT. Proceed as follows:

A.6.6.1 Deflection Amplifiers Initial Adjustment

This procedure is required only for units not having a trace on the screen. For all other units, continue to **A.6.6.2.**

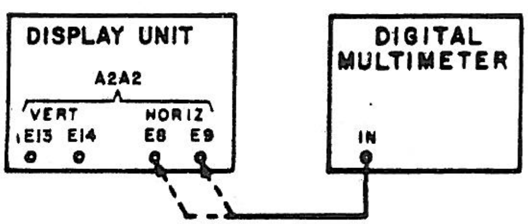

Figure A-3. Test Setup, Signal Monitor Deflection Amplifier Initial Alignment

(1) Set the Signal Monitor front panel controls as follows:

a. FOCUS: to midrange
b. INTENSITY: fully clockwise (see warning)
c. MARKER: to OFF
d. LIN-LOG: LIN
e. CENTER FREQ: to midrange
f. GAIN: fully counterclockwise
g. SWEEP WIDTH: anywhere
h. SWEEP RATE: fully clockwise

WARNING

Never leave the INTENSITY control at full brilliance when the trace is concentrated in a single area on the CRT. Permanent damage may occur to the phosphor.

(2) On Control Board A2A2, set vertical control potentiometers R34 and R52, and vertical gain potentiometer R27 to midrange.

(3) Set the digital multimeter to measure 200 Vdc. Then on Control Board A2A2 adjust horizontal width potentiometer R13 to obtain an identical voltage level at horizontal outputs E8 and E9.

(4) With horizontal and vertical outputs balanced, and with the intensity at full level, a trace should be present; if not, refer to the troubleshooting section.

A.6.6.2 <u>Sweep Rate Balance and Calibration Adjustments</u>

This procedure establishes the sawtooth repetition rate generated by transistors Q1 and Q2 on Control Board (A2A2), and provides for the adjustment of sweep balance R6 and sweep calibrate R9. Proceed as follows:

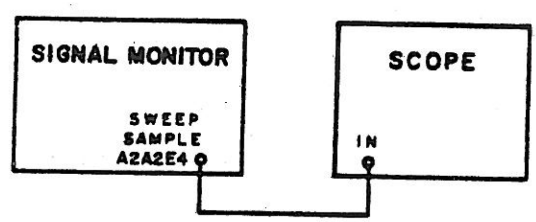

Figure A-4. Test Setup, Sweep Rate Calibrate

(1) Connect the equipment as shown in Figure A-4 and set front panel SWEEP RATE control fully clockwise.

(2) Adjust sweep rate calibrate potentiometer R54 on the control board to obtain a 2.5 Hz sawtooth waveform on the oscilloscope.

(3) Ground the oscilloscope input and establish a zero volt reference on the x axis. Then, establish a vertical sensitivity sufficient to observe a 10 V p-p waveform.

(4) Obtain the sawtooth waveform on the oscilloscope; then, on Control Board (A2A2), adjust sweep balance R6 and sweep calibrate R9 to obtain a 10 V p-p sawtooth centered on the zero reference established on the x axis.

(5) Adjust the horizontal width control R13 on the control board to obtain a trace that extends just beyond the full width of the CRT screen. This completes this series of adjustments.

A.6.6.3 Vertical Stages 12.7 MHz IF Amplifier Alignment

Use this procedure to align vertical IF amplifiers from the output of the mixer in Input Amplifier (A2A1A1) to the detector in Output Amplifier (A2A1A3). Proceed as follows:

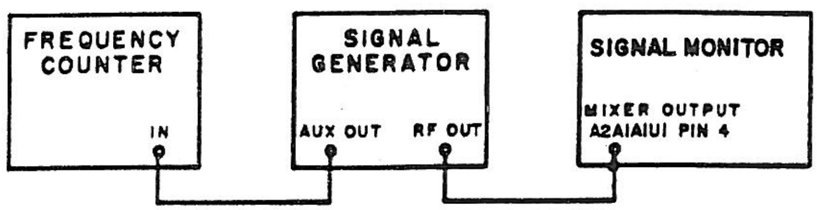

Figure A-5. Test Setup, 12.7 MHz IF Amplifier Alignment

(1) Connect the equipment as shown in **Figure A-5.**

(2) Set the Signal Monitor front panel controls as follows:

a. MARKER: turned off
b. LOG-LIN: to LIN
c. CENTER FREQ: anywhere
d. GAIN: fully counterclockwise
e. SWEEP WIDTH: anywhere
f. SWEEP RATE: fully clockwise

(3) Remove the local oscillator input cable at A2A1J3.

(4) Set the signal generator to 12.7 MHz, cw, at a level just sufficient to cause the baseline on the CRT to shift upward about half scale.

(5) Adjust the following components for maximum vertical deflection of the baseline while reducing the signal generator output level to maintain the trace on the screen. Readjust to obtain maximum gain.

a. Output Amplifier (A2A1A3): coils L1 and L2
b. 8 kHz BW IF Amplifier (A2A1A2): coils L1 and L2
c. Input Amplifier (A2A1A1): capacitor C21.

(6) Reconnect the local oscillator cable to A2A1J3. This completes these adjustments.

A.6.6.4 <u>Vertical Stages 21.4 MHz IF Amplifier Alignment</u>

Touch-up alignment of this wideband stage can be performed by tuning a signal generator on either side of 21.4 MHz while observing the pip height on the CRT. If completely misaligned, this stage may require sweep alignment to regain optimum performance. Proceed as follows:

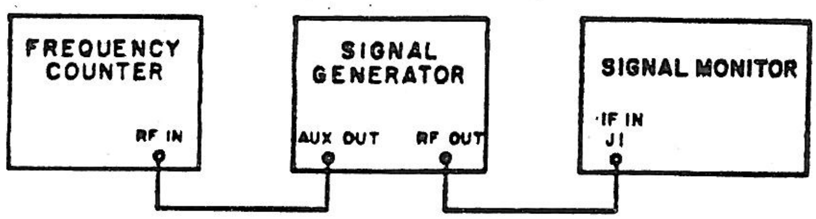

Figure A-6. Test Setup, 21.4 MHz IF Amplifier Touch-Up Alignment

(1) Connect the equipment as shown in **Figure A-6.**

(2) Set the Signal Monitor front panel controls as follows:

a. MARKER: to ON
b. LOG-LIN: to LIN
c. CENTER FREQ: to center marker
d. GAIN: fully clockwise
e. SWEEPWIDTH: fully clockwise
f. SWEEPRATE: fully clockwise

(3) After the marker is centered on the CRT, turn it off.

(4) Set the signal generator to 21.4 MHz at a level to give a pip at about 3/4 scale.

(5) Tune the signal generator through the range of 20.4 MHz to 22.4 MHz observing for symmetry, and the minimum and maximum pip heights.

(6) Set the signal generator frequency so the pip is at the maximum-height point noted. Adjust the signal generator output level for full-scale deflection of the pip. Then record the output level in dB.

(7) Set the signal generator frequency so the pip is at the minimum-height point noted in **step 5.** Increase the output level so the pip is at full scale.

(8) The output level should have increased no more than 3 dB from the level recorded in **step 6.** If this specification is met, the wideband stage of the input amplifier does not require alignment. Otherwise proceed to **step 9.**

(9) If the 3 dB flatness specification in step 8 was not met, set the signal generator output level to obtain a mid-gain pip height of 3/4 scale.

(10) Tune the signal generator from 19.4 MHz to 23.4 MHz while making adjustments to the following coils on Input Amplifier (A2A1A1) to obtain a symmetrical, nearly flat response. Roll off should be observed at the two band edges.

a. L1 at the low end
b. L4 at midband
c. L3 at the high end

(11) Repeat **steps 4** through **8** to measure flatness of the response: if this touch-up procedure does not bring the response within tolerance, proceed to the sweep alignment in **paragraph A.6.6.5.**

A.6.6.5 <u>Vertical Stages 21.4 MHz IF Amplifier Sweep Alignment</u>

Perform this alignment when the touch-up method in **paragraph A.6.6.4** fails. Proceed as follows:

(1) Connect the equipment as shown in **Figure A-7.** Solder the hi-Z detector directly to the junction of C15 and R14 on the input amplifier board.

(2) Tune the signal generator to 21.4 MHz, cw, at a level to produce a convenient marker.

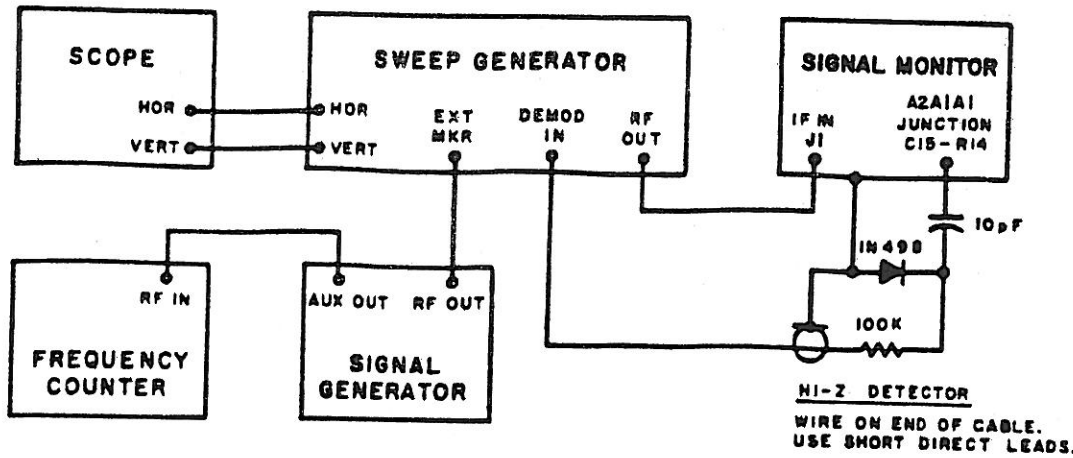

Figure A-7. Test Setup, 21.4 MHz IF Amplifier Sweep Alignment

(3) Tune the sweep generator center frequency to 21.4 MHz, at a level of -25 dBm (12 mV). Establish a sweep width of about 5 MHz.

(4) Set the oscilloscope for viewing a sweep response.

(5) Adjust coils L1, L3, and L4 on Input Amplifier (A2A1A1) to obtain a detector response like that shown in **Figure A-8.** Then disconnect the high impedance detector.

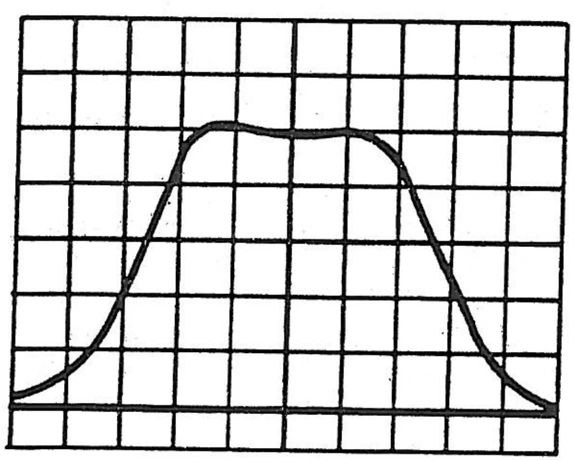

Figure A-8. Typical Response, 21.4 MHz Vertical Amplifier

(6) Perform **steps 1 through 8** of **paragraph A.6.6.4** to determine if the response is sufficiently flat to meet specifications. If not, continue with that procedure to touch up the response. Otherwise, this sweep alignment procedure is complete.

A.6.6.6 Sweep Oscillator and Frequency Linearity Adjustments

Perform these adjustments to ensure that the sweep oscillator centers at 34.1 MHz with the sawtooth properly shaped to provide linear response.

(1) Connect the equipment as shown in **Figure A-9**, and set the signal generator output to a low level until a marker is required.

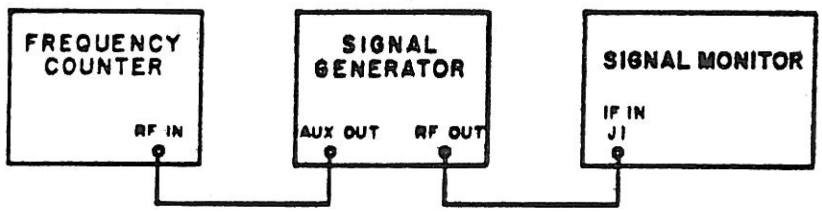

Figure A-9. Test Setup, Sweep Oscillator and Frequency Linearity Adjustments

(2) Set the Signal Monitor front panel controls as follows:

a. MARKER: to ON
b. LOG-LIN: to LIN
c. CENTER FREQ: to midrange
d. GAIN: fully clockwise
e. SWEEP WIDTH: fully clockwise
f. SWEEP RATE: fully clockwise

(3) Slowly rotate the SWEEP WIDTH control counterclockwise while adjusting A2A3A1C14 to maintain the frequency marker aligned behind the middle graticule line.

(4) Alternately, set the signal generator to 19.4 MHz while adjusting the SWEEP WIDTH control to establish a 4 MHz sweep width.

(5) Turn the marker off and set the signal generator to 19.4 MHz. Increase the frequency in steps of 500 kHz while observing for the pip behind each graticule line.

(6) Adjust sawtooth shaper A2A2R48 to establish best linearity of the 500 kHz interval pips behind the graticule. Repeat **steps 4** through **6** to minimize the interaction. Otherwise, this ends the procedure.

A.6.6.7 Signal Monitor Overall Gain Adjustments

This procedure establishes the overall gain for the vertical related circuits in the signal monitor.

(1) Set the Signal Monitor front panel controls as follows:

a. MARKER: to OFF
b. LOG-LIN: to LIN
c. CENTER FREQ: to midrange
d. GAIN: fully clockwise
e. SWEEP WIDTH: fully clockwise
f. SWEEP RATE: fully clockwise

(2) Inject 1 Vdc at A2A2E10, the control board vertical input.

(3) Adjust vertical gain potentiometer A2A2R27 for a full scale deflection of the CRT base line.

(4) Connect the equipment as shown in **Figure A-1**; set the signal generator to 21.4 MHz, cw, at a level of -87 dBm (10 μV).

(5) On 8 kHz IF Amplifier (A2A1A2), rotate gain control potentiometer R8 fully clockwise for maximum gain, then back it off about one-eighth turn.

(6) On Output Amplifier (A2A1A3), rotate output level set potentiometer R47 fully clockwise for maximum output, then set linear gain potentiometer R25 to obtain a full scale deflection of the signal generator pip.

(7) Set the LOG-LIN switch to LOG.

(8) Set the signal generator output level to -95 dBm (4 μV).

(9) On Output Amplifier (A2A1A3), set logarithmic gain control potentiometer R24 for a signal pip height at the first horizontal graticule line up from the base line.

(10) Set the signal generator output level to -65 dBm (128 μV).

(11) On Output Amplifier (A2A1A3), set logarithmic gain control potentiometer R28 for a signal pip height at full scale.

(12) Repeat steps 8 through 11 until the interaction is minimized.

(13) If the previous conditions cannot be met, make slight adjustment to vertical gain potentiometer A2A2R27, IF Amplifier (A2A1A2) gain control potentiometer R8, and Output Amplifier (A2A1A3) potentiometer R47.

A.7 REPLACEMENT PARTS LIST

The replacement parts lists for Type 794103-1 Signal Monitor are listed in paragraphs A.7.1 through A.7.6.1.

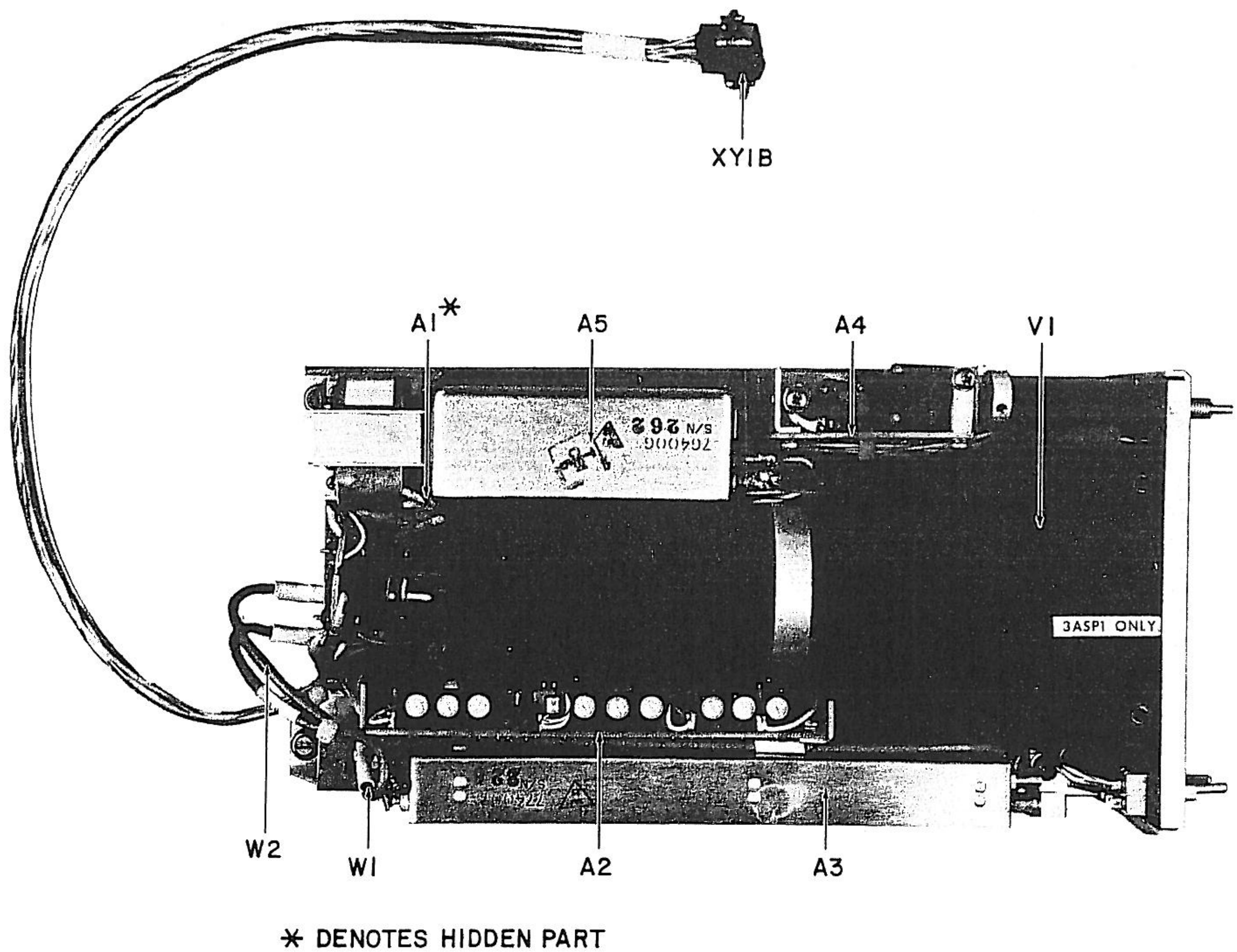

Figure A-10. Type 794103-1 Signal Monitor (A2), Top View, Location of Components

A.7.1 TYPE 794103-1 SIGNAL MONITOR REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision M				
A1	IF Amplifier	1	724005-1	14632	
A2	Control Board	1	824002-1	14632	
A3	Oscillator Assembly	1	774007-1	14632	
A4	Focus and Intensity Control	1	794099-1	14632	
A5	DC/DC Converter	1	764006-1	14632	
C1	Capacitor, Ceramic, Disc: 1000 pF, 500 V	1	5925U102P	91418	
P1	Connector, Plug	1	205204-1	00779	
R1	Resistor, Variable, Composition: 5 kΩ, 10%, 1 W	1	70A3N048L502U	01121	
R2	Not Used				
R3	Resistor, Variable, Composition: 10 kΩ, 10%, 1 W	3	70A3N048L103U	01121	
R4	Resistor, Fixed, Film: 2.4 kΩ, 5%, 1/4 W	1	CF1/4-2.4K/J	09021	
R5	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	1	CF1/4-2.2K/J	09021	
R6	Resistor, Fixed, Film: 2.94 kΩ, 1%, 1/4 W	1	RN60D2941F	81349	
R7	Resistor, Fixed, Film: 510Ω, 5%, 1/4 W	1	CF1/4-510 OHMS/J	09021	
R8	Same as R3				
R9	Resistor, Fixed, Film: 82 kΩ, 5%, 1/4 W	1	CF1/4-82K/J	09021	
R10	Same as R3				
S1	Switch, Toggle, DPDT	2	7201-S-Y4-Z-Q-E	09353	
S2	Same as S1				
T1	Transformer	1	170218-1	14632	
V1	Tube, CRT	1	3ASP1	93332	
VR1	Diode, Zener: 5.6 V Silicone	1	1N753A	80131	
W1	Cable Assembly	1	17300-191-1	14632	
W1P1	Connector, Plug	2	50-328-3875-91	98291	
W1P2	Connector, Plug: SMC	2	50-024-3875-91	98291	
W2	Cable Assembly	1	17300-191-2	14632	
W2P3	Same as W1P1				
W2P4	Same as W1P2				
XV1A	Socket, Crystal	1	9859-2	00629	
XV1B	Contact, Beryllum	1	8379-2	04435	

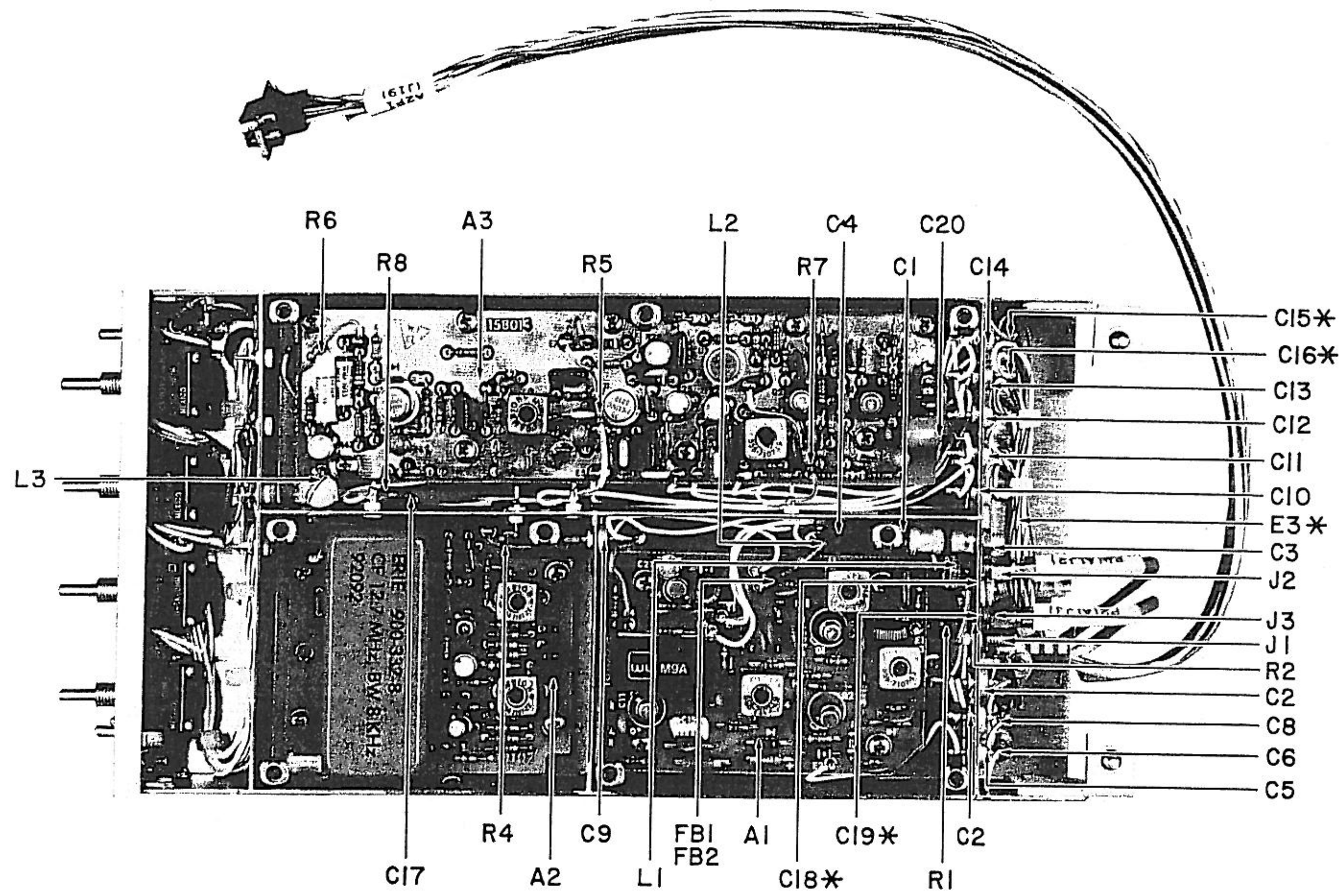

Figure A-11. Type 724005-1 IF Amplifier (A2A1), Top View, Location of Components

A.7.2 TYPE 724005-1 IF AMPLIFIER REF DESIG PREFIX A2A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision L				
A1	Input Amplifier	1	18106-2	14632	
A2	8.0 kHz IF Amplifier	1	18107-1	14632	
A3	Output Amplifier	1	15801-2	14632	
C1	Capacitor, Mica, Dipped: 33 pF, ±2%, 500 V	1	CM05ED330G03	81349	
C2	Capacitor, Ceramic, Feedthru: 470 pF, ±20%, 500 V	11	54-794-009-471M	33095	
C3	Capacitor, Variable, Glass: 1-28 pF, 1000 V	1	GER28000	52769	
C4	Capacitor, Ceramic, Disc: 5000 pF, ±20%, 100 V	5	C023B101E502M	56289	
C5	Same as C4				
C6	Same as C2				
C7	Same as C4				
C8 Thru C16	Same as C2				
C17	Capacitor, Ceramic, Disc: 0.01 µF, ±20%, 200 V	1	8131A200Z5U103M	72982	
C18	Same as C4				
C19	Same as C4				
C20	Capacitor, Electrolytic, Tantalum: 100 µF, 20%, 35V	1	MTP107M035P1C	76055	
E1	Terminal, Feedthru	3	SFU16Y	1DM30	
E2	Same as E1				
E3	Same as E1				
FB1	Ferrite Bead	4	56-590-65-4A	02114	
FB2 Thru FB4	Same as FB1				
J1	Connector, Receptacle	2	1004-7511-002	19505	
J2	Same as J1				
J3	Connector, Plug	1	UG1468U	80058	
L1	Inductor	1	22295-4	14632	
L2	Coil, Fixed: 30 µH, 5%	1	1537-50	99800	
L3	Coil, Fixed: 100 µH, 10%	1	553-3635-61	71279	
R1	Resistor, Fixed, Film: 300Ω, 5%, 1/4 W	1	CF1/4-300 OHMS/J	09021	
R2	Resistor, Fixed, Film: 18Ω, 5%, 1/4 W	1	CF1/4-18 OHMS/J	09021	
R3	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	1	CF1/4-100 OHMS/J	09021	
R4	Resistor, Fixed, Film: 2.7Ω, 5%, 1/4 W	4	CF1/4-2.7 OHMS/J	09021	
R5 Thru R7	Same as R4				
R8	Resistor, Fixed, Composition: 5.1 kΩ, 5%, 1/4 W	1	RCR07G512JS	81349	
R9*	Resistor, Fixed, Film: 240Ω, 5%, 1/4 W	1	CF1/4-240 OHMS/J	09021	

*Nominal Value - Final Value Factory Selected.

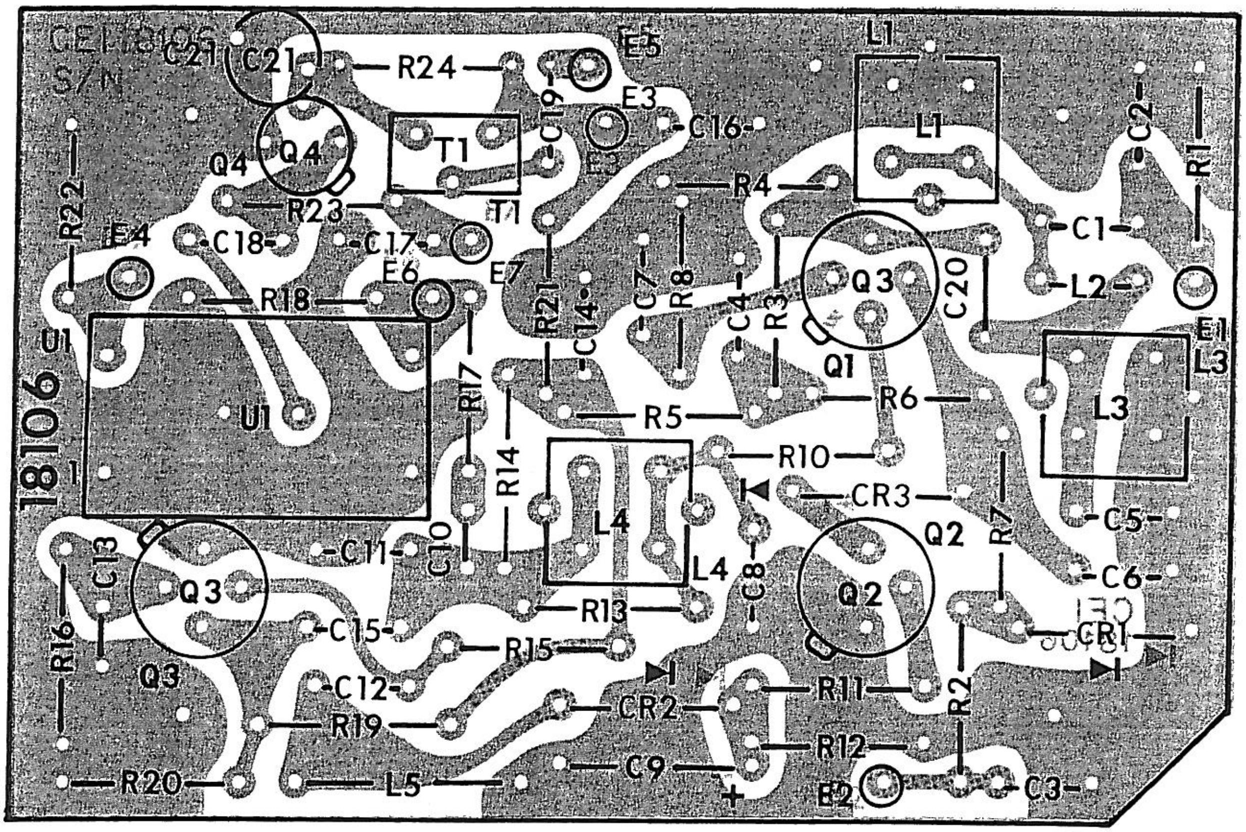

Figure A-12. Part 18106-2 Input Amplifier (A2A1A1), Location of Components

A.7.2.1 Part 18106-2 Input Amplifier

REF DESIG PREFIX **A2A1A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision G				
C1	Capacitor, Mica, Dipped: 82 pF, 2%, 500 V	1	CM05ED820G03	81349	
C2	Capacitor, Mica, Dipped: 180 pF, 2%, 500 V	1	CM05FD181G03	81349	
C3	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	10	C023B101E502M	56289	
C4	Same as C3				
C5	Capacitor, Mica, Dipped: 51 pF, 2%, 500 V	1	CM05ED510G03	81349	
C6	Same as C3				
C7	Same as C3				
C8	Capacitor, Mica, Dipped: 12 pF, 5%, 500 V	1	CM05CD120J03	81349	
C9	Capacitor, Electrolytic, Tantalum: 1.0 µF, 10%, 35 V	1	CS13BF105K	81349	
C10	Capacitor, Ceramic, Disc: 1000 pF, 500 V	2	59Z5U102P	91418	
C11	Capacitor, Mica, Dipped: 91 pF, 2%, 500 V	1	CM05FD910G03	81349	
C12	Same as C3				
C13	Same as C10				
C14	Same as C3				
C15	Capacitor, Ceramic, Tubular: 22 pF, 0.5 pF, 500 V	1	301-000C0G0-220J	59660	
C16 Thru C19	Same as C3				
C20	Capacitor, Mica, Dipped: 22 pF, 5%, 500 V	1	CM05ED220J03	81349	
C21	Capacitor, Variable, Ceramic: 5-25 pF, 100 V	1	518-000A5-25	72982	
CR1	Diode	1	1N462A	80131	
CR2	Diode	2	1N198A	80131	
CR3	Same as CR2				
L1	Coil, Variable: 0.9-1.1 µH	2	558-7107-13	71279	
L2	Coil, Fixed	1	20681-277	14632	
L3	Same as L1				
L4	Coil, Variable: 2.97-3.63 µH	1	558-7107-19	71279	
L5	Coil, Fixed: 47 µH, 5%	1	1537-60	99800	
L6	Not Used				
Q1	Transistor	1	841001-1	14632	
Q2	Transistor	1	2N930	80131	
Q3	Transistor	1	2N3478	80131	
Q4	Transistor	1	U310	17856	
R1	Resistor, Fixed, Film: 300Ω, 5%, 1/4 W	1	CF1/4-300 OHMS/J	09021	
R2	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	1	CF1/4-4.7K/J	09021	
R3	Resistor, Fixed, Film: 130 kΩ, 5%, 1/4 W	1	CF1/4-130K/J	09021	
R4	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	1	CF1/4-10K/J	09021	
R5	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	2	CF1/4-100 OHMS/J	09021	
R6	Resistor, Fixed, Film: 51 kΩ, 5%, 1/4 W	1	RCR07G513JS	81349	
R7	Resistor, Fixed, Film: 24 kΩ, 5%, 1/4 W	1	CF1/4-24K/J	09021	
R8	Resistor, Fixed, Film: 150Ω, 5%, 1/4 W	3	CF1/4-150 OHMS/J	09021	
R9	Not Used				

REF DESIG PREFIX **A2A1A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R10	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	1	CF1/4-47 OHMS/J	09021	
R11	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	1	CF1/4-47K/J	09021	
R12	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R13	Resistor, Fixed, Film: 3.9 kΩ, 5%, 1/4 W	1	CF1/4-3.9K/J	09021	
R14	Same as R8				
R15	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	2	CF1/4-1.0K/J	09021	
R16	Same as R15				
R17	Resistor, Fixed, Film: 39Ω, 5%, 1/4 W	1	CF1/4-39 OHMS/J	09021	
R18	Same as R8				
R19	Resistor, Fixed, Film: 16 kΩ, 5%, 1/4 W	1	CF1/4-16K/J	09021	
R20	Resistor, Fixed, Film: 6.2 kΩ, 5%, 1/4 W	1	CF1/4-6.2K/J	09021	
R21	Same as R5				
R22	Resistor, Fixed, Film: 56Ω, 5%, 1/4 W	1	CF1/4-56 OHMS/J	09021	
R23	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/4 W	1	CF1/4-1.8K/J	09021	
R24	Resistor, Fixed, Film: 12 kΩ, 5%, 1/4 W	1	CF1/4-12K/J	09021	
T1	Transformer	1	21428-100	14632	
U1	Mixer	1	WJ-M9A	27956	

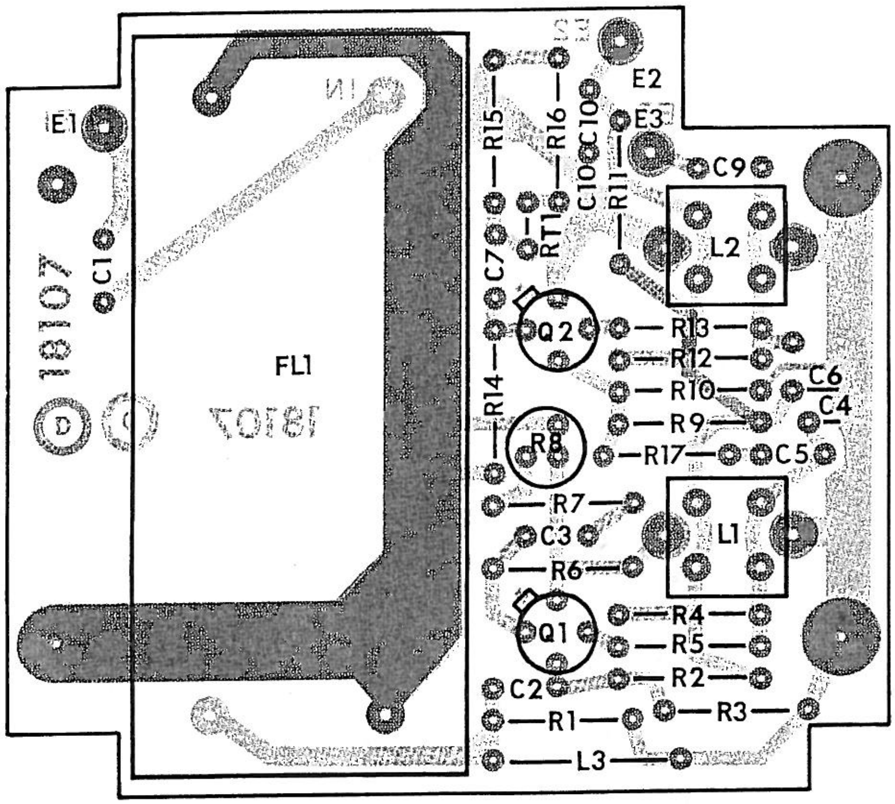

Figure A-13. Part 18107-1 8.0 kHz Amplifier (A2A1A2), Location of Components

A.7.2.2 **Part 18107-1 8.0 kHz IF Amplifier** REF DESIG PREFIX **A2A1A2**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision F				
C1	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 200 V	8	8131A200Z5U103M	72982	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Mica, Dipped: 12 pF, 5%, 500 V	1	CM04CD120J03	81349	
C5 Thru C7	Same as C1				
C8	Not Used				
C9	Same as C1				
C10	Same as C1				
FL1	Filter, Crystal	1	92092	14632	
L1	Coil, Variable: 5.04 - 6.16 µH	2	558-7107-22	71279	
L2	Same as L1				
L3	Coil, Fixed: 10 µH, 10%	1	1537-36	99800	
Q1	Transistor	2	2N3478	80131	
Q2	Same as Q1				
R1	Resistor, Fixed, Film: 240Ω, 5%, 1/4 W	1	CF1/4-240 OHMS/J	09021	
R2	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/4 W	1	CF1/4-8.2K/J	09021	
R3	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	2	CF1/4-2.2K/J	09021	
R4	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	2	CF1/4-4.7K/J	09021	
R5	Resistor, Fixed, Film: 33Ω, 5%, 1/4 W	2	CF1/4-330 OHMS/J	09021	
R6	Resistor, Fixed, Film: 470Ω, 5%, 1/4 W	1	CF1/4-470 OHMS/J	09021	
R7	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	3	CF1/4-100 OHMS/J	09021	
R8	Resistor, Trimmer, Film: 100Ω, 10%, 1/2 W	1	62PR100	73138	
R9	Same as R4				
R10	Same as R3				
R11	Same as R7				
R12	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	1	CF1/4-1K/J	09021	
R13	Same as R5				
R14	Resistor, Fixed, Film: 330Ω, 5%, 1/4 W	2	CF1/4-330 OHMS/J	09021	
R15	Same as R14				
R16	Same as R7				
R17	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	1	CF1/4-47 OHMS/J	09021	
RT1	Thermistor, 1 kΩ	1	2D102	04239	

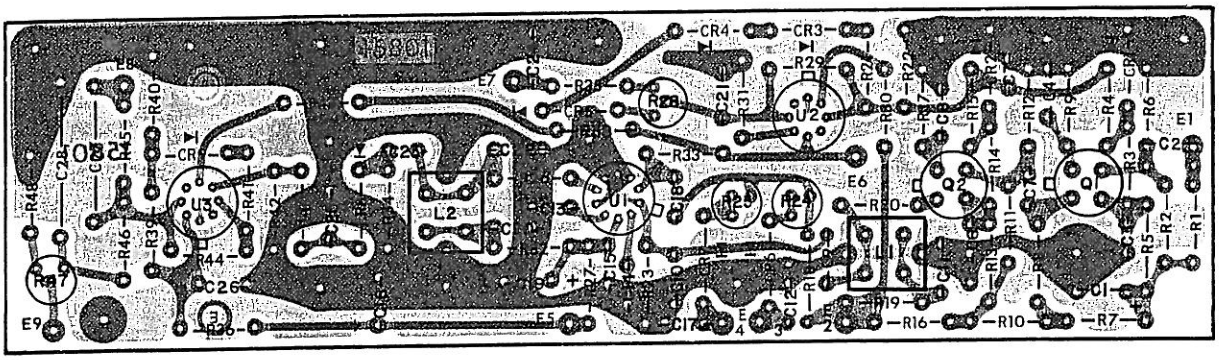

Figure A-14. Part 15801-3 Output Amplifier (A2A1A3), Location of Components

A.7.2.3 Part 15801-2 Output Amplifier

REF DESIG PREFIX **A2A1A3**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision C				
C1	Capacitor, Electrolytic, Tantalum: 27 µF, 10%, 35 V	4	199D276X9035FE4	56289	
C2	Capacitor, Mica, Dipped: 470 pF, 5%, 500 V	1	DM15-471J	72136	
C3	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	5	59Z5U102P	91984	
C4	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	4	C023B101E502M	56289	
C5 Thru C7	Same as C3				
C8	Same as C4				
C9	Capacitor, Mica, Dipped: 56 pF, 2%, 500 V	1	CM05ED560G03	81349	
C10	Capacitor, Mica, Dipped: 270 pF, 2%, 500 V	1	CM05FD271G03	81349	
C11	Same as C4				
C12	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 100 V	4	RPE122-Z5U104M100V	72982	
C13	Same as C12				
C14	Same as C12				
C15	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 200 V	3	8131A200Z5U103M	72982	
C16	Same as C1				
C17	Same as C12				
C18	Same as C15				
C19	Same as C1				
C20	Same as C15				
C21	Capacitor, Mica, Dipped: 33 pF, 2%, 500 V	1	CM05FD330G03	81349	
C22	Capacitor, Mica, Dipped: 24 pF, 5%, 500 V	1	CM05ED240J03	81349	
C23	Same as C3				
C24	Same as C4				
C25	Capacitor, Mica, Dipped: 15 pF, 5%, 500 V	1	CM05CD150J03	81349	
C26	Same as C1				
C27	Capacitor, Fixed, Plastic: 3300 pF, 10%, 100 V	1	WMF1D33	14655	
C28	Capacitor, Plastic, Tubular: 0.022 µF, 5%, 100 V	1	663UW223-5-1W	84411	
CR1	Diode	5	1N462A	80131	
CR2 Thru CR5	Same as CR1				
CR6	Diode	2	1N4449	80131	
CR7	Same as CR6				
CR8	Diode	2	5082-2800	28480	
CR9	Same as CR8				
E1	Terminal, Forked	9	140-1941-02-01	71279	
E2 Thru E9	Same as E1				
L1	Coil, Variable: 2.97 - 3.63 µH	1	558-7107-19	71279	
L2	Coil, Variable: 5.04 - 6.16 µH	1	558-7107-22	71279	
Q1	Transistor	2	SK3065	14632	
Q2	Same as Q1				
R1	Not Used				
R2	Resistor, Fixed, Film: 120 kΩ, 5%, 1/4 W	2	CF1/4-120K/J	09021	
R3	Resistor, Fixed, Film: 33 kΩ, 5%, 1/4 W	2	CF1/4-33K/J	09021	

REF DESIG PREFIX **A2A1A3**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R4	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	3	CF1/4-4.7K/J	09021	
R5	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	5	CF1/4-100K/J	09021	
R6	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	6	CF1/4-10K/J	09021	
R7	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	2	CF1/4-10 OHMS/J	09021	
R8	Resistor, Fixed, Film: 620Ω, 5%, 1/4 W	1	CF1/4-620 OHMS/J	09021	
R9	Resistor, Fixed, Film: 330Ω, 5%, 1/4 W	2	CF1/4-330 OHMS/J	09021	
R10	Same as R7				
R11	Same as R2				
R12	Same as R6				
R13	Resistor, Fixed, Film: 68 kΩ, 5%, 1/4 W	1	CF1/4-68K/J	09021	
R14	Same as R3				
R15	Same as R4				
R16	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	3	CF1/4-100 OHMS/J	09021	
R17	Same as R9				
R18	Resistor, Fixed, Film: 2.7 kΩ, 5%, 1/4 W	2	CF1/4-2.7K/J	09021	
R19	Same as R16				
R20	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	3	CF1/4-47 OHMS/J	09021	
R21	Same as R6				
R22	Resistor, Fixed, Film: 6.2 kΩ, 5%, 1/4 W	1	CF1/4-6.2K/J	09021	
R23	Same as R18				
R24	Resistor, Trimmer, Film: 500Ω, 10%, 1/2 W	2	62PR500	73138	
R25	Same as R24				
R26	Same as R20				
R27	Resistor, Fixed, Film: 1.2 kΩ, 5%, 1/4 W	1	CF1/4-1.2K/J	09021	
R28	Resistor, Trimmer, Film: 20 kΩ, 10%, 1/2 W	1	62PR20K	73138	
R29	Resistor, Fixed, Film: 1.0 MΩ, 5%, 1/4 W	2	CF1/4-1.0M/J	09021	
R30	Resistor, Fixed, Film: 2.7Ω, 5%, 1/4 W	3	CF1/4-2.7 OHMS/J	09021	
R31	Same as R6				
R32	Same as R16				
R33	Resistor, Fixed, Composition: 5.1 kΩ, 5%, 1/4 W	3	RCR07G512JS	81349	
R34	Same as R6				
R35	Same as R33				
R36	Same as R20				
R37	Same as R5				
R38	Same as R30				
R39	Same as R29				
R40	Same as R6				
R41	Same as R5				
R42	Same as R5				
R43	Same as R30				
R44	Same as R5				

REF DESIG PREFIX **A2A1A3**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R45	Same as R33				
R46	Resistor, Fixed, Film: 680Ω, 5%, 1/4 W	1	CF1/4-680 OHMS/J	09021	
R47	Resistor, Trimmer, Film: 1 kΩ, 10%, 1/2 W	1	62PR1K	73138	
R48	Same as R4				
U1	Integrated Circuit, RF-IF Amplifier	1	1550/BIA	04713	
U2	Integrated Circuit, OP Amplifier	2	741HC	07263	
U3	Same as U2				

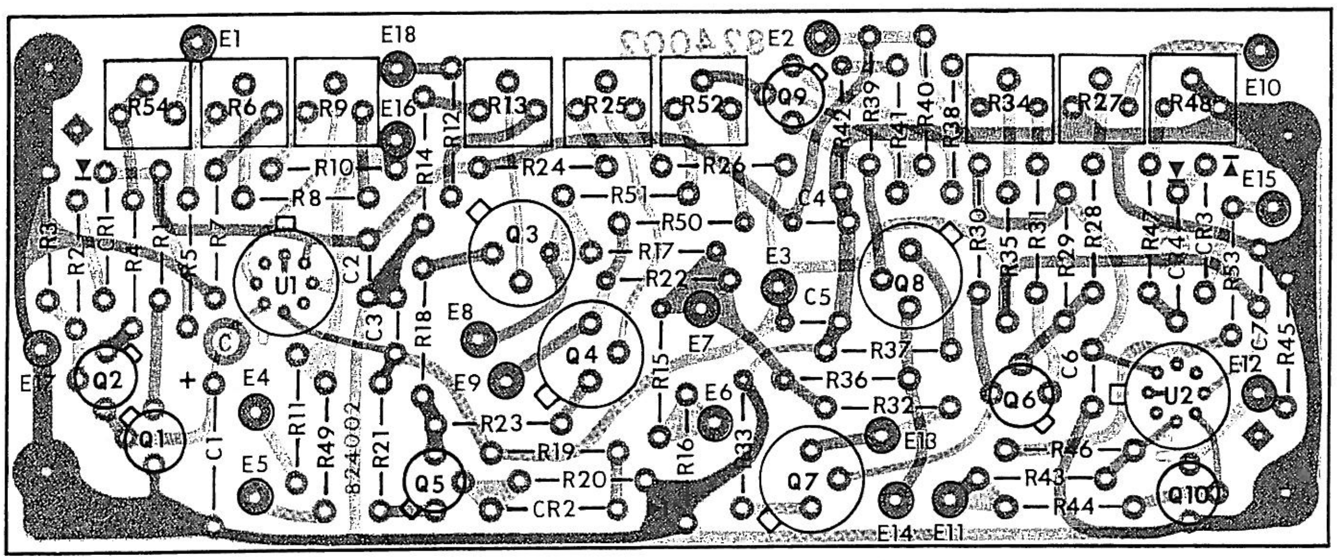

Figure A-15. Type 824002-1 Control Board (A2A2), Location of Components

A.7.3 TYPE 824002-1 CONTROL BOARD

REF DESIG PREFIX A2A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision M				
C1	Capacitor, Electrolytic, Tantalum: 1.0 µF, 10%, 35 V	1	CS13BF105K	81349	
C2	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 100 V	6	RPE122-Z5U104M100V	72982	
C3 Thru C7	Same as C2				
CR1	Diode	4	1N462A	80131	
CR2 Thru CR4	Same as CR1				
Q1	Transistor	1	2N2646	80131	
Q2	Transistor	1	2N3251	80131	
Q3	Transistor	4	2N3440	80131	
Q4	Same as Q3				
Q5	Transistor	1	2N929	80131	
Q6	Transistor	2	2N2222A	80131	
Q7	Same as Q3				
Q8	Same as Q3				
Q9	Same as Q6				
Q10	Transistor	1	U1899E	15818	
R1	Resistor, Fixed, Film: 680Ω, 5%, 1/4 W	1	CF1/4-680 OHMS/J	09021	
R2	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	1	CF1/4-2.2K/J	09021	
R3	Resistor, Fixed, Film: 22 kΩ, 5%, 1/4 W	1	CF1/4-22K/J	09021	
R4*	Resistor, Fixed, Composition: 3.9 kΩ, 5%, 1/4 W	1	RCR07G392JS	81349	
R5	Resistor, Fixed, Film: 240Ω, 5%, 1/4 W	1	CF1/4-240 OHMS/J	09021	
R6	Resistor, Trimmer, Film: 1 kΩ, 10%, 1/2 W	2	62PAR1K	73138	
R7	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	3	CF1/4-1.0K/J	09021	
R8	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	5	CF1/4-47K/J	09021	
R9	Resistor, Trimmer, Film: 100 kΩ, 10%, 1/2 W	2	62PAR100K	73138	
R10	Same as R8				
R11	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	2	CF1/4-10K/J	09021	
R12	Same as R8				
R13	Same as R9				
R14	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	1	CF1/4-47 OHMS/J	09021	
R15*	Resistor, Fixed, Film: 120 kΩ, 5%, 1/4 W	1	CF1/4-120K/J	09021	
R16	Resistor, Fixed, Film: 180 kΩ, 5%, 1/4 W	1	CF1/4-180K/J	09021	
R17	Resistor, Fixed, Film: 220 kΩ, 5%, 1/4 W	4	CF1/4-220K/J	09021	
R18	Resistor, Fixed, Film: 6.8 kΩ, 5%, 1/4 W	2	CF1/4-6.8K/J	09021	
R19	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	3	CF1/4-4.7K/J	09021	
R20	Same as R11				
R21	Same as R19				
R22	Same as R17				
R23	Same as R18				
R24	Same as R8				

REF DESIG PREFIX A2A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R25	Resistor, Trimmer, Film: 50 kΩ, 10%, 1/2 W	1	62PAR50K	73138	
R26	Same as R8				
R27	Same as R6				
R28	Resistor, Fixed, Film: 220Ω, 5%, 1/4 W	2	CF1/4-220 OHMS/J	09021	
R29	Resistor, Fixed, Film: 3.0 MΩ, 5%, 1/4 W	2	CF1/4-3.0M/J	09021	
R30	Resistor, Fixed, Film: 15 kΩ, 5%, 1/4 W	2	CF1/4-15K/J	09021	
R31	Resistor, Fixed, Film: 2.0 kΩ, 5%, 1/4 W	1	CF1/4-2.0K/J	09021	
R32	Same as R17				
R33	Resistor, Fixed, Film: 18 kΩ, 5%, 1/4 W	2	CF1/4-18K/J	09021	
R34	Resistor, Trimmer, Film: 500Ω, 10%, 1/2 W	1	62PAR500	73138	
R35	Resistor, Fixed, Film: 12 kΩ, 5%, 1/4 W	1	CF1/4-12K/J	09021	
R36	Same as R17				
R37	Same as R33				
R38	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/4 W	1	CF1/4-1.8K/J	09021	
R39	Same as R30				
R40	Same as R29				
R41	Same as R28				
R42	Same as R7				
R43	Resistor, Fixed, Film: 47.5 kΩ, 1%, 1/10 W	3	RN55C4752F	81349	
R44	Same as R43				
R45	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R46	Same as R43				
R47*	Same as R7				
R48	Resistor, Trimmer, Film: 20 kΩ, 10%, 1/2 W	1	62PAR20K	73138	
R49	Resistor, Fixed, Film: 1.6 kΩ, 5%, 1/4 W	1	CF1/4-1.6K/J	09021	
R50	Resistor, Fixed, Film: 1.0 MΩ, 5%, 1/4 W	2	CF1/4-1.0M/J	09021	
R51	Same as R50				
R52	Resistor, Trimmer, Film: 1 MΩ, 10%, 1/2 W	1	62PAR1M	73138	
R53	Same as R19				
R54	Resistor, Trimmer, Film: 2 kΩ, 10%, 1/2 W	1	62PAR2K	73138	
R55	Same as R31				
U1	Integrated Circuit	2	741HC	07263	
U2	Same as U1				

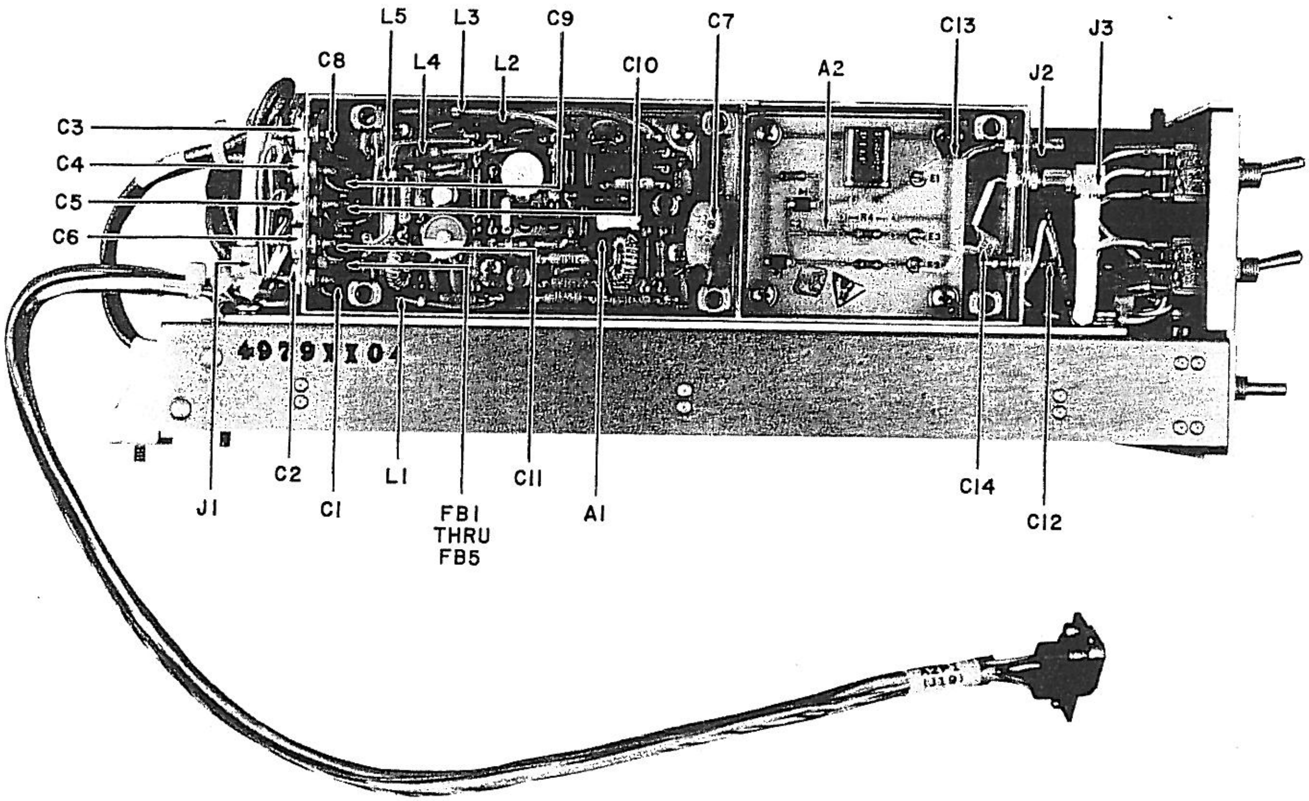

Figure A-16. Type 774007-1 Oscillator Assembly (A2A3), Location of Components

A.7.4 TYPE 774007-1 OSCILLATOR ASSEMBLY REF DESIG PREFIX A2A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision F				
A1	Sweep Oscillators	1	280915-1	14632	
A2	Reference Marker	1	270521-1	14632	
C1	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	5	C023B101E502M	56289	
C2	Capacitor, Ceramic, Feedthru: 470 pF, 20%, 500 V	5	54-794-009-471M	33095	
C3 Thru C6	Same as C2				
C7	Capacitor, Electrolytic, Tantalum: 27 μF, 10%, 35 V	1	196D276X9035TE4	56289	
C8 Thru C11	Same as C1				
C12	Capacitor, Ceramic, Feedthru: 1000 pF, GMV, 500 V	1	54-794-009-102W	33095	
C13	Capacitor, Mica, Dipped: 30 pF, 2%, 500 V	1	CM04ED300G03	81349	
C14	Capacitor, Ceramic, Disc: 1000 pF, 500 V	1	5925U102P	91984	
FB1	Ferrite Bead	5	56-590-65-4A	02114	
FB2 Thru FB5	Same as FB1				
J1	Connector, Receptacle	3	1004-7511-002	19505	
J2	Same as J1				
J3	Same as J1				
L1	Coil, Fixed: 62 μH, 5%	1	1537-66	99800	
L2	Coil, Fixed: 30 μH, 5%	4	1537-50	99800	
L3 Thru L5	Same as L2				

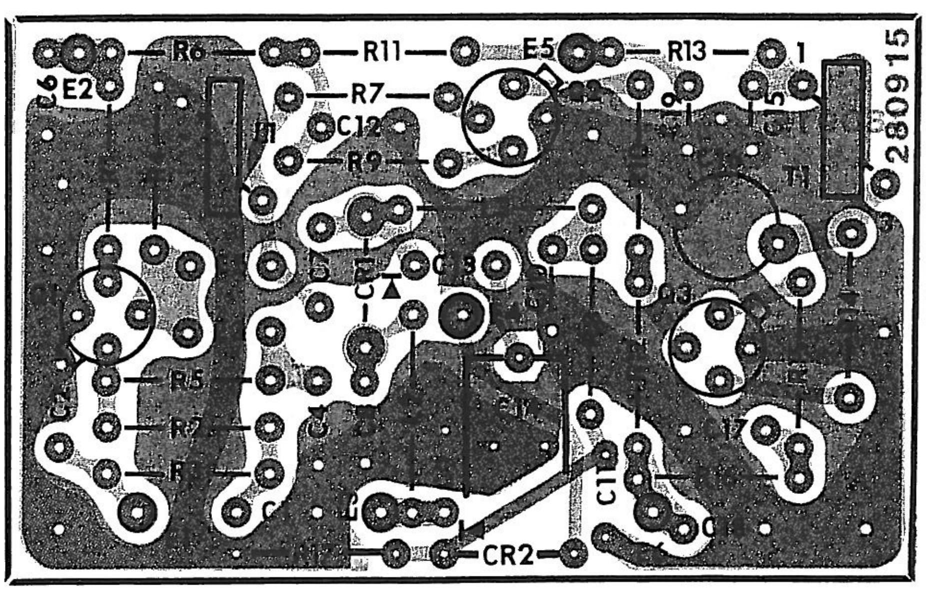

Figure A-17. Part 280915-1 Sweep Oscillator Assembly (A2A3A1), Location of Components

A.7.4.1 Part 280915-1 Sweep Oscillator Assembly

REF DESIG PREFIX **A2A3A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision C				
C1	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	10	C023B101E502M	56289	
C2	Same as C1				
C3	Capacitor, Mica, Dipped: 22 pF, 5%, 500 V	2	CM05ED220J03	81349	
C4	Same as C3				
C5	Capacitor, Ceramic, Tubular: 6.8 pF, ±.5 pF, 500 V	1	301-000U2J0-689D	59660	
C6	Same as C1				
C7	Capacitor, Mica, Dipped: 30 pF, 2%, 500 V	1	CM05ED300G03	81349	
C8	Capacitor, Mica, Dipped: 430 pF, 5%, 500 V	1	DM15-431J	72136	
C9	Same as C1				
C10	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 100 V	1	RPE122-Z5U104M100V	72982	
C11	Same as C1				
C12	Same as C1				
C13	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	1	CM05ED470G03	81349	
C14	Capacitor, Variable, Air: .6-6 pF, 250 V	1	5701	91293	
C15	Same as C1				
C16	Capacitor, Variable, Ceramic: 5.5-18 pF, 350 V	1	538-011A5.5-18	72982	
C17 Thru C19	Same as C1				
CR1	Diode, Varicap	1	KV3901	52673	
CR2	Diode	1	1N4449	80131	
L1	Coil	1	20681-180	14632	
L2	Inductor: 4.0 µH, 10%	2	1537-26	99800	
L3	Same as L2				
Q1	Transistor	1	2N2857/JAN	81350	
Q2	Transistor	2	2N3478	80131	
Q3	Same as Q2				
R1	Resistor, Fixed, Film: 20Ω, 1%, 1/4 W	2	RN60D20R0F	81349	
R2	Resistor, Fixed, Film: 4.22 kΩ, 1%, 1/4 W	1	RN60D4221F	81349	
R3	Resistor, Fixed, Film: 619Ω, 1%, 1/4 W	1	RN60D6190F	81349	
R4	Resistor, Fixed, Film: 47.5 kΩ, 1%, 1/4 W	1	RN60D4752F	81349	
R5	Resistor, Fixed, Film: 33.2Ω, 1%, 1/10 W	1	RN55D33R2F	81349	
R6	Resistor, Fixed, Film: 1.82 kΩ, 1%, 1/4 W	1	RN60D1821F	81349	
R7	Resistor, Fixed, Film: 8.45 kΩ, 1%, 1/4 W	1	RN60D8451F	81349	
R8	Resistor, Fixed, Film: 56.2 kΩ, 1%, 1/4 W	1	RN60D5622F	81349	
R9	Resistor, Fixed, Film: 51.1Ω, 1%, 1/4 W	4	RN60D51R1F	81349	
R10	Same as R9				
R11	Same as R9				
R12	Resistor, Fixed, Film: 15.0 kΩ, 1%, 1/4 W	1	RN60D1502F	81349	
R13	Resistor, Fixed, Film: 100Ω, 1%, 1/4 W	1	RN60D1000F	81349	
R14	Same as R9				
R15	Same as R1				
R16	Resistor, Fixed, Film: 3.57 kΩ, 1%, 1/10 W	1	RN55C3571F	81349	

REF DESIG PREFIX **A2A3A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R17	Resistor, Fixed, Film: 1.0MΩ, 5%, 1/4 W	1	CF1/4-1M/J	09021	
T1	Coil	1	21428-62	14632	

A.7.4.2 **Part 270521-1 Reference Marker Assembly** REF DESIG PREFIX **A2A3A2**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision E				
CR1	Diode	2	5082-3188	28480	
CR2	Same as CR1				
E1	Terminal, Forked	3	140-1941-02-01	71279	
E2	Same as E1				
E3	Same as E1				
R1	Resistor, Fixed, Composition: 51Ω, 5%, 1/4 W	1	RCR07G510JS	81349	
R2	Resistor, Fixed, Film: 1 kΩ, 5%, 1/4 W	1	CF1/4-1K/J	09021	
R3	Resistor, Fixed, Film: 3 kΩ, 5%, 1/4 W	1	CF1/4-3K/J	09021	
Y1	Crystal, Quartz	1	96402-1	14632	

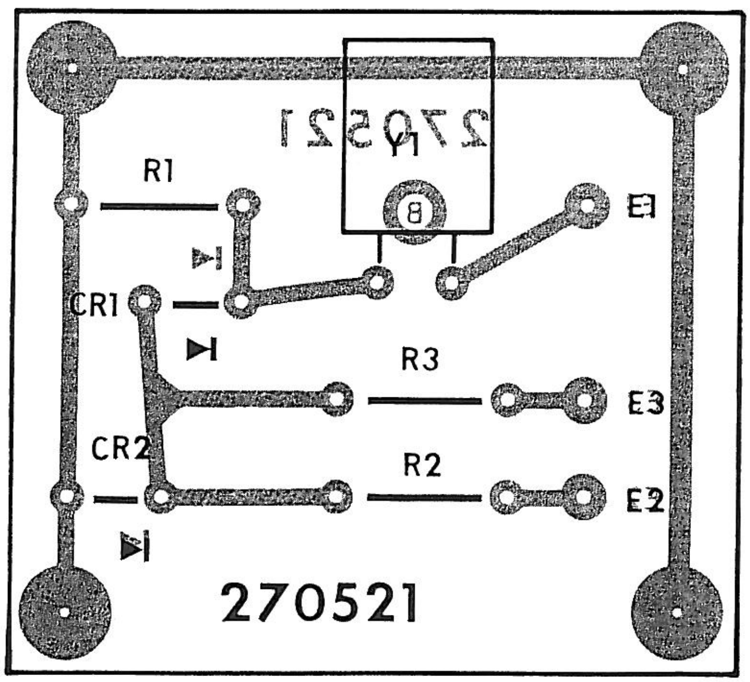

Figure A-18. Part 270521-1 Reference Marker Assembly (A2A3A2), Location of Components

A.7.5 **TYPE 794099-1 FOCUS AND INTENSITY CONTROL** REF DESIG PREFIX **A2A4**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision E				
C1	Capacitor, Ceramic, Disc: 0.05 µF, 20%, 100 V	1	TGS-50	56289	
E1	Terminal, Forked	4	140-1941-02-01	71279	
E2 Thru E4	Same as E1				
R1	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R2	Resistor, Variable, Composition: 500 kΩ, 10%, 1 W	1	72M1N048S504U	01121	
R3	Resistor, Fixed, Composition: 3.3 MΩ, 5%, 1/2 W	1	RCR20G335JS	81349	
R4	Resistor, Variable, Composition: 2.5 MΩ, 10%, 1 W	1	72M1N048S255U	01121	
R5	Resistor, Fixed, Composition: 3.9 MΩ, 5%, 1/2 W	1	RCR20G395JS	81349	
R6	Resistor, Fixed, Composition: 4.7 MΩ, 5%, 1/2 W	1	RCR20G475JS	81349	

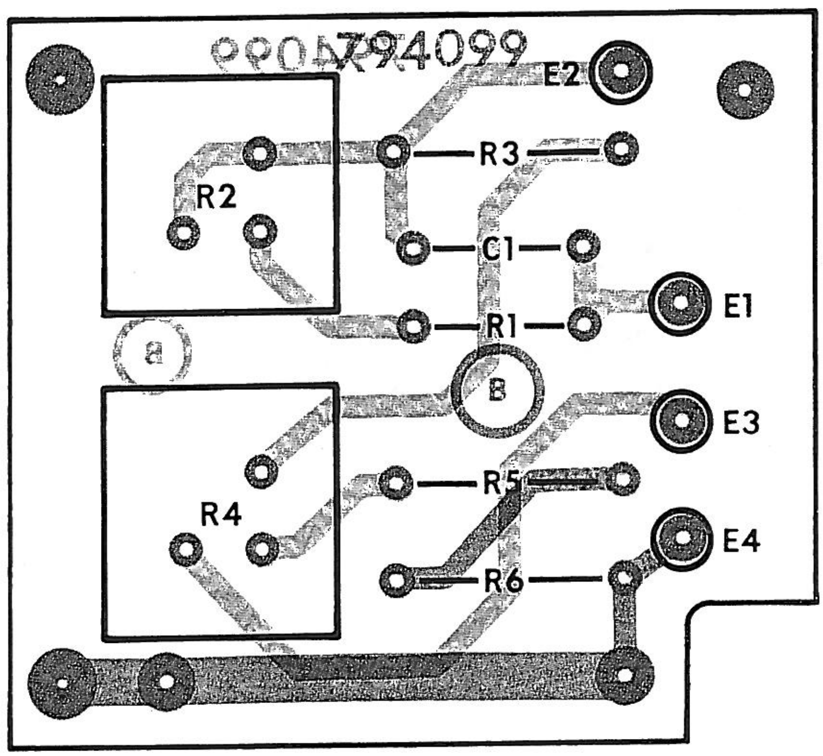

Figure A-19. Type 794099-1 Focus and Intensity Control (A2A4), Location of Components

A.7.6 **TYPE 764006-1 DC/DC CONVERTER** REF DESIG PREFIX A2A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision C				
A1	DC/DC Converter	1	16533-1	14632	

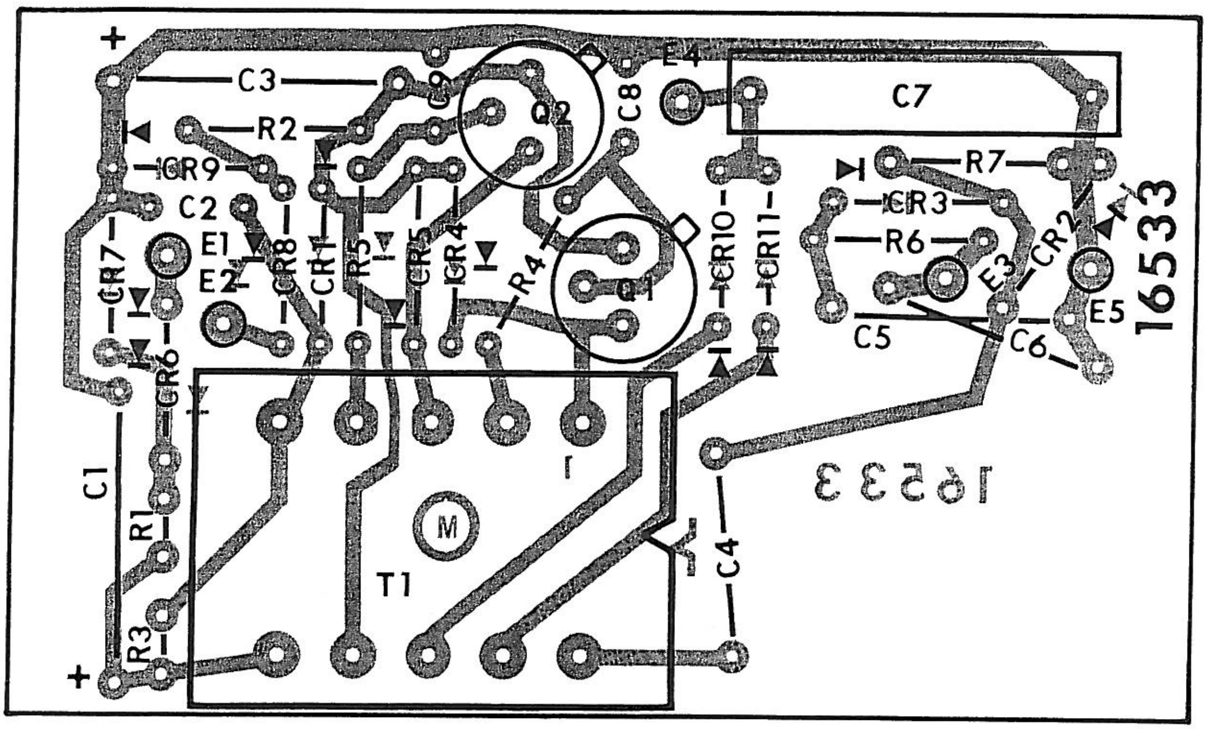

Figure A-20. Part 16533-1 DC/DC Converter (A2A5A1), Location of Components

A.7.6.1 **Part 16533-1 DC-DC Converter** REF DESIG PREFIX **A2A5A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision N				
C1	Capacitor, Electrolytic, Tantalum: 45 µF, 20%, 30 V	2	MTP456M030P1B	76055	
C2	Capacitor, Ceramic, Disc: 0.1 µF, -20+80, 25 V	1	DFJ3	73899	
C3	Same as C1				
C4	Capacitor, Ceramic, Disc: 0.01 µF, GMV, 2000 V	3	2KV.01UFP	91418	
C5	Same as C4				
C6	Same as C4				
C7	Capacitor, Mylar, Dipped: 0.22 µF, 20%, 400 V	1	B32234B6224M	25088	
C8	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 200 V	2	8131A200Z5U103M	72982	
C9	Same as C8				
CR1	Diode	1	1N4446	80131	
CR2	Diode	2	M20	14099	
CR3	Same as CR2				
CR4	Diode	2	1N458A	80131	
CR5	Same as CR4				
CR6	Diode	4	1N4003	80131	
CR7 Thru CR9	Same as CR6				
CR10	Diode	2	1N4004	80131	
CR11	Same as CR10				
Q1	Transistor	2	2N2102	80131	
Q2	Same as Q1				
R1	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	2	CF1/4-100 OHMS/J	09021	
R2	Same as R1				
R3	Resistor, Fixed, Film: 22 kΩ, 5%, 1/4 W	1	CF1/4-22K/J	09021	
R4	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	2	CF1/4-1.0K/J	09021	
R5	Same as R4				
R6	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R7	Resistor, Fixed, Film: 10 MΩ, 5%, 1/4 W	1	CF1/4-10M/J	09021	
T1	Transformer	1	16559	14632	