INSTRUCTION MANUAL

FOR

TYPE 560 RECEIVER

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

BJ/100/1/14/74/CRA

WARNING

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

ADDENDA
560 RECEIVER

1. Section V - Replacement Parts List

   A. Paragraph 5.4.3.2; Type 72338 21.4 MHz IF Amplifier (200 kHz BW) (A2A3)

      1. Change C9 from: 91 pF, 5%; Qty. 2; Part No. CM05FD910J03 to: 82 pF, 2%; Qty. 1; Part No. CM05ED820G03. (Page 5-23)
      2. Change C32 from: Same as C9 to: CAPACITOR, MICA, DIPPED: 91 pF, 5%, 500 V; Qty. 1; Part No. CM05FD910J03; Vendor Code 81349. (Page 5-23)
      3. Change C10 from: Same as C7 to: CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350 V, N650; Qty. 4; Part No. 538-006D9-35; Vendor Code 72982. (Page 5-23)
      4. Change C13, C16, and C20 to: Same as C10. (Page 5-23)
      5. Change C23 from: CAPACITOR, MICA, DIPPED: 150 pF, 5%, 500 V; Qty. 1; Part No. CM05FD151J03; Vendor Code 81349 to: CAPACITOR, CERAMIC, TUBULAR: 120 pF, 2%, 500 V, N750; Qty. 1; Part No. 302-000U2J0-121G; Vendor Code 72982. (Page 5-23).

   B. Paragraph 5.4.4.1.4; Part 11280-4 14.0 MHz Oscillator (A3A1A4)

      1. Change C2 from: CAPACITOR, CERAMIC, TUBULAR: 4.7 pF, ±0.25 pF, 500 V; Qty. 1; Part No. 301-000-C0H0-479C; Vendor Code 72982 to: CAPACITOR, COMPOSITION, TUBULAR: 4.3 pF, 10%, 500 V; Qty. 1; Part No. QC(4.3pF,K); Vendor Code 95121.

2. Section VI - Schematic Diagrams

   A. Figure 6-4; Page 6-9; Type 72338 21.4 MHz IF Amplifier (200 kHz BW) (A2A3)

      1. Change C9 from: 91 pF to: 82 pF.
      2. Change C10 from: 3-15 pF to: 9-35 pF.
      3. Change C23 from: 150 pF to: 120 pF.

B. Figure 6-9; Page 6-19; Type 8148 IF Amplifier (A3A1)

1. Change A4C2 from: 4.7 pF to: 4.3 pF.

format revised
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LIST OF ILLUSTRATIONS (Cont)

LIST OF TABLES

Table 1-1. Type 560 Receiver, Specifications

Receiver Section	
Frequency Range	20-425 MHz using three plug-in tuning heads
Types of Reception	AM, FM, and CW
IF Bandwidths	10, 50, and 200 kHz
Intermediate Frequency	21.4 MHz
Predetection IF Output	21.4 MHz center frequency; provides -7 dBm, minimum, into 50-ohm load for input signals above AGC threshold
BFO Tuning Range	±8 kHz, minimum; operates in all IF bandwidths
COR Sensitivity:	
10-kHz IF Bandwidth	-112 dBm, minimum, input
50-kHz IF Bandwidth	-105 dBm, minimum, input
200-kHz IF Bandwidth	-99 dBm, minimum, input
COR Range	Continuously adjustable to operate on minimum threshold input signals and up to -40 dBm input
COR Operate Time	5 ms, maximum
COR Release Time	0.5 sec, 5 sec, and 15 sec, all ±20%. Selected by front-panel switch
AM Output Stability with AGC:	
10-kHz Bandwidth	Output changes by no more than 6 dB for input signal levels between -111 dBm and -10 dBm
50-kHz Bandwidth	Output changes by no more than 6 dB for input signal levels between -101 dBm and -10 dBm
200-kHz Bandwidth	Output changes by no more than 6 dB for input signal levels between -98 dBm and -10 dBm
Manual Gain Control	70 dB, minimum
Audio Output Power	1. 100 mW, minimum, into 600-ohm load, balanced, at phones jack or at rear-panel barrier strip 2. 0.5 watts, minimum, into 50-ohm load, balanced, at rear-panel barrier strip
Audio Frequency Response	Within 3 dB from 100 Hz to 20 kHz (50 kHz and 200 kHz bandwidth)
Video Output Power	10 mW into 50-ohm load
Video Amplifier Response	Within 3 dB from 20 Hz to 100 kHz
Large Signal Protection	Withstands continuous +30 dBm signal input without damage
Meter	Signal strength
Operating Temperature	0°C to 55°C
Input Power	115 or 230 Vac, 50-400 Hz
Dimensions	3.5 inches high, 19 inches or 52 cm wide, and 16 inches deep
Weight	26lbs., approximately
Spectrum Display Section	
Sweep Width	0 to 3 MHz, continuously adjustable
Resolution	10 kHz
Sweep Rate	22.5 Hz, nominal
Flatness of Response	±1 dB
CRT Display	1 inch by 3 inches (3ASP1 tube)

Figure 1-1. Type 560 Receiver

SECTION I
GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

1.1.1 The Type 560 Receiver is designed to receive, amplify and demodulate AM, FM, and CW signals in the 20 MHz to 425 MHz frequency range using three plug-in tuning heads. Ranges of the tuning heads are: 20-90 MHz, 90-260 MHz, 200-425 MHz. Only one tuning head may be installed in the receiver at a time. The three tuning heads are documented in separate instruction manuals available from the Watkins-Johnson Company. The 560 Receiver employs selectable IF bandwidths of 10 kHz, 50 kHz, and 200 kHz when shipped from the factory. However, the unit is prewired to accept a fourth IF bandwidth and associated FM discriminator if desired. Bandwidths as wide as 3 MHz are available. The only modification required is the addition of an adhesive decal to the bandwidth switch on the front panel and the changing of the mechanical switch stop to include a fourth position. A beat frequency oscillator circuit located in the IF output amplifier is activated when the CW mode is selected. The CW-audio beat note can be changed by means of a front-panel control.

1.1.2 The 560 Receiver incorporates a built-in spectrum display unit (SDU) providing a visual display of signals at or near the tuned frequency. This display can be used to determine such things as the frequency, amplitude, and type of signal being received. The sweep width of the SDU is continuously variable from 0 to 3 MHz by means of a potentiometer on the front panel. The resolution of the SDU is such that two signals 10 kHz apart will be displayed with at least a 6-dB valley between the peaks (using a sweep width of 500 kHz or below). A toggle switch on the front panel associated with the SDU provides a marker to indicate the center of the IF passband. The marker serves as a substitute for a tuning meter.

1.1.3 The 560 Receiver is designed to operate with several optional CEI Division frequency counters which provide a six-digit neon display of the frequency to which the receiver is tuned. Thus, the frequency can be read within ±1 kHz over the entire tuning range. The external counters contain digital automatic frequency control circuits (DAFC) that lock the local oscillator in the receiver to the counter in 1-kHz increments. When the DAFC feature is used it counteracts local oscillator drift resulting in receiver stability that approaches that of the extremely accurate reference source in the counter.

1.1.4 The carrier operated relay (COR) circuit in the 560 Receiver provides two sets of double-pole, double-throw relay contacts available at a rear-apron terminal strip. In addition, the relay release time can be set at 0.5, 5, or 15 seconds by a front-panel switch. An adjustable threshold control is also included to set the sensitivity level of the COR. Audio squelch is also provided by the COR threshold control without the delay associated with the relay.

1.2 MECHANICAL CHARACTERISTICS

1.2.1 The Type 560 Receiver is constructed with detachable panel adapters that enable the unit to be mounted in either a standard 19-inch rack or a 52-cm (20.40 in.) rack. As shown in Figures 1-1 and 5-1, all of the operating controls (except the video gain) are mounted on the front panel. Although shown in both illustrations, the tuning head is not part of the receiver. The one shown is a Type VH-103 which tunes from 90 to 260 MHz. The other two heads are very similar in appearance and cover the remaining frequency spectrum of 20 to 90 MHz and 200 to 425 MHz.

1.2.2 All input and output connections are made on the rear apron. As shown in Figure 5-2, a variety of connector types are employed. The rear apron also contains two terminal strips for the COR and audio output signals, the primary power selector switch, S5, and the line fuses. The power input receptacle is a 3-pin Plessy Mark 4 connector.

1.2.3 The front, rear, and side panels as well as the top and bottom dust covers, main deck and tuner housing are made of aluminum. The main chassis contains nine subassemblies. Five of these are constructed on etched circuit boards that plug in to receptacles on the main deck. Three of the remaining subassemblies are constructed in brass chassis which have been plated with precious metals to prevent tarnishing and increase conductivity. One of the brass chassis contains the IF amplifier which is constructed on six plug-in etched circuit boards. The spectrum display unit is constructed on a single brass chassis which houses two etched circuit boards. A third board is mounted on the rear of the unit. The main chassis also contains the adjustment tools required for alignment as well as an etched circuit card extender and card puller. Refer to Section IV for instructions in the use of the card puller.

1.3 EQUIPMENT SUPPLIED

This equipment consists of the Type 560 Receiver only. Critical dimensions and weight of the unit are listed in Table 1-1.

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED

1.4.1 The 560 Receiver is not capable of independent operation. An associated RF tuning head is required. Presently, three tuning heads are available. These are listed below:

VH-101	20-90 MHz
VH-103	90-260 MHz
VH-105	200-425 MHz

1.4.2 For audio monitoring, 600-ohm headphones such as the Telex HM-50 are required. However, any other 600-ohm audio device which contains a loudspeaker can be connected to pins 5 and 6 of rear-apron terminal board TB2. A 50-ohm audio signal is available at terminals 3 and 4 of TB2.

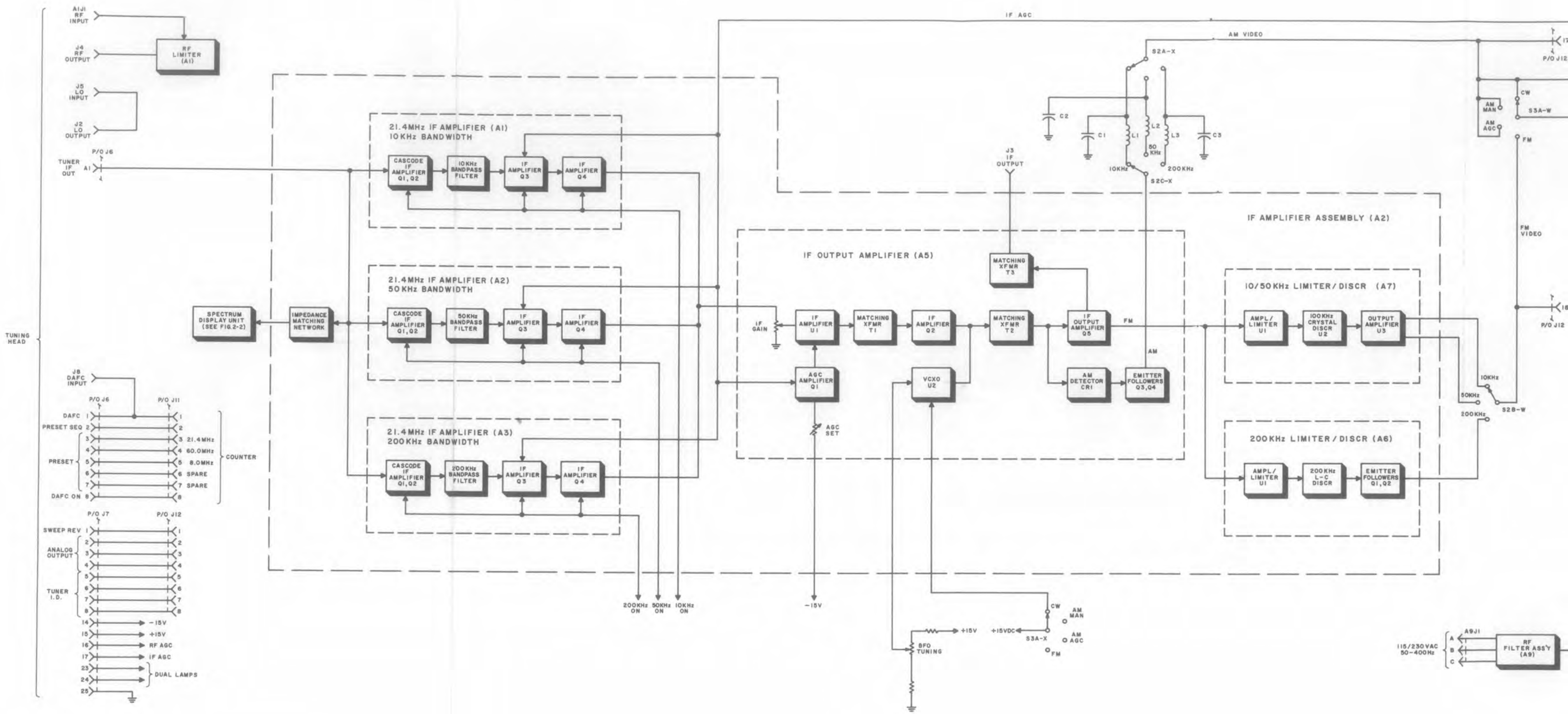
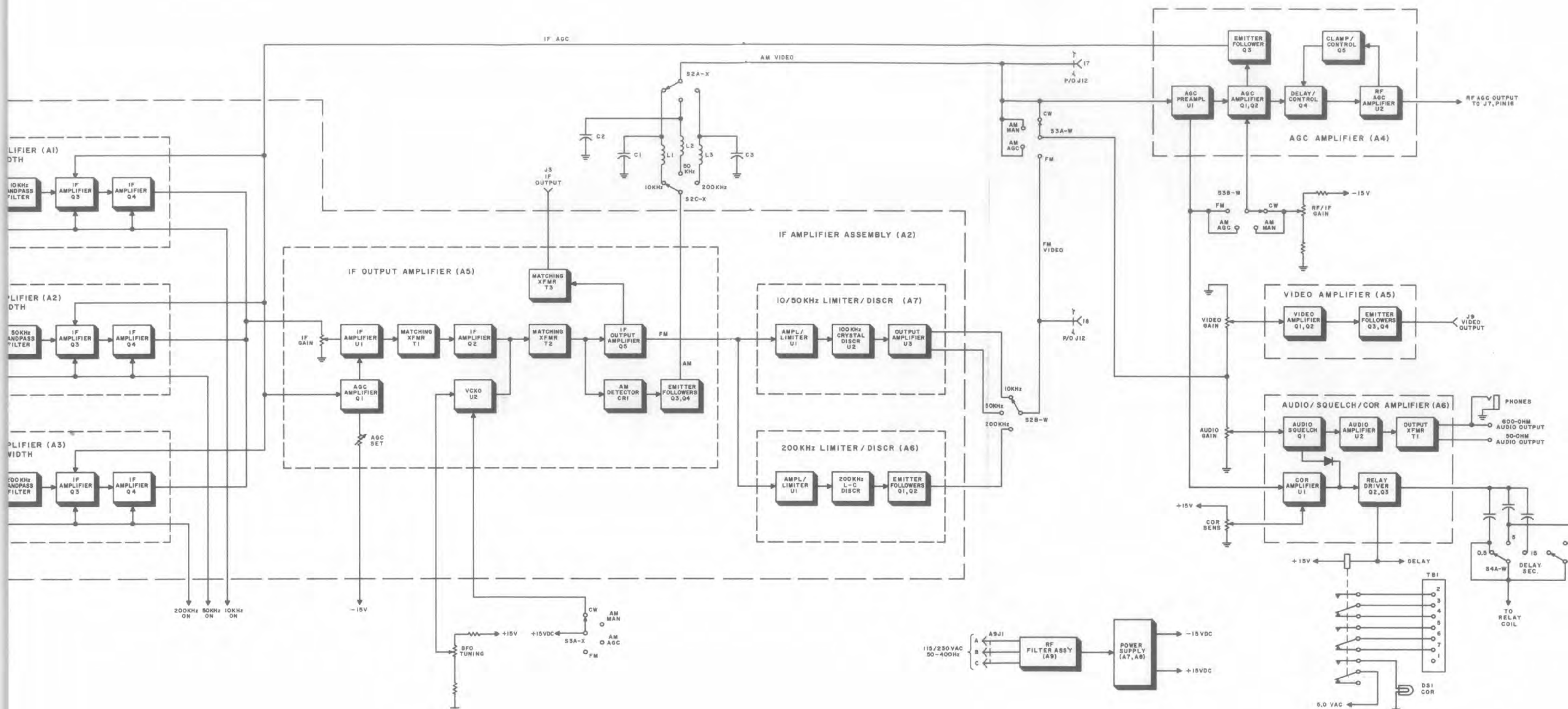
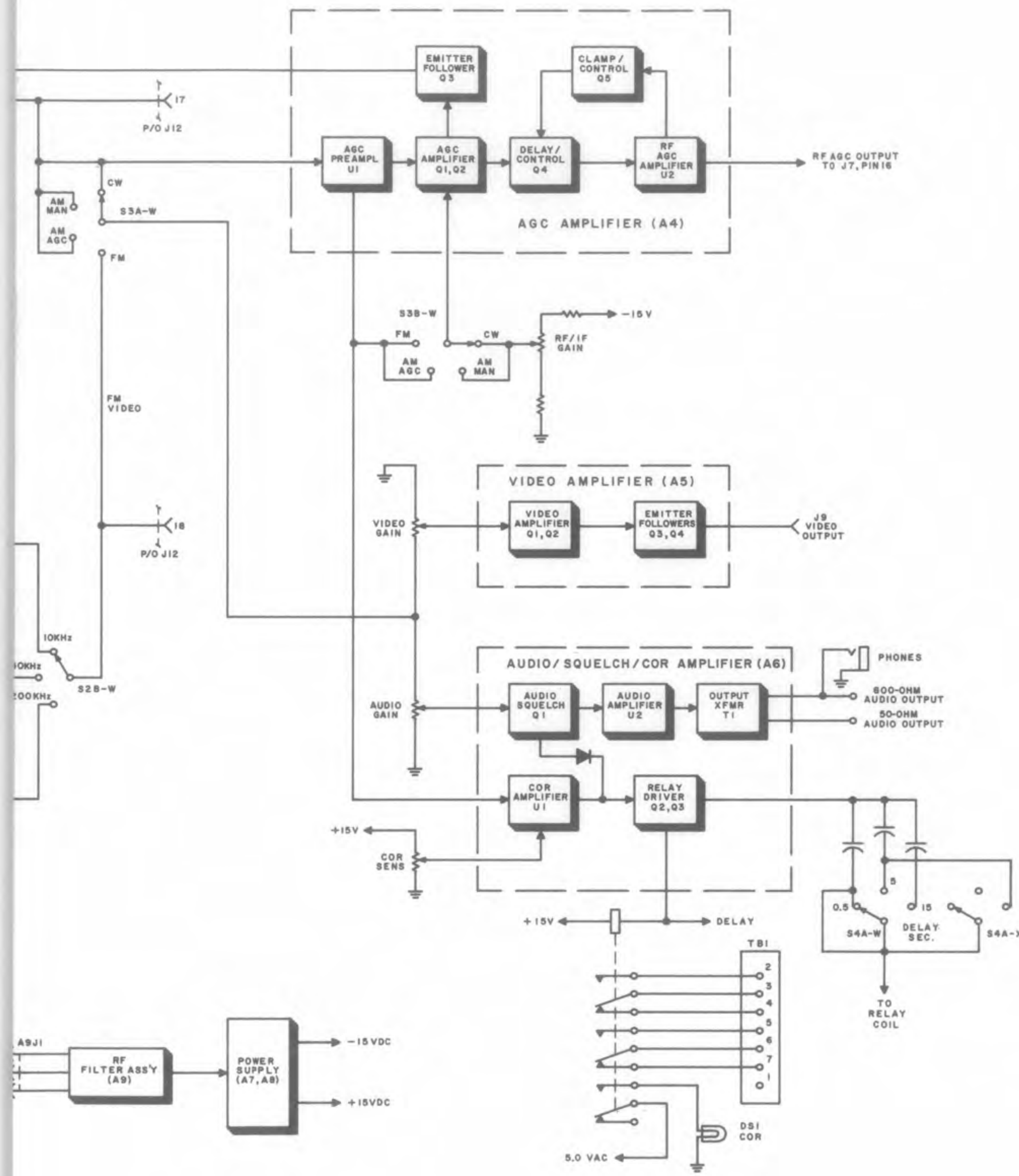


Figure 2-1. Type 560 Receiver, Functional Block Diagram


IF AGC
AM VIDEO
IF AMPLIFIER ASSEMBLY (A2)
IF OUTPUT AMPLIFIER (A5)
10/50KHz LIMITER/DISCR (A7)
200KHz LIMITER/DISCR (A6)
AGC AMPLIFIER (A4)
VIDEO AMPLIFIER (A5)
AUDIO/SQUELCH/COR AMPLIFIER (A6)
IF AMPLIFIER Q3
IF AMPLIFIER Q4
MATCHING XFMR T1
MATCHING XFMR T2
MATCHING XFMR T3
IF OUTPUT AMPLIFIER Q5
AGC AMPLIFIER Q1
VCXO U2
AM DETECTOR CR1
EMITTER FOLLOWERS Q3,Q4
AMPL/LIMITER U1
100KHz CRYSTAL DISCR U2
OUTPUT AMPLIFIER U3
200KHz L-C DISCR
EMITTER FOLLOWERS Q1,Q2
AGC PREAMPL U1
AGC AMPLIFIER Q1,Q2
EMITTER FOLLOWER Q3
CLAMP/CONTROL Q5
DELAY/CONTROL Q4
RF AGC AMPLIFIER U2
RF AGC OUTPUT TO J7, PIN 16
VIDEO AMPLIFIER Q1,Q2
EMITTER FOLLOWERS Q3,Q4
J9 VIDEO OUTPUT
AUDIO SQUELCH Q1
AUDIO AMPLIFIER U2
OUTPUT XFMR T1
COR AMPLIFIER U1
RELAY DRIVER Q2,Q3
PHONES
600-OHM AUDIO OUTPUT
50-OHM AUDIO OUTPUT
RF FILTER ASS'Y (A9)
POWER SUPPLY (A7, A8)
115/230 VAC 50-400Hz
-15VDC
+15VDC
J3 IF OUTPUT
IF GAIN
AGC SET
BFO TUNING
RF/IF GAIN
VIDEO GAIN
AUDIO GAIN
COR SENS
200KHz ON
50KHz ON
10KHz ON
DELAY SEC.
TO RELAY COIL
DS1 COR
5.0 VAC
TB1
S2A-X
S2C-X
S2B-W
S3A-W
S3B-W
S3A-X
S4A-W
P/O J12
FM VIDEO



EMITTER FOLLOWER Q3
CLAMP/ CONTROL Q5
AGC PREAMPL U1
AGC AMPLIFIER Q1,Q2
DELAY/ CONTROL Q4
RF AGC AMPLIFIER U2
RF AGC OUTPUT TO J7, PIN 16
AGC AMPLIFIER (A4)
17
P/O J12
CW
S3A-W
AM MAN
AM AGC
FM
S3B-W
FM
AM AGC
CW
AM MAN
-15V
RF/IF GAIN
FM VIDEO
VIDEO AMPLIFIER (A5)
VIDEO GAIN
VIDEO AMPLIFIER Q1,Q2
EMITTER FOLLOWERS Q3,Q4
J9 VIDEO OUTPUT
18
P/O J12
10KHz
S2B-W
AUDIO/SQUELCH/COR AMPLIFIER (A6)
PHONES
AUDIO GAIN
AUDIO SQUELCH Q1
AUDIO AMPLIFIER U2
OUTPUT XFMR T1
600-OHM AUDIO OUTPUT
50-OHM AUDIO OUTPUT
COR AMPLIFIER U1
RELAY DRIVER Q2,Q3
+15V
COR SENS
0.5
5
15
S4A-W
DELAY SEC.
S4A-X
+15V
DELAY
TB1
TO RELAY COIL
A9J1
RF FILTER ASS'Y (A9)
POWER SUPPLY (A7,A8)
-15VDC
+15VDC
DS1 COR
5.0 VAC

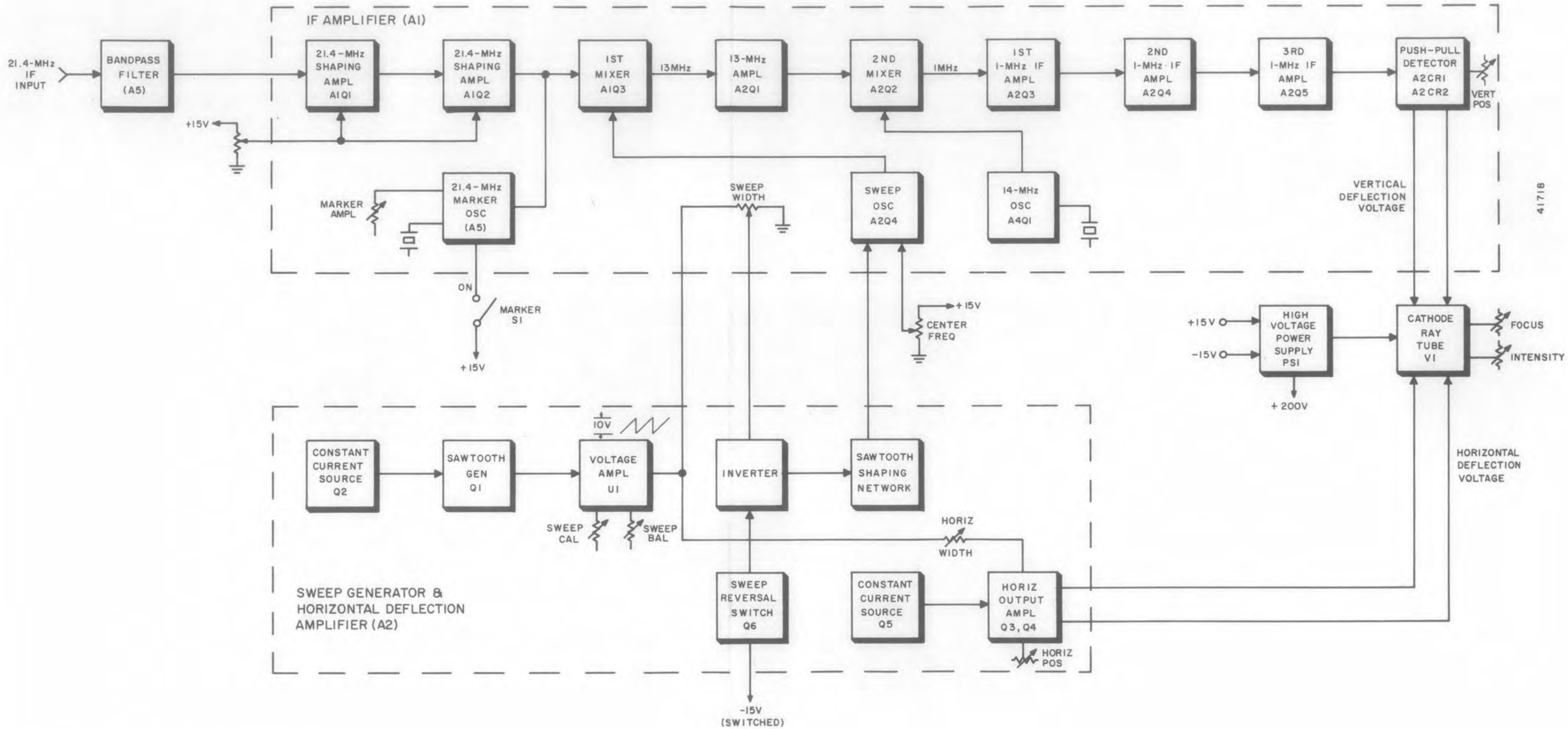


Figure 2-2. Type 79829 Spectrum Display Unit, Functional Block Diagram

SECTION II

CIRCUIT DESCRIPTION

2.1 GENERAL

Operation of the various circuits in the 560 Receiver is described in the following paragraphs using the functional block diagram, Figure 2-1, and the schematic diagrams, Figures 6-1 through 6-19, at the rear of this manual. Note that the unit numbering method is used for electrical components. This means that parts on subassemblies and modules carry a prefix before the usual class letter and number of the item (such as A2A1Q1 and A7U1). These prefixes are omitted on illustrations and in the text except in those cases where confusion might result from their omission.

2.2 FUNCTIONAL DESCRIPTION

As previously noted, the 560 Receiver performs the function of amplification and demodulation of RF signals which are received by the associated plug-in tuning head. Conversion of the RF signals down to 21.4 MHz occurs in the tuning head. This IF signal is then processed by the circuits in the receiver.

2.2.1 RF signals entering the RF tuning head first pass through the receiver and subassembly A1, a limiter module. This subchassis contains components which limit high level signals to prevent damage and overloading of the succeeding circuits. The 21.4-MHz center-frequency IF input to the receiver from the installed tuner is connected to J6 pin A1. From this point the IF signal is applied to the IF amplifier assembly, A2. In this assembly a parallel connection applies the IF signal to the three IF amplifier boards. In addition, a resistive matching network supplies the IF signal connection to the built-in spectrum display unit. IF bandwidths of 10, 50, and 200 kHz are available and can be selected by a front-panel switch. The three IF amplifier networks (A2A1 through A2A3) are quite similar in design. The input circuit is a cascode amplifier in each case. This is followed by the bandwidth determining element, a gain-controlled IF amplifier, and a third IF amplifier, except for the 200-kHz bandwidth. In this amplifier the bandpass filter is in two sections, one before and one following the gain controlled IF stage, Q3.

2.2.2 The 21.4-MHz IF output from the selected IF amplifier is connected to the IF output amplifier module (A2A5). This section contains a gain-controlled push-pull IF amplifier stage A2A5U1, followed by another IF amplifier, A2A5Q2. AM demodulation of output signals from A2A5Q2 is accomplished by detector diode A2A5CR1. The AM video signal from the detector is fed through cascade emitter followers A2A5Q3 and A2A5Q4 to one section of the IF bandwidth switch. Output signals from A2A5Q2 are also used to drive IF output amplifier A2A5Q5. This stage provides the predetection signal appearing at IF output jack J3 plus the input to the FM limiter/discriminator modules, A2A6 and A2A7. The beat frequency oscillator (A2A5U2) is also located on this module. It is a sealed, voltage-controlled crystal oscillator operating at 21.4 MHz. Activation of the BFO occurs when the MODE switch is placed in the CW position. The BFO signal is injected into the IF signal path to produce the audio beat note. The pitch of the note can be changed by the front-panel BFO TUNING control.

2.2.3 The limiter/discriminators are similar in design. Each consists of an integrated circuit input stage functioning as a limiter followed by a solid-state or conventional LC discriminator and an output buffer. The narrowband unit serves both the 10-kHz and 50-kHz IF bandwidths. The desired FM output is automatically selected by the IF BANDWIDTH switch. Output buffer stages in both modules provide the necessary output to drive the audio and video amplifiers when the FM reception mode is selected.

2.2.4 The audio, COR, and squelch amplifier, A6, operates from the dc coupled AM detector output and an audio output from either an FM discriminator or the AM detector. Audio signals from the arm of the AUDIO GAIN control are applied to audio squelch transistor A6Q1. When A6Q1 is conducting the audio signals are amplified by A6U2 which drives the audio output terminals of TB2 and the headphone jack, J10. The stages in the COR chain, A6U1 plus A6Q2 and A6Q3 control the operation of the COR relay, K1. Operational amplifier A6U1 directly controls the gate of A6Q1. The COR SENS control establishes the threshold point for U1. For signals below the threshold the output from A6U1 is negative and A6Q1 through A6Q3 are cut off. Under these conditions, the audio path is open and K1 is not operated. Once a signal above threshold is received, the output from A6U1 goes positive, all stages are turned on: the audio path is closed and K1 is activiated. When the signal falls below the threshold, a delay circuit prevents K1 from returning to the non-energized condition for selectable periods of 0.5, 5.0, or 15.0 seconds. However, the audio signal path is opened nearly instantaneously. Two sets of K1 contacts are available at terminals 2 through 7 of terminal board TB1. A third set of contacts is used to operate the COR lamp.

2.2.5 The AGC module contains amplifier circuits that provide gain control voltage for the IF and RF stages. The input to the board is the output from the AM detector. It is applied to A4U1, an inverting amplifier. Average changes in the dc level of the detector output are amplified by A4U1 and applied to a section of the MODE switch. Input signals to the following stages on the module are obtained from the arm of this switch section. It can be either the output from A4U1 when the AM AGC or FM modes are selected, or the voltage from the arm of the RF/IF GAIN control in the AM MAN or CW modes. This selected input is fed through AGC amplifier stages A4Q1 and A4Q2 to an emitter follower, A4Q3. This transistor provides the gain control voltage to the IF amplifier stages. Gain control of the RF stages is provided after a delay which is set by A4Q4. The RF AGC output amplifier is A4U2. Once the RF gain control circuits begin to function, the IF AGC voltage holds at a predetermined level. When the RF gain control voltage reaches the limit set by A4Q5, the IF control circuits again take over and further reduce the overall gain. The front-panel SIGNAL STRENGTH meter is operated from outputs derived from the interacting IF and RF AGC circuits.

2.2.6 To illustrate the general AGC circuit operation, assume a very weak signal increases in strength to a very strong signal. The IF AGC line increases from zero to approximately -4V with no RF AGC being developed. When the IF AGC reaches this point, it is clamped and RF AGC begins to be produced. When the RF AGC reaches approximately -10V it is clamped and the IF AGC line again starts to decrease further negative from -4V.

2.2.7 The video module receives its input from the VIDEO GAIN control. This module consists of video amplifiers A5Q1 and A5Q2 driving complementary symmetry emitter followers A5Q3 and A5Q4. The video output signal is applied to rear-apron connector J9.

2.2.8 The spectrum display unit (A3) receives its input from an impedance-matching network located in the IF amplifier assembly. This signal (see Figures 2-2 and 6-9), which is the 21.4-MHz output from the RF tuning head, is fed to a fixed-tuned bandpass filter, A3A1A5. The filter restricts the input spectrum from the RF tuner to a 3-MHz wide response. This action prevents undesirable signals outside the SDU response from entering the unit. From the filter, signals are fed to the gate of A1A1Q1, the first of two field-effect shaping amplifiers. The second amplifier, A1A1Q2, is coupled to the first through a double-tuned circuit. Amplified output signals from A1A1Q2 are fed to the first mixer through another double-tuned network. The bandwidth of the response at the first mixer input is slightly greater than 3 MHz, a result of combining the response curves produced by the two interstage networks. The first mixer in the spectrum display unit, A1A1Q3, is also an FET. It combines the incoming IF signal with the output of the sweep oscillator, A1A1Q4, to produce the first spectrum display unit IF frequency of 13 MHz.

2.2.9 A sawtooth wavetrain which is used to drive the sweep oscillator originates in the sweep generator and horizontal deflection amplifier A3A2. The sawtooth generator, A3A2Q1, in conjunction with constant current source A3A2Q2, produces a sawtooth wavetrain at a frequency of 22.5, ±5 Hz. The sawtooth signal is coupled through voltage amplifier A3A2U1 and the horizontal width control to the horizontal deflection amplifiers, A3A2Q3 and A3A2Q4. Transistor A3A2Q5 functions as a current source for the horizontal output circuit which operates in a differential amplifier configuration. The output from this circuit is used to drive the horizontal deflection plates in the CRT. A portion of the sawtooth output from A3A2U1 is fed to the SWEEP WIDTH control on the front panel. This control varies the amplitude of the sawtooth before it is applied to the sweep oscillator thereby providing the 0-3 MHz sweep width capability. A modification of the shape of the sawtooth signal is made by a shaping network on this module before it reaches the sweep oscillator. This is done to compensate for the non-linear characteristics of the varactor modulator in the sweep oscillator network.

2.2.10 The fact that the waveform that controls the horizontal trace and the sweep oscillator is derived from a common source helps to explain how synchronization is obtained between the various signals in the incoming RF spectrum and their position on the CRT screen. A horizontal positioning control, located in the horizontal deflection circuit provides a means of centering the trace on the CRT. The sweep oscillator, A3A1A1Q4, has a normal center (or resting) frequency of 34.4 MHz. This is 13-MHz higher than the incoming 21.4-MHz signal. Selecting the maximum sweep width (3 MHz) and having the combination of an incoming signal frequency of 22.90 MHz and a sweep oscillator frequency of 35.90 MHz results in a 13-MHz output from the first mixer. This then is the first IF frequency for the signal monitor. An incoming signal of 19.90 MHz and an oscillator frequency of 32.90 MHz also combine to produce the 13-MHz difference frequency. These conditions are noted to help explain the relationship between the signal monitor IF, the sweep oscillator frequency, and the position of a signal in the input spectrum. The modified sawtooth waveform from the shaping network is applied to a varactor (voltage-variable capacitor) in the sweep oscillator circuit. The capacitance of the varactor is changed by the impression of the modified sawtooth waveform, thereby causing the sweep oscillator to move up and down in conformance with the amplitude and rate of the impressed wave. Therefore, a 13-MHz signal is developed in the first mixer output circuit as the sweep oscillator changes in frequency and differs from the incoming signal by exactly that amount. Since the horizontal movement of the trace on the CRT is controlled by this same sawtooth wave, the signals from the mixer utlimately appear as vertical pips across the face of the tube in a position that corresponds to their original position in the input spectrum.

2.2.11 The 13-MHz signal from the first mixer is fed through IF amplifier A3A1A2Q1 to the second mixer, A3A1A2Q2. It is then heterodyned with the output of the 14-MHz crystal oscillator, A3A1A4Q1, to produce the second SDU IF frequency of 1 MHz. Transistors A3A1A2Q3 and A3A1A2Q4 amplify this 1-MHz signal and apply it to a voltage-doubling, push-pull detector circuit. The detector output consists of two signals of equal amplitude, but of opposite polarity, which are applied to the vertical deflection plates in the CRT.

2.2.12 The gain of the spectrum display unit is controlled by the front-panel SDU GAIN potentiometer. This control varies the bias level applied to the 21.4-MHz shaping amplifiers which, in turn, changes the amplitude of the pips on the CRT screen. The vertical position of the trace on the screen is adjusted by the vertical position potentiometer, A3A1A2R31, which operates in conjunction with the push-pull detector circuit. The MARKER switch A3S1, activates the marker oscillator and provides a center frequency marker at 21.4 MHz. The CENTER FREQ control changes the bias level on the varactor modulator and consequently the sweep oscillator center frequency. This permits the operator to change the position of the marker on the screen. High voltage for the cathode ray tube and the deflection circuits is provided by a dc-to-dc converter PS1, a sealed module located on top of the signal monitor chassis. All other operating voltages are provided by the main power supply in the receiver.

2.3 TYPE 79852 RF LIMITER

The schematic for this module is Figure 6-1; its reference designation prefix is A1. Incoming RF signals must pass through this module before reaching the installed tuning head. It is mounted against the inside of the rear apron and provides the antenna input connector J1. Signals are then coupled through capacitors C1 and C2 to diodes CR1 and CR2. Positive-going half-cycles of input signals in excess of 0.6 volts are shorted to ground through CR2 while negative half-cycles in excess of the biasing level are shorted through CR1. The diodes prevent these high-level signals from damaging the RF stages in the tuning head. Limited output signals are taken from J2 on the chassis and cabled to rear-apron output connector, J4.

2.4 TYPE 72346 IF AMPLIFIER ASSEMBLY

The IF amplifier assembly contains IF amplifier and demodulator circuits with bandwidths of 10 kHz, 50 kHz, and 200 kHz. The majority of the circuitry is contained on six printed circuit boards located within the assembly. An overall schematic diagram of the IF amplifier assembly is shown in Figure 6-2. Schematic diagrams for the six subassemblies are shown in Figures 6-3 through 6-7. The reference designation prefix for the IF amplifier assembly is A2; the subassemblies therefore have reference designation prefixes of A2A1 through A2A6.

2.4.1 Input. - The 21.4-MHz input signal is cabled from main chassis jack J6, pin A1, to the IF amplifier input connector J1. From this jack the incoming signal is simultaneously applied to the inputs of all three IF amplifier boards through pin 21 (refer to Figure 6-2). Also note that gain control voltage through C11 is applied to pin 8 on each module. The IF input is also fed to a resistive impedance-matching network R1, R2 and R3 to SDU output jack, J2.

2.4.2 Output. - The 21.4-MHz outputs of all three IF amplifiers (A2A1 through A2A3) at pin 2 are connected in parallel and then applied to the input of IF output amplifier (A2A5) through pin 21 of that module. From pin 6 of A2A5, a 21.4-MHz output is connected to the limiter/discriminator subassemblies (A2A6 and A2A7) at pin 2. The FM video outputs from A2A6 and A2A7 are fed to section S2B-W of the IF BANDWIDTH switch. The AM video output from C21 is fed to section S2C-X of the IF BANDWIDTH switch.

2.4.3 Control. - Five of the six subassemblies are disabled and enabled by the action of the IF BANDWIDTH switch. This is accomplished by switching the +15V source through the appropriate feedthrough capacitors as shown on Figure 6-2. For example, when an IF BANDWIDTH of 10 kHz is selected, section S2A-W applies +15V to feedthroughs C1 and C34 activating modules A2A1 and A2A7. When the desired mode is selected, for example FM, section S2B-W obtains the correct video signal from A2A7 and feeds it through MODE switch section S3A-W to the audio and video gain controls. When the CW mode is selected, +15V is applied to feedthrough C18 from switch section S3A-X, activating the beat frequency oscillator. The pitch of the beat note can be changed by the BFO TUNING control. This potentiometer has a 12-volt range which changes the BFO frequency ±8 kHz, minimum.

2.4.4 Type 72339 21.4-MHz IF Amplifier (10-kHz Bandwidth) and Type 72344 21.4-MHz IF Amplifier (50 kHz Bandwidth). - The 10-kHz bandwidth IF amplifier carries reference designation prefix A2A1. The 50-kHz bandwidth IF amplifier has reference designation prefix A2A2. The schematic diagram for both units is shown in Figure 6-3. As shown in Note 3 on this schematic, the design of both IF amplifiers is identical except for a few component value differences.

2.4.4.1 The 21.4-MHz IF input signal is connected through pin 21 of the plug-in module and coupled through C2 to the base of Q2. Transistors Q1 and Q2 form a cascode amplifier. The collector circuit of Q1 is tuned by L1, C8, and C9. A capacitive voltage divider, C8 and C9, is used to match the input impedance of the crystal filter FL1. This filter sets the bandwidth of the IF amplifier at either 10 kHz or 50 kHz as applicable. A similar impedance match is made at the output of the filter into the tuned circuit formed by L2, C10, C11, and R11.

2.4.4.2 Stage Q3 uses a dual-gate MOSFET as an IF amplifier. The 21.4-MHz IF signal is applied to one gate (pin 3) of Q3 through blocking capacitor C12. A gain control voltage from module pin 8 is applied to the other gate (pin 2) through R14 and R16. Diode CR1 provides a return path for the gate (pin 2) bias for Q3 with no AGC voltage applied. With no signal input, diode CR1 is forward biased by the +15V source through R15 and R16. This action clamps the junction of R14-R16 at +0.6V. When the incoming gain control voltage swings sufficiently negative to turn CR1 off (approximately -0.7V), the gate (pin 2) voltage on Q3 follows the AGC voltage.

2.4.4.3 The IF output at the drain of Q3 (pin 1) is connected to the base of Q4 through C17. The collector circuit of Q4 is tuned by L3, C19, and C20. Capacitor C21, places the lower end of the tuned circuit at RF ground. The output is coupled through diode CR2 which is used as a switch. When the IF amplifier is energized, CR2 is forward biased from the switched +15V source through R29, R18, R21, and R28. When this amplifier has not been selected, CR2 disconnects the tuned circuit in the collector of Q4 from similar circuits in other parallel amplifiers. Potentiometer R26 in the emitter circuit of Q4 controls the amount of degeneration and hence the gain of the stage. Similar controls are used in the other two IF amplifiers to normalize the gain-bandwidth product.

2.4.4.4 The IF amplifier is activated by a control voltage which is applied to pin 15 when the 10 kHz bandwidth is selected. Diode VR1 zeners at 12V which turns Q2 on and provides an operating point of approximately -9V to complete the base biasing network for the input cascode amplifier.

2.4.5 Type 72338 21.4-MHz IF Amplifier (200-kHz Bandwidth). - The 200-kHz bandwidth IF amplifier (A2A3) is similar in design to the IF amplifiers described in preceding paragraphs. The major difference is that discrete components form the bandpass filter in the 200-kHz strip while crystal filters are used in the 10-kHz and 50-kHz strips. The schematic diagram for the 200-kHz bandwidth IF amplifier is Figure 6-4.

2.4.5.1 The 200-kHz IF amplifier is activated by the application of +15V to pin 15 of the module. Zener diode VR1 provides a constant 12-volt drop to place the operating point of the base network for Q2 at approximately -9V to complete the biasing on the stage.

2.4.5.2 The 21.4-MHz IF input signal is connected to pin 21 of the module and coupled through blocking capacitor C2 to the base of Q2. This transistor and Q1 form a cascode amplifier. The bandwidth of the IF strip is determined by a three-pole filter located between the cascode stage and Q3, and a two pole filter located between Q3 and Q4. Coupling between the first three poles is accomplished by C8 and C11. Capacitors C23 and C25 provide an impedance adjustment between the filter and the input of Q3. A similar function is performed by C24 and C26 at the output of the second filter.

2.4.5.3 Stage Q3 uses a dual-gate MOSFET as a gain-controlled 21.4-MHz amplifier. The incoming signal is connected to gate 1 (pin 3) while the gain control voltage is connected to gate two (pin 2). Diode CR2 provides a return path for the biasing voltage divider until the AGC voltage swings sufficiently negative to reverse bias it.

2.4.5.4 The bandwidth limited 21.4-MHz signal at the output of the two-pole filter is applied to the base of amplifier stage Q4. The output is taken from the collector of Q4 through module pin 2. Potentiometer R27, in the emitter circuit of Q4, is used to set the gain of the stage to achieve gain-bandwidth normalization.

2.4.6 Type 72343 IF Output Amplifier. - The 21.4-MHz IF signal from the selected IF strip is connected to the IF output amplifier. A schematic diagram for the module is shown in Figure 6-5; the complete reference designation prefix is A2A5.

2.4.6.1 The input signal at module pin 21 is fed through gain potentiometer R1 and coupling capacitor C6 to integrated circuit amplifier U1, pin 4. This component functions as a gain-controlled IF amplifier stage providing a balanced output. Gain control voltage is applied to U1 by AGC amplifier stage Q1. Under no signal conditions, this stage is conducting as a result of the constant current bias set by R5 in the emitter circuit. The collector voltage of Q1 is approximately 8 volts and IC U1 is in a maximum gain condition. When an RF signal is received and its amplitude is such that gain control action is required, the IF AGC line becomes negative. The base voltage of Q1 begins to decrease from zero toward the negative supply. This action reduces the conduction through the stage and results in a decrease in the voltage dropped across R6. As the voltage on U1, pin 5 becomes more positive, the gain of the stage is decreased. Balanced output signals are taken from pins 1 and 8 of U1 and are fed to the primary of transformer T1. This section is center-tapped to provide the bias required by the balanced output stage in the IC. Intermediate frequency signals are taken from pin 4 of the transformer secondary and are coupled through blocking capacitor C9 and parasitic suppressor R10 to the base of IF amplifier Q2. Amplified output signals from this stage are developed across the primary of transformer T2 which forms the collector load. The transformer secondary is tuned to the IF frequency by variable capacitor C11. The secondary also provides a dc return for the detector diode. A portion of the amplified output signal from the transformer secondary is coupled to the base of Q2 through C12 to neutralize the stage.

2.4.6.2 The IF signal from T2 pin 2 is also fed through a capacitive impedance matching network (C14-C15) to IF output amplifier stage Q5. This transistor provides two output signals. One is taken from the tap on transformer T3 and is fed to the rear-apron IF output jack, J3. In addition to providing the necessary impedance transformation between Q5 and the output connector, T3 prevents the output from the emitter from being affected if the IF output signal is accidently shorted. The emitter signal is developed across R3. R31 and C24 form the rest of the emitter bias circuit. This signal is coupled through C23 and impedance-matching resistor R29 to module pin 6. From this point the IF signal is fed to the two FM limiter/discriminator subassemblies, A2A6 and A2A7.

2.4.6.3 Amplitude modulated signals are detected by diode CR1, and filtered by C17. Resistor R18 provides the diode load. Video signals are applied to cascaded emitter followers Q3 and Q4 which provide a low-impedance source to drive the two AM outputs at module pins 2 and 5.

2.4.6.4 Since a reduction of the AM video bandwidth will improve the signal-to-noise ratio of the receiver, low-pass filters have been included between the AM detector output and the output video amplifiers. These filters are functional for both narrow and wideband outputs. Inductors L1 through L3 (see Figure 6-19) plus capacitors C1 through C3 make up the filters. Each filter will reduce the video to approximately one-half the IF bandwidth. The selected AM signal is taken from section S2A-X and is fed to the AGC amplifier, to the AM positions of MODE switch section S3A-W, and to pin 17 of jack J12 on the rear apron through resistor R2.

2.4.6.5 BFO (VCXO). - The beat frequency oscillator in the 560 Receiver is a completely self-contained, sealed module located on the IF output amplifier. This subassembly, U2, is activated by the application of +15V through module pin 9 from the CW position of MODE switch section S3A-X. The 21.4-MHz output signal is taken from U2, pin 4 and fed through R34 to the collector circuit of Q2. Tuning of the BFO is accomplished by applying a changing voltage to module pin 13 from the arm of BFO TUNING potentiometer, R3A. This control is the outer knob of the RF/IF GAIN-BFO TUNING combination. An internal varactor in the VCXO reacts to the bias and changes the BFO frequency.

2.4.7 Type 79813 10-kHz Bandwidth and 50-kHz Bandwidth FM Limiter/Discriminator. - Figure 6-7 is the schematic diagram of the narrowband FM limiter/discriminator; it carries the reference designation prefix A2A7.

2.4.7.1 The 21.4-MHz IF input signal is connected to module pin 2. This module is activated when +15V is applied to pin 7 or 8. The FM video output is taken from pin 12 or pin 21.

2.4.7.2 Input stage U1 operates as an amplifier for small signals and as an overdriven amplifier/limiter for larger signals. Resistor R1 completes the bias network between the high and low level inputs of U1. Silicon diode CR1 reduces the supply voltage by 0.6V to provide the correct value to operate U1. The output collector circuit of U1 is tuned by the parallel combination of L1, C4, C6, and C7. The tuned circuit is tapped at the junction of C6 and C7 to provide an impedance match between the tuned circuit and the input of crystal discriminator, U2. The latter component demodulates the FM input signal and provides the video input to U3.

2.4.7.3 The demodulated output from the 100-kHz bandwidth crystal discriminator is fed to the non-inverting input (pin 3) of operational amplifier U3. Potentiometer R5, in conjunction with R4, sets the zero-crossing or balance point of the discriminator output. The gain of U3 is approximately 12 as determined by feedback resistors R7 and R6. Parallel outputs are taken from pin 6 of U3 and are fed to module pins 21 and 12. The output to pin 21 which is the 50-kHz signal, is fed through a resistive pad (R10-R11) and a low-pass filter, L2, C11. This filter sets the maximum noise bandwidth to one-half the IF bandwidth. A resistive pad made up of R8 and R9, feeds the 10-kHz bandwidth output to the low-pass filter made up of L3 and C10. This filter performs the same functions as the components in the 50-kHz path.

2.4.8 Type 79814 200-kHz Bandwidth FM Limiter/Discriminator. - Figure 6-6 is the schematic diagram for this module; it carries the reference designation prefix A2A6.

2.4.8.1 The design of the 200-kHz bandwidth FM limiter/discriminator is similar to that of the 10/50-kHz module described in the preceding paragraphs. The basic difference is that the discriminator is a modified Foster-Seeley circuit instead of a crystal discriminator. Input stage U1 operates as a high-gain amplifier/limiter. When signal levels are large, the amplifier is overdriven, thus limiting the input.

2.4.8.2 The output load for U1 is a tuned circuit consisting of C6, C7, C8, L1 and the primary of transformer T1. Capacitor C9 couples the IF reference voltage to the transformer secondary, which is tuned to the IF frequency by C10. Diodes CR4 and CR5 demodulate the FM signal and apply it to emitter follower Q1. Capacitor C15 filters the detector output. Transistor Q1 is connected through R11 to the base of emitter follower Q2 in a cascade arrangement. The 200-kHz bandwidth FM video signal is fed through a resistive pad, R15, R17 and a low-pass filter, L4, C19, to module pin 12. The filter sets the noise bandwidth to one-half the IF bandwidth. A second parallel output to module pin 21 is not used in the 560 Receiver.

2.4.8.3 The FM video signals from both modules are fed to section S2B-X of the IF BANDWIDTH switch which selects the desired output and feeds it to the FM position of MODE switch section S3A-W. Video signals from the arm of this switch are fed to the audio and video gain controls.

2.5 TYPE 7890 AGC AMPLIFIER

The schematic diagram for this module is Figure 6-14; reference designation prefix A4 has been assigned. This module provides gain control voltage for the IF amplifiers in the receiver and RF stages in the installed tuning head. Gain control voltage for the IF stages is taken from module pin 12 while RF AGC is taken from pin 3.

2.5.1 The input to the module is the AM video signal which is taken from section S2A-X of the IF BANDWIDTH switch and is fed to module pin 20. From pin 20 it is fed to the inverting input of AGC integrator stage U1. This stage has a gain of two as set by feedback resistors R1 and R3. Resistor R2 terminates the unused input pin to complete the input bias network. Amplified and inverted signals (negative going) from pin 6 are fed through R4 and module pin 17 to the COR board, through R5 and module pin 16 to the AM AGC and FM positions of MODE switch section S3B-W, and through R6 and module pin 15 to the signal strength meter. These outputs, particularly the one at pin 16, are the average of the dc level changes occurring at the AM detector. Consequently, with no input signal, these levels are zero. Silicon diode CR1 protects filter capacitor C1 to prevent it from breaking down in the event the output voltage at U1 pin 6 was to ever exceed +0.6V.

2.5.2 The average output at module pin 16 passes through S3B-W, if the AM AGC or FM modes are selected and appears on the base of PNP transistor Q1. This stage is connected to Q2 in a voltage feedback configuration. As the input signal level to the receiver begins to increase, and a negative-going output of approximately -2.0V is produced at U1 pin 16, transistor Q1 will conduct. The inverted signal developed across R8 is applied to the base of Q2 causing it to conduct. Series diodes CR2 and CR3 prevent Q1 from conducting until the -2.0V level, or IF AGC point is reached. These diodes essentially form an IF AGC clamp that is released when the input signal amplitude reaches a level that produces a 2-volt detector output signal. At this point, the two transistors operate as a conventional feedback voltage amplifier with a gain of slightly more than two. The collector signal from Q2 is fed through R13 and the divider network (R16, R17, R18) on the base of IF AGC output stage Q3, an emitter follower. The output from Q3 is the IF AGC signal at module pin 12, and it is fed to the gain-controlled stages in the IF amplifier modules. A portion of the collector signal from Q2 is fed through R12 and is summed with the output from U1 that is fed through R6 and R10 to drive the signal strength meter during AGC.

2.5.3 Transistor Q4 is used to clamp the IF AGC line at approximately -3V when the IF AGC reaches this level. The IF AGC line clamp is maintained until the RF AGC level reaches approximately -10 volts at module pin 3. At this time, Q5 will release the clamp allowing the IF AGC to swing further negative with an increase in the negative voltage at the junction of R13-R16. This action provides the desired AGC characteristics for both the receiver IF and RF circuits in the tuner. Transistors Q4 and Q5 are initially biased off by voltage dividers in their base circuits which are tied back to the -15V supply. This sets the base of Q4 at approximately -6.5V and the base of Q5 at approximately -8.7V. With Q4 off, the input voltage to RF AGC amplifier U2 is zero and the RF AGC voltage at module pin 3 is zero. The IF AGC emitter follower, Q3, follows the voltage at the junction of R16-R17 until this voltage is sufficiently negative to forward bias CR4 and cause Q4 to conduct (approximately -7.7V). With Q4 conducting, a constant voltage drop of 1.2 volts (across the emitter-base junction and diode CR4) is maintained which clamps the IF AGC voltage. This clamp remains until the base of Q4 becomes more negative. When Q4 is conducting, a negative voltage is developed across collector load resistors R20 and R21 which is connected directly to the non-inverting input (pin 3) of RF AGC amplifier U2. This operational amplifier has a gain of approximately three as set by R27 and R26. The RF AGC is taken from U2 pin 6 and fed to module pin 3. A portion of this output is fed through CR6 and R28 to the emitter of Q5. When this emitter voltage exceeds the base bias by approximately 0.6V (reaches -9.3V), Q5 begins to conduct. When Q5 conducts, a more negative voltage is developed across collector load resistor R23 which is also part of the base bias network for Q4. As the base voltage on Q4 swings more negative the emitter follows and the clamp on the IF AGC line is removed. Silicon diode CR5 in the collector circuit of Q4 is used to change the slope of the RF AGC voltage. When the voltage across the diode is sufficiently large to forward bias it, R20 is effectively removed from the circuit and the gain of Q4 is reduced.

2.5.4 A portion of the RF AGC voltage from U2 pin 6 is fed through R29 and is summed with the voltage appearing at the junction of R10 and R12 to drive the signal strength meter further up scale with higher level input signals. Diode CR7 clamps this point during manual gain control, to prevent it from exceeding -0.6V. This action prevents meter current from being drawn from this point and allows it to be taken from the junction of R6 and R10.

2.5.5 Manual Gain Control. - When the MODE switch is placed in the AM MAN or CW modes, the gain of the receiver is controlled by the RF/IF GAIN potentiometer on the front panel. This knob is the inner control of the concentric combination which includes the BFO TUNING potentiometer. The arm of the gain control (R3B) is connected to switch section S3B-W. When the AM MAN or CW positions are selected, the control arm is connected to module pin 21 and has the same effect as the detector input to module pin 20.

2.6 TYPE 7374 VIDEO AMPLIFIER

The schematic diagram for the video amplifier is Figure 6-15; its reference designation prefix is A5. The module consists of an NPN transistor, Q1, dc-coupled to Q2, a PNP transistor. These two stages provide the necessary voltage gain to drive complementary symmetry emitter followers Q3 and Q4. The latter two transistors are biased to operate Class AB. Negative dc feedback to set the overall gain of the amplifier is taken at the junction of emitter resistors R12 and R13 and fed to the emitter of Q1 through R7. The amount of feedback is determined by the ratio of this resistor and R6. These two components have 1% tolerances to prevent differences in gain between various 7374 video amplifiers. Silicon diodes CR1 and CR2 determine the idling currents of Q3 and Q4 and eliminate crossover distortion while improving thermal stability. Since the transistors and diodes are made of the same material they exhibit the same temperature coefficient of voltage characteristics. A rise in temperature lowers the base-emitter voltage drop of the transistors tending to make them conduct harder. However, the diode voltage drop decreases by the same amount so that the voltage applied to the bases also decreases, holding the collector current nearly constant. Resistors R12 and R13 are included in the emitter circuits of Q3 and Q4 to provide current feedback with low-input signal levels. These resistors eliminate distortion introduced by the difference between the voltage drops of CR1 and CR2 and the base-emitter junctions of Q3 and Q4. With little or no input signal the drop across the resistors is a few tenths of a volt. Large input signals would cause the drop to become excessive except that CR3 and CR4 become forward biased and limit the drop to approximately 0.6 volt. The low-impedance output of the complementary symmetry emitter followers is matched to the higher impedance output terminals by means of R15. This resistor has the additional effect of preventing amplifier damage if the output terminal is accidentally shorted to ground. Capacitor C5 provides drive for Q4 through R9 during the negative-going portion of the input signal. The base of Q3 and Q4 are coupled through capacitor C6 to equalize the input signal level to the two stages. The output signal from the module is fed to the rear-apron VIDEO OUTPUT jack, J9.

2.7 TYPE 7446 AUDIO, COR, AND SQUELCH AMPLIFIER

The schematic diagram for this plug-in board is Figure 6-16; A6 is its reference designation prefix. This module functions as an audio squelch and amplifier for signals above a preset threshold, plus a COR (carrier operated relay) featuring a delayed dropout. However, the audio squelch is almost instantaneous when the carrier level drops below the threshold.

2.7.1 Audio Path. - The audio path consists of Q1 and audio amplifier U2. Audio signals from the arm of AUDIO GAIN potentiometer R7 are applied to module pin 1. From module pin 1, the audio is coupled through isolating resistor R1 to FET switch Q1 which performs the squelch function in conjunction with U1 and CR1. This function is explained in paragraph 2.7.2. Audio signals from Q1 are applied to pin 14 of U2 through coupling capacitor C3. Amplified audio signals are taken from pin 7 of U2 and are coupled to the primary of output transformer T1. Voltage feedback to set the gain of the stage is from pin 7 through a divider made up of R16, C6, and R17. The small amount of current flow through R19 produces a dc voltage at T1, pin 2 which, in turn, develops a feedback current through R18 and C7 to pin 12 setting the output impedance of the amplifier. The resultant output impedance is approximately 40 ohms which matches the primary impedance of output transformer T1. Zener diode VR1 reduces the supply voltage to 11.4 volts which is the level required to operate U2. The audio output transformer has two secondary windings. One winding, 8-9, provides a 600-ohm signal to module pins 20 and 21. This output is fed to the two normally closed contacts of PHONES jack J10 on the front panel. The signal is then fed to rear-apron terminal board TB2, pins 5 and 6. When the phone plug is inserted this signal path will be opened. An audio reproduction device such as a loudspeaker could be connected to these terminals. The second output from module pins 18 and 19 is a 50-ohm signal supplied by secondary winding 4-7. It is fed to terminals 3 and 4 of audio terminal board TB2.

2.7.2 COR/Squelch Control. - Amplifier U1 provides switching voltage for squelch transistor Q1. U1 is used as a bistable level sensor determined by the action of positive feedback through R8 and R6 to the non-inverting input (pin 3). The COR input to the module is the average AM detector output level which has been inverted in the AGC amplifier and applied to module pin 9. In the absence of an RF input signal, this point is zero. The front-panel COR SENSITIVITY control is used to apply a threshold voltage to the same point as the detector input, namely U1 pin 2. Assume that the sensitivity control is set so that a slightly positive voltage is applied to pin 2. Since this is the inverting input, the circuit switches to approximately -15V at pin 6. This negative level will forward bias diode CR1 and lower the gate voltage of Q1. This stage will then be cut off and the audio path will be opened. Diode CR2 will be reversed biased and transistors Q2 and Q3, which control the COR relay, will be cut off. Consequently, the relay will not be activated. Assume the incoming signal now causes the input to module pin 9 to decrease in the negative direction due to AGC action. A point is reached where the bias set on pin 2 by the sensitivity control is overcome and the output at pin 6 switches to approximately +15V. Diode CR1 will be reverse biased causing the gate and source voltages of Q1 to approach each other turning the stage on. The audio path is completed and the audio signal is passed to U2. The voltage dividing action of R6 and R8 at pin 3 provides a slight hysteresis in the circuit turn-on and turn-off points which prevents squelch chatter.

2.7.3 COR Operation. - The COR function involves the components from CR2 through C5. A Darlington amplifier consisting of Q2 and Q3 controls relay K1. The Darlington configuration is used to aid the delayed relay drop-out feature. A much smaller base current is required to cause the Darlington pair to conduct then would be the case for a single switching transistor. This allows the use of a smaller hold-in capacitor, C5. Relay K1 on the main chassis is connected between the +15V supply and the collectors of Q2 and Q3. Thus when the transistors conduct the relay coil is returned to ground and the relay transfers. When the output at U1 pin 6 is negative, CR2 is reverse biased and Q2 and Q3 are cut off. With the Darlington pair off, the voltage at the collectors and at the positive end of C5 charges to +15V (through the relay coil). The negative end of C5 is returned to ground through forward biased diode CR3 and resistor R12. Thus the voltage across the capacitor is approximately 14V. When the input to pin 9 overcomes the threshold level, the Darlington pair conducts. This energizes relay K1 and places the positive end of C5 at ground making the negative end appear more negative. This negative voltage reverse biases diode CR3 and C5 discharges rapidly through CR4. When the input to module pin 9 falls below the positive threshold level, U1 changes state causing Q1 to stop conducting almost instantaneously. However, as the Darlington amplifier tries to turn off and the collector voltage rises, capacitor C5 begins to charge. The charging current through C5 flows through CR3 to the base of Q2. This charging current supplies a forward bias voltage to Q2 and

Q3 holding the amplifier in conduction. The charging current decreases as the capacitor becomes more fully charged and eventually the bias is not sufficient for Q2 and Q3 to remain on, and the relay drops out. The time required for the circuit to return to the inactive state is determined by the setting of the front panel DELAY SEC control. This switch is controlled by the inner knob of the concentric COR controls. The outer knob is the sensitivity potentiometer control. The DELAY SEC switch can be set for delay periods of 0.5, 5.0, and 15 seconds. This is a single-wafer, two section rotary switch which is used to connect main chassis capacitors C7, C8, or C9 in parallel with capacitor C5 on the module and thus change the drop-out time. Section S4A-X of the switch connects both C9 and C7 in parallel when the 15-second delay is selected.

2.8 RECEIVER POWER SUPPLY

The 560 Receiver is designed to operate from a 115 or 230-volt, 50-400 Hz source. The primary power input is through a three-pin Plessy Mark 4 connector A9J1. From the input connector, the ac input passes through RFI filter A9FL1. This is a completely sealed module mounted within the brass chassis. A schematic diagram depicting the interconnections between the connector and the filter is shown in Figure 6-18. Primary power from A9 is fed through line fuse F1 and POWER switch S1 to the two primary windings of power transformer T1. Selector switch S5, located on the rear apron, connects the two primary windings in parallel for 115-volt operation or in series for 230-volt operation. Line fuse F2 provides the overload protection when the latter input power is used.

2.8.1 Transformer T1 has four secondary windings. One of these, 5-6, supplies the ac-input to power supply board A7. Power supply board A8 receives ac input voltage from winding 7-8. A third winding, 9-10, supplies 5.0 Vac to operate the dial lamps in the associated tuning head and the COR lamp on the front panel. The fourth winding, 11-12, supplies the filament voltage for the CRT. It is at a potential of -1500 Vdc when the SDU, A3, is connected.

2.8.2 Type 76200 ±15V Power Supply. - A pair of Type 76200 power supplies are used in the 560 Receiver. This board carries the reference designation prefixes A7 and A8. Figure 6-17 is the schematic diagram for the board. One module provides a positive 15-volt output while the other supplies a negative 15-volt output.

2.8.2.1 Input power from T1 is applied to module pins 2 and 3 and then to a full-wave bridge rectifier located within U1. The pulsating dc output from U1 is filtered by C1 and C2 and applied to regulator U2 pin 3, through L1. This IC functions as the switching regulator and supplies the current pulses to operate driver transistor Q2. It, in turn, controls Q1 the regulator switch. Current flow through the regulator circuit produces a voltage across a sampling network made up of fixed resistors R10 and R12 and potentiometer R11. This sampled voltage is taken from the arm of R11 and is fed to pin 3 of operational amplifier U3 where it is compared with a fixed reference voltage set by Zener diode VR1. The difference between the two inputs is amplified and fed from pin 6 of U3 to the feedback port of U2, also pin 6. An inversion takes place within U2 which results in an output at pin 2 that controls the duty cycle of Q2. This action will change the duty cycle of Q1 and compensate for any increase or decrease in the regulated output level.

2.8.2.2 During the period when Q1 is cut off and the output current is supplied by the collapsing field around L2, diode CR1 is forward biased, providing a dc return path for L2. Since this is a decreasing current the sampling voltage will be decreased. Transistor Q2 will be turned on causing Q1 to switch on. The regulated output is filtered by electrolytic capacitor C6 plus output capacitors C7 through C9. Resistor R2 and capacitor C3 form a shelf network that stabilizes the regulator. The desired output polarity is obtained by grounding the proper output module pin. Power supply board A7 provides a positive output at pin 17 and has pin 21 grounded. The -15V output from A8 is taken from pin 21 and pin 17 is connected to ground. External filter capacitors, C4 and C5 on the main chassis are connected across module pins 1 and 4 on the respective boards, to supplement the filtering capability of C7 through C9.

2.9 TYPE 79829 SPECTRUM DISPLAY UNIT

The following paragraphs contain a description of the circuits in the Type 79829 Spectrum Display Unit. The main chassis of the SDU is shown in the schematic diagram, Figure 6-8. The reference designation prefix for the entire unit is A4. Two major subassemblies make up the SDU: a Type 8148 IF Amplifier and a Type 8229 Sweep Generator and Horizontal Deflection Amplifier. The brass chassis which mounts the components of the SDU is actually the Type 8148 IF Amplifier. It carries the reference designation prefix A1. The sweep generator is constructed on the etched circuit board that surrounds the neck of the CRT. The reference designation prefix for this subassembly is A2.

2.9.1 Type 8148 IF Amplifier. - Figure 6-9 is the schematic diagram for the IF amplifier. There are five additional subassemblies in the IF amplifier: a Part 16192 IF Amplifier Board No. 1 (A1); a Part 16193 IF Amplifier Board No. 2 (A2); a Part 11280-3 21.4-MHz Marker Oscillator (A3); a Part 11280-4 14-MHz Oscillator (A4); and a Part 16297 IF Bandpass Filter (A5). Assorted electrical components associated with various functions of the SDU are also mounted on the IF amplifier chassis. Amplifier board no. 1 mounts the shaping amplifiers, the sweep oscillator, and the first mixer. Amplifier board no. 2 mounts the second mixer, the second IF amplifiers, and the push-pull detectors.

2.9.1.1 IF Bandpass Filter. - Figure 6-12 is the schematic diagram for the bandpass filter; it carries the reference designation prefix A5. Input signals to the unit are first passed through bandpass filter A5 before being applied to board no. 1. These IF signals are obtained from the impedance matching network located within IF amplifier assembly A2 (see Figures 6-2 and 2-1). It is cabled to the input connector on the IF amplifier, A1J1. From this point it is fed to terminal E1 on the filter chassis. A second impedance-matching network consisting of a capacitive voltage divider, C5-C6, receives the IF input. These two capacitors as well as inductor L1 and capacitor C1 form the first pole of a three-pole bandpass filter. This circuit rolls off the IF input 1.5 MHz on both sides of the 21.4-MHz center frequency. Intermediate frequency signals from terminal E3 of the filter chassis are fed to terminal A1E2 of IF amplifier board no. 1.

2.9.1.2 Part 16192 IF Amplifier Board No. 1. - The schematic diagram for this subassembly is shown in Figure 6-10; its complete reference designation prefix is A3A1A1.

2.9.1.2.1 Shaping Amplifiers. - The IF input signal applied to terminal E2 is fed through dc-blocking capacitor C29 to the signal gate, pin 3, of FET Q1, the first of two shaping amplifiers. Resistor R1 terminates the input. The drain load for Q1 is formed by one-half of a double-tuned bandpass filter (L1, C2, and R9) which is resonate at the IF frequency. The second half of the network is made up of L2, C6, and C7. The latter two components are connected as an impedance-matching device to match the filter output to the input of the second FET shaping amplifier Q2. The drain load for this stage is a second double-tuned circuit, containing inductors L2 and L3. The response curves of these two networks are combined to produce a signal at the mixer input that is slightly wider than 3 MHz. A high-impedance detector is included in the output of the second bandpass network which provides a dc signal at test point TP1 that can be viewed on an oscilloscope and used as an aid during alignment of the shaping network. The IF signal from the junction of impedance-matching capacitors C14-C15 is fed to the source connection of the first mixer, Q3.

2.9.1.2.2 Sweep Oscillator. - The sweep oscillator, Q4 is basically a Clapp circuit that has its output frequency swept across a maximum range of 3 MHz. The oscillator has a nominal center frequency of 34.4 MHz. The sweeping action is controlled by CR3, a voltage-variable capacitor (varactor). The capacitance of this semiconductor varies inversely with the reverse bias applied across it. This bias voltage is obtained from two sources: the CENTER FREQ potentiometer A3A1R4 and the sweep generator A3A2. Rotation of the CENTER FREQ control in the counterclockwise direction increases the reverse bias applied to the cathode and decreases the capacitance of the varactor. Clockwise rotation decreases the bias and increases the capacitance. The varactor is connected in series with the sweep oscillator tank circuit and controls the frequency by varying the tank circuit capacitance. The modified sawtooth voltage from A3A2 is applied to the anode of the varactor. This voltage is passed through a sawtooth shaping network prior to its application to CR3. The shaping network distorts the linear sawtooth waveform to compensate for the non-linear changes in capacity of the varactor with respect to the applied voltage. Thus, the sawtooth voltage changes at a non-linear rate resulting in a sweep oscillator frequency that varies at a linear rate. The output of the sweep oscillator is taken from the base of Q4 and is coupled to the gate of the first mixer through C21.

2.9.1.2.3 First Mixer and 13-MHz IF Amplifier. - The first mixer, Q3, beats the input signal from the shaping amplifiers with the sweep oscillator signal to produce sum and difference frequencies. The mixer utilizes a type 3N128 IGFET. A FET is used as the mixer to minimize the generation of spurious signals in the mixing process. The IF signal is applied to the source element and the sweep oscillator signal is applied to the gate. Since the following circuits are tuned to the 13-MHz difference frequency, only it is passed. This IF frequency is taken from the drain and fed through a double-tuned, over-coupled network to the base of the 13-MHz IF amplifier, A2Q1 (see Figure 6-11). The output from A2Q1 is coupled through a second double-tuned network to the base of the second mixer, A2Q2.

2.9.1.2.4 14-MHz Oscillator. - The schematic for this oscillator is shown in Figure 6-9; the reference designation prefix for this subchassis is A3A1A4. It is mounted on a small etched circuit board and housed beneath an aluminum can on the top of the IF chassis. This is a conventional crystal oscillator circuit operating in a common emitter configuration. Output signals are taken from the collector and are coupled through a divider (C3-C5) and coupling capacitor C2 to terminal A2E4 on board no. 2.

2.9.1.2.5 Second Mixer. - The second mixer, A2Q2, receives the 13-MHz first IF frequency signal and the 14-MHz oscillator signal on the base. It heterodynes these two signals to produce sum and difference outputs. Since the following circuits are resonate at the 1-MHz difference frequency, only it is passed. This signal, which is taken from the collector, is fed through a double-tuned network to the base of the first 1-MHz IF amplifier, A2Q3.

2.9.1.2.6 1-MHz IF Amplifiers. - The input to the first 1-MHz IF amplifier, A2Q3, is from a capacitive impedance-matching network consisting of A2C11 and A2C12. The gain of this and the following stage is set by potentiometer R27 which varies the base bias. This control is set during initial alignment to produce a one-inch vertical deflection when a 10-μV signal is applied to the SDU input (A3A1J1). The amplified output from A2Q3 is fed through a second double-tuned circuit to the base of A2Q4, the second 1-MHz IF amplifier. A single-tuned circuit forms the collector load for A2Q4 and develops an output signal which is coupled through impedance-matching network, C21, C22, to a third amplifier stage, A2Q5. A single-tuned network forms the output load for A2Q5 and develops the input signal for the vertical deflection circuits. The resultant response bandwidth at the output of A2Q5 is approximately 8 kHz which sets the resolution of the SDU.

2.9.1.2.7 Push-Pull Detector. - The push-pull detector circuit, consisting of diodes A2CR1 through A2CR4, produces two outputs of equal amplitude but of opposite polarity. The positive output is taken from the circuit containing A2CR3 and A2R30 and is fed to one deflection plate in the CRT; the negative output is taken from the network containing A2CR4 and A2R34 and fed to the other deflection plate. The diodes are connected as half-wave voltage doublers to obtain the required output. Since the two circuits are basically similar, only the network associated with the positive output will be discussed. During the negative-going half cycle of the input signal, diode A2CR1 is forward biased and capacitor A2C26 charges to the peak value of the applied voltage less the drop across the diode. The current flow through A2C26 results in a voltage at the junction of the two diodes that is more positive than the voltage at the opposite end. During the positive-going half cycle, diode A2CR3 is forward biased permitting capacitor A2C30 to charge to the peak voltage less the drop across A2CR3. Since A2C26 is already charged to approximately the peak of the applied voltage, and since it is in series with the input, its charge is added to that across A2C30. Thus, the charge across A2C30 is twice the peak applied voltage. An off-set voltage, supplied from the resistive divider made up of A2R29, A2R31, and A2R33 is also applied across A2C30 which results in a dc voltage at the output of approximately 80 volts. The offset voltage applied to the negative doubler circuit is obtained from the arm of the vertical position potentiometer, A2R31. This permits the trace to be positioned near the bottom of the CRT screen. The offset voltage at this point is variable from approximately 72 to 88 volts.

2.9.2 Type 8244 Sweep Generator and Horizontal Deflection Amplifier. - Figure 6-13 is the schematic diagram for this board; it carries the reference designation prefix A3A2.

2.9.2.1 Sawtooth Generator. - The sawtooth waveform which is used to control the horizontal CRT trace and the sweep oscillator frequency is provided by the sawtooth generator, Q1, a unijunction transistor. Capacitor C1 charges from the +15V supply through constant current source Q2. This configuration assures maximum linearity of the sawtooth waveform. The charging action of C1 produces the leading edge of the sawtooth. When the charge across C1 reaches sufficient potential the pin 1-to-pin 2 (emitter-base one) junction of Q1 is forward biased and the stage conducts. Capacitor C1 then discharges rapidly through Q1 to ground, creating the trailing edge of the waveform. The frequency of the waveform is determined by the setting of potentiometer R5 in the emitter circuit of Q2. This control is adjusted during alignment and calibration of the SDU to obtain the nominal 22.5-Hz sweep rate. The sawtooth wavetrain taken from the collector of Q2 is fed to the non-inverting input of operational amplifier U1. This IC provides the gain required to drive the horizontal deflection and sweep oscillator circuits and the DC offset to remove the DC component of the sweep. The sweep balance control R9 and the sweep calibration control R12 are adjusted in conjunction with one another to produce a symmetrical, balanced waveform at the output of U1. Terminal E1, marked Sweep Sample on the schematic diagram, provides a test point for this purpose.

2.9.2.2 Horizontal Output Amplifier. - The sawtooth wavetrain from pin 6 of U1 is fed through R15 to the horizontal width control, R16. This potentiometer provides a means of adjusting the width of the sweep trace so that it extends across the entire face of the CRT. Transistors Q3 through Q4 form a differential amplifier that directly drives the horizontal deflection plates. High-voltage transistors are used to provide sufficient output voltage to deflect the electron beam across the face of the CRT without using a step-up transformer. The sawtooth wavetrain is applied to the base of Q3 from the arm of R16. The positive-going emitter signal on Q3 will cause Q4 to conduct less since the emitters are connected together. The positive collector signal on Q4 is connected directly to one of the horizontal deflection plates in the CRT. As a result of the increased potential on the collector of Q4 and the decreased positive level on the collector of Q3, the electron beam will be attracted toward the deflection plate connected to Q4. The trailing edge of the sawtooth will cause the collector of Q3 to suddenly become more negative than the collector of Q4 and the electron beam will be returned to the plate attached to Q3. The horizontal position of the trace can be changed by R25. This control determines the quiescent current through Q4 and thus the no-signal voltage on the deflection plates. For example, if R25 is rotated in the clockwise direction, the voltage on the base of Q4 becomes more positive causing the transistor to conduct harder. The positive emitter signal will cause Q3 to conduct less increasing the collector voltage at terminal E3. The sweep trace will now shift in the direction of the deflection plate connected to Q3.

2.9.2.3 Sweep Reversal. - In order to continue to display the frequency spectrum high frequency to low frequency from left to right on the screen when a double conversion of the RF input signal occurs, a sweep reversal is required. This is accomplished through the use of operational amplifier U2 and sweep reversal switch Q6. The sawtooth wavetrain from the arm of the SWEEP WIDTH potentiometer is fed to terminal E12 and through resistors R30 and R31 to the non-inverting and inverting inputs, respectively of U2. When a single-conversion tuning head is installed in the 560, a -15V level is applied to terminal E8 from pin 1 of jack J7 in the tuner housing. This voltage turns off Q6 resulting in the sweep input being fed to pin 3. The input to pin 2 is eliminated as a result of the feedback through R32. Non-inverted sawtooth signals from pin 6 are fed to terminal E13. If a double-conversion tuning head is installed the -15V level at E8 is removed and Q6 conducts. Pin 3 of U2 is clamped at ground and the sweep input to pin 2 is inverted and fed to terminal E13. An external jumper wire connects the sweep signal from E13 to E15, the input to the sawtooth shaping network.

2.9.2.4 Sawtooth Shaping Network. - As mentioned in paragraph 2.8.1.2.2 the dispersion of the sweep oscillator is controlled by a varactor. Since the capacitance-versus-voltage curve for varactors is extremely non-linear at low voltages, modification of the impressed sawtooth wavetrain is required. This is done by passing the sawtooth through a diode-resistive network which rounds off both the positive and negative going peaks. When the sawtooth goes negative, diode CR3 conducts followed by zener diodes VR2 and VR1. The shunting effect of adding R34 and R35 in parallel across R36 causes the attenuation to decrease as the voltage increases resulting in an increase in the slope of the negative output. During the positive going portion, diode CR4 conducts followed by zener diode VR3. Resistor R38 is paralleled with the series string containing R39 and R40, rounding off the positive portion. Potentiometer R39 provides a means of adjusting the positive network to compensate for differences in characteristics of various varactor diodes. Shaped output signals are taken from terminal E16 and are fed to the sweep oscillator circuit.

SECTION III

INSTALLATION AND OPERATION

3.1 UNPACKING AND INSPECTION

3.1.1 Examine the shipping carton for damage before the equipment is unpacked. If the carton has been damaged, try to have the carrier's agent present when the equipment is unpacked. If not, retain the shipping cartons and padding material for the carrier's inspection if damage to the equipment is evident after it has been unpacked.

3.1.2 See that the equipment is complete as listed on the packing slip. Contact Watkins-Johnson Company, Gaithersburg, or your Watkins-Johnson representative with details of any shortage.

3.1.3 The unit was thoroughly inspected and factory adjusted for optimum performance prior to shipment. It is, therefore, ready for use upon receipt. After uncrating and checking contents against the packing slip, visually inspect all exterior surfaces for dents and scratches. Remove the dust covers and inspect the internal components for apparent damage. Check the internal cables for loose connections and plug-in items, such as printed wiring boards, which may have been loosened from their receptacles.

3.2 INSTALLATION

3.2.1 Rack/Mounting Support. - Rack mount equipment, manufactured by WJ Gaithersburg, is designed for assembly in standard 19-inch racks in accordance with MIL-STD-189, or E.I.A. standard No. RS-310. The unit may be supported solely by the front panel for static installations, but it is recommended that chassis slides be added for ease of assembly, access to the unit, and to provide additional support for general installations. Mobile installations of the equipment should be evaluated on an individual basis. Additional information, such as recommended mounting methods, may be found in WJ-Gaithersburg Application Note 1302.50.

3.2.2 Thermal Considerations. - WJ-Gaithersburg equipment is designed for operational temperatures between 0° C and 50° C (32° F and 122° F). The operational temperature range is further qualified for free, unrestricted ambient air at sea level pressure. Equipment installation should provide for free flow of air around and through ventilated units. Multiple stacking, in particular close adjacent stacking of electronic equipment in a standard console, can produce an appreciable increase in the ambient air temperature for the units as compared to the ambient air in the vicinity of the console. Forced-air ventilation may be necessary to maintain the proper ambient air temperature in a console which accommodates equipment that contributes to a high thernal density. Additional information may be obtained from WJ-Gaithersburg in Application Note 1303.50.

3.2.3 Power Connection. - Connect the furnished power cable to the power receptacle on the rear apron. Rotate the AUDIO gain control fully counterclockwise to the PWR OFF position. Plug the power cable into a 115 or 230 V, 50-400 Hz source. The third pin of the power plug grounds the receiver. If a three-pin receptacle is not available, use the three-to-two pin adapter provided. The wire on the adapter should be connected to a suitable ground. Before energizing the receiver, check the rear-apron power selector switch S5 to make sure it is in the proper position for the line voltage being used.

3.2.4 Antenna Connection. - Connect the antenna to RF INPUT jack A1J1. This jack is a type N connector.

3.2.5 DAFC Input Connection. - Connect the DAFC output from the associated frequency counter to DAFC INPUT jack J8. This is a BNC connector.

3.2.6 LO Output Connection. - The local oscillator signal from the installed tuning head is available from jack J2, a BNC connector.

3.2.7 IF Output Connection. - Predetection IF output signals at 21.4 MHz are available at jack J3 on the rear apron, marked IF OUTPUT. This jack is a BNC connector.

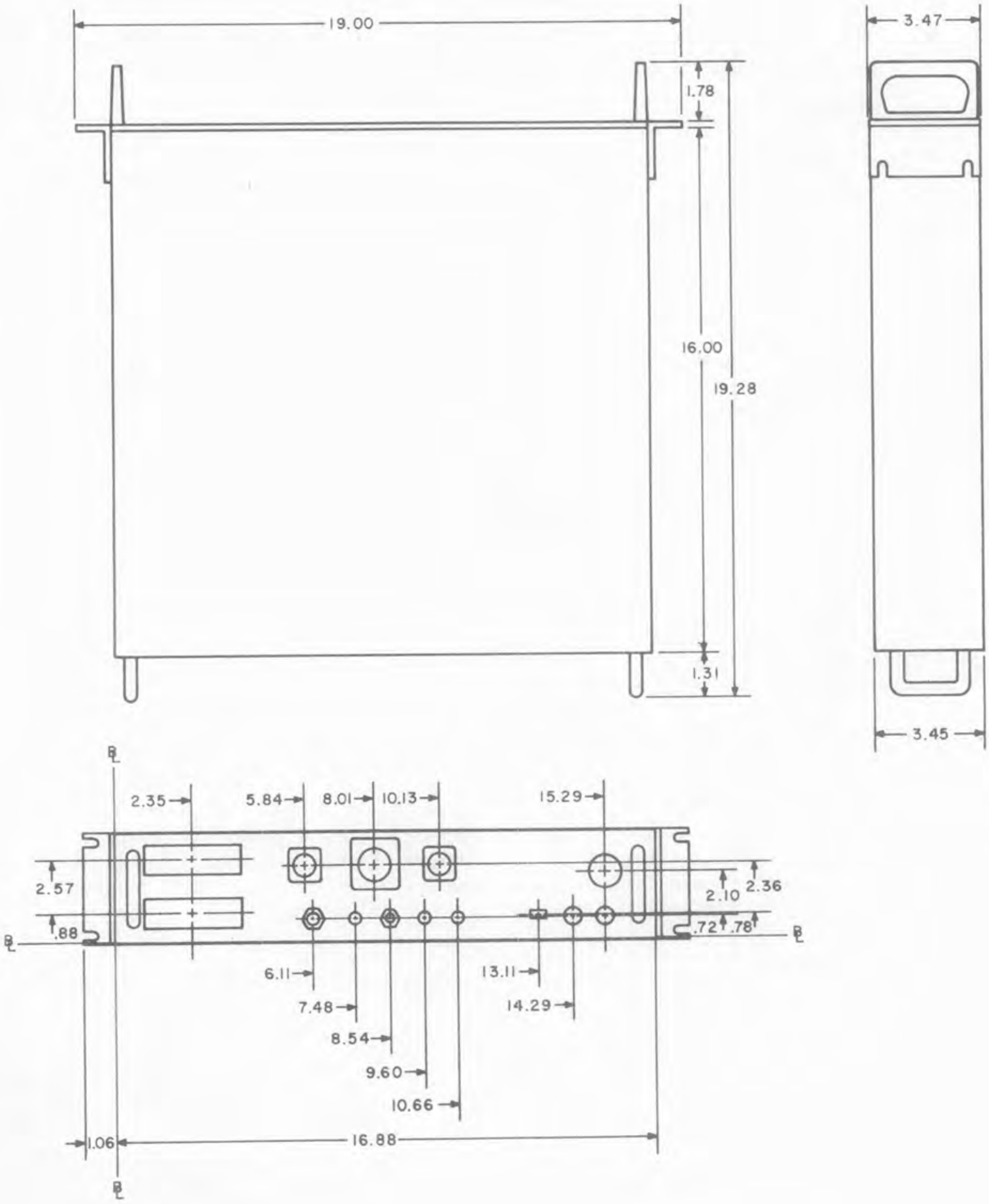


Figure 3-1. Type 560 Receiver, Critical Dimensions

3.2.8 Counter Connection. - Connect the associated frequency counter to multipin jack J11. This is a quick-disconnect Deutsch connector.

3.2.9 Video Output Connection. - Video output signals are available from BNC jack J9, marked VIDEO OUTPUT.

3.2.10 Carrier Operated Relay Connections. - Two sets of DPDT relay contacts are available at terminal board TB1. One set of normally closed contacts exists between pins 2 and 3. A second set appears between pins 5 and 6.

3.2.11 Audio Output Connection. - Audio output signals are available at terminal board TB2. Fifty-ohm signals are connected to pins 3 and 4 and 600-ohm signals are connected to pins 5 and 6. A third high impedance output is available at the front-panel headphones jack, J10.

3.2.12 Accessory Output Connection. - Multipin jack J12 provides several accessory output signals. The IF AGC signal is applied to pin 16. Both AM and FM video signals are available at pins 17 and 18 respectively. Various tuner functions are available from pins 1 through 11 (see Figure 6-19).

3.3 OPERATION

The following paragraphs contain a description of the controls and indicators found on the front panel and rear apron. These controls and indicators are shown in Figures 5-1 and 5-2.

3.3.1 Audio Gain Control and Power On/Off Switch. - The AUDIO GAIN control varies the amplitude of the signal present at terminals 3 through 6 of TB2 and at the PHONES jack. This control also turns the power on when it is rotated in the clockwise direction from its extreme counterclockwise PWR OFF position.

3.3.2 RF/IF Gain Control. - The overall gain of the receiver is controlled by the RF/IF GAIN potentiometer when the AM MAN or CW modes are selected. This control is the outermost knob on the concentric shaft.

3.3.3 BFO Tuning Control. - The pitch of the CW-audio signal is varied by the BFO TUNING control. It is the inner knob on the concentric shaft associated with the RF/IF gain control.

3.3.4 Mode Switch. - Set the MODE switch in the FM, AM AGC, AM MAN, or CW position as desired, before the receiver is tuned. When the latter two modes are selected, the receiver gain must be controlled by the RF/IF GAIN potentiometer. The gain is controlled by internal circuitry when the AM AGC or FM modes are selected.

3.3.5 COR Sensitivity Control. - The COR SENSITIVITY control is used to obtain COR operation at the desired signal level. This control also affects the audio/squelch operation. Clockwise rotation increases the sensitivity. This potentiometer is controlled by the outermost knob on the concentric COR function shaft.

3.3.6 COR Delay Switch. - The inner knob on the COR function shaft controls the length of time the COR remains in operation after the activating signal disappears. This delay can be set to 0.5, 5.0 or 15.0 seconds. The audio squelch function is not affected by the setting of the COR DELAY SEC control. Muting of the audio signal is almost immediate after the carrier disappears.

3.3.7 IF Bandwidth kHz Switch. - The IF BANDWIDTH kHz switch sets the receiver IF bandwidth at 10 kHz, 50 kHz, or 200 kHz. When searching for a signal it is advisable to use the widest bandwidth.

3.3.8 Video Gain Control. - The amplitude of the video signal present at jack J9 can be changed by the VIDEO GAIN potentiometer. This control is located on the rear apron and is a screwdriver type adjustment.

3.3.9 Intensity Control. - The brilliance of the trace on the CRT screen may be varied by the INTENSITY control.

3.3.10 Focus Control. - The FOCUS control provides a means of obtaining a shart trace on the CRT screen.

3.3.11 SDU Gain Control. - The SDU GAIN control varies the height of the pips displayed on the face of the CRT.

3.3.12 Center Frequency Control. - The CENTER FREQ control changes the horizontal position of the signal pips on the CRT screen. During normal operation this control is used to center the frequency spectrum being displayed under the center mark on the screen.

3.3.13 Sweep Width Control. - The SWEEP WIDTH control varies the width of the frequency spectrum being viewed. When this control is in the maximum clockwise position, a maximum bandwidth of 3 MHz is being displayed.

3.3.14 Marker Switch. - Placing the MARKER toggle switch in the up position places a center frequency marker on the CRT screen to indicate the center of the IF bandpass.

3.4 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 SM GAIN control setting.

3.5 PREPARATION FOR RESHIPMENT AND STORAGE

3.5.1 If the unit must be prepared for reshipment, the packaging methods should follow the pattern established in the original shipment. If retained, the original materials can be reused to a large extent or will at a minimum provide excellent guidance for the repackaging effort.

3.5.2 If time permits, contract packing and packaging firms can be found in many cities. Based on an examination of the equipment and the proposed method of shipment, these firms can usually perform a reliable repackaging service.

3.5.3 As a minimum, cover the painted surfaces of the unit with wrapping paper. Pack the unit securely in a strong corrugated container (350 lb/sq inch bursting test) with 2-inch rubberized hair pads placed along all surfaces of the equipment. If rubberized hair is not available, use a 6-inch layer of excelsior. If neither of these filler materials are available, use crumpled paper, rags, or any other available materials to provide as much cushioning as possible.

3.5.4 Conditions during storage and shipment should normally be limited as follows:

(a) Maximum humidity: 95% (no condensation).

(b) Temperature range: -30° C to +85° C.

SECTION IV
MAINTENANCE

4.1 GENERAL

The Type 560 Receiver has been conservatively designed to operate for long periods of time with little or no routine maintenance. An occasional cleaning and inspection are the only preventive maintenance operations recommended. The intervals for these operations should be based on the operating environment. Should trouble occur, repair time will be minimized if the maintenance technician is familiar with the circuit descriptions found in Section II. Reference should also be made to the block diagrams, Figures 2-1 and 2-2, and to the schematic diagrams found in Section VI. A complete parts list plus illustrations showing part locations in the receiver can be found in Section V.

4.2 CLEANING AND LUBRICATION

The receiver should be kept free of dust, moisture, grease and foreign matter to insure trouble-free operation. If available, use low pressure, compressed air to remove accumulated dust from the interior and exterior of the receiver. A clean dry cloth, a soft bristled brush, or a cloth saturated with a cleaning compound may also be used. There are no lubrication procedures required for the 560 Receiver.

4.3 INSPECTION FOR DAMAGE OR WEAR

Many potential or existing troubles can be detected by a visual inspection of the unit. For this reason, a complete visual inspection should be made for indications of mechanical and electrical defects on a periodic basis, or whenever the unit is inoperative. Electronic components that show signs of deterioration should be checked and a thorough investigation of the associated circuitry should be made to verify proper operation. Damage to parts due to heat is often the result of other less apparent troubles in the circuit. It is essential that the cause of overheating be determined and corrected before replacing the damaged parts. Mechanical parts, and front panel controls and switches should be inspected for excessive wear, looseness, misalignment, corrosion, and other signs of deterioration.

4.4 TROUBLESHOOTING AND REPAIR

Troubleshooting efforts should first be directed toward localizing the problem to a particular module or circuit group. As aids in this process, the manual contains a troubleshooting chart, Table 4-1, and a complete circuit description, Section II. Once the faulty module has been located, the defective component should be isolated using data obtained from the circuit descriptions, the voltage readings, Table 4-2, and the schematic diagrams, Figure 6-1 through 6-19.

4.5.1 Localizing Troubles. - The chart presented in Table 4-1 lists some probable troubles that may occur. The symptoms and remedies listed are typical of those that could occur and are representative of logical methods that should be applied in most cases. Initial efforts directed toward the major subassembly level are recommended. If the steps outlined do not locate the faulty subassembly, then the tests listed in paragraph 4.5 should be performed.

4.4.2 Failure Analysis. - Once the trouble has been localized, the receiver can usually be returned to service by substituting a spare module known to be in good operating condition. Before a faulty module is repaired, a review should be made of the procedures followed up to this point to determine exactly why the failure occurred. This review should disclose whether or not the problem discovered is actually the cause and not just a result of another malfunction.

4.4.3 Test Equipment Required. - The following test instruments, or a suitable equivalent, are required to align and test the 560 Receiver:

ITEM	INSTRUMENT TYPE	REQUIRED CHARACTERISTICS	USE	RECOMMENDED INSTRUMENT
1	Signal Generators	50 kHz to 480 MHz frequency range	Signal substitution; external marker source	Hewlett Packard 606B, 608E, and 202H
2	Sweeping Signal Generator	10-MHz to 500-MHz frequency range; 0 to 10 MHz sweep width; internal 21.4-MHz, 1-MHz, and 10-MHz markers	IF and SDU alignment	Hewlett Packard 675A
3	Oscilloscope	500-kHz vertical bandwidth	IF and SDU alignment; troubleshooting	Tektronix 503
4	Digital Voltmeter	1% Accuracy; automatic ranging	Power supply adjust-ments	Dana 5500/112
5	Frequency Counter	6 digits with 4-place accuracy	Signal generator cali-bration; IF alignment	CMC-738A
6	High Impedance Detector	(see text)	IF alignment	
7	RF Tuning Head			VH-101, VH-103, VH-105
8	AC VTVM	-60 to +50 dB and .001 to 300V rms ranges	Performance Checks	Hewlett Packard 400L
9	Step Attenuator	0-102 dB range 1-dB steps; 50 ohms	Performance Checks	Texscan SA50
10	Variac	0-150 volt range	Power Supply Check	General Radio WSM-T3A

4.4.4 Post-Corrective Alignment. - The basic alignment procedures given in the following paragraphs should be performed only after the replacement of a bandwidth determining component in any of the IF amplifier or FM discriminator circuits, or if the repair technician feels that the repair made would have affected the alignment. If the response curve samples given cannot be duplicated with this basic procedure, then the detailed alignment presented in paragraph 4.6 should be performed. It should be noted however that once the detailed procedures are begun, they must be completed in their entirety to insure proper alignment.

4.4.4.1 IF Amplifier, Overall Alignment Check.

4.4.4.1.1 10 kHz/50 kHz IF Amplifier. - Proceed as follows:

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

(2) Place the 560 Receiver controls in the following positions:

(a) MODE - AM MAN

(b) IF BANDWIDTH kHz - 10

(c) RF/IF GAIN - Fully clockwise.

(3) Connect the sweep generator MARKER ADDER to XA5, pin 2, of the IF amplifier assembly, A2.

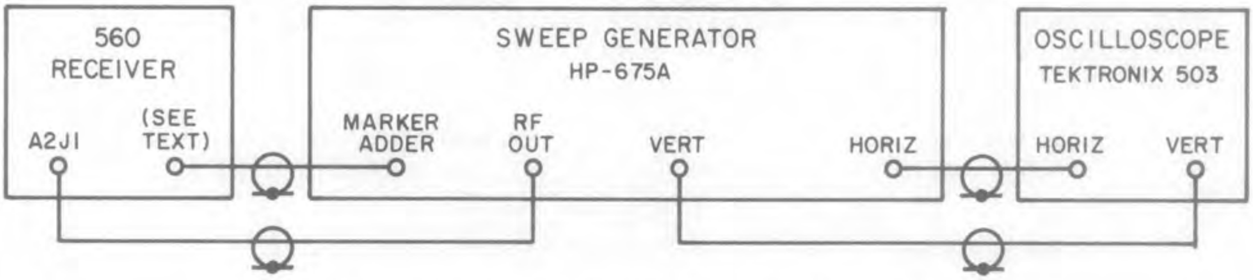


Figure 4-1. Test Setup, IF Amplifier, Overall Alignment Check

(4) Tune the sweep generator to 21.4 MHz, and turn all internal markers off.

(5) Set the oscilloscope VERTICAL SENSITIVITY to 0.2V/cm.

(6) Adjust the remaining oscilloscope and sweep generator controls to display a response curve. It should appear similar to Figure 4-2. If it does not continue to step (7).

(7) Remove the brass cover from the portion of the IF amplifier assembly housing the board under test.

(8) Turn off the power and remove the board. Install the card extender in the receptacle and install the IF board in the extender.

(9) Turn on the power and adjust inductors A1L1, A1L2, and A1L3 for a response similar to Figure 4-2.

(10) Turn off the power, remove the board and the extender and replace the IF board in the receptacle. Replace the brass cover.

(11) Change the IF BANDWIDTH kHz switch to the 50 position.

(12) Compare the response with Figure 4-3. If it is not similar, repeat steps (7), (8), and (9), except that the response should be similar to Figure 4-3.

(13) Repeat step (10).

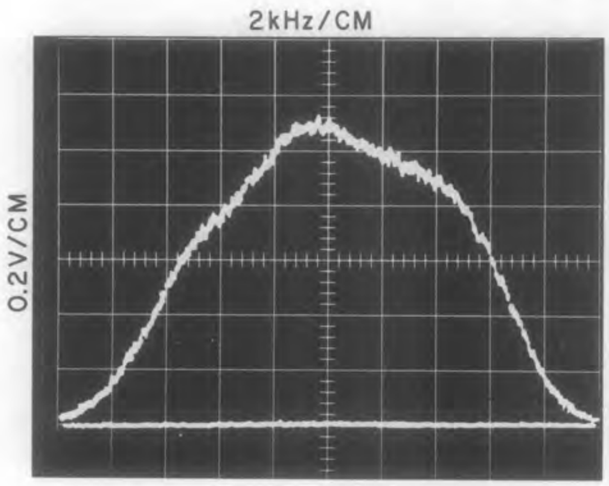


Figure 4-2. Typical Response, Overall 10-kHz IF Amplifier

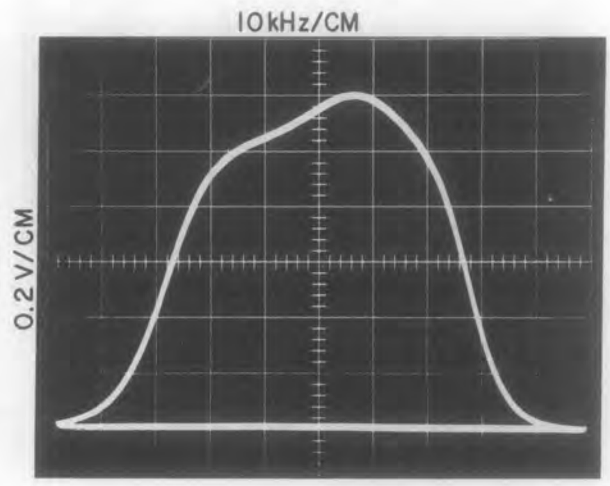


Figure 4-3. Typical Response, Overall 50-kHz IF Amplifier

4.4.4.1.2 200-kHz IF Amplifier. - Proceed as follows:

(1) Connect equipment as shown in Figure 4-1. The sweep generator MARKER ADDER input is connected to XA5, pin 2 of the IF amplifier assembly.

(2) Place the 560 Receiver controls as described in 4.4.4.1.1, step (2), except that the IF BANDWIDTH kHz switch is in the 200 position.

(3) Set the oscilloscope VERTICAL SENSITIVITY to 0.2V/cm.

(4) Adjust the sweep generator and oscilloscope controls to display a response curve. It should appear similar to Figure 4-4. If it does not continue to step (5).

(5) Adjust capacitors C7, C10, C20, C13, and C16 for a response similar to Figure 4-4.

4.4.4.2 FM Discriminator, Overall Alignment Check. -

4.4.4.2.1 10-kHz/50-kHz Discriminator. - Proceed as follows:

(1) Connect equipment as shown in Figure 4-1, with the MARKER ADDER input connected to XA7, pin 12 of the IF amplifier assembly.

(2) Place the 560 Receiver controls in the following positions:

(a) MODE - FM

(b) IF BANDWIDTH kHz - 10

(c) RF/IF GAIN - Fully clockwise.

(3) Adjust the oscilloscope VERTICAL SENSITIVITY to 0.1V/cm.

(4) Adjust the sweep generator and oscilloscope controls to display an "S" response curve. It should appear similar to Figure 4-5.

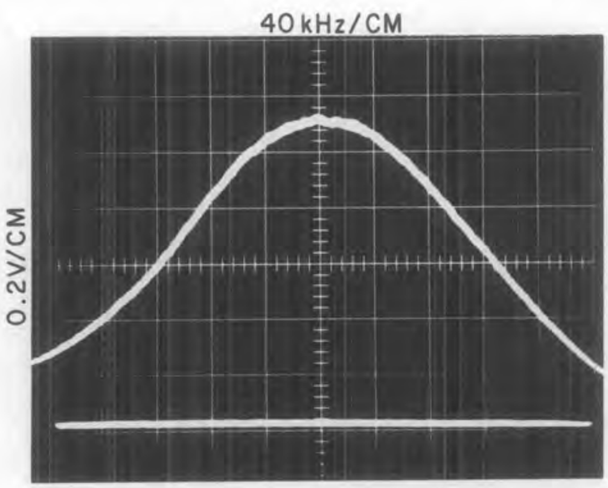


Figure 4-4. Typical Response, Overall 200-kHz IF Amplifier

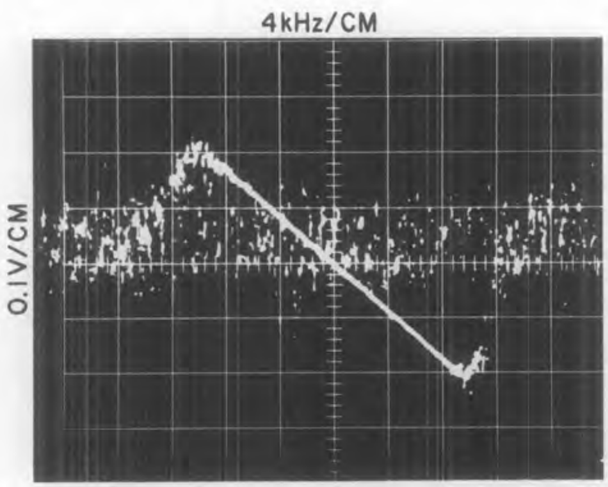


Figure 4-5. Typical Response, 10-kHz FM Discriminator

(5) If the response does not appear linear adjust A7R5 and A7C4 until it appears similar to Figure 4-5.

(6) Change the IF BANDWIDTH kHz switch to the 50 position and connect the MARKER ADDER to XA6, pin 12.

(7) Adjust the oscilloscope VERTICAL SENSITIVITY to 1.0V/cm.

(8) Adjust the oscilloscope and sweep generator controls to display an "S" response curve. It should appear similar to Figure 4-6. If not, repeat step (5).

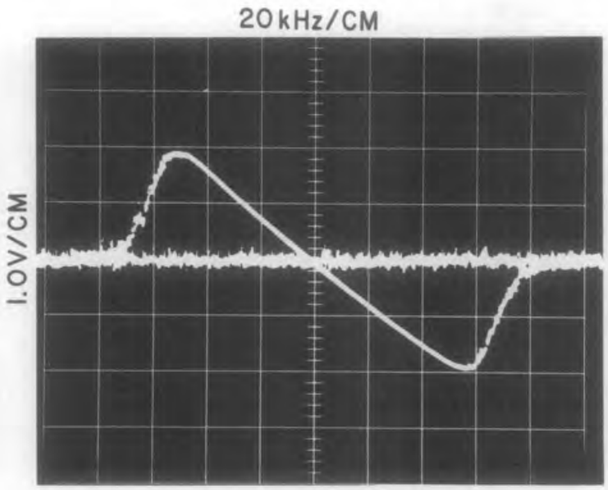


Figure 4-6. Typical Response, 50-kHz FM Discriminator

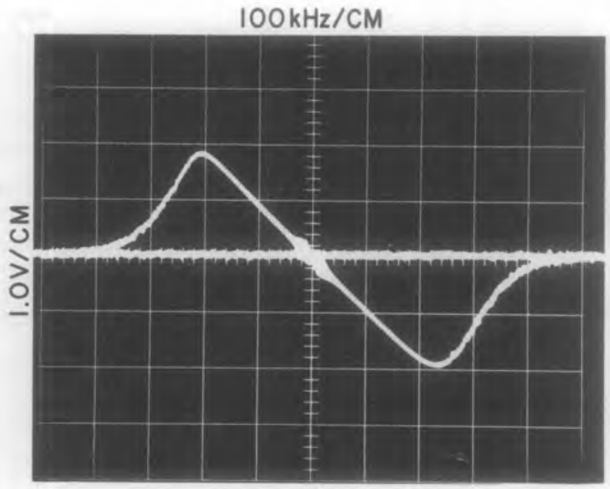


Figure 4-7. Typical Response, 200-kHz FM Discriminator

4.4.4.2.2 200-kHz FM Discriminator. - Proceed as follows:

(1) Connect equipment as shown in Figure 4-1; the MARKER ADDER input is connected to XA6, pin 12.

(2) Set the IF BANDWIDTH kHz switch in the 200 position.

(3) Set the oscilloscope VERTICAL SENSITIVITY to 1.0V/cm.

(4) Adjust the oscilloscope and sweep generator controls to display an "S" response curve. It should appear similar to Figure 4-7. If not adjust A6C8 and A6C10 for a response similar to Figure 4-7.

Table 4-1. Troubleshooting Chart, 560 Receiver

SYMPTOM	PROBABLE CAUSE	REMEDY
Receiver totally inoperative; tuner dial lamps out.	Fuse F1 blown; power switch defective; line cord or filter A9 defective.	Locate cause of blown fuse and correct; replace fuse; check components in A9; repair or replace A9; check for proper input power.
Dial lamps okay; receiver still inoperative.	Power supply board(s) defective.	Perform checks described in 4.5.1.
No AM or FM video in AM AGC or FM modes; all bandwidths affected.	a. IF output board (A2A5) failure. b. Video amplifier (A5) defective. c. Mode switch contact open. d. Defective stage in RF tuning head.	a. Replace A2A5. b. Replace A5. c. Check continuity of S3. d. Refer to manual for individual tuning head for troubleshooting.
IF output present at J4 on all IF bandwidths, still no video output.	AM detector diode failure; IF output stage failure.	Check A2A5CR1; check A2A5Q3 and A2A5Q4 and replace if necessary.
No manual gain in the MAN mode.	a. AGC amplifier defective; potentiometer R3B defective.	a. Replace A4 or R3B.

Table 4-1. Troubleshooting Chart, 560 Receiver (Continued)

SYMPTOM	PROBABLE CAUSE	REMEDY
	b. MODE switch contact open.	b. Check continuity of S3B-W.
COR relay inoperative, AGC function okay.	a. COR sensitivity control improperly set or defective b. COR circuit on board A6 defective. c. Relay K1 defective.	a. Check setting of R8 or replace. b. Replace A6 or correct fault. c. Replace K1.
No trace on SDU screen; no marker.	a. P1 or P2 loose or contact open. b. SDU power supply failure.	a. Check P1 and P2; replace if necessary. b. Check for high voltage (use CAUTION -1500 Vdc) at A3PS1, pin 4; signal trace from output to input on board A3A1A1 and A3A1A2 to find defective component.
CRT trace okay; no signal pips	Input signal from A2 interrupted	Check output network in A2; check cable to A3A1J1.
RF input present but still no CRT trace.	Sweep oscillator defective; crystal A3A1A4Y1 defective.	Check A3A1A1Q4; replace crystal or A3A1A4Q1.
Sweep oscillator okay, still no CRT trace.	Sweep generator defective.	Check stages on A3A2; replace defective component.
Sweep generator okay, still no CRT trace.	Horizontal deflection circuit failure.	Check for +200V at A3A1A2E8; check all stages on A3A1A2.

4.5 PERFORMANCE TESTS

Selected performance tests are presented in the following paragraphs which can be used to determine the relative performance of the Type 560 Receiver.

4.5.1 Power Supply Regulator Tests. - The following tests will determine if the power supply regulators are performing within acceptable limits.

4.5.1.1 The following equipment is required:

(1) Variac, General Radio, Type WSM-T3A.

(2) Digital Voltmeter, Dana Type 5500/112.

4.5.1.2 The tests are performed as follows:

(1) Connect the receiver power input to the variac. Use the digital voltmeter to check the voltages outlined; set the ac voltage to 115 Vac.

POWER SUPPLY	MEASURED AT	MINIMUM READING	MAXIMUM READING
+15V	XA7, Pin 17	+14.5	+15.5
-15V	XA8, Pin 21	-14.5	-15.5

(2) Increase the line voltage to 132 Vac and repeat the measurements listed in step (1).

(3) Decrease the line voltage to 98 Vac and repeat the measurements listed in step (1).

4.5.2 IF Bandwidth and Center Frequency Test. - The following steps ensure that the three IF paths have the proper bandwidth.

4.5.2.1 The following equipment is required:

(1) Frequency Counter, Computer Measurement Corporation, Type CMC-738A.

(2) Step Attenuator, Texscan SA50.

(3) VTVM, RCA WV-98C.

(4) Signal Generator, Hewlett Packard 606B.

4.5.2.2 The tests are performed as follows:

(1) Set the receiver controls as follows:

(a) MODE - AM MAN

(b) IF BANDWIDTH kHz - 10

(c) RF/IF GAIN - Fully clockwise.

(2) Connect equipment as shown in Figure 4-8.

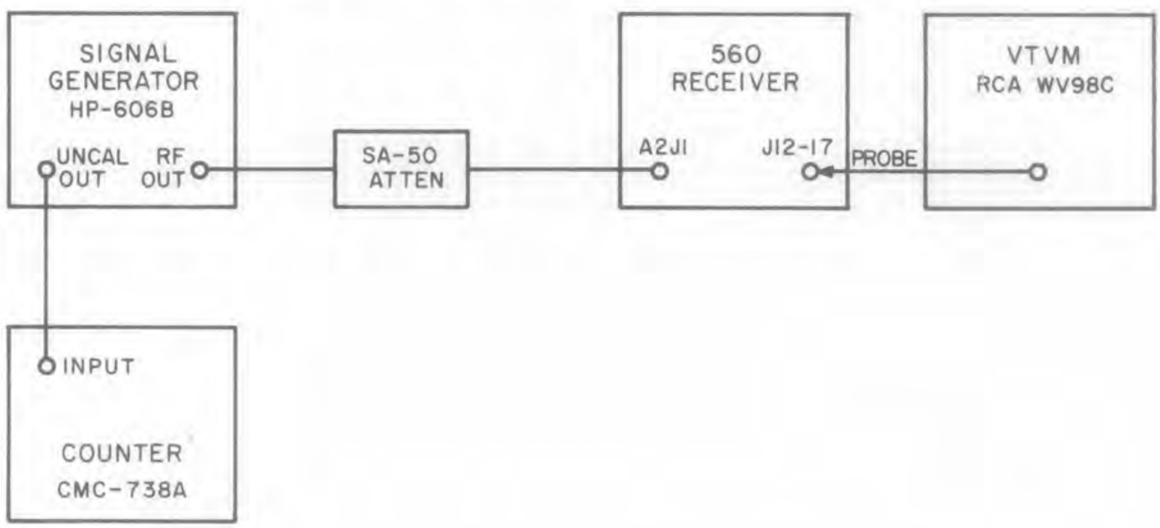


Figure 4-8. Test Setup, IF Bandwidth and Center Frequency Test

(3) Set the step attenuator to 13 dB.

(4) Adjust the signal generator for a CW output, at 21.4 MHz. Set the output level to produce a 1.5 Vdc reading on the VTVM.

(5) Set the step attenuator to 10 dB.

(6) Increase the output frequency of the signal generator until the VTVM again reads 1.5 Vdc. Record the reading on the frequency counter.

(7) Decrease the output frequency of the signal generator until a 1.5 Vdc reading is again obtained. Record the reading on the frequency counter.

(8) Subtract the reading obtained in step (7) from the reading obtained in step (6). The difference should be 10.0 ±1 kHz.

(9) Divide the remainder obtained in step (8) by 2 and add this quotient to the reading from step (7). This result shall be 21.400 MHz ±1 kHz.

(10) Repeat step (3).

(11) Set the receiver IF BANDWIDTH kHz switch to 50.

(12) Repeat steps (4) through (8). The 3-dB bandwidth at step (8) should be 50.0 ±5.0 kHz.

(13) Divide the reading in step (12) by 2 and add this to the low frequency reading. The result shall be 21.400 MHz ±2.5 kHz.

(14) Repeat step (3).

(15) Set the receiver IF BANDWIDTH kHz switch to 200.

(16) Repeat steps (4) through (8). The 3-dB bandwidth at step (8) should be 200.0 ±20.0 kHz.

(17) Divide the reading in step (16) by 2 and add this quotient to the low frequency reading. The result shall be 21.400 ±0.010 MHz.

(18) Connect the probe of the VTVM to J12, pin 18.

(19) Set the receiver MODE switch to FM and the IF BANDWIDTH kHz switch to 50.

(20) Adjust the signal generator for a CW output at 21.400 MHz and at a level that produces a 1.0 Vdc reading (or less) on the VTVM.

(21) Adjust the signal generator output frequency to obtain a zero-volt reading on the VTVM.

(22) Record the reading on the counter. It should be 21.400 MHz ±0.010 kHz.

4.5.3 <u>AM Output Stability</u>. - The AM output stability test is used to evaluate the operation of the AGC circuit under a wide range of input signal levels. Before this test can be performed an RF tuning head must be installed in the 560 Receiver. Sensitivity levels can be obtained from the following table:

Table 4-2. RF Tuning Head Input Levels

TUNING HEAD NOISE FIGURE	IF BANDWIDTH		
	10 kHz	50 kHz	200 kHz
6 dB	-110 dBm	-103 dBm	-97 dBm
7 dB	-109 dBm	-102 dBm	-96 dBm
8 dB	-108 dBm	-101 dBm	-95 dBm
9 dB	-107 dBm	-100 dBm	-94 dBm

The tests listed below assume a VH-103 tuning head to be installed in the receiver.

4.5.3.1 The following equipments are required:

(1) AC VTVM, Hewlett Packard 400L.

(2) Signal Generator, Hewlett Packard 606B.

(3) Oscilloscope, Tektronix 503.

4.5.3.2 The test is performed as follows:

(1) Connect equipment as shown in Figure 4-9.

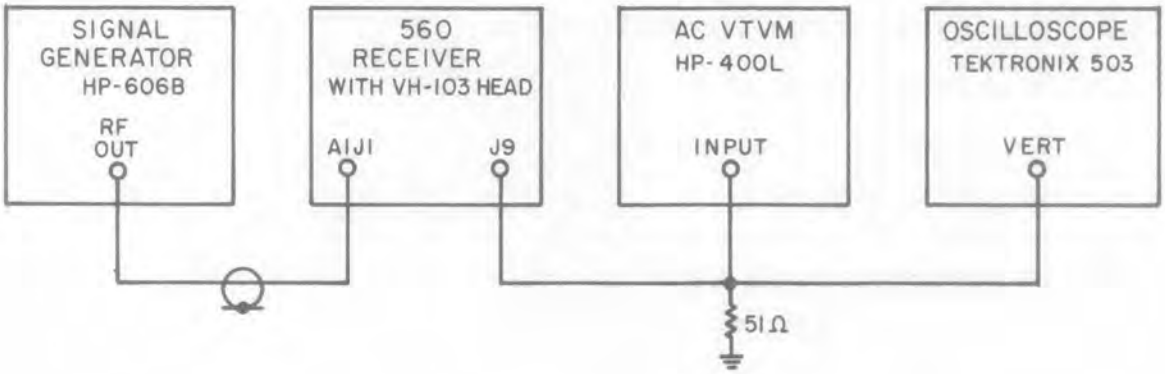


Figure 4-9. Test Setup, AM Output Stability

(2) Tune the VH-103 to 175 MHz.

(3) Set the 560 Receiver controls as follows:

(a) MODE - AM MAN

(b) IF BANDWIDTH kHz - 200

(c) RF/IF GAIN - Fully clockwise

(d) VIDEO GAIN - Fully clockwise.

(4) Tune the signal generator to 175 MHz.

(5) Adjust the signal generator controls for an AM output, modulated 50% at a 1 kHz rate. Set the output level to -109 dBm.

(6) Using the rear apron VIDEO GAIN control, set a convenient reference level on the AC VTVM.

(7) Increase the output level of the signal generator to -10 dBm while observing the AC VTVM. The increase should be no more than 6.0 dB.

(8) Set the signal generator output level to -102 dBm.

(9) Place the IF BANDWIDTH kHz switch in the 50 position.

(10) Repeat steps (6) and (7).

(11) Place the IF BANDWIDTH kHz switch in the 200 position.

(12) Set the signal generator output level to -96 dBm.

(13) Repeat steps (6) and (7).

NOTE

AM and FM sensitivity tests are included in the individual instruction manual for the selected tuning head.

4.5.4 Audio and Video Output Levels. - The following tests determine if the audio and video modules will deliver their rated outputs. These tests assume that a VH-103 tuning head is installed in the receiver.

4.5.4.1 The following equipment is required:

(1) AC VTVM, Hewlett Packard 400L.

(2) Signal Generator, Hewlett Packard 608E.

(3) Frequency Counter, CMC-738A with 735 Plug-In.

4.5.4.2 The tests are performed as follows:

(1) Set the receiver controls as follows:

(a) MODE - AM MAN

(b) RF/IF GAIN - Fully counterclockwise

(c) IF BANDWIDTH kHz - 50

(d) AUDIO and VIDEO GAIN - Fully clockwise.

(2) Connect equipment as shown in Figure 4-9.

(3) Adjust the signal generator for a -102 dBm, AM output, modulated 50% at a 1-kHz rate. Tune the signal generator to 175 MHz.

(4) Tune the VH-103 to 175 MHz.

(5) Record the reading on the AC VTVM; it should be at least 0.71V rms.

(6) Terminate the audio output at pin 3 with a 50-ohm load. Ground pins 4 and 6.

(7) Connect the AC VTVM to pin 3. The meter should read at least 5.0V rms.

(8) Terminate TB2, pin 5 with a 600-ohm load.

(9) Connect the AC VTVM to pin 5.

(10) The meter should read at least 7.7V rms.

4.5.5 Spectrum Display Unit Sweep Width and Linearity Test. - The following test determines if the spectrum display unit sweep is linear throughout its dispersion and if the sweep width is as wide as specified.

4.5.5.1 The following equipment is required:

(1) Signal Generator, Hewlett Packard 606B.

(2) Frequency Counter, Computer Measurements Corporation, Type 738A.

4.5.5.2 The test is performed as follows:

(1) Connect the signal generator to A3A1J1 and to the frequency counter.

(2) Rotate the SWEEP WIDTH control fully clockwise. Turn MARKER on and position under the center graticule mark using the CENTER FREQ control. Turn MARKER off.

(3) Adjust the signal generator controls for a CW output at 21.4 MHz. Increase the output level as necessary to operate the counter.

(4) Using the SM GAIN control, adjust the signal pip for full-scale deflection.

(5) Tune the signal generator to position the signal pip behind the third graticule mark to the left of center. Record the counter indication.

(6) Tune the signal generator to position the signal pip behind the third graticule mark to the right of center. Record the counter indication.

(7) Subtract the reading obtained in step (5) from the reading obtained in step (6). The difference must be 3 MHz ±0.010 kHz.

(8) Check the frequency-versus-position at each graticule mark on both sides of center. The difference between readings should be 500 kHz ±0.010 kHz in each case.

4.6 DETAILED ALIGNMENT PROCEDURE

The alignment procedure given in the following paragraphs should only be performed after the replacement of a bandwidth, frequency, or gain determining component or after the performance of the basic alignment presented in paragraph 4.4 has failed to restore the receiver to proper operating condition.

NOTE

Once this detailed procedure is begun, it should be completed in its entirety to ensure proper alignment. This procedure should only be done if considered absolutely necessary.

4.6.1 Control Settings. - Before starting the alignment, place the front-panel controls in the positions indicated. Controls not mentioned will not affect the procedure.

(1) MODE - AM MAN.

(2) RF/IF GAIN - Fully clockwise.

(3) IF BANDWIDTH kHz - Consistent with bandwidth being aligned.

(4) Operating tuning head installed.

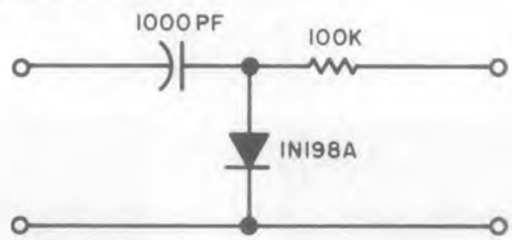


Figure 4-10. High Impedance Detector, Schematic Diagram

4.6.2 Power Supplies. - Adjust the power supplies in the sequence listed:

(1) Turn on the receiver and digital voltmeter.

(2) Connect the DVM to A7, pin 17.

(3) Adjust A7R11 for a +15.0V reading.

(4) Connect the DVM to A8, pin 21.

(5) Adjust A8R11 for a -15.0V reading.

4.6.3 200-kHz IF Preselector (A2A3) Alignment. - Proceed as follows:

(1) Turn off the power and remove the brass cover from the top of the portion of the IF assembly housing the 200-kHz preselector board (A3).

(2) Remove the board and install the extender card in its place.

(3) Plug the 200-kHz preselector board into the extender card.

(4) Place the IF BANDWIDTH kHz switch in the 200 position.

CAUTION

Do not ground A2C21 when connecting equipment. Failure to observe this caution will destroy one or more transistors.

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

(6) Connect the high-impedance detector between the MARKER ADDER and test point E1 (terminal) on the board; turn power on.

(7) Tune the sweep generator to 21.4 MHz and turn on internal 1-MHz marker.

(8) Adjust sweep generator and oscilloscope controls to display a response curve.

(9) Using a small screwdriver or other suitable tool, short out inductor L2.

(10) Adjust C7 for a peak at 21.4 MHz.

(11) Remove the short from L2.

(12) Connect a short across C20.

(13) Adjust C10 for a null at 21.4 MHz.

(14) Remove the short from C20.

(15) Adjust C20 for a peak at 21.4 MHz.

(16) Disconnect the detector from E1 and connect it to pin 2 of the module receptacle.

(17) Adjust capacitors C7, C13, and C16 for a maximum amplitude, slightly over-coupled response centered at 21.4 MHz and having no more than 1-dB ripple. A typical response is shown in Figure 4-11.

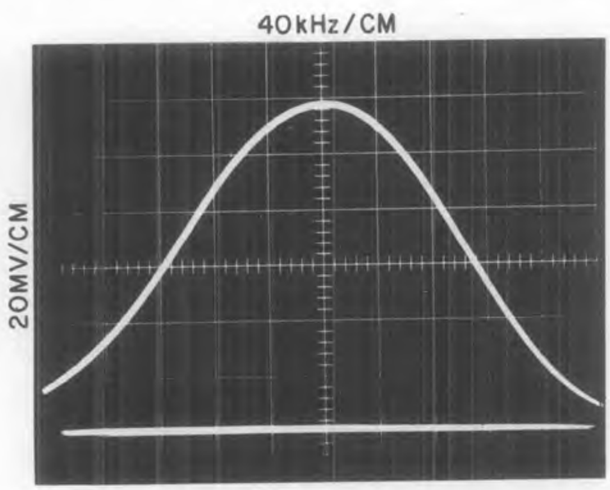


Figure 4-11. Typical Response, 200-kHz Preselector Alignment

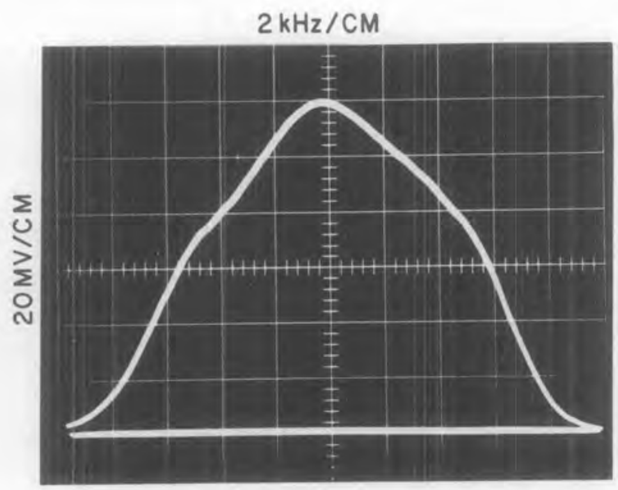


Figure 4-12. Typical Response, 10-kHz Preselector Alignment

(18) Turn off the power, remove the extender card and install the preselector board in its receptacle.

(19) Turn the power on, and readjust C7 if necessary for a response similar to Figure 4-11.

4.6.4 <u>10-kHz or 50-kHz IF Preselector (A2A1-A2A2) Alignment.</u> - Proceed as follows. Use A2A1 reference designation for the 10-kHz bandwidth and A2A2 with the 50-kHz bandwidth.

(1) Connect the equipment as shown in Figure 4-1. The detector is connected to pin 2 of the board being aligned.

(2) Remove the board being aligned and install the extender card. Connect the board to the extender card.

(3) Place the IF BANDWIDTH kHz control in the position for the IF being aligned.

(4) Adjust the sweep generator and oscilloscope controls to display a response curve.

(5) Adjust inductors L1 and L2 for minimum response ripple and L3 for a slightly rounded response centered at 21.4 MHz. Typical response curves are shown in Figures 4-12 and 4-13.

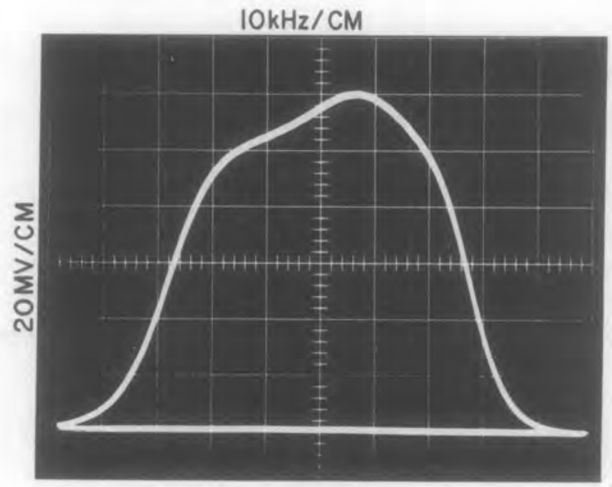


Figure 4-13. Typical Response, 50-kHz Preselector Alignment

4.6.5 IF Output Amplifier (A2A5) Alignment. - Proceed as follows:

(1) Place the receiver MODE switch in AM MAN and rotate the RF/IF GAIN control fully clockwise.

(2) Connect equipment as shown in Figure 4-1 except that the sweep generator RF output is connected to XA5 pin 21 and the MARKER ADDER is connected to XA5 pin 2. The detector is not used.

(3) Turn off the power to the receiver. Remove all of the IF preselector modules, and replace the brass covers, and turn power on.

(4) Rotate R1 and R5 (on A2A5) fully counterclockwise. Adjust capacitor C11 for maximum response at 21.4 MHz.

(5) Adjust the sweep generator and oscilloscope controls to display a response curve.

(6) Select the 200-kHz bandwidth and tune the sweep generator to 21.4 MHz.

(7) Turn off the power and remove the covers; replace the IF preselector boards and the covers.

4.6.6 IF Preselector Gain and AGC Adjustment. - After all three IF preselector modules have been aligned, the gain of each must be set. Proceed as follows:

(1) Replace all the brass covers on the IF amplifier assembly.

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

(3) Place the MODE switch in the AM MAN position.

(4) Connect the sweep generator MARKER ADDER input to pin 2 of the respective board for the following checks.

(5) Select each IF bandwidth and compare the response curves obtained, with the typical examples given in Figures 4-2 through 4-4. If any of the curves do not approximate the typical curves, repeat paragraph 4.4.4.1.

(6) Remove the brass cover from the section housing the IF output amplifier.

(7) Remove the IF output amplifier board and insert the extender card. Install the board on the card.

(8) Remove the sweep generator and oscilloscope from the test setup.

(9) Connect the RF output of an HP-606B signal generator to jack J1 on the IF assembly.

(10) Tune the signal generator to 21.4 MHz, CW mode. Set the output level to -10 dBm.

(11) Place the 560 Receiver MODE switch in the AM AGC position and the IF BANDWIDTH kHz switch in the 10 position.

(12) Connect the VTVM to capacitor C11 on the IF amplifier chassis. Adjust the meter to read negative dc volts.

(13) Rotate A5R5 fully clockwise.

(14) Rotate A5R1 fully clockwise.

(15) Rotate A1R26 and A2R26 fully clockwise.

(16) Rotate A3R27 fully clockwise.

(17) Adjust A5R5 for a -6.2V reading on the VTVM.

(18) Turn off the power and replace the IF output board in its receptacle, and install the brass cover. Decrease the signal generator output level to -88 dBm.

(19) Turn on the power and adjust A1R6 on the 10-kHz BW board for a -1.2V reading.

(20) Adjust potentiometer A5R1 on the IF output board for a -0.8V reading.

(21) Place the IF BANDWIDTH kHz switch in the 50 position and change the signal generator output level to -81 dBm.

(22) Adjust A2R26 for a -0.8V reading.

(23) Select the 200-kHz bandwidth and change the signal generator output level to -75 dBm.

(24) Adjust A3R27 for a -0.8V reading.

(25) Disconnect test equipment.

4.6.7 <u>10-kHz and 50-kHz Discriminator (A2A7) Alignment.</u> - Proceed as follows:

(1) Place the IF BANDWIDTH kHz switch in the 10 position.

(2) Connect equipment as shown in Figure 4-1 except that the sweep generator MARKER ADDER input is connected to feedthrough A2C23 (A2C36 for the 50 kHz BW) on the IF amplifier assembly chassis.

(3) Adjust the sweep generator and oscilloscope controls to display an "S" curve response.

(4) Adjust C14 for amplitude symmetry and R5 for zero-crossing of the "S" curve response. Typical response curves are shown in Figures 4-5 and 4-6. It should be noted that crystal discriminators exhibit the characteristics shown including the spurious responses. However, only a relatively small area of the curve around the center is used.

4.6.8 200-kHz Discriminator (A2A6) Alignment. - Proceed as follows:

(1) Place the IF BANDWIDTH kHz switch in the 200 position.

(2) Connect equipment as shown in Figure 4-1. The MARKER ADDER input is connected to A2C40 on the IF amplifier assembly.

(3) Adjust the sweep generator and oscilloscope controls to display an "S" curve response.

(4) Adjust C10 for amplitude symmetry and C8 for zero-crossing of the "S" curve. A typical response is shown in Figure 4-7.

4.6.9 IF Amplifier, Overall Response Curves. - After all alignment procedures given in paragraphs 4.6.3 through 4.6.8 have been completed, the overall IF responses should be checked. If a particular response fails to approximate the typical responses shown, then the IF preselector alignment for that bandwidth should be performed again. If none of the four responses appear normal, the IF output amplifier should be checked. Typical overall response curves for the 10-kHz, 50-kHz, and 200-kHz IF bandwidths are shown in Figures 4-2, 4-3, and 4-4, respectively. Proceed as follows:

(1) Connect equipment as shown in Figure 4-1. The sweep generator MARKER ADDER input is connected to XA5, pin 2 (IF output board).

(2) Place the IF BANDWIDTH kHz switch in the 200 position, the MODE switch in AM MAN and rotate the RF/IF GAIN control fully clockwise.

(3) Tune the sweep generator to 21.4 MHz and adjust the controls on it and the oscilloscope to display a response curve. Compare with Figure 4-2.

(4) Repeat steps (2) and (3) for the remaining two bandwidths. Compare with Figures 4-3 and 4-4, respectively.

WARNING

Exercise care when working around the CRT tube socket with the unit connected in the receiver. Voltages as high as -1500V are present.

4.6.10 Sweep Generator and Horizontal Amplifier Alignment (A3A2). - The sawtooth generator frequency and amplitude are adjusted by following the steps below.

(1) Connect the frequency counter input to terminal E1 on the board (sweep sample).

(2) Observe the counter reading. If it does not read 22 ±5 kHz, adjust potentiometer R5 until it does.

(3) Disconnect the counter.

(4) Connect terminal E1 to the positive (+) scope vertical input.

(5) Place both vertical input switches on the scope in the GND position.

(6) Using the SWEEP TIME/CM control, center the scope trace in the middle of the vertical graticule marks (0 volts).

(7) Change the switch associated with the scope vertical input connected to E1 to the DC position.

(8) Adjust potentiometers R9 (sweep balance) and R12 (sweep cal) to obtain a sawtooth exactly ±5V in amplitude about zero (10V, P-P).

(9) Observe the trace on the SDU screen. It should be extending across the entire face of the CRT. If not, adjust both R16 (horiz width) and R25 (horiz position) to obtain a full trace. Do not be concerned if the trace is not coincident with the base line.

4.6.11 IF Amplifier Board No. 2 (A3A1A2) Alignment. - The IF circuits on board no. 2 in the SDU are aligned by following the steps given below.

4.6.11.1 The following equipment is required:

(1) Signal Generator, Hewlett Packard 606B.

4.6.11.2 Perform the alignment as follows:

(1) Remove the bottom cover from the SDU.

WARNING

Exercise care when working around the CRT tube socket when the unit is connected in the receiver. Voltages as high as -1500V are present and are extremely dangerous.

(2) Connect the output of the signal generator to test point A1A2E5 on the board.

(3) Adjust the signal generator controls for a 1.0 MHz, CW output and at a level that produces a slight positive (vertical) shift in the SDU trace.

(4) Adjust inductors A1A2L8, A1A2L7, A1A2L6, A1A2L5, A1A2L4, and A1A2L3, in the order given for maximum positive shift of the CRT trace. Reduce the output level of the signal generator as necessary to keep the trace on the screen.

4.6.12 IF Amplifier Board No. 1 (A3A1A1) Alignment. - The shaping amplifier circuits and the output circuits on this board plus the input circuit on board no. 2 are aligned by performing the following steps.

4.6.12.1 The following equipment is required:

(1) Sweep Generator, Hewlett Packard 675A.

(2) Signal Generator, Hewlett Packard 606B.

(3) Oscilloscope, Tektronix 503.

(4) Test Oscillator, Hewlett Packard 651B.

4.6.12.2 The alignment is performed as follows:

(1) Connect the RF output of the HP-606B signal generator to terminal A1A1E8 (marker signal input terminal).

(2) Adjust the signal generator controls to produce a 13-MHz, CW output, at a level that produces a slight positive shift in the CRT trace.

(3) Adjust inductors A1A2L1 and A1A2L2 on IF amplifier board no. 2, plus A1A1L5 and A1A1L6 for maximum positive shift of the CRT trace.

(4) Disconnect the signal generator.

(5) Carefully unsolder the coaxial center conductor from input terminal A1A1E2.

WARNING

Excess heat applied to this terminal may cause damage to the center conductor insulation or to the etched circuit board. Use only a low-heat iron and only apply heat as long as necessary to remove the wire.

(6) Connect test equipment as shown in Figure 4-14.

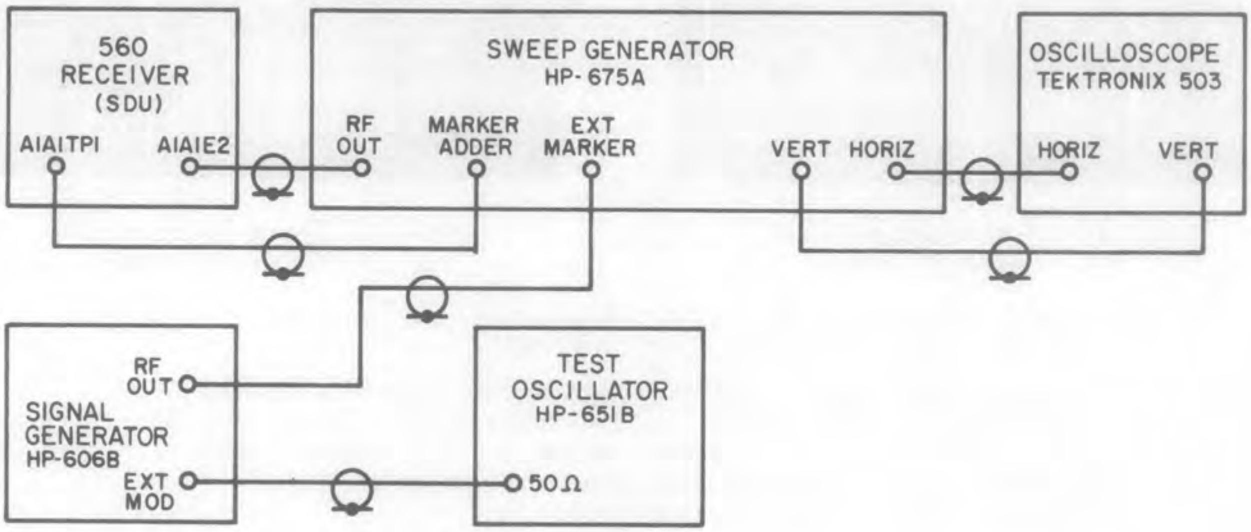


Figure 4-14. Test Setup, SDU Shaping Amplifier Alignment

(7) Adjust the sweep generator output frequency to 21.4 MHz.

(8) Tune the test oscillator to 1.5 MHz.

(9) Tune the signal generator to 21.4-MHz, CW mode. Adjust the output level to produce suitable markers. (The test oscillator modulates the signal generator to produce 3-MHz markers about 21.4 MHz.)

(10) Adjust the sweep generator and oscilloscope controls to display a response curve.

(11) Tune inductors A1A1L1, A1A1L2, A1A1L3, and A1A1L4 for a maximum amplitude, slightly over-coupled response similar to Figure 4-15. The response ripple should not be greater than 1 dB.

(12) Disconnect the test equipment and resolder the input coaxial cable to E2.

4.6.13 Part 16297 Bandpass Filter (A3A1A5) Alignment. - Proceed as follows:

(1) Connect equipment as shown in Figure 4-14, except that the sweep generator RF output is connected to jack A1J1.

(2) Set the test equipment controls as described in paragraph 4.6.12.2, steps (7) through (10).

(3) Observe the response curve. It should appear similar to Figure 4-16. If not, continue to step (4).

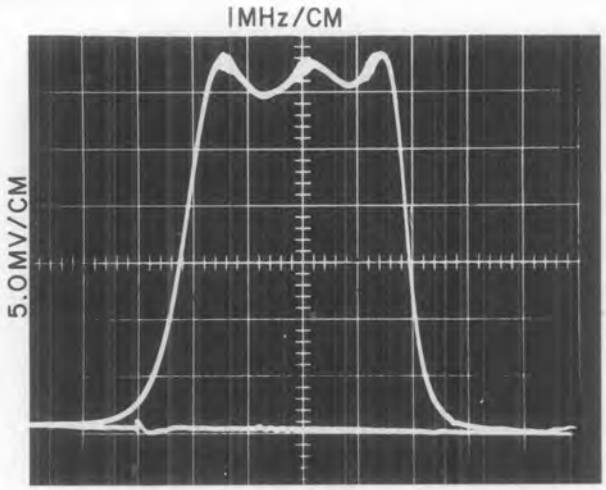


Figure 4-15. Typical Response, SDU Shaping Amplifier

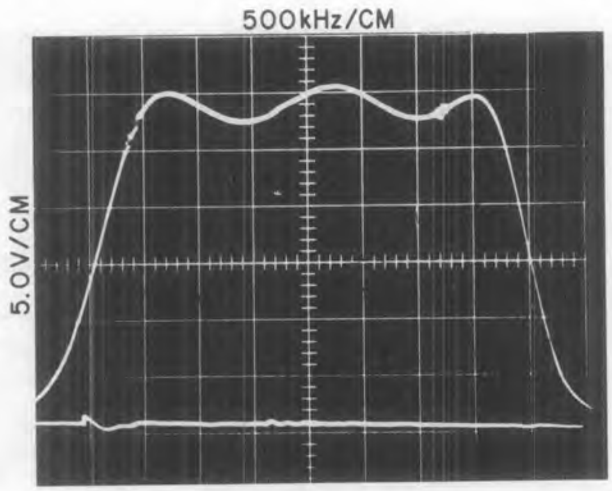


Figure 4-16. Typical Response, SDU Bandpass Amplifier

(4) Using GC Electronics No. 28-2 cement thinner or equivalent, remove the cement from inductors A1A5L1, A1A5L2, and A1A5L3.

(5) Adjust these inductors by spreading or compressing the turns, for a maximum amplitude, symmetrical response. Slight adjustment of A1A1L1 through A1A1L4 may be necessary to obtain the correct response. A typical response is shown in Figure 4-16. After alignment of the bandpass filter inductors, apply GC Electronics Polystyrene Q-Dope or equivalent.

(6) Observe the sweep trace. If it is tilted, adjust inductor A1A1L3 to straighten it.

4.6.14 Center Frequency Marker Adjustment. - Proceed as follows:

(1) Turn MARKER switch on.

(2) Center the marker using the CENTER FREQ control. Rotate the SWEEP WIDTH and SDU GAIN controls fully clockwise.

(3) Adjust inductor A1A1L7 to center the marker pip on the screen.

(4) Rotate the SWEEP WIDTH control counterclockwise approximately 3/4 of its range.

(5) Again adjust A1A1L7 to center the marker.

(6) Rotate the SWEEP WIDTH control fully clockwise and note the position of the marker pip. If it is not exactly centered, adjust the horizontal position potentiometer, A2R25, to center the pip.

Table 4-3. Type 560 Receiver, Typical Semiconductor Element Voltages

		Integrated Circuit Pin Numbers										
		1	2	3	4	5	6	7	8	9	10	
		Field Effect Transistor Pins							Transistor Elements			
Ref. Desig.	Type	Drain	Gate 2	Gate 1	Source				Emitter	Base	Collector	NOTES
A2A1Q1	2N5109								-7.00	-6.20	-1.50	1
A2A1Q2	2N5109								-0.68	0.00	+13.50	
A2A1Q3	3N140	+8.60	+3.50	+0.85	+1.20							
A2A1Q4	2N3933								+3.50	+4.20	+13.40	
A2A2Q1	2N5109								-7.40	-6.80	-1.60	
A2A2Q2	2N5109								-0.70	0.00	+13.50	
A2A2Q3	3N140	+11.20	+3.50	+0.85	+1.75							
A2A2Q4	2N3933								+3.50	+4.20	+13.40	
A2A3Q1	2N5109								-7.60	-6.80	-1.50	
A2A3Q2	2N5109								-0.70	0.00	+13.60	
A2A3Q3	3N140	+8.60	+3.40	+0.76	+1.60							
A2A3Q4	2N3933								+3.40	+4.20	+14.20	
A2A5Q1	2N929								-0.45	+0.20	+5.60	
A2A5Q2	2N3478								+1.70	+2.40	+14.60	
A2A5Q3	2N3251								+0.50	-0.10	-15.00	
A2A5Q4	2N929								0.00	+0.70	+15.00	
A2A5Q5	2N3478								+1.60	+2.30	+14.20	
A2A5U1	MC1350P	+14.20	+13.00	0.00	+4.50	+5.60	+13.40	0.00	+14.20			
A2A6Q1	2N3251								+0.20	-0.50	-15.00	2
A2A6Q2	2N929								-0.45	+0.20	+14.00	2
A2A6U1	μA719C	+2.30	+2.30			0.00	+13.60				+13.00	2
A2A7U1	μA719C	+2.40	+2.40			0.00	+13.80				+13.60	2
A2A7U3	μA741C		0.00	0.00	-15.00		+0.60	+14.40				2

Table 4-3. Type 560 Receiver, Typical Semiconductor Element Voltages

		Integrated Circuit Pin Numbers										
		1	2	3	4	5	6	7	8	9	10	
		Field Effect Transistor Pins							Transistor Elements			
Ref. Desig.	Type	Drain	Gate 2	Gate 1	Source				Emitter	Base	Collector	NOTES
A3A1A1Q1	3N140	14.00	1.50	0.88	1.30							
A3A1A1Q2	3N140	14.60	1.51	0.86	1.28							
A3A1A1Q3	3N128	12.00	5.20	3.65								
A3A1A1Q4	2N3933								6.00	6.20	12.00	
A3A1A2Q1	2N3933								2.54	3.30	14.00	
A3A1A2Q2	2N3933								2.68	3.30	14.00	
A3A1A2Q3	2N3933								0.28	0.92	14.50	
A3A1A2Q4	2N3933								1.30	2.00	13.80	
A3A1A2Q5	2N3933								1.06	1.75	14.00	
A3A2Q1	2N2646	5.80	0.00		13.50							
A3A2Q2	2N3251								13.80	13.00	5.80	
A3A2Q3	2N3440								-1.20	-0.69	88.00	
A3A2Q4	2N3440								-1.26	-0.50	89.00	
A3A2Q5	2N929								-10.40	-9.80	-4.40	
A3A2Q6	U1899E	0.00	0.00	0.00								3
A3A2U1	μA741C		Note 2	5.80	-15.00		-0.42	15.00				
A3A2U2	μA741C		0.00	0.00	-15.00		-0.42	15.00				
A4Q1	2N3251								-0.65	-1.15	-15.00	
A4Q2	2N929								-15.00	-15.00	-0.02	
A4Q3	2N3251								0.40	-0.29	-15.00	
A4Q4	2N929								-1.27	-6.70	0.00	
A4Q5	2N929								-0.27	-9.00	-6.70	
A4U1	μA741C	-15.00	0.00	0.00	-15.00	-15.00	0.00	15.00	0.00			

Table 4-3. Type 560 Receiver, Typical Semiconductor Element Voltages

		Integrated Circuit Pin Numbers											
		1	2	3	4	5	6	7	8	9	10	11	12
		Field Effect Transistor Pins							Transistor Elements				
Ref. Desig.	Type	Drain	Gate 2	Gate 1	Source				Emitter	Base	Collector		
A4U2	μA741C	-15.00	0.00	0.00	-15.00	-15.00	-0.06	15.00	0.00				
A5Q1	2N2222								0.44	1.03	14.41		
A5Q2	2N2904								15.00	14.41	0.90		
A5Q3	2N2222								0.83	0.90	15.00		
A5Q4	2N2904								-0.17	-0.81	-15.00		
A6Q1	U1899E	0.013		0.015	0.013								
A6Q2	2N4074								0.73	1.33	0.75		
A6Q3	2N4074								0.00	0.73	0.75		
A6U1	μA741C	-15.00	-0.04	0.36	-15.00	-15.00	15.00	15.00	0.10				
A6U2	PA237	0.00	0.00	0.00	0.00	12.01	0.00	-1.07	-15.00	0.00	0.00	0.00	-13.70
A7Q1	2N5039								15.46	15.80	32.20		
A7Q2	2N2905A								32.20	31.80	15.80		
A7U2	LM305	15.00	31.79	32.18	0.00	1.73	1.75	15.00	15.00				
A7U3	μA741C	0.00	0.48	6.49	0.00	0.00	5.59	15.00	0.00				
A8Q1	2N5039								0.30	0.33	17.51		
A8Q2	2N2905A								17.51	17.12	0.33		
A8U2	μA741C	0.14	17.22	17.65	-15.42	-13.66	-13.65	-0.51	0.00				
A8U3	LM305	-15.00	-8.91	-8.87	-15.42	-15.42	-9.77	0.00	0.00				

TEST CONDITIONS: Readings are positive dc with respect to chassis unless otherwise noted. Readings taken with RCA WV98C VTVM. 115 Vac applied, no signal input; no tuner installed. MODE switch in AM MAN; RF/IF GAIN fully clockwise.

NOTES:
(1) IF BANDWIDTH kHz in position for IF under test.
(2) MODE switch in FM.
(3) Readings may change when tuner is installed.

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:

A1R1

Subassembly Designation — Class and No. of Item

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 within the titles in parentheses.

5.3 LIST OF MANUFACTURERS

Mfr. Code	Name and Address
01121	Allen-Bradley Company 1201 South 2nd Street Milwaukee, Wisconsin 53212
01281	TRW Semiconductors, Inc. 14520 Aviation Boulevard Lawndale, California 90260
02114	Ferroxcube Corporation of America Mt. Marion Road Saugerties, New York 12477
03508	General Electric Company Semiconductor Products Department Electronics Park Syracuse, New York 13201
04013	Taurus Corporation 1 Academy Hill Lambertville, New Jersey 08530
04713	Motorola Semiconductor Prod. Inc. 5005 East McDowell Road Phoenix, Arizona 85008
06001	General Electric Company Capacitor Department P. O. Box 158 Irmo, South Carolina 29063
07263	Fairchild Camera & Instrument Corp. Semiconductor Division 464 Ellis Street Mountain View, California 94040
08717	Sloan Company 7704 San Fernando Road Sun Valley, California 91352
11139	Deutsch Company Electronic Component Division Municipal Airport Banning, California 92220
12969	Unitrode Corporation 580 Pleasant Street Watertown, Massachusetts 02172
13103	Thermalloy Company 8717 Diplomacy Road Dallas, Texas 75247

Mfr. Code	Name and Address
14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, Maryland 20878
15605	Cutler Hammer Incorporated 4201 N. 27th Street Milwaukee, Wisconsin 53216
15818	Teledyne Incorporated 1300 Terra Bella Avenue Mountain View, California 94040
19505	Applied Engineering Products Co. Division of Samarius Inc. 26 E. Main Street Ansonia, Connecticut 06401
21604	The Buckeye Stamping Company 555 Marion Road Columbus, Ohio 43207
27014	National Semi-Conductor Corp. 2950 San Ysidro Way Santa Clara, California 95051
28480	Hewlett-Packard Company 1501 Page Mill Road Palo Alto, California 94304
37942	P. R. Mallory and Company, Inc. 3029 E. Washington Street Indianapolis, Indiana 46206
49956	Raytheon Company 141 Spring Street Lexington, Massachusetts 02173
56289	Sprague Electric Company Marshall Street North Adams, Massachusetts 01247
71279	Cambridge Thermionic Corporation 445 Concord Avenue Cambridge, Massachusetts 02138
71468	ITT Cannon Electric Incorporated 666 E. Dryer Road Santa Ana, California 92702

Mfr. Code	Name and Address
71590	Centralab Electronics Division of Globe-Union Inc. 5757 North Green Bay Avenue Milwaukee, Wisconsin 53201
71744	Chicago Miniature Lamp Works 4433 Ravenswood Avenue Chicago, Illinois 60640
71785	Cinch Manufacturing Company Howard B. Jones Division 1026 South Homan Avenue Chicago, Illinois 60624
72136	Electro Motive Manufacturing Co., Inc. South Park & John Streets Willimantic, Connecticut 06226
72982	Erie Technological Products, Inc. 644 West 12th Street Erie, Pennsylvania 16512
73138	Beckman Instruments, Inc. Helipot Division 2500 Harbor Boulevard Fullerton, California 92634
73899	JFD Electronics Company Division of Stratford Retreat House 15th at 62nd Street Brooklyn, New York 11219
74306	Piezo Crystal Company 100 K Street Carlisle, Pennsylvania 17013
74868	Bunker-Ramo Corporation The Amphenol RF Division 33 East Franklin Street Danbury, Connecticut 06810
75042	IRC Division of TRW Incorporated 401 North Broad Street Philadelphia, Pennsylvania 19108
75915	Littlefuse, Incorporated 800 E. Northwest Highway Des Plaines, Illinois 60016
76055	Mallory Controls, Division of P. R. Mallory & Co., Inc. State Road 28 W Frankfort, Indiana 46041

Mfr. Code	Name and Address
78277	Sigma Instruments, Incorporated 170 Pearl Street South Braintree, Massachusetts 02185
80131	Electronic Industries Association 2001 Eye Street N. W. Washington, D. C. 20006
80294	Bourns, Incorporated 1200 Columbia Avenue Riverside, California 92507
81312	Winchester Electronics Division Litton Industries, Incorporated Main Street & Hillside Avenue Oakville, Connecticut 06779
81349	Military Specifications
82389	Switchcraft, Incorporated North Elston Avenue Chicago, Illinois 60630
91418	Radio Materials Company 4242 West Bryn Mawr Avenue Chicago, Illinois 60646
91737	Gremar Manufacturing Co., Inc. 922 S. Lyon Street Santa Ana, California 92705
92193	United States Smelting Works, Inc. Bristol Sts Philadelphia, Pennsylvania 19140
95121	Quality Components, Inc. P. O. Box 113 St. Mary's, Pennsylvania 15857
99800	American Precision Industries Delevan Electronics Division 270 Quaker Road East Aurora, New York 14052

5.4 PARTS LIST

When ordering replacement parts from CEI Division, specify the type and serial number of the equipment, and the reference designation and description of each part ordered. The Manufacturers and Manufacturer's 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 manufacturer 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 Division to incorporate them in proprietary products. For this reason some transistors, diodes, and integrated circuits installed in the equipment may not agree with those specified in the parts lists and schematic diagrams of this manual. However, the semiconductors designated in the manual may be substituted in every case with satisfactory results.

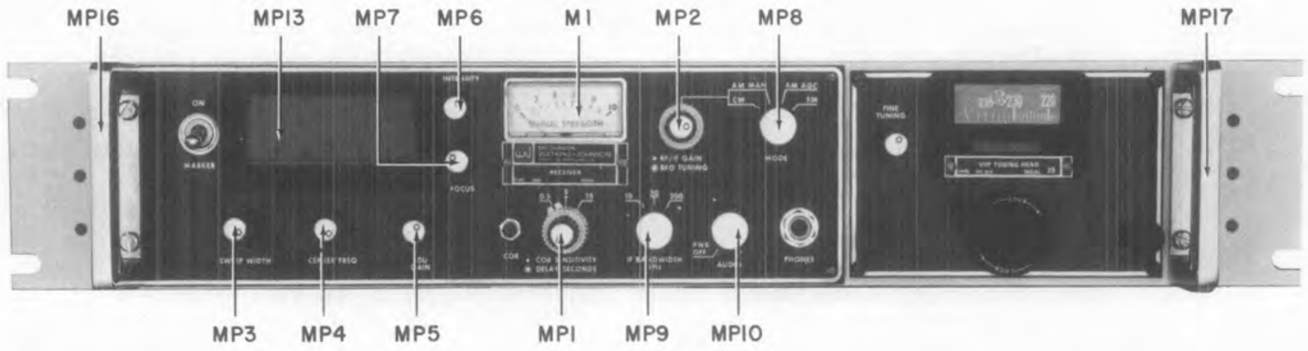


Figure 5-1. Type 560 Receiver, Front View, Component Locations

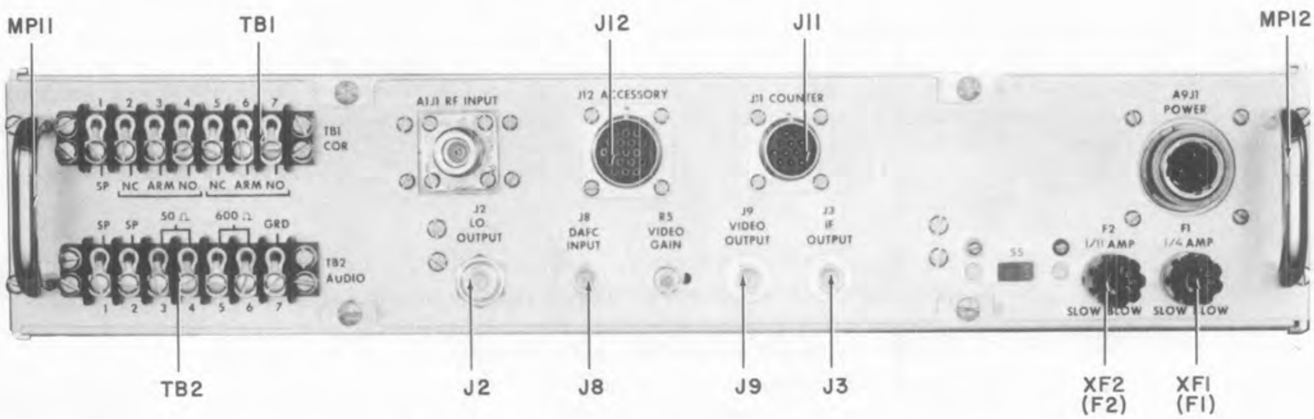


Figure 5-2. Type 560 Receiver, Rear View, Component Locations

5.4.1 Type 560 Receiver, Main Chassis

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
A1	RF LIMITER	1	79852	14632
A2	IF AMPLIFIER ASSEMBLY	1	72346	14632
A3	SPECTRUM DISPLAY UNIT	1	79829	14632
A4	AGC AMPLIFIER	1	7890	14632
A5	VIDEO AMPLIFIER	1	7374	14632
A6	AUDIO, COR, AND SQUELCH AMPLIFIER	1	7446	14632
A7	±15V POWER SUPPLY	1	76200	14632
A8	Same as A7			
A9	RFI FILTER ASSEMBLY	1	79835	14632
C1	CAPACITOR, CERAMIC, DISC: 0.068 μF, 10%, 50V	1	CK05BX683K	81349
C2	CAPACITOR, CERAMIC, DISC: 0.015 μF, 10%, 50V	1	CK05BX153K	81349
C3	CAPACITOR, CERAMIC, DISC: 3300 pF, 10%, 100V	1	CK05BX332K	81349
C4	CAPACITOR, ELECTROLYTIC, ALUMINUM: 1100 μF, -10+75%, 50V	2	39D118G050HP4	56289
C5	Same as C4			
C6	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 10%, 20V	1	CS13BE225K	81349
C7	CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μF, 10%, 20V	1	CS13BE476K	81349
C8	CAPACITOR, ELECTROLYTIC, TANTALUM: 22 μF, 10%, 35V	1	CS13BF226K	81349
C9	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.8 μF, 10%, 20 V	1	CS13E185K	81349
C10	CAPACITOR, ELECTROLYTIC, TANTALUM: .47 μF, 10%, 35V	1	CS13BF474K	81349
CR1	DIODE	1	1N462A	80131
DS1	LAMP, INCANDESCENT: 0.04A, 5V	1	685	71744
F1	FUSE, 3AG, SLOW-BLOW: 1/4A	1	F02B250V1/4A	81349
F2	FUSE, 3 AG, SLOW-BLOW: 1/8A	1	F02B250V1/8A	81349
J1	NOT USED			
J2	CONNECTOR, JACK, BNC SERIES Part of W2	1	UG-909/U	81349
J3	CONNECTOR, JACK, BNC SERIES	2	17825	74868
J4	CONNECTOR, JACK, PUSH-ON SERIES Part of W1	2	8212B	91737
J5	Same as J4 Part of W2			
J6	CONNECTOR, RECEPTACLE, MULTIPIN	1	DBM-17W-2S	71468
J6A1	CONNECTOR, RECEPTACLE, COAXIAL INSERT Part of W3	1	DM53742-5001	71468

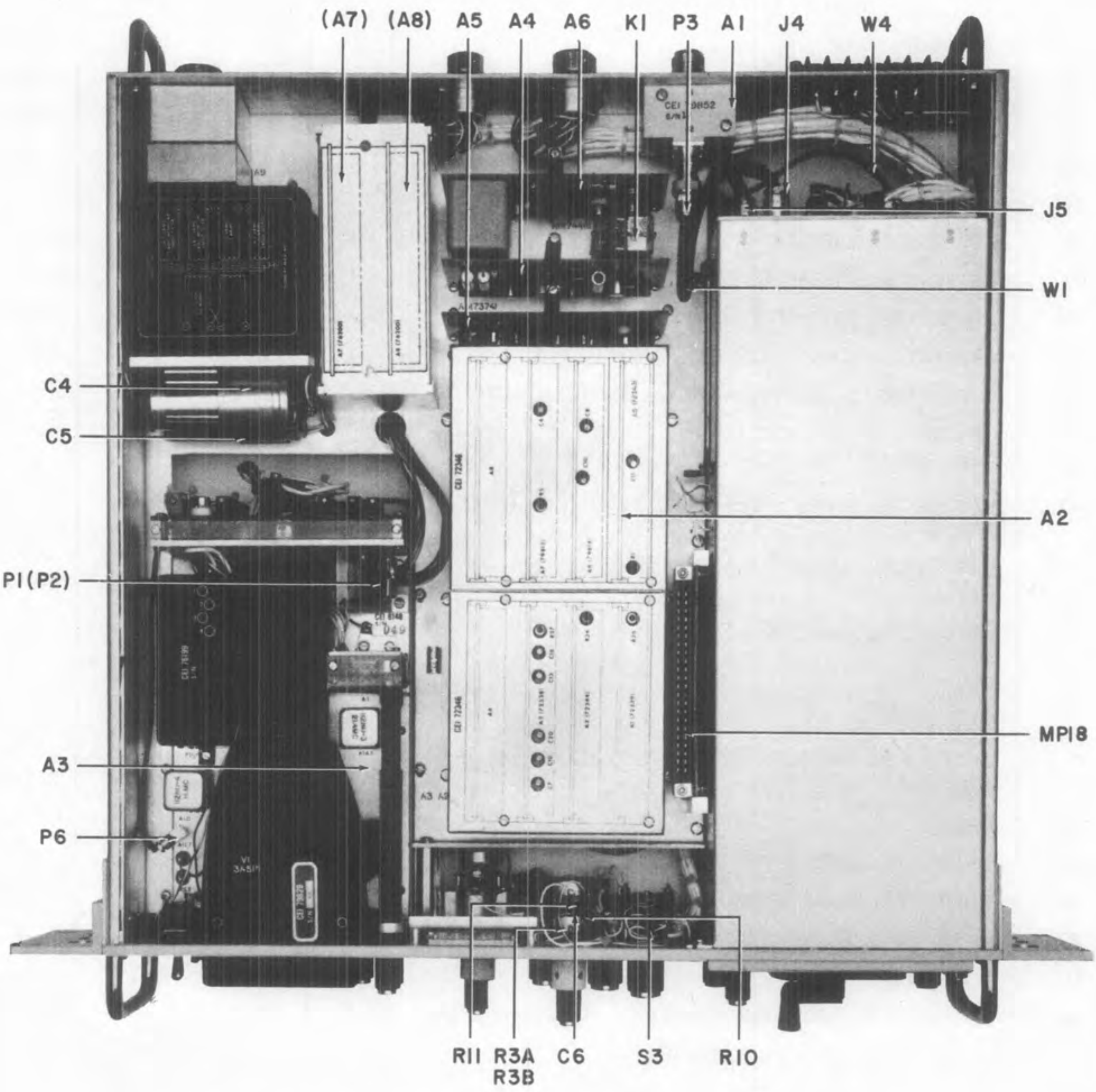


Figure 5-3. Type 560 Receiver, Top View, Component Locations

REF DESIG	DESCRIPTION		QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
J6A2	NOT USED (SPARE)				
J7	CONNECTOR, RECEPTACLE, MULTIPIN		1	DBM-25S	71468
J8	CONNECTOR, RECEPTACLE, BNC SERIES		1	UG-1094/U	81349
J9	Same as J3				
J10	CONNECTOR, PHONE JACK		1	14B	82389
J11	CONNECTOR, RECEPTACLE, MULTIPIN		1	DS00-12P	11139
J12	CONNECTOR, RECEPTACLE, MULTIPIN		1	DS00-19S	11139
K1	RELAY		1	70R4-12DC-5C0	78277
L1	COIL, FIXED: 15 mH		1	3635-51	71279
L2	COIL, FIXED: 3 mH		1	2500-50	99800
L3	COIL, FIXED: 680 μH		1	2500-20	99800
M1	METER, SIGNAL STRENGTH		1	14524-1	14632
MP1	KNOB		1	16460-1	14632
MP2	KNOB		1	PS-50D-1/70C-2	21604
MP3	KNOB		5	PS-50-1	21604
MP4	Same as MP3				
MP5	Same as MP3				
MP6	Same as MP3				
MP7	Same as MP3				
MP8	KNOB		3	PS-70PL-2	21604
MP9	Same as MP8				
MP10	Same as MP8				
MP11	HANDLE		2	1250-1	71279
MP12	Same as MP11				
MP13	CRT FILTER		1	15532-1	14632
MP14	COVER, TOP		2	32574-3	14632
MP15	COVER, BOTTOM, Same as MP14				
MP16	HANDLE		2	32306-2	14632
MP17	Same as MP16				
MP18	EXTENDER BOARD, PRINTED CIRCUIT		1	79645	14632
P1	CONNECTOR, PLUG, MULTIPIN		1	SRE-7SNSSH13	81312
P2	CONNECTOR, PLUG, MULTIPIN		1	SM-2PH	81312
P3	CONNECTOR, PLUG, BNC SERIES	Part of W1	1	UG-88/U	81349
P4	CONNECTOR, PLUG, MINIATURE SERIES	Part of W3	3	UG-1466/U	81349
P5	Same as P4	Part of W4			

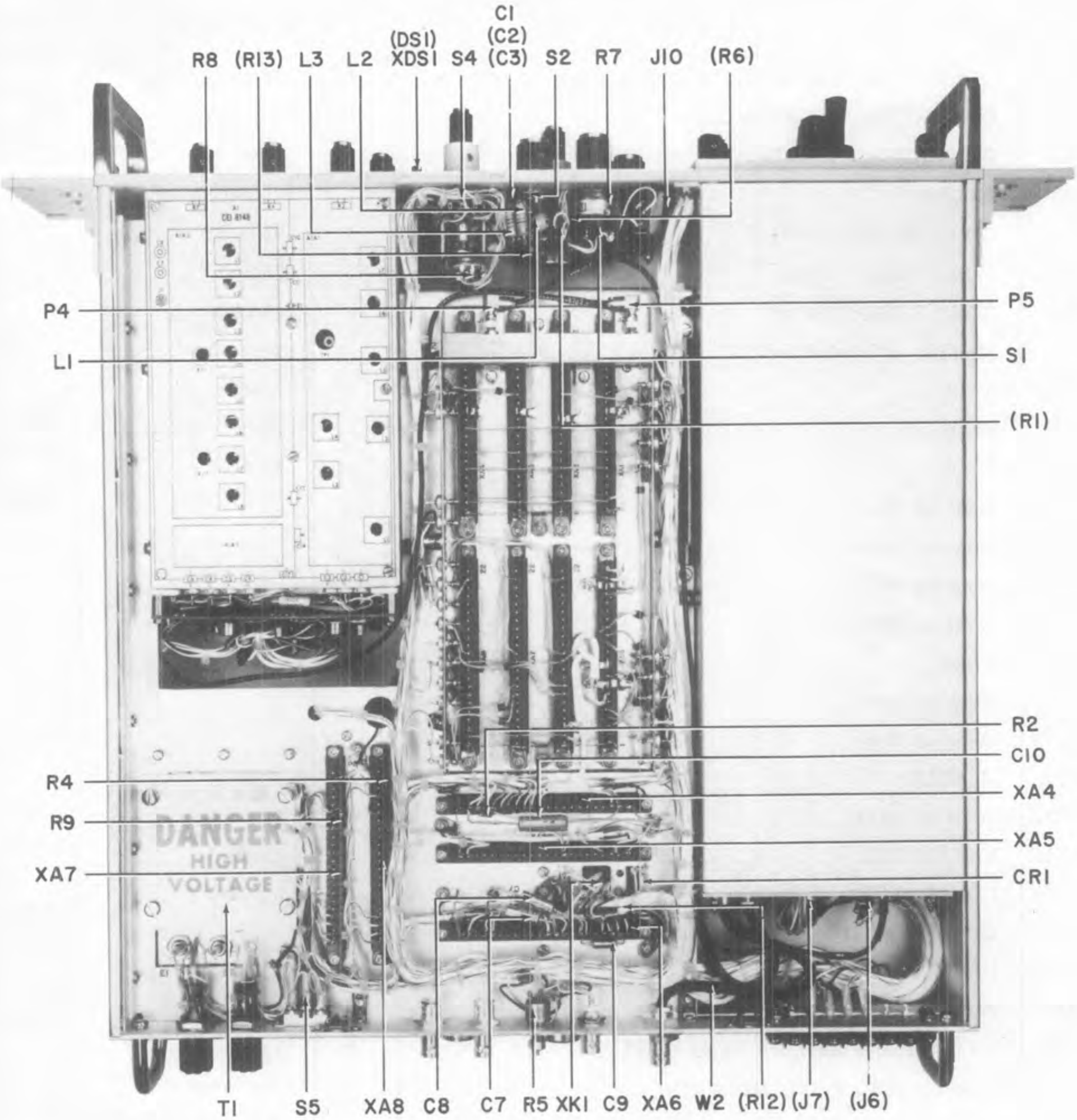


Figure 5-4. Type 560 Receiver, Bottom View, Component Locations

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
P6	Same as P4 Part of W4			
R1	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	2	RCR07G103JS	81349
R2	Same as R1			
R3	RESISTOR, VARIABLE, COMPOSITION: 10 kΩ/10 kΩ, 20%, 2W	1	JJC-96484	01121
R4	RESISTOR, FIXED, COMPOSITION: 82 kΩ, 5%, 1/4W	1	RCR07G823JS	81349
R5	RESISTOR, VARIABLE, COMPOSITION: 500 Ω, 10%, 1/3W	1	RV6LAYSA501A	81349
R6	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	2	RCR07G102JS	81349
R7	RESISTOR, VARIABLE, COMPOSITION: 50 kΩ, 10%, 2W (w/switch)	1	RV4NBYSD503A	81349
R8	RESISTOR, VARIABLE, COMPOSITION: 100 kΩ, 10%, 2W Part of S4	1	RV5NAYSD104A	81349
R9	Same as R6			
R10	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4W	1	RCR07G152JS	81349
R11	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4W	1	RCR07G822JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 27 Ω, 5%, 1/4W	1	RCR07G270JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RCR07G471JS	81349
S1	SWITCH, SNAP, SPST Part of R7	-		
S2	SWITCH, ROTARY: 3 section, 6 pole, 6 position	2	1128-02	14632
S3	Same as S2			
S4	SWITCH, ROTARY: 1 section, 3 pole, 4 position	1	22648-1	14632
S5	SWITCH, SLIDE: DPDT	1	46256-LFR	82389
T1	TRANSFORMER	1	16280	14632
TB1	TERMINAL BOARD	2	353-18-07-001	71785
TB2	Same as TB1			
W1	CABLE AND CONNECTOR ASSEMBLY	1	30020-1446	14632
W2	CABLE AND CONNECTOR ASSEMBLY	1	30020-1447	14632
W3	CABLE AND CONNECTOR ASSEMBLY	1	30020-1148	14632
W4	CABLE AND CONNECTOR ASSEMBLY	1	30020-1149	14632
XA4	CONNECTOR, PRINTED CIRCUIT CARD	5	250-22-30-170	71785
XA5	Same as XA4			
XA6	Same as XA4			
XA7	Same as XA4			
XA8	Same as XA4			
XDS1	LAMPHOLDER	1	102S-G	08717

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
XF1	FUSEHOLDER	2	342004	75915
XF2	Same as XF1			
XK1	SOCKET, RELAY	1	AD24	78277

5.4.2 Type 79852 RF Limiter

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 470 pF, 5%, 300V	2	UY03-471J	73899
C2	Same as C1			
CR1	DIODE	2	1N916B	80131
CR2	Same as CR1			
J1	CONNECTOR, RECEPTACLE, N SERIES	1	UG58A/U	81349
J2	CONNECTOR, RECEPTACLE, BNC SERIES	1	31-203-1004	74868

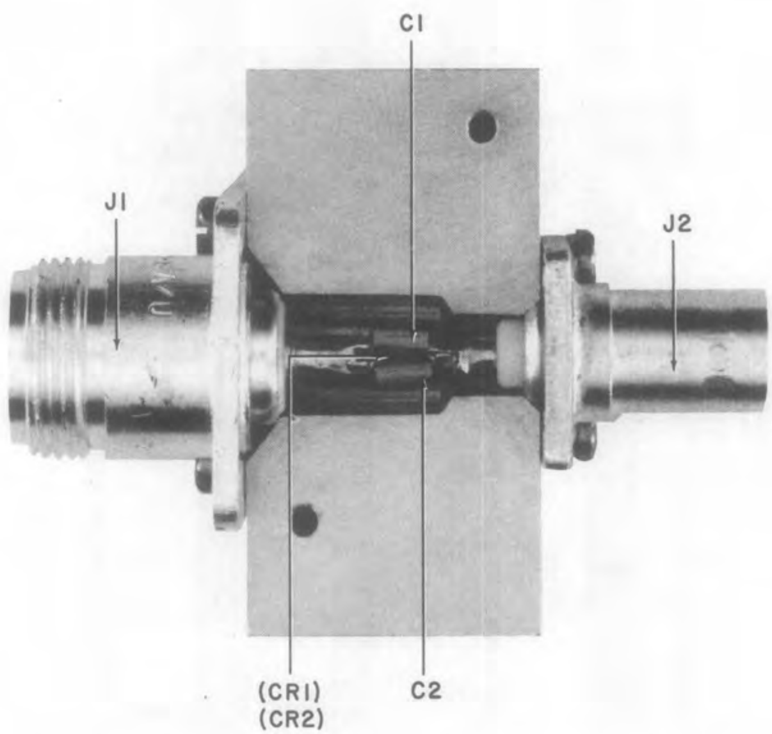


Figure 5-5. Type 79852 RF Limiter (A1), Component Locations

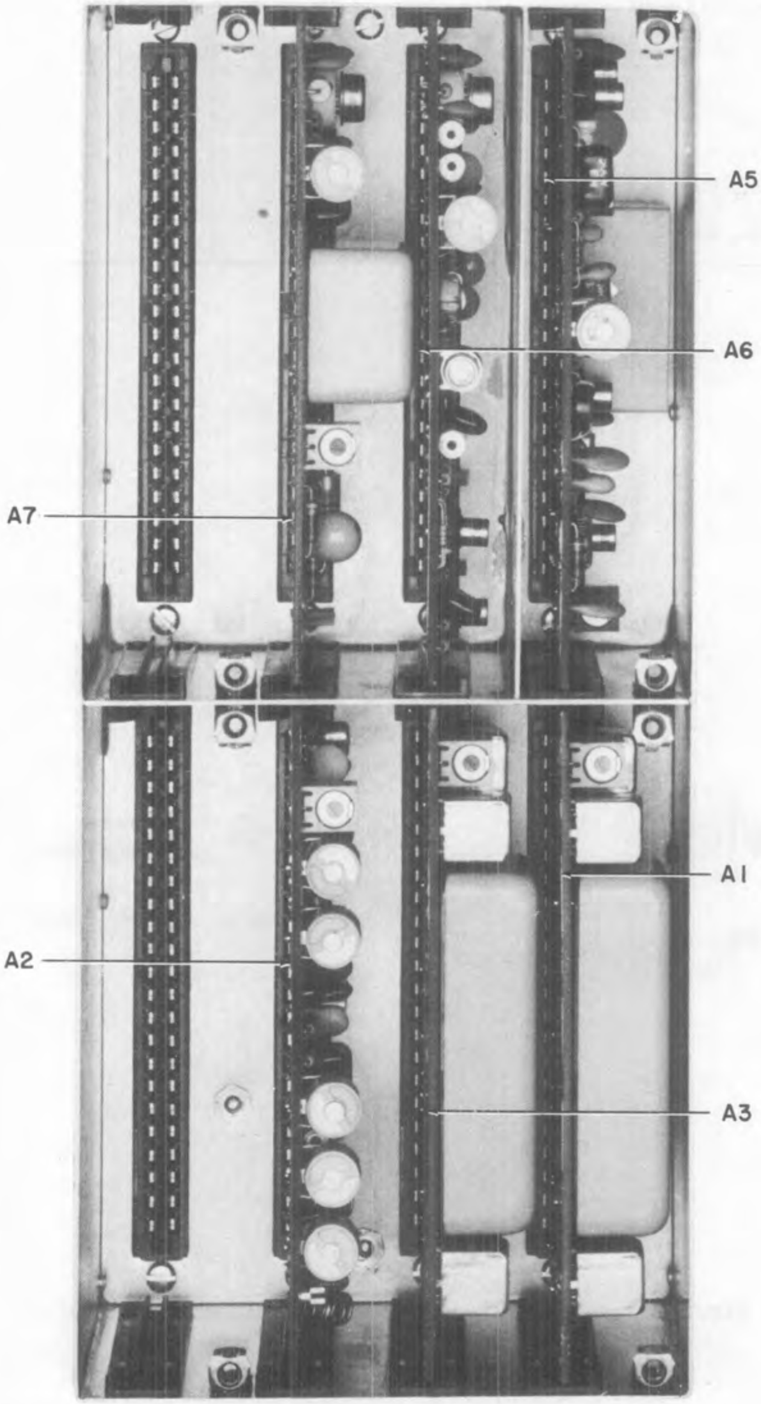


Figure 5-6. Type 72346 IF Amplifier Assembly (A2), Top View, Component Locations

5.4.3 Type 72346 IF Amplifier Assembly

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
A1	21.4-MHz IF AMPLIFIER (10-kHz BW)	1	72339	14632
A2	21.4-MHz IF AMPLIFIER (50-kHz BW)	1	72344	14632
A3	21.4-MHz IF AMPLIFIER (200-kHz BW)	1	72338	14632
A4	NOT USED			
A5	IF OUTPUT AMPLIFIER	1	72343	14632
A6	FM LIMITER/DISCRIMINATOR (200 & 500-KHz BW)	1	79814	14632
A7	FM LIMITER/DISCRIMINATOR (10 & 50-kHz BW)	1	79813	14632
C1	CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500V	21	FA5C-102W	01121
C2	Same as C1			
C3	Same as C1			
C4	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	16	C023B101E502M	56289
C5	Same as C4			
C6	Same as C4			
C7	Same as C4			
C8	Same as C1			
C9	Same as C4			
C10	Same as C1			
C11	Same as C1			
C12	Same as C4			
C13	Same as C1			
C14	Same as C4			
C15	Same as C1			
C16	Same as C4			
C17	Same as C4			
C18	Same as C1			
C19	CAPACITOR, CERAMIC, FEEDTHRU: 100 pF, 10%, 500V	9	FA5C-1011	01121
C20	Same as C19			
C21	Same as C19			
C22	Same as C1			
C23	Same as C19			
C24	Same as C1			
C25	Same as C4			
C26	Same as C4			

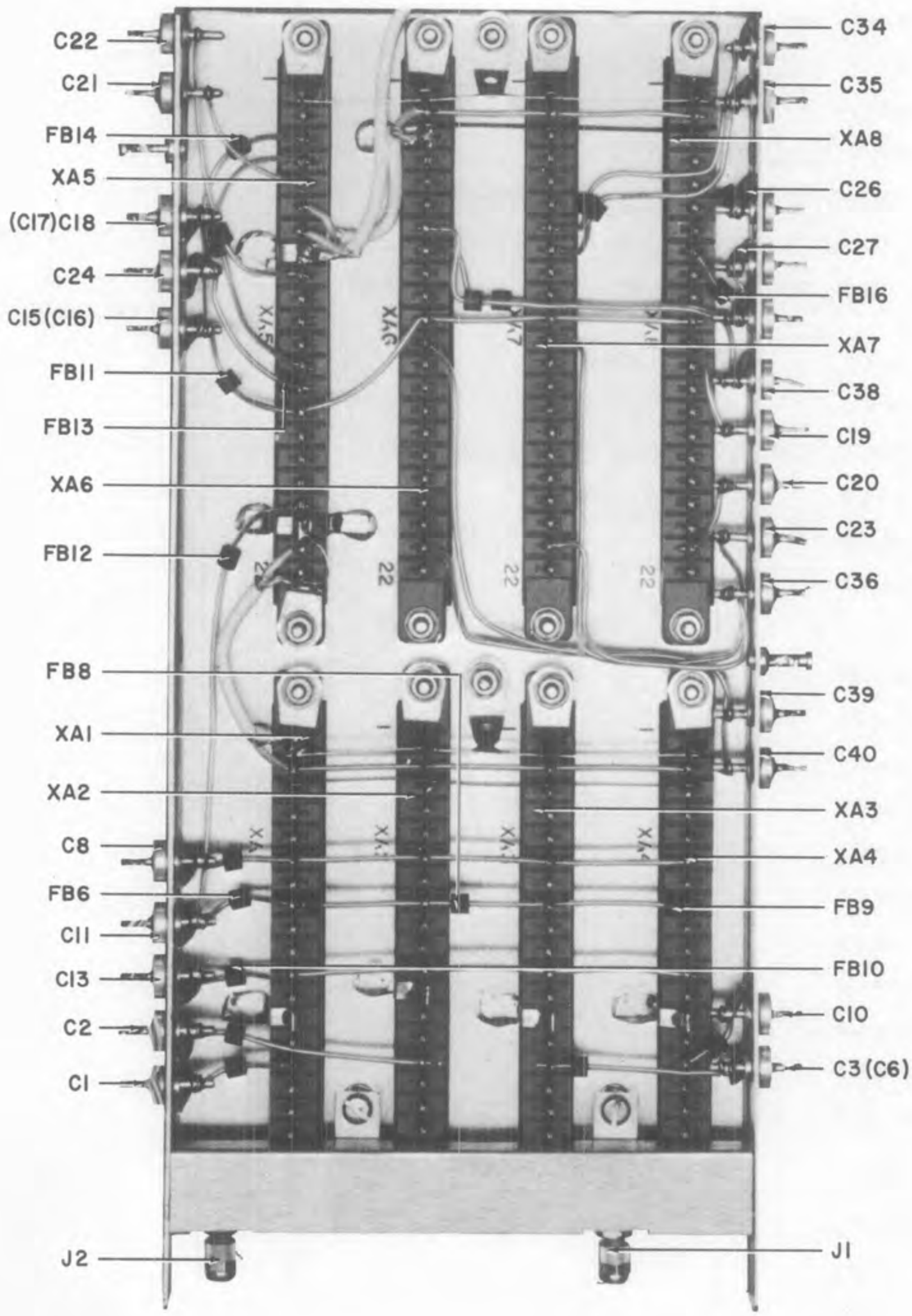


Figure 5-7. Type 72346 IF Amplifier Assembly (A2), Bottom View, Component Locations

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C27	Same as C4			
C28	Same as C4			
C29	Same as C4			
C30	Same as C4			
C31	Same as C4			
C32	Same as C1			
C33	Same as C1			
C34	Same as C1			
C35	Same as C1			
C36	Same as C19			
C37	Same as C1			
C38	Same as C1			
C39	Same as C19			
C40	Same as C19			
C41	Same as C19			
FB1	FERRITE BEAD	22	56-590-65/4A	02114
FB2	Same as FB1			
FB3	Same as FB1			
FB4	Same as FB1			
FB5	Same as FB1			
FB6	Same asFB1			
FB7	Same as FB1			
FB8	Same as FB1			
FB9	Same as FB1			
FB10	Same as FB1			
FB11	Same as FB1			
FB12	Same as FB1			
FB13	Same as FB1			
FB14	Same as FB1			
FB15	Same as FB1			
FB16	Same as FB1			
FB17	Same as FB1			
FB18	Same as FB1			
FB19	Same as FB1			
FB20	Same as FB1			

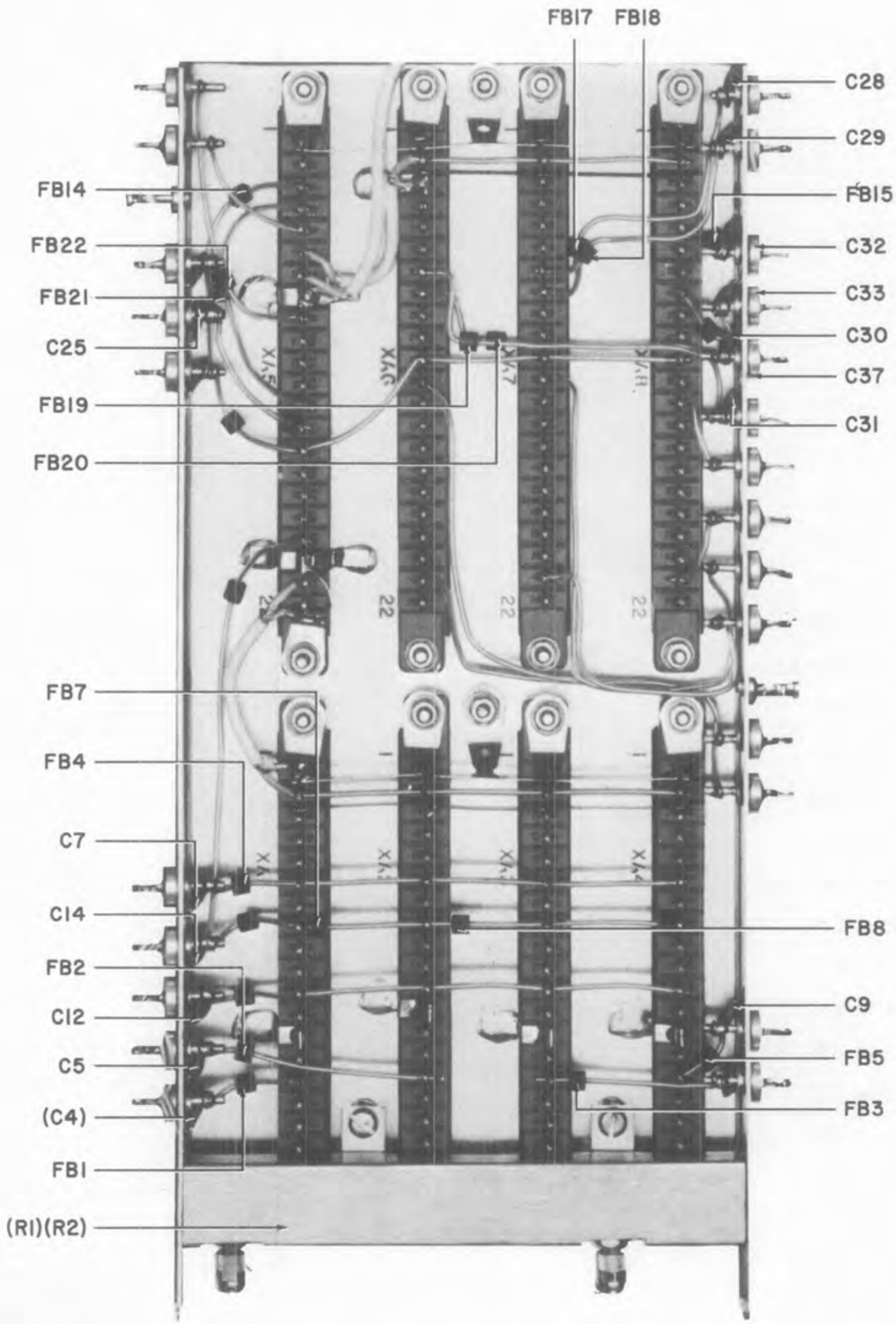


Figure 5-8. Type 72346 IF Amplifier Assembly (A2), Bottom View, Component Locations

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
FB21	Same as FB1			
FB22	Same as FB1			
J1	CONNECTOR, RECEPTACLE, MINIATURE SERIES	2	10-0104-002	19505
J2	Same as J1			
MP1	COVER	1	22634-1	14632
MP2	COVER	1	22635-1	14632
R1	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RCR07G101JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 68 Ω, 5%, 1/4W	1	RCR07G680JS	81349
R3	Same as R1			
XA1	CONNECTOR, PRINTED CIRCUIT CARD	8	250-22-30-170	71785
XA2	Same as XA1			
XA3	Same as XA1			
XA4	NOT USED			
XA5	Same as XA1			
XA6	Same as XA1			
XA7	Same as XA1			
XA8	Same as XA1			

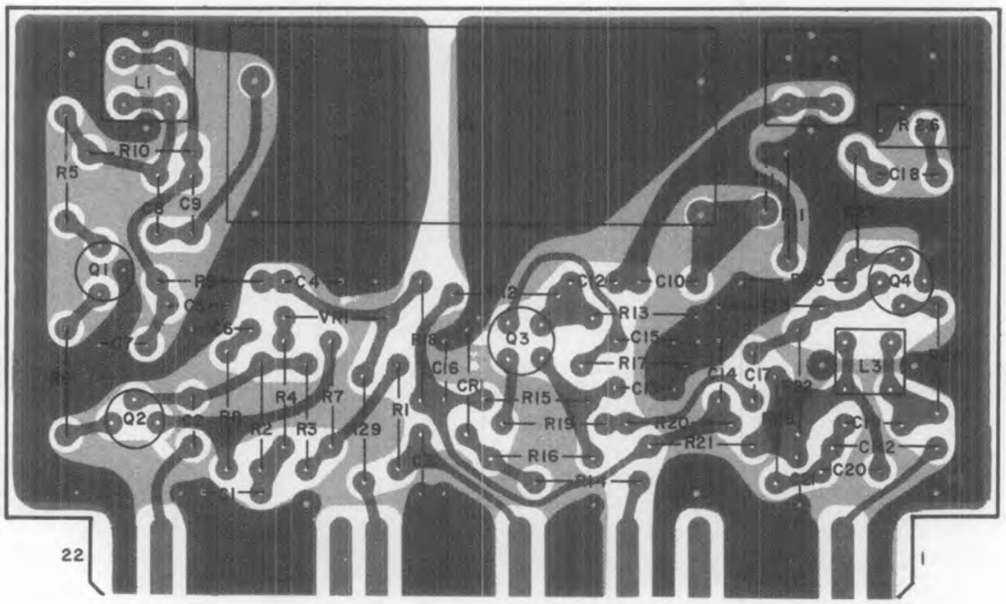


Figure 5-9. Types 72339 and 72334 21.4-MHz IF Amplifier (10-kHz/50-kHz BW) (A2A1 and A2A2), Component Locations

5.4.3.1 Types 72339 and 72344 21.4-MHz IF Amplifier (10-kHz and 50-KHz BW) REF DESIG PREFIX A2A1, A2A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	10	C023B101E502M	56289
C2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	3	SM(1000pF, GMV)	91418
C3	Same as C1			
C4	Same as C1			
C5	Same as C1			
C6	Same as C1			
C7	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, ±20%, 35V	1	196D225X0035JE3	56289
C8	CAPACITOR, MICA, DIPPED: 130 pF, 5%, 500V	1	CM05FD131J03	81349
C9	CAPACITOR, MICA, DIPPED: 240 pF, 5%, 500V	1	CM05FD241J03	81349
C10	CAPACITOR, MICA, DIPPED: 150 pF, 5%, 500V	1	CM05FD151J03	81349
C11	CAPACITOR, MICA, DIPPED: 160 pF, 5%, 500V	1	CM05FD161J03	81349
C12	Same as C2			
C13	CAPACITOR, MICA, DIPPED: 100 pF, 5%, 500V	1	CM05FD101J03	81349
C14	Same as C1			
C15	Same as C1			
C16	Same as C1			
C17	Same as C2			
C18	Same as C1			
C19	CAPACITOR, MICA, DIPPED: 330 pF, 5%, 500V	1	CM05FD331J03	81349
C20	CAPACITOR, MICA, DIPPED: 1000 pF, 5%, 100V	1	DM15-102J	72136
C21	Same as C1			
CR1	DIODE	1	1N462A	80131
CR2	DIODE	1	1N4446	80131
FL1	FILTER, CRYSTAL: 21.4 MHz C.F. 10 kHz BW Type 72339	1	92001	14632
FL1	FILTER, CRYSTAL: 21.4 MHz C.F. 50 kHz BW Type 72344	1	92000	14632
L1	COIL, VARIABLE	2	7107-11	71279
L2	Same as L1			
L3	COIL, VARIABLE	1	7107-5	71279
Q1	TRANSISTOR	2	2N5109	80131
Q2	Same as Q1			
Q3	TRANSISTOR	1	3N187	02735
Q4	TRANSISTOR	1	2N3478	80131

REF DESIG PREFIX A2A1, A2A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R1	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	1	RCR07G220JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4W	1	RCR07G392JS	81349
R3	Same as R2			
R4	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	2	RCR07G471JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	7	RCR07G470JS	81349
R6	Same as R5			
R7	RESISTOR, FIXED, COMPOSITION: 390 Ω, 5%, 1/4W	1	RCR07G391JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4W	2	RCR07G330JS	81349
R9	Same as R8			
R10	RESISTOR, FIXED, COMPOSITION: 3.0 kΩ, 5%, 1/4W Type 72339	1	RCR07G302JS	81349
R10	RESISTOR, FIXED, COMPOSITION: 3.0 kΩ, 5%, 1/4W Type 72344	1	RCR07G302JS	81349
R11	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/4W Type 72339	1	RCR07G681JS	81349
R11	RESISTOR, FIXED, COMPOSITION: 910 kΩ, 5%, 1/4W Type 72344	1	RCR07G911JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	RCR07G154JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	2	RCR07G103JS	81349
R14	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	2	RCR07G472JS	81349
R15	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4W	1	RCR07G124JS	81349
R16	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	1	RCR07G333JS	81349
R17	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349
R18	Same as R5			
R19	Same as R5			
R20	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4W Type 72339	1	RCR07G152JS	81349
R20	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W Type 72344	1	RCR07G471JS	81349
R21	Same as R5			
R22	Same as R13			
R23	Same as R14			
R24	Same as R5			
R25	Same as R4			
R26	RESISTOR, VARIABLE, FILM: 100 Ω, 10%, 1/2W Type 72339	1	62PAR100	73138

REF DESIG PREFIX A2A1, A2A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R26	RESISTOR, VARIABLE, FILM: 500 Ω, 10%, 1/2W Type 72344	1	62PAR500	73138
R27	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	2	RCR07G100JS	81349
R28	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4W	1	RCR07G562JS	81349
R29	Same as R27			
VR1	VOLTAGE REGULATOR	1	1N963B	80131

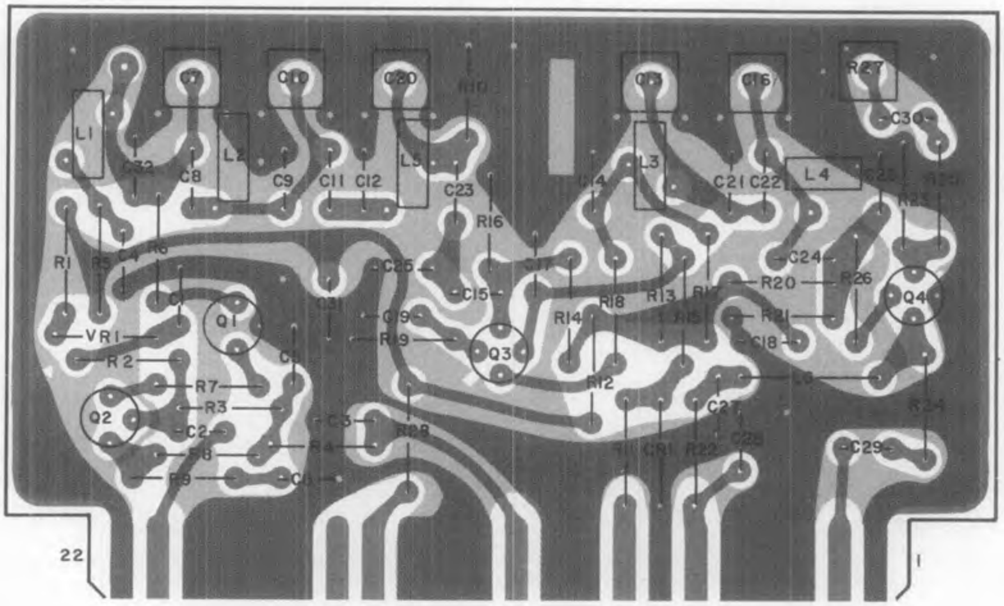


Figure 5-10. Type 72338 21.4-MHz IF Amplifier (200-kHz BW) (A2A3), Component Locations

5.4.3.2 Type 72338 21.4-MHz IF Amplifier (200-kHz BW) REF DESIG PREFIX A2A3

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	11	C023B101E502M	81349
C2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	3	SM(1000pF, GMV)	91418
C3	Same as C1			
C4	Same as C1			
C5	Same as C1			
C6	Same as C1			
C7	CAPACITOR, VARIABLE, CERAMIC: 3-15 pF, 350V	2	538-006-D3-15	72982
C8	CAPACITOR, CERAMIC, TUBULAR: 1.0 pF, ±0.1 pF, 500V	1	301-000-C0K0-109B	72982
C9	CAPACITOR, MICA, DIPPED: 91 pF, 5%, 500V	2	CM05FD910J03	81349
C10	Same as C7			
C11	CAPACITOR, CERAMIC, TUBULAR: 0.68 pF, ±0.1 pF, 500V	1	301-000-C0K0-688B	72982
C12	CAPACITOR, MICA, DIPPED: 110 pF, 5%, 500V	1	CM05FD111J03	81349
C13	CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350V	3	538-006-D9-35	72982
C14	CAPACITOR, MICA, DIPPED: 390 pF, 5%, 300V	1	CM05FD391J03	81349
C15	Same as C2			
C16	Same as C13			
C17	CAPACITOR, MICA, DIPPED: 100 pF, 5%, 500V	1	CM05FD101J03	81349
C18	Same as C1			
C19	Same as C1			
C20	Same as C13			
C21	CAPACITOR, MICA, DIPPED: 120 pF, 5%, 500V	2	CM05FD121J03	81349
C22	CAPACITOR, CERAMIC, TUBULAR: 1.5 pF, ±0.1 pF, 500V	1	301-000-C0K0-159B	72982
C23	CAPACITOR, MICA, DIPPED: 150 pF, 5%, 500V	1	CM05FD151J03	81349
C24	Same as C21			
C25	CAPACITOR, MICA, DIPPED: 300 pF, 5%, 500V	1	CM05FD301J03	81349
C26	CAPACITOR, MICA, DIPPED: 390 pF, 5%, 500V	1	CM05FD391J03	81349
C27	Same as C1			
C28	Same as C1			
C29	Same as C2			
C30	Same as C1			
C31	Same as C1			
C32	Same as C9			

REF DESIG PREFIX A2A3

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
CR1	DIODE	1	1N462A	80131
L1	COIL, FIXED	2	20681-28	14632
L2	Same as L1			
L3	COIL, FIXED	2	20681-64	14632
L4	Same as L3			
L5	COIL, FIXED	1	20681-8	14632
L6	COIL, FIXED: 10 μH	1	1537-36	99800
Q1	TRANSISTOR	2	2N5109	80131
Q2	Same as Q1			
Q3	TRANSISTOR	1	3N140	80131
Q4	TRANSISTOR	1	2N3933	80131
R1	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RCR07G471JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4W	2	RCR07G392JS	81349
R3	Same as R2			
R4	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	1	RCR07G220JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4W	1	RCR07G330JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	6	RCR07G470JS	81349
R7	Same as R6			
R8	RESISTOR, FIXED, COMPOSITION: 390 Ω, 5%, 1/4W	1	RCR07G391JS	81349
R9	Same as R6			
R10	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	3	RCR07G472JS	81349
R11	Same as R10			
R12	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	2	RCR07G221JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4W	1	RCR07G124JS	81349
R14	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	RCR07G154JS	81349
R15	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	1	RCR07G333JS	81349
R16	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	2	RCR07G103JS	81349
R17	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RCR07G102JS	81349
R18	Same as R6			
R19	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349
R20	Same as R16			
R21	Same as R10			
R22	Same as R12			
R23	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/4W	1	RCR07G681JS	81349

REF DESIG PREFIX A2A3

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R24	Same as R6			
R25	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	2	RCR07G100JS	81349
R26	Same as R6			
R27	RESISTOR, VARIABLE, FILM: 100 Ω, 10%, 1/2W	1	62PAR100	73138
R28	Same as R25			
VR1	VOLTAGE REGULATOR	1	1N963B	80131

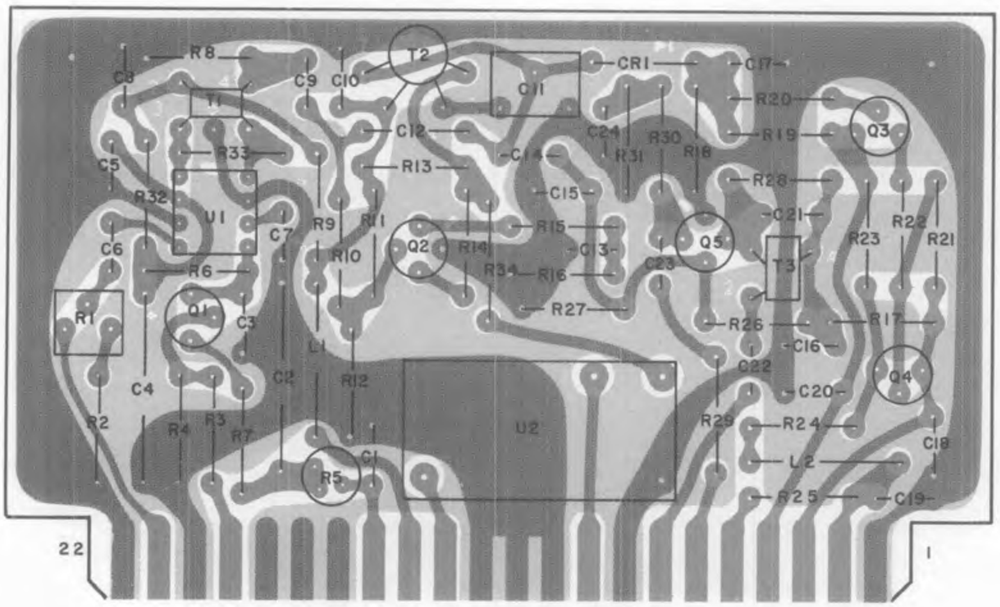


Figure 5-11. Type 72343 IF Output Amplifier (A2A5), Component Locations

5.4.3.3 Type 72343 IF Output Amplifier

REF DESIG PREFIX A2A5

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V	7	SM(5000 pF, M)	91418
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 4.7 µF, 10%, 35V	1	CS13BF475K	81349
C3	Same as C1			
C4	CAPACITOR, ELECTROLYTIC, TANTALUM: 45 µF, 20%, 30V	1	MTP456M030P1B	37942
C5	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	8	SM(1000 pF, GMV)	91418
C6	Same as C5			
C7	Same as C5			
C8	Same as C1			
C9	Same as C5			
C10	Same as C1			
C11	CAPACITOR, VARIABLE, CERAMIC: 2-8 pF, 350V	1	538-006-A2-8	72982
C12	CAPACITOR, COMPOSITION, TUBULAR: 0.82 pF, 10%, 500V	1	QC(.82 pF, K)	95121
C13	Same as C5			
C14	CAPACITOR, CERAMIC, TUBULAR: 9.1 pF, ±.5 pF, 500V	1	301-000-C0H0-919D	72982
C15	CAPACITOR, MICA, DIPPED: 62 pF, 5%, 500V	1	CM05FD620J03	81349
C16	Same as C1			
C17	CAPACITOR, MICA, DIPPED: 15 pF, 5%, 500V	1	CM05ED150J03	81349
C18	Same as C1			
C19	CAPACITOR, MICA, DIPPED: 100 pF, 5%, 500V	1	CM05FD101J03	81349
C20	Same as C1			
C21	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF, ±.25 pF, 500V	1	301-000-C0H0-479C	72982
C22	Same as C5			
C23	Same as C5			
C24	Same as C5			
CR1	DIODE	1	5082-2800	28480
L1	COIL, FIXED: 47 µH	1	1537-60	99800
L2	COIL, FIXED: 27 µH	1	1537-48	99800
Q1	TRANSISTOR	2	2N929	80131
Q2	TRANSISTOR	2	2N3478	80131
Q3	TRANSISTOR	1	2N3251	80131
Q4	Same as Q1			

REF DESIG PREFIX A2A5

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
Q5	Same as Q2			
R1	RESISTOR, VARIABLE, FILM: 100 Ω, 10%, 1/2W	1	62PAR100	73138
R2	RESISTOR, FIXED, COMPOSITION: 82 Ω, 5%, 1/4W	1	RCR07G820JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	2	RCR07G682JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	4	RCR07G103JS	81349
R5	RESISTOR, VARIABLE, FILM: 5 kΩ, 10%, 1/2W	1	62PR5K	73138
R6	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	2	RCR07G472JS	81349
R7	Same as R3			
R8	RESISTOR, FIXED, COMPOSITION: 180 Ω, 5%, 1/4W	1	RCR07G181JS	81349
R9	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	3	RCR07G470JS	81349
R10	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	1	RCR07G100JS	81349
R11	Same as R4			
R12	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	3	RCR07G222JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	3	RCR07G332JS	81349
R14	Same as R9			
R15	RESISTOR, FIXED, COMPOSITION: 12 Ω, 5%, 1/4W	1	RCR07G120JS	81349
R16	RESISTOR, FIXED, COMPOSITION: 150 Ω, 5%, 1/4W	3	RCR07G151JS	81349
R17	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RCR07G101JS	81349
R18	Same as R13			
R19	RESISTOR, FIXED, COMPOSITION: 240 kΩ, 5%, 1/4W	1	RCR07G244JS	81349
R20	Same as R12			
R21	Same as R4			
R22	Same as R16			
R23	Same as R6			
R24	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	1	RCR07G220JS	81349
R25	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RCR07G471JS	81349
R26	Same as R4			
R27	Same as R12			
R28	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	1	RCR07G221JS	81349
R29	RESISTOR, FIXED, COMPOSITION: 75 Ω, 5%, 1/4W	1	RCR07G750JS	81349
R30	Same as R9			
R31	Same as R16			
R32	Same as R17			
R33	Same as R13			

REF DESIG PREFIX A2A5

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R34	Same as R10			
T1	TRANSFORMER	1	21427-14	14632
T2	TRANSFORMER	1	21092-8	14632
T3	TRANSFORMER	1	21092-3	14632
U1	INTEGRATED CIRCUIT	1	MC1350P	04713
U2	VOLTAGE CONTROLLED CRYSTAL OSCILLATOR	1	7710311	74306

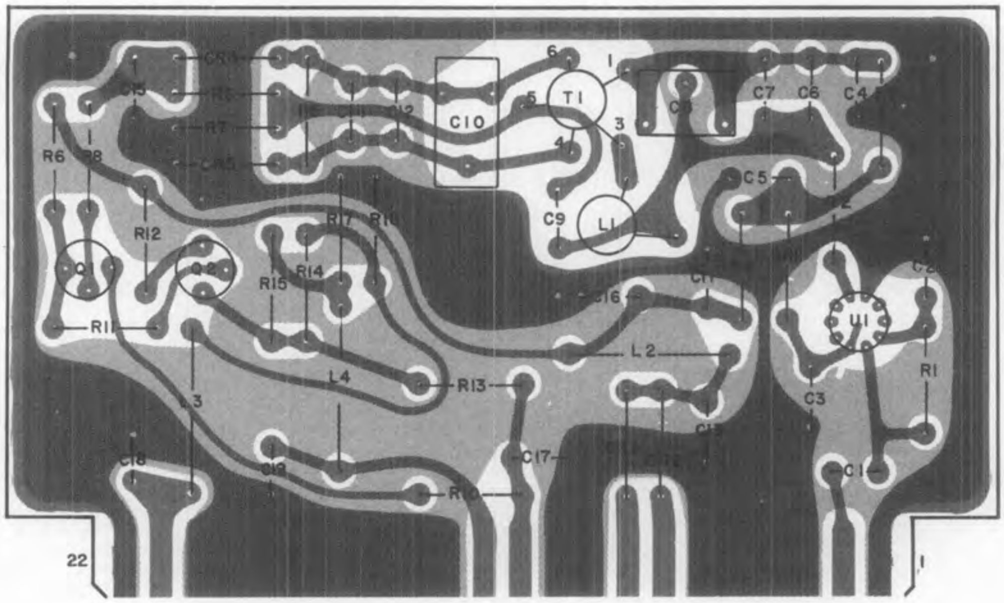


Figure 5-12. Type 79814 FM Limiter/Discriminator (200 and 500-kHz BW) (A2A6), Component Locations

5.4.3.4 Type 79814 FM Limiter/Discriminator (200 & 500-kHz BW) REF DESIG PREFIX A2A6

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	1	SM(1000pF, GMV)	91418
C2	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	8	C023B101E502M	56289
C3	Same as C2			
C4	Same as C2			
C5	Same as C2			
C6	CAPACITOR, CERAMIC, TUBULAR: 2.2 pF, ±.25 pF, 500V	1	301-000-C0J0-229C	72982
C7	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF, ±.25 pF, 500V (TC-N750)	1	301-000-U2J0-479C	72982
C8	CAPACITOR, VARIABLE, CERAMIC: 2-8 pF, 350V	1	538-006-A2-8	72982
C9	CAPACITOR, CERAMIC, TUBULAR: 8.2 pF, ±.5 pF, 500V	1	301-000-C0H0-829D	72982
C10	CAPACITOR, VARIABLE, AIR: 0.8-10 pF, 250V	1	2951	92193
C11	Same as C2			
C12	CAPACITOR, MICA, DIPPED: 36 pF, 5%, 500V	1	CM05ED360J03	81349
C13	Same as C2			
C14	CAPACITOR, CERAMIC, TUBULAR: 15 pF, 5%, 500V (TC-N750)	1	301-000-U2J0-150J	72982
C15	CAPACITOR, MICA, DIPPED: 27 pF, 5%, 500V	1	CM05ED270J03	81349
C16	Same as C2			
C17	Same as C2			
C18	CAPACITOR, CERAMIC, DISC: 1200 pF, 10%, 100V	1	CK05BX122K	81349
C19	CAPACITOR, CERAMIC, DISC: 3300 pF, 10%, 100V	1	CK05BX332K	81349
CR1	DIODE	3	1N462A	80131
CR2	Same as CR1			
CR3	Same as CR1			
CR4	DIODE	2	1N4446	80131
CR5	Same as CR4			
L1	COIL, FIXED	1	20681-26	14632
L2	COIL, FIXED: 18 μH	1	1537-42	99800
L3	COIL, FIXED: 300 μH	1	2500-02	99800
L4	COIL, FIXED: 680 μH	1	2500-20	99800
Q1	TRANSISTOR	1	2N3251	80131
Q2	TRANSISTOR	1	2N929	80131
R1	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	1	RCR07G221JS	81349

REF DESIG PREFIX A2A6

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R2	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	4	RCR07G470JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	1	RCR07G101JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	1	RCR07G100JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 20 kΩ, 5%, 1/4W	1	RCR07G203JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	RCR07G473JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	1	RCR07G223JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RCR07G102JS	81349
R9	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	1	RCR07G333JS	81349
R10	Same as R2			
R11	Same as R2			
R12	Same as R2			
R13	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	RCR07G222JS	81349
R14	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4W	1	RCR07G152JS	81349
R15	RESISTOR, FIXED, COMPOSITION: 560 Ω, 5%, 1/4W	1	RCR07G561JS	81349
R16	RESISTOR, FIXED, COMPOSITION: 750 Ω, 5%, 1/4W	1	RCR07G751JS	81349
R17	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4W	1	RCR07G562JS	81349
T1	TRANSFORMER	1	21427-7	14632
U1	INTEGRATED CIRCUIT	1	U5F7719393	07263

5.4.3.5 Type 79813 FM Limiter/Discriminator (10 & 50-kHz BW) REF DESIG PREFIX A2A7

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	1	SM(1000pF, GMV)	91418
C2	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	7	C023B101E502M	56289
C3	Same as C2			
C4	CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350V	1	538-006-D9-35	72982
C5	Same as C2			
C6	CAPACITOR, MICA, DIPPED: 43 pF, 5%, 500V	2	CM05ED430J03	81349
C7	Same as C6			
C8	Same as C2			
C9	Same as C2			
C10	CAPACITOR, CERAMIC, DISC: 0.068 μF, 10%, 50V	1	CK05BX683K	81349
C11	CAPACITOR, CERAMIC, DISC: 0.015 μF, 10%, 50V	1	CK05BX153K	81349
CR1	DIODE	3	1N462A	80131
CR2	Same as CR1			
CR3	Same as CR1			
L1	COIL, FIXED: 1.0 μH	1	1537-12	99800
L2	COIL, FIXED: 3 mH	1	2500-50	99800
L3	COIL, FIXED: 15 mH	1	3635-51	71279
R1	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	1	RCR07G221JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	1	RCR07G101JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RCR07G470JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 6.8 MΩ, 5%, 1/4W	1	RCR07G685JS	81349
R5	RESISTOR, VARIABLE, FILM: 100 kΩ, 10%, 1/2W	1	62PAR100K	73138
R6	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4W	1	RCR07G822JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RCR07G471JS	81349
R9	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R10	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4W	1	RCR07G272JS	81349
R11	RESISTOR, FIXED, COMPOSITION: 560 Ω, 5%, 1/4W	1	RCR07G561JS	81349
U1	INTEGRATED CIRCUIT	1	U5F7719393	07263
U2	DISCRIMINATOR, CRYSTAL: 21.4 MHz C.F., 100 kHz B.W.	1	8680040	74306
U3	INTEGRATED CIRCUIT	1	U5B7741393	07263

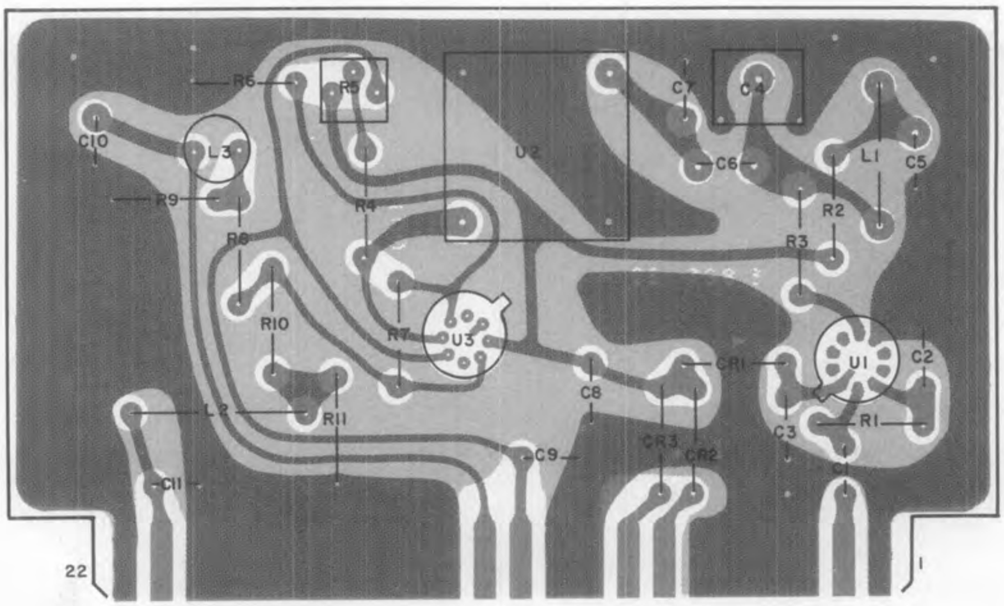


Figure 5-13. Type 79813 FM Limiter/Discriminator (10/50-kHz BW) (A2A7), Component Locations

5.4.4 Type 79829 Spectrum Display Unit

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
A1	IF AMPLIFIER	1	8148	14632
A2	SWEEP GENERATOR AND HORIZONTAL DEFLECTION AMPLIFIER	1	8244	14632
A3	FOCUS AND INTENSITY CONTROL	1	79962	14632
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 100 μF, 20%, 35V	1	MTP107M035PIC	37942
J1	CONNECTOR, RECEPTACLE, MULTIPIN	1	SM-2SN	81312
J2	CONNECTOR, RECEPTACLE, MULTIPIN	1	SRE-7PNSS	81312
MP1	TUNING SHAFT	2	14051-2	14632
MP2	Same as MP1			
MP3	SHIELD, ELECTRON TUBE	1	20519	14632
PS1	DC-DC CONVERTER	1	76199	14632
S1	SWITCH, TOGGLE: SPST	1	8280-K16	15605
V1	TUBE, CRT	1	3ASP1	80131
XV1	SOCKET, CRT	1	14075	14632

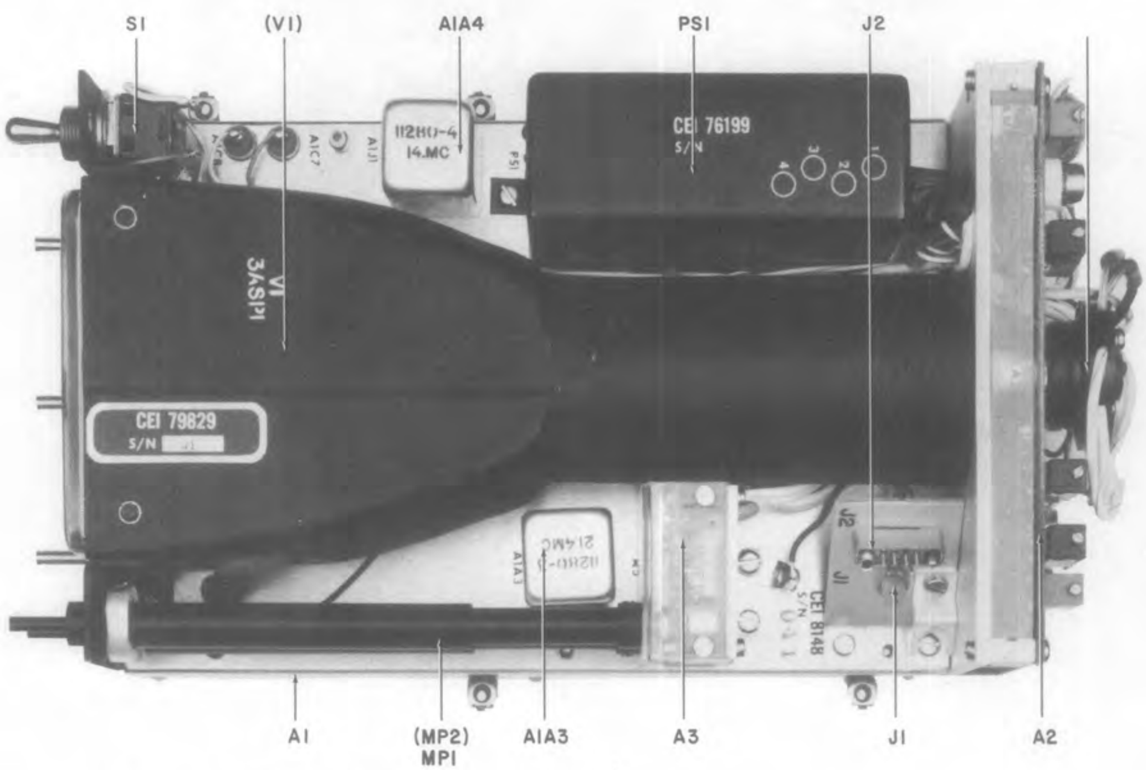


Figure 5-14. Type 79829 Spectrum Display Unit (A3), Component Locations

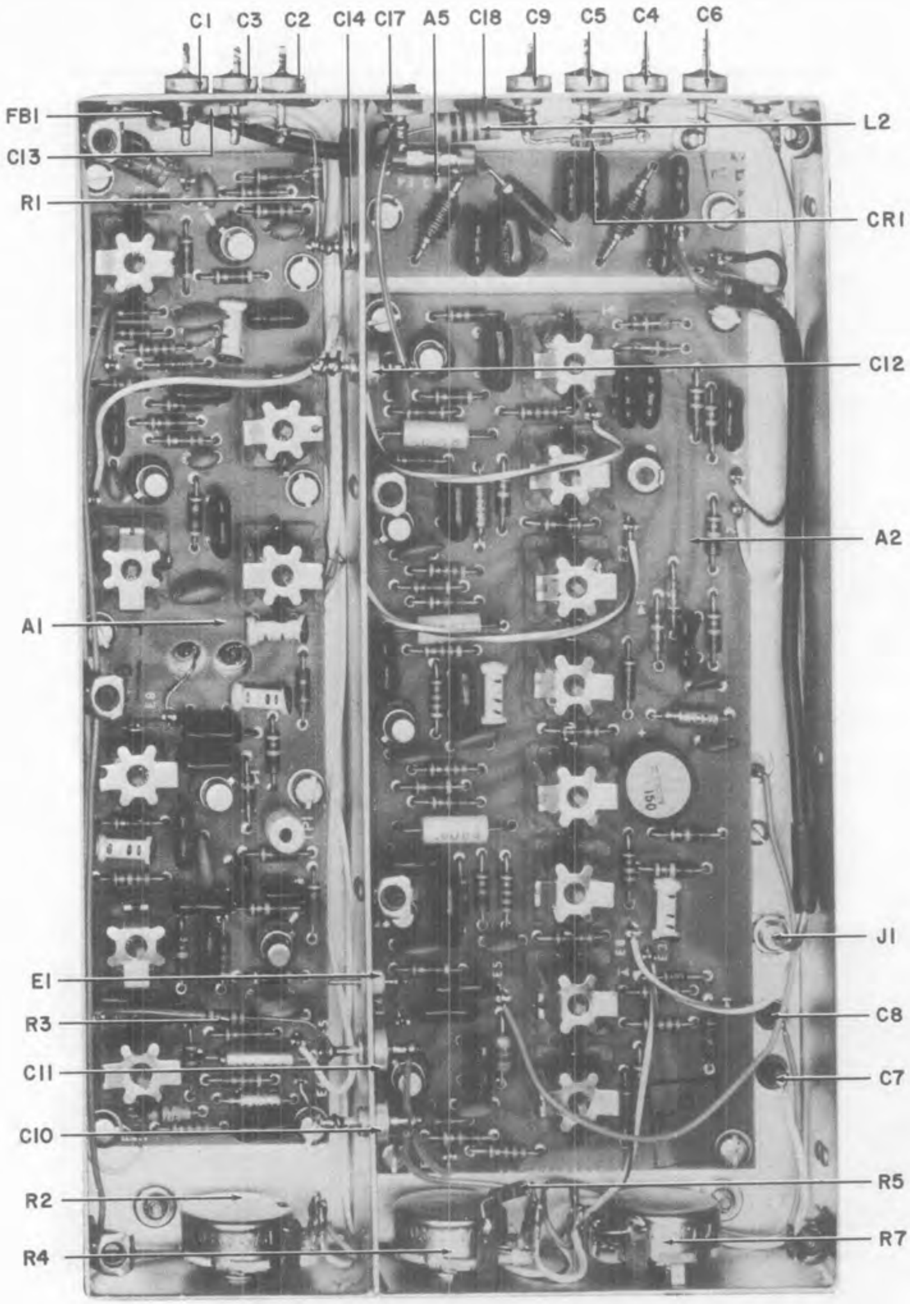


Figure 5-15. Type 8148 IF Amplifier (A3A1), Component Locations

5.4.4.1 Type 8148 IF Amplifier

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
A1	IF AMPLIFIER BOARD NO. 1	1	16192	14632
A2	IF AMPLIFIER BOARD NO. 2	1	16193	14632
A3	21.4-MHz MARKER OSCILLATOR	1	11280-3	14632
A4	14.0-MHz OSCILLATOR	1	11280-4	14632
A5	BANDPASS FILTER	1	16297	14632
C1 thru C4	CAPACITOR, CERAMIC, FEEDTHRU: 100 pF, GMV, 500V	9	FA5C-102W	01121
C5	CAPACITOR, CERAMIC, FEEDTHRU: 33pF, 10%, 500V	3	FA5C-3301	01121
C6	Same as C5			
C7 thru C10	Same as C1			
C11	Same as C5			
C12	Same as C1			
C13	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 500V	3	C023B101F103M	56289
C14	CAPACITOR, CERAMIC, STANDOFF: 1000 pF, GMV, 500V	2	SS5D-102W	01121
C15	Same as C13			
C16	Same as C13			
C17	Same as C14			
C18	CAPACITOR, CERAMIC, DISC: 0.05 μF, 20%, 100V	1	29C212A7	56289
CR	DIODE	1	1N4004	80131
E1	TERMINAL, FEEDTHRU	1	SFU-16	04013
FB1 thru FB4	FERRITE BEAD	2	56-590-65/4A	02114
J1	CONNECTOR, RECEPTACLE, MINIATURE SERIES	1	UG-1464/U	81349
L1	NOT USED			
L2	COIL, FIXED: 1000 μH	1	2500-28	99800
MP1	COVER	1	22594-1	14632
R1	RESISTOR, FIXED, COMPOSITION: 6.2 kΩ, 5%, 1/4W	1	RCR07G622JS	81349
R2	RESISTOR, VARIABLE, COMPOSITION: 10 kΩ, 10%, 1/2W	2	RV5NAYSD103A	81349

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R3	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349
R4	Same as R2			
R5	RESISTOR, FIXED, COMPOSITION: 68 kΩ, 5%, 1/4W	1	RCR07G683JS	81349
R6	NOT USED			
R7	RESISTOR, VARIABLE, COMPOSITION: 100 kΩ, 10%, 1/2W	1	RV5NAYSD104A	81349

5.4.4.1.1 Part 16192 IF Amplifier Board No. 1 REF DESIG PREFIX A3A1A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	5	SM(1000pF, GMV)	91418
C2	CAPACITOR, MICA, DIPPED: 18 pF, 5%, 500V	1	CM05CD180J03	81349
C3	Same as C1			
C4	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF, ±.25 pF, 500V	2	301-000-C0H0-479C	72982
C5	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V	3	SM(5000pF, M)	91418
C6	CAPACITOR, MICA, DIPPED: 33 pF, 5%, 500V	2	CM05ED330J03	81349
C7	CAPACITOR, MICA, DIPPED: 43 pF, 5%, 500V	1	CM05ED430J03	81349
C8	Same as C1			
C9	CAPACITOR, MICA, DIPPED: 20 pF, 5%, 500V	1	CM05ED200J03	81349
C10	Same as C1			
C11	Same as C4			
C12	Same as C5			
C13	CAPACITOR, CERAMIC, TUBULAR: 1.0 pF, ±.25 pF, 500V	2	301-000-C0K0-109C	72982
C14	Same as C6			
C15	CAPACITOR, MICA, DIPPED: 91 pF, 5%, 500V	1	CM05FD910J03	81349
C16	CAPACITOR, MICA, DIPPED: 75 pF, 5%, 500V	1	CM05ED750J03	81349
C17	Same as C5			
C18	Same as C13			
C19	CAPACITOR, MICA, DIPPED: 75 pF, 5%, 500V	1	CM04ED750J03	81349
C20	CAPACITOR, MICA, DIPPED: 820 pF, 5%, 300V	1	DM15-821J	72136
C21	CAPACITOR, MICA, DIPPED: 24 pF, 5%, 500V	1	CM05ED240J03	81349
C22	CAPACITOR, ELECTROLYTIC, TANTALUM: 10 μF, 10%, 20V	1	CS13BE106K	81349
C23	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 μF, 10%, 35V	1	CS13BF105K	81349
C24	CAPACITOR, MICA, DIPPED: 330 pF, 5%, 500V	1	CM05FD331J03	81349
C25	CAPACITOR, MICA, DIPPED: 7.5 pF 5%, 500V	1	CM05FD331J03	81349
C26	CAPACITOR, MICA, DIPPED: 56 pF, 5%, 500V	1	CM04ED560J03	81349
C27	CAPACITOR, MICA, DIPPED: 39 pF, 5%, 500V	1	CM04ED390J03	81349
C28	CAPACITOR, CERAMIC, DISC: 470 pF, 20%, 1000V	1	B(470 pF, M)	91418
C29	Same as C1			
CR1	DIODE	1	1N462A	80131
CR2	DIODE	1	1N198A	80131

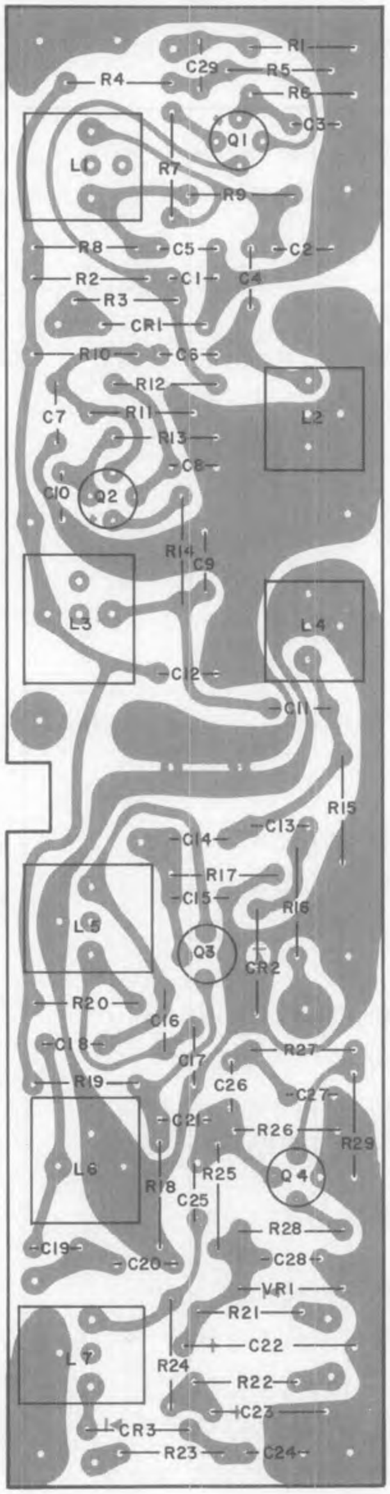


Figure 5-16. Part 16192 IF Amplifier Board No. 1 (A3A1A1), Component Locations

REF DESIG PREFIX A3A1A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
CR3	DIODE, VARICAP	1	V27E	01281
L1	COIL VARIABLE	5	30705-1	14632
L2	Same as L1			
L3	Same as L1			
L4	COIL, VARIABLE	2	30705-6	14632
L5	Same as L1			
L6	Same as L1			
L7	COIL, VARIABLE	1	30705-31	14632
Q1	TRANSISTOR	2	3N140	80131
Q2	Same as Q1			
Q3	TRANSISTOR	1	3N128	80131
Q4	TRANSISTOR	1	2N3933	80131
R1	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RCR07G101JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 62 kΩ, 5%, 1/4W	1	RCR07G623JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	2	RCR07G333JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	2	RCR07G154JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	3	RCR07G103JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	2	RCR07G331JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	3	RCR07G470JS	81349
R8	Same as R1			
R9	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ 5%, 1/4W	1	RCR07G472JS	81349
R10	Same as R4			
R11	Same as R5			
R12	Same as R5			
R13	Same as R6			
R14	Same as R7			
R15	RESISTOR, FIXED, COMPOSITION: 1.3 kΩ, 5%, 1/4W	1	RCR07G132JS	81349
R16	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	3	RCR07G104JS	81349
R17	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	RCR07G222JS	81349
R18	Same as R16			
R19	RESISTOR, FIXED, COMPOSITION: 330 kΩ, 5%, 1/4W	1	RCR07G334JS	81349
R20	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RCR07G102JS	81349
R21	RESISTOR, FIXED, COMPOSITION: 120 Ω, 5%, 1/4W	1	RCR07G121JS	81349
R22	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	2	RCR07G473JS	81349

REF DESIG PREFIX A3A1A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R23	Same as R3			
R24	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4W	1	RCR07G224JS	81349
R25	Same as R22			
R26	Same as R16			
R27	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	1	RCR07G220JS	81349
R28	Same as R7			
R29	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4W	1	RCR07G152JS	81349
TP1	TEST POINT	1	TJ-358W	49956
VR1	VOLTAGE REGULATOR	1	1N759A	80131
FB1	FERRITE BEAD	1	56-590-65-4A	02114

5.4.4.1.2 Part 16193 IF Amplifier Board No. 2 REF DESIG PREFIX A3A1A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, MICA, DIPPED: 75 pF, 5%, 500V	2	CM05ED750J03	81349
C2	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100V	6	C023B101F103M	56289
C3	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	2	C023B101F502M	56289
C4	CAPACITOR, COMPOSITION, TUBULAR: 0.68 pF, 10%, 500V	1	QC(.68pF, K)	95121
C5	Same as C1			
C6	CAPACITOR, MICA, DIPPED: 820 pF, 5%, 300V	1	DM15-821J	72136
C7	CAPACITOR, MICA, DIPPED: 470 pF, 2%, 500V	3	DM15-471G	72136
C8	Same as C2			
C9	Same as C3			
C10	CAPACITOR, CERAMIC, TUBULAR: 1.0 pF, ±.1 pF, 500V	2	301-000-C0K0-109B	72982
C11	CAPACITOR, MICA, DIPPED: 510 pF, 2%, 500V	3	DM15-511G	72136
C12	CAPACITOR, MYLAR, TUBULAR: 6800 pF, 10%, 100V	3	61F10AA183	06001
C13	Same as C7			
C14	Same as C2			
C15	Same as C2			
C16	Same as C10			
C17	Same as C11			
C18	Same as C12			
C19	Same as C2			
C20	CAPACITOR, ELECTROLYTIC, TANTALUM: 1 μF, 10% 35V	2	CS13BF105K	81349
C21	Same as C11			
C22	Same as C12			
C23	Same as C2			
C24	Same as C7			
C25	Same as C20			
C26	CAPACITOR, MICA, DIPPED: 270 pF, 5%, 500V	2	CM05FD271J03	81349
C27	Same as C26			
C28	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 200V	2	8131-A200-Z5U0-103M	72982
C29	Same as C28			
C30	CAPACITOR, CERAMIC, DISC: 100 pF, 5%, 500V	2	CM05FD101J03	81349
C31	Same as C30			

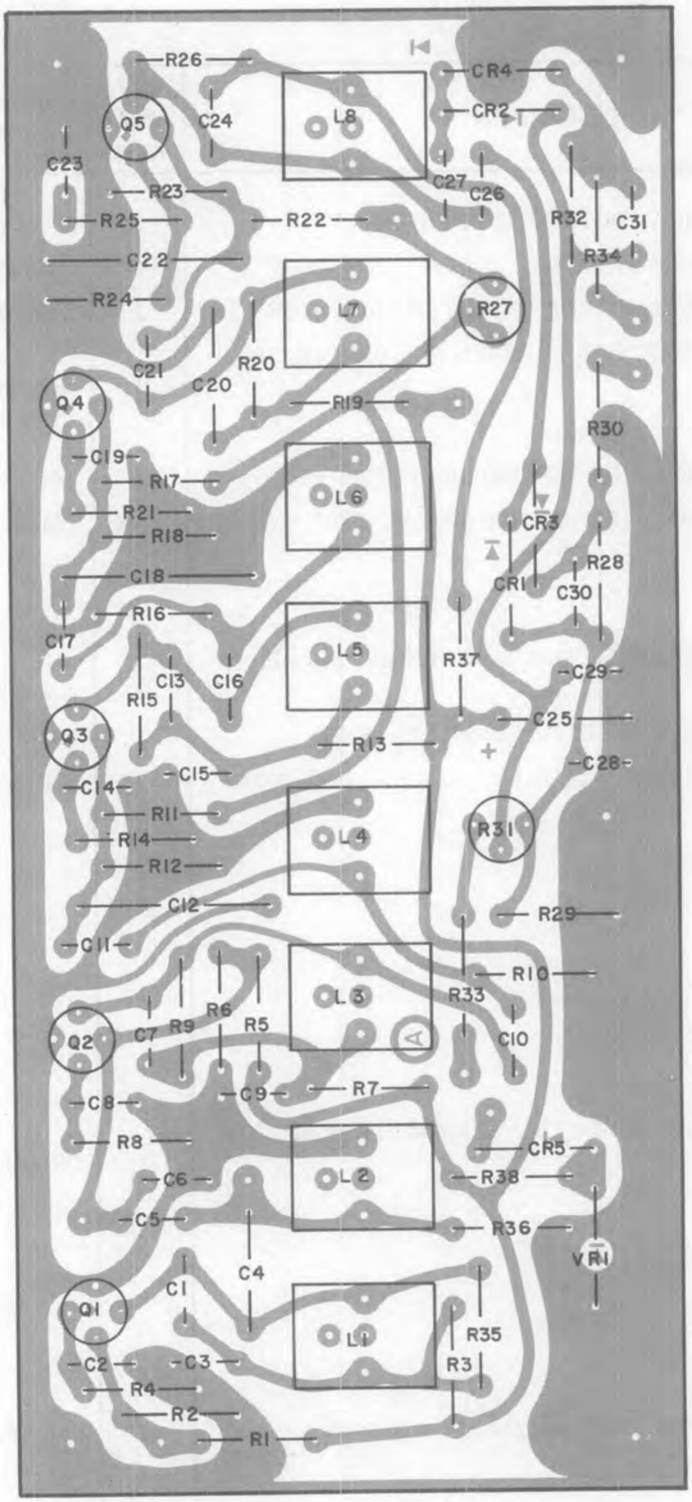


Figure 5-17. Part 16193 IF Amplifier Board No. 2 (A3A1A2), Component Locations

REF DESIG PREFIX A3A1A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
CR1	DIODE	4	1N198A	80131
CR2	Same as CR1			
CR3	Same as CR1			
CR4	Same as CR1			
CR5	DIODE	1	1N462A	80131
L1	COIL, VARIABLE	2	30705-1	14632
L2	Same as L1			
L3	COIL, VARIABLE	6	30705-3	14632
L4	Same as L3			
L5	Same as L3			
L6	Same as L3			
L7	Same as L3			
L8	Same as L3			
Q1	TRANSISTOR	5	2N3478	80131
Q2	Same as Q1			
Q3	Same as Q1			
Q4	Same as Q1			
Q5	Same as Q1			
R1	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	6	RCR07G333JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	5	RCR07G103JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	RCR07G222JS	81349
R4	Same as R2			
R5	Same as R1			
R6	Same as R2			
R7	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	4	RCR07G332JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	4	RCR07G472JS	81349
R9	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	4	RCR07G104JS	81349
R10	Same as R9			
R11	Same as R1			
R12	Same as R2			
R13	Same as R7			
R14	Same as R8			
R15	RESISTOR, FIXED, COMPOSITION: 43 kΩ, 5%, 1/4W	4	RCR07G433JS	81349
R16	Same as R15			

REF DESIG PREFIX A3A1A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R17	Same as R15			
R18	Same as R2			
R19	Same as R7			
R20	Same as R15			
R21	Same as R8			
R22	Same as R1			
R23	Same as R8			
R24	RESISTOR, FIXED, COMPOSITION: 510 Ω, 5%, 1/4W	1	RCR07G511JS	81349
R25	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RCR07G470JS	81349
R26	RESISTOR, FIXED, COMPOSITION: 20 kΩ, 5%, 1/4W	1	RCR07G203JS	81349
R27	RESISTOR, VARIABLE, FILM: 100 kΩ, 10%, 1/2W	1	62PR100K	73138
R28	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4W	2	RCR07G224JS	81349
R29	RESISTOR, FIXED, COMPOSITION: 200 kΩ, 5%, 1/4W	1	RCR07G204JS	81349
R30	Same as R9			
R31	RESISTOR, VARIABLE, FILM: 50 kΩ, 10%, 3/4W	1	150(50k, K)	75042
R32	Same as R28			
R33	RESISTOR, FIXED, COMPOSITION: 240 kΩ, 5%, 1/4W	1	RCR07G244JS	81349
R34	Same as R9			
R35	Same as R1			
R36	Same as R1			
R37	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	1	RCR07G221JS	81349
R38	Same as R7			
VR1	VOLTAGE REGULATOR	1	1N759A	80131

5.4.4.1.3 Part 11280-3 21.4-MHz Marker Oscillator REF DESIG PREFIX A3A1A3

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500V	1	FA5C-102W	01121
C2	CAPACITOR, COMPOSITION, TUBULAR: .2 pF, 10%, 500V	1	QC(.2pF, K)	95121
C3	CAPACITOR, DIPPED, MICA: 43 pF, 5%, 500V	1	CM04ED430J03	81349
C4	CAPACITOR, DIPPED, MICA: 68 pF, 5%, 500V	1	CM04ED680J03	81349
C5	CAPACITOR, CERAMIC, DISC: 470 pF, 20%, 200V	1	CK05CW471M	81349
C6	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100V	1	C023B101F103M	56289
E1	TERMINAL, INSULATED	1	SFU-16	04013
Q1	TRANSISTOR	1	2N706	80131
R1	RESISTOR, FIXED, COMPOSITION: 10 k, 5%, 1/4W	1	RCR07G103JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 470 k, 5%, 1/4W	1	RCR07G474JS	81349
Y1	CRYSTAL, QUARTZ, 21.4 MHz	1	96402-01	14632

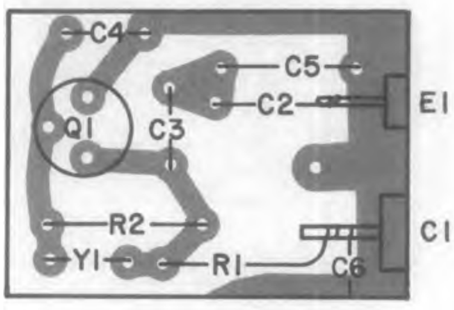


Figure 5-18. Part 11280-3 21.4-MHz Marker Oscillator (A3A1A3), Component Locations

5.4.4.1.4 Part 11280-4 14.0-MHz Oscillator REF DESIG PREFIX A3A1A4

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, FEED-THRU: 1000 pF, GMV 500V	1	FA5C-102W	01121
C2	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF, ±.25 pF, 500V	1	301-000-C0H0-479C	72982
C3	CAPACITOR, DIPPED, MICA: 43 pF, 5%, 500V	2	CM04ED430J03	81349
C4	CAPACITOR, DIPPED, MICA: 200 pF, 5%, 500V	1	DM10-201J	81349
C5	Same as C3			
E1	TERMINAL, INSULATED	1	SFU-16	04013
Q1	TRANSISTOR	1	2N706	80131
R1	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 470 kΩ, 5%, 1/4W	1	RCR07G474JS	81349
Y1	CRYSTAL, QUARTZ, 14.0 MHz (Wire Leads)	1	CR-64/U	81349

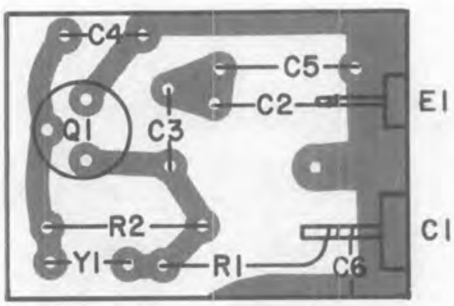


Figure 5-19. Part 11280-4 14.0-MHz Oscillator (A3A1A4), Component Locations

5.4.4.1.5 Part 16297 Bandpass Filter REF DESIG PREFIX A3A1A5

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, MICA, DIPPED: 510 pF, 5%, 500V	1	DM15-511J	72136
C2	CAPACITOR, MICA, DIPPED: 12 pF, 5%, 500V	1	CM05CD120J03	81349
C3	CAPACITOR, MICA, DIPPED: 390 pF, 5%, 500V	1	CM05FD391J03	81349
C4	CAPACITOR, MICA, DIPPED: 250 pF, 5%, 500V	1	DM15-251J	72136
C5	CAPACITOR, MICA, DIPPED: 430 pF, 5%, 500V	1	DM15-431J	72136
C6	CAPACITOR, MICA, DIPPED: 180 pF, 5%, 500V	1	CM05FD181J03	81349
L1	COIL, FIXED	2	1131-102	14632
L2	COIL, FIXED	1	21210-92	14632
L3	Same as L1			

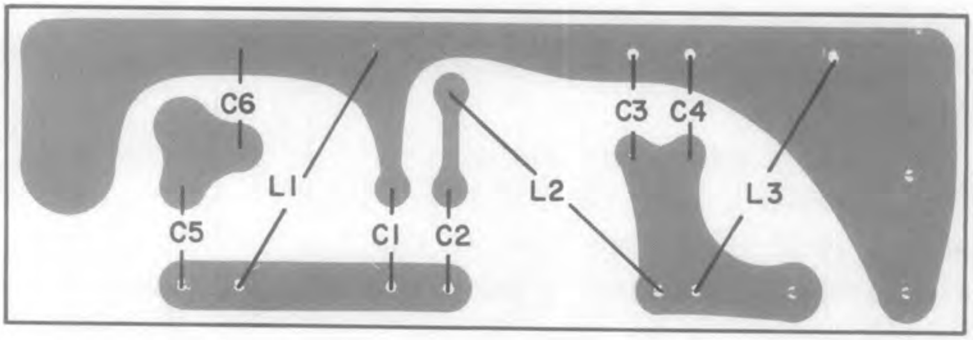


Figure 5-20. Part 16297 Bandpass Filter (A3A1A5), Component Locations

5.4.4.2 Type 8244 Sweep Generator and Horizontal Deflection Amplifier REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 1 μF, 10%, 35V	1	CS13BF105K	81349
CR1	DIODE	4	1N462A	80131
CR2	Same as CR1			
CR3	Same as CR1			
CR4	Same as CR1			
Q1	TRANSISTOR	1	2N2646	80131
Q2	TRANSISTOR	1	2N3251	80131
Q3	TRANSISTOR	2	2N3440	80131
Q4	Same as Q3			
Q5	TRANSISTOR	1	2N929	80131
Q6	TRANSISTOR	1	U1899E	15818
R1	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/4W	1	RCR07G681JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	RCR07G222JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	1	RCR07G223JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	3	RCR07G472JS	81349
R5	RESISTOR, VARIABLE, FILM: 5 kΩ, 10%, 1/2W	1	62PR5K	73138
R6	RESISTOR, VARIABLE, FILM: 500 kΩ, 20%, .2W	1	3068P-1-504	80294
R7	NOT USED			
R8	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RCR07G102JS	81349
R9	RESISTOR, VARIABLE, FILM: 1 kΩ, 10%, 3/4W	1	3069P-1-102	80294
R10	RESISTOR, FIXED, COMPOSITION: 120 Ω, 5%, 1/4W	1	RCR07G121JS	81349
R11	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	5	RCR07G473JS	81349
R12	RESISTOR, VARIABLE, FILM: 100 kΩ, 20%, .2W	3	3068P-1-104	80294
R13	Same as R11			
R14	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	2	RCR07G103JS	81349
R15	Same as R11			
R16	Same as R12			
R17	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RCR07G470JS	81349
R18	RESISTOR, FIXED, COMPOSITION: 180 kΩ, 5%, 1/4W	2	RCR07G184JS	81349
R19	Same as R18			
R20	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4W	2	RCR07G224JS	81349
R21	Same as R20			
R22	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	2	RCR07G682JS	81349

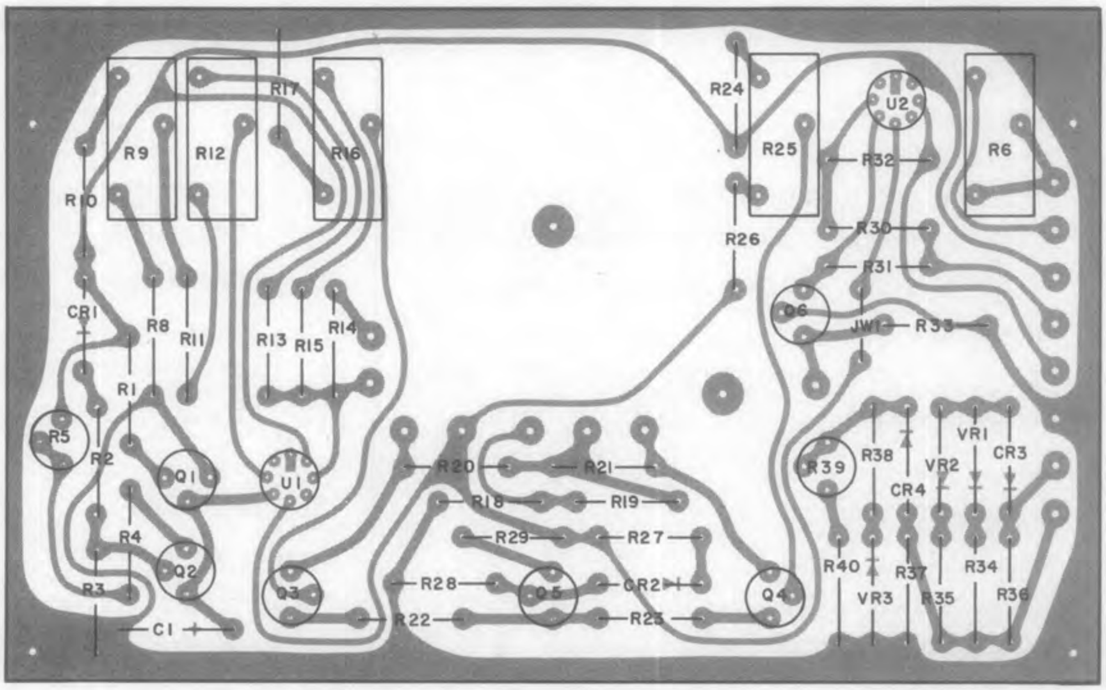


Figure 5-21. Type 8244 Sweep Generator and Horizontal Deflection Amplifier (A3A2), Component Locations

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R23	Same as R22			
R24	Same as R11			
R25	Same as R12			
R26	Same as R11			
R27	Same as R4			
R28	Same as R14			
R29	Same as R4			
R30	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	5	RCR07G104JS	81349
R31	Same as R30			
R32	Same as R30			
R33	Same as R30			
R34	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	1	RCR07G333JS	81349
R35	RESISTOR, FIXED, COMPOSITION: 240 kΩ, 5%, 1/4W	2	RCR07G244JS	81349
R36	RESISTOR, FIXED, COMPOSITION: 130 kΩ, 5%, 1/4W	1	RCR07G134JS	81349
R37	Same as R35			
R38	RESISTOR, FIXED, COMPOSITION: 620 kΩ, 5%, 1/4W	1	RCR07G624JS	81349
R39	RESISTOR, VARIABLE, FILM: 1 MΩ, 10%, 1/2W	1	62PR1M	73138
R40	Same as R30			
U1	INTEGRATED CIRCUIT	2	U5B7741393	07263
U2	Same as U1			
VR1	VOLTAGE REGULATOR	1	1N749A	80131
VR2	VOLTAGE REGULATOR	2	1N746A	80131
VR3	Same as VR2			

5.4.4.3 Type 79962 Focus and Intensity Control

REF DESIG PREFIX A3A3

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: .05 μF, 20%, 500V	1	33C17A	56289
R1	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349
R2	RESISTOR, VARIABLE, COMPOSITION: 500 kΩ, 20%, 1/4W	1	70-09172	76055
R3	RESISTOR, FIXED, COMPOSITION: 3.3 MΩ, 5%, 1/2W	1	RCR20G335JS	81349
R4	RESISTOR, VARIABLE, COMPOSITION: 2.5 MΩ, 20%, 1/4W	1	70-10548	76055
R5	RESISTOR, FIXED, COMPOSITION: 3.9 MΩ, 5%, 1/2W	1	RCR20G395JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 4.7 MΩ, 5%, 1/4W	1	RCR07G475JS	81349

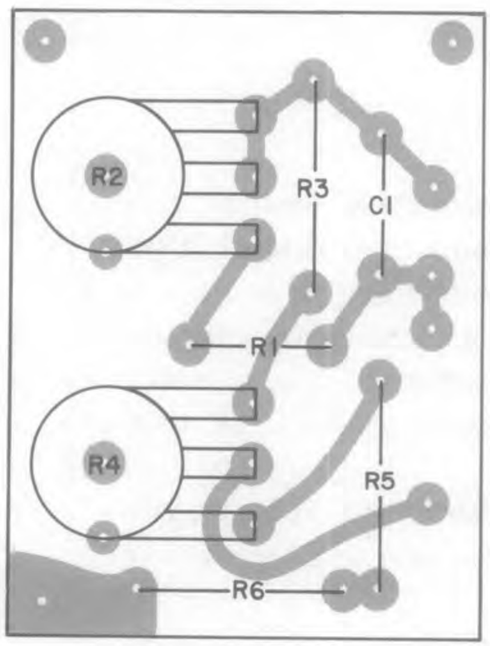


Figure 5-22. Type 79962 Focus and Intensity Control (A3A3), Component Locations

5.4.5 Type 7890 AGC Amplifier

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 10%, 20V	1	CS13BE225K	81349
C2	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100V	2	C023B101F103M	56289
C3	CAPACITOR, CERAMIC, DISC: 0.1 μF, +80-20%, 25V	1	DFJ-3	73899
C4	Same as C2			
CR1	DIODE	3	1N462A	80131
CR2	DIODE	3	1N4446	80131
CR3	Same as CR2			
CR4	Same as CR2			
CR5	Same as CR1			
CR6	Same as CR1			
CR7	DIODE	1	1N198A	80131
Q1	TRANSISTOR	2	2N3251	80131
Q2	TRANSISTOR	3	2N929	80131
Q3	Same as Q1			
Q4	Same as Q2			
Q5	Same as Q2			
R1	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	3	RCR07G104JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 68 kΩ, 5%, 1/4W	1	RCR07G683JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4W	1	RCR07G224JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	6	RCR07G103JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RCR07G102JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	2	RCR07G333JS	81349
R7	Same as R1			
R8	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349
R9	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4W	1	RCR07G392JS	81349
R10	Same as R6			
R11	RESISTOR, FIXED, COMPOSITION: 150 Ω, 5%, 1/4W	3	RCR07G151JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 180 kΩ, 5%, 1/4W	1	RCR07G184JS	81349
R13	Same as R4			
R14	Same as R4			
R15	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	2	RCR07G153JS	81349
R16	Same as R6			
R17	Same as R1			

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R18	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4W	1	RCR07G152JS	81349
R19	Same as R15			
R20	Same as R4			
R21	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	2	RCR07G682JS	81349
R22	Same as R9			
R23	Same as R4			
R24	Same as R21			
R25	Same as R4			
R26	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	1	RCR07G223JS	81349
R27	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	RCR07G473JS	81349
R28	Same as R11			
R29	RESISTOR, FIXED, COMPOSITION: 1 MΩ, 5%, 1/4W	1	RCR07G105JS	81349
R30	Same as R28			
R31	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	1	RCR07G100JS	81349
U1	INTEGRATED CIRCUIT	2	U5B7741393	07263
U2	Same as U1			

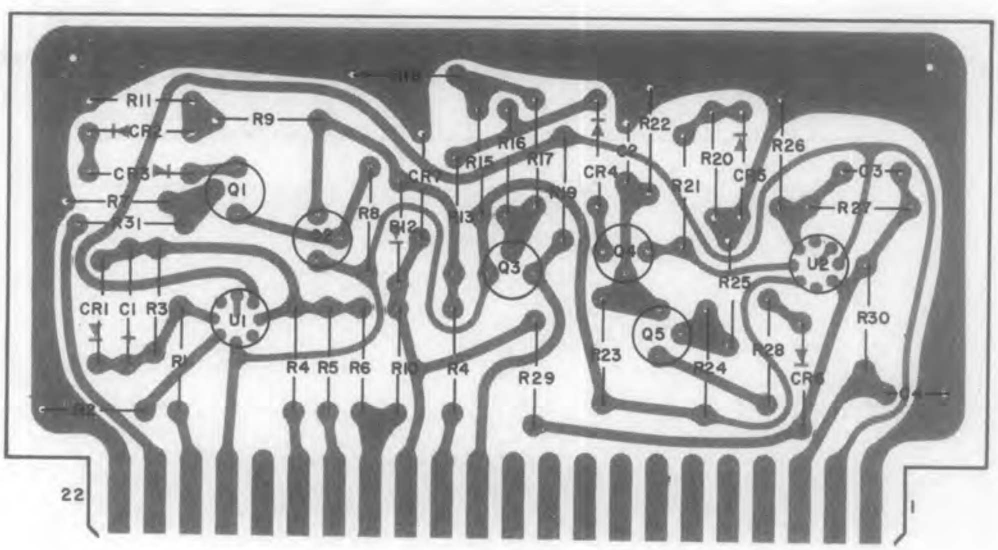


Figure 5-23. Type 7890 AGC Amplifier (A4), Component Locations

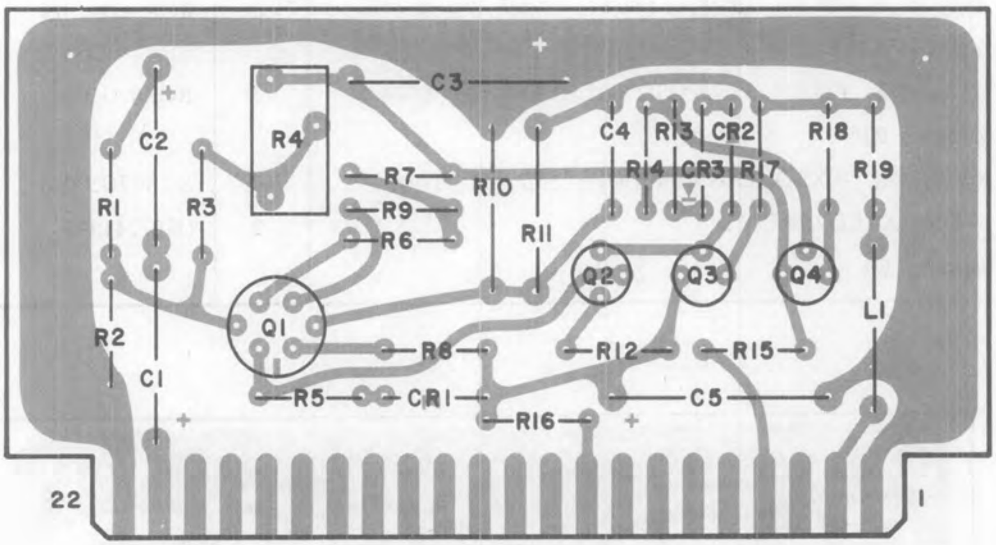


Figure 5-24. Type 7374 Video Amplifier (A5), Component Locations

5.4.6 Type 7374A Video Amplifier

REF DESIG PREFIX A5

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 10 μF, 10%, 20V	2	CS13BE106K	81349
C2	Same as C1			
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μF, 10% 20V	2	CS13BE476K	81349
C4	CAPACITOR, COMPOSITION, TUBULAR: .75 pF, 10%,500V	1	QC(.75pF, K)	95121
C5	Same as C3			
CR1 thru CR3	DIODE	3	1N4446	80131
L1	COIL, FIXED: .68 μH	1	203-11	99848
Q1	TRANSISTOR	1	2N2223	80131
Q2	TRANSISTOR	1	2N3251	80131
Q3	TRANSISTOR	1	2N2222	80131
Q4	TRANSISTOR	1	2N2907	80131
R1	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	3	RCR07G471JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	1	RCR07G472JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 120 k, 5%, 1/4W	1	RCR07G124JS	81349
R4	RESISTOR, VARIABLE, WIRE-WOUND: 50 kΩ, 20%, .2W	1	3068P-1-503	80294
R5	Same as R1			
R6	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	4	RCR07G220JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4W	1	RCR07G152JS	81349
R8	Same as R1			
R9	Same as R6			
R10	RESISTOR, FIXED, FILM: 5.62 kΩ, 1%, 1/4W	1	RN60D5621F	81349
R11	RESISTOR, FIXED, FILM: 56.2 kΩ, 1%, 1/4W	1	RN60D5622F	81349
R12	RESISTOR, FIXED, COMPOSITION: 56 Ω, 5%, 1/4W	1	RCR07G560JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	3	RCR07G100JS	81349
R14	RESISTOR, FIXED, COMPOSITION: 1.2 kΩ, 5%, 1/4W	1	RCR07G122JS	81349
R15	Same as R13			
R16	Same as R13			
R17	Same as R6			
R18	Same as R6			
R19	RESISTOR, FIXED, COMPOSITION: 91 Ω, 5%, 1/4W	1	RCR07G910JS	81349

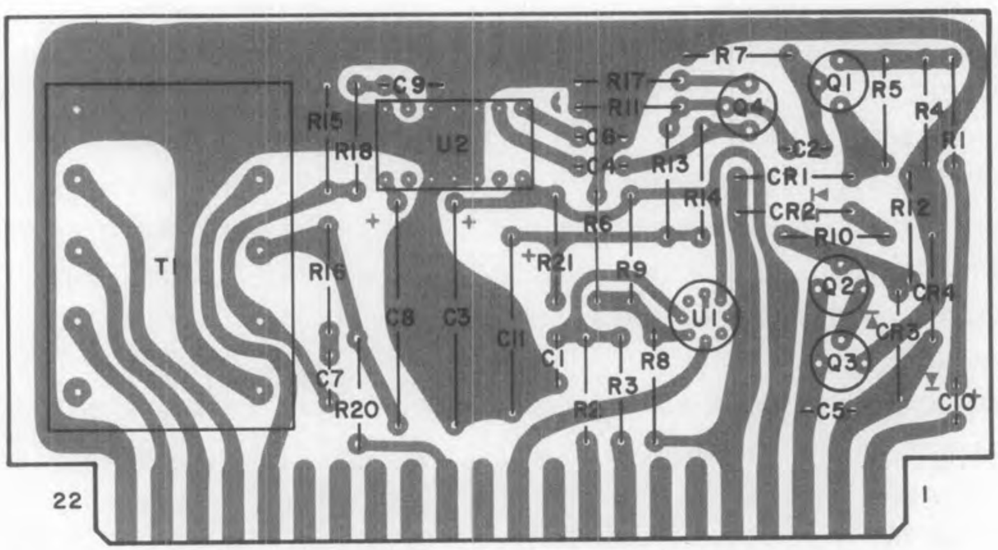


Figure 5-25. Type 7446 Audio, COR, and Squelch Amplifier (A6), Component Locations

5.4.7 Type 7446 Audio, COR, and Squelch Amplifier

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100V	4	8131-M100-651-104M	72982
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 20%, 35V	2	196D225X0035JA1	56289
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 78 μF, 20%, 50V	1	MTP786M050P1C	37912
C4	Same as C1			
C5	Same as C1			
C6	Same as C1			
C7	CAPACITOR, ELECTROLYTIC, TANTALUM: .1 μF, 20%, 100V	1	8131-M100-651-104M	72982
C8	CAPACITOR, ELECTROLYTIC, TANTALUM: 200 μF, 20%, 15V	1	MTP207M015P1C	37492
C9	CAPACITOR, DIPPED, MICA: 20 pF, 5%, 500V	1	CM05ED200J03	81349
C10	Same as C2			
C11	CAPACITOR, ELECTROLYTIC, TANTALUM: 10 μF, 10%, 20V	1	CS13BE106K	81349
CR1 thru CR4	DIODE	4	1N462A	80131
CR5	NOT USED			
Q1	TRANSISTOR	1	U1899E	15818
Q2	TRANSISTOR	2	2N4074	80131
Q3	Same as Q2			
Q4	TRANSISTOR	1	2N929	80131
R1	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RCR07G471JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	RCR07G154JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 470 kΩ, 5%, 1/4W	1	RCR07G474JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4W	1	RCR07G272JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 22 MΩ, 5%, 1/4W	1	RCR07G226JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	RCR07G222JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	RCR07G473JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 1 MΩ, 5%, 1/4W	1	RCR07G105JS	81349
R9	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	2	RCR07G104JS	81349
R10	Same as R9			
R11	RESISTOR, FIXED, COMPOSITION: 9.1 kΩ, 5%, 1/4W	1	RCR07G912JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	2	RCR07G333JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 38 kΩ, 5%, 1/4W	1	RCR07G393JS	81349

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R14	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	1	RCR07G682JS	81349
R15	RESISTOR, FIXED, COMPOSITION: 2.7 Ω, 5%, 1/4W	1	RCR07G2R7JS	81349
R16	RESISTOR, FIXED, COMPOSITION: 3.3 Ω, 5%, 1/4W	1	RCR07G3R3JS	81349
R17	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	RCR07G222JS	81349
R18	RESISTOR, FIXED, COMPOSITION: 2.2 MΩ, 5%, 1/4W	1	RCR07G225JS	81349
R19	NOT USED			
R20	RESISTOR, FIXED, COMPOSITION: 620 Ω, 5%, 1/4W	1	RCR07G621JS	81349
R21	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RCR07G471JS	81349
T1	TRANSFORMER	1	16974	14632
U1	INTEGRATED CIRCUIT	1	U5B7741393	07263
U2	AUDIO AMPLIFIER ASSEMBLY	1	LM380	27014

5.4.8 Type 76200 ±15V Power Supply

REF DESIG PREFIXES A7, A8

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 78 μF, 20%, 50V	2	MTP786M050P1C	37942
C2	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 500V	1	SM(.01 F,M)	91418
C3	CAPACITOR, MICA, DIPPED: 470 pF, 5%, 500V	2	DM15-471J	72136
C4	Same as C3			
C5	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.5 μF, 10% 35V	1	CS13BF155K	81349
C6	Same as C1			
C7	CAPACITOR, ELECTROLYTIC, TANTALUM: 100 μF, 20%, 35V	3	MTP107M035P1C	37942
C8	Same as C7			
C9	Same as C7			
CR1	DIODE	1	UTR3305	12969
L1	COIL, FIXED	2	21210-84	14632
L2	COIL, FIXED	1	30316-2	14632
L3	Same as L1			
Q1	TRANSISTOR	1	2N5039	80131
Q2	TRANSISTOR	1	2N2905A	80131
R1	RESISTOR, FIXED, COMPOSITION: 68 Ω, 5%, 1/4W	1	RCR07G680JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 180 Ω, 5%, 1/4W	1	RCR07G181JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 3.3 MΩ, 5%, 1/4W	1	RCR07G335JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	1	RCR07G220JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	1	RCR07G332JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	2	RCR07G102JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	RCR07G222JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 6.8 MΩ, 5%, 1/4W	1	RCR07G685JS	81349
R9	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	1	RCR07G153JS	81349
R10	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	2	RCR07G103JS	81349
R11	RESISTOR, VARIABLE, FILM: 10 kΩ, 10%, 1/2W	1	62PAR10K	73138
R12	Same as R10			
R13	Same as R6			
RA1	RADIATOR, TRANSISTOR	1	22633-1	14632
RA2	RADIATOR, TRANSISTOR	1	6103B-Top Sec. Only	13103
U1	RECTIFIER ASSEMBLY	1	MDA-942A-2	04713
U2	INTEGRATED CIRCUIT	1	LM305	27014

REF DESIG PREFIXES A7, A8

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
U3	INTEGRATED CIRCUIT	1	U5B7741393	07263
VR1	VOLTAGE REGULATOR	1	1N754A	80131

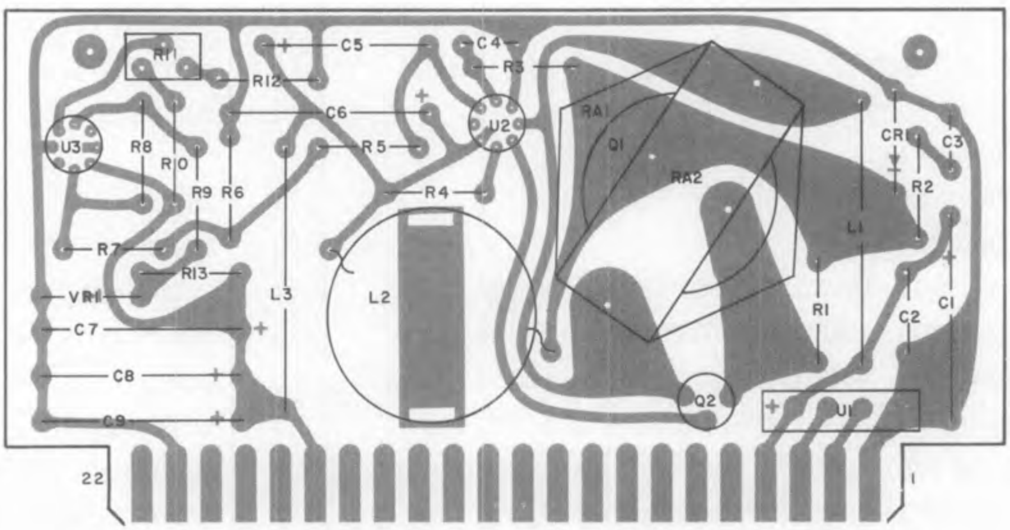


Figure 5-26. Type 76200 ±15V Power Supply (A7, A8), Component Locations

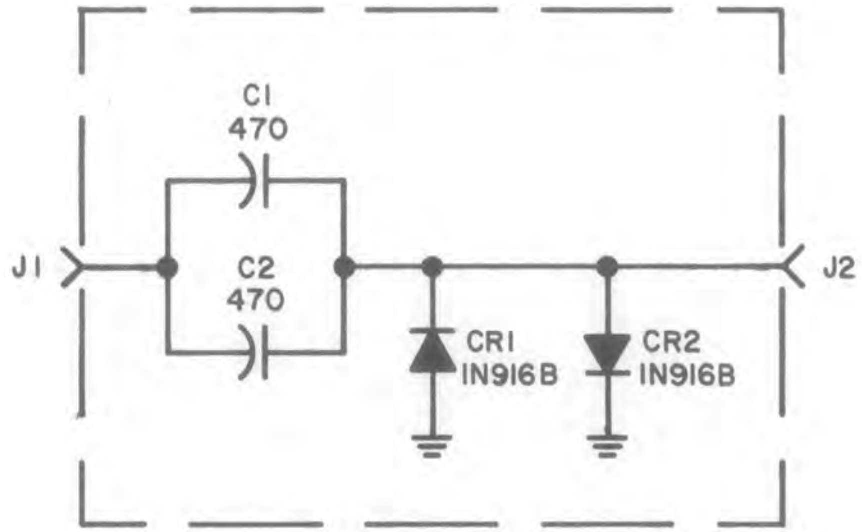
5.4.9 Type 79835 RFI Filter Assembly

REF DESIG PREFIX A9

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
FL1	FILTER, LOW-PASS	1	JN33-694B	56289
J1	CONNECTOR, RECEPTACLE, MULTIPIN	1	2CZ83283	Plessy

SECTION VI

SCHEMATIC DIAGRAMS

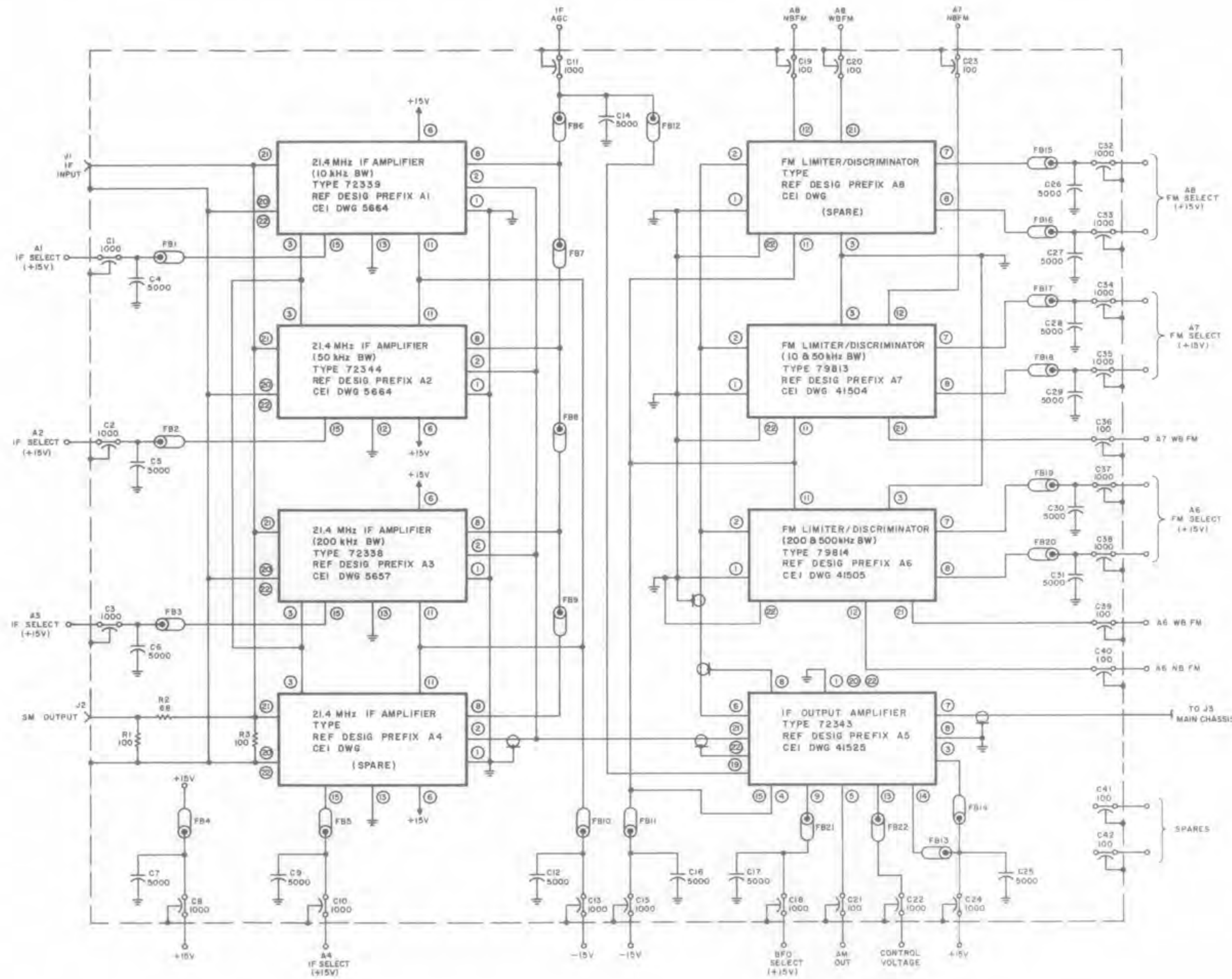


NOTES:
1. UNLESS OTHERWISE SPECIFIED:
CAPACITANCE IS MEASURED IN pF.
2. DIFFERENCE BETWEEN TYPES IS SHOWN IN DETAIL A.

DETAIL A

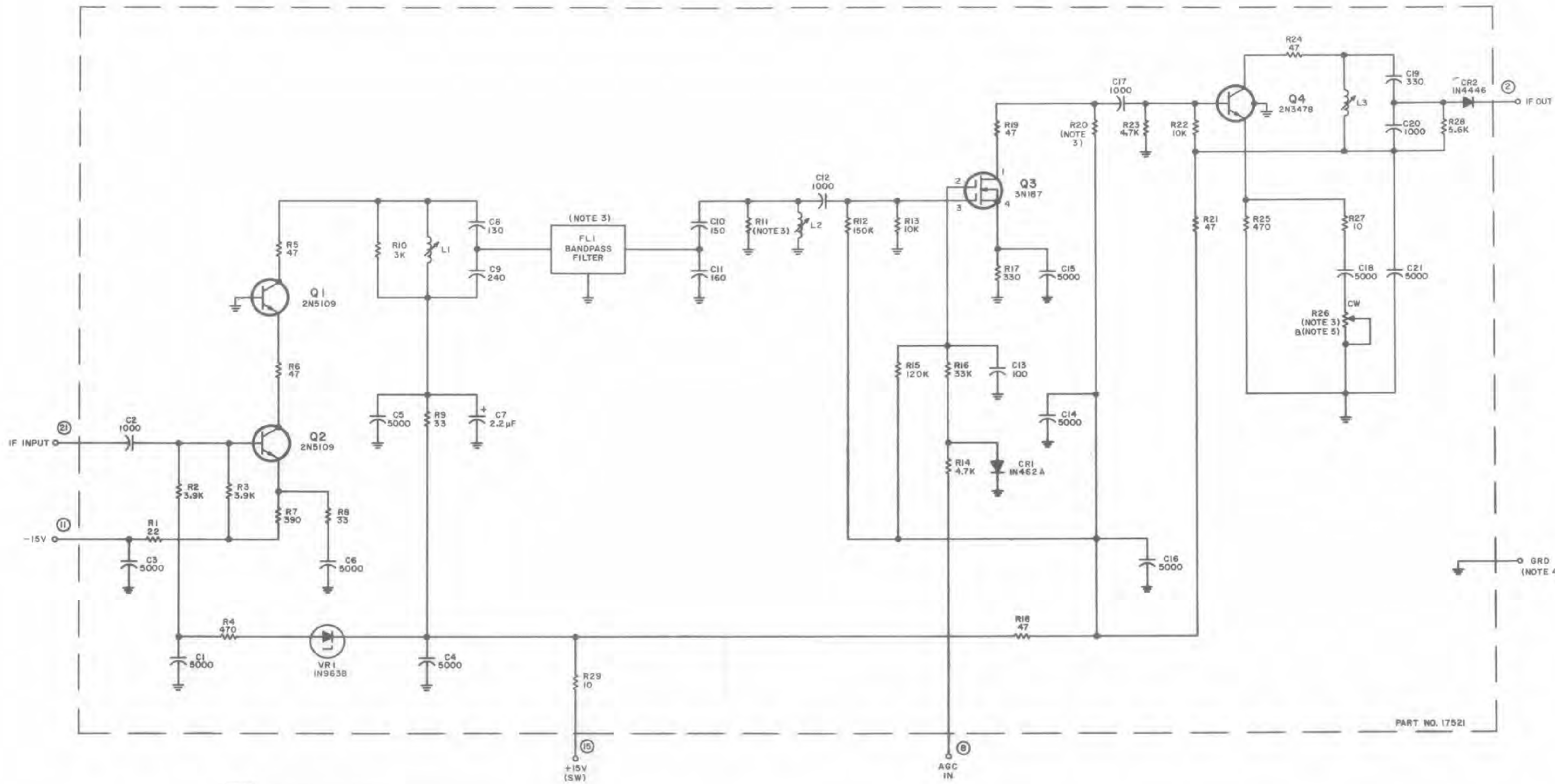
TYPE	J1 PART NO.
79852	UG-58A/U
79855	UG-568/U

Figure 6-1. Type 79852 RF Limiter (A1), Schematic Diagram



NOTES:
1 UNLESS OTHERWISE SPECIFIED
a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4 W.
b) CAPACITANCE IS MEASURED IN pF.
2 ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. REAR APRON IF OUTPUT JACK J3 IS CONNECTED FROM PINS 7 AND 8 OF CONNECTOR XA5.

Figure 6-2. Type 72346 IF Amplifier Assembly (A2), Schematic Diagram



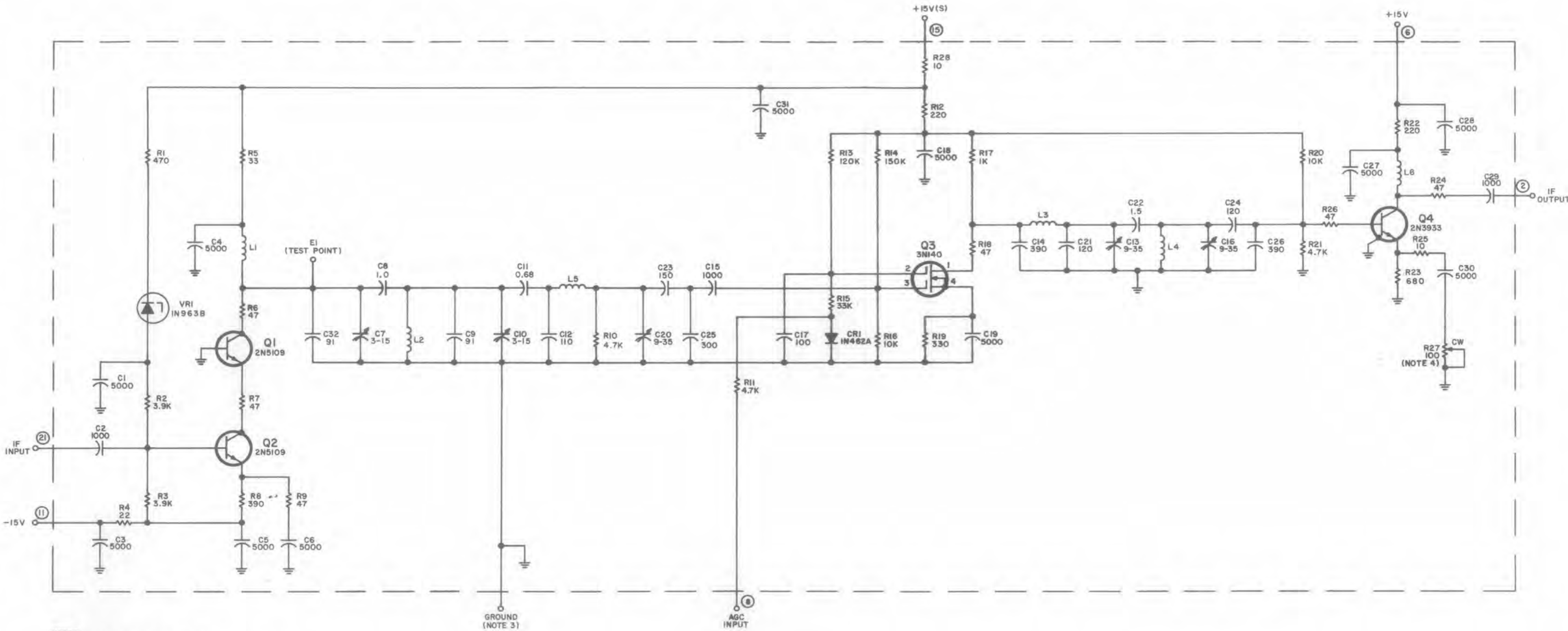
NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN pF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. DIFFERANCE BETWEEN TYPES IS SHOWN IN TABULATION BLOCK BELOW.

TYPE NO.	FL1 BANDWIDTH		R11	R20	R26
72339	10KHz		680	1.5K	100
72344	50KHz		910	470	500
72389	20KHz		1.2K	470	500

4. GROUND PINS FOR THIS MODULE ARE: 1, 3 THRU 5, 7, 9, 10, 12 THRU 14, 17 THRU 20, AND 22.
5. CW ON POTENTIOMETER INDICATES CLOCKWISE ROTATION OF ACTUATOR.

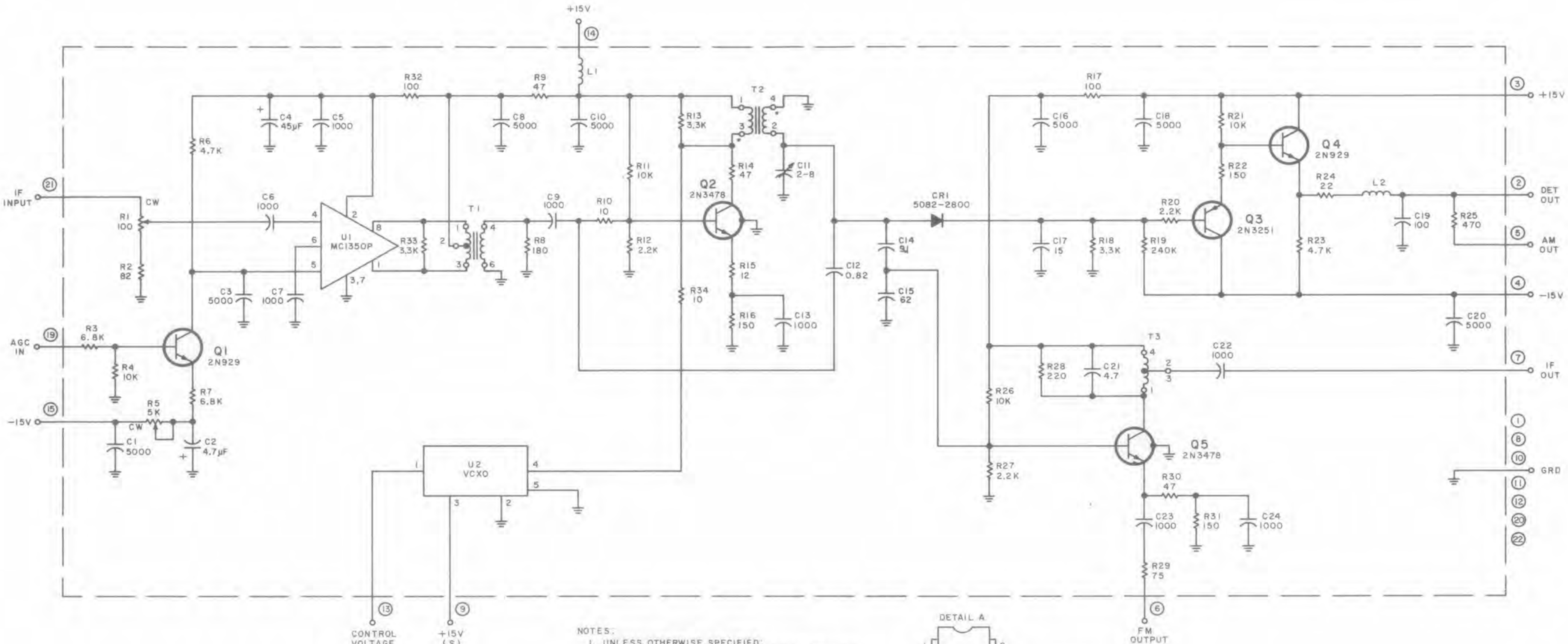
Figure 6-3. Types 72339 and 72334 21.4-MHz IF Amplifier (10-kHz/50-kHz BW) (A2A1 and A2A2), Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4 W.
   b) CAPACITANCE IS MEASURED IN pF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. GROUND PINS FOR P.C. BOARD ARE AS FOLLOWS:
   1, 3 THROUGH 5, 7, 9, 10, 12 THROUGH 14, 17 THROUGH 20, & 22.
4. CW ON POTENTIOMETER INDICATES CLOCKWISE ROTATION OF ACTUATOR.

Figure 6-4. Type 72338 21.4-MHz IF Amplifier (200-kHz BW) (A2A3), Schematic Diagram



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
 a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
 b) CAPACITANCE IS MEASURED IN pF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. CW ON R1, R5 DENOTES CLOCKWISE ROTATION OF ACTUATOR.
4. FOR U1 LEAD ARRANGEMENT, SEE DETAIL A.
5. FOR U2 LEAD ARRANGEMENT, SEE DETAIL B.

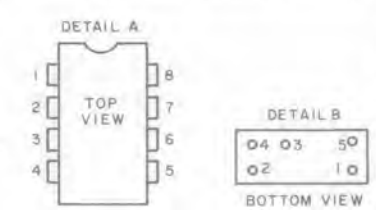
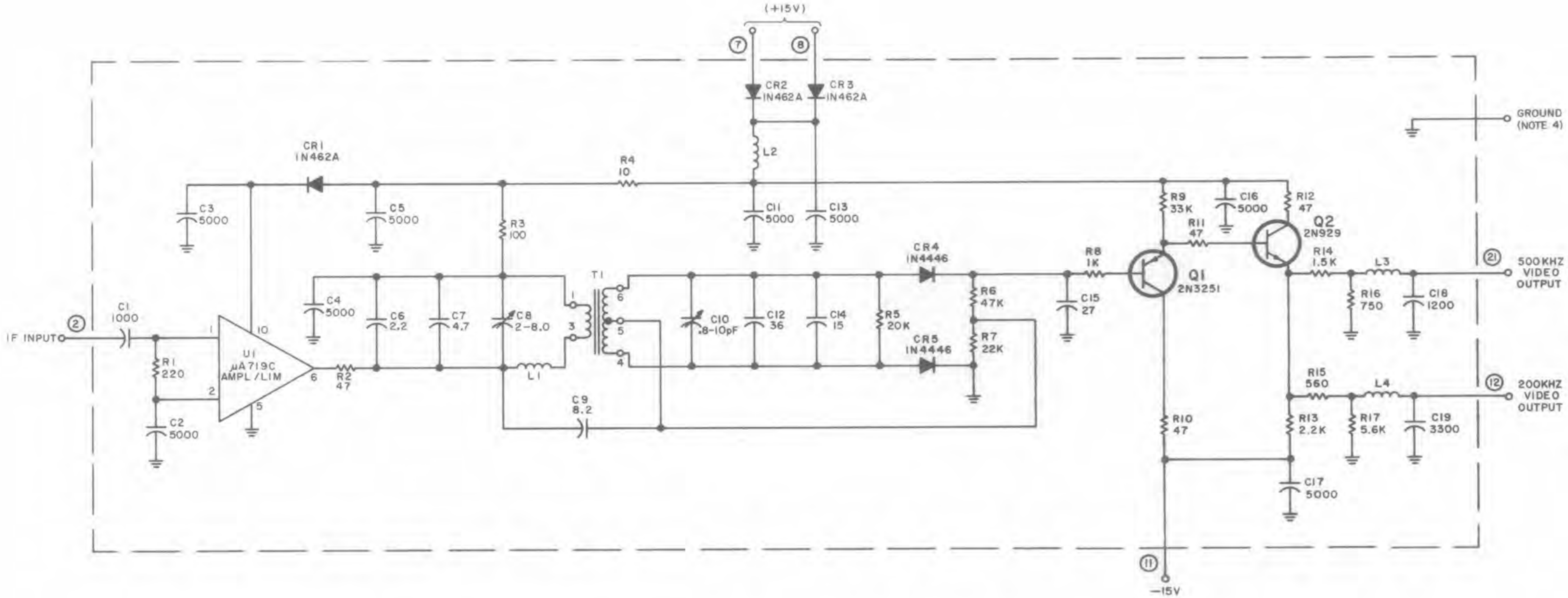
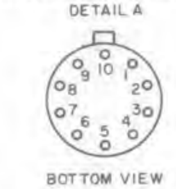


Figure 6-5. Type 72343 IF Output Amplifier (A2A5), Schematic Diagram



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W
   b) CAPACITANCE IS MEASURED IN pF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. FOR U1 LEAD ARRANGEMENT, SEE DETAIL A.

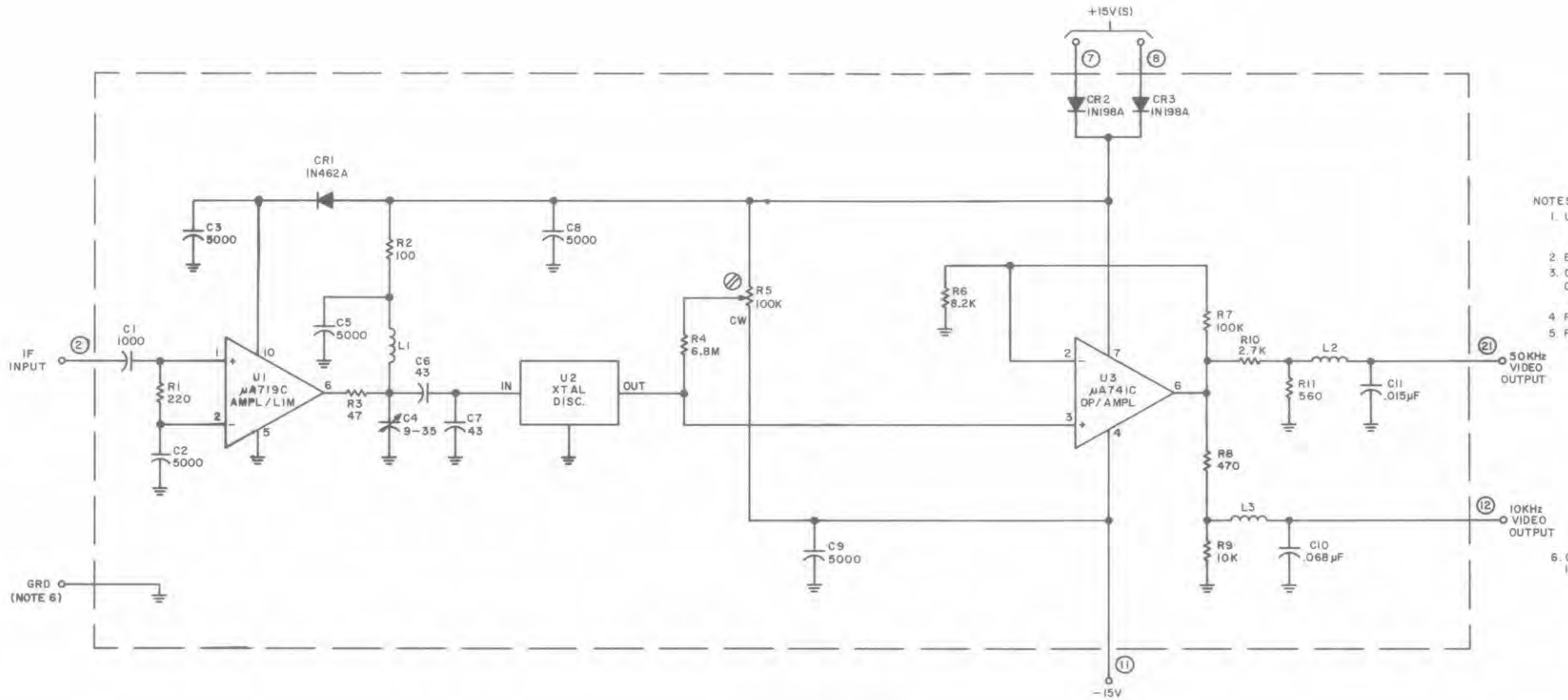
DETAIL A



BOTTOM VIEW

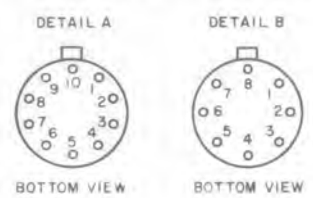
4. GROUND PINS FOR PC BOARD ARE AS FOLLOWS: 1,3 THRU 6, 9, 10, 13 THRU 20, AND 22.

Figure 6-6. Type 79814 FM Limiter/Discriminator (200 and 500-kHz BW) (A2A6), Schematic Diagram



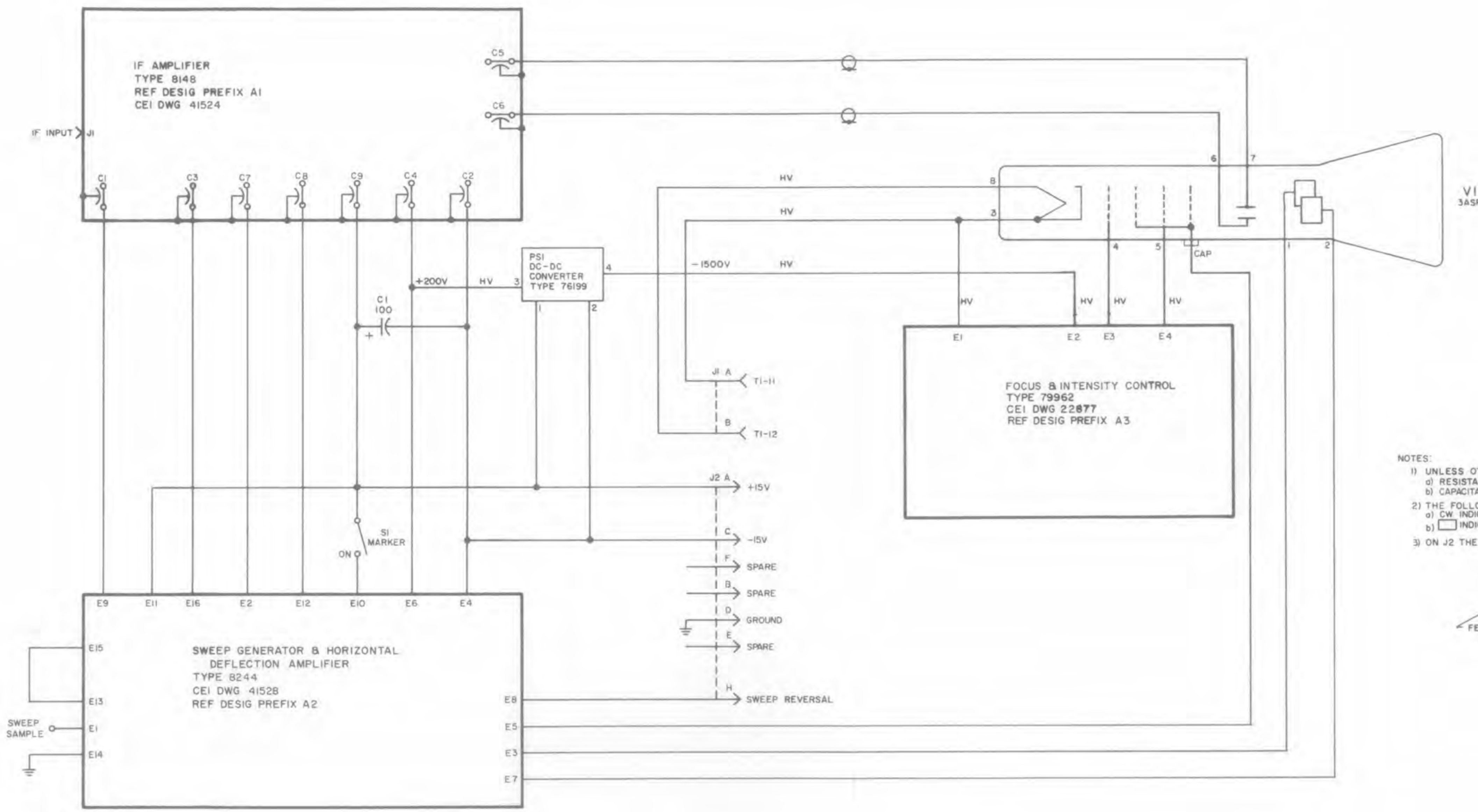
NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN pF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. CW ON POTENTIOMETER INDICATE CLOCKWISE ROTATION OF ACTUATOR.
   b) ⊘ INDICATES SCREWDRIVER ADJUSTMENT.
4. FOR U1 LEAD ARRANGEMENT, SEE DETAIL A.
5. FOR U3 LEAD ARRANGEMENT, SEE DETAIL B.



6. GROUND PINS FOR THIS MODULE ARE 1, 3 THRU 6, 9, 10, 13 THRU 20, & 22.

Figure 6-7. Type 79813 FM Limiter/Discriminator (10 and 50-kHz BW) (A2A7), Schematic Diagram



NOTES:
1) UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
b) CAPACITANCE IS MEASURED IN µF.
2) THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
a) CW INDICATES CLOCKWISE ROTATION.
b) ☐ INDICATES FRONT PANEL CONTROL.
3) ON J2 THE FEMALE GUIDE PIN IS NEXT TO PIN A AS SHOWN:

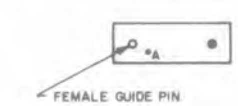


Figure 6-8. Type 79829 Spectrum Display Unit (A3), Schematic Diagram

RWISE SPECIFIED:
E IS IN OHMS ±5%, 1/4 W.
E IS IN μF.
H VOLTAGE TYPE.

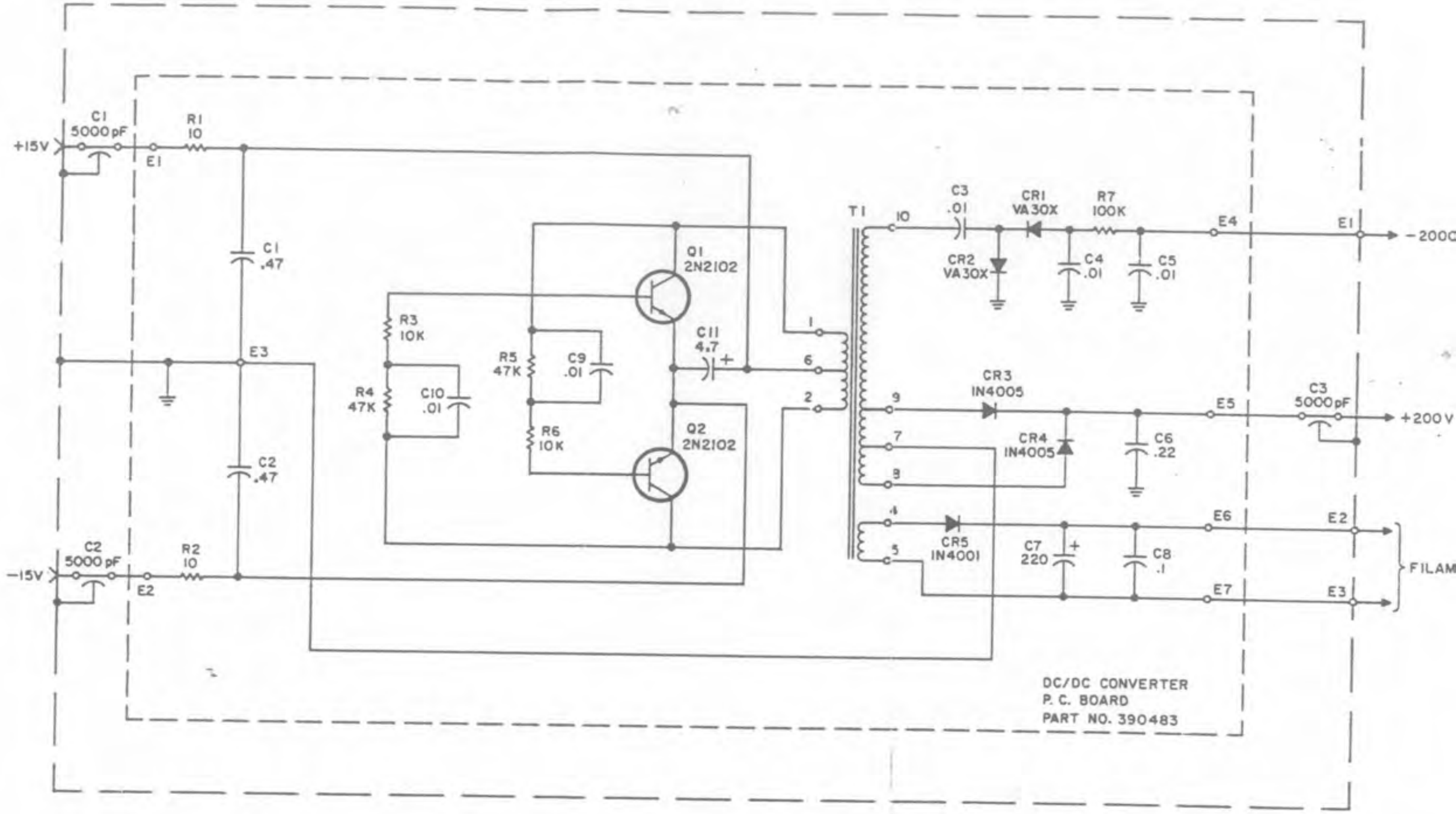
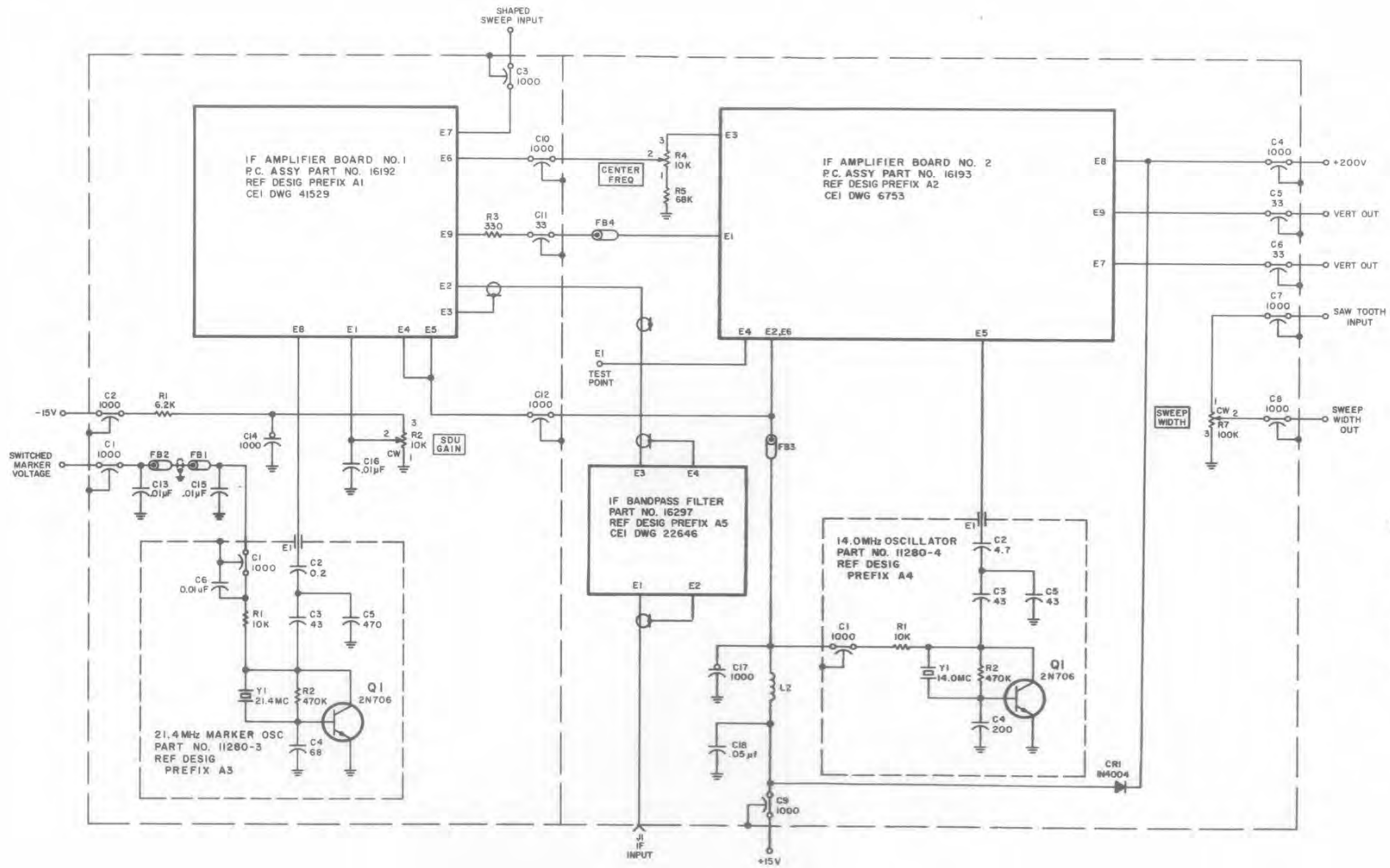


Figure 6-20. Type 798096-1, DC/DC Converter (A
Schematic Diagram 480275



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN pf.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. PREFIX THE PART DESIGNATIONS WITH A105A1.
3. THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
   a) CW INDICATES CLOCKWISE ROTATION
   b) ▭ INDICATES FRONT PANEL CONTROL.
4. NOMINAL VALUE. FINAL VALUE TO BE FACTORY SELECTED

Figure 6-9. Type 8148 IF Amplifier (A3A1), Schematic Diagram

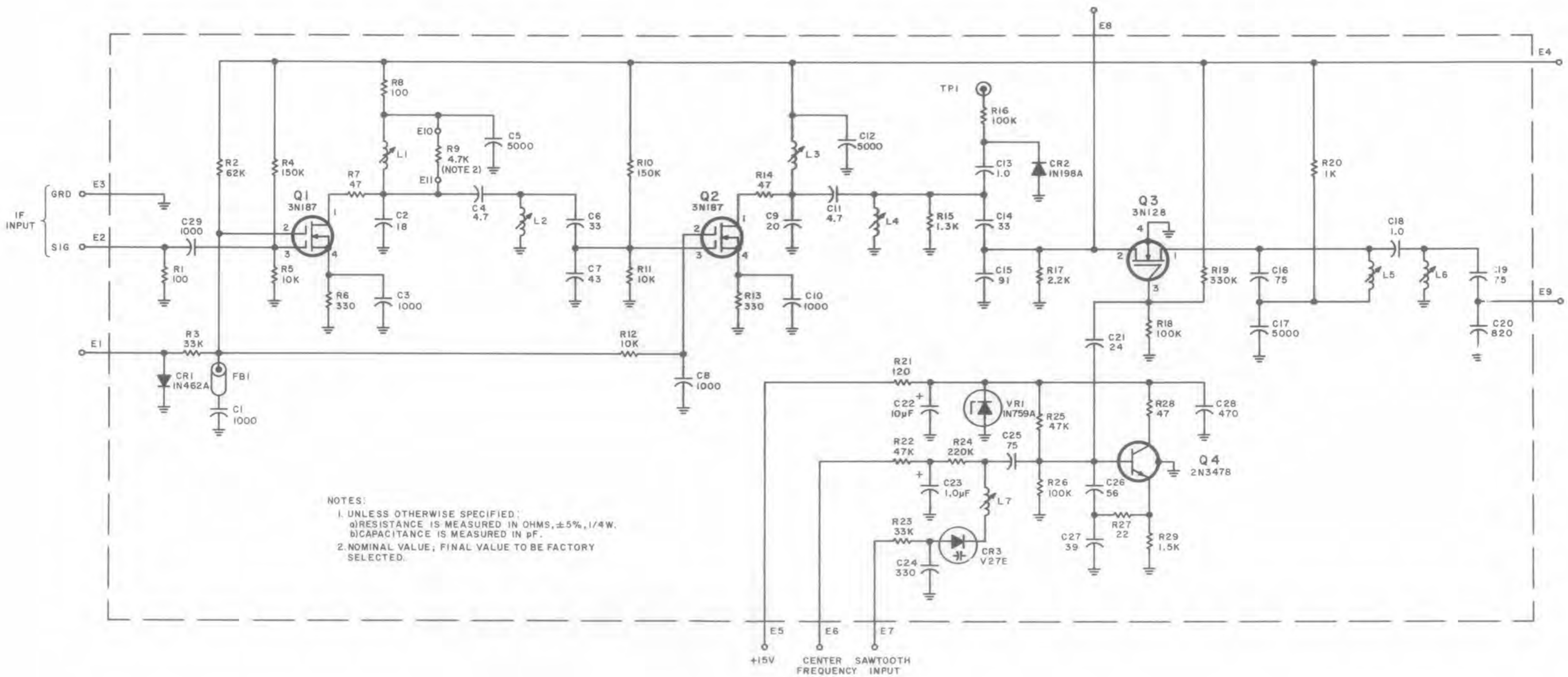


Figure 6-10. Part 16192 IF Amplifier Board No. 1 (A3A1A1), Schematic Diagram

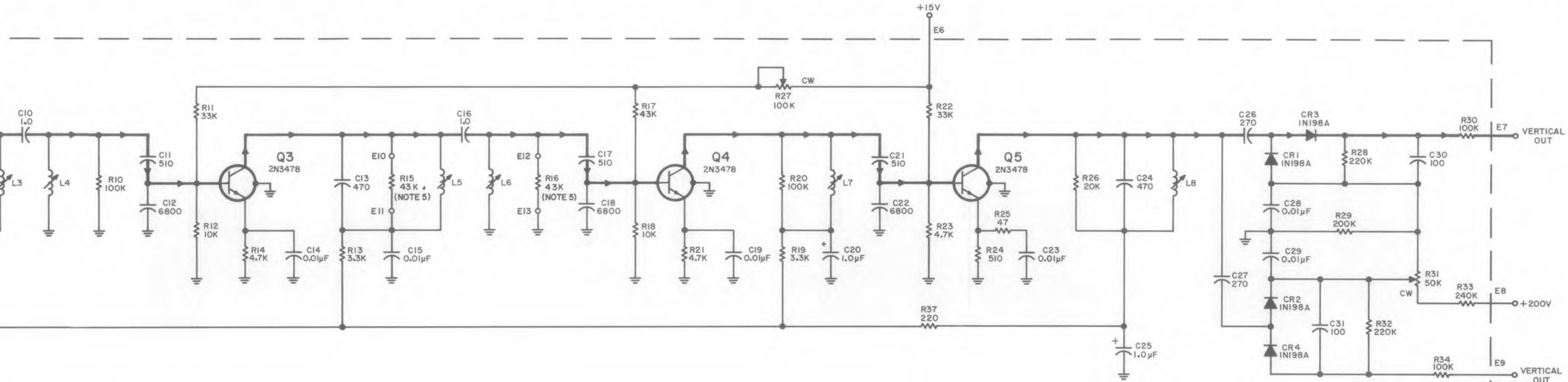
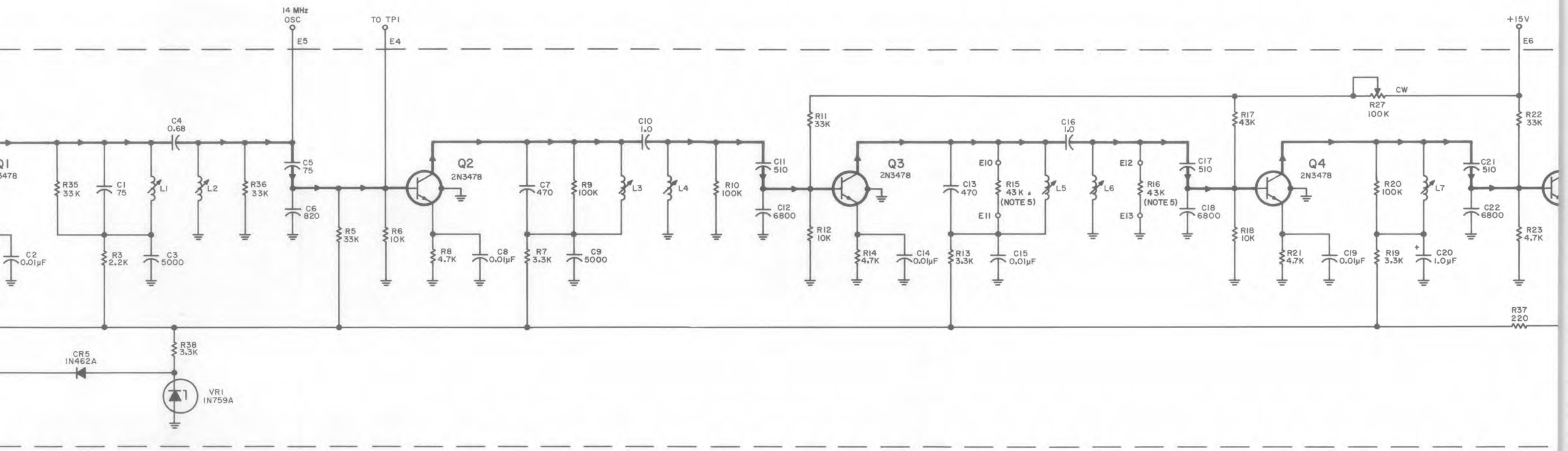
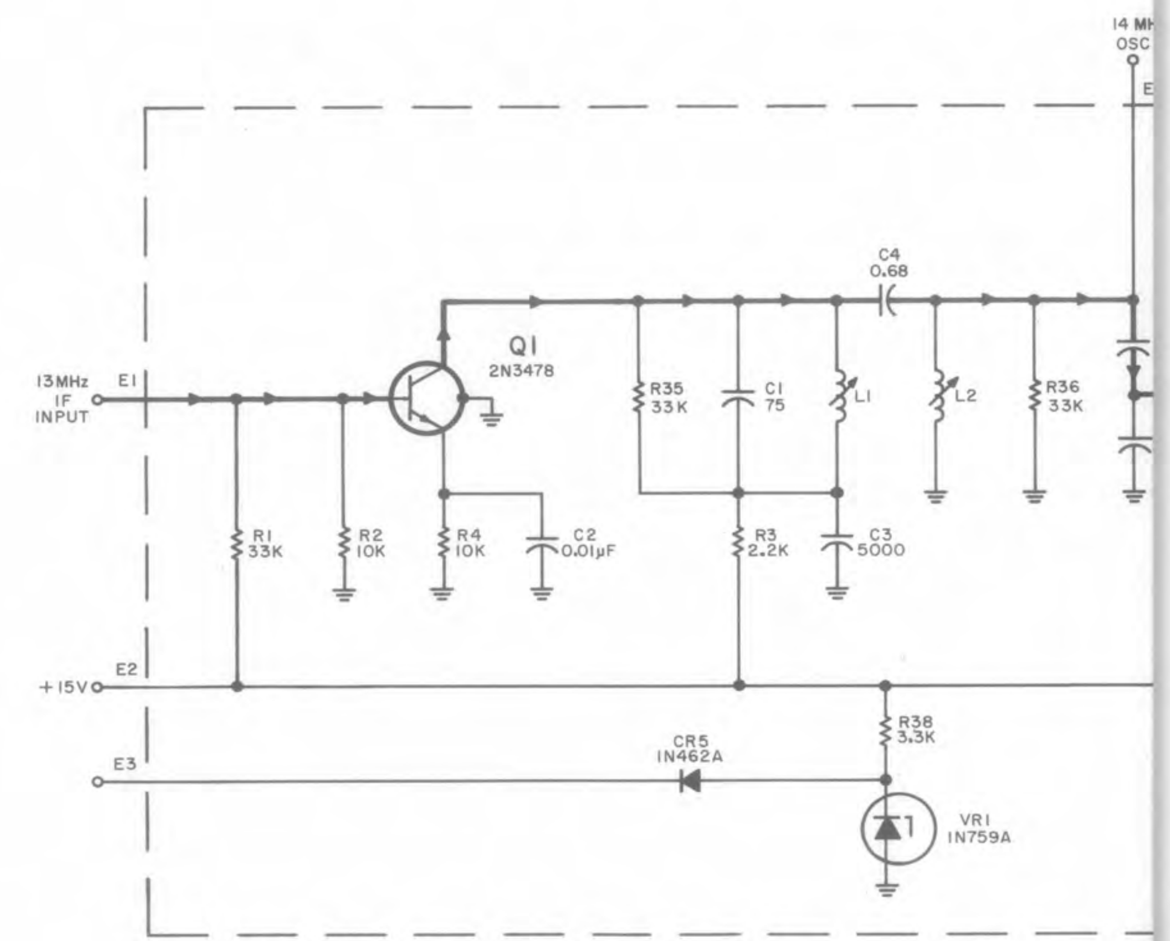


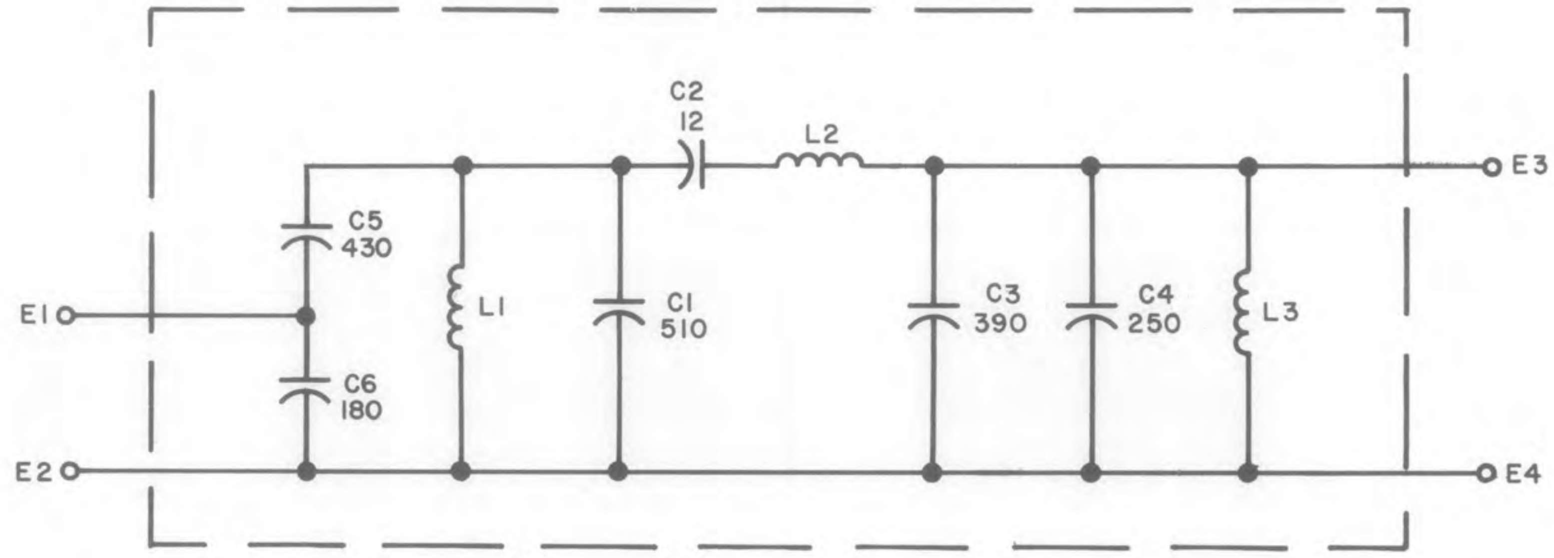
Figure 6-11. Part 16193 IF Amplifier Board No. 2 (A3A1A2), Schematic Diagram



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
 a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
 b) CAPACITANCE IS MEASURED IN pF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. CW INDICATES CLOCKWISE ROTATION.
4. HEAVY LINE INDICATES MAIN SIGNAL PATH.
5. NOMINAL VALUE, FINAL VALUE TO BE FACTORY SELECTED

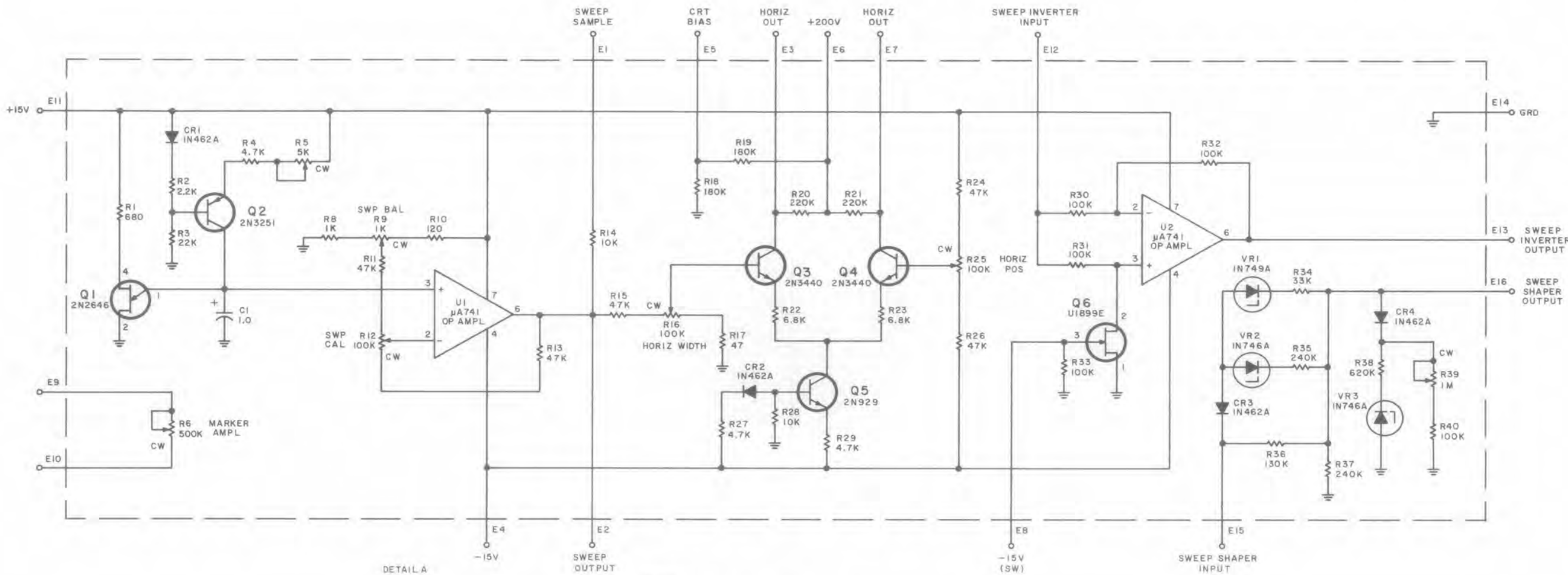


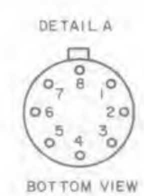
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHM
   b) CAPACITANCE IS MEASURED IN pF.
2. ENCIRCLED NUMBERS ARE MODULE PI
3. CW INDICATES CLOCKWISE ROTATION.
4. HEAVY LINE INDICATES MAIN SIGNAL
5. NOMINAL VALUE, FINAL VALUE TO E SELECTED



NOTES:
a. CAPACITANCE IS MEASURED IN pF

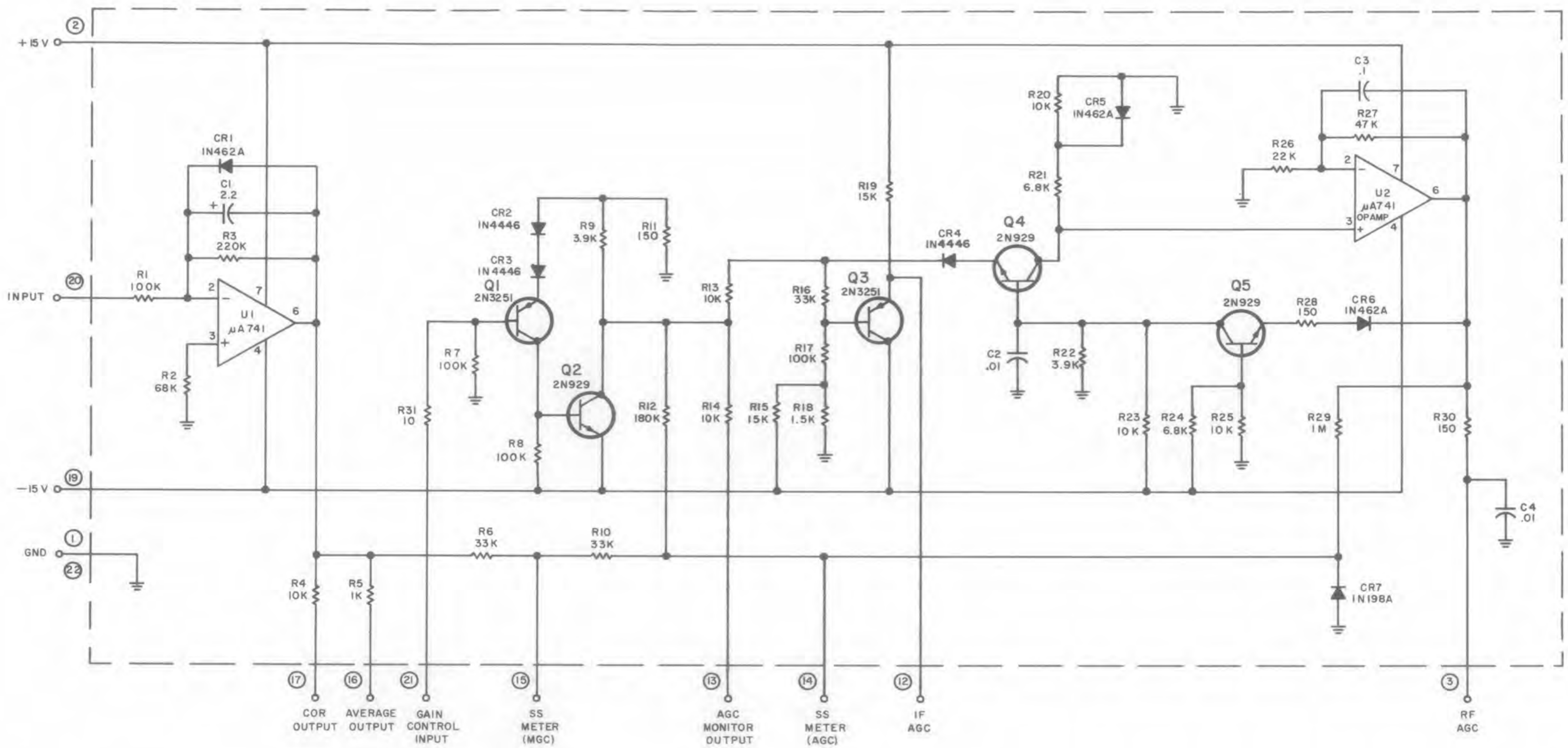
Figure 6-12. Part 16297 Bandpass Filter (A3A1A5), Schematic Diagram





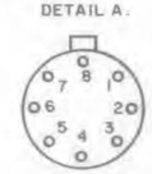
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN μF.
2. FOR U1,U2 LEAD ARRANGEMENT, SEE DETAIL A.
3. CW ON POTENTIOMETERS INDICATES CLOCKWISE ROTATION OF ACTUATOR.

Figure 6-13. Type 8244 Sweep Generator and Horizontal Deflection Amplifier (A3A2), Schematic Diagram



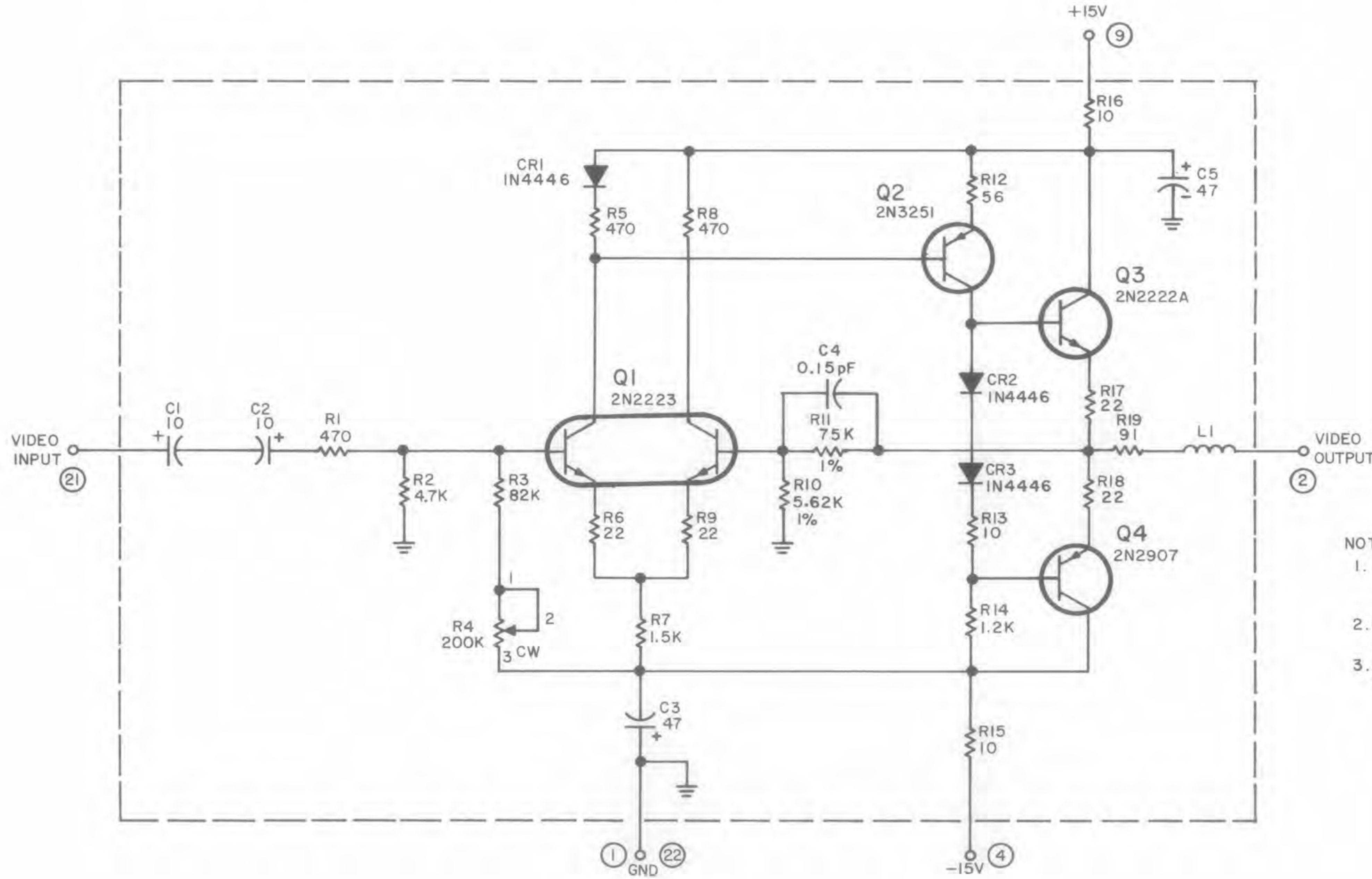
NOTES:
1. UNLESS OTHERWISE SPECIFIED
a) RESISTANCE IS MEASURED IN OHMS ± 5%, 1/4 W.
b) CAPACITANCE IS MEASURED IN µF
2. FOR U1 AND U2 LEAD ARRANGMENT SEE DETAIL A.

DETAIL A.



BOTTOM VIEW

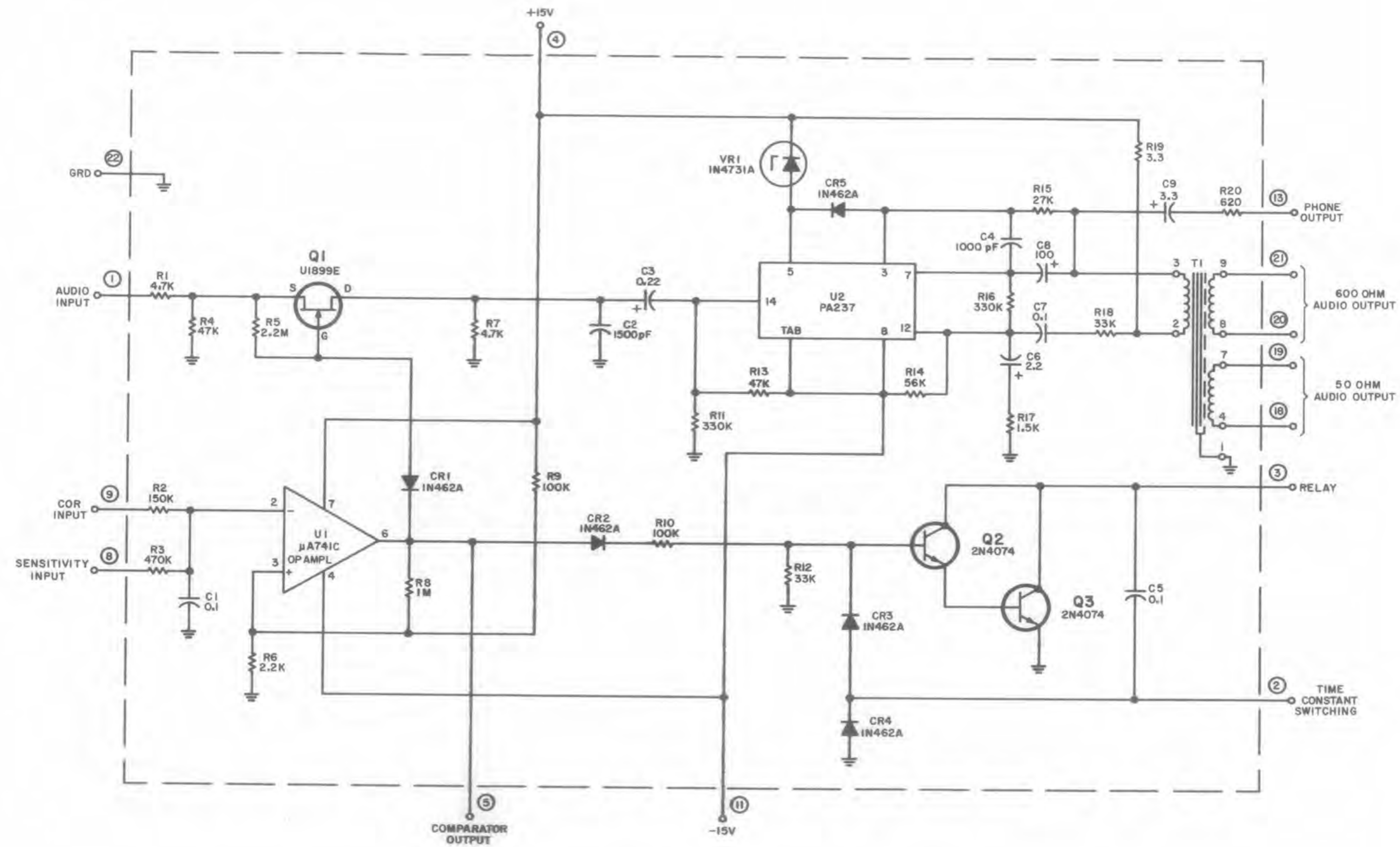
Figure 6-14. Type 7890 AGC Amplifier (A4), Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4 W.
   b) CAPACITANCE IS IN μF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. CW ON R4 INDICATES CLOCKWISE ROTATION OF ACTUATOR.

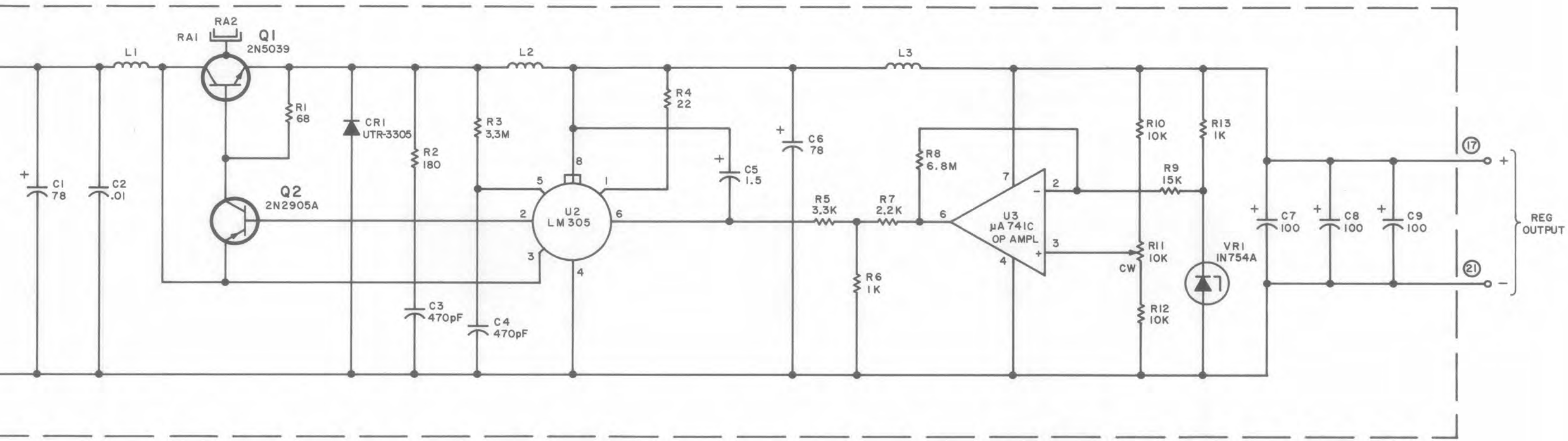
Figure 6-15. Type 7374 Video Amplifier (A5), Schematic Diagram



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

Figure 6-16. Type 7446 Audio, COR, and Squelch Amplifier (A6), Schematic Diagram

P.

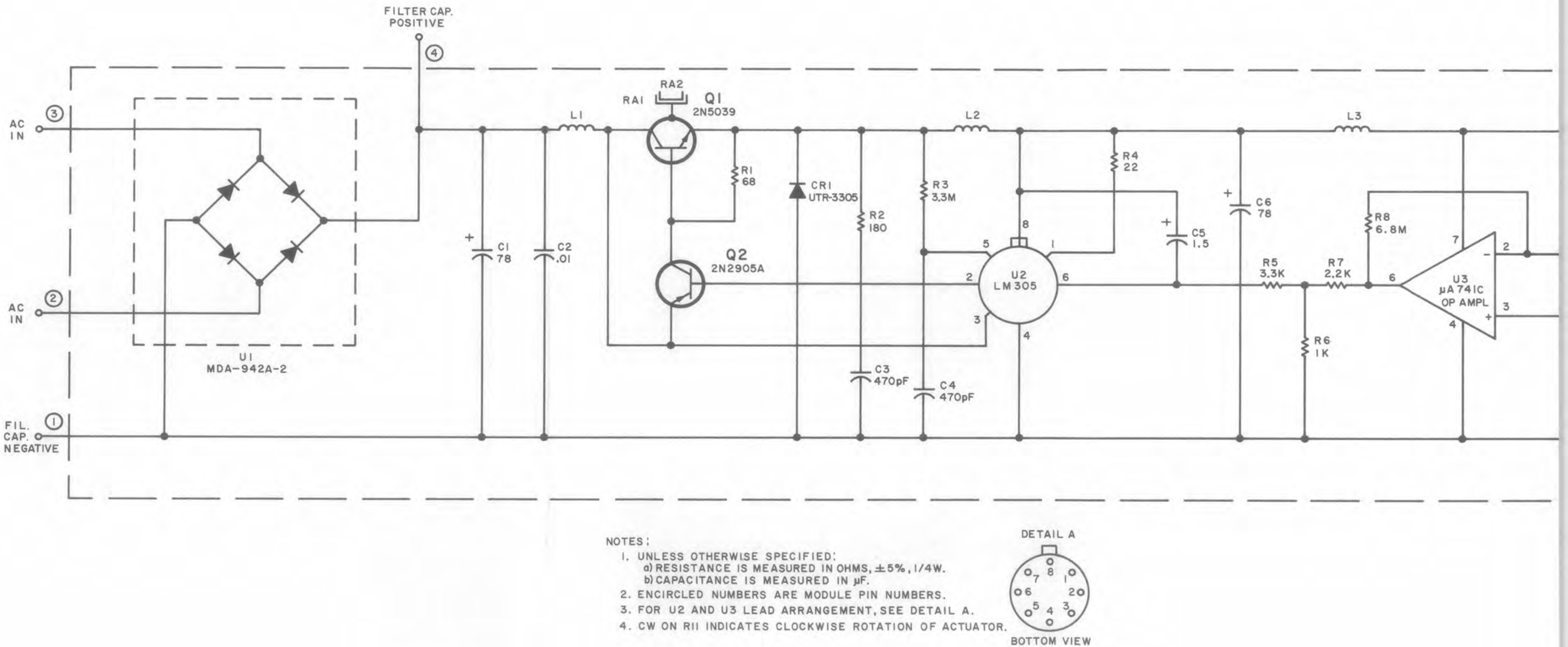


NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN μF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. FOR U2 AND U3 LEAD ARRANGEMENT, SEE DETAIL A.
4. CW ON R11 INDICATES CLOCKWISE ROTATION OF ACTUATOR.

DETAIL A

BOTTOM VIEW

Figure 6-17. Type 76200 ±15V Power Supply (A7, A8), Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN μF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. FOR U2 AND U3 LEAD ARRANGEMENT, SEE DETAIL A.
4. CW ON R11 INDICATES CLOCKWISE ROTATION OF ACTUATOR.

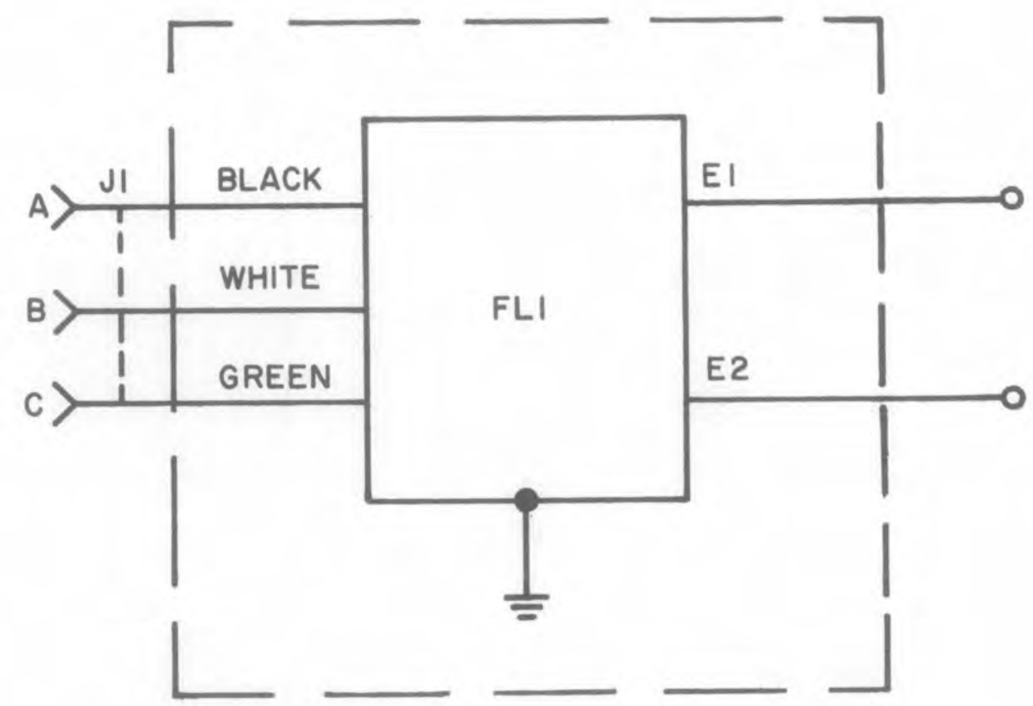


Figure 6-18. Type 79835 RFI Filter Assembly (A9), Schematic Diagram

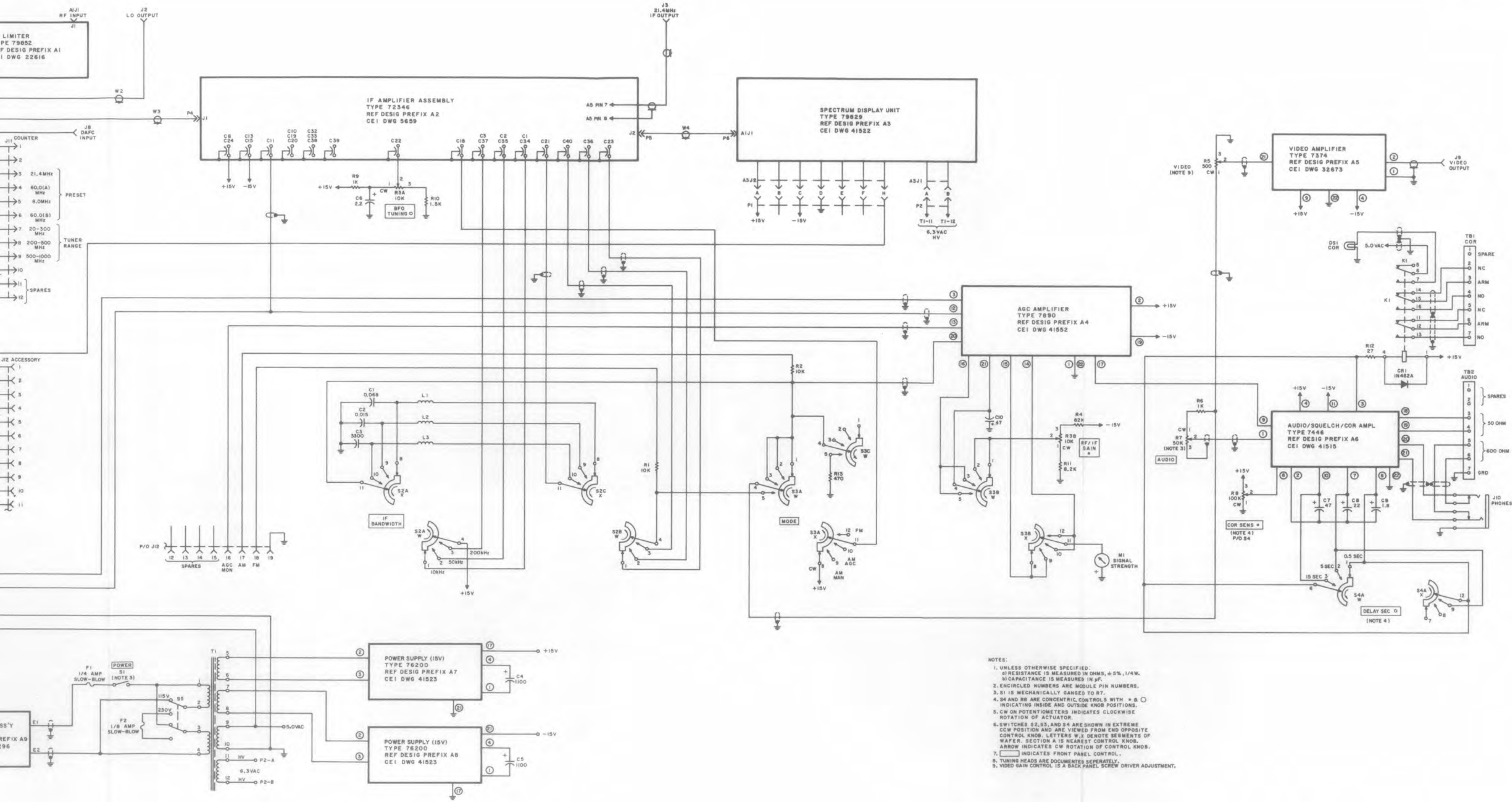
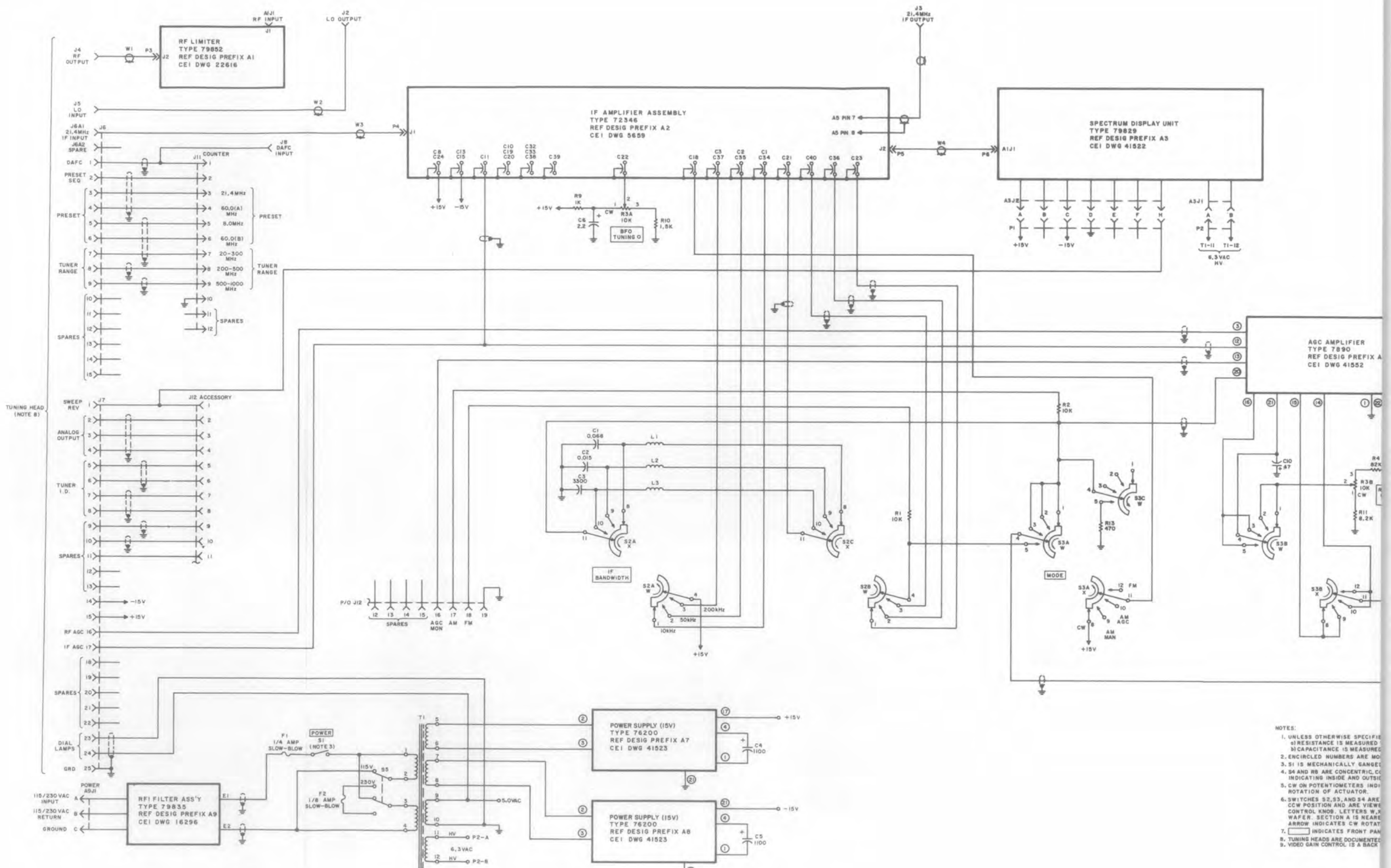


Figure 6-19. Type 560 Receiver, Main Chassis Schematic Diagram


RF LIMITER
TYPE 79852
REF DESIG PREFIX A1
CEI DWG 22616
IF AMPLIFIER ASSEMBLY
TYPE 72346
REF DESIG PREFIX A2
CEI DWG 5659
SPECTRUM DISPLAY UNIT
TYPE 79829
REF DESIG PREFIX A3
CEI DWG 41522
AGC AMPLIFIER
TYPE 7890
CEI DWG 41552
POWER SUPPLY (15V)
TYPE 76200
REF DESIG PREFIX A7
CEI DWG 41523
POWER SUPPLY (15V)
TYPE 76200
REF DESIG PREFIX A8
CEI DWG 41523
RFI FILTER ASS'Y
TYPE 79835
REF DESIG PREFIX A9
CEI DWG 16296
TUNING HEAD (NOTE 8)
PRESET
TUNER RANGE
SPARES
SWEEP REV
ANALOG OUTPUT
TUNER I.D.
DIAL LAMPS
RF AGC
IF AGC
GRD
J12 ACCESSORY
COUNTER
21.4MHz
20-300 MHz
200-500 MHz
500-1000 MHz
BFO TUNING O
IF BANDWIDTH
MODE
200kHz
50kHz
10kHz
F1 1/4 AMP SLOW-BLOW
F2 1/8 AMP SLOW-BLOW
POWER S1 (NOTE 3)
115V
230V
5.0VAC
6.3VAC
115/230 VAC INPUT
115/230 VAC RETURN
GROUND
+15V
-15V
NOTES: