INSTRUCTION MANUAL

FOR

TYPE SM-8421 SIGNAL MONITOR

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

3/13/73

ADDENDA

The following changes to this manual are required for use with Type SM-8421 Signal Monitors, SERIAL NUMBERS 12 AND ABOVE ONLY.

1. Main Chassis Parts List, Paragraph 5.4.1

Add: (1) R10, RESISTOR, VARIABLE, COMPOSITION: 500 Ω, 10%, 1/3W; Vendor Part No. RV6LAYSD501A; Vendor Code, 81349

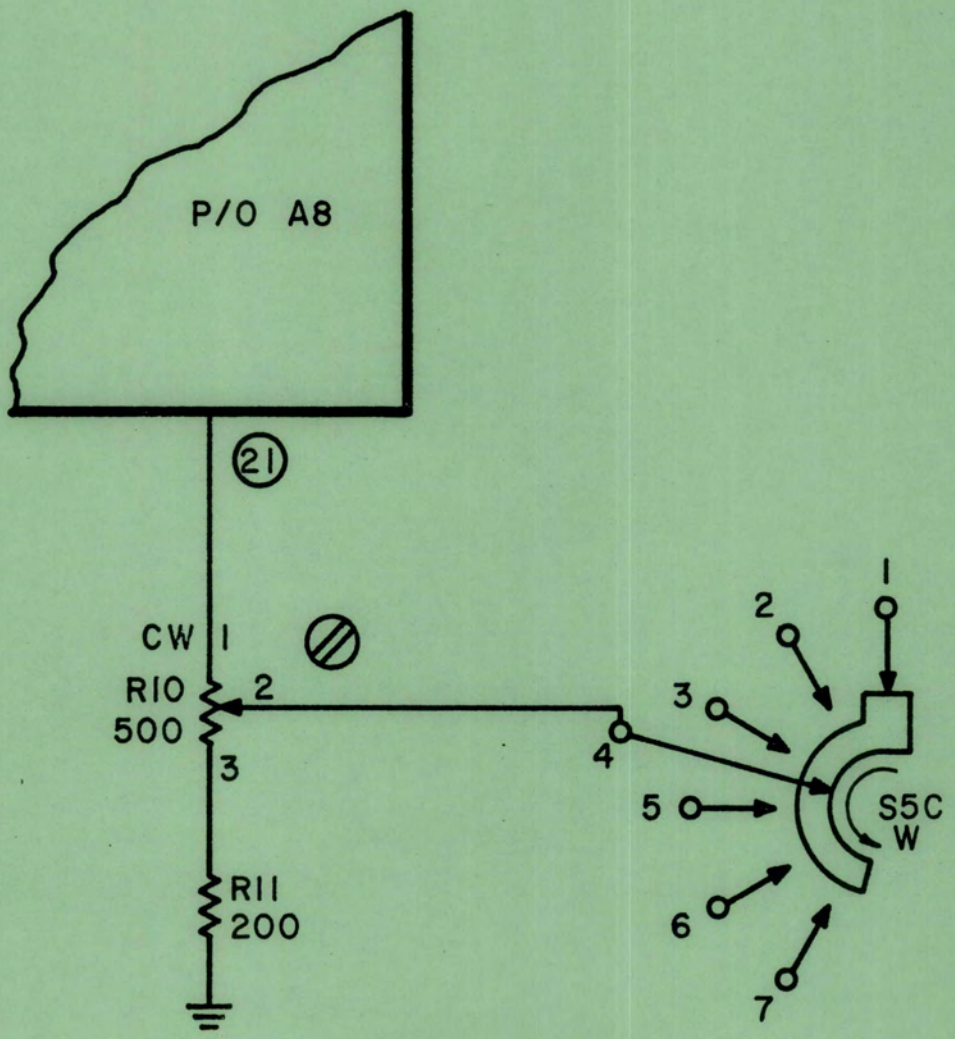
(2) R11, RESISTOR, FIXED, COMPOSITION: 200 Ω, 5%, 1/4W; Vendor Part No. RC07GF201J; Vendor Code, 81349

2. Change the alignment procedure (paragraph 4.6) as follows:

Change step 6 to: Adjust the signal generator frequency to exactly 40 kHz. Turn R10 fully clockwise. Adjust A8L1, A8L2, and A8L3 for maximum vertical deflection of the sweep. Reduce the input level as required.

Change step 22 to: Select the 50-kHz sweep width. Set the signal to 2 MHz, unmodulated, at at level of 10 μV. Turn the gain control fully clockwise. Set A1R1 to its midrange position. Adjust R10 for full-scale deflection of the pip. See step 25.

Add step 25 Steps 22, 23, and 24 serve two purposes: they set the overall gain and they also equalize the gain between the three sweep widths. Adjustments A1R1, A2R1, and A3R1 are use to equalize the gain between the three sweep widths. Adjustment R10 sets the overall gain. In step 22, setting A1R1 to its midpoint will usually allow equalization to be obtained with A2R1 and A3R1: However, R10 may be moved from this position as required to obtain equalization.



3. PAGE 6-3, FIG. 6-1, TYPE 8018 BANDPASS AMPLIFIER (A1), SCHEMATIC DIAGRAM.

Change C12 from 1100 pF to 1500 pF, and C13 from 1100 pF to 750 pF.

4. PAGE 5-9, TYPE 8018 BANDPASS AMPLIFIER (A1), PARTS LIST.

Change C12 from 1100 pF to 1500 pF, 5%, 500V, Qty. 1, Part No. CM06FD152J03. (The Vendor Code remains the same.)

Change C13 from Same as C12 to CAPACITOR, DIPPED, MICA: 750 pF, 5%, 500V, Qty. 1, Part No. CM06FD751J03, Vendor Code 81349.

5. PAGES 6-3 THROUGH 6-11, FIGURES 6-1 THROUGH 6-5, BANDPASS AND MIXER AMPLIFIERS (A1 THROUGH A5), SCHEMATIC DIAGRAMS.

Change Q1 and Q2 from 3N140 to 3N187.

6. PAGES 5-9 THROUGH 5-19, BANDPASS AND MIXER AMPLIFIERS (A1 THROUGH A5), PARTS LISTS.

Change Q1 and Q2 Part No. from 3N140 to 3N187, and Vendor Code from 80131 to 02735, with the note: Must be manufactured by RCA.

7. PAGE 6-9, FIGURE 6-4, TYPE 8021 MIXER AMPLIFIER (A4), SCHEMATIC DIAGRAM.

Change R22 from 27K to 51K.

8. PAGES 5-15 AND 5-16, TYPE 8021 MIXER AMPLIFIER (A4), PARTS LIST.

Change R22 from Same as R18 to RESISTOR, FIXED, COMPOSITION: 51K, 5%, 1/4W, Qty. 1, Part No. RCR07G513JS, Vendor Code 81349.

Change the Part No. of C1 from C023B101E103M to C023B101F103M.

9. PAGE 6-17, FIGURE 6-8, TYPE 8136 OUTPUT AMPLIFIER (A8), SCHEMATIC DIAGRAM.

Change Q1 from 3N140 to 3N187.

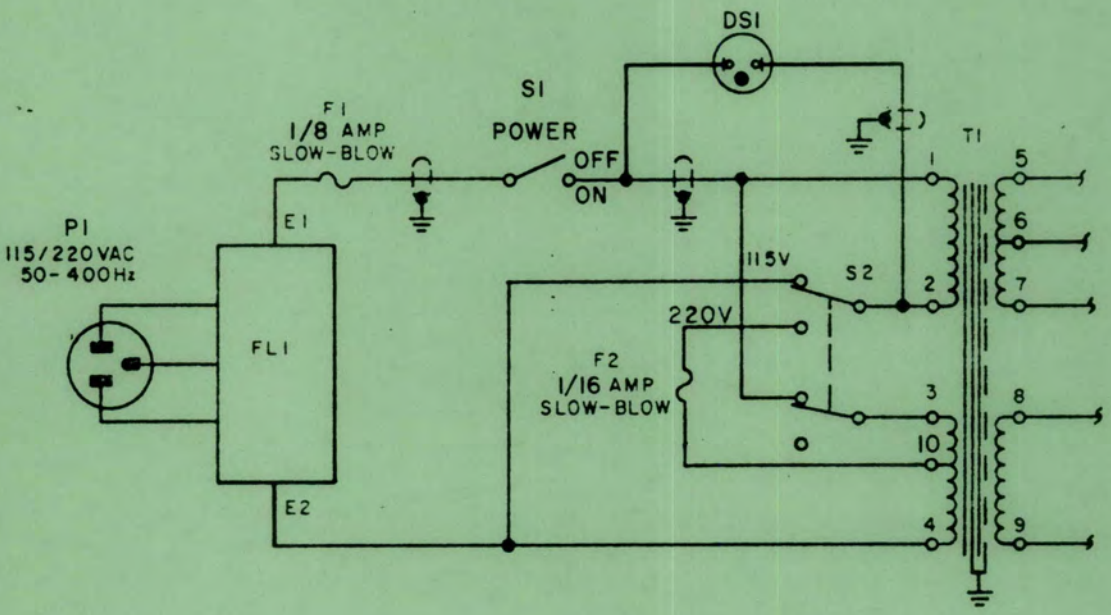
10. PAGES 5-23 AND 5-25, TYPE 8136 OUTPUT AMPLIFIER (A8), PARTS LIST.

Change Q1 Part No. from 3N140 to 3N187, and Vendor Code from 80131 to 02735, with the note: Must be manufactured by RCA.

Change C10 from Same as C7 to CAPACITOR, MYLAR, TUBULAR: 0.047 μF, 10%, 100V, Qty. 1, Part No. 663UW473-9-1-W, Vendor Code 26655.

11. PAGE 6-29, FIGURE 6-14, TYPE SM-8421 SIGNAL MONITOR, MAIN CHASSIS SCHEMATIC DIAGRAM.

Change the circuitry of the primary of transformer T1 to that shown below:



Show the cable from pin 1 on module A7 as connected to terminal 1 on switch S5C-W rather than terminal 3. Show cable from resistor R8 as connected to terminal 3 on switch S5C-W rather than terminal 1.

Add resistor R12, 10 Ω between pin 1 on module PS1 and the +24V source.

12. PAGE 5-7, TYPE SM-8421 SIGNAL MONITOR, MAIN CHASSIS PARTS LIST.

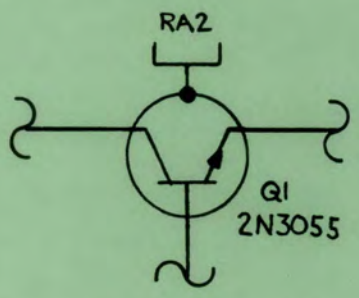
Add resistor R12, RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W, Qty, 1, Part No. RCR07G100JS, Vendor Code 81349.

13. PAGE 5-20, TYPE 76166 +18 V and +24 V REGULATED POWER SUPPLY PARTS LIST. (PARAGRAPH 5.4.11)

A. Add RA2*, Radiator, Transistor; Qty. 1; Part No. 6103B; Vendor Code 13103. Add * note as follows: *RA2 consists of 6103B top only.

14. PAGE 6-21, TYPE 76166 +18V and +24 V REGULATED POWER SUPPLY SCHEMATIC (FIGURE 6-10).

Add RA2 to Q1 as shown below:

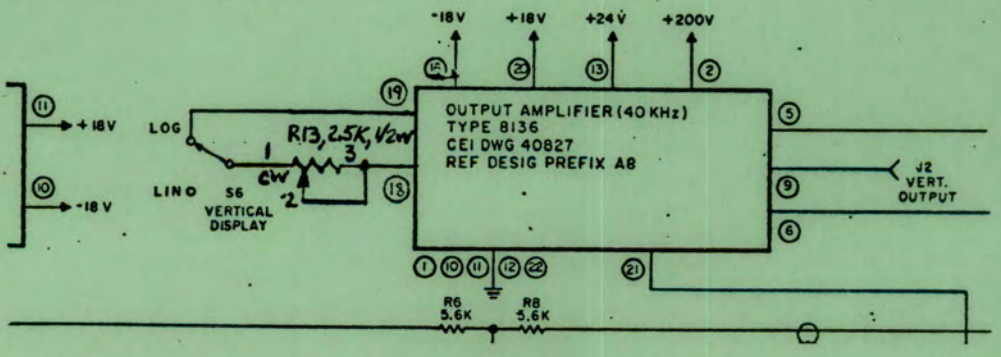


15. PAGE 5-7, TYPE SM-8421 SIGNAL MONITOR, MAIN CHASSIS PARTS LIST (PARAGRAPH 5.4.1).

Change R2 from: 2.2 kΩ; Part No. RC07GF222J to: 1.5 kΩ; Part No. RC07GF152J.
Change R9 from: 5.6 kΩ; Part No. RC07GF562J to: 4.7 kΩ; Part No. RC07GF472J.
Add R13 as follows: R13; Resistor, Variable, Composition: 2.5 kΩ, 10%, 1/2W; Qty. 1; Part No. RV6NAYSD252A; Vendor Code 81349.

16. PAGE 6-29, TYPE SM-8421 SIGNAL MONITOR, MAIN CHASSIS SCHEMATIC. (FIGURE 6-14).

Change R2 from: 2.2 kΩ to: 1.5 kΩ.
Change R9 from: 5.6 kΩ to: 4.7 kΩ.
Add R13 as shown below:



17. Section IV - Maintenance

A. Add paragraph 4.7 on page 4-4 as follows:

4.7 POWER SUPPLY CHECKS

1. Check the following points for the indicated voltage using a VTVM.

TEST POINT	REQUIRED VOLTAGES
A11 pin 19	-18 V dc
A10 pin 18	+18 V dc
A10 pin 13	+24 V dc (NOTE 1)
PS1 pin 2	200 V dc (NOTE 2)
PS1 pin 4	1400 V dc (NOTE 2)

NOTE 1: Adjust A10R7 for +24 ±0.5 V dc.
NOTE 2: Approximate voltage. Use high voltage, high resistance probe.

18. Section V - Replacement Parts List

A. Paragraph 5.4.1 SM-8421 Signal Monitor Main Chassis

1) Change XA1 from: Part No. 2VK22S/1-2; Mfr. Code 05574 to: Part No. 250-22-30-170; Mfr. Code 71785. (Page 5-7)

2) Add R14 as follows: RESISTOR, FIXED, COMPOSITION: 5.1 kΩ, 5%, 1/4W; Qty. 1; Part No. RCR07G512JS; Mfr. Code 81349. (Page 5-7)

B. Paragraph 5.4.9 Type 8136 Output Amplifier (A8)

1) Change C2 from: 0.01 μF; Qty. 1; Part No. 663UW103-9-1-W to: 0.047 μF; Qty. 2; Part No. 663UW-473-9-1-W. (Page 5-23)

C. Paragraph 5.4.14 Part 13488 Focus and Intensity Board (A13)

1) Change R4 from: 2.5 MΩ, 10%, 1/2W; Part No. RV5NAYSD255B; Mfr. Code 81349 to: 2.5 MΩ, 20%, 1W; Part 70A3N056L255M; Mfr. Code 01121. (Page 5-33)

19. Section VI - Schematic Diagrams

A. Figure 6-8 Type 8136 Output Amplifier (A8), Page 6-17.

1) Change C2 from: 0.01 μF to: 0.047 μF.

B. Figure 6-14 SM-8421 Signal Monitor Main Chassis; Page 6-29

1) Add R14 as shown below:

SM-8421

20. Section V - Replacement Parts List

A. Paragraph 5.4.12; Type 76168 -18 V Regulated Power Supply (A11)

1) Change quantity of CR3 from: 1 to: 2.

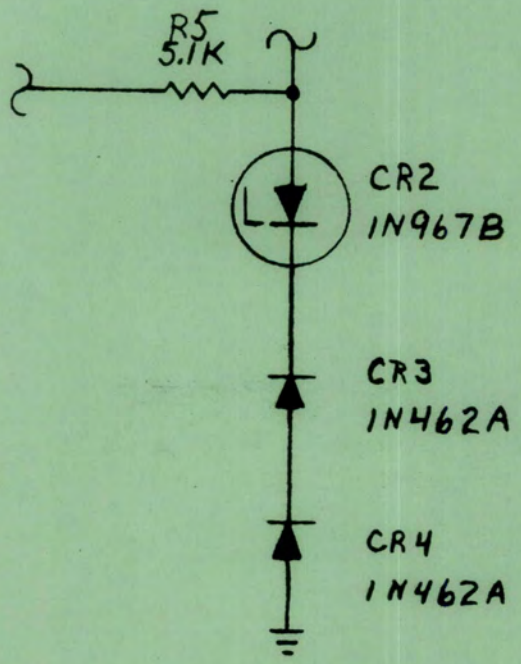
B. Paragraph 5.4.14; Part 13488 Focus and Intensity Board (A13)

1) Change R2 from: 500 k, 10%, 0.5W Linear; Part No. RV5NAYSD504A to: 500 k, 10%, 1W Linear; Part No. 70A3N056L504U; Vendor Code 01121.

21. Section VI - Schematic Diagrams

A. Figure 6-11; Type 76168 -18 V Regulated Power Supply (A11), Page 6-23.

1) Add CR4 as shown below.



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LIST OF ILLUSTRATIONS

Table 1-1. Type SM-8421 Signal Monitor, Specifications

Number of Inputs	One, type BNC
Input Impedance	50 ohms
Input Center Frequency	2 MHz
Input Bandwidth	65 kHz, 20 kHz, or 4 kHz, switched by front-panel Sweep Width control
Sweep Width	50 kHz, 15 kHz, or 3 kHz, switched by front-panel control
Sweep Linearity	Linear overall to within 5% of the total sweep width
Sweep Rate	
50-kHz Sweep Width	12 Hz, approximately
15-kHz Sweep Width	8 Hz, approximately
3-kHz Sweep Width	3 Hz, approximately
Intermediate Frequencies	455 kHz, 260 kHz, and 40 kHz
Local Oscillator Frequencies	
1st Local Oscillator	2.445 MHz, crystal controlled
2nd Local Oscillator	715 kHz, ±1/2 sweep width
3rd Local Oscillator	300 kHz, crystal controlled
Resolution	
50-kHz Sweep Width	Minimum 6-dB valley between signals 2.5 kHz apart
15-kHz Sweep Width	Minimum 6-dB valley between signals 1.2 kHz apart
3-kHz Sweep Width	Minimum 6-dB valley between signals 250 Hz apart
Image Rejection	60 dB, minimum
IF Rejection	60 dB, minimum
Sensitivity	10 μV input at 2 MHz produces at least one-inch deflection on the CRT
Outputs	Two: BNC Auxiliary Vertical and Horizontal Outputs
Gain Control Range	60 dB, minimum
Crystal Marker	
Frequency	455 kHz
Tolerance	±0.01%
Amplitude Scales	
Linear	A signal 20-dB down from the value that produces 100% vertical deflection will produce 10% deflection
Logarithmic	A signal 40-dB down from the value that produces 100% deflection will produce 10% deflection
CRT Display Type	3ASP1
Front Panel Controls	Center Frequency; Sweep Width; Gain; Marker On/Off; Vertical Display Lin/Log; Power; Intensity; Focus; Sweep Disable
Power Input	115/230 volts, 50-400 Hz
Power Consumption	15 watts, approximately
Weight	12 lbs., approximately
Size	3.5 inches high, 19 inches wide, 15.5 inches deep

Figure 1-1. Type SM-8421 Signal Monitor, Front View

SECTION I

GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

The CEI Type SM-8421 Signal Monitor is designed to provide a visual display of signals when operated with a receiver having an IF output of 2 MHz. Selection of the display bandwidth automatically sets the resolution to provide a 6-dB valley between signals 2.5 kHz apart when the 50-kHz sweep is selected. Resolutions of 1.2 kHz for a sweep width of 15 kHz, and 250 kHz for a sweep width of 3 kHz are also provided. There are two amplitude response modes: linear and logarithmic. When the linear mode is selected, a signal 20 dB down from the value that produces 100% vertical deflection will produce a 10% deflection. When the logarithmic mode is selected a signal 40 dB down from that causing 100% deflection will produce a 10% deflection. A center frequency marker is activated, when selected from the front panel, to facilitate centering of the display with the center frequency control. A 10-μV input signal will produce at least one inch of vertical deflection on the CRT. All active components in the SM-8421 are solid state except for the cathode ray tube. The performance specifications are listed in Table 1-1.

1.2 MECHANICAL CHARACTERISTICS

The type SM-8421 signal monitor is designed to be mounted in a standard 19-inch rack. All normal operating controls are front-panel mounted. The front-panel controls which are shown in Figure 1-1, are: CENTER FREQUENCY, SWEEP WIDTH, GAIN, MARKER ON/OFF, VERTICAL DISPLAY LIN/LOG, POWER, INTENSITY, FOCUS, and SWEEP DISABLE. The fuse sockets, the 115/230 Vac slide switch S4, and the input and output jacks are located on the rear apron. The SIGNAL INPUT jack, J1, the VERT OUTPUT jack, J2, and the HORIZ OUTPUT jack, J3, are type BNC connectors. The sweep direction switch, S3, is also located on the rear panel. Additional controls which require infrequent use are located internally.

1.2.1 The front panel, main chassis, and dust covers are constructed of aluminum. The front panel is overlaid with a black-anodized etched plate. The circuit assemblies are constructed on printed circuit boards that plug into recepticals mounted on the main chassis. The CRT display is centered in the front panel and is surrounded by a magnetic shield.

Figure 2-1

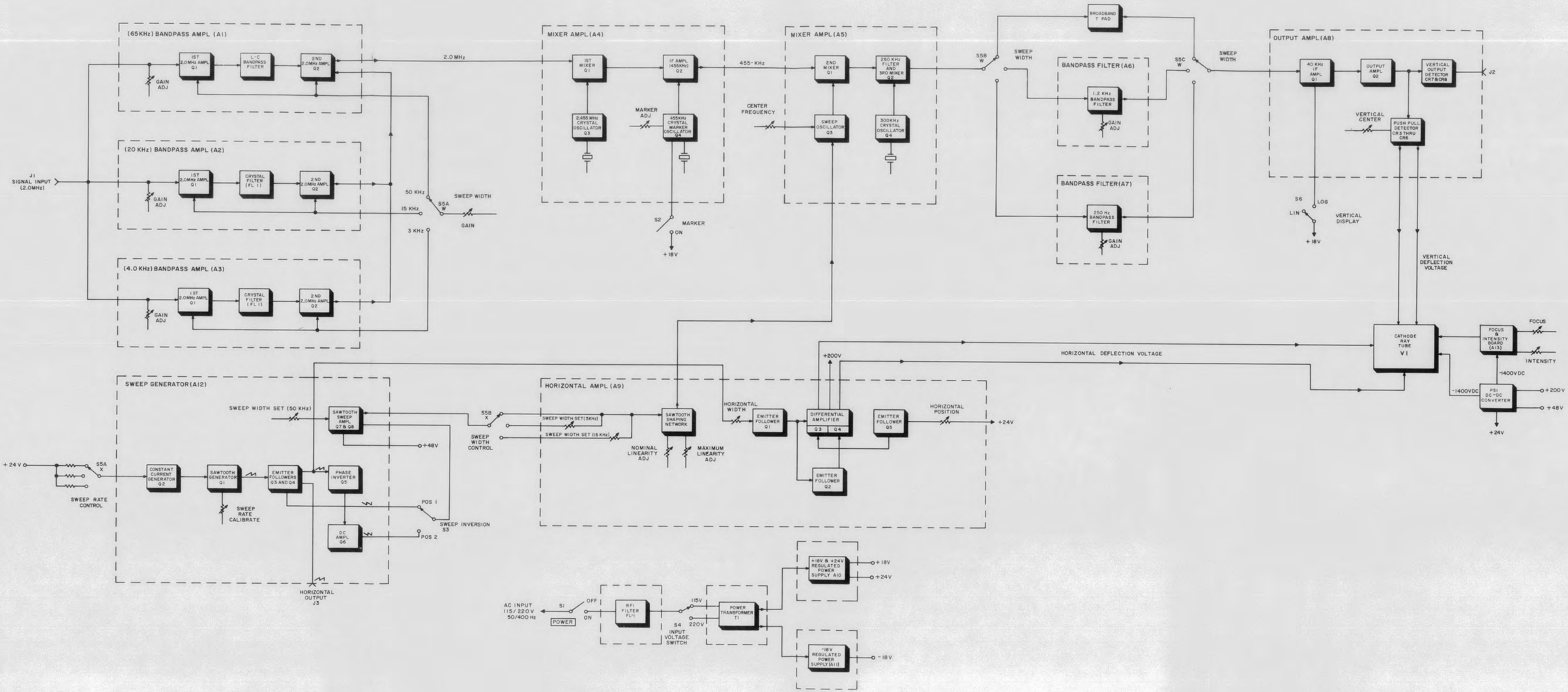


Figure 2-1. Type SM-8421 Signal Monitor, Functional Block Diagram

SECTION II

CIRCUIT DESCRIPTION

2.1 GENERAL

The operation of the Type SM-8421 Signal Monitor is explained in the following paragraphs using the functional block diagram, Figure 2-1, and the schematic diagrams included in Section VI of this manual. This signal monitor can be used to provide a spectral analysis of the 2.0-MHz mixer output signal from any appropriate receiver or tuner. The sweep width is set by a front panel control to 50 kHz, 15 kHz, or 3 kHz. As the sweep width is changed, the resolution is also changed. With the 65-kHz sweep width selected, there will be a minimum valley of 6 dB between signals 2.5 kHz apart; with the 15-kHz sweep width selected, there will be a minimum valley of 6 dB between signals 1.2 kHz apart; and with the 3-kHz sweep width selected, there will be a minimum valley of 6 dB between signals 250 Hz apart.

2.2 FUNCTIONAL DESCRIPTION

2.2.1 The 2.0 MHz input signal is first amplified by the selected bandpass amplifier. One of three amplifiers is selected by biasing on the transistors in the unit. With the SWEEP WIDTH control S5 positioned as shown in Figure 2-1, the 65-kHz bandpass amplifier, A1, is selected. The incoming signal is first amplified by A1Q1. The bandpass is then set at 65 kHz by the L-C bandpass filter, and then the signal is further amplified by A1Q2. The signal is then applied to the mixer amplifier, A4. The first mixer, A4Q1, heterodynes the 2.0-MHz input signal with the 2.455-MHz signal from crystal-controlled oscillator A4Q3 to produce an IF signal of 455 kHz. IF amplifier A4Q2, is used to amplify the signal as well as to mix in the 455-kHz marker signal from A4Q4, a crystal controlled marker oscillator. The marker can be turned on or off by S2. The 455-kHz signal is applied to a second mixer amplifier board A5. The second mixer, A5Q1, mixes the output of the sweep oscillator, A5Q3, with the 455-kHz IF signal. The sweep oscillator's center frequency can be adjusted to center the 455-kHz marker on the CRT. The 260-kHz signal from A5Q1 is heterodyned with the 300-kHz output signal from crystal-controlled oscillator, A5Q4, in the third mixer A5Q2. The 40-kHz signal resulting from the mixing action is applied to one of three bandpass filters, depending on which sweep width has been selected. The broad band T-Pad is used when the 50-kHz sweep width is selected. The 1.2-kHz bandpass filter (A6) will be used in conjunction with the 15-kHz sweep width and for the 3-kHz sweep width the 250-Hz bandpass filter (A7) will be used.

2.2.2 The vertical deflection voltage for the CRT (V1) is generated by output amplifier A8. The 40-kHz input signal is amplified by A8Q1 which in turn drives output amplifier A8Q2. Amplifier A8Q1 will provide a linear or log vertical signal depending on the setting of VERTICAL DISPLAY switch S6. Push-pull detector CR3 through CR6 provides the driving voltage to the vertical deflection plates of V1. The vertical position of the trace is by the vertical center control. The focus and intensity board, A13, contains the controls necessary for a sharp display while PS1 a DC to DC converter, provides the high voltage for the second anode of V1 and its associated deflection circuits.

2.2.3 The sawtooth wave that is used to drive the sweep oscillator, A5Q3, and the horizontal amplifier (A9) originates in the sweep generator, A12. This explains how syncronization is maintained between the incoming signal and its position on the display. The sweep rate is automatically set when the sweep width is selected. By varying the current amplitude of constant current generator A12Q2, the output frequency of sawtooth generator A12Q1 is varied, but because it is a unijunction relaxation oscillator, the amplitude of the sawtooth output will not vary. Cascade emitter followers A12Q3 and A12Q4 drive the sawtooth sweep amplifier (A12Q7 and A12Q8) directly, or through a phase inverter (A12Q5) and a DC amplifier (A12Q6) depending on the setting of S3. This arrangement is included so that the frequency of the displayed signals increases from left to right on the screen regardless of whether a high beat or low beat LO is being used in the tuner of the associated receiver. The output waveform of the sawtooth sweep amplifier is modified by the sawtooth shaping network in the horizontal amplifier (A9) to compensate for the nonlinear response of the Varicap which is used to drive the sweep oscillator. Controls are provided to adjust the positive portion of the slope of the sawtooth to maximize the linearity of the sweep. The sweep width is set at 15 kHz or 3 kHz when the 20-kHz or 4-kHz bandwidths are selected. The sawtooth waveform from emitter followers A12Q3 and A12Q4 is applied to emitter follower A9Q1 in the horizontal amplifier. This stage supplies two outputs. One is fed to emitter follower A9Q2 which, in turn, drives A9Q4, one half of a differential amplifier. The remaining output from A9Q1 drives the other half of the differential amplifier A9Q3. The horizontal width of the trace is set by controlling the sawtooth signal amplitude with the horizontal width control. The horizontal position is set by varying

the reference voltage on A9Q4 and the feedback to A9Q3 with the horizontal position control. The differential amplifier drives the horizontal deflection plates of the CRT (V1).

2.2.4 The AC input power is filtered by FL1 and applied to the dual primary windings of T1. The primaries are series connected through S4 for 220V operation and parallel connected for 115V operation. The secondary supplies power to the -18V regulated power supply (A11) and to the +18V and +24V power Supply (A10).

2.3 TYPE 8018 BANDPASS AMPLIFIER

The schematic diagram for the type 8018 bandpass amplifier is Figure 6-1; its reference designation is A1. The purpose of this amplifier is to set the passband for an incoming signal at 65 kHz with a center frequency of 2.0 MHz.

2.3.1 Bandpass Amplifiers. - The two amplifiers, Q1 and Q2, are dual IGFET (insulated gate, field-effect transistors). They are gated on when the 50-kHz sweep width is selected by the application of a positive manual gain control voltage to gate 2 (pin 2). This bias voltage is applied to Q1 from a voltage divider consisting of R3 and R4, and to Q2 from a voltage divider made up of R10 and R11. Capacitors C2 and C3 filter the gain control voltage.

2.3.2 Filter and Output Amplifier. - The RF input signal is coupled through C1 to an input attenuator consisting of potentiometer R1 and fixed resistor R2. DC bias between gate 1 (pin 3) and the source (pin 4) of Q1 is established by R1, R2, and R6. Capacitor C4 is the RF bypass for the source. The amplified signal from the drain (pin 1) of Q1 is coupled through R7 to a double-tuned network consisting of L1, C5, C6, C7, and L2. This filter has sharp skirts and a slightly overcoupled response. The signal from the double-tuned filter is coupled directly from a capacitive voltage divider (C8, C9, C14) to gate 1 of Q2, the output amplifier. The drain circuit of this amplifier is single-tuned by L3 in conjunction with voltage dividing capacitors C12 and C13. The low impedance output at pin 4 is fed to the first mixer-amplifier A4. The output single-tuned filter and impedance matching voltage divider in this circuit also provides the drain load for the output amplifier of the 20-kHz and 4-kHz bandpass amplifiers, A2 and A3 respectively. Each of the three bandpass amplifiers has a gain adjustment in the input amplifier circuit to provide uniform signal strength to the first mixer amplifier, regardless of the bandwidth selected.

2.4 TYPE 8019 BANDPASS AMPLIFIER

The schematic diagram for the type 8019 bandpass amplifier is Figure 6-2; its reference designation prefix is A2. The purpose of this amplifier is to set the 3-dB passband of an incoming 2-MHz signal at 20 kHz.

2.4.1 Bandpass Amplifiers. - The two amplifiers in ths subassembly, Q1 and Q2, are gated on when the 15-kHz sweep width is selected by S5. Selection of the 3- or 50-kHz sweep widths results in the application of -7.8V to gate 2 of both Q1 and Q2, driving them into cut-off. This ensures that no signal feedthrough will occur in the unused amplifier.

2.4.2 Filter and Output Amplifier. - The input signal is coupled through C1 to an input attenuator comprised of R1 and R2. The amplified signal from Q1 is taken at the drain and coupled through C6 to the crystal filter, FL1. This filter sets the bandpass at 20 kHz. The output from the crystal filter is fed directly to gate 1 of Q2. The drain of Q2 shares a common load with the output amplifiers of A1 and A3. This load consists of a single-tuned filter located in A1.

2.5 TYPE 8020 BANDPASS AMPLIFIER

The schematic diagram for the type 8020 bandpass amplifier is Figure 6-3; its reference designation prefix is A3. The operation of this unit, except for the bandpass of FL1, which is 4 kHz, is identical to the type 8019 bandpass amplifier. For a description of the filter circuit, refer to paragraph 2.4.

2.6 TYPE 8021 MIXER AMPLIFIER

The schematic diagram for the type 8021 mixer amplifier is Figure 6-4; its reference designation prefix is A4. The purpose of this mixer amplifier is to convert the 2-MHz IF input signal to an IF signal with a center frequency of 455 kHz, and to add a marker to the output signal at the 455-kHz point when the center marker is selected.

2.6.1 First Mixer. - The 2-MHz input signal is coupled through R1 to gate (pin 3) of Q1, the mixer/amplifier stage. Diodes CR1 and CR2 limit signals in excess of 1.2V peak-to-peak to prevent damage to Q1. Inductor L4 provides a low-impedance dc path to ground for gate 1 (pin 3) to prevent distortion that may be caused by low modulation rates. The 2.455-MHz oscillator signal is applied to gate 2 (pin 2) to be mixed with the 2-MHz input signal. This mixing action produces a 455-kHz IF signal at the drain (pin 1) of Q1. The IF signal is then passed by a double-tuned filter to output amplifier Q2. The first half of the filter, comprised of C2, C3, and L1, is coupled through C4 to the second half comprised of L2, C5, and C6. To achieve sharp selectivity, high Q circuits are used for the interstage filters. Since this causes excessive voltage gain, C5 and C6 are connected in a voltage dividing configuration to properly match the signal level into Q2.

2.6.2 Crystal Oscillator. - The frequency of the 2.455-MHz Colpitts oscillator, Q3, is set by crystal Y1. Feedback is coupled from the source (pin 2) to the gate (pin 3) through C14 to sustain oscillations. Diode CR4 causes the average voltage on the gate of Q3 to decrease below ground after oscillations begin to limit the overall conductance through Q3 by charging C13. The oscillator output is coupled through C16 to gate 2 (pin 2) of Q1.

2.6.3 Output Amplifier. - Output amplifier Q2 is biased to operate as a bandpass amplifier. The single-tuned circuit in the drain, comprised of L3, C10, and C11, is used to fill in the overcoupled response of the interstage filter, giving the overall mixer amplifier a relatively flat response with a 3-dB bandwidth of 65 kHz.

2.6.4 Marker Oscillator. - Crystal-controlled oscillator Q4 will inject a marker at the 455-kHz IF center frequency when selected. When the marker is selected, +18V is applied to the marker control voltage input terminal, pin 12. When the marker is turned off, conduction through Q4 will stop and the source voltage will decrease rapidly. Diode CR5 clamps the source at -0.6V to prevent a source-to-gate failure in Q4. The marker amplitude is set by controlling the oscillator current with variable resistor R23. The 455-kHz IF output at pin 22 is applied to pin 21 of the second mixer amplifier, A5.

2.7 TYPE 8022 MIXER AMPLIFIER

The schematic diagram for the type 8022 mixer amplifier is Figure 6-5; its reference designation prefix is A5. The purpose of this mixer amplifier is to mix the 455-kHz IF signal with a sweeping oscillator to produce a 260-kHz signal when the sweeping oscillator and the input signal are coincident in frequency. This 260-Hz signal is then mixed with a 300-kHz signal from a crystal controlled oscillator to produce a 40-kHz output signal.

2.7.1 Second Mixer. - The input signal, from the first mixer amplifier, A4, is applied through R1 to gate 1 (pin 3) of the first mixer, Q1. Diodes CR1 and CR2 clip incoming signals in excess of 1.2V peak-to-peak to prevent damage to Q1. The sweeping oscillator signal is applied to gate 2 (pin 1) of Q1 to be mixed with the incoming signal. The drain circuit of Q1 is comprised of 4 tuned networks. Each of these tuned circuits is adjustable (L1 through L4) to allow synchronous tuning to 260 kHz. The use of four high-Q tuned circuits provides sharp response skirts with a 2-kHz bandpass, and excellent image and mixer oscillator rejection prior to the final conversion at the last mixer, Q2.

2.7.2 Sweep Oscillator. - The Colpitts sweeping oscillator, Q3, is frequency modulated by changing the voltage applied to the anode of CR5, a voltage variable capacitor. The voltage applied to this device is a sawtooth wave which is shaped to compensate for the non-linear voltage to capacity relationship of CR5. Inductor L6 is adjustable to allow setting the center frequency to exactly 715 kHz. Diode CR6 allows a negative charge to build on C15 to limit conduction through Q3 and thereby limit the oscillator output amplitude.

2.7.3 300-kHz Crystal Oscillator. - The beat frequency signal for the final conversion at Q2 is provided by crystal controlled oscillator Q4. The frequency of this oscillator is set at 300 kHz by Y1. This signal is coupled from the source of Q4 through C25 to gate 2 (pin 2) of the final mixer Q2. The amplitude is limited by CR7 as it allows a negative charge to accumulate on C21, reducing the average conduction of Q4. The 40-kHz output signal at the drain (pin 1) of Q2 is single-tuned by L5 and C10 before being applied to the output voltage divider C11 and C12 which is also included in the final tuned circuit. The output at pin 1 is applied to one of three final bandpass filters, depending on the sweep width selected.

2.8 TYPE 8023 BANDPASS FILTER

The schematic diagram for the type 8023 bandpass filter is Figure 6-6; its reference designation prefix

is A6. The purpose of this filter is to provide additional selectivity when the 15-kHz sweep width is selected. An input attenuator, R1 and R2, provides a means to normalize the signal to the 50-kHz sweep width when this path is selected. The type 8023 bandpass filter is a passive L-C filter with 5 sections, all tuned to the 40-kHz center frequency and loosely coupled from one section to the next to provide sharp selectivity with a 1.2-kHz passband. The input signal is coupled from the input attenuator, R1 and R2, through C1 into the first filter section made up of C1, C2, and L1. The output signal is taken from a capacitive voltage divider (C10 and C11) which forms part of the final filter section. The output signal is fed through a section of the sweep width control to output amplifier A8.

2.9 TYPE 8024 BANDPASS FILTER

The schematic diagram number for the type 8024 bandpass filter is Figure 6-7; its reference designation prefix is A7. This bandpass filter functions in the same way as the type 8023 bandpass filter described in paragraph 2.8, except that the bandpass of this filter is 250 Hz. The output signal from this filter is fed through a section of the sweep width switch to output amplifier, A8.

2.10 TYPE 8136 OUTPUT AMPLIFIER

The schematic diagram for the type 8136 output amplifier is Figure 6-8; its reference designation prefix is A8. The purpose of this amplifier is to provide a vertical deflection output signal for the CRT display, and an auxiliary vertical output signal. The overall response of this unit is linear or logarithmic, depending on the setting of the front-panel VERTICAL DISPLAY switch.

2.10.1 IF Amplifier. - The 40-kHz IF input signal is coupled through a bandpass filter comprised of L1, C1, and C2 to gate 1 (pin 3) of Q1, a dual gate FET. The response of this stage is controlled by the voltage applied to gate 2 (pin 2). When in the linear mode, there is no connection between module pins 18 and 19. Under this condition the drain circuit functions as a single-tuned network providing feedback through L2 and R2 to maintain a linear response for this stage. When the logarithmic mode is selected, module pins 18 and 19 are connected together, placing CR1, CR2, and R6 in parallel with L2. As the incoming signal strength increases, CR1 and CR2 will conduct to lower the gain of the stage by decreasing the drain impedance and increasing the negative feedback to gate 2 of Q1.

2.10.2 Output Amplifier. - The amplified output signal from Q1 is coupled through C6 and C23 to the fixed-tuned base circuit of Q2, a voltage amplifier. The signal is then fed through a single-tuned collector ciruit to a pair of voltage doublers that drive the vertical deflection plates in the CRT.

2.10.3 Voltage Doublers. - The two voltage doubler circuits are essentially the same except that their outputs are opposite in polarity. Only the positive output circuit will be described. As the input signal goes negative, C13 will charge through CR4 to the negative signal peak voltage less the voltage drop across the diode. As the voltage goes positive CR3 will conduct charging C16 to the peak positive voltage plus the voltage stored by C13. The resultant output is approximately twice the applied voltage. The offset voltage of the negative output, pin 5, can be varied by R14 to allow vertical centering of the sweep on the CRT. The auxiliary vertical output is also supplied by a voltage doubling circuit containing diodes CR7 and CR8 which are connected to provide a positive output signal.

2.11 TYPE 8234 HORIZONTAL AMPLIFIER AND SWEEP ADJUSTER

The schematic diagram for the type 8234 horizontal amplifier and sweep adjuster is Figure 6-9; its reference designation prefix is A9. The purpose of the horizontal amplifier is to provide horizontal deflection voltages to the CRT. The purpose of the sweep adjuster is to set the sweep rate and width of the sweep oscillator and to shape the sawtooth wave to compensate for the non-linear response of the Varicap (voltage variable capacitor) which is used to control the sweep oscillator.

2.11.1 Horizontal Amplifier. - The horizontal sweep input signal is a sawtooth wave which is applied to the gain setting voltage divider comprised of R1, R4, and R5. As the input voltage increases, Q1 will conduct more raising the emitter voltage. The emitter of Q1 is fed to the base of Q3, one output driver, and the base of Q2. The emitter of Q2 is tied through R10 to the emitter of Q4. As the input signal increases raising the voltage at the emitter of Q2, the emitter voltage of Q4 will increase lowering its conduction and increasing its collector voltage. Thus, as Q3 conducts more, lowering its output voltage, Q4 conducts less raising its output voltage. The output voltages, equal in amplitude but opposite in polarity, are used to drive the horizontal deflection plates of the CRT display. Transistor

Q5 is used to provide an offset voltage, controlled by the setting of R18, to position the sweep horizontally. As R18 is turned clockwise, the voltage on the base of Q4 increases lowering its collector output voltage while the base voltage of Q5 is increased to raise the emitter voltage of Q3 which raises its collector output voltage. Thus, equal but opposite offset is developed for the two outputs to position the sweep. The sweep rate is controlled by setting the time constant of a relaxation oscillator located in the sweep generator, A12. Resistors R20, R21, and R22 are used to vary the oscillator R-C time constant.

2.11.2 Sawtooth Shaping Network. - The sweep width is changed by applying the sawtooth wave to pin 10, pin 11, or pin 8. This changes the amplitude of the sawtooth output voltage at pin 9. The output from pin 9 is connected directly to pin 7, which is the input to the sawtooth shaping network. When the sawtooth voltage goes negative and the drop across R31 is less than -5V, Zener diode CR2 will stop conducting. When the voltage drop is less than -4V CR3 will also stop conducting. The impedance of the voltage divider consisting of R31, and its parallel circuits, and R32 will therefore be increased. This action produces a non-linear response as the sawtooth voltage approaches 0V. When the sawtooth voltage reaches +0.6V, diode CR4 will conduct placing R33 and R34 in parallel with R32. The result is a decreased rate of change in the positive ramp of the sawtooth wave. When the voltage drop across R33 and R34 reaches 5.1V, Zener diode CR5 will conduct causing an even greater decreased rate of change. Potentiometers R34 and R36 permit adjustment of the sawtooth at the two positive break points to maximize the linearity of the sweep at the low frequency end of the oscillators dispersion range. The CRT anode voltage is supplied from a voltage divider comprised of R38 and R39.

2.12 TYPE 76166 +18V AND +24V REGULATED POWER SUPPLY

The schematic diagram for the type 76166 regulated power supply is Figure 6-10; its reference designation prefix is A10. 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 voltage 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 harder, 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 impedance so that the output voltage returns to its nominal value. A differential amplifier is used in the companion circuit as the base-emitter variations with temperature changes in one transistor tend to cancel the change in the other. Additional temperature compensation is provided by CR3. 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. The +24V output is taken from the emitter of Q1. The +18V output is taken from the emitter of series regulator transistor Q5. Zener diode CR4 establishes the +18V reference while CR5 compensates for temperature fluctuations and the emitter-to-base voltage drop across Q5.

2.13 TYPE 76168 -18V REGULATED POWER SUPPLY

The schematic diagram for the type 76168 -18V regulated power supply is Figure 6-11; its reference designation prefix is A11. The ac input power is full-wave rectified by CR1 and filtered by C1. Cascaded emitter followers Q1 and Q2 regulate the output voltage taken at the emitter of Q1. The fixed base reference voltage is set by Zener diode CR2. If the output voltage falls below the Zener regulator voltage, Q2 will conduct harder, lowering its emitter voltage. This will cause increased conduction in Q1 due to the reduced base voltage, and therefore the output voltage will return to its nominal value.

2.14 TYPE 8235 SWEEP GENERATOR

The schematic diagram for the type 8235 sweep generator if Figure 6-12; its reference designation prefix is A12. The purpose of the sweep generator is to provide a sawtooth voltage to drive the sweep oscillator and the horizontal amplifiers. The sawtooth waveform is generated by Q1, a unijunction transistor which is connected as a relaxation oscillator. Capacitor C1 is charged at a uniform rate through constant current generator Q2. The charging rate is selected to conform to the sweep width, but the amplitude of the sawtooth generated at the emitter of Q1 is controlled by the breakdown characteristic of Q1. This may be varied by adjustable resistor R1 thereby permitting calibration of the sweep rate. Emitter follower Q3 couples the sawtooth wavetrain to the horizontal

amplifier circuit. Emitter follower Q4 supplies the non-inverted sawtooth output at the emitter, while its collector provides an inverted signal that is directly coupled to the base of Q5. Transistors Q5 and Q6 are connected as a feedback amplifier whose gain is set by R15 and R16. The gain of this amplifier is the reciprocal of the gain of Q4, therefore the amplitudes of the number 1 and number 2 sawtooths will be the same. One of the sawtooth output signals is connected to module pin 2 by SWEEP INVERSION switch S3. The sawtooth wavetrain is then fed through swap calibration potentiometer R19 to a feedback amplifier made up of transistors Q7 and Q8. The potentiometer provides precise adjustment of the sweep to insure that the trace extends across the entire face of the CRT. The amplifier provides the necessary voltage gain to drive the horizontal amplifier circuits.

2.15 CATHODE RAY TUBE

The CRT, V1, provides a visual display of the input signal spectrum. The CRT has a rectangular face with a green plexiglass overlay which inscribed with a horizontal base line, a vertical center marker, and five smaller vertical markers on each side of the center. These markers are not calibrated in any specific units but are supplied for reference purposes only. The -1400V output from power supply PS1 (see Figure 6-14) is applied to the control grid of the tube and to the focus and intensity board. A voltage divider, (Figure 6-13), consisting of resistors R1 through R6, provides reduced voltage outputs for the various CRT operating functions. The intensity of the light beam on the face of the CRT is adjusted by the INTENSITY control, R2, which varies the accelerator voltage applied to the cathode. The FOCUS control, R4, 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 accessible from the front panel.

SECTION III

INSTALLATION AND OPERATION

3.1 INSTALLATION

The Type SM-8421 Signal Monitor mounts in a standard 19-inch rack and requires 3.5 inches vertical height and 15 inches of depth. Proper ventilation should be provided for the equipment to prevent unnecessary aging of components.

3.1.1 Power Connection. - Position the 115/230-volt switch on the rear apron to correspond with the line voltage to be used. Plug the power cord into a 115/230 volt, 50-400 Hz source. The third pin of the power cord grounds the unit. If a three-pin receptacle is not available, use the three-to-two pin adapter provided and connect the adapter wire to a suitable ground.

3.1.2 Receiver Connection. - Connect the signal monitor SIGNAL INPUT jack, J1, to the receiver signal monitor output using mating plugs and 50-ohm coaxial cable.

3.2 OPERATION

The use of the operating controls is explained in the following paragraphs. These controls are shown in the front view, Figure 1-1, and in the rear view, Figure 5-2.

3.2.1 Power. - The POWER switch applies ac power to the primary of the power supply transformer. The power should be applied several minutes before operation begins to allow for warm-up. A red lamp on the front panel indicates that power is applied.

3.2.2 Gain. - The GAIN control varies the height of the pips displayed on the CRT. Adjust this control as necessary to maintain the desired height of the display.

3.2.3 Marker. - When used, the MARKER switch results in a pip on the CRT. This pip indicates the 2-MHz center of the signal monitor response.

3.2.4 Focus. - The FOCUS control provides a means for obtaining a sharp trace on the face of the CRT.

3.2.5 Intensity. - The INTENSITY control varies the brightness of the trace on the CRT.

3.2.6 Sweep Width. - The SWEEP WIDTH switch selects either 50 kHz, 15 kHz, or 3 kHz sweep widths. The sweep rate is automatically set to obtain optimum resolution as the sweep width is changed.

3.2.7 Vertical Display. - This switch selects either the LIN or LOG vertical response.

3.2.8 Center Frequency. - The CENTER FREQUENCY control varies the horizontal position of the pips on the CRT. Under normal operation, use this control to center the frequency spectrum under display on the center mark of the CRT screen.

3.2.9 Sweep Disable Pushbutton. - This pushbutton stops the sweeping of the sweep oscillator. To center the marker exactly, turn the MARKER on, press the SWEEP DISABLE pushbutton, and adjust the CENTER FREQUENCY control for maximum vertical deflection of the trace.

3.2.10 Sweep Direction Switch. - The rear-panel sweep direction switch reverses the spectrum display on the CRT. Observing the signal monitor display, tune the associated receiver higher in frequency. Intercepted signals should first appear at the right-hand end of the trace and move to the left. If signals appear at the left-hand of the trace and move to the right, change the position of the sweep direction switch.

3.3 INTERPRETATION OF SIGNALS

The following list is presented as a guide for interpretation of various signals and waveforms that might appear on the CRT.

(1) An unmodulated carrier without noise or random disturbances will appear as a deflection with fixed height.

(2) A carrier that is amplitude modulated will appear as a deflection of variable height. If the modulation rate is high, sidebands may appear.

(3) A single-tone modulated FM signal will appear as a group of spikes corresponding to the center frequency and the sidebands.

(4) Noise appears as varying irregularities or "grass" along the base line and may be eliminated by a reduction of the GAIN control setting.

SECTION IV
MAINTENANCE

4.1 GENERAL

The Type SM-8421 Signal Monitor is designed to give trouble-free performance. It presents no special maintenance problems and normally requires no care beyond being kept clean. Should trouble occur, it is important that maintenance be performed by technicians familiar with Section II, in which the circuits are described. In addition, they should use Figures 6-1 to 6-14, the schematic diagrams, and Table 4-1 in which the pin voltages are listed. All maintenance and repair work should be carried on in a well-equipped shop and performed only by trained and experienced personnel.

4.2 CRT REMOVAL

To remove the CRT, first remove the socket from the tube. After this, remove the bezel by taking out the four front-panel screws. Then gently push the CRT out the front of the unit.

4.3 MODULE REMOVAL

The plug-in modules can be easily removed by pulling them out of the receptacles into which they are fitted after moving the retaining brackets aside. The numbers on the main chassis adjacent to the receptacle pins correspond to the encircled numbers indicated on the schematic diagram for the particular module. Individual type numbers are etched on the back of each card and stenciled on the top of the chassis adjacent to the receptacles to aid in the replacement of a removed board.

4.4 TROUBLESHOOTING

Most troubles will be caused by failures of the fuse, CRT or the semiconductors. The proper functioning of all these parts should be assured either by test or by replacement with parts known to be good before any further troubleshooting is carried out. Initial troubleshooting should be directed towards localizing the problem to a specific portion of the signal monitor. The power supply should always be one of the first circuits suspected, and voltage measurements should be taken to assure that it is functioning properly before other circuits are checked. Once the power supply is known to be operating properly, an oscilloscope can be used to trace a defect to a plug-in module, or the plug-in modules can be easily replaced with spares known to be good, thus quickly checking an entire module. The IF amplifier is most easily checked using the signal injection method, starting near the output and working back toward the input.

CAUTION

Due to the extremely high voltage present at the output of PS1, special care should always be taken to discharge it prior to carrying out any work on the chassis underside. Do not rely on the bleeder circuit. An open circuit may have occurred which leaves it charged with a lethal voltage.

4.5 ALIGNMENT INSTRUCTIONS

This alignment procedure is suitable for use in the field when making periodic performance checks, or when making adjustments after replacing defective components. The alignment of the signal monitor should be performed only with suitable test equipment and by technicians thoroughly familiar with their use.

4.5.1 Use of Marker During Alignment. - A post-detection type marker adder is recommended, and the alignment procedures in this book assume that one is used. However, if such a marker adder is not available, the marker generator output should be loosely coupled to the sweep generator output. This can be done by connecting the marker signal source to a turn or two of insulated wire wrapped aroung the sweep generator lead near the point of

connection to the circuit under test or by coupling to the sweep generator lead through a small capacitor. To insure that the addition of the marker is not affecting the response curve, disconnect the marker generator to see that no change in the curve's shape or symmetry occurs.

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 oscillocope's internal horizontal sweep is disabled, and the sweep is provided by the sweep generator.

4.5.3 Equipment 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 LH-2 plug-in head

(5) Signal Generator, Hewlett Packard 651B

(6) Assorted cables, connectors, and alignment tools

4.6 ALIGNMENT PROCEDURE

NOTE

The first five steps of this procedure pertain to the CRT adjustments and may be performed without interacting with any other section of the procedure. When going beyond this point, it is recommended that the entire procedure be performed.

To align the horizontal amplifier and sweep circuit, perform the following steps:

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

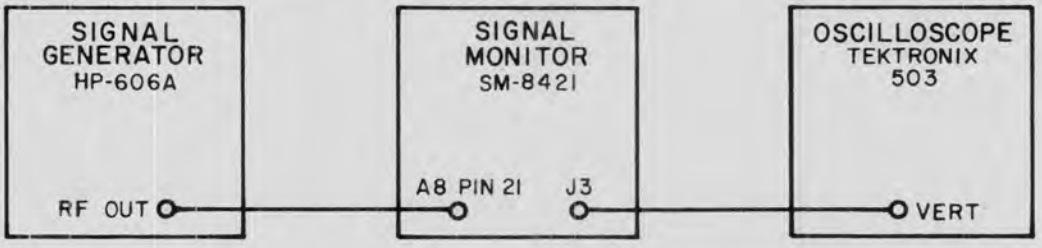


Figure 4-1. Test Equipment Setup, IF Alignment

(2) Set the signal monitor controls as follows:

a. CENTER FREQUENCY control at midrange

b. SWEEP WIDTH at 50 kHz

c. MARKER off

d. GAIN control fully counterclockwise

e. INTENSITY control for visible trace

f. FOCUS control for fine definition of trace

g. Vertical centering control A8R14 for positioning of trace on black base line

3. Adjust A12R1 until the sawtooth waveform displayed on the oscilloscope has a period of 83 ms.
4. Adjust the horizontal position potentiometer, A9R18, to center the sweep, and the width potentiometer, A9R4, to oversweep the sweep face approximately 10%.
5. Adjust the vertical position potentiometer, A8R14, to position the trace on the base line.
6. Adjust the signal generator frequency to exactly 40 kHz. Adjust A8L1, A8L2, and A8L3 for maximum vertical deflection of the sweep. Reduce the input level as required.
7. Connect the signal generator to A5 pin 1. Select the 15 kHz sweep width. Adjust A6L1, A6L3, A6L4, and A6L5 for maximum vertical deflection of the sweep.
8. Select the 3-kHz sweep width. Adjust A7L1, A7L2, A7L3, and A7L5 for maximum vertical deflection of the sweep.
9. Connect the signal generator to A5 pin 21. Adjust the signal generator to exactly 260 kHz. Adjust A5L1, A5L2, A5L3, A5L4, and A5L5 for maximum vertical deflection of the sweep.
10. Adjust the signal generator to exactly 455 kHz. Adjust A5L6 to center the pip on the screen.
11. Disconnect the signal generator and turn the marker on. Adjust A4R23 for full scale deflection of the marker.
12. Connect the equipment as shown in Figure 4-2.

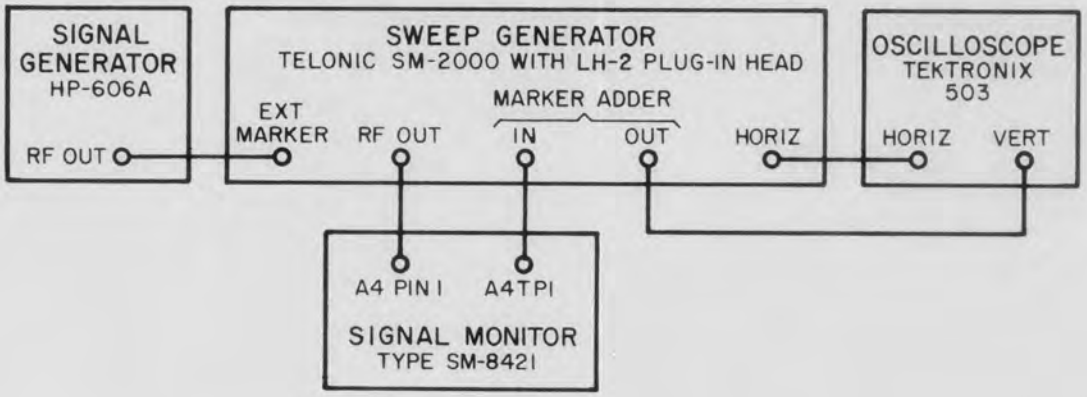


Figure 4-2. Test Equipment Setup, Mixer Amplifier

13. Adjust the sweep generator for a center frequency of 2 MHz sweeping 200 kHz. Use the signal generator to establish the exact 2-MHz point.
14. Adjust A4L3 for maximum signal at the 2-MHz point and then adjust A4L1 and A4L2 for symmetry.
15. Move the sweep generator from A4 pin 1 to the signal input jack, J1. Move the oscilloscope vertical input cable to A1TP1.
16. Select the 50-kHz sweep width. Adjust A1L3 for maximum signal at the 2-MHz point, and then adjust A1L1 and A1L2 for symmetry.

17. Connect the test equipment as shown in Figure 4-3.

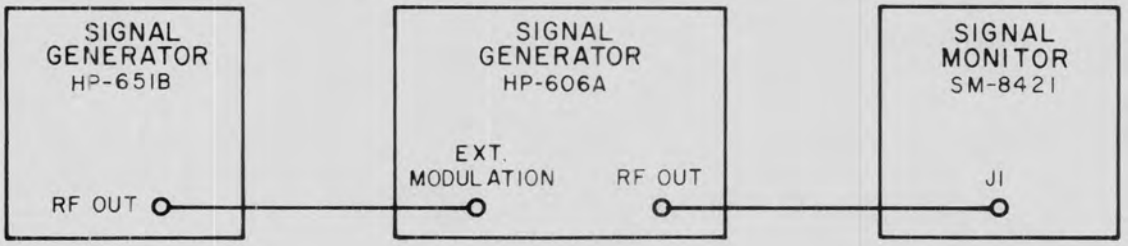


Figure 4-3. Test Equipment Setup, Linearity Adjustments

18. Adjust the output frequency of the HP-606A signal generator to exactly 2 MHz. Using the HP-651B signal generator as an external modulation source, set the output frequency of this generator to 25 kHz. Set HP-606A for approximately 80% modulation.

19. Adjust sweep calibration potentiometer A12R19 in conjunction with maximum linearity adjustment A9R36 until the sideband peaks are at the end graticule markers on the CRT screen.

20. Select the 15-kHz sweep width. Modulate the 2-MHz input signal at 7.5 kHz. Adjust A9R24 in conjunction with the nominal linearity adjustment, A9R34, until the sideband peaks are at the end graticule markers.

21. Select the 3-kHz sweep width. Modulate the 2-MHz input signal at 1.5 kHz. Adjust A9R26 until the sideband peaks are at the end graticule markers.

22. Select the 50-kHz sweep width. Set the signal to 2 MHz, unmodulated, at a level of 10 μV. Turn the gain control fully clockwise. Adjust A1R1 for full-scale deflection of the pip.

23. Select the 15-kHz sweep width. Adjust A2R1 for full-scale deflection of the pip.

24. Select the 3-kHz sweep width. Adjust A3R1 for full-scale deflection of the pip.

Table 4-1. Typical Transistor Element Voltages

Ref. Desig.	Type	Gate 1	Gate 2	Drain	Source	Emitter	Base	Collector
A1Q1	3N140	0.0	0.9	14.9	0.5			
A1Q2	3N140	0.0	0.9	14.9	0.5			
A2Q1	3N140	0.0	0.9	14.2	0.5			
A2Q2	3N140	0.0	0.9	14.5	0.5			
A3Q1	3N140	0.0	0.9	13.0	0.5			
A3Q2	3N140	0.0	0.9	14.2	0.5			
A4Q1	3N140	0.0	0.6	15.8	0.6			
A4Q2	3N140	0.0	0.8	14.1	3.5			
A4Q3	3N128	-0.2	---	17.8	-2.6			
A4Q4*	3N128	0.0	---	17.8	4.4			
A5Q1	3N140	0.0	0.5	13.7	0.6			
A5Q2	3N140	0.0	0.5	13.1	0.7			
A5Q3	3N128	-3.0	0.0	17.9	0.0			
A5Q4	3N128	-0.4	0.0	17.9	1.1			
A8Q1	3N140	0.0	3.1	15.8	0.7			
A8Q2	2N3866					0.8	0.0	22.5
A9Q1	2N2270					22.0	23.5	24.0
A9Q2	2N2270					6.0	22.0	24.0
A9Q3	2N3440					6.0	22.0	107.0
A9Q4	2N3440					6.0	6.6	109.0
A9Q5	2N2270					6.0	6.6	25.0
A10Q1	2N3055					24.0	24.3	38.0
A10Q2	2N2270					24.3	25.0	37.9
A10Q3	2N2270					7.1	7.7	25.0
A10Q4	2N2270					7.1	7.7	23.0
A10Q5	2N2270					17.8	18.5	24.0
A11Q1	2N4037					-17.5	-18.2	-40.0
A11Q2	2N4037					18.2	-18.7	-41.8
A12Q1	2N2646					8.0	0.0 [1]	18.3 [2]
A12Q2	2N4037					20.3	20.0	8.0
A12Q3	2N2270					7.4	8.0	24.0
A12Q4	2N2270					6.8	7.4	22.3
A12Q5	2N4037					22.7	22.3	0.6
A12Q6	2N2270					0.0	0.6	22.5
A12Q7	2N2270					10.1	10.5	48.6
A12Q8	2N4037					48.6	32.0	31.7

TEST CONDITIONS: All readings are positive dc with respect to chassis unless otherwise noted. Readings taken with RCA-WV98B VTVM; 115 Vac applied to signal monitor; no signal input. Control Settings: GAIN control fully clockwise; SWEEP WIDTH in position of sweep width under test; LIN-LOG switch in LIN position.

NOTES: * MARKER ON this test only.

[1] Base 1

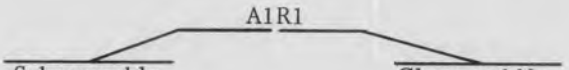
[2] Base 2

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
04426	Licon Switch Division of Illinois Tool Works, Inc. 6615 West Irving Park Road Chicago, Illinois 60634
04713	Motorola Semiconductor Prod., Inc. 5005 East McDowell Road Phoenix, Arizona 85008
05245	Components Corporation 2857 N. Halsted Street Chicago, Illinois 60657
05574	Viking Industries Inc. 21001 Nordhoff Chatsworth, California 91311
05820	Wakefield Engineering, Inc. 139 Foundry Street Wakefield, Massachusetts 01880
06978	Aladdin Electronics, Division of Alladin Industries, Inc. 705 Murfreesboro Road Nashville, Tennessee 37210
07047	The Ross Milton Company 511 Second Street Pike Southampton, Pennsylvania 18966
07387	The Birtcher Corporation 4371 Valley Boulevard Los Angeles, California 90032
09023	Cornell-Dubilier Electric Corp. Electrolytics & Paper Tubular Division 2562 Dalrymple Sanford, North Carolina 27330
14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, Maryland 20878
15605	Cutler-Hammer, Inc. 315 North 12th Street Milwaukee, Wisconsin 53233
17554	Components, Incorporated Smith Street Beddeford, Maine 04005

Vendor Code	Name and Address
21604	Buckeye Stamping Company 555 Marion Road Columbus, Ohio 43207
25088	Siemens America, Inc. 350 Fifth Avenue New York, New York 10001
26655	Oster Tool & Die Corporation 5234 W. 26th Street Cicero, Illinois 60650
28480	Hewlett-Packard Company 1501 Page Mill Road Palo Alto, California 94304
56289	Sprague Electric Company North Adams, Masschusetts 01247
71279	Cambridge Thermionic Corporation 445 Concord Avenue Cambridge, Massachusetts 02138
71450	CTS Corporation 1142 West Beardsley Avenue Elkhart, Indiana 46514
72136	Electro Motive Manufacturing Co., Inc. South Park & John Streets Willimantic, Connecticut 06226
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
74306	Piezo Crystal Company 265 East Pomfret Street Carlisle, Pennsylvania 17013
74868	Amphenol Corporation Amphenol RF Division 33 East Franklin Street Danbury, Connecticut 06810
75915	Littelfuse, Inc. 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, Inc. 5527 North Elston Avenue Chicago, Illinois 60630
84171	Arco Electronics, Inc. Community Drive Great Neck, New York 11022
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 the equipment. Except in those cases specifically noted, the replacement part may be obtained from any vendor 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.

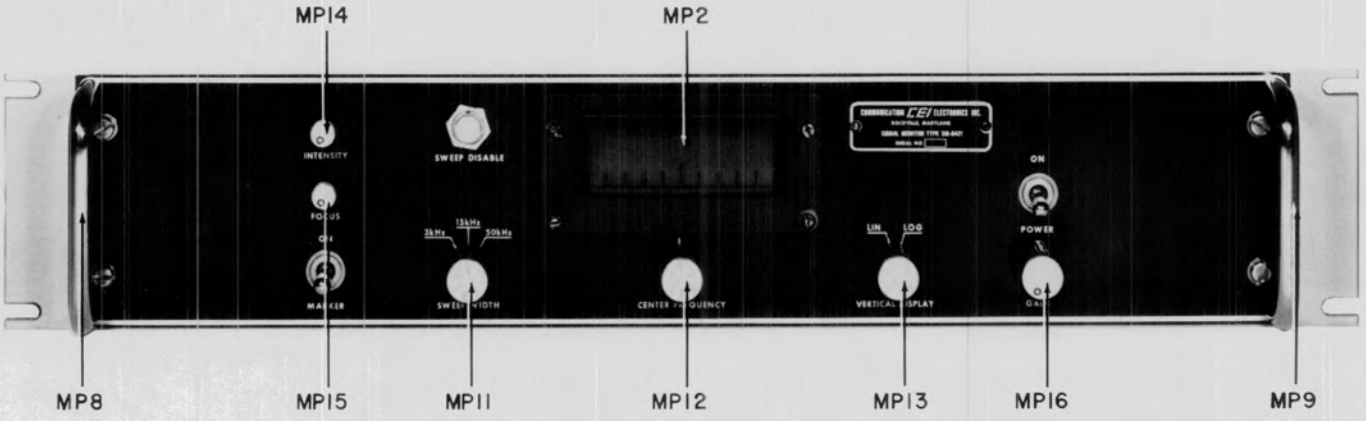


Figure 5-1. Type SM-8421 Signal Monitor, Front Panel

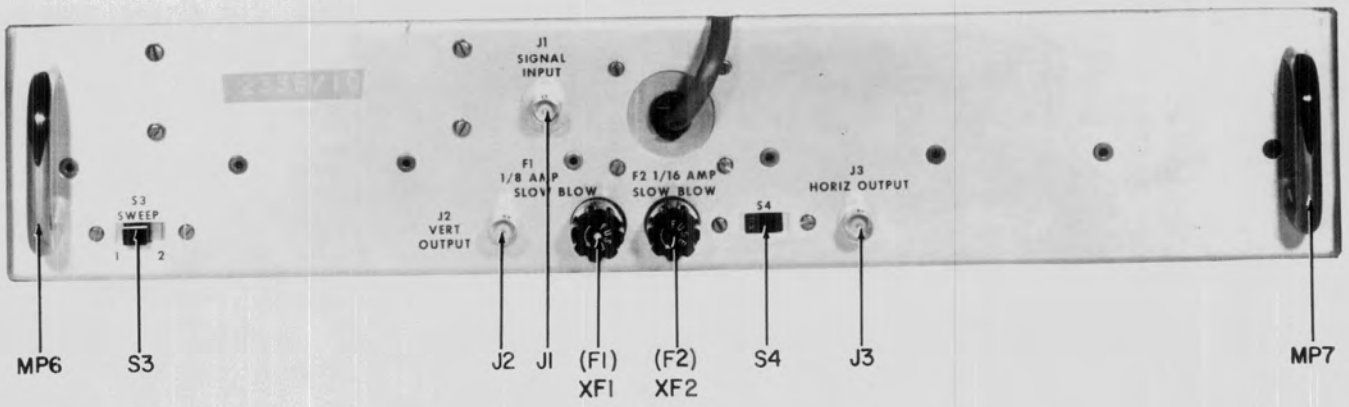


Figure 5-2. Type SM-8421 Signal Monitor, Rear Panel

5.4.1 SM-8421 Signal Monitor, Main Chassis

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
A1	BANDPASS AMPLIFIER (65 kHz)	1	8018	14632
A2	BANDPASS AMPLIFIER (20 kHz)	1	8019	14632
A3	BANDPASS AMPLIFIER (4 kHz)	1	8020	14632
A4	MIXER AMPLIFIER (2000-455 kHz)	1	8021	14632
A5	MIXER AMPLIFIER (455-40 kHz)	1	8022	14632
A6	BANDPASS FILTER	1	8023	14632
A7	BANDPASS FILTER	1	8024	14632
A8	OUTPUT AMPLIFIER (40 kHz)	1	8136	14632
A9	HORIZONTAL AMPLIFIER	1	8234	14632
A10	+18V and +24V REGULATED POWER SUPPLY	1	76166	14632
A11	-18V REGULATED POWER SUPPLY	1	76168	14632
A12	SWEEP GENERATOR	1	8235	14632
A13	FOCUS AND INTENSITY BOARD	1	13488	14632
DS1	LAMP, NEON	1	249-7866-1431-534	72619
F1	FUSE 3 AG, SLOW BLOW, 1/8A	1	F02B250V1/8A	81349
F2	FUSE 3 AG, SLOW BLOW, 1/16A	1	F02B250V1/16A	81349
FL1	FILTER, RFI	1	JN33-694A	56289
J1	CONNECTOR, RECEPTACLE, BNC SERIES	1	17825	74868
J2	CONNECTOR, RECEPTACLE, BNC SERIES	2	UG-1094/U	81349
J3	Same as J2			
MP1	CRT SOCKET ASSEMBLY	1	14075	14632
MP2	WINDOW	1	1425	14632
MP3	TUBE SHIELD	1	31310	14632
MP4	COVER	2	31340-1	14632
MP5	Same as MP4			
MP6	HANDLE	2	1250-1	71279
MP7	Same as MP6			
MP8	HANDLE	2	1252-1	71279
MP9	Same as MP8			
MP10	EXTENDER CARD	1	79446	14632
MP11	KNOB	3	PS70PL2	21604
MP12	Same as MP11			
MP13	Same as MP11			
MP14	KNOB	2	PS50D1	21604
MP15	Same as MP14			

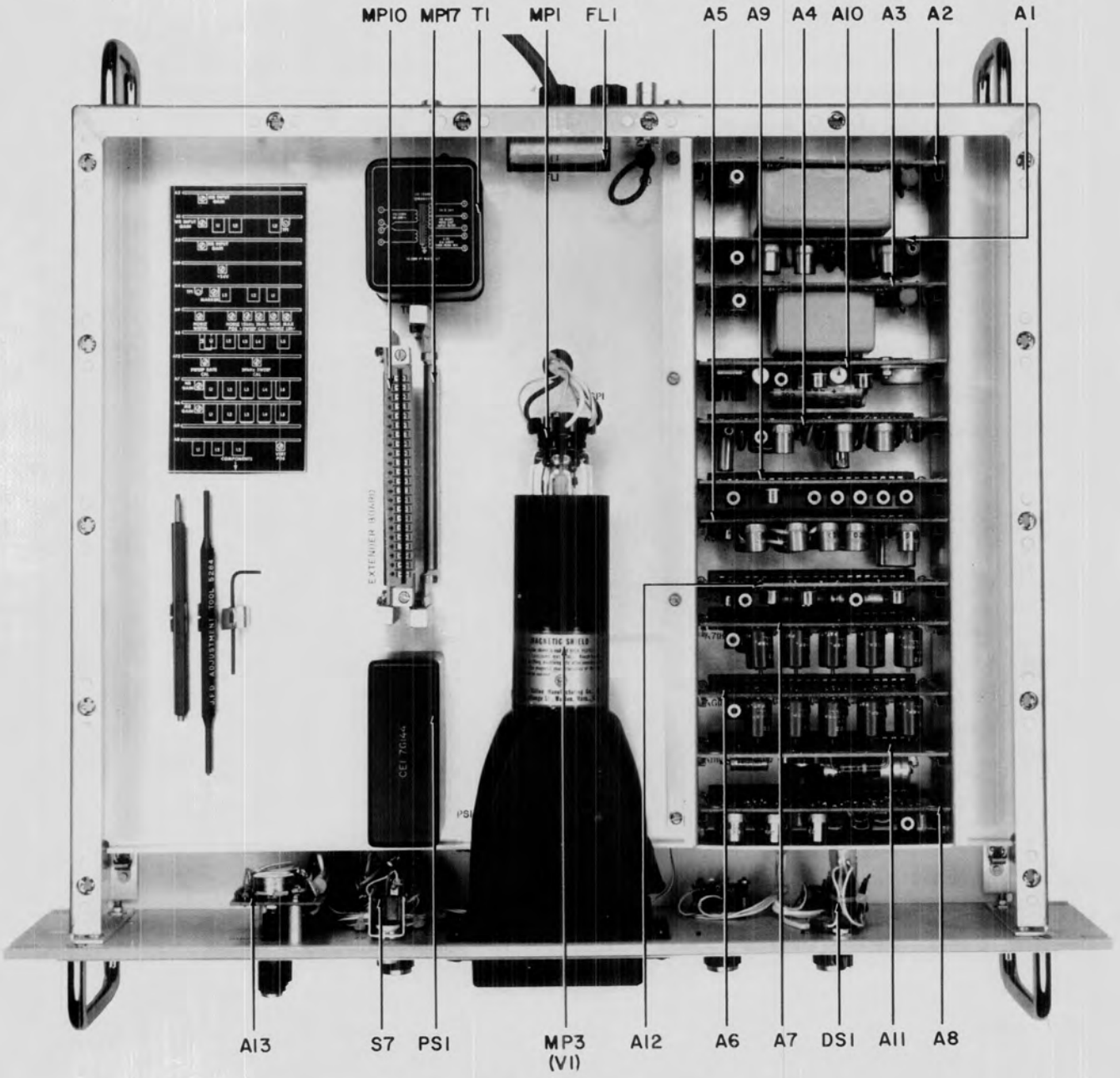


Figure 5-3. Type SM-8421 Signal Monitor, Top View

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
MP16	KNOB	1	PS70D1	21604
MP17	BOARD PULLER	1	21768-1	14632
P1	CONNECTOR, POWER PLUG & CORD Part of FL1	--		
PS1	DC-DC CONVERTER	1	76144	14632
R1	RESISTOR, VARIABLE, COMPOSITION: 2.5 kΩ, 10%, 1/2W	1	LX23567	71450
R2	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	RC07GF222J	81349
R3	RESISTOR, VARIABLE, COMPOSITION: 10 kΩ, 10%, 1/2W	1	LW23562	71450
R4	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	RC07GF473J	81349
R5	NOT USED			
R6	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4W	2	RC07GF562J	81349
R7	RESISTOR, FIXED, COMPOSITION: 300 Ω, 5%, 1/4W	1	RC07GF301J	81349
R8	Same as R6			
R9	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4W	1	RC07GF562J	81349
S1	SWITCH, TOGGLE, SPST	2	8280-K16	15605
S2	Same as S1			
S3	SWITCH, SLIDE, DPDT	1	G326	79727
S4	SWITCH, SLIDE, DPDT	1	11A-1009	82389
S5	SWITCH, ROTARY	1	1128-02	14632
S6	SWITCH, ROTARY	1	1128-43	14632
S7	SWITCH, PUSH BUTTON	1	76-2350/403	04426
T1	TRANSFORMER	1	13500	14632
T2	TRANSFORMER	1	65-128-03	06978
V1	TUBE, CRT	1	3ASP1	80131
XA1	CONNECTOR, PRINTED CIRCUIT CARD	12	2VK22S/1-2	05574
XA2	Same as XA1			
XA3	Same as XA1			
XA4	Same as XA1			
XA5	Same as XA1			
XA6	Same as XA1			
XA7	Same as XA1			
XA8	Same as XA1			
XA9	Same as XA1			
XA10	Same as XA1			
XA11	Same as XA1			
XA12	Same as XA1			

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
XF1	FUSEHOLDER	2	342004	75915
XF2	Same as XF1			

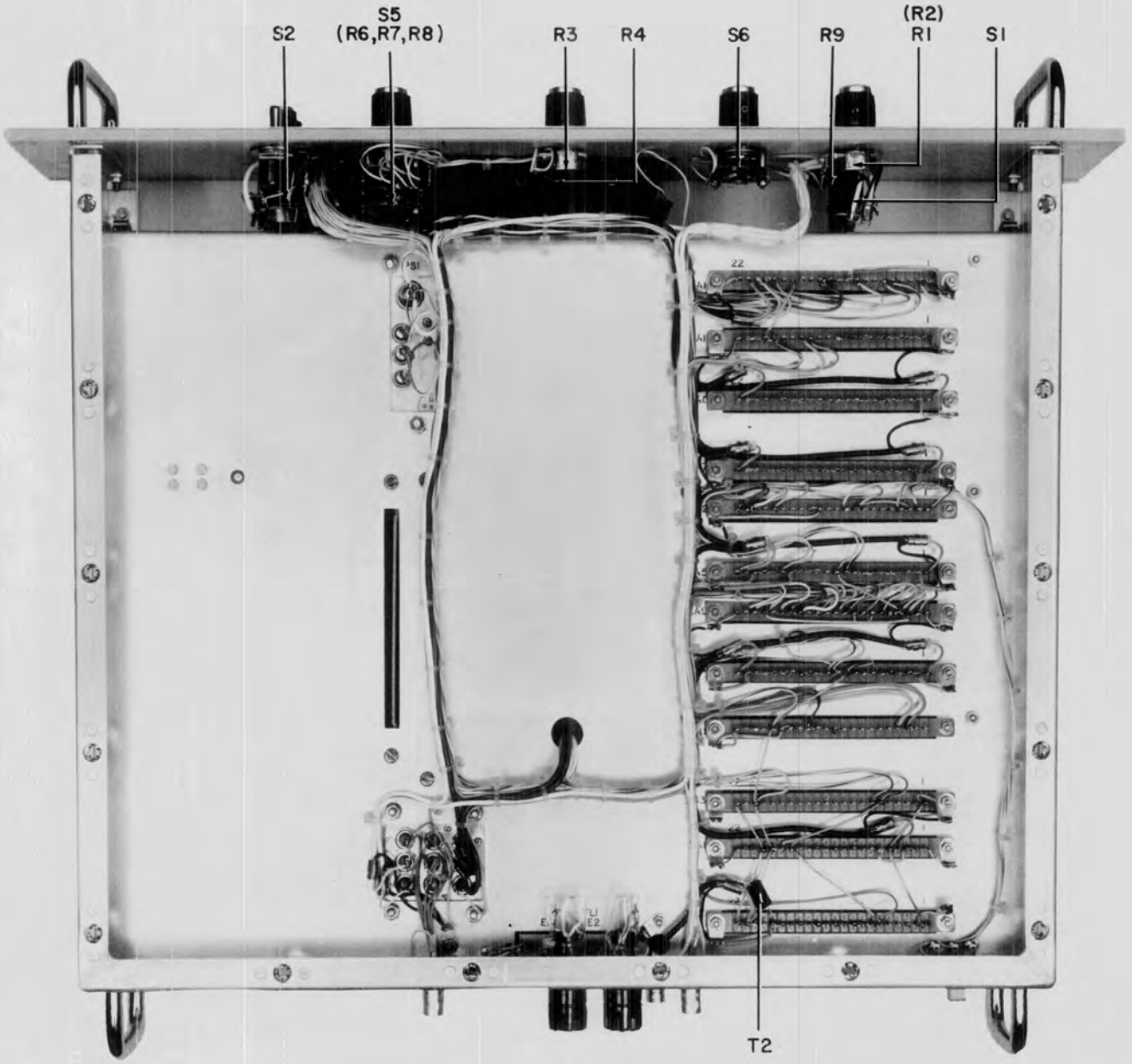


Figure 5-4. Type SM-8421 Signal Monitor, Bottom View

5.4.2 Type 8018 Bandpass Amplifier

REF DESIG PREFIX A1

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, CERAMIC, DISC: .01 μF, 20%, 100V	7	C023B101F103M	56289
C2	Same as C1			
C3	Same as C1			
C4	Same as C1			
C5	CAPACITOR, DIPPED MICA: 510 pF, 5%, 500V	1	DM15-511J	72136
C6	Same as C1			
C7	CAPACITOR, DIPPED MICA: 27 pF, 5%, 500V	1	CM05ED270J03	81349
C8	CAPACITOR, DIPPED MICA: 560 pF, 5%, 500V	1	DM15-561J	72136
C9	CAPACITOR, DIPPED MICA: 1000 pF, 5%, 500V	1	CM06FD332J03	81349
C10	Same as C1			
C11	Same as C1			
C12	CAPACITOR, DIPPED MICA: 1100 pF, 5%, 500V	2	CM06FD112J03	81349
C13	Same as C12			
C14	CAPACITOR, DIPPED MICA: 2200 pF, 5%, 500V	1	CM06FD222J03	81349
C15	CAPACITOR, CERAMIC, TUBULAR: 1.0 pF, 10%, 500V	1	QC(1.0 pF, K)	95121
CR1	DIODE	1	1N198A	80131
L1	COIL, FIXED	3	31662-5	14632
L2	Same as L1			
L3	Same as L1			
Q1	TRANSISTOR	2	3N140	80131
Q2	Same as Q1			
R1	RESISTOR, VARIABLE, FILM: 1 kΩ, 30%, 1/2W	1	62PAR1K	73138
R2	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RC07GF471J	81349
R3	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4W	4	RC07GF303J	81349
R4	Same as R3			
R5	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	3	RC07GF104J	81349
R6	RESISTOR, FIXED, COMPOSITION: 160 Ω, 5%, 1/4W	2	RC07GF161J	81349
R7	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	3	RC07GF102J	81349
R8	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	2	RC07GF103J	81349
R9	Same as R7			
R10	Same as R3			
R11	Same as R3			
R12	Same as R5			
R13	Same as R6			
R14	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RC07GF101J	81349

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
R15	Same as R8			
R16	Same as R7			
R17	Same as R14			
R18	Same as R5			
TP1	TEST POINT	1	TJ-202BR	99687

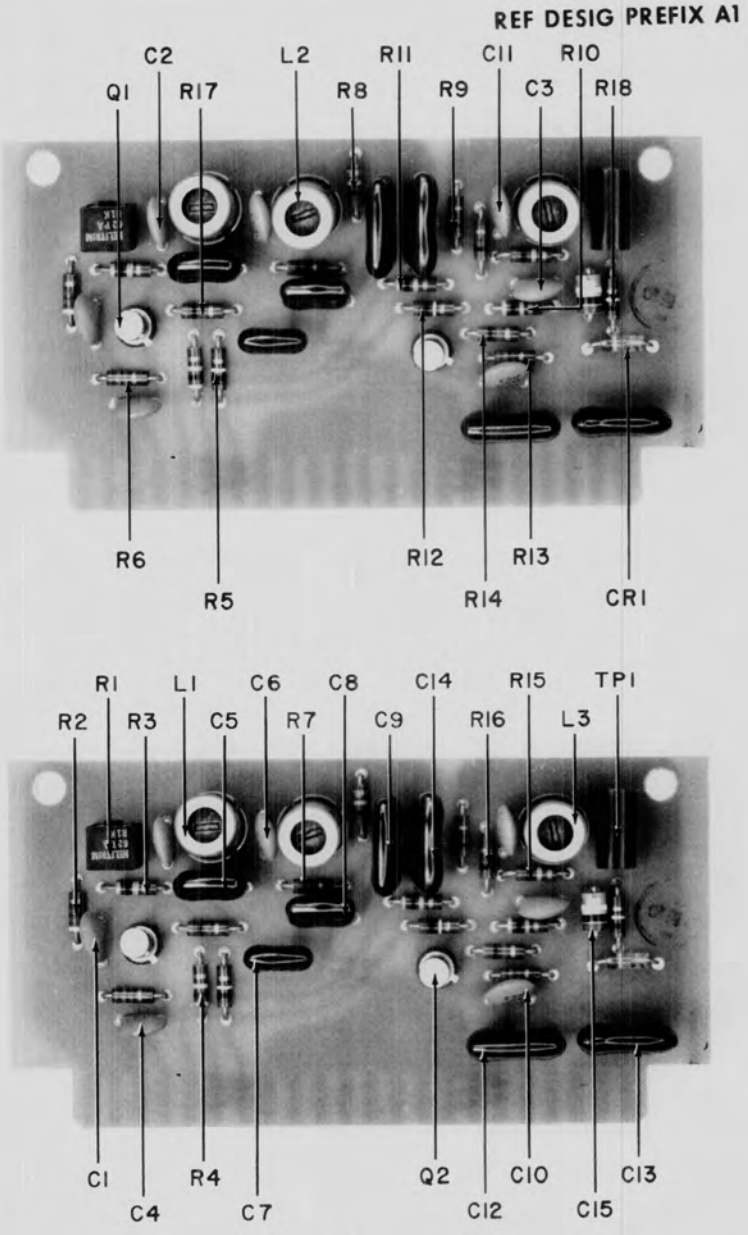


Figure 5-5. Type 8018 65-kHz Bandpass Amplifier, Component Locations

5.4.3 Type 8019 Bandpass Amplifier REF DESIG PREFIX A2

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, CERAMIC, DISC: .01μF, 20%, 100V	8	C023B101F103M	56289
C2	Same as C1			
C3	Same as C1			
C4	Same as C1			
C5	Same as C1			
C6	Same as C1			
C7	NOT USED			
C8	Same as C1			
C9	Same as C1			
FL1	FILTER, BANDPASS (20 kHz B. W.)	1	6073688	74306
Q1	TRANSISTOR	2	3N140	80131
Q2	Same as Q1			
R1	RESISTOR, VARIABLE: 1 k, 30%, 1/2W	1	62PAR1K	73138
R2	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RC07GF471J	81349
R3	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4W	4	RC07GF303J	81349
R4	Same as R3			
R5	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	2	RC07GF104J	81349
R6	RESISTOR, FIXED, COMPOSITION: 160 Ω, 5%, 1/4W	2	RC07GF161J	81349
R7	RESISTOR, FIXED, COMPOSITION: 1.1 kΩ, 5%, 1/4W	1	RC07GF112J	81349
R8	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RC07GF103J	81349
R9	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RC07GF331J	81349
R10	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RC07GF102J	81349
R11	Same as R3			
R12	Same as R3			
R13	Same as R5			
R14	Same as R6			
R15	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	1	RC07GF101J	81349

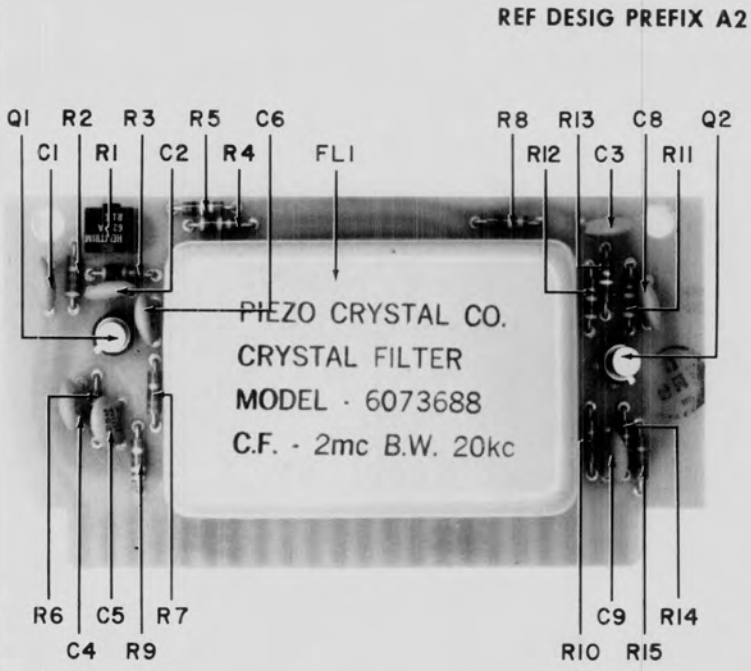


Figure 5-6. Type 8019 20-kHz Bandpass Amplifier, Component Locations

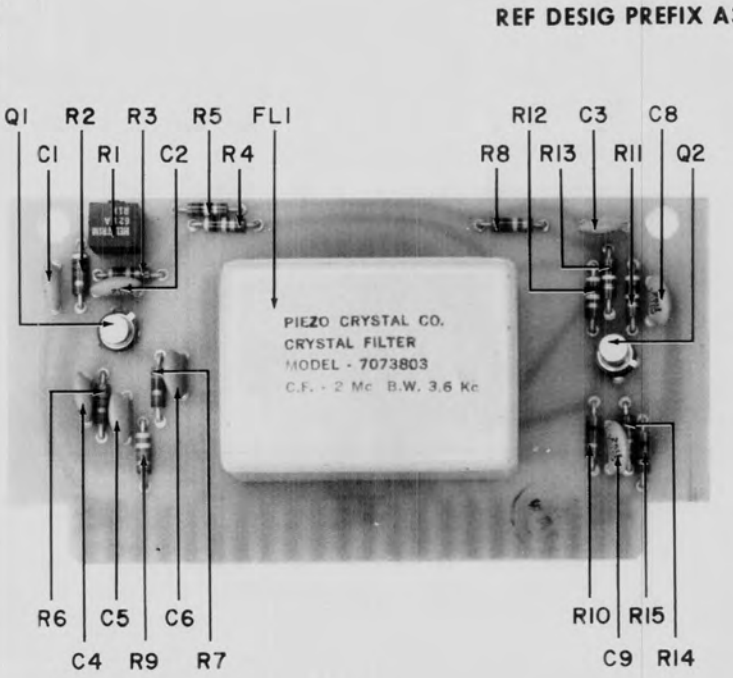
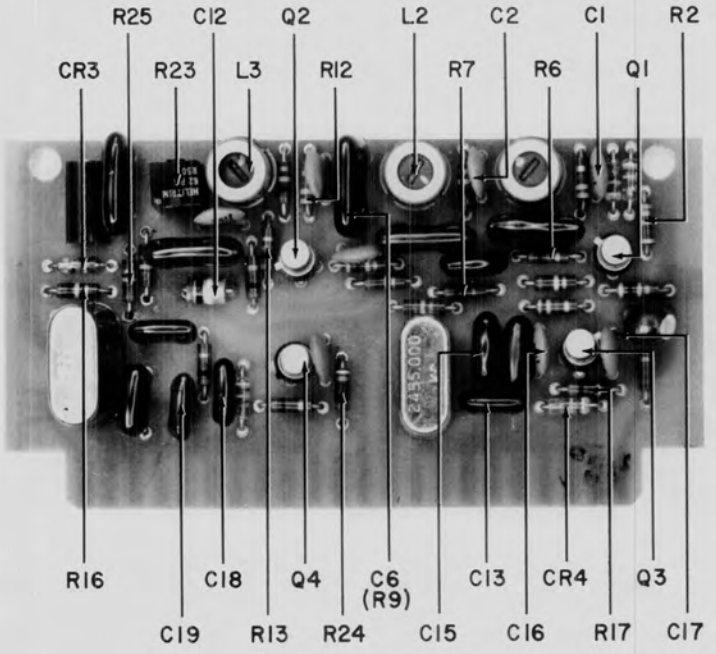


Figure 5-7. Type 8020 4-kHz Bandpass Amplifier, Component Locations

5.4.4 Type 8020 Bandpass Amplifier REF DESIG PREFIX A3

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, CERAMIC, DISC: .01 μF, 20%, 100V	8	C023B101F103M	56289
C2	Same as C1			
C3	Same as C1			
C4	Same as C1			
C5	Same as C1			
C6	Same as C1			
C7	NOT USED			
C8	Same as C1			
C9	Same as C1			
FL1	FILTER, BANDPASS (4 kHz B. W.)	1	7073803	74306
Q1	TRANSISTOR	2	3N140	80131
Q2	Same as Q1			
R1	RESISTOR, VARIABLE, FILM: 1 kΩ, 30%, 1/2W	1	62PAR1K	73138
R2	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RC07GF471J	81349
R3	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4W	4	RC07GF303J	81349
R4	Same as R3			
R5	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	2	RC07GF104J	81349
R6	RESISTOR, FIXED, COMPOSITION: 160 Ω, 5%, 1/4W	2	RC07GF161J	81349
R7	RESISTOR, FIXED, COMPOSITION: 1.1 kΩ, 5%, 1/4W	1	RC07GF112J	81349
R8	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RC07GF103J	81349
R9	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RC07GF331J	81349
R10	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RC07GF102J	81349
R11	Same as R3			
R12	Same as R3			
R13	Same as R5			
R14	Same as R6			
R15	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	1	RC07GF101J	81349

REF DESIG PREFIX A4



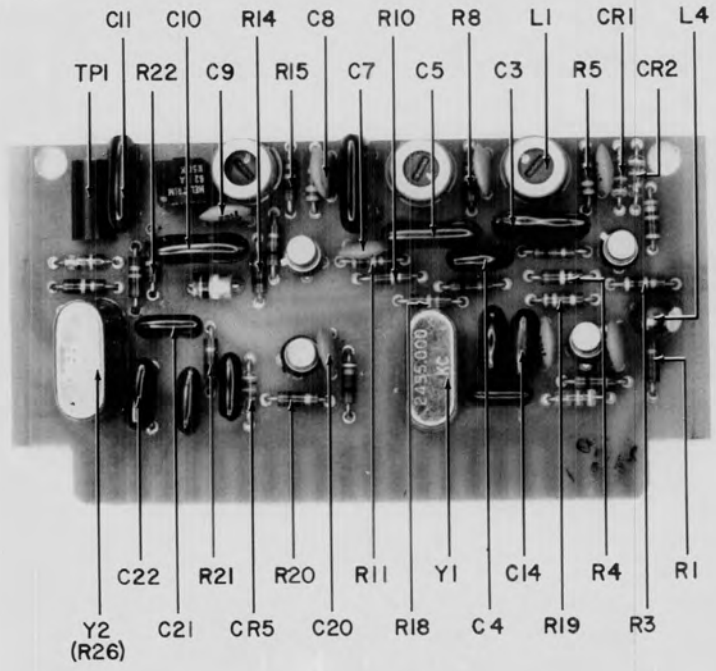


Figure 5-8. Type 8021 2000-455-kHz Mixer Amplifier, Component Locations

5.4.5 Type 8021 Mixer Amplifier REF DESIG PREFIX A4

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, CERAMIC, DISC: .01 μF, 20%, 100V	8	C023B101E103M	56289
C2	Same as C1			
C3	CAPACITOR, DIPPED MICA: 820 pF, 2%, 500V	1	CM06FD821G03	81349
C4	CAPACITOR, DIPPED MICA: 180 pF, 5%, 500V	1	CM05FD181J03	81349
C5	CAPACITOR, DIPPED MICA: 1600 pF, 2%, 500V	4	CM06FD162G03	81349
C6	Same as C5			
C7	Same as C1			
C8	Same as C1			
C9	Same as C1			
C10	Same as C5			
C11	Same as C5			
C12	CAPACITOR, COMPOSITION, TUBULAR: 1.0 pF, 10%, 500V	1	QC(1.0 pF, K)	95121
C13	CAPACITOR, DIPPED MICA: 39 pF, 5%, 500V	2	CM05ED390J03	81349
C14	CAPACITOR, DIPPED MICA: 330 pF, 5%, 500V	2	CM05FD331J03	81349
C15	Same as C14			
C16	Same as C1			
C17	Same as C1			
C18	Same as C13			
C19	CAPACITOR, DIPPED MICA: 68 pF, 5%, 500V	1	CM05ED680J03	81349
C20	Same as C1			
C21	CAPACITOR, DIPPED MICA: 10 pF, ±0.5 pF, 500V	1	CM05CD100D03	81349
C22	CAPACITOR, DIPPED MICA: 500 pF, 5%, 500V	1	DM15-501J	72136
CR1	DIODE	4	1N914A	80131
CR2	Same as CR1			
CR3	DIODE	1	1N198A	80131
CR4	Same as CR1			
CR5	Same as CR1			
L1	COIL, VARIABLE	3	31662-8	14632
L2	Same as L1			
L3	Same as L1			
L4	COIL, FIXED	1	3635-57	14632
Q1	TRANSISTOR	2	3N140	80131
Q2	Same as Q1			
Q3	TRANSISTOR	2	3N128	80131
Q4	Same as Q3			

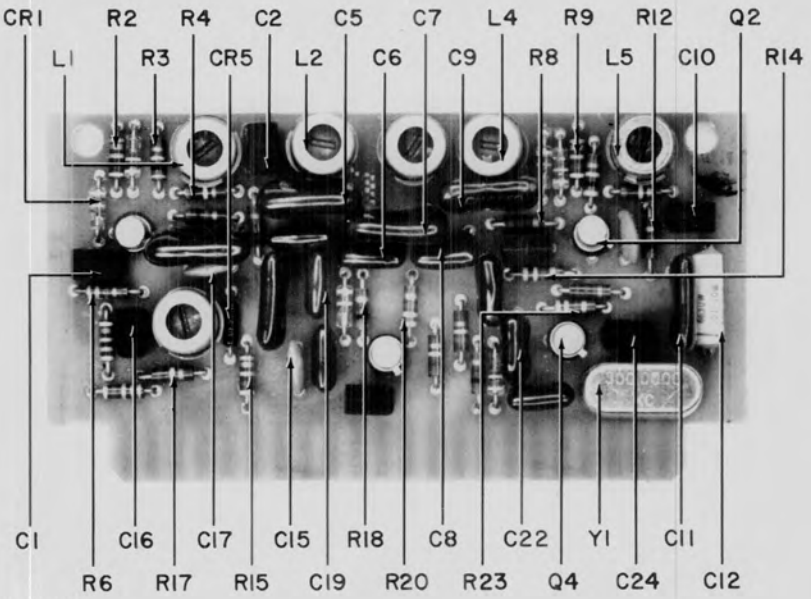
REF DESIG PREFIX A4

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
R1	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	RC07GF222J	81349
R2	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	2	RC07GF473J	81349
R3	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4W	2	RC07GF303J	81349
R4	RESISTOR, FIXED, COMPOSITION: 820 kΩ, 5%, 1/4W	1	RC07GF824J	81349
R5	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	3	RC07GF331J	81349
R6	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RC07GF101J	81349
R7	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	4	RC07GF102J	81349
R8	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	2	RC07GF103J	81349
R9	Same as R2			
R10	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4W	1	RC07GF124J	81349
R11	Same as R3			
R12	Same as R5			
R13	Same as R6			
R14	Same as R7			
R15	Same as R8			
R16	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	2	RC07GF104J	81349
R17	RESISTOR, FIXED, COMPOSITION: 1 MΩ, 5%, 1/4W	2	RC07GF105J	81349
R18	RESISTOR, FIXED, COMPOSITION: 56 kΩ, 5%, 1/4W	1	RC07GF563J	81349
R19	Same as R5			
R20	Same as R17			
R21	Same as R7			
R22	Same as R18			
R23	RESISTOR, VARIABLE, FILM: 50 kΩ, 30%, 1/2W	1	62PAR50K	73138
R24	Same as R7			
R25	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	1	RC07GF153J	81349
R26	RESISTOR, FIXED, COMPOSITION: 2.7 Ω, 5%, 1/4W	1	RC07GF272J	81349
TP1	TEST POINT	1	TJ-202BR	99687
Y1	CRYSTAL, QUARTZ: 2.455 MHz	1	91801-06	14632
Y2	CRYSTAL, QUARTZ: 455 kHz	1	94601-01	14632

5.4.6 Type 8022 Mixer Amplifier REF DESIG PREFIX A5

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 20%, 35V	7	EP35-225-20	17554
C2	Same as C1			
C3	CAPACITOR, DIPPED MICA: 2400 pF, 5%, 500V	4	CM06FD242J03	81349
C4	CAPACITOR, DIPPED MICA: 33 pF, 5%, 500V	3	CM05ED330J03	81349
C5	Same as C3			
C6	Same as C4			
C7	Same as C3			
C8	Same as C4			
C9	Same as C3			
C10	Same as C1			
C11	CAPACITOR, DIPPED MICA: 1200 pF, 5%, 500V	1	CM06FD122J03	81349
C12	CAPACITOR, MYLAR, TUBULAR: .01 μF, 10%, 100V	1	663UW103-9-1W	26655
C13	Same as C1			
C14	CAPACITOR, DIPPED MICA: 750 pF, 5%, 500V	1	CM06FD751J03	81349
C15	CAPACITOR, CERAMIC, DISC: .01 μF, 20%, 100V	3	C023B101F103M	56289
C16	Same as C1			
C17	Same as C15			
C18	CAPACITOR, DIPPED MICA: 100 pF, 5%, 500V	1	CM05FD101J03	81349
C19	CAPACITOR, DIPPED MICA: 180 pF, 5%, 500V	1	CM05FD181J03	81349
C20	Same as C1			
C21	CAPACITOR, DIPPED MICA: 39 pF, 5%, 500V	1	CM05ED390J03	81349
C22	CAPACITOR, DIPPED MICA: 560 pF, 5%, 500V	2	DM15-561J	72136
C23	Same as C22			
C24	Same as C1			
C25	Same as C15			
CR1	DIODE	6	1N914A	80131
CR2	Same as CR1			
CR3	Same as CR1			
CR4	Same as CR1			
CR5	DIODE	1	MV-1630	04713
CR6	Same as CR1			
CR7	Same as CR1			
L1	COIL, VARIABLE	4	31662-8	14632
L2	Same as L1			

REF DESIG PREFIX A5



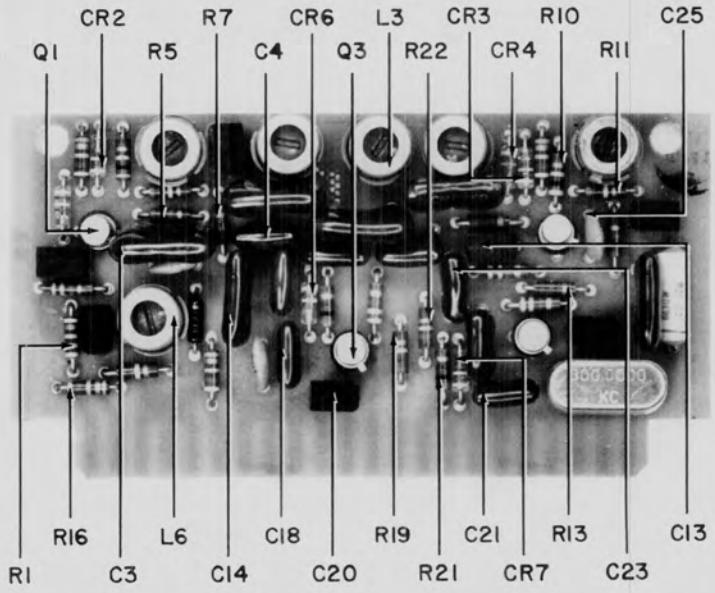


Figure 5-9. Type 8022 455-40-kHz Mixer Amplifier, Component Locations

REF DESIG PREFIX A5

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
L3	Same as L1			
L4	Same as L1			
L5	COIL, VARIABLE	1	31662-14	14632
L6	COIL, VARIABLE	1	31662-12	14632
Q1	TRANSISTOR	2	3N140	80131
Q2	Same as Q1			
Q3	TRANSISTOR	2	3N128	80131
Q4	Same as Q3			
R1	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	4	RC07GF222J	81349
R2	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	4	RC07GF473J	81349
R3	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4W	2	RC07GF303J	81349
R4	RESISTOR, FIXED, COMPOSITION: 820 kΩ, 5%, 1/4W	2	RC07GF824J	81349
R5	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RC07GF101J	81349
R6	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	4	RC07GF331J	81349
R7	Same as R1			
R8	Same as R1			
R9	Same as R2			
R10	Same as R3			
R11	Same as R4			
R12	Same as R5			
R13	Same as R1			
R14	Same as R6			
R15	Same as R2			
R16	Same as R2			
R17	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4W	1	RC07GF224J	81349
R18	RESISTOR, FIXED, COMPOSITION: 1MΩ, 5%, 1/4W	2	RC07GF105J	81349
R19	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RC07GF104J	81349
R20	Same as R6			
R21	Same as R18			
R22	RESISTOR, FIXED, COMPOSITION: 27 kΩ, 5%, 1/4W	1	RC07GF273J	81349
R23	Same as R6			
Y1	CRYSTAL, QUARTZ: 300 kHz	1	94601-02	14632

REF DESIG PREFIX A6

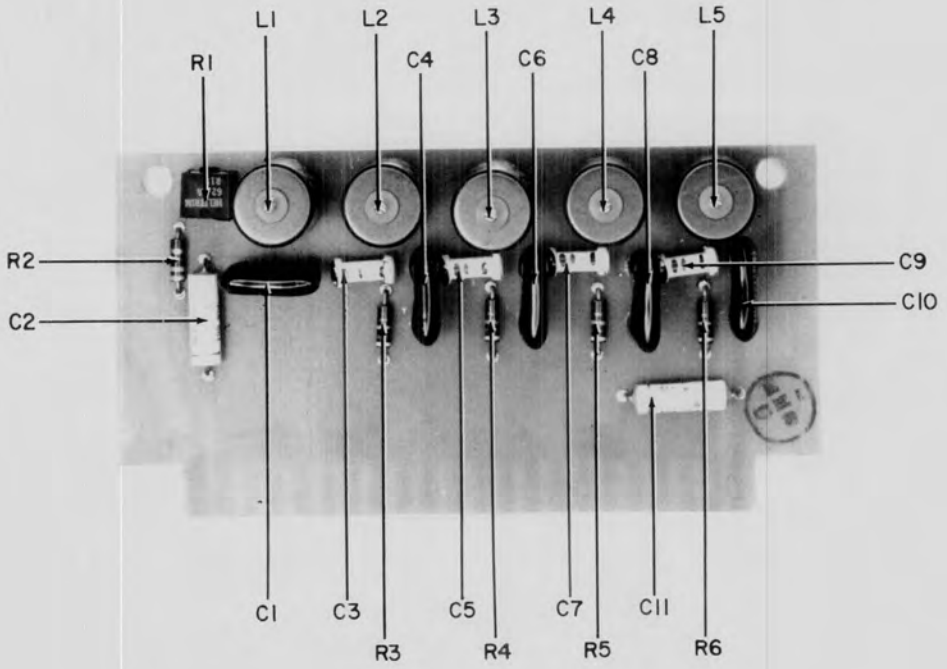


Figure 5-10. Type 8023 Bandpass Filter, Component Locations

5.4.7 Type 8023 Bandpass Filter REF DESIG PREFIX A6

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, DIPPED MICA: 1050 pF, 2%, 500V	5	DM19-1051G	72136
C2	CAPACITOR, MYLAR, TUBULAR: .01 μF, 10%, 100V	2	663UW103-9-1-W	26655
C3	CAPACITOR, CERAMIC, TUBULAR: 7.5 pF, ± .5 pF, 500V	1	301-000COHO759D	72982
C4	Same as C1			
C5	CAPACITOR, CERAMIC, TUBULAR: 6.2 pF, ±.5 pF, 500V	3	301-000COHO629D	72982
C6	Same as C1			
C7	Same as C5			
C8	Same as C1			
C9	Same as C5			
C10	Same as C1			
C11	Same as C2			
L1	COIL, VARIABLE	5	501-1502	05245
L2	Same as L1			
L3	Same as L1			
L4	Same as L1			
L5	Same as L1			
R1	RESISTOR, VARIABLE, FILM: 1 kΩ, 30%, 1/2W	1	62PAR1K	73138
R2	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RC07GF331J	81349
R3	RESISTOR, FIXED, COMPOSITION: 470 kΩ, 5%, 1/4W	4	RC07GF474J	81349
R4	Same as R3			
R5	Same as R3			
R6	Same as R3			

5.4.8 Type 8024 Bandpass Filter REF DESIG PREFIX A7

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, DIPPED MICA: 1050 pF, 1%, 500V	5	DM19-1051G	72136
C2	CAPACITOR, MYLAR, TUBULAR: 0.01 μF, 10%, 100V	2	663UW103-9-1-W	26655
C3	CAPACITOR, CERAMIC, TUBULAR: 3.3 pF, ±0.25 pF, 500V	2	301-000C0J0339C	72982
C4	Same as C1			
C5	CAPACITOR, CERAMIC, TUBULAR: 2.7 pF, ± 0.25 pF, 500V	2	301-000C0J0279C	72982
C6	Same as C1			
C7	Same as C5			
C8	Same as C1			
C9	Same as C3			
C10	Same as C1			
C11	Same as C2			
L1	COIL, VARIABLE	5	501-1502	05245
L2	Same as L1			
L3	Same as L1			
L4	Same as L1			
L5	Same as L1			
R1	RESISTOR, VARIABLE, FILM: 1 kΩ, 30%, 1/2W	1	62PAR1K	73138
R2	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RC07GF331J	81349

REF DESIG PREFIX A7

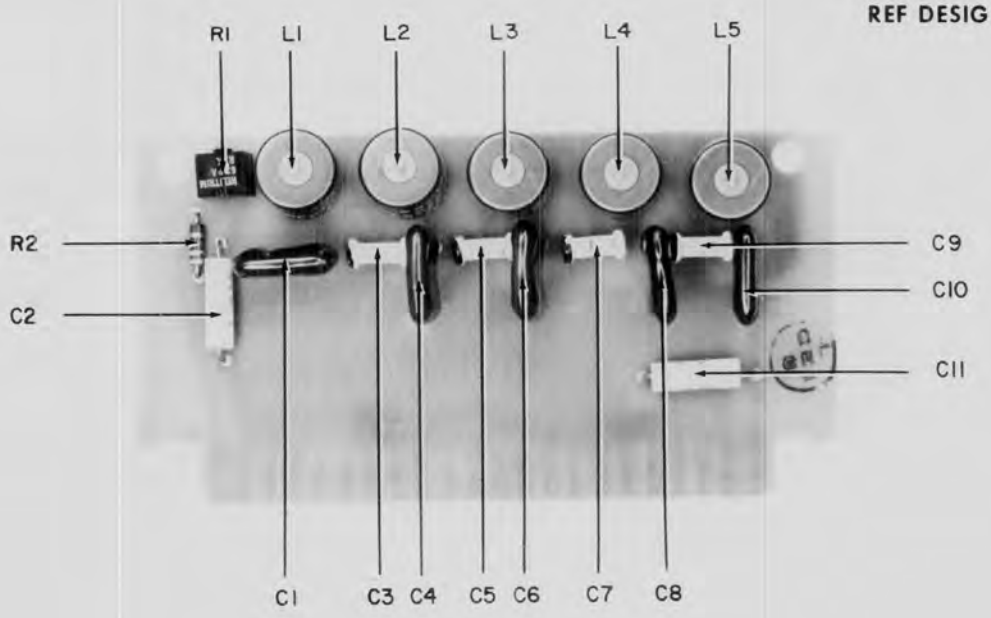


Figure 5-11. Type 8024 Bandpass Filter, Component Locations

5.4.9 Type 8136 Output Amplifier REF DESIG PREFIX A8

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, DIPPED MICA: 1100 pF, 5%, 500V	1	CM06FD112J03	81349
C2	CAPACITOR, MYLAR TUBULAR: 0.01 μF, 10%, 100V	1	663UW103-9-1-W	26655
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 20%, 35V	6	EP35-225-20	17554
C4	Same as C3			
C5	Same as C3			
C6	CAPACITOR, DIPPED MICA: 3300 pF, 5%, 500V	2	CM06FD332J03	81349
C7	CAPACITOR, MYLAR, TUBULAR: 0.1 μF, 10%, 100V	2	663UW104-9-1-W	26655
C8	Same as C3			
C9	Same as C6			
C10	Same as C7			
C11	Same as C3			
C12	Same as C3			
C13	CAPACITOR, DIPPED MICA: 560 pF, 5%, 500V	2	DM15-561J	72136
C14	Same as C13			
C15	CAPACITOR, MYLAR, METALLIZED: 0.22 μF, 20%, 400V	2	B32232-A6224-M	25088
C16	CAPACITOR, DIPPED MICA: 330 pF, 5%, 500V	2	CM05FD331J03	81349
C17	CAPACITOR, DIPPED MICA: 120 pF, 5%, 500V	2	CM05FD121J03	81349
C18	Same as C15			
C19	Same as C16			
C20	Same as C17			
C21	CAPACITOR, DIPPED MICA: 1200 pF, 5%, 500V	2	CM06FD122J03	81349
C22	Same as C21			
C23	CAPACITOR, DIPPED MICA: 2200 pF, 5%, 500V	2	CM06FD222J03	81349
C24	Same as C23			
CR1	DIODE	2	5082-2900	28480
CR2	Same as CR1			
CR3	DIODE	6	1N198A	80131
CR4	Same as CR3			
CR5	Same as CR3			
CR6	Same as CR3			
CR7	Same as CR3			
CR8	Same as CR3			
L1	COIL, VARIABLE	1	31662-14	71279
L2	COIL, VARIABLE	2	31662-12	71279

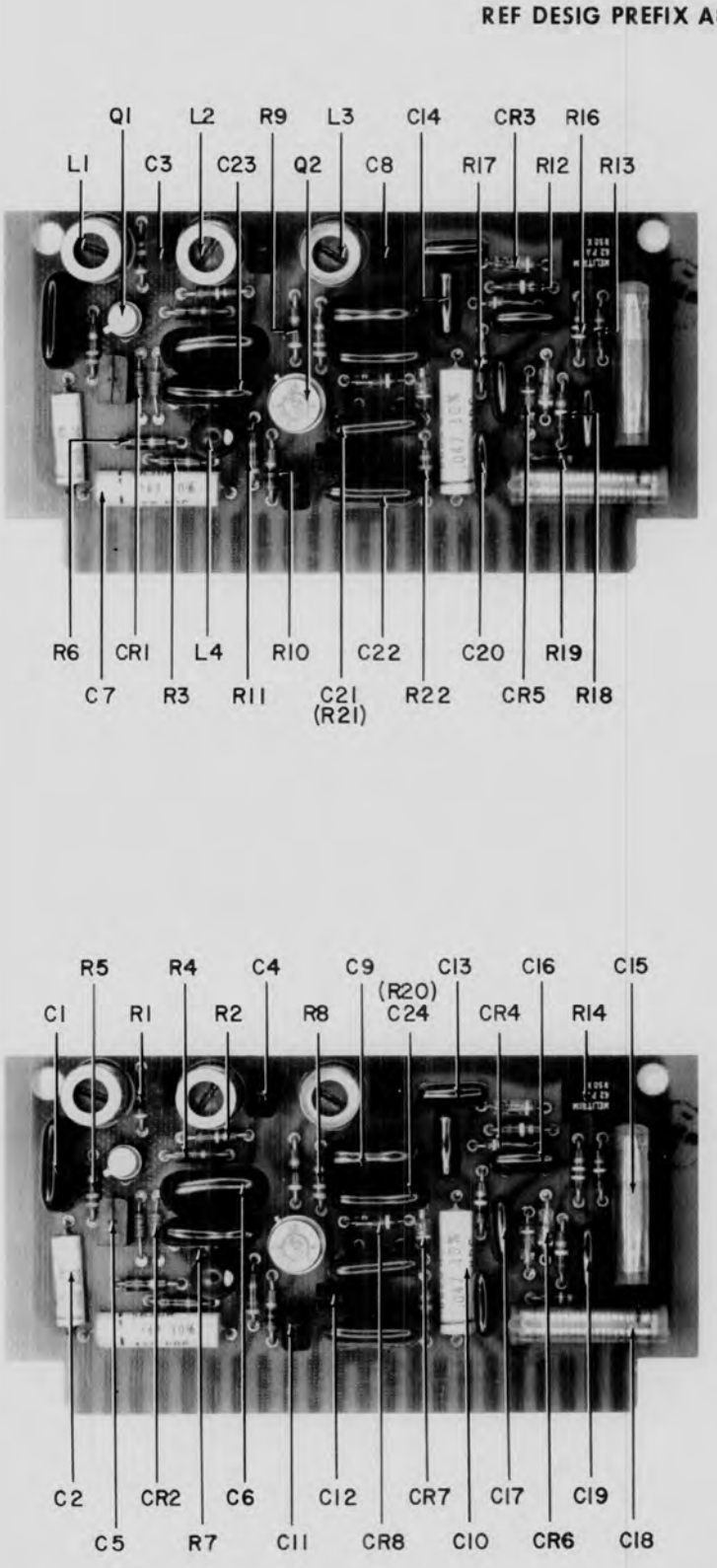


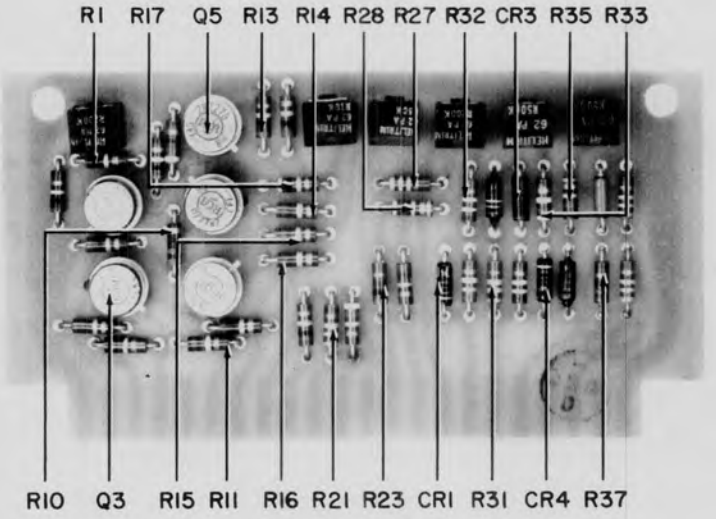
Figure 5-12. Type 8136 40-kHz Output Amplifier, Component Locations

REF DESIG PREFIX A8

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
L3	Same as L2			
L4	COIL, FIXED: 100 mH	1	3635-61	71279
Q1	TRANSISTOR	1	3N140	80131
Q2	TRANSISTOR	1	2N3866	80131
R1	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4W	1	RC07GF303J	81349
R2	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4W	1	RC07GF124J	81349
R3	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RC07GF102J	81349
R4	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	1	RC07GF101J	81349
R5	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	2	RC07GF331J	81349
R6*	RESISTOR, FIXED, COMPOSITION: 200 Ω, 5%, 1/4W	1	RC07GF201J	81349
R7	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	3	RC07GF103J	81349
R8	Same as R5			
R9	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RC07GF470J	81349
R10	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	1	RC07GF100J	81349
R11	RESISTOR, FIXED, COMPOSITION: 3.6 kΩ, 5%, 1/4W	1	RC07GF362J	81349
R12	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4W	2	RC07GF224J	81349
R13	RESISTOR, FIXED, COMPOSITION: 200 kΩ, 5%, 1/4W	1	RC07GF204J	81349
R14	RESISTOR, VARIABLE, FILM: 50 kΩ, 30%, 1/2W	1	62PAR50K	73138
R15	NOT USED			
R16	RESISTOR, FIXED, COMPOSITION: 240 kΩ, 5%, 1/4W	1	RC07GF244J	81349
R17	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	2	RC07GF104J	81349
R18	Same as R12			
R19	Same as R17			
R20	Same as R7			
R21	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	RC07GF473J	81349
R22	Same as R7			

* Nominal value, final value to be factory selected.

REF DESIG PREFIX A9



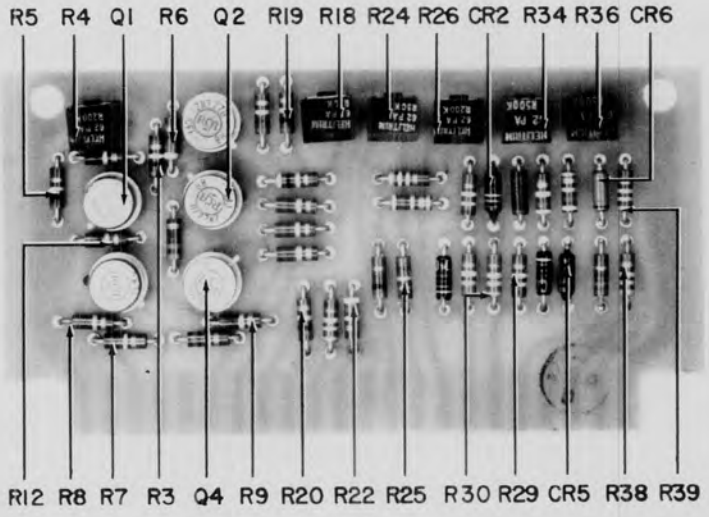


Figure 5-13. Type 8234 Horizontal Amplifier, Component Locations

5.4.10 Type 8234 Horizontal Amplifier

REF DESIG PREFIX A9

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
CR1	DIODE	2	1N462A	80131
CR1	DIODE	1	1N749A	80131
CR3	DIODE	1	1N746A	80131
CR4	Same as CR1			
CR5	DIODE	1	1N751A	80131
CR6	DIODE	1	1N966A	80131
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	RC07GF224J	81349
R2	NOT USED			
R3	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	2	RC07GF104J	81349
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	RC07GF472J	81349
R7	Same as R1			
R8	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	4	RC07GF153J	81349
R9	Same as R8			
R10	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	1	RC07GF682J	81349
R11	Same as R1			
R12	Same as R8			
R13	Same as R8			
R14	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	3	RC07GF223J	81349
R15	Same as R14			
R16	Same as R14			
R17	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4W	1	RC07GF303J	81349
R18	RESISTOR, VARIABLE, FILM: 10 kΩ, 30%, 1/2W	1	62PAR10K	73138
R19	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RC07GF103J	81349
R20	RESISTOR, FIXED, COMPOSITION: 20 kΩ, 5%, 1/4W	1	RC07GF203J	81349
R21	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	2	RC07GF333J	81349
R22	RESISTOR, FIXED, COMPOSITION: 91 kΩ, 5%, 1/4W	1	RC07GF913J	81349
R23	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RC07GF102J	81349
R24	RESISTOR, VARIABLE, FILM: 50 kΩ, 30%, 1/2W	1	62PAR50K	73138

REF DESIG PREFIX A9

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
R25	RESISTOR, FIXED, COMPOSITION: 75 kΩ, 5%, 1/4W	3	RC07GF753J	81349
R26	RESISTOR, VARIABLE, FILM: 500 kΩ, 30%, 1/2W	1	62PAR500K	73138
R27	RESISTOR, FIXED, COMPOSITION: 390 kΩ, 5%, 1/4W	1	RC07GF394J	81349
R28	Same as R25			
R29	RESISTOR, FIXED, COMPOSITION: 240 kΩ, 5%, 1/4W	2	RC07GF244J	81349
R30	Same as R21			
R31	RESISTOR, FIXED, COMPOSITION: 130 kΩ, 5%, 1/4W	1	RC07GF134J	81349
R32	Same as R29			
R33	RESISTOR, FIXED, COMPOSITION: 470 kΩ, 5%, 1/4W	1	RC07GF474J	81349
R34	RESISTOR, VARIABLE, FILM: 500 kΩ, 30%, 1/2W	2	62PAR500K	73138
R35	Same as R25			
R36	Same as R34			
R37	RESISTOR, FIXED, COMPOSITION: 1.8 kΩ, 5%, 1/4W	1	RC07GF182J	81349
R38	RESISTOR, FIXED, COMPOSITION: 330 kΩ, 5%, 1/4W	2	RC07GF334J	81349
R39	Same as R38			

REF DESIG PREFIX A10

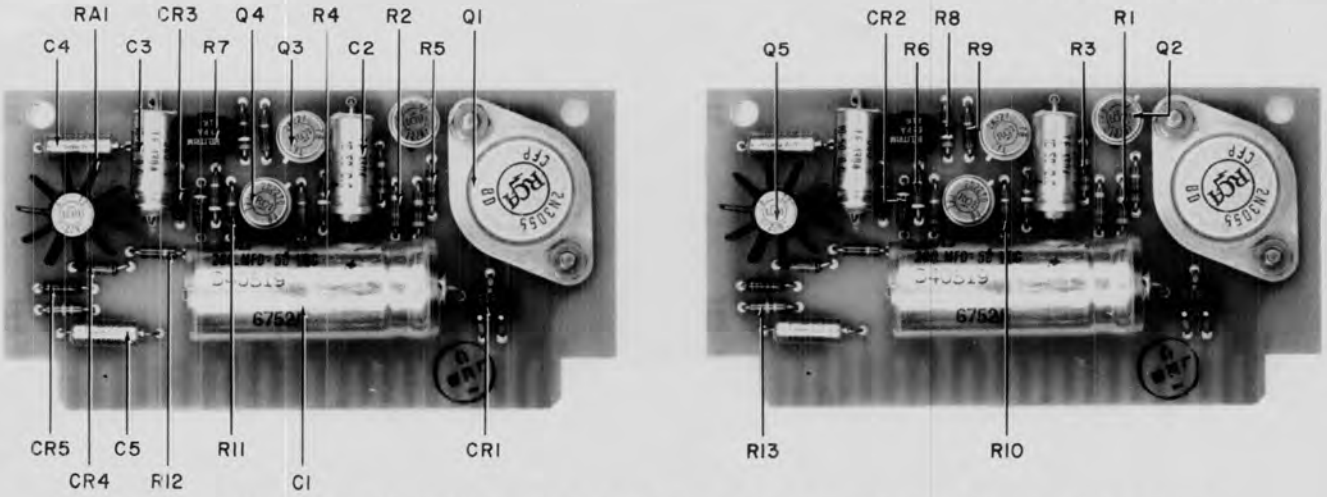


Figure 5-14. Type 76166 +18 Vdc and +24 Vdc Regulated Power Supply, Component Locations

5.4.11 Type 76166 +18 Vdc and +24 Vdc Regulated Power Supply REF DESIG PREFIX A10

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, TANTALUM: 6.8 μF, 10%, 35V	1	150D685X9035B2	56289
C5	Same as C4			
CR1	DIODE	1	MDA940A-3	04713
CR2	DIODE	1	1N754A	80131
CR3	DIODE	2	1N462A	80131
CR4	DIODE	1	1N967A	80131
CR5	Same as CR3			
Q1	TRANSISTOR	1	2N3055	80131
Q2	TRANSISTOR	4	2N2270	80131
Q3	Same as Q2			
Q4	Same as Q2			
Q5	Same as Q2			
R1	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RC07GF470J	81349
R2	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	2	RC07GF682J	81349
R3	Same as R2			
R4	RESISTOR, FIXED, COMPOSITION: 270 kΩ, 5%, 1/4W	1	RC07GF274J	81349
R5	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RC07GF102J	81349
R6	RESISTOR, FIXED, COMPOSITION: 9.1 kΩ, 5%, 1/4W	1	RC07GF912J	81349
R7	RESISTOR, VARIABLE, FILM: 1 kΩ, 30%, 1/2W	1	62PAR1K	73138
R8	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4W	1	RC07GF392J	81349
R9	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4W	1	RC07GF152J	81349
R10	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	1	RC07GF221J	81349
R11	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4W	1	RC07GF822J	81349
R12	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4W	1	RC07GF272J	81349
R13	RESISTOR, FIXED, COMPOSITION: 18 kΩ, 5%, 1/4W	1	RC07GF183J	81349
RA1	RADIATOR, TRANSISTOR	1	NF207	05820

5.4.12 Type 76168 -18V Regulated Power Supply REF DESIG PREFIX A11

Ref Desig	Description	Qty Per Assy	Vendor Part No.	Vendor Code
C1	CAPACITOR, ELECTROLYTIC, ALUMINUM: 200 pF, -10+75%, 50V	1	39D207G050FJ4	56289
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 22 pF, 10%, 35V	2	CS13BF226K	81349
C3	Same as C2			
CR1	DIODE	1	MDA950A-3	04713
CR2	DIODE	1	1N967B	80131
CR3	DIODE	1	1N462A	80131
Q1	TRANSISTOR	2	2N4037	80131
Q2	Same as Q1			
R1	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 2W	2	RC42GF221J	81349
R2	RESISTOR, FIXED, COMPOSITION: 5.1 kΩ, 5%, 1/4W	2	RC07GF512J	81349
R3	RESISTOR, FIXED, COMPOSITION: 1.8 kΩ, 5%, 1/4W	1	RC07GF182J	81349
R4	Same as R1			
R5	Same as R2			
R6	RESISTOR, FIXED, COMPOSITION: 18 kΩ, 5%, 1/4W	2	RC07GF183J	81349
R7	Same as R6			
RA1	RADIATOR, TRANSISTOR	1	3AL635-2R	07387

REF DESIG PREFIX A11

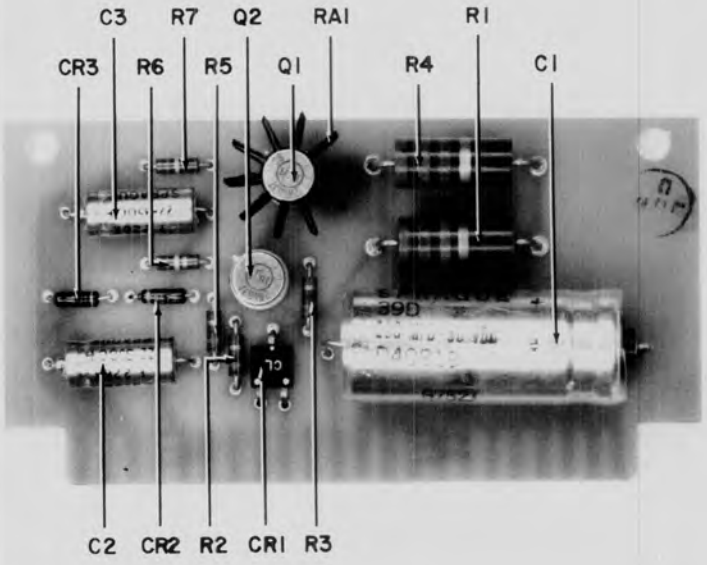


Figure 5-15. Type 76168 -18 Vdc Regulated Power Supply, Component Locations

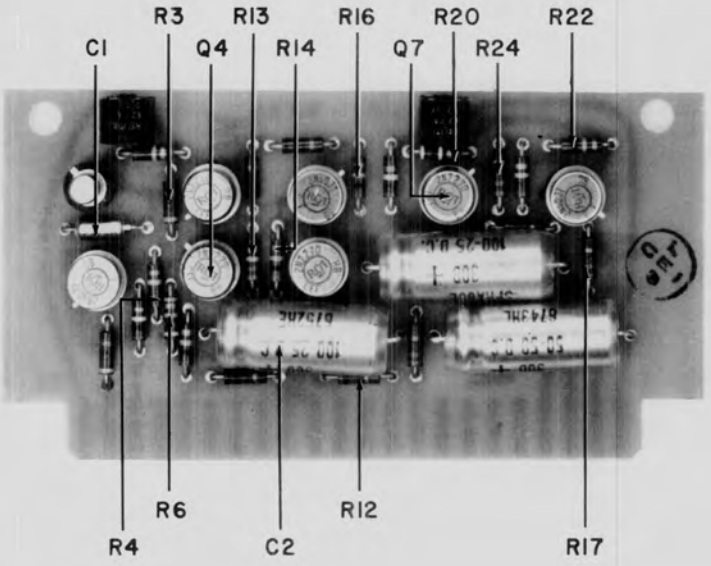
5.4.13 Type 8235 Sweep Generator REF DESIG PREFIX A12

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	2	30D107G025DD2	56289
C3	Same as C2			
C4	CAPACITOR, ELECTROLYTIC, ALUMINUM: 50 μF, -10+75%, 50V	1	30D506G050DD2	56289
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	RC07GF153J	81349
R3	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	2	RC07GF472J	81349
R4	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	1	RC07GF223J	81349
R5	Same as R3			
R6	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	RC07GF473J	81349
R7	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RC07GF104J	81349
R8	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	3	RC07GF222J	81349
R9	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	4	RC07GF103J	81349
R10	Same as R8			
R11	RESISTOR, FIXED, COMPOSITION: 6.8 MΩ, 5%, 1/4W	2	RC07GF685J	81349
R12	RESISTOR, FIXED, COMPOSITION: 1.5 MΩ, 5%, 1/4W	2	RC07GF155J	81349
R13	RESISTOR, FIXED, COMPOSITION: 68 kΩ, 5%, 1/4W	1	RC07GF683J	81349
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	RC07GF474J	81349
R21	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	RC07GF154J	81349

REF DESIG PREFIX A12

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	RC07GF682J	81349

REF DESIG PREFIX A12



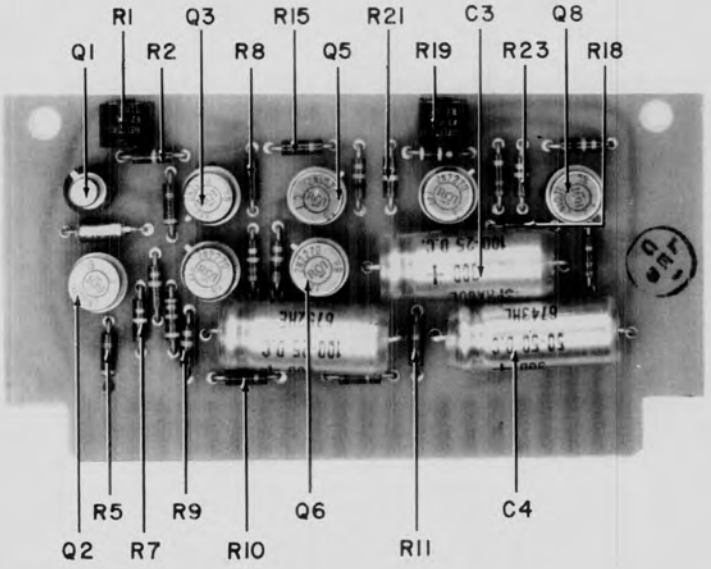


Figure 5-16. Type 8235 Sweep Generator, Component Locations

5.4.14 Part 13488 Focus and Intensity Board REF DESIG PREFIX A13

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	RC07GF104J	81349
R2	RESISTOR, VARIABLE, COMPOSITION: 500 kΩ, 10%, 1/2W	1	RV5NAYSD504A	81349
R3	RESISTOR, FIXED, COMPOSITION: 3.3 MΩ, 5%, 1/2W	1	RC20GF335J	81349
R4	RESISTOR, VARIABLE, COMPOSITION: 2.5 MΩ, 10%, 1/2W	1	RV5NAYSD255B	81349
R5	RESISTOR, FIXED, COMPOSITION: 3.9 MΩ, 5%, 1/2W	1	RC20GF395J	81349
R6	RESISTOR, FIXED, COMPOSITION: 4.7 MΩ, 5%, 1/2W	1	RC20GF475J	81349

REF DESIG PREFIX A13

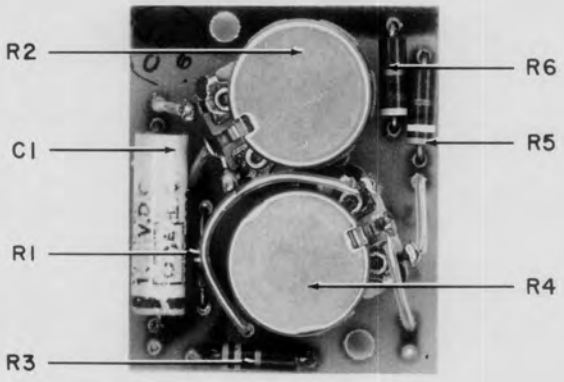
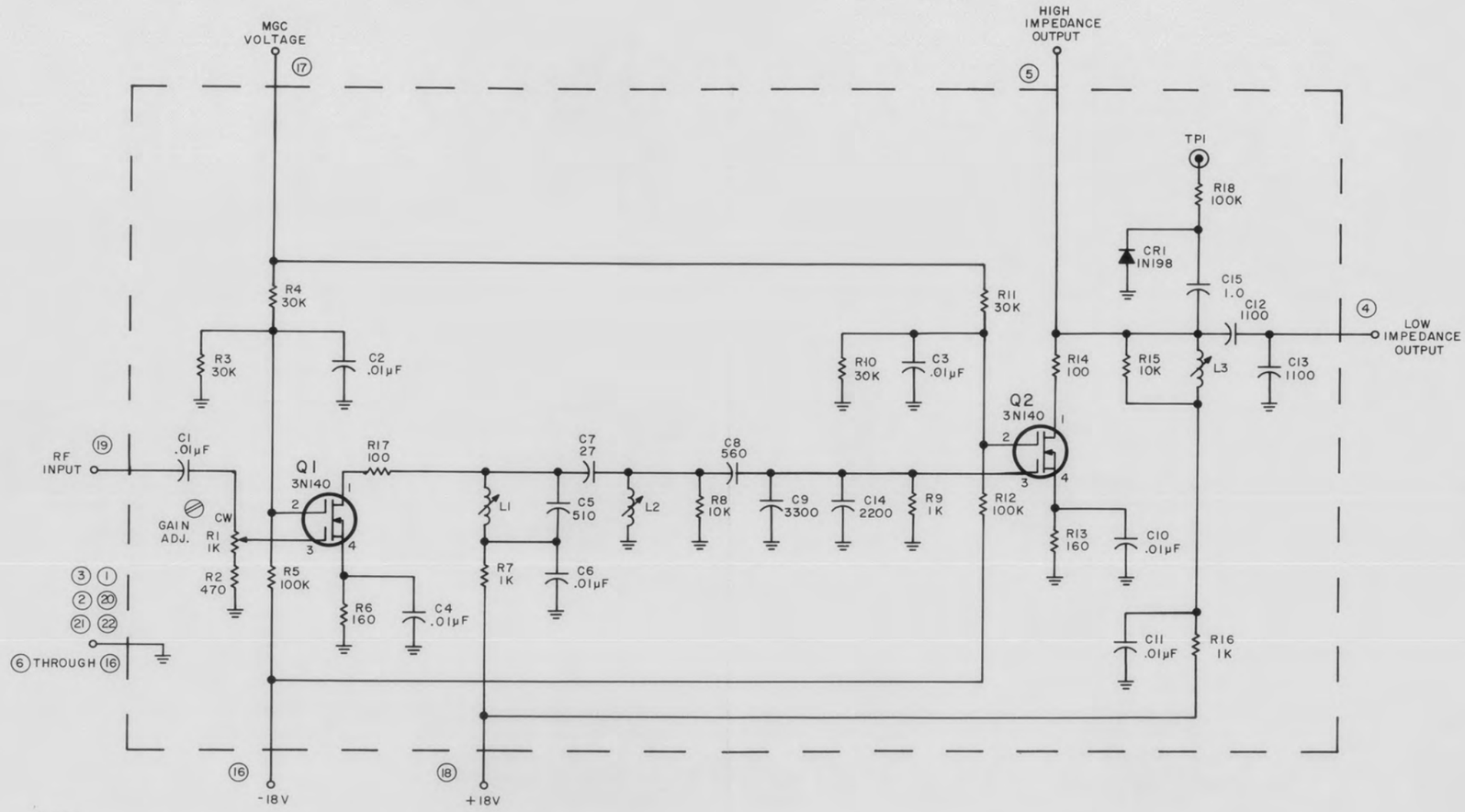


Figure 5-17. Part 13488 Focus and Intensity Board, Component Locations

SECTION VI

SCHEMATIC DIAGRAMS

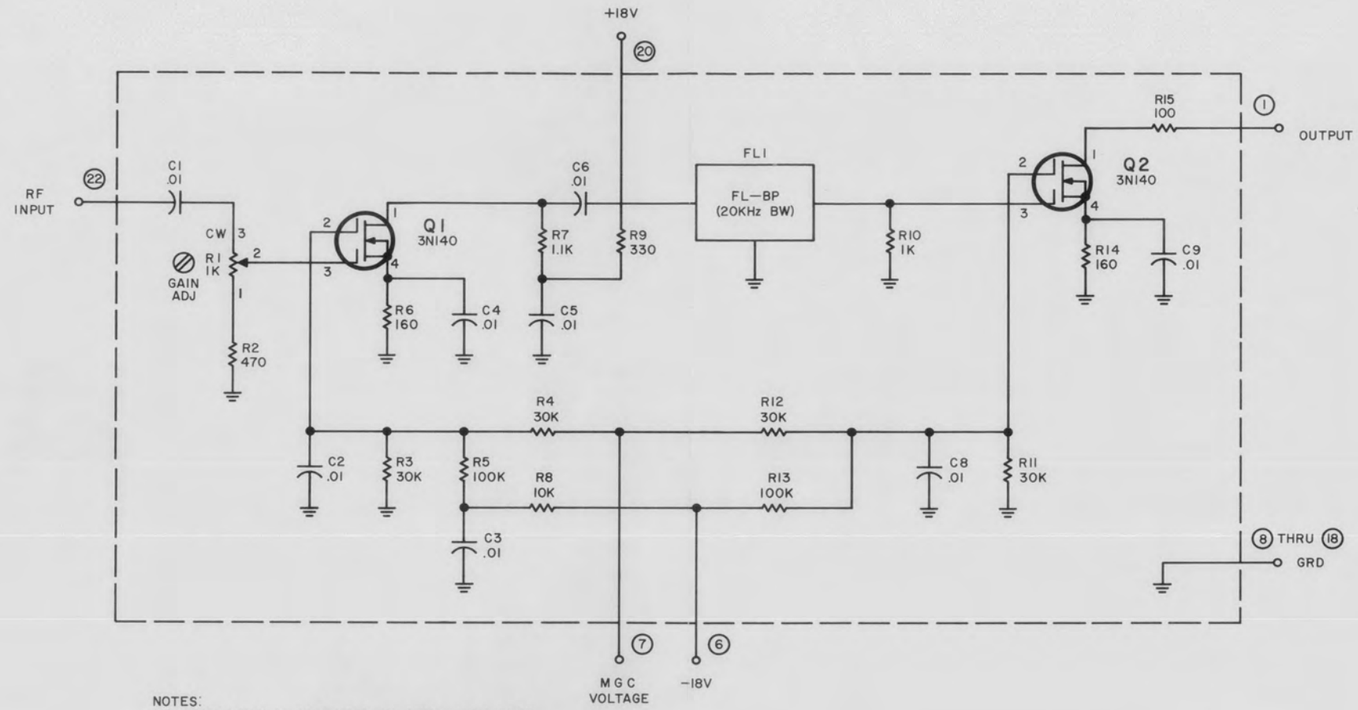
REF DESIG PREFIX A1



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a. RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b. CAPACITANCE IS MEASURED IN pF.

Figure 6-1. Type 8018 Bandpass Amplifier, Schematic Diagram

REF DESIG PREFIX A2



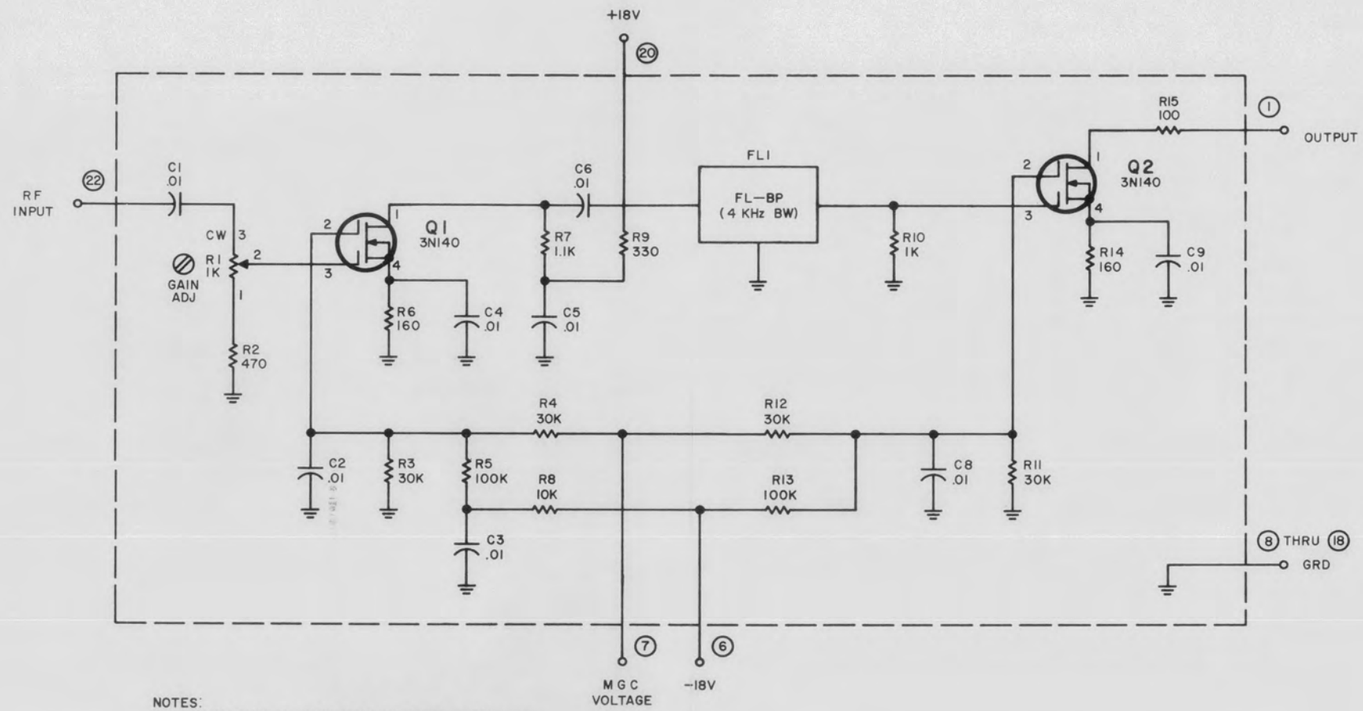
NOTES:
1. RESISTANCE IS MEASURED IN OHMS, ± 5%, 1/4W; CAPACITANCE IS MEASURED IN μF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS.

CW — INDICATES CLOCKWISE ROTATION

⊘ — INDICATES SCREWDRIVER ADJUSTMENT

Figure 6-2. Type 8019 Bandpass Amplifier, Schematic Diagram

REF DESIG PREFIX A3

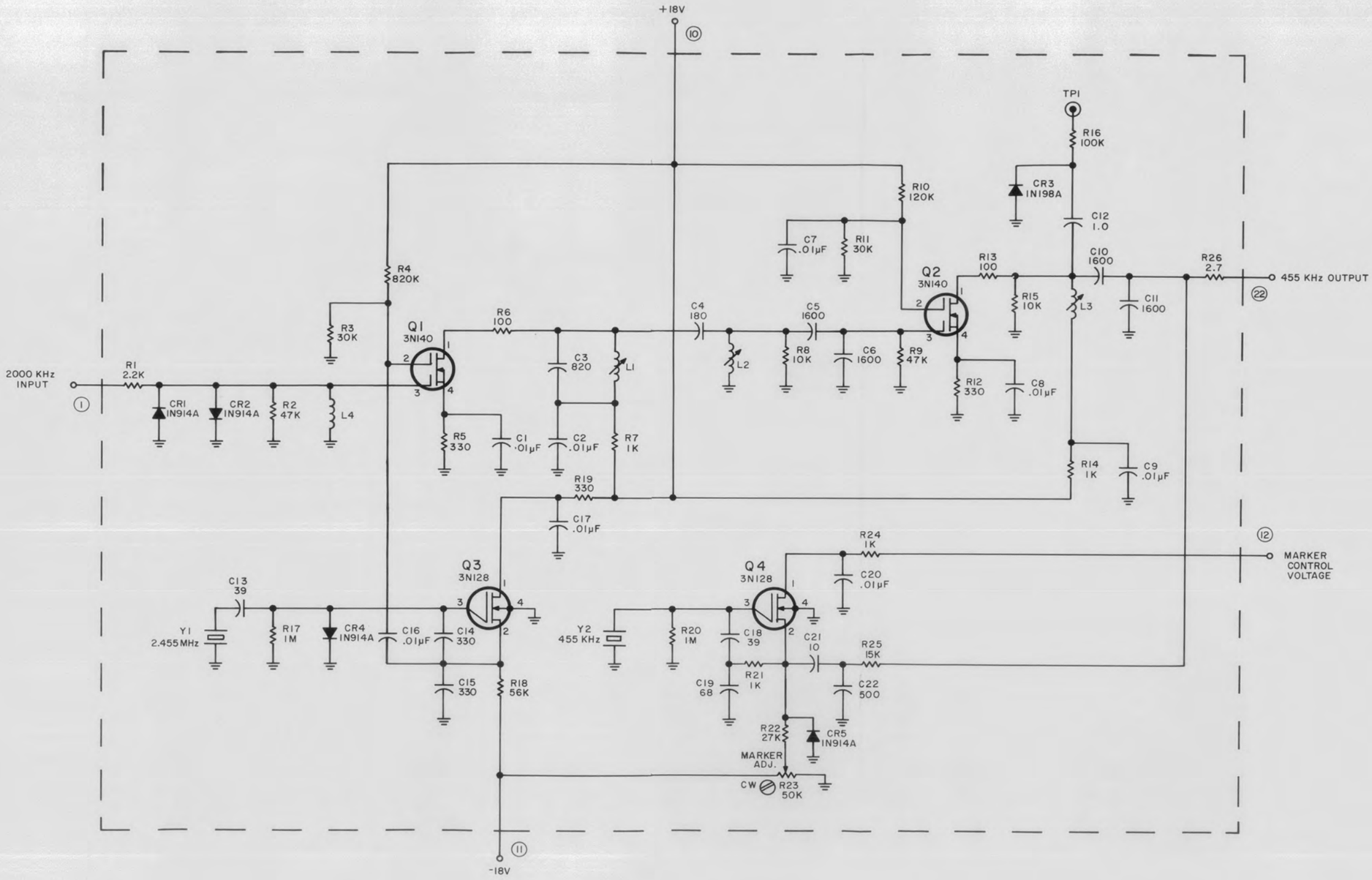


NOTES:
1. RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W; CAPACITANCE IS MEASURED IN µF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS
3. FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS.

CW	INDICATES CLOCKWISE ROTATION
⊘	INDICATES SCREWDRIVER ADJUSTMENT

Figure 6-3. Type 8020 Bandpass Amplifier, Schematic Diagram

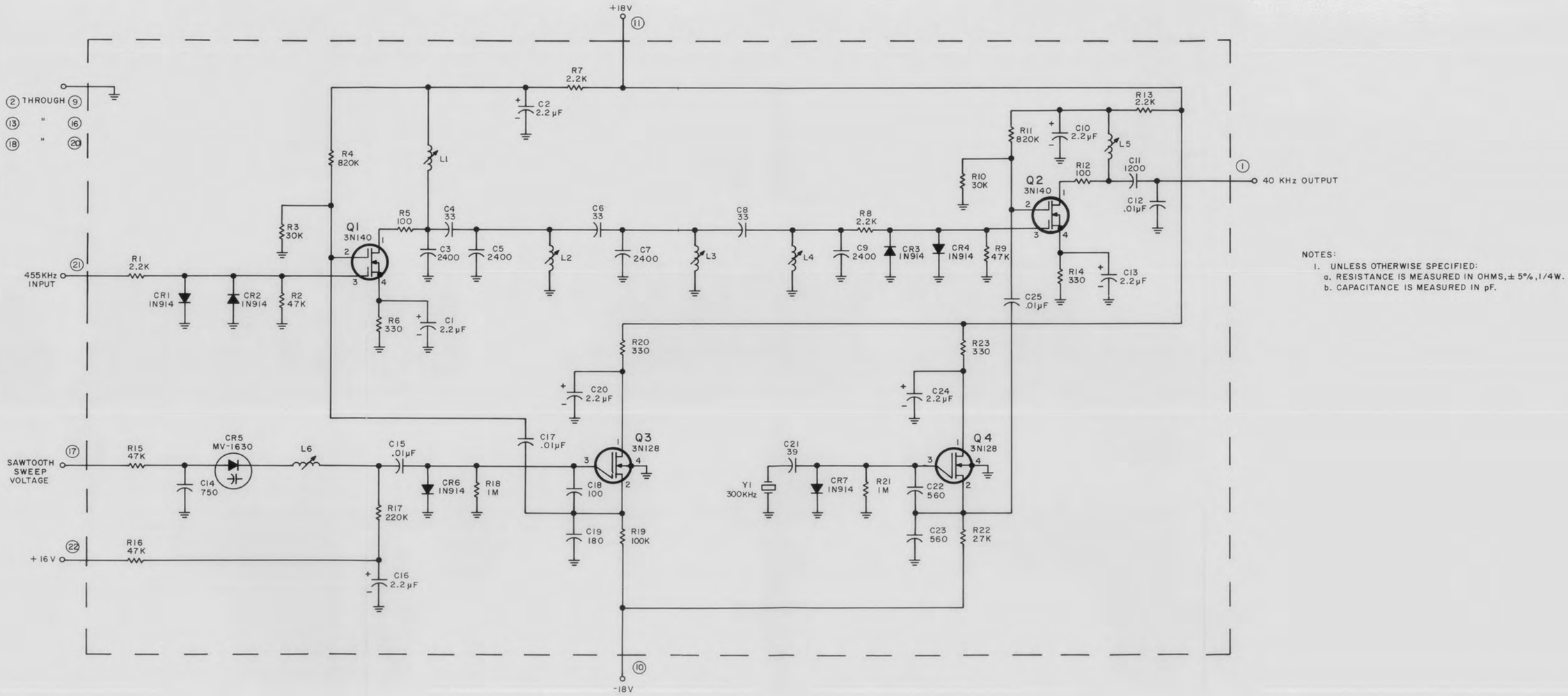
REF DESIG PREFIX A4



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a. RESISTANCE IS MEASURED IN OHMS, ± 5%, 1/4 W.
   b. CAPACITANCE IS MEASURED IN pF.

Figure 6-4. Type 8021 Mixer Amplifier, Schematic Diagram

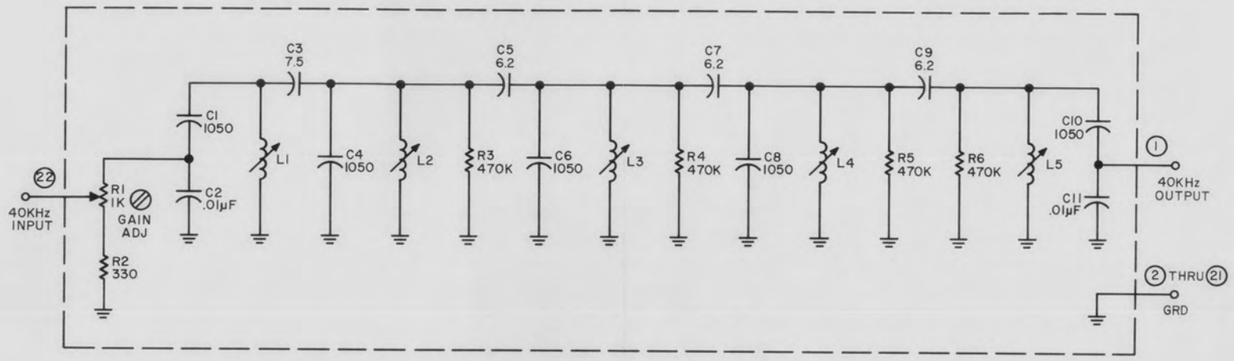
REF DESIG PREFIX A5



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a. RESISTANCE IS MEASURED IN OHMS, ± 5%, 1/4W.
   b. CAPACITANCE IS MEASURED IN pF.

Figure 6-5. Type 8022 Mixer Amplifier, Schematic Diagram

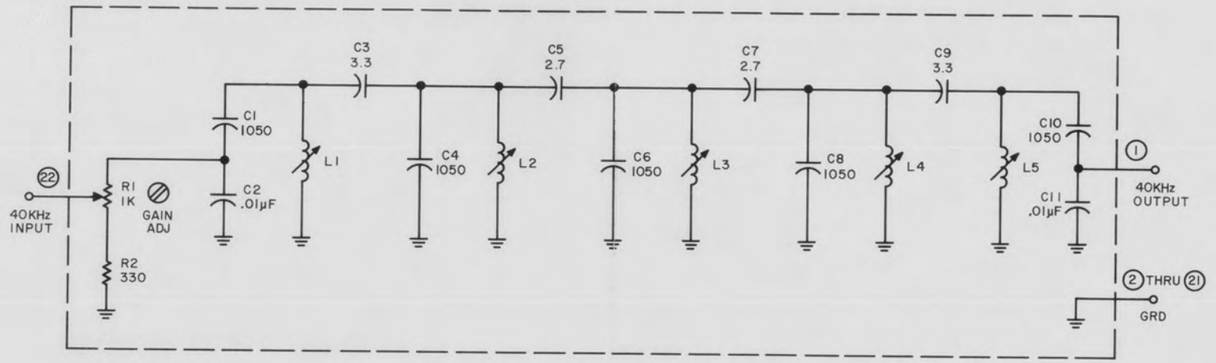
REF DESIG PREFIX A6



NOTES:
UNLESS OTHERWISE SPECIFIED
1. RESISTANCE IS MEASURED IN OHMS, ± 5%, 1/4W.
2. CAPACITANCE IS MEASURED IN pF.
3. FOLLOWING NOTATION IS USED ON A POTENTIOMETER
⊘ INDICATES SCREWDRIVER ADJUSTMENT
4. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.

Figure 6-6. Type 8023 Bandpass Filter, Schematic Diagram

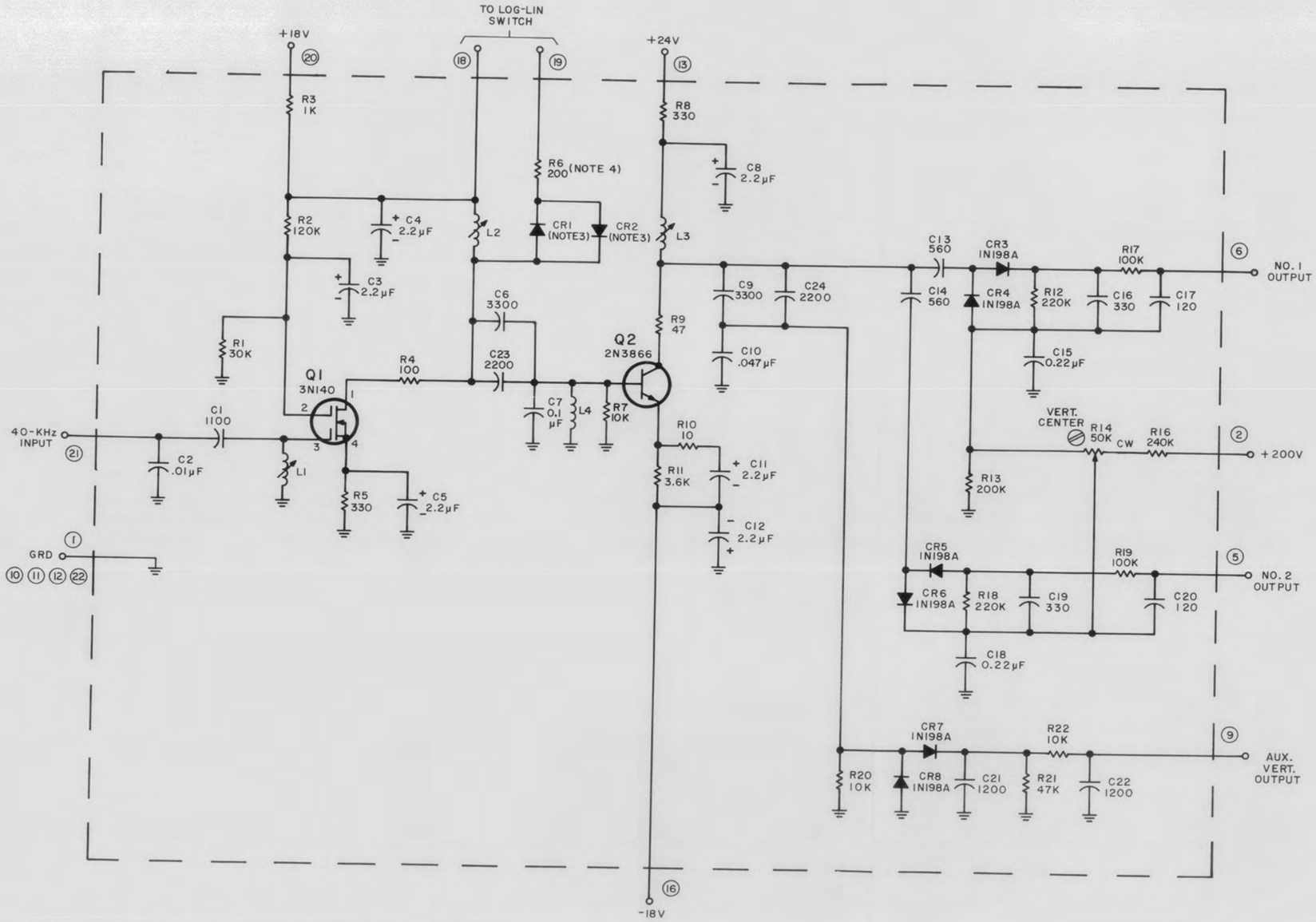
REF DESIG PREFIX A7



NOTES:
UNLESS OTHERWISE SPECIFIED
1. RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
2. CAPACITANCE IS MEASURED IN pF.
3. FOLLOWING NOTATION IS USED ON A POTENTIOMETER
⊘ INDICATES SCREWDRIVER ADJUSTMENT
4. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.

Figure 6-7. Type 8024 Bandpass Filter, Schematic Diagram

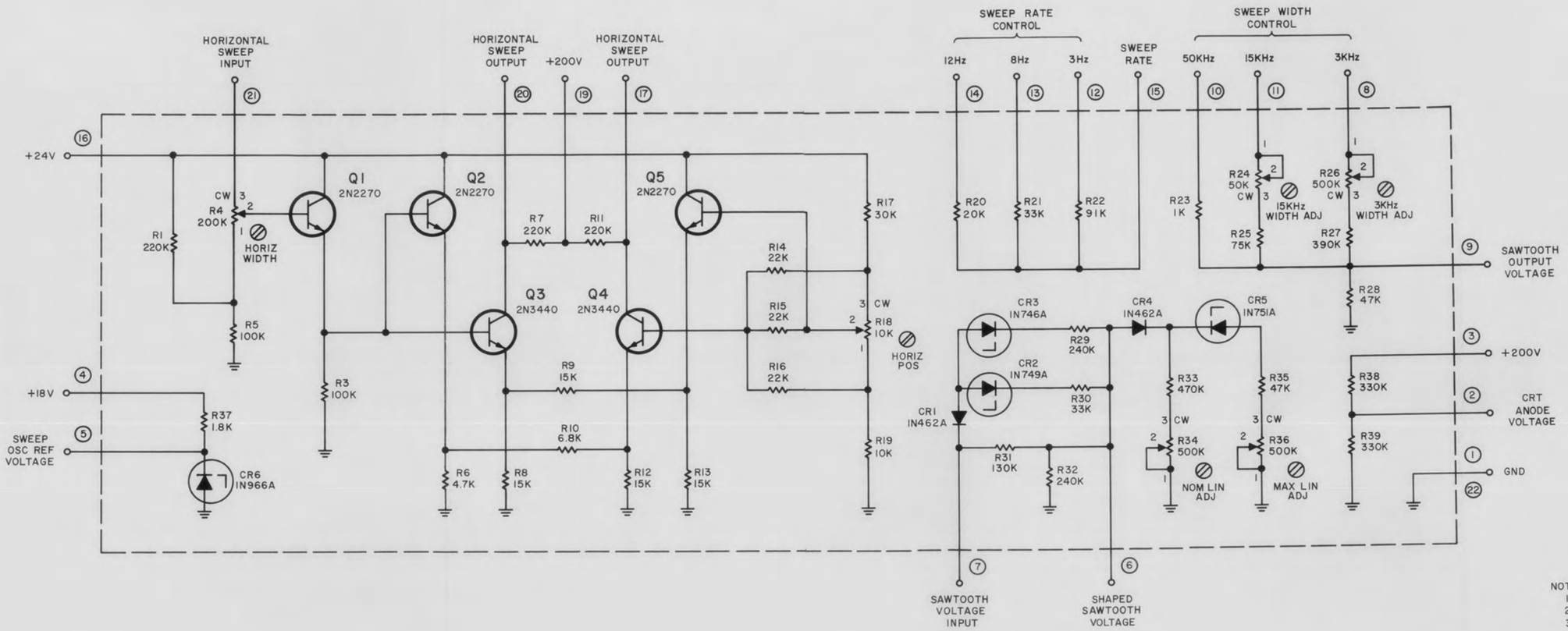
REF DESIG PREFIX A8



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a. RESISTANCE IS MEASURED IN OHMS, ± 5%, 1/W.
   b. CAPACITANCE IS MEASURED IN pF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. DIODES CR1 AND CR2 ARE 5082-2900.
4. NOMINAL VALUE. FINAL VALUE TO BE FACTORY SELECTED.

Figure 6-8. Type 8136 Output Amplifier, Schematic Diagram

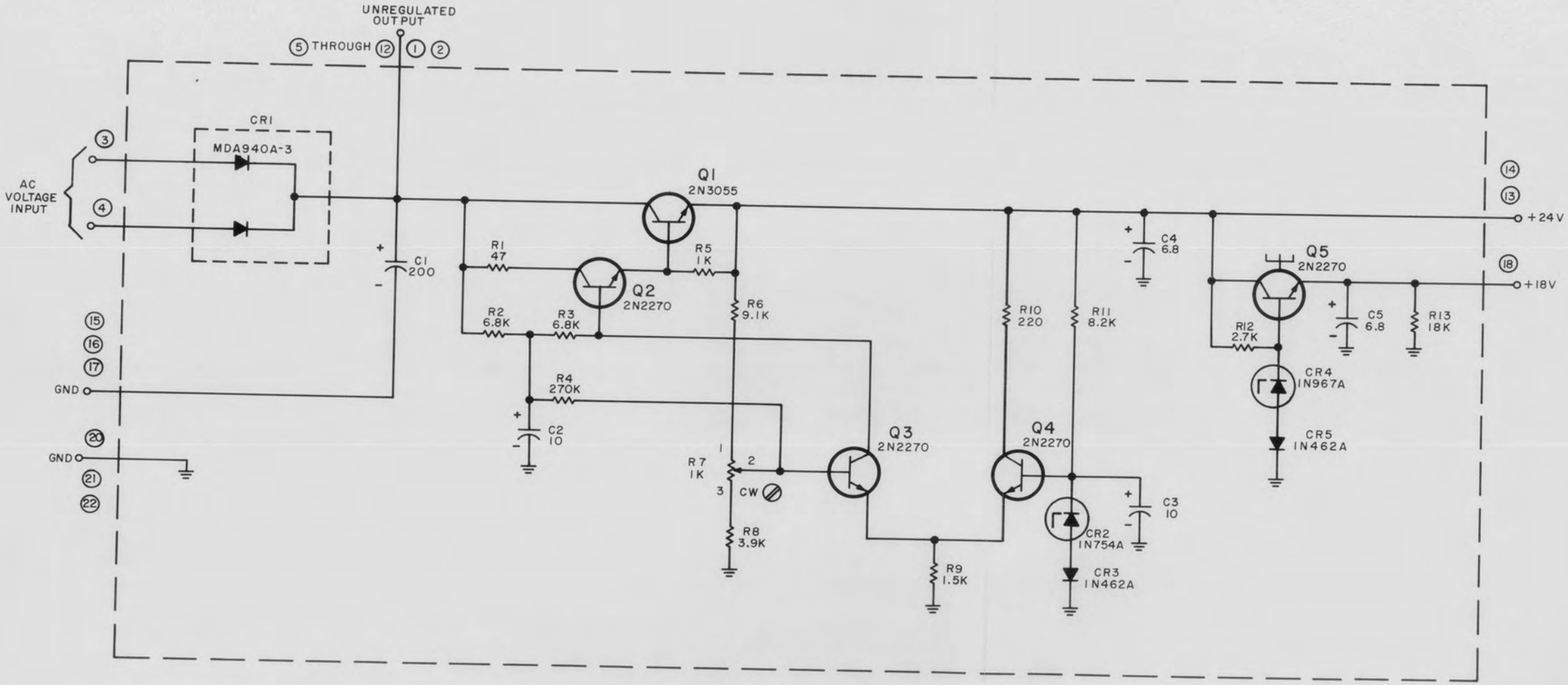
REF DESIG PREFIX A9



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 6-9. Type 8234 Horizontal Amplifier and Sweep Adjuster, Schematic Diagram

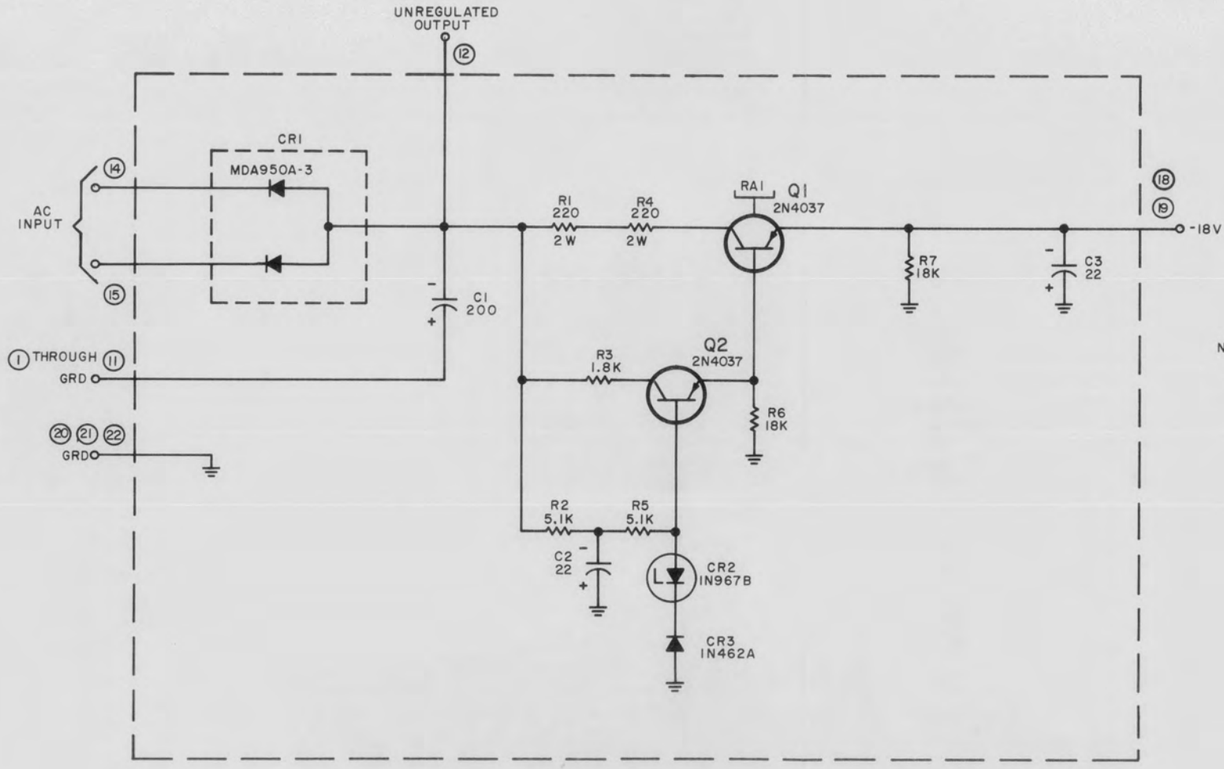
REF DESIG PREFIX A10



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

Figure 6-10. Type 76166 +18V and +24V Regulated Power Supply, Schematic Diagram

REF DESIG PREFIX A11

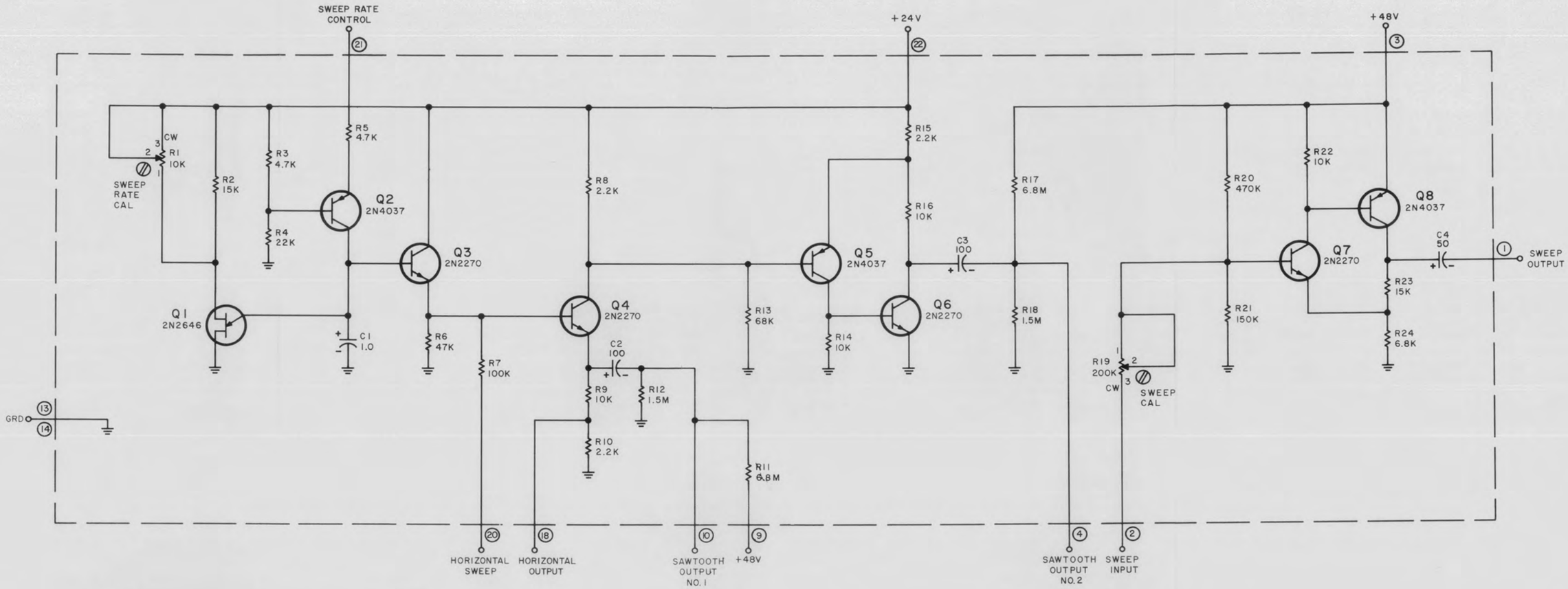


NOTES:

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

Figure 6-11. Type 76168 -18V Regulated Power Supply, Schematic Diagram

REF DESIG PREFIX A12

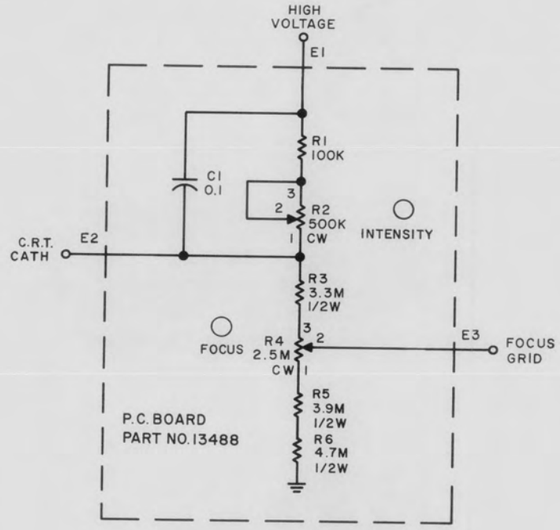


NOTES:

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 6-12. Type 8235 Sweep Generator, Schematic Diagram

REF DESIG PREFIX A13

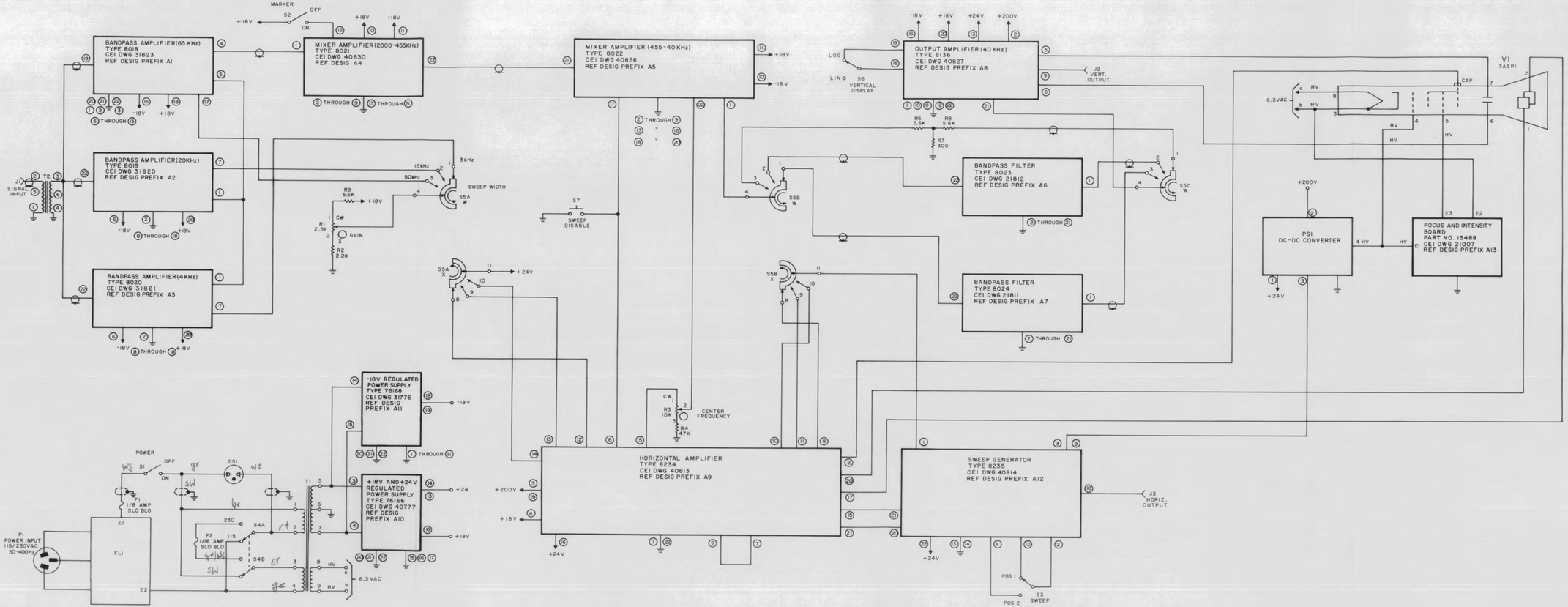


NOTES:

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 6-13. Part 13488 Focus and Intensity Board, Schematic Diagram

REF DESIG PREFIX A14



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

Figure 6-14. Type SM-8421 Signal Monitor, Main Chassis Schematic Diagram