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Instruction Manual

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MODEL 1112-VT(A) RF TUNER
(Serial No. 204 and above)

December 1972

TRADE SECRETS

MICRODYNE Corporation

POST OFFICE BOX 1527 ROCKVILLE, MD. 20850

Telephone (301) 762-8500

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SECTION I
GENERAL INFORMATION

1-1. SCOPE. This manual provides information pertaining to the installation, operation, and maintenance of the Model 1112-VT(A) RF Tuner designed and manufactured by Microdyne Corporation, Rockville, Maryland. A replacement parts list and maintenance diagrams are included herein.

1-2. PURPOSE AND DESCRIPTION

1-3. The Model 1112-VT(A) RF Tuner is designed for use in Microdyne single channel telemetry receivers. The unit functions to select, amplify, and down convert signal frequencies in the range of 215 MHz to 320 MHz, and supply a 50 MHz intermediate frequency (i-f) for further processing. Noise figures of less than 6.5 dB are obtained over the entire tuning range through the use of all solid-state components.

1-4. The 1112-VT(A) is completely voltage tuned using voltage variable capacitance diode tuning elements which eliminate the need for electromechanical tuning components such as inductuners and large capacitors. Frequency selection is accomplished through the use of either a voltage controlled oscillator (vfo), a crystal controlled oscillator, or an external source such as a synthesizer or another receiver, and a voltage tuned rf amplifier. A single tuning potentiometer used in conjunction with a dc amplifier is employed to set the operating frequency of the rf amplifier, local oscillator, and local oscillator multiplier during vfo operation. The same potentiometer adjusts the rf amplifier and local oscillator multiplier frequency during crystal controlled and external source operation. All stages are tuned in an identical manner with the voltage output of the tuning potentiometer being applied to the tuning elements via a dc amplifier to control the resonant frequency of the tuned stages. Also ganged to the tuning potentiometer is the frequency indicating mechanism. This mechanism is composed of a gear-driven, taut metal strip constructed to virtually eliminate backlash.

1-5. The 1112-VT(A) features the additional capability of being tuned from a remote station. With this capability, the unit can be precisely tuned by a voltage input from a computer interface or remote console. Refer to Section III for details.

1-6. The 1112-VT(A) is constructed as a complete front panel plug-in module for the parent receiver. All power and signal connections between the tuner and receiver are made automatically upon installation through a push-on coaxial connector, and a miniature ribbon-type connector. A front panel receptacle is provided for mounting the crystal adapter or oven. Also located on the front panel is the remote or local tuning mode switch.

1-7. Electrical, environmental, and mechanical specifications for the tuner are given in table 1-1.

Table 1-1. Specifications

ELECTRICAL:	
Operating Modes	local or remote; switch selectable.
Frequency Range	215-320 MHz; continuously tunable or crystal controlled.
Dynamic Range	receiver threshold to -7 dBm.
Input Impedance	operates from a 50 ohm source.
Noise Figure	6.5 dB maximum.
Image Rejection	80 dB minimum.
IF Rejection	90 dB minimum.
Spurious Rejection	60 dB minimum.
Spurious Emission	meets or exceeds MIL-STD-461A and MIL-STD-826A.
First LO Characteristics:	
Operating Modes	continuously tunable (VFO) or crystal controlled (XTAL); switch selectable. Mixer injection 50 MHz above rf input.
Stability	VFO - ±0.001% per degree C. XTAL - ±0.0005% with oven ±0.005% without oven.
Monitor Output	submultiple (1/4) of mixer injection - 66.25 - 92.5 MHz.
Monitor Output Level	50 mV (-13 dBm) into 50 ohms.
First IF Output:	
Frequency	50 MHz.
Bandwidth	4.5 MHz (standard).
ENVIRONMENTAL:	
Temperature Range:	32°F 122°F
Operating	0°C to +50°C.
Storage	-62°C to +65°C.
Relative Humidity	to 95%.

continued

Table 1-1, continued

Barometric Pressure:	
Operating	to 10,000 feet.
Storage	to 50,000 feet.
MECHANICAL:	
Height	4.5 inches.
Width	4.0 inches.
Depth	15 inches.
Weight	approximately 4 pounds.

SECTION II
INSTALLATION

2-1. GENERAL

2-2. The rf tuner is shipped independently from the receiver in which it is to be installed. It is sealed in a polyethylene bag, wrapped in shock absorbing insulation, and packaged in a rugged shipping container.

2-3. UNPACKING AND HANDLING

2-4. Upon receipt of the tuner carton, cut the sealing tape and lift the package from the box. Open the bag and remove the tuner. (Do not discard the packing material if the unit is to be reshipped; see paragraph 2-11.) Check the tuner for in-transit damage: broken connectors, dents, etc. If damaged, notify the proper authority immediately.

2-5. STORAGE

2-6. Storage conditions must be within the environmental limits specified in table 1-1.

2-7. INSTALLATION

2-8. The tuner is held in place in the receiver with a module lock and spring-actuated latch handle on the left side. To install the module, move the lock portion of the mechanism up and pull the handle marked PULL forward. Insert the tuner into the receiver slot. Return the PULL handle to its original position until the lock snaps into place.

2-9. REMOVAL

2-10. To remove the tuner from the receiver, lift the module lock up to disengage the release. Pull the handle marked PULL forward and slide the tuner out of the receiver.

2-11. PACKAGING FOR RESHIPMENT

2-12. To package the tuner for reshipment, proceed as follows:

a. Place the tuner and a quantity of desiccant into a moisture-proof polyethylene bag and seal.

b. Place the unit in a cardboard container, preferably a padded type, using enough shock absorbing material to prevent any movement within the carton.

c. Seal the carton and affix the necessary "Fragile" and "Delicate Equipment" labels.

SECTION III
OPERATION

3-1. GENERAL

3-2. This section provides information on the operation of the tuner only and should be used in conjunction with the overall operating procedures given in the receiver manual.

3-3. CONTROLS AND INDICATORS

3-4. Two operating controls and one indicator are included on the tuner. These are:

TUNING	This control is employed to adjust the rf amplifier, local oscillator, and multiplier in the vfo mode, and the rf amplifier and multiplier only in the crystal mode.
REMOTE/INTERNAL	This switch is employed to set the operating mode. When set to INTERNAL, tuning is accomplished through the front panel TUNING control. When set to REMOTE, tuning is accomplished through the application of a tuning voltage from an external source.
FREQUENCY MHz	This dial is employed to indicate the frequency to which the 1112-VT(A) is tuned.

3-5. OPERATING PROCEDURE

3-6. The 1112-VT(A) rf tuner may be operated in either an internal control mode or a remote control mode. Operating procedures for each mode are given in paragraphs 3-7 and 3-12, respectively.

3-7. INTERNAL OPERATION

3-8. To operate the tuner using the front panel tuning control and internal voltages, set the front panel REMOTE/INTERNAL switch to the INTERNAL position. Frequency selection in this mode is accomplished through either a voltage controlled oscillator, a crystal controlled oscillator (XTAL), or an external source such as another receiver or frequency synthesizer. Directions for operating the tuner in these modes are given in paragraphs 3-9, 3-10, and 3-11.

3-9. VFO OPERATION

a. Set the receiver 1ST LO MODE switch to VFO.

b. Adjust the TUNING control until the desired frequency mark is under the dial index.

c. Readjust the TUNING control and the receiver FINE TUNE control for a zero indication on the receiver TUNING meter.

d. Refer to the receiver instruction manual OPERATION section.

3-10. CRYSTAL OPERATION. The tuner may be operated with either a CR-52A/U crystal mounted in a Microdyne 200-070 crystal adapter assembly, or a CR-65A/U crystal mounted in a Microdyne 100-001 crystal oven assembly. In any case, the operating procedure is as follows:

a. Set the receiver 1ST LO MODE switch to XTAL.

b. Adjust the TUNING control until the desired frequency mark is under the dial index.

c. Plug an adapter and crystal or an oven and crystal into the front panel socket. The formula for determining the correct crystal frequency is given below:

$$F_c = \frac{F_r + 50}{8}$$

where: F_c = crystal frequency
F_r = rf input frequency

3-11. EXTERNAL LOCAL OSCILLATOR OPERATION. Provisions have been incorporated for driving the l-o chain from an external signal source such as a frequency synthesizer or another receiver also equipped with an 1112-VT(A). To use the capability, proceed as follows:

a. Connect the external synthesizer or other receiver to the external input on the parent receiver rear apron. If a frequency synthesizer is used, it must be capable of supplying a 66.25 to 92.5 MHz output between -13 and 0 dBm.

b. Set the receiver 1ST LO MODE switch to OFF.

c. Set the TUNING control to the desired frequency mark.

d. Set the external source to the required frequency for driving the tuner. If a second receiver is used, simply set it to the same frequency as in step c.

e. If a synthesizer is used, set for an output between -13 and 0 dBm and the correct injection frequency. This frequency is determined by the following formula:

$$F_i = \frac{F_r + 50}{4}$$

where: F_i = synthesizer input
F_r = received frequency

3-12. REMOTE CONTROL OPERATION

3-13. For remote control operation, a control voltage derived from a remote tuning console or computer interface is employed to tune the rf amplifier, local oscillator, and local oscillator multiplier. This voltage must range from 0 volts to -5 volts dc depending on the frequency to be received. The control voltage is applied to the receiver rear apron

ACCESSORIES connector and coupled to P10-13 on the tuner. To operate the tuner in this mode, proceed as follows:

a. Set the tuner INTERNAL/REMOTE switch to REMOTE.

b. Set the receiver 1ST LO MODE switch to VFO.

c. Connect a frequency counter to the receiver first l-o monitor output.

d. Connect a power supply to the remote input on the receiver ACCESSORIES connector.

e. Determine which rf carrier frequencies are to be received during the operational mission.

f. With the carriers noted, determine what voltage input level is required to adjust the tuner to each frequency. This is accomplished as follows:

   1. Monitor the input control voltage with a digital or differential voltmeter capable of indicating in millivolts.

   2. Adjust the power supply for a voltage output as indicated in figure 3-1; this is a coarse adjustment.

   3. Fine tune the power supply until the counter indicates the correct submultiple of the required local oscillator frequency. The submultiple is determined by the following formula:

   $$F_o = \frac{F_r + 50}{4}$$

   where: F_o = oscillator frequency
   F_r = rf input frequency

   This frequency should be set as accurately as possible since the control voltage is also setting the center frequency of the rf amplifier circuitry.

   4. Note the voltage level required to obtain the oscillator frequency to three decimal places. If the receiver is to be operated in the afc mode, it will not be necessary to set the control voltage as would normally be required as the afc circuit has an acquisition range greater than ±250 kHz. It is recommended that afc operation be utilized for remote tuner operation.

g. With the tuning voltages noted, program the computer or set the tuning console to supply those voltages on command.

h. Disconnect the power supply and connect the computer or console input in its place.

i. Refer to the receiver manual OPERATION section for additional information on other receiver control adjustments.

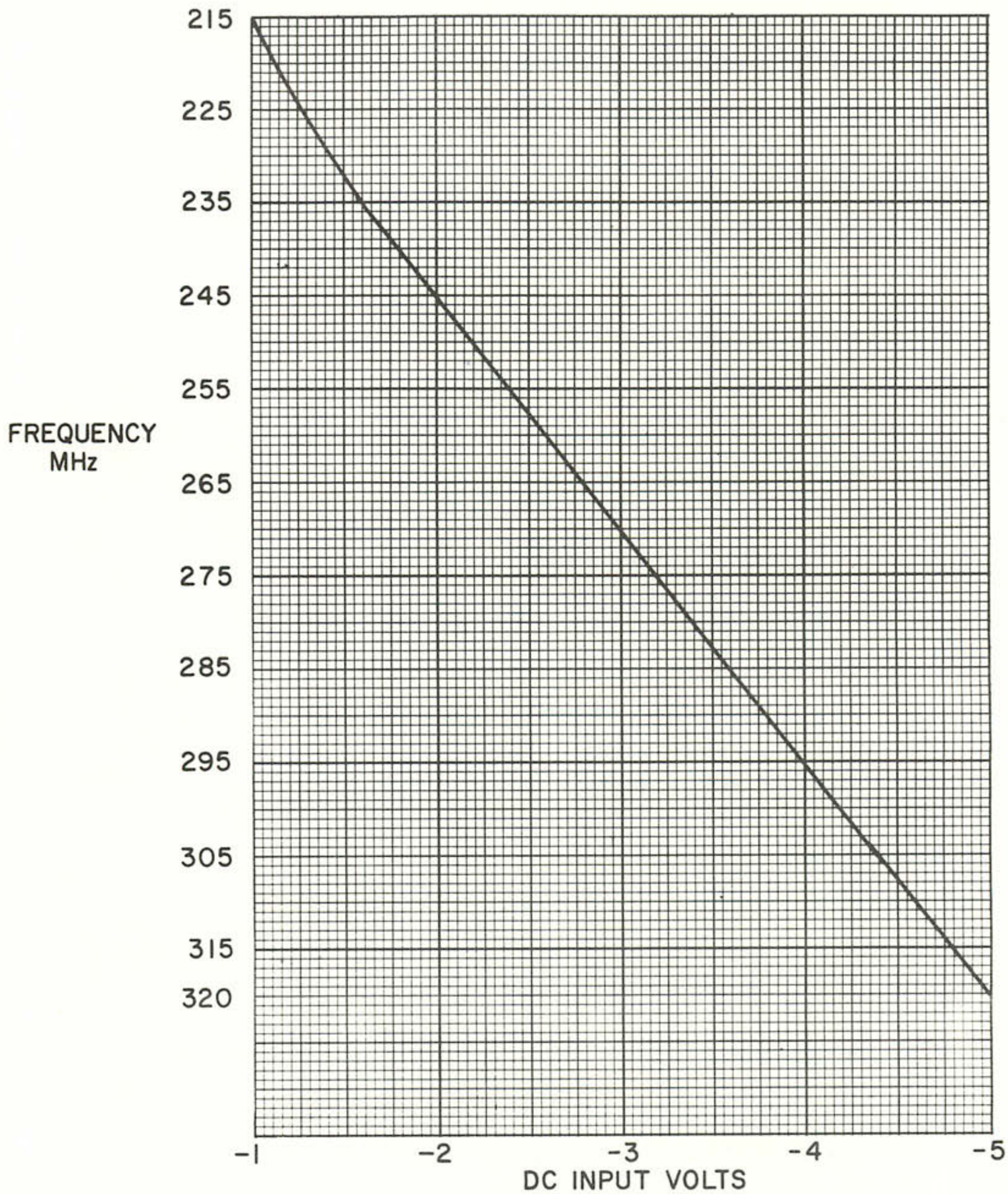


Figure 3-1. Input Voltage vs. Frequency

SECTION IV
THEORY OF OPERATION

4-1. GENERAL

4-2. The rf tuner functions as the receiver "front end" in order to select a single frequency in the 215 MHz to 320 MHz range for processing. The unit consists of an rf amplifier, mixer, 50 MHz i-f amplifier, and a local oscillator/multiplier chain. See figure 4-1.

4-3. An applied rf signal ranging from 215 to 320 MHz is amplified by the rf amplifier stage and coupled to the first mixer. In the mixer, the rf input is heterodyned with a signal generated by the first local oscillator to produce a 50 MHz output. This signal is then coupled to the 50 MHz i-f amplifier for further application to the receiver i-f circuitry.

4-4. The first local oscillator signal applied to the mixer may be supplied by a variable frequency oscillator (vfo), a crystal controlled oscillator, or an external generator. The signal generated by the selected local oscillator is multiplied and amplified to supply a mixer injection frequency 50 MHz above the applied rf signal.

4-5. CIRCUIT THEORY

4-6. Reference to the schematic diagrams shown in Section VII is recommended while reading the following circuit descriptions.

4-7. RF AMPLIFIER

4-8. The rf amplifier consists of Q1, Q2, and Q3. Double-tuned circuits preceding and following the amplifier stage are employed to establish the bandwidth of the amplifier as well as provide the selectivity. Tuning of the amplifier stage is accomplished using voltage variable capacitance diode tuning elements CR1 through CR8. See figure 7-2.

4-9. The rf input signal is applied through J1 and impedance matching transformer L4 to the first double-tuned circuit CR1 through CR4. The signal is then coupled to the rf amplifier which is configured as a differential amplifier driven from a constant current source. In actual operation, however, Q1 and Q3 function as a cascode amplifier with Q2 operating as a signal shunt for gain control purposes. Gain control voltage from the receiver is applied to the gate of Q3 via sensitivity adjustment R20. Since the total flow through the differential stage is held constant by Q1, any change in the current flow through Q3 caused by the biasing effects of the agc voltage will be compensated for by an increased or decreased current flow through Q2. For example, if the agc voltage applied to Q3 caused the current through Q3 to decrease, the current through Q2 would increase by a corresponding amount thereby shunting a larger portion of the signal out of the signal path. This configuration and method of gain minimizes the effects of load changes on the amplifier bandpass and enhances the large signal handling capability of the tuner. The output of the amplifier is taken from the drain of Q3 and applied through the output double-tuned circuit to the mixer Q4.

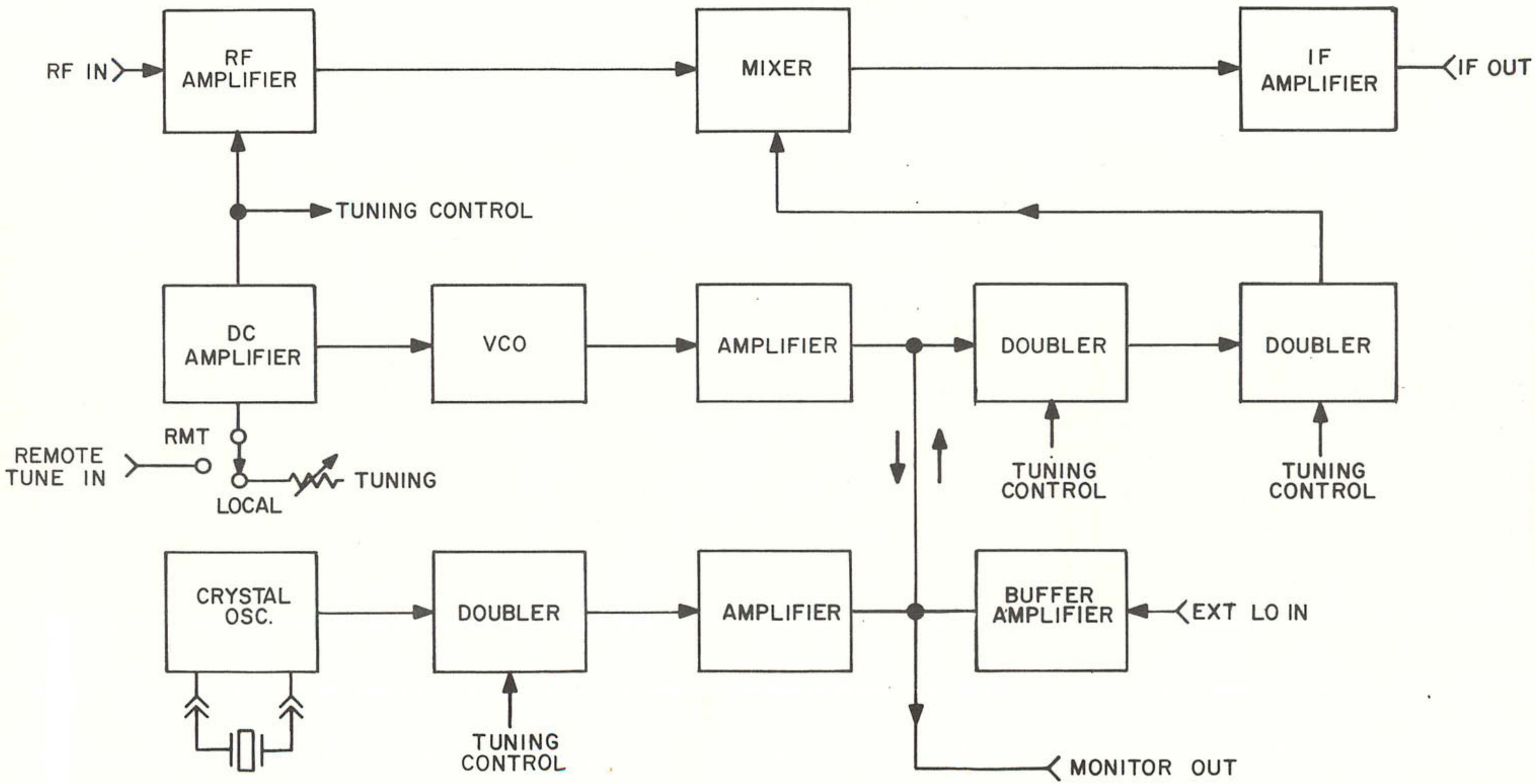


Figure 4-1. Model 1112-VT(A) RF Tuner, Simplified Block Diagram

4-10. The double-tuned input and output stages of the amplifier are tuned by a control voltage applied to the cathode of tuning elements CR1 through CR8. This voltage is derived from either the front panel tuning potentiometer R1 or an external source via dc amplifier A3, and is employed to adjust the capacitance of the tuning elements to set the resonant frequency of the tuned circuit. CR1, CR4, CR5, and CR8 are utilized to control the resonance of the circuits and elements CR2, CR3, CR6, and CR7 are utilized to maintain the 7.5 MHz bandwidth by constantly optimizing the coupling. A more complete description of the dc amplifier is presented in paragraph 4-22.

4-11. FIRST LOCAL OSCILLATOR

4-12. The first local oscillator consists of either a voltage controlled oscillator, a crystal controlled oscillator, or an external source, and the required multiplier and buffer stages.

4-13. VOLTAGE CONTROLLED OSCILLATOR. When the vfo operating mode is selected, -15V dc is applied through P1-19 and coupled to the oscillator circuit at A1C67. The voltage controlled oscillator is composed of Q6, in a modified Colpitts configuration, and tuning control circuit U1. Control of the oscillator frequency is accomplished by the application of the same tuning voltage applied to the rf amplifiers. The control voltage is applied at E7 and routed to U1 which contains the oscillator tuning elements. Also contained in U1 is a temperature control circuit employed to enhance the oscillator stability by maintaining a constant temperature. Transistors Q10 and Q11 function as a current limiter and a switch to limit maximum heater current to approximately 200 mA and to hold the temperature to 60° Centigrade.

4-14. As the control voltage is varied, U1 changes characteristics accordingly to shift the oscillator frequency. Inductor L13 and capacitor C43 are employed to establish the oscillator operating limits between 66.25 and 92.5 MHz. This output is taken from the collector of Q6 and coupled by buffer amplifier Q7 to doubler stage Q8. Tuning of the doubler stage is accomplished by the application of the tuning control voltage to diodes CR9, CR10, and CR11; diodes CR9 and CR11 control the frequency tuning and CR10 maintains the correct bandwidth. Inductors L16 and L17 are utilized to match the impedance between tuned stage and transistors Q8 and Q9. The 265 to 370 MHz output of the doubler stage is further amplified by tuned amplifier Q9. This stage is tuned in the same manner as the doubler and routes the local oscillator signal to mixer Q4.

4-15. CRYSTAL CONTROLLED OSCILLATOR. The crystal oscillator circuit is shown in figure 7-3 and housed in subassembly A2. The circuit consists of oscillator A2Q1, tripler A2Q2, and amplifier A2Q3.

4-16. When the crystal (XTAL) operating mode is selected, -15V dc is applied to P1-21 and routed to terminal A2E2 to energize the oscillator. The operating frequency of the oscillator is determined by the CR-52A/U or CR-65A/U (with oven) mounted in front panel receptacle J3. The crystal is electrically connected between the collector and base of A2Q1 and must be cut for operation between 33.125 and 46.25 MHz. Output from the oscillator is taken from the collector of Q1 and is applied to tuned doubler Q2. This stage is also voltage tuned in the same manner as the rf amplifier and other multiplier stages. Capacitors C10 and C14, and inductors L4 and L5 set the range of the multiplier, and diodes CR1 through CR14 are employed to tune the circuit; the bandwidth of the doubler is approximately 3 MHz.

4-17. From the doubler, the 66.25 - 92.5 MHz signal is further amplified by Q3 and coupled through J2 to J7 on subassembly A1. The signal applied to A1J7 is then routed through the same multiplier circuit as the vfo signal and coupled to the mixer (Q4) at a frequency of 265 to 370 MHz.

4-18. EXTERNAL OSCILLATOR AND OSCILLATOR MONITOR. When it is desirable to use another receiver or a frequency synthesizer as the l-o source, both the voltage and crystal controlled oscillators are disabled. The external l-o signal is then applied to the receiver rear apron and coupled through P1-A3 and A1J6 to amplifier Q12. This signal must be between 66.25 and 92.5 MHz and at a minimum level of -13 dBm. Taken from the collector of Q12, the external l-o signal is coupled to doubler Q8 for further application to the mixer.

4-19. For monitoring purposes, the l-o signal (crystal, VCO, or external) that appears at the input of doubler Q8 is coupled to amplifier Q15 which provides the drive for the l-o output at J8. The output impedance of J8 is set at 50 ohms for compatibility with interface requirements.

4-20. FIRST MIXER AND IF AMPLIFIER (figure 7-2)

4-21. Mixer Q4 accepts the rf input from the rf amplifier and the l-o input from the oscillator multiplier chain. The two signals are then heterodyned to produce a 50 MHz intermediate frequency (i-f). This signal is further amplified by Q5 and applied to the tuner i-f output at P1-A1 for application to the receiver i-f circuitry. An output impedance of 50 ohms is established by the collector circuit of Q5 for interface purposes.

4-22. A3, DC AMPLIFIER

4-23. The dc amplifier is shown in figure 7-4 and is composed of integrated circuits U1 and U2, and transistor amplifiers Q1 through Q4. The complete module functions as an operational amplifier having a gain of 3 to obtain the +3 to +15V control voltage for application to the tuning elements in the rf amplifiers, voltage controlled oscillator and oscillator multipliers. Input to the amplifier is derived from either the internal tuning potentiometer (R1), or an external source such as a remote tuning panel, depending on the position of S1. This voltage must be between 0V dc and -6V dc and is applied to E1. The output voltage is taken from E5 and is between +3 and +15V depending on the input level. Feedback is maintained between the output and input to obtain the required stability and shaping. Potentiometers R3 and R6 are provided as the balance adjustments in order to maintain a zero volt dc output with a zero volt input. Potentiometer R11, in the feedback loop, is the scaling adjustment and is employed to set the output to +15V with a -5V input. Capacitors C4, C6, and C7 are utilized to obtain the required voltage shape. Diodes CR1 and CR2 are field-effect current regulator devices which provide a constant current that is essentially independent of voltage. They are used as constant current sources for the associated elements in the amplifier circuit.

SECTION V
MAINTENANCE

5-1. GENERAL

5-2. This section provides maintenance information for the Model 1112-VT(A) RF Tuner. Included herein are: a list of required test equipment, a list of special tools required, preventive maintenance instructions, and corrective maintenance information.

5-3. TEST EQUIPMENT

5-4. The test equipment required to test, troubleshoot, and align the 1112-VT(A) is listed in table 5-1. Equipments listed are those recommended by Microdyne Corporation and direct equivalents may be substituted.

Table 5-1. Required Test Equipment

Signal Generator	HP608
Oscilloscope Dual Channel	HP1200A
Sweep Generator	Texscan VS-50
RF Detector	HP8471A
Noise Figure Meter (50 MHz Input)	HP342B
VHF Noise Source	HP343A
Auto Voltmeter	HP414A
Frequency Counter	HP5245L
Counter Converter	HP5253B
Broadband Sampling Voltmeter	HP3406A
RF Amplifier	Boonton 230A
BNC to Sealectro Adapters (4)	Sealectro 50-077-6801
Clip-On Milliammeter	HP428B
Digital Voltmeter	Fluke 8300A

5-5. SPECIAL CABLES

5-6. In order to test, troubleshoot, and align the rf tuner, the unit is to be connected to the receiver base chassis with special extender cables. These cables are available from Microdyne under the following part numbers: 200-452 and 200-453. These cables may also be fabricated using the following procedure:

a. Obtain the following material:

1. RG-174/U cable — length should be sufficient to make three equal-length cables approximately three feet long.
2. RG-223/U cable, approximately three feet long.
3. One roll of #24 insulated multistrand wire.

4. One set Cannon DCM-25W3P and DCM-25W3S connectors with coaxial inserts.
5. One Gremar 11749-1 and one Gremar 16908-1 connector.

b. Cut the #24 wire into twenty-two three-foot lengths and make connections between corresponding pins of the two Cannon connectors.

c. Connect the RG-174/U cable between corresponding coaxial inserts in the two Cannon connectors (A1-A2-A3). These inserts should not be permanently affixed to connectors since they must be removed for alignment. This completes fabrication of the i-f/power cable.

d. Connect the Gremar 11749-1 and 16908-1 connectors to the length of RG-223/U cable. This completes fabrication of the rf cable.

5-7. PERFORMANCE TESTS

5-8. The following tests should be performed at six-month intervals to insure proper operation of the tuner. Any discrepancies noted should be corrected immediately.

5-9. NOISE FIGURE

5-10. The procedure for measuring the noise figure is given in paragraph 5-38.

5-11. GAIN

5-12. The procedure for checking the tuner gain is given in paragraph 5-39.

5-13. LOCAL OSCILLATOR FREQUENCY

5-14. To check the local oscillator frequency, proceed as follows:

a. Connect the frequency counter (HP5245L/HP5253B) to the receiver first l-o monitor output.

b. Set the tuner 1ST LO MODE switch to VFO.

c. Measure and note the frequency at the low, middle, and high points in the tuning band.

d. Multiply each frequency by 4 and subtract 50 MHz; the calculated frequency should be within ±1% of the dial.

e. Disconnect all test equipment.

5-15. PERIODIC ADJUSTMENTS

5-16. No periodic adjustments are required during normal operation of the 1112-VT(A).

5-17. PREVENTIVE MAINTENANCE

5-18. Preventive maintenance requirements for the tuner consist of the performance test described in paragraph 5-7 and a visual inspection checking for:

a. Loose hardware - tighten immediately to prevent the occurrence of short circuits.

b. Loose or broken connectors - repair or replace as required.

c. Resistors for burning or discoloration - replace after determining the cause of overheating.

d. Wires for cuts, cracks, or frayed insulation - repair by replacing or taping.

5-19. Lubrication is not required for any tuner component.

5-20. CORRECTIVE MAINTENANCE

5-21. Corrective maintenance consists of troubleshooting, repair, and alignment. Information pertaining to these subjects is given in paragraphs 5-22, 5-25, and 5-28.

5-22. TROUBLESHOOTING

5-23. To properly troubleshoot the tuner, connect it to the parent unit using the test cables described in paragraph 5-5.

5-24. The first step in troubleshooting the tuner is to apply a test signal to the tuner noting which outputs are absent, the effects that controls have and do not have, and other indications on the parent unit. Reference should then be made to the schematic diagram and block diagram to determine which stages are common to the problem. For example, if there is no i-f output in vfo operation, but the unit functions normally in crystal operation, the fault probably lies in the vfo or associated buffer. A voltage chart is shown in table 5-2 to aid in locating the defective component.

Table 5-2. Static DC Voltages

Device	E	B	C	S	G	D
Q1	-10.3	- 9.6	+ 0.9			
Q2				+0.9	-0.91	+14.8
Q3				+0.9	0	+14.8
Q4	- 7.9	- 7.2	+14.6			
Q5	-12.2	-11.4	- 0.14			
Q6	- 4.6	- 4	- 2			
Q7	- 8.6	- 7.9	- 1.3			
Q8	+ 6.5	+ 7.1	+14.9			

continued

Table 5-2, continued

Device	E	B	C	S	G	D
Q9	+ 6.1	+ 6.8	+14.7			
Q10	-13	-13.7	-14.1			
Q11	-15	-14.75	- 1.3			
Q15	- 8.1	- 7.3	- 1.3			
A2Q1 (crystal box)	- 4	- 3.5	- 0.5 (XTAL mode)			
A2Q2 (crystal box)	- 6.8	- 4.2	0 (XTAL mode)			
A2Q3 (crystal box)	- 7.2	- 6.6	- 0.7 (XTAL mode)			

1. All voltages were measured with a Fluke 8300A digital voltmeter.
2. Voltages may vary up to ±10% between units.
3. Except for Q1, Q2, and Q3 on the crystal subassembly, all voltages are to be taken with the 1ST LO MODE switch in the VFO position.

Table 5-3. DC Amplifier DC Voltages

Test Point	Voltage
E10	-2.56
E11	-0.001
E12	-0.991
E13	-5.05

Device	E	B	C
Q1	-5.6	-5.4	+ 8.6
Q2	+7.6	+8.6	+70 *
Q3	+7.67	+7.6	+70 *
Q4	+7.62	+7.67	+ 8.6*

NOTE: E1 set to -2.55V dc with front panel TUNING control.
* +70V dc level is dependent on receiver unregulated high voltage power supply and may vary ±10%.

NOTE

After a malfunction has been located and repaired, it may be necessary to realign the circuitry in that section. Critical circuitry generally contained in rf tuners requires utmost care in this procedure, and alignment should only be attempted with the use of the proper test equipment. Since only slight adjustments are necessary after a component has been replaced, it is recommended that the alignment procedure be followed very carefully. Only realign in the area of repair; i.e., i-f amplifier, vfo, etc.

5-25. REPAIR

5-26. Once the defective component has been located, it should be replaced with an identical component as referenced in Section VI for best results. Since the majority of components are soldered in place, extreme care must be exercised when handling a soldering iron to prevent damaging adjacent circuitry. Heat sinks should also be employed to prevent thermal damage.

5-27. After a component has been replaced, thoroughly check the area in which work was done for excess solder and dirt. The joint itself should be cleaned and checked for permanent connection.

5-28. ALIGNMENT

5-29. After completing all repairs, the unit must be tested and, if necessary, realigned prior to operation. Normally, only the stage or stages in which work was done will require alignment. Other stages may be checked per paragraph 5-7 or by making measurements following the alignment procedure.

5-30. SETUP. To prepare the tuner for realignment, remove the bottom cover and connect the unit to the receiver with the test cables noted in paragraph 5-5. Set the receiver for local operation and allow sufficient warmup. No warmup is required when performing paragraph 5-31 since measurement must be made during the warmup period.

5-31. DC AMPLIFIER. The following procedure should be incorporated only when the dc amplifier has been repaired.

a. Connect the HP428B clip-on milliammeter to the -15V line on the power and control cable.

b. Note the current at the time of power turn-on.

c. Observe that the current decreases by approximately 100 mA after five minutes due to the oven reaching normal temperatures.

d. Disconnect the milliammeter.

e. Set the TUNING control to 279 MHz. Connect the digital voltmeter to R3 and adjust R2 for -5.800V dc. R2 is mounted on a bracket behind the front panel.

f. Set the TUNING control to 279 MHz and, using the digital voltmeter, measure the voltage between A3E1 and ground; it should be -2.475V dc. If not, disengage the coupling between the tuning potentiometer (R1) and the shaft. Adjust R1 for -2.475V dc and tighten the coupling.

g. Connect the digital voltmeter between A3E1 and A3E10.

h. Adjust A3R3 for 0.00V dc.

i. Move the digital voltmeter between A3E12 and A3E11.

j. Adjust A3R6 for 0.00V dc.

k. Measure and note the voltage at A3E1. Connect the voltmeter between A3E5A or E5B and ground.

l. Adjust A3R11 for four times the level noted in step k.

m. Repeat steps e through l as often as necessary.

n. Disconnect all test equipment.

5-32. VFO ALIGNMENT. To align the vfo, proceed as follows:

a. Set the tuner 1ST LO MODE switch to VFO (local control).

b. Install the bottom cover.

c. Connect the frequency counter to P1-A1 on the tuner rear panel.

d. Set the dial to 320 MHz and adjust C43 for a 92.5 MHz counter indication.

e. Set the dial to 215 MHz and adjust L13 for a 66.25 MHz counter indication.

f. Repeat steps d and e as often as necessary to obtain the required frequencies.

g. Set the TUNING control to 265 MHz and observe that the counter indicates 78.75 MHz (±100 kHz). If other than 78.75 MHz (±100 kHz), adjust A3R11 to bring the frequency in tolerance.

h. Repeat steps d, e, f, and g.

i. Check the frequency across the band; the measured frequency should be within ±250 kHz of that required at any given point in the tuning range.

5-33. LO MULTIPLIERS ALIGNMENT. To align the local oscillator multipliers, proceed as follows:

a. Connect the HP3406A sampling voltmeter, terminated in 50 ohms, to A1J4. Set the 1ST LO MODE switch to VFO.

b. Set the dial to 320 MHz and adjust C53, C58, C66, and C74 for a peak voltmeter indication; this should occur at approximately -10 dBm.

c. Set the dial to 215 MHz and adjust L16, L17, L18, and L20 for a peak voltmeter indication of approximately -10 dBm. Use a non-metallic tuning tool for these adjustments.

d. Repeat steps b and c until maximum voltage is obtained at 215 and 320 MHz.

e. Disconnect all test equipment.

5-34. CRYSTAL OSCILLATOR ALIGNMENT. To align the crystal oscillator, proceed as follows:

a. Set the tuner 1ST LO MODE switch to EXT.

b. Disconnect the cable from A1J7.

c. Connect the HP8471A detector to this cable through a 0.001 uF capacitor.

d. Connect the detector output to the video input of the Texscan VS-50 sweep generator.

e. Connect the VS-50 horizontal and vertical outputs to the respective oscilloscope inputs.

f. Connect the sweep generator rf output to J1 on the crystal box (subassembly A2).

g. Set the generator for a 92.5 MHz output at -10 dBm.

h. Set the tuner dial to 320 MHz and adjust C10 and C13 on the crystal subassembly for a double-tuned response centered at 92.5 MHz.

i. Set the tuning dial to 215 MHz and the sweep generator to 66.25 MHz.

j. Adjust L4 and L5 for a double-tuned response centered at 66.25 MHz.

k. Repeat the procedure as often as necessary to obtain optimum tracking.

l. Disconnect the test equipment and reconnect the cable to A1J7.

5-35. RF AMPLIFIER ALIGNMENT. To align the rf amplifier, proceed as follows:

a. Connect the rf output of the Texscan VS-50 sweep generator to J1.

b. Connect the HP8471A rf detector to A1J2.

c. Connect the sweep generator horizontal output and the detector output to the horizontal and vertical inputs of the oscilloscope.

d. Set the sweep generator for a 320 MHz output at -30 dBm.

e. Set the tuner 1ST LO MODE switch to EXT and the TUNING control to 320 MHz. Adjust C7, C9, C18, and C21 for a double-tuned response centered at 320 MHz.

f. Set the signal generator and tuner to 215 MHz, and adjust L4, L5, L8, and L9 for a double-tuned response centered at 215 MHz.

g. Repeat steps d, e, and f as often as necessary to obtain the required tracking.

h. Disconnect all test equipment.

5-36. IF AMPLIFIER ALIGNMENT. To align the i-f amplifier, proceed as follows:

a. Set the TUNING control to 245 MHz and the 1ST LO MODE switch to VFO.

b. Connect the Texscan VS-50 sweep generator rf output to A1J4.

c. Connect the HP8471A rf detector to P1-A3.

d. Connect the sweep generator horizontal output to the oscilloscope horizontal input and the detector output to the oscilloscope vertical input.

e. Set the sweep generator for a 50 MHz output at -10 dBm.

f. Adjust L10 and L11 for a double-tuned response centered at 50 MHz with a 3 dB bandwidth of approximately 6 MHz.

g. Disconnect all test equipment.

5-37. TESTS. After completing an alignment, the tuner should be tested prior to operational use. The tests required are given in the following paragraphs.

5-38. Noise Figure

a. Connect the HP343A noise source to the rf input J1.

b. Connect the i-f output at P1-A3 to the Boonton 230A amplifier input.

c. Connect the amplifier output to the noise figure meter 50 MHz input.

d. Set the tuner 1ST LO MODE switch to VFO and check the noise figure across the band; it should be 6.5 dB or less.

e. Set the tuner 1ST LO MODE switch to XTAL (local control) and check the noise figure for each available crystal; the noise figure should again be 6.5 dB or less.

f. Disconnect all test equipment.

5-39. Gain and AGC

a. Connect the HP608 signal generator to the rf input at J1.

b. Connect the HP3406A, terminated in 50 ohms, to the i-f output at P1-A1.

c. Set the HP608 for an output of 250 MHz at -40 dBm.

d. Set the tuner to 250 MHz. Use a frequency counter to accurately set the frequencies; the tuner first l-o output at P1-A1 will indicate 75 MHz when correctly tuned.

e. Set the receiver AGC TIME CONSTANT MSEC switch to MAN and adjust the MAN GAIN control for -0.00V dc on the tuner agc line.

f. Measure gain; it should be 20 dBm ±3 dB. If not, adjust the channel gain control R30 for a meter indication of -16 dBm ±0.5 dB.

g. Set the MAN GAIN control for -5V dc on the agc line.

h. Adjust R20 for maximum gain reduction.

i. Disconnect all test equipment.

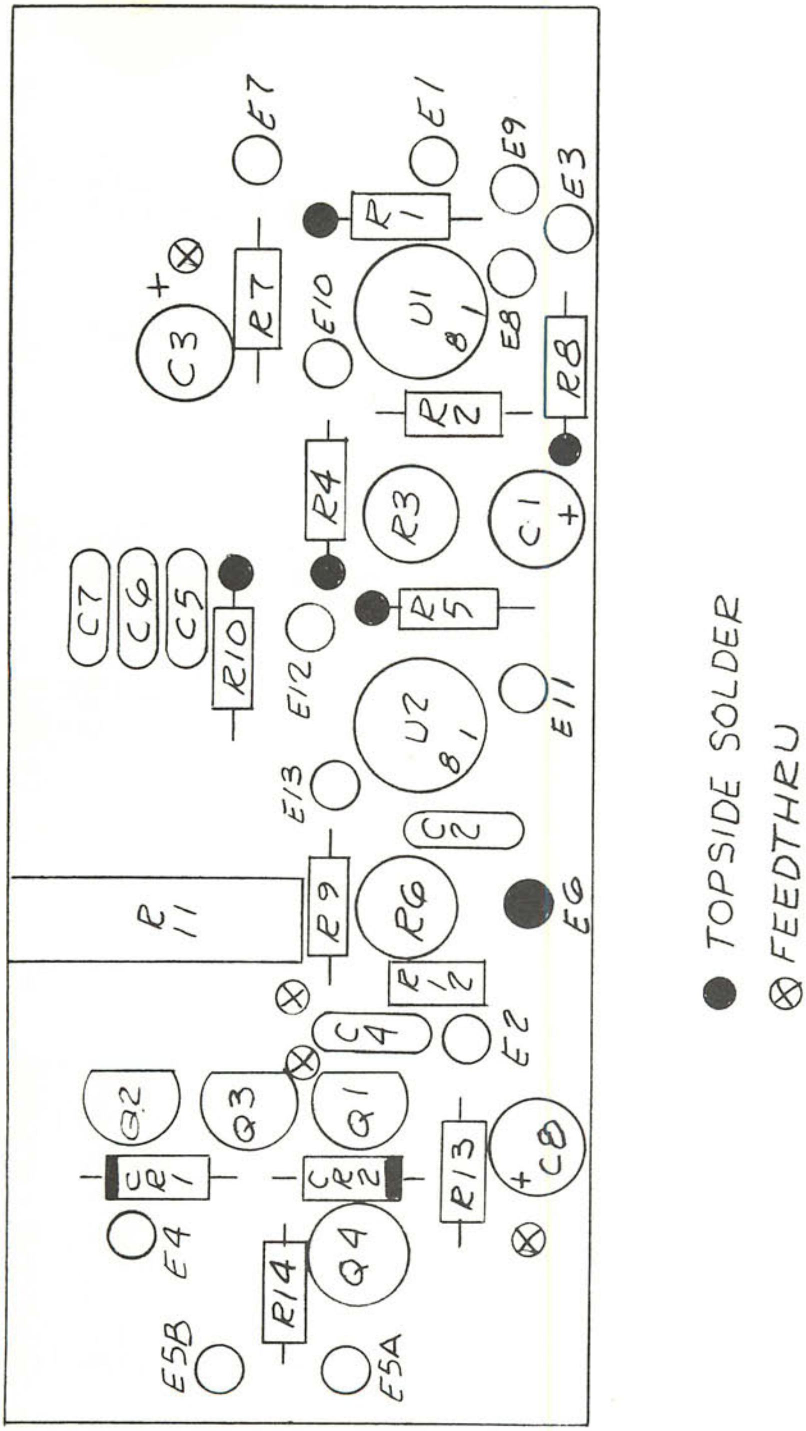


Figure 5-1. DC Amplifier, Component Location

SECTION VI
REPLACEMENT PARTS LIST

6-1 GENERAL

6-2 This section contains the replacement parts list for the 1112-VT(A) RF Tuner and all subassemblies contained therein. Parts are listed alphanumerically by subassembly and provide the reference designator, description, manufacturer, and manufacturer's part number. Include all component information when ordering spare or replacement parts.

6-3 MAIN CHASSIS

Reference Designation	Description
A1	RF Chassis, Microdyne 101-110; see paragraph 6-4 for breakdown listing
A2	Crystal Oscillator and Multiplier, Microdyne 101-109; see paragraph 6-5 for breakdown listing
A3	DC Amplifier, Microdyne 100-966; see paragraph 6-6 for breakdown listing
C1	Capacitor, ceramic, 220 pF ±20%, 100V, Erie 8101-100-X5R-221M
J1	Connector, Gremar 16908-1
P1	Connector, Cannon DCM25W3P
P1-A1	Insert, Cannon DM53740-1
P1-A2	Insert, Cannon DM53740-1
P1-A3	Insert, Cannon DM53740-1
P2 thru P7	Connector, Phelps Dodge UG1465/U
R1	Resistor, variable, 10KΩ ±10%, 2w, Bourns 3501S-1-103
R2	Resistor, variable, 200Ω, $\frac{1}{4}$w, Helitrim 78SR200BW
R3	Resistor, fixed composition, 1KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB1025
S1	Switch, with dress nut and blue cap, C&K 7101
Z1	Not Assigned
Z2 thru Z7	Ferrite Bead, Fair Rite 2673000101

6-4 A1, RF CHASSIS

Reference Designation	Description
C1	Capacitor, ceramic, 10 pF ±5%, 100V, Erie 8101-100-COG-100J
C2	Capacitor, ceramic, 110 pF ±5%, 100V, Erie 8121-100-COG-111J

Replacement Parts List - A1, RF Chassis, continued

Reference Designation	Description
C3	Capacitor, ceramic, 0.75 pF ±5%, Quality Components MC-0.75
C4	Capacitor, ceramic, 2.4 pF ±0.1 pF, 100V, Erie 8101-100-COG-249B
C5	Capacitor, ceramic, 100 pF ±20%, 100V, Erie 8101-100-X5R-101M
C6	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C7	Capacitor, variable, 0.8 - 8.5 pF, LRC 682237
C8	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C9	Capacitor, variable, 0.8 - 8.5 pF, LRC 682237
C10	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C11	Capacitor, ceramic, 100 pF ±20%, 100V, Erie 8101-100-X5R-101M
C12 thru C15	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C16	Capacitor, ceramic, 100 pF ±20%, 100V, Erie 8101-100-X5R-101M
C17	Capacitor, feedthru, 47 pF ±20%, 1000V, Erie 2482-001-X5U-470M
C18	Capacitor, variable, 0.8 - 8.5 pF, LRC 682237
C19	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C20	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C21	Capacitor, variable, 0.8 - 8.5 pF, LRC 682237
C22	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C23	Capacitor, ceramic, 100 pF ±20%, 100V, Erie 8101-100-X5R-101M
C24	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C25	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C26	Capacitor, ceramic, 100 pF ±20%, 100V, Erie 8101-100-X5R-101M
C27	Capacitor, ceramic, 4.7 pF ±0.25 pF, 100V, Erie 8101-100-COG-479C
C28	Capacitor, ceramic, 0.91 pF ±5%, Quality Components MC-0.91
C29	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C30	Capacitor, ceramic, 4.7 pF ±0.25 pF, 100V, Erie 8101-100-COG-479C
C31	Capacitor, feedthru, 47 pF ±20%, 1000V, Erie 2482-001-X5U-470M
C32	Capacitor, ceramic, 91 pF ±5%, 100V, Erie 8111-100-COG-910J
C33	Capacitor, ceramic, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C34	Capacitor, ceramic, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C35	Capacitor, ceramic, 0.01 μF ±20%, 100V, Erie 8131-B106-X5V0-103M
C36	Capacitor, ceramic, 43 pF ±5%, 100V, Erie 8121-100-COG-430J
C37	Capacitor, ceramic, 68 pF ±5%, 100V, Erie 8121-100-COG-680J
C38	Capacitor, ceramic, 0.001 μF ±20%, 100V, Erie 8111-100-X5R-102M
C39	Capacitor, ceramic, 33 pF ±5%, 100V, Erie 8121-100-COG-330J
C40	Capacitor, ceramic, 1.5 pF ±0.1 pF, 100V, Erie 8101-100-COG-159B
C41	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C42	Capacitor, ceramic, 430 pF ±5%, 100V, Erie 8121-100-COG-431J
C43	Capacitor, variable, 0.8 - 8.5 pF, LRC 682237
C44	Capacitor, ceramic, 68 pF ±5%, 100V, Erie 8121-100-COG-680J

Replacement Parts List - A1, RF Chassis, continued

Reference Designation	Description
C45	Capacitor, variable, 27 pF ±5%, 100V, Erie 8121-100-COG-270J
C46	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C47	Capacitor, ceramic, 10 pF ±5%, 100V, Erie 8121-100-COG-100J
C48	Capacitor, ceramic, 0.001 μF ±20%, 100V, Erie 8111-100-X5R-102M
C49	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C50	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C51	Capacitor, ceramic, 20 pF ±5%, 100V, Erie 8111-100-COG-200J
C52	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C53	Capacitor, variable, 0.8 - 8.5 pF, LRC 682237
C54	Capacitor, ceramic, 30 pF ±5%, 100V, Erie 8121-100-COG-300J
C55 thru C57	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C58	Capacitor, variable, 0.8 - 8.5 pF, LRC 682237
C59	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C60	Capacitor, ceramic, 10 pF ±5%, 100V, Erie 8121-100-COG-100J
C61	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C62	Capacitor, ceramic, 47 pF ±20%, 100V, Erie 8101-100-X5R-470M
C63	Capacitor, ceramic, 4.3 pF ±0.1 pF, 100V, Erie 8101-100-COG-439C
C64	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C65	Capacitor, ceramic, 47 pF ±20%, 100V, Erie 8101-100-X5R-470M
C66	Capacitor, variable, 0.8 - 8.5 pF, LRC 682237
C67	Capacitor, feedthru, 0.001 μF, Allen Bradley FA5C-102W
C68	Capacitor, ceramic, 47 pF ±5%, 100V, Erie 8131-100-COG-470J
C69	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C70	Capacitor, ceramic, 0.001 μF ±20%, 100V, Erie 8111-100-X5R-102M
C71	Capacitor, ceramic, 0.001 μF ±20%, 100V, Erie 8111-100-X5R-102M
C72	Capacitor, ceramic, 6.8 pF ±1%, 100V, Erie 8101-100-COGO-689B
C73	Capacitor, ceramic, 43 pF ±5%, 100V, Erie 8121-100-COG-430J
C74	Capacitor, variable, 0.8 - 8.5 pF, LRC 682237
C75	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C76	Capacitor, ceramic, 9.1 pF ±0.25 pF, 100V, Erie 8101-100-COG-919C
C77	Capacitor, ceramic, 9.1 pF ±0.25 pF, 100V, Erie 8101-100-COG-919C
C78	Capacitor, ceramic, 4.3 pF ±0.25 pF, 100V, Erie 8101-100-COG-439C
C79	Capacitor, ceramic, 20 pF ±5%, 100V, Erie 8111-100-COG-200J
C80	Capacitor, ceramic, 3 pF ±0.1 pF, 100V, Erie 8101-100-COG-309B
C81	Capacitor, ceramic, 0.75 pF ±5%, Quality Components MC-0.75
C82	Capacitor, tantalum, 330 μF, 6V, Kemet K330E6, T362D337M006AS
C83	Capacitor, ceramic, 20 pF ±5%, 100V, Erie 8111-100-COG-200J
C84	Capacitor, ceramic, 0.001 μF ±20%, 100V, Erie 8111-100-X5R-102M
C85	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C86	Capacitor, ceramic, 0.001 μF ±20%, 100V, Erie 8111-100-X5R-102M

Replacement Parts List - A1, RF Chassis, continued

Reference Designation	Description
C87	Capacitor, ceramic, 220 pF ±20%, 100V, Erie 8101-100-X5R-221M
C88	Capacitor, ceramic, 220 pF ±20%, 100V, Erie 8101-100-X5R-221M
C89	Capacitor, ceramic, 220 pF ±20%, 100V, Erie 8101-100-X5R-221M
CR1 thru CR4	Diode, Microdyne 301-476-1
CR5	Diode, Microdyne 301-476-2
CR6	Diode, Microdyne 301-476-1
CR7	Diode, Microdyne 301-476-1
CR8	Diode, Microdyne 301-476-2
CR9 thru CR14	Diode, Microdyne 301-476-1
CR15	Diode, Motorola 1N4743A
E1 thru E4	Termination, feedthru, teflon, Sealectro FT-SM-1
E5	Termination, standoff, teflon, Sealectro ST-SM-1
E6	Termination, standoff, teflon, Sealectro ST-SM-1
E7 thru E9	Termination, feedthru, teflon, Sealectro FT-SM-1
E10	Termination, standoff, teflon, Sealectro ST-SM-1
E11	Termination, feedthru, teflon, Sealectro FT-SM-1
E12	Termination, feedthru, teflon, Sealectro FT-SM-1
E13	Termination, standoff, teflon, Sealectro ST-SM-1
E14	Termination, standoff, teflon, Sealectro ST-SM-1
E15	Termination, feedthru, teflon, Sealectro FT-SM-1
E16	Termination, standoff, teflon, Sealectro ST-SM-1
E17	Termination, feedthru, Sealectro FT-SM-1
E18	Termination, standoff, teflon, Sealectro ST-SM-1
E19	Termination, standoff, teflon, Sealectro ST-SM-1
E20	Termination, feedthru, teflon, Sealectro FT-SM-1
E21	Termination, feedthru, teflon, Sealectro FT-SM-1
E22 thru E24	Termination, standoff, teflon, Sealectro ST-SM-1
E25	Termination, feedthru, teflon, Sealectro FT-SM-1
E26	Termination, feedthru, Sealectro FT-SM-1
E27	Termination, standoff, Sealectro ST-SM-1

Replacement Parts List - A1, RF Chassis, continued

Reference Designation	Description
J1 thru J8	Connector, Phelps Dodge UG-1619/U
L1	Inductor, variable, Microdyne 201-129
L2	Inductor, variable, Microdyne 201-130
L3	Inductor, variable, Microdyne 201-129
L4	Inductor, variable, Microdyne 201-298
L5	Inductor, variable, Microdyne 201-298
L6	Inductor, 0.22 µH, Jeffers 4416-5K
L7	Inductor, 0.15 µH, Jeffers 4415-1M
L8	Inductor, variable, Microdyne 201-299
L9	Inductor, variable, Microdyne 201-298
L10	Inductor, variable, Cambion 1507-5
L11	Inductor, variable, Cambion 1507-5
L12	Inductor, fixed, Microdyne 200-720
L13	Inductor, variable, LRC 681221
L14	Inductor, 0.47 µH, Jeffers 4425-2M
L15	Inductor, 4.7 µH, Jeffers 4425-14K
L16	Inductor, variable, Microdyne 201-300
L17	Inductor, variable, Microdyne 201-300
L18	Inductor, variable, Microdyne 201-301
L19	Inductor, 0.015 µH, Jeffers 4415-1M
L20	Inductor, variable, Microdyne 201-301
L21	Inductor, 5.6 µH, Jeffers 4435-1K
L22	Inductor, 0.68 µH, Jeffers 4425-4K
L23	Inductor, fixed, Microdyne 201-302
L24	Inductor, 5.6 µH, Jeffers 4435-1K
P1	Not Assigned
P2	Connector, Phelps Dodge UG-1465/U
P3	Connector, Phelps Dodge UG-1465/U
Q1	Transistor, RCA 2N6389
Q2	Transistor, Union Carbide 2N4416
Q3	Transistor, Union Carbide 2N4416
Q4 thru Q9	Transistor, RCA 2N5179
Q10	Transistor, Sprague 2N4413
Q11	Transistor, RCA 2N5179
Q12	Transistor, RCA 2N5179

Replacement Parts List - A1, RF Chassis, continued

Reference Designation	Description
Q13	Not Assigned
Q14	Not Assigned
Q15	Transistor, RCA 2N5179
R1	Resistor, fixed composition, 100KΩ ±5%, ¼w, Allen Bradley CB1045
R2	Resistor, fixed composition, 10Ω ±5%, ¼w, Allen Bradley CB1005
R3	Resistor, fixed composition, 100KΩ ±5%, ¼w, Allen Bradley CB1045
R4	Resistor, fixed composition, 10Ω ±5%, ¼w, Allen Bradley CB1005
R5	Resistor, fixed composition, 100Ω ±5%, ¼w, Allen Bradley CB1015
R6	Resistor, fixed composition, 10Ω ±5%, ¼w, Allen Bradley CB1005
R7	Resistor, fixed composition, 10Ω ±5%, ¼w, Allen Bradley CB1005
R8	Resistor, fixed composition, 750Ω ±5%, ¼w, Allen Bradley CB7515
R9	Resistor, fixed composition, 200KΩ ±5%, ¼w, Allen Bradley CB2045
R10	Resistor, fixed composition, 10KΩ ±5%, ¼w, Allen Bradley CB1035
R11	Resistor, fixed composition, 2.7KΩ ±5%, ¼w, Allen Bradley CB2725
R12	Resistor, fixed composition, 10Ω ±5%, ¼w, Allen Bradley CB1005
R13	Resistor, fixed composition, 10Ω ±5%, ¼w, Allen Bradley CB1005
R14	Resistor, fixed composition, 100KΩ ±5%, ¼w, Allen Bradley CB1045
R15	Resistor, fixed composition, 10Ω ±5%, ¼w, Allen Bradley CB1005
R16	Resistor, fixed composition, 4.3KΩ ±5%, ¼w, Allen Bradley CB4325
R17	Resistor, fixed composition, 4.3KΩ ±5%, ¼w, Allen Bradley CB4325
R18	Resistor, fixed composition, 1.3KΩ ±5%, ¼w, Allen Bradley CB1325
R19	Resistor, fixed composition, 5.1KΩ ±5%, ¼w, Allen Bradley CB5125
R20	Resistor, variable, 10KΩ ±5%, ¼w, Allen Bradley WA2L040S103UC
R21	Resistor, fixed composition, 4.7KΩ ±5%, ¼w, Allen Bradley CB4725
R22	Resistor, fixed composition, 10Ω ±5%, ¼w, Allen Bradley CB1005
R23	Resistor, fixed composition, 1.2KΩ ±5%, ¼w, Allen Bradley CB1225
R24	Resistor, fixed composition, 5.1KΩ ±5%, ¼w, Allen Bradley CB5125
R25	Resistor, fixed composition, 51Ω ±5%, ¼w, Allen Bradley CB5105
R26	Resistor, fixed composition, 20Ω ±5%, ¼w, Allen Bradley CB2005
R27	Resistor, fixed composition, 680Ω ±5%, ¼w, Allen Bradley CB6815
R28	Resistor, fixed composition, 51Ω ±5%, ¼w, Allen Bradley CB5105
R29	Resistor, fixed composition, 100KΩ ±5%, ¼w, Allen Bradley CB1045
R30	Resistor, variable, 10KΩ ±5%, ¼w, Allen Bradley WA2L040S103UC
R31	Resistor, fixed composition, 20Ω ±5%, ¼w, Allen Bradley CB1005
R32	Resistor, fixed composition, 10Ω ±5%, ¼w, Allen Bradley CB1005
R33	Resistor, fixed composition, 1.8KΩ ±5%, ¼w, Allen Bradley CB1825
R34	Resistor, fixed composition, 910Ω ±5%, ¼w, Allen Bradley CB9115
R35	Resistor, fixed composition, 100KΩ ±5%, ¼w, Allen Bradley CB1045
R36	Resistor, fixed composition, 270Ω ±5%, ¼w, Allen Bradley CB2715
R37	Resistor, fixed composition, 510Ω ±5%, ¼w, Allen Bradley CB5115
R38	Resistor, fixed composition, 51Ω ±5%, ¼w, Allen Bradley CB5105

Replacement Parts List - A1, RF Chassis, continued

Reference Designation	Description
R39	Resistor, fixed composition, 4.3KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB4325
R40	Resistor, fixed composition, 4.3KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB4325
R41	Resistor, fixed composition, 750Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB7515
R42	Resistor, fixed composition, 510Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB5115
R43	Resistor, fixed composition, 4.3KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB4325
R44	Resistor, fixed composition, 4.3KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB4325
R45	Resistor, fixed composition, 620Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB6215
R46	Resistor, fixed composition, 10Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1005
R47	Resistor, fixed composition, 100KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB1045
R48	Resistor, fixed composition, 10Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1005
R49	Resistor, fixed composition, 10Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1005
R50	Resistor, fixed composition, 16KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB1635
R51	Resistor, fixed composition, 4.3KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB4325
R52	Resistor, fixed composition, 1KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB1025
R53	Resistor, fixed composition, 1KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB1025
R54	Resistor, fixed composition, 10Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1005
R55	Resistor, fixed composition, 15KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB1535
R56	Resistor, fixed composition, 1KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB1025
R57	Resistor, fixed composition, 1.2KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB1225
R58	Resistor, fixed composition, 18Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1805
R59	Resistor, fixed composition, 100Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1015
R60	Resistor, fixed composition, 200Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB2015
R61	Resistor, fixed composition, 18Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1805
R62	Resistor, fixed composition, 18Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1805
R63	Resistor, fixed composition, 10Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1005
R64	Resistor, fixed composition, 4.3KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB4325
R65	Resistor, fixed composition, 4.3KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB4325
R66	Resistor, fixed composition, 750Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB7515
R67	Resistor, fixed composition, 100Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1015
R68	Resistor, fixed composition, 51Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB5105
R69	Resistor, fixed composition, 51Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB5105
R70	Resistor, fixed composition, 10Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1005
R71	Resistor, fixed composition, 100KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB1045
R72	Resistor, fixed composition, 10Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1005
R73	Resistor, fixed composition, 100KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB1045
R74	Resistor, fixed composition, 10KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB1035
R75	Resistor, fixed composition, 10Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1005
R76	Resistor, fixed composition, 680Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB6815
R77	Not Assigned
R78	Resistor, fixed composition, 620Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB6215
R79	Resistor, fixed composition, 750Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB7515
R80	Resistor, fixed composition, 10Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1005

Replacement Parts List - A1, RF Chassis, continued

Reference Designation	Description
R81	Resistor, fixed composition, 510Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB5115
R82	Resistor, fixed composition, 4.3KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB4325
R83	Resistor, fixed composition, 750Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB7515
R84	Resistor, fixed composition, 4.3KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB4325
U1	Oscillator Oven, Microdyne 301-053
XQ1 thru XQ11	Socket, transistor, Augat 8060-1G8
XQ12 thru XQ14	Not Assigned
XQ15	Socket, transistor, Augat 8060-1G8
Z1 thru Z3	Ferrite Bead, Fair Rite 2673000101

6-5 A2, CRYSTAL OSCILLATOR AND MULTIPLIER

Reference Designation	Description
C1	Capacitor, ceramic, 36 pF ±5%, 100V, Erie 8121-100-COG-360J
C2	Capacitor, ceramic, 24 pF ±5%, 100V, Erie 8111-100-COG-240J
C3	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C4	Capacitor, ceramic, 1000 pF ±20%, 100V, Erie 8111-100-X5R-102M
C5	Capacitor, ceramic, 82 pF ±5%, 100V, Erie 8131-100-COG-820J
C6	Capacitor, ceramic, 20 pF ±5%, 100V, Erie 8111-100-COG-200J
C7	Capacitor, ceramic, 1.0 pF ±0.1 pF, 100V, Erie 8101-100-COG-109B
C8	Capacitor, feedthru, 0.001 μF±20%, 1000V, Erie 2482-001-W5T-102P
C9	Capacitor, ceramic, 1000 pF ±20%, 100V, Erie 8111-100-X5R-102M
C10	Capacitor, variable, 0.8 - 8.5 pF, LRC 682237
C11	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C12	Capacitor, 0.75 pF ±5%, Quality Components MC-0.75
C13	Capacitor, variable, 0.8 - 8.5 pF, LRC 682237
C14	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C15	Capacitor, ceramic, 100 pF ±20%, 100V, Erie 8101-100-X5R-101M
C16	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P

Replacement Parts List - A2, Crystal Oscillator & Multiplier, continued

Reference Designation	Description
C17	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C18	Capacitor, ceramic, 1000 pF ±20%, 100V, Erie 8111-100-X5R-102M
C19	Capacitor, ceramic, 33 pF ±5%, 100V, Erie 8121-100-COG-330J
C20	Capacitor, ceramic, 68 pF ±5%, 100V, Erie 8131-100-COG-680J
C21	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C22	Capacitor, feedthru, 0.001 μF ±20%, 1000V, Erie 2482-001-W5T-102P
C23	Capacitor, ceramic, 3 pF ±0.1 pF, 100V, Erie 8101-100-COG-309B
C24	Capacitor, ceramic, 3 pF ±0.1 pF, 100V, Erie 8101-100-COG-309B
C25	Capacitor, ceramic, 0.33 μF ±20%, 100V, Erie 8131-100-651-334M
C26	Capacitor, ceramic, 0.33 μF ±20%, 100V, Erie 8131-100-651-334M
CR1 thru CR4	Diode, Microdyne 301-476-1
E1 thru E3	Termination, standoff, teflon, Sealectro ST-SM-1
J1	Connector, Bulkhead Jack, Phelps Dodge UG-1619/U
J2	Connector, Bulkhead Jack, Phelps Dodge UG-1619/U
J3	Connector, Cannon DEM-9S
L1	Inductor, 0.47 μH, Jeffers 4425-2M
L2	Inductor, 0.22 μH, Jeffers 4415-2M
L3	Inductor, 150.0 μH, Jeffers 4445-4K
L4	Inductor, variable, Microdyne 201-303
L5	Inductor, variable, Microdyne 201-303
L6	Inductor, fixed, Microdyne 201-302
L7	Inductor, 5.6 μH, Jeffers 4435-1K
Q1	Transistor, RCA 2N5179
Q2	Transistor, RCA 2N3478
Q3	Transistor, RCA 2N5179
R1	Resistor, fixed composition, 4.3KΩ ±5%, ¼w, Allen Bradley CB4325
R2	Resistor, fixed composition, 4.3KΩ ±5%, ¼w, Allen Bradley CB4325
R3	Resistor, fixed composition, 750Ω ±5%, ¼w, Allen Bradley CB7515
R4	Resistor, fixed composition, 24Ω ±5%, ¼w, Allen Bradley CB2405
R5	Resistor, fixed composition, 5.1KΩ ±5%, ¼w, Allen Bradley CB5125
R6	Resistor, fixed composition, 3.3KΩ ±5%, ¼w, Allen Bradley CB3325
R7	Resistor, fixed composition, 750Ω ±5%, ¼w, Allen Bradley CB7515

Replacement Parts List - A2, Crystal Oscillator & Multiplier, continued

Reference Designation	Description
R8	Resistor, fixed composition, 10Ω ±5%, ¼w, Allen Bradley CB1005
R9	Resistor, fixed composition, 100KΩ ±5%, ¼w, Allen Bradley CB1045
R10	Resistor, fixed composition, 100KΩ ±5%, ¼w, Allen Bradley CB1045
R11	Resistor, fixed composition, 1.5KΩ ±5%, ¼w, Allen Bradley CB1525
R12	Resistor, fixed composition, 2KΩ ±5%, ¼w, Allen Bradley CB2025
R13	Resistor, fixed composition, 510Ω ±5%, ¼w, Allen Bradley CB5115
R14	Resistor, fixed composition, 51Ω ±5%, ¼w, Allen Bradley CB5105
XQ1	Socket, Transistor, Augat 8060-1G8
XQ2	Socket, Transistor, Augat 8060-1G8
XQ3	Socket, Transistor, Augat 8060-1G8

6-6 A3, DC AMPLIFIER

Reference Designation	Description
C1	Capacitor, tantalum, 47 μF ±20%, 20V, Kemet K47E20, T362C476M020AS
C2	Capacitor, ceramic, 0.01 μF ±20%, 100V, Erie 8131-B106-X5V0-103M
C3	Capacitor, tantalum, 47 μF ±20%, 20V, Kemet K47E20, T362C476M020AS
C4	Capacitor, ceramic, 110 pF ±5%, 100V, Erie 8121-100-COG-111J
C5	Capacitor, ceramic, 0.01 μF ±20%, 100V, Erie 8131-B106-X5V0-103M
C6	Capacitor, ceramic, 0.33 μF ±20%, 100V, Erie 8121-100-651-334M
C7	Capacitor, ceramic, 0.33 μF ±20%, 100V, Erie 8121-100-651-334M
C8	Capacitor, tantalum, 47 μF ±20%, 20V, Kemet K47E20, T362C476M020AS
*CR1	Diode, Motorola 1N5285
*CR2	Diode, Motorola 1N5285
E1 thru E13	Termination, AMP 61067-1
Q1 thru Q3	Transistor, silicon, Motorola 2N4410
Q4	Transistor, silicon, Sprague 2N4384

* 1N5286 may be used in place of 1N5285 (Motorola)

Replacement Parts List - A3, DC Amplifier, continued

Reference Designation	Description
R1	Resistor, fixed composition, 5.6KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB5625
R2	Resistor, fixed composition, 1.5KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB1525
R3	Potentiometer, 10KΩ, Bourns 3329H-1-103
R4	Resistor, film, 10KΩ ±1%, 1/8w, RN55E1002F
R5	Resistor, fixed composition, 8.2KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB8225
R6	Potentiometer, 10KΩ, Bourns 3329H-1-103
R7	Resistor, fixed composition, 10Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1005
R8	Resistor, fixed composition, 10Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1005
R9	Resistor, fixed composition, 47KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB4735
R10	Resistor, film, 25.5KΩ ±1%, 1/8w, RN55E2552F
R11	Potentiometer, 25KΩ, Bourns 89WR25K
R12	Resistor, fixed composition, 91KΩ ±5%, $\frac{1}{4}$w, Allen Bradley CB9135
R13	Resistor, fixed composition, 10Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB1005
R14	Resistor, fixed composition, 620Ω ±5%, $\frac{1}{4}$w, Allen Bradley CB6215
U1	Operational Amplifier, Analog Devices AD502LH
U2	Operational Amplifier, Analog Devices AD502LH

SECTION VII
MAINTENANCE DIAGRAMS

This section contains the schematic-wiring diagrams for the 1112-VT(A) RF Tuner. Unless otherwise specified, the following information applies to each schematic diagram:

a. Capacitor values greater than 1.0 are in picofarads.

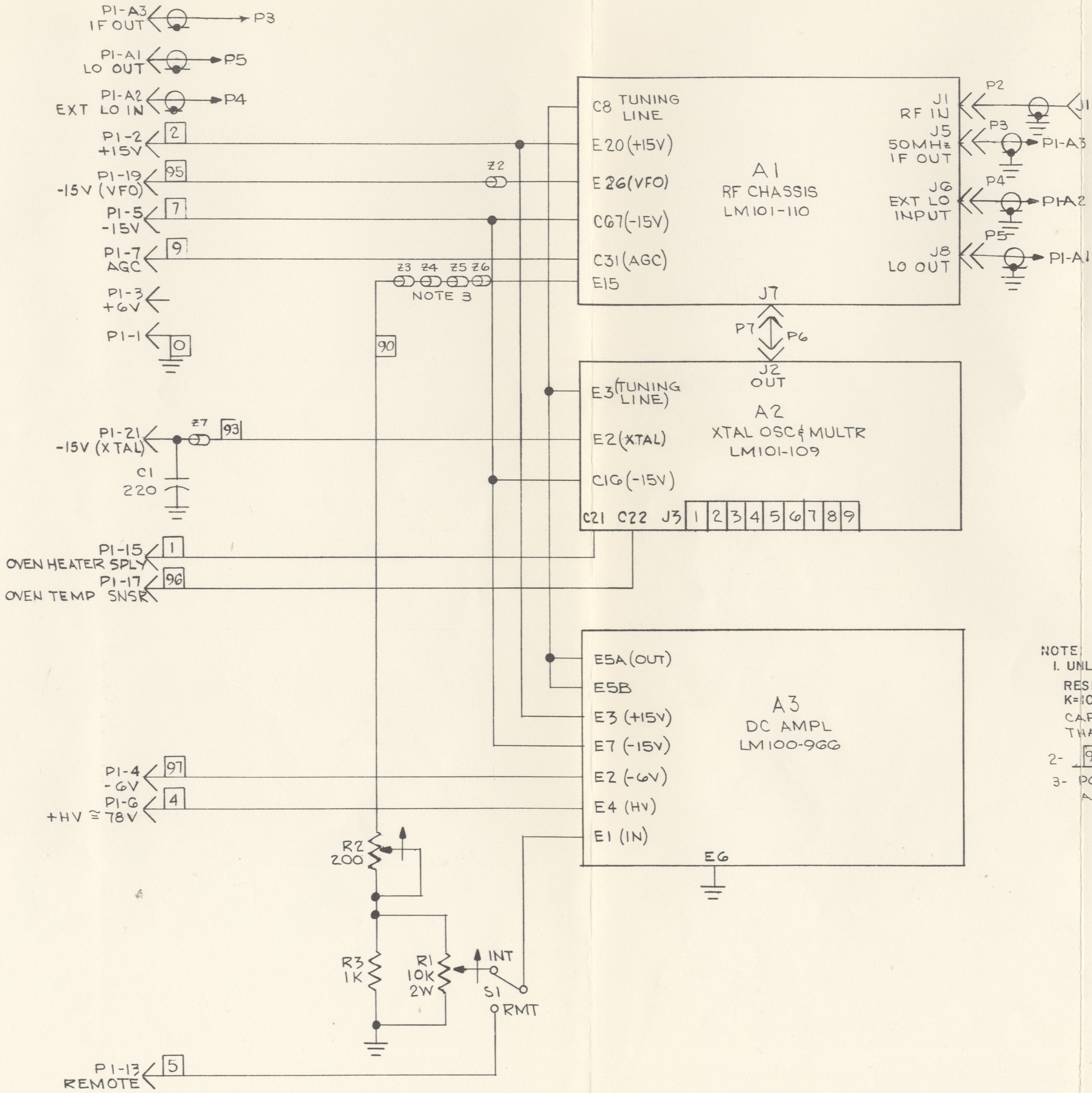
b. Capacitor values less than 1.0 are in microfarads.

c. Inductor values are in microhenrys.

d. Resistor values are in ohms: k = x 1000; m = x 1,000,000.

e. * denotes selected value.

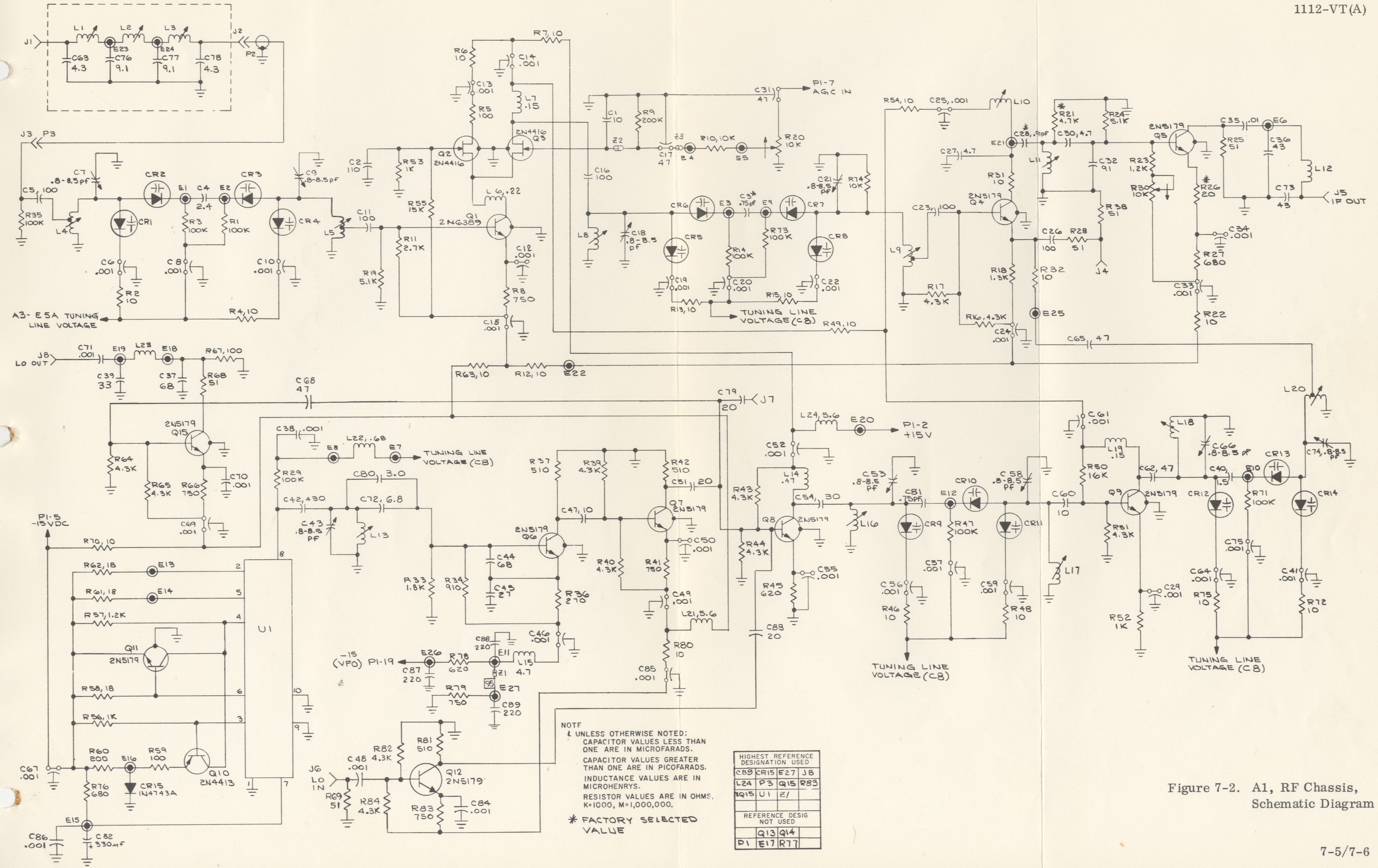
f.  ferrite bead.



NOTE:
1. UNLESS OTHERWISE NOTED:
RESISTOR VALUES ARE IN OHMS, K=1000, M=1,000,000. 1/4W
CAPACITOR VALUES GREATER THAN 1 ARE IN PICOFARADS
2- 93 WIRE COLOR
3- POSITION BEADS AS CLOSE AS POSSIBLE TO E15

HIGHEST REFERENCE DESIGNATION USED			
A3	R3	P7	J1
S1	C1	Z7	
REFERENCE DESIG NOT USED			

Figure 7-1. Main Chassis, Schematic Diagram



NOTE

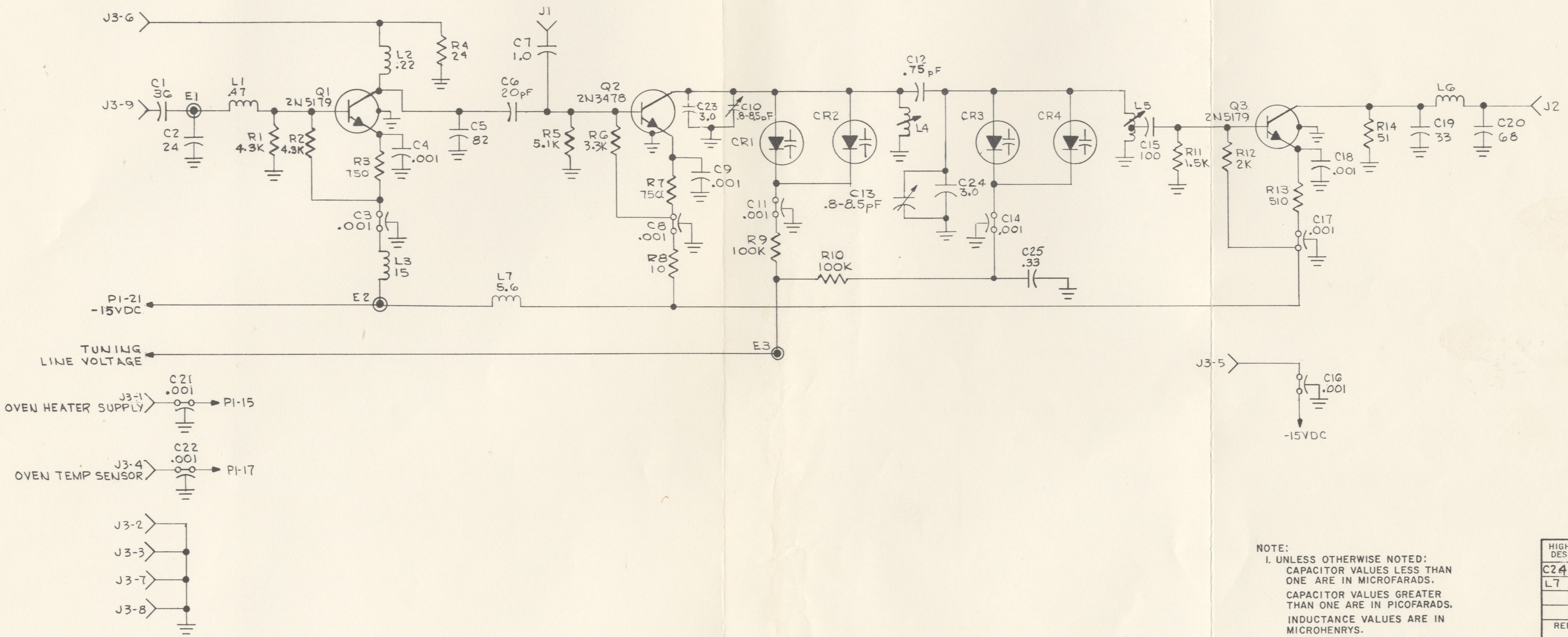
1. UNLESS OTHERWISE NOTED:
   - CAPACITOR VALUES LESS THAN ONE ARE IN MICROFARADS.
   - CAPACITOR VALUES GREATER THAN ONE ARE IN PICOFARADS.
   - INDUCTANCE VALUES ARE IN MICROHENRYS.
   - RESISTOR VALUES ARE IN OHMS, K=1000, M=1,000,000.

* FACTORY SELECTED VALUE

HIGHEST REFERENCE DESIGNATION USED			
C89	CR15	E27	J8
L24	P3	Q15	R83
Q15	U1	Z1	

REFERENCE DESIG NOT USED		
	Q13	Q14
P1	E17	R77

Figure 7-2. A1, RF Chassis, Schematic Diagram



NOTE:
1. UNLESS OTHERWISE NOTED:
   CAPACITOR VALUES LESS THAN ONE ARE IN MICROFARADS.
   CAPACITOR VALUES GREATER THAN ONE ARE IN PICOFARADS.
   INDUCTANCE VALUES ARE IN MICROHENRYS.
   RESISTOR VALUES ARE IN OHMS, K=1000, M=1,000,000.

HIGHEST REFERENCE DESIGNATION USED			
C24	CR4	E3	J3
L7	Q3	R14	
REFERENCE DESIG NOT USED			

Figure 7-3. A2, Crystal Oscillator and Multiplier, Schematic Diagram

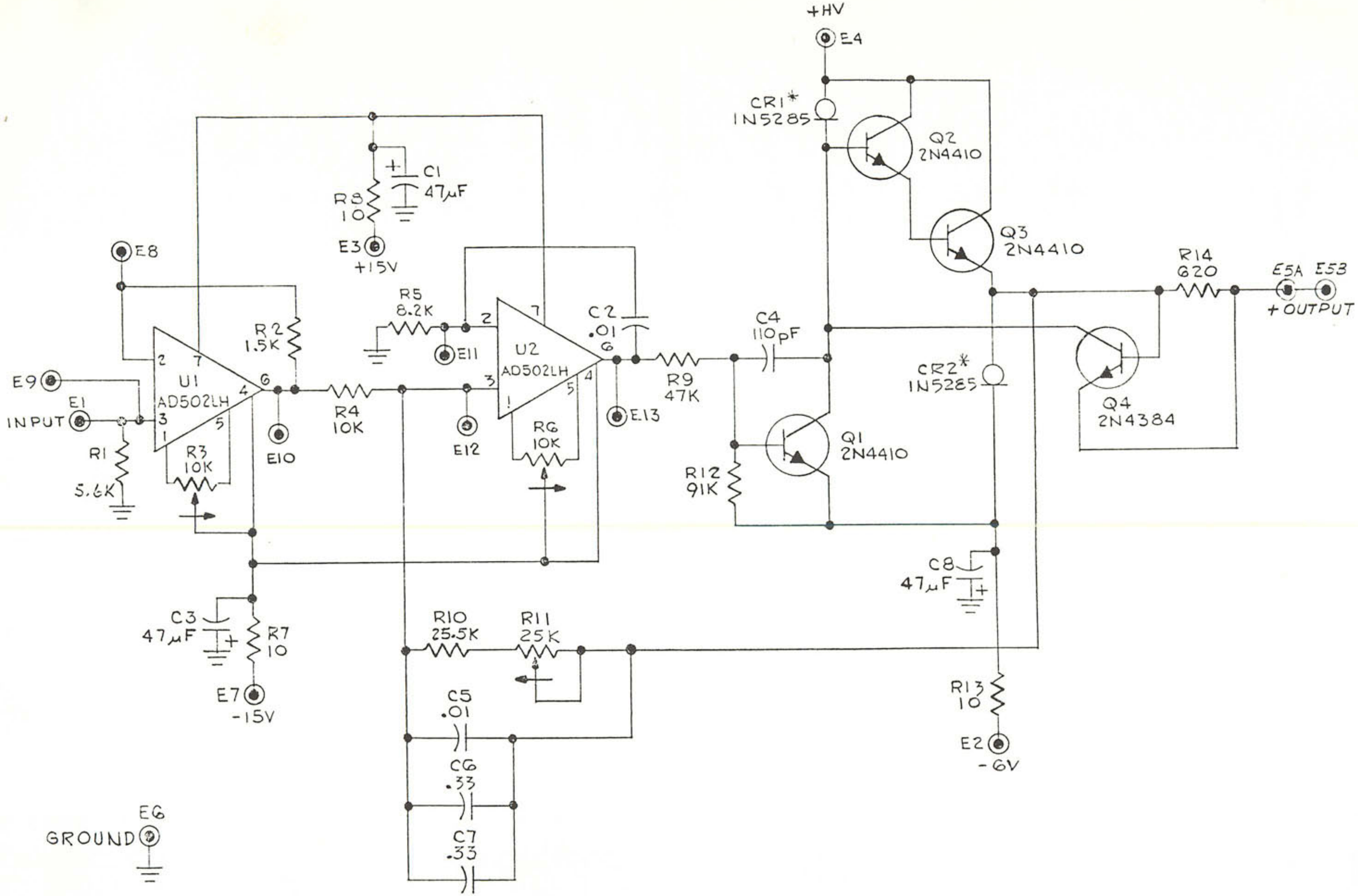


Figure 7-4. A3, DC Amplifier, Schematic Diagram