INSTRUCTION MANUAL
FOR
TYPES SM-9803A AND SM-9804A
SIGNAL MONITORS

WATKINS-JOHNSON

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WATKINS—JOHNSON COMPANY
700 Quince Orchard Road
Gaithersburg, Maryland 20878
948-7550

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WARNING

This equipment employs voltages which are dangerous and may be fatal if contacted. Extreme caution should be exercised in working with the equipment with any of the protective covers removed.

ADDENDA
SM-9803A and SM-9804A

The following changes should be incorporated into the Instruction Manual for the SM-9803A and SM-9804A Signal Monitors.

1. Section V - Replacement Parts List.

   A. Paragraph 5.4.1; SM-9803A and SM-9804A Main Chassis.

      1) Change S4 from: 11A-1009 to: 11A1211 (Page 5-7).

   B. Paragraph 5.4.2.1; Type 79326 Bandpass Filter.

      1) Change C2 from: 56 pF; Part No. CM05E560J03 to: 62 pF; Part No. CM05ED620J03 (Page 5-9).

   C. Paragraph 5.4.3.1; Part 13991 Crystal Oscillator.

      1) Change C1 and C2 from: 47 pF; Part No. DM10-470J; Vendor Code 84171 to: 51 pF, Part No. CM04ED510J03; Vendor Code 81349 (Page 5-11).

      2) Add R5 as follows: RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W; Qtyl 1; Part No. CB4705; Vendor Code 01121 (Page 5-11).

   D. Paragraph 5.4.4.1; Type 8127 IF Amplifier Board No. 1.

      1) Change C5 from: 39 pF; Part No. CM05E390J03; Qty. 3 to: 24 pF; Part No. CM05ED240J03; Qty. 1. (Page 5-14).

      2) Change C18 from: 47 pF; Part No. CM05E470J03; Qty. 1 to: 39 pF; Part No. CM05ED390J03; Qty. 3. (Page 5-14).

      3) Change C28 and C29 from: Same as C5 (39 pF) to: Same as C18 (39 pF) (Page 5-14).

      4) Change C6 from: Same as C3 (220 pF) to: CAPACITOR, MICA, DIPPED: 160 pF, 5%, 500V; Qty. 3; Part No. CM05FD161J03; Vendor Code 81349 (Page 5-14).

      5) Change C13 and C19 from: Same as C3 (220 pF) to: Same as C6 (160 pF) (Page 5-14).

      6) Delete C32 (Same as C1 (.005 μF)) (Page 5-14).

7) Change L1 from: 3387-01; 71279 to: 31662-01; 14632 (Page 5-16).

8) Change L2, L4 from: 3387-03; 71279 to: 31662-03; 14632 (Page 5-16).

9) Change L3 from: 3387-02; 71279 to: 31662-02; 14632 (Page 5-16).

10) Change L5 and L6 from: Same as L2 (31662-03) to: Same as L3 (31662-02) (Page 5-16).

E. Paragraph 5.4.4.2; Type 8128 IF Amplifier Board No. 2.

1) Change R17 from: 16 kΩ, Part No. CB1635; Qty. 5 to: 1 MΩ; Part No. CM1055; Qty. 1. (Page 5-21).

2) Change R18 from: Same as R17 (16 kΩ) to: RESISTOR, FIXED, COMPOSITION: 16 kΩ, 5%, 1/4W; Qty. 4; Part No. CB1635; Vendor Code 01121 (Page 5-21).

3) Change R24, R25, and R31 from: Same as R17 to: Same as R18 (16 kΩ) (Page 5-21).

4) Change L1 and L2 from: 3387-03; 71279 to: 31662-03; 14632 (Page 5-19).

5) Change L3 through L8 from: 3387-17; 71279 to: 31662-17; 14632 (Page 5-19).

F. Paragraph 5.4.8; Type 8230 Sweep Generator.

1) Change C4 from: Same as C2 (100 μF; Part No. 30D107G025DD2) to: CAPACITOR, ELECTROLYTIC ALUMINUM: 50 μF, -10+75%, 50V; Qty. 1; Part No. 30D506G050DD2; Vendor Code 56289 (Page 5-28).

2) Change R15 from: Same as R8 (2.2 kΩ, Part No. CB2225) to: RESISTOR, FIXED, COMPOSITION: 2.0 kΩ, 5%, 1/4W; Qty. 1; Part No. CB2025; Vendor Code 01121 (Page 5-28).

G. Paragraph 5.4.9; Type 76121A +24 V Regulated Power Supply.

1) Change R6 from: 9,1 kΩ; Part No. CB9125 to: 10 kΩ; Part No. CB1035 (Page 5-30).

2. Section VI - Schematic Diagrams

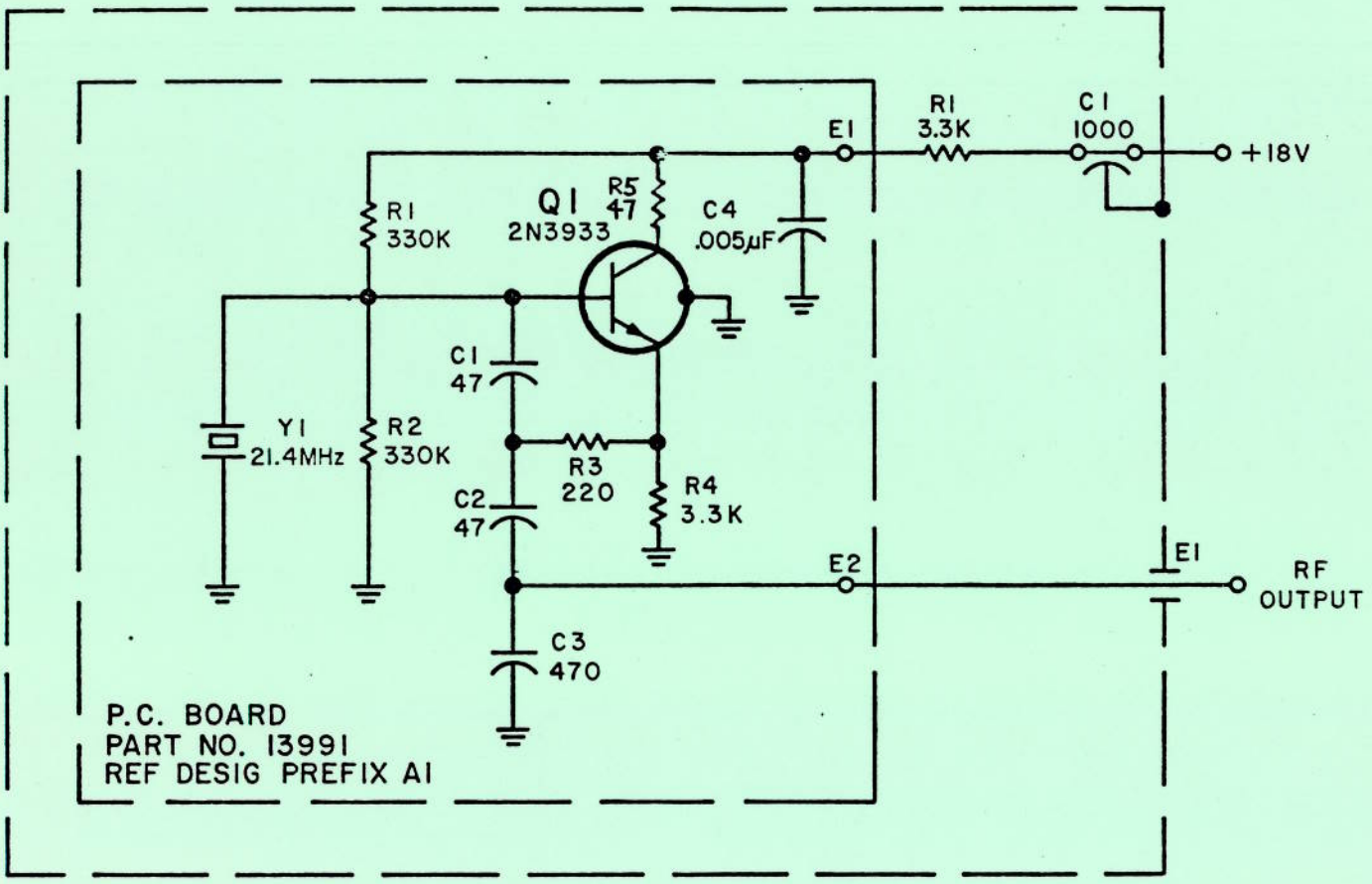
A. Figure 6-1; Type 79313 Bandpass Filter Assembly.

1) Change A1C2 from: 56 pF to: 62 pF.

B. Figure 6-2; Type 8305 Crystal Oscillator Assembly.

1) Change A1C1, A1C2 from: 47 pF to: 51 pF.

2) Add A1R5 as shown below:



C. Figure 6-4; Type 8127 IF Amplifier Board No. 1.

1) Change C5 from: 39 pF to: 24 pF.

2) Change C18 from: 47 pF to: 39 pF.

3) Change C6, C13, C19 from: 220 pF to: 160 pF.

4) Delete C32 (Connected to R38 to ground).

D. Figure 6-5; Type 8128 IF Amplifier Board No. 2.

1) Change R17 from: 16 kΩ to: 1 MΩ.

E. Figure 6-9; Type 8230 Sweep Generator.

1) Change C4 from: 100 μF to: 50 μF.

2) Change R15 from: 2.2 kΩ to: 2.0 kΩ.

F. Figure 6-10; Type 76121A +24 V Regulated Power Supply.

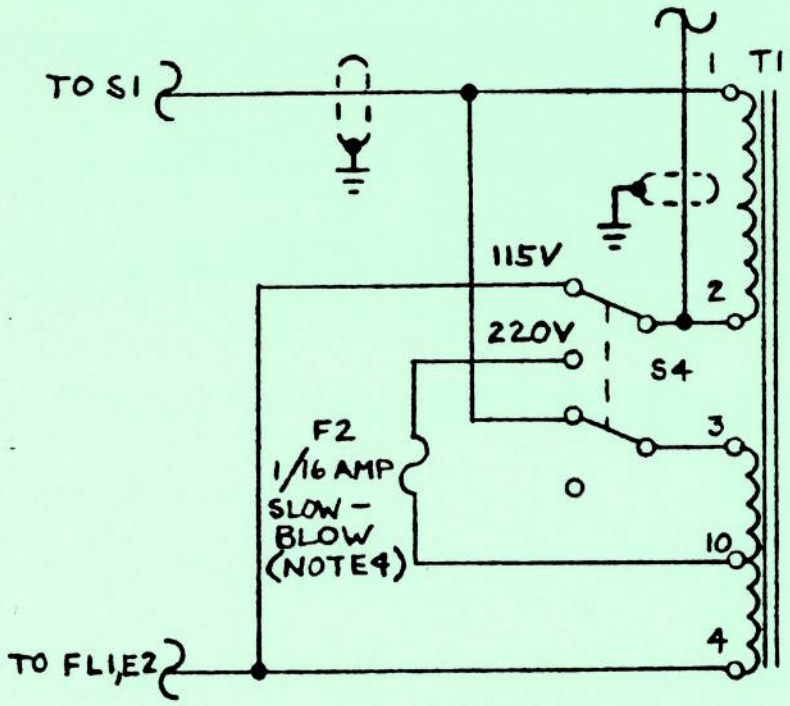
1) Change R6 from: 9.1 kΩ to: 10 kΩ.

G. Figure 6-12; SM-9803A and SM-9804A Main Chassis.

1) At A2, Change C2 to: C1.

2) At FL1, change E1 to: E2 and E2 to: E1.

3) Change T1 configuration as shown below:



4) Change at P1 from: 115/230 V ac to: 115/220 V ac.

5) Add NOTE 4 as follows: Unit shown wired for 115/220 V operation; For 115/230 V operation, disconnect F2 from T1 pin 10 and connect it to T1 pin 3 and change reference at P1 to 115/230 V ac.

25 July 1974
JKB:dwf

3. Section V- Replacement Parts List

A. Paragraph 5.4.6 Part 13488 Focus and Intensity Board (A5)

1) Change R4 from: 2.5 MΩ, 10%, 1/2W; Part No. RV5NAYSD255B; Vendor Code 81349 to: 2.5 MΩ, 20%, 1W; Part No. 70A3N056L255M; Vendor Code 01121. (Page 5-25)

TABLE OF CONTENTS

CONTENTS

LIST OF ILLUSTRATIONS

Table 1-1. Types SM-9803A and SM-9804A Signal Monitors, Specifications

Number of Inputs	One, type BNC: Signal Input
Number of Outputs	Two, type BNC: Aux. Vertical and Horizontal Outputs
Input Impedance	50 ohms
Input Center Frequency	21.4 MHz
Range of Center Frequency Control	±800 kHz
Flatness of Response	8 MHz ±2 dB
Sweep Width	0-8 MHz, continuously adjustable
Sweep Linearity	Linear over-all to within 5% of the total sweep width
Sweep Rate	5 Hz to 25 Hz, nominal, continuously variable
Resolution	Using approximately 100-kHz sweep width, two signals 20-kHz apart will be displayed with at least a 6-dB valley between the peaks
IF Frequencies	13 MHz and 1 MHz
Oscillator Frequencies:	
1st Local Oscillator	34.4 MHz ±1/2 sweep width
2nd Local Oscillator	14.0 MHz
Image Rejection	70 dB, minimum
IF Rejection	55 dB, minimum
Sensitivity	10 μV input at 21.4 MHz produces at least one-inch vertical deflection on the CRT
Gain Control Range	60 dB, minimum
Vertical Display Response	Linear
Marker Frequency	21.4 MHz ±0.01%
CRT Display Type	3ASP1
Front Panel Controls	Center Frequency, Sweep Width, Sweep Rate, Gain, Focus, Intensity, Power On-Off, Marker On-Off
Power Input	115 or 230 volts, 50-400 Hz
Power Consumption	10 watts, approximately
Weight	SM-9803A: 11 lbs., approximately SM-9804A: 10 lbs., approximately
Size	SM-9803A: 3.5-inches high, 19-inches wide, and 15.5-inches deep SM-9804A: 3.25-inches high, 7.9-inches wide, and 15.5-inches deep

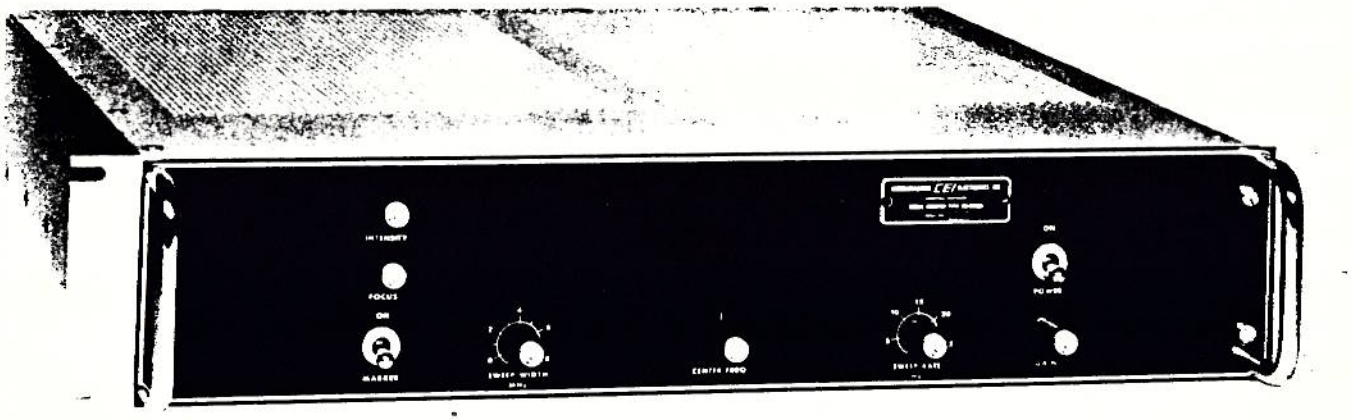


Figure 1-1. Type SM-9803A Signal Monitor, Front View

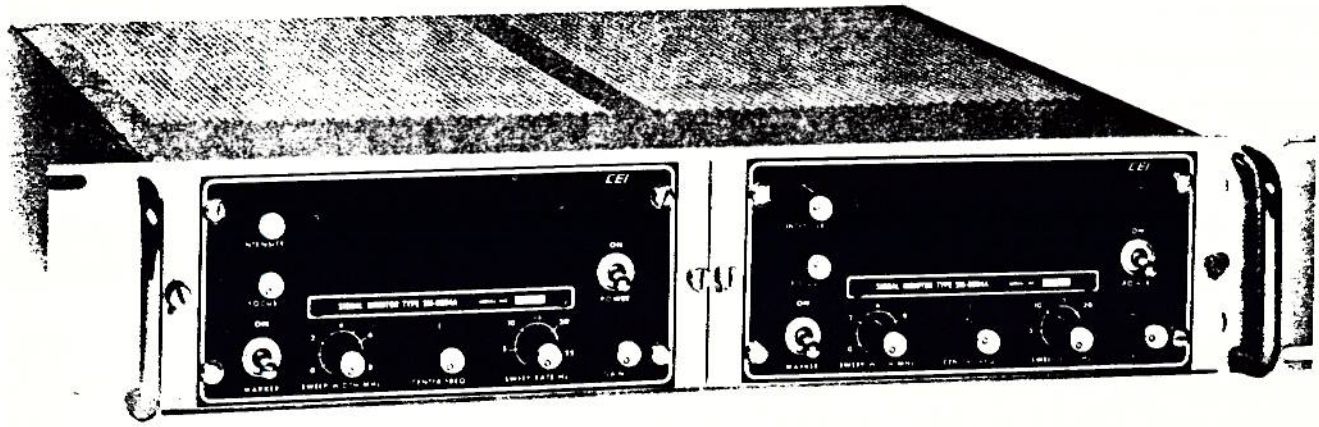


Figure 1-2. Type SM-9804A Signal Monitors Mounted in a Type EF-201A Equipment Frame

SECTION I

GENERAL DESCRIPTION

1.1 GENERAL

This instruction manual has been prepared for the Types SM-9803A and SM-9804A Signal Monitors. These two units are electrically identical, therefore this manual is applicable to either unit from an electrical standpoint. Mechanically, the type SM-9803A is constructed in a 3.5-inch high by 19-inch wide panel (Figure 1-1) while the SM-9804A is constructed as a half-rack slide-in unit which mounts in an equipment frame such as the CEI Type EF-201A.

1.2 ELECTRICAL CHARACTERISTICS

The Type SM-9803A Signal Monitor (or SM-9804A) is used with an appropriate receiver to provide a visual display of the signals present at or near the frequency to which the receiver is tuned. Such a display is an aid in analyzing signals intercepted by the receiver. The signal monitor is designed for use with a receiver or tuner having an IF output frequency of 21.4 MHz. It displays signals within a frequency spectrum continuously adjustable from 0 to 8 MHz, centered at the frequency to which the receiver is tuned. A variable sweep rate control is included which permits the operator to set the sweep rate for the optimum resolution at the sweep width being used and to prevent the loss of sensitivity by sweeping too fast. The sensitivity of the unit is such that a 10-microvolt signal at the input will produce at least a one-inch vertical deflection of the signal trace on the screen of the CRT. The resolution is such that two signals 20 kHz apart appear on the screen as separate traces with at least a 6-dB valley between them. The power supply voltages are regulated to provide stable operation independent of line voltage fluctuations. The signal monitor uses all solid state devices except for the cathode ray tube. The performance specifications are listed in Table 1-1.

1.3 MECHANICAL CHARACTERISTICS

The front panel (see Figure 1-1) mounts all of the controls used during normal operation. Additional controls which require infrequent adjustment are located internally. The front panel controls are: CENTER FREQ, SWEEP RATE, SWEEP WIDTH, GAIN, MARKER, INTENSITY, FOCUS and POWER. A pilot light is included to indicate when power is applied to the unit. Located in the center of the front panel is the CRT screen with a green plexiglass overlay.

1.3.1 Mounted on the rear apron of the chassis (see Figure 5-2) are the 115/230 Vac slide switch, the SWEEP slide switch, fuseholders F1 and F2, and three type BNC connectors: SIGNAL INPUT, J1; VERT OUTPUT, J2; and HORIZ OUTPUT, J3. The power cord is permanently connected through the rear apron.

1.3.2 The front panel, main chassis and dust covers (on the SM-9803A) are constructed of aluminum. The front panel is overlaid with a black-anodized etched plate. The IF amplifier and the bandpass filter subassemblies which mount on the main chassis are constructed of silver-plated brass which has been gold flashed to prevent tarnishing. The IF amplifier contains two plug-in etched circuit boards. Additional modules are constructed on etched circuit boards. Five plug into sockets on the main chassis, while the remaining boards are attached by means of screws.

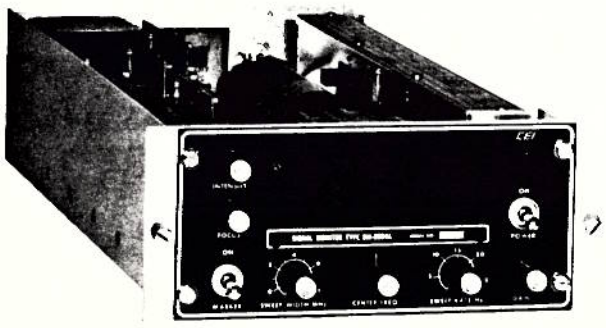


Figure 1-3. Type SM-9804A Signal Monitor, Front View

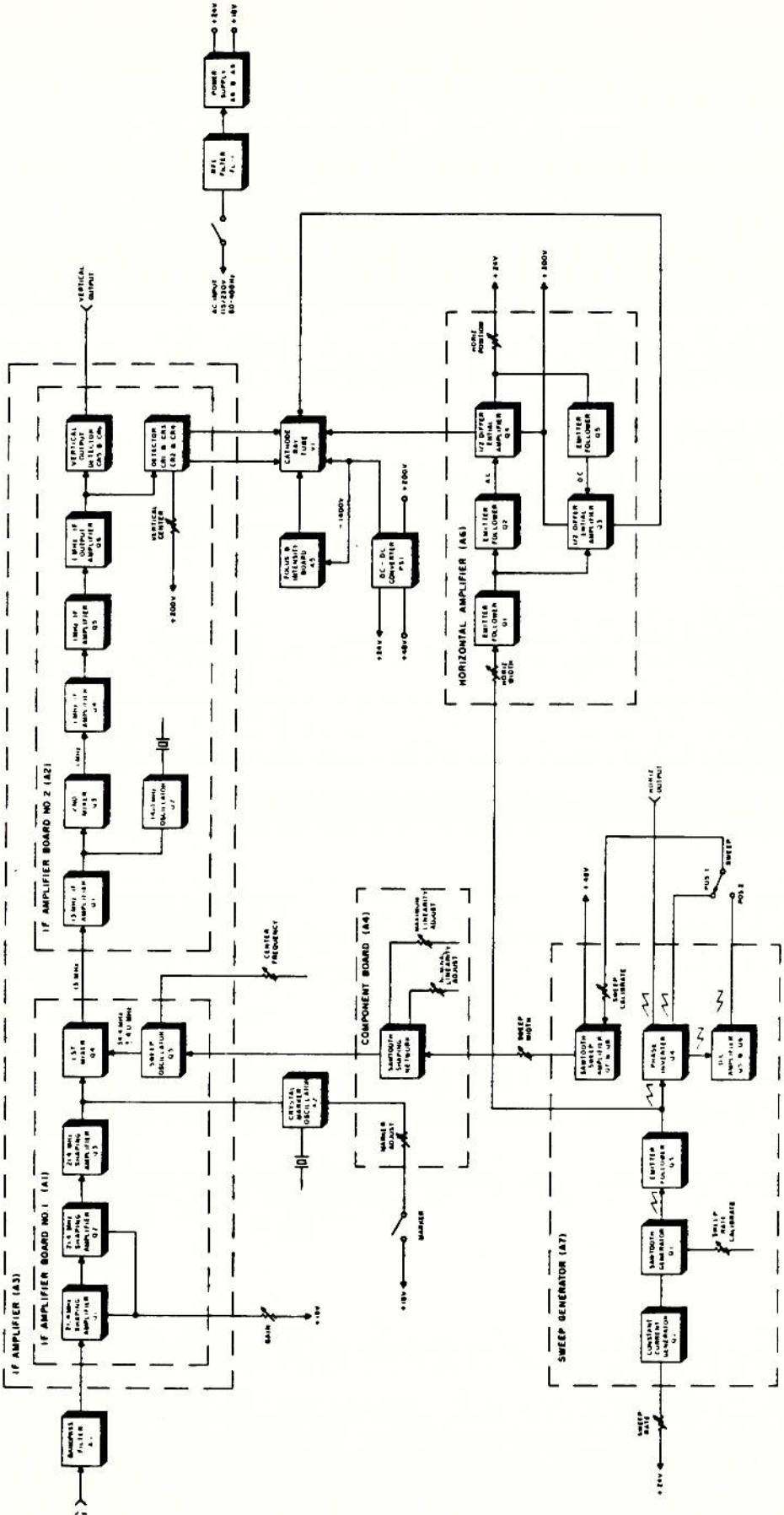


Figure 2-1. Types SM-9803A and SM-9804A Signal Monitors, Functional Block Diagram

SECTION II

CIRCUIT DESCRIPTION

2.1 GENERAL

The operation of the Types SM-9803A and SM-9804A Signal Monitors is explained in the following paragraphs using the block diagram, Figure 2-1, and the schematic diagrams included at the back of this manual. This signal monitor can be used to provide a spectral analysis of the 21.4-MHz mixer output signal from any appropriate receiver or tuner. An incoming signal having a level of 10 microvolts within 4.0 MHz of this frequency will produce full vertical deflection on the CRT screen. The sweepwidth is adjustable so that the spectrum being displayed can be adjusted from 0 to 8 MHz. The sweep rate is also adjustable to provide optimum resolution at the sweepwidth being used.

2.2 FUNCTIONAL DESCRIPTION

2.2.1 The input signal to the signal monitor is coupled through bandpass filter assembly A1. This filter has a flat bandpass of 8 MHz centered on 21.4 MHz. It aids in the rejection of image frequency signals and also reduces feedthru of 13-MHz signals, the signal monitor's first IF.

2.2.2 The signal from the filter is amplified by three shaping amplifiers A3A1Q1, A3A1Q2 and A3A1Q3, and is then applied to the first mixer A3A1Q4. The shaping amplifiers provide frequency response which is essentially flat over a 8-MHz bandwidth centered at 21.4 MHz. Gain of the first two shaping amplifiers is set by the front-panel GAIN control. The signal from the shaping amplifiers is combined with the sweep oscillator signal in mixer A3A1Q4.

2.2.3 The sweep oscillator, A3A1Q5, operates on a center frequency of 34.4 MHz. This signal combines with the 21.4 MHz input to produce a 13-MHz IF at the output of the first mixer A3A1Q4. The tuned circuits following the mixer reject all frequencies except for a narrow band centered on 13 MHz. A sawtooth waveform from sweep generator module A7 is applied to a Varicap frequency modulator in the sweep oscillator circuit. This sawtooth causes the sweep oscillator to vary above and below its center frequency. The SWEEP RATE control determines the rate at which the oscillator is swept across its frequency range. The SWEEP WIDTH control determines the deviation from center frequency. With this control at its maximum sweep width setting, 8 MHz, the sweep oscillator varies ±4.0 MHz about its 34.4-MHz center frequency. This sweep width provides complete coverage of the 8-MHz input band. As the oscillator is swept across this frequency range it hetrodynes with input signals in the first mixer. When an input signal is 13 MHz below the sweep oscillator, an output is produced. For example a signal at the high frequency end of the input band, 25.4 MHz, will beat with the sweep oscillator signal and produce a 13-MHz output when the sweep oscillator is at 38.4 MHz. When the oscillator is at 30.4 MHz, an input signal at 17.4 MHz will produce an output. Since the horizontal movement of the trace on the CRT is controlled by the same sawtooth as the sweep oscillator, the signals out of the first mixer ultimately appear as vertical pips on the face of the tube which correspond to their original position in the input spectrum.

2.2.4 The sawtooth waveform originates in the sweep generator module, A7. The sawtooth generator, A7Q1, produces a waveform which may be set to any frequency between 5 Hz and 25 Hz by the SWEEP RATE potentiometer. This control permits the operator to set the sweep rate for optimum resolution at the sweepwidth being used. It is used to adjust the output voltage of constant current generator A7Q2 which supplies the sawtooth generator A7Q1. The sweep rate calibrate potentiometer sets the center frequency of the range over which the SWEEP RATE control is effective. The sawtooth waveform from A7Q1 is coupled through emitter follower A7Q3 to both the phase inverter, A7Q4, which ultimately drives the sweep oscillator, and to the horizontal amplifier module, A6. The fact that the waveform which controls the horizontal trace and the sweep oscillator is derived from a common source explains how synchronization is obtained between the various signals in the incoming RF spectrum and their position on the CRT trace. Phase inverter A7Q4 provides two outputs which are of the same phase as that of the input sawtooth waveform. One of these outputs is used to provide the HORIZ OUTPUT jack. The second output is applied to Position 1 of the SWEEP switch. A third output from A7Q4, which is 180° out of phase with the sawtooth input, is connected to a dc amplifier consisting of A7Q5 and A7Q6. Position 2 of the SWEEP switch is connected to the output of this dc amplifier. Since there is no phase inversion through the dc amplifier, the sawtooth waveform at Position 2 is 180° out of phase with that at Position 1. This is done so that the left to right trace can always be made to indicate

low to high frequency regardless of the type (high beat or low beat) or number of conversions used in the associated receiver. The signal from the SWEEP switch is fed through the sweep calibrate potentiometer, a second dc amplifier made up of transistors A7Q7 and A7Q8, the SWEEP WIDTH potentiometer, and the sawtooth shaping network to the sweep oscillator, A3A1Q5.

2.2.5 The sawtooth shaping network modifies the sawtooth waveform to compensate for the nonlinear relation between the voltage applied to the Varicap modulator in the sweep oscillator and the output frequency of the sweep oscillator. Shaping is necessary to obtain a linear frequency display on the CRT over the entire 8-MHz bandwidth.

2.2.6 The sawtooth waveform produced by A7Q1 is also used to drive the horizontal deflection plates in the CRT. The horizontal deflection voltage is taken from the output of A7Q3 and is coupled through the horizontal width control and emitter follower A6Q1 to a differential amplifier consisting of A6Q3 and A6Q4. Emitter follower stages A6Q2 and A6Q5 provide ac and dc coupling, respectively, between the two differential stages. The use of a 200V supply and high-voltage transistors A6Q3 and A6Q4 permits direct drive of the horizontal deflection plates in the CRT without a step-up transformer. The horizontal position control permits the entire sweep trace to be moved to the left or right.

2.2.7 The 13-MHz IF signal from the first mixer is fed through IF amplifier A3A2Q1 and applied to the second mixer, A3A2Q3. The output of the crystal-controlled 14-MHz oscillator, A3A2Q2, is also applied to the second mixer. The 1-MHz difference frequency produced by the mixing action is amplified by IF amplifiers A3A2Q4 and A3A2Q5 before being applied to the 1-MHz output amplifier, A3A2Q6. This stage drives push-pull voltage-doubling detectors CR1 through CR4 and the vertical output detectors, CR5 and CR6. The output from the push-pull detectors consists of two equal signals of opposite polarity which are applied to opposing vertical deflection plates of the cathode ray tube. The vertical output detectors provide the signal at the VERTICAL OUTPUT jack.

2.2.8 The gain of the signal monitor is controlled by the front-panel GAIN control which varies the bias on the bases of the first two 21.4-MHz shaping amplifiers. Controlling the gain of these stages sets the amplitude of the signal pips on the screen of the CRT. The vertical center control, which functions in conjunction with the push-pull detector circuit and the 200V positioning voltage, is used to adjust the vertical position of the trace on the CRT. The MARKER switch activates the 21.4-MHz marker oscillator, A2, and results in a pip on the CRT screen which represents the center of the signal monitor response. This aids in receiver tuning and in determining the frequency of incoming signals. The marker adjust potentiometer is used to set the amplitude of the marker pip. The CENTER FREQUENCY control varies the bias level on the Varicap modulator to provide vernier control of the sweep oscillator center frequency.

2.2.9 High voltage for the CRT is provided by dc-to-dc converter PS1. PS1 also provides a 200-volt output which is applied to the collectors of horizontal amplifiers A3Q3 and A3Q4 and to the vertical deflection circuit for use in positioning the trace vertically. A 48V output from PS1 supplies sweep amplifiers A2Q7 and A2Q8. The remaining voltages required for operation of the unit are provided by the power supply module which is designed to operate from 115 or 230 volts, 50-400 Hz.

2.3 BANDPASS FILTER

The schematic diagram for the type 79313 bandpass filter is Figure 6-1; its reference designation prefix is A1. The module contains a three section bandpass filter with a flat bandwidth of 8 MHz centered on 21.4 MHz. It is included to improve the image rejection of the signal monitor and to reduce signal feedthru of the 13-MHz first IF frequency. The filter is tuned by squeezing the turns of the three inductors. This is a factory adjustment which should not require attention in the field.

2.4 IF AMPLIFIER

The schematic diagram for the type 8015 IF amplifier is Figure 6-3; its reference designation prefix is A3. This module contains two plug-in etched circuit subassemblies. The type 8127 board contains three shaping amplifiers, the sweep oscillator and the 1st mixer. Its reference designation prefix is A3A1; the schematic diagram is Figure 6-4. The type 8128 board contains a 13-MHz IF amplifier, a 14-MHz crystal oscillator, two 1-MHz IF stages, a 1-MHz IF output stage, and the vertical detectors. Its reference designation prefix is A3A2; the schematic diagram is Figure 6-5.

2.4.1 21.4-MHz Shaping Amplifiers. - Refer to Figure 6-4. The three shaping amplifiers are stagger tuned about 21.4 MHz. They provide an essentially flat response curve 8-MHz wide. The gain of the signal monitor is controlled by the GAIN control mounted on the front panel. This control varies the bias level at the bases of A1Q1 and A1Q2. The incoming signal is fed through dc-blocking capacitor A1C1 to the base of the first shaping amplifier A1Q1. Resistor A1R1 provides a low impedance termination for the bandpass filter. The collector circuit of A1Q1 is tuned by variable inductor A1L1. The signal voltage at the junction of A1L1 and A1R8 is out of phase with the input. This signal is fed back to the base of A1Q1 by A1C2 to neutralize the stage. Resistor A1R5 is included as a parasitic suppressor. The signal from A1Q1 is taken through an impedance matching voltage divider consisting of A1C5 and A1C6. The second and third shaping amplifiers, A1Q2 and A1Q3, are similar to A1Q1. The collector circuit of Q3 is tuned to 21.4 MHz. Transistor Q1 is tuned to the high side of the center frequency, and Q2 to the low side.

2.4.2 Sweep Oscillator. - Refer to Figure 6-4. The sweep oscillator, A1Q5 is basically a Clapp circuit that has its output frequency swept across a maximum range of 8 MHz. The oscillator center frequency is 34.4 MHz. The frequency is controlled by voltage-variable capacitor (Varicap), A1CR1, whose capacitance varies inversely with the reverse voltage applied across its terminals. Thus, as the voltage across A1CR1 increases, its capacity decreases; a decrease in voltage increases the capacity. The Varicap is connected in series with the oscillator tank circuit and controls the oscillator frequency by varying its tank circuit capacitance. The bias voltage for the Varicap is obtained from the front-panel CENTER FREQ potentiometer, R2, and is approximately 5.5 volts with the control at midrange. This control is used to set the oscillator center frequency to 34.4 MHz. The varying voltage applied to the anode terminal of the Varicap is a modified sawtooth waveform. The sawtooth voltage is obtained from the sweep generator module, A7, and is fed through the SWEEP WIDTH control, R1, and the sawtooth shaping network located on component board A4. This network in effect distorts the linear sawtooth waveform to compensate for the non-linear changes in capacity of the Varicap with respect to the applied voltage. By making the sawtooth voltage change at a nonlinear rate, the sweep oscillator frequency is made to vary at a linear rate. (See paragraph 2.6 for a detailed description of the sawtooth shaping network.) The output of the sweep oscillator is taken at the junction of A1L6 and A1C25 and coupled through A1C24 to the gate of the first mixer, A1Q4.

2.4.3 First Mixer and 13-MHz IF Amplifier. - Refer to Figures 6-4 and 6-5. The first mixer A1Q4 beats the input signal from the shaping amplifiers with the sweep oscillator signal to produce the 13-MHz first IF frequency. The mixer utilizes a type 3N128 MOS field-effect transistor (FET). A FET is used to minimize the generation of spurious signals in the mixing process. The IF signal is applied to the source element and the sweep oscillator signal is applied to the gate. The 13-MHz first IF frequency is taken from the drain and coupled through a double-tuned, under-coupled network to the base of the 13-MHz IF amplifier, A2Q1, located on IF amplifier board No. 2. The output of A2Q1 is coupled through a second double-tuned network to the base of the second mixer, A2Q3. The double-tuned networks provide the required selectivity at this point in the circuit; however, the unit's resolution is determined by the selectivity of the 1-MHz IF amplifier stages.

2.4.4 14-MHz Oscillator. - Refer to Figure 6-5. The 14-MHz oscillator, A2Q2, operates in a crystal-controlled Colpitts configuration. Regenerative emitter-to-base feedback to sustain oscillation is through A2R9 to the junction of A2C6 and A2C7 and back to the base. Resistor A2R9 linearizes the sinusoidal output from the oscillator. The output signal is taken from across crystal A2Y1 and injected by means of A2C5 into the double-tuned circuit which couples 13-MHz IF amplifier A2Q1, and the second mixer, A2Q3.

2.4.5 Second Mixer. - The second mixer, A2Q3, receives both the 13-MHz IF signal and the 14-MHz oscillator signal at its base. These two signals are heterodyned to produce the 1-MHz second IF. The 1-MHz output is coupled through a double-tuned network to the base of the first 1-MHz IF amplifier, A2Q4.

2.4.6 1-MHz IF Amplifiers. - The 1-MHz IF amplifiers, A2Q4 and A2Q5, are narrowband stages providing additional amplification and the selectivity necessary for good resolution. Coupling between these stages is through a double-tuned network. The output from A2Q5 is applied to vertical output amplifier A2Q6.

2.4.7 Output Amplifier and Vertical Detectors.

2.4.7.1 The IF output amplifier, A2Q6, provides drive for the vertical output and vertical deflection circuits. The stage is tuned to 1 MHz by inductor A2L8. A capacitive voltage divider consisting of A2C28 and A2C29 provides coupling to the vertical output circuit, a half-wave voltage doubler. Capacitor A2C28 also serves as a portion of the doubler circuit. Negative-going half cycles of the output from A2Q6 cause A2CR5 to conduct, charging

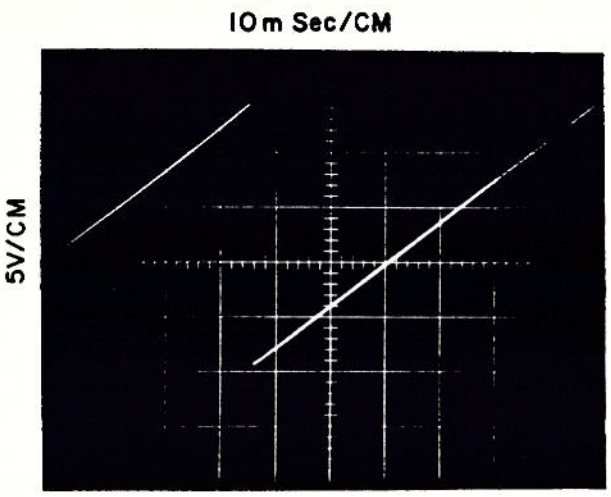


Figure 2-2. Typical Unmodified Sawtooth Waveform

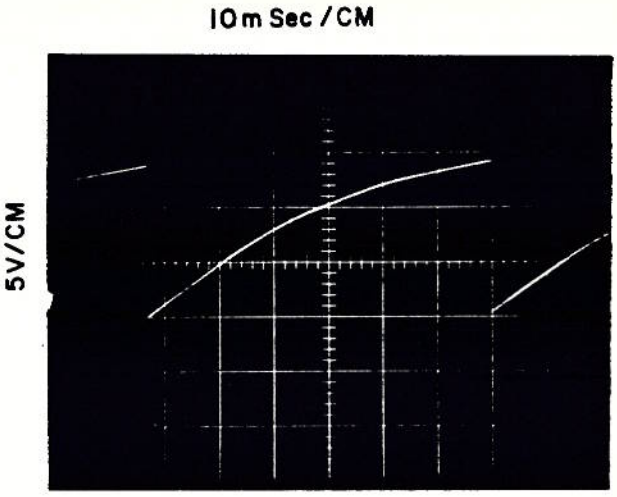


Figure 2-3. Typical Modified Sawtooth Waveform

coupled to both Q2 and Q3. During the positive-going ramp of the sawtooth Q3 conducts harder causing an increase in the voltage developed across load resistor R7, thus reducing the collector voltage. Simultaneously, the sawtooth output from Q2 is fed through R10 to the emitter of Q4. Since the base of this transistor is held at a fixed potential, the positive-going voltage applied to the emitter drives it toward cut off. As a result, the collector voltage swings in the positive direction toward the +200-volt source. Since the CRT horizontal deflection plates are connected directly to the collectors of Q3 and Q4, the electron beam is attracted across the face of the CRT toward the deflection plate connected to Q4. Retrace of the beam occurs on the trailing edge of the sawtooth when the input voltage suddenly drops. The collector voltage of Q3 rises rapidly and that of Q4 drops as Q4 now conducts heavily. The resulting change in potential on the horizontal deflection plates returns the electron beam to the opposite side of the screen. By adjusting R18 the horizontal position of the sweep trace can be changed. This control determines the quiescent current through Q3 and Q4, and thus the no-signal voltage on the deflection plates. Assuming R18 is rotated in the clockwise direction, the voltage on the bases of Q5 and Q4 goes more positive, causing both transistors to conduct harder. This causes the collector voltage of Q4 to decrease and the emitter voltage of Q5 to increase in the positive direction. The voltage increase is fed through R9 to the emitter of Q3 so that the conduction of the transistor decreases, resulting in an increase in collector voltage. The sweep trace will now shift in the direction of the deflection plate attached to Q3. If R18 is rotated in the counterclockwise direction, the effect will be opposite, with the sweep trace shifting in the direction of the deflection plate attached to Q4. Resistors R14, R15, and R16, form a current divider which maintains the emitter-to-base ac impedance of Q4 constant as R18 is varied, thus holding the gain of the transistor constant regardless of the setting of the horizontal position control.

2.8 CRYSTAL MARKER OSCILLATOR

The schematic diagram for the type 8305 crystal marker oscillator is Figure 6-2; its reference designation prefix is A2. The oscillator is constructed on printed circuit board A2A1 which mounts in shielded assembly A2. The oscillator is crystal controlled at 21.4 MHz to provide a reference pip on the CRT trace which indicates the center of the signal monitor's pass band. Marker switch S2, located on the front panel, is used to energize the oscillator. Potentiometer A4R1 sets the amplitude of the marker pip by varying the supply voltage to Q1. Regenerative feedback to sustain oscillation is taken at the emitter and fed to the junction of C1 and C2 through R3 and back to the base. The output is taken at the junction of capacitors C2 and C3.

2.9 POWER SUPPLY

2.9.1 General. - The ac input power required is 115 or 230 Vac, 50-400 Hz. As shown on the main chassis schematic diagram, Figure 6-12, the path for the ac input is from power plug P1, through RFI filter FL-1, line fuse F1, and power switch S1, to the two primary windings of transformer T1. Switch S2, located on the rear apron, places the two primary windings in parallel for 115V operation and in series for 230V operation. Line fuse F2 provides additional overload protection when the latter input power is used. Secondary winding 8-9 of T1 provides filiment

voltage for the CRT. Winding 5-6-7 supplies the ac input power for the +24V regulated power supply. Input for the +18V power supply regulator is taken from the output of the +24V supply.

2.9.2 +24V Regulated Power Supply. - The schematic diagram for the Type 76121 Regulated Power Supply is Figure 6-10; its reference designation prefix is A8. Transistor Q1 functions as a series regulator whose conduction is controlled by current amplifier Q2. Transistors Q3 and Q4 are connected as a differential amplifier which amplifies any difference in the voltage at their bases. The base of Q4 is fixed by Zener diode CR2. The base of Q3 is connected to the regulated output through a sampling circuit made up of R6, R7, and R8. Any fluctuation in the output voltage is amplified and inverted by Q3, and applied to the base of the series regulator through emitter follower Q2. If, for example, the output voltage tends to rise, Q3 conducts heavier, causing the voltage drop across R2 and R3 to increase. This lowers the bias voltage of emitter follower Q2, which is reflected through to series regulator Q1. As a result, the base of Q1 goes more negative, increasing its collector-to-emitter resistance so that the output voltage returns to its nominal value. A differential amplifier is used in the comparison circuit as the base-emitter variations with temperature changes in one transistor tend to cancel the change in the other. In addition, reference diode CR2 can be placed in a base circuit, rather than in the emitter circuit as is the case with a one-stage error amplifier. Thus, much less current is drawn through the diode, resulting in a more stable reference voltage. An emitter follower is necessary to amplify the low-current output of Q3 to provide sufficient current drive for the low-impedance base input of Q1. Resistor R4 connects the base of Q3 to the input side of the regulator so that voltage fluctuations at this point can be sensed and cancelled out.

2.9.3 +18V Power Supply Regulator. - The schematic diagram for the Type 76124 +18V Power Supply Regulator is Figure 6-11; its reference designation prefix is A9. This module functions as a voltage regulator to provide a +18V output from a +24V input. Since the input is from a filtered and regulated source, a simplified version of the regulator in the +24V supply is used.

2.10 CATHODE RAY TUBE

The cathode ray tube is shown on the main chassis schematic diagram, Figure 6-12. The focus and intensity board, part number 13488, is shown in Figure 6-7, its reference designation prefix is A5. The CRT, V1, provides a visual display of the input signal spectrum. The CRT has a rectangular face with a green plexiglass overlay which is inscribed with a horizontal base line, a vertical center marker, and five smaller vertical markers on each side of the center. With the SWEEP WIDTH control fully clockwise, each vertical marker represents 800 kHz of sweep. The -1400 volt output from power supply PS1 is applied to the control grid of the tube and to a voltage divider consisting of resistors A5R1 through A5R6. The voltage divider provides reduced voltage outputs for the various CRT operating elements. The intensity of the light beam on the face of the CRT is adjusted by the INTENSITY control, A5R2, which varies the accelerator voltage applied to the cathode. The FOCUS control, A5R4, is utilized to obtain a sharp waveform on the CRT screen by varying the potential on the focusing element. The FOCUS and INTENSITY controls are front-panel adjustments.

4.5.2 Use of Oscilloscope During Alignment. - The vertical and horizontal amplifier inputs on the oscilloscope should be set in the dc-coupled mode. The dc component of the signal on the vertical input should be cancelled out by applying an equal voltage to the unused vertical differential scope input, since the dc component sometimes makes it impossible to center the signal vertically. Otherwise it will sometimes be necessary to use the ac-coupled mode. A low-capacity shielded cable should be used to connect to the oscilloscope, and the shield should be grounded as closely as possible to the point to which the center conductor is connected. For all sweep alignment procedures the oscilloscope's horizontal sweep is disabled, and the sweep is provided by the sweep generator.

4.5.3 Equipments Required. - The following equipments, or their equivalents, are required to perform the complete signal monitor alignment:

(1) Oscilloscope, Tektronix Type 503

(2) VTVM, RCA Type WV-98C

(3) Signal Generator, Hewlett Packard 606A

(4) Sweep Generator, Telonic Model SM-2000 with Type LH2 plug-in head

(5) Assorted cables, connectors, and alignment tools

4.6 IF AMPLIFIER ALIGNMENT

The IF amplifier alignment is presented in the following paragraphs. Refer to Figures 6-1 through 6-12 as necessary.

4.6.1 Initial Control Settings. - Begin the alignment by adjusting the controls as follows. After the initial preset, do not change position of any control unless instructed to do so.

(1) CENTER FREQ control at midrange

(2) SWEEP WIDTH control fully counterclockwise

(3) SWEEP RATE control fully clockwise

(4) MARKER off

(5) GAIN control fully counterclockwise

(6) INTENSITY control for visible trace

(7) FOCUS control for fine definition of trace

(8) Vertical centering control A3A2R42 for positioning of trace on black base line

4.6.2 1-MHz and 13-MHz IF Alignment. - See Figures 5-10 and 5-11 for locations of test points. Proceed as follows:

(1) Remove cover from IF Amplifier.

(2) Turn on the signal monitor.

(3) Connect the signal generator output to A3A2TP1.

(4) Adjust the signal generator frequency to exactly 1.0 MHz using the generator's internal crystal calibration.

(5) Reducing signal generator output as necessary, adjust A3A2L3, through A3A2L8 for maximum upward deflection of the base line on the CRT.

(6) Connect the signal generator output to A3A1TP2.

(7) Using the internal calibration, adjust the signal generator frequency to exactly 13.0 MHz.

(8) Reducing signal generator output as necessary, adjust A3A1L4, A3A1L5, A3A2L1 and A3A2L2 for maximum upward deflection of the base line on the CRT.

4.6.3 21.4-MHz Shaping Amplifier Alignment. - Proceed as follows:

(1) Set up the equipment as shown in Figure 4-1.

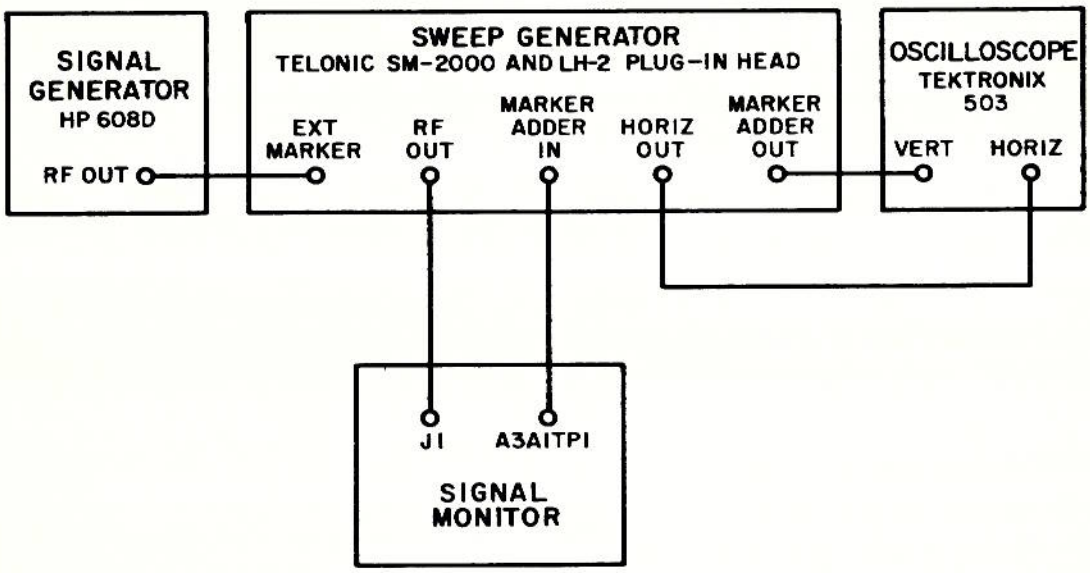


Figure 4-1. Test Equipment Setup, Shaping Amplifier Alignment

(2) Calibrate the signal generator to produce a 21.4-MHz marker.

(3) Set oscilloscope vertical sensitivity to 20 mV per cm and the horizontal sensitivity as required to produce a trace 10-cm wide.

(4) Adjust the GAIN control on the signal monitor fully clockwise.

(5) Adjust the sweep generator output level, sweep width and sweep frequency until a response curve is displayed on the oscilloscope.

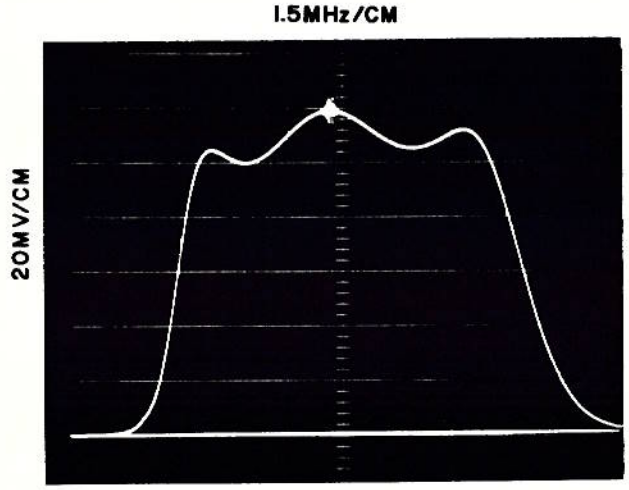


Figure 4-2. Typical Response Curve, Shaping Amplifier Alignment

(6) Adjust A3A1L1, A3A1L2, and A3A1L3 for a response similar to the one shown in Figure 4-2. The marker is at 21.4 MHz. The shaping amplifiers are stagger tuned with A3A1L3 affecting the middle of the response, A3A1L1 affecting the high-frequency side, and A3A1L2 the low-frequency. Use the signal generator to check for a 3-dB bandwidth of 8 MHz at 17.4 MHz and at 25.4 MHz.

4.7 SWEEP OSCILLATOR ALIGNMENT AND CONTROL ADJUSTMENTS

The sweep oscillator and the chassis controls are adjusted and aligned together, since some interaction is present.

4.7.1 Initial Control Settings. - Begin the adjustment by setting the controls as follows:

(1) CENTER FREQ control at midrange

(2) SWEEP WIDTH control fully clockwise

(3) SWEEP RATE control fully clockwise

(4) GAIN control fully clockwise

(5) INTENSITY control for visible trace

(6) FOCUS control for fine definition of trace

(7) Vertical centering control A3A2R42 to position trace coincident with black base line.

(8) Sweep direction switch S3 to position 2

4.7.2 Sweep Oscillator and Marker Alignment. - Proceed as follows:

(1) Connect oscilloscope vertical input to J3, the HORIZ OUTPUT jack.

(2) Adjust sweep rate calibrate potentiometer, A7R1, for a sawtooth period of 50 millisec.

(3) Adjust horizontal width control A6R4 until trace just fills CRT screen.

(4) Place MARKER switch in ON position.

(5) Adjust A3A1L6 to center marker pip on CRT screen.

(6) Turn SWEEP WIDTH control to full counterclockwise position.

(7) Adjust A3A1L6 for maximum upward deflection of the trace. If trace goes off screen, adjust marker amplitude potentiometer, A4R1, until trace is about one-fourth inch from top of screen.

(8) Return SWEEP WIDTH control to full clockwise position. If marker pip is not centered, adjust horizontal position control, A6R18, until it is centered.

NOTE

Do not adjust front-panel CENTER FREQ control or A3A1L6 to center marker pip at this point in the alignment. The horizontal position control must be used.

4.7.3 Linearity Adjustments.

(1) Check to see that controls are in positions given in paragraph 4.7.1.

(2) Connect signal generator to J1; set for 25.4 MHz CW output.

(3) Adjust sweep calibrate control A7R19 to place the 25.4-MHz pip from the signal generator on the fifth vertical graticule from the center on the right-hand side of the screen.

(4) Change signal generator frequency to 18.2 MHz.

(5) Adjust nominal linearity control A4R8, and if necessary, maximum linearity control, A4R10, to place 18.2-MHz pip on the fourth graticule from the center on the left-hand side of the screen.

(6) Decrease signal generator frequency to 17.4 MHz.

(7) Adjust maximum linearity control A4R10 to place the 17.4-MHz pip on the fifth graticule from the center on the left-hand side of the screen.

(8) Return signal generator to 18.2 MHz and recheck linearity at this point. Due to the interaction between A4R8 and A4R10 it may be necessary to repeat steps 4 through 7 several times to achieve optimum linearity at the low-frequency extremes of the sweep oscillator dispersion.

Table 4-1. Typical Tube and Transistor Element Voltages

Ref. Desig.	Type	Emitter	Base	Collector
A2A1Q1	2N3933	4.1	3.4	13.0
A3A1Q1	2N3933	3.0	3.7	14.0
A3A1Q2	2N3933	2.9	3.6	14.1
A3A1Q3	2N3933	3.6	4.3	13.3
A3A1Q4	3N128	2.2 Source	0 Gate	17.6 Drain
A3A1Q5	2N3933	7.6	8.3	17.4
A3A2Q1	2N3933	4.9	5.6	16.3
A3A2Q2	2N3933	2.0	2.7	6.4
A3A2Q3	2N3933	5.0	5.7	16.2
A3A2Q4	2N3933	4.9	5.6	16.3
A3A2Q5	2N3933	4.8	5.5	16.3
A3A2Q6	2N3933	3.2	3.9	22.7
A6Q1	2N2270	7.1	7.6	24.2
A6Q2	2N2270	6.6	7.1	24.2
A6Q3	2N3440	6.6	7.1	112
A6Q4	2N3440	6.5	7.0	109
A6Q5	2N2270	7.0	7.6	24.2
A7Q1	2N2646	8.8	0 Base 1	20.9 Base 2
A7Q2	2N4037	20.6	19.9	8.8
A7Q3	2N2270	8.2	8.8	24.3
A7Q4	2N2270	7.7	8.2	22.3
A7Q5	2N4037	23.0	22.3	0.6
A7Q6	2N2270	0	0.6	17.0
A7Q7	2N2270	10.3	10.8	47.3
A7Q8	2N4037	48.0	47.3	31.5
A8Q1	2N3055	24.3	25.0	35.0
A8Q2	2N4074	25.0	25.8	34.2
A8Q3	2N4074	6.8	7.4	25.8
A8Q4	2N4074	6.8	7.4	23.9
A9Q1	2N2270	19.0	19.7	24.0
A9Q2	2N4074	19.7	20.5	24.0
A9Q3	2N4074	6.8	7.4	20.5
A9Q4	2N4074	6.8	7.4	18.2

Table 4-1. Typical Tube and Transistor Element Voltages (Cont'd)

Cathode Ray Tube

Ref. Desig.	Type	1	2	3	4	5	6	7	8	CAP
V1	3ASP1	113	110	-1420*	-1440	-740	86	95	-1420*	88

TEST CONDITIONS: All readings taken with 115 volt, 60 Hz primary power, front panel controls fully clockwise and no signal input. All voltages are positive direct current measured with respect to ground. The high voltage measurements are made using a high impedance high voltage probe. All other readings are made using an RCA WV-98C VTVM.

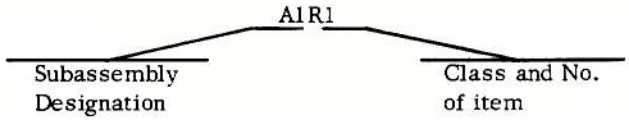
NOTES: * V1 pin 3 to 8 potential is 6.3 Vac (filament)

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:



Read 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. Prefixes are provided on drawings and illustrations following the notation "REF DESIG PREFIX."

5.3 LIST OF MANUFACTURERS

Vendor Code	Name and Address	Vendor Code	Name and Address
01121	Allen-Bradley Company 1201 South 2nd Street Milwaukee, Wisconsin 53204	14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, Maryland 20878
04013	Taurus Corporation 1 Academy Hill Lambertville, New Jersey 08530	15605	Cutler-Hammer, Incorporated 315 North 12th Street Milwaukee, Wisconsin 53233
04713	Motorola Semiconductor Prod., Inc. 5005 East McDowell Road Phoenix, Arizona 85008	18915	The Bircher Corporation Industrial Division 745 Monterey Pass Road Monterey Park, California 91754
06001	General Electric Company Capacitor Department P. O. Box 158 Irmo, South Carolina 29063	56289	Sprague Electric Company North Adams, Massachusetts 01247
06540	Amathom Electronic Hardware Co. Inc. 432 Main Street New Rochelle, New York 10801	71279	Cambridge Thermionic Corporation 430 Concord Avenue Cambridge, Massachusetts 02138
09023	Cornell-Dublier Electric Corp. Electrolytics & Paper Tubular Div. 2562 Dalrymple Sanford, North Carolina 27330	71400	Bussman Manufacturing Division of McGraw-Edison Company 2538 W. University Street St. Louis, Missouri 63107

Vendor Code	Name and Address
71450	CTS Corporation 1142 West Beardsley Avenue Elkhart, Indiana 46514
72619	Dialight Corporation 60 Stewart Avenue Brooklyn, New York 11237
72982	Erie Technological Products, Inc. 644 West 12th Street Erie, Pennsylvania 16512
73138	Beckman Instruments, Inc. Helipot Division 2500 Harbor Boulevard Fullerton, California 92634
74868	Amphenol Corporation Amphenol RF Division 33 East Franklin Street Danbury, Connecticut 06810
75915	Littelfuse, Incorporated 800 E. Northwest Highway Des Plaines, Illinois 60016
79727	Continental-Wirt Electronics Corp. 26 W. Queen Lane Philadelphia, Pennsylvania 19144
80131	Electronic Industries Association 2001 Eye Street, N. W. Washington, D. C. 20006
81349	Military Specifications
82389	Switchcraft, Incorporated 5527 North Elston Avenue Chicago, Illinois 60630
84171	Arco Electronics, Inc. Community Drive Great Neck, New York 11022
88245	Litton Industries USECO Division 13536 Saticoy Street Van Nuys, California 91402
91418	Radio Materials Company 4242 West Bryn Mawr Avenue Chicago, Illinois 60646
91662	Elco Corporation Maryland Rd. & Computer Avenue Willow Grove, Pennsylvania 19090
95121	Quality Components, Inc. P. O. Box 113 St. Mary's, Pennsylvania 15857
99687	Raytheon Company Equipment Division Wayland, Massachusetts 01778

5.4 PARTS LIST

When ordering replacement parts from CEI, specify the type and serial number of the equipment, and the reference designation and description of each part ordered. The Vendors and Vendor Part Numbers listed are included as a guide to the user of the equipment in the field and do not necessarily agree with the parts installed in as long as the physical and electrical parameters of the part selected agree with the original part.

NOTE

As improved semiconductors become available it is the policy of CEI to incorporate them in proprietary products. For this reason some transistors and diodes installed in an equipment may not agree with those specified in the parts lists and schematic diagrams of this manual. However, the semiconductors designated in the manual may be substituted in every case with satisfactory results.

5.4.1 Types SM-9803A & SM-9804A Signal Monitors, Main Chassis

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
A1	BANDPASS FILTER	1	79313	14632
A2	CRYSTAL OSCILLATOR	1	8305	14632
A3	IF AMPLIFIER	1	8015	14632
A4	COMPONENT BOARD	1	79322	14632
A5	FOCUS & INTENSITY BOARD	1	13488	14632
A6	HORIZONTAL AMPLIFIER	1	8231	14632
A7	SWEEP GENERATOR	1	8230	14632
A8	+24V REGULATED POWER SUPPLY	1	76121	14632
A9	+18V REGULATOR	1	76124	14632
C1	CAPACITOR, COMPOSITION, TUBULAR: 1.8 pF, 10%, 500V	1	QC(1.8 pF, 10%)	95121
DS1	LAMP, NEON	1	249-7866-1431-534	72619
F1	FUSE, 3 AG, Slow-Blow: 1/8A	1	MDL-1/8	71400
F2	FUSE, 3 AG, Slow-Blow: 1/16A	1	MDL-1/16	71400
FL1	RFI FILTER	1	JN33-694A	56289
J1	CONNECTOR, JACK, BNC Part of W1	1	17825	74868
J2	CONNECTOR, RECEPTACLE, BNC	2	UG-1094/U	81349
J3	Same as J2			
MP1	HANDLE, BOW (SM-9803A ONLY)	2	1252-1	71279
MP2	KNOB	4	13486-2	14632
MP3	SCALE, CRT	1	1425	14632
MP4	Same as MP1			
MP5	Same as MP2			
MP6	KNOB	2	13486-1	14632
MP7	Same as MP2			
MP8	Same as MP6			
MP9	Same as MP2			
MP10	HANDLE, BOW (SM-9803A ONLY)	2	1250-1	71279
MP11	Same as MP10			
MP12	SHIELD, ELECTRON TUBE	1	31310	14632
MP13	COVER, MAIN, TOP AND BOTTOM (SM-9803A ONLY)	2	31340-1	14632
MP14	Same as MP13			
MP15	SCREW, PANEL FASTENER (SM-9804A ONLY)	2	6105-B-0832	06540
MP16	Same as MP15			
P1	CONNECTOR, PLUG AND POWER CORD Part of FL1	REF		

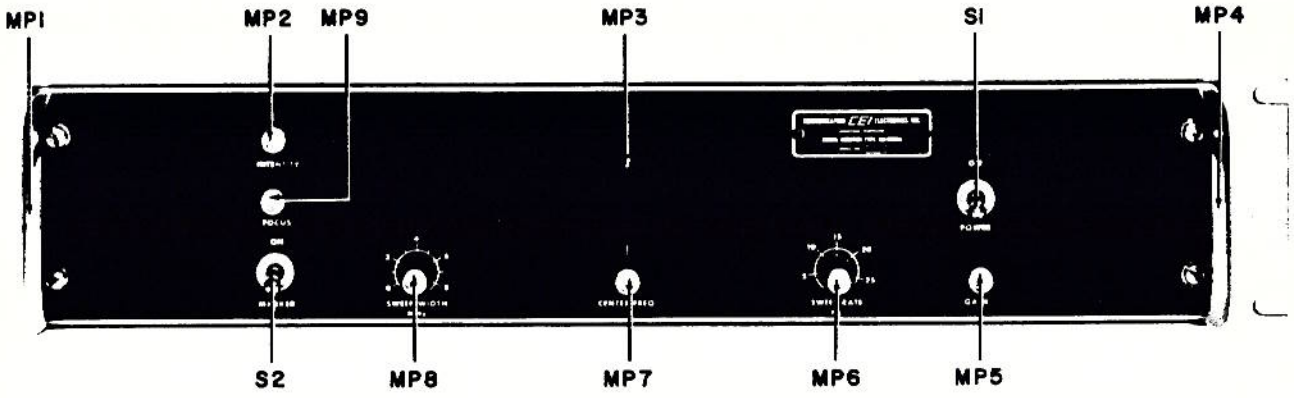


Figure 5-1. Type SM-9803A Signal Monitor, Front Panel

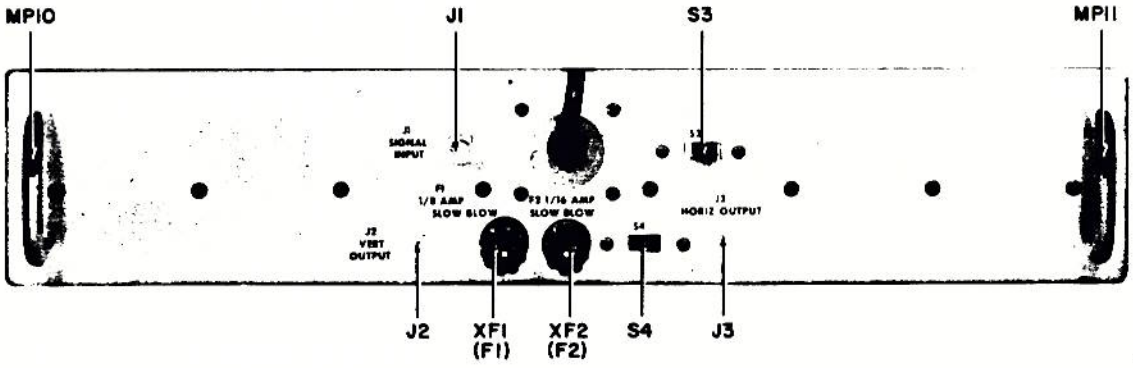


Figure 5-2. Type SM-9803A Signal Monitor, Rear Panel

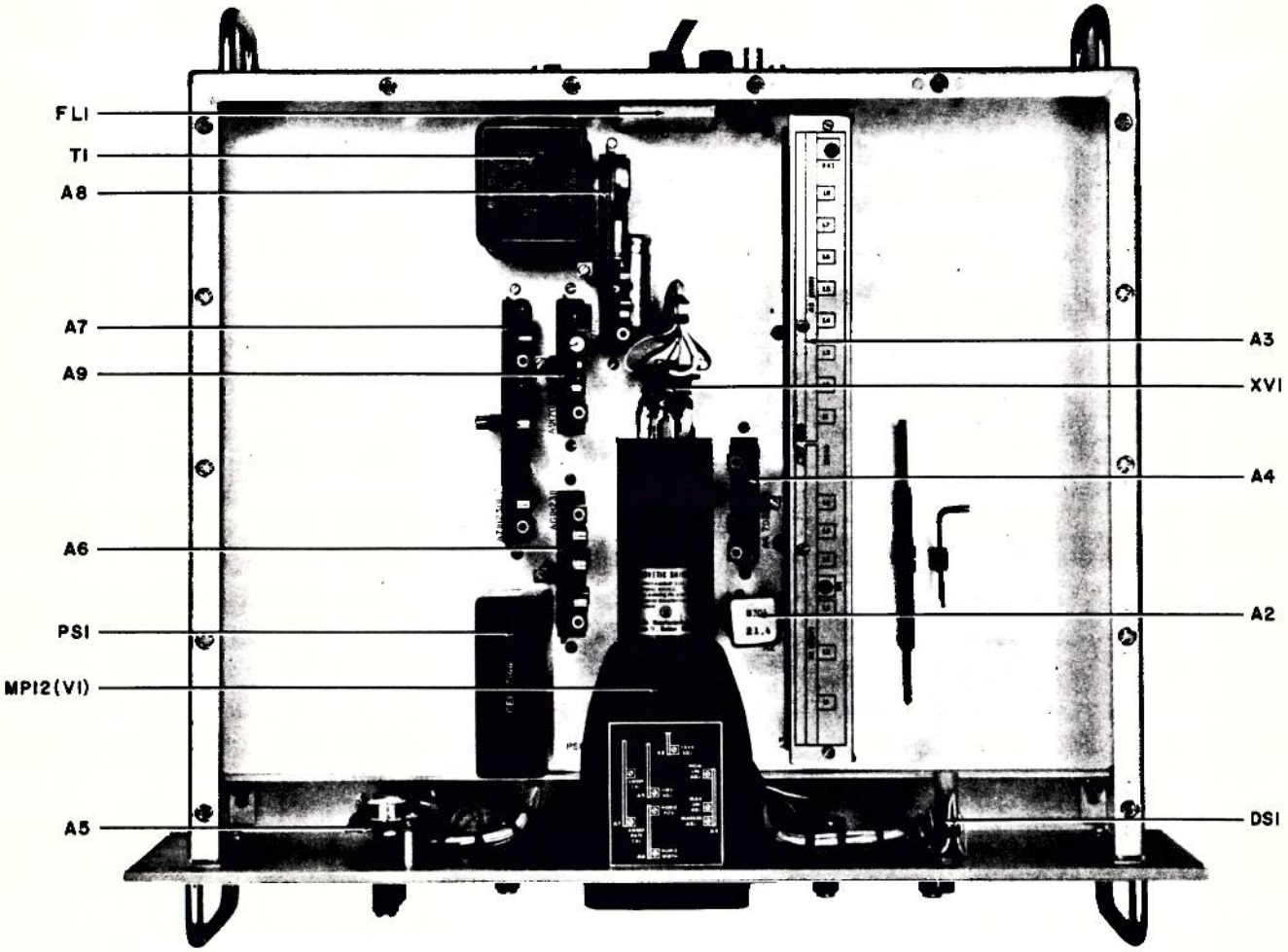


Figure 5-3. Type SM-9803A Signal Monitor, Top View

Figure 5-4

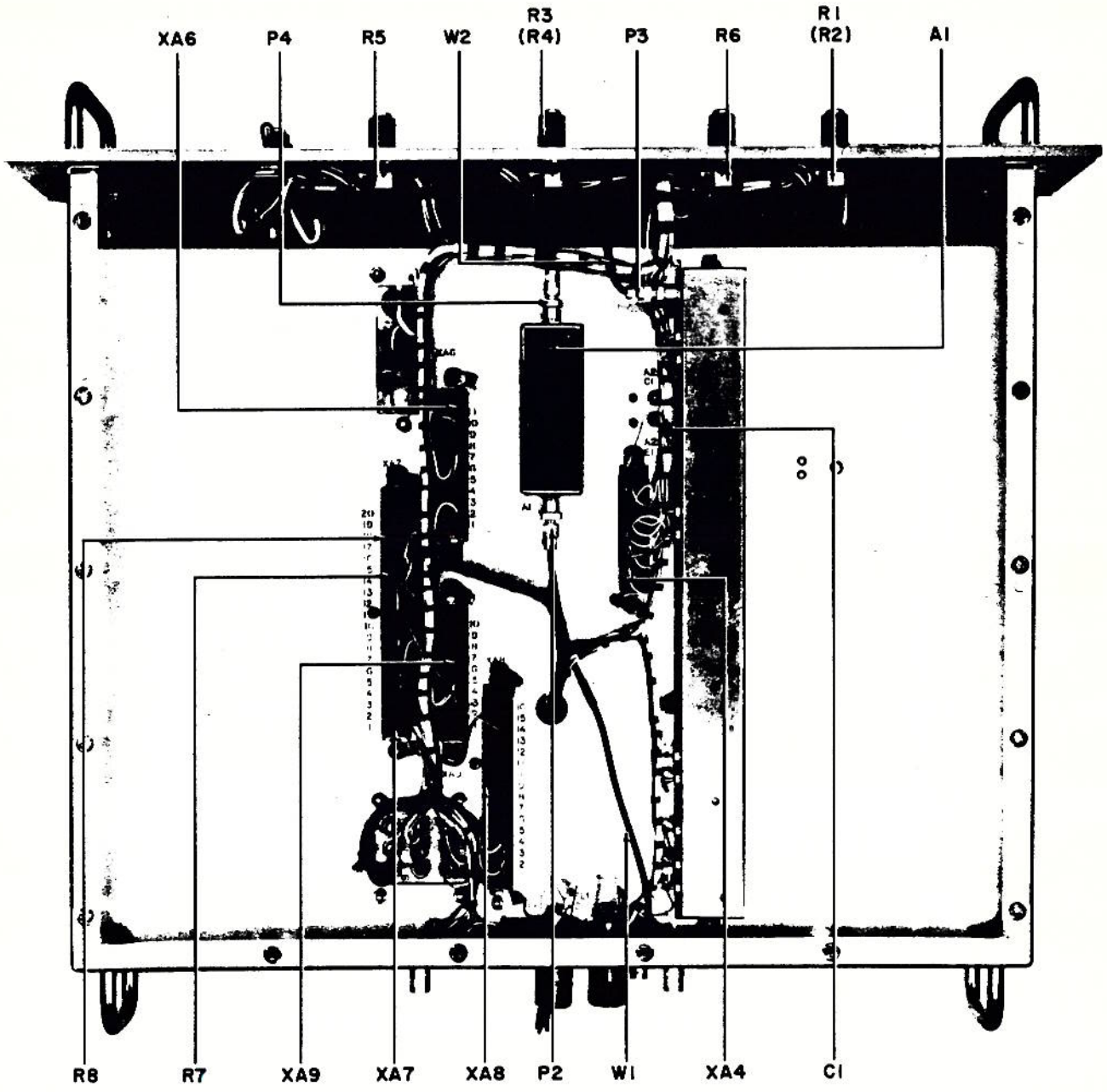


Figure 5-4. Type SM-9803A Signal Monitor, Bottom View

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
P2	CONNECTOR, PLUG, MB Part of W1	3	44950	74868
P3	Same as P2 Part of W2			
P4	Same as P2 Part of W2			
PS1	DC-DC CONVERTER	1	76144	14632
R1	RESISTOR, VARIABLE, COMPOSITION: 10 kΩ, 10%, 1/2W	3	LW23562	71450
R2	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4W	1	CB1025	01121
R3	Same as R1			
R4	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	CB4735	01121
R5	RESISTOR, VARIABLE, COMPOSITION: 50 kΩ, 10%, 1/2W	1	NX24430	71450
R6	Same as R1			
R7	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4W	1	CB8225	01121
R8	RESISTOR, FIXED, COMPOSITION: 56 kΩ, 5%, 1/4W	1	CB5635	01121
S1	SWITCH, TOGGLE, SP-ST	2	8280-K16	15605
S2	Same as S1			
S3	SWITCH, SLIDE, DP-DT	1	G326	79727
S4	SWITCH, SLIDE, DP-DT	1	11A-1009	82389
T1	TRANSFORMER	1	13500	14632
V1	TUBE, CRT	1	3ASP1	80131
W1	CABLE AND CONNECTOR ASSEMBLY	REF	30020-803	14632
W2	CABLE AND CONNECTOR ASSEMBLY	REF	30020-804	14632
XA1	NOT USED			
XA2	NOT USED			
XA3	NOT USED			
XA4	SOCKET, PC BOARD	1	00-5002-009-103-002	91662
XA5	NOT USED			
XA6	SOCKET, PC BOARD	1	00-5002-011-103-002	91662
XA7	SOCKET, PC BOARD	1	00-5002-020-103-002	91662
XA8	SOCKET, PC BOARD	1	00-5002-016-103-002	91662
XA9	SOCKET, PC BOARD	1	00-5002-010-103-002	91662
XF1	FUSEHOLDER	2	342004	75915
XF2	Same as XF1			
XV1	SOCKET, ELECTRON TUBE	1	14075	14632

5.4.2 Type 79313 Bandpass Filter Assembly

REF DESIG PREFIX A1

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
A1	BANDPASS FILTER P.C. BOARD	1	79326	14632
J1	CONNECTOR, RECEPTACLE, MB SERIES	2	46025	14632
J2	Same as J1			

REF DESIG PREFIX A1

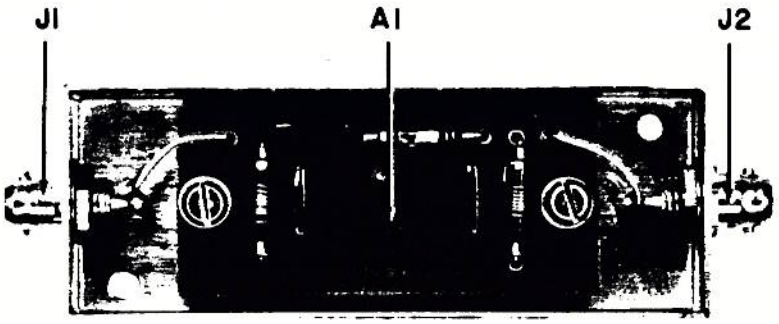


Figure 5-5. Type 79313 Bandpass Filter Assembly, Component Locations

5.4.2.1 Type 79326 Bandpass Filter Printed Circuit Board REF DESIG PREFIX A1A1

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, DIPPED MICA: 500 pF, 5%, 300V	2	DM15-501J	84171
C2	CAPACITOR, DIPPED MICA: 56 pF, 5%, 300V	1	CM05E560J03	81349
C3	Same as C1			
L1	COIL, FIXED	2	1131-95	14632
L2	COIL, FIXED	1	1131-92	14632
L3	Same as L1			

REF DESIG PREFIX A1A1

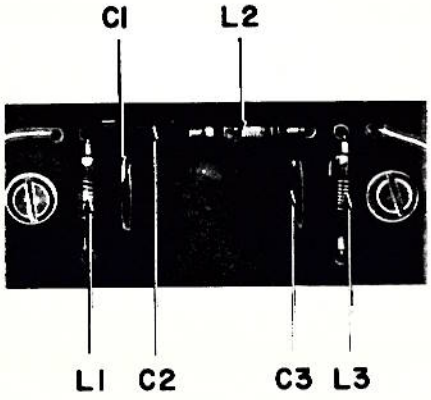


Figure 5-6. Type 79326 Bandpass Filter P. C. Board, Component Locations

5.4.3 Type 8305 Crystal Oscillator Assembly

REF DESIG PREFIX A2

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
A1	P. C. BOARD	1	13991	14632
C1	CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500V	1	FA5C-102W	01121
E1	TERMINAL, FEEDTHRU	1	SFU-16	04013
R1	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	1	CB3325	01121

REF DESIG PREFIX A2

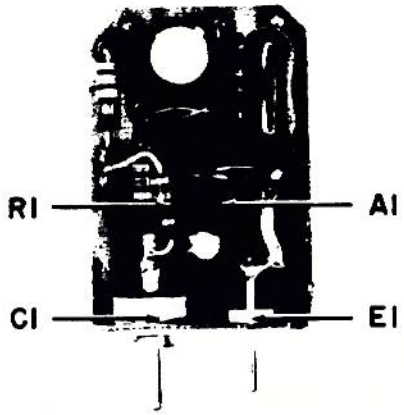


Figure 5-7. Type 8305 Crystal Oscillator Assembly, Component Locations

5.4.3.1 Part 13991 Crystal Oscillator Printed Circuit Board

REF DESIG PREFIX A2A1

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, DIPPED MICA: 47 pF, 5%, 500V	2	DM10-470J	84171
C2	Same as C1			
C3	CAPACITOR, DIPPED MICA: 470 pF, 5%, 500V	1	DM15-471J	84171
C4	CAPACITOR, CERAMIC, DISC: 0.005 μF, 20%, 50V	1	40C172A5	56289
Q1	TRANSISTOR	1	2N3933	80131
R1	RESISTOR, FIXED, COMPOSITION: 330 kΩ, 5%, 1/4W	2	CB3345	01121
R2	Same as R1			
R3	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	1	CB2215	01121
R4	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	1	CB3325	01121
Y1	CRYSTAL, QUARTZ: 21.4 MHz	1	96402-01	14632

REF DESIG PREFIX A2A1

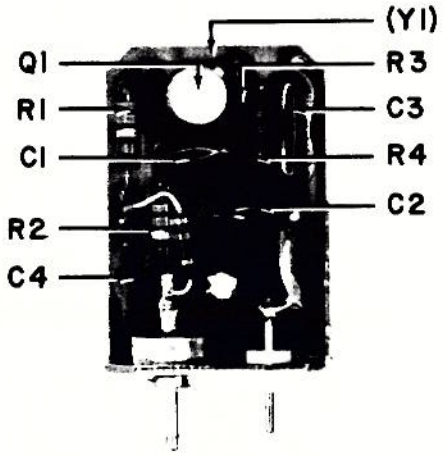


Figure 5-8. Part 13991, Crystal Oscillator P. C. Board, Component Locations

5.4.4 Type 8015 IF Amplifier Assembly

REF DESIG PREFIX A3

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
A1	IF AMPLIFIER BOARD NO. 1	1	8127	14632
A2	IF AMPLIFIER BOARD NO. 2	1	8128	14632
C1	CAPACITOR, CERAMIC, FEED-THRU: 330 pF, 10%, 500V	1	FA5C-3311	01121
C2	CAPACITOR, CERAMIC, FEED-THRU: 1000 pF, GMV, 500V	5	FA5C-102W	01121
C3	Same as C2			
C4	Same as C2			
C5	Same as C2			
C6	CAPACITOR, CERAMIC, FEED-THRU: 33 pF, 10%, 500V	3	FA5C-3301	01121
C7	Same as C2			
C8	Same as C6			
C9	Same as C6			
E1	TERMINAL, FEED-THRU	1	SFU-16	04013
J1	CONNECTOR, RECEPTACLE, MB SERIES	1	46025	74868

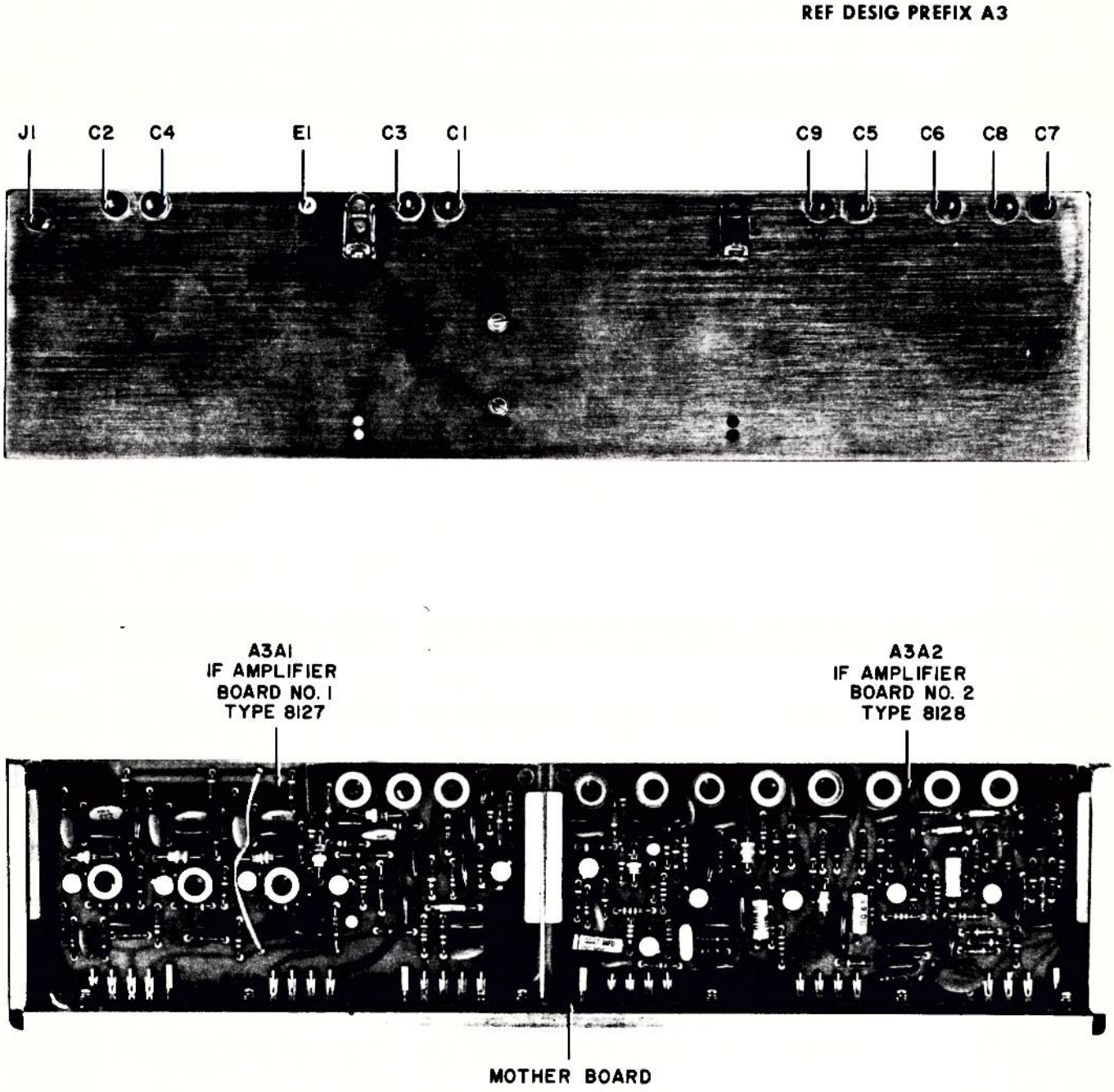


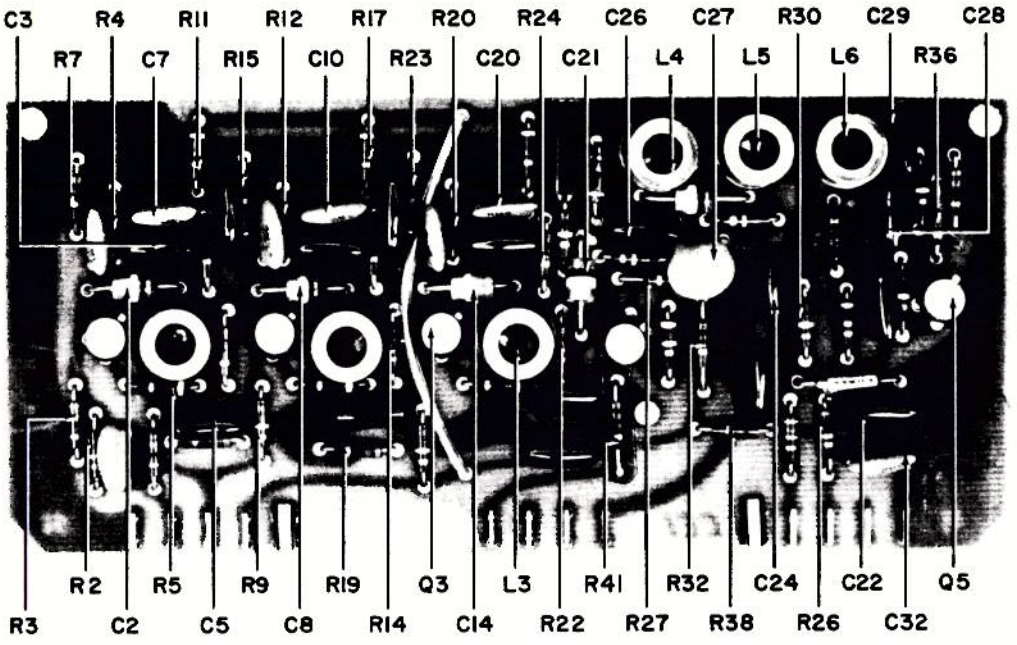
Figure 5-9. Type 8015 IF Amplifier Assembly, Component Locations

5.4.4.1 Type 8127 IF Amplifier Board No. 1

REF DESIG PREFIX A3A1

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, CERAMIC, DISC: 0.005 μF, 20%, 500V	9	SM(.005 μF, 20%)	91418
C2	CAPACITOR, COMPOSITION, TUBULAR: 2.2 pF, 10%, 500V	2	QC(2.2 pF, 10%)	95121
C3	CAPACITOR, DIPPED MICA: 220 pF, 5%, 500V	6	CM05F221J03	81349
C4	Same as C1			
C5	CAPACITOR, DIPPED MICA: 39 pF, 5%, 500V	3	CM05E390J03	81349
C6	Same as C3			
C7	Same as C1			
C8	Same as C2			
C9	Same as C3			
C10	Same as C1			
C11	Same as C1			
C12	CAPACITOR, DIPPED MICA: 68 pF, 5%, 500V	2	CM05E680J03	81349
C13	Same as C3			
C14	CAPACITOR, COMPOSITION, TUBULAR: 3.3 pF, 10%, 500V	1	QC(3.3 pF, 10%)	95121
C15	Same as C3			
C16	Same as C1			
C17	NOT USED			
C18	CAPACITOR, DIPPED MICA: 47 pF, 5%, 500V	1	CM05E470J03	81349
C19	Same as C3			
C20	Same as C1			
C21	CAPACITOR, COMPOSITION, TUBULAR: 1.0 pF, 10%, 500V	2	QC(1.0 pF, 10%)	95121
C22	CAPACITOR, DIPPED MICA: 330 pF, 5%, 500V	1	CM05F331J03	81349
C23	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 μF, 10%, 35V	1	150D105X9035A2	56289
C24	CAPACITOR, DIPPED MICA: 24 pF, 5%, 500V	1	CM05E240J03	81349
C25	CAPACITOR, DIPPED MICA: 130 pF, 5%, 500V	1	CM05F131J03	81349
C26	Same as C12			
C27	Same as C1			
C28	Same as C5			
C29	Same as C5			
C30	Same as C21			
C31	CAPACITOR, DIPPED MICA: 75 pF, 5%, 500V	1	CM05E750J03	81349
C32	Same as C1			

REF DESIG PREFIX A3A1



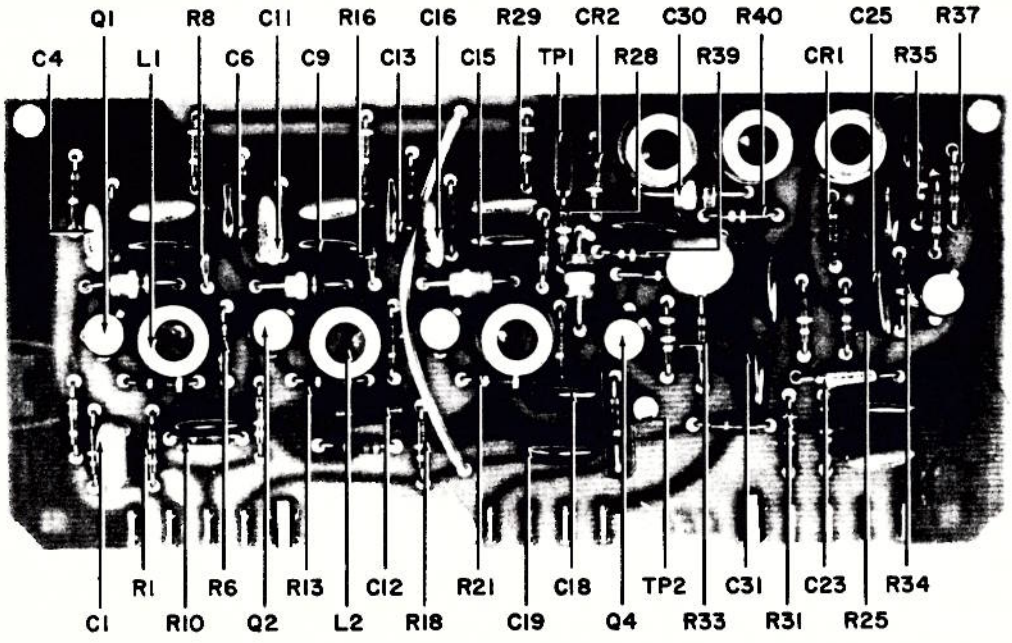


Figure 5-10. Type 8127 IF Amplifier Board No. 1, Component Locations

REF DESIG PREFIX A3A1

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
CR1	DIODE, CAPACITANCE	1	MV-832	04713
CR2	DIODE	1	1N198	80131
L1	COIL, VARIABLE	1	3387-01	71279
L2	COIL, VARIABLE	4	3387-03	71279
L3	COIL, VARIABLE	1	3387-02	71279
L4	Same as L2			
L5	Same as L2			
L6	Same as L2			
Q1	TRANSISTOR	4	2N3933	80131
Q2	Same as Q1			
Q3	Same as Q1			
Q4	TRANSISTOR	1	3N128	80131
Q5	Same as Q1			
R1	RESISTOR, FIXED, COMPOSITION: 51 Ω, 5%, 1/4W	1	CB5105	01121
R2	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	3	CB2235	01121
R3	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	3	CB6825	01121
R4	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	8	CB1025	01121
R5	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	3	CB4705	01121
R6	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4W	1	CB1525	01121
R7	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	3	CB1005	01121
R8	Same as R4			
R9	Same as R2			
R10	Same as R3			
R11	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	3	CB4715	01121
R12	Same as R4			
R13	Same as R5			
R14	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4W	1	CB2725	01121
R15	Same as R7			
R16	Same as R4			
R17	Same as R11			
R18	Same as R2			
R19	Same as R3			
R20	Same as R4			
R21	Same as R5			
R22	RESISTOR, FIXED, COMPOSITION: 820 Ω, 5%, 1/4W	1	CB8215	01121

REF DESIG PREFIX A3A1

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
R23	Same as R7			
R24	Same as R4			
R25	RESISTOR, FIXED, COMPOSITION: 3.0 Ω, 5%, 1/4W	1	CB30G5	01121
R26	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4W	1	CB3035	01121
R27	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	CB2225	01121
R28	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	3	CB1045	01121
R29	Same as R11			
R30	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4W	1	CB2245	01121
R31	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	CB4735	01121
R32	Same as R4			
R33	RESISTOR, FIXED, COMPOSITION: 470 kΩ, 5%, 1/4W	1	CB4745	01121
R34	Same as R28			
R35	Same as R28			
R36	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	1	CB1015	01121
R37	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	1	CB6825	01121
R38	Same as R4			
R39	RESISTOR, FIXED, COMPOSITION: 27 kΩ, 5%, 1/4W	2	CB2735	01121
R40	Same as R39			
R41	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/4W	1	CB6815	01121
TP1	TEST POINT	1	TJ-202BR	99687
TP2	TEST POINT	1	2010B	88245

5.4.4.2 Type 8128 IF Amplifier Board No. 2 REF DESIG PREFIX A3A2

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 50V	11	19C214A6	56289
C2	CAPACITOR, DIPPED MICA: 68 pF, 5%, 500V	1	CM05E680J03	81349
C3	Same as C1			
C4	CAPACITOR, COMPOSITION, TUBULAR: .15 pF, 10%, 500V	1	MC(.15 pF, 10%)	95121
C5	CAPACITOR, COMPOSITION, TUBULAR: 2.2 pF, 10%, 500V	1	QC(2.2 pF, 10%)	95121
C6	CAPACITOR, DIPPED MICA: 47 pF, 5%, 500V	2	CM05E470J03	81349
C7	Same as C6			
C8	CAPACITOR, DIPPED MICA: 75 pF, 5%, 500V	1	CM05E750J03	81349
C9	CAPACITOR, DIPPED MICA: 560 pF, 5%, 500V	1	CM06F561J03	81349
C10	Same as C1			
C11	Same as C1			
C12	Same as C1			
C13	CAPACITOR, COMPOSITION, TUBULAR: 4.3 pF, 10%, 500V	2	QC(4.3 pF, 10%)	95121
C14	CAPACITOR, DIPPED MICA: 680 pF, 5%, 500V	4	CM06F681J03	81349
C15	CAPACITOR, MYLAR, TUBULAR: 6800 pF, 10%, 100V	3	61F10AA682	06001
C16	Same as C1			
C17	CAPACITOR, DIPPED MICA: 620 pF, 5%, 500V	2	CM06F621J03	81349
C18	Same as C1			
C19	Same as C13			
C20	Same as C14			
C21	Same as C15			
C22	Same as C1			
C23	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 pF, 35V	2	150D105X9035A2	56289
C24	Same as C14			
C25	Same as C15			
C26	Same as C1			
C27	Same as C23			
C28	Same as C14			
C29	CAPACITOR, CERAMIC, DISC: .0022 μF, 20%, 1000V	1	JF(.0022 μF, 20%)	91418
C30	CAPACITOR, DIPPED MICA: 270 pF, 5%, 500V	2	CM05F271J03	81349
C31	Same as C30			
C32	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 200V	2	8131-026-Z5U0-102M	72982
C33	Same as C32			
C34	CAPACITOR, DIPPED MICA: 100 pF, 5%, 500V	2	CM05F101J03	81349
C35	Same as C34			

REF DESIG PREFIX A3A2

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C36	CAPACITOR, DIPPED MICA: 22 pF, 5%, 500V	1	CM05E220J03	81349
C37	CAPACITOR, MYLAR, TUBULAR: .0047 μF, 10%, 100V	1	WMF1D47	09023
C38	Same as C17			
CR1	DIODE	6	1N198	80131
CR2	Same as CR1			
CR3	Same as CR1			
CR4	Same as CR1			
CR5	Same as CR1			
CR6	Same as CR1			
L1	COIL, VARIABLE	2	3387-03	71279
L2	Same as L1			
L3	COIL, VARIABLE	6	3387-17	71279
L4	Same as L3			
L5	Same as L3			
L6	Same as L3			
L7	Same as L3			
L8	Same as L3			
Q1	TRANSISTOR	6	2N3933	80131
Q2	Same as Q1			
Q3	Same as Q1			
Q4	Same as Q1			
Q5	Same as Q1			
Q6	Same as Q1			
R1	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	5	CB3335	01121
R2	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	4	CB1535	01121
R3	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	5	CB4725	01121
R4	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	6	CB4705	01121
R5	RESISTOR, FIXED, COMPOSITION: 2.7 Ω, 5%, 1/4W	1	CB27G5	01121
R6	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	4	CB2225	01121
R7	RESISTOR, FIXED, COMPOSITION: 330 kΩ, 5%, 1/4W	2	CB3345	01121
R8	Same as R7			
R9	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/4W	2	CB6815	01121
R10	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	1	CB3325	01121
R11	RESISTOR, FIXED, COMPOSITION: 18 kΩ, 5%, 1/4W	2	CB1835	01121
R12	Same as R1			

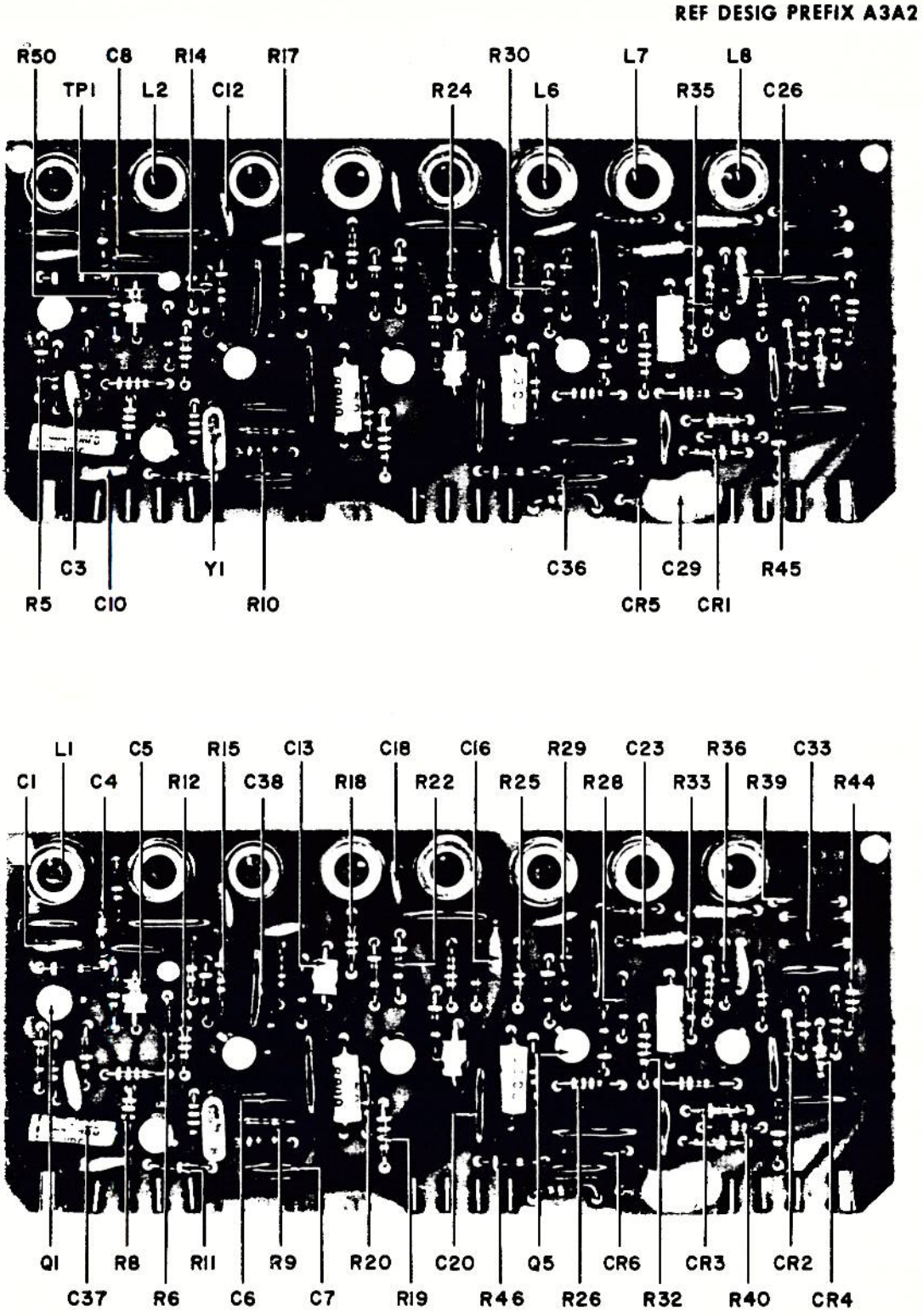


Figure 5-11. Type 8128 IF Amplifier Board No. 2, Component Locations

REF DESIG PREFIX A3A2

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
R13	Same as R2			
R14	Same as R3			
R15	RESISTOR, FIXED, COMPOSITION: 4.7 Ω, 5%, 1/4W	1	CB47G5	01121
R16	Same as R6			
R17	RESISTOR, FIXED, COMPOSITION: 16 kΩ, 5%, 1/4W	5	CB1635	01121
R18	Same as R17			
R19	Same as R1			
R20	Same as R2			
R21	Same as R3			
R22	Same as R4			
R23	Same as R6			
R24	Same as R17			
R25	Same as R17			
R26	Same as R1			
R27	Same as R2			
R28	Same as R6			
R29	Same as R3			
R30	Same as R4			
R31	Same as R17			
R32	Same as R1			
R33	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	1	CB6825	01121
R34	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	CB3315	01121
R35	Same as R9			
R36	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	1	CB1005	01121
R37	Same as R11			
R38	RESISTOR, FIXED, COMPOSITION: 51 kΩ, 5%, 1/4W	1	CB5135	01121
R39	RESISTOR, FIXED, COMPOSITION: 200 kΩ, 5%, 1/4W	1	CB2045	01121
R40	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4W	2	CB2245	01121
R41	Same as R40			
R42	RESISTOR, VARIABLE, FILM: 50 kΩ, 3%, 1/2W	1	62PAR50K	73138
R43	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	4	CB1045	01121
R44	RESISTOR, FIXED, COMPOSITION: 240 kΩ, 5%, 1/4W	1	CB2445	01121
R45	Same as R43			
R46	Same as R3			
R47	Same as R4			

REF DESIG PREFIX A3A2

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
R48	Same as R4			
R49	Same as R4			
R50	Same as R43			
R51	Same as R43			
TP1	TEST POINT	1	2010B	88245
Y1	CRYSTAL, QUARTZ: 14.00 MHz	1	CR-64/U	81349

REF DESIG PREFIX A3A2

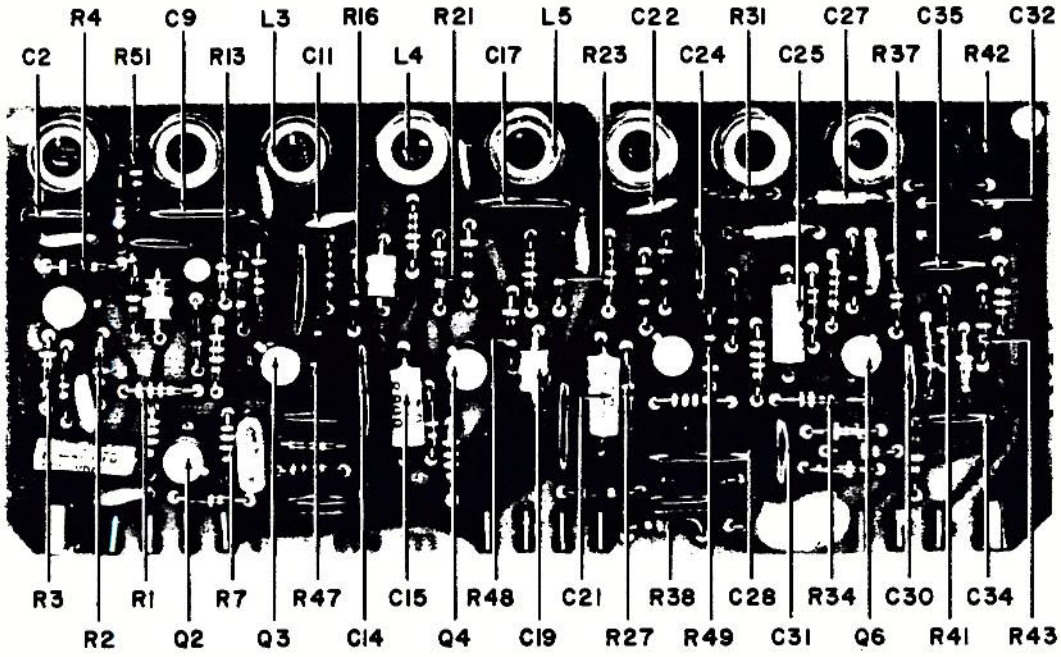


Figure 5-12. Type 8128 IF Amplifier Board No. 2, Component Locations

5.4.5 Type 79322 Component Board

REF DESIG PREFIX A4

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
CR1	DIODE	5	1N462A	80131
CR2	Same as CR1			
CR3	Same as CR1			
CR4	Same as CR1			
CR5	DIODE ZENER	1	1N749A	80131
CR6	Same as CR1			
CR7	DIODE, ZENER	1	1N751A	80131
CR8	DIODE, ZENER	1	1N756A	80131
R1	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	1	CB1005	01121
R2	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	3	CB4735	01121
R3	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	3	CB1045	01121
R4	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4W	1	CB2245	01121
R5	Same as R3			
R6	Same as R3			
R7	Same as R2			
R8	RESISTOR, VARIABLE, FILM: 500 kΩ, 30%, 1/2W	2	62PAR500K	73138
R9	Same as R2			
R10	Same as R8			
R11	RESISTOR, FIXED, COMPOSITION: 330 kΩ, 5%, 1/4W	2	CB3345	01121
R12	Same as R11			
R13	RESISTOR, VARIABLE, FILM: 50 kΩ, 30%, 1/2W	1	62PAR50K	73138
R14	RESISTOR, FIXED, COMPOSITION: 12 kΩ, 5%, 1/4W	1	CB1235	01121

REF DESIG PREFIX A4

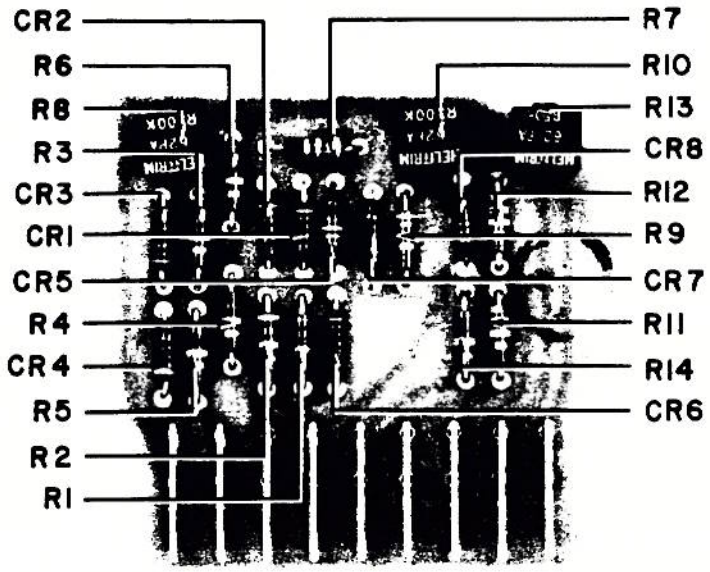


Figure 5-13. Type 79322 Component Board, Component Locations

5.4.6 Part 13488 Focus and Intensity Board

REF DESIG PREFIX A5

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, MYLAR, TUBULAR: 0.1 μF, 10%, 100V	1	WMF1P1	09023
R1	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	CB1045	01121
R2	RESISTOR, VARIABLE, COMPOSITION: 500 kΩ, 10%, 1/2W	1	RV5NAYSD504A	81349
R3	RESISTOR, FIXED, COMPOSITION: 3.3 MΩ, 5%, 1/2W	1	EB3355	01121
R4	RESISTOR, VARIABLE, COMPOSITION: 2.5 MΩ, 10%, 1/2W	1	RV5NAYSD255B	81349
R5	RESISTOR, FIXED, COMPOSITION: 3.9 MΩ, 5%, 1/2W	1	EB3955	01121
R6	RESISTOR, FIXED, COMPOSITION: 4.7 MΩ, 5%, 1/2W	1	EB4755	01121

REF DESIG PREFIX A5

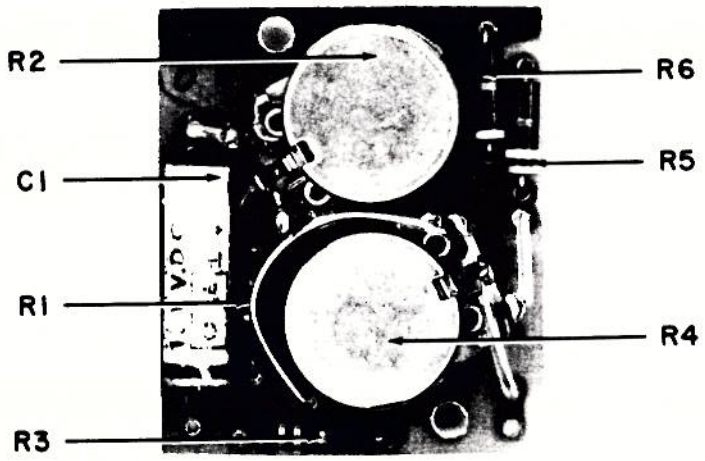


Figure 5-14. Part 13488, Focus and Intensity Board, Component Locations

5.4.7 Type 8231 Horizontal Amplifier

REF DESIG PREFIX A6

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
Q1	TRANSISTOR	3	2N2270	80131
Q2	Same as Q1			
Q3	TRANSISTOR	2	2N3440	80131
Q4	Same as Q3			
Q5	Same as Q1			
R1	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4W	3	CB2245	01121
R2	NOT USED			
R3	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	2	CB1045	01121
R4	RESISTOR, VARIABLE, FILM: 200 kΩ, 30%, 1/2W	1	62PAR200K	73138
R5	Same as R3			
R6	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	1	CB4725	01121
R7	Same as R1			
R8	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	4	CB1535	01121
R9	Same as R8			
R10	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	1	CB6825	01121
R11	Same as R1			
R12	Same as R8			
R13	Same as R8			
R14	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	3	CB2235	01121
R15	Same as R14			
R16	Same as R14			
R17	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4W	1	CB3035	01121
R18	RESISTOR, VARIABLE, FILM: 10 kΩ, 30%, 1/2W	1	62PAR10K	73138
R19	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	CB1035	01121

REF DESIG PREFIX A6

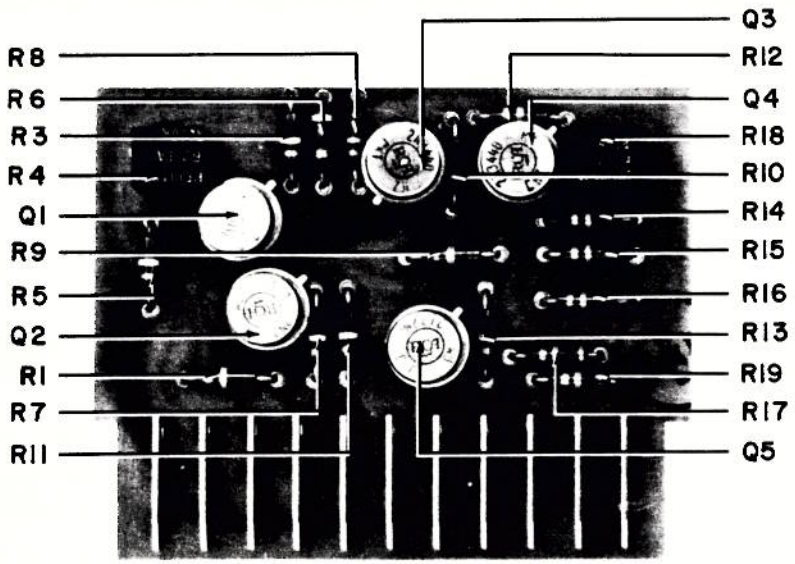


Figure 5-15. Type 8231 Horizontal Amplifier, Component Locations

5.4.8 Type 8230 Sweep Generator — REF DESIG PREFIX A7

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 μF, 10%, 35V	1	150D105X9035A2	56289
C2	CAPACITOR, ELECTROLYTIC, ALUMINUM: 100 μF, -10+75%, 25V	3	30D107G025DD2	56289
C3	Same as C2			
C4	Same as C2			
Q1	TRANSISTOR	1	2N2646	80131
Q2	TRANSISTOR	3	2N4037	80131
Q3	TRANSISTOR	4	2N2270	80131
Q4	Same as Q3			
Q5	Same as Q2			
Q6	Same as Q3			
Q7	Same as Q3			
Q8	Same as Q2			
R1	RESISTOR, VARIABLE, FILM: 10 kΩ, 30%, 1/2W	1	62PAR10K	73138
R2	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	2	CB1535	01121
R3	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	2	CB4725	01121
R4	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	1	CB2235	01121
R5	Same as R3			
R6	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	CB4735	01121
R7	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	CB1045	01121
R8	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	3	CB2225	01121
R9	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	4	CB1035	01121
R10	Same as R8			
R11	RESISTOR, FIXED, COMPOSITION: 6.8 MΩ, 5%, 1/4W	2	CB6855	01121
R12	RESISTOR, FIXED, COMPOSITION: 1.5 MΩ, 5%, 1/4W	2	CB1555	01121
R13	RESISTOR, FIXED, COMPOSITION: 68 kΩ, 5%, 1/4W	1	CB6835	01121
R14	Same as R9			
R15	Same as R8			
R16	Same as R9			
R17	Same as R11			
R18	Same as R12			
R19	RESISTOR, VARIABLE, FILM: 200 kΩ, 3%, 1/2W	1	62PAR200K	73138
R20	RESISTOR, FIXED, COMPOSITION: 470 kΩ, 5%, 1/4W	1	CB4745	01121
R21	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	CB1545	01121

REF DESIG PREFIX A7

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
R22	Same as R9			
R23	Same as R2			
R24	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	1	CB6825	01121

REF DESIG PREFIX A7

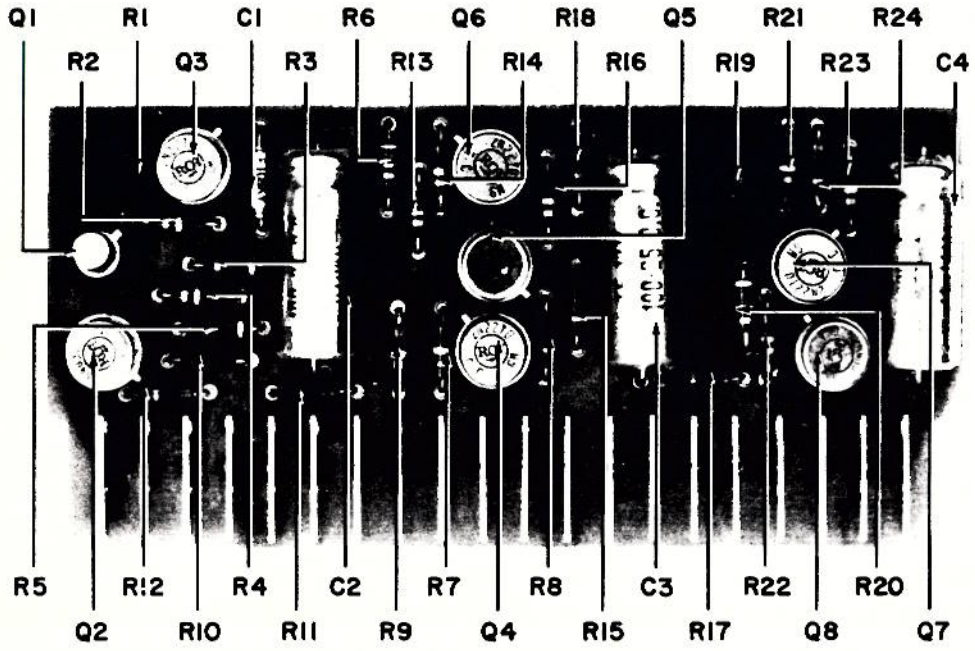


Figure 5-16. Type 8230 Sweep Generator, Component Locations

5.4.9 Type 76121A +24V Regulated Power Supply

REF DESIG PREFIX A8

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, ELECTROLYTIC, ALUMINUM: 200 μF, -10+75%, 50V	1	39D207G050FJ4	56289
C2	CAPACITOR, ELECTROLYTIC, ALUMINUM: 10 μF, -10+75%, 50V	1	30D106G050CB2	56289
C3	CAPACITOR, ELECTROLYTIC, ALUMINUM: 10 μF, -10+75%, 25V	1	30D106G025BB2	56289
C4	CAPACITOR, ELECTROLYTIC, ALUMINUM: 6.8 μF, 10%, 35V	1	150D685X9035B2	56289
CR1	DIODE	1	MDA940A-3	04713
CR2	DIODE	1	1N754A	80131
CR3	DIODE	1	1N462A	80131
Q1	TRANSISTOR	1	2N3055	80131
Q2	TRANSISTOR	3	2N4074	80131
Q3	Same as Q2			
Q4	Same as Q2			
R1	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	CB4705	01121
R2	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	2	CB6825	01121
R3	Same as R2			
R4	RESISTOR, FIXED, COMPOSITION: 270 kΩ, 5%, 1/4W	1	CB2745	01121
R5	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	CB1025	01121
R6	RESISTOR, FIXED, COMPOSITION: 9.1 kΩ, 5%, 1/4W	1	CB9125	01121
R7	RESISTOR, VARIABLE, FILM: 1 kΩ, 30%, 1/2W	1	62PAR1K	73138
R8	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4W	1	CB3925	01121
R9	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4W	1	CB1525	01121
R10	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	1	CB2215	01121
R11	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4W	1	CB8225	01121

REF DESIG PREFIX A8

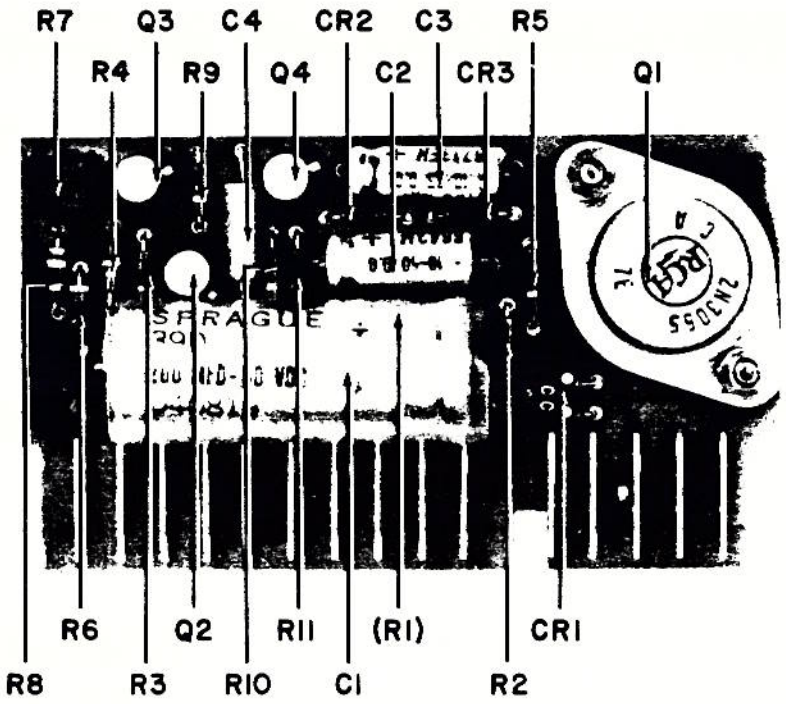


Figure 5-17. Type 76121A +24V Regulated Power Supply, Component Locations

5.4.10 Type 76124 +18V Power Supply Regulator

REF DESIG PREFIX A9

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, ELECTROLYTIC, ALUMINUM: 10 μF, -10+75%, 25V	1	30D106G025BB2	56289
C2	CAPACITOR, ELECTROLYTIC, ALUMINUM: 50 μF, -10+75%, 25V	1	30D506G025CC2	56289
CR1	DIODE	1	1N754A	80131
CR2	DIODE	1	1N462A	80131
Q1	TRANSISTOR	1	2N2270	80131
Q2	TRANSISTOR	3	2N4074	80131
Q3	Same as Q2			
Q4	Same as Q2			
R1	RESISTOR, FIXED, COMPOSITION: 27 Ω, 5%, 1/2W	1	EB2705	01121
R2	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	2	CB4725	01121
R3	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	CB1025	01121
R4	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4W	1	CB5625	01121
R5	RESISTOR, VARIABLE, FILM: 1 kΩ, 30%, 1/2W	1	62PAR1K	73138
R6	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4W	1	CB3925	01121
R7	RESISTOR, FIXED, COMPOSITION: 1.8 kΩ, 5%, 1/4W	1	CB1825	01121
R8	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	1	CB2215	01121
R9	Same as R2			
RA1	RADIATOR, TRANSISTOR	1	3AL635-2R	18915

REF DESIG PREFIX A9

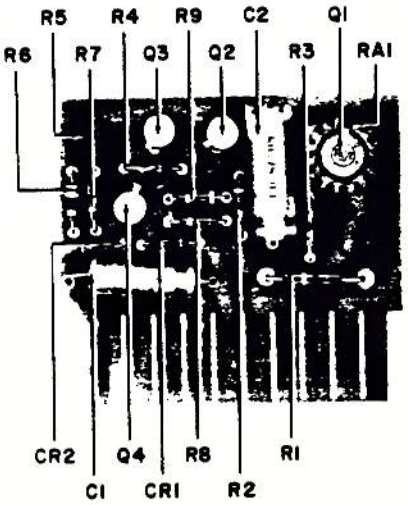


Figure 5-18. Type 76124 +18V Power Supply Regulator, Component Locations

SECTION VI

SCHEMATIC DIAGRAMS

Figure 6-1

REF DESIG PREFIX A1

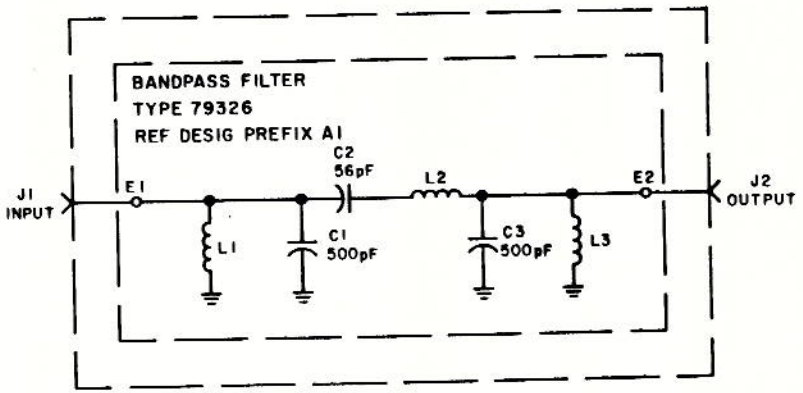
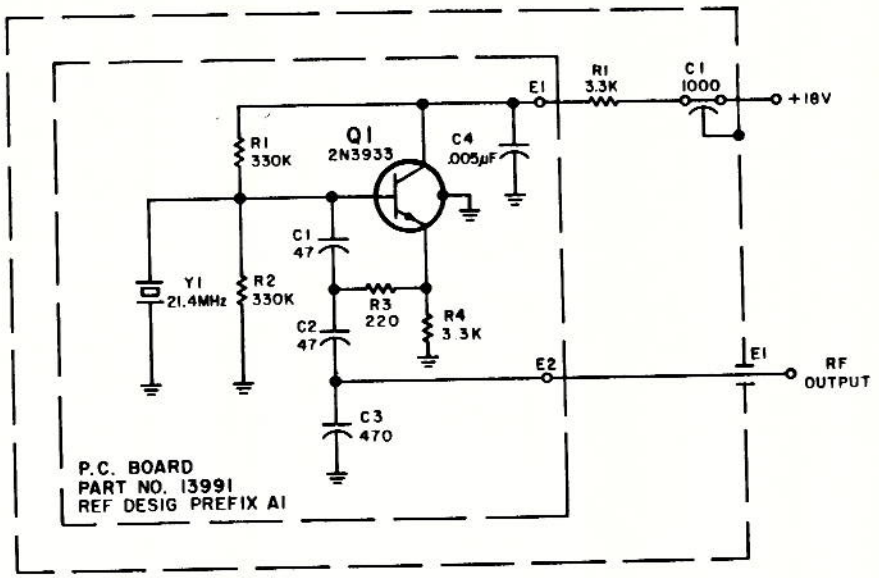


Figure 6-1. Type 79313 Bandpass Filter Assembly, Schematic Diagram

REF DESIG PREFIX A2



NOTES:
1. UNLESS OTHER SPECIFIED:
   A. RESISTANCE IS MEASURED IN OHMS, ± 5%, 1/4 W.
   B. CAPACITANCE IS MEASURED IN pF.

Figure 6-2. Type 8305 Crystal Oscillator Assembly, Schematic Diagram

Figure 6-3

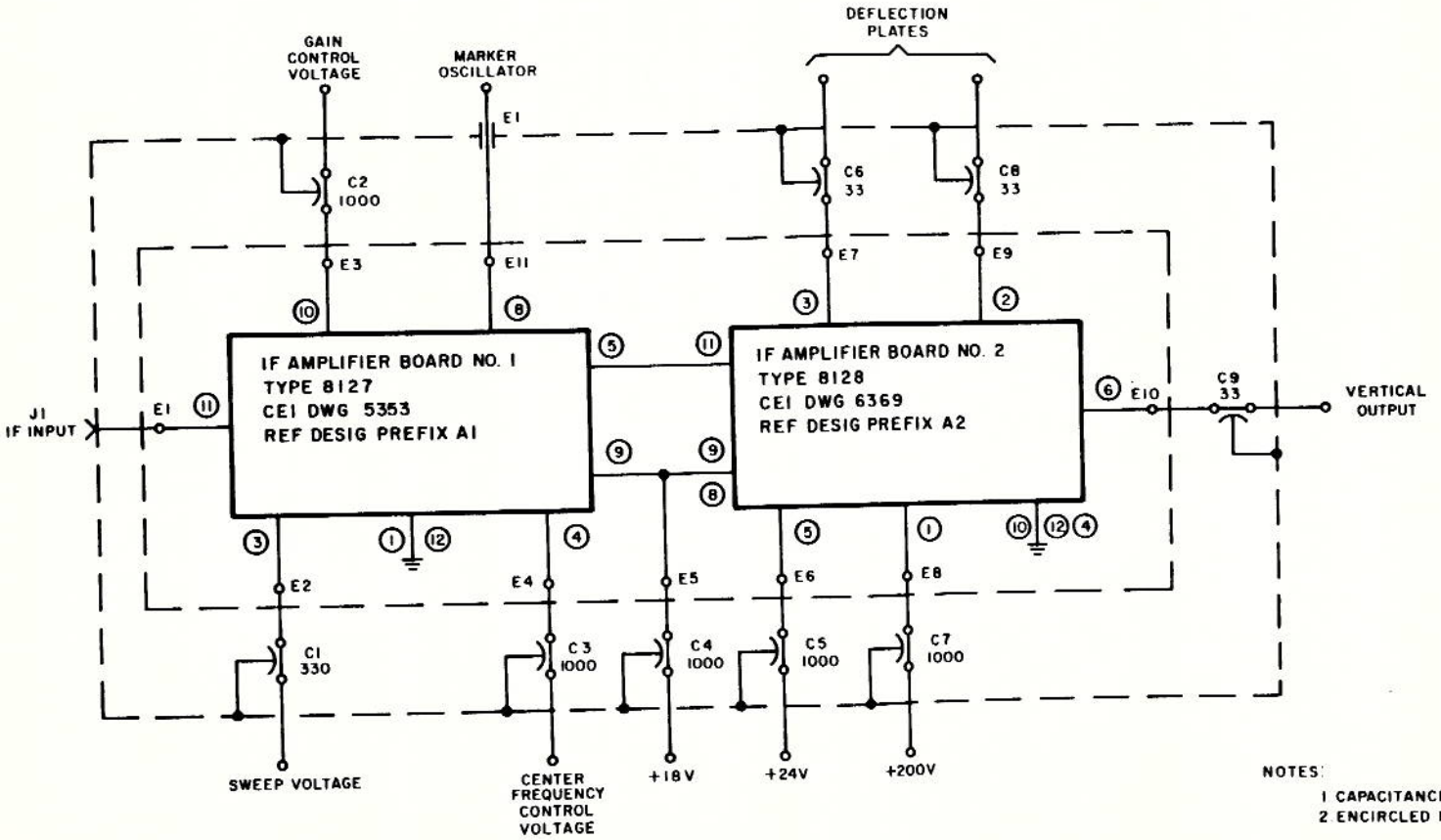


Figure 6-3. Type 8015 IF Amplifier Assembly, Schematic Diagram

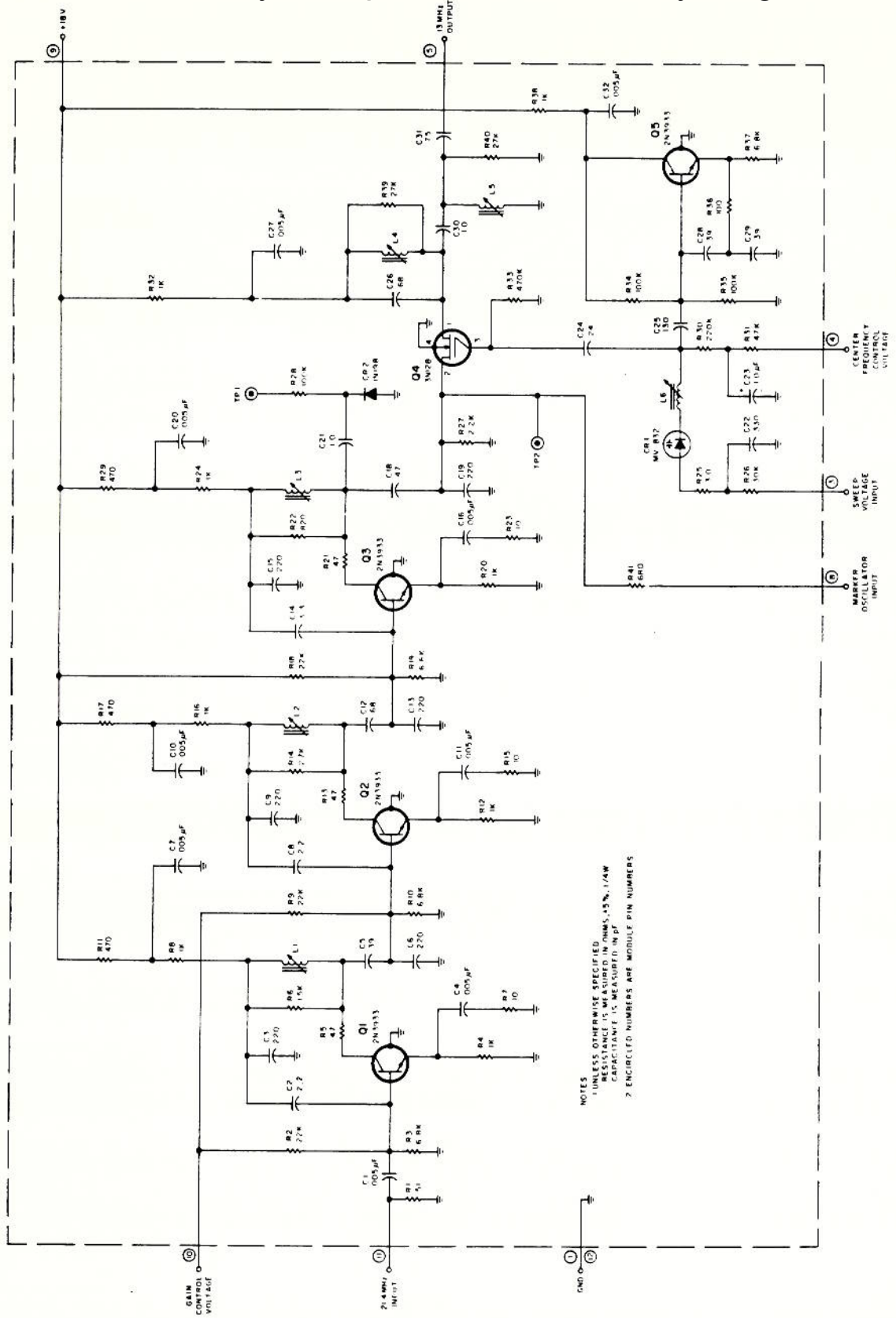


Figure 6-4. Type 8127 IF Amplifier Board No. 1, Schematic Diagram

Figure 6-5

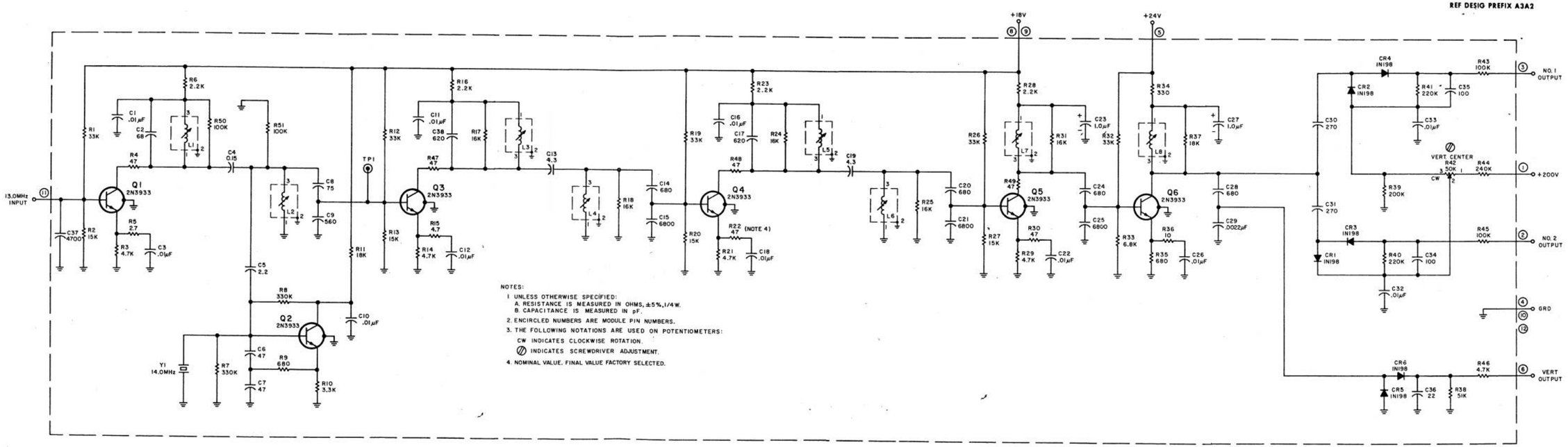
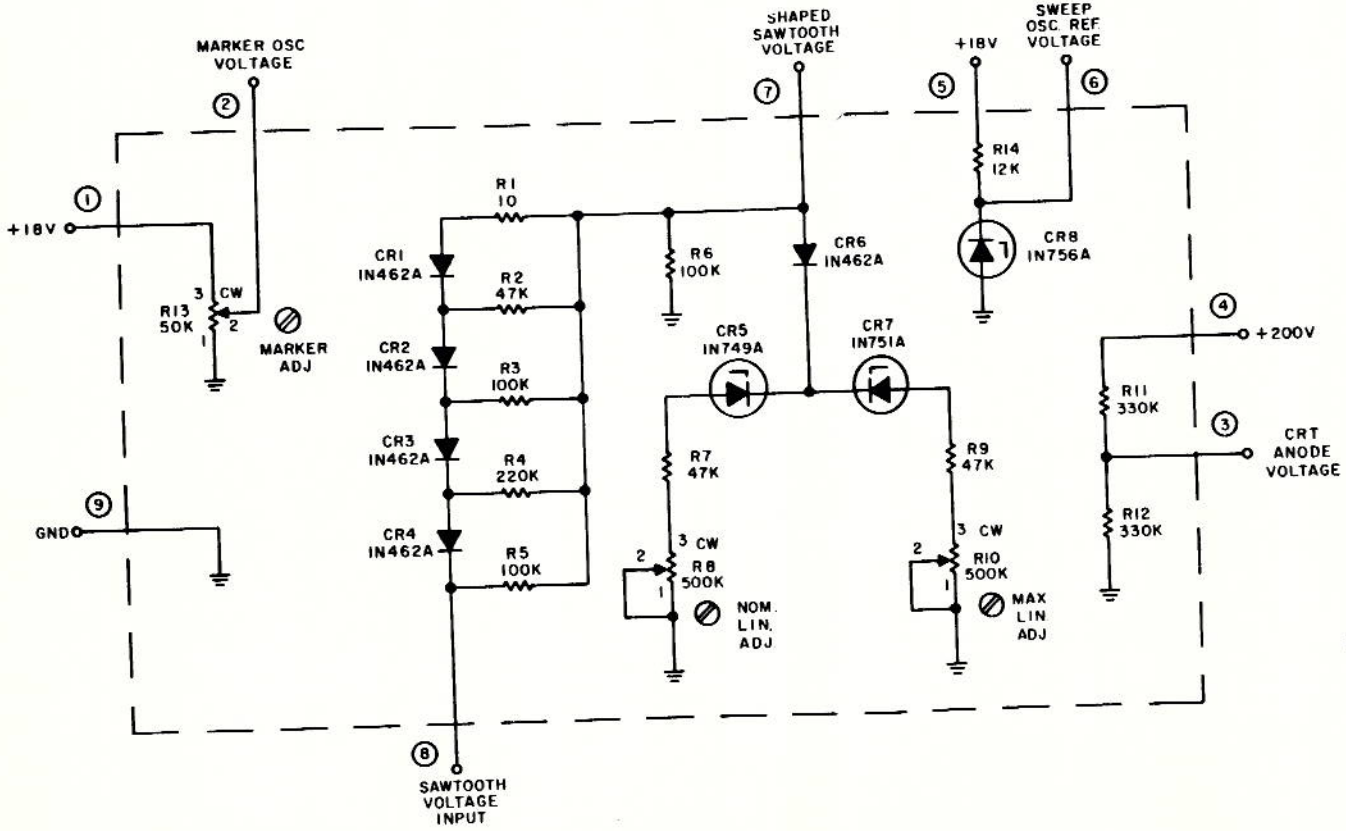


Figure 6-5. Type 8128 IF Amplifier Board No. 2, Schematic Diagram

REF DESIG PREFIX A4

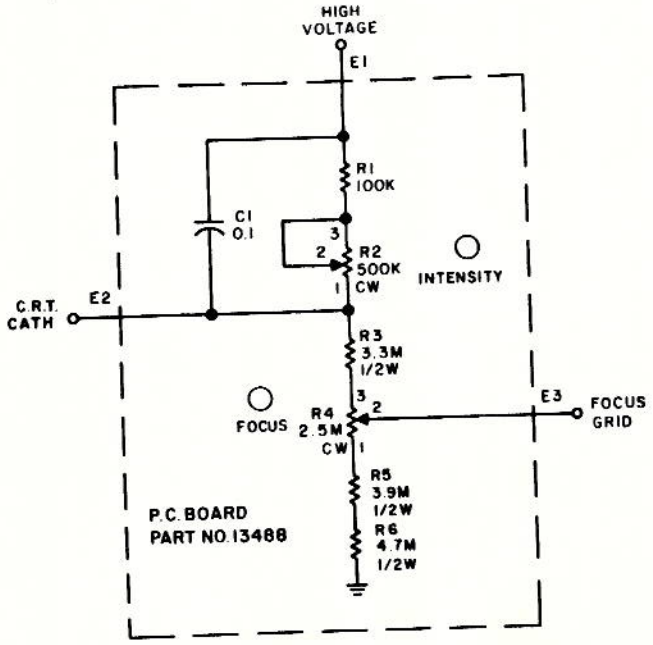


NOTES:

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

Figure 6-6, Type 79322 Component Board, Schematic Diagram

REF DESIG PREFIX A5



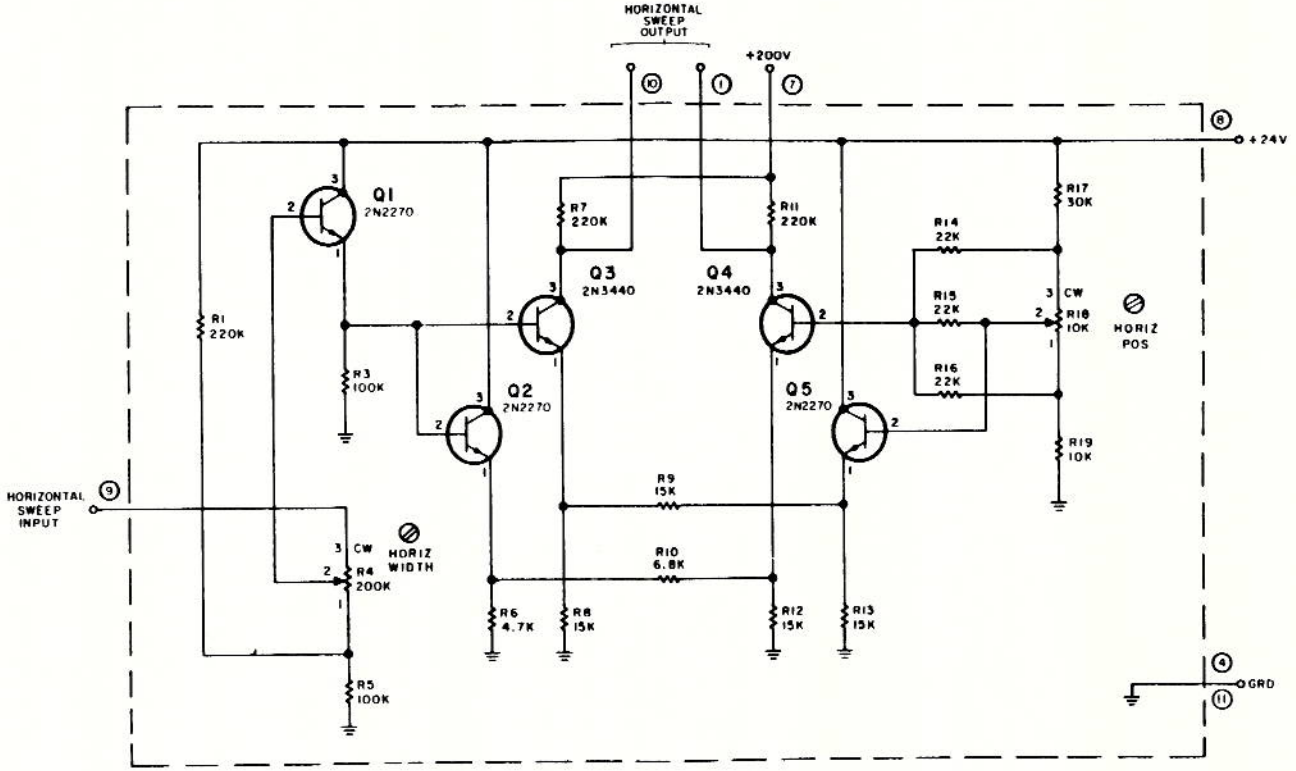
NOTES

1 UNLESS OTHERWISE SPECIFIED:
- a) RESISTANCE IS MEASURED IN OHMS, 5%, 1/4 W
- b) CAPACITANCE IS MEASURED IN μF

2 THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
- a) CW INDICATES CLOCKWISE ROTATION OF CONTROL KNOB
- b) ◯ INDICATES FRONT PANEL CONTROL

Figure 6-7. Part 13488, Focus and Intensity Board, Schematic Diagram

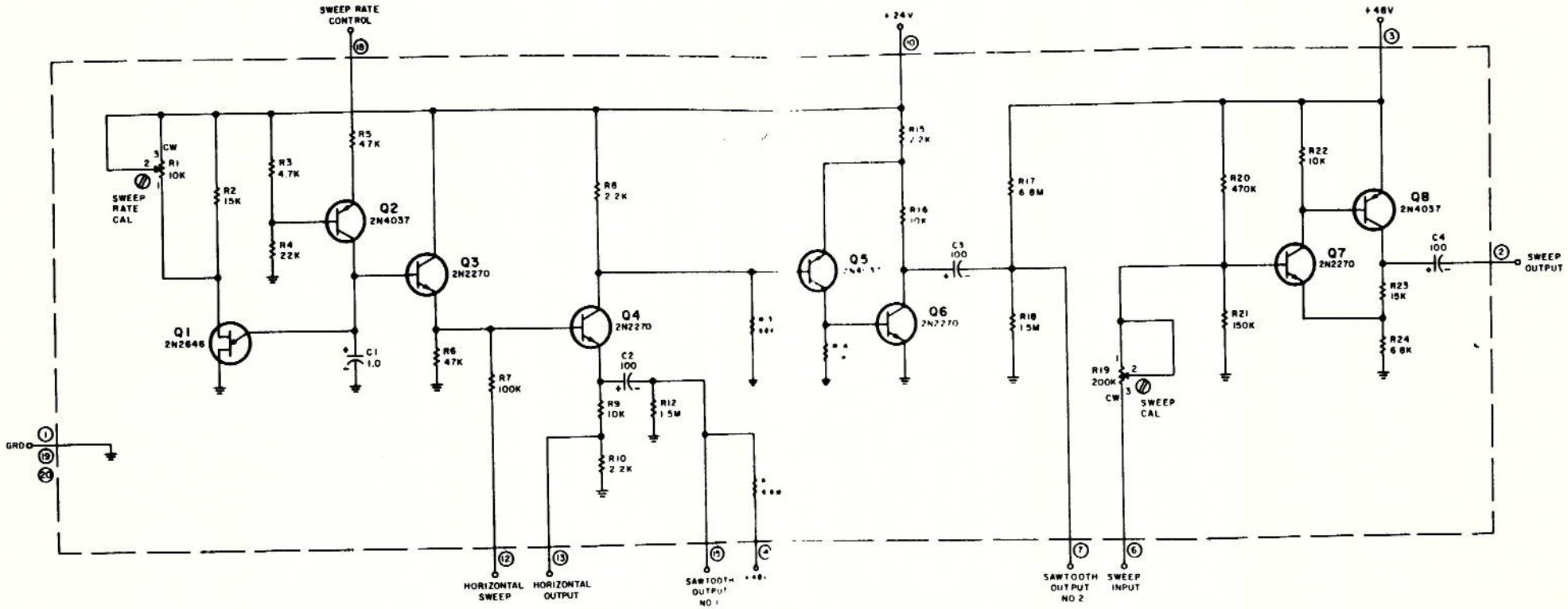
REF DESIG PREFIX A6



NOTES:
1. RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS
3. FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS
   - CW — INDICATES CLOCKWISE ROTATION
   - ⊘ — INDICATES SCREWDRIVER ADJUSTMENT

Figure 6-8. Type 823 Horizontal Amplifier, Schematic Diagram

REF DESIG PREFIX A7



NOTES:

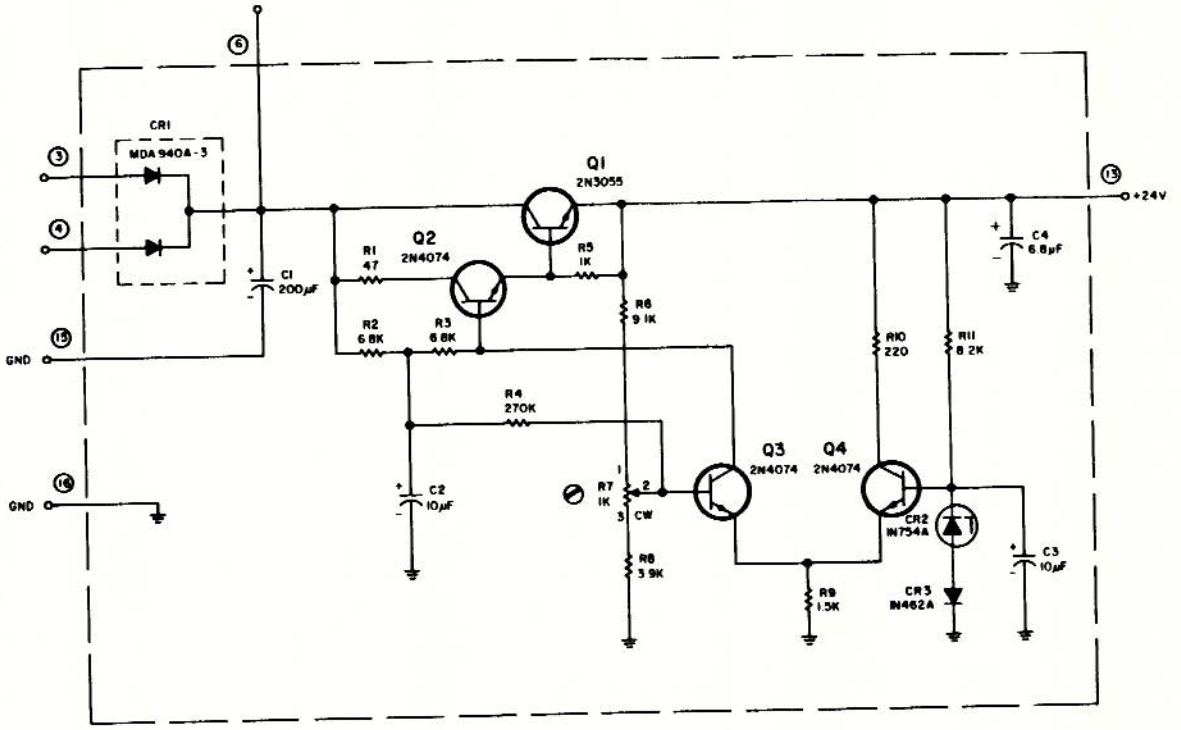
1 UNLESS OTHERWISE SPECIFIED
A RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4 W.
B CAPACITANCE IS MEASURED IN μF.

2 THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
CW INDICATES CLOCKWISE ROTATION.
⌀ INDICATES SCREWDRIVER ADJUSTMENT.

3 ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.

Figure 6-9. Type 8230 Sweep Generator, Schematic Diagram

REF DESIG PREFIX A8



NOTES

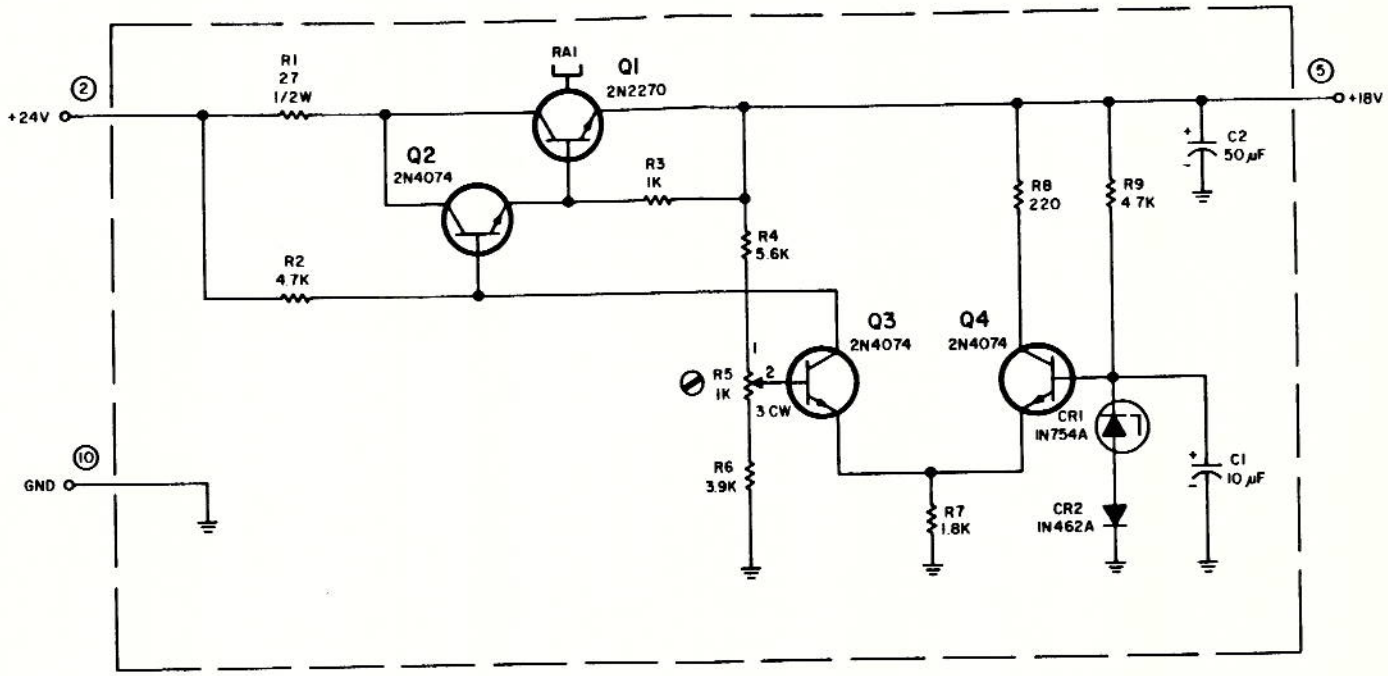
1 UNLESS OTHERWISE SPECIFIED
RESISTANCE IS MEASURED OHMS, ±5%, 1/4W

2 ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS

3 THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS
CW INDICATES CLOCKWISE ROTATION
⊘ INDICATES SCREWDRIVER ADJUSTMENT

Figure 6-10. Type 76121 +24V Regulated Power Supply, Schematic Diagram

REF DESIG PREFIX A9



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS
3. THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS
   CW INDICATES CLOCKWISE ROTATION
   ⊘ INDICATES SCREWDRIVER ADJUSTMENT

Figure 6-11. Type 76124 +18V Power Supply Regulator, Schematic Diagram

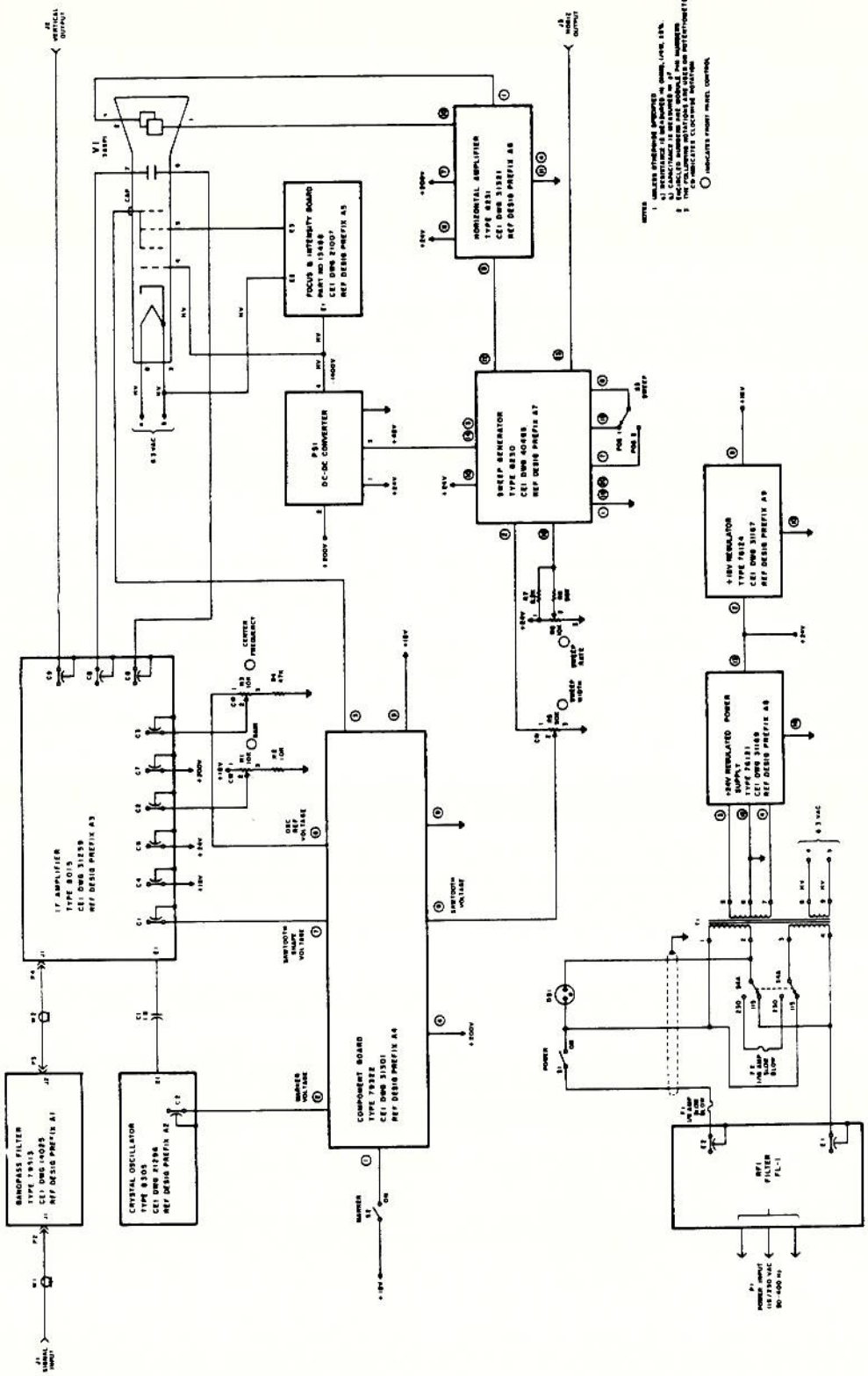


Figure 6-12. Types SM-9803A and SM-9804A Signal Monitors, Main Chassis, Schematic Diagram