INSTRUCTION MANUAL
FOR
TYPE 205-2 RECEIVER

INTRODUCTION

The Type 205-2 Receiver is a modified Type 205. Section VII of this manual details the circuit modifications and provides schematic diagrams and parts lists. Sections I through VI of this manual describe the Type 205 Receiver and in most cases this information is directly applicable.

WATKINS-JOHNSON COMPANY
CEI DIVISION
6006 EXECUTIVE BOULEVARD
ROCKVILLE, MARYLAND 20852

ADDENDA

The following changes should be made to Figure 6-20. Type 205 Receiver, Main Chassis Schematic Diagram for all 205 Receivers:

(1) Remove connection between pin F of jack J7 and terminal E2 of line filter FL1.

(2) Make a connection between J7 pin F and the junction of switch S5 arm and pin 2 of T1.

(3) Show connection made in step (2) as part of shielded cable with pins A and C of jack J7.

The following changes should be incorporated in the electrical parts lists and schematic diagrams for the 205 Receiver, where applicable:

<u>Type 72292 21.4-MHz IF Amplifier (50-kHz BW) (A2A2) Parts List</u>

Change R8 from 47 Ω to 33 Ω, 5%, 1/4W, 1, RCR07G330JS, 81349

Change R20 from 1 K to 1.2 K, RCR07G122JS, 81349

<u>Type 72292 21.4-MHz IF Amplifier (10-kHz BW) (A2A1) and Type 72293 21.4-MHz IF Amplifier (50-kHz BW) (A2A2), Schematic Diagram</u>

Change R8 from 47 to (NOTE 3)

At NOTE 3:

(1) Change 72292 R20 from 1 K to 1.2 K

(2) Add R8 column as follows:

	R8
72292	33
72293	47

<u>Type 72291 21.4-MHz IF Amplifier (300-kHz BW) (A2A3)</u>

Change C23 from 130 pF to 150 pF, 5%, 500V, CM05FD151J03

Change C25 from 390 pF to 300 pF, 5%, 500V, CM05FD301J03

<u>Type 79611 Ramp Generator and IF Selector Switch (A6)</u>

Item	From	To	Mfr. Part No.	Mfr. Code
C3	3.3 μF	3.6 μF, 10%, 60V	109D365X9060C2	56289
R14	3.3 kΩ	3.0 kΩ, 5%, 1/4W	RCR07G302JS	81349

Type 79619 Sweep Control (A7), Parts List

Item	From	To	Mfr. Part No.	Mfr. Code
R13	Wire-Wound, 1W	Film, 3/4W (Tempco ±50 PPM)	89PR5KZ	73138

Type 79612 Marker Generator and Over-Sweep (A8)

Change wattage to 0.1W at R6 through R13.

Type 76179 ±10V and +30V Precision Power Supply Regulator

Item	From	To	Mfr. Part No.	Mfr. Code
R5, R18	Wire-Wound, 1W	Film, 3/4W (Tempco ±50 PPM)	89PR500Z	73138
R8	Wire-Wound, 1W	Film, 3/4W (Tempco ±50 PPM)	89PR200Z	73138

INSTRUCTION MANUAL

FOR

TYPE 205 RECEIVER

WATKINS-JOHNSON COMPANY
CEI DIVISION
6006 EXECUTIVE BOULEVARD
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BJ/200/9/15/70/JSW

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.

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Table 1-1. Type 205 Receiver, Specifications

Tuning Modes	Panoramic or Manual
Types of Reception	AM, FM, or Pulse
Frequency Range	2-1000 MHz using plug-in tuning heads
IF Bandwidths	10 kHz, 50 kHz, 300 kHz and 1 MHz
IF Center Frequency	21.4 MHz
AGC Type	Pulse and Average AGC in manual tuning; Logarithmic in panoramic tuning
Manual Gain Control	All IF's
Video Output Capability	1V, rms, into 100-ohm load
Video Output Response	Within 3 dB from 50 Hz to 2 MHz
Audio Output	100 mW across 600 Ω, balanced or unbalanced
Predetection IF Output	50 mV, minimum into 50 Ω load for input signals above AGC threshold
AFC Input	±4V produces a frequency change of 0.3% of the installed band. Positive-going voltage produces decreasing frequency
LO Output	50 mV, minimum into a 50-ohm load
SM Output	1.7 mV, minimum, for signals above AGC threshold
Tuning Voltage Input	+10.3V for high band edge to -10.3V for low band edge
Ramp Output	Will deliver a ±0.5V ramp into a 10 kΩ load
Marker Output	0, +0.5V, and +1.2V corresponding to blanking, normal intensity, and high intensity conditions
FM Output	4V P-P into 200 ohm load, when deviation equals the IF bandwidth
AM Output	1.2V P-P into 200 ohm load with 50% modulation
COR Sensitivity Range	Full range of the control will allow operation from noise to complete cutoff
COR Output	Normally open, normally closed, and common contacts from Carrier Operated Relay
AGC Monitor Output	Negative-going logarithmic-type voltage indicates relative signal strength for signals above AGC threshold
External Blanking Input	+18V input will blank marker output
Over-Sweep Indicator	+15V when oversweep exists; zero volts normal condition
Tuning Voltage Monitor	-10V at low band edge to +10V at high band edge
Sweep Rate	Continuously variable from 0.04 to 25 sweeps per second
Sector Width	Continuously variable from zero to the full frequency range of installed tuner
Fine Tuning Range	Greater than 0.1% of the tuned frequency
Meters	Tuning and Signal Strength
Input Power	115/230 Vac, 50-400 Hz
Power Consumption	25 watts, approximately
Size	19 inches wide, 3.5 inches high, and 16 inches deep
Weight	20 lbs., approximately

Figure 1-1. Type 205 Receiver, Front View

SECTION I

GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

1.1.1 The 205 Receiver is a voltage-tuned unit designed for sweeping or manual tuning. It provides frequency coverage from 2 to 1000 MHz using nine plug-in tuning heads. Additional tuning heads may be developed in the future to include other ranges. One tuning head can be installed in the receiver at a time, or an accessory TSU-160 Tuner Switching Unit can be used which allows switch selection of up to seven tuning heads for the receiver.

1.1.2 The receiver is normally operated with a display unit such as the type SM-7301 and a digital readout such as the DRO-308. If operation with certain tuning heads is planned, then a digital readout extender such as the DRX-308 is required for use with the DRO-308.

1.1.3 In the manual tuning mode, the receiver provides AM, FM, and pulse reception. In AM, either manual or automatic gain control may be selected. The operator may select IF bandwidths of 10, 50, or 300 kHz, or 1 MHz. A COR SENSITIVITY control allows the operator to set the carrier operated relay threshold. A front-panel lamp indicates COR activity. Controls are also provided to set video and audio gain. In addition, a FINE TUNING control allows the operator to make small tuning adjustments.

1.1.4 In the manual mode, the receiver's local oscillator can be locked to an external counter having DAFC (digital automatic frequency control). The receiver's frequency stability under these conditions approaches the stability of the counter's internal reference source. A control voltage is applied to the associated frequency counter which selects the operating mode of the counter from a rear panel jack.

1.1.5 One of two sweeping modes may be selected for operation: PAN or SECTOR. In the PAN mode, the entire frequency range of the installed tuner is swept. The sweep rate may be varied by a front-panel control from about one sweep every 25 seconds to 25 sweeps per second. At the end of each sweep, the manual tuning voltage from the tuning head is inverted and returned to the tuning head for 5 ms so that the associated frequency counter can count and display the manually tuned frequency. In addition, a +18V level is removed from the counter which signifies that the receiver is operating in one of its two sweeping modes and a trigger pulse is applied to the counter which initiates its operating cycle.

1.1.6 When the SECTOR mode has been chosen, any segment of the installed tuning head, from zero to the full frequency range, may be swept. A front-panel SECTOR WIDTH control has been provided for this purpose. The sector being scanned is also influenced by the manual tuning control. The manual tuning voltage and the sweeping voltage are summed. The sector being scanned can be increased or decreased in frequency, within the limits of the installed tuner, by the manual tuning control. This means that the center of the sector being scanned will be the manually tuned frequency if the receiver is switched from the SECTOR to the MAN mode. The operation of the associated frequency counter is the same in the SECTOR mode as in the PAN mode.

1.1.7 In the PAN and SECTOR tuning modes the receiver automatically selects the optimum IF bandwidth. In the PAN mode, this is usually one of the wider IF bandwidths depending on the frequency range of the installed tuner. The same IF bandwidth will be selected for SECTOR operation when the sector width is 25% of the installed tuner bandwidth or greater. When the sector width has been reduced to less than 25%, a more narrow IF bandwidth will be selected by the receiver to increase the visual resolution of the associated display unit.

1.1.8 The receiver provides horizontal, vertical, and intensity modulation outputs to an associated display. In the PAN mode, a portion of the CRT trace will be intensified corresponding to the section of the band which will be scanned if the receiver is switched to the SECTOR mode.

1.1.9 Signal inputs to the receiver include RF input, AFC input, external blanking, and tuning voltage. The outputs include loudspeaker, counter, fan, IF output, video output, LO output, SM output, ramp, marker, SM, audio, FM, AM, COR, AGC, oversweep, and tuning voltage monitor. Pertinent specifications are listed in Table 1-1.

1.2 MECHANICIAL CHARACTERISTICS

1.2.1 The Type 205 Receiver is designed for mounting in a standard 19-inch rack. As shown in Figures 1-1 and 5-1, all of the operating controls are located on the front panel. Although shown in both illustrations, the tuning head is not a part of the receiver. The one shown is the type VH-12 which tunes from 60 to 120 MHz. The other eight tuning heads are very similar in appearance and cover the remaining frequency spectrum from 2 to 1000 MHz.

1.2.2 Input and output connections are made at the rear apron. As shown in Figure 5-2, a variety of connector types are employed. The rear apron additionally contains the primary power select or switch and the line fuses.

1.2.3 The front, rear, and side panels of the receiver are made of aluminum as well as the top and bottom dust covers, main deck, and tuner housing. The main chassis contains twelve subassemblies. Ten of these are constructed on plug-in printed wiring boards. The two remaining subassemblies are in brass chassis which have been silver plated and gold flashed for improved conductivity and to prevent tarnishing. One of the two brass chassis contains the IF amplifier which is constructed on eight plug-in printed wiring boards located inside the brass chassis.

1.3 EQUIPMENT SUPPLIED

This equipment consists of the Type 205 Receiver only. The dimensions and weight of the unit are given in Table 1-1.

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED

1.4.1 In the MAN tuning mode, the receiver is capable of independent operation. For audio monitoring, 600-ohm headphones such as the Telex HM-50 are required, or any other 600-ohm audio device which contains a loudspeaker and can be connected to a rear-apron terminal strip.

1.4.2 If digital automatic frequency control in the MAN mode is desired, a Type DRO-308 Counter is required. If tuners operating higher than 300 MHz will be used, a Type DRX-308 Readout Extender will be required for the DRO-308 Counter.

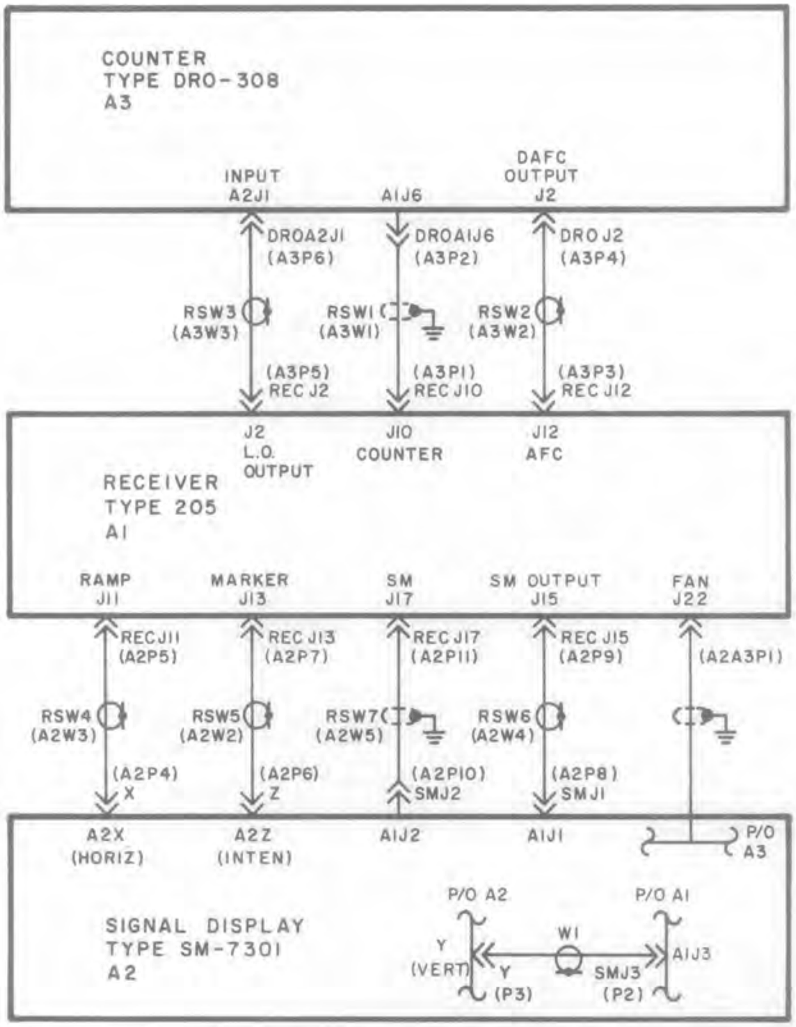
1.4.3 A display unit is required for operation in the PAN and SECTOR tuning modes. The Type SM-7301 Signal Display will serve as an RF pan display during the two sweeping modes and will automatically convert to an IF pan display when the receiver is switched to the MAN tuning mode.

1.4.4 In any mode of operation, a least one plug-in tuning head is required, based on the operating frequency ranges of interest. The following tuning heads are presently available:

MODEL	FREQUENCY RANGE
HH-11	2 to 30 MHz
VH-11	30 to 60 MHz
VH-12	60 to 120 MHz
VH-13	100 to 180 MHz
VH-14	180 to 300 MHz
VH-15	20 to 40 MHz
VH-16	40 to 80 MHz
UH-11	250 to 500 MHz
UH-12	500 to 1000 MHz

1.4.5 The combination of 205 Receiver, DRO-308 Counter, and SM-7301 Signal Display form the basic RS-160 Receiving System. Figure 1-2 illustrates the equipment interconnections. Cables necessary to interconnect the 205 Receiver and SM-7301 Signal Display are shipped with the SM-7301 and the cables which interconnect the 205

Receiver and the DRO-308 are shipped with the Counter. When a DRX-308 Frequency Extender is to be used, the necessary cables and installation instructions are shipped with the Extender.



NOTE: True reference designations for connectors and cable assemblies are shown in parentheses. The apparent reference designations shown adjacent to the true reference designations are the markings on the cable bands. These markings have been chosen to simplify the installation of the cables.

Figure 1-2. Type RS-160 Receiving System Interconnection Diagram

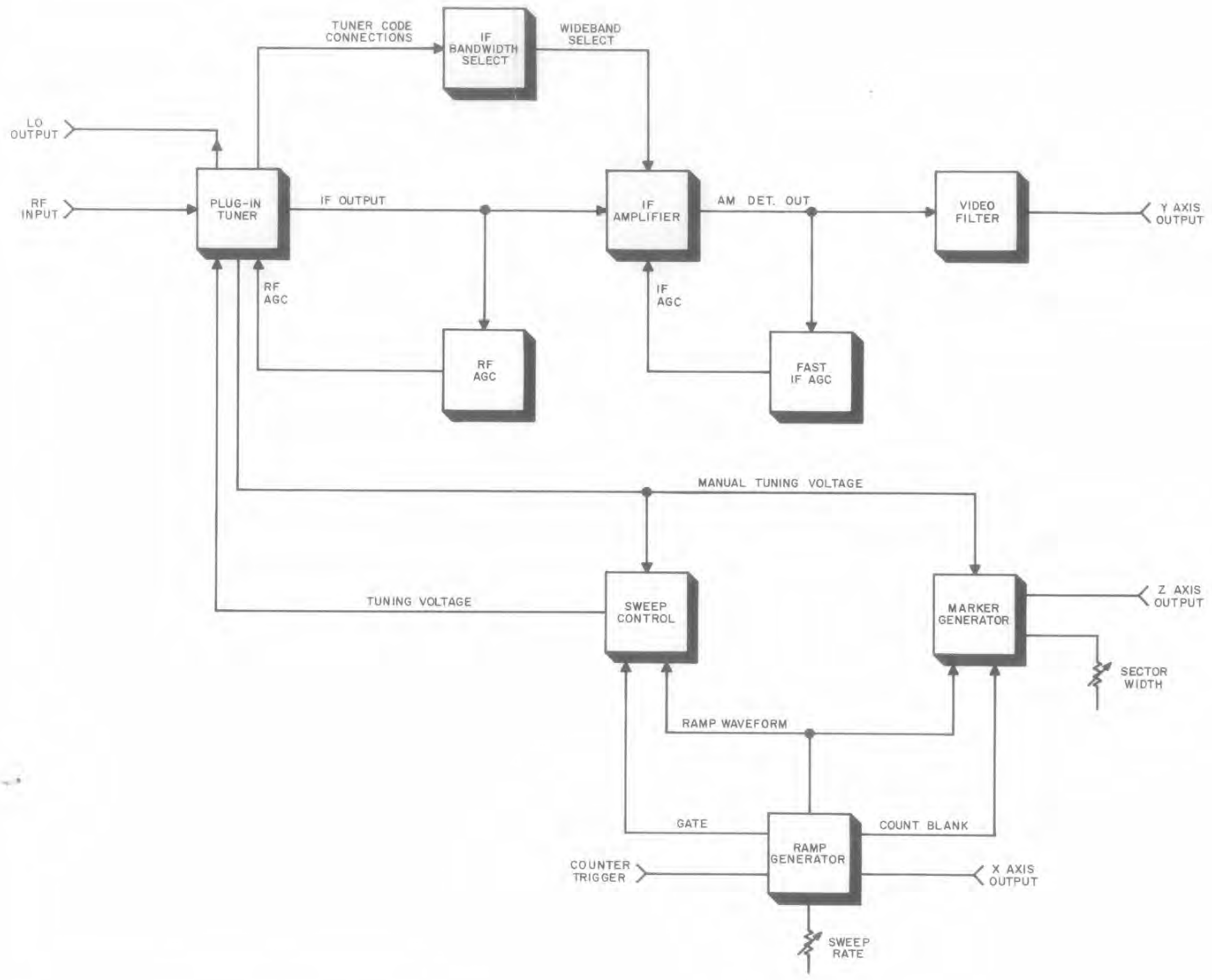


Figure 2-1a. Type 205 Receiver, Simplified Block Diagram, PAN Mode

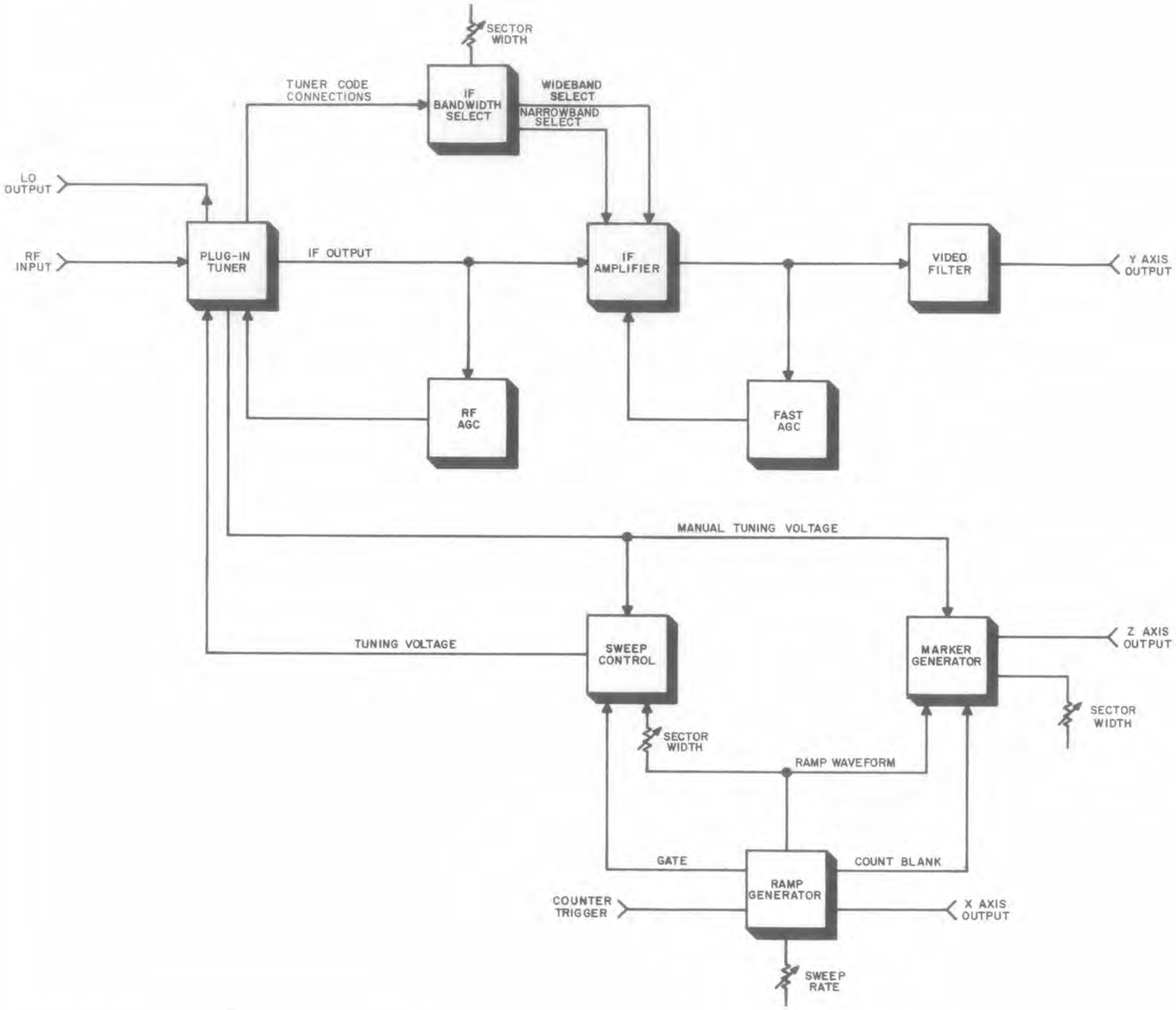


Figure 2-1b. Type 205 Receiver, Simplified Block Diagram, SECTOR Mode

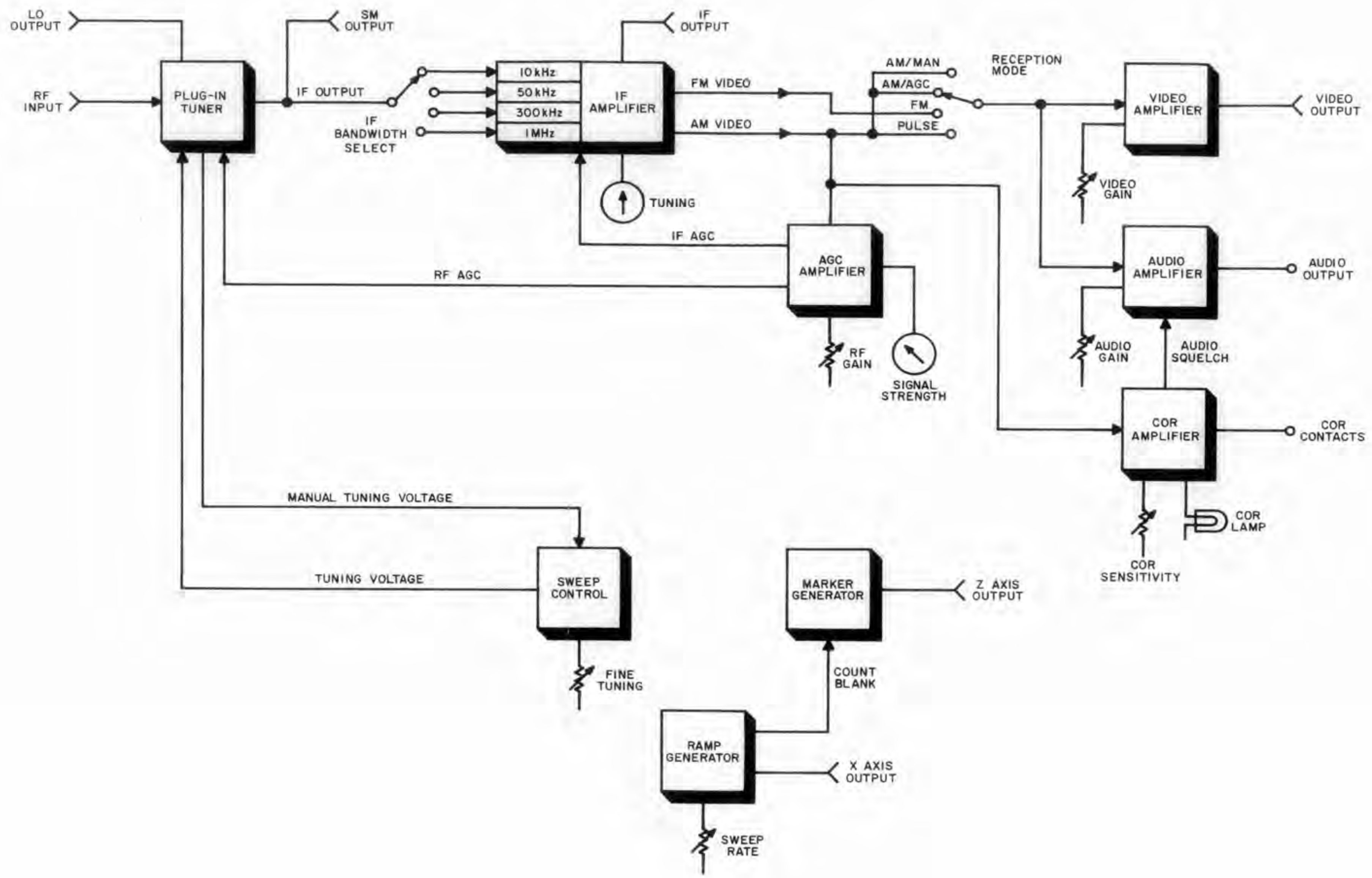


Figure 2-1c. Type 205 Receiver, Simplified Block Diagram, MAN Mode

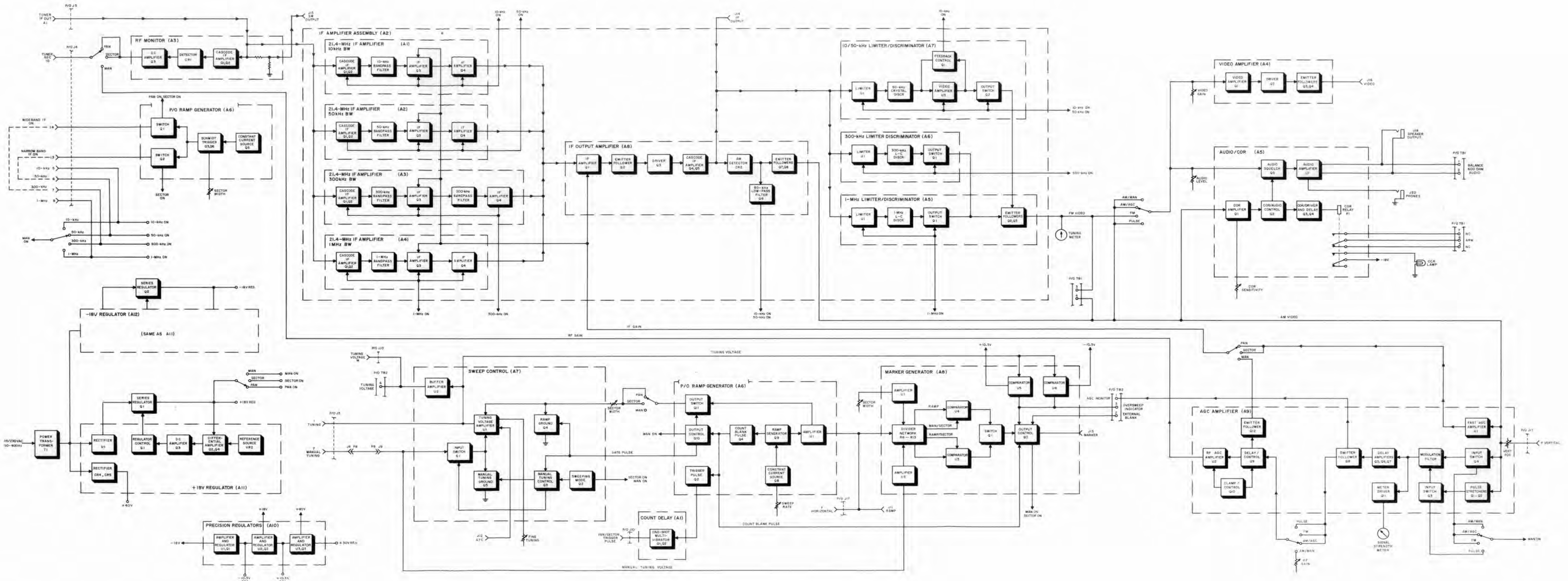


Figure 2-2. Type 205 Receiver, Functional Block Diagram

SECTION II

CIRCUIT DESCRIPTION

2.1 GENERAL

Operation of the various circuits in the 205 Receiver is described in the following paragraphs using simplified and functional block diagrams, Figures 2-1 and 2-2, and the schematic diagrams, Figures 6-1 through 6-20, located at the rear of this manual. Note that the unit numbering system 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 A8U6 and A2A8CR2). These prefixes are omitted on illustrations and in the text except in those cases where confusion might result from their omission.

2.2 BLOCK DIAGRAM DESCRIPTION

The 205 Receiver performs two distinct functions; it may be operated as a sweeping receiver or a manual receiver. As a sweeping receiver, either a PAN mode or a SECTOR mode can be selected. The block diagrams of the receiver in these various modes are quite different. A description of the receiver using simplified block diagrams will therefore be presented first followed by an overall functional block diagram.

2.2.1 Simplified Block Diagrams. - Figures 2-1a, 2-1b, and 2-1c are simplified block diagrams of the receiver in each of its three tuning modes: PAN, SECTOR, and MAN.

2.2.1.1 In the PAN tuning mode, Figure 2-1a, the ramp generator circuits produce a linear ramp waveform which has an interval set by the SWEEP RATE control. The ramp generator also supplies gate, count blank, X axis (horizontal), and counter trigger outputs. On the trailing edge of each ramp waveform, the ramp generator provides a 5 ms count period.

2.2.1.2 The counter trigger pulse is used by an associated digital readout to start a counting cycle. The X axis (horizontal) output is used by an associated pan display unit. The gate pulse switches the sweep control circuit to connect either the ramp waveform or a manual tuning voltage to the circuitry in the installed tuner. The count blank pulse turns off the CRT beam in an associated display during the count period through circuits in the marker generator.

2.2.1.3 The plug-in tuning head is a voltage tuned device. The ramp waveform increases in a linear manner from -10V to +10V. This voltage range is sufficient to sweep the tuner across its entire frequency range. When the ramp ends, the gate pulse causes the sweep control to connect the manual tuning voltage to the tuner during the 5 ms count period. This allows the tuner to assume what would be its manually tuned frequency if it was in the MAN tuning mode. An associated digital readout, connected to the LO output jack, counts and displays the manually tuned frequency during the count period.

2.2.1.4 The marker generator develops the Z axis output which is used to intensity modulate the CRT beam in an associated display. The marker generator combines the sector width voltage and manual tuning voltage to produce an intensified beam to denote the sector which would be swept if the receiver was switched to the SECTOR mode. When the count blank pulse is present, the trace is blanked. At all other times, a trace of normal intensity is supplied.

2.2.1.5 The plug-in tuning head converts incoming RF signals within its bandwidth to a band centered at the 21.4-MHz intermediate frequency. There are four IF bandwidths available. One of the four will be automatically selected for operation based on connections supplied by the tuning head. Normally, one of the wider IF bandwidths will be selected for the PAN mode, and the higher the frequency range of the tuner the wider will be the IF bandwidth selected. The output of the AM detector in the IF amplifier, through a video filter, supplies the Y axis (vertical) input to an associated display. The receiver's audio output is automatically muted in the PAN and SECTOR modes.

2.2.1.6 Special fast-acting AGC circuits are provided which function when the receiver is operated in either the PAN or SECTOR modes. They result in a logarithmic display on the associated signal display. One circuit, the

RF Monitor A3, at the input of the IF amplifier develops an AGC voltage for the tuner in Pan mode under high signal levels (≈-45 dBm). The other circuit operates from the AM detector to supply a fast AGC for the IF amplifier.

2.2.1.7 A comparison of Figure 2-1a with Figure 2-1b, which shows the SECTOR tuning mode, will reveal only minor differences. First, the sector width control is shown in the ramp waveform line from the ramp generator to the sweep control section. This means that the ramp amplitude can be varied from zero to maximum. Any sector of the tuning head can therefore be swept, from zero to the full frequency range. Also, the sweep control section now sums the ramp and manual tuning voltage during the sweep period. This allows the center of the sector being swept to be varied by the manual tuning control. The receiver action during the count period is the same as in the PAN mode.

2.2.1.8 The other major difference between PAN and SECTOR modes is the selection of an IF bandwidth. In the SECTOR mode, an IF bandwidth select circuit uses both the tuner code connections and sector width voltage. At wider sector widths, a wide IF bandwidth would be chosen as in the PAN mode. When the sector width is reduced to about 25% of maximum, the select circuit activates the next lower IF bandwidth. This action provides increased resolution on the associated signal display.

2.2.1.9 Figure 2-1c shows a simplified block diagram of the receiver in the MAN tuning mode. The ramp generator is still operational to supply horizontal sweep for an associated display. As before, the count blank pulse is used by the marker generator to blank the CRT beam during the count period. The sweep control circuits apply the manual tuning voltage to the tuner at all times combined with the fine tuning voltage. Beyond this point, the block diagram appears considerably different from the two previous ones. Any one of the four IF bandwidths can now be selected by the operator by means of a front-panel switch. The associated display now operates as an IF signal monitor from an SM output jack. The AGC amplifier operates from the AM detector and provides either pulse or average AGC or manual gain control to the tuner and the IF amplifier.

2.2.1.10 The operator can select one of four reception modes: AM/MAN, AM/AGC, FM, and PULSE. Depending on the mode selected, either AM video or FM video will be connected to the audio and video amplifiers. Each amplifier has its own front-panel gain control. The COR amplifier operates from the AM detector to provide audio squelch and COR relay operation. The COR sensitivity control adjusts the threshold of the circuit. The front panel COR lamp indicates when the COR is activated. The COR circuit has a typical hold-in time of 6 seconds after the activating signal ceases, however, the squelch circuit drop-out is nearly instantaneous.

2.2.1.11 The associated digital readout operates from the LO output jack. Since the manual tuning voltage and LO output signal is always present, it is not necessary to trigger a counting cycle as is done in the PAN and SECTOR modes. The counter operates at its own cyclic rate.

2.2.2 Functional Block Diagram. - A functional block diagram of the receiver is shown in Figure 2-2. Note that switch positions are shown operating in the PAN tuning mode.

2.2.2.1 Input power is connected to transformer T1. Regulator circuits at the output of T1 are used to produce the +18 and -18 regulated supply voltages. An additional full-wave rectifier on the +18V regulator card is used to develop +40V which is applied to A10 where it is regulated to provide the +30V precision regulated supply output. Regulator card A10 in addition contains precision regulators which provide -10.3V and +10.3V outputs from ±18V regulated inputs. The +18V and -18V regulators are similar in design. Both use a series regulator (Q1 and Q2) mounted on the main deck and control circuits mounted on printed circuit cards (A11 and A12). A zener diode, VR2, serves as a reference voltage. It is compared to the output voltage by a differential amplifier formed by Q2 and Q4. The output of the differential amplifier is amplified by Q3 and applied to Q1 which controls the dynamic impedance of the associated series regulator.

2.2.2.2 The +18V supply, through various sections of the sweep mode switch, is used as the "man on", "sector on", and "pan on" voltages. The "man on" voltage, through function switch sections, is used as the "10-kHz on", "50-kHz on", "300-kHz on", and "1-MHz on" sources. One of these sources can also be made available when the receiver is in the PAN and SECTOR modes from circuits in the ramp generator module through connections in the plug-in tuning head. These connections are shown as dashed lines from J4 pins 13 and 14 to pins 6 and 7. This would be the case for a 100-180 MHz tuning head for example. The actual choice of bandwidths is a function of the tuning range of the installed tuning head.

2.2.2.3 When the PAN sweeping mode is in use, the entire range of the tuner is swept. The wider IF bandwidth is automatically selected under those conditions. This is also true in the SECTOR sweeping mode except when the sector width becomes small. Then a narrowband IF is automatically selected to give increased resolution. On the ramp generator module (A6), switch Q1 is operative in both the PAN and SECTOR tuning modes. Switch Q7 is operative only in the sector mode. Stage Q5 is a constant current source to operate the Schmidt trigger formed by Q3 and Q6. In the PAN tuning mode the trigger state allows Q1 to connect the +18V source to the wideband IF select. In the sector mode, the Schmidt trigger will change states as a function of the setting of the SECTOR WIDTH control. When the Schmidt trigger changes state, Q1 is turned off and Q7 is turned on. This action connects the +18V source through Q7 to the narrowband IF select circuit and de-energizes the wideband IF amplifier.

2.2.2.4 Any one of the four IF bandwidths can therefore be energized in one of two ways: in the MAN tuning mode, by the +18V source connected through the sweep mode switch; and, in the PAN and SECTOR modes, by the +18V source connected through A6Q1 or A6Q7 and jumpers in the tuning head.

2.2.2.5 The 21.4-MHz center-frequency IF input to the receiver from the installed tuner is connected to J3 pin A1. From this point the IF signal is applied to RF monitor A3. In the RF monitor subassembly a parallel connection supplies the IF signal to the IF amplifiers in assembly A2. In addition, a resistive matching network supplies the IF signal connection to the rear panel SM output jack J15. The RF monitor subassembly provides a delayed AGC voltage to the installed tuning head when the receiver is operated in its sweeping modes. The tuner IF signal is amplified by A3Q1-Q2 and detected by A3CR1. Output voltage from the detector is amplified by A3Q3 and applied to the tuning head through pin 10 of J4. As previously described, any one of the four IF bandwidths can be energized in any tuning mode. All four IF amplifiers (A2A1 through A2A4) are similar in design. The input 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 300-kHz bandwidth. In this amplifier, the bandpass filter is in two sections, one before and one following the gain controlled IF stage, Q3.

2.2.2.6 The 21.4-MHz IF output from the selected IF amplifier is connected to the IF output amplifier module (A2A8). This section contains a gain-controlled IF amplifier, emitter follower, driver, and cascode IF amplifier stages. The output from Q4 - Q5 is used to drive the AM detector, IF output jack (J14), and the FM limiter/discriminators (A2A5 through A2A7). The video bandwidth at the output of the AM detector is restricted to about 80-kHz when the 10-kHz or 50-kHz IF bandwidths have been selected. Emitter followers Q7 and Q8 provide a low output impedance to drive subsequent circuits in the AM video chain.

2.2.2.7 The limiter/discriminators are similar in design. The narrowband unit serves both the 10-kHz and 50-kHz IF bandwidths. When the 10-kHz bandwidth has been selected the feedback control, Q1, increases the gain of video amplifier U3 by a factor of five to compensate for the reduced discriminator output. The emitter followers, Q2 and Q3, on the 1-MHz limiter/discriminator board are common to all IF bandwidths. They provide a low output impedance to drive the audio and video amplifiers when the FM reception mode has been chosen. The tuning meter is also operated from this point.

2.2.2.8 The video amplifier module (A4) contains an amplifier stage (Q1) followed by a driver stage (Q2). The output of Q2 drives complementary symmetry emitter followers Q3 and Q4. The video output appears at jack J16.

2.2.2.9 The audio/COR module (A5) operates from a dc coupled AM detector output and an audio output from either an FM discriminator or an AM detector. Audio signals from the arm of the audio level control are applied to audio squelch transistor Q5. When Q5 is conducting the audio signals are applied to audio amplifier U1 which drives the audio output terminals of TB1 and speaker output jack, J18. The stages in the COR chain, Q1 through Q4, control the operation of the COR relay, K1, and Q5 in the audio chain. The COR SENSITIVITY control establishes the threshold point for Q1. For signals below the threshold, Q1 is off and Q2 is on. The circuit is designed so that Q3, Q4, and Q5 are all held off when Q2 is on. Under these conditions, the audio path is open and K1 is not operated. Once a signal above threshold is received, all stages change state: Q1, Q3, Q4, and Q5 are on while Q2 is off. The audio path is closed and K1 operates. When the signal falls below the threshold, a delay circuit prevents K1 from returning to the non-energized condition for about six seconds. However, the audio signal path is opened nearly instantaneously. One set of K1 contacts are used to operate the COR lamp while a second set appears on terminals 5, 6, and 7 of TB1.

2.2.2.10 The AGC Amplifier module (A9) provides fast IF AGC when the receiver is in PAN or SECTOR tuning modes. AGC voltage for the plug-in tuning head is developed by RF monitor A3. Manual, average, or pulse IF and RF AGC are developed by module A9 when the MAN tuning mode has been selected. In the MAN tuning mode, AM/MAN reception mode, the IF and RF gain control voltages are derived from the arm of the RF GAIN control. In all other reception modes, IF and RF AGC voltages are developed from the operating AM detector. Stage U1 is an inverting amplifier which responds rapidly to the dc changes in detector level and provides fast IF AGC in the PAN or SECTOR tuning modes. In the MAN tuning mode, either Q3 or Q4 will be activated depending on the reception mode. In PULSE, stages Q1 and Q2 provide a fast attack and slow decay AGC response. In the other three reception modes, the incoming signal is connected through Q4 to the modulation filter which removes audio-rate amplitude variations from the signal. This method provides average AGC. Stages Q5, Q6, and Q7 at the output of the modulation filter provide gain and with emitter follower Q8, isolate the modulation filter from subsequent circuits. Stage Q11 operates the SIGNAL STRENGTH meter from the output of the modulation filter. In the MAN tuning mode, AM/AGC, FM, or PULSE reception mode, the IF and RF AGC are derived from interacting stages Q9, Q10, and U2 on the AGC amplifier module (A9).

2.2.2.11 To illustrate the general AGC circuit operation, assume that a very weak signal increases in strength to become a very large signal. From zero until -3V of IF AGC has been developed, no RF AGC is present. At -3V, the IF AGC becomes clamped at that value and RF AGC begins to be produced. When the RF AGC reaches -6.6V, it is clamped at that value and the clamp is removed from the IF AGC line. It will then continue to increase in a negative direction from -3V.

2.2.2.12 The ramp generator module (A6) performs two basic functions. One function is the automatic selection of the IF bandwidth in PAN and SECTOR tuning modes as described in paragraph 2.2.2.3. The second function is the generation of the ramp, count blank, and gate pulses and the count period. Stage Q9 operates from constant current source Q8 to produce a linear ramp waveform followed by a fixed 5 ms steady-state count period. The ramp interval is variable from about one sweep every 25 seconds to 25 sweeps per second by the SWEEP RATE control. Stage Q4 generates a count blank pulse which corresponds to the 5 ms count period. The count blank pulse drives Q2 which results in a counter trigger pulse being produced by count delay module A1. In the PAN and SECTOR tuning modes, blanking of the associated CRT trace and generation of a gate pulse is also accomplished by Q4.

2.2.2.13 Amplifier U1 is driven from ramp generator Q9 and provides four outputs: a ramp output to J11, a display horizontal output to J17 pin F, and one signal each to the marker generator (A8) and (through output switch Q11) sweep control (A7) modules. In the PAN and SECTOR tuning modes, the count blank pulse controls stage Q10 which, in turn, opens Q11 during the count period. Subsequent circuits will insert the manual tuning voltage during the count period. In the MAN tuning mode, output switch Q11 is always open and output control Q10 provides a constant output instead of the gate pulse.

2.2.2.14 The count delay module (A1) receives the counter trigger pulse from A6Q2. A one-shot multivibrator formed by Q1 and Q2 delays the trigger pulse for 2 ms before it appears at J10 pin A. This delay allows the installed tuner's first local oscillator to stabilize before it is sampled by the associated counter.

2.2.2.15 The tuning voltage applied to the tuning head is a function of the PAN, SECTOR, or MAN modes. In the PAN mode, the tuning voltage is a ramp waveform at a fixed amplitude which will cause the entire range of the tuner to be swept. The duration of the ramp is set by the SWEEP RATE control. At the end of the ramp, a 5 ms count period occurs. During this time, the manual tuning voltage, from a potentiometer linked to the tuner gear train, is inverted and returned to the tuner. A trigger pulse is then sent to the associated counter after 2 ms of the count period has elapsed. The counter samples the now stable local oscillator frequency and displays the manually tuned frequency. The action during the SECTOR tuning mode is similar. The ramp amplitude can be varied by the SECTOR WIDTH control and the ramp and manual tuning voltages are summed during the sweep period. The events during the count period are unchanged. In the MAN tuning mode, the tuning voltage for the installed tuner is taken from the manually tuned potentiometer linked to the tuner gear train, inverted, and returned to the tuner.

2.2.2.16 The sweep control module (A7) combines the various inputs to provide the tuning voltage configurations described in the above paragraph. In the PAN mode, stage Q2 is off. With Q2 off, stage Q3 is controlled by the gate pulse from A6Q10. During the sweep period, the gate pulse holds Q3 on and Q4 off. With Q4 off, the ramp waveform from A6Q11 reaches tuning voltage amplifier U1. When Q3 is on, it holds Q5 on and Q1 off. The manual tuning voltage is therefore unable to reach U1. The output of U1 at this time is the inverted ramp waveform. During the count period, the gate pulse turns Q4 on and Q3 off. When Q3 turns off, Q5 turns off and Q1 turns on. The output of U1 is then the manual tuning voltage. During the SECTOR mode, Q2 is always on which holds Q3 off. This allows Q1 to be on continuously and U1 now sums the manual tuning voltage with the ramp waveform. The gate pulse controls Q4 as in the PAN mode. In the MAN tuning mode, output control stage A6Q10 keeps Q4 on and Q3 off. The output of U1 is then always the manual tuning voltage.

2.2.2.17 The tuning voltage amplifier, U1, also receives the AFC input from J12 and the fine tuning input from the front-panel control. It sums these two inputs with any other input signals present. The output of U1 is connected to the tuning head through J3 pin 1. Buffer amplifier U2 provides tuning voltage outputs from U1 to rear-apron terminal strip TB2 terminal 4 and to J10 pin M.

2.2.2.18 The marker generator module (A8) performs two basic functions: intensity modulation (Z axis control) of the CRT beam in an associated display, and generation of an oversweep indicator which is on whenever a tuning voltage is present that would cause the tuner to produce a frequency above or below its tuning range. The marker signal at J13 from output control Q2 may be one of three levels: zero, +0.5V, or +1.2V. The zero, +0.5V, and +1.2V outputs correspond to no trace, a trace of normal intensity, and a brighter than normal trace. Five different inputs are used to determine the three output levels from Q2: a MAN or SECTOR mode selection voltage, switch Q1, the count blank pulse, the oversweep circuit, and an external blanking input. Either the count blank pulse or an external blanking pulse will override any other condition and cause the marker output to go to zero volts. An output from either comparator U5 or U6, when the tuning voltage exceeds +10.3V or -10.3V, will similarly force the output of Q2 to zero and also provide a +15V output on TB2 pin 3 to indicate the oversweep condition. In the SECTOR or MAN tuning modes, a control voltage causes Q2 to produce a +1.2V output except during blanking or oversweep. In the PAN mode, Q2 produces +0.5V in the absence of any inputs. With an input from switch Q1, Q2 will produce a +1.2V output.

2.2.2.19 Marker generator module stages U1 through U4 use three input signals to control switch Q1: the ramp waveform, the sector width voltage, and the manual tuning voltage. A resistive divider network is used to place various combinations in equal proportions of the three signals on the inverting and non-inverting inputs of U3 and U4. If the sector width voltage is not present, both U3 and U4 will switch when the ramp amplitude exceeds the manual tuning voltage. By summing the sector width voltage with the manual tuning voltage in one comparator and with the ramp in the other, the following is achieved: Comparator U3 output will go from -18V to +18V when the sum of the sector width voltage and the ramp exceeds the manual tuning voltage. The output of U4 at that time is -18V and Q1 will turn on, causing Q2 to produce a +1.2V output. To cause U4 to switch, the ramp amplitude must now exceed the sum of the manual tuning voltage and the sector width voltage. When this happens, the output of U4 switches from -18V to +18V. The same voltage from both U3 and U4 causes Q1 to turn off. The result is that the CRT trace is intensified (+1.2V output from Q2) only when Q1 is on. This occurs over a portion of the ramp waveform corresponding to the setting of the SECTOR WIDTH control. This intensification occurs on the ramp at a point corresponding to the setting of the manual tuning control.

2.3 TYPE 72311 IF AMPLIFIER ASSEMBLY

The IF amplifier assembly contains IF amplifier and demodulator circuits with bandwidths of 10 kHz, 50 kHz, 300 kHz, and 1 MHz. Almost all of the circuitry is contained on eight 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 eight subassemblies are shown in Figures 6-3 through 6-9. The reference designation prefix for the IF amplifier assembly is A2; the subassemblies therefore have reference designation prefixes of A2A1 through A2A8.

2.3.1 <u>Input.</u> - The 21.4-MHz input signal is cabled from main chassis jack J3 pin A1 to the IF amplifier input connector J1 through a strap in the RF monitor, A3. From J1 the incoming signal is simultaneously applied to the inputs of all four IF amplifier boards through pin 21 on each board (refer to Figure 6-2). Also note that gain control voltage through C25 is applied to all IF amplifiers through pin 8 on each module.

2.3.2 <u>Output.</u> - The 21.4-MHz outputs of all four IF amplifiers (A2A1 through A2A4) at pin 2 are connected in parallel and then applied to the input of IF output amplifier (A2A8) through pin 21 of that module. From pin 9 of

A2A8, a 21.4-MHz output is connected to the limiter/discriminator subassemblies (A2A5 through A2A7) at pins 21. The FM video outputs from A2A6 and A2A7 (through module pins 2) utilize a common video amplifier located on A2A5, the 1-MHz Limiter/Discriminator. This connection is made through A2A5 pin 10. The AM video output is taken from A2A8 pin 2 and connected to feedthru capacitor C12. In a similar fashion, the FM video output is obtained at A2A5 pin 2 and connected to C24.

2.3.3 Control. - Seven of the eight subassemblies are enabled and disabled as a function of receiver tuning mode (PAN, MAN, or SECTOR), and within these modes by the frequency range of the tuner installed, the setting of the SECTOR WIDTH control, and the setting of the IF BANDWIDTH control. This action is accomplished by switching the +18V source through sixteen different feedthru capacitors as shown on Figure 6-2.

2.3.3.1 In the MANUAL mode, +18V from the wiper of main chassis switch S3A-W is connected to C13 and C26, C19 and C28, C1 and C15, and C3 and C17 for operation of the 10 kHz, 50 kHz, 300 kHz, and 1 MHz IF bandwidths, respectively.

2.3.3.2 In the PAN mode, an IF bandwidth is chosen based on the frequency range of the tuning head. In the 500 to 1000 MHz band, the 1-MHz IF bandwidth is enabled. In the VHF bands, the 300-kHz IF bandwidth will normally be in operation. For lower frequency ranges, the 50-kHz bandwidth will usually be selected. At pin 5 of the ramp generator module, +18V is supplied when the receiver is in the PAN mode. This voltage is connected to jack J4, pin 14. The installed tuner will connect this +18V source back through J4 on pin 6, 7, or 8 as applicable. The various bandwidths are then enabled through C14 and C27, C20 and C29, C2 and C16, and C4 and C18, corresponding to 10 kHz, 50 kHz, 300 kHz, and 1 MHz.

2.3.3.3 In the SECTOR mode, one of two IF bandwidths can be enabled for each tuning head as a function of the setting of the SECTOR WIDTH control. From 25% rotation to maximum clockwise rotation of this control, the IF bandwidth selection is the same as for the PAN mode as described in paragraph 2.3.3.2. As the sector width is decreased from maximum CW to a point representing 25% of the range of the control, the +18V present at pin 5 of the ramp generator module is removed and +18V is applied to pin 4 of the ramp generator module. From pin 4, this voltage is connected to jack J4, pin 13. A strap in the tuning head connects pin 13 to J4 pin 5, 6, or 7 as applicable to provide the next lower IF bandwidth than would be operative in the PAN mode. This operating feature has been provided to allow a higher resolution display with the narrower sector widths.

2.3.4 Type 72292 10-kHz Bandwidth and Type 72293 50-kHz Bandwidth IF Amplifiers. - 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 the schematic diagram, the design of both IF amplifiers are identical except for a few component value differences.

2.3.4.1 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, and C11.

2.3.4.2 Stage Q3 uses a dual-gate MOS FET 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) of the FET, through R14. Diode CR3 provides a return path for the gate (pin 2) bias for Q3 with no AGC voltage applied. In addition, the diode provides protection for the FET should a transistor in the AGC circuit short. If a short should occur, CR3 provides a clamp on the AGC input protecting the FET. With no signal input, diode CR3 is forward biased by the +18V 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 CR3 off (approximately -0.6V), the gate (pin 2) voltage on Q3 follows the AGC voltage.

2.3.4.3 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 CR4 which is used as a switch. When the IF amplifier is energized, CR4 is forward biased from the switched +18V source through R18, R21, and R28. When this amplifier has not been selected, CR4 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 all four IF amplifiers to normalize the gain-bandwidth product.

2.3.4.4 The IF amplifier is turned on by a control voltage which may be applied to either module pin 15 or 16. In the MANUAL mode, switching occurs through pin 15 and diode CR1 becomes forward biased. In the PAN and SECTOR modes, the IF strip is turned on by connecting +18V to pin 16 which forward biases diode CR2. The two diodes are used to isolate the two +18V lines from each other. Diode VR1 zeners at 18 volts which turns Q2 on and provides an operating point of about zero volts to complete the base biasing network for the input cascode amplifier.

2.3.5 Type 72291 300-kHz Bandwidth IF Amplifier. - The 300-kHz IF Amplifier (reference designation prefix A2A3) is similar in design to the IF amplifiers described in preceeding paragraphs. The major difference is that discrete components form the bandpass filter in the 300-kHz strip while crystal filters are used in the 10-kHz and 50-kHz strips. The schematic diagram for the 300-kHz IF Amplifier is shown in Figure 6-4.

2.3.5.1 The 300-kHz bandwidth IF amplifier is turned on by the application of +18V to either module pin 12 or pin 13. In the MANUAL mode, +18V is connected to pin 13. In the PAN or SECTOR modes, the enabling voltage is connected to pin 12. Diodes CR1 and CR2 are used to isolate the two voltage supplies from each other.

2.3.5.2 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.

2.3.5.3 Stage Q3 uses a dual-gate MOS FET 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 CR3 provides a return path for the biasing voltage divider until the AGC voltage swings sufficiently negative to reverse bias it. In addition, it provides protection for the FET should a transistor in the AGC circuit short. In which case CR3 conducts and provides a voltage clamp.

2.3.5.4 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.

2.3.6 Type 72290 1-MHz Bandwidth IF Amplifier. - A schematic diagram of the 1-MHz bandwidth IF amplifier is shown in Figure 6-5; its reference designation prefix is A2A4. The design of this IF strip is very similar to the design of the 300-kHz bandwidth IF strip previously described. The only essential difference exists in the filter design. In the 300-kHz bandwidth IF strip, the bandwidth was determined by a three pole filter which was followed by a two-pole filter. In the 1-MHz bandwidth IF strip, a five-pole filter is used to set the bandwidth. The five poles are coupled together by C8, C11, C14 and the parallel combination of C17 and C18. The explanation of the 300-kHz bandwidth IF amplifier in paragraph 2.3.5 is applicable to this circuit.

2.3.7 Type 72285 IF Output Amplifier. - The 21.4-MHz IF signal from the selected IF strip is connected to the IF output amplifier module. A schematic diagram for the module is shown in Figure 6-9; the complete reference designation prefix is A2A8.

2.3.7.1 The input signal through module pin 21 is applied to gate 1 of MOS FET IF amplifier Q1. A delayed gain control voltage, connected to gate 2 (pin 2), is used on this stage. The manual or automatic gain control voltage at module pin 18 is zero volts for maximum gain and -6.6 volts for minimum gain. With zero volts at pin 18, diode CR1 is forward biased from the +18V source through resistors R18, R5, R4, and R2. Gate 2 of Q1 is therefore clamped until the voltage at pin 18 is sufficiently negative to turn CR1 off.

2.3.7.2 The drain circuit of Q1 is broadly tuned to 21.4 MHz by inductor L2 which resonates with various small capacitances in the circuit. Emitter follower Q2 provides a constant load for the tuned circuit. Stage Q3 is an IF amplifier with a gain control potentiometer in its emitter circuit. The input impedance of Q3 is therefore partially a function of the setting of potentiometer R20, and would present a varying load to Q1 if stage Q2 was not present.

2.3.7.3 Transistors Q4 and Q5 form a cascode IF amplifier. The incoming signal is applied to the base of Q5 through blocking capacitor C7. The collector circuit of Q4 is tuned by L3 and C13. Negative feedback, from the collector of Q4 through R19 and C9 to the base of Q5, is employed to stabilize the gain and increase the bandwidth of the stage. The output is applied to the limiter/discriminator modules and the rear-apron IF OUTPUT jack from a capacitive voltage divider formed by C15 and C16. The output of Q4 is also coupled to the AM detector CR2. The 21.4-MHz IF signal is filtered by C17, L5, and C21.

2.3.7.4 The AM video signal is applied to emitter followers Q7 and Q8 which provide a low impedance source to drive the two AM video outputs through module pins 2 and 3.

2.3.7.5 In the narrower IF bandwidths of 10 kHz and 50 kHz, it is desirable to reduce the bandwidth in the AM video path. Such a reduction will often improve the signal-to-noise ratio of the receiver. Stage Q6, a JFET, has been included as a switch. In the 300-kHz and 1-MHz IF bandwidths, Q6 is held off by the -18V source connected to its gate. In the 10-kHz and 50-kHz IF bandwidths, +18V is applied through module pin 5. A voltage divider is then formed by R33 and R34. The voltage at the junction of R33 and R34 turns Q6 on, and filter capacitor C20 is connected to ground. The bandwidth of the AM video path is then reduced to about 80 kHz.

2.3.8 Type 79616 10-kHz Bandwidth and 50-kHz Bandwidth FM Limiter/Discriminator. - A schematic diagram of the 10-kHz and 50-kHz limiter/discriminator is shown in Figure 6-8. This module has been assigned reference designation prefix A2A7.

2.3.8.1 The 21.4-MHz IF input signal is connected to module pin 21. The module is active when +18V is applied to module pin 14, 15, 17, or 18. When the module is active, +18V is coupled out on pin 6 to turn on the video bandwidth select circuit on the IF output amplifier module. The FM video output is taken at module pin 2.

2.3.8.2 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. Zener diode VR1 reduces the supply voltage by 4.3V to provide the correct value to operate U1. The output collector circuit of U1 is tuned by L1 and C4 with C6 and C7 in parallel. The tuned circuit is tapped at the junction of C6 and C7 to provide an impedance match for the input of the crystal discriminator U2.

2.3.8.3 The output of the 50-kHz bandwidth crystal discriminator is connected to the non-inverting input (pin 3) of operational amplifier U3. Potentiometer R4, through resistor R7, is used to obtain a zero crossover point (balance) at the output. During 50-kHz bandwidth operation, the gain of U3 is about five as determined by feedback resistors R9 and R13. In the 10-kHz bandwidth, the output of the crystal discriminator is much lower (at a given percentage of modulation) than in 50-kHz operation because the slope of the discriminator is constant. To compensate for this condition, the gain of U3 is increased to about 25 in the 10-kHz bandwidth. Transistor Q1 is turned on by the +18V supply through pin 14 or pin 15. Resistor R8 is then connected in parallel with R13 and the feedback network is now R9 and the parallel combination of R8 and R13. Resistor R14, inside the feedback loop, is used to make the impedance from U3 pin 2 to ground approximately the output impedance of the crystal discriminator which is connected at U3 pin 3 to ground.

2.3.8.4 When neither the 10-kHz or 50-kHz bandwidth is in operation it is desirable to disconnect the output of the module from other circuits in parallel with the output. Transistor Q2 is used as a switch for this purpose. When the module is on, a voltage divider is formed by 12-volt Zener diode VR2 and R11 from the switched +18V source to the -18V source. Under these conditions, diode CR7 is back biased, zero volts exists from source to gate of Q2 (a depletion mode device) turning it on. The output of amplifier U3 is then connected to the output of the module at module pin 2. With the +18V supply removed diode CR7 is forward biased and Q2 is turned off disconnecting the circuit.

2.3.9 Type 79620 300-kHz Bandwidth FM Limiter/Discriminator. - Reference designation prefix A2A6 has been assigned to the 300-kHz limiter/discriminator. A schematic diagram for this module is shown in Figure 6-7.

2.3.9.1 The design of the 300-kHz bandwidth FM limiter/discriminator is similar to the design of the 10-kHz and 50-kHz bandwidth limiter/discriminator described in paragraph 2.3.8. The basic difference is that the discriminator is a modified Foster-Seeley circuit in the wider bandwidth device instead of a crystal discriminator. Integrated circuit U1 is a high-gain amplifier/limiter for the 21.4-MHz center-frequency IF input. For most input signal levels U1 provides limiting as it becomes overdriven.

2.3.9.2 The output of U1 operates into a tuned circuit formed by C5, C6, C7, L2 and the primary of transformer T1. Capacitor C12 couples the IF reference voltage to the transformer secondary. Diodes CR3 and CR4 demodulate the FM signal and apply it to a low pass filter formed by C15, C16, L3, and L4. Junction FET Q1 operates as a switch to connect the output when the 300-kHz bandwidth is in operation. Since Q1 is a depletion mode device, it is on when zero volts exists from source to gate. It is off when the gate is negative with respect to the source. When this module is operating, +18V is present at either pin 15 or 16, the drop across zener diode VR2 is +12V and diode CR5 is back biased and the gate and source are held with zero volts between them by R7. With the module inoperative, the -18V supply from pin 11 through R8 forward biases CR5 and Q1 is off.

2.3.10 Type 79626 1-MHz Bandwidth FM Limiter/Discriminator. - The design of the 1-MHz bandwidth limiter/discriminator is nearly identical to the 300-kHz limiter/discriminator described in paragraph 2.3.9. A schematic diagram of the 1-MHz limiter/discriminator is shown in Figure 6-6; reference designation prefix A2A5 has been assigned.

2.3.10.1 Refer to paragraph 2.3.9 for an explanation of the circuit through the output switch, Q1.

2.3.10.2 The FM video outputs of all three limiter/discriminator modules are connected in parallel through module pin 10. As previously discussed, only the output of the active module is present at any one time. The output in use is directly coupled to cascaded emitter followers Q2 and Q3. Three outputs are taken from the emitter of Q3: the FM video output to the video amplifier; an external FM output to rear apron TB1 terminal 3; and an output through module pin 4 to drive the tuning meter.

2.4 TYPE 71291 RF MONITOR

A schematic diagram of the Type 71291 RF Monitor is shown in Figure 6-10. The assembly carries reference designation prefix A3. As shown on the receiver main chassis schematic diagram (Figure 6-20), the RF Monitor is connected at the input of the receiver in parallel with the IF amplifier. Its function is to provide a fast AGC for the tuner when the receiver is in the PAN or SECTOR sweeping modes maintaining fidelity of the data on the associated signal display.

2.4.1 IF Amplifiers. - The incoming 21.4-MHz IF signal from the tuner is connected to jack J1. A parallel connection at this point is made to the IF amplifier assembly (A2) through jack J2. An output to the signal monitor is made through jack J3 from a divider formed by R1 and R2. Transistors Q1 and Q2 form a cascode IF amplifier for the 21.4-MHz signal. The input is to the base of Q1 from the divider formed by R3 and R4 through blocking capacitor C5. Capacitor C8, between Q1 and Q2, reduces the high frequency gain thereby increasing the stability of the stage. The collector circuit of Q2 is tuned by L1; parallel resistor R12 broadens the frequency response of the circuit.

2.4.2 RF Detector. - The output of the tuned circuit in the collector of Q2 is coupled to the detector diode CR1. The detected signal, after filtering by L2 and C10, is amplified by stage Q3. The fast RF AGC at the collector of Q3 is filtered by R16 and C12 and connected to the output through feedthru capacitor C2.

2.4.3 Operation. - In a sweeping mode, the 21.4-MHz input to the RF Monitor at any given instant contains all of the signals within the bandpass of the tuner. Since the bandwidth of the cascode amplifier in the RF Monitor is wider than the bandwidth of the tuner, all signals present in the tuner bandpass which are above the detector threshold will contribute to the value of the detected output. Assume then that the tuner is being swept and a large signal enters the passband of the tuner. At that time, the circuit reduces the gain of the tuner. Once the tuner has been swept away from the large signal, the AGC action will decrease restoring the gain of the tuner to its no signal value.

2.5 TYPE 7366 VIDEO AMPLIFIER

A schematic diagram of the Type 7366 Video Amplifier is shown in Figure 6-11; its reference designation prefix is A4. The input to the amplifier, from the arm of the main chassis VIDEO GAIN potentiometer, is either the AM video or the FM video signal as determined by the setting of the main chassis function switch. The input signal, from module pin 21, is applied through R1 and C1 to the base of amplifier Q1. This stage is followed by Q2, another amplifier. These two stages provide the necessary voltage gain to drive complementary symmetry emitter followers Q3 and Q4. Negative dc feedback to set the overall gain of the amplifier is taken at the junction of emitter resistors R11 and R12 and fed to the emitter of Q1 through a voltage divider formed by R5 and R6. Silicon diodes CR3 and CR4 determine the idling currents of Q3 and Q4, correct for crossover distortion, and prevent thermal runaway. They also compensate for the base-emitter voltage drops of Q3 and Q4. Since the transistors and diodes are both silicon devices, they exhibit similar changes in temperature. A rise in temperature, for example, 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 R11 and R12 are included to provide additional feedback with low-level input signals. Resistor R13 sets the output impedance of the amplifier. Resistor R14 provides a discharge path for C6 if the amplifier is operated without a dc load. Capacitor C3 provides additional drive for Q4 during the negative-going portion of the input signal. The bases of Q3 and Q4 are coupled through C4 to equalize the input signal level to the two stages.

2.6 TYPE 7443 AUDIO/COR AMPLIFIER

Figure 6-12 is the schematic diagram for this module; its reference designation prefix is A5. The circuit functions as an audio squelch and amplifier for signals above a threshold level when the 205 Receiver is operating in the MAN tuning mode. The COR (carrier operated relay) circuit features a delayed drop-out, however the audio squelch function is almost instantaneous when the carrier level drops below the set threshold. The circuit is energized by application of +18V to module pin 12 when the MAN tuning mode is selected.

2.6.1 Audio Path. - The audio path consists of Q5 and operational amplifier U1. Audio signals from the arm of the main chassis AUDIO LEVEL control are applied to module pin 18. From pin 18 the audio is coupled through C3 to FET switch Q5 which performs the squelch function in conjunction with Q1 and Q2. This function will be explained in a later paragraph. From Q5 the audio is applied to the non-inverting input (pin 3) of U1 which supplies the necessary gain to drive the receiver audio output terminals. An output to the front-panel PHONES jack is provided from module pin 17, and a balanced 600 ohm output through T1 is provided on module pins 9 and 11. Conventional operational amplifier negative feedback is used by connecting the output at pin 6 to the inverting input (pin 2) through R14. Negative current feedback is also provided from R17 through R16. The current feedback raises the output impedance toward 600 ohms. Capacitor C8, R15, and C5 provide frequency compensation.

2.6.2 COR/Squelch Control. - The remaining transistors, Q1 through Q4, provide the switching voltage for Q5 and operate the COR, K1. The input to Q1 is dc coupled from the AM detector through module pin 19. Zener diode VR1 reduces the effect of the AM detector input when the voltage exceeds +3.3 volts. Resistor R1 and C1 form a modulation filter at the base of Q1 removing amplitude modulation from the AM detector input. Operating level adjustment for the circuit is accomplished by the front panel COR SENSITIVITY control. The arm of the control is connected to module pin 20 and provides an input voltage adjustable from zero to -18 volts. Transistors Q1 and Q2 are dc coupled and control the squelch and COR circuit operation. The emitter of Q1 is clamped at -0.6V from the -18 volt supply through R7 by CR2. Resistor R4 supplies a small bias current from the +18 volt supply to the base of Q1. This sets the conduction point for Q1 at approximately zero volts. Audio squelch transistor Q5 is initially biased off by the voltage divider action of R8, R11, R12, and diodes CR4 and CR5. The voltage at the junction of R8 and R11 is approximately -8 volts with Q1 and Q2 off. This voltage coupled through CR3 holds Q5 off and the audio path open. When the average AM detector input voltage is sufficiently positive to overcome the negative voltage applied from the COR SENSITIVITY control, Q1 conducts. With Q1 conducting, the voltage drop across R5 causes Q2 to conduct. When Q2 conducts, the voltage at its collector rises to approximately +18V. This voltage change is reflected at the junction of R8 and R11 which reverse biases CR3, allowing the gate voltage of Q5 to approach the source voltage and Q5 conducts completing the audio path. Resistor R19 from the collector of Q2 to the base of Q1 provides a slight hysteresis in the circuit turn-on, turn-off points which prevents squelch chatter.

2.6.3 COR Operation. - The COR function of the circuit operates from Q2 through R12. A Darlington amplifier consisting of Q3 and Q4 controls relay K1. The Darlington configuration is used to aid the delayed relay drop-out feature of the circuit. A much smaller base current is required to cause the Darlington pair to conduct than would be the case for a single switching transistor. This allows the use of a smaller hold-in capacitor, C6. Relay K1 is connected between the +18V supply and the collectors of Q3 and Q4. Thus when the transistors conduct, K1 will be energized. With AM input signals below the threshold level, Q1 and thus Q2 will be off. With Q2 off, the negative voltage from the -18 volt supply dropped through R8, R11, R12, CR4 and CR5 holds Q3 and Q4 off. With the Darlington pair off, the voltage at the collectors and the positive end of C6 is +18 volts through the winding of K1. The other end of C6 is returned to ground through forward biased diode CR5. Thus the voltage across the "hold-in" capacitor is approximately +18.6 volts. When the AM detector input exceeds the set threshold, Q1 and Q2 conduct and the Darlington pair conducts. This energizes K1 and places the positive end of C6 at ground making the other end appear more negative. This negative voltage reverse biases CR4 and the capacitor discharges rapidly through CR5. When the AM input falls below the threshold level, Q1, Q2, and Q5 stop conducting nearly instantaneously. However, as the Darlington amplifier tries to turn off and the collector voltage rises, capacitor C6 begins to charge. The charging current through C6 flows through CR4 to the base of Q3 and through R12, R11, and R8 to the -18V supply. This charging current supplies a forward bias voltage to Q3 and Q4 holding the amplifier in conduction. However, the charging current decreases as the capacitor becomes more fully charged until Q3 and Q4 decrease conduction to the point where K1 drops out. External timing control can be added to the circuit through module pins 2 and 5. An additional capacitor can be added to increase the drop-out delay from the nominal six second value, or a resistor may be added in parallel with C6 which will decrease the delay. The external resistor should be limited to a minimum of 100 ohms. Diode CR6 is included in the circuit to prevent transcient voltage developed across the winding of K1 from damaging Q3 and Q4 if the delay time is reduced.

2.7 TYPE 7867 AGC AMPLIFIER

The Type 7867 AGC Amplifier provides a fast responding IF AGC voltage when the receiver is operating in the PAN or SECTOR tuning modes. In these tuning modes, RF AGC voltage is developed by RF monitor subassembly, A3. A pulse or average responding AGC, or manual gain control voltage for the receiver RF and IF circuits is provided in the MAN tuning mode. The AGC amplifier schematic diagram is Figure 6-16; its reference designation prefix is A9. All AGC output voltages are developed from the AM detector voltage applied through module pin 18.

2.7.1 PAN/SECTOR Tuning Mode. - Operational amplifier U1 is driven by the AM detector voltage and provides a fast response IF AGC in both the PAN and SECTOR tuning modes. The AM detector voltage is also used to drive the vertical amplifier of the associated signal display in these tuning modes.

2.7.1.1 Operational amplifier U1 functions as a fast responding IF AGC amplifier. The AM detector input voltage is applied to the inverting input (pin 2) through R7. A feedback network consisting of R12, R43, and C3 shapes the amplifier response. Capacitor C10 and R44 are included for frequency compensation. The output voltage from pin 6 is coupled through R45 to module pin 20.

2.7.1.2 The voltage divider consisting of R2 and R3 provides the AM detector voltage output at module pin 19 where it is used to drive the vertical amplifier of the associated signal display. Potentiometer R9 is connected between +18 and -18 volts. The arm of the control is connected to the voltage divider through R8. This provides an adjustable dc offset voltage for the vertical output which is used to adjust the vertical trace position of the signal display. Capacitor C1 provides filtering for the vertical output voltage.

2.7.2 MAN Tuning Mode. - The remainder of the circuitry of this module is active only when the receiver is operated in the MAN tuning mode. Gain control voltage for the receiver RF and IF circuits is developed from the front panel RF GAIN control, or from the AM detector voltage depending upon the reception mode of the receiver. The circuit provides pulse responding AGC voltages when pulse reception is selected and average responding AGC voltages when AM/AGC or FM reception is selected. In addition, the circuit uses a delay and clamping technique which delays the start of IF AGC voltage until the AM detector voltage input reaches a specified level. The start of RF AGC voltage is further delayed until the IF AGC voltage reaches a specified level at which time the IF AGC voltage is clamped. With further increases in AM detector voltage input, the RF AGC voltage increases until the RF AGC voltage reaches a predetermined level. When this level is reached, the IF AGC clamp is released and both the IF and AGC voltages increase with an increase in AM detector level.

2.7.2.1 The position of the front panel reception mode switch determines which portions of the circuit are activated in the MAN tuning mode. In the AM/AGC and FM reception modes, +18 volts is applied to module pin 13. This voltage places the cathode of diode CR2 at zero volts allowing input switch Q4 (a depletion mode FET) to conduct. With Q4 on, the AM detector voltage is coupled through R6 and Q4 to a modulation filter consisting of R16 and C5 in the base circuit of Q5. Transistor Q5 is a delay amplifier which delays the start of IF AGC voltage until the AM detector voltage reaches approximately +1.5 volts. Emitter bias for Q5 is set by a voltage divider from the +18 volt supply consisting of R17 and R19. The output voltage from Q5 is direct coupled to the base of DC amplifier Q6 which is followed by another direct coupled DC amplifier, Q7. The output voltage from Q7 is direct coupled to emitter follower Q8. Transistors Q6, Q7, and Q8 perform the necessary phase inversion and level translation so that the AGC voltage from the preamplifier starts at zero and swings negative as the conduction of Q5 increases. The output voltage from the emitter of Q8 is coupled to module pin 7 where it connects to a rear panel AGC monitor terminal. A portion of the voltage from Q8 is coupled through R25 to module pin 8 and a section of the main chassis reception mode selector switch. From the reception mode switch, the preamplifier output voltage is connected to module pin 4 when the receiver is operating in AM/AGC, FM, and PULSE modes of reception. A portion of the preamplifier output voltage is also connected to module pin 6 from a voltage divider consisting of R26 (the emitter resistor of Q8), R28, CR3, CR5, and R42. Module pin 6 connects to the front panel SIGNAL STRENGTH meter negative terminal. The positive terminal of the meter is driven from the modulation filter output through Q11 and module pin 12. The voltage divider in the negative side of the SIGNAL STRENGTH meter compensates for the base-emitter voltage drop across Q5 through Q8 and Q11. This sets the SIGNAL STRENGTH meter reading at zero with no signal input.

2.7.2.2 The same preamplifier circuitry is used when PULSE type signals are selected for reception. However, the input to the modulation filter is through FET switch Q3 which is activated by the application of +18 volts to module pin 16. The input to the modulation filter is taken from a pulse stretcher circuit consisting of complementary emitter follower Q1 and Q2 and associated circuitry. Input voltage from the AM detector is direct coupled to the base of Q1 which is direct coupled to Q2. Positive-going pulses from the AM detector charge capacitor C2 in the low impedance emitter circuit of Q2. When the pulse amplitude falls, the capacitor discharge path is through R5 back to the base of Q1. The input pulse is therefore stretched by the circuit. The voltage across C2 is coupled through R10 and Q3 to the modulation filter.

2.7.2.3 Transistors Q9, Q10, and Q12 in conjunction with operational amplifier U2 provide the MAN tuning mode gain control voltage outputs. The IF gain control voltage is provided through module pin 5 from the emitter of Q12. The RF gain control voltage is from operational amplifier U2 through module pin 2. Input to this circuit (through module pin 4) is either from the AGC preamplifier, or the main chassis RF GAIN control and is selected by the main chassis reception mode switch. Transistor Q12 is an emitter follower providing low output impedance to the IF AGC line. Transistor Q9 is used to clamp the IF AGC line at approximately -3 volts when the IF AGC reaches this level. The IF AGC line clamp is maintained until the RF AGC level reaches approximately -6 volts at which time Q10 releases the clamp allowing the IF AGC to swing further negative with an increase in negative voltage at module pin 4. This action provides the desired AGC characteristics for both the receiver IF circuits and the installed tuner. Transistors Q9 and Q10 are initially biased off by voltage dividers in their base circuits from the -18 volt supply. This sets the bias at approximately -2.7 volts on Q9 and approximately -5 volts on Q10. With Q9 off, the input voltage to RF AGC amplifier U2 is zero and the RF AGC voltage is zero. The IF AGC emitter follower, Q12, follows the input voltage applied to module pin 4 until the voltage is sufficiently negative at the emitter of Q9 to cause it to conduct. With Q9 conducting, it maintains a constant base-emitter junction drop of approximately 0.6 volt which clamps the IF AGC voltage until the base voltage on Q9 changes. As Q9 conducts, it develops a negative voltage across its collector load resistors, R31 and R29, which is dc coupled to the non-inverting (pin 3) input of U2. Operational amplifier U2 has a gain of approximately three and provides the RF AGC voltage output through module pin 2. The amplifier feedback network consists of R37 and C7 in conjunction with R34. A portion of the output voltage from U2 is coupled through R38 to the emitter of Q10. When the voltage at the emitter of Q10 becomes approximately 0.6 volt more negative than the fixed -5 volt base bias, Q10 begins to conduct. With Q10 conducting a more negative voltage is developed across its collector load resistor R33 which is part of the base bias voltage divider of Q9. As the base voltage on Q9 swings negative, its emitter voltage follows and the clamp on the IF AGC voltage is removed. Diode CR4 in the collector circuit of Q9 is used to change the slope of the RF AGC voltage at high signal levels. When the voltage across the diode is sufficiently negative to forward bias it, R29 is effectively removed from the circuit and the gain of the Q9 is reduced.

2.8 TYPE 79611 RAMP GENERATOR

The Type 79611 Ramp Generator develops the basic ramp signal, blanking and trigger pulses, and the automatic IF bandwidth select circuits. A schematic diagram of the module is shown in Figure 6-13; its reference designation prefix is A6.

2.8.1 IF Select Circuits. - When the receiver is in the PAN or SECTOR tuning modes, the IF bandwidth is automatically selected and activated. In the PAN mode, the IF bandwidth is a function of the tuning range of the installed tuner. In the SECTOR mode, the selected IF bandwidth is a function of the tuning range of the installed tuner and the width of the sector being swept. At maximum sector width, a wide IF bandwidth will be activated. As the sector width decreases to about 25% of maximum, a more narrow IF bandwidth will be selected. In the PAN and SECTOR tuning modes, +18V is applied to module pin 6. Stage Q1 is then turned on by a voltage divider from the +18V to -18V supplies through R8, R9, R12, and R17, assuming the SECTOR mode has not been selected and +18V does not appear at module pin 3. Stage Q5 is a constant current source to operate stages Q3 and Q6.

2.8.1.1 As long as the receiver is in the PAN tuning mode, Q1 is on, Q6 and Q7 are off, and Q3 may be either on or off as determined by the setting of the SECTOR WIDTH control. The arm of this main chassis control is connected through module pin 2 and controls the on-off status of Q3. As long as Q6 and Q7 are not enabled, the on-off action of Q3 has no effect. Stage Q1 is always on and +18V is supplied through module pin 5 and subsequent circuits to energize a wideband IF strip.

2.8.1.2 Once the SECTOR tuning mode has been chosen, +18V is applied to module pin 3. Under this condition, Q3 and Q6 form a Schmidt trigger, under the control of the SECTOR WIDTH potentiometer. With the SECTOR WIDTH control at the maximum CW position, Q3 is on, Q1 is on, and +18V is supplied through module pin 5 as previously described. As the setting of the control is reduced, the voltage at the base of Q3 falls to a point where Q3 turns off. At that time, the Q3 collector goes positive and this change is coupled through R12 to the base of Q6 which turns on. Transistor Q6 when conducting turns Q7 on and Q1 off. A +18V source to energize a narrow band IF amplifier is now connected through module pin 4.

2.8.2 Ramp Generator. - The basic ramp or sawtooth waveform is generated by charging capacitor C3 from a constant current source. This source is transistor Q8 with diode CR2, resistors R20 and R18, and front-panel SWEEP RATE potentiometer R3 in the base-emitter circuit. The ends of the SWEEP RATE potentiometer are connected across module pins 16 and 17 while the arm is connected to +18V. This arrangement provides for smooth action of the control. The charging path for C3 is through R15, CR1 and Q8. When the collector of Q8 reaches approximately 11 volts, unijunction transistor Q9 turns on. The end of C3 which is connected to the emitter of Q9 is now pulled down to ground. The other end of C3 is therefore below ground and CR1 stops conducting. Capacitor C3 then charges from ground through the base one emitter junction of Q9 and R14 to the +18V supply. After approximately 5 ms, the charge on C3 will reach a value large enough to turn CR1 back on again, completing the cycle. The output at the emitter of Q9 is a ramp followed by a 5 ms steady-state period. The repetition rate of the ramp is variable from about one every 25 seconds to about 25 per second by the SWEEP RATE control. The 5 ms interval is the count period and remains a constant length regardless of the duration of the ramp.

2.8.3 Count Blank and Trigger. - As explained in the previous paragraph, diode CR1 is turned on and off as the ramp and count period are generated. The voltage at the collector of Q4 is therefore low when CR1 is on (while the ramp is generated) and high when CR1 is off during the count period. This pulsed waveform is the count blank pulse which is an output through module pin 19. In addition the count blank pulse is connected through R7 and "speed up" capacitor C2 to amplifier Q2. The output at the collector of Q2 is differentiated at module pin 20 by capacitor C5 operating into the input resistance of the count delay module. This differential waveform will eventually be used to trigger an associated counter. The count blank pulse will be used to blank the trace on an associated CRT display during the count period.

2.8.4 Ramp Outputs. - The basic ramp and count period waveform at the emitter of Q9 is connected to the non-inverting input (pin 3) of operational amplifier U1. Potentiometer R24, in the feedback circuit, sets the gain of the stage. Potentiometer R22 is used to center the output waveform so that the positive and negative excursions of the ramp are equal. The ramp, ramp to marker, and horizontal amplifier outputs are supplied through module pins 7, 10, 9.

2.8.5 Switched Ramp Output. - The count blank pulse at the collector of Q4 is applied to the base of Q10 through 18V zener diode VR1. This turns Q10 on and its collector goes from +18V to -18V. The gate pulse output at module pin 12 is therefore +18V during the sweep period and -18V during the count period. The -18V level during the count period forward biases diode CR4 which turns Q11 off. The output at module pin 11 is the ramp output from U1 interrupted during the count period. When the receiver is in the MAN tuning mode, a steady +18V level through module pin 14 keeps Q11 off at all times.

2.9 TYPE 79619 SWEEP CONTROL

The Type 79619 Sweep Control provides the proper tuning voltage to the installed tuner based on whether the MAN, SECTOR, or PAN tuning mode has been selected. A schematic diagram of this module is shown in Figure 6-14; reference designation prefix A7 has been assigned.

2.9.1 Pan Tuning Mode. - When the PAN tuning mode has been selected, the switched ramp is connected to module pin 14 and the gate pulse is connected to module pin 20. The manual tuning voltage, which can be any level from -10V to +10V, is present at module pin 21. Note that transistor Q1 is a junction field effect transistor which operates in the depletion mode while Q4 and Q5 are insulated-gate field-effect transistors which operate in the enhancement mode. This means that a set of conditions which will turn Q1 on will turn Q4 or Q5 off and vice versa. During the sweeping period, the gate pulse level is +18V. This turns Q4 off and Q3 on. The -18V at the Q3 collector then forward biases CR4 and turns Q5 on. When diode CR4 turns on, Q1 turns off. Under these conditions, the manual tuning voltage is disconnected, the switched ramp is connected to the inverting input of operational amplifier U1, and the parallel input to U1 is grounded by Q5. During the count period, all conditions are reversed. The -18V level of the gate pulse turns Q4 on, Q3 off, Q5 off, CR4 off, and Q1 on. Now, the manual tuning voltage is connected to the inverting input of U1 and the switched ramp is grounded through Q4.

2.9.2 Sector Tuning Mode. - The conditions in the SECTOR tuning mode are similar to the PAN tuning mode. The gate pulse and manual tuning voltage are present at module pins 20 and 21, respectively. The switched ramp is also present at pin 14 but it is now connected from the arm of the main chassis SECTOR WIDTH control. The most significant difference is that the +18V source is now applied to module pin 17. This voltage turns Q2 on which turns Q3 off. This means that Q1 is on and Q5 is off during both the sweeping period and the counter period. The output of U1 during the sweeping period is therefore the sum of the manual tuning voltage and the ramp waveform.

2.9.3 Man Tuning Mode. - During the MAN tuning mode, +18V is connected to module pin 18. This voltage turns Q2 on, Q3 off, Q5 off, and Q1 on as in the SECTOR sweeping mode. However, the input at pin 20 is now a steady -18V signal which turns Q4 on and the switched ramp signal is not present at module pin 14. The output of U1 therefore inverts the manual tuning voltage from module pin 21.

2.9.4 Sweep Control Output. - Operational amplifier U1 is used as a dc amplifier with R22, R12, R14 and gain adjust potentiometer R13 in the feedback circuit. Resistor R19 and capacitor C1 provide input frequency compensation. The voltage at the arm of potentiometer R23 is coupled through resistor R21 to U1 and sets the dc offset voltage from the operational amplifier. The output, inverted from the input, at pin 6 of U1 is as follows for the three tuning modes:

(1) In PAN, the output of U1 during the sweeping period is the inverted ramp. During the count period the output of U1 is the inverted manual tuning voltage.

(2) In SECTOR, the output of U1 during the sweeping period is the sum of the inverted ramp and the inverted manual tuning voltage. The output during the count period is the inverted manual tuning voltage.

(3) In MAN, the output of U1 is always the inverted manual tuning voltage.

2.9.5 Fine Tuning and AFC. - The arm of the FINE TUNING control is connected to a voltage divider formed by R25 and R26. This voltage at module pin 13 can be at any level between +10V and -10V. From the voltage divider, the fine tuning input is applied to the inverting input of U1 (pin 2) through isolation resistor R24. The AFC (or DAFC as the case may be) corrective voltage, if used, is connected to a voltage divider formed by R18 and R16 at module pin 12. From the divider, this signal is connected to the non-inverting input of U1 (pin 3) through isolation resistor R17. The tuning voltage output from U1 can therefore be affected by either the fine tuning or AFC inputs.

2.9.6 Tuning Monitor. - The output of U1 is applied to the inverting input of operational amplifier U2 (pin 2). The feedback network consisting of R29 and R27 sets the gain of U2 at unity. The output of U2 is therefore at the same level as the input except it is inverted.

2.10 TYPE 79612 MARKER GENERATOR

The Type 79612 Marker Generator provides the Z axis or marker output and an over-sweep indication. The marker output controls the intensity of the beam on the associated CRT display. The over-sweep output is essentially an alarm to warn that the tuning voltage present at that time would cause the tuner to exceed the low band edge or the high band edge as applicable. Reference designation prefix A8 is used for this module. A schematic diagram of the marker generator is shown in Figure 6-16.

2.10.1 Inputs. - The marker output is generated as a function of the ramp waveform, sector width voltage, and manual tuning voltage, when the receiver is in the PAN tuning mode. These three signals are connected to module pins 12, 18, and 19. The ramp waveform at pin 12 is supplied from the output of operational amplifier A6U1 on the ramp generator module through a ten-ohm resistor. The sector width and manual tuning voltage inputs are connected to operational amplifiers U1 and U2 which are arranged for unity gain and driven on the non-inverting inputs. At this point, all three signals are being supplied from very low impedance sources, namely the output of operational amplifiers U1, U2, and A6U1.

2.10.2 Voltage Dividers. - Resistors R6 through R13 are used to form precision voltage dividers to develop six signals (two from each input) at one-half of the input levels. As an example, the ramp is connected to the non-inverting inputs of both U3 and U4 through dividers formed by R11 and R13 to ground and R12 and R10 to ground through the output impedance of U1.

2.10.3 Comparators. - Operational amplifiers U3 and U4 are connected as comparators. The six outputs of the voltage dividers are connected to the comparator inputs as follows:

(1) U3 inverting input (pin 2): manual tuning voltage.

(2) U3 non-inverting input (pin 3): ramp waveform and sector width voltage.

(3) U4 inverting input (pin 2): manual tuning voltage and sector width voltage.

(4) U4 non-inverting input (pin 3): ramp waveform.

2.10.3.1 For purposes of explanation assume that the sector width and manual tuning voltages are each at a level of approximately +2V at the inputs to U3 and U4. The ramp waveform at the inputs of U3 and U4 is approximately ±5V. When the ramp starts at -5V, the input to U3 is +2V on pin 2 and -3V (-5V ramp summed with +2V sector width) on pin 3. This means the output of U3 will be -18V and remain so until the ramp crosses zero volts at which time the U3 output will switch to +18V. At U4, the voltage at the inverting input will be +4V (the manual and sector voltages summed) while the -5V ramp will be on the non-inverting input. The output of U4 is then -18V until the ramp crosses +4V at which time the output switches to +18V. Hence, U3 switches at a point representing the lower sector edge while U4 switches at a point corresponding to the upper sector edge.

2.10.3.2 In the PAN tuning mode, transistor Q1 is turned on and off by U3 and U4. When the output of U3 is +18V and the output of U4 is -18V, Q1 is conducting. Zener diode VR1 protects the transistor under these conditions. In the MAN and SECTOR tuning modes, stage Q1 is held off by +18V connected to module pins 10 or 11.

2.10.4 Marker Waveform. - The marker (or Z axis) waveform consists of three levels: zero to turn off the display tube beam; +0.5V for low intensity; and +1.2V for high intensity. These three levels exist only in the PAN tuning mode. The count blank pulse, from pin 19 of the ramp generator module, is applied to the base of Q2 through R30 and module pin 8. During the count period, this pulse goes from zero to +18V and turns Q2 on. With Q2 on, the marker output line at module pin 9 is pulled down to ground. When Q2 is off, the voltage divider formed by R16 and R23 from the +18V supply to ground provides a +0.5V output at pin 9. When U3 and U4 turn Q1 on, a second voltage divider is formed by R23, CR3, Q1, and R17 to the +18V output from U3. The voltage at pin 9 is then +1.2V because of the clamp provided by CR7 and the base-emitter junction of Q2. In the MAN and SECTOR tuning modes, +18V from module pins 10 or 11 through R22 increases the voltage drop across R23 to a value which will maintain the +1.2V output at pin 9. The output will still go to zero during the count period because of the count blank pulse on pin 8.

2.10.5 Oversweep. - The discussion in paragraph 2.10.4 ignored the oversweep condition. This occurs whenever the tuning voltage applied to the tuner would cause the tuner to exceed either the upper or lower band edge.

Usually this situation occurs only in the SECTOR sweeping mode. When the oversweep condition is present, it is desirable to blank the trace on the associated display (Z axis output to zero volts) and to provide an output to indicate the oversweep on-off situation. Operational amplifiers U5 and U6 are used as comparators to detect the oversweep condition. The tuning voltage input at module pin 2 is in parallel with the signal to the tuner from the ramp generator module. In the PAN and SECTOR tuning modes, this signal is a ramp waveform. The upper and lower limits of the ramp waveform are compared to the regulated +10.3V and -10.3V supply voltages connected through module pins 3 and 4 to U5 and U6. With no oversweep present, the outputs of U5 and U6 are both -18V. If the ramp goes above +10.5V, the output of U5 switches to +18V. This action turns CR6 on. The +18V output blanks the Z axis by turning Q2 on. The +18V at module pin 6 through R26 is the oversweep indicator. A similar action takes place in U6 when the ramp becomes more negative than -10.5V. Diodes CR6 and CR7 isolate the outputs of the two operational amplifiers.

2.11 TYPE 79653 COUNT DELAY

A schematic diagram of the Type 79653 Count Delay is shown in Figure 6-14. The assembly carries reference designation prefix A1. The count period is used to count the local oscillator frequency when the receiver is in the PAN or SECTOR tuning modes. During this time, the manual tuning voltage is connected to the local oscillator for about 5 ms and a trigger pulse is sent to the counter to initiate the counter operating cycle. It is desirable to allow the local oscillator to stabilize before the count begins. Hence, the count delay circuit provides a delay of approximately 2 ms before the trigger pulse is applied to the counter.

2.11.1 The input to the count delay module at pin 14 from the ramp generator board is a negative-going pulse of about -3V amplitude followed 5 ms later by a similar positive-going pulse. These pulses result from differentiation of the count blank pulse at the output of the ramp generator.

2.11.2 Transistors Q1 and Q2 are connected as a one-shot multivibrator. Initially, Q2 is turned on by R4 which connects to the +18V supply. Its collector voltage goes to ground which holds Q1 off. Capacitor C3 will charge to the +18V source through R3 and the base-emitter junction of Q2. The negative-going input pulse, which represents the start of the count period, is coupled through diode CR1 and turns Q2 off and forward biases diode CR2. The collector voltage of Q2 goes from zero to +18V and Q1 turns on by the voltage divider action of R5 and R6. Capacitor C3 will rapidly discharge through CR2 and Q1, and then begin to charge through Q1 and R4 to the +18V line until the voltage at the junction of C3 and R4 reaches a value sufficient to reverse bias CR2. Transistor Q2 then turns on; its collector goes back to zero and the cycle is completed. The pulse generated at the collector of Q2 has a width of 2 ms. This pulse is differentiated by C4 and the input resistance of the associated counter. The result will be a positive-going pulse followed 2 ms later by a negative-going pulse. Since the counter responds only to negative-going trigger pulses, the counter cycle is initiated 2 ms after the start of the count blank pulse. Thus allowing the local oscillator to stabilize before the counter cycle is initiated.

2.12 TYPE 76179 PRECISION REGULATORS

The precision voltage regulators on the Type 76179 Precision Regulator module use -18V, +18V, and +40V inputs to develop -10.3V, +10.3V, and +30V precision power supply sources. A schematic diagram of the module is shown in Figure 6-17; its reference designation prefix is A10.

2.12.1 Minus 10.3V Regulator. - Operational amplifier U1 and transistor Q1 provide the -10.3V precision regulated supply from a regulated -18V input to module pin 20. All other outputs from this module are dependent upon the generation of the -10.3V output. The -18V input through resistors R12 and R1 will develop a small voltage across zener diode VR1. This small negative voltage on the non-inverting input of U2 (pin 3) will cause a negative output from U2 which will turn Q1 on. The feedback path for U1 is now complete and the voltage at the emitter of Q1 through CR1 and R3 will cause VR1 to regulate at -6.2V. Potentiometer R5, in the feedback network of U1, is adjusted so that the amplifier will provide a regulated output of -10.3V at the emitter of Q1.

2.12.2 Plus 10.3V Regulator. - The -10.3V source is used to develop the +10.3V source. Operational amplifier U2 is connected as an inverting amplifier. Its feedback network is adjusted by potentiometer R8 for unity gain. The -10.3V regulated source on the inverting input (pin 2) will then cause a +10.3V output at the emitter of Q2. Amplifier U2 therefore controls series regulator Q2 to produce the +10.3V precision regulated supply.

2.12.3 Plus 30V Regulator. - The +10.3V precision supply is connected to the non-inverting input (pin 3) of operational amplifier U3. The gain of U3 has been set to provide a regulated +30V output at the emitter of Q3.

Resistor R20 and capacitor C9 provide additional filtering for the unregulated +40V input from module pin 2. Capacitor C10 across feedback resistor R16 is used to lower the power supply noise. Note that the regulated +30V output is used as the operating voltage for U3 at pin 7.

2.13 TYPE 76181 +18V REGULATED POWER SUPPLY

2.13.1 The schematic diagram for this module is Figure 6-18; its reference designation prefix is A11. Transistor Q1 mounted on the main chassis functions as a series regulator whose conduction is controlled by the regulator module. The ac input voltage from power transformer T1 is rectified by full-wave rectifier assembly U1 on A11. Electrolytic capacitor C1 on the main chassis filters the pulsating dc output from rectifier U1. The voltage is then fed back into the regulator module through pin 8. Resistor R2 and diode CR1 form a starting circuit which supplies voltage to control transistors Q2 and Q3 until the series regulator turns on. When the unit is energized CR1 is forward biased resulting in voltage being applied to the collector of Q2 and the base of Q3. Diode CR2 is reverse biased since its cathode is more positive than its anode. At the same time Zener diode VR1 breaks down, clamping the anode of CR1 at +12V. Once the regulated output rises to +18V, CR2 becomes forward biased and CR1 becomes reverse biased since its anode is clamped to +12V and its cathode voltage is approximately +18V. The voltage for the collector of Q2 and the base of Q3 is now supplied from the regulated +18V output through CR2.

2.13.2 Transistors Q2 and Q4 form a differential amplifier. Zener diode VR2 establishes a fixed reference voltage on the base of Q4. The base of Q2 is connected to the regulated output voltage through a sampling network made up of fixed resistors R4 and R6, and potentiometer R5. When a difference in voltage exists at the bases of Q2 and Q4, this voltage is amplified by Q2, Q3, and Q1. It is the latter transistor which directly controls the conduction of series regulator Q1 mounted on the main chassis. Assuming that the regulated output voltage increases, Q2 conducts harder causing the base voltage of Q3 to decrease. As a result, the voltage drop across load resistor R3 decreases so that the base voltage on Q1 swings more positive. This positive-going voltage is inverted by Q1 so that the base voltage of the series regulator swings in the negative direction. The dynamic collector-emitter impedance of main chassis Q1 (NPN) now increases, resulting in the regulated output voltage dropping to its nominal value.

2.13.3 A differential amplifier is used as the comparison circuit since variations in base-emitter voltage due to changes in temperature in one transistor will tend to cancel similar changes in the other. This configuration also permits the reference diode, VR2, to be placed in a base circuit rather than the emitter, as is the case with a one-stage error amplifier. This configuration maintains a more constant current flow through the diode, resulting in a more stable reference voltage. Silicon diode CR3 is included to provide temperature compensation for the Zener reference voltage. The negative temperature coefficient of the silicon diode counteracts the positive temperature coefficient of the Zener so that the reference voltage remains almost constant for large variations in ambient temperature. Diodes CR4 and CR5 form a full-wave rectifier for the +40V supply. This voltage is used to operate the +30V precision regulator on module A10.

2.14 TYPE 76180 -18V REGULATED POWER SUPPLY

The Type 76180 -18V Regulated Power Supply has been assigned reference designation prefix A12; its schematic diagram is shown in Figure 6-19. It is functionally identical in operation to the +18V regulator described in paragraph 2.13. It works in conjunction with main chassis regulator Q2 and filter capacitor C2.

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, CEI Division, or your Watkins-Johnson representative with details of any shortage. The absence of a minor component that does not affect proper functioning should not prevent the equipment from being used.

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

The Type 205 Receiver is designed for mounting in a standard 19-inch rack. The unit will occupy 3.5 inches of vertical space and extend approximately 16 inches back into the rack. Critical dimensions are shown in Figure 3-1. If used in a mobile installation, some means should be devised to support the sides and/or rear of the equipment. A brace extending along the sides from the front panel to the rear apron is preferred. Do not rely solely on the front-panel mounting hardware to support the unit. The rack installation should allow a free flow of air through the holes in the top and bottom dust covers. For this reason, at least 1/8-inch of clearance above and below the unit should be provided. The installation should also allow access to the rear panel so that the input and output connections can be made and changed if desired. The rear apron connections to the receiver are described in the following paragraphs. A rear view of the receiver is shown in Figure 5-2.

3.2.1 Power Connections. - Turn the POWER switch OFF. Plug the power cord into a 115 or 230 Vac, 50-400 Hz, source. The third pin of the power plug grounds the unit. If a three-pin receptacle is not available use the three-to-two pin adapter provided. Be sure to attach the wire from the adapter to a suitable ground. Before energizing the receiver, check the rear-apron input power selector switch, S5, to make sure it is in the proper position for the line voltage being used.

3.2.2 Antenna Connection. - Connect the antenna to RF INPUT jack J1. This jack is a type N connector.

3.2.3 AFC Connection. - An external voltage for automatic frequency control may be connected to the AFC jack J12 a type BNC connector. Although this input was designed to receiver a DAFC (Digital Automatic Frequency Control) input from a CEI Type DRO-308 Counter, other forms of AFC can be employed. A voltage of ±4V at J12 will produce a frequency change of 0.3% of the installed tuner operating band. A positive-going corrective voltage produces a decrease in the tuned frequency.

3.2.4 Local Oscillator Output. - The LO OUTPUT jack J2 is a type BNC connector. This output will deliver 50 mV, minimum, into a 50-ohm load.

3.2.5 Signal Monitor Output. - A 21.4-MHz signal to drive a signal monitor is available at the SM OUTPUT jack J15, a type BNC connector.

3.2.6 Ramp Connection. - The ramp waveform is available at RAMP jack J11, a BNC connector. This output will deliver a ±0.5V ramp with a 1K ohm source impedance.

3.2.7 Marker Output. - The MARKER (or Z axis) output is available at jack J13, a type BNC connector. A steady +1.2V output is present during MAN and SECTOR sweeping modes, except for zero volts during the 5 ms count period. In the PAN mode the output is a pulse on a pedestal and a zero volt count period of 5 ms. The pedestal is at a level of +0.5V and the pulse is at an amplitude of +1.2V. The width of the pulse is a function of the setting of the SECTOR WIDTH control. The horizontal position of the pulse along the pedestal is a function of the setting of the manual tuning control.

3.2.8 Tuning Voltage Connection. - The manual tuning voltage from the receiver is brought out on the rear apron and returned to the tuner at connectors marked TUNING VOLTAGE IN (J9) and OUT (J8). These twinax connectors are usually interconnected by a short cable supplied with the receiver. The tuned frequency can be controlled externally by a voltage of -10V for low band edge to +10V for high band edge, applied to jack J10. The mating plug for this connector is a Trompeter PL-76.

3.2.9 Video Output. - The video output from the receiver is available at a BNC connector marked VIDEO J16. This output will deliver 1 Vrms, into a 100-ohm load.

3.2.10 IF Output Connection. - A 21.4-MHz IF output, after bandwidth limiting, is available at IF OUTPUT jack J14, a type BNC connector. A level of at least 50 mV will be delivered into a 50-ohm load for all input signals above AGC threshold.

3.2.11 Speaker Output. - The 600-ohm audio output is available at miniature phone jack J18. This output is in parallel with the audio output available at TB1, terminals 1 and 2. A mating plug for the speaker output is the Switchcraft 780.

3.2.12 Fan Connection. - A CEI Type BU-160 Blower Fan can be operated from the receiver. A 115 Vac source for this purpose is provided at pins A and B of jack J22 marked FAN. A Winchester M4PLSH10C plug will mate with the fan jack. Be certain that the Blower Fan is rated for the line frequency in use.

3.2.13 Counter Connection. - The Type DRO-308 Counter is usually connected to the COUNTER jack J14. This 14-pin connector will mate with a Winchester SRE-14P-JTC-H13 plug. In addition to this connection, the counter also connects to the receiver's LO OUTPUT and AFC input jacks.

3.2.14 Signal Display Connection. - The Type SM-7301 Signal Display is usually connected to the 14-pin SM jack J17. Supply and control voltages are supplied through this connector as well as the vertical and horizontal outputs to the display. Note that the vertical output on pin P of J17 is not available in that form at any other connector on the receiver.

3.2.15 Balanced Audio Output. - A 100-mW, 600-ohm balanced audio output is available at terminal strip TB1, terminals 1 and 2. Note that the SPKR OUTPUT jack J18 is in parallel with this output.

3.2.16 FM Output. - A dc-coupled FM output from the discriminator in the selected IF bandwidth is available at TB1 terminal 3.

3.2.17 AM Output. - A dc-coupled AM output from the detector in the selected IF bandwidth is available at TB1 terminal 4.

3.2.18 COR Connection. - The COR relay contacts are wired to TB1 terminals 5, 6, and 7. Terminals 5 and 6 connect to the normally closed contacts while 6 and 7 go to normally open contacts.

3.2.19 AGC Monitor Output. - The AGC monitor output at TB2 terminal 1 is a negative-going voltage which indicates relative signal level for signals above AGC threshold. Response is logarithmic with respect to signal strength.

3.2.20 Oversweep Indicator. - The oversweep indicator signal is present at TB2 terminal 3 marked SWEEP. This output indicates when the sweep width setting at the particular tuned frequency would cause the tuner to be swept beyond its tuning range, either at the high end or the low end of the band. This output, normally at zero volts, rises to about +15V during any segment of the sweep cycle when an oversweep condition exists.

3.2.21 Tuning Voltage Monitor. - The tuning voltage can be monitored at TB2 terminal 4. In the MAN sweeping mode, this voltage is steady and may be at any value between -10V and +10V as a function of the setting of the manual tuning control. In the PAN sweeping mode, a ramp of ±10V is present followed by a 5 ms step which may be at any level from -10V to +10V. The duration of the step is the count period. The amplitude of the step is a function of the setting of the manual tuning control. The duration of the ramp is a function of the setting of the SWEEP RATE control. The presentation in the SECTOR sweeping mode is similar to the PAN mode except that the ramp amplitude may be varied from zero volts to ±10V as a function of the SECTOR WIDTH control.

3.2.22 Tuning Mode Indicator. - When the receiver is in the MAN tuning mode, +18V is present at TB2 terminal 5. Absence of this voltage therefore indicates receiver operation in a panoramic mode, either PAN or SECTOR.

3.2.23 External Blank Input. - The Z axis (MARKER) output at J13 can be blanked by the application of +18V to TB2 terminal 2.

3.2.24 Tuning Head Installation. - The Tuning Heads for the Type 205 Receiver are installed through the opening in the front panel. All connections are automatically made when the tuner is installed. A mechanical locking device has been provided in the lower left-hand corner of the tuner to secure the unit in place.

3.3 OPERATION

The operation of the controls and switches on the Type 205 Receiver are explained in the following paragraphs. Front and rear views of the receiver are shown in Figures 5-1 and 5-2.

3.3.1 Power Switch. - The POWER toggle switch controls the ac input to the receiver. Make certain that the setting of the rear-apron voltage selector switch marked 115V/230V is set to match the power source before the receiver is energized.

3.3.2 Tuning Mode Switch. - The tuning mode switch is used to select MAN (manual), SECTOR, or PAN (panoramic), tuning. In the MAN mode, the receiver functions as a conventional manual receiver. In the PAN mode, the entire tuning range of the installed tuner is swept. In the SECTOR mode, any segment, from zero to the full range of the installed tuner, may be swept. The sector being swept will be centered around the frequency on the tuning dial except at either band end.

3.3.3 Sector Width Control. - The SECTOR WIDTH control sets the lower and upper frequency limits of the swept sector when the receiver is in the SECTOR mode. At the maximum CW position, the entire range of the tuner will be swept if the manual tuning control is set at midband. The segment being swept approaches zero as the control is turned to the maximum CCW position.

3.3.4 Sweep Rate Control. - The SWEEP RATE control is used to adjust the sweep from a minimum of about 1 sweep every 25 seconds to a maximum of 25 sweeps per second.

3.3.5 RF Gain Control. - The RF GAIN control sets the gain of the receiver in the MAN tuning mode with the reception mode switch set for AM/MAN reception. Turning the control in a clockwise direction increases the gain.

3.3.6 Fine Tuning Control. - The FINE TUNING control is an electronic vernier on the main tuning control. With this control set initially at midrange, it is possible to increase or decrease the tuned frequency when the receiver is in the manual tuning mode.

3.3.7 Audio Level Control. - The AUDIO LEVEL control sets the level of all audio outputs from the receiver including the PHONES jack, speaker output jack J18 on the rear panel, and the balanced audio output at terminals 1 and 2 of TB1. The audio outputs are disabled in the PAN and SECTOR modes.

3.3.8 Video Gain Control. - The video level at the rear-apron VIDEO OUTPUT jack J16 is set by the VIDEO GAIN control.

3.3.9 Reception Mode Switch. - The four-position reception mode switch is used to select the type of reception desired when the receiver is in the MAN tuning mode. Either PULSE, FM, AM/AGC, or AM/MAN reception may be selected.

3.3.10 IF Bandwidth Switch. - The IF BANDWIDTH switch is operative when the receiver is in the MAN tuning mode. A bandwidth of 10-kHz, 50-kHz, 300-kHz, or 1-MHz can be selected.

3.3.11 COR Sensitivity Control and Lamp. - The COR SENSITIVITY control is used to obtain COR (carrier operated relay) action at the desired incoming signal level. The white lamp above the control indicates COR action. A delay of about six seconds will occur after the incoming signal has been removed before the COR releases. This control also acts as an audio squelch. Turning the control clockwise increases COR sensitivity.

3.3.12 Tuning Meter. - The TUNING meter operates in the MAN tuning mode to indicate the relative position of a signal in the passband of the selected IF amplifier.

3.3.13 Signal Strength Meter. - The SIGNAL STRENGTH meter operates when the receiver is in the MAN tuning mode. It indicates the relative signal strength of received signals.

3.3.14 Phones Jack. - The PHONES jack provides an audio monitoring point on the front panel. The impedance of the headphones should be 600 ohms.

3.3.15 Main Tuning. - All of the tuning heads for the Type 205 Receiver operate in a similar manner. A main tuning knob with crank has been provided to manually tune a single frequency (as indicated on a counter, if used, or the tape dial) in the MAN tuning mode, or to adjust the sector being swept if the receiver is in the SECTOR mode.

3.4 PREPARATION FOR RESHIPMENT AND STORAGE

3.4.1 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.

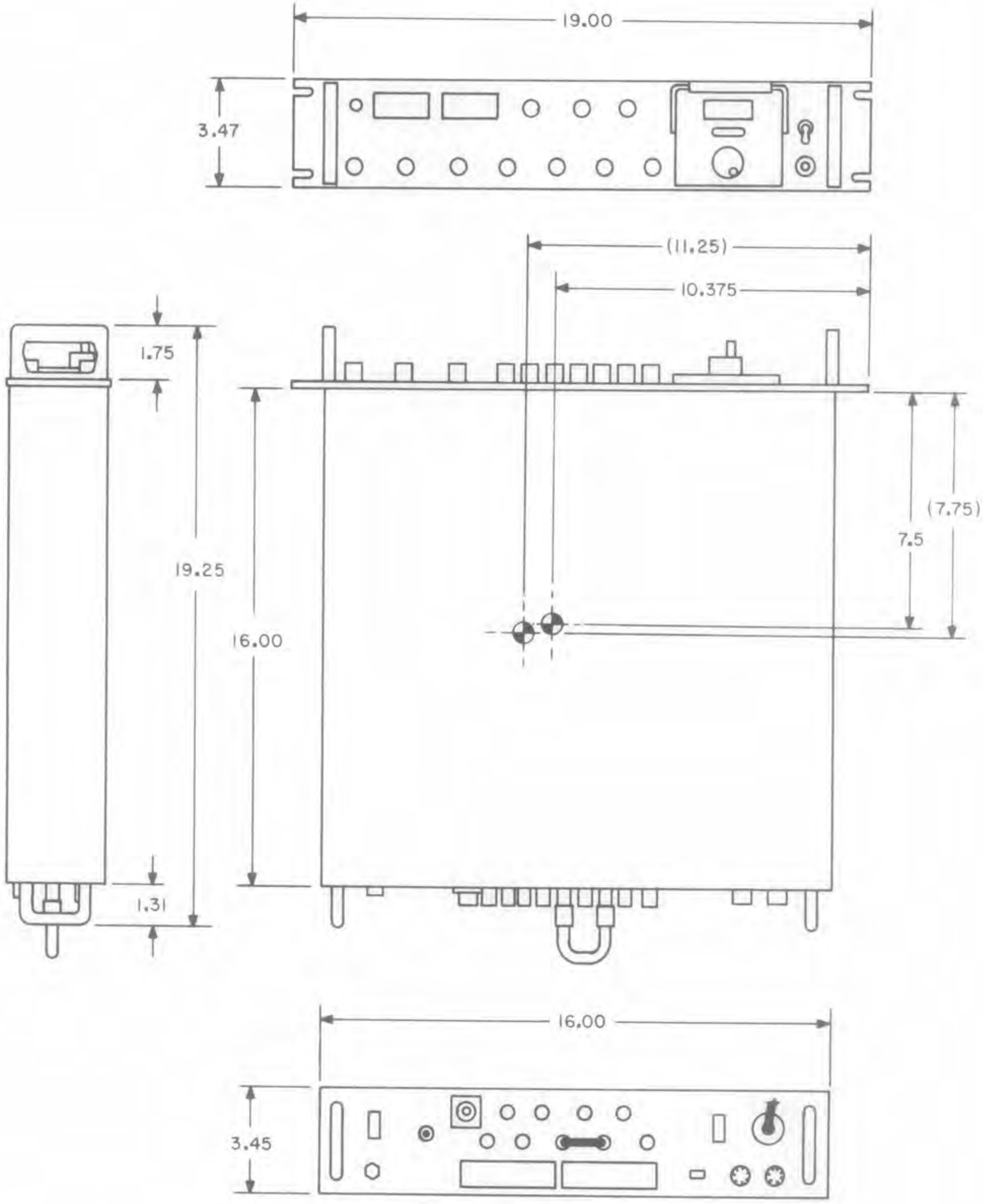
3.4.2 If time permits, contract packing and packaging firms can be found in many cities. Based on an examination of the equipment and the proposed method of shipment, these firms can usually perform a reliable repackaging service.

3.4.3 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.

3.4.4 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.



NOTE: DIMENSIONS IN ( ) INDICATES CENTER OF GRAVITY WITHOUT TUNER INSTALLED.

Figure 3-1. Type 205 Receiver, Critical Dimensions

SECTION IV
MAINTENANCE

4.1 GENERAL

The Type 205 Receiver has been conservatively designed to operate for extended periods of time with little or no routine maintenance. An occasional cleaning and inspection are the only preventive maintenance operations recommended. 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 and illustrations showing part locations can be found in Section V.

4.2 CLEANING AND LUBRICATION

The unit should be kept free of dust, moisture, grease, and foreign matter to ensure trouble-free operation. If available, use low velocity compressed air to blow accumulated dust from the exterior and interior of the unit. A clean dry cloth, a soft bristled brush, or a cloth saturated with cleaning compound may also be used. The Type 205 Receiver does not require lubrication.

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 ALIGNMENT AND ADJUSTMENT PROCEDURES

4.4.1 General. - The alignment procedures given here are suitable when making adjustments after replacing transistors or components. Only those controls specifically referred to within a series of steps given for aligning a particular circuit affect the alignment of that circuit. Those controls not mentioned in any one series of steps may be left in any position. The alignment of the receiver should be performed only with suitable equipment by technicians thoroughly familiar with the unit. If the limits and tolerances specified in the following procedures cannot be obtained, then a factory alignment is necessary.

4.4.2 Test Equipment Required. - The following test instruments, or their equivalents, are required to align the 205 Receiver.

(1) Signal Generator, Hewlett Packard Type 606B.

(2) Oscilloscope, Tektronix Type 503.

(3) Sweeping Signal Generator, Hewlett Packard Type 675A with 21.4 MHz marker.

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

(5) Frequency Counter, Computer Measurements Co., Type CMC-738A.

(6) High Impedance Detector as shown in Figure 4-1.

(7) Any tuning head used with the 205 Receiver.

(8) Assorted Cables, Connectors, and Alignment Tools.

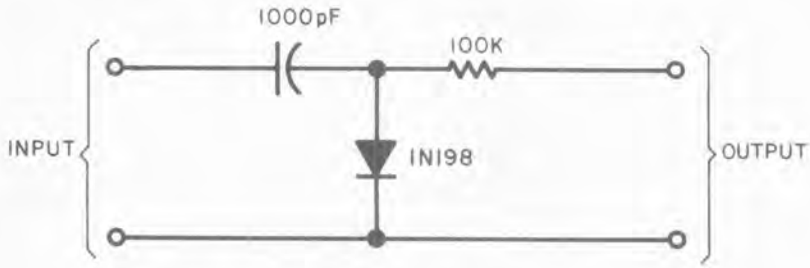


Figure 4-1. High Z Detector Diagram

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

(1) Tuning Mode - MAN

(2) Reception Mode - AM/MAN

(3) RF Gain - Max. CW

(4) IF Bandwidth - Consistent with the bandwidth being aligned.

(5) Operating tuning head installed.

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

(1) Turn on the receiver and the digital voltmeter.

(2) Connect the digital voltmeter to A12 pin 8.

(3) Adjust A12R5 for a -18.0V reading.

(4) Connect the digital voltmeter to A11 pin 14.

(5) Adjust A11R5 for a +18.0V reading.

(6) Connect the digital voltmeter to A10 pin 19.

(7) Adjust A10R5 for a -10.300V reading.

(8) Connect the digital voltmeter to A10 pin 16.

(9) Adjust A10R8 for a +10.300V reading.

(10) Connect the digital voltmeter to A10 pin 3.

(11) Adjust A10R18 for a +30.000V reading.

4.4.5 Sweep Control Adjustments (A7). - Make the following sweep control adjustments after the power supply voltages have been adjusted.

(1) Disconnect any input to AFC jack J12. Make sure pin 12 reads zero volts.

(2) Set FINE TUNING control to mid-range and then connect A7 pin 13 to pin 11 or board ground.

(3) Disconnect main chassis P8 and short center conductor to shield.

(4) Connect digital voltmeter to A7 pin 9.

(5) Adjust A7R23 for a 0V ± 0.001V reading.

(6) Remove short on P8 and reconnect P8 to J8.

(7) Connect digital voltmeter to A7 pin 21. Adjust main tuning knob on tuning head until a +10.000 ± .001V reading is obtained. Do not disturb the tuning knob until the next two steps are complete.

(8) Move digital voltmeter to A7 pin 9.

(9) Adjust A7R13 for a -10.000 ± .001V reading.

4.4.6 Ramp Generator (A6). - Make the following ramp generator adjustments after the sweep control adjustments have been completed:

(1) Connect the 205 Receiver and oscilloscope as follows:

a. Connect the ramp output from the receiver (J11) to the external horizontal input (positive) of the oscilloscope.

b. Connect the vertical input (positive) of the oscilloscope to pin 3 of TB2 on the receiver rear panel.

(2) Make the following initial control settings:

a. Oscilloscope. - Horizontal Amplifier, Sweep Disabled.

b. Oscilloscope. - Sensitivity (horizontal), 0.1V/cm calibrated.

c. Receiver. - PAN mode, SWEEP RATE maximum CW; tuner installed.

(3) Adjust A6R22 and A6R24 maximum CW.

(4) Adjust the oscilloscope vertical amplifier controls to display the +15 volt oversweep pulse(s).

NOTE

The oscilloscope horizontal position control will have to be adjusted to see both pulses.

(5) Adjust the oscilloscope horizontal position control to observe the second pulse and then adjust A6R22 to obtain a width of 0.03V for the second pulse.

(6) Adjust the oscilloscope horizontal position control to observe the first pulse and adjust A6R24 for a pulse width of 0.06 volts.

4.4.7 RF Monitor (A3). - Proceed as follows:

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

(2) Adjust the sweep generator to produce a 21.4 MHz center frequency with a sweep width of ±7 MHz. Use a slow sweep rate.

(3) Adjust the oscilloscope controls until a response is displayed.

(4) Align A3L1 for a symmetrical response centered at 21.4 MHz with a bandwidth of 7-10 MHz.

4.4.8 IF Output Amplifier (A2A8). - Proceed to align the IF Output Amplifier as follows:

CAUTION

Do not ground A2C12 when connecting the equipment. Failure to observe this caution will destroy one or more transistors.

(1) Connect the equipment as shown in Figure 4-2 except RF output connects to A2A8 pin 21 and the marker adder connects to A2C12.

(2) Set IF BANDWIDTH switch in the 1 MHz position.

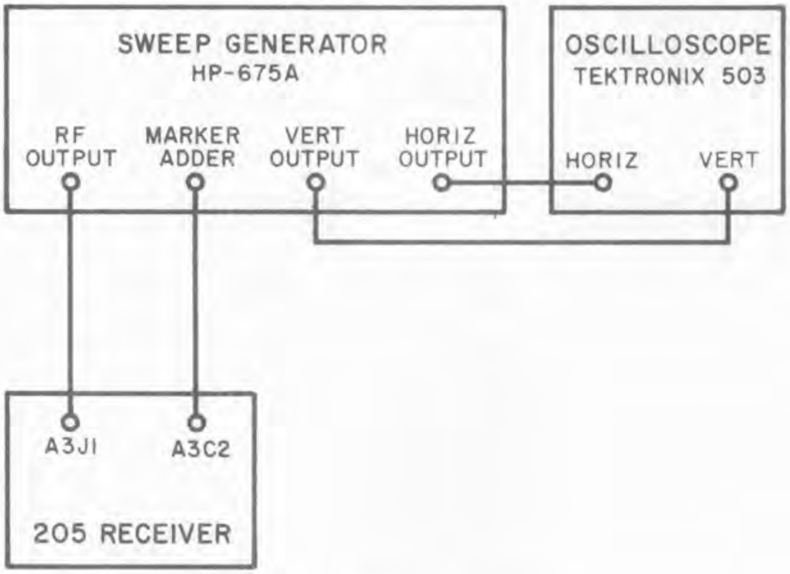


Figure 4-2. RF Monitor Alignment

(3) Adjust the sweep generator to produce a 21.4 MHz center frequency and ±5 MHz sweep width.

(4) Set the oscilloscope controls until a response is displayed.

(5) Adjust C13 for a symmetrical response centered at 21.4 MHz. The 3-dB bandwidth should be about 7 MHz.

(6) Adjust the sweep generator to produce a CW signal at 21.4 MHz at a level of -50 dBm. Adjust R20 for a reading of 1.5 Vdc at A2C12.

4.4.9 <u>1-MHz IF Preselector (A2A4)</u>. Proceed as follows:

(1) Install the 1-MHz bandwidth IF preselector board in the extender card. Place the IF bandwidth switch in the 1 MHz position.

(2) Connect the equipment as shown in Figure 4-3.

(3) Use a small screwdriver or other suitable tool and short out L2 on the back of the printed wiring board.

(4) Adjust C7 for a peak at 21.4 MHz. Use the other vertical oscilloscope input if necessary to peak C7 and use this input for the remainder of the procedure.

(5) Remove short from L2.

(6) Connect short across L3.

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

(8) Remove short from L3.

(9) Connect short across L4.

(10) Adjust C13 for a peak at 21.4 MHz.

(11) Remove short from L4.

(12) Connect short across L5.

(13) Adjust C16 for a null at 21.4 MHz.

(14) Remove short from L5.

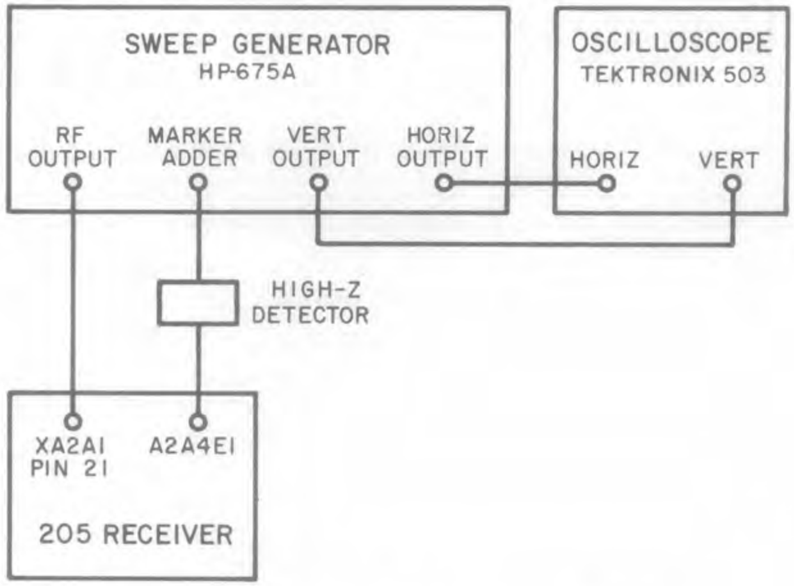


Figure 4-3. Test Setup, IF Preselector Alignment

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

(16) Remove the high impedance detector from E1.

(17) Remove the extender card and place the IF preselector board in its connector.

(18) Connect the high impedance detector to pin 2.

(19) Carefully readjust C7 for an overall 1-MHz bandwidth at the 3-dB points centered at 21.4 MHz. A typical response is shown in Figure 4-4.

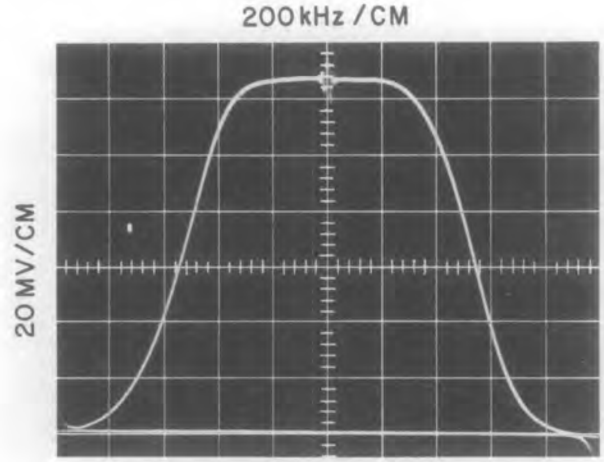


Figure 4-4. 1 MHz IF Preselector, Typical Response

(20) Slight readjustment of C7, C10, C13, C6 and C20 may be required for best response.

4.4.10 300-kHz IF Preselector (A2A3). - Proceed as follows:

(1) Install extender card between the 300-kHz bandwidth IF preselector board and its connector.

(2) Connect the equipment as shown in Figure 4-3 except the detector connects to A2A3E1. Place the IF bandwidth switch in the 300 kHz position.

(3) Adjust the sweep generator and oscilloscope controls until a response is displayed centered at 21.4 MHz.

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

(5) Adjust C7 for a peak at 21.4 MHz. Use the opposite oscilloscope input if necessary to obtained a peak instead of a null and continue to use this input for the balance of the procedure.

(6) Remove the short from L2.

(7) Connect a short across C20.

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

(9) Remove the short from C20.

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

(11) Change the sweep injection point to gate 1 (pin 3) of Q3 through a 1000 pF capacitor.

(12) Move the detector connection to module pin 2.

(13) Adjust C13 and C16 for an overcoupled response centered at 21.4 MHz with a 1-dB dip.

(14) Remove the extender card and place the board in its connector.

(15) Connect the sweep input to pin 21.

(16) Carefully readjust C7 for an overall response centered at 21.4 MHz with a 3-dB bandwidth of 300 kHz. A typical response is shown in Figure 4-5.

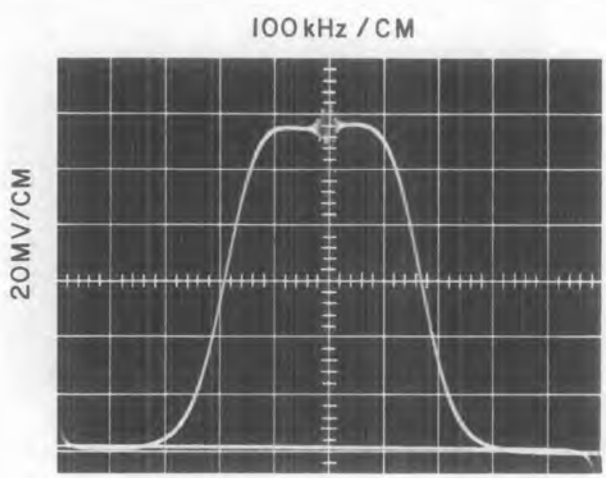


Figure 4-5. 300-kHz IF Preselector, Typical Response

4.4.11 10-kHz or 50-kHz IF Preselector (A2A1-A2A2). - Proceed as follows. Use A2A1 reference designation prefix with the 10-kHz bandwidth and A2A2 with 50-kHz:

(1) Connect the equipment as shown in Figure 4-3, except the detector is connected to pin 2.

(2) Install the extender card between the IF preselector board and its connector.

(3) Adjust the sweep generator and oscilloscope controls until a response is displayed at 21.4 MHz.

(4) Adjust L1 and L2 for minimum response ripple.

(5) Adjust L3 for a slightly round-nosed response centered at 21.4 MHz. Typical responses are shown in Figures 4-6 and 4-7.

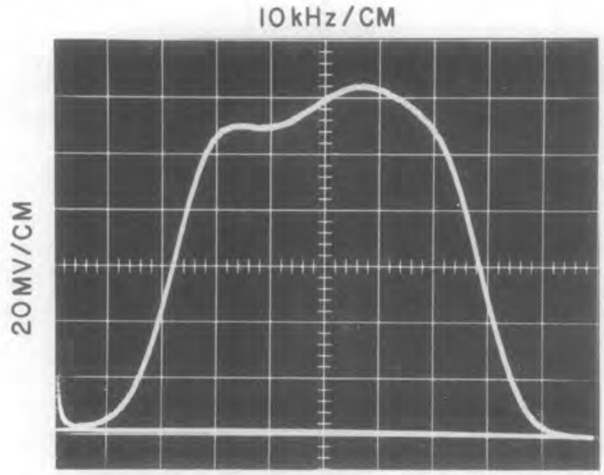


Figure 4-6. 50-kHz IF Preselector, Typical Response

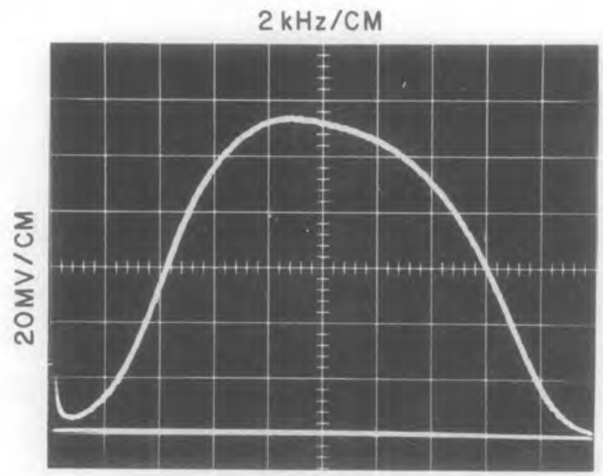


Figure 4-7. 10-kHz IF Preselector, Typical Response

4.4.12 <u>IF Preselector Gain Adjustments.</u> - After all four IF preselector modules and the IF output module have been aligned, the gain of each IF preselector should be set. Proceed as follows:

CAUTION

In connecting the equipment, do not short A2C12 to ground. Failure to observe this caution will destroy several transistors.

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

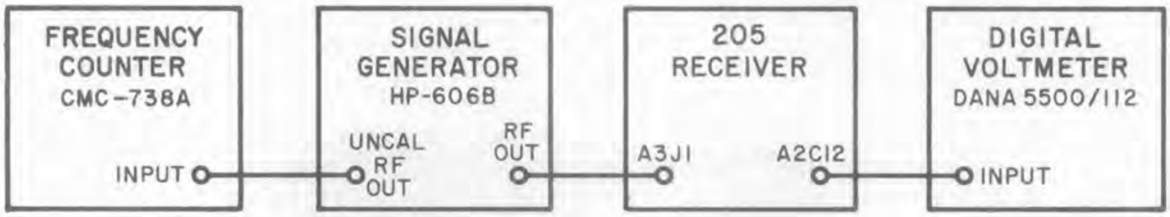


Figure 4-8. Test Setup, IF Preselector Gain Adjustments

(2) The gain adjust potentiometer on each IF preselector board should be set to produce a 1.5 Vdc reading on the meter with a 21.4 MHz CW input at the level specified. Use the counter to obtain a 21.4 MHz output from the signal generator.

OUTPUT LEVEL	IF BANDWIDTH	ADJUST
-89 dBm	10 kHz	A2A1R26
-82 dBm	50 kHz	A2A2R26
-74 dBm	300 kHz	A2A3R27
-69 dBm	1 MHz	A2A4R27

4.4.13 <u>1-MHz Discriminator (A2A5).</u> - Proceed as follows:

(1) Place the IF BANDWIDTH switch in the 1 MHz position.

(2) Connect the equipment as shown in Figure 4-2 except the sweep input connects to A2A5 pin 21 and the marker adder connects to A2A5 pin 2.

(3) Adjust the sweep generator and oscilloscope controls until an S-curve response is displayed.

(4) Adjust C7 for centering of the S-curve at 21.4 MHz.

(5) Adjust C11 for response symmetry. A typical response is shown in Figure 4-9.

4.4.14 <u>300-kHz Discriminator (A2A6).</u> - Proceed as follows:

(1) Set the IF BANDWIDTH switch to the 300 kHz position.

(2) Connect the equipment as shown in Figure 4-2 except the sweep input connects to A2A5 pin 21 and the marker adder connects to A2A6 pin 2.

(3) Adjust the sweep generator and oscilloscope controls until an S-curve response is displayed.

(4) Adjust C7 for centering of the S-curve at 21.4 MHz.

(5) Adjust C11 for response symmetry. A typical response is shown in Figure 4-10.

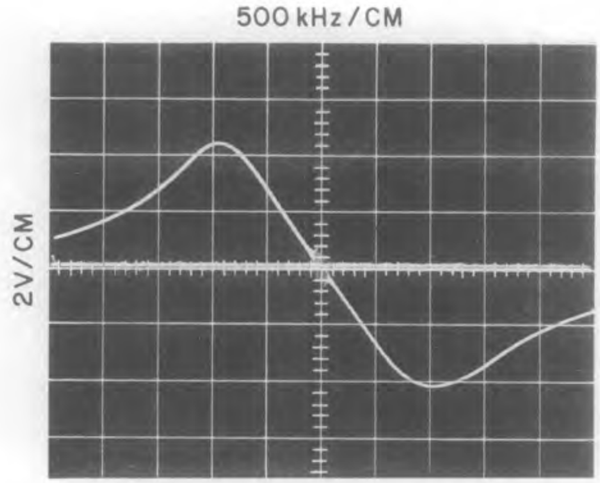


Figure 4-9. 1 MHz Discriminator, Typical Response

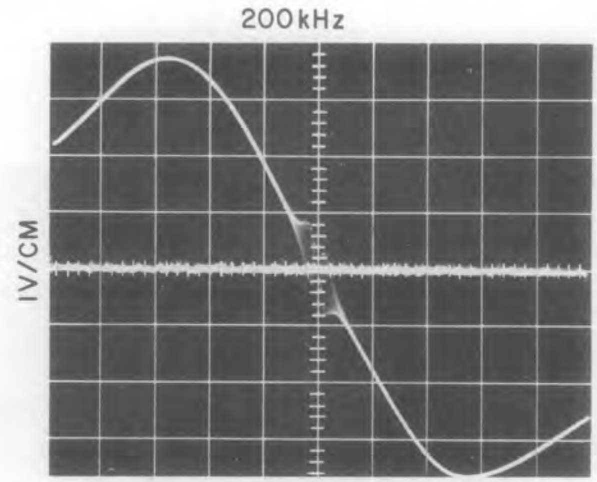


Figure 4-10. 300 kHz Discriminator, Typical Response

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

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

(2) Connect the equipment as shown in Figure 4-2, except the sweep input connects to A2A5 pin 21 and the marker adder connects to A2A7 pin 2.

(3) Adjust the sweep generator and oscilloscope controls until and S-curve response is obtained.

(4) Adjust C4 to linearize the response around 21.4 MHz.

(5) Adjust R4 for zero output at 21.4 MHz. A typical response is shown in Figure 4-11. 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.

4.4.16 <u>IF Amplifier, Overall Response Curves.</u> - After all alignment procedures given in paragraphs 4.4.8 through 4.4.15 have been completed, the overall IF responses should be checked. If a particular response fails

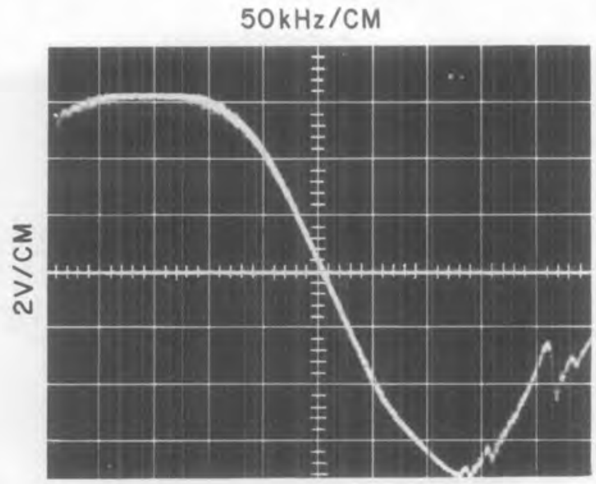


Figure 4-11. 10 kHz and 50 kHz Discriminator, Typical Response

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 response curves are shown in Figures 4-12 through 4-15 for the 1 MHz, 300 kHz, 50 kHz, and 10 kHz IF bandwidths, respectively. Proceed as follows:

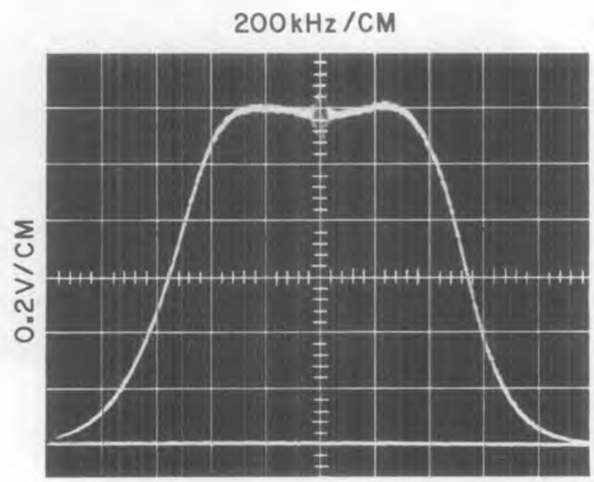


Figure 4-12. 1 MHz IF Bandwidth, Typical Overall Response

CAUTION

Do not short A2C12 to ground when connecting the equipment. Failure to observe this caution will destroy several transistors.

(1) Connect the equipment as shown in Figure 4-2 except the marker adder connects to A2C12.

(2) Place the IF BANDWIDTH switch in the 1 MHz position. Place the tuning mode switch in MAN and the RF GAIN control at the maximum CW position.

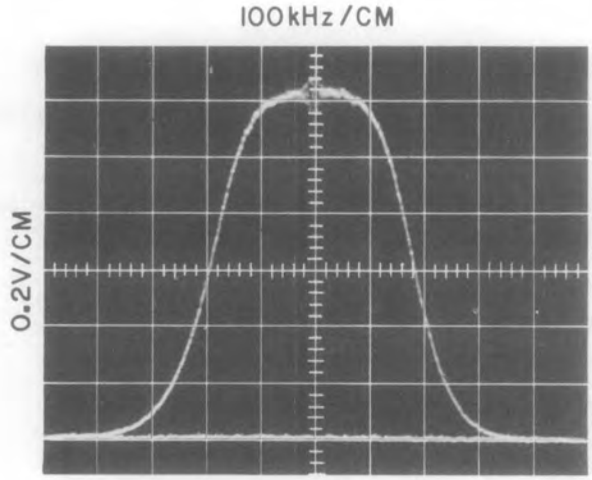


Figure 4-13. 300 kHz IF Bandwidth, Typical Overall Response

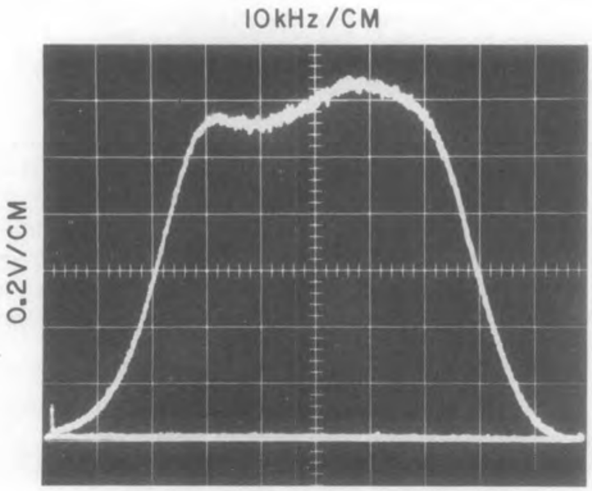


Figure 4-14. 50 kHz IF Bandwidth, Typical Overall Response

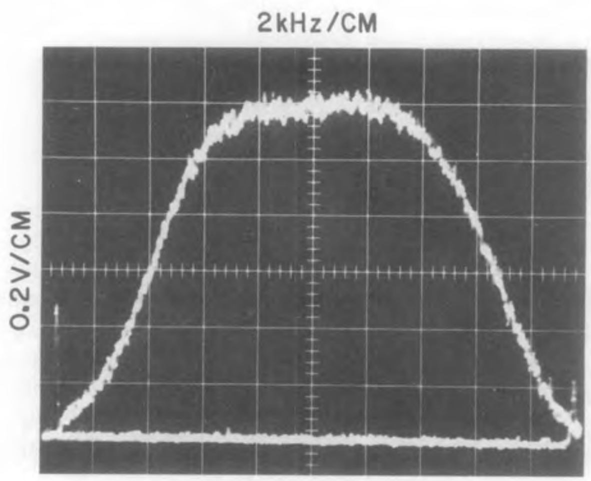


Figure 4-15. 10 kHz IF Bandwidth, Typical Overall Response

(3) Adjust the sweep generator and oscilloscope controls until a response is displayed.

(4) Repeat steps (2) and (3) for the other three IF bandwidths.

4.4.17 CRT Vertical Position. - If an SM-7301 Signal Display is used with the 205 Receiver, it may be necessary to adjust the vertical trace position. Proceed as follows:

(1) Connect the SM-7301 to the 205 using normal operating connections (refer to Figure 1-2).

(2) Place the 205 in the MAN tuning mode.

(3) Using the display controls, set the vertical trace position.

(4) Switch the 205 to the PAN mode.

(5) Adjust A9R9 until the same position is obtained as in step (3).

4.5 TROUBLESHOOTING

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 in block diagram form (Figure 4-16), waveforms taken at key points (Figure 4-17), simplified and functional block diagrams (Figures 2-1 and 2-2), 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, voltage measurements (Table 4-2), and detailed circuit diagrams (Figures 6-1 through 6-20).

4.5.1 Localizing Troubles. - The chart shown in Figure 4-16 has been designed to show the methods by which logical troubleshooting can be applied to the Type 205 Receiver. Starting on the left side of the illustration, the first step is to decide if the unit will operate in any of its three tuning modes: PAN, SECTOR, or MAN. If the unit is totally inoperative, the problem is most likely associated with the input power, rectifiers, or power supply regulators. If the unit will operate in the PAN and SECTOR modes but fails to operate in the MAN mode, then circuits after the AM detectors should be suspected, such as the AGC amplifier. If the receiver will operate in the MAN mode but fails in the PAN and SECTOR modes, then the ramp generator and sweep control circuits should be suspected.

4.5.2 Failure Analysis. - Once the trouble has been localized, the unit can be returned to operating condition by substituting a spare module or subassembly known to be in good condition. Prior to performing corrective action on the faulty module, the procedures followed up to this point should be reviewed to determine exactly why the failure affected the equipment in the manner it did. This review is necessary to make certain that the problem discovered is actually the cause and not just the result of the malfunction.

4.5.3 Equipment Required. - Trouble isolation to the module or subassembly level, using the troubleshooting chart in Figure 4-16, can be accomplished using the following equipment or their equivalents:

(1) Signal Generator, Hewlett Packard, Type 606B.

(2) Signal Generator, Hewlett Packard, Type 608E.

(3) Signal Generator, Hewlett Packard, Type 612A.

(4) Oscilloscope, Tektronix, Type 503.

(5) VTVM, RCA, Type WV-98C.

4.5.3.1 All of the signal generators listed may or may not be needed, depending on the operating frequency range of the installed tuning head.

4.5.3.2 The oscilloscope can be used to check waveforms and can also substitute for the signal display in the PAN and SECTOR modes. A signal generator can be used to substitute for the 21.4 MHz IF output from the tuning head or to simulate the receiver's local oscillator to the associated digital readout.

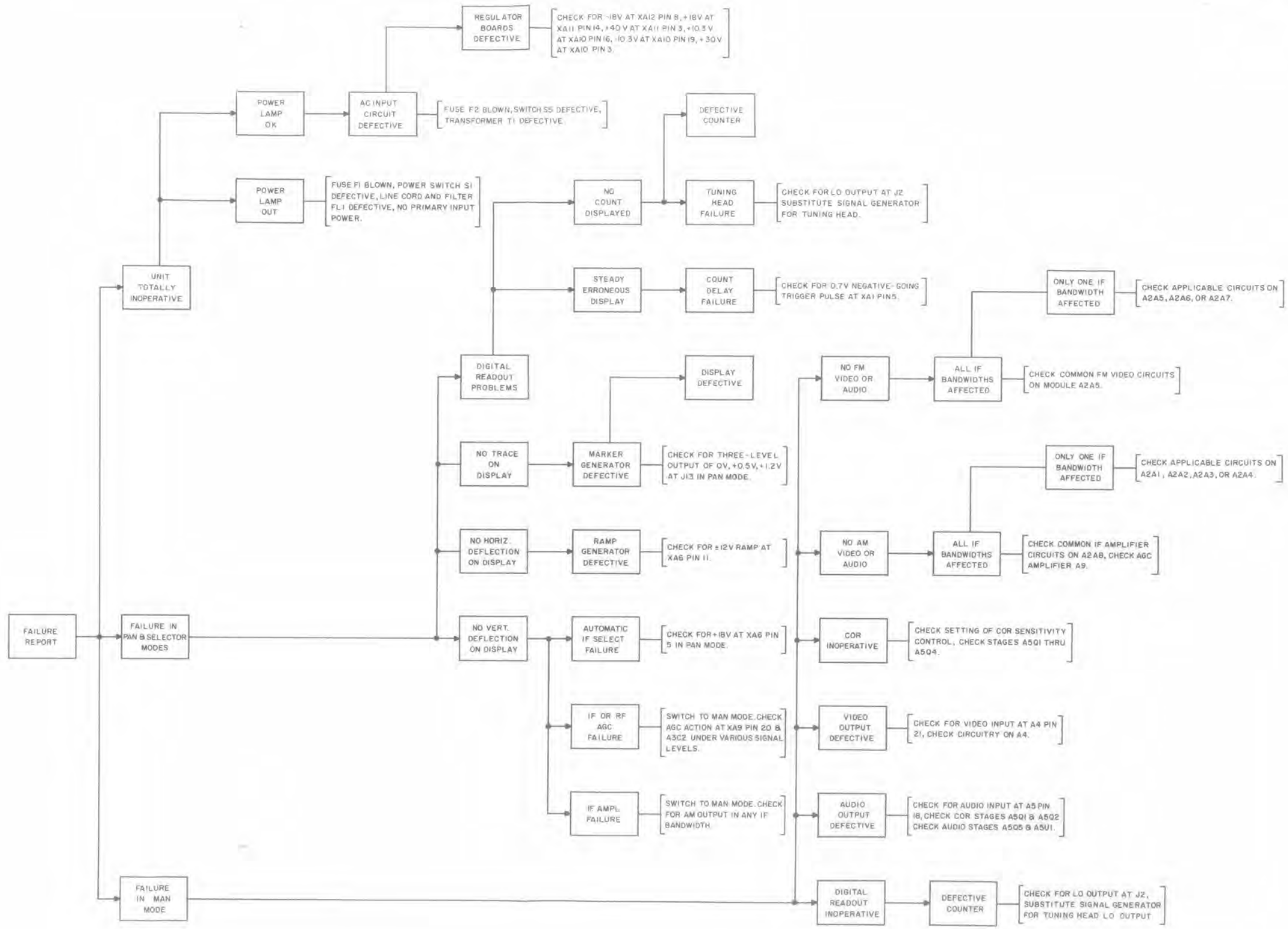


Figure 4-16. Troubleshooting Chart

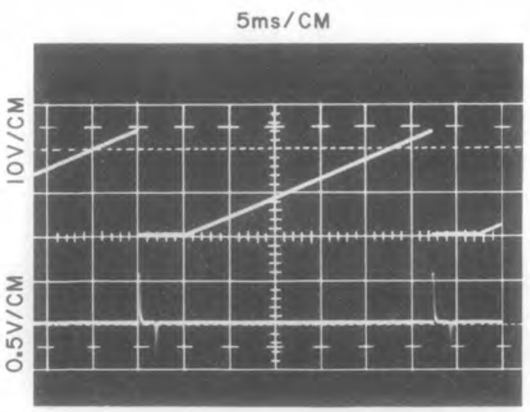


Figure 4-17d. Delayed trigger pulse at XA1 pin 5.

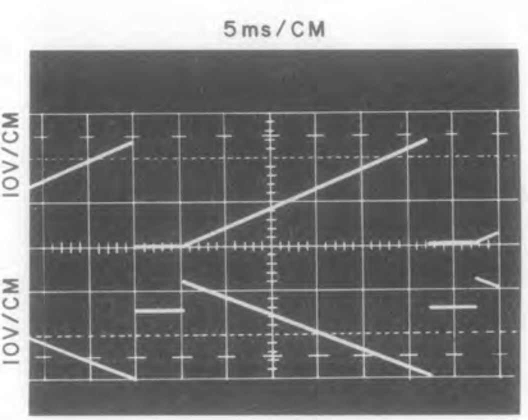


Figure 4-17e. Tuning voltage at XA7 pin 9.

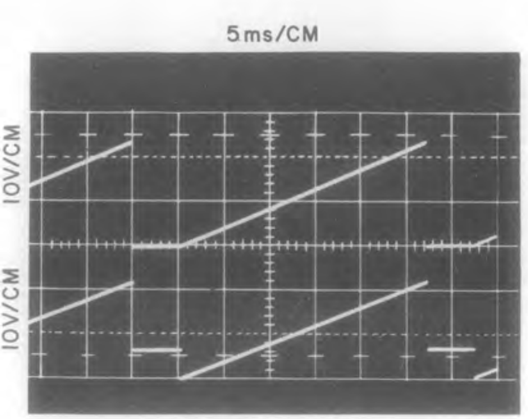


Figure 4-17f. Tuning monitor at XA7 pin 3.
Manual tuning voltage adjusted
to -5 Vdc at XA7 pin 21.

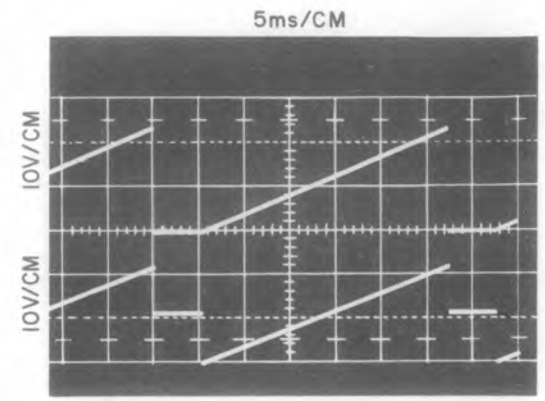


Figure 4-17g. Tuning voltage at XA7 pin 3.
Manual tuning voltage adjusted
to 0 Vdc at XA7 pin 21.

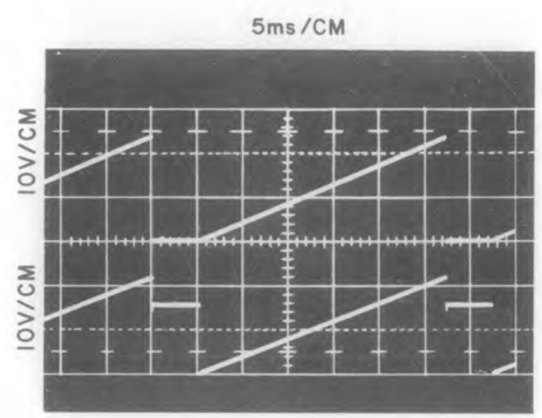


Figure 4-17h. Tuning voltage at XA7 pin 3.
Manual tuning voltage adjusted
to +5 Vdc at XA7 pin 21.

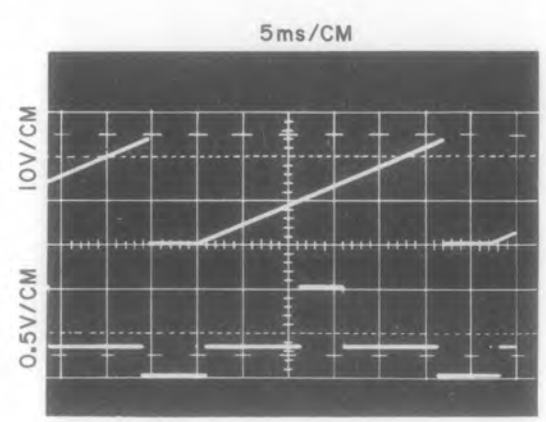


Figure 4-17i. Marker output at XA8 pin 9.
Tuning voltage 0 Vdc at XA8 pin 19.
Sector width voltage +2 Vdc at XA8 pin 18.

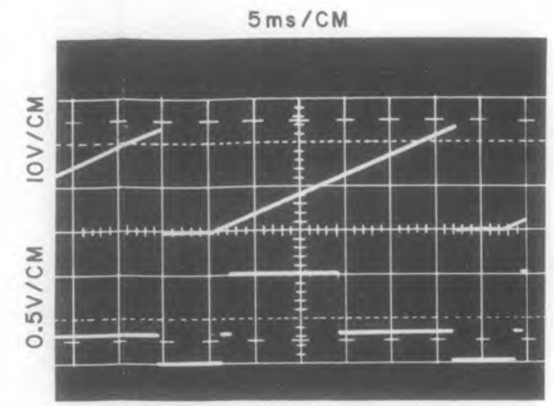


Figure 4-17j. Marker output at XA8 pin 9.
Tuning voltage -5 Vdc at XA8 pin 19.
Sector width voltage +5 Vdc at XA8 pin 18.

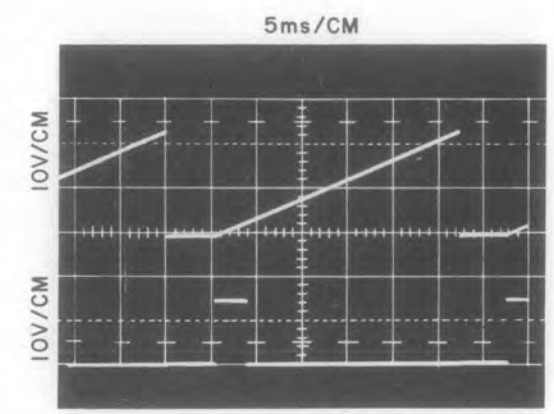


Figure 4-17k. Sector mode oversweep output at XA8 pin 6.
Tuning voltage -5 Vdc at XA8 pin 19.
Sector width voltage +5 Vdc at XA8 pin 18.

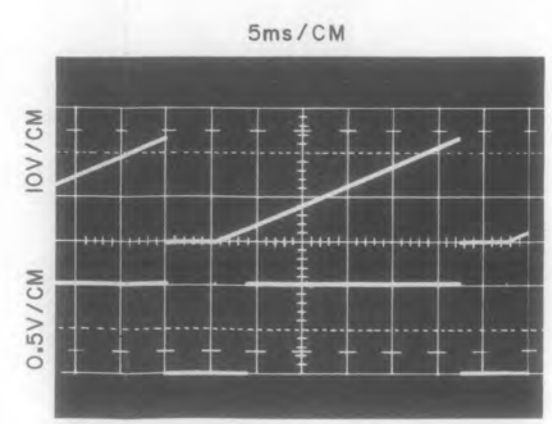


Figure 4-17l. Marker output at XA8 pin 9.
Tuning voltage -5 Vdc at XA8 pin 19.
Sector width voltage +5 Vdc at XA8 pin 18.

NOTES:
1. PAN tuning mode unless otherwise specified.
2. SWEEP RATE control maximum CW.
3. Top trace is basic ramp waveform observed at XA6 pin 10.

Figure 4-17. Typical Sweep Circuit Waveforms.

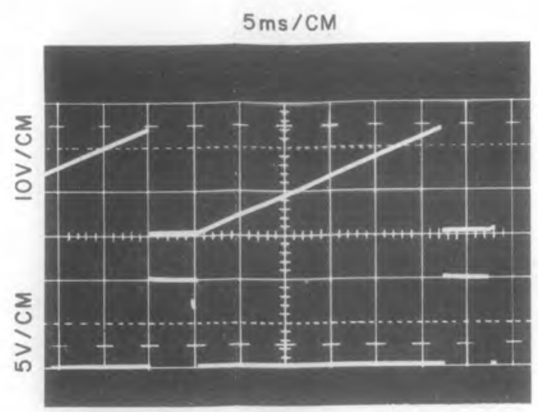


Figure 4-17a. Count blank pulse at XA6 pin 19.

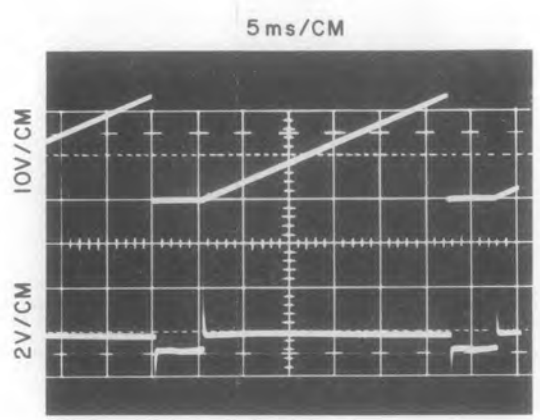


Figure 4-17b. Trigger pulse at XA6 pin 20.

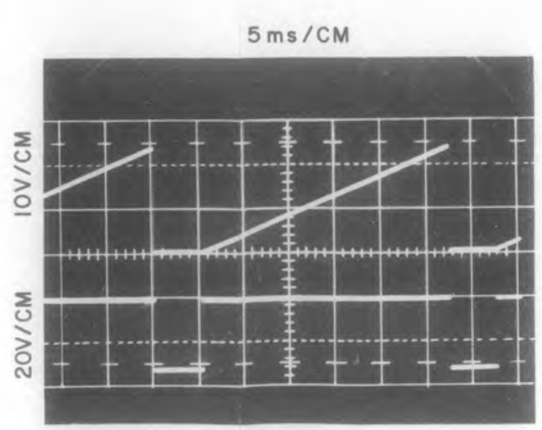


Figure 4-17c. Gate pulse at XA6 pin 12.

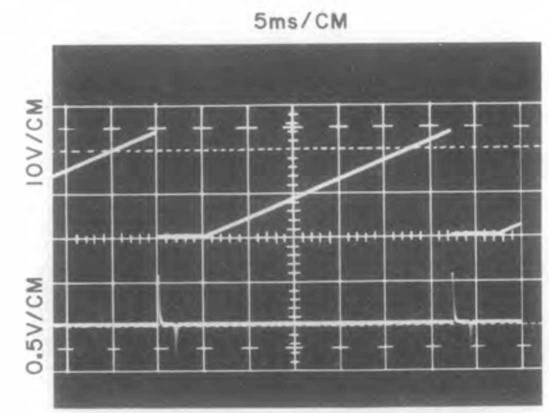


Figure 4-17d. Delayed trigger pulse at XA1 pin 5.

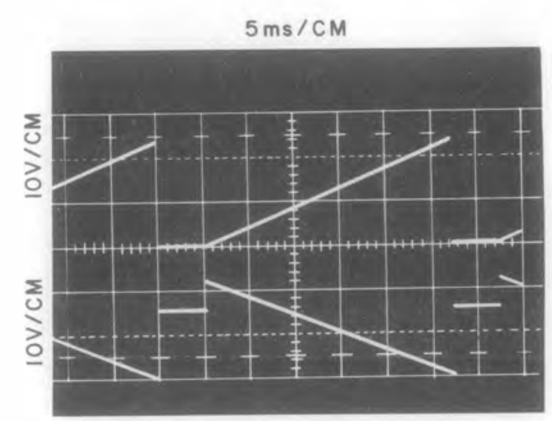


Figure 4-17e. Tuning voltage at XA7 pin 9.

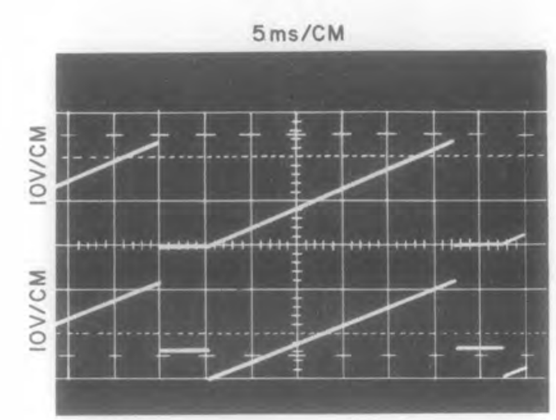


Figure 4-17f. Tuning monitor at XA7 pin 3. Manual tuning voltage adjusted to -5 Vdc at XA7 pin 21.

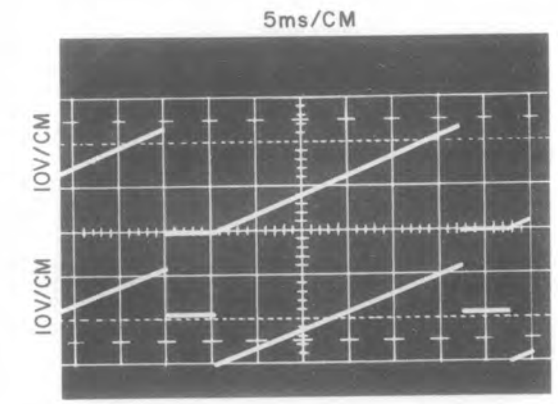


Figure 4-17g. Tuning voltage at XA7 pin 3. Manual tuning voltage adjusted to 0 Vdc at XA7 pin 21.

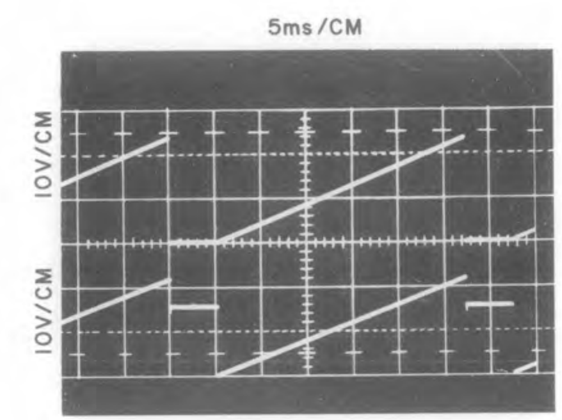


Figure 4-17h. Tuning voltage at XA7 pin 3. Manual tuning voltage adjusted to +5 Vdc at XA7 pin 21.

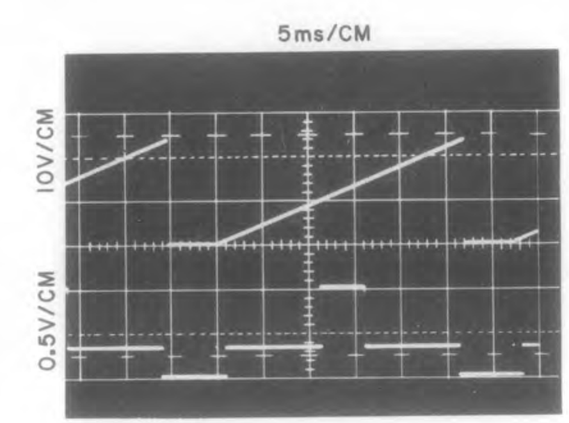
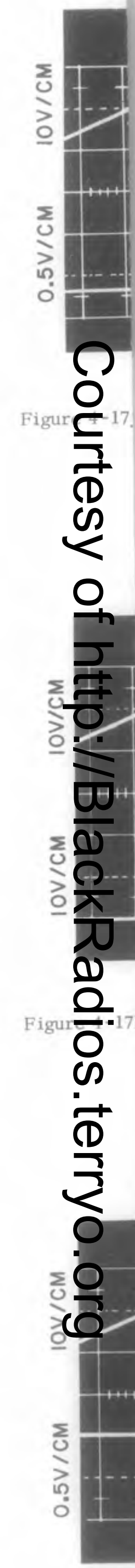


Figure 4-17i. Marker output at XA8 pin 9. Tuning voltage 0 Vdc at XA8 pin 19. Sector width voltage +2 Vdc at XA8 pin 18.



4.6 PERFORMANCE CHECKS

Selected performance tests are presented in subsequent paragraphs which can be used to determine the relative performance of the Type 205 Receiver.

4.6.1 Power Supply Regulator Tests. - The following tests will ensure that the power supply regulators are performing within acceptable limits.

4.6.1.1 The following test equipment is required:

(1) Variac, General Radio, Type W5MT3A.

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

(3) An operating tuning head for the 205 Receiver.

4.6.1.2 Install the tuning head in the receiver. Connect the receiver power input to the variac. Use the digital voltmeter to check the voltages as outlined:

(1) With line voltage maintained at 115 Vac:

Power Supply	Measured At	Minimum Reading	Maximum Reading
+18V	A11 pin 14	+17.5V	+18.5V
-18V	A12 pin 8	-17.5V	-18.5V
+10.3V	A10 pin 16	+10.299V	+10.301V
-10.3V	A10 pin 19	-10.299V	-10.301V
+30V	A10 pin 3	+29.99V	+30.01V

(2) Maintain the line voltage at 125 Vac and repeat the measurements listed in step (1) above.

(3) Maintain the line voltage at 105 Vac and repeat the measurements listed in step (1) above.

4.6.2 IF Gain and Bandwidth. - The following tests ensure that the four IF preselectors operating through the IF output amplifier have the proper gain and bandwidth.

4.6.2.1 The following equipment is required:

(1) Frequency Counter, Computer Measurement Corp., Type 738A.

(2) Signal Generator, Hewlett Packard, Type 606B.

(3) 3-dB Attenuator, Applied Research Inc., Type HFA-50.

(4) VTVM, RCA, Type WV-98C.

4.6.2.2 The tests are made as follows:

(1) Place the tuning mode switch in MAN.

(2) Place the reception mode switch in AM/MAN.

(3) Set the RF GAIN control to the maximum CW position.

CAUTION

When connecting the test equipment, do not short A2C12 to ground. Failure to observe this caution may destroy several transistors.

(4) Place the IF BANDWIDTH switch in the 1 MHz position.

(5) Connect the equipment as shown in Figure 4-18.

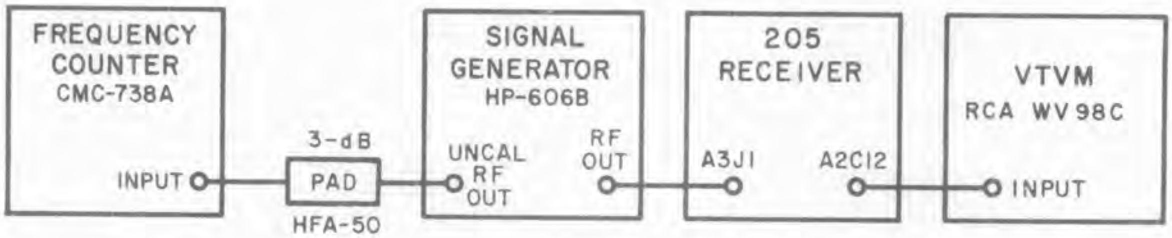


Figure 4-18. Test Setup, IF Gain and Bandwidth Tests

(6) Using the counter, adjust the signal generator to produce a 21.4 MHz CW signal.

(7) Adjust the signal generator output until the VTVM reads exactly 1.5 Vdc.

(8) With the 3 dB pad installed as shown, the signal generator output must be between -68 dBm and -66 dBm.

(9) Remove the 3 dB pad.

(10) Increase the generator frequency until the VTVM again indicates exactly 1.5 Vdc.

(11) Record the counter indication.

(12) Repeat steps (10) and (11) tuning the signal generator below 21.4 MHz.

(13) Subtract the frequency obtained in step (12) from the frequency obtained in step (11). The difference in frequency must be between 900 kHz and 1.1 MHz.

(14) Move the VTVM to TB1 terminal 3, FM output.

(15) Use the counter to adjust the frequency of the signal generator to first 21.4 MHz plus one-half the IF bandwidth and then 21.4 MHz minus one-half the IF bandwidth.

(16) The VTVM should read 2V ±0.4V at the nominal 3 dB bandwidth points.

(17) Replace the 3 dB pad, place the IF BANDWIDTH switch in 300 kHz, and repeat steps (5) through (16). The signal generator output at step (8) must be between -73 dBm and -71 dBm. The 3 dB bandwidth must be between 270 kHz and 330 kHz.

(18) Replace the 3 dB pad, place the IF BANDWIDTH switch in the 50 kHz position, and repeat steps (5) through (16). The signal generator output at step (8) must be between -81 dBm and -79 dBm. The 3 dB bandwidth must be between 45 kHz and 55 kHz.

(19) Replace the 3 dB pad, place the IF BANDWIDTH switch in the 10 kHz position, and repeat steps (5) through (16). The signal generator output at step (8) must be between -88 dBm and -86 dBm. The 3 dB bandwidth must be between 9 kHz and 11 kHz.

4.6.3 AM Output Stability Test. - The AM output stability test is used to evaluate the operation of the average AGC circuit under a wide range of input signal levels.

4.6.3.1 The following equipment is required:

(1) AC VTVM, Hewlett Packard, Type 400L.

(2) Signal Generator, Hewlett Packard, Type 606B.

(3) Frequency Counter, Computer Measurements Corp., Type 738A.

4.6.3.2 The tests are made as follows:

(1) Set the 205 Receiver controls as follows:

a. Tuning mode - MAN.

b. Reception mode - AM/AGC.

c. IF BANDWIDTH - 1 MHz.

(2) Connect the test equipment as shown in Figure 4-19.

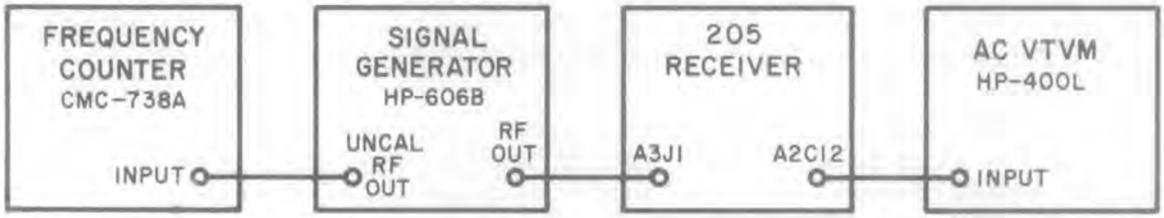


Figure 4-19. Test Setup, AM Output Stability Test

(3) Use the counter to set the signal generator to 21.4 MHz, 1 kHz modulation rate, 50% modulation amplitude.

(4) Adjust the signal generator output level to -62 dBm. Set the AC VTVM to produce a convenient reading.

(5) Record the indication on the AC VTVM.

(6) Increase the signal generator output level to -21 dBm.

(7) Record the indication on the AC VTVM.

(8) Subtract the readings obtained in steps (5) and (7). The difference must be 4 dB or less.

(9) Place the IF BANDWIDTH switch in the 300 kHz position.

(10) Adjust the signal generator output level to -67 dBm and repeat steps (5) through (8).

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

(12) Adjust the signal generator output level to -75 dBm and repeat steps (5) through (8).

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

(14) Adjust the signal generator output level to -82 dBm and repeat steps (5) through (8).

4.6.4 Video and Audio Output Tests. - The following tests ensure that the video and audio amplifiers will deliver their rated outputs.

4.6.4.1 The following equipment is required:

(1) AC VTVM, Hewlett Packard, Type 400L.

(2) Signal Generator, Hewlett Packard, Type 606B.

(3) Frequency Counter, Computer Measurements Corp., Type 738A.

4.6.4.2 The tests are performed as follows:

(1) Place the receiver controls as follows:

a. IF BANDWIDTH - 300 kHz.

b. Tuning mode - MAN.

c. Reception mode - AM/AGC.

d. VIDEO GAIN - max CW.

e. AUDIO LEVEL - max CW.

f. COR SENSITIVITY - max CW.

(2) Connect the equipment as shown in Figure 4-19 except the AC VTVM connects to J16.

(3) Adjust the signal generator to produce an output level of -47 dBm, 1 kHz modulation rate, 50% modulation amplitude. Set the output frequency to 21.4 MHz using the counter.

(4) Terminate the video output jack, J16, in a 100-ohm load.

(5) The AC VTVM must read 1.0 Vrms, minimum.

(6) Terminate the audio output, TB1 terminals 1 and 2, in a 600-ohm load.

(7) Connect the AC VTVM across the audio output. It must read 7.7 Vrms, minimum.

4.6.5 Sweeping Mode AGC Tests. - The following tests will evaluate the AGC system in the PAN and SECTOR modes. In these modes, AGC voltages are produced by the RF Monitor (A3) and the AGC Amplifier (A9).

4.6.5.1 The following equipment is required:

(1) Signal Generator, Hewlett Packard, Type 608E.

(2) Oscilloscope, Tektronix, Type 503.

(3) VTVM, RCA, Type WV-98C.

4.6.5.2 The tests are performed as follows:

(1) Connect the equipment as shown in Figure 4-20.

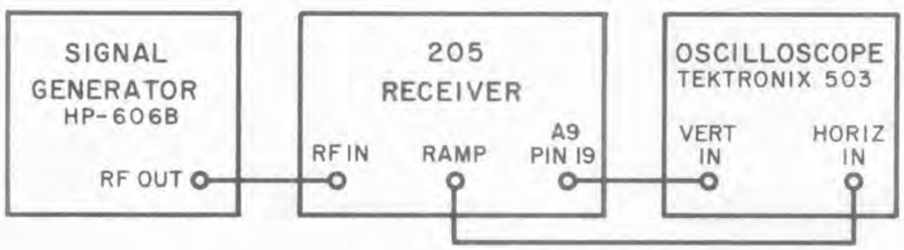


Figure 4-20. Test Setup, AGC Tests

(2) Adjust the signal generator to produce a CW signal near mid-band of the installed tuner at a level of 1 mV.

(3) Refer to Table 4-1. Place the receiver in PAN and SECTOR modes with maximum and minimum sweep width as required to obtain two readings on the oscilloscope at A9 pin 19. The limits are:

Table 4-1. Operating IF Bandwidths in Pan and Sector Tuning Modes

		IF Bandwidth		
			Sector Tuning Mode	
Tuner Type	Frequency Range	Pan Tuning Mode	Sweep Width max CW	Sweep Width max CCW
HH-11	2-30 MHz	50 kHz	50 kHz	10 kHz
VH-11	30-60 MHz	50 kHz	50 kHz	10 kHz
VH-12	60-120 MHz	300 kHz	300 kHz	50 kHz
VH-13	100-180 MHz	300 kHz	300 kHz	50 kHz
VH-14	180-300 MHz	300 kHz	300 kHz	50 kHz
VH-15	20-40 MHz	50 kHz	50 kHz	10 kHz
VH-16	40-80 MHz	50 kHz	50 kHz	10 kHz
UH-11	250-500 MHz	1 MHz	1 MHz	300 kHz
UH-12	500-1000 MHz	1 MHz	1 MHz	300 kHz

10 kHz - 0.8 Vdc ±0.1 Vdc
50 kHz - 0.7 Vdc ±0.1 Vdc
300 kHz - 0.6 Vdc ±0.1 Vdc
1 MHz - 0.5 Vdc ±0.1 Vdc

(4) Connect the signal generator output to A3J1.

(5) Adjust the signal generator to produce a CW signal at 21.4 MHz at a level of -30 dBm.

(6) Connect the VTVM to A3C2. Adjust the VTVM for a convenient mid-scale reading.

(7) Gradually increase the signal generator output level. The VTVM reading should start moving in a negative direction at -26 dBm ±2 dBm.

4.7 SUBASSEMBLY REMOVAL, REPAIR, AND REPLACEMENT

With one exception all of the 205 Receiver subassemblies are constructed on printed wiring boards. This exception is the RF Monitor (A3) which is wired in a brass chassis. Connections to C1 through C3 must be unsoldered, coax cables at J1 through J3 disconnected and the mounting removed before this subassembly can be removed. All of the other subassemblies on printed wiring boards can be removed by pulling the boards out of their connectors. Repair procedures are straight forward and conventional observing the usual precautions regarding temperature on semiconductors and damage to circuit patterns on boards.

Table 4-2. Typical Semiconductor Element Voltages

Ref. Desig.	Type	Integrated Circuit Pin Numbers									
		1	2	3	4	5	6	7	8	9	10
		Field Effect Transistor Pins							Transistor Elements		
		Drain	Gate 2	Gate 1	Source				Emitter	Base	Collector
Q1	2N3055								18.01	18.60	28.65
Q2	2N3055								-28.61	-28.03	-18.00
A1Q1	2N3904								0.0	0.068	15.04
A1Q2	2N3904								0.0	0.646	0.778
A2A1Q1	2N5109 (1) (2)								-10.56	-9.813	-1.505
A2A1Q2	2N5109 (1) (2)								-0.706	0.0	15.75
A2A1Q3	3N140 (1) (2)	10.94	3.495	0.853	1.803						
A2A1Q4	2N3933 (1) (2)								1.562	2.281	16.12
A2A2Q1	2N5109 (1) (3)								-10.56	-9.813	-1.505
A2A2Q2	2N5109 (1) (3)								-0.706	0.0	15.75
A2A2Q3	3N140 (1) (3)	10.94	3.495	0.853	1.803						
A2A2Q4	2N3933 (1) (3)								1.562	2.281	16.12
A2A3Q1	2N5109 (1) (4)								-10.67	-9.925	-1.523
A2A3Q2	2N5109 (1) (4)								-0.714	0.0	15.80
A2A3Q3	3N140 (1) (4)	12.88	3.300	0.801	1.804						
A2A3Q4	2N3933 (1) (4)								1.607	2.335	17.63
A2A4Q1	2N5109 (1) (5)								-10.74	-10.01	-1.504

Table 4-2. Typical Semiconductor Element Voltages (Continued)

Ref. Desig.	Type	Integrated Circuit Pin Numbers									
		1	2	3	4	5	6	7	8	9	10
		Field Effect Transistor Pins							Transistor Elements		
		Drain	Gate 2	Gate 1	Source				Emitter	Base	Collector
A2A4Q2	2N5109 (1) (5)								-0.712	0.0	15.81
A2A4Q3	3N140 (1) (5)	14.45	3.407	0.864	1.163						
A2A4Q4	2N3933 (1) (5)								1.603	2.334	17.63
A2A5Q1	U1899E (1) (5)	-1.462	---	-1.833	-1.462						
A2A5Q2	2N3251 (1) (5)								-0.780	-1.45	-18.0
A2A5Q3	2N2270 (1) (5)								-1.324	-0.796	17.74
A2A5U1	μA719C (1) (5)	1.980	1.984	---	0.702	0.0	14.86	0.818	0.156	5.910	11.13
A2A6Q1	U1899E (1) (4)	-0.082	---	-0.024	-0.081						
A2A6U1	μA719C (1) (4)	1.969	1.972	1.655	0.686	0.0	15.14	0.788	0.147	6.242	11.37
A2A7Q1	U1899E (1) (3)	0.059	---	-17.74	0.0						
A2A7Q2	U1899E (1) (3)	0.317	---	-0.419	0.318						
A2A7U1	μA719C (1) (3)	2.070	2.073	---	0.680	0.0	16.00	0.816	0.177	6.191	12.25
A2A7U2	μA719C (1) (3)	-18.0	0.052	0.042	-18.0	-18.0	0.303	16.38	---	---	---
A2A8Q1	3N140 (1)	16.26	3.547	0.849	1.816						
A2A8Q2	2N3933 (1)								3.839	4.556	17.12
A2A8Q3	2N3933 (1)								3.107	3.839	16.64
A2A8Q4	2N5109 (1)								-15.30	-14.57	-1.150

Table 4-2. Typical Semiconductor Element Voltages (Continued)

		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
A2A8Q5	2N5109 (1)								-0.708	0.0	17.10
A2A8Q6	U1899E (1) (2)	0.002	0.507	0.0							
A2A8Q7	2N3251 (1) (2)								0.418	-0.213	-18.0
A2A8Q8	2N2222 (1) (2)								-0.036	0.637	18.0
A3Q1	2N3933								-14.96	-14.20	-11.47
A3Q2	2N3933								-11.27	-10.52	0.0
A3Q3	2N929								-17.99	-17.46	0.424
A4Q1	2N3904								1.467	2.102	17.11
A4Q2	2N3906								17.79	17.11	9.209
A4Q3	2N3904								8.560	9.209	18.0
A4Q4	2N3906								8.014	7.40	0.0
A5Q1	2N929								-0.641	-0.077	-0.555
A5Q2	2N3251 (9)								17.99	17.37	17.94
A5Q3	2N4074 (9)								0.691	1.287	0.693
A5Q4	2N4074 (9)								0.0	0.690	0.693
A5Q5	U1899E (9)	-0.008	---	-9.306	-0.008						
A5U1	LM709C (9)	12.15	-0.008	-0.008	-18.0	-17.17	-0.037	18.00	13.07		

Table 4-2. Typical Semiconductor Element Voltages (Continued)

		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
A6Q1	2N4918 (7)								18.0	17.30	17.96
A6Q2	2N2222 (8)								0.0	0.120	4.422
A6Q3	2N4074 (7)								9.623	10.26	12.48
A6Q4	2N2222 (8)								0.0	0.788	1.760
A6Q5	2N4074 (7)								-13.36	-12.74	9.623
A6Q6	2N4074 (7)								9.623	2.124	17.98
A6Q7	2N4918 (7)								18.0	18.0	-0.236
A6Q8	2N3251 (8)								14.66	13.97	≈ 5.5
A6Q9	2N4853 (8)								≈5.5	0.0 (12)	11.68 (13)
A6Q10	2N4074 (8)								-17.44	-17.29	≈10.0
A6Q11	U1899E	NOT APPLICABLE									
A6U1	μA741C (8)	-17.42	---	---	-17.43	-17.42	---	16.90	---		
A7Q1	U1899E (9)	-2.003	---	1.686	-2.004						
A7Q2	2N929 (9)								-18.0	-17.42	-17.96
A7Q3	2N929 (9)								-18.0	-17.96	13.61
A7Q4	MEM511C (9)	-2.00	10.93 (14)	11.60	0.0						
A7Q5	MEM511C (9)	0.0	0.0 (14)	-17.80	0.0						

Table 4-2. Typical Semiconductor Element Voltages (Continued)

		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
A7U1	LM201A (9)	-16.72	-0.002	-0.002	-18.0	-16.78	2.030	18.0	1.419		
A7U2	μA741C (9)	-18.0	0.002	-0.002	-18.0	-18.0	1.942	18.0	0.0		
A8Q1	2N2907 (9)								16.88	17.28	0.037
A8Q2	2N4074 (9)								0.0	0.587	0.849
A8U1	μA741C (9)	-17.36	10.29	10.29	-17.37	-17.36	10.29	17.45	---		
A8U2	μA741C (9)	-17.36	-2.00	-2.00	-17.37	-17.36	-2.00	17.45	---		
A8U3	μA741C (9)	-17.36	-0.994	4.35	-17.37	-17.35	16.89	17.45	---		
A8U4	μA741C (9)	-17.36	4.14	≈-1.0	-17.37	-17.36	-12.20	17.45	---		
A8U5	μA741C (9)	-17.34	1.950	-10.3	-17.37	-17.36	-15.52	17.45	---		
A8U6	μA741C (9)	-17.34	10.28	1.950	-17.36	-17.36	-15.45	17.45	---		
A9Q1	2N3251 (10)								0.645	-0.032	0.007
A9Q2	2N2270 (10)								0.218	0.645	17.99
A9Q3	U1899E (10)	0.197	---	0.064	0.197						
A9Q4	U1899E (11)	-0.027	---	-0.010	-0.027						
A9Q5	2N929 (11)								0.551	-0.027	17.87
A9Q6	2N3251 (11)								17.98	17.27	-17.98
A9Q7	2N929 (11)								-18.00	-17.98	0.040

Table 4-2. Typical Semiconductor Element Voltages (Continued)

Ref. Desig.	Type	Integrated Circuit Pin Numbers									
		1	2	3	4	5	6	7	8	9	10
		Field Effect Transistor Pins							Transistor Elements		
		Drain	Gate 2	Gate 1	Source				Emitter	Base	Collector
A9Q8	2N3251 [11]								0.672	0.040	-18.00
A9Q9	2N929 [11]								0.671	-2.787	0.0
A9Q10	2N929 [11]								-0.004	-5.1	-2.774
A9Q11	2N929 [11]								-0.417	-0.022	18.00
A9Q12	2N3251 [11]								0.496	0.671	-18.00
A9U1	MC1439C [7]	14.45	0.004	0.0	-18.00	1.517	0.037	18.00	14.55		
A9U2	μA741C	-17.99	-0.002	0.0	-18.00	-17.99	-0.004	18.00	---		
A10Q1	2N2907								-10.30	-10.94	-16.20
A10Q2	2N4074								17.08	10.94	10.30
A10Q3	2N4074								30.00	26.30	43.10
A10U1	μA741C	-16.33	-6.332	-6.334	-16.34	-16.32	-10.94	0.0	---		
A10U2	μA741C	-16.34	0.001	0.0	-16.35	-16.34	-10.94	16.80	---		
A10U3	μA741C	0.008	10.30	10.30	0.0	0.009	17.12	30.00	---		
A11Q1	2N4037								28.23	27.60	18.60
A11Q2	2N929								6.708	7.330	13.34
A11Q3	2N929								12.77	13.34	27.26
A11Q4	2N929								6.708	7.355	12.77

Table 4-2. Typical Semiconductor Element Voltages (Continued)

		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
A12Q1	2N2270								-27.42	-26.83	-18.00
A12Q2	2N3251								-6.621	-7.27	-13.47
A12Q3	2N3251								-12.87	-13.47	-26.83
A12Q4	2N3251								-6.620	-7.275	-12.88

TEST CONDITIONS: All readings are positive DC with respect to the chassis unless otherwise noted. Readings taken with DANA Type 5500/112 Digital Voltmeter. Line voltage applied to receiver set at 115 Vac, 60 Hz; no signal input.

NOTES:

(1) MAN mode, AM/MAN, RF GAIN control max. CW.
(2) 10 kHz BW on.
(3) 50 kHz BW on.
(4) 300 kHz BW on.
(5) 1 MHz BW on.
(6) MAN mode, COR SENSITIVITY CONTROL max. CW.
(7) SECTOR mode, SECTOR WIDTH max. CW.
(8) PAN mode, SECTOR WIDTH max CW, SWEEP RATE max. CW.
(9) MAN mode, set MAN tune voltage on PIN 21 of A7 to -2.0V by operating manual tuning control.
(10) MAN mode, PULSE.
(11) MAN mode, AM/AGC
(12) Base should be interpreted Base 1.
(13) Collector should be interpreted Base 2.
(14) Gate 2 should be interpreted Case.

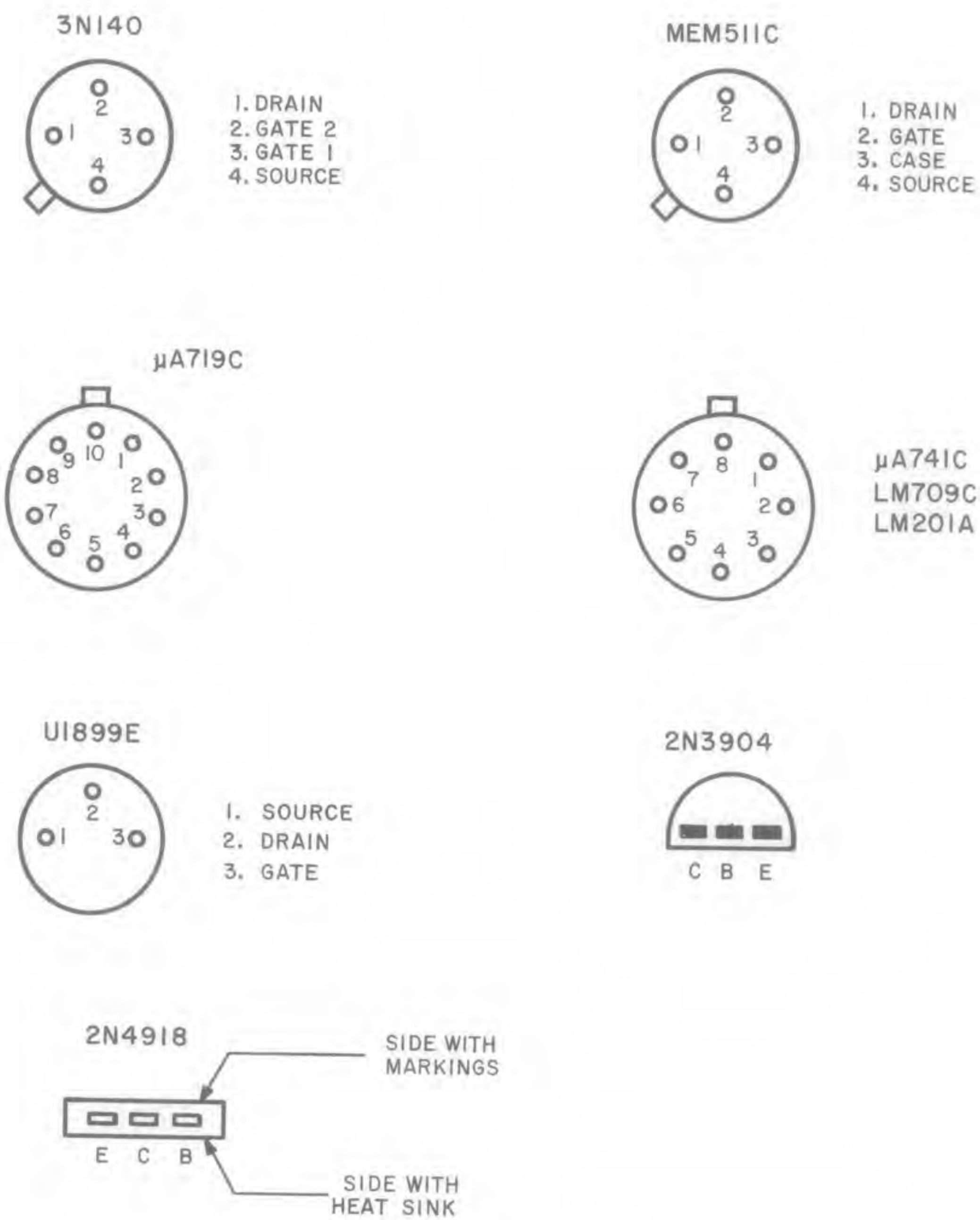


Figure 4-21. Bottom View Pin Locations of Semiconductors

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 following the notation "REF DESIG PREFIX."

5.3 LIST OF MANUFACTURERS

Mfr. Code	Name and Address
01121	Allen-Bradley Company 1201 South 2nd Street Milwaukee, Wisconsin 53204
02114	Ferroxcube Corp. of America Mt. Marion Road Saugerties, New York 12477
04713	Motorola Semiconductor Products 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 and Instrument Co. Semiconductor Division 313 Frontage Road Mountain View, California 94040
08108	Lamp industry for use with industry designations and abbreviations for lamps.
11711	General Instrument Corporation Rectifier Division 65 Gouverneur Street Newark, New Jersey 07014
13103	Thermalloy Company 8717 Diplomacy Row Dallas, Texas 75247
14193	CAL-R Incorporated 1631 Colorado Avenue Santa Monica, California 90404
14632	Watkins-Johnson Company CEI Division 6006 Executive Boulevard Rockville, Maryland 20852
14949	Trompeter Electronics, Inc. 8936 Comanche Avenue Chatsworth, California 91311
15818	TELEDYNE Incorporated Amelco Semiconductor Division P. O. Box 1030 Mountain View, California 94042

Mfr. Code	Name and Address
17554	Components, Incorporated Maine Division Smith Street Biddeford, Maine 04005
21604	The Buckeye Stamping Company 555 Marion Road Columbus, Ohio 43207
27014	National Semi-Conductor Corp. 2950 San Ysidro Way Santa Clara, California 95051
27193	Cutler-Hammer, Inc. Special Products Division 4201 North 27th Street Milwaukee, Wisconsin 53216
28480	Hewlett-Packard Company 1501 Page Mill Road Palo Alto, California 94304
44655	Ohmite Manufacturing Company 3601 West Howard Street Skokie, Illinois 60076
56289	Sprague Electric Company Marshall Street North Adams, Massachusetts 01247
71279	Cambridge Thermionic Corporation 445 Concord Avenue Cambridge, Massachusetts 02138
71400	Bussman Manufacturing Division of McGraw-Edison Co. 2536 West University Street St. Louis, Missouri 63107
71468	ITT Cannon Electric Incorporated 3208 Humbolt Street Los Angeles, California 90031
71590	Globe-Union Incorporated Centralab Division P. O. Box 591 Milwaukee, Wisconsin 53201
71785	Cinch Manufacturing Company Howard B. Jones Division 1026 South Homan Avenue Chicago, Illinois 60624

Mfr. Code	Name and Address
72136	Electro Motive Manufacturing Company, Inc. South Park and John Streets Willimantic, Connecticut 06226
72619	Dialight Corporation 60 Stewart Avenue Brooklyn, New York 11237
72982	Erie Technological Products, Inc. 644 West 12th Street Erie, Pennsylvania 16512
73138	Beckman Instruments, Inc. Helipot Division 2500 Harbor Boulevard Fullerton, California 92634
74306	Piezo Crystal Company 100 K Street Carlisle, Pennsylvania 17013
74868	Amphenol Corporation Amphenol RF Division 33 East Franklin Street Danbury, Connecticut 06810
75915	Littelfuse, Incorporated 800 East Northwest Highway Des Plaines, Illinois 60016
77342	American Machine and Foundry Co. Potter and Brumfield Division 1200 East Broadway P. O. Box 522 Princeton, Indiana 47570
80131	Electronic Industries Association 2001 Eye Street, N. W. Washington, D. C. 20006
80294	Bourns, Incorporated 1200 Columbia Avenue Riverside, California 92507
81073	Grayhill Incorporated 561 Hillgrove Avenue LaGrange, Illinois 60525
81312	Winchester Electronics Division Litton Industries, Incorporated Main Street and Hillside Avenue Oakville, Connecticut 06779

Mfr. Code	Name and Address
81349	Military Specifications
82389	Switchcraft, Incorporated 5527 North Elston Avenue Chicago, Illinois 60630
91293	Johanson Manufacturing Company P. O. Box 329 Boonton, New Jersey 07005
91418	Radio Materials Company 4242 West Bryn Mawr Avenue Chicago, Illinois 60646
91506	Augat, Incorporated 33 Perry Avenue Attleboro, Massachusetts 02703
91737	Gremar Manufacturing Co., Inc. 7 North Avenue Wakefield, Massachusetts 01880
97979	Reon Resistor Corporation 155 Saw Mill River Road Yonkers, New York 10701
98291	Sealectro Corporation 225 Hoyt Mamaroneck, New York 10544
99800	Delevan Electronics Corporation 270 Quaker Road East Aurora, New York 14052
99848	Wilco Corporation 4030 West 10th Street P. O. Box 22248 Indianapolis, Indiana 46222

5.4 PARTS LIST

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

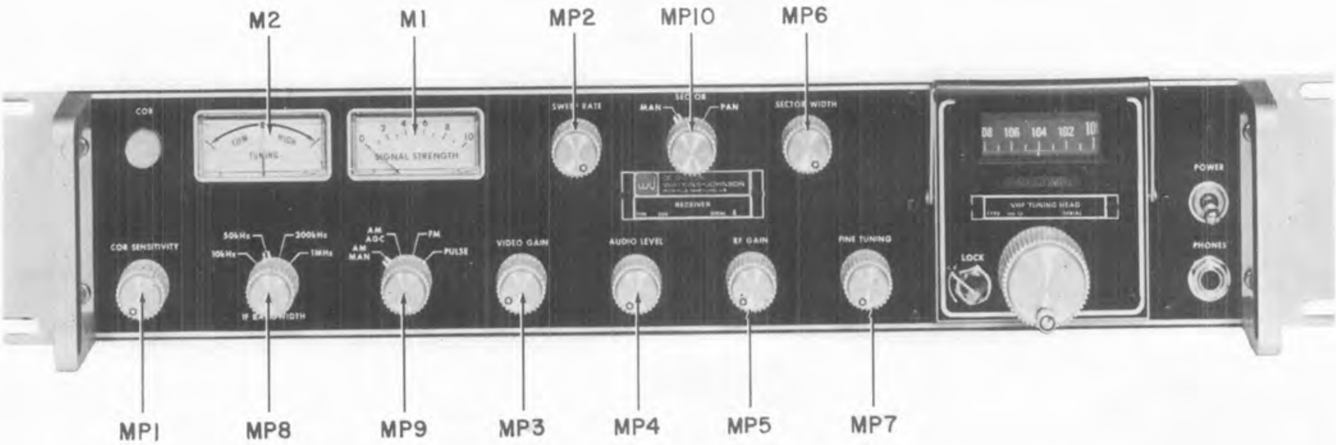


Figure 5-1. Type 205 Receiver, Front View, Location of Components

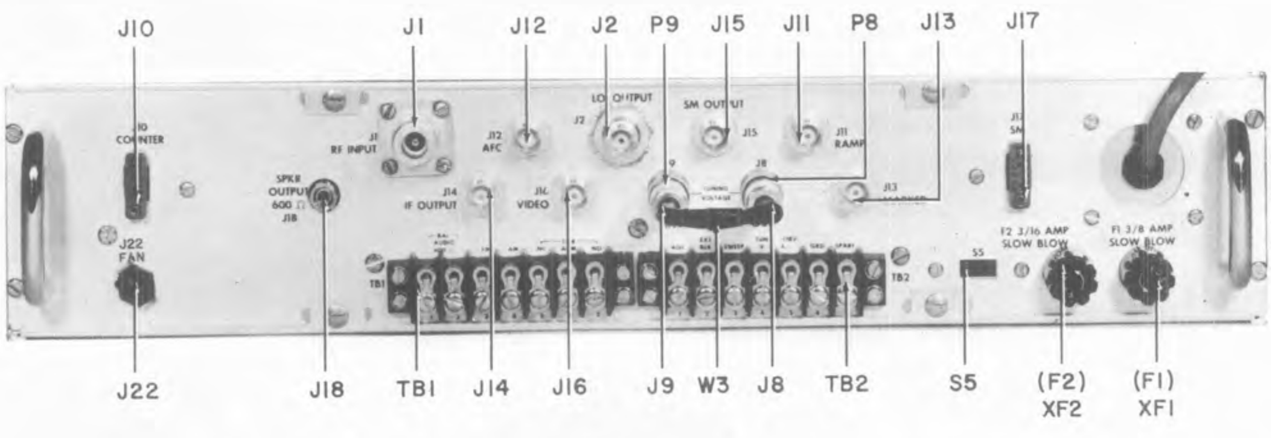


Figure 5-2. Type 205 Receiver, Rear View, Location of Components

5.4.1 205 Receiver, Main Chassis

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
A1	COUNT DELAY	1	79653	14632
A2	IF AMPLIFIER ASSEMBLY	1	72311	14632
A3	RF MONITOR	1	71291	14632
A4	VIDEO AMPLIFIER	1	7366	14632
A5	AUDIO AMPLIFIER/CARRIER OPERATED RELAY	1	7443	14632
A6	RAMP GENERATOR	1	79611	14632
A7	SWEEP CONTROL	1	79619	14632
A8	MARKER GENERATOR	1	79612	14632
A9	AGC AMPLIFIER	1	7867	14632
A10	PRECISION REGULATORS	1	76179	14632
A11	+18V POWER SUPPLY REGULATOR	1	76181	14632
A12	-18V POWER SUPPLY REGULATOR	1	76180	14632
C1	CAPACITOR, ELECTROLYTIC, ALUMINUM: 1400 μF, -10+100%, 50V	2	86F164M	06001
C2	Same as C1			
C3	CAPACITOR, ELECTROLYTIC, ALUMINUM: 500 μF, -10+100%, 75V	1	43F3007CA4	06001
C4	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100V	2	C023B101F103M	56289
C5	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V	1	SM(5000pF, M)	91418
C6	Same as C4			
C7	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100V	1	8131-100-651-104M	72982
C8	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	1	C023B101E502M	56289
CR1	DIODE	1	1N462A	80131
DS1	LAMP, NEON	1	249-7866-1431-534	72619
DS2	LAMP, INCANDESCENT: 28V, 0.04A	1	327	08108
F1	FUSE, 3AG, SLOW-BLOW: 3/8A	1	F02B250V3/8A	81349
F2	FUSE, 3AG, SLOW-BLOW: 3/16A	1	MDL-3/16A	71400
FL1	FILTER, POWER	1	JN33-694A	56289
J1	CONNECTOR, JACK, N SERIES Part of W1	1	UG-1052/U	81349
J2	CONNECTOR, JACK, BNC SERIES Part of W2	1	UG-909B/U	81349
J3	CONNECTOR, RECEPTACLE, MULTIPIN	1	DAM-11W1S	71468
J3A1	CONNECTOR, RECEPTACLE, COAXIAL INSERT Part of W4	1	DM53742-5001	71468
J4	CONNECTOR, RECEPTACLE, MULTIPIN	1	DAM-15S	71468
J5	CONNECTOR, RECEPTACLE, MULTIPIN	1	MRE-18S-G7	81312
J6	CONNECTOR, RECEPTACLE, MULTIPIN	1	MRE-26S-G7	81312

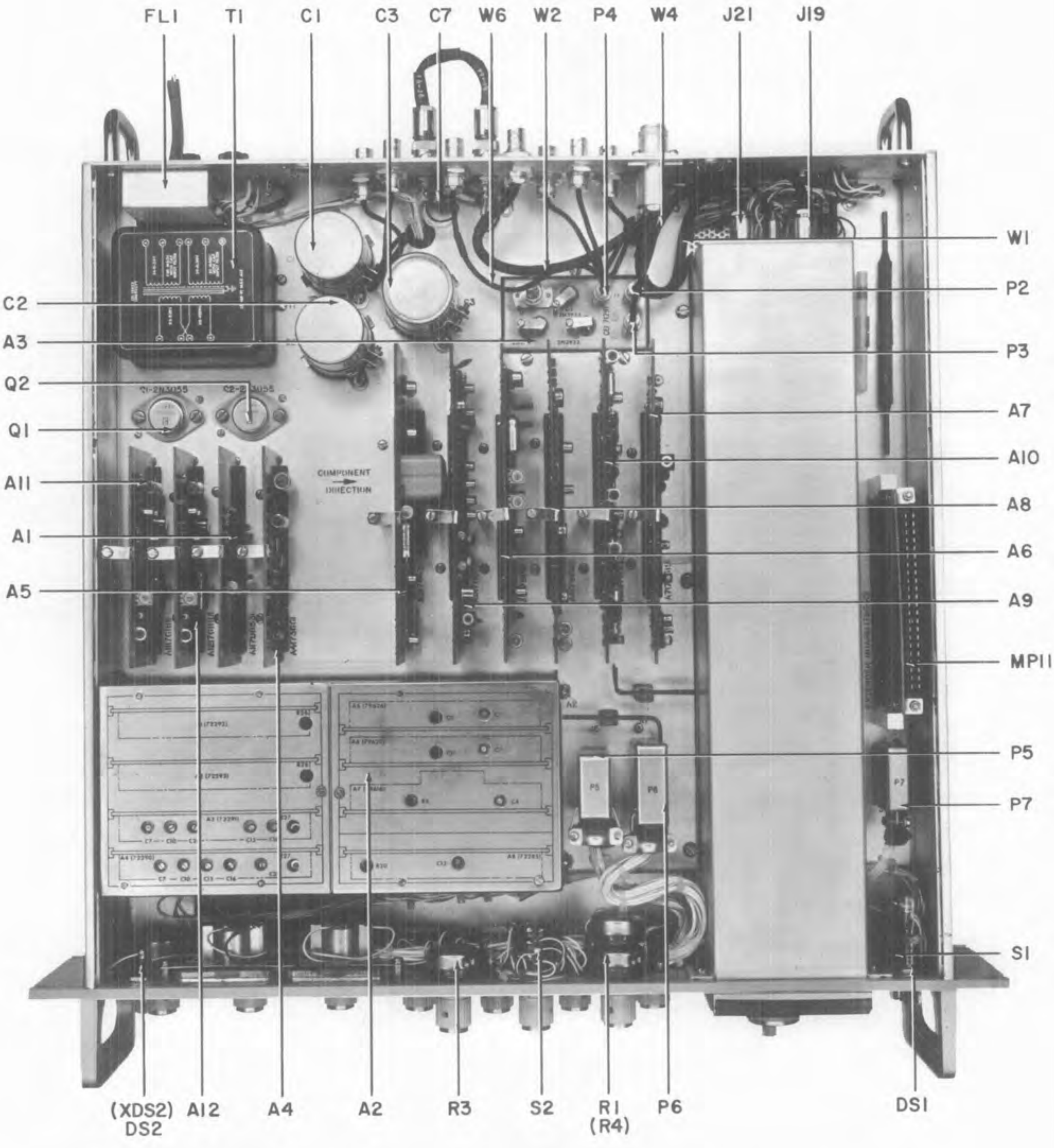


Figure 5-3. Type 205 Receiver, Top View, Location of Components

Ref Desig	Description		Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
J7	CONNECTOR, RECEPTACLE, MULTIPIN		1	MRE-7-2SG7	81312
J8	CONNECTOR, JACK, TWINAX SERIES		2	BJ-77	14949
J9	Same as J8				
J10	CONNECTOR, RECEPTACLE, MULTIPIN		2	SRE-14SJ	81312
J11	CONNECTOR, JACK, BNC SERIES		6	17825	74868
J12	Same as J11				
J13	Same as J11				
J14	Same as J11				
J15	Same as J11				
J16	Same as J11				
J17	Same as J10				
J18	CONNECTOR, JACK, PHONE		1	41	82389
J19	CONNECTOR, JACK, PUSH-ON SERIES	Part of W2	2	8212B	91737
J20	CONNECTOR, JACK, PHONE		1	L-11	82389
J21	Same as J19	Part of W1			
J22	CONNECTOR, RECEPTACLE, MULTIPIN		1	M4S-LRN	81312
M1	METER, SIGNAL STRENGTH		1	14524-1	14632
M2	METER TUNING		1	14549-1	14632
MP1	KNOB		7	PS70D2(Light Gray)	21604
MP2	Same as MP1				
MP3	Same as MP1				
MP4	Same as MP1				
MP5	Same as MP1				
MP6	Same as MP1				
MP7	Same as MP1				
MP8	KNOB		3	PS70PL2(Light Gray)	21604
MP9	Same as MP8				
MP10	Same as MP8				
MP11	EXTENDER CARD		1	79645	14632
MP12	COVER, TOP AND BOTTOM		2	30625-7	14632
MP13	Same as MP12				
P1	CONNECTOR, PLUG, MB SERIES	Part of W5	4	44950	74868
P2	Same as P1	Part of W5			
P3	Same as P1	Part of W4			
P4	Same as P1	Part of W6			

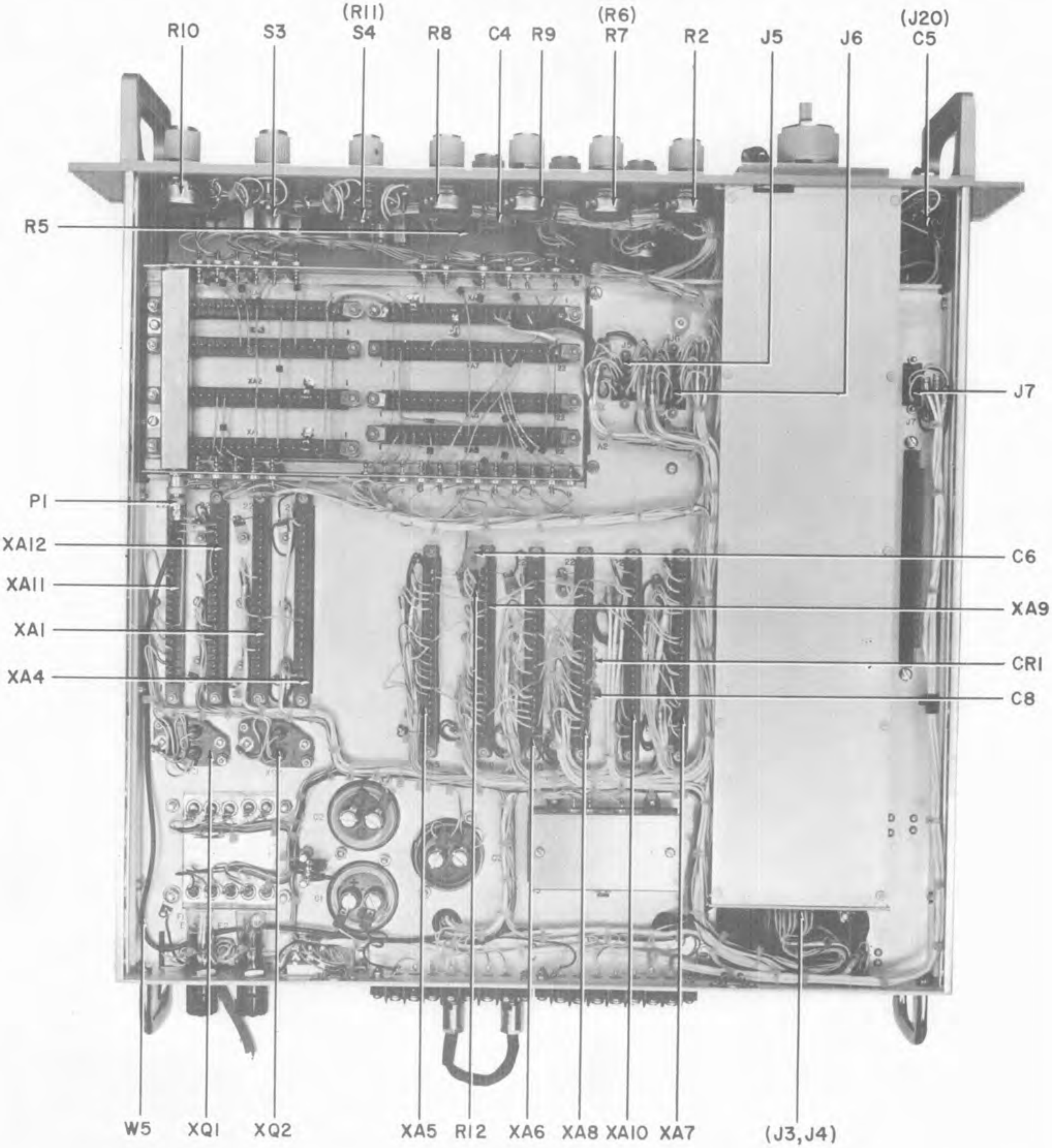


Figure 5-4. Type 205 Receiver, Bottom View, Location of Components

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
P5	CONNECTOR, PLUG, MULTIPIN	1	MRE-18P-G7H9	81312
P6	CONNECTOR, PLUG, MULTIPIN	1	MRE-26P-G7H9	81312
P7	CONNECTOR, PLUG, MULTIPIN	1	MRE-7-2P-G7H1	81312
P8	CONNECTOR, PLUG, TWINAX SERIES Part of W3	2	PL-76	14949
P9	Same as P8 Part of W3			
Q1	TRANSISTOR	2	2N3055	80131
Q2	Same as Q1			
R1	RESISTOR, VARIABLE, COMPOSITION: 10 kΩ/10 kΩ, 10%, 2W	1	CCU-1031	44655
R2	RESISTOR, VARIABLE, COMPOSITION: 10 kΩ, 10%, 2W	2	RV4NAYSD103A	81349
R3	RESISTOR, VARIABLE, COMPOSITION: 25 kΩ, 10%, 2W	3	RV4NAYSD253A	81349
R4	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RCR07G470JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	2	RCR07G102JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	1	RCR07G682JS	81349
R7	Same as R2			
R8	RESISTOR, VARIABLE, COMPOSITION: 250 Ω, 10 %, 2W	1	RV4NAYSD251A	81349
R9	Same as R3			
R10	Same as R3			
R11	RESISTOR, FIXED, COMPOSITION: 240 Ω, 5%, 1/4W	1	RCR07G241JS	81349
R12	Same as R5			
S1	SWITCH, TOGGLE, SPST	1	8280-K16	27193
S2	SWITCH, ROTARY: 3 Section, 6 Pole, 6 Position	1	1128-02	14632
S3	SWITCH, ROTARY: 1 Section, 2 Pole, 6 Position	1	1128-43	14632
S4	SWITCH, ROTARY: 2 Section, 4 Pole, 6 Position	1	1128-03	14632
S5	SWITCH, SLIDE, DPDT	1	46256-LF	82389
T1	TRANSFORMER	1	15822	14632
TB1	TERMINAL BOARD	2	353-18-07-001	71785
TB2	Same as TB1			
W1	CONNECTOR AND CABLE ASSEMBLY	1	30020-1192	14632
W2	CONNECTOR AND CABLE ASSEMBLY	1	30020-1193	14632
W3	CONNECTOR AND CABLE ASSEMBLY	1	30020-1194	14632
W4	CONNECTOR AND CABLE ASSEMBLY	1	30020-1195	14632
W5	CONNECTOR AND CABLE ASSEMBLY	1	30020-1196	14632
W6	CONNECTOR AND CABLE ASSEMBLY	1	30020-1197	14632
XA1	CONNECTOR, PRINTED CIRCUIT CARD	10	250-22-30-170	71785

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
XA4	Same as XA1			
XA5	Same as XA1			
XA6	Same as XA1			
XA7	Same as XA1			
XA8	Same as XA1			
XA9	Same as XA1			
XA10	Same as XA1			
XA11	Same as XA1			
XA12	Same as XA1			
XAS2	LAMPHOLDER	1	107-1930-0975-201	72619
XF1	FUSEHOLDER	2	342004	75915
XF2	Same as XF1			
XQ1	SOCKET TRANSISTOR	2	8038-1G1	91506
XQ2	Same as XQ1			

5.4.2 Type 79653 Count Delay REF DESIG PREFIX A1

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C1	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 200V	2	CK06CW103M	81349
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 10 μF, 10%, 35V	1	CS13BF106K	81349
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 0.22 μF, 10%, 35V	1	150D224X9035A2	56289
C4	Same as C1			
CR1	DIODE	2	1N462A	80131
CR2	Same as CR1			
Q1	TRANSISTOR	2	2N3904	80131
Q2	Same as Q1			
R1	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RCR07G471JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	1	RCR07G333JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4W	2	RCR07G822JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	1	RCR07G153JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	1	RCR07G223JS	81349
R7	Same as R3			

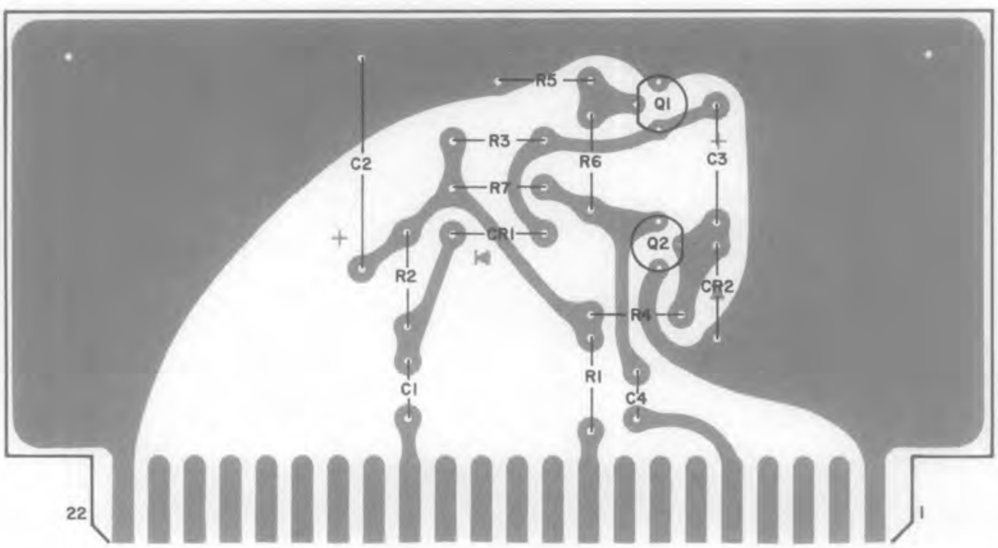


Figure 5-5. Type 79653 Count Delay (A1), Location of Components

5.4.3 Type 72311 IF Amplifier Assembly REF DESIG PREFIX A2

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
A1	21.4-MHz IF AMPLIFIER (10-kHz BW)	1	72292	14632
A2	21.4-MHz IF AMPLIFIER (50-kHz BW)	1	72293	14632
A3	21.4-MHz IF AMPLIFIER (300-kHz BW)	1	72291	14632
A4	21.4-MHz IF AMPLIFIER (1-MHz BW)	1	72290	14632
A5	FM LIMITER/DISCRIMINATOR (1-MHz BW)	1	79626	14632
A6	FM LIMITER/DISCRIMINATOR (300-kHz BW)	1	79620	14632
A7	FM LIMITER/DISCRIMINATOR (10 and 50-kHz BW)	1	79616	14632
A8	IF OUTPUT AMPLIFIER	1	72285	14632
C1	CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500V	25	FA5C-102W	01121
C2	Same as C1			
C3	Same as C1			
C4	Same as C1			
C5	Same as C1			
C6	Same as C1			
C7	Same as C1			
C8	Same as C1			
C9	Same as C1			
C10	Same as C1			
C11	CAPACITOR, CERAMIC, FEEDTHRU: 330 pF, 10%, 500V	4	FA5C-3311	01121
C12	Same as C11			
C13	Same as C1			
C14	Same as C1			
C15	Same as C1			
C16	Same as C1			
C17	Same as C1			
C18	Same as C1			
C19	Same as C1			
C20	Same as C1			
C21	Same as C1			
C22	Same as C1			
C23	Same as C11			
C24	Same as C11			
C25	Same as C1			
C26	Same as C1			
C27	Same as C1			

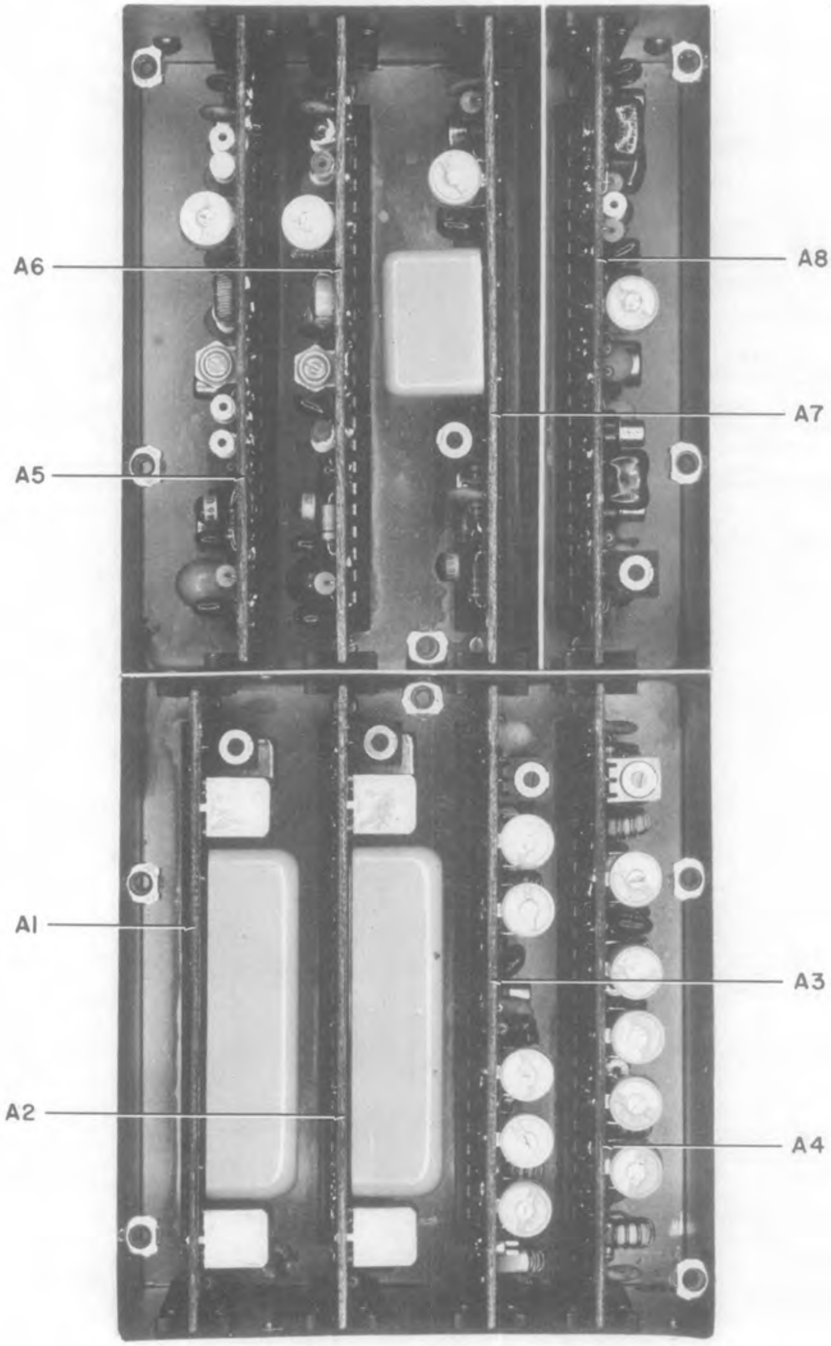


Figure 5-6. Type 72311 IF Amplifier Assembly (A2), Top View, Location of Components

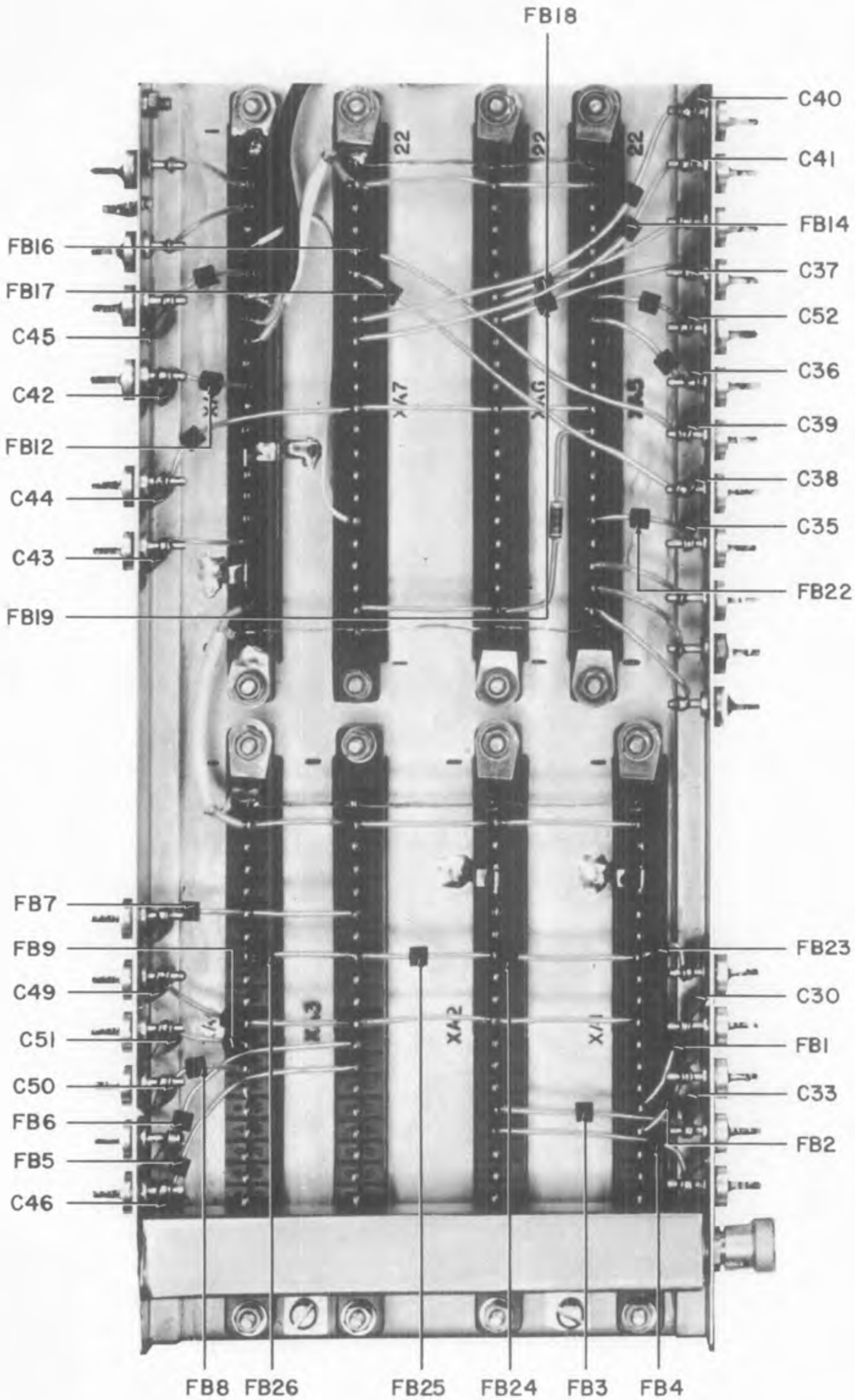


Figure 5-7. Type 72311 IF Amplifier Assembly (A2), Bottom View, Location of Components

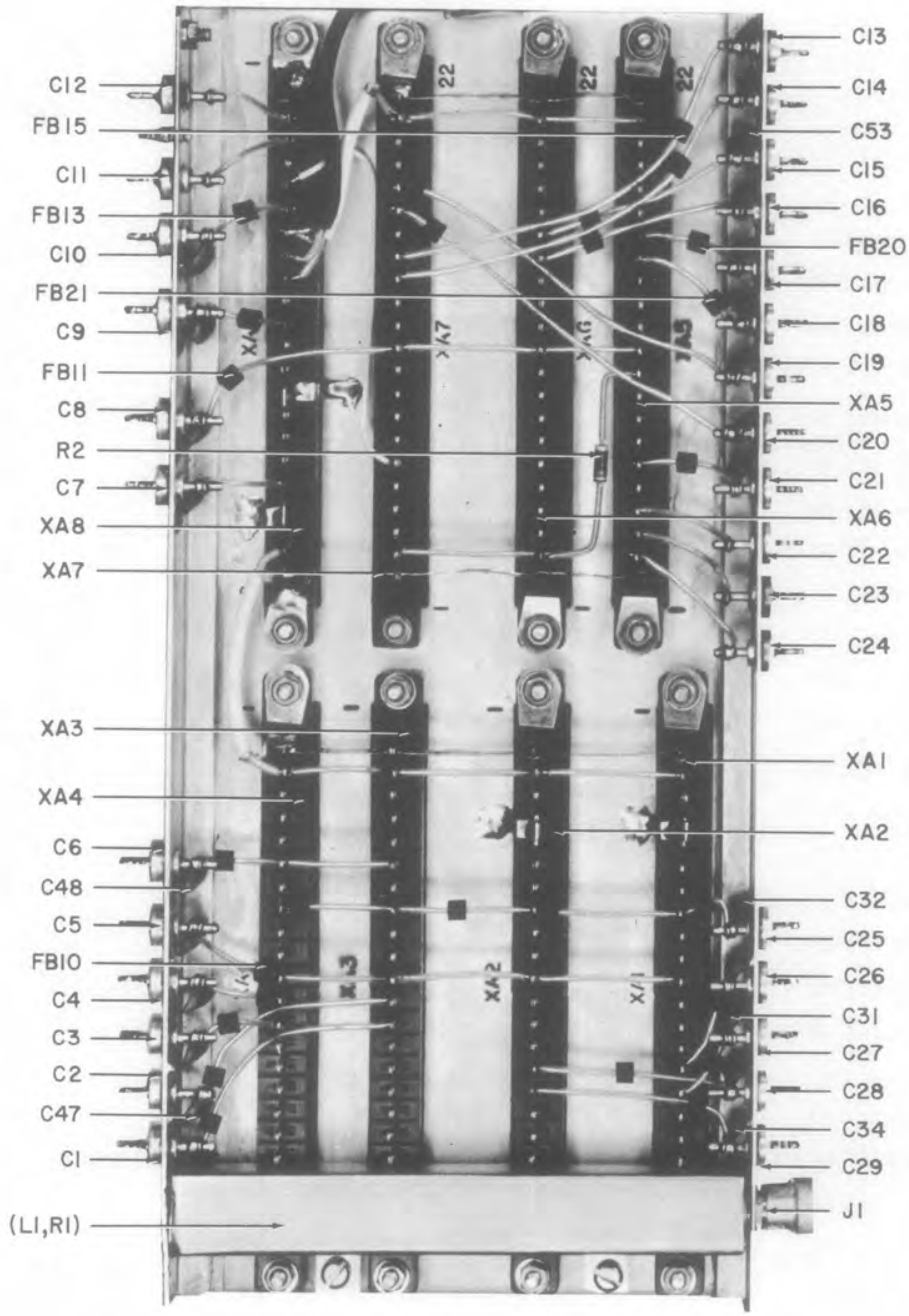


Figure 5-8. Type 72311 IF Amplifier Assembly (A2), Bottom View, Location of Components

REF DESIG PREFIX A2

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C28	Same as C1			
C29	Same as C1			
C30	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	24	C023B101E502M	56289
C31	Same as C30			
C32	Same as C30			
C33	Same as C30			
C34	Same as C30			
C35	Same as C30			
C36	Same as C30			
C37	Same as C30			
C38	Same as C30			
C39	Same as C30			
C40	Same as C30			
C41	Same as C30			
C42	Same as C30			
C43	Same as C30			
C44	Same as C30			
C45	Same as C30			
C46	Same as C30			
C47	Same as C30			
C48	Same as C30			
C49	Same as C30			
C50	Same as C30			
C51	Same as C30			
C52	Same as C30			
C53	Same as C30			
FB1	FERRITE BEAD	26	56-590-65/4A	02114
FB2	Same as FB1			
FB3	Same as FB1			
FB4	Same as FB1			
FB5	Same as FB1			
FB6	Same as FB1			
FB7	Same as FB1			
FB8	Same as FB1			
FB9	Same as FB1			

REF DESIG PREFIX A2

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
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			
FB21	Same as FB1			
FB22	Same as FB1			
FB23	Same as FB1			
FB24	Same as FB1			
FB25	Same as FB1			
FB26	Same as FB1			
J1	CONNECTOR, RECEPTACLE, MB SERIES	1	46025	74868
L1	COIL, FIXED: 0.56 μH	1	202-11	99848
MP1	COVER	1	22231-1	14632
MP2	COVER	1	22232-1	14632
R1	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	1	RCR07G101JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RCR07G471JS	81349
XA1	CONNECTOR, PRINTED CIRCUIT BOARD	8	250-22-30-170	71785
XA2	Same as XA1			
XA3	Same as XA1			
XA4	Same as XA1			
XA5	Same as XA1			
XA6	Same as XA1			
XA7	Same as XA1			
XA8	Same as XA1			

5.4.3.1 Type 72292 21.4-MHz IF Amplifier (10-kHz BW) REF DESIG PREFIX A2A1

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. 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	EP35-225-20	17554
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: 160 pF, 5%, 500V	2	CM05FD161J03	81349
C11	Same as C10			
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: 430 pF, 5%, 500V	1	DM15-431J	72136
C20	CAPACITOR, MICA, DIPPED: 560 pF, 5%, 300V	1	DM15-561J	72136
C21	Same as C1			
CR1	DIODE	3	1N462A	80131
CR2	Same as CR1			
CR3	Same as CR1			
CR4	DIODE	1	1N914A	80131
FL1	FILTER, BANDPASS: 21.4-MHz C. F. 10-kHz BW	1	9680067	74306
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	3N140	80131
Q4	TRANSISTOR	1	2N3933	80131
R1	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	1	RCR07G220JS	81349

REF DESIG PREFIX A2A1

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
R2	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4W	2	RCR07G392JS	81349
R3	Same as R2			
R4	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	3	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	Same as R5			
R9	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4W	1	RCR07G330JS	81349
R10	RESISTOR, FIXED, COMPOSITION: 3.0 kΩ, 5%, 1/4W	1	RCR07G302JS	81349
R11	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/4W	1	RCR07G681JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 180 kΩ, 5%, 1/4W	1	RCR07G184JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R14	Same as R4			
R15	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	1	RCR07G153JS	81349
R16	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	1	RCR07G332JS	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 kΩ, 5%, 1/4W	1	RCR07G102JS	81349
R21	Same as R5			
R22	RESISTOR, FIXED, COMPOSITION: 27 kΩ, 5%, 1/4W	1	RCR07G273JS	81349
R23	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	1	RCR07G472JS	81349
R24	Same as R5			
R25	Same as R4			
R26	RESISTOR, VARIABLE, FILM: 100 Ω, 30%, 1/2W	1	62PAR100	73138
R27	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	1	RCR07G100JS	81349
R28	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4W	1	RCR07G562JS	81349
VR1	VOLTAGE REGULATOR	1	1N967B	80131

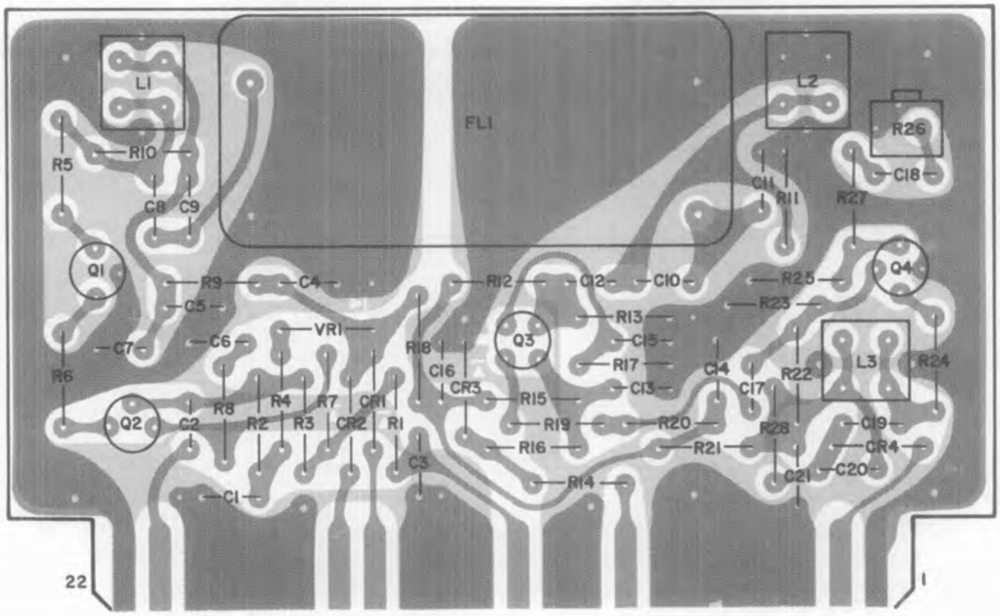


Figure 5-9. Type 72292 21.4-MHz IF Amplifier (10-kHz BW) (A2A1), Location of Components

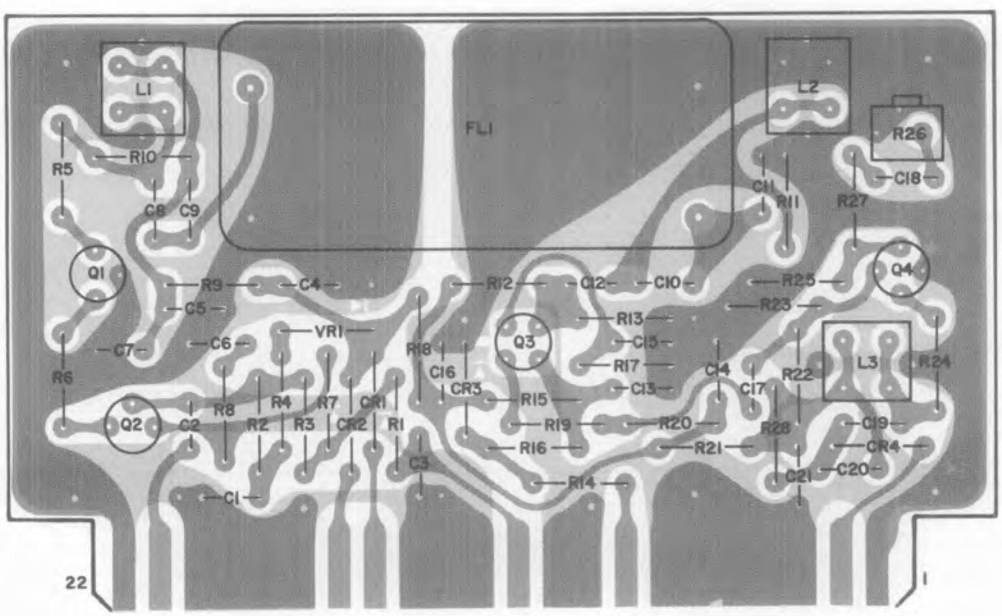


Figure 5-10. Type 72293 21.4-MHz IF Amplifier (50-kHz BW) (A2A2), Location of Components

5.4.3.2 Type 72293 21.4-MHz IF Amplifier (50-kHz BW) REF DESIG PREFIX A2A2

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. 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	EP35-225-20	17554
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: 160 pF, 5%, 500V	2	CM05FD161J03	81349
C11	Same as C10			
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: 430 pF, 5%, 500V	1	DM15-431J	72136
C20	CAPACITOR, MICA, DIPPED: 560 pF, 5%, 300V	1	DM15-561J	72136
C21	Same as C1			
CR1	DIODE	3	1N462A	80131
CR2	Same as CR1			
CR3	Same as CR1			
CR4	DIODE	1	1N914A	80131
FL1	FILTER, BANDPASS: 21.4-MHz C. F. 50-kHz BW	1	9680068	74306
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	3N140	80131
Q4	TRANSISTOR	1	2N3933	80131
R1	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	1	RCR07G220JS	81349

REF DESIG PREFIX A2A2

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
R2	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4W	2	RCR07G392JS	81349
R3	Same as R2			
R4	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	4	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	Same as R5			
R9	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4W	1	RCR07G330JS	81349
R10	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	2	RCR07G472JS	81349
R11	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	RCR07G222JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 180 kΩ, 5%, 1/4W	1	RCR07G184JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R14	Same as R4			
R15	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	1	RCR07G153JS	81349
R16	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	1	RCR07G332JS	81349
R17	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349
R18	Same as R5			
R19	Same as R5			
R20	Same as R4			
R21	Same as R5			
R22	RESISTOR, FIXED, COMPOSITION: 27 kΩ, 5%, 1/4W	1	RCR07G273JS	81349
R23	Same as R10			
R24	Same as R5			
R25	Same as R4			
R26	RESISTOR, VARIABLE, FILM: 500 Ω, 30%, 1/2W	1	62PAR500	73138
R27	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	1	RCR07G100JS	81349
R28	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4W	1	RCR07G562JS	81349
VR1	VOLTAGE REGULATOR	1	1N967B	80131

5.4.3.3 Type 72291 21.4-MHz IF Amplifier (300-kHz BW) REF DESIG PREFIX A2A3

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. 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: 9-35 pF, 350V	5	538-006-94D	72982
C8	CAPACITOR, CERAMIC, TUBULAR: 1.2 pF, ±0.1 pF, 500V	1	301-000-C0K0-129B	72982
C9	CAPACITOR, MICA, DIPPED: 82 pF, 5%, 500V	2	CM05ED820J03	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	2	CM05FD111J03	81349
C13	Same as C7			
C14	CAPACITOR, MICA, DIPPED: 620 pF, 5%, 300V	1	DM15-621J	72136
C15	Same as C2			
C16	Same as C7			
C17	CAPACITOR, MICA, DIPPED: 100 pF, 5%, 500V	1	CM05FD101J03	81349
C18	Same as C1			
C19	Same as C1			
C20	Same as C7			
C21	Same as C12			
C22	CAPACITOR, CERAMIC, TUBULAR: 1.8 pF, ±0.1 pF, 500V	1	301-000-C0K0-189B	72982
C23	CAPACITOR, MICA, DIPPED: 130 pF, 5%, 500V	1	CM05FD131J03	81349
C24	CAPACITOR, MICA, DIPPED: 120 pF, 5%, 500V	1	CM05FD121J03	81349
C25	CAPACITOR, MICA, DIPPED: 390 pF, 5%, 500V	2	CM05FD391J03	81349
C26	Same as C25			
C27	Same as C1			
C28	Same as C1			
C29	Same as C2			
C30	Same as C1			
C31	Same as C1			
C32	Same as C9			
CR1	DIODE	3	1N462A	80131

REF DESIG PREFIX A2A3

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
CR2	Same as CR1			
CR3	Same as CR1			
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	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	2	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: 5.1 kΩ, 5%, 1/4W	1	RCR07G512JS	81349
R11	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	2	RCR07G472JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	2	RCR07G221JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	RCR07G154JS	81349
R14	RESISTOR, FIXED, COMPOSITION: 180 kΩ, 5%, 1/4W	1	RCR07G184JS	81349
R15	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	1	RCR07G333JS	81349
R16	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R17	Same as R1			
R18	Same as R6			
R19	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349
R20	RESISTOR, FIXED, COMPOSITION: 27 kΩ, 5%, 1/4W	1	RCR07G273JS	81349
R21	Same as R11			
R22	Same as R12			
R23	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RCR07G102JS	81349

REF DESIG PREFIX A2A3

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
R24	Same as R6			
R25	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	1	RCR07G100JS	81349
R26	Same as R6			
R27	RESISTOR, VARIABLE, FILM: 100 Ω, 30%, 1/2W	1	62PAR100	73138
VR1	VOLTAGE REGULATOR	1	1N967B	80131

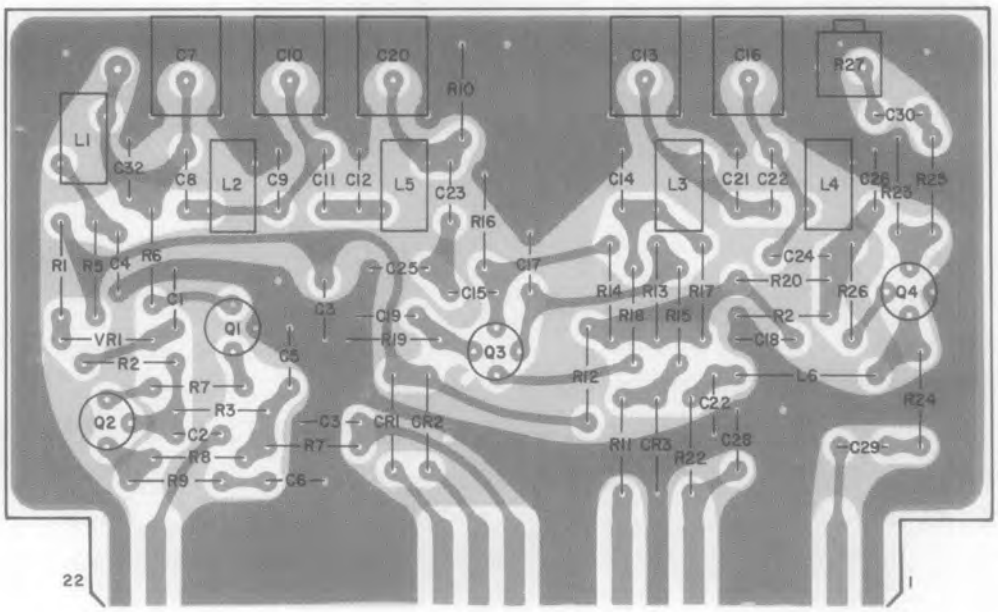


Figure 5-11. Type 72291 21.4-MHz IF Amplifier (300-kHz BW) (A2A3), Location of Components

5.4.3.4 Type 72290 21.4-MHz IF Amplifier (1-MHz BW) REF DESIG PREFIX A2A4

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	11	C023B101E502M	81349
C2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	4	SM(1000pF, GMV)	91418
C3	Same as C1			
C4	Same as C1			
C5	Same as C1			
C6	Same as C1			
C7	CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350V	5	538-006-94D	72982
C8	CAPACITOR, CERAMIC, TUBULAR: 3.6 pF, ±0.25 pF, 500V	1	301-000-C0J0-369C	72982
C9	CAPACITOR, MICA, DIPPED: 82 pF, 5%, 500V	4	CM05ED820J03	81349
C10	Same as C7			
C11	CAPACITOR, CERAMIC, TUBULAR: 3.0 pF, ±0.1 pF, 500V	1	301-000-C0J0-309B	72982
C12	Same as C9			
C13	Same as C7			
C14	CAPACITOR, CERAMIC, TUBULAR: 4.0 pF, ±0.1 pF, 500V	1	301-000-C0H0-409B	72982
C15	Same as C9			
C16	Same as C7			
C17	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF, ±0.1 pF, 500V	1	301-000-C0H0-479B	72982
C18	CAPACITOR, CERAMIC, TUBULAR: 6.0 pF, ±0.1 pF, 500V	1	301-000-C0H0-609B	72982
C19	CAPACITOR, MICA, DIPPED: 110 pF, 5%, 500V	1	CM05FD111J03	81349
C20	Same as C7			
C21	CAPACITOR, MICA, DIPPED: 120 pF, 5%, 500V	1	CM05FD121J03	81349
C22	CAPACITOR, MICA, DIPPED: 470 pF, 5%, 500V	1	DM15-471J	72136
C23	Same as C2			
C24	CAPACITOR, MICA, DIPPED: 100 pF, 5%, 500V	1	CM05FD101J03	81349
C25	Same as C1			
C26	Same as C2			
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 A2A4

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C33	Same as C1			
CR1	DIODE	3	1N462A	80131
CR2	Same as CR1			
CR3	Same as CR1			
L1	COIL, FIXED	4	20681-28	14632
L2	Same as L1			
L3	Same as L1			
L4	Same as L1			
L5	COIL, FIXED	1	20681-8	14632
L6	COIL, FIXED: 10 μH	1	1537-36	14632
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	2	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: 10 kΩ, 5%, 1/4W	2	RCR07G103JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	5	RCR07G470JS	81349
R8	Same as R7			
R9	RESISTOR, FIXED, COMPOSITION: 390 Ω, 5%, 1/4W	2	RCR07G391JS	81349
R10	Same as R7			
R11	Same as R9			
R12	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	2	RCR07G472JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	2	RCR07G221JS	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: 180 kΩ, 5%, 1/4W	1	RCR07G184JS	81349
R17	Same as R6			
R18	Same as R1			
R19	Same as R7			
R20	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349
R21	RESISTOR, FIXED, COMPOSITION: 27 kΩ, 5%, 1/4W	1	RCR07G273JS	81349

REF DESIG PREFIX A2A4

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
R22	Same as R12			
R23	Same as R13			
R24	Same as R7			
R25	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RCR07G102JS	81349
R26	RESISTOR, FIXED, COMPOSITION: 27 Ω, 5%, 1/4W	1	RCR07G270JS	81349
R27	RESISTOR, VARIABLE, FILM: 1 kΩ, 30%, 1/2W	1	62PAR1K	73138
VR1	VOLTAGE REGULATOR	1	1N967B	80131

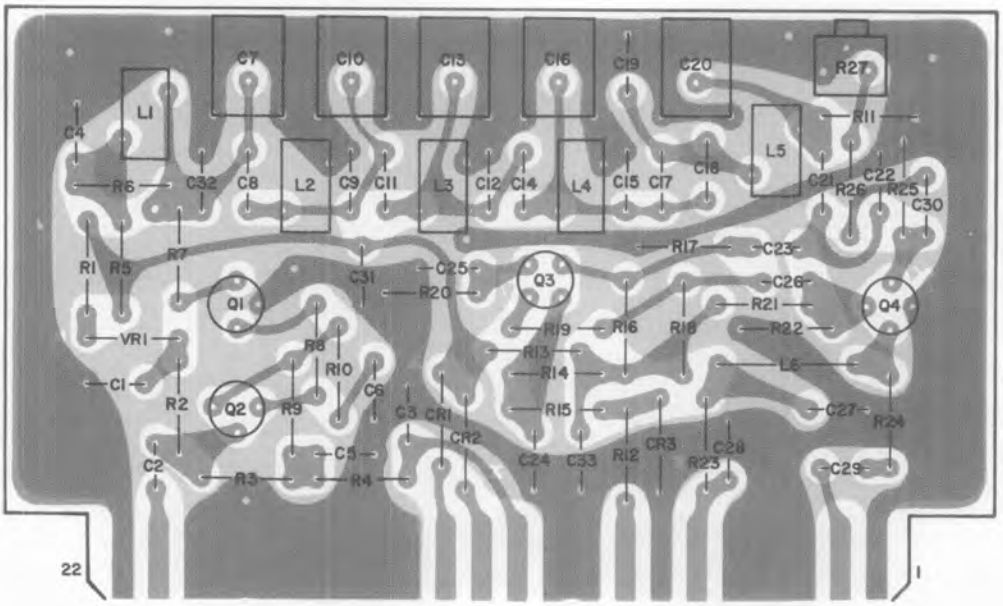


Figure 5-12. Type 72290 21.4-MHz IF Amplifier (1-MHz BW) (A2A4), Location of Components

5.4.3.5 Type 79626 FM Limiter/Discriminator (1-MHz BW) REF DESIG PREFIX A2A5

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	1	SM(1000pF, GMV)	91418
C2	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	11	C023B101E502M	81349
C3	Same as C2			
C4	Same as C2			
C5	CAPACITOR, CERAMIC, TUBULAR: 1.5 pF, ±0.25 pF, 500V	1	301-000-C0K0-159C	72982
C6	CAPACITOR, CERAMIC, TUBULAR: 1.5 pF, ±0.25 pF, 500V (N470)	1	301-000-T2K0-159C	72982
C7	CAPACITOR, VARIABLE, CERAMIC: 2-8.0 pF, 350V	1	538-006-89A	72982
C8	Same as C2			
C9	Same as C2			
C10	Same as C2			
C11	CAPACITOR, VARIABLE, AIR: 0.8-10 pF, 250V	1	2951	91293
C12	CAPACITOR, CERAMIC, TUBULAR: 5/1 pF, ±0.5 pF, 500V	1	301-000-C0H0-519D	72982
C13	CAPACITOR, CERAMIC, TUBULAR: 1.5 pF, ±0.25 pF, 500V (N1500)	1	301-000-P3K0-159C	72982
C14	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF, ±0.25 pF, 500V (N1500)	1	301-000-P3K0-479C	72982
C15	CAPACITOR, MICA, DIPPED: 12 pF, 5%, 500V	1	CM05CD120J03	81349
C16	CAPACITOR, MICA, DIPPED: 10 pF, ±0.5 pF, 500V	1	CM05CD100D03	81349
C17	Same as C2			
C18	Same as C2			
C19	Same as C2			
C20	Same as C2			
C21	Same as C2			
CR1	DIODE	2	1N462A	80131
CR2	Same as CR1			
CR3	DIODE	2	5082-2800	28480
CR4	Same as CR3			
CR5	DIODE	1	1N458A	80131
L1	COIL, FIXED: 18 μH	2	1537-42	99800
L2	COIL, FIXED	1	20681-40	14632
L3	Same as L1			
L4	COIL, FIXED: 4.7 mH	1	3635-45	71279
L5	COIL, FIXED: 5.6 mH	1	1537-30	99800
L6	COIL, FIXED: 15 μH	2	1537-40	99800

REF DESIG PREFIX A2A5

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
L7	Same as L6			
Q1	TRANSISTOR	1	U1899E	15818
Q2	TRANSISTOR	1	2N3251	80131
Q3	TRANSISTOR	1	2N2270	80131
R1	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	1	RCR07G221JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	4	RCR07G470JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RCR07G101JS	81349
R4	Same as R3			
R5	RESISTOR, FIXED, COMPOSITION: 12 kΩ, 5%, 1/4W	1	RCR07G123JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	2	RCR07G223JS	81349
R7	Same as R6			
R8	RESISTOR, FIXED, COMPOSITION: 22 MΩ, 5%, 1/4W	1	RCR07G226JS	81349
R9	Same as R2			
R10	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349
R11	RESISTOR, FIXED, COMPOSITION: 5.6 MΩ, 5%, 1/4W	1	RCR07G565JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	1	RCR07G333JS	81349
R13	Same as R2			
R14	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	1	RCR07G100JS	81349
R15	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4W	1	RCR07G152JS	81349
R16	Same as R2			
R17	RESISTOR, FIXED, COMPOSITION: 20 kΩ, 5%, 1/4W	1	RCR07G203JS	81349
T1	TRANSFORMER	1	21427-6	14632
U1	INTEGRATED CIRCUIT	1	U5F7719393	07263
VR1	VOLTAGE REGULATOR	1	1N749A	80131
VR2	VOLTAGE REGULATOR	1	1N759A	80131

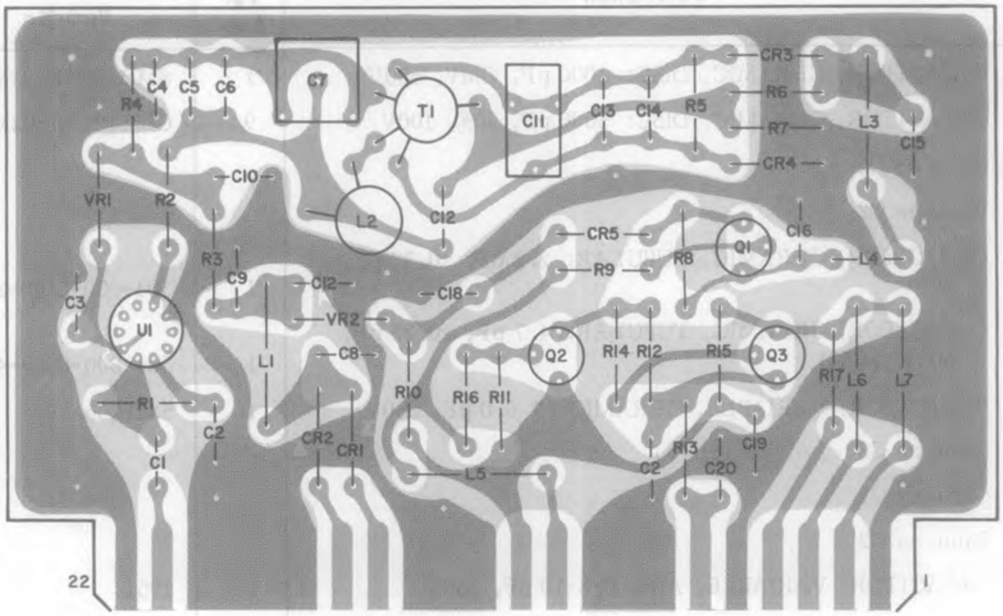


Figure 5-13. Type 79626 FM Limiter/Discriminator (1-MHz BW) (A2A5), Location of Components

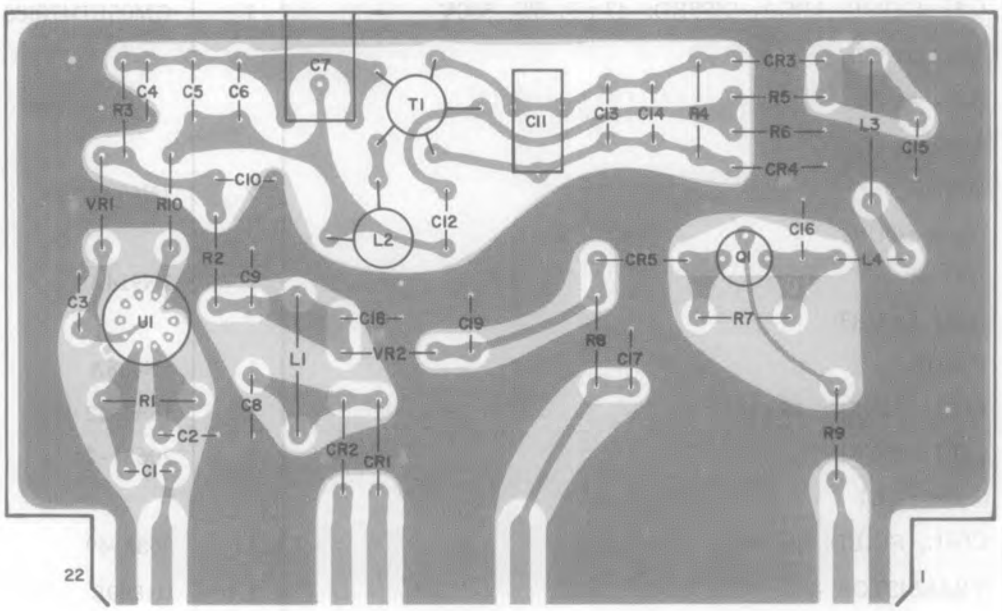


Figure 5-14. Type 79620 FM Limiter/Discriminator (300-kHz BW) (A2A6), Location of Components

5.4.3.6 Type 79620 FM Limiter/Discriminator (300-kHz BW) REF DESIG PREFIX A2A6

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	1	SM(1000pF, GMV)	91418
C2	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	9	C023B101E502M	81349
C3	Same as C2			
C4	Same as C2			
C5	CAPACITOR, CERAMIC, TUBULAR: 2.2 pF, ±0.25 pF, 500V	1	301-000-C0J0-229C	72982
C6	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF, ±0.25 pF, 500V (N750)	1	301-000-U2J0-479C	72982
C7	CAPACITOR, VARIABLE, CERAMIC: 2-8.0 pF, 350V	1	538-006-89A	72982
C8	Same as C2			
C9	Same as C2			
C10	Same as C2			
C11	CAPACITOR, VARIABLE, AIR: 0.8-10 pF, 250V	1	2951	91293
C12	CAPACITOR, CERAMIC, TUBULAR: 8.2 pF, ±0.5 pF, 500V	1	301-000-C0H0-829D	72982
C13	CAPACITOR, MICA, DIPPED: 36 pF, 5%, 500V	1	CM05ED360J03	81349
C14	CAPACITOR, CERAMIC, TUBULAR: 15 pF, ±5%, 500V (N750)	1	301-000-U2J0-150J	72982
C15	CAPACITOR, MICA, DIPPED: 27 pF, 5%, 500V	1	CM05CD270J03	81349
C16	CAPACITOR, MICA, DIPPED: 47 pF, 5%, 500V	1	CM05ED470J03	81349
C17	Same as C2			
C18	Same as C2			
C19	Same as C2			
CR1	DIODE	2	1N462A	80131
CR2	Same as CR1			
CR3	DIODE	2	1N914A	80131
CR4	Same as CR3			
CR5	DIODE	1	1N458A	80131
L1	COIL, FIXED: 18 μH	2	1537-42	99800
L2	COIL, FIXED	1	20681-26	14632
L3	Same as L1			
L4	COIL, FIXED: 10 mH	1	3635-49	71279
Q1	TRANSISTOR	1	U1899E	15818
R1	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	1	RCR07G221JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RCR07G101JS	81349
R3	Same as R2			

REF DESIG PREFIX A2A6

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
R4	RESISTOR, FIXED, COMPOSITION: 20 kΩ, 5%, 1/4W	1	RCR07G203JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	RCR07G473JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	1	RCR07G223JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 22 MΩ, 5%, 1/4W	1	RCR07G226JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349
R9	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	2	RCR07G470JS	81349
R10	Same as R9			
T1	TRANSFORMER	1	21427-7	14632
U1	INTEGRATED CIRCUIT	1	U5F7719393	07263
VR1	VOLTAGE REGULATOR	1	1N749A	80131
VR2	VOLTAGE REGULATOR	1	1N759A	80131

5.4.3.7 Type 79616 FM Limiter/Discriminator (10 and 50-kHz BW) REF DESIGN PREFIX A2A7

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. 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	538-006-94D	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	Same as C2			
C11	Same as C2			
CR1	DIODE	6	1N462A	80131
CR2	Same as CR1			
CR3	Same as CR1			
CR4	Same as CR1			
CR5	Same as CR1			
CR6	Same as CR1			
CR7	DIODE	1	1N458A	80131
L1	COIL, FIXED: 1.0 μH	1	1537-12	99800
L2	COIL, FIXED: 18 μH	1	1537-42	99800
Q1	TRANSISTOR	2	U1899E	15818
Q2	Same as Q1			
R1	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	1	RCR07G221JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RCR07G101JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RCR07G470JS	81349
R4	RESISTOR, VARIABLE, FILM: 100 kΩ, 30%, 1/2W	1	62PAR100K	73138
R5	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	RCR07G154JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	3	RCR07G104JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 6.8 MΩ, 5%, 1/4W	1	RCR07G685JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4W	1	RCR07G562JS	81349
R9	Same as R6			
R10	RESISTOR, FIXED, COMPOSITION: 22 MΩ, 5%, 1/4W	1	RCR07G226JS	81349
R11	Same as R6			
R12	Same as R2			
R13	RESISTOR, FIXED, COMPOSITION: 24 kΩ, 5%, 1/4W	1	RCR07G243JS	81349

REF DESIG PREFIX A2A7

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
R14	RESISTOR, FIXED, COMPOSITION: 39 kΩ, 5%, 1/4W	1	RCR07G393JS	81349
U1	INTEGRATED CIRCUIT	1	U5F7719393	07263
U2	DISCRIMINATOR, CRYSTAL: 21.4-MHz C. F., 100-kHz BW	1	8680040	74306
U3	INTEGRATED CIRCUIT	1	U5B7741393	07263
VR1	VOLTAGE REGULATOR	1	1N749A	80131
VR2	VOLTAGE REGULATOR	1	1N759A	80131

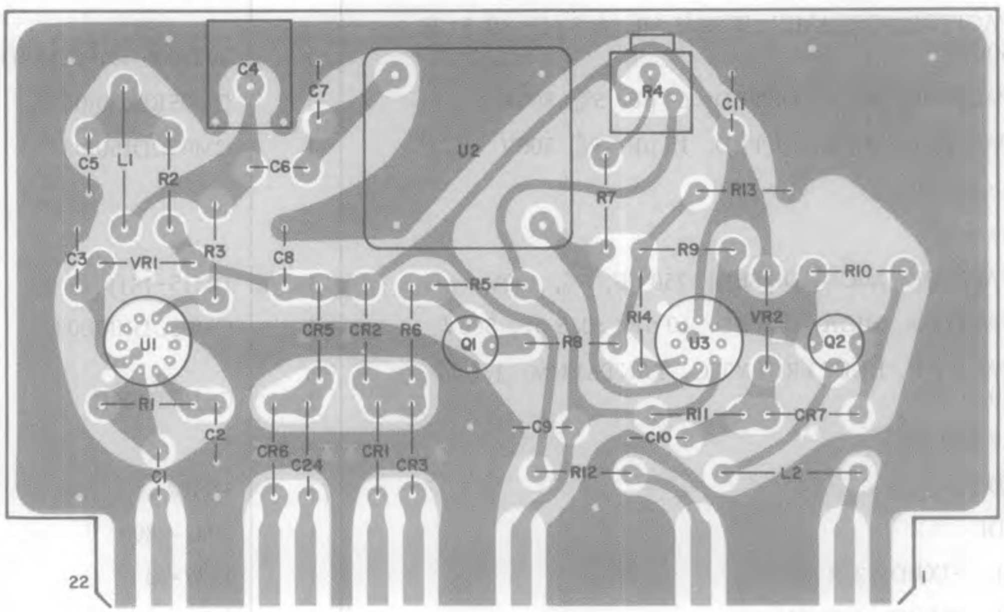


Figure 5-15. Type 79616 FM Limiter/Discriminator (10 and 50-kHz BW) (A2A7), Location of Components

5.4.3.8 Type 72285 IF Output Amplifier REF DESIG PREFIX A2A8

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	9	C023B101E502M	81349
C2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	3	SM(1000pF, GMV)	91418
C3	CAPACITOR, MICA, DIPPED: 100 pF, 5%, 500V	2	CM05FD101J03	81349
C4	Same as C1			
C5	Same as C1			
C6	Same as C2			
C7	Same as C2			
C8	CAPACITOR, MICA, DIPPED: 470 pF, 5%, 500V	1	DM15-471J	72136
C9	Same as C1			
C10	Same as C1			
C11	Same as C1			
C12	Same as C1			
C13	CAPACITOR, VARIABLE, CERAMIC: 5.5-18 pF, 350V	1	538-006-92A	72982
C14	CAPACITOR, MICA, DIPPED: 47 pF, 5%, 500V	1	CM05ED470J03	81349
C15	CAPACITOR, CERAMIC, TUBULAR: 6.8 pF, ±0.5 pF, 500V	1	301-000-C0H0-689D	72982
C16	CAPACITOR, MICA, DIPPED: 68 pF, 5%, 500V	1	CM05ED680J03	81349
C17	CAPACITOR, MICA, DIPPED: 15 pF, 5%, 500V	1	CM05CD150J03	81349
C18	Same as C1			
C19	Same as C1			
C20	CAPACITOR, MICA, DIPPED: 750 pF, 5%, 100V	1	DM15-751J	72136
C21	CAPACITOR, MICA, DIPPED: 10 pF, ±0.5 pF, 500V	1	CM05CD100D03	81349
C22	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 μF, 10%, 35V	1	CS13BF105K	81349
C23	Same as C3			
CR1	DIODE	1	1N462A	80131
CR2	DIODE	1	5082-2800	28480
L1	COIL, FIXED: 2.2 μH	1	1537-20	99800
L2	COIL, FIXED: 4.7 μH	2	1537-28	99800
L3	COIL, FIXED: 3.9 μH	1	1537-26	99800
L4	Same as L2			
L5	COIL, FIXED: 130 μH	1	1537-82	99800
L6	COIL, FIXED: 27 μH	1	1537-48	99800
L7	COIL, FIXED: 18 μH	1	1537-42	99800
Q1	TRANSISTOR	1	3N140	80131
Q2	TRANSISTOR	2	2N3933	80131

REF DESIG PREFIX A2A8

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
Q3	Same as Q2			
Q4	TRANSISTOR	2	2N5109	80131
Q5	Same as Q4			
Q6	TRANSISTOR	1	U1899E	15818
Q7	TRANSISTOR	1	2N3251	80131
Q8	TRANSISTOR	1	2N2222	80131
R1	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RCR07G471JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	1	RCR07G332JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	2	RCR07G221JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	1	RCR07G153JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	1	RCR07G101JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 180 kΩ, 5%, 1/4W	1	RCR07G184JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	3	RCR07G103JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	2	RCR07G102JS	81349
R9	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	7	RCR07G470JS	81349
R10	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349
R11	RESISTOR, FIXED, COMPOSITION: 12 kΩ, 5%, 1/4W	2	RCR07G123JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	2	RCR07G472JS	81349
R13	Same as R9			
R14	Same as R8			
R15	RESISTOR, FIXED, COMPOSITION: 150 Ω, 5%, 1/4W	1	RCR07G151JS	81349
R16	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	3	RCR07G220JS	81349
R17	RESISTOR, FIXED, COMPOSITION: 820 Ω, 5%, 1/4W	1	RCR07G821JS	81349
R18	Same as R9			
R19	Same as R7			
R20	RESISTOR, VARIABLE, FILM: 100 Ω, 30%, 1/2W	1	62PAR100	73138
R21	Same as R11			
R22	RESISTOR, FIXED, COMPOSITION: 3 kΩ, 5%, 1/4W	1	RCR07G302JS	81349
R23	Same as R9			
R24	Same as R9			
R25	Same as R9			
R26	RESISTOR, FIXED, COMPOSITION: 4.7 Ω, 5%, 1/4W	1	RCR07G4R7JS	81349
R27	RESISTOR, FIXED, COMPOSITION: 240 Ω, 5%, 1/4W	1	RCR07G241JS	81349
R28	Same as R9			
R29	Same as R16			

REF DESIG PREFIX A2A8

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
R30	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	RCR07G154JS	81349
R31	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	2	RCR07G222JS	81349
R32	Same as R31			
R33	RESISTOR, FIXED, COMPOSITION: 24 kΩ, 5%, 1/4W	1	RCR07G243JS	81349
R34	RESISTOR, FIXED, COMPOSITION: 39 kΩ, 5%, 1/4W	1	RCR07G393JS	81349
R35	Same as R7			
R36	RESISTOR, FIXED, COMPOSITION: 91 Ω, 5%, 1/4W	1	RCR07G910JS	81349
R37	Same as R12			
R38	Same as R16			
R39	Same as R3			

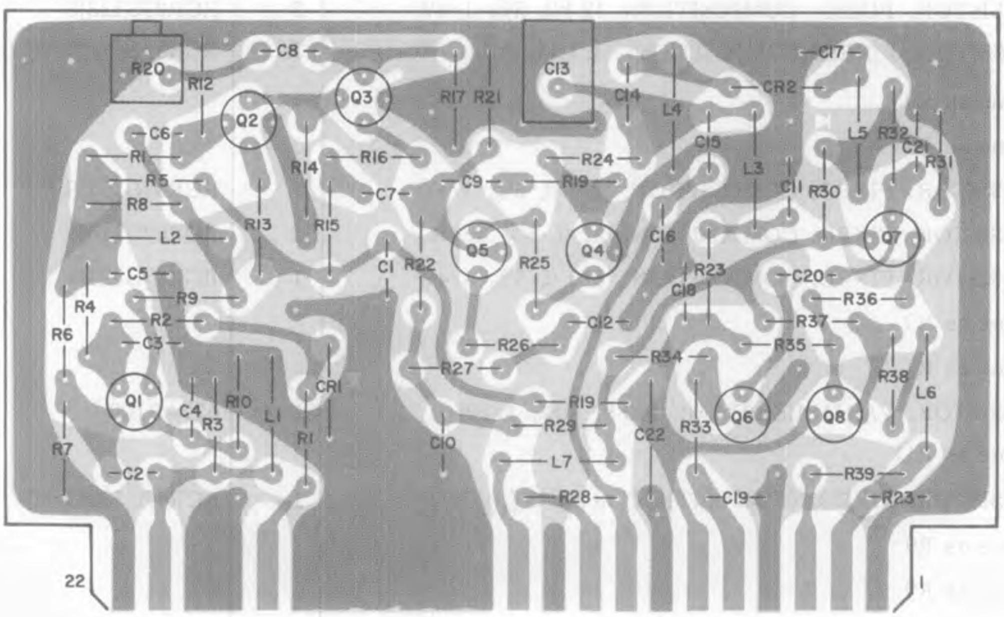
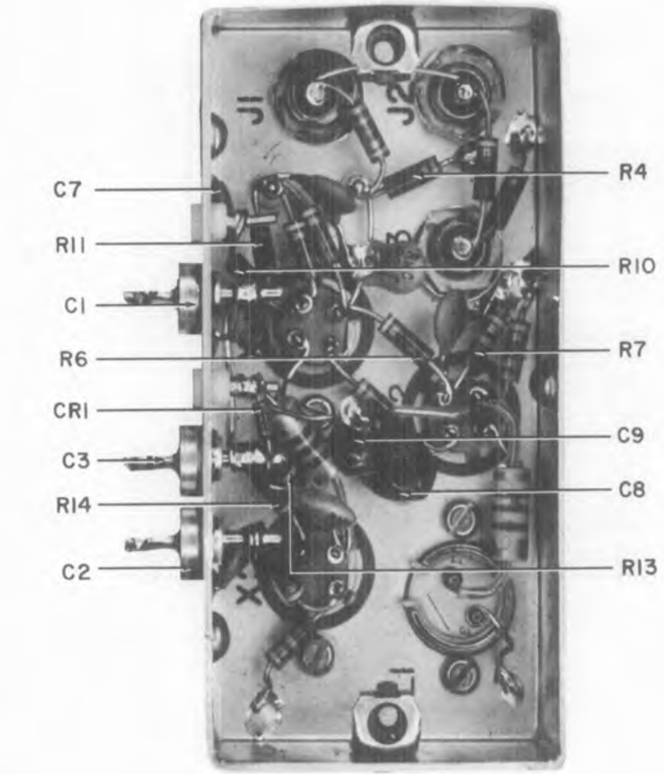


Figure 5-16. Type 72285 IF Output Amplifier (A2A8), Location of Components

5.4.4 Type 71291 RF Monitor

REF DESIG PREFIX A3

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C1	CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500V	3	FA5C-102W	01121
C2	Same as C1			
C3	Same as C1			
C4	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	5	C023B101E502M	56289
C5	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	1	SM(1000pF, GMV)	91418
C6	Same as C4			
C7	Same as C4			
C8	CAPACITOR, MICA, DIPPED: 10 pF, ±0.5 pF, 500V	1	CM04CD100D03	81349
C9	CAPACITOR, MICA, DIPPED: 100 pF, 5%, 500V	1	CM05FD101J03	81349
C10	CAPACITOR, CERAMIC, DISC: 470 pF, 20%, 1000V	1	B(470pF, M)	91418
C11	Same as C4			
C12	Same as C4			
CR1	DIODE	1	5082-2800	28480
J1	CONNECTOR, RECEPTACLE, MB SERIES	3	46025	74868
J2	Same as J1			
J3	Same as J1			
L1	COIL, VARIABLE	1	1472-4	14632
L2	COIL, FIXED: 18 μH	1	1537-42	99800
L3	COIL, FIXED: 12 μH	1	1537-38	99800
MP1	COVER	1	15646-1	14632
Q1	TRANSISTOR	2	2N3933	80131
Q2	Same as Q1			
Q3	TRANSISTOR	1	2N929	80131
R1	RESISTOR, FIXED, COMPOSITION: 75 Ω, 5%, 1/4W	1	RCR07G750JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	3	RCR07G101JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 150 Ω, 5%, 1/4W	1	RCR07G151JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	2	RCR07G682JS	81349
R6	Same as R5			
R7	RESISTOR, FIXED, COMPOSITION: 18 kΩ, 5%, 1/4W	2	RCR07G183JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/4W	1	RCR07G681JS	81349
R9	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	2	RCR07G470JS	81349
R10	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	1	RCR07G100JS	81349
R11	Same as R9			



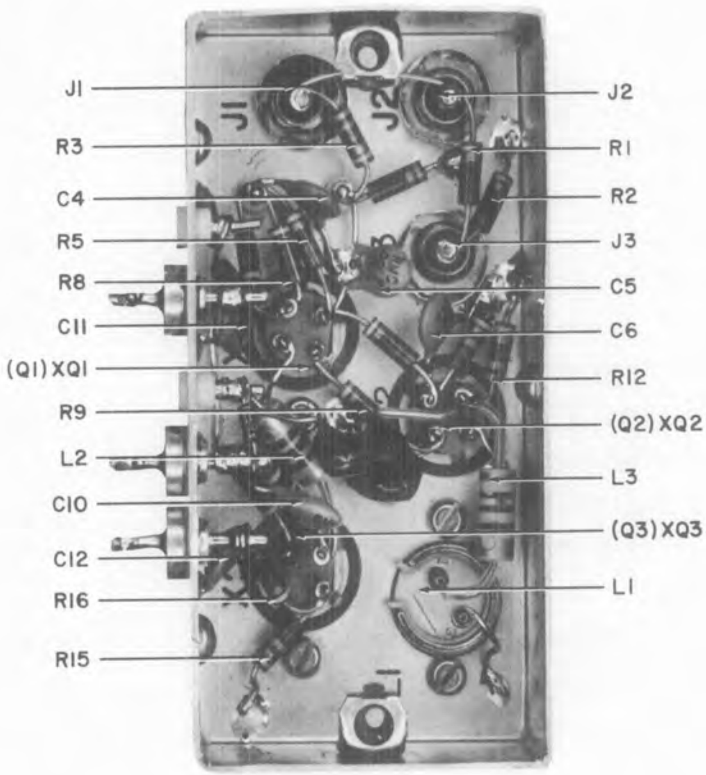


Figure 5-17. Type 71291 RF Monitor (A3), Location of Components

REF DESIG PREFIX A3

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
R12	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	1	RCR07G332JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 470 kΩ, 5%, 1/4W	1	RCR07G474JS	81349
R14	Same as R2			
R15	Same as R7			
R16	Same as R2			
XQ1	SOCKET, TRANSISTOR	2	22-16-4	81073
XQ2	Same as XQ1			
XQ3	SOCKET, TRANSISTOR	1	22-16-2	81073

5.4.5 Type 7366 Video Amplifier REF DESIG PREFIX A4

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 10%, 35V	1	CS13BF225K	81349
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 μF, 10%, 35V	4	CS13BF105K	81349
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 22 μF, 105, 35V	1	CS13BF226K	81349
C4	Same as C2			
C5	Same as C2			
C6	CAPACITOR, ELECTROLYTIC, TANTALUM: 100 μF, 10%, 30V	1	109D107X9030T2	56289
C7	Same as C2			
CR1	DIODE	2	1N462A	80131
CR2	Same as CR1			
CR3	DIODE	2	1N914A	80131
CR4	Same as CR3			
Q1	TRANSISTOR	2	2N3904	80131
Q2	TRANSISTOR	2	2N3906	80131
Q3	Same as Q1			
Q4	Same as Q2			
R1	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RCR07G471JS	81349
R2	RESISTOR, FIXED, FILM: 150 kΩ, 1%, 1/4W	1	RN60D1503F	81349
R3	RESISTOR, FIXED, FILM: 24.3 kΩ, 1%, 1/4W	1	RN60D2432F	81349
R4	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	3	RCR07G102JS	81349
R5	RESISTOR, FIXED, FILM: 681 Ω, 1%, 1/4W	1	RN60D6810F	81349
R6	RESISTOR, FIXED, FILM: 4.75 kΩ, 1%, 1/4W	1	RN60D4751F	81349
R7	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	4	RCR07G470JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	1	RCR07G101JS	81349
R9	Same as R4			
R10	Same as R4			
R11	Same as R7			
R12	Same as R7			
R13	Same as R7			
R14	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R15	RESISTOR, FIXED, COMPOSITION: 20 kΩ, 5%, 1/4W	1	RCR07G203JS	81349

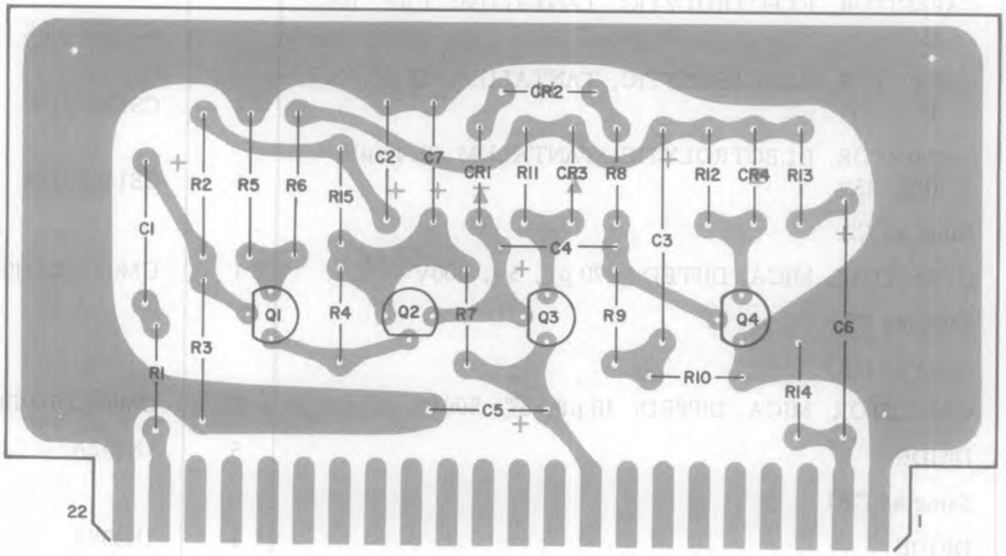


Figure 5-18. Type 7366 Video Amplifier (A4), Location of Components

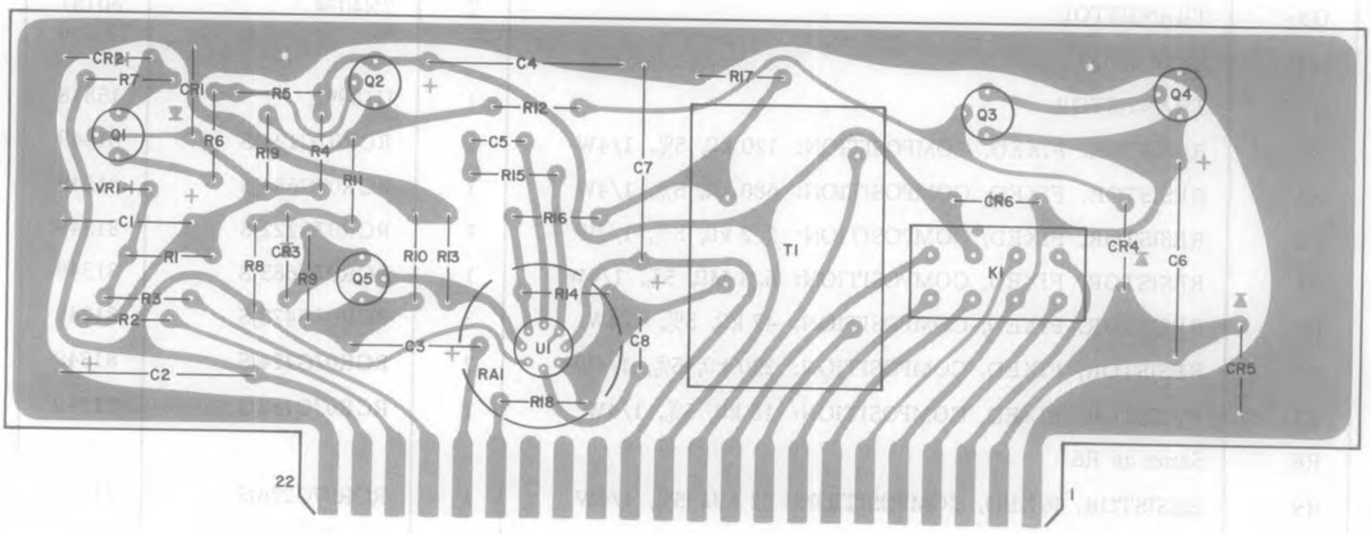


Figure 5-19. Type 7443 Audio Amplifier/Carrier Operated Relay (A5), Location of Components

5.4.6 Type 7443 Audio Amplifier/Carrier Operated Relay REF DESIG PREFIX A5

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 1 μF, 10%, 35V	1	CS13BF105K	81349
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 22 μF, 10%, 35V	4	CS13BF226K	81349
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 0.47 μF, 10%, 35V	1	CS13BF474K	81349
C4	Same as C2			
C5	CAPACITOR, MICA, DIPPED: 270 pF, 5%, 500V	1	CM05FD271J03	81349
C6	Same as C2			
C7	Same as C2			
C8	CAPACITOR, MICA, DIPPED: 10 pF, 5%, 500V	1	CM05CD100D03	81349
CR1	DIODE	5	1N462A	80131
CR2	Same as CR1			
CR3	DIODE	1	1N458A	80131
CR4	Same as CR1			
CR5	Same as CR1			
CR6	Same as CR1			
K1	RELAY	1	HP11D-24V	77342
Q1	TRANSISTOR	1	2N929	80131
Q2	TRANSISTOR	1	2N3251	80131
Q3	TRANSISTOR	2	2N4074	80131
Q4	Same as Q3			
Q5	TRANSISTOR	1	U1899E	15818
R1	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4W	1	RCR07G124JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 680 kΩ, 5%, 1/4W	1	RCR07G684JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	RCR07G222JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 6.8 MΩ, 5%, 1/4W	1	RCR07G685JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	3	RCR07G473JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4W	2	RCR07G224JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 18 kΩ, 5%, 1/4W	1	RCR07G183JS	81349
R8	Same as R6			
R9	RESISTOR, FIXED, COMPOSITION: 22 MΩ, 5%, 1/4W	1	RCR07G226JS	81349
R10	Same as R5			
R11	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	RCR07G154JS	81349
R13	Same as R5			

REF DESIG PREFIX A5

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
R14	RESISTOR, FIXED, COMPOSITION: 68 kΩ, 5%, 1/4W	1	RCR07G683JS	81349
R15	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4W	1	RCR07G152JS	81349
R16	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RCR07G102JS	81349
R17	RESISTOR, FIXED, COMPOSITION: 4.7 Ω, 5%, 1/4W	1	RCR07G4R7JS	81349
R18	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RCR07G471JS	81349
R19	RESISTOR, FIXED, COMPOSITION: 10 MΩ, 5%, 1/4W	1	RCR07G106JS	81349
RA1	RADIATOR, TRANSISTOR	1	2225B	13103
T1	TRANSFORMER	1	15589-1	14632
U1	INTEGRATED CIRCUIT	1	LM709C	27014
VR1	VOLTAGE REGULATOR	1	1N746A	80131

5.4.7 Type 79611 Ramp Generator and IF Selection Switch REF DESIG PREFIX A6

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 100 μF, 20%, 25V	2	109D107X0025F2	56289
C2	CAPACITOR, MICA, DIPPED: 43 pF, 5%, 500V	1	CM05ED430J03	81349
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 3.3 μF, 10%, 100V	1	109D335X9100C2	56289
C4	Same as C1			
C5	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	1	SM(1000pF, GMV)	91418
CR1	DIODE	2	1N462A	80131
CR2	DIODE	1	1N914A	80131
CR3	Same as CR1			
CR4	DIODE	1	1N458A	80131
Q1	TRANSISTOR	2	2N4918	80131
Q2	TRANSISTOR	2	2N2222	80131
Q3	TRANSISTOR	4	2N4074	80131
Q4	Same as Q2			
Q5	Same as Q3			
Q6	Same as Q3			
Q7	Same as Q1			
Q8	TRANSISTOR	1	2N3251	80131
Q9	TRANSISTOR	1	2N4853	80131
Q10	Same as Q3			
Q11	TRANSISTOR	1	U1899E	15818
R1	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	2	RCR07G470JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	3	RCR07G472JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	3	RCR07G102JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 18 kΩ, 5%, 1/4W	2	RCR07G183JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	1	RCR07G223JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	RCR07G473JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	2	RCR07G331JS	81349
R9	Same as R3			
R10	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	2	RCR07G682JS	81349
R11	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	2	RCR07G332JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 13 kΩ, 5%, 1/4W	1	RCR07G133JS	81349
R13	Same as R3			
R14	Same as R11			

REF DESIG PREFIX A6

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
R15	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RCR07G471JS	81349
R16	Same as R8			
R17	Same as R2			
R18	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	2	RCR07G100JS	81349
R19	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	2	RCR07G104JS	81349
R20	RESISTOR, FIXED, COMPOSITION: 1.8 kΩ, 5%, 1/4W	2	RCR07G182JS	81349
R21	Same as R20			
R22	RESISTOR, VARIABLE, FILM: 2 kΩ, 30%, 1/2W	1	62PAR2K	73138
R23	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	RCR07G222JS	81349
R24	RESISTOR, VARIABLE, FILM: 10 kΩ, 30%, 1/2W	1	62PAR10K	73138
R25	Same as R5			
R26	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4W	1	RCR07G562JS	81349
R27	RESISTOR, FIXED, COMPOSITION: 68 kΩ, 5%, 1/4W	2	RCR07G683JS	81349
R28	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	1	RCR07G333JS	81349
R29	Same as R27			
R30	Same as R1			
R31	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RCR07G101JS	81349
R32	RESISTOR, FIXED, FILM: 21.5 kΩ, 1%, 1/4W	1	RN60D2152F	81349
R33	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	1	RCR07G153JS	81349
R34	Same as R31			
R35	Same as R18			
R36	Same as R19			
R37	Same as R10			
R38	RESISTOR, FIXED, COMPOSITION: 470 kΩ, 5%, 1/4W	1	RCR07G474JS	81349
R39	Same as R2			
R40	RESISTOR, FIXED, FILM: 1.13 kΩ, 1%, 1/4W	1	RN60D1131F	81349
U1	INTEGRATED CIRCUIT	1	U5B7741393	07263
VR1	VOLTAGE REGULATOR	1	1N967B	80131

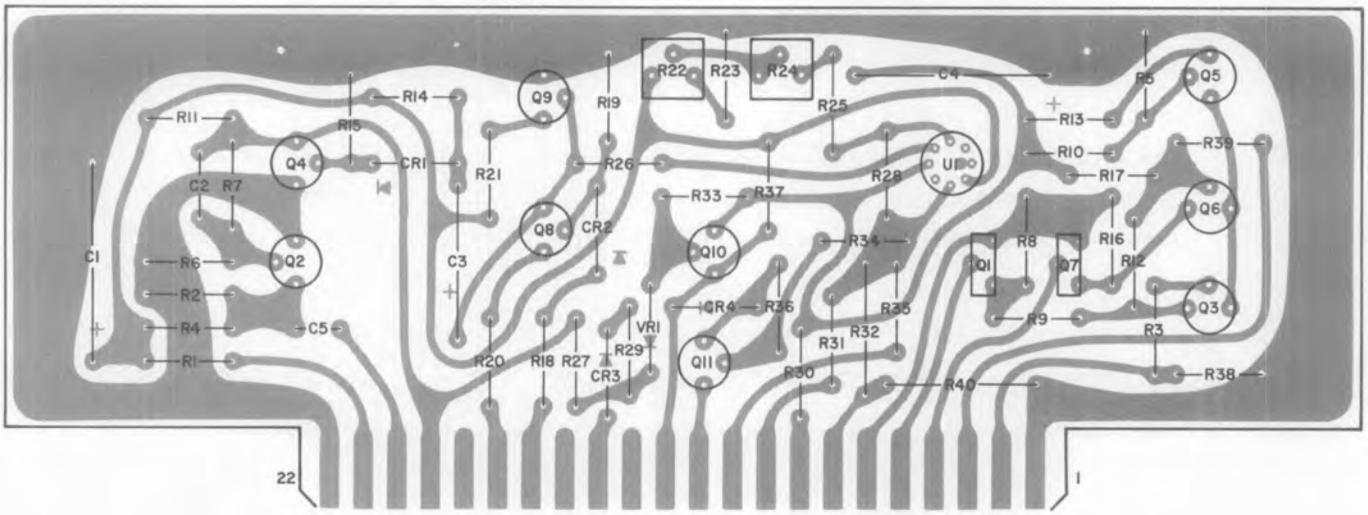


Figure 5-20. Type 79611 Ramp Generator and IF Selection Switch (A6), Location of Components

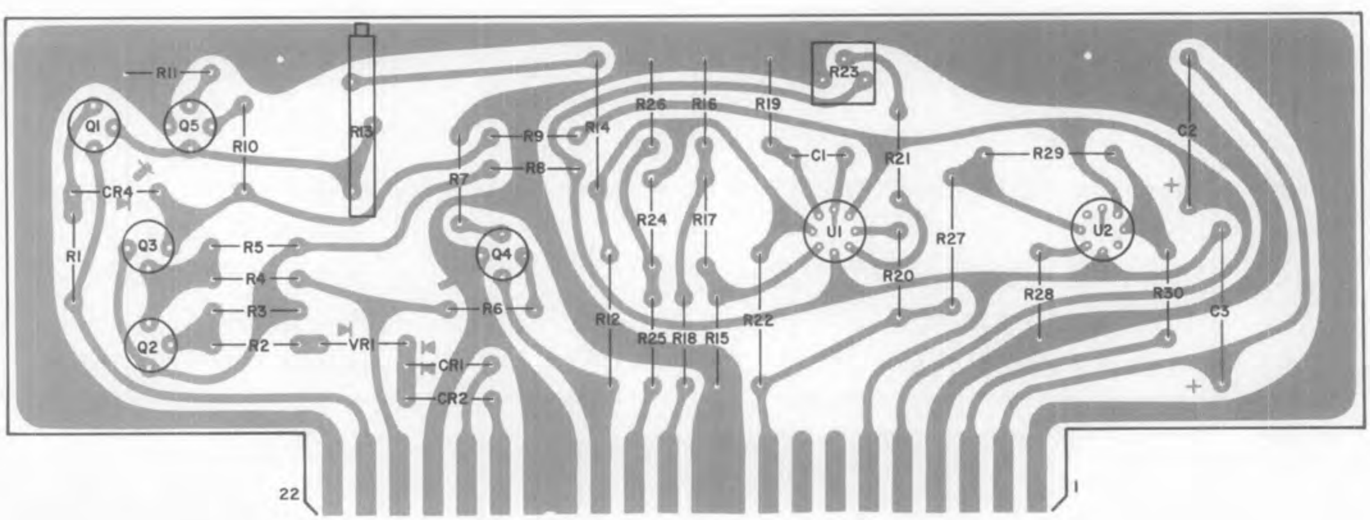


Figure 5-21. Type 79619 Sweep Control (A7), Location of Components

5.4.8 Type 79619 Sweep Control REF DESIG PREFIX A7

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C1	CAPACITOR, MICA, DIPPED: 62 pF, 5%, 500V	1	CM05ED620J03	81349
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 22 μF, 20%, 25V	2	109D226X0025C2	56289
C3	Same as C2			
CR1	DIODE	2	1N462A	80131
CR2	Same as C1			
CR3	NOT USED			
CR4	DIODE	1	1N458A	80131
Q1	TRANSISTOR	1	U1899E	15818
Q2	TRANSISTOR	2	2N929	80131
Q3	Same as Q2			
Q4	TRANSISTOR	2	MEM-511C	11711
Q5	Same as Q4			
R1	RESISTOR, FIXED, COMPOSITION: 2.2 MΩ, 5%, 1/4W	1	RCR07G225JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4W	2	RCR07G224JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	3	RCR07G473JS	81349
R4	Same as R2			
R5	Same as R3			
R6	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	3	RCR07G104JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4W	2	RCR07G124JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 2.7 Ω, 5%, 1/4W	1	RCR07G2R7JS	81349
R9	Same as R3			
R10	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	1	RCR07G223JS	81349
R11	Same as R7			
R12	RESISTOR, FIXED, WIRE-WOUND: 100 kΩ, 1%, 1/4W	2	A2537(100K, F)	14193
R13	RESISTOR, VARIABLE, WIRE-WOUND: 5 kΩ, 10%, 1W	1	3005P-1-502	80294
R14	RESISTOR, FIXED, WIRE-WOUND: 97.6 kΩ, 1%, 1/4W	1	A2537(97.6K, F)	14193
R15	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	2	RCR07G333JS	81349
R16	Same as R15			
R17	RESISTOR, FIXED, COMPOSITION: 1 MΩ, 5%, 1/4W	2	RCR07G105JS	81349
R18	Same as R6			
R19	RESISTOR, FIXED, COMPOSITION: 10 MΩ, 5%, 1/4W	1	RCR07G106JS	81349
R20	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RCR07G101JS	81349
R21	RESISTOR, FIXED, COMPOSITION: 5.1 MΩ, 5%, 1/4W	1	RCR07G515JS	81349
R22	Same as R12			

REF DESIG PREFIX A7

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
R23	RESISTOR, VARIABLE, FILM: 100 kΩ, 30%, 1/2W	1	62PAR100K	73138
R24	Same as R17			
R25	Same as R6			
R26	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4W	1	RCR07G392J	81349
R27	RESISTOR, FIXED, WIRE-WOUND: 20 kΩ, 0.1%, 0.1W	2	M40(20K, B, .1W)	14193
R28	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R29	Same as R27			
R30	Same as R20			
U1	INTEGRATED CIRCUIT	1	LM201A	27014
U2	INTEGRATED CIRCUIT	1	U5B7741393	07263
VR1	VOLTAGE REGULATOR	1	1N967B	80131

5.4.9 Type 79612 Marker Generator and Over-Sweep REF DESIG PREFIX A8

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 100 μF, 20%, 25V	2	109D107X0025F2	56289
C2	Same as C1			
CR1	DIODE	8	1N462A	80131
CR2	Same as CR1			
CR3	Same as CR1			
CR4	Same as CR1			
CR5	Same as CR1			
CR6	Same as CR1			
CR7	Same as CR1			
CR8	Same as CR1			
Q1	TRANSISTOR	1	2N2907	80131
Q2	TRANSISTOR	1	2N4074	80131
R1	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	2	RCR07G102JS	81349
R2	Same as R1			
R3	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	2	RCR07G470JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	2	RCR07G222JS	81349
R5	Same as R4			
R6	RESISTOR, FIXED, WIRE-WOUND: 20 kΩ, 0.1%, 0.1W	8	M40(20K, B, .1W)	14193
R7	Same as R6			
R8	Same as R6			
R9	Same as R6			
R10	Same as R6			
R11	Same as R6			
R12	Same as R6			
R13	Same as R6			
R14	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	5	RCR07G103JS	81349
R15	Same as R14			
R16	RESISTOR, FIXED, COMPOSITION: 27 kΩ, 5%, 1/4W	1	RCR07G273JS	81349
R17	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	1	RCR07G472JS	81349
R18	RESISTOR, FIXED, COMPOSITION: 470 kΩ, 5%, 1/4W	1	RCR07G474JS	81349
R19	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	2	RCR07G100JS	81349
R20	Same as R19			
R21	Same as R14			
R22	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	1	RCR07G153JS	81349

REF DESIG PREFIX A8

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
R23	RESISTOR, FIXED, COMPOSITION: 750 Ω, 5%, 1/4W	1	RCR07G751JS	81349
R24	Same as R14			
R25	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4W	3	RCR07G562JS	81349
R26	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	RCR07G473JS	81349
R27	Same as R14			
R28	Same as R3			
R29	Same as R25			
R30	Same as R25			
U1	INTEGRATED CIRCUIT	6	U5B7741393	07263
U2	Same as U1			
U3	Same as U1			
U4	Same as U1			
U5	Same as U1			
U6	Same as U1			
VR1	VOLTAGE REGULATOR	1	1N752A	80131

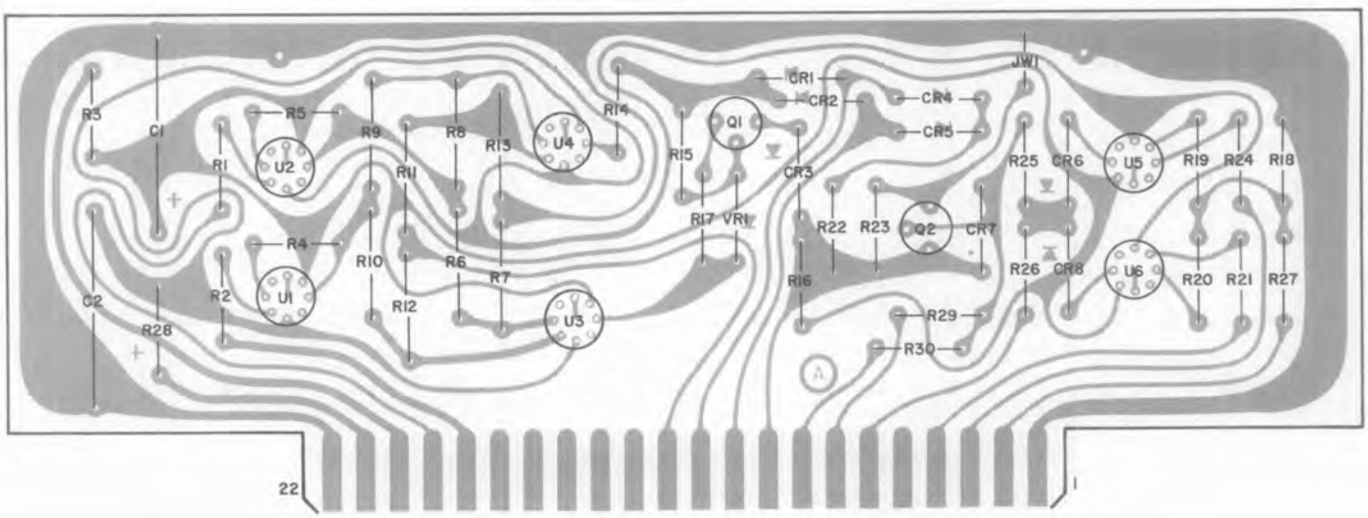


Figure 5-22. Type 79612 Marker Generator and Over-Sweep (A8), Location of Components

5.4.10 Type 7867 AGC Amplifier

REF DESIG PREFIX A9

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100V	1	C023B101F103M	56289
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 0.47 μF, 10%, 35V	1	CS13BF474K	81349
C3	CAPACITOR, MICA, DIPPED: 470 pF, 5%, 500V	1	DM15-471J	72136
C4	CAPACITOR, ELECTROLYTIC, TANTALUM: 22 μF, 20%, 25V	2	109D226X0025C2	56289
C5	CAPACITOR, ELECTROLYTIC, TANTALUM: 10 μF, 10%, 20V	1	CS13BE106K	81349
C6	CAPACITOR, CERAMIC, DISC: 0.05 μF, +80-20%, 20V	1	UK20-503	91590
C7	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	1	SM(1000pF, GMV)	91418
C8	Same as C4			
C9	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V	1	SM(5000pF, M)	91418
C10	CAPACITOR, CERAMIC, DISC: 2200 pF, 20%, 1000V	1	JF(2200pF, M)	91418
CR1	DIODE	2	1N458A	80131
CR2	Same as CR1			
CR3	DIODE	1	1N270	80131
CR4	DIODE	2	1N462A	80131
CR5	Same as CR4			
Q1	TRANSISTOR	4	2N3251	80131
Q2	TRANSISTOR	1	2N2270	80131
Q3	TRANSISTOR	2	U1899E	15818
Q4	Same as Q3			
Q5	TRANSISTOR	5	2N929	80131
Q6	Same as Q1			
Q7	Same as Q5			
Q8	Same as Q1			
Q9	Same as Q5			
Q10	Same as Q5			
Q11	Same as Q5			
Q12	Same as Q1			
R1	RESISTOR, FIXED, COMPOSITION: 68 kΩ, 5%, 1/4W	3	RCR07G683JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	8	RCR07G103JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 1.8 kΩ, 5%, 1/4W	1	RCR07G182JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	2	RCR07G682JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 330 kΩ, 5%, 1/4W	3	RCR07G334JS	81349

REF DESIG PREFIX A9

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R6	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RCR07G101JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 18 kΩ, 5%, 1/4W	1	RCR07G183JS	81349
R8	Same as R5			
R9	RESISTOR, VARIABLE, FILM: 100 kΩ, 30%, 1/2W	1	62PAR100K	73138
R10	Same as R2			
R11	RESISTOR, FIXED, COMPOSITION: 22 MΩ, 5%, 1/4W	2	RCR07G226JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	1	RCR07G153JS	81349
R13	Same as R11			
R14	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	3	RCR07G104JS	81349
R15	Same as R14			
R16	Same as R14			
R17	RESISTOR, FIXED, COMPOSITION: 680 kΩ, 5%, 1/4W	1	RCR07G684JS	81349
R18	Same as R1			
R19	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	2	RCR07G223JS	81349
R20	Same as R2			
R21	Same as R2			
R22	Same as R2			
R23	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	1	RCR07G332JS	81349
R24	Same as R2			
R25	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	3	RCR07G102JS	81349
R26	Same as R2			
R27	RESISTOR, FIXED, COMPOSITION: 2.7 Ω, 5%, 1/4W	2	RCR07G2R7JS	81349
R28	Same as R1			
R29	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4W	1	RCR07G272JS	81349
R30	Same as R2			
R31	Same as R4			
R32	RESISTOR, FIXED, COMPOSITION: 24 kΩ, 5%, 1/4W	1	RCR07G243JS	81349
R33	RESISTOR, FIXED, COMPOSITION: 4.3 kΩ, 5%, 1/4W	1	RCR07G432JS	81349
R34	Same as R19			
R35	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	1	RCR07G472JS	81349
R36	RESISTOR, FIXED, COMPOSITION: 12 kΩ, 5%, 1/4W	1	RCR07G123JS	81349
R37	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	RCR07G473JS	81349
R38	Same as R6			
R39	Same as R25			
R40	Same as R27			

REF DESIG PREFIX A9

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R41	RESISTOR, FIXED, COMPOSITION: 7.5 MΩ, 5%, 1/4W	1	RCR07G755JS	81349
R42	Same as R5			
R43	RESISTOR, FIXED, COMPOSITION: 1.1 kΩ, 5%, 1/4W	1	RCR07G112JS	81349
R44	RESISTOR, FIXED, COMPOSITION: 390 Ω, 5%, 1/4W	1	RCR07G391JS	81349
R45	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RCR07G470JS	81349
R46	Same as R25			
U1	INTEGRATED CIRCUIT	1	MC1439G	04713
U2	INTEGRATED CIRCUIT	1	U5B7741393	07263

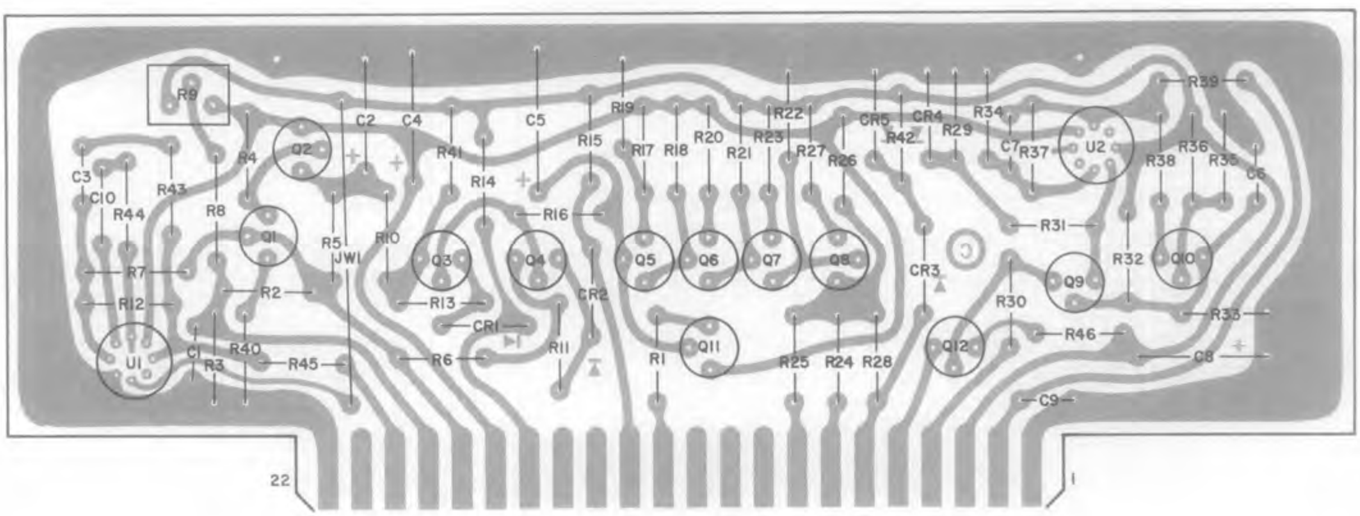


Figure 5-23. Type 7867 AGC Amplifier (A9), Location of Components

5.4.11 Type 76179 ±10V and +30V Precision Power Supply Regulator

REF DESIG PREFIX A10

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 100 μF, 20%, 25V	4	109D107X0025F2	56289
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 10%, 20V	2	CS13BE225K	81349
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 22 μF, 20%, 25V	2	109D226X0025C2	56289
C4	Same as C1			
C5	Same as C3			
C6	Same as C1			
C7	Same as C2			
C8	Same as C1			
C9	CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μF, 20%, 50V	1	109D476X0050F2	56289
C10	CAPACITOR, ELECTROLYTIC, TANTALUM: 4.7 μF, 10%, 100V	1	109D475X9100C2	56289
C11	CAPACITOR, CERAMIC, DISC: 5000 pF, ±20%, 100V	1	C023B101E502M	56289
CR1	DIODE	1	1N914A	80131
Q1	TRANSISTOR	1	2N2907	80131
Q2	TRANSISTOR	2	2N4074	80131
Q3	Same as Q2			
R1	RESISTOR, FIXED, COMPOSITION: 180 kΩ, 5%, 1/4W	1	RCR07G184JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 1.1 kΩ, 5%, 1/4W	1	RCR07G112JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 430 Ω, 5%, 1/4W	1	RCR07G431JS	81349
R4	RESISTOR, FIXED, WIRE-WOUND: 1.82 kΩ, 1%, 1/4W	1	A2537(1.92K, F)	14193
R5	RESISTOR, VARIABLE, WIRE-WOUND: 500 Ω, 10%, 1W	2	3005P-1-501	80294
R6	RESISTOR, FIXED, WIRE-WOUND: 2.80 kΩ, 1%, 1/4W	1	A2537(2.80K, F)	14193
R7	RESISTOR, FIXED, COMPOSITION: 2.7 Ω, 5%, 1/4W	1	RCR07G2R7JS	81349
R8	RESISTOR, VARIABLE, WIRE-WOUND: 200 Ω, 10%, 1W	1	3005P-1-201	80294
R9	RESISTOR, FIXED, WIRE-WOUND: 4.54 kΩ, 1%, 1/4W	1	A2537(4.54K, F)	14193
R10	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	2	RCR07G222JS	81349
R11	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	2	RCR07G471JS	81349
R12	Same as R11			
R13	RESISTOR, FIXED, WIRE-WOUND: 4.64 kΩ, 1%, 1/4W	1	A2537(4.64K, F)	14193
R14	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RCR07G101JS	81349
R15	Same as R10			
R16	RESISTOR, FIXED, WIRE-WOUND: 6.65 kΩ, 1%, 1/4W	1	A2537(6.65K, F)	14193

REF DESIG PREFIX A10

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
R17	RESISTOR, FIXED, WIRE-WOUND: 3.22 kΩ, 1%, 1/4W	1	A2537(3.22K, F)	14193
R18	Same as R5			
R19	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R20	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4W	1	RCR07G562JS	81349
R21	Same as R14			
R22	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	1	RCR07G472JS	81349
TP1	TEST POINT	2	SKT-103PC(Red)	98291
TP2	TEST POINT	1	SKT-103PC(Br)	98291
TP3	Same as TP1			
U1	INTEGRATED CIRCUIT	3	U5B7741393	07263
U2	Same as U1			
U3	Same as U1			
VR1	VOLTAGE REGULATOR	1	1N827	80131

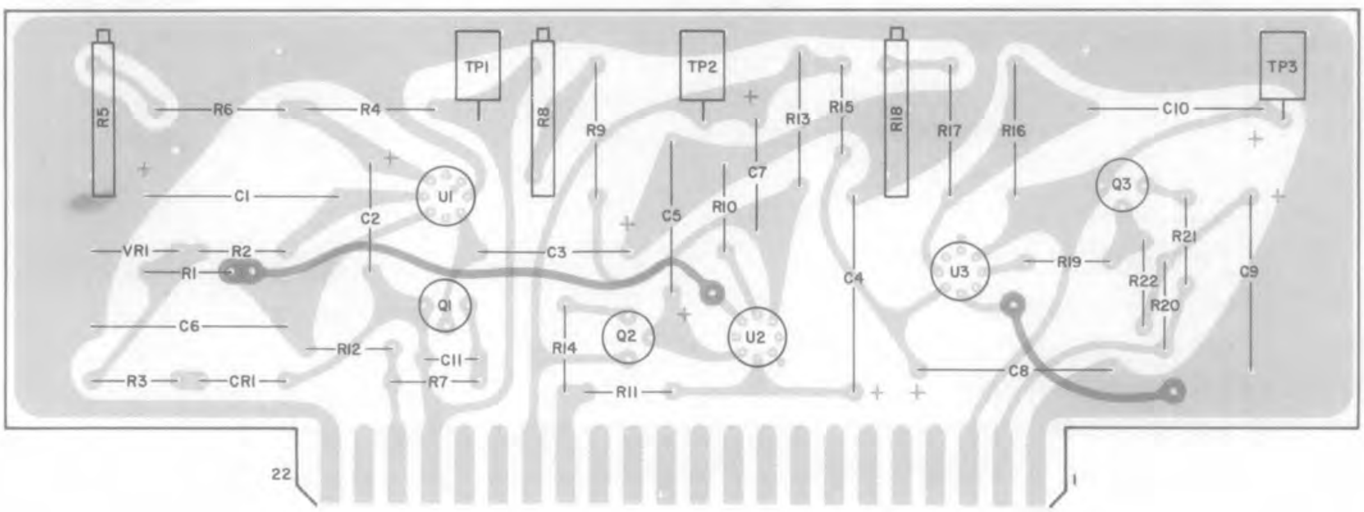


Figure 5-24. Type 76179 ±10V and +30V Precision Power Supply Regulator (A10), Location of Components

5.4.12 Type 76181 +18V Power Supply Regulator REF DESIG PREFIX A11

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C1	CAPACITOR, MICA, DIPPED: 47 pF, 5%, 500V	1	CM05ED470J03	81349
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 10 μF, 10%, 35V	1	CS13BF106K	81349
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μF, 10%, 35V	1	CS13BF476K	81349
CR1	DIODE	3	1N462A	80131
CR2	Same as CR1			
CR3	Same as CR1			
CR4	DIODE	2	1N4003	80131
CR5	Same as CR4			
Q1	TRANSISTOR	1	2N4037	80131
Q2	TRANSISTOR	3	2N929	80131
Q3	Same as Q2			
Q4	Same as Q2			
R1	RESISTOR, FIXED, COMPOSITION: 300 Ω, 5%, 1/4W	1	RCR07G301JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4W	1	RCR07G822JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R4	RESISTOR, FIXED, FILM: 5.11 kΩ, 1%, 1/4W	1	RN60D5111F	81349
R5	RESISTOR, VARIABLE, FILM: 1 kΩ, 30%, 1/2W	1	62PAR1K	73138
R6	RESISTOR, FIXED, FILM: 3.16 kΩ, 1%, 1/4W	1	RN60D3161F	81349
R7	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	3	RCR07G472JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	1	RCR07G332JS	81349
R9	Same as R7			
R10	Same as R7			
TP1	TEST POINT	1	SKT-103PC(Red)	98291
U1	RECTIFIER ASSEMBLY	1	MDA-940A-3	04713
VR1	VOLTAGE REGULATOR	1	1N759A	80131
VR2	VOLTAGE REGULATOR	1	1N754A	80131

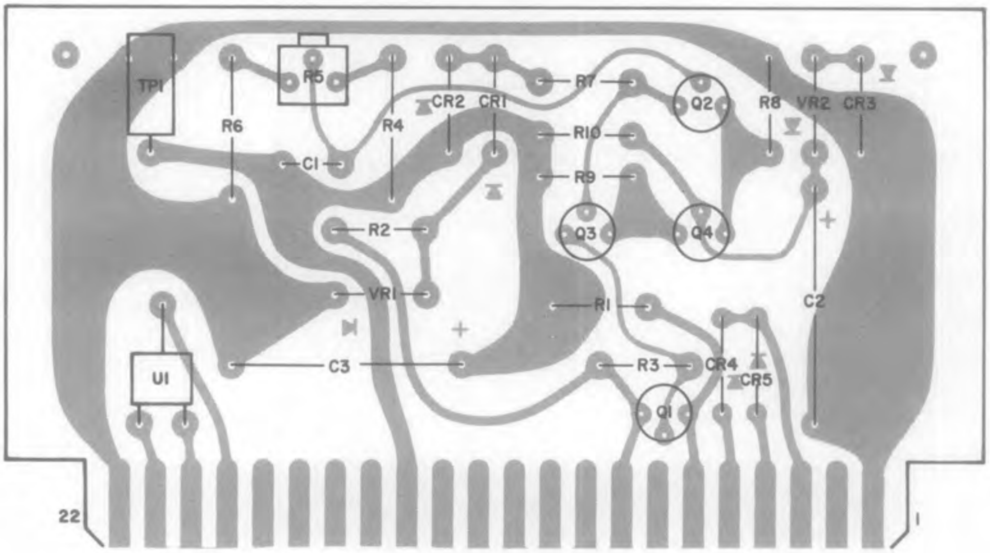


Figure 5-25. Type 76181 +18V Power Supply Regulator (A11), Location of Components

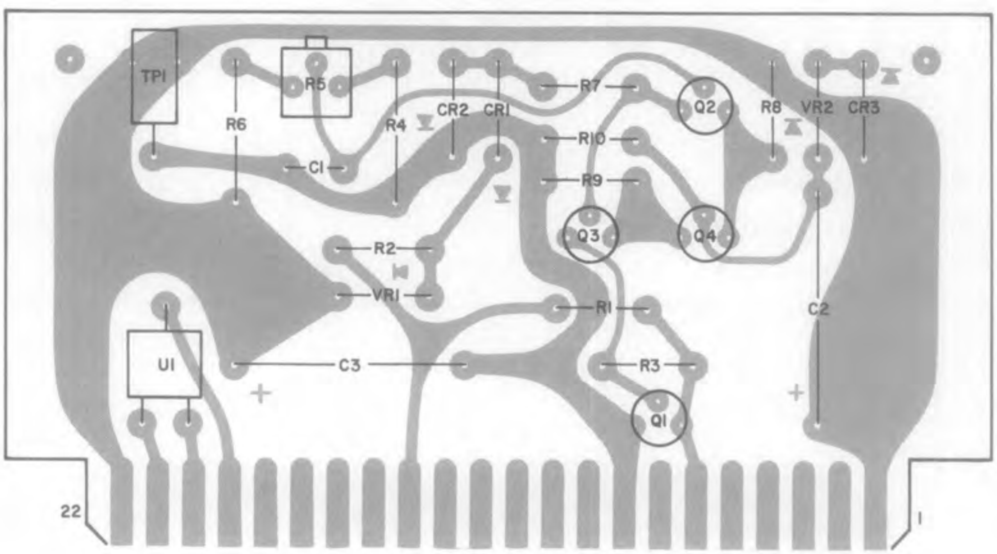
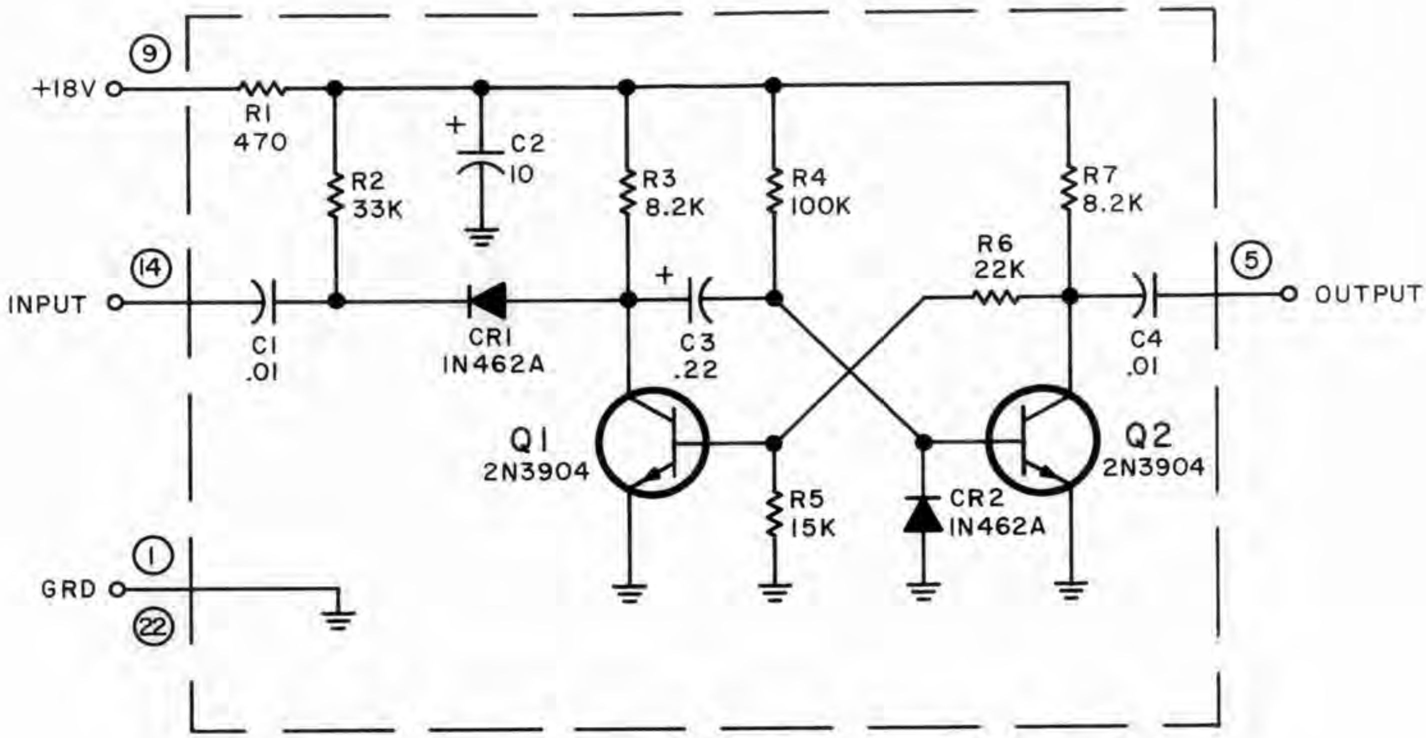


Figure 5-26. Type 76180 -18V Power Supply Regulator (A12), Location of Components

5.4.13 Type 76180 -18V Power Supply Regulator REF DESIG PREFIX A12

Ref Desig	Description	Qty. Per Assy.	Manufacturer's Part No.	Mfg. Code
C1	CAPACITOR, MICA, DIPPED: 47 pF, 5%, 500V	1	CM05ED470J03	81349
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 10 μF, 10%, 35V	1	CS13BF106K	81349
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μF, 10%, 35V	1	CS13BF476K	81349
CR1	DIODE	3	1N462A	80131
CR2	Same as CR1			
CR3	Same as CR1			
Q1	TRANSISTOR	1	2N2270	80131
Q2	TRANSISTOR	3	2N3251	80131
Q3	Same as Q2			
Q4	Same as Q2			
R1	RESISTOR, FIXED, COMPOSITION: 300 Ω, 5%, 1/4W	1	RCR07G301JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4W	1	RCR07G822JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R4	RESISTOR, FIXED, FILM: 5.11 kΩ, 1%, 1/4W	1	RN60D5111F	81349
R5	RESISTOR, VARIABLE, FILM: 1 kΩ, 30%, 1/2W	1	62PAR1K	73138
R6	RESISTOR, FIXED, FILM: 3.16 kΩ, 1%, 1/4W	1	RN60D3161F	81349
R7	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	3	RCR07G472JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	1	RCR07G332JS	81349
R9	Same as R7			
R10	Same as R7			
TP1	TEST POINT	1	SKT-103PC(Brown)	98291
U1	RECTIFIER ASSEMBLY	1	MDA-950A-3	04713
VR1	VOLTAGE REGULATOR	1	1N759A	80131
VR2	VOLTAGE REGULATOR	1	1N754A	80131

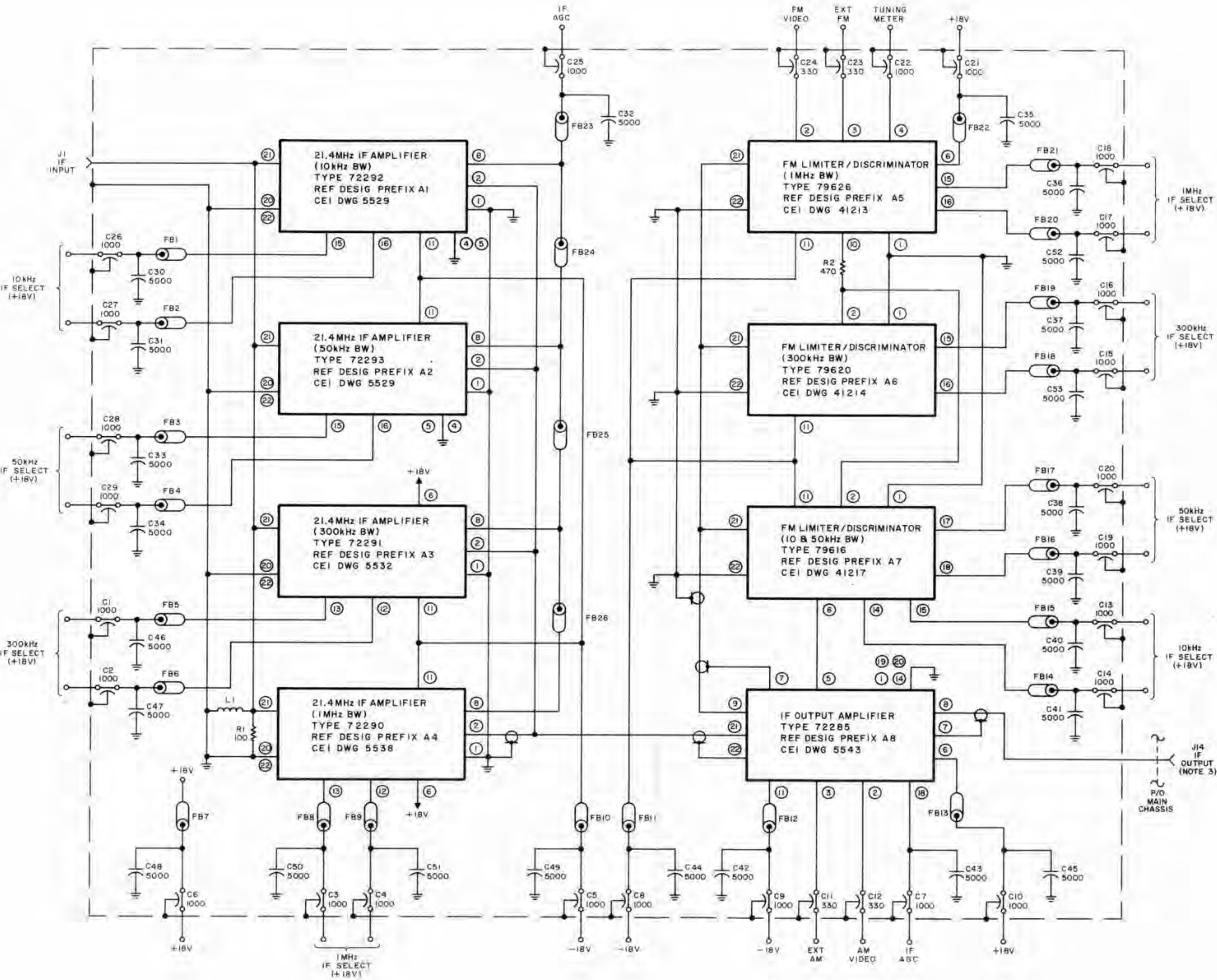
SECTION VI
SCHEMATIC DIAGRAMS



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.

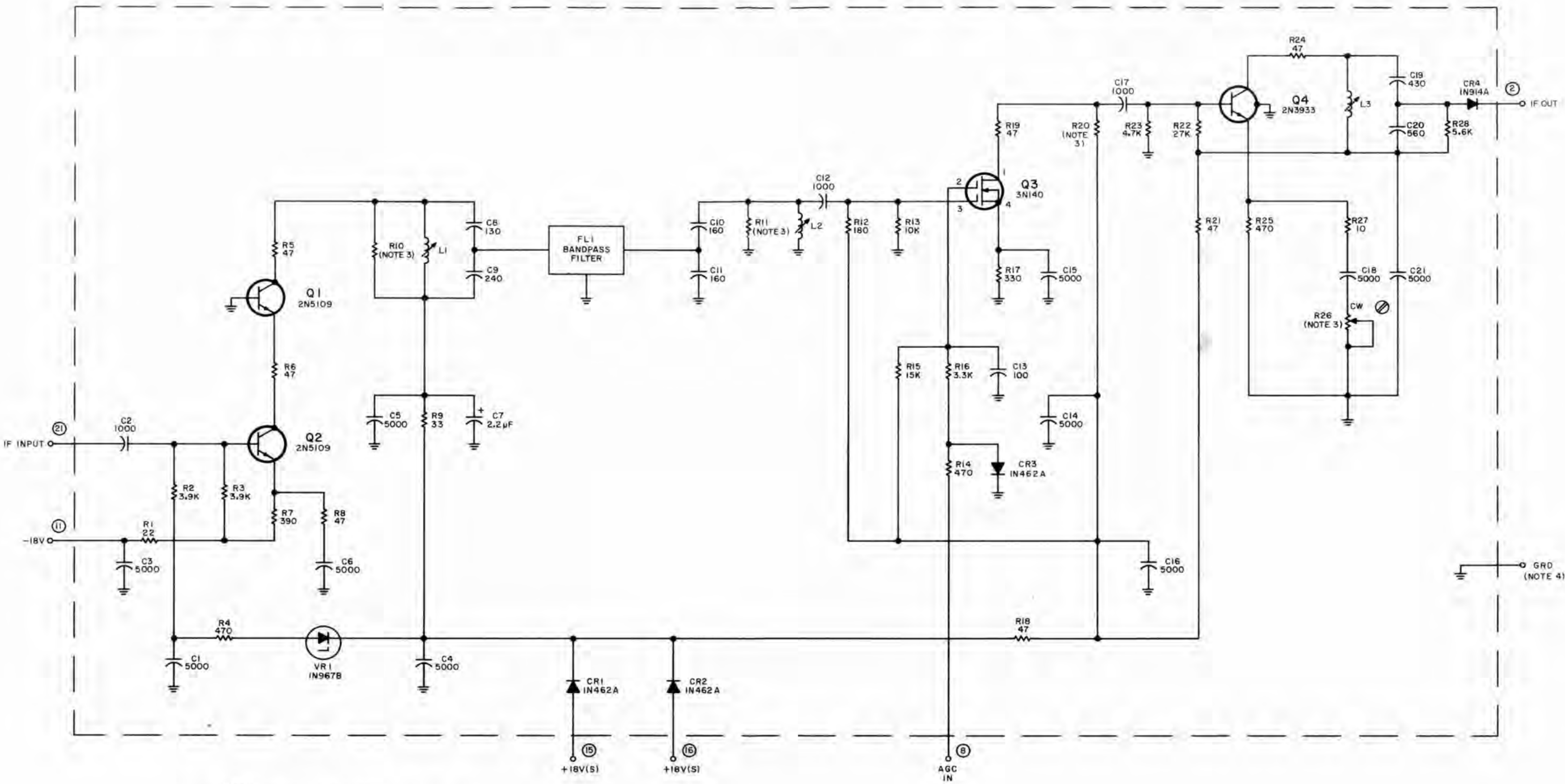
Figure 6-1. Type 79653 Count Delay (A1), Schematic Diagram



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. REAR APRON IF OUTPUT JACK J14 IS CONNECTED FROM PINS 7 AND 8 OF CONNECTOR XA8.

Figure 6-2. Type 72311 IF Amplifier Assembly (A2), Schematic Diagram



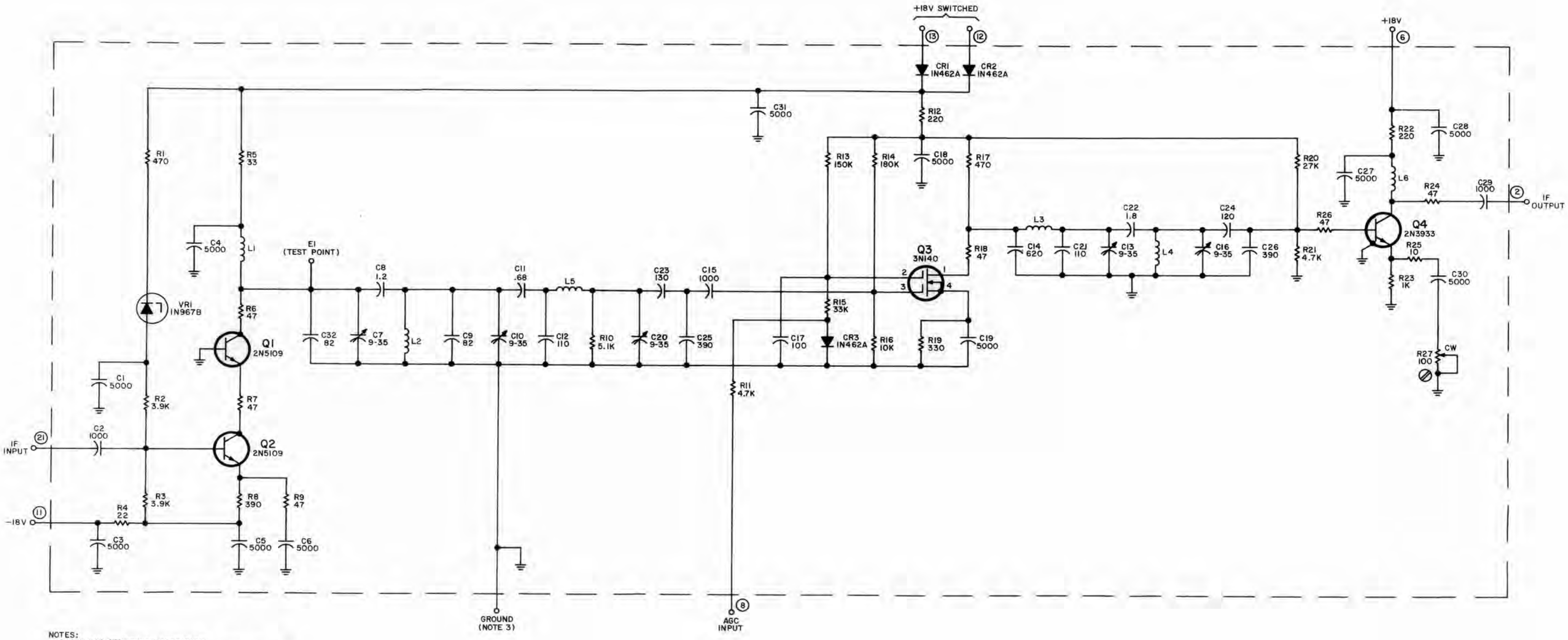
NOTES:

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	R10	R11	R20	R26
72292	10KHz	3K	680	1K	100
72293	50KHz	4.7K	2.2K	470	500

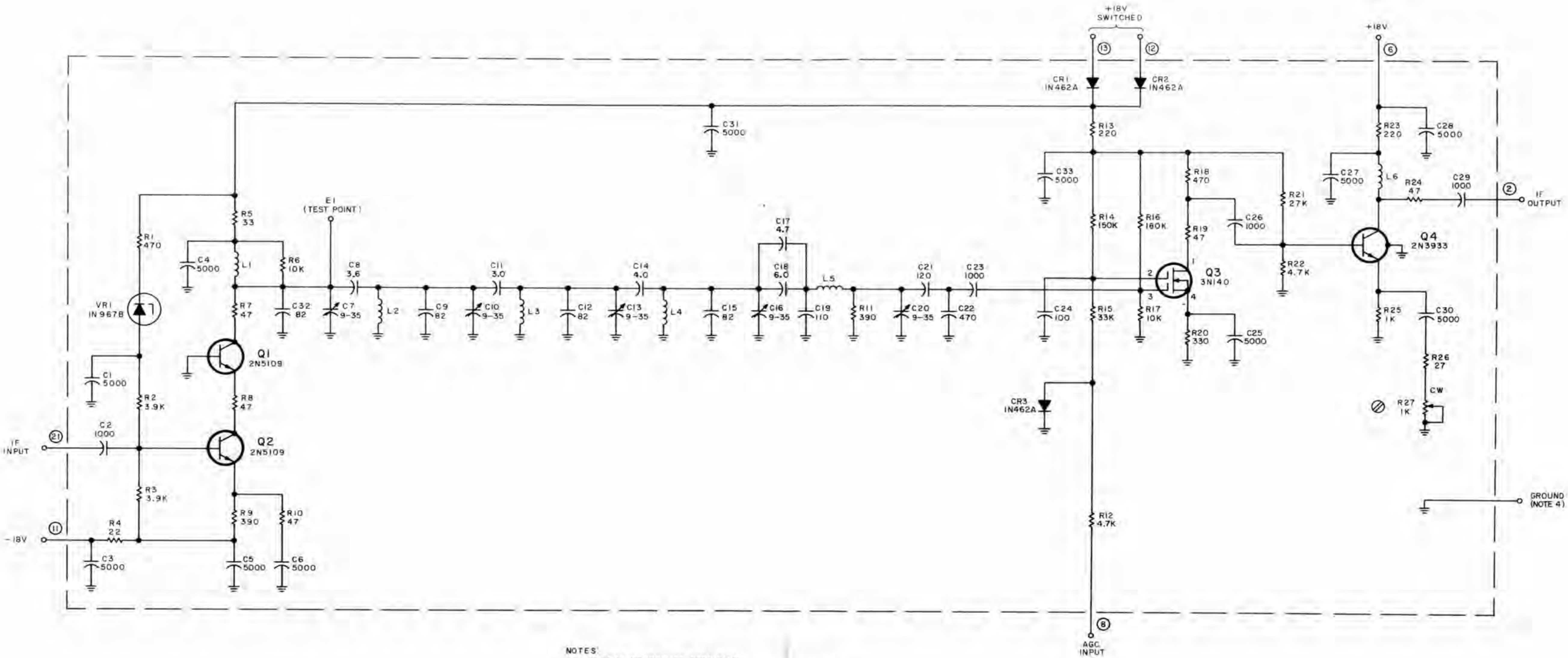
4. GROUND PINS FOR THIS MODULE ARE: 1,3 THRU 7,9,10,12 THRU 14,17 THRU 20,22.

Figure 6-3. Type 72292 21.4-MHz IF Amplifier (10-kHz BW) (A2A1) and Type 72293 21.4-MHz IF Amplifier (50-kHz BW) (A2A2), Schematic Diagram



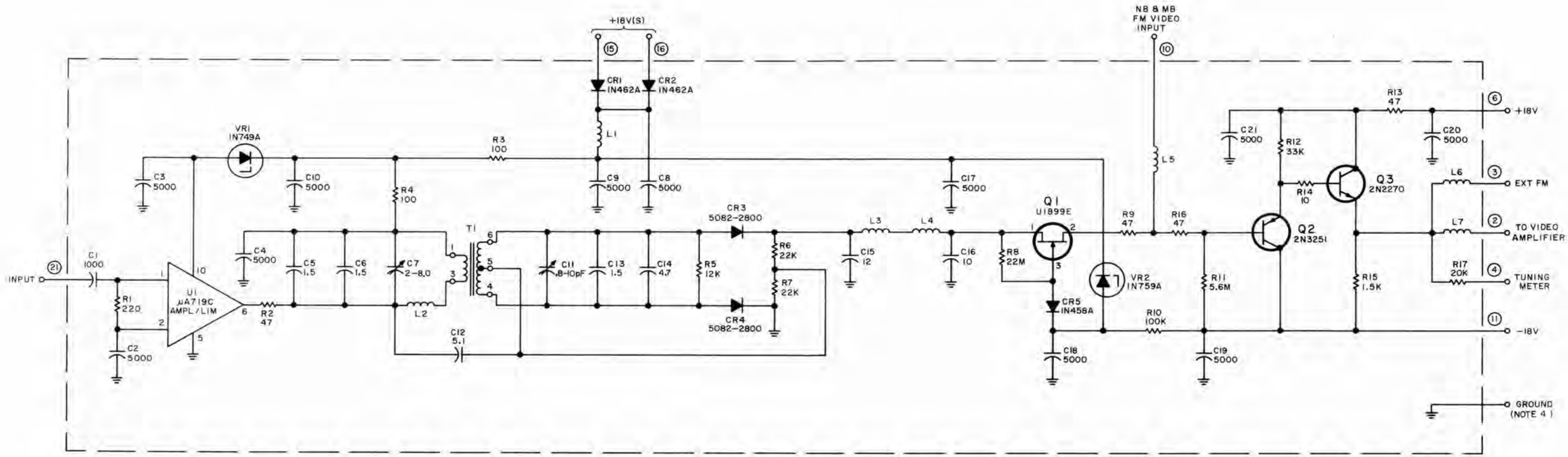
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4 W.
   b) CAPACITANCE IS MEASURED IN pF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. GROUND PINS FOR P.C. BOARD ARE AS FOLLOWS; 1, 3 THROUGH 5, 9, 10, 14 THROUGH 20 & 22.

Figure 6-4. Type 72291 21.4-MHz IF Amplifier (300-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. FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
   a) CW INDICATES CLOCKWISE ROTATION
   b) ⊘ INDICATES SCREWDRIVER ADJUSTMENT
3. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
4. GROUND PINS FOR PC BOARD ARE AS FOLLOWS: 1,3,4,5,7,9,10,14 THRU 20, 22.

Figure 6-5. Type 72290 21.4-MHz IF Amplifier (1-MHz BW) (A2A4), Schematic Diagram



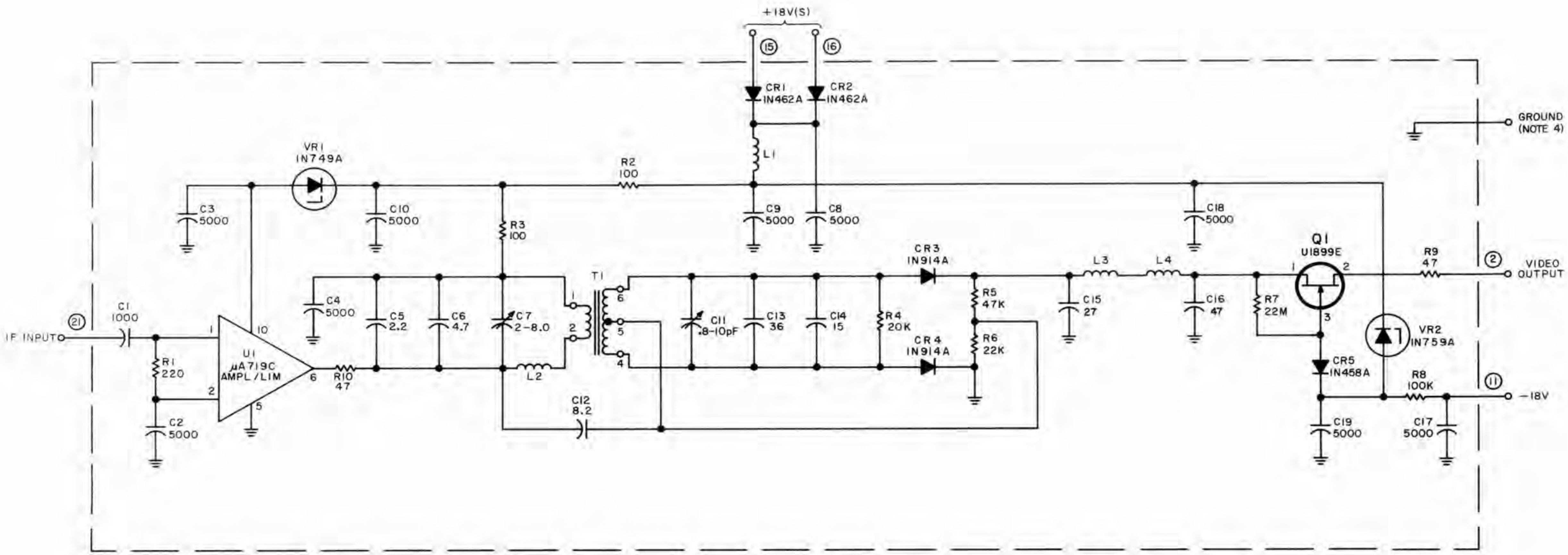
NOTES:

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. FOR U1 LEAD ARRANGEMENT, SEE DETAIL A.
4. GROUND PINS FOR PC BOARD ARE AS FOLLOWS: 1,5,7,8,9,12,13,14,17, THRU 20, 22.

DETAIL A

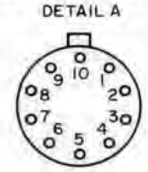
BOTTOM VIEW

Figure 6-6. Type 79626 FM Limiter/Discriminator (1-MHz BW) (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.

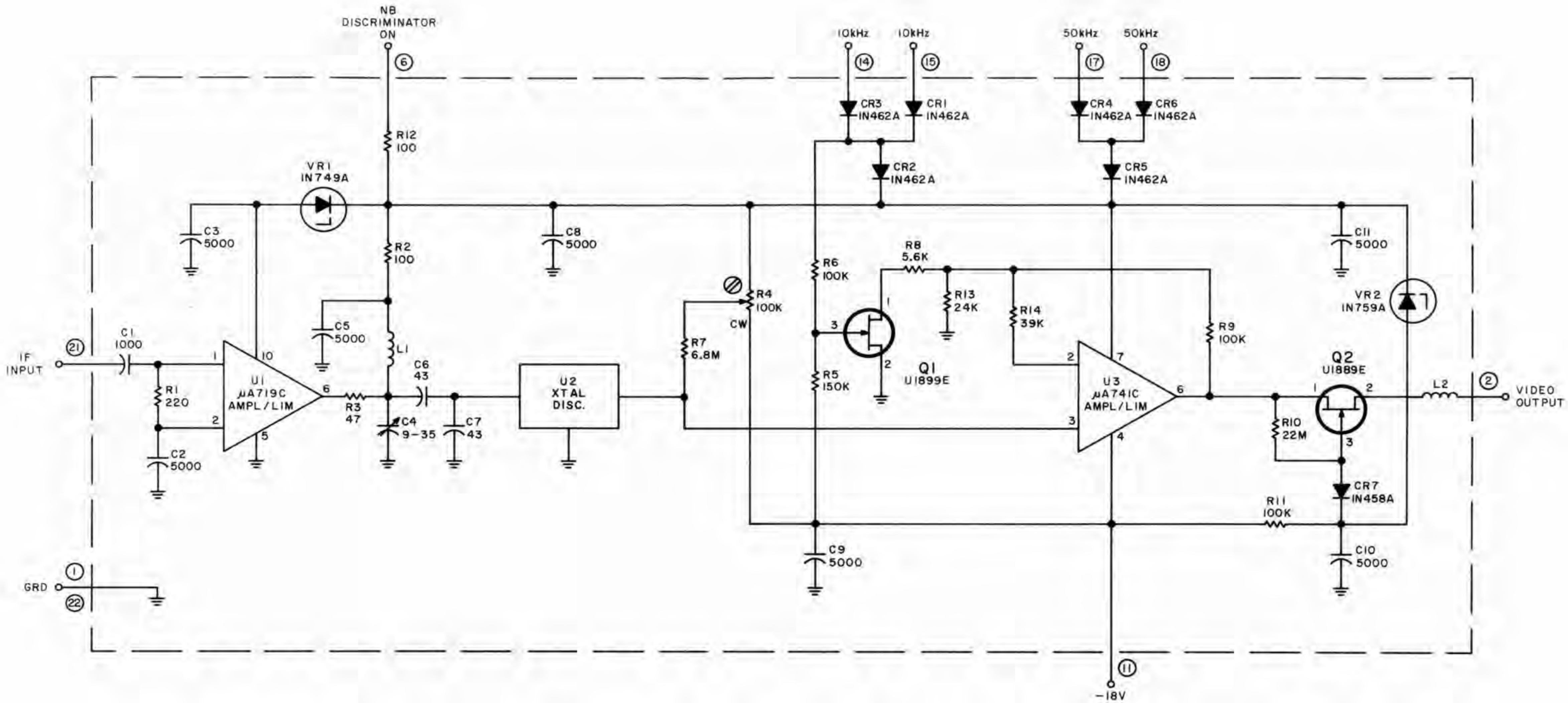
DETAIL A



BOTTOM VIEW

4. GROUND PINS FOR PC BOARD ARE AS FOLLOWS: 1,3 THRU 10, 12,13 & 14, 17 THRU 20 AND 22.

Figure 6-7. Type 79620 FM Limiter/Discriminator (300-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. FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
   a) CW INDICATES CLOCKWISE ROTATION.
   b) ⊘ INDICATES SCREWDRIVER ADJUSTMENT.
4. FOR U1 LEAD ARRANGEMENT, SEE DETAIL A.
5. FOR U3 LEAD ARRANGEMENT, SEE DETAIL B.

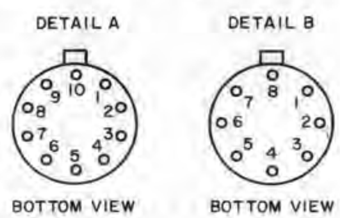
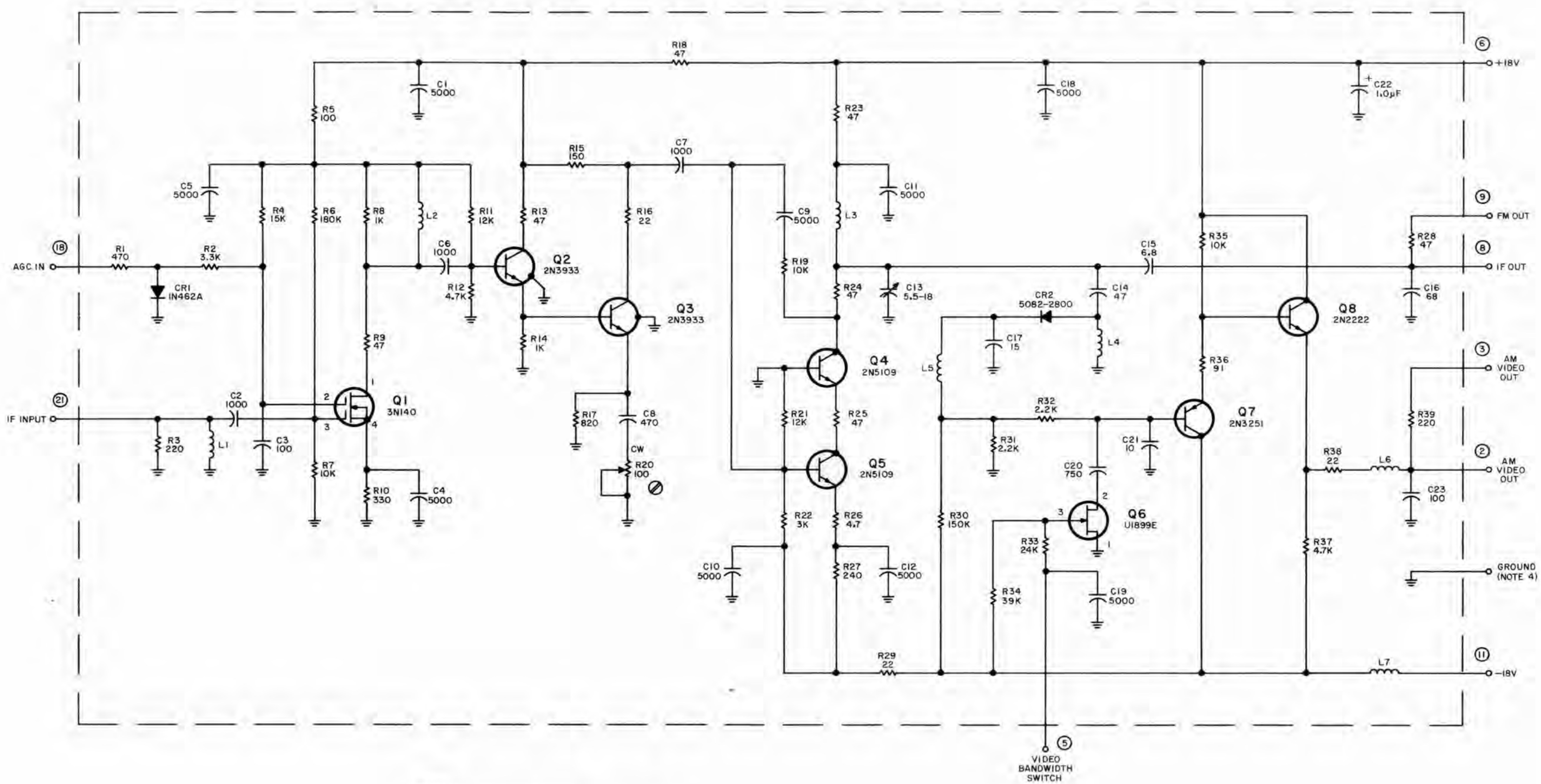
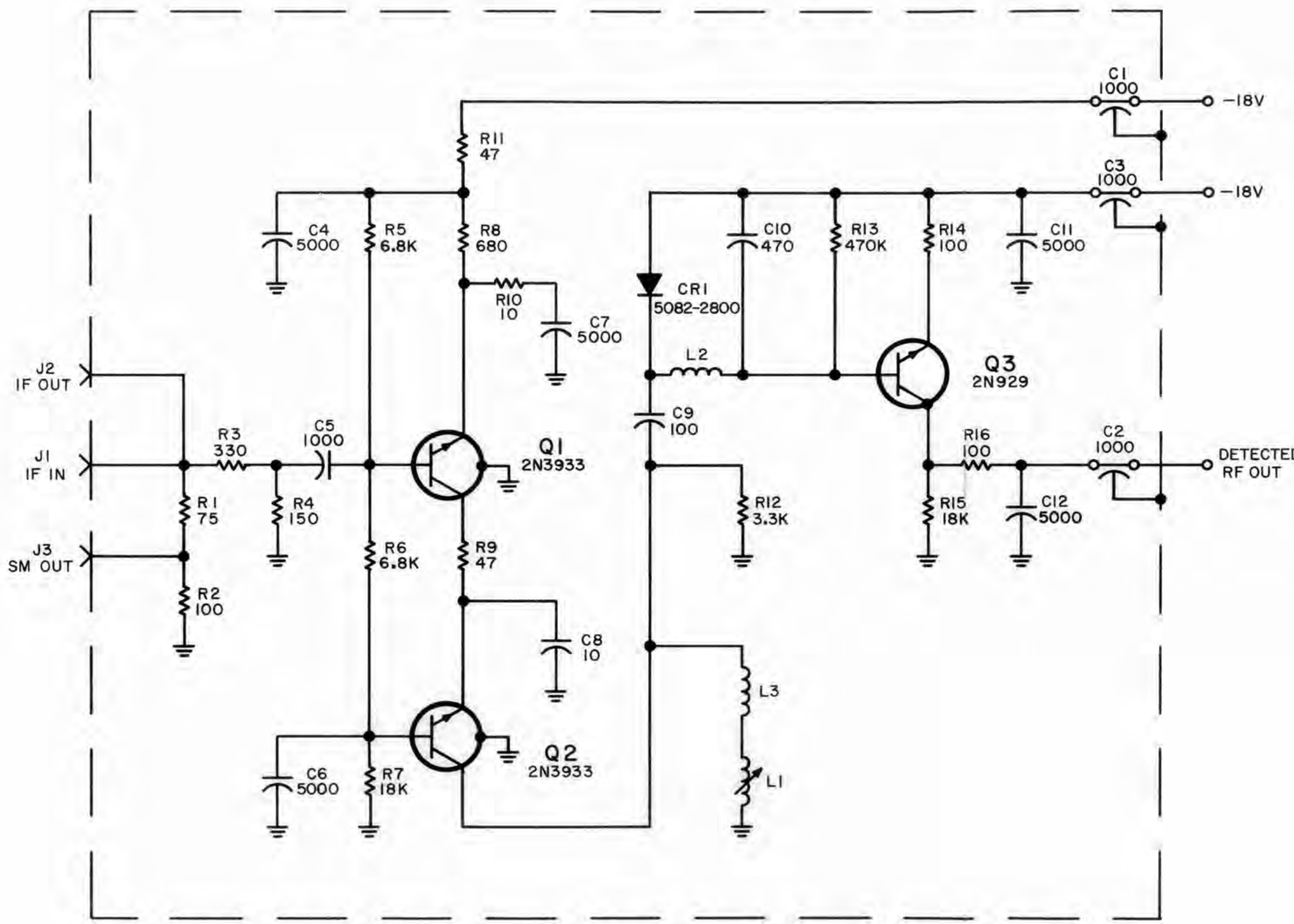


Figure 6-8. Type 79616 FM Limiter/Discriminator (10 and 50-kHz BW) (A2A7), Schematic Diagram



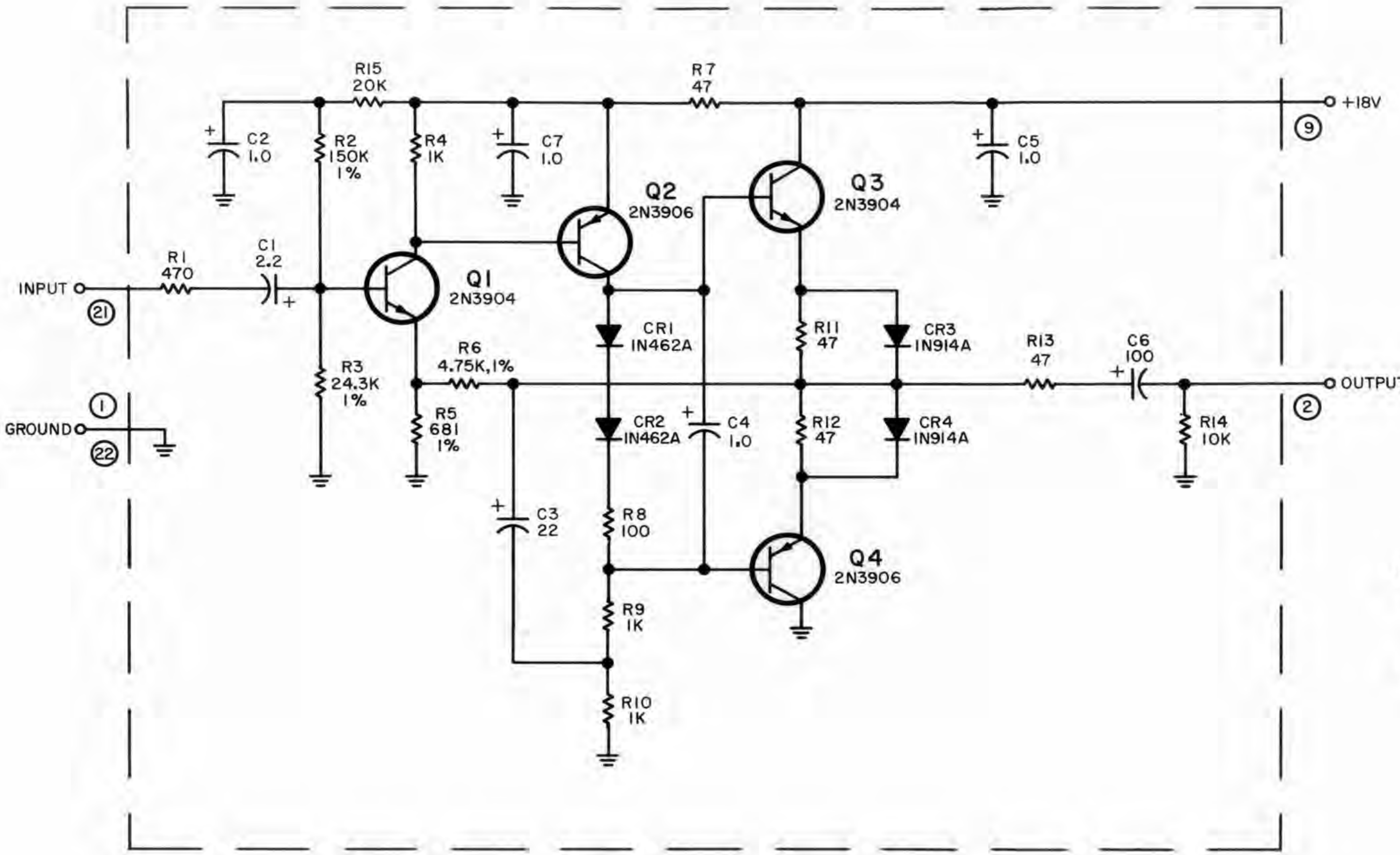
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
b) CAPACITANCE IS MEASURED IN pF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
a) CW INDICATES CLOCKWISE ROTATION.
b) ⊘ INDICATES SCREWDRIVER ADJUSTMENT.
4. GROUND PINS FOR THIS MODULE ARE AS FOLLOWS:
1, 4, 7, 10, 12 THRU 17, 19, 20 & 22.

Figure 6-9. Type 72285 IF Output Amplifier (A2A8), Schematic Diagram



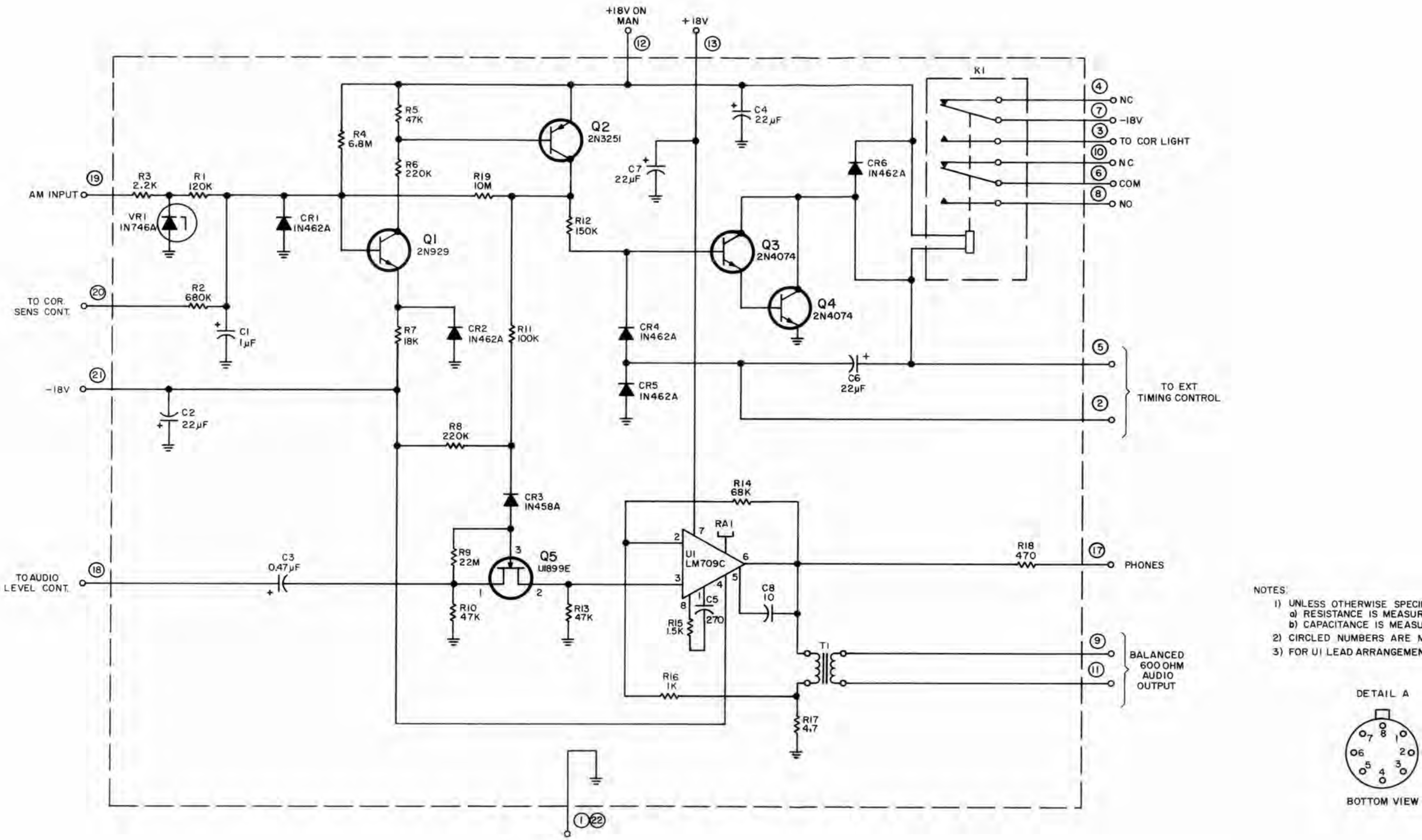
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ± 5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN pF

Figure 6-10. Type 71291 RF Monitor (A3), Schematic Diagram



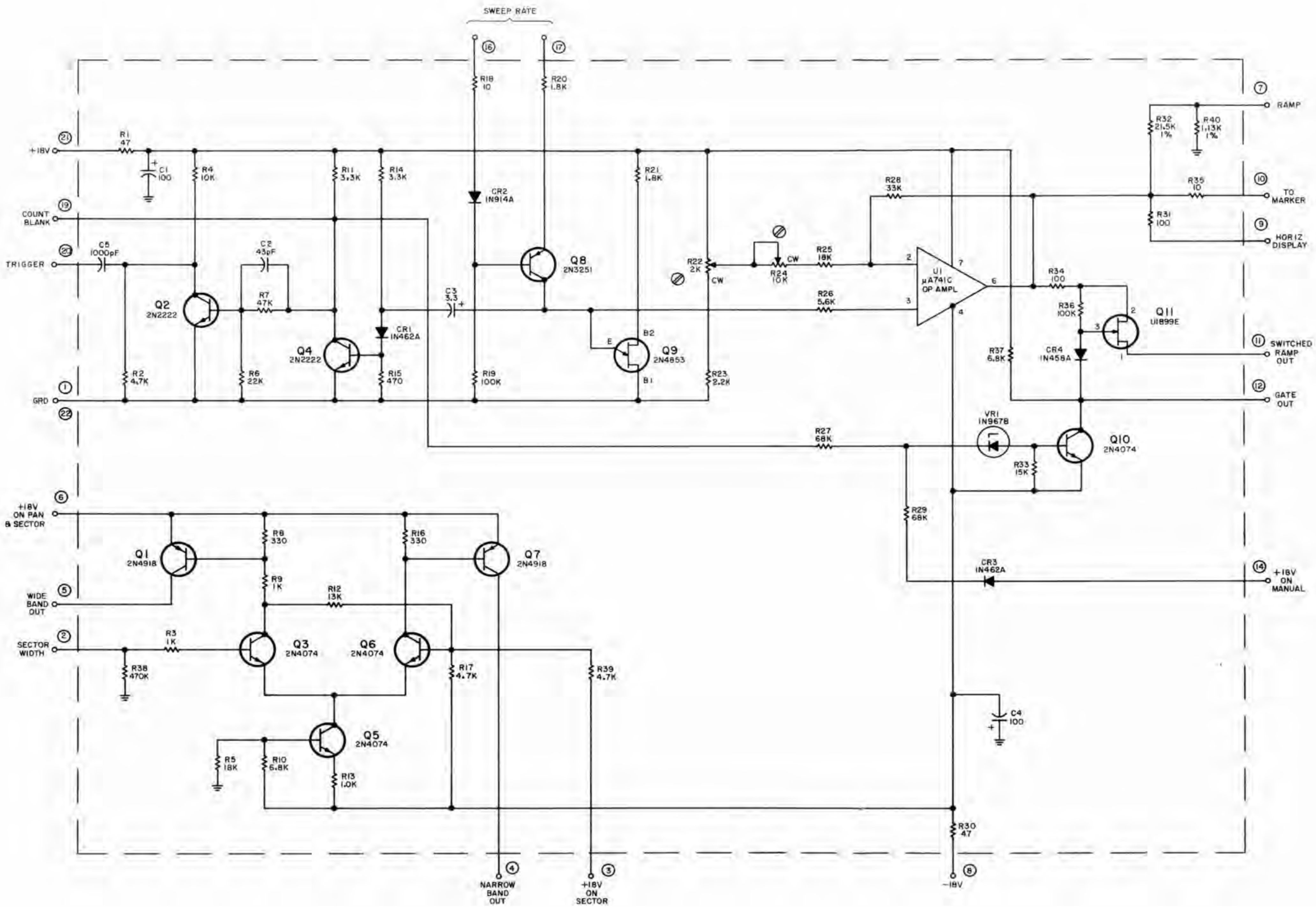
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN µF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.

Figure 6-11. Type 7366 Video Amplifier (A4), Schematic Diagram



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

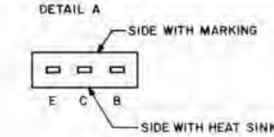
Figure 6-12. Type 7443 Audio Amplifier/Carrier Operated Relay (A5), Schematic Diagram



NOTES:

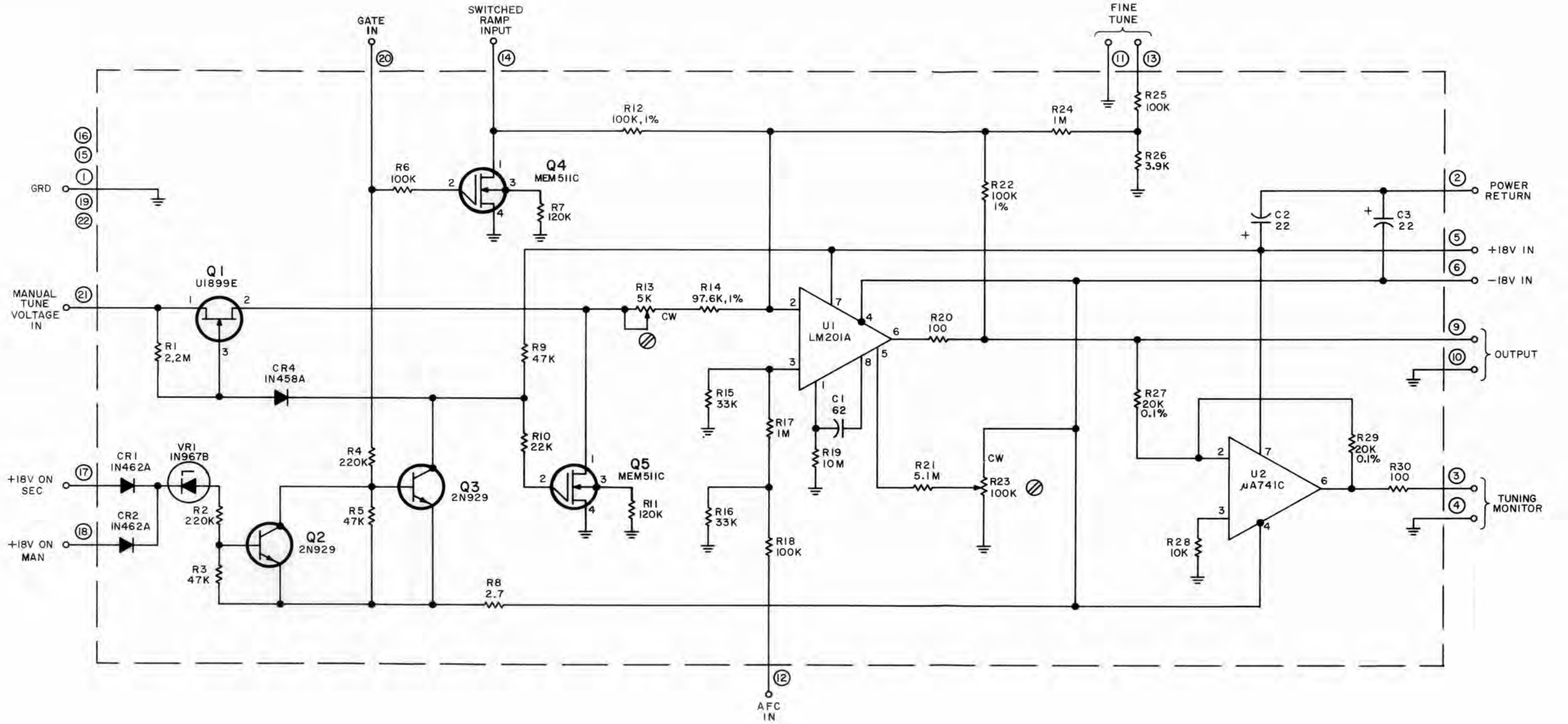
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHM, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN μF
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
   a) CW INDICATES CLOCKWISE ROTATION.
   b) ⊘ INDICATES SCREWDRIVER ADJUST.
4. SEE DETAIL A BELOW FOR PIN ARRANGEMENT OF Q1 AND Q7.

DETAIL A



2N4918
BOTTOM VIEW

Figure 6-13. Type 79611 Ramp Generator and IF Selection Switch (A6), 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. FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
   a) CW INDICATES CLOCKWISE ROTATION OF ADJ. KNOB.
   b) ⊘ INDICATES SCREWDRIVER ADJUSTMENT.
4. FOR U1, U2, LEAD ARRANGEMENT, SEE DETAIL A.

5. FOR Q4 & Q5 LEAD ARRANGEMENT, SEE DETAIL B.

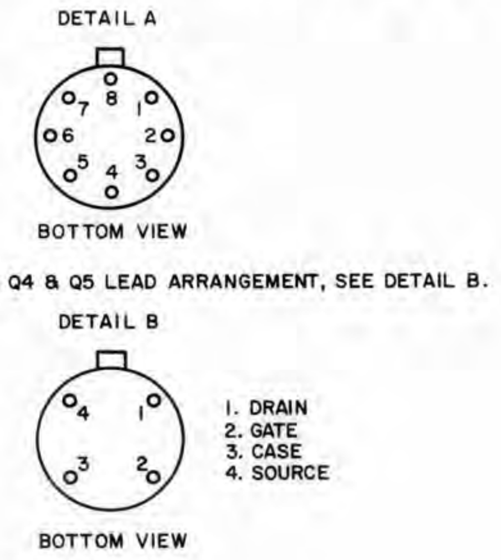
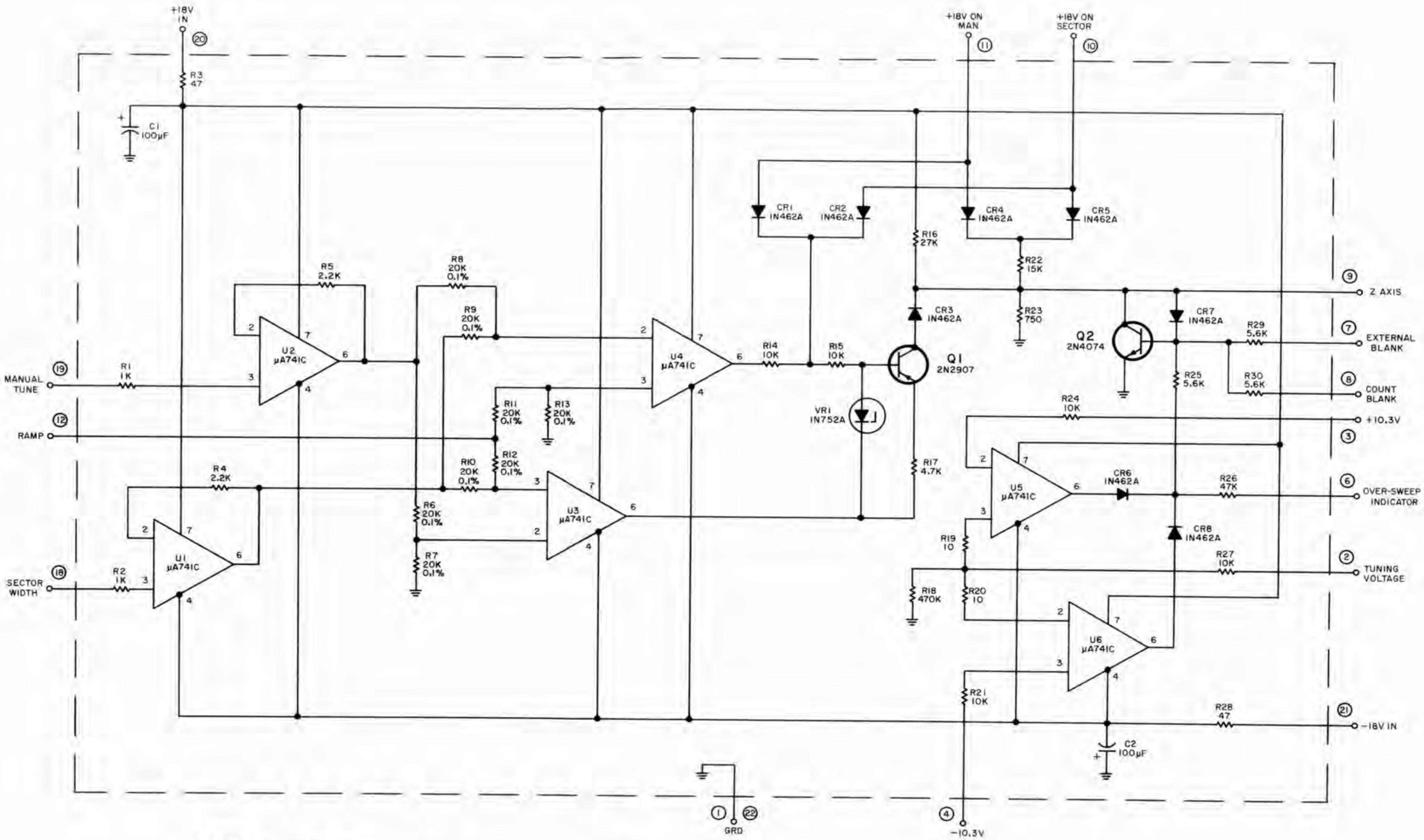
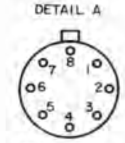


Figure 6-14. Type 79619 Sweep Control (A7), Schematic Diagram



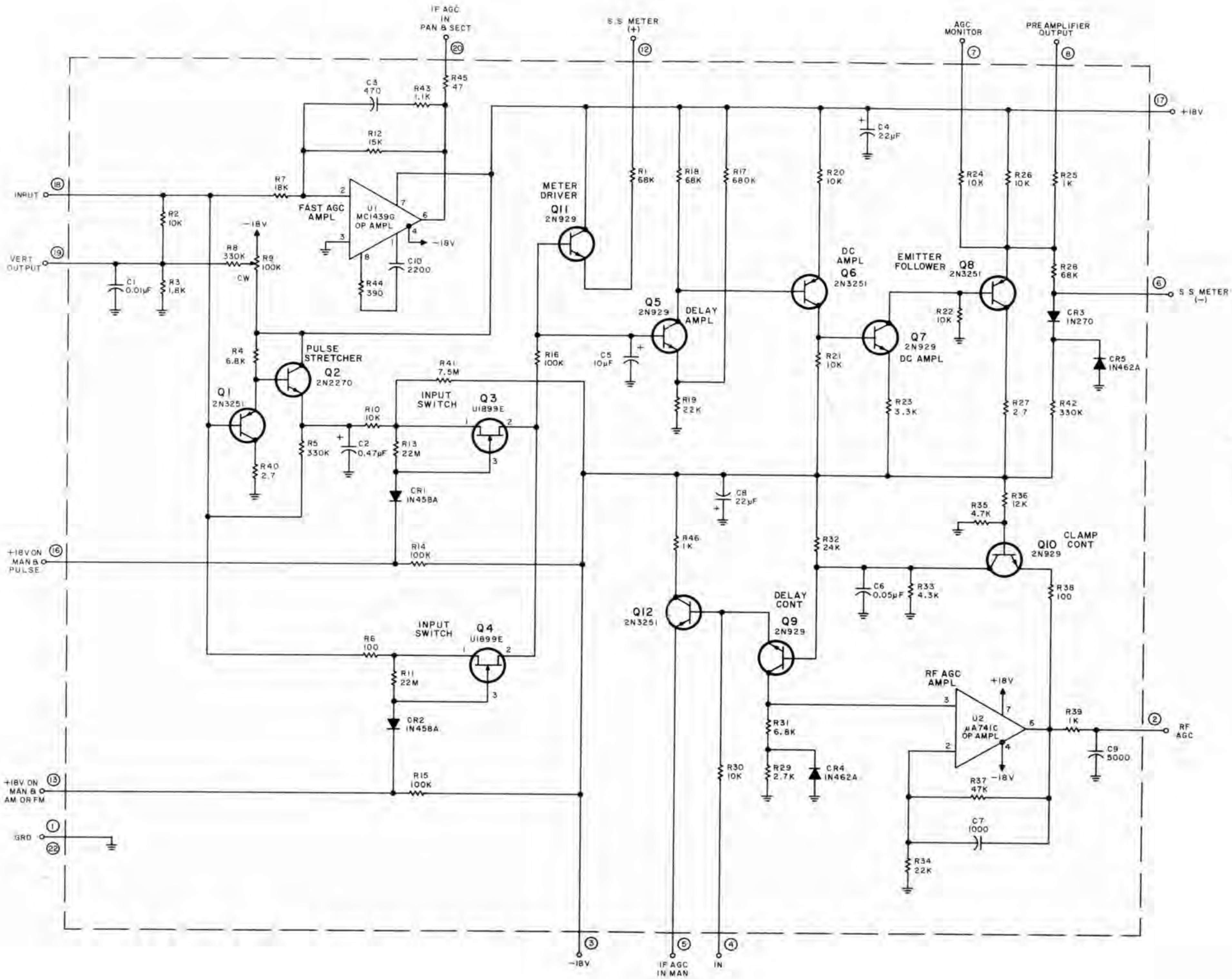
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
2. FOR U1 THRU U6 LEAD ARRANGEMENT SEE DETAIL A.
3. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.

DETAIL A



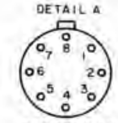
BOTTOM VIEW

Figure 6-15. Type 79612 Marker Generator and Over-Sweep (A8), Schematic Diagram



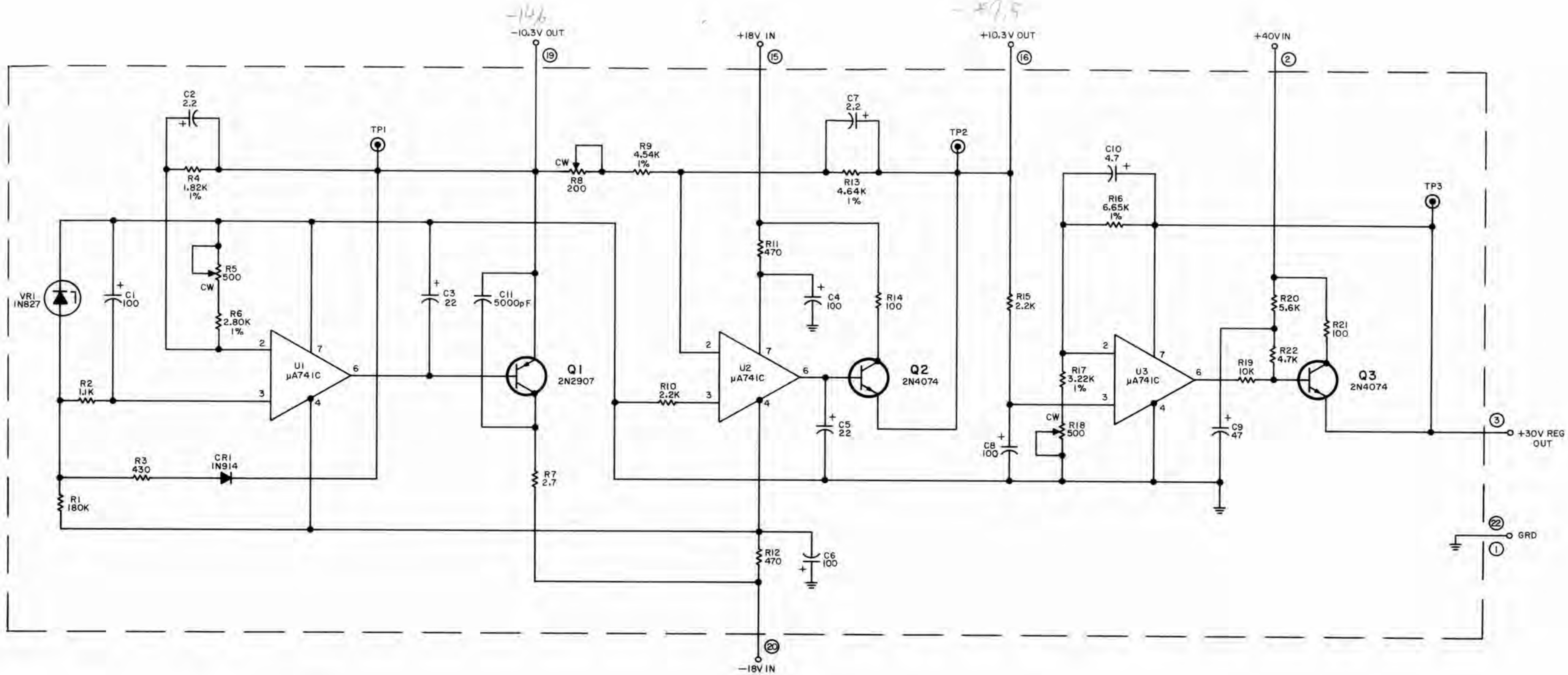
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN pF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. FOR U1, U2 PIN ARRANGEMENT, SEE DETAIL A.
4. CW ON R9 INDICATES CLOCKWISE ROTATION OF ACTUATOR.

DETAIL A



BOTTOM VIEW

Figure 6-16. Type 7867 AGC Amplifier (A9), Schematic Diagram



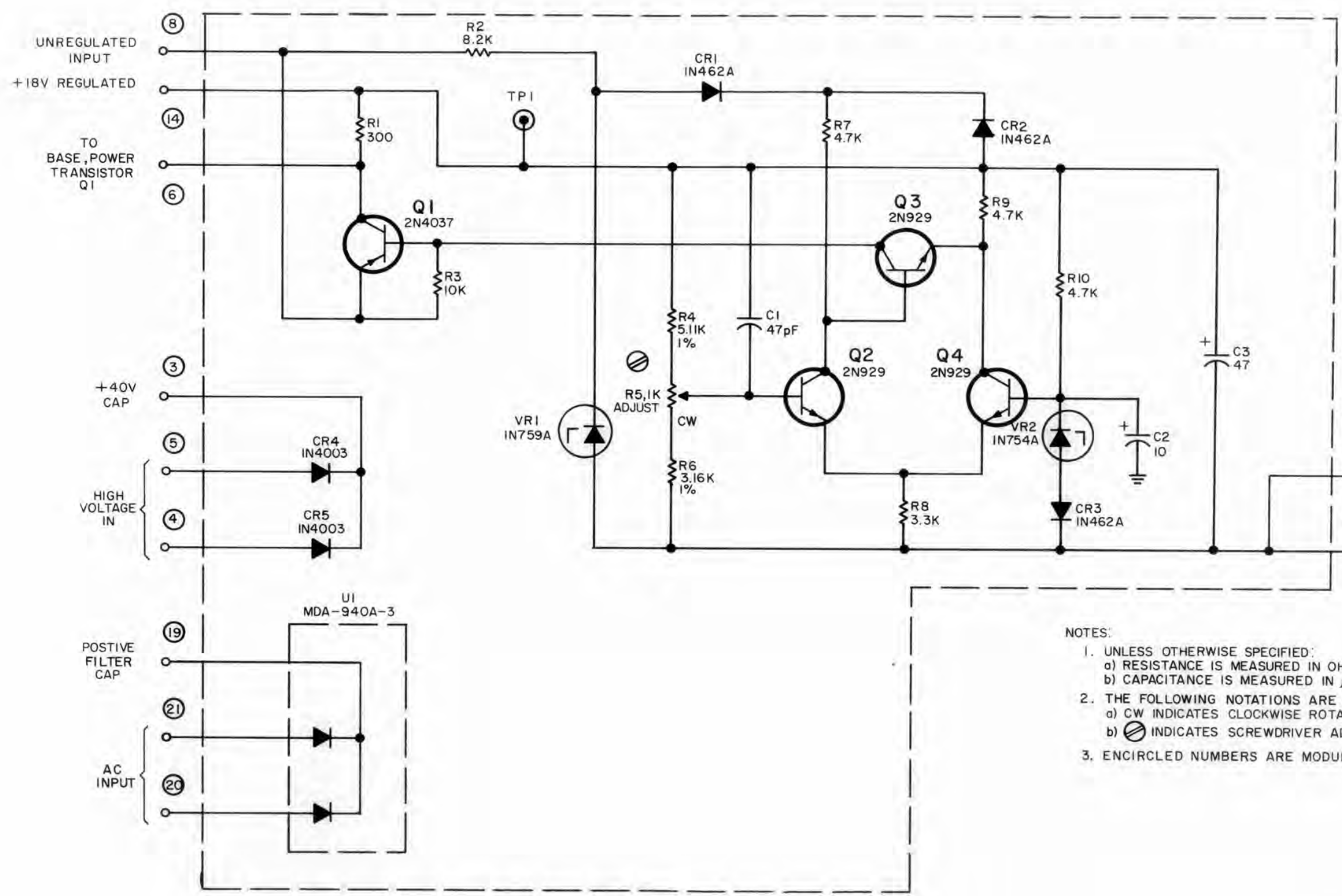
NOTES:

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. THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
   a) CW INDICATES CLOCKWISE ROTATION.
   b) ⊘ INDICATES SCREWDRIVER ADJUST.
4. FOR U1 THRU U3 LEAD ARRANGEMENT SEE DETAIL A.

DETAIL A

BOTTOM VIEW

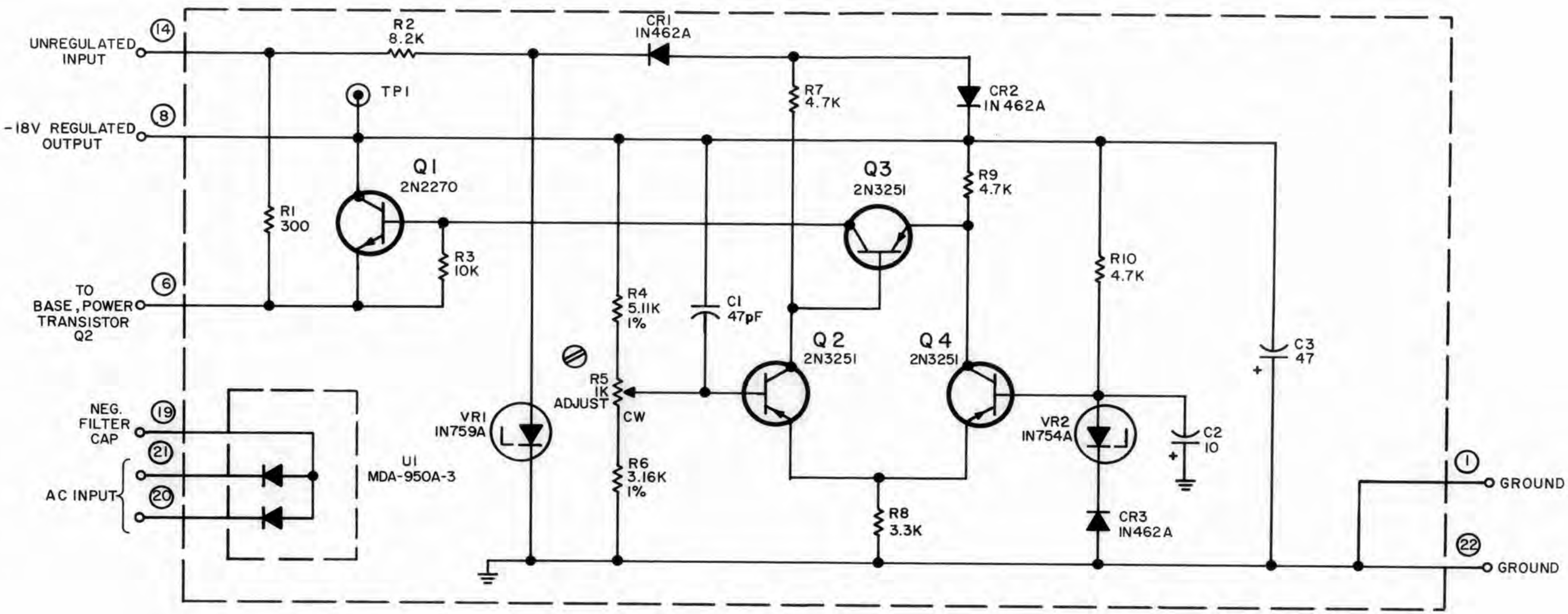
Figure 6-17. Type 76179 ±10V and +30V Precision Power Supply Regulator (A10), Schematic Diagram



NOTES:

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

Figure 6-18. Type 76181 +18V Power Supply Regulator (A11), 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 SCREWDRIVER ADJUSTMENT.

Figure 6-19. Type 76180 -18V Power Supply Regulator (A12), Schematic Diagram

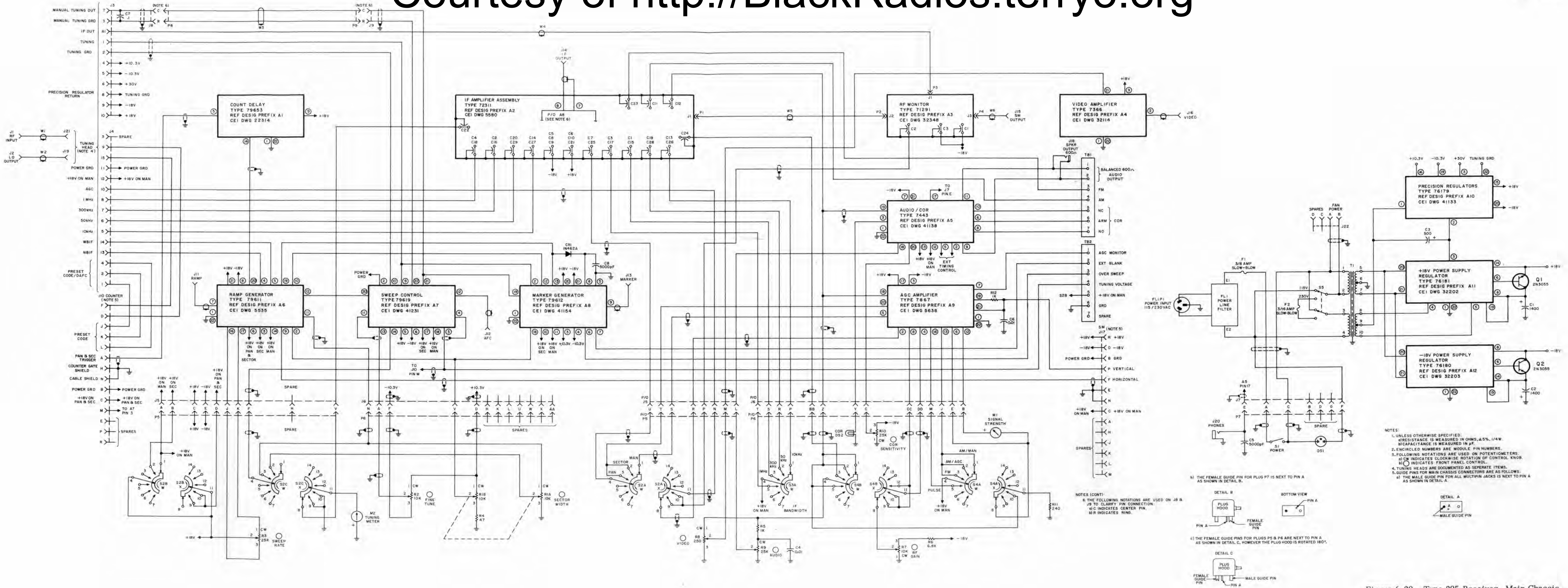


Figure 6-20. Type 205 Receiver, Main Chassis, Schematic Diagram

SECTION VII

SUPPLEMENT FOR TYPE 205-2 RECEIVER

7.1 GENERAL

The 205-2 Receiver is a Type 205 Receiver modified to provide additional operating capability. The modification provides two additional operating modes: (1) PAN/SEC, and (2) REMOTE TUNE.

7.1.1 PAN/SEC Mode. - This mode provides continuous operation of the 205-2 in the PAN and SECTOR modes on alternating sweeps. The receiver functions on each sweep (PAN and SECTOR) identically to that of the 205 except that triggering of an accessory frequency counter occurs only on the SECTOR sweeps, and the blanking (Z-axis) voltage level applied to the accessory SM-7301(A) Signal Display is changed slightly to prevent trace blooming on the SECTOR sweep.

7.1.2 REMOTE TUNE Mode. - In the REMOTE TUNE mode, all functions of the 205-2 are identical to the 205 MAN mode except that tuning voltage for the plug-in tuning head can be applied from an external source through rear panel jack, J9. This allows the receiver to be tuned from an external voltage source without the necessity of rear panel cable changes on the receiver.

7.1.3 Modifications. - Changes to the 205-2 include: (1) the addition of two positions to the front panel tuning mode selector switch, S2; (2) rear-panel jack J8 and jumper W3 have been deleted (the tuning mode switch supplies the required connections); (3) a Type 79848 Split Display Switch (A1) has been added in place of count delay module (A1); and, (4) main chassis wiring has been changed.

7.1.4 Schematic diagrams, parts lists, and circuit descriptions for all modified circuits in the 205-2 are included in this section. In all other respects the information in Sections I through VI of this manual is directly applicable.

7.1.5 RS-160 System Interconnections. - Figure 7-1 illustrates interconnections between the 205-2 Receiver and components of the basic RS-160 System. The cable assemblies specified are shipped with the particular unit which connects to the receiver.

7.2 CIRCUIT DESCRIPTION

7.2.1 Type 79848 Split Display Switch. - Figure 7-3 is the schematic diagram of this module; its reference designation prefix is A1. The split display switch replaces count delay module (A1). It contains all of the circuits of the original board and additional circuits for electronic mode switching. A bi-stable flip-flop is included to perform the switching between PAN and SECTOR modes of sweeping for the receiver.

In the PAN/SEC mode, the flip-flop alternates the receiver operation between these modes. Operation of the flip-flop is controlled by a trigger pulse from the ramp generator board and +18V inputs from tuning mode switch, S2, on the receiver main chassis. The flip-flop drives electronic switches which provide: (1) switching of the ramp waveform, (2) supply a +18V SECTOR on output in the SECTOR mode, or SECTOR portion of the PAN/SEC mode, (3) provide a dc shift for the vertical output voltage for the associated SM-7301(A) during the SECTOR portion of the PAN/SEC cycle, (4) inhibit triggering of the DRO-308 counter accessory for the PAN portion of the PAN/SEC cycle, (5) supply a dc shift to the marker output voltage during the SECTOR portion of the PAN/SEC cycle, and (6) reduce the vertical output level (video) by a factor of two in the PAN/SEC mode.

7.2.1.1 PAN/SEC Timing. - A bi-stable flip-flop controls the PAN, SECTOR, PAN/SEC tuning mode switching for the 205-2. The flip-flop is triggered by negative-going pulses from the ramp generator board (A6). The trigger pulses occur at the end of each ramp waveform. In addition, the flip-flop is also controlled by the +18V PAN, SEC, and PAN/SEC voltage inputs. Figure 7-2 illustrates the timing of the split display switch board for a complete PAN/SEC operating cycle. Waveform A is the switched ramp output from A1 pin 12. Waveform B is the trigger input applied to A1 pins 2 and 16. Waveform C is the +18V output in SECTOR from A1 pin 15. Waveform D is the dc shift voltage for the SM-7301(A) vertical voltage during the SECTOR portion of the PAN/SEC mode. Waveform E is the delayed counter trigger pulse output from A1 pin 20. As shown in the diagram, the ramp output is alternated between the PAN and SECTOR sweeps in the PAN/SEC mode. When the 205-2 is operated in the PAN or SECTOR modes, the proper ramp is selected, counter triggering occurs every sweep, and dc shifting of the SM-7301(A) vertical trace does not occur.

7.2.1.2 Bi-Stable Flip-Flop. - Referring to Figure 7-3, transistors Q2 and Q3 form the bi-stable flip-flop. The trigger pulse input from module pin 16 is coupled through R35 to capacitors C1 and C2. These capacitors couple the pulses to the bases of Q2 and Q3 through steering diodes CR4 and CR5. In all three sweeping modes (PAN, SECTOR, and PAN/SEC) +18V is applied to module pin 3 from main chassis tuning mode switch, S2. This voltage activates the switching circuitry. Assuming that the PAN/SEC mode is selected, there are no inputs to module pins 5 and 6 (+18V in PAN, +18V in SEC). Flip-flop Q2-Q3 will change state with each negative-going trigger input. With Q2 initially on and Q3 off, the negative-going trigger is coupled through C1 and CR4 to the base of Q2 turning it off. The rising collector voltage of Q2 is coupled through R33 to the base of Q3 and holds it on. This flip-flop state (Q2 off, Q3 on) is the SECTOR enabled portion of the PAN/SEC modes. With Q3 on, its collector voltage is low, which pulls the base of Q6 low through R14. With the base of Q6 low, it conducts since the emitter is at +18V. When Q6 is conducting, +18V is supplied to module pin 15 through the transistor. When Q6 conducts and its collector voltage goes high, the change is reflected through VR1, R16, and R17 to the base of Q7 which also conducts providing -18 volts at its collector. The -18 volts turns Q8 off through CR7 and turns Q11 off through R23. With Q8 off the PAN ramp path to the module ramp output (module pin 12) is broken.

With Q11 off, the source-to-gate voltage of Q10 allows it to conduct completing the path for the SECTOR width ramp from module pin 13 to module pin 12. During the SECTOR sweep, the associated signal monitor trace intensity is reduced slightly. This is accomplished by diode CR8 and R26 from the collector of Q7. The negative voltage coupled through the diode and R26 to module pin 7 slightly reduces the high intensity voltage output (approximately +1.2V) from the marker generator, A8.

7.2.1.3 Counter Trigger Inhibit. - Transistor Q1 is used to inhibit the counter trigger pulse output from Q9-Q12 during the PAN portion of the PAN/SEC cycle. When Q1 conducts, it holds the junction of R19 and CR9 high preventing the one-shot circuit from being triggered by the negative-going pulse at module pin 2. Transistor Q1 conducts when several conditions are met: (1) +18V is applied to module pin 3, (2) transistor Q2 of the PAN/SEC flip-flop is conducting (PAN mode), (3) the PAN only mode has not been selected by main chassis switch, S2. An examination of these conditions shows that the counter trigger will be inhibited only during the PAN portion of the PAN/SEC mode. With +18V applied to module pin 3, diode CR1 supplies the voltage to the emitter of Q1. Transistor Q1 will conduct when its base is pulled low by Q2 conducting and only if +18V is not supplied to module pin 6 (PAN mode) and coupled through CR6 to the base of Q1.

7.2.1.4 SECTOR Portion dc Shift, Video Reduction. - Transistor Q4 supplies a dc shift to the vertical output voltage to the SM-7301(A) Signal Display during the SECTOR portion of the PAN/SEC cycle. In the PAN/SEC mode, +18V is applied to module pin 18 which is coupled through R7 to the base of Q5 and through CR2 to the emitter of Q4. Transistor Q5 conducts applying R13 in parallel with the vertical output line through module pin 19. This forms a voltage divider with components on the AGC board (A9) which reduces the vertical (video) output by a factor of two. Transistor Q4 conducts on the SECTOR portion of the PAN/SEC cycle to supply a positive voltage through R11 and R12 to the vertical output line which shifts the trace position on the SM-7301(A). During the PAN/SEC mode operation, the SECTOR portion baseline is at the middle of the CRT screen and the PAN trace baseline is at the CRT bottom. Potentiometer R11 allows exact positioning of the SECTOR trace. Transistor Q4 and Q5 are only active during the PAN/SEC mode as the +18V input at module pin 18 is not present in any other mode.

7.2.1.5 PAN, SECTOR Mode Switching. - Mode switching in the PAN and SECTOR tuning modes is also accomplished by flip-flop Q2-Q3. However in these modes, the flip-flop is forced to the appropriate state by either the +18V applied to module pins 5 or 6. Note that in the SECTOR mode, +18V is supplied through CR11 and R31 to module pin 7. This voltage counteracts the voltage from CR8 and R26 allowing full SECTOR trace identification.

7.2.2 Type 205-2 Receiver. - Figure 7-4 is the main chassis schematic diagram of the 205-2 Receiver. Front panel switch S2D supplies the tuning mode function switching. Remote tuning voltage for the receiver is applied through rear panel jack J9 when the REMOTE TUNE mode is used. The main chassis schematic also shows the wiring associated with the split display switch module, A1.

7.3 LIST OF MANUFACTURERS

Mfr. Code	Name and Address
11139	Deutsch Company Electronic Component Division Municipal Airport Banning, California 92220
14900	Norman Jones, Incorporated South Merrimack New Hampshire 03083
25088	Siemens America, Inc. 350 5th Avenue New York, New York 10001

7.4 PARTS LIST

7.4.1 Type 205-2 Receiver, Main Chassis

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
A1	SPLIT DISPLAY SWITCH	1	79848	14632
A2	IF AMPLIFIER ASSEMBLY	1	72311	14632
A3	RF MONITOR	1	71291	14632
A4	VIDEO AMPLIFIER	1	7366	14632
A5	AUDIO AMPLIFIER/CARRIER OPERATED RELAY	1	7443	14632
A6	RAMP GENERATOR	1	79611	14632
A7	SWEEP CONTROL	1	79619	14632
A8	MARKER GENERATOR	1	79612	14632
A9	AGC AMPLIFIER	1	7867A	14632
A10	PRECISION REGULATORS	1	76179	14632
A11	+18V POWER SUPPLY REGULATOR	1	76181	14632
A12	-18V POWER SUPPLY REGULATOR	1	76180	14632
C1	CAPACITOR, ELECTROLYTIC, ALUMINUM: 1400 μF, -10+100%, 50V	2	86F164M	06001
C2	Same as C1			
C3	CAPACITOR, ELECTROLYTIC, ALUMINUM: 500 μF, -10+100%, 75V	1	43F3007CA4	06001
C4	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100V	2	C023B101F103M	56289
C5	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V	1	SM(5000pF, M)	91418
C6	Same as C4			
C7	CAPACITOR, CERAMIC, DISC: .1 μF, 20%, 100V	2	8131-M100-651-104M	72982
C8	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	1	C023B101E502M	56289
C9	CAPACITOR, MYLAR, TUBULAR: .47 μF, 20%, 250V	1	B32231-(.47/M/250)	25088
C10	Same as C7			

REF DESIG	DESCRIPTION		QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
CR1	DIODE		1	1N462A	80131
DS1	LAMP, NEON		1	249-7866-1431-534	72619
DS2	LAMP, INCANDESCENT: 28V, 0.04A		1	327	80131
F1	FUSE, 3AG, SLOW-BLOW: 3/8A		1	F02B250V3/8A	81349
F2	FUSE, 3AG, SLOW-BLOW: 3/16A		1	MDL-3/16A	71400
FL1	FILTER, POWER		1	JN33-694B	56289
J1	CONNECTOR, JACK, N SERIES	Part of W1	1	UG-1052/U	81349
J2	CONNECTOR, JACK, BNC SERIES	Part of W2	1	UG-909B/U	81349
J3	CONNECTOR, RECEPTACLE, MULTIPIN		1	DAM-11W1S	71468
J3A1	CONNECTOR, RECEPTACLE, COAXIAL INSERT	Part of W4	1	DM53742-5001	71468
J4	CONNECTOR, RECEPTACLE, MULTIPIN		1	DAM-15S	71468
J5	CONNECTOR, RECEPTACLE, MULTIPIN		1	MRE-18S-G7	81312
J6	CONNECTOR, RECEPTACLE, MULTIPIN		1	MRE-26S-G7	81312
J7	CONNECTOR, RECEPTACLE, MULTIPIN		1	MRE-7-2SG7	81312
J8	NOT USED				
J9	CONNECTOR, JACK, TWINAX SERIES		1	BJ-77	14949
J10	CONNECTOR, RECEPTACLE, MULTIPIN		1	DS00-19S	11139
J11	CONNECTOR, JACK, BNC SERIES		6	17825	74868
J12	Same as J11				
J13	Same as J11				
J14	Same as J11				
J15	Same as J11	Part of W6			

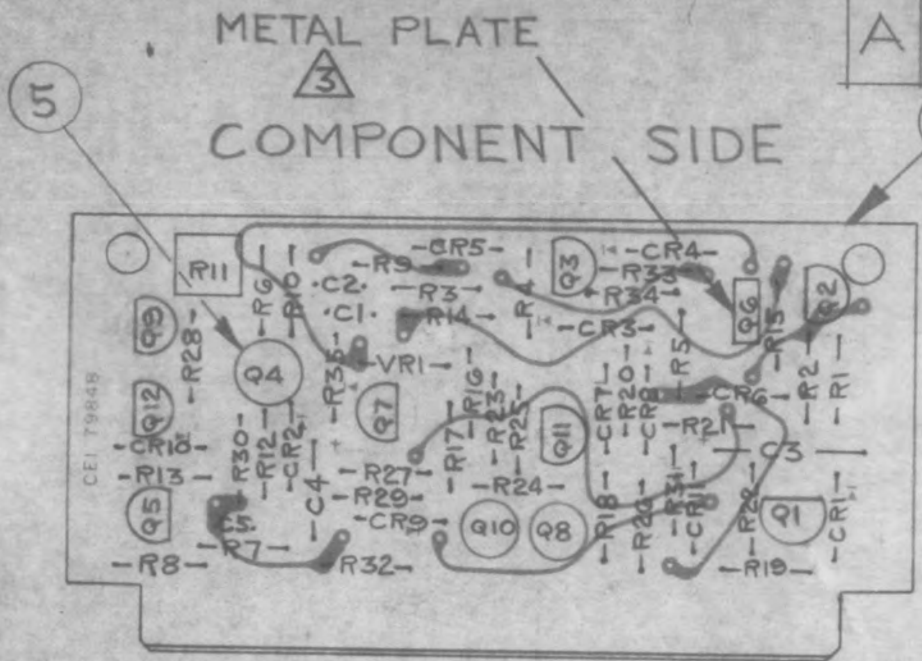
REF DESIG	DESCRIPTION		QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
J16	Same as J11				
J17	CONNECTOR, RECEPTACLE, MULTIPIN		1	DS00-12S	11139
J18	CONNECTOR, JACK, PHONE		1	41	82389
J19	CONNECTOR, JACK, PUSH-ON SERIES	Part of W2	2	8212B	91737
J20	CONNECTOR, JACK, PHONE		1	L-11	82389
J21	Same as J19	Part of W1			
M1	METER, SIGNAL STRENGTH		1	14524-1	14632
M2	METER, TUNING		1	14549	14632
P1	CONNECTOR, PLUG, MB SERIES	Part of W5	4	44950	74868
P2	Same as P1	Part of W5			
P3	Same as P1	Part of W4			
P4	Same as P1	Part of W6			
P5	CONNECTOR, PLUG, MULTIPIN		1	MRE-18P-G7H9	81312
P6	CONNECTOR, PLUG, MULTIPIN		1	MRE-26P-G7H9	81312
P7	CONNECTOR, PLUG, MULTIPIN		1	MRE-7-2P-G7H1	81312
Q1	TRANSISTOR		2	2N3055	80131
Q2	Same as Q1				
R1	RESISTOR, VARIABLE, COMPOSITION: 10 kΩ/10 kΩ, 10%, 2W		1	CCU-1031	44655
R2	RESISTOR, VARIABLE, COMPOSITION: 10 kΩ, 10%, 2W		2	RV4NAYSD103A	81349
R3	RESISTOR, VARIABLE, COMPOSITION: 25 kΩ, 10%, 2W		3	RV4NAYSD253A	81349
R4	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W		1	RCR07G470JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W		2	RCR07G102JS	81349

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R6	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	1	RCR07G682JS	81349
R7	Same as R2			
R8	RESISTOR, VARIABLE, COMPOSITION: 250 Ω, 10%, 2W	1	RV4NAYSD251A	81349
R9	Same as R3			
R10	Same as R3			
R11	RESISTOR, FIXED, COMPOSITION: 240 Ω, 5%, 1/4W	1	RCR07G241JS	81349
R12	Same as R5			
R13	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R14	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	1	RCR07G220JS	81349
S1	SWITCH, TOGGLE, SPST	1	8280-K16	27193
S2	SWITCH, ROTARY: 4 Section, 8 Pole, 6 Position	1	1128-55	14632
S3	SWITCH, ROTARY: 1 Section, 2 Pole, 6 Position	1	1128-43	14632
S4	SWITCH, ROTARY: 2 Section, 4 Pole, 6 Position	1	1128-03	14632
S5	SWITCH, SLIDE, DPDT	1	46256-LF	82389
T1	TRANSFORMER	1	15822	14632
TB1	TERMINAL BOARD	2	353-18-07-001	71785
TB2	Same as TB1			
W1	CONNECTOR AND CABLE ASSEMBLY	1	30020-1192	14632
W2	CONNECTOR AND CABLE ASSEMBLY	1	30020-1193	14632
W3	NOT USED			
W4	CONNECTOR AND CABLE ASSEMBLY	1	30020-1195	14632
W5	CONNECTOR AND CABLE ASSEMBLY	1	30020-1196	14632

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
W6	CONNECTOR AND CABLE ASSEMBLY	1	30020-1197	14632
	Accessory connector, not shown on schematic but shipped with equipment:			
--	CONNECTOR, PLUG, TWINAX SERIES	1	PL-76	14900

79848 A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	DELETE ITEM 5 FROM UNDER Q1, CORRECTED ORIENTATION Q1 ECN	10-8-70	MJM 10-12-70



NOTES:
1. PARTS LIST REF PL79848
2. INSTALL ITEM 5 UNDER Q4.
3. ORIENT Q6 AS SHOWN

QTY REQD	VENDOR OR CODE IDENT	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	NOTE	ITEM/ FIND NO.

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ±
2 PLACE DECIMALS ± —
3 PLACE DECIMALS ± —
ANGLES ± —

CONTRACT NO.

DATE ______

PREPARED	R.V.P.	9/22/70
CHECKED		
ENGINEER	E.B.	23 Sept 70

MATERIAL
SEE P/L

FINISH
FLOW SOLDER

NEXT ASSY	USED ON
	205-2 RCVR

APPLICATION

wj CEI DIVISION
WATKINS-JOHNSON
ROCKVILLE MARYLAND U.S.A.

SPLIT DISPLAY SWITCH
PRINTED CIRCUIT ASSEMBLY

SIZE	CODE IDENT NO.	DRAWING NO.
A	14632	79848 A

SCALE 1/1 | JOB 3811 | SHEET 1 OF 2

7.4.2 Type 79848 Split Display Switch

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V	2	SM(5000pF, M)	91418
C2	Same as C1			
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 10 μF, 10%, 20V	1	CS13BE106K	81349
C4	CAPACITOR, ELECTROLYTIC, TANTALUM: 0.22 μF, 10%, 35V	1	150D224X9035A2	56289
C5	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 200V	1	8131-A200-Z5U0-103M	72982
CR1	DIODE	7	1N462A	80131
CR2	Same as CR1			
CR3	DIODE	4	1N458A	80131
CR4	Same as CR1			
CR5	Same as CR1			
CR6	Same as CR1			
CR7	Same as CR3			
CR8	Same as CR3			
CR9	Same as CR1			
CR10	Same as CR1			
CR11	Same as CR3			
Q1	TRANSISTOR	1	2N3906	80131
Q2	TRANSISTOR	7	2N3904	80131
Q3	Same as Q2			
Q4	TRANSISTOR	1	2N3251	80131
Q5	Same as Q2			

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
Q6	TRANSISTOR	1	2N4918	80131
Q7	Same as Q2			
Q8	TRANSISTOR	2	U1899E	15818
Q9	Same as Q2			
Q10	Same as Q8			
Q11	Same as Q2			
Q12	Same as Q2			
R1	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	3	RCR07G222JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	2	RCR07G332JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 470 kΩ, 5%, 1/4W	2	RCR07G474JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	5	RCR07G103JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	7	RCR07G104JS	81349
R6	Same as R4			
R7	Same as R5			
R8	Same as R4			
R9	Same as R3			
R10	Same as R5			
R11	RESISTOR, VARIABLE, FILM: 10 kΩ, 10%, 1/2W	1	62PAR10K	73138
R12	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	1	RCR07G473JS	81349
R13	Same as R1			
R14	Same as R2			
R15	Same as R1			

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R16	Same as R5			
R17	Same as R4			
R18	RESISTOR, FIXED, COMPOSITION: 2.2 MΩ, 5%, 1/4W	2	RCR07G225JS	81349
R19	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R20	RESISTOR, FIXED, COMPOSITION: 18 kΩ, 5%, 1/4W	1	RCR07G183JS	81349
R21	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RCR07G471JS	81349
R22	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	1	RCR07G333JS	81349
R23	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4W	1	RCR07G224JS	81349
R24	Same as R18			
R25	Same as R4			
R26	RESISTOR, FIXED, COMPOSITION: 20 kΩ, 5%, 1/4W	2	RCR07G203JS	81349
R27	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4W	2	RCR07G822JS	81349
R28	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	1	RCR07G153JS	81349
R29	Same as R5			
R30	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	1	RCR07G223JS	81349
R31	Same as R26			
R32	Same as R27			
R33	Same as R5			
R34	Same as R5			
R35	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	1	RCR07G472JS	81349
VR1	VOLTAGE REGULATOR	1	1N967B	80131

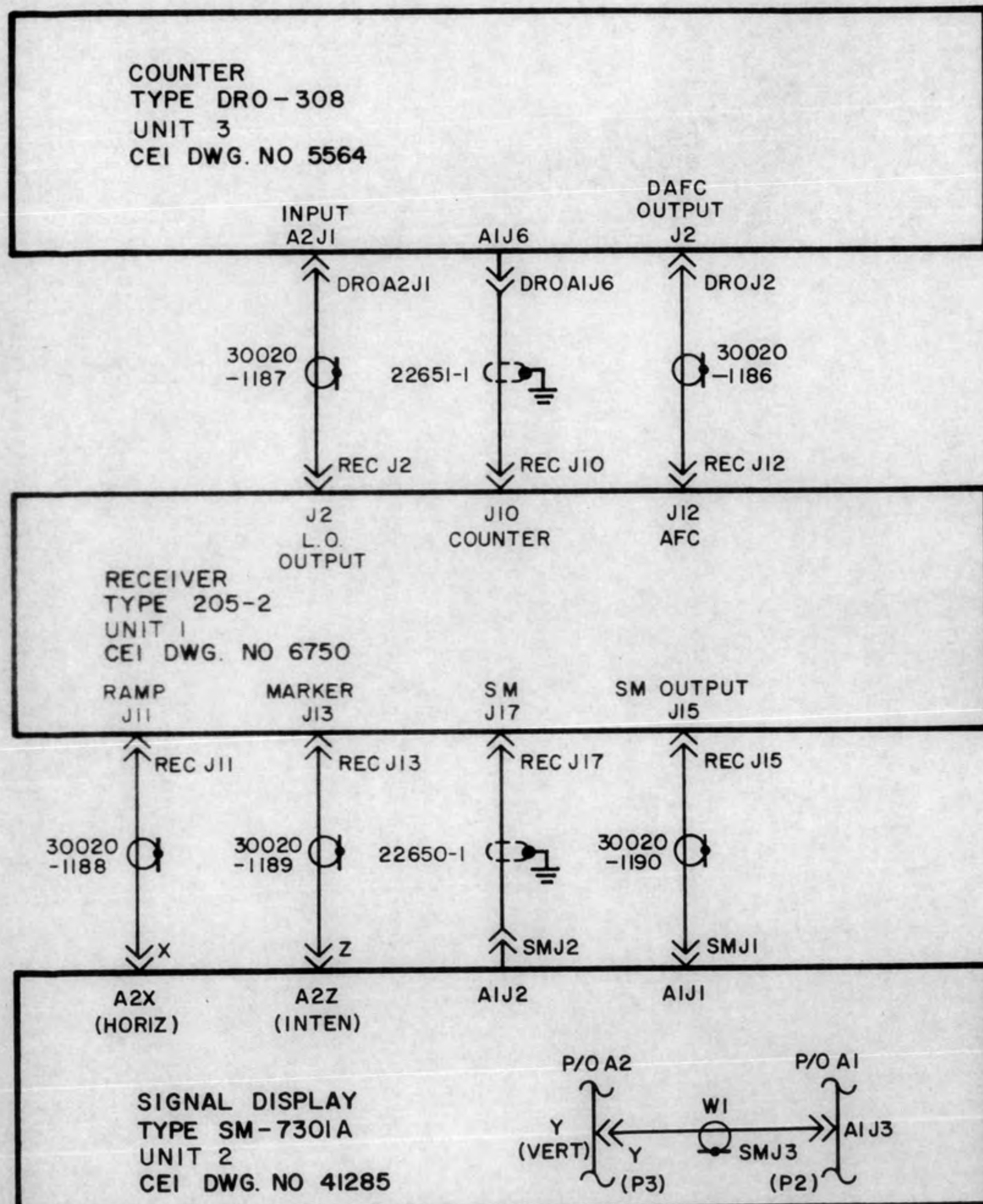


Figure 7-1. Type RS-160 System
Interconnection Diagram

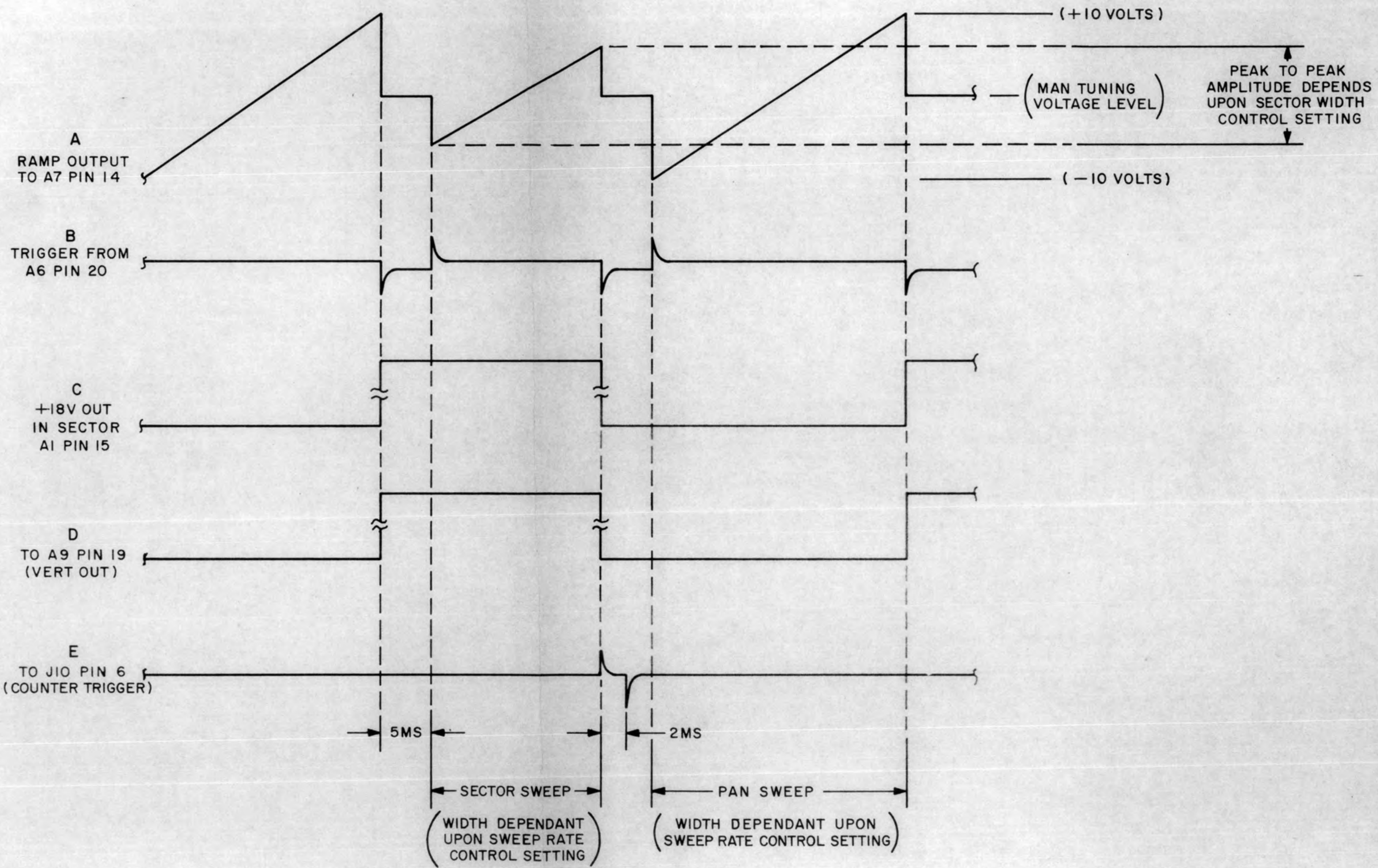
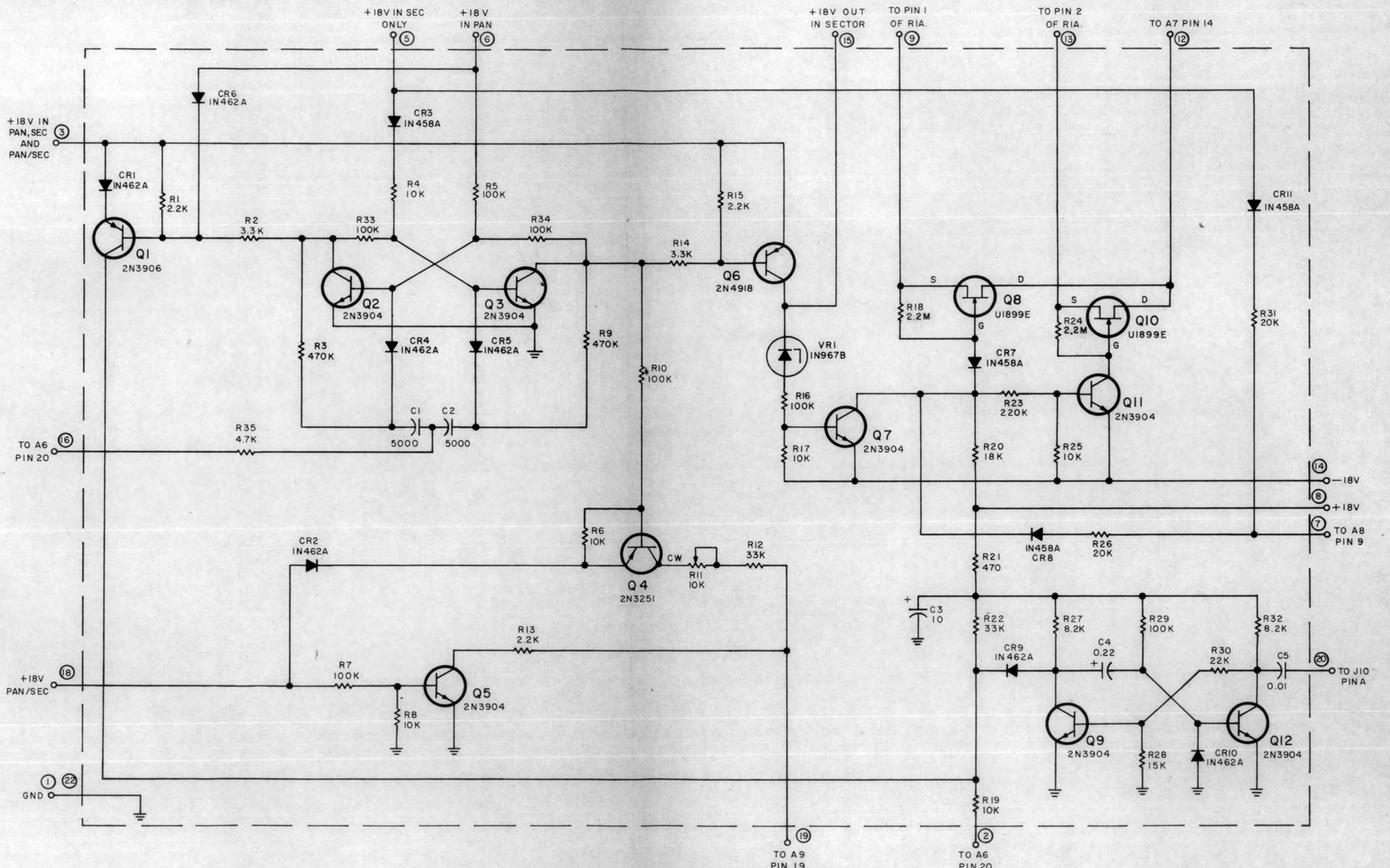


Figure 7-2. PAN/SEC Mode Timing Diagram



NOTE:
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 7-3. Type 79848 Split Display Switch (A1), Schematic Diagram

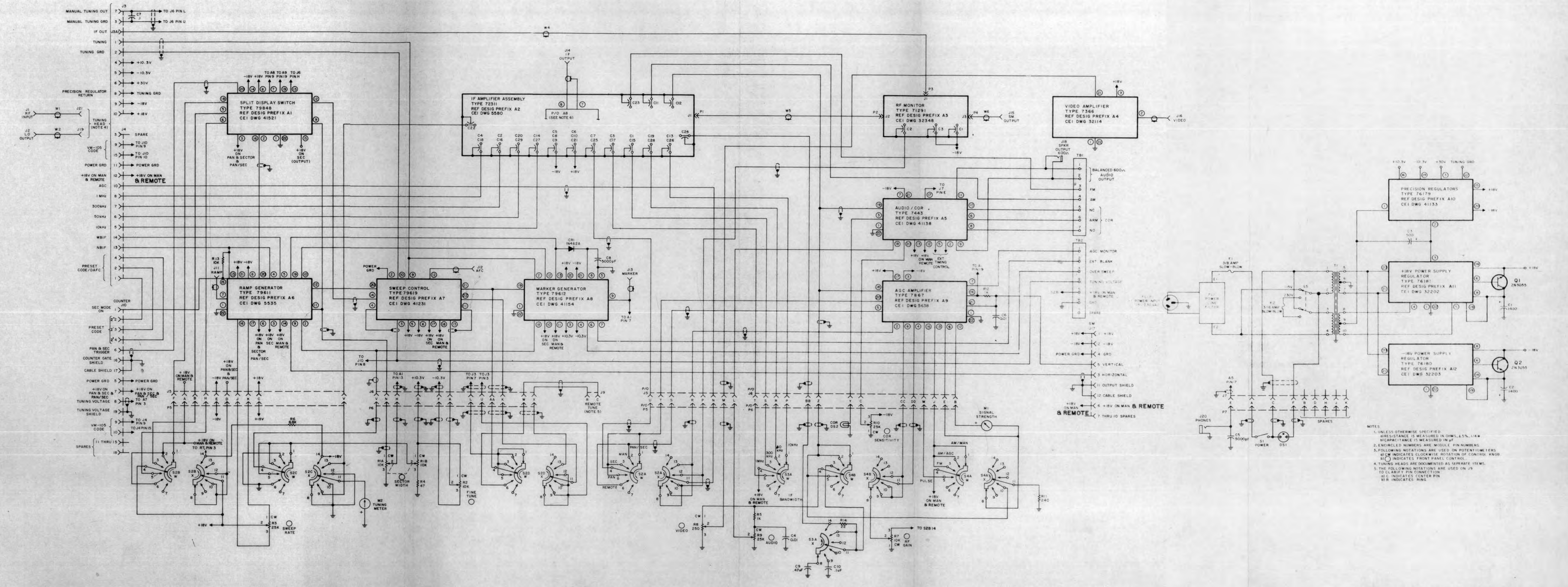


Figure 7-4. Type 205-2 Receiver, Main Chassis, Schematic Diagram