INSTRUCTION MANUAL

FOR

TYPE WJ-9028/RU RECEIVER UNIT

INTRODUCTION

The WJ-9028/RU Receiver Unit is similar in design and operation to the WJ-9026/RU. With the exception of the differences listed in the Section VII supplement, the WJ-9026/RU Manual is applicable.

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

RAH 12/77

INSTRUCTION MANUAL
FOR
TYPE WJ-9026/RU RECEIVER UNIT

WATKINS-JOHNSON COMPANY
700 Quince Orchard Road
Gaithersburg, Maryland 20878-1794

WJ/ 200/07/79

WARNING

The equipment employs voltages which are dangerous and may be fatal if contacted. Extreme caution should be exercised in working with the equipment to avoid contact with primary ac power wiring.

ADDENDA

WJ-9026/RU

The following changes should be incorporated into the Instruction Manual for the WJ-9026/RU Receiver Unit.

1. Section V - Replacement Parts List

1.1 Paragraph 5.4.1 Type WJ-9026/RU Receiver Unit, Main Chassis (page 5-7).

1.1.1 Change C4 from: 47 μF, 10%, 35 V, P/N CS13BF476K, Mfr. code 81349 to: 45 μF, 20%, 30 V, P/N MTP456M030P1B, Mfr. code 76055 (page 5-45).

1.2 Paragraph 5.4.4 Type WJ-9064-3 235-500 MHz Tuning Head A3 (page 5-45).

1.2.1 Add P2: Connector, Plug SMC Series, P/N UG1465/U, quantity 2, Mfr. code 80058 (page 5-45).

1.2.2 Add P3: Same as P2 (page 5-45).

1.2.3 Add W1: Cable Assembly, P/N 17300-22-1, quantity 1, Mfr. code 14632 (page 5-45).

1.3 Paragraph 5.4.4.3.2 Part 18121-1 Oscillator/Buffer (A3A3A2) (page 5-67).

1.3.1 Add C9: Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V, P/N C023B101E502M, quantity 1, Mfr. code 56289 (page 5-67).

1.3.2 Add R12: Resistor, Fixed, Composition: 47 Ω, 5%, 1/8 W, P/N RCR05G470JS, quantity 1, Mfr. code 81349 (page 5-68).

1.4 Paragraph 5.4.7.2 Type 72472-1 21.4 MHz IF Amplifier (8 kHz B.W.) A6Ax (page 5-107).

1.4.1 Change quantity of R2 from: 3 to: 2 (page 5-108).

1.4.2 Change R10 from: Same as R2 to: Resistor, Fixed, Film: 3.92 kΩ, 1%, 1/10 W, P/N RN55C3921F, quantity 1, Mfr. code 81349 (page 5-108).

1.4.3 Change quantity of R4 from: 3 to: 2 (page 5-108).

1.4.4 Change R11 from: Resistor, Fixed, Composition: 680 Ω, 5%, 1/4 W, P/N RCR07G681JS to: Resistor, Fixed, Film: 909 Ω, 1%, 1/10 W, P/N RN55C9090F (page 5-108).

1.4.5 Change R20 from: Same as R4 to: Resistor, Fixed, Composition: 1.5 kΩ, 5%, 1/4 W, P/N RCR07G152JS, Mfr. code 81349, quantity 1 (page 5-109).

1.4.6 Change C8 from: 270 pF, 2%, 500 V, P/N CM05FD271G03 to: 200 pF, 2 %, 500 V, P/N CM05FD201G03 (page 5-107).

1.4.7 Change C9 from: 130 pF, 2%, 500 V, P/N CM05FD131G03 to: 160 pF, 2%, 500 V, P/N CM05FD161G03 (page 5-107).

1.5 Paragraph 5.4.7.26 Type 23909-2 IF Mother Board A6A9 (page 5-195).

1.5.1 Add R5: Resistor, Fixed, Composition: 100 Ω, 5%, 1/4 W, P/N RCR07G101JS, Mfr. code 81349, quantity 1 (page 5-195).

1.6 Paragraph 5.4.8.1 Part 18075-1 IF Power Divider A7A1 (page 5-199).

1.6.1 Change C5 from: 5.1 pF ± 0.5 pF, 500 V, P/N 301-000C0H0-519D to: 3.3 pF ± 0.25 pF, 500 V, P/N 301-000C0J0-3339C (page 5-199).

1.6.2 Change R2 from: 4.7 kΩ, 5% 1/4 W, P/N RCR07G472JS to: 1.8 kΩ, 5%, 1/4 W, P/N RCR07G182JS (page 5-199).

1.7 Paragraph 5.4.12 Type 7446-2 Audio, Car and Squelch Amplifier A11 (page 5-212).

1.7.1 Change quantity of C1 from: 5 to: 6 (page 5-212).

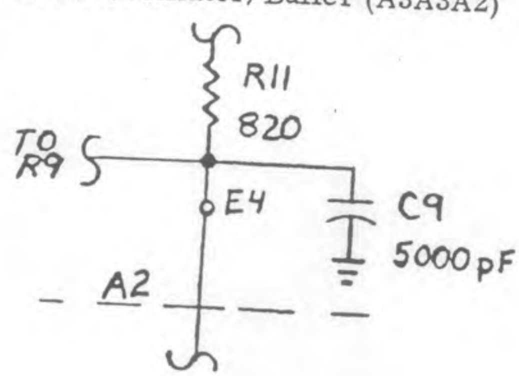
1.7.2 Add C12: Same as C1 (page 5-212).

1.7.3 Add C13: Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V, P/N C023B101E502M, quantity 1, Mfr. code 56289 (page 5-212).

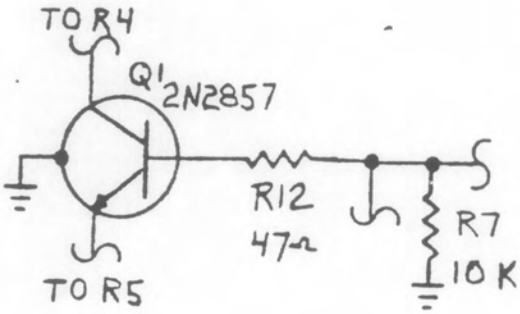
2. Section VI - Schematic Diagrams

2.1 Figure 6-7; page 6-15 Part 18121 Oscillator/Buffer (A3A3A2)

2.1.1 Add C9 as shown below:

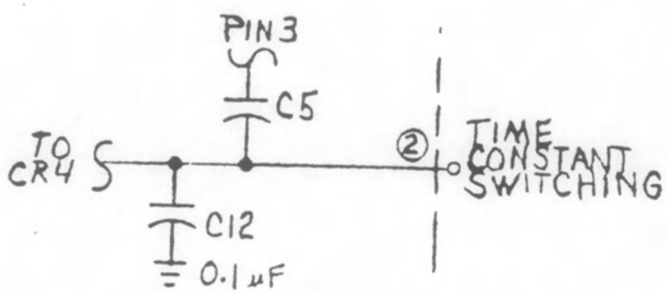


2.1.2 Add R12 as shown below:



2.2 Figure 6-31; page 6-63; Type 7446-2 Audio, COR and Squelch Amplifier (A11).

2.2.1 At Pin 2 add C12 as shown below:



2.2.2 Add C13 as shown below:

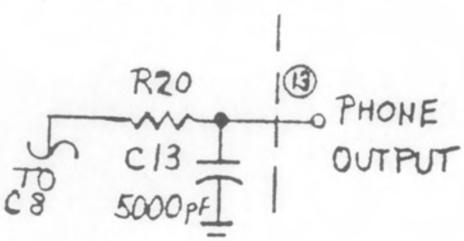


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Figure 1-1. Type WJ-9026/RU Receiver Unit

NOTES

SECTION I
GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

The WJ-9026 Receiving System consists of two units, a Receiving Unit and a Display Unit. The RU receives signals in the 26 MHz to 1000 MHz range, in four bands, and provides am, fm, cw, and pulse signals as demodulated outputs. Also provided are tuner rf outputs, an i-f amplifier predetect output and other outputs. Display Unit features consist primarily of a signal monitor and a frequency counter. The DU receives all operating voltages and signals from the Receiver Unit. The signal monitor portion of the DU displays signals up to 3 MHz, centered on the tuned frequency of the Receiver Unit. The frequency counter provides a six-digit display of tuned frequency and can provide a digital automatic frequency control (dafc) voltage to the active local oscillator of the RU locked to the time base of the frequency counter. Five system cables are required to interconnect the Receiver Unit and the Display Unit.

The Receiver Unit tuning range is covered by four permanently-installed tuners, each of which covers a portion of the frequency range. The 26-90 MHz, 90-300 MHz, 235-500 MHz, and 500-1000 MHz ranges are covered by the WJ-9066-3, WJ-9062-3, WJ-9064-3, and WJ-9065-3 tuners, respectively.

Three i-f amplifiers having bandwidths chosen by the user are installed for selection by a front panel switch (8-, 20-, and 200-kHz are standard in the WJ-9026 System). The available bandwidths are between 8 kHz and 3.0 MHz (see Table 1-3). FM limiter discriminator boards matching the i-f amplifier bandwidths are installed along with the i-f amplifiers. When the 26-90 MHz WJ-9066-3 tuner is used, the i-f bandwidth is limited by the selective circuits in the tuner to a maximum of 1.0-1.5 MHz, depending upon the tuned frequency.

A front panel switch permits the receiver to be operated in the automatic frequency control (AFC), DAFC, or open-loop (no automatic frequency correction) modes. The dafc voltage is developed in the companion frequency counter section of the WJ-9026/DU, interfaced with the Receiver. The counter's range and preset features are automatically established by the selected tuner.

Additional features of the RU are agc, audio squelch, two audio outputs (3.2Ω and 600Ω) video, signal monitor and i-f outputs, and a COR (carrier operated relay) output. The squelch/COR threshold is adjustable from the front panel. When the audio output is squelched, the video output is not interrupted.

1.2 MECHANICAL CHARACTERISTICS

The Receiver mounts in a standard 19" equipment rack, and occupies 3.5 inches of vertical rack space. The top and bottom covers are partially perforated to permit ventilation. The front panel is overlaid with a black bezel etched with control and indicator markings. All of the operator controls, a meter, and a COR indicator are mounted on or extend through the front panel. The audio PHONES jack is located on the front panel, while all other input, output, and interface connectors are on the rear panel. The ac line fuses and a line voltage selector switch are also mounted on the rear panel. It also mounts a local oscillator output coupling network, an rf coaxial relay, and an ac line filter with a permanently attached power cord.

The main chassis mounts four removable rf tuners; an i-f amplifier assembly; an agc amplifier board; an audio, COR, and squelch amplifier board; two power regulator modules; three coaxial relays; a power transformer; and nine filter capacitors. The i-f amplifier assembly is a nickel-plated brass box containing the three selected i-f amplifier boards, the three corresponding fm limiter/discriminator boards, an i-f output amplifier board and a video/afc-dafc amplifier board. The tuning shafts of the rf tuners extend through holes in the front panel. Shielding and filtering has been employed to minimize rf leakage.

The four WJ-9060 Series RF Tuners may be removed for maintenance purposes, but are not intended to be replaced by other types of WJ-9060 Series Tuners. The only tuners intended for use with the WJ-9026/RU are the WJ-9066-3, WJ-9062-3 WJ-9064-3, and WJ-9065-3.

1.3 EQUIPMENT SUPPLIED

The equipment supplied consists of the WJ-9026/RU Receiver, but the WJ-9026/DU and interconnecting cables are required for a working system.

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED

The WJ-9026/RU Receiver requires an antenna and a set of 600-ohm (or higher) impedance headphones (if local audio monitoring is desired). The companion WJ-9026/DU Display Unit must be interconnected to provide frequency readout, dafc, voltage, and spectrum display. Interconnection cables, supplied when the RU/DU system is shipped, must be available.

Table 1-1. WJ-9026/RU Receiver Specifications

Frequency Range	26-1000 MHz in four ranges: 26-90 MHz, 90-300 MHz, 235-500 MHz, and 500-1000 MHz.
Types of Reception	am, fm, cw, and pulse.
Noise Figure:	
26-90 MHz	8 dB, maximum
90-300 MHz	9 dB, maximum
235-500 MHz	11 dB, maximum
500-1000 MHz	13 dB, maximum
Sensitivity	Table 1-2 correlates noise figure, bandwidth, and sensitivity
Tuning/Frequency Control	Tuning range selected by front panel bandswitch, main tuning accomplished using tuning knob on appropriate installed tuner. Fine tuning adjustment provided, afc provision included, and dafc voltage can be supplied by WJ-9026/DU Display Unit.

Table 1-1. WJ-9026/RU Receiver Specifications (Continued)

IF Bandwidths	Up to three front-panel selectable i-f bandwidths provided (see Table 1-3 for list of available i-f bandwidths).
Intermediate Frequency	21.4 MHz
Predetection IF Output	21.4 MHz center frequency. Minimum output is 100 mV into 50 ohm load for input signals above agc threshold.
Gain Control Characteristics:	
Pulse agc, 3 MHz Bandwidth	Charge time sufficiently short to permit pulse widths as narrow as 1 μs. Discharge time sufficiently long to operate with PRR as low as 100 pps with a 1 μs pulse.
AM Output Stability with agc	Output changes by no more than 6 dB from input signal level required for a 10 dB (S + N)/N (see Table 1-2) up to -10 dBm.
Manual Control Range	70 dB, minimum
Video Output Level	0.1 V rms, minimum, into a 100 ohm load.
Video Amplifier 3 dB Response	2 Hz to 2 MHz
Audio Frequency 3 dB Response	100 Hz to 20 kHz
Meter	Signal strength.
COR Sensitivity	Operates at signal level 6 dB below the level required for a 10 dB (s + n)/n. Minimum acceptable limit : (-40 dBm).
COR Range	Continuously adjustable to operate from minimum threshold signal levels up to -40 dBm input.
COR Operate Time	5 milliseconds, maximum.
COR Release Time	2 or 12 seconds, ±25%, selectable
Permissable Operating Temperature Range	0°-50° C
Power Requirements	115/220 V ac, ±10%, 50-400 Hz
Power Consumption	35 watts typical, Receiver Unit only; 68 watts maximum, Receiver Unit and Display Unit.
Dimensions	3.5 inches high, 19 inches wide, and 21.5 inches deep
Weight	33 lb, approximately

Table 1-2. Receiver Sensitivity and Noise Figure vs. Bandwidth Options

Receiver AM*, FM** Sensitivity in dBm at Receiver IF Bandwidths

Frequency Range	Tuner	Noise Figure	8 kHz	10 kHz	20 kHz	50 kHz	100 kHz
26-90 MHz	WJ-9066-3	8 dB	-108	-107	-104	-100	-97
90-300 MHz	WJ-9062-3	9 dB	-107	-106	-103	- 99	- 96
235-500 MHz	WJ-9065-3	11 dB	-105	-104	-101	- 97	- 94
500-1000 MHz	WJ-9065-3	13 dB	-103	-102	- 99	- 95	- 92

Frequency Range	Tuner	Noise Figure	200 kHz	300 kHz	500 kHz	1 MHz	3 MHz
26-90 MHz	WJ-9066-3	8 dB	-94	-92	-90	-87	-82
90-300 MHz	WJ-9062-3	9 dB	-93	-91	-89	-86	-81
235-500 MHz	WJ-9064-3	11 dB	-91	-89	-87	-84	-79
500-1000 MHz	WJ-9065-3	13 dB	-89	-87	-85	-82	-77

*AM ... The input signal levels tabulated above will produce at least a 10 dB (s + n)/n when modulated 50% at 1 kHz rate.

**FM .. The input signal levels tabulated above will produce at least 17 db (s + n)/n when modulated at a 1 kHz rate with a deviation equal to 30% of the i-f bandwidths. However, for an 8-or 10-kHz bandwidth, the modulation rate is 400 Hz. Also, for 20 kHz i-f bandwidths, the input level for all tuners is a -95 dBm input level.

Table 1-3. IF Bandwidth Options

IF BANDWIDTH	IF AMPLIFIER PC TYPE NO.	FM LIMITER/DISC PC TYPE NO.
8 kHz	72472-1	791205-4
10 kHz	72339	791205-1
20 kHz	72389-1/-3	791205-2
50 kHz	72344	791205-3
100 kHz	72431	791331
200 kHz	72338	791338
300 kHz	72366	791366
500 kHz	72429	791329
1 MHz	72378-1	791378
2 MHz	72378-2	791365-2
3 MHz	72365	791365-1

The 72389-3 is specified for the WJ-9026 System.

SECTION II
INSTALLATION AND OPERATION

2.1 UNPACKING AND INSPECTION

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 this is not possible and damage to the equipment is evident after unpacking, retain the shipping cartons and padding material for the carrier's inspection.

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

The unit was thoroughly inspected and factory adjusted for optimum performance prior to shipment. Therefore, it is ready for use upon receipt. After uncrating and checking contents against the packing slip, visually inspect all exterior surfaces for dents and scratches. If external damage is visible, remove the dust covers and inspect the internal components for apparent damage. Also check the internal cables for loose connections, and plug-in items, such as printed wiring boards, for loose connections in their receptacles.

2.2 INSTALLATION

The Receiver is designed for mounting in a standard 19-inch rack. It occupies 3.5 inches of vertical space and extends approximately 21 inches into the rack, including the rear handles and relay cover. Do not rely solely on front panel mounting hardware to support the unit. A brace extending along the sides from the front panel to the rear panel is preferred. The rack should permit a free flow of air through the holes in the top and bottom covers. Access to the rear panel should be allowed so that connections can be made and changed if desired. The connections to the receiver are described in the following paragraphs.

2.2.1 FUSE F1, 3/4 AMP SLOW BLOW. - This fuse protects the Receiver during 115 V operation. The fuse is also in the circuit during 220 V operation, but fuse F2 (3/8 A) protects the Receiver during this operating condition.

2.2.2 FUSE F2, 3/8 AMP SLOW BLOW. - This fuse protects the Receiver during 220 V operation. Fuse F1 is in series with F2 during 220 V operation, but normally will not blow during an overload condition because of its greater value.

2.2.3 AC POWER CONNECTOR (FL1P1). - Before making the power connection, rotate the AUDIO GAIN control fully counterclockwise to the PWR OFF position. Check that the rear-panel line voltage selector slide switch is in the position corresponding to the line voltage being used. Insert the plug into a 3-pin power source receptacle providing 115 or 220 V ac (±10%) at 50-400 Hz. The third pin of the receptacle must be a ground connection. The receiver can be energized by rotating the AUDIO GAIN control clockwise.

2.2.4 RF INPUT CONNECTOR (J1; 26-1000 MHz). - This is a BNC connector which accepts signals from the antenna. The nominal input impedance is 50 ohms.

2.2.5 FXD LO OUT J2. - This output is a 81.4 MHz oscillator contained within the 60-21.4 MHz converter. This converter is associated with the 235-500 MHz and 490-1000 MHz tuners.

2.2.6 SM OUT J3-J4. - These 50 ohm outputs are taken from an active power divider. Level depends on signal strength, and nominally should be 20 dB above the input signal level.

2.2.7 POWER Connector (J5). - This multipin connector supplies all operating power and a sweep reverse voltage to the Display Unit. This output should be interconnected with POWER INPUT J1 of the Display Unit.

2.2.8 COUNTER Connector (J6). - This connector provides tuner range, preset, and preset sequence logic to the Display Unit.

2.2.9 COR Connector (J7). - This multipin connector provides the two DPDT COR relay contacts for external use. Pin L of J7 supplies a -15 V dc, 1 kΩ source impedance, switched, sweep-reverse voltage when a tuner is activated that reverses sideband order of the signals. Pin J of J7 supplies the agc voltage as an output.

2.2.10 VID OUT Connector (J8). - The wideband demodulated output is available from this BNC connector. Minimum output at rated input is 1 V rms into 100 ohms with the front panel VIDEO GAIN control fully clockwise.

2.2.11 DAFC IN Connector (J9). - The dafc input BNC connector accepts a dafc analog frequency control voltage. It connects to J6 of the Display Unit.

2.2.12 DSCRM OUT (J10). - The discriminator output is taken from the activated discriminator. Nominal level is 1 V from this output when loaded by 500 kΩ or greater.

2.2.13 IF OUT Connector (J11). - This BNC connector provides a predetection i-f output with a 21.4 MHz center frequency. It is band-limited by the selected i-f amplifier or tuner. The output level is 100 mV into 500 ohms for rf input signal levels above the agc threshold.

2.2.14 AM DET OUT (J12). - This output is derived from the detector diode and routed through a dc-coupled, emitter-follower pair. Output impedance is 10 kΩ.

2.2.15 PHONES Jack (J13). - The PHONES jack is located on the front panel. The mating plug is a Switchcraft 440, MIL type PJ-055B, or equivalent.

2.2.16 115V-220V (S5) - Set this switch to match the available line voltage. For installation sites where 230 V power is used, refer to the main chassis schematic diagram for a wiring change on the power transformer which compensates for the higher voltage.

2.2.17 AUD OUT Terminals (TB1). - Do not load both pairs of outputs simultaneously. When the front panel AUDIO GAIN control is set to provide less than 10 percent distortion on the signal, at least 17.5 V rms will be available from the 600 ohm pair. For the 3.2 ohm pair, at least 1.25 V rms will be available. Both pairs of outputs are balanced. These outputs are squelched, as is the front panel phones jack, when the input signal level is below the squelch threshold established by the front panel COR/SQUELCH THRESHOLD control.

2.2.18 VAR LO OUT Connector (U1J1, U1J2). - The LO output from the active tuner is available at both of these BNC connectors. The LO output is 50 mV (-13 dBm), minimum, into 50 ohms. Connect U1J1 to LO input J1 of the WJ-9026/DU.

2.3 OPERATION

The following paragraphs describe the front panel control and indicators.

2.3.1 AUDIO GAIN Control/PWR OFF Switch. - The AUDIO GAIN control varies the amplitude of the signal at the PHONES jack and at Audio Output Terminal Board TB1. This control also turns the ac power on when it is rotated in the clockwise direction from its extreme counterclockwise PWR OFF position.

2.3.2 PHONES Jack. - This output has a 600 ohm impedance and is squelched along with the rear panel terminal board output. The mating plug is a Switchcraft 440, MIL type PJ-055B, or equivalent.

2.3.3 COR FAST/SLOW Switch. - This switch determines the dropout delay of the COR relay after carrier disappears. In FAST the delay is about 2 seconds; in SLOW the delay is about 12 seconds. The squelching action takes place at the PHONES Jack and rear panel Audio Output Terminal Board TB1.

2.3.4 VIDEO GAIN Control. - This control sets the amplitude of the signals at VID OUT connector J8.

2.3.5 BAND Switch. - This switch selects the tuner appropriate for the frequency range to be covered. The dial lamps for the selected tuner illuminate.

2.3.6 IF BANDWIDTH kHz Switch. - This switch selects the i-f bandwidth indicated on the card mounted above the switch knob, by activating the appropriate i-f amplifier. The i-f amplifiers installed are 8-, 20-, and 300-kHz. The bandwidth selected during operation should be wide enough to pass the desired signal, but should be as narrow as possible to minimize noise.

2.3.7 MODE Switch. - Set this switch to match the signals to be received. In CW and AM MAN, the Receiver operates in the manual gain mode with control established by the RF/IF GAIN control. In all other modes the receiver operates with automatic gain control and the RF/IF GAIN control is disabled. The FAST AM/AGC mode provides control for standard signals. In the SLOW AM/AGC mode, the agc loop is modified so that a 40 Hz, 50 percent modulated signal will be demodulated without appreciable distortion being introduced by the agc.

2.3.8 BFO Control. - The beat frequency oscillator control is activated when the MODE switch rests in the CW position. Varying the BFO control changes the pitch (frequency) of the audio output signal. The total range of this control is ±8 kHz.

2.3.9 RF/IF GAIN Control. - Adjust this to manually control receiver rf and i-f gain when the MODE switch is in the CW and AM/MAN positions. In all other positions of the MODE switch, gain control is automatic.

2.3.10 AFC/DAFC Switch. - This is a three-position toggle switch used to select afc or dafc operation. In the OFF position, the frequency may be controlled manually, using either the tuning knob of the active tuning head (coarse tuning) or the FINE TUNING control. In dafc operation the frequency counter portion of the WJ-9026/DU is utilized. In dafc the receiver is locked to the tuned frequency so that the receiver does not drift. To change the receiver tuned frequency, it is first necessary to disable the dafc by placing the AFC/DAFC switch in the center, OFF position. In dafc operation, there are no restrictions on the type of signal received. However, dafc does not permit the receiver to track any possible carrier frequency drift of a received signal. Operation in afc permits the receiver to track carrier drift, but effective afc requires the presence of a carrier. Consequently, carrier dropout (such as occurs with cw and pulse operation) cannot be tolerated. In addition, strong signals near the desired signal can sometimes "capture" the receiver, locking the receiver tuned-frequency to the frequency of the strong interfering carrier. In both afc and dafc operation, the coarse and fine tuning controls are used to tune in the desired signal with the AFC/DAFC switch OFF, after which either afc or dafc is activated.

2.3.11 COR/SQUELCH THRESHOLD Control. - This control adjusts the signal level at which the squelch circuit interrupts the audio outputs and de-energizes the carrier-operated relay (COR). A time delay keeps the relay energized for 2 or 12 seconds depending on the COR FAST/SLOW switch setting, after the input signal level drops below the COR/SQUELCH threshold to avoid receiver squelching squelching during momentary signal dropouts. The COR indicator illuminates when the relay is energized. The squelch circuit eliminates the unnecessary irritation of listening to background noise when no signal is being received. Video output J8 has no relationship to this squelching action.

2.3.12 Main Tuning AND FINE TUNING Controls. - The main tuning control (the one corresponding to the active tuner in the WJ-9026/RU) tunes the receiver to the frequency indicated on the Display Unit. The FINE TUNING control is then used to accurately set the frequency. The AFC/DAFC switch should be OFF when using either control during initial tuning. When the Receiver operates in the dafc condition, however, the FINE TUNING control can be slowly adjusted to bring the Display Unit TUNING CORRECTION meter back to midscale.

2.3.12 SIGNAL STRENGTH Meter. - In the AM MAN mode, this meter indicates signal strength logarithmically with a 30 dB range. In CW this logarithmic scale also operates but the bfo injects a strong signal into the i-f amplifier, thus overriding weaker signals. In AM/FAST AGC, AM/SLOW AGC, FM and PULSE modes, the signal strength meter is driven by the agc circuits, and does not provide a logarithmic response.

2.4 PREPARATION FOR RESHIPMENT AND STORAGE

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 guidance for the repackaging effort.

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

(1) Maximum humidity: 95% (no condensation)

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

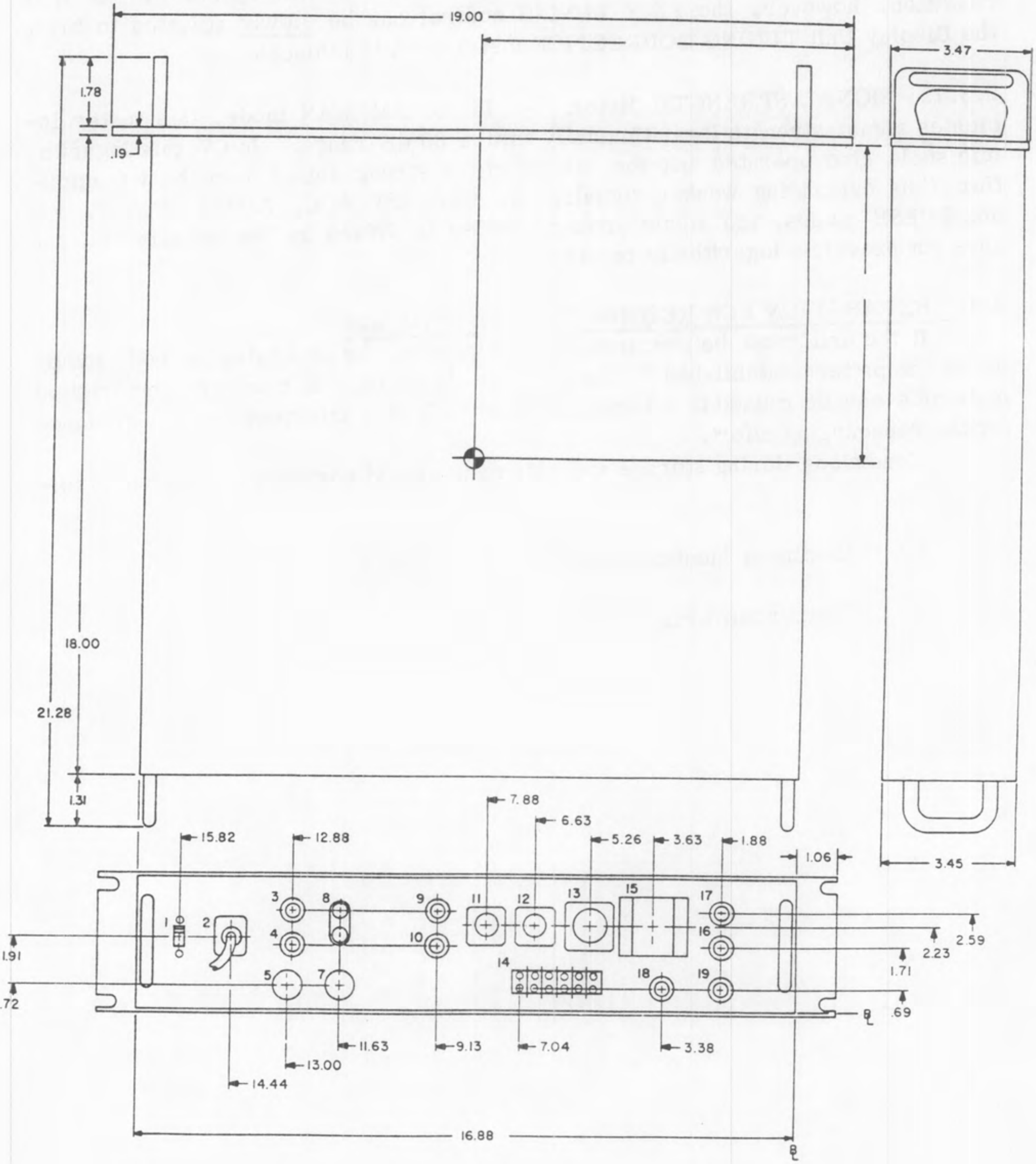


Figure 2-1. WJ-9026/RU Receiver, Critical Dimensions

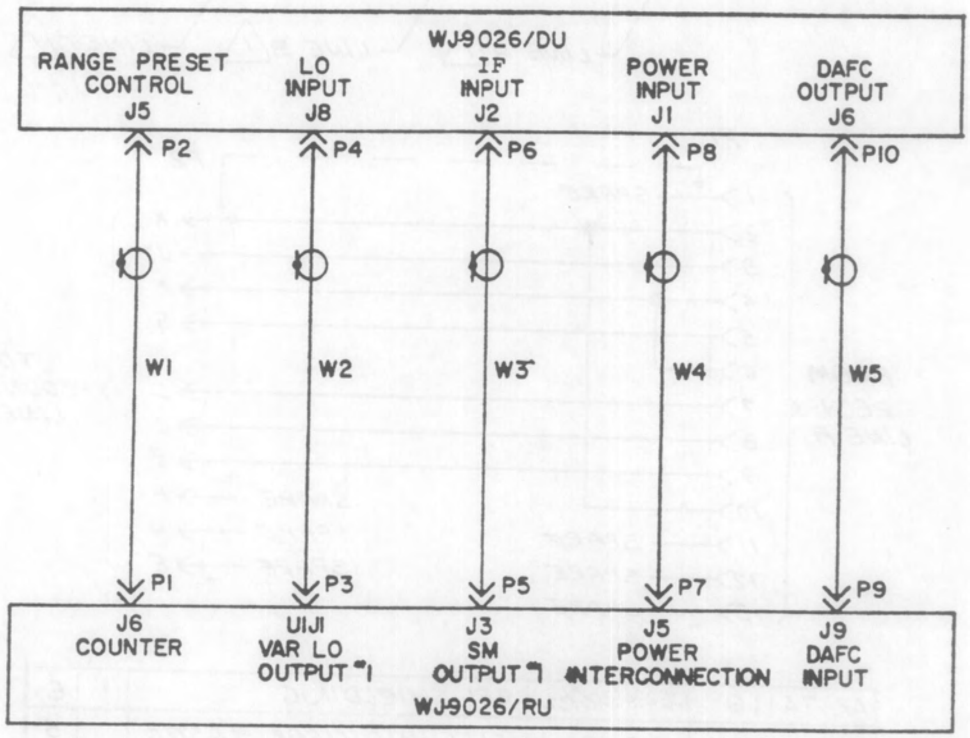
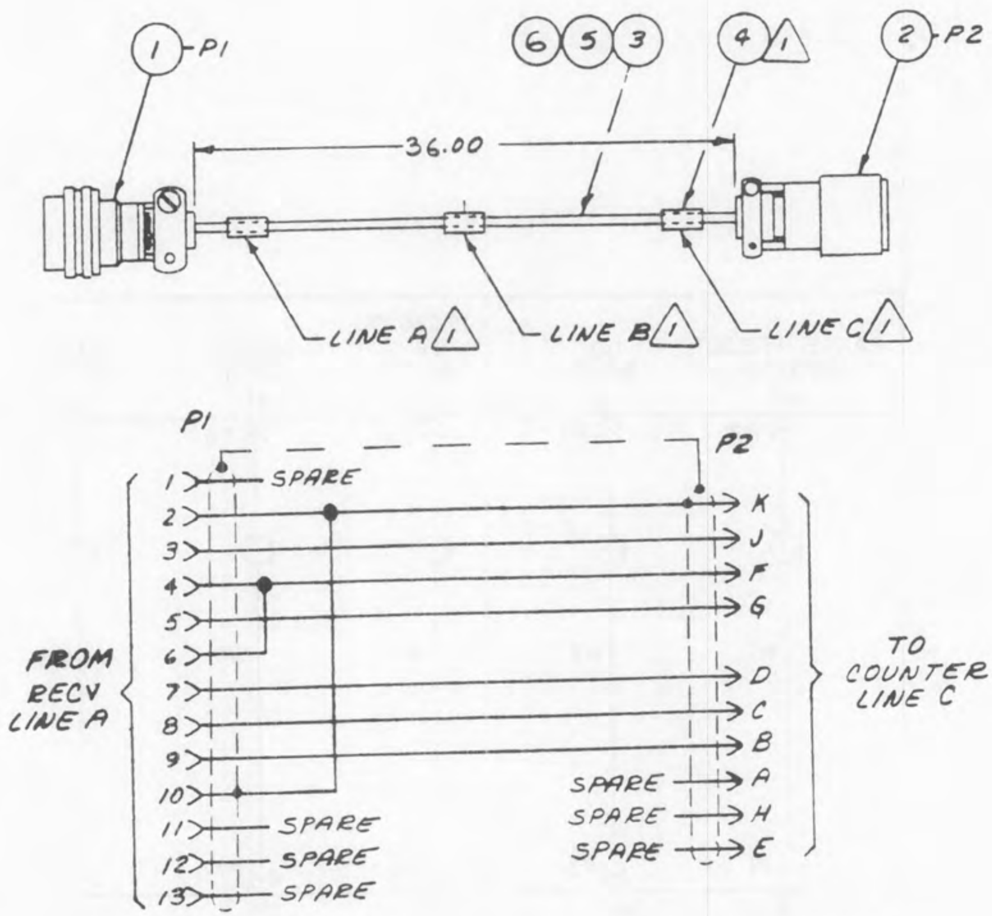


Figure 2-2. System Interconnection Diagram, WJ-9026/RU and WJ-9026/DU



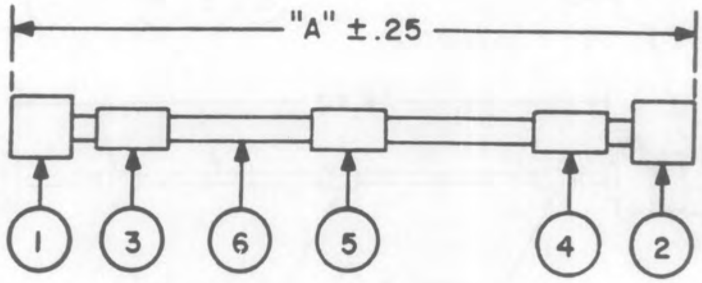
AR	74116	NEQ24530-9/32	RFI SHIELDING	•	6
AR	20484	NO 10	SLEEVING/CLEAR PLASTIC		5
3	59740	WTW-1214	CABLE MARKER		4
AR	90484	A2408	WIRE, PLASTIC INS		3
1	09922	LI2TF10P6N-A	CONNECTOR		2
1	77820	JT06RE10-13S5R	CONNECTOR		1
-1 QTY REQD	VENDOR OR CODE IDENT	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	NOTE	ITEM/ FIND NO

PARTS LIST

THE CABLE REFERENCE DESIGNATION IS FOR THE SYSTEM, NOT THE WJ-9026/RU OR /DU

DASH NO	LINE A	LINE B	LINE C
24143-1	P1 (RECEIVER)	W1 (24143-1)	P2 (COUNTER)

Figure 2-3. System Range/Preset Cable (W1), Wiring Diagram



NOTES:

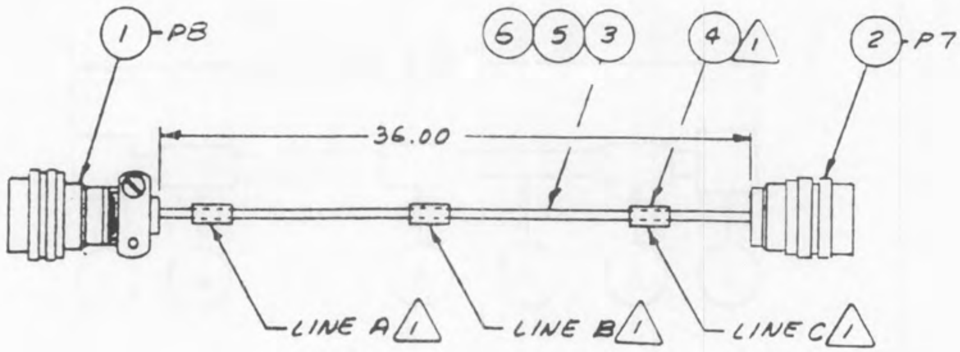
1. SLEEVE MATERIAL TO BE BLACK.
   TYPE I – #8 F.I.T. 275 TUBING, SHRINKABLE
   TYPE II – #14 F.I.T. 275 TUBING, SHRINKABLE
   TYPE III – #4 F.I.T. 275 TUBING, SHRINKABLE
   TYPE IV – #5/16 F.I.T. 275 TUBING, SHRINKABLE
   TYPE V – E-Z CODE CABLE MARKERS
   PART NO. WTW-1214 THOMAS & BETTS

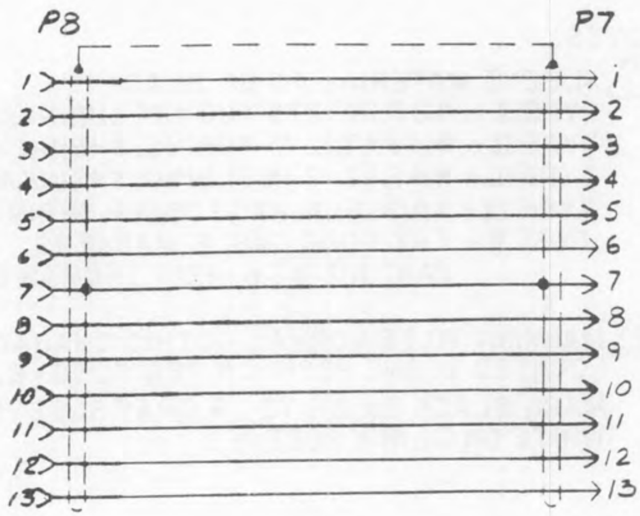
2. MARKING TO BE NORMAL GOTHIC CHARACTERS LOCATED IN ONE POSITION PER SLEEVE.
   MARK BLACK ON WHITE OR GRAY SLEEVES; WHITE ON BLACK SLEEVES

DASH NO.	ITEM 1	ITEM 2	ITEM 3 SEE 2	ITEM 4 SEE 2	ITEM 5 SEE 2	ITEM 6	SLEEVE MATL SEE 1	DIM "A"	REF OBS DWG 30020
1	UG88U	UG88U	P3	P4	W2	RG55BU	TYPE V	36"	
2	UG88U	UG88U	P5	P6	W3	RG55BU	TYPE V	36"	
3	UG88U	UG88U	P9	P10	W5	RG55BU	TYPE V	36"	

CABLE REFERENCE DESIGNATIONS REFER TO THE SYSTEM, NOT THE INDIVIDUAL WJ-9026/RU AND THE WJ-9026/DU

Figure 2-4. System Signal Cables (W2, W3, W5), Wiring Diagram





-1 QTY REQD	VENDOR OR CODE IDENT	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	NOTE	ITEM/FIND NO.
AR	74116	NEQ24530-9/32	RFI SHIELDING		6
AR	20484	NQ 10	SLEEVING/CLEAR PLASTIC		5
3	59740	WTW-1214	CABLE MARKER		4
AR		#22 STRANDED	WIRE, PLASTIC INS		3
1	77820	JTG06RE10-13PSR	CONNECTOR		2
1	77820	JT06RE10-13SSR	CONNECTOR		1

PARTS LIST

THE CABLE REFERENCE DESIGNATION IS FOR THE SYSTEM, NOT THE WJ-9026/RU OR /DU

DASH NO	LINE A	LINE B	LINE C
24144-1	P8 (DU)	W4 (24144-1)	P7 (RU)

Figure 2-5. System Power Cable (W4), Wiring Diagram

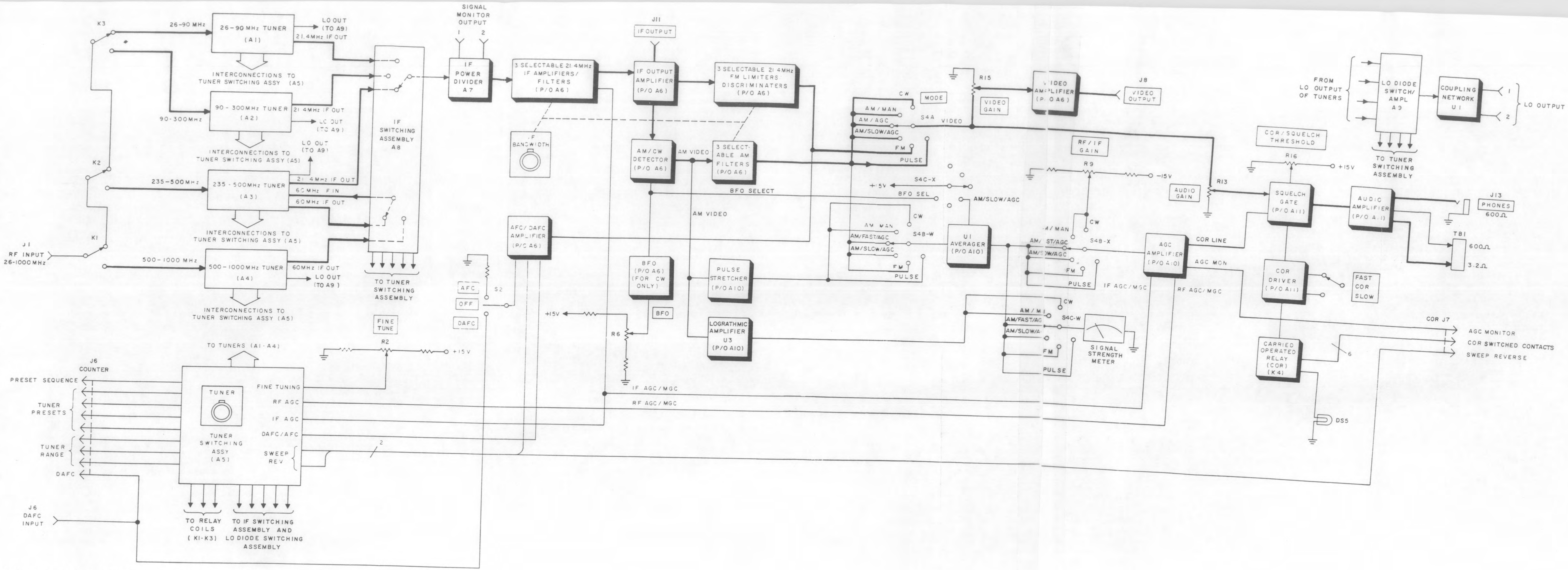


Figure 3-1. WJ-9026/RU Receiver Unit, Functional Block Diagram

SECTION III
CIRCUIT DESCRIPTION

3.1 GENERAL

The following paragraphs describe the various circuits for the WJ-9026/RU Receiver. Schematic discussions are preceeded by an overall functional block diagram discussion. Additional diagrams supplement the schematic discussions, where they may be helpful. The schematic discussions are arranged in functional rather than numerical sequence to aid in progressive reading. The table of contents of this manual should be consulted for locating discussion of specific circuits.

The unit numbering system is used for identification of electrical components such that each circuit board or assembly part carries a prefix before the usual class letter and item number. For example, the full designation of R1 on circuit board A4 in subassembly A1 of assembly A2 is A2A1A4R1. These prefixes are omitted on illustrations and in the text except where they are necessary to avoid confusion.

3.2 FUNCTIONAL DESCRIPTION

3.2.1 MAIN SIGNAL PATH. - Referring to the functional block diagram (Figure 3-1), and to the main chassis schematic (Figure 6-32). The receiver rf input is applied to one of four tuners (A1-A4). These tuners cover the 26-90 MHz, 90-300 MHz, 235-500 MHz, and 500-1000 MHz bands, respectively. Since only one tuner is active at any given time, a front panel bandswitch is employed to permit the operator to select the desired frequency range. The bandswitch controls tuner switching assembly A5, which in turn activates the selected tuner and disables the remaining three. The tuner switching assembly also determines the positions of the rf input relays, and the routing of i-f and LO signals in assemblies A8 and A9, respectively. Relays K1, K2, and K3 route the signal from J1 to the appropriate tuner rf input. A 21.4 MHz i-f output from tuners A1, A2, and A3 is selected in the i-f switching assembly and routed to the i-f power divider A7. Tuners A3 and A4 provide a 60 MHz i-f output, one of which is selected by another stage in i-f switching assembly A8 and routed back into tuner A3 for conversion to 21.4 MHz. Thus, A3 provides i-f outputs at both 60 and 21.4 MHz, and A4 provides an i-f output at 60 MHz. Since the i-f amplifiers require 21.4 MHz, A8 selects the 60 MHz i-f output of either A3 or A4 (depending upon which of those two tuners is active) to be applied to the 60/21.4 converter (60 MHz IF IN) of A3. The resulting 21.4 MHz signal is then selected by A8 for routing through power divider A7 to i-f amplifier A6, provided that the 235-500 MHz or 500-1000 MHz tuner is active. This arrangement requires only one 60/ 21.4 MHz converter to be used for the two dual-conversion, high-band tuners.

The 21.4 MHz i-f output from switching assembly A8 is split three ways in i-f power divider A7. Two outputs are routed to the rear panel for signal monitor use, and the third output provides signals to the i-f amplifier assembly.

The i-f amplifier assembly contains, among other circuits, three selectable 21.4 MHz i-f amplifiers followed by an i-f output amplifier. The IF BANDWIDTH switch selects the i-f amplifier to be used and disables the remaining two. Since each i-f amplifier contains a different bandwidth i-f filter, switching in a different i-f amplifier changes the receiver i-f bandwidth. The output of the selected i-f amplifier is then applied to the i-f output amplifier, which has three i-f signal outputs. One of these is applied to rear-panel i-f output jack J11. Another is applied to three selectable 21.4 MHz fm limiter/discriminators, and the third is applied to an am/cw detector.

An active fm limiter/discriminator is also determined by the setting of the IF BANDWIDTH switch. It is necessary to switch in different limiter/discriminators to complement the different i-f bandwidths. The fm video (demodulated) output is then applied to the fm terminal of mode switch S4A. The am/cw detector demodulates am, cw, and pulse signals. The bfo is activated only for cw detection. The am video output signal is then band-limited by one of three filters selected by the IF BANDWIDTH switch. The filtered am video signal is then applied to the cw, am/man, am/fast agc, am/slow agc, and pulse terminals of mode switch S4A.

The wiper of S4A selects the desired demodulated (video) signal for application to the VIDEO GAIN and AUDIO GAIN controls to their respective amplifiers. The same filtered am video signal is utilized for cw, am/man, am/agc, and pulse reception. These are all types of am signals, and the manner in which the receiver processes one type differently than the others is concerned with post-demodulation signal processing (primarily in the method of gain control) rather than with the method of demodulation itself. Other sections of MODE switch S4 affect post demodulation signal processing, as will be explained in greater detail in the schematic descriptions.

A video amplifier provides a rear panel video output signal at J8. The level of this signal is controlled by VIDEO GAIN control R15. The video signal is also applied to the squelch gate through AUDIO GAIN control R13. The squelch gate mutes the receiver audio output until the agc-derived COR voltage at the squelch gate is sufficient to override the applied voltage from COR/SQUELCH THRESHOLD control R16. When this occurs (due to the presence of a signal strong enough to produce the required COR voltage), the squelch gate completes the circuit, and the audio signal is permitted to pass through and be applied through the amplifier, to the audio outputs at rear panel AUD/OUT terminal TR1, and to the front panel PHONES jack. The COR squelch threshold level can be varied by means of front panel COR/SQUELCH THRESHOLD control R16.

3.2.2 TUNER SWITCHING ASSEMBLY. - Tuner switching assembly A5 interfaces power and control voltages with the selected tuner. It also interfaces range and preset information from the tuners to the frequency counter portion of the Display Unit.

The fine-tuning input voltage is derived from FINE TUNING control R2. This voltage is applied to a voltage-variable capacitance in the LO (local oscillator) of the active tuner to cause a slight frequency excursion.

Both rf and i-f agc voltages are produced in the receiver. They are applied to the gain-controlled stages in the rf and i-f sections, respectively, of the active tuner.

The afc/dafc voltage is applied to a voltage-variable capacitance in the active tuner LO in much the same manner as the fine tuning voltage mentioned above. The resulting frequency change corrects for LO drift, and, in the case of afc, for transmitter carrier drift as well. In the DAFC mode, the control voltage is produced by dafc circuits in the Display Unit. In the afc mode, the control voltage is obtained from the output of the active fm discriminator.

The sweep reversal output of the tuner switching unit is applied to the afc/dafc amplifier and causes that amplifier to reverse the polarity slope of the afc/dafc voltage applied to the active tuner. Since the conversion process in the tuners may or may not result in a net sideband inversion (depending upon which tuner is selected), it is necessary to have the capability of reversing the afc/dafc voltage polarity when the band is changed; otherwise, the afc/dafc circuit would tend to magnify tuner LO drift instead of reducing it for some bands. A voltage level from the active tuner programs the afc/dafc amplifier to produce a correction voltage of the proper polarity. The sweep reversal voltage is also made available as a rear panel output at J7 for application to the Display Unit signal monitor. This will change its sweep direction in order to accommodate the difference in sideband inversions among the tuners as mentioned above.

The tuner switching assembly also provides range and preset information at J6 for the Display Unit frequency counter. The range information sets the frequency counter so that it is capable of counting the frequency range of the active tuner LO. The preset information causes the counter to offset the actual LO frequency by an amount equal to the first i-f, (tuner) thus resulting in a true, receiver-frequency readout (as opposed to an LO frequency readout). For example, if the 500-1000 MHz tuner (A4) is active and tuned to a frequency of 700 MHz, the LO frequency would be 60 MHz higher (the tuner first i-f), or 760 MHz. To offset this, the tuner preset output at J7 automatically causes the counter to read 60 MHz lower, or 700 MHz, the actual receiver tuned frequency. Thus, a true receiver frequency reading is obtained. The preset sequence input of the tuner switching assembly is normally grounded in the frequency counter to activate the tuner presets. The selected receiver tuner LO output is applied via coupling network U1 to the external counter.

3.2.3 AGC. - Gain control voltages are produced for all reception modes. In the AM/FAST AGC, AM/SLOW AGC, FM, and PULSE modes, the gain control voltage is produced automatically (agc). In the CW and AM/MAN modes, a manual gain control voltage is used, although the agc voltage is still produced to drive the signal strength meter.

The agc voltage is derived from the am detector. For the AM/FAST AGC, AM/SLOW AGC, and FM reception modes, the filtered am video signal is applied to an averager circuit via S4B-W. For the CW, AM/MAN, and PULSE reception modes, the am video output of the am detector is applied to a pulse stretcher (which exhibits a fast-attack slow-decay characteristic), and then to the averager via S4B-W.

The averager produces a dc output voltage proportional to the average value of the applied input voltage, which is then applied to the agc amplifier through S4C-W in the AM/FAST AGC, AM/SLOW AGC, FM, and PULSE modes. In the

CW and AM/MAN modes, a manual gain control voltage from RF/IF GAIN control R9, is applied to the agc amplifier. The averager output is used to drive the signal strength meter in all reception modes.

From S4B-W, the gain control voltage is applied to the agc amplifier, which produces rf and i-f agc or MGC (manual gain control) voltages, a COR line voltage, and an agc monitor voltage. The rf agc/MGC voltage is applied to the rf section of the active tuner. The i-f agc/MGC voltage is applied to the active i-f amplifier in the receiver and the i-f section of the active tuner. The COR line voltage is applied to the squelch gate as mentioned in paragraph 3.2.1. The agc monitor voltage is made available as a rear panel output at J7 Pin J.

3.2.4 COR/SQUELCH. - The operation of the squelch gate was explained in paragraph 3.2.1. Assuming that a signal has caused the squelch gate to pass signals, a dc level is applied to the COR driver, which quickly activates the carrier-operated relay. The COR release time (the time required for the relay to release after the received input signal falls below the squelch threshold) is approximately 2 or 12 seconds, depending on the setting of the front panel COR FAST/SLOW switch. The relay comprises three SPDT contacts, two sets of which are wired to rear panel connector J7, with the remaining set being used to illuminate front panel indicator DS5 when the relay is activated.

3.2.5 AFC/DAFC. - A three-position (center off) toggle switch (S2) is used to select either the open loop, afc, or dafc frequency correction modes. With S2 in the OFF position (open loop), no frequency correction is made to the active tuner LO to compensate for tuner LO or transmitted carrier drift. When S2 is placed in the afc position, the afc/dafc amplifier responds to the afc error voltage (fm video) output of the active fm discriminator (note that the fm video signal is available for all reception modes). For a frequency-symmetrical signal the fm video output voltage should average zero volts when the receiver is tuned exactly to the center (carrier) frequency. If the tuner LO or transmitter carrier frequency drifts, the average value of the fm video output voltage will become either positive or negative, depending upon the direction of the drift. This error voltage is then amplified by the afc/dafc amplifier, and applied to the active tuner LO as explained in paragraph 3.2.2, varying the LO frequency to counteract the drift. If S2 is placed in the dafc position, a dafc correction voltage from the counter section of the Display Unit is applied to the active-tuner LO in the same manner as for the afc mode. The dafc circuits lock the receiver to a single frequency, giving greater frequency stability than afc can provide. The dafc circuits, however, do not permit the receiver to track a drifting transmitter carrier as with afc. See paragraph 2.3.10 for a fuller discussion of the advantages and disadvantages of these two modes of frequency control.

3.3 MAIN CHASSIS SCHEMATIC

Figure 6-32 is the main chassis schematic diagram. All the interconnections among the inputs, outputs, and major assemblies (A1-A11) are shown. The subassemblies of the major assemblies are shown in the individual schematic diagrams of the corresponding major assemblies, and will be covered in subsequent paragraphs. Also shown on the main chassis schematic diagram are the switches, relays, meters, controls, and other components that are not part of any of the assemblies.

Tuner switching assembly A5 selects tuning head A1-A4 for use by the receiver as explained in paragraph 3.2.2. The details of the interconnections are shown on the main chassis schematic diagram.

AC line filter FL1 and power supply transformer T1 are also mounted on the main chassis. F1 and F2 are power line fuses that protect the receiver against current overloads. These fuses are in series with POWER switch S1 and the primary windings of the transformer. When rear panel line voltage selector switch S5 is in the 115 V position, the transformer primary windings are in parallel, and F1 (3/4 A) is used. When S5 is in the 220 V position, the windings are placed in series, and F2 (3/8 A) is used. (F1 is still in the circuit for 220 V operation, but in the event of a current overload, F2 will blow first because of its lower current rating.) A simple modification can be made (see schematic note 4) to permit 230 volt operation.

The transformer has four secondary windings. One of these, connected to pins 6-7-8, supply ac to ±15 V power supply modules U2 and U3. The second winding, pins 14 and 15, supply 5 V ac to operate the dial lamps in the active tuner and the front panel receiver COR lamp. The 6.3 V ac winding (connected to pins 12-13) routes to power interconnect J5.

3.4 WJ-9066-3 26-90 MHz TUNING HEAD (A1)

3.4.1 GENERAL. - Figures 6-1 and 6-2 are the schematic diagrams of the WJ-9066-3 Tuning Head. Referring to functional block diagram Figure 3-2, the incoming rf signal is applied to A1J1 and then to a tunable preselector. After amplifications by a cascode rf amplifier (the first stage of which is automatic gain controlled), the signal is applied to an interstage network (gang-tuned with the preselector) and down-converted to the 21.4 MHz range in a double-balanced mixer. The output of the local oscillator (also gang-tuned with the preselector) is buffered before being applied to the mixer to be heterodyned with the incoming signal. The mixer output is amplified by a cascode i-f amplifier, and routed to i-f output jack A1J3.

The LO signal is made available at A1J2. The dafc and fine tuning inputs are applied to a varactor diode in the LO tank circuit.

3.4.2 TYPE 71425-1 26-90 MHz RF TUNER (A1A1). - Figure 6-2 is the schematic diagram for the rf tuner. Incoming rf signals from jack J1 are applied to an impedance matching network made up of capacitors C10 and C11. These capacitors match the antenna impedance to the input impedance of the first rf stage to achieve the best combination of noise figure and VSWR. Resistor R1 returns to ground any static charge that may build up on the antenna. Signals from the divider are applied to a tunable preselector network, a double-tuned bandpass filter. The input and output sections of the network are mechanically tuned by inductors L1A and L1B respectively. These two components are the first and second sections of a five-section inductuner. The center frequency response is set by variable capacitors C13 and C17. End inductors L3 and L4 supply the required inductance to limit the inductuner range to 26-90 MHz. Capacitor C15 provides primary coupling through the network. As the tuning approaches the low end and the impedance of L3 and L4 is reduced, signal coupling is increased through C16. Additional loading at the low-frequency end is provided by resistor R2. Blocking capacitor C20 couples the signals from the preselector to the RF amplifier stage.

3.4.2.1 RF Amplifier. - Q1, a dual insulated-gate field-effect transistor (IGFET) functions as the first rf amplifier. Q1 is ac-coupled to Q2, a junction field-effect transistor (JFET). The input stage operates in a common source circuit while Q2 operates in a grounded gate circuit. The cascode configuration formed by Q1 and Q2 eliminates the need for neutralization. Q2 is housed in a separate brass compartment for maximum input-to-output isolation. The source of Q1 is held at rf ground potential by C23 and gate no. 2 is held at rf ground potential by C21. Incoming rf signals are applied to gate no. 1 (pin 3) of Q1. Amplified signals are taken from pin 1, the drain connection. The agc voltage is applied to gate no. 2 of Q1 via R7 and divider R8 and R9. Before agc action begins, CR1 is forward biased through R6 and R7. Gate no. 2 is held at +3.4 V by the resultant voltage drops across R6, R7, and CR1. When the negative agc voltage goes above 0.6 V, CR1 becomes reverse biased and the positive bias on gate no. 2 is reduced, reducing the gain of Q1. Diode CR1 creates a delayed agc action, by allowing the agc voltage to increase to 0.6 V before having an effect on the gain of Q1. CR1 also protects Q1 from an accidental application of positive voltage at the agc input. Signals taken from pin 1 of Q1 are fed through inductor L5 and blocking capacitor C25 to the source connection of output stage Q2. An LC-network filter formed by the output capacitance of Q1, inductor L5, and the input capacitance of Q2 increases the effective gain of the rf amplifier at high-frequencies to compensate for losses in the circuit at the high end of the tuning range. Amplified rf signals from the drain (pin 1) of Q2 are coupled through parasitic suppressor R13 to the interstage network.

3.4.2.2 Interstage Network. - A double-tuned, tunable bandpass filter couples the rf signal between the rf amplifier and balanced mixer. Inductuner sections L1C and L1D tune the input and output sections, respectively. Variable capacitors C28 and parallel combination C16+C36 set the low-end response center frequency while end inductors L7 and L9 affect the high-end center response frequency. Signals are coupled through the network near the 90 MHz end of the band through C29 and C35. In order to maintain a constant coefficient of coupling between the input and output sections as the tuning approaches 90 MHz, a compensation network is used. This network, consisting of L8 and C33, is resonant just below the low end of the band and appears capacitive as the tuner approaches 90 MHz. The dividing action that occurs between C29 and C33 eliminates an over-coupled condition that would result at higher frequencies. By maintaining optimum coupling through the tuning range, the bandwidth and gain of the rf stage are kept even across the band. L7, L9, and C32 increase coupling through the interstage network at the low end of the tuning range. End inductors L7 and L9 provide increased inductor reactance at higher frequencies, decreasing coupling through C32 at the high end of the tuning range. R15 provides additional loading of the network at the low end of the range. Capacitor C38 couples rf signals from the interstage network to the first mixer.

3.4.2.3 Local Oscillator and Buffer. - Local oscillator Q3 is a Clapp circuit that tunes 21.4 MHz higher than the incoming rf signal. The oscillator is tuned between 47.4-111.4 MHz by inductuner section L1E, which is mechanically coupled to the other sections of the inductuner. Regenerative feedback to sustain oscillation is taken from the emitter of Q1 and fed through R17 and the tuned circuit to the base. Variable capacitor C43 is connected across the oscillator tank to provide a means of adjusting the frequency at the low end of the band for precise dial tracking. End inductor L11 provides the same function at the high end of the band. Shunt inductor L12 sets the lowest frequency tuned by the oscillator. Varactor CR2, a diode whose capacitance varies inversely with the reverse bias applied across it, allows the oscillator frequency to be varied by a control voltage from outside the tuning head. This bias is derived from two sources: a FINE TUNING control on the front panel of the receiver, or an external frequency counter when dafc is used. The FINE TUNING control can be adjusted over a range of approximately 3.5 V. Changing the bias across CR2 through this range will shift the local oscillator a minimum of 21.4 kHz. If the FINE TUNING control is rotated in the clockwise direction, the reverse bias will be increased. The capacitance of the diode will be decreased and the oscillator frequency will be increased. The dafc voltage (from the WJ-9026/DU) is applied to CR2 through R21. The level of the dafc correction voltage, and the corresponding amount of frequency change, is determined by the amount of local oscillator drift sensed by the dafc counting circuits in the Display Unit. Capacitor C45 couples the varactor into the oscillator tank circuit. Temperature compensation to reduce frequency drift is provided by C56, which has a negative temperature coefficient. The oscillator output signal is fed to the base of buffer amplifier Q4 through coupling capacitors C46 and C47. The buffer amplifier isolates the oscillator from the first mixer and from the LO output jack to prevent changing load conditions from affecting oscillator frequency. Torroidal transformer T1 forms the collector load for Q4 and is tapped to provide a better impedance match to the following network. Blocking capacitor B48 provides coupling between T1 and T2. Transformers T1 and T2 and resistor R30 form a hybrid power splitter. A portion of the LO signal is taken from T2, pin 3, and fed through a 50-ohm attenuator made up of R31, R32, and R36, to output jack J2. The remaining portion of the LO signal is taken from T2, pin 2, and is fed directly to the first mixer (U1).

3.4.2.4 Part 18056-1 Mixer/IF Amplifier. - U1 is a balanced mixer that suppresses the rf and LO inputs, producing sum and difference signals at its output. The rf signal is applied to pin 8 of U1 and the LO signal is connected to pin 5. The mixer output signals are taken from pins 3 and 7 through blocking capacitor C1 to the i-f amplifier stage. Since the following circuit is tuned to the difference frequency of 21.4 MHz, only it is passed. Transistors Q1 and Q2 form a cascode i-f output amplifier. Transistor Q1 operates in a common emitter circuit and Q2 operates in a grounded base circuit. Negative feedback from the collector to the base of Q1 through C2 and R2 improves the stability of the amplifier. The 21.4 MHz output signals are developed across a tuned circuit formed by variable capacitor C4 and transformer T1. The transformer is tapped to provide the proper impedance match between the amplifier circuit and the i-f input. Blocking capacitor C6 couples the i-f signals from the tank circuit to gain potentiometer R7. The arm of of R7 feeds the output signals to jack J3.

3.5 WJ-9062-3 90-300 MHz TUNING HEAD (A2)

3.5.1 GENERAL. - Figure 6-3 is the schematic diagram for the WJ-9062-3 Tuning Head. Referring to functional block diagram Figure 3-3, the incoming rf signal is applied to A1J1 and then to a double-tuned preselector. After amplification by a cascode rf amplifier (the first stage of which is automatic gain controlled), the signal is applied to a double-tuned interstage network (gang-tuned with the preselector), and down-converted to the 21.4 MHz range in a double-balanced mixer designed for low intermodulation distortion. The output of the local oscillator (also gang-tuned with the preselector) is buffered before being applied to the mixer to be heterodyned with the incoming signal. The mixer output is then amplified by a cascode i-f output amplifier. A selective impedance matching network at the output of this amplifier passes the 21.4 MHz mixer output, rejects mixer sum and fundamental components, and steps down the circuit impedance to 50 ohms. The 21.4 MHz i-f output of the tuning head is made available at A1J3.

The LO signal is made available at A1J2. The dafc and fine tuning inputs are applied to a varactor diode in the LO tank circuit.

3.5.2 TYPE 71401-3 90-300 MHz RF TUNER (A2A1). - Figure 6-4 is the schematic diagram for the rf tuner. Incoming rf signals from jack J1 are applied to an impedance matching network made up of capacitors C10 and C11. These capacitors match the antenna impedance to the input impedance of the first rf stage to achieve the best combination of noise figure and VSWR. Resistor R1 returns to ground any static charge that may build up on the antenna. Signals from the divider are fed to a tunable preselector network, a double-tuned bandpass filter. The input and output sections of the network are mechanically tuned by inductors L1A and L1B respectively. These two components are the first and second sections of a five-section inductuner. The low-frequency response is set by variable capacitors C13 and C17. End inductors L3 and L4 are center-tapped to provide a better impedance match at the input and output and to give a vernier adjustment of the highest frequency tuned by the network. These inductors, along with L2 and L5, compress the range of the inductuner into the range covered by the tuning head. Signal coupling between the network sections is provided by C12 and C14. C14 has most of its effect at the low end of the band. Blocking capacitor C16 couples the signals from the preselector network to the rf amplifier stage.

3.5.2.1 RF Amplifier. - Transistor Q1, a dual insulated-gate field-effect transistor (IGFET), functions as the first rf amplifier. It is ac-coupled to Q2, a junction field-effect transistor (JFET) in a cascode circuit. Q1 is operated in a common source circuit while Q2 is operated in a common gate circuit. Q2 is housed in

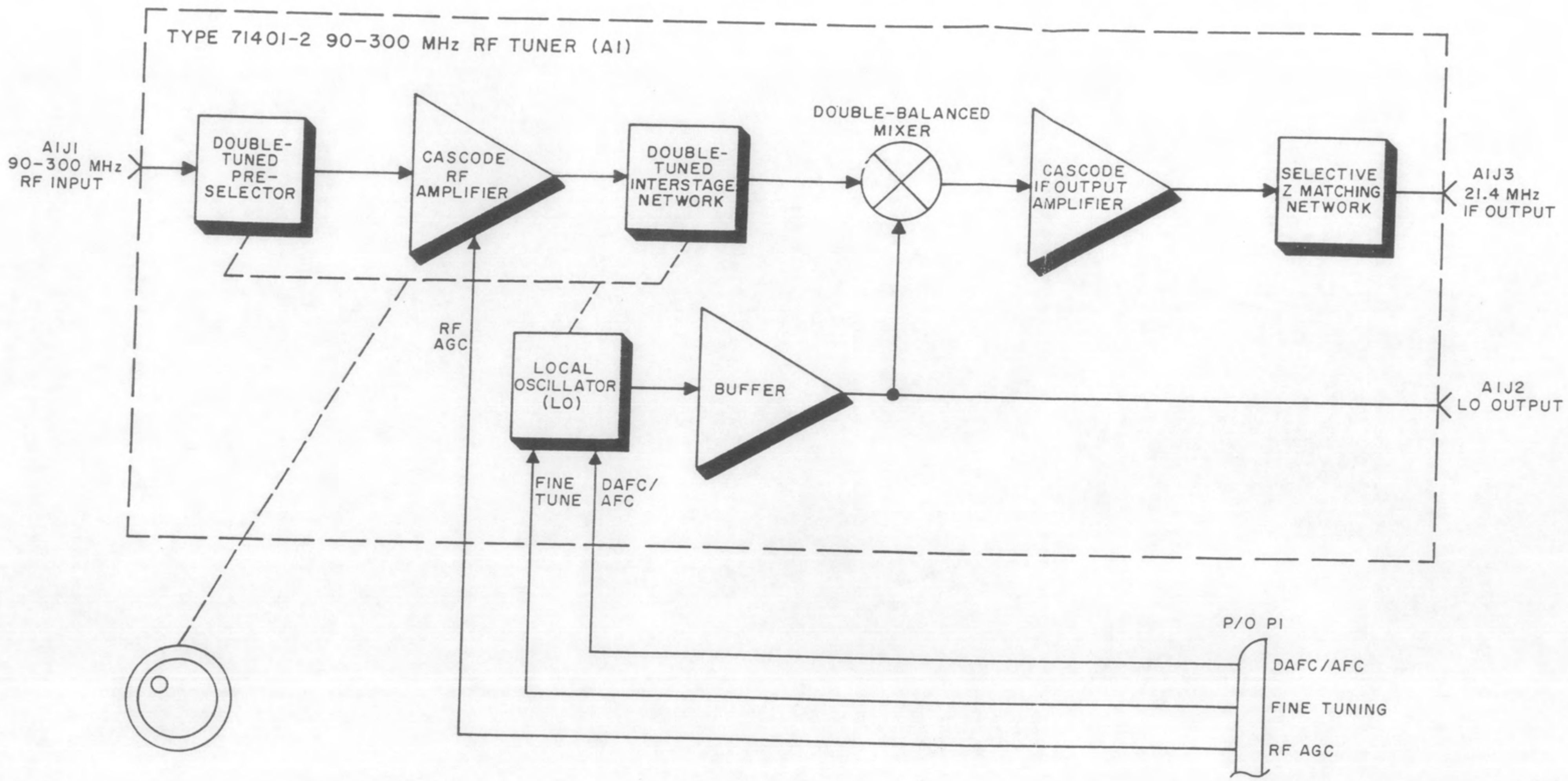


Figure 3-3. WJ-9062-3 Tuning Head (A2),
Functional Block Diagram

a brass compartment for maximum input-to-output isolation. The source (pin 2) and gate-pin 4 of transistor Q1 are held at rf ground by capacitors C19 and C15, respectively. Incoming rf signals are applied to gate no. 1 (pin 3) of Q1. Amplified signals are taken from pin 1, the drain connection. The agc voltage is applied to gate no. 2 of Q1 via R7 and R6. Before agc action begins, CR1 is forward biased through R6 and R7. Gate no. 2 is held at +3.4 V by the resultant voltage drops across R6, R7, and CR1. When the negative agc voltage goes above 0.6 V, CR1 becomes reverse biased and the positive bias on gate no. 2 is reduced, reducing the gain of Q1. CR1 creates a delayed agc action by allowing the agc voltage to increase to 0.6 V before having an effect on the gain of Q1. Diode CR1 also protects Q1 from the accidental application of a positive voltage at the agc input. Signals taken from pin 1 are applied through inductor L6 and blocking capacitor C21 to the source connection of the output stage, Q2. A pi-network filter formed by the output capacitance of Q1, inductor L6, and the input capacitance of Q2 increases the gain of the rf amplifier at the high-frequency end to compensate for the reduced gain of the FETs at higher frequencies. Amplified rf signals from the drain (pin 1) of Q2 are fed through parasitic suppressor R12 to the interstage network.

3.5.2.2 Interstage Network. - This interstage network is a double-tuned, tunable bandpass filter which couples the rf signal between the rf amplifier and balanced mixer. Inductuner sections L1C and L1D tune the input and output sections, respectively. Variable capacitors C28 and C36 set the low-end response center frequency. End inductors L8 and L10 affect the high-end center frequency and are tapped to provide a better impedance match at the input and output of the filter. The high-end bandwidth is adjusted by capacitor C33. Capacitor C23 increases the coupling at the low end of the tuning range. These two components, in conjunction with L9 and L11, also help compress the range of interstage network inductor sections into that covered by the tuning head. Resistor R35 loads the output section at the low end of the tuning range. Coupling capacitor C29 feeds rf signals from the interstage network to the mixer.

3.5.2.3 Local Oscillator and Buffer. - Local oscillator Q3 operates in a Clapp circuit that tunes 21.4 MHz above the incoming rf signal. The oscillator is tuned between 111.4 and 321.4 MHz by inductuner section L1E which is mechanically coupled to the other sections of the inductuner. Regenerative feedback to sustain oscillation is taken from the emitter of Q1 and applied through R15 and the tuned circuit to the base. Variable capacitor C43 is connected across the oscillator tank circuit to provide a means of adjusting the frequency at the mid band to establish oscillator tracking. Inductor L14 performs the same function at the high end of the tuning range. Shunt inductor L12 sets the lowest frequency tuned by the oscillator. Varactor CR2, a diode whose capacitance varies inversely with the reverse bias applied across it, allows the oscillator to be tuned by a control voltage from outside the tuning head. The control voltage is taken from either a FINE TUNING control on the front panel of the receiver, the afc circuit in the receiver, or from the Display Unit frequency counter when dafc is used. The FINE TUNING control can be adjusted over a range of approximately 3.5 V.

Changing the bias across CR2 through this range will shift the local oscillator a minimum of 8 kHz. If the FINE TUNING control is rotated in the clockwise direction, the reverse bias will be increased. The capacitance of the diode will be decreased and the oscillator frequency will be increased. The afc/dafc voltage is applied to CR2 through R21. The level of the correction voltage and the corresponding amount of frequency change is determined by the amount of local oscillator drift sensed by the afc/dafc counting circuits of the external dafc counter. Capacitor C35 couples the varactor into the oscillator tank circuit. The oscillator output signal is applied to the base of buffer amplifier Q4 through parasitic suppressor R22 and capacitor C38. The buffer amplifier isolates the oscillator from the balanced mixer and from the LO output jack to prevent changing load conditions from affecting oscillator frequency. Toroidal transformer T2 forms the collector load for Q4. It is tapped to provide a better impedance match to the following network. Blocking capacitor C41 provides coupling between transformer T2 and T3. Transformers T2 and T3 and resistor R28 form a hybrid power splitter. A portion of the LO signal is taken from T3, pin 2, and fed through a coaxial cable to the mixer. The remaining LO output from T3, pin 3, is applied through a 50-ohm attenuator made up of R29 through R31 to jack J2. Capacitor C44 attenuates high order harmonics at jack J2.

3.5.2.4 Part 16311 Mixer/IF Amplifier. - Module U1 is a double-balanced mixer that suppresses the rf and LO inputs, producing sum and difference signals at its output. The rf signal is applied to pin 8 of U1 and the LO signal is connected to pin 5. The mixer output is taken from pins 3 and 7 and coupled through blocking capacitor C1 to the i-f amplifier stage. Since the i-f amplifier stage that follows is tuned to the difference frequency of 21.4 MHz, only it is passed. Transistors Q1 and Q2 form a cascode i-f output amplifier. Transistor Q1 operates in a common emitter circuit and Q2 operates in a grounded base circuit. Negative feedback is developed across an unbypassed emitter resistor, R4, and from the collector to the base of Q2 through C2 and R2 to improve the intermodulation characteristics of the amplifier. A 21.4 MHz output signal is developed across a tuned tank circuit formed by variable capacitor C4 and transformer T1. Transformer T1 provides an impedance match between the amplifier circuit and the i-f input of the associated receiver. Blocking capacitor C6 couples the i-f signals from the transformer to gain control potentiometer R7. The arm of R7 feeds the output signals to output jack J3.

3.6 WJ-9064-3 235-500 MHz TUNING HEAD (A3)

3.6.1 Referring to the functional block diagram, Figure 3-4, a signal at the received frequency is applied to an rf preselector network. From this network the signal is applied to i-f amplifiers A1Q1 and A1Q2. The amplified signal from A1Q2 is then applied to a double-tuned interstage network which adds greater front end selectivity to the tuner. The signal is further amplified by A1Q3, and coupled to a single-tuned bandpass network which further enhances the rf selectivity. The high degree of rf selectivity results in rf images being attenuated to very low levels. Ganged tuning is used to track the front end rf tuned circuits

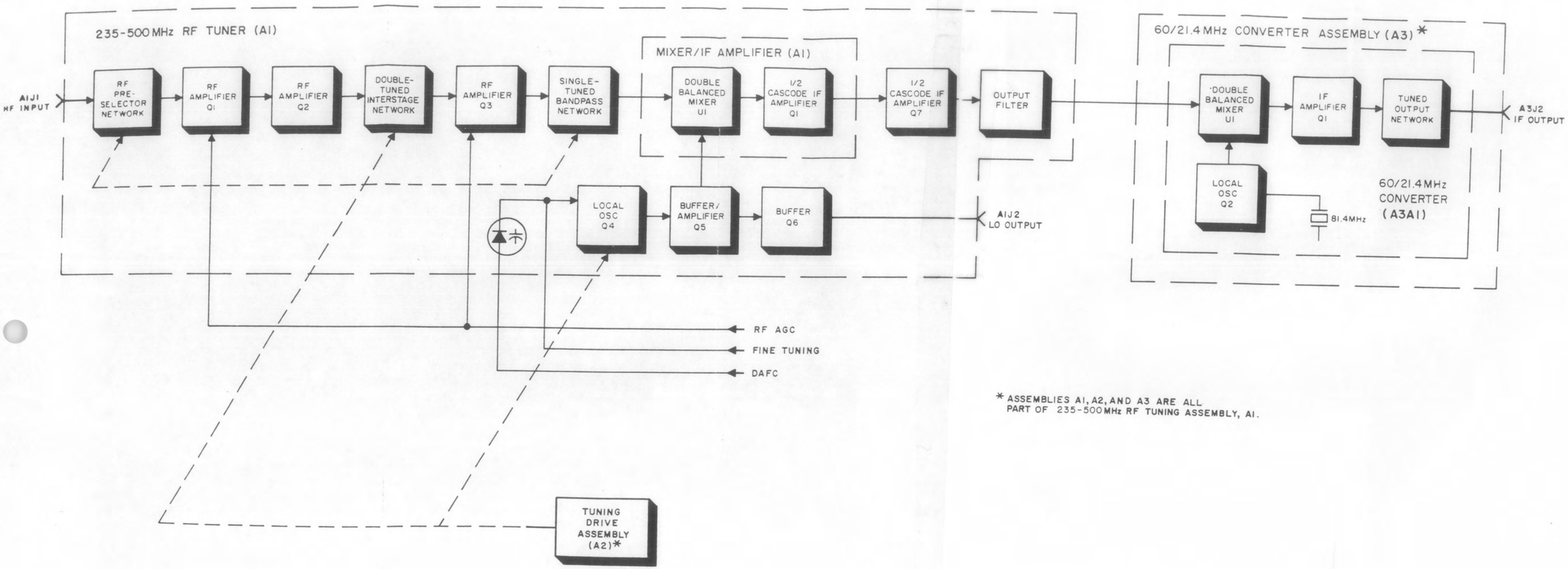


Figure 3-4. WJ-9064-3 Tuning Head (A3), Functional Block Diagram

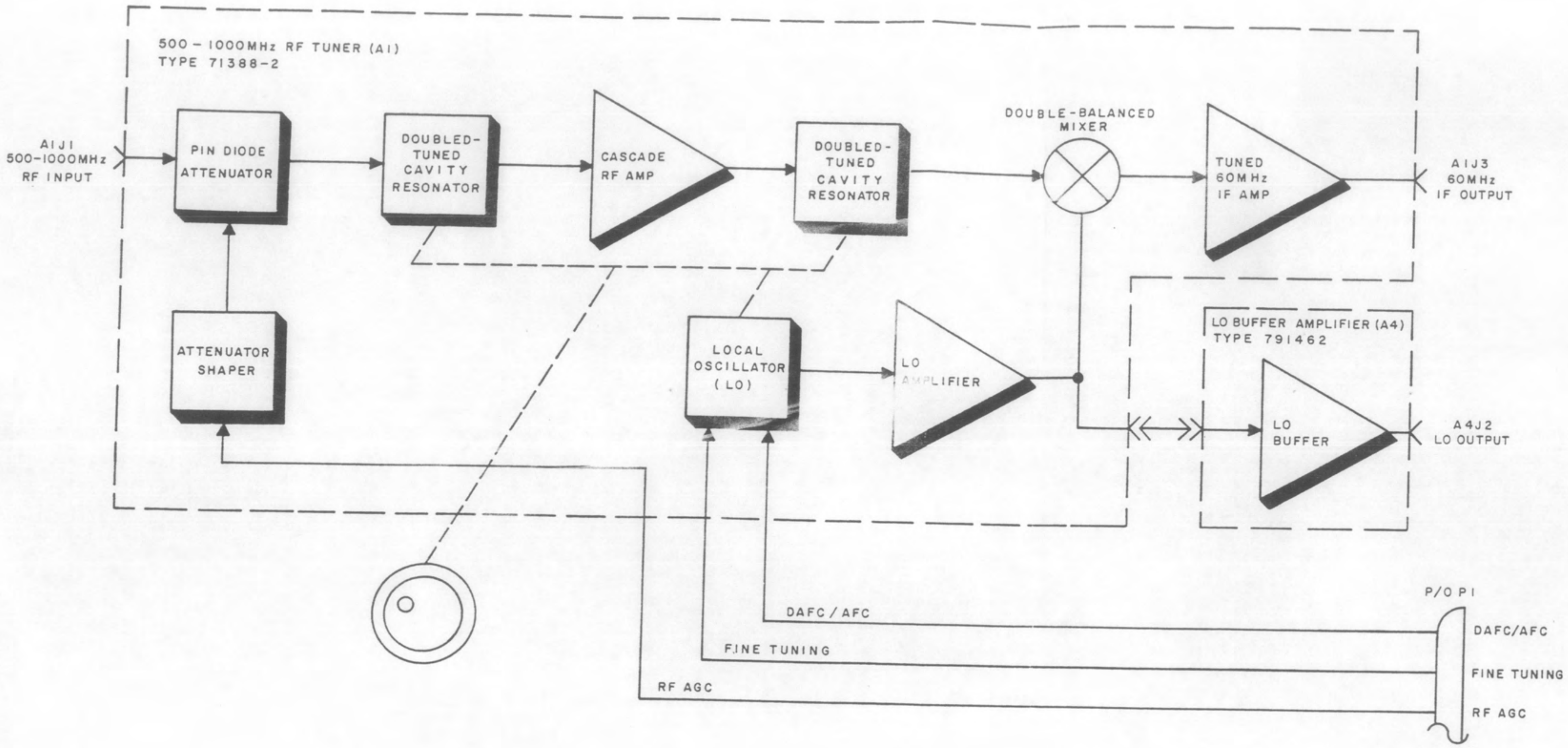


Figure 3-5. WJ-9065-3 Tuning Head (A4), Functional Block Diagram

with the LO, both of which are inductively tuned.

3.6.2 The amplified and band limited signal from the single-tuned bandpass network is mixed with the LO signal in double-balanced mixer A1A1U1. The LO signal is first amplified by buffer amplifier A1Q5 which also provides load isolation to minimize LO frequency pulling. Buffer A1Q6 provides external LO output. Since the LO tunes 60 MHz higher than the incoming signal frequency, the difference frequency is 60 MHz. This difference frequency is the first i-f. The 60 MHz i-f signal is amplified by cascode amplifier A1A1Q1 and A1Q7. The output filter rejects unwanted mixer products and incidental signals that are not at or near the 60 MHz i-f center frequency.

3.6.3 The 60 MHz i-f signal is then sent to the 60/21.4 MHz converter assembly, A3, where it is mixed in double-balanced mixer A3A1U1 with an 81.4 MHz signal from crystal-controlled oscillator A3A1Q2. The 21.4 MHz difference-frequency output is used as the second i-f. The mixer output is then amplified by A3A1Q1. The output network establishes a 5 MHz bandwidth at 21.4 MHz output J2. Level can be adjusted by potentiometer R7.

3.6.4 Additional inputs to the tuning head are provided for fine tuning, afc, and rf agc. The fine tuning control is located on the associated receiver, and varies a dc voltage on the fine tuning control line. This voltage in turn varies the reverse bias on a varactor diode in the local oscillator (A1Q4) which results in a slight frequency excursion. The afc input varies the frequency of the local oscillator in a similar manner as does the fine tuning, and is used to correct the local oscillator for changes in frequency due to drift. The agc voltage from the associated receiver is applied to the rf amplifiers to maintain constant output. In addition to these inputs, the tuning head provides an external output for the LO signal at A1J2.

3.6.5 TYPE 71423-1 60/21.4 MHz CONVERTER ASSEMBLY. - The schematic diagram for the converter is Figure 6-7; its reference designation prefix is A3A3. Intermediate frequency signals from the 60 MHz i-f amplifier entering the converter at J1 are coupled through a low pass filter made up of L1 and C1 on the brass chassis. The filter is used to provide additional rejection of the first LO signal, which otherwise would enter the converter and would produce undesirable spurious frequencies. The i-f signal from the LO filter is applied to balanced mixer U1, at pin 6. Sum and difference outputs from U1 are coupled to the base of i-f amplifier Q1; original and LO components are suppressed by the mixer. Since the collector of this stage is tuned to the 21.4 MHz difference frequency, only the signals at this frequency will be passed. Negative feedback, provided by R2 and C2, improve the intermodulation characteristics of this stage. The collector is connected to impedance-matching transformer T1 through parasitic suppressor R4. The transformer is resonant with C9 at the intermediate frequency and forms the first section of a double-tuned bandpass filter. The output is a pi-network made up of C6, L1 and C7. The filter eliminates the unwanted mixer products and sets the desired output bandwidth. Potentiometer R7 sets the overall gain of the tuning head.

3.6.5.1 The buffered LO signal is applied from the collector of Q1 to pin 1 of U1. Transistor Q3 is an oscillator circuit which operates through a feedback loop containing an 81.4 MHz crystal. Inductor L2 provides fine tuning centered on this frequency. The input to Q1 is tapped off resonant tank circuit C4, C5 and L2. Transistor Q1 is a buffer amplifier providing coupling between the oscillator and the input to the mixer U1. Resonant tank circuit C2-L1 can be adjusted for the center frequency of 81.4 MHz.

3.7 WJ-9065-3 500-1000 MHz TUNING HEAD (A4)

3.7.1 GENERAL. - Figures 6-8 and 6-9 are the schematic diagrams for the WJ-9065-3 Tuning Head. Referring to functional block diagram Figure 3-5, incoming rf signals in the 500-1000 MHz range are applied to a PIN diode attenuator through A1J1. The attenuator is controlled by the rf agc voltage (as modified by the attenuator shaper) developed in the receiver i-f stages, resulting in an rf agc voltage-controlled attenuation from less than 1 dB to at least 40 dB. The attenuator shaper produces an agc characteristic that is more compatible with the PIN diode attenuator.

The rf selectivity is provided by four tuned cavities, with two preceeding and two following the rf amplifier. The output of the fourth cavity is applied to a hot-carrier diode, double-balanced mixer, where it is heterodyned with an LO signal 60 MHz higher in frequency to produce a 60 MHz i-f signal. A tuned 60 MHz i-f stage amplifies the signal, rejects sum and fundamental mixer products, and provides a 50 ohm, 60 MHz i-f output at A1J3 for application to the 60/21.4 MHz converter in the 235-500 MHz, WJ-9064-3 Tuner.

The LO is gang-tuned with the rf cavities so that its resonant frequency tracks 60 MHz higher in frequency. The LO signal is amplified for application to the double-balanced mixer, and then routed to an LO buffer amplifier. The buffered LO signal is available at A4J2. Fine tuning and afc/dafc inputs at P1 are applied to varactor diodes in the LO tank.

3.7.2 TYPE 71388-2 500-1000 MHz RF TUNER (A4A1). - Figure 6-9 is the schematic diagram for the rf tuner. Refer also to the WJ-9065-3 functional block diagram (Figure 3-5) for the following circuit description.

3.7.2.1 PIN Diode Attenuator. - The PIN diode attenuator reduces the available signal level from J1 as a function of the agc level. Attenuation for signals beneath the agc threshold is less than 1 dB, while attenuation of strong signals that produce the maximum agc voltage is approximately 40 dB. Since this attenuator is identical to the one discussed in paragraph 3.6.2.1, a detailed discussion of the module will not be presented here.

3.7.2.2 Attenuator Shaper. - The attenuator shaper modifies the agc characteristic so that it is more compatible with the PIN diode attenuator. Since the attenuator shaper is identical to the one discussed in paragraph 3.6.2.2, a detailed discussion of the module will not be presented here.

3.7.2.3 Double-Tuned Cavity Resonators. - The rf signals from the PIN diode attenuator are coupled to the first section of the cavity via L7. The cavity is tuned to resonance by variable capacitor C1A (the first section of the main tuning capacitor). C25 and L19 are adjusted during alignment so that the tuned cavity tracks with the other cavities in the tuner 60 MHz below the LO frequency. RF energy is coupled from the first cavity to the second through coupling iris M (a small hole in the wall separating the two cavities). The second cavity is identical to the first. RF energy from this cavity is coupled to the first rf stage (Q1) via L10. The output of the second rf amplifier stage (Q2) is coupled into two additional cavities identical to the two previously described by means of L11. L14 couples the output of the fourth cavity to double-balanced mixer A3U1. The overall rf bandwidth is 17 MHz at 500 MHz and 40 MHz at 1000 MHz.

3.7.2.4 RF Amplifier. - Q1 and Q2 are cascaded common emitter rf amplifiers. The output of Q1 is developed across L3 and applied to the base of Q2 through bandstop filter L18-C40. This filter provides some attenuation to signals near the low end of the tuning range to compensate for lower amplifier gain at the high end, thus providing a flatter frequency response across the 500-1000 MHz range. R30 sets the Q of the filter. CR3 is a PIN diode that varies its resistance with applied agc voltage, resulting in a voltage-variable diode resistance between 30 and 1000 ohms (the variable shunt resistance changes the overall gain of the rf amplifier). After the PIN diode and bandstop filter, the signal is amplified by Q2 and coupled through L11 into the tuned cavity. Extensive decoupling is achieved using bypass capacitors and ferrite beads.

3.7.2.5 Local Oscillator. - The LO comprises Q4 and its associated components. The tuning range of the LO is 560-1060 MHz, with tuning accomplished by C1E (gang-tuned with the rf cavities). The LO tuning circuitry is adjusted during alignment by C29 and C34 so that the LO frequency tracks 60 MHz above the tuned frequency of the rf cavities. Q4 is operated in the common emitter mode as a modified colpitts oscillator. CR2 is a varactor diode that is used to vary the LO frequency when afc/dafc or fine tuning voltages are applied to FL5 and FL6, respectively. The LO output is inductively coupled from L17 to L15, from where it is applied to the input of common emitter LO amplifier, A3Q2. The output of A3Q2 is applied simultaneously to the L port of double-balanced mixer A3U1 and the input of common emitter amplifier Q3. The output impedance of Q3 is stepped down to 50 ohms by L3-C15-L4 and applied to LO output jack J2.

3.7.2.6 Double-Balanced Mixer and IF Amplifier. - The rf signal from the last cavity and the LO signal (60 MHz higher in frequency) are heterodyned in double-balanced mixer A3U1 to produce a 60 MHz difference frequency. The mixer output is amplified by cascode amplifier A3Q1 and Q3. A 60 MHz filter and impedance matching network at the output of Q3 rejects mixer sum and fundamental products and step down the impedance to 50 ohms. The 60 MHz i-f signal is applied to J3 (i-f output) via the resistive pad formed by R15, R16, and R17. From J3, the 60 MHz signal is routed to i-f switching assembly A8 from where it is sent to the 60/21.4 MHz converter on the WJ-9064-3 Tuning Head. As mentioned previously, this 60/21.4 MHz converter is used for both the WJ-9064-3 and WJ-9065-3 Tuning Heads.

3.7.3 TYPE 791462 LO BUFFER AMPLIFIER (A4A4). - Figure 6-10 is the schematic diagram for the buffer amplifier. The LO signal from J2 on the rf tuner (see Figure 6-10 for an interconnection diagram between the WJ-9065-3 Tuning Head modules) is applied via J1 to the amplifier input. The amplifier is an untuned common emitter type. In order to maintain a relatively flat frequency response over the 560-1060 MHz range, a frequency compensation network consisting of a resistive attenuation pad (R1, R2, and R3) shunted by a capacitor (C1) is employed. Since the reactance of C1 is less at higher frequencies, more of the input signal bypasses the pad as the LO frequency increases, providing more drive to the base of Q1. This tends to compensate for the reduction in gain of Q1 with increasing frequency resulting in a relatively flat network and transistor composite frequency response. The collector signal output voltage is developed across L1 and applied to J2.

3.8 TYPE 791499-1 TUNER SWITCHING ASSEMBLY (A5)

Figure 6-11 is the schematic diagram for the Tuner Switching Assembly. J1-J4 mate with P1 of the WJ-9066-3, WJ-9062-3, WJ-9064-3, and WJ-9065-3 Tuning Heads, respectively. All the corresponding pins of J1-J4 are connected in parallel with each other except for the ground, spares, preset sequence, ±15 V, sweep reversal, and dial light pins. The fine tuning afc/dafc, agc, and preset inputs are applied to the tuner switching assembly at the E terminals shown at the lower left corner of the schematic. Although these inputs are applied to all four tuners simultaneously, only the active tuner is affected. TUNER SELECT switch S1 determines which tuner is activated. S1D-X and S1A-W switch the respective +15 V and -15 V inputs to the selected tuner. S1A-X router the preset sequence ground from the Display Unit frequency counter to the active tuner. S1D-W routes the sweep reversal information from the selected tuner to the afc/dafc amplifier to provide the correct afc polarity. Refer to paragraph 3.2.2 in the functional description for more information on preset sequencing and sweep reversal.

S1B is used to activate relays K1 and K2 of the rf input. Switch S1C-W activates relay K3. Since one side of each relay (K1-K3) coil is wired to a positive power supply voltage, it is only necessary for a switch to ground the opposite side of the coil to activate the relay. S1C-X routes 5 V ac to the dial lights of the active tuner.

At the same time a tuner is selected, the tuner switching assembly must activate the proper signal path in LO diode switch/amplifier A9 and i-f signal path(s) in i-f switching assembly A8. Switch S1D-X supplies +15 V dc to output pins E26 through E29, as required, to activate the required stages in the LO and i-f switching subassemblies. Output E30 receives +15 V dc through diodes CR1 and CR2 when either tuner 3 or tuner 4 is selected. This output voltage routes to one input of the i-f switching assembly.

3.9 TYPE 72462-3 IF AMPLIFIER ASSEMBLY (A6)

3.9.1 GENERAL. - Figure 6-12 is the schematic diagram of the Type 72462-3 IF Amplifier assembly. This assembly contains three 21.4 MHz i-f amplifier subassemblies (A2, A3, A4,=AX), an i-f output amplifier subassembly (A5), three fm limiter/discriminator subassemblies (A6, A7, A8,=AY), a video/afc-dafc amplifier subassembly (A1), and a 12 dB attenuator (R1, R2, R3). +15 V power supply voltage received via section BX of IF BANDWIDTH switch S3 energizes only one i-f amplifier-fm limiter/discriminator pair at a time. The i-f input signal is applied in parallel to the three 21.4 MHz i-f amplifiers (pin 21 of each amplifier). The amplified i-f signal from the active 21.4 MHz i-f amplifier is applied to pin 21 of the i-f output amplifier subassembly. The gain of the active 21.4 MHz i-f amplifier is controlled by agc voltage at pin 8, obtained from the agc circuitry in assembly A10 (Type 78108-1 agc amplifier).

The i-f output amplifier subassembly provides an amplified i-f output from pin 7 which is applied to receiver rear-panel jack J12, and an amplified i-f output from pin 6 which is applied to pin 2 of each fm limiter/discriminator subassembly. The agc voltage on pin 19 controls the i-f output amplifier gain. The subassembly also contains, in addition to the i-f amplifier, an am detector and a beat-frequency oscillator. The am detector output at pin 5 is applied, via section AW of IF BANDWIDTH switch S3, to a lowpass filter in the active fm limiter/discriminator subassembly (pin 12). The variable frequency bfo is activated by +15 V received at pin 9 from section CX of MODE switch S4 when in the CW position.

The i-f output from pin 6 of the i-f output amplifier subassembly is demodulated by the active fm limiter/discriminator subassembly. The discriminator output from pin 21 is applied to the audio and video amplifier in main chassis assembly A11 and subassembly A6A1, respectively, and to the afc/dafc amplifier in subassembly A6A1, via section BW of IF BANDWIDTH switch S4, section AW of MODE switch S4, and AUDIO GAIN and VIDEO GAIN potentiometers R13 and R15. The am signal received on pin 12 of the active fm limiter/discriminator subassembly is lowpass filtered to reduce noise. The filtered signal from pin 13 is applied to the audio and video output amplifiers in assembly A11 and subassembly A6A1, respectively, and to averager U1 in assembly A10, via section AX of IF BANDWIDTH switch S3, sections AW and BW of MODE switch S4, and AUDIO GAIN and VIDEO GAIN potentiometers R7 and R9.

The video/afc-dafc amplifier subassembly receives the discriminator fm video output (pin 21) via section BW of IF BANDWIDTH switch S3 and VIDEO GAIN control R10, the am/fm signal (pin 2) via section AW of MODE switch S4, and the dafc signal (pin 17) from A13J2 or J6 via AFC/DAFC switch S2. The am/fm signal is amplified for application to VIDEO OUTPUT jack J4. The voltage at pin 7 provided by the AFC/DAFC switch selects either the fm video or the dafc signal for return to the tuner (from pin 17) for controlling the local oscillator frequency. The sweep reversal voltage (pin 20) from the actual tuner selects the slope of the fm video afc signal.

A 21.4 MHz i-f output from pin 6 of the i-f output amplifier connects to all three fm limiter/discriminator boards, A6-A8. The active board demodulates the fm signals, providing an output at pin 20 of each board. These outputs route through i-f amplifier assembly feedthrough capacitors C23, C36, and C41 to switch S3A-W. The wiper of this switch picks up the active output and provides rear panel discriminator output J9 with the signal. This signal also couples to one contact of switch S4A-W which the wiper picks up in the fm mode and routes back through the video gain control to i-f amplifier assembly at input C39. This input routes to pin 2 of the video/afc-dafc amplifier located within the i-f amplifier assembly. An amplified output appears at pin 10 which is routed to video output J3 on the assembly, then to receiver rear panel video output J11.

3.9.2 TYPES 72472-1 (8 kHz), 72339 (10 kHz BW), 72389 (20 kHzBW), 72389-3 (20 kHz), 72344 (50 kHz BW), AND 72431 (100 kHz BW) 21.4 MHz IF AMPLIFIER SUBASSEMBLY (A6AX). Figures 6-14 and 6-15 are the schematic diagrams for these subassemblies. The 21.4 MHz i-f signal received at pin 21, from the active rf tuner, is coupled through C2 to the base of Q2. Transistors Q1 and Q2 form a cascode amplifier. The cascode amplifier has low Miller feedback and therefore does not tend to oscillate. R10, L1, C8, anc C9 comprise a tuned impedance matching network for the input of filter FL1, and C10, C11, R11, and L2 form a tuned impedance matching network for the output of FL1. FL1 is a crystal bandpass filter which determines the i-f bandwidth.

The band-limited i-f output from the second impedance-matching network is coupled through C12 to gate 1 of dual IGFET amplifier Q3. The gain of Q3 is controlled by the agc voltage applied to gate 2 of Q3. R14, R15, and R16, connected in series between the positive supply voltage and the negative agc voltage at subassembly pin 8, offset the gain control voltage swing at Q3 to between approximately +3 V to -1 V for agc control voltages ranging between 0 V and -4 V. Diode CR1 protects Q3 from excessive positive control-gate voltage when the agc input is open.

The i-f output at the drain (pin 1) of Q3 is coupled to output stage Q4 through C17. Potentiometer R26 in the emitter circuit of Q4 controls the amount of degeneration and hence the gain of the stage. L3, C19, and C20 comprise a tuned impedance matching network which matches the high collector impedance of Q4 to the 200 ohm subassembly load impedance. When the subassembly is energized by the +15 V applied to pin 15, diode CR2 is forward biased (via R21 and R28) and couples the i-f signal to the output. With the +15 V absent, CR2 presents a high impedance to the active parallel-connected i-f amplifier assembly, thus isolating the inactive assembly.

Resistor-capacitor networks R4-C1, R29-C4, R9-C5-C7, R1-C3 and R18-C14-C16 provide supply voltage high-frequency decoupling. Breakdown diode VR1 provides a 12 V reduction in positive bias supply voltage for Q2, so that divider R2-R3 presents the base of Q2 with a biasing voltage of -9 V. R8 determines the ac gain of Q2. R12-R13 and R22-R23 are biasing dividers for Q3 and Q4, respectively. R7, R17, and R25 help determine the dc operating points of their respective transistors. R5, R6, R19, and R24 prevent parasitic oscillation of the transistors.

3.9.3 TYPES 72338 (200 kHz BW), 72366 (300 kHz BW), AND 72429 (500 kHz BW), 21.4 MHz IF AMPLIFIER SUBASSEMBLIES (A6AX). - Figures 6-16, 6-17, and 6-18 are the schematic diagrams for these subassemblies. The 21.4 MHz i-f signal received at pin 21 from the rf tuner is coupled through C2 to the base of Q2.

Transistors Q1 and Q2 form a cascode input amplifier. The cascode amplifier has low Miller feedback and therefore does not tend to oscillate.

The overall i-f bandwidth is determined by the three-pole filter situated between the collector of Q1 and gate 1 (pin 3) of intermediate amplifier Q3 and the two-pole filter situated between the drain of Q3 and base of output amplifier Q4. Both filters have appropriate input and output impedance matching networks.

The gain of Q3 is controlled by the agc voltage applied to gate 2 (pin 2) of Q3. R11, R13, and R15, connected in series between the positive supply voltage and the negative agc voltage at subassembly pin 8, offset the gain control voltage swing at Q3 to between approximately +3 V to -1 V for agc control voltages ranging between 0 V and -4 V. Diode CR1 protects Q3 from excessive positive control gate voltage when the agc input is open. Potentiometer R27 in the emitter circuit of output amplifier Q4 controls the amount of degeneration and hence the gain of the stage.

Resistor-capacitor networks R22-C27-C28, R12-C18, R28-C31, R5-C4, R1-C1, and R4-C3-C5 provide supply-voltage high-frequency decoupling. Breakdown diode VR1 provides a 12 V reduction in positive bias supply voltage for Q2 so that divider R2-R3 presents the base of Q2 with a biasing voltage of -9 V. R9 determines the ac gain of Q2. R14, R16 and R20, R21 are biasing dividers for Q3 and Q4, respectively. R8, R19, and R23 help determine the dc operating points of their respective transisors. R26, R18, R7, and R6 prevent parasitic oscillation of the transistors.

3.9.4 TYPES 72378-1 (1 MHz BW), 72378-2 (2 MHz BW) AND 72365 (3 MHz BW), 21.4 MHz AMPLIFIER SUBASSEMBLIES (A6AX). Figures 6-19 and 6-20 are the schematic diagrams for these subassemblies. These types are identical in form to those described in paragraph 3.9.3, with the exception that a five pole i-f filter is used instead of a three pole filter between the input and intermediate amplifiers, and no filter is used between the intermediate and output amplifiers Q3 and Q4. Many of the circuit component reference designations are different from those mentioned in the preceeding discussions, but correspondences may be made from their positions on the schematics.

3.9.5 TYPE 72343 IF OUTPUT AMPLIFIER SUBASSEMBLY (A6A5). - Figure 3-6 is a functional block diagram for this subassembly. The subassembly contains an agc-controlled i-f amplifier, a bfo, an am detector with output amplifier, and an i-f output buffer amplifier. When the bfo is energized in the cw operating mode, the 21.4 MHz bfo signal is added to the i-f signal in the second stage of the i-f amplifier. The beat-frequency component is produced by the am detector for use as the audio output signal.

3.9.5.1 Refer to Figure 6-21 for schematic diagram. The input signal at module pin 21 is fed through gain potentiometer R1 and coupling capacitor C6 to integrated circuit amplifier U1, pin 4. This component functions as a gain-controlled i-f amplifier stage providing a balanced output. Gain control voltage is applied to U1 by agc amplifier stage Q1. Under no-signal conditions, this stage is conducting as a result of the constant current bias set by R5 in the emitter circuit. The collector voltage of Q1 is approximately 8 volts and IC U1 is in a maximum gain condition. When an rf signal is received and its amplitude is such that gain control action is required, the i-f agc line becomes negative. The base voltage of Q1 begins to decrease from zero toward the negative supply. This action reduces the conduction through the stage and results in a decrease in the voltage dropped across R6. As the voltage on U1, pin 5 becomes more positive, the gain of the stage is decreased. Balanced output signals are taken from pins 1 and 8 of U1 and are fed to the primary of transformer T1. This section is center tapped to provide the bias required by the balanced output stage in the IC. Intermediate frequency signals are taken from pin 4 of the transformer secondary and are coupled through blocking capacitor C9 and parasitic suppressor R10 to the base of i-f amplifier Q2. Amplified output signals from this stage are developed across the primary of transformer T2 which forms the collector load. The transformer secondary is tuned to the i-f frequency by variable capacitor C11. The secondary also provides a dc return for the detector diode. A portion of the amplified output signal from the transformer secondary is coupled to the base of Q2 through C12 to neutralize the stage.

3.9.5.2 The i-f signal from T2 pin 2 is also fed through a capacitive impedance matching network (C14-C15) to i-f output amplifier stage Q5. This transistor provides two output signals. One is taken from the tap on transformer T3 and is fed to the rear-apron i-f output jack, J3. In addition to providing the necessary impedance transformation between Q5 and the output connector, T3 prevents the output from the emitter from being affected if the i-f output signal is accidentally shorted. The emitter signal is developed across R30. R31 and C24 form the rest of the emitter bias circuit. This signal is coupled through C23 and impedance-matching resistor R29 to module pin 6. From this point the i-f signal is fed to the two fm limiter/discriminator subassemblies, A2A6 and A2A7.

3.9.5.3 Amplitude modulated signals are detected by diode CR1, and filtered by C17. Resistor R18 provides the diode load. Video signals are applied to cascaded emitter followers Q3 and Q4 which provide a low-impedance source to drive the two am outputs at module pins 2 and 5. R5 sets pin 5 output impedance to 500 ohms.

3.9.5.4 Since a reduction of the am video bandwidth will improve the signal-to-noise ratio of the receiver, low-pass filters have been included between the am detector output and the output video amplifiers. These filters are functional for both narrow and wideband outputs. Inductors L1 through L3 (see Figure 6-21) plus capacitors C1 through C3 make up the filters. Each filter will reduce the video to approximately one-half the i-f bandwidths. The selected a, signal is taken from section S2A-X and is fed to the agc amplifier, to the am positions of mode switch section S3A-W, and to pin 17 of jack J12 on the rear apron through resistor R2.

3.9.5.5 BFO (VCXO). The beat frequency oscillator in the Receiver is a completely self-contained, sealed module located on i-f output amplifier A6A5. Module U2

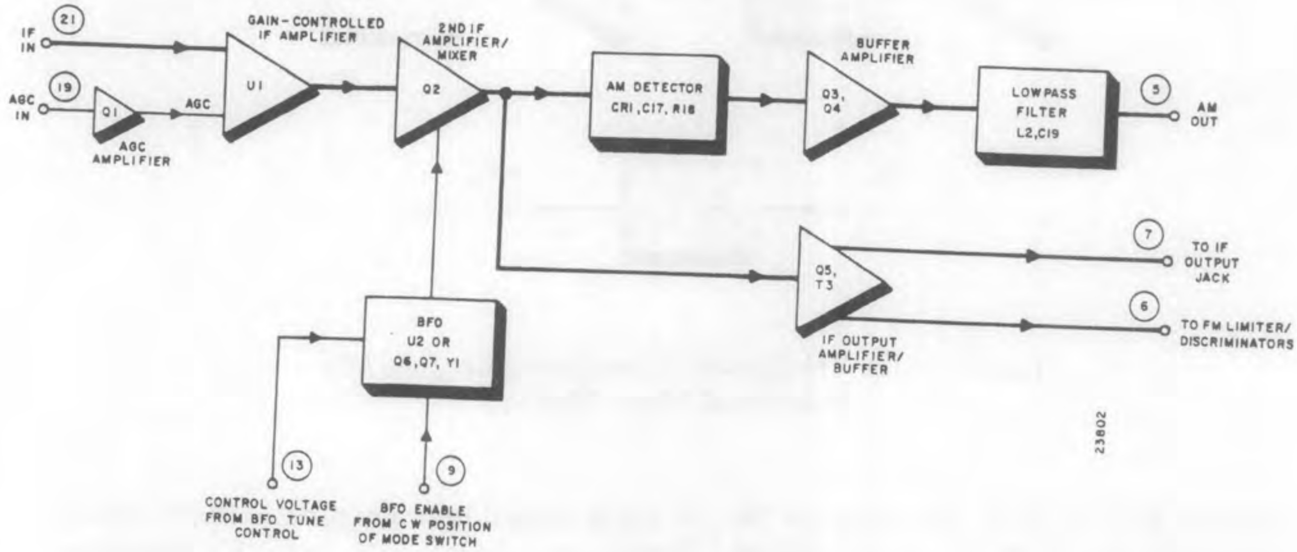


Figure 3-6. Type 72343 IF Output Amplifier (A6, A5), Functional Block Diagram

is activated by the application of +15 V through pin 9 of A6A5. This voltage is taken from the CW position of mode switch section S3A-X. The 21.4 MHz output signal is taken from U2 pin 4 and fed through R34 to the collector circuit of Q2. Tuning of the bfo is accomplished by applying a variable voltage to module pin 13 from the arm of BFO TUNING potentiometer R6. An internal varactor in the VCXO reacts to the bias and changes the bfo frequency.

3.9.6 TYPES 791331 (100 kHz BW), 791338 (200 kHz BW), 791366 (300 kHz BW), 791329 (500 kHz BW), and 791378 (1 MHz BW) FM LIMITER/DISCRIMINATOR SUBASSEMBLIES (A6AY). - Refer to the block diagram, Figure 3-7. Each subassembly contains an fm limiter/discriminator circuit and a lowpass filter that is a part of the am video circuit. The limiter/discriminator demodulates the i-f signal from subassembly A6A5, thus providing the fm video signal for the receiver. The circuit is composed of a limiter, an fm discriminator, an output buffer, and an output lowpass filter. The am video lowpass stage filters the detector output of subassembly A6A5, so that the bandwidth is only wide enough to pass the desired am video signal. The bandwidth employed is approximately one-half that of the discriminator. As a result of the band limiting, noise is reduced.

3.9.6.1 Figures 6-23, 6-24, and 6-25 are the schematic diagrams for these limiter/discriminators. The difference between subassembly types lies in component values which determine full scale output at the i-f band edges. The i-f input is applied to U1 via dc blocking capacitor C1. U1 is a high-gain wideband amplifier, which hard-limits at its output at an i-f input signal level of approxi-

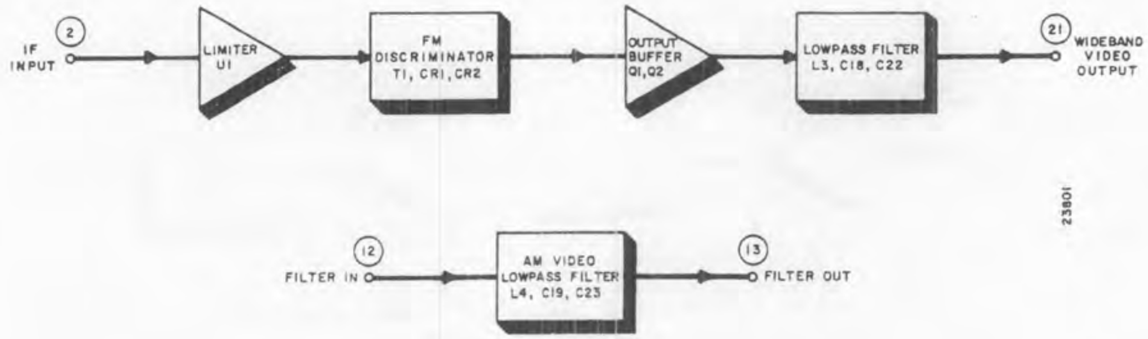


Figure 3-7. FM Limiter/Discriminators, A6AY, Functional Block Diagram

mately 10 mV rms. R1 develops the i-f input signal between pins 1 and 2 while C2 holds pin 2 of U1 at ac ground. Breakdown diodes VR1 and VR2 drop the supply voltage by 5.1 V and 3.3 V, respectively, such that U1 is provided with an operating voltage on pin 10 of approximately 6.6 V, and an output collector supply voltage of approximately 10 V via R3, T1, L1, and R2. The fm discriminator is a Foster-Seely type. C6, C7, C8, L1 and the primary of T1 comprise a tuned circuit resonant at the i-f center frequency. C4 provides ac ground for the tuned circuit. C9 couples and phase shifts a portion of the primary i-f signal to the secondary circuit for summing with the components in the secondary of T1. C10, C12, and C14 tune the T1 secondary to the i-f center frequency. CR1 and CR2 are discriminator detector diodes which detect the video amplitude-modulation component of the T1 output signal. R6 and R7 develop the detected voltage, with their junction providing a return to the center-tap of T1. C15 eliminates i-f components from the detected signal.

3.9.6.2 U2 is an output buffer amplifier. L3 and C18, provide lowpass filtering of the video signal to eliminate residual i-f components and noise. RF decoupling of the supply voltages is achieved by C3-C5-R4, C13, L2-C11-C16 and C17. R9 is adjusted for a zero volt output at pin 20 or 21 with no signal input.

3.9.6.3 The am lowpass filter is composed of L4 and C19. The 3 dB roll-off point is approximately 1/2 the bandwidth of the i-f amplifier with which this subassembly is to operate (see Table 1-3).

3.9.7 TYPE 791365-1 (3 MHz BW), 791365-2 (2 MHz) FM LIMITER/DISCRIMINATOR (A6AY). Refer to the schematic diagram Figure 6-26. This subassembly is similar to the types described above, the main difference being in the output stage. The wider bandwidth of this subassembly increases the gain requirement, so that a different output amplifier is used. The remaining circuitry is similar to that of the above discussed subassemblies, the notable differences being in the primary tuned circuit of T1 and in that only one breakdown diode, VR1 (8.2V, is used in providing voltages to U1. L4 and C12 comprise the am video lowpass filter.

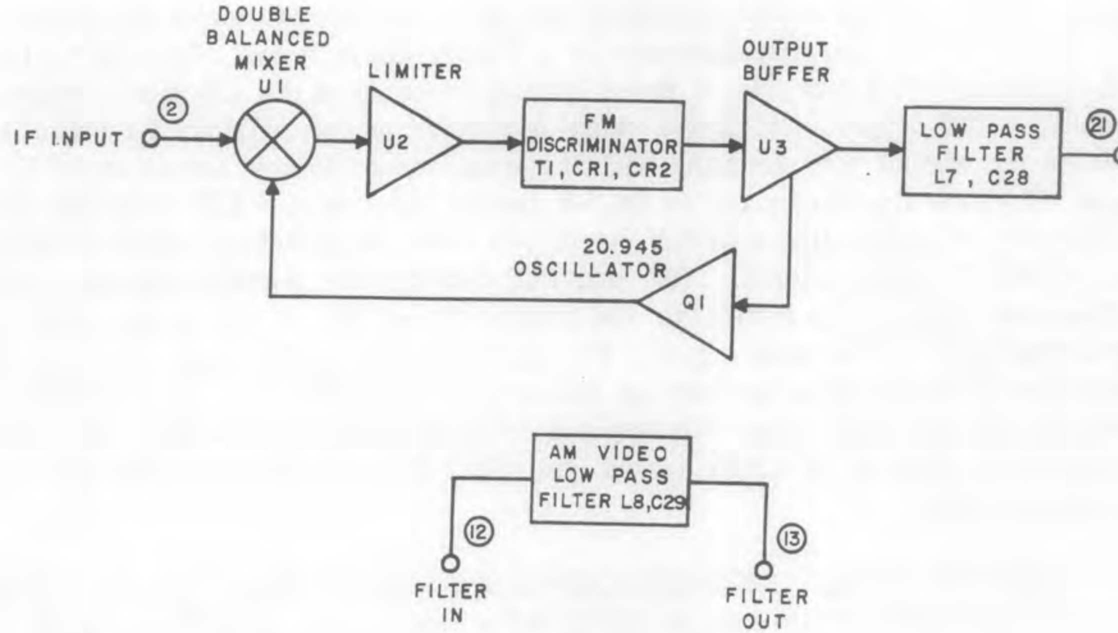


Figure 3-8. FM Limiter/Discriminators A6 (8 kHz-50 kHz)

3.9.8 TYPES 791205-1, -2, -3 AND -4 (8-, 10-, 20-, and 50-kHz BW), FM LIMITER/DISCRIMINATOR SUBASSEMBLYS (A6AY). - This subassembly is functionally similar to the types described above in paragraph 3.9.6, except that a mixer is included which converts the 21.4 MHz i-f down to 455 kHz before being applied to the limiter. (Refer to Figure 3-8 for Functional Diagram). Conversion of the i-f center frequency from 21.4 MHz down to 455 kHz is necessary to avoid temperature instability characteristics of discriminators having small bandwidth/center frequency ratios.

3.9.8.1 Refer to schematic diagram Figure 6-22. Q1 and Y1 comprise a 20.945 MHz crystal oscillator, the output of which is applied via C2 to mixer U1. U1 is a double-balanced mixer that provides sum and difference outputs but suppressed carrier and LO components. Pins 7 and 8 of U1 are differential LO inputs, although pin 8 is held at ac ground by C35 so that the LO signal can be applied single-ended. The 21.4 MHz center-frequency i-f signal is applied to mixer pin 1 via dc blocking capacitor C1. Pins 1 and 4 are differential mixer signal inputs, with pin 4 held at ac ground by C8 so that the input signal can be applied single-ended. Pins 6 and 9 are differential mixer outputs, with C9 holding pin 6 at ac ground as only a single-ended output is required. Positive dc supply voltage is provided to the mixer via rf chokes L2 and L3. Breakdown diode VR1 reduces the -15 V supply voltage by 6.8 V, necessary for operating U1. Voltage dividerr R8, R9 and R1, R12 provide the necessary mixer input biasing.

3.9.8.2 The two-pole lowpass filter composed of C10, C12, L4, and L5 permits only the 455 kHz difference-frequency mixer product to reach fm limiter U2. U2 hard-limits the signal at a level corresponding to a board pin 2 input level of 10 mV. Pin 8 of the limiter is held at ac ground by supply voltage decoupling capacitor C20. Output collector supply voltage is provided to pin 8 and to pin 7 via T1 and L6. The fm discriminator is a Foster-Seely type. C18, C19, L6, and the primary of T1 comprise a tuned circuit resonant at the 455 kHz i-f center frequency. C21 couples and phase shifts a portion of the primary i-f signal to the secondary circuit for summing with the components in the secondary of T1. C22 and C23 tune the secondary to the i-f center frequency. CR1 and CR2 are discriminator detector diodes which detect the video amplitude-modulation component of the T1 output signal. R21 and R22 develop the detected voltage, with their junction providing a return to the center tap of T1. C24 eliminates i-f components from the detected signal. The discriminator video output signal level is increased by approximately two by operational amplifier U3, then low-pass filtered by L7 and C28 to eliminate residual i-f components and noise. The filtered signal is applied to board output pin 21. L8 and C29 comprise the am video lowpass filter.

3.9.9 TYPE 7383 VIDEO/AFC-DAFC AMPLIFIER SUBASSEMBLY (A6A1). - This subassembly contains an afc-dafc amplifier and a video output amplifier. Refer to block diagram Figure 3-9 for the afc-dafc amplifier circuits representation. The afc-dafc amplifier selects between the afc and dafc voltages for controlling the

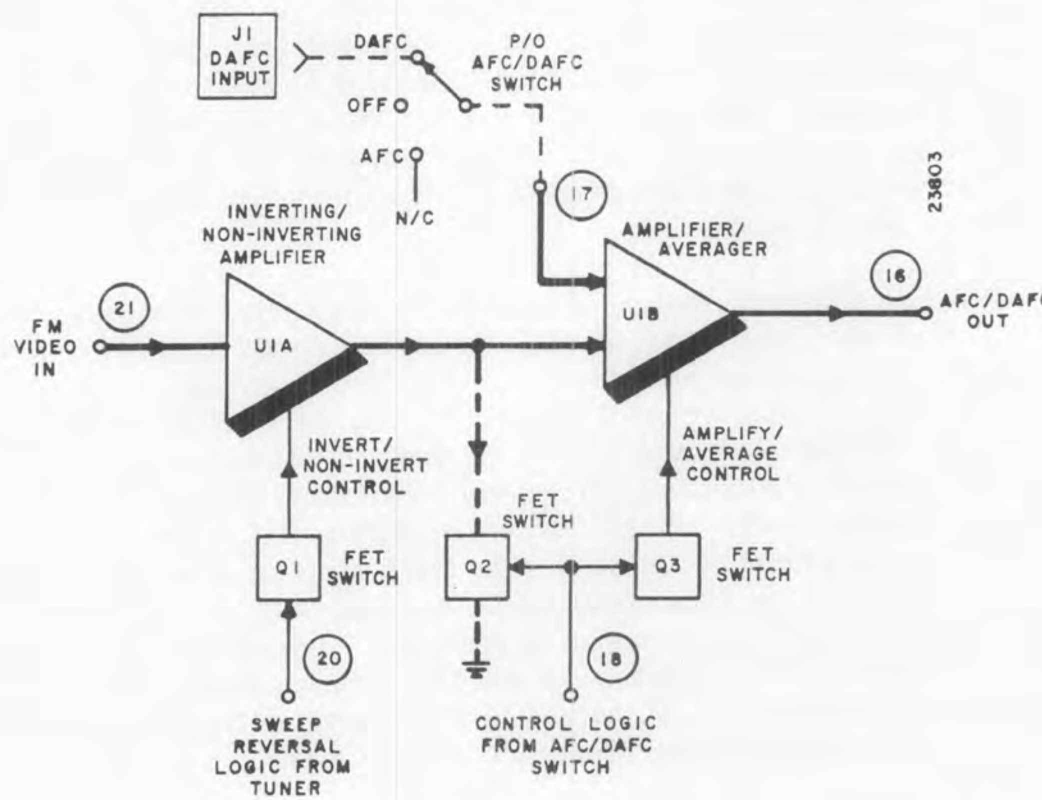


Figure 3-9. AFC/DAFC Amplifier, Part of A6A1,
Functional Block Diagram

local oscillator frequency in the tuning head. Sweep reversal voltage on pin 20 controls the slope of the afc voltage (for purposes described in the overall block diagram discussion) by causing amplifier U1A to invert or not invert the fm video signal. Selection of afc-dafc is made by the control voltage on subassembly pin 18. When dafc is selected Q2 shorts the fm video from U1A to ground, and Q3 renders U1B a unity-gain amplifier by shorting the feedback components. When afc is selected, U1B functions as an averager for the fm video signal from U1A, thus converting the fm video to a signal usable by the afc circuit in the tuning head.

3.9.9.1 Refer to the schematic diagram, Figure 6-13. The afc-dafc amplifier comprises U1, Q1, Q2, Q3 and associated components. With no sweep reversal voltage (open line), the gate of FET Q1 is grounded through R4. Q1 becomes a low impedance path between pin 3 of U1A and ground, such that the operational amplifier operates in the conventional inverting mode with a unity gain as determined by R1 and R3. With -15 V applied to subassembly pin 20, Q1 presents a high impedance between pin 3 of U1A and ground. In this case, U1A operates as a non-inverting unity-gain amplifier. This can be seen by noting that the voltage on pin 2 must exactly follow the voltage on pin 3, which can occur only if zero current flows through R1. Therefore, R3 must also pass zero current, which implies that the output voltage on pin 1 must follow the input voltage.

3.9.9.2 Operational amplifier U1B functions as a unity-gain non-inverting amplifier for the dafc input signal, or as an inverting averager for the afc video signal from U1A, depending on the condition of the afc-dafc switch voltage on subassembly pin 18. With no afc-dafc switch voltage (open line), the gates of Q2 and Q3 assume the voltages on pin 2, so that the FET's present low-impedance paths. The afc video signal from U1A is thus prevented from reaching U1B, and the feedback elements of U1B are short-circuited between pin 6 and pin 7. This causes U1B to function as a unity-gain amplifier for the dafc signal at subassembly pin 17. With -15 V applied to subassembly pin 18, Q2 and Q3 present high impedances to their respective circuits. Also, the dafc signal is removed by the AFC-DAFC switch so that pin 5 of U1B is grounded through R10. U1B therefore, operates as an inverting averager for the afc video from U1A, with C3-C4, R9, and R5-R7 determining the averaging time constant and gain. Back-to-back breakdown diodes VR1 and VR2 protect the rf tuners from excessive afc voltage.

3.9.9.3 The video output amplifier is an operational amplifier composed of Q4 through Q7 and associated components. The bases of emitter-coupled pair Q4A and B are the non-inverting and inverting inputs of the operational amplifier. The collector voltage of Q4A, representing the difference of the Q4A and B inputs, is amplified by Q5 for application to complementary emitter-follower output transistors Q6 and Q7. CR2 temperature-compensates the base of Q5. CR3 and CR4 provide the necessary 1.2 V offset for the common signal driving the bases of Q6 and Q7. R20 and R21 are feedback attenuator resistors. Operational amplifier gain from pin 6 of Q4 to the junction of R27 and R28 is equal to the ratio of R20 plus R21 to R20. C8 provides high-frequency rolloff to prevent oscillation. Potentiometer R14 permits the dc offset due to base leakage current to be compensated by providing a small amount of current from the negative supply to the input. R29 sets the output impedance at 100 ohms. Networks R26-C2-C9 and R25-C1-C7 high-frequency decouple the dc supplies.

3.10 TYPE 791495-1 IF POWER DIVIDER (A7).

Refer to Figure 6-27 for the schematic diagram and to Figure 5-47 for the location of components. This assembly receives 21.4 MHz i-f signals at J1 and provides unity gain at outputs J2, J3, and J4. Power supply voltages enter the assembly at C1 and C2 to provide +15 V dc and -15 V dc, respectively, to a circuit board which amplifies, then power-divides the 21.4 MHz signals for the three outputs.

3.10.1 Part 18075-1 IF Power Divider (A7A1). - Refer to Figure 6-27 for the schematic diagram of these circuits and to figure 5-48 for the location of components. The 21.4 MHz signals enter the board at E1 and couple through C1 to amplifier Q1. The drain of the amplifier is resonated at 21.4 MHz, with the transformer tapped to match 50 ohms into power splitter U1. Three equal level outputs appear at pins 1, 2, and 3 of the power splitter, which are in turn routed through E4, E5, and E6 to the outputs of the assembly. Overall gain from the input of the board to the power splitter outputs is about 1 dB.

3.11 TYPE 72465-1 IF SWITCHING ASSEMBLY (A8).

Refer to Figure 6-28 for the schematic diagram. There are five switching networks included in this assembly. BANDS 1, 2 (3 and 4) switch the i-f signal to output jack J6. Input select voltages for Bands 1, 2 and 3-4 connect to C1, C2, and C3. Output for any selected Band is J6. The 60 MHz inputs to J4 and J5 are selected by C4 and C5 respectively. In this case the output is jack J7.

Since all switching networks are identical, only one will be explained. The SELECT signal (+15 volts) enters a biasing network for CRl, consisting of R1, R2 and R11 which provides a dc path to ground. As CR1 becomes forward biased, the i-f signal entering at jack J1 passes through capacitor C6 and is routed to output jack J6. Blocking capacitor C16 prevents the dc biasing voltage from entering output jack J6.

3.12 TYPE 791501-1 DIODE SWITCH AND AMPLIFIER ASSEMBLY (A9).

3.12.1 Referto Figure 6-29 for the schematic diagram. There are four switching networks included, one for each band of the receiver. Since they are identical in design, only one will be described. Resistor R2 is biased with a -15 volt signal supplied externally to pin E5. This will allow diode CR2 to become reverse biased and permit diode CR1 to conduct the LO input directly to ground.

3.12.2 As a +15 volt signal is applied to pin E1, through C1, it will allow CR1 to become reverse biased and CR2 will be forward biased. This action will permit the LO input signal of BAND 1 to enter the impedance coupling network, consisting of C11-R9, R10-R11 and C12-R12.

3.12.3 The signal enters the common emitter amplifier Q, through the voltage divider R13 and R14. Resistor R17 provides feedback for stability. Capacitor C16 provides an ac bypass to ground for any stray LO signals that might appear. Capacitor C17 provides coupling to the next stage taken from jack J5.

3.13 TYPE 78108-1 PULSE/AVERAGE AGC AMPLIFIER (A10)

3.13.1 GENERAL. - Refer to the overall functional block diagram, Figure 3-1, and to the schematic diagram, Figure 6-30. This subassembly contains a peak-detecting pulse stretcher, an AGC averager, agc circuitry, a resistor network which combines the averager output with certain agc voltages for operating the signal strength meter in agc modes, and a logarithmic signal strength meter circuit for use in the am-manual mode.

3.13.2 The peak-detecting pulse stretcher permits the agc averager to provide a usable output for short as well as long pulses by increasing the pulse width while preserving the peak pulse amplitude. It is composed of emitter-follower transistors Q1, Q2 and associated circuitry. Assume that a positive pulse from the am detector is applied through R1 to the base of Q1. The emitter of Q2 follows the base voltage of Q1, such that C1 rapidly charges to the peak input voltage. When the input pulse falls to zero, the emitter voltage of Q1, in following the base voltage (plus 0.6 V offset), reverse biases Q2 until C1 can discharge sufficiently through R3 (and R7 via mode switch S4BW). Thus, the output at assembly pin 8 is a pulse having fast attack, slow decay characteristics.

3.13.3 The agc averager is a standard operational amplifier integrator composed of operational amplifier U1, summing input resistor R7, and feedback components C3, R10, and C3 and R10 determine the averaging time constant in the AM/SLOW AGC mode. In the AM/FAST AGC mode +15 V dc is applied to pin 20 to activate relay K1, which adds C7 to the feedback network of U1. This provides the slow agc characteristic. The dc gain of U1 is about 2:1. With the mode switch in AM/FAST AGC, AM/SLOW AGC, and FM positions, the averager receives the am video signal for averaging, and with the mode switch in CW, AM MAN, and PULSE position, it receives the pulse stretcher output for averaging. The average output from pin 6 of U1 is applied to the agc circuitry on this assembly (via assembly pin 17 and the mode switch), to the squelch threshold comparator on assembly A5 (via assembly pin 17), and to the signal strength meter from pin 5.

3.13.4 The agc circuitry comprises Q3 through Q7, U2, and associated components. This circuit converts the averager output to separate i-f and rf agc outputs and provides an agc monitor output (to J8).

3.13.5 The initial conditions of the agc circuit, with 0 V from the averager at assembly pin 21, are as follows: Q3 is biased off and remains biased off until the averager output exceeds the series diode drops of CR2, CR3, and the emitter junction of Q3 (about -2 V). The resulting -15 V off-voltage at the collector of Q3 reverse biases Q4, which in turn results in 0 V at the collector of Q4. Q6 is held off by the reverse bias voltage developed by divider R31-R32 (-4.2 V, approximately).

The resulting collector output from Q6 of 0 V is coupled to the rf agc output (assembly pin 8) via non-inverting operational amplifier U2. The 0 V U2 output and the -9 V bias voltage at the junction of R33 and R34 hold Q7 off, so that Q7 does not affect the reverse bias provided to Q6 by R31 and R32. With Q6 off, the junction of R21, R24, and CR4 follows the collector voltage of Q4. When the collector voltage of Q4 is 0 V, Q5 is biased on with approximately -0.6 V developed by the bias divider composed of resistors R23 through R26. This 0.6 V is dropped by the emitter junction of Q5 so that the i-f agc output from assembly pin 15 is approximately 0 V.

3.13.6 When the gain control input on pin 21 exceeds approximately -2 V, Q3 and Q4 turn on and perform normally as a X 28 voltage amplifier, with the output of Q4 being applied to i-f agc output pin 15 via the X 0.7 divider comprising R21, R24, and R25, and emitter-follower Q5 (overall i-f agc gain of X20). When the voltage at the junction of R21, R24, and CR4 exceeds the 4.2 V reverse bias on Q6 plus the two 0.6 V diode drops of the emitter junction of Q6 and CR4 (corresponding to an i-f agc output of approximately -5 V), Q6 turns on and clamps the voltage at the R21-R13-CR4 junction at -5.4 V. With Q6 clamping the Q4 output, further increases in the gain control input cannot cause increases in the i-f agc output voltage until Q7 turns on. Q6 now performs as a common-base amplifier which passes most of the current output of Q4 to the collector circuit where it develops as a voltage across R29 and R30.

This voltage is amplified X3 by operational amplifier U2 for application to the rf agc output. Diode CR5 is initially off so that Q6 amplifies the Q4 output voltage by approximately 1.7, yielding an overall rf agc gain of X 143. When the voltage across R29 exceeds approximately 0.6 V, CR5 becomes forward biased and effectively eliminates R29 from the circuit, reducing the Q6 gain to X 0.7 and thereby reducing the overall rf agc gain to approximately X 59. When the U2 output exceeds approximately -10 V, Q7 turns on and provides a feedback voltage to the base of Q6 by passing current through R31. Completing this feedback loop causes Q6 to again present a high emitter input impedance. The i-f agc output again increases at the same rate as before, while the rf agc gain reduces to X 10, determined by the gain of Q3-Q4 (X 28), voltage divider R21, R24, R25 (X 0.93), and the reciprocal of the gain of Q7 (X 0.38). The relative rf/i-f breakpoint characteristics are illustrated in Figure 3-10.

3.13.7 The signal strength meter is connected to subassembly pin 5 by switch S4CW when in the PULSE, FM, AM/SLOW AGC, and AM/FAST AGC positions. Therefore the meter deflection is proportional to the average signal strength at the am detector. Hot-carrier diode CR7 prevents the output of Q4 from significantly affecting the signal strength meter by preventing the voltage at the junction of R18 and R20 from exceeding -0.2 V.

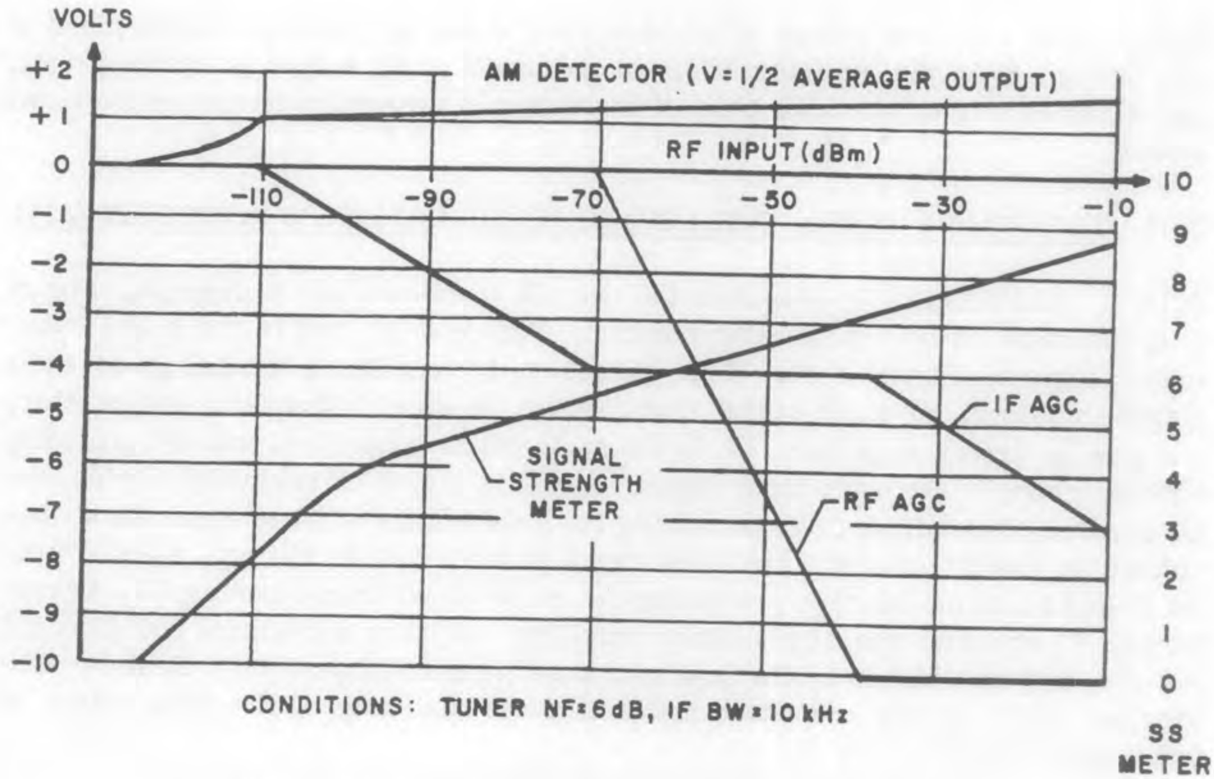


Figure 3-10. AGC Circuit Breakpoint Characteristics

When the MODE switch is in the AM MAN or CW modes, signals from the detector enter the board at pulse stretcher input pin J and connect to the non-inverting input of U3A. Diode CR8 provides a logarithmic response for the stage to provide a 30 dB range for the signal strength meter. The diode is maintained at an elevated temperature by heater HR1 to maintain the diode in a porthon of its characteristic curve having good logarithmic characteristic. Potentiometer R48 cancels an offset inherent at the output of U3A. The output from U3B is applied to the signal strength meter through the AM MAN and CW contacts of switch S4CW. In the CW mode, the meter will show an indication not necessarily associated with input signal level. The bfo signal injected into the i-f amplifier when in the cw mode is detected and provides a dc output voltage just as does a signal, though the meter indication resulting from the injected signal has no relationship to received signal strength.

3.13.8 In the agc modes (AM/FAST AGC, AM/SLOW AGC, FM, and PULSE), the averager output from pin 17 is connected to the gain control input pin 13 by the MODE switch. Before Q3 and Q4 turn on, the averager output drives the signal strength meter via R15 and R18. When Q3 and Q4 turn on, agc action holds the averager output relatively constant, and the output of Q4 takes over driving the signal strength meter via R20. When the rf agc becomes active, the increased loop gain causes a reduction in the slope of the Q4 output driving the meter. A portion of the rf agc signal adding to the meter drive current via R38 compensates for this decrease. Diode CR7 does not conduct in the agc modes because the meter voltage does not exceed the 0.2 V turn-on requirement of the diode.

3.13.9 The collector voltage of Q4 is applied to the agc monitor output, pin J of J8, through 10 kilohm resistor R22. In agc modes, this output is inhibited until agc becomes active, at which point it increases in proportion to the agc averager output.

3.14 TYPE 7446-2 AUDIO, COR, AND SQUELCH AMPLIFIER ASSEMBLY (A11)

3.14.1 GENERAL. - Refer to the overall functional block diagram, Figure 3-1, the main chassis schematic diagram, Figure 6-32, and to the board schematic diagram, Figure 6-31. This subassembly contains a squelch-gated audio output amplifier, an audio output transformer, a squelch threshold comparator, and a relay driver amplifier. U2 is the audio output amplifier, with Q1 providing squelch gating of the audio input signal. A +15 V output from squelch comparator U1 reverse-biases diode CR1, permitting the gate voltage of Q1 to equal the source voltage so that Q1 conducts the audio signal to the output amplifier. A -15 V output from U1 cuts off Q1, thus preventing the audio signal from reaching U2. Transformer T1 converts the single-ended amplifier output to a balanced 600 ohm and 3.2 ohm outputs which is available at rear panel terminal board TB1. Resistor R20 provides short circuit protection and impedance matching of the audio output at front-panel PHONES jack J13.

3.14.2 Squelch comparator U1 is an operational amplifier connected in a hysteresis switch configuration. A portion of the output from pin 6 is fed back to pin 3 (non-inverting input) causing sufficient hysteresis to prevent squelch chatter. The agc averager output from assembly A10 is summed by resistors R2 and R3 with the voltage provided by the COR/SQUELCH THRESHOLD potentiometer. When the sum voltage at pin 2 of U1 exceeds approximately +30 mV, the output of U1 changes from +15 V to -15 V, and when the sum voltage becomes less than approximately -30 mV, the output of U1 changes from -15 V to +15 V.

3.14.3 Transistors Q2 and Q3 are the COR relay drivers. The emitter of Q2 drives the base of Q3 to minimize the overall drive requirements of the circuit. Assume initially that the output of U1 is negative so that CR2 is reverse biased. In a quiescent condition no current flows from main chassis capacitor C4 or C5, so that no voltage is developed across R12. Q2 and Q3 are therefore reverse-biased, and the collector end of C4/C5 is charged to +15 V (through relay K4 - see main chassis schematic). Upon change of the output of U1 to +15 V, CR2 becomes forward biased, which permits current flow to the base of Q2, turning Q2 and Q3 on and energizing relay K4. The collector end of C4/C5 quickly discharges to 0 V, with CR4 providing a low-impedance discharge path for the charge accumulated on the lower end of the capacitor. When the output of U1 returns again to -15 V, reverse biasing CR2, Q2 and Q3 start to turn off; however, the rise in collector voltage causes the lower end of C4/C5 to put current into R12 and the bases of Q2 and Q3 via CR3. This slows the rise in collector voltage by preventing Q2 and Q3 from turning off completely, thereby keeping K4 energized. As C4/C5 charges, the collector voltage of Q2 and Q3 continues to rise, maintaining a supply of current to R12 and the bases of Q2 and Q3 until C4/C5 is almost fully charged and the charge current can no longer hold CR3 and the transistors on. Relay K4 is held on for two seconds by C5 or twelve seconds by C4.

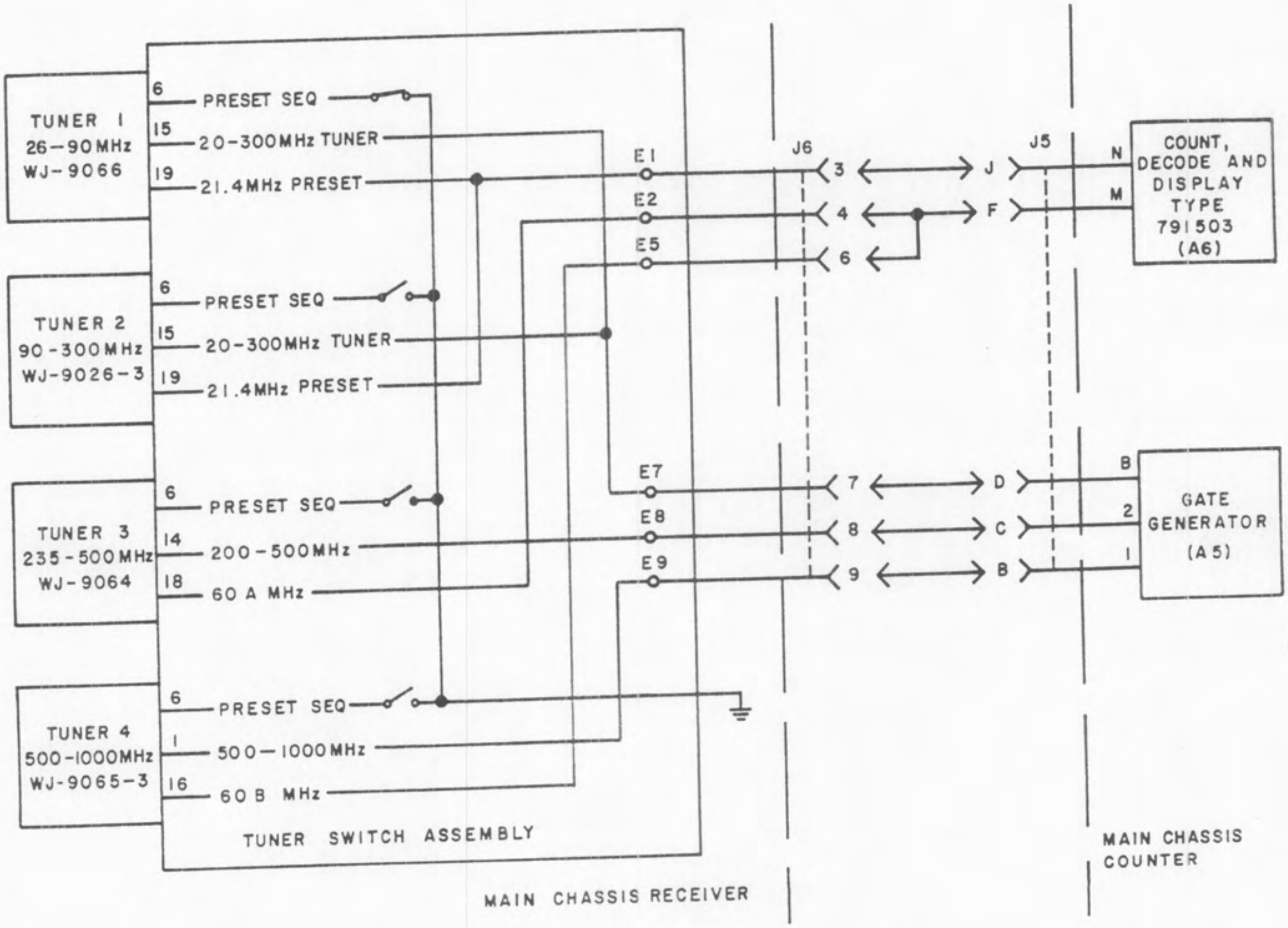


Figure 4-1. Preset/Tuner Select Lines

SECTION IV
MAINTENANCE

4.1 GENERAL

The WJ-9026/RU Receiver has been conservatively designed to operate for extended periods of time with minimum routine maintenance. Cleaning, inspection, and performance tests should be performed at regular intervals consistent with the facility's normal scheduling and after troubleshooting. No routine adjustments are required. Troubleshooting and performance tests can be most effectively carried out if the technician first familiarizes himself with the operating instructions and circuit descriptions provided in Sections II and III, respectively. Parts lists and component location diagrams are in Section V.

4.2 CLEANING AND LUBRICATION

The receiver should be kept free of dust, moisture, grease, and other foreign matter to ensure trouble-free operation. Use low pressure compressed air, if available, to remove accumulated dust from the interior and exterior of the receiver. A clean dry cloth, a soft bristled brush, or a cloth saturated with cleaning solution also may be used. The receiver does not require lubrication.

4.3 INSPECTION FOR DAMAGE OR WEAR

Many potential or existing troubles can be detected by making a visual inspection of the unit. For this reason, a complete visual inspection should be made on a regular basis and whenever the unit is inoperative. Components showing signs of deterioration should be checked and a thorough investigation of the associated circuitry should be made to verify proper operation. Damage due to overheating may be the result of other less apparent trouble in the circuit. It is essential that the cause of overheating be determined and corrected before replacing the damaged parts. Mechanical parts such as pin connectors and chassis wiring should be inspected for excessive wear, looseness, misalignment, corrosion, and other signs of deterioration.

4.4 TEST EQUIPMENT REQUIRED

The test equipment listed in Table 4-1 or equivalents are required for performing preventive and corrective maintenance.

4.5 TROUBLESHOOTING PROCEDURE

4.5.1 LOCALIZING TROUBLES. - Troubleshooting efforts first should be directed toward eliminating possible external causes of the trouble, then towards symptoms within the unit when it is properly connected and tested. Signal, voltage, and resistance checks should be made using test equipment listed in Table 4-1. To remove i-f or fm limiter/discriminator boards, use the board

Table 4-1. Test Equipment Required

EQUIPMENT TYPE	REQUIRED CHARACTERISTICS	RECOMMENDED EQUIPMENT
VOM	Standard	Simpson 260
VTVM	High Impedance	RCA WV-98C
AC VTVM	Scale calibrated in dBm	HP-400EL
RF Voltmeter	28-1060 MHz range 50 mV sensitivity	Boonton 91DA-S5 with 91-12F probe and 91-8B 50 BNC adapter
Digital Voltmeter	DC ranges; 1% or better accuracy	Fluke 8100A
AM/FM/CW Signal Generator	20-1120 MHz	HP-8640B with internal frequency doubler
Sweep Generator	20-1000 MHz; sweep width variable to 100 MHz	Wavetek 2001
Oscilloscope	500 kHz or greater vertical bandwidth	Tektronix 503
Frequency Counter	21.4-1060 MHz capability	HP-5248L Counter with HP-5253B and HP-5254C plug-in converters
Step Attenuator	0-30 dB in 1 dB steps; 1 GHz capability	Kay 431-C
Impedance Comparator	50 Ω; alc provision	Telonic Rho-Tector (TRB-4) with 1:1, 3:1, and 4:1 vswr terminations
Low Impedance Detector	50 Ω impedance	Telonic XD-3A
High Impedance Detector	Low capacitance	See Figure 4-1
Resistive Loads	100 Ω and 600 Ω; non-inductive	1/4 W, 5% carbon resistors, local stock

Table 4-1. Test Equipment Required (cont'd)

EQUIPMENT TYPE	REQUIRED CHARACTERISTICS	RECOMMENDED EQUIPMENT
Variable Transformer	103-127 V ac or 200-240 V ac	General Radio W5MT3A General Radio W5HMT
-10 V dc Supply	-10 V dc output	HP6215A
Miscellaneous Tees, Adapters, etc.	To suit available test instruments	

Table 4-2. Receiver Troubleshooting Chart

SYMPTOM	TROUBLESHOOTING PROCEDURE
1) Receiver totally inoperative; meter lamp does not illuminate; no outputs	a) Check ac line cord to ensure that it is connected to a proper power source.
	b) Check ac line fuses F1 and F2 (F2 required only for 220/230 V operation).
2) Receiver operates erratically, symptoms varied	a) Check +15 V dc supply from U2 at E8. Test -15 V dc supply from U3 at E9. Readings should be within ±0.1 V.
	b) Check ac line voltage to ensure that it is within ±10% of nominal value required by receiver.
3) Receiver inoperative on some bands, OK on others.	a) Check relays K1-K3; relay coils should have voltage drop of zero when de-energized and approximately 15 volts when energized. Check relay contacts with ohmmeter.
	b) Check tuning head corresponding to inoperative band.
	c) Inspect tuner switching assembly (A5) for loose connections and shorted wire; clean A5S1 (TUNER SELECT) switch contacts.
4) Receiver sensitivity poor for one band only.	a) Check corresponding tuning head.

Table 4-2. Receiver Troubleshooting Chart (cont'd)

SYMPTOM	TROUBLESHOOTING PROCEDURE
5) Frequency indication on Display Unit does not go to end of band	a) Refer to tuner oscillator tracking adjustments on related tuner.
6) Zero or low receiver audio/video outputs for a particular i-f bandwidth; same symptoms for all operating modes.	a) If inadequate i-f output available at J11 (see Table 1-1 for proper output levels), check corresponding selectable 21.4 MHz i-f amplifier (A6A2, A6A3, or A6A4) for defect or misalignment.
	b) Check i-f output amplifier (A6A5).
	c) Check S3 (IF BANDWIDTH).
7) Receiver works OK in AM, CW, or PULSE modes, but not in FM mode.	a) Check i-f output amplifier (A6A5).
	b) Check S4A (MODE).
8) Same as above, but FM mode does not work only for a single i-f bandwidth.	a) Check corresponding fm limiter/discriminator (A6A6, A6A7, or A6A8).
9) Receiver operates only in FM mode.	a) Check i-f output amplifier (A6A5).
10) Receiver operates properly in all but CW.	a) Check BFO section of i-f output amplifier (A6A5).
11) Video output low or zero.	a) Check video/afc-dafc amplifier.
	b) Check R15 (VIDEO GAIN).
12) No audio output; video output OK.	a) Check squelch gate, audio amplifier both parts of A11).
	b) Check R13 (AUDIO GAIN).
13) No fine tuning or DAFC/AFC (one tuner only).	a) Check corresponding tuning head for defective varactor diode circuit in LO.
14) No fine tuning for any band, DAFC/AFC OK.	a) Check for presence of +6 to +12 V dc at arm of R2 (FINE TUNE). Voltage varies as control is rotated.

Table 4-2. Receiver Troubleshooting Chart (cont'd)

SYMPTOM	TROUBLESHOOTING PROCEDURE
15) Fine tuning OK, AFC and/or DAFC inoperative (all bands).	a) Check afc-dafc amplifier (A6A1).
16) DAFC inoperative; AFC and fine tuning OK.	a) Check external dafc frequency counter and interconnecting cables.
17) Receiver gain low for all bands and all modes; under no-signal conditions, signal strength meter does not read zero, and rf and/or i-f agc lines (XA10 pin 8 and XA10 pin 15, respectively) show negative voltage reading (instead of approximately zero volts).	a) Check agc amplifier circuitry (A10).
18) Same as above, but receiver OK in CW and AM/MAN modes.	a) Check agc averager circuitry (A10).
19) Receiver overloads with strong signal inputs in AM/AGC, FM, and PULSE modes; insufficient deflection on signal strength meter.	a) Check agc averager/amplifier circuitry (A10).
20) COR output inoperative; COR relay activates normally.	a) Check K4 (COR relay) contacts.
	b) Check J7 pins.
21) COR output inoperative; COR relay does not activate.	a) Check squelch gate, COR driver (A11).
	b) Check K4 for open winding.

pulling tool located on the partition separating the tuners from the i-f and fm limiter/discriminator board. Deenergize the receiver before making resistance checks or soldering components. Test the power supply voltages as a first step in any troubleshooting procedure. Efforts should then be directed toward isolating the trouble to a particular circuit group on a block diagram level, then to a specific circuit board and component. The block diagram and schematic discussions in Section III were written to aid in localizing troubles. The alignment procedure test setups given in paragraph 4-7 may be used to determine proper functioning of specific circuits and to determine if repair or alignment is necessary. Table 4-2 is a troubleshooting chart for tracing typical troubles down to the modular level. Figure 4-1 shows the routing of preset lines from the tuning heads to the circuit boards in the Display Unit. Use this figure and the appropriate schematic diagrams to troubleshoot problems in these areas.

4.5.2 REPAIR. - When a trouble has been isolated to a specific circuit board the user may either repair the board or send it to a higher maintenance level for repair. If the board has adjustable components, the alignment procedure given in paragraph 4.7 pertaining to that particular board should be used to determine if alignment is correct. When repair is completed, the overall performance test procedure should be carried out to determine if further alignment is necessary.

4.5.3 REMOVAL OF TUNING HEADS. - Under certain circumstances (normally for troubleshooting) it may be necessary to remove one or more of the tuning heads. This can be accomplished by the user, but great care must be exercised to avoid breaking cables and pinching wires. The procedure below should be used to remove and reinstall the tuning heads.

CAUTION

In the following procedure, make sure that the cables in the receiver do not get caught between the tuner and receiver chassis. The sharp edges could sever the cable insulation.

4.5.3.1 WJ-9066-3 Tuning Head. - Proceed as follows:

(1) Remove the receiver from its source of ac power. Slide off the top and bottom covers.

(2) Remove the WJ-9066-3 tuning knob from its shaft using an allen wrench.

(3) Carefully pull the power/control cable plug (A1P1) from its socket (A5J1). Note that the plug and socket can only mate one way.

(4) Disconnect all coaxial cables from the tuning head.

(5) Remove the four screws that fasten the tuning head to the receiver chassis.

(6) Remove the tuning head by carefully pulling it toward the bottom side of the receiver (the tuning head does not come out through the top-side of the receiver.)

(7) To reinstall the tuning head, reverse the above procedure. When reconnecting A1P1 to A5J1, be sure that the plug and socket are mated correctly. Do not use force, as the pins might bend or break.

4.5.3.2 WJ-9062-3, WJ-9064-3, and WJ-9065-3 Tuning Heads. - These tuning heads are removed and reinstalled in a manner similar to that of the WJ-9066-3, and the same general procedure may be employed.

4.6 PERFORMANCE TESTS

4.6.1 GENERAL. - The performance test procedures given here may be used as an incoming inspection, for periodic checks, as an aid in troubleshooting, or after repairs have been made. The procedure should be carried out only by skilled technicians using equipment listed in Table 4-1, or equivalents. If the receiver does not operate within the limits and tolerances specified in these procedures, troubleshooting may be necessary. These are selected, overall performance tests; they do not test the receiver in all modes of operation. In addition to these tests, therefore, the user should perform functional checks of all operating features of the receiver, using the operating instructions in Section II as a guide. Keep the terminations and caps on all unused outputs during test and alignment. Refer to the installation instruction in Section II for output impedances of these various outputs.

4.6.2 POWER SUPPLY REGULATOR TESTS. - Proceed as follows:

(1) Connect a Variac or variable-frequency power source to the ac line power source (115 V or 220 V ac,). Set the voltage at 115 V or 220 V rms. If a variable-frequency power source is used, set the frequency to the applicable line frequency.

(2) Check that the rear-panel line voltage selector slide switch (S5) is in the position corresponding to the line voltage to be used. Plug the receiver line cord into the Variac or variable-frequency power source, then energize the receiver.

(3) Use a digital voltmeter to measure the ±15 V regulator outputs at the points indicated in Table 4-3. Adjust the Variac or power source as necessary to produce a receiver line voltage of 103 V rms, then 127 V rms, or 200 V rms, then 240 V rms, while noting the dc readings. The regulator output voltages should not fall outside the limits specified in the following table. Do not operate the Variac or power source outside the rated receiver limits.

Table 4-3. Power Supply Voltages

POWER SUPPLY	MEASURED AT	MINIMUM READING	MAXIMUM READING
+15 V	E8 (See Fig. 6-32)	+14.9 V	+15.1 V
-15 V	E9 (See Fig. 6-32)	-14.9 V	-15.1 V

4.6.3 IF BANDWIDTH AND CENTER FREQUENCY TESTS. - Proceed as follows:

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

(2) Set the receiver MODE switch at AM/MAN, set the RF/IF GAIN control fully clockwise, and set the IF BANDWIDTH switch in position number 1 (ccw).

(3) Set the step attenuator for 13 dB attenuation.

(4) Set the signal generator for a cw output at 21.4 MHz. Adjust the signal generator output level for a 1 V dc reading on the vtvm.

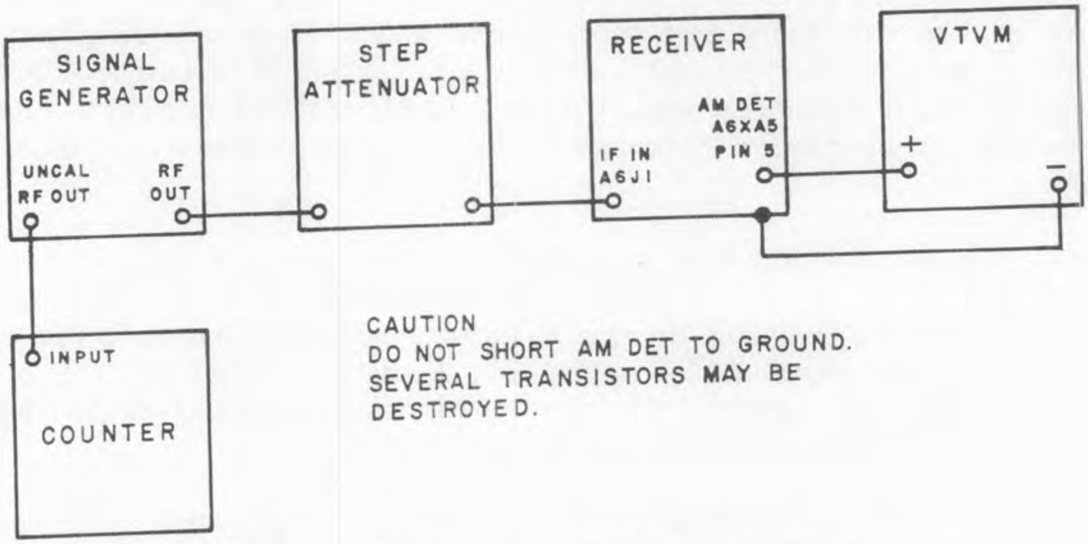


Figure 4-2. Test Setup for IF Bandwidth and Center Frequency Performance Tests.

(5) Change the step attenuator setting to 10 dB. This will cause an increase in the vtvm reading.

(6) Increase the frequency of the signal generator until the vtvm again reads 1 V dc. Record the frequency counter reading.

(7) Decrease the signal generator frequency until a 1 V dc reading is obtained, and record the corresponding frequency counter reading.

(8) Subtract the frequency counter reading taken in step (7) from the reading taken in step (6). If the i-f bandwidth is 100 kHz, or less, the difference should be within +20% to -10% of the bandwidth selected by the IF BANDWIDTH switch. If the bandwidth is greater than 100 kHz, the difference should be ±10% of the i-f bandwidth. The bandwidths are printed on the card-insert mounted just above the IF BANDWIDTH switch.

(9) Add the readings taken in steps (6) and (7), and divide the sum by two. The quotient should be 21.4 MHz, ±5% of the i-f bandwidth.

(10) Repeat steps (3) through (9) for the remaining two positions of the IF BANDWIDTH switch.

4.6.4 OVERALL AM SENSITIVITY TESTS. - Proceed as follows:

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

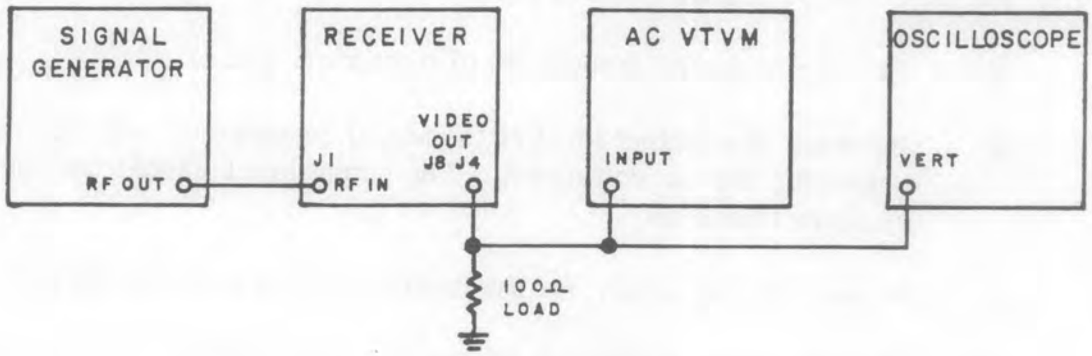


Figure 4-3. Test Setup for AM and CW Sensitivity, AM Output Stability, and AM Audio and Video Output Level Performance Tests.

(2) Place the receiver MODE switch in the AM/FAST AGC position.

(3) Select any convenient bandwidth with the IF BANDWIDTH switch.

(4) Select the tuner BAND in which the test is to be performed. Set the the corresponding tuner at the desired frequency.

(5) Set the signal generator and tuner to the same frequency so the signal is in the center of the i-f bandpass. The signal generator should be in the cw mode.

(6) Set the signal generator to the level shown in Table 1-2 for the corresponding tuner and bandwidth. For example, with a 100 kHz bandwidth setting, if the selected tuner was the WJ-9062-3 (TUNER 2) the signal generator would be set for a -96 dBm output.

(7) Amplitude-modulate the signal generator 50% at a 1 kHz rate, without disturbing the frequency or level settings.

(8) Adjust the VIDEO GAIN of the receiver for a convenient dB reference on the ac voltmeter.

(9) Remove the modulation of the signal generator, without disturbing

the frequency or level settings. The meter reading should decrease a minimum of 10 dB from the reference set in step (8). It may be convenient to perform the am output stability tests at this point (paragraph 4.6.5).

(10) Repeat the procedure at any other desired bandwidth and/or test frequency.

(11) Repeat the above procedure for the other tuners.

4.6.5 AM OUTPUT STABILITY (AGC) TESTS. - Proceed as follows:

(1) Perform steps (1) through (8) of paragraph 4.6.4.

(2) Increase the output level of the signal generator to -10 dBm while observing the ac voltmeter. The output level should not increase by more than 6 dB.

(3) Repeat the procedure for the remaining two i-f bandwidths.

(4) Perform steps (1) through (3) for the other tuners.

4.6.6 AM AUDIO AND VIDEO OUTPUT LEVEL TESTS. - Proceed as follows:

(1) Perform steps (1) through (7) of paragraph 4.6.4.

(2) Place the receiver MODE switch in AM/MAN.

(3) Rotate the RF/IF GAIN control fully clockwise. Set the VIDEO GAIN control for maximum undistorted output.

(4) Note the video output level as measured by the ac voltmeter. It should be at least 0.1 V rms.

(5) Connect a 600 ohm load between pins 1 and 2 of rear panel terminal board TB1. Set the COR/SQUELCH control fully clockwise. Connect the ac voltmeter and oscilloscope across the load. Set the AUDIO GAIN control for maximum output with less than 10% distortion.

(6) Note the voltmeter reading. It should be at least 17.5 V rms.

4.6.7 OVERALL CW SENSITIVITY TESTS. - Proceed as follows:

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

(2) Place the receiver MODE switch in the cw position and adjust the RF/IF GAIN maximum clockwise.

(3) Select any convenient bandwidth with the IF BANDWIDTH switch.

(4) Select the tuner for which the test is to be performed and set it at the desired frequency.

(5) Set the signal generator to the tuner frequency so the signal is centered in the i-f bandpass. The generator should be unmodulated.

(6) From Table 1-2, determine the tuner input level required by correlating the selected tuner and bandwidth. For example, a 90-300 MHz tuner and 300 kHz i-f amplifier correlate to -91 dBm. For the purposes of this test, the actual level must be 6 dB or less than that determined in the table. Thus, -97 dBm would be the actual level used for this test. Set the signal generator output level to the level determined in this step.

(7) Set the AFC/DAFC switch OFF, and offset the receiver fine tuning to obtain a 1 kHz tone output at J8, the video output.

(8) Adjust the VIDEO GAIN of the receiver for a convenient dB reference on the ac voltmeter.

(9) Disconnect the signal generator. The meter reading should decrease a minimum of 10 dB from the reference set in step (8).

(10) Repeat the procedure at any other bandwidth and/or test frequency. Repeat the procedure for the other tuners.

4.6.8 FM SENSITIVITY TESTS. - Proceed as follows:

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

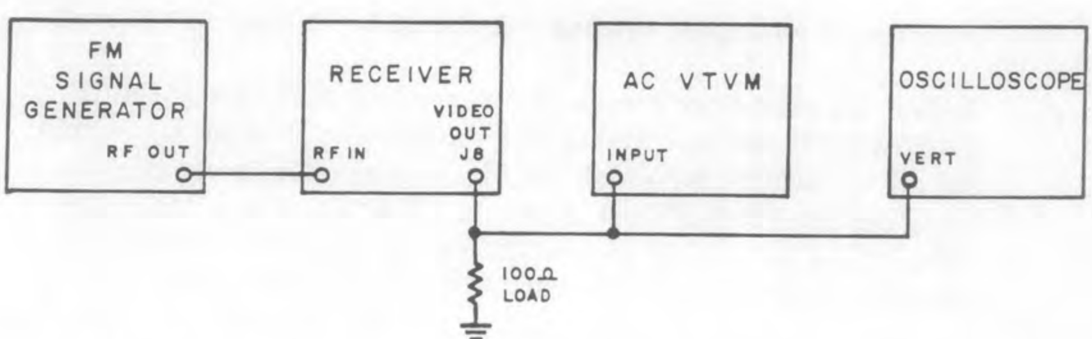


Figure 4-4. Test Setup for FM Video Output Level Performance Tests

(2) Place the receiver MODE switch in the FM position. Set the BAND switch to the tuner to be used in the test.

(3) Select bandwidth number 1 with the IF BANDWIDTH switch.

(4) Operate the signal generator in the cw mode, and set the frequency at approximately the center of the tuner range. Fine tune the receiver to this frequency.

(5) Modulate the signal generator at a 1 kHz rate, with a deviation equal to 30% of the i-f bandwidth (use a 400 Hz rate for a 10 kHz or less i-f bandwidth).

(6) Refer to Table 1-2. Set the signal generator output at the level corresponding to the tuner noise figure and the i-f bandwidth.

(7) Adjust the VIDEO GAIN of the receiver for a convenient dB reference on the ac voltmeter.

(8) Remove the modulation from the signal generator, without disturbing the center frequency or level settings. The meter reading should decrease a minimum of 17 dB from the reference set in step (7).

(9) Repeat steps (4) through (8) for the remaining two i-f bandwidths. For the 20 kHz i-f bandwidth, fm sensitivity with any tuner is specified as 20 dB (s+n)/n with 5 kHz deviation and an input level of - 95 dBm.

4.6.9 FM VIDEO OUTPUT LEVEL TESTS. - Proceed as follows:

(1) Perform steps (1) through (5) of paragraph 4.6.8.

(2) Set the signal generator level at -47 dBm.

(3) Set the VIDEO GAIN control for maximum undistorted output.

(4) Note the ac voltmeter reading. It should be at least 0.1 V rms.

(5) Repeat the procedure for the two remaining positions of the IF BANDWIDTH switch. The meter should read at least 0.1 V rms for all bandwidths for which the signal generator is capable of being deviated 30% of the bandwidth. If it is not possible to deviate 30% of the 3 MHz bandwidth, set the deviation at 300 kHz. The meter should read at least 0.034 V rms in this case.

4.6.10 OVERALL TUNER GAIN CHECK. - Proceed as follows:

(1) Connect the equipment as shown by the solid lines in Figure 4-5.

(2) Place the receiver in the AM MAN mode and in its narrowest i-f

bandwidth position. Rotate the RF/IF gain control fully clockwise.

(3) Place the BAND switch in the TUNER 1 position. This activates the 26-90 MHz WJ-9066-3 Tuning Head.

(4) Set the tuning head and sweep generator to 26 MHz.

(5) Set the step attenuator at 30 dB attenuation.

(6) With the oscilloscope vertical sensitivity at 5 mV/cm, adjust the sweep generator controls for an undistorted response curve.

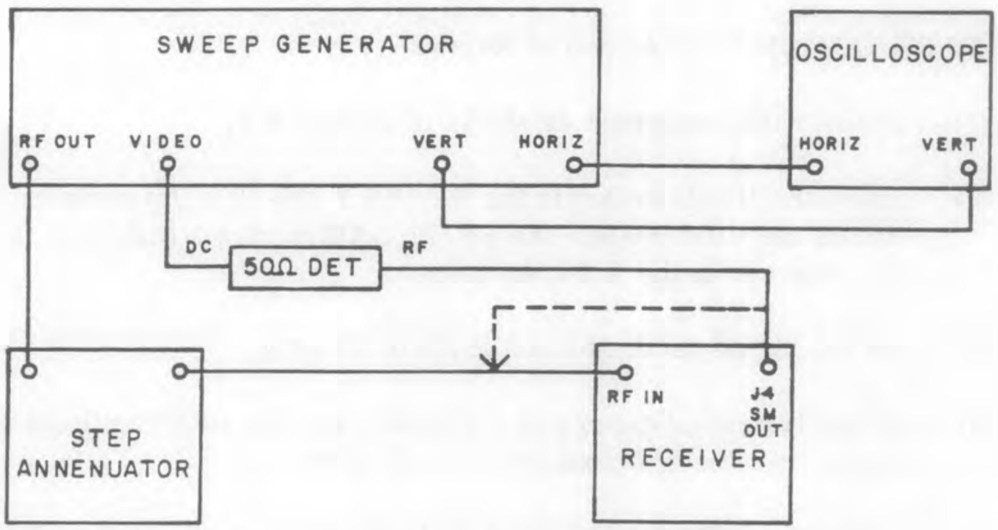


Figure 4-5. Test Setup, Tuner Gain

(7) While tuning the tuning head and sweep generator center frequency slowly across the entire 26-90 MHz frequency range, observe the response amplitude and find the frequency at which this amplitude is minimum. When this frequency is determined, adjust the oscilloscope vertical sensitivity to place the response peak at a convenient reference point on the graticule.

(8) Connect the step attenuator output to the detector input as shown by the dotted line in Figure 4-5. Decrease the attenuation of the step attenuator until the response peak on the oscilloscope reaches the level noted in step (7).

(9) The difference between the attenuator settings in steps (5) and (8) is the minimum overall gain on the unit. Repeat steps (1) through (8), this time using the frequency of maximum gain as the basis for the computation. In either case, the gain of the tuning head should be between 21 and 27 dB.

(10) The gains of the three remaining tuning heads can be measured using a procedure similar to that presented in steps (1) through (9) above. Place the BAND switch in the appropriate position for each tuning head. Listed below are the acceptable gains of each tuning head:

WJ-9066-3	21-27 dB
WJ-9062-3	19-25 dB
WJ-9064-3	17-23 dB
WJ-9065-3	15-21 dB

4.6.11 IF REJECTION. - Proceed as follows:

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

(2) Place the BAND switch in the TUNER 1 (26-90 MHz) position. Rotate the VIDEO GAIN and RF/IF GAIN controls fully cw. Place the receiver in the AM MAN mode.

(3) Set the signal generator and tuner to 26 MHz.

(4) Adjust the signal generator controls for 1 kHz 50% amplitude modulation. Set the rf output level to -96 dBm.

(5) Adjust the VIDEO GAIN control slightly for a convenient reference indication on the ac vtvm. If an indication is not clearly obtainable, reduce the receiver i-f bandwidth.

(6) Tune the signal generator to 21.4 MHz and increase the output level to again obtain the ac vtvm reading noted in step (5). Note the new signal generator output level. The new signal generator output level should be -36 dBm or greater (at least 60 dB above the level set in step (5) of this procedure).

(7) A similar procedure is employed to measure the i-f rejection for the other tuners. Refer to the chart below for the test frequency, i-f frequencies, and minimum acceptable i-f rejection for each tuner:

TUNER	TEST FREQUENCY	IF FREQUENCY	MIN. IF REJECTION
WJ-9066-3 (1)	26 MHz	21.4 MHz	60 dB
WJ-9062-3 (2)	90 MHz	21.4 MHz	80 dB
WJ-9064-3 (3)	250 MHz	60 MHz, 21.4 MHz	80 dB
WJ-9065-3 (4)	500 MHz	60 MHz, 21.4 MHz	80 dB

4.6.12 IMAGE REJECTION. - Proceed as follows:

(1) Repeat paragraph 4.6.11 steps (1) through (5), tuning the signal generator and tuner to a frequency of 90 MHz.

(2) Tune the signal generator to 132.8 MHz and increase the output level until the indication on the ac vtvm is the same as the reference level set above. The signal generator output level should now be -38 dBm or greater (at least 60 dB greater than the reference level set above).

(3) A similar procedure is employed to measure the image rejection of the other tuners. Refer to the chart below for the test frequency, image frequency, and minimum acceptable image rejection for each tuner:

TUNER	TEST FREQUENCY	IMAGE FREQUENCY	MIN. IMAGE REJECTION
WJ-9066-3 (1)	90 MHz	132.8 MHz	60 dB
WJ-9062-3 (2)	300 MHz	342.8 MHz	60 dB
WJ-9064-3 (3)	470 MHz	590 MHz	60 dB
WJ-9065-3 (5)	1000 MHz	1120 MHz	60 dB

4.6.13 LOCAL OSCILLATOR OUTPUT LEVEL TEST. - Proceed as follows:

(1) Connect an rf voltmeter to LO output jack U1J1, using a 50-ohm adapter. With the BAND switch in the TUNER 1 position, tune the WJ-9066-3 Tuning Head (tuner 1) across its range, noting the rf voltmeter indication. The LO output level should be no less than 50 mV across the band.

(2) Repeat step (1) with the BAND switch in the TUNER 2, 3 or 4 positions. The LO output should be no less than 50 mV across each band.

4.7 TROUBLESHOOTING CHECKOUT AND ALIGNMENT.

4.7.1 GENERAL. - The following alignment procedures should not be performed on a routine basis. Rather, the test setups should be used as troubleshooting aids and for post-repair tests, and the corresponding alignment procedures should be performed only if the tests indicate that troubleshooting and repair have disturbed the alignment. The procedures may also be used for testing and aligning, if necessary, new or repaired subassemblies received from the factory or depot, before returning the receiver to service with the new subassemblies installed. Procedures for subassemblies not having adjustable components are not included. The alignment tools mounted on the chassis should be used as required when aligning the receiver.

4.7.2 POWER SUPPLY MODULES. - These +15 V dc and -15 V dc power supplies require no adjustments.

4.7.3 IF AMPLIFIER BANDPASS ALIGNMENT. - Refer to schematic diagram Figures 6-12 through 6-21 (as appropriate) when performing the adjustments in this paragraph. The parts list illustrations for the Type 72462 IF Amplifier Assembly (A6) are Figures 5-33 through 5-40. This procedure is divided into two parts, these being touch-up and complete-alignment procedures. The technician should first attempt to achieve the required bandpass characteristics using the touch-up procedure. Complete alignment need not be performed unless the touch-up procedure fails. The overall i-f amplifier gain, and agc threshold alignment should be checked, and adjusted if necessary, when the i-f bandpass alignment is completed. Do not use an extender card when doing the touch-up procedure because the bandpass characteristics will change when the boards are reinstalled in their sockets.

4.7.3.1 <u>Touch-up Bandpass Alignment.</u> -

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

(2) Turn off the power to the receiver. Remove all three of the 21.4 MHz i-f amplifiers boards, A6A2, A6A3, and A6A4. Make a note of the locations of the boards so they may be returned to their original positions.

(3) Connect the test equipment as shown in Figure 4-7, and turn the power on.

(4) Set the sweep generator output to greater than 5 MHz sweepwidth, centered on a frequency of 21.4 MHz. Turn on the sweep generator's 21.4 MHz marker. Set the oscilloscope vertical sensitivity at 200 mV/cm. Adjust the sweep generator output level and oscilloscope sweep controls to obtain a 5 MHz wide response curve.

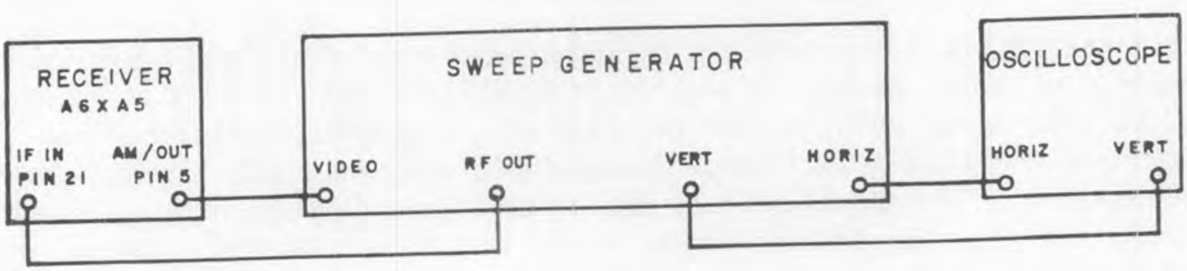


Figure 4-6. Test Setup No. 1 for IF Amplifier Alignment

(5) Do not touch A6A5R1 or A6A5R5. If these are accidently turned, the overall i-f and agc gain will require alignment after this procedure is completed. If it is known that the overall i-f and agc gain will require alignment, rotate these potentiometers fully clockwise.

(6) Adjust capacitor A6A5C11 for a maximum-amplitude response curve. It should be symmetrical about the 21.4 MHz marker.

(7) Turn off the power and reinstall the i-f amplifier boards.

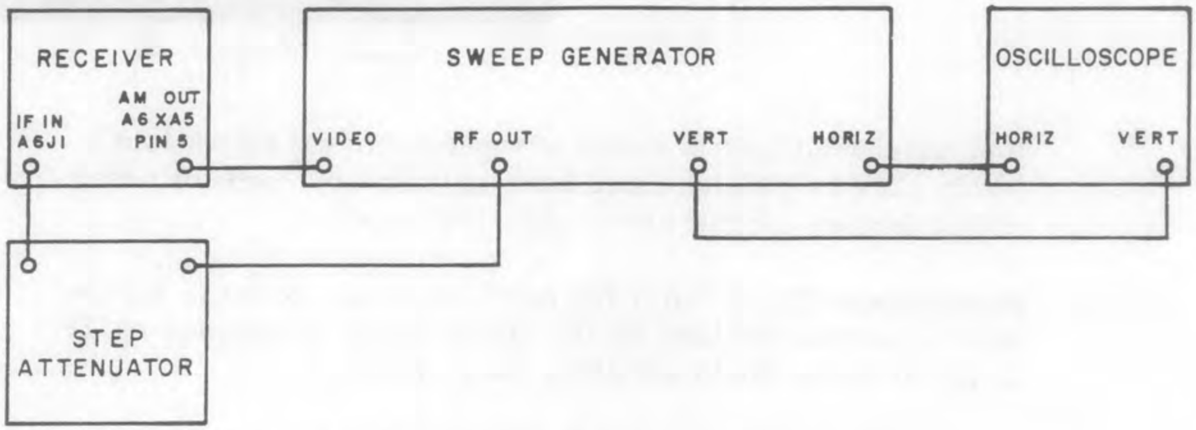


Figure 4-7. Test Setup No. 2 for IF Amplifier Alignment

(8) Reconnect the test equipment as shown in Figure 4-7. Turn on the power.

(9) Check that the receiver controls are in positions described in step (1).

(10) Rotate the IF BANDWIDTH switch fully clockwise.

(11) Set the oscilloscope vertical sensitivity at approximately 0.2 V cm.

(12) Sweep the sweep generator frequency to 21.4 MHz with a sweepwidth of twice the i-f bandwidth printed on the card mounted above the IF BANDWIDTH switch. Adjust the oscilloscope sweep, sweep generator output level, and step attenuator to obtain a full-scale display of the i-f response. It should resemble Figure 4-8.

(13) Touch-up the A6A2 i-f amplifier board tuning components listed for this bandwidth in Table 4-4, for an i-f response curve as close as possible to the ideal curve shown in Figure 4-8. That is, the curve should be symmetrical about 21.4 MHz, be as flat as possible on

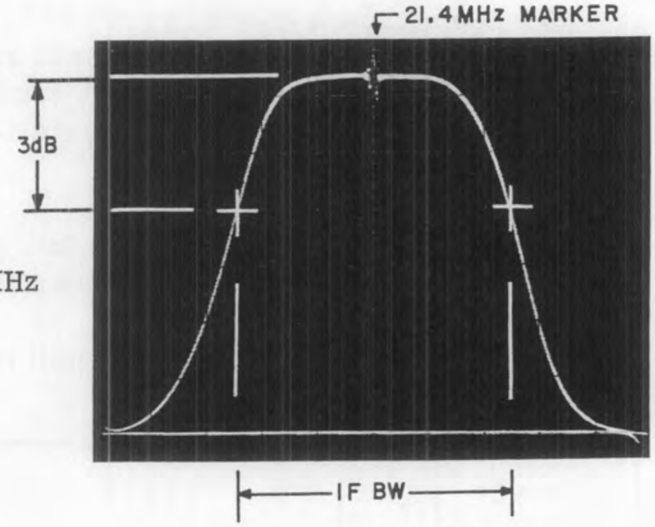


Figure 4-8. Typical Response, 21.4 MHz IF Amplifier

top, and the 3 dB points should be separated by the i-f bandwidth within +20% to -10% tolerance for 8-100 kHz BW boards or within ±10% tolerance for 200 kHz -3 MHz BW boards.

(14) Repeat steps (12) and (13) for positions 1 and 2 of the IF BANDWIDTH switch, touching up the listed tuning components on IF amplifier boards A6A3 and A6A4, respectively.

Table 4-4. IF Amplifier Tuning Components

IF BANDWIDTH	TUNING COMPONENTS	GAIN CONTROL
8 kHz 10 kHz 20 kHz 50 kHz 100 kHz	L1, L2, L3	R26
200 kHz 300 kHz 500 kHz 1 MHz 2 MHz 3 MHz	C7, C10, C20, C13, C16	R27

NOTE

Do not adjust the gain control potentiometers. If these are accidently turned, the overall i-f and afc gain will require alignment. If it is known that the overall i-f and agc gain will require alignment, turn these potentiometers fully clockwise.

4.7.3.2 Complete Bandpass Alignment. -

(1) Perform steps (1) through (4) of the touch-up alignment procedure given in paragraph 4.7.3.1. Rotate A6A5R1 and A6A5R5 fully clockwise, then perform steps (6) and (7) of that procedure.

(2) Perform the following alignment for each i-f bandwidth of 8 kHz, 10 kHz, 20 kHz, 50 kHz, and 100 kHz.

(a) Connect the equipment as shown in Figure 4-7, i-f amplifier alignment test setup No. 2.

(b) Place the receiver MODE switch in the AM/MAN position, rotate the RF/IF GAIN control fully clockwise, and select the bandwidth to be aligned with the IF BANDWIDTH switch.

(c) Turn R26 on narrow bandwidth i-f amplifiers fully clockwise.

(d) Perform step (12) of the touch-up alignment procedure given in paragraph 4.7.3.1.

(e) Adjust inductors L1 and L2 for minimum response ripple and adjust L3 for a slightly rounded response centered at 21.4 MHz.

(f) Touch up the i-f amplifier board tuning components listed in Table 4-4 for this bandwidth. Adjust for an i-f response curve similar to the idealized curve shown in Figure 4-8. That is, the curve should be symmetrical about 21.4 MHz, be as flat as possible on top, and the 3 dB points should be separated by the i-f bandwidth within +20% to -10% tolerance.

(3) Perform the following alignment for each i-f bandwidth of 200 kHz, 300 kHz, and 500 kHz.

(a) Turn off the power, and install the i-f amplifier board to be aligned on the extender card.

(b) Connect the equipment as shown in Figure 4-9, Test Setup No. 3, connecting the detector to board test point terminal E1. Turn the power on.

(c) Place the receiver MODE switch in the AM/MAN position, rotate the RF/IF GAIN control fully clockwise, and select the bandwidth to be aligned with the IF BANDWIDTH switch.

(d) Turn on the sweep generator 21.4 MHz marker, and sweep

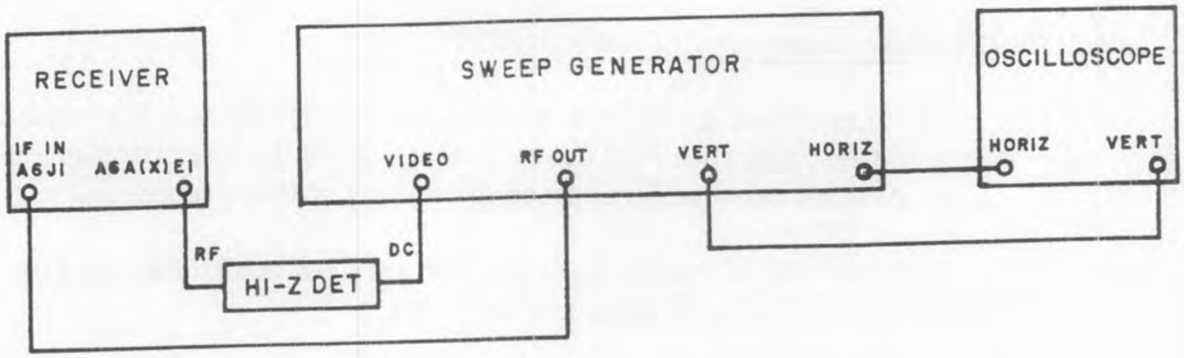


Figure 4-9. Test Setup No. 3 for IF Amplifier Alignment

the frequency about a 21.4 MHz center frequency.

(e) Adjust the sweep generator and oscilloscope controls as necessary to obtain an undistorted sweep response.

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

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

(h) Remove the short from L2.

(i) Connect a short across C20.

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

(k) Remove the short from C20.

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

(m) Remove the high-impedance detector connection from terminal E1. Turn off the receiver power, and return the board to its receptacle. Turn the power back on.

(n) Connect the equipment as shown in Figure 4-7, test setup No. 2.

(o) Turn R27 fully clockwise.

(p) Adjust capacitors C7, C13, and C16 for a maximum amplitude, slightly overcoupled response centered at 21.4 MHz, with no more than 1 dB ripple.

(q) Touch up the i-f amplifier board tuning component listed for this bandwidth in Table 4-4, for an i-f response curve similar to the idealized curve shown in Figure 4-8. That is, the curve should be symmetrical about 21.4 MHz, be as flat as possible on top, and the 3 dB points should be separated by the i-f bandwidth ±10%.

(4) Perform the following alignment for each i-f bandwidth of 1 MHz, 2 MHz, and 3 MHz.

(a) Turn off the power, and install the board to be aligned on the extender card.

(b) Connect the equipment as shown in Figure 4-9, Test Set-up No. 3, connecting the detector to board test point terminal E1. Turn on the power.

(c) Place the receiver MODE switch in the AM/MAN position, rotate the RF/IF GAIN control fully clockwise, and select the bandwidth to be aligned with the IF BANDWIDTH switch.

(d) Turn on the sweep generator 21.4 MHz marker, and sweep the frequency about a 21.4 MHz center frequency.

(e) Adjust the sweep generator and oscilloscope controls to obtain an undistorted sweep response presentation.

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

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

(h) Remove the short from L2.

(i) Connect the short across L3.

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

(k) Remove the short from L3.

(l) Connect a short across L4.

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

(n) Remove the short from L4.

(o) Connect a short across L5.

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

(q) Remove the short from L5.

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

(s) Remove the high-impedance detector connection from E1, turn off the receiver power, and return the board to its receptacle. Turn the power back on.

(t) Connect the equipment as shown in Figure 4-7, Test Setup No. 2.

(u) Touch up the i-f amplifier board tuning components listed in Table 4-4 for this bandwidth. Adjust for an i-f response curve as close as possible to the ideal curve shown in Figure 4-8. That is, the curve should be symmetrical about 21.4 MHz, be as flat as possible on top, and the 3 dB points should be separated by the i-f bandwidth ±10%.

(5) Adjust the i-f amplifier gain and agc threshold, using the procedure given in paragraph 4.7.4 below.

4.7.4 IF AMPLIFIER GAIN AND AGC THRESHOLD ALIGNMENT. - Refer to the same schematic diagrams and parts list illustrations (as appropriate) as indicated in paragraph 4.7.3. This procedure should be performed after the i-f amplifier bandpass alignment is checked, and adjusted. Proceed as follows:

(1) Turn off the receiver power. Remove all three i-f amplifier boards and install i-f output amplifier board A6A5 on the extender card. Turn on the receiver power.

(2) Turn R5 on A6A5 fully ccw (no agc).

(3) Connect the signal generator (see Figure 4-10) to A6XA5 pin 21, (i-f input). Set the signal generator frequency at 21.4 MHz cw, and set the level at 500 μV (-53 dBm).

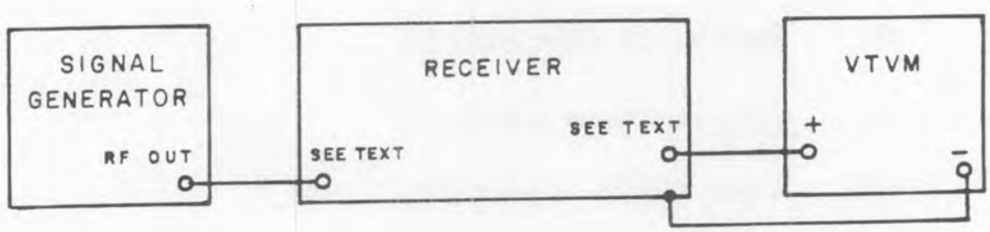


Figure 4-10. Test Setup for IF Amplifier Gain and AGC Threshold Alignment

(4) Connect the dc voltmeter (see Figure 4-10) to A6XA5 pin 2 (detector output).

(5) Adjust gain potentiometer A6A5R1 for a reading of 1.25 V dc on the dc voltmeter.

(6) Turn off the receiver power, and replace the i-f boards after first setting their gain potentiometers (see Table 4-4) fully clockwise (maximum gain).

(7) Connect the signal generator to the i-f input, A6J1.

(8) Connect the dc voltmeter to the i-f agc line at A6C11.

(9) Set the signal generator at 21.4 MHz, unmodulated, at the level listed in the following table for each i-f bandwidth used.

IF BANDWIDTH (kHz)	IF LEVEL (dBm)	IF BANDWIDTH (kHz)	IF LEVEL (dBm)
8	-89	200	-75
10	-88	300	-73
20	-85	500	-71
50	-81	1000	-68
100	-78	2000	-65
		3000	-59

(10) For each i-f bandwidth, set the respective i-f amplifier board gain potentiometer (see Table 4-4) for a meter reading of approximately -0.8 V.

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

(12) Connect the dc voltmeter to A6XA5 pin 2 (detector output).

(13) Set the signal generator (still connected to the i-f input) output level for a 1.0 V detector output reference on the dc voltmeter.

(14) Connect the dc voltmeter to the i-f agc line at A6C11.

(15) Adjust the RF/IF GAIN control for a meter reading of -3.5 V dc.

(16) Reconnect the dc voltmeter to the detector output, A6XA5 pin 2.

(17) Increase the signal generator level by exactly 40 dB, then adjust A6A5R5 for a dc voltmeter reading of exactly 1.0 V.

(18) Return A6A5 to its receptacle in the i-f amplifier assembly.

4.7.5 FM DISCRIMINATOR ALIGNMENT. - Refer to schematic diagram Figures 6-22 through 6-26 (as appropriate) when performing the adjustments in this paragraph.

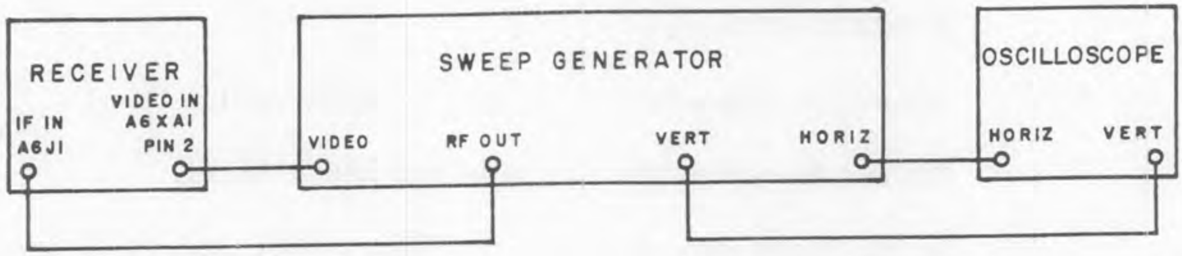


Figure 4-11. Test Setup for FM Discriminator Alignment

(1) Connect the equipment as shown in Figure 4-11.

(2) Select bandwidth number 1 with the IF BANDWIDTH switch, and select the FM mode with the MODE switch.

(3) Turn the VIDEO GAIN control fully clockwise.

(4) Set the sweep generator level at approximately -30 dBm, and sweep the sweep generator approximately 20% more than the selected bandwidth about a center frequency of 21.4 MHz. Adjust the oscilloscope controls and refine the sweep generator control settings for a display curve resembling an "S" similar to the one shown in Figure 4-12. For narrow i-f bandwidths, use a slow sweep speed to avoid having spurious filter response characteristics distort the waveform.

(5) Adjust the A6A8 discriminator linearity and zero crossing controls, listed in Table 4-5 for this bandwidth, for a straight line extending from +0.5 V to -0.5 V between band edges. The exact shape of the remaining portion of the waveform is not critical as long as it has the general "S" shape. Note that there are two zero controls for the 3 MHz discriminator, whereas the other discriminators have only one. To adjust the 3 MHz discriminator, first temporarily remove the sweep generator input signal, and adjust R14 for a 0 V dc discriminator output. Then reconnect the sweep generator and adjust C2 and C6 for optimum linearity and zero crossing of the "S" curve.

(6) Repeat the procedure for the remaining two bandwidths, adjusting the listed (Table 4-5) components on discriminator board A3A7 for bandwidth number 2, and on board A3A6 for bandwidth number 3.

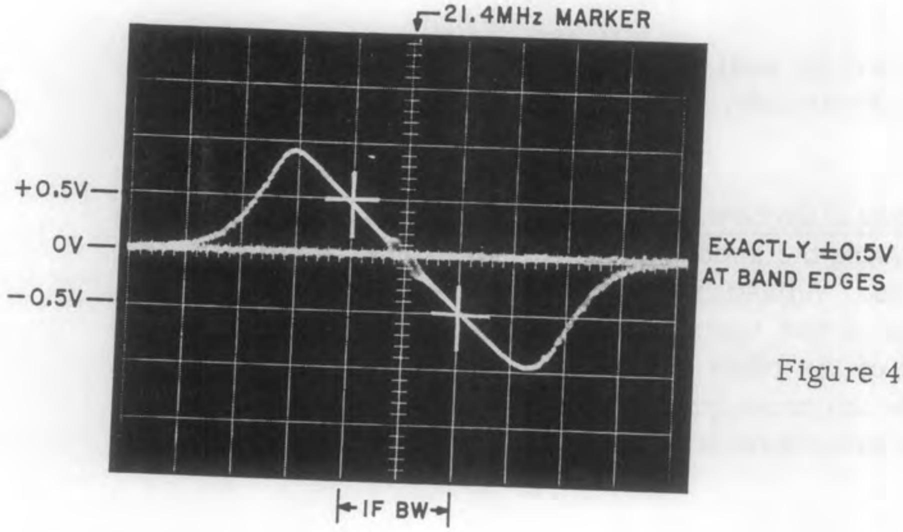


Figure 4-12. Ideal FM Discriminator Output "S" Curve

Table 4-5 FM Discriminator Alignment Components

IF BW	LINEARITY	ZERO CROSSING	DC ZERO
8, 10, 20,50 kHz	L6	R26	-
100, 200, 300 500 kHz, 1 MHz	C8	C10	-
2, 3 MHz	C2	C6	R14

4.7.6 WJ-9066-3 26-90 MHz TUNING HEAD ALIGNMENT (A1). Refer to schematic diagram Figures 6-1 and 6-2 (as appropriate) when performing the adjustments in this paragraph. The location of components for the WJ-9066-3 Tuning Head (A1) are shown in Figures 5-7 through 5-9. Place the receiver BAND switch in position 1 and rotate the RF/IF GAIN control fully clockwise before proceeding with the alignment.

4.7.6.1 Oscillator Tracking Adjustments. - Oscillator frequency must be set at the mechanical stops of the tuning range. To do this, proceed as follows:

(1) Connect a test counter to LO output U1J1 of the Receiver; select position 1 (for 26-90 MHz) of the BAND switch.

(2) Rotate the 26-90 MHz tuning knob fully clockwise.

(3) If necessary, expand or compress the windings of L12 in the tuner to obtain an indication of 46.9±0.3 MHz on the readout.

(4) Rotate the tuning knob fully counterclockwise and, if necessary, expand or compress the windings of L11 to obtain an indication of 112.4±0.9 MHz.

(5) Repeat steps (3) and (4) until the conditions of both steps are met without further adjustments.

4.7.6.2 Preselector Network Alignment. - Although it is possible to align the preselector network by observing the swept bandpass response of the entire tuner, considerable skill is required. Adjusting the preselector network while observing the swept vswr response of the tuner input allows the preselector network to be adjusted independently of the other tuned circuits in the tuner, requiring a minimum of skill. Follow the procedure given below to adjust the preselector network and then follow the procedure in paragraph 4.7.6.2 to adjust the interstage network.

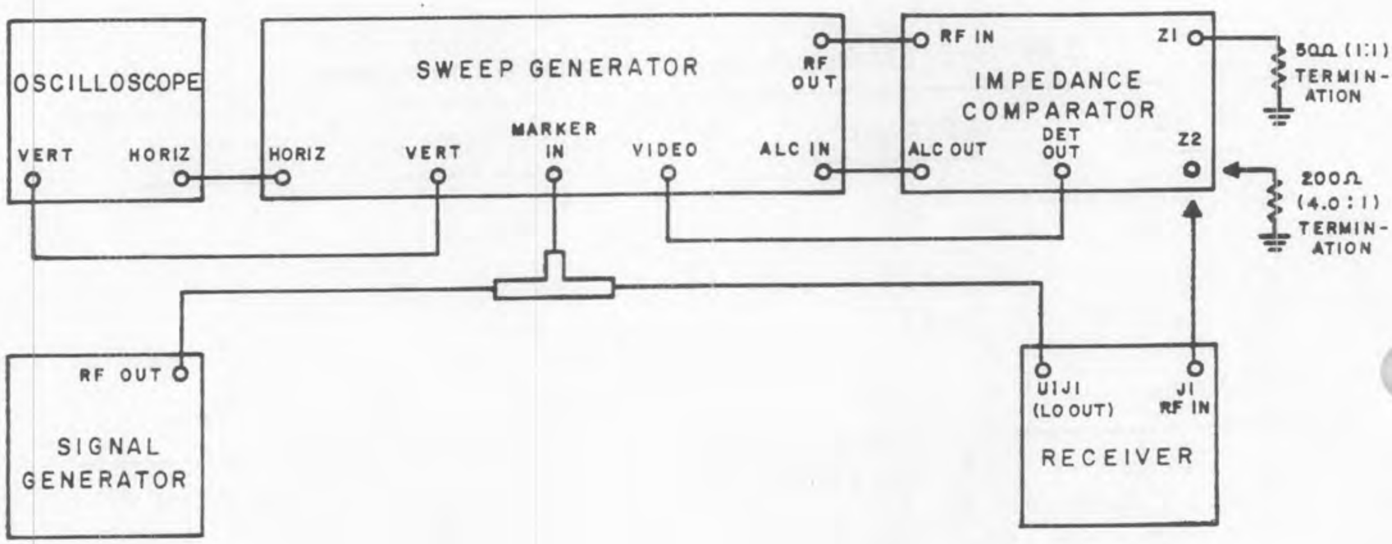


Figure 4-13. Test Setup, Preselector Network Alignment

(1) Connect the test equipment as shown in Figure 4-13. Tune the sweep generator and tuner to 26 MHz. Tune the signal generator to 21.4 MHz. Connect the rf input on the receiver to the Z2 input on the impedance comparator and adjust the sweep generator and oscilloscope controls for an undistorted sweep response with the marker visible.

(2) Disconnect the rf input on the receiver from the impedance comparitor and substitute a 200 ohm (4:1 vswr) termination. A straight horizontal line should appear on the oscilloscope screen representing a 4:1 vswr response. Use the position control on the oscilloscope to make the horizontal line coincide with the X-axis. Remove the termination from the Z2 input on the impedance comparator and reconnect the rf input on the receiver.

CAUTION

The adjustment of A1L3 and A1L4 described in the following step should not be attempted unless considered absolutely necessary (unless, for example, the five section inductuner, L1A-E, is replaced). The shape and positioning of A1L3 and A1L4 is extremely critical. If responses similar to Figures 4-14 and 4-15 cannot be obtained, the tuner should be sent back to the factory for alignment.

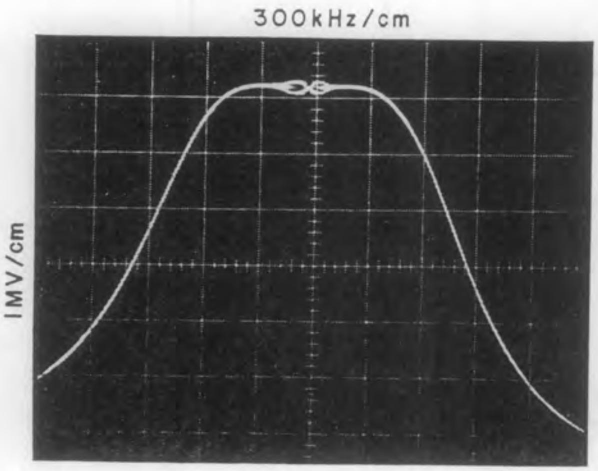


Figure 4-14. Typical VSWR Response, Preselector Network at 20 MHz

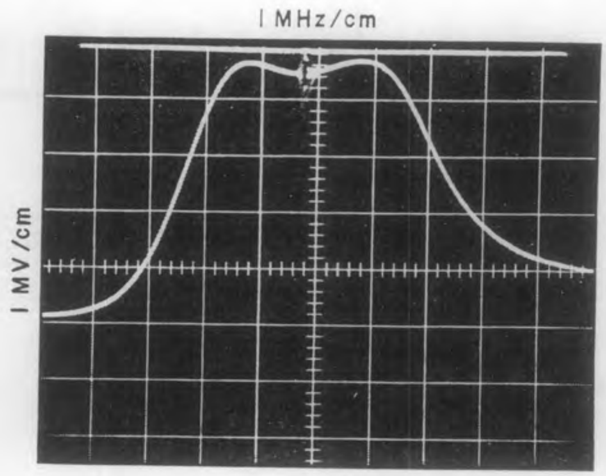


Figure 4-15. Typical VSWR Response, Preselector Network at 90 MHz

(3) Adjust A1C13 and A1C17 for a symmetrical vswr response centered around the 26 MHz marker. The marker should not fall below the X-axis. Figure 4-14 shows a typical vswr response.

(4) Tune the sweep generator and tuner to 90 MHz. Adjust A1L3 and A1L4 (by spreading or compressing the turns as required) for a response centered around the marker. The marker should not fall below the X-axis. Figure 4-15 shows a typical vswr response.

(5) Repeat the alignment procedure at 26 and 90 MHz until interaction between the adjustments is minimized. Then slowly tune the sweep generator and tuner across the tuning range, observing the position of the marker on the response curve. The marker should not fall below the X-axis (indicating a vswr above 4:1) at any frequency in the tuning range.

4.7.6.3 Interstage Network and Converter Alignment. - Proceed as follows:

(1) Connect the equipment as shown in Figure 4-16.

(2) Set the MODE switch to the AM MAN position, set the IF BANDWIDTH switch to its widest bandwidth, and turn the RF/IF GAIN control fully clockwise.

(3) Tune the WJ-9066-3 to 26 MHz and center the FINE TUNING control on the receiver.

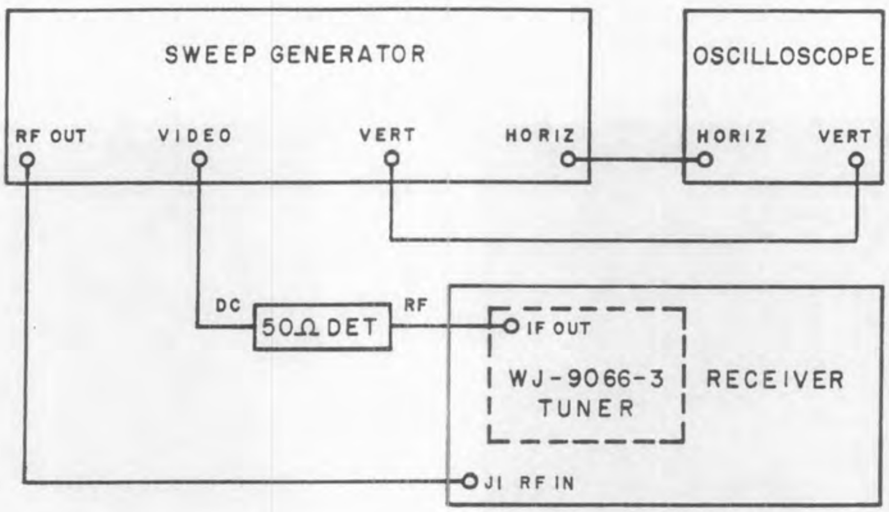


Figure 4-16. Test Setup, Interstage Network and Converter Alignment

(4) Tune the sweep generator to 26 MHz and turn on 1 MHz COMB markers. Set the output level of the generator to -30 dBm.

(5) Adjust the sweep generator and oscilloscope controls to display a response curve. (The oscilloscope vertical sensitivity setting is shown on the left-hand margin of Figure 4-17.) The rf response should appear similar to Figure 4-17.

(6) If the response curve does not appear similar to Figure 4-17, adjust capacitors A1C28, A1C33, A1C36, and A1A1C4 until it does. Adjust A1C33 for 1 MHz minimum bandwidth at 26 MHz.

CAUTION

Do not adjust A1C13, A1C17, or A1L3 and A1L4 at this time. The adjustment of A1L7 and AlL9, described in the following steps, should not be attempted unless considered absolutely necessary (unless, for example, the five section inductuner L1A-L1E is replaced). The shape and positioning of A1L7 and A1L9 is extremely critical. If responses similar to Figures 4-17 and 4-18 cannot be obtained, the tuner should be sent back to the factory for alignment.

(7) Tune the sweep generator and WJ-9066-3 to 90 MHz.

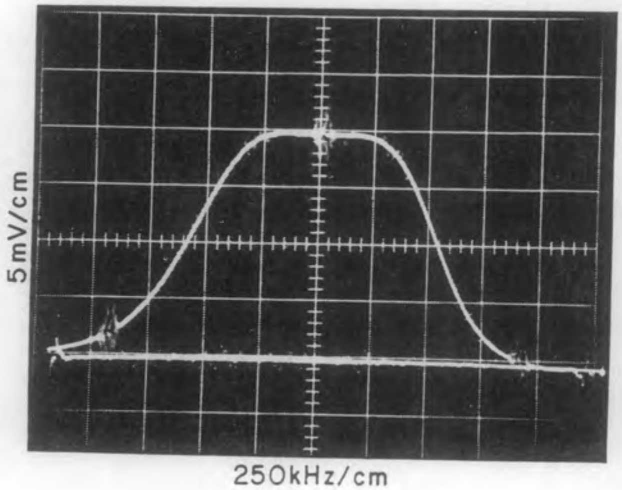


Figure 4-17. Typical Overall Response at 20 MHz

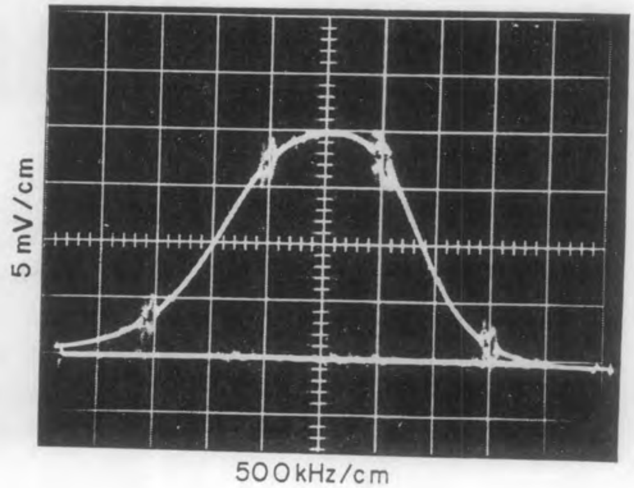


Figure 4-18. Typical Overall Response at 90 MHz

(8) Adjust the sweep generator and oscilloscope controls to display a responsive curve. It should appear similar to Figure 4-17.

(9) If the response curve does not resemble Figure 4-17, adjust A1L7 and A1L9 (by spreading or compressing the turns as required) until it does.

(10) Repeat the alignment procedure at 26 and 90 MHz until the interaction between the adjustments in steps (6) and (9) is at a minimum.

4.7.7 WJ-9062-3 (90-300 MHz) TUNING HEAD ALIGNMENT (A2). - Refer to schematic diagram Figures 6-3 and 6-4, as appropriate, when performing the adjustments in this procedure. Location of components for this tuner are shown in Figures 5-12 through 5-14. Begin the alignment by placing the tuner-select BAND switch in position 2. Rotate the RF/IF GAIN control fully clockwise, then proceed with the alignment.

4.7.7.1 Oscillator Tracking Adjustments. - Oscillator frequency must be set at the mechanical stops of the tuning range. To do this, proceed as follows:

(1) Connect a test counter to LO output U1J1 of the Receiver, and select position 2 of the BAND switch (for 90-300 MHz).

(2) Rotate the 90-300 MHz tuning knob fully clockwise.

(3) If necessary, expand or compress the windings of L12 in the tuner to obtain an indication of 110.4±0.9 MHz.

(4) Rotate the tuning knob fully counterclockwise and, if necessary, expand or compress the windings of L14 to obtain an indication of 328.4±3 MHz.

(5) Repeat steps (3) and (4) until no further adjustments are required.

4.7.7.2 Preselector Network Alignment. - Although it is possible to align the preselector network by observing the swept bandpass response of the entire tuner, considerable skill is required. Adjusting the preselector network while observing the swept vswr response of the tuner input allows the preselector network to be adjusted independently of the other tuned circuits in the tuner, requiring a minimum of skill. Follow the procedure given below to adjust the preselector network and then follow the procedure in paragraph 4.7.7.3 to adjust the interstage network.

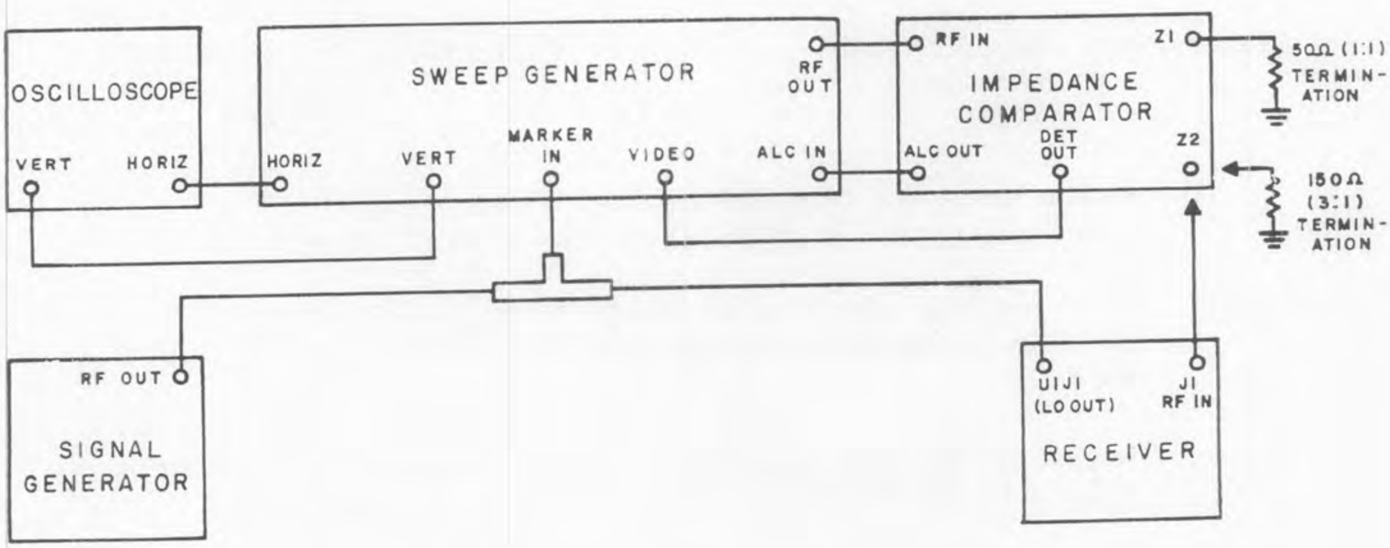


Figure 4-19. Test Setup, Preselector Network Alignment

(1) Connect the test equipment as shown in Figure 4-19. Select BAND 2 and tune the sweep generator and tuner to 150 MHz. Tune the

signal generator to 21.4 MHz. Connect rf input J1 on the receiver to the Z2 input on the impedance comparator and adjust the sweep generator and oscilloscope controls for an undistorted sweep response with the marker visible.

(2) Disconnect the rf input on the receiver from the impedance comparator and substitute a 150 ohm (3:1 vswr) termination. A straight horizontal line should appear on the oscilloscope screen representing a 3:1 vswr response. Use the position control on the oscilloscope to make the horizontal line coincide with the X-axis. Remove the termination from the Z2 input on the impedance comparator and reconnect the rf input on the receiver.

(3) Set the tuner to 150 MHz and adjust C13 and C17 for a symmetrical vswr response similar to Figure 4-20; however, the valley in the center of the response should only dip to midway between the two peaks and the 3:1 vswr reference at the X-axis. There should be 3 MHz separation just inside the two peaks.

(4) Set the tuner to 90 MHz and adjust the relative positioning of L3 and L4 for a 3 MHz peak-to-peak response consistent with, but not exceeding the 3:1 vswr reference at the X-axis. Refer to Figure 4-20 for a typical response. Adjust padder inductors L2 and L5 to center the response about the 90 MHz marker.

(5) Repeat steps (3) and (4) until the interaction is minimized.

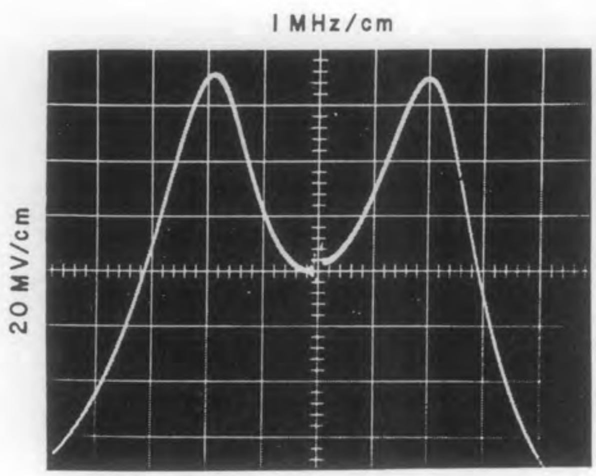


Figure 4-20. Typical VSWR Response, Preselector Network at 90 MHz

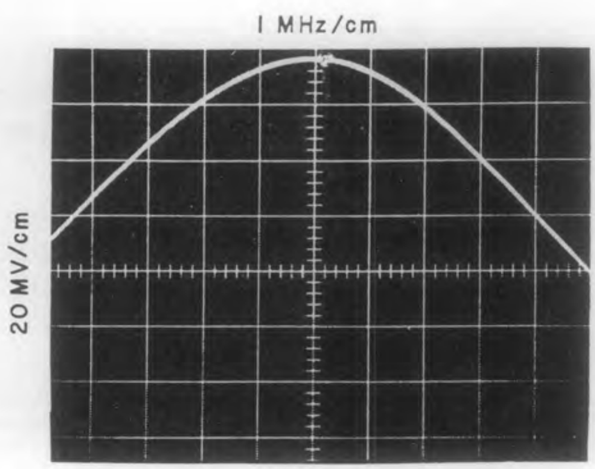


Figure 4-21. Typical VSWR Response, Preselector Network at 300 MHz

CAUTION

The adjustment of A1L3 and A1L4, described in the following step, should not be attempted unless considered absolutely necessary (unless, for instance, the five section inductuner, L1A-E, is replaced). The shape and positioning of A1L3 and A1L4 is extremely critical. If responses similar to Figures 4-20 and 4-21 cannot be obtained, the tuner may require factory alignment.

(6) Set the tuner to 300 MHz and adjust the length of L3 and L4 for a symmetrical vswr response as shown in Figure 4-21. Adjust the tap location of C10 and C16 on L3 and L4 for a bandwidth of 8 MHz to 12 MHz at the 3:1 vswr reference on the X-axis. Also adjust for a bandwidth of 3 MHz near the peak of the response as shown in Figure 4-21.

(7) Repear steps (3) through (6) until the interaction is minimized.

(8) Tune through the band to verify that the vswr is less than 3:1 through a 3 MHz bandwidth of the full tuner range.

4.7.7.3 Interstage Network Alignment. - Proceed as follows:

(1) Connect the equipment as shown in Figure 4-22.

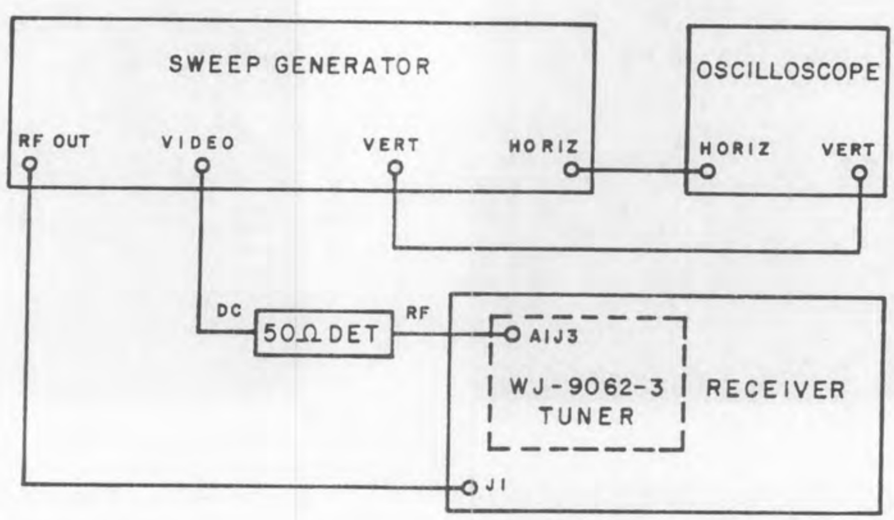


Figure 4-22. Test Setup, Interstage Network and Converter Alignment

(2) Set the MODE switch to the AM MAN position, set the IF BANDWIDTH switch to its widest bandwidth, and turn the RF/IF GAIN control fully clockwise.

(3) Set the 90-300 MHz tuner to 90 MHz and center the FINE TUNING control.

(4) Tune the sweep generator to 90 MHz and turn on 1 MHz COMB markers. Set the output level of the generator to -37 dBm.

(5) Adjust the sweep generator and oscilloscope controls to display a response curve. (The oscilloscope vertical sensitivity setting is shown on the left-hand margin of Figure 4-23.) The rf response should resemble that shown.

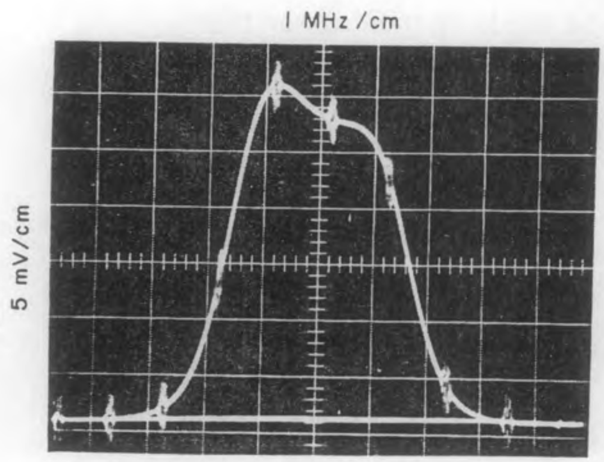


Figure 4-23. Typical Response, RF at 90 MHz

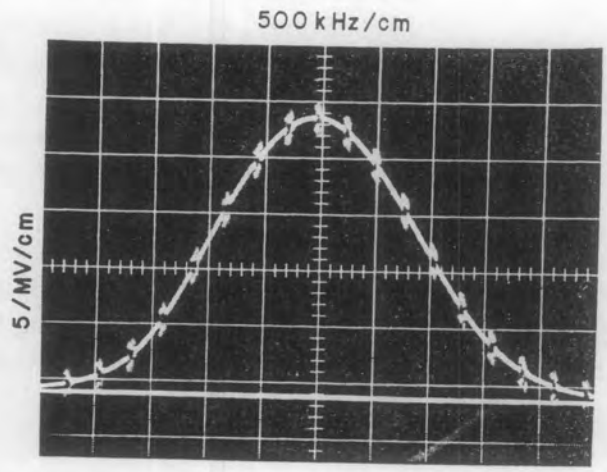


Figure 4-24. Typical Response, RF at 300 MHz

(6) If the response curve does not resemble Figure 4-23, adjust capacitors A1C28, A1C33, A1C36, and A1A1C4 until it does.

NOTE

The alignment tool clipped to the receiver chassis must be shortened to adjust A1A1C4 when the tuner is mounted in the receiver.

(7) Tune the sweep generator and 90-300 MHz tuner to 300 MHz.

(8) Adjust the sweep generator and oscilloscope controls to display a response curve. It should appear similar to Figure 4-24.

CAUTION

Do not adjust A1C13, A1C17, or A1L3 and A1L4 when aligning the interstage network. The adjustment of A1L8 and A1L10, described in the following steps, should not be attempted unless considered absolutely necessary (unless, for instance, the five section inductuner, L1A-E, is replaced). The shape and positioning of A1L8 and A1L10 is extremely critical. If responses similar to Figures 4-23 and 4-24 cannot be obtained, the tuner may require factory alignment.

(9) If the response curve does not resemble Figure 4-24, adjust A1L8 and A1L10 (by spreading or compressing the turns as required) until it does. A fine adjustment can be made by moving the taps on the coils. Adjust A1C33 for a 3 dB bandwidth of about 6 MHz.

(10) Repeat the alignment procedures at 90 MHz and 300 MHz until the interaction between the adjustments is at a minimum.

4.7.8 WJ-9064-3 (235-500 MHz) TUNING HEAD ALIGNMENT (A3). - Refer to Figures 6-5 through 6-7 for the schematics and to Figures 5-15 through 5-24 for components locations. Before proceeding with the alignment, put the BAND switch to 3, the MODE switch to AM/MAN and the RF/IF GAIN fully clockwise.

4.7.8.1 Oscillator Tracking Adjustment. - This procedure adjusts the LO at the band extremes. In general, perform this adjustment only when the readout does not cover the full range.

(1) Connect the counter to the rear panel LO output.

(2) Rotate the 235-500 MHz tuning dial fully counterclockwise.

(3) The counter should read 291±2.35 MHz. If it does not, first remove the cement from inductor A1L27. Then adjust this inductor, by spreading or compressing the turns, for a reading within ±2.35 MHz (the cover must be secured for the reading).

(4) Rotate the tuning knob fully clockwise for an indication of 565±5 MHz. If required, adjust the position of A1L17 for a reading within ±5.0 MHz.

(5) Repeat steps (2) through (4) until the conditions of both steps are met simultaneously.

(6) If the frequency counter "runs" (does not give a stable reading to

within a few kHz), the LO may be "squegging" (generating more than one frequency). If squegging occurs, reposition the LO components slightly. If squegging still occurs, increase the value of A1R25 by a small amount. If the spurious outputs cannot be eliminated consistent with adequate LO output, the transistor should be replaced, and the value of A1R25 changed, if necessary, for proper operation. This step is normally required only after replacement of A1Q4.

4.7.8.2 Type 71423-1 60/21.4 MHz Converter Alignment. - Proceed as follows:

(1) Connect the equipment as shown in Figure 4-25.

(2) Tune the sweep generator and signal generator to 60 MHz, using a frequency counter to calibrate the signal generator.

(3) Adjust the sweep generator and oscilloscope controls to display a response curve. If a response cannot be obtained, adjust A1L2 on the converter to start the oscillator. Once a response is obtained, cycle the input power to confirm that the oscillator will restart. If it does not, readjust A1L2 and retest.

(4) After rechecking the signal generator to insure that its frequency is precisely 60.0000 MHz, as indicated on the frequency counter, disconnect the counter and connect its input instead to A3J2 (the sweep generator video input cable should be removed). The fre-

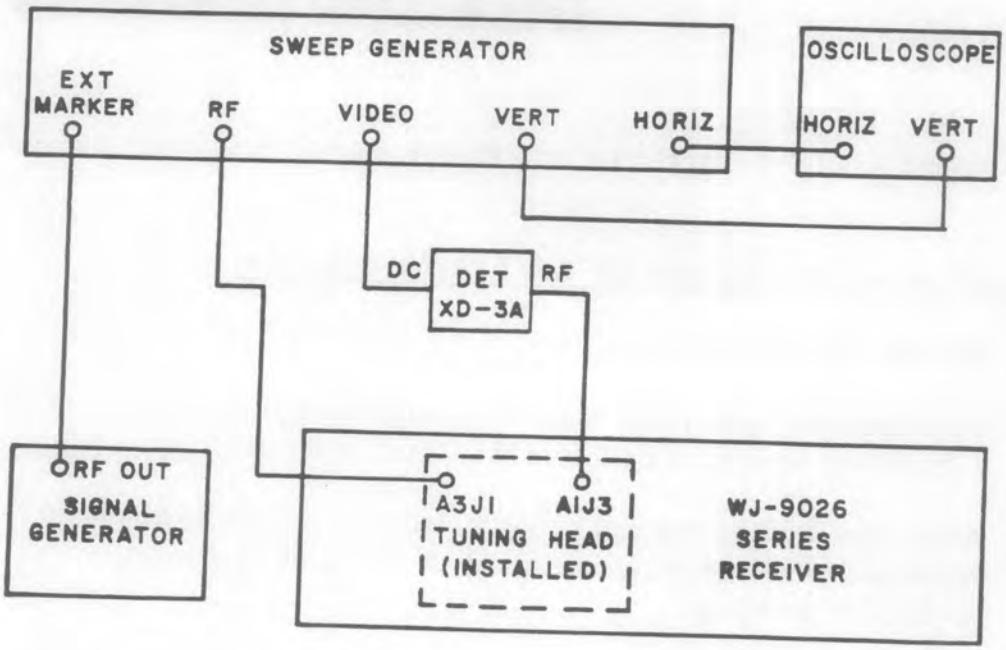


Figure 4-25. Test Setup, 60-21.4 MHz Converter Alignment

quency counter should indicate an output frequency of 21.4000 MHz, ±2 kHz. If the indicated frequency is not within the acceptable limits, readjust A3L2 for a proper reading, and once again cycle the input power to confirm that the oscillator will restart. Reconnect the frequency counter to signal generator output and recheck the frequency to make sure that the signal generator has not drifted appreciably. Reconnect the equipment as indicated in step (1).

(5) Adjust capacitors A3C5 and A3C6 for a maximum amplitude, symmetrical response centered at 60 MHz. A typical response is shown in Figure 4-26. The 1 MHz comb marker in the sweep generator can be used to determine the bandpass. Use the 10 MHz comb marker to establish the 60 MHz center frequency.

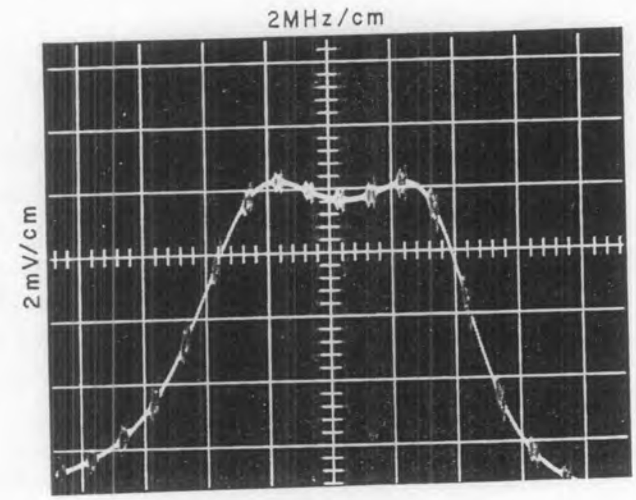


Figure 4-26. Typical Response, 60/21.4 MHz Converter

(6) Adjust A3L1 for a maximum amplitude response on the oscilloscope.

4.7.8.3 <u>Type 71404-2 235-500 MHz RF Tuner (A3A1) Alignment</u>. -

(1) Connect the equipment as shown in Figure 4-27.

(2) Tune the sweep generator and the signal generator to 60 MHz, using a frequency counter to calibrate the signal generator.

(3) Adjust the oscilloscope and sweep generator controls to display a response. The sweep generator output should be kept to as low a level as is practical.

(4) Switch on the 1 MHz comb marker in the sweep generator. Adjust capacitors C55, C59, and C61 for a symmetrical response similar to Figure 4-28.

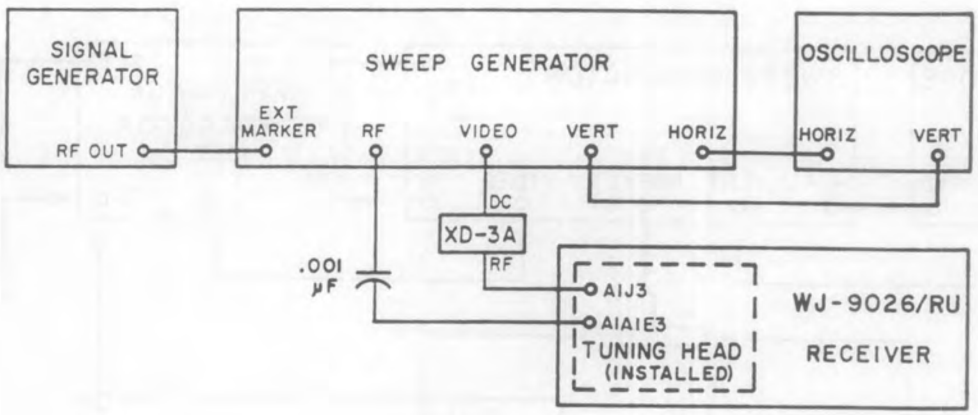


Figure 4-27. Test Setup, 60 MHz Alignment

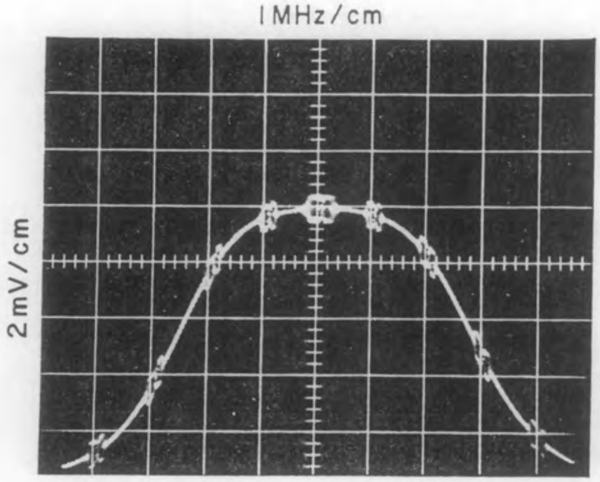


Figure 4-28. Typical Response, RF Tuner Output Filter

(5) Connect the equipment as shown in Figure 4-29.

(6) Tune the sweep generator and tuner to 235 MHz and the marker signal generator to 60 MHz. Connect the receiver/tuner input to Z2 of the impedance comparator and adjust the sweep generator and oscilloscope controls for an undistorted sweep response with the marker visible.

(7) Disconnect the receiver/tuner from Z2 of the impedance comparator and substitute the 150 ohm (3:1 vswr) termination. A new, straight horizontal line should now appear on the oscilloscope screen. Adjust the oscilloscope vertical position control so that the horizontal line coincides with the X-axis. The horizontal reference line represents the 3:1 maximum acceptable input vswr of the tuner. Remove the 150 ohm termination from Z2 of the impedance comparator and reconnect the receiver/tuner input J1.

(8) Adjust C4 and C7 for a response centered (approximately) around

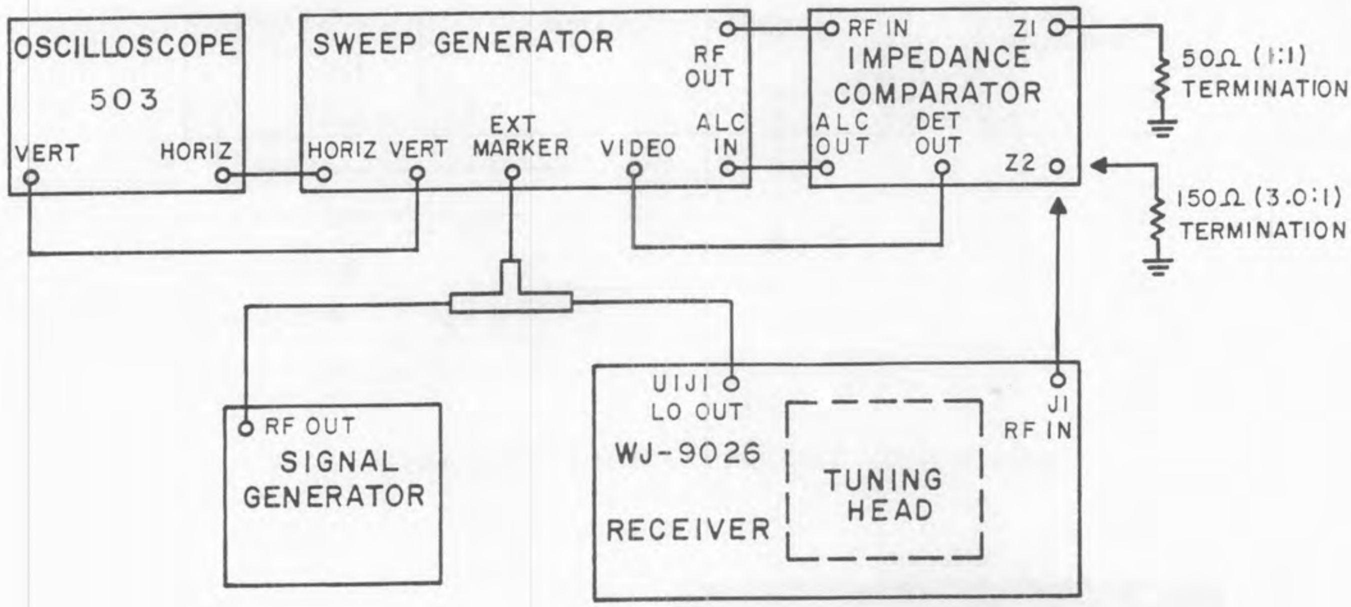


Figure 4-29. Test Setup, VSWR Alignment

the marker similar to Figure 4-30. The marker must remain below the 3:1 vswr reference line.

(9) Tune the sweep generator and tuner to 500 MHz and adjust L2 and L5 (by spreading or compressing the turns as required) for a response centered around the marker similar to Figure 4-31. The marker must remain below the 3:1 vswr reference line.

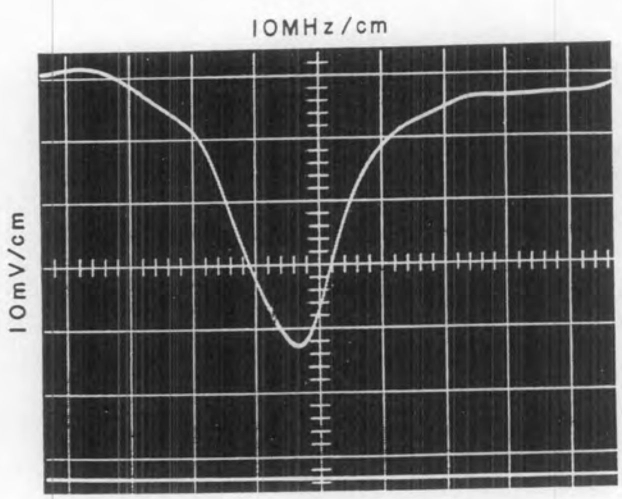


Figure 4-30. 235 MHz Input VSWR Response

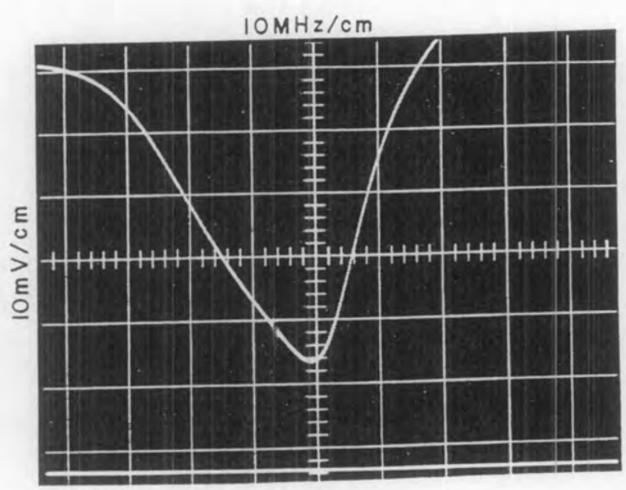


Figure 4-31. 500 MHz VSWR Response

(10) Repeat the alignment procedure at each end of the tuning range until interaction between the adjustments is minimized. With the alignment satisfactory at the end frequencies, slowly tune the sweep generator and tuner across the band, observing the vertical position of the marker on the oscilloscope. The marker should not cross the 2:1 vswr reference line (the X-axis) at any frequency in the tuning range.

(11) Reconnect the equipment as shown in Figure 4-25.

(12) Tune the sweep generator, tuner, and signal generator to 240 MHz using a frequency counter to calibrate the signal generator.

(13) Replace the cover and adjust the controls of the sweep generator and oscilloscope to produce a response. Adjust C17, C21, and C31 for a response characteristic similar to Figure 4-32.

(14) Tune the sweep generator, tuning head, and signal generator to 500 MHz using a frequency counter to calibrate the signal generator.

(15) Adjust the controls of the sweep generator and oscilloscope to produce a response. Remove the bottom cover and adjust L9, L11, and L14 for a response characteristic similar to Figure 4-33 (the inductors are adjusted by spreading or compressing the turns). Replace the cover and recheck the response characteristic.

(16) Repeat steps (12) through (15) until the proper response characteristic is obtained at both ends of the tuning range.

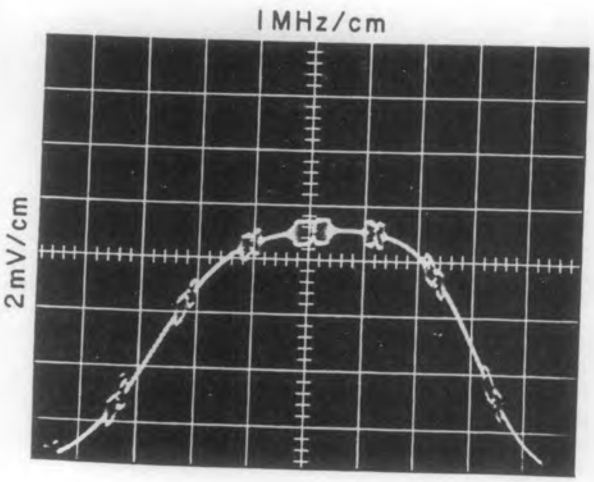


Figure 4-32. 240 MHz Overall RF Response

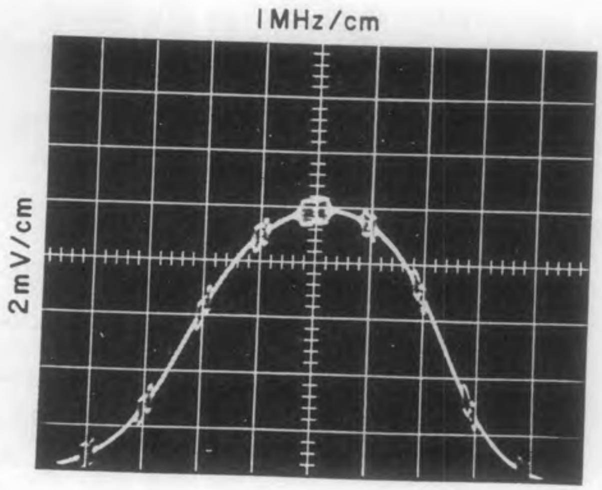


Figure 4-33. 500 MHz Overall RF Response

(17) Check the overall gain of the tuner as described in paragraph 4.6.10 to verify that the tuner gain is between 17 and 23 dB. The gain can be varied, if necessary, by adjusting A3A1R16.

4.7.9 WJ-9065-3 (500-1000 MHz) TUNING HEAD ALIGNMENT (A4). - Refer to schematic diagram Figure 6-8 through 6-10 (as appropriate) when perfoming the adjustments in this paragraph. The location of components for the WJ-9065-3 Tuning Head (A4) are shown in Figures 5-23 through 5-33. Place the receiver BAND switch in position 1, the MODE SWITCH in the AM/MAN position, and the RF/IF GAIN control fully clockwise before proceeding with the alignment.

4.7.9.1 Oscillator Tracking Adjustment. - In this procedure, the LO is adjusted at the two band extremes. The adjustments are intended to ensure that the specified range of the tuner is available for tuning. Proceed as follows:

(1) Connect a frequency counter capable of counting from 554-1070 MHz to LO output jack U1J1 on the receiver rear apron.

(2) Rotate the tuning shaft fully ccw.

(3) Check the tuner cover over the oscillator cavity to ensure that it is securely fastened.

(4) Carefully adjust A1C34 for an indication of 554±0.5 MHz on the counter.

(5) Rotate the tuning shaft fully cw.

(6) Carefully adjust A1C29 for an indication of 1070±1 MHz on the counter.

(7) Repeat steps (3) through (6) until correct readings are obtained simultaneously at both ends of the tuning range.

If the touch-up procedure above fails to secure adequate dial tracking, the tuner should be returned to the factory for alignment.

4.7.9.2 RF Tuner Alignment. - Proceed as follows:

CAUTION

No attempt should be made to adjust the rf cavities. Cavity resonator alignment generally cannot be performed satisfactorily at the field repair level, and instead should be done at the factory. To determine if realignment is necessary, perform the am-sensitivity and tuner-gain checks of paragraphs 4.6.9 and 4.6.10, respectively. If these tests indicate satisfactory performance, the alignment of the rf cavities is satisfactory.

(1) Connect the equipment as shown in Figure 4-34.

(2) Tune the sweep and signal generators to 60 MHz, using the counter to calibrate the signal generator.

(3) Adjust the oscilloscope and sweep generator controls to display an an undistorted response. The sweep generator output should be held to as low a level as is practical.

(4) Adjust A1C18, A1C20, and A1C22 to produce a symmetrical response similar to Figure 4-35.

(5) Connect a vtvm probe to the output of operational amplifier A1A1U1A in the rf tuner, then adjust A1A2R6 for a reading between +5.7 and +6.2 V dc.

(6) Connect the equipment as shown in Figure 4-36.

(7) Tune the signal generator and tuner to 1000 MHz. Set the signal generator at a -30 dBm output level.

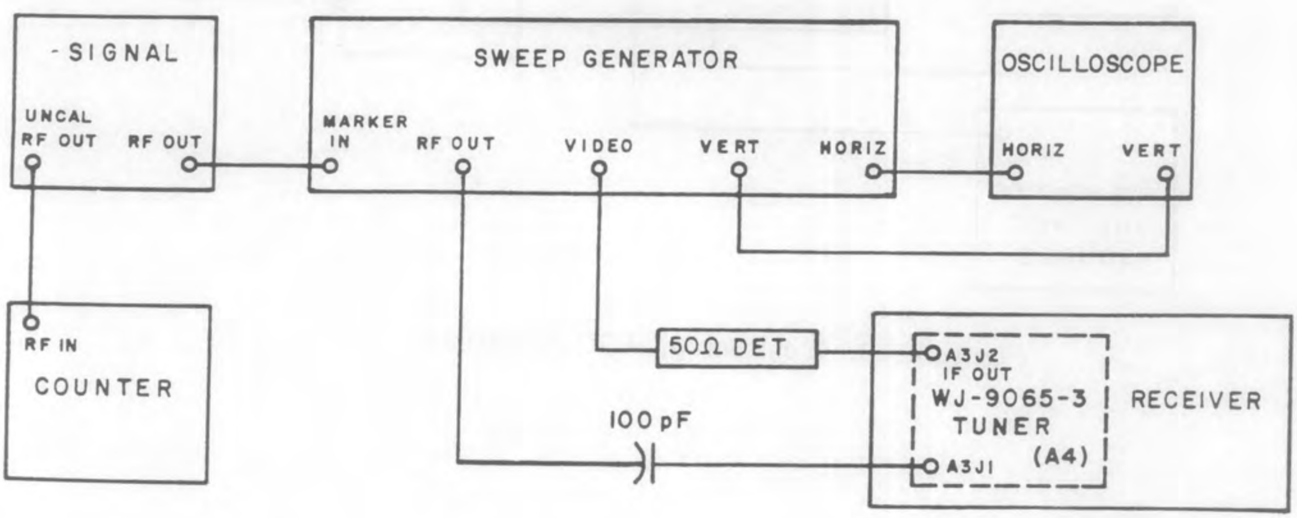


Figure 4-34. Test Setup, 60 MHz Alignment

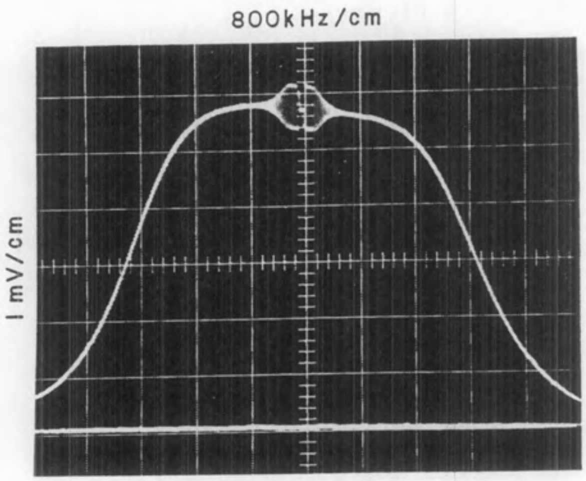


Figure 4-35. Typical Response, 60 MHz Output Filter

(8) Note the level indicated on the rf voltmeter.

(9) Apply -10 V dc to A1FL2 (the tuner agc input).

(10) Increase the signal generator output to +1 dBm and adjust A1A2R16 for the same rf voltmeter indication as noted in step (8). This completes the procedure.

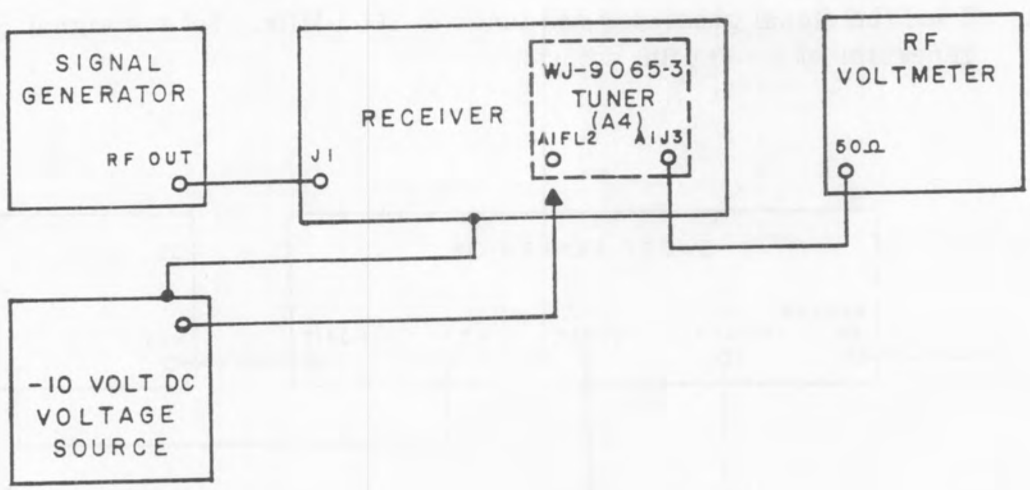


Figure 4-36. Test Setup, AGC Adjustment

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. As example of the unit method follows:

A1	R1
Subassembly Designation	Class and No. of item
Identify from right to left as:	First (1) resistor (R) of first (1) subassembly (A)

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

5.2 REFERENCE DESIGNATION PREFIX

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

5.3 LIST OF MANUFACTURERS

Mfr. Code	Name and Address
01121	Allen-Bradley Company 1201 South 2nd Street Milwaukee, Wisconsin 53204
01351	Dynamic Gear Co., Inc. 175 Dixon Avenue Amityville, NY 11701
02114	Ferroxcube Corporation P. O. Box 359 Mt. Marion Road Saugerties, N. Y. 12477
02735	RCA Corporation Solid State Division Route 202 Somerville, New Jersey 08876

Mfr. Code	Name and Address
03508	General Electric Company Semiconductor Products Dept. Electronics Park Syracuse, New York 13201
04013	Taurus Corporation 1 Academy Hill Lambertville, NJ 08530
04713	Motorola Incorporated Semiconductor Products Div. 5005 East McDowell Road Phoenix, Arizona 85008
07263	Fairchild Camera and Instrument Corporation Semiconductor Division 464 Ellis Street Mountain View, CA 94040
08108	Lamp industry for use with industry designations and abbreviations for lamps.
08717	Sloan Company 7704 San Fernando Road Sun Valley, CA 91352
14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, Maryland 20878-1794
14949	Trompeter Electronics, Inc. 8936 Comanche Avenue Chatsworth, CA 91311
15454	Rodan Industries, Inc. 2905 Blue Star Street Anaheim, CA 92806

Mfr. Code	Name and Address
15818	Teledyne Semiconductor 1300 Terra Bella Avenue Mountain View, CA 94040
16179	Omni-Spectra, Incorporated 24600 Hallwood Court Farmington, Michigan 48024
18324	Signetics Corporation 811 East Arques Avenue Sunnyvale, CA 94806
19505	Applied Engineering Products, Co. Division of Samarius Inc. 300 Seymour Avenue Derby, Connecticut 06418
20754	KMC Semiconductor Corporation Parker Road Long Valley, NJ 07853
21604	The Buckeye Stamping Company 555 Marion Road Columbus, Ohio 43207
21912	Anzac Electronics Division of Adams-Russell Co., Inc. 39 Green Street Waltham, MA 02154
24602	E. M. C. Technology, Inc. 1300 Arch Street Philadelphia, PA 19107
25088	Siemens America, Inc. 186 Wood Avenue S. Iselin, NJ 08830

Mfr. Code	Name and Address
27956	Relcom 3333 Hillview Avenue Palo Alto, CA 94304
28480	Hewlett-Packard Company Corporate Headquarters 1501 Page Mill Road Palo Alto, CA 94304
31433	Union Carbide Corporation Highway 276, S. E. Greenville, SC 29606
33095	Spectrum Control Inc. 152 E. Main Street Fairview, PA 16415
34156	Semicoa 333 McCormick Avenue Costa Mesa, CA 92626
37942	P.R. Mallory and Co., Inc. 3029 E. Washington Street Indianapolis, Indiana 46206
54753	General Instrument Corporation F.W. Sickles Division 165 Front Street Chicopee, Massachusetts 01014
56289	Sprague Electric Company Marshall Street North Adams, MA 01247
56878	Standard Pressed Steel Co. Box 608 Benson East Jenkintown, PA 19046
70417	Chrysler Corporation Amplex Division 6501 Harper Avenue Detroit, Michigan 48211
71279	Cambridge Thermionic Corp. 445 Concord Avenue Cambridge, MA 02138
71400	Bussman Manufacturing Division of McGraw-Edison Co. 2536 W. University Street St. Louis, Missouri 63107
71744	Chicago Miniature Lamp Works 4433 Ravenswood Avenue Chicago, Illinois 60640
71785	TRW Electronic Components Cinch Connector Operations 1501 Morse Avenue Elk Grove Village, Illinois 60007
72136	Electro Motive Manufacturing Co. South Park & John Streets Willimantic, Connecticut 06226
72619	Dialight Corporation Sub. of Digitronics Corporation 60 Stewart Avenue Brooklyn, NY 11237
72982	Erie Technological Products, Inc. 644 West 12th Street Erie, Pennsylvania 16512
73138	Beckman Instruments, Inc. Heliport Division 2500 Harbor Boulevard Fullerton, CA 92634

Mfr. Code	Name and Address
73682	George K. Garrett Company Division of MSL Industries, Inc. Torresdale Ave. at Tolbut Street Phildelphia, PA 19136
73734	Federal Screw Products, Inc. 3917 North Kedzie Avenue Chicago, Illinois 60618
73803	Texas Instruments, Inc. Metallurgical Materials Div. 34 Forest Street Attleboro, MA 02703
73899	JFD Electronics Company 15th at 62nd Street Brooklyn, New York 11219
74306	Piezo Crystal Company 100 K Street Carlisle, PA 17013
74868	Bunker Ramo Corporation The Amphenol RF Division 33 East Franklin Street Danbury, Connecticut 06810
75042	TRW Electronic Components IRC Fixed Resistors 401 North Broad Street Philadelphia, PA 19108
75915	Littlefuse, Incorporated 800 E. Northwest Highway Des Plaines, Illinois 60016
76055	Mallory Controls Division P.R. Mallory and Co., Inc. P.O. Box 327 State Road 28 W Frankfort, Indiana 46041

Mfr. Code	Name and Address
77820	Bendix Corporation Electrical Components Div. Sherman Avenue Sidney, New York 13838
78189	Illinois Tool Works Inc. Shakeproof Division St. Charles Road Elgin, Illinois 60120
79136	Waldes Kohinoor Inc. 47-16 Austel Place Long Island City, NY 11101
80058	Joint Electronic Type Designation System
80103	Lambda Electronics Corporation Div. of Veeco Instruments, Inc. 515 Broad Hollow Road Melville, New York 11746
80131	Electronic Industries Association 2001 Eye Street, N.W. Washington, D.C. 20006
80294	Bourns, Incorporated Instrument Division 6135 magnolia Avenue Riverside, CA 92506
81073	Grayhill Incorporated 561 Hillgrove Avenue LaGrange, Illinois 60525
81312	Winchester Electronics Division Litton Industries, Incorporated Main Street & Hillside Avenue Oakville, Connecticut 06779

Mfr. Code	Name and Address
81349	Military Specifications
82389	Switchcraft, Inc. 5555 North Elston Avenue Chicago, Illinois 60630
83086	New Hampshire Ball Bearings, Inc. Route 202 Peterborough, NH 03458
91293	Johanson Manufacturing Company P. O. Box 329 Boonton, NJ 07005
91418	Radio Materials Company 4242 West Bryn Mawr Avenue Chicago, Illinois 60646
91984	Maida Development Company 214 Academy Street Hampton, Virginia 23369
93332	Sylvania Electric Products, Inc. Semiconductor Products Division 100 Sylvan Road Woburn, MA 01801
93958	Republic Electronics Corp. 176 East 7th Street Paterson, New Jersey 07524
95121	Quality Components, Inc. P. O. Box 113 St. Mary's, PA 15857
95146	Alco Electronics Products, Inc. P. O. Box 1348 Lawrence, MA 01842
95348	Gordos Corporation 250 Glenmont Avenue Bloomfield, NJ 07003
96906	Military Standards
98291	Sealectro Corporation 225 Hoyt Mamaroneck, New York 10544
99800	American Precision Industries Delevan Electronics Division 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

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

NOTE

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

5.4.1 TYPE WJ-9026/RU RECEIVER UNIT, MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	26-90 MHz TUNING HEAD	1	WJ-9066-3	14632	
A2	90-300 MHz TUNING HEAD	1	WJ-9062-3	14632	
A3	235-500 MHz TUNING HEAD	1	WJ-9064-3	14632	
A4	500-1000 MHz TUNING HEAD	1	WJ-9065-3	14632	
A5	TUNER SWITCHING ASSEMBLY	1	791499-1	14632	
A6	IF AMPLIFIER	1	72462-3	14632	
A7	IF POWER DIVIDER	1	791495-1	14632	
A8	IF SWITCHING ASSEMBLY	1	72465-1	14632	
A9	LO DIODE SWITCH/AMPLIFIER	1	791501-1	14632	
A10	AGC AMPLIFIER	1	78108-1	14632	
A11	AUDIO COR AND SQUELCH AMPLIFIER	1	7446-2	14632	
AT1	TERMINATION, RESISTIVE: 51 Ω	8	35650-0051	74868	
AT2 Thru AT8	Same as AT1				
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 10 μF, 10%, 35 V	1	CS13BF106K	81349	56289
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 10%, 35 V	1	CS13BF225K	81349	56289
C3	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	1	8131M100-651-104M	72982	
C4	CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μF, 10%, 35 V	1	CS13BF476K	81349	56289
C5	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.8 μF, 10%, 20 V	1	CS13BE185K	81349	56289
C6	CAPACITOR, ELECTROLYTIC, ALUMINUM: 8000 μF, -10+75%, 15 V	1	TCG802U015N2L	37942	
C7	CAPACITOR, ELECTROLYTIC, ALUMINUM: 1100 μF, -10+75%, 40 V	2	39D118G040HL4	56289	

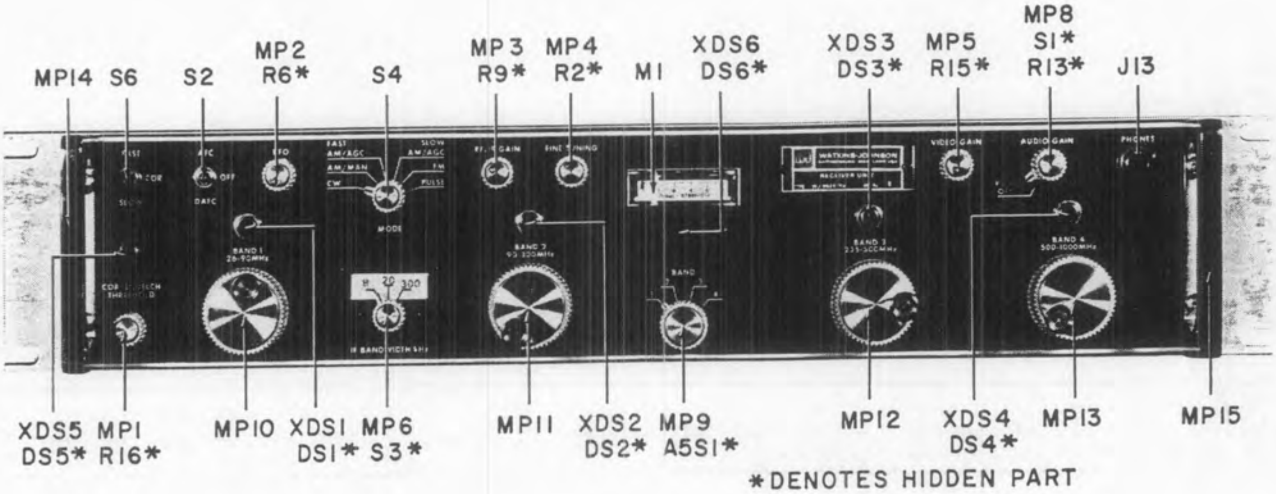


Figure 5-1. Type WJ-9026/RU Receiver Unit, Front View, Location of Components

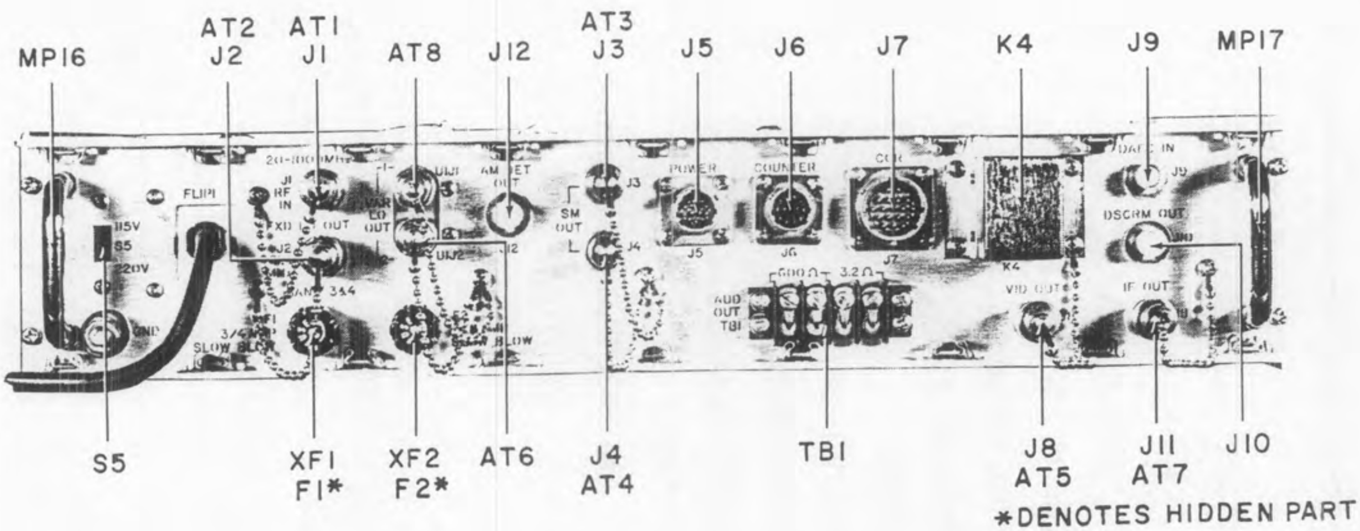


Figure 5-2. Type WJ-9026/RU Receiver Unit, Rear View, Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C8	CAPACITOR, ELECTROLYTIC, TANTALUM: 27μF, 10%, 35 V	6	196D276X9035MA3	56289	
C9	Same as C8				
C10	Same as C8				
C11	Same as C7				
C12 Thru C14	Same as C8				
CR1	DIODE	4	1N462A	80131	93332
CR2 Thru CR4	Same as CR1				
CR5	DIODE	6	1N4003	80131	04713
CR6 Thru CR10	Same as CR5				
DS1	LAMP, INCANDESCENT: 5 V, 0.04 AMP	5	685	08108	71744
DS2 Thru DS5	Same as DS1				
DS6	LAMP, INCANDESCENT: 6 V, 0.2 AMP	1	328	08108	
F1	FUSE, CARTRIDGE: 3/4 AMP 3AG SLOW BLOW	1	MDL3/4	71400	
F2	FUSE, CARTRIDGE: 3/8 AMP 3AG SLOW BLOW	1	MDL3/8	71400	
FL1	POWER LINE FILTER	1	23154-1	14632	
J1	CONNECTOR RECEPTACLE: BNC SERIES	9	17825-1002	74868	

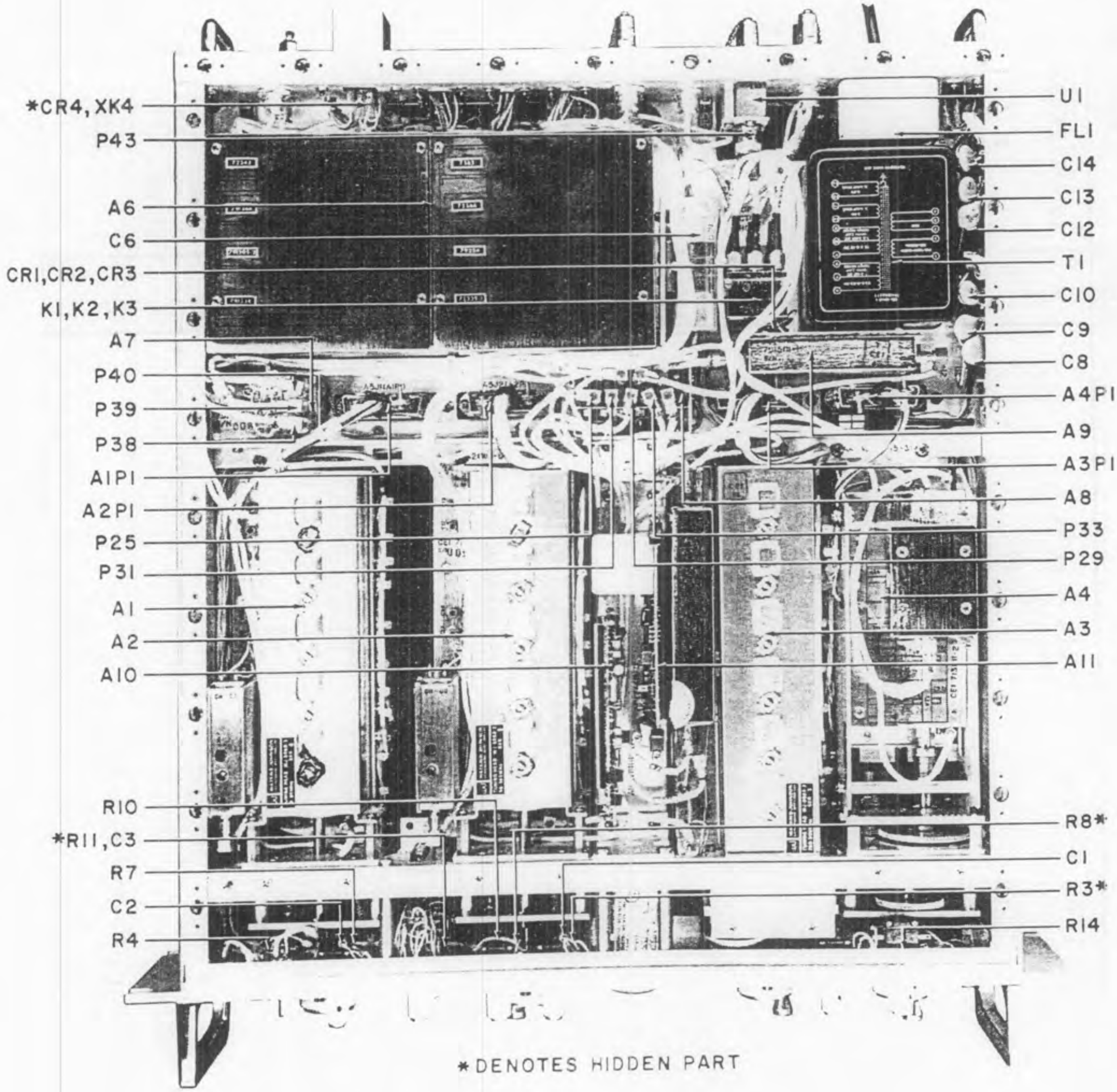


Figure 5-3. Type WJ-9026/RU Receiver Unit, Top View, Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
J2 Thru J4	Same as J1				
J5	CONNECTOR,RECEPTACLE,MULTIPIN	1	JTP02RE10-13S	77820	
J6	CONNECTOR,RECEPTACLE,MULTIPIN	1	JTP02RE10-13P	77820	
J7	CONNECTOR,RECEPTACLE,MULTIPIN	1	JTP02RE14-18P	77820	
J8 Thru J12	Same as J1				
J13	JACK, TELEPHONE	1	L11	82389	
K1	RELAY, COAXIAL	3	303-10002-3	74868	
K2	Same as K1				
K3	Same as K1				
K4	RELAY, 4PDT, 5A, 12 V, 185Ω COIL	1	70R4-12DCSC0	78277	
L1	COIL, FIXED: 27 mH	1	1537-48	99800	
M1	METER, SIGNAL, STRENGTH	1	16698-1	14632	
MP1	KNOB	5	PS50D1/LG	21604	
MP2 Thru MP5	Same as MP1				
MP6	KNOB	3	PS50PL1/LG	21604	
MP7	Same as MP6				
MP8	Same as MP6				
MP9	KNOB	1	PS70PL1/LG	21604	

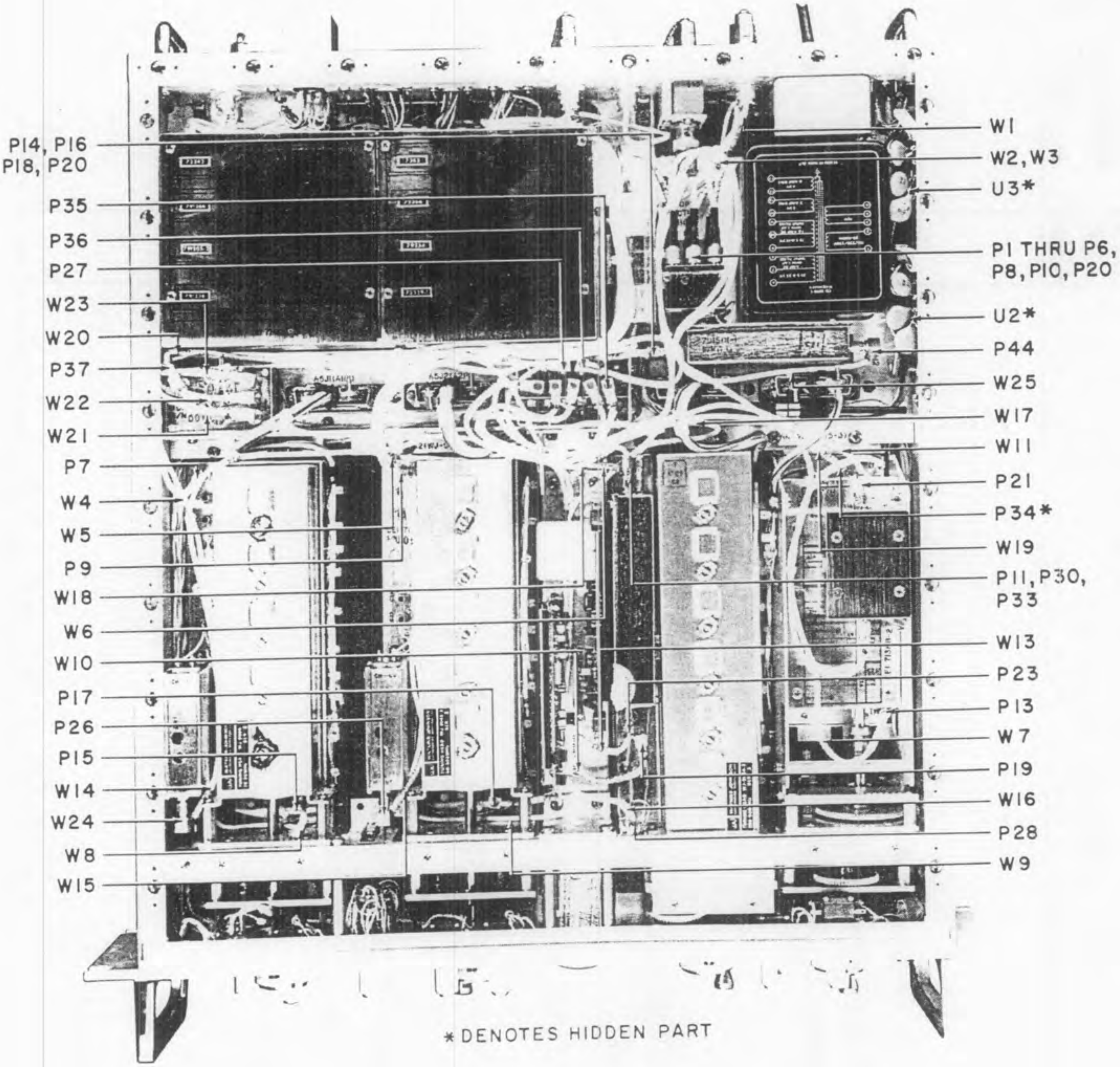


Figure 5-4. Type WJ-9026/RU Receiver Unit, Top View, Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
MP10	KNOB, SPINNER	4	23625-1	14632	
MP11 Thru MP13	Same as MP10				
MP14	HANDLE, FRONT	2	32306-2	14632	
MP15	Same as MP14				
MP16	HANDLE, REAR	2	415-1250-01-02	71279	
MP17	Same as MP16				
MP18	COVER, TOP	2	42818-1	14632	
MP19	Same as MP18 (BOTTOM)				
P1	CONNECTOR, PLUG, SMA SERIES	12	501-3	16179	
P2 Thru P8	Same as P1				
P9	CONNECTOR, PLUG, SMC SERIES	12	UG1465/U	80058	19505
P10	Same as P1				
P11	Same as P9				
P12	Same as P1				
P13	Same as P1				
P14 Thru P16	Same as P9				
P17	CONNECTOR, PLUG, SMC SERIES	19	UG1466/U	80058	19505
P18	Same as P9				

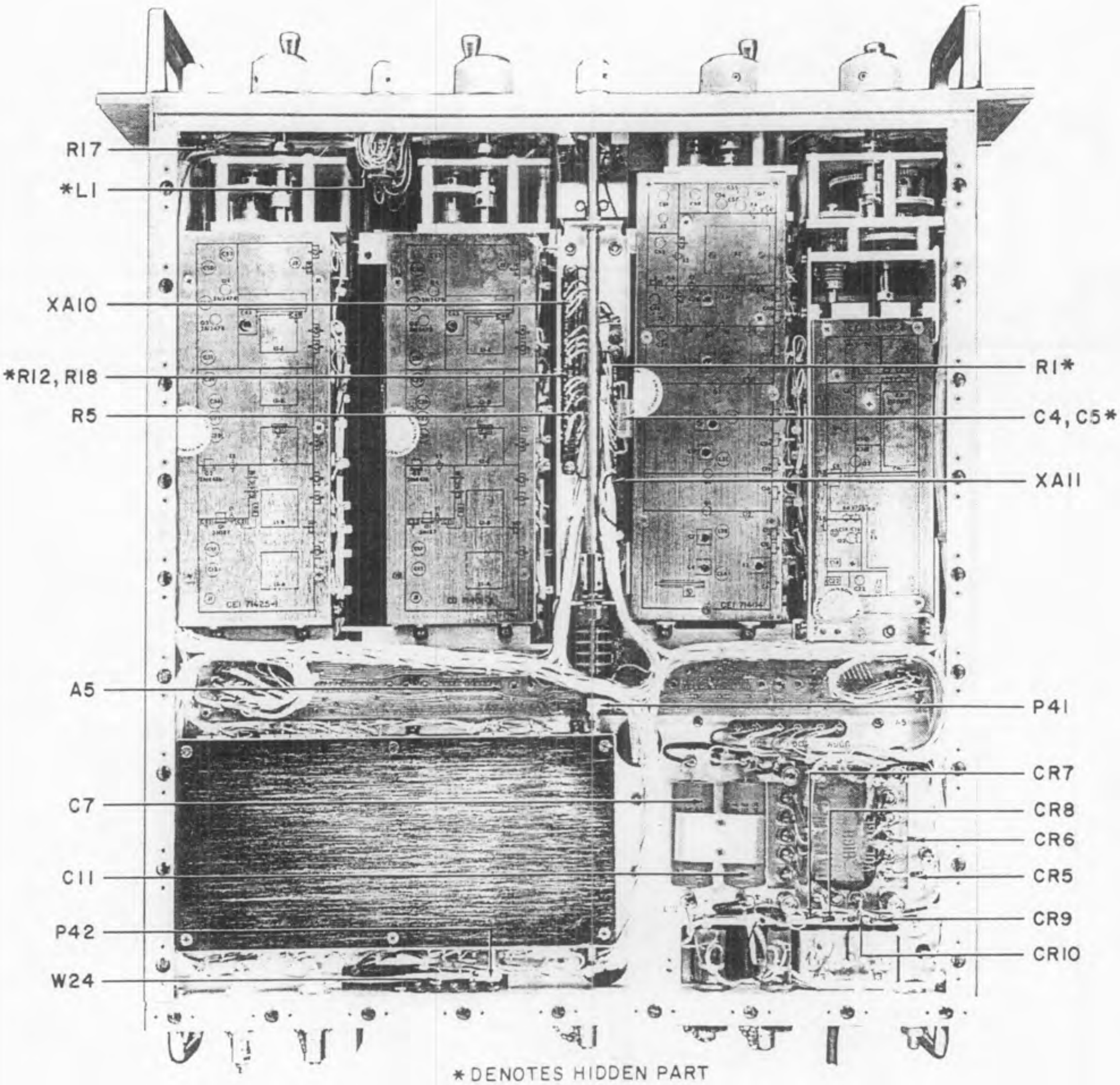


Figure 5-5. Type WJ-9026/RU Receiver Unit, Bottom View, Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
P19	Same as P17				
P20	Same as P9				
P21	Same as P9				
P22	Not Used				
P23	Same as P9				
P24 Thru P27	Same as P17				
P28	Same as P9				
P29 Thru P31	Same as P17				
P32	Same as P9				
P33	Same as P17				
P34	Same as P9				
P35 Thru P42	Same as P17				
P43	CONNECTOR, PLUG, BNC SERIES	1	PL20-5	14949	
P44	Same as P17				
R1	RESISTOR, FIXED, COMPOSITION: 1.5kΩ, 5%, 1/4 W	2	RCR07G152JS	81349	01121
R2	RESISTOR, VARIABLE, COMPOSITION: 2.5kΩ, 10%, 1 W	1	70A3N056L252U	01121	
R3	RESISTOR, FIXED, COMPOSITION: 6.8kΩ, 5%, 1/4 W	2	RCR07G682JS	81349	01121
R4	Same as R3				

MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R5	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R6	RESISTOR, VARIABLE, COMPOSITION: 10 kΩ, 10%, 1 W	2	70A3N056L103U	01121	
R7	Same as R1				
R8	RESISTOR, FIXED, COMPOSITION: 82 kΩ, 5%, 1/4 W	1	RCR07G823JS	81349	01121
R9	Same as R6				
R10	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4 W	1	RCR07G822JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	1	RCR07G103JS	81349	01121
R13	RESISTOR, VARIABLE, COMPOSITION: 50 kΩ, 10%, 1.0 W W/SWITCH	2	70K3N056R503U	01121	
R14	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4 W	1	RCR07G272JS	81349	01121
R15	RESISTOR, VARIABLE, COMPOSITION: 500 Ω, 10%, 1 W	1	70A3N056L501U	01121	
R16	RESISTOR, VARIABLE, COMPOSITION: 100 kΩ, 10%, 1 W	1	70A3N056L104U	01121	
R17	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4 W	1	RCR07G104JS	81349	01121
R18	Same as R12				
S1	SWITCH, SNAP Part Of R13				
S2	SWITCH, TOGGLE, DPDT	1	MTA206P	95146	
S3	SWITCH, ROTARY	1	9A30-03-2-3N	81073	
S4	SWITCH, ROTARY	1	9A30-03-2-6N	81073	
S5	SWITCH, SLIDE, DPDT	1	11A1211	82389	
S6	SWITCH, TOGGLE, SPDT	1	MTA106D	95146	
T1	TRANSFORMER, POWER	1	18110-1	14632	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
TB1	TERMINAL BOARD	1	353-18-04-001	71785	
U1	POWER DIVIDER/COMBINATION	1	84100	14632	
U2	VOLTAGE REGULATOR	1	LAS2115	80103	
U3	VOLTAGE REGULATOR	1	LAS2615	80103	
W1	CABLE ASSEMBLY	1	17300-85-1	14632	
W2	CABLE ASSEMBLY	1	17300-85-2	14632	
W3	CABLE ASSEMBLY	1	17300-85-3	14632	
W4	CABLE ASSEMBLY	1	17300-84-4	14632	
W5	CABLE ASSEMBLY	1	17300-85-5	14632	
W6	CABLE ASSEMBLY	1	17300-85-6	14632	
W7	CABLE ASSEMBLY	1	17300-85-7	14632	
W8	CABLE ASSEMBLY	1	17300-85-8	14632	
W9	CABLE ASSEMBLY	1	17300-85-9	14632	
W10	CABLE ASSEMBLY	1	17300-85-10	14632	
W11	CABLE ASSEMBLY	1	17300-85-11	14632	
W12	Not Used				
W13	CABLE ASSEMBLY	1	17300-85-13	14632	
W14	CABLE ASSEMBLY	1	17300-85-14	14632	
W15	CABLE ASSEMBLY	1	17300-85-15	14632	
W16	CABLE ASSEMBLY	1	17300-85-16	14632	
W17	CABLE ASSEMBLY	1	17300-85-17	14632	
W18	CABLE ASSEMBLY	1	17300-85-18	14632	

MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
W19	CABLE ASSEMBLY	1	17300-85-19	14632	
W20	CABLE ASSEMBLY	1	17300-85-20	14632	
W21	CABLE ASSEMBLY	1	17300-85-21	14632	
W22	CABLE ASSEMBLY	1	17300-85-22	14632	
W23	CABLE ASSEMBLY	1	17300-85-23	14632	
W24	CABLE ASSEMBLY	1	17300-85-24	14632	
W25	CABLE ASSEMBLY	1	17300-85-25	14632	
XA10	CONNECTOR,PRINTED CIRCUIT BOARD	1	251-22-30-160	71785	
XA11	CONNECTOR,PRINTED CIRCUIT BOARD	1	250-22-30-170	71785	
XDS1	LAMPHOLDER	4	102SG	08717	
XDS2 Thru XDS4	Same as XDS1				
XDS5	LAMPHOLDER	1	102SR	08717	
XDS6	LAMP ASSEMBLY, INCANDESCENT	1	270-1930-0171-702	72619	
XF1	FUSEHOLDER	2	342004	75915	
XF2	Same as XF1				
XK4	SOCKET, RELAY	1	AD24	78277	
	ACCESSORY ITEM FURNISHED WITH EQUIPMENT				
A11	CONNECTOR, PLUG, MULTIPIN		JTG06RE14-18S SR	77820	

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	26-90 MHz RF TUNER	1	71425-1	14632	
A2	TUNING DRIVE ASSEMBLY	1	85127-1	14632	
CR1	DIODE	1	1N995	80131	93332
FB1	FERRITE BEAD	1	56-590-65-4A	02114	
J1	CONNECTOR, RECEPTACLE, PLUG	1	JF3P1SACD	81312	
P1	CONNECTOR, PLUG, MULTIPIN	1	17-20250-1	29587	
P2	CONNECTOR, PLUG, SMC SERIES	2	UG1466/U	80058	19505
P3	Same as P2				
P4	CONNECTOR, RECEPTACLE, PLUG	1	JF3S1PACD	81312	
W1	CABLE ASSEMBLY	1	17300-20-1	14632	

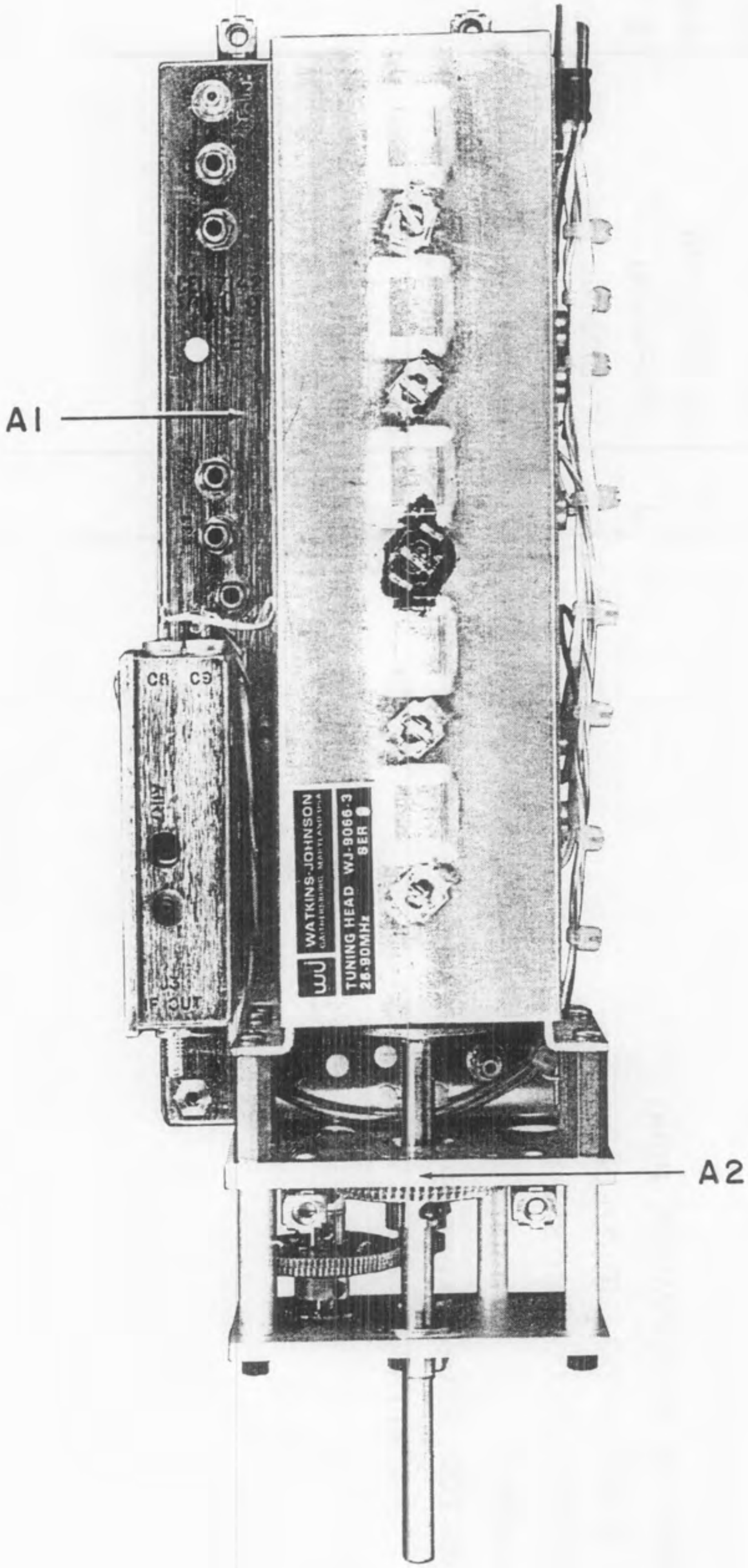


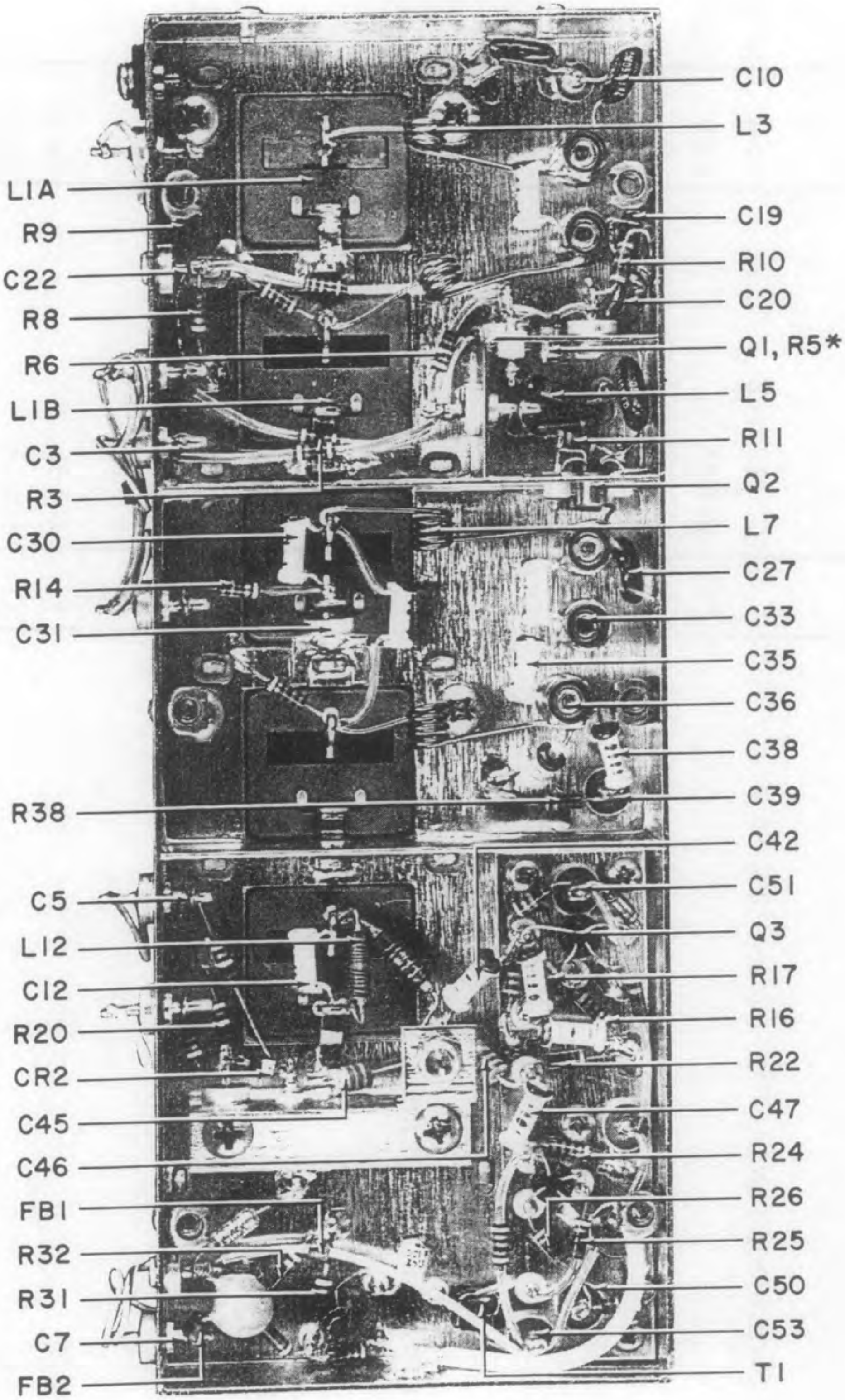
Figure 5-6. Type WJ-9066-3 26-90 MHz Tuning Head (A1), Top View, Location of Components

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	MIXER/IF AMPLIFIER				
C1	CAPACITOR, CERAMIC, FEED-THRU: 1000pF, GMV 500 V	1	18056-1	14632	
C2 Thru C9	Same as C1	11	54-794-009-102W	33095	
C10	CAPACITOR, MICA, DIPPED: 27pF, 2%, 500 V	1	CM05FD270G03	81349	72136
C11	CAPACITOR, MICA, DIPPED: 100pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C12	CAPACITOR, CERAMIC, TUBULAR: 1.0pF±0.1pF, 500 V	1	301-000U2K0-1098	72982	
C13	CAPACITOR, VARIABLE, GLASS: 0.8-8.5pF, 750 V	5	VC20GY	73899	
C14	Not Used				
C15	CAPACITOR, CERAMIC, TUBULAR: 2.0pF±0.1pF, 500 V	1	301-000C0K0-209B	72982	
C16	CAPACITOR, CERAMIC, TUBULAR: 5.6pF±0.25pF, 500 V	1	301-000C0H0-569C	72982	
C17	Same as C13				
C18	Not Used				
C19	CAPACITOR, MICA, DIPPED: 15pF, 5%, 500 V	2	CM05CD150J03	81349	72136
C20	CAPACITOR, MICA, DIPPED: 270pF, 2%, 500 V	1	CM05FD271G03	81349	72136
C21	CAPACITOR, CERAMIC, STAND-OFF: 1000pF, GMV, 500 V	10	54-803-003-102W	33095	
C22	Same as C21				
C23	Same as C21				
C24	Same as C1				
C25	CAPACITOR, MICA, DIPPED: 220pF, 2%, 500 V	1	CM05FD221G03	81349	72136
C26	Same as C1				

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C27	Same as C19				
C28	Same as C13				
C29	CAPACITOR, CERAMIC, TUBULAR: 4.7pF±0.25pF, 500 V	3	301-000C0H0-479C	72982	
C30	CAPACITOR, CERAMIC, TUBULAR: 2.0pF±0.1pF, 500 V	1	301-000C0K0-209B	72982	
C31	Same as C21				
C32	CAPACITOR, CERAMIC, TUBULAR: 1.2pF±0.1pF, 500 V	1	301-000C0K0-129B	72982	
C33	Same as C13				
C34	Not Used				
C35	Same as C29				
C36	Same as C13				
C37	Not Used				
C38	CAPACITOR, CERAMIC, TUBULAR: 12pF, 5%, 500 V	1	301-000C0G0-120J	72982	
C39	CAPACITOR, CERAMIC, FEED-THRU: 33pF, 10%, 500 V	1	54-794-001-3301	33095	
C40	CAPACITOR, CERAMIC, TUBULAR: 22pF, 5%, 500 V	2	301-000C0G0-220J	72982	
C41	Same as C29				
C42	CAPACITOR, CERAMIC, TUBULAR: 4.7pF±0.25pF, 500 V	1	301-000T2J0-479C	72982	
C43	CAPACITOR, VARIABLE, AIR: 0.8-10.0pF, 250 V	1	5202	91293	
C44	Not Used				
C45	CAPACITOR, COMPOSITION, TUBULAR: 0.68pF, 10%, 500 V	2	QC(0.68pF,K)	95121	
C46	Same as C45				
C47	Same as C40				
C48	CAPACITOR, CERAMIC, DISC: 1000pF, GMV, 500 V	1	SM(1000pF,P)	91418	



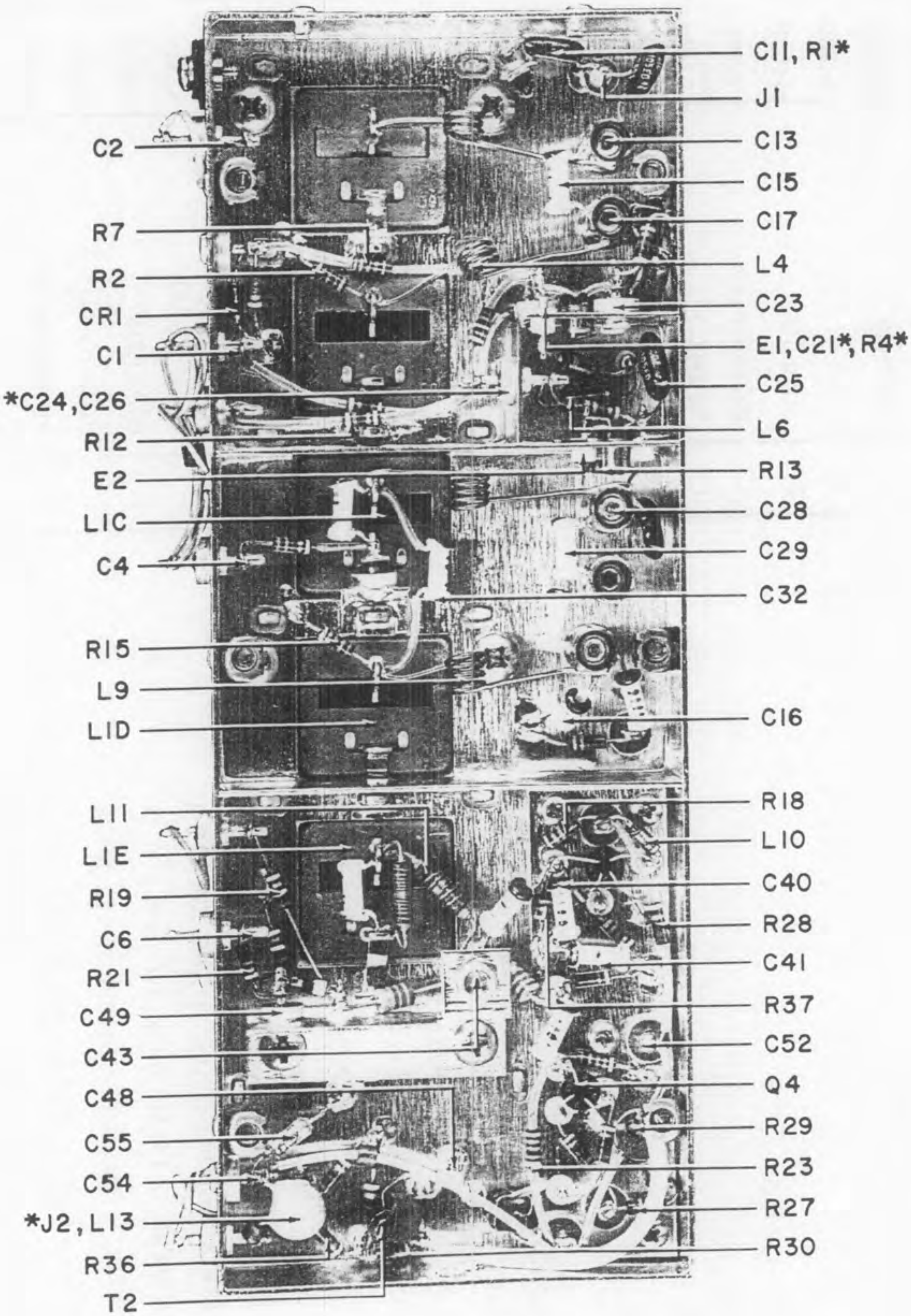
∗ DENOTES HIDDEN PART

Figure 5-7. Type 71425-1 26-90 MHz RF Tuner (A1A1), Bottom View, Location of Components

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C49 Thru C54	Same as C21				
C55	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 μF, 10%, 35 V	1	CS13BF105K	81349	56289
CR1	DIODE	1	1N462A	80131	93332
CR2	DIODE/VARICAP	1	BB105B	25088	
E1	TERMINAL, FEED-THRU	2	SFU16Y	04013	
E2	Same as E1				
FB1	FERRITE BEAD	2	56-590-65-4A	02114	
FB2	Same as FB1				
J1	CONNECTOR, RECEPTACLE, SMC SERIES	3	10-0104-002	19505	
J2	Same as J1				
J3	Same as J1				
L1	INDUCTOR, MODIFIED	1	21701-8	14632	
L2	Not Used				
L3	INDUCTOR, AIR CORE	2	22292-106	14632	
L4	Same as L3				
L5	COIL, FIXED: 0.82 μH	1	204-11	99848	
L6	COIL, FIXED: 2.2 μH	1	1537-20	99800	
L7	INDUCTOR, AIR CORE	1	22292-107	14632	
L8	Not Used				
L9	Same as L7				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L10	INDUCTOR (RESISTOR FORM)	1	21209-10	14632	
L11	INDUCTOR	1	21210-7	14632	
L12	INDUCTOR	1	21210-151	14632	
L13	COIL, FIXED: 4.7 mH	1	553-3635-45	71279	
Q1	TRANSISTOR	1	841001-1	14632	
Q2	TRANSISTOR	1	2N4416	80131	04713
Q3	TRANSISTOR	2	2N3478	80131	34156
Q4	Same as Q3				
R1	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4 W	3	RCR07G104JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4 W	2	RCR07G822JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	3	RCR07G470JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 510 kΩ, 5%, 1/4 W	1	RCR07G514JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4 W	1	RCR07G473JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	1	RCR07G472JS	81349	01121
R9	RESISTOR, VARIABLE, FILM: 5 kΩ, 10%, 5 W	1	62PAR5K	73138	
R10	RESISTOR, FIXED, COMPOSITION: 300 Ω, 5%, 1/4 W	1	RCR07G301JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4 W	1	RCR07G822JS	81349	01121
R12	Same as R3				
R13	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	3	RCR07G100JS	81349	01121



* DENOTES HIDDEN PART

Figure 5-8. Type 71425-1 26-90 MHz RF Tuner (A1A1), Bottom View, Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R14	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R15	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4 W	2	RCR07G272JS	81349	01121
R16	RESISTOR, FIXED, COMPOSITION: 820 Ω, 5%, 1/4 W	1	RCR07G821JS	81349	01121
R17	Same as R3				
R18	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121
R19	Same as R1				
R20	Same as R1				
R21	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R22	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	3	RCR07G101JS	81349	01121
R23	Same as R2				
R24	Same as R15				
R25	Same as R13				
R26	Same as R13				
R27	RESISTOR, FIXED, COMPOSITION: 180 Ω, 5%, 1/4 W	1	RCR07G181JS	81349	01121
R28	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	2	RCR07G220JS	81349	01121
R29	Same as R28				
R30	Same as R22				
R31	RESISTOR, FIXED, COMPOSITION: 75 Ω, 5%, 1/4 W	2	RCR07G750JS	81349	01121
R32	Same as R31				
R33	Same as R11				
R34	RESISTOR, FIXED, COMPOSITION: 150 Ω, 5%, 1/4 W	1	RCR07G151JS	81349	01121
R35	RESISTOR, FIXED, COMPOSITION: 270 Ω, 5%, 1/4 W	1	RCR07G271JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R36	Same as R22				
R37	Same as R18				
R38	RESISTOR, FIXED, COMPOSITION: 120 Ω, 5%, 1/4 W	1	RCR07G121JS	81349	01121
R39	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
T1	TRANSFORMER, TOROIDAL	1	21727-4	14632	
T2	TRANSFORMER, TOROIDAL	1	21278-7	14632	

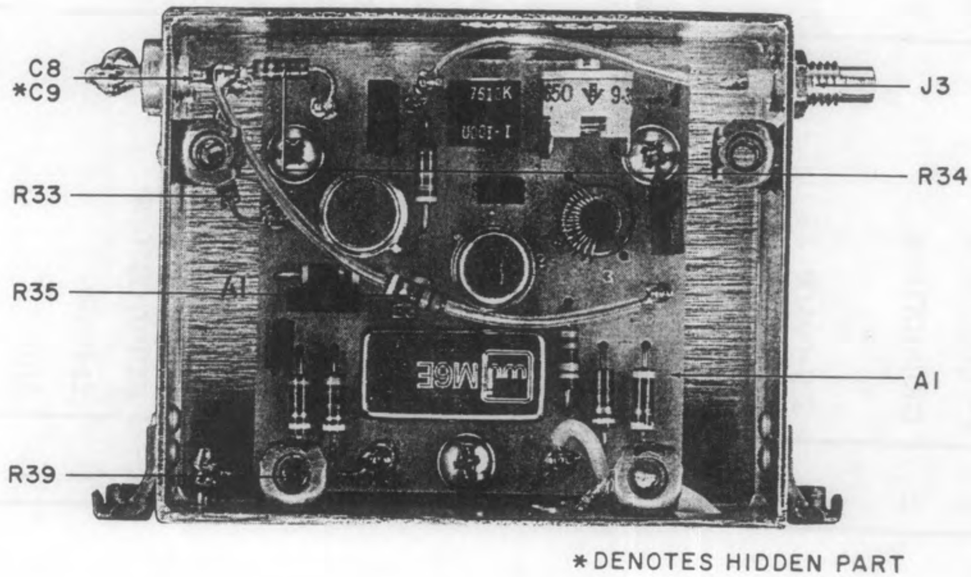


Figure 5-9. Type 71425-1 26-90 MHz RF Tuner (A1A1), Side View, Location of Components

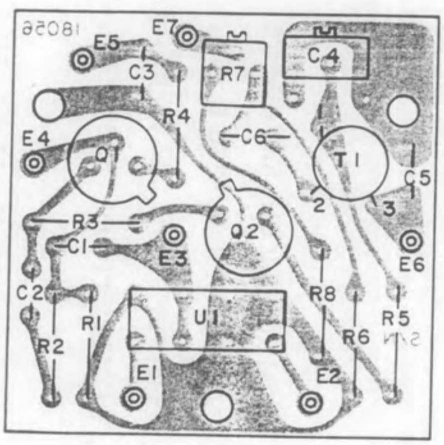


Figure 5-10. Part 18056-1 Mixer/IF Amplifier (A1A1A1 and A2A1A1), Location of Components

5.4.2.1.1 PART 18056-1 Mixer/IF Amplifier

REF DESIG PREFIX A1A1A1, A2A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 0.01 μF, 10%, 200 V	3	CK06BK103K	81349	56289
C2	CAPACITOR, CERAMIC, DISC: 1000 pF, 10%, 200 V	2	CK05BX102K	81349	56289
C3	Same as C1				
C4	CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350 V	1	538-006D9-35	72982	
C5	Same as C1				
C6	Same as C2				
Q1	TRANSISTOR	2	2N5109	80131	02735
Q2	Same as Q1				
R1	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4 W	1	RCR07G822JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 360 Ω, 5%, 1/4 W	1	RCR07G361JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	2	RCR07G470JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 6.8 Ω, 5%, 1/4 W	1	RCR07G6R8JS	81349	01121
R5	Same as R3				
R6	RESISTOR, FIXED, COMPOSITION: 150 Ω, 5%, 1/4 W	1	RCR07G151JS	81349	01121
R7	RESISTOR, VARIABLE, FILM: 100 Ω, 10%, .5 W	1	62 PAR100	73138	
R8	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
T1	COIL, TOROIDAL	1	21428-7	14632	
U1	MIXER, BALANCED	1	M6E	27956	

5.4.2.2 TYPE 85127-1 26-90 MHz TUNING DRIVE
TYPE 85128-1 90-300 MHz TUNING DRIVE

REF DESIG PREFIX A1A2 and A2A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
1	FRONT GEAR PLATE (TYPE 85127-1)	1	24100-1	14632	
1	FRONT GEAR PLATE (TYPE 85128-1)	1	24103-1	14632	
2	BALL BEARING	2	SFR33PP	83086	
3	BALL BEARING	2	SFR1883PP	83086	
4	COLLAR	1	11581-2	14632	
5	SPRING, TENSION	AR	3502-14-47	78189	
6	THRUST BEARING	1	TT504	70417	
7	DRIVE SHAFT	1	1002-96	14632	
8	RETAINING RING	2	5100-25	79136	
9	GEAR, SPUR	1	13955-1	14632	
10	RETAINING RING	1	5100-18	79136	
11	IDLER SHAFT	1	21352-2	14632	
12	COLLAR	1	11581-6	14632	
13	SPRING, TENSION	2	ARC232	73682	
14	CLUTCH BEARING	2	11582-7	14632	
15	GEAR ANTI-BACKLASH (TYPE 85127-1)	1	20182-18	14632	
15	GEAR ANTI-BACKLASH (TYPE 85128-1)	1	20182-1	14632	
16	GEAR, SPUR (TYPE 85127-1)	1	2984-59	14632	
16	GEAR, SPUR (TYPE 85128-1)	1	2984-10	14632	
17	SHIM SPACER	AR	SSS23	01351	
18	GEAR, ANTI-BACKLASH (TYPE 85127-1)	1	20180-25	14632	
18	GEAR, ANTI-BACKLASH (TYPE 85128-1)	1	20180-6	14632	

REF DESIG PREFIX A1A2 and A2A2

REF DESIG	DESCRIPTION		QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
19	SPACER		4	20757-26	14632	
20	REAR GEAR PLATE	(TYPE 85127-1)	1	22790-1	14632	
20	REAR GEAR PLATE	(TYPE 85128-1)	1	16202-1	14632	
21	SHOULDER SPACER		4	20755-77	14632	
22	20-90 MHz RF TUNER	(TYPE 85127-1)	REF	71331-3	14632	
22	90-300 MHz RF TUNER	(TYPE 85128-1)	REF	71401-3	14632	
23	SET SCREW: #4-40 x 1/8 LG		10	SSCR4-40x1/8 HT TR	56878	
24	#4 LOCK WASHER		4	MS35338-135	96906	73734
25	#6 LOCK WASHER		4	MS35338-136	96906	73734
26	#4-40 x 3/8 LG PAN HEAD MACHINE SCREW		4	MS51957-15	96906	73734
27	#6-32 x 3/8 LG FLAT HEAD MACHINE SCREW		4	MS24693C26	96906	73734
28	#6-32 x 3/8 LG SCH CAP SCREW		4	MS16995-17	96906	73734

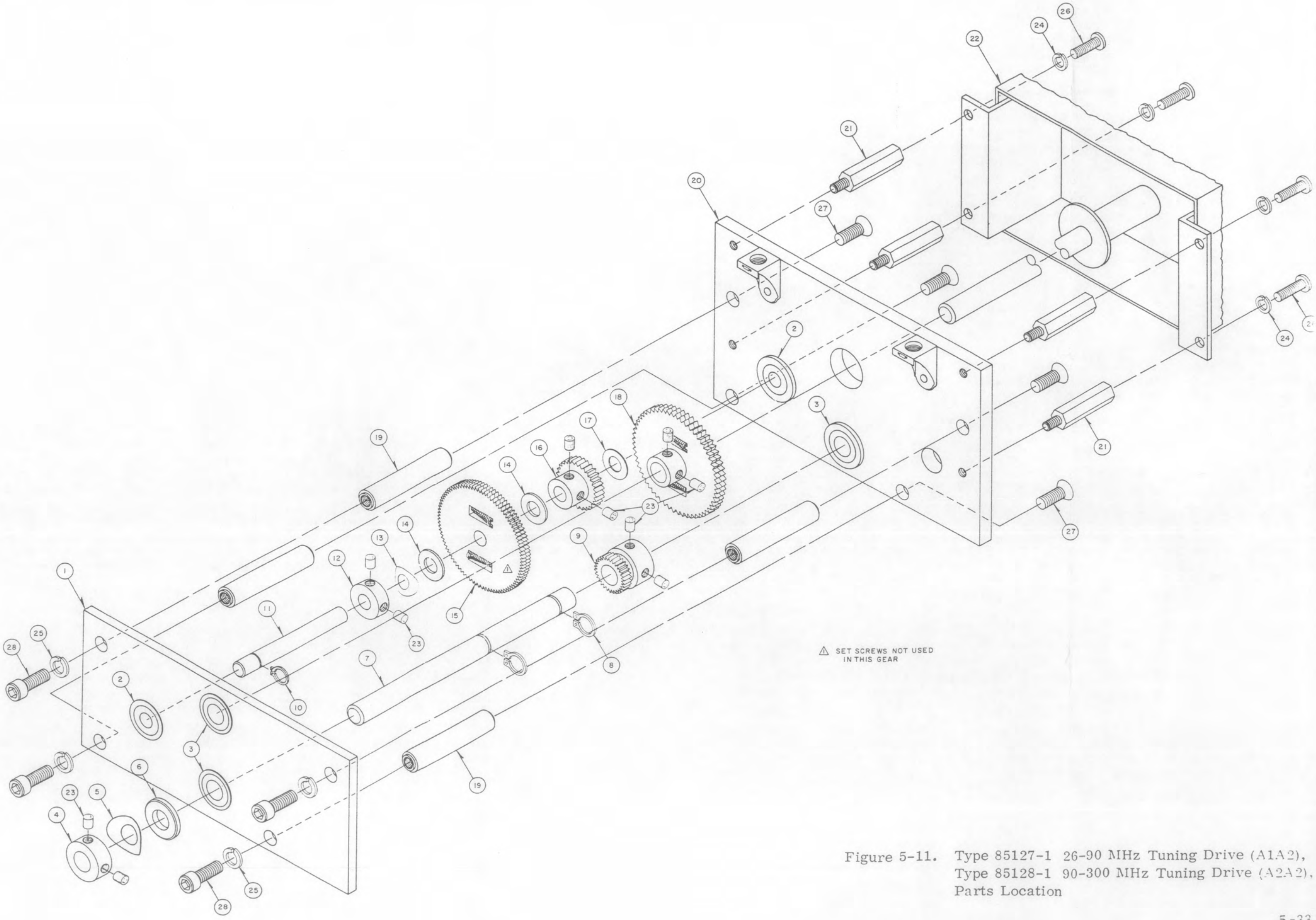


Figure 5-11. Type 85127-1 26-90 MHz Tuning Drive (A1A2), Type 85128-1 90-300 MHz Tuning Drive (A2A2), Parts Location

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	90-300 MHz RF TUNER	1	71401-3	14632	
A2	TUNING DRIVE ASSEMBLY (90-300 MHz)	1	85128-1	14632	
CR1	DIODE	1	1N995	80131	
P1	CONNECTOR, PLUG, MULTIPIN	1	17-20250-1	29587	

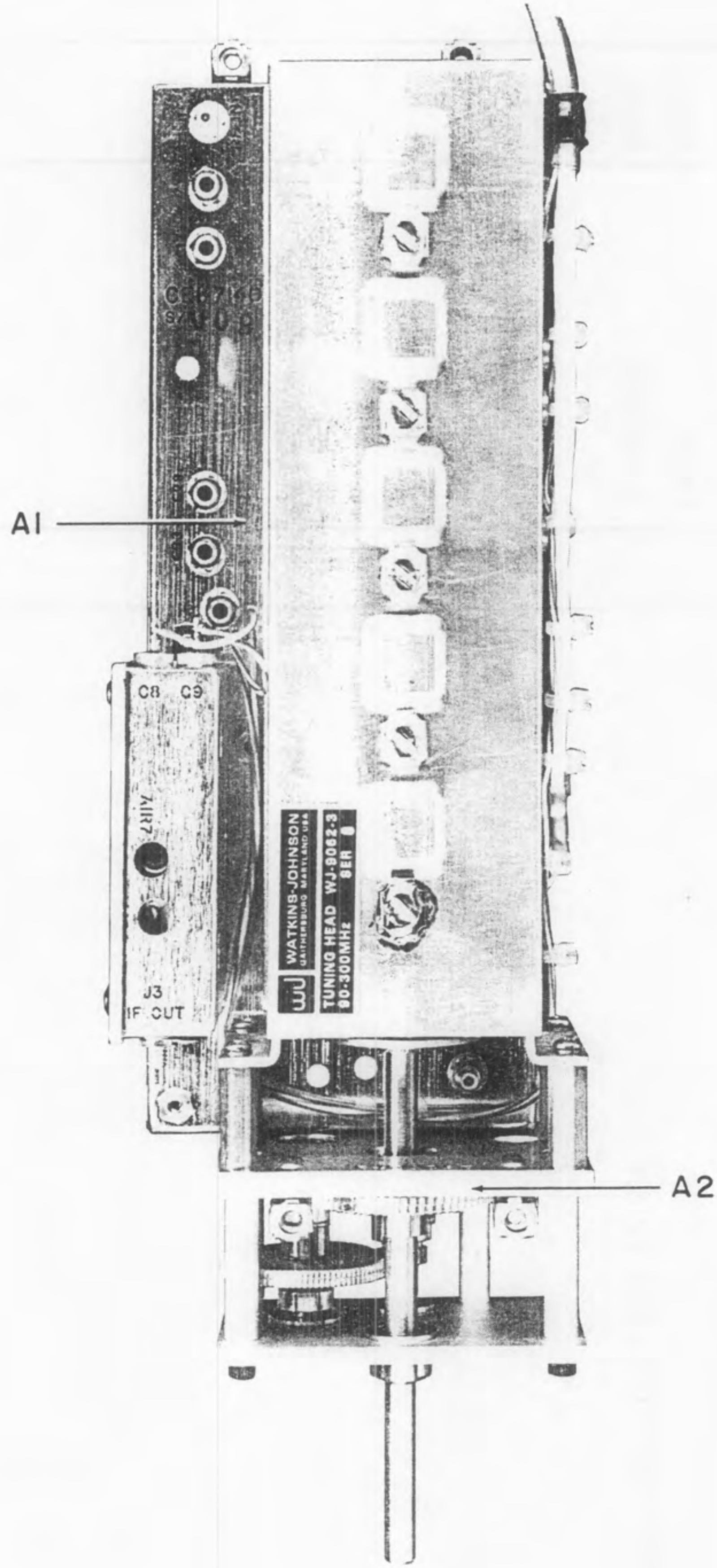


Figure 5-12. Type WJ-9062-3 90-300 MHz Tuning Head (A2), Top View, Location of Components

REF DESIG PREFIX A2A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	MIXER, IF AMPLIFIER	1	18056-1	14632	
C1	CAPACITOR, CERAMIC, FEED-THRU: 1000 pF, GMV, 500 V	11	54-794-009-102W	33095	
C2 Thru C9	Same as C1				
C10	CAPACITOR, CERAMIC, TUBULAR: 2.7 pF ± 0.25 pF, 500 V	1	301-000C0J0-279C	72982	
C11	CAPACITOR, CERAMIC, TUBULAR: 8.2 pF ± 0.5 pF, 500 V	1	301-000C0H0-829D	72982	
C12	CAPACITOR, COMPOSITION, TUBULAR: 0.1 pF, 10%, 500 V	1	QC(0.1 pF, K)	95121	
C13	CAPACITOR, VARIABLE, GLASS: 0.8-8.5 pF, 750 V	5	VC20GY	73899	
C14	CAPACITOR, COMPOSITION, TUBULAR: 0.15 pF, 10%, 500 V	1	QC(0.15 pF, K)	95121	
C15	CAPACITOR, CERAMIC, STAND-OFF: 1000 pF, GMV, 500 V	9	54-803-003-102W	33095	
C16	CAPACITOR, CERAMIC, TUBULAR: 3.0 pF ± 0.25 pF, 500 V	1	301-000C0J0-309C	72982	
C17	Same as C13				
C18	Same as C15				
C19	Same as C15				
C20	Same as C1				
C21	CAPACITOR, MICA, DIPPED: 22 pF, 5%, 500 V	1	CM05ED220J03	81349	72136
C22	Same as C1				
C23	CAPACITOR, COMPOSITION, TUBULAR: 0.3 pF, 10%, 500 V	1	QC(0.3 pF, K)	95121	
C24	Same as C15				
C25	CAPACITOR, COMPOSITION, TUBULAR: 0.47 pF, 10%, 500 V	2	QC(0.47 pF, K)	95121	
C26	CAPACITOR, CERAMIC, TUBULAR: 2.2 pF ± 0.25 pF, 500 V	1	301-000C0J0-229C	72982	

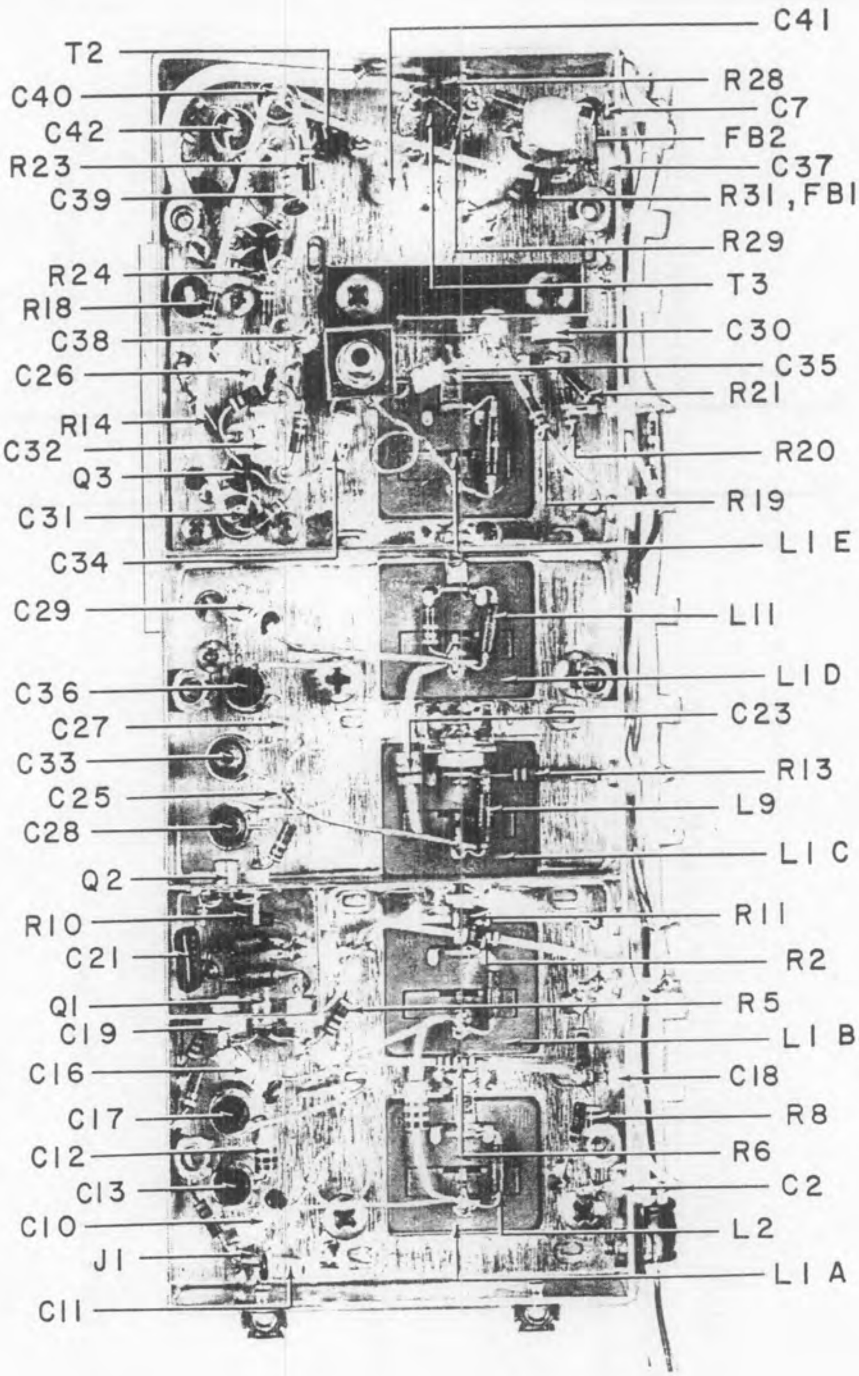


Figure 5-13. Type 71401-3 90-300 MHz RF Tuner (A2A1), Bottom View, Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C27	Same as C25				
C28	Same as C13				
C29	CAPACITOR, CERAMIC, TUBULAR: 1.5 pF ± 0.1 pF, 500 V	1	301-000C0K0-159B	72982	
C30	Same as C15				
C31	Same as C15				
C32	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF ± 0.25 pF, 500 V, N750	1	301-000U2J0-479C	72982	
C33	Same as C13				
C34	CAPACITOR, CERAMIC, TUBULAR: 2.2 pF ± 0.25 pF, 500 V, N470	1	301-000T2J0-229C	72982	
C35	CAPACITOR, COMPOSITION, TUBULAR: 0.43 pF, 10%, 500 V	1	QC(o.43 pF, K)	95121	
C36	Same as C13				
C37	Same as C15				
C38	CAPACITOR, COMPOSITION, TUBULAR: 0.36 pF, 10%, 500 V	1	QC(0.36 pF, K)	95121	
C39	CAPACITOR, CERAMIC, TUBULAR: 22 pF, 5%, 500 V	1	301-000C0G0-220J	72982	
C40	Same as C15				
C41	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	1	SM(1000 pF, P)	91418	
C42	Same as C15				
C43	CAPACITOR, VARIABLE, GLASS: 0.8-4.5 pF, 750 V	1	VC21GY	73899	
C44	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF ± 0.25 pF, 500 V	1	301-000C0H0-479C	72982	
C45	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 μF, 10%, 35 V	1	CS13BF105K	81349	56289
CR1	DIODE	1	1N462A	80131	93332
CR2	DIODE, VARICAP	1	BB105B	25088	

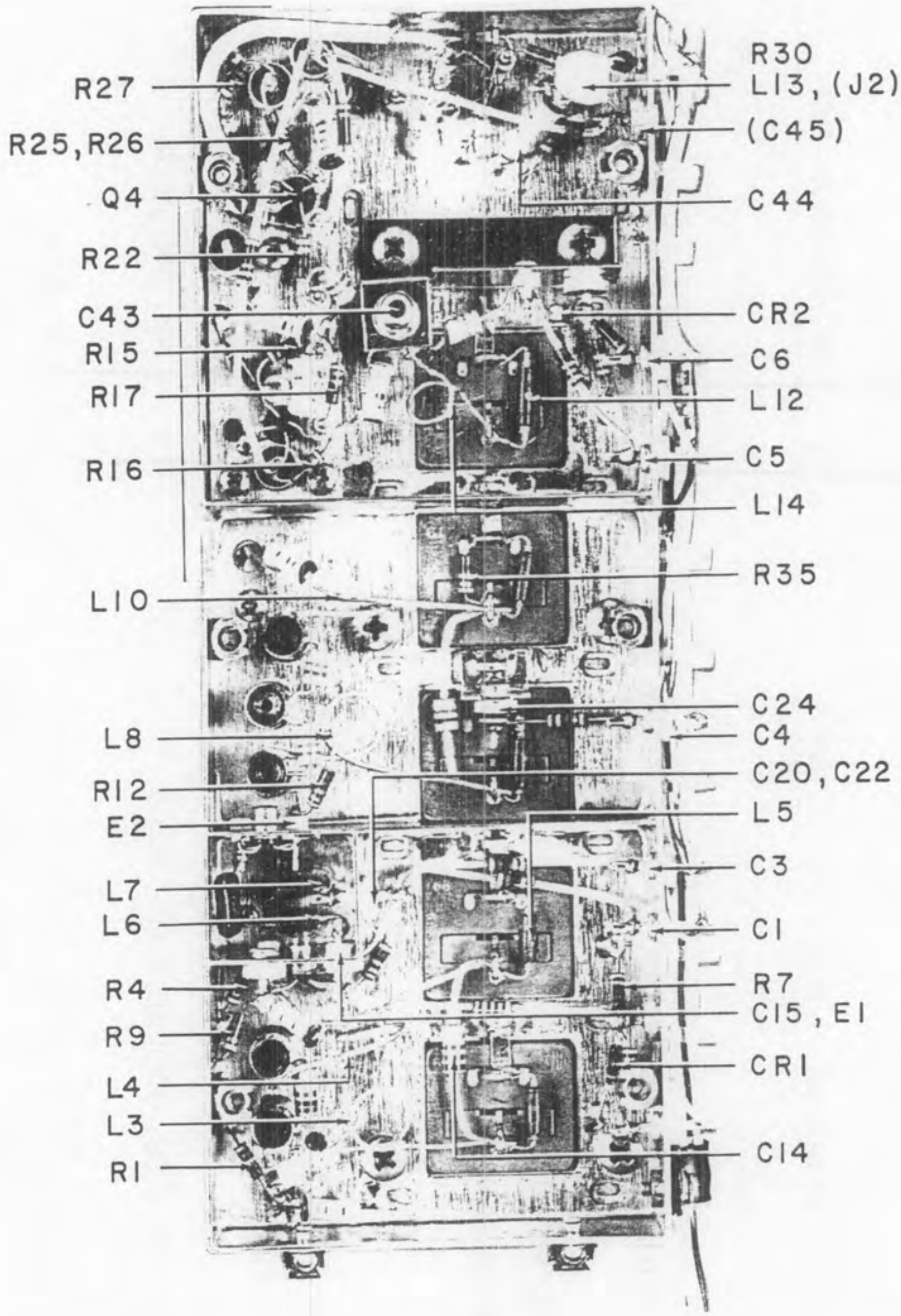


Figure 5-14. Type 71401-3 90-300 MHz RF Tuner (A2A1), Bottom View, Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
E1	TERMINAL, FEED-THRU	2	SFU16Y	04013	
E2	Same as E1				
FB1	FERRITE BEAD	2	56-590-65-4A	02114	
FB2	Same as FB1				
J1	CONNECTOR, RECEPTACLE, SMC SERIES	3	10-0104-002	19505	
J2	Same as J1				
J3	Same as J1				
L1	INDUCTOR MODIFIED	1	21701-6	14632	
L2	INDUCTOR	4	21210-108	14632	
L3	INDUCTOR FIXED	2	22292-76	14632	
L4	INDUCTOR, FIXED	3	22292-75	14632	
L5	Same as L2				
L6	COIL, FIXED	1	21210-10	14632	
L7	COIL, FIXED: 0.56 μH	1	202-11	99848	
L8	Same as L4				
L9	Same as L2				
L10	Same as L4				
L11	Same as L2				
L12	INDUCTOR	1	21210-163	14632	
L13	COIL, FIXED: 4.7 mH	1	553-3635-45	71279	
L14	Same as L3				
Q1	TRANSISTOR	1	841001-2	14632	

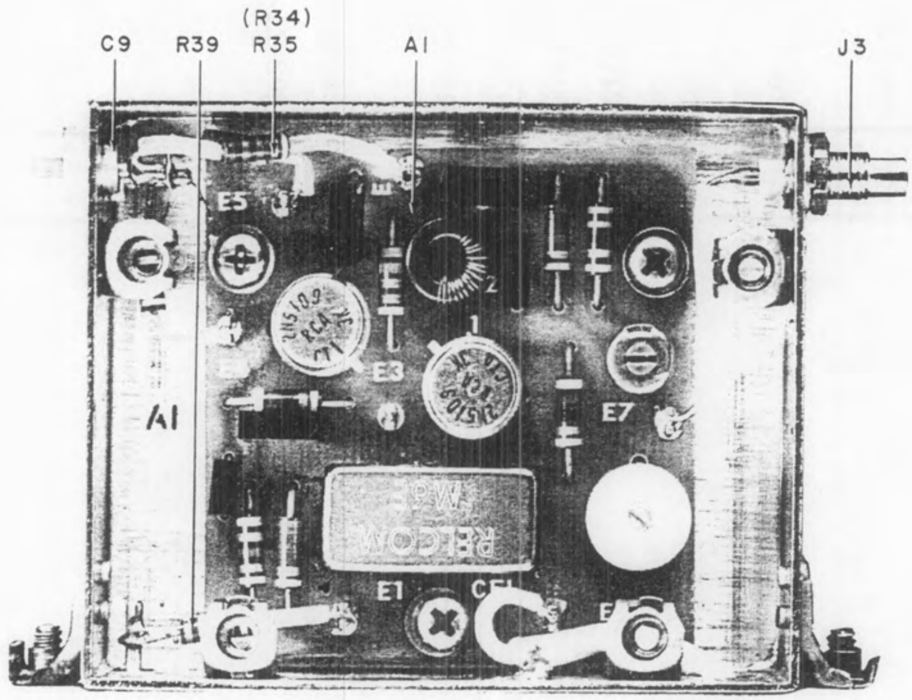


Figure 5-15. Type 71401-3 90-300 MHz RF Tuner (A2A1), Side View, Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
Q2	TRANSISTOR	1	2N4416	80131	04713
Q3	TRANSISTOR	1	2N3478	80131	34156
Q4	TRANSISTOR	1	2N2857	80131	02735
R1	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4 W	3	RCR07G104JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	4	RCR07G470JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 510 kΩ, 5%, 1/4 W	1	RCR07G514JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4 W	1	RCR07G473JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 91 kΩ, 5%, 1/4 W	1	RCR07G913JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4 W	1	RCR07G682JS	81349	01121
R8*	RESISTOR, FIXED, COMPOSITION: 3.6 kΩ, 5%, 1/4 W	1	RCR07G362JS	81349	01121
R9	RESISTOR, FIXED, COMPOSITION: 180 Ω, 5%, 1/4 W	3	RCR07G181JS	81349	01121
R10	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4 W	2	RCR07G272JS	81349	01121
R11	Same as R2				
R12	RESISTOR, FIXED, COMPOSITION: 2.7 Ω, 5%, 1/4 W	1	RCR07G2R7JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R14	RESISTOR, FIXED, COMPOSITION: 820 Ω, 5%, 1/4 W	1	RCR07G821JS	81349	01121
R15	Same as R2				
R16	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	3	RCR07G103JS	81349	01121
R17	Same as R16				
R18	Same as R2				

*Nominal value, final value factory selected.

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R19	Same as R1				
R20	Same as R1				
R21	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R22	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	3	RCR07G100JS	81349	01121
R23	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4 W	1	RCR07G822JS	81349	01121
R24	Same as R10				
R25	Same as R22				
R26	Same as R22				
R27	Same as R9				
R28	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121
R29	RESISTOR, FIXED, COMPOSITION: 68 Ω, 5%, 1/4 W	2	RCR07G680JS	81349	01121
R30	Same as R9				
R31	Same as R29				
R32	RESISTOR, FIXED, COMPOSITION: 270 Ω, 5%, 1/4 W	1	RCR07G271JS	81349	01121
R33	RESISTOR, FIXED, COMPOSITION: 150 Ω, 5%, 1/4 W	1	RCR07G151JS	81349	01121
R34	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4 W	1	RCR07G332JS	81349	01121
R35	Same as R16				
T1	Not Used				
T2	TRANSFORMER TOROIDAL	2	21278-7	14632	
T3	Same as T2				

5.4.4 TYPE WJ-9064-3 235-500 MHz Tuning Head

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	235-500 MHz RF TUNER	1	71404-2	14632	
A2	TUNING DRIVE ASSEMBLY	1	85130-1	14632	
A3	60/21.4 MHz CONVERTER	1	71423-1	14632	
CR1	DIODE	2	1N995	80131	93332
CR2	Same as CR1				
P1	CONNECTOR, PLUG, MULTIPIN	1	17-20250-1	29587	

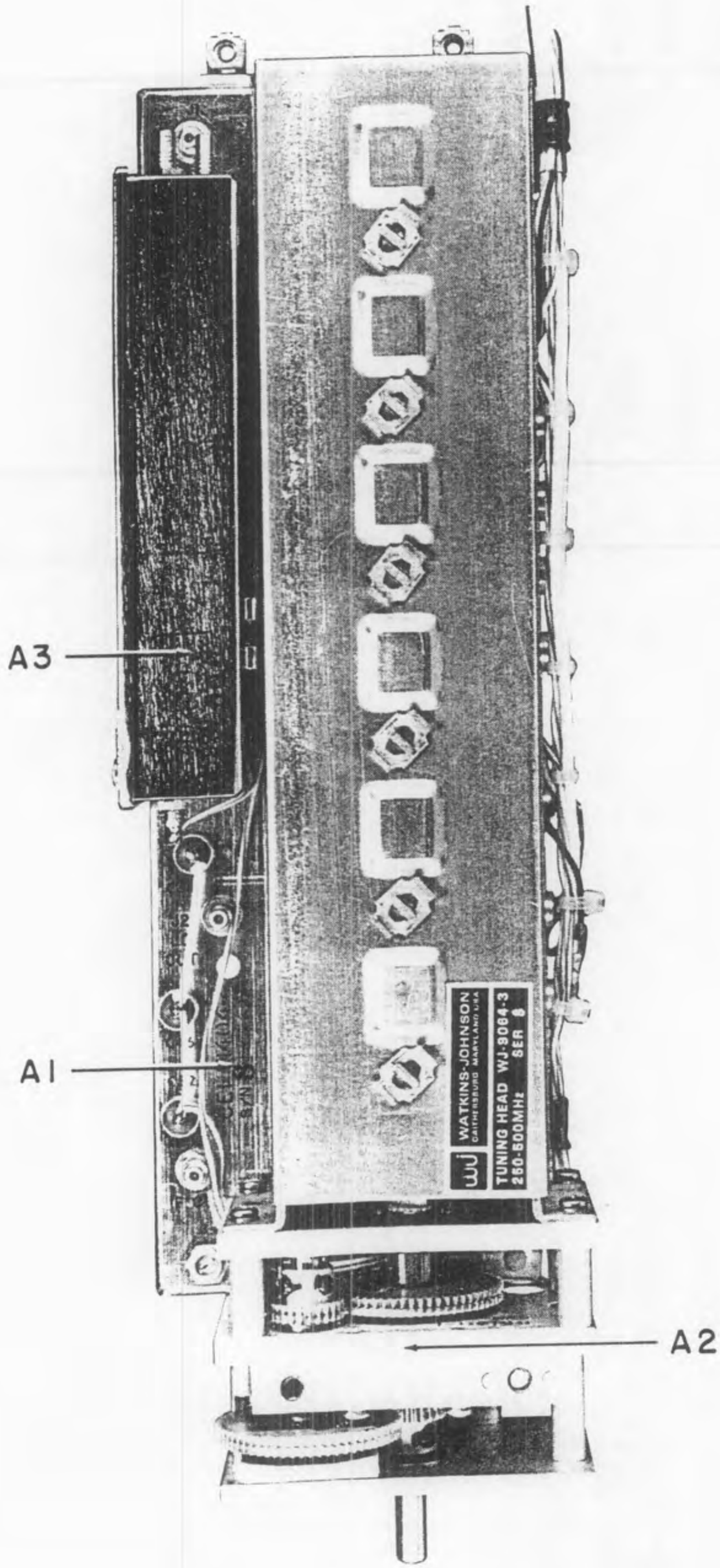


Figure 5-16. Type WJ-9064-3 235-500 MHz Tuning Head (A3), Top View, Location of Components

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	MIXER, IF AMPLIFIER	1	16689	14632	
C1	Not Used				
C2	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF ± 0.1 pF, 500 V	2	301-000C0H0-479B	72982	
C3	CAPACITOR, CERAMIC, TUBULAR: 2.4 pF ± 0.25 pF, 500 V	1	301-000C0J0-249C	72982	
C4	CAPACITOR, VARIABLE, AIR: 0.6-6 pF, 250 V	5	5701	91293	
C5	CAPACITOR, COMPOSITION. TUBULAR: 0.36 pF, 10%, 500 V	1	QC(0.36 pF, K)	95121	
C6	CAPACITOR, CERAMIC, FEED-THRU: 470 pF, 20%, 500 V	18	54-794-009-471M	33095	
C7	Same as C4				
C8	CAPACITOR, CERAMIC, DISC: 200 pF, -0+50%, 500 V	5	32-257578-40	91984	
C9*	CAPACITOR, CERAMIC, TUBULAR: 3.3 pF ± 0.1 pF, 500 V	1	301-000C0J0-339B	72982	
C10	Same as C6				
C11	Same as C6				
C12	Same as C6				
C13	Same as C8				
C14	Not Used				
C15	CAPACITOR, CERAMIC, DISC: 100 pF, 5%, 300 V	2	UY02-101J	73899	
C16	Same as C6				
C17	Same as C4				
C18	CAPACITOR, CERAMIC, STAND-OFF: 137 pF, 20%, 500 V	1	J102(137pF, 20%, 500V)	54753	
C19	Same as C6				
C20	CAPACITOR, COMPOSITION, TUBULAR: 0.27 pF, 10%, 500 V	1	QC(0.27 pF, K)	95121	
C21	Same as C4				

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C22	Same as C8				
C23	CAPACITOR, CERAMIC, TUBULAR: 1.8 pF ± 0.1 pF, 500 V	1	301-000C0K0-189B	72982	
C24	Same as C6				
C25	Same as C6				
C26	Same as C8				
C27	Not Used				
C28	Same as C6				
C29	CAPACITOR, CERAMIC, TUBULAR: 1.5 pF ± 0.1 pF, 500 V	1	301-000C0K0-159B	72982	
C30	CAPACITOR, CERAMIC, STAND-OFF: 470 pF, 20%, 500 V	2	54-803-003-4712	33095	
C31	Same as C4				
C32	CAPACITOR, CERAMIC, TUBULAR: 2.2 pF ± 0.1 pF, 500 V	1	301-000C0J0-229B	72982	
C33	CAPACITOR, CERAMIC, TUBULAR: 5.6 pF ± 0.25 pF, 500 V	2	301-000C0H0-569C	72982	
C34	Same as C6				
C35	Same as C6				
C36	Same as C6				
C37	Same as C2				
C38	CAPACITOR, VARIABLE, AIR: 0.8-10.0 pF, 250 V	1	5201	91293	
C39	CAPACITOR, CERAMIC, TUBULAR: 6.8 pF ± 0.25 pF, 500 V, N330	1	301-000S2H0-689C	72982	
C40	Same as C6				
C41	CAPACITOR, CERAMIC, TUBULAR: 3.3 pF ± 0.25 pF, 500 V	1	301-000C0J0-339C	72982	
C42	CAPACITOR, COMPOSITION, TUBULAR: 0.82 pF, 10%, 500 V	1	QC(0.82 pF, K)	95121	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C43	Same as C8				
C44	CAPACITOR, CERAMIC, TUBULAR: 2.7 pF ± 0.25 pF, 500 V	1	301-000C0J0-279C	72982	
C45	Same as C6				
C46	Same as C6				
C47	Same as C6				
C48	Same as C30				
C49	CAPACITOR, COMPOSITION, TUBULAR: 0.47 pF, 10%, 500 V	1	QC(0.47 pF, K)	95121	
C50	Same as C6				
C51	Same as C15				
C52	Same as C6				
C53	CAPACITOR, CERAMIC, FEED-THRU: 1000 pF, GMV, 500 V	3	54-794-009-102W	33095	
C54	Same as C53				
C55	CAPACITOR, VARIABLE, AIR: 0.8-10.0 pF, 250 V	3	5202	91293	
C56	CAPACITOR, CERAMIC STAND-OFF: 1000 pF, GMV, 500 V	1	54-803-003-102W	33095	
C57	Same as C53				
C58	CAPACITOR, COMPOSITION, TUBULAR: 1.2 pF, 10%, 500 V	1	QC(1.2 pF, K)	95121	
C59	Same as C55				
C60	CAPACITOR, COMPOSITION, TUBULAR: 0.75 pF, 10%, 500 V	1	QC(0.75 pF, K)	95121	
C61	Same as C55				
C62	CAPACITOR, CERAMIC, DISC: 24 pF, 5%, 500 V, N750	2	603U2J240J	91984	
C63	Same as C62				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C64	CAPACITOR, ELECTROLYTIC, TANTALUM: 100 μF, 20 %, 35 V	2	MTP107M035P1C	76055	
C65	Same as C64				
C66*	Same as C33				
C67	CAPACITOR, CERAMIC, TUBULAR: 1.0 pF ± 0.25 pF, 500 V	1	301-000C0K0-109C	72982	
CR1	DIODE	2	1N462A	80131	93332
CR2	Same as CR1				
CR3	DIODE, VARICAP	1	BB105B	25088	
E1	TERMINAL, FEED-THRU, INSULATION	5	SFU16Y	04013	
E2 Thru E5	Same as E1				
J1	CONNECTOR, RECEPTACLE, SMC SERIES	3	10-0104-002	19505	
J2	Same as J1				
J3	Same as J1				
L1	Not Used				
L2	INDUCTOR	6	16105-3	14632	
L3	INDUCTUNER MODIFIED	1	22985-1	14632	
L4	INDUCTOR	4	16899	14632	
L5	Same as L2				
L6	Same as L4				
L7	INDUCTOR AIR CORE	1	22292-53	14632	
L8	INDUCTOR AIR CORE	1	22292-77	14632	

*Nominal value, final value factory selected

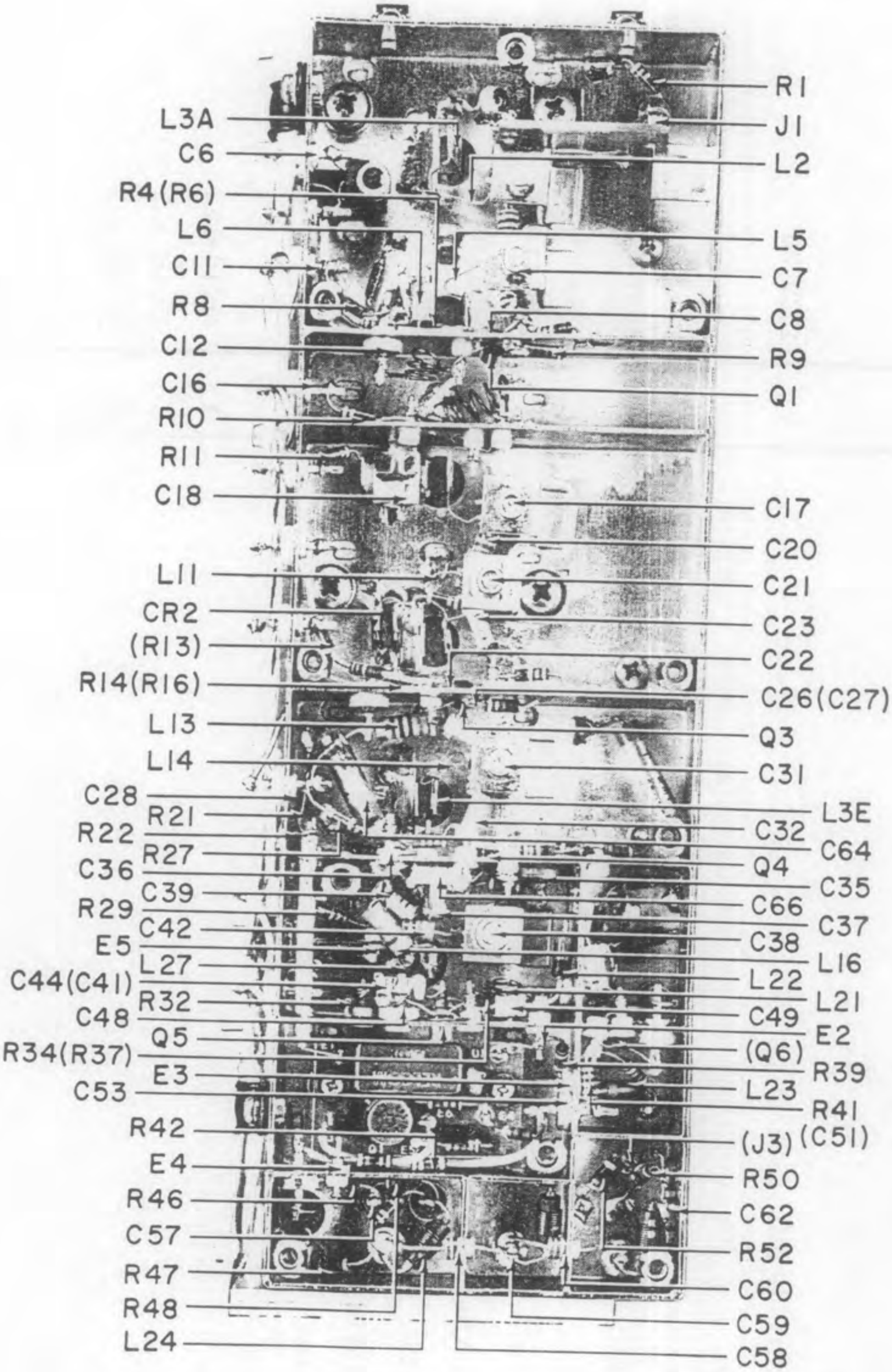


Figure 5-17. Type 71404-2 235-500 MHz RF Tuner (A3A1), Bottom View, Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L9	Same as L2				
L10	Not Used				
L11	Same as L2				
L12	Same as L4				
L13	COIL, FIXED: 10 μH	1	1537-36	99800	
L14	Same as L2				
L15	Same as L4				
L16	COIL, FIXED: 8.2 μH	1	1537-34	99800	
L17	Same as L2				
L18	COIL, FIXED: 1.0 μH	2	205-11-10	99848	
L19	INDUCTOR AIR CORE	1	22292-52	14632	
L20	COIL, FIXED: 1.2 μH	2	206-11-12	99848	
L21	INDUCTOR AIR CORE	1	22292-51	14632	
L22	Same as L18				
L23	Same as L20				
L24	INDUCTOR	1	21210-132	14632	
L25	INDUCTOR	1	21210-133	14632	
L26	INDUCTOR	1	21210-134	14632	
L27	INDUCTOR	1	1131-34	14632	
Q1	TRANSISTOR	1	18157-1	14632	
Q2	TRANSISTOR	1	2N5397	80131	04713
Q3	TRANSISTOR	1	841001-2	14632	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
Q4	TRANSISTOR	3	2N2857	80131	02735
Q5	Same as Q4				
Q6	Same as Q4				
Q7	TRANSISTOR	1	2N5109	80131	02735
R1	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4 W	6	RCR07G104JS	81349	01121
R2	POTENTIOMETER ASSY	1	16808-1	14632	
R3	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	2	RCR07G102JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4 W	2	RCR07G154JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 330 kΩ, 5%, 1/4 W	2	RCR07G334JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 620 kΩ, 5%, 1/4 W	2	RCR07G624JS	81349	01121
R7	Same as R6				
R8	RESISTOR, FIXED, COMPOSITION: 270 Ω, 5%, 1/4 W	2	RCR07G271JS	81349	01121
R9	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	3	RCR07G221JS	81349	01121
R10	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4 W	1	RCR07G222JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	5	RCR07G471JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	3	RCR07G472JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4 W	1	RCR07G272JS	81349	01121
R14	Same as R4				
R15	Same as R5				
R16	Same as R6				
R17	Same as R1				

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R18	Same as R9				
R19	Same as R8				
R20	RESISTOR, FIXED, COMPOSITION: 8.2 Ω, 5%, 1/4 W	2	RCR07G8R2JS	81349	01121
R21	RESISTOR, FIXED, COMPOSITION: 150 Ω, 5%, 1/4 W	1	RCR07G151JS	81349	01121
R22	Same as R20				
R23	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	1	RCR07G103JS	81349	01121
R24	RESISTOR, FIXED, COMPOSITION: 2.4 kΩ, 5%, 1/4 W	1	RCR07G242JS	81349	01121
R25*	RESISTOR, FIXED, COMPOSITION: 47Ω, 5%, 1/4 W	3	RCR07G470JS	81349	01121
R26	RESISTOR, FIXED, COMPOSITION: 13 kΩ, 5%, 1/4 W	1	RCR07G133JS	81349	01121
R27	Same as R11				
R28	RESISTOR, FIXED, COMPOSITION: 300 Ω, 5%, 1/4 W	2	RCR07G301JS	81349	01121
R29	Same as R1				
R30	RESISTOR, FIXED, COMPOSITION: 18 Ω, 5%, 1/4 W	1	RCR07G180JS	81349	01121
R31	Same as R28				
R32*	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R33	Same as R1				
R34	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4 W	1	RCR07G682JS	81349	01121
R35	RESISTOR, FIXED, COMPOSITION: 6.2 kΩ, 5%, 1/4 W	1	RCR07G622JS	81349	01121
R36	Same as R1				
R37	Same as R11				
R38	Same as R3				
R39*	Same as R11				

*Nominal value, final value factory selected.

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R40	RESISTOR, FIXED, COMPOSITION: 39 kΩ, 5%, 1/4 W	1	RCR07G393JS	81349	01121
R41	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R42	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4 W	3	RCR07G332JS	81349	01121
R43	RESISTOR, FIXED, COMPOSITION: 200 Ω, 5%, 1/4 W	1	RCR07G201JS	81349	01121
R44	Same as R42				
R45	Same as R25				
R46	RESISTOR, FIXED, COMPOSITION: 11 kΩ, 5%, 1/4 W	1	RCR07G113JS	81349	01121
R47	Same as R25				
R48	Same as R9				
R49*	Same as R42				
R50	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	2	RCR07G101JS	81349	01121
R51	RESISTOR, FIXED, COMPOSITION: 62 Ω, 5%, 1/4 W	1	RCR07G620JS	81349	01121
R52	Same as R50				
R53	Same as R11				

*Nominal value, final value factory selected.

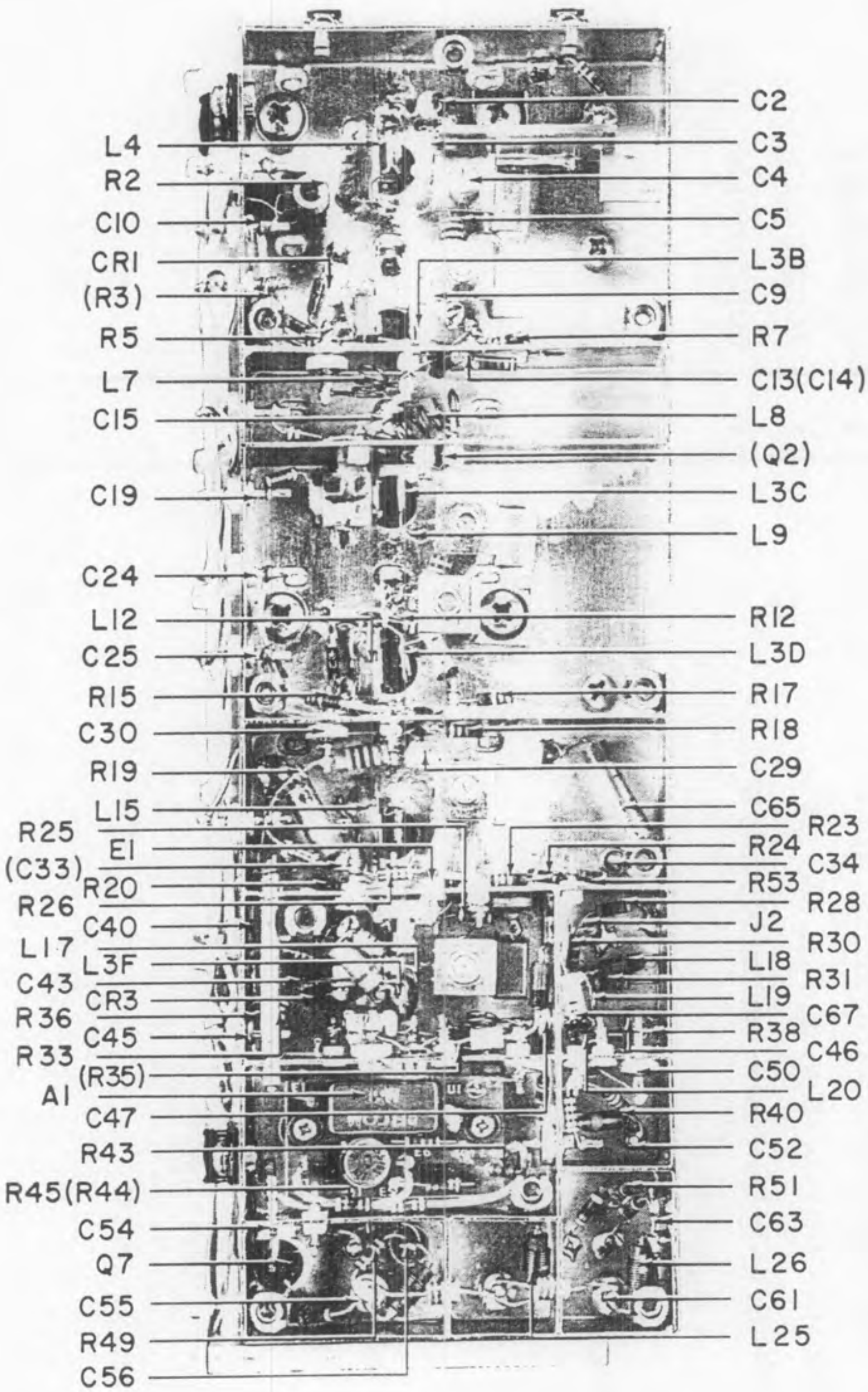


Figure 5-18. Type 71404-2 235-500 MHz RF Tuner (A3A1), Bottom View, Location of Components

5.4.4.1 PART 16689 Mixer/IF Amplifier

REF DESIG PREFIX A3A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 470 pF, 10%, 200 V	2	CK05BX471K	81349	56289
C2	Same as C1				
C3	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	1	SM(1000 pF, P)	91418	
Q1	TRANSISTOR	1	2N5109	80131	02735
R1	RESISTOR, FIXED, COMPOSITION: 360 Ω, 5%, 1/4 W	1	RCR07G361JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 4.7 Ω, 5%, 1/4 W	1	RCR07G4R7JS	81349	01121
U1	MIXER, BALANCED	1	M6E	27956	

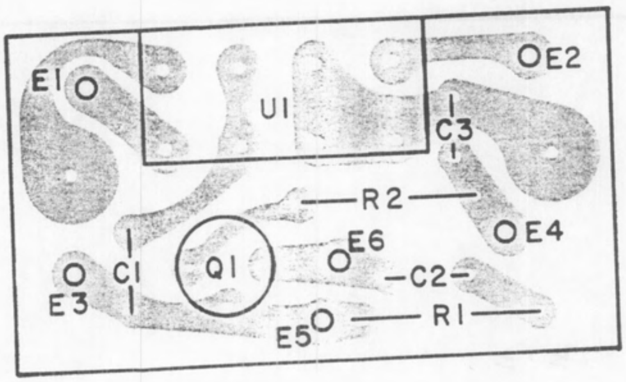


Figure 5-19. Part 16689 Mixer/IF Amplifier (A3A1A1), Location of Components

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
1	FRONT GEAR PLATE	1	24125-1	14632	
2	BALL BEARING	2	SFR33PP	83086	
3	BALL BEARING	6	SFR1883PP	83086	
4	CABLE RETAINER PLATE	1	17806-1	14632	
5	DRIVE SHAFT	1	1002-106	14632	
6	RETAINING RING	3	5100-25	79136	
7	SHIM SPACER	AR	SSS-33	01351	
8	CLUTCH BEARING	2	11582-10	14632	
9	GEAR, SPUR	1	13955-1	14632	
10	SPRING, WASHER	AR	3502-14-47	78189	
11	COLLAR	1	11581-10	14632	
12	RETAINING RING	1	5100-18	79136	
13	IDLER SHAFT	1	24128-1	14632	
14	GEAR, ANTI-BACKLASH	1	20182-1	14632	
15	GEAR, SPUR	1	2984-10	14632	
16	SHIM SPACER	AR	SSS-23	14632	
17	IDLER SHAFT	1	1002-107	14632	
18	GEAR, SPUR	2	2984-19	14632	
19	GEAR, ANTI-BACKLASH	2	20180-6	14632	
20	IDLER SHAFT	1	1002-105	14632	
21	SPACER--GEAR TRAIN	1	20757-43	14632	

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
22	SPACER--GEAR TRAIN	3	20757-42	14632	
23	REAR GEAR PLATE	1	23562-1	14632	
24	TUNER SUPPORT PLATE	1	17525-1	14632	
25	SPACER	4	17819-1	14632	
26	BEARING PLATE	1	23800-1	14632	
27	RF TUNER (235-500 MHz)	Ref	71404-2	14632	
28	SET SCREW #4-40-1/8 Lg	12	SSCR4-40 x 1/8 HT TR	56878	
29	SET SCREW #6-32 x 1/8 Lg	4	SSCR6-32 x 1/8 HT TR	56878	
30	#4 LOCK WASHER, SPLIT	8	MS35338-135	96906	73734
31	#4-40 x 1/4 Lg PAN HEAD MACHINE SCREW	2	MS31957-13	96906	73734
32	#4-40 x 3/8 Lg PAN HEAD MACHINE SCREW	4	MS31957-15	96906	73734
33	#4-40 x 1/2 Lg FIL HEAD MACHINE SCREW	2	MS35275-217	96906	73734
34	#4-40 x 5/16 Lg FLAT HEAD MACHINE SCREW	4	MS24693-C3	96906	73734
35	#6-32 x 3/8 Lg FLAT HEAD MACHINE SCREW	8	MS24693-C26	96906	73734

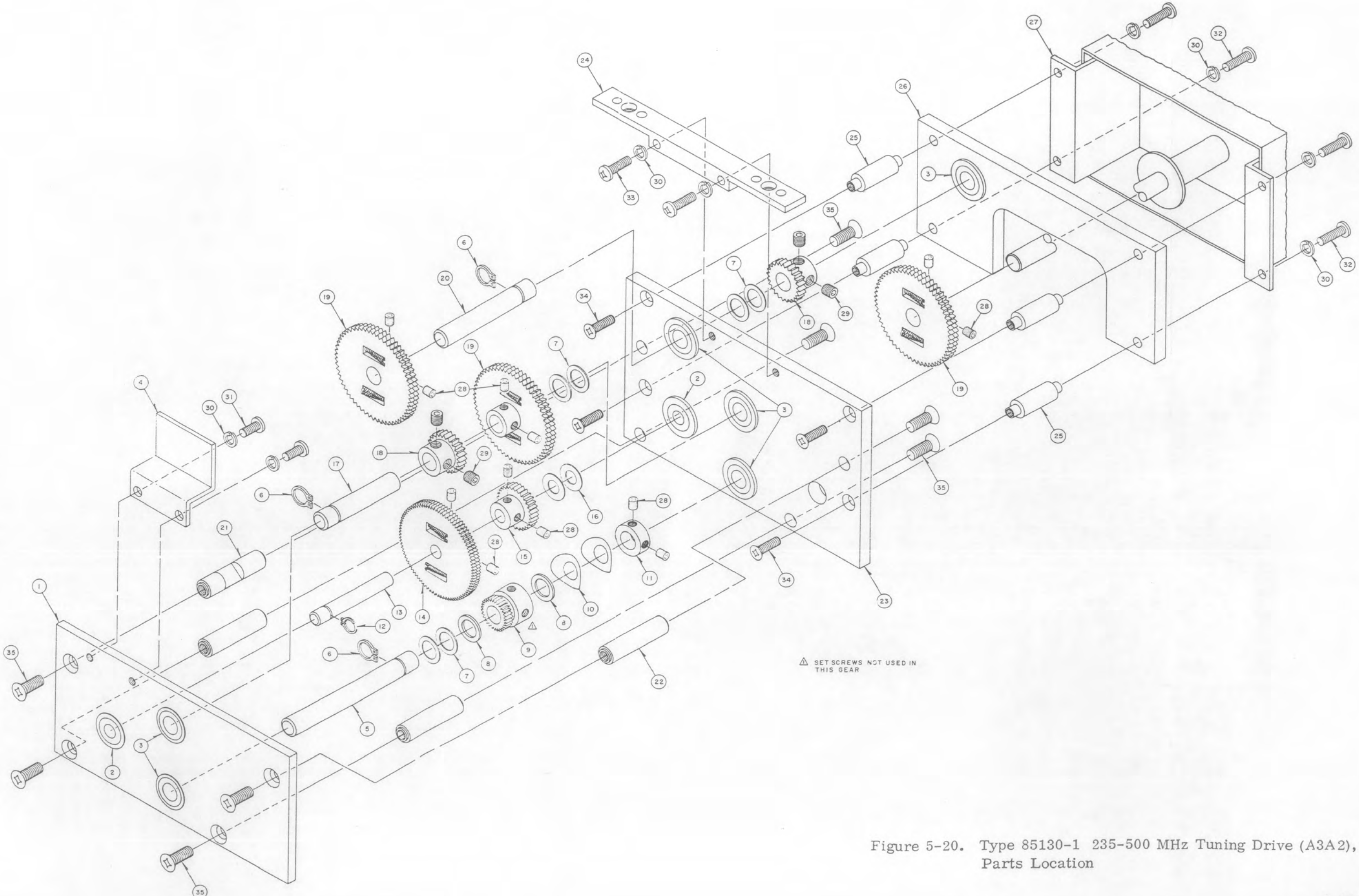


Figure 5-20. Type 85130-1 235-500 MHz Tuning Drive (A3A2), Parts Location

REF DESIG PREFIX A3A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	IF AMPLIFIER	1	18120-1	14632	
A2	OSCILLATOR/BUFFER	1	18121-1	14632	
C1	CAPACITOR, CERAMIC, DISC: 24 pF, 5%, 500 V, N750	1	603U2J240J	91984	
C2	CAPACITOR, CERAMIC, FEED-THRU: 470 pF, 20%, 500 V	2	54-794-009-471M	33095	
C3	Same as C2				
E1	TERMINAL, FEED-THRU	1	SFU16Y	04013	
J1	CONNECTOR, RECEPTACLE, SMC SERIES	3	10-0104-002	19505	
J2	Same as J1				
J3	Same as J1				
L1	INDUCTOR	1	21210-14	14632	

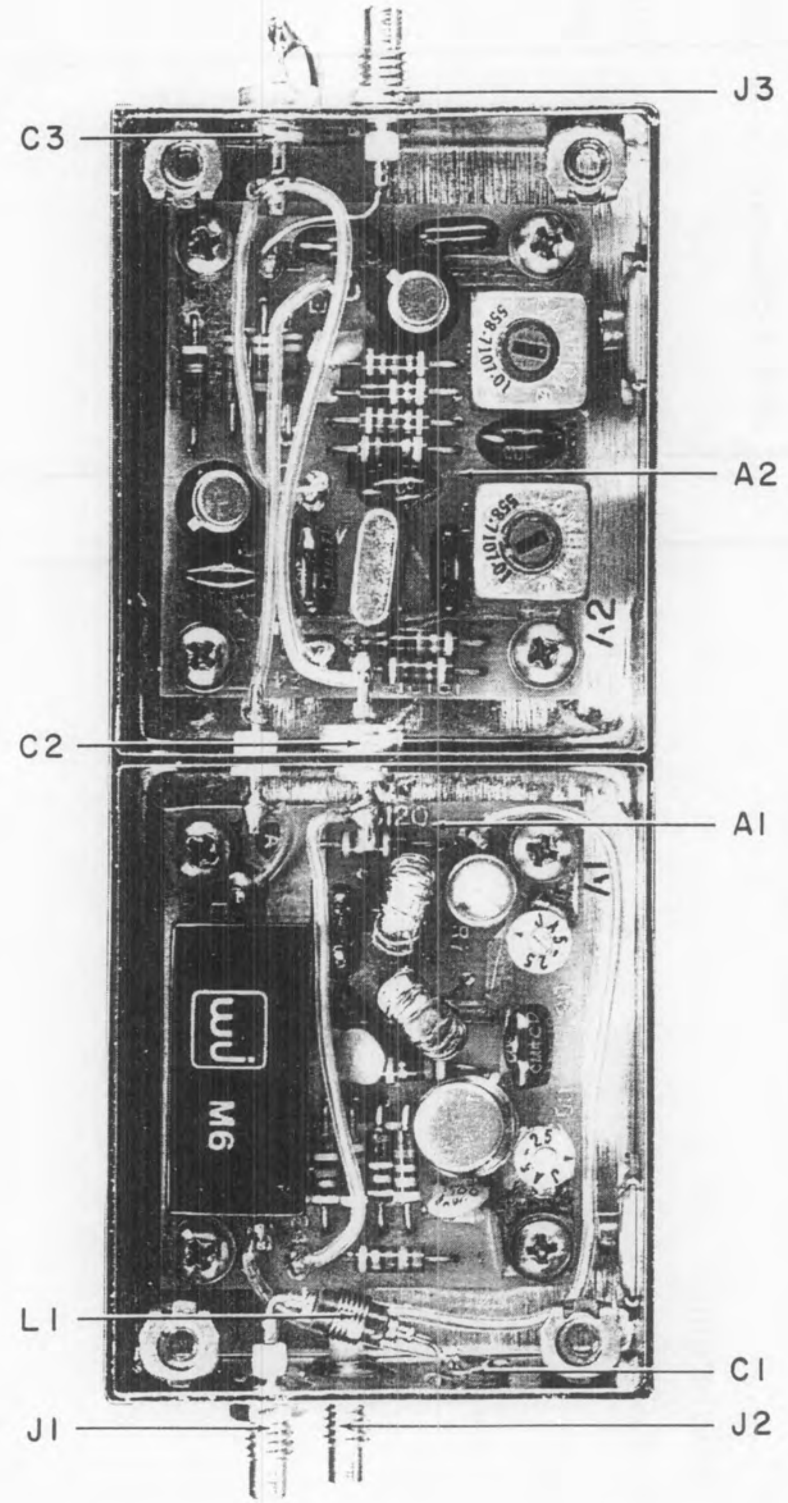


Figure 5-21. Type 71423-1 60/21.4 MHz Converter (A3A3), Location of Components

REF DESIG PREFIX A3A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	2	SM(1000 pF, P)	91418	
C2	Same as C1				
C3	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 200 V	1	8131A200Z5U103M	72982	
C4	CAPACITOR, MICA, DIPPED: 15 pF, 5%, 500 V	1	CM04CD150J03	81349	72136
C5	CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350 V	2	538-011D9-35	72982	
C6	Same as C5				
C7	CAPACITOR, MICA, DIPPED: 82 pF, 2%, 500 V	1	CM04ED820G03	81349	72136
L1	INDUCTOR	1	20681-81	14632	
Q1	TRANSISTOR	1	2N5109	80131	02735
R1	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4 W	1	RCR07G682JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 820 Ω, 5%, 1/4 W	1	RCR07G821JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	1	RCR07G103JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	1	RCR07G470JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 5.6 Ω, 5%, 1/4 W	1	RCR07G5R6JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 270 Ω, 5%, 1/4 W	1	RCR07G271JS	81349	01121
R7	RESISTOR, VARIABLE, FILM: 100 Ω, 10%, 1/2 W	1	62PR100	73138	
R8	RESISTOR, FIXED, COMPOSITION: 68 Ω, 5%, 1/4 W	1	RCR07G680JS	81349	01121
T1	COIL, TORODIAL	1	21428-26	14632	
U1	MIXER, BALANCED	1	M6	27956	

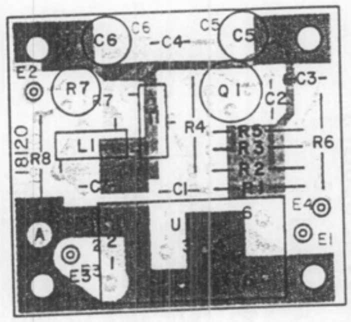


Figure 5-22. Part 18120-1 IF Amplifier (A3A3A1), Location of Components

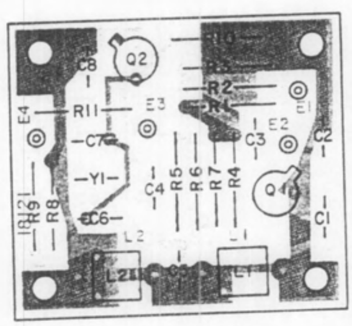


Figure 5-23. Part 18121-1 Oscillator/Buffer (A3A3A2), Location of Components

5.4.4.3.2 PART 18121-1 Oscillator/Buffer

REF DESIG PREFIX A3A3A

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, MICA, DIPPED: 43 pF, 2%, 500 V	1	CM04ED430G03	81349	72136
C2	CAPACITOR, MICA, DIPPED: 240 pF, 2%, 500 V	1	CM04FD241G03	81349	72136
C3	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	1	SM(1000 pF, P)	91418	
C4	CAPACITOR, MICA, DIPPED: 18 pF, 5%, 500 V	1	CM04CD180J03	81349	72136
C5	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	1	CM04FC101G03	81349	72136
C6	CAPACITOR, MICA, DIPPED: 51 pF, 2%, 500 V	1	CM04ED510G03	81349	72136
C7	CAPACITOR, MICA, DIPPED: 62 pF, 2%, 500 V	1	CM04ED620G03	81349	72136
C8	CAPACITOR, MICA, DIPPED: 56 pF, 2%, 500 V	1	CM04ED560G03	81349	72136
L1	COIL, VARIABLE: 0.09 - 0.11 μH	2	558-7107-01	71279	
L2	Same as L1				
Q1	TRANSISTOR	2	2N2857	80131	02735
Q2	Same as Q1				
R1	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	2	RCR07G101JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 82 Ω, 5%, 1/4 W	1	RCR07G820JS	81349	01121
R3	Same as R1				
R4	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	3	RCR07G472JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
R6	Same as R4				
R7	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121
R8	Same as R7				
R9	Same as R4				
R10	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121

REF DESIG PREFIX A3A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R11	RESISTOR, FIXED, COMPOSITION: 820 Ω, 5%, 1/4 W	1	RCR07G821JS	81349	01121
Y1	CRYSTAL, QUARTZ	1	98204-3	14632	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	500-1000 MHz TUNING HEAD	1	71388-2	14632	
A2	TUNING DRIVE ASSEMBLY	1	85129-1	14632	
A3	Not Used				
A4	LO BUFFER AMPLIFIER	1	791462	14632	
CR1	DIODE	1	1N995	80131	93332
P1	CONNECTOR, PLUG, MULTIPIN	1	17-20250-1	29587	
P2	CONNECTOR, PLUG, SMC SERIES	2	UG1465/U	80058	19505
P3	Same as P2				
W1	CABLE ASSEMBLY	1	17300-51-1	14632	

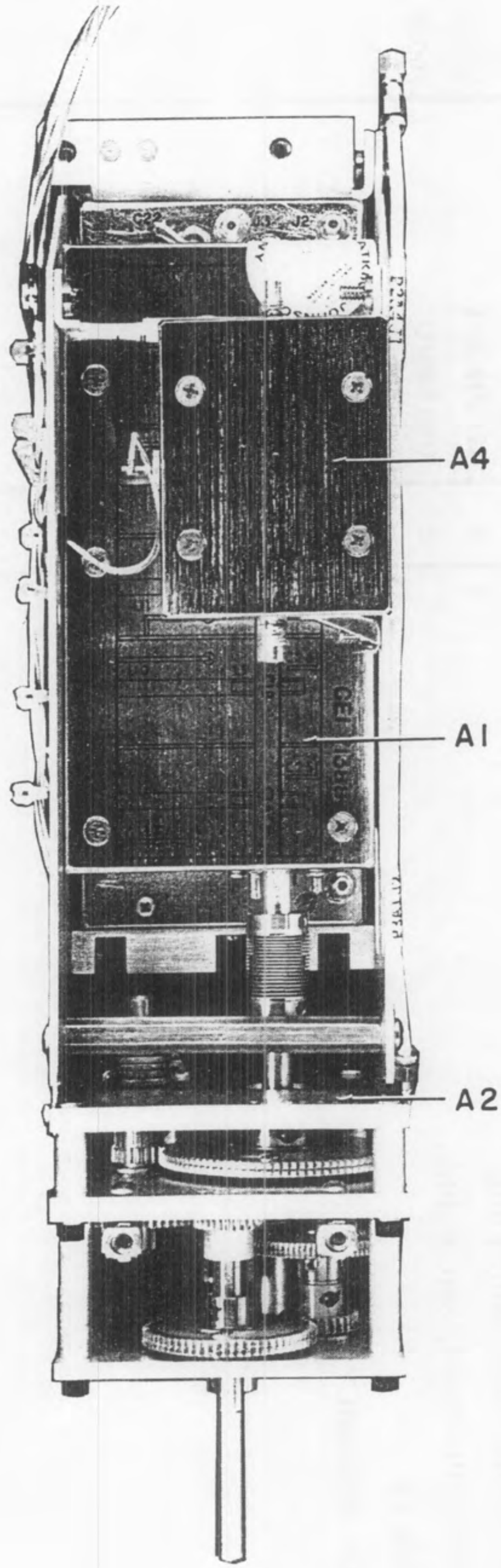


Figure 5-24. Type WJ-9065-3 500-1000 MHz Tuning Head (A4), Top View, Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	PIN DIODE ATTENUATOR	1	17083	14632	
A2	ATTENUATOR SHAPER	1	17059	14632	
A3	AMPLIFIER/MIXER	1	23215	14632	
C1	TUNER SHAFT ASSEMBLY	1	33773-1	14632	
C2	CAPACITOR, CERAMIC, FEED-THRU: 1000 pF, GMV, 500 V	3	54-794-009-102 W	33095	
C3	Same as C2				
C4	Same as C2				
C5	CAPACITOR, MICA, FEED-THRU: 250 pF, 10%, 250 V	5	2933-000-251K	72982	
C6 Thru C9	Same as C5				
C10	CAPACITOR, CERAMIC, DISC: 100 pF, 5%, 300 V	2	UY02-101J	73899	
C11	CAPACITOR, CERAMIC, DISC: 200 pF, -0+50%, 500 V	9	32-25758-40	91984	
C12	Same as C11				
C13	Same as C11				
C14	Same as C10				
C15	Same as C11				
C16	CAPACITOR, CERAMIC, STAND-OFF: 1000 pF, GMV, 500 V	2	54-803-003-102W	33095	
C17	Same as C16				
C18	CAPACITOR, VARIABLE, AIR: 0.8-10.0 pF, 250 V	3	5202	91293	
C19	CAPACITOR, COMPOSITION, TUBULAR: 1.2 pF, 10%, 500 V	1	QC(1.2 pF, K)	95121	
C20	Same as C18				

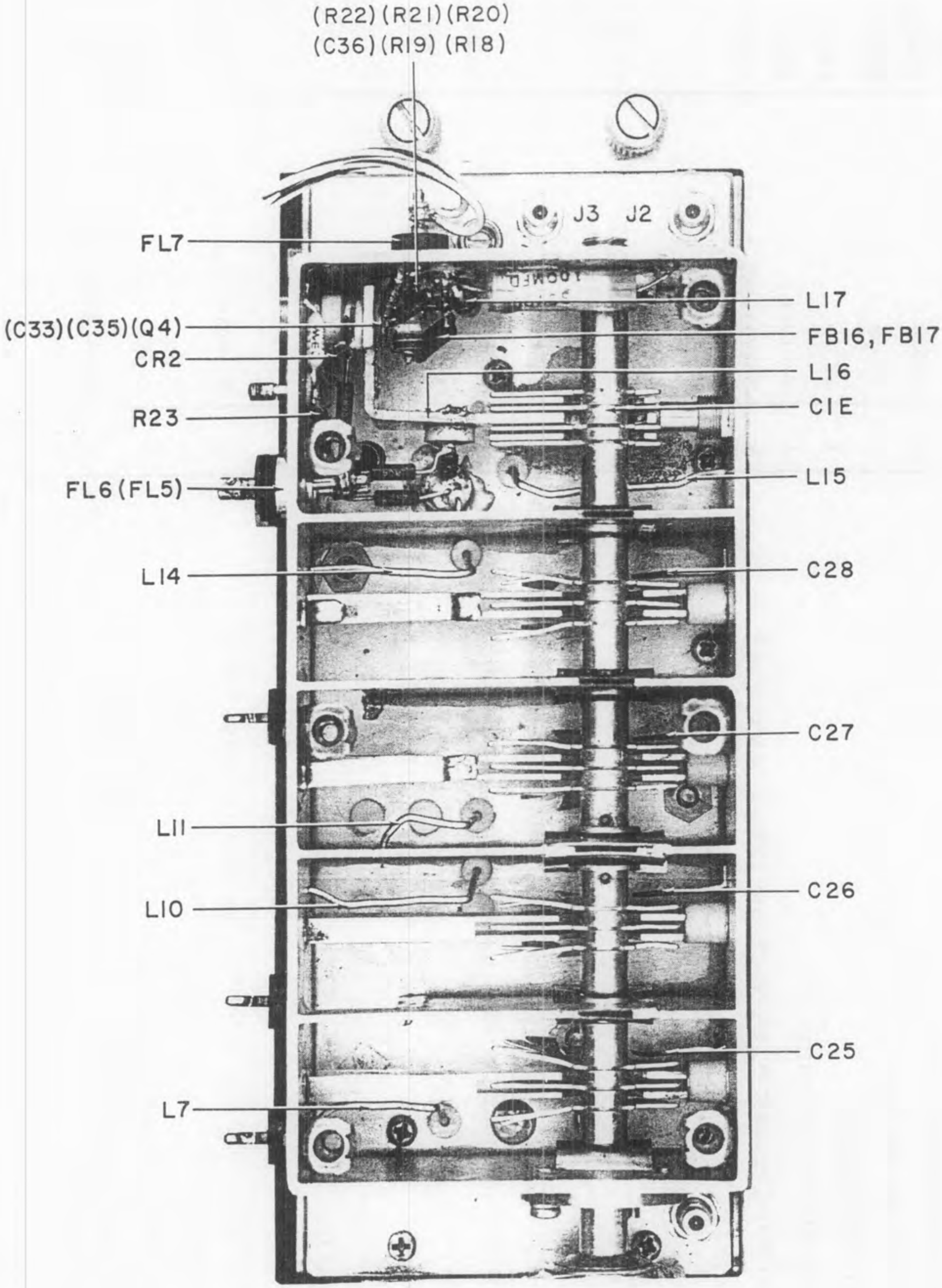


Figure 5-25. Type 71388-2 500-1000 MHz RF Tuner (A4A1), Top View, Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C21	CAPACITOR, COMPOSITION, TUBULAR: 0.75 pF, 10%, 500 V	1	QC(0.75 pF, K)	95121	
C22	Same as C18				
C23	CAPACITOR, CERAMIC, DISC: 24 pF, 5%, 500 V	2	603U2J240J	91984	
C24	Same as C23				
C25	RF TRIMMER PLATE	4	17833-1	14632	
C26 Thru C28	Same as C25				
C29	TUNING SLUG CAPACITOR	1	6927	91293	
C30	CAPACITOR, ELECTROLYTIC, TANTALUM: 100 μF, 20%, 35 V	1	MTP107M035PIC	76055	
C31	Same as C11				
C32	CAPACITOR, COMPOSITION, TUBULAR: 1.5 pF, 10%, 500 V	2	QC(1.5 pF, K)	95121	
C33	Same as C11				
C34	CAPACITOR MODIFIED	1	17352-1	14632	
C35	Same as C11				
C36	CAPACITOR, CERAMIC, CHIP: 1.0 pF ± 0.1 pF, 500 V	1	603M7K010B	91984	
C37	Not Used				
C38	CAPACITOR, CERAMIC, DISC: 1.5 pF ± 0.1 pF, 500 V	1	603M7K1R5B	91984	
C39	Same as C11				
C40	CAPACITOR, CERAMIC, TUBULAR: 1.2 pF ± 0.1 pF, 500 V	1	301-000C0K0-129B	72982	
C41	Not Used				
C42	Same as C11				

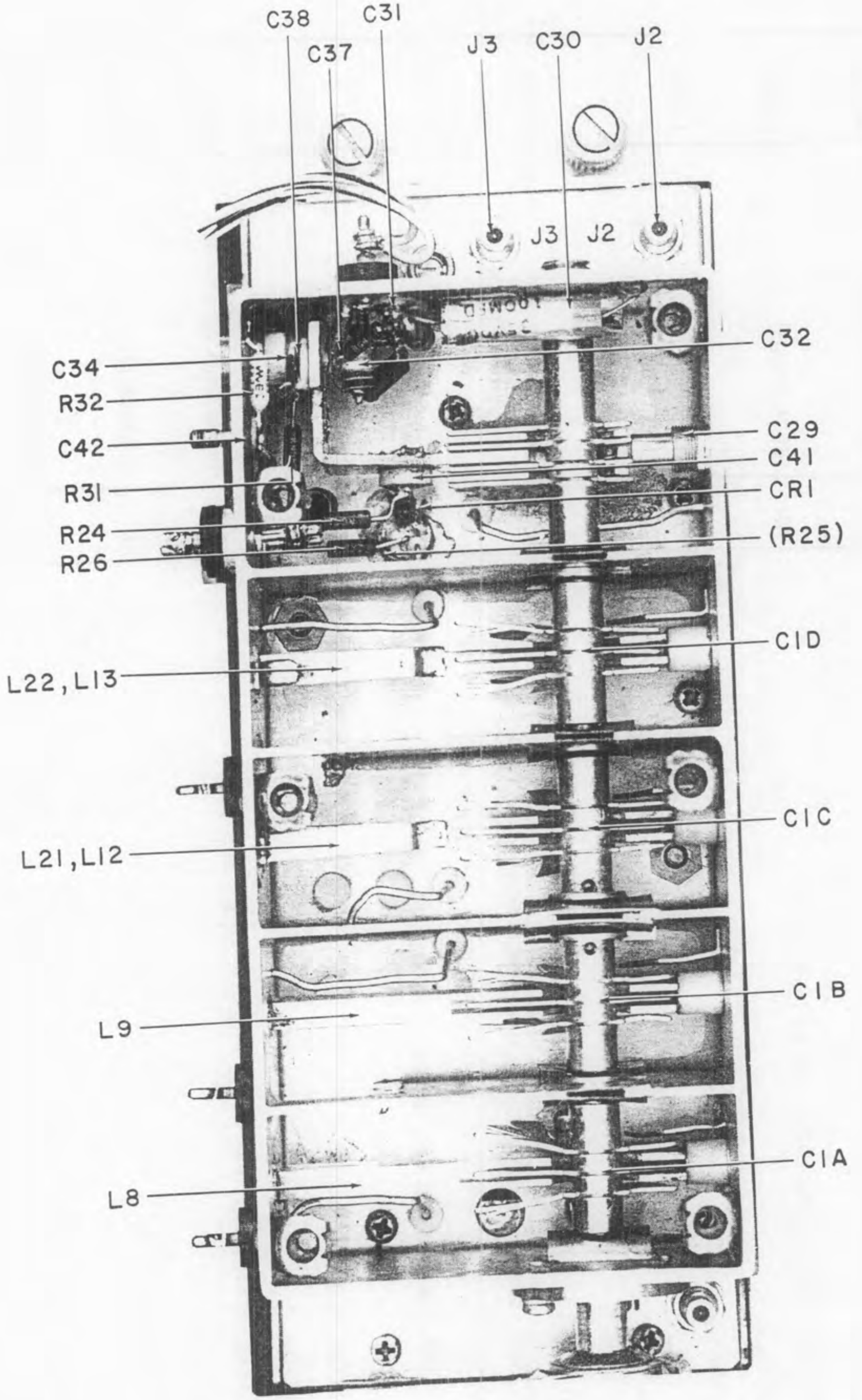


Figure 5-26. Type 71388-2 500-1000 MHz RF Tuner (A4A1), Top View, Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C43	Same as C32				
CR1	Not Used				
CR2	Not Used				
CR3	DIODE	1	5082-3080	28480	
E1	TEFLON FEED-THRU MODIFIED	5	17277-1	14632	
E2 Thru E5	Same as E1				
E6	TERMINAL, FEED-THRU, INSULATED	2	SFU16Y	04013	
E7	Same as E6				
FB1	FERRITE BEAD	17	56-590-65-4A	02114	
FB2 Thru FB17	Same as FB1				
FL1	CAPACITOR MODIFIED	7	33728-4	14632	
FL2 Thru FL7	Same as FL1				
J1	CONNECTOR, RECEPTACLE, SMC SERIES	3	10-0104-002	19505	
J2	Same as J1				
J3	Same as J1				
L1	COIL FIXED: 1.0 μH	2	205-11-10	99848	
L2	Same as L1				
L3	INDUCTOR	1	22292-25	14632	

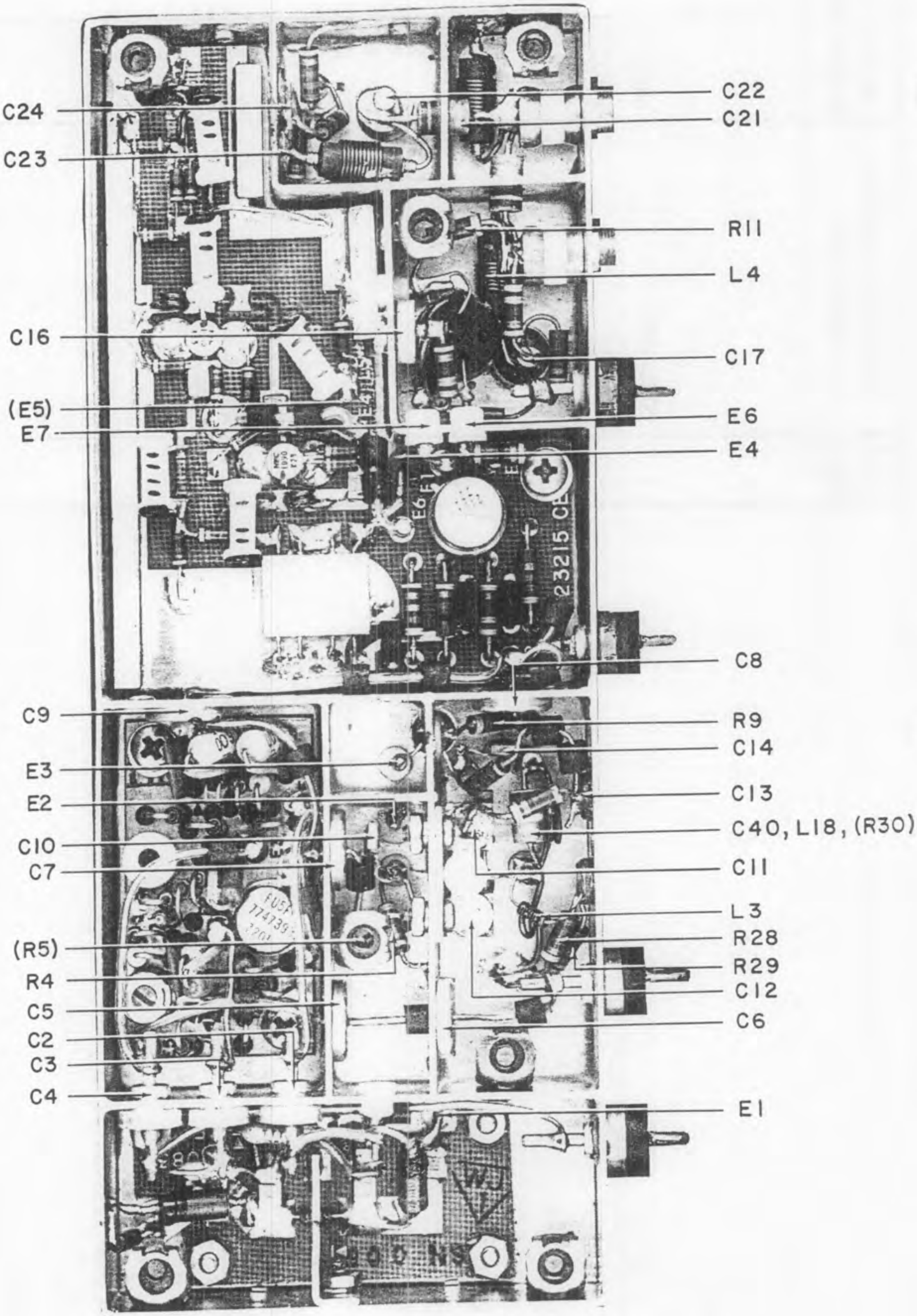


Figure 5-27. Type 71388-2 500-1000 MHz RF Tuner (A4A1), Bottom View, Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L4	INDUCTOR	1	21210-132	14632	
L5	INDUCTOR	1	21210-133	14632	
L6	INDUCTOR	1	21210-134	14632	
L7	INDUCTOR FIXED	1	17275-1	14632	
L8	RF STATOR ASSEMBLY	4	17891-1	14632	
L9	Same as L8				
L10	INDUCTOR, FIXED	1	17275-2	14632	
L11	INDUCTOR, FIXED	1	17276-1	14632	
L12	Same as L8				
L13	Same as L8				
L14	INDUCTOR, FIXED	1	17275-4	14632	
L15	INDUCTOR, FIXED	1	17275-5	14632	
L16	STATOR ASSEMBLY	1	23866-1	14632	
L17	COIL, FIXED: 0.47 μH	1	201-11	99848	
L18	INDUCTOR, AIR CORE	1	22292-43	14632	
L19	INDUCTOR	4	17377	14632	
L20 Thru L22	Same as L19				
Q1	TRANSISTOR	1	KD5525	20754	
Q2	TRANSISTOR	1	2N3570	80131	01295
Q3	TRANSISTOR	1	2N5109	80131	02735

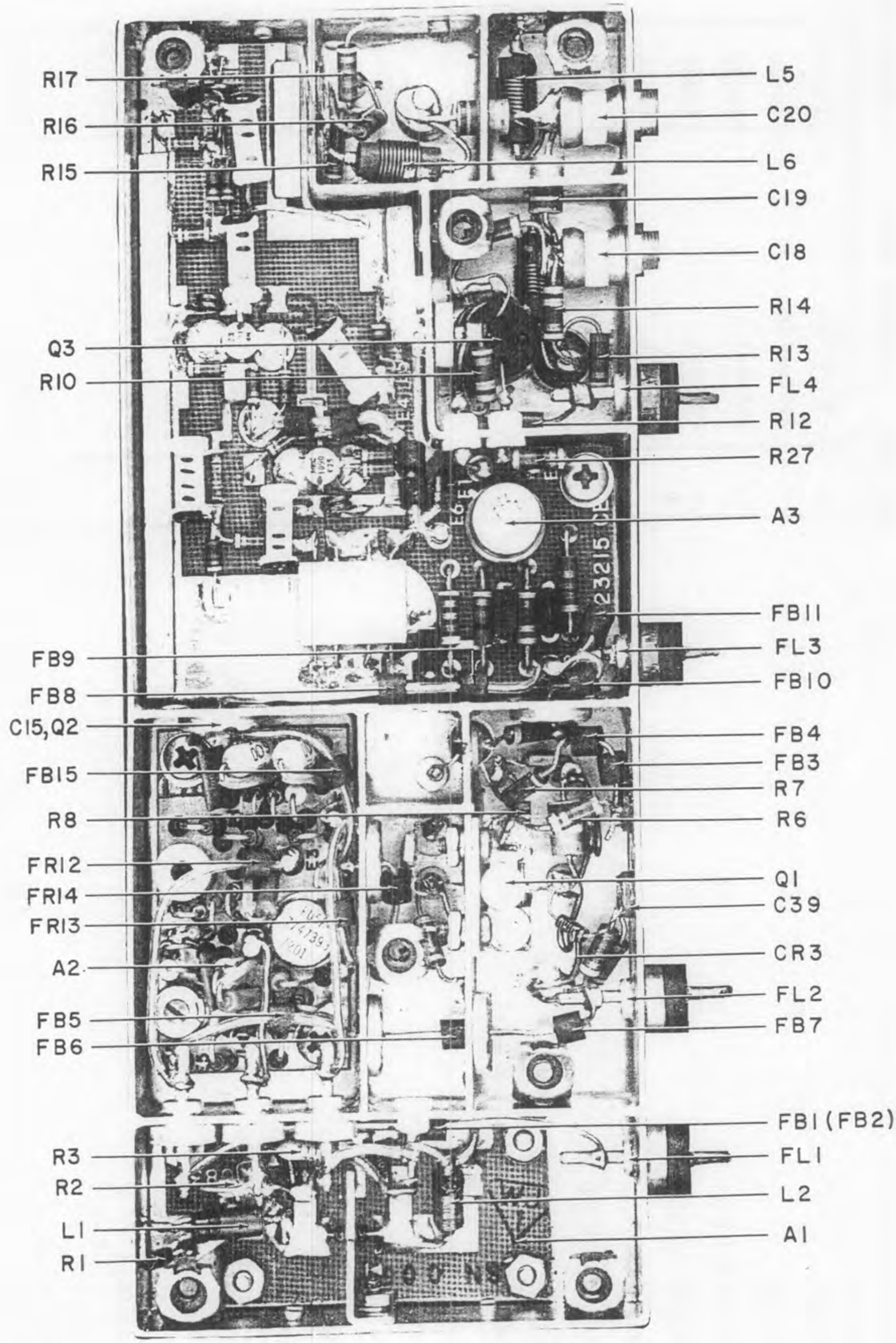


Figure 5-28. Type 71388-2 500-100 MHz RF Tuner (A4A1), Bottom View, Location of Components

REF DESIG PREFIX A4A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
Q4	TRANSISTOR	1	35821B	28480	
R1	RESISTOR, FIXED, FILM: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	75042
R2	RESISTOR, FIXED, FILM: 5.11 kΩ, 1%, 1/10 W	2	RN55C5111F	81349	75042
R3	Same as R2				
R4	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4 W	2	RCR07G392JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4 W	2	RCR07G272JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 470Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
R7	Same as R5				
R8	Same as R4				
R9	RESISTOR, FIXED, COMPOSITION: 510 Ω, 5%, 1/4 W	1	RCR07G511JS	81349	01121
R10	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4 W	2	RCR07G332JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	2	RCR07G470JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 11 kΩ, 5%, 1/4 W	1	RCR07G113JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	1	RCR07G221JS	81349	01121
R14*	Same as R10				
R15	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	2	RCR07G101JS	81349	01121
R16*	RESISTOR, FIXED, COMPOSITION: 75 Ω, 5%, 1/4 W	1	RCR07G750JS	81349	01121
R17	Same as R15				
R18	RESISTOR, FIXED, FILM: 274 Ω, 1%, 1/10 W	1	RN55C2740F	81349	75042
R19	RESISTOR, FIXED, FILM: 562 Ω, 1%, 1/10 W	1	RN55C5620F	81349	75042
R20	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/8 W	2	RCR07G100JS	81349	01121
R21	RESISTOR, FIXED, FILM: 8.25 kΩ, 1%, 1/10 W	2	RN55C8251F	81349	75042

* Nominal value, final value factory selected.

REF DESIG PREFIX A4A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R22	Same as R21				
R23	Not Used				
R24	Same as R1				
R25	Not Used				
R26	Not Used				
R27	Same as R11				
R28	RESISTOR, FIXED, COMPOSITION: 7.5 kΩ, 5%, 1/4 W	1	RCR07G752JS	81349	01121
R29	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4 W	1	RCR07G822JS	81349	01121
R30*	RESISTOR, FIXED, COMPOSITION: 68 Ω, 5%, 1/4 W	1	RCR07G680JS	81349	01121
R31	Same as R1				
R32	RESISTOR, FIXED, FILM: 48.7 kΩ, 1%, 1/10 W	1	RN55C4872F	81349	75042
R33	Same as R20				

* Nominal value, final value factory selected.

REF DESIG PREFIX A4A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, CHIP: 220 pF, 10%, 50 V	6	C1210C221K5G1H	31433	
C2 Thru C6	Same as C1				
CR1	DIODE	1	5082-3039	28480	
CR2	DIODE	2	5082-3080	28480	
CR3	Same as CR2				

5.4.5.1.2 PART 17059 Attenuator Shaper

REF DESIG PREFIX A4A1A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 200 V	2	8131A200Z5U103M	72982	
C2	Same as C1				
CR1	DIODE	3	5082-2800	28480	
CR2	Same as CR1				
CR3	Same as CR1				
R1	RESISTOR, FIXED, FILM: 1/0 kΩ, 1%, 1/10 W	1	RN55C1001F	81349	75042
R2	RESISTOR, FIXED, FILM: 412 kΩ, 1%, 1/4 W	1	CC4123F	01121	
R3	RESISTOR, FIXED, FILM: 38.3 kΩ, 1%, 1/10 W	1	RN55C3832F	81349	75042
R4	RESISTOR, FIXED, FILM: 100 kΩ, 1%, 1/10 W	5	RN55C1003F	81349	75042
R5	RESISTOR, FIXED, FILM: 261 kΩ, 1%, 1/4 W	1	MF4C(261kΩ, F)	80031	
R6	RESISTOR. VARIABLE, FILM: 100 kΩ, 10%, 1/2 W	1	62PR100K	73138	
R7	RESISTOR, FIXED, FILM: 121 kΩ, 1%, 1/4 W	1	MF4C(121kΩ, F)	80031	
R8	RESISTOR, FIXED, FILM: 475 kΩ, 1%, 1/4 W	1	CC4753F	01121	
R9	Not Used				
R10	RESISTOR, FIXED, FILM: 9.09 kΩ, 1%, 1/10 W	1	RN55C9091F	81349	75042
R11	Same as R4				
R12	RESISTOR, FIXED, FILM: 309 kΩ, 1%, 1/4 W	1	CC3093F	01121	
R13	Same as R4				
R14	Same as R4				
R15	Same as R4				
R16	RESISTOR, VARIABLE, FILM: 20 kΩ, 10%, 1/2 W	1	62PR20K	73138	
R17	RESISTOR, FIXED, FILM: 34.8 kΩ, 1%, 1/10 W	1	RN55C3482F	81349	75042

REF DESIG PREFIX A4A1A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R18	RESISTOR, FIXED, FILM: 42.2 kΩ, 1%, 1/10 W	1	RN55C4222F	81349	75042
R19	RESISTOR, FIXED, FILM: 619 kΩ, 1%, 1/4 W	1	CC6193F	01121	
R20	RESISTOR, FIXED, FILM: 21.5 kΩ, 1%, 1/10 W	1	RN55C2152F	81349	75042
R21	RESISTOR, FIXED, FILM: 68.1 kΩ, 1%, 1/10 W	1	RN55C6812F	81349	75042
R22	RESISTOR, FIXED, FILM: 6.19 kΩ, 1%, 1/10 W	1	RN55C6191F	81349	75042
RT1	THERMISTOR: 3.9 kΩ, 5%, 1/8 W	1	DG125-392J	15454	
U1	INTEGRATED CKT	1	747HC	07263	
VR1	DIODE, ZENER: 6.3 V	1	.4M6.3AZ2	04713	

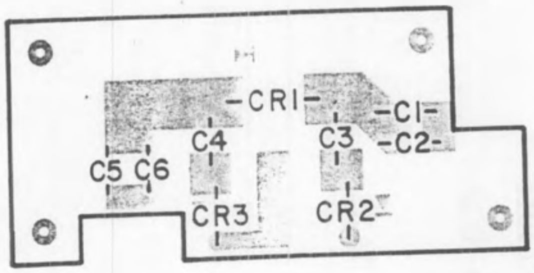


Figure 5-29. Part 17083 Pin Diode Attenuator (A4A1A1)
Location of Components

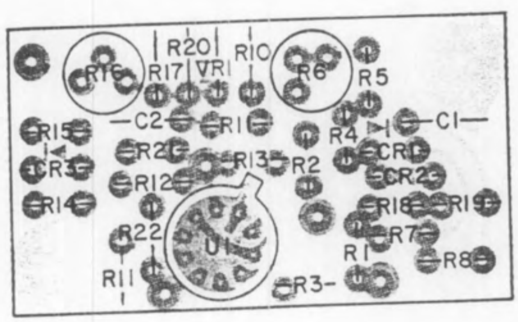


Figure 5-30. Part 17509 Attenuator Shaper (A4A1A2),
Location of Components

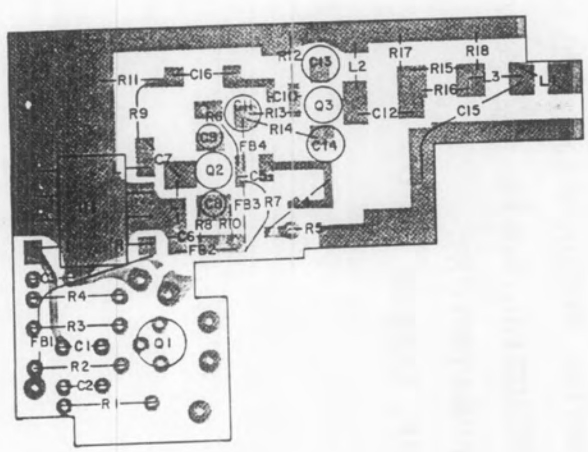


Figure 5-31. Part 23215 Amplifier/Mixer (A4A1A3),
Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 470 pF, 10%, 200 V	2	CK05BX471K	81349	56289
C2	Same as C1				
C3	CAPACITOR, CERAMIC, DISC: 1000 pF, 10%, 200 V	1	CK05BX102K	81349	56289
C4*	CAPACITOR, CERAMIC, TUBULAR: 1.2 pF ± 0.25 pF, 500 V	1	301-000C0K0-129C	72982	
C5	CAPACITOR, CERAMIC, CHIP: 220 pF, 10%, 50 V	3	C1210C221K5G1H	05397	
C6	Same as C5				
C7	CAPACITOR, CERAMIC, TUBULAR: 5.6 pF ± 0.25 pF, 500 V	2	301-000C0H0-569C	72982	
C8	CAPACITOR, CERAMIC, DISC: 200 pF, -0+50%, 500 V	5	32-257578-40	91984	
C9	Same as C8				
C10	Same as C5				
C11	Same as C8				
C12	Same as C7				
C13	Same as C8				
C14	Same as C8				
C15	CAPACITOR, CERAMIC, TUBULAR: 1.8 pF ± 0.1 pF, 500 V	1	301-000C0K0-189B	72982	
C16	CAPACITOR, CERAMIC, TUBULAR: 1.0 pF ± 0.25 pF, 500 V	1	301-000C0K0-109C	72982	
FB1	FERRITE BEAD	4	56-590-65-4A	02114	
FB2 Thru FB4	Same as FB1				
L1	INDUCTOR	2	22292-67	14632	
L2	Same as L1				

* Nominal Value. Final Value Factory selected.

REF DESIG PREFIX A4A1A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L3	INDUCTOR	2	22292-56	14632	
L4	Same as L3				
L5	INDUCTOR	1	17471-1	14632	
Q1	TRANSISTOR	1	2N5109	80131	02735
Q2	TRANSISTOR	2	23342-2	14632	
Q3	Same as Q2				
R1	RESISTOR, FIXED, COMPOSITION: 360 Ω, 5%, 1/4 W	1	RCR07G361JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4 W	1	RCR07G332JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 200 Ω, 5%, 1/4 W	1	RCR07G201JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 4.7 Ω, 5%, 1/4 W	1	RCR07G4R7JS	81349	01121
R5*	RESISTOR, FIXED, COMPOSITION: 82 Ω, 5%, 1/8 W	1	RCR05G820JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/8 W	4	RCR05G682JS	81349	01121
R7	Same as R6				
R8	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/8 W	1	RCR05G681JS	81349	01121
R9*	RESISTOR, FIXED, COMPOSITION: 560 Ω, 5%, 1/8 W	1	RCR05G561JS	81349	01121
R10	Same as R8				
R11	RESISTOR, FIXED, COMPOSITION: 150 Ω, 5%, 1/8 W	1	RCR05G151JS	81349	01121
R12	Same as R6				
R13	Same as R6				
R14	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/8 W	1	RCR05G102JS	81349	01121
R15	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/8 W	2	RCR05G220JS	81349	01121
R16	Same as R15				

* Nominal Value, Final Value Factory Selected.

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R17	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/8 W	2	RCR05G471JS	81349	01121
R18	Same as R17				
U1	DOUBLE BALANCED MIXER	1	MD113	21912	

5.4.5.2 TYPE 85129-1 500-1000 MHz Tuning Drive

REF DESIG PREFIX A4A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
1	FRONT GEAR PLATE	1	24102-1	14632	
2	BALL BEARING	7	SFR1883PP	83086	
3	BALL BEARING	1	SFR33PP	83086	
4	BALL BEARING	2	SFR2-63MM	83086	
5	COLLAR	1	11581-2	14632	
6	SPRING, WASHER	1	3502-14-47	78189	
7	THRUST WASHER (BRONZE)	1	TT-504	70901	
8	DRIVE SHAFT	1	1002-83	14632	
9	RETAINING RING	3	5100-25	79136	
10	GEAR, SPUR	1	13955-1	14632	
11	SHIM SPACER	AR	SSS-23	01351	
12	IDLER SHAFT	1	17957-1	14632	
13	GEAR, SPUR	1	2984-10	14632	
14	CLUTCH BEARING	2	11582-7	14632	
15	GEAR ANTI-BACKLASH	1	20182-1	14632	
16	SPRING, WASHER	2	ARC-232	73682	
17	COLLAR	1	11581-6	14632	
18	SHAFT	1	1002-100	14632	
19	GEAR, ANTI-BACKLASH	2	20180-6	14632	
20	GEAR, SPUR	1	2984-19	14632	
21	SHIM SPACER	AR	SSS-33	01351	
22	SHAFT	1	1002-29	14632	

REF DESIG PREFIX A4A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
23	SPACER - GEAR TRAIN	3	20757-26	14632	
24	SPACER - GEAR TRAIN	1	20757-41	14632	
25	CENTER REAR PLATE	1	23964-1	14632	
26	GEAR, SPUR	1	2984-55	14632	
27	GEAR, ANTI-BACKLASH	1	20180-22	14632	
28	OUTPUT SHAFT	1	11134-16	14632	
29	SPACER-GEAR TRAIN	4	20757-4	14632	
30	REAR GEAR PLATE	1	23965	14632	
31	PIN, SRING 1/16 DIA. x 1/4 LG	2	MS16562-190	96906	73734
32	#10 FLAT WASHER	2	MS15795-808	96906	73734
33	STOP WASHER	2	13863-2	14632	
34	STOP RETAINER ASSEMBLY	1	13868-3	14632	
35	BELLOWS COUPLING	1	SC-10	18469	
36	SET SCREW #4-40 x 1/8 LG	AR	MS51021-9	96906	73734
37	SER SCREW #6-32 x 1/8 LG	AR	MS51021-21	96906	73734
38	#6-32 x 3/8 LG FLAT HEAD MACHINE SCREW	5	MS24693-C26	96906	73734
39	#6 LOCK WASHER, SPLIT	11	MS35338-136	96906	73734
40	#6-32 x 3/8 SOCKET HD-CAP MACHINE SCREW	11	MS16995-17	96906	73734

NOTES

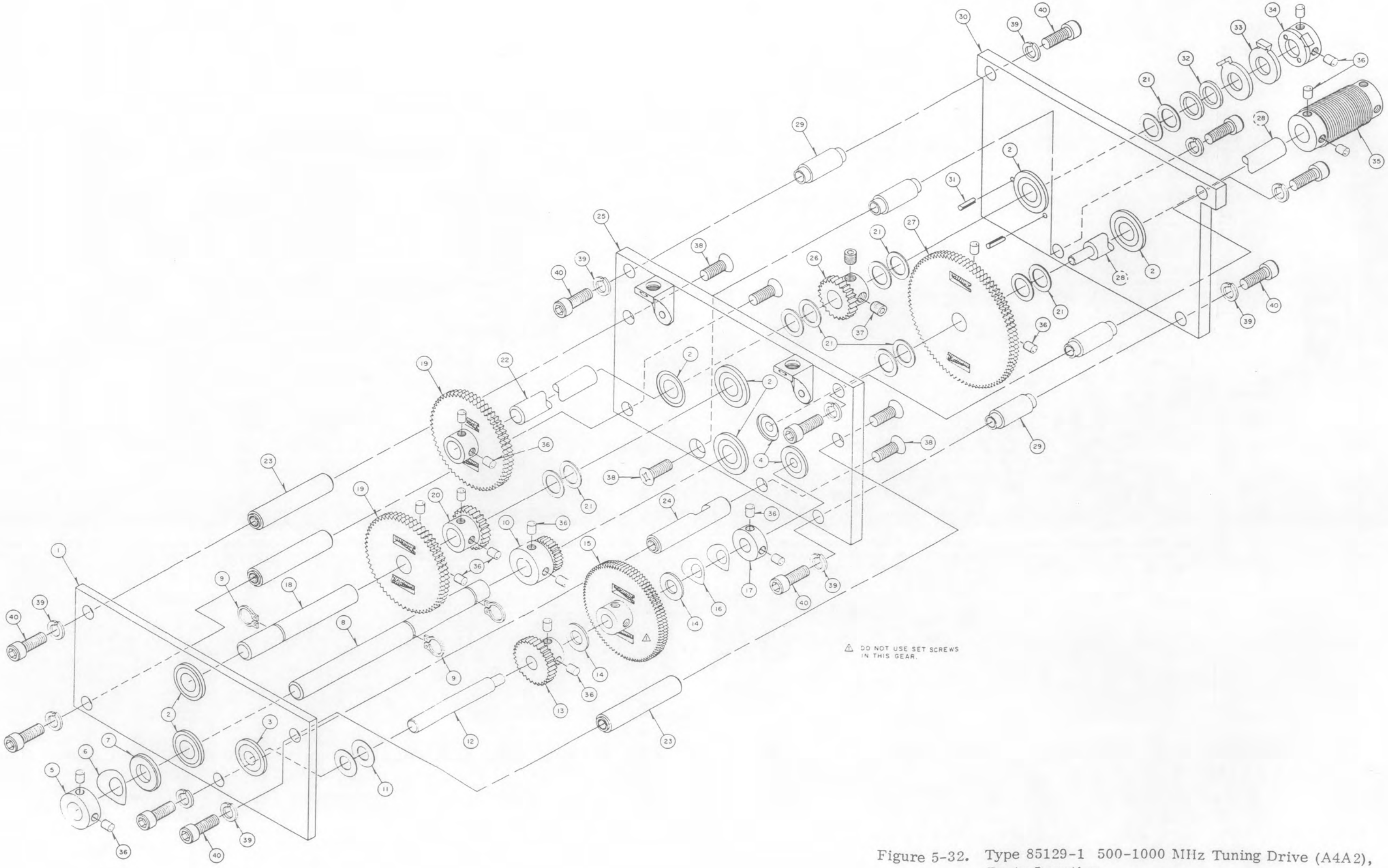


Figure 5-32. Type 85129-1 500-1000 MHz Tuning Drive (A4A2), Parts Location

5.4.5.3 TYPE 791462 LO Buffer Amplifier

REF DESIG PREFIX A4A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	LO BUFFER AMPLIFIER	1	17546-1	14632	
C1	CAPACITOR, CERAMIC, FEED-THRU: 470 pF, 20%, 500 V	1	54-794-009-471M	33095	
J1	CONNECTOR, RECEPTACLE, SMC SERIES	2	50-045-4524-31	98291	
J2	Same as J1				

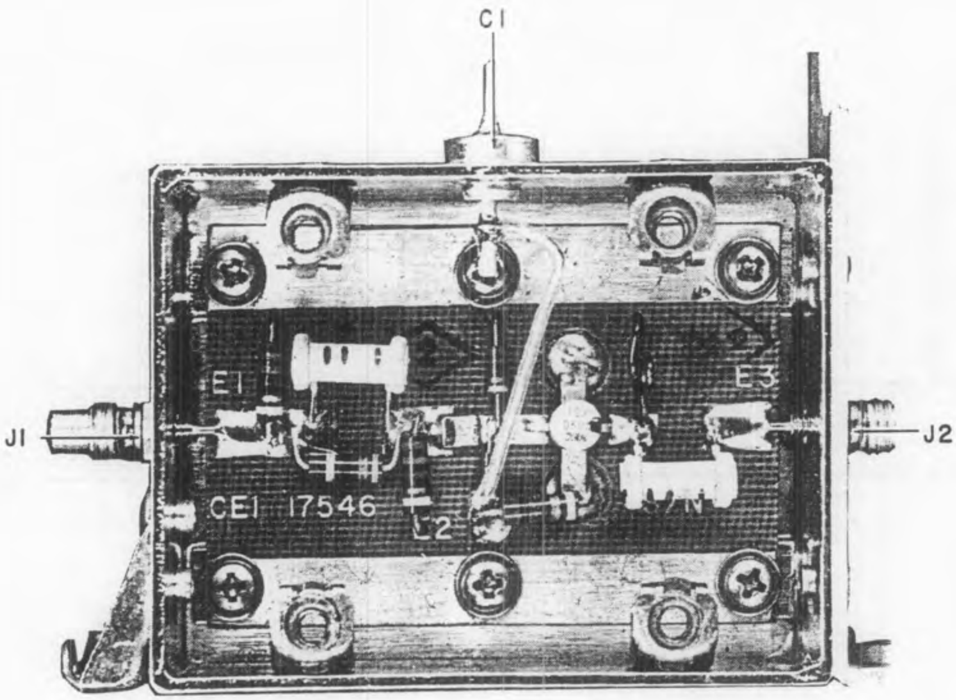


Figure 5-33. Type 791462 LO Buffer Amplifier (A4A4), Location of Components

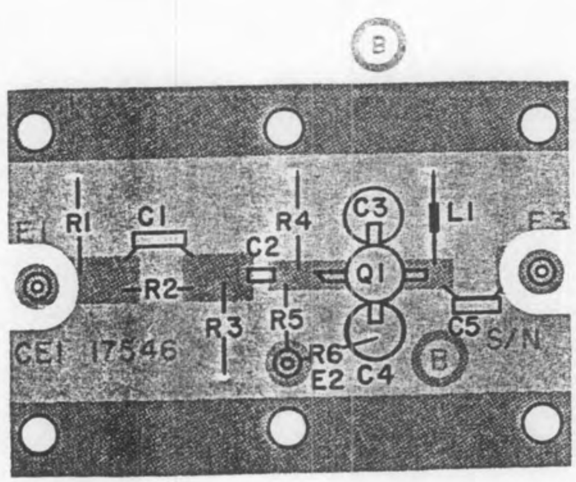


Figure 5-34. Part 17546 LO Buffer Amplifier (A4A4A1), Location of Components

REF DESIG PREFIX A4A4A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, TUBULAR: 2.9 pF ± 0/25 pF, 500 V	1	301-000C0J0-279C	72982	
C2	CAPACITOR, CERAMIC, CHIP: 220 pF, 10%, 50 V	1	C1210C221K5G1H	31433	
C3	CAPACITOR, CERAMIC, DISC: 200 pF, -0+50%, 500 V	2	32-257578-40	91984	
C4	Same as C3				
C5	CAPACITOR, CERAMIC, TUBULAR: 6.2 pF, ± 0.5 pF, 500 V	1	301-000C0H0-629D	72982	
L1	COIL FIXED	1	22292-56	14632	
Q1	TRANSISTOR	1	23342-2	14632	
R1	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	2	RCR07G221JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 24 Ω, 5%, 1/4 W	1	RCR07G240JS	81349	01121
R3	Same as R1				
R4	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/8 W	2	RCR05G682JS	81349	01121
R5	Same as R4				
R6	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121

5.4.6 TYPE 791499-1 RF Tuner Switching Assembly

REF DESIG PREFIX A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
CR1	DIODE	2	1N4449	80131	93332
CR2	Same as CR1				
CR3	DIODE	1	1N995	80131	93332
J1	CONNECTOR, RECEPTACLE, MULTIPIN	4	17-10250-11	29587	
J2 Thru J4	Same as J1				
R1	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	
S1	SWITCH, ROTARY	1	71BF30-04-2-4NF	81073	

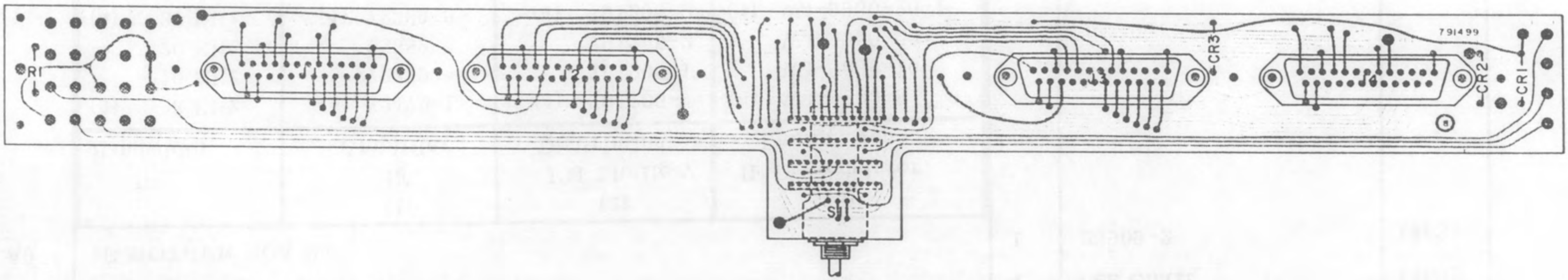


Figure 5-35. Type 791499-1 RF Tuner Switching Assembly (A5), Location of Components

5.4.7 TYPE 72462-3 IF Amplifier

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	VIDEO/DAFC-AFC AMPLIFIER	1	7383	14632	
A2	IF AMPLIFIER	1	See Chart	14632	
A3	IF AMPLIFIER	1	See Chart	14632	
A4	IF AMPLIFIER	1	See Chart	14632	
A5	IF OUTPUT AMPLIFIER	1	72343	14632	
A6	FM LIMITER/DISCRIMINATOR	1	See Chart	14632	
A7	FM LIMITER/DISCRIMINATOR	1	See Chart	14632	
A8	FM LIMITER/DISCRIMINATOR	1	See Chart	14632	
A9	IF MOTHER BOARD	1	23909-2	14632	

IF Bandwidth	(1) IF Amplifier	(2) FM Limiter/ Discriminator	(3) IF Demodulator Designation
(4) 8 KHz	(4) 72472-1	(4) 791205-4	(4) WJ-9930-8
10 KHz	72339	791205-1	WJ-9930-10
20 KHz	72389	791205-2	WJ-9920-20
(4) 20 KHz	(4) 72389-3	(4) 791205-2	(4) WJ-9930-20-1
50 KHz	72344	791205-3	WJ-9930-50
100 KHz	72431	791331	WJ-9930-100
200 KHz	72338	791338	WJ-9930-200
(4) 300 KHz	(4) 72366	(4) 791366	(4) WJ-9930-300
500 KHz	72429	791329	WJ-9930-500
1 MHz	72378-1	791378	WJ-9930-1M
2 MHz	72378-2	791365-2	WJ-9930-2M
3 MHz	72365	791365-1	WJ-9930-3M

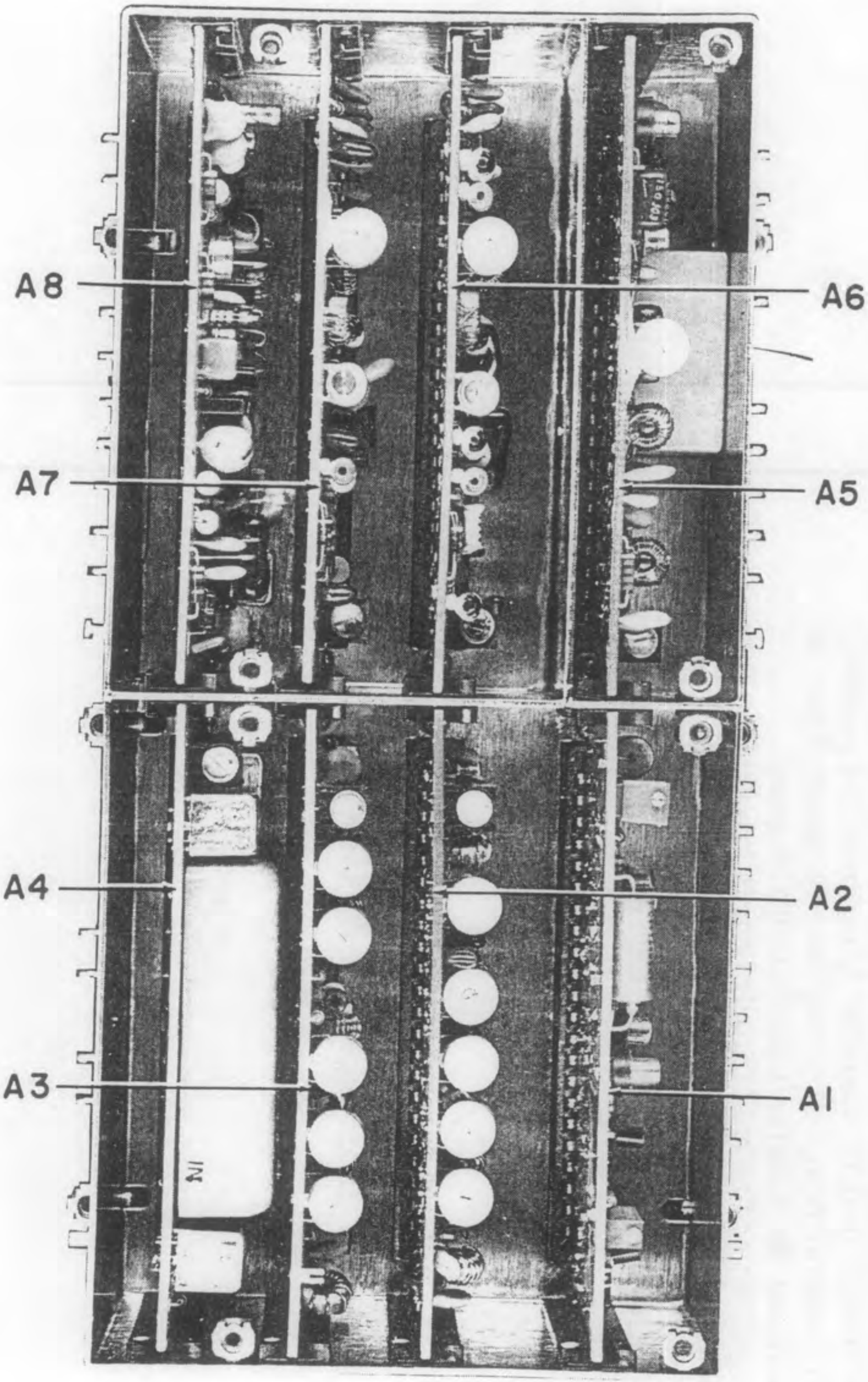


Figure 5-36. Type 72462-3 IF Amplifier (A6), Top View, Location of Components

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
	NOTES: (1) The IF Amplifier Boards are located in positions A2, A3, and A4, with the widest IF Bandwidth being in A2 position. (2) The FM Limiter/Discriminator Boards are located in positions A6, A7, and A8, with the widest IF Bandwidth being in the A6 position. (3) The IF Demodulator Designation consists of a matched pair of IF Amplifier and FM Limiter/Discriminator Boards. (4) These Bandwidths and related Circuit Boards are unique to the WJ-9026/RU.				
C1	CAPACITOR, CERAMIC, FEED-THRU: 1000 pF, GMV, 500 V	14	54-794-009-102W	33095	
C2	Same as C1				
C3	Same as C1				
C4 Thru C6	Not Used				
C7	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	4	C023B101E502M	56289	
C8	Same as C1				
C9	Not Used				
C10	Same as C1				
C11	Same as C1				
C12	Not Used				
C13	Same as C1				
C14	Not Used				
C15	Same as C1				
C16	Same as C7				

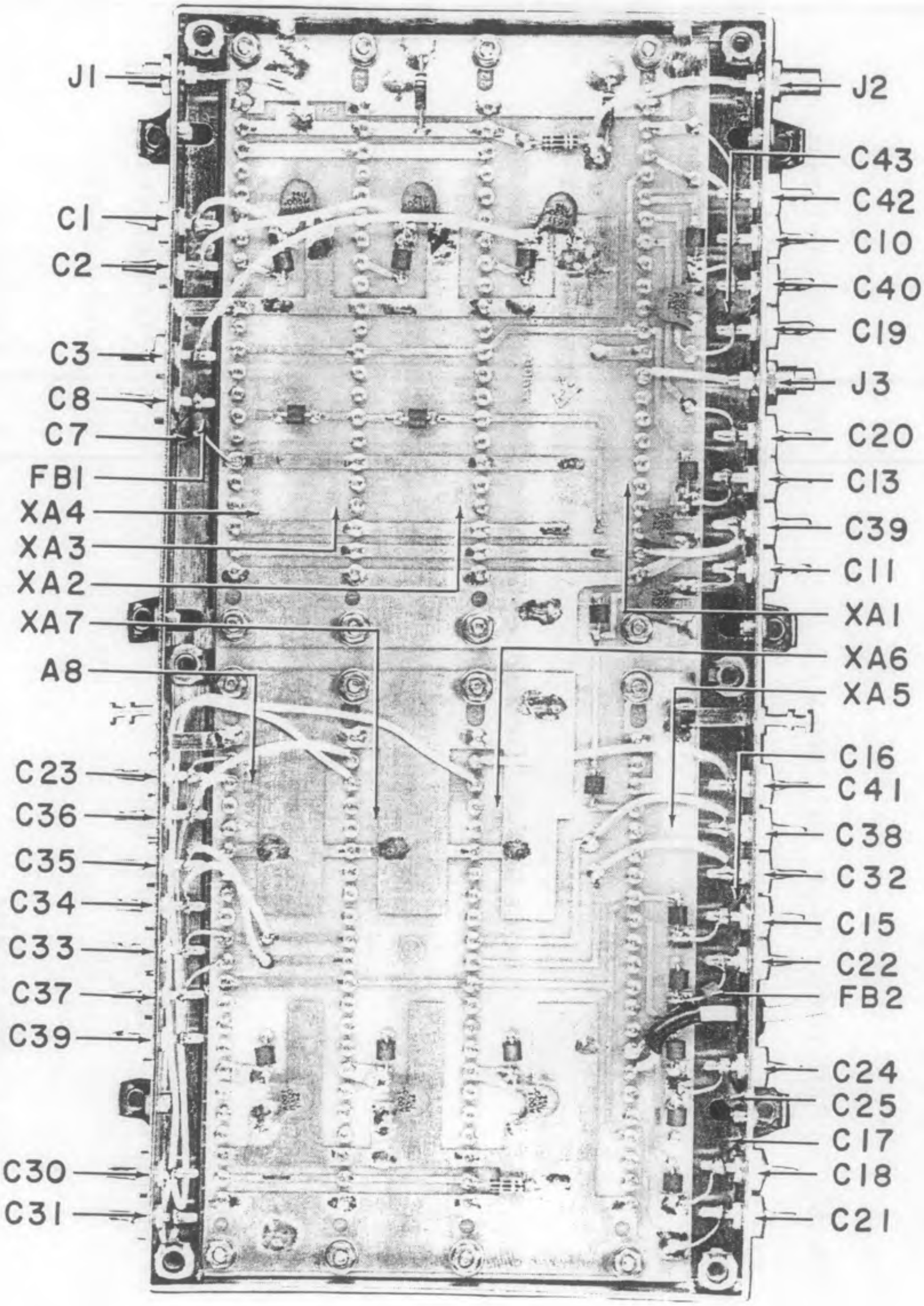


Figure 5-37. Type 72462-3 IF Amplifier (A6), Bottom View, Location of Components

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C17	Same as C7				
C18 Thru C20	Same as C1				
C21	CAPACITOR, CERAMIC, FEED-THRU: 33 pF, 10%, 500 V	15	54-794-001-3301	33095	
C22	Same as C1				
C23	Same as C21				
C24	Same as C1				
C25	Same as C7				
C26	Not Used				
C27	Not Used				
C28	Not Used				
C29 Thru C39	Same as C21				
C40	Same as C1				
C41	Same as C21				
C42	Same as C21				
C43	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100 V	1	C023B101F103M	56289	
FB1	FERRITE BEAD	2	56-590-65-4A	02114	
FB2	Same as FB1				
J1	CONNECTOR, RECEPTACLE, SMC SERIES	3	10-0104-002	19505	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 0.1 μF, 10%, 100 V	2	CK06BX104K	81349	56289
C2	Same as C1				
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 μF, 10%, 35 V	2	CS13BF105K	81349	56289
C4	Same as C3				
C5	CAPACITOR, ELECTROLYTIC, TANTALUM: 10 μF, 10%, 20 V	2	CS13BE106K	81349	56289
C6	Same as C5				
C7	CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μF, 10%, 20 V	2	CS13BE476K	81349	56289
C8	CAPACITOR, COMPOSITION, TUBULAR: 0.15 pF, 10%, 500 V	1	QC(0.15 pF, K)	95121	
C9	Same as C7				
CR1	DIODE	1	1N462A	80131	93332
CR2	DIODE	3	1N4446	80131	93332
CR3	Same as CR2				
CR4	Same as CR2				
L1	COIL, FIXED: 0.68 μH	1	203-11	99848	
Q1	TRANSISTOR	3	U1899E	15818	
Q2	Same as Q1				
Q3	Same as Q1				
Q4	TRANSISTOR	1	2N2223	80131	04713
Q5	TRANSISTOR	1	2N3251	80131	04713
Q6	TRANSISTOR	1	2N2222A	80131	04713
Q7	TRANSISTOR	1	2N2907/JAN	81350	04713
R1	RESISTOR, FIXED, FILM: 10 kΩ, 1%, 1/10 W	1	RN55C1002F	81349	75042

REF DESIG PREFIX A6A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R2	RESISTOR, FIXED, FILM: 2.49 kΩ, 1%, 1/10 W	1	RN55C2491F	81349	75042
R3	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	1	RCR07G103JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4 W	2	RCR07G104JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4 W	2	RCR07G332JS	81349	01121
R6	Same as R4				
R7	Same as R5				
R8	RESISTOR, FIXED, COMPOSITION: 2.2 MΩ, 5%, 1/4 W	1	RCR07G225JS	81349	01121
R9	RESISTOR, FIXED, COMPOSITION: 3.3 MΩ, 5%, 1/4 W	1	RCR07G335JS	81349	01121
R10	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4 W	1	RCR07G473JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	3	RCR07G471JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	1	RCR07G472JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 82 kΩ, 5%, 1/4 W	1	RCR07G823JS	81349	01121
R14	RESISTOR, VARIABLE, FILM: 200 kΩ, 20%, 1/5 W	1	3068P1-204	80294	
R15	Same as R11				
R16	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	4	RCR07G220JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4 W	1	RCR07G152JS	81349	01121
R18	Same as R11				
R19	Same as R16				
R20	RESISTOR, FIXED, FILM: 5.62 kΩ, 1%, 1/4 W	1	RN60D5621F	81349	75042
R21	RESISTOR, FIXED, FILM: 75.0 kΩ, 1%, 1/4 W	1	RN60D7502F	81349	75042
R22	RESISTOR, FIXED, COMPOSITION: 56 Ω, 5%, 1/4 W	1	RCR07G560JS	81349	01121
R23	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	3	RCR07G100JS	01121	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R24	RESISTOR, FIXED, COMPOSITION: 1.2 kΩ, 5%, 1/4 W	1	RCR07G122JS	81349	01121
R25	Same as R23				
R26	Same as R23				
R27	Same as R16				
R28	Same as R16				
R30	RESISTOR, FIXED, COMPOSITION: 91 Ω, 5%, 1/4 W	1	RCR07G910JS	81349	01121
R30	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R31	RESISTOR, FIXED, FILM: 7.5 kΩ, 1%, 1/10 W	1	RN55C7501F	81349	75042
R32	RESISTOR, FIXED, FILM: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	75042
R33	Same as R32				
R34	RESISTOR, FIXED, COMPOSITION: 68 kΩ, 5%, 1/4 W	1	RCR07G683JS	81349	01121
R35	RESISTOR, VARIABLE, FILM: 5 kΩ, 10%, 3/4 W	1	89PR5K	73138	
U1	INTEGRATED CKT	1	MC1458V	18324	
VR1	DIODE, ZENER: 6.2 V	2	1N753A	80131	04713
VR2	Same as VR1				

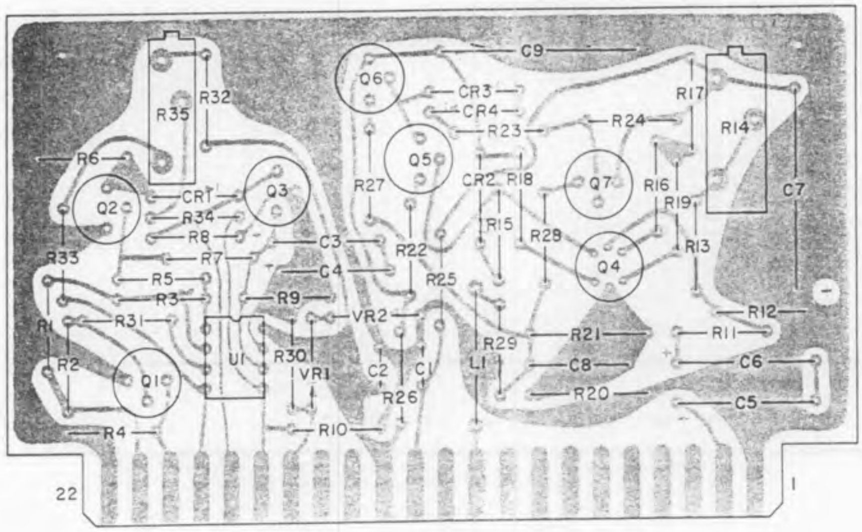


Figure 5-38. Type 7383 Video/DAFC-AFC Amplifier (A6A1), Location of Components

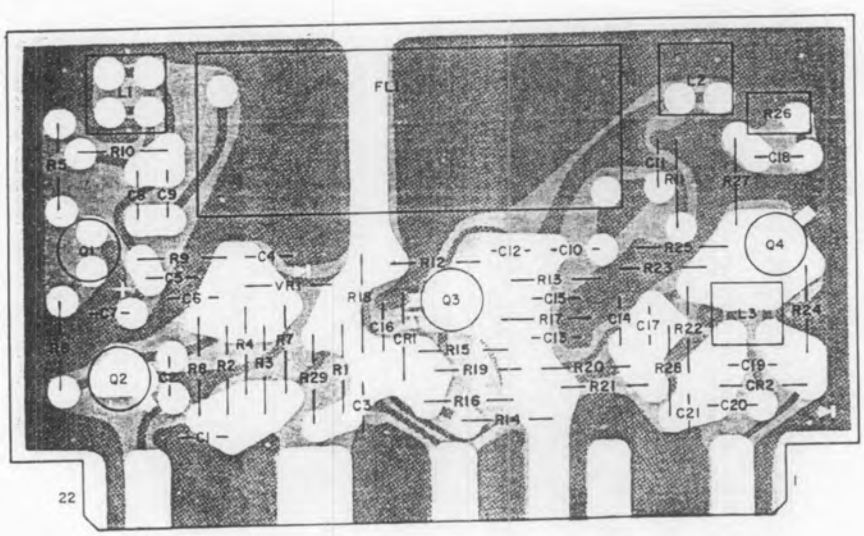


Figure 5-39. Types 72472-1 (8 kHz BW), 72339 (10 kHz BW), 72389-(x) (20 kHz BW), and 72431 (100 kHz BW), 21.4 MHz IF Amplifier (A6AX) Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	11	C023B101E502M	56289	
C2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	3	SM(1000 pF, P)	91418	
C3 Thru C6	Same as C1				
C7	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 20%, 35 V	1	196D225X0035JE3	56289	
C8	CAPACITOR, MICA, DIPPED: 270 pF, 2%, 500 V	1	CM05FD271G03	81349	72136
C9	CAPACITOR, MICA, DIPPED: 130 pF, 2%, 500 V	1	CM05FD131G03	81349	72136
C10	Same as C1				
C11	CAPACITOR, MICA, DIPPED: 75 pF, 2%, 500 V	1	CM05ED750G03	81349	72136
C12	Same as C2				
C13	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C14 Thru C16	Same as C1				
C17	Same as C2				
C18	Same as C1				
C19	CAPACITOR, MICA, DIPPED: 330 pF, 2%, 500 V	1	CM05ED331G03	81349	72136
C20	CAPACITOR, MICA, DIPPED: 1000 pF, 5%, 100 V	1	DM15-102J	72136	
C21	Same as C1				
CR1	DIODE	1	1N462A	80131	93332
CR2	DIODE	1	1N4446	80131	93332
FL1	CRYSTAL FILTER	1	92087	14632	

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L1	COIL, VARIABLE: 0.612-0.74 μH	2	558-7107-11	71279	
L2	Same as L1				
L3	COIL, VARIABLE: 0.198-0.242 μH	1	558-7107-05	71279	
Q1	TRANSISTOR	2	2N5109	80131	02735
Q2	Same as Q1				
Q3	TRANSISTOR	1	841001-1	14632	
Q4	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 22Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4 W	3	RCR07G392JS	81349	01121
R3	Same as R2				
R4	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	3	RCR07G471JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	6	RCR07G470JS	81349	01121
R6	Same as R5				
R7	RESISTOR, FIXED, COMPOSITION: 390 Ω, 5%, 1/4 W	1	RCR07G391JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 39 Ω, 5%, 1/4 W	1	RCR07G390JS	81349	01121
R9	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R10	Same as R2				
R11	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/4 W	1	RCR07G681JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121
R14	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R15	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R16	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R18	Same as R5				
R19	Same as R5				
R20	Same as R4				
R21	Same as R5				
R22	Same as R13				
R23	Same as R14				
R24	Same as R5				
R25	Same as R4				
R26	RESISTOR, VARIABLE, FILM: 100 Ω, 10%, 1/2 W	1	62PAR100	73138	
R27	RESISTOR, FIXED, COMPSOITION: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
R28	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4 W	1	RCR07G562JS	81349	01121
R29	Same as R27				
VR1	DIODE, ZENER: 12 V	1	1N963B	80131	04713

.4.7.3 TYPE 72339-1 21.4 MHz IF Amplifier (10 kHZ BW) REF DESIG PREFIX A6AX

EF ESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	10	C023B101E502M	56289	
2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	3	SM(1000 pF, P)	91418	
3 Thru 6	Same as C1				
7	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 20%, 35 V	1	196D225X0035JE3	56289	
8	CAPACITOR, MICA, DIPPED: 130 pF, 2%, 500 V	1	CM05FD131G03	81349	72136
9	CAPACITOR, MICA, DIPPED: 240 pF, 2%, 500 V	1	CM05FD241G03	81349	72136
C10	CAPACITOR, MICA, DIPPED: 150 pF, 2%, 500 V	1	CM05FD151G03	81349	72136
C11	CAPACITOR, MICA, DIPPED: 160 pF, 2%, 500 V	1	CM05FD161G03	81349	72136
C12	Same as C2				
C13	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C14	Same as C1				
C15	Same as C1				
C16	Same as C1				
C17	Same as C2				
C18	Same as C1				
C19	CAPACITOR, MICA, DIPPED: 330 pF, 2%, 500 V	1	CM05FD331G03	81349	72136
C20	CAPACITOR, MICA, DIPPED: 1000 pF, 5%, 100 V	1	DM15-102J	72136	
C21	Same as C1				
CR1	DIODE	1	1N462A	80131	93332
CR2	DIODE	1	1N4446	80131	93332

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
FL1	CRYSTAL FILTER	1	92001	14632	
L1	COIL, VARIABLE: 0/612-0.748 µH	2	558-7107-11	71279	
L2	Same as L1				
L3	COIL, VARIABLE: 0.198-0.242 µH	1	558-7107-05	71279	
Q1	TRANSISTOR	2	2N5109	80131	02735
Q2	Same as Q1				
Q3	TRANSISTOR	1	841001-1	14632	
Q4	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4 W	2	RCR07G392JS	81349	01121
R3	Same as R2				
R4	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	2	RCR07G471JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	7	RCR07G470JS	81349	01121
R6	Same as R5				
R7	RESISTOR, FIXED, COMPOSITION: 390 Ω, 5%, 1/4 W	1	RCR07G391JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	2	RCR07G330JS	81349	01121
R9	Same as R8				
R10	RESISTOR, FIXED, COMPOSITION: 3.0 kΩ, 5%, 1/4 W	1	RCR07G302JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/4 W	1	RCR07G681JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R14	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R15	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121
R16	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R18	Same as R5				
R19	Same as R5				
R20	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4 W	1	RCR07G152JS	81349	01121
R21	Same as R5				
R22	Same as R13				
R23	Same as R14				
R24	Same as R5				
R25	Same as R4				
R26	RESISTOR, VARIABLE, FILM: 100 Ω, 10%, 1/2 W	1	62PAR100	73138	
R27	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
R28	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4 W	1	RCR07G562JS	81349	01121
R29	Same as R27				
VR1	DIODE, ZENER: 12 V	1	1N963B	80131	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	10	C023B101E502M	56289	
C2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	3	SM(1000 pF, P)	91418	
C3 Thru C6	Same as C1				
C7	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 µF, 20%, 35 V	1	196D225X0035JE3	56289	
C8	CAPACITOR, MICA, DIPPED: 130 pF, 2%, 500 V	1	CM05FD131G03	81349	72136
C9	CAPACITOR, MICA, DIPPED: 240 pF, 2%, 500 V	1	CM05FD241G03	81349	72136
C10	CAPACITOR, MICA, DIPPED: 150 pF, 2%, 500 V	1	CM05FD151G03	81349	72136
C11	CAPACITOR, MICA, DIPPED: 160 pF, 2%, 500 V	1	CM05FD161G03	81349	72136
C12	Same as C2				
C13	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C14	Same as C1				
C15	Same as C1				
C16	Same as C1				
C17	Same as C2				
C18	Same as C1				
C19	CAPACITOR, MICA, DIPPED: 330 pF, 2%, 500 V	1	CM05FD331G03	81349	72136
C20	CAPACITOR, MICA, DIPPED: 1000 pF, 5%, 100 V	1	DM15-102J	72136	
C21	Same as C1				
CR1	DIODE	1	1N462A	80131	93332
CR2	DIODE	1	1N4446		
FL1	CRYSTAL FILTER	1	92002	14632	

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L1	COIL, VARIABLE: 0.612-0.748 μH	2	558-7107-11	71279	
L2	Same as L1				
L3	COIL, VARIABLE: 0.198-0.242 μH	1	558-7107-05	71279	
Q1	TRANSISTOR	2	2N5109	80131	02735
Q2	Same as Q1				
Q3	TRANSISTOR	1	841001-1	14632	
Q4	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4 W	2	RCR07G392JS	81349	01121
R3	Same as R2				
R4	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	3	RCR07G471JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	6	RCR07G470JS	81349	01121
R6	Same as R5				
R7	RESISTOR, FIXED, COMPOSITION: 390 Ω, 5%, 1/4 W	1	RCR07G391JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 62 Ω, 5%, 1/4 W	1	RCR07G620JS	81349	01121
R9	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R10	RESISTOR, FIXED, COMPOSITION: 3.0 kΩ, 5%, 1/4 W	1	RCR07G302JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 1.2 kΩ, 5%, 1/4 W	1	RCR07G122JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121
R14	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R15	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	FR CODE	RECM VENDOR
R16	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R18	Same as R5				
R19	Same as R5				
R20	Same as R4				
R21	Same as R5				
R22	Same as R13				
R23	Same as R14				
R24	Same as R5				
R25	Same as R4				
R26	RESISTOR, VARIABLE, FILM: 500 Ω, 10%, 1/2 W	1	62PAR500	73138	
R27	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
R28	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4 W	1	RCR07G562JS	81349	01121
R29	Same as R27				
VR1	DIODE, ZENER: 12 V	1	1N963B	80131	04713

5.4.7.5 TYPE 72389-3 21.4 MHz IF Amplifier (20 KHz BW) REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	10	C023B101E502M	56289	
C2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	3	SM(1000 pF, P)	91418	
C3 Thru C6	Same as C1				
C7	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 20%, 35 V	1	196D225X0035JE3	56289	
C8	CAPACITOR, MICA, DIPPED: 130 pF, 2%, 500 V	1	CM05FD131G03	81349	72136
C9	CAPACITOR, MICA, DIPPED: 240 pF, 2%, 500 V	1	CM05FD241G03	81349	72136
C10	CAPACITOR, MICA, DIPPED: 150 pF, 2%, 500 V	1	CM05FD151G03	81349	72136
C11	CAPACITOR, MICA, DIPPED: 160 pF, 2%, 500 V	1	CM05FD161G03	81349	72136
C12	Same as C2				
C13	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C14	Same as C1				
C15	Same as C1				
C16	Same as C1				
C17	Same as C2				
C18	Same as C1				
C19	CAPACITOR, MICA, DIPPED: 330 pF, 2%, 500 V	1	CM05FD331G03	81349	72136
C20	CAPACITOR, MICA, DIPPED: 1000 pF, 5%, 100 V	1	DM15-102J	72136	
C21	Same as C1				
CR1	DIODE	1	1N462A	80131	93332
CR2	DIODE	1	1N4446	80131	93332

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
FL1		1	92094	14632	
L1	COIL, VARIABLE : 0.612-0.748 μH	2	558-7107-11	71279	
L2	Same as L1				
L3	COIL, VARIABLE: 0.198-0.242 μH	1	558-7107-05	71279	
Q1	TRANSISTOR	2	2N5109	80131	02735
Q2	Same as Q1				
Q3	TRANSISTOR	1	841001-1	14632	
Q4	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4 W	2	RCR07G392JS	81349	01121
R3	Same as R2				
R4	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	3	RCR07G471JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	6	RCR07G470JS	81349	01121
R6	Same as R5				
R7	RESISTOR, FIXED, COMPOSITION: 390 Ω, 5%, 1/4 W	1	RCR07G391JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 62 Ω, 5%, 1/4 W	1	RCR07G620JS	81349	01121
R9	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R10	RESISTOR, FIXED, COMPOSITION: 3.0 kΩ, 5%, 1/4 W	1	RCR07G302JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 1.2 kΩ, 5%, 1/4 W	1	RCR07G122JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121
R14	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R15	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121
R16	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R18	Same as R5				
R19	Same as R5				
R20	Same as R4				
R21	Same as R5				
R22	Same as R13				
R23	Same as R14				
R24	Same as R5				
R25	Same as R4				
R26	RESISTOR, VARIABLE, FILM: 500 Ω, 10%, 1/2 W	1	6 2PAR500	73138	
R27	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
R28	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4 W	1	RCR07G562JS	81349	01121
R29	Same as R27				
VR1	DIODE, ZENER: 12 V	1	1N963B	80131	04713

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	10	C023B101E502M	56289	
C2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	3	SM(1000 pF, P)	91418	
C3 Thru C6	Same as C1				
C7	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 20%, 35 V	1	196D225X0035JE3	56289	
C8	CAPACITOR, MICA, DIPPED: 130 pF, 2%, 500 V	1	CM05FD131G03	81349	72136
C9	CAPACITOR, MICA, DIPPED: 240 pF, 2%, 500 V	1	CM05FD241G03	81349	72136
C10	CAPACITOR, MICA, DIPPED: 150 pF, 2%, 500 V	1	CM05FD151G03	81349	72136
C11	CAPACITOR, MICA, DIPPED: 160 pF, 2%, 500 V	1	CM05FD161G03	81349	72136
C12	Same as C2				
C13	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C14	Same as C1				
C15	Same as C1				
C16	Same as C1				
C17	Same as C2				
C18	Same as C1				
C19	CAPACITOR, MICA, DIPPED: 330 pF, 2%, 500 V	1	CM05FD331G03	81349	72136
C20	CAPACITOR, MICA, DIPPED: 1000 pF, 5%, 100 V	1	DM15-102J	72136	
C21	Same as C1				
CR1	DIODE	1	1N462A	80131	93332
CR2	DIODE	1	1N4446	80131	93332

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
FL1	CRYSTAL FILTER	1	92000	14632	
L1	COIL, VARIABLE: 0.612-0.748 μH	2	558-7107-11	71279	
L2	Same as L1				
L3	COIL, VARIABLE: 0.198-0.242 μH	1	558-7107-05	71279	
Q1	TRANSISTOR	2	2N5109	80131	02735
Q2	Same as Q1				
Q3	TRANSISTOR	1	841001-1	14632	
Q4	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4 W	2	RCR07G392JS	81349	01121
R3	Same as R2				
R4	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	2	RCR07G471JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	7	RCR07G470JS	81349	01121
R6	Same as R5				
R7	RESISTOR, FIXED, COMPOSITION: 390 Ω, 5%, 1/4 W	1	RCR07G391JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R9	RESISTOR, FIXED, COMPOSITION: 51 Ω, 5%, 1/4 W	1	RCR07G510JS	81349	01121
R10	RESISTOR, FIXED, COMPOSITION: 3.0 kΩ, 5%, 1/4 W	1	RCR07G302JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 910 Ω, 5%, 1/4 W	1	RCR07G911JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R14	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R15	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121
R16	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R18	Same as R5				
R19	Same as R5				
R20	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R21	Same as R5				
R22	Same as R13				
R23	Same as R14				
R24	Same as R5				
R25	Same as R4				
R26	RESISTOR, VARIABLE,FILM: 500 Ω, 10%, 1/2 W	1	62PAR500	73138	
R27	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
R28	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4 W	1	RCR07G562JS	81349	01121
R29	Same as R27				
VR1	DIODE, ZENER: 12 V	1	1N963B	80131	04713

5.4.4.7 TYPE 72431 21.4 MHz IF Amplifier (100 KHz BW) REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	10	C023B101E502M	56289	
C2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	3	SM(1000 pF, P)	91418	
C3 Thru C6	Same as C1				
C7	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 20%, 35V	1	196D225X0035JF3	56289	
C8	CAPACITOR, MICA, DIPPED: 130 pF, 2%, 500 V	1	CM05FD131G03	81349	72136
C9	CAPACITOR, MICA, DIPPED: 240 pF, 2%, 500 V	1	CM05FD241G03	81349	72136
C10	CAPACITOR, MICA, DIPPED: 150 pF, 2%, 500 V	1	CM05FD151G03	81349	72136
C11	CAPACITOR, MICA, DIPPED: 160 pF, 2%, 500 V	1	CM05FD161G03	81349	72136
C12	Same as C2				
C13	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C14	Same as C1				
C15	Same as C1				
C16	Same as C1				
C17	Same as C2				
C18	Same as C1				
C19	CAPACITOR, MICA, DIPPED: 330 pF, 2%, 500 V	1	CM05FD331G03	81349	72136
C20	CAPACITOR, MICA, DIPPED: 1000 pF, 5%, 100 V	1	DM15-102J	72136	
C21	Same as C1				
CR1	DIODE	1	1N462A	80131	93332
CR2	DIODE	1	1N4446	80131	93332
FL1	CRYSTAL FILTER	1	92024	[illegible]32	

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L1	COIL, VARIABLE: 0.612-0.748 μH	2	558-7107-11	71279	
L2	Same as L1				
L3	COIL, VARIABLE: 0.198-0.242 μH	1	558-7107-05	71279	
Q1	TRANSISTOR	2	2N5109	80131	02735
Q2	Same as Q1				
Q3	TRANSISTOR	1	841001-1	14632	
Q4	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4 W	2	RCR07G392JS	81349	01121
R3	Same as R2				
R4	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	3	RCR07G471JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	6	RCR07G470JS	81349	01121
R6	Same as R5				
R7	RESISTOR, FIXED, COMPOSITION: 390 Ω, 5%, 1/4 W	1	RCR07G391JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 62 Ω, 5%, 1/4 W	1	RCR07G620JS	81349	01121
R9	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R10	RESISTOR, FIXED, COMPOSITION: 3.0 kΩ, 5%, 1/4 W	1	RCR07G302JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4 W	1	RCR07G222JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121
R14	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R15	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121

REF DESIG PREFIX A6AX

EF SIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
16	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
17	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
18	Same as R5				
19	Same as R5				
20	Same as R4				
21	Same as R5				
22	Same as R13				
23	Same as R14				
24	Same as R5				
25	Same as R4				
26	RESISTOR, VARIABLE, FILM: 500 Ω, 10%, 1/2 W	1	62PAR500	73138	
27	RESISTOR, FIXED, COMPOSITION: 27 Ω, 5%, 1/4 W	1	RCR07G270JS	81349	01121
28	RESISTOR, FIXED, COMPOSITION: 5.6 kΩ, 5%, 1/4 W	1	RCR07G562JS	81349	01121
29	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	1	RCR07G100JS	81349	01121
R1	DIODE, ZENER: 12 V	1	1N963B	80131	04713

5.4.7.8 TYPE 72338 21.4 MHz IF Amplifier (200 KHz BW)

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	11	C023B101E502M	56289	
C2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	3	SM(1000pF, P)	91418	
C3 Thru C6	Same as C1				
C7	CAPACITOR, VARIABLE, CERAMIC: 3-15 pF, 350 V	1	538-006-D3-15	72982	
C8	CAPACITOR, CERAMIC, TUBULAR: 0.68 pF ± 0.1 pF, 500 V	2	301-000C0K0-688B	72982	
C9	CAPACITOR, MICA, DIPPED: 82 pF, 2%, 500 V	1	CM05ED820G03	81349	72136
C10	CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350 V	4	538-006D9-35	72982	
C11	Same as C8				
C12	CAPACITOR, MICA, DIPPED: 110 pF, 2%, 500 V	1	CM05D111G03	81349	72136
C13	Same as C10				
C14	CAPACITOR, MICA, DIPPED: 390 pF, 2%, 500 V	2	CM05FD391G03	81349	72136
C15	Same as C2				
C16	Same as C10				
C17	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C18	Same as C1				
C19	Same as C1				
C20	Same as C10				
C21	CAPACITOR, MICA, DIPPED: 120 pF, 2%, 500 V	2	CM05FD121G03	81349	72136
C22	CAPACITOR, CERAMIC, TUBULAR: 1.5 pF ± 0.1 pF, 500 V	1	301-000C0K0-159B	72982	
C23	CAPACITOR, CERAMIC, TUBULAR: 120 pF, 2%, 500 V, N750	1	302-000U2J0-121G	72982	

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C24	Same as C21				
C25	CAPACITOR, MICA, DIPPED: 300 pF, 2%, 500 V	1	CM05FD301G03	81349	72136
C26	Same as C14				
C27	Same as C1				
C28	Same as C1				
C29	Same as C2				
C30	Same as C1				
C31	Same as C1				
C32	CAPACITOR, MICA, DIPPED: 91 pF, 2%, 500 V	1	CM05FD910G03	81349	
CR1	DIODE	1	1N462A	80131	93332
L1	COIL, TOROIDAL	2	20681-28	14632	
L2	Same as L1				
L3	COIL, TOROIDAL	2	20681-64	14632	
L4	Same as L3				
L5	COIL, TOROIDAL	1	20681-8	14632	
L6	COIL, FIXED: 10 μH	1	1537-36	99800	
Q1	TRANSISTOR	2	2N5109	80131	02735
Q2	Same as Q1				
Q3	TRANSISTOR	1	841001-1	14632	
Q4	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4 W	2	RCR07G392JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R3	Same as R2				
R4	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	6	RCR07G470JS	81349	01121
R7	Same as R6				
R8	RESISTOR, FIXED, COMPOSITION: 390 Ω, 5%, 1/4 W	1	RCR07G391JS	81349	01121
R9	Same as R6				
R10	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	3	RCR07G472JS	81349	01121
R11	Same as R10				
R12	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	2	RCR07G221JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121
R14	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R15	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R16	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R18	Same as R6				
R19	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R20	Same as R16				
R21	Same as R10				
R22	Same as R12				
R23	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/4 W	1	RCR07G681JS	81349	01121
R24	Same as R6				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R25	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
R26	Same as R6				
R27	RESISTOR, VARIABLE, FILM: 100 Ω, 10%, 1/2 W	1	62PAR100	73138	
R28	Same as R25				
VR1	DIODE, ZENER: 12 V	1	1N963B	80131	04713

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	11	C023B101E502M	56289	
C2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	3	SM(1000 pF, P)	91418	
C3 Thru C6	Same as C1				
C7	CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350 V	5	538-006D9-35	72982	
C8	CAPACITOR, CERAMIC, TUBULAR: 1.2 pF ± 0.1 pF, 500 V	1	301-000C0K0-129B	72982	
C9	CAPACITOR, MICA, DIPPED: 82 pF, 2%, 500 V	2	CM05ED820G03	81349	72136
C10	Same as C7				
C11	CAPACITOR, CERAMIC, TUBULAR: 0.68 pF ± 0.1 pF, 500 V	1	301-000C0K0-688B	72982	
C12	CAPACITOR, MICA, DIPPED: 62 pF, 2%, 500 V	1	CM05ED620G03	81349	72136
C13	Same as C7				
C14	CAPACITOR, MICA, DIPPED: 620 pF, 5%, 300 V	1	DM15-621J	72136	
C15	Same as C2				
C16	Same as C7				
C17	CAPACITOR, MICA, DIPPED: 1000 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C18	Same as C1				
C19	Same as C1				
C20	Same as C7				
C21	CAPACITOR, MICA, DIPPED: 110 pF, 2%, 500 V	1	CM05FD111G03	81349	72136
C22	CAPACITOR, CERAMIC, TUBULAR: 1.8 pF ± 0.1 pF, 500 V	1	301-000C0K0-189B	72982	
C23	CAPACITOR, MICA, DIPPED: 150 pF, 2%, 500 V	1	CM05FD151G03	81349	72136
C24	CAPACITOR, MICA, DIPPED: 120 pF, 2%, 500 V	1	CM05FD121G03	81349	72136

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C25	CAPACITOR, MICA, DIPPED: 300 pF, 2%, 500 V	1	CM05FD301G03	81349	72136
C26	CAPACITOR, MICA, DIPPED: 390 pF, 2%, 500 V	1	CM05FD391G03	81349	72136
C27	Same as C1				
C28	Same as C1				
C29	Same as C2				
C30	Same as C1				
C31	Same as C1				
C32	Same as C9				
C33	Not Used				
C34	CAPACITOR, CERAMIC, TUBULAR: 47 pF, 5%, 500 V	1	308-000S2H0470J	72982	
CR1	DIODE	1	1N462A	80131	93332
L1	COIL, TOROIDAL	2	20681-28	14632	
L2	Same as L1				
L3	COIL, TOROIDAL	2	20681-64	14632	
L4	Same as L3				
L5	COIL, TOROIDAL	1	20681-8	14632	
L6	COIL, FIXED: 10 μH	1	1537-36	99800	
Q1	TRANSISTOR	2	2N5109	80131	02735
Q2	Same as Q1				
Q3	TRANSISTOR	1	841001-1	14632	
Q4	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	2	RCR07G471JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R2	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4 W	2	RCR07G392JS	81349	01121
R3	Same as R2				
R4	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	6	RCR07G470JS	81349	01121
R7	Same as R6				
R8	RESISTOR, FIXED, COMPOSITION: 390 Ω, 5%, 1/4 W	1	RCR07G391JS	81349	01121
R9	Same as R6				
R10	RESISTOR, FIXED, COMPOSITION: 5.1 kΩ, 5%, 1/4 W	1	RCR07G512JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	2	RCR07G221JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121
R14	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R15	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R16	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	1	RCR07G103JS	81349	01121
R17	Same as R1				
R18	Same as R6				
R19	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R20	RESISTOR, FIXED, COMPOSITION: 27 kΩ, 5%, 1/4 W	1	RCR07G273JS	81349	01121
R21	Same as R11				
R22	Same as R12				
R23	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121

REF DESIG PREFIX A6AX

EF SIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
24	Same as R6				
25	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
26	Same as R6				
27	RESISTOR, VARIABLE, FILM: 100 Ω, 10%, 1/2 W	1	62PAR100	73138	
28	Same as R25				
R1	DIODE, ZENER: 12 V	1	1N973B	80131	04713

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	11	C023B101E502M	56289	
C2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	3	SM(1000 pF, P)	91418	
C3 Thru C6	Same as C1				
C7	CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350 V	5	538-006D9-35	72982	
C8	CAPACITOR, CERAMIC, TUBULAR: 2.4 pF ± 0.25 pF, 500 V	1	301-000C0J0-249C	72982	
C9	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	2	CM05FD101G03	81349	72136
C10	Same as C7				
C11	CAPACITOR, CERAMIC, TUBULAR: 1.8 pF ± 0.1 pF, 500 V	1	301-000C0K0-189B	72982	
C12	CAPACITOR, MICA, DIPPED: 91 pF, 2%, 500 V	1	CM04FD910G03	81349	72136
C13	Same as C7				
C14	CAPACITOR, MICA, DIPPED: 390 pF, 2%, 500 V	1	CM05FD391G03	81349	72136
C15	Same as C2				
C16	Same as C7				
C17	Same as C9				
C18	Same as C1				
C19	Same as C1				
C20	Same as C7				
C21	CAPACITOR, MICA, DIPPED: 120 pF, 2%, 500 V	2	CM05FD121G03	81349	72136
C22	CAPACITOR, CERAMIC, TUBULAR: 3.6 pF ± 0.25 pF, 500 V	1	301-000C0J0-369C	72982	
C23	CAPACITOR, MICA, DIPPED: 110 pF, 2%, 500 V	1	CM05FD111G03	81349	72136
C24	Same as C21				

EF ESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
25	CAPACITOR, MICA, DIPPED: 220 pF, 2%, 500 V	1	CM05FD221G03	81349	72136
26	CAPACITOR, MICA, DIPPED: 430 pF, 5%, 500 V	1	DM15-431J	72136	
27	Same as C1				
28	Same as C1				
29	Same as C2				
30	Same as C1				
31	Same as C1				
32	CAPACITOR, CERAMIC, TUBULAR: 100 pF, 5%, 500 V, N750	1	302-000U2J0-101J	72982	
CR1	DIODE	1	1N462A	80131	93332
1	COIL, FIXED	3	20681-154	14632	
L2	Same as L1				
L3	COIL, FIXED	1	20681-155	14632	
L4	Same as L1				
L5	COIL, FIXED	1	20681-156	14632	
L6	COIL, FIXED: 10 μH	1	1537-36	99800	
Q1	TRANSISTOR,	2	2N5109	80131	02735
Q2	Same as Q1				
Q3	TRANSISTOR	1	841001-1	14632	
Q4	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	2	RCR07G471JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4 W	1	RCR07G152JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R3	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	2	RCR07G102JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	5	RCR07G470JS	81349	01121
R7	Same as R6				
R8	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	2	RCR07G101JS	81349	01121
R9	Same as R8				
R10	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4 W	1	RCR07G272JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	2	RCR07G221JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121
R14	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R15	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R16	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	1	RCR07G103JS	81349	01121
R17	Same as R1				
R18	Same as R6				
R19	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R20	RESISTOR, FIXED, COMPOSITION: 27 kΩ, 5%, 1/4 W	1	RCR07G273JS	81349	01121
R21	Same as R11				
R22	Same as R12				
R23	Same as R3				
R24	Same as R6				

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R25	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
R26	Same as R6				
R27	RESISTOR, VARIABLE, FILM: 100 Ω, 10%, 1/2 W	1	62PAR100	73138	
R28	Same as R25				
R29	RESISTOR, FIXED, COMPOSITION: 5.1 kΩ, 5%, 1/4 W	1	RCR07G512JS	81349	01121
VR1	DIODE, ZENER: 12 V	1	1N963B	80131	04713

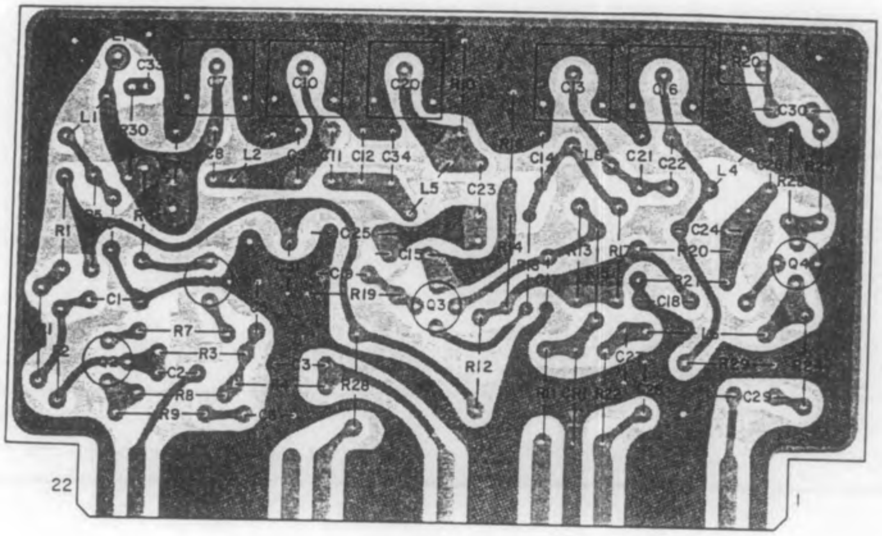


Figure 5-40. Types 72388 (200 kHz BW), 72366 (300 kHz BW) and 72429 (500 kHz BW), 21.4 MHz IF Amplifier (A6AX), Location of Components

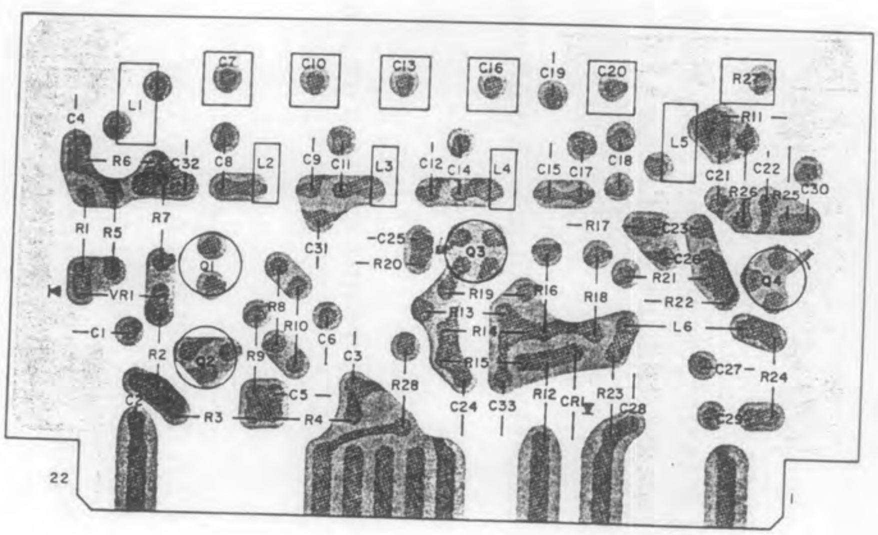


Figure 5-41. Types 72378-(x) (1- and 2-kHz BW) and 72365 (3 MHz BW), 21.4 MHz IF Amplifier (A6AX), Location of Components

5.4.7.11 TYPE 72378-1 21.4 MHz IF Amplifier (1MHz BW) RED DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, DERAMIC, DISC: 5000 pF, 20%, 100 V	11	C023B101E502M	56289	
C2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	4	SM(1000 pF, P)	91418	
C3 Thru C6	Same as C1				
C7	CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350 V	5	538-006D9-35	72982	
C8	CAPACITOR, CERAMIC, TUBULAR: 3.6 pF ± 0.25 pF, 500 V	1	301-000C0J0-369C	72982	
C9	CAPACITOR, MICA, DIPPED: 82 pF, 2%, 500 V	4	CM05ED820G03	81349	72136
C10	Same as C7				
C11	CAPACITOR, CERAMIC, TUBULAR: 3.0 pF ± 0.1 pF, 500 V	1	301-000C0J0-309B	72982	
C12	Same as C9				
C13	Same as C7				
C14	CAPACITOR, CERAMIC, TUBULAR: 4.0 pF ± 0.1 pF, 500 V	1	301-000C0H0-409B	72982	
C15	Same as C9				
C16	Same as C7				
C17	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF ± 0.1 pF, 500 V	1	301-000C0H0-479B	72982	
C18	CAPACITOR, CERAMIC, TUBULAR: 6.0 pF ± 0.1 pF, 500 V	1	301-000C0H0-609B	72982	
C19	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	3	CM05FD101G03	81349	72136
C20	Same as C7				
C21	Same as C19				
C22	CAPACITOR, MICA, DIPPED: 430 pF, 5%, 500 V	1	DM15-431J	72136	
C23	Same as C2				
C24	Same as C19				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C25	Same as C1				
C26	Same as C2				
C27	Same as C1				
C29	Same as C2				
C30	Same as C1				
C31	Same as C1				
C32	Same as C9				
C33	Same as C1				
CR1	DIODE	1	1N462A	80131	93332
L1	COIL, TOROIDAL	4	20681-147	14632	
L2 Thru L4	Same as L1				
L5	COIL, TOROIDAL	1	20681-144	14632	
L6	COIL, FIXED: 10 μH	1	1537-36	99800	
Q1	TRANSISTOR	2	2N5109	80131	02735
Q2	Same as Q1				
Q3	TRANSISTOR	1	841001-1	14632	
Q4	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	2	RCR07G471JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4 W	2	RCR07G392JS	81349	01121
R3	Same as R2				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R4	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 20 kΩ, 5%, 1/4 W	1	RCR07G203JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	5	RCR07G470JS	81349	01121
R8	Same as R7				
R9	RESISTOR, FIXED, COMPOSITION 390 Ω, 5%, 1/4 W	2	RCR07G391JS	81349	01121
R10	Same as R7				
R11	Same as R9				
R12	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	2	RCR07G221JS	81349	01121
R14	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121
R15	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R16	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	1	RCR07G103JS	81349	01121
R18	Same as R1				
R19	Same as R7				
R20	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R21	RESISTOR, FIXED, COMPOSITION: 27 kΩ, 5%, 1/4 W	1	RCR07G273JS	81349	01121
R22	Same as R12				
R23	Same as R13				
R24	Same as R7				
R25	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R26	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
R27	RESISTOR, VARIABLE, FILM: 100 Ω, 10%, 1/2 W	1	62PAR100	73138	
R28	Same as R26				
VR1	DIODE, ZENER: 12 V	1	1N759A	80131	04713

5.4.7.12 TYPE 72378-2 21.4 MHz IF Amplifier (2 MHz BW) REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20% 100 V	11	C023B101E502M	56289	
C2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	4	SM(1000 pF, P)	91418	
C3 Thru C6	Same as C1				
C7	CAPACITOR, VARAIBLE, CERAMIC: 9-35 pF, 350 V	5	538-006D9-35	72982	
C8	CAPACITOR, CERAMIC, TUBULAR: 7.5 pF ± 0.5 pF, 500 V	2	301-000C0H0-759D	72982	
C9	CAPACITOR, MICA, DIPPED: 68 pF, 2%, 500 V	4	CM05ED680G03	81349	72136
C10	Same as C7				
C11	CAPACITOR, CERAMIC, TUBULAR: 5.1 pF ± 0.5 pF, 500 V	1	301-000C0H0-519D	72982	
C12	Same as C9				
C13	Same as C7				
C14	CAPACITOR, CERAMIC, TUBULAR: 5.6 pF ± 0.25 pF, 500 V	2	301-000C0H0-569C	72982	
C15	Same as C9				
C16	Same as C7				
C17	Same as C14				
C18	Same as C8				
C19	CAPACITOR, MICA, DIPPED: 91 pF, 2%, 500 V	2	CM05FD910G03	81349	72136
C20	Same as C7				
C21	Same as C19				
C22	CAPACITOR, MICA, DIPPED: 360 pF, 2%, 500 V	1	CM05FD361G03	81349	72136
C23	Same as C2				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C24	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
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				
C33	Same as C1				
CR1	DIODE	1	1N462A	80131	93332
L1	COIL TOROIDAL	4	20681-147	14632	
L2 Thru L4	Same as L1				
L5	COIL, TOROIDAL	1	20681-148	14632	
L6	COIL, FIXED: 10 μH	1	1537-36	99800	
Q1	TRANSISTOR	2	2N5109	80131	02735
Q2	Same as Q1				
Q3	TRANSISTOR	1	841001-1	14632	
Q4	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	2	RCR07G471JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R2	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4 W	2	RCR07G392JS	81349	01121
R3	Same as R2				
R4	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	5	RCR07G470JS	81349	01121
R8	Same as R7				
R9	RESISTOR, FIXED, COMPOSITION: 390 Ω, 5%, 1/4 W	2	RCR07G391JS	81349	01121
R10	Same as R7				
R11	Same as R9				
R12	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	2	RCR07G221JS	81349	01121
R14	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121
R15	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R16	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R17	Same as R6				
R18	Same as R1				
R19	Same as R7				
R20	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R21	RESISTOR, FIXED, COMPOSITION: 27 kΩ, 5%, 1/4 W	1	RCR07G273JS	81349	01121
R22	Same as R12				
R23	Same as R13				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R24	Same as R7				
R25	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R26	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
R27	RESISTOR, VARIABLE, FILM: 100 Ω, 10%, 1/2 W	1	62PAR100	73138	
R28	Same as R26				
VR1	DIODE, ZENER: 12 V	1	1N759A	80131	04713

EF ESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500 V	11	SM(5000 pF, M)	91418	
2	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	4	SM(1000 pF, P)	91418	
3 hru 6	Same as C1				
7	CAPACITOR, VARIABLE, CERAMIC: 5.5-18 pF, 350 V	5	538-006A5.5-18	72982	
8	CAPACITOR, CERAMIC, TUBULAR: 9.1 pF ± 0.5 pF, 500 V	3	301-000C0H0-919D	72982	
9	CAPACITOR, MICA, DIPPED: 56 pF, 2%, 500 V	4	CM05ED560G03	81349	72136
10	Same as C7				
11	Same as C8				
12	Same as C9				
13	Same as C7				
14	CAPACITOR, CERAMIC, TUBULAR: 7.5 pF ± 0.5 pF, 500 V	1	301-000C0H0-759D	72982	
15	Same as C9				
16	Same as C7				
17	Same as C8				
18	CAPACITOR, CERAMIC, TUBULAR: 10 pF ± 0.5 pF, 500 V	1	301-000C0H0-100D	72982	
19	CAPACITOR, MICA, DIPPED: 62 pF, 2%, 500 V	1	CM05ED620G03	81349	72136
C20	Same as C7				
C21	CAPACITOR, MICA, DIPPED: 150 pF, 2%, 500 V	1	CM05FD151G03	81349	72136
C22	CAPACITOR, MICA, DIPPED: 91 pF, 2%, 500 V	1	CM05FD910G03	81349	72136
C23	Same as C2				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C24	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
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				
C33	Same as C1				
CR1	DIODE	1	1N462A	80131	93332
L1	COIL, TOROIDAL	4	20681-157	14632	
L2	Same as L1				
L3	Same as L1				
L4	Same as L1				
L5	COIL, TOROIDAL	1	20681-158	14632	
L6	COIL, FIXED: 10 μH	1	1537-36	99800	
Q1	TRANSISTOR	2	2N5109	80131	02735
Q2	Same as Q1				
Q3	TRANSISTOR	1	841001-1	14632	
Q4	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	2	RCR07G471JS	81349	01121

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R2	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4 W	2	RCR07G392JS	81349	01121
R3	Same as R2				
R4	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 270 Ω, 5%, 1/4 W	1	RCR07G271JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	5	RCR07G470JS	81349	01121
R8	Same as R7				
R9	RESISTOR, FIXED, COMPOSITION: 390 Ω, 5%, 1/4 W	1	RCR07G391JS	81349	01121
R10	Same as R7				
R11	RESISTOR, FIXED, COMPOSITION: 200 Ω, 5%, 1/4 W	1	RCR07G201JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	2	RCR07G221JS	81349	01121
R14	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121
R15	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R16	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121
R18	Same as R1				
R19	Same as R7				
R20	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R21	Same as R17				
R22	Same as R12				
R23	Same as R13				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R24	Same as R7				
R25	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/4 W	1	RCR07G681JS	81349	01121
R26	RESISTOR, FIXED, COMPOSITION: 27 Ω, 5%, 1/4 W	1	RCR07G270JS	81349	01121
R27	RESISTOR, VARIABLE, FILM: 500 Ω, 10%, 1/2 W	1	62PAR500	73138	
R28	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	1	RCR07G100JS	81349	01121
VR1	DIODE, ZENER: 12 V	1	1N963B	80131	04713

5.4.7.14 TYPE 72343 IF Output Amplifier

REF DESIG PREFIX A6A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500 V	7	SM(5000 pF, M)	91418	
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 4.7 μF, 10%, 35 V	1	CS13BF475K	81349	56289
C3	Same as C1				
C4	CAPACITOR, ELECTROLYTIC, TANTALUM: 45 μF, 20%, 30 V	1	MTP456M030P1B	76055	
C5	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	7	SM(1000 pF, P)	91418	
C6	Same as C5				
C7	Same as C5				
C8	Same as C1				
C9	Same as C5				
C10	Same as C1				
C11	CAPACITOR, VARIABLE, CERAMIC; 2-8 pF, 350 V	1	538-006A2-8	72982	
C12	CAPACITOR, COMPOSITION, TUBULAR: 0.82 pF, 10%, 500 V	1	QC(0.82 pF, K)	95121	
C13	Same as C5				
C14	CAPACITOR, CERAMIC, TUBULAR: 6.8 pF ± 0.25 pF, 500 V	1	301-000C0H0-689C	72982	
C15	CAPACITOR, MICA, DIPPED: 62 pF, 2%, 500 V	1	CM05ED620G03	81349	72136
C16	Same as C1				
C17	CAPACITOR, MICA, DIPPED: 15 pF, 5%, 500 V	1	CM05CD150J03	81349	72136
C18	Same as C1				
C19	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	2	CM05FD101G03	81349	72136
C20	Same as C1				
C21	Same as C19				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C22	Same as C5				
C23	Same as C5				
CR1	DIODE	1	5082-2800	28480	
L1	COIL, FIXED: 47 μH	1	1537-60	99800	
L2	COIL, FIXED: 27 μH	1	1537-48	99800	
Q1	TRANSISTOR	2	2N929	80131	04713
Q2	TRANSISTOR	2	2N3478	80131	34156
Q3	TRANSISTOR	1	2N3251	80131	04713
Q4	Same as Q1				
Q5	Same as Q2				
R1	RESISTOR, VARIABLE, FILM: 100 Ω, 10%, 1/2 W	1	62PAR100	73138	
R2	RESISTOR, FIXED, COMPOSITION: 82 Ω, 5%, 1/4 W	1	RCR07G820JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4 W	2	RCR07G682JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	4	RCR07G103JS	81349	01121
R5	RESISTOR, VARIABLE, FILM: 5kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R6	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R7	Same as R3				
R8	RESISTOR, FIXED, COMPOSITION: 180 Ω, 5%, 1/4 W	2	RCR07G181JS	81349	01121
R9	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	2	RCR07G470JS	81349	01121
R10	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
R11	Same as R4				
R12	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4 W	3	RCR07G222JS	81349	01121

REF DESIG PREFIX A6A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R13	RESISTOR, FIXED. COMPOSITION: 1.8 kΩ, 5%, 1/4 W	1	RCR07G182JS	81349	01121
R14	Same as R9				
R15	RESISTOR, FIXED, COMPOSITION: 12 Ω, 5%, 1/4 W	1	RCR07G120JS	81349	01121
R16	RESISTOR, FIXED, COMPOSITION: 150 Ω 5%, 1/4 W	2	RCR07G151JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	3	RCR07G101JS	81349	01121
R18	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4 W	2	RCR07G332JS	81349	01121
R19	RESISTOR, FIXED, COMPOSITION: 240 kΩ, 5%, 1/4 W	1	RCR07G244JS		
R20	Same as R12				
R21	Same as R4				
R22	Same as R16				
R23	Same as R6				
R24	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R25	RESISTOR. FIXED, COMPOSITION 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
R26	Same as R4				
R27	Same as R12				
R28	Same as R8				
R29	RESISTOR. FIXED. COMPOSITION: 30 Ω 5%, 1/4 W	1	RCR07G300JS	81349	01121
R30	RESISTOR, FIXED. COMPOSITION: 62 Ω, 5%, 1/4 W	2	RCR07G620JS	81349	01121
R31	Same as R30				
R32	Same as R17				
R33	Same as R18				
R34	Same as R10				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R35	Same as R17				
T1	TRANSFORMER, TOROIDAL	1	21427-14	14632	
T2	TRANSFORMER TOROIDAL	1	21092-8	14632	
T3	TRANSFORMER TOROIDAL	1	21428-59	14632	
U1	INTEGRATED CKT	1	MC1350P	04713	
U2	VCXO, 21.4 MHz	1	7710311	74306	

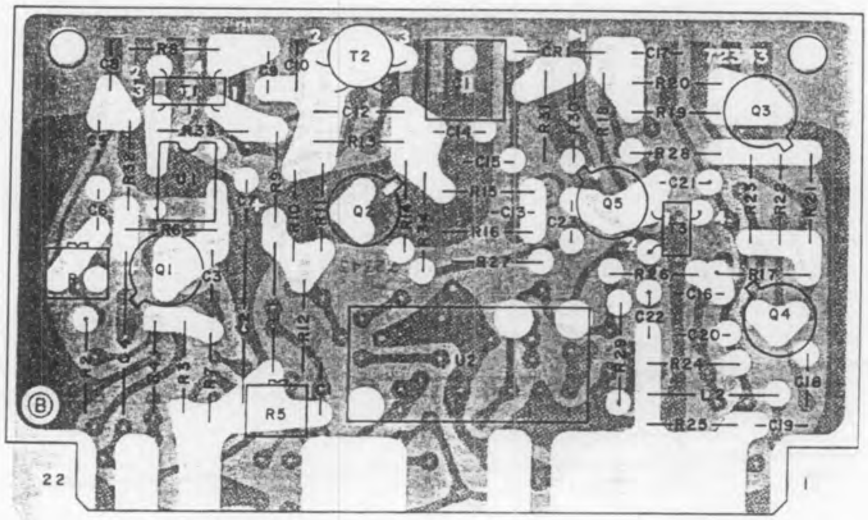


Figure 5-42. Type 72343 IF Output Amplifier (A6A5), Location of Components

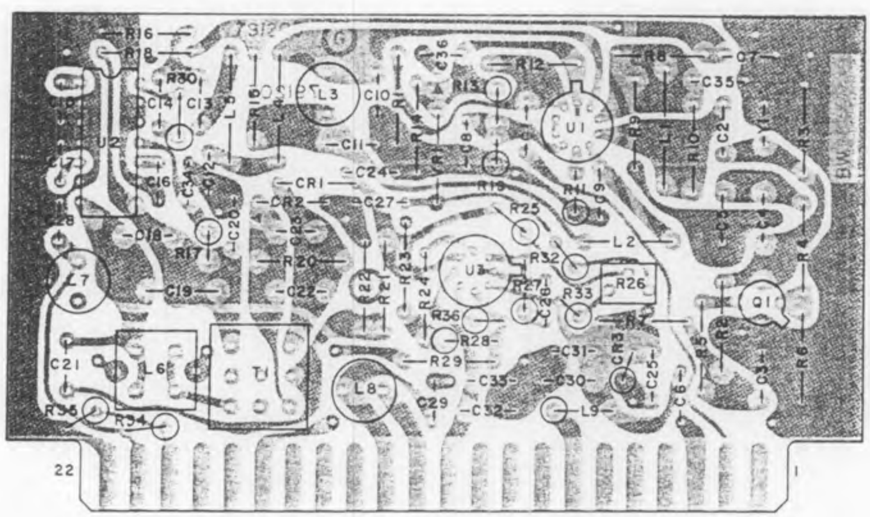


Figure 5-43. Type 791205-(x) (8-, 10-, 20-, and 50-kHz BW), FM Limiter/Discriminator (A6AX), Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	8	C023B101E502M	56289	
C2	CAPACITOR, CERAMIC, TUBULAR: 2.7 pF ± 0.25 pF, 500 V	1	301-000C0J0-279C	72982	
C3	Same as C1				
C4	CAPACITOR, MICA, DIPPED: 27 pF, 2%, 500 V	2	CM05ED270G03	81349	72136
C5	Same as C4				
C6 Thru C8	Same as C1				
C9	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100 V	7	C023B101F103M	56289	
C10	CAPACITOR, CERAMIC, DISC: 4700 pF, 10%, 200 V	1	CK06BX472K	81349	56289
C11	Same as C9				
C12	CAPACITOR, CERAMIC, DISC: 3300 pF, 10%, 200 V	1	CK06BX332K	81349	56289
C13	Same as C9				
C14	Same as C9				
C15	CAPACITOR, CERAMIC, DISC: 0.1 μF 20%, 100 V	8	8131M100-651-104M	72982	
C16	Same as C15				
C17	Same as C15				
C18	CAPACITOR, MICA, DIPPED: 82 pF, 2%, 500 V	1	CM05ED820G03	81349	72136
C19	CAPACITOR, MICA, DIPPED: 620 pF, 2%, 500 V	1	CM05FD621G03	81349	72136
C20	Same as C9				
C21	CAPACITOR, MICA, DIPPED: 330 pF, 20%, 500 V	1	CM05FD331G03	81349	72136
C22	CAPACITOR, MICA, DIPPED: 430 pF, 5%, 500 V	1	DM15-431J	72136	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C23	CAPACITOR, CERAMIC, DISC: 150 pF, 5%, 50 V	1	1U150RJ	93958	
C24	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C25	Same as C9				
C26	CAPACITOR, CERAMIC, DISC: 2200 pF, 10%, 200 V	1	CK06BX222K	81349	56289
C27	Same as C9				
C28	Same as C15				
C29	CAPACITOR, CERAMIC, DISC: .0 68 μF, 10%, 100 V	1	CK06BX683K	81349	56289
C30	Same as C1				
C31	Same as C15				
C32	Same as C1				
C33	Same as C15				
C34	Same as C15				
C35	Same as C1				
C36	Same as C15				
CR1	DIODE	2	1N4446	80131	93332
CR2	Same as CR1				
CR3	DIODE	1	1N462A	80131	93332
L1	COIL, FIXED, MOLD: 24 μH	1	1537-46	99800	
L2	COIL, FIXED, MOLD: 27 μH	2	1025-54	99800	
L3	COIL, FIXED: 1.2 mH	1	553-3635-38	71279	
L4	COIL, FIXED: 12 μH	1	1537-38	99800	
L5	COIL, FIXED: 3.3 μH	1	1537-24	99800	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L6	COIL, VARIABLE: 135-165 μH	1	558-7107-39	71279	
L7	COIL, FIXED: 22 mH	2	553-3635-53	71279	
L8	Same as L7				
L9	Same as L2				
Q1	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 200 Ω, 5%, 1/4 W	2	RCR07G201JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 270 Ω, 5%, 1/4 W	1	RCR07G274JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	1	RCR07G474JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	3	RCR07G101JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	2	RCR07G221JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	1	RCR07G472JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 3.0 kΩ, 5%, 1/4 W	1	RCR07G302JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	2	RCR07G102JS	81349	01121
R9	Same as R8				
R10	RESISTOR, FIXED, COMPOSITION: 510 Ω, 5%, 1/4 W	2	RCR07G511JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4 W	1	RCR07G682JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	6	RCR07G103JS	81349	01121
R13	Same as R12				
R14	Same as R12				
R15	Same as R4				
R16	RESISTOR, FIXED, COMPOSITION: 56 Ω, 5%, 1/4 W	1	RCR07G560JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 820 Ω, 5%, 1/4 W	1	RCR07G821JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R18	Same as R4				
R19	Same as R1				
R20	RESISTOR, FIXED, COMPOSITION: 4.3 kΩ, 5%, 1/4 W	1	RCR07G432JS	81349	01121
R21	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R22	RESISTOR, FIXED, COMPOSITION: 43 kΩ, 5%, 1/4 W	1	RCR07G433JS	81349	01121
R23	Same as R12				
R24	RESISTOR, FIXED, COMPOSITION: 20 kΩ, 5%, 1/4 W	1	RCR07G203JS	81349	01121
R25	RESISTOR, FIXED, COMPOSITION: 560kΩ , 5%, 1/4 W	1	RCR07G564JS	81349	01121
R26	RESISTOR, VARIABLE, FILM: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R27	Same as R10				
R28*	RESISTOR, FIXED, COMPOSITION: 16 kΩ, 5%, 1/4 W	1	RCR07G163JS	81349	01121
R29	Same as R5				
R30	Same as R12				
R31	Not Used				
R32	RESISTOR, FIXED, FILM: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	75042
R33	Same as R32				
R34	RESISTOR, FIXED, COMPOSITION 3.9 kΩ, 5%, 1/4 W	1	RCR07G392JS	81349	01121
R35	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R36	Same as R12				
T1	TRANSFORMER	1	30705-13	14632	
U1	INTEGRATED CIRCUIT	1	796HC	07263	
U2	INTEGRATED CIRCUIT	1	MC1355P	04713	

* Nominal Value, Final Value Factory Selected.

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
U3	INTEGRATED CIRCUIT	1	MC1439G	04713	
VR1	DIODE, ZENER: 6.8 V	1	1N754A	80131	04713
Y1	CRYSTAL, QUARTZ	1	96402-2	14632	

5.4.7.16 Type 791205-1 FM Limiter/Discriminator (10 KHz BW) REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	8	C023B101 502M	56289	
C2	CAPACITOR, CERAMIC, TUBULAR: 2.7 pF ± 0.25 pF, 500 V	1	301-000C0E0-279C	72982	
C3	Same as C1				
C4	CAPACITOR, MICA, DIPPED: 27 pF, 2%, 500 V	2	CM05ED270G03	81349	72136
C5	Same as C4				
C6	Same as C1				
C7	Same as C1				
C8	Same as C1				
C9	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100 V	7	C023B101F103M	56289	
C10	CAPACITOR, CERAMIC, DISC: 4700 pF, 10%, 200 V	1	CK06BX472K	81349	56289
C11	Same as C9				
C12	CAPACITOR, CERAMIC, DISC: 3300 pF, 10%, 200 V	1	CK06BX332K	81349	56289
C13	Same as C9				
C14	Same as C9				
C15	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	8	8131M100-651-104M	72982	
C16	Same as C15				
C17	Same as C15				
C18	CAPACITOR, MICA, DIPPED: 82 pF, 2%, 500 V	1	CM05ED820G03	81349	72136
C19	CAPACITOR, MICA, DIPPED: 620 pF, 2%, 500 V	1	CM06FD621G03	81349	72136
C20	Same as C9				
C21	CAPACITOR, MICA, DIPPED: 330 pF, 2%, 500 V	1	CM05FD331G03	81349	72136
C22	CAPACITOR, MICA, DIPPED: 430 pF, 5%, 500 V	1	DM15-431J	72136	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C23	CAPACITOR, CERAMIC, DISC: 150 pF, 5%, 50 V	1	1U150RJ	93958	
C24	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C25	Same as C9				
C26	CAPACITOR, CERAMIC, DISC: 2200 pF, 10%, 200 V	1	CK06BX222K	81349	56289
C27	Same as C9				
C28	Same as C15				
C29	CAPACITOR, CERAMIC, DISC: .068 μF, 10%, 100 V	1	CK06BX683K	81349	56289
C30	Same as C1				
C31	Same as C15				
C32	Same as C1				
C33	Same as C15				
C34	Same as C15				
C35	Same as C1				
C36	Same as C15				
CR1	DIODE	2	1N4446	80131	93332
CR2	Same as CR1				
CR3	DIODE	1	1N462A	80131	93332
L1	COIL, FIXED, MOLD: 24 μH	1	1537-46	99800	
L2	COIL, FIXED, MOLD: 27 μH	2	1025-54	99800	
L3	COIL, FIXED: 1.2 mH	1	553-3635-38	71279	
L4	COIL, FIXED: 12 μH	1	1537-38	99800	
L5	COIL, FIXED: 3.3 μH	1	1537-24	99800	

REF DESIG PREFIX A6AX

EF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L6	COIL, VARIABLE: 135-165 μH	1	558-7107-39	71279	
L7	COIL, FIXED: 22 mH	1	553-3635-53	71279	
L8	COIL, FIXED: 15 mH	1	553-3635-51	71279	
L9	Same as L2				
Q1	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 200 Ω, 5%, 1/4 W	2	RCR07G201JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 270 kΩ, 5%, 1/4 W	1	RCR07G274JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 470 kΩ 5%, 1/4 W	1	RCR07G474JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5% 1/4 W	3	RCR07G101JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	1	RCR07G221JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 3.0 kΩ, 5%, 1/4 W	1	RCR07G302JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	2	RCR07G102JS	81349	01121
R9	Same as R8				
R10	RESISTOR, FIXED, COMPOSITION: 510 Ω, 5%, 1/4 W	4	RCR07G511JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4 W	1	RCR07G682JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	6	RCR07G103JS	81349	01121
R13	Same as R12				
R14	Same as R12				
R15	Same as R4				
R16	RESISTOR, FIXED, COMPOSITION: 56 Ω, 5%, 1/4 W	1	RCR07G560JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 820 Ω, 5%, 1/4 W	1	RCR07G821JS	81349	01121

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R18	Same as R4				
R19	Same as R1				
R20	RESISTOR, FIXED, COMPOSITION: 4.3 kΩ, 5%, 1/4 W	1	RCR07G432JS	81349	01121
R21	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R22	RESISTOR, FIXED, COMPOSITION: 43 kΩ, 5% 1/4 W	1	RCR07G433JS	81349	01121
R23	Same as R12				
R24	RESISTOR, FIXED, COMPOSITION: 20 kΩ, 5%, 1/4 W	1	RCR07G203JS	81349	01121
R25	RESISTOR, FIXED, COMPOSITION: 560 kΩ, 5%, 1/4 W	1	RCR07G564JS	81349	01121
R26	RESISTOR, VARIABLE, FILM: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R27	Same as R10				
R28*	RESISTOR, FIXED, COMPOSITION: 16 kΩ, 5%, 1/4 W	1	RCR07G163JS	81349	01121
R29	Same as R10				
R30	Same as R12				
R31	Not Used				
R32	RESISTOR, FIXED, FILM: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	75042
R33	Same as R32				
R34	Same as R6				
R35	Same as R10				
R36	Same as R12				
T1	TRANSFORMER	1	30705-13	14632	
U1	INTEGRATED CKT	1	796HC	07263	
U2	INTEGRATED CKT	1	MC1355P	04713	

* Nominal Value, Final Value Factory Selected.

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
U3	INTEGRATED CKT	1	MC1439G	04713	
VR1	DIODE, ZENER: 6.8 V	1	1N754A	80131	04713
Y1	CRYSTAL, QUARTZ	1	96402-2	14632	

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	8	C023B101E502M	56289	
C2	CAPACITOR, CERAMIC, TUBULAR: 2.7 pF ± 0.25 pF, 500 V	1	301-000C0J0-279C	72982	
C3	Same as C1				
C4	CAPACITOR, MICA, DIPPED: 27 pF, 2%. 500 V	2	CM05ED270G03	81349	72136
C5	Same as C4				
C6	Same as C1				
C7	Same as C1				
C8	Same as C1				
C9	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100 V	7	C023B101F103M	56289	
C10	CAPACITOR, CERAMIC, DISC: 4700 pF, 10%, 200 V	1	CK06BX472K	81349	
C11	Same as C9				
C12	CAPACITOR, CERAMIC, DISC: 330 pF, 10%, 200 V	1	CK06BX332K	81349	56289
C13	Same as C9				
C14	Same as C9				
C15	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	7	8131M100-651-104M	72982	
C16	Same as C15				
C17	Same as C15				
C18	CAPACITOR, MICA, DIPPED: 82 pF, 2%, 500 V	1	CM05ED820G03	81349	72136
C19	CAPACITOR, MICA, DIPPED: 620 pF, 2%, 500 V	1	CM06FD621G03	81349	72136
C20	Same as C9				
C21	CAPACITOR, MICA, DIPPED: 330 pF, 2%, 500 V	1	CM05FD331G03	81349	72136
C22	CAPACITOR, MICA, DIPPED: 430 pF, 5%, 500 V	1	DM15-431J	72136	

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C23	CAPACITOR, CERAMIC, DISC: 150 pF, 5%, 50 V	1	1U150RJ	93958	
C24	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C25	Same as C9				
C26	CAPACITOR, CERAMIC, DISC: 2200 pF, 10%, 200 V	1	CK06BX222K	81349	
C27	Same as C9				
C28	CAPACITOR, CERAMIC, DISC: .047 μF, 10%, 100 V	1	CK06BX473K	81349	56289
C29	CAPACITOR, CERAMIC, DISC: .033 μF, 10%, 100 V	1	CK06BX333K	81349	56289
C30	Same as C1				
C31	Same as C15				
C32	Same as C1				
C33	Same as C15				
C34	Same as C15				
C35	Same as C1				
C36	Same as C15				
CR1	DIODE	2	1N4446	80131	9333
CR2	Same as CR1				
CR3	DIODE	1	1N462A	80131	9333
L1	COIL, FIXED, MOLD: 24 μH	1	1537-46	99800	
L2	COIL, FIXED, MOLD: 27 μH	2	1025-54	99800	
L3	COIL, FIXED: 1.2 mH	1	553-3635-38	71279	
L4	COIL, FIXED: 12 μH	1	1537-38	99800	
L5	COIL, FIXED: 3.3 μH	1	1537-24	99800	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L6	COIL, VARIABLE: 135-165 μH	1	558-7107-39	71279	
L7	COIL, FIXED: 10 mH	1	553-3635-49	71279	
L8	COIL, FIXED: 6.8 mH	1	553-3635-47	71279	
L9	Same as L2				
Q1	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 200 Ω, 5%, 1/4 W	2	RCR07G201JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 270 kΩ, 5%, 1/4 W	1	RCR07G274JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 470 kΩ, 5%, 1/4 W	1	RCR07G474JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	3	RCR07G101JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 220 Ω 5%, 1/4 W	1	RCR07G221JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	1	RCR07G472JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 3.0 kΩ, 5%, 1/4 W	2	RCR07G302JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	2	RCR07G102JS	81349	01121
R9	Same as R8				
R10	RESISTOR, FIXED, COMPOSITION: 510 Ω, 5%, 1/4 W	3	RCR07G511JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4 W	1	RCR07G682JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	6	RCR07G103JS	81349	01121
R13	Same as R12				
R14	Same as R12				
R15	Same as R4				
R16	RESISTOR, FIXED, COMPOSITION: 56 Ω, 5%, 1/4 W	1	RCR07G560JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 820 Ω, 5%, 1/4 W	1	RCR07G821JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R18	Same as R4				
R19	Same as R1				
R20	RESISTOR, FIXED, COMPOSITION: 4.3 kΩ, 5%, 1/4 W	1	RCR07G432JS	81349	01121
R21	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R22	RESISTOR, FIXED, COMPOSITION: 43 kΩ, 5%, 1/4 W	1	RCR07G433JS	81349	01121
R23	Same as R12				
R24	RESISTOR, FIXED, COMPOSITION: 20 kΩ, 5%, 1/4 W	1	RCR07G203JS	81249	01121
R25	RESISTOR, FIXED, COMPOSITION: 560 kΩ, 5%, 1/4 W	1	RCR07G564JS	81349	01121
R26	RESISTOR, VARIABLE, FILM: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R27	Same as R10				
R28*	Same as R7				
R29	Same as R10				
R30	Same as R12				
R31	Not Used				
R32	RESISTOR, FIXED, FILM: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	75042
R33	Same as R32				
R34	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4 W	1	RCR07G222JS	81349	01121
R35	RESISTOR, FIXED, COMPOSITION: 560 Ω, 5%, 1/4 W	1	RCR07G561JS	81349	01121
R36	Same as R12				
T1	TRANSFORMER	1	30705-13	14632	
U1	INTEGRATED CKT	1	796HC	07263	
U2	INTEGRATED CKT	1	MC1355P	04713	

*Nominal value, final value factory sel[illegible]ed.

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
U3	INTEGRATED CKT	1	MC1439G	04713	
VR1	DIODE, ZENER: 6.8 V	1	1N754A	80131	04713
Y1	CRYSTAL, QUARTZ	1	96402-2	14632	

.4.7.18 TYPE 791205-3 FM Limiter/Discriminator (50 KHz) REF DESIG PREFIX A6AX

EF SIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000pF, 20%, 100 V	8	C023B101E502M	56289	
C2	CAPACITOR, CERAMIC, TUBULAR: 2.7 pF ± 0.25 pF, 500 V	1	301-000C0J0-279C	72982	
C3	Same as C1				
C4	CAPACITOR, MICA, DIPPED: 27 pF, 2%, 500 V	2	CM05ED270G03	81349	72136
C5	Same as C4				
C6 Thru C8	Same as C1				
C9	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100 V	7	C023B101F103M	56289	
C10	CAPACITOR, CERAMIC, DISC: 4700 pF, 10%, 200 V	1	CK06BX472K	81349	56289
C11	Same as C9				
C12	CAPACITOR, CERAMIC, DISC: 3300 pF, 10%, 200 V	1	CK06BX332K	81349	56289
C13	Same as C9				
C14	Same as C9				
C15	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	7	8131M100-651-104M	72982	
C16	Same as C15				
C17	Same as C15				
C18	CAPACITOR, MICA, DIPPED: 82 pF, 2%, 500 V	1	CM05ED820G03	81349	72136
C19	CAPACITOR, MICA, DIPPED: 620 pF, 2%, 500 V	1	CM06FD621G03	81349	72136
C20	Same as C9				
C21	CAPACITOR, MICA, DIPPED: 330 pF, 2%, 500 V	1	CM05FD331G03	81349	72136
C22	CAPACITOR, MICA, DIPPED: 430 pF, 5%, 500 V	1	DM15-431J	72136	

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C23	CAPACITOR, CERAMIC, DISC: 150 pF, 5%, 50 V	1	1U150RJ	93958	
C24	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C25	Same as C9				
C26	CAPACITOR, CERAMIC, DISC: 2200 pF, 10%, 200 V	1	CK06BX222K	81349	56289
C27	Same as C9				
C28	CAPACITOR, CERAMIC, DISC: .015 µF, 10%, 100 V	1	CK06BX153K	81349	56289
C29	CAPACITOR, CERAMIC, DISC: .012 µF, 10%, 100 V	1	CK06BX123K	81349	56289
C30	Same as C1				
C31	Same as C15				
C32	Same as C1				
C33	Same as C15				
C34	Same as C15				
C35	Same as C1				
C36	Same as C15				
CR1	DIODE	2	1N4446	80131	93332
CR2	Same as CR1				
CR3	DIODE	1	1N462A	80131	93332
L1	COIL, FIXED, MOLD: 24 µH	1	1537-46	99800	
L2	COIL, FIXED, MOLD: 27 µH	2	1025-54	99800	
L3	COIL, FIXED: 1.2 mH	1	553-3635-38	71279	
L4	COIL, FIXED: 12 µH	1	1537-38	99800	
L5	COIL, FIXED: 3.3 µH	1	1537-24	99800	

REF DESIG PREFIX A6AX

EF SIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L6	COIL, VARIABLE: 135-165 μH	1	558-7107-39	71279	
L7	COIL, FIXED: 4.7 mH	1	553-3635-45	71279	
L8	COIL, FIXED: 3.3 mH	1	553-3635-43	71279	
L9	Same as L2				
Q1	TRANSISTOR	1	2N3478	80131	34156
R1	RESISTOR, FIXED, COMPOSITION: 200 Ω, 5%, 1/4 W	2	RCR07G201JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 270 kΩ, 5%, 1/4 W	1	RCR07G274JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 470 kΩ, 5%, 1/4 W	1	RCR07G474JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	3	RCR07G101JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	1	RCR07G221JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	1	RCR07G472JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 3.0 kΩ, 5%, 1/4 W	1	RCR07G302JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	3	RCR07G102JS	81349	01121
R9	Same as R8				
R10	RESISTOR, FIXED, COMPOSITION: 510 Ω, 5%, 1/4 W	4		81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4 W	1		81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	6		81349	01121
R13	Same as R12				
R14	Same as R12				
R15	Same as R4				
R16	RESISTOR, FIXED, COMPOSITION: 56 Ω, 5%, 1/4 W	1	RCR07G560JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 820 Ω, 5%, 1/4 W	1	RCR07G821JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R18	Same as R4				
R19	Same as R1				
R20	RESISTOR, FIXED, COMPOSITION: 4.3 Ω, 5%, 1/4 W	1	RCR07G432JS	81349	01121
R21	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R22	RESISTOR, FIXED, COMPOSITION: 43 kΩ, 5%, 1/4 W	1	RCR07G433JS	81349	01121
R23	Same as R12				
R24	RESISTOR, FIXED, COMPOSITION: 20 kΩ, 5%, 1/4 W	1	RCR07G203JS	81349	01121
R25	RESISTOR, FIXED, COMPOSITION: 560 kΩ, 5%, 1/4 W	1	RCR07G564JS	81349	01121
R26	RESISTOR, VARIABLE, FILM: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R27	Same as R10				
R28*	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
R29	Same as R8				
R30	Same as R12				
R31	Not Used				
R32	RESISTOR, FIXED, FILM: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	75042
R33	Same as R32				
R34	Same as R10				
R35	Same as R10				
R36	Same as R12				
T1	TRANSFORMER	1	30705-13	14632	
U1	INTEGRATED CIRCUIT	1	796HC	07263	
U2	INTEGRATED CIRCUIT	1	MC1355P	04713	

*Nominal value, final value factory selected.

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
U3	INTEGRATED CIRCUIT	1	MC1439G	04713	
VR1	DIODE, ZENER: 6.8 V	1	1N754A	80131	04713
Y1	CRYSTAL, QUARTZ	1	96402-2	14632	

5.4.7. TYPE 791331 FM Limiter/Discriminator (100 KHz BW)

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	1	SM(1000pF, P)	91418	
C2	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	6	C023B101E502M	56289	
C3	Same as C2				
C4	Same as C2				
C5	Same as C2				
C6	CAPACITOR, MICA, DIPPED: 24 pF, 5%, 500 V	1	CM05ED240J03	81349	72136
C7	Not Used				
C8	CAPACITOR, VARIABLE, CERAMIC: 2-8 pF, 350 V	1	538-006A2-8	72982	
C9	CAPACITOR, CERAMIC, TUBULAR: 18 pF, 5%, 500 V	1	301-000C0G0-180J	72982	
C10	CAPACITOR, VARIABLE, AIR: 0.8-10.0 pF, 250 V	1	5201	91293	
C11	Same as C2				
C12	CAPACITOR, MICA, DIPPED: 56 pF, 2%, 500 V	1	CM05ED560G03	81349	72136
C13	Same as C2				
C14	CAPACITOR, CERAMIC, TUBULAR: 18 pF, 5%, 500 V, N750	1	301-000U2J0-180J	72982	
C15	CAPACITOR, MICA, DIPPED: 27 pF, 2%, 500 V	1	CM05ED270G03	81349	72136
C16	CAPACITOR, CERAMIC, DISC: 0.01 μF, 10%, 200 V	3	CK06BX103K	81349	56289
C17	Same as C16				
C18	Same as C16				
C19	CAPACITOR, MICA, DIPPED: 6200pF, 5%, 300 V	1	DM19-622J	72136	
C20	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	2	8131M100-651-104M	72982	
C21	Same as C20				
C22	Not Used				

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C23	Not Used				
C24	CAPACITOR, CERAMIC, DISC: 2200 pF, 20%, 1000 V	1	JF(2200 pF, M)	91418	
CR1	DIODE	2	1N4446	80131	93332
CR2	Same as CR1				
L1	COIL, FIXED	1	20681-124	14632	
L2	COIL, FIXED: 18 μH	1	1537-42	99800	
L3	COIL, FIXED: 2.2 mH	1	553-3635-41	71279	
L4	COIL, FIXED, MOLD: 1800 μH	1	2500-40	99800	
R1	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	2	RCR07G221JS	81349	01121
R2	Same as R1				
R3	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	1	RCR07G100JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4 W	1	RCR07G303JS	81349	01121
R6	Not Used				
R7	RESISTOR, FIXED, COMPOSITION: 16 kΩ, 5%, 1/4 W	3	RCR07G163JS	81349	01121
R8	Same as R7				
R9	RESISTOR, VARIABLE, FILM: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R10	RESISTOR, FIXED, FILM: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	75042
R11	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	4	RCR07G103JS	81349	01121
R12	Same as R11				
R13	Same as R10				
R14	Same as R11				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R15	RESISTOR, FIXED, COMPOSITION: 510 Ω, 5%, 1/4 W	1	RCR07G511JS	81349	01121
R16*	Same as R7				
R17	Same as R11				
R18	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	2	RCR07G102JS	81349	01121
R19	Same as R18				
T1	TRANSFORMER	1	21427-36	14632	
U1	INTEGRATED CKT	1	CA3011	02735	
U2	INTEGRATED CKT	1	MC1439G	04713	
VR1	DIODE, ZENER: 3.3 V	1	1N746A	80131	04713
VR2	DIODE, ZENER: 5.1 V	1	1N751A	80131	04713

*Nominal value, final value factory selected.

5.4.7.20 TYPE 791338 FM Limiter/Discriminator (200 KHz BW)

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	1	SM(1000pF, P)	91418	
C2	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	6	C023B101E502M	56289	
C3 Thru C5	Same as C2				
C6	CAPACITOR, MICA, DIPPED: 24 pF, 5%, 500 V	1	CM05ED240J03	81349	72136
C7	Not Used				
C8	CAPACITOR, VARIABLE, CERAMIC: 2-8 pF, 350 V	1	538-006A2-8	72982	
C9	CAPACITOR, CERAMIC, TUBULAR: 8.2 pF ± 0.5 pF, 500 V	1	301-000C0H0-829D	72982	
C10	CAPACITOR, VARIABLE, AIR: 0.8-10.0 pF, 250 V	1	5201	91293	
C11	Same as C2				
C12	CAPACITOR, MICA, DIPPED: 56 pF, 2%, 500 V	1	CM05ED560G03	81349	72136
C13	Same as C2				
C14	CAPACITOR, CERAMIC, TUBULAR: 18 pF, 5%, 500 V, N750	1	301-000U2J0-180J	72982	
C15	CAPACITOR, MICA, DIPPED: 27 pF, 2%, 500 V	1	CM05ED270G03	81349	72136
C16	CAPACITOR, CERAMIC, DISC: 0.01 μF, 10%, 200 V	2	CK06BX103K	81349	56289
C17	Same as C16				
C18	CAPACITOR, CERAMIC, DISC: 4700 pF, 10%, 200 V	1	CK06BX472K	81349	56289
C19	CAPACITOR, CERAMIC, DISC: 3300 pF, 10%, 200 V	1	CK06BX332K	81349	56289
C20	CAPACITOR, CERAMIC, DISC: 0.1 μF, 2%, 100 V	2	8131M100-651-104M	72982	
C21	Same as C20				
C22	Not Used				

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C23	Not Used				
C24	CAPACITOR, CERAMIC, DISC: 2200 pF, 20%, 1000 V	1	JF(2200pF, M)	91418	
CR1	DIODE	2	1N4446	80131	93332
CR2	Same as CR1				
L1	COIL, FIXED	1	20681-124	14632	
L2	COIL, FIXED: 1.8 μH	1	1537-42	99800	
L3	COIL, FIXED, MOLD: 1000 μH	1	2500-28	99800	
L4	COIL, FIXED, MOLD: 750 μH	1	2500-22	99800	
R1	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	2	RCR07G221JS	81349	01121
R2	Same as R1				
R3	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	1	RCR07G100JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4 W	1	RCR07G303JS	81349	01121
R6	Not Used				
R7	RESISTOR, FIXED, COMPOSITION: 16 kΩ, 5%, 1/4 W	2	RCR07G163JS	81349	01121
R8	Same as R7				
R9	RESISTOR, VARIABLE, FILM: 5kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R10	RESISTOR, FIXED, FILM: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	75042
R11	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	4	RCR07G103JS	81349	01121
R12	Same as R11				
R13	Same as R10				
R14	Same as R11				

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R15	RESISTOR, FIXED, COMPOSITION: 510 Ω, 5%, 1/4 W	1	RCR07G511JS	81349	01121
R16*	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4 W	1	RCR07G223JS	81349	01121
R17	Same as R11				
R18	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	2	RCR07G102JS	81349	01121
R19	Same as R18				
R20	RESISTOR, FIXED, COMPOSITION: 240 Ω, 5%, 1/4 W	1	RCR07G241JS	81349	01121
R21	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
T1	TRANSFORMER	1	21427-36	14632	
U1	INTEGRATED CIRCUIT	1	CA3011	02735	
U2	INTEGRATED CIRCUIT	1	MC1439G	04713	
VR1	DIODE, ZENER: 3.3 V	1	1N746A	80131	04713
VR2	DIODE, ZENER: 5.1 V	1	1N751A	80131	04713

*Nominal value, final value fac[illegible]y selected.

5.4.7.21 TYPE 791366 FM Limiter/Discriminator (300 KHz BW)

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	1	SM(1000pF, P)	91418	
C2	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	6	C023B101E502M	56289	
C3	Same as C2				
C4	Same as C2				
C5	Same as C2				
C6	CAPACITOR, CERAMIC, TUBULAR: 2.2 pF, ± 0.25 pF, 500 V	1	301-000C0J0-229C	72982	
C7	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF ± 0.25 pF, 500 V, N750	1	301-000U2J0-479C	72982	
C8	CAPACITOR, VARIABLE, CERAMIC: 2-8 pF, 350 V	1	538-006A2-8	72982	
C9	CAPACITOR, CERAMIC, TUBULAR: 8.2 pF ± 0.5 pF, 500 V	1	301-000C0H0-829D	72982	
C10	CAPACITOR, VARIABLE, AIR: 0.8-10.0 pF, 250 V	1	5201	91293	
C11	Same as C2				
C12	CAPACITOR, MICA, DIPPED: 30 pF, 2%, 500 V	1	CM05ED300G03	81349	72136
C13	Same as C2				
C14	CAPACITOR, CERAMIC, TUBULAR: 15 pF, 5%, 500 V, N750	1	301-000U2J0-150J	72982	
C15	CAPACITOR, MICA, DIPPED: 27 pF, 2%, 500 V	1	CM05ED270G03	81349	72136
C16	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100 V	2	C023B101F103M	56289	
C17	Same as C16				
C18	CAPACITOR, MICA, DIPPED: 2200 pF, 2%, 500 V	1	CM06FD222G03	81349	72136
C19	CAPACITOR, MICA, DIPPED: 2000 pF, 2%, 500 V	1	CM06FD202G03	81349	72136
C20	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	2	8131M100-651-104M	72982	
C21	Same as C20				
C22	Not Used				

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C23	Not Used				
C24	CAPACITOR, CERAMIC, DISC: 2200 pF, 20%, 1000 V	1	JF(2200pF,M)	91418	
CR1	DIODE	2	1N4446	80131	93332
CR2	Same as CR1				
L1	COIL, FIXED	1	20681-152	14632	
L2	COIL, FIXED: 18 μH	1	1537-42	99800	
L3	COIL, FIXED, MOLD: 750 μH	1	2500-22	99800	
L4	COIL, FIXED, MOLD: 470 μH	1	2500-12	99800	
R1	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	1	RCR07G221JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	1	RCR07G470JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	1	RCR07G100JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4 W	1	RCR07G303JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 20 kΩ, 5%, 1/4 W	1	RCR07G203JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 16 kΩ, 5%, 1/4 W	2	RCR07G163JS	81349	01121
R8	Same as R7				
R9	RESISTOR, VARIABLE, FILM: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R10	RESISTOR, FIXED, FILM: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	75042
R11	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	4	RCR07G103JS	81349	01121
R12	Same as R11				
R13	Same as R10				
R14	Same as R11				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R15	RESISTOR, FIXED, COMPOSITION: 510 Ω, 5%, 1/4 W	1	RCR07G511JS	81349	01121
R16*	Same as R5				
R17	Same as R11				
R18	RESISTOR, FIXED, COMPOSITION: 750 Ω, 5%, 1/4 W	1	RCR07G751JS	81349	01121
R19	Same as R 18				
R20	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	2	RCR07G471JS	81349	01121
R21	Same as R20				
T1	TRANSFORMER	1	21427-45	14632	
U1	INTEGRATED CKT	1	CA3011	02735	
U2	INTEGRATED CKT	1	MC1439G	04713	
VR1	DIODE, ZENER: 3.3 V	1	1N746A	80131	04713
VR2	DIODE, ZENER: 5.1 V	1	1N751A	80131	04713

*Nominal value, final value factory selected.

5.4.7.22 TYPE 791329 FM Limiter/Discriminator (500KHz BW) REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	1	SM(1000pF, P)	91418	
C2	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	6	C023B101E502M	56289	
C3 Thru C5	Same as C2				
C6*	CAPACITOR, CERAMIC, TUBULAR: 1.5 pF ± 0.1 pF, 500 V	2	301-000C0K0-159B	72982	
C7	CAPACITOR, CERAMIC, TUBULAR: 1.5 pF ± 0.25 pF, 500 V. N470	1	301-000T2K0-159C	72982	
C8	CAPACITOR, VARIABLE, CERAMIC: 2-8 pF, 350 V	1	538-006A2-8	72982	
C9	CAPACITOR, CERAMIC, TUBULAR: 5.1 pF ± 0.5 pF, 500 V	1	301-000C0H0-519D	72982	
C10	CAPACITOR, VARIABLE, AIR: 0.8-10.0 pF, 250 V	1	5201	91293	
C11	Same as C2				
C12	Same as C6				
C13	Same as C2				
C14	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF ± 0.25 pF, 500 V, N750	1	301-000U2J0-479C	72982	
C15	CAPACITOR, CERAMIC, TUBULAR: 22 pF, 5%, 500 V	1	301-000C0G0-220J	72982	
C16	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100 V	2	C023B101F103M	56289	
C17	Same as C16				
C18	CAPACITOR, MICA, DIPPED: 1500 pF, 2%, 500 V	1	CM06FD152G03	81349	72136
C19	CAPACITOR, MICA, DIPPED: 1200 pF, 2%, 500 V	1	CM06FD122G03	81349	72136
C20	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	2	8131M100-651-104M	72982	
C21	Same as C20				
C22	Not Used				

*Nominal value, final value fac[illegible]y selected.

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C23	Not Used				
C24	CAPACITOR, CERAMIC, DISC: 2200 pF, 20%, 1000 V	1	JF(2200pF, M)	91418	
CR1	DIODE	2	5082-2800	28480	
CR2	Same as CR1				
L1	COIL, FIXED	1	20681-40	14632	
L2	COIL, FIXED: 18 μH	1	1537-42	99800	
L3	COIL, FIXED, MOLD: 470 μH	1	2500-12	99800	
L4	COIL, FIXED, MOLD: 330 μH	1	2500-04	99800	
R1	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	1	RCR07G221JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	1	RCR07G470JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	1	RCR07G100JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 18 kΩ, 5%, 1/4 W	1	RCR07G183JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 12 kΩ, 5%, 1/4 W	1	RCR07G123JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4 W	2	RCR07G223JS	81349	01121
R8	Same as R7				
R9	RESISTOR, VARIABLE, FILM: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R10	RESISTOR, FIXED, FILM: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	75042
R11	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	4	RCR07G103JS	81349	01121
R12	Same as R11				
R13	Same as R10				
R14	Same as R11				

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R15	RESISTOR, FIXED, COMPOSITION: 510 Ω, 5%, 1/4 W	1	RCR07G511JS	81349	01121
R16*	RESISTOR, FIXED, COMPOSITION: 43 kΩ, 5%, 1/4 W	1	RCR07G433JS	81349	01121
R17	Same as R11				
R18	Not Used				
R19	Not Used				
R20	RESISTOR, FIXED, COMPOSITION: 910 Ω, 5%, 1/4 W	1	RCR07G911JS	81349	01121
R21	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
T1	TRANSFORMER	1	21427-6	14632	
U1	INTEGRATED CIRCUIT	1	CA3011	02735	
U2	INTEGRATED CIRCUIT	1	MC1439G	04713	
VR1	DIODE, ZENER: 3.3 V	1	1N746A	80131	04713
VR2	DIODE, ZENER: 5.1 V	1	1N751A	80131	04713

*Nominal value, final value fact[illegible] selected.

5.4.7.25 TYPE 791378 FM Limiter/Discriminator (1MHz BW)

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	1	SM(1000pF, P)	91418	
C2	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	6	C023B101E502M	56289	
C3 Thru C5	Same as C2				
C6*	CAPACITOR, CERAMIC, TUBULAR: 1.5 pF ± 0.1 pF, 500 V	2	301-000C0K0-159B	72982	
C7	CAPACITOR, CERAMIC, TUBULAR: 1.5 pF ± 0.25 pF, 500 V, N470	1	301-000T2K0-159C	72982	
C8	CAPACITOR, VARIABLE, CERAMIC: 2-8 pF, 350 V	1	538-006A2-8	72982	
C9	CAPACITOR, CERAMIC, TUBULAR: 5.1 pF ± 0.5 pF, 500 V	1	301-000C0H0-519D	72982	
C10	CAPACITOR, VARIABLE, AIR: 0.8-10.0 pF, 250 V	1	5201	91293	
C11	Same as C2				
C12	Same as C6				
C13	Same as C2				
C14	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF ± 0.25 pF, 500 V, N750	1	301-000U2J0-479C	72982	
C15	CAPACITOR, CERAMIC, TUBULAR: 22 pF, 5%, 500 V	1	301-000C0G0-220J	72982	
C16	CAPACITOR, CERAMIC, DISC: 0.1 μF, 10%, 100 V	2	CK06BX104K	81349	56289
C17	Same as C16				
C18	CAPACITOR, MICA, DIPPED: 620 pF, 2%, 500 V	2	CM06FD621G03	81349	72136
C19	Same as C18				
C20	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	2	8131M100-651-104M	72982	
C21	Same as C20				
C22	Not Used				

*Nominal value, final value factory selected.

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C23	Not Used				
C24	CAPACITOR, MICA, DIPPED: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C25	CAPACITOR, MICA, DIPPED: 1000 pF, 5%, 100 V	1	DM15-102J	72136	
C26	CAPACITOR, CERAMIC, TUBULAR: 15 pF, 5%, 500 V	1	301-000C0G0-150J	72982	
C27	CAPACITOR, CERAMIC, DISC: 470 pF, 20%, 1000 V	1	B(470pF,M)	91418	
CR1	DIODE	2	5082-2800	28480	
CR2	Same as CR1				
L1	COIL, FIXED	1	20681-40	14632	
L2	COIL, FIXED: 18μH	1	1537-42	99800	
L3	COIL, FIXED: 220 μH	1	1537-92	99800	
L4	COIL, FIXED: 160 μH	1	1537-86	99800	
R1	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	1	RCR07G221JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	1	RCR07G470JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	1	RCR07G100JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 18 kΩ, 5%, 1/4 W	1	RCR07G183JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 12 kΩ, 5%, 1/4 W	1	RCR07G123JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4 W	2	RCR07G223JS	81349	01121
R8	Same as R7				
R9	RESISTOR, VARIABLE, FILM: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R10	RESISTOR, FIXED, FILM: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	75042
R11	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	3	RCR07G103JS	81349	01121

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R12	Same as R11				
R13	Same as R10				
R14	Same as R11				
R15	Not Used				
R16	RESISTOR, FIXED, COMPOSITION; 56 kΩ, 5%, 1/4 W	1	RCR07G563JS	81349	01121
R17	Not Used				
R18	Not Used				
R19	Not Used				
R20	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4 W	1	RCR07G222JS	81349	01121
R21	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
T1	TRANSFORMER	1	21427-6	14632	
U1	INTEGRATED CKT	1	CA3011	02735	
U2	INTEGRATED CKT	1	715HC	07253	
VR1	DIODE, ZENER: 3.3 V	1	1N746A	80131	04713
VR2	DIODE, ZENER: 5.1 V	1	1N751A	80131	04713

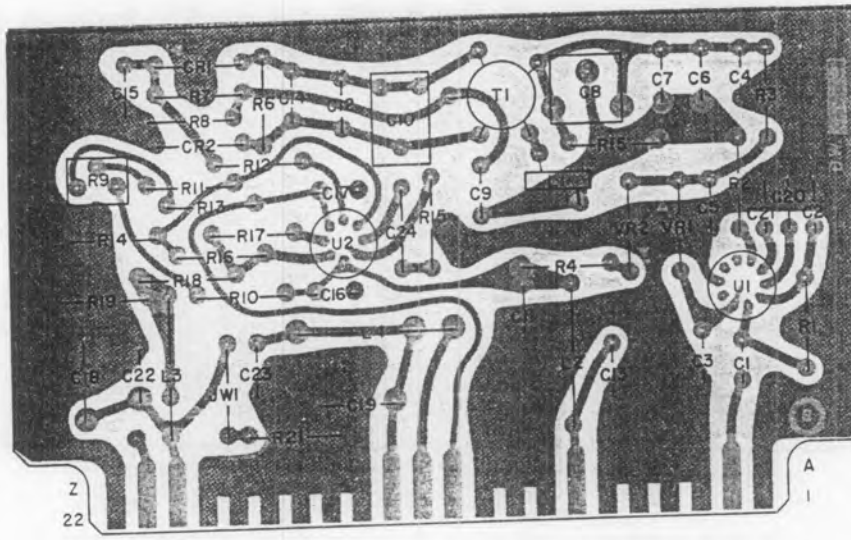


Figure 5-44. Types 791331 (100 kHz BW), 791338 (200 kHz BW), 791366 (300 kHz BW), 791329 (500 kHz BW) and 791378 (1 MHz BW), FM Limiter/Discriminator (A6AX), Location of Components

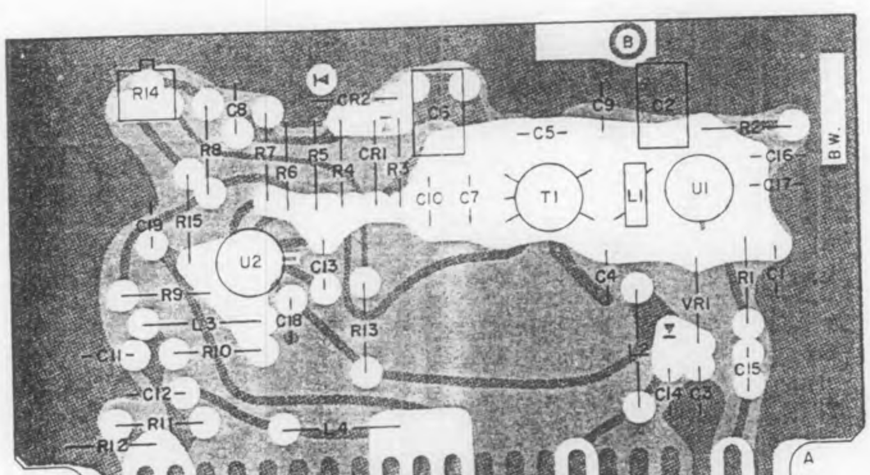


Figure 5-45. Type 791365-(x) (2-, and 3 MHz BW), FM Limiter/Discriminator (A6AX), Location of Components

5.4.7.2.4 Type 791365-2 FM Limiter/Discriminator (2 MH

REF DESIG PREFIX A6A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	6	C023B101E502M	56289	
C2	CAPACITOR, VARIABLE, AIR: 0.8-10.0 pF, 250 V	2	5201	91293	
C3	Same as C1				
C4	Same as C1				
C5	CAPACITOR, CERAMIC, TUBULAR: 18 pF, 5%, 500 V	1	301-000C0G0-180J	72982	
C6	Same as C2				
C7	CAPACITOR, CERAMIC, TUBULAR: 20 pF, 2%, 500 V, N750	1	301-000U2J0-200G	72982	
C8	CAPACITOR, CERAMIC, TUBULAR: 6.8 pF ± 0.25 pF, 500 V	1	301-000C0H0-689C	72982	
C9	Not Used				
C10	Not Used				
C11	CAPACITOR, MICA, DIPPED: 150 pF, 2%, 500 V	1	CM05FD151G03	81349	72136
C12	CAPACITOR, MICA, DIPPED: 300 pF, 2%, 500 V	1	CM05FD301G03	81349	72136
C13	CAPACITOR, MICA, DIPPED: 10 pF ± 0.5 pF, 500 V	1	CM05CD100D03	81349	72136
C14	Same as C1				
C15	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	1	SM(1000pF, P)	91418	
C16	Same as C1				
C17	Same as C1				
C18	CAPACITOR, CERAMIC, DISC: 0.47 μF, 20%, 100 V	2	8131M100-651-474M	72982	
19	Same as C18				
R1	DIODE	2	1N4446	80131	93332
R2	Same as CR1				
1	COIL, TOROIDAL	1	20681-153	14632	

REF DESIG PREFIX A6A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L2	COIL, FIXED: 18 μH	1	1537-42	99800	
L3	COIL, FIXED: 200 μH	1	1537-90	99800	
L4	COIL, FIXED: 75 μH	1	1537-70	99800	
R1	RESISTOR, FIXED, COMPOSITION: 200 Ω, 5%, 1/4 W	1	RCR07G201JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4 W	1	RCR07G152JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4 W	3	RCR07G223JS	81349	01121
R4	Same as R3				
R5	Same as R3				
R6	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	3	RCR07G103JS	81349	01121
R7	Same as R6				
R8	Same as R6				
R9	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4 W	1	RCR07G104JS	81349	01121
R10	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 3.0 kΩ, 5%, 1/4 W	1	RCR07G302JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
R13	RESISTOR, FIXED, FILM: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	75042
R14	RESISTOR, VARIABLE, FILM: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R15	Same as R13				
T1	TRANSFORMER, TOROIDAL	1	21427-46	14632	
U1	INTEGRATED CKT	1	CA3011	02735	
U2	INTEGRATED CKT	1	CA3100T	02735	
VR1	DIODE, ZENER: 8.2 V	1	1N756A	80131	04713

5.4.7.2 TYPE 791365-1 FM Limiter/Discriminator (3 MHz BW)

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	4	C023B101E502M	56289	
C2	CAPACITOR, VARIABLE, AIR: 0.8-10.0 pF, 250 V	2	5201	91293	
C3	Same as C1				
C4	Same as C1				
C5	CAPACITOR, CERAMIC, TUBULAR: 10 pF ± 0.5 pF, 500 V	1	301-000C0H0-100D	72982	
C6	Same as C2				
C7	CAPACITOR, CERAMIC, TUBULAR: 5.6 pF ± 0.25 pF, 500 V, N750	1	301-000U2J0-569C	72982	
C8	CAPACITOR, CERAMIC, TUBULAR: 6.8 pF ± 0.25 pF, 500 V	1	301-000C0H0-689C	72982	
C9	CAPACITOR, CERAMIC, TUBULAR: 6.2 pF ± 0.5 pF, 500 V	1	301-000C0H0-629D	72982	
C10	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF ± 0.25 pF, 500 V, N1500	1	301-000P3K0-479C	72982	
C11	CAPACITOR, MICA, DIPPED: 150 pF, 2%, 500 V	1	CM05FD151G03	81349	72136
C12	CAPACITOR, MICA, DIPPED: 180 pF, 2%, 500 V	1	CM05FD181G03	81349	72136
C13	CAPACITOR, MICA, DIPPED: 10 pF, 0.5 pF, 500 V	1	CM05CD100D03	81349	72136
C14	Same as C1				
C15	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	1	SM(1000pF, P)	91418	
C16	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	2	8131M100-651-104M	72982	
C17	Same as C16				
C18	CAPACITOR, CERAMIC, DISC: 0.47 μF, 20%, 100 V	2	8131M100-651-474M	72982	
C19	Same as C18				
CR1	DIODE	2	1N4446	80131	93332
CR2	Same as CR1				
1	COIL, TOROIDAL	1	20681-153	14632	

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L2	COIL, FIXED: 18 μH	1	1537-42	99800	
L3	COIL, FIXED: 100 μH	1	1537-76	99800	
L4	COIL, FIXED: 47 μH	1	1537-60	99800	
R1	RESISTOR, FIXED, COMPOSITION: 200 Ω, 5%, 1/4 W	1	RCR07G201JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4 W	1	RCR07G152JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	1	RCR07G472JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4 W	2	RCR07G223JS	81349	01121
R5	Same as R4				
R6	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	3	RCR07G103JS	81349	01121
R7	Same as R6				
R8	Same as R6				
R9	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4 W	1	RCR07G104JS	81349	01121
R10	RESISTOR, FIXED, COMPOSITION: 510 Ω, 5%, 1/4 W	1	RCR07G511JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 3.0 kΩ, 5%, 1/4 W	1	RCR07G302JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
R13	RESISTOR, FIXED, FILM: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	75042
R14	RESISTOR, VARIABLE, FILM: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R15	Same as R13				
T1	TRANSFORMER, TOROIDAL	1	21427-47	14632	
U1	INTEGRATED CKT	1	CA3011	02735	
U2	INTEGRATED CKT	1	CA3100T	02735	
VR1	DIODE, ZENER: 8.2 V	1	1N756A	80131	04713

5.4.7.? TYPE 23909-2 IF Mother Board

REF DESIG PREFIX A6A9

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	9	C023B101E502M	56289	
C2 Thru C9	Same as C1				
FB1	FERRITE BEAD	17	56-590-65-4A	02114	
FB2 Thru FB17	Same as FB1				
R1	RESISTOR, FIXED, COMPOSITION: 51 Ω, 5%, 1/4 W	2	RCR07G510JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 1.0 MΩ., 5%, 1/4 W	1	RCR07G105JS	81349	01121
R3	Same as R1				
R4	RESISTOR, FIXED, COMPOSITION: 12 Ω, 5%, 1/4 W	1	RCR07G120JS	81349	01121
XA1	CONNECTOR PRINTED CIRCUIT BOARD	8	252-22-30-240	71785	
XA2 Thru XA8	Same as XA1				

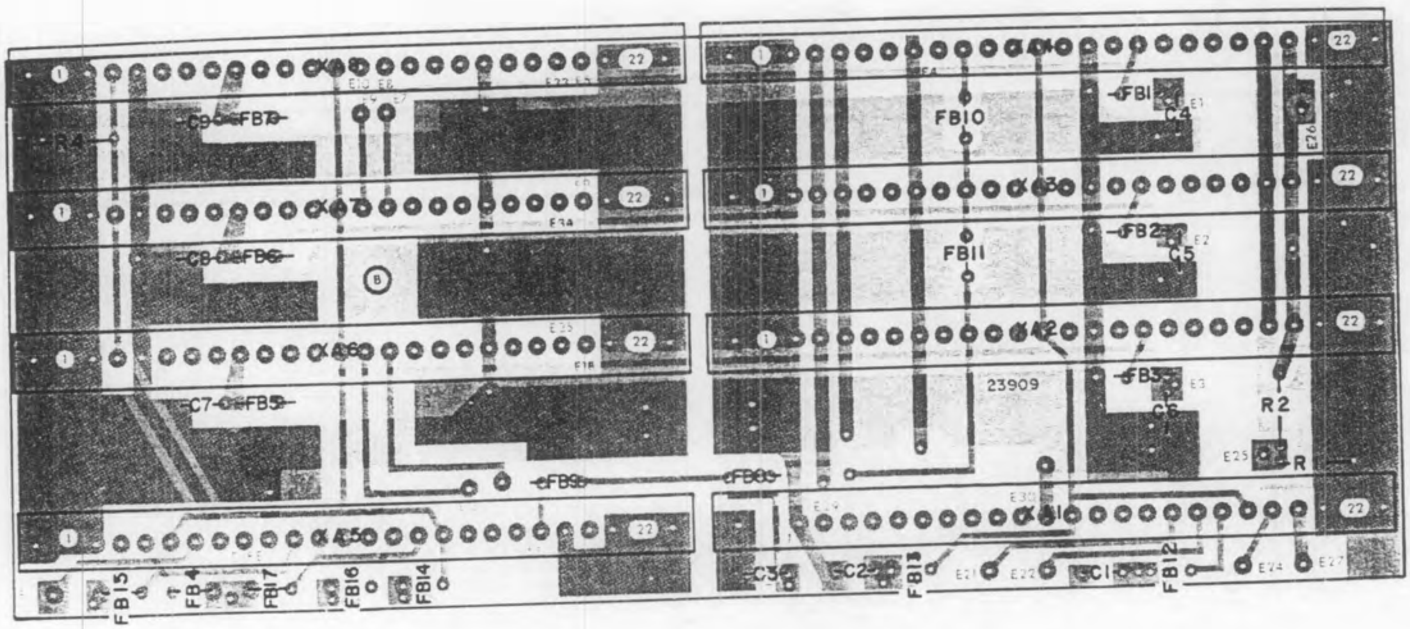


Figure 5-46. Type 23909-2 IF Mother Board (A6A9), Location of Components

5.4.8 TYPE 791495-1 IF Power Divider

REF DESIG PREFIX A7

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	IF POWER DIVIDER	1	18075-1	14632	
C1	CAPACITOR, CERAMIC, FEED-THRU: 0.05μF, GMV, 300 V	2	54-785-005-503P	33095	
C2	Same as C1				
J1	CONNECTOR, RECEPTACLE, SMC SERIES	4	10-0104-002	19505	
J2 Thru J4	Same as J1				

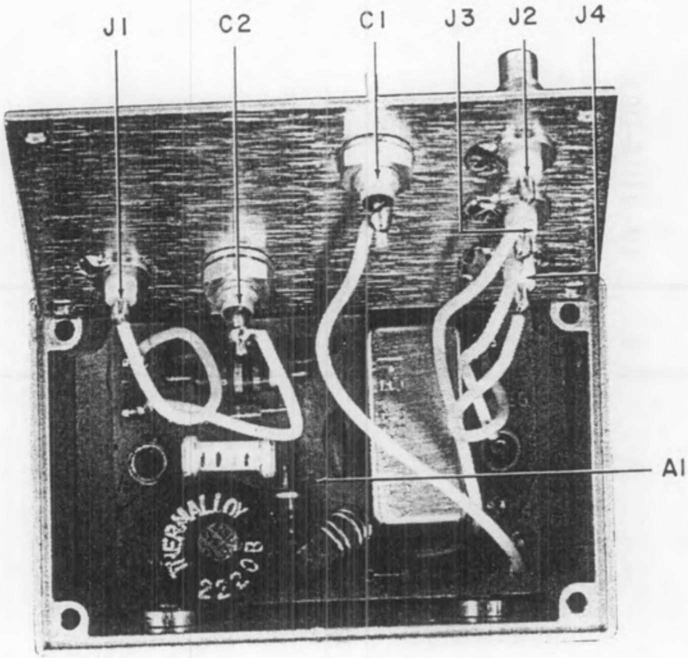


Figure 5-47. Type 791495-1 IF Power Divider (A7), Location of Components

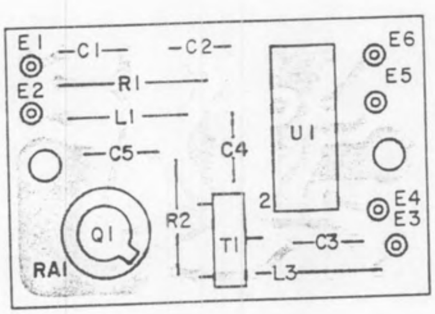


Figure 5-48. Part 18075-1 IF Power Divider (A7A1), Location of Components

5.4.8.1 PART 18075-1 IF Power Divider

REF DESIG PREFIX A7A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	4	C023B101E502M	56289	
C2 Thru C4	Same as C1				
C5	CAPACITOR, CERAMIC, TUBULAR: 5.1 pF ± 0.5 pF, 500 V	1	301-000C0H0-519D	72982	
L1	COIL, FIXED, MOLD: 27 μH	2	1025-54	99800	
L2	Same as L1				
Q1	TRANSISTOR	1	CP643	12498	
R1	RESISTOR, FIXED, WIRE-WOUND: 680Ω, 5%, 1W	1	BW20(680Ω, J)	75042	
R2	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	1	RCR07G472JS	81349	01121
RA1	HEATSINK	1	22208	13103	
T1	TRANSFORMER	1	21428-57	14632	
U1	POWER DIVIDER	1	PSC3-1	15542	

REF DESIG PREFIX A8

5.4.9 TYPE 72465-1 IF Switching Assembly

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, FEED-THRU: .05 µF, GMV, 300 V	5	54-785-005-503P	33095	
C2 Thru C5	Same as C1				
C6	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	7	C023B101E502M	56289	
C7 Thru C10	Same as C6				
C11	CAPACITOR, CERAMIC, STAND-OFF: 1000 pF, GMV, 500 V	5	54-803-003-102W	33095	
C12 Thru C15	Same as C11				
C16	Same as C6				
C17	Same as C6				
CR1	DIODE	5	MPN3401	04713	
CR2 Thru CR5	Same as CR1				
J1	CONNECTOR, RECEPTACLE, SMC SERIES	7	10-0104-002	19505	
J2 Thru J7	Same as J1				
R1	RESISTOR, FIXED, COMPOSITION: 120 Ω, 5%, 1/4 W	5	RCR07G121JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 620 Ω, 5%, 1/4 W	5	RCR07G621JS	81349	01121

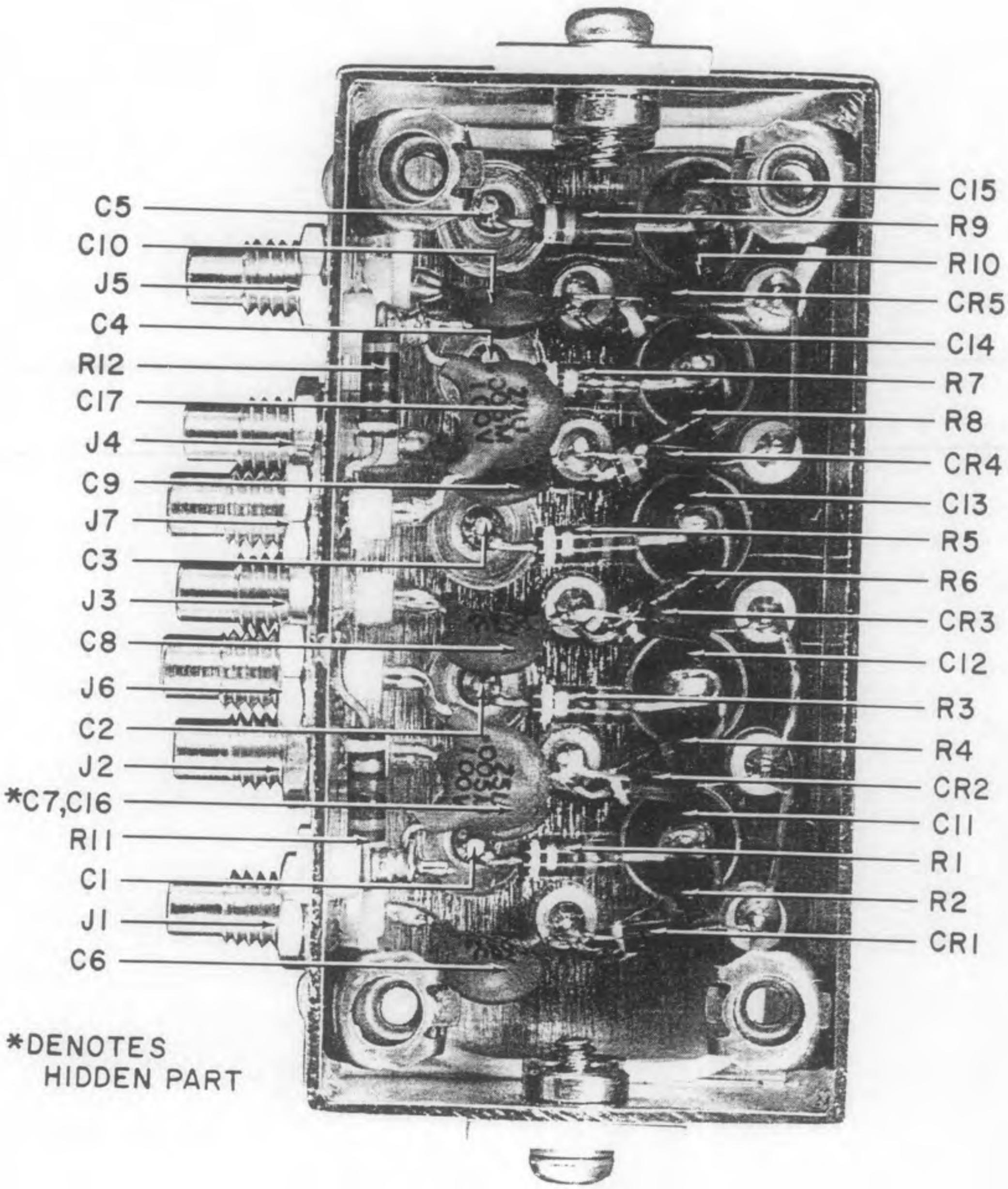


Figure 5-49. Type 7246-1 IF Switching Assembly (A8), Location of Components

REF DESIG PREFIX A8

EF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
3	Same as R1				
4	Same as R2				
5	Same as R1				
6	Same as R2				
7	Same as R1				
8	Same as R2				
9	Same as R1				
10	Same as R2				
11	RESISTOR, FIXED, COMPOSITION: 750 Ω, 5%, 1/4 W	2	RCR07G751JS	81349	01121
12	Same as R11				

REF DESIG PREFIX A9

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	LO DIODE SWITCH AND AMPLIFIER	1	24106-1	14632	
C1	CAPACITOR, CERAMIC, FEED-THRU: .05 μF, GMV, 300 V	6	54-785-005-503P	33095	
C2 Thru C6	Same as C1				
J1	CONNECTOR, RECEPTACLE, SMC SERIES	5	10-0104-002	19505	
J2 Thru J5	Same as J1				

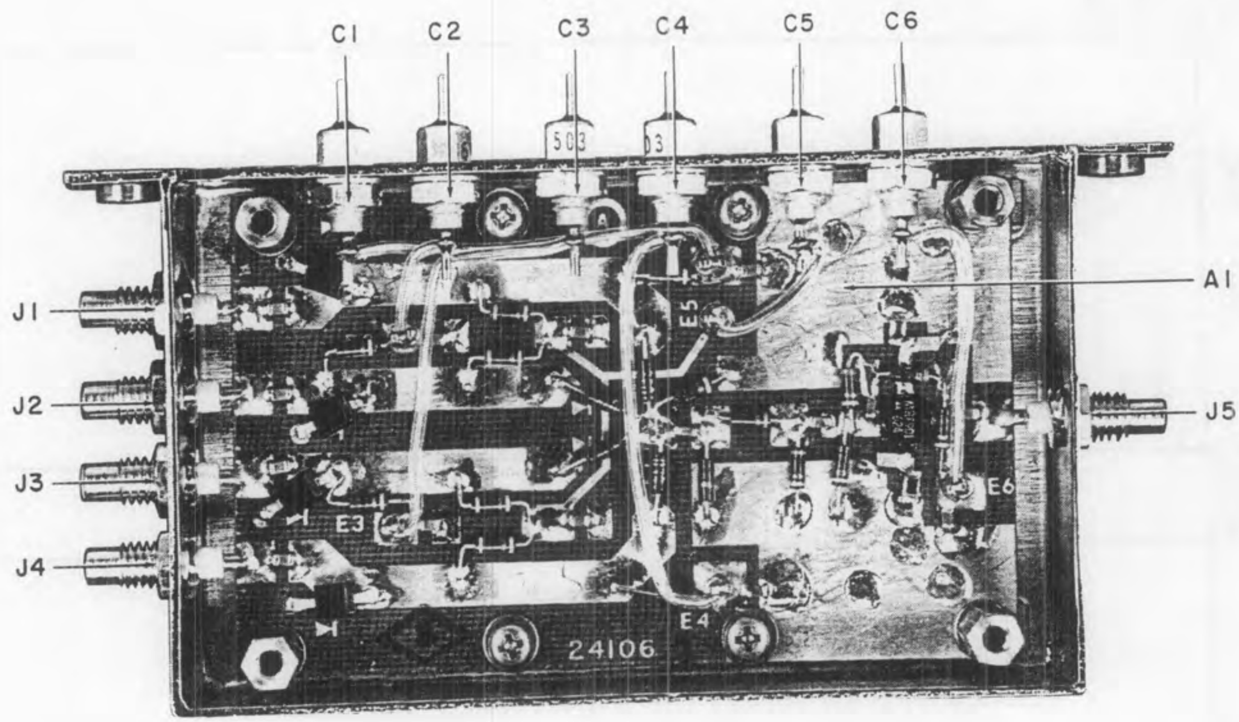


Figure 5-50. Type 791501-1 LO Diode Switch and Amplifier (A9), Location of Components

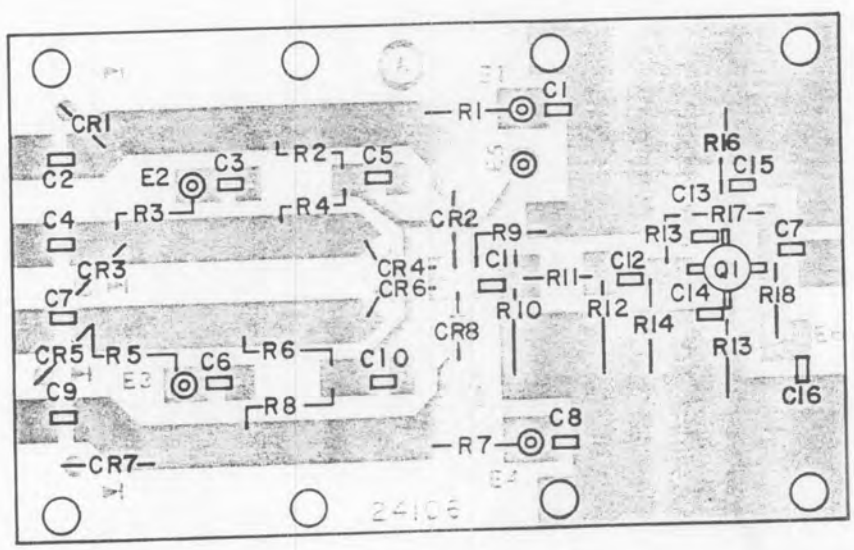


Figure 5-51. Type 24106-1 LO Diode Switch and Amplifier (A9A1), Location of Components

5.4.10. TYPE 24106-1 LO Diode Switch and Amplifier

REF DESIG PREFIX A9A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, CHIP: 2200 pF, 20%, 100 V	15	CDR01BX222BMSM	81349	
C2 Thru C13	Same as C1				
C14	CAPACITOR, CERAMIC, CHIP: 6.5 pF, 5%, 50 V	2	C1005C659J5GPH	31433	
C15	Same as C14				
C16	Same as C1				
C17	Same as C1				
CR1	DIODE	4	MPN3401	04713	
CR2	DIODE	4	5082-3039	28480	
CR3	Same as C1				
CR4	Same as C2				
CR5	Same as C1				
CR6	Same as C2				
CR7	Same as C1				
CR8	Same as C2				
Q1	TRANSISTOR	1	MRF901	04713	
R1	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/8 W	6	RCR05G681JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/8 W	4	RCR05G472JS	81349	01121
R3	Same as R1				
R4	Same as R2				
R5	Same as R1				

REF DESIG PREFIX A9A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R6	Same as R2				
R7	Same as R1				
R8	Same as R2				
R9	Same as R1				
R10	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/8 W	2	RCR05G201JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 18 Ω, 5%, 1/8 W	1	RCR05G180JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 300 Ω, 5%, 1/8 W	1	RCR05G301JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 3.6 kΩ, 5%, 1/8 W	1	RCR05G362JS	81349	01121
R14	Same as R1				
R15	RESISTOR, FIXED, CHIP: 15 Ω, 10%, 1/8 W	2	CR12(15Ω, k)	24602	
R16	Same as R15				
R17	Same as R10				

REF DESIG PREFIX A10

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 0.47 μF, 10%, 35 V	1	CS13BF474K	81349	56289
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 15 μF, 10%, 20 V	1	CS13BE156K	81349	56289
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 10%, 35 V	1	CS13BF225K	81349	56289
C4	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	4	8131M100-651-104M	72982	
C5	CAPACITOR, CERAMIC, DISC: 0.01μF, 20%, 100 V	2	C023B101F103M	56289	
C6	Same as C5				
C7	CAPACITOR, ELECTROLYTIC, TANTALUM: 10 μF, 10%, 20 V	1	CS13BE106K	81349	56289
C8 Thru C10	Same as C4				
CR1	DIODE	4	1N462A	80131	93332
CR2	DIODE	3	1N4446	80131	93332
CR3	Same as CR2				
CR4	Same as CR2				
CR5	Same as CR1				
CR6	Same as CR1				
CR7	DIODE	2	5082-2800	28480	
CR8	Same as CR7				
CR9	DIODE	1	1N995	80131	04713
CR10	Same as CR1				
HR1	HEATER	1	3ST1-2	73803	
K1	RELAY, REED	1	831A-3	95348	

REF DESIG PREFIX A10

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
Q1	TRANSISTOR	3	2N3251	80131	04713
Q2	TRANSISTOR	1	2N2222A	80131	04713
Q3	Same as Q1				
Q4	TRANSISTOR	3	2N929	80131	04713
Q5	Same as Q1				
Q6	Same as Q4				
Q7	Same as Q4				
R1	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	3	RCR07G102JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 330 kΩ, 5%, 1/4 W	1	RCR07G334JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	10	RCR07G103JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	1	RCR07G472JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 3.3 Ω, 5%, 1/4 W	1	RCR07G3R3JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4 W	7	RCR07G104JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 68 kΩ, 5%, 1/4 W	1	RCR07G683JS	81349	01121
R9	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121
R10	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4 W	1	RCR07G224JS	81349	01121
R11	Same as R4				
R12	Same as R1				
R13	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	1	RCR07G100JS	81349	01121
R14	Same as R7				
R15	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	3	RCR07G333JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R16	Same as R7				
R17	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4 W	2	RCR07G392JS	81349	01121
R18	Same as R15				
R19	RESISTOR, FIXED, COMPOSITION: 150 Ω, 5%, 1/4 W	3	RCR07G151JS	81349	01121
R20	RESISTOR, FIXED, COMPOSITION: 180 kΩ, 5%, 1/4 W	1	RCR07G184JS	81349	01121
R21	Same as R4				
R22	Same as R4				
R23	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4 W	2	RCR07G153JS	81349	01121
R24	Same as R15				
R25	Same as R7				
R26	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4 W	1	RCR07G152JS	81349	01121
R27	Same as R23				
R28	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	1	RCR07G221JS	81349	01121
R29	Same as R4				
R30	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4 W	2	RCR07G682JS	81349	01121
R31	Same as R17				
R32	Same as R4				
R33	Same as R30				
R34	Same as R4				
R35	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4 W	1	RCR07G223JS	81349	01121
R36	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4 W	1	RCR07G463JS	81349	01121
R37	Same as R19				

REF DESIG PREFIX A10

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R38	RESISTOR, FIXED, COMPOSITION: 1.0 MΩ, 5%, 1/4 W	1	RCR07G105JS	81349	01121
R39	Same as R19				
R40	RESISTOR, FIXED, COMPOSITION: 820 Ω, 5%, 1/4 W	1	RCR07G821JS	81349	01121
R41	RESISTOR, FIXED, COMPOSITION: 24 Ω, 5%, 1 W	1	RCR07G240JS	81349	01121
R42	Same as R4				
R43	RESISTOR, FIXED, COMPOSITION: 9.1 kΩ, 5%, 1/4 W	1	RCR07G912JS	81349	01121
R44	Same as R7				
R45	Same as R1				
R46	RESISTOR, FIXED, COMPOSITION: 12 kΩ, 5%, 1/4 W	1	RCR07G123JS	81349	01121
R47	Same as R7				
R48	RESISTOR, VARIABLE, FILM: 10 kΩ, 10%, 1/2 W	1	62PAR10K	73138	
R49	Same as R4				
R50	Same as R4				
R51	Same as R7				
U1	INTEGRATED CKT	2	741HC	07263	
U2	Same as U1				
U3	INTEGRATED CKT	1	MC1458V	18324	

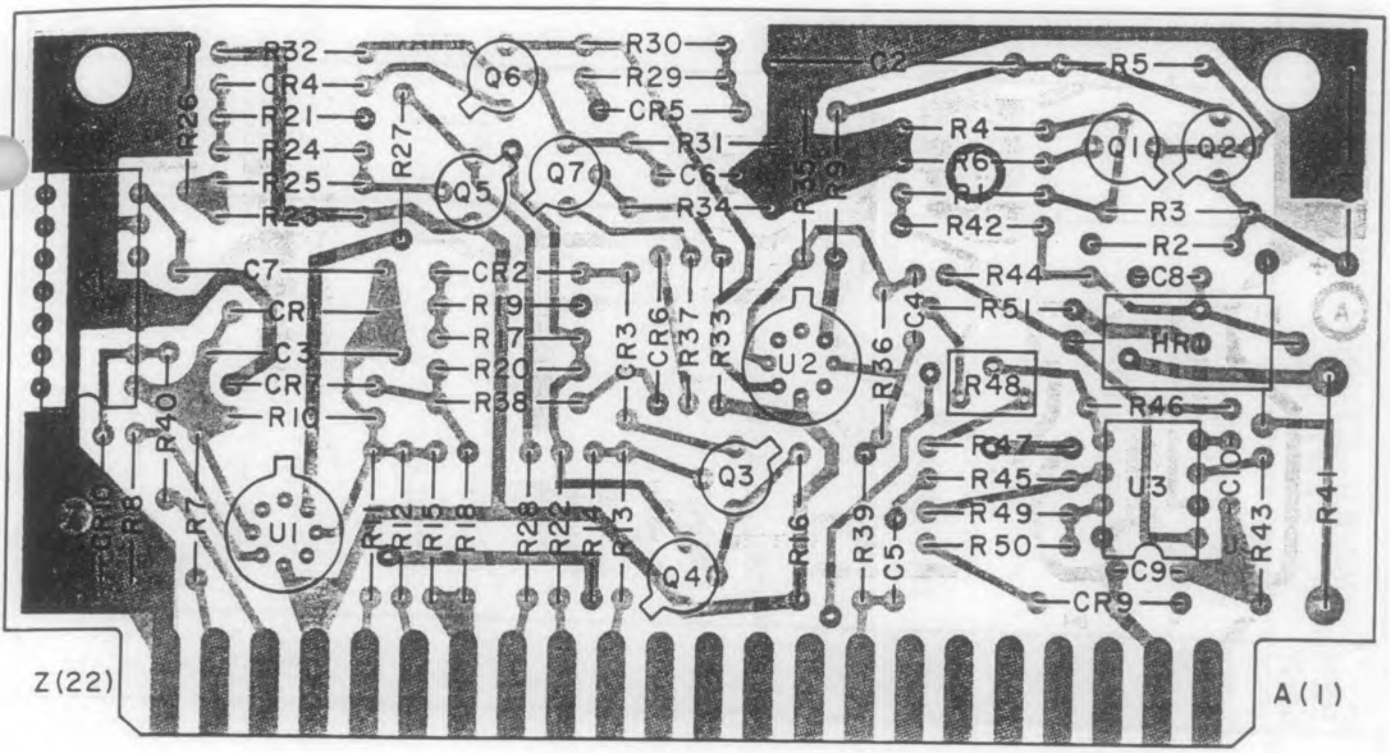


Figure 5-52. Type 78108-1 Pulse/Average AGC Amplifier (A10), Location of Components

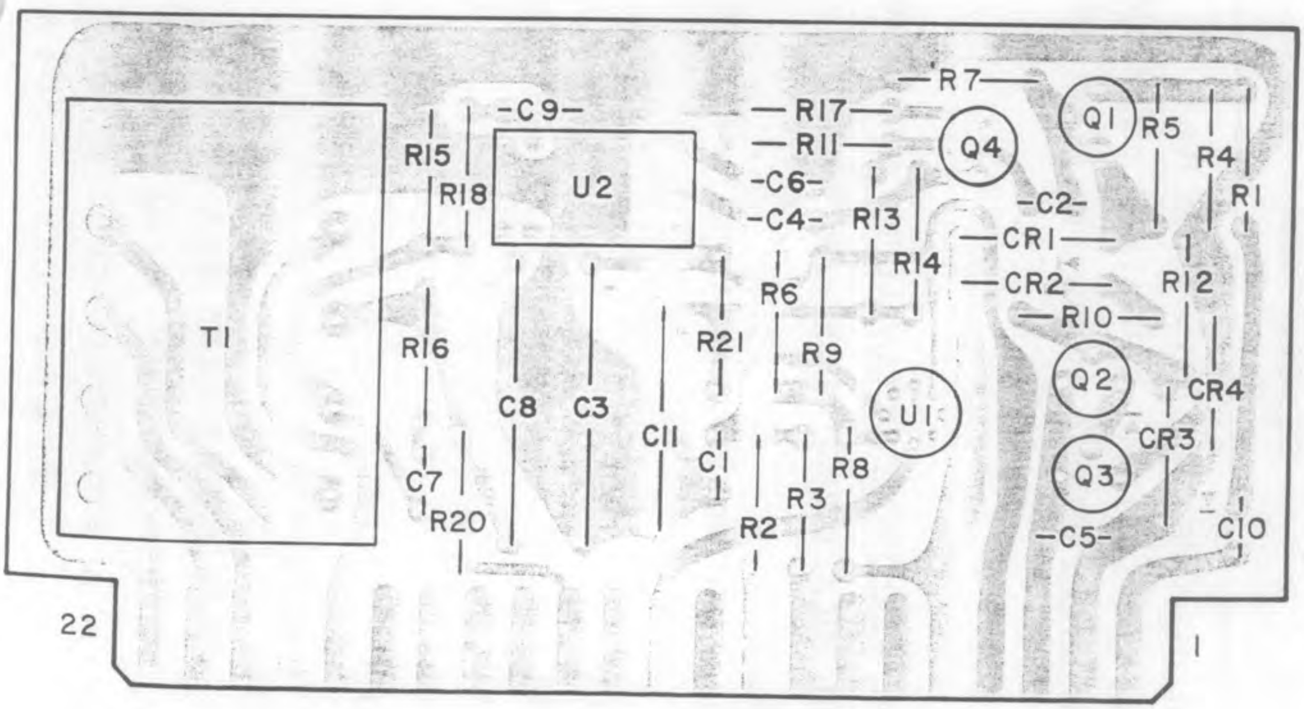


Figure 5-53. Type 7446-2 Audio, Cor and Squelch Amplifier (A11) Location of Components

5.4.12 TYPE 7446-2 Audio, Cor and Squelch Amplifier

REF DESIG PREFIX A11

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	5	8131M100-651-104M	72982	
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 20%, 35 V	2	196D225X0035JE3	56289	
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 78 μF, 20%, 50 V	1	MTP786M050P1C	76055	
C4 Thru C7	Same as C1				
C8	CAPACITOR, ELECTROLYTIC,TANTALUM: 200 μF, 20%, 15 V	1	MTP207M015P1C	76055	
C9	CAPACITOR, MICA, DIPPED: 20 pF, 5%, 500 V	1	CM05ED200J03	81349	72136
C10	Same as C2				
C11	CAPACITOR, ELECTROLYTIC TANTALUM: 10 μF, 10%, 20 V	1	CS13BE106K	81349	56289
CR1	DIODE	4	1N462A	80131	93332
CR2	Same as CR1				
CR3	Same as CR1				
CR4	Same as CR1				
Q1	TRANSISTOR	1	U1899E	15818	
Q2	TRANSISTOR	2	2N2222A	80131	04713
Q3	Same as Q2				
Q4	TRANSISTOR	1	2N929	80131	04713
R1	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 470 kΩ, 5%, 1/4 W	1	RCR07G474JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4 W	1	RCR07G272JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R5	RESISTOR, FIXED, COMPOSITION: 22 MΩ, 5%, 1/4 W	1	RCR07G226JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	1	RCR07G100JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4 W	1	RCR07G473JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 1.0 MΩ, 5%, 1/4 W	1	RCR07G105JS	81349	01121
R9	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4 W	2	RCR07G104JS	81349	01121
R10	Same as R9				
R11	RESISTOR, FIXED, COMPOSITION: 9.1 kΩ, 5%, 1/4 W	1	RCR07G912JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 39 kΩ, 5%, 1/4 W	1	RCR07G393JS	81349	01121
R14	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4 W	1	RCR07G682JS	81349	01121
R15	RESISTOR, FIXED, COMPOSITION: 2.7 Ω, 5%, 1/4 W	1	RCR07G2R7JS	81349	01121
R16	RESISTOR, FIXED, COMPOSITION: 3.3 Ω, 5%, 1/4 W	1	RCR07G3R3JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4 W	1	RCR07G222JS	81349	01121
R18	RESISTOR, FIXED, COMPOSITION: 2.2 MΩ, 5%, 1/4 W	1	RCR07G225JS	81349	01121
R19	Not Used				
R20	RESISTOR, FIXED, COMPOSITION: 620 Ω, 5%, 1/4 W	1	RCR07G621JS	81349	01121
R21	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
T1	AUDIO TRANSFORMER	1	18088-1	14632	
U1	INTEGRATED CKT	1	741HC	07263	
U2	INTEGRATED CKT	1	LM380N	03508	

SECTION VI
SCHEMATIC DIAGRAMS

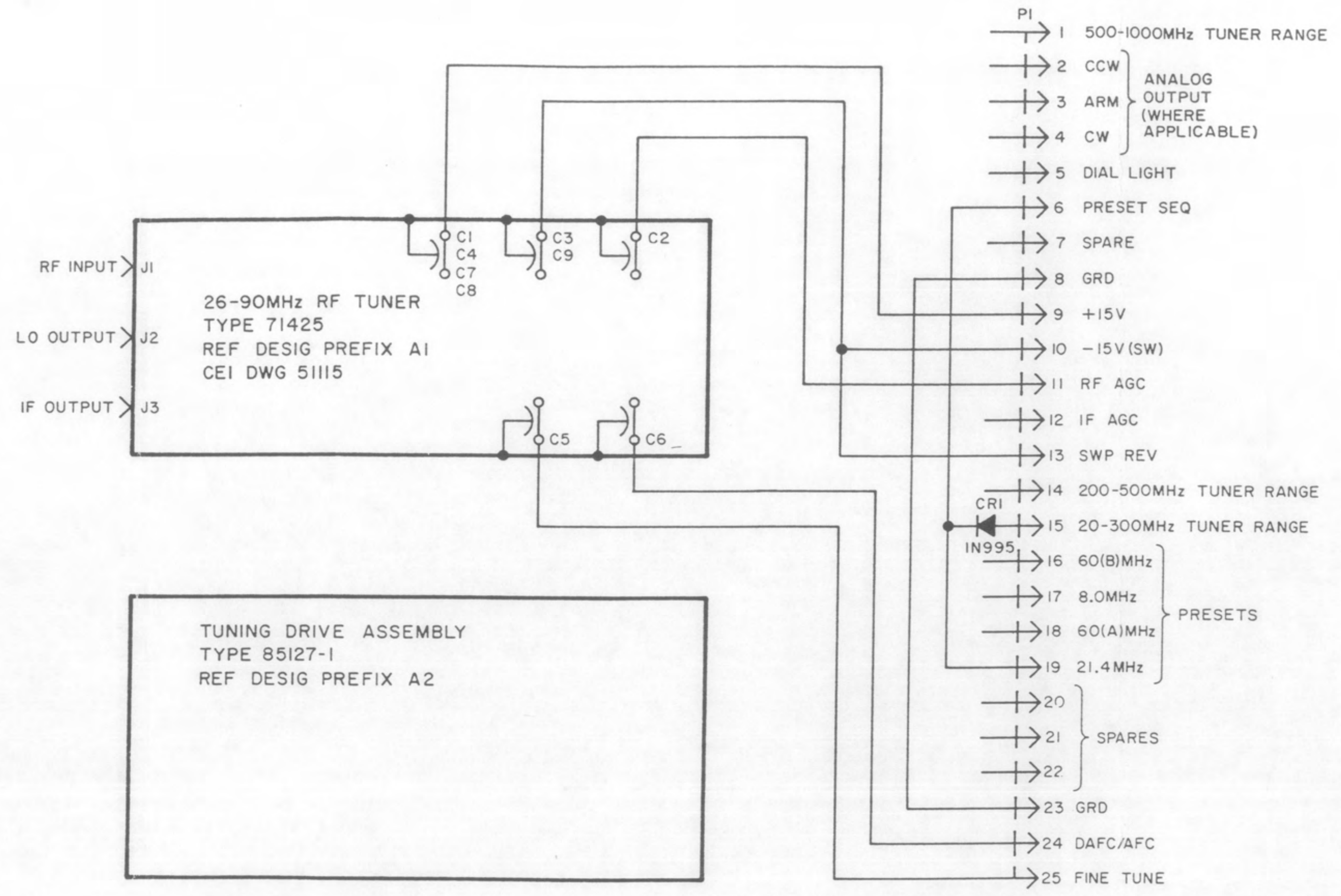


Figure 6-1. Type WJ-9066-3 26-90 MHz Tuning Head (A1), Schematic Diagram

DETAIL A

TYPE	R31	R32	R36	A1
71425	75	75	100	18056-1

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN pF.
2. CW ON A1R7 INDICATES CLOCKWISE ROTATION OF ACTUATOR.
3. L1-A THRU L1-E ARE GANGED SECTIONS OF INDUCTUNER L1.
4. HEAVY LINE INDICATES MAIN SIGNAL PATH.
5. DIFFERENCE BETWEEN TYPES IS IN DETAIL A.

HIGHEST REF DESIG USED	REF DESIG NOT USED
A1	-
C55	C14, 18, 34 C37, 44
CR2	-
E2	-
FB2	-
J3	-
L13	L8, L2
Q4	-
R39	-
T2	-

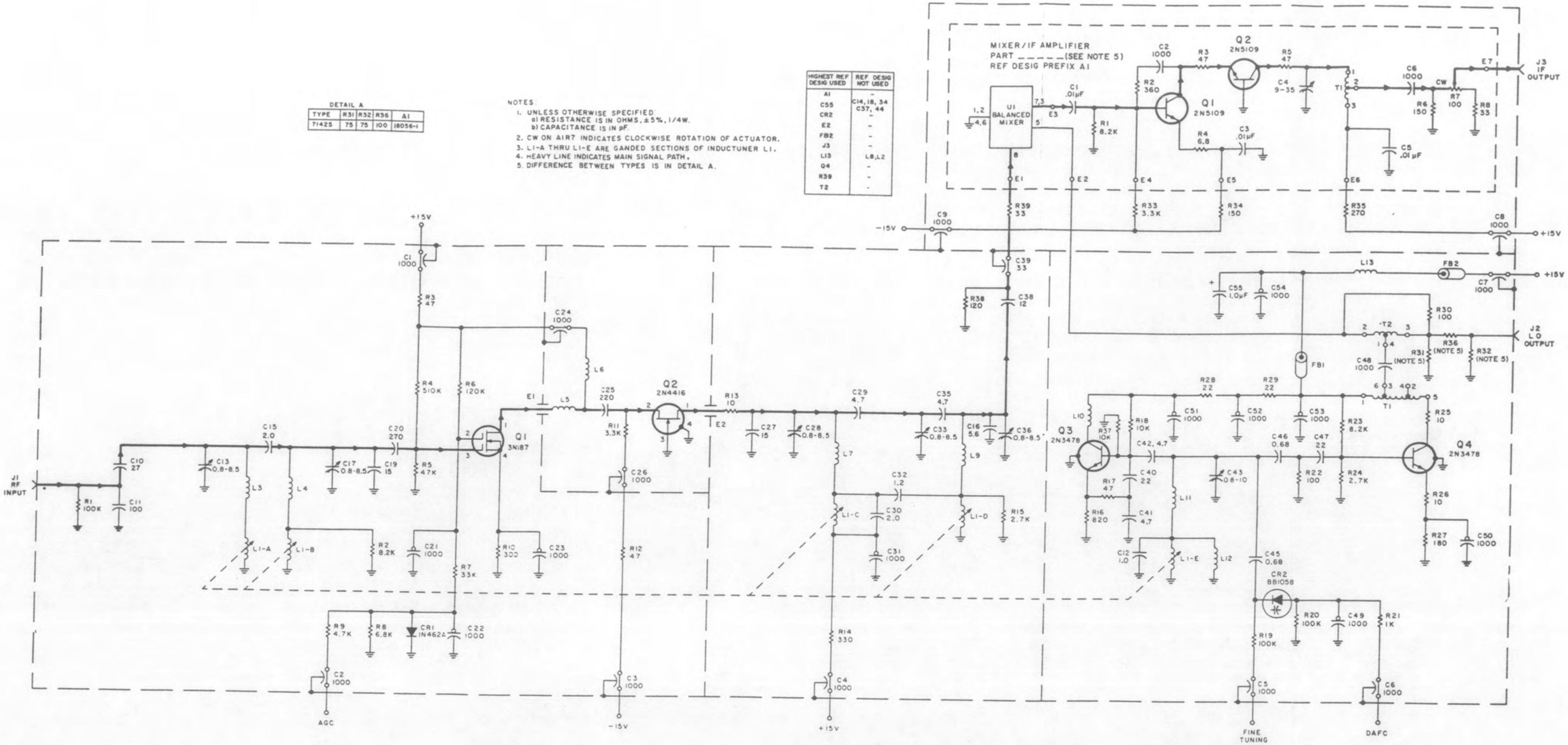


Figure 6-2. Type 71425-1 26-90 MHz RF Tuner (A1A1), Schematic Diagram

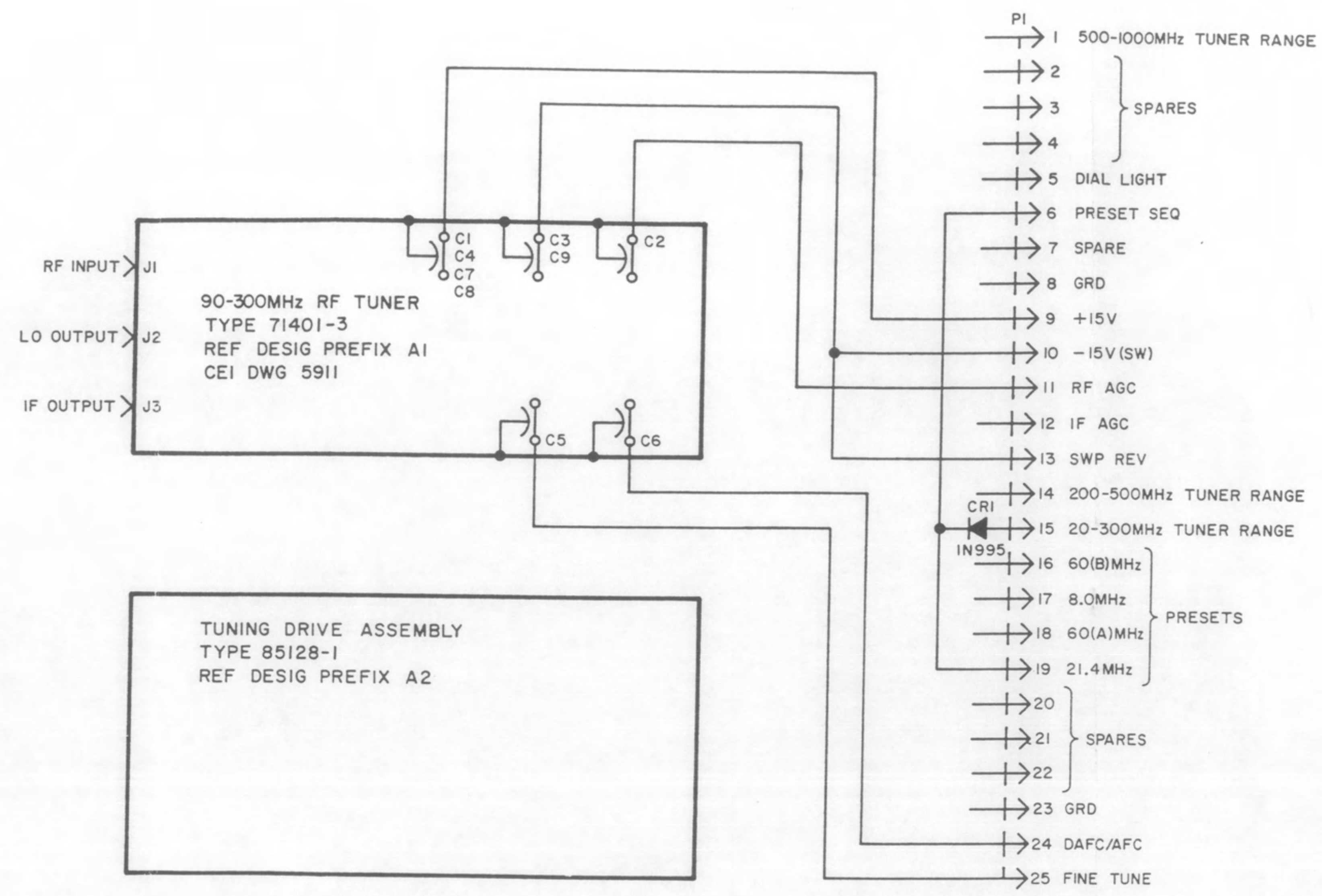
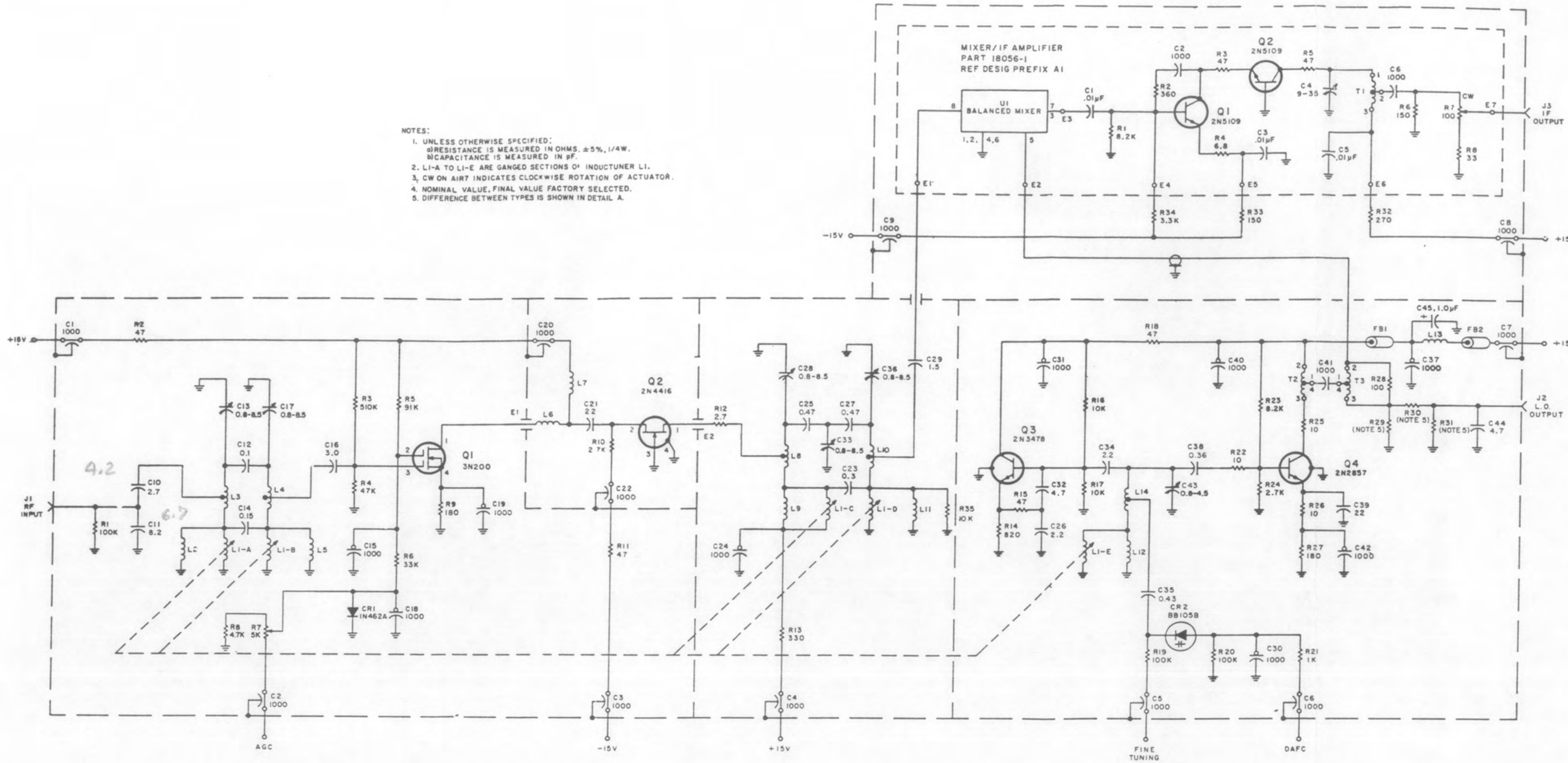


Figure 6-3. Type WJ-9062-3 90-300 MHz Tuning Head (A2), Schematic Diagram

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN pF.
2. L1-A TO L1-E ARE GANGED SECTIONS OF INDUCTUNER L1.
3. CW ON A1R7 INDICATES CLOCKWISE ROTATION OF ACTUATOR.
4. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.
5. DIFFERENCE BETWEEN TYPES IS SHOWN IN DETAIL A.



DETAIL A

TYPE	R29	R30	R31
-2	120	51	120
-3	68	180	68

71318-1 Tuner
Q1 = TA7153

Figure 6-4. Type 71401-3 90-300 MHz RF Tuner (A2A1), Schematic Diagram

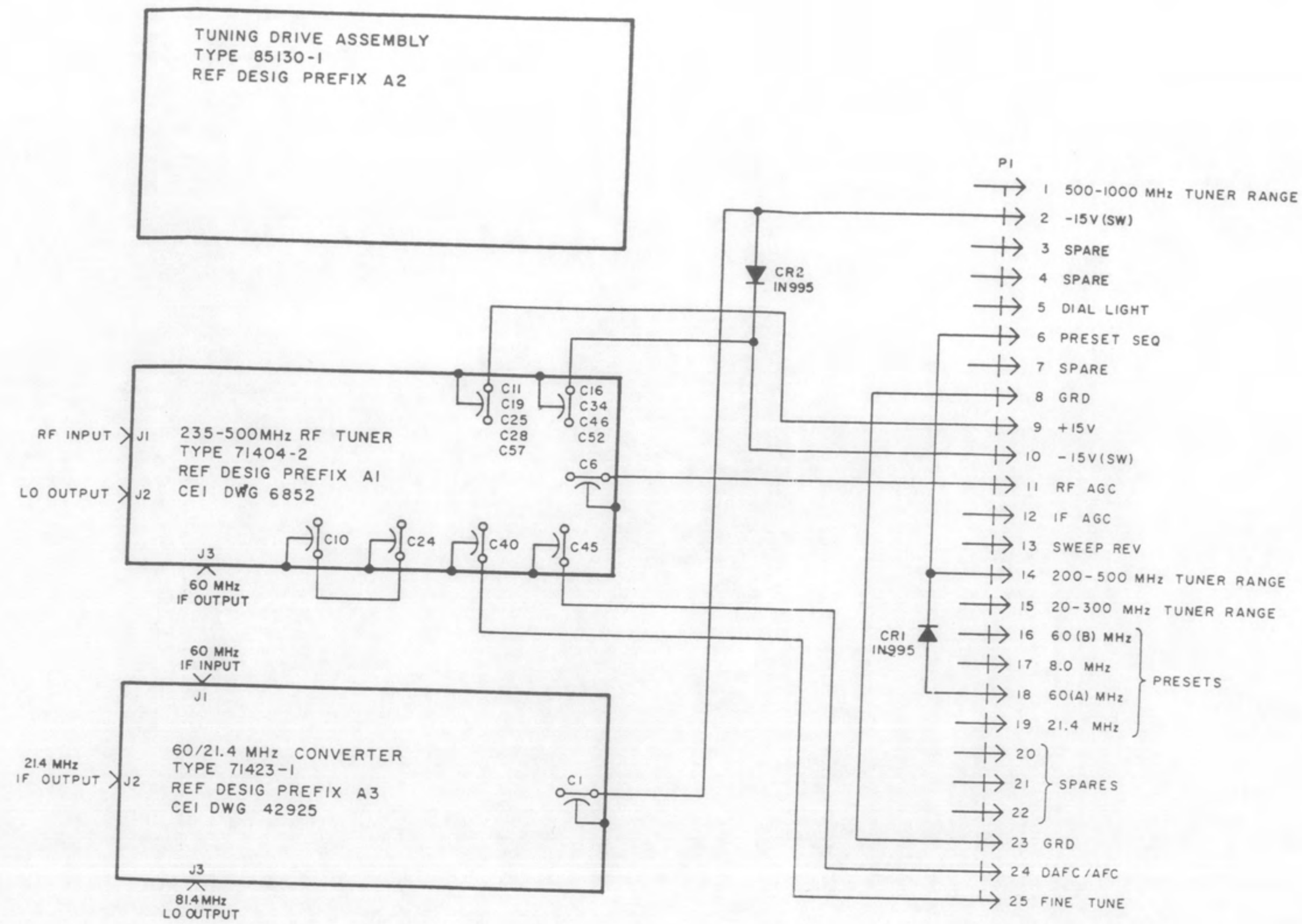
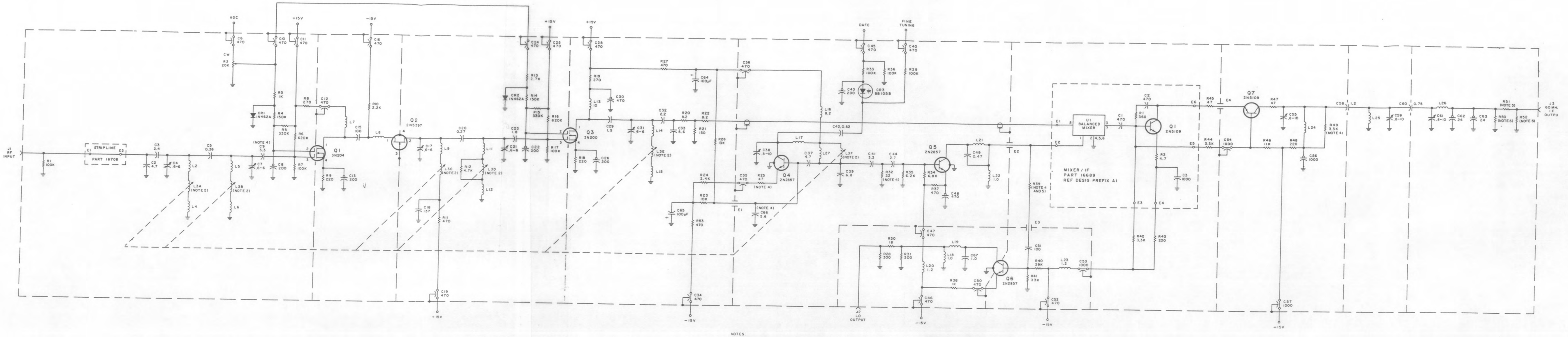


Figure 6-5. Type WJ-9064-3 235-500 MHz Tuning Head (A3), Schematic Diagram



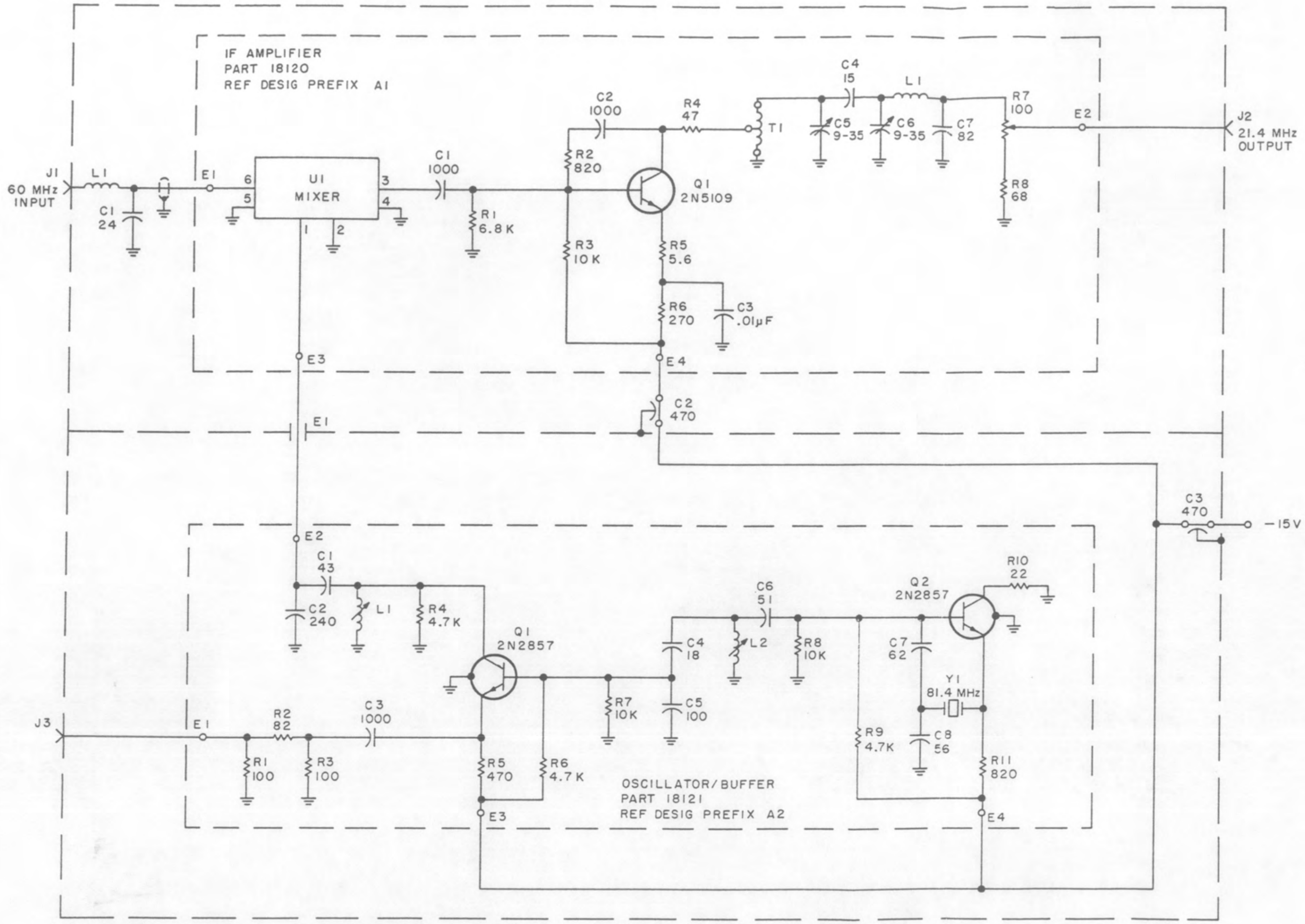
NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN µH.
2. L3A THRU L3F ARE GANGED SECTIONS OF INDUCTUNER L3.
3. CW ON R2 INDICATES CLOCKWISE ROTATION OF ACTUATOR.
4. NOMINAL VALUE; FINAL VALUE FACTORY SELECTED.
5. DIFFERENCE BETWEEN TYPES IS, AS SHOWN IN DETAIL A.

DETAIL A

TYPE	R39	R50	R51	R52
71346-1	390	91	68	91
71346-2	470	91	68	91
71404-1	470	91	68	91
71404-2	470	100	62	100

Figure 6-6. Type 71404-2 235-500 MHz RF Tuner (A3A1), Schematic Diagram



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

HIGHEST REF DESIG	REF DESIG NOT USED
A2 C3 E1 J3 L1	

A1

C7 E4 L1 Q1 R8 T1 U1	

A2

C8 E4 L2 Q2 R11 Y1	

Figure 6-7. Type 71423-1 60-21.4 MHz Converter (A3A3), Schematic Diagram

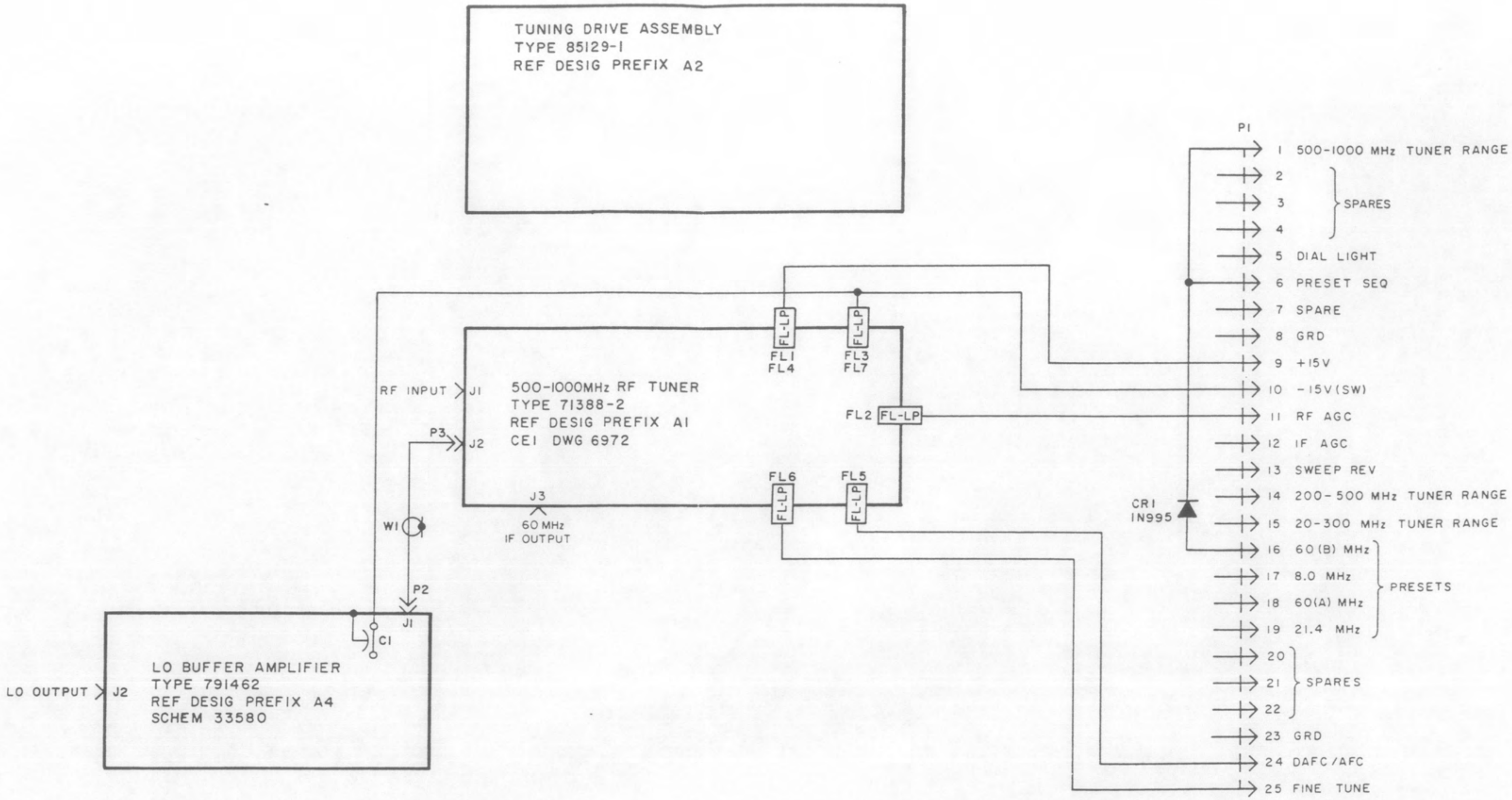
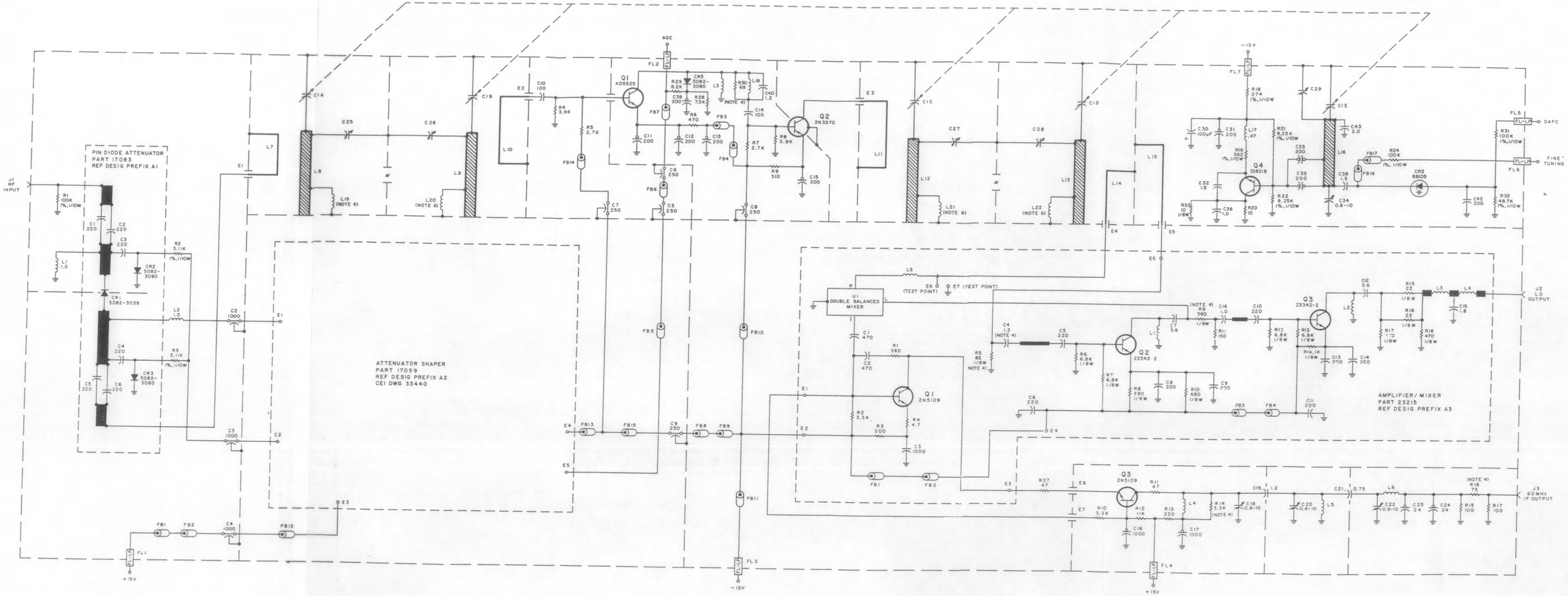


Figure 6-8. Type WJ-9065-3 500-1000 MHz Tuning Head (A4), Schematic Diagram

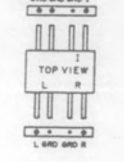


NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4 W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN µH.
2. CW ON A2R6 AND A2R16 INDICATES CLOCKWISE ROTATION OF ACTUATOR.
3. PIN ARRANGEMENT FOR A2U1 IS SHOWN IN DETAIL A.
4. NOMINAL VALUE. FINAL VALUE FACTORY SELECTED.
5. LEAD ARRANGEMENT FOR A3U1 IS SHOWN IN DETAIL B.
6. SHUNT INDUCTOR INSTALLED, IF REQUIRED.
7. DIFFERENCE BETWEEN TYPES IS MECHANICAL.

DETAIL A

DETAIL B



HIGHEST REF DESIG USED	REF DESIG NOT USED
A3 C42 E7 FB17 FL7 L22 Q4 R32 CR2 J3	

Figure 6-9. Type 71388-2 500-1000 MHz RF Tuner (A4A1), Schematic Diagram

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

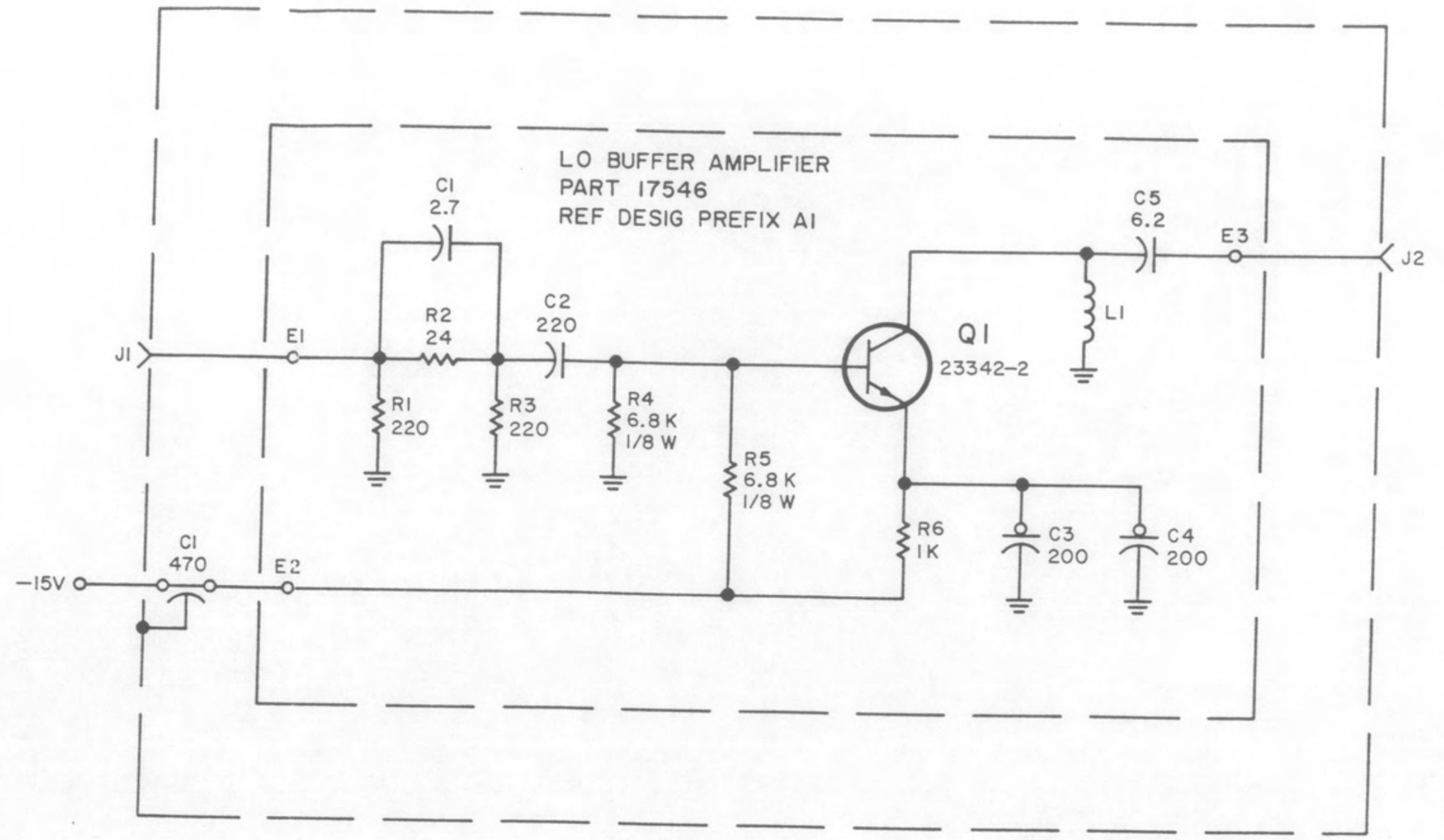
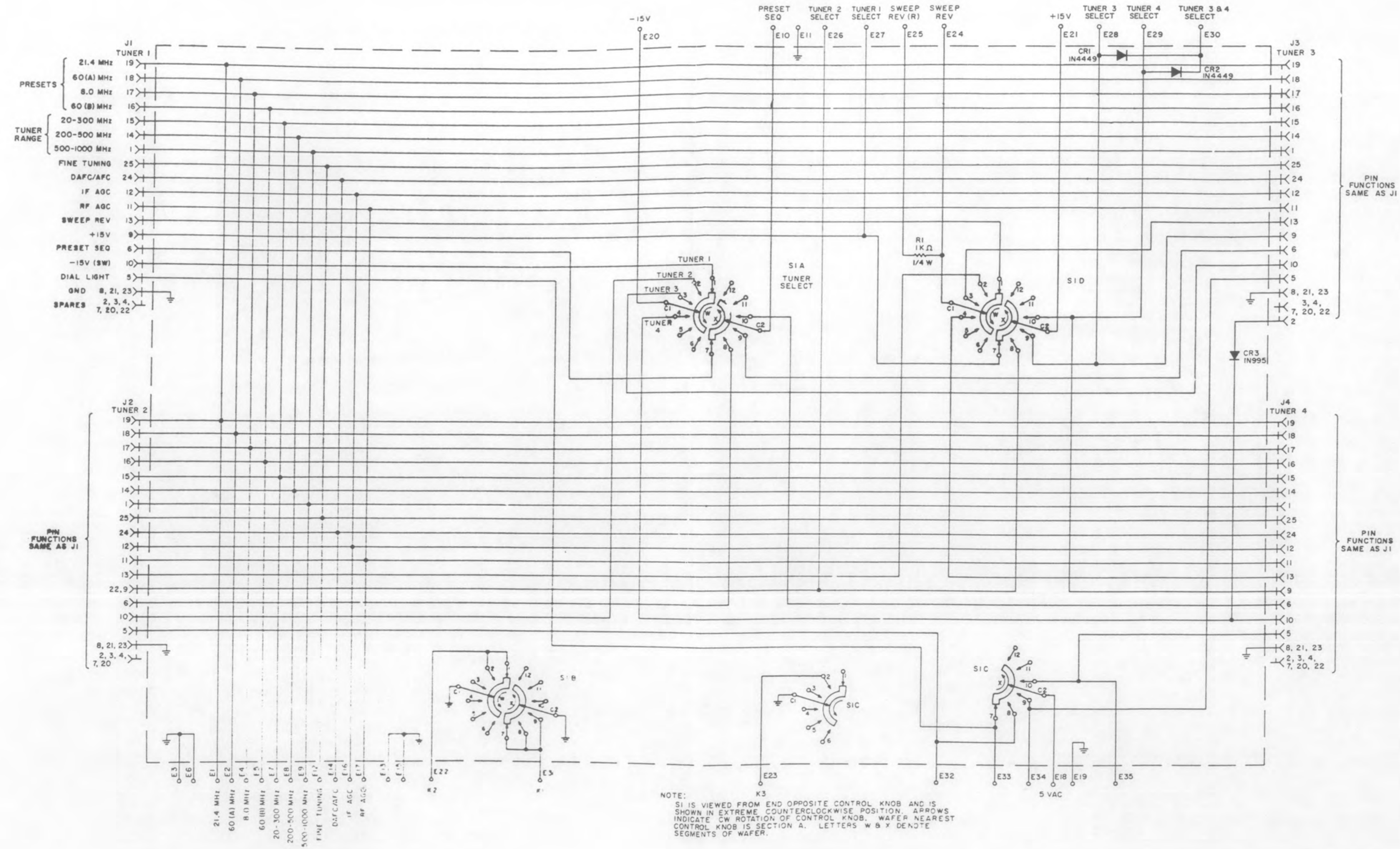


Figure 6-10. Type 791462 LO Buffer Amplifier (A4A4), Schematic Diagram

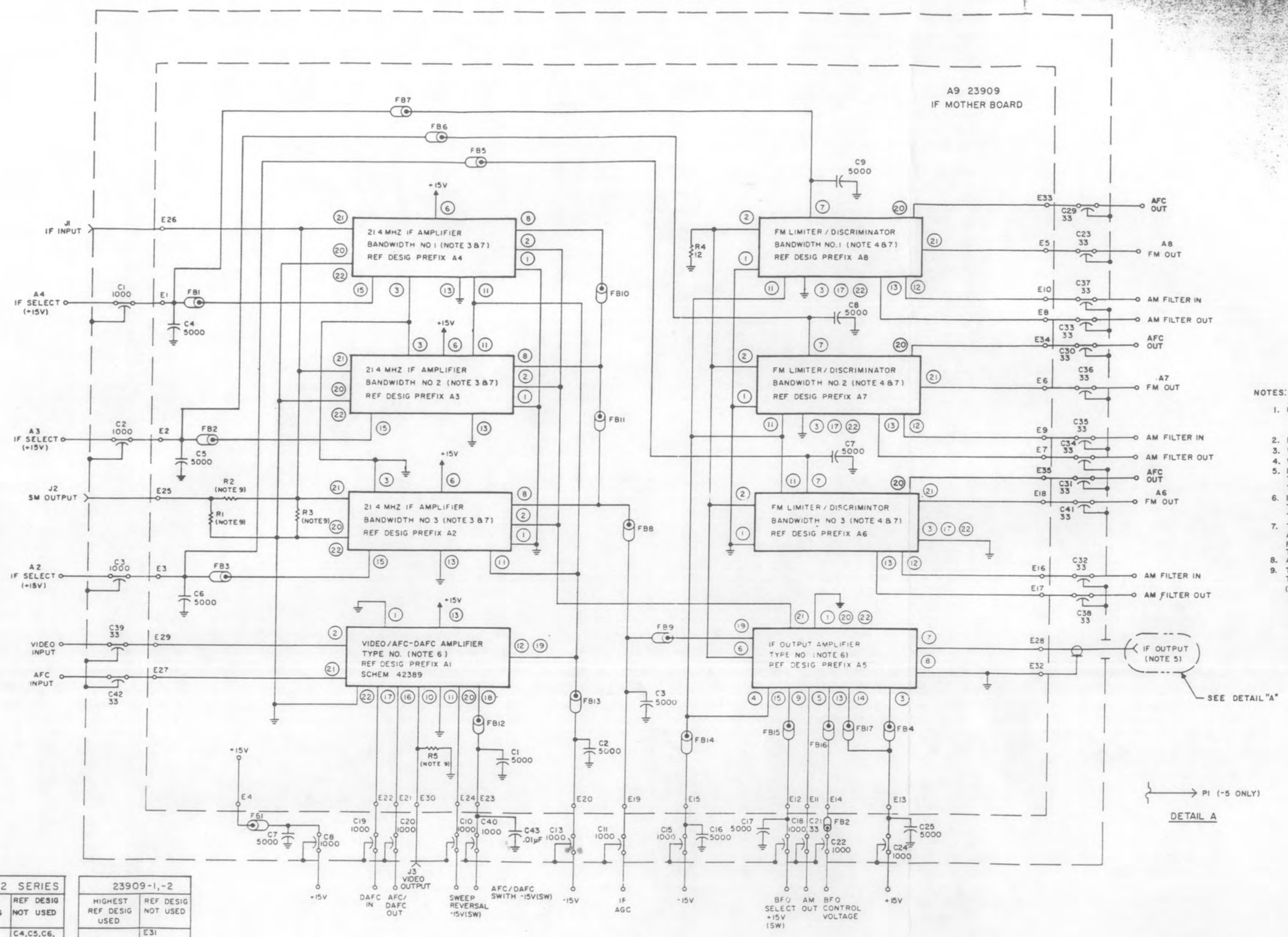


NOTE:
S1 IS VIEWED FROM END OPPOSITE CONTROL KNOB AND IS SHOWN IN EXTREME COUNTERCLOCKWISE POSITION. ARROWS INDICATE CW ROTATION OF CONTROL KNOB. WAFER NEAREST CONTROL KNOB IS SECTION A. LETTERS W & X DENOTE SEGMENTS OF WAFER.

Figure 6-11. Type 791499-1 RF Tuner Switching Assembly (A5), Schematic Diagram

TABULATION										
IF AMPLIFIER ASSY	IF OUTPUT AMPLIFIER A5		UNITS USED ON	MAIN UNIT IF OUTPUT RECEPTACLE (REF DESIG)	VIDEO / AFC-DAFC AMPLIFIER A1	PART NO FOR A9	R1	R2	R3	R5
	OSCILLATOR	TYPE NO								
72462-1	XTAL BFO	72372	WJ-8730A, 31A, 30R, & WJ-8736	J3	7383	23909-1	100	68	100	N/U
72462-2	VCXO	72343	WJ-8732A, 33A & 565A	J3	7383	23909-1	100	68	100	N/U
72462-3	VCXO	72343	WJ-9026/RU	J11	7383	23909-2	51	1M	51	100
72462-4	VCXO	72343	WJ-8732A-2	J3	7386	23909-1	100	68	100	N/U
72462-5	XTAL BFO	72372	WJ-8737/RU	SEE DETAIL A		23909-1	100	68	100	N/U
72462-6	VCXO	72343-2	WJ-8736-3	J3	7383	23909-1	100	68	100	N/U
72462-7	XTAL BFO	72372-2	WJ-8730A-1	J3	7383	23909-1	100	68	100	N/U

AVAILABLE BANDWIDTHS (REF. INFO)			
WJ PART NO.	IF BANDWIDTH	IF AMPLIFIER PC TYPE NO A2 THRU A4	FM LIMITER / DISC PC TYPE NO A6 THRU A8
WJ-9930-4	4 KHz	72339-2	791205-5
WJ-9930-10	10 KHz	72339	791205-1
WJ-9930-20	20 KHz	72389	791205-2
WJ-9930-50	50 KHz	72344	791205-3
WJ-9930-100	100 KHz	72431	791331
WJ-9930-200	200 KHz	72338	791338
WJ-9930-300	300 KHz	72366	791366
WJ-9930-500	500 KHz	72429	791329
WJ-9930-1M	1 MHz	72378-1	791378
WJ-9930-2M	2 MHz	72378-2	791365-2
WJ-9930-3M	3 MHz	72365	791365-1
WJ-9930-4M	4 MHz	72430	791330
WJ-9930-8	8 KHz	72472	791205-4
WJ-9930-20-1	20 KHz	72389-3	791205-2



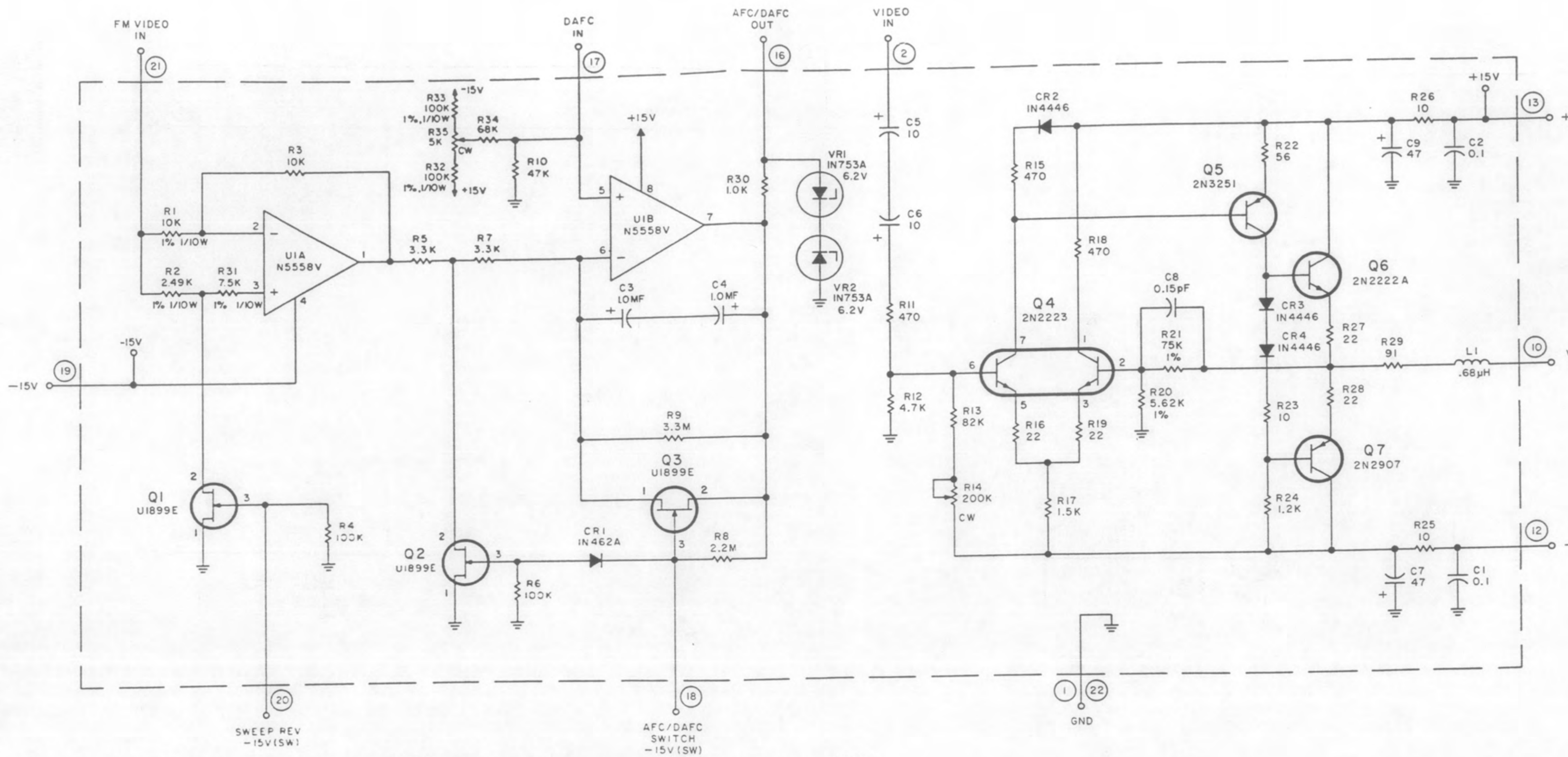
72462 SERIES	
HIGHEST REF DESIG USED	REF DESIG NOT USED
C43 FB2 J3 A9 P1 (-5 ONLY)	C4, C5, C6, C9, C12, C14, C26, C27, C28

23909-1,-2	
HIGHEST REF DESIG USED	REF DESIG NOT USED
C9 E35 FB17 R5	E31

NOTES:

1. UNLESS OTHERWISE SPECIFIED.
   A. RESISTANCE IS IN OHMS, ± 5%, 1/4 W.
   B. CAPACITANCE IS IN PF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. WIDEST IF BW ALWAYS IN POSITION A2.
4. WIDEST BW DESCRIMINATOR ALWAYS IN POSITION A6.
5. IF OUTPUT FROM E28 & E32 OF A9 TO BE CONNECTED TO JACK ON REAR PANEL OF MAIN UNIT. SEE TABULATION (SHEET 2).
6. IF OUTPUT AMPLIFIER & VIDEO/AFC-DAFC AMPLIFIER TYPE NOS. ARE SELECTED ACCORDING TO RECEIVER TYPE. REFER TO TABULATION (SHEET 2).
7. THE IF AMPLIFIER & FM LIMITER/DESCRIMINATOR P.C. ASSEMBLIES ARE SELECTED ACCORDING TO BANDWIDTH. REFER TO AVAILABLE BANDWIDTHS (SHEET 2) FOR TYPE NO. & PROPER MATCHING.
8. A1 THRU A8 ARE NOT SUPPLIED AS PART OF A9.
9. THE IF MOTHER BOARD (A9) IS SELECTED ACCORDING TO IF AMPLIFIER ASSEMBLY DASH NO. SEE TABULATION (SHEET 2).

Figure 6-12. Type 72462-3 IF Amplifier (A6), Schematic Diagram



NOTES

1. UNLESS OTHERWISE SPECIFIED
   a) RESISTANCE IS IN OHMS, ± 5%, 1/4W.
   b) CAPACITANCE IS IN µF
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. CW ON R14 INDICATES CLOCKWISE ROTATION OF ACTUATOR.
4. LEAD ARRANGEMENT FOR U1 IS SHOWN IN DETAIL A.

DETAIL A

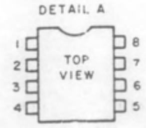
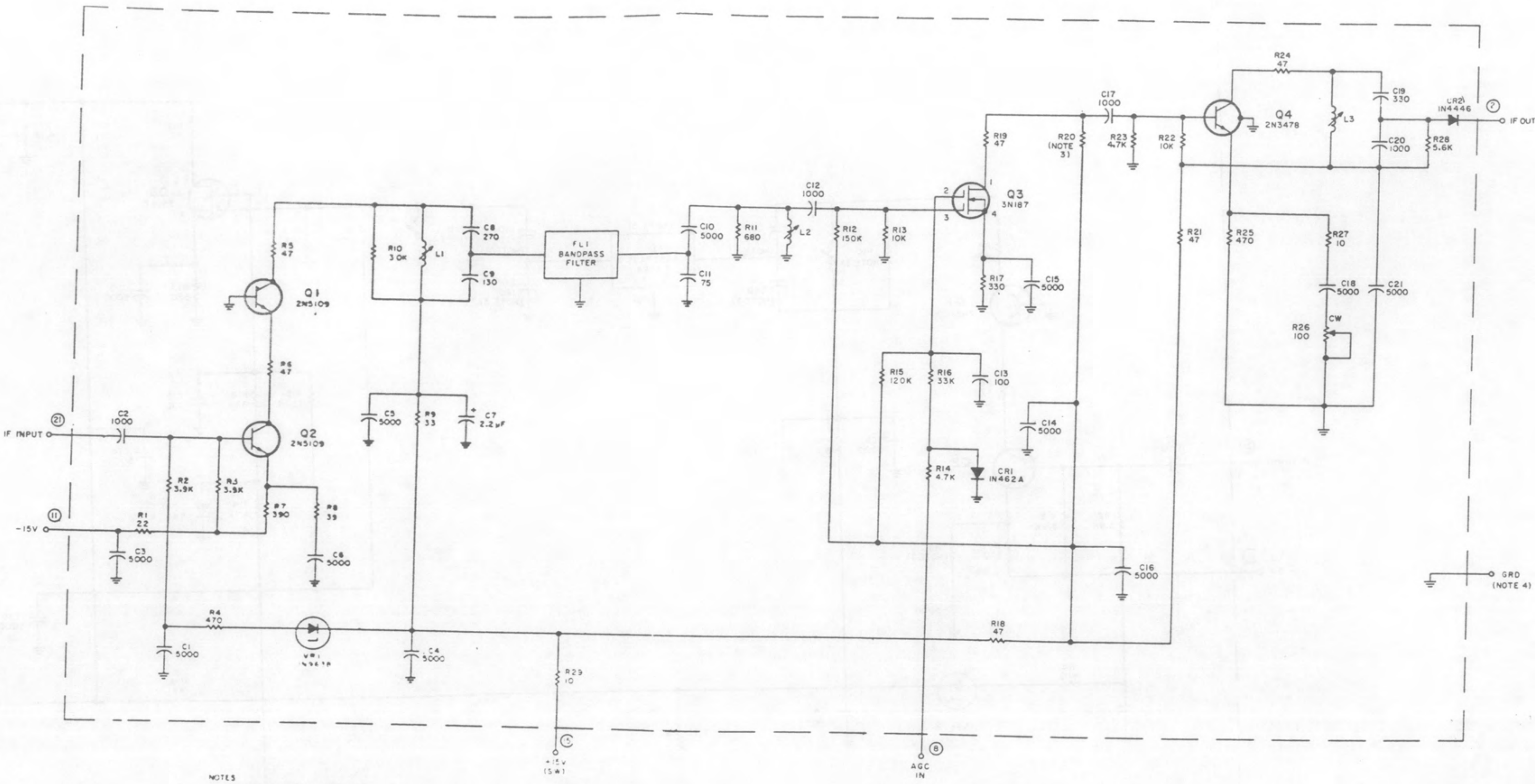
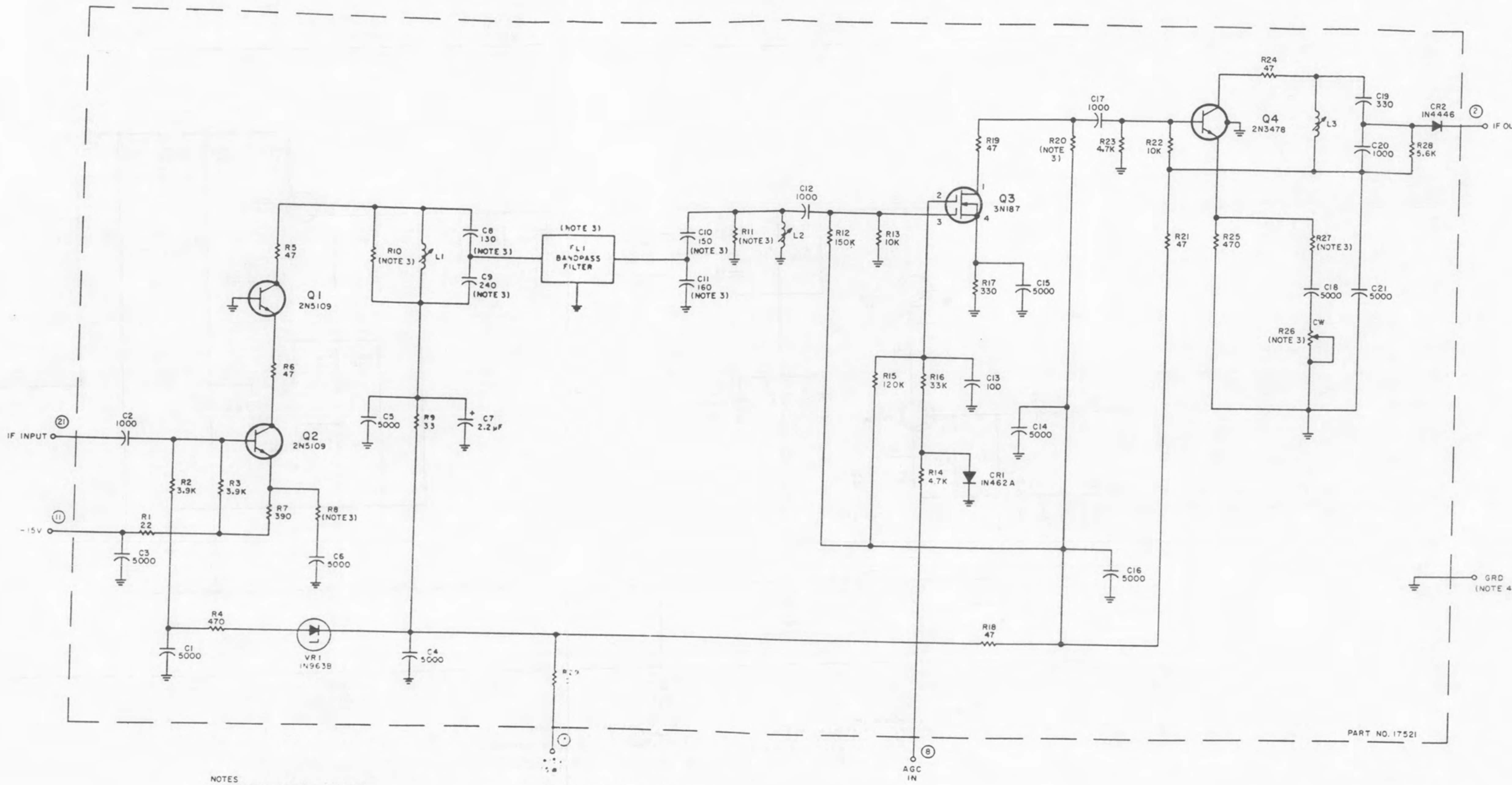


Figure 6-13. Type 7383 Video/DAFC-AFC Amplifier (A6A1), Schematic Diagram



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.
4. GROUND PINS FOR THIS MODULE ARE 1,4,5,7,9,10,12,13,14,17 THRU 20,22.
5. CW ON R26 INDICATES CLOCKWISE ROTATION OF ACTUATOR.

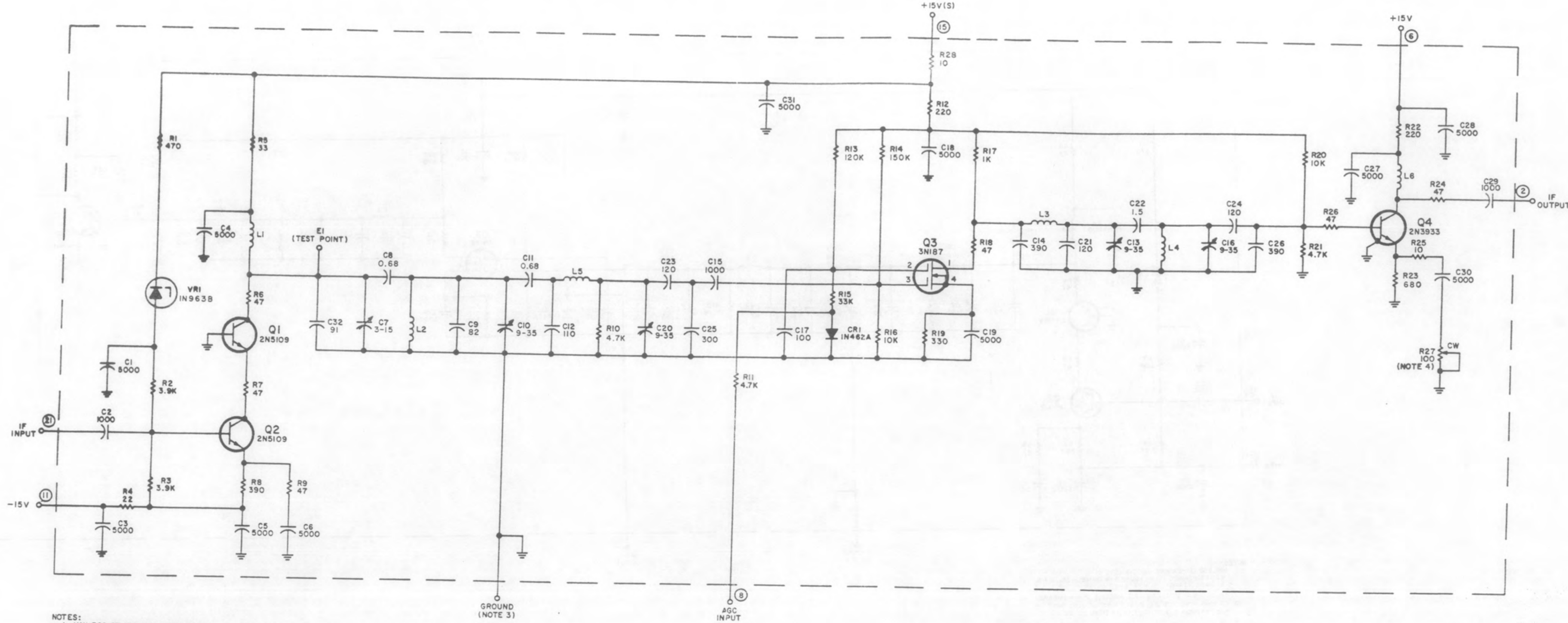
Figure 6-14. Type 72472-1 (8 kHz BW) 21.4 MHz IF Amplifier, A6A(X), Schematic Diagram



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.
4. GROUND PINS FOR THIS MODULE ARE 1,3,4,5,7,9,10,12,13,14,17 THRU 20,22
5. CW ON R26 INDICATES CLOCKWISE ROTATION OF ACTUATOR

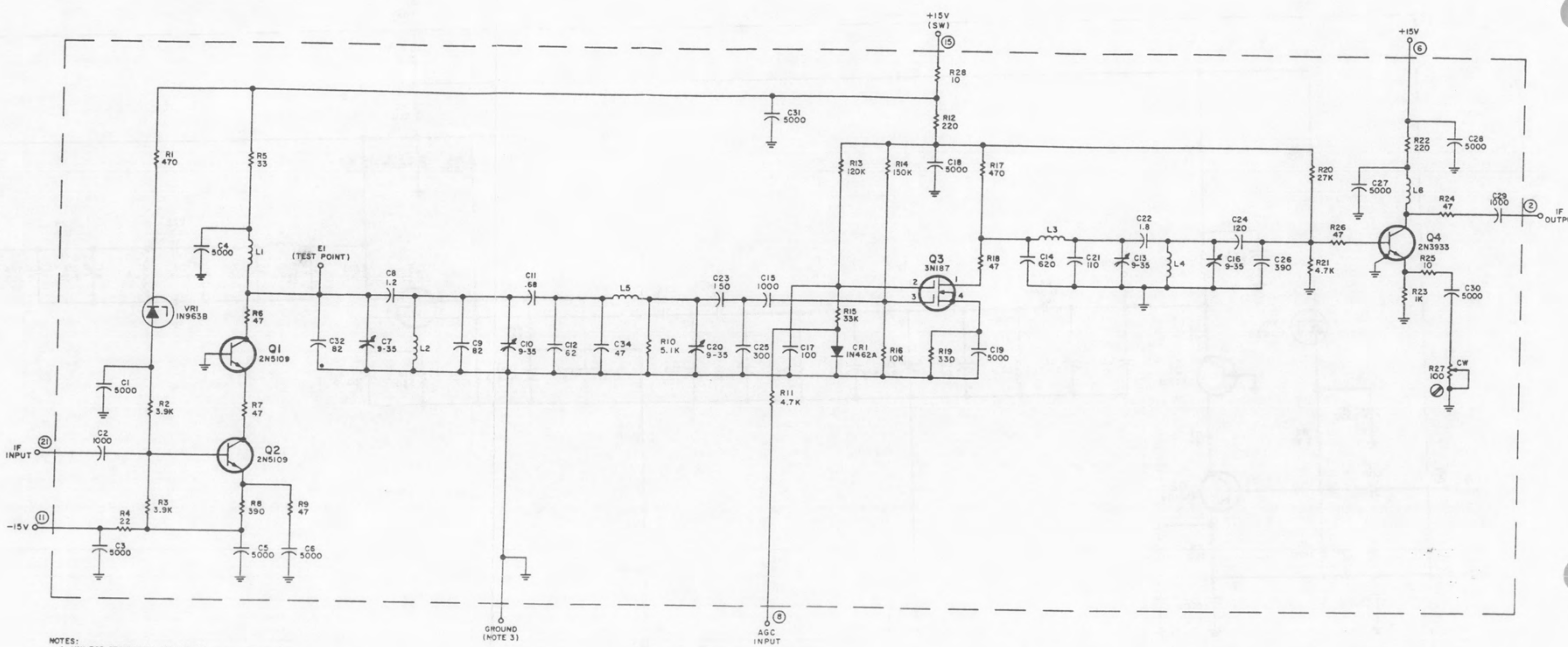
TYPE NO	FL1 BANDWIDTH	R27	R20	R26	R9	C8	C9	C10	C11	R10	R11
72339-1	10KHz	10	[illegible]	100	33	120	220	[illegible]	60	2.49K,1%,1/10W	1.21K,1%,1/10W
72344-1	50KHz	10	10K	500	3	120	220	150	60	2.49K,1%,1/10W	1.21K,1%,1/10W
72389-1	20KHz	10	470	500	62	[illegible]	240	[illegible]	[illegible]	3.0K	1.2K
72431	100KHz	27	470	50	62	130	240	150	160	3.3K	2.2K
72339-2	4KHz	2.7	10K	100	33	[illegible]	240	[illegible]	60	2.7K	1.8K
72344-2	50KHz LP	10	10K	500	3	120	220	150	160	2.49K,1%,1/10W	1.21K,1%,1/10W
72389-2	20KHz LP	10	470	500	62	130	240	150	160	2.4K	910
72389-3	20kHz	10	470	500	62	130	240	150	160	3.0K	1.2K

Figure 6-15. Types 72339 (10 kHz BW); 72389 and 72389-3 (20 kHz BW), 72344 (50 kHz BW); 72431 (100 kHz BW) 21.4 MHz IF Amplifier, A6A(X), Schematic Diagram



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

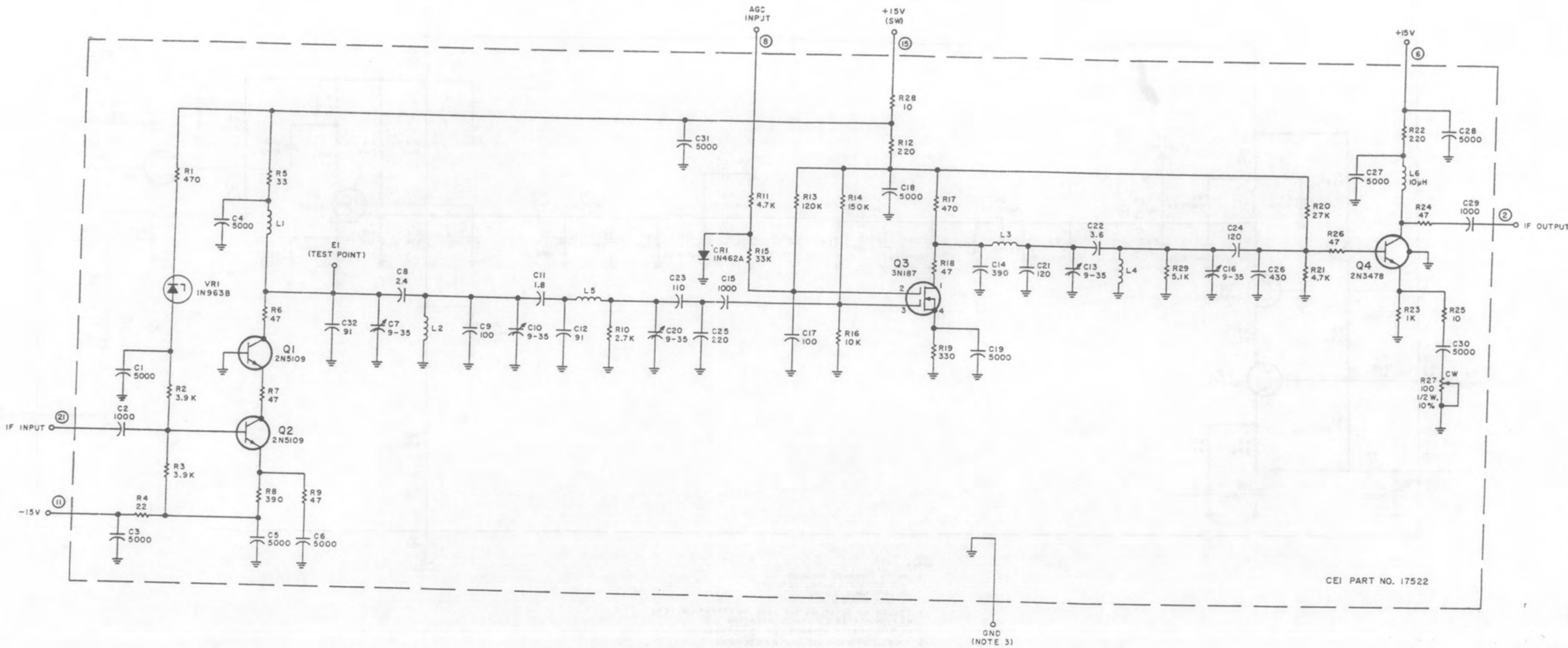
Figure 6-16. Type 72338 (200 kHz BW) 21.4 MHz IF Amplifier, A6A(X), Schematic Diagram



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, 12, 13, 14, 17 THRU 20, 22.

Figure 6-17. Type 72366 (300 kHz BW) 21.4 MHz IF Amplifier, A6A(X), Schematic Diagram

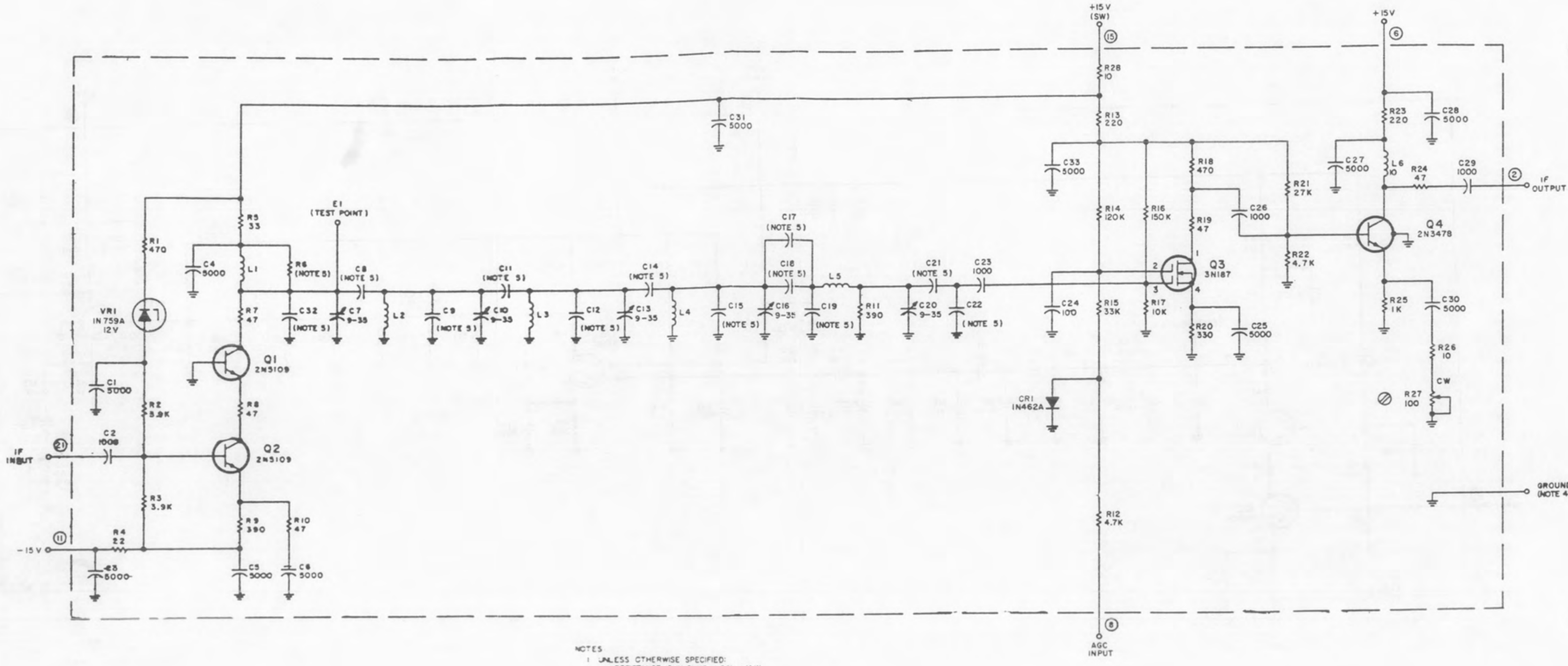


NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN pF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. GROUND PINS ARE THE FOLLOWING: 1, 3, 4, 5, 9, 10, 12, 13, 14, 17 THRU 20, 22.
4. CW ON R27 INDICATES CLOCKWISE ROTATION OF ACTUATOR.

HIGHEST REF DESIG USED	REF DESIG NOT USED
C32 E1 L6 Q4 R29 VR1	

Figure 6-18. Type 72429 (500 kHz BW) 21.4 MHz IF Amplifier, A6A(X), Schematic Diagram

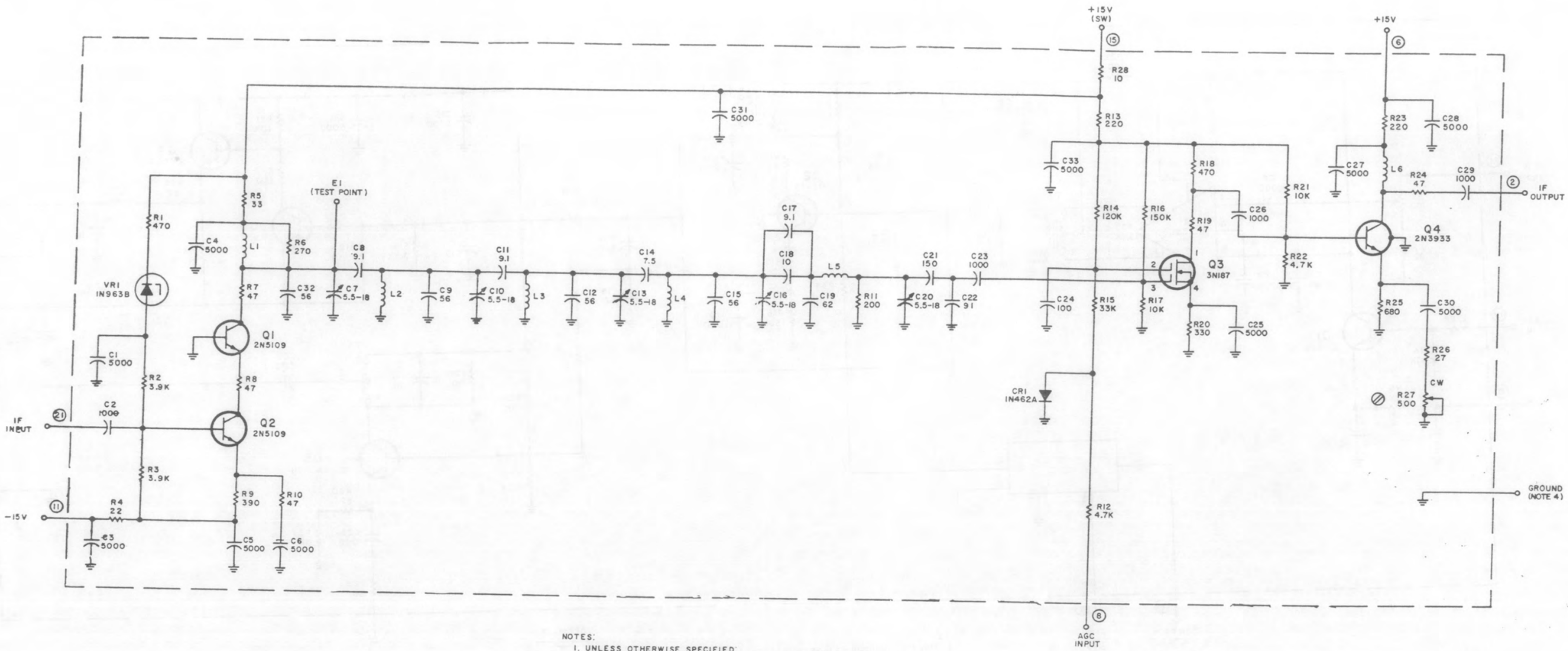


NOTES

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4 W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN μH.
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:
   3 THRU 5, 9, 10, 12 THRU 14, 17 THRU 20, 22.
5. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABULATION BLOCK.

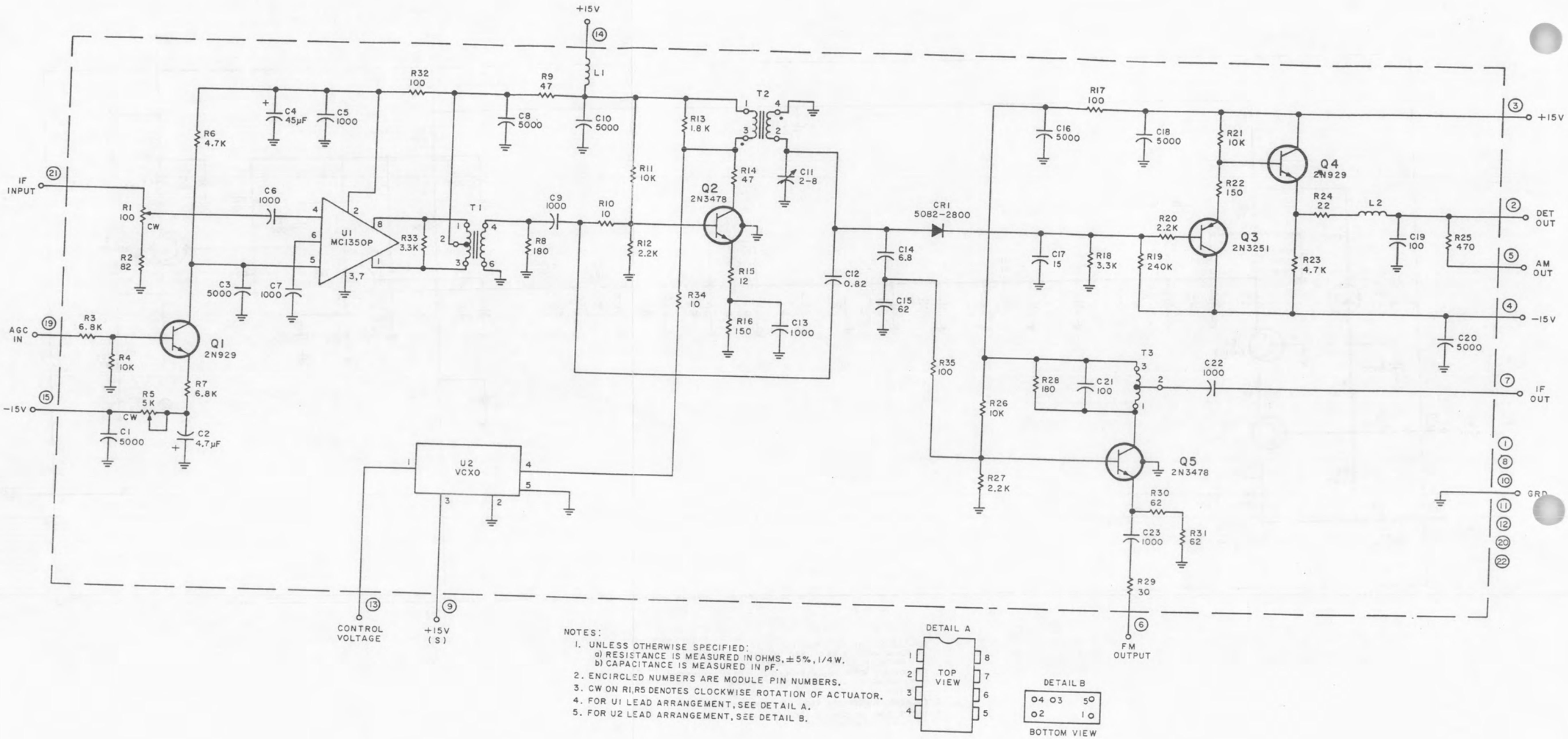
TYPE NO.	BW	C8	C9	C11	C12	C14	C15	C17	C18	C19	C21	C22	C32	R6
72378-1	1MHz	3.6	82	3.0	82	4.0	82	4.7	6.0	100	100	430	82	20K
72378-2	2MHz	75	68	5.1	68	5.6	68	5.6	7.5	91	91	360	68	10K
72378-3	600KHz	3.6	180	3.0	180	4.0	160	4.7	6.0	180	330	330	82	20K

Figure 6-19. Type 72378-1 (1 MHz BW)
Type 72378-2 (2 MHz BW)
21.4 MHz IF Amplifier, A6A(X), 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 THRU 5, 9.10,16 THRU 20, 22

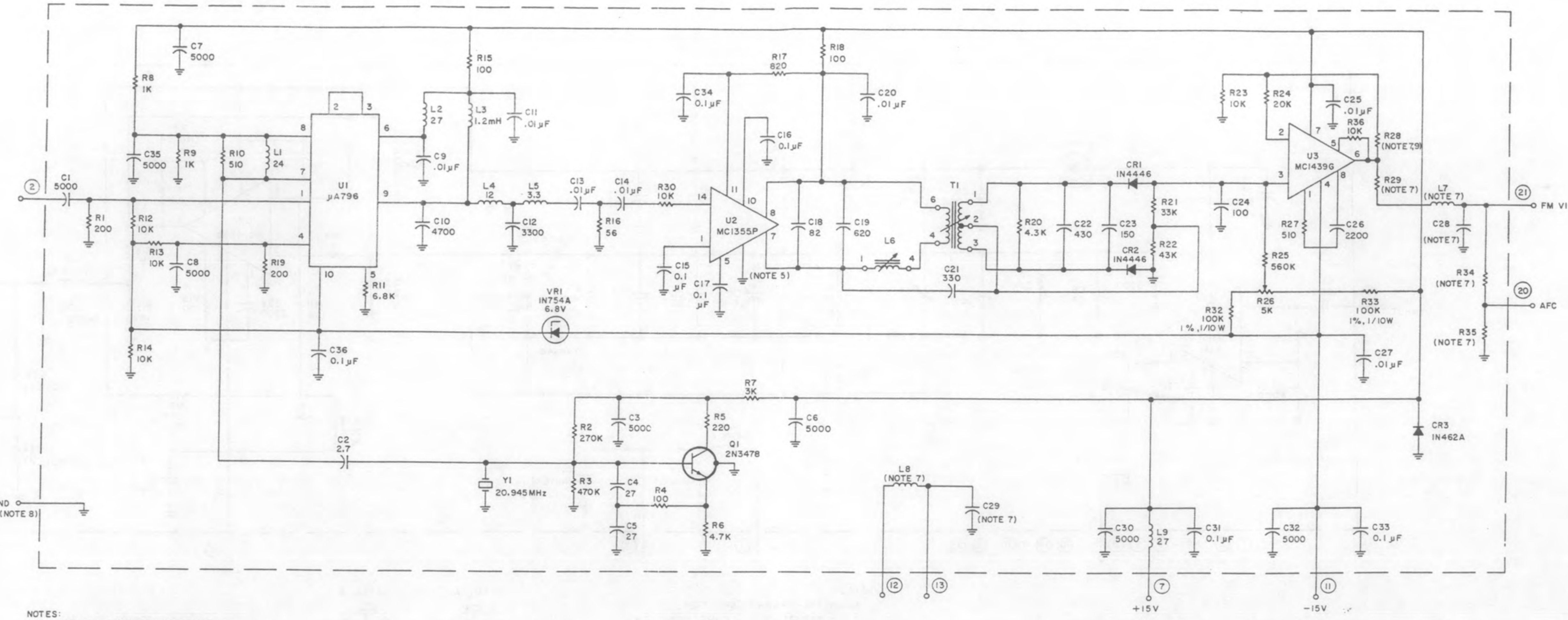
Figure 6-20. Type 72365 (3 MHz BW) 21.4 MHz IF Amplifier, A6A(X), Schematic Diagram



NOTES:

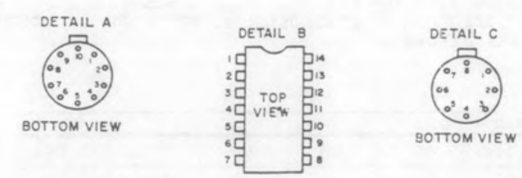
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN pF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. CW ON R1, R5 DENOTES CLOCKWISE ROTATION OF ACTUATOR.
4. FOR U1 LEAD ARRANGEMENT, SEE DETAIL A.
5. FOR U2 LEAD ARRANGEMENT, SEE DETAIL B.

Figure 6-21. Type 72343 IF Output Amplifier (A6A5), Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN μH.
2. ENCIRCLED NUMBERS ARE MODULE PINS.
3. PIN ARRANGEMENT FOR U1 AS SHOWN IN DETAIL A.
4. PIN ARRANGEMENT FOR U2 AS SHOWN IN DETAIL B.
5. GROUND PINS ARE 2,3,4,6,9, 12 AND 13.
6. PIN ARRANGEMENT FOR U3 AS SHOWN IN DETAIL C.
7. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE 1.
8. GROUND PINS FOR THIS MODULE ARE 3, 17 AND 22.
9. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

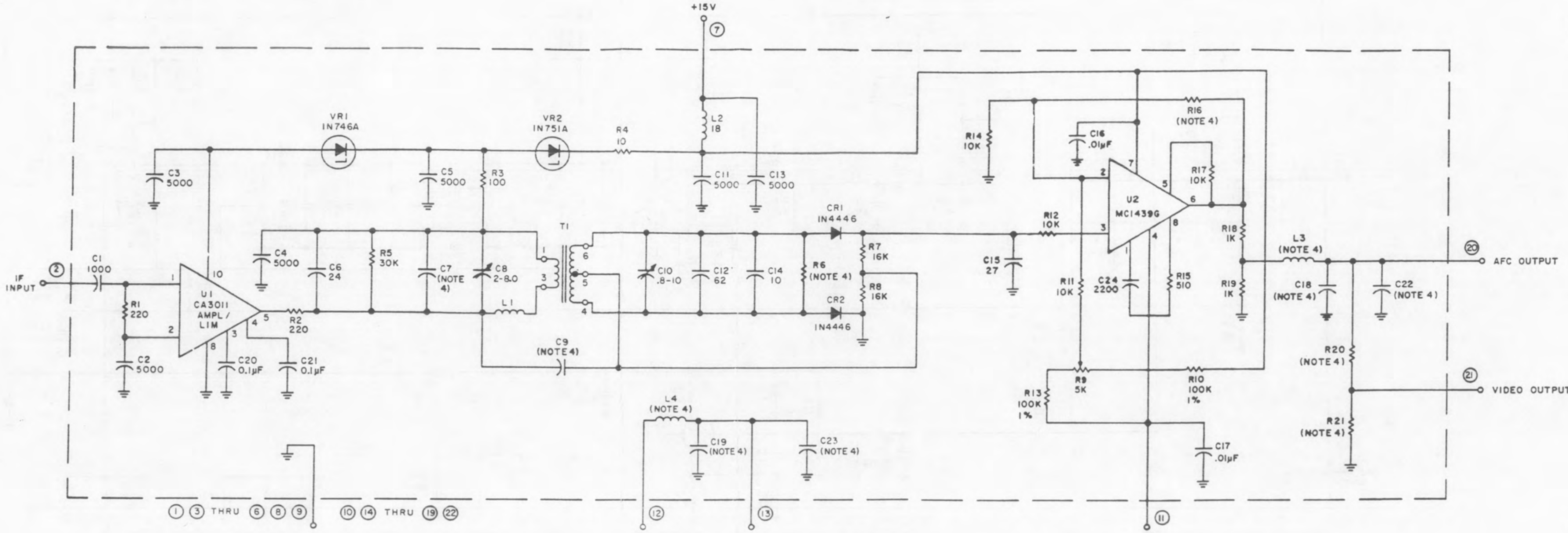


HIGHEST REF DESIG USED	REF DESIG NOT USED
C36	—
CR2	—
L9	—
Q1	—
R35	R31
U3	—
VR1	—
Y1	—

TABLE 1

TYPE No.	BW	C28	C29	L7	L8	R28	R29	R31	R34	R35
791205 - 1	10KHz	0.1μF	.068 μF	22 mH	15mH	16K	510	—	4.7K	510
791205 - 2	20KHz	.047μF	.033 μF	10 mH	6.8mH	3 K	510	—	2.2K	560
791205 - 3	50KHz	.015μF	.012 μF	4.7 mH	3.3mH	470	1K	NOT USED	510	510
791205 - 4	8KHz	0.1μF	.068μF	22 mH	22 mH	16K	220	—	3.9K	330

Figure 6-22. Type 791205-4 (8 kHz BW)
Type 791205-1 (10 kHz BW)
Type 791205-2 (20 kHz BW)
Type 791205-3 (50 kHz BW)
FM Limiter/Discriminator, A6A(X), Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED;
   a) RESISTANCE IS IN OHMS, ±5%, 1/4 W
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN µH.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. FOR U1 PIN ARRANGEMENT, SEE DETAIL A, U2 SEE DETAIL B.
4. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABULATION BLOCK.

DETAIL A

BOTTOM VIEW

DETAIL B

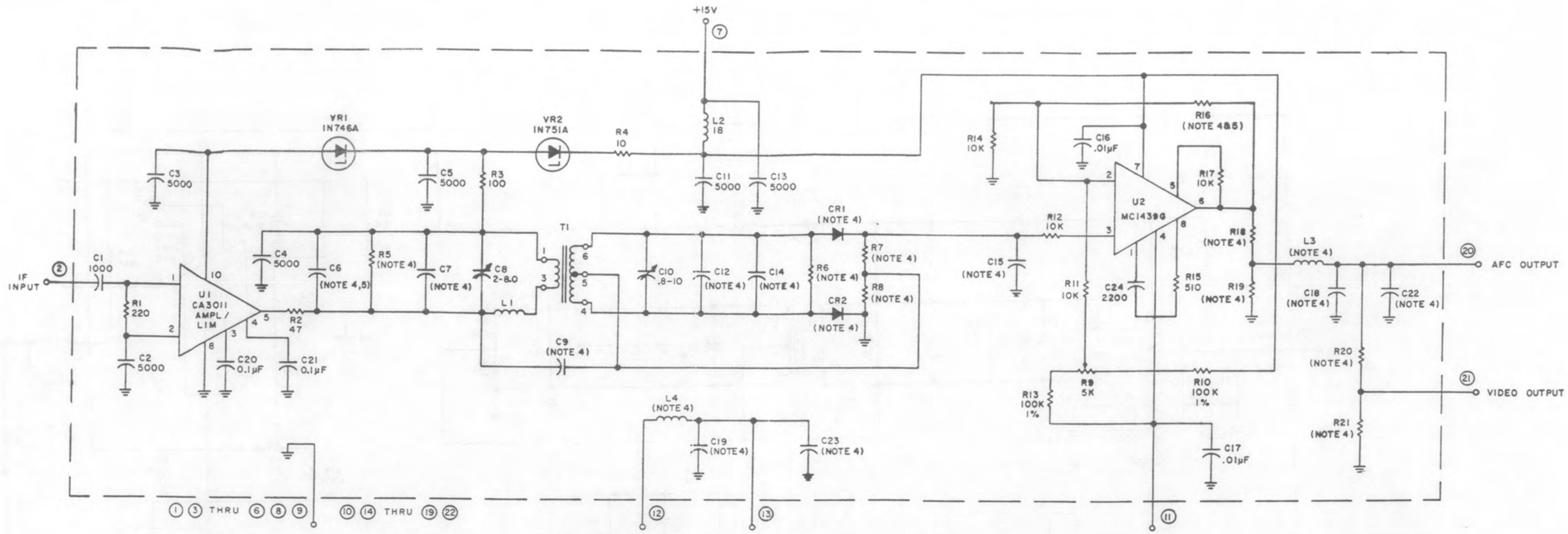
BOTTOM VIEW

HIGHEST REF DES USED	NOT USED REF DES
C24 CR2 L4 R21 T1 VR2 U2	SEE TAB

TABULATION BLOCK

TYPE NO.	BW	L3	L4	C18	C19	C22	C23	R6	R16	R20	R21	C7	C9
791331	100 KHz	2.2mH	1.8mH	.01µF	6200	N/U	N/U	N/U	16K	JUMPER	N/U	N/U	18
791338	200KHz	1.0mH	750	4700	3300	N/U	N/U	N/U	22K	240	470	N/U	8.2

Figure 6-23. Type 791331 (100 kHz BW)
Type 791338 (200 kHz BW)
FM Limiter/Discriminator, A6A(X),
Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED;
   a) RESISTANCE IS IN OHMS, ±5%, 1/4 W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN µH.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. FOR U1 PIN ARRANGEMENT, SEE DETAIL A, U2 SEE DETAIL B.
4. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABULATION BLOCK.

DETAIL A

BOTTOM VIEW

DETAIL B

BOTTOM VIEW

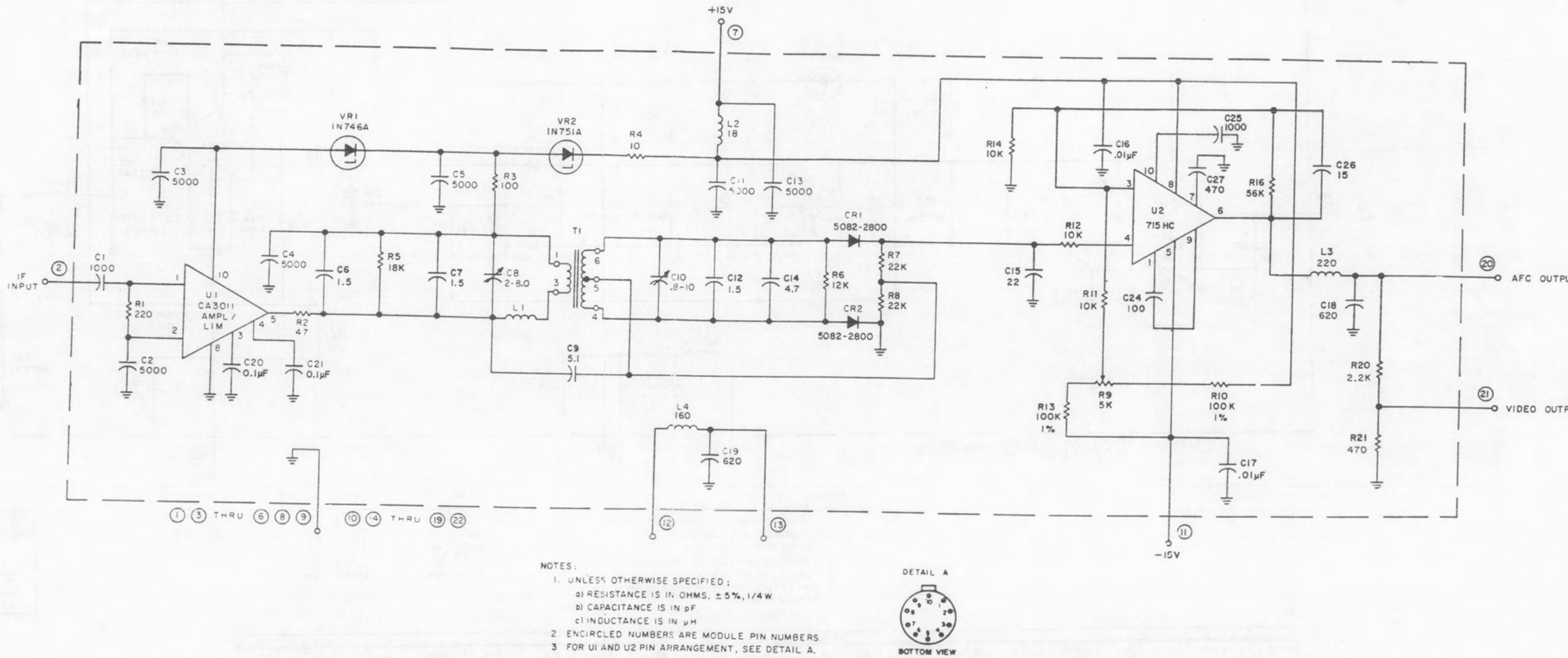
HIGHEST REF DES USED	NOT USED REF DES
C24 CR2 L4 R21 T1 VR2 U2	SEE TAB

TABULATION BLOCK

TYPE NO.	B.W.	L3	L4	C6	C7	C9	C12	C14	C15	C18	C19	C22	C23	R5	R6	R7	R8	R16	R18	R19	R20	R21	CR1	CR2
791366	300 KHz	750	470	2.2	4.7	8.2	30	15	27	2200	2000	NOT USED	NOT USED	30K	20K	16K	16K	30K	750	1K	470	470	1N4446	1N4446
791329	500 KHz	470	330	1.5	1.5	5.1	1.5	4.7	22	1500	1200	NOT USED	NOT USED	18K	12K	22K	22K	43K	JUMPER	NOT USED	910	470	5082-2800	5082-2800

5. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

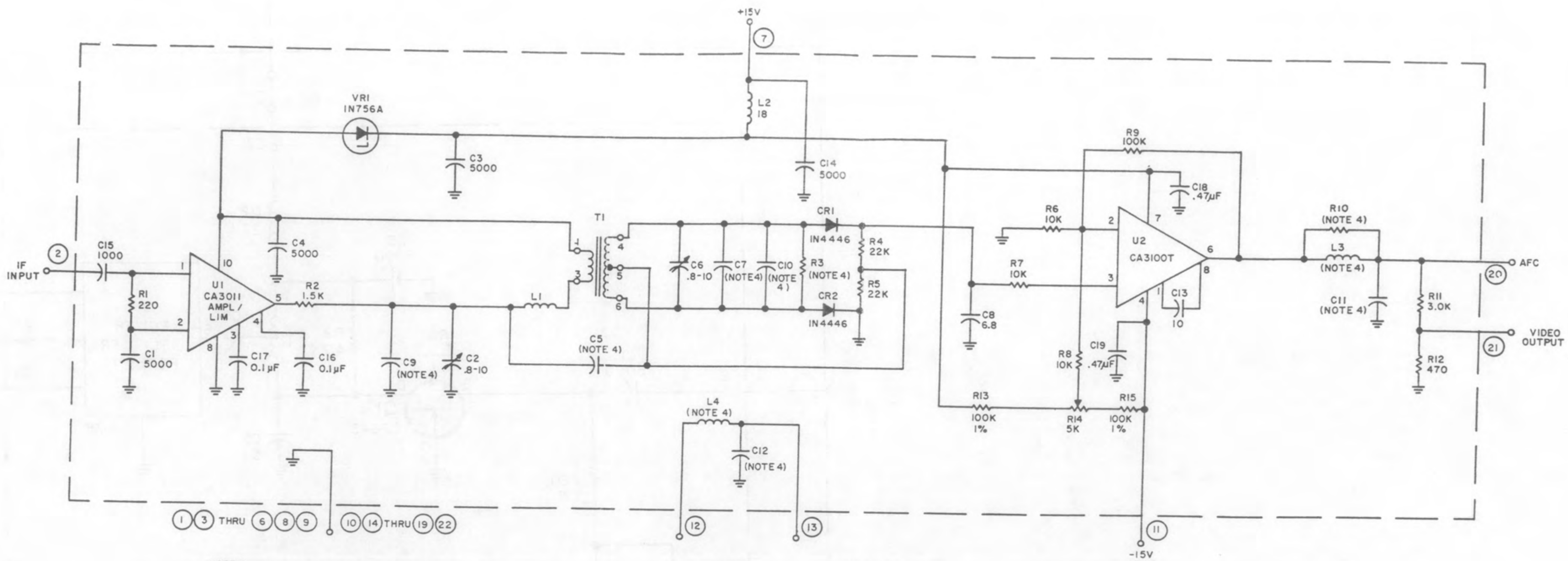
Figure 6-24. Type 791366 (300 kHz BW)
Type 791329 (500 kHz BW)
FM Limiter/Discriminator, A6A(X), Schematic Diagram



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ±5%, 1/4W
b) CAPACITANCE IS IN pF
c) INDUCTANCE IS IN µH
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. FOR U1 AND U2 PIN ARRANGEMENT, SEE DETAIL A.

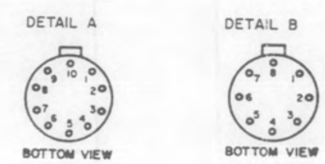
HIGHEST REF DES USED	NOT USED REF DES
C25	C22
CR2	C23
L4	R18
T1	R19
VR2	R15
U2	R17

Figure 6-25. Type 791378 (1 MHz BW) FM Limiter/Discriminator, A6A(X), Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED;
   (a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   (b) CAPACITANCE IS IN pF.
   (c) INDUCTANCE IS IN µH.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. FOR U1 PIN ARRANGEMENT, SEE DETAIL A, AND FOR U2 PIN ARRANGEMENT, SEE DETAIL B.
4. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABULATION BLOCK.

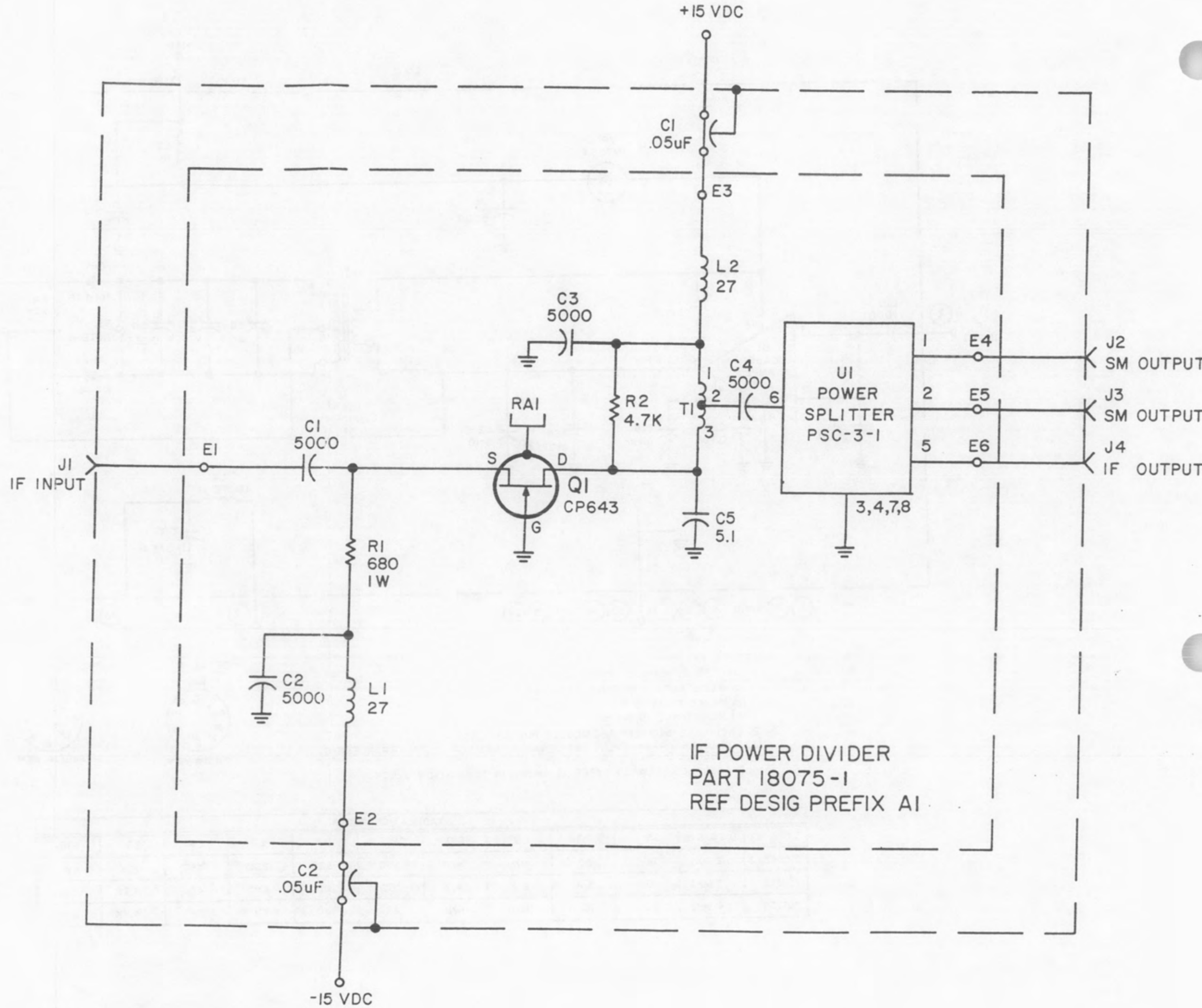


TABULATION BLOCK

TYPE NO.	DISC. B.W.	C5	C7	C9	C10	C11	C12	L3	L4	R3	R10
791365-2	2 MHz	18	20	N/U	N/U	150	300	200	75	22K	1K
791365-1	3 MHz	10	5.6	6.2	4.7	150	180	100	47	4.7K	510
791330	4 MHz	10	10	N/U	N/U	82	130	75	39	4.7K	510

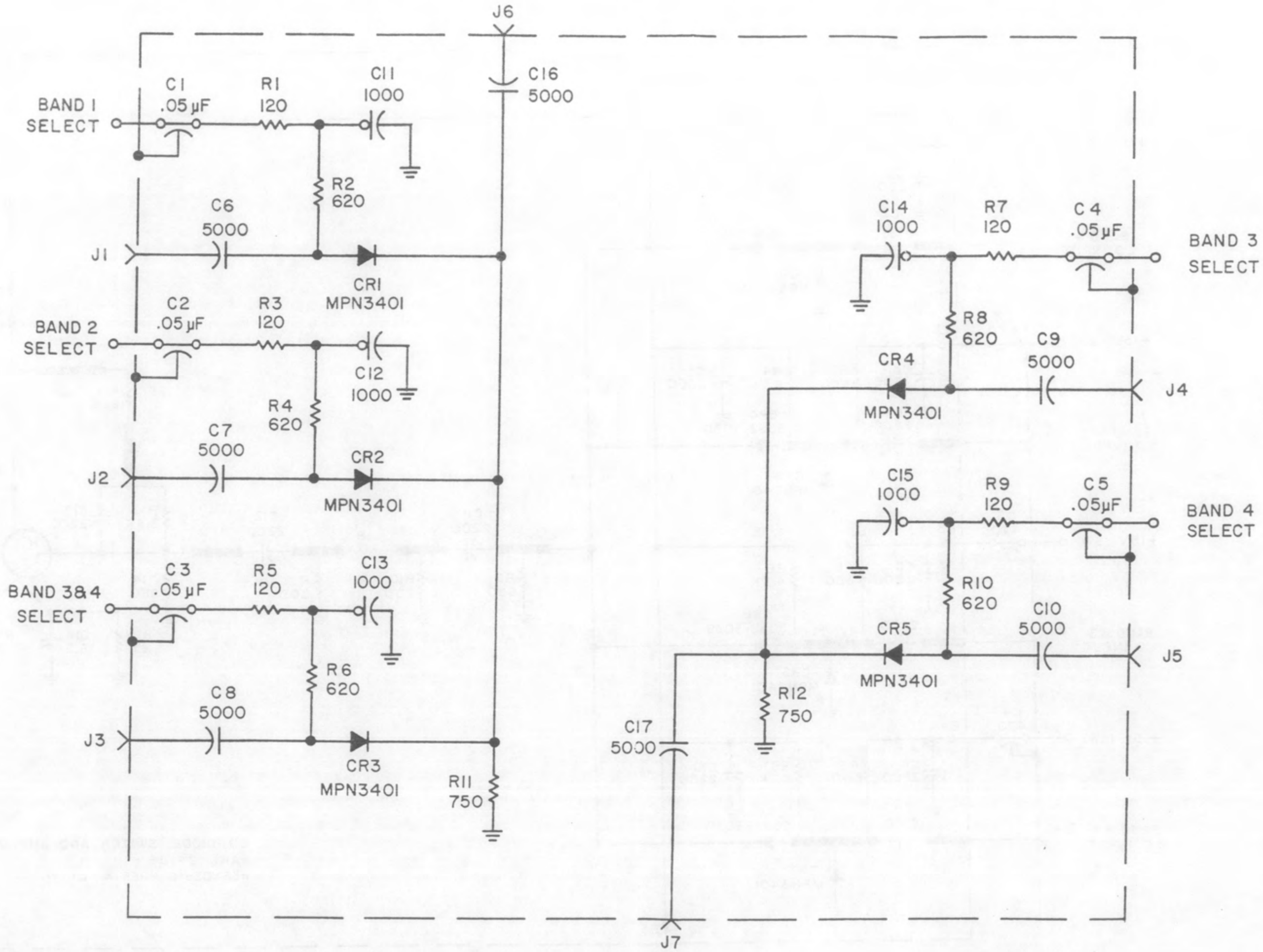
HIGHEST REF DESIG USED	REF DESIG NOT USED
C19 CR2 L4 R15 T1 U2 VR1	SEE TABULATION BLOCK

Figure 6-26. Type 791365-2 (2 MHz BW)
Type 791365-1 (3 MHz BW)
FM Limiter/Discriminator, A6A(X), Schematic Diagram



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

Figure 6-27. Type 791495-1 IF Power Divider (A7), Schematic Diagram



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

Figure 6-28. Type 72465-1 IF Switching Assembly (A8), Schematic Diagram

NOTE:

UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ±5%, 1/8W.
b) CAPACITANCE IS IN pF.

HIGHEST REF DESIG	REF DESIG NOT USED
A1 C6 J5	

A1

C17 CR8 E6 Q1 R18	

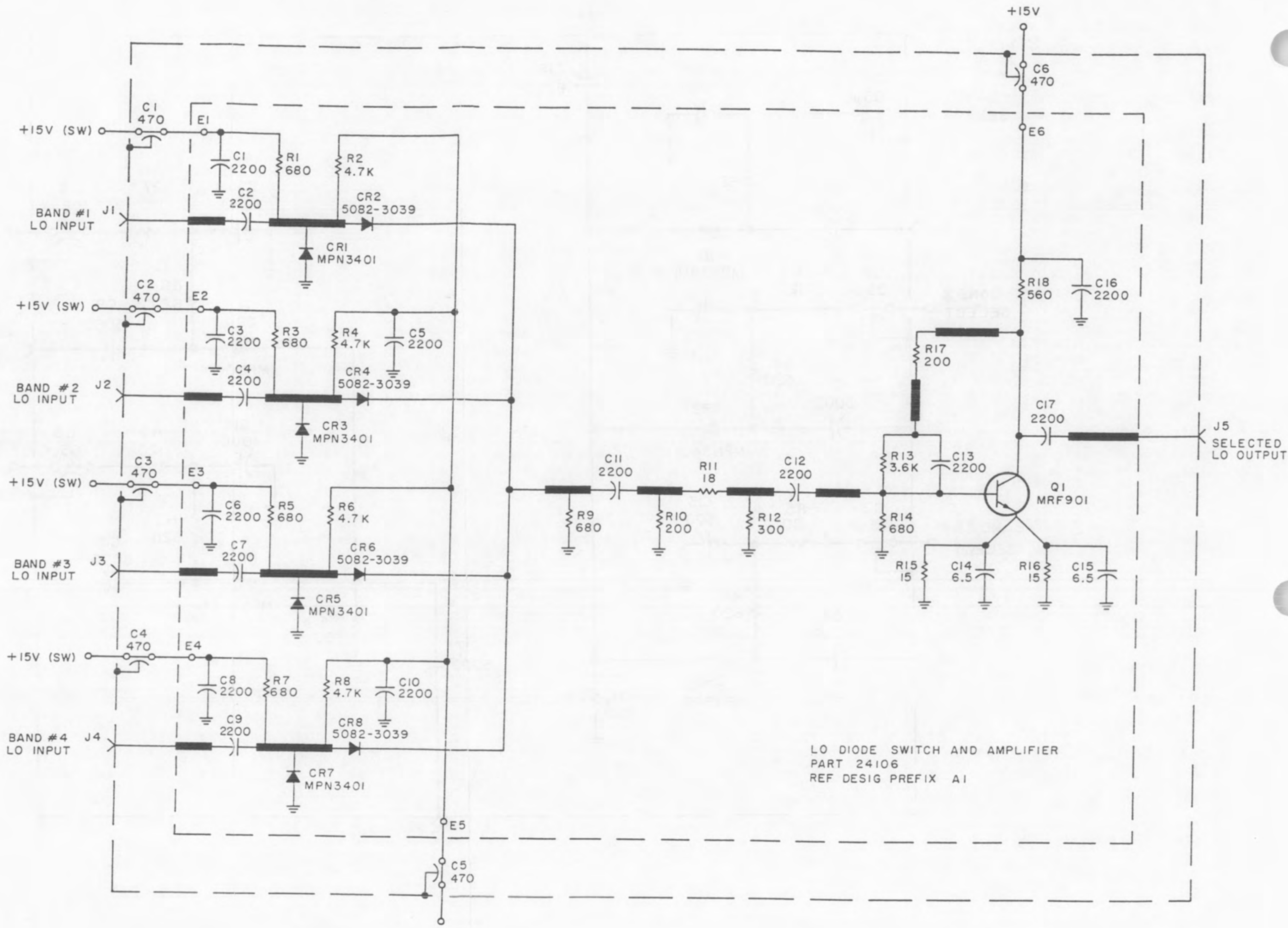
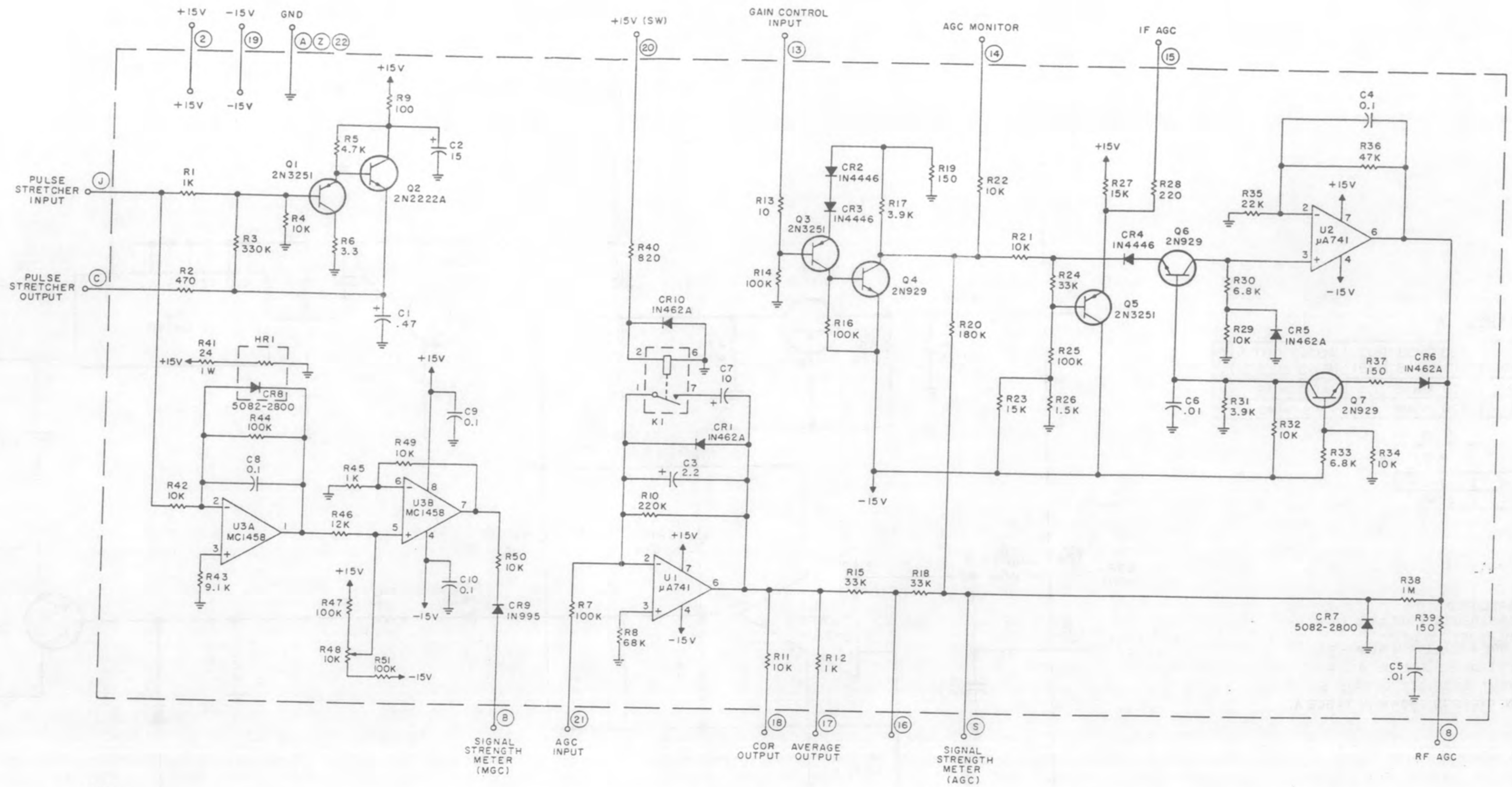
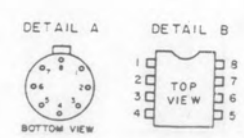


Figure 6-29. Type 791501-1 LO Diode Switch and Amplifier (A9) Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4 W.
   b) CAPACITANCE IS IN μF.
2. PIN ARRANGEMENTS ARE SHOWN AS FOLLOWS:
   U1, U2 - DETAIL A
   U3 - DETAIL B



HIGHEST REF DESIG	REF DESIG NOT USED
C10 CR10 HR1 K1 Q7 R51 U3	

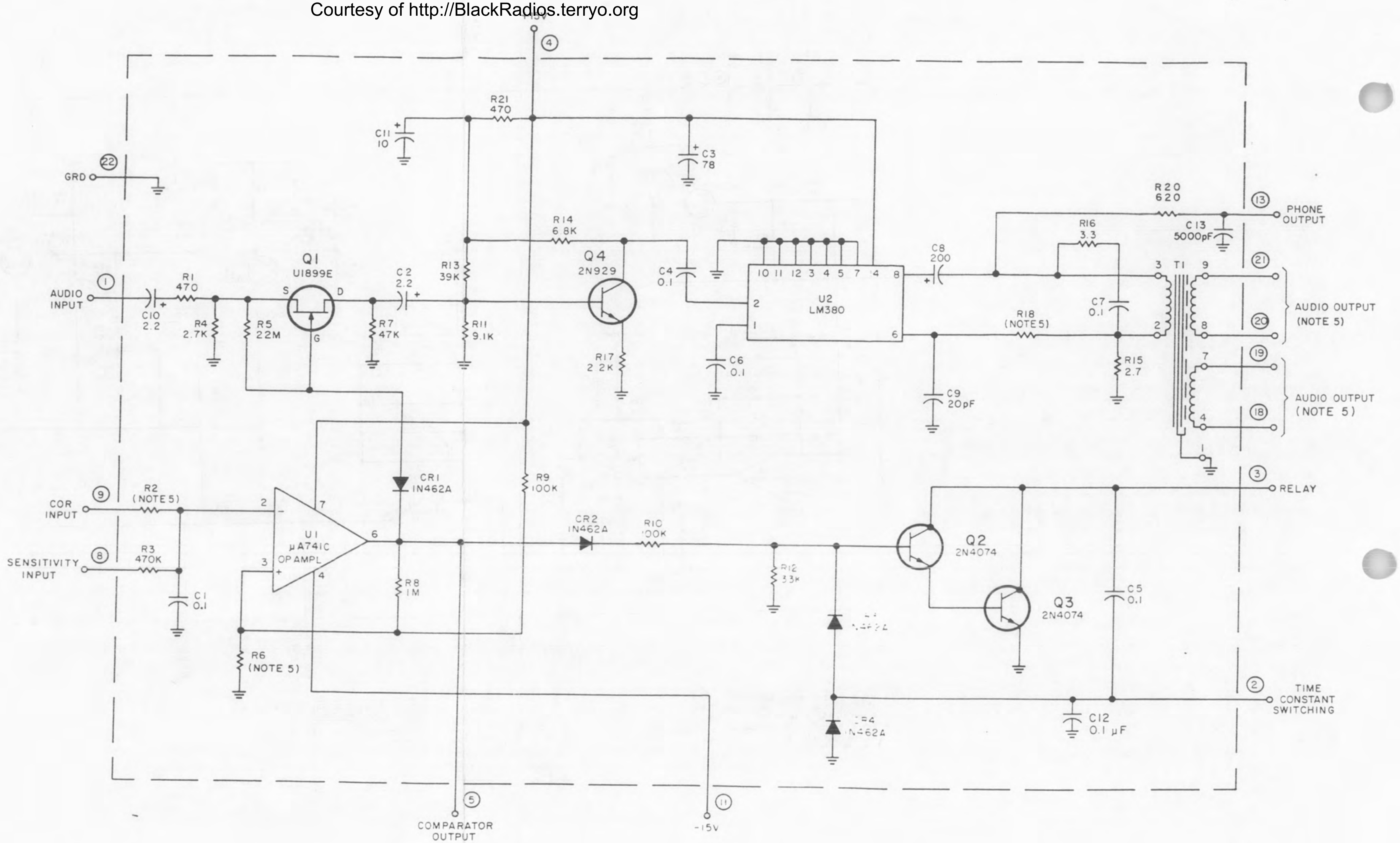
Figure 6-30. Type 78108-1 Pulse/Average AGC Amplifier (A10), Schematic Diagram

TABLE A

DASH NO.	R6	AUDIO OUTPUT (PINS 18 & 19)	AUDIO OUTPUT (PINS 20 & 21)
7446-1	2.2K	50 OHMS	600 OHMS
7446-2	10	600 OHMS	3.2 OHMS

DASH NO.	R2	R18
7446-1	150 K	2.2 M
7446-2	10 K	22 M

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN μF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. FOR PIN ARRANGEMENT OF U2 SEE DETAIL A.
4. FOR LEAD ARRANGEMENT OF U1 SEE DETAIL B.
5. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE A.



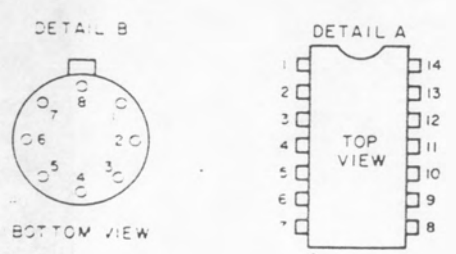
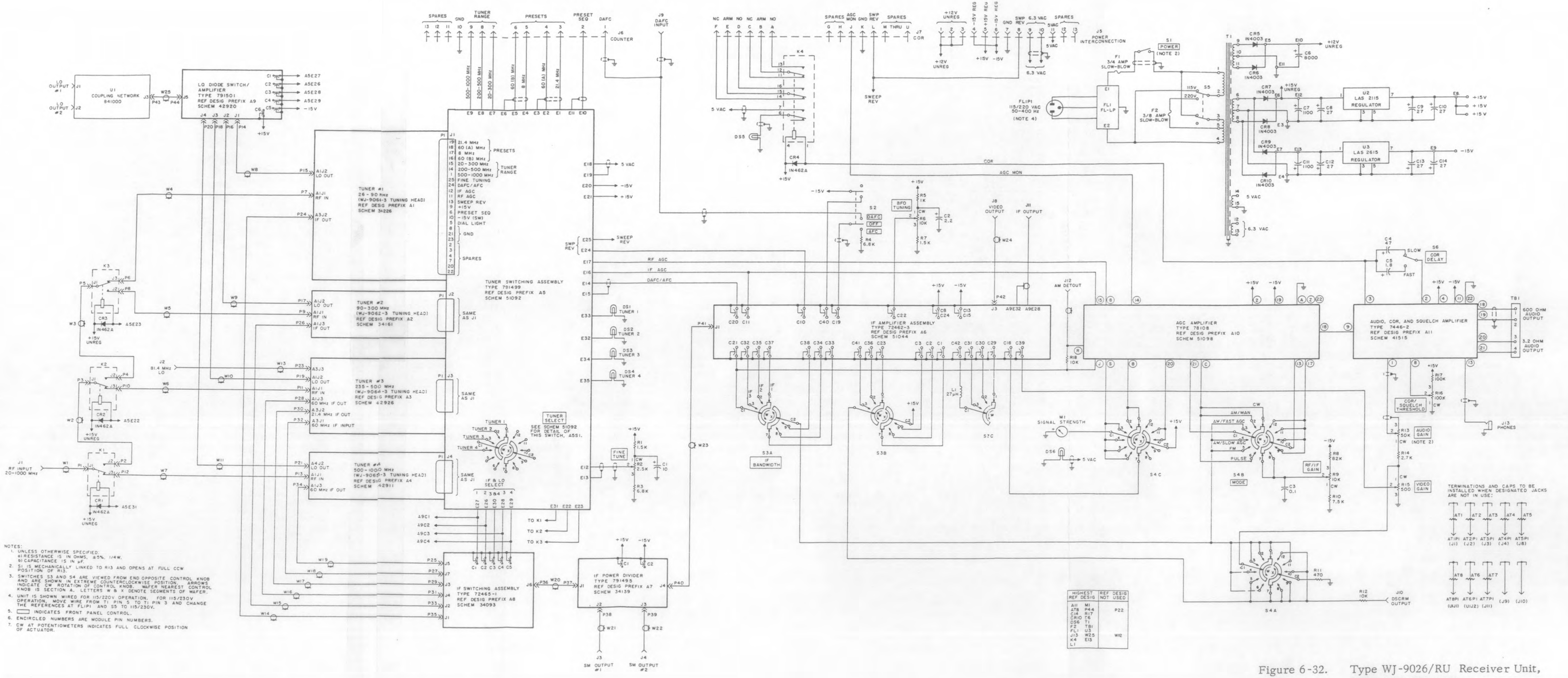


Figure 6-31. Type 7446-2 Audio COR and Squelch Amplifier (A1
Schematic Diagram



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN μF.
2. S1 IS MECHANICALLY LINKED TO R13 AND OPENS AT FULL CCW POSITION OF R13.
3. SWITCHES S3 AND S4 ARE VIEWED FROM END OPPOSITE CONTROL KNOB AND ARE SHOWN IN EXTREME COUNTERCLOCKWISE POSITION. ARROWS INDICATE CW ROTATION OF CONTROL KNOB. WAFER NEAREST CONTROL KNOB IS SECTION A. LETTERS W & X DENOTE SEGMENTS OF WAFER.
4. UNIT IS SHOWN WIRED FOR 115/220V OPERATION. FOR 115/230V OPERATION, MOVE WIRE FROM T1 PIN 5 TO T1 PIN 3 AND CHANGE THE REFERENCES AT FLIP1 AND S5 TO 115/230V.
5. ▭ INDICATES FRONT PANEL CONTROL.
6. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
7. CW AT POTENTIOMETERS INDICATES FULL CLOCKWISE POSITION OF ACTUATOR.

HIGHEST REF DESIG		REF DESIG NOT USED
A11	M1	
AT8	P44	P22
C14	R17	
CR10	S6	
DS6	T1	
F2	TB1	
FL1	U3	
J13	W25	W12
K4	E13	
L1		

Figure 6-32. Type WJ-9026/RU Receiver Unit, Schematic Diagram

SECTION VII

TYPE WJ-9028/RU RECEIVER UNIT

SUPPLEMENT

Table 7-1. WJ-9028/RU Receiver Specifications

Frequency Range	20-1000 MHz in four ranges: 20-90 MHz, 90-300 MHz, 235-500 MHz and 500-1000 MHz.
Types of Reception	CW, AM, FM and PULSE.
Noise Figure:	
20-90 MHz	6 dB, maximum
90-300 MHz	8 dB, maximum
235-500 MHz	10 dB, maximum
500-1000 MHz	12 dB, maximum
Sensitivity	Table 7-2 correlates noise figure, bandwidth and sensitivity.
Tangential Sensitivity	Input signal levels 6 dB lower than those in the table will provide tangential sensitivity for pulse signals with a repetition rate equal to .01 of the IF bandwidth and a 10% duty cycle.
Tuning/Frequency Control	Tuning range selected by front panel bandswitch, main tuning accomplished using tuning knob on appropriate installed tuner. Fine tuning adjustment provided, AFC provision included and DAFC correction voltage can be supplied by WJ-9028/DU Display Unit.
3rd Order Intermod Intercept Point	-10 dBm min. referred to input (in band)
Frequency Stability (LO drift at constant temperature after initial one-hour warmup) :	
Band A	10 kHz per hour, maximum
Band B	20 kHz per hour, maximum
Band C	30 kHz per hour, maximum
Band D	60 kHz per hour, maximum
IF Bandwidths	Up to three front-panel selectable IF bandwidths provided (See Table 7-3 for list of available IF bandwidths).
Intermediate Frequency	21.4 MHz
Predetection IF Output	21.4 MHz center frequency. Minimum output is 100 mV into 50 ohm load for input signals above AGC threshold.
IF Rejection	
Band A	60 dB, minimum
Bands B, C and D	80 dB, minimum
Image Rejection (All Bands)	60 dB, minimum

Table 7-1. WJ-9028/RU Receiver Specifications (Continued)

Overall RF Bandwidth:	
Band A	1.0 MHz, min. below 40 MHz; 1.5 MHz, above 40 MHz.
Bands B, C and D	3.0 MHz, minimum
LO Output	Output level at J2A is 50 mV rms, minimum, terminated in 50Ω.
DC Power	DC power is provided from the receiver mainframe to the Display Unit. ±15 volts regulated and +12 volts unregulated.
BFO Circuit	Operates in all IF bandwidths. Crystal controlled, zero beat oscillator.
Gain Control Characteristics:	
Pulse AGC, 3 MHz Bandwidth	Charge time sufficiently short to permit pulse widths as narrow as 1 μs. Discharge time sufficiently long to operate with PRR as low as 100 pps.
AM Output Stability with AGC . . .	Output changes by no more than 6 dB from input signal level required for a 10 dB (S + N)/N (see Table 7-2) up to -10 dBm.
Manual Control Range	70 dB, minimum
Video Output Level.	1 V rms, minimum, into a 100 ohm load.
Video Amplifier Response	Within 3 dB from 20 Hz to 2 MHz.
Audio Frequency Response	Within 3 dB from 100 Hz to 20 kHz.
Meters	Signal Strength.
COR Sensitivity	Operates at signal level 6 dB below the level required for a 10 dB (s + n)/n.
COR Range	Continuously adjustable to operate from minimum threshold signal levels up to -40 dBm input.
COR Operate Time.	20 ms, maximum
COR Release Time.	6 seconds, ±25%, fixed
Permissable Operating Temperature Range.	0°-50° C
Power Requirements.	115/220 VAC, ±10%, 50-400 Hz
Power Consumption	35 watts typical, Receiver Unit only; 60 watts maximum, Receiver Unit and Display Unit.
Dimensions.	5.25 inches high, 19 inches wide, and 19.5 inches deep
Weight	35 lbs. approximately (receiver only)

Table 7-2. Receiver Sensitivity and Noise Figure vs. Bandwidth Options

Receiver AM*, FM** Sensitivity in dBm at Receiver IF Bandwidths

Frequency Range	Tuner	Noise Figure	4KHz	8KHz	10KHz	20KHz	50KHz	100KHz
20- 90 MHz	WJ-9061-4	6dB	-113	-110	-109	-106	-102	-99
90- 300 MHz	WJ-9062-3	8db	-111	-108	-107	-104	-100	-97
235- 500 MHz	WJ-9064-3	10db	-109	-106	-105	-102	- 98	-95
500-1000 MHz	WJ-9065-3	12dB	-107	-104	-103	-100	- 96	-93

Frequency Range	Tuner	Noise Figure	200KHz	300KHz	500KHz	1MHz	3MHz	4MHz
20- 90 MHz	WJ-9061-4	6dB	-96	-94	-92	-89	-84	-83
90- 300 MHz	WJ-9062-3	8dB	-94	-92	-90	-87	-82	-81
235- 500 MHz	WJ-9064-3	10dB	-92	-90	-88	-85	-80	-79
500-1000 MHz	WJ-9065-3	12dB	-90	-88	-86	-83	-78	-77

* AM . . . The input signal levels tabulated above will produce at least a 10dB (s+n)/n when modulated 50% at a 1KHz rate.

** FM . . . The input signal levels tabulated above will produce at least a 17 db (s+n)/n when modulated at a 1KHz rate with a deviation equal to 30% of the i-f bandwidths. However, for an 8 or 10 KHz bandwidth, the modulation rate is 400 Hz.

Table 7-3. IF Bandwidth Options

IF BANDWIDTH	IF AMPLIFIER PC TYPE NO.	FM LIMITER/DISC. PC TYPE NO.
4 KHz	72339-2	791205-5
8 KHz	72472	791205-4
10 KHz	72339	791205-1
20 KHz	72389/-3	791205-2
50 KHz	72344	791205-3
100 KHz	72431	791331
200 KHz	72338	791338
300 KHz	72366	791366
500 KHz	72429	791329
1 MHz	72378-1	791378
2 MHz	72378-2	791365-2
3 MHz	72365	791365-1
4 MHz	72430	791330

7.1 ELECTRICAL CHARACTERISTICS

Information in this section provides an accurate listing of all major changes made throughout the receiver. All descriptions are compared directly to the assemblies used in the WJ-9026/RU, even though some type numbers may change.

7.1.1 The balanced mixer in the mixer IF amplifier stage of Tuner 1 is modified. The LO input to the mixer is amplified to meet the required power specifications for a higher intercept point.

7.1.2 The Type 71429-1 8-21.4 MHz Converter Assembly (A1A3), included with the 20-90 MHz Tuning Head Assembly (A1) is also modified to meet the specifications for a higher intercept point.

7.1.3 The Type 791495 IF Power Divider is eliminated. The output of the IF Switching Assembly (A8) is directly connected to J1 of IF Amplifier Assembly (A6). Only one SM output is available from the IF Amplifier Assembly and is located at rear panel Jack J4.

7.1.4 LO Coupling Network U1 is eliminated. The LO output is taken directly from J ck J5 of LO Diode Switch Amplifier (A9). Its rear panel Jack Designation is J2A.

7.1.5 The BFO Tuning Potentiometer is eliminated from the front panel. The BFO is now fixed at 21.4 MHz.

7.1.6 The AM Detector Output, previously taken from AGC Amplifier Assembly (A10) is eliminated for this application.

7.1.7 The Discriminator Output Jack J10 is eliminated for this application.

7.1.8 The DAFC On/Off line is added to Switch S2 and allows the application of +15 volts to pin 12 of Jack J5. This addition controls the DAFC function for both units, from one switch located on the front panel of the receiver.

7.1.9 The COR Delay Switch S6 is eliminated from the front panel controls. The COR release time is now fixed at 6 sec ±25%.

7.1.10 Terminal Board TB1 is eliminated. The 600 Ω audio output from the Audio COR and Squelch Assembly (A11) is now available from pins G and H of COR Jack J7, located on the rear panel.

7.1.11 The AGC fast/slow position of Switch S4 is eliminated. The AGC attack time is now fixed at approximately 30 msec.

7.1.12 Light assembly DS6 is eliminated from the signal strength meter for this application.

7.1.13 The IF Amplifier Assembly (A6) is changed to Type 72462-1. The changes made on this assembly pertain only to the replacement of the IF output amplifier.

7.1.14 The AGC Amplifier Assembly (A10) is changed to Type 7875.

7.1.15 The Audio, COR and Squelch Amplifier Assembly (A11) is changed to Type 7457 and is only provided with a 600 Ω output impedance.

7.2 MECHANICAL CHARACTERISTICS

This Receiver is mechanically similar to the WJ-9026/RU except for a new rear panel layout and some modifications made within the front panel controls.

7.3 INSTALLATION AND OPERATION

Procedures concerning Installation and Operation for the WJ-9028/RU are the same as those included with the WJ-9026/RU, except for the differences explained in the following paragraphs.

7.3.1 REAR PANEL REFERENCE DESIGNATION CHANGES

Table 7-4 includes Reference Designation changes for the rear panel of the WJ-9028/RU. The outputs for this unit are identical to the WJ-9026/RU except for the additions and deletions listed in the following table. The Jack additions are signified by a dash in the WJ-9026/RU column and the Jack deletions are signified by a dash in the WJ-9028/RU column.

Table 7-4. Reference Designation Changes

Output	WJ-9028	WJ-9026
LO Output #1	J2A	J1
LO Output #2	--	J2
IF OUT	J10	J11
COR Audio Out	J7	J7
A) AUDIO OUT	J7-(G&H)	TB1 (pins 1 & 2)

Table 7-4. Reference Designation Changes (cont'd)

Output	WJ-9028	WJ-9026
POWER INTER-CONNECTOR	J5	J5
A) DAFC ON/OFF	J5-12	--
SM OUT #1	--	J3
AM DET OUT	--	J12
PHONES	J11	J13
DSCRM OUT	--	J10
AUXILIARY RF IN	J3A	--
DAFC IN	J9	J9

7.3.2 FRONT PANEL CONTROL CHANGES

The following paragraphs concern front panel control changes made on the WJ-9028/RU.

7.3.2.1 Mode Switch. - The AGC Fast/Slow position of this switch is eliminated, causing the AGC rate to be set at a fixed rate. All other functions of this control remain the same.

7.3.2.2 IF Bandwidth Switch. - The function of the IF Bandwidth Switch remains the same.

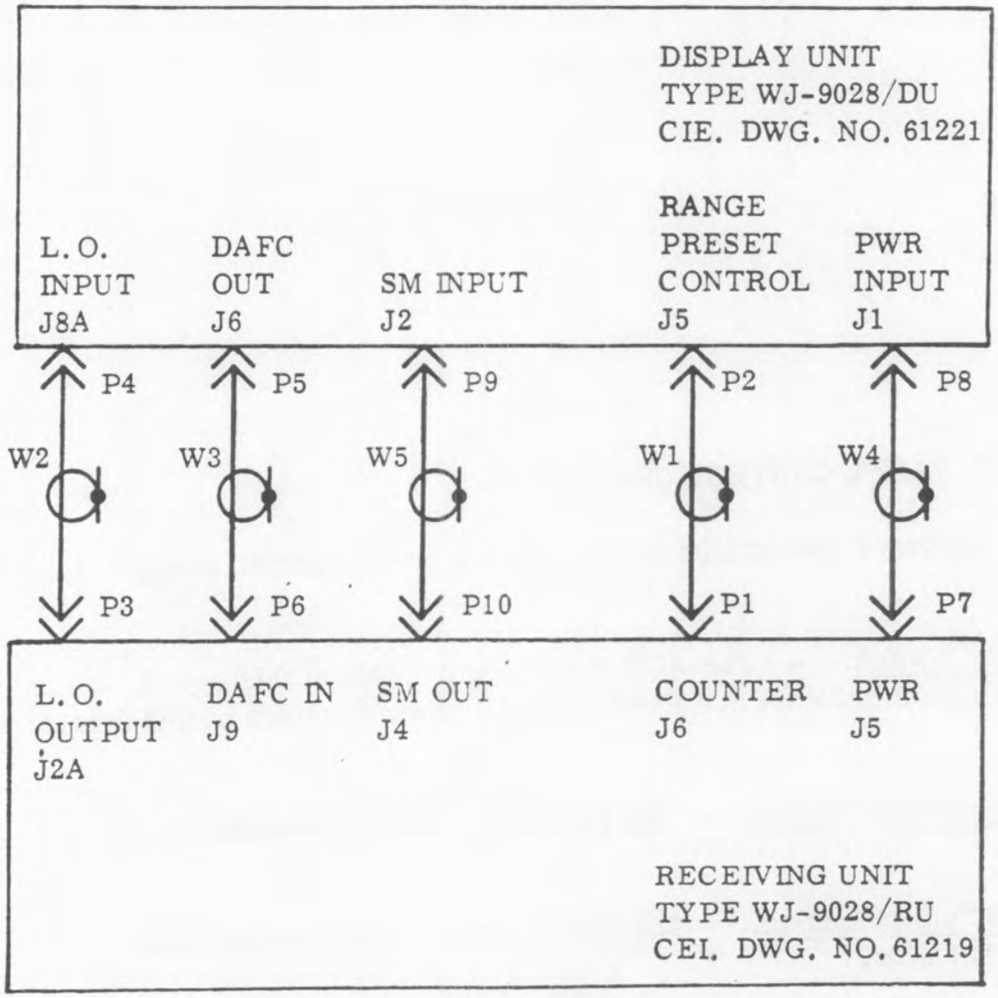
7.3.2.3 BFO Tuning Control. - The BFO Tuning Control is eliminated. The BFO is now fixed at 21.4 MHz.

7.3.2.4 COR/Squelch Threshold Control. - The function of this control remains identical to its usage in the WJ-9026/RU. The time delay for the carrier operated relay is fixed at 6 sec, ±25%.

7.3.3 WJ-9028 RECEIVING SYSTEM INTERCONNECTIONS

The diagram below contains the information needed for system interconnections between the WJ-9028/RU and WJ-9028/DU. These interconnections are identical to those employed with the WJ-9026 System, except for Reference Designation changes made on the rear panel. The proper Reference Designations for the WJ-9028 System are provided on this diagram.

Figure 7-1. WJ-9028/RU and WJ-9028/DU, System Interconnection Diagram



7.4 CIRCUIT DESCRIPTIONS

The information in the succeeding paragraphs is prepared to give a detailed description of the changes incorporated within the major assemblies and a short explanation concerning the effects of these changes. The assemblies that are not mentioned in this section are identical in design and operation to those used in the Type WJ-9026 Receiver.

7.4.1 TYPE WJ-9061-4 TUNING HEAD ASSEMBLY (A1)

The Schematic Diagrams for this assembly are Figures 7-2 through 7-4. This assembly replaces the Type WJ-9066-3 Tuning Head Assembly (A1), previously used with the WJ-9026 Receiver. The major changes concerning the Tuning Head consist of the addition of a 8-21.4 MHz Converter Subassembly and the replacement of the Tuner Subassembly with a similar tuner having a bandwidth of 20-90 MHz.

7.4.1.1 Type 71428-1 20-90 MHz RF Tuner (A1A1). The Schematic Diagram for this subassembly is Figure 7-3. The major changes incorporated with the RF Amplifier are the additions of AGC Amplifier Stage Q6 and the first stage active device Q5. On the Mixer I-F Amplifier, (subassembly A1) the addition of Junction Field-Effect Transistor Q1 replaces the cascode amplifier configuration Q1-Q2. On the same assembly an I-F output filter configuration consisting of L1, C7 and C8 is added. At the output of the first balanced mixer, an 8-21.4 MHz Converter subassembly (A1A3) has been added to provide a 21.4 MHz signal to the I-F Amplifier. The preselector network is modified to insure a range of 20-90 MHz.

An AGC amplifier configuration is added to change the voltage on C2 from (0-10 VDC) to (+10.5 VDC-2.5 VDC) required to drive the gate of Q1 (SD306).

In addition, amplifier Q5 and associated components provide approximately +16 dBm required to drive the LO input of the M9D balanced mixer.

The I-F output filter configuration consisting of C7, L1 and C8 prevents unwanted harmonics of the LO signal from reaching IF output Jack J3.

7.4.1.2 Type 71429-1 8-21.4 MHz Converter (A1A3). Figure 7-4 is the Schematic Diagram for the converter subchassis. Since the converter is not described in the WJ-9026 manual, a detailed explanation of its operation will be given.

7.4.1.2.1 Input Filter. - A three pole bandpass filter is included between the IF input Jack J1, and the double balanced mixer. This filter has a 2 MHz bandwidth which eliminates unwanted signals generated by the harmonic outputs of the first and second local oscillators. Transformers T1 and T2 provide matched impedance at the input and output of the filter.

7.4.1.2.2 Part 24350 Mixer I-F Amplifier (A1A3A1). - The Double Balanced Mixer, U1, mixes the 8 MHz IF input with the 13.4 MHz output from the crystal oscillator to produce the sum frequency of 21.4 MHz. A three section bandpass filter forms the output network which maintains an approximate 2.0 MHz bandwidth at a center frequency of 21.4 MHz. This filter prevents spurious signals and unwanted harmonics from reaching the input to the receiver.

7.4.1.2.3 Part 24349 13.4 MHz Crystal Oscillator (A1A3A2). - A crystal controlled Clapp Oscillator consisting of Q3 and Y1 is used. Regenerative feedback is provided from the emitter to the base of Q3 by R15 and divider capacitors C12 and C13. Capacitor C14 holds the collector of Q3 at RF ground.

Output signals developed across C10 are coupled to the input of the two stage common emitter amplifier, consisting of Q1 and Q2. Variable capacitor C9 adjusts the frequency to exactly 13.4 MHz. The two stage common emitter amplifier provides the 13.4 MHz signal with an approximate 17 dB gain, which is used to drive balanced mixer U1. Transformer T1 and capacitor C1 provide impedance matching to the LO port of Balanced Mixer U1.

7.4.2 TYPE 7875 PULSE/AVERAGE AGC AMPLIFIER (A10)

The Schematic Diagram for this assembly is Figure 7-12. The major differences incorporated within this assembly are the elimination of Relay K1 and operational amplifier U3.

The input for the (MGC) signal strength meter is derived from a voltage divider network consisting of R12 and R18, which is connected from the output of AGC/OP. AMPL U1.

Relay K1 is eliminated. Its function was to add capacitance in the feedback loop of AGC/OP.AMPL U1. This action provided a variable setting for a fast or slow time constant. The time constant is now set at a fixed rate.

7.4.3 TYPE 7457 AUDIO COR AND SQUELCH AMPLIFIER (A11).

The Schematic Diagram for this assembly is Figure 7-13. The major changes incorporated with this assembly are the elimination of Buffer Amplifier Q4 and the elimination of a 3.2 Ω output terminal derived from Transformer T1.

The audio signal after being passed by Q1 (depending on Comparator U1) is directly coupled to the input of Audio Amplifier U2. The buffer amplifier previously connected between Q1 and U2 is eliminated for this application. A 600 Ω 100 mW balanced output is provided at Output Jack J7, pins G and H.

7.4.4 WJ-9028 MAIN CHASSIS

The Schematic Diagram for the main chassis is Figure 7-14. The information in this section describes the modifications made on the main chassis that effect the operation of the other assemblies but do not include changes made within each assembly.

7.4.4.1 <u>DAFC On/Off Line</u>. - The DAFC on/off line is added to pin 12 of the Power Interconnection Jack (J5). When the triple-ganged DAFC/AFC Switch is set to DAFC it provides a +15V voltage to Jack J5 which, in turn, is applied (through interconnection cables) to Jack J1, pin 12 of the DU unit. The purpose of this addition is to control the DAFC functions for both units from one switch located on the front panel of the RU Unit.

7.4.4.2 Terminal Board TB1. - Terminal Board TB1 is eliminated from the WJ-9028 Receiver. The 600 Ω output of the Audio, COR and Squelch Amplifier (A11) is now routed to pins G and H of Cor Jack (J7), located on the rear panel.

7.4.4.3 COR Delay. - The COR Delay, previously operated by Switch S6 on the front panel is eliminated. Its rate is now fixed at 6 sec ± 25%.

7.4.4.4 BFO Tuning. - The BFO tuning dial and its associated components are eliminated, resulting in a fixed BFO of 21.4 MHz.

7.4.4.5 Type 791495 IF Power Divider (A7). - The IF Power Divider, formerly connected to the output of the IF Switching Assembly (A8), is eliminated. There is only one SM output, taken directly from Jack J2 of the IF Amplifier Assembly (A6). This output is available at rear panel Jack J4.

7.4.4.6 Coupling Network U1. - The LO Coupling Network is eliminated for this application. There is only one LO output available, which is taken directly from Jack J5 of the LO Diode Switch/Amplifier (A9).

7.4.4.7 COR Jack (J7). - The function of this rear panel output Jack remains identical to its usage in the WJ-9026 Receiver. Pins G and H are now activated for the 600 Ω audio output from the Audio Cor and Squelch Assembly (A11).

7.5 REPLACEMENT PARTS LIST AND SCHEMATIC DIAGRAMS

The following list of manufacturers, parts lists, and schematic diagrams are a supplement for the WJ-9028/RU and are to be used in conjunction with Sections V and VI of this manual.

Mfr. Code	Name and Address
09353	C & K Components, Inc. 103 Morse Street Watertown, Mass. 02172
12898	Cleveland Tramrail Div. of Cleveland Crane & Eng. 8676 E. 289th Street Wickliffe, Ohio 44092
29587	Bunker Ramo Corporation Amphenol Industrial Division 1830 South 54th Avenue Chicago, Illinois 60650
72653	GC Electronics Company A Division of Hydrometals Inc. 400 South Wyman Street Rockford, Illinois 61101

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDO
	With the exception of those items listed below, the WJ-9028/RU Receiver Unit is electrically identical to the WJ-9026/RU Receiver Unit.				
A1	20-90 MHz Tuning Head	1	WJ-9061-6	14632	
A6	IF Amplifier	1	72462-1	14632	
A7	Not Used				
A10	AGC Amplifier	1	7875	14632	
A11	Audio Cor and Squelch Amplifier	1	7457	14632	
AT1	Terminal, Resistor, Connector: 51 Ω, BNC	1	35650-0051	74868	
C2	Capacitor, Electrolytic, Tantalum: 27 μF, 10%, 35 V	7	196D276X9035TE4	56289	
C4	Not Used				
C5	Not Used				
C8	Same as C2				
C9	Same as C2				
C10	Same as C2				
C12	Same as C2				
C13	Same as C2				
C14	Same as C2				
DS6	Not Used				
J1	Connector, Receptacle: BNC Series	5	17825-1002	74868	
J2	Connector, Adapter	1	60-0909-090	19505	
J3	Connector, Adapter	1	21011	16179	
J4	Same as J1				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
J8	Same as J1				
J9	Same as J1				
J10	Same as J1				
J11	Jack, Telephone	1	L11	82389	
K1	Relay Modified	1	32194-23	14632	
K2	Relay Modified	1	32194-24	14632	
K3	Relay Modified	1	32194-25	14632	
P1	Connector Plug, SMA Series	1	501-3	16179	
P2	Connector Plug, SMC Series	20	UG1466/U	80058	19505
P3	Same as P2				
P4	Connector Plug, SMC Series	9	UG1465/U	80058	19505
P5	Same as P2				
P6	Same as P4				
P7	Same as P2				
P8	Same as P4				
P9	Same as P2				
P10	Same as P4				
P11 Thru P20	Same as P2				
P21	Same as P4				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDO
P22 Thru P26	Same as P2				
P27	Same as P1				
P28	Same as P1				
P29	Same as P1				
P30	Same as P1				
P31	Connector, Plug	1	JTG06RE14-18SSR	77820	
P32	Same as P1				
P33	Same as P4				
P34	Same as P1				
P35	Same as P4				
P36	Same as P1				
P37	Same as P4				
P38	Same as P1				
P39	Same as P4				
R1	Resistor, Fixed, Composition: 1.5 kΩ, 5%, 1/4 W	1	RCR07G152JS	81349	01121
R5	Resistor, Fixed, Composition: 12 Ω, 5%, 1/4 W	1	RCR07G120JS	81349	01121
R6	Not Used				
R7	Not Used				
R9	Resistor, Variable, Composition: 10 kΩ, 10%, 1 W	1	70A3N056L103U	01121	
R10	Resistor, Fixed, Composition: 7.5 kΩ, 5%, 1/4 W	1	RCR07G752JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDO
R12	Not Used				
R18	Not Used				
S2	Switch, Toggle	1	7303	09353	
S4	Switch, Rotary	1	9A30-03-2-5N	81073	
S6	Not Used				
TB1	Not Used				
U1	Not Used				
W1	Cable Assembly	1	17300-107-1	14632	
W2	Cable Assembly	1	17300-107-2	14632	
W3	Cable Assembly	1	17300-107-3	14632	
W4	Cable Assembly	1	17300-107-4	14632	
W5	Cable Assembly	1	17300-107-5	14632	
W6	Cable Assembly	1	17300-107-6	14632	
W7	Cable Assembly	1	17300-107-7	14632	
W8	Cable Assembly	1	17300-107-8	14632	
W9	Cable Assembly	1	17300-107-9	14632	
W10	Cable Assembly	1	17300-107-10	14632	
W11	Cable Assembly	1	17300-107-11	14632	
W12	Cable Assembly	1	17300-107-12	14632	
W13	Cable Assembly	1	17300-107-13	14632	
W14	Cable Assembly	1	17300-107-14	14632	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDO
W15	Cable Assembly	1	17300-107-15	14632	
W16	Cable Assembly	1	17300-107-16	14632	
W17	Cable Assembly	1	17300-107-17	14632	
W18	Cable Assembly	1	17300-107-18	14632	
W19	Cable Assembly	1	17300-107-19	14632	
W20	Cable Assembly	1	17300-107-20	14632	
W21	Cable Assembly	1	17300-107-21	14632	
XDS6	Not Used				
	Accessory items furnished with equipment				
AI1	Connector Plug	1	JTG06RE14-18SSR	77820	
AI2	Extender Board	1	79878	14632	
AI3	Allen Wrench No. 4	1	GGGW0652-050AF	81349	72653
AI4	Allen Wrench No. 6	1	GGGW0652-1/16AF	81349	72653
AI5	Allen Wrench No. 8	1	GGGW0652-5/64AF	81349	72653

7.6.1 TYPE WJ-9061-4 20-90 MHz TUNING HEAD

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION		QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	20-90 MHz RF Tuner		1	71428-1	14632	
A2	Tuning Drive Assembly		1	85127-1	14632	
A3	8/21.4 MHz Converter		1	71429-1	14632	
CR1	Diode		2	1N995	80131	93332
CR2	Same as CR1					
FB1	Ferrite Bead		1	56-590-65-4A	02114	
J1	Connector, Receptacle, Plug		1	JF3P1SACD	81312	
P1	Connector, Plug, Multipin		1	17-20250-1	29587	
P2	Connector, Plug: SMC Series	Part of W1	2	UG1466/U	80058	19505
P3	Same as P2	Part of W1				
P4	Connector, Receptacle, Plug		1	JF3S1PACD	81312	
W1	Cable Assembly		1	17300-20-1	14632	

7.6.1. Type 71428-1 20-90 MHz RF Tuner

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	Mixer/IF Amplifier	1	18297	14632	
C1	Capacitor, Ceramic, Feedthru: 1000 pF, GMV, 500 V	11	54-794-009-102W	33095	
C2 Thru C9	Same as C1				
C10	Capacitor, Mica, Dipped: 36 pF, 2%, 500 V	2	CM05ED360G03	81349	72136
C11	Capacitor, Mica, Dipped: 82 pF, 2%, 500 V	1	CM05ED820G03	81349	72136
C12	Capacitor, Ceramic, Tubular: 7.5 pF ± 0.5 pF, 500 V	1	301-000C0H0-759D	72982	
C13	Capacitor, Variable, Glass: 0.8-8.5 pF, 750 V	5	VC20GY	73899	
C14	Capacitor, Ceramic, Tubular: 10 pF ± 0.5 pF, 500 V	4	301-000C0H0-100D	72982	
C15	Capacitor, Ceramic, Tubular: 2.2 pF ± 0.1 pF, 500 V	2	301-000C0J0-229B	72982	
C16	Same as C15				
C17	Same as C13				
C18	Same as C14				
C19	Capacitor, Mica, Dipped: 27 pF, 2%, 500 V	1	CM05ED270G03	81349	72136
C20	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	2	SM (1000 pF, P)	91418	
C21	Capacitor, Ceramic, Standoff: 1000 pF, GMV, 500 V	10	54-803-003-102W	33095	
C22	Capacitor, Ceramic, Disc: 0.01 μF, 20%, 200 V	1	8131A200Z5U103M	72982	
C23	Same as C21				
C24	Same as C1				
C25	Capacitor, Mica, Dipped: 220 pF, 2%, 500 V	1	CM05FD221G03	81349	72136
C26	Same as C1				
C27	Same as C10				

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C28	Same as C13				
C29	Capacitor, Ceramic, Tubular: 2.7 pF ± 0.25 pF, 500 V	2	301-000C0J0-279C	72982	
C30	Same as C14				
C31	Same as C21				
C32	Capacitor, Ceramic, Tubular: 2.4 pF ± 0.25 pF, 500 V	1	301-000C0J0-249C	72982	
C33	Same as C13				
C34	Same as C14				
C35	Same as C29				
C36	Same as C13				
C37	Capacitor, Ceramic, Tubular: 18 pF, 5%, 500 V	1	301-000C0G0-180J	72982	
C38	Capacitor, Mica, Dipped: 24 pF, 5%, 500 V	1	CM05ED240J03	81349	72136
C39	Capacitor, Ceramic, Feedthru: 100 pF, 10%, 500 V	1	54-794-009-101K	33095	
C40	Capacitor, Ceramic, Disc: 68 pF, 5%, 500 V (N750)	1	1U68RJ	93958	
C41	Capacitor, Mica, Dipped: 39 pF, 2%, 500 V	1	CM05ED390G03	81349	72136
C42	Capacitor, Mica, Dipped: 20 pF, 5%, 500 V	1	CM05ED200J03	81349	72136
C43	Capacitor, Variable, Air: 0.8-10 pF, 250 V	1	5202	91293	
C44	Capacitor, Ceramic, Tubular: 15 pF, 5%, 500 V	1	301-000C0G0-150J	72982	
C45	Capacitor, Ceramic, Tubular: 1.8 pF ± 0.25 pF, 500 V	1	301-000C0K0-189C	72982	
C46	Capacitor, Composition, Tubular: 0.68 pF, 10%, 500 V	1	QC (0.68 pF, K)	95121	
C47	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C48	Same as C20				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C49 Thru C54	Same as C21				
C55	Capacitor, Electrolytic, Tantalum: 1 μF, 10%, 35 V	1	CS13BF105K	81349	56289
C56	Capacitor, Ceramic, Tubular: 3 pF ± 0.25 pF, 500 V (N750)	1	301-000U2J0-309C	72982	
C57	Capacitor, Ceramic, Disc: 500 pF, 20%, 500 V	3	SM (5000 pF, M)	91418	
C58	Same as C57				
C59	Same as C57				
C60	Not Used				
C61	Same as C21				
C62	Capacitor, Mica, Dipped: 33 pF, 2%, 500 V	1	CM05ED330G03	81349	72136
C63	Capacitor, Ceramic, Tubular: 0.68 pF ± 0.1 pF, 500 V	1	301-000C0K0-688B	72982	
CR1	Diode	1	1N462A	80131	93332
CR2	Diode	1	BB105B	25088	
E1	Terminal, Feedthru	2	SFU16Y	04013	
E2	Same as E1				
FB1	Ferrite Bead	2	56-590-65-4A	02114	
FB2	Same as FB1				
J1	Connector, Receptacle: SMC Series	3	10-0104-002	19505	
J2	Same as J1				
J3	Same as J1				
L1	Inductor, Modified	1	21701-8	14632	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L2	Coil, Fixed: 12 μH	1	1537-38	99800	
L3	Inductor, Air Core	2	22292-33	14632	
L4	Inductor, Air Core	2	22292-41	14632	
L5	Coil, Fixed: 0.56 μH	1	202-11	99848	
L6	Coil, Fixed: 1.2 μH	1	1537-14	99800	
L7	Same as L4				
L8	Coil, Fixed: 15 μH	1	1537-40	99800	
L9	Same as L3				
L10	Inductor	1	21209-10	14632	
L11	Inductor	1	21210-33	14632	
L12	Inductor	1	21210-113	14632	
L13	Coil, Fixed: 4.7 mH	1	553-3635-45	71279	
Q1	Transistor	1	SD306	18324	
Q2	Transistor	1	2N4416	80131	04713
Q3	Transistor	2	2N3478	80131	34156
Q4	Same as Q3				
Q5	Transistor	1	2N5090	80131	04713
Q6	Transistor	1	2N3251	80131	04713
R1	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/4 W	3	RCR07G104JS	81349	01121
R2	Resistor, Fixed, Composition: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R3	Resistor, Fixed, Composition: 47 Ω, 5%, 1/4 W	3	RCR07G470JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R4	Resistor, Fixed, Composition: 150 kΩ, 5%, 1/4 W	2	RCR07G154JS	81349	01121
R5	Same as R4				
R6	Resistor, Fixed, Composition: 22 Ω, 5%, 1/4 W	3	RCR07G220JS	81349	01121
R7	Resistor, Fixed, Film: 2 kΩ, 1%, 1/10 W	1	RN55C2001F	81349	75042
R8	Resistor, Fixed, Film: 4.64 kΩ, 1%, 1/10 W	1	RN55C4641F	81349	75042
R9	Resistor, Fixed, Film: 21.5 Ω, 1%, 1/10 W	1	RN55C21R5F	81349	75042
R10	Resistor, Fixed, Composition: 220 Ω, 5%, 1/4 W	1	RCR07G221JS	81349	01121
R11	Resistor, Fixed, Composition: 3.3 kΩ, 5%, 1/4 W	1	RCR07G332JS	81349	01121
R12	Same as R3				
R13	Resistor, Fixed, Composition: 10 Ω, 5%, 1/4 W	3	RCR07G100JS	81349	01121
R14	Resistor, Fixed, Composition: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R15	Resistor, Fixed, Composition: 2.7 kΩ, 5%, 1/4 W	2	RCR07G272JS	81349	01121
R16	Resistor, Fixed, Composition: 820 Ω, 5%, 1/4 W	1	RCR07G821JS	81349	01121
R17	Same as R3				
R18	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121
R19	Same as R1				
R20	Same as R1				
R21	Resistor, Fixed, Composition: 1 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R22	Resistor, Fixed, Composition: 100 Ω, 5%, 1/4 W	3	RCR07G101JS	81349	01121
R23	Resistor, Fixed, Composition: 8.2 kΩ, 5%, 1/4 W	1	RCR07G822JS	81349	01121
R24	Same as R15				
R25	Same as R13				

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R26	Same as R13				
R27	Resistor, Fixed, Composition: 180 Ω, 5%, 1/4 W	1	RCR07G181JS	81349	01121
R28	Same as R6				
R29	Same as R6				
R30	Same as R22				
R31	Resistor, Fixed, Composition: 75 Ω, 5%, 1/4 W	2	RCR07G750JS	81349	01121
R32	Same as R31				
R33	Resistor, Fixed, Composition: 75 Ω, 5%, 1 W	1	RCR32G750JS	81349	01121
R34	Resistor, Fixed, Film: 10 kΩ, 1%, 1/10 W	1	RN55C1002F	81349	75042
R35	Resistor, Variable, Film: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R36	Same as R22				
R37	Same as R18				
R38	Resistor, Fixed, Composition: 200 Ω, 5%, 1/4 W	1	RCR07G201JS	81349	01121
R39	Resistor, Fixed, Composition: 1.2 kΩ, 5%, 1/4 W	1	RCR07G122JS	81349	01121
R40	Resistor, Fixed, Composition: 680 Ω, 5%, 1/4 W	1	RCR07G681JS	81349	01121
R41	Resistor, Fixed, Composition: 390 Ω, 5%, 1/4 W	1	RCR07G391JS	81349	01121
T1	Transformer, Toroidal	1	21727-4	14632	
T2	Transformer, Toroidal	1	21728-7	14632	
T3	Transformer, Toroidal	1	21727-24	14632	

REF DESIG PREFIX A1A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 0.01 μF, 20%, 20 V	4	8131A200Z5U103M	72982	
C2	Same as C1				
C3	Capacitor, Variable, Ceramic: 9-35 pF, 350 V (N650)	1	538-006D9-35	72982	
C4	Not Used				
C5	Same as C1				
C6	Same as C1				
C7	Capacitor, Mica, Dipped: 230 pF, 2%, 500 V	2	CM05FD331G03	81349	72136
C8	Same as C7				
E1	Terminal, Forked	6	140-1941-02-01		
E2 Thru E6	Same as E1				
L1	Coil, Fixed: 1.2 μH	1	1537-14	99800	01121
Q1	Transistor	1	CP640	12898	
R1	Resistor, Fixed, Composition: 680 Ω, 5%, 1 W	1	RCR32G681JS	81349	01121
R2	Resistor, Fixed, Composition: 820 Ω, 5%, 1/4 W	1	RCR07G821JS	81349	01121
R3	Resistor, Trim, Film: 100 Ω, 10%, 1/2 W	1	62PAR100	73138	
R4	Resistor, Fixed, Composition: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
T1	Coil, Toroidal	1	21428-19	14632	
U1	Mixer, Balanced	1	M9D	27956	

7.6.1.2 Type 71429-1 8-21.4 MHz Converter

REF DESIG PREFIX A1A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	Mixer/IF Amplifier	1	24350	14632	
A2	13.4 MHz Oscillator	1	24349	14632	
C1	Capacitor, Mica, Dipped: 500 pF, 5%, 500 V	2	DM15-501J	72136	
C2	Capacitor, Variable, Glass: 1-28 pF, 1000 V	2	MC603	73899	
C3	Capacitor, Mica, Dipped: 15 pF, 5%, 500 V	1	CM05CD150J03	81349	
C4	Same as C1				
C5	Same as C2				
C6	Capacitor, Ceramic, Feedthru: 1000 pF, GMV, 500 V	3	54-794-009-102W	33095	
C7	Capacitor, Ceramic, Disc: 5000 pF, 20%, 500 V	2	SM (5000 pF, M)	91418	
8	Same as C6				
9	Same as C7				
10	Same as C6				
1	Terminal, Feedthru	3	SFU16Y	04013	
2	Same as E1				
3	Same as E1				
	Connector, Receptacle: SMC Series	2	10-0104-002	19505	
2	Same as J1				
1	Coil, Fixed, Molded: 47 μH	1	1537-60	99800	
2	Coilform Assembly	1	1471-9	14632	
1	Transistor	1	2N5090	80131	04713

REF DESIG PREFIX A1A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R1	Resistor, Fixed, Composition: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121
R2	Same as R1				
R3	Resistor, Fixed, Composition: 1.2 kΩ, 5%, 1/4 W	1	RCR07G122JS	81349	01121
T1	Toroidal, Transformer	2	21428-64	14632	
T2	Same as T1				

7.6.1.2.1 Part 24350 Mixer/IF Amplifier

REF DESIG PREFIX A1A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 0.01 μF, 20%, 200 V	3	8131A200Z5U103M	72982	
C2	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	1	SM (1000 pF, P)	91418	
C3	Same as C1				
C4	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	1	C023B101E502M	56289	
C5	Same as C1				
C6	Capacitor, Variable, Ceramic: 9.35 pF, 200 V	3	538-006D9-35	72982	
C7	Capacitor, Ceramic, Tubular: 4.3 pF ± 0.25 pF, 500 V	2	301-000C0J0-439C	72982	
C8	Same as C6				
C9	Same as C7				
C10	Same as C6				
C11	Capacitor, Mica, Dipped: 36 pF, 2%, 500 V	1	CM04ED360G03	81349	72136
C12	Capacitor, Mica, Dipped: 120 pF, 2%, 500 V	1	CM04FD121G03	81349	72136
C13	Capacitor, Ceramic, Disc: 27 pF, 10%, 200 V	1	CK05BX270K	81349	56289
L1	Coil, Fixed	3	20681-94	14632	
L2	Same as L1				
L3	Same as L1				
Q1	Transistor	1	2N5109	80131	02735
R1	Resistor, Fixed, Composition: 1.2 kΩ, 5%, 1/4 W	1	RCR07G122JS	81349	01121
R2	Resistor, Fixed, Composition: 1.5 kΩ, 5%, 1/4 W	1	RCR07G152JS	81349	01121
R3	Resistor, Fixed, Composition: 10 Ω, 5%, 1/4 W	1	RCR07G100JS	81349	01121
R4	Resistor, Fixed, Composition: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121

REF DESIG PREFIX A1A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R5	Resistor, Fixed, Composition: 43 Ω, 5%, 1/4 W	1	RCR07G430JS	81349	01121
R6	Resistor, Fixed, Composition: 75 Ω, 5%, 1/4 W	1	RCR07G750JS	81349	01121
R7	Resistor, Fixed, Composition: 47 kΩ, 5%, 1/4 W	1	RCR07G473JS	81349	01121
U1	Mixer, Balanced	1	M9D	27956	

7.6.1.2.2 Part 24349 13.4 MHz Oscillator

REF DESIG PREFIX A1A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 0.01 μF, 20%, 200 V	6	8131A200Z5U103M	72982	
C2	Capacitor, Mica, Dipped: 75 pF, 2%, 500 V	1	CM04ED750G03	81349	72136
C3	Same as C1				
C4	Same as C1				
C5	Same as C1				
C6	Capacitor, Mica, Dipped: 27 pF, 2%, 500 V	1	CM04ED270G03	81349	72136
C7	Same as C1				
C8	Capacitor, Ceramic, Tubular: 1.5 pF ± 0.25 pF, 500 V	1	301-000-C0K0-159C	72982	
C9	Capacitor, Variable, Ceramic: 2-8 pF, 350 V	1	538-006A2-8	72982	
C10	Capacitor, Mica, Dipped: 30 pF, 2%, 500 V	1	CM04ED300G03	81349	72136
C11	Same as C1				
C12	Capacitor, Mica, Dipped: 110 pF, 2%, 500 V	2	CM05FD111G03	81349	72136
C13	Same as C12				
C14	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	1	SM (1000 pF, P)	91418	
L1	Coil, Fixed: 4.7 μH	1	1537-28	99800	
Q1	Transistor	1	2N5109	80131	02735
Q2	Transistor	1	2N3478	80131	34156
Q3	Transistor	1	2N2222A	80131	04713
R1	Resistor, Fixed, Composition: 270 Ω, 5%, 1/4 W	1	RCR07G271JS	81349	01121
R2	Resistor, Fixed, Composition: 27 Ω, 5%, 1/4 W	1	RCR07G270JS	81349	01121
R3	Resistor, Fixed, Composition: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R4	Resistor, Fixed, Composition: 100 Ω, 5%, 1/2 W	1	RCR20G101JS	81349	01121

REF DESIG PREFIX A1A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R5	Resistor, Fixed, Composition: 1.8 kΩ, 5%, 1/4 W	2	RCR07G182JS	81349	01121
R6	Resistor, Fixed, Composition: 1.2 kΩ, 5%, 1/4 W	1	RCR07G122JS	81349	01121
R7	Resistor, Fixed, Composition: 47 Ω, 5%, 1/4 W	2	RCR07G470JS	81349	01121
R8	Resistor, Fixed, Composition: 390 Ω, 5%, 1/4 W	1	RCR07G391JS	81349	01121
R9	Resistor, Fixed, Composition: 15 kΩ, 5%, 1/4 W	1	RCR07G153JS	81349	01121
R10	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	1	RCR07G103JS	81349	01121
R11	Resistor, Fixed, Composition: 10 Ω, 5%, 1/4 W	1	RCR07G100JS	81349	01121
R12	Resistor, Fixed, Composition: 82 kΩ, 5%, 1/4 W	1	RCR07G823JS	81349	01121
R13	Resistor, Fixed, Composition: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121
R14	Resistor, Fixed, Composition: 820 Ω, 5%, 1/4 W	1	RCR07G821JS	81349	01121
R15	Same as R7				
R16	Same as R5				
1	Transformer, Toroidal	1	21428-63	14632	
1	Crystal, Quartz: 13.4 MHz	1	CR64/U/13.4 MHz	80058	74306

7.6.2 TYPE 72462-1 IF AMPLIFIER ASSEMBLY

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
	With the exception of those items listed below, type 72462-1 is identical electrically to type 72462-3.				
A1	Video/DAFC-AFC Amplifier	1	7383	14632	
A2	IF Amplifier	1	See Chart	14632	
A3	IF Amplifier	1	See Chart	14632	
A4	IF Amplifier	1	See Chart	14632	
A5	IF Output Amplifier	1	72372	14632	
A6	FM Limiter/Discriminator	1	See Chart	14632	
A7	FM Limiter/Discriminator	1	See Chart	14632	
A8	FM Limiter/Discriminator	1	See Chart	14632	
A9	IF Mother Board	1	23909-1	14632	

The following IF Amplifiers and FM Limiter/Discriminators are added to the chart in Section V of this manual.

IF Bandwidth	IF Amplifier	FM Limiter/ Discriminator	IF Demodulator Designation
4 kHz	72339-2	791205-5	WJ-9930-4
20 kHz	72389-2	791205-2	WJ-9930-20LP
20 kHz	72477-1	791205-2	WJ-9930-20-HI
50 kHz	72344-2	791205-3	WJ-9930-50LP
100 kHz	72477-2	791331	WJ-9930-100-HI
4 MHz	72430	791330	WJ-9930-4M

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
J2	Same as J1				
J3	Same as J1				
P1	Not Used				

7.6.2.1 TYPE 72339-2 21.4 MHz IF AMPLIFIER (4 kHz BW)

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
	With the exception of those items listed below the 72339-2 IF Amplifier is electrically identical to the 72339-1 IF Amplifier				
C8	Capacitor, Mica, Dipped: 120 pF, 2%, 35 V	1	CM05FD121G03	81349	72136
C9	Capacitor, Mica, Dipped: 220 pF, 2%, 500 V	1	CM05FG221G03	81349	72136
FL1	Filter, Crystal	1	92070	14632	
Q3	Transistor	1	3N187	02735	
R8	Same as R1				
R9	Resistor, Fixed, Composition: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R10	Resistor, Fixed, Film: 2.49 kΩ, 1%, 1/10 W	1	RN55C2491F	81349	75042
R11	Resistor, Fixed, Film: 1.21 kΩ, 1%, 1/10 W	1	RN55C1211F	81349	75042
R20	Resistor, Fixed, Composition: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R27	Resistor, Fixed, Composition: 2.7 Ω, 5%, 1/4 W	1	RCR07G2R7JS	81349	01121
R29	Resistor, Fixed, Composition: 10 Ω, 5%, 1/4 W	1	RCR07G100JS	81349	01121

7.6.2.2 TYPE 72389-2 21.4 MHz IF AMPLIFIER (20 kHz)

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
	With the exception of those items listed below, the 72389-2 IF Amplifier is electrically identical to the 72389-3 IF Amplifier.				
C8	Capacitor, Mica, Dipped: 120 pF, 2%, 500 V	1	CM05FD121G03	81349	72136
C9	Capacitor, Mica, Dipped: 220 pF, 2%, 500 V	1	CM05FD221G03	81349	72136
FL1	Crystal Filter	1	92069	14632	
R10	Resistor, Fixed, Film: 2.49 kΩ, 1%, 1/10 W	1	RN55C2491F	81349	75042
R11	Resistor, Fixed, Film: 1.21 kΩ, 1%, 1/10 W	1	RN55C1211F	81349	75042

7.6.2.3 Type 72477-1 21.4 MHz IF Amplifier (20 kHz BW)

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	10	C023B101E502M	56289	
C2	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	3	SM (1000 pF, P)	91418	
C3 Thru C6	Same as C1				
C7	Capacitor, Electrolytic, Tantalum: 2.2 μF, 20%, 35 V	1	196D225X0035JE3	56289	
C8	Same as C1				
C9	Capacitor, Variable, Ceramic: 9-35 pF, 350 V (N650)	1	538-006D9-35	72982	
C10	Capacitor, Mica, Dipped: 150 pF, 2%, 500 V	1	CM05FD151G03	81349	72136
C11	Capacitor, Mica, Dipped: 160 pF, 2%, 500 V	1	CM05FD161G03	81349	72136
C12	Same as C2				
C13	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C14 Thru C16	Same as C1				
C17	Same as C2				
C18	Same as C1				
C19	Capacitor, Mica, Dipped: 330 pF, 2%, 500 V	1	CM05FD331G03	81349	72136
C20	Capacitor, Mica, Dipped: 1000 pF, 5%, 100 V	1	DM15-102J	72136	
CR1	Diode	1	1N462A	80131	93332
CR2	Diode	1	1N4446	80131	93332
FL1	Crystal Filter	1	92002	14632	
L1	Coil, Fixed: 1 μH	1	1537-12	99800	

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L2	Coil, Variable: 0.612-0.748 μH	1	558-7107-11	71279	
L3	Coil, Variable: 0.198-0.242 μH	1	558-7107-05	71279	
Q1	Transistor	1	2N5090	80131	04713
Q2	Transistor	1	2N5109	80131	02735
Q3	Transistor	1	841001-1	14632	
Q4	Transistor	1	2N3478	80131	34156
R1	Resistor, Fixed, Composition: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R2	Resistor, Fixed, Composition: 1.5 kΩ, 5%, 1/4 W	1	RCR07G152JS	81349	01121
R3	Resistor, Fixed, Composition: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R4	Resistor, Fixed, Composition: 470 Ω, 5%, 1/4 W	2	RCR07G471JS	81349	01121
R5	Resistor, Fixed, Composition: 47 Ω, 5%, 1/4 W	4	RCR07G470JS	81349	01121
R6	Resistor, Fixed, Composition: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
R7	Resistor, Fixed, Composition: 100 Ω, 5%, 1/2 W	1	RCR20G101JS	81349	01121
R8	Resistor, Fixed, Composition: 62 Ω, 5%, 1/4 W	1	RCR07G620JS	81349	01121
R9	Resistor, Fixed, Composition: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R10	Resistor, Fixed, Composition: 270 Ω, 5%, 1/4 W	1	RCR07G271JS	81349	01121
R11	Resistor, Fixed, Compositon: 1.2 kΩ, 5%, 1/4 W	1	RCR07G122JS	81349	01121
R12	Resistor, Fixed, Composition: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R13	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121
R14	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R15	Resistor, Fixed, Composition: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121
R16	Resistor, Fixed, Composition: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
17	Resistor, Fixed, Composition: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
18	Same as R5				
19	Same as R5				
20	Same as R4				
21	Same as R5				
22	Same as R13				
23	Same as R14				
4	Resistor, Variable, Film: 500 Ω, 10%, 1/2 W	1	62PAR500	73138	
5	Resistor, Fixed, Composition: 20 Ω, 5%, 1/4 W	2	RCR07G200JS	81349	01121
6	Resistor, Fixed, Composition: 5.6 kΩ, 5%, 1/4 W	1	RCR07G562JS	81349	01121
7	Resistor, Fixed, Composition: 10 Ω, 5%, 1/4 W	1	RCR07G100JS	81349	01121
8	Same as R6				

7.6.2.4 Type 72344-2 21.4 MHz IF Amplifier (50 kHz BW)

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
	With the exception of those items listed below, the 72344-2 IF Amplifier is electrically identical to the 72344 IF Amplifier.				
C8	Capacitor, Mica, Dipped: 120 pF 2%, 500 V	1	CM05FD13103	81349	72136
C9	Capacitor, Mica, Dipped: 240 pF, 2%, 500 V	1	CM05FD241G03	81349	72136
FL1	Filter, BP	1	9680068	74306	
R5	Resistor, Fixed, Composition: 47 ohms, 5%, 1/4 W	6	RCR07G470JS	81349	01121
R8	Resistor, Fixed, Composition: 51 ohms, 5%, 1/4 W	1	RCR07G510JS	81349	01121
R9	Resistor, Fixed, Composition: 33 ohms, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R10	Resistor, Fixed, Film: 2.49 kΩ, 1%, 1/10 W	1	RN55C2491F	81349	75042
R11	Resistor, Fixed, Film: 1.21 kΩ, 1%, 1/10 W	1	RN55C1211F	81349	75042

7.C.2.5 Type 72477-2 21.4 MHz IF Amplifier (100 kHz BW)

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	10	C023B101E502M	56289	
C2	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	3	SM (1000 pF, P)	91418	
3 hru 6	Same as C1				
7	Capacitor, Electrolytic, Tantalum: 2.2 μF, 20%, 35 V	1	196D225X0035JE3	56289	
8	Same as C1				
9	Capacitor, Variable, Ceramic: 9-35 pF, 350 V, (N650)	1	538-006D9-35	72982	
10	Capacitor, Mica, Dipped: 150 pF, 2%, 500 V	1	CM05FD151G03	81349	72136
1	Capacitor, Mica, Dipped: 160 pF, 2%, 500 V	1	CM05FD161G03	81349	72136
2	Same as C2				
3	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
4	Same as C1				
5	Same as C1				
6	Same as C1				
7	Same as C2				
8	Same as C1				
	Capacitor, Mica, Dipped: 330 pF, 2%, 500 V	1	CM05FD331G03	81349	72136
	Capacitor, Mica, Dipped: 1000 pF, 5%, 100 V	1	DM15-102J	72136	
	Diode	1	1N462A	80131	93332
	Diode	1	1N4446	80131	93332
	Crystal Filter	1	92024	14632	
	Coil, Fixed: 1.00 μH	1	1537-12	99800	

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L2	Coil, Variable: 0.612-0.748 μH	1	558-7107-11	71279	
L3	Coil, Variable: 0.198-0.242 μH	1	558-7107-05	71279	
Q1	Transistor	1	2N5090	80131	04713
Q2	Transistor	1	2N5109	80131	02735
Q3	Transistor	1	841001-1	14632	
Q4	Transistor	1	2N3478	80131	34156
R1	Resistor, Fixed, Composition: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R2	Resistor, Fixed, Composition: 1.5 kΩ, 5%, 1/4 W	1	RCR07G152JS	81349	01121
R3	Resistor, Fixed, Composition: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R4	Resistor, Fixed, Composition: 470 Ω, 5%, 1/4 W	2	RCR07G471JS	81349	01121
R5	Resistor, Fixed, Composition: 47 Ω, 5%, 1/4 W	4	RCR07G470JS	81349	01121
R6	Resistor, Fixed, Composition: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
R7	Resistor, Fixed, Composition: 100 Ω, 5%, 1/4 W	1	RCR20G101JS	81349	01121
R8	Resistor, Fixed, Composition: 62 Ω, 5%, 1/4 W	1	RCR07G620JS	81349	01121
R9	Resistor, Fixed, Composition: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R10	Resistor, Fixed, Composition: 270 Ω, 5%, 1/4 W	1	RCR07G271JS	81349	01121
R11	Resistor, Fixed, Composition: 2.2 kΩ, 5%, 1/4 W	1	RCR07G222JS	81349	01121
R12	Resistor, Fixed, Composition: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R13	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121
R14	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R15	Resistor, Fixed, Composition: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121
R16	Resistor, Fixed, Composition: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121

REF DESIG PREFIX A6AX

REF ESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R17	Resistor, Fixed, Composition: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R18	Same as R5				
R19	Same as R5				
20	Same as R4				
21	Same as R5				
22	Same as R13				
23	Same as R14				
24	Resistor, Variable, Film: 500 Ω, 10%, 1/2 W	1	62PAR500	73138	
25	Resistor, Fixed, Composition: 27 Ω, 5%, 1/4 W	1	RCR07G270JS	81349	01121
26	Resistor, Fixed, Composition: 5.6 kΩ, 5%, 1/4 W	1	RCR07G562JS	81349	01121
27	Resistor, Fixed, Composition: 10 Ω, 5%, 1/4 W	1	RCR07G100JS	81349	01121
28	Same as R6				

7.6.2.6 TYPE 72430 21.4 MHz IF AMPLIFIER (4 MHz BW)

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	12	CO23B101E502M	56289	
C2	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	3	SM(1000PF, P)	91418	
C3 Thru C6	Same as C1				
C7	Capacitor, Variable, Ceramic: 2-8 pF, 350 V	3	538-006A2-8	72982	
C8	Capacitor, Ceramic, Tubular: 3.9 pF, 0.25 pF, 500 V	1	301-000C0J0-399C	72982	
C9	Capacitor, Ceramic, Tubular: 10 pF, 0.5 pF, 500 V	1	301-000C0H0-100D	72982	
C10	Same as C7				
C11	Capacitor, Ceramic, Tubular: 2.7 pF, 0.25 pF, 500 V	1	301-000C0J0-279C	72982	
C12	Capacitor, Mica, Dipped: 12 pF, 5%, 500 V	2	CM05CD120J03	81349	72136
C13	Capacitor, Variable, Ceramic: 9-35 pF, 350 V	2	538-006D9-35	72982	
C14	Capacitor, Mica, Dipped: 220 pF, 2%, 500 V	1	CM05FD221G03	81349	72136
C15	Same as C2				
C16	Same as C13				
C17	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C18	Same as C1				
C19	Same as C1				
C20	Same as C7				
C21	Capacitor, Mica, Dipped: 110 pF, 2% 500 V	1	CM05FD111G03	81349	72136
C22	Capacitor, Mica, Dipped: 33 pF, 2%, 500 V	1	CM05ED330G03	81349	72136
C23	Capacitor, Mica, Dipped: 62 pF, 2%, 500 V	1	CM05ED620G03	81349	72136

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C24	Capacitor, Mica, Dipped: 82 pF, 2%, 500 V	1	CM05ED820G03	81349	72136
C25	Same as C12				
C26	Capacitor, Mica, Dipped: 300 pF, 2%, 500 V	1	CM05FD301G03	81349	72136
C27	Same as C1				
C28	Same as C1				
C29	Same as C2				
C30	Same as C1				
C31	Same as C1				
C32	Capacitor, Ceramic, Tubular: 3.0 pF, 0.1 pF, 500 V	1	301-000C0J0-309B	72982	
C33	Same as C1				
CR1	Diode	1	1N462A	80131	93332
L1	Coil Fixed	2	20681-120	14632	
L2	Same as L1				
L3	Coil Fixed	1	20681-150	14632	
L4	Coil Fixed	1	20681-140	14632	
L5	Coil Fixed	1	20681-121	14632	
L6	Coil Fixed: 10 μH, 10%	1	1537-36	99800	
Q1	Transistor	2	2N5109	80131	02735
Q2	Same as Q1				
Q3	Transistor	1	841001-1	14632	
Q4	Transistor	1	2N3478	80131	34156
R1	Resistor, Fixed, Composition: 470 Ω, 5%, 1/4 W	2	RCR07G471JS	81349	01121

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R2	Resistor, Fixed, Composition: 3.9 kΩ, 5%, 1/4 W	2	RCR07G392JS	81349	01121
R3	Same as R2				
R4	Resistor, Fixed, Composition: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R5	Resistor, Fixed, Composition: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R6	Resistor, Fixed, Composition: 47 Ω, 5%, 1/4 W	6	RCR07G470JS	81349	01121
R7	Same as R6				
R8	Resistor, Fixed, Composition: 390 Ω, 5%, 1/4 W	1	RCR07G391JS	81349	01121
R9	Same as R6				
R10	Resistor, Fixed, Composition: 1.1 kΩ, 5%, 1/4 W	1	RCR07G112JS	81349	01121
R11	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R12	Resistor, Fixed, Composition: 220 Ω, 5%, 1/4 W	2	RCR07G221JS	81349	01121
R13	Resistor, Fixed, Composition: 120 kΩ, 5%, 1/4 W	1	RCR07G124JS	81349	01121
R14	Resistor, Fixed, Composition: 150 kΩ, 5%, 1/4 W	1	RCR07G154JS	81349	01121
R15	Resistor, Fixed, Composition: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R16	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	1	RCR07G103JS	81349	01121
R17	Same as R1				
R18	Same as R6				
R19	Resistor, Fixed, Composition: 330 Ω, 5%, 1/4 W	2	RCR07G331JS	81349	01121
R20	Resistor, Fixed, Composition: 27 kΩ, 5%, 1/4 W	1	RCR07G273JS	81349	01121
R21	Same as R11				
R22	Same as R12				

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R23	Resistor, Fixed, Composition: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R24	Same as R6				
R25	Resistor, Fixed, Composition: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
R26	Same as R6				
R27	Resistor, Variable, Film: 100 Ω, 10%, 1/2 W	1	62PAR100	73138	
R28	Same as R25				
R29	Same as R19				
R30	Resistor, Fixed, Composition: 5.6 kΩ, 5%, 1/4 W	1	RCR07G562JS	81349	01121
VR1	Diode, Zener: 12V	1	1N963B	80131	04713

7.6.2.7 Type 72372 IF Output Amplifier

REF DESIG PREFIX A6A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 5000 pF, 20%, 500 V	8	SM (5000 pF, M)	91418	
C2	Capacitor, Electrolytic, Tantalum: 4.7 µF, 10%, 35 V	1	CS13BF475K	81349	
C3	Same as C1				
C4	Capacitor, Electrolytic, Tantalum: 45 µF, 20%, 30 V	1	MTP456M030P1B	76055	
C5	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	9	SM (1000 pF, P)	91418	
C6	Same as C5				
C7	Same as C5				
C8	Same as C1				
C9	Same as C5				
C10	Same as C1				
C11	Capacitor, Variable, Ceramic: 2-8 pF, 350 V	1	538-006A2-8	72982	
C12	Capacitor, Composition, Tubular: 0.82 pF, 10%, 500 V	1	QC (0.82 pF, K)	95121	
C13	Same as C5				
C14	Capacitor, Ceramic, Tubular: 6.8 pF ± 0.25 pF, 500 V	1	301-000C0H0-689C	72982	
C15	Capacitor, Mica, Dipped: 62 pF, 2%, 500 V	1	CM05ED620G03	81349	72136
C16	Same as C1				
C17	Capacitor, Mica, Dipped: 15 pF, 5%, 500 V	1	CM05CD150J03	81349	72136
C18	Same as C1				
C19	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	2	CM05FD101G03	81349	72136
C20	Same as C1				
C21	Same as C19				
C22	Same as C5				

REF DESIG PREFIX A6A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C23	Same as C5				
C24	Not Used				
C25	Same as C1				
C26	Same as C5				
C27	Capacitor, Mica, Dipped: 68 pF, 2%, 500 V	1	CM05ED680G03	81349	72136
C28	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	1	CM05ED470G03	81349	72136
C29	Same as C5				
CR1	Diode	1	5082-2800	28480	
L1	Coil, Fixed: 47 μH	1	1537-60	99800	
L2	Coil, Fixed: 27 μH	1	1537-48	99800	
Q1	Transistor	2	2N929	80131	04713
Q2	Transistor	4	2N3478	80131	34156
Q3	Transistor	1	2N3251	80131	04713
Q4	Same as Q1				
Q5	Same as Q2				
Q6	Same as Q2				
Q7	Same as Q2				
R1	Resistor, Variable, Film: 100 Ω, 10%, 1/2 W	1	62PAR100	73138	
R2	Resistor, Fixed, Composition: 82 Ω, 5%, 1/4 W	1	RCR07G820JS	81349	01121
R3	Resistor, Fixed, Composition: 6.8 kΩ, 5%, 1/4 W	2	RCR07G682JS	81349	01121
R4	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	4	RCR07G103JS	81349	01121
R5	Resistor, Variable, Film: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	

REF DESIG PREFIX A6A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R6	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R7	Same as R3				
R8	Resistor, Fixed, Composition: 180 Ω, 5%, 1/4 W	2	RCR07G181JS	81349	01121
R9	Resistor, Fixed, Composition: 47 Ω, 5%, 1/4 W	2	RCR07G470JS	81349	01121
R10	Resistor, Fixed, Composition: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
R11	Same as R4				
R12	Resistor, Fixed, Composition: 2.2 kΩ, 5%, 1/4 W	4	RCR07G222JS	81349	01121
R13	Resistor, Fixed, Composition: 1.8 kΩ, 5%, 1/4 W	1	RCR07G182JS	81349	01121
R14	Same as R9				
R15	Resistor, Fixed, Composition: 12 Ω, 5%, 1/4 W	1	RCR07G120JS	81349	01121
R16	Resistor, Fixed, Composition: 150 Ω, 5%, 1/4 W	2	RCR07G151JS	81349	01121
R17	Resistor, Fixed, Composition: 100 Ω, 5%, 1/4 W	4	RCR07G101JS	81349	01121
R18	Resistor, Fixed, Composition: 3.3 kΩ, 5%, 1/4 W	2	RCR07G332JS	81349	01121
R19	Resistor, Fixed, Composition: 240 kΩ, 5%, 1/4 W	1	RCR07G244JS	81349	01121
R20	Same as R12				
R21	Same as R4				
R22	Same as R16				
R23	Same as R6				
R24	Resistor, Fixed, Composition: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R25	Resistor, Fixed, Composition: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
R26	Same as R4				
R27	Same as R12				

REF DESIG PREFIX A6A5

EF SIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
8	Same as R8				
9	Resistor, Fixed, Composition: 30 Ω, 5%, 1/4 W	1	RCR07G300JS	81349	01121
0	Resistor, Fixed, Composition: 62 Ω, 5%, 1/4 W	2	RCR07G620JS	81349	01121
1	Same as R30				
2	Same as R17				
3	Same as R18				
4	Same as R10				
5	Same as R17				
6	Resistor, Fixed, Composition: 220 kΩ, 5%, 1/4 W	1	RCR07G224JS	81349	01121
	Same as R12				
	Resistor, Fixed, Composition: 8.2 kΩ, 5%, 1/4 W	1	RCR07G822JS	81349	01121
	Resistor, Fixed, Composition: 300 Ω, 5%, 1/4 W	1	RCR07G301JS	81349	01121
	Same as R17				
	Transformer	1	21427-14	14632	
	Transformer	1	21092-8	14632	
	Transformer	1	21428-59	14632	
	Integrated Circuit	1	MC1350P	04713	
	Crystal, Quartz	1	96402-1	14632	

7.6.2.8 Type 791205-5 21.4 MHz Limiter/Discriminator(4 kHz)

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
	With the exception of those items listed below, the 791205-5 Limiter/ Discriminator is electrically identical to the 791205-4.				
C15	Capacitor, Ceramic, Disc: 1 μF, 20%, 100 V	7	8131M100-651-104M	72982	
C28	Capacitor, Ceramic, Disc: 1 μF, 10%, 100 V	1	CK06BX104K	81349	56289
C29	Capacitor, Ceramic, Disc: 27 μF, 20%, 100 V	1	8131M100-651-274M	72982	
L7	Coil, Fixed: 47 MH, 10%	1	553-3635-57	71279	
L8	Coil, Fixed: 22 MH, 10%	1	553-3635-53	71279	

7.6.2.9 TYPE 791330 FM LIMITER/DISCRIMINATOR (4 MHz BW)

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 5000 pF, 20% 100 V	4	CO23B101E502M	56289	
C2	Capacitor, Variable, Air: 0.8-10.0 pF 250 V	2	5201/W HDW	91293	
C3	Same as C1				
C4	Same as C1				
C5	Capacitor, Ceramic, Tubular: 10 pF, 0.5 pF, 500 V	1	301-000C0H0-100D	72982	
C6	Same as C2				
C7	Capacitor, Ceramic, Tubular: 10 pF, 0.5 pF, 500 V	1	301-000U2J0-100D	72982	
C8	Capacitor, Ceramic, Tubular: 6.8 pF, 0.25 pF, 500 V	1	301-000C0H0-689C	72982	
C9	Not Used				
C10	Not Used				
C11	Capacitor, Mica, Dipped: 82 pF, 2%, 500 V	1	CM05ED820G03	81349	72136
C12	Capacitor, Mica, Dipped: 130 pF, 2%, 500 V	1	CM05FD131G03	81349	72136
C13	Capacitor, Mica, Dipped: 10 pF, 0.5 pF, 500 V	1	CM05CD100D03	81349	72136
C14	Same as C1				
C15	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	1	SM1000PFP	91418	
C16	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 100 V	2	8131M100-651-104M	72982	
C17	Same as C16				
C18	Capacitor, Ceramic, Disc: 0.47 μF, 20%, 100 V	2	8131M100-651-474M	72982	
C19	Same as C18				
CR1	Diode	2	1N4446	80131	93332
CR2	Same as CR1				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L1	Coil, Torodial	1	20681-153	14632	
L2	Coil, Fixed: 18 μH, 10%	1	1537-42	99800	
L3	Coil, Fixed: 75 μH, 5%	1	1537-70	99800	
L4	Coil, Fixed: 39 μH, 10%	1	1537-56	99800	
R1	Resistor, Fixed, Composition: 220 Ω, 5%, 1/4 W	1	RCR07G221JS	81349	01121
R2	Resistor, Fixed, Composition: 1.5 kΩ, 5%, 1/4 W	1	RCR07G152JS	81349	01121
R3	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/4 W	1	RCR07G472JS	81349	01121
R4	Resistor, Fixed, Composition: 22 kΩ, 5%, 1/4 W	2	RCR07G223JS	81349	01121
R5	Same as R4				
R6	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	3	RCR07G103JS	81349	01121
R7	Same as R6				
R8	Same as R6				
R9	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349	01121
R10	Resistor, Fixed, Composition: 510 Ω, 5%, 1/4 W	1	RCR07G511JS	81349	01121
R11	Resistor, Fixed, Composition: 3.0 kΩ, 5%, 1/4 W	1	RCR07G302JS	81349	01121
R12	Resistor, Fixed, Composition: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
R13	Resistor, Fixed, Film: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	75042
R14	Resistor, Variable, Film: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R15	Same as R13				
T1	Transformer, Toroidal	1	21427-48	14632	
U1	Integrated Circuit	1	CA3011	02735	

REF DESIG PREFIX A6AX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
U2	Integrated Circuit	1	CA3100T	02735	
VR1	Diode, Zener: 8.2 V Silicon	1	1N756A	80131	

7.6.2.10 Type 23909 IF Mother Board

REF DESIG PREFIX A6A9

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
	With the exception of those items listed below, the 23909 IF Mother Board is electircally identical to the 23909-2 IF Mother Board				
R1	Resistor, Fixed, Composition: 100 ohms, 5%, 1/4 W	2	RCR07G101JS	81349	01121
R2	Resistor, Fixed, Composition: 68 ohms, 5%, 1/4 W	1	RCR07G680JS	81349	01121
R5	Not Used				

.6.3 TYPE 7875 PULSE/AVERAGE AGC AMPLIFIER

REF DESIG PREFIX A10

EF ESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
1	Capacitor, Electrolytic, Tantalum: 0.47 μF, 10%, 35 V	1	CS13BF474K	81349	56289
2	Capacitor, Electrolytic, Tantalum: 15 μF, 10%, 20 V	1	CS13BE156K	81349	56289
3	Capacitor, Electrolytic, Tantalum: 2.2 μF, 10%, 35 V	1	CS13BF225K	81349	56289
4	Capacitor, Ceramic, Disc: 0.1 μF, -20+80%, 25 V	1	DFJ3	73899	
5	Capacitor, Ceramic, Disc: 0.01 μF, 20%, 100 V	2	C023B101F103M	56289	
6	Same as C5				
CR1	Diode	3	1N462A	80131	93332
CR2	Diode	3	1N4446	80131	93332
CR3	Same as CR2				
CR4	Same as CR2				
CR5	Same as CR1				
CR6	Same as CR1				
CR7	Diode	1	5082-2800	28480	
Q1	Transistor	3	2N3251	80131	04713
Q2	Transistor	1	2N2222A	80131	04713
Q3	Same as Q1				
Q4	Transistor	3	2N929	80131	04713
Q5	Same as Q1				
Q6	Same as Q4				
Q7	Same as Q4				
R1	Resistor, Fixed, Composition: 1 kΩ, 5%, 1/4 W	2	RCR07G102JS	81349	01121
R2	Resistor, Fixed, Composition: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121

REF DESIG PREFIX A10

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R3	Resistor, Fixed, Composition: 330 kΩ, 5%, 1/4 W	1	RCR07G334JS	81349	01121
R4	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	7	RCR07G103JS	81349	01121
R5	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/4 W	1	RCR07G472JS	81349	01121
R6	Resistor, Fixed, Composition: 3.3 Ω, 5%, 1/4 W	1	RCR07G3R3JS	81349	01121
R7	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/4 W	4	RCR07G104JS	81349	01121
R8	Resistor, Fixed, Composition: 68 kΩ, 5%, 1/4 W	1	RCR07G683JS	81349	01121
R9	Resistor, Fixed, Composition: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121
R10	Resistor, Fixed, Composition: 220 kΩ, 5%, 1/4 W	1	RCR07G224JS	81349	01121
R11	Same as R4				
R12	Same as R1				
R13	Resistor, Fixed, Composition: 10 Ω, 5%, 1/4 W	1	RCR07G100JS	81349	01121
R14	Same as R7				
R15	Resistor, Fixed, Composition: 33 kΩ, 5%, 1/4 W	3	RCR07G333JS	81349	01121
R16	Same as R7				
R17	Resistor, Fixed, Composition: 3.9 kΩ, 5%, 1/4 W	2	RCR07G392JS	81349	01121
R18	Same as R15				
R19	Resistor, Fixed, Composition: 150 Ω, 5%, 1/4 W	3	RCR07G151JS	81349	01121
R20	Resistor, Fixed, Composition: 180 kΩ, 5%, 1/4 W	1	RCR07G184JS	81349	01121
R21	Same as R4				
R22	Same as R4				
R23	Resistor, Fixed, Composition: 15 kΩ, 5%, 1/4 W	2	RCR07G153JS	81349	01121
R24	Same as R15				

REF DESIG PREFIX A10

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
25	Same as R7				
26	Resistor, Fixed, Composition: 1.5 kΩ, 5% 1/4 W	1	RCR07G152JS	81349	01121
27	Same as R23				
28	Resistor, Fixed, Composition: 220 Ω, 5%, 1/4 W	1	RCR07G221JS	81349	01121
29	Same as R4				
30	Resistor, Fixed, Composition: 6.8 kΩ, 5%, 1/4 W	2	RCR07G682JS	81349	01121
31	Same as R17				
32	Same as R4				
33	Same as R30				
34	Same as R4				
35	Resistor, Fixed, Composition: 22 kΩ, 5%, 1/4 W	1	RCR07G223JS	81349	01121
36	Resistor, Fixed, Composition: 47 kΩ, 5%, 1/4 W	1	RCR07G473JS	81349	01121
37	Same as R19				
38	Resistor, Fixed, Composition: 1.0 M Ω, 5%, 1/4 W	1	RCR07G105JS	81349	01121
39	Same as R19				
U1	Integrated Circuit	2	741HC	07263	
U2	Same as U1				

7.6.4 TYPE 7457 AUDIO, COR & SQUELCH AMPLIFIER

REF DESIG PREFIX A11

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 100 V	5	8131M100-651-104M	72982	
C2	Same as C1				
C3	Capacitor, Electrolytic, Tantalum: 100 μF, 10%, 30 V	1	109D107X9030T2	56289	
C4	Capacitor, Ceramic, Disc: 0.1 μF, -20+80%, 25 V	1	DFJ3	73899	
C5	Same as C1				
C6	Capacitor, Electrolytic, Tantalum: 47 μF, 10%, 35 V	1	CS13BF476K	81349	56289
C7	Capacitor, Electrolytic, Tantalum: 1.0 μF, 10%, 35 V	1	CS13BF105K	81349	56289
C8	Capacitor, Mica, Dipped: 10 pF ± 0.5 pF, 500 V	1	CM05CD100D03	81349	72136
C9	Same as C1				
C10	Capacitor, Electrolytic, Tantalum: 22 μF, 10%, 35 V	1	CS13BF226K	81349	56289
C11	Capacitor, Ceramic, Disc: 5000 pF, 20%, 500 V	1	SM (5000 pF, M)	91418	
C12	Capacitor, Electrolytic, Tantalum: 0.47 μF, 10%, 35 V	1	CS13BF474K	81349	56289
C13	Same as C1				
CR1	Diode	4	1N462A	80131	93332
CR2 Thru CR4	Same as CR1				
Q1	Transistor	1	U1899E	15818	
Q2	Transistor	2	2N2222A	80131	04713
Q3	Same as Q2				
R1	Resistor, Fixed, Composition: 470 Ω, 5%, 1/4 W	2	RCR07G471JS	81349	01121
R2	Resistor, Fixed, Composition: 150 kΩ, 5 %, 1/4 W	1	RCR07G154JS	81349	01121
R3	Resistor, Fixed, Composition: 1.2 M Ω, 5 %, 1/4 W	1	RCR07G125JS	81349	01121

REF DESIG PREFIX A11

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R4	Resistor, Fixed, Composition: 15 kΩ, 5%, 1/4 W	1	RCR07G153JS	81349	01121
R5	Resistor, Fixed, Composition: 22 M Ω, 5%, 1/4 W	1	RCR07G226JS	81349	01121
R6	Resistor, Fixed, Composition: 2.2 kΩ, 5%, 1/4 W	1	RCR07G222JS	81349	01121
R7	Resistor, Fixed, Composition: 47 kΩ, 5%, 1/4 W	1	RCR07G473JS	81349	01121
R8	Resistor, Fixed, Composition: 1.0 M Ω, 5%, 1/4 W	1	RCR07G105JS	81349	01121
R9	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/4 W	1	RCR07G104JS	81349	01121
R10	Resistor, Fixed, Composition: 47 Ω, 5%, 1/4 W	1	RCR07G470JS	81349	01121
R11	Resistor, Fixed, Composition: 2.7 Ω, 5%, 1/4 W	3	RCR07G2R7JS	81349	01121
R12	Resistor, Fixed, Composition: 300 kΩ, 5%, 1/4 W	1	RCR07G304JS	81349	01121
R13*	Resistor, Fixed, Composition: 30 kΩ, 5%, 1/4 W	1	RCR07G303JS	81349	01121
R14	Same as R11				
R15	Same as R1				
R16	Resistor, Fixed, Composition: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R17	Same as R11				
T1	Audio Transformer	1	16934	14632	
U1	Integrated Circuit	1	741HC	07263	
U2	Integrated Circuit	1	LM380N	03508	

*Nominal Value, Final Value Factory Selected

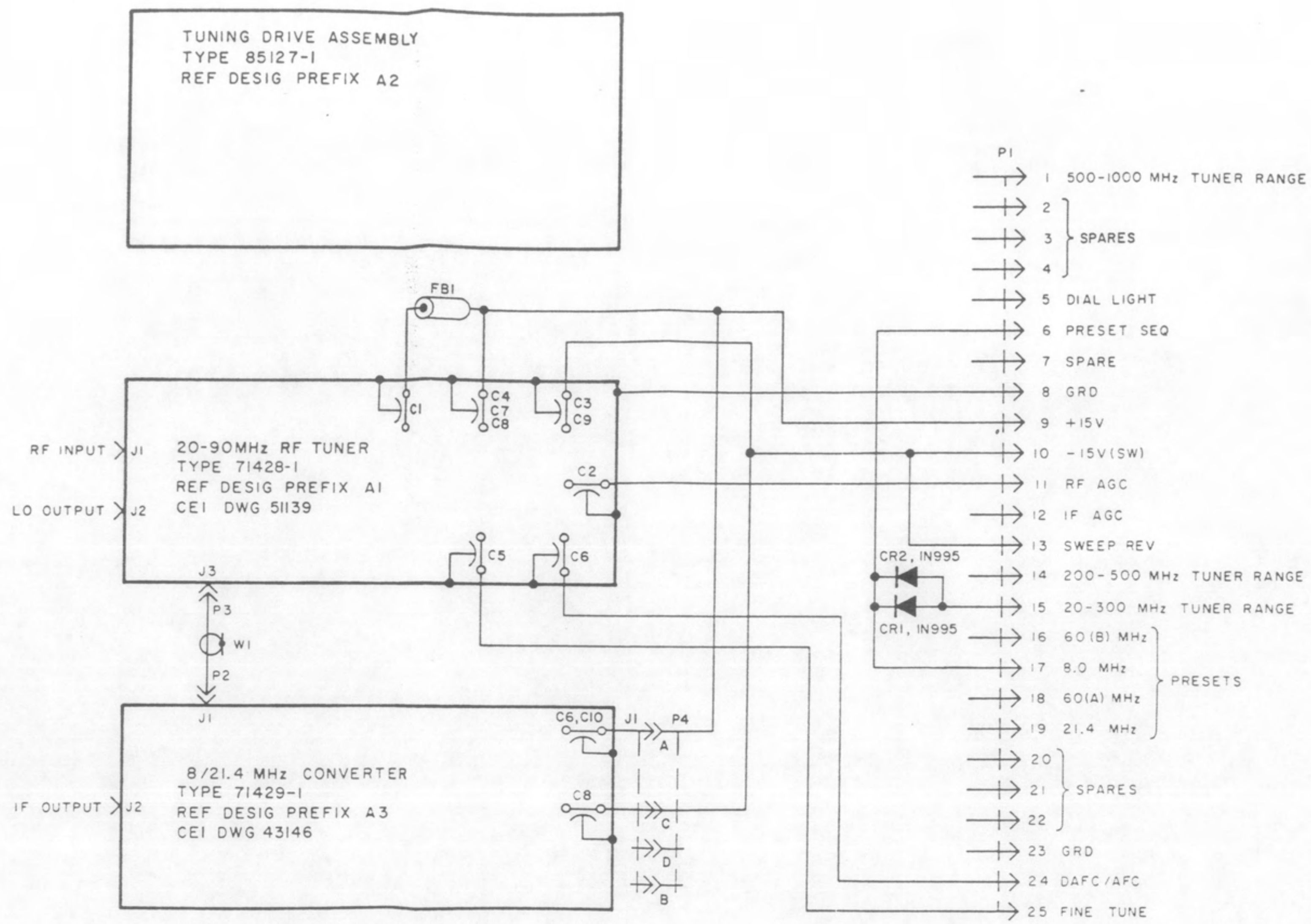
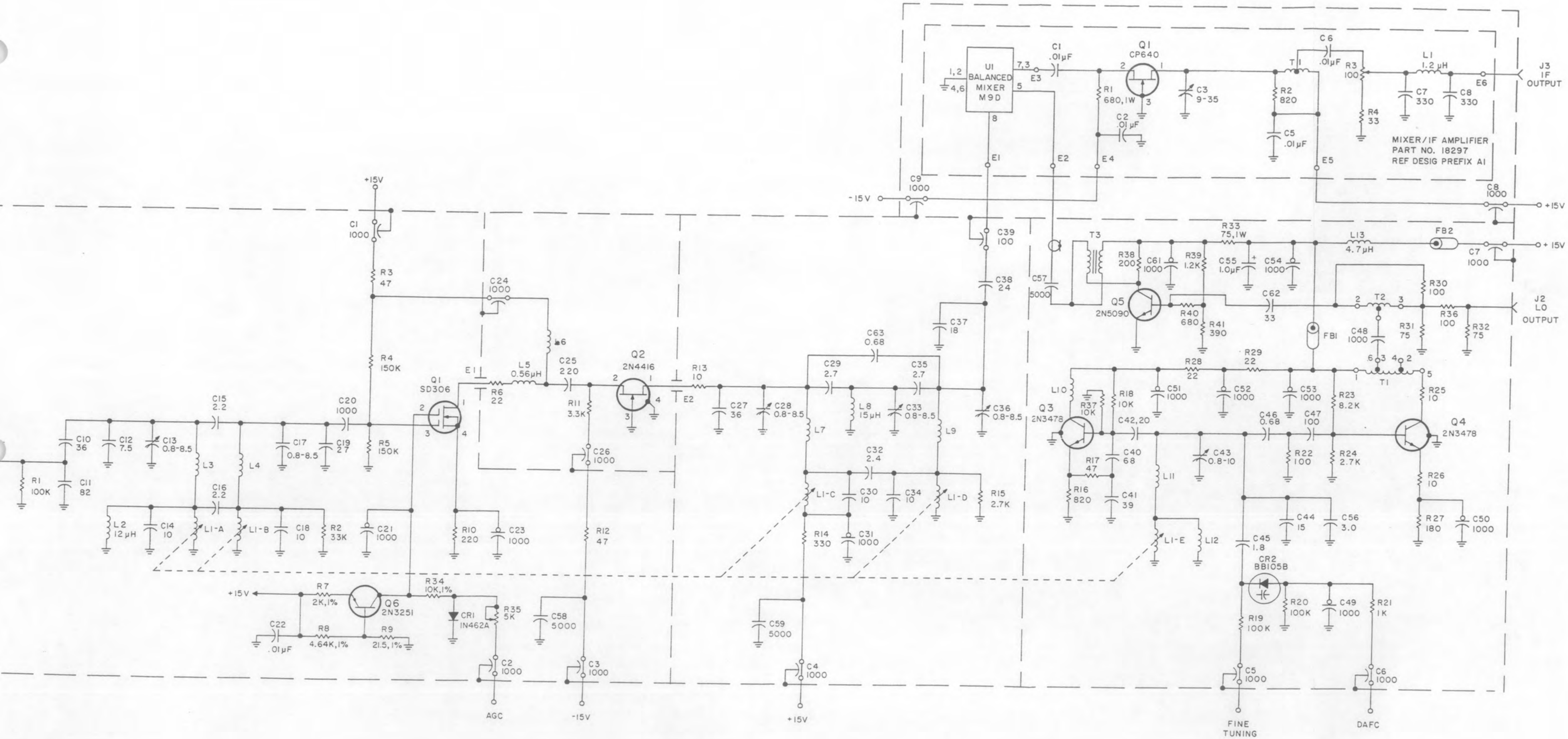
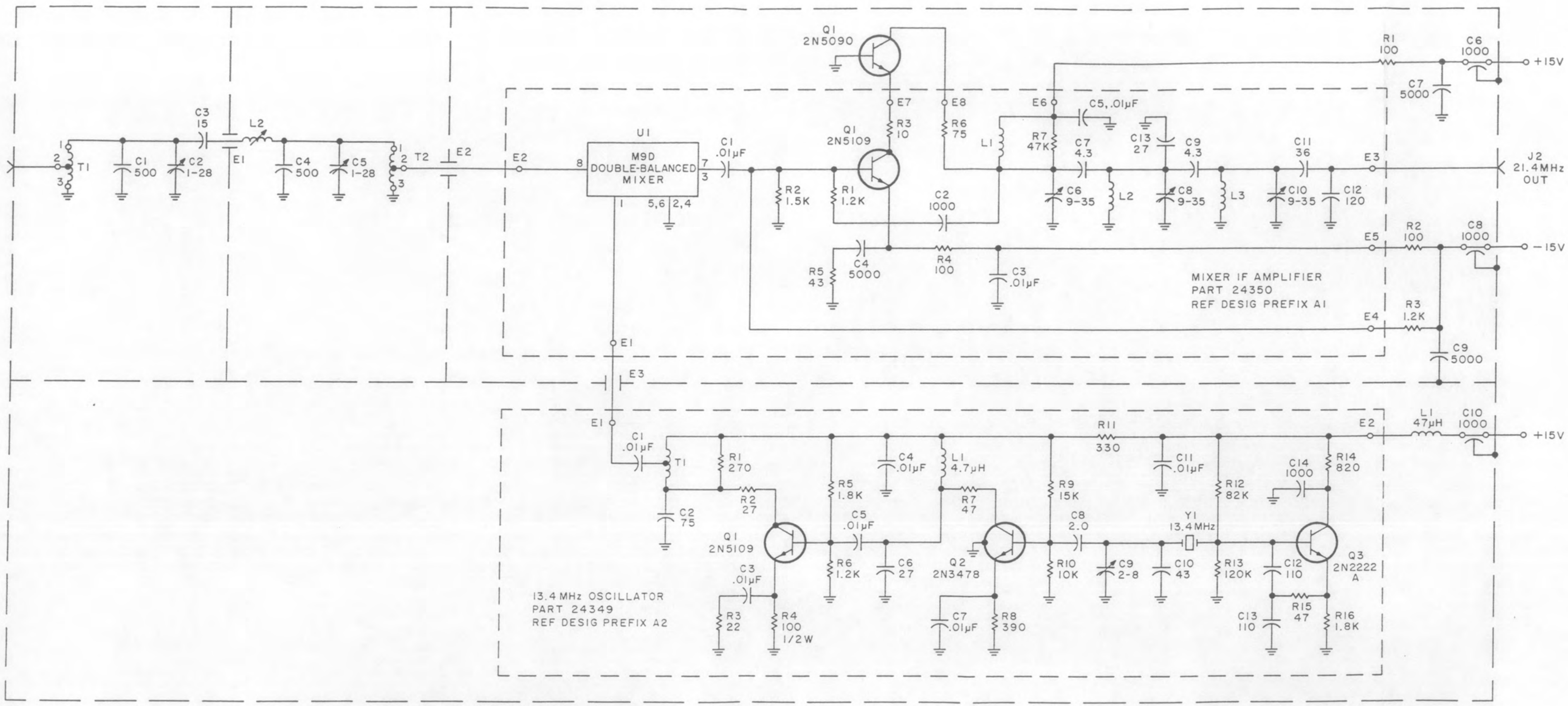


Figure 7-2. Type WJ-9061-6 20-90 MHz Tuning Head (A1), Schematic Diagram



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN pF.
2. L1-A THRU L1-E ARE MECHANICALLY GANGED SECTIONS OF INDUCTOR L1.

Figure 7-3. Type 71428-1 20-90 MHz RF Tuner (A1A1), Schematic Diagram



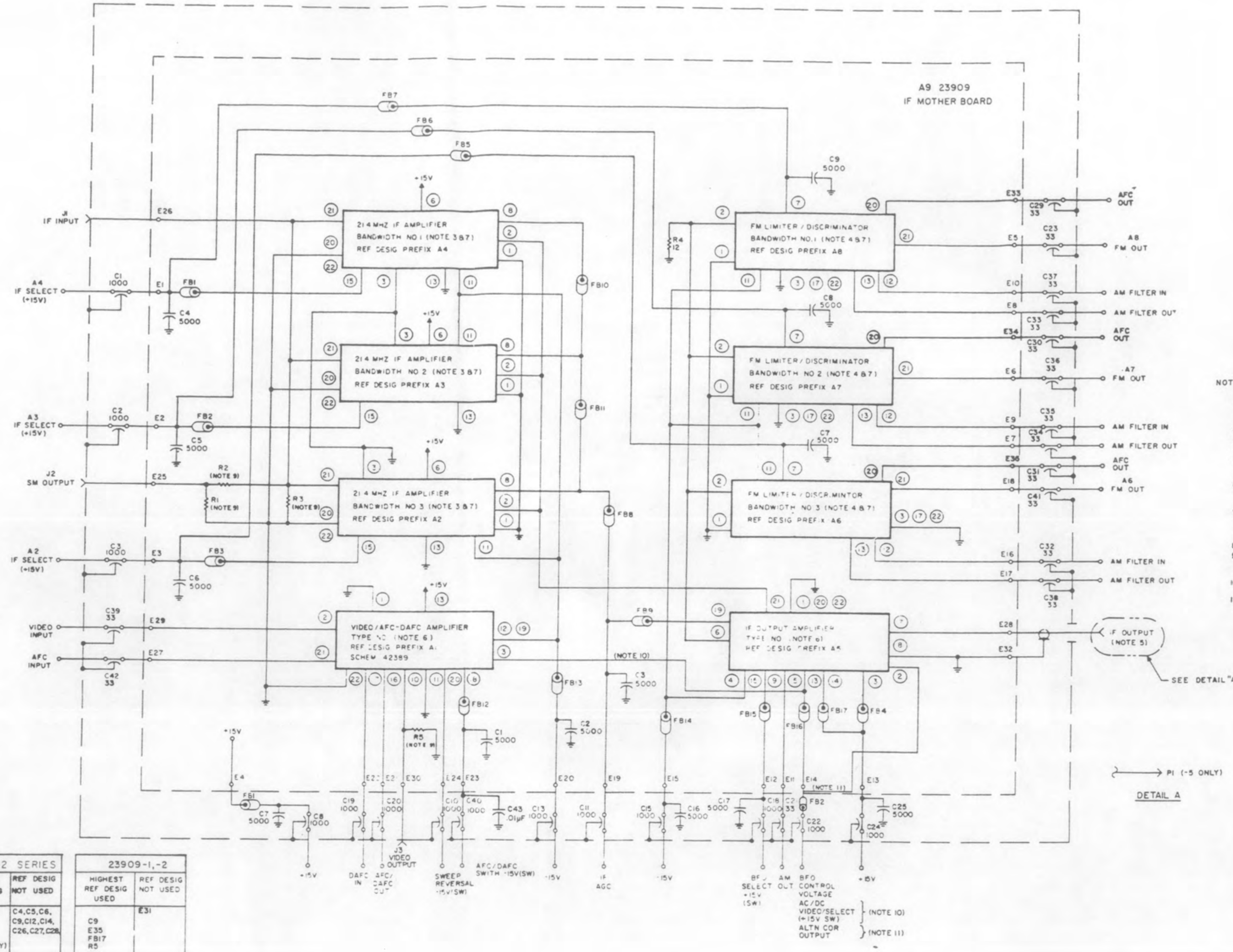
NOTE:

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

Figure 7-4. Type 71429-1 8-21.4 MHz Converter (A1A3), Schematic Diagram

AVAILABLE BANDWIDTHS (REF. INFO.)			
WJ PART NO	IF BANDWIDTH	IF AMPLIFIER PC TYPE NO. A2 THRU A4	FM LIMITER / DISC PC. TYPE NO. A6 THRU A8
WJ-9930-4	4 KHz	72339-2	791205-5
WJ-9930-10	10 KHz	72339	791205-1
WJ-9930-20	20 KHz	72389	791205-2
WJ-9930-50	50 KHz	72344	791205-3
WJ-9930-100	100 KHz	72431	791331
WJ-9930-200	200 KHz	72338	791338
WJ-9930-300	300 KHz	72366	791366
WJ-9930-500	500 KHz	72429	791329
WJ-9930-1M	1 MHz	72378-1	791378
WJ-9930-2M	2 MHz	72378-2	791365-2
WJ-9930-3M	3 MHz	72365	791365-1
WJ-9930-4M	4 MHz	72430	791330
WJ-9930-8	8 KHz	72472	791205-4
WJ-9930-20-1	20 KHz	72389-3	791205-2
WJ-9930-20HI	20KHz	72477-1	791205-2
WJ-9930-100HI	100KHz	72477-2	791331
WJ-9930-20LP	20KHz	72389-2	791205-2
WJ-9930-50LP	50KHz	72344-2	791205-3

TABULATION										
IF AMPLIFIER ASSY	IF OUTPUT AMPLIFIER A5		UNITS USED ON	MAIN UNIT IF OUTPUT RECEPTACLE (REF DESIG)	VIDEO / AFC-DAFC AMPLIFIER A1	PART NO. FOR A9	A9R1	A9R2	A9R3	A9R5
	OSCILLATOR	TYPE NO.								
72462-1	XTAL BFO	72372	WJ-8730A, 31A, 30R, & WJ-8736	J3	7383	23909-1	100	68	100	N/U
72462-2	VCXO	72343	WJ-8732A, 33A & 565A	J3	7383	23909-1	100	68	100	N/U
72462-3	VCXO	72343	WJ-9026/RU	J11	7383	23909-2	51	1M	51	100
72462-4	VCXO	72343	WJ-8732A-2	J3	7386	23909-1	100	68	100	N/U
72462-5	XTAL BFO	72372	WJ-8737/RU	SEE DETAIL A	7389	23909-1	100	68	100	N/U
72462-6	XTAL BFO	72372-3	WJ-8736-3	J3	7383	23909-1	100	68	100	N/U
72462-7	XTAL BFO	72372-2	WJ-8730A-1	J3	7383	23909-1	100	68	100	N/U
72462-8	XTAL BFO	72372-4	WJ-9026A	J11	7383	23909-2	51	1M	51	100
72462-9	VCXO	72343-3	WJ-8732A-6	J3	7383	23909-1	100	68	100	N/U



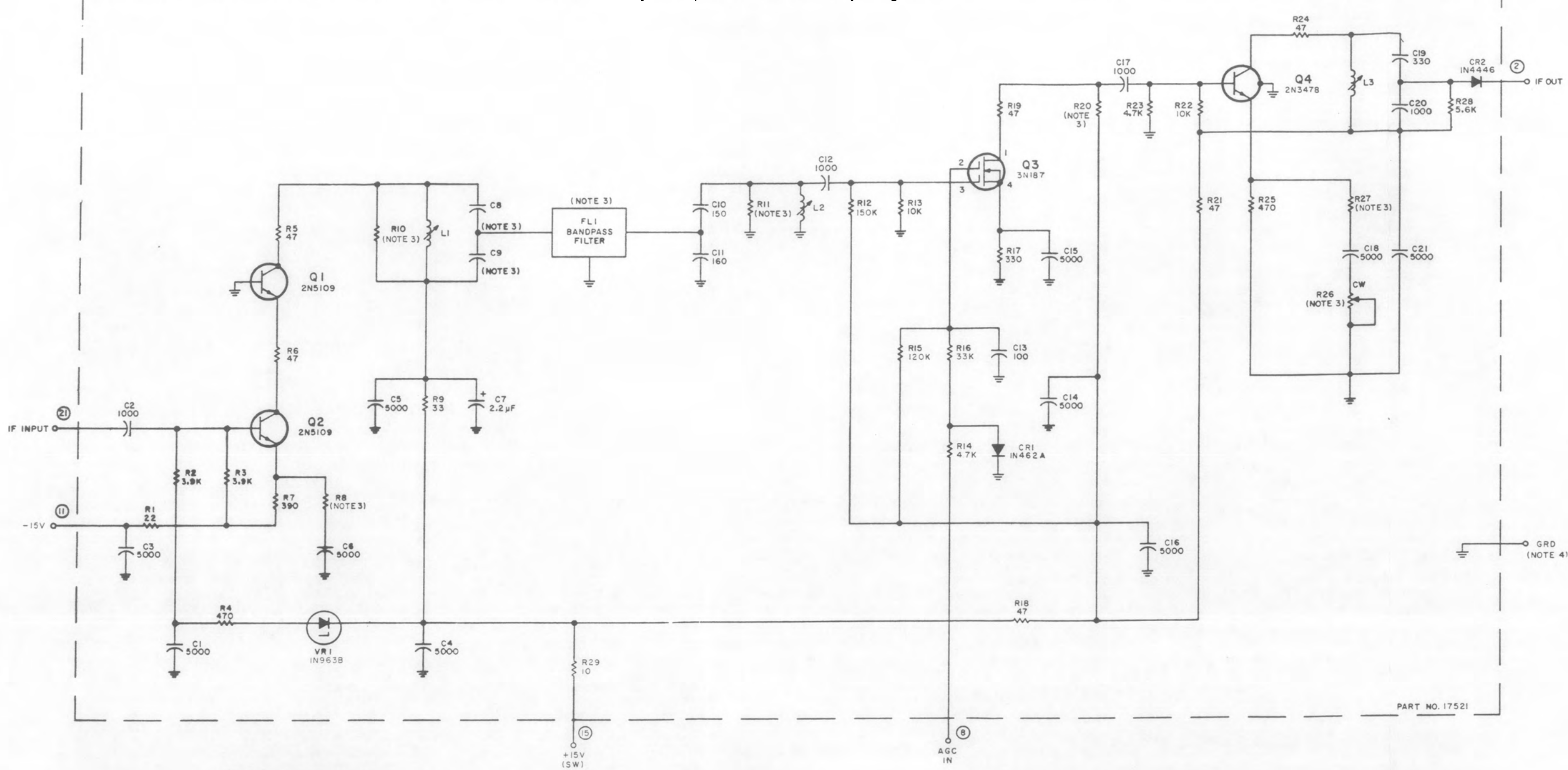
72462 SERIES	
HIGHEST REF DESIG USED	REF DESIG NOT USED
C43 FB2 J3 A9 P1 (-5 ONLY)	C4, C5, C6, C9, C12, C14, C26, C27, C28

23909-1,-2	
HIGHEST REF DESIG USED	REF DESIG NOT USED
C9 E35 FB17 R5	E31

NOTES:

1. UNLESS OTHERWISE SPECIFIED.
   A. RESISTANCE IS IN OHMS, ± 5%, 1/4 W.
   B. CAPACITANCE IS IN PF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. WIDEST IF BW ALWAYS IN POSITION A2.
4. WIDEST BW DESCRIMINATOR ALWAYS IN POSITION A6.
5. IF OUTPUT FROM E28 & E32 OF A9 TO BE CONNECTED TO JACK ON REAR PANEL OF MAIN UNIT. SEE TABULATION (SHEET 2).
6. IF OUTPUT AMPLIFIER & VIDEO/AFC-DAFC AMPLIFIER TYPE NOS. ARE SELECTED ACCORDING TO RECEIVER TYPE. REFER TO TABULATION (SHEET 2).
7. THE IF AMPLIFIER & FM LIMITER/DESCRIMINATOR RC. ASSEMBLIES ARE SELECTED ACCORDING TO BANDWIDTH. REFER TO AVAILABLE BANDWIDTHS (SHEET 2) FOR TYPE NO. & PROPER MATCHING.
8. A1 THRU A8 ARE NOT SUPPLIED AS PART OF A9.
9. THE IF MOTHER BOARD (A9) IS SELECTED ACCORDING TO IF AMPLIFIER ASSEMBLY DASH NO. SEE TABULATION (SHEET 2).
10. CONNECT JUMPER WIRE FROM A5-PIN 13 TO A1-PIN 3, FOR -5 ONLY.
11. DISCONNECT FB2 FROM E14 & RECONNECT TO A5-PIN 2, FOR -8 ASSY ONLY.

Figure 7-5. TYPE 72462-1 Series IF Amplifier (A6), Schematic Diagram

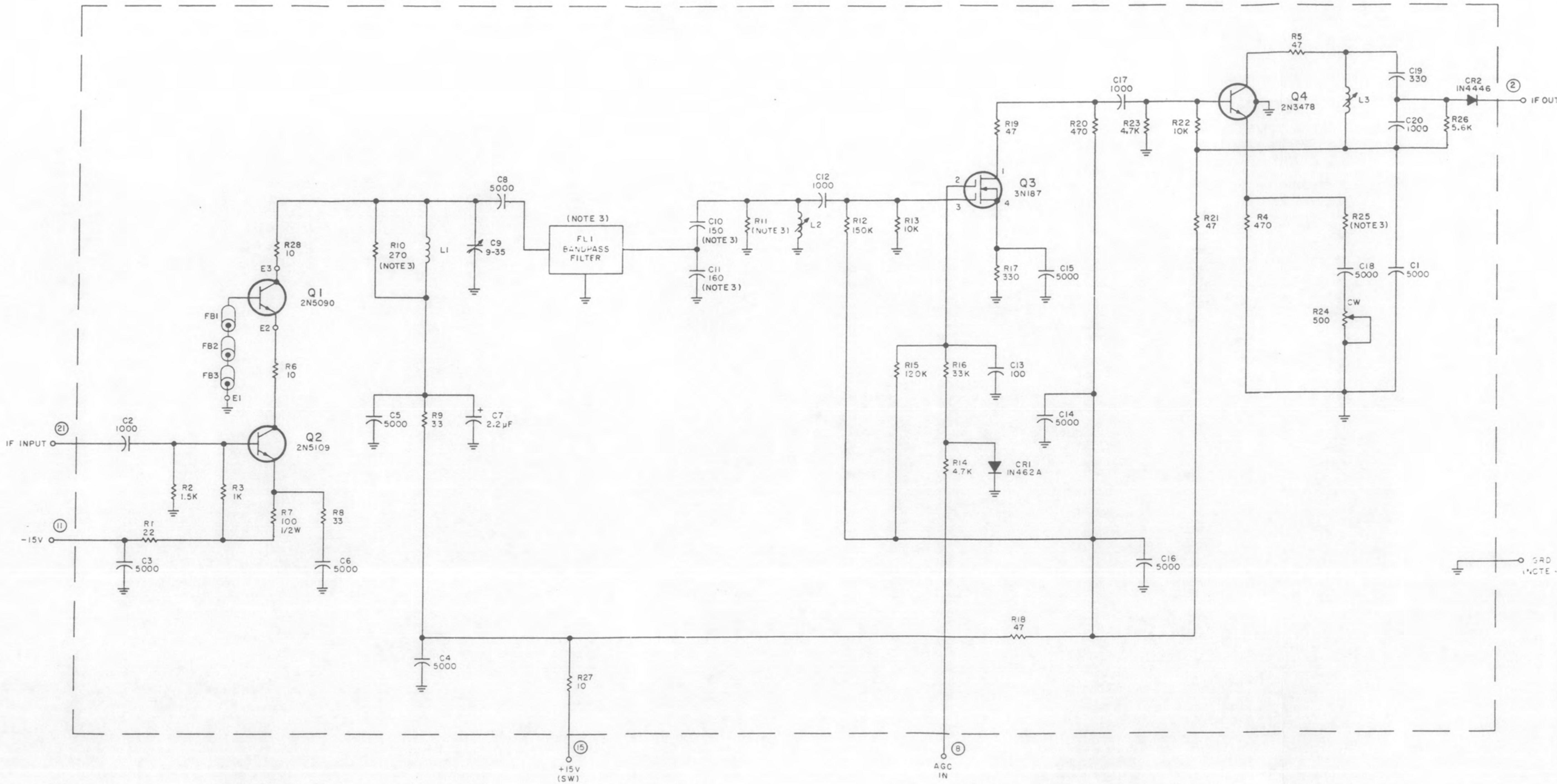


NOTES:

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.
4. GROUND PINS FOR THIS MODULE ARE 1, 3, 4, 5, 7, 9, 10, 12, 13, 14, 17 THRU 20, 22.
5. CW ON R26 INDICATES CLOCKWISE ROTATION OF ACTUACTOR.

TYPE NO.	FL1 BANDWIDTH	R27		R20	R26	R8	C8	C9			R10	R11
72339-1	10KHz	10		1.5K	100	33	120	220			2.49K, 1%, 1/10W	1.21K, 1%, 1/10W
72344-1	50KHz	10		1.0K	500	51	120	220			2.49K, 1%, 1/10W	1.21K, 1%, 1/10W
72389-1	20KHz	10		470	500	62	120	220			2.49K, 1%, 1/10W	1.21K, 1%, 1/8W
72431	100KHz	27		470	500	62	130	220			2.49K, 1%, 1/10W	1.21K, 1%, 1/4W
72339-2	4 KHz	2.7		1.0K	100	33	130	240			2.7K	1.8K
72344-2	50 KHz L.P.	10		1.0K	500	51	120	220			2.49K, 1%, 1/10W	1.21K, 1%, 1/10W
72389-2	20 KHz L.P.	10		470	500	62	120	220			2.49K, 1% 1/10W	1.21K, 1%, 1/10W
72389-3	20kHz	10		470	500	62	130	240			3.0K	1.2K

Figure 7-6. Types 72339-2, 72389-2, 72344-2 and 72431 21.4 MHz IF Amplifiers (A6AX), Schematic Diagram



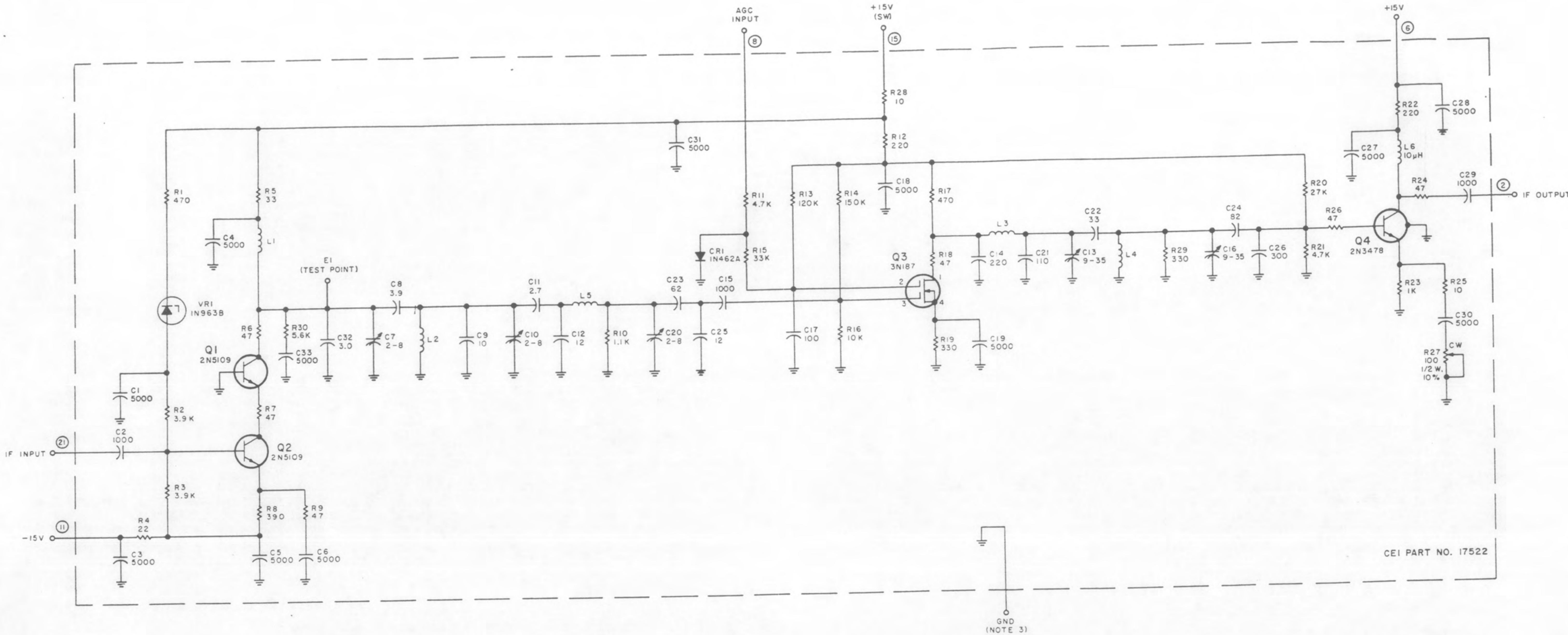
NOTES

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

TYPE NO	FL1 BANDWIDTH	R11	R25	R10	C10	C11
72477-1	20KHz	1.8K	20	240	130	180
72477-2	100KHz	4.3K	10	270	100	270

4. GROUND PINS FOR THIS MODULE ARE 1,3,4,5,7,9,10,12,13,14,17 THRU 20,22.
5. CW ON R24 INDICATES CLOCKWISE ROTATION OF ACTUACTOR.

Figure 7-7. Types 72477-1, -2 21.4 MHz IF Amplifiers (A6AX) Schematic Diagram

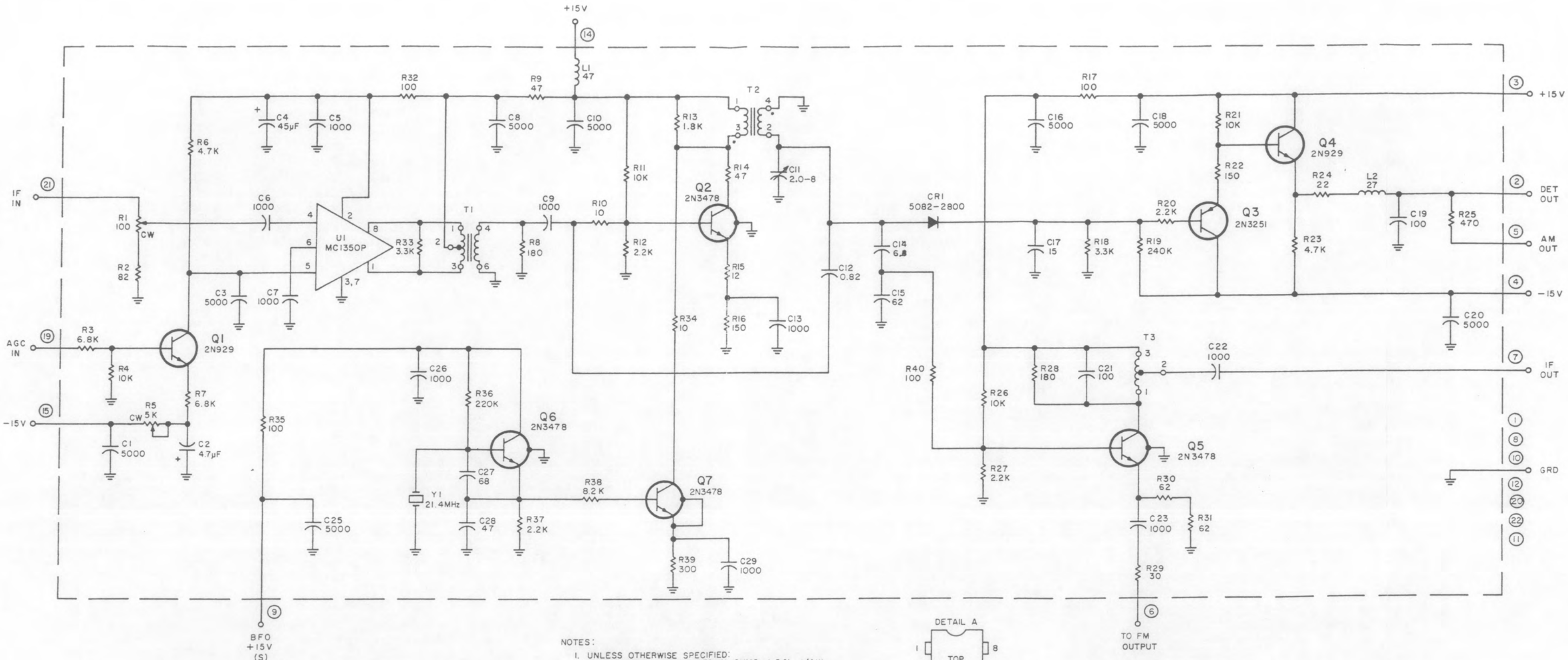


NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN pF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. GROUND PINS ARE THE FOLLOWING:
   1, 3, 4, 5, 9, 10, 12, 13, 14, 17 THRU 20, 22.
4. CW ON R27 INDICATES CLOCKWISE ROTATION OF ACTUATOR.

HIGHEST REF DESIG USED	REF DESIG NOT USED
C33 E1 L6 Q4 R30 VR1	

Figure 7-8. Type 72430 21.4 MHz IF Amplifier (A6AX), Schematic Diagram



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

DETAIL A

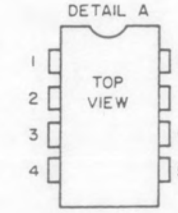
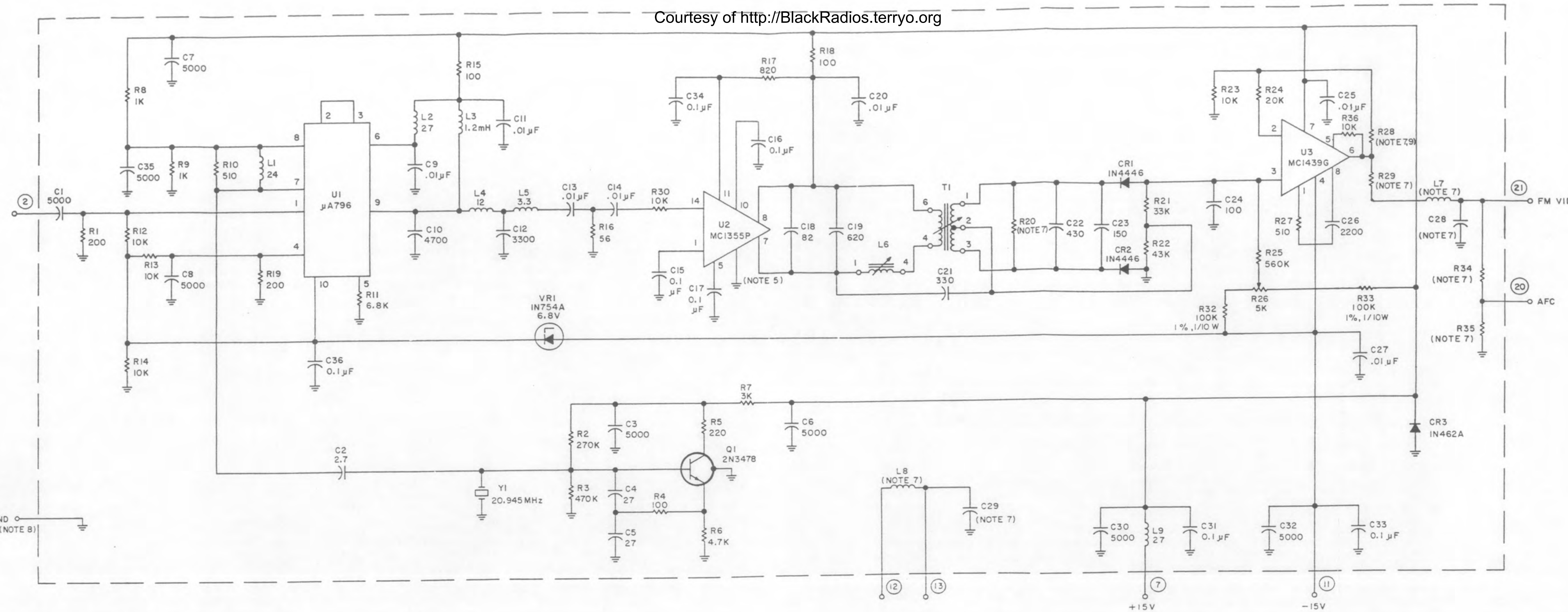
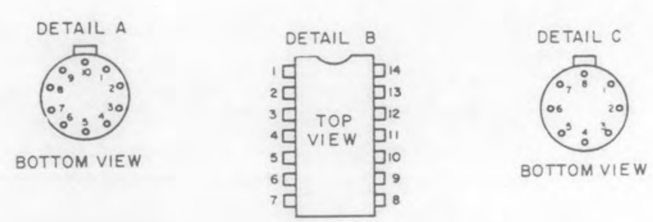


Figure 7-9. Type 72372 IF Output Amplifier (A6A5), Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN µH.
2. ENCIRCLED NUMBERS ARE MODULE PINS.
3. PIN ARRANGEMENT FOR U1 AS SHOWN IN DETAIL A.
4. PIN ARRANGEMENT FOR U2 AS SHOWN IN DETAIL B.
5. GROUND PINS ARE 2,3,4,6,9,12 AND 13.
6. PIN ARRANGEMENT FOR U3 AS SHOWN IN DETAIL C.
7. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE 1.
8. GROUND PINS FOR THIS MODULE ARE 3,17 AND 22.
9. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

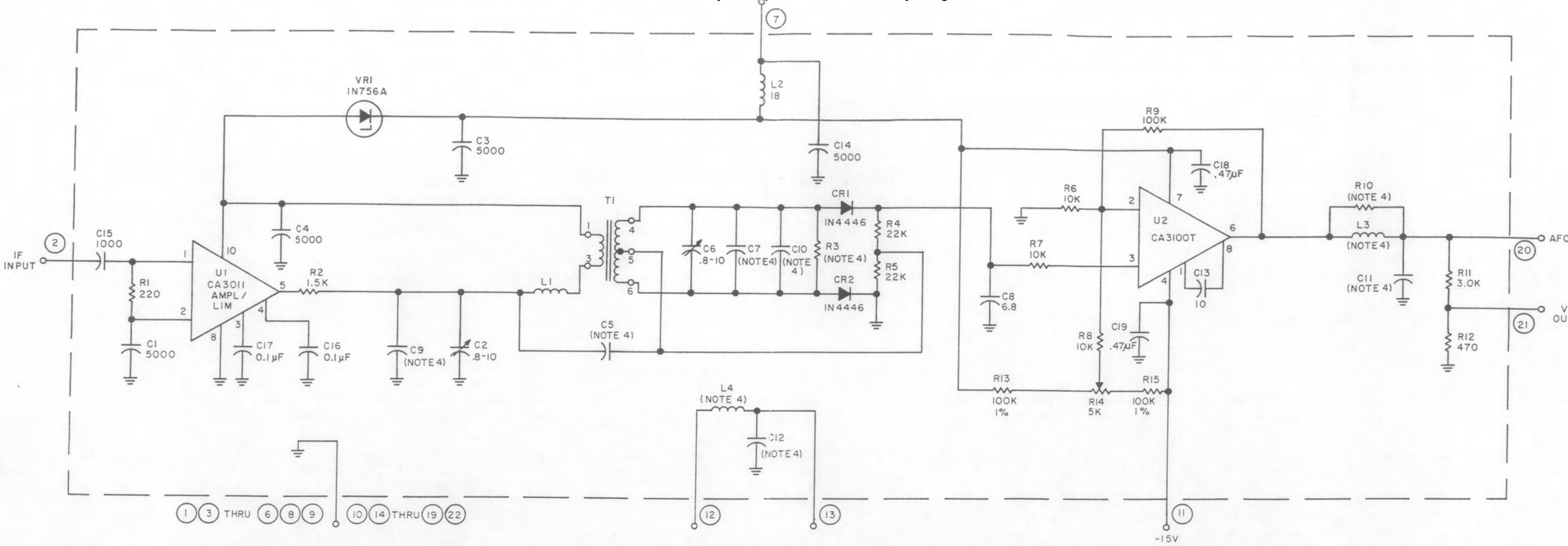


HIGHEST REF DESIG USED	REF DESIG NOT USED
C36	—
CR2	—
L9	—
Q1	—
R36	R31
U3	—
VR1	—
Y1	—

TABLE 1

TYPE No.	BW	C28	C29	L7	L8	R28	R29	R31	R34	R35	R20
791205 - 1	10KHz	0.1µF	.068µF	22 mH	15mH	16K	510	—	4.7K	510	4.3K
791205 - 2	20KHz	.047µF	.033µF	10 mH	6.8mH	3K	510	—	2.2K	560	4.3K
791205 - 3	50KHz	.015µF	.012µF	4.7mH	3.3mH	470	1K	NOT USED	510	510	3.6K
791205 - 4	8KHz	0.1µF	.068µF	22 mH	22 mH	16K	220	—	3.9K	330	4.3K
791205 - 5	4KHz	0.1µF	.27µF	47mH	22mH	16K	220	—	3.9K	330	4.3K

Figure 7-10. Type 791205-X FM Limiter/Discriminator (A6AX), Schematic Diagram



NOTES:
1. UNLESS OTHERWISE SPECIFIED;
   (a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   (b) CAPACITANCE IS IN pF.
   (c) INDUCTANCE IS IN μH.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. FOR U1 PIN ARRANGEMENT, SEE DETAIL A, AND FOR U2 PIN ARRANGEMENT, SEE DETAIL B.
4. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABULATION BLOCK.

DETAIL A

BOTTOM VIEW

DETAIL B

BOTTOM VIEW

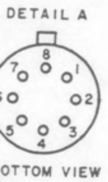
HIGHEST REF DESIG USED	REF DESIG NOT USED
C19 CR2 L4 R15 T1 U2 VR1	SEE TABULATION BLOCK

TABULATION BLOCK

TYPE NO.	DISC. B.W.	C5	C7	C9	C10	C11	C12	L3	L4	R3	R10
791365-2	2 MHz	18	20	N/U	N/U	150	300	200	75	22K	1K
791365-1	3 MHz	10	5.6	6.2	4.7	150	180	100	47	4.7K	510
791330	4 MHz	10	10	N/U	N/U	82	130	75	39	4.7K	510

Figure 7-11. Type 791330 FM Limiter/Discriminator (A6AX), Schematic Diagram

SE SPECIFIED: 1.
S IN OHMS, ± 5%, 1/4 W.
IS IN μF.
RS ARE MODULE PIN NUMBERS. 2.
RANGEMENT, SEE DETAIL A. 3.
for U1, U2



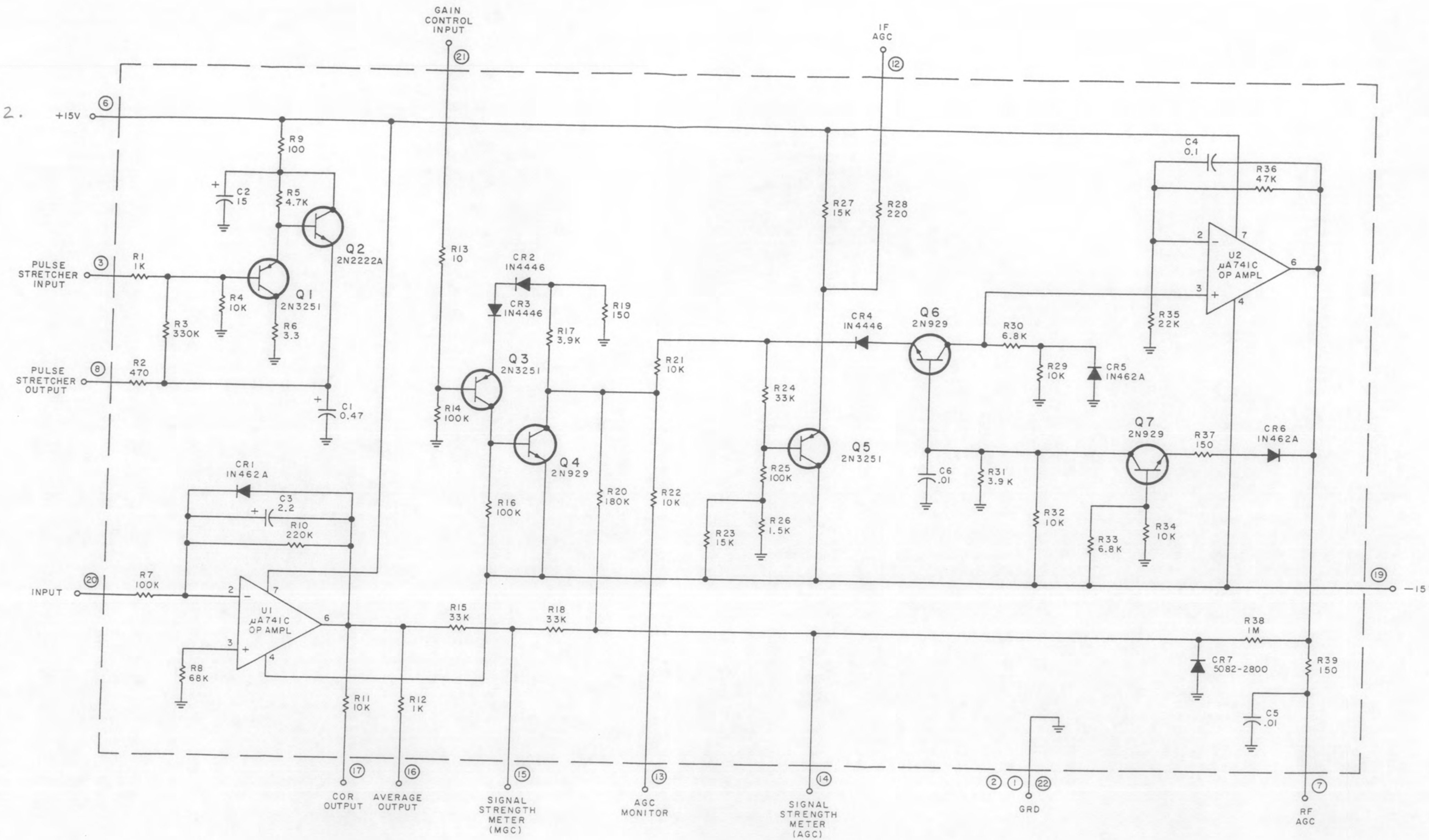
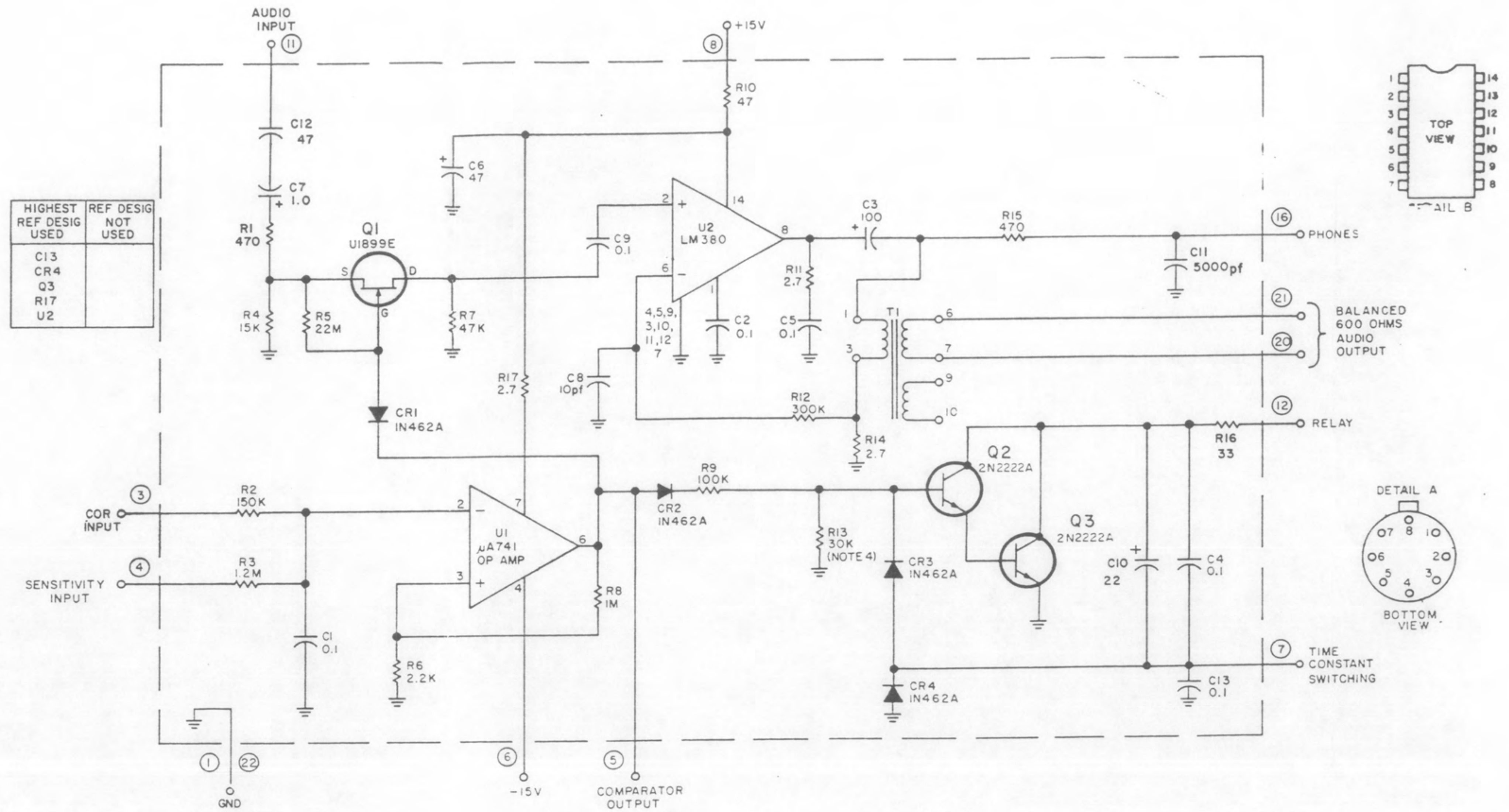


Figure 7-12. Type 7875 Pulse/Average AGC Amplifier (A10), Schematic Diagram

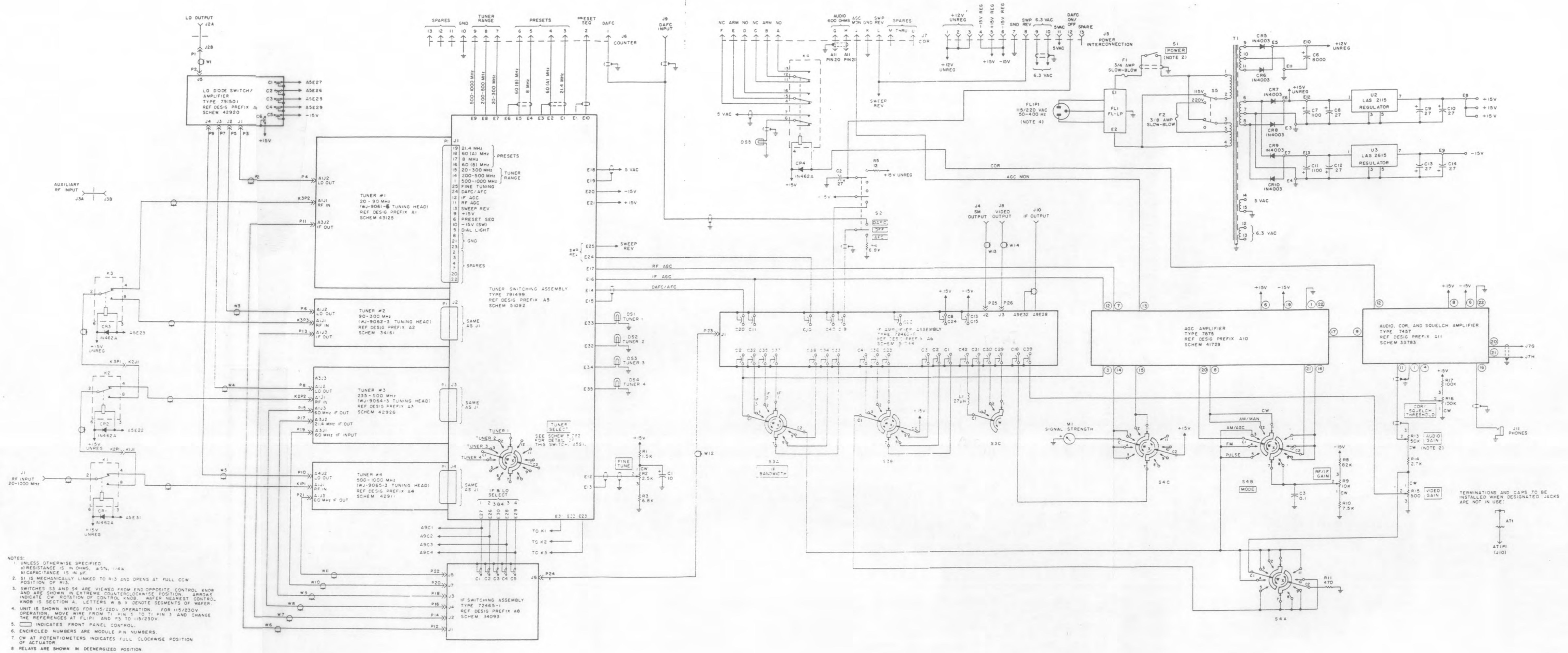


HIGHEST REF DESIG USED	REF DESIG NOT USED
C13	
CR4	
Q3	
R17	
U2	

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN μF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. FOR LEAD ARRANGEMENT OF U1 SEE DETAIL A.
4. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.
5. FOR LEAD ARRANGEMENT OF U2 SEE DETAIL B.

Figure 7-13. Type 7457 Audio, COR, and Squelch Amplifier (A11), Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN μF.
2. S1 IS MECHANICALLY LINKED TO R13 AND OPENS AT FULL CCW POSITION OF R13.
3. SWITCHES S3 AND S4 ARE VIEWED FROM END OPPOSITE CONTROL KNOB AND ARE SHOWN IN EXTREME COUNTERCLOCKWISE POSITION. ARROWS INDICATE CW ROTATION OF CONTROL KNOB. WAFER NEAREST CONTROL KNOB IS SECTION A. LETTERS W & X DENOTE SEGMENTS OF WAFER.
4. UNIT IS SHOWN WIRED FOR 115/220V OPERATION. FOR 115/230V OPERATION, MOVE WIRE FROM T1 PIN 5 TO T1 PIN 3 AND CHANGE THE REFERENCES AT FLIP1 AND S5 TO 115/230V.
5. ▭ INDICATES FRONT PANEL CONTROL.
6. ENCIRCLED NUMBERS ARE MODULE P N NUMBERS.
7. CW AT POTENTIOMETERS INDICATES FULL CLOCKWISE POSITION OF ACTUATOR.
8. RELAYS ARE SHOWN IN DEENERGIZED POSITION.

Figure 7-14. Type WJ-9028/RU Receiver Unit, Schematic Diagram

INSTRUCTION MANUAL

FOR

TYPE WJ-9028/DU DISPLAY UNIT

INTRODUCTION

The WJ-9028/DU Display Unit is similar in design and operation to the WJ-9026/DU. With the exception of the differences listed in the Section VII supplement, the WJ-9026/DU Manual is applicable.

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

RAH 12/77

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.

PROPRIETARY STATEMENT

INSTRUCTION MANUAL
FOR
TYPE WJ-9026/DU DISPLAY UNIT

WATKINS-JOHNSON COMPANY
700 Quince Orchard Road
Gaithersburg, Maryland 20878-1794

WJ/ 200/07/79

WARNING

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

ADDENDA

WJ-9026/DU

The following changes should be incorporated into the Instruction Manual for the WJ-9026/DU Display Unit.

1. Section V - Replacement Parts List

1.1 Paragraph 5.4.1 WJ-9026/DU Display Unit, Main Chassis (page 5-7).

1.1.1 Add L2: Inductor, P/N 21210-112, quantity 1, Mfr. code 14632 (page 5-9).

1.1.2 Change R1 from: 10 kΩ, 10%, 1 W, P/N 70A3N056L103U, quantity 3 to: 5 kΩ, 10%, 1 W, P/N 70A3N056L502U, quantity 1 (page 5-10).

1.1.3 Change R3 from: Same as R1 to: Resistor, Variable, Composition: 10 kΩ, 10%, 1 W, P/N 70A3N056L103U, quantity 2, Mfr. code 01121 (page 5-10).

.4 Change R8 from: Same as R1 to: Same as R3 (page 5-10).

1.2 Paragraph 5.4.2.2 Part 18107-1 8.0 kHz IF Amplifier A1A2 (page 5-21).

1.2.1 Change C4 from: 24 pF to: 12 pF (page 5-21).

1.3 Paragraph 5.4.3 Type 8261 Control Board A2 (page 5-29).

1.3.1 Change quantity of R9 from: 6 to: 5 (page 5-31).

1.3.2 Change quantity of R13 from: 5 to: 2 (page 5-31).

1.3.3 Change R22 from: 180 kΩ, 5%, 1/4 W, P/N RCR07G184JS, quantity 2 to: 51 kΩ, 5%, 1/4 W, P/N RCR07G513JS, quantity 1 (page 5-31).

1.3.4 Change R23 from: Same as R22 to: Resistor, Fixed, Composition: 180 kΩ, 5%, 1/4 W, P/N RCR07G184JS, quantity 1, Mfr. code 81349 (page 5-31).

1.3.5 Change R50 from: Same as R13 to: Resistor, Fixed, Composition: 510kΩ, 5%, 1/4 W, P/N RCR07G514JS, quantity 3, Mfr. code 81349 (page 5-33).

1.3.6 Change R51 from: Same as R13 to: Same as R50 (page 5-33).

1.3.7 Change R53 from: Same as R13 to: Same as R50 (page 5-33).

1.3.8 Change R56 from: 15 kΩ, 5%, 1/4 W, P/N RCR07G163JS to: 8.3 kΩ, 5%, 1/4 W, P/N RCR07G822JS (page 5-33).

1.4 Paragraph 5.4.4.1 Part 18084 Marker Oscillators A3A1 (page 5-37).

1.4.1 Change R12 from: Same as R1 to: Same as R3 (page 5-38).

1.4.2 Change R13 from: Same as R3 to: Same as R5 (page 5-38).

1.4.3 Change R14 from: Same as R5 to: Same as R7 (page 5-38).

1.4.4 Change R15 from: Same as R6 to: Same as R7 (page 5-38).

1.4.5 Change R16 from: Same as R7 to: Same as R5 (page 5-38).

1.4.6 Change R17 from: Same as R5 to: Same as R6 (page 5-38).

1.4.7 Change R25 from: 20 Ω, 5%, 1/4 W, P/N RCR07G200JS to: 200 Ω, 5%, 1/4 W, P/N RCR07G201JS (page 5-39).

1.5 Paragraph 5.4.4.2 Part 15799-2 Sweep Oscillator A3A2 (page 5-41).

1.5.1 Change L1 from: P/N 20681-165 to: 20681-180 (page 5-41).

1.6 Paragraph 5.4.8.1 Part 18125-1 1200 MHz Prescaler A7A1 (page 5-59).

1.6.1 Change C1 from: 2200 pF, 5%, 50 V, P/N C1005C222J5GPH, Mfr. code 31433 to: 2200 pF ± 10%, 50 V, P/N 3BX050S222K, Mfr. code 26654 (page 5-59).

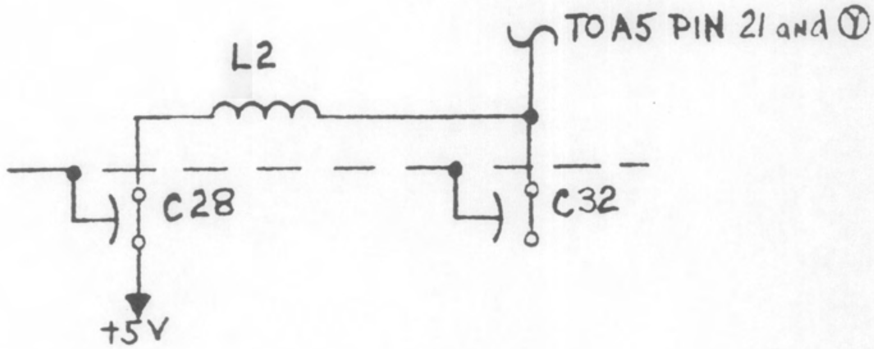
1.6.2 Change quantity of U2 from: 1 to: 2 (page 5-62).

1.6.3 Change U3 from: Integrated Circuit, P/N MC1670L, Mfr. code 04713, quantity 1 to: Same as U2 (page 5-62).

2. Section VI - Schematic Diagrams

2.1 Figure 6-13; page 6-27; Type WJ-9026/DU Display Unit, Main Chassis.

2.1.1 Add C32 first and then add + 5V to C28 and connect it to C32 along with adding L2 as shown on next page of this addenda:


TO A5 PIN 21 and Y
L2
C28
C32
+5V

WJ-8737/DU AND WJ-9026/DU
DISPLAY UNIT
INSTRUCTION MANUAL
CHANGE 2

TITLE:	WJ-8737/DU and WJ-9026/DU Display Unit
MANUAL DATE:	FEBRUARY 1977
CHANGE 2:	NOVEMBER 1988
APPLICABILITY:	Units manufactured from January 1979 thru present.
CHANGES/ERRATA INFORMATION:	Changes refer to updates of the manual to cover design modifications. Errata refer to corrections to and clarifications of information in the manual.
ERRATA:	None presently

CHANGES:

Paragraph	Clarification
5.4.8	Remove page 5-57 containing the Parts List for Type 791505-1 1200 MHz Prescaler, and replace with new page 5-57.
5.4.8.1	Remove pages 5-59 thru 5-62 containing the Parts List for Part 18125-1 1200 MHz Prescaler, and replace with new pages 5-59 thru 5-60, and delete pages 5-61 and 5-62.
5.4.8.1.1	Add page 5-62a containing the Parts List for Part 170056 Divide-By-4 Prescaler (A7A1A1).

Schematics:

Figure 6-12	Remove page 6-25 containing the Type 791505-1 1200 MHz Prescaler Schematic Diagram, and replace with new page 6-25.
Figure 6-12A	Add page 6-25A containing the Part 170056 Divide-By-4 Prescaler (A7A1A1), Schematic Diagram 270298.

WJ-8737/DU AND WJ-9026/DU REVISION RECORD

REVISION	DESCRIPTION
A	Initial Printing
CHANGE 1	Implemented Miscellaneous ECNS
CHANGE 2	Addition of Divide-By-4 Prescaler (A7A1A1)

5.4.8 TYPE 791505-1 1200 MHz PRESCALER ASSEMBLY

REF DESIG PREFIX A7

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	1200 MHz Prescaler	1	18125-1	14632	
C1	Capacitor, Ceramic, Feedthru: 0.05 µF, GMV, 300 V	6	54-785-002-503P	33095	
C2	Same as C1				
C3	Same as C1				
C4	Not Used				
C5 Thru C7	Same as C1				
C8	Capacitor, Ceramic, Disc: 0.01 µF, 10%, 100 V	1	CK06BX104K	81349	
J1	Connector, Receptacle, SMC	4	1004-7511-002	19505	
J2 Thru J4	Same as J1				
P1	Connector, Plug, Multipin	1	M10PLSH19C	81312	
R1	Resistor, Fixed, Composition: 82Ω, 5%, 1/2 W	1	RCR20G820JS	81349	
R2	Resistor, Fixed, Film: 47Ω, 5%, 1/8 W	1	CF1/8-47 OHMS/J	09021	

5.4.8.1 **Part 18125-1 1200 MHz Prescaler** REF DESIG PREFIX A7A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Divide-By-4 Prescaler	1	170056-1	14632	
C1	Capacitor, Ceramic, Disc: 2200 pF, 10%, 50 V	6	C1005C222K5RAC	31433	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Ceramic, Disc: 6.8 pF, ±.5 pF, 50 V	4	C1005C689D5GAC	31433	
C5	Same as C4				
C6	Capacitor, Ceramic, Disc: 470 pF, 20%, 1000 V	1	8381KVZ5U470	59660	
C7	Same as C1				
C8	Same as C4				
C9	Capacitor, Ceramic, Disc: 0.01 µF, 10%, 200 V	7	CK06BX103K	81349	
C10	Same as C1				
C11	Same as C4				
C12 Thru C15	Not Used				
C16	Same as C9				
C17	Capacitor, Ceramic, Disc: 0.1 µF, 10%, 100 V	4	CK06BX104K	81349	
C18	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 100 V	1	8131M100-651-104M	59660	
C19	Same as C9				
C20	Same as C9				
C21	Capacitor, Ceramic, Disc: 0.47 µF, 20%, 100 V	1	8131M100-651-474M	59660	
C22	Same as C9				
C23	Same as C9				
C24	Not Used				
C25	Same as C17				
C26	Same as C1				
C27	Capacitor, Electrolytic, Tantalum: 200 µF, 20%, 15 V	2	MTP207M015P1C	76055	
C28	Same as C27				
C29	Same as C17				
C30	Same as C9				
C31	Capacitor, Ceramic, Disc	2	CDR01BP100BJSM	81349	
C32	Same as C31				
CR1	Diode	1	5082-2900	28480	
CR2 Thru CR6	Not Used				
CR7	Diode	1	5082-3188	28480	
E1	Terminal, Forked	11	140-1941-02-01	71279	
E2 Thru E11	Same as E1				
L1	Coil, Fixed: 5.6 µH, 10%	1	1537-30	99800	
Q1	Transistor	2	MRF901	04713	
Q2	Same as Q1				
Q3	Transistor	2	2N2222A	80131	
Q4	Same as Q3				

REF DESIG PREFIX A7A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R1	Resistor, Fixed, Film: 200Ω, 5%, 1/8 W	2	CF1/8-200 OHMS/J	09021	
R2	Resistor, Fixed, Film: 2.7 kΩ, 5%, 1/8 W	2	CF1/8-2.7K/J	09021	
R3	Resistor, Fixed, Film: 680Ω, 5%, 1/8 W	2	CF1/8-680 OHMS/J	09021	
R4	Resistor, Fixed, Film: 270Ω, 5%, 1/8 W	2	CF1/8-270 OHMS/J	09021	
R5	Resistor, Fixed, Film: 15Ω, 5%, 1/8 W	4	CF1/8-15 OHMS/J	09021	
R6	Same as R5				
R7	Same as R2				
R8	Same as R3				
R9	Resistor, Fixed, Film: 22Ω, 5%, 1/8 W	1	CF1/8-22 OHMS/J	09021	
R10*	Same as R1				
R11	Same as R5				
R12	Same as R5				
R13	Same as R4				
R14 Thru R16	Not Used				
R17	Resistor, Fixed, Composition: 470Ω, 5%, 1/8 W	3	RCR05G471JS	81349	
R18	Same as R17				
R19	Resistor, Fixed, Film: 330Ω, 5%, 1/8 W	4	CF1/8-330 OHMS/J	09021	
R20	Resistor, Fixed, Film: 1.5 kΩ, 5%, 1/8 W	2	CF1/8-1.5K/J	09021	
R21	Same as R19				
R22	Resistor, Fixed, Film: 120Ω, 5%, 1/8 W	1	CF1/8-120 OHMS/J	09021	
R23	Resistor, Fixed, Film: 47Ω, 5%, 1/8 W	1	CF1/8-47 OHMS/J	09021	
R24	Resistor, Fixed, Film: 150Ω, 5%, 1/8 W	1	CF1/8-150 OHMS/J	09021	
R25	Resistor, Fixed, Film: 220Ω, 5%, 1/8 W	1	CF1/8-220 OHMS/J	09021	
R26	Resistor, Fixed, Film: 68Ω, 5%, 1/8 W	1	CF1/8-68 OHMS/J	09021	
R27	Same as R19				
R28	Same as R19				
R29*	Resistor, Fixed, Film: 18Ω, 5%, 1/8 W	1	CF1/8-18 OHMS/J	09021	
R30	Not Used				
R31	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	2	CF1/8-100 OHMS/J	09021	
R32	Resistor, Fixed, Composition: 180Ω, 5%, 1/8 W	1	RCR05G181JS	81349	
R33	Same as R17				
R34	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	1	CF1/8-1.0K/J	09021	
R35	Same as R31				
R36	Same as R20				
U1	Not Used				
U2	Integrated Circuit: 500 MHz Binary	2	MC1690L	04713	
U3	Same as U2				
VR1	Diode, Zener: 8.2 V	1	1N756A	80131	

*Nominal Value, Final Value Factory Selected.

5.4.8.1.1 **Part 170056-1 Divided-By-4 Prescaler** REF DESIG PREFIX A7A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 1000 pF, 5%, 100 V	3	8121-100-C0G0-102J	59660	
C2	Not Used				
C3	Same as C1				
C4	Same as C1				
E1	Terminal, Forked	1	140-1941-02-01	71279	
JW1	Wire, Buss	AR	8022 24AWG	70903	
R1	Resistor, Fixed, Film: 330Ω, 5%, 1/8 W	2	CF1/8-330 OHMS/J	09021	
R2	Same as R1				
R3*	Resistor, Fixed, Film: 20 kΩ, 5%, 1/8 W	1	CF1/8-20K/J	09021	
RA1	Heatsink	1	6012B	13103	
U1	Integrated Circuit	1	SP8611B/DG	52648	

*Nominal Value, Final Value Factory Selected.

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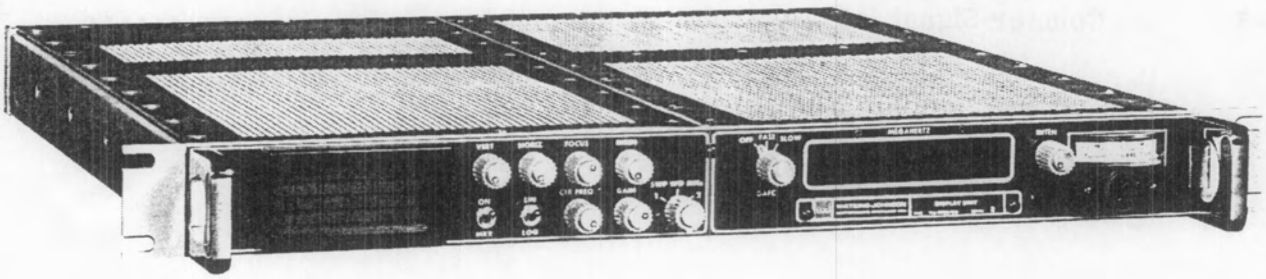


Figure 1-1. Type WJ-9026/DU Display Unit

SECTION I
GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

1.1.1 SIGNAL MONITOR. The signal monitor accepts 21.4±1.5 MHz signals and provides a visual display of signal activity from the full 3 MHz bandwidth to a bandwidth of 20 kHz, depending on the setting of a front panel sweepwidth control. Resolution is fixed at 8 kHz; sweep rate at 18 Hz. The signal pips may be displayed either linearly or logarithmically, with the gain mode established by a front panel switch. Turning the markers on establishes a 21.4 MHz center frequency pip, and 6 dB lower in level, single pips 100 kHz above and below the center frequency pip. Other front panel controls give control of vertical and horizontal movement of the crt trace, focus and intensity of the electron beam, and center frequency control of the signal pips, which also receive gain setting from another control.

1.1.2 FREQUENCY COUNTER. - The frequency counter portion of the Display Unit supplies readout for the tuned frequency of the Receiver Unit by counting the frequency of the local oscillator (LO) of the operating tuner and subtracting the i-f frequency. The resulting count is visually displayed in six digits on shaped dot arrays of light emitting diodes. The readout has a resolution of ±1 kHz. Circuit features include binary coded decimal (BCD) output, digital automatic frequency control (dafc) to stabilize the LO frequency of the associated tuner and the capability for preset defeat during maintenance periods.

The light emitting diode (LED) visual display is updated from 10 times-per-second to 20 times-per-second. There is, therefore, no significant delay in obtaining a new count after the associated tuner is retuned.

Presetting to a number other than zero before each counting period enables the counter to effectively subtract the intermediate frequency of the associated tuner from the display count. A preset number for a tuner i-f frequency of 21.4 MHz is provided for use on the 20-300 MHz vhf range. A preset number for a tuner i-f frequency of 60 MHz is also provided, for use on the 200-500 and 490-1000 MHz uhf ranges. If desired, the preset may be deactivated so the frequency counter reads out the input frequency with no offset and may be used as a conventional test counter.

When the dafc feature of the counter is utilized, the LO of the operating tuner can be locked to within plus or minus one count of any desired frequency in its tuning range. The long term stability of the LO frequency will then approach the stability of the counter time-base crystal oscillator. When the dafc circuit is switched on it stores the tuner LO frequency. If the LO frequency attempts to change on subsequent counts, the counter will vary an analog voltage supplied to the tuner local oscillator thus returning the LO to the desired frequency. Wide error-sensing range is achieved by storing BCD information from the two least significant digits of the display, with one BCD bit from the third digit utilized. In addition to the FAST-SLOW function controlled by the front panel DAFC switch, an automatic rapid/delayed speed control which senses the magnitude of the correction is included. This feature allows the dafc to quickly retune the receiver if a large error occurs, but minimizes incidental fm when the tuning correction is small. The wide acquisition range and automatic speed control of the dafc circuit makes this counter particularly useful in applications where the associated receiver may be subject to mechanical or thermal shock, such as in mobile installations. The dafc output voltage is monitored by the TUNING CORRECTION meter, which indicates the magnitude and direction of the correction. If the dafc voltage approaches the limits of the hold-in range, this will be indicated by the meter so that the receiver unit may be retuned before lock is broken.

The counter section provides a BCD output which can be connected to a remote display or printer. There are twenty four lines of data and two supply voltages which may be used to power a remote display. The BCD is positive true logic in a 1248 code. Levels are compatible with transistor-transistor logic (TTL). If desired, updating of the count can be inhibited while the BCD is being read out. The updating is provided at a rear panel connector.

The counter section achieves measurement of input frequencies up to 1060 MHz by direct prescaling; no heterodyning techniques or transfer oscillators are employed. The prescaler employs microwave transistors and stripline etched circuit board techniques to produce ultra-high-speed frequency dividers. Integrated circuit flip-flops capable of operating to 1060 MHz are also employed. AGC circuits ensure stable counting over a wide range of input levels. Additional circuit features include the use of highly stable TCXO (temperature compensated crystal oscillator) for the time base oscillator, and ±5 volt precision regulation modules.

1.2 MECHANICAL CHARACTERISTICS

The Display Unit is packaged in a 1.72 inch high, 19 inch rack mount chassis. As viewed from the front, the signal monitor section occupies the left half of the main deck, the frequency counter section the right half. All operator controls appear on the front panel; all interconnections are made on the rear panel. Refer to the installation and operations section for detailed information about these connectors. Side or rear mounting hardware must be used in any installation; the chassis cannot be supported solely by the front panel.

The signal monitor half of the main chassis contains four subassemblies, a sealed power supply module, an isolation transformer, and the cathode ray tube enclosed in a magnetic shield. All power supply voltages enter J1 into this portion of the Display Unit. Voltages required for the frequency counter route through feedthrough capacitors into the other compartment.

The counter section occupies the right half of the chassis. All subassemblies are constructed on etched circuit boards. Some plug into receptacles; others are bolted into a subchassis and hard wired to a cable harness.

1.3 EQUIPMENT SUPPLIED

The equipment consists of the WJ-9026/DU, but the WJ-9026/RU and interconnecting cables are required for a working system.

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED

Rack mounting of this equipment requires that the sides or rear of the two chassis be supported. An ideal method is to use slide mounts for supporting the equipment. For this and other mounting considerations, see Watkins-Johnson Gaithersburg, Application Note 1302.50. Antenna signals must be provided for the Receiving Unit, and signal outputs require monitoring equipment such as tape recorders or computer interface equipment.

Table 1-1. Type WJ-9026/DU Signal Monitor Specifications

Input Frequency	21.4 ±1.5 MHz
Flatness of Response	±1.5 dB
Input Impedance	50 ohms, nominal
Sweep Widths	20 kHz to 3 MHz, continuously variable
Resolution	Two equal level signals with a 10 kHz separation will have at least a 5 dB dip between them with a sweep width of 50 kHz.
Sweep Linearity	Linear overall to within 5% of total sweep width
Sweep Rate	18 ±2 Hz
Range of Center Frequency Control	150 kHz, minimum
Sensitivity:	
Linear	10 μV input produces 1 inch vertical deflection
Logarithmic	32 μV input produces 1 division vertical deflection, nominal
Gain Control Range	60 dB
Vertical Display Response:	
Linear	20 dB, minimum
Logarithmic	40 dB, minimum
Marker Frequencies	21.4 MHz ±3 kHz and ±100 kHz markers from center frequency, accurate to within ±200 Hz of the 21.4 MHz marker.
Front-Panel Controls	Center Frequency, Gain, Marker ON, Vertical Display, Log/Lin, Sweep Width MHz, Horizontal Display, Focus, Intensity.
Display Area	3 x 1 inch
Remote Power Input	+12 V dc, ±15 V dc and 5 V ac, supplied by receiver
Power Consumption (WJ-9026/DU)	28 watts, approximately
Size	1.72 inches high, 19 inches wide, and 18 inches deep*
Weight	14 lbs, approximately

* measured from back of front panel to rear panel

Table 1-2. Type WJ-9026/DU Frequency Counter Specifications

Readout Frequency Range .... 26 MHz to 1000 MHz in four ranges

Range Dependent Characteristics:

Nominal Readout Freq. Range (with Internal Preset)	Input Freq. Range	Input Level	Update Rate BCD & DAFC	Update Rate Display	Resolution
26-300 MHz	47.4-321.4 MHz	35 mV rms to 500 mV rms	100 Hz	20 Hz	±1 kHz
235-500 MHz	295-560 MHz	35 mV rms to 500 mV rms	50 Hz	10 Hz	±1 kHz
500-1000 MHz	560-1060 MHz	35 mV rms to 500 mV rms	50 Hz	10 Hz	±1 kHz

Readout Accuracy .... Resolution, ±1 PPM, 0°-50°C

Display Type .... Six digit decimal display by shaped dot arrays of light emitting diodes

Input Impedance .... 50 ohms, nominal

Signal Input Connector .... One, BNC

BCD Output Characteristics:

- Outputs .... 24 lines of data; one inhibit line; one storage pulse line; two power supply lines for external readout.
- Code .... 1248 positive true logic
- Data Voltages .... $1 \geq 2.4V$ and $0 \leq 0.4V$ (with 1/2 standard TTL unit load)
- Inhibit Command .... Contact closure between control lines or sink inhibit lines to $\leq 0.4V$
- Storage Pulse .... Negative going pulse from DTL logic, positive transistion indicates new count ready
- Power Supply Voltages .... +5 V dc and -5 V dc derived from WJ-9026/RU +12 V dc and -15 V dc supplies.

Table 1-2. Type WJ-9026/DU, Frequency Counter Specifications (cont'd)

DAFC Characteristics:	
Digits Locked	Least significant digit, second digit, one BCD bit from third digit
Lock Recovery Range	At least ±99 counts of two least significant digits
Correction Rates	Two, selected by front panel switch; each rate has automatic rapid/delayed speed for large/small errors
Output Voltage	Zero volts off, nominal with a range of +2.5 to -3.0V, negative frequency/volts slope
Output Impedance	2.0 ±0.5 kilohms
Stability	Holds receiver to lock frequency ±1 count of least significant digit
Meter	Indicates direction and magnitude of dafc frequency correction
Preset Modes	Two modes, selected by internal switch: OFF: Allows unit to be used as conventional counter during maintenance. EXTERNAL: Provides count offset for tuner LOs of WJ-9026/RU; automatically selected by Receiver BAND switch.
Front Panel Controls and Indicators	INTENSITY controls. DAFC rotary switch, six digit numerical display, TUNING CORRECTION meter.
Input Power	+12 V dc and -15 V dc, counter only
Power Consumption	28 watts, approximately, total DU
Dimensions	19.00 inches wide, 1.72 inches high, and 18.00 inches long*
Weight	14 lbs. approximately

* measured from back of front panel to rear panel.

SECTION II
INSTALLATION AND OPERATION

2.1 UNPACKING AND INSPECTION

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 this is not possible, retain the shipping cartons and padding material for the carrier's inspection if damage to the equipment is evident after it has been unpacked.

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

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. If external damage is visible, remove the dust covers and inspect the internal components for apparent damage. Then check the internal cables for loose connections, and plug-in items, such as printed circuit boards, for a tight fit in their receptacles.

2.2 INSTALLATION

Figure 2-1 is the critical dimension diagram for the Display Unit. Mount the Display Unit above the WJ-9026/RU and interconnect the two units as shown in Figure 2-2, the system interconnection diagram. The reference designations shown for cables W1 through W5 refer only to the system interconnection diagram and have no relationship to the internal cables or parts lists for either the WJ-9026/DU or the WJ-9026/RU. Wiring diagrams for the system cables appear in Figures 2-3 through 2-5. The two units should be bonded together with a heavy braided strap and then connected to a low resistance ground to provide maximum safety and to provide good signal returns. Refer to the following subparagraphs for a description of each rear panel connector and other features. Front panel operator controls are described in paragraph 2.3

2.2.1 POWER INPUT J1. - This multipin input interconnects with the WJ-9026/RU. The Display Unit receives all operating power at this connector. Pin 8 receives a sweep reverse voltage for the signal monitor, depending on the operating tuner in the Receiver Unit.

2.2.2 IF INPUT J2. - This BNC connector interconnects with the Receiving Unit to supply the signal monitor with 21.4 MHz signals.

2.2.3 RANGE AND PRESET CONTROL CONNECTOR (J5). The range and preset conditions required for the Receiver Unit are established by selector lines in RANGE-PRESET CONT connector J5. Table 2-1 identifies the functions of the selector lines. Activation of a desired function is effected by pulling the pin to ground.

Table 2-1. Range and Preset External Control Functions

RANGE	Pin of J5 (Control)	PRESET	Pin of J5 (Control)
0.1-50 MHz (Not Used)			
20-300 MHz VHF			
26-90 MHz	D	a. (21.4 MHz IF)	J
90-300 MHz	D	a. (21.4 MHz IF)	J
200-500 MHz UHF	C	b. (60 MHz IF)	F
490-1000 MHz UHF	B	b. (60 MHz IF)	F

2.2.4 DAFC OUTPUT (J6). - Connect DAFC OUTPUT jack J3 of the Display Unit to DAFC INPUT J9 of the Receiver Unit.

2.2.5 BCD OUTPUT CONNECTOR (J7). - Multipin BCD OUTPUT J7 provides BCD information to a printed or remote readout. The main chassis schematic diagram, Figure 6-13, identifies the function of each pin of the BCD output connector. In addition to 24 lines of BCD data, J7 provides two power supply voltages, a storage pulse output, and an inhibit input. The BCD data lines can drive a printer or remote display capable of accepting inputs from TTL logic. Since the BCD data is stored, it may be read out at any time. The storage pulse is a negative-going pulse from a DTL output. When it goes low, the BCD output is updated. When the pulse goes high, the BCD is stored. After this positive transition of the storage pulse, the BCD data will remain stable for at least 9.8 ms, after which updating may occur. If desired, the inhibit line can be set low and updating ceases until it is returned to a high state. Since the inhibiting count also prevents the dafc circuitry from receiving new count frequency data, lengthy inhibiting should be avoided while the dafc is in use.

2.2.6 LO INPUT (J8). - Local oscillator input J8 is a BNC type connector that accepts the local oscillator output from the operating tuner of the Receiving Unit.

2.3 OPERATION

All front panel operating controls for the Display Unit are described here.

2.3.1 SIGNAL MONITOR CONTROLS AND INDICATORS.

a. VERT. - The vertical control moves the base line up and down on the crt. For normal operation, set the base line at the bottom of the crt so it is aligned behind the graticule base line. With the GAIN control set fully clockwise, noise will appear on the base line.

b. HORIZ. - The horizontal control moves the trace right and left. Set it so that each end is just off the crt phosphor.

c. FOCUS. - The focus control maintains the sharpness of the trace. Set it for maximum detail of the trace.

d. INTEN. - The Intensity control establishes the brightness of the trace. Set it for the level required by the ambient light conditions.

e. MKR. - With this control set to ON, three markers will appear on the crt if the sweep width is greater than 200 kHz. The center marker indicates 21.4 MHz; the other two indicate 21.3 MHz and 21.5 MHz; these two markers, indicating 100 kHz above and below center frequency, are 6 dB lower in amplitude than the 21.4 MHz center frequency marker.

f. LOG-LIN. - The logarithmic-linear switch establishes the gain mode for the signal monitor. In the LOG mode, signals displayed will have a range of 40 dB. In the LIN mode, the range will be about 20 dB with any one gain setting.

g. CTR FREQ. - The center frequency control shifts the signals right and left on the crt. Use this control to align the 21.4 MHz center frequency marker behind the center graticule line.

h. GAIN. - The manual gain control provides at least 60 dB of control on incoming signals. An internal agc circuit provides 20 dB of control in the presence of strong signals, but only if the manual GAIN control is set at least 20 dB below the total gain-control range.

i. SWP WD MHz. - The sweep width control establishes how far either side of center frequency the signal monitor will display signals. The total control range is from 20 kHz to 3 MHz, equally divided above and below 21.4 MHz.

2.3.2 FREQUENCY COUNTER CONTROLS.

a. FREQUENCY INDICATION. - The frequency counter reads out the tuned frequency of the Receiver Unit with a resolution of ±1 kHz on the 26-1000 MHz ranges. If dafc operation is not desired set the DAFC front panel switch to OFF.

b. DAFC OPERATION. - The dafc feature is used to lock the local oscillator of the associated receiver for reception of an acquired signal, or to any arbitrary frequency within the tuning range of the receiver.

Locking to the Frequency of a Signal. - With the counter DAFC switch set to OFF and the receiver AFC-DAFC switch set to OFF, tune in the desired signal as accurately as possible, using the signal monitor portion of the Display Unit. Set the Receiver Unit switch to DAFC and the counter switch to FAST, and the LO frequency will be locked. The dafc will store the lock-frequency and oppose any tendency of the receiver to drift away from it. The automatic, dual correction speed will provide rapid correction if a large tuning error occurs, or delayed correction for small errors to minimize incidental fm of the receiver local oscillator. If fm is apparent when receiving cw or FSK signals, set the DAFC switch to SLOW.

Locking to an Arbitrary Frequency. - Any frequency within the tuning range of the receiver may be locked. With the counter DAFC switch set to OFF and the receiver DAFC-AFC switch set to OFF, tune the receiver until the readout indicates the desired frequency. Set the counter DAFC switch to FAST and the receiver switch to DAFC and the frequency will be locked. The DAFC switch may then be set to SLOW if desired.

Retuning. - When a change of lock frequency is desired, or when the TUNING CORRECTION meter indicates end of range, retuning is required. The TUNING CORRECTION meter shows the magnitude and direction of dafc correction. When the pointer of the meter reaches end of scale in either direction the dafc circuit has developed its maximum output voltage. Retuning is required to prevent loss of dafc lock. To bring the dafc correction voltage back to center range, slowly adjust the fine tuning control of the receiver to bring the counter dafc meter back to center of scale without switching off the dafc.

2.4 PREPARATION FOR RESHIPMENT AND STORAGE

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 guidance for the repackaging effort.

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

(1) Maximum humidity: 95% (no condensation)

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

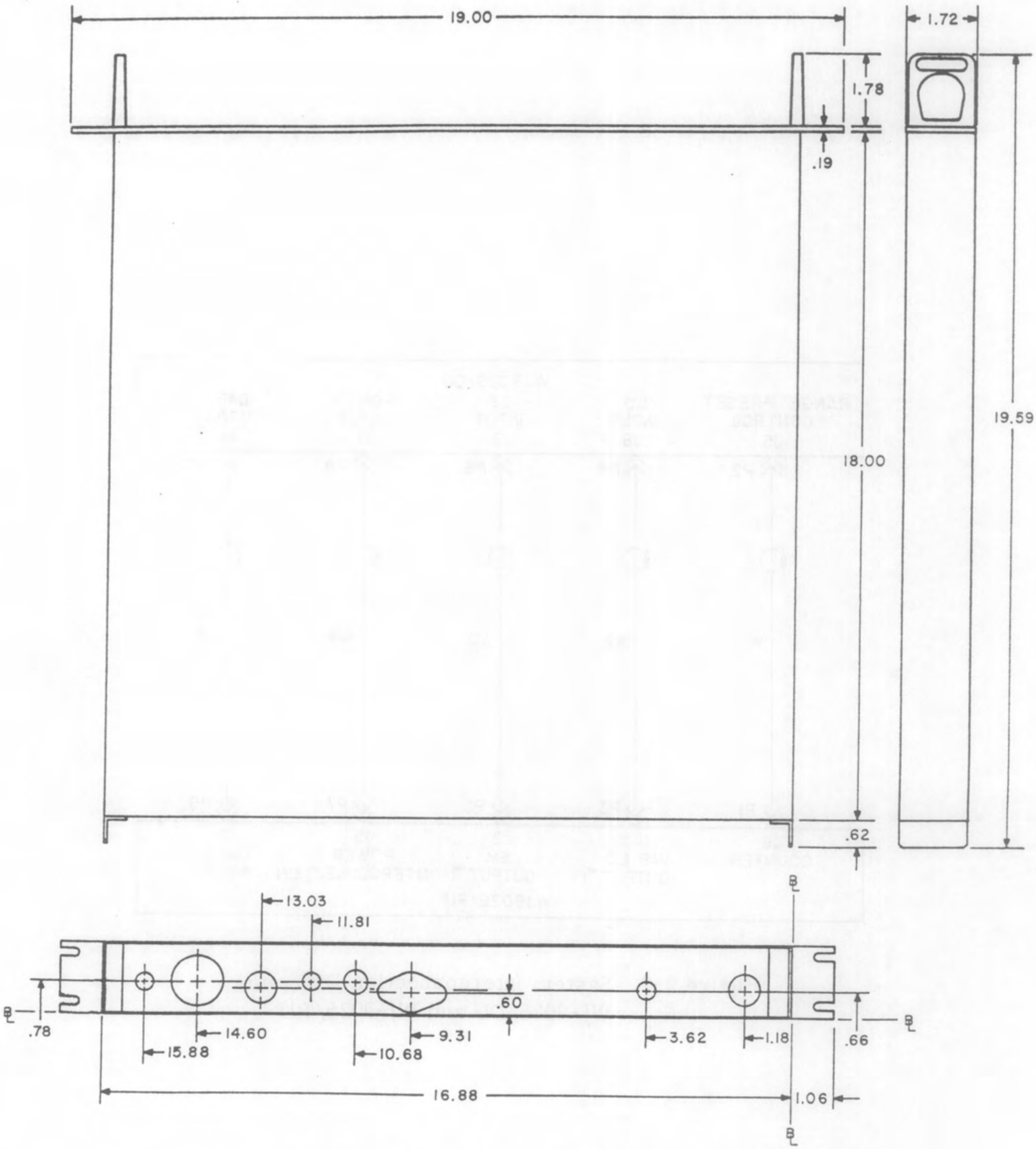


Figure 2-1. Type WJ-9026/DU Critical Dimensions

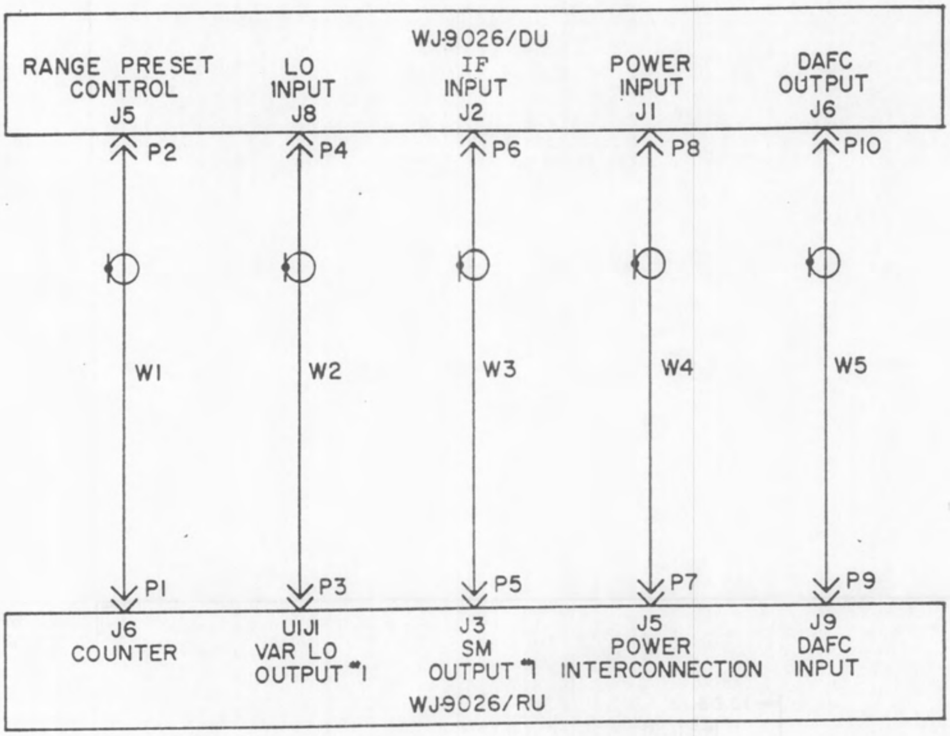
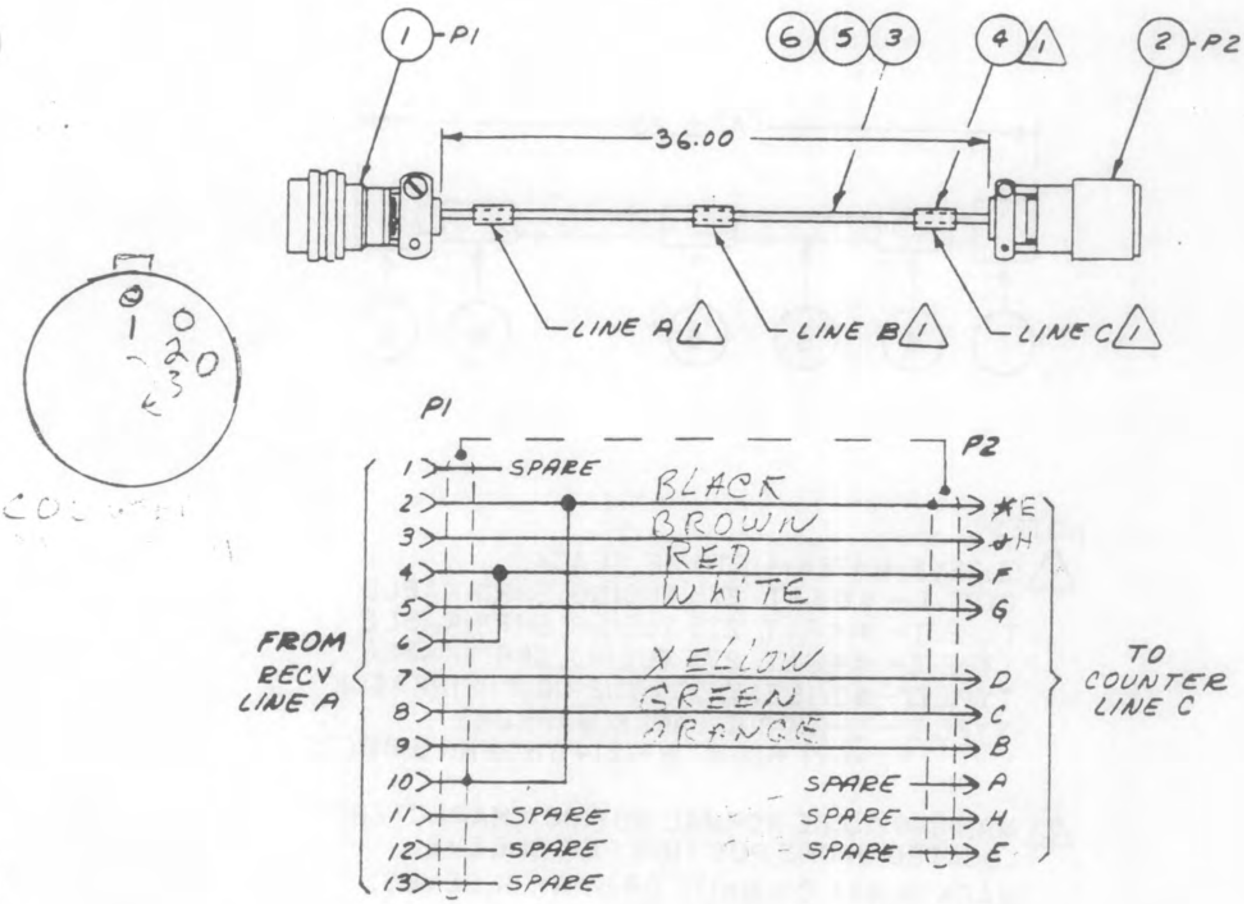


Figure 2-2. System Interconnection Diagram, WJ-9026/DU and WJ-9026/RU



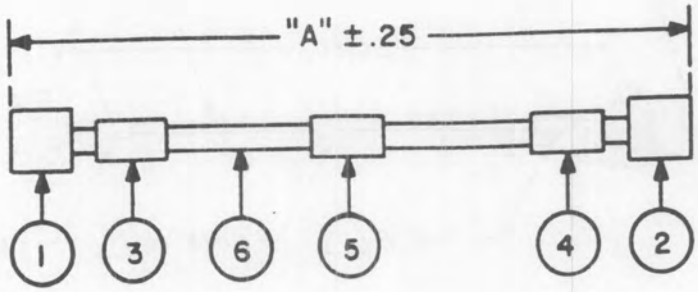
AR	74116	NEQ24530-9/32	RFI SHIELDING	•	6
AR	20484	NQ 10	SLEEVING/CLEAR PLASTIC		5
3	59740	WTW-1214	CABLE MARKER		4
AR	90484	A2408	WIRE, PLASTIC INS		3
1	09922	L12TF10P6N-A	CONNECTOR		2
1	77820	JT06RE10-13SSR	CONNECTOR		1
-1 QTY REQD	VENDOR OR CODE IDENT	PART NO OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	NOTE	ITEM/ FIND NO

PARTS LIST

THE CABLE REFERENCE DESIGNATION IS FOR THE SYSTEM, NOT THE WJ-9026/RU OR /DU

DASH NO	LINE A	LINE B	LINE C
24143-1	P1 (RECEIVER)	W1 (24143-1)	P2 (COUNTER)

Figure 2-3. System Range/Preset Cable (W1), Wiring Diagram



NOTES:

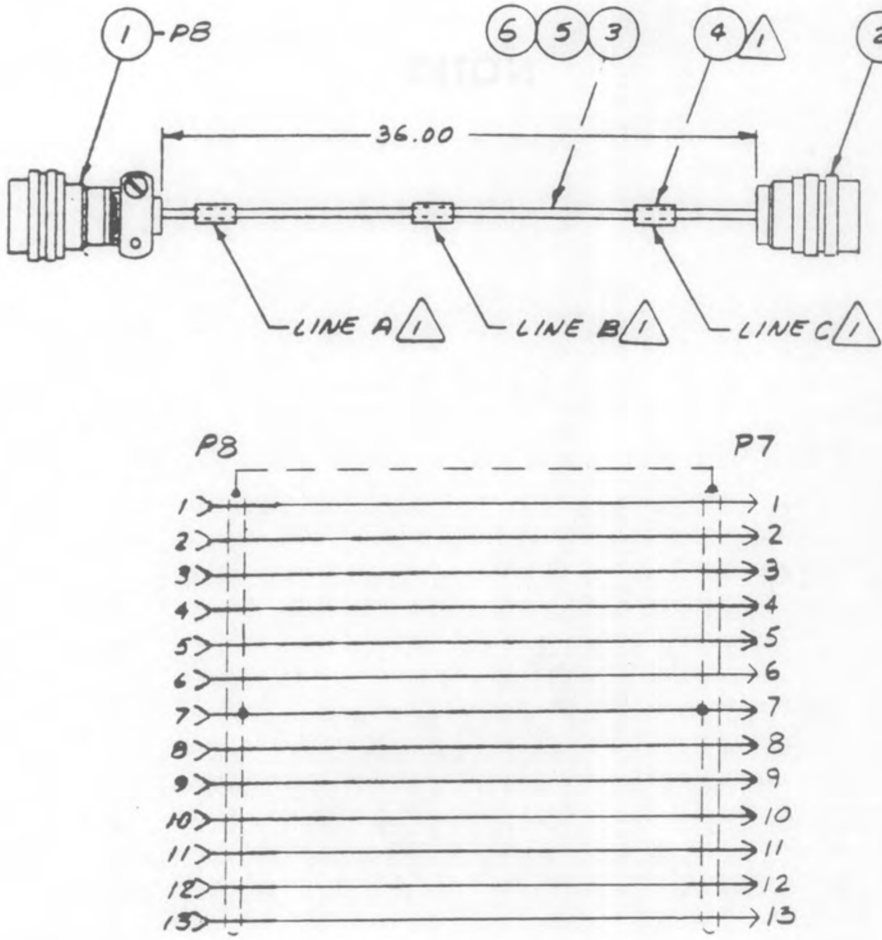
1. SLEEVE MATERIAL TO BE BLACK.
TYPE I - #8 F.I.T. 275 TUBING, SHRINKABLE
TYPE II - #14 F.I.T. 275 TUBING, SHRINKABLE
TYPE III - #4 F.I.T. 275 TUBING, SHRINKABLE
TYPE IV - #5/16 F.I.T. 275 TUBING, SHRINKABLE
TYPE V - E-Z CODE CABLE MARKERS
PART NO. WTW-1214 THOMAS & BETTS

2. MARKING TO BE NORMAL GOTHIC CHARACTERS LOCATED IN ONE POSITION PER SLEEVE.
MARK BLACK ON WHITE OR GRAY SLEEVES;
WHITE ON BLACK SLEEVES

DASH NO.	ITEM 1	ITEM 2	ITEM 3 SEE 2	ITEM 4 SEE 2	ITEM 5 SEE 2	ITEM 6	SLEEVE MATL SEE 1	DIM "A"	REF OBS DWG 30020
1	UG88U	UG88U	P3	P4	W2	RG55BU	TYPE V	36"	
2	UG88U	UG88U	P5	P6	W3	RG55BU	TYPE V	36"	
3	UG88U	UG88U	P9	P10	W5	RG55BU	TYPE V	36"	

CABLE REFERENCE DESIGNATIONS REFER TO THE SYSTEM, NOT THE INDIVIDUAL WJ-9026/RU AND THE WJ-9026/DU

Figure 2-4. System Signal Cables (W2, W3, W5), Wiring Diagram



-1 QTY REQD	VENDOR OR CODE IDENT	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	NOTE	ITEM/FIND NO.
AR	74116	NEQ24530-9/32	RFI SHIELDING		6
AR	20484	NQ 10	SLEEVING/CLEAR PLASTIC		5
3	59740	WTW-1214	CABLE MARKER		4
AR		#22 STRANDED	WIRE, PLASTIC INS		3
1	77820	JTG06RE10-13PSR	CONNECTOR		2
1	77820	JT06RE10-13SSR	CONNECTOR		1

PARTS LIST

THE CABLE REFERENCE DESIGNATION IS FOR THE SYSTEM, NOT THE WJ-9026/RU OR /DU

DASH NO	LINE A	LINE B	LINE C
24144-	P8 (DU)	W4 (24144-1)	P7 (RU)

Figure 2-5. System Power Cable (W4), Wiring Diagram

NOTES

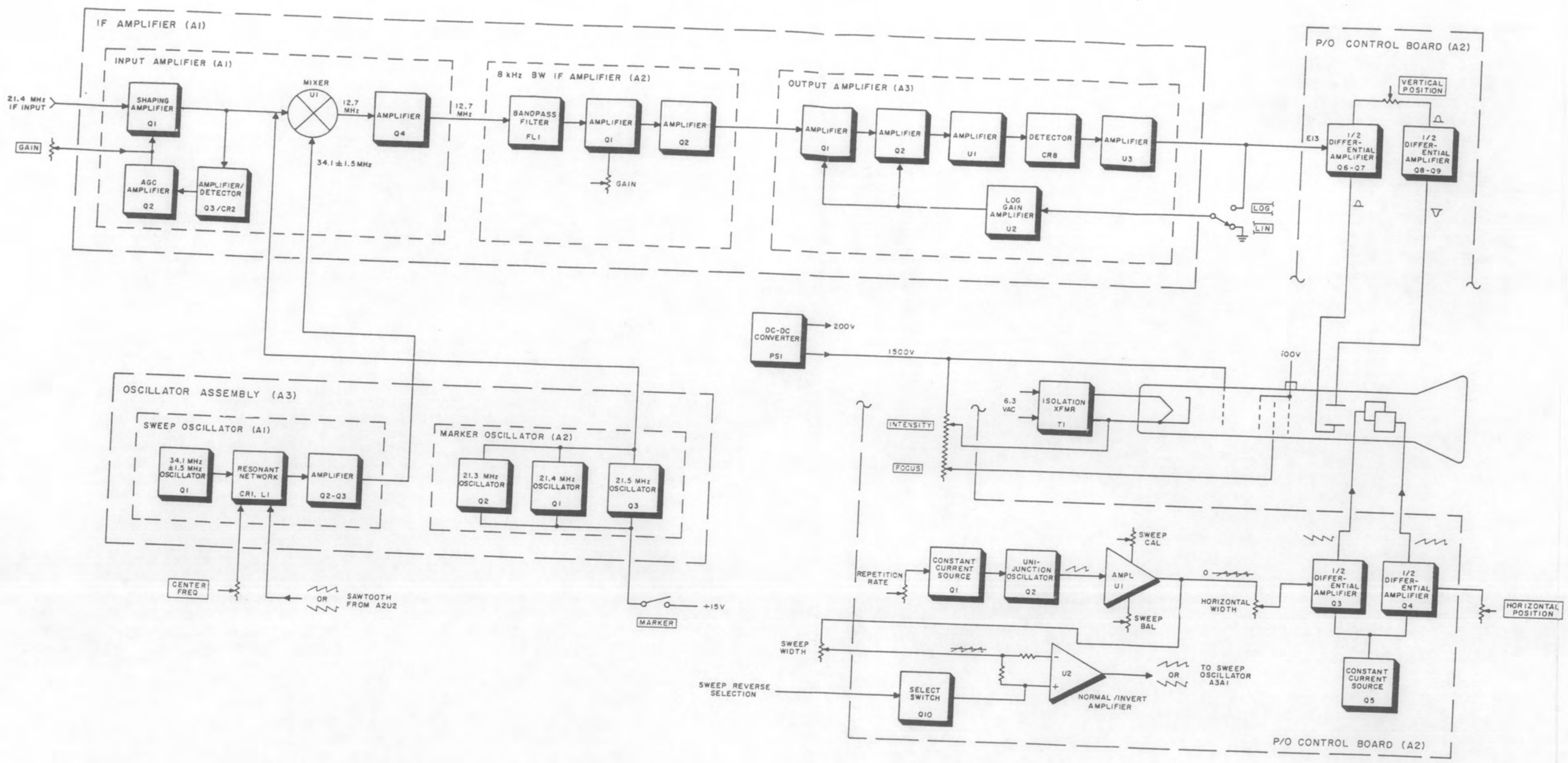


Figure 3-1. Type WJ-9026/DU Signal Monitor, Functional Block Diagram

SECTION III
CIRCUIT DESCRIPTION

3.1 GENERAL

Operation of the various circuits in the WJ-9026/DU appears in this section. Paragraph 3.2 provides a functional description of the signal monitor and paragraph 3.3 provides detailed circuit descriptions written to the component level. Likewise, paragraph 3.4 provides a functional description of the frequency center circuits, and paragraphs 3.5 through 3.9 describe these circuits in detail. The unit numbering system designates the identification of electrical components. This means that subassembly and module parts have a prefix before the usual class letter and number of the item, i.e., A2Q1 or A3A2Q3. These subassembly prefixes are omitted on figures and in the text, except where confusion might occur.

3.2 SIGNAL MONITOR FUNCTIONAL CIRCUIT DESCRIPTIONS

Functional descriptions are written against Functional Block Diagram Figure 3-1 and simplified signal monitor diagram Figure 3-2. The functional diagram illustrates each major item necessary to understand the relationships of circuits in the signal monitor. The simplified diagram shows the basic principles of operation of a signal monitor as an introduction to the actual circuits used in the WJ-9026/DU.

3.2.1 SIGNAL MONITOR THEORY. - Figure 3-2 shows a simplified diagram of the operation of the signal monitor. First note the ramp generator. It produces a slowly rising voltage which quickly returns to its reference at regular intervals to give a repetition rate of about 18 Hz (5.3 ms period). This ramp is applied to the horizontal deflection plate to drive the electron beam across the face of the cathode ray tube. When the ramp voltage drops to its referenced level, the trace quickly returns to the left side of the crt face. The next ramp voltage then begins to drive the trace across the face again, and the cycle repeats.

The trace shown in the ilustration contains three signals. These occur when a voltage from the detector is applied to the vertical deflection plates as the trace is made to move horizontally across the face of the crt. This detector voltage appears in response to the oscillator signal and the three input frequencies combining in the mixer to produce 12.7 MHz. As the oscillator responds to the rising sawtooth voltage, it changes frequency from 32.6 MHz to 35.6 MHz and in doing so beats in turn against the 19.9-, 21.4-, and 22.9-MHz input signals to produce 12.7 MHz. Each time the mixer produces 12.7 MHz, a signal passes through the i-f filter to the detector, which supplies a voltage to the vertical deflection plate for moving the electron beam in response to the input signals. The three signals appear on the crt in relation to the input signals because the same sawtooth voltage drives both the oscillator and the horizontal deflection plate. That is, as the sawtooth voltage increases level, the oscillator frequency increases, beating in turn with each signal applied to the mixer, producing 12.7 MHz i-f signals which are detected to drive the vertical deflection plate.

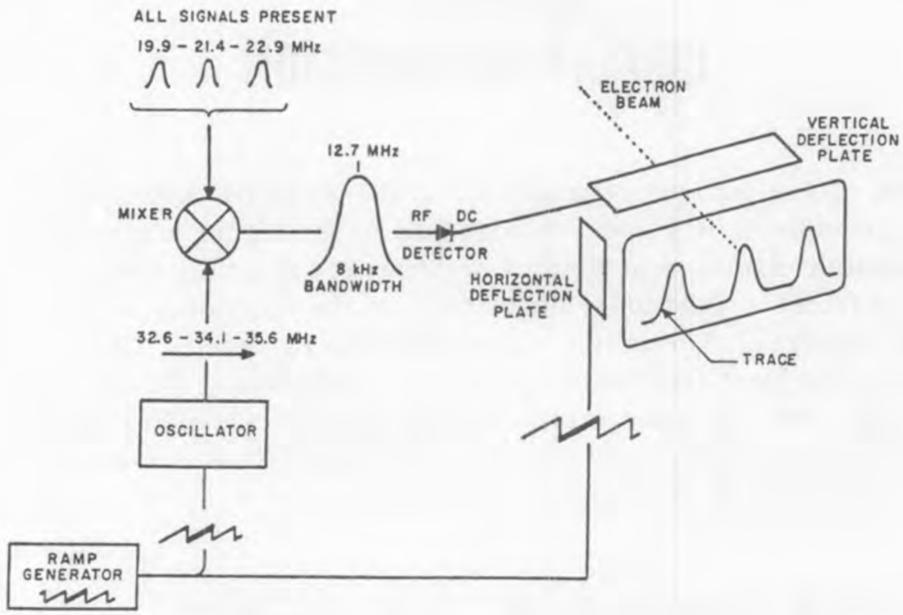


Figure 3-2. Signal Monitor Basic Operation

Synchronized with this is the beam being driven horizontally across the face of the crt. As the beam moves from left to right across the face of the crt, in response to the sawtooth, the detected vertical signals cause the beam to move upward vertically each time a 12.7 MHz i-f signal is produced.

3.2.2 INPUT AMPLIFIER (A1A1). - A 21.4 MHz i-f signal from the Receiver Unit is applied to i-f input jack J1 of subassembly A1. From the i-f input jack, the signal is coupled to shaping amplifier Q1. The shaping amplifier circuit consists of a double-tuned, over-coupled resonant tank and transistor Q1. It drives balanced mixer U1. This amplifier provides a ±1.5 dB flat response over a 3-MHz bandwidth centered at 21.4 MHz when combined with the peaked response of a single-tuned impedance-matching input circuit for mixer U1. Overall gain of the shaping amplifier is controlled by the front-panel GAIN control in conjunction with agc amplifier Q2. The 21.4 MHz signal from the shaping amplifier is combined with the sweep-oscillator signal in balanced mixer U1 to produce a 12.7 MHz i-f signal. Signals from the mixer obtain amplification in stage Q4 before being coupled to the next subassembly. Amplifier Q4 is a tuned stage providing impedance matching to the bandpass filter in subassembly A1A2.

If signals applied to the 21.4 MHz input become too strong, an agc voltage is developed by amplifier/detector Q3/CR2. Then, agc amplifier Q2 applies the voltage to shaping amplifier Q1 to reduce its gain. This agc feature is supplemented by a gain control voltage from the front panel GAIN potentiometer, which also is applied to the shaping amplifier.

3.2.3 8 kHz BANDWIDTH IF AMPLIFIER (A1A2). - This subassembly passes only signals within 4 kHz of 12.7 MHz, for a bandwidth of 8 kHz. The signals entering the subassembly first pass through bandpass filter FL1, then receive amplification in amplifiers Q1 and Q2. Both these amplifier stages contain tuned circuits centered on

12.7 MHz. Overall gain for the subassembly is set by the gain control potentiometer in stage Q1.

3.2.4 OUTPUT AMPLIFIER (A1A3). - The 12.7 MHz signal from the 8 kHz bandwidth i-f amplifier is applied to two series, gain-controlled amplifier stages, Q1 and Q2. Gain of these stages can be controlled by logarithmic amplifier U2. With a front-panel switch in the LIN position, the input to amplifier U2 is grounded and Q1-Q2 operate at nominal gain in a linear mode. When the switch is moved to the LOG position amplifier U2 is enabled and the gain characteristics of the two gain-controlled stages become logarithmic. The gain is controlled by applying a negative-going voltage, with increasing signal strength, to the two amplifier stages. Integrated circuit U2 is utilized as a dc amplifier and derives the negative gain control voltage by inverting and amplifying a portion of the final output signal from U3. Gain of U2, and thus the gain of Q1 and Q2, is controlled by components in the negative-feedback loop of the amplifier. Output signals from Q2 are coupled to i-f amplifier U1. This integrated circuit is a high frequency amplifier with high gain. Amplified 12.7 MHz i-f signals from U1 are detected by CR8 and applied to the non-inverting input of U3. The output from U3 is routed out of the assembly and applied to vertical deflection circuits on control board A2.

3.2.5 SWEEP OSCILLATOR (A3A1). - Sweep Oscillator A3A1 operates from a center frequency of 34.1 MHz with a maximum deviation of ±1.5 MHz. This circuit consists of a tank circuit tuned by a voltage-variable capacitor (varactor) and transistor Q1. A sawtooth waveform from control board A2 is coupled to the varactor-diode frequency modulator in the sweep oscillator circuit located on A3A1. A rising ramp of the sawtooth causes the oscillator to increase from 32.6 MHz to 35.6 MHz. Then when the ramp voltage suddenly drops to begin another cycle, the oscillator follows and returns to 32.6 MHz. For an inverted sawtooth, the ramp drives the oscillator high-to-low, then quickly goes high again. Output from this swept oscillator is amplified and buffered by Q2 and Q3 to drive mixer U1 on i-f amplifier A1A1.

As the oscillator is swept across its frequency range it heterodynes with the ouput of A1A1Q1 to produce a 12.7 MHz output from the mixer. When an input signal to mixer A1A1U1 is 12.7 MHz below the sweep oscillator frequency, an output from the i-f amplifier assembly is produced. For example, a signal at the high frequency end of the input band, 22.9 MHz, will beat with the sweep oscillator signal (35.6 MHz) and produce a 12.7 MHz output. When the sweep oscillator is at 32.6 MHz, an input signal at 19.9 MHz will produce the 12.7 MHz output. Because the horizontal movement of the trace on the display unit crt is controlled by the same sawtooth waveform controlling the sweep oscillator, the signals out of the mixer ultimately appear as vertical pips on the face of the display screen which correspond to their original position in the input spectrum.

3.2.6 MARKER OSCILLATOR (A3A2). - This board consists of three crystal oscillator stages operating simultaneously when energized by the front panel MARKER switch. Stage Q1 provides a 21.4 MHz marker for center frequency. The other two stages establish single markers 100 kHz above and below center frequency, at 21.3 MHz and 21.5 MHz. These three signals couple to the input of mixer A1A1U1.

3.2.7 CONTROL BOARD (A4). - The control board contains circuits to provide horizontal and vertical deflection for the cathode ray tube, and also some biasing circuits for the crt.

Vertical Deflection Circuits. - Output Amplifier A1A3 provides a dc signal that must be amplified to drive the vertical deflection plates of the crt. The control board uses a differential amplifier to supply the required signal gain and push-pull type drive. Transistors Q6, Q7, Q8, and Q9 make up the amplifier. The VERTICAL POSITION potentiometer adjusts the bias voltages applied to the two vertical deflection plates thereby establishing a base line near the bottom of the crt. Then any signal voltage from the i-f amplifier will cause a vertical deflection to indicate the presence of signals.

Horizontal Deflection Circuits. - These circuits must supply a recurring sawtooth voltage to the horizontal deflection plates to drive the electron beam across the face of the crt. This same sawtooth voltage must be applied to sweep oscillator A3A1 to maintain synchronization for converting 21.4 MHz input signals to vertical deflection voltage for the crt.

The recurring ramp voltage originates with constant current source Q1 and unijunction oscillator Q2. The current source charges a capacitor at a uniform rate until the peak-point-voltage of the unijunction is reached. Then the unijunction conducts, rapidly discharging the capacitor, and another ramp begins. This recurring ramp voltage is directed to two places.

One path ultimately leads to sweep oscillator A3A1. In this path, the SWEEP WIDTH potentiometer gives control of the ramp voltage, which determines the excursion of the sweep oscillator above and below 34.1 MHz. The controlled ramp voltage from the SWEEP WIDTH potentiometer is applied to both inputs of normal/invert amplifier U2. If select switch Q10 is not activated, the amplifier output provides the same ramp voltage output as is present at the input. When the select switch activates, however, the non-inverting input of the amplifier is pulled to ground, and an inverted ramp voltage appears at the output of the amplifier. This output is routed to the sweep oscillator, A3A1.

The other path for the ramp generated by the constant current source and the unijunction ultimately provides driving voltage for the horizontal deflection plates. This ramp voltage path provides amplification in amplifier U1. The sweep calibrate and sweep balance potentiometers are associate with this stage.

The calibrate adjustment sets the gain of the stage and determines the peak-to-peak excursion of the sawtooth voltage.

The balance adjustment sets the dc offset at the output of the amplifier so that the sawtooth maintains equal peak levels above and below zero volts.

The horizontal width potentiometer controls the voltage level applied to differential amplifier Q3-Q4. This amplifier supplies the two horizontal deflection plates with bias voltage which is made to change, moving the electron beam across the face of the crt. The front panel HORIZONTAL WIDTH control provides adjustment of this bias voltage to provide centering of the trace. Stage Q3 provides inversion for the ramp voltage; stage Q4 does not. Thus, as the ramp voltage from the horizontal width control drives the two differential amplifier stages, one deflection plate receives an increasing voltage, the other plate receives a decreasing voltage in a push-pull arrangement.

Bias Circuits. - The control board mounts a string of divider resistors containing the front panel FOCUS and INTENSITY controls. This divider receives 1500 V dc from power supply module PS1. Voltage from these two controls is applied to the appropriate crt elements to control the electron beam.

3.3 DETAILED CIRCUIT DESCRIPTIONS

Refer to the schematic diagrams in Section VI when reading these circuit descriptions. The main chassis schematic diagram is Figure 6-13.

3.3.1 TYPE 72474 IF AMPLIFIER ASSEMBLY (A1). - Refer to Figure 6-1 for the schematic diagram for this assembly. It receives 21.4 MHz signals at i-f input J1 and provides a detected output at E3, which after amplification, is used to drive the vertical deflection plates of the crt. Three subassemblies contained within the i-f amplifier assembly perform the actual circuit operations. Input amplifier A1A1 receives the 21.4 MHz signals and converts them to 12.7 MHz. These signals couple to the 8 kHz bandwidth i-f amplifier which only passes signals within 4 kHz of the 12.7 MHz center frequency. These signals are coupled to output amplifier A3 where detection occurs. Amplifier A3 also contains a logarithmic agc amplifier that can be selected from a front panel LOG-LIN switch. Other features associated with the i-f amplifier assembly are a 12.7 MHz trap on i-f input jack J1, and a low-pass filter on the output at E3.

3.3.2 PART 18106 INPUT AMPLIFIER (A1A1). Refer to Figure 6-2 for the schematic diagram of this circuit board.

Shaping amplifier Q1 is a dual insulated-gate field-effect transistor (IGFET). Gain of this stage is controlled by applying a negative-going voltage to gate no. 2 (pin 2) of the transistor. Gain-control voltage is derived from both the manual gain input at E2 and agc amplifier Q2.

Assuming a condition with little or no signal present at input E1 (signal strength at the cathode of CR2 less than 400 mV) dual IGFET Q1 will be operating at maximum gain. As the signal strength increases, diode CR2 rectifies a portion of the output of Q1 and feeds it to the base of agc amplifier Q2 through resistor R11. When Q2 begins to conduct, the voltage at gate no. 2 (pin 2) of Q1 begins to go in the negative direction resulting in a reduction in the gain of the stage. Manual gain voltage to E2 provides approximately 60 dB of range in the gain of the shaping amplifier. Diode CR1 prevents the junction of R2 and R7 from ever exceeding +0.6 V. The agc loop provides 20 dB of gain control when the manual gain voltage applied to E2 is set for maximum gain.

The signal from Q1 is coupled to a single-tuned impedance-matching circuit for balanced mixer U1 consisting of variable inductor L4 and capacitors C8 and C11. A ±1.5 dB flat response over a 3-MHz bandwidth centered at 21.4 MHz is present at the input of U1. This is a result of the combination of the shaping amplifier output and the peaked response of pi-network L3, C8, and C11. Balanced mixer U1 heterodynes this signal with an LO input signal from E4. This LO input signal is centered on 34.1 MHz and continually sweeps from 32.6 MHz to 35.6 MHz when maximum sweep width is desired. The two input signals combine in the mixer to produce 55.5 MHz sum signals and 12.7 MHz difference signals. The two input frequencies are attenuated in the mixer and appear at the mixer output at the low level. Only the difference signals receive amplification by FET amplifier Q4, which has a drain circuit tuned to 12.7 MHz by C21. The i-f output is taken from a tap on transformer T1.

3.3.3 PART 18107-1 8 kHz BW IF AMPLIFIER (A1A2). - Refer to Figure 6-3 for the schematic diagram of this circuit board. The 12.7 MHz signals from E1 enter the filter and are restricted to a bandwidth of 8 kHz. Transistor Q1 works into a 12.7 MHz tank circuit made up of L1 and C4. Gain is established by potentiometer R8, in the emitter circuit of the transistor. The amplified signals from the tank circuit couple to the base of Q2 for further amplification. Inductor L2 and capacitor C8 resonate the collector stage of this amplifier. The 8 kHz bandwidth, 12.7 MHz signals route out of the board at E3.

3.3.4 TYPE 15801-2 OUTPUT AMPLIFIER (A1A3). - Refer to Figure 6-4 for the schematic diagram of this circuit board.

Signal flow from module pin E1 to gate no. 1 (pin 3) of Q1 is through dc-blocking capacitor C2. Transistor Q1 is the first of two gain-controlled stages. Both semiconductors are dual insulated-gate field-effect transistors. Gain of each stage is controlled by applying a negative-going voltage to gate no. 2 (pin 2) of the IGFET.

When the output amplifier is to operate in the linear mode, the input to integrated circuit agc amplifier U2 is grounded. Transistors Q1 and Q2 will then operate at nominal gain. In this mode, the voltage on gate 2 is derived from the voltage drop across R5 (R13), R3 (R14), and CR1 (CR2). When the amplifier is to be operated in the logarithmic mode, the control input at E7 is removed from ground and connected through external switching to the output of U3 at E8. Then agc amplifier U2 provides a logarithmic agc characteristic. Integrated circuit U2 is utilized as a dc amplifier. Resistors R29 and R35 control the initial negative feedback for the agc amplifier. As the output from U2 reaches -1.8 V, diodes CR3, CR4, and CR5 conduct and insert R21 and R28 into the feedback determining network. It is at this point that the gain curve becomes logarithmic. Potentiometer R28 is used to calibrate the overall LOG range of the entire i-f amplifier. Resistor R31 returns the non-inverting input (pin 3 of U2 to ground to balance current flow through both IC inputs.

Drain load for stage Q2 is a single-tuned resonant circuit consisting of variable inductor L1 and capacitors C9 and C10. Resistor R20 is a parasitic suppressor. Intermediate frequency output signals from the capacitive voltage divider are applied to linear i-f amplifier U1. There are two gain-calibration networks associated with U1. The logarithmic gain calibration circuit consists of diode CR6, capacitor C12, and potentiometer R24. Diode CR7, capacitor C17, and potentiometer R25 make up the linear-gain calibration network. These circuits are energized, respectively, when front-panel switch S2 is placed in either the LOG or LIN position. The operation of the gain calibration circuits is identical. The LOG network will be explained as an example. With front panel switch S2 in the LOG position the cathode (pin E3) of CR6 is grounded. Therefore, the +18 V through resistor R18 forward biases diode CR6. The gain circuit is now coupled through dc-blocking capacitor C18 to pin 2 of U1 which is the emitter of the input amplifier transistor of the IC. Emitter bias is provided through resistor R33 from the negative supply voltage. With R24 in its extreme clockwise position, capacitors C18 and C12 provide almost a short circuit ac path to ground which causes maximum gain of the input transistor in IC U1. As potentiometer R24 is rotated in the counterclockwise direction, series resistance is added to the emitter ac ground path which increases the emitter degeneration. This reduces the gain of the stage. A single-tuned circuit, L2 and C22, is the load for the output of U1.

The 12.7 MHz i-f output from U1 is coupled to detector CR8 by dc-blocking capacitor C23. Signals from the detector are coupled to the non-inverting input (pin 3) of output amplifier U3. A matching network consisting of resistors R36, R39, R40, and R41, and diode CR9 is connected to the inverting input (pin 2) of U3. This network provides the same amount of current flow through diode CR9 as there is through detector CR8 during periods of no signal input (noise only). Therefore, U3, which is a differential amplifier, will produce a zero volt output for a zero volt input. The detected output from CR8 is amplified by integrated circuit U3 and applied to output level set potentiometer R47 (module pin E9).

3.3.5 TYPE 8261 CONTROL BOARD (A2). - Refer to Figure 6-5 for the schematic diagram of this board. Three major functional groups of circuits appear on this board: a ramp voltage generator and associated inverter stage, an amplifier stage for driving vertical deflection plates of the crt, and a horizontal amplifier stage for driving the horizontal deflection plates of the crt. Vertical amplifiers consist of transistors Q6, Q7, Q8, and Q9. They make up a differential amplifier supplying the vertical deflection plates of the crt with a pair of balanced voltages to maintain the electron beam at the desired vertical location. Vertical position control R41 establishes the exact location of the electron beam in the vertical plane by making slight adjustments between the two halves of the differential amplifier. When properly adjusted, the control causes the electron beam to strike the crt near the bottom of its face. A recurring voltage applied to a pair of horizontal deflection plates causes the electron beam to sweep across the tube thereby producing a horizontal base line on the tube.

Signals are made to appear on the crt face when the vertical deflection plates move the electron beam up and then back down to its base line position as the electron beam is moving across the face of the tube. This produces the characteristic pip used to indicate signals. The dc signal voltage used to unbalance the steady state condition of the vertical deflection plates appears at vertical input E13. This voltage couples through vertical gain potentiometer R34 to the base of transistor Q6. As the signal voltage goes positive, Q6 increases conduction causing its collector voltage to decrease. This reduces the conduction of Q7, and its collector voltage increases. Thus vertical output E16 receives an increasing vertical deflection voltage for an increasing signal input at E13.

Bias current for Q6 flows through resistor R42, which is also shared with the other half of the differential amplifier. When Q6 draws more current because of the signal input, R42 must supply the current. Directly related to an increase in current flow through R42 is an increase in voltage developed. The emitter of Q9 reacts to this attempted increase in voltage by lowering the conduction of the transistor. That is, as the voltage on the emitter of Q9 attempts to increase, a corresponding decrease in current flow occurs that just maintains a state of equilibrium for total current through R42.

With the conduction of Q9 reduced, its collector voltage rises which in turn reduces the collector voltage of vertical output transistor Q8. For the same vertical input signal at E13, vertical output E16 provides an increased voltage, and vertical output E17 provided a decreased vertical output voltage. This push-pull arrangement provides the required deflection for the electron beam to indicate the presence of signals.

The base of Q9 receives a signal from a resistive divider connected between the two horizontal deflection outputs at E11 and E12. This additional input to the differential amplifier at the base of Q9 provides a "tilt" control for making the base line horizontal behind the graticule base line. Potentiometer R59 establishes balance and level of the horizontal deflection voltage coupled to the input of the vertical deflection amplifier at Q9.

The ramp voltage for driving the horizontal deflection plates and the sweep oscillator originates with Q1 and Q2. Transistor Q2 provides a constant current, as determined by R4, to charge capacitor C1. This capacitor charges until the firing voltage of unijunction Q1 is reached. Then the capacitor is suddenly discharged through Q1, and the recharge cycle begins again. This recurring ramp voltage (sawtooth) couples to the non-inverting input of operational amplifier U1 which acts as a buffer and amplifier. Sweep calibration potentiometer R10 establishes the slope of the ramp voltage applied to the horizontal width control and the sweep output at E8.

Differential amplifier Q3-Q4 maintains a dynamic voltage to keep the electron beam on the face of the crt in the presence of the ramp voltage which drives the electron beam across the face of the crt. HORIZONTAL POSITION potentiometer R32 balances the two voltages and shifts the sweep range, determined by the horizontal width control, left or right. This action will align the center of the sweep range to the center of the screen.

The ramp voltage applied to the base of Q3 appears at the collector, amplified and inverted. Transistor Q4 receives its driving signal on the emitter so no inversion occurs with the amplified signal at the collector. Constant current source Q5 provides common mode rejection to maintain stability of the horizontal trace.

Sweep output E8 routes through the front panel SWEEP WIDTH potentiometer and couples back into the board at sweep inverter input E14. After processing in operational amplifier U2, this ramp voltage is applied to a varactor in sweep oscillator A3A2, and the frequency is made to change slowly as the ramp voltage increases. Then, when the ramp voltage suddenly returns to its initial level, the oscillator follows to its initial frequency and begins to track the ramp voltage again. Either a positive-going or a negative-going ramp voltage can be applied to the oscillator, depending on the direction which frequency must track. This tracking depends on the mixer conversion involved with tuners and i-f converters in units external to the signal monitor. If the total conversion process has inverted the order of the signals applied to the signal monitor, reversing the sweep effectively restores their position in the spectrum.

Sweep inverter U2 receives the ramp voltage on both input resistors. FET Q10 pulls the signal applied to the non-inverting input to ground when the ramp voltage is to be inverted. Under this condition, resistors R50 and R53 establish unity gain for the ramp voltage. Diodes CR3 and CR4 provide a breakpoint for the sawtooth voltage developed across the series output resistor.

When Q10 does not pull the non-inverting input to ground, the ramp voltage applied to the inputs appears at the output with an identical level and slope. With the ramp voltage applied to both inputs, as in this situation, the effect is to oppose each other. However, the non-inverting input of an operational amplifier in this configuration maintains a gain equal to the gain of the inverting input (the ratio of R50 and R53) plus one. For this circuit, R50 and R53 establish unity gain; so the non-inverting input has a gain of two. With both inputs receiving the same signal, the unity gain of the inverting input opposes the gain-of-2 associated with the non-inverting input. The net effect is a gain-of-1 for the output ramp, and it is in phase with the input ramp. The ramp from the sweep inverter output at E18 is applied to sweep oscillator A3A2.

3.3.6 TYPE 7781 OSCILLATOR ASSEMBLY (A3). - Refer to Figure 6-6 for the schematic diagram of this assembly. Two printed circuit boards are contained within this assembly. Marker oscillator A1 provides output signals at 21.3, 21.4, and 21.5 MHz when 15 V dc is applied to input C1.

Sweep oscillator A2 maintains an output frequency of 34.1 ±1.5 MHz at sweep oscillator output J2. This frequency is controlled by a center frequency voltage applied to C5 and a sweep (ramp) voltage applied to C4. All power and sweep voltage leads are filtered to prevent oscillator signals from leaving the assembly.

3.3.7 TYPE 18084 MARKER OSCILLATOR (A3A2). - Refer to Figure 6-7 for the schematic diagram of this circuit board. Three nearly identical oscillator circuits operate simultaneously when 15 V dc is supplied to E1. Oscillator Q1 maintains frequency to within ±3 kHz of 21.4 MHz. The other two oscillator circuits contain crystal frequencies of 21.3 MHz and 21.5 MHz, 100 kHz on either side of 21.4 MHz. These two crystals are paralleled by variable trimmer capacitors for "pulling" their crystal frequencies to establish 100 kHz markers to within ±200 Hz of the 21.4 MHz crystal frequency.

All three oscillators operate in the common-collector mode. Amplified signal from the emitter circuit supplies both the feedback to the base required to sustain oscillation and the output signal to E4. The potentiometer in each collector circuit controls the output level from the three oscillators. In addition, the lower valve of output resistor R4 in the 21.4 MHz stage sets up a 6 dB greater output for this frequency.

3.3.8 PART 15799-2 SWEEP OSCILLATOR (A3A2). - Refer to Figure 6-8 for the schematic diagram of this circuit board. Sweep oscillator Q1 is basically a Clapp circuit that has its output frequency swept across a maximum range of 4 MHz. The oscillator center frequency is 34.1 MHz. The tuned frequency is controlled by voltage-variable capacitor (varactor) CR1 whose capacitance varies inversely with the reverse voltage applied across its terminals. Thus, as the voltage across CR1 increases, its capacitance decreases; a decrease in voltage increases the capacitance. The varactor diode is connected in parallel with the oscillator tank circuit. Inductor L1 and CR1 form the basic tuning elements of the oscillator tank. Capacitor C7 is a padder and C14 is a trimmer. These two components shape the oscillator output frequency. Inductors L2 and L3 are rf chokes. They, in conjunction with the associated capacitors, prevent leakage of oscillator frequencies through the varactor bias circuits. Feedback to sustain oscillation is taken from the emitter Q1 and coupled to the junction of C3 and C4 through R5. Capacitors C3 and C4 provide the necessary impedance step-up to sustain oscillation. Bias voltage for the varactor (applied through pin E4) is obtained from the front-panel CENTER FREQ potentiometer. This control is used to set the oscillator center frequency to 34.1 MHz. The ramp voltage applied to the anode terminal of the varactor diode is a modified sawtooth waveform to compensate for the non-linear changes in capacity of the varactor with respect to the applied voltage. The applied non-linear sawtooth voltage linearly varies the sweep oscillator frequency. The shaping network displays signals of 19.9 MHz and 22.9 MHz (3-MHz bandwidth) equidistant from the center frequency of 21.4 MHz with the SWEEP WIDTH control fully clockwise. As the SWEEP WIDTH control is rotated counterclockwise, the ramp voltage applied to E3 decreases amplitude. This reduces the voltage variations on the anode of varactor diode A3A2CR1, thus reducing the sweep width. Output of the sweep oscillator is taken at the junction of capacitors C5 and C7, and coupled through R7 to the base of emitter-follower Q2.

The sweep signal couples from emitter follower Q2 to the base of buffer amplifier Q3. Collector load for Q3 is a single-tuned circuit consisting of variable capacitor C16 and transformer T1. This circuit is broadly tuned to the oscillator center frequency of 34.1 MHz.

3.3.9 SIGNAL MONITOR MAIN CHASSIS WIRING. - Refer to Figure 6-13 when reading this description of the main chassis wiring. All power and a sweep reverse voltage enter the Display Unit at rear panel jack J1. IF input J2 receives 21.4 MHz signals from the companion WJ-9026/RU. These signals are routed to the i-f amplifier assembly at J1. Also supplied to the i-f amplifier assembly are a swept frequency centered on 34.1 MHz and three markers centered on 21.4 MHz. These two signal inputs originate in the oscillator assembly, and enter the i-f amplifier at J3 and J2, respectively. The i-f amplifier processes these various inputs and provides a detected output at E3 which routes to the control board for amplification.

A front panel CENTER FREQUENCY control provides for shifting the sweep response to center the trace behind the graticule. When the front panel MARKER switch applies 15 V dc to the oscillator assembly, markers appear at 21.4 MHz, and at 100 kHz either side of this center frequency, at 21.3 MHz and 21.5 MHz. LOG-LIN switch S2 establishes the gain mode for the i-f amplifier assembly.

Oscillator assembly A3 receives a sawtooth voltage at C4 to sweep the oscillator either side of its 34.1 MHz center frequency. This voltage originates in control board A2. The center frequency voltage applied to the oscillator assembly originates with the 15 V dc supply. Diode VR1 and heat sensitive resistor RT1 act to stabilize the center frequency voltage applied to A3C5.

Control board A2 supplies the crt with bias voltages and signals which maintain the electron beam on the screen. The trace is made to deflect horizontally by push-pull sawtooth outputs E11 and E12. For vertical deflection, signals entering at E13 receive amplification, before being applied to outputs E16 and E17, also push-pull voltages. Output E9 supplies 100 V dc derived from the 200 V dc line. Voltage from the front panel FOCUS control (which actually is contained on the control board) appears at E4. High voltage appearing at E3 originates at the INTENSITY control. Like the FOCUS control, this control appears on the front panel but mounts on the control board. High voltage input E1 receives -1500 V dc which connects to a resistive divider containing the

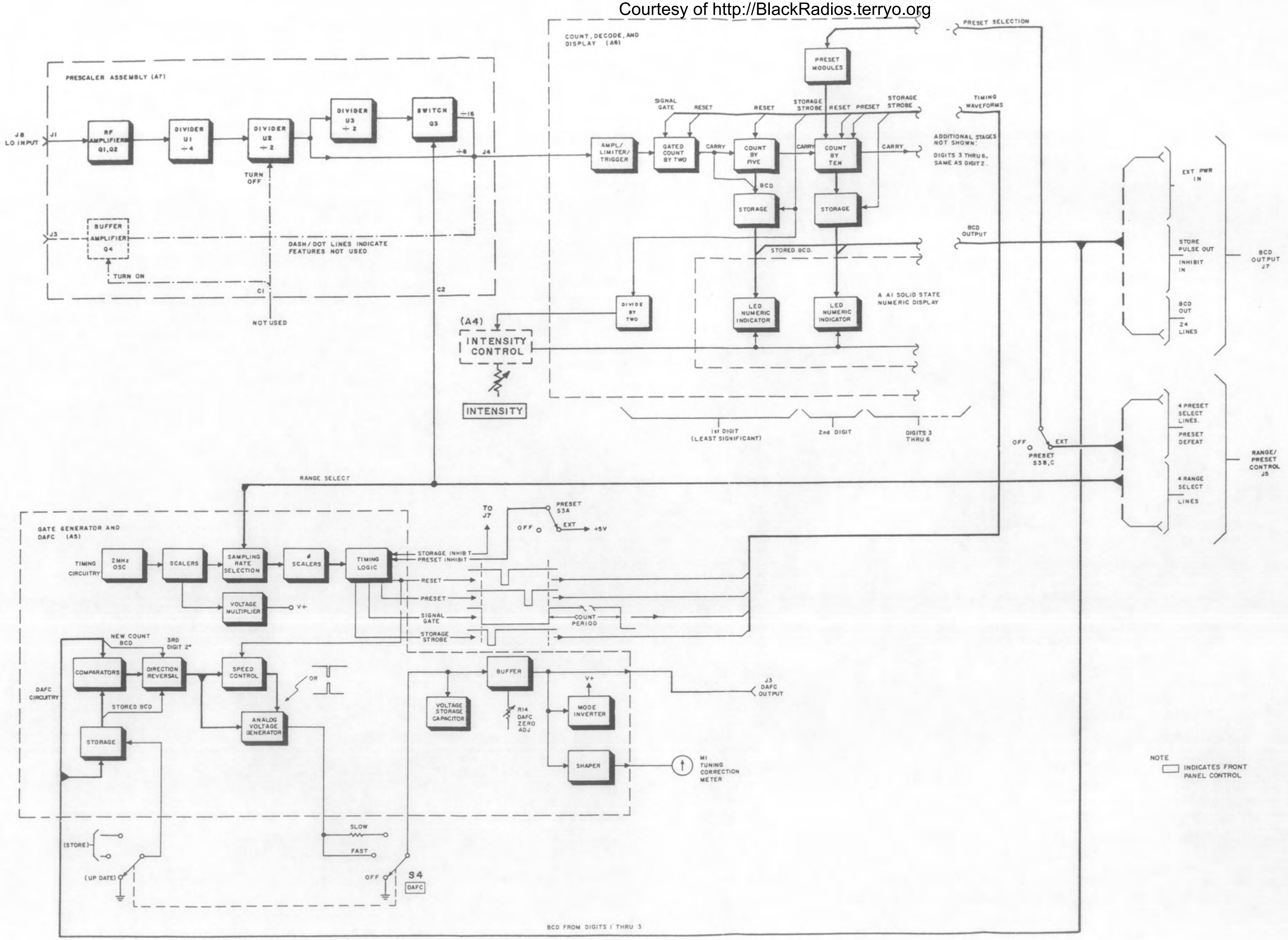


Figure 3-14. Type WJ-9026/DU Frequency Counter Functional Block Diagram

INTENSITY and FOCUS controls. The 200 V dc into the board at E10 is distributed to various circuits within the board. Sweep voltage output E18 supplies the sawtooth voltage to the oscillator assembly. This sawtooth appearing at E18 also appears at output E8 and is returned to E14 by the SWEEP WIDTH control which establishes the voltage level. The sawtooth voltage at E18 may be inverted from that at the SWEEP WIDTH control, and it will be "shaped" by internal circuit action. The sawtooth appearing at output E18 will be re-inverted when -15 V dc is applied to input E15 of the control board.

The dc-dc converter is a sealed module which provides the two high voltages required for the crt. Isolation transformer T1 prevents the high voltage (about -1500 V dc) from coupling back into the 6.3 V ac lines.

3.4 FREQUENCY COUNTER FUNCTIONAL CIRCUIT DESCRIPTION

The functional description of the counter is divided into six main headings:

(1) BCD Counting
(2) Digital Integrated Circuits
(3) Operating Principles
(4) DAFC
(5) External Interfacing Functions
(6) Power Supply

3.4.1 BCD COUNTING DESCRIPTION. - To aid in understanding operation of

Nth NEG IN TRANSITION		1	2	3	4	5	6	7	8	9	10
COUNT VALUE	0	1	2	3	4	5	6	7	8	9	10
1 OUT	0	1	0	1	0	1	0	1	0	1	0
2 OUT	0	0	1	1	0	0	1	1	0	0	0
4 OUT	0	0	0	0	1	1	1	1	0	0	0
8 OUT	0	0	0	0	0	0	0	0	1	1	0

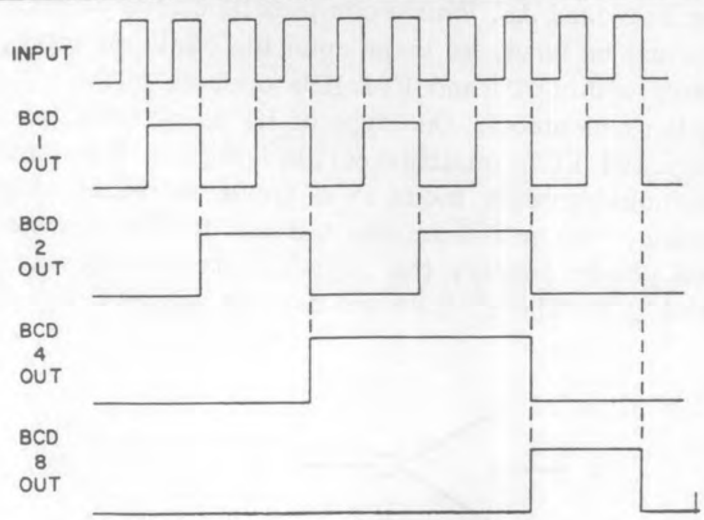


Figure 3-4. BCD Counting-Waveforms and Truth Table

the counter digital circuits, a brief explanation of the binard coded decimal (BCD) system of counting and waveform development follows. Only two characters, 0 or 1, are used for each binary place. BCD representation of a digit in the base ten, or decimal system, requires four binary places. The first place, or bit, represents 2^0 or 1, the second bit 2^1 or 2, the third bit 2^2 or 4, and the fourth bit 2^3 or 8. Thus, 0001 equals 1, 0010 equals 2, 0011 equals 3 and so on. Four flip-flops each representing the 0 or 1 state of each binary place, are required to count up to ten. However, a logic 1 output from each of the four flip-flops (1111) would represent 15 so a means must be provided to restrict the count to ten. A combination of four flip-flops plus an AND gate is used to count 0 through 9 and automatically reset to zero. Note that instead of the total count the value held in a decade is the least significant decimal digit. For example, the actual count of twelve results in a two in the counter. Decade counters, upon receipt of the tenth pulse, reset themselves to zero and pass a "ten" or "carry" pulse to the decade counter for the next, more significant digit. Figure 3-4 is included to show the BCD equivalent waveforms of the digits 0 through 9. The symmetrical BCD 1 waveform is exactly one-half the basic frequency. The output waveforms of the other flip-flops are modified by the feedback connections and are not symmetrical. The BCD 8 is also the carry pulse to the next decade of counting.

3.4.2 DIGITAL INTEGRATED CIRCUITS. - Most circuitry in the counter section consists of logic functions contained in integrated circuits (IC's). Three logic families are used: DTL, TTL, and ECL. For some slow speed functions, DTL (diode-transistor-logic) is employed. Where greater speed and output driving capability are required, TTL (transistor-transistor-logic) is employed. The DTL and TTL IC's include inverters, NAND gates, NOR gates, J-K flip-flops, decade counters, digital comparators, and numeric indicators. These IC's have a high, or 1, output state that is at least +3.0 V and may approach the supply voltage (+5 V dc) under light loading. The low, or 0 state, is +0.4 V or less. Due to the similar voltage states, DTL and TTL gates are intermixed in some circuitry where speed is not critical, as on the gate generator card A5. Where complex functions or high speed are required, TTL circuits alone must be used, as in the counting chain on count, decode, and display board A6. Transistors within DTL and TTL IC's operate in the saturated mode, switching between saturation and cutoff. One type of IC using nonsaturated circuitry is employed and is designated ECL (emitter-coupled-logic). Transistors within the ECL IC's operate in the nonsaturated mode to achieve extremely high switching speeds. A smaller logic swing, 900 mV from the 0 state to the 1 state is employed. When used with a positive power supply, the approximate voltages of the logic states are: 0 = +3.3 V and 1 = +4.2 V. The ECL device used is a type D flip-flop.

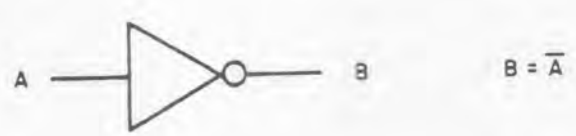
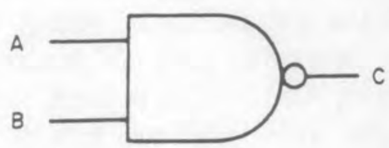


Figure 3-5. Inverter - Logic Symbol

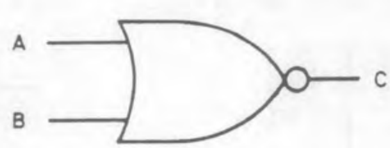
Inverter. - This circuit is used in the counter to reverse the polarity of a pulse or waveform. When a waveform passes through the inverter the high and low states are reversed. The inverter logic symbol is shown in Figure 3-5. A small circle on the symbol indicates inversion or that the low input state is dominent. The bar over the character A in the statement $B = \overline{A}$ also indicates inversion and is read "not-A". The 9936 IC contains six inverters in one package. Inverters are contained in the 9014 and 9016 along with other functions.



A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

Figure 3-6. NAND Gate - Logic Symbol and Truth Table

NAND Gate. - A simple logic function used in the counter is the NAND (Inverting AND) gate. The NAND gate symbol and truth table refer to the high and low states of positive logic. The function of a NAND gate is this: if any input is low, the output will go high; only when all inputs are high will the output go low. The counter uses four types of NAND gate IC's. The 9946 contains four gates, each of which has two inputs; the 9962 contains three gates each of which has three inputs; and the 9961 contains two gates, each of which has four inputs. Another type, the 9016, contains two NAND gates along with inverters. (See Figure 3-6).



A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

Figure 3-7. NOR Gate - Logic Symbol and Truth Table

NOR Gate. - This logic function provides a low output if any input is high. Only when all inputs are low will the output go high. Figure 3-7 shows the logic symbol and truth table for this device. The 9015 contains four NOR gates; three have two inputs and one has four inputs.

A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

Figure 3-8. Exclusive OR Gate - Logic Symbol and Truth Table

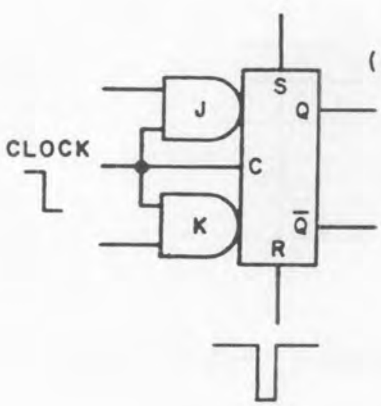
Exclusive OR. - The exclusive OR gate gives a high output only if the two inputs have opposite states. If both inputs are high, or both low, the output will be low. These characteristics give the IC the capability of acting as a programmable inverter--it may be an inverting or non-inverting gate as desired. The truth table in Figure 3-8 shows, that if A is held low, C=B. If A is high, $C=\overline{B}$. Four exclusive OR gates are included in each 9014 package, along with two inverters.

J-K Flip-Flop. - Figure 3-9 shows the logic symbol and truth tables for the J-K flip-flop. As used in this counter, the device has several important characteristics:

(1) When a pulse is presented to the clock input, the flip-flop switches its outputs to a state determined by the states of the J and K inputs.

(2) With J and K inputs held high, the flip-flop responds to pulses at its clock input by changing states of the Q output in a divide-by-2 action. This occurs because there is internal feedback from the Q and $\overline{Q}$ outputs to the J and K inputs.

(3) When the set-reset (S and R) inputs are active, they dominate all clocked inputs (J, K, or clock).



SET-RESET
TRUTH TABLE
(J&K MAY HAVE ANY STATE)

R	S	Q
0	0	NOT DEFINED
0	1	0
1	0	1
1	1	NO CHANGE

PARTIAL CLOCKED
TRUTH TABLE
(R & S=1)

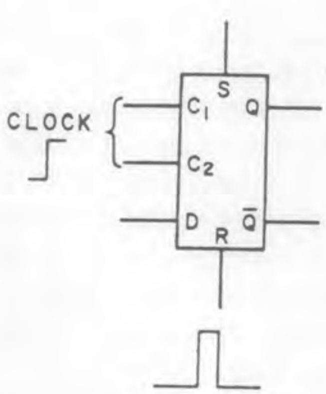
J	K	Qn+1
0	0	Qn
1	1	$\overline{Qn}$

Qn = INITIAL STATE OF Q OUTPUT.
Qn+1 = STATE AFTER ONE NEGATIVE TRANSITION OF CLOCK PULSE.

Figure 3-9. J-K Flip-Flop Logic Symbol and Truth Table

The flip-flop changes output state on the negative-going edge of the clock pulse, depending on the state of the J and K inputs. During counting, the R, S and J-K inputs are held high. Pulses to be counted are applied to the clock input. When a positive input goes high, then low, the Q output changes to the opposite state. This is shown by the last line of the clocked truth table. The negative transition of a second clock pulse will make the Q output revert to its original state. Therefore, the flip-flop divides the number of input pulses by two. When stopping the divide-by-2 action is required, the J and K inputs are held low. As indicated by the first line of the clocked truth table, clock pulses can no longer change the Q output state. Before presenting a new train of clock pulses to be counted, it is necessary to set the Q output low so that the count starts from zero. The set-reset truth table shows that this is accomplished when the reset lines goes low, for any state of the clocked inputs. The Q output is then high, because its state is always opposite to that of the Q output. Two types of J-K flip-flop IC's are used in the counter. The 3202 contains a single TTL flip-flop for high speed counting. The 322 contains two J-K flip-flops. Additionally, all decade counter IC's include J-K flip-flops.

Type D Flip-Flop. - The MC1670 and MC1690 flip-flops are ECL master-slave types capable of operating as a frequency divider above 300 MHz. They are similar to the J-K flip-flop described above. However, they have a single D input with a J and K function. Thus the single input line can determine two output stages. The clock input is triggered on positive transitions. When the clock is low, data is entered at the D input and stored in the master flip-flop. When the clock goes high, the data is transferred to the slave flip-flop and is available at the Q and $\overline{Q}$ outputs. Figure 3-10 shows a logic symbol and truth tables. The R and S inputs override any clocked inputs. The high input state is active at the R and S inputs, and at the clock inputs. There are two OR'ed clock inputs, C_1 and C_2. When used with the $\overline{Q}$ output tied back to the D input, the flip-flop will complement (change state) on each pulse at the clock inputs in a divide-by-2 function. This is indicated by the clocked truth table. If the $\overline{Q}$ is high the D input is conditioned so that the next positive transition of the clock switches Q low. When $\overline{Q}$ goes low, it conditions the D input so that the next clock pulse will set $\overline{Q}$ high.



SET-RESET TRUTH TABLE (C & D MAY HAVE ANY STATE)

R	S	Q
0	0	NO CHANGE
0	1	1
1	0	0
1	1	NOT DEFINED

PARTIAL CLOCKED TRUTH TABLE (R & S = 0)

D	Qn+1	$\overline{Q}$n+1
0	0	1
1	1	0

Qn+1 = STATE OF Q OUTPUT AFTER ONE POSITIVE TRANSITION OF CLOCK PULSE.

Figure 3-10. Type D Flip-Flop - Logic Symbol and Truth Table

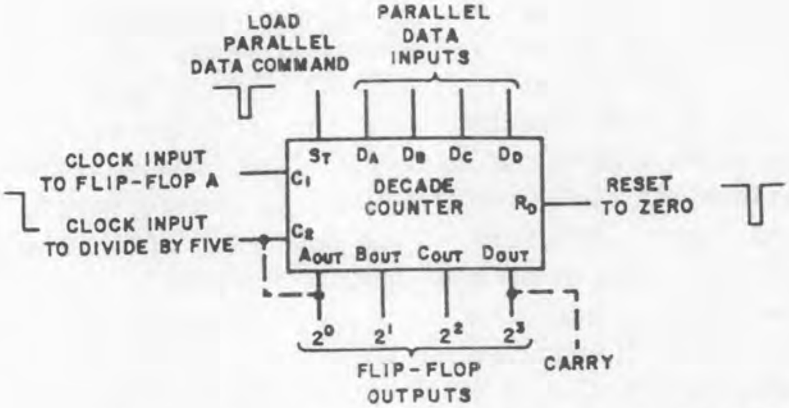
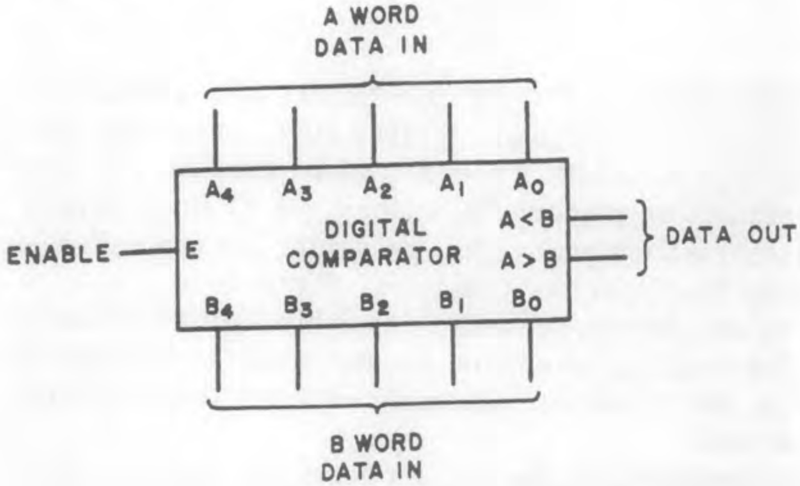


Figure 3-11. Decade Counter - Logic Symbol

Decade Counter. - These modules serve a variety of functions including counting, scaling, and data storage. A logic symbol is shown in Figure 3-11. These devices contains four J-K flip-flops with feedback and feed forward lines to produce count-by-10 operation. In addition, a group of NAND gates allows parallel entry of four lines of data, which program the R and S inputs of the internal flip-flops. Two clock inputs C_1 and C_2 are provided. Input pulses may be provided. Input pulses may be applied directly to the first of four flip-flops at C_1, with the output of this flip-flop driving the other three via C_2. (These three flip-flops are connected in a divide-by-5 configuration.) This connection is used whenever the device is used as a counter; that is, whenever its function is to provide a BCD output telling how many pulses have been presented to the input. Figure 3-4 is applicable as a truth table forthe counting mode. Areset function is also provided for counting applications. When the R_D input is driven low, the outputs of all flip-flops will be set to zero in preparation for a new count. The connection to C_1 is also used when scaling by a factor of ten is needed. In scaling, the IC serves only as a frequency divider, with the input signal applied to a clock input and the output taken at the D_{OUT} pin. If the input is applied to C_2, the scaling factor is five. Entry of parallel data is effected when the S_T terminal is driven low. Under this condition the parallel data will be loaded into the flip-flops and the output terminals will be set accordingly. Use of the parallel input capability has two applications in the frequency counter. One application is in presetting. It is desirable to have some of the decade counters begin their count from numbers other than zero, and the parallel entry makes loading in of these preset numbers possible. In a second application, only parallel entry occurs; the IC does not count or scale. Instead, it serves only as a storage element. It holds the BCD data from a similar IC that is used as a counter while a new count is being made. Once the data is loaded in, it will be held until another storage strobe pulse applied to the S_T input commands updating of the stored data. A series of similar TTL decade counters is used in the frequency counter. The 8292, a low power version, is used in greatest quantity. The 8280, a medium speed version, and the 8290, a high speed version, are also used. Except for speed, all are identical.



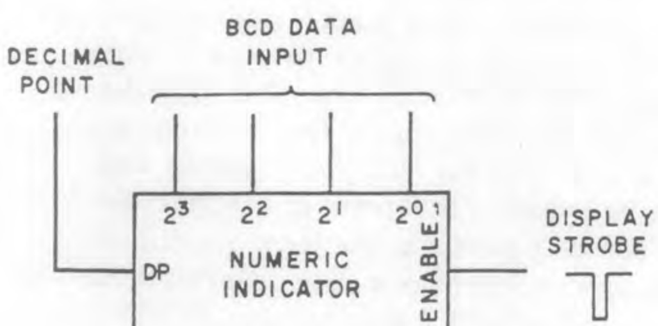
INPUT CONDITIONS	A < B OUT	A > B OUT
A WORD>B WORD	0	1
A WORD<B WORD	1	0
A WORD=B WORD	0	0

NOTE: ENABLE INPUT = 0

Figure 3-12. Digital Comparator - Logic Symbol and Truth Table

Digital Comparator. - The logic symbol and truth table for the 93L24 comparator are shown in Figure 3-12. This IC compares a five bit binary word at its "A" inputs to a five bit word at its "B" inputs. Three conditions of the two outputs are generated, indicating that A is larger, B is larger, or both are equal. Each of the succeedingly more significant bits of input data carries greater weight in the comparison process. To accept more inputs bits, the IC's may be cascaded by using outputs of the IC accepting the most significant bits to drive the A_4 and B_4 inputs of the comparator for less significant bits.

Numeric Indicator. - This IC type is used to visually display the count accumulated by the counting circuits. Each numeric indicator displays one digit of the count. A shaped numerical character is presented on a 4 x 7 dot array of light emitting diodes. The character represents the value of the BCD input data to the IC. The numeric indicator has three principal functions. First, the BCD input data is stored in latches to provide a steady readout until reading of new inputs is desired. The latches are controlled by an enable line which commands the latches to store previous data (enable line high) or to read new input (enable line low). The second major circuit function is decoding of the stored BCD to a 4 x 7 matrix dot pattern. Last, the LED's are activated to visually display the appropriate character. A right hand decimal point (also controlled by the enable line) is provided; a low input activates the decimal. A logic symbol and truth table are shown in Figure 3-13.



NUMERICAL CHARACTER TRUTH TABLE

BCD INPUTS 2^3	2^2	2^1	2^0	ENABLE	CHARACTER DISPLAYED
0	0	0	0	0	0
THROUGH				0	THROUGH
1	0	0	1	0	9
ANY				1	NO CHANGE

DECIMAL POINT TRUTH TABLE

DP INPUT	ENABLE	DECIMAL POINT
0	0	ON
1	0	OFF
ANY	1	NO CHANGE

Figure 3-13. Numeric Indicator - Logic Symbol and Truth Table

3.4.3 FREQUENCY COUNTER FUNCTIONAL CIRCUIT DESCRIPTIONS. - The frequency counter accepts input signals over the range of 47-1060 MHz, counts the signal for a precise interval, and digitally subtracts a predetermined number. Output information is a six digit visual readout on numeric indicators and 24 lines of BCD data. The following paragraphs describe the signal paths, presetting and timing functions. The description is keyed to the functional block diagram, Figure 3-14.

Signal Path. - Input signals pass through prescaler assembly A7 for frequency division before being applied to the counting circuit on count, decode, and display card A6. As shown in Figure 3-14, the prescaler assembly contains three divider stages and a direct path which is not used.

Prescaler A divides the LO frequency at the vhf/uhf inputs by eight or sixteen. A signal to direct input J1 on the prescaler assembly can also be coupled through a buffer amplifier in the prescaler directly to the prescaler output without being prescaled. The direct capability is not used with the WJ-9026/DU. RF amplifiers Q1 and Q2 amplify and clip the signal from the LO input to provide a signal with the rise time needed to toggle divide-by-4 prescaler U1. Prescaler U1 drives prescaler U2, which divides the output of U4 by two, and gives an output that is one-eighth the prescaler assembly input signal frequency. The output from U2 is always present on the prescaler output. The output of U2 also drives divide-by-2 prescaler U3, which gives an output that is one-sixteenth of the prescaler-assembly input frequency. Switch Q3 determines whether the divided-by-16 output from prescaler U3 will appear at the prescaler output. When the vhf control input is grounded, switch Q3 allows signals to pass and the divided-by-16 signal from U3 appears at the output along with the divided-by-8 output signal from U2. Since the output frequency from U2 is the second harmonic of the output frequency from U3, both signals can be present at the prescaler assembly output at the same time. When the vhf control is grounded, only the divided-by-8 signal from U2 appears at the output of the prescaler assembly.

Grounding the 0.1-50 MHz control input causes buffer amplifier Q4 to send a voltage to prescaler U2 that turns it off, disabling the prescaler circuits. Grounding the 0.1-50 MHz control input also allows buffer amplifier Q4 to pass signals from the direct input to the output of the prescaler assembly. Leaving the 0.1-50 MHz control input open allows prescaler U2 to operate and causes buffer amplifier Q4 to isolate signals appearing at the direct input.

Basic Counting Circuits. - Count, decode, and display board A6 receives the output from prescaler assembly A7 and performs all counting functions. Board A6 contains six decades of count and readout circuitry. The input signal is first conditioned by a diode limiter, IC amplifier, and trigger transistor to give a large amplitude, fast fall time pulse to the following count-by-2 IC. This J-K flip-flop is the first component of the counting chain. The flip-flop forms the first decade of counting with the divide-by-5 portion of a decade counter IC. A separate high speed divide-by-2 is used so that the signal can be gated at this point and to increase the highest counting frequency. This decade of counting produces the least significant digit of the readout. When the signal gate timing waveform from gate generator A5 goes high, the J and K inputs of the flip-flop are enabled for a discrete period which depends upon the range in use. A burst of pulses is then accepted by the flip-flop and the frequency divide-by-2 carry pulses are passed to the count-by-5 IC. These two counters produce a BCD output representing the least significant digit and carry pulses to the following decade. The BCD data is held in a storage IC so that the data is continuously available to the external BCD output connector, the dafc circuits, and the numeric indicator which provides a visual readout of the count. To prevent operator confusion from a rapidly changing readout of the least significant digit, the divide-by-2 portion of a decade counter provides one readout strobe pulse to update the numeric indicators for every other storage strobe pulse. The second decade differs from the first in that all of the count-by-10 function is contained in a single IC, and preset modules are provided to set the counter to a number other than zero before each count period begins. Following decades contain the same combination of decade counter, preset, storage, and numeric indicator modules.

Table 3-1. Presetting Subtraction

21.400	-- IF Freq
+978.600	-- Preset Number
1 000.000	
	-- Read out
	-- Not Read out
300.000	-- Receiver Tuned Freq
+21.400	-- Receiver IF Freq
321.400	-- Receiver LO Freq (Input to Counter)
+978.600	-- Counter Preset Number
1 300.000	--
	-- Counter Readout = Received Tuned Freq

Presetting. - The frequency counter in effect subtracts a desired number from the count before reading it out. This is necessary because the receiver's LO frequency, which is the counted signal, is equal to the tuned frequency plus the i-f frequency. Therefore, the i-f frequency must be subtracted. Actually, an addition process is employed, with a carry of the unused most significant digit. The preset number is loaded into the decade counters of count, decode, and display card A6 before each updating of the count. Several preset numbers are available for different i-f frequencies. The selector lines at rear panel jack J5 determine which preset will be active. BCD data supplied by preset modules load the desired preset number into the parallel-entry inputs of the decade counters. Loading occurs upon command of the gate generator, when the preset timing waveform goes low. The output lines of each decade counter will then hold the BCD code for one decimal digit of the preset number. When the count period occurs, the preset digit and the counted digit will be added. Table 3-1 illustrates the presetting process for an i-f frequency of 21.4 MHz. Effectively, the counter has to count up to a readout of all zeros, and then continue to count to produce the final readout. An input of 21.4 MHz gives a readout of all zeros. A most significant digit of one would be displayed, but there is no decade to read out this digit position. Table 3-1 also shows how the tuned frequency of a receiver is converted to the LO frequency and then back to a readout of the tuned frequency on the counter.

Timing Cycle Events. - The frequency counter functions by cycling many times per second through a four-step timing sequence. These steps are performed in response to waveforms developed by gate generator card A5. To produce these waveforms, the output frequency from a highly stable crystal oscillator is divided by a series of decade scalers. Sampling-rate-selection circuitry passes waveforms from various scalers, depending on operating range. Additional decade scalers produce waveforms that are combined in NAND gates which make up the timing logic circuitry, to produce the timing waveforms. The waveforms are shown in Figure 3-14. Each timing cycle begins when the gate generator produces a negative going reset pulse. The pulse is applied to all decade counters to set their outputs to zero in preparation for a new count. Next the gate generator produces the preset pulse; it connects to all but the least-significant-digit decade. When the pulse goes low, the values of the selected preset modules are loaded into the decade counter IC's. The states of the decade counter outputs then represent the desired preset in BCD format. Next the count period begins. The signal gate waveform to the countby-2 of A6 goes high. For a discrete interval the incoming signal is counted. The highest speed decade counts zero through nine many times, each time passing a carry pulse to the following decade. Each succeeding decade performs its count and supplies a carry to the decade counter which follows it. If the receiver is tuned to 300 MHz, the input frequency to the frequency counter is 321.4 MHz. On the 20-300 MHz vhf range, the effective gate time (as determined by actual gate time and prescaling factor) is one millisecond. The number of pulses counted is 321.4×10^6 cycles per second times 10^{-3} seconds, or 321.400 pulses. When added to preset number of 978,600 the result is 1,300.000. Only the six least significant digits are readout, and one numeric indicator provides a decimal point. The resultant readout is 300.000 MHz, the correct tuned frequency. This count is left standing on the BCD output lines of the decade counters when the signal gate goes low to end the count period. The outputs of the counters connect to storage elements. As the last step in the counting cycle, the storage strobe output from the gate generator goes low, commanding the storage elements to read new input data and update their output data. The BCD outputs of the storage elements connect to numeric indicators which decode the BCD and visually display the appropriate numerical character.

Counting Periods and Prescaling Factors. - Because the prescaler divides incoming frequencies by multiples of two rather than multiples of ten, corresponding adjustments must be made in the counting period to provide a readout whose digits are the same as the six most-significant-digits of the input frequency. Table 3-2 shows the various characteristics that relate counting periods to prescaling factors. First consider the 0.1-50 MHz direct range, where no prescaling is employed and the counting period is related to one second by a power of ten. The basic sampling rate, as determined by gate generator A5, is 80 Hz; that is 80 complete counting cycles occur each second. The period of a cycle is the reciprocal of 80 Hz (0.0125 s), and the counting period within the cycle is designated to be 80 percent of the cycle time. Therefore, the actual counting period is 0.010 second. Since no prescaling is employed, this period is also the effective counting period. The resolution of the readout is the reciprocal of the effective counting period. A period of one second would give a resolution of 1 Hz, and the effective period of 0.010 second gives a resolution of 100 Hz. A different situation exists on the 20-300 MHz vhf range. As shown in the

Table 3-2. Counting Periods and Prescaling Factors

RANGE	SAMPLING RATE	ACTUAL COUNTING PERIOD = 80% x 1/Sampling Rate	PRESCALING FACTOR	EFFECTIVE COUNTING PERIOD = Actual Counting Period/ Prescaling Factor	RESOLUTION = 1/ Effective Counting Period
DIRECT 0.1-50 MHz	80 Hz	0.010 sec	none	0.010 sec	100 Hz
VHF 26-300 MHz	100 Hz	0.008 sec	8	0.001 sec	1000 Hz
UHF 235-500 MHz 500-1000 MHz	50 Hz	0.016 sec	16	0.001 sec	1000 Hz

table, a prescaling factor of eight is used. An actual counting period must be provided which gives an effective counting period that is related to one second by a power of ten. This situation is effected by choosing a sampling rate that gives an actual counting period of 0.008 second. The relationship defining the effective counting period is that it equals the actual counting period divided by the prescaling factor. Thus, the 0.008 second actual counting period and the prescaling factor of eight result in an effective counting period of 0.001 second. Since this is one tenth the effective counting period for the 0.1-50 MHz direct range, the resolution is only one tenth as much; that is, 1000 Hz. Similarly, the two uhf ranges employ a prescaling factor of 16 and an actual counting period of 0.016 second, again giving an effective counting period of 0.001 second and a resolution of 1000 Hz.

3.4.4 DAFC. - The dafc (digital automatic frequency control) circuitry is used to stabilize the local oscillator of the associated receiver against long term drift. If the LO frequency of the receiver drifts away from a selected lock frequency, an analog voltage supplied to the receiver by the counter returns the receiver to the lock frequency. This is accomplished by having the analog voltage from the frequency counter vary the reverse bias on the varactor (voltage variable capacitor diode) in the receiver's local oscillator circuit. The dafc circuitry stores BCD data representing the desired lock frequency and compares this data to BCD data generated during each new count period. If the sets of data differ, the analog voltage is changed, with an automatic rapid/delayed feature selecting one of two correction speeds for large/small errors. As shown in Figure 3-14 most of the dafc circuitry is on the gate generator card, A5.

Digital Comparison Circuitry. - When the front panel DAFC switch is set to OFF, the storage elements on A5 constantly update their information after each new counting period in response to BCD data from count, decode, and display card A6. When the DAFC switch is set to the FAST position, the storage elements are commanded to hold the latest set of data and they store the desired dafc lock frequency. They then control BCD for the two least significant digits of the display plus one bit from the third digit. Digital comparator IC's compare this stored BCD to the BCD generated by each new counting period. The states of the comparator outputs indicate whether the new count BCD is greater then, less than, or equal to the stored BCD. After further processing, these outputs will be used to generate the analog output voltage. Exclusive-OR gates provide a direction reversal for the comparator outputs. They act as inverting or noninverting gates depending on the state of the BCD 1 bit from digit three. This circuit configuration provides a greater input-error sensing range. Assume that the counter is reading out a frequency of XXX.050 MHz and that the receover is in dafc lock. If a sudden shock changes the receiver frequency to XXX.110, the dafc would try to maintain lock for the two least significant digits by seeking a frequency of XXX.150. However, since the third digit changed from zero to one, the BCD 1 bit also changed. The stored bit is now different from the new count bit, causing a reversal of the direction of dafc correction. The dafc now seeks the correct lock frequency of XXX.050.

Automatic Correction Speed. - The dafc circuitry is capable of responding to the magnitude of the required correction by switching to one of two correction speeds, rapid or delayed. If error signals from the comparator occur only occasionally, due to the plus or minus one count error inherent in a gated counter, the delayed speed is used to provide a very slow correction with minimum fm of the receiver's LO. If a constant error signal from the comparator exists, indicating loss of dafc lock, the rapid speed is activated to quickly regain lock. To control which correction speed is to be used, the speed control circuitry strobes the analog voltage generator with a waveform which has a high ratio of high/low state times. The analog voltage generator can change its output while the waveform is high. For delayed correction speed, the speed control circuit strobes the analog generator with a waveform which is high for only two percent of each counting cycle (the inverted reset pulse). When the speed control circuit senses that a rapid correction speed is required, the control waveform is inverted so that its duty cycle is 98 percent, providing a much more rapid change of the analog output.

Analog Circuitry. - The analog voltage generator provides duty cycle controlled paths to the +5 and -5 V dc power supplies to produce the dafc analog correction voltage. The output voltage is used to charge a storage capacitor, whose charge is the correction voltage. Negative charging voltage increases the tuned frequency of the associated receiver. The charging current reaches the capacitor through S4. This switch selects the correction rate, and introduces a series resistor in the SLOW position to provide a longer RC time constant for charging the capacitor. When set to OFF, S4 grounds the capacitor to dump the stored voltage. The charge present on the capacitor is buffered to provide a low impedance output. A MOSFET (metal oxide silicon field effect transistor) is used in the buffer stage. The extremely high input impedance of the MOSFET prevents excessive leaking off of the capacitive charge. The buffer stage includes a potentiometer, A5R14, which is adjusted to give zero offset between buffer input and output voltages. The buffer output is the mode 2 dafc output voltage, which is routed directly to rear panel connector J6. The mode 2 voltage is also applied to a mode inverter stage which includes an operational amplifier. In this stage the mode 2 voltage, which is zero centered and has a negative slope of voltage-versusfrequency correction, is converted to a mode 1 voltage, which is centered at +8 V and has a positive slope. The mode inverter requires a supply of +18 V dc; this voltage is produced by a voltage multiplier which uses a waveform from the timing logic circuitry. The mode 1 voltage is not used in this system. Tuning correction meter M1 receives the mode 2 voltage through a shaper circuit which makes needle deflection conform more closely to frequency correction in the associated receiver.

3.4.4 EXTERNAL INTERFACING FUNCTIONS. - The frequency counter provides an external BCD output and associated command signals from J7 to a remote readout or printer. External control of range and preset selection enters the unit at J5.

BCD Output. - Count, decode, and display card A6 supplies a 24 line BCD output to rear panel connector J7. The BCD is 1248 code positive true logic from TTL storage IC's. Gate generator card A5 also has two connections to J7. A storage pulse output is provided whose positive transition indicates that a new count has just been completed, and an inhibit line is provided which may be set low to stop updating of the storage IC's on A6.

External Range and Preset Control. Rear panel connector J5 has control lines which are used to remotely select the desired range and preset. One of the four selector lines in J5 (pins j, f, g, or h) is set low to activate the proper range.

3.5 TYPE 791505-1 PRESCALER ASSEMBLY (A7)

Refer to the schematic diagram of the prescaler assembly in Figure 6-12. The prescaler assembly uses two stages of rf preamplification (Q1 and Q2) and three ECL prescaler circuits (U1 through U3) to divide its input signal by a factor of eight or sixteen. During maintenance, a signal can also be coupled from direct input J3 to prescaler output J4 to allow the frequency counter to count signals in the 0.1 to 50 MHz range. Grounding or leaving open the 0.1 to 50 MHz Select and vhf Select inputs causes the prescaler assembly to divide its input signal by eight or sixteen, or allows a signal to pass between its direct-input and its output.

3.5.1 RF AMPLIFIERS. - Relay K1 is not used to switch the input of amplifier Q1 to either vhf input J2 or to uhf/vhf input J1. The dash-1 version of the board uses a hard-wire connection.

Pi attenuator R27-R28-R29 improves the match between the input of amplifier Q1 and the vhf input or vhf/uhf input. Capacitor C1 couples the signal from the output of the pad to the input of amplifier Q1. Amplifier Q1 overdrives Q2 so that the output signal from Q2 is clipped, giving the risetimes necessary to drive the clock input of prescaler U1. The amplifiers use negative dc feedback to stabilize their operating points and negative ac feedback to equalize their gains over the 50 MHz to 1 GHz frequency range. Resistors R1 -R2 provide dc feedback between the collector and base circuits of Q1, and R7-R10 provide dc feedback between the collector and base circuits of Q2. R1 and C2 provide ac feedback between the collector and base circuits of Q1; likewise R10 and C7 provide ac feedback between the collector and base circuits of Q2.

The emitter feedback circuits of Q1 and Q2 minimize the effects of emitter lead inductance. Transistors Q1 and Q2 are enclosed in stripline packages with two emitter leads. To reduce the emitter lead inductances of the transistors, each of their emitter leads connects to its own emitter resistor and bypass capacitors so that the inductances of the emitter leads are paralleled to ground. R5-C4 and R6-C5 separately connect to the emitter leads of Q1, while R11-C8 and R12-C11 separately connect to the emitter leads of Q2. R5-R6 and C4-C5 provide negative feedback in the emitter circuit of Q1, while R11-R12 and C8-C11 provide negative feedback in the emitter circuit of Q2. Bypass capacitors C9 and C30 provide the emitters of Q1 and Q2 with rf grounds at lower frequencies.

Resistors R3 and R8 provide Q1 and Q2 with input loads and stabilize their base bias voltages. C3 couples the signal developed across load resistor R4 to the input of Q2, and C10 couples the signal developed across load resistor R13 to the input of divide-by-4 prescaler U1.

3.5.2 PRESCALERS. - Divide-by-4 prescaler U1 consists of two D flip-flops which divide its input signal frequency by four. Capacitor C13 bypasses a bias voltage source in the prescaler to ground. Resistors R15 and R14 provide loads for the open-emitter Q and Q outputs of the prescaler (pins 3 and 2).

Bypass capacitor C26 couples the output signal from U1 to the clock input of prescaler U2. Prescaler U2 (a master-slave ECL flip-flop) divides the frequency at the output of U1 by two, giving a frequency on its Q outputs that is one eighth the frequency on the prescaler assembly input. Since U2 is an ECL circuit operating from a +5 V power supply, its clock input signal must be level shifted so that it swings around +3.5 V. Divider R32-R33 provides this level shift. Resistors R31 and R19 divide down the signal voltage at the Q output of U2 (pin 2) and provide a load for its open emitter output. Coupling capacitors C22 and C25 connect the divided-by-8 output signal from the Q output to output connector J4.

The Q output of U2 drives the clock input of divide-by-2 prescaler U3, a master-slave ECL flip-flop almost identical to U2. U3 supplies a signal at its Q output that is one sixteenth the frequency of the signal at the prescaler input. Divider R35-R21 attenuates the output of U3 and coupling capacitors C23 and C25 connect it to output connector J4. R18 provides a load for the open emitter Q output of U3.

3.5.3 CONTROL CIRCUITS. - Transistors Q3 and Q4 and their associated control inputs make the prescalers divide-by-8 or -16, or allow a signal from the direct input to appear at the prescaler output. Leaving the vhf select input open allows Q3 to be on (R34 limits the forward bias on the base of Q3). Transistor Q3 grounds the collector end of R21 when it is on, so that R35 and R21 provide a load for the open emitter Q output of U3. This allows the divided-by-16 output of U3 to appear at output connector J4 via C23 and C25. The Q output of U2 can always be present at the output since the Q output of U2 is the second harmonic of the Q output of U3. Grounding the vhf select input biases Q3 off, removing the emitter load from the output of U3 so that only the divide-by-8 output of U2 appears at output J4. CR1 protects Q1 from voltages accidentally applied to the vhf-select-input and C20 keeps the end of R19 at rf ground.

Grounding the select 0.1-50 MHz control input causes transistor Q4 to conduct less, allowing one of the clock inputs of U2 (pin 7) to be biased near 3.5 V (C21 keeps the clock input at rf ground). This puts a logical 1 on the clock input since U2 is an ECL circuit being operated from a +5 V power supply, shutting U2 off and keeping an output signal from the prescaler from appearing at output J4. If a signal appears at direct input J3 under these conditions, Q4 acts as an emitter follower amplifier, and the output signal developed across emitter resistor R24 goes to output J4 via coupling capacitor C25.

Leaving the select 0.1-50 MHz input open allows transistor Q4 to saturate so that the clock input of U2 goes to 3 V. This puts a logical 0 on the clock input at pin 7 (since U2 is an ECL circuit operating from a +5 V supply) allowing the other clock input (pin 9) to toggle the Q and not Q outputs so that a divided output appears at J4.

3.5.4 POWER SUPPLY INPUTS. - A +10 unregulated power supply input would activate relay K1 if it were used. It provides voltages for rf amplifiers Q1 and Q2. R1-C29 and R9-C6 decouple the power supply inputs to the rf amplifiers. Voltage breakdown VR1 regulates the +10 V power supply input.

Pi network C28-L1-C27 provides rf isolation for the +5 V power supply input. C18 and C19 provide low frequency ac and rf bypassing for the inputs of prescalers U2 and U3. R16-R30-C15-C12 decouple the positive power supply input to prescaler U1. The forward voltage drops of diodes CR3 and CR4 keep the positive power supply input to prescaler U1 at about 1.7 V. C14-C16-C17 provide low frequency ac and rf bypassing the for -5 V power supply input to prescaler U1.

3.6 TYPE 791503 COUNT, DECODE, AND DISPLAY (A6)

The reference designation prefix for this module is A6; its schematic diagram is Figure 6-11. This card includes circuitry to amplify and shape the input waveform, and six decades of counting that provide a visual frequency readout on numeric indicator IC's.

3.6.1 INPUT AMPLIFIER. - Input signals are applied to module pin 22. Resistor R1 provides a dc return for the input of IC U1. Diodes CR1 and CR2 limit the amplitude of incoming signals to avoid overloading of the amplifier IC. This device is a wideband video amplifier which provides gain needed when the counter is operating on the 0.1-50 MHz direct range during which low level input signals are applied directly to this card. The output from U1 is ac coupled to trigger transistor Q1. This transistor is driven from cutoff to saturation by the waveform from U1. It provides a fast fall-time pulse output as required to trigger U2.

3.6.2 FIRST DECADE OF COUNTING. - Integrated circuit U2, a J-K flip-flop, gates the input signal into bursts, and it forms the first decade of counting with divide-by-5 counter U3. The signal from Q1 connects to the clock input of the J-K flip-flop. The IC divides its input frequency by two, but only when the signal gate waveform is high. This waveform, from the gate generator, enters the card at module pin 18 and connects to a J and K input of U2. Prior to each counting period, the reset pulse is applied to U2 and U3 to set them to zero. After this, the signal gate waveform goes high, and the count period occurs. The Q output of U2 drives the C_2 input of U3 for division-by-5. This output of U2 also connects to U4 where it is the BCD 1 bit to the low power decade counter used as a storage element. Integrated circuit U3 is a high speed decade counter which supplies the remaining BCD bits of the least significant digit to the storage element. The outputs of the storage element, which are updated upon command of the storage strobe pulse, are connected to numeric indicator IC A1U1. This IC decodes the BCD and displays the appropriate character on an array of LED's. This least significant display may flicker between two characters due to the ±1 count indeterminancy inherent in a gated counter. To help prevent operation confusion (for example, flicker between 9 and 0 being interpreted as 8) the numeric indicator is updated every other counting period. The frequency of the display strobe is divided-by-2 in decade counter U41. The display strobe enters the card at module pin 1 and is the same waveform as that at pin A storage strobe. Clock input C receives the input signal; the divided-by-2 output is a BCD 8 waveform. The output pulse is inverted by Q2. Due to the length of the high state of the BCD 8, a second storage pulse, commanding U4 to update, might affect the readout on A1U1. Therefore, the emitter of Q2 is tied to the input waveform rather than to ground, so that the negative going pulse at the collector of Q2 can be no wider than the input pulse at module pin 1. The BCD outputs from storage element U4 also connect to module pins which route them to the rear panel BCD output connector.

3.6.3 SECOND DECADE OF COUNTING. - The second decade contains the same basic functions as the first. However, the use of a separate J-K flip-flop for gating is not required and a single medium speed decade counter IC performs the counting function. In addition, the second decade and all following decades have presetting capability. This function could be performed in the second decade by preset modules U5 and U6. These modules would be capable of loading a BCD number into the parallel data inputs of decade counter U7. Module U6 contains pull-up resistors for all parallel data inputs, and module U5 could pull down certain lines to determine the BCD number. A preset selector line determines whether U5 will be active. In the WJ-9026/RU system it never will be active. Figure 3-14 shows how preset operation would occur if a preset-to-five module were installed for U5. Resistor R1 in each module has a very low value; resistors R2 through R5 of U6 are 10 kilohms. When the preset line for module U5 would be made active (grounded) by rear panel range/preset connector J5, germanium diodes CR1 and CR3 of U5 would be forward biased and pull the BCD 2 and 8 lines down to 0.3 V to set them to the 0 state. But pull-up resistors R3 and R5 of U6 hold the BCD 1 and 4 lines in the 1 state, so that parallel data inputs D_A through D_D of U7 would have a BCD value of five. If the preset pulse

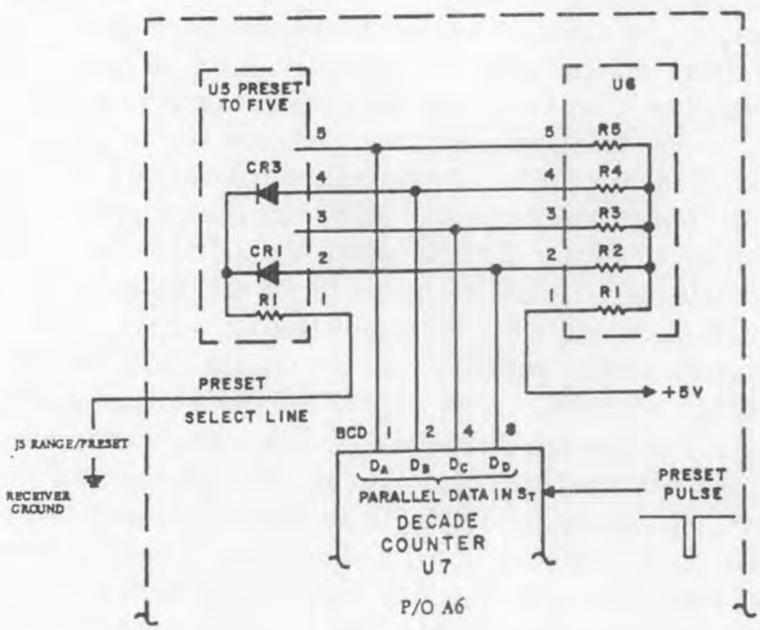


Figure 3-14. Preset Operation

from the gate generator drove S_T low, the parallel data would be loaded into the internal flip-flops. The preset number of five would be added to the value accumulated during the following count period. Components CR4, CR5, and R8 in Figure 6-11 form a preset isolator for U7. The components form an AND function that will allow the preset line to pull down the S_T input of U7 only if the preset selector line is low. Otherwise, a false count of BCD number 1111 would be loaded into U8 when the preset strobe goes low and a preset is selected for which this decade has no preset module.

3.6.4 REMAINING DECADES. - The third decade of counting is similar to the second decade. However, the preset isolation components are omitted and there are six preset modules. A low power decade counter IC is used. All following decades are similar to the third decade. The numeric indicator for the fourth decade displays a right hand decimal point on the vhf and uhf ranges (as in 999.999). This decimal is activated by a 0 at J3. The fifth decade displays a decimal point on the 0.1-50 MHz direct range (as in 50.000), in response to a 0 at J4. The direct range is used only for maintenance purposes.

3.7 <u>TYPE 79907 GATE GENERATOR AND DAFC (A5)</u>

The reference designation prefix for this module is A5; its schematic diagram is Figure 6-10. This card has two principal functions: a crystal oscillator and timing circuit generate waveforms to control the counting circuitry on board A6, and storage, comparison, and analog voltage generating circuits produce two dafc output voltages.

3.7.1 TIME BASE GENERATION. - Timing circuitry of the gate generator produces four output waveforms with three possible repetition rates. All waveforms are referenced to the output frequency of U10. This TCXO (temperature compensated crystal oscillator) is a sealed module that provides a highly stable 2 MHz output frequency. This frequency is divided down by a chain of scalers including decade counters U1 and U2 and J-K flip-flop U4A. Output waveforms are taken from this chain at three points. NOR gates in U5 select one of the three waveforms in response to range selection applied to pins 1, 2, B, and E. The output frequency from U5 is divided by a factor of 100 by U6 and U7. These two decade counters supply several BCD waveforms which are combined in NAND gates U8, U9, and U13 to produce the output timing pulses.

<u>Sampling Rate Selection</u>. Range selector lines from rear panel range/preset connector J5 control NOR gates in IC U5 to determine cycling rate of the output timing waveforms from this board. For example, during maintenance the 0.1-50 MHz direct range sampling rate is selected by a control line connected to module pin E. If this range is not selected, module pin E will be in an open circuit condition, which NOR gate U5C accepts as a logic 1. By the basic NOR function, if any input is high, the output must stand low. Therefore, U5C blocks the waveform from U3A. But if the 0.1-50 MHz direct range is selected, ground is applied to module pin E and U5C. With one input at a logic 0 state, the NOR gate acts as an inverter for data at the other input, and the waveform from U3A is passed on to U5D. It also passes the waveform as the outputs from U5A and U5B stand low because their respective ranges are inactive. On this range, the 2 MHz output of U10 has passed through U1, U2A, and

U3A for frequency division by a factor of 250, and it will pass from U5D through U6 and U7 for division by a factor of 100. The output from U7, which determines the basic sampling rate is thus ($2x10^6$ Hz)/(250) (100), or 80 Hz. This result is in accordance with the data tabulated in Table 3-2. Similarly, U5 B selects the output of U2B and U3B, both of which divide-by-2 to produce the 100 Hz sampling rate required on the 20-300 MHz vhf range. Gate U5A selects the output of U4A to produce the 50 Hz sampling rate required on the two uhf ranges. Inverters U13D and U13E with expansion diodes CR1 and CR2 are used to activate U5A. When the uhf ranges are inactive, R1 pulls the input of U13D up to a 1 state, which is doubly inverted and applied to U5A. Diodes CR1 and CR2 form an AND function to allow either of the two uhf control lines (module pins 1 and 2) to pull the input of U13D low while keeping the control lines isolated from each other. The low input this supplied to U5A by U13E activates the 50 Hz sampling rate. The output of U13E also connects via module pin A to count, decode, and display board A6 to activate preset B (for 60 MHz i-f frequency) when the uhf ranges and internal selection of preset are used. Inverter U13C provides a low output to enable the fourth decade decimal point of A6 on all but the 0.1-50 MHz direct range, when the range selector line directly enables the fifth decade decimal point.

Timing Waveforms. - The various waveforms that are combined to produce the output timing waveforms all include the BCD 8 from U7. This waveform determines the basic sampling rate. The waveform is asymmetrical with an 80/20 percent relationship of logic states. During the 80 percent portion, the counting period occurs. During the 20 percent portion, the reset, preset, and storage strobe functions occur. Figure 3-15 shows the various BCD waveforms which are combined to produce timing

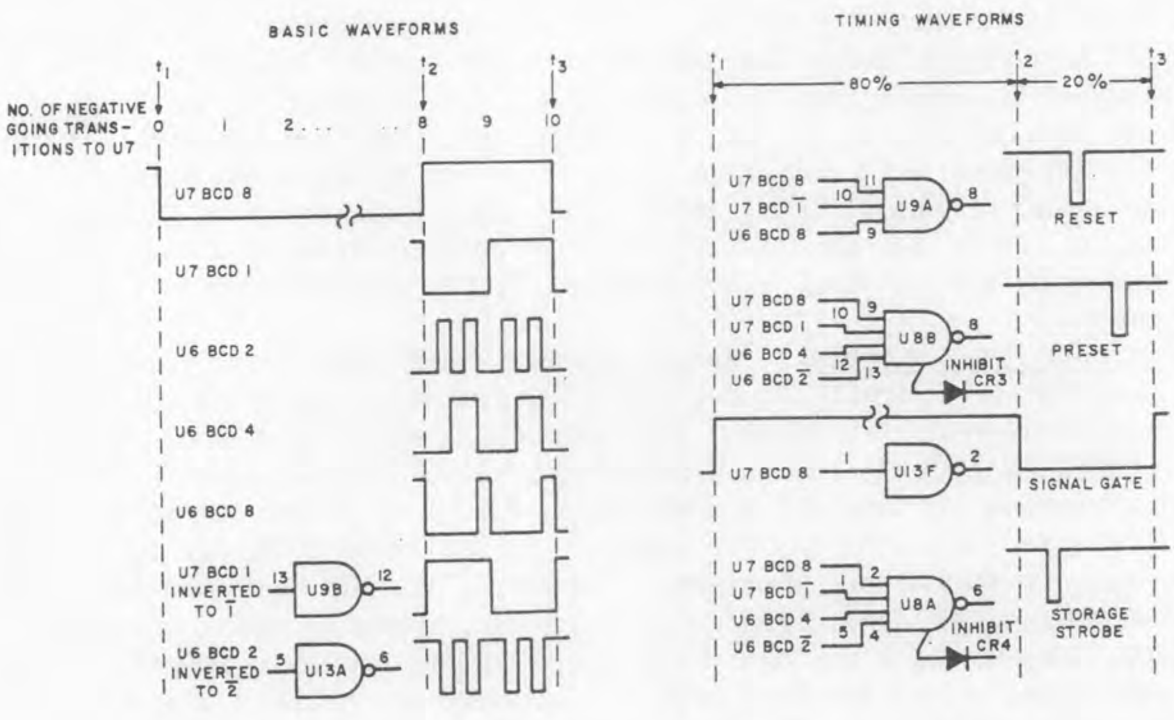


Figure 3-15. Timing Waveform Development

pulses. The U7 BCD 8 is combined with two other waveforms to produce the reset pulse. The inverter U7 BCD 1 divides the 20 percent portion of the U5 BCD 8 into halves, and is high during the first half. The U6 BCD 8 is high for 20 percent of the time that the two previous waveforms are high. When these three waveforms are combined and inverted in NAND gate U9A, the reset pulse is the result. To produce the preset pulse, the U7 BCD 8 waveform is combined with the U7 BCD 1 without inversion, which puts the output pulse in the latter half of the 20 percent portion of the U7 BCD 8. These waveforms are combined with the U6 BCD 4 and the inverted BCD 2 from U6 in NAND gate U8B to produce the negative going preset pulse. To provide the signal gate waveform, it is only necessary to invert the U7 BCD 8, and this is done by NAND gate U13F. To produce storage strobe pulses, the inverted U7 BCD 1 is again used, to locate the output pulse in the first half of the 20 percent portion of the U7 BCD 8. Otherwise the same BCD waveforms are used as were used to produce the preset. The waveforms are combined in U8A. All of these four output timing waveforms connect directly to module pins which route them to count, decode, and display board A6 to control its function. Provision is made for disabling the storage strobe and preset pulse if desired. Diode CR4 provides the inhibit function for the storage strobe (see Figure 6-10). The diode, which is necessary to establish proper logic levels, connects to an expansion node in U8A. In normal operation, the cathode of CR4 is pulled up to a 1 state by R3. But when board pin 4 is pulled low by pin F of rear panel BCD output connector J7, CR4 holds the expansion node in a 0 state. The storage strobe pulse stays high and no further updating of the storage elements occurs on count, decode and display card A6. This feature may be used when the external BCD output is being read out. Components CR3 and R2 perform a similar function for disabling the preset pulse. Resistor R11 on the main chassis sinks the inhibit line to ground when the rear panel preset switch is set to OFF.

3.7.2 DAFC CIRCUITRY. - The dafc circuitry on this board includes digital IC's to store the desired lock frequency for comparison with subsequent counts. Analog circuitry selects one of two correction speeds, generates up and down commands, and stores and buffers the two analog output voltages.

Data Storage and Comparison. - The dafc circuitry receives BCD data from the three least significant digits of count, decode, and display card A6. The lines of BCD data connect to storage elements U17 and U18 and to one set of inputs of digital comparators U16 and U15. The outputs of the storage elements supply the other sets of inputs to the comparators. When the front panel DAFC switch is set to one of the on positions, the state of module pin X changes from ground to open circuit. The S_T input of storage elements U17 and U18 accept this input as a 1 state. The storage elements then stop updating and store the BCD for the frequency present when the dafc was activated. The storage elements supply the four bits for the "A" word inputs of comparators U16 and U15. As count, decode, and display card A6 continues to update its count, the new count BCD supplies the "B" word inputs. If the tuned frequency of the operating tuner changes, the "B" word inputs change. The $A > B$ and $A < B$ outputs of the comparators indicate which of the input numbers--"A" word or "B" word--is greater. The outputs of U16 connect to the A_4 and B_4 inputs to expand the comparison greater than, equal to, or less than the value of the "B" data.

Direction Reversal. - The BCD 1 bit from the third digit of the readout is also stored. This bit determines whether the output from U15 will be inverted before reaching the analog portions of the dafc circuitry. This feature provides capability for reversing the direction of correction, which increases the error sensing range as described in paragraph 3.2.4 for Digital Comparison Circuitry. NAND gates U9C, U12D, and flip-flop U4B form a latch to store the BCD bit. The output of U19A gives an update/store command and data is entered into the latch at U9C pin 4. When the dafc is off, module pin X is at ground and the output of U19A is high, giving an update command. Gates U9C and U12D, with one input high, acts as inverters. Data entered into U9C is applied to the S input of flip-flop U4B. The opposite state is applied to the R input by U12D. Depending on the data entered, either S or R will be set low to determine the state of the Q output. When the dafc is on, the output of U19A goes low, giving a store command. Because both NAND gates have a low input, their outputs stand high. High state inputs have no effect on S and R of the flip-flop, so it remains in the previous state, storing its input data. Exclusive OR gate U11C receives both the stored third digit BCD 1 from U4B and the new count bit from module pin 12. If the bits are 11 or 00, the direction reversal command for the outputs of U15 is not needed. The output from U11C stays low, and the exclusive OR gates used as programmable inverters, U11A and U11B, pass their data without inversion. If the inputs to U11C are 01 or 10, direction reversal is required. The output of U11C will go high, and U11A and U11B will invert their input signals. Outputs of the programmable inverters connect to gates where duty cycle of the dafc correction is controlled.

Automatic Correction Speed Control. - The decision of whether rapid or delayed dafc correction will be enabled is made by components which process the outputs of U11A and U11B and control the duty cycle of data passing through U12B and U12C. Components U12A and Q1 charge or discharge capacitor C11 to cause rapid or delayed correction. Operational amplifier U14A acts as a high input impedance voltage follower to buffer the charge on C11. Output voltage of U14A is shifted to a voltage 0.7 V less positive than voltage at the non-inverting input by diode CR7 in the negative feedback path, and this output voltage effectively supplies a 1 or 0 to control exclusive OR gate U11D. This gate operates as a programmable inverter. Its input is a positive pulse with a two percent duty cycle, obtained by inverting the reset pulse in U19B. To explain operation of the circuit the rapid speed is first considered. This speed is initiated when a constant error exists between the stored lock frequency and the new count frequency, as indicated by the outputs of comparator U15. They will be in the 1 0 or 0 1 state. The outputs may be inverted in U11A and U11B, and will be inverted by U11E and U11F; regardless, the inputs to U12A will be in opposite states. With one input low, the output of U12A will be high, and it will charge C11 positively through R7. After about 1.3 seconds the charge on C11 will rise to a value which will cause the buffered output of U14A to be accepted as a 1 by U11D. The exclusive OR will act as an inverter, and the narrow positive input pulse will be inverted to a narrow negative pulse whose voltage is high 90 percent of the time. This waveform is applied to NAND gates U12B and U12C so that their output data to the analog voltage generating circuitry has a very high active duty cycle. Rapid correction will occur until the desired lock frequency is acquired, at which time Q1 will discharge C11. To explain this occurrence, consider that the actual counted frequency is higher than the lock frequency, so that the A < B output of U15 is in the 1 state. When rapid correction has acquired the desired lock frequency, the A<B output of U15 makes a transition from 1 to 0. At this time U11A and U11B will be operating in the non-inverting mode, so the output of U11E will make a transition from 0 to 1. Capacitor C9 and R5 differentiate this transition into a positive going spike which forward biases CR5 and momentarily causes Q1 to turn on. As Q1 conducts it quickly discharges C11 to ground. The output of U14A falls to a low voltage value which provides a 0 state to U11D. The exclusive OR gate now passes its input pulse without inversion, providing a narrow positive pulse to U12B and U12C, so that they can pass correction data for only 2 percent of the time. This is the delayed mode of operation. If the initial error frequency is below the lock frequency, the pulse to turn on Q1 will be provided by the output of U11F. Diodes CR5 and CR6 block the unwanted negative spikes produced when the initial error condition occurs and an output of U15 goes from 0 to 1.

Analog Voltage Generator. - Gates U12B, U12C, and U13B with transistors Q2 and Q3, convert the data originating in U15 into an analog control voltage which is stored in capacitors C13 and C14. The analog voltage may be negative or positive. Consider the case where the actual counted frequency is above the lock frequency, but with a small enough error so that U11A and U11B operate in the non-inverting mode. The A < B output of U15 will be in the 1 state. Gate U12B inverts this output to a low state, and pulls down the base of Q2 through current limiting resistor R8. Since Q2 is a PNP transistor with its emitter tied to +5 V dc, it is turned on by the low input. Collector current for Q2 follows a path through R12 to module pin 11, through the front panel DAFC switch, back into the module at pin 10, and into storage capacitors C13 and C14. In the SLOW position, the DAFC switch inserts a resistor in the current path to further increase the R12-C13-C14 time constant. The capacitors are polarized types connected back to back so that they can store either positive or negative voltage. In the case where the actual counted frequency is below the lock frequency, the A > B output of U15 will be in the 1 state. This output is doubly inverted in U12C and U13B to provide a high state to turn on Q3. Since Q3 has its emitter tied to -5 V dc, 5.6 V voltage breakdown diode R1 is required to shift the output of U13B to negative levels. The diode is held in the breakdown region by R10, and R9, which also limits Q3 base current. When Q3 conducts it charges C13 and C14 in a negative direction.

Buffer. - The charge stored in C13 and C14 is buffered by MOSFET Q4 to provide the mode 2 dafc output voltage. The extremely high input impedance of the MOSFET gate prevents leaking off the charge on the capacitors. Current for Q4 is provided by a constant current source consisting of Q5, CR8, and CR9. The diodes are forward biased from the -5 V dc supply by R15. The voltage drop across the two diodes is approximately 1.4 V dc. Since the drop across the base emitter junction of Q5 is about 0.7 V dc, approximately 0.7 V dc is applied to potentiometer R14. This potentiometer can be varied to set the current through itself and the collector of Q5. The collector supplies the source current to Q4. This current through the MOSFET is set to a value that will give zero offset voltage between gate and source. Then, when the front panel DAFC switch is set to OFF, grounding module pin 10, the dafc mode 2 output at module pin K will also be zero volts. Resistor R16 provides short circuit protection for the output at the Q4 source, and C15 filters noise from the dafc output line.

Mode Inverter. - Operational amplifier U14B produces the mode 1 output voltage by shifting the off voltage of mode 2 from 0 to +8 V dc, inverting the slope, and increasing the voltage swing. The IC is connected as a difference amplifier, comparing the incoming mode 2 voltage to a reference derived from the +5 V dc power supply by R22 and R23. The mode 2 voltage is applied to the inverting input of the operational amplifier through R19. Negative feedback is supplied by R20. The ratios of R19 to R20 and R22 to R23 determine the output voltage. Output is taken through current limiting resistor R21 and rf filter C16. In order to produce the large positive excursion required, U14B receives a +18 V dc supply voltage (Vcc 2) from a voltage multiplier composed of Q6 and CR13 through CR18.

Meter Shaper. - Diode CR10 with R17 and R18 shapes the voltage to the tuning correction meter so that needle swing more accurately represents the degree of dafc frequency correction produced by the varactor in the local oscillator of the associated tuner. When the dafc mode 2 voltage is positive and the voltage drop across R18 exceeds about 0.3 V dc, CR10 begins to conduct to supply additional current to the meter through R17. This causes the meter needle to swing more rapidly to end-of-scale as the dafc correction voltage continues to increase.

Voltage Multiplier. - Transistor Q6 and diodes CR13 through CR18 are used to produce Vcc 2, the +18 V dc supply required by dafc mode inverter U14B. Transistor Q6 and inductor L1 produce a 10 V p-p square wave at the transistor collector which serves as the ac input to the voltage multiplier diodes. When the transistor is driven into conduction, it provides approximately zero volts at its collector, to establish the amplitude of the negative going half cycle of the ac waveform. Inductor L1 conducts heavily from Vcc 2, the +5 V dc supply. When the transistor cuts off, the energy stored in L1 attempts to maintain current flow in the same direction. Since L1 now serves as a current source rather than a load, the voltage of the Q6 collector swings up to a positive voltage. This voltage equals the voltage formerly impressed across the coil, plus the voltage to which one end of the coil is clamped, for a total of +10 V. The square-wave peak voltages are thus zero volts and +10 V. The voltage multiplier consists of five sections, CR13-CR19, etc., each of which half wave rectifies the ac. Each section produces a dc voltage equal to one half the peak-to-peak amplitude of the ac input signal and adds its rectified voltage to the voltages produced by the preceeding sections. For example, when the voltage at the collector of Q6 swings positive, C19 is charged through CR13. When the collector swings low, C21 is charged through CR14. The voltage at the cathode of CR14 represents the sum of the charges on the two capacitors. This voltage is added to the charges produced by the following stages, and the voltage produced at the cathode of CR17 is several times the peak value of the input waveform. At filter section CR18-CR25 the output voltage of approximately +18 V dc is available.

3.8 TYPE 791594 INTENSITY CONTROL (A4)

Refer to Figure 6-9 for the schematic diagram and to Figure 5-14 for the location of components. In essence, this board provides a pulse-width-modulated +5 V dc output at pin E5 which is synchronized to an input pulse at E1. The pulse width of the 5 V output is determined by an external potentiometer connected between pins E3 and E4.

Integrated circuit U1 is a monostable timing device whose input is derived from the signal gate. The main function of U1 is to provide and stabilize a 40 ms pulse width which is determined by R1 and C1.

This identical pulse width appears at pin 2 of monostable timing device U2. This device is similar to U1 but its timing interval is variable ranging from 6 ms to 36 ms. The controlling network responsible for this variable range is capacitor C4 and the series resistance network consisting of R2 and a main chassis potentiometer.

The variable output of U2 drives buffer amplifier Q1-Q2 which isolates any unwanted effects of the preceding stage. This configuration provides a 5 V, 600 ma output.

3.9 POWER SUPPLIES

Modules U1 and U2 provide regulated positive and negative five volts for the frequency counter circuits. These two regulators obtain their input voltages from rear panel connector J1. Fuse F1 protects the +5 V dc power supply from overloads. The -5 V dc supply operates at a lower current and depends on its -15 V dc source in the companion Receiver Unit for protection.

NOTES

SECTION IV
MAINTENANCE

4.1 GENERAL

The Display Unit 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 preventative maintanance operations recommended. Intervals for the operations should be based on the operating environment. Should trouble occur, repair time will be minimized if the maintenance technician is familiar with Section III of this manual, in which the circuits are described, and with the schematic diagrams found in Section VI. Reference should also be made to the troubleshooting and maintenance procedures contained in this section. A complete parts list and illustrations showing parts locations can be found in Section V. Figure numbers are given at some steps in the procedures.

4.2 CLEANING AND LUBRICATION

The unit should be kept free of dust, moisture, grease and other foreign matter to ensure trouble-free operation. If available use low-pressure compressed air to remove accumulated dust from the exterior and interior. A clean dry cloth, a soft bristled brush, or a cloth saturated with cleaning solution may also be used. Do not lubricate gear teeth in the tuning drive assemblies. Be sure to keep solvents away from the meter face and crt graticule face.

4.3 INSPECTION FOR DAMAGE OR WEAR

Many potential or existing troubles can be detected by a visual inspection of the unit. For this reason, a complete visual inspection should be made for indications of mechanical and electrical defects on a periodic basis, or whenever the unit is being checked for a reported trouble. Electronic components that show signs of deterioration should be checked and a thorough investigation of the associated circuitry should be made to verify proper operation. Mechanical parts should be inspected for excessive wear, looseness, misalignment, corrosion, and other signs of deterioration.

4.4 TEST EQUIPMENT REQUIRED

Two tables of recommended test equipment appear in this section, one for the signal monitor portion of the Display Unit, the other for the frequency counter portion. Although these two assemblies share the same main chassis, they do not inter-relate in any functional manner. Throughout this maintenance section, all operations maintain this separation. The equipment recommended in these tables have been chosen for their wide availability and general knowledge of their operating characteristics. For a more exact indication of the required operating characteristics, rely on the required characteristics columns. These specifications do not reflect the actual characteristics of the recommended equipment, but instead are the minimum requirements needed to perform the maintenance. Procedures have been written so that substitutions of test equipment may be made with a minimum of trouble to the maintenance technician.

Table 4-1. Signal Monitor Test Equipment

ITEM	EQUIPMENT TYPE	REQUIRED CHARACTERISTICS	RECOMMENDED EQUIPMENT
1	Digital Multimeter	Input voltage: 0-250 V dc 0-10 V ac	Fluke Model 8100A
2	Frequency Counter	Input frequency: 10-40 MHz Sensitivity: 50 mV	Hewlett Packard Model 5381A
3	Oscilloscope	Bandwidth: dc-500 kHz Vert. sens.: 3 mV/cm Horiz. input: for sweep sawtooth	Tektronix Models: 5403 Mainframe D40 Display Unit 5A15N Vert. Amp. 5B10N Horiz. Amp.
4	Signal Generator	Output frequency: 12-35 MHz Output level: 5 μV-500 mV Modulation: cw only	Hewlett Packard Model 608E
5	Sweep Generator	Output frequency: 10-25 MHz Output level: -70 dBm to -10 dBm	Hewlett Packard Models: 8690B Mainframe 8698B Plug-in
6	Receiver Unit	Compatibility with the WJ-9026/DU	Watkins-Johnson Type WJ-9026/RU
7	High Voltage Probe	Input voltage: 500-1500 V dc	Fluke Model 80F-5
8	System Interconnection Cables	Compatible with WJ-9026/RU and WJ-9026/DU	Watkins-Johnson WJ-9026 System Interconnection
9	Assorted Test Cables and Connectors	Depends on the test equipment used for maintenance	As required

4.5 SIGNAL MONITOR TROUBLESHOOTING

Troubleshooting is divided into signal monitor problems and frequency counter problems. If both units malfunction at the same time, problems with the WJ-9026/RU should be suspected. This could relate to power supply problems or to signal processing within the Receiving Unit. Refer to Table 4-2 for signal monitor problems.

Table 4-2. Signal Monitor Troubleshooting

Symptom	Probable Cause	Isolation Procedure
No trace on crt.	Intensity control.	Rotate clockwise.
	Vertical control.	Rotate and observe for trace.
	Power circuits	See paragraph 2.6.1.
	Vertical deflection amplifiers.	See paragraph 4.7.1
	Horizontal deflection amplifiers.	See paragraph 4.7.1
	Sawtooth generator	Test for sawtooth at A2U1.
	Tube biasing	Measure voltages shown on main chassis schematic.
No signal pips on crt screen.	Input amplifier A1A1	Inject 12.7 MHz cw signal into A1A2. Baseline should move vertically.
	Sweep oscillator A1A1	Turn markers on and inject 34.1 MHz signal into A1J3. Base line should move vertically.
	IF Amplifier A1A2	Inject 12.7 MHz cw signal into A1A3. Baseline should move vertically.
	Output amplifier A1A3	Inject 1 V dc into A2E13. Baseline should move vertically to about full scale.
		Turn markers on and inject 34.1 MHz signal into A1J3. Base line should move vertically.

Table 4-2. Signal Monitor Troubleshooting (Continued)

Symptom	Probable Cause	Isolation Procedure
No horizontal trace on crt, but single dot present which deflects vertically in presence of signals.	No sawtooth to A2Q3	Use oscilloscope to test for sawtooth at base of A2Q3.
No marker pips on crt screen, switch on	Marker switch S1 defective or cable W2 defective	Check for 15 V dc at A3C1; check cable.
Signal display spectrum inverted on crt	Wrong sweep reverse voltage to Display Unit	With receiver in BAND 1 or 2, the voltage to A2E15 should be -15 V dc; in BAND 3 or 4, this input floats.
	A2Q10 defective	Check FET A2Q10
Center frequency drifts	Thermal resistor RT1 defective	Replace
	Voltage regulator diode VR1 defective	Replace
	Sweep oscillator A3A2 defective	Substitute tank circuit components; replace sweep oscillator assembly.
Overloads on strong signals	AGC Circuits on A1A1	Check A1A1Q1 for agc voltage at pin 2 with high level signal input to signal monitor
Spurious signals on crt	Poor i-f rejection	Check tuning of 12.7 MHz i-f trap on input of i-f amplifier A1 (L1, C1, C3).
Only LOG mode defective	A1A3U2 defective or not receiving an input; A1C13 not being grounded	Check for input signal at A1C15; verify ground at A1C13 in LOG mode; replace A1A3U2
Only LIN mode defective	A1C14 not being grounded	Verify ground at A1C14 in LIN mode

4.6 SIGNAL MONITOR PERFORMANCE TESTS

These tests can be used to determine if the Display Unit operates properly as part of regularly scheduled maintenance or when a problem is thought to exist. Paragraphs 4.6.1 pertains to the signal monitor portion of the Display Unit. The frequency counter performance tests are in paragraph 4.8. If the performance tests are being used to isolate a problem, also refer to the troubleshooting information to obtain additional guides to aid in the process.

4.6.1 SIGNAL MONITOR PERFORMANCE TESTS. - Tests in this sequence include sweep width, sweep linearity, marker oscillator frequency, and resolution. Proceed as follows:

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

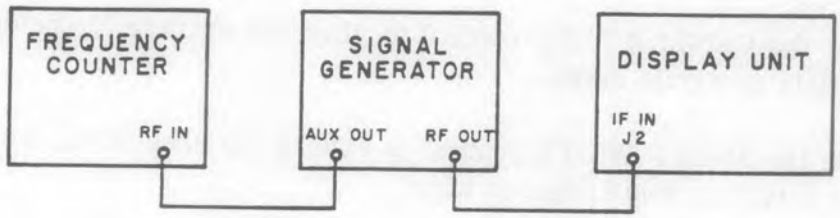


Figure 4-1. Test Setup, Signal Monitor Performance Tests

(2) Set the signal generator controls for a 21.4 MHz cw output. Set the output level to approximately 20 μV.

(3) On the Display Unit, set the signal monitor controls as follows:

a. SWEEP WIDTH: maximum clockwise
b. LOG-LIN: to LIN
c. GAIN: maximum counterclockwise
d. MARKERS: ON
e. INTENSITY: for a visible trace
f. FOCUS: for a sharp trace

(4) Use the CENTER FREQ control to position the middle marker under the center graticule mark.

(5) Turn the MARKERS switch off.

(6) Adjust the GAIN control for a full-scale deflection of the input signal.

(7) Decrease the signal generator output frequency until the pip on the crt is centered behind the third graticule mark to the left of center. Record the frequency counter indication.

(8) Increase the output frequency until the pip is centered behind the third graticule mark to the right of the center mark. Record the frequency counter indication.

(9) Subtract the frequency recorded in step 7 from the frequency recorded in step 8 to determine the maximum sweep width. The frequency difference should be in the range of 3.0 MHz to 3.3 MHz.

(10) To verify the proper sweep linearity, the frequency recorded in step 7 should be in the range of 19.750 MHz to 20.050 MHz; in step 8 it should be in the range of 22.750 MHz to 23.050 MHz.

(11) Turn the signal monitor GAIN control maximum counterclockwise. Turn the MARKERS switch ON.

(12) Use the CENTER FREQ control to align the marker pip behind the middle graticule mark.

(13) Use the SWEEP WIDTH control to expand the base of the marker pip until it is two divisions wide.

(14) Rotate the signal monitor GAIN control clockwise until the signal generator pip is the same height as the center marker pip. Turn the marker off and then on again to observe the two heights.

(15) Adjust the signal generator frequency for a zero beat with the center signal monitor marker.

(16) The indication on the frequency counter at zero beat should be 21.4 MHz ±3 kHz. This assures that the marker oscillator frequency is within tolerance. Record the frequency for use in steps 17, 18, and 20.

(17) Tune the signal generator to each of the two 100 kHz markers (21.3 and 21.5 MHz), carefully zero-beating with each marker. They should be at 100 kHz ±200 Hz of the center frequency marker recorded in step 16.

(18) With the 21.4 MHz marker, two divisions wide at the base, tune the signal generator frequency until the dip between the 21.4 MHz marker and the signal generator signal is 0.5 of the peak signals as shown in Figure 4-2.

(19) Record the frequency counter indication.

(20) Subtract the frequency recorded in step 16 and the frequency recorded in step 18. This difference should be less than 10 kHz to

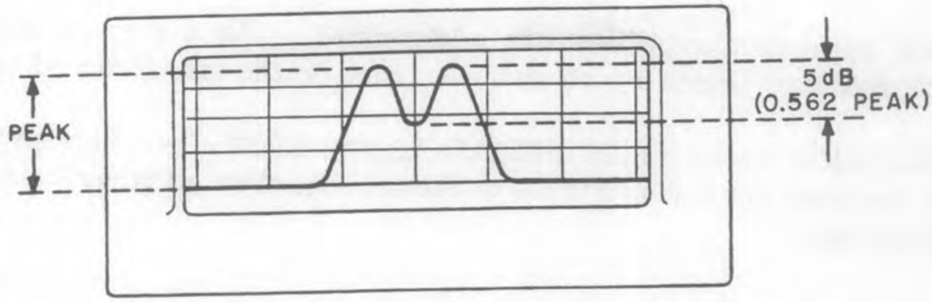


Figure 4-2. Typical Response, Signal Monitor Resolution Test

assure that the signal monitor has proper resolution.

(21) Perform steps 22 through 29 to determine if signal monitor gain and response flatness are within specification.

(22) Set the SWEEP WIDTH maximum clockwise, the LOG/LIN switch to LIN, the MARKERS switch off, and the GAIN maximum clockwise.

(23) Set the signal generator output level for a pip that is about 3/4 height on the screen.

(24) Tune the signal generator through the range of 19.9 MHz to 22.9 MHz while observing for minimum and maximum heights of the pip.

(25) Set the signal generator frequency so the pip is at the maximum height point noted. Adjust the output level for full scale deflection of the pip and record the signal generator level in dB.

(26) Set the signal generator output frequency so the pip is at the minimum level noted in step 24. Adjust the output level so the pip is at full scale.

(27) The output level established in step 26 should be a maximum of 3 dB greater than the level recorded in step 25.

(28) Set the front panel switch to LOG and repeat steps 23 through 27, except that the maximum difference should be no greater than 4 dB.

(29) Return the LOG/LIN switch to LIN, set the signal generator to -81 dBm (20 μV) and observe that the pip is at full scale or greater. This completes the signal monitor tests.

4.7 SIGNAL MONITOR ALIGNMENT

These procedures assume that the signal monitor requires a complete alignment. If this is true, the trace may not be present on the crt because the horizontal and vertical deflection amplifiers are misadjusted. As a starting point, then, the alignment procedure begins by obtaining a trace on the crt. Proceed as follows:

4.7.1 DEFLECTION AMPLIFIERS INITIAL ADJUSTMENT. - This procedure is required only for units not having a trace on the screen. For all other units, continue to the next paragraph.

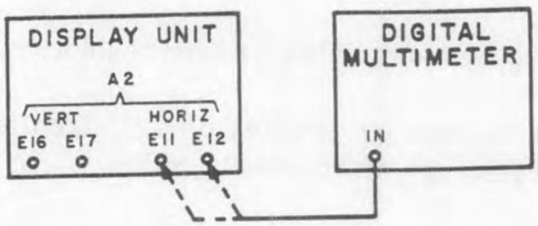


Figure 4-3. Test Setup, Signal Monitor Deflection Amplifier Initial Alignment

(1) Set the Signal Monitor front panel controls as follows:

a. VERT: to midrange
b. HORIZ: to midrange
c. FOCUS: to midrange
d. INTEN: fully clockwise (see warning)
e. MKR: to off
f. LIN-LOG: LIN
g. CTR FREQ: to midrange
h. GAIN: fully counterclockwise
i. SWP WD MHz: anywhere

WARNING

Never leave the intensity control at full brilliance when the trace is concentrated in a single area on the crt. Permanent damage may occur to the phosphor.

(2) On control board A2, set vertical control potentiometers R41 and R59, and vertical gain potentiometer R34 to midrange.

(3) Set the digital multimeter to measure 200 V dc. Then on control board A2 adjust horizontal width potentiometer R20 to obtain an identical voltage level at horizontal outputs E11 and E12.

(4) Slowly vary the front panel VERT (vertical) control while observing for a trace on the crt screen. Be sure to reduce the INTEN (intensity) control when the trace appears. If the trace cannot be made to appear, measure voltages at vertical outputs E16 and E17 while varying the VERT control for equal levels.

(5) With horizontal and vertical outputs balanced, and with the intensity at full level, a trace should be present. If not, refer to the troubleshooting section.

4.7.2 SWEEP RATE BALANCE AND CALIBRATION ADJUSTMENTS. - This procedure establishes the sawtooth repetition rate generated by transistors Q1 and Q2 on control board A2, and provides for the adjustment of sweep balance R7 and sweep calibrate R10. Proceed as follows:

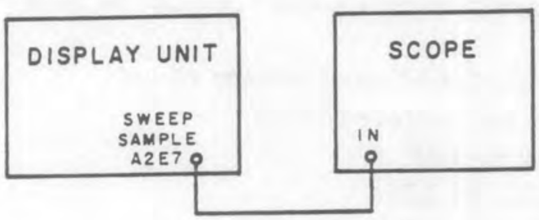


Figure 4-4. Test Setup, Sweep Rate Calibrate

(1) Set up the oscilloscope for observing a 5.5 ms recurring waveform, having a peak-to-peak level of about 10 volts.

(2) Adjust sweep rate calibrate potentiometer R4 on the control board to obtain a 5.5 ms (18 Hz) sawtooth waveform on the oscilloscope.

(3) Ground the oscilloscope input and establish a zero volt reference on the x-axis. Then, establish a vertical sensitivity sufficient to observe a 10 V p-p waveform.

(4) Obtain the sawtooth waveform on the oscilloscope; then, on control board A2, adjust sweep balance R7 and sweep calibrate R10 to obtain a 10 V p-p sawtooth centered on the zero reference established on the x-axis.

(5) Adjust the front panel HORIZ control and horizontal width control R20 on the control board to obtain a trace that extends just beyond the full width of the crt screen. This completes this series of adjustments.

4.7.3 VERTICAL STAGES 12.7 MHz IF AMPLIFIER ALIGNMENT. - Use this procedure to align vertical i-f amplifiers from the output of the mixer in input amplifier A1A1 to the detector in output amplifier A1A3. Proceed as follows:

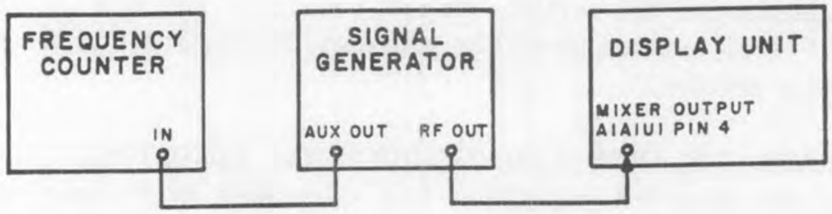


Figure 4-5. Test Setup, 12.7 MHz IF Amplifier Alignment

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

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

a. VERT: for baseline at bottom of crt
b. HORIZ: for centered trace
c. MKR: turned off
d. LOG-LIN: to LIN
e. CTR FREQ: anywhere
f. GAIN: fully counterclockwise
g. SWP WD MHz: anywhere

(3) Remove the local oscillator input cable at A1J3.

(4) Set the signal generator to 12.700 00 MHz, cw, at a level just sufficient to cause the base line on the crt to shift upward about half scale.

(5) Adjust the following components for maximum vertical deflection of the base line while reducing the signal generator output level to maintain the trace on the screen. Readjust to obtain maximum gain.

a. Output amplifier A1A3: coils L1 and L2
b. 8 kHz BW i-f amplifier: coils L1 and L2
c. Input amplifier: capacitor C21.

(6) Reconnect the local oscillator cable to A1J3. This completes these adjustments.

4.7.4 VERTICAL STAGES 21.4 MHz IF AMPLIFIER ALIGNMENT. - Touch-up alignment of this wideband stage can be performed by tuning a signal generator on either side of 21.4 MHz while observing the pip height on the crt. If completely misaligned, this stage may require sweep alignment to regain optimum performance. Proceed as follows:

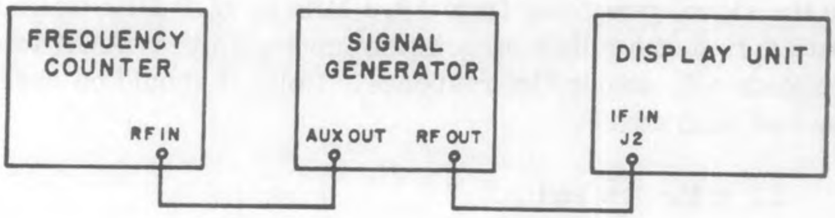


Figure 4-6. Test Setup, 21.4 MHz IF Amplifier Touch-Up Alignment

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

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

a.	VERT.	for baseline at bottom of crt
b.	HORIZ	for centered trace
c.	MKR	to ON
d.	LOG-LIN.	to LIN
e.	CTR FREQ.	to center markers
f.	GAIN	fully clockwise
g.	SWP WD MHz	fully clockwise

(3) After the markers are centered on the crt, turn them off.

(4) Set the signal generator to 21.4 MHz at a level to give a pip at about 3/4 scale.

(5) Tune the signal generator through the range of 20.4 MHz to 22.4 MHz observing for symmetry, and the minimum and maximum pip heights.

(6) Set the signal generator frequency so the pip is at the maximum-height point noted. Adjust the signal generator output level for full-scale deflection of the pip. Then record the output level in dB.

(7) Set the signal generator frequency so the pip is at the minimum-height point noted in step 5. Increase the output level so the pip is at full scale.

(8) The output level should have increased no more than 3 dB from the level recorded in step 6. If this specification is met, the wideband stage of the input amplifier does not require alignment. Otherwise proceed to step 9.

(9) If the 3 dB flatness specification in step 8 was not met, set the signal generator output level to obtain a mid-gain pip height of 3/4 scale.

(10) Tune the signal generator from 19.9 MHz to 22.9 MHz while making adjustments to the following coils on input amplifier A1A1 to obtain a symmetrical, nearly flat response. Roll off should be observed at the two band edges.

a. L1 at the low end
b. L4 at midband
c. L3 at the high end

(11) Repeat steps 4 through 8 to measure flatness of the response: if this touch-up procedure does not bring the response within tolerance, proceed to the sweep alignment in paragraph 4.7.5.

4.7.5 VERTICAL STAGES 21.4 MHz IF AMPLIFIER SWEEP ALIGNMENT. - Perform this alignment when the touch-up method in paragraph 4.7.4 fails. Proceed as follows:

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

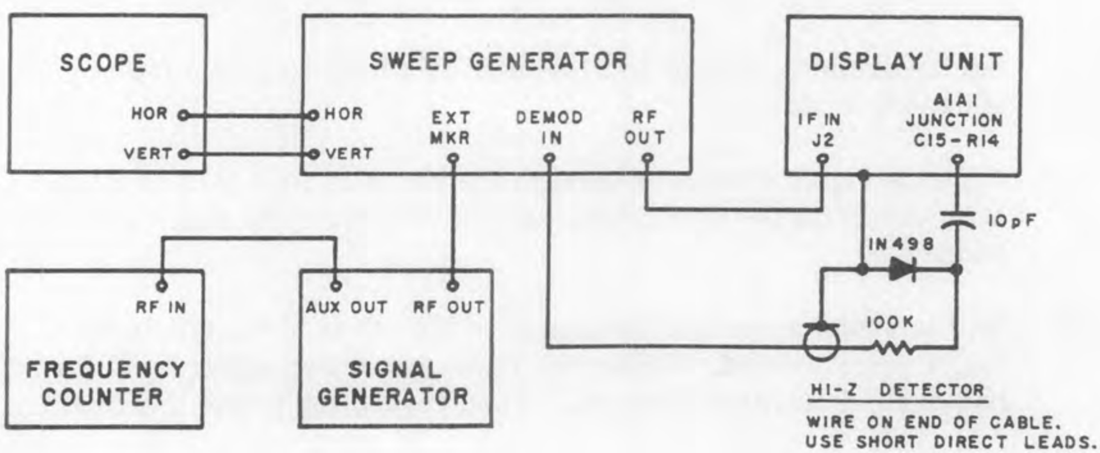


Figure 4-7. Test Setup, 21.4 MHz IF Amplifier Sweep Alignment

(2) Tune the signal generator to 21.4 MHz, cw, at a level to produce a convenient marker.

(3) Tune the sweep generator center frequency to 21.4 MHz, at a level of -25 dBm (12 mV). Establish a sweep width of about 5 MHz.

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

(5) Adjust coils L1, L3, and L4 on input amplifier A1A1 to obtain a detector response like that shown in figure 4-8. Then disconnect the high impedance detector.

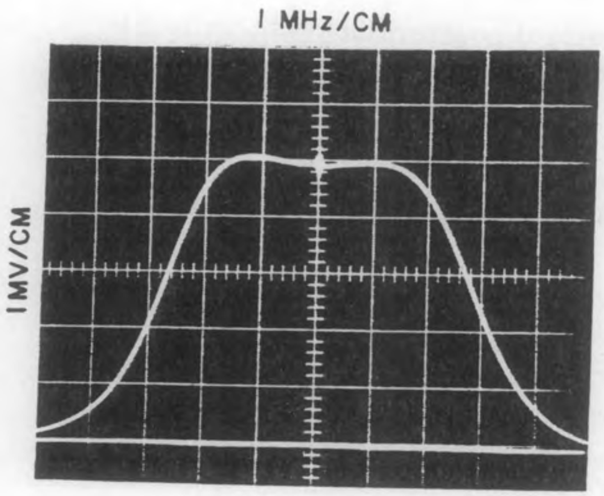


Figure 4-8. Typical Response, 21.4 MHz Vertical Amplifier

(6) Perform steps 1 through 8 of paragraph 4.7.4 to determine if the response is sufficiently flat to meet specifications. If not, continue with that procedure to touch up the response. Otherwise, this sweep alignment procedure is complete.

4.7.6 SWEEP OSCILLATOR AND FREQUENCY LINEARITY ADJUSTMENTS. - Perform these adjustments to ensure that the sweep oscillator centers at 34.1 MHz with the sawtooth properly shaped to provide linear response.

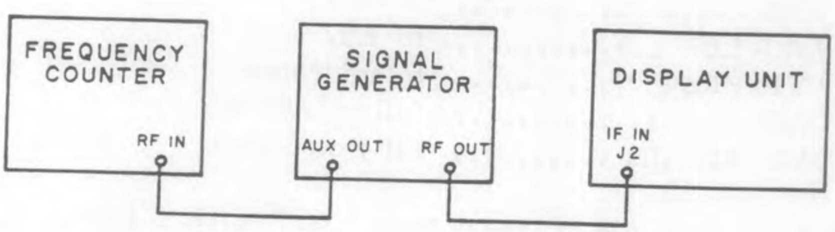


Figure 4-9. Test Setup, Sweep Oscillator and Frequency Linearity Adjustments

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

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

a. VERT............... for baseline at bottom of crt
b. HORIZ.............. for centered trace

c. MKR .... to ON
d. LOG-LIN .... to LIN
e. CTR FREQ.......... to midrange
f. GAIN .... fully clockwise
g. SWP WD MHz .... fully clockwise

(3) Slowly rotate the SWP WD MHz control counterclockwise while adjusting A3A2C14 to maintain the center frequency marker aligned behind the middle graticule line.

(4) Alternately, set the signal generator to 19.9 MHz and 22.9 MHz while adjusting the SWP WD MHz control to establish a 3 MHz sweep width.

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

(6) Adjust sawtooth shaper A2R55 to establish best linearity of the 500 kHz interval pips behind the graticule. Repeat steps (4) through (6) to minimize the interaction. Otherwise, this ends the procedure.

4.7.7 SIGNAL MONITOR OVERALL GAIN ADJUSTMENTS. - This procedure establishes the overall gain for the vertical related circuits in the signal monitor.

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

a. VERT .... for baseline at bottom of crt
b. HORIZ .... for centered trace
c. MKR .... to OFF
d. LOG-LIN .... to LIN
e. CTR FREQ .... to midrange
f. GAIN .... fully clockwise
g. SWP WD MHz .... fully clockwise

(2) Inject 1 V dc at A2E13, the control board vertical input.

(3) Adjust vertical gain potentiometer A2R34 for a full scale deflection of the crt base line.

(4) Connect the equipment as shown in Figure 4-1; set the signal generator to 21.4000 MHz, cw, at a level of -87 dBm (10 μV).

(5) On 8 kHz i-f amplifier A1A2, rotate gain control potentiometer R8 fully clockwise for maximum gain, then back it off about one-eighth turn.

(6) On output amplifier A1A3, rotate output level set potentiometer R47 fully clockwise for maximum output, then set linear gain potentiometer R25 to obtain a full scale deflection of the signal generator pip.

(7) Set the LOG-LIN switch to LOG.

(8) Set the signal generator output level to -65 dBm (128 μV).

(9) On output amplifier A1A3, set logarithmic gain control potentiometer R24 for a signal pip height at the first horizontal graticule line up from the base line.

(10) Set the signal generator output level to -95 dBm (4 μV).

(11) On output amplifier A1A3, set logarithmic gain control potentiometer R28 for a signal pip height at full scale.

(12) Repeat steps (8) through (11) until the interaction is minimized.

(13) If the previous conditions cannot be met, make slight adjustments to vertical gain potentiometer A2R34, i-f amplifier A1A2 gain control potentiometer R8, and output amplifier A1A3 potentiometer R47.

4.8 FREQUENCY COUNTER PERFORMANCE TESTS

Table 4-3 lists all test equipment needed for the Performance Tests, Troubleshooting and the Alignment and Adjustment Procedures.

Table 4-3. Frequency Counter Test Equipment

ITEM	EQUIPMENT TYPE	REQUIRED CHARACTERISTICS	RECOMMENDED EQUIPMENT
1	Digital Multimeter	V dc, High 2	Fluke 8100 A
2	Digital Recorder	24 line handling capability of BCD Data	HP-5050B
3	Frequency Counter	1.00 MHz, 1.5 MHz, 21.4 MHz	CMC 738A
4	Oscilloscope	To 1060 MHz	HP 180 + 1801A
5	Signal Generator	1.00 MHz, 1.50 MHz	HP 606B
6	Signal Generator	10-455 MHz	HP 608E

Table 4-3. Frequency Counter Test Equipment (cont'd)

ITEM	EQUIPMENT TYPE	REQUIRED CHARACTERISTICS	RECOMMENDED EQUIPMENT
6	Signal Generator	10-455 MHz	HP 608E
7	Signal Generator	450-1000 MHz	HP 612A
8	Stop Watch	--	Micronta-Model 63-635
9	Sweep Generator	18-1100 MHz	Wavetek 2001
10	WJ-9026/ Receiver Unit	--	WJ-9026/ Receiver Unit

4.8.1 GENERAL. - Selected performance tests for the Counter are presented in the following paragraphs. The tests are useful in determining that performance is adequate to meet performance standards. The tests are also of value in troubleshooting, and can be used to verify satisfactory performance of a repaired unit. If the limits and tolerances specified cannot be met, refer to the alignment and adjustment procedures in subsection 4.10.

4.8.2 EQUIPMENT REQUIRED. - The following instruments, or their equivalents, are required to execute performance tests on the frequency counter:

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

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

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

(4) Oscilloscope, Hewlett Packard Model 180A, with Model 1801A Dual Channel Vertical Amplifier and 1821A Time Base.

(5) Digital Multimeter, Fluke 8100A.

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

(7) WJ-9026/Receiver Unit.

(8) External readout or printout device capable of handling 24 lines of positive true 1248 BCD data at TTL logic levels, such as Digital Recorder, Hewlett Packard Model 5050B.

(9) Stopwatch, Micronta Corporation Model 63-635.

(10) Assorted cables and connectors.

4.8.3 SENSITIVITY. - These tests determine that the Display Unit produces stable indications for all its rated input frequencies and levels.

4.8.3.1 Initial Equipment Setup. -

Figure 4-10. Test Setup, Count Input

(1) Refer to Table 4-4 to determine the proper test frequencies. Interconnect the counter and the signal generator as shown in Figure 4-10.

Table 4-4. Counter Test Frequencies

Test Frequency MHz	28	50	100	250	500	750	1000	1060
Minimum Sensitivity mV	35	35	35	35	35	35	35	35

(2) Set the receiver BAND switch to the range associated with the test frequency. Set the rear panel preset switch of the counter to OFF.

4.8.3.2 Test Operations. -

(1) Refer to Table 4-4 to determine test frequencies for sensitivity checks. Successively tune the signal generator to the frequencies listed.

(2) At each frequency, adjust the output attenuator of the signal generator for a decreasing signal amplitude to determine the lowest level that will enable stable counting. The level must not exceed the minimum sensitivity level shown by the table.

(3) Increase the signal generator output to 500 mV overload test level.

(4) Successively tune the signal generator to the test frequencies shown in the table. At each frequency, verify that stable counting can be obtained.

4.8.4 NUMERICAL SEQUENCE. - This test verifies that all characters for each digit position of the display of the counter unit readout are in correct sequence. Proceed as follows:

4.8.4.1 Initial Equipment Setup. -

(1) Interconnect the counter and a signal generator as shown in Figure 4-10.

(2) Set the front panel BAND switch of the receiver to position 1 (26-90 MHz). Set the Display Unit internal Preset switch E3 to external.

(3) Set the signal generator controls for a cw output signal at 26 MHz with a level of 50 mV rms.

4.8.4.2 Test Operations. -

(1) Slowly tune the signal generator upward in frequency to 90 MHz. Observe each digit of the display, beginning with the least significant digit. Each digit should display the characters 0 through 9 in sequence, except 0 through 5 for the most significant digit. Characters should be brightly lit and legible.

(2) Set the receiver BAND switch to position 2 (90-300 MHz) and tune the signal generator from 90 to 300 MHz while observing the most significant digit for stable readout.

(3) Set the receiver BAND switch to position 4 (500-1000 MHz).

(4) Vary the input signal frequency from 500 to 900 MHz and verify that the most significant digit displays the characters 5 through 9 in sequence.

4.8.5 PRESETS. - This test determines that the counter activates the proper preset numbers to provide a frequency offset for the readout.

4.8.5.1 Initial Equipment Setup. -

(1) Remove any connections to LO input jack J8 of the counter.

(2) Disconnect plug P7 of cable W5 from prescaler A7. This isolates the count, decode, and display circuits.

Table 4-5. Counter Preset Test Data

PRESET DESIGNATION	*INTERNAL PRESET RANGE		J5 PIN___ EXTERNAL PRESET	PRESET NUMBER
a	26-300	BAND 1 OR 2	J	978.600
c	NOT USED		G	992.000
d	NOT USED		H	900.000
b	235-500 500-1000	BAND 3 OR 4	F	940.000

* frequency in MHz

4.8.5.2 Internal Presets. - Preset a is activated when the Receiver BAND switch is in position 1 (26-90 MHz) or position 2 (90-300 MHz). Preset b is activated when the BAND switch is in positions 3 or 4 (235-500 MHz or 500-1000 MHz, respectively). Refer to Figure 4-1 of the Receiver Unit manual for the switching arrangement.

Test Operations. -

(1) Using the front panel BAND switch, successively select BAND 1 and 2. Then select BAND 3 and 4.

(2) Verify that the corresponding numbers shown in the "Preset Number" column are obtained. To verify presets c and d, remove the range/preset cable from connector J5 on the Display Unit and ground the appropriate external preset pin.

(3) Reconnect the cable to prescaler A7.

4.8.6 READOUT ACCURACY. - This test determines that the maximum readout error of the counter is ±1 count of the least significant digit for the highest input frequency ever applied to the basic counter.

4.8.6.1 Initial Equipment Setup. -

(1) Interconnect the counter with a low-frequency signal generator and the test counter as shown in Figure 4-11.

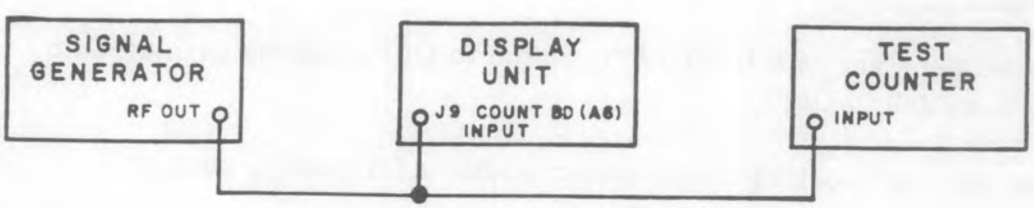


Figure 4-11. Test Setup, Counter Readout Accuracy Test

(2) Remove the range/preset cable from J5 of the Display Unit. Set the preset switch to OFF. Ground pin e of J5.

(3) Tune the signal generator to approximately 50 MHz. Set the attenuator for an output of 500 mV rms.

(4) Set the range switch of the test counter to measure 50 MHz, with maximum resolution.

(5) Energize all equipment and allow one half hour of warmup for frequency stabilization.

4.8.6.2 Test Operations. -

(1) Observe the readouts of the two counters. Note that the least significant digit of the test counter represents at least 10 Hz, while the least significant digit displayed by the counter is 100 Hz.

(2) Verify that the two counters agree in readout frequency to within 100 Hz.

4.8.7 DAFC TESTS. - These tests assure that the dafc circuits can achieve lock to a desired frequency and provide proper correction voltages and correction rates. Proceed as follows:

4.8.7.1 Locking Operation. -

4.8.7.1.1 Initial Equipment Setup. -

(1) Interconnect the Display Unit and Receiver Unit as shown in Figure 2-2.

(2) Set the Receiver Unit BAND switch to position 2 (90-300 MHz) and the front panel DAFC/AFC switch to OFF. Set the preset switch to external.

(3) Tune the receiver to approximately 200 MHz.

4.8.7.1.2 Test Operations. -

(1) Set the Receiver Unit DAFC/AFC switch to OFF, and the Display Unit DAFC switch to OFF.

(2) Fine tune the receiver for an even megahertz frequency, such as XXX.000.

(3) After setting the receiver switch to DAFC, set the Display Unit DAFC switch to FAST to lock the frequency.

(4) Using the fine tuning control of the receiver, quickly retune the receiver to a frequency approximately 10 kHz higher in frequency.

(5) Verify that after a delay of about 1.5 seconds, the readout quickly shifts back to the original lock frequency.

(6) Repeat steps (3) and (4), but tune the receiver to a lower frequency.

(7) Repeat steps (1) through (5) for all other characters that can be readout by the least significant digit, i.e., XXX.001, XXX.002, etc., to XXX.009.

(8) Repeat steps (1) through (5) for all other characters that can be readout by the next to least significant digit, i.e., XXX.010, XXX.020, etc., to XXX.090.

4.8.7.2 Automatic Rapid/Delayed Correction Speed. -

4.7.7.2.1 Initial Equipment Setup. -

(1) Remove the top cover from the Display Unit. Remove the two mounting screws for card A5 and tilt the board up.

(2) Connect the oscilloscope probe to pin 13 of U11D. Refer to Figure 5-15 to identify the component.

(3) Set oscilloscope controls for a display of 2 ms/cm and 1 V/cm. Use dc coupling and automatic internal triggering.

(4) Repeat all steps of paragraph 4.8.7.1.1

4.8.7.2.2 Test Operations. -

(1) Set the receiver DAFC/AFC switch to OFF and the Display Unit DAFC switch to OFF. Fine tune the receiver for a readout of XXX.050 MHz.

(2) Set the receiver switch to DAFC and the Display Unit DAFC switch to FAST to lock the frequency.

(3) Observe that the waveform shown in Figure 4-14c is momentarily obtained.

(4) Remove the connection from LO input jack J8 of the counter.

(5) Verify that after approximately 1.5 seconds the waveform changes to resemble Figure 4-14d.

Figure 4-12

4.8.7.3 Output Voltage Range. -

4.8.7.3.1 Initial Equipment Setup. -

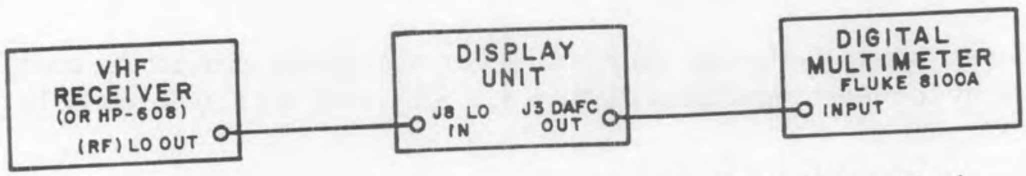


Figure 4-12. Test Setup, Counter DAFC Range Test

(1) Interconnect equipment as shown in Figure 4-12

(2) Set the receiver front panel BAND switch for 90-300 MHz and the DAFC/AFC switch to OFF.

(3) Set the digital multimeter controls to read dc voltage.

4.8.7.3.2 Test Operations. -

(1) Tune the receiver for a readout of XXX.050. Set the front panel DAFC switch of the Display Unit to FAST.

(2) Remove the LO input cable from J8 of the Display Unit.

(3) Verify that the TUNING CORRECTION meter deflects toward the LOW mark.

(4) When the meter reaches end of scale and the output voltage stabilizes, read the voltage on the digital multimeter. The reading should be greater than -3 V dc, (that is, more negative).

(5) Set the DAFC switch to OFF and repeat steps (1) and (2), but tune the receiver to XXX.950 MHz.

(6) Observe that the TUNING CORRECTION meter deflects toward the HIGH mark and that the voltage reading is greater than +2.5 V dc.

4.8.7.4 Correction Rate. -

4.8.7.4.1 Initial Equipment Setup. -

(1) Perform steps (1) through (3) of paragraph 4.8.7.3.1.

4.8.7.4.2 Test Operations. -

(1) Tune the receiver for a readout of XXX.050. Set the front panel DAFC switch of the Display Unit to FAST.

(2) Start the stopwatch and simultaneously remove the connection from the signal generator.

(3) When the digital multimeter indicates -3.0 V dc, stop the stopwatch. A reading of less than 10 seconds should be obtained.

(4) Repeat steps (1) through (3) but use the SLOW setting on the DAFC switch. A typical result is approximately 30 seconds.

4.8.8 BCD OUTPUT. - These tests assure that the BCD output lines provide accurate data and that power supply and auxiliary functions operate properly.

4.8.8.1 Numerical Sequence. -

4.8.8.1.1 Initial Equipment Setup. - Connect a printer, remote readout, or other readout device to BCD OUTPUT jack J7. Refer to paragraph 2.25 for interconnection information. Also connect a signal generator as shown in Figure 4-10.

4.8.8.1.2 Test Operations. -

(1) Set the preset switch to off.

(2) Tune the signal generator to 777.777 MHz.

(3) Verify that this readout appears on the counter and the remote readout.

(4) Tune the signal generator to 888.888 MHz and repeat step (3).

4.8.8.2 Count Inhibit Input. -

4.8.8.2.1 Test Operations. -

(1) Obtain any stable readout.

(2) Ground pin f of rear panel connector J7.

(3) Disconnect the signal generator.

(4) Verify that the readout does not change until the ground at J7 is removed.

4.8.8.3 Store Pulse Output. -

4.8.8.3.1 Initial Equipment Setup. -

(1) Connect the oscilloscope to pin U of rear panel connector J7.

(2) Set the Receiver Unit front panel BAND switch to position 3 for 235-500 MHz.

(3) Set the oscilloscope controls for dc coupling with automatic internal negative triggering. Use a vertical sensitivity of 1 V/cm and a time base of 1 ms/cm.

4.8.8.3.2 Test Operation. - Verify the presence of a negative going pulse with a width of approximately 0.4 ms and an amplitude greater than 2 V p-p.

4.8.8.4 Output Power. -

4.8.8.4.1 Initial Equipment Setup. - Set the controls of the digital multimeter to read dc voltage.

4.8.8.4.2 Test Operations. -

(1) Connect the multimeter probe to pin d of J7. Verify a reading of +5±0.02 V dc.

(2) Connect the multimeter probe to pin j of J7. Verify a reading of -5±0.2 V dc.

4.9 TROUBLESHOOTING

4.9.1 GENERAL. - Troubleshooting efforts should be directed toward localizing the problem to a defective module or circuit. This section contains aids for this process, including a troubleshooting chart, a table of typical voltage readings, and photographs of typical waveforms. The performance test (subsection 4.8) and the alignment procedures (subsection 4.10) are also of value in diagnosing the causes of manfunction. Background information needed for a thorough understanding of the theory of operation is provided by the circuit description in Section III, the functional block diagram (Figure 3-14), and the schematic diagrams in Section VI.

4.9.2 EQUIPMENT REQUIRED. - Trouble isolation to the module or subassembly level can be accomplished by use of the following instruments or their equivalents:

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

(2) Oscilloscope, Hewlett Packard Model 180A, with Model 1801A Dual Channel Vertical Amplifier and 1821A Time Base.

(3) Digital Multimeter, Fluke 8100A.

(4) WJ-9026/RU Receiver.

(5) Assorted cables, connectors, and adapters.

NOTE

The following instruments are considered useful but nonessential for execution of troubleshooting procedures.

(6) Spectrum Analyzer - RF Section, Hewlett Packard Model 8554L, with Spectrum Analyser - Display Section, Model 8552A, and Oscilloscope Main Frame, Model 140S.

4.9.3 LOCALIZATION OF FAULTS. - The primary method of localizing faulty modules and components is discussed below.

4.9.3.1 Visual Inspection. - A thorough visual inspection may be sufficient to locate the source of trouble. This method is valuable in avoiding additional damage which might result from continued operation of the equipment. Look for burned or crushed components, broken wires, loosened retaining brackets on plug-in modules, improper mating of connectors, or other signs of trouble.

4.9.3.2 Troubleshooting Chart. Table 4-6 gives a detailed listing of possible failure indications, with procedures to be followed in diagnosing faults. The first step is to decide which of the failure symptoms listed on the left side of the chart is applicable. Waveform and voltage measurements or signal injection are then indicated to isolate the faulty module or component. Faults on gate generator board A5 are diagnosed primarily by observation of waveforms. For count, decode, and display card A6 the readout on the numeric indicators may indicate the cause of the failure. Failure of the input voltages or internal power suppy regulators can cause subtle problems not easily isolated. Always verify power supply voltages and regulation before troubleshooting for problems.

Table 4-6. Frequency Counter Troubleshooting Chart

Table 4-6a. Faults Indicated by Abnormal Readouts

Trouble Indication	Probable Fault	Diagnostic Procedure
(1) All numeric indicators dark.	Blown fuse.	Replace.
	No power from Receiver Unit.	Check for +12 V at C49.
	Failed A6U41, A6Q2; or A4U1, A4U2, A4Q1, A4Q2	Check waveforms at A6U41 and on board A4.

Table 4-6a. Faults Indicated by Abnormal Readouts (cont'd)

(2) One numeric indicator shows incomplete character.	Defective numeric indicator IC.	Substitute component.
(3) A numeric indicator has any gross failure indication; indicators to the left readout normally.	Defective storage IC on A6.	Substitute component.
	Defective numeric indicator on A6.	Substitute component.
(4) A numeric indicator has any gross failure indication; indicators to the left also failed.	Failure of decade counter IC on A6.	Substitute component.
(5) Only readout is all zeros, with or without input.	Reset pulse from A5 failed; stays low (active).	Check waveform per Figure 4-14a.
(6) Only readout is stable indeterminate number, with or without input.	Storage strobe pulse from A5 failed, stays high (inactive).	Check waveform per Figure 4-14a.
(7) Only readout is preset number with or without input.	Signal gate pulse from A5 failed, stays low (inactive).	Check waveform per Figure 4-14b.
(8) Erratic readout with or without input.	Storage strobe pulse from A5 failed, stays low (active).	Check waveform per Figure 4-14a.
	Signal gate pulse from A5 failed, stays high (inactive).	Check waveform per Figure 4-14b.
	Reset pulse from A5 failed, stays high (inactive).	Check waveform per Figure 4-14a.
(9) Readout with input is same as input frequency instead of lower by i-f frequency	Rear panel Preset switch set to OFF.	Set switch to EXT.
	Reset pulse from A5 failed, stays high (inactive).	Check waveform per Figure 4-14a.

Table 4-6a. Counter Faults Indicated by Abnormal Readouts (cont'd)

(10) Only readout is preset number; except least significant digit responds to input.	Preset pulse from A5 failed, stays low (inactive).	Check waveform per Figure 4-14a.
(11) No response to LO input at J8.	Defective prescaler A7 or count, decode, and display (A6).	Inject signals per paragraph 4.9.3.3

Table 4-6b. Counter Faults Indicated by DAFC Malfunction

Trouble Indication	Probable Fault	Diagnostic Procedure
(1) DAFC failed on one correction rate only.	Defective DAFC switch, S4.	Make continuity checks.
(2) DAFC will not lock, all correction rates.	Defective storage or comparator IC's on A5.	Substitute components.
	Defective FET A5Q4.	Substitute component.
(3) TUNING CORRECTION meter does not read zero when DAFC switch is set to OFF.	Erroneous DAFC zero adjustment.	Make adjustment per paragraph 4.10.3.
(4) Automatic rapid/delayed correction speed inoperative.	Defective speed control IC's A5U11, A5U12, A5U14.	Substitute components; test per paragraph 4.8.7.2.

4.9.3.3 Signal Injection. - Table 4-7 relates the receiver local oscillator output frequencies to the divide ratio of prescaler A7. The prescaler output supplies signals to count, decode, and display board A6. Information from the table can be used in various ways to isolate problems. For example, the LO input cable to the counter may be removed and a signal generator substituted for the LO signal. Remember that in BANDS 1 and 2 the LO tracks 21.4 MHz above the tuned frequency; in BANDS 3 and 4, 60 MHz above the tuned frequency.

A test counter can be connected to the output of the prescaler to determine if the divide ratio is correct, or a signal generator can be connected directly to the input of the count, decode, and display board. Be sure to establish the correct preset by placing the receiver BAND switch in the related frequency range. This also establishes the required counting period in gate generator board A5 circuitry.

Table 4-7. Counter Signal Injection

RECEIVER			DISPLAY UNIT		
BAND	* TUNER RANGE	* TUNER LO OUTPUT	PRESCALER ÷ RATIO	* PRESCALER OUTPUT	PRESET
1	26-90	47.4-111.4	÷ 8	5.925-13.925	a
2	90-300	111.4-321.4	÷ 8	13.925-40.175	a
3	235-500	295-560	÷ 16	18.4375-35	b
4	500-1000	560-1060	÷ 16	35-66.25	b

* frequency in MHz

4.9.3.4 Typical Spectra and Waveform Photographs. - Figures 4-13 and 4-14 show spectrum displays and waveforms from counter circuits. Figure 4-13 illustrates the count, decode and display signal path. Figures 4-13a through 4-13d make it possible to trace a signal from the count board A6 input through all counting circuits. (The signal injection procedures of paragraph 4.9.3.3 are indicated for prescaler troubleshooting.) The last waveform from the counting path is Figure 4-13d. This pulse is the BCD 8 output or carry from the first decade of counting on A6. The carry pulses from following decades have the same shape, but with the period multiplied by 10 for each additional decade. Figure 4-14 shows waveforms from gate generator A5. Figures 4-14a and 4-14b show outputs of the gate generator timing circuits. A single photograph is shown to represent three waveforms--reset, preset, and storage strobe. These waveforms are identical but staggered in time. Two waveforms, Figure 4-14c and 4-14d, illustrate the automatic rapid/delayed dafc correction speeds. Figure 4-14e illustrates operation of the voltage multiplier on A5.

4.9.4 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, troubleshooting procedures should be reviewed to determine that the fault discovered is the actual cause of the trouble rather than a result.

4.9.5 SUBASSEMBLY REMOVAL, REPAIR, AND REPLACEMENT. - All subassemblies of the counter are constructed on etched circuit cards. Several modules are plug-in cards. These modules may be removed by pulling them out of their sockets after releasing the retaining devices. Other modules are attached to the main chassis or a subchassis by mounting screws and are hard wired to a harness. Removal of these boards involves unsoldering leads from eyelets on the modules and removing the mounting screws. No special problems should be encountered in repair of cards A4, A5, and A6 if good rework practices are followed. Observe precautions to avoid

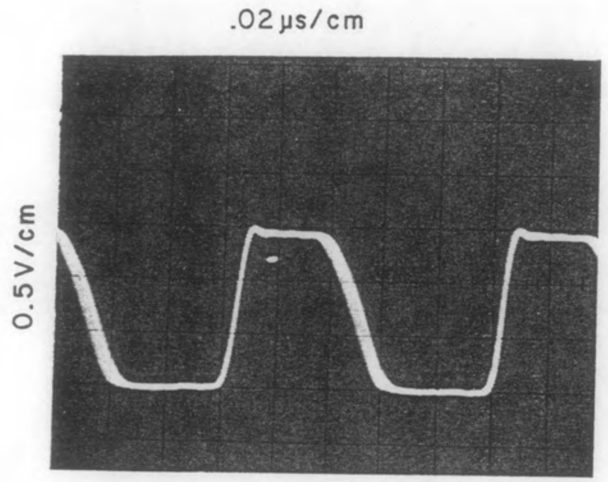


Figure 4-13a
Output of Video Amplifier of
Count, Decode and Display,
A6Ql Base

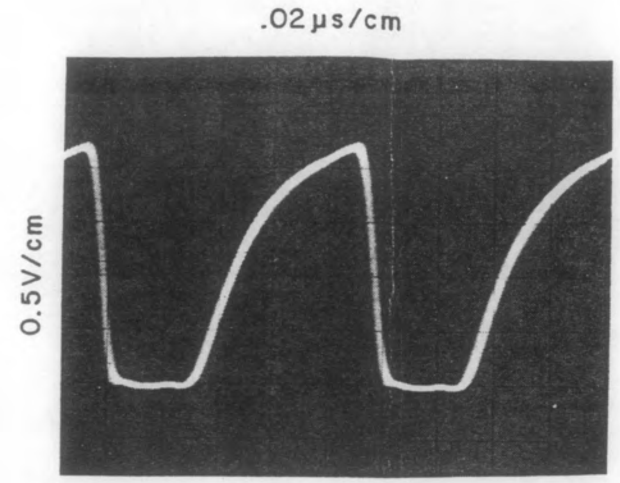


Figure 4-13b
Output of Trigger Transistor
of Count, Decode, and Display,
A6Q1 Collector

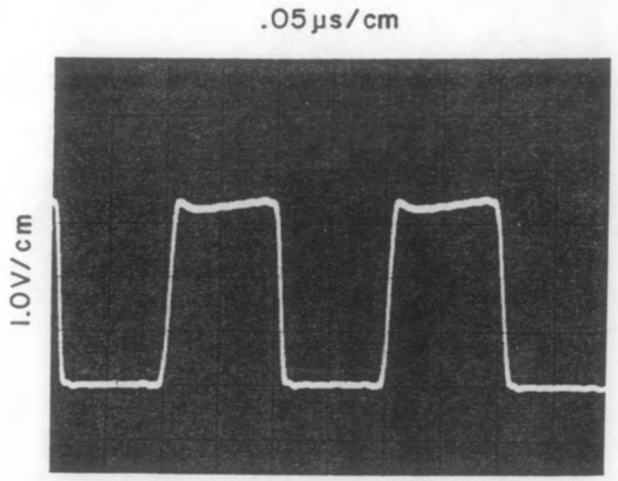


Figure 4-13c
Output of Count-By-Two of
Count, Decode and Display
A6U2 Pin 11

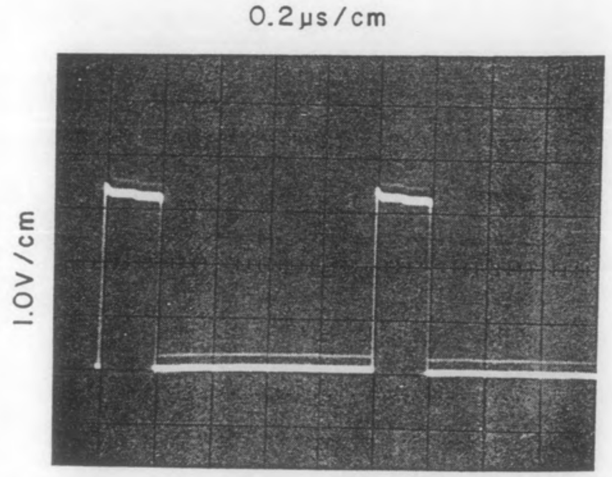


Figure 4-13d
Output of Count-By-Five
of Count, Decode and Display,
A6U3 Pin 12

NOTES:

(1) Refer to paragraph 4.9.2 for recommended test equipment.

(2) To obtain waveforms shown, apply an input of 30 MHz at 100 mV rms at J8 and establish a 0.1-50 MHz range. To achieve this range, remove the range/preset cable from rear panel connector J5 and then ground J5-Pin E.

Figure 4-13. Typical Waveforms, Counting Path

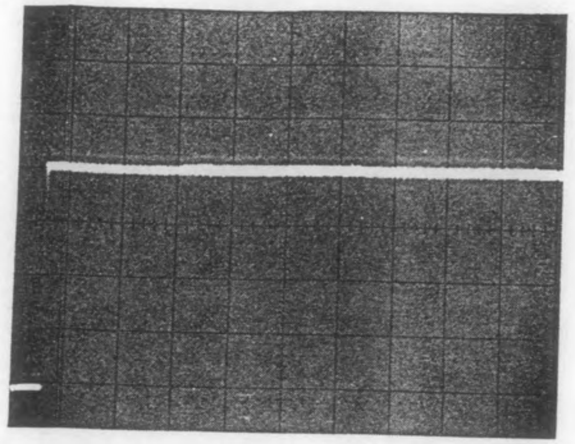


Figure 4-14a
Reset, Preset, or Storage
Strobe From Gate Generator,
A5U9A Pin 8,
A5U8B Pin 8, or A5U8A Pin 6

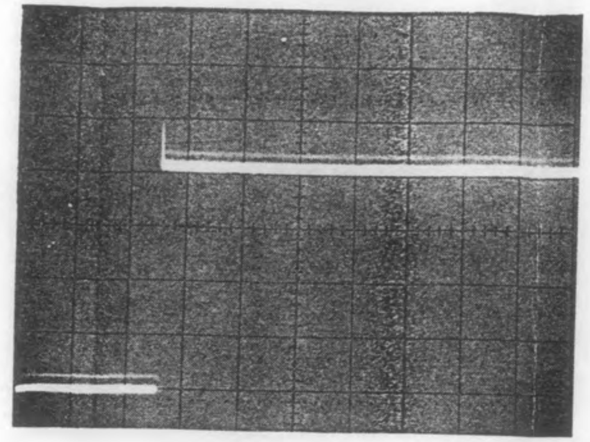


Figure 4-14b
Signal Gate From Gate
Generator, A5U13F Pin 2

NOTES:

(1) Waveforms 4-14a and 4-14b are taken with the counter in the 0.1-50 MHz range. To establish this mode, remove the range/preset cable from rear panel connector J5 and then ground J5-Pin E. All other waveforms are in the 20-300 MHz mode.

(2) To obtain waveforms 4-14c and 4-14d, refer to paragraph 4.8.7.2.

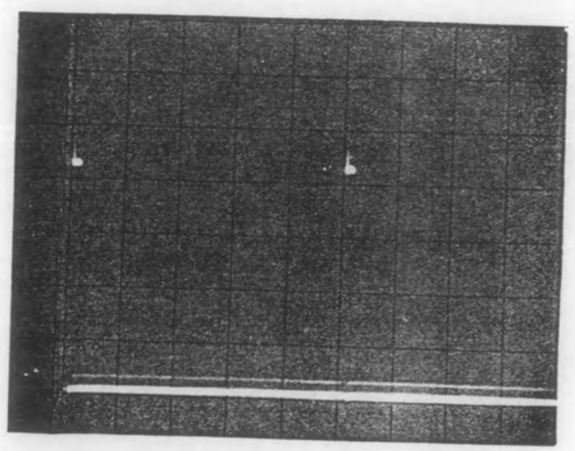


Figure 4-14c
DAFC Duty Cycle Strobe
on Gate Generator, Delayed
Speed, A5U11D, Pin 13

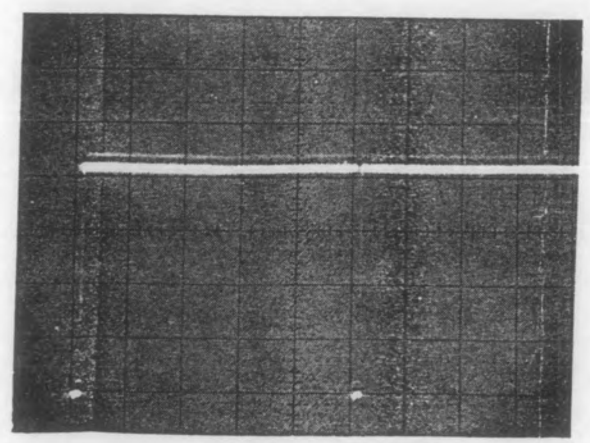


Figure 4-14d
DAFC Duty Cycle Strobe
on Gate Generator, Rapid
Speed, A5U11D Pin 13

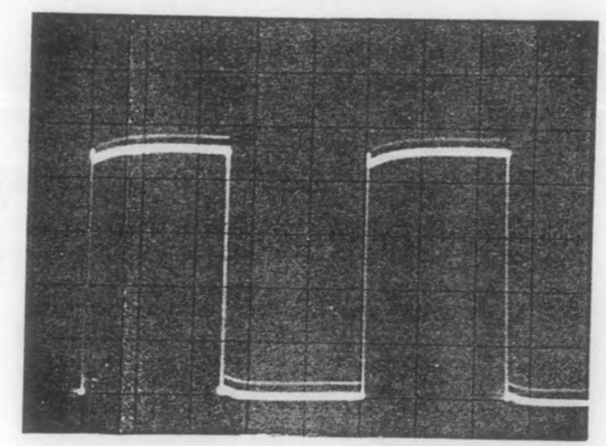


Figure 4-14e
Voltage Multiplier on Gate
Generator, Q6 Collector

Figure 4-14. Typical Waveforms, Counter Gate Generator application of excessive heat to component leads and etched circuit patterns. A minimum amount of solder should be employed.

NOTE

The Prescaler PC board in A7 is particularly susceptible to overheating during soldering, due to the low mass of the miniature components used. Use of a low wattage soldering iron with a small tip is essential. An iron consisting of the following components is recommended. All are manufactured by the Ungar Division of Eldon Industries:

No. 7155 Stepped Chisel Tiplet
No. 4035 Heating Unit
No. 776 Handle

4.10 ALIGNMENT AND ADJUSTMENT PROCEDURES

4.10.1 GENERAL. - The alignment procedures given here are suitable when making adjustments after replacing transistors or other components. Alignment should be performed only with suitable equipment by technicians familiar with the unit. Malfunctions indicated by the performance tests in subsection 4.8 may be corrected by execution of the alignment procedures. 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.

4.10.2 TEST EQUIPMENT REQUIRED. - The following instruments, or their equivalents, are required to perform adjustments on the Counter:

(1) Digital Multimeter, Fluke 8100A

(2) Signal Generator, Hewlett Packard Model 608E

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

4.10.3 ZERO ADJUSTMENT OF DAFC VOLTAGE. - Proceed as follows:

4.10.3.1 Initial Equipment Setup. -

(1) Remove the top cover from the counter.

(2) Tilt up the top printed circuit card beneath the cover (A5) after releasing the retaining screws.

(3) Interconnect the Display Unit and the Fluke 8100A Digital Multimeter as shown in Figure 4-15.

Figure 4-15

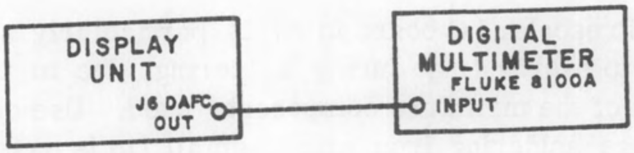


Figure 4-15. Test Setup, Counter DAFC Zero Adjustment

(4) Set the front panel DAFC switch of the Display Unit to OFF.

(5) Set the digital multimeter controls to read dc voltage.

4.10.3.2 Test Operations. -

(1) Refer to Figure 5-15 to identify potentiometer A5R14.

(2) Adjust the potentiometer so that the digital multimeter reads less than ±0.1 V dc.

4.10.4 ALIGNMENT OF PRESCALER ASSEMBLY (A7). - This assembly does not require adjustment or alignment.

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:

A1 R1

Subassembly Designation — Class and No. of item

Identify from right to left as: First (1) resistor (R) of first (1) subassembly (A)

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

5.2 REFERENCE DESIGNATION PREFIX

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

5.3 LIST OF MANUFACTURERS

Mfr. Code	Name and Address
00629	Eby Sales Co., Inc. 148-05 Archer Avenue Jamaica, New York 11435
00779	AMP, Incorporated P.O. Box 3608 Harrisburg, Penna. 17105
01121	Allen-Bradley Company 1201 South 2nd Street Milwaukee, Wisconsin 53204
01281	TRW Semiconductors, Inc. 14520 Aviation Boulevard Lawndale, California 90260

Mfr. Code	Name and Address
02114	Ferroxcube Corp. P.O. Box 359 Mt. Marion Rd. Saugerties, N.Y. 12477
02735	RCA Corporation Solid State Division Route 202 Somerville, N. J. 08876
04013	Taurus Corporation 1 Academy Hill Lambertville, N.J. 08530
04239	General Electric Company Chemical & Metallurgical Ventures Opn. Magnetic Mtls. Product Sec. P.O. Box 72 Edmore, Michigan 49928
04713	Motorola Incorporated Semiconductor Products Division 5005 East McDowell Road Phoenix, Arizona 85008
07263	Fairchild Camera & Instrument Corp. Semiconductor Division 464 Ellis Street Mountain View, Calif. 94040
09922	Burndy Corporation Richards Avenue Norwalk, Conn. 06852
14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, Maryland 20878-1794
14655	Cornell-Dubilier Electronics Div. of Federal Pacific Electric Co. 150 Avenue L. Newark, New Jersey, 07101

Mfr. Code	Name and Address
15818	Teledyne Semiconductor 1300 Terra Bella Avenue Mountain View, Calif. 94040
17856	Siliconix, Inc. 2201 Laurelwood Road Santa Clara, Calif. 95050
18324	Signetics Corporation 811 East Arques Avenue Sunnyvale, Calif. 94086
19505	Applied Engineering Products Co. Division of Samarius Inc. 300 Seymour Avenue Derby, Connecticut 06418
21604	The Buckeye Stamping Company 555 Marion Road Columbus, Ohio 43207
25088	Siemens America, Inc. 186 Wood Avenue S. Iselin, New Jersey 08830
27956	Relcom 3333 Hillview Avenue Palo Alto, California 94304
28480	Hewlett-Packard Company 1501 Page Mill Road Palo Alto, California 94304
31433	Union Carbide Corporation Highway 276, S.E. Greenville, S. C. 29606

Mfr. Code	Name and Address
33095	Spectrum Control Inc. 152 E. Main Street Fairview, Penna. 16415
34156	Semicoa 333 McCormick Avenue Costa Mesa, Calif. 92626
49956	Raytheon Co. 141 Spring Street Lexington, Mass. 02173
56289	Sprague Electric Company Marshall Street North Adams, Mass. 01247
71279	Cambridge Thermionic Corp. 445 Concord Avenue Cambridge, Mass. 02138
71400	Bussman Manufacturing Division of McGraw-Edison Co. 2536 W. University Street St. Louis, Missouri 63107
71744	Chicago Miniature Lamp Works 4433 Ravenswood Avenue Chicago, Illinois 60640
71785	TRW Electronic Components Cinch Connector Operations 1501 Morse Avenue Elk Grove Village, Ill. 60007
72136	Electro Motive Manufacturing Co. Inc. South Park and John Streets Willimantic, Conn. 06226

Mfr. Code	Name and Address
72619	Dialight Corporation Sub. of Digitronics Corp. 60 Stewart Avenue Brooklyn, N.Y. 11237
72982	Erie Technological Products, Inc. 644 West 12th Street Erie, Pennsylvania 16512
73138	Beckman Instruments, Inc. Helipot Division 2500 Harbor Boulevard Fullerton, Calif. 92634
73899	JFD Electronics Company 15th at 62nd Street Brooklyn, N.Y. 11219
74868	Bunker Ramo Corporation The Amphenol RF Division 33 East Franklin Street Danbury, Connecticut 06810
75042	TRW Electronic Components IRC Fixed Resistors 401 North Broad Street Philadelphia, Pa. 19108
75915	Littelfuse, Incorporated 800 E. Northwest Highway Des Plaines, Illinois 60016
76055	Mallory Controls Division P.R. Mallory and Co., Inc. P.O. Box 327 State Road 28 W Frankfort, Indiana 46041
77820	Bendix Corporation The Electrical Components Div. Sherman Avenue Sidney, New York 13838

Mfr. Code	Name and Address
80058	Joint Electronic Type Designation System
80103	Lambda Electronics Corp. Division of Veeco Instruments, Inc. 515 Broad Hollow Road Melville, N.Y. 11746
80131	Electronic Industries Association 2001 Eye Street, N.W. Washington, D.C. 20006
81073	Grayhill Incorporated 561 Hillgrove Avenue LaGrange, Illinois 60525
81312	Winchester Electronics Division Litton Industries, Incorporated Main Street & Hillside Avenue Oakville, Connecticut 06779
81349	Military Specifications
84411	TRW Electric Components TRW Capacitors 112 W. First Street Ogallala, Nebraska 69153

Mfr. Code	Name and Address
91418	Radio Materials Company 4242 West Bryn Mawr Avenue Chicago, Illinois 60646
91506	Augat, Incorporated 33 Perry Avenue Attleboro, Massachusetts 02703
93332	Sylvania Electric Products, Inc. Semiconductor Products Division 100 Sylvan Road Woburn, Massachusetts 01801
95146	Alco Electronics Products, Inc. P.O. Box 1348 Lawrence, Massachusetts 01842
99800	American Precision Industries Delevan Electronics Division 270 Quaker Road East Aurora, N.Y. 14052
99848	Wilco Corporation 4030 West 10th Street P.O. Box 22248 Indianapolis, Indiana 46222

5.4 PARTS LIST

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

NOTE

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

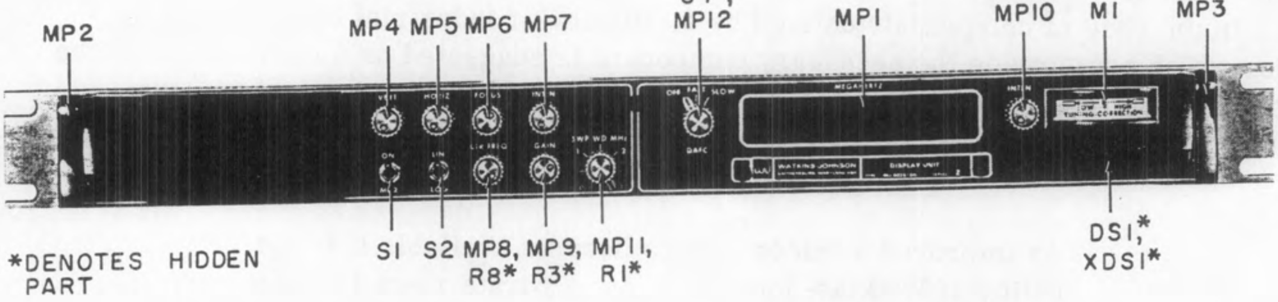


Figure 5-1. Type WJ-9026/DU Display Unit, Front View, Location of Components

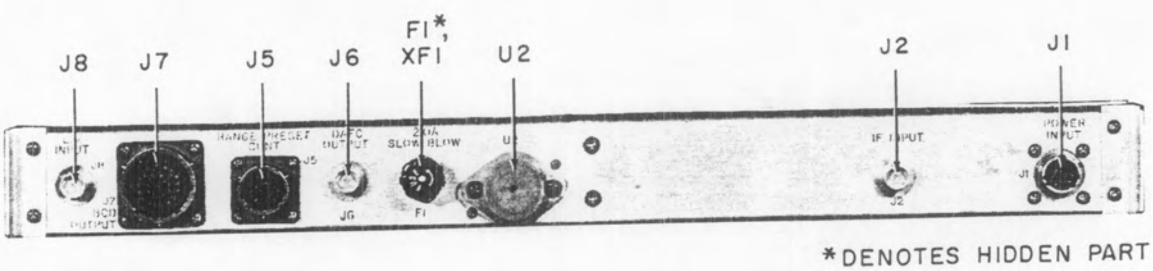


Figure 5-2. Type WJ-9026/DU Display Unit, Rear View, Location of Components

5.4.1 WJ-9026/DU DISPLAY UNIT, MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	IF AMPLIFIER	1	72474	14632	
A2	CONTROL BOARD	1	8261	14632	
A3	OSCILLATOR ASSEMBLY	1	7781	14632	
A4	INTENSITY CONTROL BOARD	1	791504	14632	
A5	GATE GENERATOR AND DAFC	1	79907	14632	
A6	COUNT, DECODE AND DISPLAY	1	791503	14632	
A7	PRESCALER ASSEMBLY	1	791505-1	14632	
C1	CAPACITOR, CERAMIC, FEEDTHRU: 0.05 μF, GMV, 300 V	46	54-785-002-503P	33095	
C2 Thru C25	Same as C1				
C26	CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500 V	1	2404-000X5U0-102P	72982	
C27 Thru C29	Same as C1				
C30	CAPACITOR, CERAMIC, FEEDTHRU: 5000 pF, 20%, 500 V	1	2404-000X5U0-502M	72982	
C31 Thru C48	Same as C1				
C49	CAPACITOR, CERAMIC, FEEDTHRU: 0.05 μF, GMV, 330 V	6	54-785-005-503P	33095	
C50 Thru C54	Same as C49				
C55	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	1	8131M100-651-104M	72982	

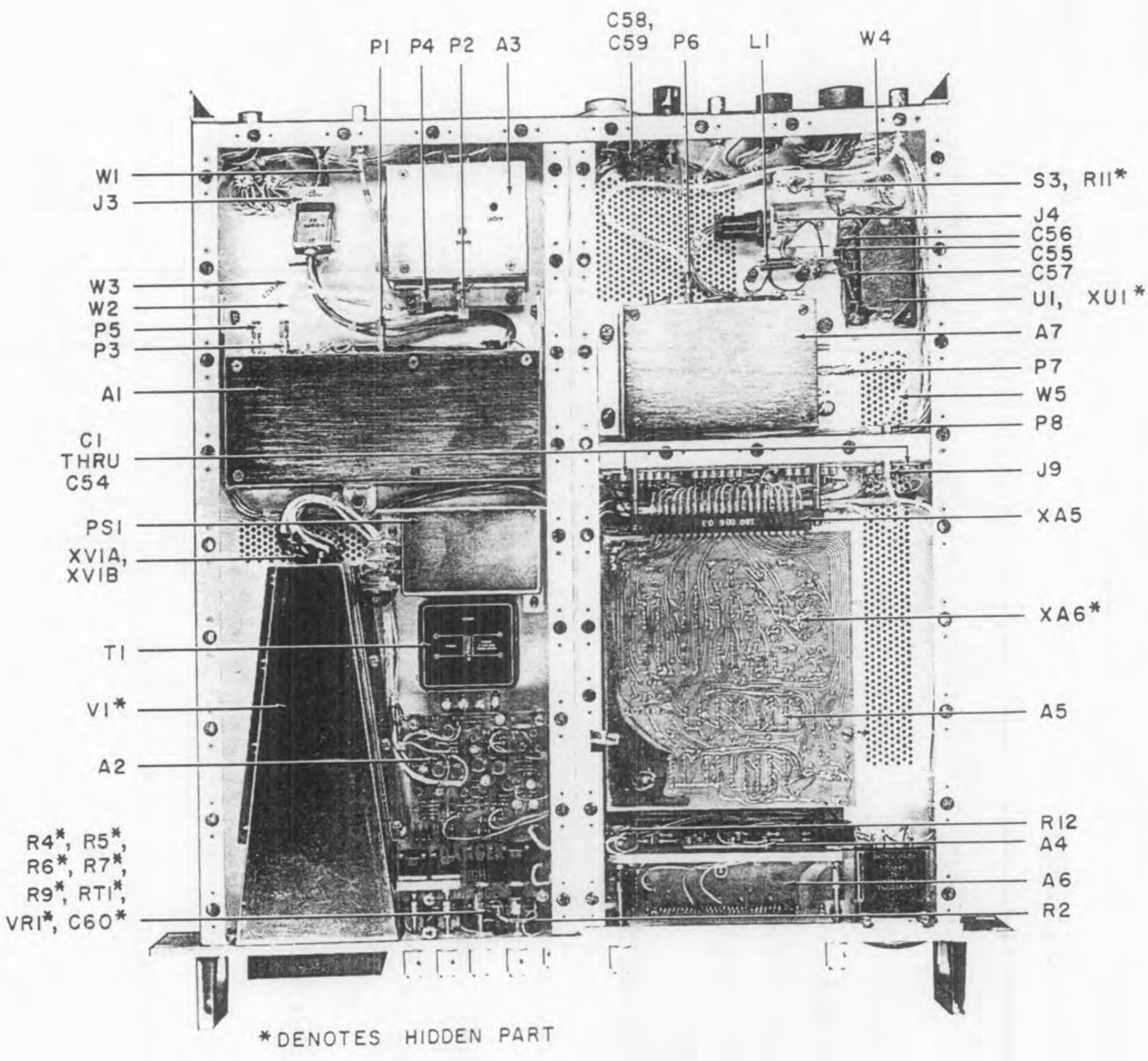


Figure 5-3. Type WJ-9026/DU Display Unit, Top View, Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C56	CAPACITOR, ELECTROLYTIC, TANTALUM: 27 μF, 10%, 35 V	4	19D276X9035MA3	56289	
C57 Thru C59	Same as C56				
C60	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	1	SM (1000 PF, P)	91418	
DS1	LAMP, INCANDESCENT	1	328	71744	
F1	FUSE CARTRIDGE: 2 AMP, 3 AG, SLOW BLOW	1	MDX2	71400	
J1	CONNECTOR RECEPTACLE MULTIPIN	1	JTP02RE10-13P	77820	
J2	CONNECTOR RECEPTACLE	3	17285-1002	74868	
J3	CONNECTOR RECEPTACLE MULTIPIN	1	SRE14SNSS	81312	
J4	CONNECTOR RECEPTACLE MULTIPIN	1	M105LRN	81312	
J5	CONNECTOR RECEPTACLE MULTIPIN	1	L12TE10S2NA	09922	
J6	Same as J2				
J7	CONNECTOR RECEPTACLE MULTIPIN	1	L18TE32S2NA	09922	
J8	Same as J6				
J9	CONNECTOR, PLUG, SMC SERIES	1	UG1468/U	80058	19505
L1	INDUCTOR	1	21210-126	14632	
M1	METER, TUNING	1	15617-1	14632	
MP1	EMI SHIELDED WINDOW	1	24018-1	14632	
MP2	HANDLE, FRONT	2	32306-3	14632	
MP3	Same as MP2				
MP4	KNOB	7	PS50D1/LG	21604	

MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
MP5 Thru MP10	Same as MP4				
MP11	KNOB	1	PS50PL1/LG	21604	
MP12	Same as MP11				
P1	CONNECTOR, PLUG, SMC SERIES	6	UG1465/U	80058	19505
P2	CONNECTOR, PLUG, SMC SERIES	2	UG1466/U	80058	19505
P3	Same as P1				
P4	Same as P2				
P5 Thru P8	Same as P1				
PS1	DC-DC CONVERTER	1	76199	14632	
R1	RESISTOR, VARIABLE, COMPOSITION: 10 kΩ, 10%, 1 W	3	70A3N056L103U	01121	
R2	RESISTOR, FIXED, FILM: 60.4 Ω, 1%, 1/4 W	1	RN60D60R4F	81349	75042
R3	Same as R1				
R4	RESISTOR, FIXED, COMPOSITION: 2.4 kΩ, 5%, 1/4 W	1	RCR07G242JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121
R6	RESISTOR, FIXED, FILM: 2.94 kΩ, 1%, 1/4 W	1	RN60D294IF	81349	75042
R7	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4 W	1	RCR07G222JS	81349	01121
R8	Same as R1				
R9	RESISTOR, FIXED, COMPOSITION: 82 kΩ, 5%, 1/4 W	1	RCR07G823JS	81349	01121
R10	RESISTOR, VARIABLE, COMPOSITION: 100 kΩ, 10%, 1 W	1	70A3N056L104U	01121	

MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R11	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 5.1 kΩ, 5%, 1/4 W	1	RCR07G515JS	81349	01121
RT1	THERMISTOR 1 k @ 25°	1	2D102	81349	01121
S1	SWITCH, TOGGLE, SPDT	1	MTA106D	95146	
S2	SWITCH, TOGGLE, DPDT	1	MTA206N	95146	
S3	SWITCH, TOGGLE, 3 PDT	1	MTG306D	95146	
S4	SWITCH, ROTARY	1	71AD30-01-2AJN	81073	
T1	TRANSFORMER, POWER	1	18118	14632	
U1	VOLTAGE, REGULATOR: +5 V	1	LAS2105	80103	
U2	VOLTAGE, REGULATOR	1	LAS1805	80103	
V1	TUBE, CRT	1	3ASP1	93332	
VR1	DIODE, ZENER: 5.6 V	1	1N752A	80131	04713
W1	CABLE ASSEMBLY	1	17300-84-1	14632	
W2	CABLE ASSEMBLY	1	17300-84-2	14632	
W3	CABLE ASSEMBLY	1	17300-84-3	14632	
W4	CABLE ASSEMBLY	1	17300-84-4	14632	
W5	CABLE ASSEMBLY	1	17300-84-5	14632	
XA5	CONNECTOR PRINTED CIRCUIT BOARD	2	251-22-30-160	71785	
XA6	Same as XA5				
XDS1	LAMP ASSEMBLY, INCANDESCENT	1	270-1930-0171-702	72619	
XF1	FUSEHOLDER	1	342004	75915	

MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
XU2	SOCKET, TRANSISTOR	1	8038-1G1	91506	
XV1A	SOCKET, CRT	1	9859-2	00629	
XV1B	CONNECTOR	1	463-99-99-097	71785	

5.4.2 Type 72474 IF Amplifier

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	INPUT AMPLIFIER	1	18106-1	14632	
A2	8.0 kHz IF AMPLIFIER	1	18107-1	14632	
A3	OUTPUT AMPLIFIER	1	15801-2	14632	
C1	CAPACITOR, MICA, DIPPED: 33 pF, 2%, 500 V	1	CM05ED330G03	81349	72136
C2	CAPACITOR, CERAMIC, FEEDTHRU: 470 pF, 20%, 500 V	11	54-794-009-471M	33095	
C3	CAPACITOR, VARIABLE, GLASS: 1-28 pF, 1000 V	1	MC603	73899	72136
C4	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	5	C023B101E502M	56289	
C5	Same as C4				
C6	Same as C2				
C7	Same as C4				
C8 Thru C16	Same as C2				
C17	CAPACITOR, CERAMIC, DISC: 0.01 pF, 20%, 200 V	1	8131A200Z5U103M	72982	
C18	Same as C4				
C19	Same as C4				
E1	TERMINAL, FEEDTHRU, INSULATED	3	SFU16Y	04013	
E2	Same as E1				
E3	Same as E1				
FB1	FERRITE BEAD	10	56-590-65-4A	02114	
FB2 Thru FB10	Same as FB1				

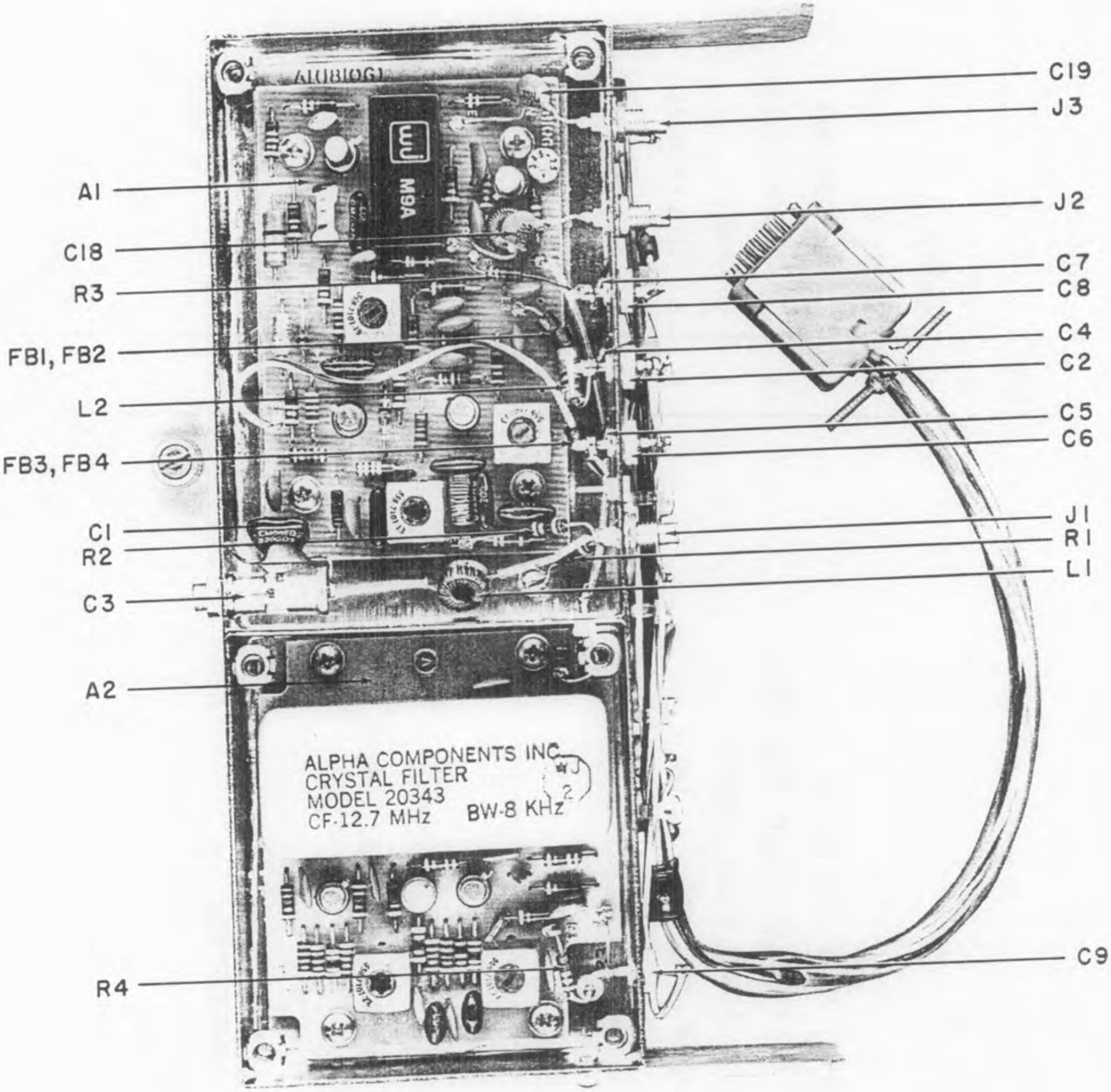


Figure 5-4. Type 72474 IF Amplifier (A1), Top View, Location of Components

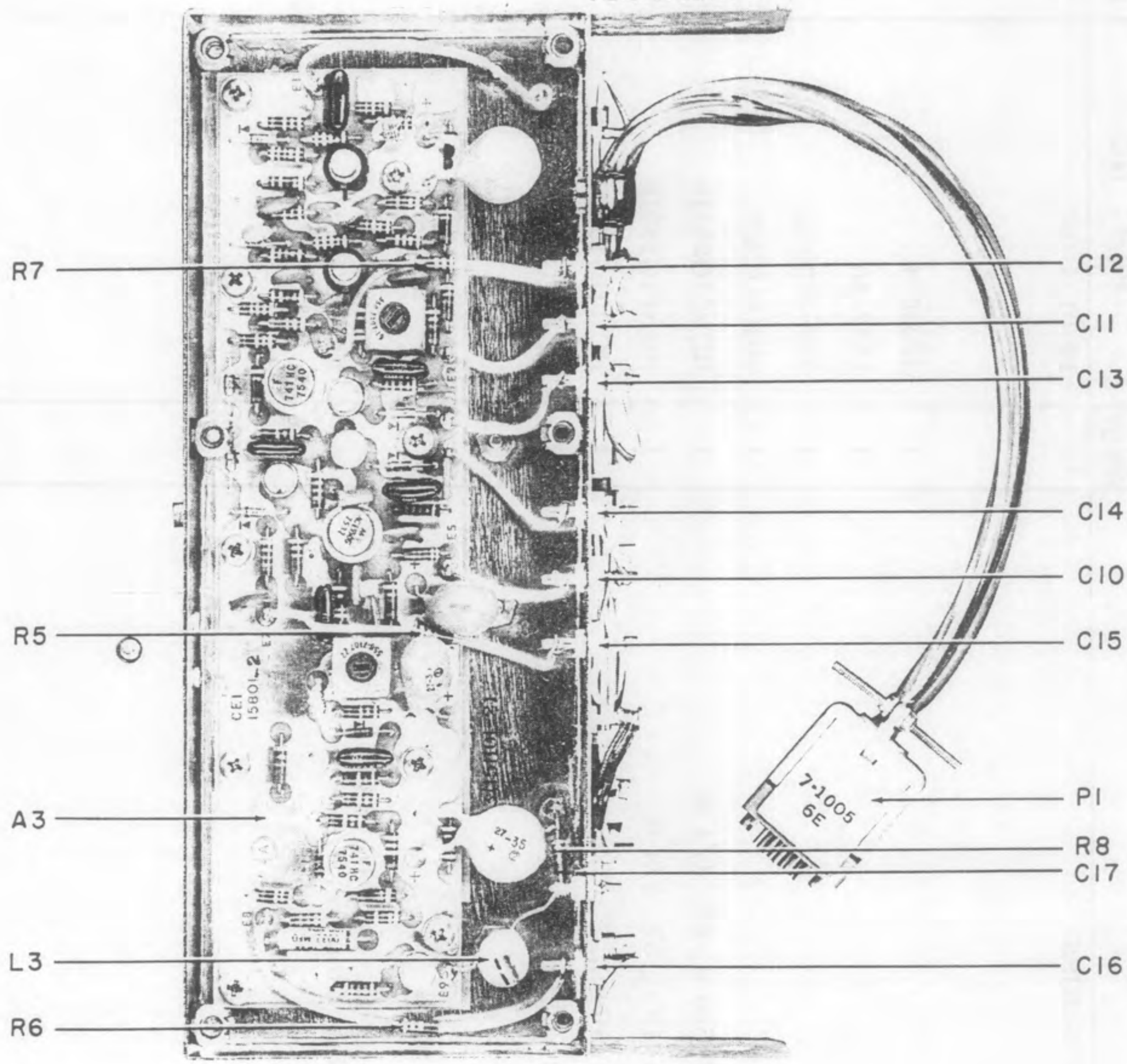


Figure 5-5. Type 72474 IF Amplifier (A1), Bottom View, Location of Components

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
J1	CONNECTOR, RECEPTACLE, SMC SERIES	3	10-0104-002	19505	
J2	Same as J1				
J3	Same as J1				
L1	INDUCTOR	1	22295-4	14632	
L2	COIL, FIXED: 30 μH	1	1537-50	99800	
L3	COIL, FIXED: 100 MH	1	553-3635-61	71279	
P1	CONNECTOR, PLUG, MULTIPIN	1	SRE14PNSS	81312	
R1	RESISTOR, FIXED, COMPOSITION: 300 Ω, 5%, 1/4 W	1	RCR07G301JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 18 Ω, 5%, 1/4 W	1	RCR07G180JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 2.7 Ω, 5%, 1/4 W	4	RCR07G2R7JS	81349	01121
R5	Same as R4				
R6	Same as R4				
R7	Same as R4				
R8	RESISTOR, FIXED, COMPOSITION: 5.1 kΩ, 5%, 1/4 W	1	RCR07G512JS	81349	01121

5.4.2.? Part 18106-1 Input Amplifier REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, MICA, DIPPED: 82 pF, 2%, 500 V	1	CM05ED820G03	81349	72136
C2	CAPACITOR, MICA, DIPPED: 160 pF, 2%, 500 V	1	CM05FD161G03	81349	72136
C3	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	10	C023B101E502M	56289	
C4	Same as C3				
C5	CAPACITOR, MICA, DIPPED: 51 pF, 2%, 500 V	1	CM05ED510G03	81349	72136
C6	Same as C3				
C7	Same as C3				
C8	CAPACITOR, MICA, DIPPED: 12 pF, 5%, 500 V	1	CM05CD120J03	81349	72136
C9	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 μF, 10%, 35 V	1	CS13BF105K	81349	56289
C10	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	2	SM (1000 PF, P)	91418	
C11	CAPACITOR, MICA, DIPPED: 91 pF, 2%, 500 V	1	CM05FD910G03	81349	72136
C12	Same as C3				
C13	Same as C10				
C14	Same as C3				
C15	CAPACITOR, CERAMIC, TUBULAR: 6.25 pF ± 0.5 pF, 500 V	1	301-000C0H0-629D	72982	
C16 Thru C19	Same as C3				
C20	CAPACITOR, MICA, DIPPED: 22 pF, 5%, 500 V	1	CM05ED220J03	81349	72136
C21	CAPACITOR, VARIABLE, CERAMIC: 5-25 pF, 100 V	1	518-000A5-25	72982	
CR1	DIODE	1	1N462A	80131	93332
CR2	DIODE	2	1N198A	80131	93332

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
CR3	Same as CR2				
L1	COIL, VARIABLE: 0.9-1.1 μH	2	558-7107-13	71279	
L2	COIL, FIXED	1	20681-44	14632	
L3	Same as L1				
L4	COIL, VARIABLE: 2.97-3.63 μH	1	558-7107-19	71279	
L5	COIL, FIXED: 47 μH	1	1537-60	99800	
L6	Not Used				
Q1	TRANSISTOR	1	3N187	02735	02735
Q2	TRANSISTOR	1	2N930	80131	02735
Q3	TRANSISTOR	1	2N3478	80131	34156
Q4	TRANSISTOR	1	U310	17856	
R1	RESISTOR, FIXED, COMPOSITION: 300 Ω, 5%, 1/4 W	1	RCR07G301JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	1	RCR07G472JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 130 kΩ, 5%, 1/4 W	1	RCR07G134JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	1	RCR07G103JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	4	RCR07G101JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 51 kΩ, 5%, 1/4 W	1	RCR07G513JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 24 kΩ, 5%, 1/4 W	1	RCR07G243JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 150 Ω, 5%, 1/4 W	1	RCR07G151JS	81349	01121
R9	Not Used				
R10	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	1	RCR07G470JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4 W	1	RCR07G473JS	81349	01121

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R12	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4 W	1	RCR07G104JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4 W	1	RCR07G392JS	81349	01121
R14	Same as R5				
R15	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	2	RCR07G102JS	81349	01121
R16	Same as R15				
R17	RESISTOR, FIXED, COMPOSITION: 68 Ω, 5%, 1/4 W	1	RCR07G680JS	81349	01121
R18	Same as R5				
R19	RESISTOR, FIXED, COMPOSITION: 16 kΩ, 5%, 1/4 W	1	RCR07G163JS	81349	01121
R20	RESISTOR, FIXED, COMPOSITION: 6.2 kΩ, 5%, 1/4 W	1	RCR07G622JS	81349	01121
R21	Same as R5				
R22	RESISTOR, FIXED, COMPOSITION: 56 Ω, 5%, 1/4 W	1	RCR07G560JS	81349	01121
R23	RESISTOR, FIXED, COMPOSITION: 1.8 kΩ, 5%, 1/4 W	2	RCR07G182JS	81349	01121
R24	Same as R23				
T1	TRANSFORMER	1	21428-19	14632	
U1	MIXER, BALANCED	1	M9A	27956	

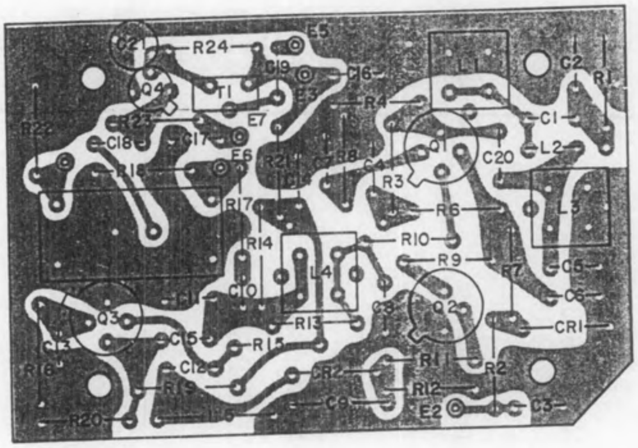


Figure 5-6. Part 18106-1 Input Amplifier (A1A1), Location of Components

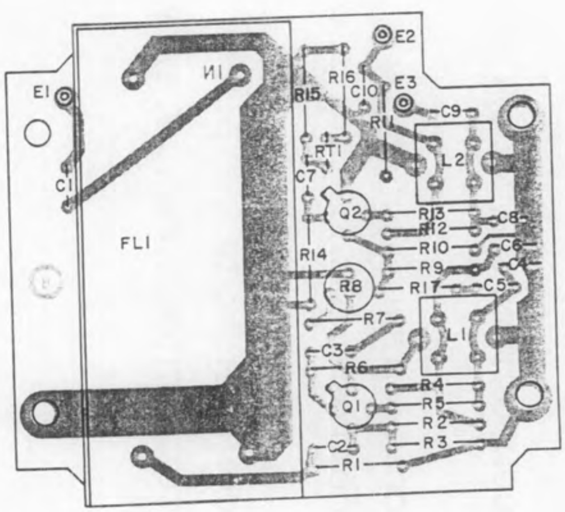


Figure 5-7. Part 18107-1 8.0 kHz IF Amplifier (A1A2), Location of Components

REF DESIG PREFIX A1A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 200 V	8	8131A200Z5U103M	72982	
C2	Same as C1				
C3	Same as C1				
C4	CAPACITOR, MICA, DIPPED: 24 pF, 5%, 500 V	2	CM04ED240J03	81349	72136
C5	Same as C1				
C6	Same as C1				
C7	Same as C1				
C8	Same as C4				
C9	Same as C1				
C10	Same as C1				
FL1	CRYSTAL FILTER	1	92092	14632	
L1	COIL, VARIABLE: 5.04-6.16 uH	2	558-7107-22	71279	
L2	Same as L1				
Q1	TRANSISTOR	2	2N3478	80131	34156
Q2	Same as Q1				
R1	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	1	RCR07G221JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 8.2 kΩ, 5%, 1/4 W	1	RCR07G822JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4 W	2	RCR07G222JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	2	RCR07G330JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	3	RCR07G101JS	81349	01121

REF DESIG PREFIX A1A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R8	RESISTOR, VARIABLE, FILM: 100 Ω, 10%, 1/2 W	1	62PR100	73138	
R9	Same as R4				
R10	Same as R3				
R11	Same as R7				
R12	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R13	Same as R5				
R14	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	2	RCR07G331JS	81349	01121
R15	Same as R14				
R16	Same as R7				
R17	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	1	RCR07G470JS	81349	01121
RT1	THERMISTOR: 1 k @ 25°	1	2D102	04239	

5.4.2.3 Part 15801-2 Output Amplifier

REF DESIG PREFIX A1A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 27 μF, 10%, 35 V	4	196D276X9035MA3	56289	
C2	CAPACITOR, MICA, DIPPED: 47 pF, 5%, 500 V	1	DM15-471J	72136	
C3	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	5	SM (1000 PF, P)	91418	
C4	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	4	C023B101E502M	56289	
C5	Same as C3				
C6	Same as C3				
C7	Same as C3				
C8	Same as C4				
C9	CAPACITOR, MICA, DIPPED: 56 pF, 2%, 500 V	1	CM05ED560G03	81349	72136
C10	CAPACITOR, MICA, DIPPED: 270 pF, 2%, 500 V	1	CM05FD271G03	81349	72136
C11	Same as C4				
C12	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	4	8131M100-651-104M	72982	
C13	Same as C12				
C14	Same as C12				
C15	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 200 V	3	8131A200Z5U103M	72982	
C16	Same as C1				
C17	Same as C12				
C18	Same as C15				
C19	Same as C1				
C20	Same as C15				
C21	CAPACITOR, MICA, DIPPED: 33 pF, 2%, 500 V	1	CM05ED330G03	81349	72136
C22	CAPACITOR, MICA, DIPPED: 24 pF, 5%, 500 V	1	CM05ED240J03	81349	72136

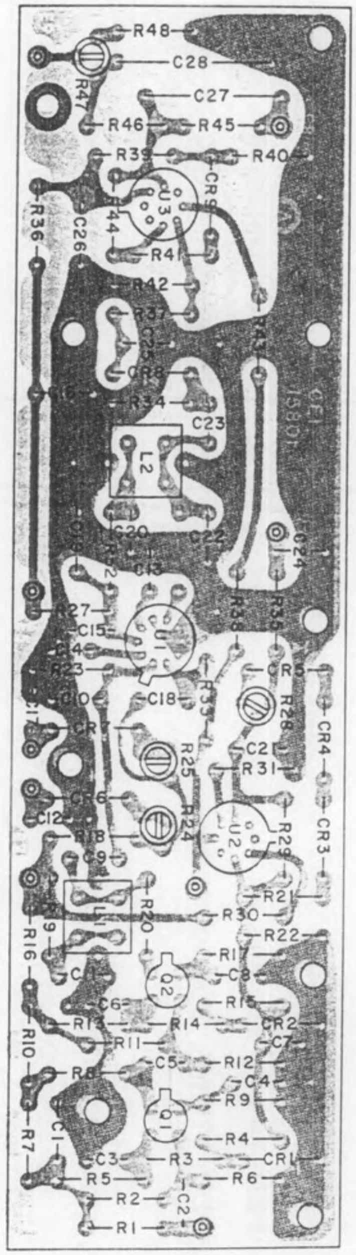


Figure 5-8. Part 15801-2 Output Amplifier (A1A3), Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C23	Same as C3				
C24	Same as C4				
C25	CAPACITOR, MICA, DIPPED: 15 pF, 5%, 500 V	1	CM05CD150J03	81349	72136
C26	Same as C1				
C27	CAPACITOR, FIXED, PLASTIC: 3300 pF, 10%, 100 V	1	WMF1D33	14655	
C28	CAPACITOR, PLASTIC, TUBULAR: 0.022 μF, 5%, 100 V	1	663UW223-5-1W	84411	
CR1	DIODE	5	1N462A	80131	93332
CR2 Thru CR5	Same as CR1				
CR6	DIODE	2	1N4449	80131	93332
CR7	Same as CR6				
CR8	DIODE	2	5082-2800	28480	
CR9	Same as CR8				
L1	COIL, VARIABLE: 2.97-3.63 μH	1	558-7107-19	71279	
L2	COIL, VARIABLE: 5.04-6.16 μH	1	558-7107-22	71279	
Q1	TRANSISTOR	2	3N187	02735	02735
Q2	Same as Q1				
R1	Not Used				
R2	RESISTOR, FIXED, COMPOSITION: 120 kΩ, 5%, 1/4 W	2	RCR07G124JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4 W	2	RCR07G333JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	3	RCR07G472JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4 W	5	RCR07G104JS	81349	01121

REF DESIG PREFIX A1A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R6	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	6	RCR07G103JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4 W	2	RCR07G100JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 620 Ω, 5%, 1/4 W	1	RCR07G621JS	81349	01121
R9	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4 W	2	RCR07G331JS	81349	01121
R10	Same as R7				
R11	Same as R2				
R12	Same as R6				
R13	RESISTOR, FIXED, COMPOSITION: 68 kΩ, 5%, 1/4 W	1	RCR07G683JS	81349	01121
R14	Same as R3				
R15	Same as R4				
R16	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	3	RCR07G101JS	81349	01121
R17	Same as R9				
R18	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4 W	1	RCR07G272JS	81349	01121
R19	Same as R16				
R20	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	3	RCR07G470JS	81349	01121
R21	Same as R6				
R22	RESISTOR, FIXED, COMPOSITION: 6.2 kΩ, 5%, 1/4 W	1	RCR07G622JS	81349	01121
R23	Same as R18				
R24	RESISTOR, VARIABLE, FILM: 500 Ω, 10%, 1/2 W	2	62PR500	73138	
R25	Same as R24				
R26	Same as R20				
R27	RESISTOR, FIXED, COMPOSITION: 1.2 kΩ, 5%, 1/4 W	1	RCR07G122JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R28	RESISTOR, VARIABLE, FILM: 20 kΩ, 10%, 1/2 W	1	62PR20K	73138	
R29	RESISTOR, FIXED, COMPOSITION: 1.0 MΩ, 5%, 1/4 W	2	RCR07G105JS	81349	01121
R30	RESISTOR, FIXED, COMPOSITION: 2.7 Ω, 5%, 1/4 W	3	RCR07G2R7JS	81349	01121
R31	Same as R6				
R32	Same as R16				
R33	RESISTOR, FIXED, COMPOSITION: 5.1 kΩ, 5%, 1/4 W	3	RCR07G512JS	81349	01121
R34	Same as R6				
R35	Same as R33				
R36	Same as R20				
R37	Same as R5				
R38	Same as R30				
R39	Same as R29				
R40	Same as R6				
R41	Same as R5				
R42	Same as R5				
R43	Same as R30				
R44	Same as R5				
R45	Same as R33				
R46	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/4 W	1	RCR07G681JS	81349	01121
R47	RESISTOR, VARIABLE, FILM: 1 kΩ, 10%, 1/2 W	1	62PR1K	73138	
R48	Same as R4				
U1	INTEGRATED CIRCUIT	1	MC1550G	04713	

REF DESIG PREFIX A1A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
U2	INTEGRATED CIRCUIT	2	741HC	07263	
U3	Same as U2				

5.4.3 Type 8261 Control Board

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 μF, 10%, 35 V	1	CS13BF105K	81349	56289
C2	CAPACITOR, CERAMIC, DISC: 0.05 μF, 20%, 100 V	1	29C212A7	56289	
C3	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	6	8131M100-651-104M	72982	
C4 Thru C8	Same as C3				
CR1	DIODE	4	1N462A	80131	93332
CR2	Same as CR1				
CR3	Same as CR1				
CR4	Same as CR1				
Q1	TRANSISTOR	1	2N2646	80131	04713
Q2	TRANSISTOR	1	2N3251	80131	04713
Q3	TRANSISTOR	4	2N3440	80131	04713
Q4	Same as Q3				
Q5	TRANSISTOR	1	2N929	80131	04713
Q6	TRANSISTOR	2	2N2222A	80131	04713
Q7	Same as Q3				
Q8	Same as Q3				
Q9	Same as Q6				
Q10	TRANSISTOR	1	U1899E	15818	
R1	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/4 W	1	RCR07G681JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4 W	1	RCR07G222JS	81349	01121

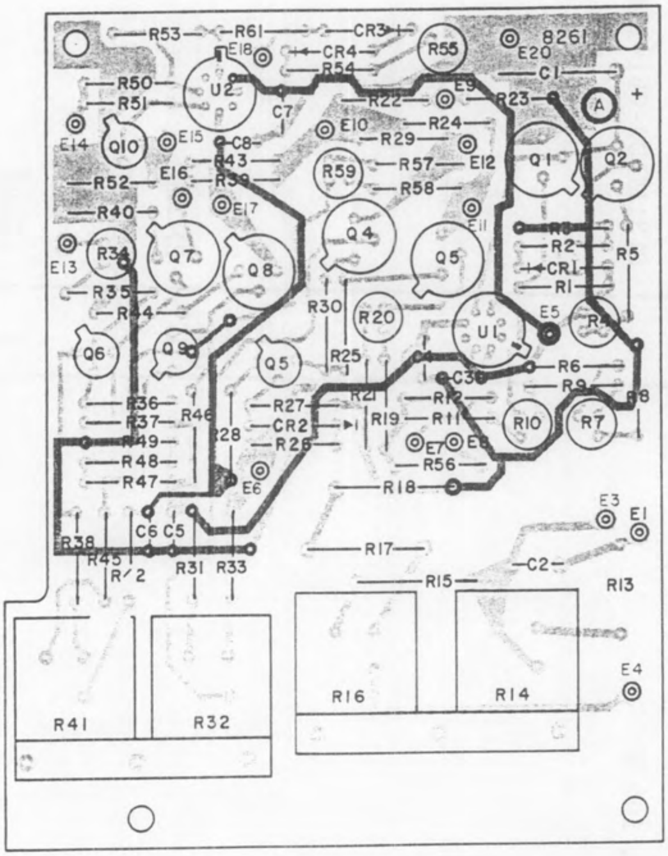


Figure 5-9. Type 8261 Control Board (A2), Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R3	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4 W	1	RCR07G223JS	81349	01121
R4	RESISTOR, VARIABLE, FILM: 5 kΩ, 10%, 1/2 W	1	62PR5K	73138	
R5	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	1	RCR07G472JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 120 Ω, 5%, 1/4 W	1	RCR07G121JS	81349	01121
R7	RESISTOR, VARIABLE, FILM: 1 kΩ, 10%, 1/2 W	2	62PR1K	73138	
R8	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	2	RCR07G102JS	81349	01121
R9	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4 W	6	RCR07G473JS	81349	01121
R10	RESISTOR, VARIABLE, FILM: 100 kΩ, 10%, 1/2 W	2	62PR100K	73138	
R11	Same as R9				
R12	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	3	RCR07G103JS	81349	01121
R13	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4 W	5	RCR07G104JS	81349	01121
R14	RESISTOR, VARIABLE, COMPOSITION: 500 kΩ, 10%, 1 W LINEAR	1	72M1N048S504U	01121	01121
R15	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/2 W	1	RCR20G335JS	81349	01121
R16	RESISTOR, VARIABLE, COMPOSITION: 2.5 MΩ, 10%, 1 W LINEAR	1	72M1N048S255U	01121	01121
R17	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/2 W	1	RCR20G392JS	81349	01121
R18	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/2 W	1	RCR20G475JS	81349	01121
R19	Same as R9				
R20	Same as R10				
R21	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	1	RCR07G470JS	81349	01121
R22	RESISTOR, FIXED, COMPOSITION: 180 kΩ, 5%, 1/4 W	2	RCR07G184JS	81349	01121
R23	Same as R22				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R24	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4 W	4	RCR07G224JS	81349	01121
R25	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4 W	2	RCR07G682JS	81349	01121
R26	Same as R5				
R27	Same as R12				
R28	Same as R5				
R29	Same as R24				
R30	Same as R25				
R31	Same as R9				
R32	RESISTOR, VARIABLE, COMPOSITION: 50 kΩ, 10%, 1 W LINEAR	1	70M1N048R503U	01121	
R33	Same as R9				
R34	Same as R7				
R35	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	2	RCR07G221JS	81349	01121
R36	RESISTOR, FIXED, COMPOSITION: 3.0 MΩ, 5%, 1/4 W	2	RCR07G305JS	81349	01121
R37	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4 W	2	RCR07G153JS	81349	01121
R38	RESISTOR, FIXED, COMPOSITION: 2.0 kΩ, 5%, 1/4 W	1	RCR07G202JS	81349	01121
R39	Same as R24				
R40	RESISTOR, FIXED, COMPOSITION: 24 kΩ, 5%, 1/4 W	2	RCR07G243JS	81349	01121
R41	RESISTOR, VARIABLE, COMPOSITION: 500 Ω, 10%, 1 W LINEAR	1	70M1N048R501U	01121	
R42	RESISTOR, FIXED, COMPOSITION: 12 kΩ, 5%, 1/4 W	1	RCR07G123JS	81349	01121
R43	Same as R24				
R44	Same as R40				
R45	RESISTOR, FIXED, COMPOSITION: 1.8 kΩ, 5%, 1/4 W	1	RCR07G182JS	81349	01121

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R46	Same as R37				
R47	Same as R36				
R48	Same as R35				
R49	Same as R8				
R50	Same as R13				
R51	Same as R13				
R52	Same as R13				
R53	Same as R13				
R54	Same as R12				
R55	RESISTOR, VARIABLE, FILM: 20 kΩ, 10%, 1/2 W	1	62PR20K	73138	
R56	RESISTOR, FIXED, COMPOSITION: 16 kΩ, 5%, 1/4 W	1	RCR07G163JS	81349	01121
R57	RESISTOR, FIXED, COMPOSITION: 1.0 MΩ, 5%, 1/4 W	2	RCR07G105JS	81349	01121
R58	Same as R57				
R59	RESISTOR, VARIABLE, FILM: 1 MΩ, 10%, 1/2 W	1	62PR1M	73138	
R60	Same as R5				
U1	INTEGRATED CIRCUIT	2	741HC	07263	
U2	Same as U1				

5.4.4 Type 7781 Oscillator Assembly

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	MARKER OSCILLATOR	1	18084	14632	
A2	SWEEP OSCILLATOR	1	15799-2	14632	
C1	CAPACITOR, CERAMIC, FEEDTHRU: 470 pF, 20%, 500 V	6	54-794-009-471M	33095	
C2 Thru C6	Same as C1				
C7	CAPACITOR, ELECTROLYTIC, TANTALUM: 27 μF, 10%, 35 V	1	196D276X9035MA3	56289	
C8	CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500 V	1	54-794-009-102W	33095	
C9	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	6	C023B101E502M	56289	
C10 Thru C14	Same as C9				
FB1	FERRITE BEAD	6	56-590-65-4A	02114	
FB2 Thru FB6	Same as FB1				
J1	CONNECTOR, RECEPTACLE, SMC SERIES	2	10-0104-002	19505	
J2	Same as J1				
L1	COIL. FIXED: 30 μH	5	1537-50	99800	
L2	Not Used				
L3	COIL, FIXED: 62 μH	1	1537-66	99800	
L4 Thru L7	Same as L1				

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R1	RESISTOR, FIXED, COMPOSITION: 18 kΩ, 5%, 1/4 W	1	RCR07G183JS	81349	01121

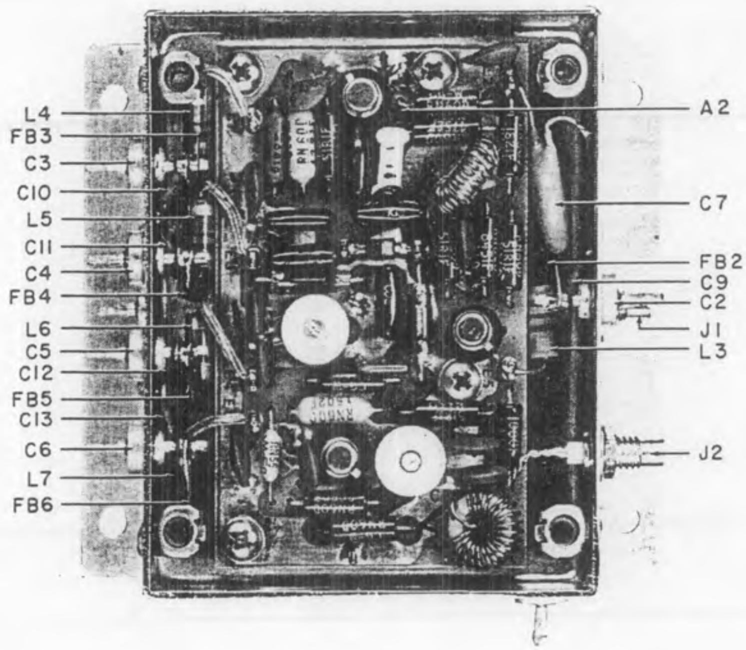


Figure 5-10. Type 7781 Oscillator Assembly (A3), Top View, Location of Components

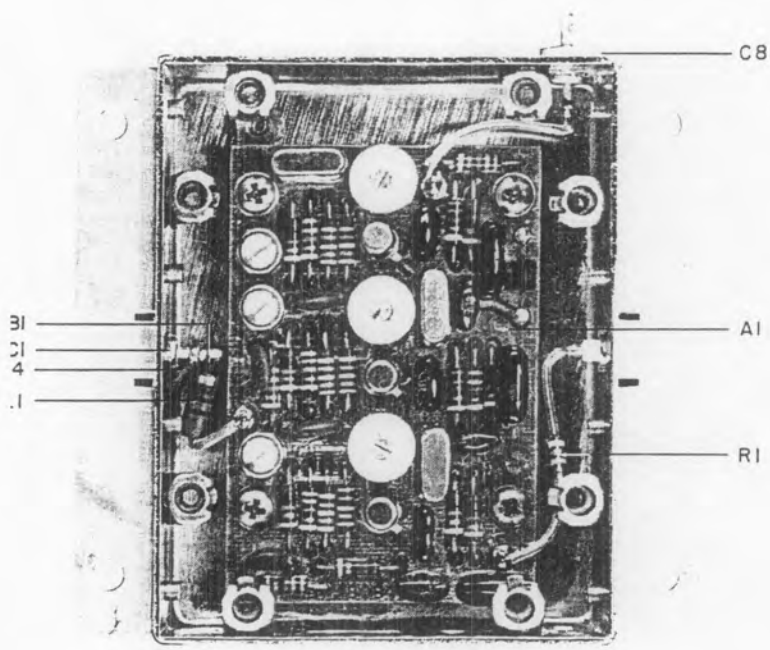


Figure 5-11. Type 7781 Oscillator Assembly (A3), Bottom View, Location of Components

5.4.4.1 Part 18084 Marker Oscillators

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, MICA, DIPPED: 33 pF, 2%, 500 V	3	CM04ED330G03	81349	72136
C2	CAPACITOR, MICA, DIPPED: 47 pF, 2%, 500 V	3	CM04ED470G03	81349	72136
C3	CAPACITOR, MICA, DIPPED: 470 pF, 5%, 500 V	3	DM15-471J	72136	
C4	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	4	C023B101E502M	56289	
C5	Same as C1				
C6	Same as C2				
C7	Same as C3				
C8	Same as C4				
C9	Same as C1				
C10	Same as C2				
C11	Same as C3				
C12	Same as C4				
C13	Same as C4				
C14	CAPACITOR, VARIABLE, CERAMIC: 2-8 pF, 350 V	3	538-011A2-8	72982	
C15	Same as C14				
C16	Same as C14				
CR1	DIODE	1	MPN3401	04713	
Q1	TRANSISTOR	3	2N3478	80131	34156
Q2	Same as Q1				
Q3	Same as Q1				
R1	RESISTOR, FIXED, COMPOSITION: 330 kΩ, 5%, 1/4 W	6	RCR07G334JS	81349	01121

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R2	Same as R1				
R3	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4 W	3	RCR07G221JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 510 Ω, 5%, 1/4 W	1	RCR07G511JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4 W	7	RCR07G332JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	5	RCR07G102JS	81349	01121
R7	RESISTOR, VARIABLE, FILM: 10 kΩ, 10%, 1/2 W	3	62PR10K	73138	
R8	Same as R5				
R9	Same as R6				
R10	Same as R1				
R11	Same as R1				
R12	Same as R1				
R13	Same as R3				
R14	Same as R5				
R15	Same as R6				
R16	Same as R7				
R17	Same as R5				
R18	Same as R6				
R19	Same as R1				
R20	Same as R3				
R21	Same as R5				
R22	Same as R7				
R23	Same as R5				

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R24	Same as R6				
R25	RESISTOR, FIXED, COMPOSITION: 20 Ω, 5%, 1/4 W	1	RCR07G200JS	81349	01121
R26	Same as R5				
Y1	CRYSTAL, QUARTZ	1	96402-1	14632	
Y2	CRYSTAL, QUARTZ	1	96402-5	14632	
Y3	CRYSTAL, QUARTZ	1	96402-6	14632	

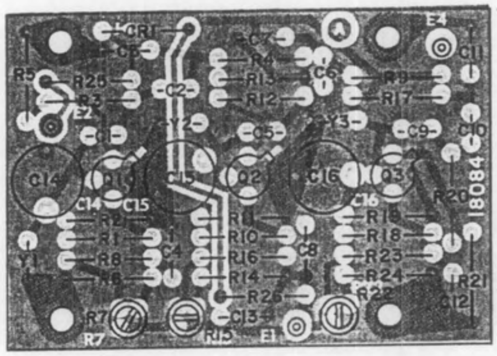


Figure 5-12. Part 18084 Marker Oscillators (A3A1), Location of Components

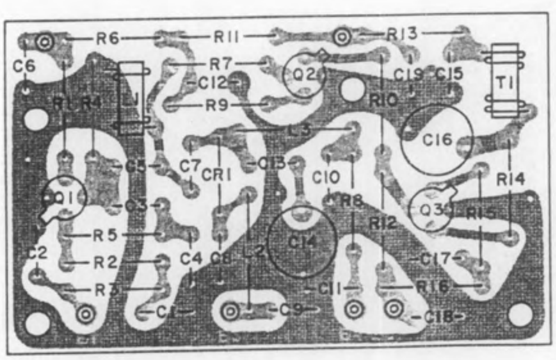


Figure 5-13. Part 15799-2 Sweep Oscillators (A3A1), Location of Components

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100 V	10	C023B101E502M	56289	
C2	Same as C1				
C3	CAPACITOR, MICA, DIPPED: 22 pF, 5%, 500 V	2	CM05ED220J03	81349	72136
C4	Same as C3				
C5	CAPACITOR, CERAMIC, TUBULAR: 6.8 pF ± 0.25 pF, 500 V	1	301-000COHO-689C	72982	
C6	Same as C1				
C7	CAPACITOR, MICA, DIPPED: 27 pF, 2%, 500 V	1	CM05ED270G03	81349	72136
C8	CAPACITOR, MICA, DIPPED: 430 pF, 5%, 500 V	1	DM15-431J	72136	
C9	Same as C1				
C10	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	1	8131M100-651-104M	72982	
C11	Same as C1				
C12	Same as C1				
C13	CAPACITOR, MICA, DIPPED: 47 pF, 2%, 500 V	1	CM05ED470G03	81349	72136
C14	CAPACITOR, VARIABLE, CERAMIC: 2-8 pF, 350 V	1	538-011A2-8	72982	
C15	Same as C1				
C16	CAPACITOR, VARIABLE, CERAMIC: 2.5-11 pF, 350 V	1	538-011B2.5-11	72982	
C17	Same as C1				
C18	Same as C1				
C19	Same as C1				
CR1	DIODE, VARICAP	1	BB109	25088	
L1	COIL	1	20681-165	14632	

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
L2	INDUCTOR	2	1131-41	14632	
L3	Same as L2				
Q1	TRANSISTOR	1	2N2857	80131	02735
Q2	TRANSISTOR	2	2N3478	80131	34156
Q3	Same as Q2				
R1	RESISTOR, FIXED, FILM: 20 Ω, 1%, 1/4 W	2	RN60D20R0F	81349	75042
R2	RESISTOR, FIXED, FILM: 4.22 kΩ, 1%, 1/4 W	1	RN60D4221	81349	75042
R3	RESISTOR, FIXED, FILM: 619 Ω, 1%, 1/4 W	1	RN60D6190F	81349	75042
R4	RESISTOR, FIXED, FILM: 47.5 kΩ, 1%, 1/4 W	1	RN60D4752F	81349	75042
R5	RESISTOR, FIXED, FILM: 51.1 Ω, 1%, 1/4W	5	RN60D51R1F	81349	75042
R6	RESISTOR, FIXED, FILM: 1.82 kΩ, 1%, 1/4 W	1	RN60D1821F	81349	75042
R7	RESISTOR, FIXED, FILM: 8.45 kΩ, 1%, 1/4 W	1	RN60D8451F	81349	75042
R8	RESISTOR, FIXED, FILM: 56.2 kΩ, 1%, 1/4 W	1	RN60D5622F	81349	75042
R9	Same as R5				
R10	Same as R5				
R11	Same as R5				
R12	RESISTOR, FIXED, FILM: 15.0 kΩ, 1%, 1/4 W	1	RN60D1502F	81349	75042
R13	RESISTOR, FIXED, FILM: 100 Ω, 1%, 1/4 W	1	RN60D1000F	81349	75042
R14	Same as R5				
R15	Same as R1				
R16	RESISTOR, FIXED, FILM: 3.57 kΩ, 1%, 1/10 W	1	RN55C3571F	81349	75042
T1	COIL, TAPPED	1	21428-62	14632	

5.4.5 Type 791504 Intensity Control Board

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	2	8131M100-651-104M	72982	
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 0.10 μF, 10%, 35 V	1	150D104X9035A2	56289	
C3	Same as C1				
C4	CAPACITOR, ELECTROLYTIC, TANTALUM: 0.22 μF, 10%, 35 V	1	150D224X9035A2	56289	
Q1	TRANSISTOR	1	2N2222A	80131	04713
Q2	TRANSISTOR	1	2N4918	80131	04713
R1	RESISTOR, FIXED, FILM: 332 kΩ, 1%, 1/4 W	1	2N60D3323F	81349	75042
R2	RESISTOR, FIXED, FILM: 21.5 kΩ, 1%, 1/4 W	1	RN60D2152F	81349	75042
R3	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	2	RCR07G102JS	81349	01121
R4	Same as R3				
R5	RESISTOR, FIXED, COMPOSITION: 200 Ω, 5%, 1/4 W	1	RCR07G201JS	81349	01121
U1	INTEGRATED CIRCUIT	2	NE555V	18324	
U2	Same as U1				

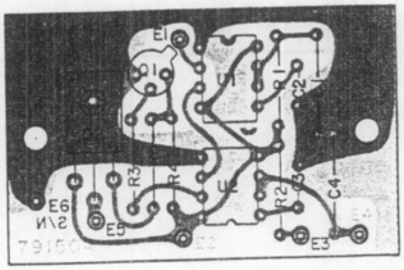


Figure 5-14. Type 791504 Intensity Control Board (A4), Location of Components

5.4.6 Type 79907 Gate Generator and DAFC

REF DESIG PREFIX A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 4.7 μF, 10%, 35 V	5	CS13BF475K	81349	56289
C2	CAPACITOR, CERAMIC, DISC: 0.1 μF, M20P80, 25 V	10	DF J3	73899	
C3	Same as C1				
C4 Thru C10	Same as C2				
C11	Same as C1				
C12	Same as C1				
C13	CAPACITOR, ELECTROLYTIC, TANTALUM: 10 μF, 10%, 20 V	2	CS13BE106K	81349	56289
C14	Same as C13				
C15	Same as C2				
C16	Same as C2				
C17	Same as C1				
C18	Not Used				
C19	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100 V	6	8131M100-651-104M	72982	
C20	Not Used				
C21 Thru C25	Same as C19				
C26	CAPACITOR, MICA, DIPPED: 510 pF, 5%, 500 V	1	DM15-511J	72136	
CR1	DIODE	12	1N995	80131	04713
CR2 Thru CR6	Same as CR1				

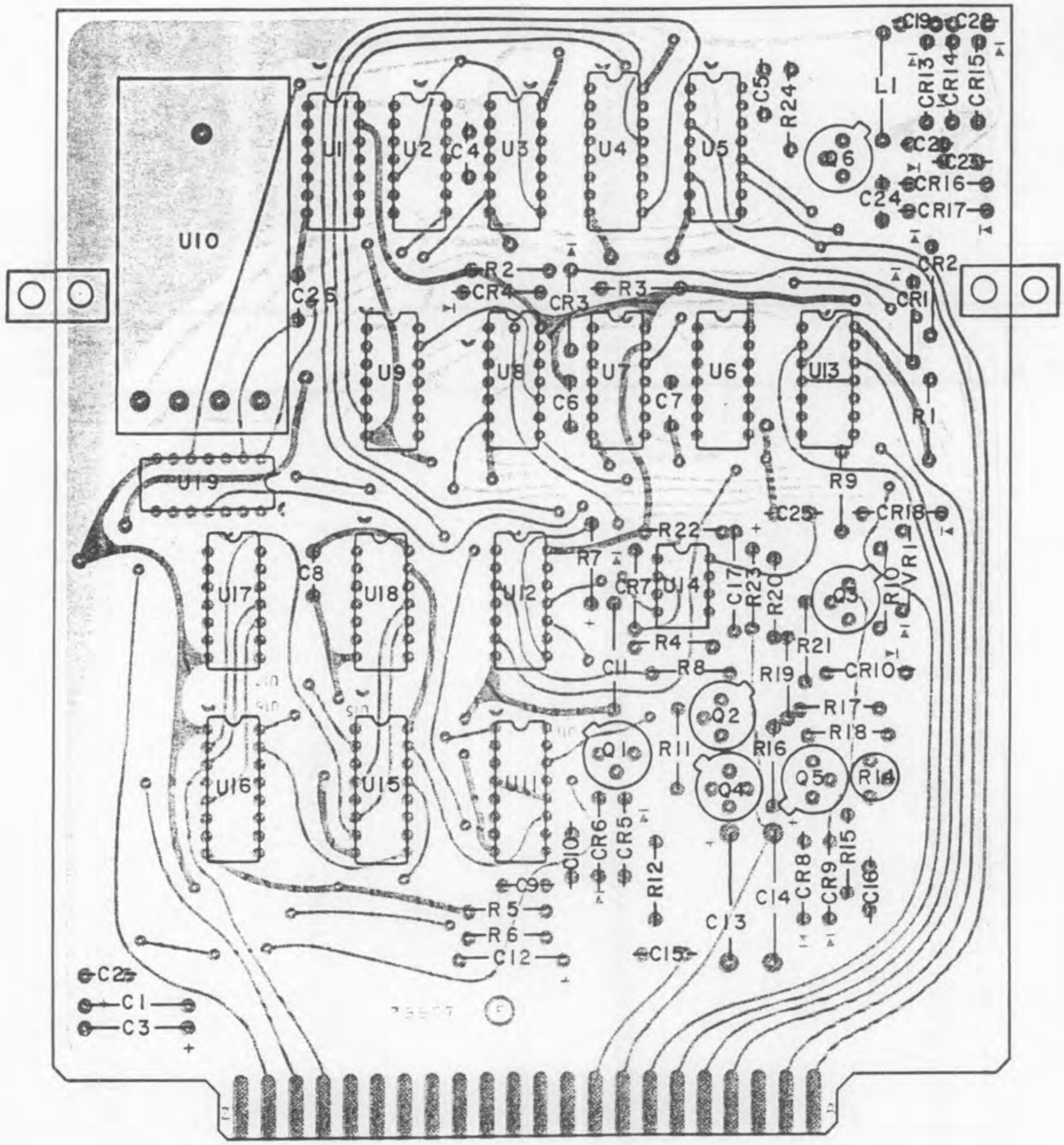


Figure 5-15. Type 79907 Gate Generator and DAFC (A5), Location of Components

REF DESIG PREFIX A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
CR7	DIODE	1	1N4446	80131	93332
CR8	DIODE	2	1N462A	80131	93332
CR9	Same as CR8				
CR10	DIODE	1	1N198A	80131	93332
CR11	Not Used				
CR12	Not Used				
CR13 Thru CR18	Same as CR1				
L1	COIL, FIXED, MOLD: 500 μH	1	1500-15	99848	
Q1	TRANSISTOR	2	2N2222A	80131	04713
Q2	TRANSISTOR	1	2N3251	80131	04713
Q3	TRANSISTOR	1	2N929	80131	04713
Q4	TRANSISTOR	1	3N139	07263	02735
Q5	Same as Q1				
Q6	TRANSISTOR	1	2N709A	80131	02735
R1	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	7	RCR07G103JS	81349	01121
R2 Thru R6	Same as R1				
R7*	RESISTOR, FIXED, COMPOSITION: 750 kΩ, 5%, 1/4 W	1	RCR07G754JS	81349	01121
R8	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4 W	1	RCR07G472JS	81349	01121
R9	RESISTOR, FIXED, COMPOSITION: 6.2 kΩ, 5%, 1/4 W	1	RCR07G622JS	81349	01121

* Nominal value, final value factory selected

REF DESIG PREFIX A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R10	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4 W	1	RCR07G153JS	81349	01121
R11	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	01121
R12	RESISTOR, FIXED, COMPOSITION: 510 kΩ, 5%, 1/4 W	1	RCR07G514JS	81349	01121
R13	Not Used				
R14	RESISTOR, VARIABLE, FILM: 500 Ω, 10%, 1/2 W	1	62PR500	73138	
R15	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	2	RCR07G102JS	81349	01121
R16	Same as R15				
R17	RESISTOR, FIXED, COMPOSITION: 200 kΩ, 5%, 1/4 W	1	RCR07G204JS	81349	01121
R18	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4 W	1	RCR07G104JS	81349	01121
R19	Same as R1				
R20	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4 W	1	RCR07G303JS	81349	01121
R21	RESISTOR, FIXED, COMPOSITION: 2.0 kΩ, 5%, 1/4 W	1	RCR07G202JS	81349	01121
R22	RESISTOR, FIXED, COMPOSITION: 18 kΩ, 5%, 1/4 W	2	RCR07G183JS	81349	01121
R23	Same as R22				
R24	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
U1	INTEGRATED CIRCUIT	7	868292	14632	
U2	Same as U1				
U3	Same as U1				
U4	INTEGRATED CIRCUIT	1	SP322B	18324	
U5	INTEGRATED CIRCUIT	1	9015DC	07263	
U6	Same as U1				
U7	Same as U1				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
U8	INTEGRATED CIRCUIT	1	86961	14632	
U9	INTEGRATED CIRCUIT	1	962DC	07263	
U10	TCXO	1	92063-1	14632	
U11	INTEGRATED CIRCUIT	1	9014DC	07263	
U12	INTEGRATED CIRCUIT	1	86946	14632	
U13	INTEGRATED CIRCUIT	1	867404	14632	
U14	INTEGRATED CIRCUIT	1	MC1458V	18324	
U15	INTEGRATED CIRCUIT	2	8693L24	14632	
U16	Same as U15				
U17	Same as U1				
U18	Same as U1				
U19	INTEGRATED CIRCUIT	1	86936	14632	
VR1	DIODE, ZENER: 5.6 V	1	LVA56A	01281	

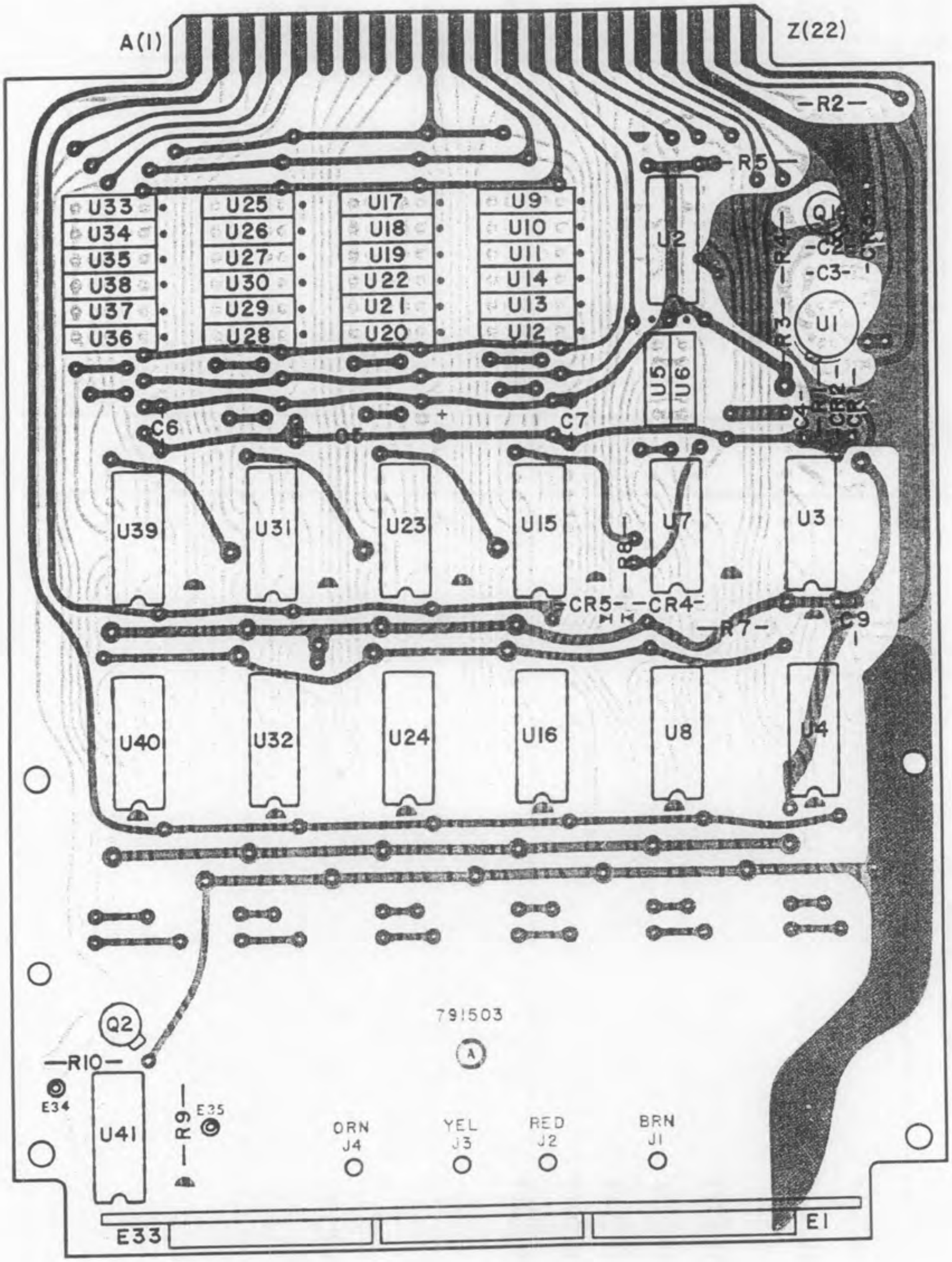


Figure 5-16. Type 791503 Count, Decode, and Display (A6), Location of Components

5.4.7 Type 791503 Count Decode and Display REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	SOLID STATE NUMERIC DISPLAY	1	16513	14632	
C1	CAPACITOR, CERAMIC, DISC: 0.1 µF, -20+80%, 25 V	8	DF J3	73899	
C2	Same as C1				
C3	Same as C1				
C4	Same as C1				
C5	CAPACITOR, ELECTROLYTIC, TANTALUM: 10 µF, 10%, 20 V	1	CS13BE106K	81349	56289
C6	Same as C1				
C7	Same as C1				
C8	Same as C1				
C9	Same as C1				
CR1	DIODE	2	5082-2800	28480	
CR2	Same as CR1				
CR3	DIODE	1	1N4449	80131	93332
CR4	DIODE	2	1N4446	80131	93332
CR5	Same as CR4				
J1	CONNECTOR, RECEPTACLE	4	60599-3	00779	
J2	Same as J1				
J3	Same as J1				
J4	Same as J1				
Q1	TRANSISTOR	1	2N709A	80131	02735
Q2	TRANSISTOR	1	2N2222A	80131	04713
R1	RESISTOR, FIXED, COMPOSITION: 620 Ω, 5%, 1/4 W	1	RCR07G621JS	81349	01121

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R2	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4 W	2	RCR07G470JS	81349	01121
R3	Same as R2				
R4	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4 W	1	RCR07G103JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/4 W	3	RCR07G102JS	81349	01121
R6	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121
R7	RESISTOR, FIXED, COMPOSITION: 200 Ω, 5%, 1/4 W	1	RCR07G201JS	81349	01121
R8	Same as R5				
R9	Same as R5				
R10	RESISTOR, FIXED, COMPOSITION: 1.8 kΩ, 5%, 1/4 W	1	RCR07G182JS	81349	01121
U1	INTEGRATED CIRCUIT	1	N5733K	18324	
U2	INTEGRATED CIRCUIT	1	RF3202DC	49956	
U3	INTEGRATED CIRCUIT	1	868290	14632	
U4	INTEGRATED CIRCUIT	11	868292	14632	
U5	Not Used				
U6	PRESET MODULE	5	31689-20	14632	
U7	INTEGRATED CIRCUIT	1	868280	14632	
U8	Same as U4				
U9	PRESET MODULE	1	31689-16	14632	
U10	PRESET MODULE	6	31689-10	14632	
U11	Same as U10				
U12	Same as U10				
U13	Not Used				

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
U14	Same as U6				
U15	Same as U4				
U16	Same as U4				
U17	PRESET MODULE				
U18	Same as U10	1	31689-18	14632	
U19	PRESET MODULE				
U20	Same as U10	1	31689-12	14632	
U21	Not Used				
U22	Same as U6				
U23	Same as U4				
U24	Same as U4				
U25	PRESET MODULE				
U26	PRESET MODULE	1	31689-17	14632	
U27	PRESET MODULE	1	31689-14	14632	
U28	Same as U10	5	31689-19	14632	
U29	Not Used				
U30	Same as U6				
U31	Same as U4				
U32	Same as U4				
U33	Same as U27				
U34	Same as U27				
U35	Same as U27				

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
U36	Same as U27				
U37*	PRESET MODULE	1	31689-XX	14632	
U38	Same as U6				
U39	Same as U4				
U40	Same as U4				
U41	Same as U4				

* Customer Option

5.4.7.1 Part 16513 Solid State Numeric Display

REF DESIG PREFIX A6A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 4.7 μF, 10%, 35 V	1	CS13BF475K	81349	56289
C2	CAPACITOR, CERAMIC, DISC: 0.1 μF, -20+80%, 25 V	1	DF J3	73899	
U1	INTEGRATED CIRCUIT	6	5082-7300	28480	
U2 Thru U6	Same as U1				

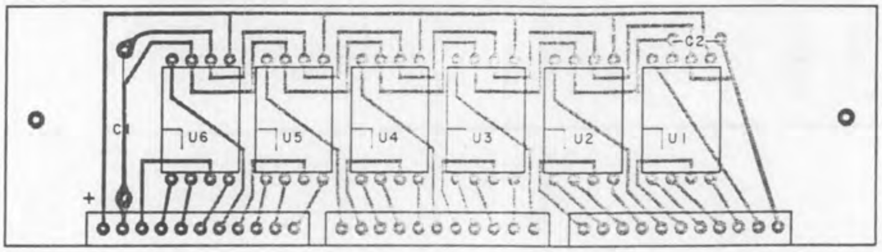


Figure 5-17. Part 16513 Solid State Numeric Display (A6A1), Location of Components

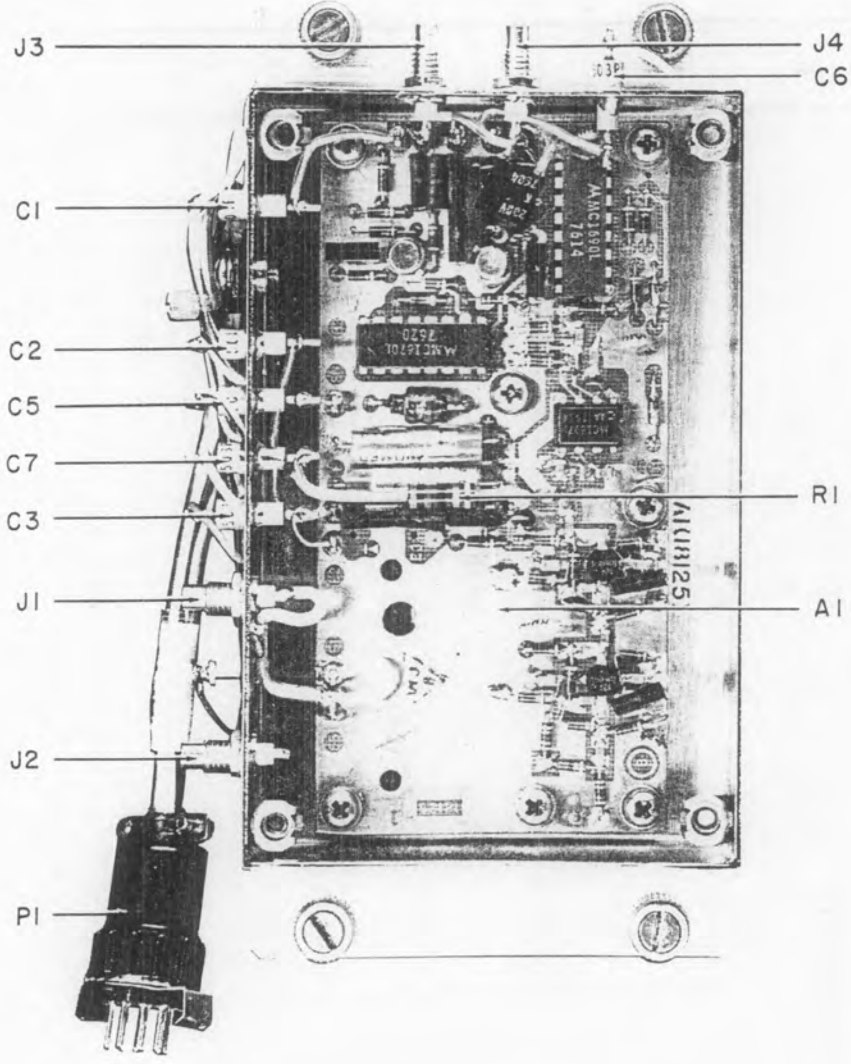


Figure 5-18. Type 791505-1 1200 MHz Prescaler (A7), Location of Components

5.4.8 Type 791505-1 1200 MHz Prescaler

REF DESIG PREFIX A7

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
A1	1200 MHz PRESCALER	1	18125-1	14632	
C1	CAPACITOR, CERAMIC, FEEDTHRU: .05 μF, GMV, 300 V	6	54-785-002-503P	33095	
C2	Same as C1				
C3	Same as C1				
C4	Not Used				
C5	Same as C1				
C6	Same as C1				
C7	Same as C1				
J1	CONNECTOR, RECEPTACLE, SMC SERIES	4	10-0104-002	19505	
J2	Same as J1				
J3	Same as J1				
J4	Same as J1				
P1	CONNECTOR, PLUG, MULTIPIN	1	M10PLSH19C	81312	
R1	RESISTOR, FIXED, COMPOSITION: 82 Ω, 5%, 1/2 W	1	RCR20G820JS	81349	01121

NOTE: OMIT K1, CR6, J2 FOR 18125-1

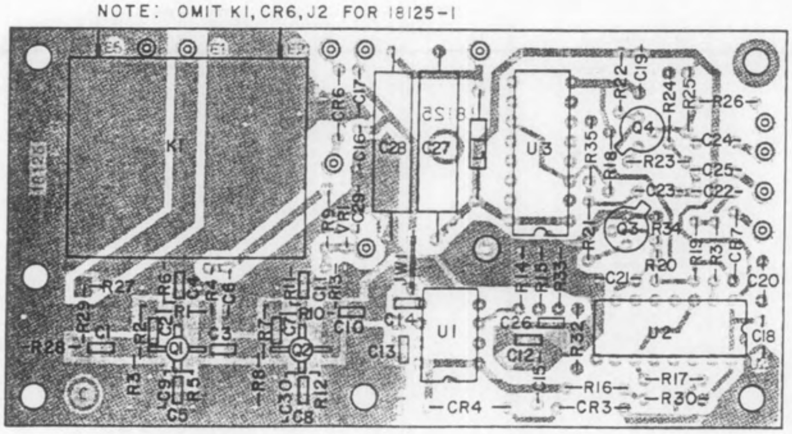


Figure 5-19. Part 18125-1 1200 MHz Prescaler (A7A1), Location of Components

REF DESIG PREFIX A7A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C1	CAPACITOR, CERAMIC, CHIP: 2200 pF, 5%, 50 V	9	C1005C222J5GPH	31433	
C2	Same as C1				
C3	Same as C1				
C4	CAPACITOR, CERAMIC, CHIP: 6.5 pF, 5%, 50 V	4	C1005C659J5GPH	31433	
C5	Same as C4				
C6	CAPACITOR, CERAMIC, DISC: 470 pF, 20%, 1000 V	2	B (470 PF, M)	91418	
C7	Same as C1				
C8	Same as C4				
C9	CAPACITOR, CERAMIC, DISC: 0.01 μF, 10%, 200 V	8	CK06BX103K	81349	56289
C10	Same as C1				
C11	Same as C4				
C12	Same as C1				
C13	Same as C1				
C14	Same as C1				
C15	Same as C6				
C16	Same as C9				
C17	CAPACITOR, CERAMIC, DISC: 0.1 μF, 10%, 100 V	4	CK06BX104K	81349	56289
C18	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	1	SM (1000 PF, P)	91418	
C19 Thru C23	Same as C9				
C24	Same as C17				
C25	Same as C17				

REF DESIG PREFIX A7A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
C26	Same as C1				
C27	CAPACITOR, ELECTROLYTIC, TANTALUM: 200 μF, 20%, 15 V	2	MTP207M015P1C	76055	
C28	Same as C27				
C29	Same as C17				
C30	Same as C9				
CR1	DIODE	1	5082-2900	28480	
CR2	Not Used				
CR3	DIODE	2	1N4449	80131	93332
CR4	Same as CR3				
L1	COIL, FIXED: 634H	1	3063-15	99848	
Q1	TRANSISTOR	2	MFR901	04713	
Q2	Same as Q1				
Q3	TRANSISTOR	2	2N2222A	80131	04713
Q4	Same as Q3				
R1	RESISTOR, FIXED, COMPOSITION: 200 Ω, 5%, 1/8 W	2	RCR05G201JS	81349	01121
R2	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/8 W	2	RCR05G272JS	81349	01121
R3	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/8 W	2	RCR05G681JS	81349	01121
R4	RESISTOR, FIXED, COMPOSITION: 270 Ω, 5%, 1/8 W	2	RCR05G271JS	81349	01121
R5	RESISTOR, FIXED, COMPOSITION: 15 Ω, 5%, 1/8 W	4	RCR05G150JS	81349	01121
R6	Same as R5				
R7	Same as R2				
R8	Same as R3				

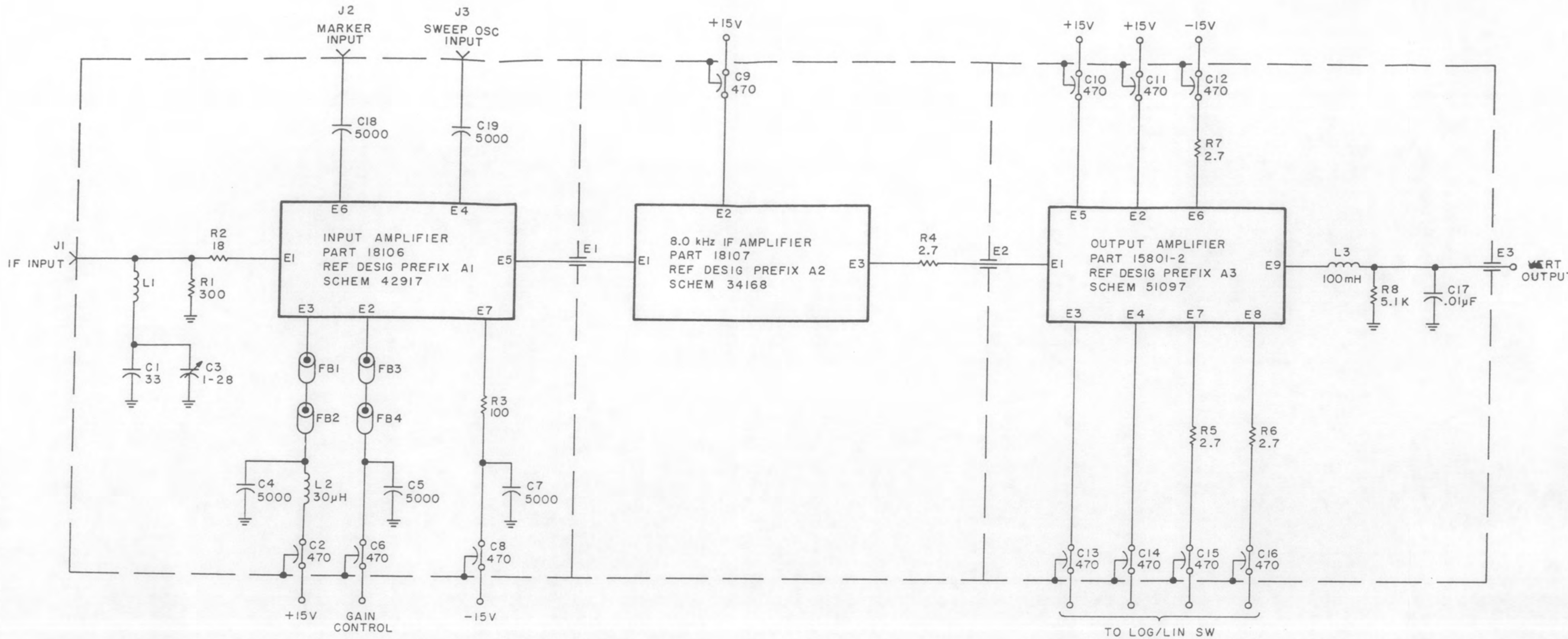
REF DESIG PREFIX A7A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R9	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/8 W	1	RCR05G220JS	81349	01121
R10	Same as R1				
R11	Same as R5				
R12	Same as R5				
R13	Same as R4				
R14	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/8 W	3	RCR05G470JS	81349	01121
R15	Same as R14				
R16	RESISTOR, FIXED, COMPOSITION: 15 Ω, 5%, 1/4 W	2	RCR07G150JS	81349	01121
R17	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/8 W	3	RCR05G471JS	81349	01121
R18	Same as R17				
R19	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/8 W	4	RCR05G331JS	81349	01121
R20	RESISTOR, FIXED, COMPOSITION: 1.0 kΩ, 5%, 1/8 W	2	RCR05G102JS	81349	01121
R21	Same as R19				
R22	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/8 W	3	RCR05G101JS	81349	01121
R23	Same as R14				
R24	RESISTOR, FIXED, COMPOSITION: 150 Ω, 5%, 1.8 W	2	RCR05G151JS	81349	01121
R25	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/8 W	2	RCR05G221JS	81349	01121
R26	Same as R25				
R27	Same as R19				
R28	Same as R19				
R29	RESISTOR, FIXED, COMPOSITION: 18 Ω, 5%, 1/8 W	1	RCR05G180JS	81349	01121
R30	Same as R16				

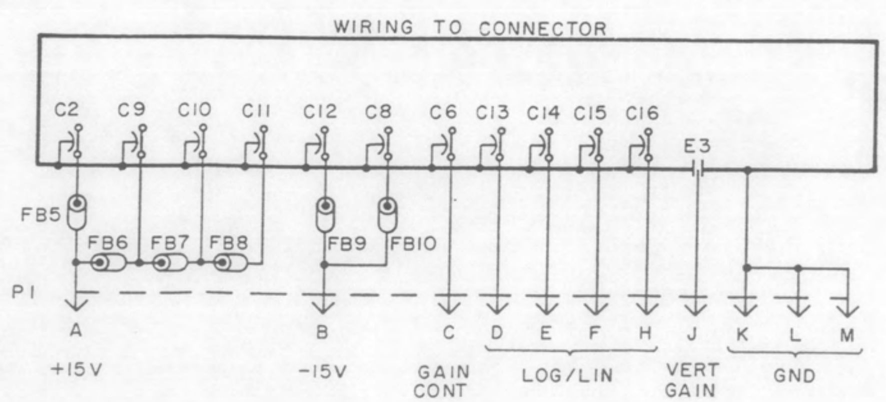
REF DESIG PREFIX A7A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R31	Same as R22				
R32	Same as R24				
R33	Same as R17				
R34	Same as R20				
R35	Same as R22				
U1	INTEGRATED CIRCUIT	1	MC1697P	04713	
U2	INTEGRATED CIRCUIT	1	MC1690L	04713	
U3	INTEGRATED CIRCUIT	1	MC1670L	04713	
VR1	DIODE, ZENER: 8.2 V	1	1N756A	80131	04713

SECTION VI
SCHEMATIC DIAGRAMS

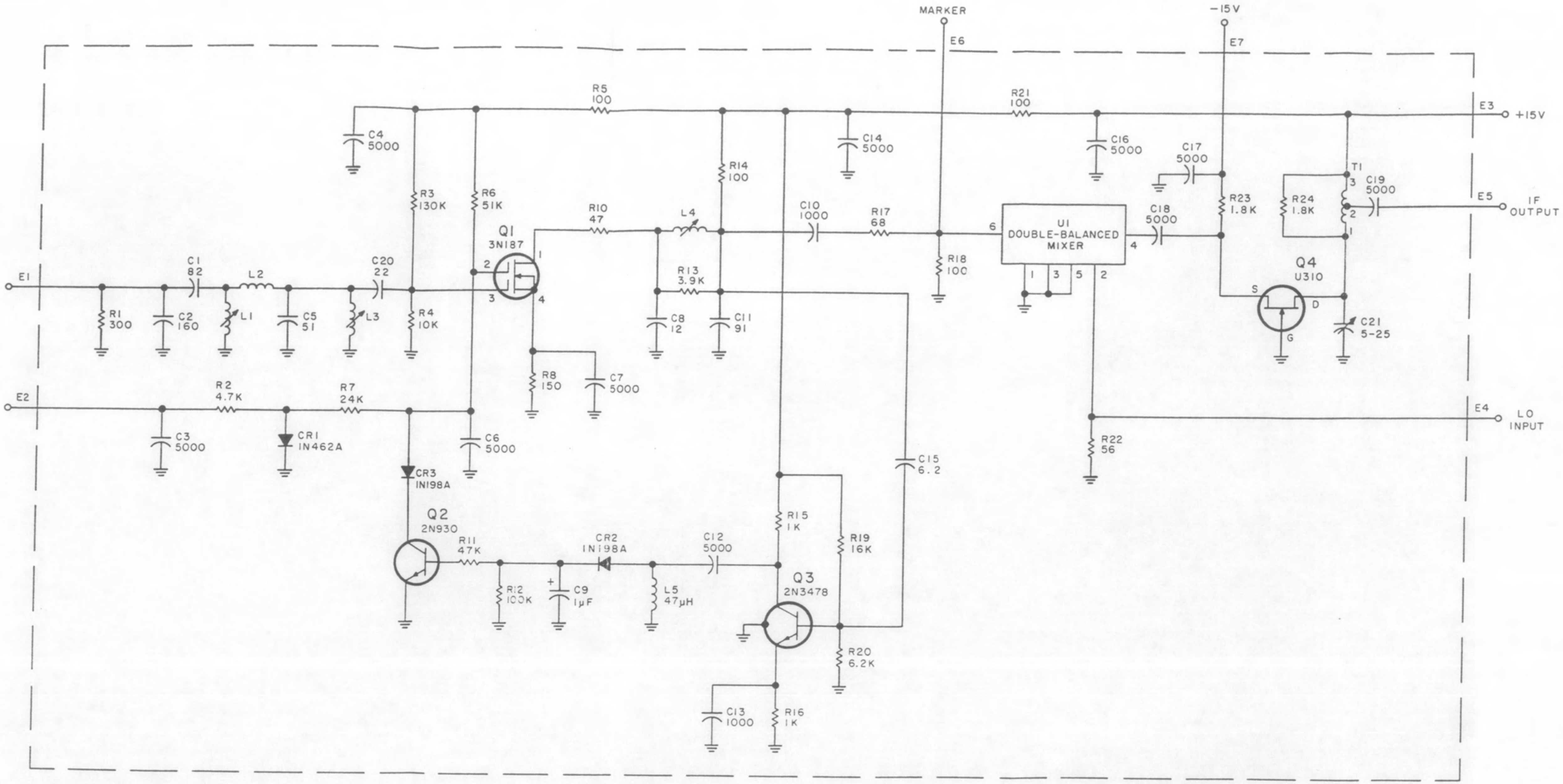


NOTE:
UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
b) CAPACITANCE IS IN pF.



HIGHEST REF DESIG		REF DESIG NOT USED
A3	J3	
C19	L3	
E3	P1	
FB10	R8	

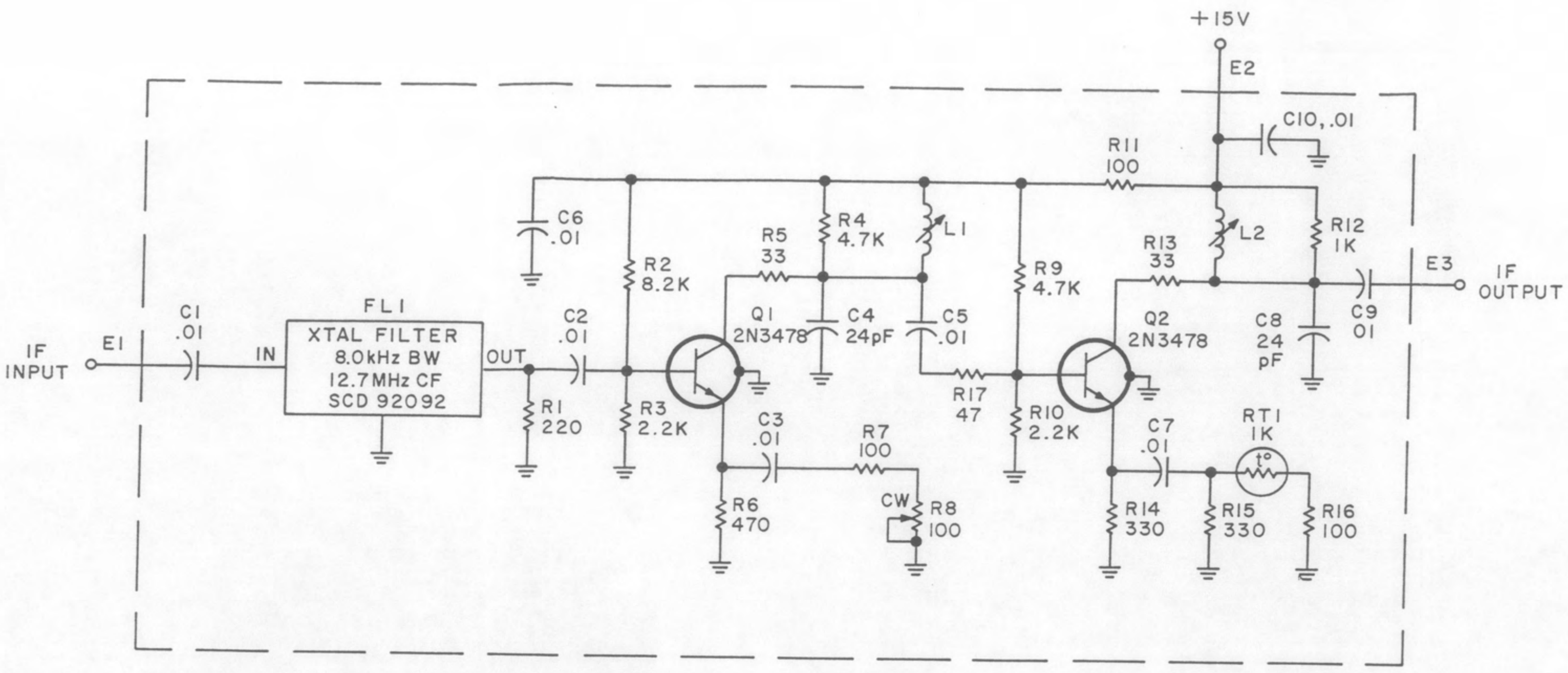
Figure 6-1. Type 72474 IF Amplifier (A1), Schematic Diagram



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

HIGHEST REF DESIG USED	REF DESIG NOT USED
C21	
R24	R9
L5	
CR3	
U1	
Q4	
T1	

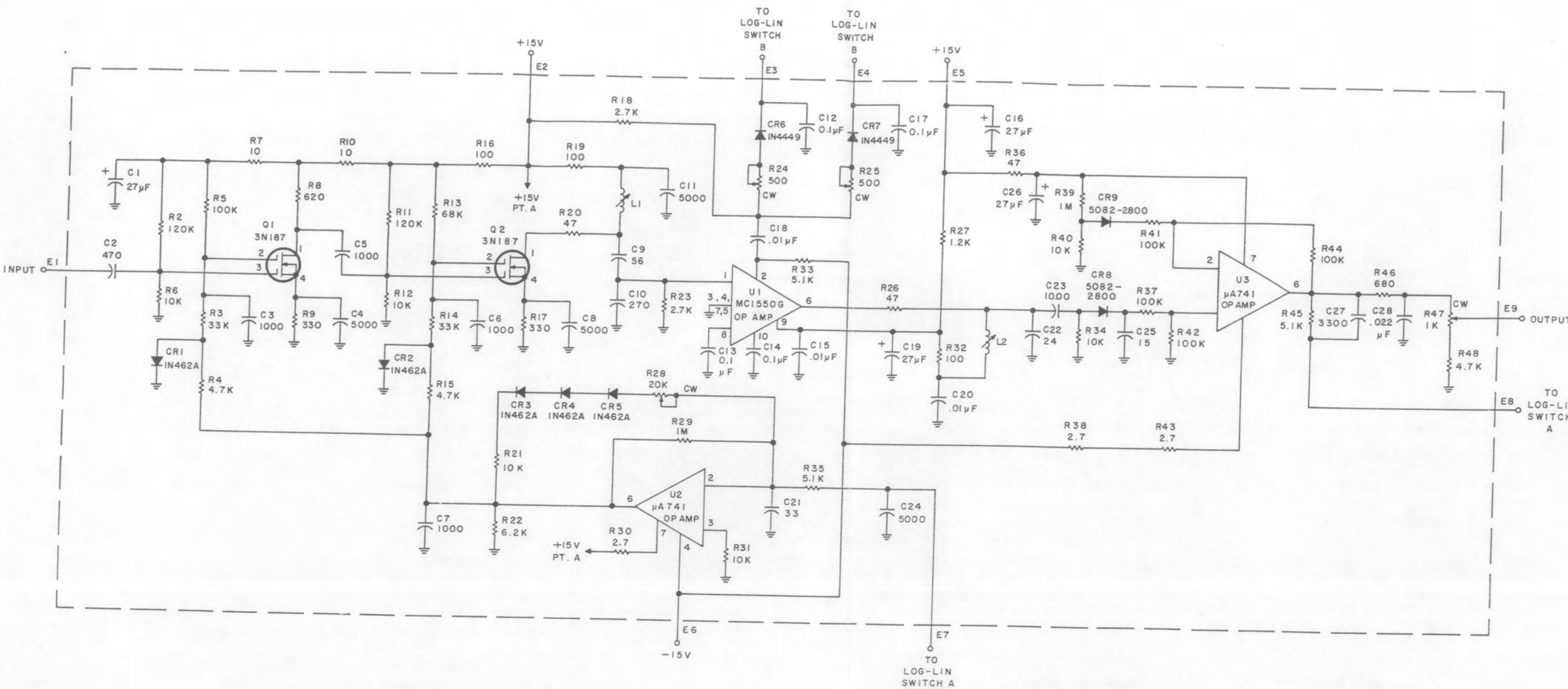
Figure 6-2. Part 18106-1 Input Amplifier (A1A1), Schematic Diagram



NOTE:

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

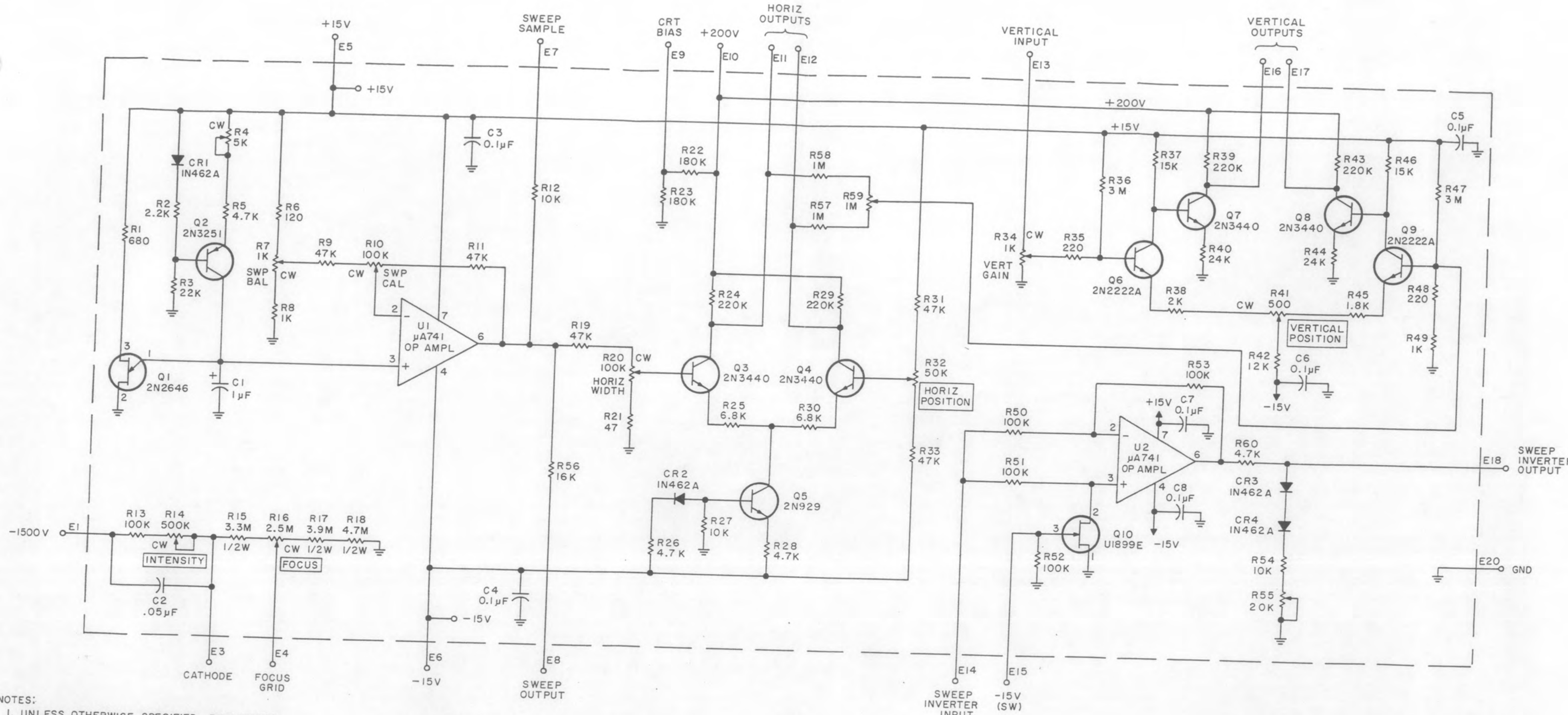
Figure 6-3. Part 18107-1 8.0 kHz IF Amplifier (A1A2), Schematic Diagram



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

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

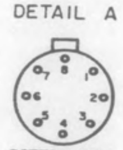
Figure 6-4. Part 15801-2 Output Amplifier (A1A3), Schematic Diagram



NOTES:

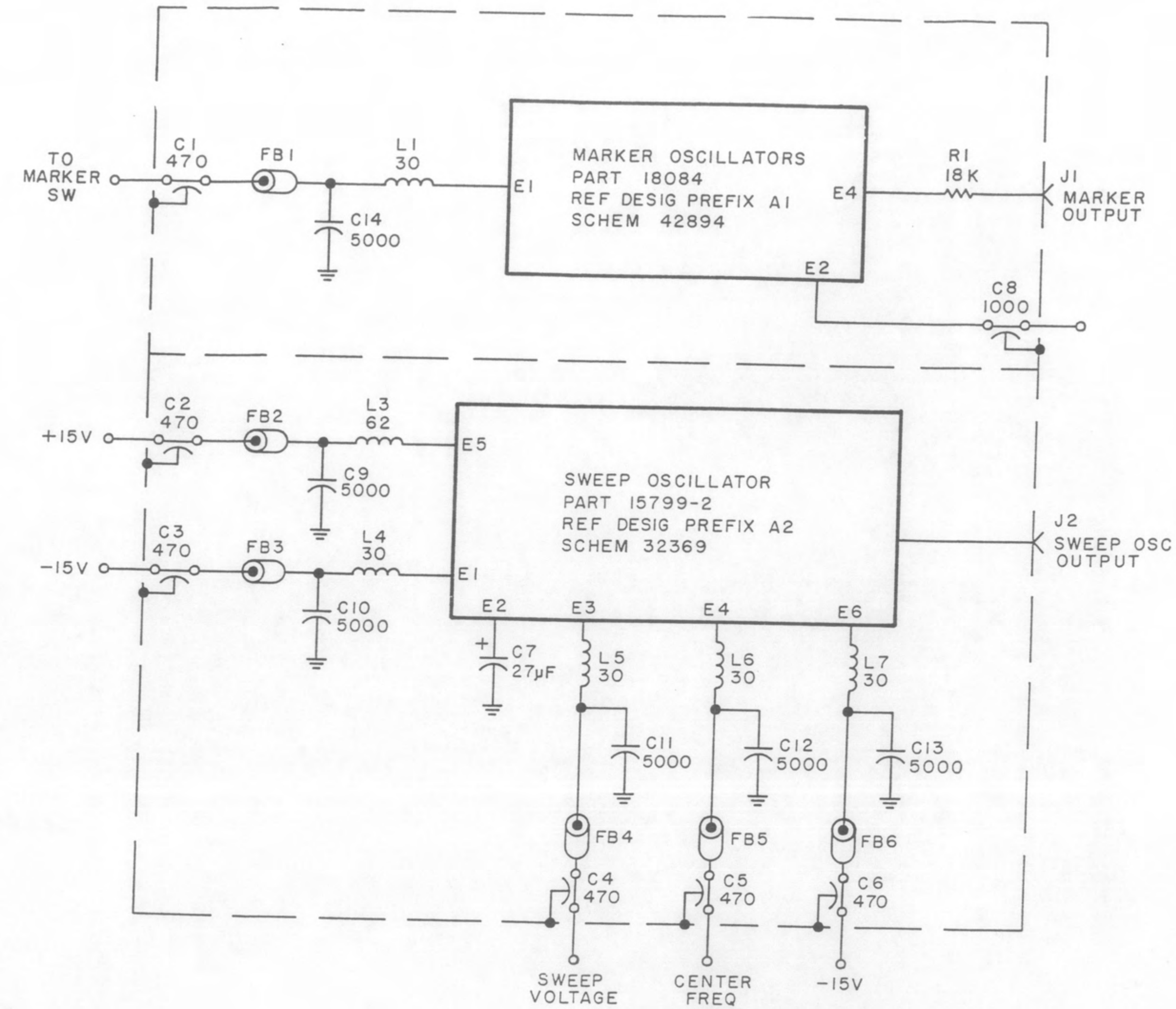
1. UNLESS OTHERWISE SPECIFIED, RESISTANCE IS IN OHMS, ±5%, 1/4 W.
2. U1, U2 LEAD ARRANGEMENT IS SHOWN IN DETAIL A.
3. CW AT POTENTIOMETERS INDICATES FULL CLOCKWISE POSITION OF ACTUATOR.
4. ▭ INDICATES FRONT PANEL CONTROL.

DETAIL A



HIGHEST REF DESIG	REF DESIG NOT USED
C8 CR4 E20 Q10 R60 U2	E2, E19

Figure 6-5. Type 8261 Control Board (A2), Schematic Diagram



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

Figure 6-6. Type 7781 Oscillator Assembly (A3), Schematic Diagram

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W
   b) CAPACITANCE IS pF.
2. CW ON POTENTIOMETERS INDICATES FULL CLOCKWISE POSITION OF ACTUATOR.

HIGHEST REF DESIG USED	REF DESIG NOT USED
C16, CR1 E4 R26 Y3 Q3	E3

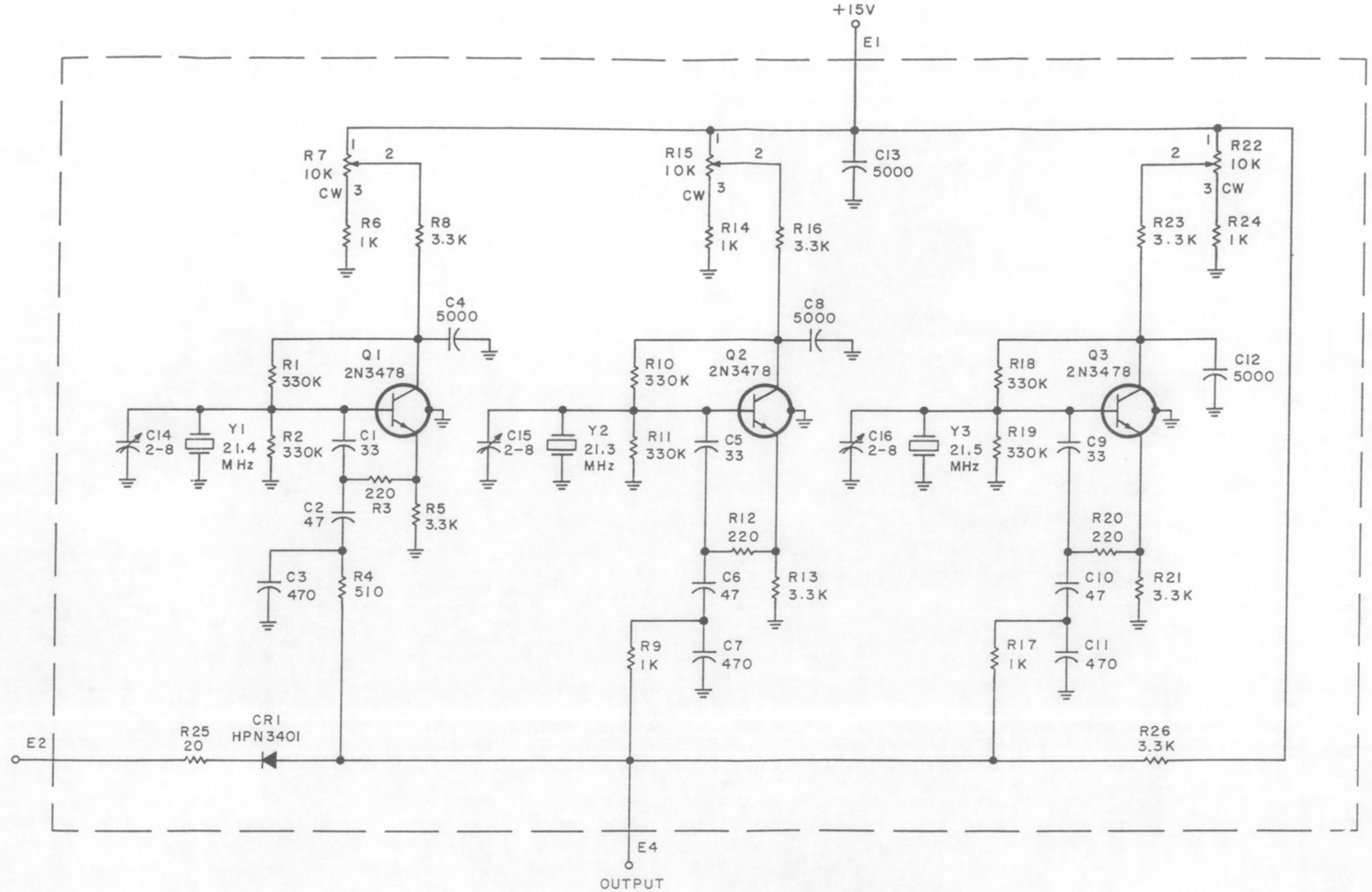


Figure 6-7. Part 18084 Marker Oscillators (A3A1), Schematic Diagram

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

	R2	R4	R7	R12	R16
15799-1	5.11K	56.2K	10K	18.2K	4.12K
15799-2	4.22K	47.5K	8.45K	15 K	3.57K

HIGHEST REF DESIG	REF DESIG NOT USED
C19 CR1 E6 L3 Q3 R15 T1	

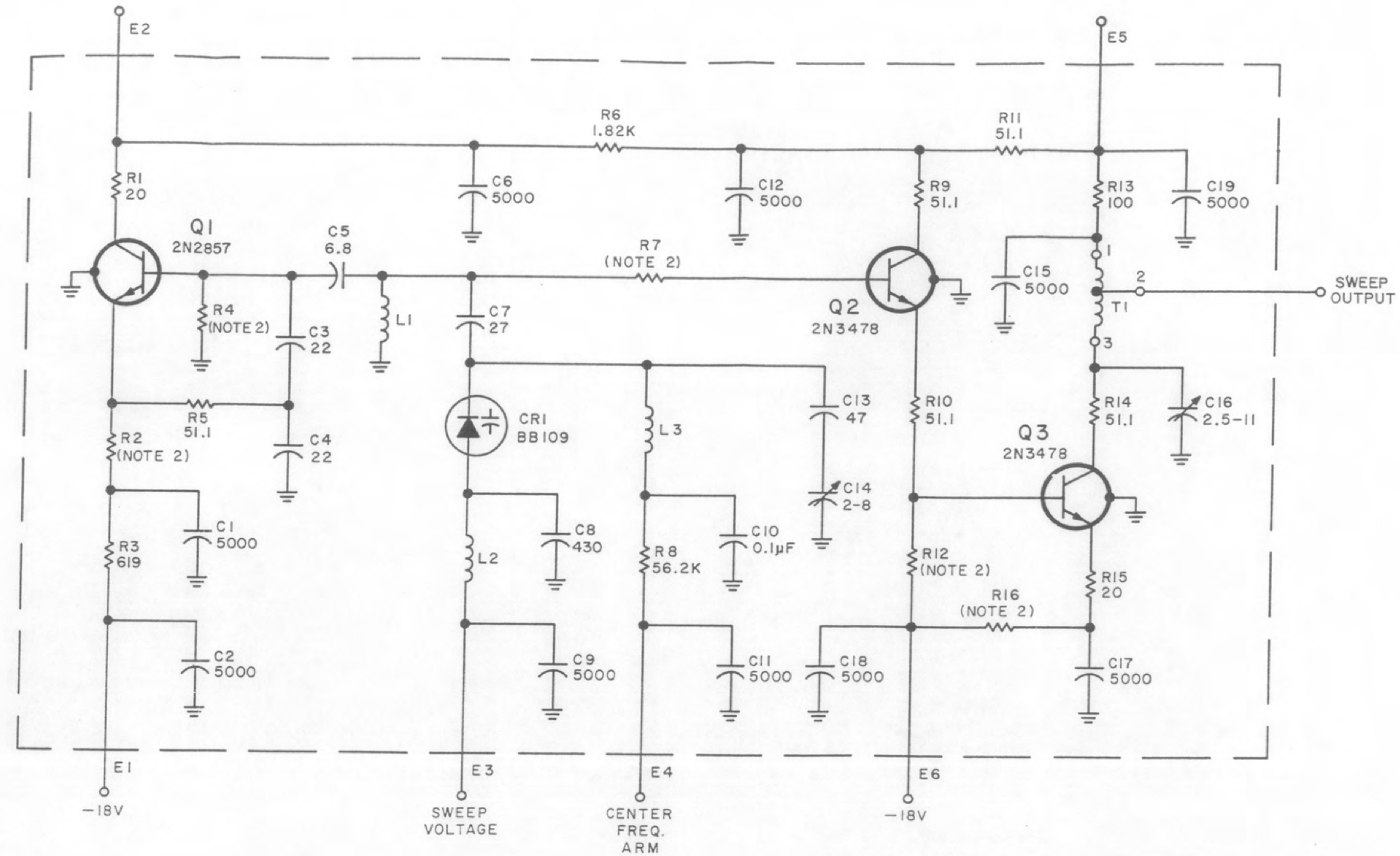
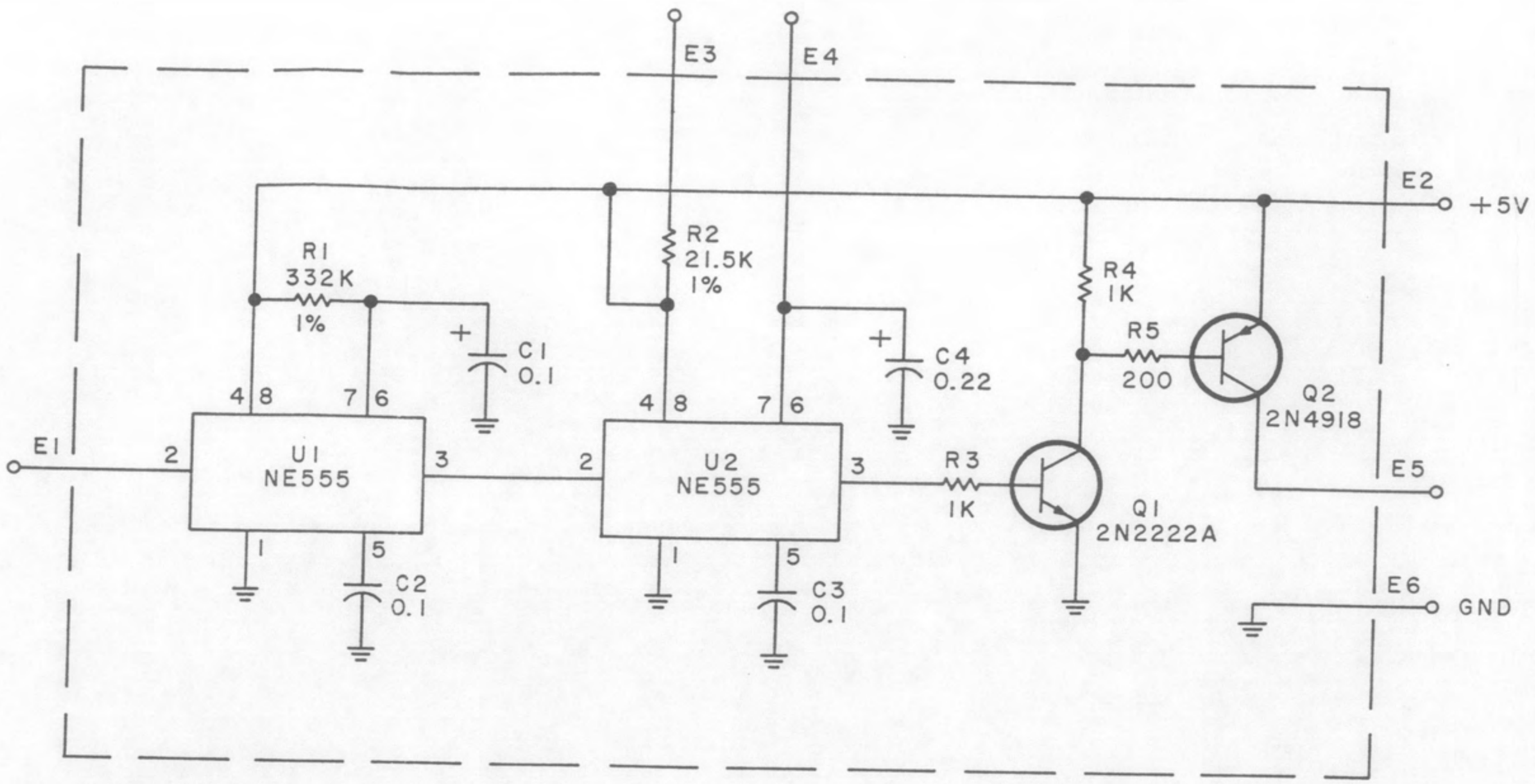


Figure 6-8. Part 15799-2 Sweep Oscillator (A3A2), Schematic Diagram



NOTES:

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

DETAIL A

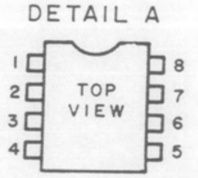
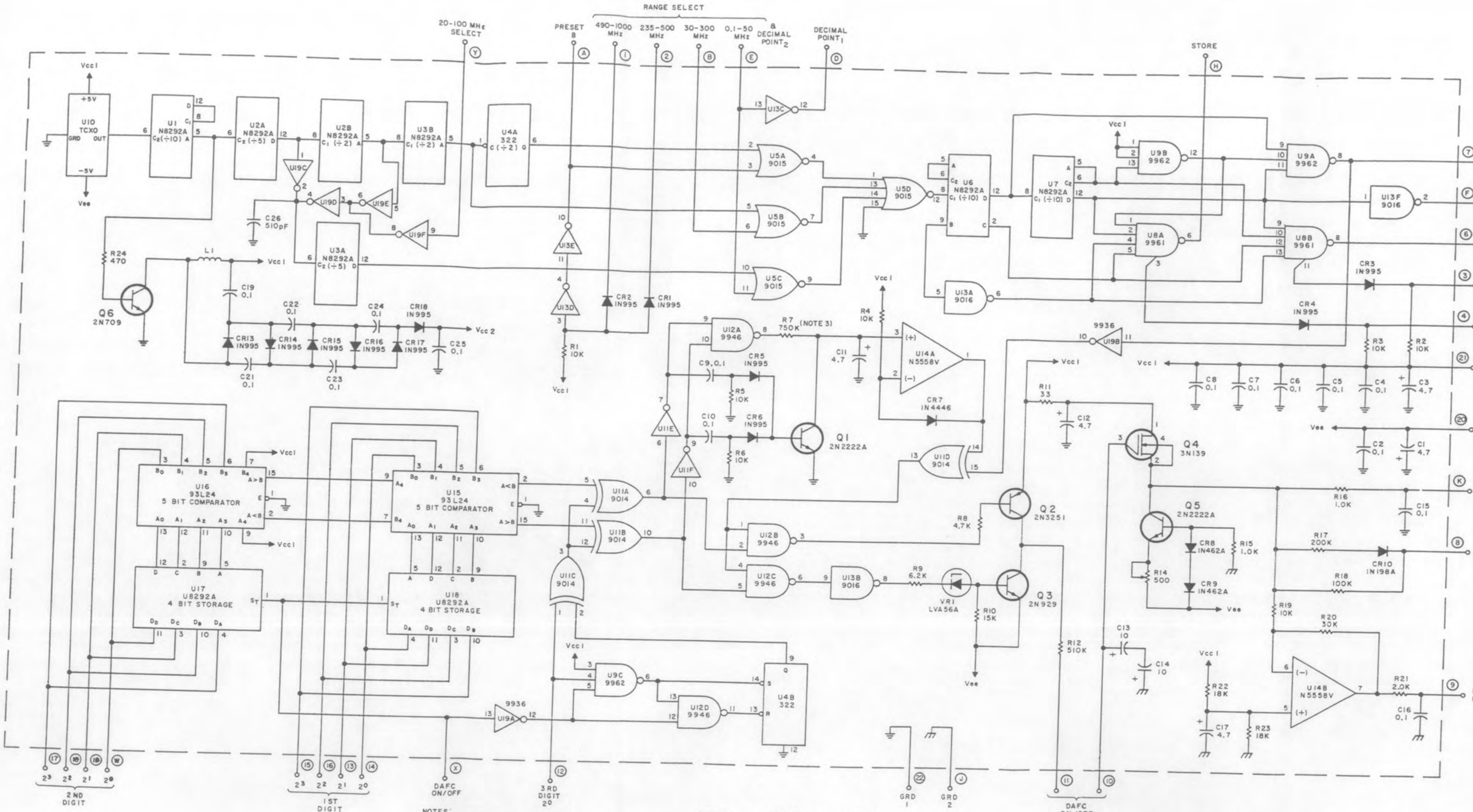
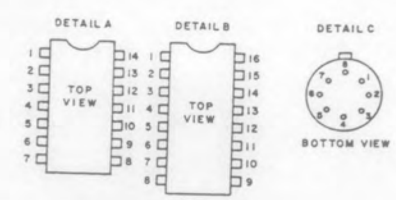


Figure 6-9. Type 791504 Intensity Control Board (A4), Schematic Diagram



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. NOMINAL VALUE; FINAL VALUE FACTORY SELECTED.
4. FOR U1, U2, U3, U6, U7, U8, U9, U12, U13, AND U17, U18, U19 LEAD ARRANGEMENT, SEE DETAIL A.
5. FOR U4, U5, U11, AND U15, U16 LEAD ARRANGEMENT, SEE DETAIL B.
6. FOR U14 PIN ARRANGEMENT SEE DETAIL C.
7. FOR U1 THRU U9 AND U11 THRU U19 GROUND AND Vcc1, Vcc2, Vee SEE DETAIL D.

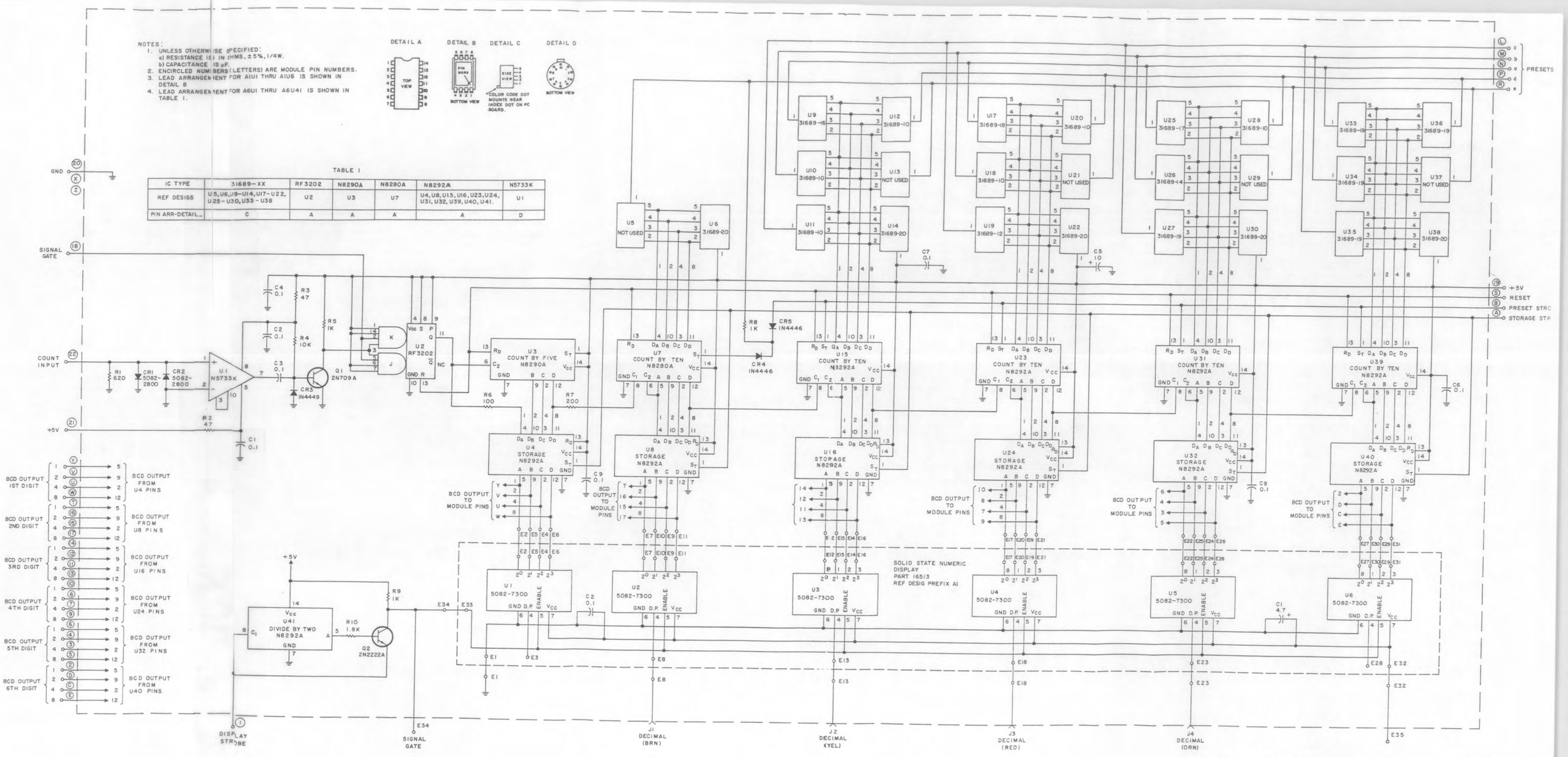


	U1	U2	U3	U4	U5	U6	U7	U8	U9	U11	U12	U13	U15	U16	U17	U18	U19
Vcc1	1	1	1	16	16	1	1	14	14	16	14	14	16	16	13	13	14
	13	13	13			13	13								14	14	
	14	14	14			14	14										
GRD	7	7	7	8	8	7	7	7	7	8	7	7	8	8	7	7	7

DETAIL D

	U14
Vcc2	8
Vee	4

Figure 6-10. Type 79907 Gate Generator and DAFC (A5), Schematic Diagram

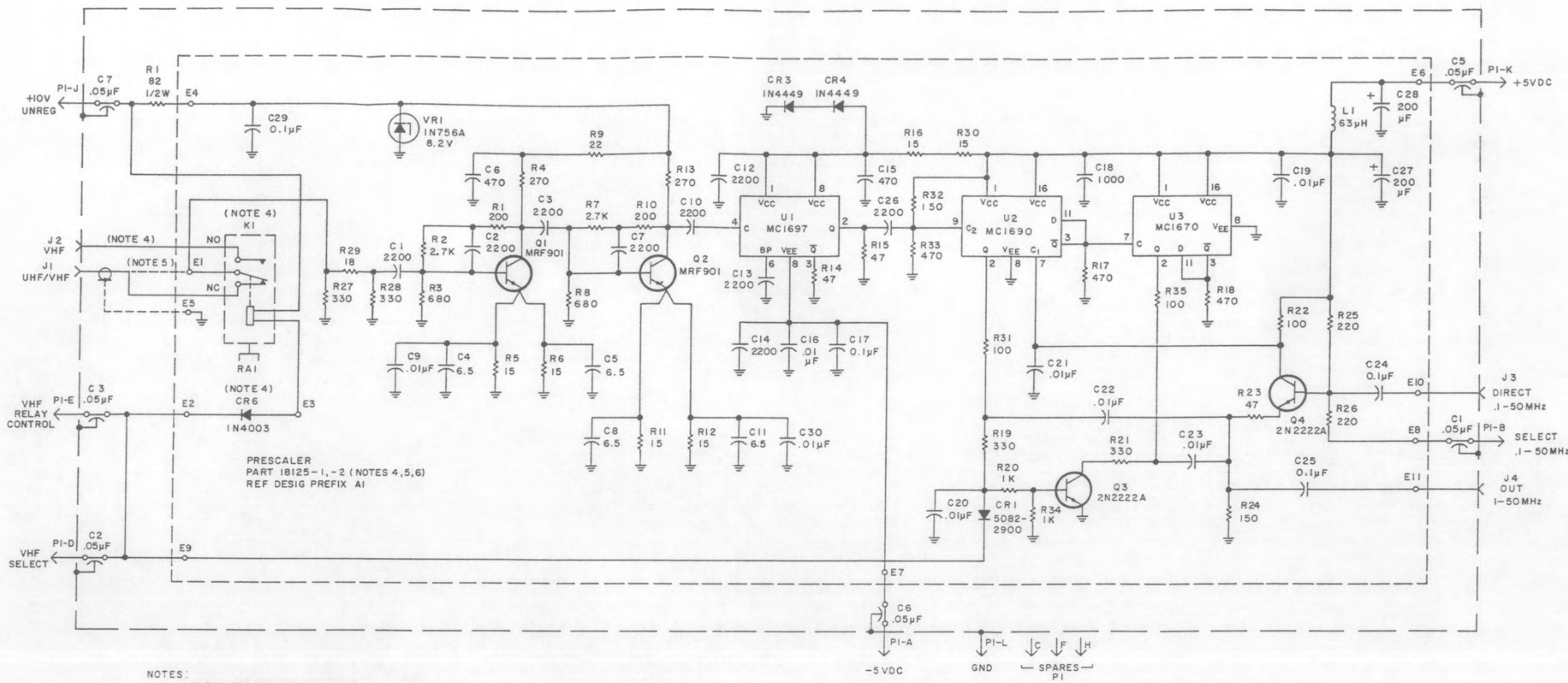


NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS μF.
2. ENCIRCLED NUMBERS (LETTERS) ARE MODULE PIN NUMBERS.
3. LEAD ARRANGEMENT FOR A1U1 THRU A1U6 IS SHOWN IN DETAIL B
4. LEAD ARRANGEMENT FOR A6U1 THRU A6U41 IS SHOWN IN TABLE 1.

TABLE I

IC TYPE	31689—XX	RF3202	N8290A	N8280A	N8292A	N5733K
REF DESIGS	U5, U6, U9–U14, U17–U22, U25–U30, U33–U38	U2	U3	U7	U4, U8, U15, U16, U23, U24, U31, U32, U39, U40, U41.	U1
PIN ARR-DETAIL	C	A	A	A	A	D

Figure 6-11. Type 791503 Count Decode and Display (A6 Schematic Diagram

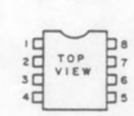


NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ± 5%, 1/8W.
   b) CAPACITANCE IS pF.
2. LEAD ARRANGEMENT FOR U1 IS SHOWN IN DETAIL A.
3. LEAD ARRANGEMENT FOR U2 & U3 IS SHOWN IN DETAIL B.
4. A1K1, A1CR6, & J2 ARE USED ON 18125-2 ONLY; OMIT FOR 18125-1.
5. SEMI-RIGID COAXIAL CONNECTION USED ON 18125-1 (OMITING A1K1, A1CR6, & J2 CONNECTIONS).
6. TYPE 791505-1 INCLUDES PART 18125-1; TYPE 791505-2 INCLUDES PART 18125-2.

HIGHEST REF DESIG (A1)	REF DESIG NOT USED
C30	C4
CR6	A1CR2,5
E11	
K1	
L1	
Q4	
R35	
U3	
VR1	
RA1	

DETAIL A



DETAIL B

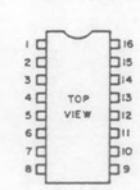
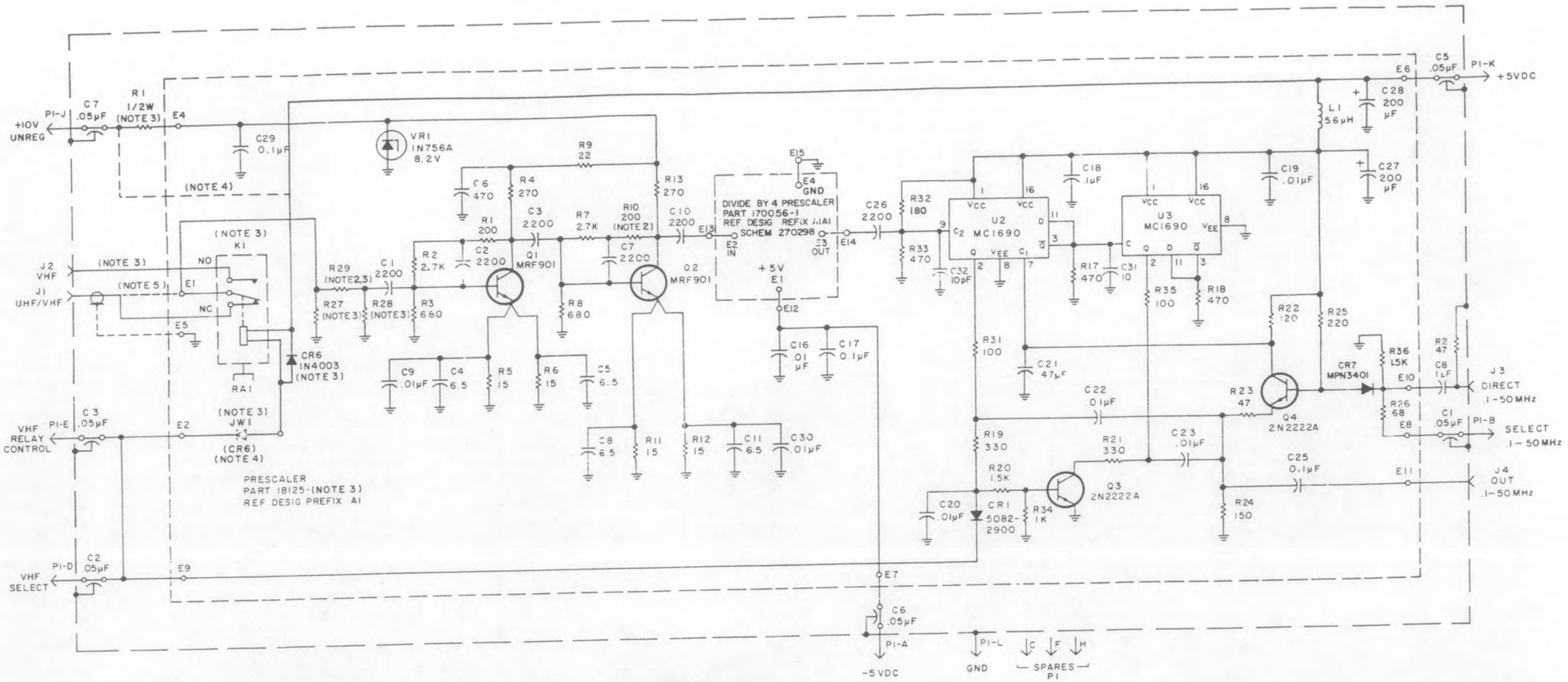


Figure 6-12. Type 791505-1 1200 MHz Prescaler Assembly (A7), Schematic Diagram



NOTES
1 UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ± 5%, 1/8W
b) CAPACITANCE IS pF.
2 NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.
3. DIFFERENCE BETWEEN TYPES IS LIST IN TABLE A.
4 USE FOR 18125-2 ONLY (CR6 LOCATION ALSO).
5 SEMI-RIGID COAXIAL CONNECTION USED ON 18125-1,-3 (OMITING A1K1, A1CR6, & J2 CONNECTIONS).
6. TYPE 791505-1 INCLUDES PARTS 18125-1 & 170056-1
TYPE 791505-2 INCLUDES PARTS 18125-2 & 170056-1
TYPE 791505-3 INCLUDES PARTS 18125-3 & 170056-1
TYPE 791505-4 INCLUDES PARTS 18125-4 & 170056-1

TABLE A

TYPE	A1	A1 R27	A1 R28	A1 R29	A1 CR6	A1 JW1	A1K1	R1	J2
791505-1	18125-1	330	330	18	N/U	USED	N/U	82	N/U
791505-2	18125-2	330	330	18	NOTE4	N/U	303-1001-2	82	USED
791505-3	18125-3	100K	100K	2.7	N/U	USED	N/U	82	N/U
791505-4	18125-4	330	330	18	USED	USED	303-1001-1	51	USED

Figure 6-12. Type 791505-1 1200 MHz Prescaler Assembly (A7), Schematic Diagram 42927

NOTE:
1. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

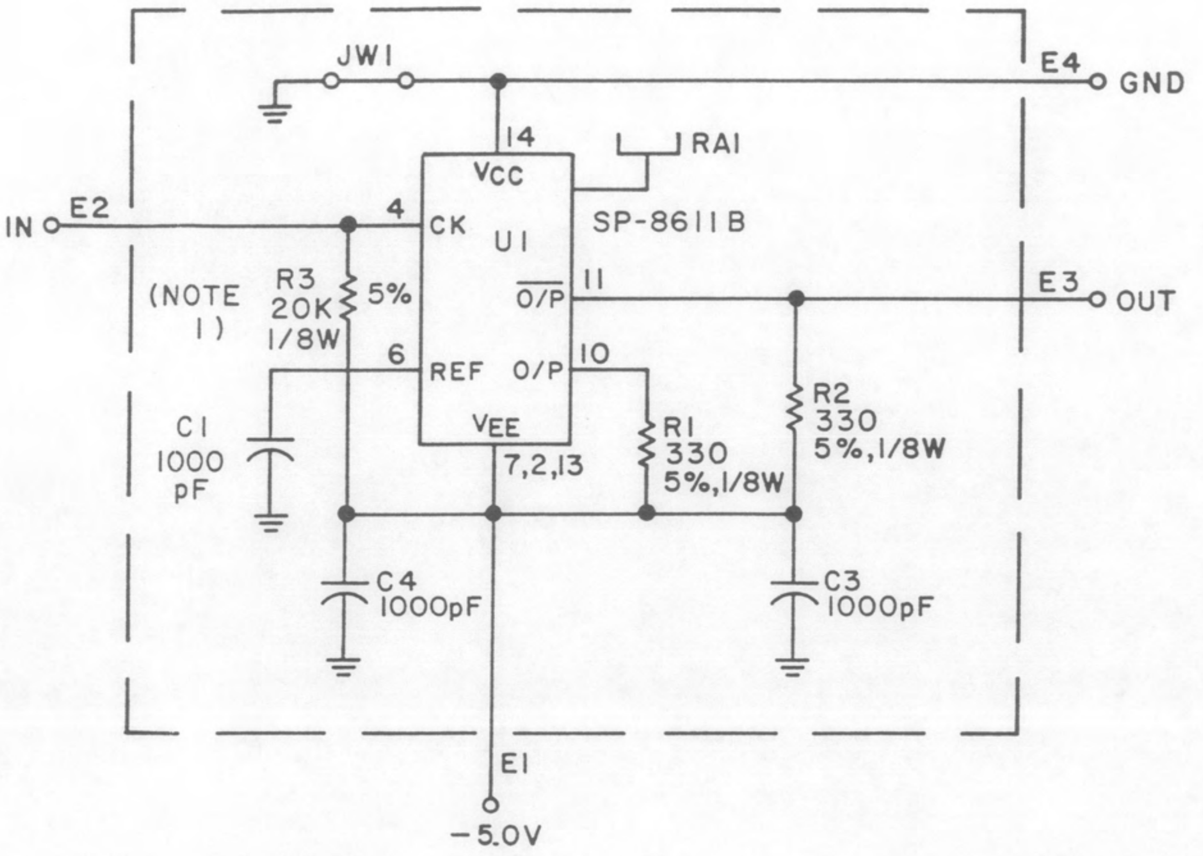
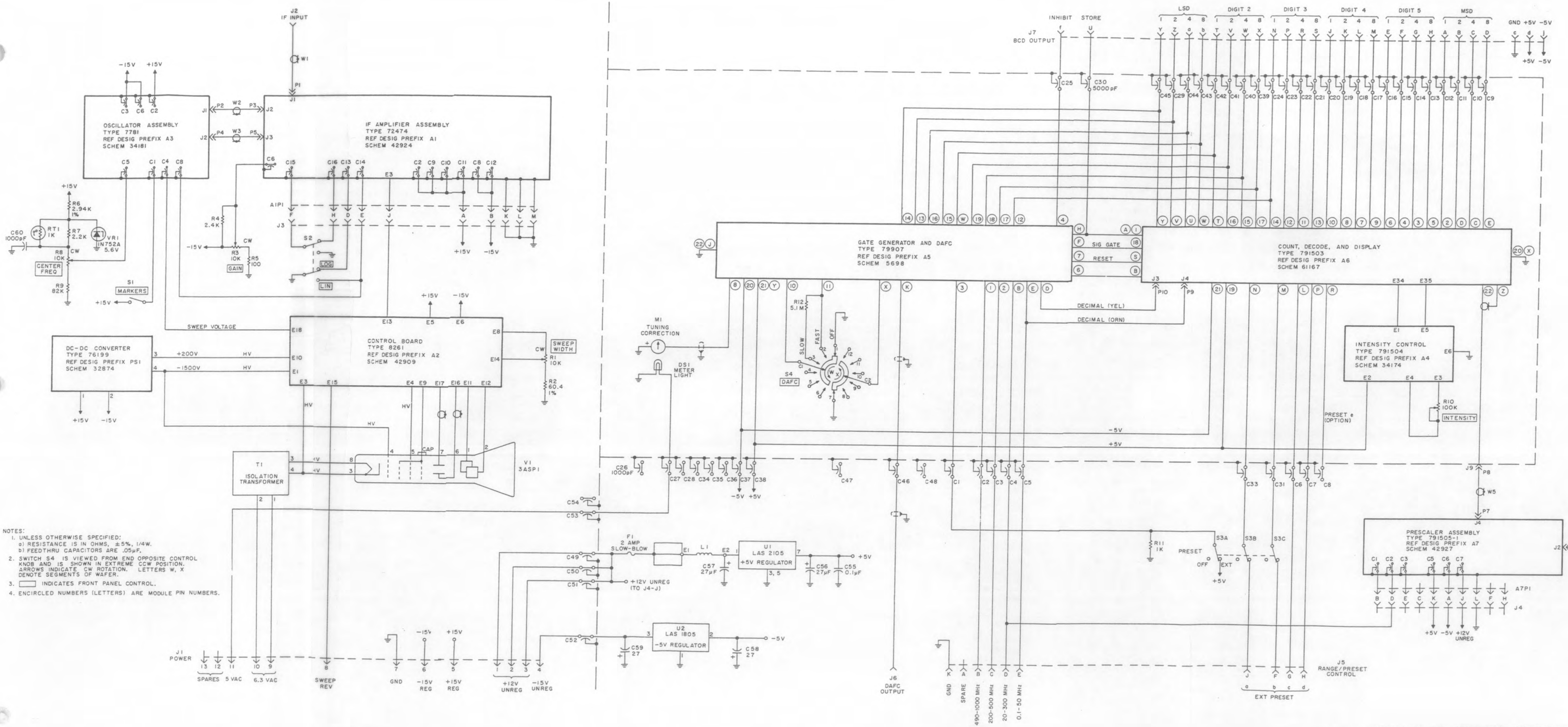


Figure 6-12a. Part 170056-1 Divide By 4 Prescaler (A7A1A1), Schematic Diagram 270298



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) FEEDTHRU CAPACITORS ARE .05μF.
2. SWITCH S4 IS VIEWED FROM END OPPOSITE CONTROL KNOB AND IS SHOWN IN EXTREME CCW POSITION. ARROWS INDICATE CW ROTATION. LETTERS W, X DENOTE SEGMENTS OF WAFER.
3. ▭ INDICATES FRONT PANEL CONTROL.
4. ENCIRCLED NUMBERS (LETTERS) ARE MODULE PIN NUMBERS.

Figure 6-13. Type WJ-9026/DU Display Unit, Schematic Diagram

SECTION VII

TYPE WJ-9028/DU DISPLAY UNIT

SUPPLEMENT

Table 1-1. Type WJ-9028/DU Display Unit Specifications

(Differences between the WJ-9026/DU and the WJ-9028/DU are listed.)

Marker Frequencies	21.4 MHz ±1.1 kHz. The 21.4 MHz ±100 kHz markers were eliminated.
DAFC Characteristics:	
Meter	Meter is deleted in WJ-9028/DU.
Front Panel Controls and indicators	DAFC Rotary Switch, Meter and Meter Light are deleted.
Correction Rates	DAFC ON/OFF is selected by front panel control on the WJ-9028/RU. The former rate switch on the WJ-9028/DU has been eliminated and its correction rate corresponds to the FAST mode of the WJ-9026/DU.

7.1 ELECTRICAL CHARACTERISTICS

Information in this section provides an accurate listing of all major changes made throughout the Display Unit.

7.1.1 The Marker Oscillator Circuitry on the Oscillator Assembly (A3) has been reduced. The remaining oscillator, Q1, maintains a frequency to within 1.1 kHz of 21.4 MHz. The other two oscillator circuits that maintained the 21.4 MHz ± 100 kHz markers were eliminated.

7.1.2 The DAFC frequency correction meter that had previously been connected to pin 8 of the Gate Generator and DAFC Unit was deleted.

7.1.3 The light meter (DS1), that had been associated with the correction meter, was also eliminated in this unit. Due to this deletion, pin #11 on J1 on the rear panel is now a spare.

7.1.4 The DAFC Switch (S4) has been eliminated and replaced in the WJ-9028/DU Display Unit main chassis layout by relay K1.

7.1.5 The DAFC ON/OFF control is now controlled from the Receiving Unit by way of pin #12 of the systems power cable (W4).

7.1.6 The L.O. input to the Prescaler Assembly on the rear panel of the Display Unit was changed. Its reference designation was changed from J8 to J8A and its physical location on the rear panel was altered.

7.1.7 The DAFC OUTPUT receptacle was also deleted from its old physical location. On the WJ-9028/DU it is located in the upper left hand corner of the units rear panel.

7.1.8 Receptacle J2 which is located on the rear panel of the WJ-9028/DU was changed to SM INPUT.

7.2 MECHANICAL CHARACTERISTICS

The WJ-9028/DU is mechanically similar to the WJ-9026/DU except for the following additions and deletions. Delete the following features: the Frequency Correction Meter, meter light and DAFC mode switch; all of which were located on the front panel. On its rear panel delete: Voltage Regulator (U2).

Addition of the following will complete the dissimilarities between the two units: REAR PANEL: Nomenclature and physical location of jack J6 for DAFC output and receptacle (J8A), and nomenclature of J2 changed to SM INPUT.

7.3 INSTALLATION AND OPERATION

Procedures concerning Installation and Operation of the WJ-9028/DU are identical to those of the WJ-9026/DU except for the following changes.

7.3.1 FRONT PANEL CONTROLS AND INDICATOR CHANGES

7.3.1.1 DAFC Control Switch - This switch has been eliminated from the Display Unit. This function is now controlled by a switch on the front panel of the WJ-9028/RU Receiving Unit.

7.3.1.2 Tuning Correction Meter - The tuning correction meter that is located on the front panel of the WJ-9026/DU Display Unit has been deleted for this unit.

7.3.2 ADAPTER AND CONNECTOR CHANGES

7.3.2.1 Power Input Jack - This input line remains identical to the WJ-9026 power cord except in the WJ-9028/DU Display Unit, pin #11 is now a spare and pin #12 is the DAFC ON/OFF control line.

7.3.2.2 LO Input Jack (J8A) - This input receptacle to the prescaler network was changed for RFI purposes. Its type and part number may be found in the parts list.

7.3.2.3 DAFC Output - The output of the DAFC signal has been physically changed on the rear panel of the Display Unit.

7.4 CIRCUIT DESCRIPTIONS

The information in the following paragraphs will describe in detail the changes incorporated into the major subassemblies. If a subassembly is not listed then it can be assumed to be identical in design and operation to that of the WJ-9026/DU Display Unit.

7.4.1 TYPE 7786 OSCILLATOR ASSEMBLY (A3)

The Schematic Diagrams for this assembly are shown in Figure 7-1 and Figure 7-2. The major change in this unit is in subassembly A1 (Marker Oscillators).

7.4.1.1 Type 18048-2 Marker Oscillator - The 21.4 MHz Marker Oscillator circuit that is present in this unit is identical to the one described and shown for the WJ-9026/DU. The only differences between the units are the eliminations of the single marker circuits that were previously 100 kHz above and below center frequency.

7.4.2 WJ-9028/DU MAIN CHASSIS

The changes described below effect the operation of the unit as a whole.

7.4.2.1 Relay K1 - Relay K1 is added to the main chassis of the WJ-9028/DU. Its function is to replace the DAFC selector switch that was previously located on the front panel of the WJ-9026/DU. When this circuit is activated pin X is open circuited and pins 10 and 11 are connected permitting operation of the DAFC to begin. The DAFC circuitry is identical to that which is described in the WJ-9026/DU manual.

7.5 REPLACEMENT PARTS LIST AND SCHEMATIC DIAGRAMS

The following list of manufacturers, parts lists and schematic diagrams are a supplement for the WJ-9028/DU and are to be used in conjunction with Sections V and VI of this manual.

Mfr. Code	Name and Address
06324	Glenair, Incorporated 1211 Airway Glendale, California 91201
27925	Frost Controls Corp. 26 Pearl Street Bellingham, Ma. 02019

7.6 TYPE WJ-9028/DU DISPLAY UNIT, MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
	With the exception of those items listed below, the WJ-9028/DU Display Unit is electrically identical to the WJ-9026/DU Display Unit.				
A3	Oscillator Assembly	1	7786	14632	
C1	Capacitor, Ceramic, Feedthru: 0.05 μF, GMV, 300 V	45	54-785-002-503P	33095	
C32	Not Used				
C49	Capacitor, Ceramic, Feedthru: 0.05 μF, GMV, 300 V	8	54-785-005-503P	33095	
C61	Same as C49				
C62	Same as C49				
CR1	Diode	1	1N462A	80131	93332
DS1	Not Used				
J2	Connector, Receptacle: BNC Series	2	17285-1002	74868	
J6	Same as J2				
J8	Connector, Receptacle: SMA Series	1	60-0909-090	19505	
K1	Relay	1	CR4DDSF24VDN	27925	
MP1	EMI Shielded Window	1	24018-1	14632	
MP2	Handle, Front	2	32306-3	14632	
MP3	Same as MP2				
MP4	Knob	8	PS50D1/LG	21604	
MP5 Thru MP11	Same as MP4				
R12	Not Used				

MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
S2	Switch, Toggle: 3 PDT	1	MTA-306D	95146	
S4	Not Used				
W1	Cable Assembly	1	17300-110-1	14632	
W2	Cable Assembly	1	17300-110-2	14632	
W3	Cable Assembly	1	17300-110-3	14632	
W4	Cable Assembly	1	17300-110-4	14632	
W5	Cable Assembly	1	17300-110-5	14632	
XDS1	Not Used				
XF1	Fuseholder	1	340255	75915	
	Accessory Items Furnished with Equipment				
AI1	Connector, Plug: Multipin, 32 Pins	1	L18TF32P6NA	09922	
AI2	Adapter, RFI-NONRFI	1	G3T00P184-2.0T	06324	

7.6.1 TYPE 7786 OSCILLATOR ASSEMBLY

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
	With the exception of those items listed below the 7786 Oscillator Assembly is electrically identical to the 7781 Oscillator Assembly.				
A1	Marker Oscillators	1	18084-2	14632	

7.6.1.1 Type 18084-2 Marker Oscillators

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
	With the exception of those items listed below the 18084-2 Marker Oscillators is electrically identical to the 18084 Marker Oscillators.				
C1	Capacitor, Mica, Dipped: 33 pF, 2%, 500 V	1	CM04ED330G03	81349	72136
C2	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	1	CM04ED470G03	81349	72136
C3	Capacitor, Mica, Dipped: 470 pF, 5%, 500 V	1	DM15-471J	72136	
C4	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	2	C023B101E502M	56289	
C5 Thru C12	Not Used				
C14	Capacitor, Variable, Ceramic: 2-8 pF, 350 V	1	538-011A2-8	72982	
C15	Not Used				
C16	Not Used				
Q1	Transistor	1	2N3478	80131	34156
Q2	Not Used				
Q3	Not Used				
R1	Resistor, Fixed, Composition: 330 kΩ, 5%, 1/4 W	2	RCR07G334JS	81349	01121
R3	Resistor, Fixed, Composition: 220 Ω, 5%, 1/4 W	1	RCR07G221JS	81349	01121
R5	Resistor, Fixed, Composition: 3.3 kΩ, 5%, 1/4 W	3	RCR07G332JS	81349	01121
R6	Resistor, Fixed, Composition: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R7	Resistor, Variable, Film: 10 kΩ, 10%, 1/2 W	1	62PR10K	73138	
R9 Thru R24	Not Used				

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR CODE	RECM VENDOR
R25	Resistor, Fixed, Composition: 200 Ω, 5%, 1/4 W	1	RCR07G201JS	81349	01121
Y2	Not Used				
Y3	Not Used				

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

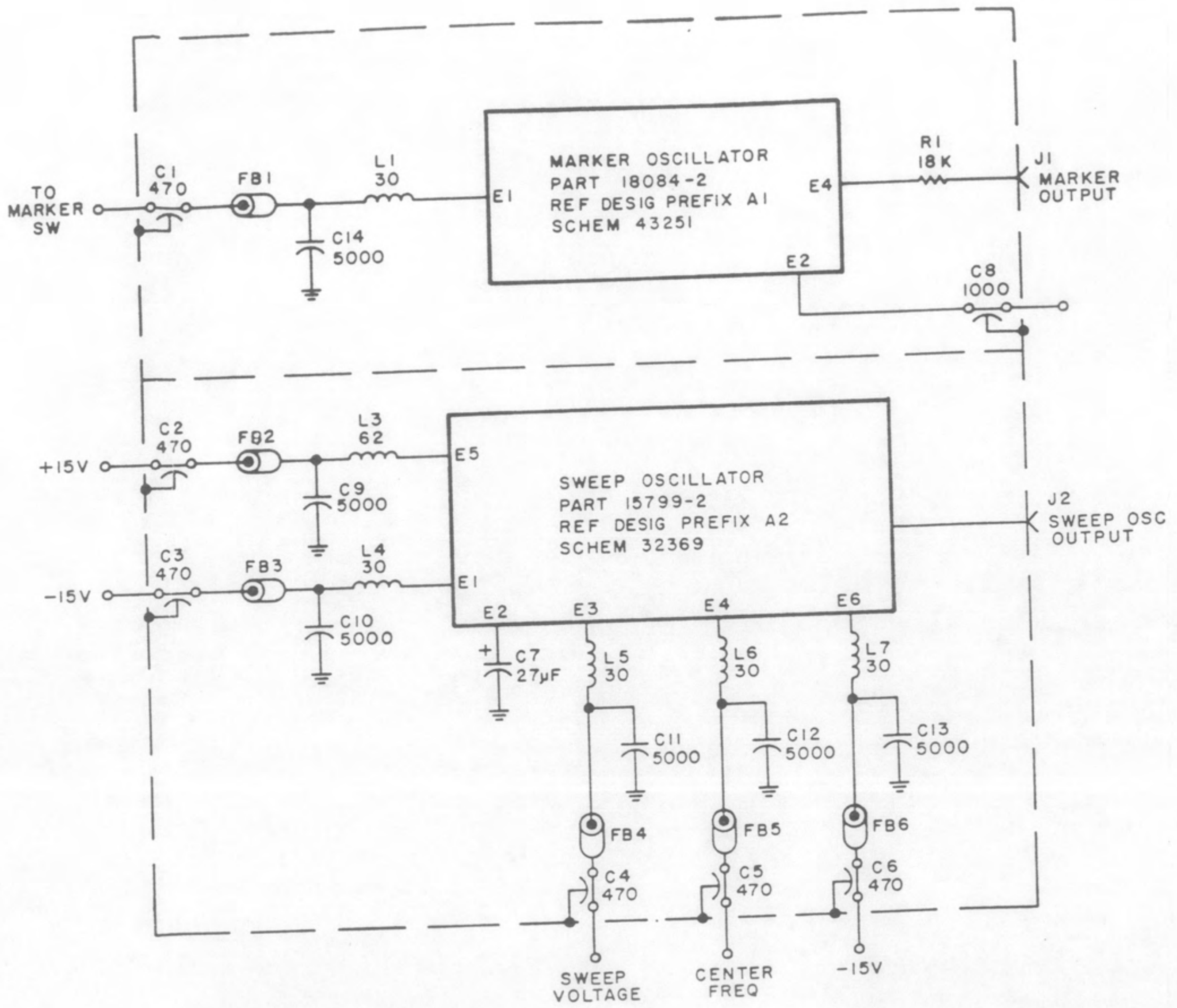


Figure 7-1. Type 7786 Oscillator Assembly (A3), Schematic Diagram

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ±5%, 1/4W
b) CAPACITANCE IS pF.
2. CW ON POTENTIOMETERS INDICATES FULL CLOCKWISE POSITION OF ACTUATOR.

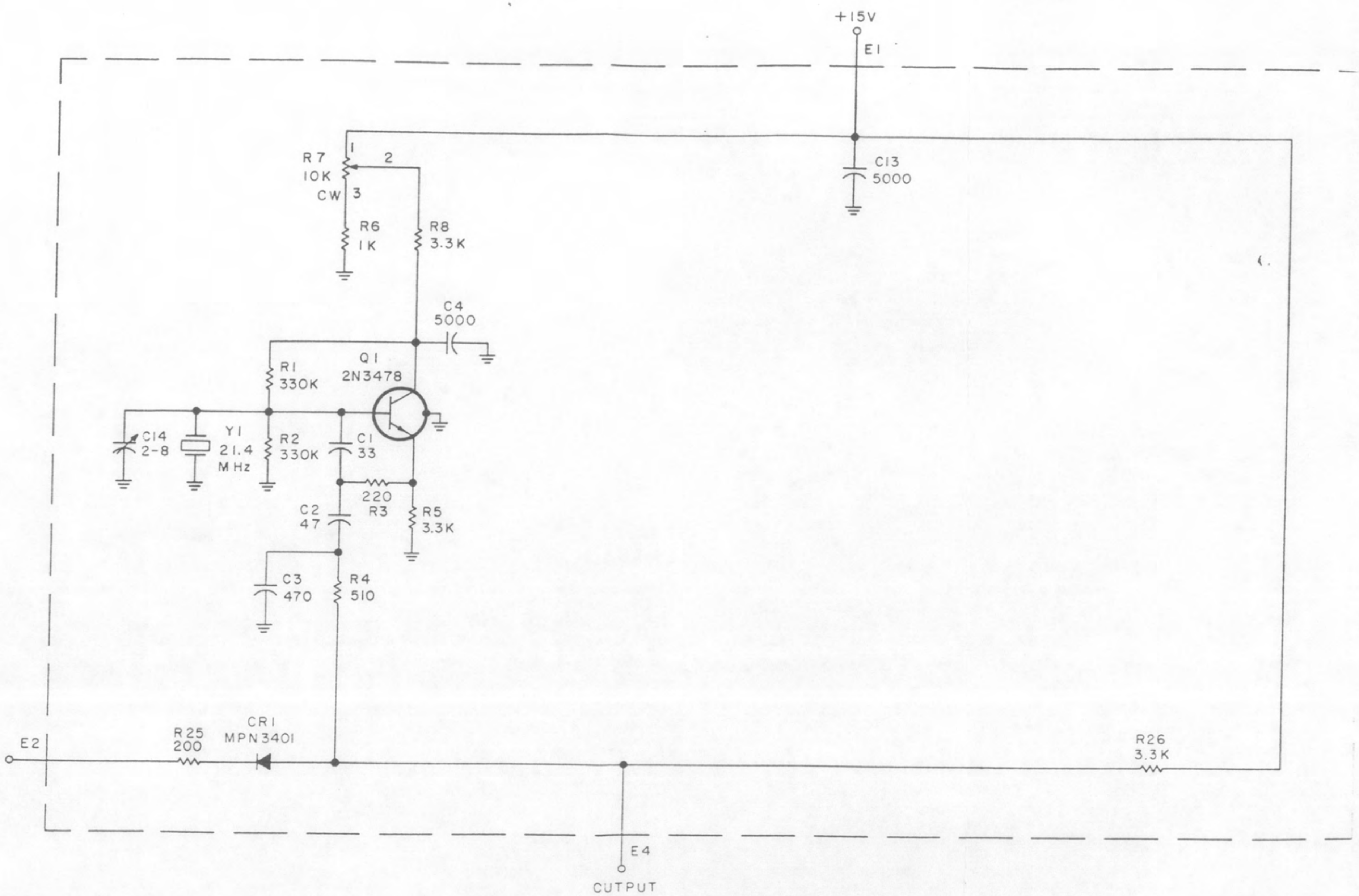


Figure 7-2. Type 18084-2 Marker Oscillator (A3A1), Schematic Diagram

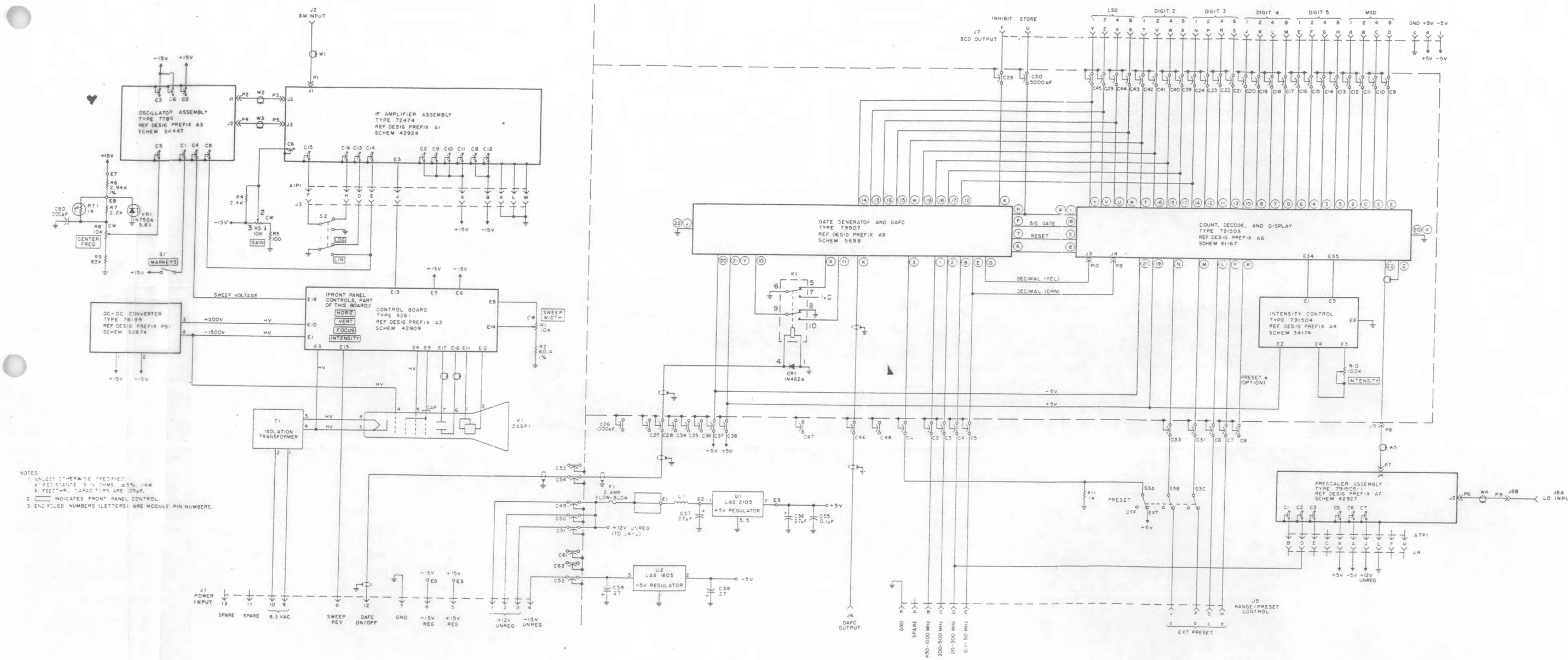


Figure 7-3. Type WJ-9028/DU Display Unit, Schematic Diagram