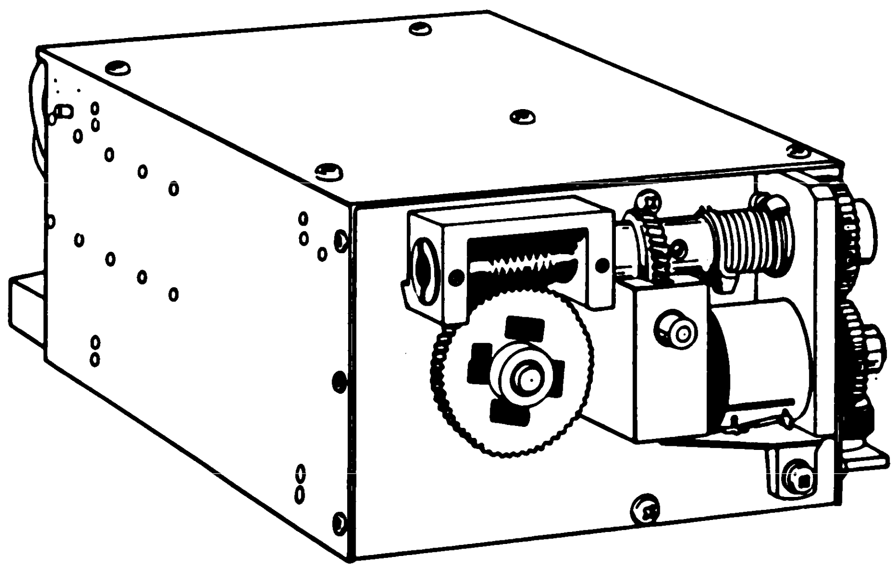
TM 11-5895-1227-14-1-1

TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL



TUNER TN-586/GRR-8(V) (NSN 5895-01-075-3694)

PART OF RECEIVER, R-2200/GRR-8(V) (NSN 5895-01-060-6492)

HEADQUARTERS, DEPARTMENT OF THE ARMY

1 APRIL 1988

WARNING

The Receiver uses voltages which may be fatal if contacted. DO not be misled by the term "Low Voltage." Potentials as low as 50 volts may cause death under adverse conditions. Extreme caution should be exercised when-working this equipment. Death on contact may result if personnel fail to observe safety precautions.

1. Do not work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.

2. Whenever possible, turn off the power supply to the equipment before beginning maintenance on the equipment.

<u>Do not be misled by the term "Low Voltage." Potentials as low as 50 volts may cause death under adverse conditions.</u>

3. Do not remove the protective covers to the equipment unless you are authorized to do so.

4. When the technicians are aided by operators, they must be warned about dangerous areas. Aperiodic review of safety precautions in TB 385-4, Safety Precautions for Maintenance of Electrical/Electronic Equipment, is recommended.

5. Seek advice from your supervisor whenever you are in doubt about electrical safety conditions.

6. For Artificial Respiration, refer to FM 21-11.

Technical Manual

No. 11-5895-1227-14-1-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 1 April 1988

Operator's, organizational, Direct Support and General Support Maintenance Manual

TUNER TN-586/GRR-8(V) (NSN 5895-01-075-3694)

PART OF
RECEIVER AN/GRR-8(V)
(NSN 5895-01-060-6492)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of away to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, NJ 07703-5000. A reply will be furnished direct to you.

SECTION VI
SCHEMATIC DIAGRAM

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APPENDIX B
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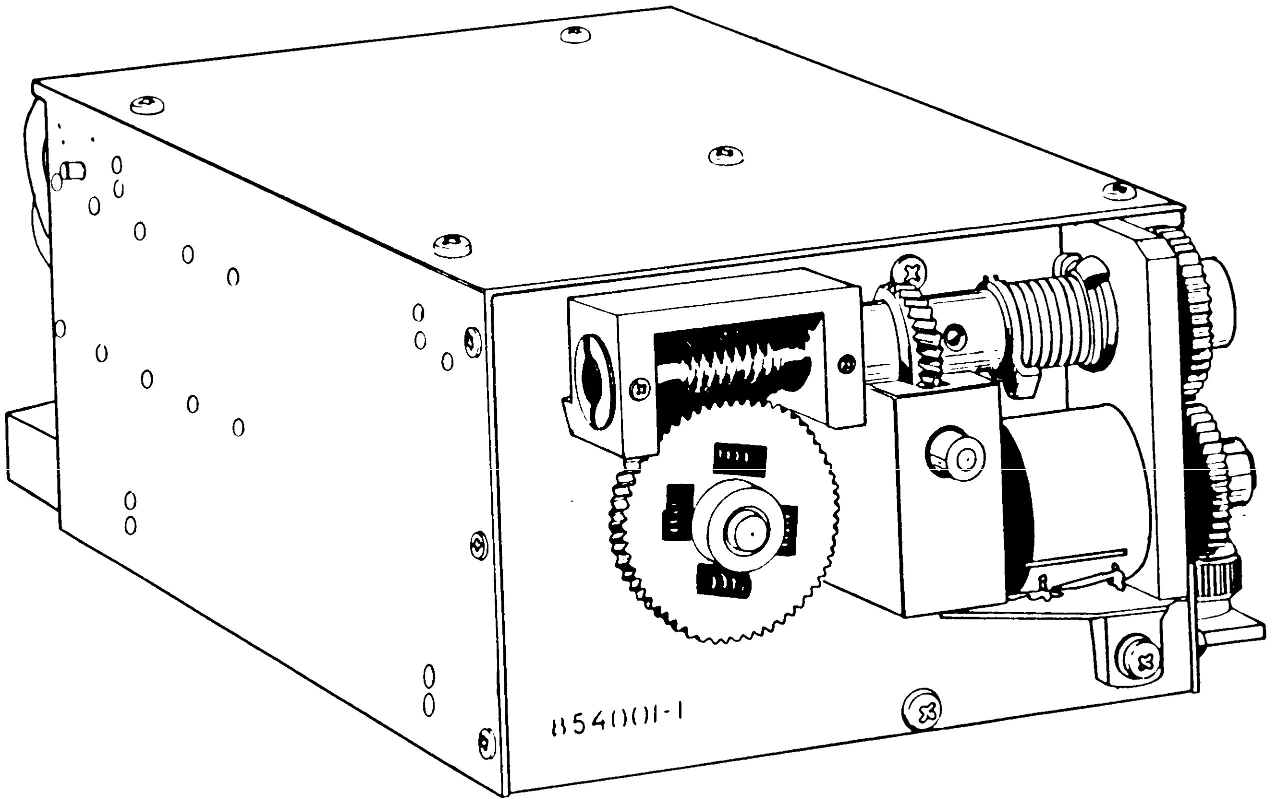


Figure 1-1. WJ-9120 0.5-30 MHz Tuner Assembly

SECTION O

INTRODUCTION

0.1 SCOPE

0.1.1 TYPE OF MANUAL. This is an Operator, Organizational, Direct Support and General Support Maintenance commercial manual.

0.1.2 MODEL NUMBERS AND.) EQUIPMENT NAMES. The Tuner Assembly, TN-586/GRR-8(V), is one of three separate tuners that can be used with the AN/GRR-8(V) Receiver. The Receiver is part of the Radio Receiver Direction Finder Set, AN/PRD-11. The other units of the Direction Finder Set include the Direction Finder Antennas, AS-3732/PRD-11 and AS-3733/PRD-11, the Processor Display Control, C-11495/ PRD-11, and the Panoramic Indicator IP-1355/GRR-8(V). In this manual, the TN-586/GRR-8(V) Tuner Assembly will be referred to as the WJ-9120 Tuner Assembly. The Receiver will be referred to as the receiver, manpack receiver or portable receiver, and by its manufacturers model number, WJ-8640-1. A complete cross reference of common equipment names and nomenclatures used in this manual is provided in paragraph 0.7.

0.1.3 PURPOSE OF EQUIPMENT. The TN-586/ANGRR-8(V) Tuner Assembly is an interchangeable assembly of the receiver. The tuner assembly allows the receiver to tune in to rf signals within the 0.5 to 30 3MHz range in the AM, FM and CW modes.

0.2 CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS

Refer to the latest issue of DA Pam 25-30 to determine whether there are new editions, changes or additional publications pertaining to the equipment.

0.3 MAINTENANCE FORMS, RECORDS AND REPORTS

0.3.1 REPORTS OF MAlNTENANCE AND) UNSATISFACTORY EQUIPMENT. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in Maintenance Management Update.

0.3.2 REPORT OF PACKAGING AND HANDLING DEFICIENCIES. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-1l-2/DLAR 4140.55/NAVMATINST 4355.73 B/AFR 400-54/MCO 4430.3H.

0.3.3 DISCREPANCY IN SHIPMENT REPORT (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/ NAVSUPINST 4610.33 C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

0.4 DESTRUCTION OF ARMY ELECTRONICS MATERIEL.

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

0.5 ADMINISTRATIVE STORAGE

Disassembly and repacking of equipment for shipment or limited storage are covered in section II.

0.6 TOOL AND TEST EQUIPMENT

Test equipment required for troubleshooting and maintenance of the tuner assembly is listed in paragraph 4.4 (Table 4-1).

0.7 OFFICIAL NOMENCLATURE, NAMES AND DESIGNATIONS

The list below will help you identify the official nomenclature of the major equipment items used with the tuner assembly. It also provides the common name used in the manual when it is different from the official nomenclature. Official nomenclature must be used when completing forms or when looking up technical manuals.

Common Name	Official Nomenclature
Direction Finder Set	Radio Receiver Direction Finder Set, AN/PRD-11
Manpack Receiver, WJ-8640	Receiver, AN/GRR-8(V)
Tuner Assembly, WJ-9120	Tuner, RF, TN-586/GRR-8(V)

0.8 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS

If your tuner assembly needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communication-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, NJ 07703-5000. We'll send you a reply.

0.9 WARRANTY INFORMATION

The tuner assembly is warranted by Watkins-Johnson Company for a period of 1 year following delivery. It starts on the date found in block 23, DA Form 2408-9, in the logbook. This warranty may contain repair restrictions. Report all defects in material or workmanship to your supervisor.

SECTION I

GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

1.1.1 The Type WJ-9120 Tuner Assembly is designed to operate with the WJ-8640 Series Manpack Receiver. The assembly is an interchangeable drop-in unit requiring simple hand tools for installation and removal. The WJ-9120 uses four separate RF preselectors to cover the 0.5 to 30 MHz frequency range. Preselectors A2 thru A4 (band 1) automatically cover the 0.5 to 12 MHz range in three segments of 0.5 to 1.5 MHz, 1.5 to 4.5 MHz and 4.5 to 12 MHz respectively. Preselector A5 (band 2) covers the 12 MHz to 30 MHz range. The intermediate frequencies (IF) provided by the tuner are 21.4 MHz for band 1,and 10 MHz for band 2. A two-position rotary switch located on the associated receiver's front panel determines which band is selected. The tuner is manually controlled by way of a coupling spring that connects the A9 tuning drive assembly to the coarse tuning control on the receiver's front panel. The electrical interface of the receiver and the tuner is accomplished by six-coaxial SMC series connectors (J1 thru J6) and a multipin connector P1. Operating voltages, AGC, FINE TUNE, DAFC and band 1 or 2 select signals are carried by the multipin connector. The RF input, IF and LO output signals for each band are passed between the receiver and tuner by the SMC connectors. A listing of the tuner's specifications is available in Table 1-1, and a 3/4 view photograph is shown on the adjacent page in Figure 1-1.

1.2 MECHANICAL CHARACTERISTICS

1.2.1 The main chassis of the WJ-9120 is constructed of nickel plated brass. The partitions and the subassembly enclosures that are mounted on the main chassis are also constructed of brass. The printed circuit boards used are of the copper clad laminated epoxy-fiberglass base type. Approximately 56 turns of the receiver's coarse tuning control are required for band edge to band edge coverage. The A9 tuning drive assembly transfers the mechanical rotation of the receiver's coarse tuning control to the tuners circuitry via a reduction gear ratio of 30 to 1. The tuned frequency is indicated on the receiver's front control panel by a six-digit LED display. Refer to Figure 5-11 for a two view illustration of the type 854001-1 tuning drive assembly. A9 is the reference designation for the tuning drive assembly.

1.3 EQUIPMENT SUPPLIED

1.3.1 This equipment consists of the WJ-9120 Tuner Assembly only.

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED

1.4.1 The WJ-9120 Tuner Assembly is incapable of independent operation and therefore, requires a compatible receiver. The associated receiver will supply the required operating power and signal connections. The WJ-8640 Series Manpack Receivers are designed to operate with this tuner. Refer to the instruction manuals on the WJ-8640 Series Receivers for information on the receivers.

Table 1-1. Type WJ-9120,0.5-30 MHz Tuner Assembly, Specifications

Tuning Ranges	Band 1 . . . . . .5 to 12 MHz Band 2 . . . . . 12 to 30 MHz
Fine Tuning Range	0.05% of tuned frequency
Main Tuning Control	Approximately 56 turns from bandedge to bandedge
RF gain	17 to 23dB
Noise Figure	12 dB maximum
Input Impedance	50 ohms unbalanced
Input VSWR	5:1 maximum over 1% tuned frequency
Antenna Conducted LO.	15 uV maximum across 50 ohms
Image Rejections	60 dB minimum
IF Rejection	60 dB minimum
Local Oscillator Radiation	15 uV maximum, across 50 ohm load
Local Oscillator Stability (open loop)	
Drift due to shock	20 ppm (@ 30 MHz 600 Hz)
Drift with time	10 ppm/hr. maximum after 1 hour warmup at constant temperature (@ 30 MHz 300 Hz)
Local Oscillator Stability (with DAFC)	±1 kHz
Local Oscillator Output Level	-17 dBm, minimum
Intermediate Frequency	Band 1. . . . .21.4 MHz Band 2 . . . . . 10 MHz
Power Consumption	±15Vdc, 100 mA
Dimensions	Approximately 9.5 inches long, 5 inches wide, and 2.5 inches high
Weight	Approximately3.5 lbs

SECTION II

INSTALLATION AND OPERATION

2.1 UNPACKING AND INSPECTION

2.1.1 Examine the shipping carton for damage before the equipment is unpacked. If the carton appears to be damaged, try to have the carriers agent present when the equipment is unpacked. If this is not possible, retain all packing material and shipping containers for the carriers 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, CEI Division, Gaithersburg, Maryland or your Watkins-Johnson representative for any discrepancies or shortages. This 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, inspect the unit for dents or scratches. If external damage is evident, make an internal inspection. Check the internal cables for loose connections and printed circuit boards which may have been loosened from their receptacles. If factory seals must be broken, contact your Watkins-Johnson representative before proceeding.

2.2 INSTALLATION

2.2.1 The following step by step description is the removal and installation procedure for replacing a WJ-9120 Tuner Assembly in a WJ-8640-1 Manpack Receiver Steps 1 through 4. pertain to removing the receiver covers, and thereby permit access to the tuner. The remaining steps (5 through 10) involve the disconnection of the tuner. A tuner can be installed, and the associated receiver reassembled by reversing steps 1 through 10. Reference to the indicated figure illustrations of this manual, and the WJ-8640-1 VHF PORTABLE RECEIVER instruction manual will aid the replacement procedure. A table of electrical connectors is included at the end of this section. (See Table 2-1).

(1) Place the receiver on a clean flat surface so that it rests on its topside.

(2) Turn the latches that hold the front panel cover to the receiver counterclockwise. Pull the latches away from the sides of the receiver until the cover is removable. The receiver front panel is now visible. Refer to Figure 5-1 on page 5-8 of the WJ-8640-1 manual for a front view of the receiver.

(3) Remove the four (captive type) slot screws that hold the front panel of the receiver to the outer protective cover. These screws are located on the rear corner edges of the receiver's front panel. Refer to Figure 5-2on page 5-8 of the WJ-8640-1 manual for a rear view of the receiver. The figure is an illustration of the receiver without the protective cover.

(4) Holding the front panel by its protective handles, pull it away from the battery pack. After removing the receiver’s main chassis from its protective case (and disconnecting) its power

connection) lay the receiver on a flat surface with its protective handles nearest you and the top side down. Refer to Figure 5-4 on page 5-12 of the WJ-8640-1 manual for a bottom view of the receiver. A bottom view of the tuner mounted inside the receiver is shown on the left side of the illustration. The tuner reference designation is A2. Note the location of the flexible coupling which is between the tuner's tuning drive assembly and the backside of the receiver's front panel. The flexible coupling connects the tuning drive assembly to the coarse tuning control on the receiver's front panel.

(5) Use an allen wrench to loosen the allen-type screw on the rear section (nearest tuning drive assembly) of the flexible coupling (tuning shaft-spring extender) until it can be disconnected from the tuning shaft.

(6) Disconnect the six coaxial connectors labeled J1 through J6 from the jack mounting that extends off the rear side of the tuners main frame. Refer to Figure 5-3 for an illustration of a top view of the tuner. The jacks are called out on the top portion of the page.

(7) Remove the multipin plug P1 from the receiver receptacle J7, which is located directly behind the coaxial connectors, by pulling it straight up from its receptacle. Refer to Figure 5-4 on page 5-12 of the WJ-8640-l manual. The multipin plug is called out as A2P1. A side view of the plug is also shown in Figure 5-2 of this manual.

(8) Using a slot-type screwdriver, release the three spring loaded captive screws that secure the base (right side) of the tuner to the receiver’s main chassis. Refer to Figure 5-4 of the WJ-8640-1 manual, and Figure 5-3 in this manual. The three spring loaded captive screws are shown on the right side of the tuner in both illustrations.

(9) Remove the two upper-most machine screws that are located on the left vertical side of the receiver's frame using a phillips-type screwdriver. Refer to Figure 5-3 for the location of the screws on the tuner (LOCATION OF PHILLIPS-TYPE INSTALLATION SCREWS).

(10) Remove the tuner assembly from the receiver's main chassis by lifting it to a 45 angle and pulling away from the receiver’s front panel.

(11) To replace the tuner reverse steps (5) through (10). When securing the flexible coupling to the tuning shaft of the tuner, allow a slight clearance between the base of the flexible coupling and the tuner front panel. Rotate the tuning knob to check for a smooth rotation, with no binding.

2.3 OPERATION

2.3.1 Operation of the WJ-9120 Tuner Assembly is controlled entirely by the associated receiver. Consult the receiver manual for futher specifications and operation.

2.4 PREPARATION FOR RESHIPMENT AND STORAGE

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

2.4.2 The environmental conditions for storage are:

(1) Maximum humidity: 97%

(2) 0°F to 150°F (-17.8° C to +65.6°C)

Table 2-1. Type WJ-9120 Electrical Connectors

Connector Reference Designation	Connector Nomenclature	Function *	Mating Plug*
J1	RF Input, B and 2	Antenna Switch. Output for B and 2.	SMC Male P3 of W2
J2	RF Input, Band 1	Antenna Switch. Output for Band 1.	SMC Male P5 of W3
J3	IF Output, Band 2 10 MHz	IF Demodulator. 10 MHz IF Input for Band 2.	SMC Male P6 of W4
J4	LO Output, Band 2 22-40 MHz	Counter. RF Input for Band 2.	SMC Male A3P1 of A3W1.
J5	IF Output, Band 1 21.4 MHz	IF Demodulator. 21.4 MHz IF Input for Band 1.	SMC Male P8 of W5
J6	LO Output, Band 1 21.9 -33.4 MHz	Counter. RF Input for Band 1.	SMC Male A3P2 of A3W2
P1	Receiver/Tuner Inter-face	Operating Voltages, AGC, FINE TUNE, DAFC & Band 1 or 2 select.	SRE Female J7

* The Function and Mating Plug columns pertain to the assemblies and the connectors with their associated cables from the WJ-8640 Series Receivers.

SECTION III

CIRCUIT DESCRIPTION

3.1 GENERAL

3.1.1 The operation of the circuitry found in the WJ-9120 Tuner is described in the following paragraphs. The functional block diagram shown in Figure 3-1 should be used as a reference for the circuit descriptions that follow, along with the schematic diagrams in Section VI. Note that the unit numbering system is used for electrical components, which means that parts on the subassemblies and modules carry a prefix before the usual class letter and number of the item (such as A1U1 and A6Q1). These subassembly prefixes are omitted on illustrations and in the text except in cases where confusion may result from their omission.

3.2 FUNCTIONAL DESCRIPTION

3.2.1 Refer to the Functional Block Diagram, Figure 3-1, for the following functional description. The WJ-9120 Tuner covers a frequency range of from 0.5 to 30 MHZ in two bands. The low band covers the 0.5 to 12 MHz range and the high band covers the 12 to 30 MHz range. Switching between bands is accomplished using the bandswitch located on the parent WJ-8640 Series Receiver front panel. The receiver's bandswitch routes the RF signal to the proper RF input of the tuner (J1 or J2) and supplies operating voltages to the circuitry of the selected band.

3.2.2 During high band operation, the RF signal enters the tuner via the 12-30 MHz RF input J1 and is applied to the input of the 12-30 MHz RF Preselector (A5). Enroute to the A5 subassembly, the signal encounters a 10 MHz trap consisting of Ll, C10 and Cll, which prevents RF signals at the tuner's IF frequency from reaching the IF amplifier. The 12 - 30 MHz RF Preselector consists of a double tuned input circuit, an RF amplifier and a double tuned output circuit. The tuned input and output circuits function as impedance matching circuits and the first and second stages of tuner selectivity. These circuits are electronically tuned to the selected RF frequency of the receiver by a tuning voltage from the Auto Band Select and Tuning Voltage Shapers Subassembly (Al). The RF Amplifier (Ql) in the preselector provides amplification for the RF signal. The gain of this stage is controlled by an AGC voltage applied to Q1 from the AGC circuitry of the parent receiver. From the output of the RF amplifier, the RF signal is passed to the IF Amplifiers Subassembly (A6) via the tuned output circuit of the 12 - 30 MHz RF Preselector. In the IF Amplifiers Subassembly, the signal enters mixer U1 where it mixes with a 22-40 MHz LO frequency to produce the 10 MHz IF. The 10 MHz IF signal is amplified approximately 12 dB by a cascoded IF amplifier (Ql and Q2). The IF output is then band-limited to 30 kHz by filter FL1 and passed to the 10 MHz output connector J3.

3.2.3 During low band operation, the RF signal enters the WJ-9120 Tuner via J2 and is routed to the Auto Band Select and Tuning Voltage Shapers Subassembly (Al). The signal is applied to the Auto Band Select portion of this subassembly where it is routed to the 0.5 - 1.5 MHz RF Preselector (A2), 1.5-4.5 MHz RF Preselector (A3) or the 4.5-12 MHz RF Preselector (A4) in accordance with the RF tuned frequency. IF switch outputs are also supplied by this circuit to the IF Amplifier subassembly to select an input to the IF Amplifier from the appropriate preselector. The Tuning Voltage Shaper portion of the Al subassembly provides a tuning voltage to each preselector to tune the input and output circuits to the tuned RF frequency. Both the Auto Band Select Circuit and the Tuning Voltage Shapers are contolled by a tuning voltage from the Tuning Drive Assembly (A9). This tuning voltage is a dc voltage that varies from +10 Vdc to approximately +2 Vdc in accordance with the tuned RF frequency.

3.2.4 From the Auto Band Select and Tuning Voltage Shapers Subassembly, the RF signal passes through the appropriate RF Preselector and is applied to the IF input switch network on the IF Amplifier Subassembly (A6). The IF input switch selects the output of the appropriate preselector and applies the RF signal to mixer U2 where it is mixed with a 21.9 - 33.4 MHz LO signal. The mixer output is a 21.4 Hz IF signal which is applied to a cascoded IF Amplifier (Q3 and Q4) where it is amplified by approximately 12 dB. From the IF amplifier the signal is band-limited to 30 kHz by filter FL2 and passed to the 21.4 MHz IF output connector J5.

3.3 DETAILED CIRCUIT DESCRIPTION

3.3.1 TYPE 714126-1 AUTO BAND SELECT AND TUNING VOLTAGE SHAPERS (A1)

3.3.1.1 The reference designation for this subassembly is Al. Refer to Figure 6-1 for the Auto Band Select and Tuning Voltage Shapers Schematic Diagram.

3.3.1.2 The Auto Band Select portion of the Al subassembly provides a means of switching the low band RF signal to the IF Amplifier via the appropriate RF Preselect or. The circuitry consists of three high gain operational amplifiers (UIA, UIB. and U2A) and a PIN diode switching network comprised of CR1 through CR6. The outpus of U1A U1B, and U2A switch between +12 Vdc and -12 Vdc at predetermined levels of the tuning voltage input (Pin H) to bias the PIN diode switches and to provide IF switch outputs to the IF Amplifier Subassembly (A6). Voltage dividers consisting of R3, R5 and potentiometer R4 and R10, R12 and potentiometer Rll apply an offset voltage to the inverting inputs of U2A and U1B, respectively, to control the voltage levels at which switching occurs. Diodes CR9 and CR7 apply +12 Vdc to the inverting inputs of U1A and U1B, thus holding their outputs at -12 Vdc when the output of U1B is +12 Vdc. This arrangement assures that only one of the Pin Diode switches is switched on at any one time.

3.3.1.3 Each of the three PIN diode switches consists of a series diode (CR2, CR4 or CR6) and a shunt diode (CR1, CR3 or CR5). When the switch is turned on, by a +12 Vdc output from its respective driver, the shunt diode is reverse biased and the series diode is forward biased, permitting the RF sgnal to pass to the proper RF Preselector. A -12 Vdc output from the RF signal path, and forward biases the shunt diodes placing the remaining RF outputs at signal ground potential. Capacitors C9, C8, C6 and C3 couple the RF signal through the switch network and capacitors Cl, C2, C4, C5 and C7 function as decoupling capacitors for the power supply and driver outputs. Potentiometers R4 and Rll adjust the offset voltage of U2A and U1B to set the points at which switching occurs.

3.3.1.4 The Tuning Voltage Shaper portion of the Al subassembly operates in conjunction with shaping circuitry on each RF Preselector to electronically tune the active preselector to the receiver tuned frequency. The shaper circuitry consists of U2B, U3A, and U3B for the low band and U4 for the high band. Amplifier U2B provides a tuning voltage from +1.07Vdc (when 0.5 MHz is tuned) to 5.48 Vdc (when 1.5 MHz is tuned) to the 0.5 - 1.5 MHz RF Preselector as the tuner is tuned through the 0.5 to 1.5 MHz frequency range. The gain of U2B is set by resistors R19, R25 and potentiometer R26, and an offset voltage is applied to the non-inverting input via the voltage divider network comprised of R20 through R23. During operation within the 1.5 to 4.5 MHz frequency range, U3A provides a tuning voltage to the 1.5-4.5 MHz RF Preselector (A3). This voltage ranges from 1.00 Vdc (when 1.5 MHz is tuned) to 8.97 Vdc (when 4.5 MHz is tuned). The offset for U3A is set by the voltage divider comprised of R29 through R32 and the gain is set by R35, R34 and R28. U3B provides tuning for the 4.5- 12 MHz RF Preselector (A4). The output voltage ranges from 1.34 Vdc (when 4.5 MHz is tuned) to 9.30 Vdc (when 12 MHz is tuned). The offset voltage for U3B is provided by resistors R38 through R42 and gain is controlled by R44, R43 and R37.

3.3.1.5 During high band operation, amplifier U4 provides the required tuning voltage to the 12-30 MHz RF Preselector (A5). The output of this shaper varies from 0.75 Vdc (when 12 MHz is tuned) to 6.53 Vdc (when 30 MHz is tuned). This circuit functions in the same manner as the low band shapers with the exception of the voltage divider at the input of U4. The voltage divider formed by R46 and R47 reduces the tuning voltage input to approximately 75% of the value supplied at board terminal H. This reduction of the input voltage extends the range of U4 to cover the entire 12 - 30 MHZ frequency range.

3.3.2 TYPES 714007-1 (0.5 -1.5 MHz), 714007-2 (1.5 -4.5 MHz), and 714007-3 (4.5 - 12 MHz) RF PRESELECTORS (A2 through A4)

3.3.2.1 The reference designations for the Types 714007-1, -2, -3 RF Preselectors are A2 (Type 714007-1), A3 (Type 714007-2) and A4 (Type 714007-3). Refer to Figure 6-2 for the RF Preselector Schematic Diagram.

3.3.2.2 With the exception of the differences noted in the table of Figure 6-2, these three preselectors are identical. Power is applied via board pin 7 when the low band is selected on the parent WJ-8640 series receiver. The RF signal enters the RF Preselector via board terminal 10 and is applied to a double-tuned input network which provides impedance matching and the first stage of tuner selectivity. The first half of the tuned input network consists of Ll, L2, C1 and varactor diodes CR1A through CR4A and L4, C4 and varactor diodes CRIB through CR4B comprise the second half (see table in Figure 6-2 for component variations between types). Inductor L3 provides inductive coupling between the two parts of the input network.

3.3.2.3 From the tuned input network, the RF signal is coupled through C5 to the gate (pin3) of the RF Amplifier Q1 is a Dual Insulated Gate Field Effect Transistor, incorporated to insure good inter modulation characteristics. Bias for the first gate is achieved via the voltage divider consisting of R8, R4, and R3.Gate 2 (pin 2) receives bias via the biasing network consisting of R5 through R8 and CR17 which sets the bias at approximately 3.5 V when the AGC voltage is 0. When the AGC voltage goes sufficiently negative to reverse bias CR17 (-0.6 V), CR17 is effectively removed from the circuit, permitting the bias on Q1 to follow the AGC voltage input. The output of Q1 is developed across the first half of the double tuned output circuit, comprised of L5, C10, and CR1C through CR4C. Inductor L6 provides inductive coupling to the second half of the double-tuned output filter, comprised of L7, L8, C13 and CR1D through CR4D (see Figure 6-2 table for component variations between types). Potentiometer R13 provides a means of adjusting the output level of the preselector.

3.3.2.4 The double tuned input and output filters utilize varactor diodes to tune the circuits to the selected RF frequency. The diodes used are matched sets selected to exhibit similar voltage versus capacity characteristics. Tuning of the preselector is accomplished utilizing the tuning voltage output from the voltage shapers circuitry of the Al subassembly. This tuning voltage is applied to the varactor diodes via a voltage shaping circuit consisting of R15 through R19, CR18 and VR1 (see the table in Figure 6-2 for component variations between types). Shaping of the tuning voltage is required to compensate for the non-linear voltage versus capacity characteristics of the varactor diodes, thus permitting the preselector tuning to track with the tuning of the local oscillator.

3.3.3 TYPE 714010 RF PRESELECTOR (A5)

3.3.3.1 The reference designation for the Type 714010 RF Preselector is A5. Refer to Figure 6-3 for the 12-30 MHz RF Preselector Schematic Diagram.

3.3.3.2 With the exception of the frequency range covered, the operation of the 12 - 30 MHz RF Preselector is identical to the low band RF Preselector described in paragraph 3.3.2.

3.3.4 TYPE 724010-1 IF AMPLIFIERS

3.3.4.1 The reference designation for the IF Amplifiers Subassembly is A6. Refer to Figure 6-4 for the Type 724010 IF Amplifiers Schematic Diagram.

3.3.4.2 The IF Amplifier Subassembly consist of a 10 MHz IF Amplifier which is active during high band operation and a 21.4 MHz IF Amplifier, active during low band operation. During high band operation +15 Vdc is applied to board terminal 2 and -15 Vdc is applied to terminal 3 to provide power for the 10 MHz IF Amplifier. The RF signal enters terminal 7 and is applied to mixer Ul, where is it mixed with a 22-40 MHz LO signal to obtain a 10 MHz difference frequency. The 22-40 MHz LO signal enters at terminal 5 and is applied to the mixer via a 3 dB pad consisting of R26, R27 and R28. A sample of the LO signal is routed out terminal 4 of the IF Amplifier board via R29 and R30 to provide the 22-40 MHz LO output at J4 of the tuner. Resistors R29 and R30 attenuate the LO signal and isolate the LO output from any load changes at J4.

3.3.4.3 The mixer output is coupled to the IF Amplifier via capacitor Cl. The IF Amplifier is a cascoded amplifier comprised of transistors Q1 and Q2. This type amplifier is utilized because of its low Miller feedback, which reduces the possibility of oscillation. Base bias for Q1 is obtained by the voltage divider formed by R1 and R2 connected between -15 Vdc and ground.

3.3.4.4 Resistors R6 and R7 prevent parasitic oscillations and the feedback network comprised of R3 and C3 are utilized to improve stability. The output of the amplifier is developed across the tuned circuit consisting of Ll, C6 and C7 and is then applied to the input of bandpass filter FL1. The bandwidth of the IF signal is limited to 30 kHz by FL1 and it is then passed to the tuned circuit consisting of L2, C8, C9 and C24. This circuit provides additional attenuation to signals out of the 30 kHz bandwidth of the IF signal. Resistors R9, R10 and Rll form an attenuation pad and set the output of the IF Amplifier at 50 ohms.

3.3.4.5 With the exception of the input circuitry, the 21.4 MHz low band IF Amplifier functions the same as the 10 MHZ circuit previously described. Since three RF Preselectors are utilized to cover the 0.5 to 12 MHz frequency range, the IF input switching network comprised of PIN diodes CR1 through CR6 has been incorporated to select the output from the active preselector. The outputs of the remaining preselector are isolated to prevent their affecting the desired signal. Switching is accomplished by a +12 Vdc or -12 Vdc IF switch voltage applied to board terminals 8, 11 and 14, from Auto Band Select circuitry of the Al subassembly. A +12 Vdc IF switch voltage applied to one of the IF switch inputs activates its respective pin-diode switch and provides a signal path from the active Preselector to the IF Amplifier. The remaining two pin-diode switches are biased off by a -12 Vdc IF switch voltage. From the input switching network, the RF signal is passed to mixer U2 via a low-pass filter comprised of L3, C13 and C14. This filter improves image and IF rejection by attenuating frequencies above 12 MHz that may pass through the RF Preselectors.

3.3.5 PART 270447-1 LOCAL OSCILLATORS (A7)

3.3.5.1 The reference designation for this subassembly is A7. Refer to Figure 6-5 for the Local Oscillators Schematic Diagram.

3.3.5.2 The Local oscillators Subassembly (A7) consists of two independent oscillators. The 21.9-33.4 MHz oscillator (Ql) is active during low-band operation and the 22-40 MHz oscillator (Q3) is active during high-band operation. Both are modified Colpitts configured oscillators with the frequency of oscillation determined by the tuned base circuits.

3.3.5.3 During low band operation, +15 Vdc is applied to board terminal El and -15 Vdc is applied to terminal E2 to activate the 21.9-33.4 MHz Local Oscillator (Ql). Capacitors C2, C3, C26 and C27 form a capacitive voltage divider to provide positive feedback to the emitter of Ql, via R3, to sustain oscillation. The tuned base of the oscillator consists of capacitors C5A, C6, C8, C9, T1 and CR1 with the frequency of oscillation determined by the setting of tuning capacitor C5A. DC blocking capacitor C4 isolates the base bias of Q1 from the tank circuit. Base bias is provided by the voltage divider formed by R4 and R5.

3.3.5.4 Varactor diode CR1 provides a means of fine tuning the oscillator or automatically locking onto the frequency by selecting Digital Automatic Frequency Control (DAFC) on the parent receiver. Both fine tuning and DAFC are accomplished by varying the DC bias on CR1. When DAFC is selected, a voltage ranging from -4 V to +4 V is present at terminal E4. This voltage, which is applied to the anode of CR1, varies its capacitance to compensate for any frequency shift in the local oscillator. Zener diode VR1, along with resistors R10 and R11 maintain a constant reverse bias condition for CR1. Any fine tuning voltage applied to terminal E3 will vary the cathode voltage of CR1 which will, in turn, vary the oscillator frequency slightly.

3.3.5.5 The oscillator signal is taken from a tap on T1 and is coupled via Cll to the base of buffer/amplifier Q2. Q2 provides isolation between the output and the oscillator and amplification of the oscillator signal. Base bias for Q2 is provided by the voltage divider formed by R14 and R13. The output signal at the collector of Q2 is transformer coupled to 21.9-33.4 MHz LO output terminal (E5) by transformer T2.

3.3.5.6. The operation of the 22-40 MHz oscillator utilized during high band operation is identical to the 21.9-33.4 MHZ oscillator described above with the exception of the reference designations of the circuit components. Refer to the schematic diagram (Figure 6-5) for the corresponding reference designations.

3.3.6 PART 270448-1, 10.5 V VOLTAGE REFERENCE (A8)

3.3.6.1 The reference designation for this subassembly is A8. Refer to the WJ-9120 Main Chassis Schematic Diagram, Figure 6-6, for the 10.5 V Voltage Reference Schematic Diagram.

3.3.6.2 The 10.5 V Voltage Reference Subassembly (A8) provides a regulated 10.5 V output which is used as a reference for the Auto Band Select and Tuning Voltage Shapers Subassembly

(Al) and the RF Preselectors (A2-A5). This output voltage is also supplied to the Tuner Drive Assembly (A9) to provide the tuning voltage input to the Al subassembly. The input to this circuit is +15 Vdc from the low band or high band +15 Vdc lines. Diodes CR1 and CR2 isolate the two 15 V lines to prevent operating voltage from being fed back from the A8 subassembly to the circuitry of the inactive band. The +15 Vdc input is applied to pins 12 and 11 of voltage regulator Ul, to provide a regulated 10.5 Vdc output, via current sensing resistor R2, at board terminal E3. The regulated output is sampled by Ul through a voltage divider formed by R3, R5 and potentiometer R4. Any change in the output voltage is sensed at the inverting input of Ul causing the output to increaser decrease in order to maintain a constant 10.5 V output.

3.3.6.3 Potentiometer R4 provides a means of adjusting the output voltage and resistor Rl and capacitor Cl provide frequency compensation to prevent the regulator from going into high frequency oscillations.

NOTE

The troubleshooting, performance checks, alignment and adjustment procedures, and subassembly removal, repair and replacement actions contained in section IV are to be performed at the depot maintenance level only.

SECTION IV

MAINTENANCE

4.1 GENERAL

4.1.1 The WJ-9120 Tuner has been designed cooperate for extended periods of time with only routine maintenance. The unit requires no special attention in its care and requires only occasional gear train cleaning. The duration between cleaning and inspection of the unit should depend on its usage and the environmental conditions. Should trouble occur, repair time will be minimized if the maintenance technician is familiar with the circuit descriptions found in Section III. Reference should be made to the functional block diagram, Figure 3-1, and to the schematic diagrams found in Section VI. A complete parts list and part location illustrations can be found in Section V.

4.2 CLEANING AND LUBRICATION

4.2.1 The unit should be kept free of dust, grease, dirt and foreign matter to insure trouble-free operation. If available, low pressure compressed air should be used to remove accumulated dust from the interior and exterior of the unit as needed. A clean dry cloth, soft bristled brush, or a cloth saturated with a cleaning solution may be used.

4.3 INSPECTION FOR DAMAGE OR WEAR

4.3.1 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 on a periodic basis, or when the unit is inoperative, for indications of electrical or mechanical defects. Electronic components that show signs of deterioration, such as overheating, should be checked and a thorough investigation of the associated circuitry should be made to verify proper operation. Damage of parts due to heat is often the result of other less apparent troubles in the circuit. It is essential that the cause of the overheating be determined and corrected before replacing the damaged parts. All mechanical parts should rechecked for looseness, excessive wear, corrosion and other signs of deterioration.

4.4 TEST EQUIPMENT REQUIRED

4.4.1 The test equipment listed in Table 4-1, or their equivalents are required to execute the troubleshooting procedures, performance checks and alignment procedures on the WJ-9120 Tuner.

4.5 TROUBLESHOOTING PROCEDURES

4.5.1 Troubleshooting of the WJ-9120 can be accomplished utilizing the high band and low band power connections as illustrated in Figures 4-2 and 4-3. The initial investigation should be directed toward determining if the problem is related to the high or low band operation or if the problem is common to both bands. Once this has been determined, reference should be made to the functional block diagram in Figure 3-1 to aid in localizing the trouble to a specific subassembly. By utilizing acceptable troubleshooting techniques, inject the proper input signal and trace it back from the output. This method should aid in identifying the faulty component. Before attempting troubleshooting and repairs of the tuner, the technician should have a thorough understanding of the tuner's operation as described in Section III. Reference should also be made to the functional block diagram and the schematic diagrams for the unit.

Table 4-1. Test Equipment Required

Equipment	Characteristics	Type
Sweep Generator	Range: 10 kHz-32 MHz	HP-675A
Oscilloscope	Sensitivity: 1 mV Bandwidth: dc to 500 kHz	Tektronix 503
Digital Voltmeter	High impedance	Fluke 8000 A
50 ohm Detector	50 ohm input impedance	Telonic XD-3A
RF Power Meter	Range: -20 to +l0 dBm	HP-432A
Power Sensor	50 ohm impedance	HP-8481 A
Signal Generator	Range: 10-480 MHz	HP-608E
High-Impedance Detector	High impedance	Figure 4-1
Frequency Counter	Range: dc to 50 MHz	HP-245L
Power Supply(l)	Range 0 to ±4 Vdc at 100 mA	HP-721A
Power Supply (2)	Range: 0 to ±15 Vdc at 200 mA	HP-6215 A
Spectrum Analyze] (Display section, IF section, RF section)	Range: 1 kHz to 110 MHz	HP-141T, 8552B, 8553B
Mixer	Range: 50 kHz to 200 MHz	WJ-M9A

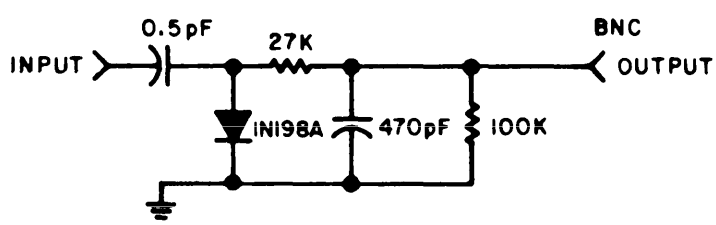


Figure 4-1. High Impedance

4.6 PERFORMANCE CHECKS

The performance checks that follow are designed to aid in troubleshooting and evaluating the operation of the WJ-9120 Tuner. They can also serve as part of a periodic maintenance check. Any output not used during a particular check should be terminated into its characteristic impedance of 50 ohms. Figures 4-2 and 4-3 illustrate the power connections for the low band and high band operation. These power connections will be used throughout the test procedures.

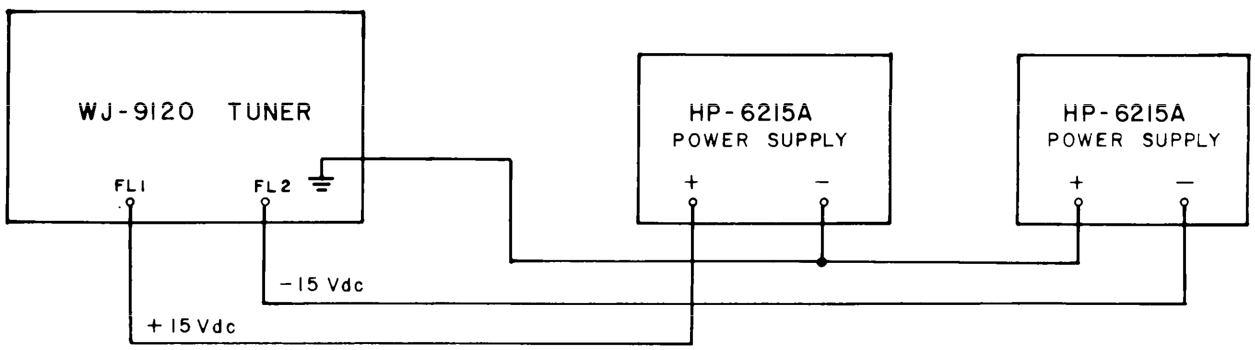


Figure 4-2. Power Connection, Low Band Operation

4.6.1 +10.5V VOLTAGE REFERENCE (A8) - To check the performance of the sub-assembly, proceed as follows:

(1) Connect the +15 Vdc and -15 Vdc power supplies as illustrated in Figure 4-2 and apply power to the unit.

(2) Remove the covers necessary to gain access to the A8 sub-assembly.

(3) Using the FLUKE 8000A DVM, measure the dc voltage at terminal A8E3. The voltage at A8E3 should measure +10.5 ±0.05 Vdc.

4.6.2 LOW BAND PERFORMANCE CHECKS

4.6.2.1 Local Oscillator Output Checks

(1) Connect power to the tuner for low band operation, as illustrated in Figure 4-2 and apply power.

(2) Connect the HP-432A RF Power Meter, with the HP-8481A Power Sensor to the 21.9-33.4 MHz L0 output jack (J6).

(3) Tune the tuner through its range while observing the LO output level on the RF Power Meter. The output should remain between -17 and -7 dBm (31.5mV to 0.1 V) throughout the frequency range.

(4) Remove the RF Power Meter and connect the frequency counter to jack J6.

(5) Rotate the tuner shaft fully clockwise, then fully counterclockwise while noting the frequency reading at each extreme. The frequency counter should read approximately 21.7 MHz when the tuner shaft is fully counterclockwise and approximately 33.6 MHz when fully clockwise.

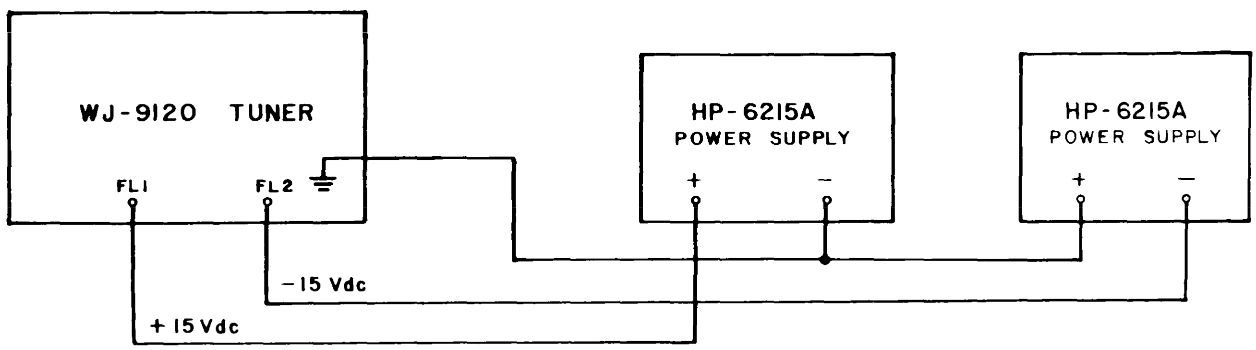


Figure 4-3. Power Connection, High Band Operation

4.6.2.2 DAFC Range Check

(1) Connect the power connection as illustrated in Figure 4-2 and connect the frequency counter to the 21.9- 33.4 MHz LO output J6.

(2) Adjust the tuner shaft for a frequency counter reading of 21.9 MHz.

(3) Connect the negative line of the HP-721A Power Supply to the tuner DAFC input (FL6) and set the DAFC voltage to -4.0 Vdc. Note the frequency counter reading.

(4) Connect the positive line of the HP-721A Power Supply to FL6 and set the DAFC voltage to +4.0 Vdc. Note the frequency counter reading.

(5) The difference between the readings in steps (3) and (4) is the DAFC range at the low end of the band. The DAFC range should be a minimum of 5.0 kHz.

(6) Disconnect the DAFC connection from FL6 and adjust the tuner shaft for a frequency counter reading of 33.4 MHz. Repeat steps (3) and (4).

(7) The difference between steps (3) and (4) is the DAFC range at the upper end of the band. The DAFC range should be a minim-urn of 12.0 kHz.

4.6.2.3 Gain Measurement

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

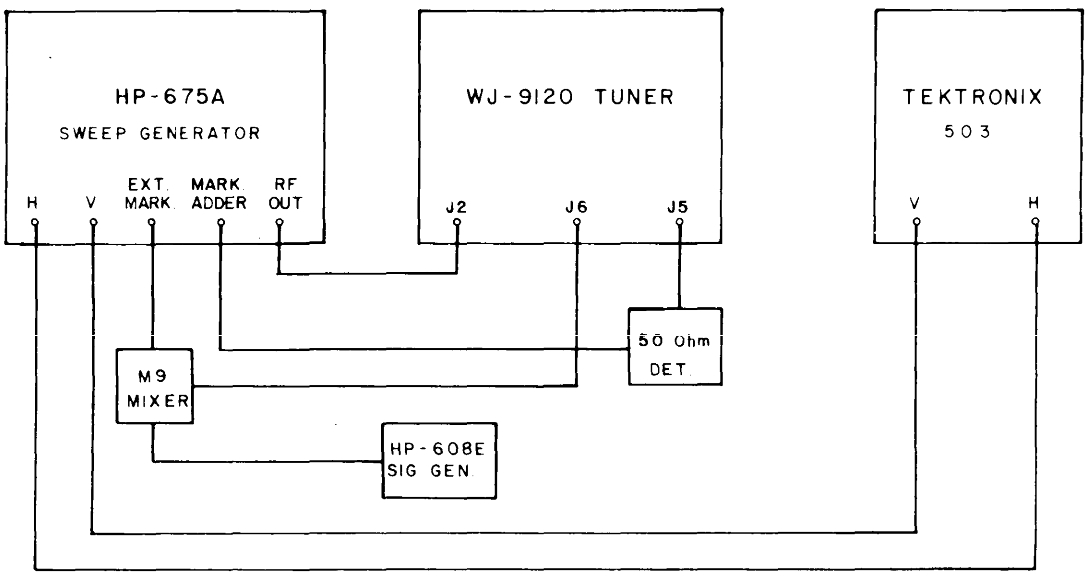


Figure 4-4. Equipment Connections, Gain Measurement

(2) Set the signal generator to 21.4 MHz and the output to produce a visable marker.

(3) Adjust the sweep generator frequency and output level to produce an undistorted response with the marker centered on the response curve.

(4) Note the response amplitude while tuning the sweep generator and the tuner across the tuner's frequency range. Tune to the lowest amplitude point found and note the sweep generator's output attenuator setting at this point.

(5) Connect the detector to the RF output of the sweep generator and decrease the output attenuation until the scope deflection is equal to the level instep (4).

(6) The difference between the attenuator setting in step (5) and the setting in step (4) is the tuner gain.

(7) Repeat steps (3) through (6), measuring the gain at the highest amplitude point within the-tuner's frequency range.

(8) The tuner's minimum and maximum gain should fall within a 17-23 dB range.

4.6.3 HIGH BAND PERFORMANCE CHECKS

4.6.3.1 Local Oscillator Output Check

(1) Connect power to the tuner for high band operation as illustrated in Figure 4-3 and apply power.

(2) Connect the HP-432A RF Power Meter with the HP-8481A Power Sensor to the 22- 40 MHz LO output jack (J4).

(3) Tune the tuner through its range while observing the LO output level on the RF Power Meter. The output should remain between -17 and -7 dBm (31.5 mV to 0.1 V) throughout the frequency range.

(4) Remove the RF Power Meter and connect the frequency counter to jack J4.

(5) Rotate the tuner shaft fully clockwise, then fully counterclockwise while noting the frequency reading at each extreme. The frequency counter should read approximately 40.2 MHz when the shaft is fully clockwise and 21.8 MHz when fully counterclockwise

4.6.3.2 DAFC Range Check

(1) Connect the power connection as illustrated in Figure 4-3 and connect the frequency counter to the 22-40 MHz LO output jack (J4).

(2) Adjust the tuner shaft for a frequency counter reading of 22.0 MHz.

(3) Connect the negative line of the HP-721A Power Supply to the tuner DAFC input (FL6) and set the DAFC voltage to -4.0 Vdc. Note the frequency counter reading.

(4) Connect the positive line of the HP-721A Power Supply to the tuner DAFC input (FL6) and set the DAFC voltage to +4.0 Vdc. Note the frequency counter reading.

(5) The difference between the readings in steps (3) and (4) is the DAFC range at the low end of the band. The DAFC range should be a minimum of 12.0 kHz.

(6) Disconnect the DAFC connection from FL6 and adjust the tuner shaft for a frequency counter reading of 40 MHz. Repeat steps (3) and (4).

(7) The frequency difference between steps (3) and (4 is the DAFC range at the high end of the band. The DAFC range should be a minimum of 30 kHz.

4.6.3.3 Gain Measurement

(1) Connect the test equipment as illustrated in Figure 4-5.

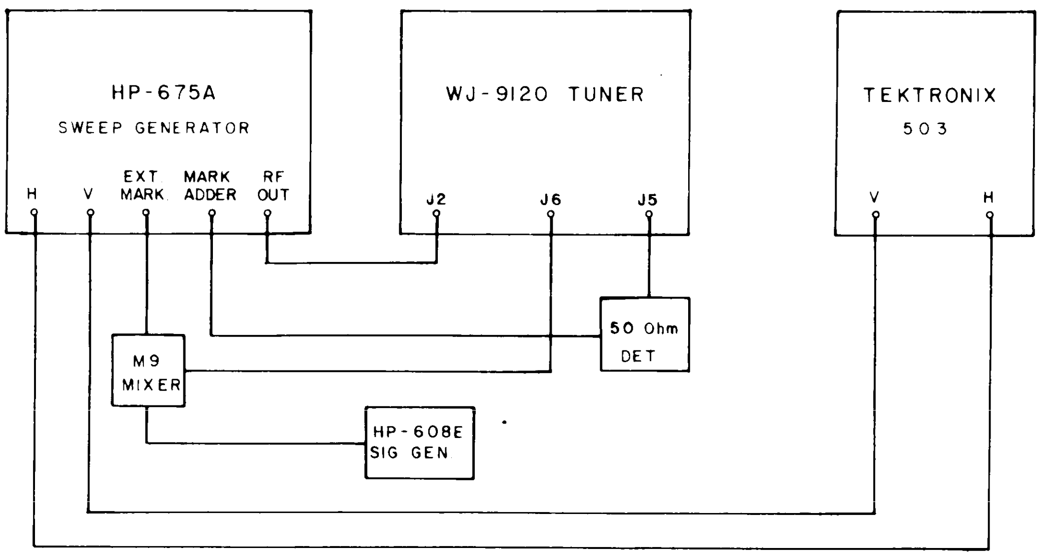


Figure 4-5. Equipment Connection, Gain Measurement

(2) Set the signal generator frequency to 10 MHz and adjust the output to produce a visable marker.

(3) Adjust the sweep generator frequency and output level to produce an undistorted response with the marker centered on the response curve.

(4) Note the response amplitude while tuning the sweep generator and the tuner across the tuner’s frequency range. Tune to the lowest amplitude point found and note the sweep generator output attenuator setting at this point.

(5) Connect the detector to the RF output of the sweep generator and decrease the output attenuation until the scope deflection is equal to the level instep (4).

(6) The difference between the attenuator setting in step (5) and the setting instep (4) is the tuner gain.

(7) Repeat steps (3) through (6), measuring the gain at the highest amplitude point within the tuner's frequency range.

(8) The tuner's minimum and maximum gain should fall within a 17-23 dB range.

4.7 ALIGNMENT AND ADJUSTMENT PROCEDURES

4.7.1 Alignment of the WJ-9120 Tuner should be performed only by personnel thoroughly familiar with RF tuner alignment. Prior to performing any of the alignment steps, the complete alignment procedure should be reviewed to obtain a thorough understanding of each step in the procedures. Removal of the top cover of the tuner causes a slight detuning of the local oscillator. Therefore, after making any adjustment, replace the cover before checking the results. As an alternative to this procedure, a partial cover can be constructed to cover the cavity housing the tuning capacitors, the A7 and the A8 subassemblies.

4.7.1.1 Local Oscillators Alignment

(1) Connect power to the WJ-9120 Tuner for low band operation (Figure 4-2) and connect the HP-245L Frequency Counter to the 21.9 - 33.4 MHz LO output connector (J6).

(2) Rotate the tuner shaft to its extreme counterclockwise position.

(3) Adjust the oscillator frequency to 21.7 MHz by spreading or compressing the turns of transformer A7Tl as required.

(4) Rotate the tuner shaft to its extreme clockwise position and adjust capacitor A7C8 for a frequency of 33.6 MHz.

(5) Repeat steps (2) through (4) until interaction between the adjustments is minimized. Once the frequency range of 21.7-33.6 MHz is obtained, apply Q-dope to the transformer turns to prevent movement.

(6) Disconnect the low band power connections and connect power for high band operation (Figure 4-3).

(7) Connect the HP-245L Frequency Counter to the 22-40 MHz LO output connector (J4) and rotate the tuner shaft to its extreme counterclockwise position.

(8) Adjust the oscillator frequency to 21.8MHz by spreading or compressing the turns of transformer A7T3 as required.

(9) Rotate the tuner shaft to its extreme clockwise position and adjust capacitor A7C19 for a frequency of 40.2 MHz.

(l0) Repeat steps (7) through (9) until interaction between the adjustments is minimized. Once the frequency range of 21.8-40.2 MHz is obtained, apply Q-dope to the transformer turns to prevent movement.

4.7.1.2 10.5 V Voltage Ref. and Tuning Potentiometer Adjustment

(1) Connect power for low band operation (Figure 4-2) and connect the Fluke 8000A DVM to the +10.5 Vdc output terminal of the 10.5 V Voltage Ref. (A8E3).

(2) Adjust trimmer potentiometer A8R4 for +10.5 ±.05Vdc at terminal A8E3.

(3) Disconnect the DVM from A8E3 and reconnect the meter lead to the wiper terminal of the tuning potentiometer (A9R1 Terminal S). Connect the frequency counter to the 21.9-33.4 MHz LO output (J6).

(4) Reinstall the top cover (or partial cover described in paragraph 4.7.1) and rotate the tuning shaft for an LO frequency of 21.9 MHz.

(5) Loosen the two set screws of the gear mounted to the tuning potentiometer shaft. While holding the gear in place, insert a screwdriver into the slot on the potentiometer shaft and rotate the shaft until exactly +10.0 Vdc is displayed on the DVM.

(6) Tighten the set screws and recheck to assure that no gear train movement occurred during the adjustment. The tuning voltage should be +10.0 Vdc when the LO is tuned to 21.9 MHz.

4.7.1.3 Auto Band Select and Tuning Voltage Shapers Alignment

4.7.1.3.1 Auto Band Select Alignment

(1) Connect power to the WJ-9120 Tuner for low band operation (Figure 4-2) and connect the frequency counter to J6.

(2) Tune for an LO frequency of 22.9 MHz (1.5 MHz tuned frequency) and extend the Auto Band Select and Tuning Voltage Shapers Subassembly (Al). Rotate A1R4 and AIR1l to their full counterclockwise position.

(3) Connect the Fluke 8000A DVM to terminal 2 of XAl and adjust A1R4 clockwise until the voltage at terminal 2 first switches between +12 Vdc and-12 Vdc.

(4) Tune off 22.9 MHz to an LO frequency of 22.7 MHz and then upward until switching occurs. Note the frequency when the voltage at terminal 2 switches. Due to hysteresis, this frequency will be slightly greater than 22.9 MHz.

(5) Tune off 22.9 MHz to 23.1 MHz, on the frequency counter, and then tune downward until switching occurs, noting the frequency when the voltage at terminal 2 switches. This frequency will be slightly less than 22.9 MHz. (Approximately 100 kHz of hysteresis centered at the switch frequency is typical in steps (4) and (5)).

(6) Tune to an LO frequency of 25.9 MHz and connect the DVM to terminal 6 of XA1.

(7) Adjust AIR1l clockwise until the voltage at terminal 6 first switches between +12 Vdc and -12 Vdc.

(8) Repeat steps (4) and (5) tuning off to 25.7 MHz in step (4) and 26.1 MHz in step (5) from a switch frequency of 25.9 MHz.

4.7.1 .3.2 Tuning Voltage Shapers Initial Alignment

(1) Connect power for low band operation (Figure 4-2) and connect the frequency counter to the 21.9- 33.4 MHz LO output connector (J6).

(2) Attach the DVM to terminal 1 of XA1 and tune to an LO frequency of 21.9 MHz (.5 MHz tuned frequency).

(3) Adjust the .5-1.5 MHz shaper gain potentiometer (A1R26) for +1.07 Vdc at terminal 1.

(4) Tune to an LO frequency of 22.9 MHz (1.5 MHz tuned frequency) and adjust the .5- 1.5 MHz shaper offset potentiometer (A1R23) for +5.48 Vdc at terminal 1.

(5) Repeat steps (2) through (4) until interaction between adjustments is minimized.

(6) Connect the DVM to terminal 5 of XA1 and between adjustments frequency of 22.9 MHz (1.5 MHz tuned frequency) at J6. Adjust the 1.5- 4.5 MHz shaper gain potentiometer (A1R35) for +1.0 Vdc at terminal 5.

(7) Retune for an LO frequency of 25.9 MHz (4.5 MHz tuned frequency) and adjust the 1.5-- 4.5 MHz offset potentiometer (A1R32) for +8.97 Vdc at terminal 5.

(8) Repeat steps (6) and (7) until interaction between adjustments is minimized.

(9) Connect the DVM to terminal 9 of XA1 and tune for an LO frequency of 25.9 MHz (4.5 MHz tuned frequency). Adjust the 4.5- 12 MHz shaper gain potentiometer (A1R44) for +1.34 Vdc at terminal 9.

(l0) Retune for an LO frequency of 33.4 MHz (12 MHz tuned frequency) and adjust the 4.5-12 MHz shaper offset potentiometer (A1R41) for +9.30 Vdc at terminal 9.

(11) Repeat steps (9) and (10) until interaction between adjustments is minimized.

(12) Connect power for high band operation (Figure 4-3) and connect the frequency counter to the 22 -40 MHz LO output connector (J4). Attach the DVM to terminal 15 of XA1.

(13) Tune for an LO frequency of 22 MHz (12 MHz tuned frequency) and adjust the 12-30 MHz shaper gain potentiometer (A1R55) for +.075 Vdc at terminal 15.

(14) Retune for an LO frequency of 40 MHz (30 MHz tuned frequency) and adjust the 12-30 MHz Shaper offset potentiometer (AlR52) for 6.53 Vdc at terminal 15.

(15) Repeat steps (13 and (14) until interaction between adjustments is minimized.

4.7.1.4 IF Amplifiers Alignment

4.7.1.4.1 21.4 MHz Low Band IF Amplifier

(1) Remove the three low band RF Preselectors (A2 through A4) and connect power for low band operation (Figure 4-2). Adjust the tuner for an LO frequency of 22.4 MHz at J6 (1.0 MHz tuned frequency).

(2) Connect the test equipment as illustrated in Figure 4-6.

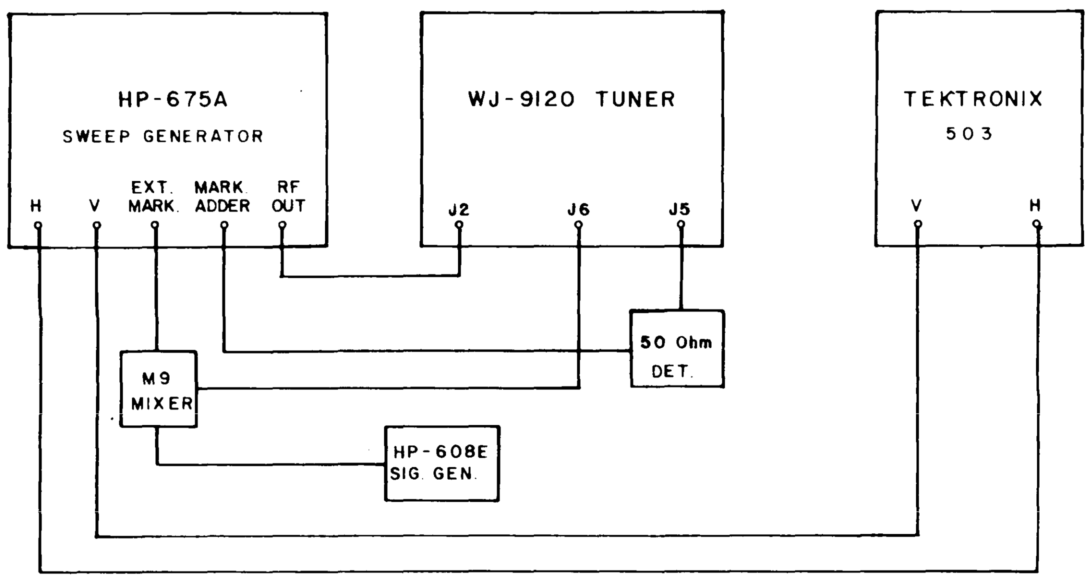


Figure 4-6. Equipment Connections, 21.4 MHz IF Amplifier

(3) Adjust the HP-675A Sweep Generator to sweep 100 kHz about a center frequency of 1 MHz at a level of -15 dBm. Adjust the oscilloscope to produce a suitable response.

(4) Set the HP-608E Signal Generator for an output frequency of 21.4 MHz and adjust the output level to produce a visable marker.

NOTE

IF response will be displayed at the RF tuned frequency, not at the IF center frequency.

(5) Adjust capacitors A6C21 and A6C25 for maximum gain and response flatness. (If the capacitor settings fall at their maximum or minimum extremes, A6L4 and A6L5 may be adjusted by spreading or compressing the coil turns as required.) Refer to Figure 4-7 for a typical response of the 21.4 MHz IF Amplifier.

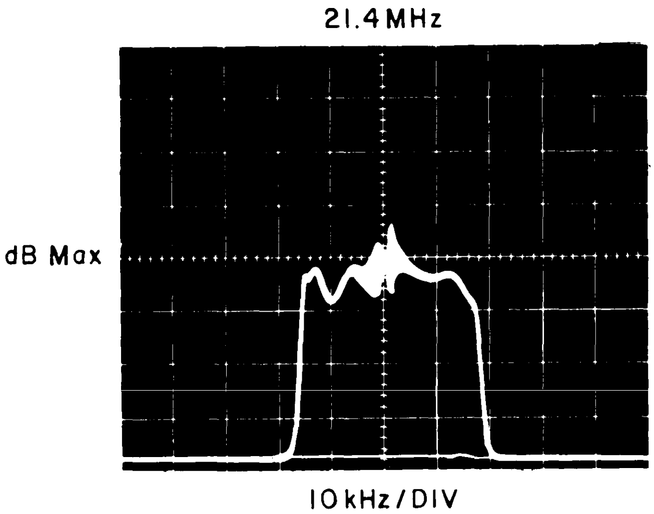


Figure 4-7. Typical Response, 21.4 MHz IF Amplifier

(6) Disconnect the 50 ohm detector from J5 and connect it to the sweep generator RF output. Decrease the output attenuation of the generator until the trace amplitude is equal to that noted in step (5).

(7) The difference between the attenuator settings in steps (5) and (6) is the gain of the 21.4 MHz IF Amplifier. The gain should be a minimum of 12 dB. The response bandwidth should be approximately 30 kHz with a maximum of 2 dB response ripple.

(8) Reinstall the three Low Band RF Preselectors into their respective receptacles.

4.7.1.4.2 10 MHz High Band IF Amplifier

(1) Remove the high band RF Preselector (A5) and connect power for high band operation (Figure 4-3). Adjust the tuner for an LO frequency of 30 MHz at J4 (20 MHz tuned frequency).

(2) Connect the test equipment as illustrated in Figure 4-8.

(3) Adjust the HP-675A Sweep Generator to sweep 100 kHz about a center frequency of 20 MHz at a level of -15 dBm. Adjust the oscilloscope to produce a suitable response.

(4) Set the HP-608E Signal Generator for an output frequency of 10 MHz and adjust the output level to produce a visable marker.

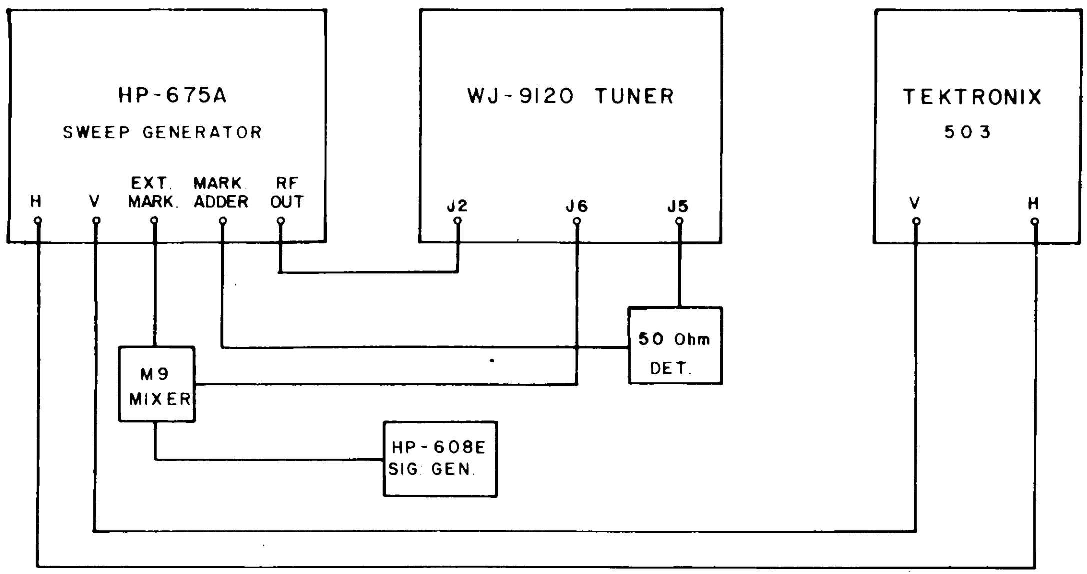


Figure 4-8. Equipment Connections, 10 MHz IF Amplifier

NOTE

IF response will be displayed at the RF tuned frequency, not at the IF center frequency.

(5) Adjust capacitors A6C7 and A6C24 for maximum gain and response flatness. (If the capacitor settings fall at their maximum or minimum extremes, A6L1 and A6L2 may be adjusted by spreading or compressing the coil turns as required.) Refer to Figure 4-9 for a typical response of the 10 MHz IF Amplifier.

(6) Disconnect the 50 ohm detector from J3 and connect it to the sweep generator RF output. Decrease the output attenuation of the generator until the trace amplitude is equal to that noted in step (5).

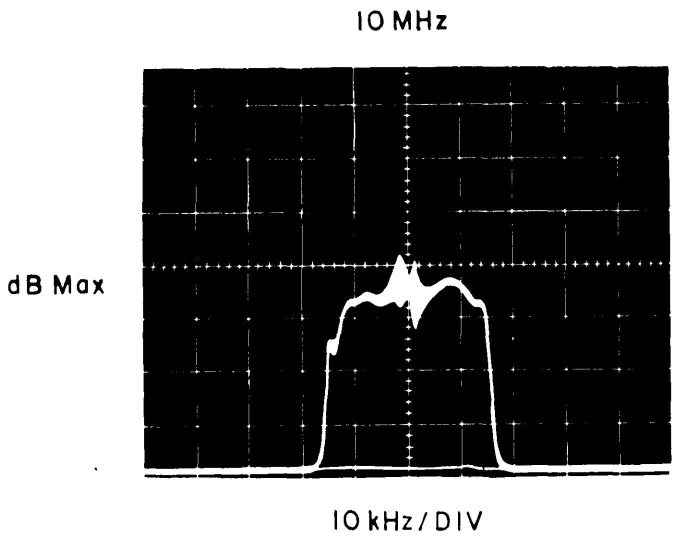


Figure 4-9. Typical Response, 10 MHz IF Amplifier

(7) The difference between the attenuator settings insteps (5) and (6) is the gain of the 10 MHz IF Amplifier. The gain should be a minimum of 12 dB. The response bandwidth should be approximately 30 kHz with a maximum of 2 dB response ripple.

(8) Reinstall the high band RF Preselector.

4.7.1.5 RF Preselector Prealignment

4.7.1.5.1 Low Band RF Preselectors

(1) Connect power for low band operation (Figure 4-2) and connect the test equipment as illustrated in Figure 4-10.

(2) Set the HP-675A Sweep Generator to sweep 2 MHz about a center frequency of 1 MHz at an output level of -15 dBm. Adjust the signal generator to 21.4 MHz and adjust the output level to produce a visable marker.

(3) Connect the DVM to board terminal 5 of the .5-1.5 MHz RF Preselector (A2) and adjust the tuning shaft for +1.07 Vdc at this point.

(4) Adjust A2L1, A2L4, A2L5 and A2L7 for maximum response.

(5) Readjust the tuning shaft for 5.5 Vdc at terminal 5.

(6) Adjust A2C1, A2C4, A2C10 and A2C13 for maximum response.

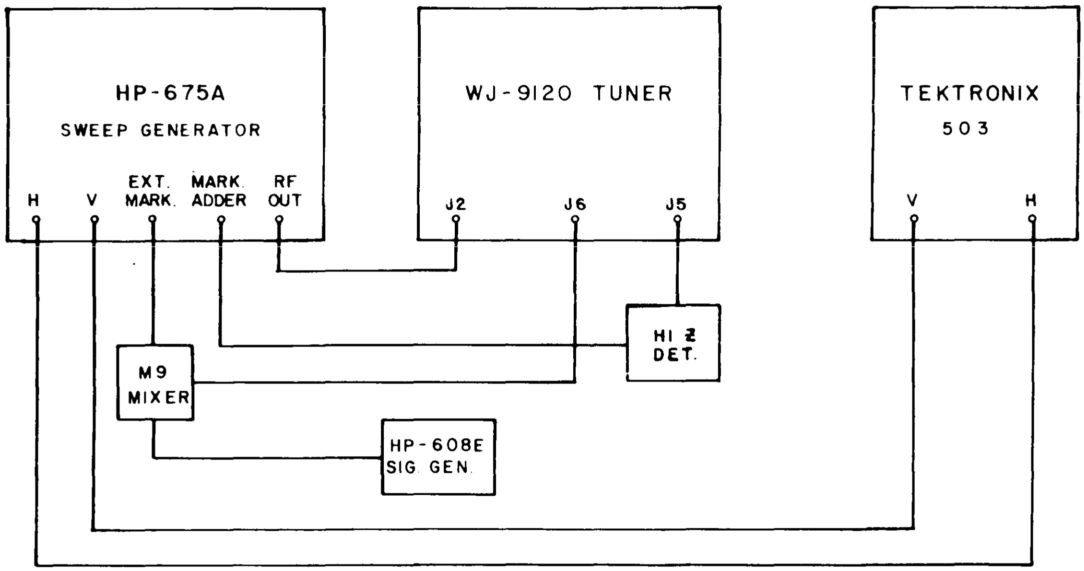


Figure 4-10. Equipment Connections, Low Band RF Preselectors

(7) Repeat steps (3) through (6) until interaction between adjustments is minimized. The response obtained should be similar to the typical response illustrated in Figure 4-11. The 3 dB bandwidth should be approximately 20% of the tuned frequency.

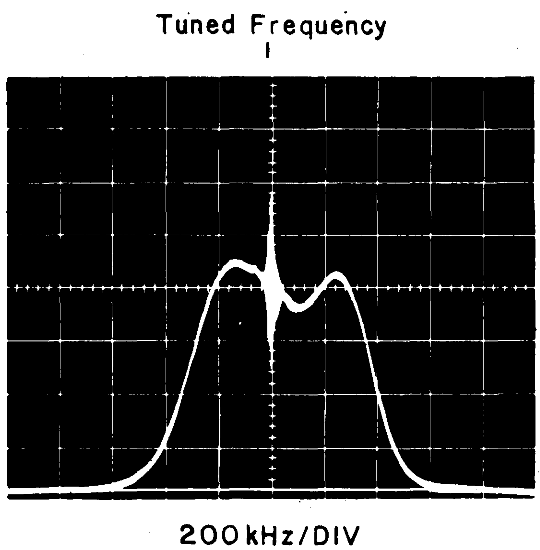


Figure 4-11. Typical Response, .5-1.5 MHz RF Preselector

(8) Connect the DVM to board terminal 5 of the 1.5- 4.5 MHz RF Preselector (A3) and adjust the tuning shaft for 1.00 Vdc at this point.

(9) Set the sweep generator to sweep 2 MHz about a 1.5 MHz center frequency at a -15 dBm output level.

(10) Adjust A3L1, A3L4, A3L5 and A3L7 for maximum response.

(11) Readjust the tuning shaft for +9.0 Vdc at terminal 5 and set the sweep generator center frequency to 4.5 MHz.

(12) Adjust A3C1, A3C4, A3C10 and A3C13 for maximum response.

(13) Repeat steps (9) through (12) until interaction between steps is minimized. Figure 4-12 illustrates a typical response for the 1.5- 4.5 MHz RF Preselector. The 3 dB bandwidth should be approximately 20% of the tuned frequency.

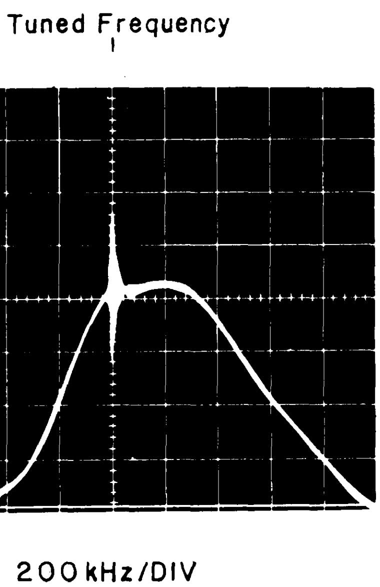


Figure 4-12. Typical Response, 1.5-4.5 MHz RF Preselector

(14) Connect the DVM to board terminal 5 of the 4.5- 12 MHz RF Preselector (A4) and adjust the tuning shaft for +1.34 Vdc at this point.

(15) Set the sweep generator to sweep 5 MHz about a center frequency of 4.5 MHz at a-15 dBm output level.

(16) Adjust A4L1, A4L4, A4L5 and A4L7 for maximum response.

(17) Readjust the tuning shaft for +9.5 Vdc at terminal 5 and reset the sweep generator center frequency to 12 MHz.

(18) Adjust A4C1, A4C4, A4C10 and A4C13 for maximum response.

(19) Repeat steps (14) through (18) until interaction between adjustments is minimized. Figure 4-13 illustrates a typical response for the 4.5-12 MHz RF Preselector. The 3 db bandwidth should be approximately 20% of the tuned frequency.

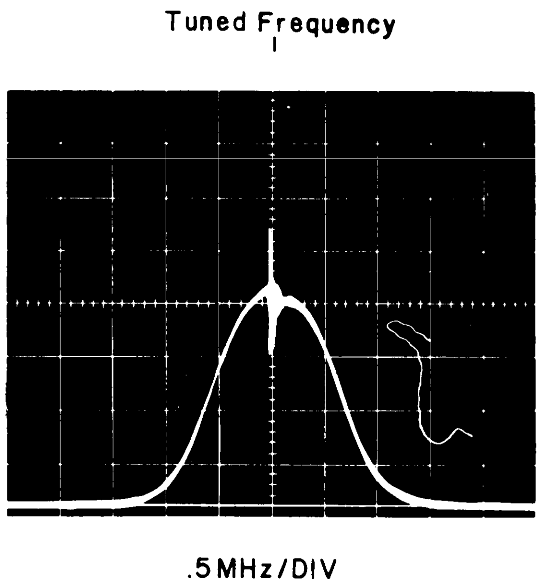


Figure 4-13. Typical Response, 4.5-12 MHz RF Preselector

4.7.1.5.2 High Band RF Preselector

(1) Connect power for high band operation (Figure 4-3) and connect the test equipment as illustrated in Figure 4-14.

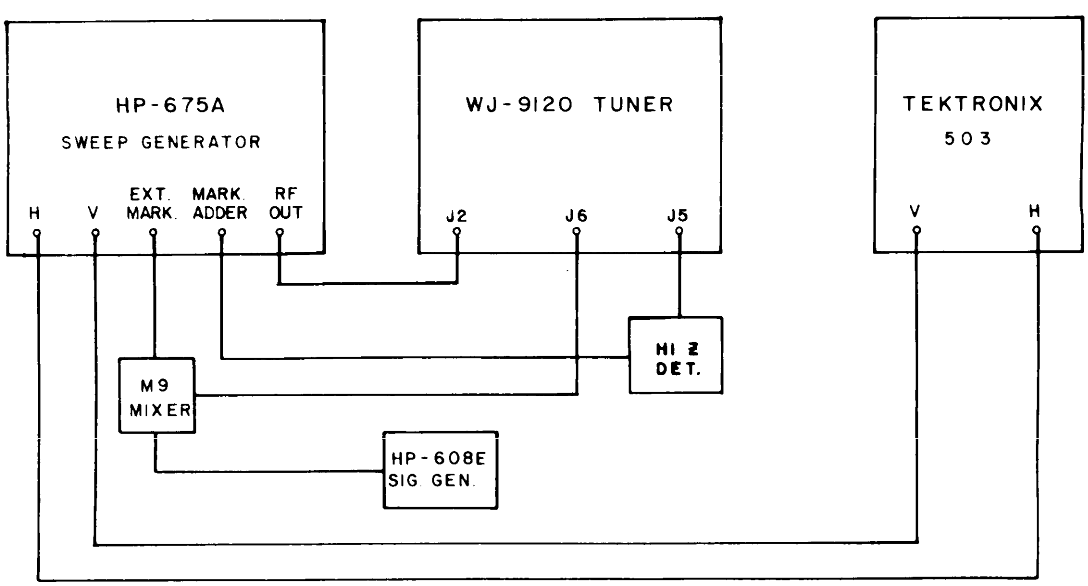


Figure 4-14. Equipment Connections, 12-30 MHz Preselector

(2) Connect the DVM to board terminal 5 of the 12-30 MHz RF Preselector (A5) and adjust the tuning shaft for +0.75 Vdc at this point.

(3) Set the HP-675A Sweep Generator to sweep 10 MHz about a 12 MHz center frequency at an output level of-15 dBm. Adjust the HP-608E Signal Generator to 10 MHz and adjust the output level to produce a visible marker.

(4) Adjust A5L1, A5L4, A5L5 and A5L7 for maximum response.

(5) Readjust the tuning shaft for +6.5 Vdc at terminal 5. Reset the sweep generator center frequency to 30 MHz.

(6) Adjust A5C1, A5C4, A5C10 and A5C13 for maximum response.

(7) Repeat steps (3) through (6) until interaction between adjustments is minimized. Figure 4-15 illustrates a typical response for the 12-30 MHz RF Preselector.

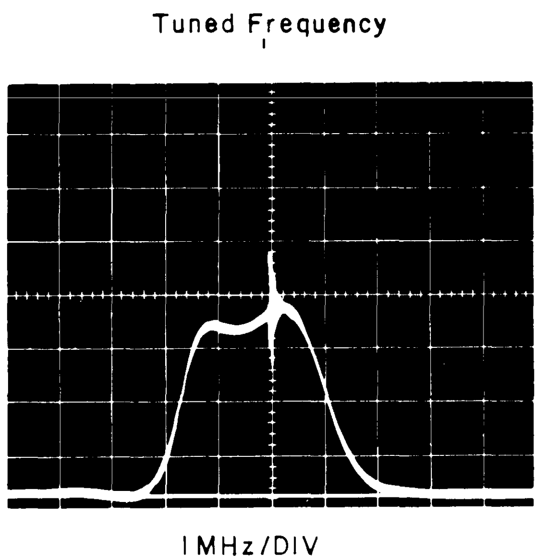


Figure 4-15. Typical Response, 12-30 MHz RF Preselector

4.7.1.6 Preselector to LO Tracking

(1) Connect power for low band operation and connect the test equipment as illustrated in Figure 4-10,

(2) Set the sweep generator to sweep 2 MHz about a center frequency of .5 MHz and adjust the tuning fo an LO frequency of 21.9 MHz at J6 (.5 MHz tuned frequency).

(3) Slowly tune the sweep generator and the WJ-9120 tuning shaft upward in frequency while observing the tracking marker on the response curve. The marker should remain within the preselector 2 dB bandwidth throughout range of the preselector.

(4) Adjust the shaper gain potentiometer (A1R26) to correct tracking at the low end of the Preselector's frequency range and adjust the shaper offset potentiometer (A1R23) to correct tracking at the high end.

(5) Repeat steps (2) through (4) until tracking within the preselector's 2 dB bandwidth is attained throughout the range of the preselector.

(6) Set the sweep generator to sweep 2 MHz about a 1.5 MHz center frequency and adjust the tuner knob for an LO frequency of 22.9 MHz at J6.

(7) Repeat steps (3) through (5), adjusting shaper gain potentiometer (A1R35) and shaper offset potentiometer (A1R32).

(8) Set the sweep generator to sweep 5 MHz about a center frequency of 4.5 MHz and adjust the tuning shaft for an LO frequency of 25.9 MHz at J6.

(9) Repeat steps (3) through (5), adjusting shaper gain potentiometer (A1R44) and shaper offset potentiometer (A1R42).

(l0) Connect power for high band operation (Figure 4-3) and connect the test equipment as illustrated in Figure 4-14.

(11) Set the sweep generator to sweep 10 MHz about a center frequency of 12 MHz and adjust the tuning shaft for an LO frequency of 22 MHz at J4.

(12) Repeat steps (3) through (5), adjusting shaper gain potentiometer (A1R55) and shaper offset potentiometer (A1R52).

4.7.1.7 Overall Gain Adjustment

(1) Connect power for low band operation (Figure 4-2) and connect the test equipment as illustrated in Figure 4-16.

(2) Set the sweep generator to sweep 2 MHz about a center frequency of 1 MHz and rotate the tuning shaft to center the response curve on the oscilloscope.

(3) Set the gain reference by connecting the detector to the sweep generator RF output and increase the output to 0 dBm (the trace amplitude is the +17 dB reference). Increase the output level +6 dBm (the trace amplitude at this output level is the +23 dB reference).

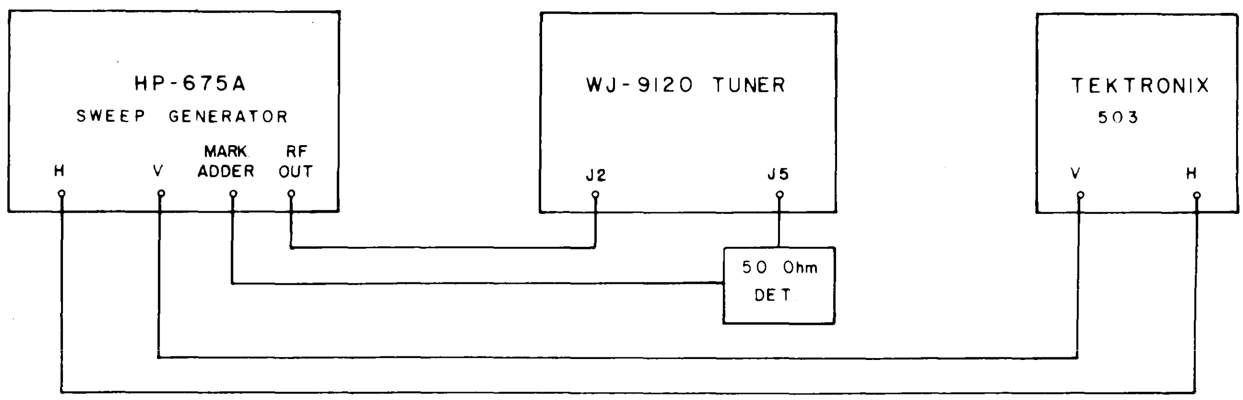


Figure 4-16. Equipment Connection, Overall Gain Adjustment (Low Band)

(4) Decrease the sweep generator RF output to -17 dBm and reconnect the 50 ohm detector to J5 and the generator RF output to J2.

(5) Adjust A2R13 on the .5-1.5MHz RF Preselector, for an overall gain of 17 to 23 dB.

(6) Set the sweep generator to sweep 2 MHz about a 3 MHz center frequency at a -17 dBm output level. Rotate the tuning shaft to center the response curve on the oscilloscope.

(7) Adjust A3R13 on the 1.5-4.5 MHz RF Preselector for an overall gain of 17 to 23 dB.

(8) Set the sweep generator to sweep 5 MHz about a center frequency of 8 MHz and rotate the tuning shaft to center the response curve on the oscilloscope.

(9) Adjust A4R13, on the 4.5-12 MHz RF Preselector, for an overall gain of 17 to 23 dB.

(10) Connect power for high band operation (Figure 4-3) and connect the test equipment as illustrated in Figure 4-17.

(11) Set the sweep generator to sweep 10 MHz about a 20 MHz center frequency at a -17 dBm level. Rotate the tuning shaft to center the response on the oscilloscope.

(12) Adjust A5R13 on the 12-30 MHz RF Preselector for an overall gain of 17 to 23 dB.

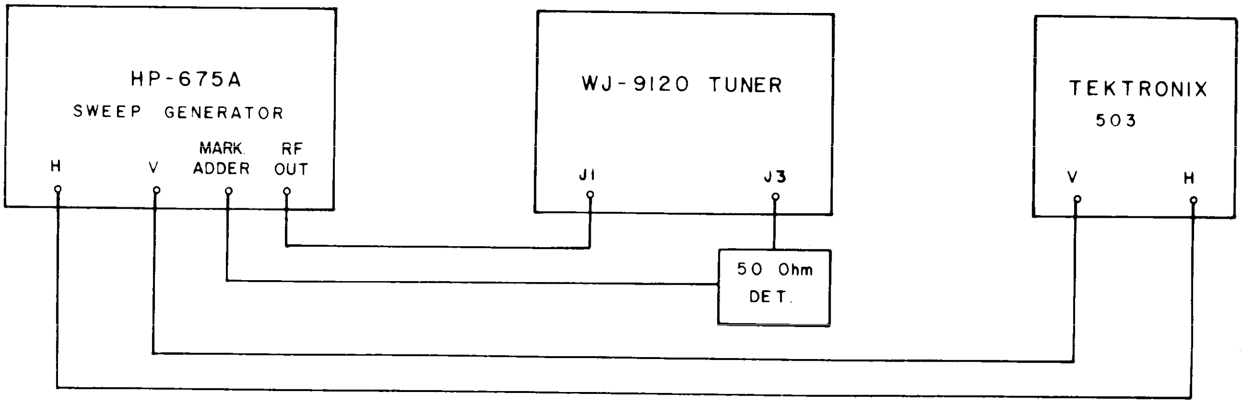


Figure 4-17. Equipment Connection, Overall Gain Adjustment (Highland)

4.7.1.8 10 MHz Trap Adjustment

(1) Connect power for high band operation (Figure 4-3) and connect the test equipment as illustrated in Figure 4-18.

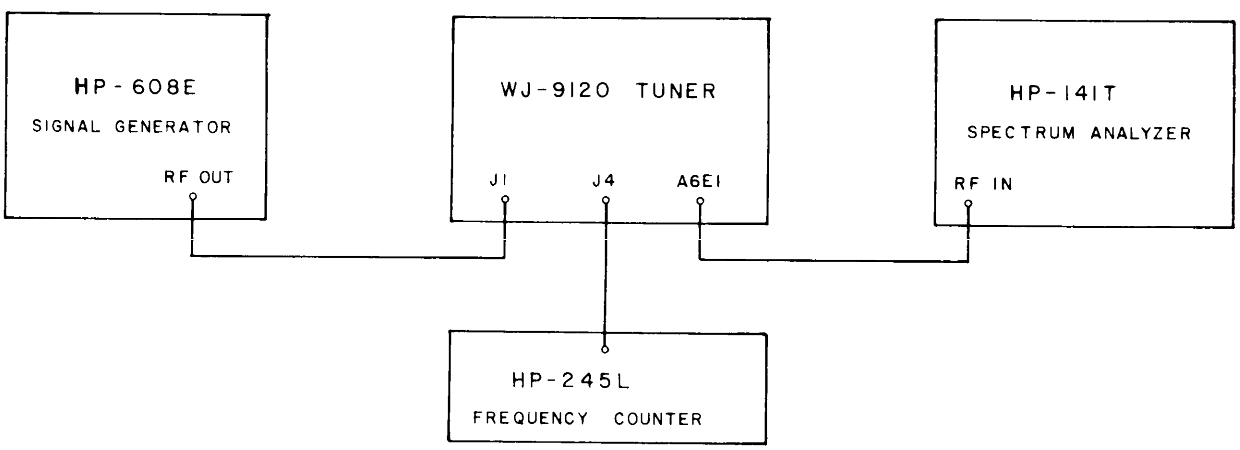


Figure 4-18. Equipment Connection, 10 MHz Trap Adjustment

(2) Set the HP-608E Signal Generator to 10 MHz at a -15 dBm output level. Rotate the tuning shaft for an LO frequency of 22 MHz at J4 (12 MHz tuned frequency).

(3) Adjust the HP-141T Spectrum Analyzer to display the 10 MHz signal.

(4) Adjust L1 and C10, on the WJ-9120 Chassis, for maximum attenuation of the 10 MHz signal.

(5) Apply Q-dope to the turns of L1 to prevent movement after adjustment is completed.

4.8 SUBASSEMBLY REMOVAL, REPAIR AND REPLACEMENT

4.8.1 Most of the circuitry of the WJ-9120 Tuner is mounted on plug-in printed circuit boards. Removal of a printed circuit board consists of simply unplugging the board from its associated connector socket. Once removed the board can be replaced with a known operating board or repairs can be performed observing the usual precautions regarding temperature on semiconductors and printed circuit patterns on the circuit boards.

4.8.2 Removal of the Tuning Drive Assembly (A9), Local Oscillators (A7) and the +10.5V Voltage Ref. (A8) is accomplished by first removing the two spacer bars mounted between the Tuning Drive Assembly and the main chassis of the Tuner (refer to Figures 5-3 and 5-4 for the top and bottom views of the Tuner). Next, remove the three screws on each side panel that mount the Tuning Drive Assembly to the chassis. Once the mounting screws are removed, the assemblies can be accessed by sliding the A9 assembly forward slightly and tilting toward the bottom of the tuner to clear the chassis.

Table 4-2. Typical Semiconductor Voltages

REF DESIG	IC Pin Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14
*A1U1	-11.01	+11.40	+ 8.70	- 15.00	+8.60	+11.35	-11.00	+15.00						
*A1U2	+ 11.90	+ 8.60	+ 8.65	- 15.00	+ 8.00	+ 8.06	+ 5.50	+15.00						
*A1U3	+ .80	+ 7.09	- 7.06	- 15.00	+4.60	+ 4.60	- 2.71	+15.00						
**A1U4	+ .46	+ .61	+ .61	+ .15	0	0	0	0						
A8U1	-	10.60	10.50	7.41	7.14	7.41	0	-	-	10.60	+15.00	+15.00	-	-

	Transistor Elements E	B	C	Field Effect Transistor Elements 1	2	3	4
*A2Q1				15.0	4.07	.90	1.32
*A3Q1				15.0	4.04	.98	1.19
*A4Q1				15.1	4.10	.99	1.19
**A5Q1				15.5	4.20	.58	.72
**A6Q1	- 5.44	- 4.68	- 1.66				
**A6Q2	- .69	0	14.53				
*A6Q3	- 5.04	- 4.29	- 1.71				
*A6Q4	- .69	0	14.22				
*A7Q1	4.13	4.82	14.56				
*A7Q2	-10.85	-10.16	- .50				
**A7Q3	4.05	4.76	14.56				
**A7Q4	-10.91	-10.20	- .51				

* Low Band 1.5 MHz Tuned Frequency

** High Band 13 MHz Tuned Frequency

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:

Subassembly Designation Al	R1 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 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
00141	Pic Design Corp P. O. Box 335 Benrus Center Ridgefield, CT 06877
04713	Motorola, Incorporated Semiconductor Products Division 5005 East McDowell Road Phoenix, AZ 80058
07263	Fairchild Camera & Instr. Corp. Semiconductor Division 464 Ellis Street Mountain View, CA 94040
14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, MD 20878
15542	Mini-Circuits Laboratory Div. of Scientific Comp. Corp. 2913 Quentin Road Brooklyn, NY 11229
18324	Signetics Corporation 811 East Arques Avenue Sunnyvale, CA 94086
25088	Siemens America, Inc. 186 Wood Avenue S. Iselin, NJ 08830
25120	Piezo Technology, Inc. P. O. Box 7877 2400 Diversified Way Orlando, FL 32804

Mfr. Code	Name and Address'
27956	Relcom 3333 Hillview Avenue Palo Alto, CA 94304
33095	Spectrum Control, Inc. 152 E. Main Street Fairview, PA 16415
46384	Penn Engineering & Mfg. Corp. Old Easton Highway Doylestown, PA 18901
52673	KSW Electronic Corporation South Bedford Street Burlington, ME 01803
56289	Sprague Electric Co. Marshall Street North Adams, MA 01247
56878	Standard Pressed Steel Company Box 608 Benson East Jenkintown, PA 19046
71279	Cambridge Thermionic Corp. 445 Concord Avenue Cambridge, MA 02138
71785	TRW Electronic Components Cinch Connector Operations 1501 Morse Avenue Elk Grove Village, IL 60007
72982	Erie Tech. Products, Inc. 644 West 12th Street Erie, PA 16512
73138	Beckman Instr., Inc. Helipot Division 2500 Harbor Blvd. Fullerton, CA 92634

Mfr. Code	Name and Address
78189	Illinois Tool Works, Inc. Shakeproof Division St. Charles Road Elgin, IL 60120
80058	Joint Electronic Designation System
80131	Electronic Industries Association 2001 Eye Street, N.W. Washington, D.C. 20006
81312	Winchester Electronics Div. Litton Industries, Inc. Main Street & Hillside Avenue Oakville, CT 06779
81349	Military Specifications
83086	New Hampshire Ball Bearings, Inc. Route 202 Petterborough, NH 03458
91293	Johanson Mfg. Company P. O. Box 329 Boonton, NJ 07005
91418	Radio Materials Company 4242 West Bryn Mawr Avenue Chicago, IL 60646
96906	Military Standards Promulgated by Military Departments Under Authority of Defense Standardi- zation Manua14120 3-M
99800	American Precision Industries Delevan Electronics Division 270 Quaker Road East Aurora, NY 14052

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 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 paratraph 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 semi-conductors 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 list and schematic diagrams of this manual. However, the semi-conductors designated in the manual may be substituted in every case with satisfactory results.

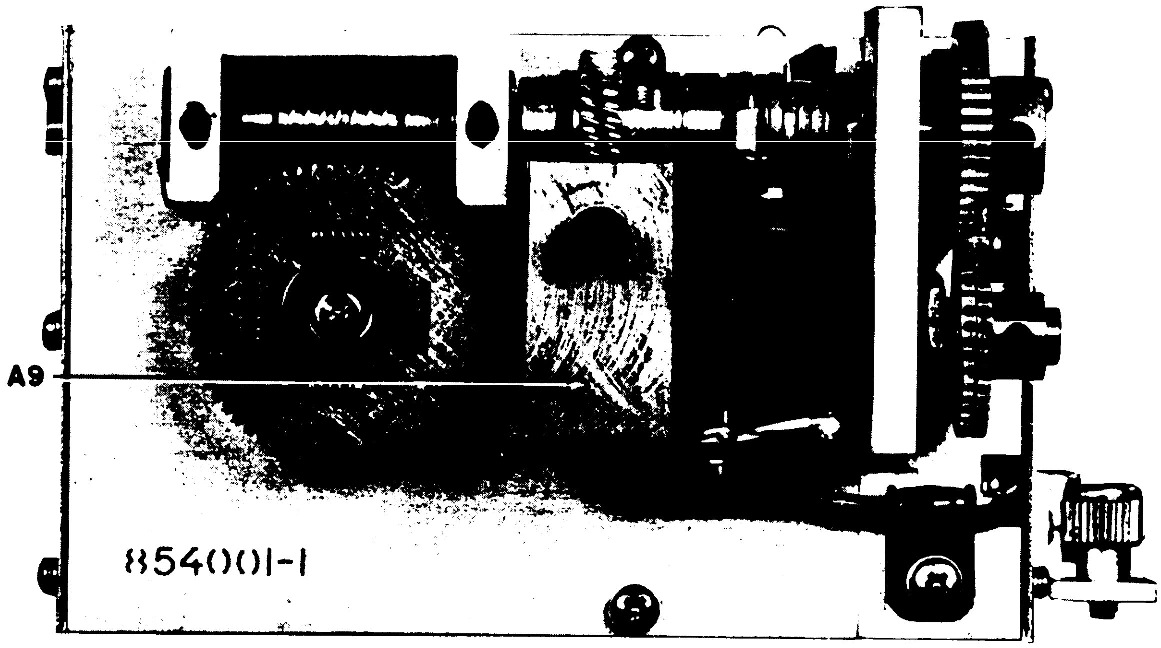


Figure 5-1. Type WJ-9120 0.5-30 MHz Tuner Assembly, Front View, Location of Components

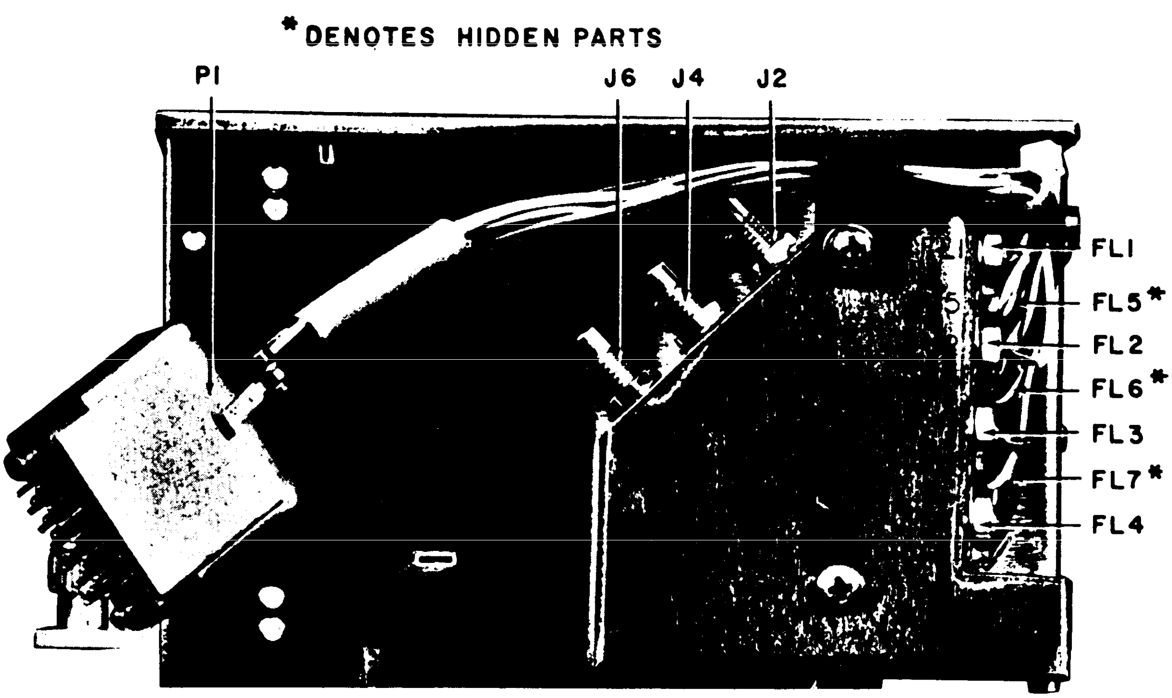


Figure 5-2. Type WJ-9120 0.5-30 MHz Tuner Assembly, Rear View, Location of Components

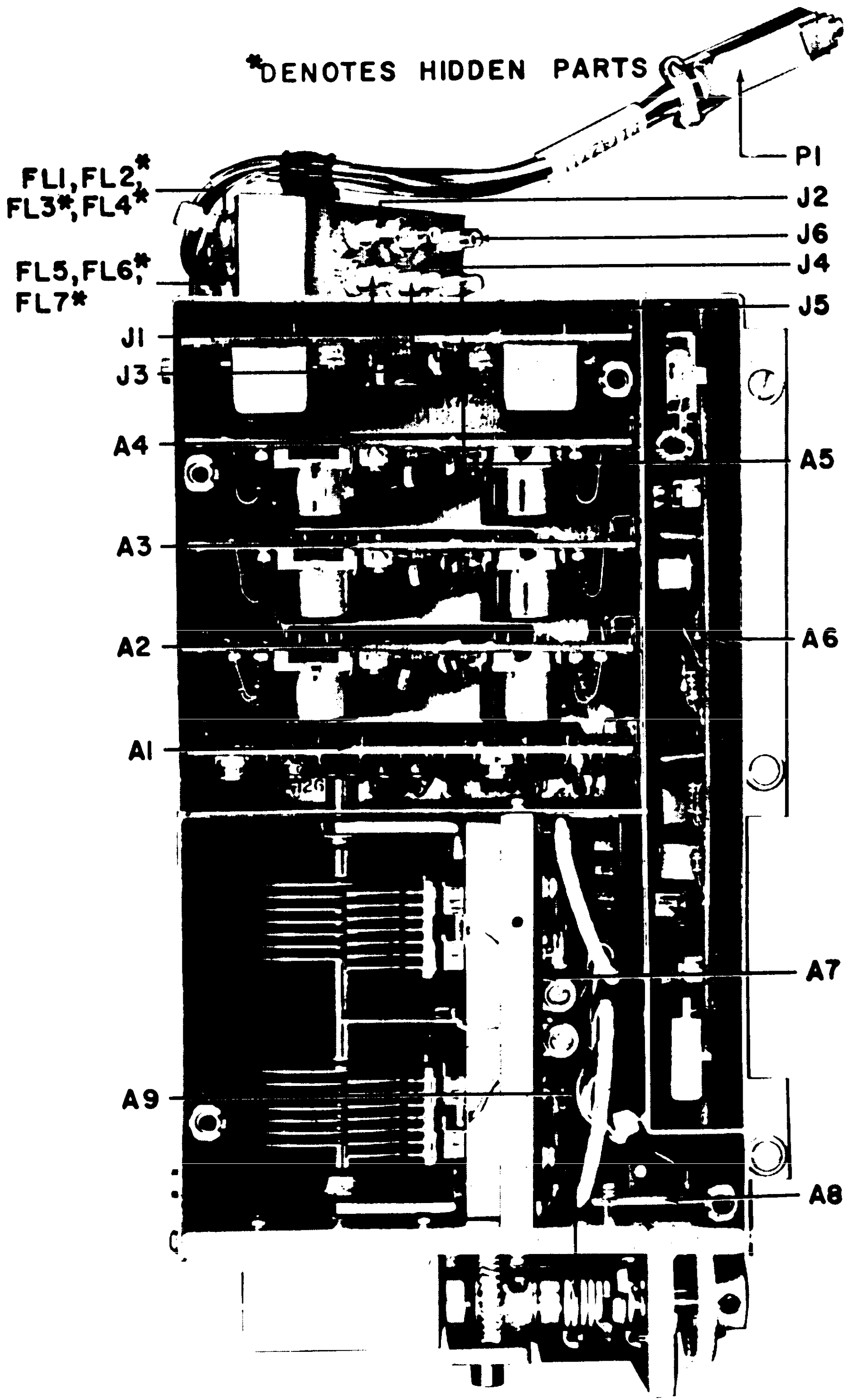


Figure 5-3. Type WJ-9120 0.5-30 MHz Tuner Assembly, Top View, Location of Components

5.5 TYPE WJ-9120 0.5-30 MHz TUNER ASSEMBLY. MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
A1	Auto Band Select and Tuning Voltage Shapers	1	794126-1	14632	
A2	RF Preselector 0.5 - 1.5 MHz	1	714007-1	14632	
A3	RF Preselector 1.5 - 4.5 MHz	1	714007-2	14632	
A4	RF Preselector 4.5 - 12 MHz	1	714007-3	14632	
A5	RF Preselector 12 - 30 MHz	1	714010-1	14632	
A6	IF Amplifiers	1	724010-1	14632	
A7	Local Oscillators	1	270447-1	14632	
A8	10.5 V Voltage Reference Assembly	1	270448-1	14632	
A9	Tuning Drive Assembly	1	854001-1	14632	
C1	Capacitor, Ceramic, Feedthru: .05 µF 300 V	11	54-785-002-503P	33095	
C2 Thru C9	Same as C1				
C10	Capacitor, Variable, Air: 0.8-10 pF, 250 V	1	5202	91293	
C11	Capacitor, Mica, Dipped: 68 pF, 5%, 500 V	1	CM04ED680G03	81349	
C12	Same as C1				
C13	Same as C1				
C14	Capacitor, Modified	6	33728-11	14632	
C15 Thru C19	Same as C14				
E1	Connector, Terminal	2	144/188	19505	
E2	Same as E1				
FL1	Filter, LP	7	9051-100-0000	72982	
FL2 Thru FL7	Same as FL1				
J1	Connector, Plug	6	UG1468/U	80058	
J2 Thru J6	Same as J1				
L1	Coil, Fixed	1	20681-83	14632	
P1	Connector, Plug: Multipin	1	SRE20PNSSH13	81312	
XA1	Connector, P.C. Board	1	251-15-30-160	71785	
XA2	Connector, P.C. Board	4	251-10-30-160	71785	
XA3 Thru XA5	Same as XA2				
XA6	Connector, P.C. Board	1	251-22-30-160	71785	

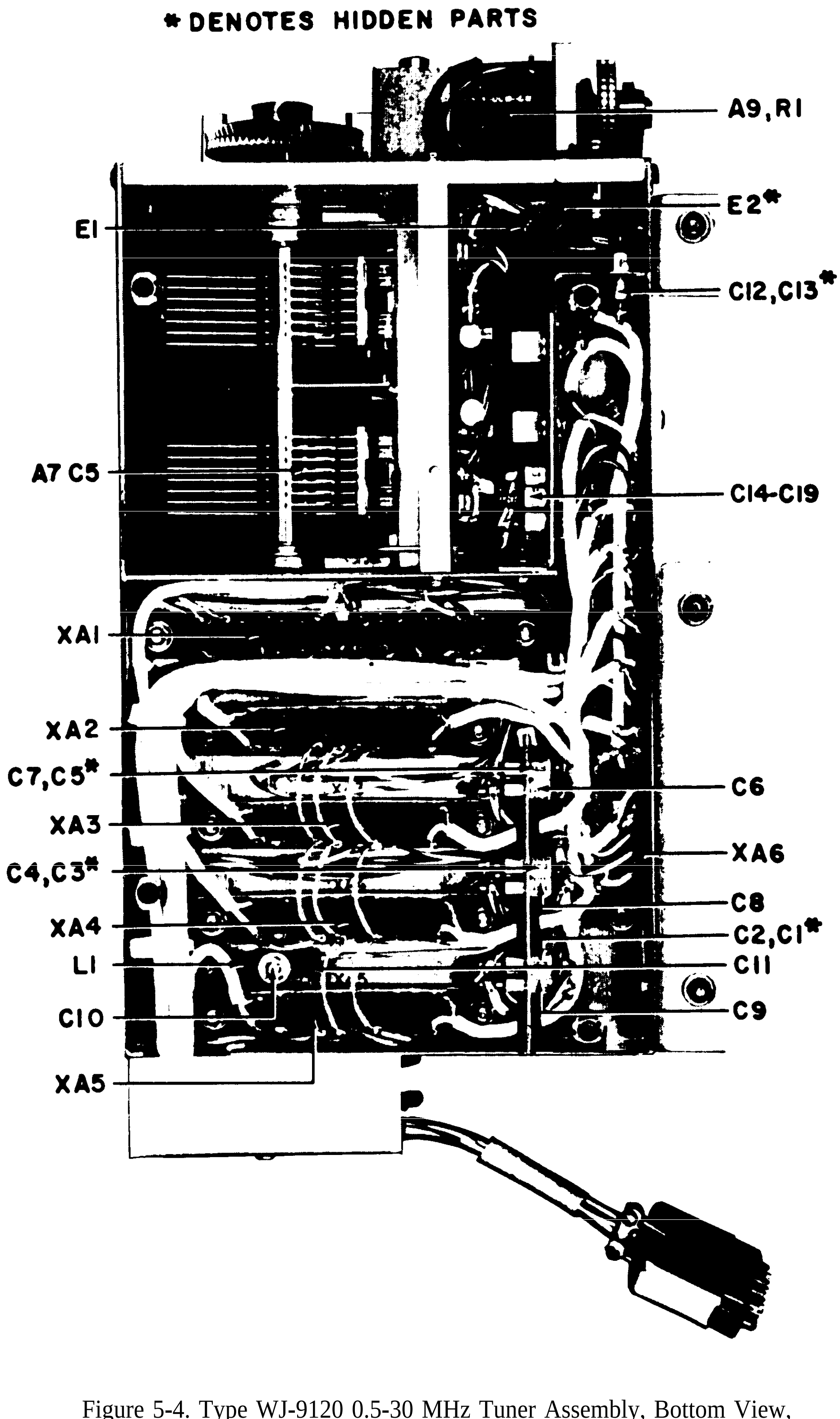
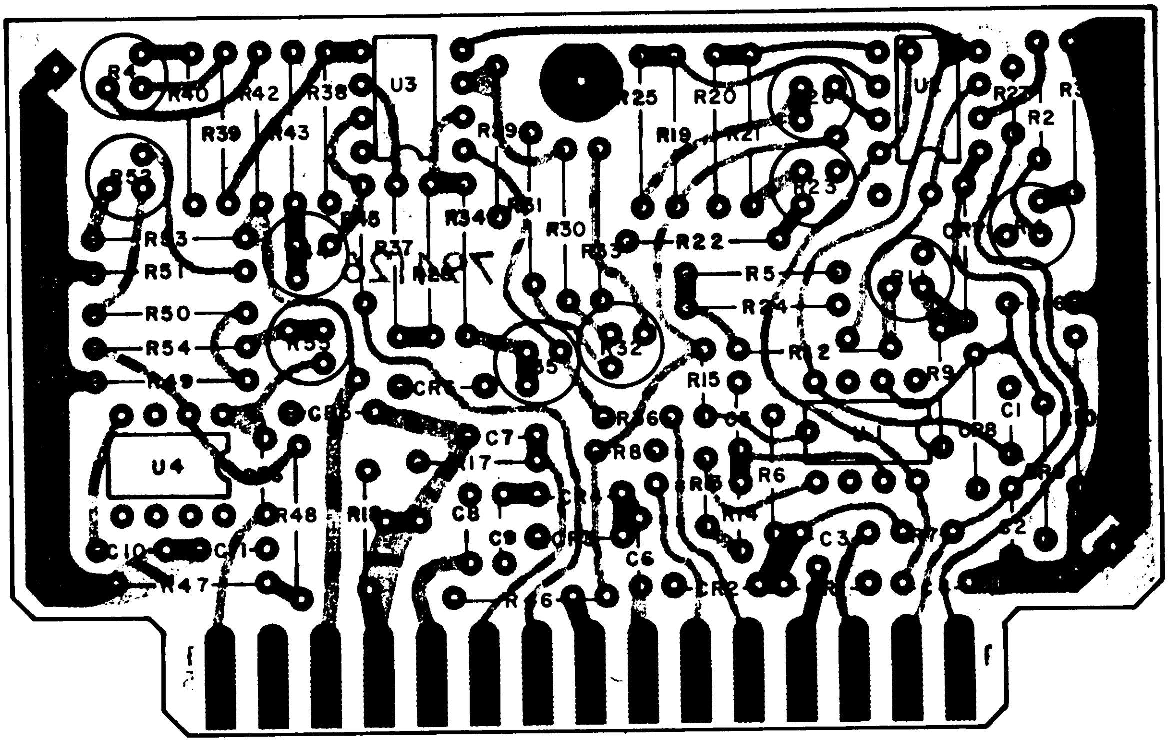


Figure 5-4. Type WJ-9120 0.5-30 MHz Tuner Assembly, Bottom View, Location of Components

5.5:1 TYPE 794126-1 AUTO BAND SELECT AND TUNING VOLTAGE SHAPERS REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 100 V	9	8131M100-651-104M	72982	
C2	Same as C1				
C3	Capacitor, Ceramic, Disc: 0.47 µF, 20%, 100 V	2	8131M100-651-474M	72982	
C4 Thru C8	Same as C1				
C9	Same as C3				
C10	Same as C1				
C11	Same as C1				
CR1	Diode	6	MPN3401	04713	
CR2 Thru CR6	Same as CR1				
CR7	Diode	3	1N4446	80131	
CR8	Same as CR7				
CR9	Same as CR7				
JW1	Jumper Wire: #26 stranded	1			
R1	Resistor, Fixed, Composition: 56 kΩ, 5%, 1/8 W	10	RCR05G563JS	81349	
R2	Same as R1				
R3	Resistor, Fixed, Film: 82.5 kΩ, 1%, 1/10 W	1	RN55C8252F	81349	
R4	Resistor, Variable, Film: 10 kΩ, 10%, 1/2 W	2	62PR10K	73138	
R5	Resistor, Fixed, Film: 15.0 kΩ, 1%, 1/10 W	1	RN55C1502F	81349	
R6	Resistor, Fixed, Composition: 6.8 MΩ, 5%, 1/8 W	2	RCR05G685JS	81349	
R7	Resistor, Fixed, Composition: 2 kΩ, 5%, 1/8 W	3	RCR05G202JS	81349	
R8	Same as R1				
R9	Same as R1				
R10	Resistor, Fixed, Film: 56.2 kΩ, 1%, 1/10 W	1	RN55C5622F	81349	
R11	Same as R4				
R12	Resistor, Fixed, Film: 33.2 kΩ, 1%, 1/10 W	1	RN55C3322F	81349	
R13	Same as R6				
R14	Same as R7				
R15	Same as R1				
R16	Same as R1				
R17	Same as R7				
R18	Resistor, Fixed, Composition: 1 kΩ, 5%, 1/8 W	5	RCR05G102JS	81349	
R19	Same as R1				
R20	Resistor, Fixed, Composition: 220 kΩ, 5%, 1/8 W	1	RCR05G224JS	81349	
R21	Same as R1				
R22	Resistor, Fixed, Composition: 12 kΩ, 5%, 1/8 W	1	RCR05G123JS	81349	
R23	Resistor, Variable, Film: 1 kΩ, 10%, 1/2 W	4	62PR1K	73138	
R24	Not Used				
R25	Resistor, Fixed, Composition: 120 kΩ, 5%, 1/8 W	2	RCR05G124JS	81349	



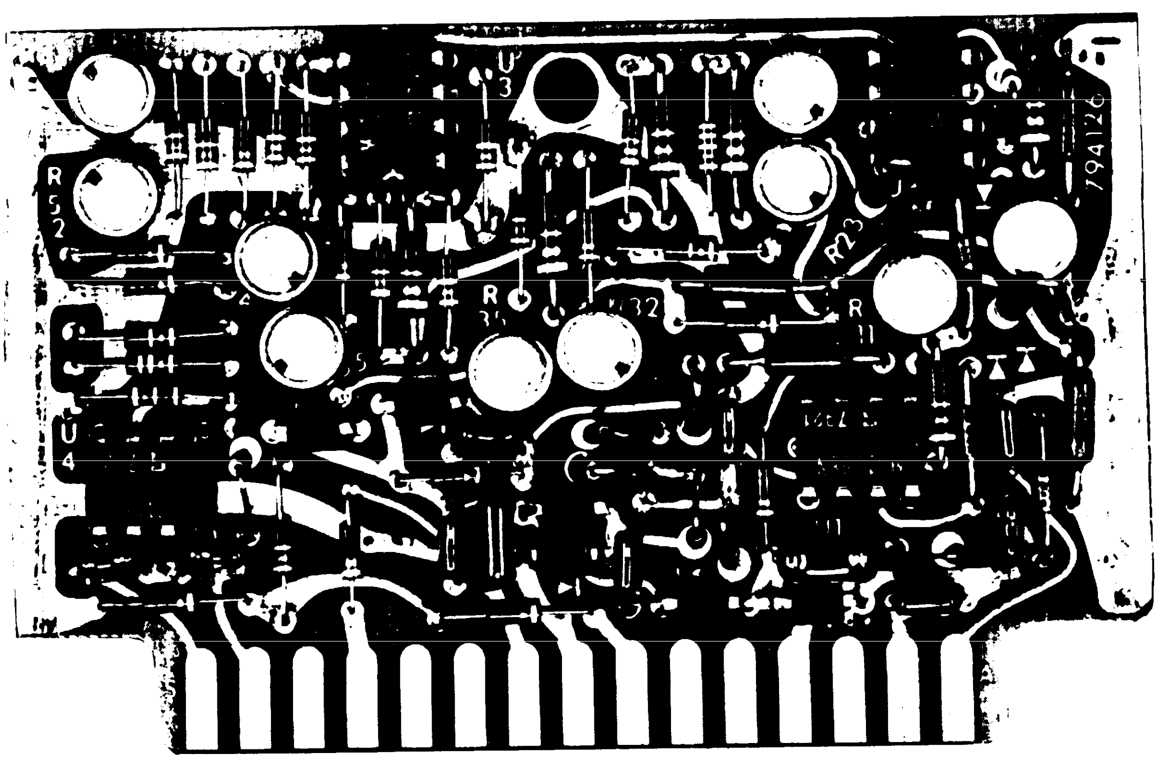


Figure 5-5. Type 794126-1 Auto Band Select and Tuning Voltage Shapers (Al),
Location of Components

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
R26	Resistor, Variable, Film: 200 kΩ, 10%, 1/2 W	1	62PR200K	73138	
R27	Same as R18				
R28	Same as R1				
R29	Resistor, Fixed, Composition: 270 kΩ, 5%, 1/8 W	1	RCR05G274JS	81349	
R30	Same as R1				
R31	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/8 W	2	RCR05G103JS	81349	
R32	Same as R23				
R33	Resistor, Fixed, Composition: 1.8 kΩ, 5%, 1/8 W	1	RCR05G182JS	81349	
R34	Resistor, Fixed, Composition: 150 kΩ, 5%, 1/8 W	1	RCR05G154JS	81349	
R35	Resistor, Variable, Film: 100 kΩ, 10%, 1/2 W	2	62PR100K	73138	
R36	Same as R18				
R37	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/8 W	2	RCR05G104JS	81349	
R38	Resistor, Fixed, Composition: 180 kΩ, 5%, 1/8 W	1	RCR05G184JS	81349	
R39	Same as R37				
R40	Same as R31				
R41	Same as R23				
R42	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/8 W	1	RCR05G472JS	81349	
R43	Same as R25				
R44	Same as R35				
R45	Same as R18				
R46	Resistor, Fixed, Composition: 2.7 kΩ, 5%, 1/8 W	2	RCR05G272JS	81349	
R47	Resistor, Fixed, Composition: 8.2 kΩ, 5%, 1/8 W	1	RCR07G822JS	81349	
R48	Resistor, Fixed, Composition: 560 kΩ, 5%, 1/8 W	3	RCR05G564JS	81349	
R49	Same as R48				
R50	Same as R48				
R51	Resistor, Fixed, Composition: 6.8 kΩ, 5%, 1/8 W	1	RCR05G682JS	81349	
R52	Same as R23				
R53	Same as R46				
R54	Resistor, Fixed, Composition: 240 kΩ, 5%, 1/8 W	1	RCR05G244JS	81349	
R55	Resistor, Variable, Film: 500 kΩ, 10%, 1/2 W	1	62PR500K	73138	
R56	Same as R18				
U1	Integrated Circuit	4	MC1558N	18324	
U2 Thru U4	Same as U1				

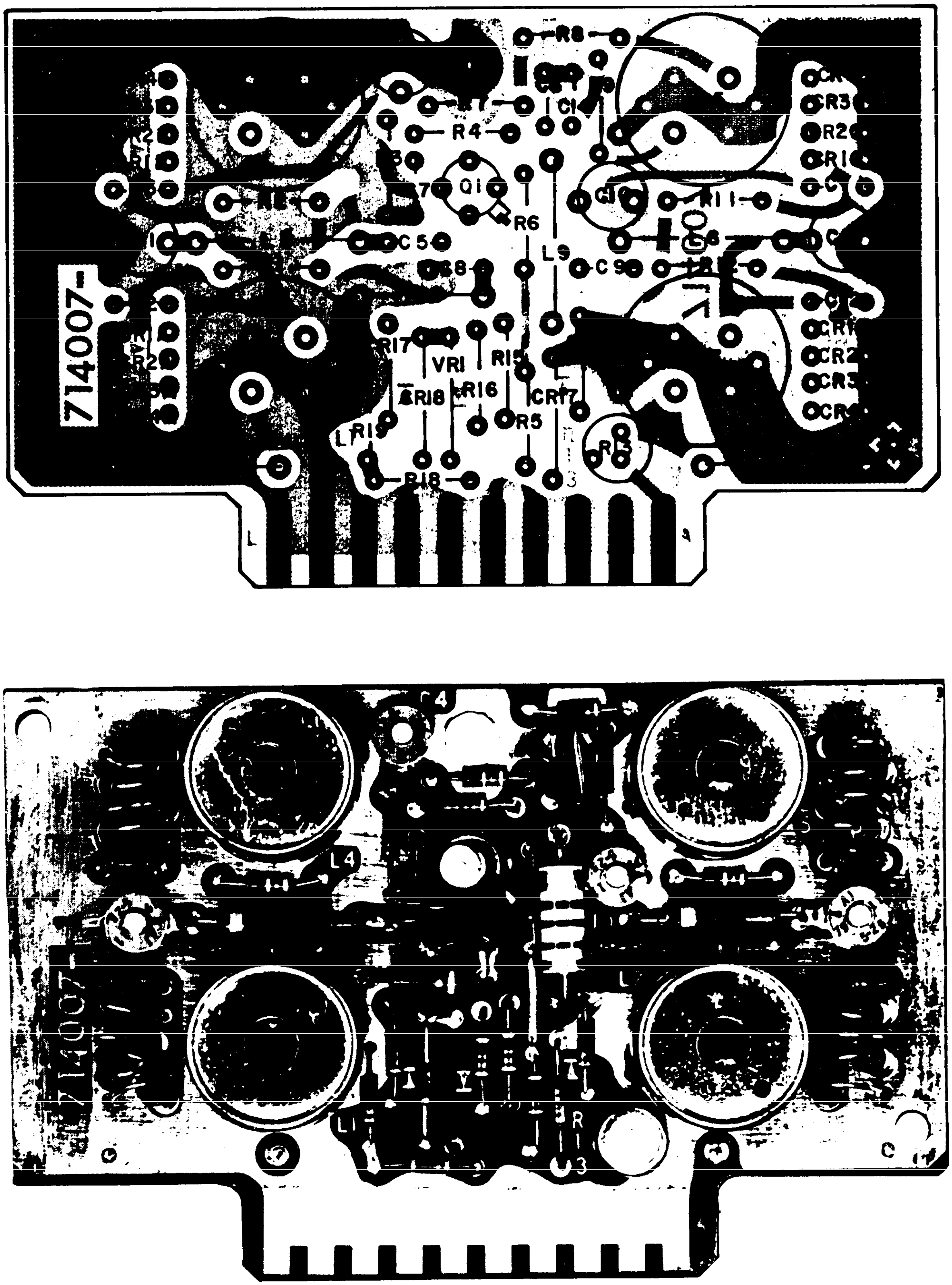


Figure 5-6. Type 714007-1, 2, & 3 RF Preselectors (A2, A3, A4), Location of Components

5.5.2 TYPE 714007-1 RF PRESELECTOR 0.5-1 .5 MHZ REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Variable, Ceramic: 5-25 pF, 100 V	4	518-000A5-25	72982	
C2	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 100 V	8	8131M100-651-104M	72982	
C3	Same as C2				
C4	Same as C1				
C5	Same as C2				
C6	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 200 V	2	8131A200-Z5U103M	72982	
C7	Same as C2				
C8	Same as C6				
C9	Same as C2				
C10	Same as C1				
C11	Same as C2				
C12	Same as C2				
C13	Same as C1				
C14	Same as C2				
CR1	Diode	4	841042	14632	
CR2 Thru CR4	Same as CR1				
CR5 Thru CR16	Not Used				
CR17	Diode	2	1N4446	80131	
CR18	Same as CR17				
L1	Coil, Variable	4	30312-277	14632	
L2	Not Used				
L3	Coil, Fixed: 180 µH	2	1537-88	99800	
L4	Same as L1				
L5	Same as L1				
L6	Same as L3				
L7	Same as L1				
L8	Not Used				
L9	Coil, Fixed: 100 µH	1	1537-76	99800	
Q1	Transistor	1	841001-2	14632	
R1	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/8 W	5	RCR05G104JS	81349	
R2	Same as R1				
R3	Resistor, Fixed, Composition: 2.2 kΩ, 5%, 1/8 W	2	RCR05G222JS	81349	
R4	Resistor, Fixed, Composition: 33 kΩ, 5%, 1/8 W	2	RCR05G333JS	81349	
R5	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/8 W	2	RCR05G472JS	81349	
R6	Same as R4				
R7	Same as R1				
R8	Resistor, Fixed, Composition: 100 Ω, 5%, 1/8 W	1	RCR05G101JS	81349	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
R9	Same as R3				
R10	Resistor, Fixed, Composition: 270 Ω, 5%, 1/4 W	1	RCR07G271JS	81349	
R11	Same as R1				
R12	Same as R1				
R13	Resistor, Variable, Film: 100 Ω, 10%, 1/2 W	1	62PR100	73138	
R14	Resistor, Fixed, Composition: 27 Ω, 5%, 1/8 W	1	RCR05G270JS	81349	
R15	Resistor, Fixed, Composition: 47 kΩ, 5%, 1/8 W	2	RCR05G473JS	81349	
R16	Same as R15				
R17	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/8 W	1	RCR05G103JS	81349	
R18	Same as R5				
R19*	Resistor, Fixed, Composition: 15 kΩ, 5%, 1/8 W	1	RCR05G153JS	81349	
VR1	Not Used				

* Nominal value, final value factory selected.

5.5.3 TYPE 714007-2 RF PRESELECTOR 1.5-4 .5 MHZ REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Variable, Ceramic: 5-25 pF, 100 V	4	518-000A5-25	72982	
C2	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 100 V	8	8131M100-651-104M	72982	
C3	Same as C2				
C4	Same as C1				
C5	Same as C2				
C6	Capacitor, Ceramic, Disc: 0.01 μF, 20%, 200 V	2	8131A200-Z5U103M	72982	
C7	Same as C2				
C8	Same as C6				
C9	Same as C2				
C10	Same as C1				
C11	Same as C2				
C12	Same as C2				
C13	Same as C1				
C14	Same as C2				
CR1	Diode	1	841042	14632	
CR2 Thru CR16	Not Used				
CR17	Diode	2	1N4446	80131	
CR18	Same as CR17				
L1	Coil, Variable	2	30312-278	14632	
L2	Coil, Fixed: 6.8 μH	2	1537-32	99800	
L3	Coil, Fixed: 120 μH	2	1537-80	99800	
L4	Coil, Variable	2	30312-279	14632	
L5	Same as L4				
L6	Same as L3				
L7	Same as L1				
L8	Same as L2				
L9	Coil, Fixed: 100 μH	1	1537-76	99800	
Q1	Transistor	1	841001-2	14632	
R1	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/8 W	5	RCR05G104JS	81349	
R2	Same as R1				
R3	Resistor, Fixed, Composition: 2.7 kΩ, 5%, 1/8 W	2	RCR05G272JS	81349	
R4	Resistor, Fixed, Composition: 39 kΩ, 5%, 1/8 W	1	RCR05G393JS	81349	
R5	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/8 W	1	RCR05G472JS	81349	
R6	Resistor, Fixed, Composition: 33 kΩ, 5%, 1/8 W	1	RCR05G333JS	81349	
R7	Same as R1				
R8	Resistor, Fixed, Composition: 100 Ω, 5%, 1/8 W	1	RCR05G101JS	81349	
R9	Same as R3				
R10	Resistor, Fixed, Composition: 270 Ω, 5%, 1/4 W	1	RCR07G271JS	81349	

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
R11	Same as R1				
R12	Same as R1				
R13	Resistor, Variable, Film: 100 Ω, 10%, 1/2 W	1	62PR100	73138	
R14	Resistor, Fixed, Composition: 27 Ω, 5%, 1/8 W	1	RCR05G270JS	81349	
R15	Resistor, Fixed, Composition: 47 kΩ, 5%, 1/8 W	1	RCR05G473JS	81349	
R16	Resistor, Fixed, Composition: 12 kΩ, 5%, 1/8 W	1	RCR05G123JS	81349	
R17	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/8 W	1	RCR05G103JS	81349	
R18	Resistor, Fixed, Composition: 1.5 kΩ, 5%, 1/8 W	1	RCR05G152JS	81349	
R19*	Same as R16				
VR1	Voltage Regulator: 6.2 V	1	1N753A	80131	

* Nominal value, final value factory selected.

5.5.4 TYPE 714007-3 RF PRESELECTOR 4.5-12 MHz REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Variable, Ceramic: 5-25 pF, 100 V	2	518-000A5-25	72982	
C2	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 100 V	8	8131M100-651-104M	72982	
C3	Same as C2				
C4	Capacitor, Variable, Ceramic: 2.5-9 pF, 25 V	2	518-000A2.5-9	72982	
C5	Same as C2				
C6	Capacitor, Ceramic, Disc: 0.01 μF, 20%, 200 V	2	8131A200-Z5U103M	72982	
C7	Same as C2				
C8	Same as C6				
C9	Same as C2				
C10	Same as C4				
C11	Same as C2				
C12	Same as C2				
C13	Same as C1				
C14	Same as C2				
CR1	Diode	1	841042	14632	
CR2 Thru CR16	Not Used				
CR17	Diode	2	1N4446	80131	
CR18	Same as CR17				
L1	Coil, Variable	2	30312-280	14632	
L2	Coil, Fixed: 1 μH	2	1537-12	99800	
L3	Coil, Fixed: 22 μH	1	1537-44	99800	
L4	Coil, Variable	2	30312-281	14632	
L5	Same as L4				
L6	Coil, Fixed: 24 μH	1	1537-46	99800	
L7	Same as L1				
L8	Same as L2				
L9	Coil, Fixed: 100 μH	1	1537-76	99800	
Q1	Transistor	1	841001-2	14632	
R1	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/8 W	5	RCR05G104JS	81349	
R2	Same as R1				
R3	Resistor, Fixed, Composition: 2.2 kΩ, 5%, 1/8 W	3	RCR05G222JS	81349	
R4	Resistor, Fixed, Composition: 33 kΩ, 5%, 1/8 W	2	RCR05G333JS	81349	
R5	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/8 W	1	RCR05G472JS	81349	
R6	Same as R4				
R7	Same as R1				
R8	Resistor, Fixed, Composition: 100 Ω, 5%, 1/8 W	1	RCR05G101JS	81349	
R9	Same as R3				
R10	Resistor, Fixed, Composition: 270 Ω, 5%, 1/4 W	1	RCR07G271JS	81349	
R11	Same as R1				
R12	Same as R1				

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
R13	Resistor, Variable, Film: 100 Ω, 10%, 1/2 W	1	62PR100	73138	
R14	Resistor, Fixed, Composition: 27 Ω, 5%, 1/8 W	1	RCR05G270JS	81349	
R15	Resistor, Fixed, Composition: 47 kΩ, 5%, 1/8 W	1	RCR05G473JS	81349	
R16	Resistor, Fixed, Composition: 12 kΩ, 5%, 1/8 W	1	RCR05G123JS	81349	
R17	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/8 W	1	RCR05G103JS	81349	
R18	Same as R3				
R19*	Resistor, Fixed, Composition: 8.2 kΩ, 5%, 1/8 W	1	RCR05G822JS	81349	
VR1	Not Used				

* Nominal value, final value factory selected.

5:5.5 TYPE 714010 RF PRESELECTOR 12-30 MHz

REF DESIG PREFIX A5

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Variable, Ceramic: 0.5-25 pF, 100 V	2	518-000A5-25	72982	
C2	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 100 V	8	8131M100-651-104M	72982	
C3	Same as C2				
C4	Capacitor, Variable, Ceramic: 2.5-9 pF, 100 V	2	518-000A2.5-9	72982	
C5	Same as C2				
C6	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 200 V	2	8131A200-Z5U103M	72982	
C7	Same as C2				
C8	Same as C6				
C9	Same as C2				
C10	Same as C4				
C11	Same as C2				
C12	Same as C2				
C13	Same as C1				
C14	Same as C2				
CR1	Diode	1	841041	14632	
CR2 Thru CR16	Not Used				
CR17	Diode	2	1N4446	80131	
CR18	Same as CR17				
L1	Coil, Variable	2	3476-38	14632	
L2	Coil, Fixed: 0.47 µH	2	1537-06	99800	
L3	Coil, Fixed: 3.9 µH	2	1537-26	99800	
L4	Coil, Variable	2	3476-39	14632	
L5	Same as L4				
L6	Same as L3				
L7	Same as L1				
L8	Same as L2				
L9	Coil, Fixed: 100 µH	1	1537-76	99800	
Q1	Transistor	1	841001-2	14632	
R1	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/8 W	5	RCR05G104JS	81349	
R2	Same as R1				
R3	Resistor, Fixed, Composition: 1.5 kΩ, 5%, 1/8 W	2	RCR05G152JS	81349	
R4	Resistor, Fixed, Composition: 39 kΩ, 5%, 1/8 W	1	RCR05G393JS	81349	
R5	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/8 W	1	RCR05G472JS	81349	
R6	Resistor, Fixed, Composition: 33 kΩ, 5%, 1/8 W	1	RCR05G333JS	81349	
R7	Same as R1				
R8	Resistor, Fixed, Composition: 100 Ω, 5%, 1/8 W	1	RCR05G101JS	81349	
R9	Resistor, Fixed, Composition: 1.2 kΩ, 5%, 1/8 W	1	RCR05G122JS	81349	

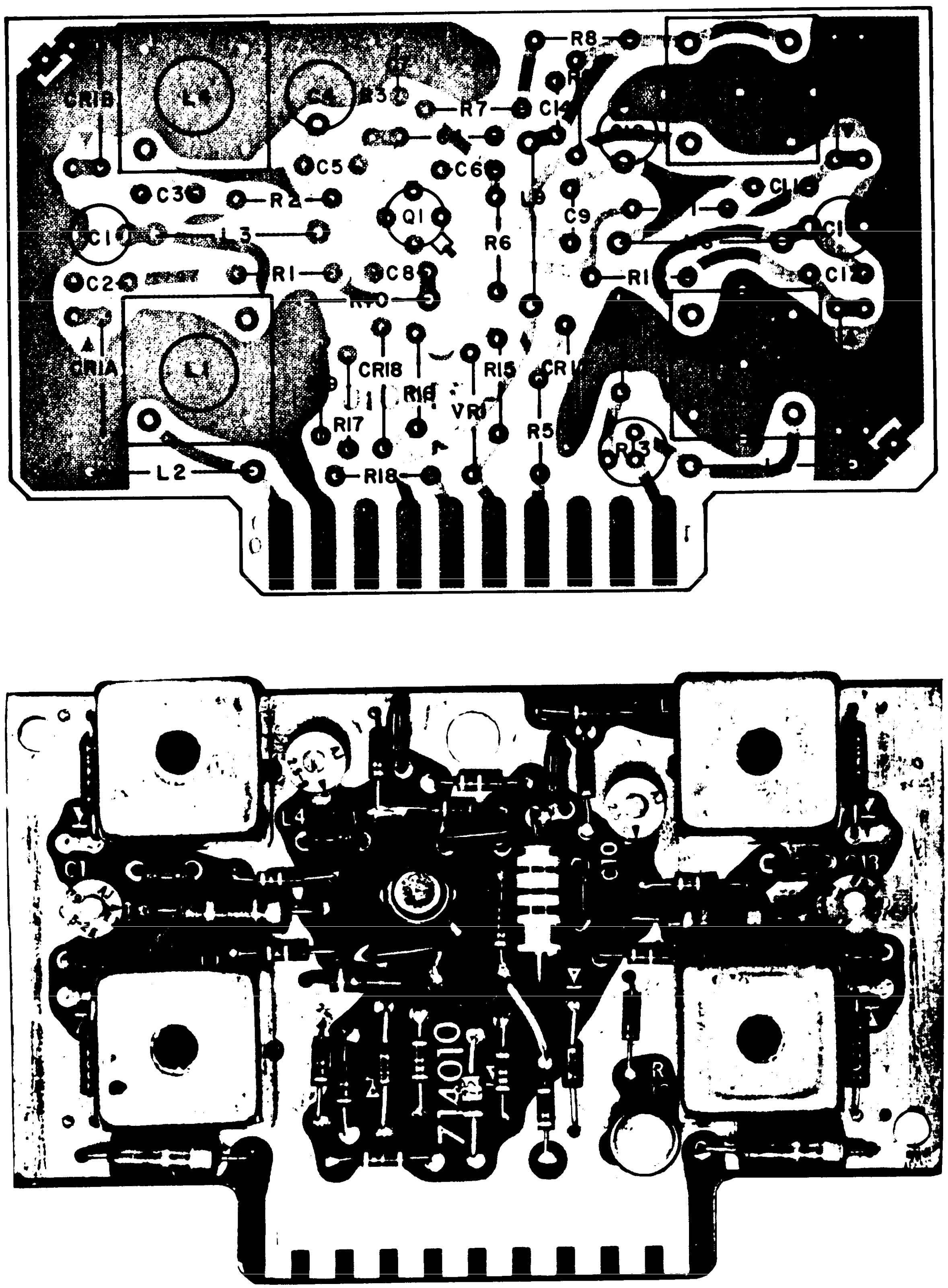
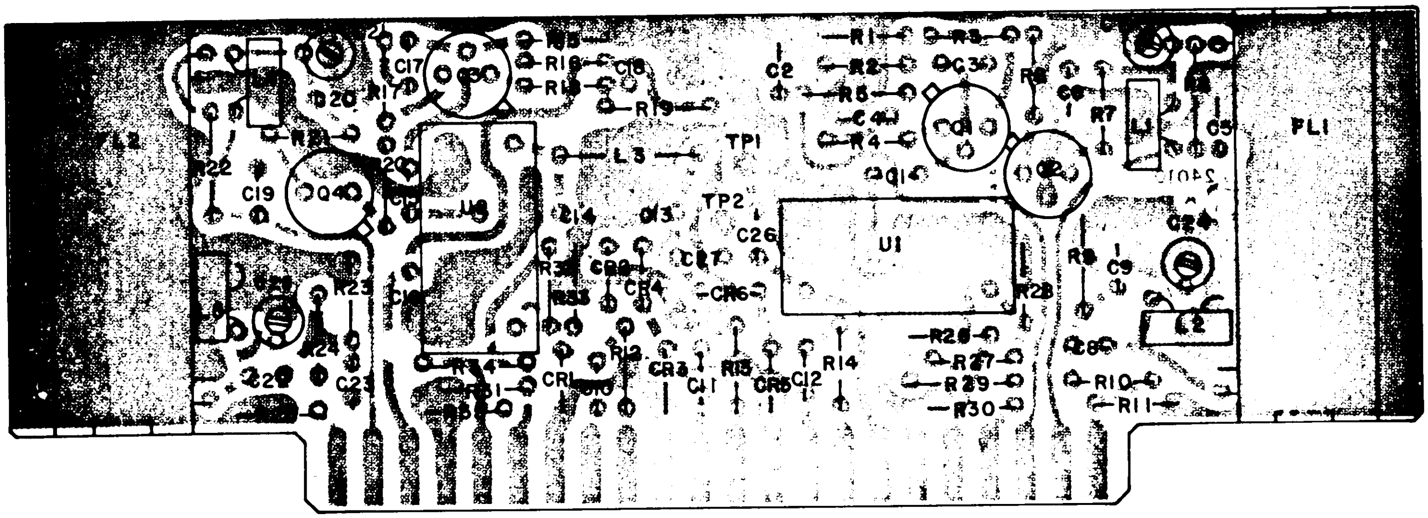


Figure 5-7. Type 714010-1 RF Preselector 12-30 MHz (A5),
Location of Components

REF DESIG PREFIX A5

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
R10	Resistor, Fixed, Composition: 130 Ω, 5%, 1/4 W	1	RCR07G131JS	81349	
R11	Same as R1				
R12	Same as R1				
R13	Resistor, Variable, Film: 100 Ω, 10%, 1/2 W	1	62PR100	73138	
R14	Resistor, Fixed, Composition: 39 Ω, 5%, 1/8 W	1	RCR05G390JS	81349	
R15	Resistor, Fixed, Composition: 47 kΩ, 5%, 1/8 W	3	RCR05G473JS	81349	
R16	Same as R15				
R17	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/8 W	2	RCR05G103JS	81349	
R18*	Same as R15				
R19	Same as R17				
VR1	Voltage Regulator: 5.1 V	1	1N751A	80131	

* Nominal value, final value factory selected.



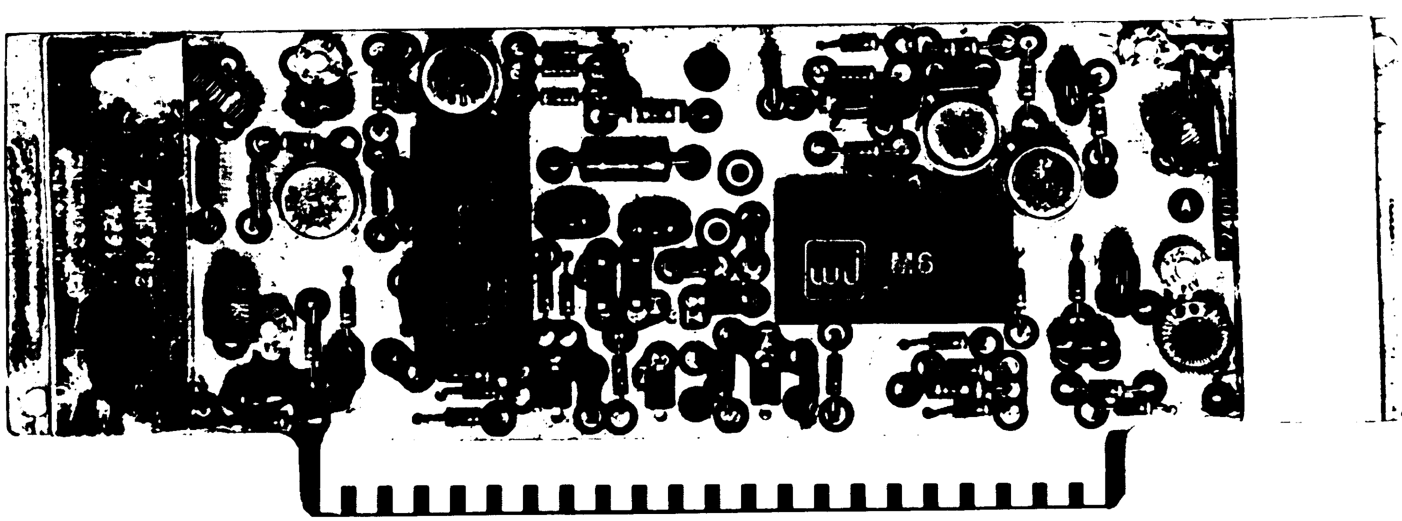


Figure 5-8. Type 724010-1 IF Amplifier,
Location of Components

5.5.6 TYPE 724010-1 IF AMPLIFIER REF DESIG PREFIX A6

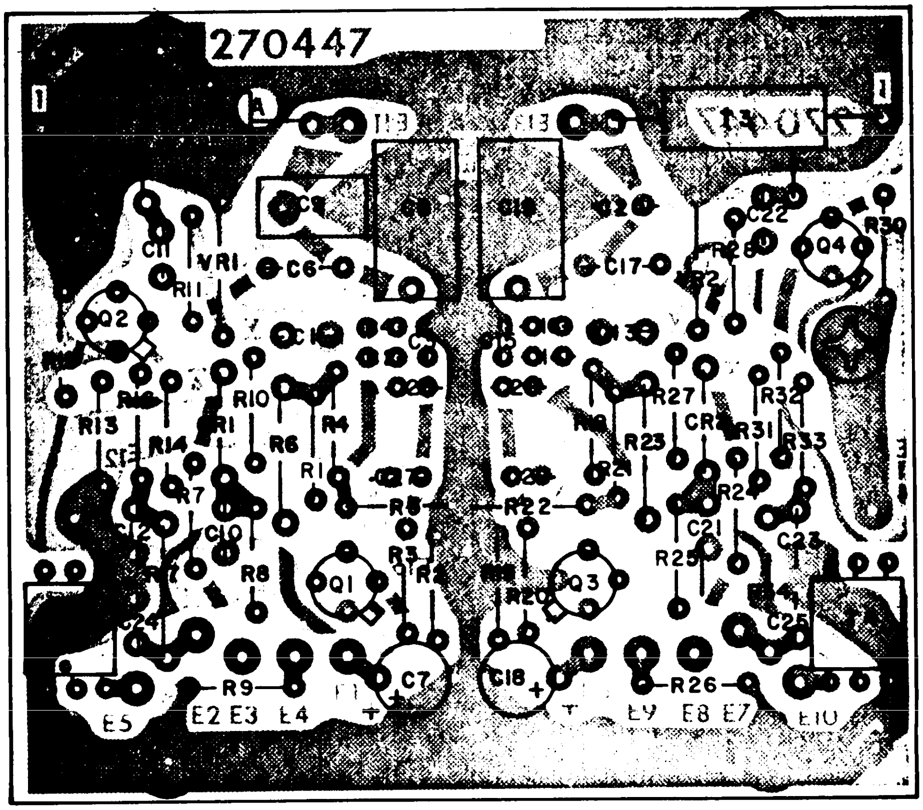
REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Ceramic, Disc: 0.01 μF, 20%, 200 V	10	8131A200-Z5U103M	72982	
C2 Thru C5	Same as C1				
C6	Capacitor, Mica, Dipped: 27 pF, 2%, 500 V	1	CM04ED270G03	81349	
C7	Capacitor, Variable, Ceramic: 5-25 pF, 100 V	4	518-000A5-25	72982	
C8	Capacitor, Mica, Dipped: 33 pF, 2%, 500 V	1	CM04ED330G03	81349	
C9	Capacitor, Mica, Dipped: 180 pF, 2%, 500 V	3	CM04FD181G03	81349	
C10	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 100 V	5	8131M100-651-104M	72982	
C11	Same as C10				
C12	Same as C10				
C13	Same as C9				
C14	Same as C9				
C15 Thru C19	Same as C1				
C20	Capacitor, Mica, Dipped: 18 pF, 5%, 500 V	1	CM04CD180J03	81349	
C21	Same as C7				
C22	Capacitor, Mica, Dipped: 22 pF, 5%, 500 V	1	CM04ED220J03	81349	
C23	Capacitor, Mica, Dipped: 56 pF, 2%, 500 V	1	CM04ED560G03	81349	
C24	Same as C7				
C25	Same as C7				
C26	Same as C10				
C27	Same as C10				
CR1	Diode	6	MPN3401	04713	
CR2 Thru CR6	Same as CR1				
E1	Terminal, Forked	2	140-1941-02-01	71279	
E2	Same as E1				
FL1	Filter, B.P.: 10 MHz CF, 30 kHz BW	1	1536	25120	
FL2	Filter, B.P.: 21.4 MHz CF, 30 kHz BW	1	1634	25120	
L1	Coil, Fixed	2	20681-206	14632	
L2	Same as L1				
L3	Coil, Fixed: 1 μH	1	1537-12	99800	
L4	Coil, Fixed	2	20681-207	14632	
L5	Same as L4				
Q1	Transistor	4	2N5109	80131	
Q2 Thru Q4	Same as Q1				
R1	Resistor, Fixed, Composition: 8.2 kΩ, 5%, 1/8 W	2	RCR05G822JS	81349	
R2	Resistor, Fixed, Composition: 33 kΩ, 5%, 1/8 W	2	RCR05G333JS	81349	

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
R3	Resistor, Fixed, Composition: 390 Ω, 5%, 1/8 W	2	RCR05G391JS	81349	
R4	Resistor, Fixed, Composition: 6.8 Ω, 5%, 1/8 W	1	RCR05G6R8JS	81349	
R5	Resistor, Fixed, Composition: 470 Ω, 5%, 1/4 W	4	RCR07G471JS	81349	
R6	Resistor, Fixed, Composition: 47 Ω, 5%, 1/8 W	4	RCR05G470JS	81349	
R7	Same as R6				
R8	Resistor, Fixed, Film: 6.19 kΩ, 1%, 1/10 W	1	RN55C6191F	81349	
R9	Resistor, Fixed, Composition: 100 Ω, 5%, 1/8 W	4	RCR05G101JS	81349	
R10	Resistor, Fixed, Composition: 68 Ω, 5%, 1/8 W	4	RCR05G680JS	81349	
R11	Same as R9				
R12	Resistor, Fixed, Composition: 2.2 kΩ, 5%, 1/8 W	3	RCR05G222JS	81349	
R13	Same as R12				
R14	Same as R12				
R15	Same as R1				
R16	Same as R2				
R17	Same as R3				
R18	Resistor, Fixed, Composition: 4.7 Ω, 5%, 1/8 W	1	RCR05G4R7JS	81349	
R19	Same as R5				
R20	Same as R6				
R21	Same as R6				
R22	Resistor, Fixed, Film: 3.16 kΩ, 1%, 1/10 W	1	RN55C3161F	81349	
R23	Same as R9				
R24	Same as R10				
R25	Same as R9				
R26	Resistor, Fixed, Composition: 300 Ω, 5%, 1/8 W	4	RCR05G301JS	81349	
R27	Resistor, Fixed, Composition: 18 Ω, 5%, 1/8 W	2	RCR05G180JS	81349	
R28	Same as R26				
R29	Same as R5				
R30	Resistor, Fixed, Composition: 51 Ω, 5%, 1/8 W	2	RCR05G510JS	81349	
R31	Same as R26				
R32	Same as R27				
R33	Same as R26				
R34	Same as R5				
R35	Same as R30				
U1	Mixer	2	M6	27956	
U2	Same as U1				

5.5.7 PART 270447-1 LOCAL OSCILLATORS REF DESIG PREFIX A7

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	10	SM(1000 pF, P)	91418	
C2	Capacitor, Ceramic, Disc: 33 pF, 5%, 100 V	4	8121-100C0G0-330J	72982	
C3	Same as C2				
C4	Capacitor, Ceramic, Mono: 68 pF, 5%, 100 V	4	8121-100C0G0-680J	72982	
C5	Capacitor, Variable, Air: 6-100 pF	1	MCD-100M/180 DEG	80583	
C6	Capacitor, Ceramic, Tubular: 2.4 pF, ±0.25 pF, 500 V	2	301-000C0J0-249C	72982	
C7	Capacitor, Electrolytic, Tantalum: 4.7 μF, 20%, 35 V	2	196D475X0035JE3	56289	
C8	Capacitor, Variable, Air: 0.8-10 pF, 250 V	2	5201/W HDW	91293	
C9*	Capacitor, Mica, Dipped: 27 pF, 2%, 500 V	1	CM04ED270G03	81349	
C10 Thru C13	Same as C1				
C14	Same as C2				
C15	Same as C2				
C16	Same as C4				
C17	Same as C6				
C18	Same as C7				
C19	Same as C8				
C20*	Capacitor, Ceramic, Mono: 3.3 pF, ±0.5 pF, 100 V	1	8101-100C0J0-339C	72982	
C21 Thru C25	Same as C1				
C26	Capacitor, Ceramic, Mono: 5.6 pF, ±0.5 pF, 100 V	4	8101-100C0H0-569D	72982	
C27 Thru C29	Same as C26				
CR1	Diode	2	BB109-YELLOW	25088	
CR2	Same as CR1				
E1	Terminal	12	140-1942-02-01	71279	
E2 Thru E10	Same as E1				
E11 Thru E14					
E15	Same as E1				
E16	Same as E1				
Q1	Transistor	2	2N3478	80131	
Q2	Transistor	2	2N2857	81350	
Q3	Same as Q1				
Q4	Same as Q2				
R1	Resistor, Fixed, Composition: 10Ω, 5%, 1/8 W	4	RCR05G100JS	81349	
R2	Resistor, Fixed, Composition: 1 kΩ, 5%, 1/8 W	2	RCR05G102JS	81349	
R3	Same as R1				



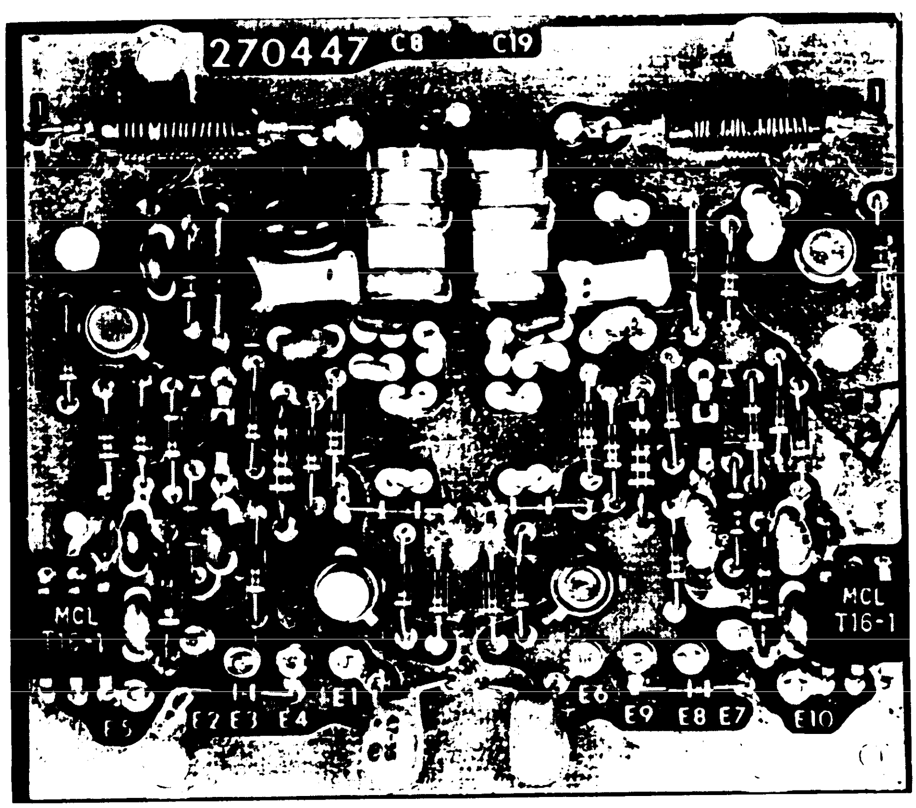
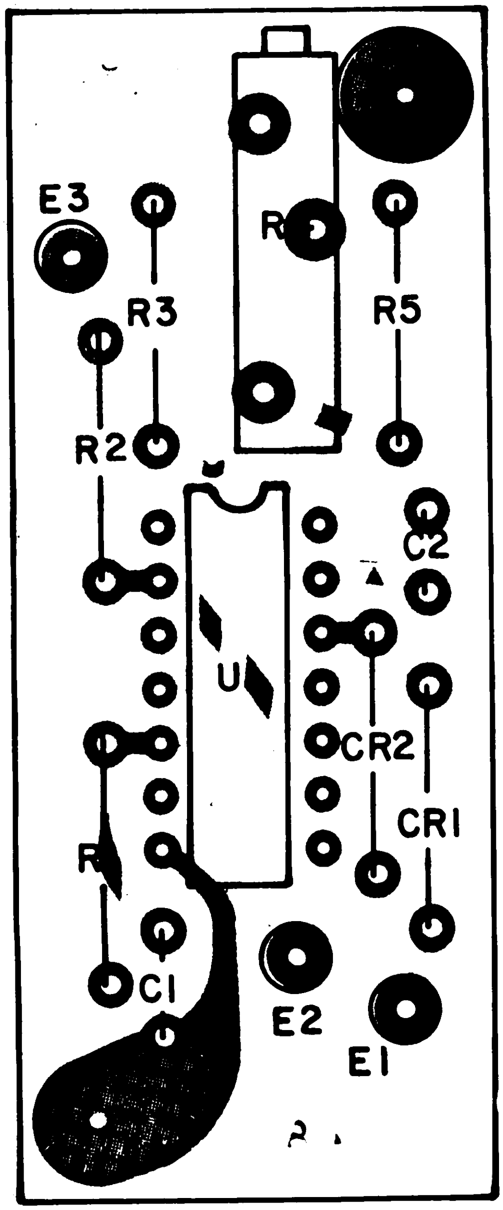


Figure 5-9. Part 270447-1 Local Oscillators (A7), Location of Components

REF DESIG PREFIX A7

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
R4	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/8 W	4	RCR05G103JS	81349	
R5	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/8 W	4	RCR05G472JS	81349	
R6	Resistor, Fixed, Composition: 100 Ω, 5%, 1/4 W	2	RCR07G101JS	81349	
R7	Resistor, Fixed, Composition: 47 kΩ, 5%, 1/8 W	2	RCR05G473JS	81349	
R8	Resistor, Fixed, Composition: 15 kΩ, 5%, 1/8 W	2	RCR05G153JS	81349	
R9	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/8 W	4	RCR05G104JS	81349	
R10	Resistor, Fixed, Composition: 2.2 kΩ, 5%, 1/8 W	2	RCR05G222JS	81349	
R11	Same as R9				
R12	Not Used				
R13	Same as R4				
R14	Same as R5				
R15	Resistor, Fixed, Composition: 1.2 kΩ, 5% 1/8 W	2	RCR05G122JS	81349	
R16	Resistor, Fixed, Composition: 56 Ω, 5%, 1/8 W	2	RCR05G560JS	81349	
R17	Resistor, Fixed, Composition: 180 Ω, 5%, 1/4 W	2	RCR07G181JS	81349	
R18	Same as R1				
R19	Same as R2				
R20	Same as R1				
R21	Same as R4				
R22	Same as R5				
R23	Same as R6				
R24	Same as R7				
R25	Same as R8				
R26	Same as R9				
R27	Same as R10				
R28	Same as R9				
R29	Not Used				
R30	Same as R4				
R31	Same as R5				
R32	Same as R15				
R33	Same as R16				
R34	Same as R17				
T1	Transformer	1	11464-99	14632	
T2	Transformer	2	T16-1	15542	
T3	Transformer	1	11464-100	14632	
T4	Same as T2				
VR1	Voltage Regulator: 10 V	2	1N758A	80131	
VR2	Same as VR1				
*	Nominal value, final value, factory selected.				



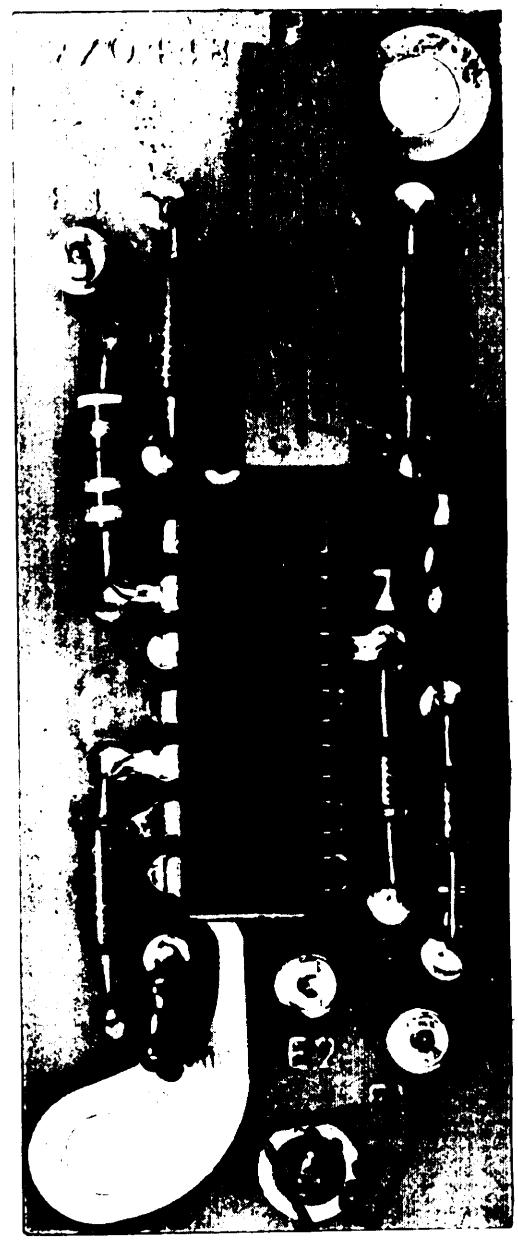


Figure 5-10. Part 270448-1 10.5 V Voltage Reference (A8),
Location of Components

5.5.8 PART 270448-1 10.5 V VOLTAGE REFERENCE REF DESIG PREFIX A8

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 100 V	1	8131M100-651104M	72982	
C2	Capacitor, Mica, Dipped: 100 pF, 2% 500 V	1	CM04FD101G03	81349	
CR1	Diode	2	1N4449	80131	
CR2	Same as CR1				
E1	Terminal, Formed	3	140-1941-02-01	71279	
E2	Same as E1				
E3	Same as E1				
R1	Resistor, Fixed, Film: 1 kΩ, 1%, 1/10 W	2	RN55C1001F	81349	
R2	Resistor, Fixed, Composition: 33 Ω, 5%, 1/4 W	1	RCR07G330JS	81349	
R3	Same as R1				
R4	Resistor, Variable, Film: 500 Ω, 10%, 3/4 W	1	89PR500	73138	
R5	Resistor, Fixed, Film: 2.74 kΩ, 1% 1/10 W	1	RN55C2741F	81349	
U1	Integrated Circuit	1	723DM	07263	

5.5.9 TYPE 854001-1 TUNING DRIVE ASSEMBLY REF DESIG PREFIX A9

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
1	Front Plate	1	370368-1	14632	
2	Pot Plate	1	270457-1	14632	
3	Bearing Cup	3	270437-1	14632	
4	Worm Gear	1	270438-1	14632	
5	Worm Gear	1	270439-1	14632	
6	Anti-Backlash Wormwheel, 48 P, 60 T	1	270440-1	14632	
7	Bracket, Worm Gear	1	370350-1	14632	
8	Bearing Bracket, Worm Gear	1	370362-1	14632	
9	Spur Gear, 48 P, 45 T	1	154-45-2SH	01351	
10	Anti-Backlash Gear, 48 P, 40 T	1	MAB150-40-.250	01351	
11	Wormwheel, 48 P, 30 T	1	Q11-24	00141	
12	Collar	1	11581-8	14632	
13	Not Used				
14	Clutch Bearing	2	11582-14	14632	
15	Stop Retainer Assembly	1	13868-3	14632	
16	Capacitor, Modified	1	270485-1	14632	
17	Potentiometer	1	8106R10K-L.25	73138	
18	Ball Bearing	1	SFR1883PP	83086	
19	Ball Cres, .062 Dia.	AR	MS19060-4804	96906	
20	Stop Washer	8	13863-2	14632	
21	Shim Washer	4	SSS-33	01351	
22	Spring Friction Washer	2	3502-14-47	78189	
23	PHMS 4-40 x .75 L	2	MS51957-19	96906	
24	PHMS 4-40 x .44 L	4	MS51957-16	96906	
25	Not Used				
26	Set Screw 4-40 x. 12 L	6	SSCR4-40X1/8HT	56878	
27	Set Screw 4-40 x .25 L	4	SSCR4-40X1/4HT	56878	
28	Set Screw 6-32 x .12 L	4	SSCR6-32X1/8HT	56878	
29	Not Used				
30	Lock, Washer # 4	6	MS35338-135	96906	

SECTION VI

SCHEMATIC DIAGRAMS

APPENDIX A

REFERENCES

Refer to TM 11-5895-1227-14-1 for references.

APPENDIX B

MAINTENANCE ALLOCATION CHART

NOTE

The Tuner, TN-586/GRR-8(V), is an assembly of the Receiver, AN/GRR-8(V). The Maintenance Allocation Chart covering maintenance actions on the tuner is located in TM 11-5895-1227-14-1, Operator, Organizational, Direct Support and General Support Maintenance Technical ManuaL

APPENDIX C

BASIC ISSUE ITEMS LIST

NOTE

The Tuner, TN-586/GRR-8(V), is an assembly of the Receiver, AN/GRR-8(V). The Basic Issue Items List covering the basic issue items for the receiver to help you inventory items required for safe and efficient operation on the tuner is located in TM 11-5895-1227- 14-1, Operator, Organizational, Direct Support and General Support Maintenance Technical Manual.

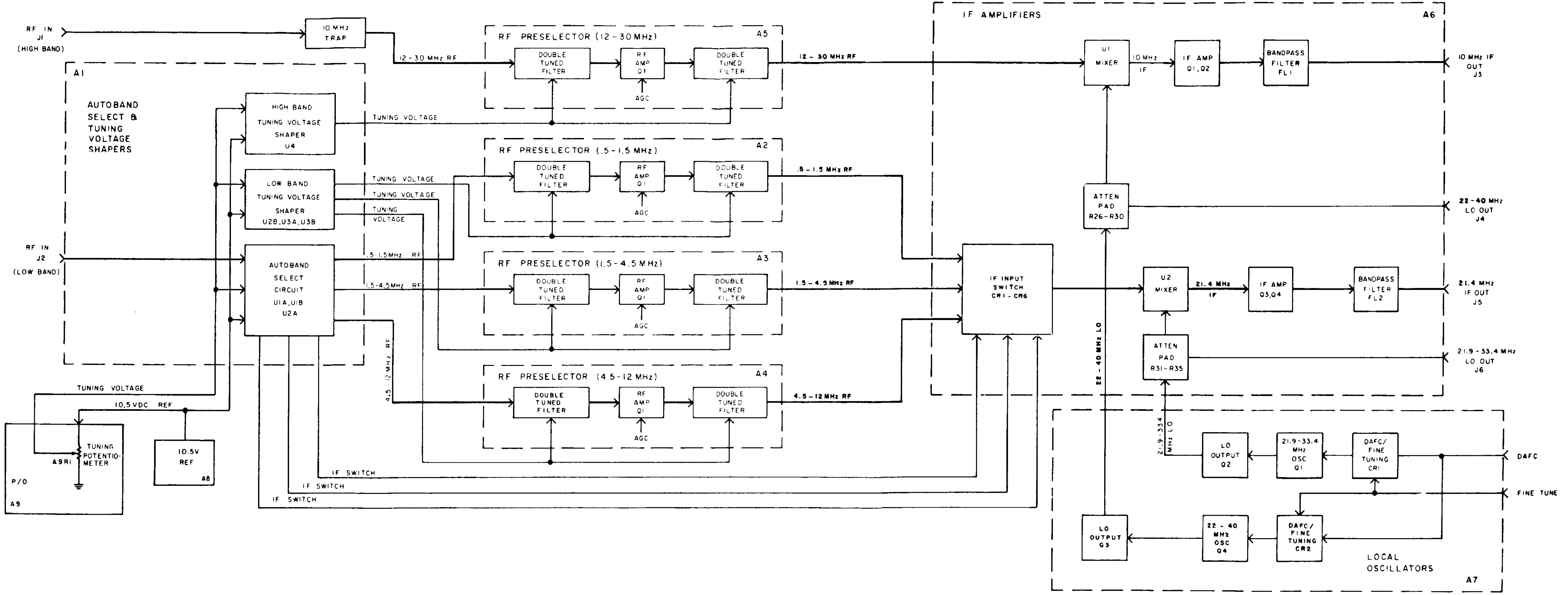


Figure 3-1. Type WJ-9120 Functional Block Diagram

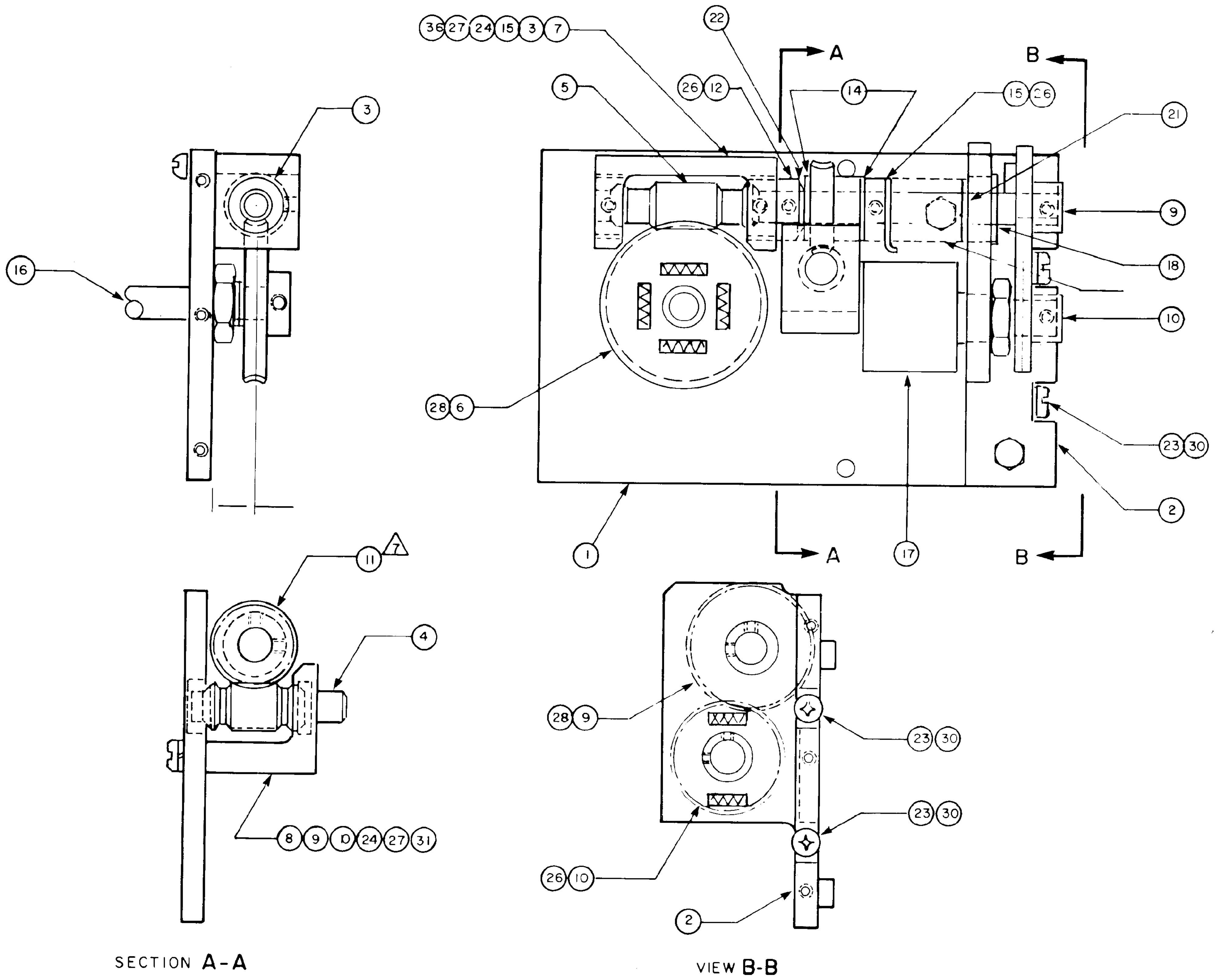
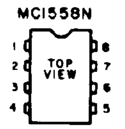


Figure 5-11. Type 854001-1 Tuning Drive Assembly (A8), Location of Components.

NOTE UNLESS OTHERWISE SPECIFIED:
a) RESISTORS NOT MARKED ARE IN OHMS, ±5%, 1/8W.
b) CAPACITANCE IS IN pF.



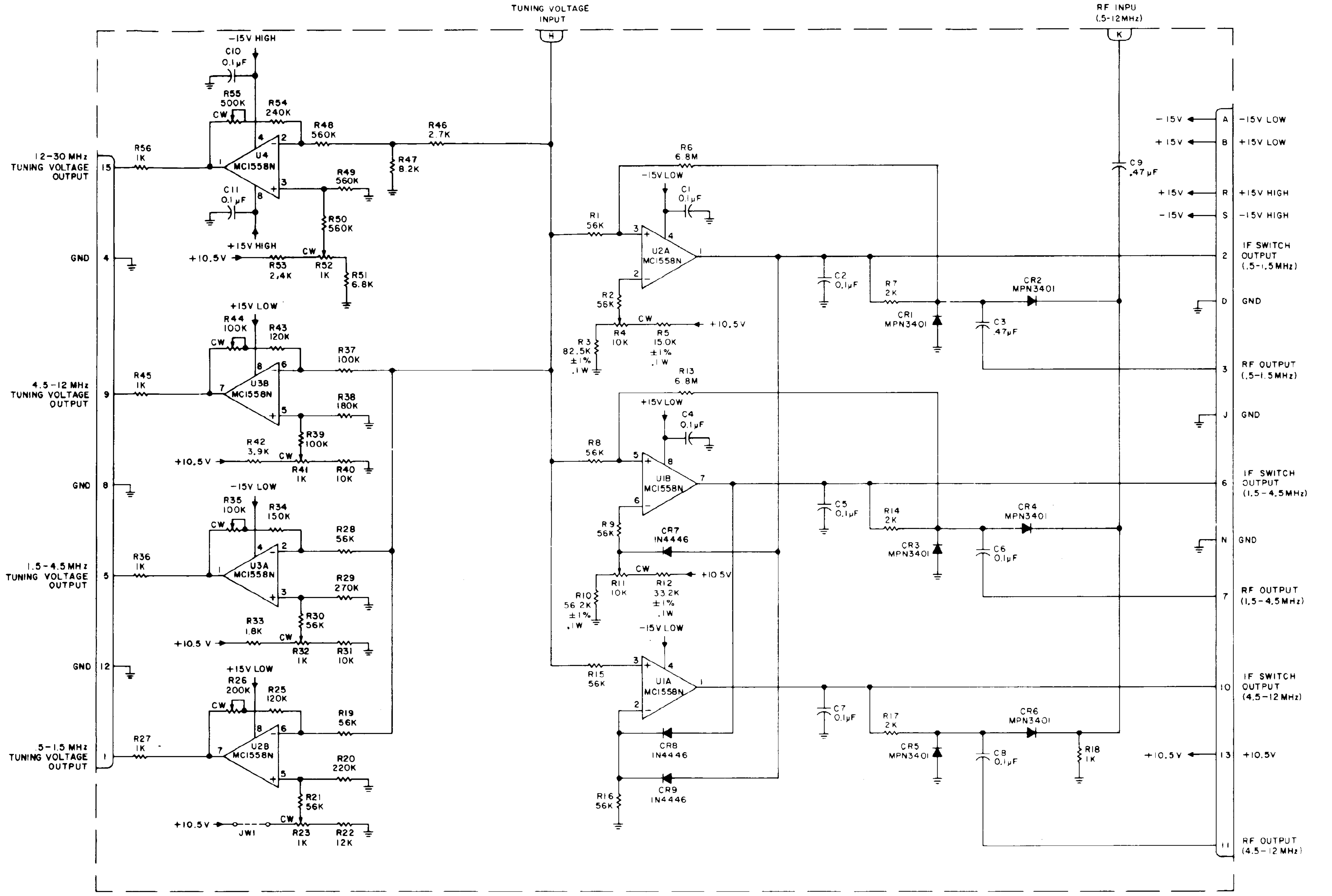
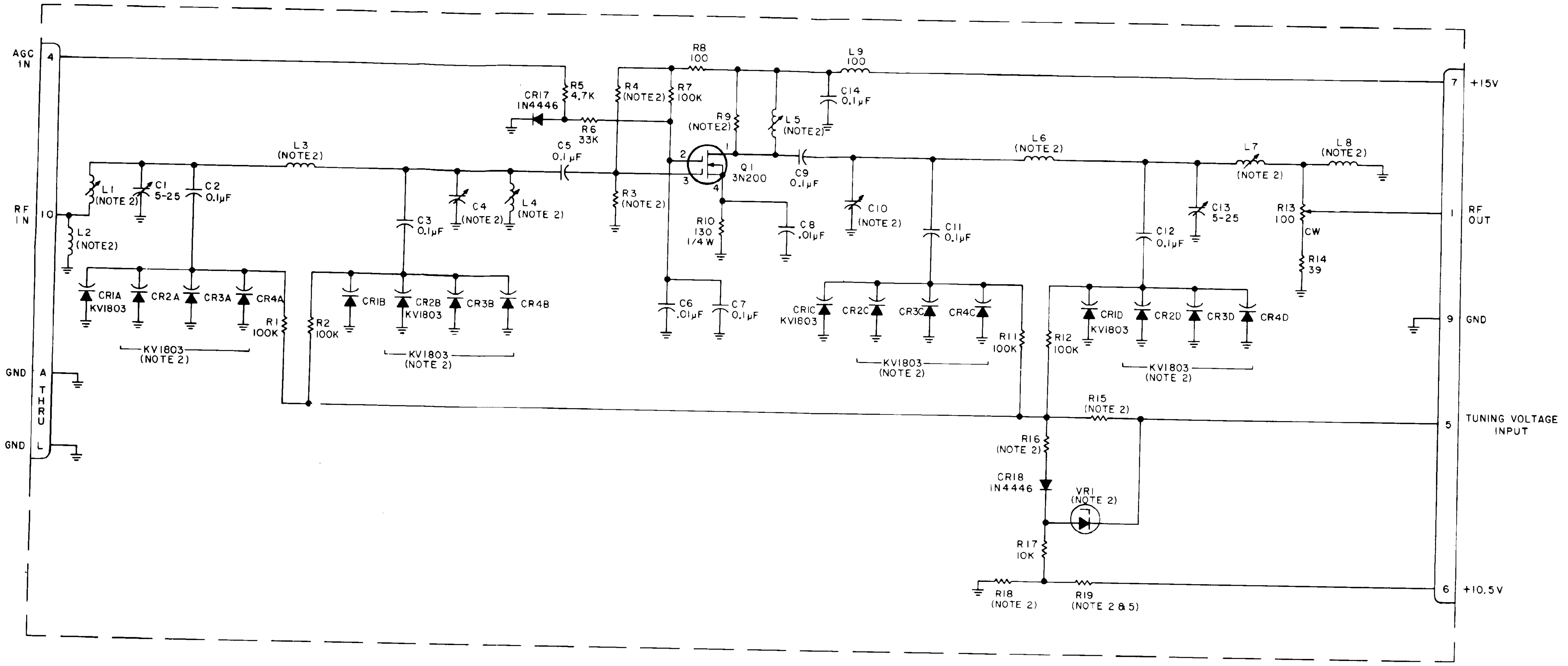


Figure 6-1. Type 794126-1 Auto Band Select and Tuning Voltage Shapers (A1), Schematic Diagram 570092



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ± 5%, 1/8W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN μH.
2. DIFFERENCE BETWEEN TYPES IS LISTED IN TABLE.
3. TRANSISTOR 3N200 IS PROVISIONED AS #841001-2
4. CR1, CR2, CR3 AND CR4 ARE MATCHED SETS.
5. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

TABLE

TYPE	CR2 THRU CR4	L1	L2	L3	L4	L5	L6	L7	L8	R3	R4	R9	R15	R16	R18	R19	VR1	C4, C10
714007-1 (.5-1.5MHz)	USED	30312-277	NOT USED	180	30312-277	30312-277	180	30312-277	NOT USED	2.2K	33K	2.2K	47K	47K	4.7K	15K	NOT USED	5-25
714007-2 (1.5-4.5MHz)	NOT USED	30312-278	6.8	120	30312-279	30312-279	120	30312-278	6.8	2.7K	39K	2.7K	47K	12K	15K	12K	IN753A	5-25
714007-3 (4.5-12MHz)	NOT USED	30312-280	1.0	22	30312-281	30312-281	24	30312-280	1.0	2.2K	33K	2.2K	47K	12K	2.2K	8.2K	NOT USED	2.5-9

Figure 6-2. Type 714007-1, 2, 3 RF Preselector (A2 thru A4). Schematic Diagram 470203

NOTE:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   b) CAPACITANCE IS IN μF.
2. TRANSISTOR 3N200 IS PROVISIONED AS "841001-2.
3. CR1 IS A MATCHED SET.
4. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

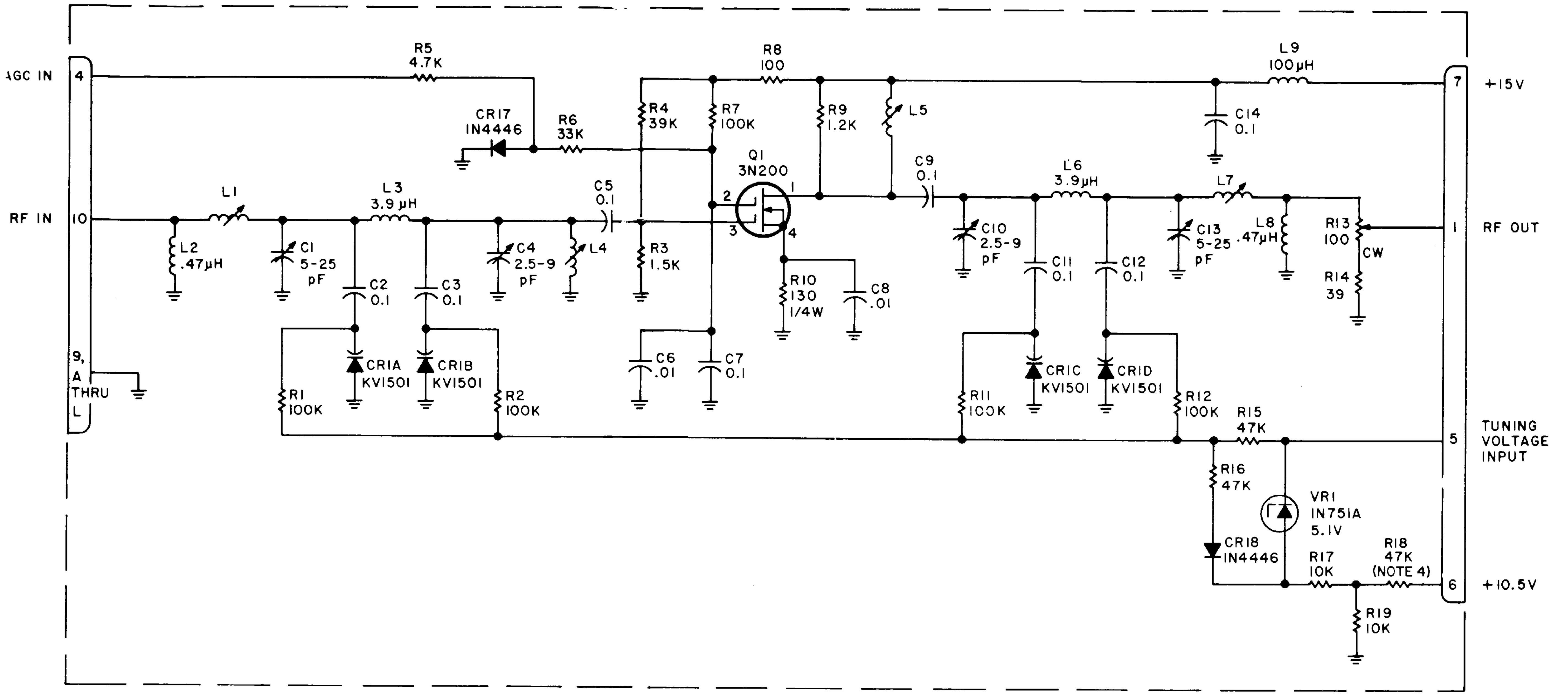
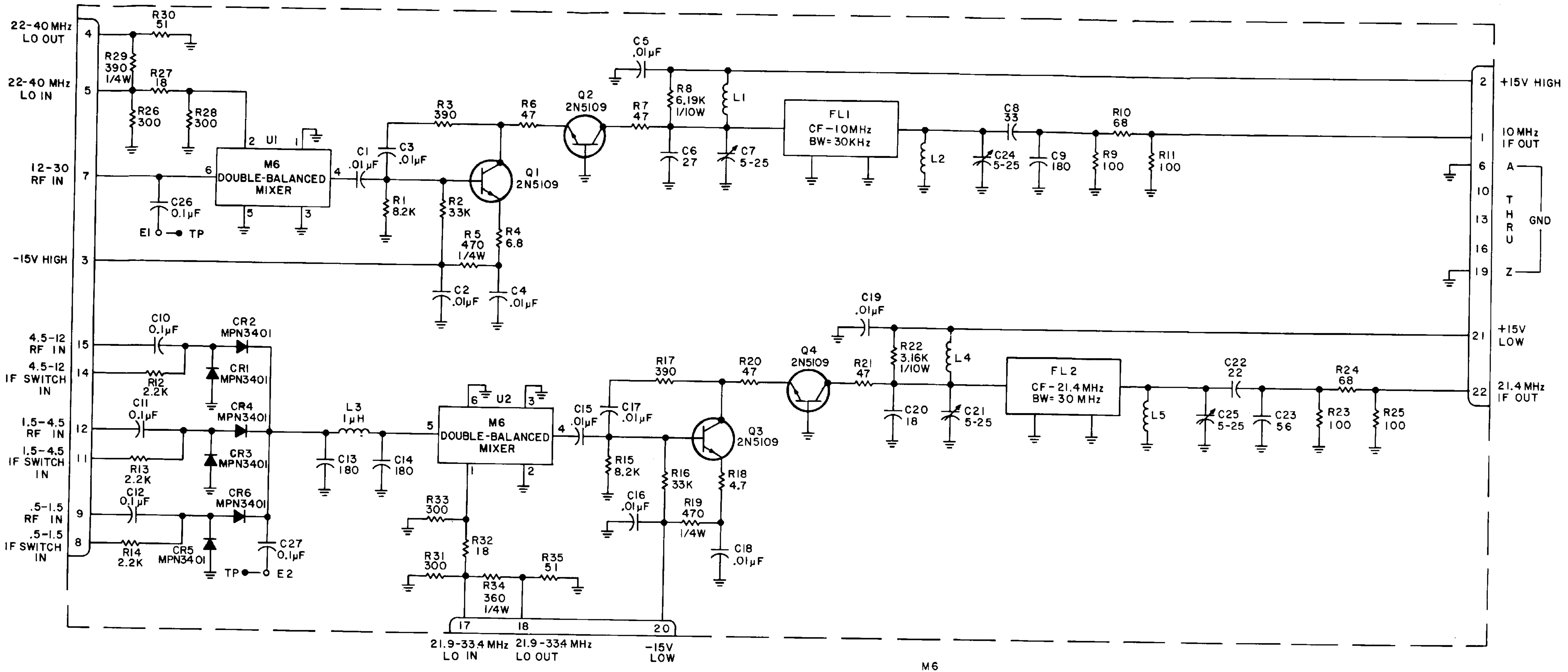


Figure 6-3. Type 714010-1 RF Preselector (A5), Schematic Diagram 470204



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   b) CAPACITANCE IS IN pF.

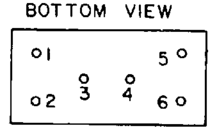
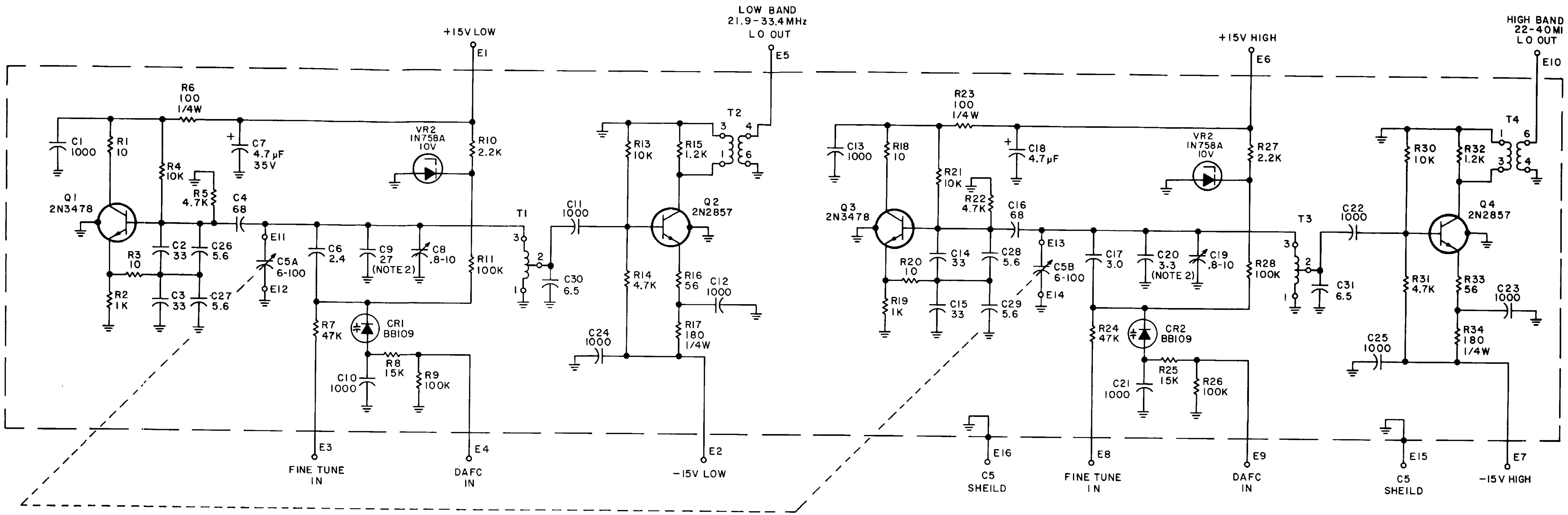


Figure 6-4. Type 724010 IF Amplifier (A6), Schematic Diagram 470209



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   b) CAPACITANCE IS IN pF.
2. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

Figure 6-5. Type 270447-1 Local Oscillators (A7), Schematic Diagram 470195

NOTES
1. UNLESS OTHERWISE SPECIFIED.
   a) RESISTANCE IS IN OHMS, ±1%, 1/10W.
   b) CAPACITANCE IS IN μF.
2. A9R1 IS MECHANICALLY GANGED TO A7C5.

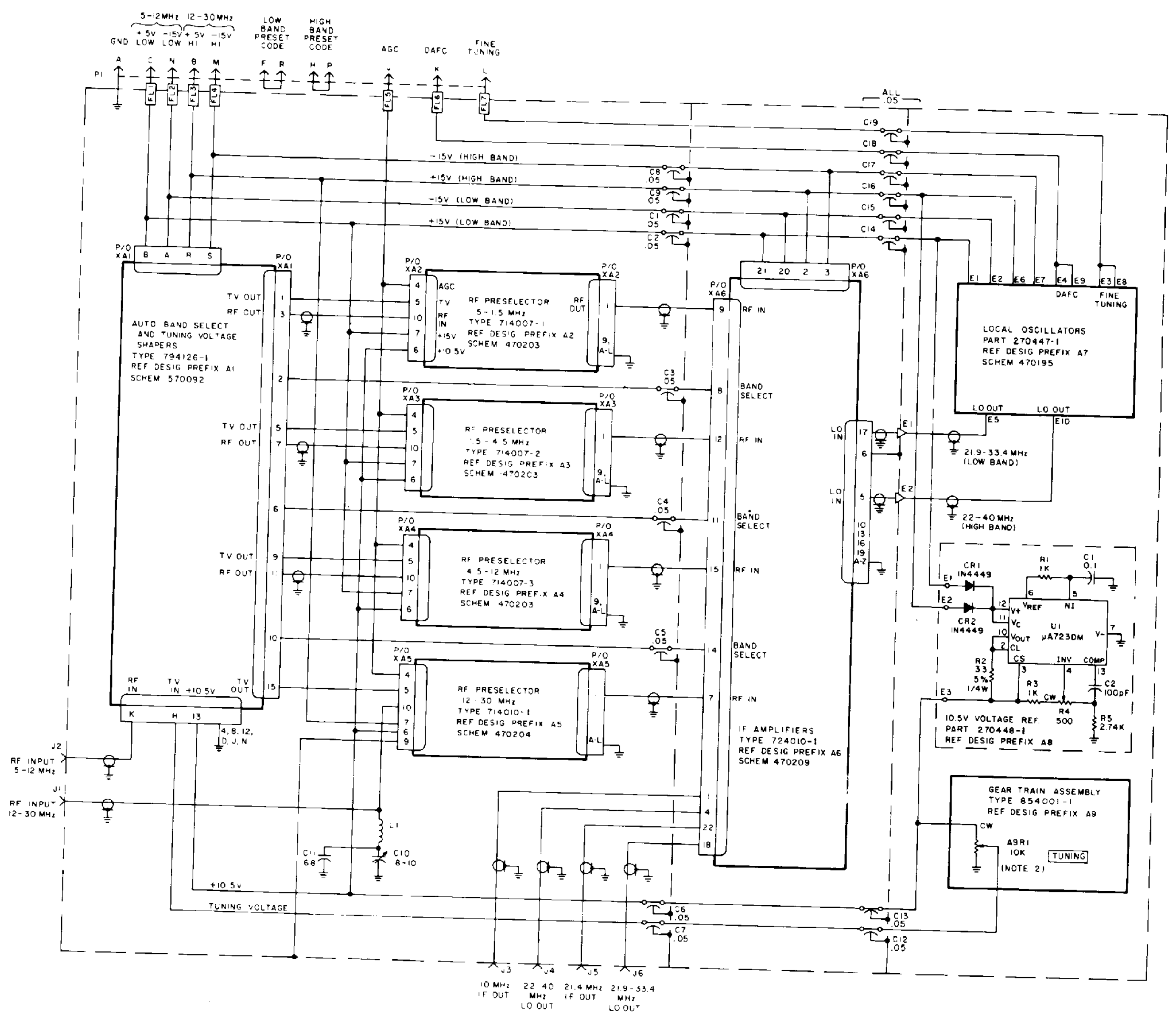


Figure 6-6. Type WJ-8120 HF Tuner, Schematic Diagram 570098

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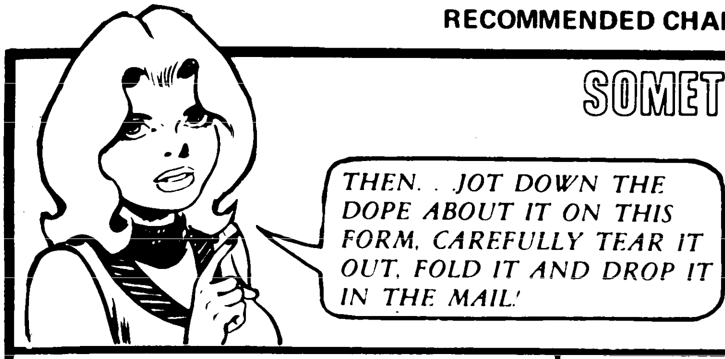

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TM 11-5840-340-12	23 Jan 74	Radar Set AN/PRC-76

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PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°. REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		F03		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

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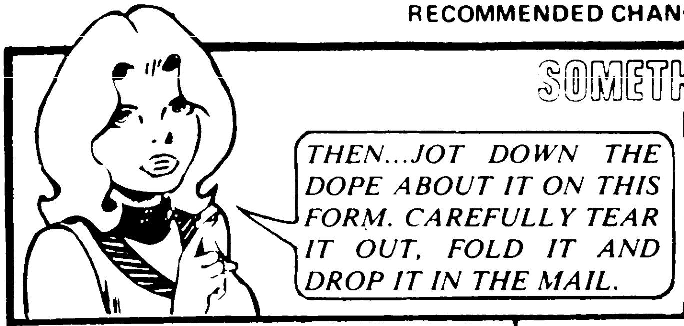

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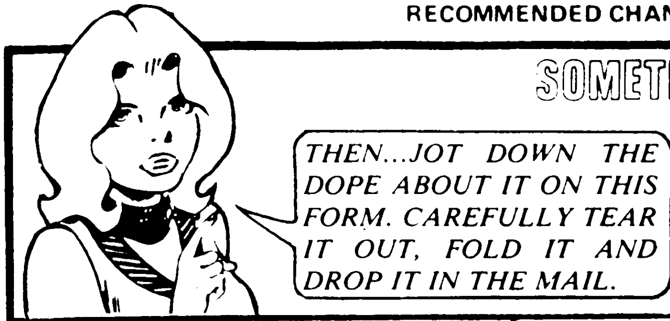

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