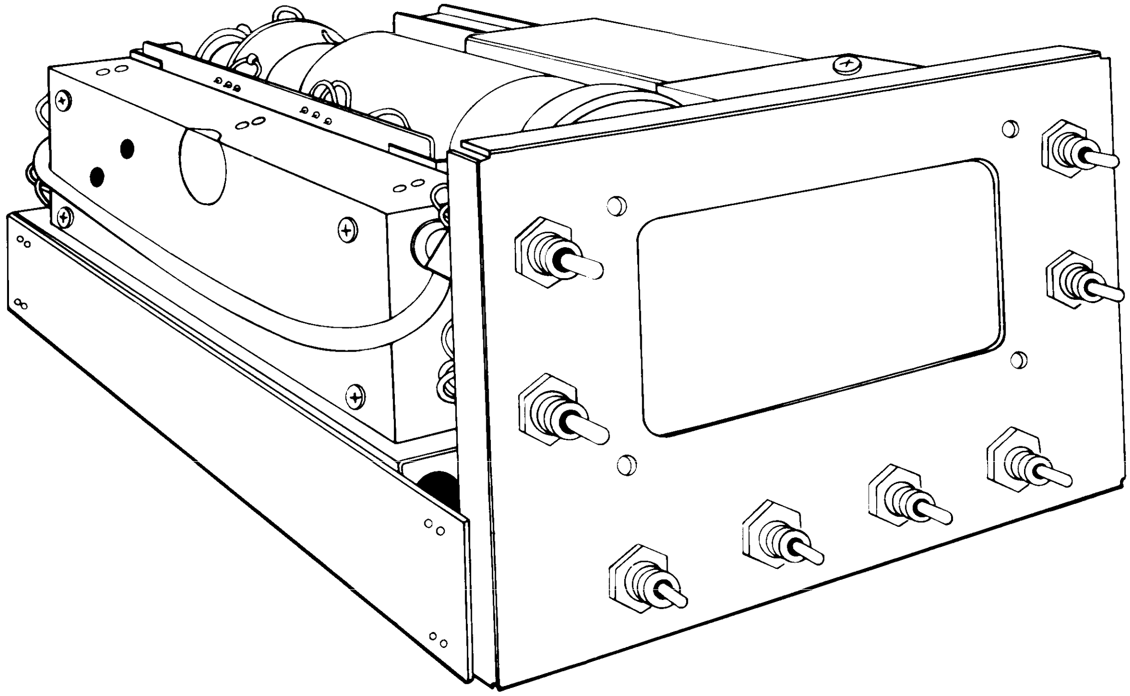
TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL



SIGNAL MONITOR (NSN 5895-01-073-1604)

PART OF RECEIVER, RADIO R-2311/G (NSN 5820-01-204-0283)

Distribution authorized to this Department of Defense and DOD contractors only for official use or for adminstration or operational purposes. This determination was made on 24 November 1987. Other requests for this document will be referred to Commander, US Army Communication-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-P, Fort Monmouth, NJ 07703-5000.

DESTRUCTION NOTICE - Destroy by any method that will prevent disclosure of contents or reconstruction of this document.

HEADQUARTERS, DEPARTMENT OF THE ARMY
1 MARCH 1988

SAFETY SUMMARY

These general precautions should be followed whenever working with electronic equipment to prevent injury to personnel:

1. Do not work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.
2. Whenever possible, turn off the power supply to the equipment before beginning maintenance on the equipment.
3. Do not remove the protective covers to the equipment unless you are authorized to do so.
4. When technicians are aided by operators, they must be warned about dangerous areas. A periodic review of safety precautions in TB 385-4, Safety Precautions For Maintenance of Electrical/Electronic Equipment, is recommended.
5. Seek advice from your supervisor whenever you are in doubt about electrical safety conditions.
6. For Artificial Respiration, refer to Fill 21-11.

Pins 3, 4, 5, and 8 on the CRT plug contain dangerous voltages. Use extreme caution when working near this plug. Use only a high voltage probe when checking these pins.

The Signal Monitor employs voltages which may be fatal if contacted. Extreme caution must be exercised when working with the equipment.

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.

PROPRIETARY STATEMENT

TECHNICAL MANUAL

NO. 11-5820-936-14-1-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 1 March 1988

Operator's, Organizational,
Direct Support and General Support
Maintenance Manual

SIGNAL MONITOR
(NSN 5895-01-073-1604)

Part of
Receiver, Radio R-2311/G
(NSN 5820-01-204-0283)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of away to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, NJ 07703-5000. Are reply will be furnished direct to you.

TABLE OF CONTENTS

SECTION 0

INTRODUCTION

Paragraph		Page
0.1	Scope	0-1
0.1.1	Type of Manual	0-1
0.1.2	Model Numbers and Equipment Names	0-1
0.1.3	Purpose of Equipment	0-1
0.2	Consolidated Index of Army Publications and Blank Forms	0-1
0.3	Maintenance Forms, Records, and Reports	0-1
0.3.1	Reports of Maintenance and Unsatisfactory Equipment	0-1
0.3.2	Report of Packaging and Handling Deficiencies	0-1
0.3.3	Discrepancy in Shipment Report (DISREP) (SF 361)	0-2
0.4	Destruction of Army Electronics Materiel	0-2
0.5	Administrative Storage	0-2
0.6	Tools and Test Equipment	0-2
0.7	Official Nomenclature, Names and Designations	0-2
0.8	Reporting Equipment Improvement Recommendations	0-2
0.9	Warranty Information	0-3

TABLE OF CONTENTS (Continued)

Paragraph		Page
	SECTION I	
	GENERAL DESCRIPTION	
1.1	Electrical Characteristics	1-1
1.2	Mechanical Characteristics	1-1
1.3	Equipment Supplied	1-1
	SECTION II	
	INSTALLATION AND OPERATION	
2.1	Installation	2-1
2.2	Operation	2-1
2.3	Controls	2-1
	SECTION III	
	CIRCUIT DESCRIPTION	
3.1	General	3-1
3.2	Functional Description	3-1
3.3	Detailed Circuit Descriptions	3-2
3.3.1	Type 724005-l, IF Amplifier Assembly, (A2A1)	3-2
3.3.2	Part 18106-2, input Amplifier, (A2A1A1)	3-2
3.3.3	Part 18107-l, 8 kHz BW IF Amplifier, (A2A1A2)	3-3
3.3.4	Part 15801-3, Output Amplifier, (A2A1A3)	3-3
3.3.5	Type 824002, Control Board, (A2A2)	3-4
3.3.6	Type 774007-l, Oscillator Assembly, (A2A3)	3-6
3.3.7	Part 270521-1, Reference Marker, (A2A3A2)	3-6
3.3.8	Part 15799-3, Sweep Oscillator, (A2A3A1)	3-6
3.3.9	Type 794099-l, Focus and Intensity Control, (A2A4)	3-7
3.3.10	Type 764006-l, DC-DC Converter, (A2A5)	3-7
3.3.11	Signal Monitor Main Chassis Wiring	3-7
	SECTION IV	
	MAINTENANCE	
4.1	General	4-1
4.2	Cleaning and Lubrication..	4-1
4.3	Inspection for Damage or Wear	4-1
4.4	Test Equipment Required	4-1
4.5	Troubleshooting Procedures	4-2
4.6	Equipment Performance Checks	4-2
4.7	Alignment and Adjustment Procedures	4-5
4.7.1	General	4-5

TABLE OF CONTENTS (Continued)

Paragraph		Page
4.7.1.1	Deflection Amplifiers Initial Adjustments	4-6
4.7.1.2	Sweep Rate Balance and Calibration Adjustments	4-7
4.7.1.3	Vertical Stages 12.7 MHz IF Amplifier Alignment	4-7
4.7.1.4	Vertical Stages 21.4 MHz IF Amplifier Alignment	4-8
4.7.1.5	Vertical Stages 21.4 MHz IF Amplifier Sweep Alignment	4-9
4.7.1.6	Sweep Oscillator and Frequency Linearity Adjustments	4-11
4.7.1.7	Signal Monitor Overall Gain Adjustments	4-11
4.8	Subassembly Removal, Repair, and Replacement	4-12

SECTION V

REPLACEMENT PARTS LIST

5.1	Unit Numbering Method	5-1
5.2	Reference Designation Prefix	5-1
5.3	List of Manufacturers	5-1
5.4	Parts List	5-4
5.4.1	Type 724005-l IF Amplifier (A2Al)	5-5
5.4.1.1	Part 18106-21 Input Amplifier (2AlAl)	5-6
5.4.1.2	Part 18107-18.0 kHz IF Amplifier (A2A1A2)	5-8
5.4.1.3	Part 15801-3 Output Amplifier (A2AlA3)	5-9
5.4.2	Type 824002-l Control Board (A2A2)	5-12
5.4.3	Type 774007-1 Oscillator Assembly (A2A3)	5-14
5.4.3.1	Part 15799-3 Sweep Oscillator Assembly (A2A3A1)	5-15
5.4.3.2	Part 270521-1 Reference Marker Assembly (A2A3A2)	5-17
5.4.4	Type 794099-1 Focus and Intensity Control (A2A4).	5-18
5.4.5	Type764006-l DC/DC Converter (A2A5)	5-19
5.4.6	Type 794103-l Signal Monitor (A2)	5-20

SECTION VI

SCHEMATICS

APPENDIXES

Appendix A, References	A-1
Appendix B, Maintenance Allocation Chart	B1
Appendix C, Components of End Item and Basic Issue Items List	C-1

LIST OF ILLUSTRATIONS

Figure		Page
1-1	Type WJ-794103-1 Signal Monitor	1-0
3-1	Signal Monitor Functional Block Diagram	3-9
4-1	Test Setup, Signal Monitor Performance Tests	4-3

LIST OF ILLUSTRATIONS (Continued)

Figure		Page
4-2	Typical Response Signal Monitor Resolution Test	4-4
4-3	Test Setup, Signal Monitor Deflection Amplifier Initial Alignment	4-6
4-4	Test Setup, Sweep Rate Calibrate	4-7
4-5	Test Setup, 12.7 MHz IF Amplifier Alignment	4-7
4-6	Test Setup, 21.4 MHz IF Amplifier Touch-Up Alignment	4-8
4-7	Test Setup, 21.4 MHz IF Amplifier Sweep Alignment	4-10
4-8	Typical Response, 21.4 MHz Vertical Amplifier	4-10
4-9	Test Setup, Sweep Oscillator and Frequency Linearity Adjustments	4-11

LIST OF TABLES

Table		Page
1-1	Signal Monitor Specifications	1-2
4-1	Signal Monitor Test Equipment	4-2

SECTION O

INTRODUCTION

0.1 SCOPE

0.1.1 TYPE OF MANUAL

This Signal Monitor manual is an Operator's, organizational, Direct Support, and General Support Maintenance commercial manual.

0.1.2 MODEL NUMBERS AND EQUIPMENT NAMES

The Signal Monitor is an assembly of the WJ-8617B-5 VHF/UHF Receiver. The receiver is part of the Receiver Set, Radio AN/TRQ-37. In this manual, the R-231l/G Receiver will be referred to as the receiver. A complete cross reference of common equipment names and nomenclature used in this manual is provided in paragraph 0.7.

0.1.3 PURPOSE OF EQUIPMENT

As part of the receiver the Signal Monitor provides a visual waveform display of tuned frequency signal activity. The Signal Monitor aids an operator in determining the amplitude and type of signal being detected and in fine tuning a signal.

0.2 CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS

Refer to the latest issue of DA Pam 25-30 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

0.3 MAINTENANCE FORMS, RECORDS, AND REPORTS

0.3.1 REPORTS OF MAINTENANCE AND UNSATISFACTORY EQUIPMENT

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in Maintenance Management Update.

0.3.2 REPORT OF PACKAGING AND HANDLING DEFICIENCIES

Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-1l-2/DLAR 4140.55/NAVMATINST 4355.673B/AFR 400-54/MCO 4430.H.

0.3.3 DISCREPANCY IN SHIPMENT REPORT (DISREP)(SF 361)

Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/ NAVSUPINST 4610.33 C/AFR 75-18/MCO P4610.19B/DLAR 4500.15.

0.4 DESTRUCTION OF ARMY ELECTRONICS MATERIEL

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

0.5 ADMINISTRATIVE STORAGE

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage the PMCS should be performed to assure operational readiness. The Signal Monitor is an assembly of Receiver, Radio R-231l/G. Refer to TM 11-5820-936-14-1 paragraph 2.4 for preparation of the receiver for storage.

0.6 TOOLS AND TEST EQUIPMENT

Maintenance of the Signal Monitor requires no special tools. Test equipment required for troubleshooting and maintenance of the Signal Monitor is listed in **paragraph 4.4.**

0.7 OFFICIAL NOMENCLATURE, NAMES AND DESIGNATIONS

The list below will help you identify the official nomenclature of the major equipment items used with the Signal Monitor. It also provides the common name used in the manual when it is different from the official nomenclature. Official nomenclature must be used when completing forms or when looking up technical manuals.

Common Name	Official Nomenclature
Receiver Set, Radio	Receiver Set, Radio AN/TRQ-37
Receiver, WJ-8617B-5	Receiver, Radio R-231l/G
Signal Monitor, WJ-794103-1	N/A

0.8 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS

If your Signal Monitor needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-PA-MA-D, Fort Monmouth, NJ 07703-5000. We'll send you a reply.

0.9 WARRANTY INFORMATION

The Signal Monitor is covered under the warranty on the R-2311/G Receiver. The receiver is warranted by Watkins-Johnson Company for a period of one year following delivery. It starts on the date found in block 23, DA Form 2408-9, in the logbook. This warranty may contain repair restrictions. Report all defects in material or workmanship to your supervisor.

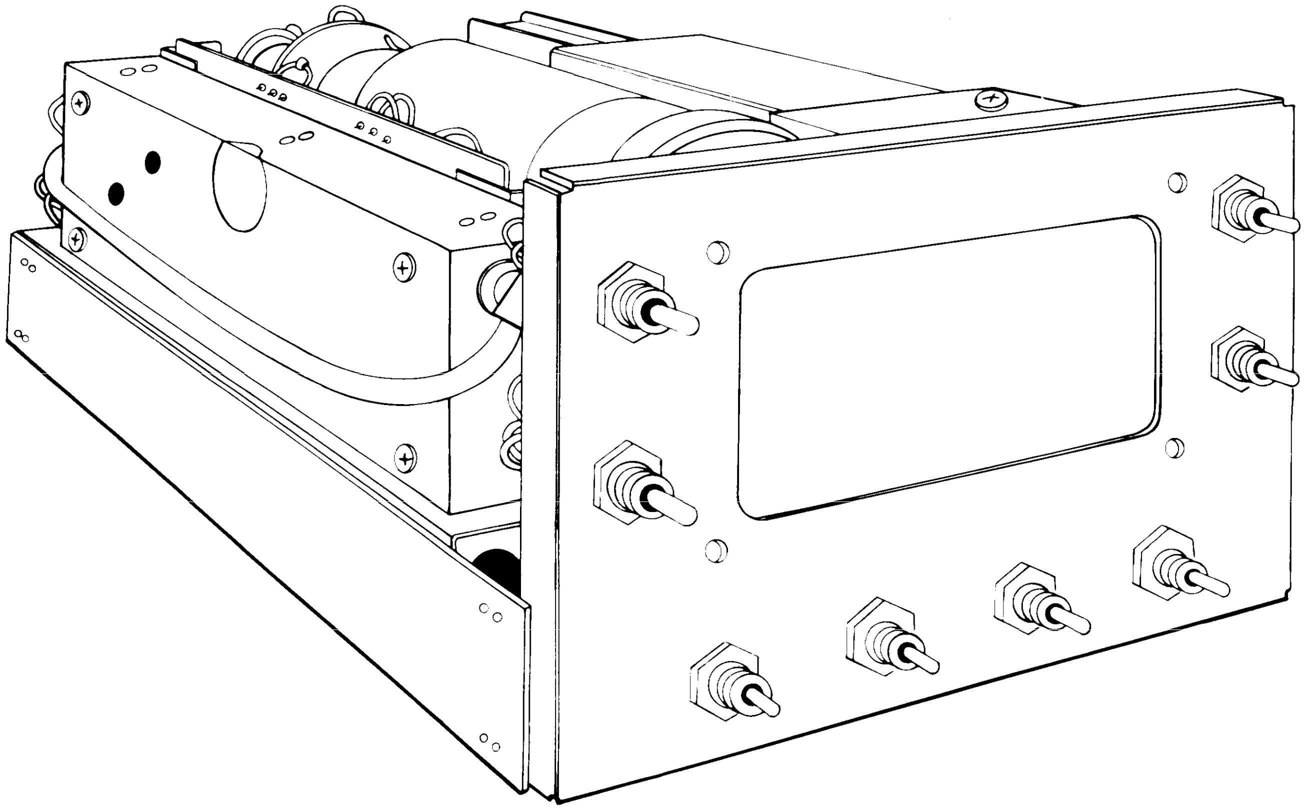


Figure 1-1. Type WJ-794103-l Signal Monitor

SECTION I

GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

The Signal Monitor is an assembly option designed for use with the WJ-8617B-5 VHF/UHF Receiver.

The Signal Monitor accepts 21.4 ±2 MHz signals and provides a visual display of signal activity across a sweep width 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.

1.2 MECHANICAL CHARACTERISTICS

The Signal Monitor is an assembly (A2) of the receiver. The inputs and outputs of the Signal Monitor are internal to the receiver. An illustration of the Signal Monitor is shown in **Figure 1-1.** The controls and indicators appearing on the front panel are: FOCUS and INTENSITY, SWEEP RATE, SWEEP WIDTH, CENTER FREQ, GAIN, MARKER/ON and LIN/LOG and CRT SCREEN.

The Signal Monitor contains seven etched circuit boards. Three of these circuit boards (IF amplifier boards) are mounted inside the brass chassis located underneath the CRT. The FOCUS AND INTENSITY control board is located to the right front of the CRT. The DC/DC converter board located near the right rear of the main chassis is mounted in a nickel-plated brass box that has been gold flashed. The last two boards (control board and oscillator board) are located to the left of the CRT.

1.3 EQUIPMENT SUPPLIED

The Signal Monitor is incapable of independent operation and therefore comes installed in the WJ-8617B-5 VHF/UHF Receiver. The receiver will supply the required operating power and signal connection. Refer to TM 11-5820-936-14-1 for information on the receiver.

Table 1-1. Signal Monitor Specifications

Input	BNC
Input Impedance	50 ohms, nominal
Input Frequency	10 MHz
Range of Center Frequency	50 kHz
Sweep Width	0 to 1 MHz
Sweep Linearity	Linear overall to within 5% of total sweep width
Sweep Rate	5 Hz to 25 Hz nominal, continuously variable
Resolution	Using approximately 50 kHz sweep width, two signals 5 kHz apart will be displayed with at least a 6 dB valley between the peaks
Oscillator Frequency:	
1st LO	12 MHz
2nd LO	2.205 MHz
Sensitivity	10 μV input at 10 MHz produces at least 3/4 of an inch vertical deflection on CRT
Image Rejection	60 dB, minimum
IF Rejection	60 dB, minimum
Gain Control	60 dB, minimum
Vertical Display Response	3 dB
Marker Frequency	10 MHz $\pm$0.01%
Operating Temperature Range*	$0^{\circ}C$ to $50^{\circ}C$
Power Input	11 to 16 Vdc
Power Consumption	10 watts, approximately
Front Panel Controls	Center frequency, sweep width, sweep rate, sweep reversing, SM gain, marker ON/OFF, intensity, focus

* Operation within specifications guaranteed at $25^{\circ}C \pm 5^{\circ}C$

SECTION II

INSTALLATION AND OPERATION

2.1 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 A2A32J2, and the cable from P20 on the receiver connects at A2A1J1.

2.2 OPERATION

All Signal Monitor controls are located on the front panel.

2.3 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.

SECTION III

CIRCUIT DESCRIPTION

3.1 GENERAL

The operation of the circuitry found in the Signal Monitor is described in the following paragraphs. The functional block diagram shown in **Figure 3-1** should be used as a reference for the circuit descriptions that follow, along with the schematic diagrams in **Section VI.** Note that the unit numbering system is used for electrical components, which means that parts on the subassemblies and modules carry a prefix before the usual class letters and number of the item (such as A1U1 and A6Ql). These prefixes are omitted on the illustration and in the text except in cases where confusion may result from the omission.

3.2 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 on a 21.4 MHz signal to mixer U1 on IF Amplifier (A2A1A1) when the front panel MARKER switch is ON.

The 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 cause a vertical deflection indicating the presence of signals. Horizontal deflection circuits supply a recurring sawtooth voltage to the horizontal deflection plates driving the electron beam across the face of the CRT. This same sawtooth voltage must be applied to Sweep Oscillator (A2A341) to maintain synchronization for converting 21.4 MHz input signals to vertical deflection voltages for the CRT. A recurring ramp voltage is applied 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 controlling 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.

3.3 DETAILED CIRCUIT DESCRIPTIONS

Refer to the schematic diagrams when reading these circuit descriptions.

3.3.1 TYPE 724005-1, IF AMPLIFIER ASSEMBLY, (A2A1)

Refer to Figure 6-1 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 utilized 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 the 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 is selectable from the front panel LIN/LOG switch. The IF amplifier assembly also has a 12.7 MHz trap on IF input jack Jl, and a low-pass filter on the output at E3.

3.3.2 PART 18106-2, INPUT AMPLIFIER, (A2A1A1)

Refer to **Figure 6-2** 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 El (signal strength at the cathode of CR2 less than 400 mV) dual IGFET Q1 operates at maximum gain. As the signal strength increases, diode CR2 rectifies a portion of the output of Q1 and applies it to the base of AGC amplifier Q2 through resistor R11. When Q2 begins to conduct, the voltage at gate 2 of Q1 begins going negative 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 C1l. A ±l.5 dB flat response over a 3 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 C1l. Balanced mixer U1 heterodynes this signal with an LO input signal from E4. This LO input signal is centered at 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 producing 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.

3.3.3 PART 18107-1, 8 kHz BW IF AMPLIFIER, (A2A1A2)

Refer to **Figure 6-3** for the schematic diagram of this circuit board. The 12.7 MHz signals from El 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 applied to E3.

3.3.4 PART 15801-3, OUTPUT AMPLIFIER, (A2A1A3)

Refer to **Figure 6-4** for the schematic diagram of this circuit board. Signal flow from pin El to gate 1 (pin 3) of Q1 is through de-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 operates 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 operates 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 utilized to calibrate the overall LOG range of the entire IF amplifier. Resistor R31 returns the non-inverting input (pin 3) of U2 to ground balancing 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 is 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 Ul which is the emitter of the input amplifier transistor of the IC. Emitter bias is applied 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 de-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, R-40, 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, produces 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 potentiometer R47 (pin E9).

3.3.5 TYPE 824002, CONTROL BOARD, (A2A2)

Refer to **Figure 6–5** 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 utilized to indicate signals. The dc signal voltage utilized 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 is applied 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 maintaining 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 determinedly R54, to charge capacitor C1. This capacitor charges until the firing voltage of unijunction Q1 is reached, then the capacitor is suddenly discharged through Ql, and the recharge cycle begins again. This recurring ramp voltage (sawtooth) couples to the noninverting 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 keeping 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 aligns 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 is applied 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 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).

3.3.6 TYPE 774007-1, OSCILLATOR ASSEMBLY, (A2A3)

Refer to **Figure 6-6** 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 (A2A3Al) 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 preventing oscillator signals from leaving the assembly.

3.3.7 PART 270521-1, REFERENCE MARKER, (A2A3A2)

Refer to **Figure 6-6** 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 does 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.

3.3.8 PART 15799-3, SWEEP OSCILLATOR, (A2A3A1)

Refer to **Figure 6-7** 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 utilized 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 compensating 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 19.9 MHz and 22.9 MHz (3-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.

3.3.9 TYPE 794099-1, FOCUS AND INTENSITY CONTROL, (A2A4)

Refer to **Figure 6-8** for the schematic diagram of this assembly. High voltage appearing at E3 originates at the front panel INTENSITY control. High voltage input El receives -1500 Vdc which connects to a resistive divider containing the INTENSITY and FOCUS controls.

3.3.10 TYPE 764006-1, DC-DC CONVERTER, (A2A5)

Refer to **Figure 6-9** for the schematic diagram of this assembly. Transistors Q1 and Q2 act as a multivibrator creating an oscillating current in the primary windings of transformer T1. Input from E2 turns Q2 on producing high current in the windings between pins 6 and 3. Q2 saturates and the feedback loop createsa 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 applying -1500 Vdc at E3. Full wave rectifiers CR10 and CR11 change the ac output from T1 to positive going dc with C7 smoothing the 200 Vdc output at E4.

3.3.11 SIGNAL MONITOR MAIN CHASSIS WIRING

Refer to **Figure 6-10** 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 applied to the IF amplifier assembly at J1. Also supplied to the IF amplifier assembly are a swept frequency centered at 34.1 MHz and a marker centered at 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 is applied 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 Control Board (A2A2). The center frequency voltage applied to the oscillator assembly originates with the 15 Vdc supply. Diode VR1 and heat sensitive resistor RTI 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.

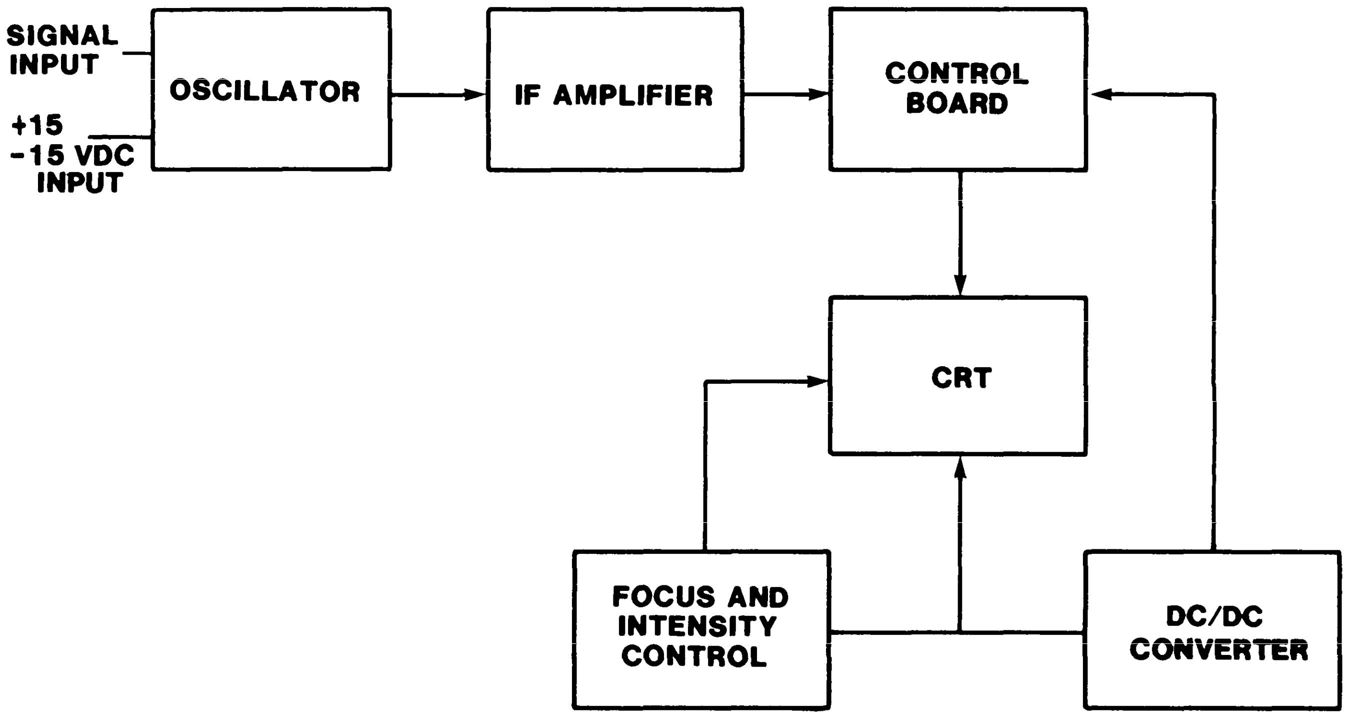


Figure 3-1. Signal Monitor Functional Block Diagram

SECTION IV

MAINTENANCE

> **NOTE**
>
> The Signal Monitor is an assembly of Receiver R-2311/G. Troubleshooting, removal, repair, replacement, performance testing, and alignment are not authorized at the Direct Support Maintenance level.

4.1 GENERAL

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 III** 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 can be found in **Section V.** Figure numbers are given at some steps in the procedures.

4.2 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 bristle brush, or a cloth saturated with cleaning solution may also be used.

4.3 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.

4.4 TEST EQUIPMENT REQUIRED

A table of recommended test equipment appears in this section **(Table 4-l).** The equipment recoin mended has been chosen for its wide availability and operating characteristics. Procedures have been written so that substitutions of test equipment may be made with a minimum of trouble to the maintenance technician.

Table 4-1. Signal Monitor Test Equipment

Item	Equipment Type	NSN
1	Multi reeler, Digital AN/PS51-45	6625-01-134-2512
2	Test Lead Set, Simpson Catalog No. 00577	N/A
3	Generator. Signal. SG-1112(V) 1/U, w/options 001,002	6625-00-500-6525
4	Cable, RF, ohms, 4 ft. BNC-BNC	5995-00-070-8747
5	Oscilloscope, AN/USM-488	N/A
6	Voltage Probe. 10X. TEK P6006	6625-00-524-0572
7	Counter, Frequency, TD-1225:4(V) l/U	6625-00-498-8946
8	Generator, Sweep Signal, SG-1206	N/A
9	High Frequency Probe 5kv, Simpson Cat. No. 0053	N/A
10	Assorted Test Cables and Connectors - Depends on test equipment need for maintenance.	N/A

4.5 TROUBLESHOOTING PROCEDURES

Troubleshooting efforts should first redirected toward localizing the problem to a particular module or circuit group. As an aid in the process, the manual contains a complete circuit description, **Section III.** Once the faulty module has been located, the defective component should be isolated using data obtained from the circuit descriptions, and the schematic diagrams. **Figure 6-1 through 6-10.** Once the trouble has been localized, the Signal Monitor can usually be returned to service by substituting a spare module known to be in good operating condition. Before a faulty module is repaired, a review should be made of the procedures followed up to this point to determine exactly why the failure occurred.

4.6 EQUIPMENT PERFORMANCE CHECKS

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 4-1.**

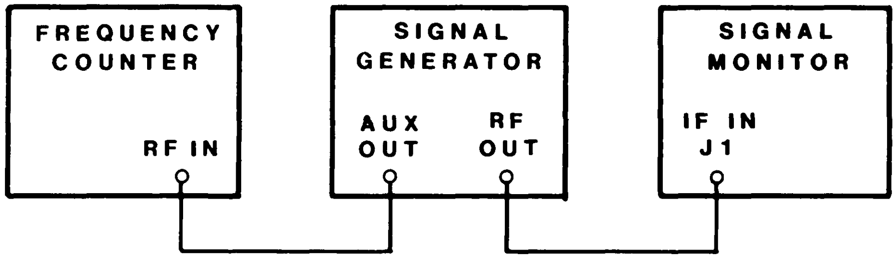


Figure 4-1. Test Setup, Signal Monitor Performance Tests

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

(3) Set the Signal Monitor controls as follows:
- a. SWEEP WIDTH: maximum clockwise
- b. LOG-IN: 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 instep 7 from the frequency record instep 8 to determine the maximum sweep width. The frequency difference should be in the range of 4.0MHz to 4.4 MHz.

(l0) To verify the proper sweep linearity, the frequency recorded instep 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 4–2.**

(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.

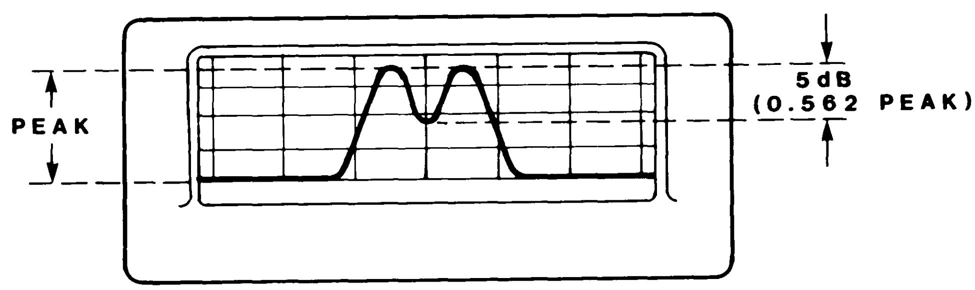


Figure 4-2. Typical Response, Signal Monitor Resolution Test

(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 19.9 MHz to 22.9 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 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 pV) and observe that the pip is at full scale or greater. This completes the signal monitor tests.

4.7 <u>ALIGNMENT AND ADJUSTMENT PROCEDURES</u>

NOTE

Alignment and adjustment procedures are not to be performed at the direct support maintenance level. Replacement assemblies and subassemblies are pre-aligned at the manufacturing plant. No further alignment is required upon installation.

4.7.1 GENERAL

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 procedures begin by obtaining a trace on the CRT. Proceed as follows:

WARNING

The Signal Monitor employs voltages which may be fatal if contacted. Extreme caution must be exercised when working with the equipment.

4.7.1.1 DEFLECTION AMPLIFIERS INITIAL ADJUSTMENTS

This procedure is required only for units not having a trace on the screen. For all other units, continue to 4.7.1.2.

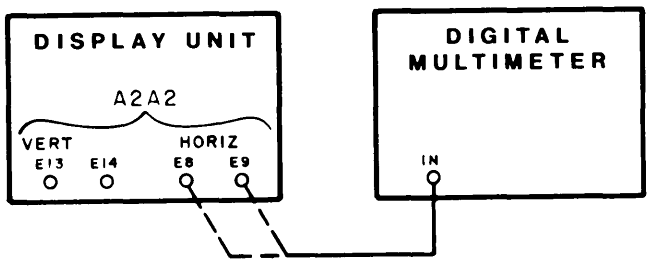


Figure 4-3. Test Setup, Signal Monitor Deflection Amplifier Initial Alignment

(1) set the Signal Monitor Front Panel controls as follows:

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

CAUTION

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 multi meter 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.

4.7.1.2 SWEEP RATE BALANCE AND CALIBRATION ADJUSTMENTS

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

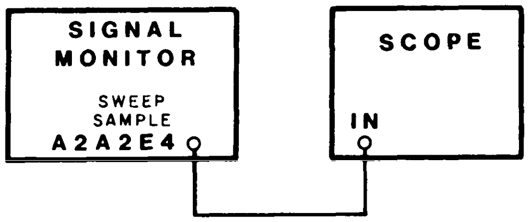


Figure 4-4. Test Setup, Sweep Rate Calibrate

(1) 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 refererence 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.

4.7.1.3 VERTICAL STAGES 12.7 MHz IF AMPLIFIER ALIGNMENT

Utilize this procedure to align vertical IF amplifiers from the output of the mixer in Input Amplifier (A2A1A1) to the detector in Output Amplifier (A2A1L43). Proceed as follows:

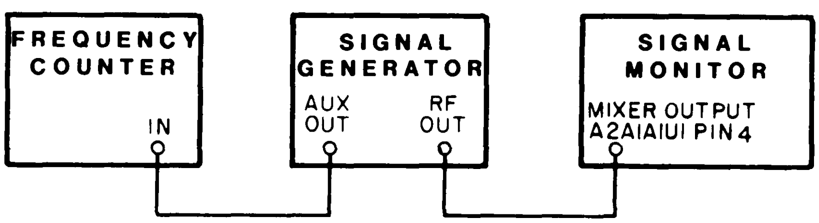


Figure 4-5. Test Setup, 12.7 MHz IF Amplifier Alignment

(1) Connect the equipment as shown in **Figure 4-5.**

(2) Set the signal monitor front panel controls as follows:

MARKER: turned off
LOG-LIN: to LIN
CENTER FREQ: anywhere
GAIN: fully counterclockwise
SWEEP WIDTH: anywhere
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.

4.7.1.4 VERTICAL STAGES 21.4 MHz IF AMPLIFIER ALIGNMENT

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:

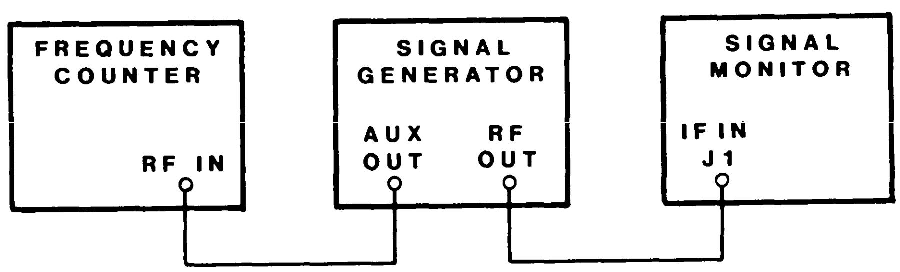


Figure 4-6. Test Setup, 21.4 MHz IF Amplifier Touch-Up Alignment

(1) Connect the equipment as shown in Figure 4-6.

(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. SWEEP WIDTH: fully clockwise
f. SWEEP RATE: 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.

(l0) Tune the signal generator from 19.9 MHz to 22.9 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 4.7.1.5.

4.7.1.5 VERTICAL STAGES 21.4 MHz IF AMPLIFIER SWEEP ALIGNMENT

Perform this alignment when the touch-up method in paragraph 4.7.1.4 fails. Proceed as follows:

(1) Connect the equipment as shown in Figure 4-7. Solder the hi-Z detector directly to the junction of C15 and R14 on the input amplifier board.

(2) Tune the signal generator to 21.3 MHz, CW, at a level producing a convenient marker.

(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.

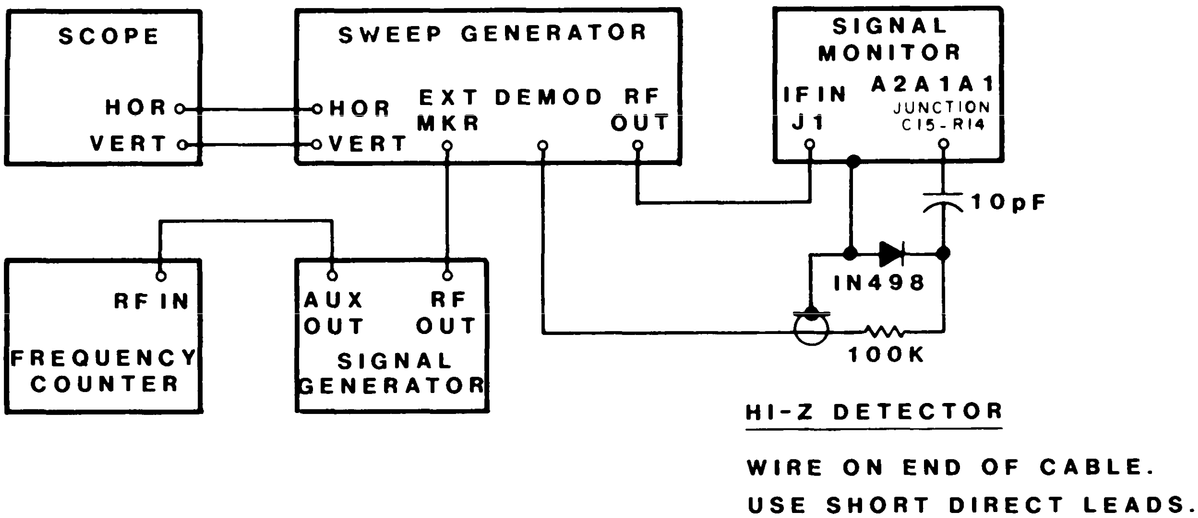


Figure 4-7. Test Setup, 21.4 MHz IF Amplifier Sweep Alignment

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

(5) Adjust coils Ll, L3, and L4 on Input Amplifier (A2A1A1) obtaining a detector response like that shown in Figure 4-8. Then disconnect the high impedance detector.

(6) Perform steps 1 through 8 of paragraph 4.7.1.4 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 incomplete.

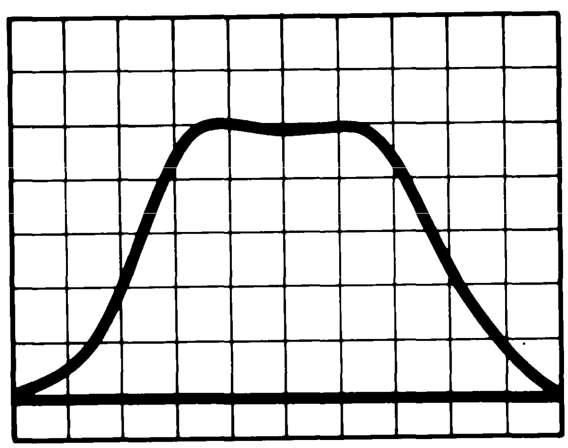


Figure 4-8. Typical Response, 21.4MHz Vertical Amplifier

4.7.1.6. SWEEP OSCILLATOR AND FREQUENCY LINEARITY ADJUSTMENTS

Perform these adjustments ensuring the sweep oscillator center sat 34.1 MHz with the sawtooth properly shaped providing linear response.

(1) Connect the equipment as shown in **Figure 4-9,** and set the signal generator output to allow level until a marker is required.

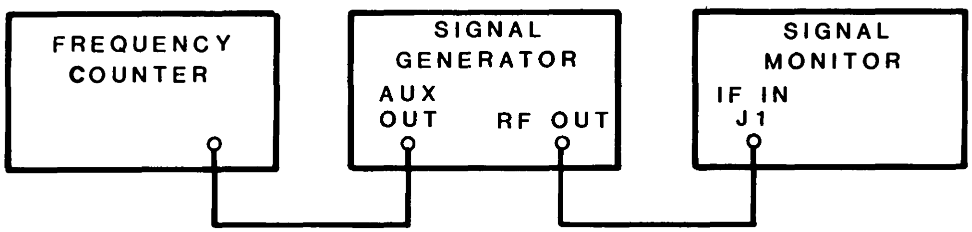


Figure 4-9. Test Setup, Sweep Oscillator and Frequency Linearity Adjustments

(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 maintaining the frequency marker aligned behind the middle graticule line.

(4) Alternately, set the signal generator to 19.9 MHz while adjusting the SWEEP WIDTH control establishing a 3 MHz sweep width.

(5) Turn the marker off and set the signal generator to 19.9 MHz. Increase the frequency in steps of 500 kHz while observing for the pip behind each graticule line.

(6) Adjust Sawtooth Shaper (A2A2R48) establishing 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.

4.7.1.7 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 4-1;** set the signal generator to 21.4 MHz, CW, at a level of -87 dBm (10 PV).

(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 -65 dBm (128 PV).

(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.

(l0) Set the signal generator output level to -95 dBm (4 PV).

(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.

4.8 SUBASSEMBLY REMOVAL, REPAIR, AND REPLACEMENT

Removal, repair, and replacement of the signal monitor is not authorized at the direct support maintenance level.

SECTION V

REPLACEMENT PARTS LIST

5.1 UNIT NUMBERING METHOD

The unit numbering method of assigning reference designations (electrical symbol numbers) has been used to identify assemblies, subassemblies (and modules) and parts. An example of the unit method follows:

Subassembly Designation Al	R1 Class and No. of Item
Identify from right to left as:	First (1) resistor(R) of First (1) subassembly (A)

As shown on the main chassis schematic, components which are an integral part of the main chassis have no subassembly designation.

5.2 REFERENCE DESIGNATION PREFIX

Partial reference designations have been used on the equipment and on the illustrations in this manual. The partial reference designations consist of the class letter(s) and identifying item number. The complete reference designations may be obtained by placing the proper prefix before the partial reference designations. Reference Designation Prefixes are provided on drawings and illustrations in parenthesis within the figure titles.

5.3 LIST OF MANUFACTURERS

Mfr. Code	Name and Address
00629	Eby Sales Company, Inc. 148-05 Archer Avenue Jamaica, New York 11435
01121	Allen-Bradley Company 1201 South 2nd Street Milwaukee, Wisconsin 53204
01281	TRW Semiconductors, Inc. 14520 Aviation Boulevard Lawndale, California 90260
04713	Motorola Incorporated Semiconductor Products Division 5005 East McDowell Road Phoenix, Arizona 85008
02114	Ferroxcube Corporation P.O. Box 359 Mt. Marion Road Saugerties, New York 12477
02735	RCA Corporation Solid State Division Route 202 Somerville, New Jersey 08876
04013	Taurus Corporation 1 Academy Hill Lambertville, New Jersey 08530
34156	Semicoa 333 McCormick Avenue Costa Mesa, California 92626

Mfr. Code	Name and Address
07263	Fairchild Camera & Instr. Corp. Semiconductor Division 464 Ellis Street Mountain View, California 94040
07700	Technical Wire Products, Inc. 129 Dermody Street Crawford, New Jersey 07016
14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, Maryland 20760
16237	Connector Corporation 6025 N. Keystone Avenue Chicago, Illinois 60646
18324	Signetics Corporation 811 East Arques Avenue Sunnyvale, California 94086
25350	Donald Bruce and Company 3600 N. Talman Street Chicago, Illinois 60618
27193	Cutler-Hammer, Incorporated Specialty Products Division 402 North 27th Street Milwaukee, Wisconsin 53216
33095	Spectrum Control Inc. 152 E. Main Street Fairview, Pennsylvania 16415
74306	Piezo Crystal Company 100 K Street Carlisle, Pennsylvania 17013
74868	Bunker Ramo Corporation The Amphenol RF Division 33 East Franklin Street Danbury, Connecticut 06810
75042	TRW Electronic Components IRC Fixed Resistors 401 North Board Street Philadelphia, Pennsylvania 19108

Mfr. Code	Name and Address
37942	P.R. Mallory and Company, Inc. 3029 E. Washington Street Indianapolis, Indiana 46206
49956	Raytheon Company 141 Spring Street Lexington, Massachusetts 02173
55289	Sprague Electric Company Marshall Street North Adams, Massachusetts 01274
71279	Cambridge Thermionic Corp. 445 Concord Avenue Cambridge, Massachusetts 02138
71400	Bussman Manufacturing Division of McGraw-Edison Co. 2536 W. University Street St. Louis, Missouri 63107
72136	Electro Motive Mfg. Co., Inc. South Park and Johns Streets Willimantic, Connecticut 06226
72982	Erie Technological Products, Inc. 644 West 12th Street Erie, Pennsylvania 16512
73138	Beckman Instruments, Inc. Heliport Division 2500 Harbor Boulevard Fullerton, California 92634
81312	Winchester Electronics Division Litton Industries, Incorporated Main Street & Hillside Avenue Oakville, Connecticut 06779
81349	Military Specifications
84411	TRW Electric Components TRW Capacitors 112 W. First Street Ogallala, Nebraska 69153

Mfr. Code	Name and Address
75915	Little Fuse, Incorporated 800 E. Northwest Highway Des Plaines, Illinois 60016
76055	Mallory Controls Division P.O. Box 327 State Road 28 W Frankfort, Indiana 46041
80058	Joint Electronic Type Designation System
80131	Electronic Industries Association 2001 Eye Street, N.W. Washington, D.C. 20006
80294	Bourns, Incorporated Instrument Division 6135 Magnolia Avenue Riverside, California 92506
81073	Grayhill Incorporated 561 Hillgrove Avenue Lagrange, Illinois 60525
95146	Alto Electronics Products Inc. P.O. Box 1348 Lawrence, Massachusetts 01842
95712	Bendix Corporation Microwave Devices Plant Hurricane Road Franklin, Indiana 46131

Mfr. Code	Name and Address
91418	Radio Materials Company 4242 West Bryn Mawr Avenue Chicago, Illinois 60646
91506	Augat, Incorporated 33 Perry Avenue Attleboro, Massachusetts 02703
91767	Mite Corporation 466 Blake Street New Haven, Connecticut 06515
93332	Sylvania Electric Products, Inc. Semiconductor Products Division 100 Sylvan Road Woburn, Massachusetts 01801
94144	Raytheon Company Components Division 465 Center Street Quincy, Massachusetts 02169
95121	Quality Components, Inc. P.O. Box 113 St. Mary's, Pennsylvania 15857
97539	APM-Hexseal Corporation 44 Honeck Street Englewood, New Jersey 07631

5.4 PARTS LIST

The parts list which follows contains all electrical parts used in the equipment and certain mechanical parts which are subject to unusual wear or damage. When ordering replacement parts from Watkins-Johnson Company, specify the type and serial number of the equipment and the reference designation and description of each part ordered. The list of manufacturers provided in **paragraph 5.3** and the manufacturer's part number for components are included as a guide to the user of the equipment in the field. These parts may not necessarily agree with the parts installed in the equipment; however, the parts specified in this list will provide satisfactory operation of the equipment. Replacement parts may be obtained from any manufacturer as long as the physical and electrical parameters of the part selected agree with the original indicated part. In the case of components defined by a military or industrial specification, a vendor which can provide the necessary component is suggested as a convenience to the user.

NOTE

As improved semi-conductors become available, it is the policy of Watkins-Johnson Company to incorporate them in proprietary products. For this reason some transistors, diodes, and integrated circuits installed in the equipment may not agree with those specified in the parts list and schematic diagrams of this manual. However, the semi-conductors designated in the manual may be substituted in every case with satisfactory results.

5.4.1 TYPE 724005-1 IF AMPLIFIER REF DESIG PREFIX A2A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Input Amplifier	1	18106-2	14632	
A2	8.0 kHz IF Amplifier	1	18107-1	14632	
A3	Output Amplifier	1	15801-3	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	MC603	73899	
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%, 20V	1	196D107X0020TE4	56289	
E1	Terminal, Feedthru	3	SFU16Y	04013	
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	10-0104-002	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, Composition: 300 Ω, 5%, 1/4 W	1	RCR07G301JS	81349	
R2	Resistor, Fixed, Composition: 18 Ω, 5%, 1/4 W	1	RCR07G180JS	81349	
R3	Resistor, Fixed, Composition: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	
R4	Resistor, Fixed, Composition: 2.7 Ω, 5%, 1/4 W	4	RCR07G2R7JS	81349	
R5 Thru R7	Same as R4				
R8	Resistor, Fixed, Composition: 5.1 kΩ, 5%, 1/4 W	1	RCR07G512JS	81349	
R9	Resistor, Fixed, Composition: 240 Ω, 5%, 1/4 W	1	RCR07G241JS	81349	

5.4.1.1 Part 18106-2 Input Amplifier

REF DESIG PREFIX A2A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
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, GMV, 500 V	2	B-GP1000PFP	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	72982	
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	20861-44	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, Composition: 300 Ω, 5%, 1/4 W	1	RCR07G301JS	81349	
R2	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/4 W	1	RCR07G472JS	81349	
R3	Resistor, Fixed, Composition: 130 kΩ, 5%, 1/4 W	1	RCR07G134JS	81349	
R4	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	
R5	Resistor, Fixed, Composition: 100 Ω, 5%, 1/4 W	2	RCR07G101JS	81349	
R6	Resistor, Fixed, Composition: 51 kΩ, 5%, 1/4 W	1	RCR07G513JS	81349	
R7	Resistor, Fixed, Composition: 24 kΩ, 5%, 1/4 W	1	RCR07G243JS	81349	
R8	Resistor, Fixed, Composition: 150 Ω, 5%, 1/4 W	3	RCR07G151JS	81349	
R9	Not Used				

REF DESIG PREFIX A2A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R10	Resistor, Fixed, Composition: 47 Ω, 5%, 1/4 W	1	RCR07G470JS	81349	
R11	Resistor, Fixed, Composition: 47 kΩ, 5%, 1/4 W	1	RCR07G473JS	81349	
R12	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/4 W	1	RCR07G104JS	81349	
R13	Resistor, Fixed, Composition: 3.9 kΩ, 5%, 1/4 W	1	RCR07G392JS	81349	
R14	Same as R8				
R15	Resistor, Fixed, Composition: 1.0 kΩ, 5%, 1/4 W	2	RCR07G102JS	81349	
R16	Same as R15				
R17	Resistor, Fixed, Composition: 39 Ω, 5%, 1/4 W	1	RCR07G390JS	81349	
R18	Same as R8				
R19	Resistor, Fixed, Composition: 16 kΩ, 5%, 1/4 W	1	RCR07G163JS	81349	
R20	Resistor, Fixed, Composition: 6.2 kΩ, 5%, 1/4 W	1	RCR07G622JS	81349	
R21	Same as R5				
R22	Resistor, Fixed, Composition: 56 Ω, 5%, 1/4 W	1	RCR07G560JS	81349	
R23	Resistor, Fixed, Composition: 1.8 kΩ, 5%, 1/4 W	1	RCR07G182JS	81349	
R24	Same as R4				
T1	Transformer	1	21428-100	14632	
U1	Mixer	1	M9A	27956	

5.4.1.2 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
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, Composition: 240 Ω, 5%, 1/4 W	1	RCR07G241JS	81349	
R2	Resistor, Fixed, Composition: 8.2 kΩ, 5%, 1/4 W	1	RCR07G822JS	81349	
R3	Resistor, Fixed, Composition: 2.2 kΩ, 5%, 1/4 W	2	RCR07G222JS	81349	
R4	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	
R5	Resistor, Fixed, Composition: 33 Ω, 5%, 1/4 W	2	RCR07G330JS	81349	
R6	Resistor, Fixed, Composition: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	
R7	Resistor, Fixed, Composition: 100 Ω, 5%, 1/4 W	3	RCR07G101JS	81349	
R8	Resistor, Trimmer, Film: 100 Ω, 10%, 1/2 W	1	62PR100	73138	
R9	Same as R4				
R10	Same as R3				
R11	Same as R7				
R12	Resistor, Fixed, Composition: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	
R13	Same as R5				
R14	Resistor, Fixed, Composition: 330 Ω, 5%, 1/4 W	2	RCR07G331JS	81349	
R15	Same as R14				
R16	Same as R7				
R17	Resistor, Fixed, Composition: 47 Ω, 5%, 1/4 W	1	RCR07G470JS	81349	
RT1	Thermistor, 1 kΩ	1	2D102	04239	

5.4.1.3 Part 15801-3 Output Ampifier REF DESIG PREFIX A2A1A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Electrolytic, Tantalum: 22 μF, 20%, 15 V	4	196D226X0015KE3	56289	
C2	Capacitor, Mica, Dipped: 470 pF, 5%, 500 V	1	DM15-471J	72136	
C3	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	5	B-GP1000PFP	91418	
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	8131M100-651-104M	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	WMF133	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	

REF DESIG PREFIX A2A1A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
Q1	Transistor	2	3N187	3N187	
Q2	Same as Q1				
R1	Not Used				
R2	Resistor, Fixed, Composition: 120 kΩ, 5%, 1/4 W	2	RCR07G124JS	81349	
R3	Resistor, Fixed, Composition: 33 kΩ, 5%, 1/4 W	2	RCR07G333JS	81349	
R4	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/4 W	3	RCR07G472JS	81349	
R5	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/4 W	5	RCR07G104JS	81349	
R6	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	6	RCR07G103JS	81349	
R7	Resistor, Fixed, Composition: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	
R8	Resistor, Fixed, Composition: 620 Ω, 5%, 1/4 W	1	RCR07G621JS	81349	
R9	Resistor, Fixed, Composition: 330 Ω, 5%, 1/4 W	2	RCR07G331JS	81349	
R10	Same as R7				
R11	Same as R2				
R12	Same as R6				
R13	Resistor, Fixed, Composition: 68 kΩ, 5%, 1/4 W	1	RCR07G683JS	81349	
R14	Same as R3				
R15	Same as R4				
R16	Resistor, Fixed, Composition: 100 Ω, 5%, 1/4 W	3	RCR07G101JS	81349	
R17	Same as R9				
R18	Resistor, Fixed, Composition: 2.7 kΩ, 5%, 1/4 W	2	RCR07G272JS	81349	
R19	Same as R16				
R20	Resistor, Fixed, Composition: 47 Ω, 5%, 1/4 W	3	RCR07G470JS	81349	
R21	Same as R6				
R22	Resistor, Fixed, Composition: 6.2 kΩ, 5%, 1/4 W	1	RCR07G622JS	81349	
R23	Same as R18				
R24	Resistor, Trimmer, Film: 500 Ω, 10%, 1/2 W	2	62PR500	73138	
R25	Same as R24				
R26	Same as R20				
R27	Resistor, Fixed, Composition: 1.2 kΩ, 5%, 1/4 W	1	RCR07G122JS	81349	
R28	Resistor, Trimmer, Film: 20 kΩ, 10%, 1/2 W	1	62PR20K	73138	
R29	Resistor, Fixed, Composition: 1.0 MΩ, 5%, 1/4 W	2	RCR07G105JS	81349	
R30	Resistor, Fixed, Composition: 2.7 Ω, 5%, 1/4 W	3	RCR07G2R7JS	81349	
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				

REF DESIG PREFIX A2A1A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R40	Same as R6				
R41	Same as R5				
R42	Same as R5				
R43	Same as R30				
R44	Same as R5				
R45	Same as R33				
R46	Resistor, Fixed, Composition: 680 Ω, 5%, 1/4 W	1	RCR07G681JS	81349	
R47	Resistor, Trimmer, Film: 1 kΩ, 10%, 1/2 W	1	62PR1K	73138	
R48	Same as R4				
U1	Integrated Circuit	1	MC1550G	04713	
U2	Integrated Circuit	2	741HC	07263	
U3	Same as U2				

5.4.2 TYPE 824002-1 CONTROL BOARD REF DESIG PREFIX A2A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Electrolytic, Tantalum: 1.0 μF, 10%, 35 V	1	CS13BF105K	81349	
C2	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 100 V	6	8131M100-651-104M	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, Composition: 680 Ω, 5%, 1/4 W	1	RCR07G681JS	81349	
R2	Resistor, Fixed, Composition: 2.2 kΩ, 5%, 1/4 W	1	RCR07G222JS	81349	
R3	Resistor, Fixed, Composition: 22 kΩ, 5%, 1/4 W	1	RCR07G223JS	81349	
R4	Resistor, Fixed, Composition: 5.1 kΩ, 5%, 1/4 W	1	RCR07G512JS	81349	
R5	Resistor, Fixed, Composition: 120 Ω, 5%, 1/4 W	1	RCR07G121JS	81349	
R6	Resistor, Trimmer, Film: 1 kΩ, 10%, 1/2 W	2	62PAR1K	73138	
R7	Resistor, Fixed, Composition: 1.0 kΩ, 5%, 1/4 W	2	RCR07G102JS	81349	
R8	Resistor, Fixed, Composition: 47 kΩ, 5%, 1/4 W	5	RCR07G473JS	81349	
R9	Resistor, Trimmer, Film: 100 kΩ, 10%, 1/2 W	2	62PAR100K	73138	
R10	Same as R8				
R11	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	3	RCR07G103JS	81349	
R12	Same as R8				
R13	Same as R9				
R14	Resistor, Fixed, Composition: 47 Ω, 5%, 1/4 W	1	RCR07G470JS	81349	
R15	Resistor, Fixed, Composition: 51 kΩ, 5%, 1/4 W	1	RCR07G513JS	81349	
R16	Resistor, Fixed, Composition: 180 kΩ, 5%, 1/4 W	1	RCR07G184JS	81349	
R17	Resistor, Fixed, Composition: 220 kΩ, 5%, 1/4 W	4	RCR07G224JS	81349	
R18	Resistor, Fixed, Composition: 6.8 kΩ, 5%, 1/4 W	2	RCR07G682JS	81349	
R19	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/4 W	3	RCR07G472JS	81349	
R20	Same as R11				
R21	Same as R19				
R22	Same as R17				
R23	Same as R18				

REF DESIG PREFIX A2A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R24	Same as R8				
R25	Resistor, Variable, Film: 50 kΩ, 10%, 1/2 W	1	62PAR50K	73138	
R26	Same as R8				
R27	Same as R6				
R28	Resistor, Fixed, Composition: 220 Ω, 5%, 1/4 W	2	RCR07G221JS	81349	
R29	Resistor, Fixed, Composition: 3.0 MΩ, 5%, 1/4 W	2	RCR07G305JS	81349	
R30	Resistor, Fixed, Composition: 15 kΩ, 5%, 1/4 W	2	RCR07G153JS	81349	
R31	Resistor, Fixed, Composition: 2.0 kΩ, 5%, 1/4 W	1	RCR07G202JS	81349	
R32	Same as R17				
R33	Resistor, Fixed, Composition: 18 kΩ, 5%, 1/4 W	2	RCR07G183JS	81349	
R34	Resistor, Variable, Film: 500 Ω, 10%, 1/2 W	1	62PAR500	73138	
R35	Resistor, Fixed, Composition: 12 kΩ, 5%, 1/4 W	1	RCR07G123JS	81349	
R36	Same as R17				
R37	Same as R33				
R38	Resistor, Fixed, Composition: 1.8 kΩ, 5%, 1/4 W	1	RCR07G182JS	81349	
R39	Same as R30				
R40	Same as R29				
R41	Same as R28				
R42	Same as R7				
R43	Resistor, Fixed, Composition: 47.5 kΩ, 1%, 1/10 W	3	RN55C4752F	81349	
R44	Same as R43				
R45	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/4 W	1	RCR07G104JS	81349	
R46	Same as R43				
R47	Same as R11				
R48	Resistor, Trimmer, Film: 20 kΩ, 10%, 1/2 W	1	62PAR20K	73138	
R49	Resistor, Fixed, Composition: 1.6 kΩ, 5%, 1/4 W	1	RCR07G162JS	81349	
R50	Resistor, Fixed, Composition: 1.0 MΩ, 5%, 1/4 W	2	RCR07G105JS	81349	
R51	Same as R50				
R52	Resistor, Trimmer, Film: 1 MΩ, 10%, 1/2 W	1	62PAR1M	73138	
R53	Same as R19				
R54	Resistor, Variable, Film: 2 kΩ, 10%, 1/2 W	1	62PAR2K	73138	
R55	Resistor, Fixed, Composition: 1.3 kΩ, 5%, 1/4 W	1	RCR07G132JS	81349	
U1	Integrated Circuit	2	741HC	07263	
U2	Same as U1				

5.4.3 TYPE 774007-1 OSCILLATOR ASSEMBLY REF DESIG PREFIX A2A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Sweep Oscillators	1	15799-3	14632	
A2	Reference Marker	1	270521-1	14632	
C1	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	5	C023B101E502M	56289	
C2	Capacitor, Ceramic, Feed-thru: 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, Feed-thru: 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	B-GP1000PFP	91418	
FB1	Ferrite Bead	5	56-590-65-4A	02114	
FB2 Thru FB5	Same as FB1				
J1	Connector, Receptacle	3	10-0104-002	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				

5.4.3.1 Part 15799-3 Sweep Oscillator Assembly REF DESIG PREFIX A2A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
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, ±0.25 pF, 500 V	1	301-000C0H0-689C	72982	
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	8131M100-651-104M	72982	
C11	Same as C1				
C12	Same as C1				
C13	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	1	CM05ED470G03	81349	
C14	Capacitor, Variable, Ceramic: 2-8 pF, 350 V	1	538-011A2-8	72982	
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	BB109-YELLOW	25088	
E1	Terminal, Forked	8	140-1941-02-01	71279	
E2 Thru E8	Same as E1				
L1	Coil	1	20681-180	14632	
L2	Inductor: 4.0 μH, 10%	2	1131-41	14632	
L3	Same as L2				
Q1	Transistor	1	2N2857	80131	
Q2	Transistor	2	2N3478	80131	
Q3	Same as Q2				
R1	Resistor, Fixed, Film: 20 Ω, 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: 619 Ω, 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: 51.1 Ω, 1%, 1/4 W	5	RN60D51R1F	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 Thru R11	Same as R5				
R12	Resistor, Fixed, Film: 15.0 kΩ, 1%, 1/4 W	1	RN60D1502F	81349	

REF DESIG PREFIX A2A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R13	Resistor, Fixed, Film: 100 Ω, 1%, 1/4 W	1	RN60D1000F	81349	
R14	Same as R5				
R15	Same as R1				
R16	Resistor, Fixed, Film: 3.57 kΩ, 1%, 1/10 W	1	RN55C3571F	81349	
T1	Coil	1	21428-62	14632	

5.4.3.2 Part 270521-1 Reference Marker Assembly REF DESIG PREFIX A2A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	2	MPN3401	04713	
CR2	Same as CR1				
R1	Resistor, Fixed, Composition: 51 Ω, 5%, 1/4 W	1	RCR07G510JS	81349	
R2	Resistor, Fixed, Composition: 1 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	
R3	Resistor, Fixed, Composition: 3 kΩ, 5%, 1/4 W	1	RCR07G302JS	81349	
Y1	Crystal, Quartz	1	96402-1	14632	

5.4.4 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
C1	Capacitor, Ceramic, Disc: 0.05 μF, 20%, 100 V	1	C023B101R503M	56289	
E1	Terminal	4	140-1941-02-01	71279	
E2	Same as E1				
E3	Same as E1				
E4	Same as E1				
R1	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/4 W	1	RCR07G104JS	81349	
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	

5.4.5 TYPE 764006-1 DC/DC CONVERTER REF DESIG PREFIX A2A5

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

5.4.6 TYPE 794103-1 SIGNAL MONITOR REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	IF Amplifier	1	724005	14632	
A2	Control Board	1	824002	14632	
A3	Oscillator Assembly	1	774007	14632	
A4	Focus and Intensity Control	1	794099	14632	
A5	DC/DC Converter	1	764006	14632	
C1	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	1	B-GP1000PFP	91418	
P1	Connector, Plug, SMC	2	50-328-3875	98291	
P2	Connector, Plug, SMC	2	50-024-3875	98291	
P3	Same as P1				
P4	Same as P2				
R1	Resistor, Variable, Composition: 5 kΩ, 10%, 1 W Linear	1	70A3N048L502U	01121	
R2	Not Used				
R3	Resistor, Variable, Composition: 10 kΩ, 10%, 1 W Linear	3	70A3N048L103U	01121	
R4	Resistor, Fixed, Composition: 2.4 kΩ, 5%, 1/4 W	1	RCR07G242JS	81349	
R5	Resistor, Fixed, Composition: 2.2 kΩ, 5%, 1/4 W	2	RCR07G222JS	81349	
R6	Resistor, Fixed, Film: 2.94 kΩ, 1%, 1/4 W	1	RN60D2941F	81349	
R7	Same as R5				
R8	Same as R3				
R9	Resistor, Fixed, Composition: 82 kΩ, 5%, 1/4 W	1	RCR07G823JS	81349	
R10	Same as R3				
RT1	Thermistor 1 kΩ at 25°C	1	2D102	04239	
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	1N752A	80131	
W1	Cable Assembly	1	17300-191-1	14632	
W2	Cable Assembly	1	17300-191-2	14632	
XY1A	Socket, Crystal	1	9859-2	00629	
XY1B	Connector, Plug	1	463-99-99-097	71785	

SECTION VI

SCHEMATICS

The following pages contain the Signal Monitor schematic diagrams. A numerical list by figure number follows:

Figure No.	Diagram No.	Title
6-1	470156	Type 724005-1, IF Amplifier Assembly, (A2A1)
6-2	42917	Part 18106-2, Input Amplifier, (A2A1A1)
6-3	34168	Part 18107-1, 8.0 kHz IF Amplifier, (A2A1A2)
6-4	51097	Part 15801-3, Output Amplifier, (A2A1A3)
6-5	470227	Type 824002-1, Control Board, (A2A2)
6-6	370315	Type 774007-1, Oscillator, (A2A3)
6-7	32369	part 15799-3, Sweep Oscillator, (A2A3A1)
6-8	270343	Type 794099-1, Focus and Intensity Control, (A2A4)
6-9	32874	Type 764006-1, DC-DC Converter, (A2A5)
6-10	470212	Type 794103-1, Signal Monitor Assembly, (AZ)

NOTE:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN pF.
2. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

HIGHEST REF DESIG	REF DESIG NOT USED
A3 J3 C20 L3 E3 FB4 R8	

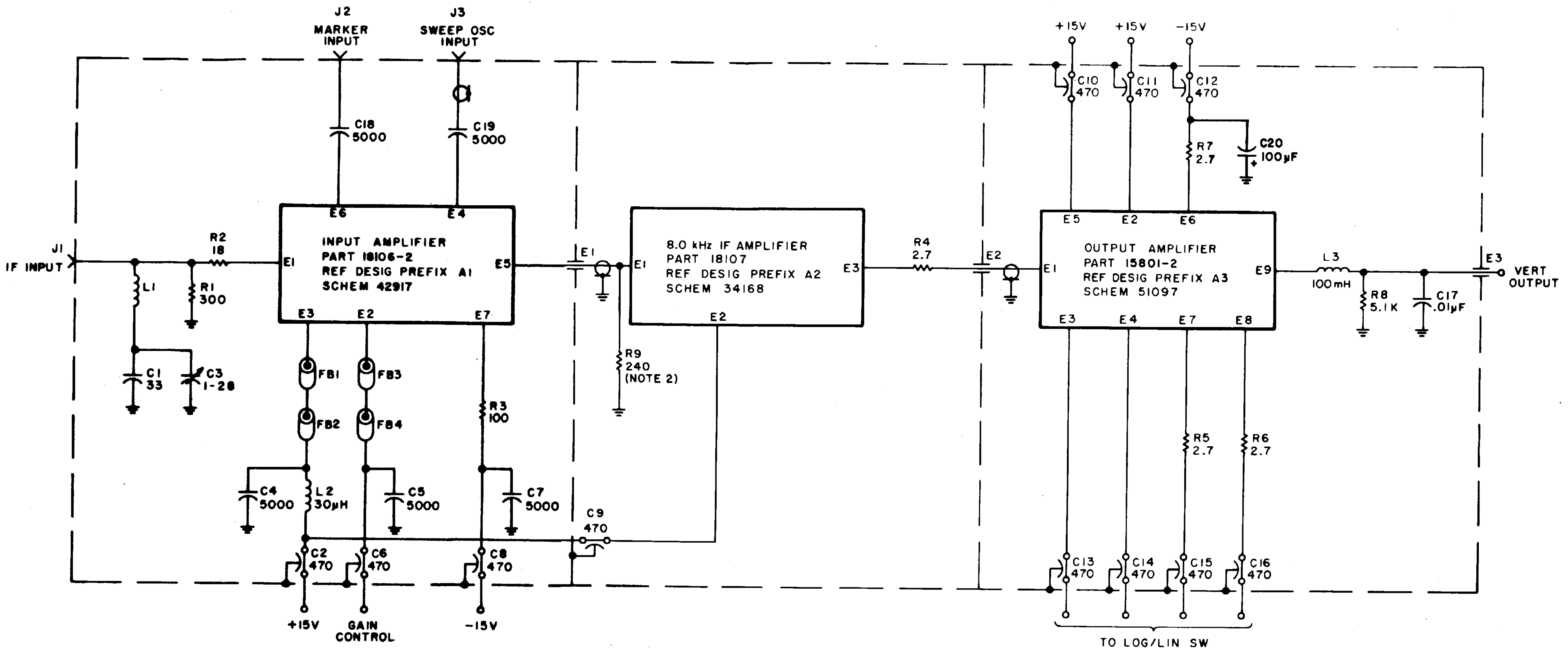


Figure 6-1. Type 724005-1, IF Amplifier Assembly, (A2A1) Schematic Diagram 470156

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ± 5%, 1/4W.
   b) CAPACITANCE IS pF
2. DIFFERENCE BETWEEN TYPES IS LISTED IN TABLE A.

TABLE A

TYPE NO	C2	C15	R24
18106-1	160	6.0	1.8K
18106-2	180	22	2.2K

HIGHEST REF DESIG USED	REF DESIG NOT USED
C21	
R24	R9
L5	
CR3	
U1	
Q4	
T2	

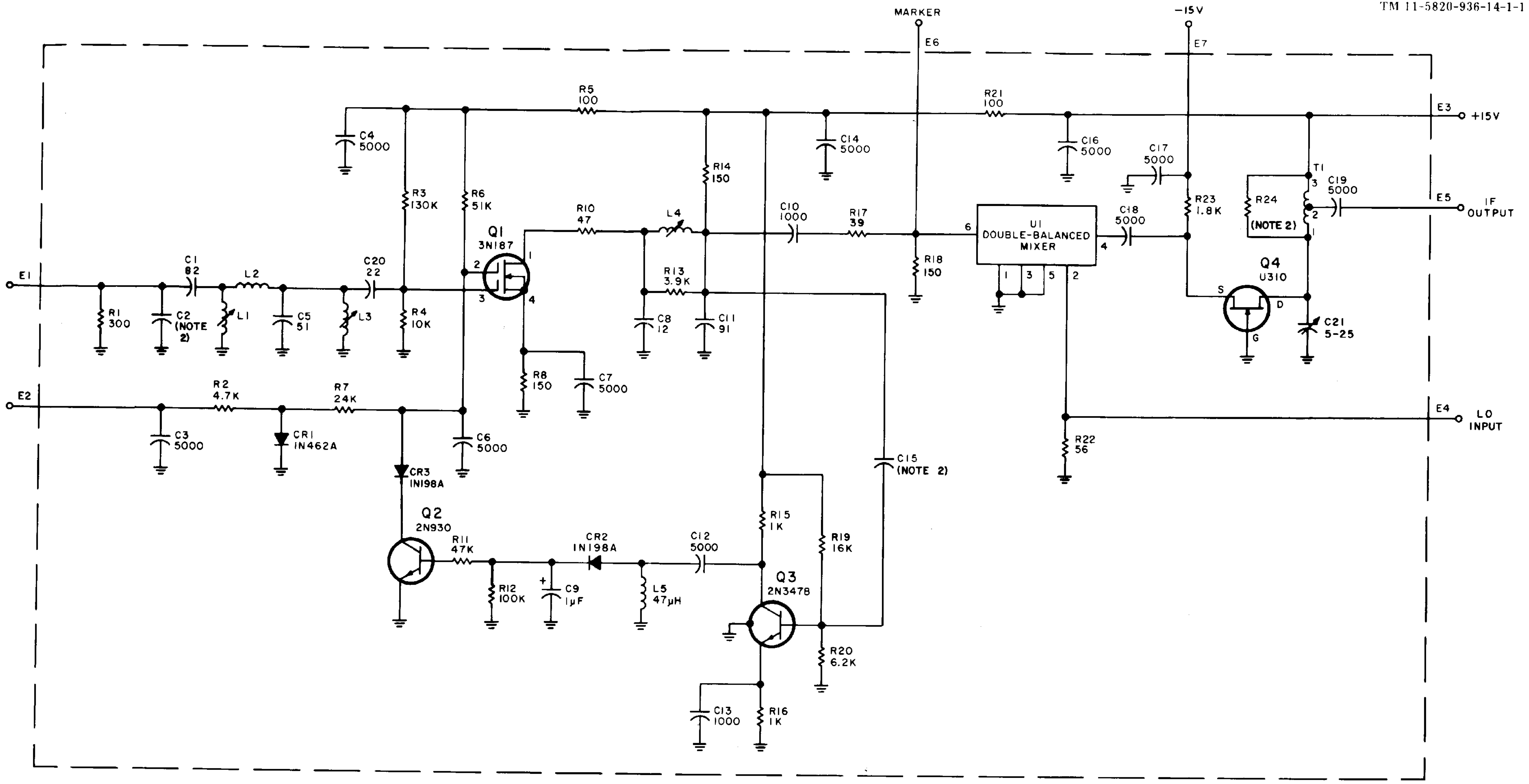
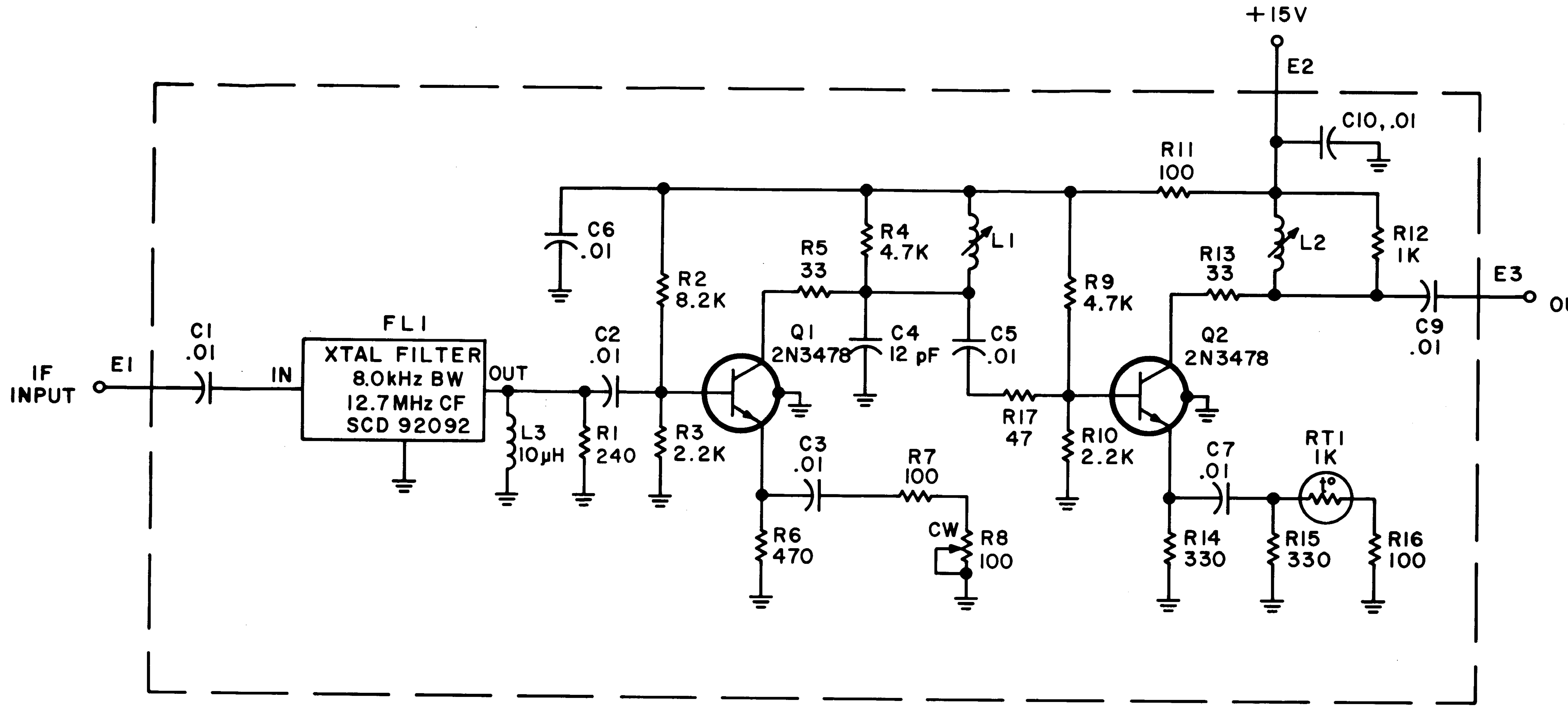


Figure 6-2. Part 18106-2, Input Amplifier, (A2A1A1) Schematic Diagram 42917



NOTE:

UNLESS OTHERWISE SPECIFIED:
RESISTANCE IS IN OHMS, ±5%, 1/4 W;
CAPACITANCE IS IN μF.

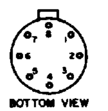
Figure 6-3. Part 18107-1, 8.0 kHz IF Amplifier, (A2A1A2) Schematic Diagram 34168

NOTES:

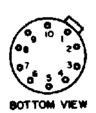
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS pF.
2. CW ON POTENTIOMETERS INDICATES FULL CLOCKWISE POSITION OF ACTUATOR.
3. LEAD ARRANGEMENT FOR U2 & U3 IS SHOWN IN DETAIL A.
4. LEAD ARRANGEMENT FOR U1 IS SHOWN IN DETAIL B.
5. DIFFERENCE BETWEEN -2, -3 AND -4 IS LISTED IN TABULATION

PART NO.	C1	C16	C19	C26	R1	R46	R47	R48
15801-2	27µF	27µF	27µF	27µF	NU	680	1K	4.7K
15801-3	22µF	22µF	22µF	22µF	NU	680	1K	4.7K
15801-4	27µF	27µF	27µF	27µF	1.2K	560	5K	220

DETAIL A



DETAIL B



HIGHEST REF DESIG	REF DESIG NOT USED
C28	
CR9	
E9	
L2	
Q2	
R48	R1
U3	

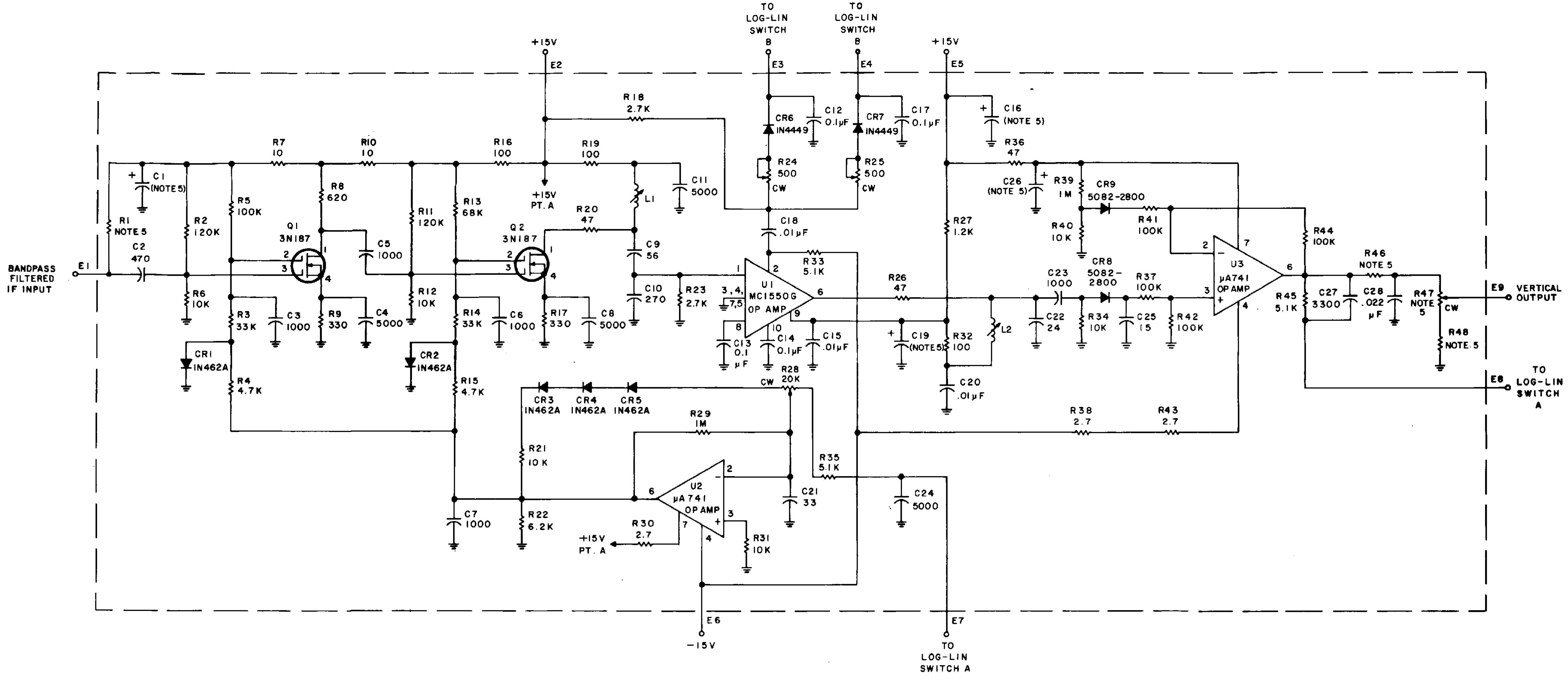


Figure 6-4. Part 15801-3, Output Amplifier, (A2A1A3) Schematic Diagram 51097

NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTANCE IS IN OHMS, ±5%, 1/4 W.
2. U1, U2 LEAD ARRANGEMENT IS SHOWN IN DETAIL A.
3. CW AT POTENTIOMETERS INDICATES FULL CLOCKWISE POSITION OF ACTUATOR.
4. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

HIGHEST REF DESIG	REF DESIG NOT USED
C7 CR4 E18 Q10 R53 U2	

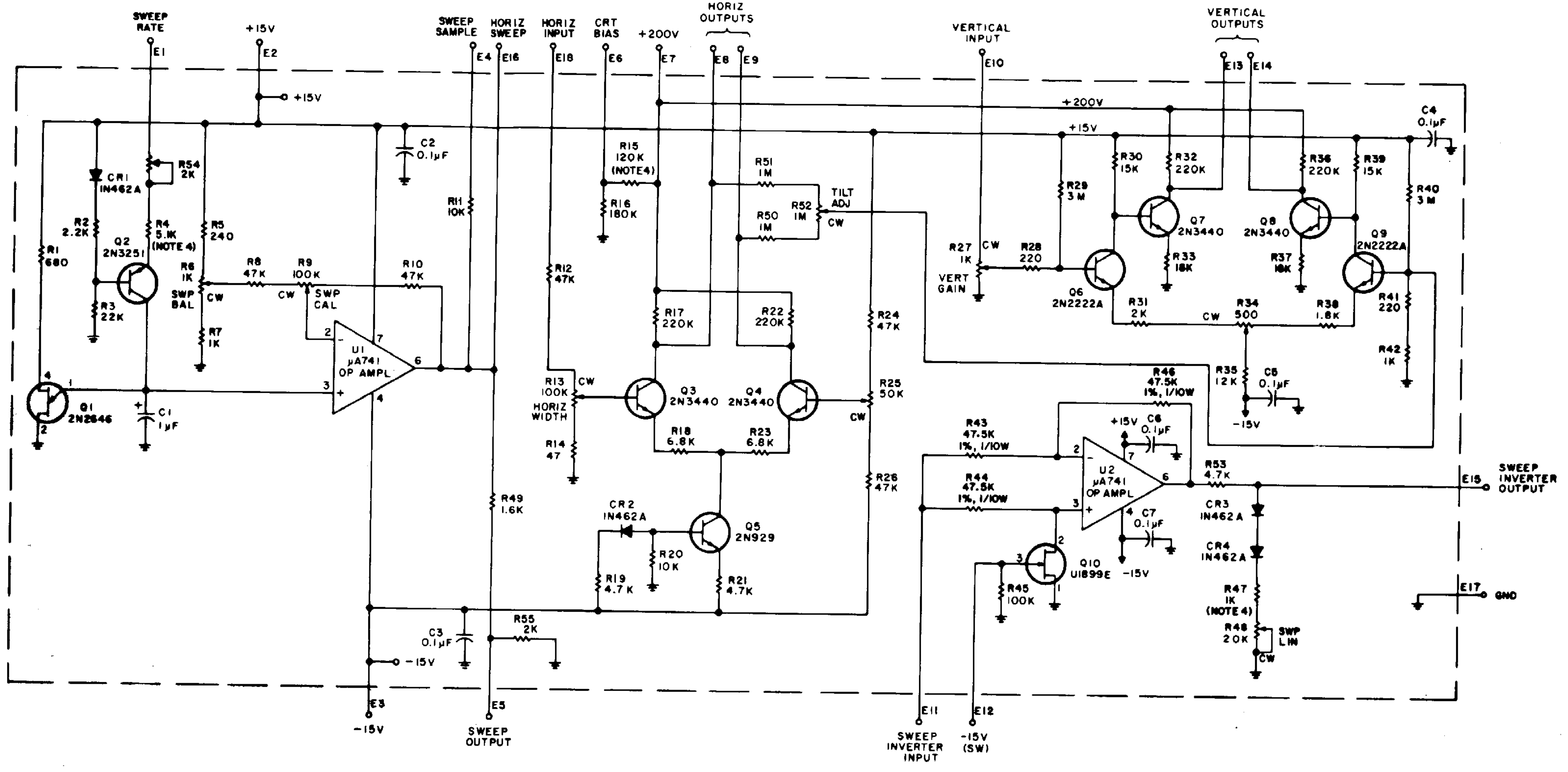


Figure 6-5. Type 824002-1, Control Board, (A2A2) Schematic Diagram 470227

NOTE:
UNLESS OTHERWISE SPECIFIED:

a) CAPACITANCE IS IN pF.
b) INDUCTANCE IS IN μH.
c) RESISTANCE IS IN OHMS ±5%, 1/4W.

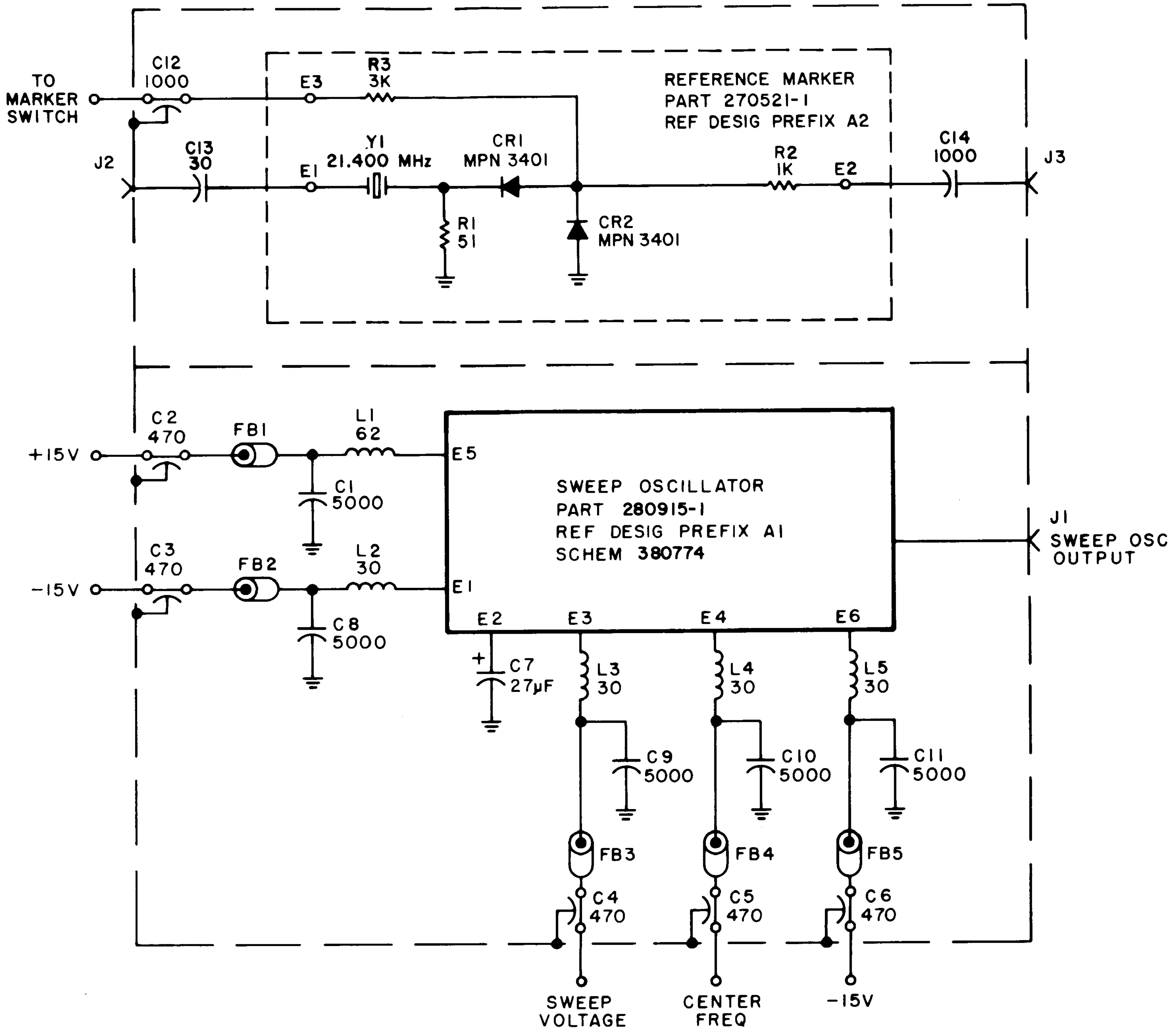


Figure 6-6. Type 774007-1, Oscillator, (A2A3) Schematic Diagram 370315

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±1%, 1/4W.
   b) CAPACITANCE IS MEASURED IN pF.
2. DIFFERENCE BETWEEN DASH NUMBERS IS GIVEN IN TABULATION

TYPE NO	C16	R2	R4	R7	R12	R16	C7
15799-1	2.5-11pF	5.11K	56.2K	10K	18.2K	4.12K	27
15799-2	2.5-11pF	4.22K	47.5K	8.45K	15K	3.57K	27
15799-3	5.5-18pF	4.22K	47.5K	8.45K	15K	3.57K	30
15799-4	5.5-18pF	4.22K	47.5K	8.45K	15K	3.57K	30pF

TYPE NO	Q1	E1	E5	E6	CR1
15799-1	2N2857	-18V	+18V	-18V	BB109
15799-2	2N2857	-15V	+15V	-15V	BB109
15799-3	2N2857/JAN	-15V	+15V	-15V	BB109
15799-4	2N2857JAN	-15V	+15V	-15V	KV3901

HIGHEST REF DESIG	REF DESIG NOT USED
C19 CR1 E6 L3 Q3 R16 T1	

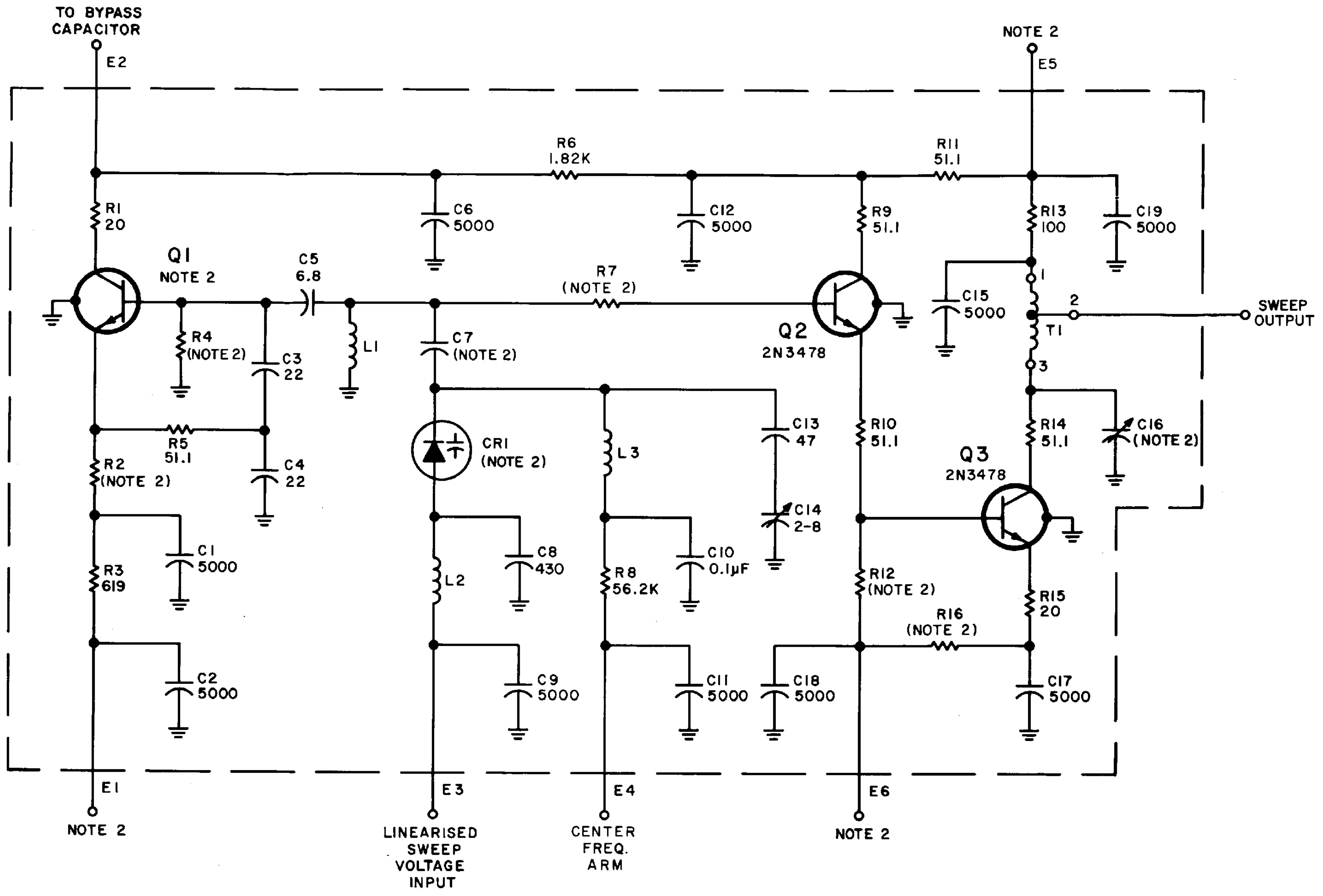


Figure 6-7. Part 15799-3 Sweep Oscillator Assembly, (A2A3A1) Schematic Diagram 32369

NOTES:
1. UNLESS OTHERWISE SPECIFIED, RESISTANCE IS IN OHMS, ±5%, 1/4W.
2. CW AT POTENTIOMETERS INDICATES FULL CLOCKWISE POSITION OF ACTUATOR.
3. ▭ INDICATES FRONT PANEL CONTROL.

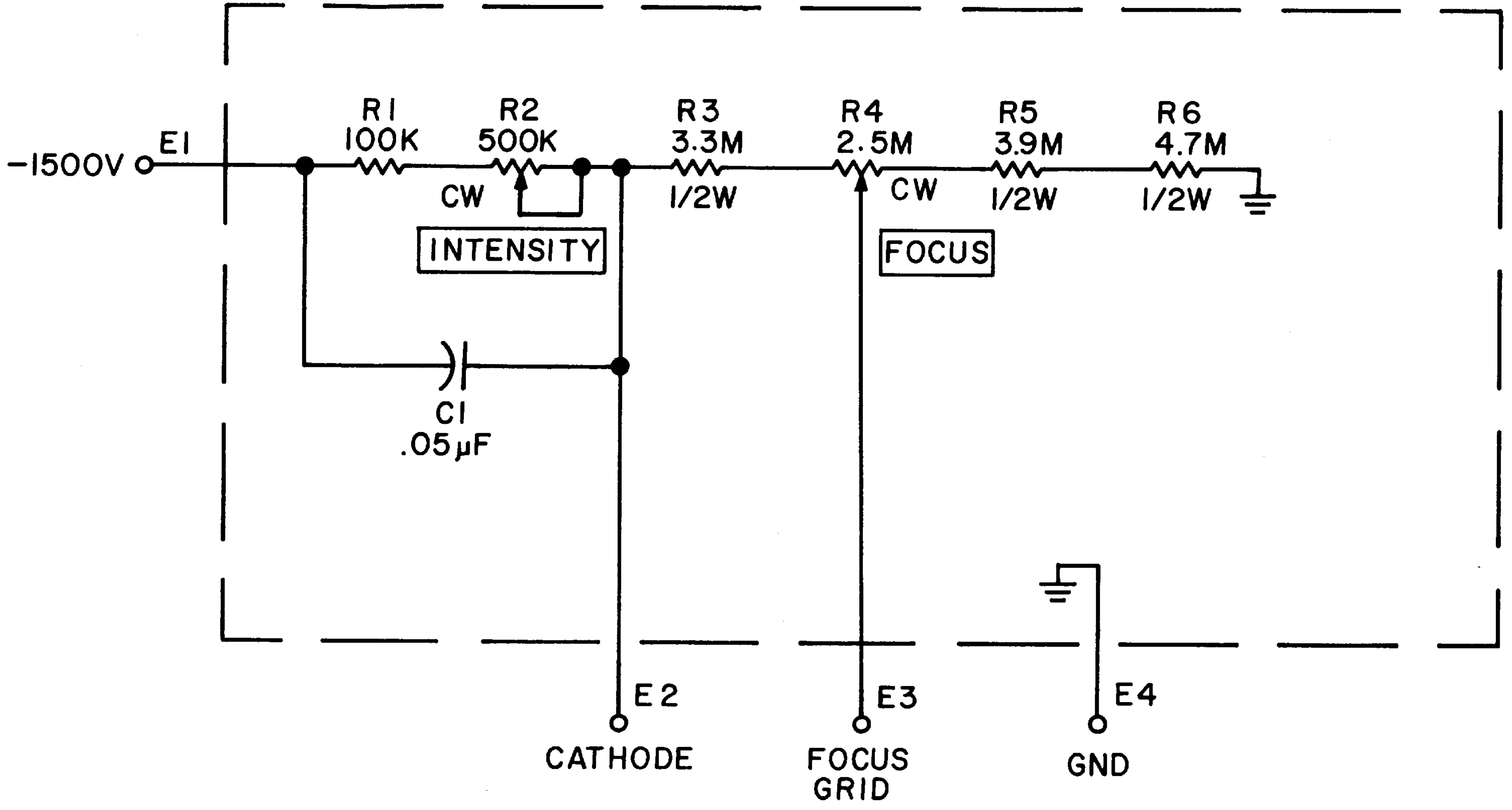


Figure 6-8. Type 794099-1, Focus and Intensity Control, (A2A4) Schematic Diagram 270343

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   (a) RESISTANCE IS IN OHMS, 1/4W, 5%.
   (b) CAPACITANCE IS IN µF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS

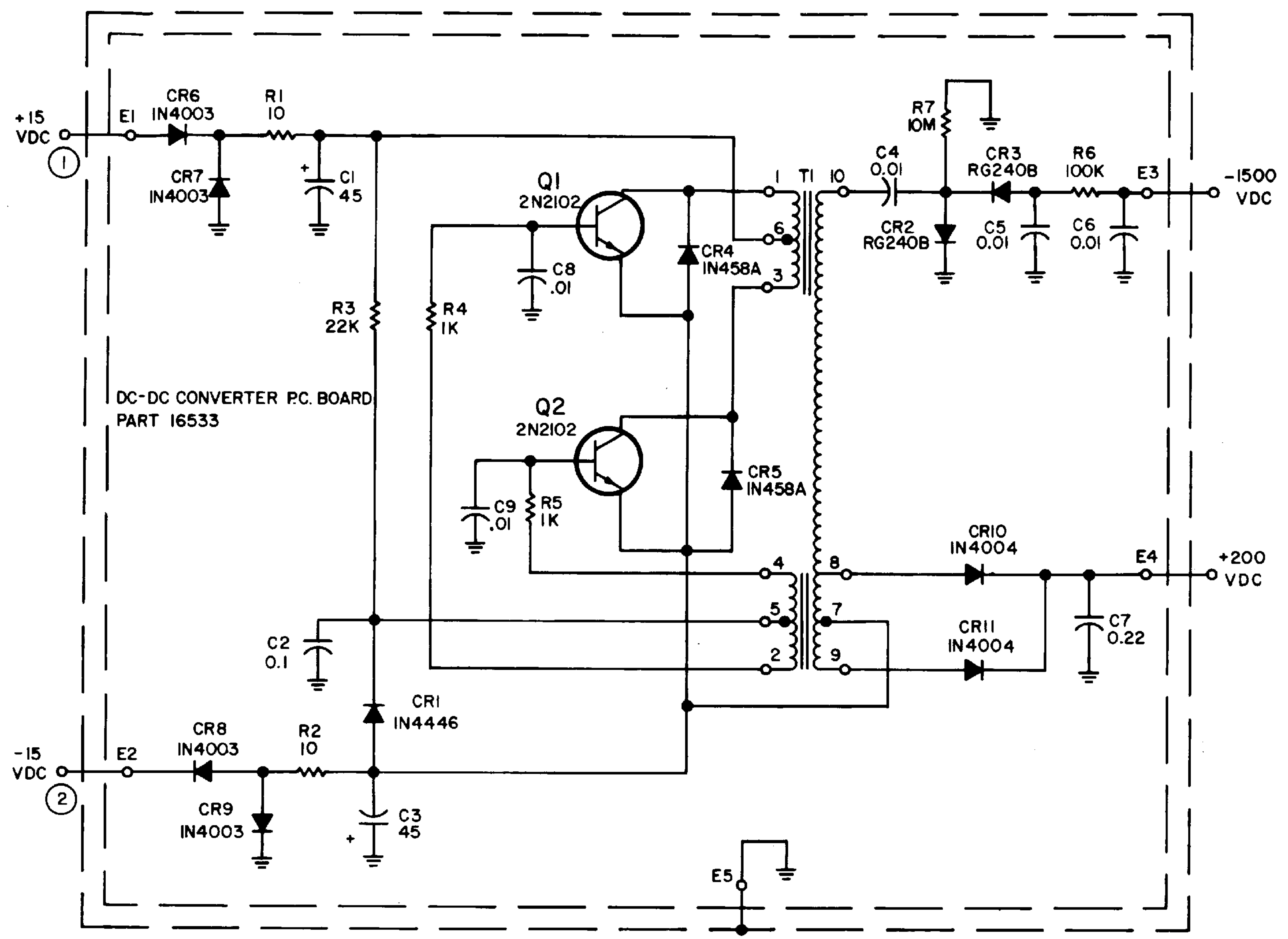


Figure 6-9. Type 764006-1, DC-DC Converter, (A2A5) Schematic Diagram 32874

NOTE: UNLESS OTHERWISE SPECIFIED,
RESISTANCE IS IN OHMS, ±5%, 1/4W.

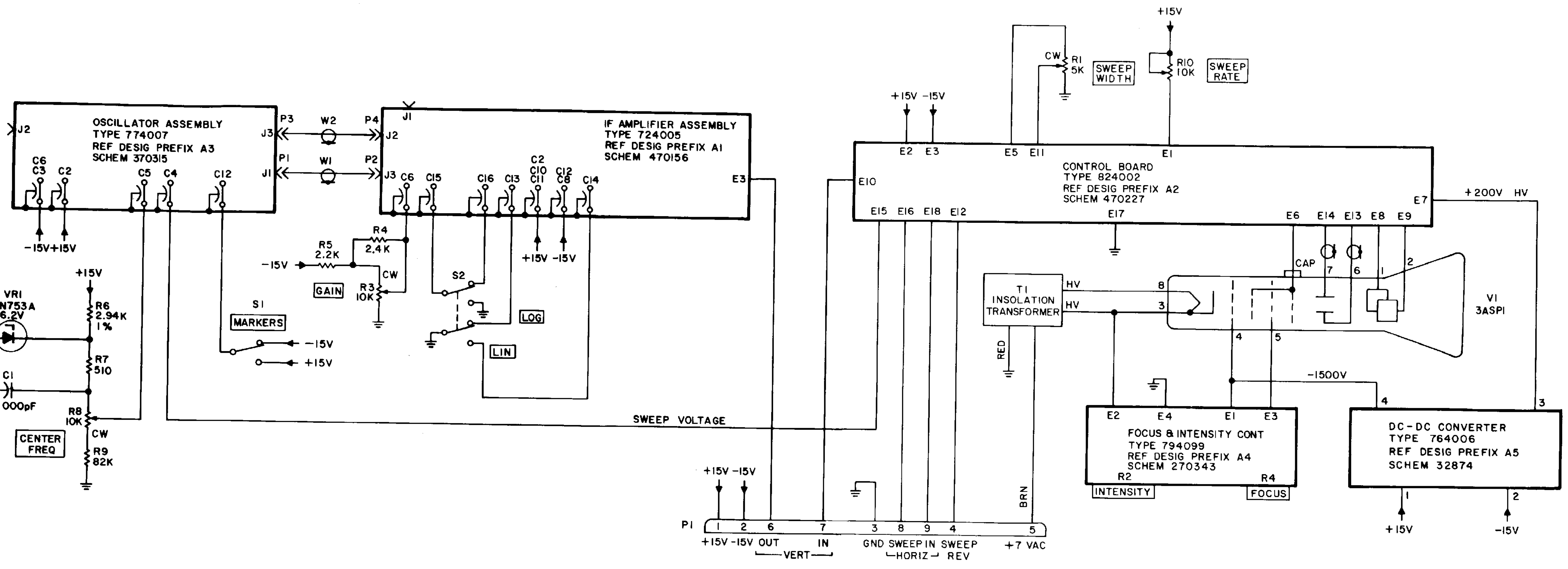


Figure 6-10. Type 794103-1, Signal Monitor Assembly, (A2) (Option A-SM)
Schematic Diagram 470212

APPENDIX A

REFERENCES

SECTION I. INTRODUCTION

A-1. SCOPE

This appendix lists all the forms, field manuals, technical manuals, and miscellaneous publications that apply to the Signal Monitor. Only those publications available to, and required by operators and organizational maintenance personnel are listed.

A-2. FORMS

Discrepancy in Shipment Report	SF 361
Quality Deficiency Report	SF 368
Recommended Changes to Equipment Technical Manuals	DA Form 2028-2
Report of Discrepancy	SF 364

A-3. FIELD MANUALS

First Aid for Soldiers l	FM 21-11

A-4. TECHNICAL MANUALS

Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (CECOM)	TM 750-244-2
Operator, Organizational, Direct Support and General Support Maintenance Manual, Receiver, Radio R-2311/G	TM 11-5820-936-14-1
Operator, Organizational, Direct Support and General Support Maintenance Manual, Direction Finder, Indicator ID-2380/G	TM 11-5820-936-14-2
Operator, Organizational, Direct Support and General Support Maintenance Manual, Indicator Unit ID-2381/G	TM 11-58290936-14-3

A-4. TECHNICAL MANUALS-Continued

Operator, Organizational, Direct Support and General Support Maintenance Manual, Intercommunication Units, LS-672/G and LS-673/G	TM 11-5820-936-14-4
Operator, Organizational, Direct Support and General Support Maintenance Manual, Antenna AS-3778/G.	TM 11-5820-936-14-5
Receiver Set, RadioAN/TRQ-37	TM 11-5820-938-12

A-5. MISCELLANEOUS PUBLICATIONS

The Army Maintenance Management System (TAMMS)	DAPam 738-750
Consolidated Index of Army Publications and Blank Forms	DAPam25-30
Safety Precautions for Maintenance of Electrical/ElectronicEquipment	TB 385-4
Report of Packaging and Handling Deficiencies	AR 735-11-2
Reporting of Transportation Discrepancies in Shipment	AR 55-38
Painting and Preservation Supplies for Field Use for Electronics Command Equipment	SB1l-573
Safety Measures To Be Observed When Installing and Using Whip Antennas Field-Type Masts, Towers and Antennas that are Used With Communications, Radar and Direction Finder Equipment	TB 43-0129

APPENDIX B

MAINTENANCE ALLOCATION CHART

NOTE

The Signal Monitor is an assembly of the Receiver, Radio R-2311/G. The Maintenance Allocation Chart covering maintenance actions on the Signal Monitor is located in TM 11-5820-936-14-1 Operator, Organizational, Direct Support, and General Support Maintenance Technical Manual.

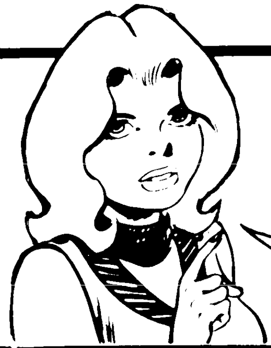
APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

NOTE

The Signal Monitor is an assembly of the Receiver, Radio R-2311/G. The Basic Issue Items List covering the basic issue items for the receiver to help you inventory items required for safe and efficient operation on the Signal Monitor is located in TM 11-5820-936-14-1, Operator, Organizational, Direct Support, and General Support Maintenance Technical Manual.

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
Commander
Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703-5007

DATE SENT
10 July 1975

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PRC-76

BE EXACT PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°. REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		FO3		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
SSG I. M. DeSpiritof 999-1776

SIGN HERE
SSG I. M. DeSpiritof

TEAR ALONG PERFORATED LINE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

TEAR ALONG PERFORATED LINE

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD 314

U.S. MAIL

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

SAMPLE

Commander
US Army Communications-Electronics Command
and Fort Monmouth
ATTN: AMSEL-ME-MP
Fort Monmouth, New Jersey 07703-5000

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS	
DATE SENT	

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5820-936-14-1-1	1 March 1988	Signal Monitor Part of Receiver, Radio R-2311/G

BE EXACT PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.	

PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

TEAR ALONG PERFORATED LINE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPE OF THIS

REVERSE OF DA FORM 2028-2

TEAR ALONG PERFORATED LINE

FILL IN YOUR
UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD 314

U.S.MAIL

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

Commander
US Army Communications-Electronics Command
and Fort Monmouth
ATTN: AMSEL-ME-MP
Fort Monmouth, New Jersey 07703-5000

PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER

SIGN HERE

DA FORM JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPE OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

LINE

TEAR ALONG PERFORATED LINE

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD 314

U.S. MAIL

Commander
US Army Communications-Electronics Command
and Fort Monmouth
ATTN: AMSEL-ME-MP
Fort Monmouth, New Jersey 07703-5000

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

R.L. DILWORTH
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-51 literature requirements for AN/TRQ-37.

PIN: 059439-000