TM 11-5820-873-34

TECHNICAL MANUAL

DIRECT AND GENERAL SUPPORT

MAINTENANCE MANUAL

RADIO SET

AN/URC-92

(NSN 5820-01-057-6447)

HEADQUARTERS, DEPARTMENT OF THE ARMY

1 FEBRUARY 1980

WARNING

Several kilovolts are present at the Antenna Coupler antenna post, E1, during steps 13 thru 14b. Exercise caution and do not contact antenna post E1.

TECHNICAL MANUAL
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DEPARTMENT OF THE ARMY
WASHINGTON, DC *1 February 1980*

Direct and General Support Maintenance Manual
RADIO SET AN/URC-92
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REPORTING OF ERRORS

You can improve this manual by recommending improvements using DA Form 2028-2 (Test) located in the back of the manual. Simply tear out the self-addressed form, fill it out as shown on the sample, fold it where shown, and drop it in the mail.

If there are no blank DA Form 2028-2 (Test) in the back of your manual, use the standard DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forward it to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ Fort Monmouth, NJ 07703. A reply will be furnished direct to you.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

THE RADIO SET AN/URC-92 is COVERED BY A RELIABILITY IMPROVEMENT WARRANTY DO NOT PERFORM ANY MAINTENANCE ON THIS EQUIPMENT UNTIL AFTER THE WARRANTY PROVISIONS (TM11-5820-873-12) HAVE BEEN COMPLIED WITH.

1-1. Scope.

a. This manual contains direct and general support instructions for Radio Set AN/URC-92 (Fig. 1-1). Instructions for troubleshooting, testing, disassembling, inspecting, aligning and reassembling the components of the radio set are included in this manual. A detailed functional analysis of the AN/URC-92 is included in Chapter 2.

b. The AN/URC-92 is comprised of Radio Receiver-Transmitter RT-1277/URC-92 and Antenna Coupler CU-2229/URC-92.

1-2. Forms and Records.

a. Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750, the Army Maintenance Management System.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 700-58/NAVSUPINST 4030 29/AFR 71-13/MCO P4030 29A, and DSAR 4145.8.

c. 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 33B/AFR 75-18/MCO P4610 19C, and DLAR 4500.15.

1-3. Warranty.

a. This equipment is under a Reliability Improvement Warranty. To ensure validation of the warranty, the following steps must be taken when returning discrepant equipment.

(1) DA Form 2407 is to accompany the equipment to the contractor's facility.

(2) Fill in the required information on the WARRANTY NOTICE attached to the equipment.

b. Failure to provide the information required by those documents may invalidate the warranty.

c. Return the equipment as expeditiously as possible to the contractor at the address shown on the WARRANTY NOTICE (figure 1-2).

1-4. Destruction of Army Materiel.

Demolition and destruction of electronic equipment will be under the direction of the commander and in accordance with TM 750-4244-2.

1-5. Administrative Storage.

Administrative storage of equipment issued to and used by Army activities shall be in accordance with the procedures specified. Refer to TM 11-5820-873-12 for specific procedures to be followed when preparing the AN/URC-92 for administrative storage.

1-6. Calibration.

Calibration is not required for Radio Set AN/URC-92.

1-7. Reporting Equipment Improvement Recommendations (EIR).

If your Radio Set AN/URC-92 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 your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. We'll send you a reply.

Section II. Description of Radio Set

1-8. Description of Radio Set.

Refer to TM 11-5820-873-12 for the description and illustrations of the components of Radio Set AN/URC-92.

1-9. Tabulated Data.

Technical characteristics of Radio Set AN/URC-92 are listed in TM 11-5820-873-12.

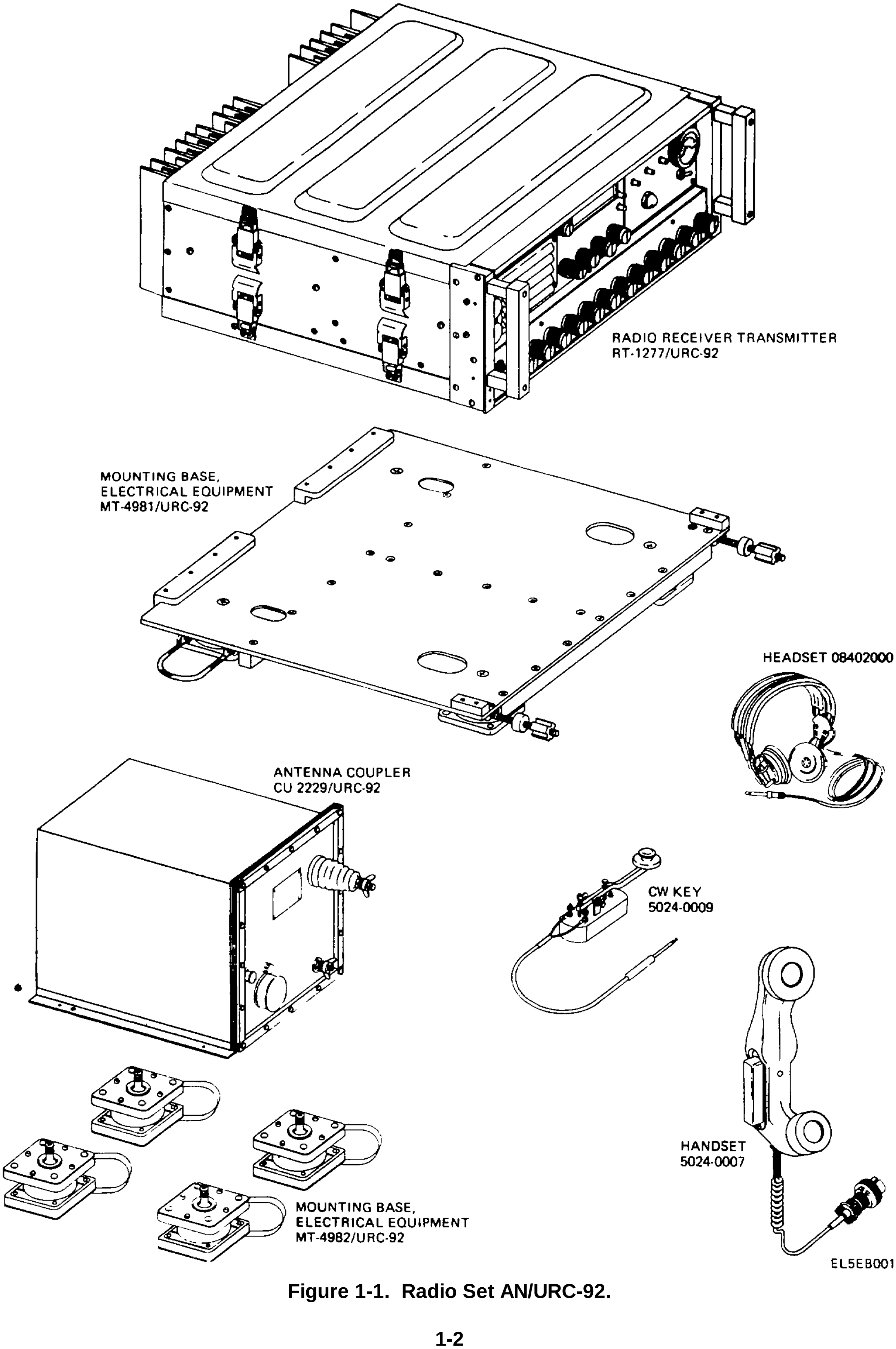


Figure 1-1. Radio Set AN/URC-92.

WARRANTY

VALID UNTIL OCT 79

1. **RADIO SET AN/URC-92 COMPONENTS. RECEIVER-TRANSMITTER; ANTENNA COUPLER, HANDSET; HEADSET; CW KEY.**
2. **RETURN FAILED COMPONENT, FOR EXCHANGE, TO: SUNAIR; 3101 S. W. 3 AVE.; FT. LAUDERDALE, FLA 33315. PHONE 305-525-1505.**
3. **SHIPPING INSTRUCTIONS: CARDBOARD BOX + FILLER; RETURN ADDRESS.**
4. **INCLUDE FAILURE CIRCUMSTANCE.**

EL5EB002

Figure 1-2. Typical Warranty Notice.

CHAPTER 2

FUNCTIONING OF EQUIPMENT

Section I. GENERAL

2-1. Introduction.

This chapter describes how the radio set operates. The chapter is divided into four sections which present the information in a logical sequence.

2-2. Description of Sections.

a. Functional Operation of Radio Receiver-Transmitter RT-1277/URC-92. Section II describes the functional operation of the RT-1277/URC-92. The section progresses from a simplified system explanation and block diagram to detailed circuit descriptions and block diagrams. This presentation enables easy identification of circuitry common in both receive and transmit functions and that circuitry specific to either receive or transmit.

NOTE

Although ANTENNA COUPLER CONTROL 1A2 is housed in the radio set, it functions as part of the CU-2229/URC-92. Certain functioning with meter 1A2M1 will be discussed in this section but the remainder of ANTENNA COUPLER CONTROL 1A2 functions will be covered in Section III.

b. Functional Operation of Antenna Coupler CU-2229/URC-92. Section III describes the functional operation CU-2229/URC-92.

c. Functional Operation of Circuits. Section IV describes the functional operation of non-conventional circuits and certain conventional circuits. The conventional circuits discussed in this section are those circuits that perform functions that may not be readily apparent to an experienced maintenance technician.

Section II. RADIO RECEIVER-TRANSMITTER RT-1277/URC-92 FUNCTIONAL OPERATION

2-3. Simplified Overall Operation (Fig. 2-1).

a. Operating Frequency. The RT-1227/URC-92 operates over a frequency range of 1.6 to 29 9999 MHz. The operating frequency is determined by the setting of FREQ CONTROL 1A1S15 and the FREQUENCY A and FREQUENCY B front panel switches.

(1) FREQ CONTROL 1A1S15 selects which group of FREQUENCY switches that control the operating frequency

(2) The setting of the selected FREQUENCY switches is decoded by decoder 1A1A2 and displayed by LED display 1A1A3.

(3) Synthesizer 1A4 has three output frequencies. Two of the output frequencies are fixed and the third controls the operating frequency of the RT-1277/URC-92.

b. Receive Operation. The RF signal is received at ANT jack 1A8J1 and passed through filter 1A5 to receiver/exciter 1A3. The receiver/exciter converts the RF signal to audio. The audio signal is amplified by speaker driver 1A1A1 and used to drive speaker 1A1LS1.

c. Transmit Operation.

(1) *CW.* Operating the CW Key causes a sidetone to be generated in receiver/exciter 1A3. The sidetone is coupled through speaker driver 1A1A1 to speaker 1A1LS1. The receiver/exciter also uses the sidetone to modulate the signals from the synthesizer. The RF output from the receiver/exciter is amplified by RF power amplifier 1A7. The output from the RF power amplifier is passed through filter 1A5 to ANT jack 1A8J1.

(2) Voice Audio from the handset is coupled into receiver/exciter 1A3. The receiver/exciter uses the audio to modulate the signals from the synthesizer. The RF output from the receiver/exciter is amplified by RF power amplifier 1A7. The output from the RF power amplifier is passed through filter 1A5 to ANT jack 1A8J1.

2-4. Receiver Functional Operation (Fig. FO-1).

a. Overall Functional Operation. Incoming RF is filtered by the selected bandpass filters in filter module 1A5 (para 2-10). The output of the bandpass filters is a narrow segment of the RF spectrum that includes the frequency selected by the FREQUENCY switches. The output from the filter module is coupled into VHF mixer 1A3A1 where it is fed through a high pass filter. The signal is then amplified and mixed with the 1st local

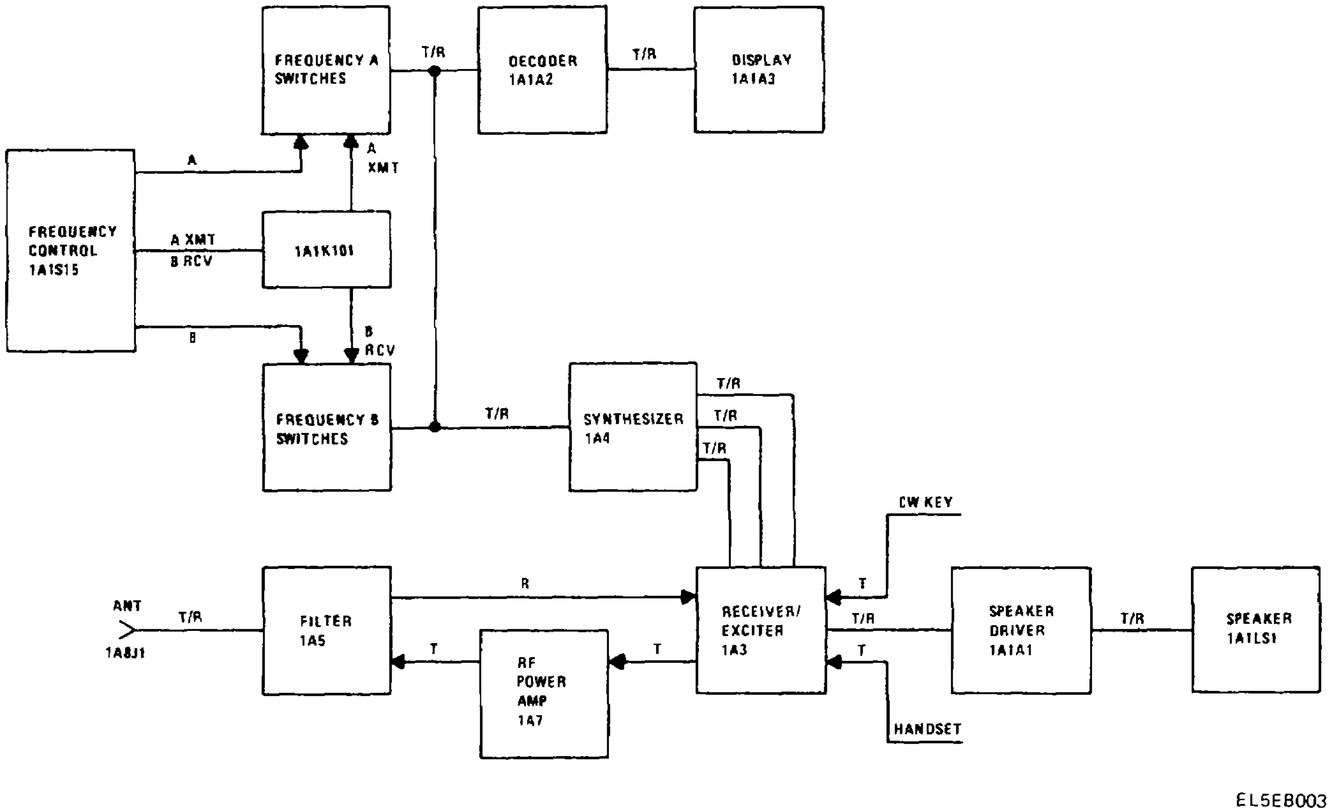


Figure 2-1. Radio Receiver-Transmitter Simplified Block Diagram.

oscillator signal from synthesizer 1A4. The resultant signal is filtered m a narrow band filter which passes only the 91.25 MHz ± 15 kHz portion of the signal. The output from the filter is amplified and mixed with the 2nd local oscillator signal from synthesizer 1A4, to produce 10.5 MHz. The 10.5 MHz output form the VHF mixer is coupled into IF filter 1A3A2. The IF filter amplifies the signal and it is fed to a diode gating network The diode gating network selects the upper sideband filter (USB), lower sideband filter (LSB), or amplitude modulation filter (AM) in accordance with the setting of the mode switch. These filters determine the receiver's bandwidth and reduce the interference form adjacent channels The upper sideband, lower sideband, or double sideband output from the filters is further amplified and coupled into audio board 1A3A4 where it is detected and amplified In the audio board the signal is coupled to a product detector when receiving sideband signals and to a fixed amplifier and an envelope detector for receiving amplitude modulated signals. The fixed amplifier also feeds into the AGC detector which develops a DC voltage proportional to the received signal amplitude. The AGC voltage is amplified and used to control the voltage gain of the RF amplifier and the IF amplifiers. The product detector combines the signal with the 3rd local oscillator (10.5 MHz), giving an audio signal which reproduces the original transmitted audio. The audio is fed to a 600 ohm line driver and to a fixed audio amplifier. The envelope detector detects the amplitude of the received signal reproducing the audio on a transmitted AM signal. The resultant audio is also fed to the 600 ohm line driver and to the fixed audio amplifier. The output of the fixed audio amplifier is connected to the VOLUME control, then to the speaker driver (located on the front panel), which supplies up to five watts of audio to the speaker. The AGC voltage is also used to vary the current through the front panel meter to give a visual indication of relative signal strength received. The front panel RF GAIN control acts to vary the gain of an amplifier which reduces the AGC voltage, reducing the gain of the RF amplifier and the IF amplifiers. This greatly reduces background noise when receiving strong signals.

b. Detailed Functional Operation.

(1) Power supply 1A6 (para 2-7) provides the regulated DC voltages required to operate the circuits in the RT-1277/URC-92.

(2) TCXO 1A8U1 is an extremely stable, temperature controlled, crystal oscillator and provides the 5 MHz reference signal to the synthesizer.

(3) Synthesizer 1A4 (para 2-8) generates three local oscillator frequencies The 1st local oscillator frequency of 91.25 to 121.2499 MHz is controlled by the

selected front panel FREQUENCY switches and determines the operating frequency of the radio. The 2nd local oscillator frequency is 80.75 MHz And, the 3rd local oscillator frequency is 10.5 MHz.

(*a*) The 3rd local oscillator signal is derived by direct synthesis techniques (i.e. by dividing and mixing the output of 1A8U1). This local oscillator signal is used as a product detector injection signal.

(*b*) The 2nd local oscillator consists of a crystal oscillator at a nominal frequency of 80.75 MHz. This frequency is used in VHF mixer 1A3A1 to convert the 1st IF of 91.25 MHz to the 2nd IF of 10.5 MHz. Since the 2nd local oscillator is not referenced to 1A8U1, a small frequency error can exist. However, because of the mixing scheme used, this same error appears on the 1st local oscillator signal and is therefore canceled at the output of the VHF mixer.

(*c*) The VCO (1st local oscillator) is a phase locked oscillator covering the frequency range of 91.25 to 121.2499 Hz in 100 Hz steps. The exact frequency of the 1st local oscillator is equal to 91.25 MHz plus the setting of the selected FREQUENCY switches and the difference between the frequency of the 2nd local oscillator and 80.75 MHz. The 1st local oscillator is used to convert the incoming signal to 91.25 MHz.

(4) The incoming RF signal is coupled into the RT-1277/URC-92 at ANT jack 1A8J1. From the ANT jack, the signal is coupled through the selected bandpass filter in filter module 1A5 (para 2-10) to VHF mixer board 1A3A1 in the receiver/exciter.

(5) Diode gate 1A3A1CRJ is switched off by the + 12 volts receive enable signal and has no effect on circuit operation. In the transmit mode diode 1A3A1CR1 would ground gate 2 of RF amplifier 1A3A1Q2, disabling the amplifier.

(6) The 1 6 to 29 9999 MHz output from bandpass filter 1A5 is amplified by RF amplifier 1A3A1Q2 and coupled through diode gate 1A3A1CR3 to the 1st balanced mixer composed of diodes 1A3A1CR4 thru 1A3A1CR7. Diode gate 1A3A1CR3 is enabled by the + 12 volts receive enable signal and allows the 1 6 to 29 9999 MHz signal to pass.

(7) The 91.25 MHz to 121.2499 MHz 1st local oscillator signal from synthesizer 1A4 is coupled to the 1st balanced mixer through 1st local oscillator ampllfier 1A3A1Q5. The nominal frequency of the 1st local oscillator signal is 91.25 MHz plus the setting of the selected FREQUENCY switches.

(*a*) If the selected FREQUENCY switches are set to 16, the 1st local oscillator nominal frequency is 92.85 MHz.

(*b*) If the selected FREQUENCY switches are set to 29 9999, the 1st local oscillator nominal frequency is 121.24999 MHz.

(8) The output of the 1st balanced mixer is the sum of the input frequencies and the difference between the two input frequencies. Since the nominal frequency of the 1st local oscillator signal is 91.25 MHz plus the setting of the selected FREQUENCY switches, the difference between the two input frequencies will always be 91.25 MHz.

(9) The output of the 1st balanced mixer is coupled to VHF filter 1A3A1FL1. The filter is a narrow band crystal filter with a center frequency of 91.25 MHz. Therefore, only the difference frequency output from the 1st balanced mixer is passed by 1A3A1FL1.

(10) Amplifier 1A3A1Q6 is enabled by the 12 volts receive enable signal and amplifies the 91.25 MHz output from 1A3A1FL1. The output from amplifier 1A3A1Q6 is applied to the 2nd balanced mixer composed of diodes 1A3A1CR9 thru 1A3A1CR12.

(11) The nominal 80.75 MHz 2nd local oscillator signal from synthesizer 1A4 is coupled to the 2nd balanced mixer through 2nd local oscillator amplifier 1A3A1Q8. The 10.5 MHz (difference frequency) output of the 2nd balanced mixer is coupled to amplifier 1A3A2Q3.

(12) Amplifier 1A3A2Q3 is enabled by the 12 volts receive enable signal and amplifies the 10.5 MHz output from the 2nd balanced mixer. The output from amplifier 1A3A2Q3 is applied to the Input of three diode gates.

(13) The diode gates at the Inputs and outputs of filters 1A3A2FT1, 1A3A2FL2 and 1A3A2FL3 are enabled by + 12 volts from mode switch 1A1S13. The 10.5 MHz signal from 1A3A2Q3 is coupled through the selected filter to amplifiers 1A3A2U1 and 1A3A2U2.

(14) Because the RT-1277/URC-92 uses high side conversion, the sidebands are reversed in the IF circuits. That is, the lower sideband is at a higher frequency than the upper sideband.

(*a*) With mode switch 1A1S13 set to LSB, diode gate 1A3A2CR8, diode gate 1A3A2CR1, 1A3A3CR2 and diode gate 1A3A2CR11, 1A3A2CR12 are enabled The lower sideband signal is coupled through upper sideband filter 1A3A2FL1. The center frequency of 1A3A2FL1 is 10.5016 MHz.

(*b*) With mode switch 1A1S13 ste to USB or CW, diode gate 1A3A2CR10, diode gate 1A3A2CR5, 1A3A2CR6 and diode gate 1A3A2CR15, 1A3A2CR16 are enabled. The upper sideband signal is coupled through lower sideband filter 1A3A2FL3. The center frequency of 1A3A2FL3 is 10 4984 MHz.

(*c*) With mode switch 1A1S13 set to AM (and relay 1A8K1 not energized) diode gate 1A3A2CR7, diode gate 1A3A2CR3, 1A3A2CR4 and diode gate 1A3A2CR13, 1A3A2CR14 are enabled. The signal is coupled through AM filter 1A3A2FL2 The center frequency of 1A3A2FL2 is 10.5 MHz.

(15) The output from the selected filter is amplified

by amplifiers 1A3A2U1 and 1A3A2U2 and coupled to the inputs of amplifier 1A3A4Q1 and product detector 1A3A4Q6, 1A3A4Q8, 1A3A4Q9.

(*a*) The output from amplifier 1A3A4Q1 is coupled to emitter follower 1A3A4Q2 and AM detector 1A3A4Q7, 1A3A4Q10.

1. The output from emitter follower 1A3A4Q2 is coupled to AGC detector 1A3A4Q3. The DC output from 1A3A4Q3 is coupled to emitter follower 1A3A4Q4. The output of 1A3A4Q4 is the AGC voltage RF gain control amplifier 1A3A4Q12 is connected across the AGC line, RF GAIN control 1A1R55 controls the gain of 1A3A4Q12 and established the minimum level of AGC. With 1A1R55 fully counterclockwise, it should be possible to completely disable the receiver. The AGC voltage is also used to drive S meter amplifier 1A3A4Q5. The output of 1A3A4Q5 drives meter 1A2M1.

2. When extremely high signal levels are present, peak signal level AGC amplifier 1A3A5Q2 limits the level of input signal that is applied to RF amplifier 1A3A1Q2.

3. With mode switch 1A1S13 set to AM (and relay 1A8K1 not energized) AM detector 1A3A4Q7, 1A3A4Q10 is enabled. The 10.5 MHz signal from 1A3A4Q1 is detected by AM detector 1A3A4Q7, 1A3A4Q10. The audio signal from the AM detector is coupled to the inputs of 600 ohm audio line driver 1A3A4U1 and audio amplifier 1A3A4Q11.

(*b*) With mode switch 1A1S13 set to LSB, USB or CW product detector 1A3A4Q6, 1A3A4Q8, 1A3A4Q9 is enabled. The 10.5 MHz 3rd local oscillator signal from the synthesizer is mixed with the 10.5 MHz signal from amplifier 1A3A2U1, 1A3A2U2 in product detector 1A3A4Q6, 1A3A4Q8, 1A3A4Q9. The audio signal from the product detector is coupled to the inputs of 600 ohm audio line driver 1A3A4U1 and audio amplifier 1A3A4Q11.

(16) The audiot signal from 600 ohm audio line driver 1A3A4U1 is coupled to AUDIO connector 1A8J2. The audio signal from audio amplifier 1A3A4Q11 is coupled through VOLUME control 1A1R51 to speaker driver 1A1A1. The output from 1A1A1 is coupled through the normally closed contacts of PHONE jack 1A1J3 to speaker 1A1LS1.

2-5. Transmitter Functional Operation (Fig. FO-2).

The RT-1277/URC-92 can be used in the transmit mode in any setting of the mode switch. This paragraph describes functional operation as a transmitter with the mode switch set to LSB, USB, AM, or CW For functional operation with the mode switch set to CPLR TUNE KW refer to paragraph 2-6.

a. *Overall Functional Operation*. The RT-1277/URC-92 is placed in the transmit mode by operating the press-to-talk switch on the handset, by grounding the keyline at AUDIO connector 1A8J2, or by operating the CW key. Operating the CW key energizes the CW tone oscillator, which produces a 1 kHz audio signal. Input audio from the handset, the 600 ohm balanced line, or the CW tone oscillator is amplified and used to modulate the 10.5 MHz, 3rd local oscillator signal from synthesizer 1A4. The resultant double sideband suppressed carrier signal is amplified and filtered in accordance with the setting of the mode switch. The remaining upper or lower sideband signal (AM transmission is actually upper sideband plus carrier) is amplified and, if the mode switch is set to AM, mixed with the 10.5 MHz carrier signal. The lower sideband, upper sideband, or upper sideband plus carrier signal is mixed with the 80.75 MHz of the 2nd local oscillator signal from synthesizer 1A4. The resultant signals are amplified and passed through a 91.25 MHz (sum frequency) filter. The 91.25 MHz signal is mixed with the 91.25 to 121.2499 MHz, 1st local oscillator signal, from synthesizer 1A4. The difference frequency (1st local oscillator frequency minus 91.25 MHz) is amplified to the 100 watt level and passed through a low pass filter to ANT jack 1A8J1.

b. Detailed Functional Operation.

(1) Power supply 1A6 (para 2-7) provides the regulated DC voltages required to operate the circuits in the RT-1277/URC-92.

(2) TCXO 1A8U1 is an extremely stable, temperature controlled, crystal oscillator and provides the 5 MHz reference signal to the synthesizer.

(3) Synthesizer 1A4 (para 2-8) generates three local oscillator frequencies. The 1st local oscillator frequency of 91.25 to 121.2499 MHz is controlled by the selected front panel FREQUENCY switches and determines the operating frequency of the radio. The 2nd local oscillator frequency is 80.75 MHz. And, the 3rd local oscillator frequency is 10.5 MHz.

(*a*) The 3rd local oscillator signal is derived by direct synthesis techniques (i.e. by dividing and mixing the output of 1A8U1). This local oscillator signal is used as a carrier generator.

(*b*) The 2nd local oscillator consists of a crystal oscillator at a nominal frequency of 80.75 MHz. This frequency is used in VHF mixer 1A3A1 to convert the 1st IF of 91.25 MHz to the 2nd IF of 10.5 MHz. Since the 2nd local oscillator is not referenced to 1A8U1, a small frequency error can exist. However, because of the mixing scheme used, this same error appears on the 1st local oscillator signal and is therefore canceled at the output of the VHF mixer.

(*c*) The VCO (1st local oscillator) is a phase locked oscillator covering the frequency range of 91.25 to 121.2499 Hz in 100 Hz steps. The exact frequency of the 1st local oscillator is equal to 91.25 MHz plus the setting of the selected FREQUENCY switches and the difference between the frequency of the 2nd local oscillator and 80.75 MHz. The 1st local oscillator is used to convert the 1st IF frequency of 91.25 MHz to the selected operating frequency.

(4) The RT-1277/URC-92 is normally in the receive mode It is placed in the transmit mode when relays 1A5A4K2 and 1A8K1 are energized (see para 2-22 for a discussion of the keying circuits). The relays are energized as follows:

(*a*) Operating the press-to-talk switch on the handset energizes relays 1A5A4K2 and 1A8K1 when mode switch 1A1S13 is set to LSB, USB, or AM.

(*b*) Grounding the keyline at AUDIO connector 1A8J2 (600 ohm audio) energizes relays 1A5A4K2 and 1A8K1 when mode switch 1A1S13 is set to LSB, USB, CW, or AM.

(*c*) Operating the CW key causes transistors 1A3AQ12 and 1A3A3Q14 to energize relays 1A5A4K2 and 1A8K1 when mode switch 1A3S13 is set to CW. Transistors 1A3A3Q12 and 1A3A3Q14 hold the relays energized for approximately 1 second after the CW key is released. This prevents the relays from deenergizing between normal CW characters and words but automatically returns the unit to the receive mode when the CW key has not been operated for 1 second. This delay is adjusted by 1A3A3R50.

(5) Audio is brought into the RT-1277/URC-92 as follows:

(*a*) Audio from the handset is coupled through XMT GAIN control 1A1R58 to microphone audio amplifier 1A3A3Q4 when mode switch 1A1S13 is set to LSB, USB, or AM. The amplified audio from 1A3A3Q4 is applied to balanced modulator 1A3A3CR3 thru 1A3A3CR6.

(*b*) Audio from the 600 ohm balanced input is amplified by 600 ohm audio amplifier 1A3A3Q11. The amplified audio from 1A3A3Q11 is applied to balanced modulator 1A3A3CR3 thru 1A3A3CR6.

(*c*) Operating the CW key turns on the CW tone oscillator, 1A3A3Q7 and 1A3A3Q8, when mode switch 1A1S13 is set to CW. The 1 kHz tone from the CW tone oscillator is applied to 600 ohm audio line driver 1A3A4U1, audio amplifier 1A3A4Q11, and emitter follower 1A3A3Q6.

1. The audio signal from 600 ohm audio line driver 1A3A4U1 is coupled to AUDIO connector 1A8J2.

2. The audio signal from audio amplifier 1A3A411 is coupled through VOLUME control 1A1R51 to speaker driver 1A1A1. The output from 1A1A1 is coupled through the normally closed contacts of PHONE jack 1A1J3 to speaker 1A1LSL.

3. The audio signal from emitter follower 1A3A3Q6 is applied to balanced modulator 1A3A3CR3 thru 1A3A3CR6.

(6) When the transmit enable signal is present and the mode switch is not m CPLR TUNE KW, transmit audio enable/disable switch 1A3A5Q1 is enabled. This enables 3rd local oscillator amplifier 1A3A3Q1. The 10.5 MHz 3rd local oscillator signal from synthesizer 1A4 is amplified by 3rd local oscillator amplifier 1A3A3Q1 and applied to balanced modulator 1A3A3CR3 thru 1A3A3CR6.

(7) The balanced modulator modulates the 10.5 MHz 3rd local oscillator signal with the audio signal from either of the three audio sources ((5) above). The output from the balanced modulator is a double sideband suppressed carrier signal at 10.5 MHz. The double sideband suppressed carrier signal from the balanced modulator is applied to IF amplifier 1A3A2Q4.

(8) IF amplifier 1A3A2Q4 is enabled by the transmit enable signal and amplifies the output from the balanced modulator. The output from 1A3A2Q4 is coupled to the inputs of two diode gates.

(9) The diode gates at the inputs and outputs of filters 1A3A2FL1 and 1A3A2FL2 are enabled by + 12 volts from mode switch 1A1S13. The 10.5 MHz signal is coupled through the selected filter to amplifier 1A3A2Q1, 1A3A2Q2.

(10) Because the RT-1277/URC-92 uses high side conversion, the sidebands are reversed in the IF circuits. That is, the lower sideband is at a higher frequency than the upper sideband.

(*a*) With mode switch 1A1S13 set to LSB, diode gate 1A3A2CR8, diode gate 1A3A2CR1, 1A3A2CR2 and diode gate 1A3A2CR11, 1A3A2CR12 are enabled. The lower sideband signal is coupled through upper sideband filter 1A3A2FL1. The center frequency of 1A3A2FL1 is 10.5016 MHz.

(*b*) With mode switch 1A1S13 set to USB or CW, diode gate 1A3A2CR10, diode gate 1A3A2CR5, 1A3A2CR6 and diode gate 1A3A2CR15, 1A3A2CR16 are enabled. The upper sideband signal is coupled through lower sideband filter 1A3A2FL3. The center frequency of 1A3A2FL3 is 10.4984 MHz.

(*c*) The AM transmit mode of the RT-1277/URC-92 is actually upper sideband plus carrier. With mode switch 1A1S13 set to AM and relay 1A8K1 energized, diode gate 1A3A2CR9, diode gate 1A3A2CR5, 1A3A2CR6 and diode gate 1A3A2CR15, 1A3A2CR16 are enabled. The upper sideband signal is coupled through lower sideband filter 1A3A2FL3. The upper sideband signal is combined with the 10.5 MHz carrier signal by amplifier 1A3A2Q1, 1A3A2Q2 ((12) below).

(11) The gain of amplifier 1A3A2Q1, 1A3A2Q2 is controlled by the output of ALC amplifier 1A3A3Q9, 1A3A3Q10 ((19) below). The ALC voltage limits the gain of 1A3A2Q1, 1A3A2Q2 when the transmitter output reaches 100 watts peak or there is a higher VSWR at the transmitter output. Amplifier 1A3A2Q1, 1A3A2Q2 is enabled by the transmit enable signal and amplifies the

signal from the selected filter when mode switch 1A1S13 is set to LSB, USB or CW The output from the amplifier is coupled to 2nd balanced mixer 1A3A1CR9 thru 1A3A1CR12.

(12) When mode switch 1A1S13 is set to AM, amplifier 1A3A2Q1, 1A3A2Q2 combines the upper sideband signal with the 10.5 MHz carrier signal and amplifies the combined signal ((11) above).

(*a*) The AM/CPLR TUNE KW transmit enable signal is coupled from mode switch 1A1S13 through relay 1A8K1 to turn on AM transmit switch 1A3A3Q13. The AM transmit switch enables automatic carrier control (ACC) amplifier 1A3A3Q2, 1A3A3Q3, 1A3A3Q5.

(*b*) The gain of the automatic carrier control amplifier is controlled by the detected carrier signal from ACC detector 1A5A4CR6, 1A5A4CR12 ((20) below). The automatic carrier control amplifier amplifies the 10.5 MHz 3rd local oscillator signal. The amplified 3rd local oscillator signal is injected into amplifier 1A3A2Q1, 1A3A2Q2 where it is combined with the upper sideband signal.

(13) The nominal 80.75 MHz 2nd local oscillator signal from synthesizer 1A4 is coupled to the 2nd balanced mixer through 2nd local oscillator amplifier 1A3A1Q8. The output from the 2nd balanced mixer is coupled to amplifier 1A3A1Q7.

(14) Amplifier 1A3A1Q7 is enabled by the transmit enable signal and amplifies the output from the 2nd balanced mixer. The 91.25 MHz (sum frequency) output signal from lA3A1Q7 is coupled through VHF filter 1A3A1FL1 to 1st balanced mixer 1A3A1CR4 thru 1A3A1CR7.

(15) The 91.25 MHz to 121.2499 MHz 1st local oscillator signal from synthesizer 1A4 is coupled to the 1st balanced mixer through 1st local oscillator amplifier 1A3A1Q5. The nominal frequency of the 1st local oscillator signal is 91.25 MHz plus the setting of the selected FREQUENCY switches. If the selected FREQUENCY switches are set to 12.3456, the 1st local oscillator frequency is 103.5956 MHz. The output of the 1st balanced mixer is coupled to amplifier 1A3A1Q1, 1A3A1Q3.

(16) The gain of amplifier 1A3A1Q1, 1A3A1Q3 is controlled by the output of current ALC amplifier 1A3A1Q4 ((18) below). The current ALC amplifier limits the gain of 1A3A1Q1, 1A3A1Q3 during high current peaks. Amplifier 1A3A1Q1, 1A3A1Q3 is enabled by the transmit enable signal and amplifies the difference frequency (equal to the setting of the selected FREQUENCY switches) output of the 1st balanced mixer.

(17) RF power amplifier 1A7A1Q11 thru 1A7A1Q6 is enabled by the transmit enable signal and amplifies the HF signal from 1A3A1Q1, 1A3A1Q3 to the 100 watt level. The output from the RF power amplifier is coupled through the selected low pass filter (para 2-10) to ANT jack 1A8J1.

(18) Current ALC detector 1A7A17 monitors the supply current to the RF power amplifier. When the supply current exceeds 10 amperes, 1A7A1Q7 is turned on causing current ALC amplifier 1A3A1Q4 to reduce the gain of amplifier 1A3A1Q1l, 1A3A1Q3.

(19) ALC amplifier 1A3A3Q9, 1A3A3Q10 limits the gain of amplifier 1A3A2Q1, 1A3A2Q2 when the VSWR is too high or the RF output voltage is too high.

(a) VSWR ALC detector 1A7A1CR4 causes the ALC amplifier to limit the gain of amplifier 1A3A2Q1, 1A3A2Q2 when the peak voltage on the collector of 1A7A1Q6 is too high.

(*b*) Reflected power detector 1A5A4CR16 causes the ALC amplifier to limit the gain of amplifier 1A3A2Q1, 1A3A2Q2 when the VSWR on the RF output line is too high.

(*c*) Voltage ALC detector 1A5A4Q2, 1A5A4Q3 causes the ALC amplifier to limit the gain of amplifier 1A3A2Q1, 1A3A2Q2 when the RF output voltage is too high.

(20) ACC detector 1A5A4CR6, 1A5A4CR12 reduces the gain of automatic carrier control amplifier 1A3A3Q2, 1A3A3Q3, 1A3A3Q5. At initial turn on in AM transmit mode, automatic carrier control amplifier 1A3A3Q2, 1A3A3Q3, 1A3A3Q5 is operating at maximum gain ACC detector 1A5A4CR6, 1A5A4CR12 detects the level of carrier signal on the RF output line and reduces the gain of the automatic carrier control amplifier to establish the desired carrier signal level.

(21) Power output detector 1A5A4CR5 samples the voltage on the RF output line. The output from 1A5A4CR5 drives meter 1A2M1 when FWD power is selected by 1A2S1.

2-6. CPLR TUNE KW Functional Operation (Fig. FO-2)

With mode switch 1A1S13 in CPLR TUNE KW, pressing TUNE START switch 1A2S2 places the RT-1277/URC-92 in the transmit mode. Relays 1A5A4K2 and 1A8K1 are energized through the SU-2229/URC-92.

a. Overall Functional Operation. The 10.5 MHz, 3rd local oscillator signal from synthesizer 1A4 is amplified and mixed with the 80.75 MHz, 2nd local oscillator signal from synthesizer 1A4. The resultant signals are amplified and passed through a 91.25 MHz (sum frequency) filter. The 91.25 MHz signal is mixed with the 91.25 to 121.2499 MHz, 1st local oscillator signal from synthesizer 1A4. The difference frequency (1st local oscillator frequency minus 91.25 MHz) is amplified to the 30-40 watt level and passed through a low pass filter to ANT jack 1A8J1.

b. Detailed Functional Operation.

(1) Power supply 1A6 (para 2-7) provides the regulated DC voltages required to operate the circuits in the RT-1277/URC-92.

(2) TCXO 1A8U1 is an extremely stable, temperature controlled, crystal oscillator and provides the 5 MHz reference signal to the synthesizer.

(3) Synthesizer 1A4 (para 2-8) generates three local oscillator frequencies. The 1st local oscillator frequency of 91.25 to 121.2499 MHz is controlled by the selected front panel FREQUENCY switches and determines the operating frequency of the radio. The 2nd local oscillator frequency is 80.75 MHz. And, the 3rd local oscillator frequency is 10.5 MHz.

(*a*) The 3rd local oscillator signal is derived by direct synthesis techniques (i.e. by dividing and mixing the output of 1A8U1). This local oscillator signal is used to generate the carrier signal.

(*b*) The 2nd local oscillator consists of a crystal oscillator at a nominal frequency of 80.75 MHz. This frequency is used in VHF mixer 1A3A1 to convert the 1st IF of 91.25 MHz to the 2nd IF of 10.5 MHz. Since the 2nd local oscillator is not referenced to 1A8U1, a small frequency error can exist. However, because of the mixing scheme used, this same error appears on the 1st local oscillator signal and is therefore canceled at the output of the VHF mixer.

(*c*) The VCO (1st local oscillator) is a phase locked oscillator covering the frequency range of 91.25 to 121.2499 Hz in 100 Hz steps. The exact frequency of the 1st local oscillator is equal to 91.25 MHz plus the setting of the selected FREQUENCY switches and the difference between the frequency of the 2nd local oscillator and 80.75 MHz. The 1st local oscillator is used to convert the 1st IF frequency of to 91.25 MHz to the selected operating frequency.

(4) Transmit audio enable/disable switch 1A3A5Q1 is turned off by the audio disable from mode switch 1A1S13. This blocks the transmit enable from 1A8K1 and 3rd local oscillator amplifier 1A3A3Q1 is not enabled. With no 10.5 MHz input, balanced modulator 1A3A3CR3 thru 1A3A3CR6 has no output and audio can not enter the IF circuits.

(5) The AM/CPLR TUNE KW transmit enable signal is coupled from mode switch 1A1S13 through relay 1A8K1 to turn on AM transmit switch 1A3A3Q13. The AM transmit switch enables automatic carrier control amplifier 1A3A3Q2, 1A3A3Q3, and 1A3A3Q5. The gain of the automatic carrier control amplifier is established by the setting of 1A3A3R18.

(6) The 10.5 MHz, 3rd local oscillator signal from synthesizer 1A4 is amplified by the automatic carrier control amplifier and coupled to the input of amplifier 1A3A2Q1, 1A3A2Q2.

(7) Amplifier 1A3A2Q1, 1A3A2Q2 is enabled by the transmit enable signal and amplifies the 10.5 MHz carrier signal from the automatic carrier control amplifier. The output from amplifier 1A3A2Q1, 1A3A2Q2 is coupled to 2nd balanced mixer 1A3A1CR9 thru 1A3A1CR12 ALC amplifier 1A3A3Q9, 1A3A3Q10 has no effect on 1A3A2Q1, 1A3A2Q2. If no VSWR ALC signal, PA high voltage or PA high current ALC input voltages are present at the inputs of 1A3A3Q9 & 1A3A3Q10. The voltage ALC does not take effect until the transmitter output reaches 100 watt peak (transmitter output in CPLR TUNE KW mode is 30 to 40 watts).

(8) The nominal 80.75 MHz, 2nd local oscillator signal from synthesizer 1A4 is coupled to the 2nd balanced mixer through 2nd local oscillator amplifier 1A3A1Q8. The output from the 2nd balanced mixer is couple to amplifier 1A3A1Q7.

(9) Amplifier 1A3A1Q7 is enabled by the transmit enable signal and amplifies the output from the 2nd balanced mixer. The 91.25 MHz (sum frequency) output signal from 1A3A1Q7 is coupled through VHF filter 1A3A1FL1 to 1st balanced mixer 1A3A1CR4 thru 1A3A1CR7.

(10) The 91.25 MHz to 121.2499 MHz, 1st local oscillator signal from synthesizer 1A4 is coupled to the 1st balanced mixer through 1st local oscillator amplifier 1A3A1Q5. The nominal frequency of the 1st local oscillator signal is 91.25 MHz plus the setting of the selected FREQUENCY switches. (If the selected FREQUENCY switches are set to 12.3456, the 1st local oscillator frequency is 103.5956 MHz.) The output of the 1st balanced mixer is coupled to amplifier 1A3A1Q1, 1A3A1Q3.

(11) The gain of amplifier 1A3A1Q1, 1A3A1Q3 is controlled by the output of current ALC amplifier 1A3A1Q4 ((13) below). The current ALC amplifier limits the gain of 1A3A1Q1, 1A3A1Q3 during high current peaks. Amplifier 1A3A1Q1, 1A3A1Q3 is enabled by the transmit enable signal and amplifies the difference frequency (equal to the setting of the selected FREQUENCY switches) output of the 1st balanced mixer.

(12) RF power amplifier 1A7A1Q1 thru 1A7A1Q6 is enabled by the transmit enable signal and amplifies the HF signal from 1A3A1Q1, 1A3A1Q3 to the 100 watt level (30-40 watts AM & CPLR TUNE KW). The output from the RF power amplifier is coupled through the selected low pass filter (para 2-10) to ANT jack 1A8J1.

(13) Current ALC detector 1A7A1Q7 monitors the supply current to the RF power amplifier. When the supply current exceeds 10 amperes, 1A7A1Q7 is turned on causing current ALC amplifier 1A3A1Q4 to reduce the gain of amplifier 1A3A1Q11, 1A3A1Q3.

(14) Power output detector 1A5A4CR5 samples the voltage on the RF output line. The output from 1A5A4CR5 drives meter 1A2M1 when FWD power is selected by 1A2S1.

2-7. Power Supply 1A6 Functional Operation (Fig. 2-2 and Fig. FO-31)

a. The power supply provides regulated DC voltages to operate the circuits in the RT-1277/URC-92. The input to the power supply can be from 115 or 230 volt, 50 to 60 Hz AC power sources or from 13 or 26 volt DC power sources.

b. When operated from a DC power source, the input DC is applied to DC inverter 1A6A2. The DC inverter converts the DC input to a 120 to 200 Hz square wave which is applied to primary 2 of transformer 1A6T1. When operated from an AC power source, the input AC is applied directly to primary 1 of transformer 1A6T1.

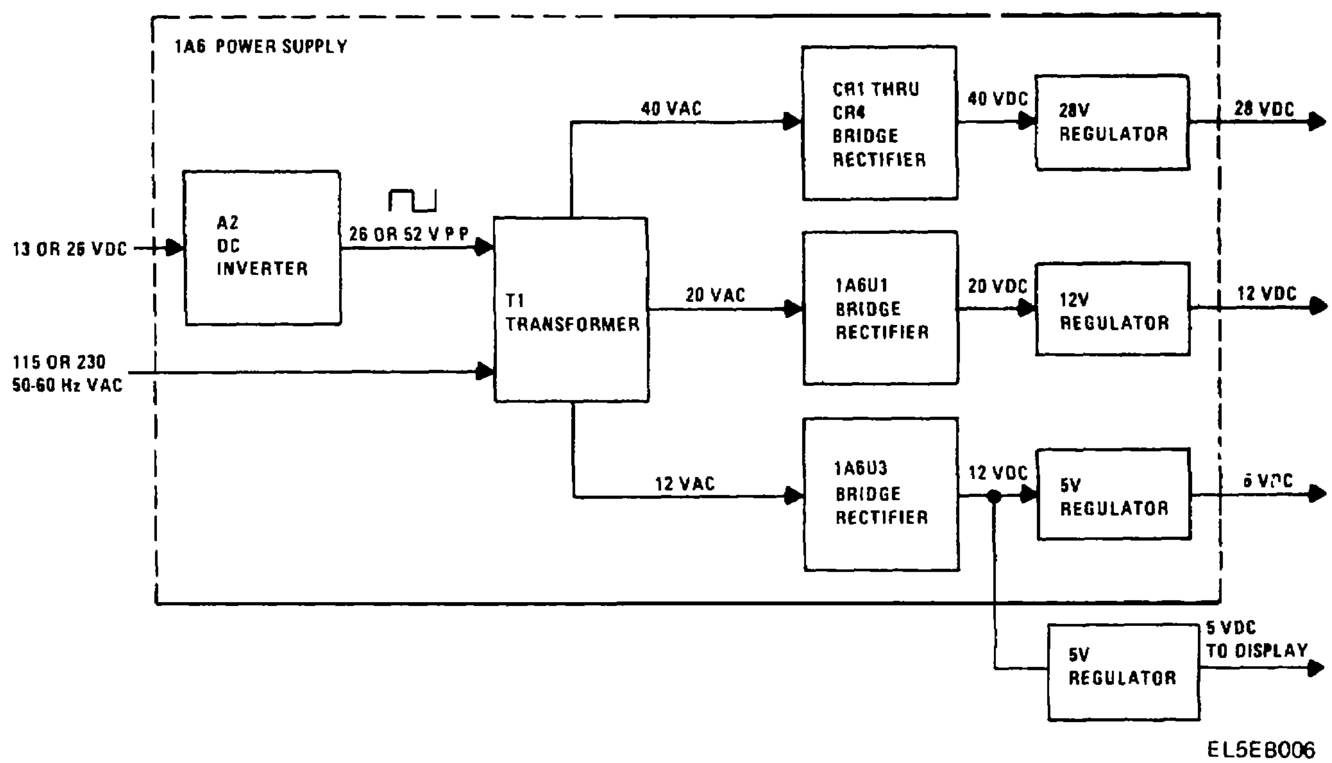
c. Transformer 1A6T1 has three secondary outputs of 40 VAC, 20 VAC and 12 VAC. The secondary outputs are applied through bridge rectifiers to the regulator circuits. The 28, 12 and 5 volt outputs from the regulator circuits are used to operate the circuits In the radio.

2-8. Synthesizer 1A4 Simplified Functional Operation (Fig. 2-3).

a. Spectrum Generator 1A4A1. The spectrum generator generates the 3rd local oscillator frequency and the reference frequencies needed in the synthesizer. All of the frequencies generated by the spectrum generator are derived by a combination of multiplying, dividing and/or mixing the 5 MHz reference signal from TCXO 1A8U1. The outputs from the spectrum generator are the 10.5 MHz, 3rd local oscillator signal, 17 MHz and 1 kHz signals that are coupled to low digit generator 1A4A2, 20 and 21 MHz signals that are coupled to translator 1A4A3 and a 100 kHz signal that is coupled to VHF divider 1A4A4.

b. Low Digit Generator 1A4A2. The low digit generator controls the 10 kHz, 1 kHz and 100 Hz components of the radios operating frequency. The inputs to the low digit generator are 17 MHz and 1 kHz signals from the spectrum generator, binary coded decimal from the selected to 10 kHz, 1 kHz and 100 Hz FREQUENCY switches and a coarse steering voltage from the 10 kHz FREQUENCY switch. The output is a 1.5 to 1.5999 MHz signal with the frequency of the signal being equal to 1.5 MHz plus the frequency set by the selected 10 kHz, 1 kHz and 100 Hz FREQUENCY switches.

c. Translator 1A4A3. The translator generates the 80.75 MHz, 2nd local oscillator frequency. The translator also combines the 80.75 MHz signal with the 20 MHz signal from spectrum generator 1A4A1, the 21 MHz signal from spectrum generator 1A4A1 (or from



an internal oscillator with the VFO control on), the 1.5 to 1.5999 MHz signal from low digit generator 1A4A2 and the 91.25 to 121.2499 MHz signal from VCO 1A4A5, and produces a 10.0 to 39 9 MHz signal. The 10.0 to 39.9 MHz signal is coupled to VHF divider 1A4A4. The frequency of the 1.5 to 1.5999 MHz signal is equal to 1 5 MHz plus the frequency set by the selected 10 kHz, 1 kHz and 100 Hz FREQUENCY switches. The frequency of the 91.25 to 121.2499 MHz signal from VCO 1A4A5 is equal to 91.25 MHz plus the frequency set by all of the selected FREQUENCY switches. The frequency of the 10.0 to 39 9 MHz signal is equal to 10.0 MHz plus the setting of the selected 10 MHz, 1 MHz and 100 kHz FREQUENCY switches and the difference between the frequency of the 2nd local oscillator and 80.75 MHz.

d. VHF Divider 1A4A4. The VHF divider generates a fine steering control voltage for VCO 1A4A5. The inputs to the VHF divider are a 100 kHz reference signal from spectrum generator 1A4A1, a 10.0 to 39 9 MHz signal from translator 1A4A3, binary coded decimal from the selected 1 MHz and 100 kHz FREQUENCY switches and binary coded decimal, representing the setting of the selected 10 MHz FREQUENCY switch, from VCO 1A4A5. The VHF divider compares the input signals and generates a fine steering correction voltage that represents the difference between the frequency of the 91.25 to 121.2499 MHz signal from VCO 1A4A5 and the frequency set by the selected FREQUENCY switches plus 91.25 MHz plus the difference between the frequency of the 2nd local oscillator and 80.75 MHz.

e. VCO 1A4A5. The voltage controlled oscillator generates the 91.25 to 121.2499 MHz, 1st local oscillator frequency. The variable frequency 1st local oscillator signal controls the operating frequency of the RT-1277/URC-92. The output frequency from the VCO is equal to the frequency set by the selected FREQUENCY switches plus 91.25 MHz and the difference between the frequency of the 2nd local oscillator and 80.75 MHz The VCO frequency is determined by the following:

$$F_S - (F_O + 91.25 \text{ MHz} = e)$$

where:

F_S = 91.25 to 121.2499 MHz signal from VCO 1A4A5

F_O = Frequency set by selected FREQUENCY switches

e = 80.75 MHz minus the frequency of 2nd local oscillator

The VCO contains three oscillators that are selected by the band control voltage from the selected 10 MHz FREQUENCY switch. The operating frequency of the selected oscillator is controlled by a course steering voltage from the selected 1 MHz FREQUENCY switch and a fine steering voltage from VHF divider 1A4A4.

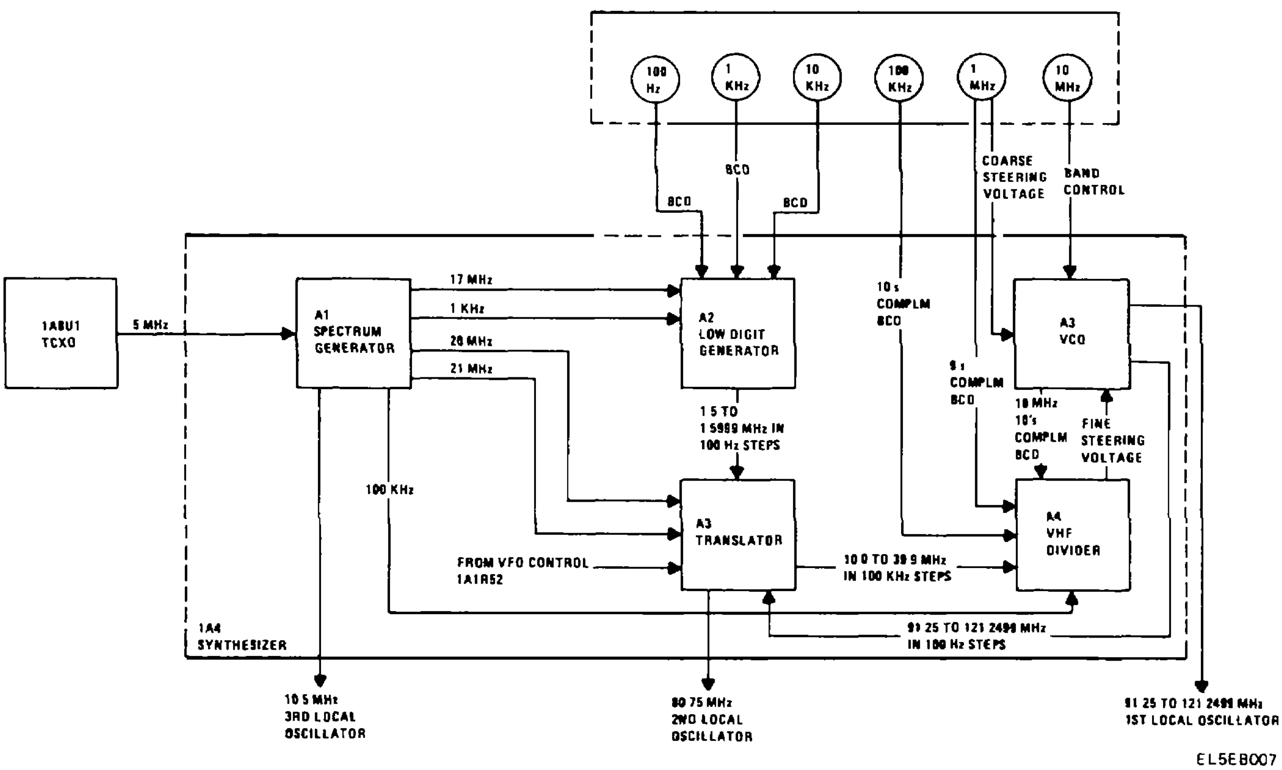


Figure 2-3. Synthesizer Simplified Block Diagram.

2-9. Synthesizer 1A4 Detailed Functional Operation (Fig. FO-3, and FO-18 thru FO-23)

The synthesizer generates the three local oscillator injection frequencies used in the IF circuits of the radio. The 3rd local oscillator frequency is fixed at 10.5 MHz and is generated by spectrum generator 1A4A1 (a below). The 2nd local oscillator frequency is fixed at 80.75 MHz and is generated by translator 1A4A3 (c below). The 1st local oscillator frequency is variable and controls the operating frequency of the radio. The 1st local oscillator frequency is generated by VCO 1A4A5 (*e* below). The signals used to control the 1st local oscillator frequency are generated in other areas of the synthesizer. The frequency of some of these signals is controlled by the setting of the selected FREQUENCY control switches. Table 2-1 lists the points where programmed frequencies and division ratios can be found in the synthesizer. The table also shows the frequency or division ratio at these points for various settings of the selected FREQUENCY control switches.

a. Spectrum Generator 1A4A1 (Fig. FO-3 and Fig. FO-18).

(1) *20 MHz Reference Generator.* The 5 MHz reference signal from TCXO 1A8U1 is amplified by 1A4A1U1 and clipped by the diode clipper. The positive going half waves from the diode clipper are inverted by 1A4A1U2A. The output of 1A4A1U2A is applied to divide-by-5 counter 1A4A1U4 ((2) below) and one shot 1A4A1U2B, 1A4A1U2C. The 5 MHz pulse from the one shot is inverted by 1A4A1U2D. The fourth harmonic of this 5 MHz pulse (20 MHz) is filtered by the 20 MHz bandpass filter and amplified by 1A4A1U33. The 20 MHz pulse output from 1A4A1U3 is applied to low digit generator 1A4A2 (b below), 17 MHz mixer 1A4A1Q6 ((5) below) and 20 MHz amplifier 1A4A1U8 ((6) below).

(2) *1 MHz Reference Generator*. The 5 MHz signal from inverter 1A4A1U2A ((1) above) is applied to divide-by-5 counter 1A4A1U4. The 1 MHz output from 1A4A1U4 is applied to divided-by-10 counter 1A4A1U5 ((3 below), through the 1 MHz bandpass filter to amplifier 1A4A1Q1, 1A4A1Q2 ((6) below) and to 3 MHz amplifier 1A4A1Q5 ((5) below).

(3) *100 kHz Reference Generator*. The 1 MHz pulse from 1A4A1U4 ((2) above) is applied to divideby-10 counter 1A4A1U5 The 100 kHz output from 1A4A1U5 is applied to VHF divider 1A4A4 (d below) and to divide-by-10 counter 1A4A1U6 ((4) below)

(4) *1 kHz Reference Generator*. The 100 kHz pulse from 1A4A1U5 ((3) above) is applied to divideby-10 counter 1A4A1U6 The 10 kHz pulse from 1A4A1U6 is applied to divIde-by-10 counter 1A4A1U7 The 1 kHz pulse from 1A4A1U7 is applied to low digit generator 1 A4A2 (*b* below).

(5) *17 MHz Reference Generator*. The third harmonic of the 1 MHz pulse from 1A4A1U4 ((2) above) is amplified by 3 MHz amplifier 1A4A1Q5. The 3 MHz output from 1A4A1Q5 is applied to 17 MHz mixer 1A4A1Q6. The other input to 1A4A1Q6 is the 20 MHz signal from 1A4A1U3 ((1) above). The two inputs are mixed in 1A4A1Q6 and the 17 MHz difference frequency is filtered by the bandpass filter. The 17 MHz output of the bandpass filter is coupled through amplifier (complementary emitter follower) 1A4A1Q7, 1A4A1Q8 to low digit generator 1A4A2 (*b* below).

(6) *21 MHz Reference Generator*. The 1 MHz pulse from 1A4A1U4 ((2) above) is filtered by the 1 MHz bandpass filter. The 1 MHz sinewave from the 1 MHz bandpass filter is amplified by complementary emitter follower 1A4A1Q1, 1A4A1Q2. The 1 MHz sinewave from the complementary emitter follower is applied to balanced mixer 1A4A1CR4 thru 1A4AiCR7. The other input to be balanced mixer is the 20 MHz signal from 1A4A1U3 ((1) above). The 20 MHz signal from 1A4A1U3 is amplified by 1A4A1U8 and applied to the balanced mixer. The 21 MHz sum frequency is filtered by the 21 MHz bandpass filter and amplified by 1A4A1U9. The 21 MHz signal from 1A4A1U9 is coupled through emitter follower 1A4A1Q9 to translator 1A4A3 (*c* below).

(7) *10.5 MHz 3rd Local Oscillator Signal*. The 21 MHz signal from 1A4A1U9 ((6) above) is coupled to divide-by-2 counter 1A4A1U10. When the RT-1277/URC-92 is operating in the AM receive mode, or if the setting of the selected 1 MHz FREQUENCY switch is changed while transmitting switch 1A4A1Q3 is turned on disabling 1A4A1U10. At all other times 1A4A1Q3 is off and 1A4A1U10 divides the 21 MHz input by 2. The 10.5 MHz output from 1A4A1U10 is coupled through emitter follower 1A4A1Q4 to receiver/exciter 1A3.(para 2-4).

b. Low Digit Generator 1A4A2 (Fig. FO-3 and Fig. FO-21)

(1) *Voltage Controlled Oscillator 1A4A2*. VCO 1A4A2Q1, 1A4A2Q2 is a Colpitts oscillator with a frequency range of 15 0 to 15 999 MHz. The oscillating frequency of the VCO is equal to the setting of the selected 10 kHz, 1 kHz and 100 Hz FREQUENCY switches times 10, plus 15 MHz. Coarse frequency tuning is provided by the action of the coarse frequency voltage (from the selected 10 kHz FREQUENCY switch) on varactor diodes 1A4A2CR1, 1A4A2CR2. Fine frequency control is provided by comparing the output of the VCO with the 17 MHz and 1 kHz signals from spectrum generator 1A4A1 (*a* above). Phase detector 1A4A2U2 ((4) below) develops an output voltage that is proportional to the difference between the frequency of the VCO and the desired frequency of the VCO This voltage is applied to varactor

Table 2-1. Synthesizer Programmed Frequencies.

FREQUENCY switch setting 10 MHz	1 MHz	100 KHz	10 KHz	1 KHz	100 Hz	1A4A2U1 Frequency MHz	1A4A2 Preset Counter Divided by	1A4A2Q6 Frequency MHz	1A4A3Q3 Frequency MHz	1A4A3Q11 Frequency MHz	1A4A3Q4 Frequency MHz	1A4A5 Frequency MHz	1A4A4U2 Frequency MHz	1A4A2 Preset Counter Divided by
0	1	6	0	0	0	15 0	2000	1 5	19 5	81 25	11 6	92 85	2 9	116
0	1	6	0	0	1	15 001	1999	1 5001	19 4999	81 2501	11 6	92 8501	2 9	116
0	1	6	0	1	0	15 01	1990	1 501	19 499	81 251	11 6	92 851	2 9	116
0	1	6	0	1	1	15 011	1989	1 5011	19 4989	81 2511	11 6	92 8511	2 9	116
0	1	6	1	0	0	15 1	1900	1 51	19 49	81 26	11 6	92 86	2 9	116
0	1	6	1	2	3	15 123	1877	1 5123	19 4877	81 2629	11 6	92 8623	2 9	116
0	1	7	0	0	0	15 0	2000	1 5	19 5	81 25	11 7	92 95	2 925	117
0	1	7	1	2	3	15 123	1877	1 5123	19 4877	81 2629	11 7	92 9623	2 925	117
0	2	6	0	0	1	15 001	1999	1 5001	19 4999	81 2501	12 6	93 8501	3 150	126
1	0	0	0	0	0	15 0	2000	1 5	19 5	81 25	20 0	101 25	5 0	200
1	1	6	1	2	3	15 123	1877	1 5123	19 4877	81 2629	21 6	102 8629	5 4	216
2	0	0	0	0	0	15 0	2000	1 5	19 5	81 25	30 0	111 25	7 5	300
2	0	3	0	0	0	15 0	2000	1 5	19 5	81 25	30 3	111 55	7 575	303
2	4	0	0	0	0	15 0	2000	1 5	19 5	81 25	34 0	115 25	8 5	340
2	4	5	0	0	0	15 0	2000	1 5	19 5	81 25	34 5	115 75	8 625	345
2	4	5	6	0	0	15 6	1400	1 56	19 44	81 31	34 5	115 81	8 625	345
2	4	5	6	7	0	15 67	1330	1 567	19 433	81 317	34 5	115 817	8 625	345
2	4	5	6	7	8	15 678	1322	1 5678	19 4322	81 3178	34 5	115 8178	8 625	345
2	9	0	0	0	0	15 0	2000	1 5	19 5	81 25	39 0	120 25	9 75	390
2	9	9	0	0	0	15 0	2000	1 5	19 5	81 25	39 9	121 15	9 975	399
2	9	9	9	0	0	15 9	1100	1 59	19 41	81 34	39 9	121 24	9 975	399
2	9	9	9	9	0	15 99	1010	1 599	19 401	81 349	39 9	121 249	9 975	399
2	9	9	9	9	9	15 999	1001	1 5999	19 4001	81 3499	39 9	121 2499	9 975	399

diodes 1A4A2CR3, 1A4A2CR4 as a fine steering voltage. Transistor 1A4A2Q1 is the oscillator while 1A4A2Q2 regulates the source voltage in order to provide frequency stability. The output from the VCO is coupled through buffer 1A4A2U1 to mixer 1A4A2Q3 ((2) below) and driver 1A4A2Q5 ((5) below).

(2) *Mixer and Pulse Generator*. The 15.0 to 15.999 MHz signal from the VCO ((1) above) is applied to mixer 1A4A2Q3. The other input to the mixer is the 17 MHz reference signal from spectrum generator 1A4A1 (*a* above). The 1.001 to 2.0 MHz difference frequency output from 1A4A2Q3 is filtered by the 2 MHz low pass filter and amplified by 1A4A2U6. The sinewave output from 1A4A2U6 is formed into pulses by pulse generator 1A4A2U7 The output from 1A4A2U7 is applied to the inputs of the preset counter and the count filled detector ((3) below).

(3) *Preset Counter and Preset Generator*. The preset counter consists of three divide-by-10 counters (1A4A2U8, 1A4A2U9 and 1A4A2U10) and one divide-by-2 counter 1A4A2U11). With the selected 10 kHz, 1 kHz and 100 Hz FREQUENCY switches set to 000, the preset counter is divide-by-2000 counter. With the selected 10 kHz, 1 kHz and 100 HZ FREQUENCY switches set to a value other than 000, the counter will divide by 2000 minus the value set by the switches. If the selected 10 kHz, 1 kHz and 100 Hz FREQUENCY switches are set to 1, 2 and 3 respectively, the output frequency of VCO 1A4A2Q1 ((1) above) is 15 123 MHz (the setting of the selected FREQUENCY switches times 10, plus 15 MHz). The output of the mixer and pulse generator ((2) above) is 1.877 MHz (the difference between the VCO frequency and the 17 MHz reference signal. And, the preset counter will divide by 1,877. The output from the preset counter will be a 1 kHz pulse. The operation of the preset counter is as follows:

(*a*) Assuming the selected 10 kHz, 1 kHz and 100 Hz FREQUENCY switches are set to 1, 2 and 3 respectively, 1A4A2U8 will have the binary coded decimal equivalent of three present at the preset input; 1A4A2U9 will have the binary coded decimal equivalent of two present at the preset input; and 1A4A2U10 will have the binary coded decimal equivalent of one present at the preset input. When a data strobe pulse is received from preset generator 1A4A2U4, the divide-by-10 counters are preset to the count that is present at their preset inputs.

(*b*) Divide-by-10 counter 1A4A2U8 has been preset to a count of three ((a) above). The output at pin 5 is high and the output at pin 12 is low. The output at pin 5 will be high for each odd count and low for each even count. The divide-by-10 counter will count on the trailing edge of each input pulse. After six input pulses, the count in 1A4A2U8 will be nine (preset of three, plus six counts). At the count of nine, the output at pin 12 will be high because of the nine count and the output at pin 5 will be high because the count is an odd number. On the trailing edge of the next input pulse, the outputs at pins 5 and 12 will both go low. When pin 12 goes low, 1A4A2U9 will advance one count. On the trailing edge of the next input pulse from pulse generator

1A4A2U7, divide-by-10 counter 1A4A2U8 will assume a count of one instead of the preset count, since a data strobe pulse was not received from preset generator 1A4A2U4. Divide-by-10 counter 1A4A2U8 will have an output at pin 12 after every 10 input pulses until preset by the next data strobe pulse ((*c*) below).

(*c*) Divide-by-10 counter 1A4A2U9 has been preset to a count of two ((*a*) above). The outputs at pins 5 and 12 are low. As described in ((*b*) above), 1A4A2U8 will have 7 outputs after 67 inputs from 1A4A2U7. After seven outputs from 1A4A2U8, the count in 1A4A2U9 will be nine (preset of two, plus seven counts). At the count of nine, the output at pin 12 will be high because of the nine count and the output at pin 5 will be high because the count is an odd number. On the trailing edge of the next input pulse to 1A4A2U9 (77 inputs to 1A4A2U8), the outputs at pins 5 and 12 will both go low. When pin 12 goes low, 1A4A2U10 will advance one count. On the trailing edge of the next input pulse (87 inputs to 1A4A2U8), 1A4A2U9 will assume a count of one instead of the preset count, since a data strobe pulse was not received from preset generator 1A4A2U4. Divide-by-10 counter 1A4A2U9 will have an output at pin 12 after every 10 input pulses (100 inputs to 1A4A2U8) until preset by the next data strobe pulse ((*e*) below).

(*d*) Divide-by-10 counter 1A4A2U10 has been preset to a count of one ((*a*) above). The output at pin 5 is high and the output at pin 12 is low. As described m ((*b*) and (*c*) above), 1A4A2U9 will have 8 outputs after 777 inputs to 1A4A2U8. After eight outputs from 1A4A2U9, the count in 1A4A2U10 will be nine (preset at one, plus eight counts). At the count of nine, the output at pin 12 will be high because of the nine count and the output at pin 5 will be high because the count is an odd number. On the trailing edge of the next input pulse to 1A4A2U10 (877 inputs to 1A4A2U8), the outputs at pins 5 and 12 will both go low. When pin 12 goes low, 1A4A2Ull will advance one count. On the trailing edge of the next input pulse (977 inputs to 1A4A2U8), 1A4A2U10 will assume a count of one instead of the preset count, since a data strobe pulse was not received from preset generator 1A4A2U4. Divide-by-10 counter 1A4A2U10 will go high at pin 12 after the next nine input pulses (900 inputs to 1A4A2U8).

(*e*) The output from divide-by-two counter 1A4A2Ull is high because the output from 1A4A2U10 went low after 877 inputs to 1A4A2U8 ((*d*) above). After 999 more inputs to 1A4A2U8 the count will be 1876. All of the divide-by-10 counters will have a count of 9. The outputs at pin 5 will be high because the count is an odd number and the outputs at pin 12 will be high because of the nine count. The output from divide-by-two counter 1A4A2U11 is still high because the output of 1A4A2U10 has not gone low. With the exception of the input that is connected to pulse generator 1A4A2U7, all of the inputs to count filled detector 1A4A2U3 are high. On the next output pulse from pulse generator 1A4A2U7, the count will be 1877 (the preset count) When the output from 1A4A2U7 goes high, it will put a high on the only input to 1A4A2U3 that is low and 1A4A2U3 will output a 50 nanosecond pulse. On the trailing edge of the pulse from 1A4A2U3 preset generator 1A4A2U4 will output a 75 nanosecond pulse. The output from 1A4A2U4 is coupled to phase detector 1A4A2U2 ((4) below) and to the data strobe inputs of the preset counter

(4) *Phase Detector and Loop Filter*. Phase detector 1A4A2U2 compares the output frequency of the preset counter ((3) above) with the 1 kHz reference signal from spectrum generator 1A4A1 (*a* above) and develops a DC output voltage that is proportional to the two signals. The output of the preset counter will be 1 kHz when the VCO is operating at the desired frequency If the output of the VCO is high, the output frequency of the preset counter will be less than 1 kHz. The output voltage from the phase detector will decrease, causing the operating frequency of the VCO to decrease. If the output of the VCO is low, the output frequency of the preset counter will be more than 1 kHz. The output voltage from the phase detector will increase, causing the operating frequency of the VCO to increase. The loop filter removes any 1 kHz components in the phase detector output and also determines the transient response of the loop.

(5) *Output Divider*. The output from buffer 1A4A2U1 ((1) above) is amplified by driver 1A4A2Q5. Divide-by-10 counter 1A4A2U5 divides the signal from 1A4A2Q5 and the 1.50 to 1.5999 MHz output signal is fed through the 1 55 MHz bandpass filter and emitter follower 1A4A2Q6 to translator 1A4A3 ((*c*) below).

c. Translator 1A4A3 (Fig. FO-3 and FO-20)

(1) *Voltage Controlled Crystal Oscillator*. With the VFO control pulled out (on), + 12 volts is applied to 21 MHz reference amplifier 1A4A3U1 disabling the amplifier. The same + 12 volts turns voltage controlled crystal oscillator 1A4A3Q1 and switch 1A4A3Q3. Turning on 1A4A3Q3 enables amplifier 1A4A3U2. 1A4A3Q1 is a crystal controlled Colpitts oscillator operating In the frequency range of 20.995 to 21 005 MHz. The control voltage from the VFO control is applied through control amplifier 1A4A3Q3 to the varactor diodes in the circuit to control the operating frequency of 1A4A3Q1. The output from 1A4A3Q1 is amplified by 1A4A3U2 and applied to the 19 MHz balanced mixer ((3) below).

(2) *21 MHz Reference Amplifier*. With the VFO control pushed in (off), 1A4A3Q1 and 1A4A3U2 are

disabled and 21 MHz reference amplifier 1A4A3U1 is enabled. The 21 MHz reference signal from spectrum generator 1A4A1 (*a* above) is amplified by 1A4A3U1 and applied to the 19 MHz balanced mixer ((3) below).

(3) *19 MHz Balanced Mixer*. The 21 MHz signal from the 21 MHz reference amplifier ((2) above) or the voltage controlled crystal oscillator ((1) above) is mixed with the 1.50 to 1.5999 MHz signal from low digit generator 1A4A2 (*b* above) in the 19 MHz balanced mixer. The difference frequency output is filtered by the 19.45 MHz bandpass filter and amplified by 1A4A3U3. Diodes 1A4A3CR5 and 1A4A3CR12 provide AGC to amplifier 1A4A3U3 to ensure a constant level 19.4001 to 19.50 MHz signal out. The 19.4001 to 19.50 MHz signal from 1A4A3U3 is applied to 81.25 MHz mixer 1A4A3Q11 (6) below.

(4) *2nd Local Oscillator*. The 2nd local oscillator is a crystal controlled Colpitts oscillator operating at 80.75 MHz. The output from 2nd local oscillator 1A4A3Q7 is applied to 100 MHz mixer 1A4A3Q8 ((5) below) and through buffer amplifier 1A4A3Q9 to receiver/exciter 1A3 (para 2-4).

(5) *100 MHz Mixer*. The 80.75 MHz signal from the 2nd local oscillator ((4) above) is mixed with the 20 MHz reference signal from spectrum generator 1A4A1 (*a* above) in 100 MHz mixer 1A4A3Q8. The sum frequency output is filtered by the 100.75 MHz bandpass filter and applied to 81.25 MHz mixer 1A4A3Q11 ((6) below)

(6) *81.25 MHz Mixer*. The 100.75 MHz signal from the 100.75 MHz bandpass filter ((5) above) is mixed with the 19.4001 to 19.50 MHz signal from 1A4A3U3 ((3) above) in 81.25 MHz mixer 1A4A3Q11. The difference frequency output is filtered by the 81.25 MHz bandpass filter and applied to output mixer 1A4A3Q4 ((7) below).

(7) *Output Mixer*. The 81.25 to 81.3499 MHz signal from the 81.25 MHz bandpass filter ((6) above) is mixed with the 91.25 to 121.2499 MHz signal from VCO 1A4A5 (*e* below). The frequency of the 81.25 to 81.3499 MHz signal represents the setting of the selected 10 kHz, 1 kHz and 100 HZ FREQUENCY switches. The frequency of the 91.25 to 121.2499 MHz signal represents the setting of all of the selected FREQUENCY switches. Since the 10 kHz, 1 kHz and 100 Hz frequency components are present in both signals, they will cancel in the output mixer when the output of the synthesizer is at the correct frequency (normal operating condition). Therefore, the signal from output mixer 1A4A3Q4 will only represent the setting of the selected 10 MHz, 1MHz and 100 kHz FREQUENCY switches, and will change in 100 kHz steps. The 10.0 to 39.9 MHz difference frequency signal from output mixer 1A4A3Q4 is amplified by the broadband amplifier and applied to VHF divider 1A4A4 (*d* below).

d. VHF Divider 1A4A4 (Fig. FO-3 and Fig. FO-21).

(1) *Broadband Amplifier, Divide-by-Four Counter, and Driver*. The 10.0 to 39.9 MHz signal from translator 1A4A3 (*c* above) is amplified and applied to divide-by-four counter 1A4A4U2. The 2.5 to 9.975 MHz signal from 1A4U2 is inverted by driver 1A4A1U1 and applied to the inputs of the preset counter and the preset generator ((2) below).

(2) *Preset Counter, Carry Detector and Preset Generator*. The preset counter and preset generator are similar to the preset counter and preset generator in the low digit generator (*b*(3) above). The major differences are a carry detector is used when the selected 100 kHz FREQUENCY switch is set to 0 and divide-by-four counter 1A4A4U7 is preset by the 10 MHz preset gate instead of directly from the selected 10 MHz FREQUENCY switch.

(*a*) *Preset Counter*. The preset counter consists of two divide-by-10 counters (1A4A4U3 and 1A4A4U6) and one divide-by-four counter (1A4A4U7). The counter will divide by the number the selected 10 MHz, 1 MHz and 100 kHz FREQUENCY switches are set at plus 100 (table 2-1).

(*b*) *Carry Detector*. When all four 100 kHz preset lines are programmed to a 0 state by the front panel switches (corresponding to a dial setting of 0 on the selected 100 kHz FREQUENCY switch), a special carry signal must be generated to program the counters to the correct division ratio. Mathematically, this is necessary because a dial setting of zero requires 1A4A4U3 to divide by zero-an impossible operation. The count is corrected by programming 1A4A4U3 to divide-by-ten and then subtracting one count from the next decade counter. Note that this is the same mathematical operation of borrowing when, for example, one subtracts nine from ten. Quad two input NAND gate 1A4A4U4 is connected as a quad inverter with a common output. One of the four 100 kHz input lines is connected to each section of the gate. The output of 1A4A4U4 is inverted by 1A4A4U5A. If all four inputs to 1A4A4U4 are zero, the output of 1A4A4U4 will be in a one state and the 1A4A4U5A output will be a zero. If any of the 100 kHz inputs are in a one state, the 1A4A4U5A output will also be a one.

(*c*) *Count Filled Detector*. The inputs count filled detector 1A4A4U8C, 1A4A4U9 are similar to the inputs to count filled detector 1A4A3U3 described in b(3)(*e*) above. However, the input at pin 5 will always be high if the selected 100 kHz FREQUENCY switch is set to zero. If the selected 100 kHz FREQUENCY switch is set to a number other than zero, the input at pin 5 will follow the output at pins 5 and 6 of 1A4A4U6. The output from the count filled detector is a 400 nanosecond positive pulse.

(*d*) *Preset Generator*. Preset generator 11 5A4A4U10 provides a 200 nanosecond negative data strobe pulse when it is triggered by the pulse from the count filled detector ((*c*) above)

(3) *Phase Detector*. The 100 kHz reference signal from spectrum generator 1A4A1 (*a* above) is applied to divide-by-four counter 1A4A4U11. The 25 kHz output from 1A4A4U11 is applied to phase detector 1A4A4U12. The phase detector compares the nominal 25 kHz output frequency of the preset counter ((2) above) with the 25 kHz input from 1A4A4U11 and develops a DC output voltage that is proportional to the two signals. The output from the phase detector is coupled to VCO 1A4A5 (*e* below).

e. *VCO 1A4A5* (Fig. FO-3 and Fig. FO-11).

(1) *Band Oscillators*. The selected 10 MHz FREQUENCY switch enables one of the three band oscillators through one of the three transistor switches. The band oscillators are Colpitts oscillators similar to voltage controlled oscillator 1A4A2 (*b*(1) above). Band 0 oscillator 1A4A5Q7 operates over a frequency range of 91.25 to 101.2499 MHz Band 1 oscillator 1A4A5Q7 operates over a frequency range of 101.25 to 111.2499 MHz. And, Band 2 oscillator 1A4A5Q8 operates over a frequency range of 111.25 to 121.2499 MHz. Coarse frequency tuning is provided by the action of the course frequency voltage from the selected 10 MHz FREQUENCY switch. Fine frequency tuning is provided by the DC voltage from VHF divider 1A4A4 (*d*(3) above). The output from the enabled band oscillator is coupled through amplifier 1A4A5Q11, 1A4A5Q12 to translator 1A4A3 (*c* above) and through amplifier 1A4A5Q9, 1A4A5Q10 and the 91 to 122 MHz bandpass filter to receiver/exciter 1A3 (para 2-4).

(2) *Binary Coded Decimal Converter*. The BCD converter consists of two transistor switches, 1A4A5Q1 and 1A4A5Q2, that convert the ground signal from the selected 10 MHz FREQUENCY switch to tens complement binary coded decimal. The output from the BCD converter is applied to the 10 MHz preset gate (d(2) above) in VHF divider 1A4A4.

f. *Local Oscillator Blanker* (Fig. FO-23). The local oscillator blanker protects the power amplifier from transients caused by a frequency change while transmitting. When the selected 1 MHz FREQUENCY switch setting is changed, the synthesizer may change frequency by several MHz while the switch is momentarily open. If this occurs while transmitting, it would result in a large transient that could damage RF power amplifier 1A7A1.

When the setting of the selected 1 MHz FREQUENCY switch is changed, the "preset 20 1 MHz" frequency control line will change from either:

logical "0" (approximately 0.2 volts) to
logical "1" (approximately 3 volts) state
or
logical "1" to logical "0" state

In the first case, the positive going signal is formed into a 100 to 200 millisecond positive differentiated pulse. The positive differentiated pulse turns switch 1A4A6Q2 on Switch 1A4A6Q2 turns switch 1A4Q6Q1 on, generating a blanking pulse. In the second case, the negative going signal is formed into a 100 to 200 millisecond negative differentiated pulse The negative differentiated pulse turns switch 1A4A6Q1 on, generating a blanking pulse In either case, the blanking pulse is applied to spectrum generator 1A4A1 (*a* above), and disables the 3rd local oscillator signal.

2-10. Filter Module 1A5 Detailed Functional Operation (Fig. FO-4)

a. *Filtering*. The filter module provides low pass filtering in transmit mode and band pass in receive mode. The filters have been divided among three different boards. Board 1A5A1 has the low pass filters for the odd number channels. Board 1A5A2 has the low pass filters for the even number channels. Board 1A5A3 has high pass filters. Only the low pass filters are used in the transmit mode. The high pass filters are used, along with the low pass filters, for band pass filtering in the receiver mode. Correct filtering for each band is accomplished automatically when the front panel frequency control switches are set. Inactive filters, for any given band, are switched to ground through a 10 ohm resistor. This discharges the filter and prevents unwanted interaction with active filters. Table 2-2 lists the filter band numbers and their corresponding frequency ranges.

Table 2-2. Band Numbers and Frequency Ranges.

BAND NUMBER	FREQUENCY RANGE
1	1 6 to 1 9999 MHz
2	2 0 to 2 9999 MHz
3	3 0 to 3 9999 MHz
4	4 0 to 5 9999 MHz
5	6 0 to 8 9999 MHz
6	9 0 to 12 9999 MHz
7	13 0 to 19 9999 MHz
8	20 0 to 29 9999 MHz

b. *Filter Selection*. Correct filter selection for the band in use is setup through wafer switches driven by a DC motor. The motor (B1) is mounted on the Motor Control Board 1A5A4. Motor control is accomplished with an "open seeking" circuit comprised of relay 1A5A4K1 and wafer switch 1A5A4S1. When changing the 1 MHz or 10 MHz switch of the selected frequency changes the band, relay 1A5A4K1 is energized thru 1A5A4S1. The now closed contacts, 5 and 9, of 1A5A4K1 supply + 12 VDC to motor 1A5A4B1. The motor simultaneously rotates the wafer switches on each of the four filter module boards. Wafer switch 1A5A4S1 rotates until the open position reaches the hand position supplying the + 12 V. At that point + 12 V is removed from switch 1A5A4-8 and relay 1A5A4K1 deenergizes. The 1A5A4B1 motor input switches from + 12 V to ground through normally closed contacts, 1 and 9, of 1A5A4K1. This quickly stops the motor and prevents excessive overshoot. Diode 1A5A4CR1 prevents motor back emf from keeping 1A5A4K1 energized. With the motor stopped, all wafer switches are set to provide the correct filtering for the selected band. A filter, capacitors 1A5A4C1, 1A5A4C2 and inductor 1A5A4L1, prevents noise on the motor input line.

c. Receiver Protector. Diodes 1A5A4CR18 and 1A5A4CR19 form a shunt power limiter to protect the receiver front end from excessive power input.

d. Voltage ALC Detector. The ALC (Automatic Level Control) detector is the sensing circuit for the ALC circuitry that limits the peak power output to 100 watts. It provides an output reference voltage to the receiver/exciter for use in the IF stages for output level control. The voltage ALC detector consists of a voltage divider (1A5A4R25 and 1A5A4R26) and RF detector (1A5A4CR17), and emitter followers 1A5A4Q2 and 1A5A4Q3. Capacitor 1A5A4C28 filters out any audio modulation and variable capacitor 1A5A4C24 tunes the circuit for best performance over the transceiver frequency range.

e. ACC Detector. The ACC (Automatic Carrier Control) detector provides a carrier sampling to the ACC circuitry for control of AM power output. The ACC detector derives its output by sampling the signal at the antenna connector of the filter module. A voltage divider (1A5A4R4 and 1A5A4R5), a rectifier (1A5A4CR6 and 1A5A4CR12), and a filter network (1A5A4C5, 1A5A4L2 and 1A5A4C6) make up the ACC detector. Variable capacitor 1A5A4C13 tunes the circuit for heat operation. The detector output at this point has a fast rise/fall time. To maintain a constant carrier level the detector output is fed to an averaging network on the receiver/exciter sideband generator board.

f. Level Detector. A forward power level and a reflected power level (VSWR) are the two level detector outputs. The forward power level is obtained by sampling the signal at the antenna connector of the filter module. The signal level is dropped by a voltage divider 1A5A4R1 and 1A5A4R2), and developed by detector 1A5A4CR5. A filter network (1A5A4C3, 1A5A4R3 and 1A5A4C4) then smoothes the signal for use by the front panel power monitor. The reflected power level is used to protect the RF power amplifier. The level of reflected power (VSWR) is derived inductively (1A5A4T1 and 1A5A4R20) from the signal to the antenna connector on the filter module. The VSWR is developed by diode 1A5A4CR16 and filter network 1A5A4C22, 1A5A4L4 and 1A5A4C23. If the VSWR is less than 1.7 to 1 no output (VSWR ALC) is generated.

g. Keyline. The filter module also contains some of the components necessary for transmit keying. Refer to paragraph 4-1.

2-11. Antenna Coupler Control Unit 1A2 Detailed Functional Operation (Fig. 2-4).

This unit contains the controls and indicators necessary for the operator to check, select and monitor antenna tuning. Meter 1A2M1 indicates either reflected or forward power as selected by REFL FWD POWER MONITOR switch 1A2S1. The TUNE START switch initiates a coupler tune cycle when depressed if the radio set has been set to CPLR TUNE KW. The COUPLER STATUS indicators provide Antenna Coupler operating condition indications.

Section III. ANTENNA COUPLER CU-2229/URC-92 FUNCTIONAL OPERATION

2-12. Simplified Overall Operation

The CU-2229/URC-92 antenna coupler is located near the antenna base and provides automatic antenna tuning. Operation is controlled by the antenna coupler control mounted in the front panel of the RT1277/URC-92 transceiver. Automatic tuning is accomplished by a variable inductor and a variable capacitor. Auxiliary, fixed value, capacitive circuits are also switched in and out as necessary by relays. When automatic tuning is initiated at the control unit, a tuning cycle begins The green READY light, on the control, illuminates when the cycle is complete.

NOTE

Any time the red FAULT light illuminates, it is an indication that the antenna coupler should be tuned

In a tune cycle, a demodulated RF is supplied to phase and amplitude detectors. These detectors generate error signals proportionate to the impedance and phase differences of the RF line. The error signals are differentiated and amplified to drive the DC motors that control 2C1 and 2L4.

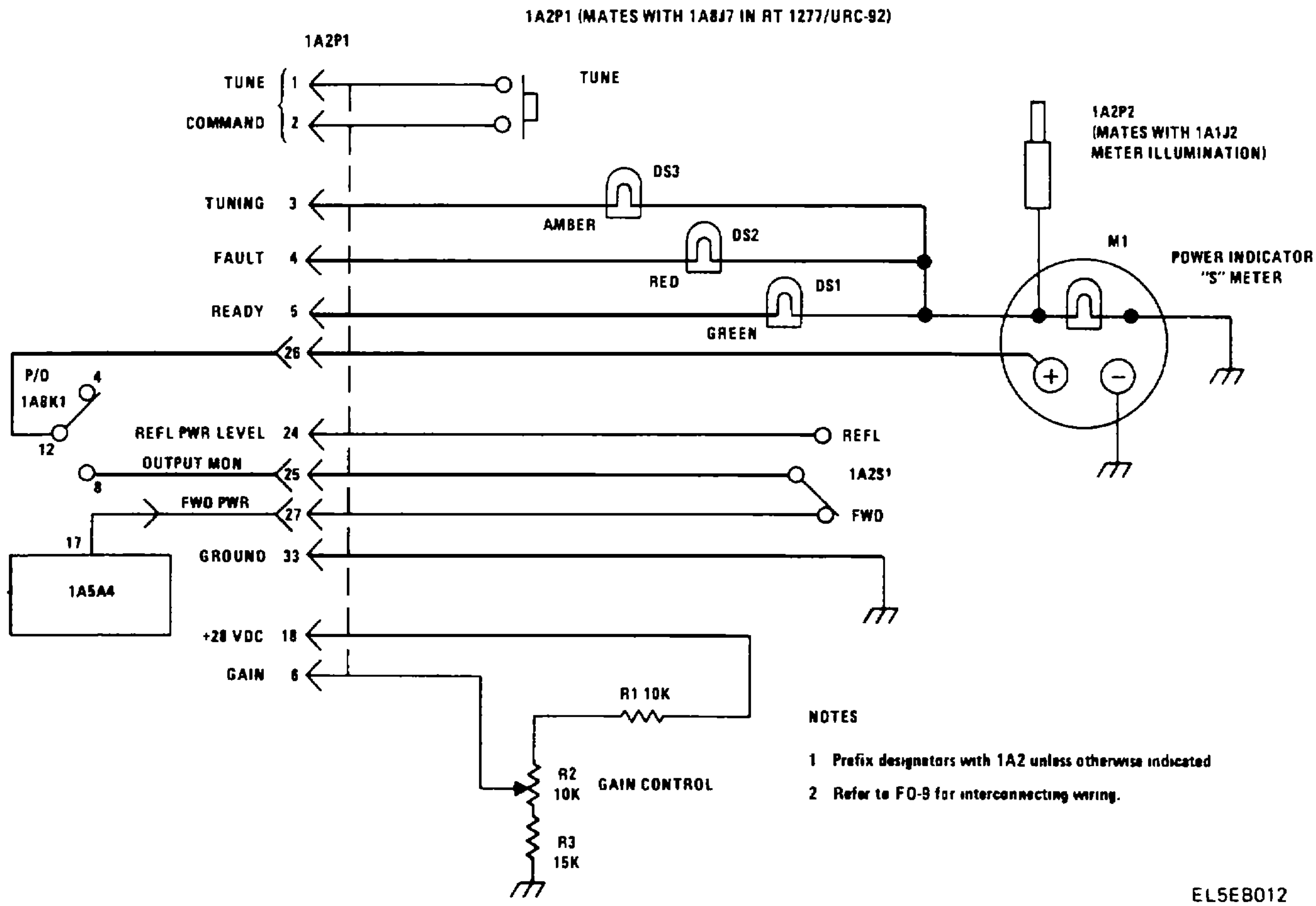


Figure 2-4. Antenna Coupler Control Unit Schematic Diagram.

2-13. Detailed Theory of Operation (Fig. FO-5 and Fig. FO-32)

To begin a tune cycle, the RT-1277/URC-92 mode switch must be set to CPLR TUNE KW. The CPLR TUNE KW position provides the ground necessary to energize relay 2K1. When 2K1 is energized, +28 VDC (CPLR tune +) is present at one side of the antenna coupler control TUNE START switch. Depressing TUNE start returns the +28 VDC (CPLR tune + R) to the antenna coupler control logic board 2A1 pin A. The +28 VDC at 2A1-A generates a keying signal at 2A1-7, a 2C1 home pulse at 2A1-13 and a 2L4 home pulse at 2A1-R. A ground is supplied, by 2A1-6, to 1A2-3 which lights the COUPLER STATUS TUNING indicator. Also, a ground is present at 2A1-15 which energizes 2K4. Normally 2K4-9, 1 with 2K4-10, 2 shunt the RF around the 3 dB attenuator. In a tune cycle, with 2K4 energized, the 3 dB attenuator is placed in series in the RF line. The 2A1 home pulses enter the phase and amplitude control board 2A2 on pin 6 for 2C1 and pin R for 2L4. The home pulses set 2A2 flip-flops to provide a homing signal at 2A2-5 for 2C1 and at 2A2-V for 2L4. Simultaneously, the transceiver produces an RF output that is sensed in the phase and amplitude detector board 2A4. Board 2A4 develops phase (2A4-2), amplitude (2A4-5) and reflected power (2A4-3) error signals. Each of these error signals is referenced to the 10 volt line. The reflected power signal goes to control logic board 2A1 pin 15. It is used as a control signal for many AN/URC-92 operations. Phase error between 2A2-2 and 2A2-3 is processed and a corrective drive signal is produced. The home drive is removed and the corrective drive takes over as soon as the phase becomes positive. The corrective drive signal for phase occurs at either 2A2-4 or 2A2-5 depending upon the 2C1 adjustment necessary. Amplitude error between 2A2-16 and 2A2-U is processed and a corrective drive signal produced for 2L4 adjustment. Again the home drive signal is removed and the corrective drives takes over, at either 2A2-17 or 2A2-V, when the phase goes positive. The phase and amplitude corrective drive signals oscillate until 2C1 and 2L4 are tuned to minimum reflected power. At that point, 2A2 causes a motor braking action at 2A2-T and 2A212. The servo motor control (2A6) receives the drive signals from 2A2 and amplifies them to drive 2M1 and 2M2 as necessary. Motors 2M1 and 2M2 then adjust 2C1 and 21L4 respectively to the correct position for minimum reflected power When reflected power has been adjusted below the threshold, control logic board 2A1 ends the tune cycle The COUPLER STATUS READY Indicator is illuminated by a ground at 2A1-N and the AN/URC-92 is ready for transmitting

2-14. Control Logic Board 2A1 Detailed Functional Operation

(Fig FO-6 and Fig FO-33)

Board 2A1 provides control co-ordination for the automatic tuning cycle The logic outputs of 2A1 provide initiation, cycling, completion and fault signals The control logic board Is divided into eight functional blocks which will he discussed Individually The eight functions are Tune flip-flop, 50 ohm flip-flop, Fault flip-flop, Time Delay, C3-C6 control, Reflected Power Amp, RF Detector, and Lamp Driver

a. Tune Flip-Flop The Tune flip-flop is comprised of 2A1Q10, 2AlQ15, 2A1U3B-C-D, 2A1U4C-D and all related components When the unit is first turned on, 2A1U3B-6 is at a logic 0 due to circuit loading. Depressing the TUNE START pushbutton on the antenna coupler control (1A2) applied + 28 VDC to 2XA1-A The +28 VDC turns on 2A1Q15, causing a logic 0 at the collector, which initiates a tune cycle The logic 0 initiate signal resets 2AIU3C-8 causing a logic 1 at 2A1U3B-6 Because of this, 2AlQ10 turned on and ground the Interlock (2XA1-7) which keys the transmitter on in am The 2AlU: 3B-6 output is also fed to the Lamp Driver to light the COUPLER STATUS TUNING Indicator The same logic 0 initiate signal is used in all the other functions except the [,amp I)river It also provides the 2C1 home (2XA1-13) and 2I,L4 home (2XA1-R) outputs The Tune FF is reset, when the tune cycle ends, by a logic 1 at 2AlU4C-9 from the Reflected Power Amp which produces logic 0 at 2AlU4C-8 That logic 0 resets the Fault FF and the Tune FF which extinguishes the COUPILER STATUS TUNNG Indicator At the same time 2A1U41)-11 is at a logic 1 which is fed to the Lamp Driver to light the COUPLER STATUS REAI)Y indicator

b. 50 Ohm Flip-Flop The 50 Ohm FF includes 2AlQ13, 2A1Q19 1A1U6A-B C-D, 2A1U4C and associated components When a tune cycle is Initiated, a logic 0 is placed at 2AlU6C-8 and sets the FF with a logic 1 at 2AlU6D-11 The logic 1 triggers 2A1Q14 to provide a ground, for energizing 2K4, at 2XA1-15 Energizing 2K4 switches the 3 dB attenuator in series with the rf transmission line When reflected power drops below threshold or RF power is not sensed by the RF Detector, the 50 Ohm FF is reset This causes 2A1Q14 to cease conduction and 2K4 deenergizes, taking the 3 dB attenuator out of the transmission line If the reflected power is below threshold, 2A1Q3 of the Reflected Power Amp develops logic 0 at U6A-1 Gate 2A1U6A then establishes logic 1 at 2A1U6B-4 and 2XA1-14, which is the 50 (+) output. Gate 2A1U6B generates logic 0 at 2AIU6C-9 to reset the FF If RF is not present during a tuning cycle, the FF also resets but is set again by 2A1Q19 and 2A1U5C. The 50 Ohm FF is also set, and triggers 2A1Q14 if any of the following conditions occur the Time Delay running out or variable inductor 2L4 reaching L max will set the FF thru 2A1CR15 and/or 2A1CR16 respectively. Also, some frequency-impedance combinations may cause the FF to reset and the tuner will not tune. This situation occurs if reflected power rises above threshold during the same tune cycle Then an RC network, 2A1R29 and 2A1C36, charges to trigger 2AlQ13 Then 2A1Q13 established a logic 0 at 2A1U6D-13 to set the FF, 2A1U6D1 1, at logic 1 and trigger 2A1Q14 on. With that the 3 dB attenuator Is again switched in to prevent transmitting into a possible open or short circuit.

c. Fault Flip-Flop. The Fault FF consists of 2A1U4A-B, 2A1U5A-B-D, 2AICR12, 2A1CR13 and their corresponding circuits When power is first applied (transceiver turned on), circuit loading causes 2A1U4B-6 to be logic 0 and set the FF The logic 1 at 2alU4A-3 Is then fed to the Lamp Driver to light the COUPLER STATUS FAULT indicator. When the mode switch is set to CPLR TUNE KW, +10V is switched to 2XA1-2 thru 2K1. The + 10V is applied to an RC network and voltage regulator, in the Fault FF to generate a single logic 1 pulse This pulse is inverted by 2A1U5D and the logic 0 makes 2A1U4B-6 a logic 0 The logic 0 is also fed to Tune FF 2A1U3D-13 to extinguish the CPLR TUNE READY indicator The output of 2A1U4A-3 is then at logic 1 and fed to the Lamp Driver to light the COUPLER STATUS FAULT indicator The Fault FF is also set by a logic 0 from 2A1U5A-11. A logic 0 from 2A1U5A is caused when two conditions are met First, the reflected power is above threshold and Reflected Power Amp 2A1Q3 causes a logic 1 at 2A1U5A-13. Second, Tune FF 2A1U3C-8 produces a logic 1 at 2A1U5A-12, indicating tuning is not in process This ensures. the COUPLER STATUS FAULT indicator will light any time timing is required due to antenna or frequency change If the Time Delay runs out, the Fault FF will he set with a logic 0 from 2A1CR20 to 2A1U4B-6.

d. Reflected Power Amp Components 2A101.2A1Q1, 2A1Q2, 2A1Q3. 2A1Q4, 2A1Q5, 2A1CR1, 2A1CR2 and associated resistors and capacitors make up the Reflected Power Amp From 2X1A-3 a DC voltage, proportionate to reflected power on the transmission line, is fed to 2A1U1-4. This signal Is referenced to + 10 VDC and 2AlU1 develops its output from that reference. The output at 2A1U1-10, along with a gain input (2XA1-8) from the antenna coupler control, controls 2A1Q1 operation The gain input establishes the reflected power threshold that causes 2A1Q1 conduction Transistor 2A1Q2 converts the 2A1Q1 output into an on/off output characteristic of reflected power When 2A1Q2 conducts, it represents reflected power above threshold With 2A1Q2 off, reflected power Is below threshold and a positive voltage is felt at the base of 2A1Q3 Transistor 2A1Q3 conducts when reflected power is below threshold and its collector is at ground The 50 (-) output of board 2A1, at 2XA1-8, is taken from the collector of 2A1Q3 Also, 2A1Q3 drives 2A1Q4 Transistor 2A1Q4 and associated components establish a short time delay The time delay prevents brief intervals of reflected power drop from terminating a tuning cycle The 2A1Q4 output operates 2A1Q5 to provide logic outputs characteristic of reflected power level A logic 1 from 2A1Q5 indicates reflected power below threshold The logic 1 is fed to Tune FF 2A1U4C-9 to terminate the tune cycle Diode 2AlCR1 and resistor 2A1R7 in the Reflected Power Amp cut it off during receive mode This prevents keying spikes from causing the CPLR STATUS FAULT indicator to come on when unkeying.

e. Time Delay. The time delay consists of 2A1Q16, 2AlQ17, 2AlQ18 and their related components Variable resistor 2A1R46 adjusts the length of the time delay The normal time delay setting should be approximately 40 seconds Time Delay operation is as follows When a tune cycle is initiated, the collector of 2A1Q16 rises to near +VDC Capacitor 2A1C40 begins charging thru 2A1R47 and the anode of 2A1Q17 increases toward +5 VDC Transistor 2A1Q17 is a programmable unifunction transistor that fires when the anode voltage reaches the voltage applied to the gate Voltage divider 2A1R49 and 2AlR50 sets the gate voltage at approximately +5 VDC When 2A1Q17 fires, the positive pulse triggers 2A1Q18 and 2A1Q18 collector produces a logic 0. The logic 0 resets the Tune FF thru 2A1CR21 and the Fault FF thru 2A1CR20. This terminates the tune cycle and lights the CPLR STATUS FAULT indicator Diode 2A1CR26 places a logic 0 on the L max line to terminate the L force function at the end of the time delay.

f. RF Detector. The RF Detector is comprised of 2A1Q8 and its associated components. When RF Is sensed on the transmission line, a DC signal is present at 2XA1-B This signal is coupled into the RF detector thru an RC network, 2A1R23 and 2A1C34 The RC network allows 2A1Q8 to trigger on only when a constant DC level is present Erratic levels and spikes are shunted to ground through 2A1C34. This prevents noise from turning the antenna tuner off when the transmitter is first keyed on when 2A1Q8 triggers on, a logic 0 is generated at the collector and inverted by 2A1U3. The logic 1 from 2A1U3-3 is fed to the Fault FF (2A1U4C-10) and the 50 ohm FF (2A1U6B-5).

g. C3/C6 Control Assembly. Components 2A1Q6, 2A1Q7, 2A1U2 and their associative circuitry make up the C3/C6 control Capacitor 2C3 is switched in and out of the circuit in the following way. Each time the time delay runs out, 2A1U2C inverts the logic 0 from Time Delay 2AlQ18 to logic 1. The logic 1 (2A1U2-8) then triggers 2A1Q6 to provide a ground at 2XA1-17 which energizes bistable relay 2A5K2. Bistable relay 2A5K2 is the control for 2K3 which controls 2C3A-B Control of 2C6 also utilizes a bistable relay, 2A5K1 It is controlled by 2A1U2A-B-D The L max signal, a logic 0, is produced when 2L4 reaches maximum inductance. This logic 0 comes in on 2XA1-T to 2A1U2D and is inverted. The logic 1 at 2A1UD-11 then triggers 2A1Q7 to provide a ground at 2XA1-V. That ground toggles 2A5K1 into its opposite state. This action either switches 2C6 in or out across 2L4, depending on its previous condition. If 2C6 is switched across the 2L4, +28 VDC is also switched on to 2XA1-U. This +28 VDC is reduced to a logic 1 level by voltage divider 2A1R19 and 2A1R20. The logic 1 is then fed to 2A1U2B-5 and a logic 0 is then present at 2A1U2B-6. That logic 0 is inverted by 2A1U2D and again 2A1Q7 is triggered Bistable relay 2A5K1 is toggled into its opposite state and 2C6 is either switched in or out across 2L4. It should be noted that if 2L4 reaches L min and 2K2 is not energized, 2A5K1 will not be toggled. Also, if a tune cycle is initiated, 2A1U2A has a logic 0 output. At this time, if 2C6 is across 2L4, it will be removed.

h. Lamp Driver. The three CPLR STATUS indicators, on the antenna coupler control, are controlled by 2A1Q9, 2A1Q11 and/or 2A1Q12. These lamp drivers are turned on by logic signals at the appropriate times. The CPLR STATUS FAULT lamp driver is 2A1Q12. It is triggered on anytime the Fault FF has a logic 1 at 2A1U4A-3 Lamp driver 2A1Q11 lights the CPLR STATUS READY indicator. This happens with a logic 1 from the Tune FF at 2A1U4D11 CPLR STATUS is lit by 2A1Q9 with a logic 1 from Tune FF 2A1U3B-6.

2-15. Phase and Amplitude Control Board 2A2 Detailed Functional Operation

(Fig FO-7 and FO-34)

Board 2A2 processes inputs from Phase and Amplitude Detector 2A4 to provide drive signals for Servo Motor Control 2A6. Thirteen functions are contained on 2A2. These functions are: Phase Preamp, Phase Level Changer, Phase Positive Logic Generator, C1 Home-Flip-Flop, C1 Drive Inhibit, Phase Servo Preamp, Amplitude Preamp, Amplitude Level Changer, L4 Home Flip-Flop, L4 Force Flip-Flop, L4 Drive Inhibit, Amplitude Servo Preamp and Phase/Amplitude Brake.

a Phase Preamp. The Phase Preamp consists of differential amplifier 2A2U1, 2A2CR1, 2A2CR2 and related components. A + 10 VDC reference is applied to 2A2U1-4. The 2A2U1-5 input is a DC level proportionate to phase angle. The 2A2U1-10 output is referenced at a + 10 VDC level which is the null output level. When phase angle goes negative, 2A2U1-10 generates a corresponding output level below +10 VDC. If phase angle is positive, 2A2U1-10 is at a corresponding level above +10 VDC Operational levels of 2A2U1-10 are between ground and +28 VDC.

b. Phase Level Changer. Components of this function are 2A2Q1, 2A2Q2, 2A2Q3 and associated circuitry. An input, to the Phase Level Changer, above +10 VDC controls 2A2Q1 conduction Transistor 2A2Q1 output, in turn, controls 2A2Q3 which establishes a drive signal to the Phase Servo Preamp positive drive. Also 2A2Q3 provides an output to the Phase Positive Logic Generator. If the Phase Level Changer input is below + 10 VDC, 2A2Q2 conducts to provide a drive signal to the Phase Servo Preamp negative drive.

c Phase Positive Logic Generator. Transistor 2A2Q4 functions as a logic level generator. When triggered by the Phase Level Changer, it establishes a logic level 0. This logic 0 indicates a positive phase angle to board 2A2 flip-flop functions.

d. C1 Home Flip-Flop. The C1 Home flip-flop is comprised of 2A2U2A-B-C, 2A2Q5, 2A2CR3, 2A2CR4, 2A2CR5 and associated components When power is first applied, this FF resets and 2A2U2A-3 is at logic 0. A C1 home signal, logic 0 at 2XA2-6, to 2A2U2A-2 sets the FF. The logic 1 at 2A2U2A-3 then triggers Phase Servo Preamp 2A2Q7 to provide a drive signal at 2XA2-5. The same logic 1 is used by the C1 Drive Inhibit function. The C1 Home FF is reset (home cycle terminated) by logic 0 on the collector of 2A2Q4 or logic 0 on the C min line. In other words, the capacitor will be driven toward maximum until a positive phase angle is detected or until the capacitor reaches maximum capacity A positive phase angle resets the C1 Home FF by a logic 0 at 2A2U2B-5 C max resets the FF by applying a logic 0 to 2A2U2A3 thru 2A2CR7. The C max line also shorts out the output to 2A2Q7 through 2A2CR6. This action is required because the phase may still be negative when 2C1 reaches maximum capacitance and, although the C1 home function is terminated the negative phase would try to drive the capacitor beyond the end stop. Diode 2A2CR3 shorts out the positive phase drive to 2A2Q6 during the interval of the C1 home signal. This prevents the initial turn on of the transmitter from generating a positive phase angle and causing 2A2Q7 and 2A2Q6 to be turned on simultaneously. Diode 2A2CR4 resets the C1 Home FF when the capacitor reaches minimum capacitance and forces the capacitor toward maximum. Diode 2A2CR5 shorts out the positive phase drive during the time interval when C1 mm pulse exists. If this action were not taken, and phase were positive when 2C1 reached minimum, C1 Home FF would be set and 2A2Q6 and 2A2Q7 would be turned on at the same time Diode 2A2CRll is connected to the 50 (-) line and removes the drive from 2A2Q7 when the reflected power falls below the threshold If the unit is homing and the 50 ohm threshold point occurs before a positive phase angle occurs, the home drive will be terminated by 2A2CR11. Variable capacitor 2C1 will overshoot and the resultant positive phase angle will reset the C1 Home FF. However, the driven elements have come to rest and slight servo action will correct the phase error to zero

e. C1 Drive Inhibit. Gate 2A2U2C, 2A2Q5, 2A2CR8 and associated resistors make up the C1 Drive Inhibit. The C1 home signal and a C1 Home FF reset, logic 0, causes a logic 1 at 2A2U2C-8. The logic 1 triggers 2A2Q5 to short out the drive signal from the Phase Level Changer during the home cycle. This action is necessary to prevent driving 2A2Q6 while 2A2Q7 is driving during the home cycle. Transistor 2A2Q5 is also utilized to remove the drive from the phase servo during intervals when reflected power is below threshold. This is accomplished by the 50 (+) signal triggers 2A2Q5 through 2A2CR8 and 2A2R21.

f. Phase Servo Preamp. The Phase Servo Preamp contains 2A2CR6, 2A2CR9, 2A2CR10, 2A2CR11, 2A2Q6, 2A2Q7 and required resistors. A positive phase signal triggers 2A2Q6 to supply a drive signal at 2XA2-4 A negative phase signal triggers 2A2Q7 to provide a drive signal at 2XA2-5 Transistor 2A2Q6 is cutoff, when reflected power is below threshold, through 2A2CR9. Similarly, 2A2Q7 is cutoff through 2A2CR10 Cutoff 2A2Q7 is also accomplished through 2A2CR6 at C max or through 2A2CR11 by a 50 (-) signal at 2XA210

g. Amplitude Preamp. The Amplitude Preamp is comprised of 2A2U3, 2A2CR20, 2A2CR21 and associated components A + 10 VDC reference is applied to 2A2U3-4. The 2A2U3-5 input is a DC level proportionate to impedance magnitude. The 2A2U3-10 output is referenced at a + 10 VDC level which is the null output level. When impedance is above 50 ohms, a negative voltage is applied to 2A2U3-5 Conversely, impedance below 50 ohms means a positive input to 2A2U3-5. With a positive at 2A2U3-5, the output of 2A2U3-10 goes to a corresponding level above + 10 VDC. With a negative input to 2A2U3-5, 2A2U3-10 provides a corresponding output below + 10 VDC. Operational levels of 2A2U3-10 are between +28 VDC and ground.

h. Amplitude Level Changer. The Amplitude Level Changer includes 2A2Q10, 2A2Q11, 2A2Q12 and related components. An input above + 10 VDC, to the Amplitude Level Changer, controls 2A2Q10 conduction Transistor 2A2Q10 then regulates 2A2Q12 which generates a drive signal to the Amplitude Servo Preamp positive drive. If the Amplitude Level Changer input is below + 10 VDC, 2A2Qll conducts to establish a drive signal to the Amplitude Servo Preamp negative drive.

i. L4 Home Flip-Flop. Diodes 2A2CR14, 2A2CR15, 2A2CR17, gates 2A2U4A-B and associated components make up the L4 Home flip-flop. A logic 0 is established at 2A2U4A-3, by 2A2C32, when power is first applied. An L4 home signal, logic 0 at 2XA2-14, to 2A2U4A-2 sets the FF for logic 1 at 2A2U4A-3. Amplitude Servo Preamp transistor 2A2Q14 is triggered by the logic 1 to generate a drive signal at 2XA2-V. At the same time, the logic 0 at 2A2U4B-6 is fed to L4 Drive Inhibit. The 2A2U4A-3 logic 1 is maintained until L4 mm is achieved. Either an L minlogic 0 or positive phase angle logic 0 applied to 2A2U4A-3 resets the L4 Home FF.

j. L4 Force Flip-Flop. The L4 Force Flip-Flop consists of 2A2CR12, 2A2CR16, 2A2U4C-D, 2A2U5B-C-D and related components. When power first comes on, 2A2C31 causes the FF to reset with logic 0 at 2A2U4C-8. A reset also occurs with an L4 Home signal. This logic 0 signal is applied to 2A2U4C-8 through 2A2CR12. It is necessary to prevent L4 Home and L4 Force flip-flops from being on simultaneously. The FF is not set, logic 1 at 2A2U4C-8, unless 2C1 reaches max and 2L4 reaches min and an untuned condition still exists. Since both 2C1 and 2L4 have reached limits, a force function is required to drive 2L4 toward maximum. This action is necessary to create a positive phase angle so tuning can continue. The C max and L mm logic 0 signals are applied to 2A2U5B after being inverted by either 2A2U5C or 2A2U5D. The 2A2U5B-6 logic 0 is applied to 2A2U4C-9 and sets the L4 Force FF. The logic 1 on 2A2U4C-8 is fed to the Amplitude Servo Preamp to drive 2L4 toward maximum inductance. When a positive phase angle occurs, L4 Force FF will be reset by logic 0 through 2A2CR16 to 2A2U4C-8. If the force function continues until L max, the FF will be reset by logic 0 through 2A2CR24 to 2A2U4C-8.

k. Drive Inhibit. Gate 2A2U5A, diode 2A2CR25, transistor 2A2Q15 and associated resistors comprise this circuit. If either L4 Home FF or L4 Force FF is set, then 2A2U5A-3 has a logic 1 output. The logic 1 triggers 2A2Q15 to short out any drive signals to the Amplitude Servo Preamp. Transistor 2A2Q15 is also triggered through 2A2CR25 with a logic 1, 50 (+) signal. Again, the drive signals to the Amplitude Servo Preamp are shorted out. This action stops the drive to the servo preamp anytime reflected power is below threshold.

l. Amplitude Servo Preamp. Contained in the Amplitude Servo Preamp are 2A2CR22, 2A2CR23, 2A2CR27, 2A2CR28, 2A2CR30, 2A2Q13, 2A2Q14 and associated circuitry. A positive amplitude signal triggers 2A2Q13 to provide a drive signal at 2XA2-17. A negative amplitude signal triggers 2A2Q14 to supply a drive signal at 2XA2-V. Transistor 2A2Q14 is cutoff, terminating the L4 home function, through 2A2CR30 when a 50 ohm point is detected. Similarly, 2A2Q14 is cutoff at L min through 2A2CR23 and by an inhibit signal through 2A2CR27. Transistor 2A2Q13 is cutoff at L max through 2A2CR22 and by an inhibit signal through 2A2CR26

m. Phase/Amplitude Brake. The Phase/Amplitude Brake is made up of 2A2CR18, 2A2CR19, 2A2CR31, 2A2Q8, 2A2Q9 and related components Normal operation is with both 2A2Q8 and 2A2Q9 conducting. A ground is maintained at 2XA2-12 by 2A2Q8 and at 2XA2-T by 2A2Q9. Braking occurs when one and/or the other transistor is cutoff. Both transistors are cutoff by a logic 0, on the 50 (-) line, at 2XA2-10. The logic 0 is fed through 2A2CR18 to 2A2Q8 and through 2A2C19 to 2A2Q9. An L mm logic 0 will also cutoff 2A2Q19 through 2A2CR31. When cutoff, the output of the cutoff transistor goes positive. This positive voltage that is the braking signal to the Servo Motor Control Assembly 2A6.

2-16. Regulator Board 2A3 Detailed Functional Operation

(Fig FO-32)

The Regulator Board contains an RF detector comprised of 2A3R2, 2A3CR1, 2A3CR2 and 2A3C4 and a voltage regulator The RF detector senses the presence of RF on the transmission line The detector output is a reduced level of the positive signals only The voltage regulator provides a filtered + 5 VDC level It also provides some filtering for the + 10 VDC line and the + 28 VDC switched line.

2-17. Filter Board 2A3A Detailed Functional Operation

(Fig FO-32)

The Filter Board provides RF filtering to keep RF off the antenna coupler control cable. Each input and output of the antenna coupler passes through a separate filter network on this board. The filters are standard pi type configuration with capacitors and choke.

2-18. Phase and Amplitude Detectors 2A4 Detailed Functional Operation

(Fig FO-32)

Board 2A4 provides the outputs necessary to initiate driving 2C1 and 2L4 for tuning Its outputs are proportionate to inductive and/or capacitive phase differences and amplitude variations above and below 50 ohms. Three separate detectors are located on this board. They are the Amplitude Detector, the Reflected Power Detector and the Phase Detector.

a. Amplitude Detector. The amplitude detector provides a method of measuring the magnitude of the impedance that exists at the input to 2T1. If this magnitude is greater than 50 ohms, the output from the amplitude detector will be one polarity. If the magnitude of the impedance is less than 50 ohms, the output polarity will be reversed. A voltage sample is derived from the line by capacitive divider 2A4C1, 2A4L1 and 2A4C2. This voltage sample is rectified by 2A4CR3 and produces a DC voltage proportional to the voltage on the line. A voltage proportional to the current in the line is generated by transformer 2A4T1 and is rectified by diode 2A4CR2 2A4C1 is a variable capacitor and is adjusted so the voltage sample is exactly equal to the current sample when the detector is terminated with 50 ohms. If the magnitude of the impedance at the input to 2T1 is greater than 50 ohms, the voltage sample will be larger than the current sample. Under these conditions, the output voltage (measured between 2A4L6 10V REF and 2A4L4 output) would be negative. If the magnitude is less than 50 ohms, the current sample is larger than the voltage sample and the output (between 10V REF and 2A4L4 output) will be positive. This output is fed to a differential amplifier located on 2A2 and generates a voltage suitable for driving the servo preamplifiers. It should be noted that the amplitude detector is floating on 10 volts and is not referenced to ground. All measurements for the amplitude detector must be referenced to the 10 volt reference line.

b. Reflected Power Detector. The amplitude detector portion of 2A4 also provides an output proportional to the reflected power on the line This is accomplished by 2A4CR1, 2A4C4, 2A4L2, and 2A4T1. The voltage sample and the current sample are added in 2A4CR1 and a voltage is produced between the 10V reference and the REF PWR output. The reflected power detector compares both phase and magnitude of the voltage and current samples. The REF PWR output Is always one polarity, that is, it is always positive with respect to the 10V reference Its output will be a minimum when the unit is correctly tuned. The reflected power detector is important to operation because it is used to control the operation of nearly all functions in the unit. The reflected power output from 2A4 is fed to 2A1 and amplified in a differential amplifier, 2A1U1.

c. Phase Detector. The phase detector observes the phase of the voltage at the input to 2T1 and generates a DC voltage proportional to the phase error The voltage sample for the phase detector is derived by 2A4C22, 2A4R6, 2A4C10, and 2A4Cll This voltage sample is shifted in phase 90 degrees by the differentiating action of 2A4C22 and 2A4R6. The current sample is generated by 2A4T2 and is in phase with the line current. The voltage sample (shifted 90 degrees from the line voltage) is injected into the center tap of the current sensing transformer. The output of the transformer is detected by 2A4CR4 and 2A4CR5 to produce a DC voltage proportional to the phase error between the voltage on the line and the current in the line. The output of the phase detector is nulled (near zero) when the line current and the line voltage are in phase. Resistor 2A4R5 is a balance control and is adjusted so the output from the phase detector is nulled when the input to 2T1 (50 12 5) is terminated with a 50 ohm-nonreactive load. It should be noted that the phase detector is also floated on the 10V reference. The 10V reference is connected to one side of the phase detector and all measurements are made with respect to the 10V reference. A capacitive load (negative phase) will cause point A to go positive with respect to the 10V reference The output of the phase detector is fed to a differential amplifier on 2A2. The phase detector is connected to the phase servo amplifier so that a positive phase angle will drive the variable capacitor toward minimum capacity while a negative phase angle will drive the variable capacitor toward maximum capacity. The amplitude detector is phased so that an impedance magnitude greater than 50 ohms will drive the variable inductor toward minimum inductance while an impedance magnitude less than 50 ohms will increase the inductance.

2-19. C3 and C6 Control Assembly 2A5 Detailed Functional Operation

(Fig FO-32)

Board 2A5 contains two bistable relays, 2A5K1 and 2A5K2. Relay 2A5K1 controls 2C6 switching relay 2K2. Relay 2A5K controls 2C3 switching relay 2K3. The bistable operation of 2A5K1 and 2A5K2 means, each time an energize signal is received, it will assume its opposite state Thus, if the capacitor is in the circuit it will be switched out of the circuit. Conversely, if the capacitor is out of the circuit, it will be switched into the circuit For most antennas and frequencies, 2C3 is not needed. However, with the 2C3 switching capability, antenna tuning Is covered for a much wider range of antennas.

2-20. Servo Motor Control 2A6 Detailed Functional Operation

(Fig. FO-35)

Two identical servo amplifiers make up the Servo Motor Control One servo amp drives the phase drive motor 2M1. The other servo amp drives the inductance drive motor 2M2.

NOTE

Since both servo amps operate identically, only one will be discussed in detail.

A drive signal is received at either 2XA6-4 or 2XA6-5 for phase correction. The drive signal is a ground supplied by Control Logic Board 2A1. When no ground is present at either 2XA6-4 or 2XA6-5, both are at + 28 VDC. Thus the servo amp is cutoff from driving in either direction. A drive signal (ground) at 2XA6-4 causes 2A6Q1 to conduct. Transistor 2A6Q1 then triggers 2A6Q2 and 2A6Q4 on. When 2A6Q2 conducts, +28 VDC is applied to 2M1-1. When 2A6Q4 conducts, a ground is provided to 2M1-2. This causes 2M1 to rotate in one direction. Removing the ground level drive signal from 2XA6-4 cuts off 2A6Q1. The DC excitation to 2M1 is removed and rotation stops. A drive signal (ground) at 2XA6-5 causes 2A6Q6 to conduct. Transistor 2A6Q6 then triggers 2A6Q5 and 2A6Q3 on. When 2A6Q5 conducts, + 28 VDC is supplied to 2M1-2 When 2A6Q3 is conducting, ground is present at 2M1-1 The motor then rotates In the opposite direction Again, removing the ground level drive signal at 2XA6-5 this time, cuts off 2A6Q6 Motor 2M1 stops rotating. A positive braking signal is applied at 2XA6-12 to prevent overshoot and oscillation of 2M1. The positive brake signal causes both 2A6Q3 and 2A6Q4 to conduct and place a ground at 2M1-1 and 2M1-2.

CAUTION

If a drive signal (ground) is placed on 2XA6-4 and 2XA6-5 simultaneously, the transistors will be destroyed A positive brake signal at 2XA6-12 anytime the motor is being driven will also destroy transistors.

2-21. 3 dB Attenuator Detailed Functional Operation
(Fig FO-32)

The 3 dB Attenuator consists of 2K4, 2CR1, and a 3 dB pad containing 2C4, 2R3, 2R4, 2R5, 2R6, 2R7 and 2R8 The 3 dB circuitry is used to prevent transmitting into a possible open or short circuit. The accomplish this, a 3 dB pad is switched in series with the transmission line. Switching is accomplished thru 2K4 Control Logic Board 2A1 operates 2K4. The pad is switched in when coupler tuning is initiated. When reflected power drops below threshold, the 3 dB pad is taken out of the RF path If reflected power goes above threshold the pad will be switched in series in the RF path again.

Section IV. NONCONVENTIONAL CIRCUITS

2-22. Key Line
(Fig. FO-8)

Keying the radio set to transmit mode is accomplished by grounding the key line. For normal operation a ground from the mic key, the cw key, or AUDIO connector 1A8J2-G will establish transmit mode. During tuning, the Antenna Coupler Unit grounds the key line at 1A8J4-P to switch the radio set to transmit mode for tuning purposes.

NOTE

The Antenna Coupler Unit must be connected to ACCESSORY connector 1A8J4 or 1A8J4-p and 1A8J4-n jumpered for keying to occur.

a. LSB, USB and AM Keying. In these modes the key line is grounded when the handset press to talk switch is depressed. This ground is applied to terminal 1A3E26 on the key line. From there the key line routing is to the Antenna Coupler Unit and through relay 2K1 closed contacts 11 and 3. Diode 1A8CR6 prevents the grounded key line from energizing 2K1 at this time. The key line then returns to the transceiver and goes through closed contacts 12 and 4 of IA5Kl to energize 1A5K2. Energizing 1A5K2 also energizes 1A8K1 through 1A5K2 now closed contacts 1 and 5. With 1A5K2 and 1A8K1 energized, all switching is complete for LSB, USB and AM transmit. The RF power amplifier is switched to the low pass filter and + 28 VDC is applied to the power amplifier bias circuit. Also, low voltage transmit (+ 12T) is switched in, low voltage receive (+ 12R) is grounded through 1A5R9 and the front panel meter is switched to output monitor If the band channeling motor 1A5Bl is running, 1A5K1 is energized opening contacts 12 and 4 to prevent transmit operation.

b. CW Keying. For CW transmission the key line is ground in the following manner The mode switch must be set to CW When the CW key is depressed a ground is applied to the base of 1A3A3Q12 thru 1A1S13B contacts 2 and 6. Transistor 1A3A3Q12 is turned on and applies ground to terminal 1A3E26 through 1A3A3Q14. The key line then functions as described in paragraph 41a. above.

c. Tuning Cycle Keying. When the mode switch is set to CPLR TUNE KW, a ground is to the key line through 1A1S13A-8 and 10. But in this case 2K1 is energized by the ground and 2K1-11 and 3 open The key line ground is then controlled by the Control Logic Board (2A1) output on pin 7. From this point on, key line operation is as described in paragraph 2-22a. above Refer to Chapter III Section III for Control Logic Board 2A1 operation.

CHAPTER 3

DIRECT SUPPORT

Section I. GENERAL

3-1. Scope

This chapter contains checkout, troubleshooting, repair, removal, replacement and other maintenance authorized for direct support of Radio Set AN/URC-92. The checkout and troubleshooting procedures are separated into a checkout/troubleshoot for the receiver transmitter RT-1277/URC-92 and a checkout/troubleshoot for the antenna coupler CU-2229/URC-92.

3-2. Voltage Measurements

Applicable voltages and acceptable tolerances are listed in Table 3-1

Section II. TOOLS AND EQUIPMENT

3-3. Test Equipment

Refer to TM 11-5820-873-12, Appendix D, TM 11-5820-873-20P and TM 11-5820-873-34P Also, a BNC to clip lead cable is required (Fig 3 -1)

Table3-1 Voltage Measurements

0VDC ± 0.2	12 VDC ± 0.8
2VDC ± 0.5	22 VDC ± 1.5
3VDC ± 025	28 VDC ± 1.5
5 VDC ± 0.25	
7.7VDC ± 08	
9VDC ± 0.8	12VAC ± 0.8
9.56VDC ± 0.8	20VAC ± 1.5
10 VDC ± 0.8	115 VAC ± 15

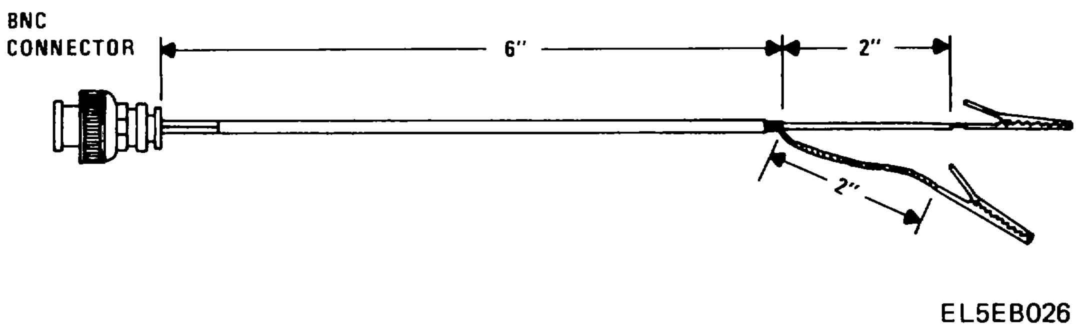


Figure 3-1 BNC/Clip Lead Cable.

Section III. CHECKOUT/TROUBLESHOOT

3-4. General

This section contains checkout and troubleshooting for both the receiver-transmitter and the antenna coupler. Completion of a checkout signifies a particular unit is operationally ready for use. Troubleshooting procedures are designed to function from incorrect indications in the checkout.

3-5. Receiver-Transmitter RT-1277/ URC-92 Checkout/Troubleshoot

The following procedures in Table 3-2 will establish the operational readiness of RT-1277/URC-92 receiver-transmitter. Successful completion of the checkout portion indicates the receiver-transmitter Is operationally ready for use. Troubleshooting procedures are designed to function from incorrect indications in the checkout. The procedures correspond with the authorized maintenance level at direct support. Following any repair action, the test technician must return to step 1 of the checkout unless directed differently by the procedure. The troubleshooting does not consider incorrect or missing supply voltages to subassemblies. Before any replace/repair action is accomplished on a subassembly, the test technician should verify all necessary supply voltages at the subassembly. Refer to List of Illustrations for the appropriate schematic. Incorrect or missing supply voltages are not authorized for repair at this maintenance level. If supply voltage malfunctions are noted, route the Receiver-Transmitter RT-1277/URC-92 to the next higher maintenance level for repair.

Table 3-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC- 92

STEP	ACTION	INDICATION	NEXT STEP
1	Remove top and bottom covers Connect 115 VAC power cable to POWER connector 1A8J3 Connect 50 ohm dummy load thru a thruline wattmeter to ANT jack lA8Jl Connect a known good Antenna Coupler CU-22291URC-92 to ACCESSORY jack 1A8J4 Set XMIT GAIN control fully counterclockwise Set VOLUME control clockwise, 1/4 turn Push VFO control in (off) Set DIM control fully clockwise		
2a	Set mode switch to LSB	ANTENNA COUPLER CONTROL meter lamp iiluminates	Yes step 2b No step 17
2b	Check pilot lamp and display	Pilot lamp and display illuminate	Yes: step 2c No: step 19
2c	Rotate DIM control one position counterclockwise Then rotate DIM control another position counterclockwise	Pilot lamp and display intensity dim, then go out Meter lamp retain intensity, then goes out	Yes: step.3a No: step 132
3a	Set FREQ CONTROL switch to A Set FREQUENCY A control to 1 5000 MHz Rotate 100 KHz control thru positions 4, 3, 2, 1, and 0	LOW FREQ LIMIT lamp illuminates and speaker noise level decreases	Yes: step3b No: step 21
3b	Rotate 100KHz control thru positions 6,7,8, and 9	LOW FREQ LIMIT lamp is out and receiver/ transmitter is enabled	Yes: step3c No: step 132
3c	Set FREQ CONTROL switch to B QUENCY B controls to 1 5000 MHz Rotate 100 KHz control thru positions 4, 3, 2, 1 and 0	Set FRE-LOW FREQ LIMIT lamp Illuminates	Yes step 3d No: step 132
3d	Rotate 100 KHz control thru positions 6, 7,8, and 9	LOW FREQ LIMIT lamp is out.	Yes: Step 3e No: step 132
3e	Set FREQ CONTROL switch to A Set FREQUENCY A controls to 16000 MHz Increase VOLUME control until noise is heard in speaker	Noise is heard In speaker.	Yes: step 3e No: step26
3f	Connect a known good headphone at 1A1J3	Noise is heard in headphone.	Yes step 3g No: step 132
3g	Disconnect headphone. Connect known good handset at MIC connector 1A1J1	Noise is heard In ear piece of handset	Yes: step 3h No step 140
3h	Disconnect handset. Rotate RF GAIN control counterclockwise and observe meter	Front panel meter reading increases to almost full scale deflection	Yes: step4a No: step 28
4a	Return RF GAIN control to fully clockwise position and VOLUME control to I/4 turn clockwise Connect a known good CW key at the KEY jack Set FREQUENCY A controls to 29 9950 MHz Set mode switch to CW Depress CW key	Sidetone is heard in speaker	Yes: step 4b No: step 29
4b	Depress CW key and observe wattmeter.	Wattmeter indicates 100W ± 10W	Yes: step 5a No: step 33
5a	Connect oscilloscope across dummy load. Set oscilloscope to 2V/division Set FREQUENCY A controls to 29 9995 MHz Set mode switch to LSB Connect microphone to MIC connector Key microphone and observe oscilloscope.	Oscilloscope displays waveform similar to Fig 3-2A, less than 2 V peak-to-peak	Yes: step 5b No: step 84
5b	Set mode switch to USB Key microphone and observe oscilloscope.	Oscilloscope displays waveform similar to Fig 3-2A, less than 2 V peak-to-peak	Yes: step 5c No: step 84
5c	Set oscilloscope to 50 V/division Key, and speak into microphone Increase XMT GAIN control until no further increase m peak-to-peak voltage is observed	Oscilloscope displays waveform similar to Fig 3-2A, 190 V peak-to-peak maximum	Yes: step 5d No: step 85
5d	Set mode switch to LSB. Key and speak into microphone Increase XMT Gain until no further increase In peak-to-peak voltage is observed	Oscilloscope displays waveform similar to Fig 3-2A, 190 V peak-to-peak maximum	Yes: step 5e No: step 132
5e	Set mode switch to AM Key, and speak into microphone Observe oscilloscope	Oscilloscope displays waveform similar to Fig 3-2B, modulated carrier signal	Yes: step 6a No: step88
6a	Connect frequency counter to oscilloscope vertlcal amplifier output. Connect oscilloscope across dummy load Set FREQUENCY A controls to 1 6000 MHz Turn XMT GAIN Control fully counter clockwise Key microphone Starting with 100 Hz control, rotate each FREQUENCY A control through its entire range	Frequency counter and front panel readouts agree for each frequency	Yes: step 6b No: step 132

Table 3-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC- 92-Continued

STEP	ACTION	INDICATION	NEXT STEP
6b	Set FREQ CONTROL switch to B Repeat step 6a using FREQUENCY B controls	Frequency counter and front panel readouts agree for each frequency	Yes: step 6c No: step 132
6c	Set FREQ CONTROL switch to A Pull out VFO PULL control (VFO on)	VFO lamp illuminates	Yes: step 6d No: step 108
6d	Connect frequency counter to oscilloscope vertlcal amplifier output. Connect oscilloscope across dummy load Set FREQUENCY A controls to 2.0000 MHz Key microphone Rotate VFO PULL Control through its entire range	Frequency counter indicates 2.0000 MHz ± 5 KHz minimum	Yes: step 7a No: step 109
7a	Set FREQ CONTROL to A XMT B RCV. Key microphone Rotate FREQUENCY B, 10 KHz control.	Frequency counter indicates 1 6000 MHz and front panel readouts agree	Yes: step7b No: step 132
7b	Release microphone key. Observe front panel readout and rotate FREQUENCY A, 10 KHz control	No readout change occurs	Yes: step 8a No: step 132
8a	Disconnect antenna coupler control cable Disconnect CW key and mlc. Remove dummy load from ANT jack IA8JI Connect signal generator to ANT jack 1A8J1 Connect VTVM (AC) to PHONE jack 1A1J3 Set mode switch to LSB Set FREQ CONTROL to B Set FREQUENCY B controls to 29 9994 MHz Adjust VOLUME CONTROL for VTVM indication of - 20 dB Set signal generator output level to 0.5 uV Adjust signal generator frequency to approximately 29 9994 MHz, until VTVM indication peaks	VTVM indicates - 10 dB or more	Yes: step 8b No: step 110
8b	Repeat step 82 substituting the following FREQUENCY B, and signal generator frequency settings: 16 0100 MHz 10 0100 MHz 7 5100 MHz 5 0100 MHz 3 5100 MHz 2.0100 MHz 1 6100 MHz	VTVM indicates at least - 10 dB or more	Yes: step 9a No: step 132
9a	Set mode switch to USB Return FREQUENCY B switches to 29 9994 MHz. Adjust signal generator frequency to approximately 29 9994 MHz, until VTVM indication peaks.	VTVM indicates at least - 10 dB or more	Yes step 9b No: step 136
9b	Set mode switch to AM, FREQUENCY B controls to 29 9994 MHz Signal generator output level to 3 0 uV, frequency to 29 9994 MHz, 300k, 1 KHz modulation Adjust signal generator for peak VTVM indication Adjust VOLUME control for -10 dB VTVM indication. Remove modulation from signal generator output.	VTVM indicates less than - 20 dB	Yes: step 9c No: step 122
9c	Set mode switch to LSB. Set FREQUENCY B switches to 20 000 MHz Disconnect VTVM from PHONE jack Increase VOLUME control until noise is heard Rotate 1 MHz control thru each of its positions.	At each position noise blanks momentarily then returns.	Yes: step 10 No: step 132
10	Set mode switch to OFF Disconnect control cable at receiver-transmitter 1A8J4 Connect multimeter between ACCESSORY connector 1A8J4-P and ground Set mode switch to AM Slowly adjust ANTENNA COUPLER CONTROL gam control 1A2R2 thru its entire range.	Meter indicates a range between + 12 and + 22 VDC + 10%	Yes: step 11 No: step 143
11	Reset gain control 1A2R2 to 14.5 VDC ± 0.5 VDC Set mode switch to OFF Disconnect dummy load from antenna jack 1A&J1 Connect RF and control cables between the receiver-transmitter and a known good CU-22291URC-92 Antenna Coupler Connect a 50 ohm dummy load to		Step 12

Table 3-2 Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92-Continued

STEP	ACTION	INDICATION	NEXT STEP
	the Antenna Coupler antenna post and ground post using a BNC/clip lead cable		
12	Set mode switch to CPLR TUNE KW	COUPLER STATUS FAULT indicator illuminates	Yes: step 13 No: step 130
13	**WARNING** Several kilovolts are present at the Antenna Coupler antenna post, E1, during steps 13 thru 14b Exercise caution and do not contact antenna post E1.	**NOTE** If COUPLER STATUS READY indicator does not illuminate during this step, depress TUNE START once more If READY indicator illuminates after the second time, the indication is good.	
	Depress TUNE START.	COUPLER STATUS FAULT indicator goes out and COUPLER STATUS TUNING indicator illuminates When the antenna coupler is tuned. COUPLER STATUS TUNING Indicator goes out and COUPLER STATUS READY indicator Illuminates	Yes: step 14a No: step 100
14a	Set frequency to 40 MHz. Set REFL FWD POWER MONITOR switch to REFL Depress TUNE START and observe meter 1A2M1.	Meter 1A2M1 indicates a refl power level	Yes: step 14b No: step 143
14b	Set REFL FWD POWER MONITOR switch to FWD. Set frequency to 12 995 MHz Depress TUNE START and observe meter 1A2M1.	Meter 1A2M1 indicates a fwd power level	Yes: step 15a No: step 143
15a	Set mode switch to OFF Connect DC power cord to 1A8J3 Connect wattmeter and dummy load to ANT jack 1A8J1 Connect CW key to Key jack 1A1J4 Check DC fuse 1A6F3 for proper value for 13 VDC operation. Check 1A6TB2 wiring for 13 VDC operation. refer to Operator and Organizational Maintenance Manual TM 11-5820-873-12. Set 1A6A2-S1 for 13 VDC operation Set mode switch to CW. Depress CW key.	Clear audio tone with minimal background noise in speaker Wattmeter indicates 100W ± 10W	Yes: step 15b No: step114
15b	Set mode switch to OFF Replace DC fuse with appropriate fuse for 26 VDC operation Rewire 1A6TB2 for 26 VDC operation, refer to Operator and Organizational Maintenance Manual TM 11-5820-873-12 Set 1A6A2-S1 for 26 VDC operation Turn power on Depress CW key.	Clear audio tone with minimal background noise heard in speaker Wattmeter indicates 100 W ± 10 W.	Yes step 16a No: step 132
16a	Set mode switch to OFF Disconnect all external cabling and test equipment.		Step 16b
16b	Reassemble Receiver-Transmitter RT-12771 URC-92.		Step 16c
16c	Ensure inverter is tagged properly for 26 VDC operation.		Step 16d
16d	Receiver-Transmitter RT-1277/URC-92 checkout is now complete Receiver-Transmitter is operationally ready.		
17	Check fuse 1A6F2	Fuse checks good	Yes: step 18 No: replace fuse 1A6F2
18	Connect multimeter between meter lamp center contact and ground	Multimeter indicates + 12 VDC ± 0.8V	Yes: replace meter lamp No: step 132
19	Check fuse 1A6F3	Fuse checks good	Yes: step 20 No: replace fuse 1A6F3
20	Connect multimeter between 1A1DS3 center contact and ground.	Multimeter indicates + 5 VDC ± 0.25 VDC	Yes: replace 1A1DS3 No: step 132
21	Connect multimeter between 1AIDS1-1 center contact and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC	Yes: replace 1A1DS1 No: step 22
22	Connect multimeter between 1A3XJ5-B and ground	Multimeter indicates +12 VDC ± 0.8 VDC	Yes: step 23 No: step 132%
23	Connect multimeter between 1A3XA4J4-14 and ground	Multimeter indicates + 12 VDC ± 0.8 VDC	Yes: step 24 No: step 132

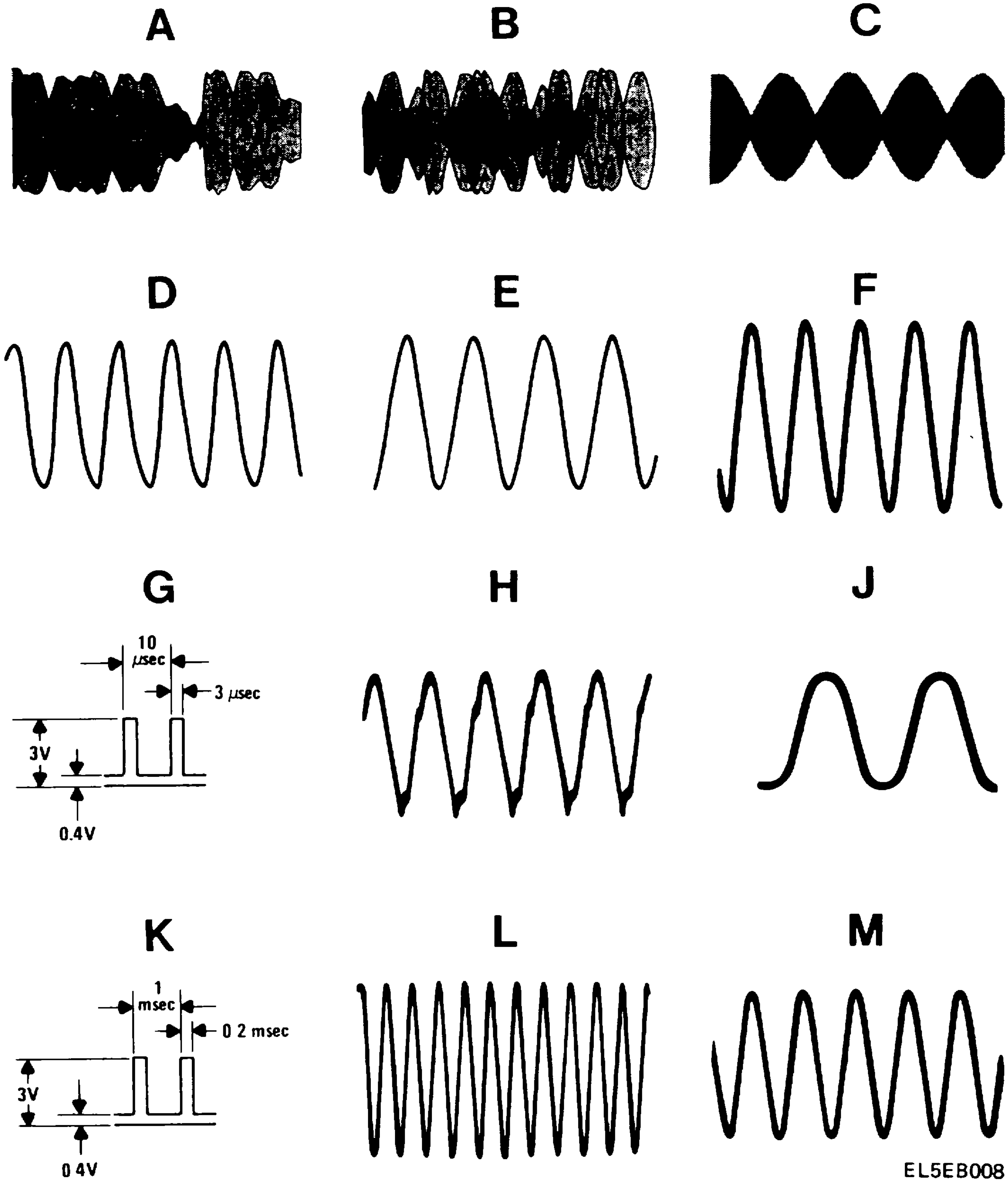


Figure 3-2. Direct Support Checkout/Troubleshoot the Receiver-Transmitter Waveforms.

Table 3-2 Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92-Continued

STEP	ACTION	INDICATION	NEXT STEP
24	Connect multimeter between 1A3XA3J3-S and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 25 No: step 132
25	Set mode switch to OFF. Replace Audio CCA 1A3A4 with a known good Audio CCA Set mode switch to LSB.	Receiver-transmitter is disabled.	Yes: step 121 No: step 134
26	Connect oscilloscope probe to 1A3XA4J4-18, ground lead to ground.	Check for noise above ambient level.	Yes: step 132 No: step 27
27	Connect multimeter between 1A3XA4J4-14 and ground.	Multimeter indicates + 2 VDC to ± 8.0 VDC.	Yes: step 133 No: step 132
28	Connect multimeter between 1A3XA4J4-15 and ground.	Multimeter indicates +2 VDC to +8.0 VDC.	Yes: step 132 No: step 133
29	Connect frequency counter to 1A3XA3J3-D, ground lead to ground Depress CW key.	Frequency counter indicates 1 KHz.	Yes: step 30 No: step 31
30	Connect frequency counter to 1A3A4P1-4, ground lead to ground Depress CW key.	Frequency counter indicates 1 KHz.	Yes: step 133 No: step 132
31	Continuity check 1AIJ4 center contact to 1AlP2-J.	Continuity checks good.	Yes step 32 No: step 132
32	Continuity check 1A3XA3J3-2 to 1A3A5-J.	Continuity checks good.	Yes: step 134 No: step 132
33	Connect oscilloscope probe to 1A3XA3J3-16, ground lead to ground.	Oscilloscope displays waveform similar to Fig 3-2C.	Yes: step 34 No: step 37
34	Connect oscilloscope probe to 1A3XA1J1-5, ground lead to ground Depress CW key.	Oscilloscope displays waveform similar to Fig 3-2D.	Yes: step 35 No: step 41
35	Remove 1A3P3 from 1A7J1 Connect VTVM (AC) to 1A3P3 center contact, ground lead to ground Depress CW key.	VTVM indicates more than 100 mV.	Yes: step 36 No: step 42
36	Remove 1A8P3 from 1A7J2 Connect wattmeter to 1A7J2 center contact, ground lead to ground Depress CW key.	Wattmeter indicates more than 90 watts.	Yes: step 132 No: step 43
37	Connect frequency counter to 1A3XA3J3-F, ground lead to ground Depress CW key.	Frequency counter indicates 10.5 MHz.	Yes: step 38 No: step 44
38	Connect multimeter between 1A3XA3J3-T and ground Depress CW key	Multimeter indicates less than + 0.5 VDC.	Yes: step 39 No: step 45
39	Connect multimeter between 1A3XA3J3-S and ground Depress CW key	Multimeter indicates less than + 1.4 VDC.	Yes: step40 No: step 132
40	Connect multimeter between 1A3XA3J3-10 and ground	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 134 No: step 132
41	Connect oscilloscope probe to 1A3XA2J2-5, ground lead to ground Depress CW key	Oscilloscope displays waveform similar to Fig 3-2D.	Yes: step 132 No: step 46
42	Reconnect 1A7J1 to 1A3P3 Connect VTVM (AC) to 1A3XA1J1-8, ground lead to ground Depress CW key	VTVM indicates more than 100 mV.	Yes: step 132 No: step 49
43	Connect multimeter between 1A7A1J3-F and ground Depress CW key	Multimeter indicates + 28 VDC ± 1.5 VDC.	Yes: step 135 No: step 132
44	Connect VTVM (AC) to 1A4XA1J1-13, ground lead to ground Depress CW key	VTVM indicates 0.1V minimum.	Yes: step 132 No: step 135
45	Connect multimeter between 1A7A1J3-D and ground Depress CW key	Multimeter indicates less than + 0.5 VDC.	Yes: step 132 No: step 135
46	Connect oscilloscope probe to 1A3XA2J2-16, ground lead to ground Depress CW key	Oscilloscope displays waveform similar to Fig 3-2C.	Yes: step 47 No: step 132
47	Connect multimeter between 1A3XA2J2-10 and ground Depress CW key	Multimeter indicates + 12 VDC + 0.8 VDC.	Yes: step 48 No: step 132
48	Connect multimeter between 1A3XA2J2-D and ground Depress CW key	Multimeter indicates + 10 7 VDC ± 0.8 VDC.	Yes: step 136 No: step 59
49	Connect multimeter between 1A3XA1J1-U and ground Depress CW key	Multimeter indicates less than + 1.2 VDC.	Yes: step 50 No: step 61
50	Connect multimeter between 1A3XA1J1-10 and ground	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 51 No: step 132
51	Connect multimeter between 1A3XA1J1-13 and ground Depress CW key	Multimeter indicates less than + 8 VDC.	Yes: step 52 No: step 62
52	Connect frequency counter to oscilloscope ver-tlcal output jack Connect oscilloscope probe to 1A3XA1J1-1, ground lead to ground	Oscilloscope displays waveform similar to Fig 3-2E, minimum amplitude, 300 millivolts Fre-quency counter indicates 80.75 MHz ± 10 KHz.	Yes: step 53 No: step 63

Table 3-2 Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92-Continued

STEP	ACTION	INDICATION	NEXT STEP
53	Connect oscilloscope with frequency counter at vertical output to 1A3XA1J1-18, ground lead to ground.	Frequency counter indicates between 111.000 MHz and 122.000 MHz.	Yes: step 137 No: step 64
54	Connect frequency counter to oscilloscope vertical output jack Connect oscilloscope probe to 1A4XA1J1-S, ground lead to ground.	Oscilloscope displays waveform similar to Fig 3-2F, 0 3 to 0 9 V peak-to-peak Frequency counter indicates 5 0 MHz ± 5 Hz.	Yes: step138 No: step 132
55	Connect multimeter between 1A4A6-E1 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step56 No: step 132
56	Connect multimeter between 1A4A6XALJ1-K and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 57 No: step 132
57	Connect multimeter between 1A6A1-15 and ground.	Multimeter indicates + 5 VDC ± 0.25 VDC.	Yes: step 138 No: step 58
58	Check fuse 1A6A1F3.	Fuse checks good.	Yes: step 132 No: replace fuse 1A6A1F3 If fuse blows again go to step 120
59	Connect multimeter between 1A3A5-R and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 60 No: step 132
60	Connect multimeter between 1A3A5XA2J2-8 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 136 No: step 132
61	Connect multimeter between 1A7A1J3-B and ground Depress CW key.	Multimeter indicates less than +1.2VDC.	Yes: step 132 No: step 135
62	Connect multimeter between 1A3XA2J2-P and ground Depress CW key.	Multimeter indicates less than + 8.0 VDC.	Yes: step 132 No: step 136
63	Connect oscilloscope probe to 1A4XA3J3-11, ground lead to ground.	Oscilloscope displays waveform similar to Fig 3-2E. minimum amplitude 300 millivolts Frequency counter indicates 80.75 MHz ± 10 KHz.	Yes: step 132 No: step 65
64	Remove 1A3P1 from 1A4A5-J1. Connect frequency counter to oscilloscope vertical output Connect oscilloscope probe to 1A4A5-J1 center pin, ground lead to ground	Frequency counter indicates between 111.0000 MHz and 122.0000MHz.	Yes: step 132 No: step69
65	Connect RF voltmeter to 1A4XA3J3-D, ground lead to ground.	RF voltmeter indicates .085 V minimum.	Yes: step 66 No: step 70
66	Connect frequency counter to oscilloscope vertical output jack Connect oscilloscope probe to 1A4XA3J3-P, ground lead to ground.	Oscilloscope displays waveform similar to Fig 3-2G, 0 3 V minimum amplitude. Frequency counter indicates 20 MHz + 20 Hz.	Yes: step 67 No: step 71
67	Connect frequency counter to 1A4XA3J3-B ground lead to ground.	Frequency counter indicates between 1.5000 MHz and 1.5999 MHz.	Yes: step 68 No: step 72
68	Connect frequency counter to 1A4XA3J3-U, ground lead to ground.	Frequency counter indicates between 111.0000 MHz and 122.0000 MHz.	Yes step 139 No: step 73
69	Connect multimeter between 1A4XA5J5-4 and ground.	Multimeter indicates + 2.0 VDC ± 0.5 VDC .	Yes: step 140 No: step 74
70	Connect RF voltmeter to 1A4XA1J1-4, ground lead to ground.	RF voltmeter indicates .085 V minimum.	Yes: step 132 No: step 138
71	Connect oscilloscope probe to 1A4XAIJI-1, ground lead to ground.	Oscilloscope displays waveform similar to Fig 3-2G, 0 3 V minimum amplitude Frequency counter indicates 20 MHz ± 20 Hz.	Yes: step 132 No: step 138
72	Connect frequency counter to 1A4XA2J2-1, ground lead to ground.	Frequency counter indicates between 1.5000 MHz and 1.5999 MHz	Yes: step 132 No: step 75
73	Connect frequency counter to 1A4XA5J5-2, ground lead to ground.	Frequency counter indicates between 111.0000 MHz and 122.0000 MHz	Yes: step 132 No: step 140
74	Connect multimeter between 1A4XA4J4-15 and ground.	Multimeter indicates + 2.0 VDC ± 0.5 VDC	Yes: step 132 No: step 78
75	Connect frequency counter to oscilloscope vertical output jack Connect oscilloscope probe to 1A4XA2J2-18, ground lead to ground	Oscilloscope displays waveform similar to Fig 3-2H. Frequency counter indicates 1 KHz ± 1 Hz.	Yes: step 76 No: step 80
76	Connect VTVM (AC) to 1A4XA2J2-C, ground lead to ground.	VTVM indicates .09 V peak-to-peak minimum	Yes: step 77 No: step 81
77	Connect multimeter between 1A4XA2J2-U and ground.	Multimeter indicates + 7.7 VDC ± 0.8 VDC	Yes: step 141 No: step 132
78	Set FREQUENCY A controls to 00.0000 MHz Connect oscilloscope probe to 1A4XA4J4-V, Ground lead to ground	Oscilloscope displays waveform similar to Fig 3-2J.	Yes: step79 No: step82

Table 3-2 Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92-Continued

STEP	ACTION	INDICATION	NEXT STEP
79	Connect oscilloscope to 1A4XA4J4-B, ground lead to ground.	Oscilloscope displays waveform similar to Fig 3-2K.	Yes: step 142 No: step 83
80	Connect oscilloscope probe to 1A4XA1J1-18, ground to lead ground.	Oscilloscope displays waveform similar to Fig 3-2H.	Yes: step 132 No: step 138
81	Connect VTVM (ACO 1A4XA1J1-6, ground lead to ground.	VTVM indicates 09 V peak-to-peak minimum.	Yes step 132 No: step 138
82	Connect oscilloscope probe to 1A4XA1J1-17, ground lead to ground.	Oscilloscope displays waveform similar to Fig 3-2J.	Yes: step132 No: step 138
83	Connect oscilloscope to 1A4XA3J3-15, ground lead to ground.	Oscilloscope displays waveform similar to Fig 3-2L.	Yes: step 132 No: step 139
84	Replace Sideband Generator CCA with known good Sideband Generator CCA Key microphone.	Oscilloscope displays waveform similar to Fig 3-2A, less than 2 V peak-to-peak maximum.	Yes: step 134 No: step 132
85	Connect multimeter between 1A3XA3J3-17 and ground.	Multimeter indicates less than +1.6VDC.	Yes: step 86 No: step 132
86	Connect frequency counter to 1A3XA2J2-1.	Frequency counter indicates 10.5 MHz.	Yes: step 136 No: step 87
87	Connect frequency counter to 1A3XA3J3- 1.	Frequency counter indicates 10.5 MHz.	Yes: step 132 No: step 134
88	Connect multimeter between 1A3A5-E11 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 89 No: step 132
89	Connect multimeter between 1A3A5XA2J2-6 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 90 No: step 132
90	Connect multimeter between 1A3A5XA3J3-5 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 91 No: step 132
91	Connect frequency counter to 1A3A5XA2J2-1, ground lead to ground.	Frequency counter indicates 10.5 MHz.	Yes: step 136 No: step 134
92	Remove Translator CCA 1A4A3 Connect frequency counter to 1A4XA2J2-1. Perform frequency checks as shown below.	Frequency checks are correct.	Yes: step 93 No: step 97

Frequency Checks

Frequency Switch Settings			
10 KHz	1 KHz	100 Hz	FREQUENCY
0	0	1	1.5001 MHz
0	0	2	1.5002 MHz
0	0	3	1.5003 MHz
0	0	4	1.5004 MHz
0	0	5	1.5005 MHz
0	0	6	1.5006 MHz
0	0	7	1.5007 MHz
0	0	8	1.5008 MHz
0	0	9	1.5009MHz
10 KHz	1 KHz	100 Hz	FREQUENCY
0	1	0	1.5010 MHz
0	2	0	1.5020 MHz
0	3	0	1.5030 MHz
0	4	0	1.5040 MHz
0	5	0	1.5050 MHz
0	6	0	1.5060 MHz
0	7	0	1.5070 MHz
0	8	0	1.5080 MHz
0	9	0	1.5090 MHz
10 KHz	1 KHz	100 Hz	FREQUENCY
1	0	0	1.5100 MHz
2	0	0	1.5200 MHz
3	0	0	1.5300 MHz
4	0	0	1.5400 MHz
5	0	0	1.5500 MHz
6	0	0	1.5600 MHz
7	0	0	1.5700 MHz
8	0	0	1.5800 MHz
9	0	0	1.5900 MHz

Table 3-2 Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92-Continued

STEP	ACTION	INDICATION	NEXT STEP
93	Connect signal generator to 1A4A6-E17 using 50 ohm coaxial cable. Connect multimeter between 1A4A4-TP1 and ground. Set signal generator frequency to 9.9 MHz, output level to 1 V RMS. Temporarily unplug translator CCA 1A4A3. Set 10 MHz, 1 MHz, and 100 KHz switches to 0.	Multimeter indicate, more than + 4.5 VDC	Yes: step 94 No: step 105
94	Slowly increase signal generator frequency.	At 10 0 MHz, multimeter indication changes to less than +0.9 VDC.	Yes: step 95 No: step 105
95	Using a multimeter between ground and pin indicated, and by varying the frequency above and below the indicated transition frequency, perform frequency switch checks as shown below.	In each case, multimeter indicates greater than + 4.5 VDC with signal generator below the transition frequency, and less than +0.9 VDC with signal generator above the transition frequency.	Yes: step 96 No: step 105

Frequency Checks

Frequency Switch Settings 10 MHz	1 MHz	100 KHz	Frequency (±1 KHz)
0	0	1	10.1 MHz
0	0	2	10.2 MHz
0	0	3	10.3 MHz
0	0	4	10.4 MHz
0	0	5	10.5 MHz
0	0	6	10.6 MHz
0	0	7	10.7 MHz
0	0	8	10.8 MHz
0	0	9	10.9 MHz
0	1	0	11.0 MHz
0	2	0	12.0 MHz
0	3	0	13.0 MHz
0	4	0	14.0 MHz
0	5	0	15.0 MHz
0	6	0	16.0 MHz
0	7	0	17.0 MHz
0	8	0	18.0 MHz
0	9	0	19.0 MHz

STEP	ACTION	INDICATION	NEXT STEP
96	Using a multimeter between ground and pin indi cated, and by varying the frequency above and below the indicated transition frequency, perform frequency switch checks as shown below.	In each case, multimeter indicates greater than +4.5 VDC with signal generator below the transition frequency, and less than +09 VDC with signal generator above the transition frequency.	Yes: step 85 No: step 104

Frequency Checks

Frequency Switch Settings 10 MHz	1 MHz	100 KHz	Frequency (±1 KHz)
1	0	0	20 0 MHz
2	0	0	30 0 MHz
2	9	9	39 9 MHz

STEP	ACTION	INDICATION	NEXT STEP
97	Connect multimeter between 1A4XA2J2-U and ground Check low digit coarse steering voltages as shown below.	Voltages check good.	Yes: step 98 No: step99

VCO Low Digit Coarse Steering

10 KHz Switch Setting	1A4XA2J2 pin U VOLTS
0	3.50
1	3.85
2	4.15
3	4.55
4	4.95
5	5.40
6	5.90
7	6.40
8	7.00
9	7.70

Table 3-2 Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92-Continued

STEP	ACTION	INDICATION	NEXT STEP
98	Continuity check 1A4XA4-B to 1A4XA3-15.	Continuity checks good.	Yes: step 139 No: step 132
99	Connect multimeter between 1A4XA2J2-U and ground. Check low digit coarse steering voltages as shown.	Voltages check good	Yes: step 100 No. step 101
100	Continuity check 1A4A6J1-12 to 1A4XA2J2-M 1A4A6J1-11 to lA4XA2J2-10 1A4A6J1-M to 1A4XA2J2-11 1A4A6J1-Nto 1A4XA2J2-12 1A4A6J1-13 to 1A4XA2J2-P 1A4A6J1-10 to 1lA4XA2J2-12 1A4A6J1-L to 1A4XA2J2-13 1A4A6J1-P to 1A4XA2J2-N 1A4A6J1-14 to IA4XAZJ2-S 1A4A6J1-9to 1A4XA2W2-14 1A4A6J1-K to 1A4XA2J2-15 1A4A6J1-R to lA4XA2J2-R	Continuity checks good	Yes: step 141 No: step 132
101	Using multimeter perform 10 MHz switch/VHF Divider preset checks as shown below	10 MHz/VHF Divider preset checks are good	Yes: step 102 No: step 142
	10MHz Switch Setting	1A4XA4J4-12 Volts	1A4X4J4-13 Volts
	0	8 or less	2.0 to 5 0
	1	2.0 to50	8 or less
	2	0.8 or less	0.8 or less
102	Continuity check 1A4XA4J4-12 to 1A4XA5J5-7 1A4XA4J4-3 to 1A4XA5J5-6 1A4A6J1-2 to 1A4XA5J5-18 1A4A6J1-3 to 1A4XA5J5-17 1A46J1-B to 1A4XA5J5-16	Continuity checks good	Yes: step 103 No: step 132
103	Continuity check 1A4A6J1-2 to 1A1S1A-10, front 1A4A6J1-3 to 1A1S1A-1, front 1A4A6Jl-B to 1A1S1A-2, front	Continuity checks good	Yes: step 140 No: step 132
104	Connect multimeter between 1A4XA5J5-15 and ground Check coarse steering voltages as shown below	Voltages check good	Yes: step 132 No: step 140
	Coarse Steering		
	1 MHz Switch Setting	1A4XA5J5 pin 15 VOLTS	
	0	1.37	
	1	1.78	
	2	2.18	
	3	2.75	
	4	3.31	
	5	4.12	
	6	4.93	
	7	6.15	
	8	7.85	
	9	9.56	
105	Replace VHF Divider CCA 1A4A4 with known good VHF Divider CCA Repeat steps 81, 82. and 83.	Respective indications are correct	Yes: step 142 No: step 132
106	Replace VHF VCO CCA 1A4A5 with known good VHF VCO CCA Repeat step 84.	Indication Is correct	Yes: step 140 No: step 132
107	Replace Low Digit Generator CCA 1A4A2 with known good Low Digit generator Repeat step 85.	Indication is correct	Yes: step 141 No: step 132
108	Connect multimeter across 1A1DS2 contacts.	Multimeter indicates + 12 VDC ± 0.8 VDC	Yes: replace 1A1DS2 No: step 109
109	Connect multimeter between 1A4XA3J3-A and ground.	Multimeter indicates + 7 6 VDC ± 0.8 VDC	Yes: step 132 No: step 139

Table 3-2 Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92-Continued

STEP	ACTION	INDICATION	NEXT STEP
110	Set signal generator to 0 dB. Connect oscilloscope probe to 1A3XA2J2-5, ground lead to ground.	Oscilloscope displays waveform similar to Fig 3-2D.	Yes: step 111 No: step 115
111	Connect oscilloscope probe to 1A3XA4.14-11, ground lead to ground.	Oscilloscope displays waveform similar to Fig 3-2D.	Yes: step 112 No: step 116
112	Connect multimeter between 1A3XA4J4-9 and ground.	Multimeter indicates +12 VDC ± 0.8 VDC	Yes: step 113 No: step 132
113	Connect multimeter between 1A3XA4J4-13 and ground.	Multimeter indicates between +2.0 VDC and + 8.0 VDC.	Yes: step 114 No: step 132
114	Connect VTVM (AC) to 1A3XA4J4-6, ground lead to ground.	VTV indicates 0.1 minimum.	Yes: step 133 No: step 132
115	Connect frequency counter to 1A3XA1J1-15, ground lead to ground.	Frequency counter indicates 29.9994 MHz.	Yes: step 117 No: step 132
116	Connect frequency counter to oscilloscope ver-tlcal output jack Connect oscilloscope probe to 1A3XA2J2-11, ground lead to ground.	Oscilloscope displays waveform similar to Fig 3-2M.	Yes: step 132 No: step 119
117	Connect multimeter between 1A3XA1J1-3 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 118 No: step 132
118	Connect multimeter between 1A3XA1J1-P and ground.	Multimeter indicates between +2.0 VDC and +8.0VDC.	Yes: step 137 No: step 132
119	Connect multimeter between 1A3XA2J2-9 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC	Yes: step 120 No: step 132
120	Connect multimeter between 1A3XA2J2-P and ground.	Multimeter indicates + 2.0 VDC and 8.0 VDC	Yes: step 121 No: step 132
121	Connect multimeter between 1A3XA2J2-3 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC	Yes step 136 No: step 132
122	Connect multimeter between 1A3A5-E5 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC	Yes: step 123 No: step 132
123	Set signal generator to 0 dB and 100% modula-tion. Connect oscilloscope probe to 1A4XA1-13, ground lead to ground.	Oscilloscope displays waveform similar to Fig 3-21.	Yes: step 124 No: step 126
124	Connect multimeter between 1A4A6-E16 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC	Yes: step 125 No: step 132
125	Connect multimeter between 1A4XA1J1-L and ground.	Multimeter indicates +12 VDC ± 0.8 VDC	Yes: step 138 No: step 132
126	Connect oscilloscope probe to 1A3XA2J2-11, ground lead to ground.	Oscilloscope displays waveform similar to Fig. 3-2M.	Yes: step127 No: step 128
127	Connect multimeter between 1A3XA4J4-7 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 133 No: step 132
128	Connect multimeter between 1A3XA2J2-7 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 136 No: step 132
129	Check DC fuse 1A6F3 and fuse cartridge.	DC fuse and fuse cartridge check good.	Yes: step 132 No: replace fuse 1A8F3
130	Connect multimeter across contacts of COUP-LER STATUS FAULT lamp 1A2DS2.	Multimeter indicates + 12 VDC± 0.8 VDC.	Yes: replace 1A2DS2 and go to step 13 No: step 143
131	Set mode switch to OFF. Disconnect antenna coupler control cable Connect multimeter across contacts of indicator that did not illuminate	Multimeter indicates less than 300 ohms.	Yes: step 143 No: replace faulty indicator
132	Unit not authorized for repair at this mainte-nance level Route entire RT-12771URC-92 to next higher maintenance lev level for repair		---
133	Replace Audio CCA 1A3A4 Route original Audio CCA to next higher maintenance level for repair		---
134	Replace Sideband Generator CCA 1A3A3 Route original Sideband Generator CCA to next higher maintenance level for repair		---
135	Replace RF Power Amplifier Assy 1A7A1 Route original RF Power amplifier Assy to next higher maintenance level for repair		---
136	Replace IF Filter CCA 1A3A2 Perform 2nd IF adjustment Route original IF Filter CCA to next higher main tenance level for repair		---

Table 3-2 Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92-Continued

STEP	ACTION	INDICATION	NEXT STEP
137	Replace VHF Mixer CCA 1A3A1 Route original VHF Mixer CCA to next higher maintenance level for repair		---
138	Replace Spectrum Generator CCA 1A4A1 Route original Spectrum Generator CCA to next higher maintenance level for repair		---
139	Replace Translator CCA 1A4A3 Route original translator CCA to next higher maintenance level for repair		---
140	Replace VHF VCO CCA 1A4A5 Route original VHF VCO CCA to next higher maintenance level for repair		---
141	Replace Low Digit Generator CCA 1A4A2 Route original Low Digit Generator CCA to next higher maintenance level for repair		---
142	Replace VHF Divider CCA 1A4A4 Route original Low Digit Generator CCA to next higher maintenance level for repair		---
143	Replace ANTENNA COUPLER CONTROL 1A2 Route original ANTENNA COUPLER CONTROL to next higher maintenance level for repair		---

3-6. Antenna Coupler CU-2229/URC-92 Checkout/Troubleshoot

The following procedures in Table 3-3 will establish the operational readiness of CU-2229/URC-92 antenna coupler. Successful completion of the checkout portion indicates the antenna coupler is operationally ready for use. Troubleshooting procedures are designed to function from incorrect Indications in the checkout Following any repair action, the test technician must return to step 1 of the checkout unless instructed differently by the procedure The troubleshooting does not consider incorrect or missing supply voltages to subassemblies Before any replace/repair action is accomplished on a subassembly, the test technician should verify all necessary supply voltages at the subassembly Refer to List of Illustrations for appropriate schematics Incorrect or missing supply voltages are not authorized for repair at this maintenance level If supply voltage malfunctions are noted, route the Antenna Coupler CU-2229/URC-92 to the next higher maintenance level for repair.

Table 3-3. Checkout/Troubleshoot the Antenna Coupler CU-2229/URC-92

STEP	ACTION	INDICATION	NEXT STEP
1	Remove case from Antenna Coupler CU-22291URC-92 Connect RF and control cables between the Antenna Coupler to be checked and a known good RT-1277/URC-92 Receiver-Transmitter. Insure the receiver-transmitter is correctly powered and grounded		Step 2a
2a	Set mode switch to AM.	COUPLER STATUS FAULT indicator illuminates.	Yes: step 2b No: step 7
2b	Disconnect RF cable at the receiver-transmitter Connect a 50 ohm dummy load to the receiver-transmitter. **NOTE** A means of timing, in seconds, is required for this step. Set mode switch to CPLR TUNE KW. Depress TUNE START. Begin timing and observe COUPLER STATUS indicators.	COUPLER STATUS FAULT indicator goes out COUPLER STATUS TUNING indicator is Illuminated and transmitter keys on. After 35 to 45 seconds, transmitter unkeys and COUPLER STATUS TUNING indicator goes out COUPLER STATUS FAULT indicator illuminates	Yes: step 3a No: step 8
3a	Disconnect dummy load from receiver-transmitter. Reconnect rf cable from Antenna Coupler. Connect 50 ohm dummy load to the Antenna Coupler antenna post. Connect ground	COUPLER STATUS TUNING indicator illuminates, transmitter keys and both drive motors, 2M1 and 2M2, drive.	Yes: step 3b No: step14

Table 3-3. Checkout/Troubleshoot the Antenna Coupler CU-2229/URC-92-Continued

STEP	ACTION	INDICATION	NEXT STEP
	to ground post. Set frequency to 1 602 MHz. Depress TUNE START.		
3b	Set mode selector to CW.	COUPLER STATUS FAULT indicator Is Illuminated, transmitter unkeys and drive motors stop driving.	Yes: step 4a No: step33
4a	Set mode switch to CPI,R TUNE KW. Depress TUNESTART.	**NOTE** If the time delay runs out during this test, depress TUNE START once more If tuning occurs the second tune the indication is good Antenna Coupler completes tune cycle, COUPLER STATUS FAUI,T indicator goes out and COUPLER STATUS READY indicator illuminates.	Yes: step 4b No: step 34
4b	Set mode switch to CW then return to CPLR TUNE KW.	COUPLER STATUS READY indicator goes out And COUPLER STATUS FAULT indicator illuminates.	Yes: step 4c No: step 35
4c	Set mode switch to AM Key transmitter.	COUPLER STATUS FAULT indicator goes out and COUPLER STATUS READY indicator illuminates.	Yes: step 4d No: step 37
4d	Set frequency to 1 802 MHz Key transmitter.	COUPLER STATUS FAULT indicator illuminates.	Yes: step 4e No: step 37
4e	Set frequency to l 602 MHz Key transmitter	COUPLER STATUS READY indicator illuminates.	Yes: step 5a No: step 37
5a	Perform the following procedure for each setting listed Set and tune to the tune frequency Reset frequency to the check frequency. Set mode switch to CW and key transmitter Check both the FWD and REFL power. **NOTE** The frequencies below do not necessarily match the average powers listed in the Indication column for this step.	**NOTE** The Antenna Coupler Control gain adjustment can affect both the REFL power indication and tuning Normal gain setting is about 14.5 VDC ± 0.5 VDC but a sight adjustment may be necessary If some frequencies do not tune, adjust the gain slightly clockwise If the REFL power indication is a little high, adjust the gain slightly counterclockwise The final gain control setting must satisfy both requirements If not, proceed to the troubleshooting reference for this step Antenna coupler completes each tune cycle Also the power readings should be approximate to one of the acceptable FWDIREFL ratios below	Yes: step 6a No: step39

Tune Frequency	Check Frequency
1.604	1.602
2.004	2.002
4.001	4.000
8.001	8.000
12.001	12.000
16.001	16.001
20.001	20.000
24.001	24.000
29.999	29.998

Average FWD (watts)	REFL (or less)
20	0.8
30	1.2
40	1 6
50	2.0
60	2.4
70	2.8
80	3.2
100	4.0

STEP	ACTION	INDICATION	NEXT STEP
6a	Set mode switch to OFF Disconnect cabling between receiver-transmitter and coupler unit.		
6b	Reassemble Antenna Coupler Unit		
6c	Antenna Coupler Unit CU-22291URC-92 checkout is now complete. Coupler unit is now serviceable.		
7	Set mode switch to OFF Remove Control Logic CCA 2A1. Set mode switch to AM. Jumper 2XA1-12 to ground.	COUPLER STATUS FAULT indicator illuminates.	Yes: step 37 No: step39
8		COUPLER STATUS FAULT indicator went out.	Yes: step 9 No: step 10
9		COUPLER STATUS TUNING indicator Illuminated and transmitter is keyed	Yes: step37 No: step 11
10	Set mode switch to OFF Remove Control Logic CCA 2A1 Set mode switch to CPLR TUNE KW.	COUPLER STATUS FAULT indicator is not lit	Yes: step37 No: step 39
11		COUPLER STATUS TUNING indicator illuminated	Yes: step 12 No: step 13

Table 3-3. Checkout/Troubleshoot the Antenna Coupler CU-2229/URC-92-Continued

STEP	ACTION	INDICATION	NEXT STEP
12	Set mode switch to OFF Remove Control Logic CCA 2A1 Set mode switch to AM **CAUTION** When testing on or jumpering connector contacts, take care not to short adjacent contact Jumper 2XA1-7 to ground	Transmitter keys on	Yes: step 37 No: step39
13	Set mode switch to OFF Remove Control Logic CCA 2A1 Set mode switch to CPLR TUNE KW **CAUTION** When testing on or jumpering connector contacts, take care not to short adjacent contacts Jumper2XAl-6toground	COUPLER STATUS TUNING indicator Illuminates.	Yes: step37 No: step 39
14	Set frequency to 1.802 MHz. Depress TUNE START	Both drive motors, 2M1 and 2M2, drive.	Yes: step 3b No: step 1l
15		Drive motor 2M1 drives.	Yes: step 16 No: step 23
16	Set mode switch to OFF. Remove Phase and Amplitude CCA 2A2 **CAUTION** When testing on or jumpering connector contacts, take care not to short adjacent contacts **CAUTION** Insure roller on 2L4 is positioned near center of travel before beginning the following checks **NOTE** For steps requiring jumpers, remove jumper before motor drives to end step Set mode switch to AM. Momentarily jumper 2XA2-V to ground.	Motor 2M2 rotates clockwise (viewed from shaft end).	Yes: step 17 No: step 39
17	Momentarily jumper 2XA2-17 to ground	Motor 2M2 rotates counterclockwise	Yes step 18 No: step 39
18	Connect VTVM between 2XA2-U and ground	Meter indicates + 10 VDC + 0.8 VDC	Yes step 19 No: step 39
19	**CAUTION** Ensure VTVM is isolated from ground Connect VTVM between 2XA2-16 and 2XA2-U	Meter indicates a voltage difference(+ or -)	Yes: step 20 No: step 39
20	Set mode switch to CPLR TUNE KW VTVM between 2XA2-14 and ground. Depress and hold TUNE START	Connect Meter indicates + 3 VDC to + 5 VDC	Yes: step 21 No: step 39
21	Set mode switch to OFF. Connect multimeter between 2XA2-7 and ground	Meter indicates 200 ohms or more	Yes: step 22 No: step 39
22	Connect multimeter between 2XA2-15 and ground	Meter indicates 1000 ohms or more	Yes: step 35 No: step 39
23	Drive motor 2M2 drives		Yes: step 24 No: step 30
24	Set mode switch to OFF. Remove Phase and Amplitude CCA 2A2 **CAUTION** When testing on or jumpering connector contacts, take care not to short adjacent contacts Ensure the 2C1 sensor bar is positioned near center of travel before beginning the following checks **NOTE** For steps requiring jumpers, remove jumper before sensor contacts micro switches Set mode switch to AM. Momentarily jumper 2XA2-4 to ground	Motor 2M1 rotates clockwise (viewed from shaft end)	Yes: step 25 No: step 39
25	Momentarily jumper 2XA2-5 to ground	Motor 2M 1 rotates counterclockwise	Yes: step 26 No: step 39
26	Connect VTVM between 2XA2-3 and ground	Meter indicates + 10 VDC + 0.8 VDC	Yes step 27 No: step 39

Table 3-3. Checkout/Troubleshoot the Antenna Coupler CU-2229/URC-92-Continued

STEP	ACTION	INDICATION	NEXT STEP
27	**CAUTION** Ensure VTVM is Isolated from ground Connect VTVM between 2XA2-2 and 2XA2-3	Meter indicates a voltage difference(+ or -)	Yes: step 28 No: step 39
28	Set mode switch to OFF. Connect multimeter between 2XA2-8 and ground.	Meter indicates 1000 ohms or more.	Yes step 29 No: step 39
29	Connect multimeter between 2XA2-11 and ground.	Meter indicates 1000 ohms or more	Yes: step 38 No step 39
30	Set mode switch to OFF Remove Control Logic CCA 2A1. Set mode switch to AM. Connect VTVM between 2XA1-3 and 2XA 1-F	Meter indicates greater than 0.1 VDC	Yes step 31 No: step 39
31	Connect VTVM between 2XA1-B and ground	Meter indicates + 12 VDC ± 4 VDC	Yes step 32 No: step 39
32	Set mode switch to OFF Reinstall Control Logic CCA 2A2 Remove Phase and Amplitude Control CCA 2A2 Set mode switch to CPLR TUNE KW. Connect VTVM between 2XA2- 10 and ground.	Meter indicates 0 VDC ± 0.5 VDC	Yes step 38 No: Reinstall Phase and Amplitude Control CCA 2A2, go to step 37
33	Set mode switch to OFF Remove Control Logic CCA 2A1 Set mode switch to CPL,RTUNE KW **CAUTION** When testing on or jumpering connector contacts, take care not to short adjacent contacts Connect VTVM between 2XA1-2 and ground	Meter indicates + 10 VDC ± 0. 8 VDC	Yes step 37 No: step 39
34	Set mode switch to OFF Replace Control Logic CCA 2A1 with a known good Control Logic CCA Set mode switch to CPLR TUNE KW TUNE START.	**NOTE** If the time delay runs out during this test, de-Depress press TUNE START once more If tuning occurs the second time, the indication is good Antenna Coupler completes tune cycle, COUPLER STATUS FAULT indicator goes out and COUPLER STATUS READY illuminates.	Yes step 37 No: step 39
35	Set mode switch to OFF Replace Control Logic CCA 2A1 with a known good Control Logic CCA Set mode switch to CPLR TUNE KW. Depress TUNE START to tune antenna coupler Set mode switch to CW then return to CPLR TUNE KW	COUPLER STATUS READY indicator goes out and COUPLER STATUS FAULT indicator illuminates.	Yes step 37 No: step39
36	Set mode switch to OFF Replace Control Logic CCA 2A1 with a known good Control Logic CCA Set mode switch to CPLR TUNE KW TUNE START to tune antenna coupler Set mode switch to CW then return to CPLR TUNE KW Finally, set mode switch to AM and key transmitter	COUPLER STATUS FAULT indicator goes out and COUPLER STATUS READY indicator Depress illuminates.	Yes step37 No: step 39
37	Replace Control Logic CCA 2A1 Route original Control Logic CCA to next higher maintenance level for repair		
38	Replace Phase and Amplitude Control CCA 2A2 Route original Phase and Amplitude Control CCA to next higher maintenance level for repair		
39	Unit not authorized for repair at this maintenance level. Route Antenna Coupler CU-2229/URC-92 to next higher maintenance level for repair		

Section IV. MAINTENANCE

3-7. General.

Direct support maintenance of the AN/URC-92 is limited to the replacement of interconnecting cables, circuit card replacement and the procedures outlined in this manual.

3-8. Spectrum Generator (8), Low Digit Generator (9), Translator (10), and VHF Divider (11) Circuit Card Assemblies

(Fig 3-3)

a. Removal.

(1) Remove transceiver top cover.

(2) Remove four mounting screws (1) and lock washers (2) from top of Synthesizer Assembly.

(3) Lift off top protective cover (3).

(4) Gently extract circuit card

b. Replacement.

CAUTION

Upon reinstallation of these circuit cards, Component side must face rear of transceiver.

(1) Gently reinstall circuit card.

(2) Position protective cover in place (3).

(3) Reinstall four mounting screws (1) and washers (2).

(4) Reinstall transceiver top cover.

3-9. VHF VCO (4) Circuit Card Assembly

(Fig 3-3)

a. Removal.

(1) Remove transceiver top cover.

(2) Remove transceiver bottom cover.

(3) Remove six mounting screws (12) attaching front panel (13).

(4) Pull front panel away from receiver.

(5) Disconnect electrical quick disconnect 1A3P1

(7) from 1A4A5J1 on front of VCO board (4).

(6) Remove four mounting screws (6) and washers

(5) from front of VCO board (4)

(7) Gently slide out VCO board.

b. Replacement.

(1) Gently reinstall circuit card.

(2) Reinstall four mounting screws (6) and washers (5).

(3) Reconnect electrical quick disconnect 1A3P1 (7) to 1A4A5J1 on front of VCO board (4).

(4) Position front panel in place.

(5) Reinstall six mounting screws (12).

(6) Reinstall transceiver bottom cover.

(7) Reinstall transceiver top cover.

3-10. VHF Mixer (14), IF Filter (15), Side-band Generator (16), and Audio (17) Circuit Card Assemblies

(Fig 3- 3)

a. Removal.

(1) Remove transceiver top cover.

(2) Remove four mounting screws (1) and washers

(2) from top of Receiver/Exciter.

(3) Lift off top protective cover (3).

(4) Gently extract circuit card.

b. Replacement.

CAUTION

Upon reinstallation of these circuit cards, component side must face front of transceiver.

(1) Gently reinstall circuit card.

(2) Position protective cover (3) in place

(3) Reinstall four mounting screws (1) and washers (2).

(4) Reinstall transceiver top cover.

3-11. RF Power Amplifier Assy

a. Removal.

(1) Remove four mounting screws and washers attaching heat sink and RF power amplifier to rear panel.

(2) Carefully pull heat sink and RF power amplifier away from back panel.

(3) Disconnect coax cable connector.

(4) Remove two retaining nuts and washers from connector 1A8P1.

(5) Disconnect connector 1A8P1.

(6) Disconnect connector 1A8P3.

b. Replacement.

(1) Reinstall/replace gasket.

(2) Reconnect connector 1A8P3.

(3) Reconnect connector 1A8P1.

(4) Reinstall two retaining nuts and washers on connector 1A8P1.

(5) Reconnect coax cable connector.

(6) Position heat sink and RF power amplifier in place.

(7) Reinstall four mounting screws and lock-washers.

3-12. Antenna Coupler Tuning Control

(Fig 3-4)

a. Removal.

(1) Remove transceiver top cover.

(2) Remove four mounting screws (4) and lock-washers (3) from front tuning control (2) 1A2.

(3) Disconnect connector 1A2P1 from 1A8J7.

(4) Carefully pull tuning control forward

(5) Disconnect jack 1A2P2 from 1A1J2.

b.Replacement

(1) Reinstall/replace gasket (1)

(2) Reconnect jack 1A2P2 to 1A1J2.

(3) Position tuning control (2) 1A2 in place

(4) Reinstall four mounting screws (4) and lockwashers (3).

(5) Reconnect connector 1A2P1 to 1A8J7

(6) Reinstall transceiver top cover.

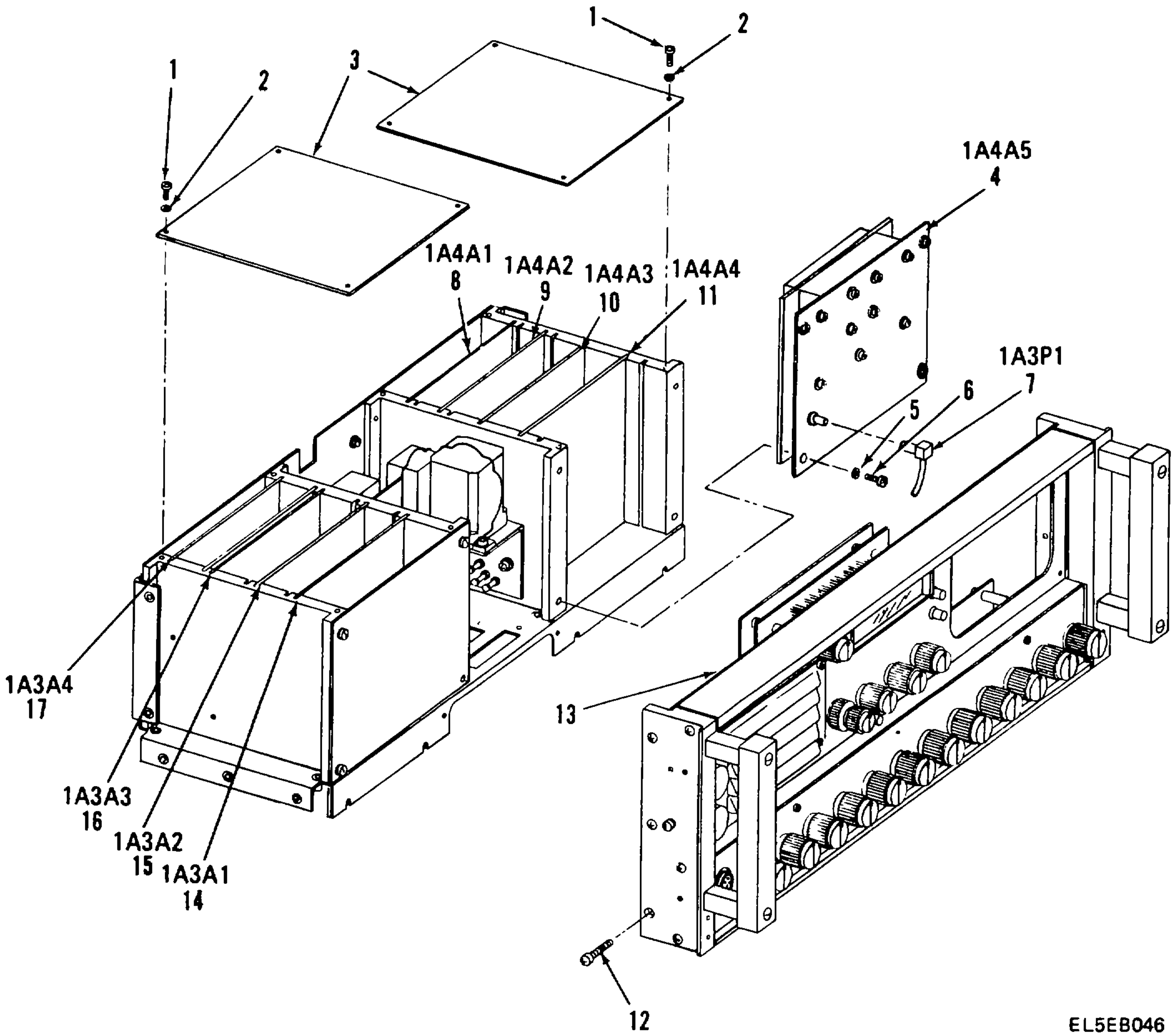


Figure 3-3. Front Panel and Circuit Card Assemblies.

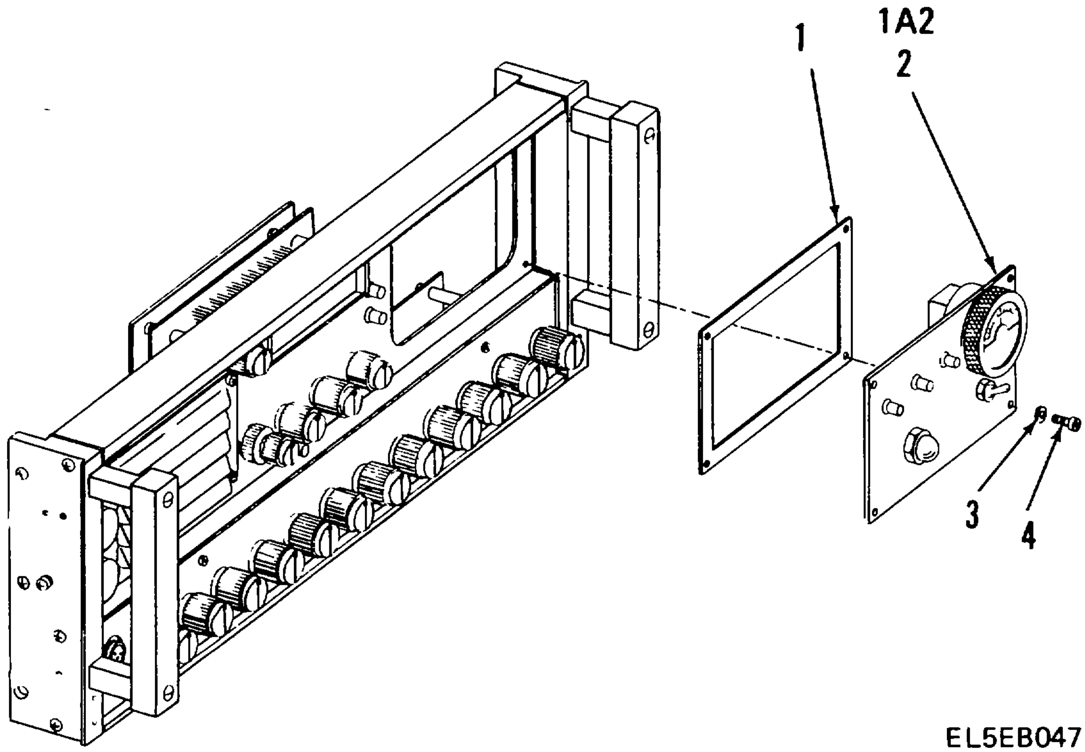


Figure 3-4. Antenna coupler Tuning Control.

Section V. ADMINISTRATIVE STORAGE

3-13. Preparation for Storage

Prepare the AN/URC-92 for administrative storage in accordance with the following:

a. Perform the Preventive Maintenance Checks and Services outlined in Chapter 4.

b. Perform the Preventive Maintenance Checks and Services outlined in this chapter.

c. Place all loose components in a plastic bag and secure the bag to one of the handles on the RT1277/URC-92

d. The RT-1277/URC-92 and the CU-22291 URC-92 are completely sealed and do not require any special storage precautions The units may be stored in temperatures ranging from 55 to 85 °C at humidities up to 100% without damage.

CHAPTER 4

GENERAL SUPPORT

Section I. GENERAL

4-1. Scope

This chapter contains checkout, troubleshooting, repair, removal, replacement and other maintenance required for general support of Radio Set AN/URC-92. The checkout and troubleshooting procedures are separated into a receiver-transmitter RT-1277/URC-92 checkout/troubleshoot and an antenna coupler CU-2229/URC-92 checkout/troubleshoot.

4-2. Voltage Measurements

Applicable voltages and acceptable tolerances are listed in Table 4-1.

Section II. TOOLS AND EQUIPMENT

4-3. Test Equipment

Refer to TM 11-5820-873-12 Appendix D, TM-11-5820-873-20P and TM 11-5820-873-34P. Also, a BNC to clip lead cable is required (Fig 4-1).

Table 4-1 Voltage Measurements

0	VDC ± 0.2	12 VDC ± 0.8
2	VDC ± 0.5	22 VDC ± 1.5
3	VDC ± 0.25	28 VDC ± 1.5
5	VDC ± 0.25	
7.7	VDC ± 0.8	
9	VDC ± 0 8	12 VAC ± 0 8
9.56	VDC ± 0.8	20 VAC ± 1.5
10	VDC ± 0.8	115 VAC ± 15

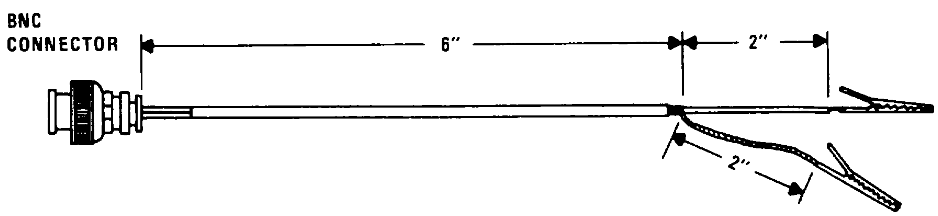


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Figure 4-1. BNC/Clip Lead Cable

Section III. CHECKOUT/TROUBLESHOOT

4-4. General

This section contains checkout and troubleshooting for both the receiver-transmitter and the antenna coupler. Completion of a checkout signifies a particular unit is operationally ready for use. Troubleshooting procedures are designed to function from incorrect indications in the checkout.

4-5. Receiver-Transmitter RT-1277/-URC-92 Checkout/Troubleshoot.

The following procedures in Table 4-2 will establish the operational readiness of RT-1277/URC-92 receiver-transmitter Successful completion of the checkout portion (steps 1 thru 16) indicates the receiver-transmitter is operationally ready for use Troubleshooting procedures are designed to function from incorrect indications in the checkout Following any repair action, the test technician must return to step 1 of the checkout unless directed differently by the procedure The troubleshooting does not consider incorrect or missing supply voltages to subassemblies Before any replace/repair action is accomplished on a subassembly, the test technician should verify all necessary supply voltages at the subassembly. Incorrect or missing supply voltages should be repaired using conventional troubleshooting methods. Refer to the List of Illustrations for the appropriate schematics

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92

STEP	ACTION	INDICATION	NEXT STEP
1	Remove top and bottom covers. Connect 115 VAC power cable to POWER connector 1A8J3. Connect 50 ohm dummy load through a thruline wattmeter to ANT jack 1A8J1. Connect a known good Antenna Coupler CU-2229/URC-92 to ACCESSORY jack 1A8J4. Set XMIT GAIN control fully counterclockwise Set VOLUME control clockwise, 1/4 turn Push VFO control in (off). Set DIM control fully clockwise.		Step 2a
2a	Set mode switch to LSB.	ANTENNA COUPLER CONTROL meter lamp luminates.	Yes: step 2b No: step 17
2b	Check pilot lamp and display.	Pilot lamp and display illuminate.	Yes: step 2c No: step 29
2c	Rotate DIM control one position counterclockwise. Then rotate DIM control another position counterclockwise.	Pilot lamp and display intensity dim, then go out. Meter lamp retains intensity, then goes out.	Yes: step 3a No: step 42
3a	Set FREQ CONTROL switch to A. Set FREQUENCY A controls to 1.5000 MHz. Rotate 100 KHz control through positions 4, 3, 2, 1, and 0.	LOW FREQ LIMIT lamp illuminates and speaker noise level decreases.	Yes: step 3b No: step 44
3b	Rotate 100 KHz control through positions 6, 7, 8, and 9.	LOW FREQ LIMIT lamp is out and receiver transmitter is enabled.	Yes: step 3c No: step 44
3c	Set FREQ CONTROL switch to B. Set FRE QUENCY B controls to 1.5000 MHz. Rotate 100 KHz control thru positions 4, 3, 2, 1, and 0.	LOW FREQ LIMIT lamp illluminates.	Yes: step 3d No: step 50
3d	Rotate 100 KHz control thru positions 6, 7, 8, and 9.	LOW FREQ LIMIT lamp is out.	Yes. step 3e No: step 50
3e	Set FREQ CONTROL switch to A. Set FREQUENCY A controls to 1.6000 MHz. Increase VOLUME control until noise is heard in speaker.	Noise is heard in speaker.	Yes: step 3f No: step 54
3f	Connect known good headphone to 1A1J3.	Noise is heard in headphone.	Yes: step3g No: step 280
3g	Disconnect headphone. Connect known good handset.	Noise is heard in ear piece of handset.	Yes: step 3h No: step 289
3h	Disconnect handset. Rotate RF GAIN control counterclockwise and observe meter.	Front panel meter reading increases to almost full scale deflection.	Yes: step 4a No: step 64
4a	Return RF GAIN control to fully clockwise position and VOLUME control to 1/4 turn clockwise. Connect a known good CW key at the KEY jack. Set FREQUENCY A controls to 29.9950 MHz. Set mode switch to CW. Depress CW key.	Sidetone is heard in speaker.	Yes: step 4b No: step 77
4b	Depress CW key and observe wattmeter.	Wattmeter indicates 100 W ± 10 W.	Yes: step 5a No: step 74
5a	Connect oscilloscope across dummy load. Set oscilloscope to .2 V/division. Set FREQUENCY A controls to 29.9995 MHz. Set mode switch to LSB. Connect microphone to MIC connector. Key microphone and observe oscilloscope.	Oscilloscope displays waveform similar to Fig. 4-2A, less than 2 V peak-to-peak.	Yes: step 5b No: step 163
5b	Set mode switch to USB. Key microphone and observe oscilloscope.	Oscilloscope displays waveform similar to Fig. 4-2A, less than 2 V peak-to-peak.	Yes: step 5c No: step 163
5c	Set oscilloscope to 50 V/division. Key, and speak into microphone. Increase XMT GAIN control until no further increase peak-to-peak voltage is observed.	Oscilloscope displays waveform similar to Fig. 4-2A, 190 V peak-to-peak, maximum.	Yes: step 5d No: step 165
5d	Set mode switch to LSB Key and speak into microphone. Increase XMT Gain until no further increase in peak-to-peak voltage is observed.	Oscilloscope displays waveform similar to Fig. 4-2A, 190 V peak-to-peak.	Yes: step 5e No: step 175
5e	Set mode switch to AM. Key and speak into microphone. Observe oscilloscope.	Oscilloscope displays waveform similar to Fig. 4-B, modulated carrier signal.	Yes: step 6a No: step 177
6a	Connect frequency counter to oscilloscope vertical amplifier output. Connect oscilloscope across dummy load. Set FREQUENCY A controls to 1.6000 MHz. Turn XMT GAIN Control fully counterclockwise. Key microphone. Starting with 100 Hz control, rotate each FREQUENCY A control through its entire range.	Frequency counter and front panel readouts agree for each frequency.	Yes: step6b No: step 185

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP
6b	Set FREQ CONTROL switch to B. Repeat step 6a using FREQUENCY B controls.	Frequency counter and front panel readouts agree for each frequency.	Yes: step 6c No: step 211
6c	Set FREQ CONTROL switch to A. Pull out VFO PULL control (VFO on).	VFO lamp illuminates.	Yes: step 6d No: step 215
6d	Connect frequency counter to oscilloscope vertical amplifier output. Connect oscilloscope across dummy load. Set FREQUENCY A controls to 2.000 MHz. Key microphone. Rotate VFO PULL control through its entire range.	Frequency counter indicates 2.0000 MHz ± 5 KHz minimum.	Yes: step7a No: step 218
7a	Set FREQ CONTROL to A XMT B RCV. Key microphone. Rotate FREQUENCY B, 10 KHz control.	Frequency counter indicates 1.6000 MHz and front panel readouts agree.	Yes: step 7b No: step 223
7b	Release microphone key. Observe front panel readout and rotate FREQUENCY A, 10 KHz control.	No readout change occurs	Yes: step 82 No: step 223
8a	Disconnect antenna coupler control cable. Disconnect CW key and mic. Remove dummy load from ANT jack 1A8J1. Connect signal generator to ANT jack 1A8J1. Connect Audio VTVM to PHONE jack 1A1J3. Set mode switch to LSB. Set FREQ CONTROL to B Set FREQUENCY B controls to 29.9994 MHz. Adjust VOLUME CONTROL for VTVM indication of -20 dB. Set signal generator output level to 0.5 uV. Adjust signal generator frequency to approximately 29.9994 MHz, until VTVM indication peaks.	Audio VTVM indicates -10 dB or more.	Yes: step 8b No: step 225
8b	Repeat step 8a substituting the following FREQUENCY B, and signal generator frequency settings. 16.0100 MHz 10.0100 MHz 7.5100 MHz 5.0100 MHz 3.5100 MHz 2.0100 MHz 1.6100 MHz	Audio VTVM indicates -10 dB or more.	Yes: step 9a No: step292
9a	Set mode switch to USB Return FREQUENCY B switches to 29.9994 MHz. Adjust signal generator frequency to approximately 29.9994 MHz, until VTM indication peaks.	Audio VTVM indicates at least -10 dB or more.	Yes: step 9b No: step 295
9b	Set mode switch to AM, FREQUENCY B controls to 29.9994 MHz. Signal generator output level to 3.0 uV, frequency to 29.9994 MHz, 30%, 1 KHz modulation. Adjust signal generator for peak VTVM indication. Adjust VOLUME control for -10 dB VTVM Indication. Remove modulation from signal generator output.	VTVM indicates less than -20 dB.	Yes: step 9c No: step 242
9c	Set mode switch to LSB. Set FREQUENCY B switches to 20.000 MHz. Disconnect VTVM from PHONE jack. Increase VOLUME control until noise is heard. Rotate 1 MHz control thru each of its positions.	At each position, noise blanks momentarily then returns.	Yes: step 10 No: step 297
10	Set mode switch to OFF. Disconnect control cable at receiver-transmitter 1A8J4. Connect multimeter between ACCESSORY Connector 1A8J4-P and ground. Set mode switch to AM. Slowly adjust ANTENNA coupler CONTROL gain control 1A2R2 thru its entire range.	Meter indicates a range between + 12 and +22 VDC ± 10%	Yes: step 11 No: step 264
11	Reset gain control 1A2R2 to 14.5 VDC ± 0.5 VDC. Set mode switch to OFF. Disconnect dummy load from antenna jack lA8Jl. Connect RF and control cables between the receiver-transmitter and a known good CU-2229/URC-92 Antenna Coupler Connect a 50 ohm dummy load to the Antenna Coupler antenna post and ground post using a BNC/clip lead cable.		Step 12

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP
12	Set mode switch to CPLR TUNE KW.	COUPLER STATUS FAULT indicator	Yes: step 13 No: step 265
13	**WARNING** Several kilovolts are present at the Antenna Coupler antenna post, E1, during steps 13 thru 14b. Exercise caution and do not contact antenna post E1.	**NOTE** If COUPLER STATUS READY indicator does not illuminate during this step, depress TUNE START once more. If COUPLER STATUS READY indicator illuminates after the second time, the indication is good.	
	Depress TUNE START.	COUPLER STATUS FAULT indicator goes out and COUPLER STATUS TUNING indicator illuminates. When the antenna coupler is tuned, COUPLER STATUS TUNING indicator goes out and COUPLER STATUS READY indicator illuminates.	Yes: step 14a No: 266
14a	Set frequency to 4.0 MHz. Set REFL FWD POWER MONITOR switch to REFL. Depress TUNE START and observe meter 1A2M1.	Meter 1A2M1 indicates a refl power level.	Yes: step 14b No: step 272
14b	Set REFL FWD POWER MONITOR switch to FWD. Set frequency to 12.995 MHz. Depress TUNE START and observe meter 1A2M1.	Meter 1A2M1 indicates a fwd power level.	Yes: step 15a No: step 274
15a	Set mode switch to OFF Connect DC power cord to 1A8J3. Connect wattmeter and dummy load to ANT jack 1A8J1. Connect CW key to Key jack 1A1J4. Check DC fuse 1A8F3 for proper value for 13 VDC operation. Check 1A6TB2 wiring for 13 VDC operation, refer to Operator and Organizational Maintenance Manual TM 11-5820873-12. Set 1A6A2-S1 for 13 VDC operation. Set mode switch to CW Depress CW key.	Clear audio tone with minimal background noise in speaker. Wattmeter indicates 100 W ± 10 W.	Yes: step 15b No: step 277
15b	Set mode switch to OFF. Replace DC fuse 1A8F3 with appropriate fuse for 26 VDC operation. Rewire 1A6TB2 for 26 VDC operation., refer to Operator and Organizational Maintenance Manual TM 11-5820-873-12 Set 1A6A2-S1 for 26 VDC operation. Depress CW key. Set mode switch to CW.	Clear audio tone with minimal background noise heard in speaker. Wattmeter indicates 100 W ± 10 W.	Yes: step 16a No: step 303
16a	Set mode switch to OFF. Disconnect all external cabling and test equipment.		Step 16b
16b	Reassemble Receiver-Transmitter RT-1277/ URC-92.		Step 16c
16c	Ensure inverter is tagged properly for 26 VDC operation.		Step 16d
16d	Recelver-Transmltter RT-1277/URC-92 checkout is now complete. Receiver-Transmitter is operationally ready.	**NOTE** For location of parts see figures 4-22 thru 4-66.	- - -
17	Connect multimeter between 1A6P1, pins 1 and 3, then between pins 5 and 7.	Multimeter indicates 115 VAC ± 15%	Yes: step 18 No: step 21
18	Connect multimeter between 1A6XA1-B and Ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 19 No: step 23
19	Connect multimeter between 1A1S16-8 and Ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 20 No: step 25
20	Connect multimeter between meter lamp center contact and ground.	Multimeter Indicates + 12 VDC ± 0.8 V.	Yes: replace meter lamp. No: step 285
21	Disconnect AC power cord. Remove 1A8F1 and 1A8F2 from rear panel. Check fuses 1ASF1 and 1A8F2.	Fuses check good.	Yes step 22 No: replace fault component.
22	Check 1A1S13C, front, and 1A1S13B, rear.	Switch checks good.	Yes : step 285 No: replace 1A1S13
23	Connect multimeter between 1A6XA1-C and ground.	Multimeter indicates + 20 VAC ± 1.5 VAC.	Yes: step 24 No: step 27
24	Check transistor Q102.	Q102 checks good.	Yes: step 25 No: replace transistor Q102
25	Set mode switch to OFF. Check fuse 1A6F2.	Fuse Checks good.	Yes: step 290 No: replace fuse 1A6F2

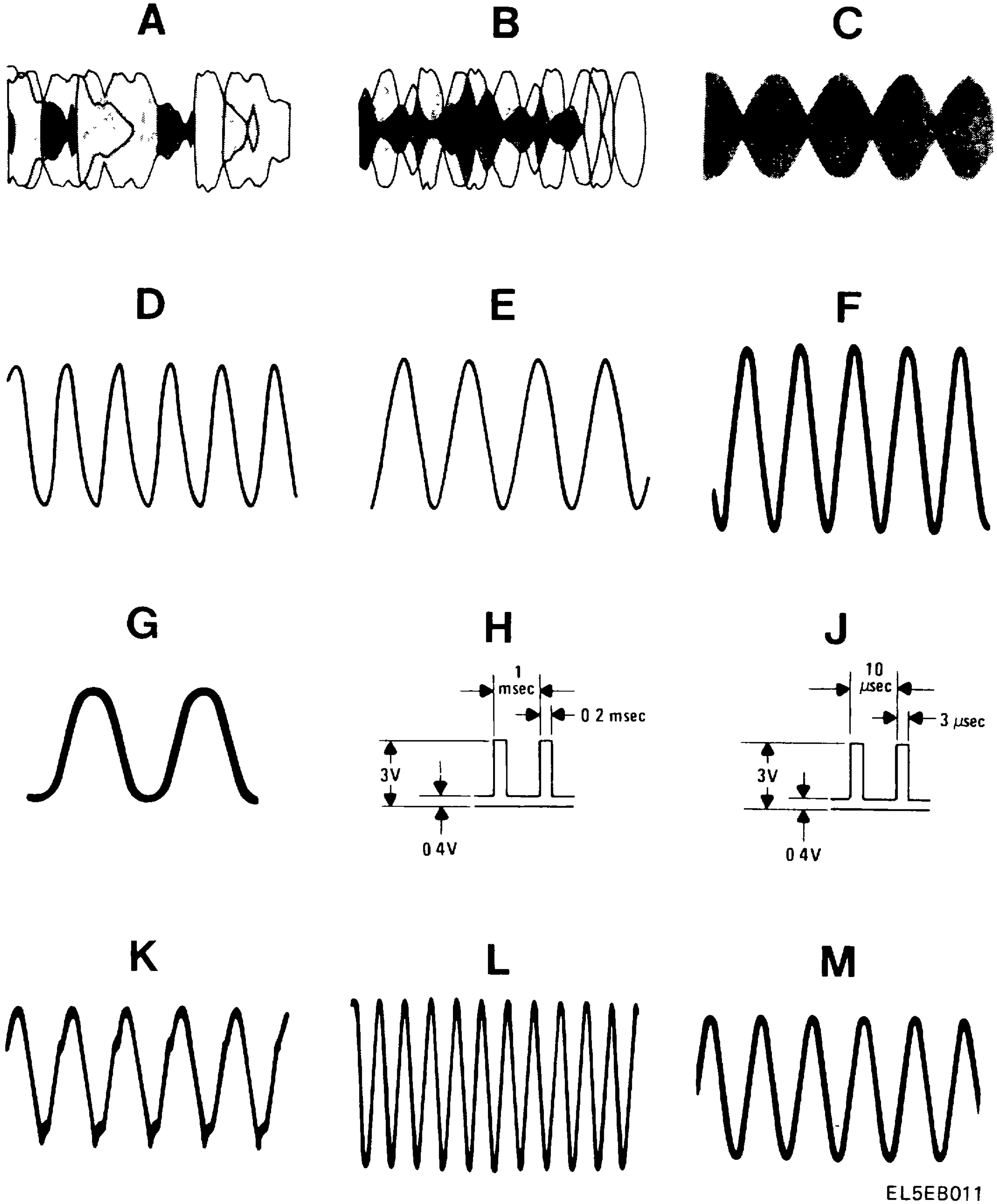


Figure 4-2. General Support Checkout/Troubleshoot the Receiver-Transmitter Waveforms

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP
26	Connect multimeter between 1A1S16-7 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: replace 1A1S16 No: step 285
27	Set mode switch to OFF. Remove 1A6A1 from 1A6XA1. Check continuity between 1A6XA1 pins C and 3.	Continuity checks good.	Yes: step 28 No: replace transformer 1A6T1.
28	Continuity check 1A6TB1 pins E1 to E3, and pins E5 to E6.	Continuity checks good.	Yes: step 285 No: replace transformer 1A6T1.
29	Connect multimeter between 1A6XA1-15 and ground.	Multimeter indicates + 5 VDC ± 0.25 VDC.	Yes: step 31 No: step 32
30	Connect multimeter between 1A1S16-3 and ground.	Multimeter indicates + 5 VDC ± 0.25 VDC.	Yes: step 31 No: step 36
31	Connect multimeter between 1A1DS3 center contact and ground.	Multimeter indicates + 5 VDC ± 0.25 VDC.	Yes: replace 1A1DS3 No: step 285
32	Connect multimeter between 1A6XA1-P and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 33 No: step 35
33	Check transistor 1A6Q103.	Transistor 1A6Q103 checks good.	Yes: step 34 No: replace transistor 1A6Q103
34	Check fuse 1A6A1F3.	Fuse checks good.	Yes: step 286 No: replace fuse 1A6A1F3
35	Set mode switch to OFF. Remove 1A6XA1 from 1A6A1. Continuity checks 1A6XA11 pin P to pin 13.	Continuity checks good.	Yes: step 36 No: replace transformer 1A6T1
36	Check components 1A1Q101, 1A1C5, and 1A1C7.	Components check good.	Yes: step 37 No: replace faulty component.
37	Connect multimeter between 1A1S16-3 and ground.	Multimeter indicates + 5 VDC ± 0.25 VDC.	Yes: step 39 No: step 38
38	Connect multimeter between 1A6A1F3 and A6A1C9 junction and ground.	Multimeter indicates + 10 to + 22 VDC.	Yes: step 285 No: step 286
39	Connect multimeter between 1A1A3P1-44 and ground.	Multimeter indicates + 5 VDC ± 0.25 VDC.	Yes: step 288 No: step 40
40	Connect multimeter between 1A1A2-1 and ground.	Multimeter indicates + 5 VDC ± 0.25 VDC.	Yes: step 289 No: step 41
41	Connect multimeter between 1A1S16-4 and ground.	Multimeter indicates + 5 VDC ± 0.25 VDC.	Yes: step 285 No: replace switch 1A1S16
42	Connect multimeter between 1A1S16-2 and ground.	Multimeter indicates + 3 VDC ± 0.25 VDC.	Yes: step 43 No: replace switch 1A1S16
43	Check components 1A1CRF53. lA1CR54, and 1A1CR55.	Components check good.	Yes: step 285 No: replace faulty com ponent.
44	Connect multimeter between 1A1DS1-1 center contact and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: replace 1A1DS1 No: step 45
45	Connect multimeter between 1A1S1A, rear, pin 4 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 46 No: step 48
46	Connect multimeter between 1A1S2C, rear, pin 4 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 47 No: step 49
47	Check diode 1A1CR16.	1A1CR16 checks good.	Yes: step 48 No: replace diode 1A1CR16
48	Check switch 1A1S15.	1A1S15 checks good.	Yes: step 49 No: replace switch 1A1S15
49	Check switches 1A1SlA rear, 1A1S2C rear, and 1A 1S3B rear.	Components check good.	Yes: step 52 No: replace fault component.
50	Set FREQ CONTROL switch to B. Set FREQUENCY B controls to 1.5000 MHz. Rotate 100 KHz control thru positions 4, 3, 2, 1 and 0.	LOW FREQ LIMIT lamp illuminates sometimes.	Yes: step 52 No: replace switch 1A1S9
51	Check the following components 1A1S7A rear, 1A1S8C rear, 1A1S9B rear, 1A1S15 and 1A1CR37.	Component d check good.	Yes: step 285 No: replace fault component.

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP			
52	Connect multimeter between 1A3A5-B and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 53 No: step 285
53	Connect multimeter between 1A1A5XA4-14 and ground.	Multimeter indicates + 10 VDC ± 2 VDC.	Yes: step 290 No: step 287
54	Connect oscilloscope probe to 1A1A1-E3, ground lead to ground.	Check for noise above ambient level.	Yes: step 55 No: step 54
55	Connect oscilloscope to speaker 1A1LS1, signal input terminal, ground lead to ground.	Check for noise above ambient level.	Yes: replace speaker 1A1LS1 No: step 56
56	Check resistor 1A1R50.	1A1R50 checks good.	Yes: step 57 No: replace resistor 1A1R50
57	Check 1A1J3.	1A1J3 checks good.	Yes: step 285 No: replace 1A1J3
58	Connect oscilloscope probe to 1A3A5-M, ground lead to ground.	Check for noise above ambient level.	Yes: step 59 No: step 60
59	Connect oscilloscope probe to 1A1A1-E4 ground lead to ground.	Check for noise above ambient level.	Yes: step 250 No: step 61
60	Connect oscilloscope probe to 1A3XA4J4-18, ground lead to ground.	Check for noise above ambient level.	Yes: step287 No: step 62
61	Check resistor 1A1R51.	1A1R51 checks good.	Yes: step 285 No: replace resistor 1A1R51
62	Connect multimeter between 1A3XA4J4-12 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 290 No: step 63
63	Connect multimeter between 1A3A5-E7 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 287 No: step 63
64	Rotate RF GAIN control fully CCW. Connect multimeter between 1A3XA4J4-15 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 65 No: step 67
65	Connect multimeter between 1A3A5-E12 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 66 No: step 287
66	Connect multimeter between 1A2M1 positive(+) pin and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: replace meter 1A2M1 No: step 69
67	Connect multimeter between 1A3A5-A and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 68 No: step 73
68	Connect multimeter between 1A3XA4J4-14 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 290 No: step 287
69	Connect multimeter between 1A8P2 pins 12 and 13.	Multimeter Indicates 0 V ± 2 VDC.	Yes: step 70 No: step 71
70	Check components 1A8K1 and 1A8CR1.	Components check good.	Yes: step 285 No: replace faulty compo-nent.
71	Connect multimeter between 1A5XA4-11 and ground.	Multimeter indicates + 12 VDC ± 2 VDC.	Yes: step 292 No: step 72
72	Remove Sideband Generator CCA 1A3A3.	Multimeter indicates + 12 VDC ± 2 VDC.	Yes: step 294 No: reinstall Sideband Generator CCA 1A3A3 and go to step 285.
73	Check components 1A1R5, 1A1R54, and 1A1CR50.	Components check good.	Yes: step 285 No: replace faulty compo-nent.
74	Connect oscilloscope probe to 1A3XA3J3-16, ground lead to ground. Depress CW key.	Oscilloscope displays waveform similar to Fig. 4-2C.	Yes: step 75 No: step 102
75	Remove 1A8P3 from 1A7J2. Connect wattmeter to 1A7J2 center contact, ground lead to ground. Depress CW key.	Wattmeter indicates more than 90 watts.	Yes: step 76 No: step 79
76	Reconnect 1A7J2 to 1A8P3. Remove 1A8P5 from 1A5J4. Connect wattmeter to 1A5J4 center contact ground lead to ground. Depress CW key.	Wattmeter indicates more than 90 watts.	Yes: step 285 No: step 82
77	Connect frequency counter to 1A3XA3J3-D, ground lead to ground. Depress CW key.	Frequency counter indicates 1 KHz.	Yes: step 78 No: step 290
78	Connect frequency counter to 1A3XA4J4-4, ground lead to ground. Depress CW key.	Frequency counter indicates 1 KHz.	Yes: step 290 No: step 286

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP
79	Reconnect 1A7J2 to 1ASP3. Connect oscilloscope to 1A3XA1J1-5, ground lead to ground. Depress CW key.	Oscilloscope displays waveform similar to Fig. 4-2D.	Yes: step 80 No: step 86
80	Remove 1A3P3 from 1A7J1. Connect VTVM(AC) to 1A3P3 center contact, ground lead to ground. Depress CW key.	VTVM indicates more than l00m V.	Yes: step 81 No: step 90
81	Connect multimeter between 1A7A1J3-F and ground. Depress CW key.	Multimeter indicates + 28 VDC ± 1.5 VDC.	Yes: step 293 No: step 92
82	Reconnect 1A5J4 to 1ASP5. Remove 1A8P4 from 1A5J2. Connect wattmeter to 1A8P4 center contact ground lead to ground. Depress CW key.	Wattmeter indicates more than 90 watts.	Yes: step 83 No: step 285
83	Reconnect 1A5J2 to 1A8P4. Connect multimeter between 1A8P2-8 and ground. Depress CW key.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 292 No: step 93
84	Continuity check 1A1J4 center contact to 1A1P2-J.	Continuity checks good.	Yes: step 85 No: step 94
85	Continuity check 1A3XA3J3-2 to 1A3A5-J.	Continuity checks good.	Yes: step 294 No: step 287
86	Connect oscilloscope probe to 1A3XA2J2-16, ground lead to ground. Depress CW key.	Oscilloscope displays waveform similar to Fig. 4-2C.	Yes: step 90 No: step 287
87	Connect multimeter between 1A3A5-R and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 88 No: step 89
88	Connect multimeter between 1A3A5XA2J2-8 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 295 No: step 287
89	Check switch 1A1S13 front.	Switch checks good.	Yes: step 285 No: replace switch 1A1S13.
90	Reconnect 1A7J1 to 1A3P3 Connect VTVM (AC) to 1A3XA1J1-8. Depress CW key.	VTVM indicates more than 100 m V.	Yes: step 91 No: step 95
91	Connect VTVM (AC) to 1A3A56-E20. Depress CW key.	VTVM indicates more than 100 m V.	Yes: step 285 No: step 287
92	Connect multimeter between 1A5J1-18 and ground. Depress CW key.	Multimeter indicates + 28 VDC ± 2.5 VDC.	Yes: step285 No: step 292
93	Check switch 1 A1SB, rear, and diode 1A1CR51.	Components check good.	Yes: step 285 No: replace faulty component.
94	Continuity check 1A1S13, rear pin 2 to pin 6.	Continuity checks good	Yes: step 285 No: replace switch 1A1S13.
95	Connect multimeter between 1A3XA1J1-U and ground. Depress CW key.	Multimeter indicates less than + 1.2 VDC	Yes: step 96 No: step 110
96	Connect multimeter between 1A3XA1J110 and ground. Depress CW key.	Multimeter indicates + 12 VDC ± 0. 8 VDC	Yes: step 97 No: step 287
97	Connect multimeter between 1A3XA1J1-13 and ground. Depress CW key.	Multimeter indicates less than + 8 VDC	Yes: step 98 No: step 112
98	Connect frequency counter to oscilloscope vertical output. Connect oscilloscope probe to 1A3A5-E18 ground lead to ground. Depress CW key.	Oscilloscope displays waveform similar to Fig. 4-2E, minimum amplitude 300 millivolts. Frequency counter indicates 80.75 MHz ± 10 KHz.	Yes: step 99 No: step 113
99	Connect oscilloscope probe to 1A3A5XA1J1-1, ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2E, minimum amplitude 300 millivolts. Frequency counter indicates 80.75 MHz ± 10 KHz.	Yes: step 100 No: step 287
100	Connect frequency counter to oscilloscope vertical output. Connect oscilloscope probe to 1A3A5-E24, ground lead to ground. Depress CW key.	Frequency counter indicates between 111.0000 MHz and 122.0000 MHz.	Yes: step 101 No: step 114
101	Connect oscilloscope, with frequency counter, at vertical output to 1A3XA1J1-18, ground lead to ground.	Frequency counter indicates between 111.0000 MHz and 122.0000 MHz.	Yes: step 298 No: step 287
102	Connect multimeter between 1A3XA3J310 and ground. Depress CW key.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 103 No: step 106
103	Connect multimeter between 1A3XA3J3-T and ground. Depress CW key.	Multimeter indicates less than + 0.5 VDC.	Yes: step 104 No: step 115
104	Connect multimeter between 1A3XA3J3-S and ground. Depress CW key.	Multimeter indicates less than + 1.4 VDC.	Yes: step 105 No: step 118

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP
105	Connect frequency counter to 1A3XA3J3-F, ground lead to ground. Depress CW key.	Frequency counter indicates 10.5 MHz.	Yes: step 294 No: step 120
106	Connect multimeter between 1A3A5-E6 and ground. Depress CW key.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 287 No step 107
107	Connect multimeter between 1A3A5-E32 and ground. Depress CW key.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 287 No step 108
108	Check relay 1A8K1.	Relay checks good.	Yes: step 109 No: replace relay 1A8K1
109	Check switch 1A1S13, rear.	Switch checks good.	Yes: step 285 No: replace switch A1S13
110	Connect multimeter between 1A7A1J3-B and ground. Depress CW key.	Multimeter indicates less than + 1.2 VDC.	Yes: step 111 No: step 293
111	Connect multimeter between 1A3A5-E13 and ground. Depress CW key.	Multimeter indicates less than + 1.2 VDC.	Yes: step 287 No: step 274
112	Connect multimeter between 1A3XA2J2-P and ground. Depress CW key.	Multimeter indicates less than + 8.0 VDC.	Yes: step 287 No: step 285
113	Connect oscilloscope probe to 1A4XA3J3-11, ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2E, minimum amplitude 300 millivolts. Frequency counter indicates 80.75 MHz ± 10 KHz.	Yes: step 285 No: step 299
114	Remove 1A3Pl from 1A4A5-J1 Connect frequency counter to oscilloscope vertical output. Connect oscilloscope probe to 1A4A5-J1 center pin, ground lead to ground.	Frequency counter indicates between 111.0000 MHz and 122.0000 MHz.	Yes: step 285 No: step 123
115	Disconnect 1A8P2 from 1A5J1. Connect multimeter between 1A7A1J3-D and ground. Depress CW key.	Multimeter indicates less than + 0.5 VDC.	Yes: step 116 No: step 293
116	Reconnect 1A8P2 to 1A5J1. Connect multimeter between 1A5J1-0 and ground. Depress CW key.	Multimeter indicates less than + 0.6 VDC.	Yes: step285 No: step 118
117	Set mode switch to OFF. Disconnect 1A5P5 from 1A5J4. Connect multimeter between center contact of 1A8P5 and ground.	Multimeter indicates 50 ohms ± 4 ohms.	Yes: step 292 No: step 285
118	Connect multimeter between 1A5J1-9 and ground. Depress CW key.	Multimeter indicates less than + 1.4 VDC.	Yes: step 119 No: step 292
119	Connect multimeter between 1A3A5-E14 and ground.	Multimeter indicates less than + 1.4 VDC.	Yes: step 287 No: step 285
120	Connect VTVM (AC) to IA4XAlJl-13 ground lead to ground.	VTVM indicates 0.1 V minimum.	Yes: step l21 No: step 124
121	Connect VTVM (AC) to 1A4A6-E3, ground lead to ground. Depress CW key.	VTVM indicates 0.1 V minimum.	Yes: step 122 No: step 285
122	Connect VTVM (AC) to 1A3A5-E16, ground lead to ground. Depress CW key.	VTVM indicates 0.1 V minimum.	Yes: step 287 No: step 285
123	Reconnect 1A4A5-J1 to 1A3P1. Connect multimeter between 1A4XA5J5-4 and ground.	Multimeter indicates + 2.0 VDC ± 0.5 VDC.	Yes: step 300 No: step 137
124	Connect frequency counter to oscilloscope vertical output jack. Connect oscilloscope probe to 1A8U1-6 ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2F, .3V to .9V peak-to-peak. Frequency counter indicates 5.0 MHz ± 5 Hz.	Yes: step 125 No: step 138
125	Connect oscilloscope probe to 1A4XA1J1-S, ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2F, .3V to .9V peak-to-peak. Frequency counter indicates 5.0 MHz ± 5 Hz.	Yes: step 126 No: step 139
126	Connect multimeter between 1A4A6-E1 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 127 No: step 285
127	Connect multimeter between 1A4A6XA1J1-K and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 128 No: step 297
128	Connect multimeter between 1A6A1-15 and ground.	Multimeter indicates + 5 VDC ± 0.25 VDC.	Yes: step 129 No: step 135
129	Connect multimeter between 1A4A6XA1J1-M and ground.	Multimeter indicates + 5 VDC ± 0.25 VDC.	Yes: step 130 No: step 131
130	Connect multimeter between 1A4A6-L and ground.	Multimeter indicates less than 1 VDC.	Yes: step 296 No: step 136
131	Connect multimeter between 1A4A6-E16 and ground.	Multimeter indicates 1 VDC or more.	Yes: step 132 No: step 297
132	Connect multimeter between 1A1P1-18 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 133 No: step 134

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP
133	Check switch 1A1S13A front.	Switch checks good.	Yes: step 285 No: replace switch 1A1S13
134	Check relay 1A8K1.	Relay checks good.	Yes: step 285 No replace relay 1A8K1.
135	Check components 1A6A1F3 and 1A6Q103.	Components check good.	Yes: step 286 No: replace faulty component
136	Connect multimeter between 1A4A6-E2 and ground.	Multimeter indicates + 5 VDC ± 0.25 VDC.	Yes: step 297 No: step 285
137	Connect multimeter between 1A4XA4J4-15 and ground.	Multimeter indicates + 2.0 VDC ± 0.5 VDC.	Yes: step 297 No: step 140
138	Connect multimeter between TCXO 1A8U1-2 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: replace TCXO 1A8U1. No: step 142
139	Connect oscilloscope to 1A4A6-E5 ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2F, 0.3V to .09V peak-to-peak. Frequency counter Indicates 5.0 MHz ± 5 Hz.	Yes: step 297 No: step 285
140	Set FREQUENCY A controls to 00.0000 MHz. Connect oscilloscope probe to 1A4XA4J4-V ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2G.	Yes: step 141 No: step 158
141	Connect oscilloscope to 1A4XA4J4-B, ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2H.	Yes: step 302 No: step 143
142	Check the following components, 1A8C1, 1A8C2, and 1A8L1.	Components check good.	Yes: step 285 No: replace faulty component
143	Connect oscilloscope to 1A4XA3J3-15, ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2H.	Yes: step297 No: step 144
144	Connect VTVM (AC) to 1A4XA3J3-D, ground lead to ground.	VTVM indicates 0.085 V minimum	Yes: step 145 No: step 148
145	Connect frequency counter to oscilloscope vertical output jack. Connect oscilloscope probe to 1A4XA3J3-P. Ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2J, 0.3 V minimum amplitude. Frequency counter indicates 20 MHz ± 20 Hz. See Fig. 4-6 below.	Yes: step 146 No: step 149
146	Remove Translator CCA 1A4A3. Connect frequency counter to 1A4XA3J3-B, ground lead to ground.	Frequency counter indicates between 1.5000 MHz and 1.59999 MHz.	Yes: step 147 No: step 150
147	Reinstall Translator CCA 1A4A3 Connect frequency counter to 1A4XA3J3-U, ground lead to ground.	Frequency counter indicates between 111.0000 MHz and 122.0000 MHz.	Yes: step 299 No: step 151
148	Connect VTVM (AC) to 1A4XA1J1-4, ground lead to ground.	VTVM indicates 0.085 V minimum	Yes: step 297 No: step 296
149	Connect oscilloscope probe to 1A4XA1J1-1 ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2J, 0.3 V minimum amplitude. Frequency counter indicates 20 MHz ± 20 Hz.	Yes: step 297 No: step 296
150	Connect frequency counter to 1A4XA2J2-1, ground lead to ground.	Frequency counter indicates between 1.5000 MHz and 1.5999 MHz.	Yes: step 297 No: step 152
151	Connect frequency counter to 1A4XA5J5-2, ground lead to ground.	Frequency counter indicates between 111.0000 MHz and 122.0000 MHz.	Yes: step 297 No: step 300
152	Connect VTVM (AC) to 1A4XA2J2-C, ground lead to ground.	VTVM indicates 0.09 V peak-to-peak minimum.	Yes: step 153 No: step 155
153	Connect frequency counter to oscilloscope vertical output jack. Connect oscilloscope probe to 1A4XA2J218, ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2K. Frequency counter indicates 1KHz ± 1 Hz.	Yes: step 154 No: step 156
154	Connect multimeter between 1A4XA2J2-U and ground.	Multimeter indicates + 7.7 VDC ± 0.8 VDC.	Yes: step 301 No: step 157
155	Connect VTVM (AC) to 1A4XA1J1-6, ground lead to ground.	VTVM indicates 0 09 V peak-to-peak	Yes: step 156 No: step 296
156	Connect oscilloscope probe to 1A4XA1J1-18, ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2G.	Yes: step 297 No: step 296
157	Connect multimeter between 1A1S15, front, pin 5 and ground.	Multimeter indicates + 7.7 VDC ± 0.8 VDC.	Yes: step 158 No: step 160
158	Connect multimeter between 1A4A6-1 and ground.	Multimeter indicates + 7.7 VDC ± 0.8 VDC.	Yes: step 297 No: step 285

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP
159	Connect oscilloscope probe to 1A4XA1J1-17, ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2G.	Yes: step 297 No: step 296
160	Connect multimeter between 1A1S4B, rear, pin 7 and ground.	Multimeter indicates + 7.7 VDC ± 0.8 VDC.	Yes: step 161 No: step 162
161	Set mode switch to OFF. Continuity check 1AlS15, front, pin 2 to pin 5.	Continuity checks good.	Yes: step 285 No: replace switch 1A1S15
162	Check the following components 1A1R12, 1A1R13, 1A1R14, 1A1R15, 1A1R16, 1A1R17, 1A1R18, 1A1R19, 1A1R20, 1A1R22, and 1A1S4B, rear.	Components check good.	Yes: step 285 No: replace faulty component.
163	Continuity check 1A1J1-B to 1A3A5-H.	Continuity checks good.	Yes: step 164 No: step 285
164	Continuity check 1A3XA3J3-3 to 1A3XA 5J5-H.	Continuity checks good.	Yes: step 294 No: step 297
165	Check resistance between 1A3A5-D and junction of 1A1C1 and 1A1TB1.	Multimeter indicates 5000 ohms or less	Yes: step 166 No: step 171
166	Check components 1AIC1, 1A1C2, and 1A1C3.	Components check good.	Yes: step 167 No: replace faulty component.
167	Check 1A1J1.	1A1J1 checks good.	Yes: step 168 No: replace 1A1J1
168	Continuity check 1A3A5-D to 1A3XA3J3-18	Continuity checks good.	Yes: step 169 No: step 287
169	Connect multimeter between 1A3XA3J3-17 and ground.	Multimeter indicates less than + 1.6 VDC.	Yes: step 170 No: step 173
170	Connect frequency counter to 1A3XA2J2-1.	Frequency counter indicates 10.5 MHz.	Yes: step 295 No: step 174
171	Continuity check 1A3XA5J5-D to 1AlS13B, front, pin 8.	Continuity checks good.	Yes: step 183 No: step 182
172	Check resistance between 1A1S13B, front, pin 8, and junction, 1A1C1 and TB1.	Multimeter indicates 5000 ohms or less	Yes: step 285 No: step 183
173	Connect multimeter between 1A3A5-E15 and ground.	Multimeter indicates less than + 1.6 VDC.	Yes: step 287 No: step 184
174	Connect frequency counter to 1A3XA3J3-1.	Frequency counter indicates 10.5 MHz.	Yes: step 287 No: step 294
175	Check switch 1A1S13A, front.	Switch checks good.	Yes: step 176 No: replace switch 1A1S13
176	Continuity check 1A3XA5-S to 1A3XA3-9.	Continuity checks good.	Yes: step 285 No: step 287
177	Connect multimeter between 1A3A5-E11 and ground.	Multimeter indicates +12 VDC ± 0 8 VDC	Yes: step 178 No: step 181
178	Connect multimeter between 1A3A5XA2J2-6 and ground.	Multimeter indicates + 12 VDC ± 0 8 VDC	Yes: step 179 No: step 287
179	Connect multimeter between 1A3A5XA3J3-5 and ground.	Multimeter indicates + 12 VDC ± 0 8 VDC	Yes: step 180 No: step 287
180	Connect frequency counter to 1A3A5XA2J2-1, ground lead to ground.	Frequency counter indicates 10.5 MHz.	Yes: step 295 No: step 294
181	Check relay 1A8K1 and switch 1A1S13A front.	Components check good.	Yes: step 285 No: replace faulty component.
182	Continuity check 1A1S13B, front, pin 8 to pin 10.	Continuity checks good.	Yes: step 285 No: replace switch 1A1S13.
183	Check resistor 1A1R51.	Component checks good.	Yes: step 285 No: replace resistor 1A1R51
184	Connect multimeter between 1A8P2-10 and ground.	Multimeter indicates less than + 1 6 VDC	Yes: step 285 No: step 292
185	Check wattmeter indication for frequency switch positions at which the frequency counter and readout did not agree.	Wattmeter indicates 100 W ± 10 W	Yes: step 186 No: step 189

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP
186	Set mode switch to OFF. Using a multimeter between ground and pin indicated, perform frequency switch checks as shown below.	Switches check good.	Yes: step 187 No: step 191

NOTE

1 = 500 ohms or more
0 = 0 ohms

Frequency Switch Coding

10 MHz Switch Setting (A or B)	1A1P3 Pin 2	Pin 3	Pin B
0	0	1	1
1	1	0	1
2	1	1	0

1 MHz Switch Setting (A or B)	Pin 4	Pin D	1A1P3 Pin H	Pin 7
0	1	0	0	1
1	1	0	0	0
2	0	1	1	1
3	0	1	1	0
4	0	1	0	1
5	0	1	0	0
6	0	0	1	1
7	0	0	1	0
8	0	0	0	1
9	0	0	0	0

100 KHz Switch Setting (A or B)	Pin 5	Pin E	1A1P3 Pin F	Pin 6
0	0	0	0	0
1	1	0	0	1
2	1	0	0	0
3	0	1	1	1
4	0	1	1	0
5	0	1	0	1
6	0	1	0	0
7	0	0	1	1
8	0	0	1	0
9	0	0	0	1

10 KHz Switch Setting (A or B)	Pin R	Pin K	1A 1P3 Pin 9	Pin 14
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

1 KHz Switch Setting (A or B)	Pin P	Pin L	1A1P3 Pin 10	Pin 13
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

100 Hz Switch Setting (A or B)	Pin N	Pin M	1A1P3 Pin 11	Pin 12
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP

Frequency Switch Checks (Continued)

3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

STEP	ACTION	INDICATION	NEXT STEP
187	Set mode switch to LSB. Using multimeter between ground and pin indicated, perform display checks as shown below.	Display checks are good.	Yes: step 288 No: step 188

NOTE

0 = 0.8 V or less
1 = 2-5 V

Display Checks

Display Readout Indication	Pin 1	Pin 7	Pin 5	1A1A2J1 Pin 6	Pin 3	Pin 4
00.0000	0	0	0	0	0	1
11.1111	1	0	0	1	1	1
22.2222	0	0	1	0	1	0

Display Readout Indication	Pins 10, 18, 27, 34, 39	Pins 14, 20, 29, 36, 43	Pins 12, 21, 25, 32, 41	1A1A2J1 Pins 13, 22, 28, 35, 40	Pins 8, 15, 23, 31, 37	Pins 9, 17, 26, 33, 38	Pins 11, 19 24, 30 42
0.0000	0	0	0	0	0	0	1
1.1111	1	0	0	1	1	1	1
2.2222	0	0	1	0	0	1	0
3.3333	0	0	0	0	1	1	0
4.4444	1	0	0	1	1	0	0
5.5555	0	1	0	0	1	0	0
6.6666	1	1	0	0	0	0	0
7.7777	0	0	0	1	1	1	1
8.8888	0	0	0	0	0	0	0
9.9999	0	0	0	1	1	0	0

STEP	ACTION	INDICATION	NEXT STEP
188	Set mode switch to OFF. Using a multimeter between ground and pin indicated, perform frequency switch checks as shown below.	Frequency switch checks are good.	Yes: step 289 No: step 285

NOTE

0 = 500 ohms or more
0 = 0 ohms

Frequency Switch Checks

10 MHz Switch Setting (A or B)	Pin 18	1A1J5 Pin 17	Pin 19
0	0	1	1
1	1	0	1
2	1	1	0

1 MHz Switch Setting (A or B)	Pin 21	Pin 22	1A1J5 Pin 23	Pin 20
0	1	0	0	1
1	1	0	0	0
2	0	1	1	1
3	0	1	1	0
4	0	1	0	1
5	0	1	0	0

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION			INDICATION		NEXT STEP
	Frequency Switch Checks (Continued)					
	6	0	0	1	1	
	7	0	0	1	0	
	8	0	0	0	1	
	9	0	0	0	0	
	100 MHz Switch Setting			1A1J5		
	(A or B)	Pin 25	Pin 26	Pin 27	Pin 24	
	0	0	0	0	0	
	1	1	0	0	1	
	2	1	0	0	0	
	3	0	1	1	1	
	4	0	1	1	0	
	5	0	1	0	1	
	6	0	1	0	0	
	7	0	0	1	1	
	8	0	0	1	0	
	9	0	0	0	1	
	10 KHz Switch Setting			1A1J5		
	(A or B)	Pin 13	Pin 14	Pin 15	Pin 12	
	0	0	0	0	0	
	1	0	0	0	1	
	2	0	0	1	0	
	3	0	0	1	1	
	4	0	1	0	0	
	6	0	1	0	1	
	6	0	1	1	0	
	7	0	1	1	1	
	8	1	0	0	0	
	9	1	0	0	1	
	1 KHz Switch Setting			1A1J5		
	(A or B)	Pin 9	Pin 11	Pin 10	Pin 8	
	0	0	0	0	0	
	1	0	0	0	1	
	2	0	0	1	0	
	3	0	0	1	1	
	4	0	1	0	0	
	5	0	1	0	1	
	6	0	1	1	0	
	7	0	1	1	1	
	8	1	0	0	0	
	9	1	0	0	1	
	100 Hz Switch Setting			1A1J5		
	(A or B)	Pin 5	Pin 6	Pin 7	Pin3	
	0	0	0	0	0	
	1	0	0	0	1	
	2	0	0	1	0	
	3	0	0	1	1	
	4	0	1	0	0	
	5	0	1	0	1	
	6	0	1	1	0	
	7	0	1	1	1	
	8	1	0	0	0	
	9	1	0	0	1	
189	Disconnect 1A8P2 from 1A5J1. Continuity check the following. 1A8P2-1 to 1A1S2-A front 10, 1 1A8P2-2 to 1A1S2-A front 2 1ASP2-3 to 1A1S2-A front 3 1A8P2-4 to 1A1S2-A front 4, 5 1A8P2-6 to 1A1S2-A front 6, 7, 8 1A8P2-6 to 1A1S2-B front 1, 2, 10 1A8P2-7 to 1A1S2-B front 3, 4, 5, 6, 7, 8, 9 1A8P2-8 to 1A1S1-B rear 2			Continuity checks good.		Yes: step 290 No: step 285

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP
190	Check switches 1A1S7, 1A1S8, 1A1S1 and 1A1S2.	Switches check good.	Yes: step 292 No: replace faulty switch
191	Check FREQ CONTROL switch 1A1S15.	Switch checks good.	Yes: step 192 No: replace switch 1A1S15
192	Set mode switch to LSB. Check frequency switch and associated diode related to faulty indication in step 167. (Refer to FO-10).	Components check good.	Yes: step 193 No: step 274
193	Remove Translation CCA 1A4A3. Connect frequency counter to 1A4XA2J2-1. Perform freqeuncy checks as shown below.	Frequency checks are correct.	Yes: step 194 No: step 201

Frequency Checks

Frequency Switch Settings			
10 KHz	1 KHz	100 Hz	Frequency
0	0	1	1.5001 MHz
0	0	2	1.5002MHz
0	0	3	1.5003 MHz
0	0	4	1.5004 MHz
0	0	5	1.5005 MHz
0	0	6	1.5006MHz
0	0	7	1.5007MHz
0	0	8	1.5008 MHz
0	0	9	1.5009 MHz

Frequency Switch Settings			
10 KHz	1 KHz	100 Hz	Frequency
0	1	0	1.5010 MHz
0	2	0	1.5020 MHz
0	3	0	1.5030 MHz
0	4	0	1.5040 MHz
0	5	0	1.5050 MHz
0	6	0	1.5060 MHz
0	7	0	1.5070 MHz
0	8	0	1.5080 MHz
0	9	0	1.5090 MHz

Frequency Switch Settings			
10 KHz	1 KHz	100 Hz	Frequency
1	0	0	1.5100 MHz
2	0	0	1.5200 MHz
3	0	0	1.5300 MHz
4	0	0	1.5400 MHz
5	0	0	1.5500 MHz
6	0	0	1.5600 MHz
7	0	0	1.5700 MHz
8	0	0	1.5800MHz
9	0	0	1.5900 MHz

STEP	ACTION	INDICATION	NEXT STEP
194	Connect signal generator to 1A4A6-E17 using 50 ohm coaxial cable. Connect multimeter between 1A4A4-TP1 and ground. Set signal generator frequency to 9.9 MHz, output level to 0.1 V, RMS. Set 10 MHz, 1 MHz, and 100 KHz switches to 0.	Multimeter indicates more than + 4.5 VDC.	Yes: step 195 No: step 199
195	Slowly increase signal generator frequency.	At 10.0 MHz, multimeter indication changes to less than + 0.9 VDC.	Yes: step 196 No: step 299
196	Using a multimeter between ground and pin indicated, and by varying the frequency above and below the indicated transition frequency, perform frequency switch checks as shown below.	In each case, multimeter indicates greater than + 4.5 VDC with signal generator below the transition frequency, and less than + 0.9 VDC with signal generator above the transition frequency.	Yes: step 197 No: step 202

Frequency Checks

Frequency Switch Settings			Transition
10MHz	1 MHz	100 KHz	Frequency (± 1 KHz)
0	0	1	10.1 MHz
0	0	2	10.2 MHz

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP

Frequency Checks

Frequency Switch Settings 10 MHz	1 MHz	100 KHz	Transition Frequency (± 1 KHz)
0	0	3	10.3 MHz
0	0	4	10.4 MHz
0	0	5	10.5 MHz
0	0	6	10.6 MHz
0	0	7	10.7 MHz
0	0	8	10.8 MHz
0	0	9	10.9 MHz
0	1	0	11.0 MHz
0	2	0	12.0 MHz
0	3	0	13.0 MHz
0	4	0	14.0 MHz
0	5	0	15.0 MHz
0	6	0	16.0 MHz
0	7	0	17.0 MHz
0	8	0	18.0 MHz
0	9	0	19.0 MHz

STEP	ACTION	INDICATION	NEXT STEP
197	Using a multimeter between ground and pin indicated, and by varying the frequency above and below the indicated transition frequency, perform frequency switch checks as shown below.	In each case, multimeter indicates greater than + 4.5 VDC with signal generator below the transition frequency, and less than + 0.9 VDC with signal generator above the transition frequency.	Yes: step 198 No: step 203

Frequency Checks

Frequency Switch Settings 10 MHz	1 MHz	100 KHz	Transition Frequency (± 1 KHz)
1	0	0	20.0 MHz
2	0	0	30.0 MHz
3	9	9	39.9 MHz

STEP	ACTION	INDICATION	NEXT STEP
198	Connect multimeter between 1A4XA2J2-U and ground. Check low digit coarse steering voltages as shown below.	Voltages check good.	Yes: step 199 No: step 200

VCO Low Digit Coarse Steering

10 KHz Switch Setting	1A4XA2J2-U Volts	10 KHz Switch Setting	1A4XA2J2-U Volts
0	3.50	5	5.40
1	3.85	6	5.90
2	4.15	7	6.40
3	4.55	8	7.00
4	4.95	9	7.70

STEP	ACTION	INDICATION	NEXT STEP
199	Continuity check 1A4XA4-B to 1A4XA3-15.	Continuity checks good.	Yes: step 299 No: step 297
200	Connect multimeter between 1A4XA2J2-U and ground. Check low digit coarse steering voltages as shown below.	Voltages check good.	Yes: step 201 No: step 208

VCO Low Digit Coarse Steering

10 KHz Switch Setting	1A4XA2J2-U Volts	10 KHz Switch Setting	1A4XA2J2-U Volts
0	3.50	5	5.40
1	3.85	6	5.90
2	4.15	7	6.40
3	4.55	8	7.00
4	4.95	9	7.70

STEP	ACTION	INDICATION	NEXT STEP
201	Continuity check 1A4A6J11-12 to 1A4XA2J2-M 1A4A6J1-11 to 1A4XA2J2-10 1A4A6J1-M to 1A4XA2J2-11 1A4A6J1-N to 1A4XA2J2-12 1A4A6J1-13 to 1A4XA2J2-P 1A4A6J1-10 to 1A4XA2J2-12 1A4A6J1-L to 1A4XA2J2-13	Continuity checks good.	Yes: step 301 No: step 297

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP
	1A4A6J1-P to 11A4XA2J2-N 1A4A6J1-14 to 11A4XA2J2-S 1A4A6J1-9 to 1A4XA2J2-14 1A4A6J1-K to 1A4XA2J2-15 1A4A6J1-R to 1A4XA2J2-R		
202	Continuity check the following: 1A4A6J1-4 to 1A4XA4-7 1A4A6J1-D to 1A4XA4-8 1A4A6J1-H to 1A4XA4-H 1A4A6J1-7 to 11A4XA4-J 1A4A6J1-5 to 11A4XA4-4 1A4A6J1-E to 1A4XA4-5 1A4A6J1-F to 1A4XA4-D 1A4A6J1-6 to 1A4XA4-E	Continuity checks good.	Yes: step 302 No: step 297
203	Connect multimeter between 1A4XA5J5-15 and ground. Check coarse steering voltages as shown below.	Voltages check good.	Yes: step 206 No: step 208

Coarse Steering

1 MHz Switch Setting	1A4XA6J5 Pin 15 Volts
0	1.37
1	1.78
2	2.18
3	2.75
4	3.31
5	4.12
6	4.93
7	6.15
8	7.85
9	9.56

STEP	ACTION	INDICATION	NEXT STEP
204	Continuity check the following: 1A4XA4-12 to 1A4XA5-7 1A4XA4-13 to 1A4XA5-6	Continuity checks good.	Yes: step 300 No: step 297
205	Continuity check 1A4A6-1 to 1A4XA2-U	Continuity checks good.	Yes: step 285 No: step 297
206	Continuity check 1A4XA5-15 to 1A4XA6-C.	Continuity checks good.	Yes: step 207 No: step 297
207	Check switch 1A1S2D rear switch 1A1S15 and 1A1R1 thru R11.	Components check good.	Yes: step 285 No: replace faulty component
208	Using multimeter, perform 10 MHz switch/VHF Divider preset checks as shown below.	10 MHz/VHF Divider preset checks are good.	Yes: step 209 No: step 300

10 MHz Switch Setting	1A4XA4-12 Volts	1A4XA4-13 Volts
0	0.8 or less	2.0 - 5.0
1	2.0 - 5.0	0.8 or less
2	0.8 or less	0.8 or less

STEP	ACTION	INDICATION	NEXT STEP
209	Continuity check 1A4XA4J4-12 to 1A4XA5J5-7 1A4XA4J4-3 to 11A4XA5J5-6 1A4A6J1-2 to 11A4XA5J5-18 1A46J1-3 to 1A4XA5J5-17 1A46J1-13 to 1A4XA5J5-16	Continuity checks good.	Yes: step 211 No: step 297
210	Continuity check 1A4A6J1-2 to 1A1S1A-10, front 1A4A6J1-3 to 1A1S1A-1, front 1A4A6J1-B to 1A1S1A-2, front	Continuity checks good.	Yes: step 301 No: step 285
211	Check frequency switch and associated diode related to faulty indication in step 6b.	Components check good.	Yes: step 212 No: replace faulty component.

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP
212	Check switch 1A1S8-D, rear, and 1A1R23 thru R33.	Components check good.	Yes: step 213 No: replace faulty component.
213	Check switch 1A1S10-13, rear, and 1A1R34 thru R44.	Components check good.	Yes: step 214 No: replace faulty component.
214	Check switch 1A1S15.	Switch checks good.	Yes: step 285 No: replace switch 1A1S15
215	Connect multimeter across 1A1DS2 contacts.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: replace 1A1DS2 No: step 216
216	Set mode switch to OFF. Remove front panel. Check continuity between 1A1R52, pins A and B.	Continuity checks good.	Yes: step 285 No: replace VFO control 1A1R52.
217	Connect multimeter between synthesizer mother board 1A4A6-J and ground. Rotate VFO control.	Multimeter indicates + 7.6 VDC ± 0.8 V.	Yes: step 217 No: step 221
218	Connect multimeter between Translator CCA, 1A4XA3-A and ground Rotate VFO control.	Multimeter indicates + 7.6 VDC ± 0.8 V.	Yes: step 219 No: step 221
219	Connect multimeter between 1A4A6-8 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 220 No: step 285
220	Connect multimeter between 1A4XA3-1 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 222 No: step 297
221	Check VFO control 1A1R52.	Component checks good.	Yes: step 285 No: replace VFO control 1A1R52.
222	Adjust 1A4A3-L22 for a multimeter indication of 7.6 VDC ± 0.8 VDC.	L22 adjusts within tolerance.	Yes: step 6d No: step 299
223	Check relay 1A1K101 and diode 1A1CR17.	Components check good.	Yes: step 224 No: replace faulty component.
224	Check FREQ CONTROL switch 1A1S15.	Component checks good.	Yes: step 285 No: replace switch 1A1S15
225	Set signal generator to 0 dB. Connect oscilloscope probe to 1A3XA2J2-5.	Oscilloscope displays waveform similar to Fig. 4-2L.	Yes: step 226 No: step 230
226	Connect oscilloscope probe to 1A3XA4J4-11, ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2M.	Yes: step 227 No: step 232
227	Connect multimeter between 1A3XA4J4-9 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 228 No: step 287
228	Connect multimeter between 1A3XA4J4-13 and ground.	Multimeter indicates between + 2.0 VDC and + 8.0 VDC.	Yes: step 229 No: step 290
229	Connect VTVM (AC) to 1A3XA4J4-6, ground lead to ground.	VTVM indicates 0.1 V minimum.	Yes: step 290 No: step 187
230	Connect frequency counter to 1A5A4-E1, ground lead to ground.	Frequency counter indicates 29.9994 MHz.	Yes: step 231 No: step 292
231	Connect frequency counter to 1A3XA1J1-15, ground lead to ground.	Frequency counter indicates 29.9994 MHz.	Yes: step 233 No: step 234
232	Connect oscilloscope probe to 1A3XA2J2-11, ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2M.	Yes: step 287 No: step 236
233	Connect multimeter between 1A3XA1J1-3 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 235 No: step 239
234	Connect frequency counter to 1A3A5-E22, ground lead to ground.	Frequency counter indicates 29.9994 MHz.	Yes: step 287 No: step 285
235	Connect multimeter between 1A3XA1J1-P and ground.	Multimeter indicates between + 2.0 VDC and + 8.0 VDC.	Yes: step 298 No: step 287
236	Connect multimeter between 1A3XA2J2-9 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 237 No: step 287
237	Connect multimeter between 1A3XA2J2-3 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 238 No: step 287
238	Connect multimeter between 1A3XA2-P and ground.	Multimeter indicates between + 2.0 VDC + 0.8 VDC.	Yes: step 295 No: step 287
239	Connect multimeter between 1A3A5-E1 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 287 No: step 241
240	Connect multimeter between mode switch, 1A1S13-2 and ground.	Meter indicates + 12 VDC ± 0.8 VDC.	Yes: step 285 No: replace 1A1S13.

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP
241	Check relay 1A8K1.	Relay checks good.	Yes: step 285 No: replace relay 1A8K1.
242	Connect multimeter between 1A3A5-E5 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 243 No: step 246
243	Set signal generator to 0 dB and 100% modulation. Connect oscilloscope probe to 1A4XA113, ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2L.	Yes: step 244 No: step 247
244	Connect multimeter between 1A4A6-E16 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 245 No: step 285
245	Connect multimeter between 1A4XA1-L and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 296 No: step 297
246	Check relay 1A8K1.	Relay checks good.	Yes: step 285 No: replace relay 1A8K1
247	Connect oscilloscope probe to 1A3XA2-11, ground lead to ground.	Oscilloscope displays waveform similar to Fig. 4-2M.	Yes: step 248 No: step 249
248	Connect multimeter between 1A3XA4-7 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 290 No: step 287
249	Connect multimeter between 1A3XA2-7 and ground.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: step 295 No: step 287
250	Connect multimeter to Speaker Driver CCA 1A1A1-E1.	Multimeter indicates + 28 VDC ± 1.5 VDC.	Yes: step 291 No: step 251
251	Connect multimeter between 1A6A1-8 and ground.	Multimeter indicates + 40 VDC ± 1.5 VDC.	Yes: step 252 No: step 253
252	Connect multimeter between 1A6A1-9 and ground.	**NOTE** If no, set mode switch to OFF. Walt approximately 15 seconds then set mode switch to LSB and repeat step. If still no, go to step 263. Multimeter indicates + 28 VDC ± 1.5 VDC.	Yes: step 255 No: step 263
253	Check 1A6Q101 and 1A6R2.	Components check good.	Yes: step 285 No: replace faulty component.
254	Connect multimeter between junction of 1A6CR1 and 1A6CR3 and the junction of 1A6CR2 and 1A6CR4.	Multimeter indicates 46 VAC or more	Yes: step 255 No: Replace transformer 1A6T1.
255	Check fuse 1A6F1.	Fuse checks good.	Yes: step 261 No: step 256
256	Check component 1A6Q101.	Component checks good.	Yes: step 257 No: replace transistor 1A6Q101; and replace fuse 1A6F1.
257	Connect multimeter between 1A6XA1-J and ground.	Multimeter indicates between 450 ohms and 650 ohms.	Yes: step 258 No: step 259
258	Remove Regulator Board 1A6A1. Connect multimeter on 1A6A1 between 1A6A1-E and 1A6A1-R.	Multimeter indicates 850 ohms or more.	Yes: replace fuse 1A6F1 No: replace fuse 1A6F1 and go to step 286
259	Remove Regulator Board 1A6A Connect multimeter between 1A6XA1-J and ground.	Meter indicates between 450 ohms and 850 ohms.	Yes: replace fuse 1A6F1 No: step 260
260	Check component 1A6Q104.	Component checks good.	Yes: replace fuse 1A6F1 and go to step 285. No: replace 1A6Q104; and replace fuse 1A6F1.
261	Check diodes 1A6CR1, 1A6CR2, 1A6CR3, 1A6CR4.	Diodes check good.	Yes: step 262 No: replace faulty component.
262	Check components 1A6R1, 1A6C5, and 1A6C6.	Components check good.	Yes: step 285 No: replace faulty compo-nent.
263	Check transistor 1A6Q101 and resistor 1A6R2.	1A6Q101 and 1A6R2 check good.	Yes: step 286 No: replace faulty compo-nent.
264	Set mode switch to OFF. Remove ANTENNA COUPLER CONTROL (para. 3-12). Check components 1A2R1, 1A2R2 and 1A2R3.	Components check good.	Yes: step 285 No: replace faulty compo-nent.

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP
265	Connect multimeter across contacts of 1A2DS2.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes:replace 1A2DS2 and go to step 13. No: step 285
266		COUPLER STATUS FAULT indicator went out.	Yes: step 267 No: step 270
267		COUPLER STATUS TUNING indicator illuminated.	Yes: step 268 No: step 271
268		COUPLER STATUS TUNING indicator went out.	Yes: step 269 No: step 285
269	Connect multimeter across contacts of 1A2DS1.	Multimeter indicates + 12 VDC ± 0.8 VDC.	Yes: replace 1A2DS1 and go to step 13. No: step 285
270	Check switch 1A2S2.	Switch 1A2S2 checks good.	Yes: step 285 No: replace switch 1A2S2
271	Connect multimeter across 1A2DS3.	Multimeter indicates less than 300 ohms.	Yes: step 285 No: replace 1A2DS1 and go to step 13.
272	Set mode switch to OFF. Check REFL FWD POWER MONITOR switch 1A2S1.	REFL FWD POWER MONITOR switch 1A2S1 checks good.	Yes: step 273 No: replace switch 1A2S1.
273	Check relay 1A8K1.	Relay checks good.	Yes: step 285 No: replace relay 1A8K1.
274	Set mode switch to OFF. Check REFL FWD POWER MONITOR switch 1A2S1.	REFL FWD POWER MONITOR switch 1A2S1 checks good.	Yes: step 276 No: replace switch 1A2S1.
275	Check resistor 1A1R49.	Resistor checks good.	Yes: step 285 No: replace resistor 1A1R49.
276	Continuity check 1A8P2-17 to 1A2S1 center contact.	Continuity checks good.	Yes: step 292 No: step 285
277	Connect multimeter between 1A6A2-E6 and ground.	Multimeter indicates + 13 VDC.	Yes: step 278 No: step 280
278	Set mode switch to OFF. Check 1A6T1 primary windings; 1A6TB2-7 to 1A6TB2-6 1A6TB2-7 to 1A6TB2-5 1A6TB2-7 to 1A6TB2-4 1A6TB2-7 to 1A6TB2-2 1A6TB2-7 to 1A6TB2-1	1A1T1 primary windings check good.	Yes: step 279 No: replace transformer 1A6T1.
279	Continuity check the following: 1A6TB2-7 to 1A6A2-E2 1A6TB2-6to 1A6A2-E1 1A6TB2-4 to 1A6A2-E5 1A6TB2-2 to 1A6A2-E8 1A6TB2-2 to 1A6A2-E3 1A6TB2-1 to 1A6A2-E4	Continuity checks good.	Yes: step 303 No: step 285
280	Connect multimeter between 1A8J5-11 and ground.	Multimeter indicates + 13 VDC.	Yes: step 285 No: step 281
281	Check DC fuse 1A8F3.	Fuse checks good.	Yes: step 282 No: replace fuse 1A8F3.
282	Check relay 1A8K2 for proper DC operation.	Relay checks good.	Yes: step 283 No: replace relay 1A8K2.
283	Check components 1A8Q1, 1A8CR2, 1A8CR3, 1A3CR4, 1A8CR5, IA8R1, 1A8R2.	Components check good.	Yes: step 284 No: replace faulty compo- nent.
284	Check switch 1A1S13-C front.	Switch checks good.	Yes: step 284 No: replace switch 1A1S13.
285	Repair and/or replace wiring and connectors as necessary.		- - -
286	Replace and/or repair Regulator Assy 1A6A1. Use conventional troubleshooting methods for repair. (If 1A6F1 is blown--check 1A6Q104).		- - -
287	Replace and/or repair Receiver/Exciter Mother Board 1A3A5. Use conventional troubleshooting methods for repair. (If no modulation when mic is		- - -

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP
	keyed--check 1A3A5Q1 and associated circuitry)		
288	Replace and/or repair Display CCA 1A1A3. Use conventional troubleshooting methods for CCA repair. (If one or more segments are incorrect--check 1A1A2J1 for proper connection.)		- - -
289	Replace and/or repair Decoder CCA 1A1A2. Use conventional troubleshooting methods for CCA repair.		- - -
290	Replace and/or repair Audio CCA 1A3A4. Use conventional troubleshooting methods for CCA repair.		- - -
291	Replace and/or repair Speaker Driver CCA 1A1A1. Use conventional troubleshooting methods for CCA repair.		- - -
292	Replace and/or repair Filter Module Assy. 1A5. Use conventional troubleshooting methods for repair.		- - -
293	Replace and/or repair RF Power Amplifier Assy. 1A7A1. Use conventional troubleshooting methods for repair.		- - -
294	Replace and/or repair Sideband Generator CCA 1A3A3. Perform ALC, ACC, Carrier Null, and Balanced Modulator adjustments. Use conventional troubleshooting methods for repair. (If no CW sidetone--check 1A3A2C28 and 1A3A3C31.)		- - -
295	Replace and/or repair IF Filter CCA 1A3A2. Perform 2nd IF adjustment. Use conventional troubleshooting methods for CCA repair. (If low transmit audio and low receive sensitivity—check diodes 1A3A2CR1 thru 1A3A2CR16).		- - -
296	Replace and/or repair Spectrum Generator CCA 1A4A1. Perform 17 MHz, 20 MHz, and 21 MHz adjustments. Use conventional troubleshooting methods for CCA repair. (If tone or beat note Is heard in AM receive--check 1A4A1Q3.)		- - -
297	Replace and/or repair Synthesizer Mother Board 1A4A6. Use conventional troubleshooting methods for repair. (If 3rd local oscillator blanks only every other time--check 1A4A6Q2.)		- - -
298	Replace and/or repair VHF Mixer CCA 1A3A1. Perform 1st IF and IF Gain adjustments. Use conventional troubleshooting methods for CCA repair. (If loss of receive or receive sensitivity--check 1A3A1Q2 and associated circuitry.)		- - -
299	Replace and/or repair Translator CCA 1A4A3. Perform VFO, 21 MHz, 19.45 MHz, 81.25 MHz, 100.75 MHz Bandpass Filter, 2nd L.O., and Output Level adjustments. Use conventional troubleshooting methods for CCA repair. (If no transmit or receive--check oscillator circuit, 1A4A3Q7 and associated components.)		- - -
300	Replace and/or repair VHF VCO CCA 1A4A5. Perform Band 0, Band 1, Band 2, and 1st L.O. adjustments. Use conventional troubleshooting methods for CCA repair. (If off frequency—check 1A4A5Q1 and 1A4A5Q2.)		- - -
301	Replace and/or repair Low Digit Generator CCA 1A4A2. Perform VCO adjustment. Use conventional troubleshooting methods for CCA repair. (1 If incorrect frequency--check 1A4A2CR14 and 1A4A2U5; 2. If 1A4A2U3 has a high output--check that all are switching between low and high, if one input is not switching then		- - -

Table 4-2. Checkout/Troubleshoot the Receiver-Transmitter RT-1277/URC-92--Continued

STEP	ACTION	INDICATION	NEXT STEP
	1A4A2U3 is not at fault; 3. If TP3 is below 1.5 V, TP2 should be below 15 MHz and vice versa. When yes, check divider circuit; when on, check oscillator circuit.		
302	Replace and/or repair VHF Divider CCA 1A4A4. Use conventional troubleshooting methods for CCA repair. (If off frequency by approximately 1 MHz but good when 100 KHz control is on zero--check 1A4A4U4.)		- - -
303	Replace and/or repair DC Inverter Assy. 1A6A2. Use conventional troubleshooting methods for repair. (If blowing transistors and/or inverter doesn't work--check 1A6A2K1.)		

4-6. Antenna Coupler CU-2229/URC-92 Checkout/Troubleshoot

The following procedure in Table 4-3 will establish the operational readiness of CU-2229/URC-92 antenna coupler. Successful completion of the checkout portion indicates the antenna coupler is operationally ready for use. Troubleshooting procedures are designed to function from incorrect indications in the checkout.

Following any repair action, the test technician must return to step 1 of the checkout unless instructed differently by the procedure. The troubleshooting does not consider incorrect or missing supply voltages to subassemblies. Before any replace/repair action is accomplished on a subassembly, the test technician should verify all necessary supply voltages at the subassembly. Incorrect or missing supply voltages should be repaired using conventional troubleshooting methods. Refer to List of Illustrations for the appropriate schematics.

Table 4-3. Checkout/Troubleshoot the Antenna Coupler CU-2229/URC-92

STEP	ACTION	INDICATION	NEXT STEP
1a	Remove case from Antenna Coupler CU-2229/ URC-92. Connect RF and control cables between the Antenna Coupler to be checked and a known good RT-1277/URC-92 Receiver-Transmitter. Insure the receiver-transmitter is correctly powered and grounded.		Step 2a
2a	Set mode switch to AM.	COUPLER STATUS FAULT indicator illuminates.	Yes: step 2b No: step 8
2b	Disconnect RF cable at the receiver-transmitter. Connect a 50 ohm dummy load to the receiver transmitter. **NOTE** A means of timing, in seconds, is required for this step. Set mode switch to CPLR TUNE KW. Depress TUNE START. Begin timing and observe COUPLER STATUS indicators.	COUPLER STATUS FAULT indicator goes out. COUPLER STATUS TUNING indicator is illuminated and transmitter keys on. After 35 to 45 seconds, transmitter unkeys and COUPLER STATUS TUNING indicator goes out. COUPLER STATUS FAULT indicator illuminates.	Yes: step 3a No: step 24
3a	Disconnect dummy load from receiver-transmitter. Reconnect rf cable from Antenna Coupler. Connect 50 ohm dummy load to the Antenna Coupler antenna post. Connect ground post to ground. Set frequency to 1.602 MHz. Depress TUNE START.	COUPLET STATUS TUNING indicator illuminates, transmitter keys and both drive motors, 2M1 and 2M2, dive.	Yes: step 3b No: step 50
3b	Set mode selector to CW.	COUPLER STATUS FAULT indicator is illuminated, transmitter unkeys and drive motors stop driving.	Yes: step 4a No: step 90
4a	Set mode switch to CPLR TUNE KW. Depress TUNE START.	**NOTE** If the time delay runs out during this test, depress TUNE START once more. If tuning occurs the second time the indication is good.	

Table 4-3. Checkout/Troubleshoot the Antenna Coupler CU-2229/URC -92--Continued

STEP	ACTION	INDICATION	NEXT STEP
		Antenna Coupler completes tune cycle, COUP LER STATUS FAULT indicator goes out and COUPLER STATUS READY indicator illuminates	Yes: step 4b No: step 91
4b	Set mode switch to CW then return to CPLR TUNEKW	COUPLER STATUS READY indicator goes out and COUPLER STATUS FAULT indicator illuminates	Yes step 4c No step 140
4c	Set mode switch to AM Key transmitter	COUPLER STATUS FAULT indicator goes out and COUPLER STATUS READY indicator illuminates	Yes step 4d No step 140
4d	Set frequency to 1.802 MHz Key transmitter	COUPLER STATUS FAULT indicator illuminates-	Yes step 4e No step 140
4e	Set frequency to 1.602 MHz Key transmitter	COUPLER STATUS READY indicator illuminates	Yes step5a No step 140
5	Perform the following procedure for each setting listed Set and tune to the tune frequency Reset frequency to the check frequency. Set mode switch to CW and key transmitter Check both the FWD and REFL, power. **NOTE** The frequencies below do not necessarily match the average powers listed In the indication column for this step Tune Frequency / Check Frequency 1.604 / 1.602 2.004 / 2.002 4.001 / 4.000 8.001 / 8.000 12.001 / 12.000 16.001 / 16.001 20.001 / 20.000 24.001 / 24.000 29.999 / 29.998	**NOTE** The Antenna Coupler Control gain adjustment can affect both the REFL power indication and tuning Normal gain setting is about 14 5 VDC ± 0 5 VDC but a sight adjustment may be necessary If some frequencies do not tune, adjust the gain slightly clockwise If the REFL power indlca tlon is a little high, adjust the gain slightly coun- terclockwlse The final gain control setting must satisfy both requirements If not, proceed to the troubleshooting reference for this step Antenna Coupler completes each tune cycle Also the power readings should be approximate to one of the acceptable FWD/REFL ratios below Average FWD (watts) / REFL (or less) 20 / 0.8 30 / 1.2 40 / 1.6 50 / 2.0 60 / 24 70 / 28 80 / 32 100 / 40	Yes step 6a No step 129
6a	Set mode switch to OFF Disconnect cabling be- tween receiver-transmitter and antenna coupler		Step 6b
6b	Reassemble Antenna Coupler Unit		Step 6c
6c	Antenna Coupler Unit CU-2229/URC-92 check- out is now complete Antenna Coupler is opera- tionally ready	**NOTE** For location of parts see figures 4-22 thru 4-66	- - -
7	Connect multimeter between 2A3-E7 and ground	Meter indicates + 5 VDC ± 0 25 VDC	Yes step8 No step 10
8	Connect multimeter between 2A3-E21 and ground	Meter indicates 0 VDC ± 0 5 VDC	Yes: step 9 No step 12
9	Connect multimeter between 2A3-E5 and ground	Meter indicates 0 VDC ± 0 5 VDC	Yes step 139. No: step 13
10	Connect multimeter between 2A3-E8 and ground	Meter indicates + 10 VDC ± 0 8 VDC	Yes step 11 No step 14
11	Check components 2A3AR4, 2A3AC2 and 2A3ACR3	Components check good	Yes step 139 No replace faulty component
12	Set mode switch to OFF Remove control Logic CCA 2A1 Continuity check 2A3-E7 to 2XA1-P and 2XA1-12 to 2A3A-E21	Continuity checks good	Yes step 140 No step 139
13	Check components 2A3AC20, 2A3AL5 and 2A3AC5	Components check good	Yes step 139 No replace faulty component
14	Connect multimeter between 2A3A-E12 and ground	Meter indicates +28VDC ± 1 5VDC	Yes step15 No step 16

Table 4-3. Checkout/Troubleshoot the Antenna Coupler CU-2229/URC -92--Continued

STEP	ACTION	INDICATION	NEXT STEP
15	Check components 2A3AC13, 2A3AL12, 2A3AC12, 2R1, and 2CR2	Components check good	Yes: step 139 No: replace faulty component.
16	Set mode switch to OFF Remove and check fuse 2F1	Fuse checks good	Yes reinstall fuse 2F1 and go to step 139 No step 17
17	Connect multimeter between 2A3A-E14 and ground	Meter indicates more than 25 ohms	Yes step21 No step 18
18	Remove Phase and Amplitude CCA 2A2 Connect multimeter between 2A3A-E14 and ground	Meter indicates more than 25 ohms	Yes step 141 No step 19
19	Reinstall Phase and Amplitude CCA 2A2 Remove Control Logic CCA 2A1 Connect multimeter between 2A3A-E14 and ground	Meter indicates 25 ohms or more	Yes step 140 No step 20
20	Reinstall Control Logic CCA 2A1 Check components, 2A3AC12, 2A3AC13, 2K1, 2CR3, 2K4, 2CR1 and 2A5 for shorts and/or shorts to ground	Components check good	Yes replace fuse 2F1 and go to step 139 No replace fuse and replace faulty component
21	Connect multimeter between 2A3-E6 and ground	Meter indicates 100 ohms or more	Yes replace fuse 2F1 No step 22
22	Disconnect connector from Servo Control Assy 2A6 Connect multimeter between 2A3-E6 and ground	Meter indicates 100 ohms or more	Yes step 142 No step 23
23	Reconnect connector to Servo Control Assy 2A6 Check components 2A3R1, 2A3C2, 2A3AC9, 2A3AL9 and 2A3AC16 for shorts and/or shorts to ground	Components check good	Yes step 139 No replace faulty component
24		COUPLER STATUS FAULT indicator went out	Yes step 25 No step 28
25		COUPLER STATUS TUNING indicator illumlnated and transmitter is keyed	Yes step26 No. step 29
26		COUPLER STATUS TUNING indicator went out and transmitter unkeyed	Yes step 27 No step 31
27	Adjust 2A1R4 for approximately a 40 second delay	Delay can be adjusted for 35 to 45 seconds	Yes step2c No step 140
28	Set mode switch to OFF Remove Control Logic CCA 2A1 Disconnect control cable at Antenna Coupler Connect multimeter between 2A3A-E21 and ground	Meter indicates 1000 ohms or more	Yes step 140 No step 33
29		COUPLER STATUS TUNING Indicator illumlnated	Yes step 30 No step 34
30	Set mode switch to OFF Disconnect control cable at Antenna Coupler Remove Control Logic CCA 2A1 Continuity check 2Pl-p to 2XA1-7	Continuity checks, 10 ohms or less	Yes step 140 No step 36
31		COUPLER STATUS TUNING indicator went out	Yes step 32 No step 37
32	Set mode switch to OFF Disconnect control cable at Antenna Coupler Remove Control Logic CCA 2A1 Connect multimeter between 2A3A-E16 and ground	Meter indicates 100 ohms or more	Yes step 140 No step 39
33	Check components 2A3AC5, 2A3AL5 and 2A3AC20 for shorts and/or shorts to ground	Components check good	Yes reinstall Control Logic CCA 2A1, go to step 139 No replace faulty component, reinstall Control Logic CCA 2A1
34		Transmitter keyed	Yes step 35 No step 40

Table 4-3. Checkout/Troubleshoot the Antenna Coupler CU-2229/URC -92—Continued

STEP	ACTION	INDICATION	NEXT STEP
35	Set mode switch to OFF Disconnect control cable at Antenna Coupler Remove Control Logic CCA 2A1 Continuity check 2P1-L to 2XA1-6	Continuity checks, 10 ohms or less	Yes step 140 No step 43
36	Check component 2A3L10	Component checks good	Yes step 139 No replace faulty component Reinstall Control Logic CCA2A1
37		Transmitter unkeyed	Yes step 38 No step 140
38	Set mode switch to OFF Disconnect control cable at Antenna Coupler Remove Control Logic CCA 2A1 Connect multimeter between 2A3A-E22 and ground	Meter indicates 100 ohms or more	Yes step 140 No step 44
39	Check components 2A3AC10, 2A3AL10, 2A3AC15, 2A3AC11. 2A3AL11 and 2A3AC14 for shorts and/or shorts to ground	Components check good trolLoglc CCA 2A1, go	Yes reinstall Con- to step 139 No: replace faulty component Reinstall Control Logic CCA 2A1
40	Connect multimeter between 2A3A-E17 and ground	Meter indicates + 28 VDC ±1.5 VDC	Yes step 41 No step 45
41	Connect multimeter between 2A3A-E18 and ground Depress and hold TUNE START	Meterindicates+28VDC ±1.5VDC	Yes step 42 No step 49
42	Set mode switch to OFF Remove control Logic CCA 2A1 Continuity check 2A3A-E18 to 2XA1-A	Continuity check good	Yes step 140 No step 139
43	Check component 2A3AL4A	Component checks good	Yes step 139 No replace faulty component Reinstall Control Logic CCA 2A1
44	Check components 2A3AC4, 2A3A1A and 2A3AC21 for shorts and/or shorts to ground	Components check good	Yes step 139 No replace faulty component Reinstall Control Logic CCA 2A1
45	Connect multimeter between 2K1-9 and ground	Meter indicates + 28 VDC + 1.5 VDC	Yes step 46 No step 139
46	Connect multimeter between 2K1-13 and ground	Meter indicates + 28 VDC ± 1.5 VDC	Yes step 147 No step 139
47	Set mode switch to OFF Check components 2A3AL7, 2CR4, and 2K1 coil	Components check good	Yes step 148 No replace faulty component
48	Set mode switch to CPLR TUNE KW multimeter between 2K1-5 and ground	Connect Meter indicates + 28 VDC ± 1.5 VDC	Yes step 139 No replace relay 2K1
49	Set mode switch to OFF Check components 2A3AL8, 2A3AC8, 2A3AC17 and 2A3AL9	Components check good	Yes step 139 No replace faulty component
50	Set frequency to 1 802 MHz Depress TUNE START	Both drive motors, 2M1 and 2M2, drive	Yes step 3b No step 51
51		Drive motor 2M1 drives	Yes step 52
52	Set mode switch to OFF Remove Phase and Amplitude CCA 2A2 **CAUTION** When testing at connector, take care not to short adjacent connector contacts **CAUTION** Ensure the roller on 2L4 is positioned near center of travel before beginning the following checks	No step 59	

Table 4-3. Checkout/Troubleshoot the Antenna Coupler CU-2229/URC -92--Continued

STEP	ACTION	INDICATION	NEXT STEP
	NOTE For steps requiring jumpers, remove jumper before motor drives to end stop Set mode switch to AM Momentarily jumper 2XA2-V to ground	Motor 2M2 rotates clockwise (viewed from shaft end)	Yes step 53 No step 67
53	Momentarily jumper 2XA2-17 to ground	Motor 2M2 rotates counterclockwise	Yes step 54 No step 68
54	Connect VTVM between 2XA2-U and ground	Meter indicates + 10 VDC ± 0.8 VDC	Yes step 55 No step 139
55	**CAUTION** Ensure VTVM Is isolated from ground Connect VTVM between 2XA2-16 and 2XA2-U	Meter indicates a voltage difference (+ or -)	Yes step 56 No step 70
56	Set mode switch to CPLR TUNE KW Connect VTVM between 2XA2-14 and ground Depress and hold TUNE START	Meter indicates + 3 VDC to + 5 VDC	Yes step 57 No step 71
57	Set mode switch to OFF Connect multimeter between 2XA2-7 and ground	Meter indicates 200 ohms or more	Yes step 58 No step 72
58	Connect multimeter between 2XA2-15 and ground	Meter indicates 1000 ohms or more	Yes step 141 No step 74
59		Drive motor 2M2 drives	Yes step 60 No step 75
60	Set mode switch to OFF Remove Phase and Amplitude CCA 2A2 **CAUTION** When testing at connectors, take care not to short adjacent connector contacts **CAUTION** Ensure the 2C1 sensor bar is positioned near center of travel before beginning the following checks **NOTE** For steps requiring jumpers, remove jumper before sensor contacts micro switches Set mode switch to AM Momentarily jumper 2XA2-4 to ground	Motor 2M1 rotates clockwise (viewed from shaft end)	Yes step 61 No step 78
61	Momentarily jumper 2 XA2 -5 to ground	Motor 2M 1 rotates counterclockwise	Yes step 62 No step 84
62	Connect VTVM between 2XA2-3 and ground	Meter indicates + 10 VDC ± 0.8 VDC	Yes step 63 No step 139
63	**CAUTION** Ensure VTVM Is Isolated from ground Connect VTVM between 2XA2-2 and 2XA2-3	Meter indicates a voltage difference (+ or -)	Yes step 64 No step 81
64	Set mode switch to CPLR TUNE KW Connect VTVM between 2XA2-6 and ground Depress and hold TUNE START	Meter indicates + 3 VDC to + 5 VDC	Yes step 65 No step 82
65	Set mode switch to OFF Connect multimeter between 2XA2-8 and ground	Meter indicates 1000 ohms or more	Yes step 66 No step 83
66	Connect multimeter between 2XA2-11 and ground	Meter indicates 1000 ohms or more	Yes step 141 No step 84
67	Connect VTVM between 2XA2-T and ground	Meter indicates 0 VDC ± 0.5 VDC	Yes step 68 No reinstall removed components, go to step 141
68	Set mode switch to OFF Disconnect connector from Servo Control Assy 2A6 Connect multlmeter between 2M2-1 and 2M2-2	Meter indicates less than 50 ohms	Yes step69 No replace motor 2M2 Reinstall removed components
69	Continuity check the following 2XA2-V to 2XA6-C 2XA2-17 to2XA6-H 2XA6-B to 2M2-1 2XA6-E to 2M2-2	Continuity checks good	Yes step 142 No reinstall removed components, go to step 139

Table 4-3 Checkout/Troubleshoot the Antenna Coupler CU-2229/URC- 92-Continued

STEP	ACTION	INDICATION	NEXT STEP
70	Connect VTVM between feed thru capacitors 2A4C19 and 2A4C17	Meter indicates a voltage difference of more than 0 1 VDC(+ or -)	Yes: reinstall removed com-ponents, go to step 139 No: step 85
71	Set mode switch to OFF Continuity check 2XA1-R to 2XA2-14	Continuity checks good	Yes: reinstall removed com-ponents, go to step 140 No: reinstall removed components, go to step 139
72	Check that 2S1 L MAX switch (roller and 1, MAX plunger) is not activated	2S1 checks good	Yes: step 73 No: reinstall removed components, repair and/or adjust 2S1 LMAX
73	Remove Control Logic CCA 2A1 Connect mul-tlmeter between 2XA2-7 and ground	Meter indicates 1000 ohms or more No	Yes: step 140 reinstall removed components, go to step 139
74	Check that 2S2 L MIN switch (roller and L MIN plunger) is not activated	2S2 checks good	Yes: 139 No: reinstall removed components, repair and/or adjust 2S2 LMIN
75	Set mode switch to OFF Remove Control Logic CCA 2A1. Set mode switch to AM Connect VTVM between 2XA1-3 and 2XA1-F	Meter Indicates greater than 0.1 VDC	Yes: step 76 No: step 85
76	Connect VTVM between 2XA1-B and ground	Meter indicates ± 12 VDC ± 4 VDC	Yes: step 77 No: step 86
77	Set mode switch to OFF Reinstall Control Logic CCA 2A1 Remove Phase and Amplitude Control CCA 2A2 Set mode switch to CPLR TUNE KW Connect VTVM between 2XA2-10 and ground	Meter indicates 0 VDC ± 0.5 VDC	Yes: step 141 No: reinstall removed components, go to step 140
78	Connect VTVM between 2XA2-12 and ground	Meter indicates 0 VDC ± 0.5 VDC	Yes step 79 No: step 87
79	Set mode switch to OFF Disconnect connector from Servo Control Assy 2A6 Connect multlm-eter between 2M1-1 and 2M1-2	Meter indicates less than 50 ohms	Yes: step 80 No: replace motor 2M1, reinstall removed components
80	Continuity check the following 2XA2-5 to 2XA6-R 2XA2-4 to 2XA6-D 2XA6-N to 2M2-1 2XA6-P to2M2-2	Continuity checks good	Yes reinstall removed com-ponents, go to step 142 No: reinstall removed components, go to step 139
81	Connect VTVM between feed thru capacitors 2A4C21 and 2A4C20	Meter indicates a voltage difference of more than 0 1 VDC(+ or-)	Yes reinstall removed com-ponents, go to step 143 No: step 88
82	Set mode switch to OFF. Continuity check 2XA1-13 to 2XA1-6.	Continuity checks good	Yes: reinstall removed com-ponents, go to step 140 No: reinstall removed components, go to step 139

Table 4-3 Checkout/Troubleshoot the Antenna Coupler CU-2229/URC- 92-Continued

STEP	ACTION	INDICATION	NEXT STEP
83	Check that 2S3 C MIN switch is not activated and that 2S3 contacts are open	2S3 checks good	Yes: reinstall removed components. go to step 139 No: reinstall removed components Replace switch 2S3, perform C MIN and C MAX adjustment
84	Check that 2S4 C MAX switch Is not activated and that 2S4 contacts are open	2S4 checks good	Yes: reinstall removed components. go to step 139 No: reinstall removed components Re place 2S4, perform C MIN and C MAX adjustment
85	Perform Amplitude Detector Adjustment	Amplitude Detector adjusts to within tolerance	Yes: reinstall removed components, go to step 3a. No: reinstall removed components, go to step 143
86	Set mode switch to OFF Check wiring for continuity and shorts to ground between 2J2 and 2A3-E3 and between 2A3-E4 and 2XA1-B	Wiring checks good	Yes: reinstall removed components, go to step 144 No: reinstall removed components, go to step 139
87	Set mode switch to OFF. Disconnect connector from Servo Control Assy 2A6 Set mode switch to AM. Connect VTVM between 2XA6-M and ground.	Meter indicates 0 VDC ± 0.5 VDC	Yes: reinstall removed components, go to step 142 No: reinstall removed components, go to step 140
88	Perform Phase Detector Adjustment	Phase Detector adjusts to within tolerance	Yes: step 3a No: reinstall removed components, go to step 143
89	Set mode switch to OFF Remove Control Logic CCA 2A1 Set mode switch to CPLR TUNE KW Connect VTVM between 2XA1-2 and ground	Meter indicates + 10 VDC ± 0.8 VDC	Yes: step 140 No: step 90
90	Continuity check the following 2A3-E8 to 2K1-12 2K1-8 to2XA1-2	Continuity checks good	Yes: replace 2K1 Reinstall removed components No: reinstall removed components, go to step 139
91		COUPLER STATUS FAULT indicator s lit	Yes: step 92 No: step 101
92	Set frequency to 15.602	**NOTE** If the time delay runs out during this test, depress TUNE START again If tuning occurs the second time the Indication is good	Yes: step 93 No: step 102
		Antenna Coupler completes tune cycle and COUPLER STATUS READY indicator illumlnates	Yes: step 93 No: step 102

Table 4-3 Checkout/Troubleshoot the Antenna Coupler CU-2229/URC- 92-Continued

STEP	ACTION	INDICATION	NEXT STEP
93	Set mode switch to OFF Remove Control Logic CCA2A1 **CAUTION** When testing at connectors, take care not to short adjacent connector contacts Set mode switch to AM. Momentarily jumper 2XA1-V to ground	Relay 2K2 changes state	Yes: step 94 No: step 115
94	Again momentarily jumper 2XA1-V to ground	Relay 2K2 changes to the state opposite that of step 94 2A5K1	Yes: step 95 No: replace relay
95	Momentarily jumper 2XA1-17 to ground	Relay 2K3 changes state	Yes: step 96 No: step 115
96	Again momentarily jumper 2XA1-17 to ground	Relay 2K3 changes to the state opposite that of step 96 2ASK2.	Yes: step 97 No: replace relay
97	Set mode switch to OFF Insure 2L4 roller is not touching L MAX plunger	Meter indicates 300 ohms or more	Yes: step 98 No: step 139
98	Rotate inductor 2L4 to position roller against L MAX plunger(2S1)	Meter indicates 5 ohms or less	Yes: step 99 No: step 139
99	Check components 2C6A-B-C-D-E and 2C3A-B	Components check good	Yes: step 100 No: replace faulty component Reinstall removed components.
100	Continuity check the following 2K2 contact to 2C6 2C6 to ground 2K3 contact to 2C3	Continuity checks good	Yes: reinstall re-moved com-ponents; go to step 140 No: step 139
101	Set mode switch to OFF Remove Control Logic CCA 2A1 Disconnect control cable from Antenna Coupler. Connect multimeter between 2P1-N and 2XA1-N	Meter indicates 10 ohms or less.	Yes- reinstall re moved com-ponents; go to step 140 No: step 117
102	Check Amplitude Detector Adjustment Refer to Section IV - Maintenance	Amplitude Detector is within tolerance.	Yes: step 103 No: step 120
103	Check Phase Detector Adjustment Refer to Sec-tion IV - Maintenance	Phase Detector is within tolerance.	Yes. step 104 No: step 121
104	Check 2K4, 2C4, 2R3, 2R4, 2R5, 2R6, 2R7 and 2R8	Components check good	Yes: step 105 No: replace faulty component.
105	Check motor drive belts for 2Ml/2C1 and 2M2/2L4	Drive belts are m good condition and function properly.	Yes: step 106 No: replace drive belts as required.
106	Set mode switch to OFF Remove Phase and-Am-plitude CCA 2A2 Connect multimeter between 2XA2-8 and ground Activate 2S3 - C MIN	Meter indicates 10 ohms or less.	Yes: step 107 No: step 122
107	Connect multimeter between 2XA2-11 and ground Activate 2S4 - C MAX	Meter ndicates10 ohms or less.	Yes: step108 No: step 123
108	Continuity check the following 2S1-L MAX to 2XA2-7 2S2-L MIN to2X2A-15	Continuity checks good.	Yes. step 109 No: reinstall removed components, go to step 139
109	Reinstall Phase and Amplitude CCA 2A2 Check limit switch adjustments (refer to Section IV - Maintenance) for the following- 2S1- L MAX 2S2 - L MIN 2S3 - C MIN 2S4 - C MAX	Limit switch adjustments check good	Yes: step 110 No: perform neces sary limit switch adjustments; go to step 4a.
110	Remove Control Logic CCA2A1 Disconnect con-nector from Servo Control Assy 2A6 Set mode switch to AM Connect multimeter between 2XA6-A and ground	Meter indicates +22VDC± 1.5 VDC	Yes: step 111 No: step 124

Table 4-3 Checkout/Troubleshoot the Antenna Coupler CU-2229/URC- 92-Continued

STEP	ACTION	INDICATION	NEXT STEP
111	**CAUTION** When jumpering pins, take care not to short adjacent connector contacts Set mode switch to OFF Jumper 2XA1-15 to ground Set mode switch to AM Connect multimeter between 2XA6-A and ground	Meter indicates +9 VDC ± 0.8 VDC.	Yes: step 112 No: step 125
112	Set mode switch to OFF Remove jumper between 2XA1-15 and ground Reconnect connector to Servo Control Assy Disconnect control cable at Antenna Coupler Connect multimeter between 2P1-P and 2XA1-8	Meter indicates 10 ohms or less.	Yes: step 113 No: step 126
113	Check components 2C1,2L4, 2T1 and 2R10.	Components check good.	Yes: step 114 No: reinstall removed components, replace faulty component.
114	Check RF transmission line, point to point wiring.	RF transmission line wiring checks good	Yes: reinstall removed components, go to step 140 No: reinstall removed components, go to step 139
115	**NOTE** The following test is on a bistable relay The voltage when checked, may be either + 28 VDC ± 1.5 VDC or 0 VDC This depends upon the relay state when the measurement is made Connect multimeter between 2A5-E2 and ground. Record meter indication Momentarily jumper 2XA1-V to ground	If recorded meter indication was 0 VDC, then meter Indicates +28 VDC ± 1.5 VDC If recorded meter indication was + 28 VDC ± 1.5 VDC, then meter indicates 0 VDC	Yes: step 116 No: step 127
116	Set mode switch to OFF. Check the following components: 2K2 2CR5	Components check good.	Yes: step 139 No: replace faulty component
117	**NOTE** The following test is on a bistable relay. The voltage, when checked, may be either +28 VDC ±1.5 VDC or O VDC This depends upon the relay state when the measurement is made Connect multimeter between 2A5-E5 and ground. Record meter indication Momentarily jumper 2XA1-17 to ground.	If recorded meter indication was 0 VDC, then meter indicates + 28 VDC ± 1.5 VDC If recorded meter indication was + 28 VDC ± 1.5 VDC, then meter indicates 0 VDC	Yes. step 118 No: step 128
118	Set mode switch to OFF Check the following components: 2K3 2CR6	Components check good.	Yes: step 139 No: replace faulty component
119	Check components 2A3AC3, 2A3AL3 and 2A3AC22 for shorts and/r shorts to ground.	Components check good.	Yes: step 139 No: replace faulty component
120	Perform Amplitude Detector Adjustment.	Amplitude Detector adjusts to within tolerance	Yes: step 4a No: step 143
121	Perform Phase Detector Adjustment.	Phase Detector adjusts to within tolerance	Yes: step 4a No: step 143
122	Connect multimeter across 2S3 - C MIN normally open contacts Activate 2S3 - C MIN.	Meter indicates less than 10 ohms	Yes: step 139 No: replace 2S3 C MIN limit switch
123	Connect multimeter across 2S4 - C MAX normally open contacts Activate 2S4 - C MAX.	Meter indicates less than 10 ohms	Yes: step 139 No: replace 2S4 C MAX limit switch

Table 4-3 Checkout/Troubleshoot the Antenna Coupler CU-2229/URC- 92-Continued

STEP	ACTION	INDICATION	NEXT STEP
124	Check relay 2K4 coil and contacts for proper operation.	Relay checks good	Yes: step 139 No: replace relay 2K4
125	Check resistor 2R9.	Resistor checks good	Yes: step 139 No: replace resistor 2R9
126	Check components 2A3AC6, 2A3AL6 and 2A3AC19.	Components check good	Yes: step 139 No: replace faulty component
127	Check bistable relay 2A5K1 coil and contacts for proper operation.	Bistable relay checks good	Yes: step 139 No: replace bistable relay 2A5K1.
128	Check bistable relay 2A5K2 coil and contacts for proper operation.	Bistable relay checks good	Yes: step 139 No: replace bistable relay 2A5K2
129	Check Amplitude Detector Adjustment.	Amplitude Detector Is within tolerance	Yes: step 130 No: step 135
130	Check Phase Detector Adjustment.	Phase Detector adjusts to within tolerance	Yes: step 131 No: step 136
131	Set mode switch to OFF Remove Control Logic CCA 2A1 Disconnect control cable at Antenna Coupler Connect multimeter between 2P1-P and 2XA1-8.	Meter indicates 10 ohms or less	Yes: step 132 No: step 137
132	Connect multimeter between 2XA1-8 and ground.	Meter indicates 1000 ohms or more	Yes: step 133 No: step 137
133	Connect multimeter between 2P1-g and 2XA1-9.	Meter indicates 1000 ohms or more	Yes step 134 No: step 138
134	Connect multimeter between 2XA1-9 and ground	Meter indicates 1000 ohms or more	Yes. step 136 No: step 138
135	Perform Amplitude Detector Adjustment	Amplitude Detector adjusts to within tolerance	Yes: step 6a No: step 139
136	Perform Phase Detector Adjustment	Phase detector adjusts to within tolerance	Yes step 6a No: step 139
137	Check components 243AC6, 2A3AL6 and 2A3AC19 for opens, shorts and shorts to ground	Components check good	Yes: reinstall re moved components; go to step 139 No: reinstall removed components; replace faulty component.
138	Check components 2A3AC2, 2A3AL2 and 2A3AC23 for opens, shorts and shorts to ground	Components check good	Yes: reinstall removed components; go to step 139 No: reinstall removed components; replace faulty component.
139	Repair and/or replace wiring and connectors as necessary		---
140	Replace and/or repair Control Logic CCA 2A1. Use conventional troubleshooting methods for CCA repair		---
141	Replace and/or repair Phase and Amplitude CCA 2A2. Use conventional troubleshooting methods for CCA repair		---
142	Replace and/or repair Servo Control Assy 2A6 Use conventional troubleshooting methods for repair		---
143	Replace and/or repair Phase and Amplitude Assy 2A4. Perform Amplitude Detector Adjustment and Phase Detector Adjustment Use conventional troubleshooting methods for repair		---
144	Replace and/or repair Regulator CCA 2A3. Use conventional troubleshooting methods for repair		---

Section IV. MAINTENANCE

4-7. General

General support maintenance of the AN/URC-92 is limited to the replacement and/or repair of wiring and connectors, circuit card replacement and/or repair and the procedures outlined in this manual.

4-8. Power Supply 1A6

(Fig 4-3)

a. Removal.

(1) Remove transceiver top cover.

(2) Remove transceiver bottom cover.

(3) Remove four screws holding Synthesizer 1A4 protective cover and remove protective cover.

(4) Extract Spectrum Generator 1A4A1, Low Digit Generator 1A4A2, Translator 1A4A3, and VHF Divider 1A4A4 circuit card assemblies.

(5) Remove two screws and washers (16) holding Power Supply 1A6 to Synthesizer 1A4.

(6) Remove one screw and washer (15) mounting power supply to chassis assembly.

(7) Remove two screws (17) mounting power supply to rear panel.

(8) Remove six screws mounting rear panel to right and left side panels and pull away rear panel

(9) Remove four screws (1) from Regulator Assembly 1A6A1 protective cover (2) and remove cover.

(10) Remove two standoffs (3) from Regulator Assembly 1A6A1 (25).

(11) Remove four screws (4) and washers (5) mounting capacitors 1A6AIC5 (9) and 1A6A1C9 (10) and remove capacitors.

(12) Remove two mounting screws (21) and washers (19 & 20) from connector 1A6XA1 (18).

(13) Extract Regulator Assembly 1A6A1 (22) from connector 1A6XA1 (18).

(14) Remove two mounting screws (11) and washers (12 & 13) from terminal board 1A6TB1 (14).

NOTE

Reposition terminal board 1A6TB1 to access screws mounting Power Supply 1A6 to transformer 1A6T1.

(15) Remove four screws (8) and washers (7) mounting Power Supply 1A6 to Power Transformer 1A6T1 (6) and remove Power Supply.

b. Replacement.

(1) Position Power Supply 1A6 in place and secure with four screws (8) and washers (7) to Power Transformer 1A6 T1 (6).

(2) Position terminal board 1A6TB1 (14) in place and secure with two mounting screws (11) and washers (12 & 13).

CAUTION

Component side of Regulator Assembly must face top of transceiver.

(3) Reinstall Regulator Assembly 1A6A1 (22) into connector 1A6XA1 (18).

(4) Position rubber support (23) between Regulator Assembly 1A6A1 (22) and Power Supply 1A6.

CAUTION

Positive terminals of capacitors 1A6A1C5 and 1A6A1C9 must match positive markings on Regulator Board.

(5) Position capacitors 1A6A1C5 (9) and 1A6A1C9 (10) and secure each with two mounting screws (4) and washers (5) through Regulator Assembly 1A6A1 (22).

(6) Reinstall two mounting screws (21) and washers (19 & 20) in connector 1A6XA1 (18).

(7) Reinstall two standoffs (3) on Regulator Assembly 1A6A1 (22).

(8) Position Regulator Assembly 1A6A1 protective cover (2) and secure with four screws (1).

(9) Position rear panel in place and secure with six mounting screws to left and right side panels.

(10) Reinstall two power supply mounting screws (17) through rear panel.

(11) Reinstall one power supply mounting screw (15) through chassis assembly.

(12) Reinstall two power supply mounting screws (16) through Synthesizer 1A4.

CAUTION

When reinstalling Spectrum Generator, Low Digit Generator, Translator, and VHF Divider circuit card assemblies, component side must face rear of transceiver.

(13) Reinstall Spectrum Generator 1A4A1, Low Digit Generator 1A4A2, Translator 1A4A3, and VHF Divider 1A4A4 circuit card assemblies.

(14) Position Synthesizer 1A4 protective cover in place and secure with four mounting screws.

(15) Reinstall transceiver bottom cover.

(16) Reinstall transceiver top cover.

4-9. Power Transformer (1A6T1)

(Fig 4-3)

a. Removal.

(1) Remove transceiver top cover

(2) Remove transceiver bottom cover.

(3) Remove four screws (1) from Regulator Assembly 1A6A1 protective cover (2) and remove cover.

(4) Remove two standoffs (3) from Regulator Assembly 1A6A1 (22).

(5) Remove two screws (4) and washers (5) from capacitor 1A6A1C5 (9) and remove capacitor.

(6) Remove two screws (4) and washers (5) from capacitor 1A6A1C9 (12) and remove capacitor.

(7) Remove two mounting screws (21) and washers (19 & 20) from connector 1A6XA1 (21).

(8) Extract Regulator Assembly 1A6A1 (20) from connector 1A6XA1 (18).

(9) Remove two mounting screws (11) and washers (12 & 13) from terminal board 1A6TB1 (16)

NOTE

Reposition terminal board 1A6TB1 for access to screws mounting transformer 1A6T1.

(10) Remove three screws mounting right side panel to front panel.

(11) Remove five screws mounting right side panel to chassis assembly.

(12) Remove three screws mounting right side panel to rear panel.

(13) Remove four screws mounting right side panel to Power Transformer 1A6T1 (6) and remove right side panel

(14) Remove four screws (8) and washer (7) mounting Power Transformer 1A6T1 (6) to the Power Supply 1A6.

(15) Record Power Transformer 1A6T1 wiring and remove Power Transformer.

b. Replacement.

(1) Make proper Power Transformer wiring connections.

(2) Position Power Transformer 1A6T1 (6) in place and install with four mounting screws (8) and washers (7) through Power Supply 1A6.

(3) Position right side panel in place and install with four screws to Power Transformer 1A6T1.

(4) Reinstall three mounting screws to front panel.

(5) Reinstall five mounting screws to chassis assembly.

(6) Reinstall three mounting screws to rear panel.

(7) Position terminal board 1A6TB1 (14) in place and secure with two mounting screws (11) and washers (12 & 13).

CAUTION

Components side of Regulator Assembly must face top of transceiver

(8) Reinstall Regulator Assembly 1A6A1 (22) into connector 1A6XA1 (18).

(9) Position rubber support (23) between Regulator Assembly 1A6A1 (22) and Power Supply 1A6.

CAUTION

Positive terminals of capacitors 1A6A1C5 and 1A6A1C9 must match positive markings on Regulator Board

(10) Position capacitors 1A6A1C5 (9) and 1A6A1C9 (10) and secure with four mounting screws (4) and washers (5) through Regulator Assembly 1A6A1 (22).

(11) Reinstall two mounting screws (21) and washers (19 & 20) in connector 1A6XA1 (18).

(12) Reinstall two standoffs (3) on Regulator Assembly 1A6A1 (22).

(13) Position protective cover (2) in place and secure with four mounting screws (1)

(14) Reinstall transceiver bottom cover

(15) Reinstall transceiver top cover.

4-10. Regulator Assembly

(Fig 4-3)

a Removal.

(1) Remove transceiver top cover

(2) Remove four screws (1) from Regulator Assembly 1A6A1 protective cover (2) and remove cover.

(3) Remove two standoffs (3) from Regulator Assembly 1A6A1 (22).

(4) Remove four screws (4) and washers (5) mounting capacitors 1A6A1C5 (9) and 1A6A1C9 (10) and remove capacitors.

(5) Remove two mounting screws (21) and washers (19 & 20) from connector 1A6XA1 (18)

(6) Extract Regulator Assembly 1A6A1 (22) from connector 1A6XA1 (18)

b Replacement

CAUTION

Component side of Regulator Assembly must face top of transceiver.

(1) Reinstall Regulator Assembly 1A6A1 (22) into connector 1A6XA1 (18).

(2) Position rubber support (23) between Regulator Assembly 1A6A1 (22) and Power Supply 1A6.

CAUTION

Positive terminals of capacitors 1A6A1C5 and 1A6A1C9 must match positive markings on Regulator Board.

(3) Position capacitors 1A6AlC5 (9) and 1A6A1C9 (10) and secure each with two mounting screws (4) and washers (5) through Regulator Assembly 1A6A1 (22).

(4) Reinstall two mounting screws (21) and washers (19 & 20) in connector 1A6XA1 (18).

(5) Reinstall two standoffs (3) on Regulator Assembly 1A6A1 (22).

(6) Position Regulator Assembly 1A6A1 protective cover (2) and secure with four screws (1).

(7) Reinstall transceiver top cover.

4-11. Receiver/Exciter Mother Board

a. Removal.

(1) Remove transceiver top cover.

(2) Remove transceiver bottom cover.

(3) Remove four mounting screws from Receiver/Exciter top protective plate and remove plate.

(4) Extract Audio 1A3A4, Sideband Generator 1A3A3, IF Filter 1A3A2 and VHF Mixer 1A3A1 circuit card assemblies.

(5) Extract protective card shield

(6) Remove four mounting screws and washers

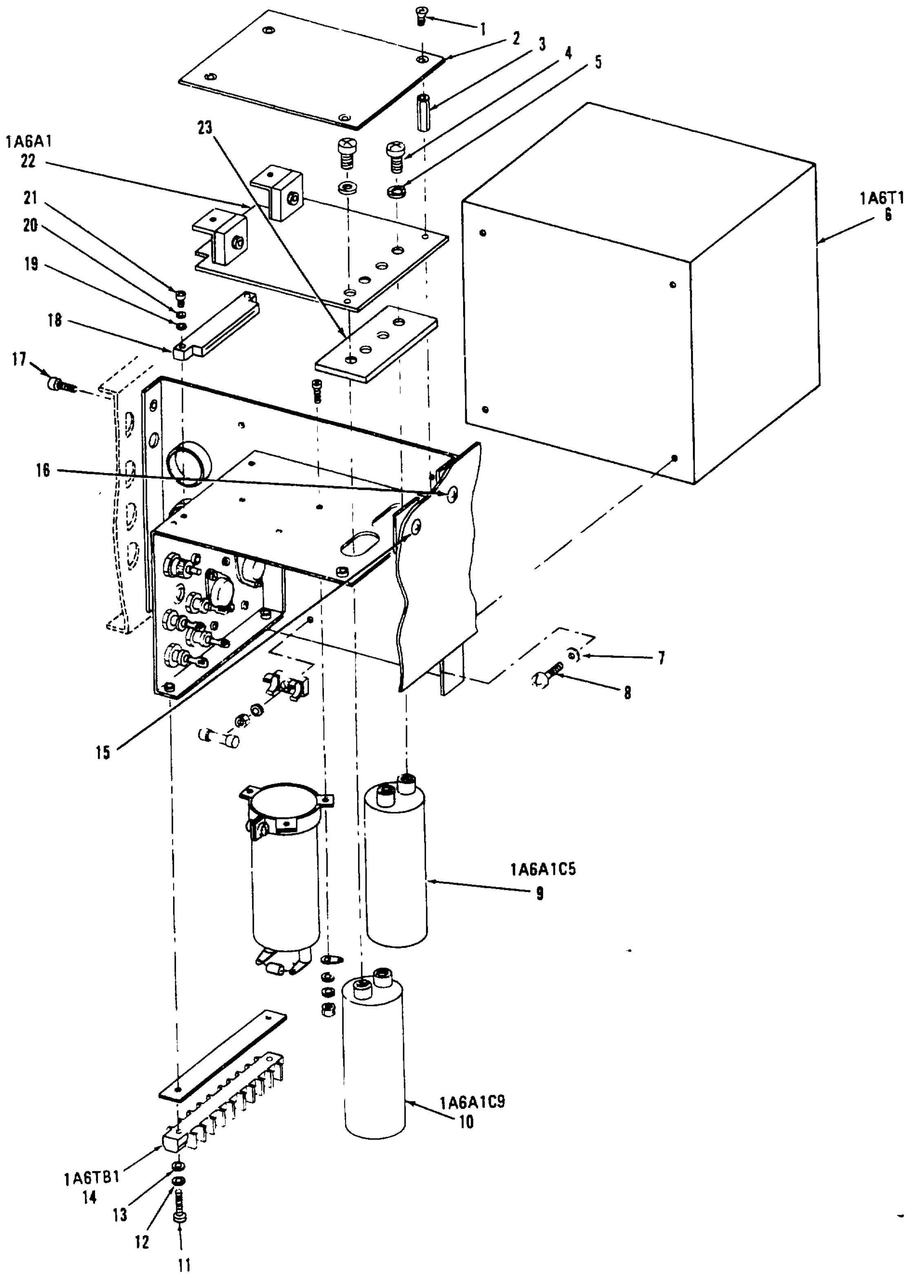


Figure 4-3 Power Supply

from Receiver/Exciter bottom shield and remove bottom shield.

(7) Disconnect connector 1A1P2 from connector 1A3A5J5.

(8) Remove four mounting screws from Receiver/Exciter Mother Board 1A3A5.

(9) Remove two mounting screws and washers from Receiver/Exciter Coax Bracket and remove bracket.

(10) Label all wiring connections.

(11) Unsolder wires and remove Receiver/Exciter Mother Board 1A3A5.

b. Replacement.

(1) Make necessary wiring connections.

NOTE

When securing Receiver/Exciter Mother Board in place, two loop clamps are used to retain wiring.

(2) Position Receiver/Exciter Mother Board 1A3A5 in place and secure with four mounting screws.

(3) Position Receiver/Exciter Coax Bracket in place and secure with two mounting screws and washers.

(4) Reconnect connector 1A1P2 to connector 1A3A5J5.

(5) Position Receiver/Exciter bottom shield in place and secure with four mounting screws and washers.

NOTE

When installing Audio, Sideband Generator, IF Filter, and VHF Mixer circuit card assemblies, components side must face front of transceiver.

(6) Reinstall Audio 1A3A4, Sideband Generator 1A3A3, IF Filter 1A3A2, VHF Mixer 1A3A1 circuit card assemblies.

(7) Reinstall protective card shield.

(8) Position Receiver/Exciter top protective plate in place and secure with four screws.

(9) Replace transceiver bottom cover.

(10) Replace transceiver top cover.

4-12. Synthesizer Mother Board

a. Removal.

(1) Remove transceiver top cover.

(2) Remove transceiver bottom cover.

(3) Remove four mounting screws from Synthesizer top protective plate and remove plate.

(4) Remove six mounting screws attaching front panel to transceiver and swing front panel downward.

(5) Remove four mounting screws and washers from VCO 1A4A5 and extract VCO.

(6) Extract Spectrum Generator 1A4A1, Low Digit Generator 1A4A2, Translator 1A4A3, and VHF Divider 1A4A4 circuit card assemblies.

(7) Remove four mounting screws and washers from Snythesizer bottom shield and remove shield (8) Disconnect connector 1A1P3 from connector 1A4A6J1.

(9) Remove four mounting screws from Synthesizer Mother Board 1A4A6.

(10) Remove two mounting screws and washers from Snythesizer coax bracket and remove bracket.

(11) Label all wiring connections.

(12) Unsolder wires and remove Synthesizer Mother Board 1A4A6.

b. Replacement

(1) Make necessary wiring connections.

(2) Position Synthesizer Coax Bracket m place and secure with two mounting screws and washers.

(3) Position Synthesizer Mother Board 1A4A6 and secure with four mounting screws.

(4) Reconnect connector 1A1P3 to connector 1A4A6J1.

(5) Position Synthesizer bottom shield in place and secure with four mounting screws.

NOTE

When installing Spectrum Generator, Low Digit Generator, Translator, and VHF Divider circuit card assemblies, component side must face rear of transceiver.

(6) Reinstall Spectrum Generator 1A4A1, Low Digit Generator 1A4A2, Translator 1A4A3, and VHF Divider 1A4A4 circuit card assemblies.

(7) Reinstall VCO 1A4A5 and secure with four mounting screws and washers.

(8) Position Front Panel in place and secure with six mounting screws.

(9) Position Synthesizer top protective plate in place and secure with four mounting screws.

(10) Reinstall transceiver bottom cover.

(11) Reinstall transceiver top cover.

4-13. Filter Module

(Fig 4-4)

a. Removal.

(1) Remove transceiver top cover.

(2) Remove transceiver bottom cover.

(3) Disconnect connector 1A8P2 from connector 1A5J1

(4) Disconnect connector 1A8P4 from connector 1A5J2.

(5) Disconnect connector 1A3P4 from connector 1A5J3.

(6) Disconnect connector 1A8P5 from connector 1A5J4.

(7) Remove two mounting screws (3) from filter support bracket (2).

(8) Remove two mounting screws (6) and washers (5) from filter assembly cradle (4) and lift out Filter Module 1A5 (1).

b. Replacement.

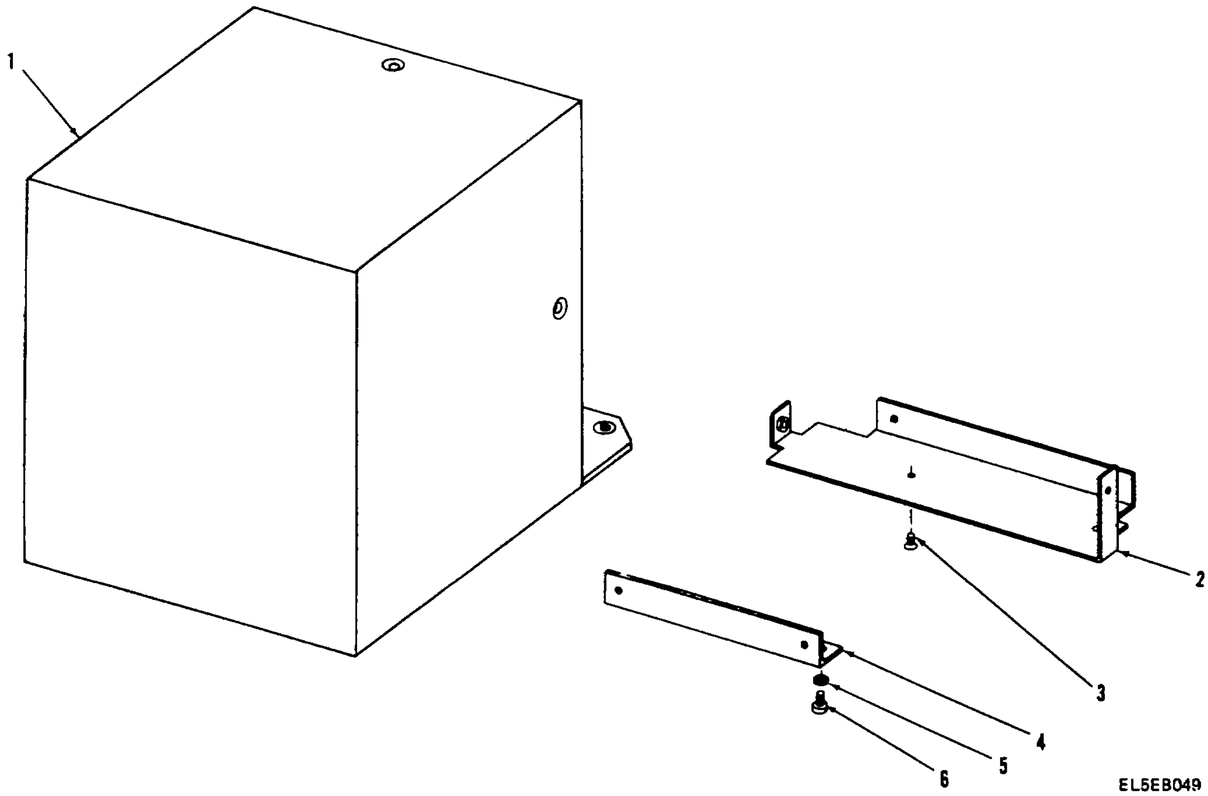


Figure 4-4. Filter Module

(1) Position Filter Module 1A5 (1) in place and secure with two mounting screws (3) through filter support bracket (2).

(2) Reinstate two mounting screws (6) and washers (5) through filter assembly cradle (4).

(3) Reconnect connector 1A3P5 to connector 1A5J4.

(4) Reconnect connector 1A3P4 to connector 1A5J3.

(5) Reconnect connector 1A8P4 to connector 1A5J2.

(6) Reconnect connector 1A8P2 to connector 1A5J1.

(7) Replace transceiver top cover.

(8) Replace transceiver bottom cover.

4-14. Motor Control Board (1), and Receiver Filter (2), Even Channel Filter (3), and Odd Channel Filter (4) Assemblies

(Fig 4-5)

a. Removal.

NOTE

Remove Filter Module 1A5 following Filter Module removal procedures

(1) Remove four mounting screws (8) and pull out circuit card assemblies from shield box (7).

(2) Remove four mounting nuts (9), flat washers (10), and lock washers (11).

(3) Remove threaded rod (12) and spacers (13, 14 and 15).

(4) Label and unsolder wires.

(5) Pull circuit cards off of glass shaft (5).

b. Replacement.

CAUTION

When inserting circuit cards on glass shaft (5) make certain that index marks in wafer slots (6) are aligned.

(1) Make proper wiring connections,

NOTE

Medium spacer fits between Odd Channel Filter (4) and Even Channel Filter (3). Small spacer fits between Even Channel Filter (3) and Receive Filter (2). Large spacer fits between Receive Filter (2) and Motor Control Board (1).

(2) Position circuit cards in place and reinstall threaded rod (12) and spacers (13, 14 and 15).

(3) Reinstall four mounting nuts (9), flat washers (10), and lock washers (11).

NOTE

When inserting circuit card assemblies in shield box (7) relays 1A5A4K1 and 1A5A4K2 must match up with long side of shield box.

(4) Position circuit card assemblies in place and reinstall four mounting screws (8)

(5) Reinstall Filter module 1A5 following Filter Module replacement procedures

4-15. Display CCA

(Fig 4 -6)

a. Removal.

(1) Remove transceiver top cover

(2) Remove six mounting screws from front panel 1A1 to transceiver and swing front panel downward.

(3) Disconnect connector 1A1J5 from connector 1A1A2J2 on Decoder 1A1A2 (4).

(4) Remove two mounting screws (1), flat washers (3) and lock washers (2) from Decoder 1A1A2 (4) and remove Decoder 1A1A2.

(5) Remove two loose spacers (5) between Decoder 1A1A2 (4) and Display 1A1A3 (6).

(6) Remove two mounting nuts, flat washers, and lock washers (7) from Display 1A1A3 (6) and remove Display.

(7) Remove lens and bezel (8) from front of Front Panel.

b. Replacement.

(1) Position bezel and lens (8) in place.

(2) Position Display 1A1A3 (6) in place and secure with two mounting nuts, flat washers, and lock washers (P/O 7).

(3) Position two spacers (5) in place between Display 1A1A3 (6) and Decoder 1A1A2 (4)

(4) Position Decoder 1A1A2 (4) in place and secure with two mounting screws (1), flat washers (3), and lock washers (2).

(5) Connect connector 1A1J5 to connector 1A1A2J2.

(6) Position front panel m place and secure with

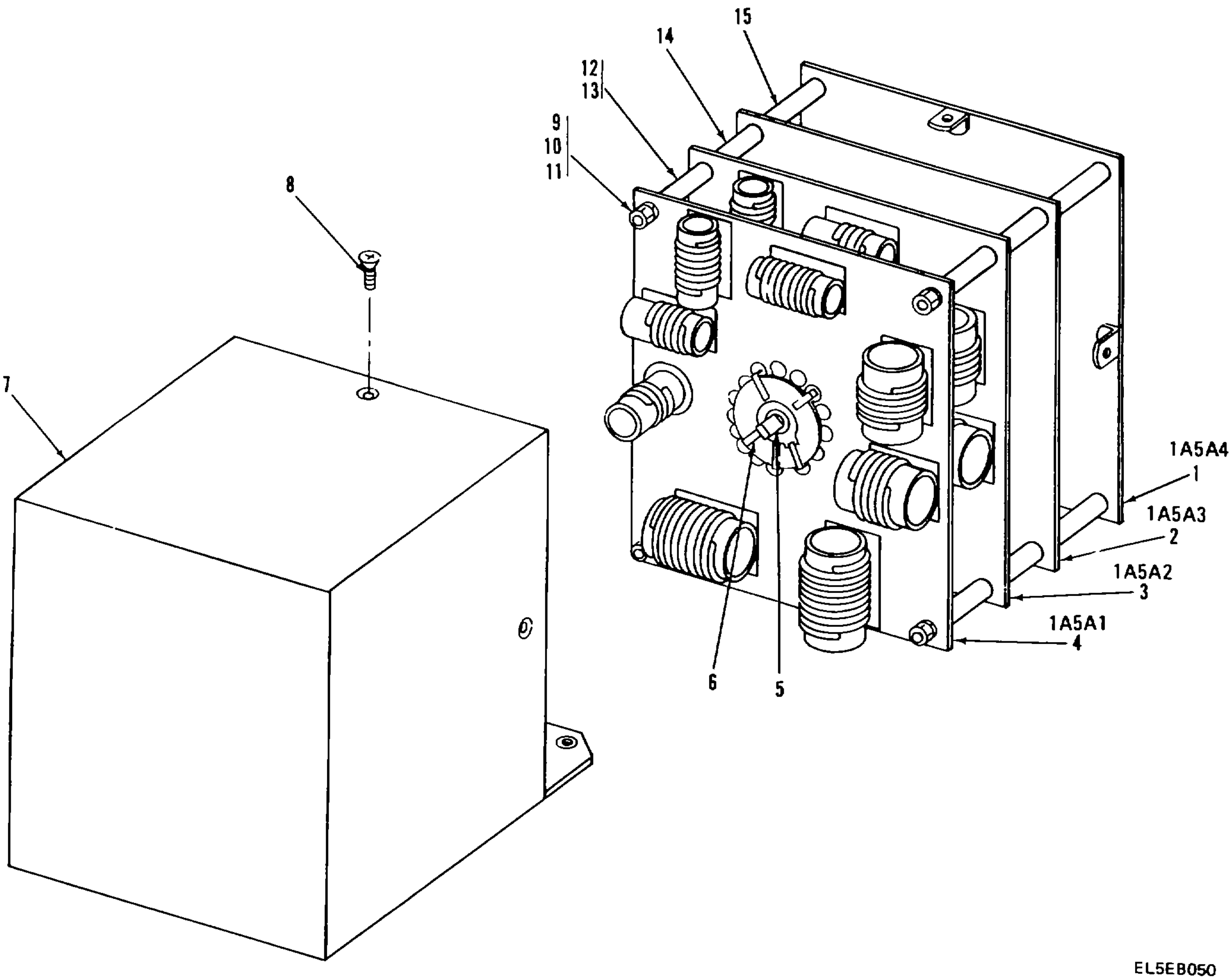


Figure 4-5. Filter Module Circuit Cards

six mounting screws.

(7) Reinstall transceiver top cover.

4-16. Decoder CCA

(Fig 4-6)

a. Removal.

(1) Remove transceiver top cover.

(2) Remove six mounting screws from front panel 1A1 to transceiver and swing front panel downward.

(3) Disconnect connector 1A1J5 from connector 1A1A2J2 on Decoder 1A1A2 (4).

(4) Remove two mounting screws (1), flat washers (3), and lock washers (2) from Decoder 1A1A2 (4) and remove Decoder.

(5) Remove two loose spacers (5) between decoder 1A1A2 (4) and display 1A1A3 (6).

b. Replacement.

CAUTION

Decoder connector 1A1A2J2 should be facing to the top and rear of transceiver.

(1) Position two spacers (5) in place between Display Assembly (6) and Decoder (4).

(2) Position Decoder (4) in place and secure with two mounting screws (1), flat washers (3) and lock washers (2).

(3) Connect connector 1A1J5 to 1A1A2P2.

(4) Position front panel in place and secure with six mounting screws.

(5) Reinstall transceiver top cover.

4-17. Speaker Driver CCA

a. Removal.

(1) Remove transceiver top cover.

(2) Remove six mounting screws from front panel to transceiver and position front panel 1A1 for access to Speaker Driver 1A1A1.

(3) Remove two mounting screws, flat washers and lock washers from Speaker Driver 1A1A1.

(4) Label all wiring connections

(5) Unsolder wires and remove Speaker Driver Board 1A1A1.

b. Replacement.

CAUTION

Component side of Speaker Driver Board should face the front of the transceiver.

(1) Make proper wiring connections.

(2) Position Speaker Driver Board 1A1A1 in place and secure with two mounting screws, flat washers and lock washers.

(3) Position Front Panel 1A1 in place and secure with six mounting screws.

(4) Reinstall transceiver top cover.

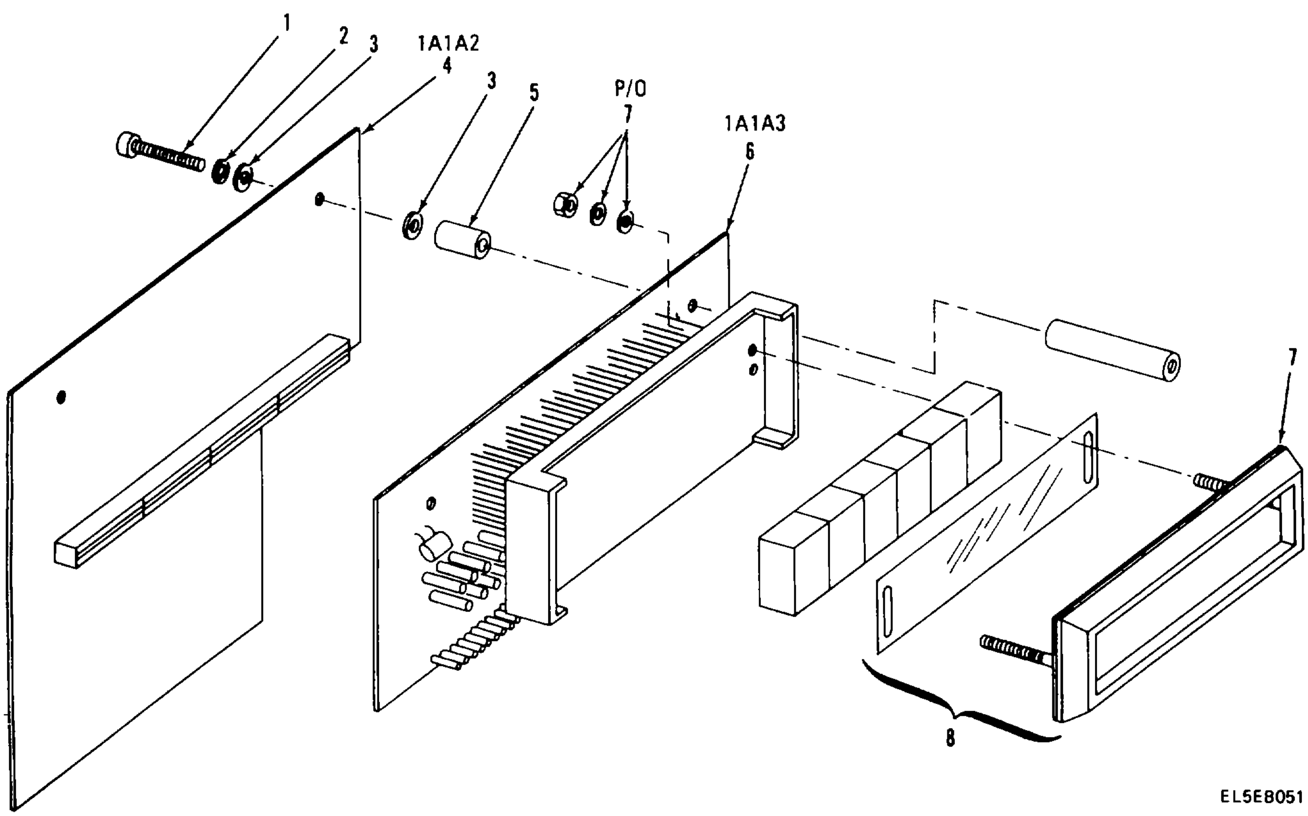


Figure 4-6. Display Assembly

4-18. Receiver-Transmitter RT-1277/URC-92 Adjustments.

The following adjustments are not intended as a means of circuit card assembly checkout or troubleshooting. If an adjustment cannot- be performed, troubleshoot the related circuit card assembly using conventional troubleshooting methods for repair Refer to the List of Illustrations for required schematic figure numbers

a. Spectrum Generator 1A4A1 Adjustment.

(1) Remove receiver-transmitter top cover Remove Synthesizer protective cover Place Spectrum Generator CCA 1A4A1 on card extender Connect a 50 ohm dummy load to receiver-transmitter ANT jack.

(2) 20 MHz Adjustment(1A4A1).

(a) Connect oscilloscope probe to 1A4A1-1. Connect frequency counter to oscilloscope vertical amplitude output.

NOTE

The following adjustment involves three interacting components Due to this interaction, the adjustment of each component should be repeated until maximum output is obtained.

(b) Adjust 1A4A1L2, 1A4A1L3 and 1A4A1L4 for maximum output Minimum acceptable output is 300 mV peak-to-peak at a frequency of 20 MHz ± 20 Hz.

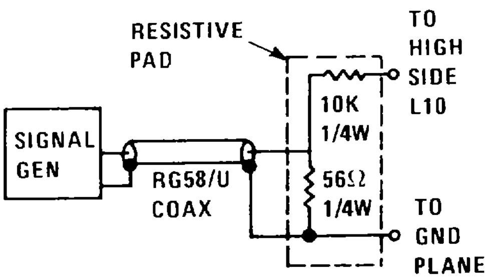
(3) 21 Mhz Adjustment.

(a) Connect VTVM (AC) (unterminated) to 1A4A1-4. Connect signal generator as shown in Figure 4-7.

(b) Jumper 1A4A1U8-2 to CCA ground. Jumper across 1A4A1L7 Set signal generator for 250 mV RMS.

NOTE

The following adjustment involves three interacting components. Due to this interaction, the adjustment of each component should be repeated until maximum output is obtained.



EL5EB053

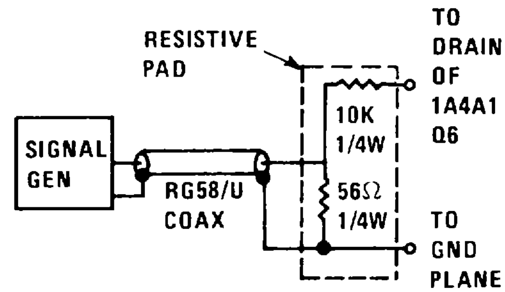
Figure 4-7. 21 MHz Adjustment Setup (1A4A1)

(c) Adjust 1A4A1L10, 1A4A1L9 and 1A4A1L8 for maximum output First adjust L10, then L9, and then L8. Repeat as necessary to obtain maximum output as indicated by the RF voltmeter.

(d) Remove resistive pad connected between L10 and ground. Remove jumpers from 1A4A1U8-2 and 1A4A1L7. VTVM (AC) remains connected to 1A4A1-4. Again adjust L10, L9 and L8, as in step (c) above, until maximum output is attained. Minimum acceptable output, when adjusted, is 85 mV RMS.

(4) 17 MHz Adjustment (1A4A1).

(a) Connect VTVM (AC) (unterminated) to 1A4A1-6. Connect signal generator as shown in Figure 4-8. Jumper junction of 1A4A1C56, C61 and R50 to CCA ground.



EL5EB054

Figure 4-8. 17MHz Adjustment Setup (1A4A1)

NOTE

The following adjustment involves two interacting components. Due to this interaction, the adjustment of each component should be repeated until maximum output is obtained.

(b) Adjust 1A4A1L16 and 1A4A1L17 for maximum output.

(c) Remove jumper from C56, C61, R50 junction. Remove resistive pad connected between 1A4A1Q6 and ground VTVM remains connected to 1A4A1-6.

(d) Adjust 1A4A1L14 for maximum output Again adjust L16 and L17 for maximum output. Minimum acceptable output, when adjusted, is 90 mV RMS.

(5) Remove card extender and reinstall Spectrum Generator CCA 1A4A1 Reinstall Synthesizer protective cover Reinstall receiver-transmitter top cover. Remove dummy load.

b. Low Digit Generator 1A4A2 Adjustment.

(1) Remove receiver-transmitter top cover. Remove Synthesizer protective cover. Place Low Digit Generator CCA 1A4A2 on card extender. Connect a 50 ohm dummy load to receiver-transmitter ANT jack.

(2) VCO Adjustment (1A4A2)

(a) Connect VTVM between 1A4A2-TP3 and ground.

NOTE

The following two steps involve two interacting components. Due to this, the adjustments should be worked together for the desired output.

(b) Set 100 Hz, 1 KHz and 10 KHz to 5 Adjust 1A4A2L3 for a VTVM indication of 1 95 VAC ± 0 25 VAC.

(c) Set 10 KHz to 0 Adjust 1A4A2C8 for a VTVM indication of 1.95 VAC ± 0.25 VAC.

(3) Remove card extender and reinstall Low Digit Generator CCA 1A4A2. Reinstall Synthesizer protective cover. Reinstall receiver-transmitter top cover. Remove dummy load.

c. Translator 1A4A3 Adjustment.

(1) Remove receiver-transmitter top cover Remove Synthesizer protective cover. Place Translator 1A4A3 on card extender. Connect a 50 ohm dummy load to receiver-transmitter ANT jack.

(2) 21 MHz Adjustment (1A4A3).

(a) Connect oscilloscope to 1A4A3-TP4. Set front panel VFO PULL control to in position.

(b) Adjust 1A4A3-L13 for maximum output. Minimum acceptable output is 800 mV peak-to-peak at a 0.0476 usec repetition rate.

(3) VFO Adjustment

(a) Connect oscilloscope to 1A4A3-TP4. Connect frequency counter to oscilloscope vertical amplitude output. Connect VTVM (AC) between 1A4A3-A and ground. Pull VFO PULL control to its out position.

(b) Rotate VFO PULL control for a VTVM indication of 7.6 VDC. Observe oscilloscope and adjust 1A4A3L23 until an oscillation is indicated on the scope.

(c) Continue to adjust L23 in the same direction and note adjustment range until oscillation stops. Adjust L23 to approximate midpoint of available adjustment range.

NOTE

If the following indication cannot be achieved, a slight readjustment of L23 is acceptable to obtain the correct frequency count.

(d) Adjust 1A4A3L22 for a frequency counter indication of 21 MHz ± 100 Hz. Oscilloscope should indicate a minimum sine wave of 700 mV peak to peak.

(4) 19.45 MHz Adjustment (1A4A3)

(a) Remove Low Digit Generator CCA 1A4A2. Connect VTVM (AC) 1A4A3U3-6. Jumper 1A4A3U1-2 to CCA ground. Connect signal generator as shown in Figure 4-9.

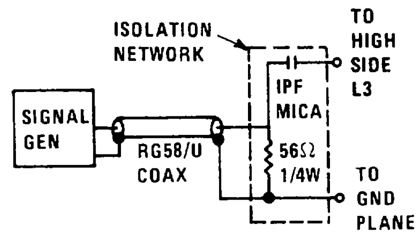


Figure 4-9. 19.45 MHz Adjustment Setup #1 (1A4A3)

NOTE

As adjustment progresses in the following step, reduce signal generator output level to maintain VTVM indication below 100 mV RMS.

(b) Using frequency counter, set signal generator for 19 45 MHz Set signal generator level to 250 mV RMS Adjust 1A4A3L3 and 1A4A3L5 for maximum VTVM indication.

(c) Connect signal generator as shown in Figure 4-10.

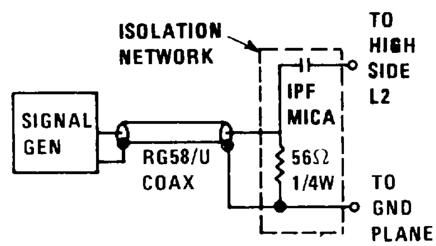


Figure 4-10. 19.45MHz Adjustment Setup #2(1A4A3)

NOTE

The following adjustment involves two interacting components. Due to this interaction, the adjustment of each component should be repeated until maximum output is obtained.

NOTE

As adjustment progresses in the following step, reduce signal generator output level to maintain RF voltmeter indication below 100 mV RMS.

(d) Adjust 1A4A3L2 and then 1A4A3L3 for maximum VTVM indication.

(e) Connect signal generator as shown in Figure 4-11.

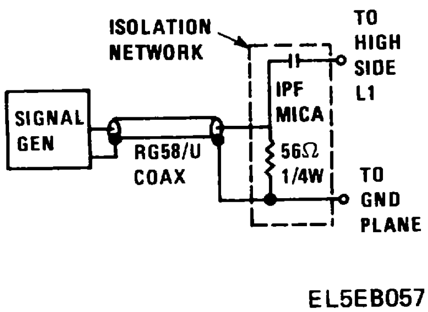


Figure 4-11. 19.45 MHz Adjustment Setup #3 (1A4A3)

NOTE

The following adjustment involves three interacting components Due to this interaction the adjustment of each component should be repeated until maximum output is obtained

NOTE

As adjustment progresses in the following step, reduce signal generator output level to maintain VTVM indication below 100 mV RMS.

(f) Adjust 1A4A3L1, then 1A4A3L2 and then 1A4A3L3 for maximum VTVM Indication.

(g) Remove Isolation pad connected between L1 and ground Remove jumper from 1A4A3U1-2. Reinstall Low Digit Generator CCA 1A4A2 Connect VTVM (AC) between 1A4A3U3-1 and ground Connect RF voltmeter to 1A4A3-TP1 using a 50 ohm termination.

NOTE

The following adjustment involves four interacting components Due to this interaction the adjustment of each component should be repeated until maximum output is obtained.

(h) Carefully readjust L1, L2, L3, and L5 for maximum VTVM indication.

(5) 2nd Local Oscillator Adjustment

(a) Connect oscilloscope to 1A4A3-11. Ground scope to CCA ground Connect frequency counter to oscilloscope vertical amplitude output.

(b) Adjust 1A4A3L25 to approximately the midpoint of its adjustment range. Adjust 1A4A3L17 for 80.75 MHz. Readjust L25 for maximum output Minimum acceptable output is 300 mV peak-to-peak at 80.75 MHz ± 4 KHz.

(6) 100 75 MHz Bandpass Filter Adjustment (1A4A3).

(a) Jumper junction of 1A4A3Q8 gate #1 and R70 to CCA ground. Connect VTVM (AC) (w/50 ohm termination) to 1A4A3-TP3 Using frequency counter set signal generator to 100.75 MHz. Connect signal generator as shown in Figure 4-12.

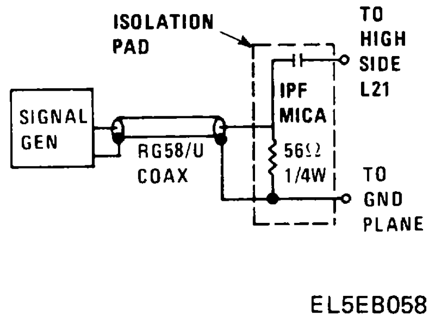


Figure 4-12. 100.75 MHz Bandpass Filter Adjustment Setup #1

(b) Adjust 1A4A3L21 for maximum output.

(c) Connect signal generator as shown in Figure 4-13. Frequency setting remains at 100.75 MHz.

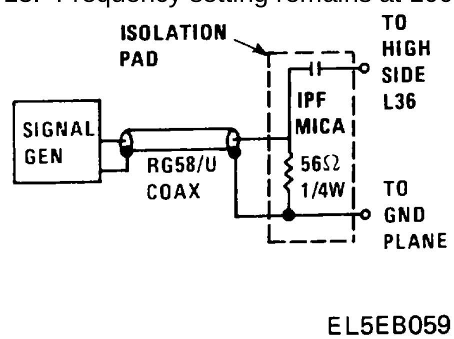


Figure 4-13. 100.75 MHz Bandpass Filter Adjustment Setup #2

NOTE

The following adjustment involves two interacting components. Due to this Interaction the adjustment of each component should be repeated until maximum output is obtained.

(d) Adjust 1A4A3L36 and then L21 for maximum VTVM indication.

(e) Connect signal generator as shown in Figure 4-14. Frequency setting remains at 100.75 MHz.

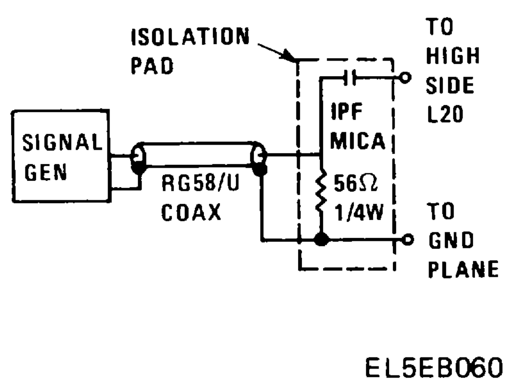


Figure 4-14. 100.75 MHz Bandpass Adjustment Setup #3

NOTE

The following adjustment involves three interacting components. Due to this interaction the adjustment of each component should be repeated until maximum output is obtained.

(f) Adjust 1A4A3L20, then L36, and then L21 for maximum RF voltmeter indication.

(g) Remove isolation pad connected between L20 and ground. Remove jumper from between junction of 1A4A3Q8, R71 and ground.

NOTE

The following adjustment involves three interacting components Due to this interaction the adjustment of each component should be repeated until maximum output is obtained.

(h) Carefully readjust L20, L36 and L21 for maximum RF voltmeter indication.

(7) 81.25 MHz Bandpass Filter Adjustment (1A4A3)

(a) Jumper Junction of 1A4A3Q11 gate # and R14 to CCA ground. Connect VTVM (AC) to 1A4A3-TP2. Using frequency counter, set signal generator to 81.25 MHz. Set signal generator output level to 250 mV. Connect signal generator as shown in Figure 4-15.

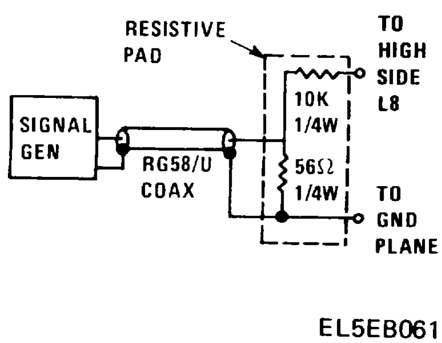


Figure 4-15. 81.25 MHz Bandpass Filter Adjustment Setup #1.

(b) Adjust 1A4A3L8 for maximum RF voltmeter indication.

(c) Connect signal generator as shown in figure 4-16. Frequency setting remains at 81.25 MHz.

NOTE

The following adjustment involves two interacting components. Due to this interaction the adjustment of each component should be repeated until maximum output is obtained.

(d) Adjust 1A4A3L7 and then L8 for maximum VTVM indication.

(e) Remove isolation pad connected between L7 and ground. Remove jumper from between junction of 1A4A3Q11, R14 and ground.

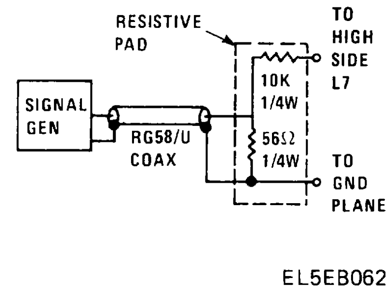


Figure 4-16. 81.25 MHz Bandpass Filter Adjustment Setup #2

NOTE

The following adjustment involves two interacting components. Due to this interaction the adjustment of each component should be repeated until maximum output is obtained.

(f) Carefully readjust L7 and L8 for maximum VTVM indication. Minimum acceptable output is 40 mV.

(8) To adjust Output Level, connect oscilloscope to 1A4A3-15. Set front panel FREQUENCY switches to 29.9999 MHz. Adjust 1A4A3R54 for 600 mV peak-to-peak.

(9) Remove card extender and reinstall Translator 1A4A3. Reinstall Synthesizer protective cover. Reinstall receiver-transmitter top cover. Remove dummy load.

d. VHF VCO CCA 1A4A 5Adjustment.

(1) Remove receiver-transmitter top cover. Remove Synthesizer protective cover Remove receiver transmitter bottom cover. Remove six front panel mounting screws. Lay front panel forward. Connect a 50 ohm dummy load to receiver-transmitter ANT jack. (See Fig 4-17 for adjustment points.) Remove VHF Divider CCA 1A4A4.

(2) Band "O" Adjustment

(a) Connect frequency counter to 1st Local Oscillator output 1A4A5J1 Inject + 1.95 VDC, from a bench power supply, at 1A4A5-4.

(b) Set front panel 10 MHz and 1 MHz frequency selectors to 0. Adjust 1A4A5L1 for 91.75 ± 0.2 MHz.

(c) Set front panel 1 MHz frequency selector only, to 9. Adjust 1A4A5C16 for 100.75 ± 0.75 MHz.

(d) Repeat steps (b) and (c) above until both frequency adjustments are within tolerance simultaneously.

(3) Band "1" Adjustment

(a) Connect frequency counter to 1st Local Oscillator output 1A4A5J1. Inject +1.95 VDC, from a bench power supply, at 1A4A5-4.

(b) Set front panel 10 MHz frequency selector to

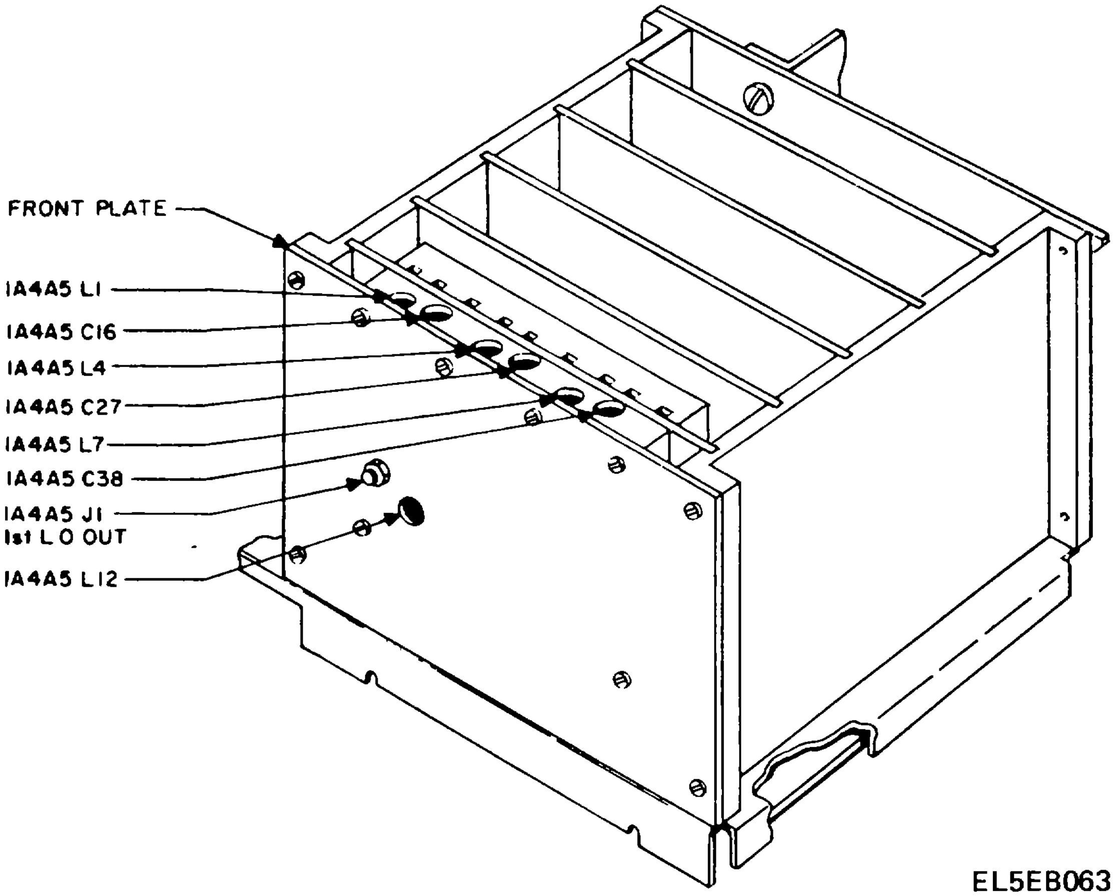


Figure 4-17. VHF VCO CCA Adjustment Points

1. Set front panel 1 MHz frequency selector to 0 Adjust 1A4A5L4 for 101.75 ± 0.2 MHz.

(c) Set front panel 1 MHz frequency selector only to 9 Adjust 1A4A5C27 for 110.75 ± 0.75 MHz.

(d) Repeat step (b) and (c) above until both frequency adjustments are within tolerance simultaneously.

(4) Band "2" Adjustment

(a) Connect frequency counter to 1st Local Oscillator output 1A4A5J1. Inject + 1.95 VDC, from a bench power supply, at 1A4A5-4.

(b) Set front panel 10 MHz frequency selector to 2. Set front panel 1 MHz frequency selector to 0. Adjust 1A4A5L7 for 111.75 ± 0.2 MHz

(c) Set front panel 1 MHz frequency selector only, to 9 Adjust 1A4A5C38 for 120.75 ± 0.75 MHz.

(d) Repeat steps (b) and (c) above until both frequency adjustments are within tolerance simultaneously.

(5) 1st Local Oscillator Output Level

(a) Connect VTVM (AC) (w/50 ohm termination) to 1st Local Oscillator output 1A4A5-J1. Inject + 1.95 VDC, from a bench power supply, at 1A4A5-4. Connect a 47 ohm, 1/2 or 1/4 watt, resistor between 1A4A5-2 and ground.

(b) Set front panel 10 MHz frequency selector to 1. Set front panel 1 MHz frequency selector to 6. Adjust 1A4A5L12 for approximately 225 mV RMS. Minimum acceptable output is 100 mV RMS.

(c) Record VTVM reading 1 MHz frequency selector set to 0. Record RF voltmeter reading with 10 MHz frequency selector set to 2 and 1 MHz frequency selector set to 9.

(d) Readjust 1A4A5L12 as necessary so the VTVM readings are within 3 dB of each other in steps (b) and (c) above.

(e) Remove 47 ohm resistor between 1A4A5-2 and ground.

(6) Remove dummy load. Reinstall VHF Divider CCA 1A4A4. Reinstall Synthesizer protective cover. Reinstall receiver-transmitter bottom cover. Reinstall receiver-transmitter top cover. Reinstall front panel.

e. VHF Mixer CCA 1A3AI Adjustments.

(1) Remove receiver-transmitter top cover Remove Receiver/Exciter protective cover. Place VHF Mixer CCA on card extender. Connect RF signal generator to ANT jack 1A8J1 Set RF signal generator to 16 MHz.

(2) Set front panel frequency switches to 16 MHz. Set mode switch to USB Adjust front panel RF GAIN control for an S9 reading on the ANTENNA COUPLER CONTROL S meter 1A2M1.

(3) Set RF signal generator level to 10 mV and adjust signal generator frequency until a tone is heard from the receiver speaker.

(4) Alternately adjust 1A3A1C41 and C44 for a maximum peak on S meter 1A2M1.

(5) Alternately adjust 1A3AlT7 and T8 for a maximum peak on S meter 1A2M1.

(6) Readjust 1A3A1T7 and 1A3A1C44 for maximum S meter, 1A2M1, peak.

(7) Remove card extender and install VHF Mixer CCA 1A3A1 Reinstall Receiver/Exciter protective cover. Reinstall receiver-transmitter top cover.

f. IF/Filter CCA 1A3A2Adjustment.

(1) Remove receiver-transmitter top cover Remove Receiver/Exciter protective cover. Place IF/Filter CCA on card extender Connect RF signal generator to ANT jack 1A8J1. Set RF signal generator to 16 MHz.

(2) Set front panel frequency switches to 16 MHz. Set mode switch to USB. Adjust front panel RF GAIN control for an S9 reading on the ANTENNA COUPLER CONTROL S meter 1A2M1.

(3) Set RF signal generator level to 10 mV and adjust signal generator frequency until a tone is heard from the receiver speaker.

(4) Alternately adjust 1A3A2L3 and L4 for a maximum peak on S meter 1A2M1.

(5) Remove card extender and reinstall IF/Filter CCA 1A3A2. Reinstall Receiver/Exciter protective cover. Reinstall receiver-transmitter top cover.

g. Sideband Generator CCA 1A3A3 Adjustment.

(1) Remove receiver-transmitter top cover Remove Receiver/Exciter protective cover. Place Sideband Generator CCA 1A3A3 on card extender. Connect a 50 ohm dummy load to ANT jack 1A8J1. Connect VTVM (AC) across the dummy load.

(2) Balanced Modulator Tuning.

(a) Rotate 1A3A3R34 fully counterclockwise. Then turn 1A3A3R34 approximately 8 turns clockwise Set front panel XMT GAIN fully counterclockwise. Set mode switch to USB.

(b) Using microphone, key transmitter and observe VTVM. With transmitter keyed, adjust 1A3A3T1 for maximum output reading on VTVM.

(c) Remove card extender and reinstall Sideband Generator CCA 1A3A3. Rotate XMIT GAIN control fully counterclockwise Set mode switch to USB.

(d) Alternately adjust 1A3A3R34 and 1A3A3C26 for minimum output reading on VTVM.

(3) ALC Adjustment Set front panel frequency switches to 16 MHz. Set mode switch to CW. Key transmitter and adjust 1A3A3R55 for 71 volts RMS output on VTVM.

(4) ACC Adjustment Set mode switch to AM. Adjust 1A3A3R18 for 42 volts RMS output on VTVM.

(5) Remove card extender and reinstall Sideband Generator CCA 1A3A3. Reinstall Receiver/Exciter protective cover. Reinstall receiver-transmitter top cover. Remove dummy load.

4-19. Antenna Coupler CU-2229/URC-92 Adjustments

The following adjustments are not intended as a means of checkout or troubleshooting. If an adjustment cannot be performed, troubleshoot using conventional troubleshooting methods. Refer to List of Illustrations for required schematic figure numbers.

a. C MAX/C MIN Limit Switch Adjustments (Fig 4-18)

(1) Remove case from Antenna Coupler CU-2229/URC-92. Remove Phase and Amplitude Control CCA 2A2. Remove 2M1/2C1 drive belt (2).

(2) Connect multimeter between 2XA2-11 and chassis ground. Rotate capacitor shaft (3) counterclockwise (viewed from pulley end) until shaft just begins to leave capacitor end plate.

NOTE

Shaft will rotate more freely at the point where it begins to leave the capacitor end plate

Rotate shaft (3) clockwise (viewed from pulley end) two complete turns

(3) Adjust C MAX plunger (1) to activate C MAX 2S4 (meter indicates short) at this shaft position.

(4) Connect multimeter between 2XA2-8 and chassis ground. Rotate shaft (3) clockwise (viewed from pulley end) 15 complete turns.

(5) Adjust C MIN plunger (4) to activate C MIN 2S3 (meter indicates short) at this shaft position.

(6) Disconnect multimeter and reinstall 2M1/2C1 drive belt. Reinstall Phase and Amplitude Control CCA 2A2. Reinstall antenna coupler in case.

b. L MAX and L MIN Limit Switch Adjustments.

(Fig 4-19)

(1) Remove case from Antenna Coupler CU-2229/URC-92.

(2) Connect multimeter between L MAX plunger.

(3) and chassis ground Rotate inductor to move roller (2) in contact with L MAX plunger. Stop when roller/plunger contact causes meter to indicate a short.

(3) Check the distance from the roller to the end

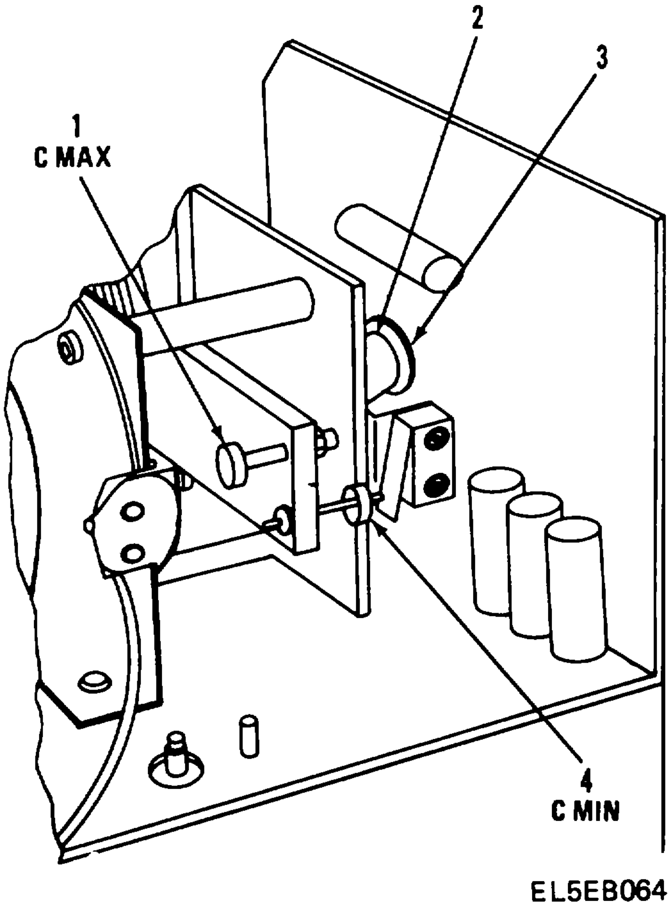


Figure 4-18. CMAX/C MIN Adjustment Locator

of the coil wire. It should be between 1/4 and S/4 inch. If not, move roller (2) away from plunger and adjust plunger length as necessary. Repeat steps 2 and 3 until adjustment is within tolerance.

(4) Connect multimeter between L MIN plunger (1) and chassis ground. Rotate inductor to move roller (2) in contact with L MIN plunger. Stop when roller/plunger contact causes meter to indicate a short.

(5) Check the distance from the roller to the end of the coil wire. It should be between 1/ and /4 inch. If not, move roller (2) away from plunger and adjust plunger length as necessary. Repeat steps 4 and 5 until adjustment is within tolerance. Reinstall antenna coupler in case.

c. *Amplitude Detector Adjustment*. (Fig 4-20)

(1) Remove case from Antenna Coupler CU2229/URC-92. Connect RF and control cables between the Antenna Coupler and Receiver/Transmitter RT-1277/URC-92. Ensure the receiver/transmitter is correctly powered and grounded.

(2) Loosen fasteners and swing Phase and Amplitude Control CCA away from chassis. Disconnect and isolate RF line from terminal post (1). Connect clip leads of a BNC/clip lead cable (fig 4-1) to terminal post (1) and ground post (2) Connect a 50 ohm dummy load to BNC/clip lead cable.

NOTE

Cable clip leads should not exceed 1 inch in length. Overall cable length should not exceed 6 inches.

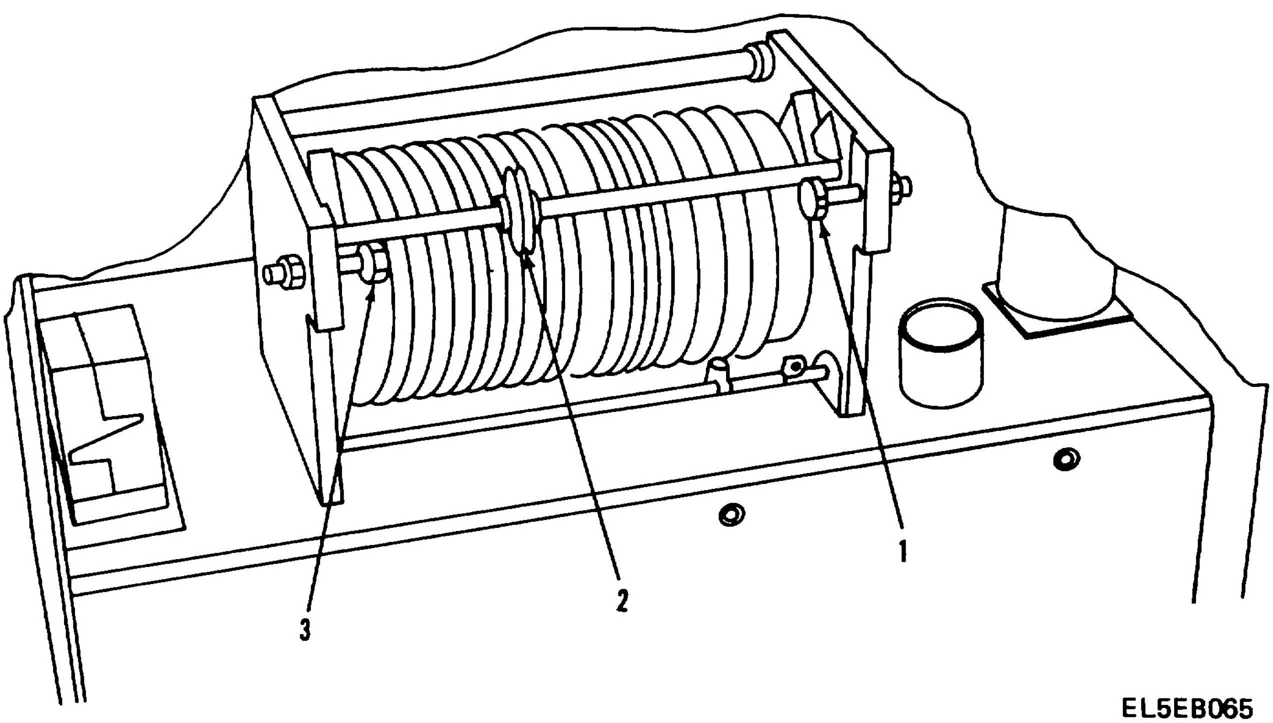


Figure 4-19 LMAX/L MIN Adjustment Locator

NOTE

Ensure VTVM is isolated from ground at the power cord.

(3) Connect VTVM DC between 2A4C20 (5) and 2A4C21 (3). Set mode switch to AM. Set frequency to 1.6 MHz. Key microphone.

(4) Adjust 2A4C1 (4) for a VTVM null indication of 0 VDC + 0.005 VDC.

(5) Unkey microphone. Set mode switch to OFF.

Remove meter and cable.

(6) Swing Phase and Amplitude Control CCA into place and secure fasteners. Reconnect RF line to terminal post (1). Reinstall antenna coupler in case.

d. *Phase Detector Adjustment*. (Fig 4-21)

(1) Remove case from Antenna Coupler CU2229/URC-92. Connect RF and control cables between the antenna coupler and Receiver/Transmitter RT-1277/URC-92. Ensure the receiver/transmitter is correctly powered and grounded.

(2) Loosen fasteners and swing Phase and Amplitude Control CCA away from chassis. Disconnect and isolate RF line from terminal post (1). Connect clip leads of a BNC/clip lead cable to terminal post (1) and ground post (2). Connect a 50 ohm dummy load to BNC/clip lead cable.

NOTE

Cable clip leads should not exceed 1/2 inch in length. Overall cable length should not exceed 6 inches.

Ensure VTVM is isolated from ground at the power cord.

(3) Connect VTVM DC between 2A4C17 (4) and 2A4C19 (5). Set mode switch to AM. Set frequency to 1.6 MHz. Key microphone.

(4) Adjust 2A4R5 (3) for a VTVM null indication of O VDC ± 0.1 VDC.

NOTE

When adjusting the phase detector output, it may not be possible to adjust a 0 VDC null at both 1 6 MHz and 29.9 MHz. If not, 2A4R5 should be adjusted for a negative at 1.6 MHz equal to the positive at 29.9 MHz. Neither signal should exceed the 0.1 VDC tolerance from 0 VDC.

(5) Set frequency to 29.9 MHz. Adjust 2A4R5 (3) for a VTVM null indication of 0 VDC + 0.1 VDC.

(6) Set frequency to 1.6 MHz and recheck VTVM null indication. If not within tolerance, readjust 2A4R5 as indicated in NOTE above.

(7) Unkey microphone. Set mode switch to OFF.

Remove meter and cable.

(8) Swing Phase and Amplitude Control CCA into place and secure fasteners. Reconnect RF line to terminal post (1). Reinstall antenna coupler in case.

4-20. Antenna Coupler Lubrication

Approximately every twelve months (6 months in salty atmospheres) the antenna coupler should be lubricated as follows. Remove the case from Antenna Coupler CU-2229/URC-92. Apply a small amount of type G molybdenum grease to the roller bar. Also apply the molybdenum grease on the end bearings or roller inductor 2L4. Operate 2L4 thru its full range several times to evenly distribute the grease. Lubricate the threaded shaft or variable capacitor 2C1 with molybdenum grease or a light weight petroleum base grease. Reinstall case on antenna coupler.

4-21. Conversion Requirements for 13/26 VDC Operation

Refer to Operator and Organizational Maintenance Manual, TM 11-5820-873-12.

4-22. Conversion Requirements for 115, 230/132, 264 VAC Operation

Refer to Operator and Organizational Maintenance Manual, TM 11-5820-873-12.

Section V. ADMINISTRATIVE STORAGE

4-23. Prepare the AN/URC-92 for administrative storage in accordance with the following

a. Perform the Preventive Maintenance Checks and Services outlined in Chapter 4.

b. Perform the Preventive Maintenance Checks and Services outlined in this chapter.

c. Place all loose components in a plastic bag and secure the bag to one of the handles on the RT1277/URC-92.

d. The RT-1277/URC-92 and the CU2229/URC-92 are completely sealed and do not require any special storage precautions. The units may be stored in temperatures ranging from 55 to 85°C at humidities up to 100% without damage.

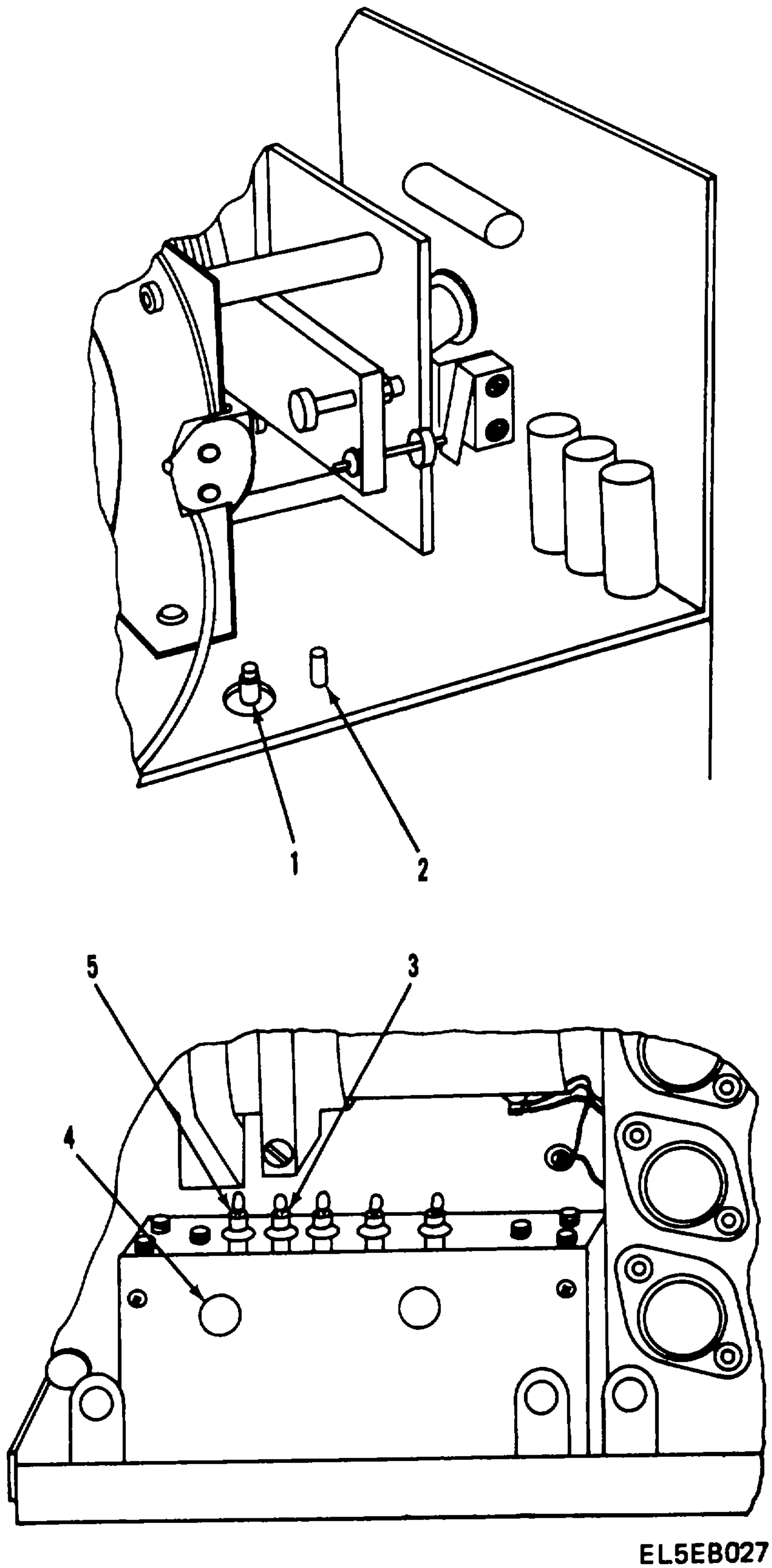


Figure 4-20. Connection and Adjustment Points - Amplitude Detector Adjustment

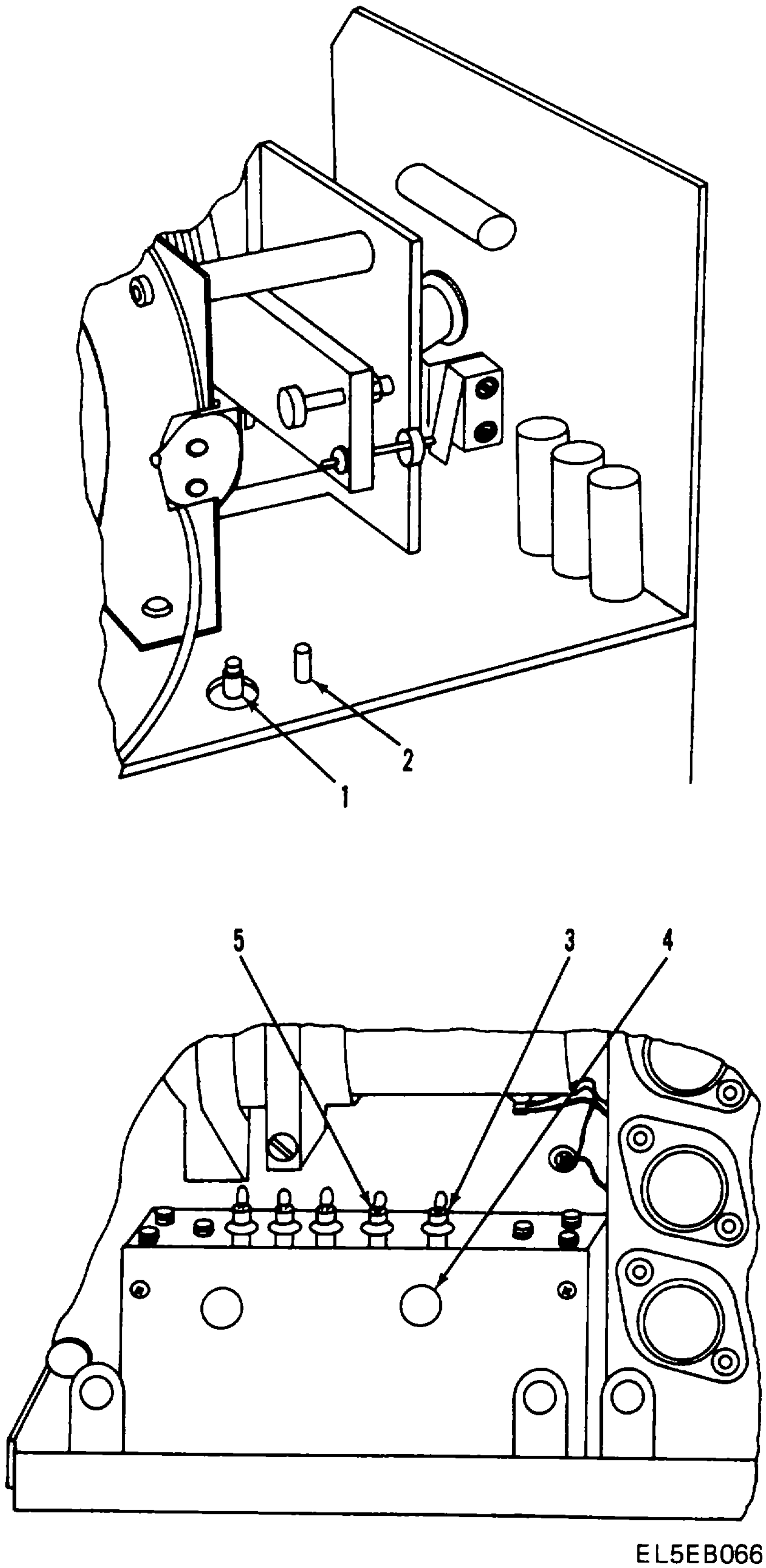
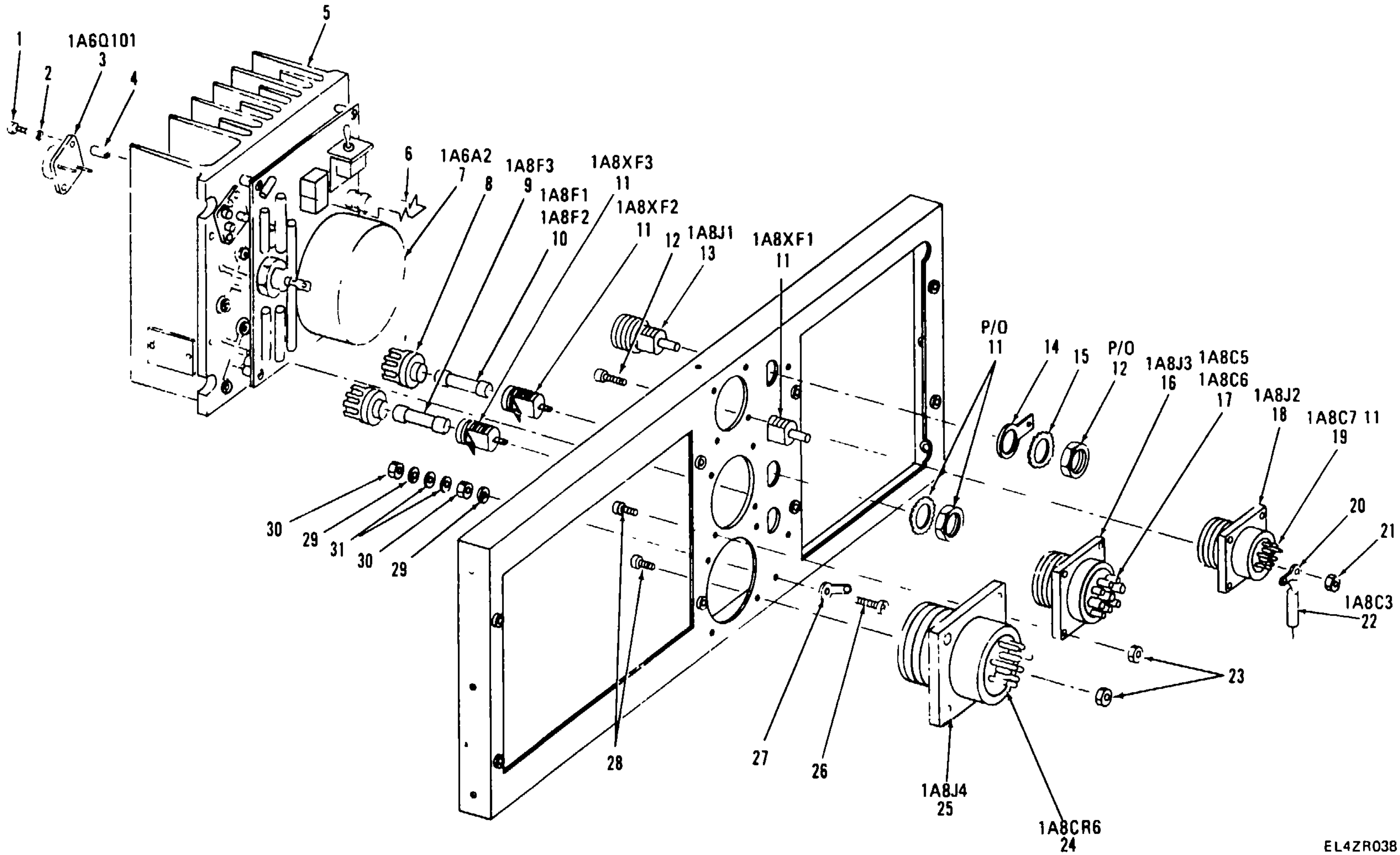
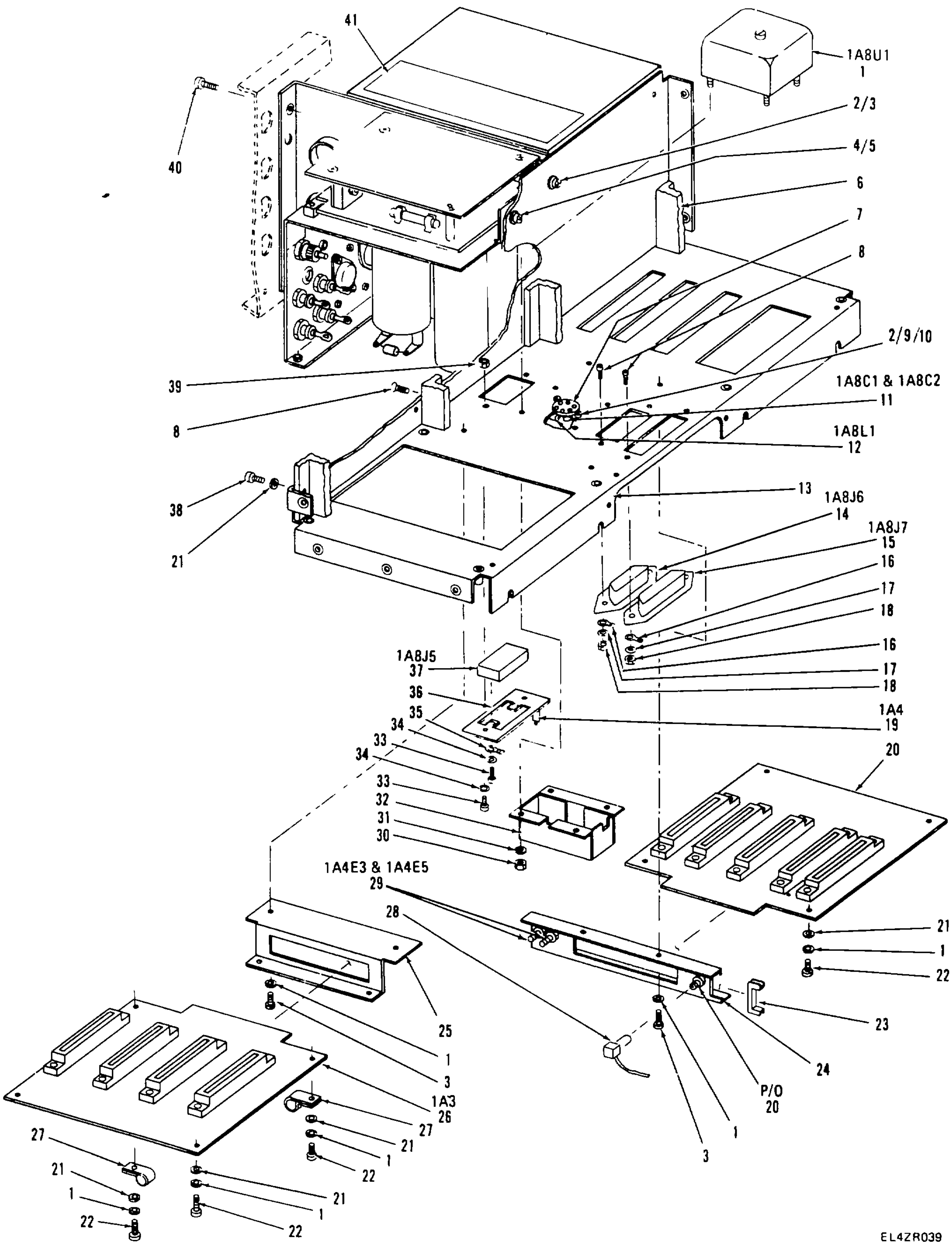


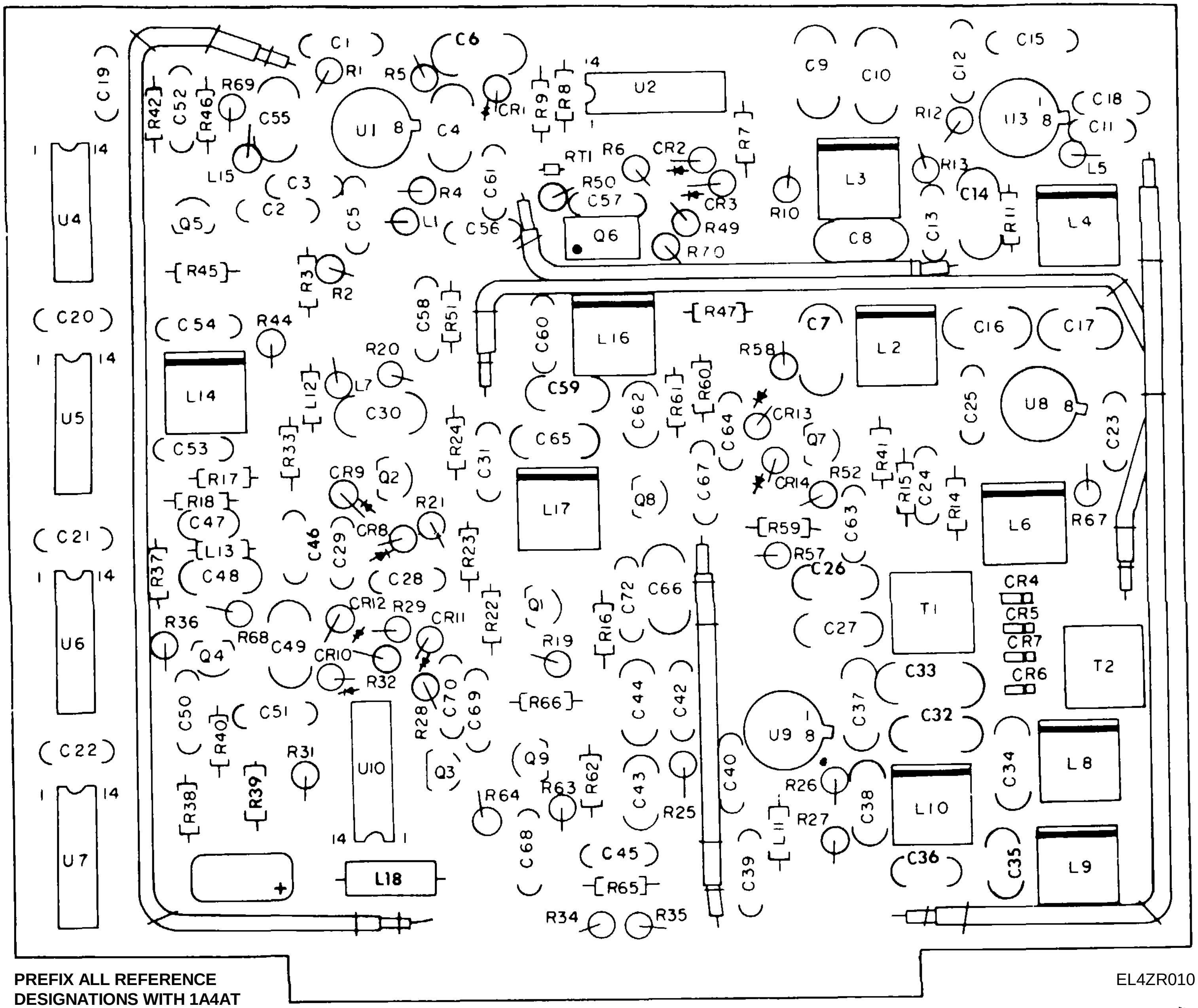
Figure 4-21 Connection and Adjustment Points - Phase Detector Adjustment



4-22 Back-Panel-Exploded View



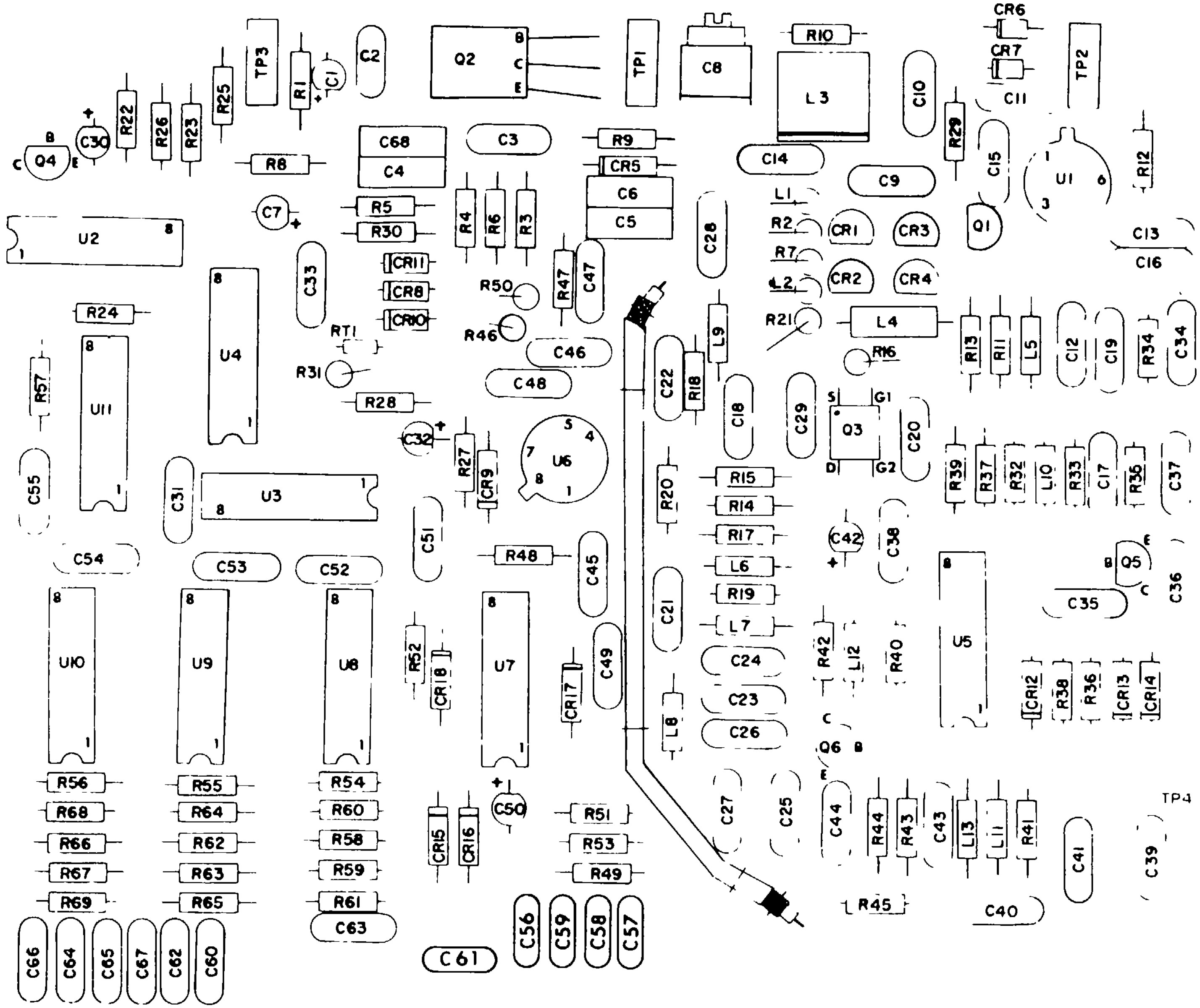
4-23 Receiver-Transmitter-Center



PREFIX ALL REFERENCE DESIGNATIONS WITH 1A4AT

EL4ZR010

4-24 Spectrum Generator Circuit Card Assembly (CCA)



PREFIX ALL REFERENCE
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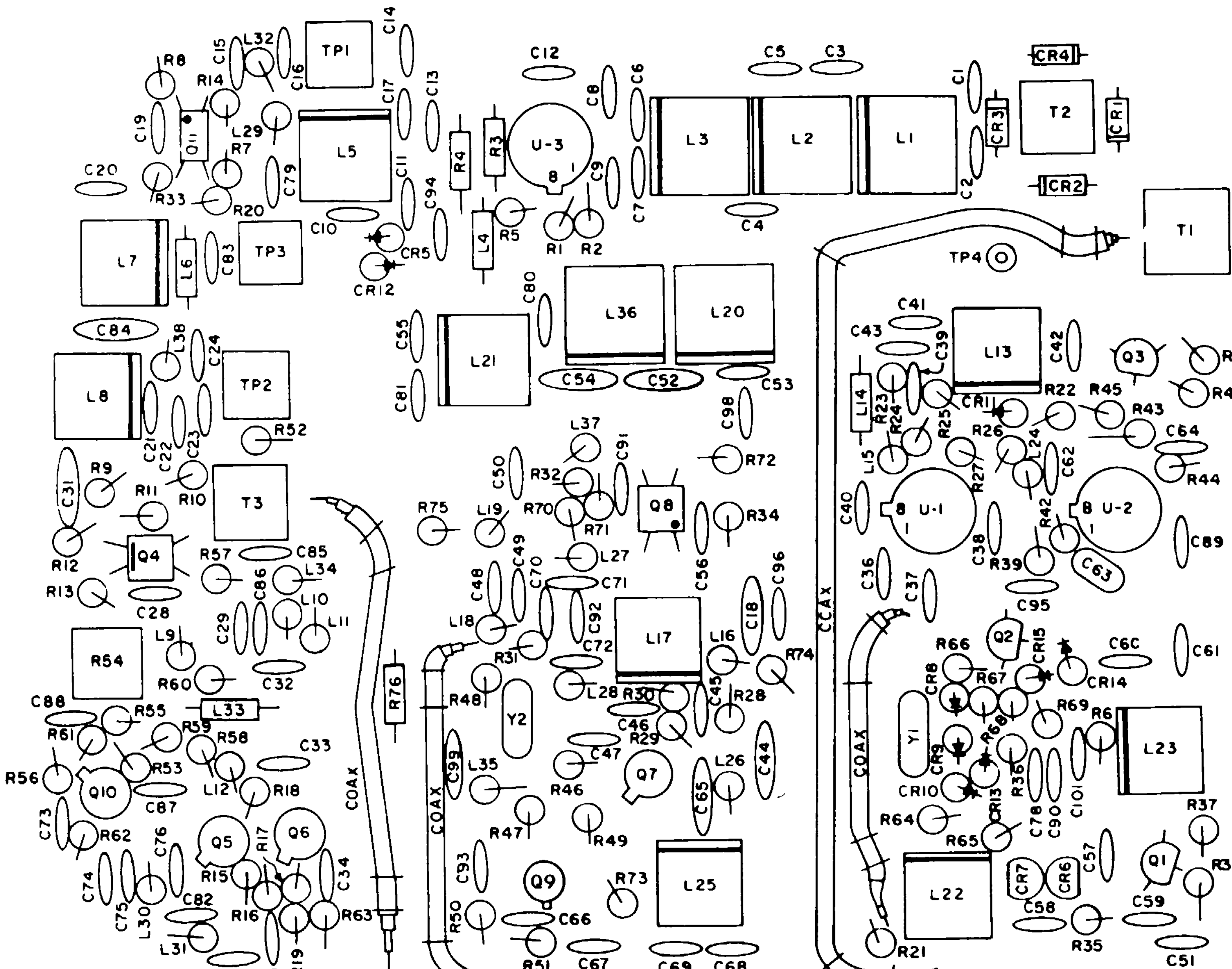
4-25 Low Digit Generator (CCA)



PREFIX ALL REFERENCE
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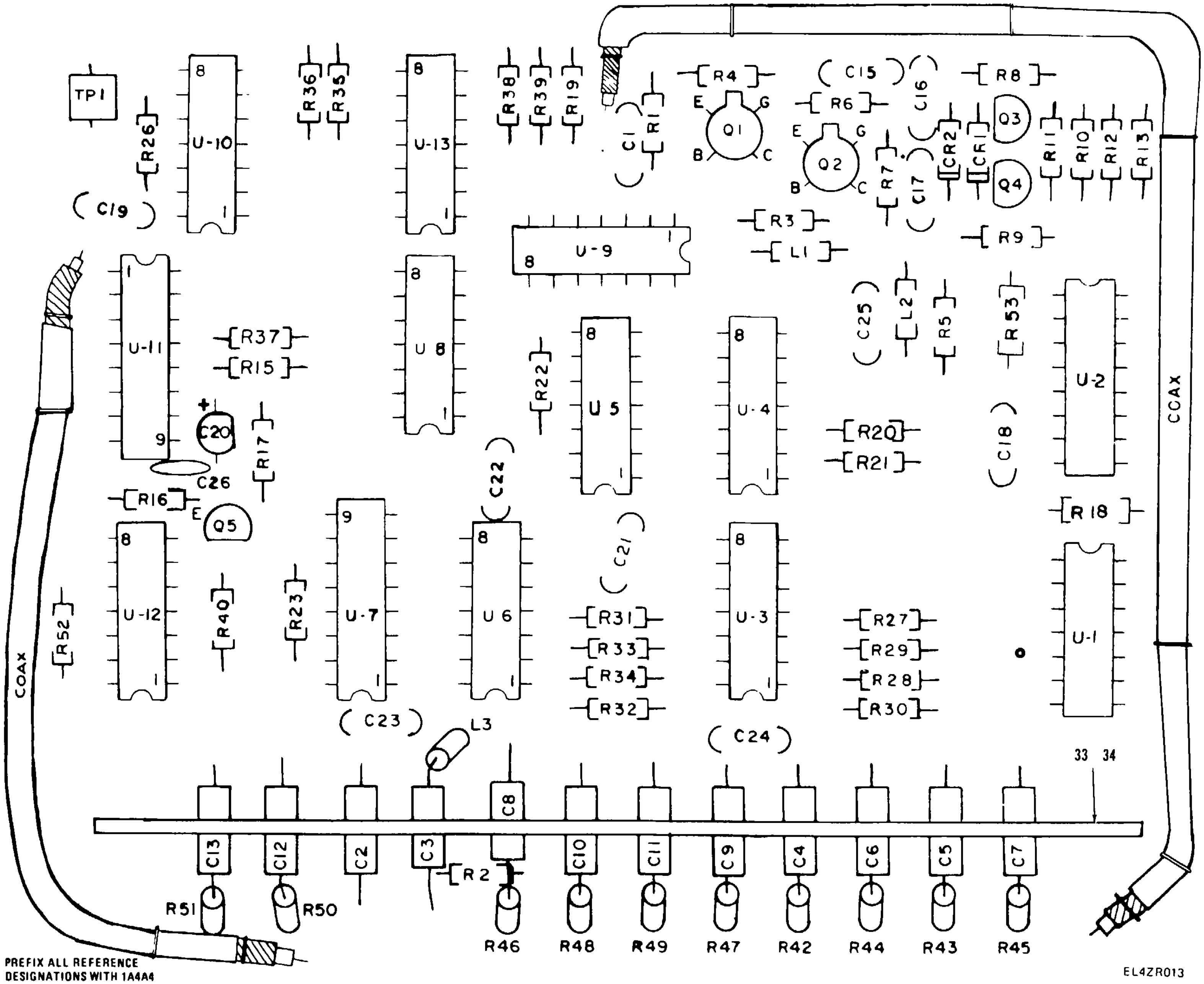
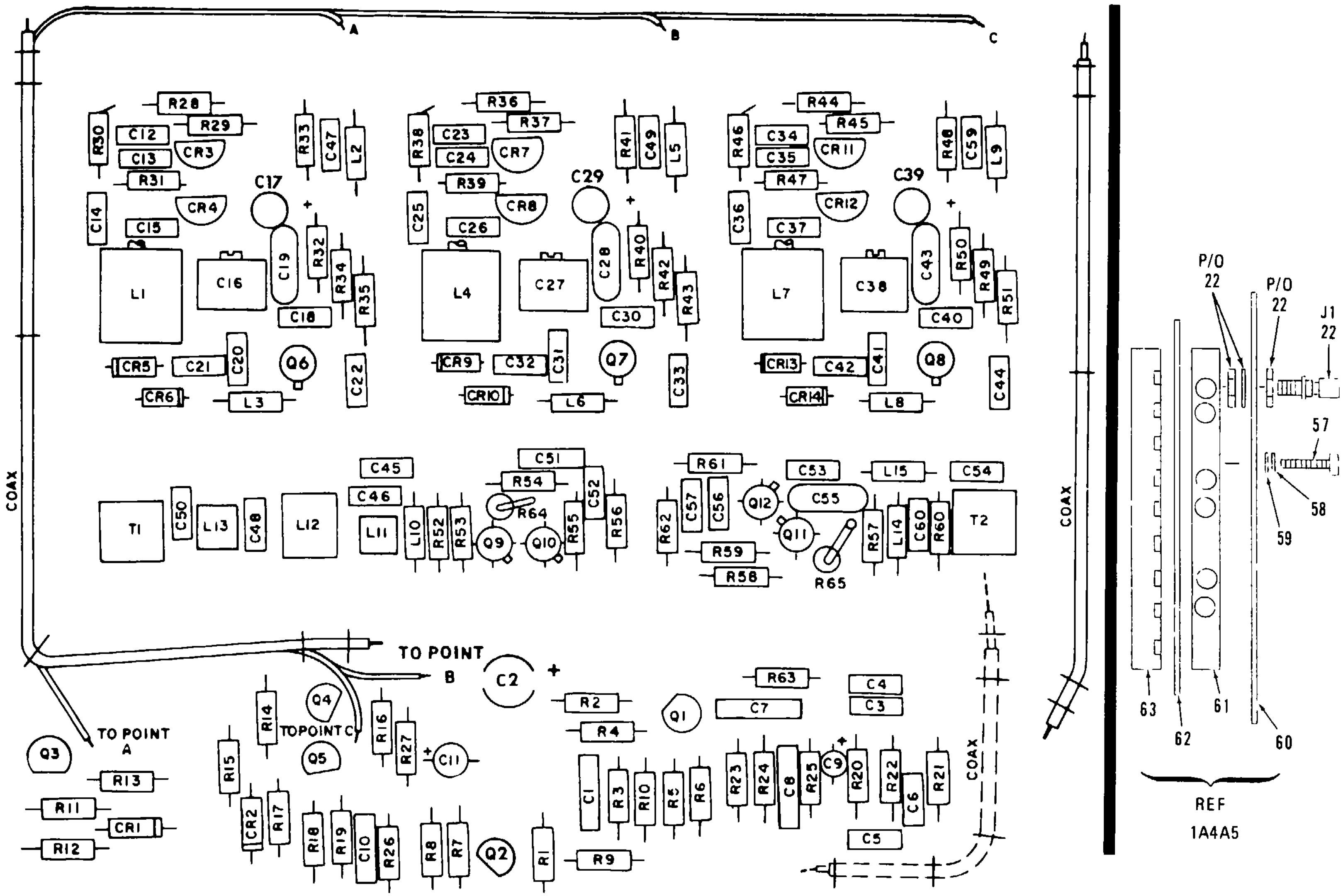
EL4ZR012

4-26 Translator(CCA)



4-27 VHF Divider (CCA)



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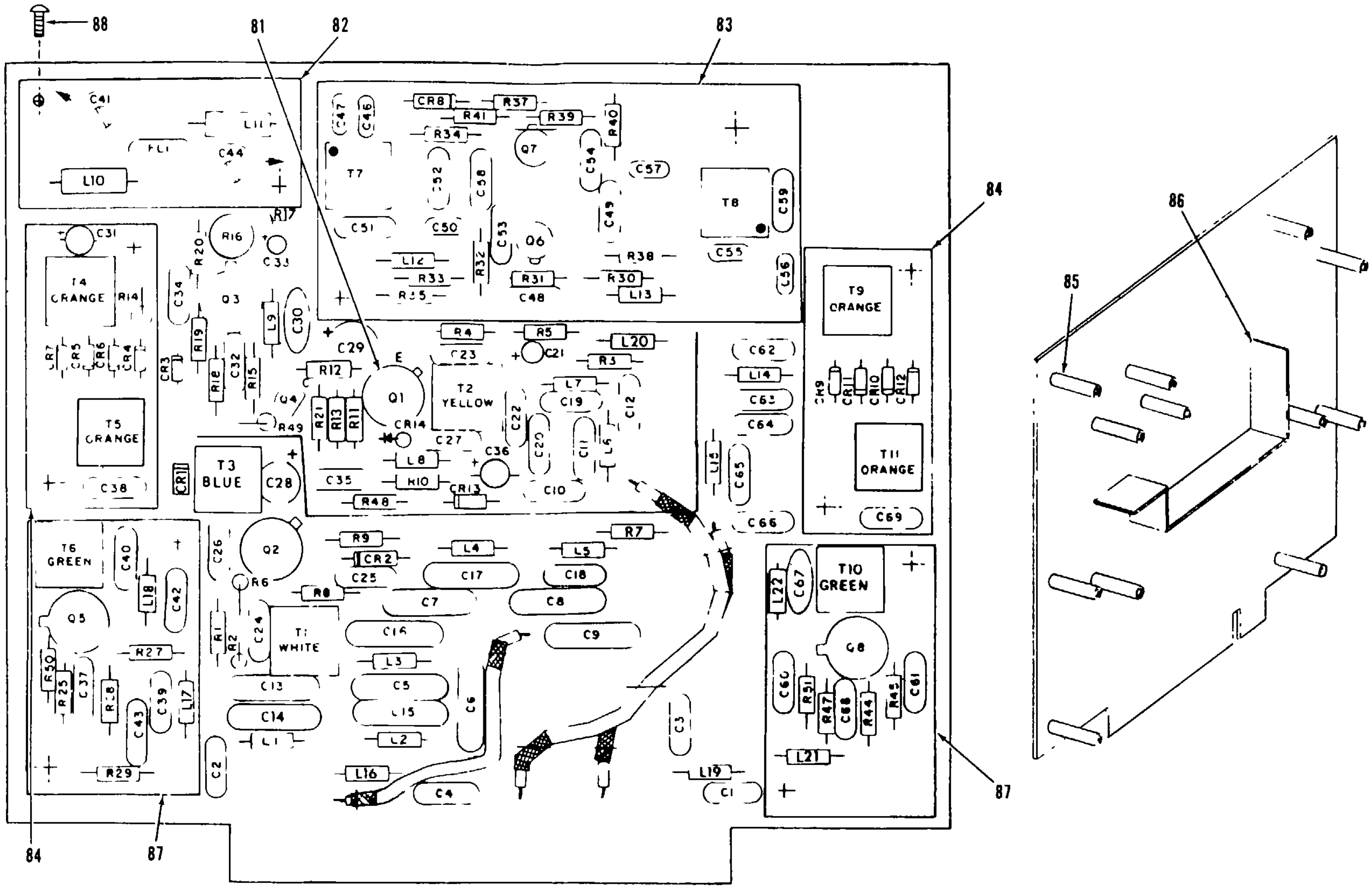
EL4ZR014

4-28 VHF VCO(CCA)



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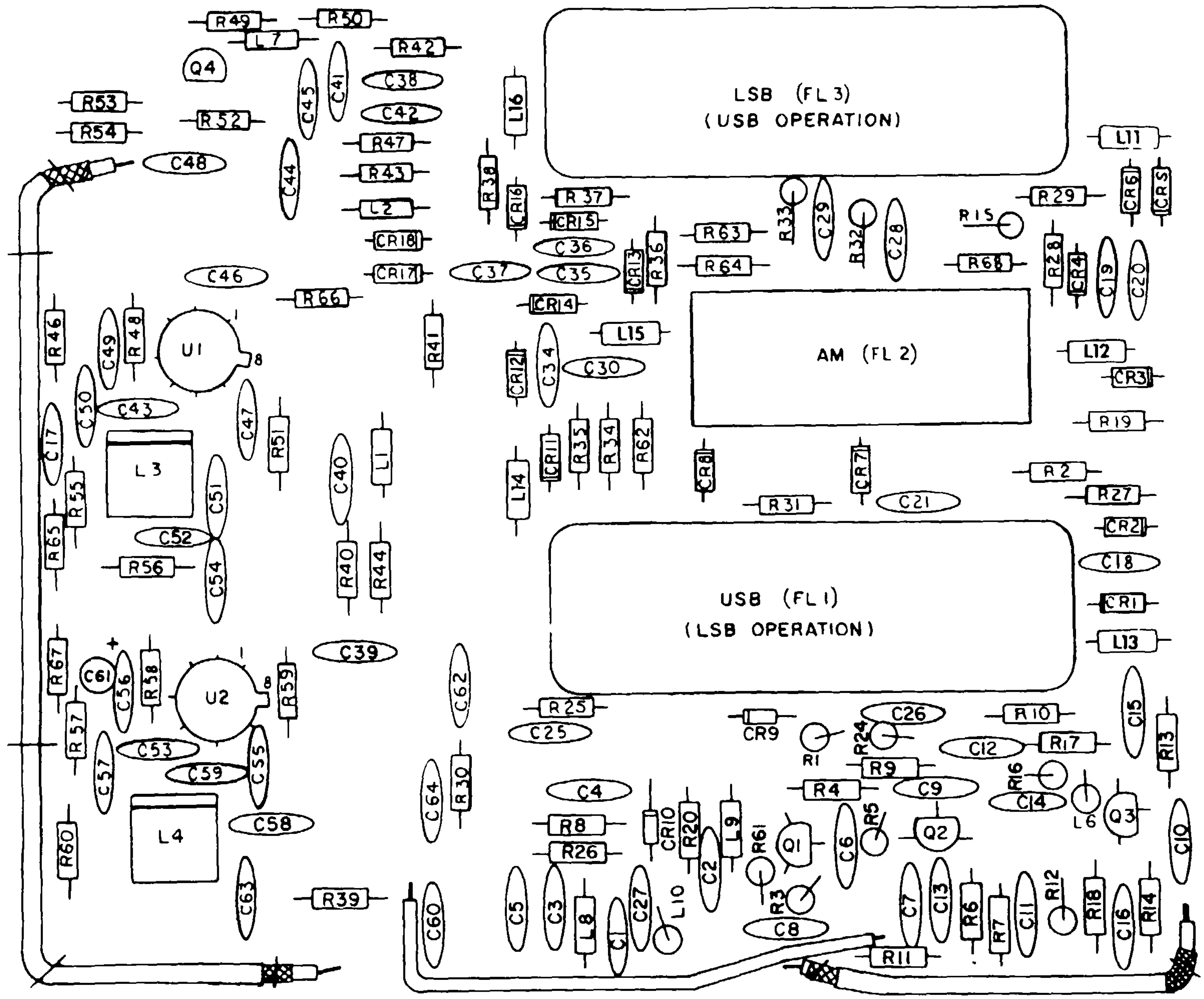
ELZR015

4-29 VHF Mixer(CCA)



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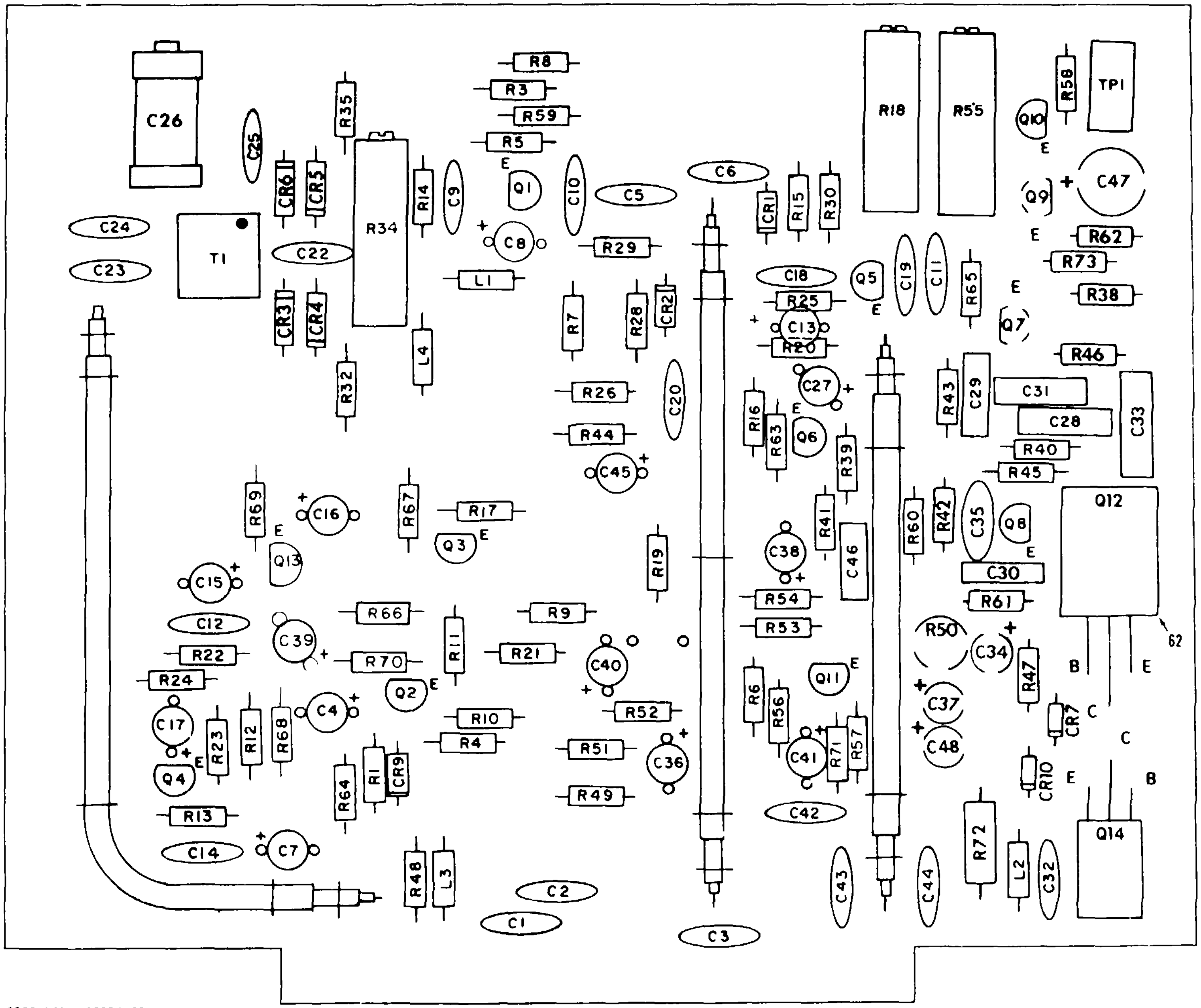
EL4ZR016

4-30 IF Filter(CCA)



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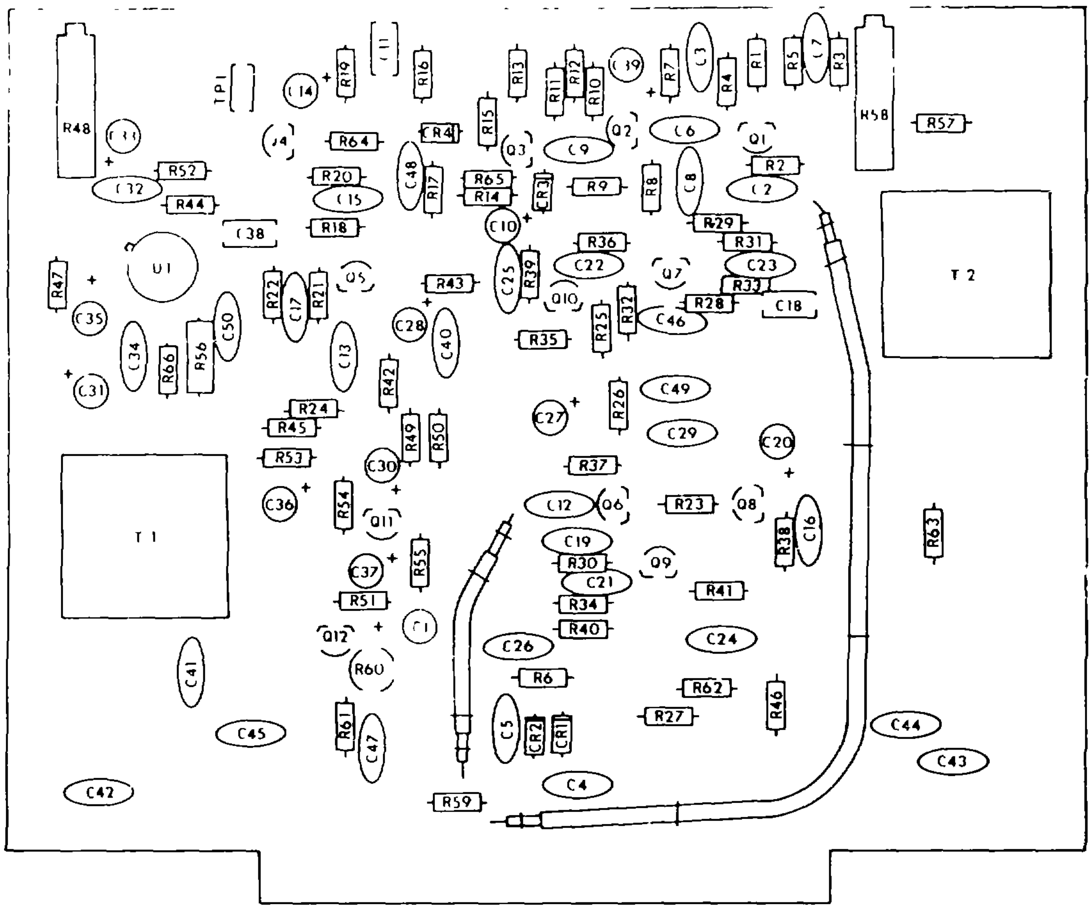
EL47R017

4-31 Sideband Generator (CCA)



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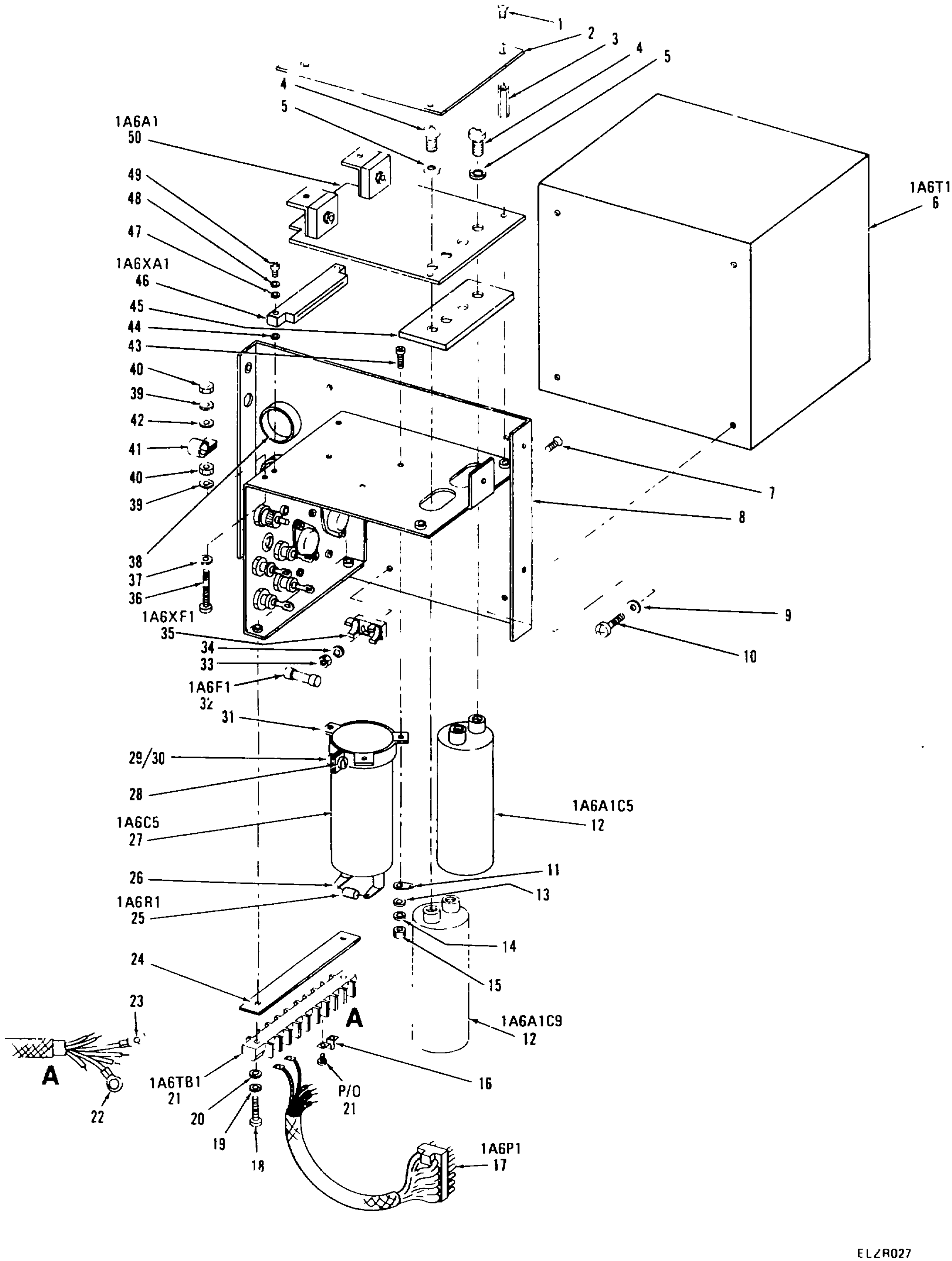
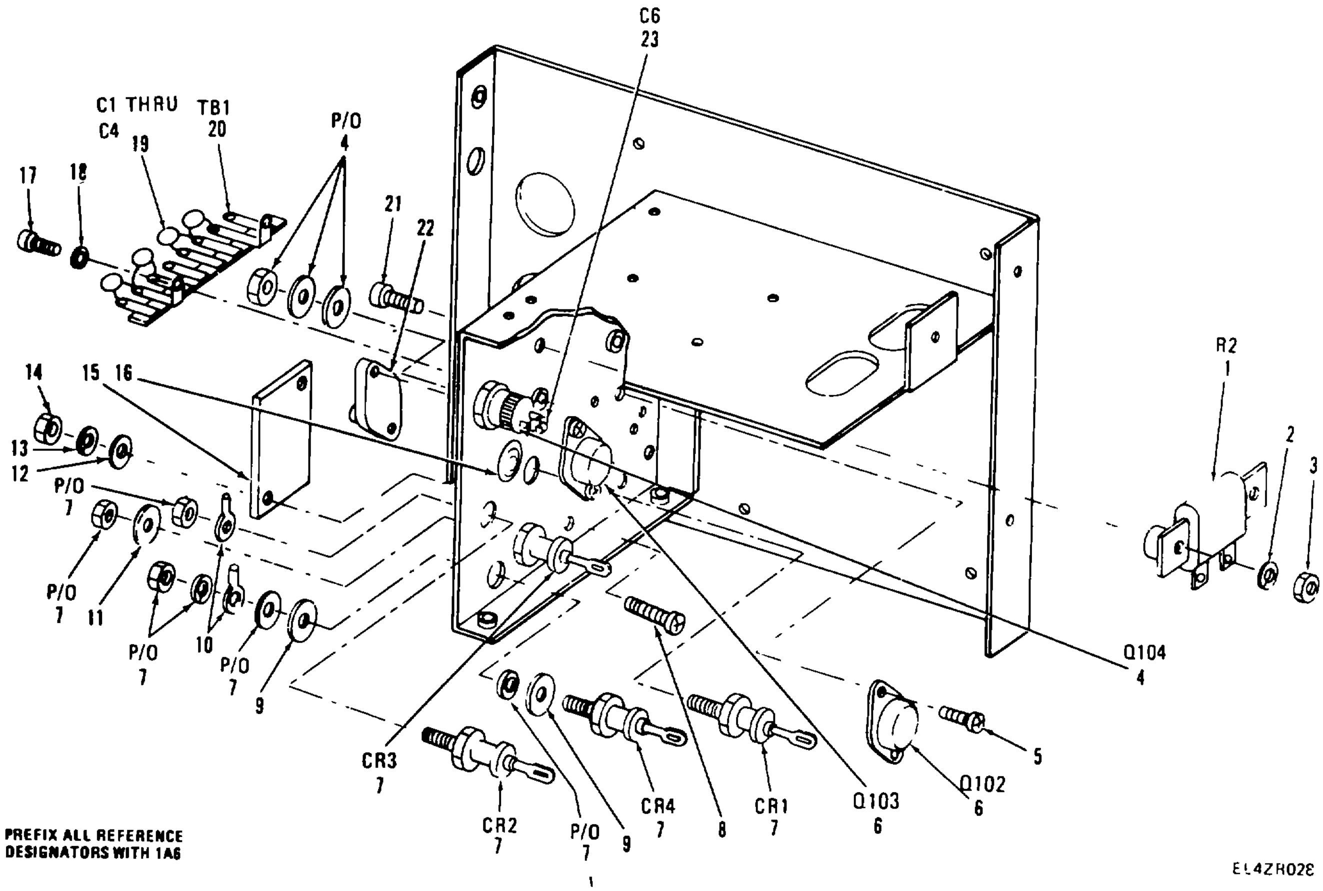
C2	2	C18	4	C34	2	CR1	9	R2	13	R19	28	R36	37	R54	29
C3	2	C19	2	C35	7	CR2	9	R3	14	R20	29	R37	13	R55	17
C4	2	C20	3	C36	6	CR3	9	R4	15	R2;	30	R38	19	R56	43
C5	2	C21	2	C37	1	CR4	9	R5	16	R22	31	R39	31	R57	39
C6	2	C22	2	C38	4	Q1	10	R6	17	R23	24	R40	37	R58	44
C7	2	C23	2	C39	3	Q2	10	R7	18	R24	15	R41	13	R59	24
C8	2	C24	2	C40	2	Q3	10	R8	19	R25	17	R42	20	R60	45
C9	2	C75	2	C41	2	Q4	10	R9	16	R26	32	R43	32	R61	29
C10	3	C26	2	C42	2	Q5	11	R10	20	R27	14	R44	38	R62	15
C11	4	C27	6	C43	2	Q6	10	R11	21	R28	33	R45	39	R63	40
C12	5	C28	6	C44	2	Q7	10	R12	22	R29	19	R46	27	R64	28
C13	2	C29	2	C45	2	Q8	10	R13	23	R30	34	R47	40	R65	39
C14	3	C30	6	C46	2	Q9	10	R14	24	R31	35	R48	41	R66	46
C15	2	C31	7	C47	2	Q10	10	R15	18	R32	20	R49	33	T1	47
C16	2	C.32	2	C48	2	Q11	10	R16	25	R33	36	R50	27	T2	48
				C49	2	Q12	10	R17	26	R34	20	R51	15	TP1	49
												R52	42	U1	50

EL4ZR018

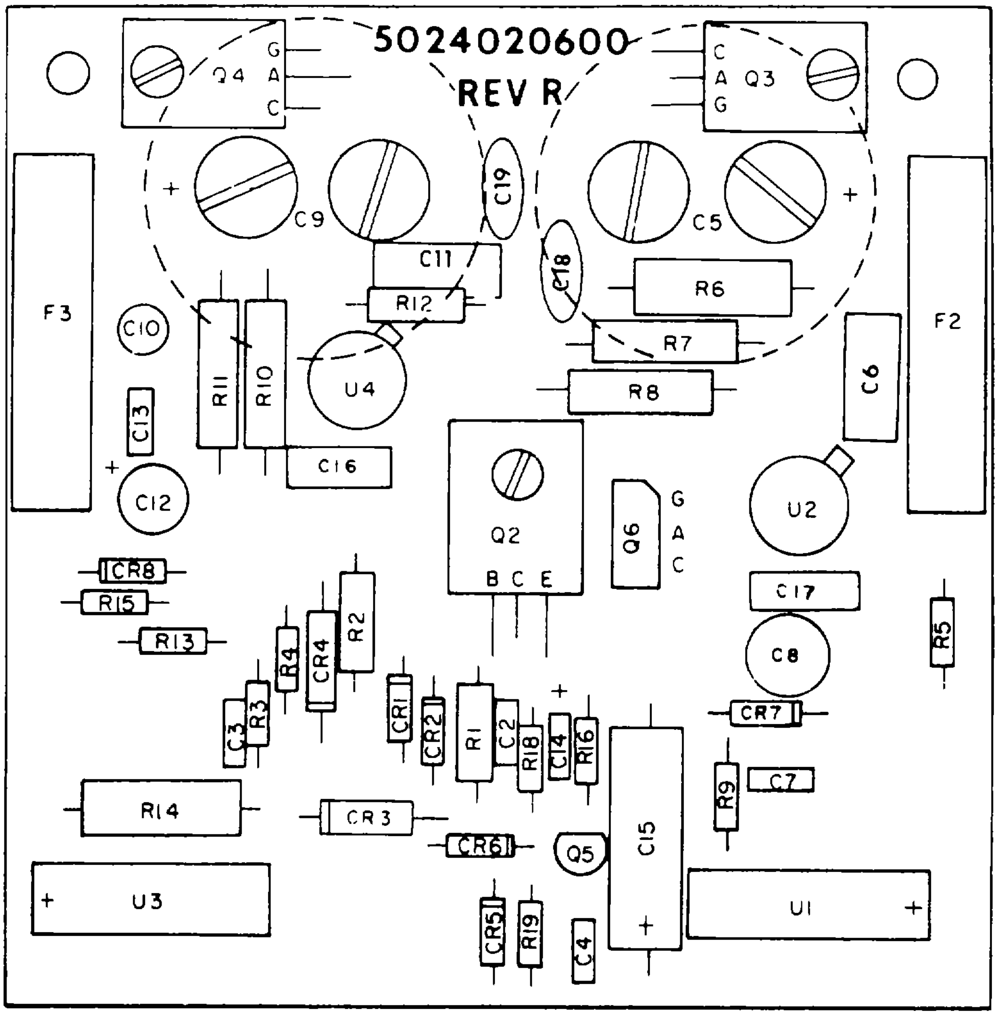
4-32 Audio (CCA)



4-33 Power Supply-Exploded View



4-34 Power Supply Chassis-Exploded View



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C4	1	C16	8	CR7	14	R3	23	R14	25
C6	3	C17	8	CR8	15	R4	24	R15	24
C7	2	C18	9	F2	16	R5	23	R16	24
C8	4	C19	9	F3	16	R6	25	R18	31
C10	5	CR1	10	Q2	17	R7	26	R19	24
C11	3	CR2	10	Q3	18	R8	27	U1	32
C12	4	CR3	11	Q4	18	R9	24	U2	33
C13	2	CR4	12	Q5	19	R10	28	U3	32
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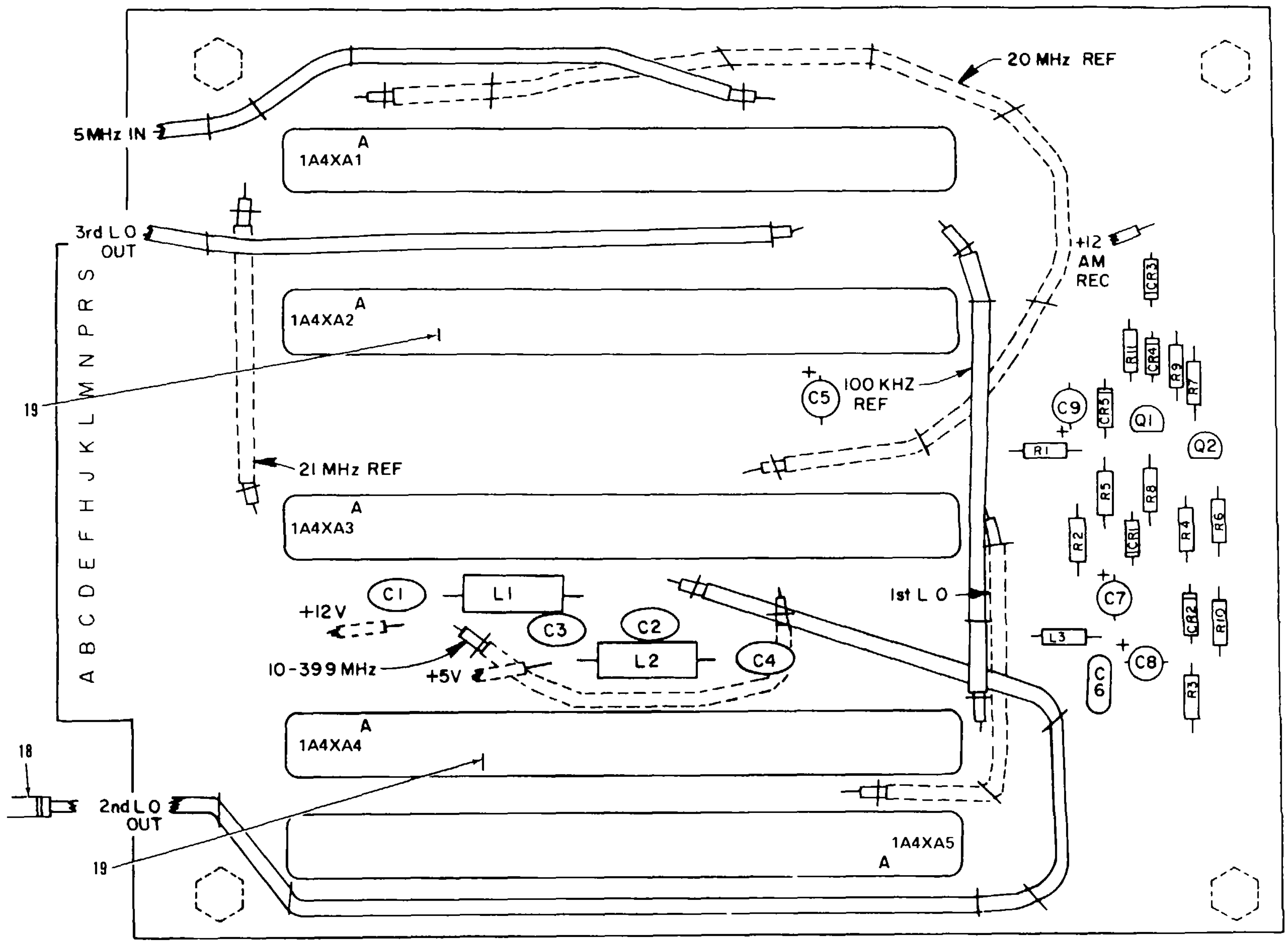
EL4ZR029

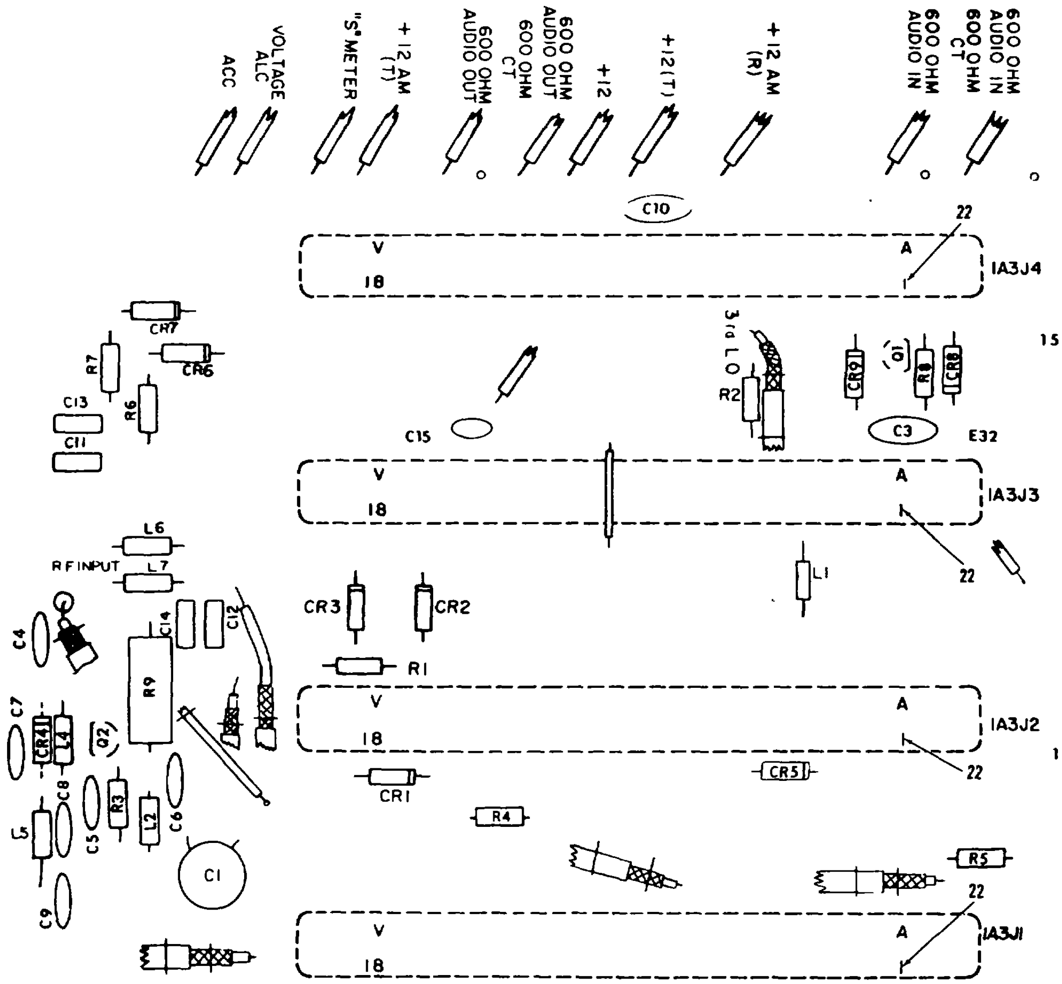
4-35 Regulator Assy



PREFIX ALL REFERENCE
DESIGNATIONS WITH 1A4A6

EL4ZR020

4-36 Synthesizer Mother Board



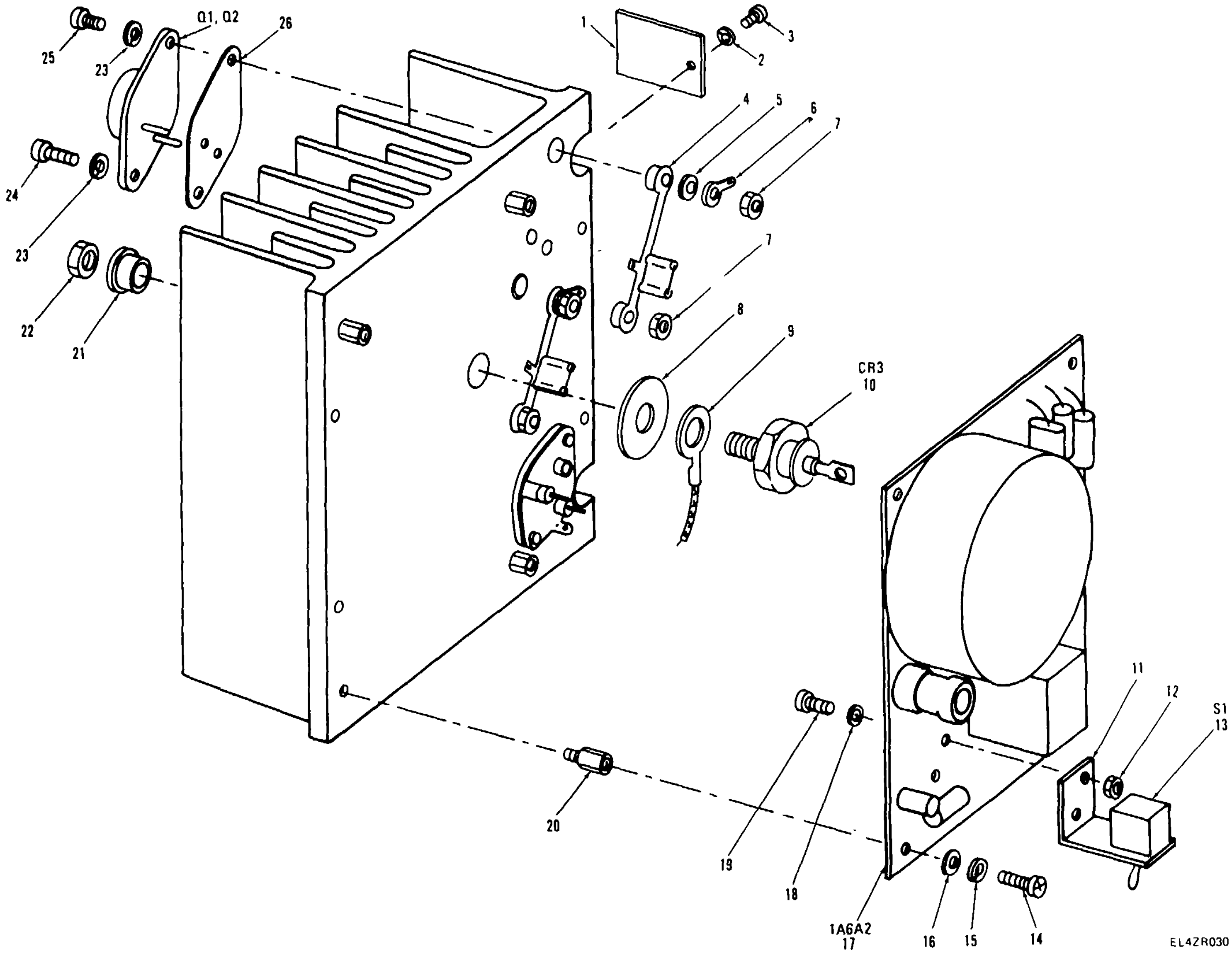
PREFIX ALL REFERENCE DESIONATIONS WITH 1A1A5

LEGEND

REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO
C1	1	C11	3	CR5	7	L1	11	R2	15
C3	2	C12	3	CR6	7	L2	11	R3	16
C4	3	C13	3	CR7	7	L4	11	R4	17
C5	3	C14	3	CR8	7	L5	12	R5	15
C6	3	C15	6	CR9	9	L6	11	R6	18
C7	4	CR1	7	J1	10	L7	11	R7	19
C8	5	CR2	7	J2	10	Q1	13	R8	20
C9	4	CR3	7	J3	10	Q2	13	R9	21
C10	3	CR4	8	J4	10	R1	14		

EL4ZR019

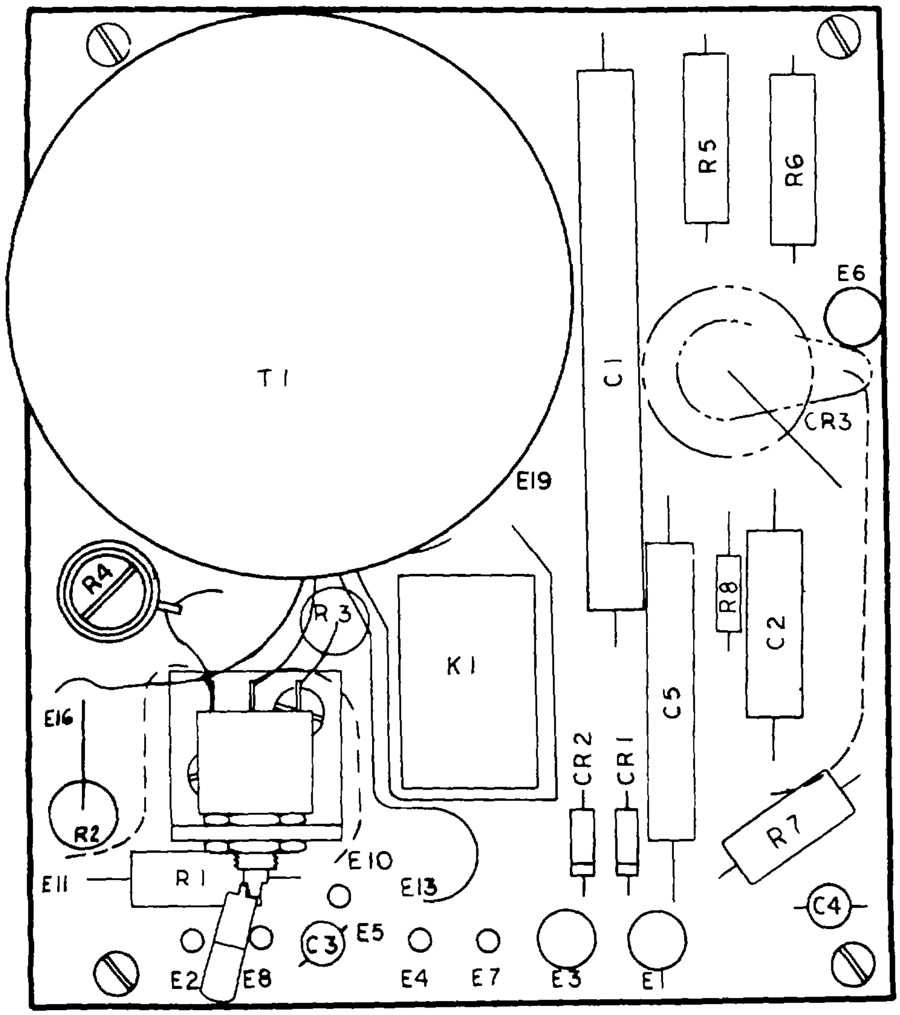
4-37 Receiver/Exciter Mother Board



PREFIX ALL REFERENCE
DESIGNATIONS WITH 1A6A2

EL4ZR030

4-38 DC Inverter-Exploded View



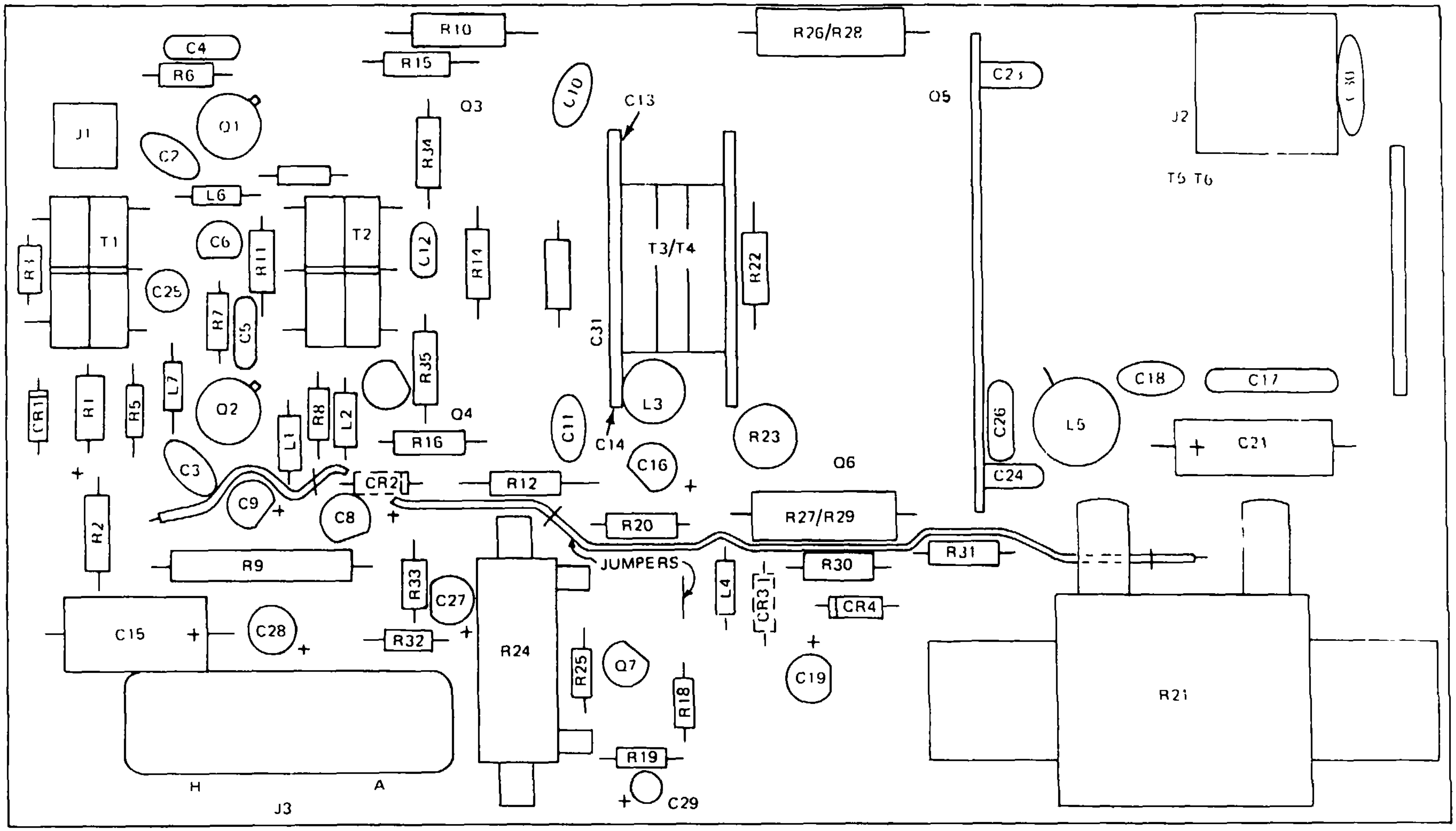
PREFIX ALL REFERENCE DESIGNATIDNSWITH 1A6A2

LEGEND

REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO
C1	1	CR3	6	R5	11	E3	15
C2	2	Q1	7	R6	11	E4	16
C3	3	Q2	7	R7	12	E5	16
C4	3	R1	8	R8	13	E6	15
C5	4	R2	8	T1	14	E7	16
CR1	5	R3	9	E1	15	E8	16
CR2	5	R4	10	E2	16	K1	17

EL4ZR031

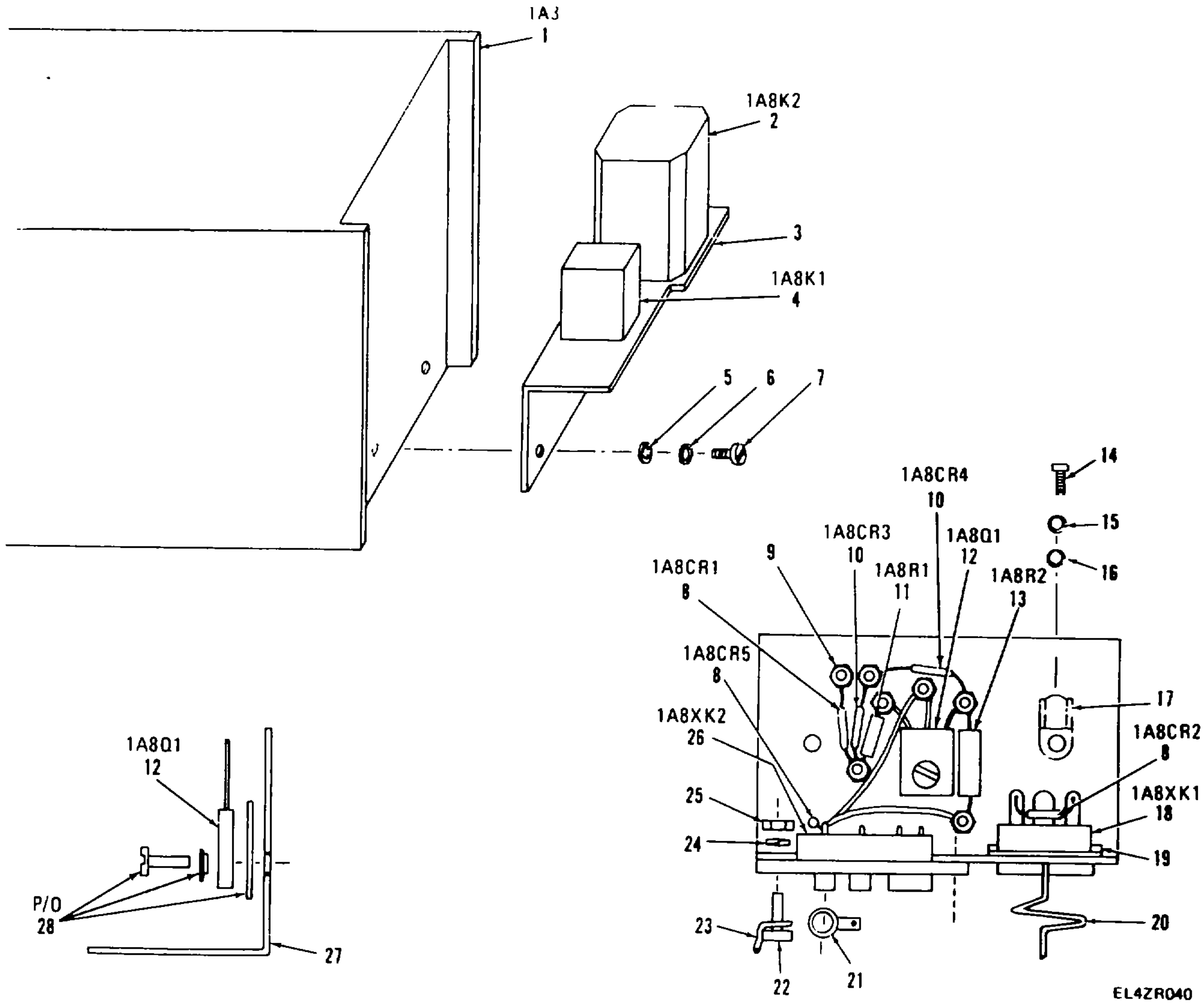
4-39 DC Inverter(CCA)



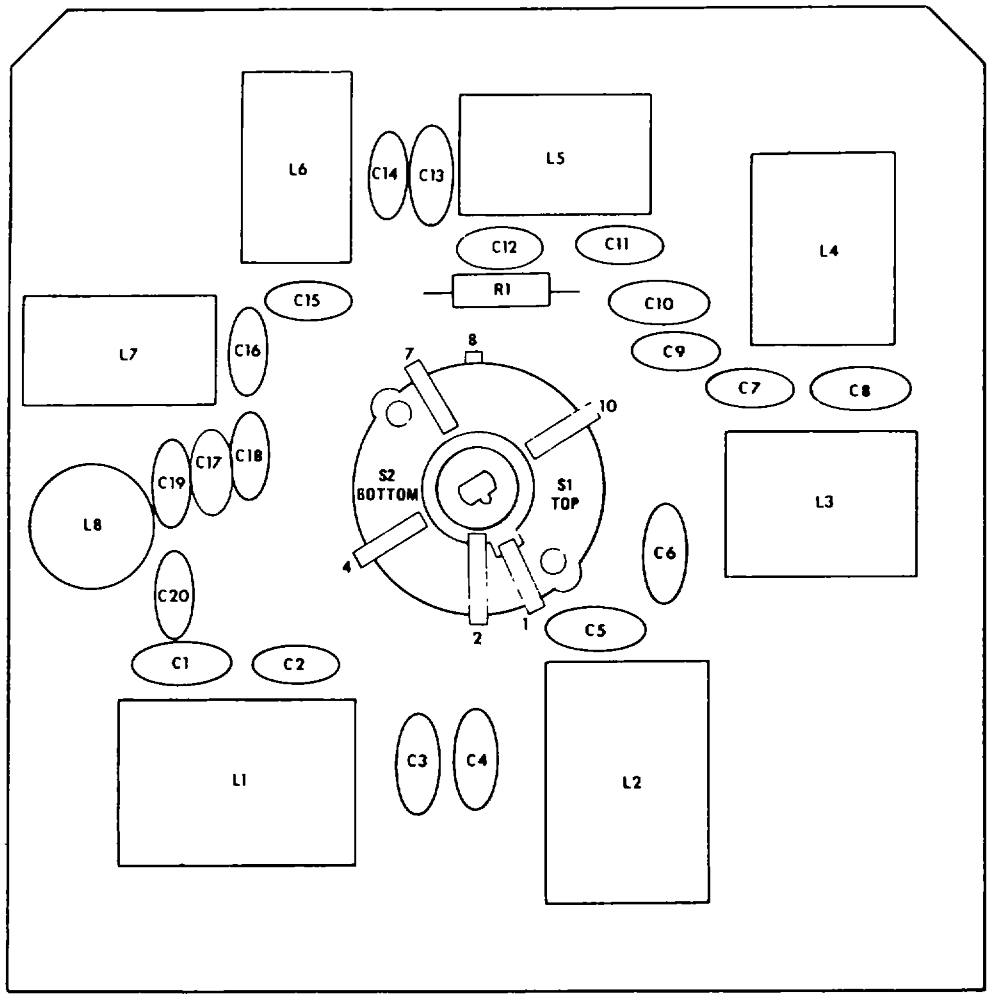
PREFIX ALL REFERENCE
DESIGNATORS WITH 1A7A1

EL4ZR033

4-40 RF Power Amplifier (CCA)



4-41 Main Harness



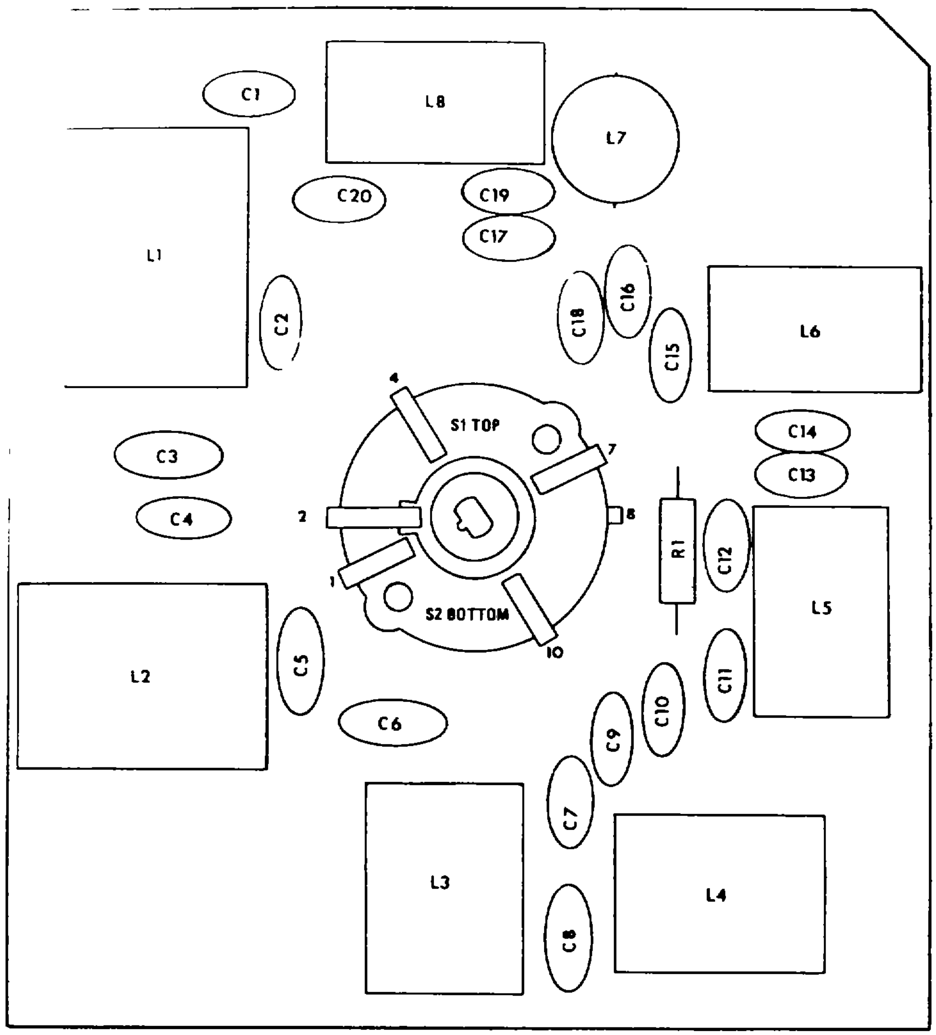
PREFIX ALL REFERENCE DESIGNATIONS WITH 1ASA1

LEGEND

REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO
C1	1	C8	7	C15	13	L2	18
C2	2	C9	8	C16	14	L3	19
C3	3	C10	9	C17	15	L4	20
C4	4	C11	10	C18	13	L5	21
C5	5	C12	11	C19	16	L6	22
C6	4	C13	9	C20	14	L7	23
C7	6	C14	12	L1	17	L8	24
						R1	25
						S1	26
						S2	27

EL4ZR026

4-42 Odd Channel Filter (CCA)



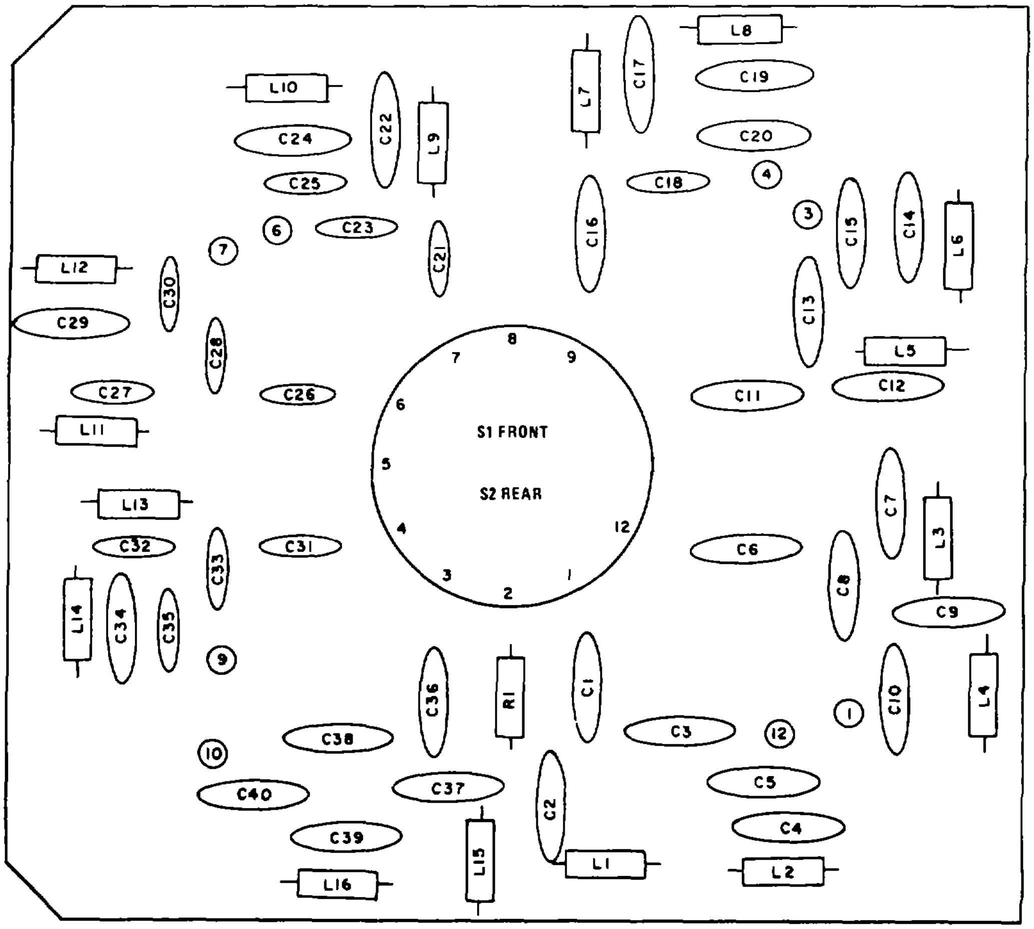
PREFIX ALL REFERENCE DESIGNATORS WITH 1ASA2

LEGEND

REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO
C1	1	C8	5	C15	2	L2	17
C2	2	C9	8	C16	12	L3	18
C3	3	C10	9	C17	13	L4	19
C4	4	C11	2	C18	14	L5	20
C5	5	C12	10	C19	12	L6	21
C6	6	C13	9	C20	15	L7	22
C7	7	C14	11	L1	16	L8	23
						R1	24
						S1	25
						S2	26

EL4ZR025

4-43 Even Channel Filter (CCA)



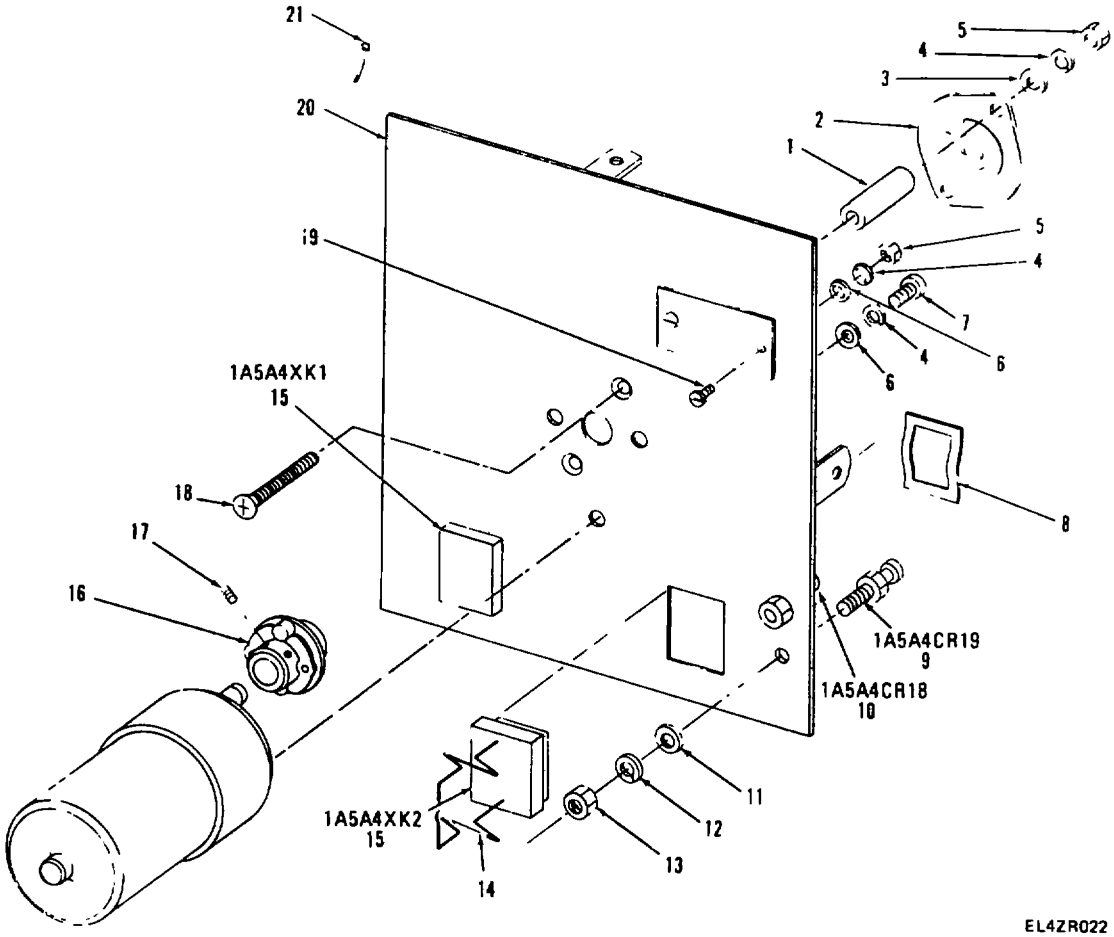
PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A3

LEGEND

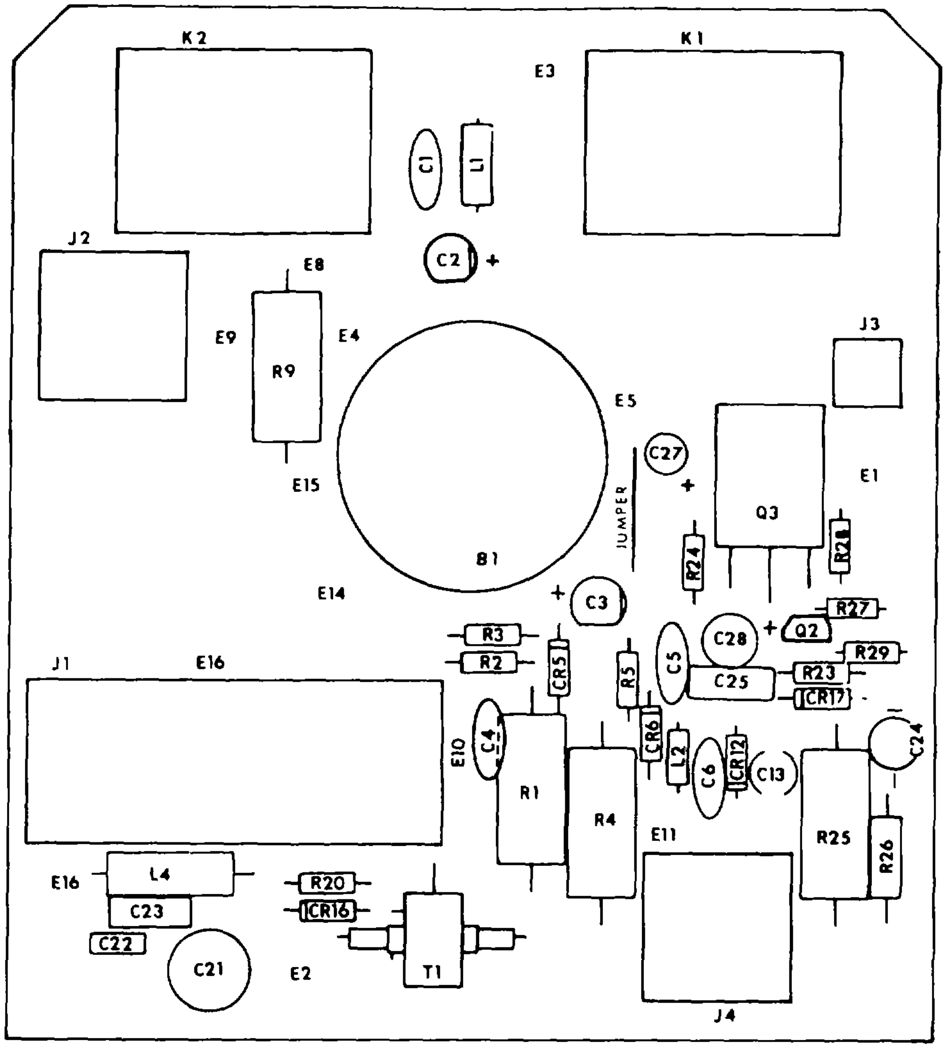
REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO
C1	1	C8	7	C15	7	C22	16	C29	21	C36	20	L3	30	L10	37
C2	2	C9	8	C16	7	C23	17	C30	22	C37	26	L4	31	L11	38
C3	3	C10	9	C17	13	C24	18	C31	17	C38	27	L5	32	L12	39
C4	4	C11	10	C18	14	C25	14	C32	23	C39	28	L6	33	L13	39
C5	5	C12	5	C19	2	C26	19	C33	24	C40	24	L7	34	L14	40
C6	5	C13	11	C20	15	C27	11	C34	10	L1	29	L8	35	L15	41
C7	6	C14	12	C21	11	C28	20	C35	25	L2	30	L9	36	L16	42
														R1	43
														S1	44
														S2	45

EL4ZR024

4-44 Receiver Filter (CCA)



4-45 Motor Control Board Assembly



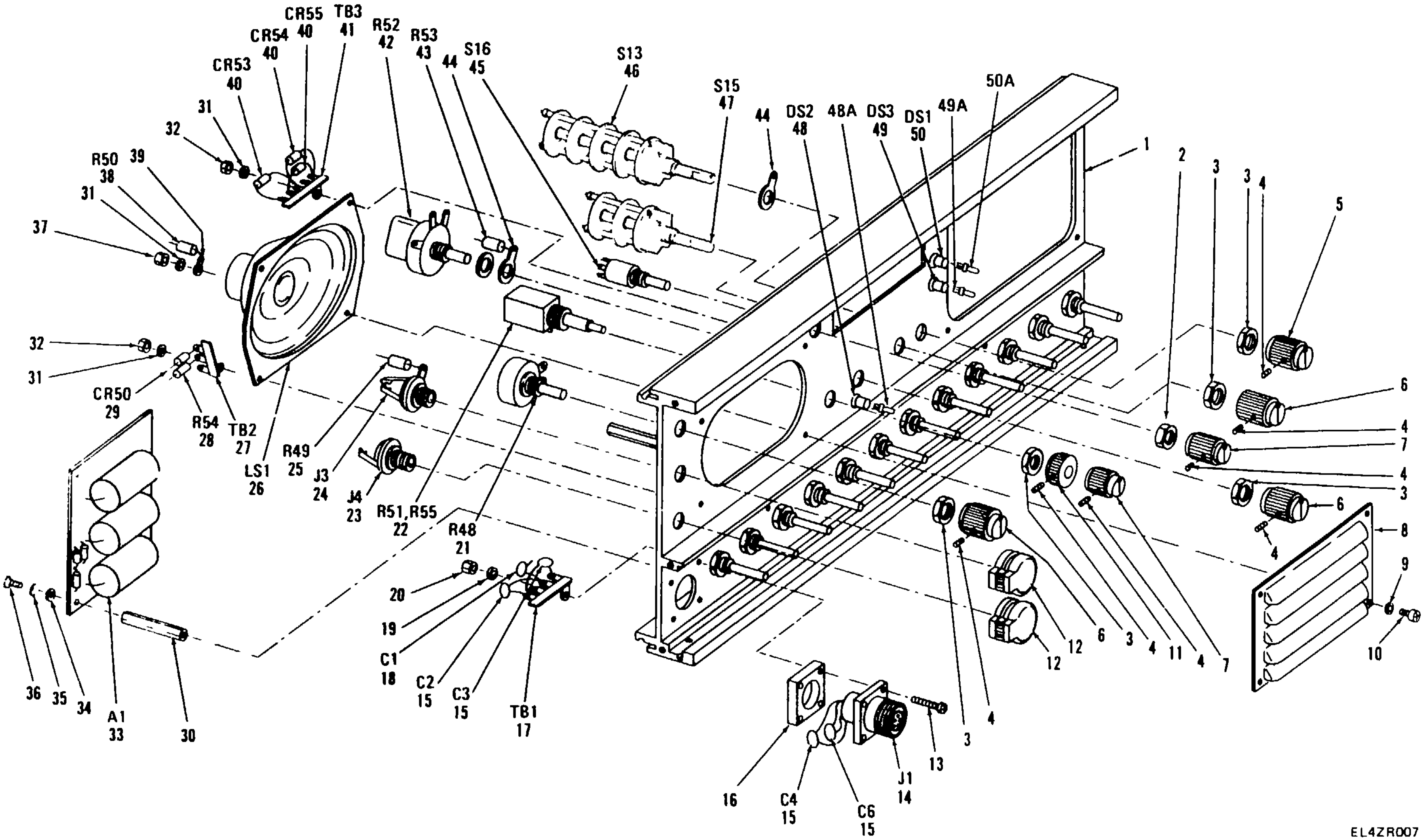
PREFIX ALL REFERENCE DESIGNATIONS WITH 1A5A4

LEGEND

REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO
C1	1	C24	3	CR12	11	R3	20	R27	27
C2	2	C25	7	CR16	12	R4	21	R28	28
C3	2	C27	8	CR17	11	R5	22	R29	29
C4	1	C28	9	L1	13	R6	19	K1	30
C5	1	CR1	10	L2	14	R9	23	K2	30
C6	1	CR2	10	L4	15	R20	24	J1	31
C13	3	CR3	10	Q2	16	R23	19	J2	32
C21	4	CR4	10	Q3	17	R24	25	J3	33
C22	5	CR5	11	R1	18	R25	21	J4	32
C23	6	CR6	11	R2	19	R26	26	B1	34
								T1	35

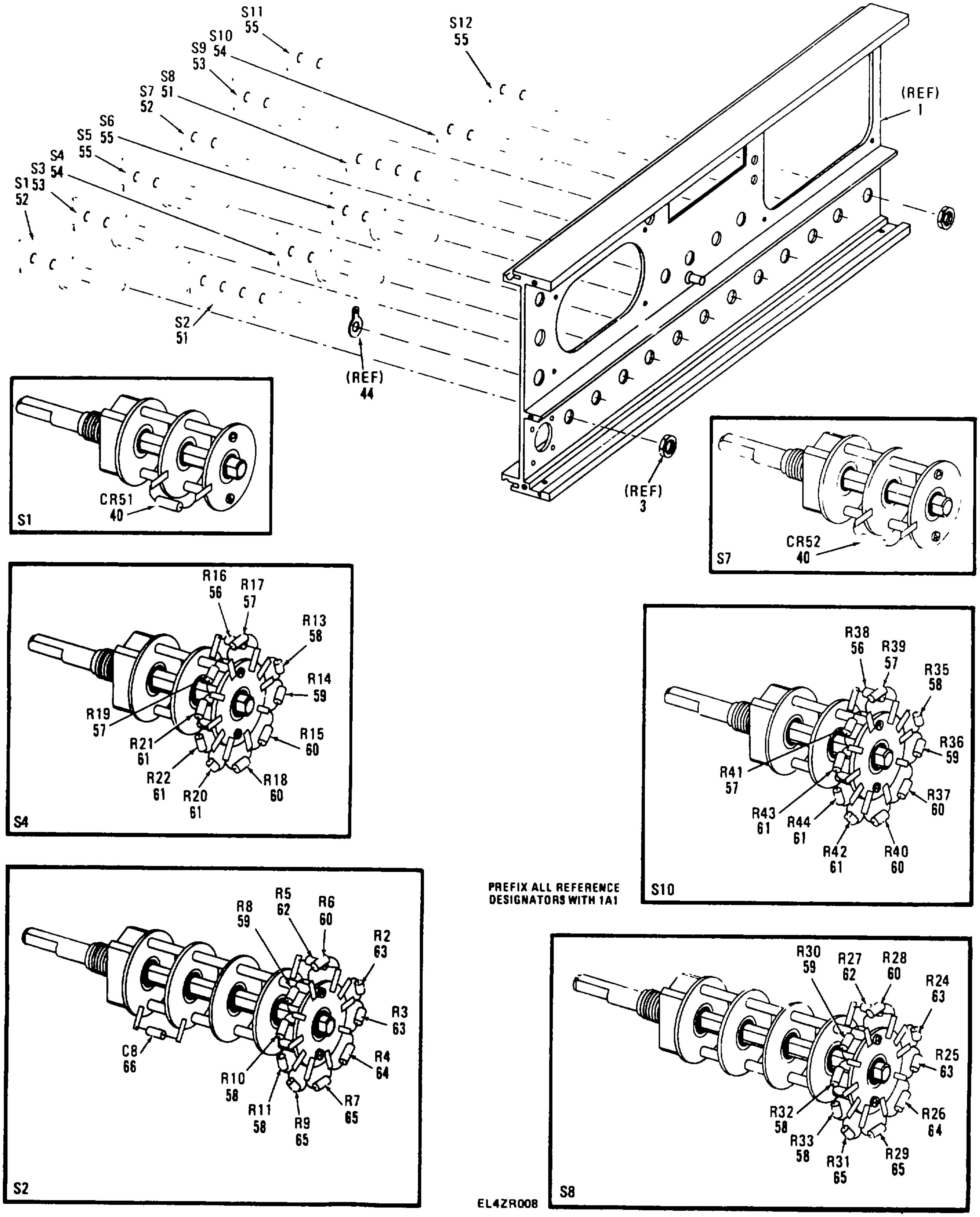
EL4ZR023

4-46 Motor Control Board(CCA)

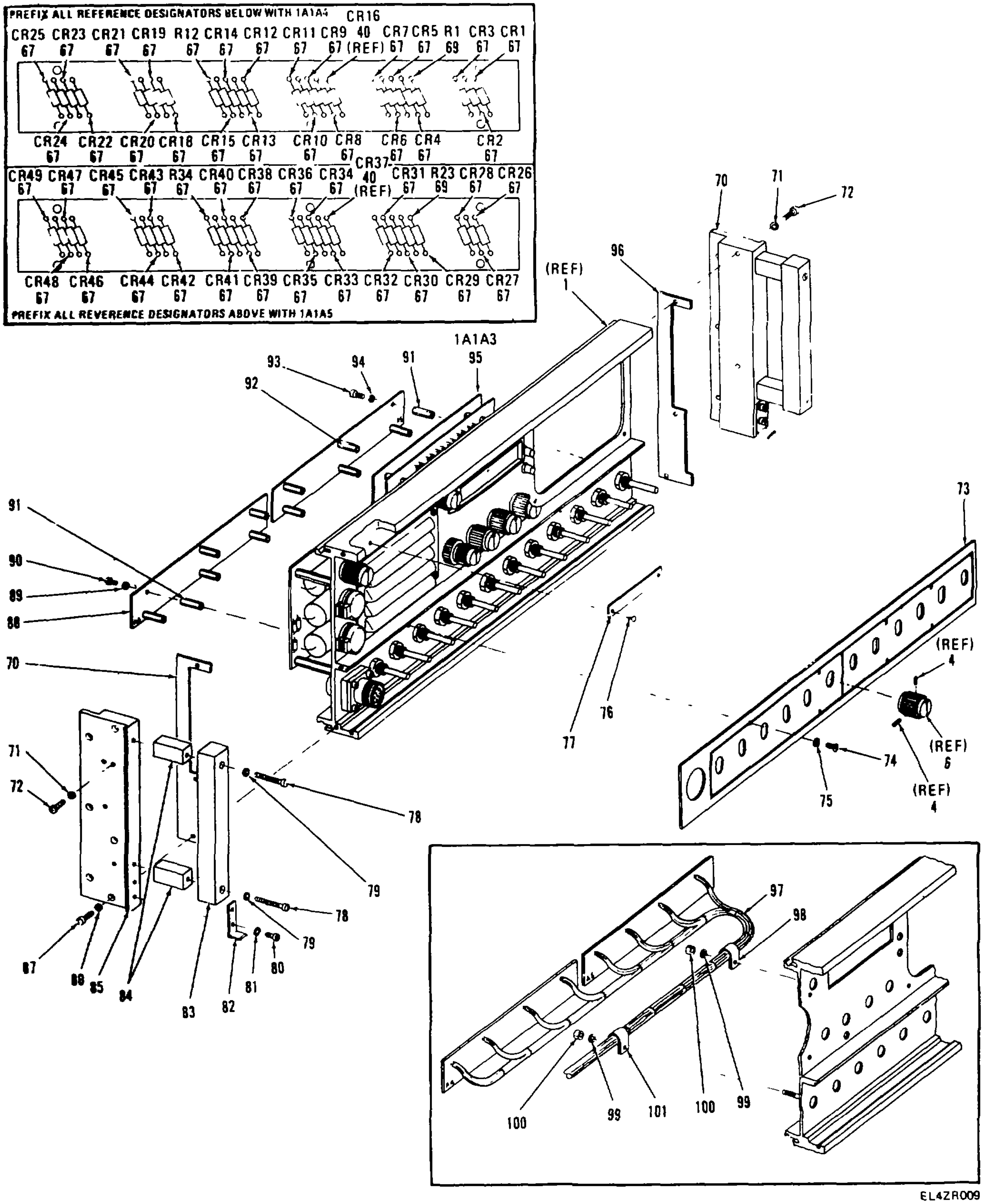


PREFIX ALL REFERENCE DESIGNATORS WITH 1A1

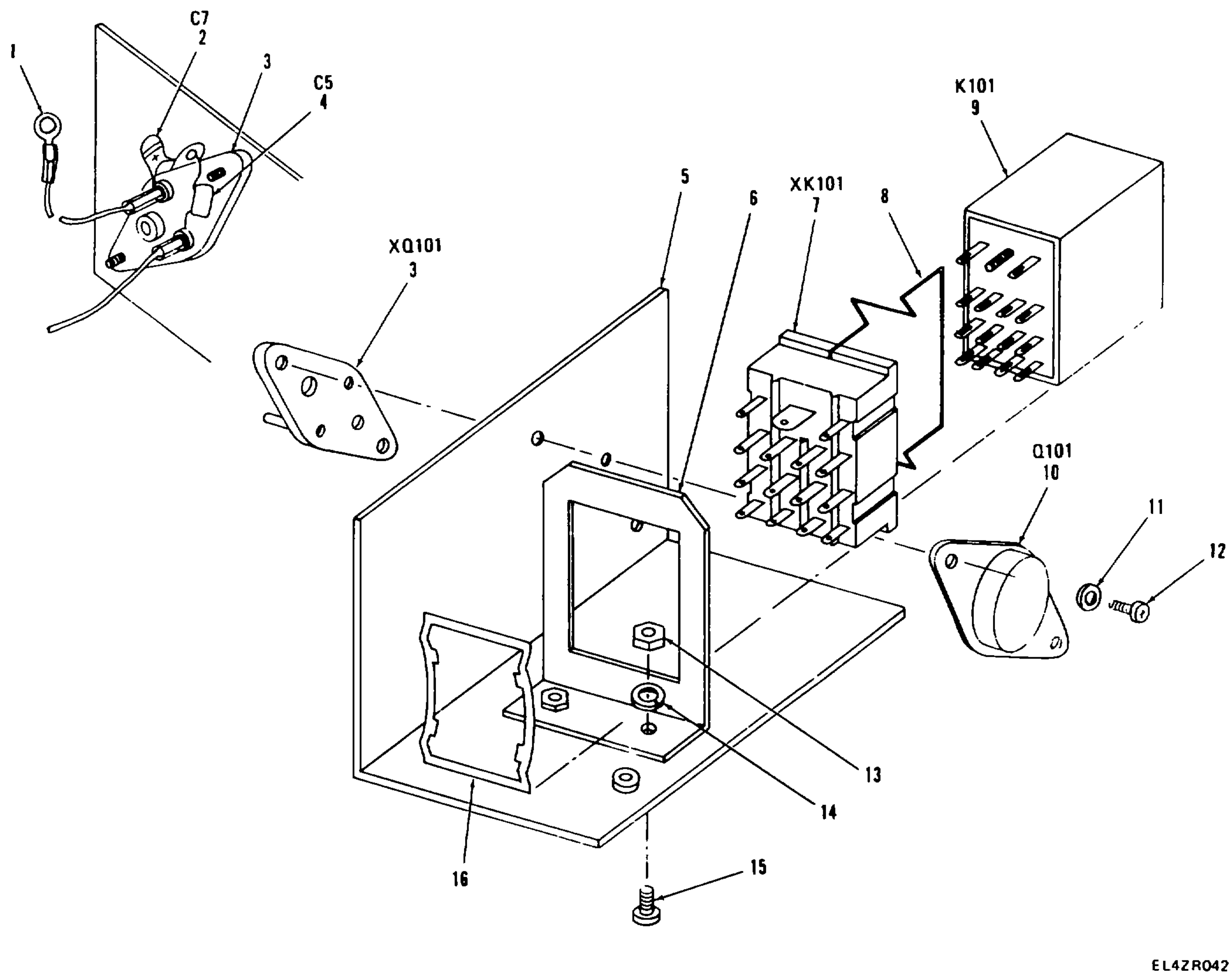
4-47 Front Panel Assembly (1 of 3)



4-47 Front Panel Assembly (2 of 3)

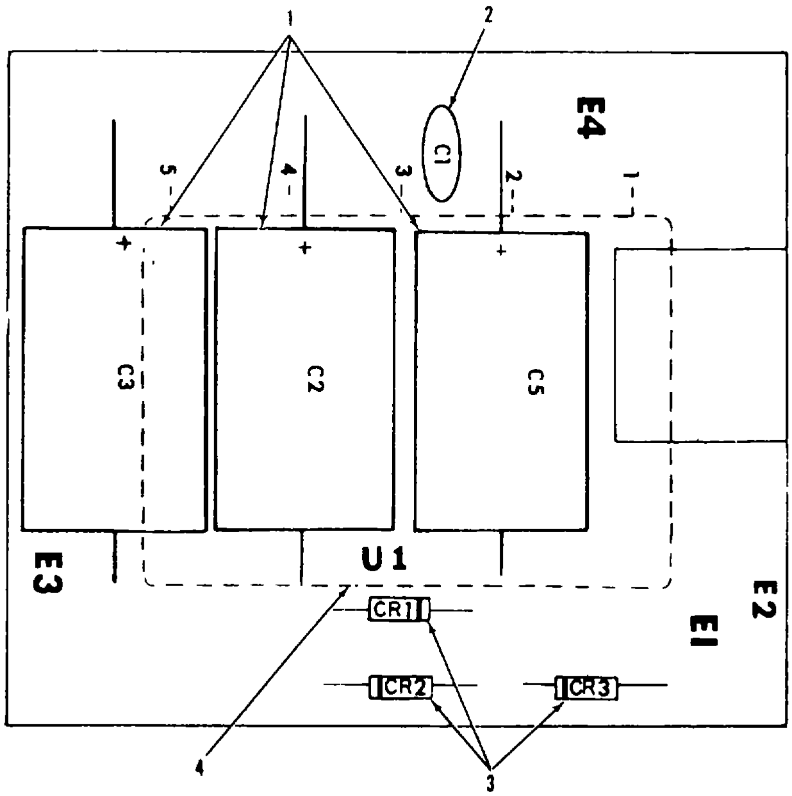


4-47 Front Panel Assembly (3 of 3)



PREFIX ALL REFERENCE DESIGNATORS WITH 1A8

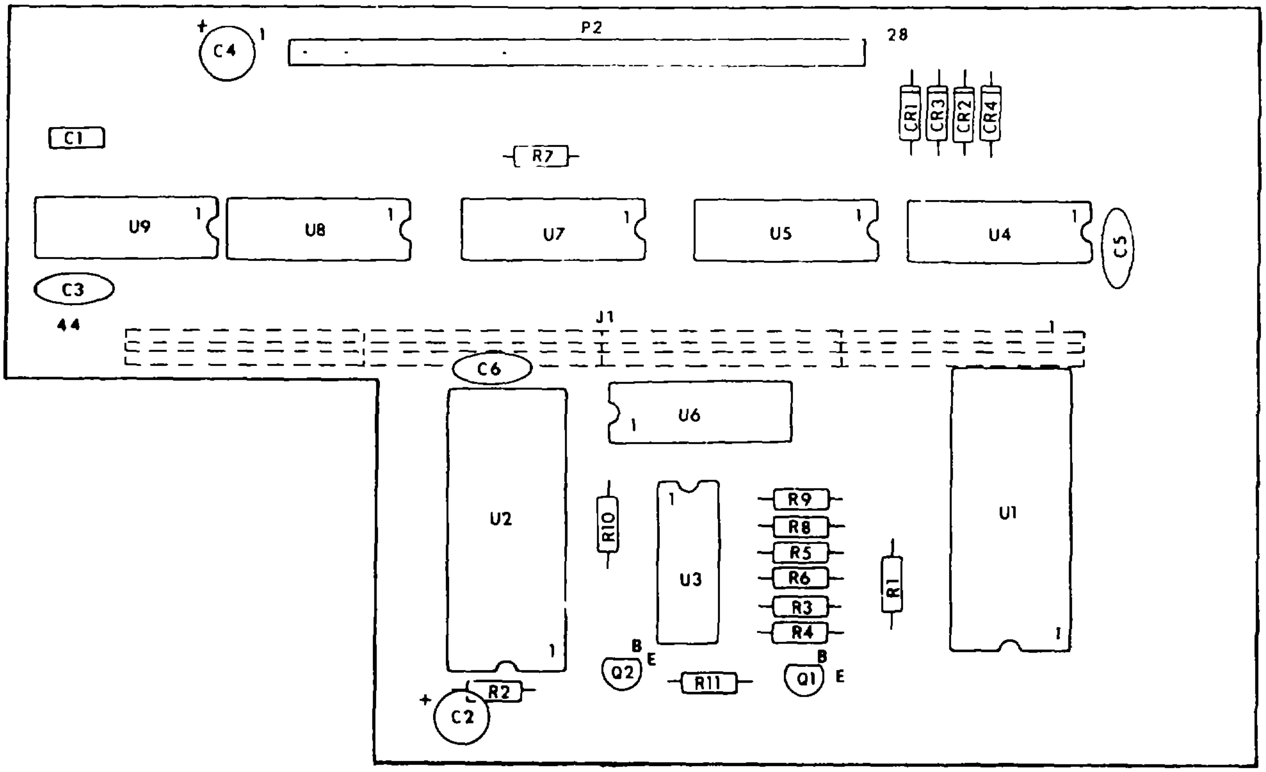
4- 48 Main Harness-Front Panel A Transmit B Receive Relay



PREFIX ALL REFERENCE
DESIGNATORS WITH 1A1A1

EL4ZR062

4-49 Speaker Driver(CCA)

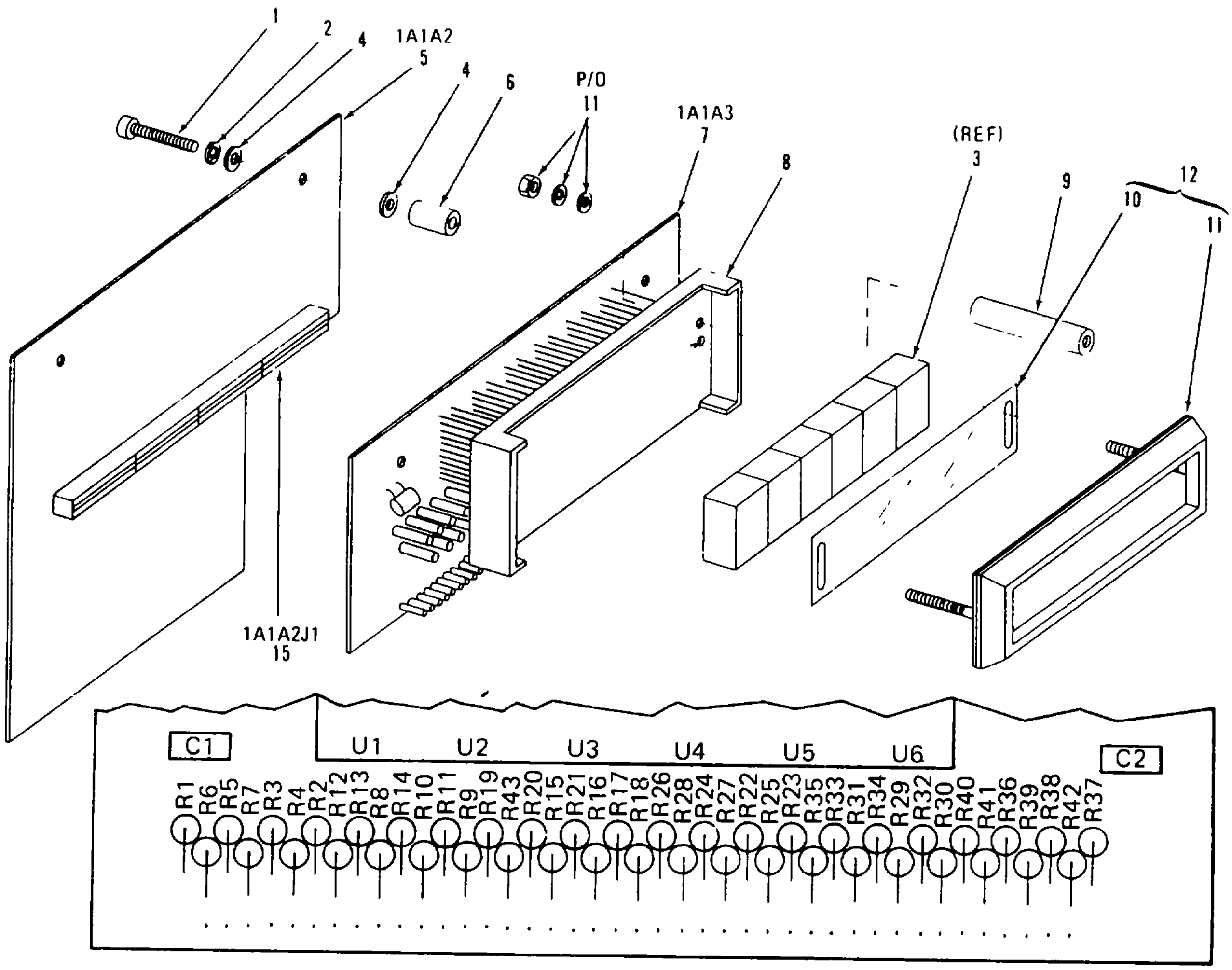


PREFIX ALL REFERENCE
DESIGNATORS WITH 1A1A2 LEGEND

REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO
R1	1	C1	3	Q2	8
R2	1	C2	4	U1	9
R3	1	C3	3	U.2	9
R4	1	C4	5	U3	10
R5	1	C5	6	U4	11
R6	1	C6	6	U5	11
R7	2	CR1	7	U6	11
R8	1	CR2	7	U7	11
R9	1	CR3	7	U8	11
R10	1	CR4	7	U9	11
R11	1	Q1	8	J1	12
				P2	13

EL4ZR035

4-50 Decoder(CCA)



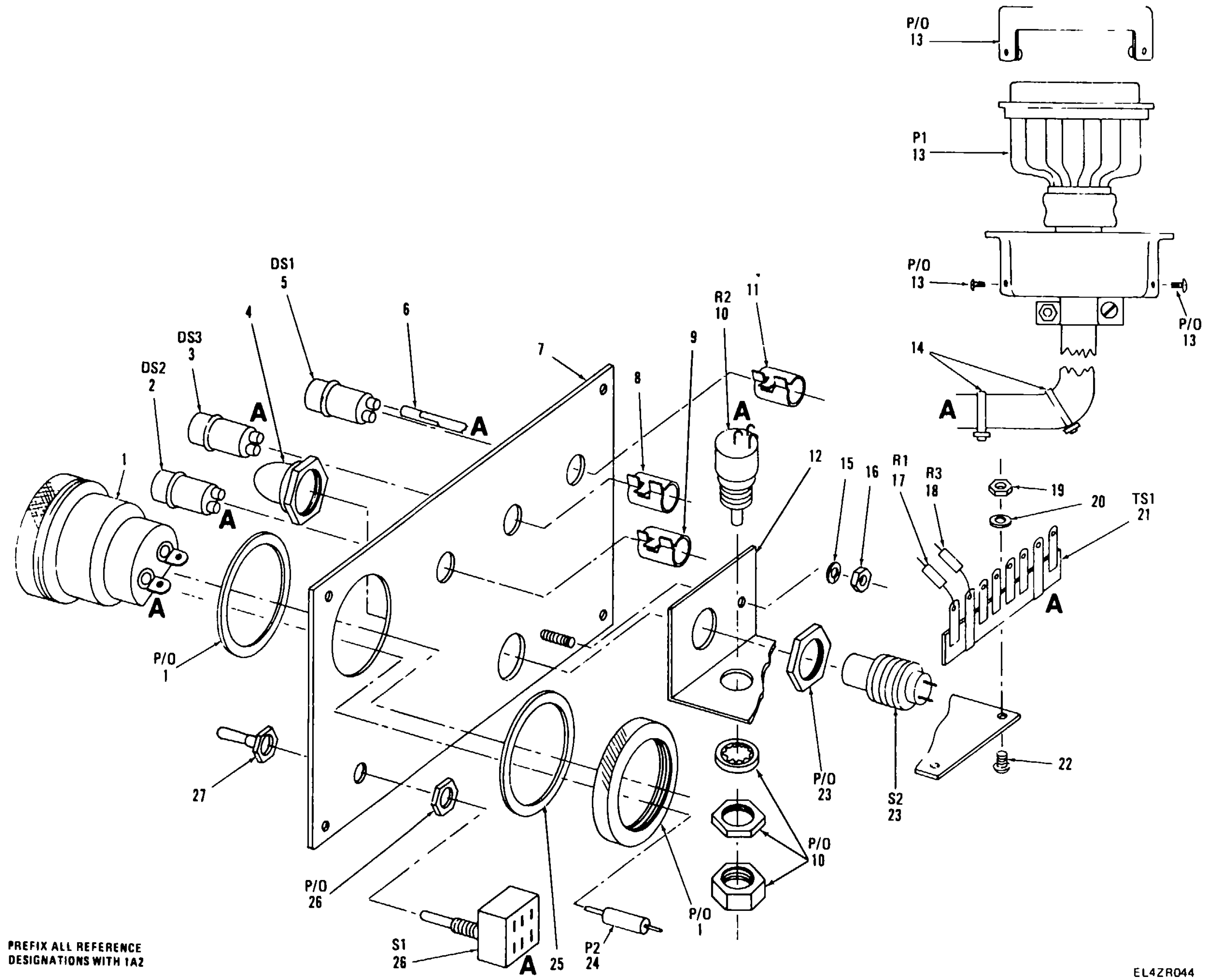
PREFIX ALL REFERENCE DESIGNATORS BELOW WITH 1A1A3

LEGEND

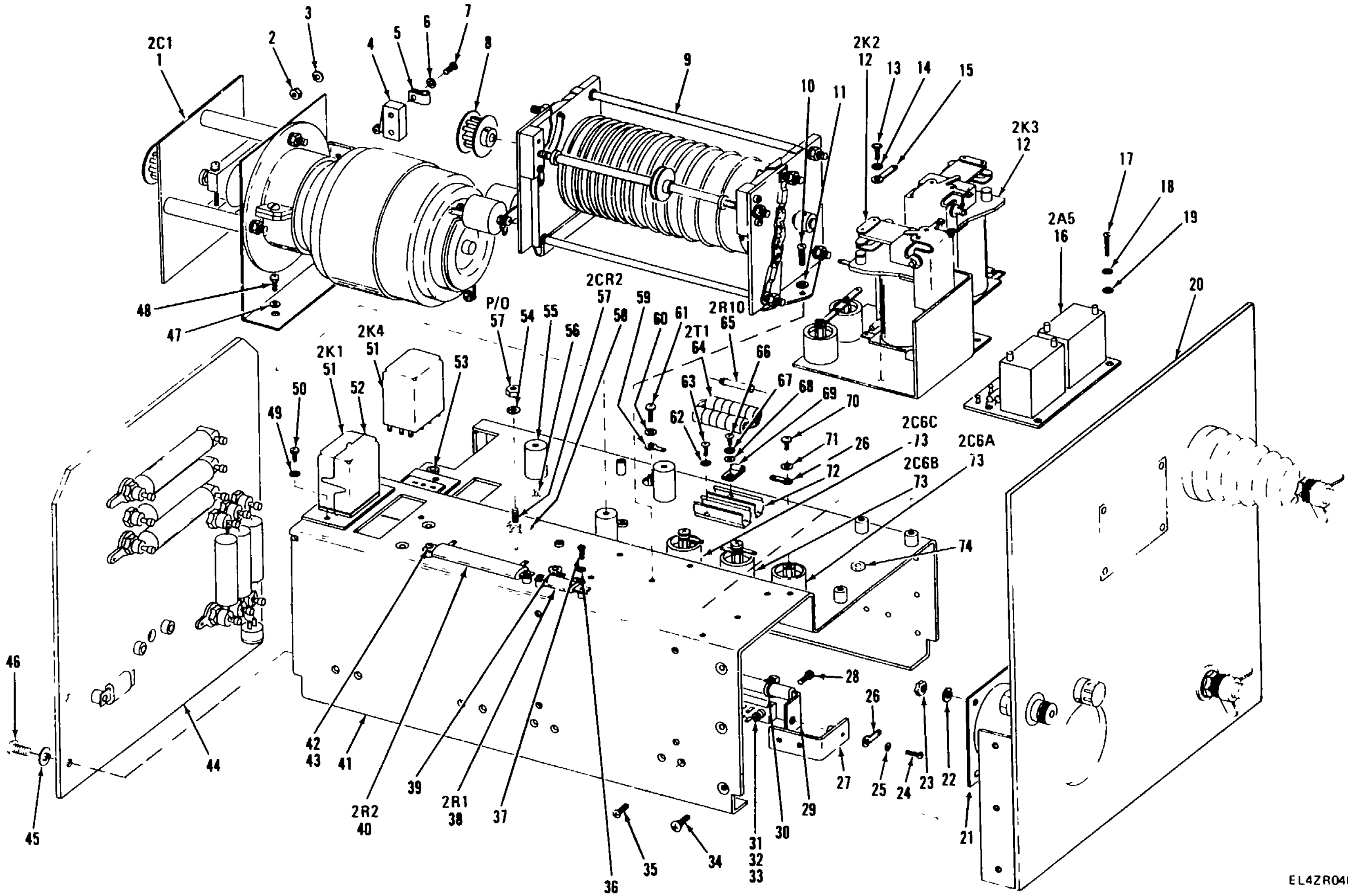
REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM * NO
U1	3	R5	13	R15	13	R25	13	R35	13
U2	3	R6	13	R16	13	R26	13	R36	13
U3	3	R7	13	R17	13	R27	13	R37	13
U4	3	R8	13	R18	13	R28	13	R38	13
U5	3	R9	13	R19	13	R29	13	R39	13
U6	3	R10	13	R20	13	R30	13	R40	13
R1	13	R11	13	R21	13	R31	13	R41	13
R2	13	R12	13	R22	13	R32	13	R42	13
R3	13	R13	13	R23	13	R33	13	R43	13
R4	13	R14	13	R24	13	R34	13	C1	14
								C2	14

FL4ZR034

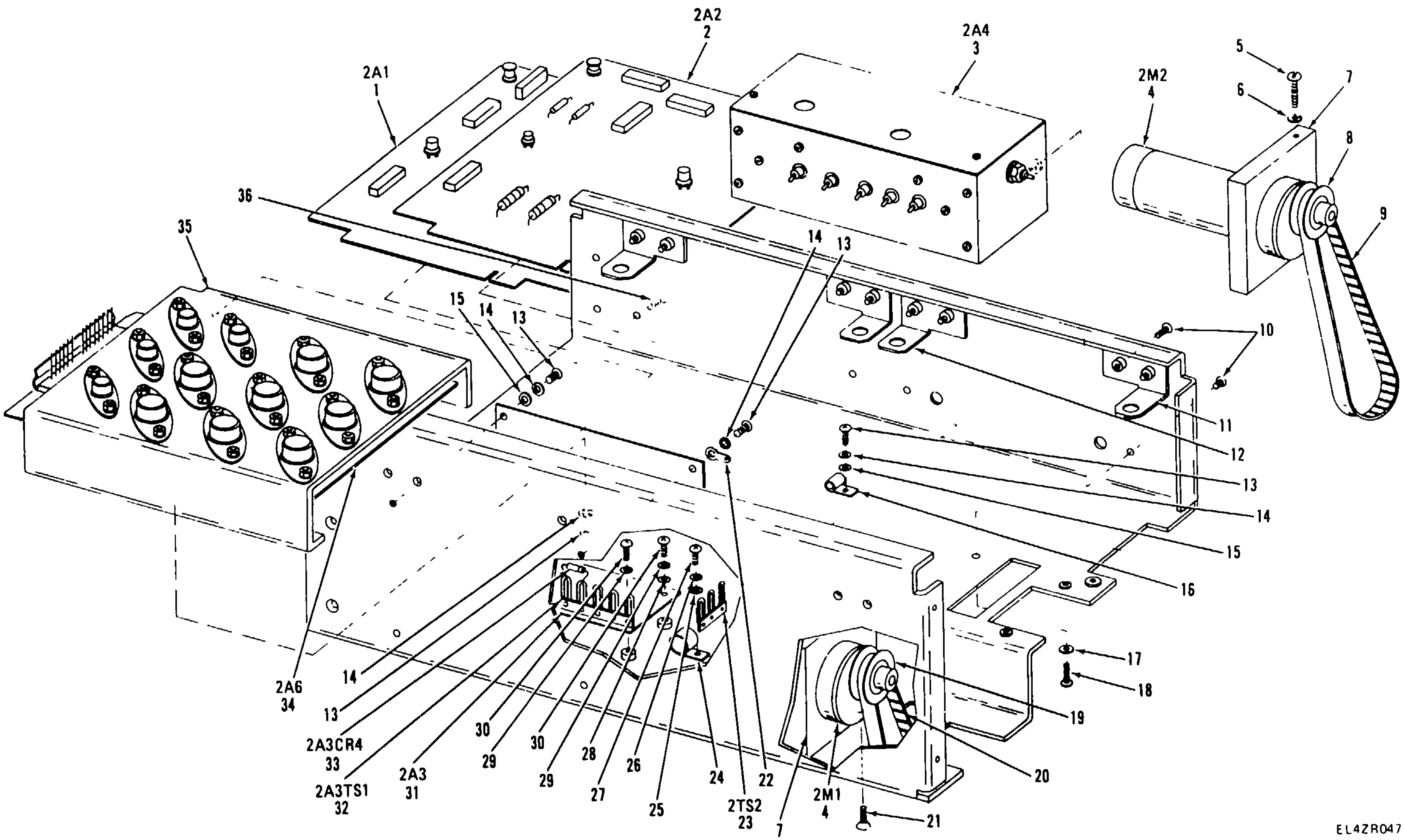
4-51 Display Assembly & (CCA)



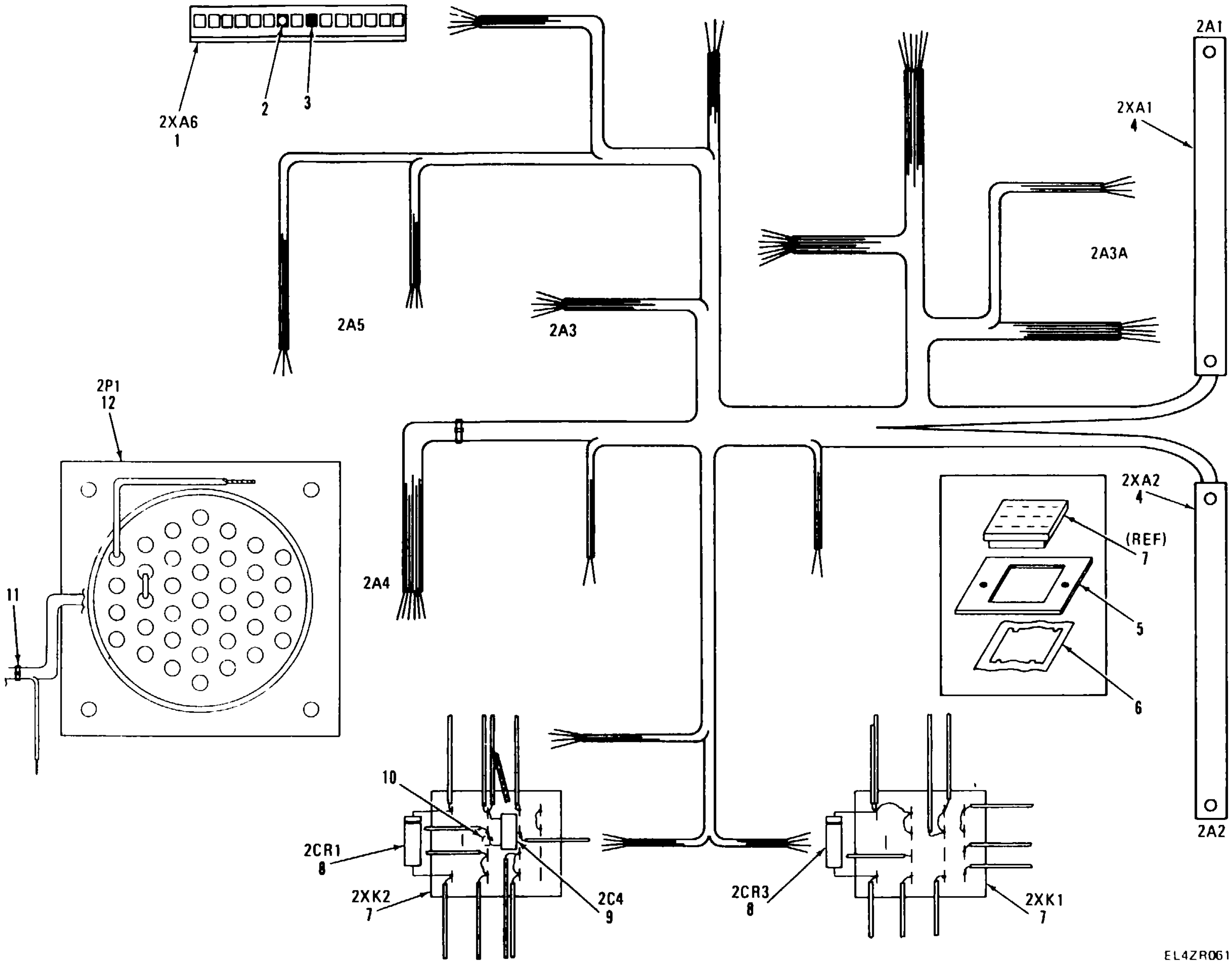
4-52 Tuning Control



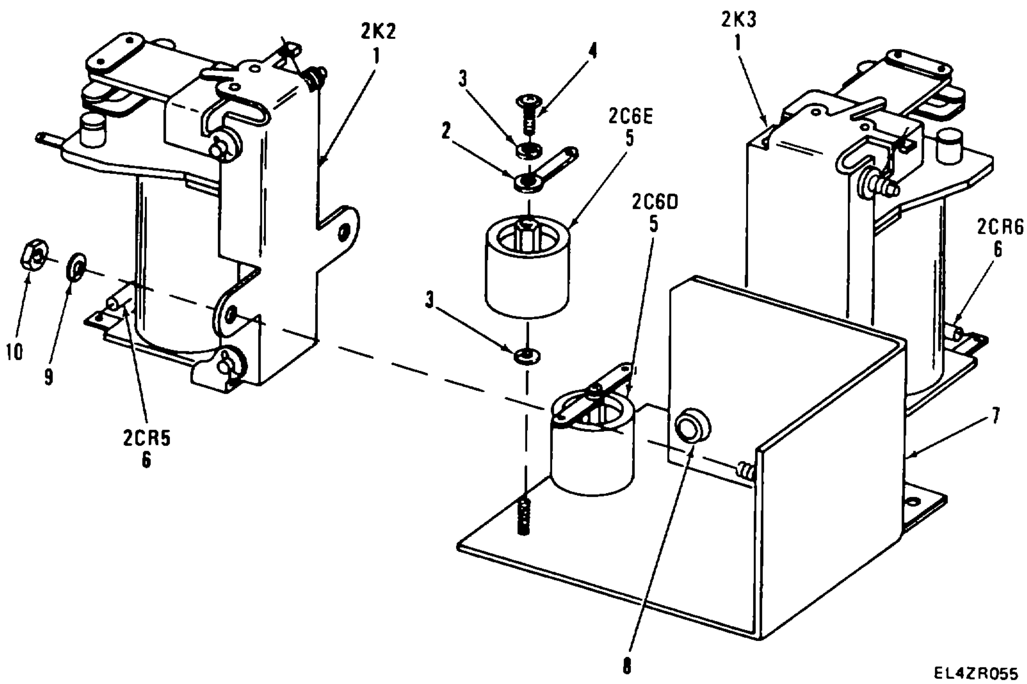
4-53 Coupler Unit CU-2229/URC View B



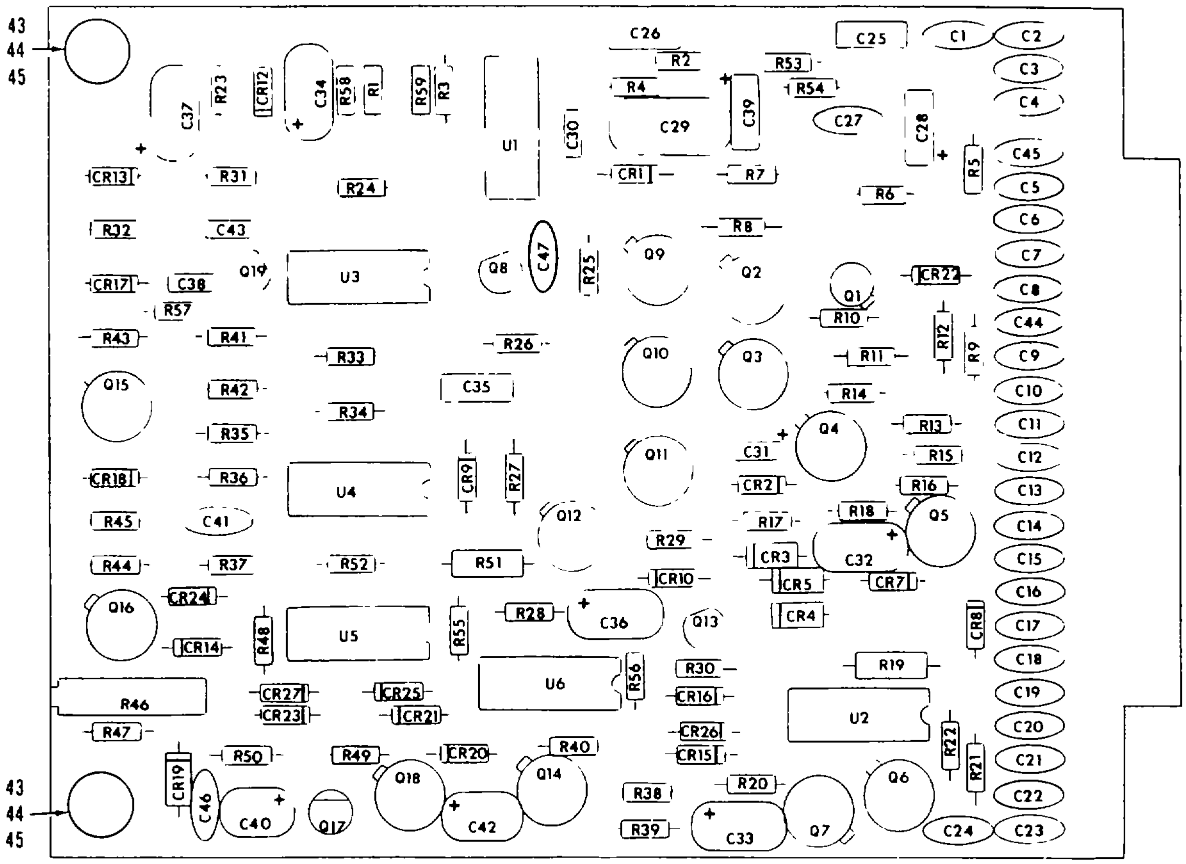
4-54 Coupler Unit CU-2229/URC View C



4-55 Main Harness



4-56 K2-K3 Relay Assembly



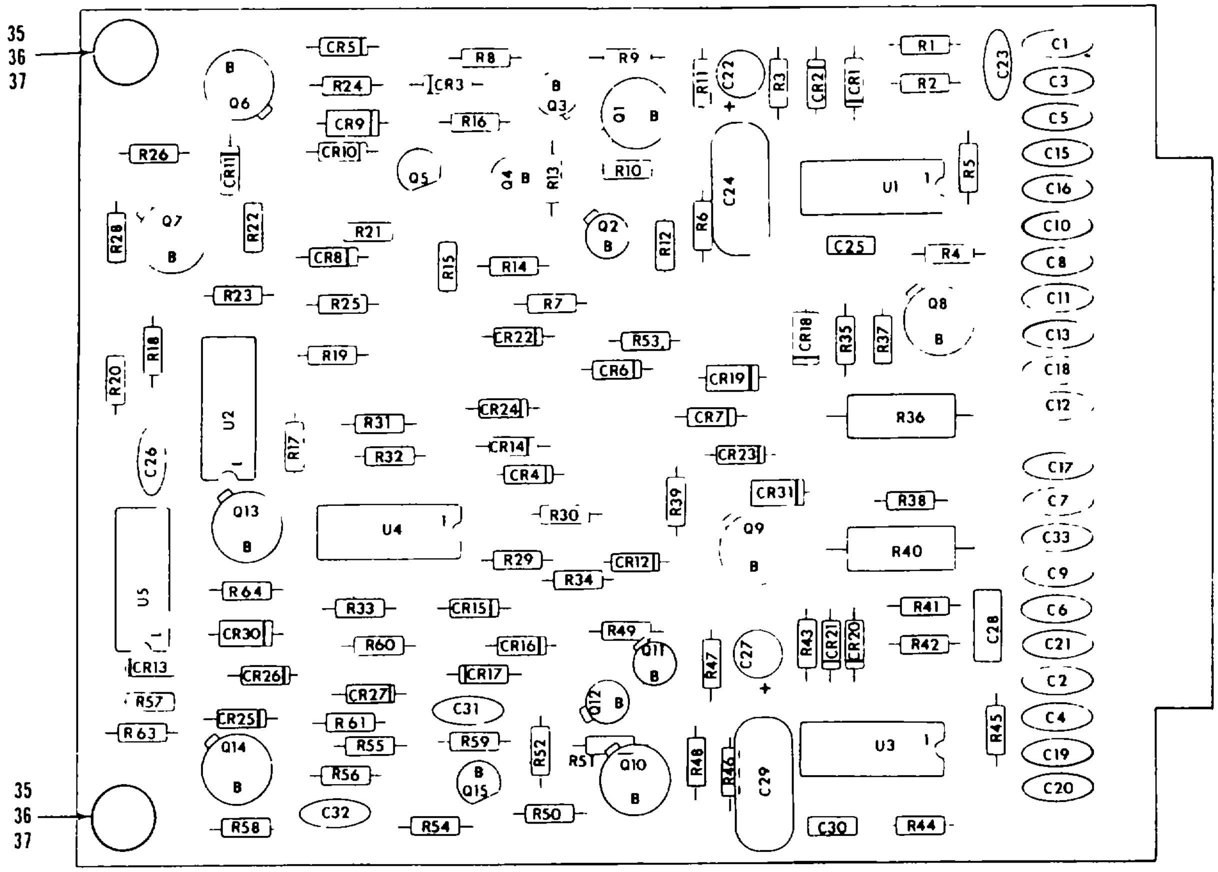
PREFIX ALL REFERENCE DESIGNATORSWITH 2A1

LEGEND

REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES , NO	ITEM DES	REF NO	ITEM
C1	1	C16	1	C31	7	C46	1	CR16	9	R5	17	R21	17	R37	17	R53	23	Q10	37
C2	1	C17	1	C32	8	C47	4	CR17	9	R6	18	R22	17	R38	29	R54	35	Q11	37
C3	1	C18	1	C33	8	CR1	9	CR18	9	R7	19	R23	19	R39	29	R55	19	Q12	37
C4	1	C19	1	C34	8	CR2	10	CR19	11	R8	19	R24	28	R40	17	R56	28	Q13	39
C5	1	C20	1	C35	3	CR3	11	CR20	9	R9	20	R25	16	R41	14	R57	17	Q14	37
C6	1	C21	1	C36	8	CR4	11	CR21	9	R10	21	R26	17	R42	17	R58	19	Q15	38
C7	1	C22	1	C37	2	CR5	11	CR22	9	R11	22	R27	17	R43	30	R59	19	Q16	37
C8	1	C23	2	C38	3	CR7	9	CR23	9	R12	19	R28	17	R44	28	Q1	36	Q17	40
C9	1	C24	1	C39	8	CR8	12	CR24	9	R13	23	R29	19	R45	19	Q2	37	Q18	38
C10	1	C25	3	C40	8	CR9	9	CR25	9	R14	23	R30	29	R46	31	Q3	38	Q19	39
C11	1	C26	3	C41	1	CR10	11	CR26	12	R15	24	R31	19	R47	32	Q4	37	U1	41
C12	I	C27	4	C42	8	CR12	11	CR27	9	R16	25	R32	29	R48	33	Q5	37	U2	42
C13	1	C28	2	C43	3	CR13	13	R1	14	R17	25	R33	29	R49	34	Q6	37	U3	42
C14	1	C29	5	C44	1	CR14	9	R2	14	R18	17	R34	29	R50	25	Q7	37	U4	42
C15	1	C30	6	C45	1	CR15	9	R3	15	R19	26	R35	29	R51	26	Q8	39	U5	42
								R4	16	R20	27	R36	29	CR52	27	09	37	U6	42

EL4ZR048

4-57 Control Logic (CCA)



PREFIX ALL REFERENCE DESIGNATORS WITH 2A2

LEGEND

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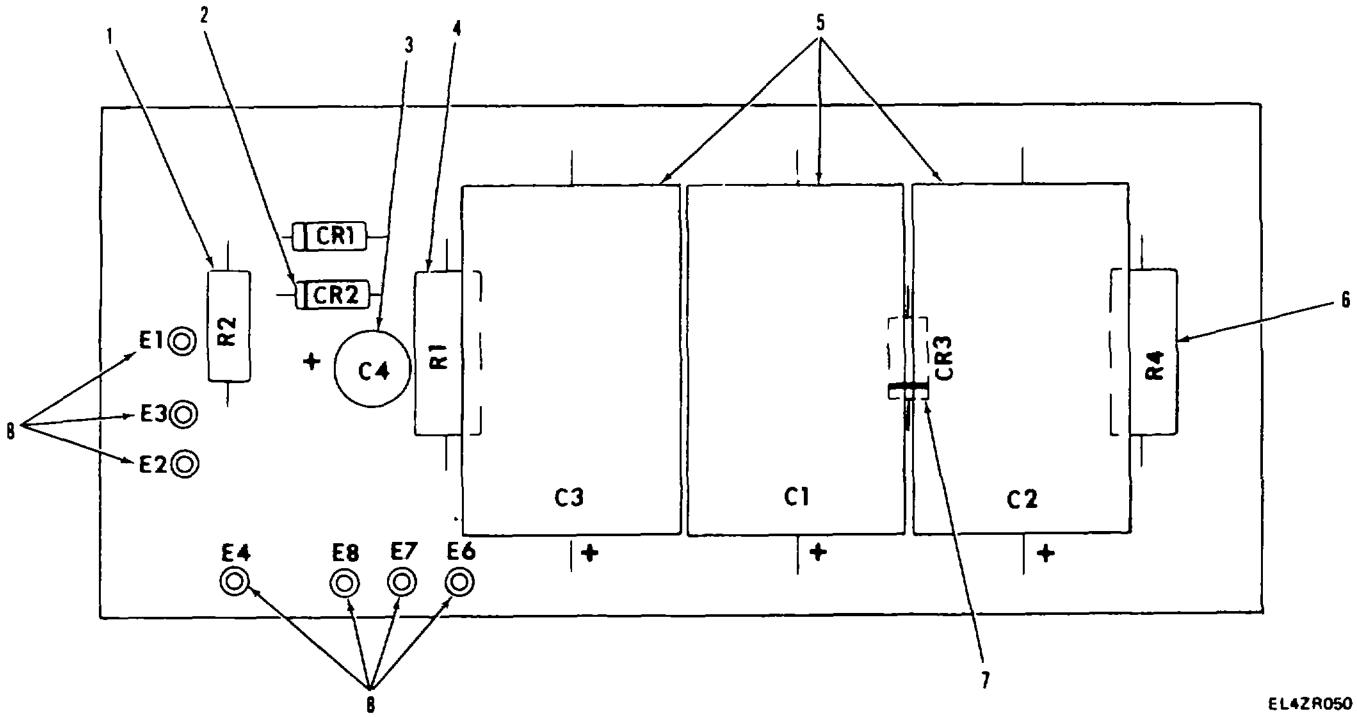
C1	1	C16	1	C30	5	CR11	8	CR26	6	RII	17	R25	20	R40	26	R55	10	Q6	30
C2	1	C17	2	C31	1	CR12	8	CR27	6	R12	16	R26	24	R41	9	R56	22	Q7	30
C3	1	C18	1	C32	1	CR14	6	CR30	7	R13	18	R28	24	R42	9	R57	22	Q8	30
C4	1	C19	1	C33	1	CR15	6	CR31	7	R14	19	R29	10	R43	10	R58	23	Q9	30
C5	1	C20	1	CR1	6	CR16	6	R1	9	R15	11	R30	10	R44	11	R59	20	010	30
C6	1	C21	2	CR2	6	CR17	6	R2	9	R16	20	R31	21	R45	27	R60	20	0ll	31
C7	1	C22	3	CR3	7	CR18	7	R3	10	R17	21	R32	21	R46	13	R61	28	012	31
C8	1	C23	2	CR4	6	CR19	7	R4	11	R18	21	R33	21	R47	17	R63	24	013	30
C9	1	C24	4	CR5	6	CR20	6	R5	12	R19	10	R34	21	R48	16	R64	24	014	30
C10	1	C25	5	CR6	6	CP21	6	R6	13	R20	10	R35	25	R49	16	R70	29	015	32
CII	1	C26	1	CR7	6	CR22	6	R7	14	R21	22	R36	26	R50	14	Q1	30	U1	33
C12	1	C27	3	CR8	6	CR23	6	R8	15	R22	22	R37	17	R51	16	02	31	U2	34
C13	1	C28	2	CR9	7	CR24	8	R9	16	R23	23	R38	25	R52	18	03	31	UJ3	33
C15	1	C29	4	CR10	6	CR25	6	R10	16	R24	20	R39	17	R53	20	04	32	U4	34
																R54	15	Q5	32	U5	34

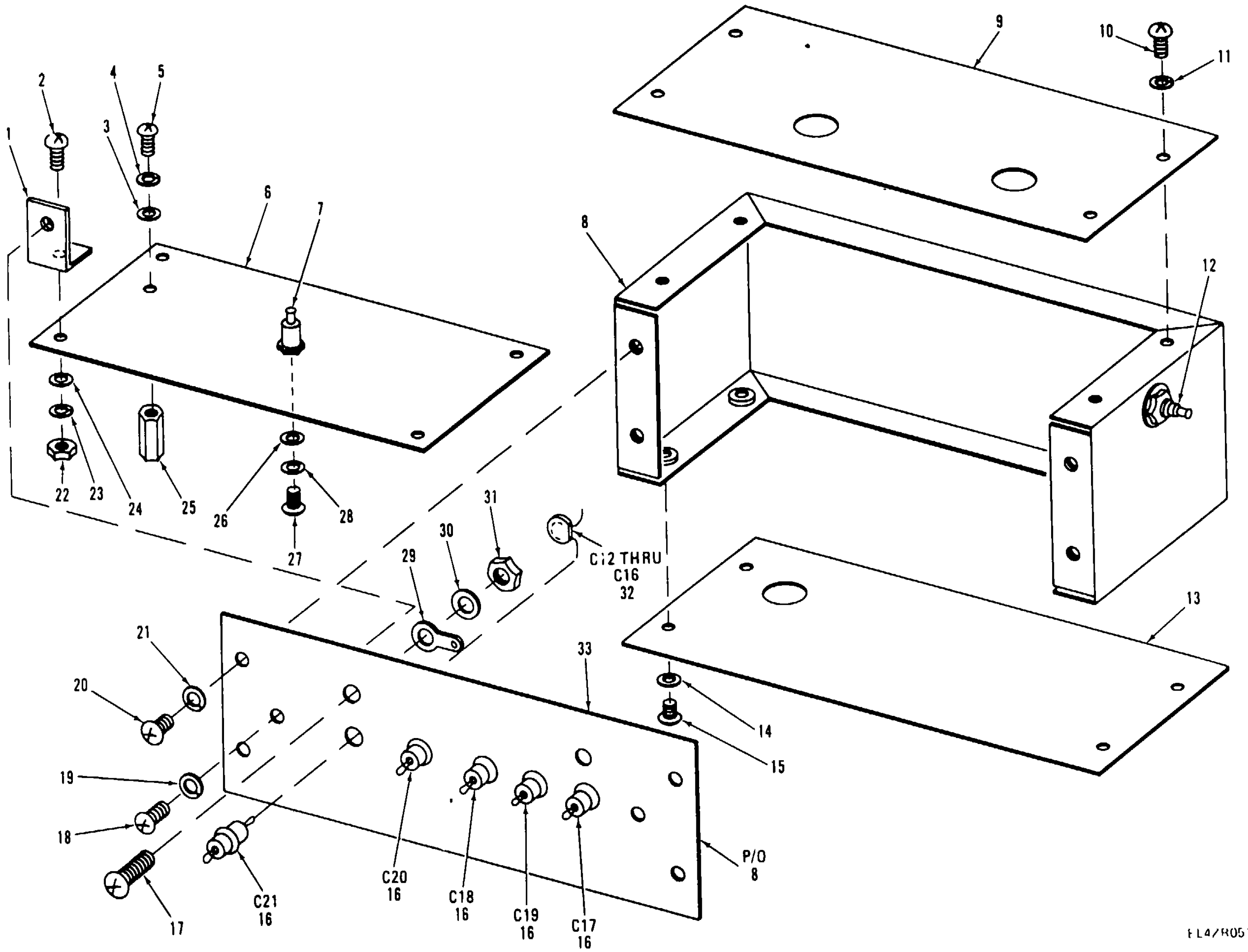
EL4ZR049

4-58 Phase and Amplitude Control (CCA)



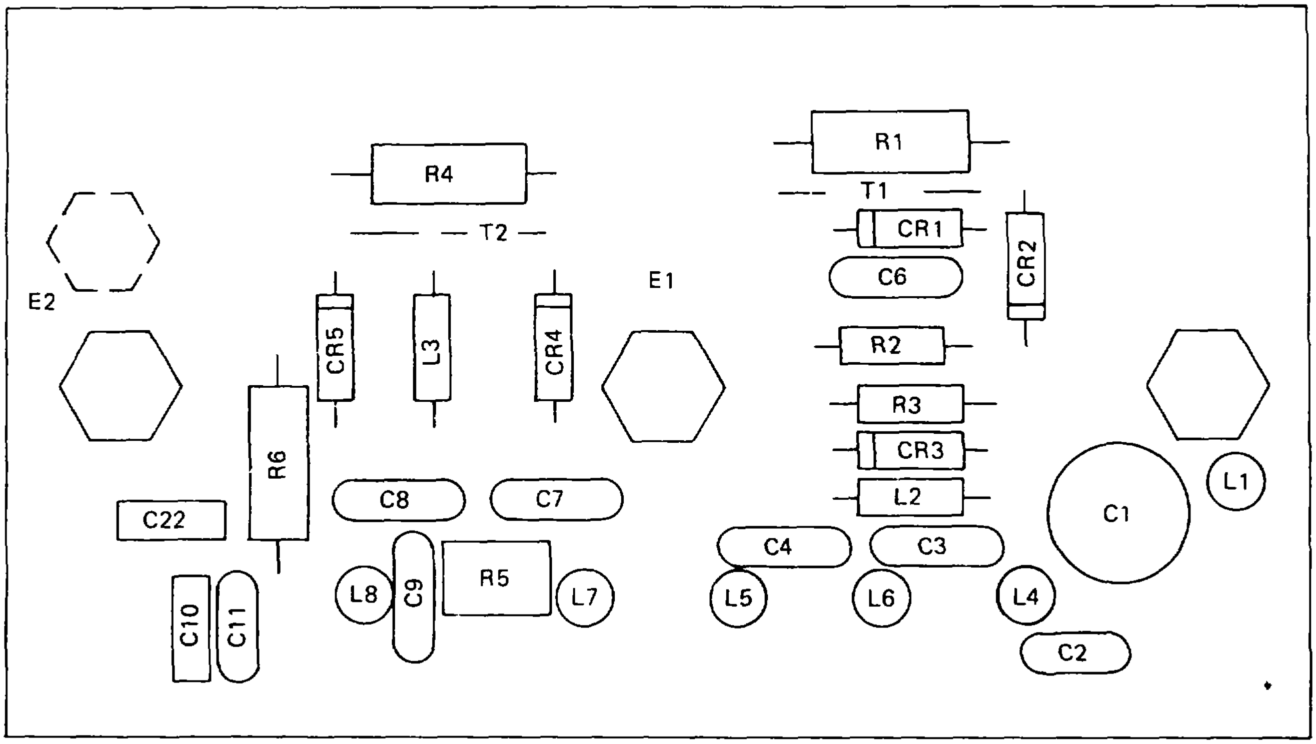
PREFIX ALL REFERENCE
DESIGNATIONS WITH 2A3

4-59 Regulator(CCA)



PREFIX ALL REFERENCE
DESIGNATORS WITH 2A4

4-60 Phase and Amplitude Assembly



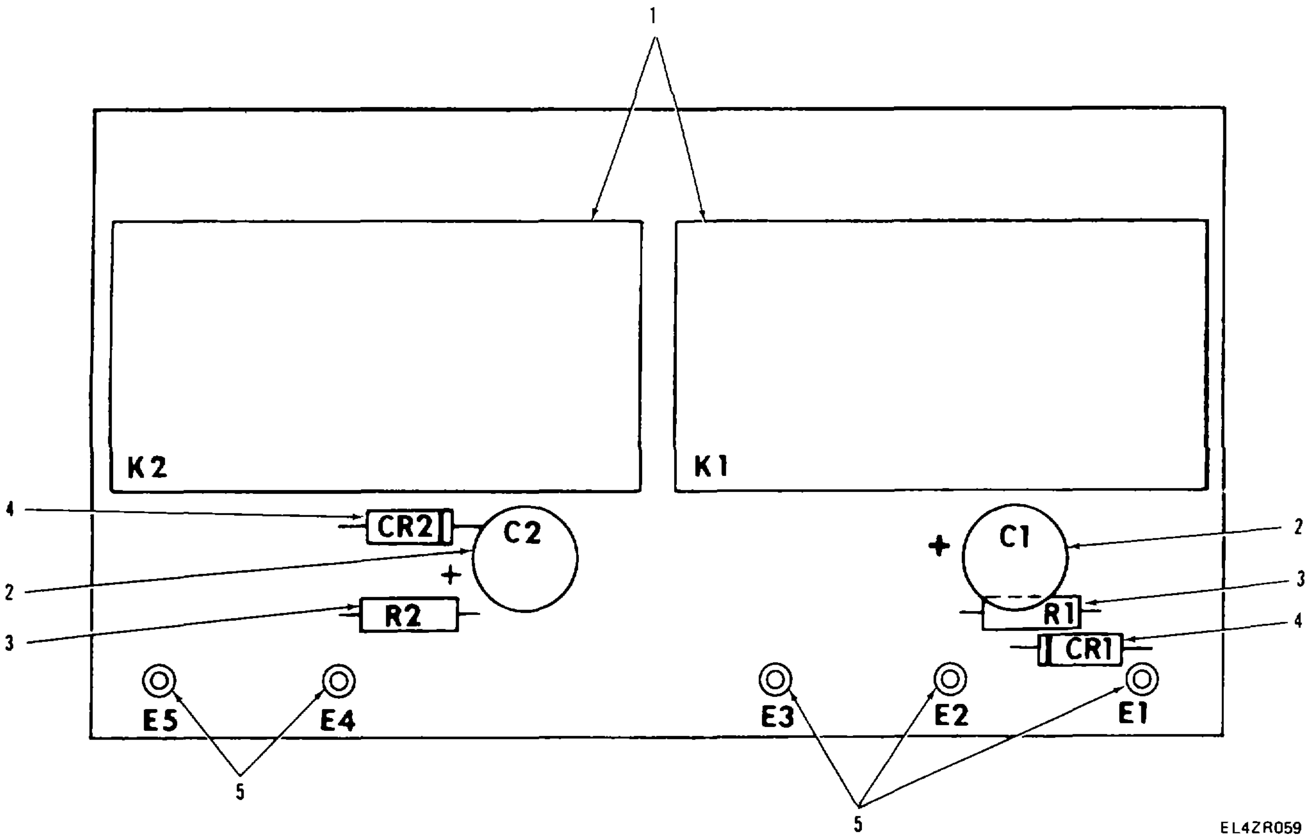
PREFIX ALL REFERENCE DESIGNATORS WITH 2A4

LEGEND

REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO
C1	1	C10	4	L1	8	R1	12
C2	2	Cl1	5	L2	9	R2	13
C3	3	C22	6	L3	10	R3	13
C4	3	CR1	7	L4	11	R4	14
C6	3	CR2	7	L5	11	R5	15
C7	3	CR3	7	L6	11	R6	14
C8	3	CR4	7	L7	11	T1	16
C9	3	CR5	7	L8	11	T2	17

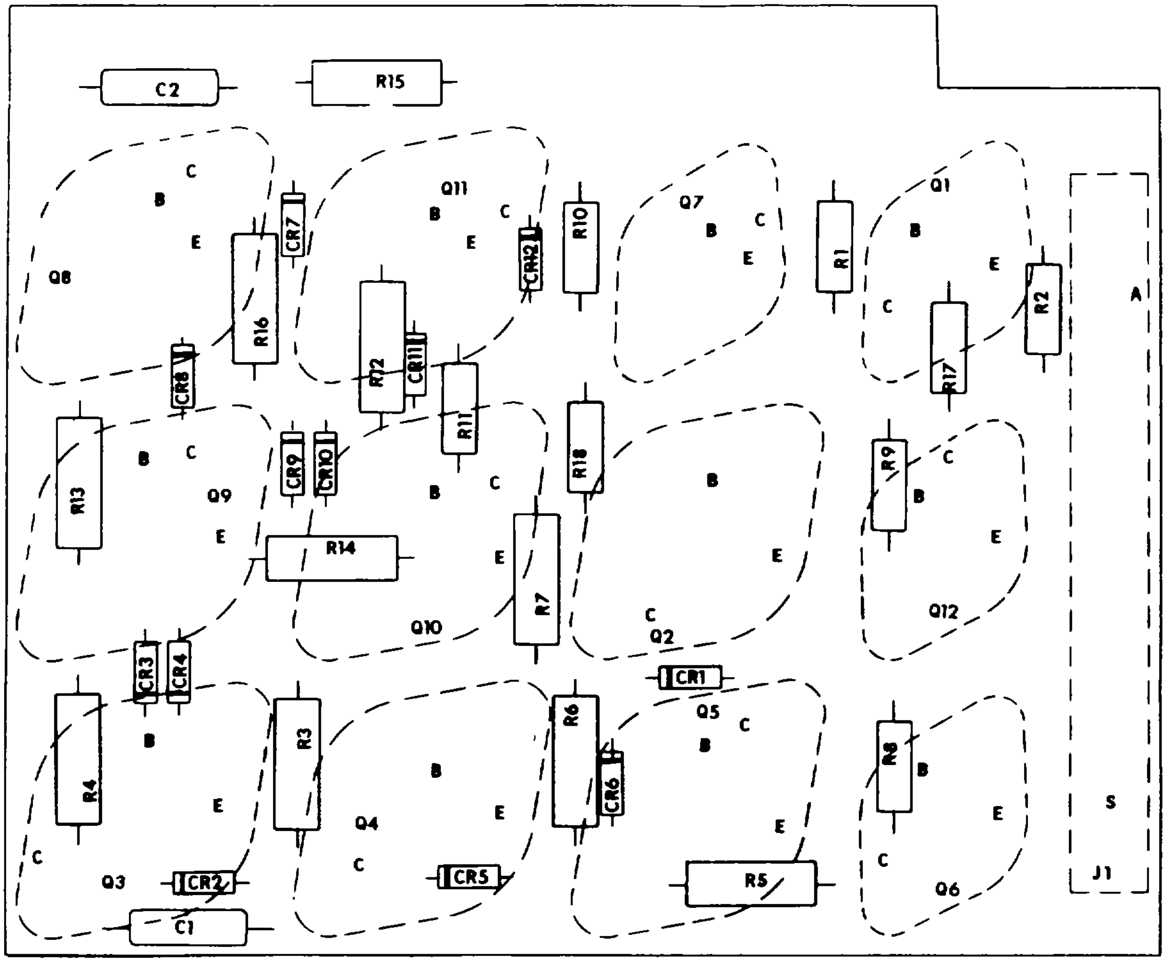
EL4ZRO52

4-61 Phase and Amplitude (CCA)



PREFIX ALL REFERENCE
DESIGNATIONS WITH 2A5

4-62 Relay Control Assembly



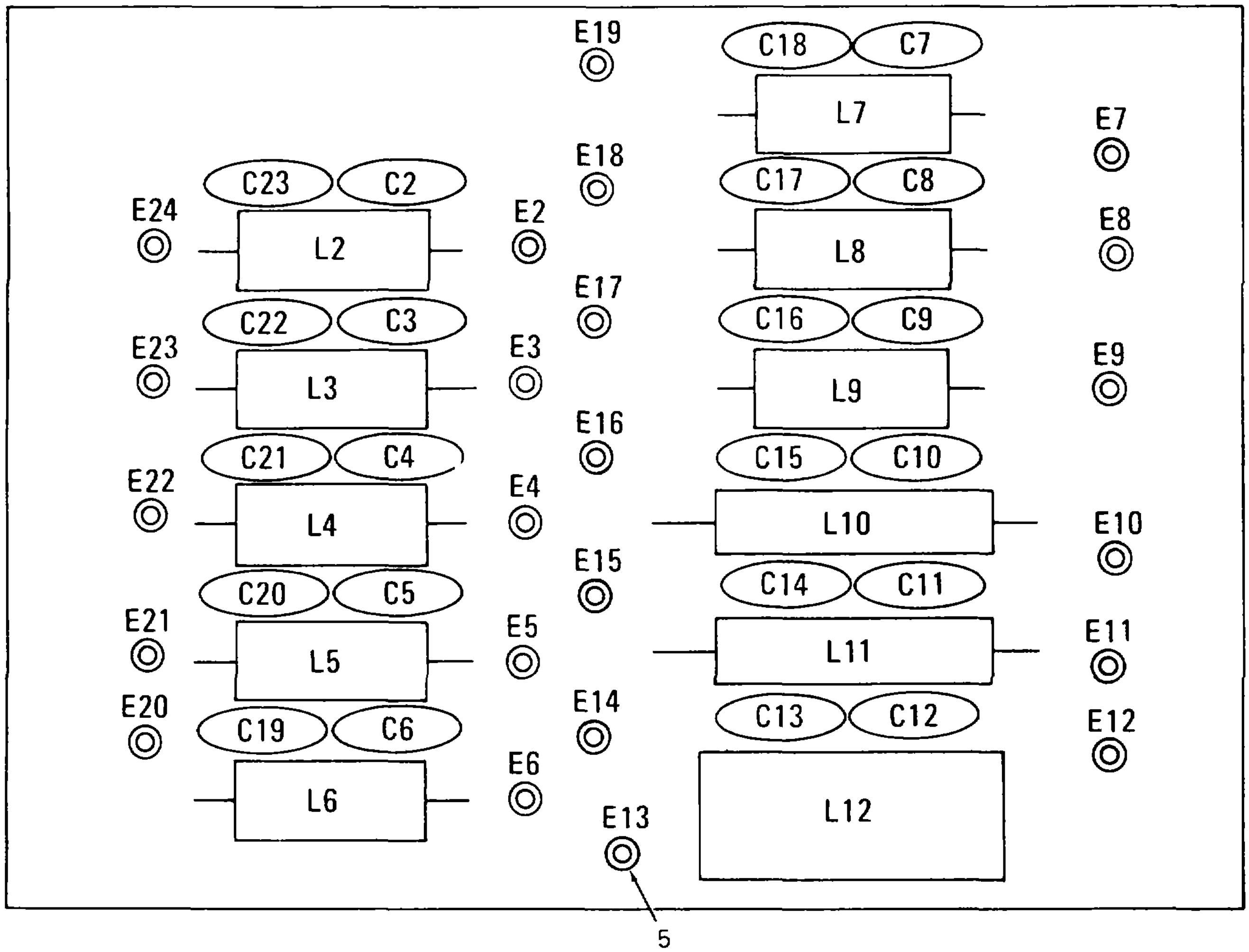
PREFIX ALL REFERENCE DESIGNATORS WITH 2A6

LEGEND

REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO
C1	1	CR8	2	R5	7	R14	6
C2	1	CR9	2	R6	6	R15	7
CR1	2	CR10	2	R7	5	R16	5
CR2	2	CR11	2	R8	4	R17	4
CR3	2	CR12	2	R9	3	R18	3
CR4	2	R1	3	R10	3		
CR5	2	R2	4	R11	4		
CR6	2	R3	5	R12	5		
CR7	2	R4	6	R13	6		

EL4ZR057

4-63 Servo Control (CCA)



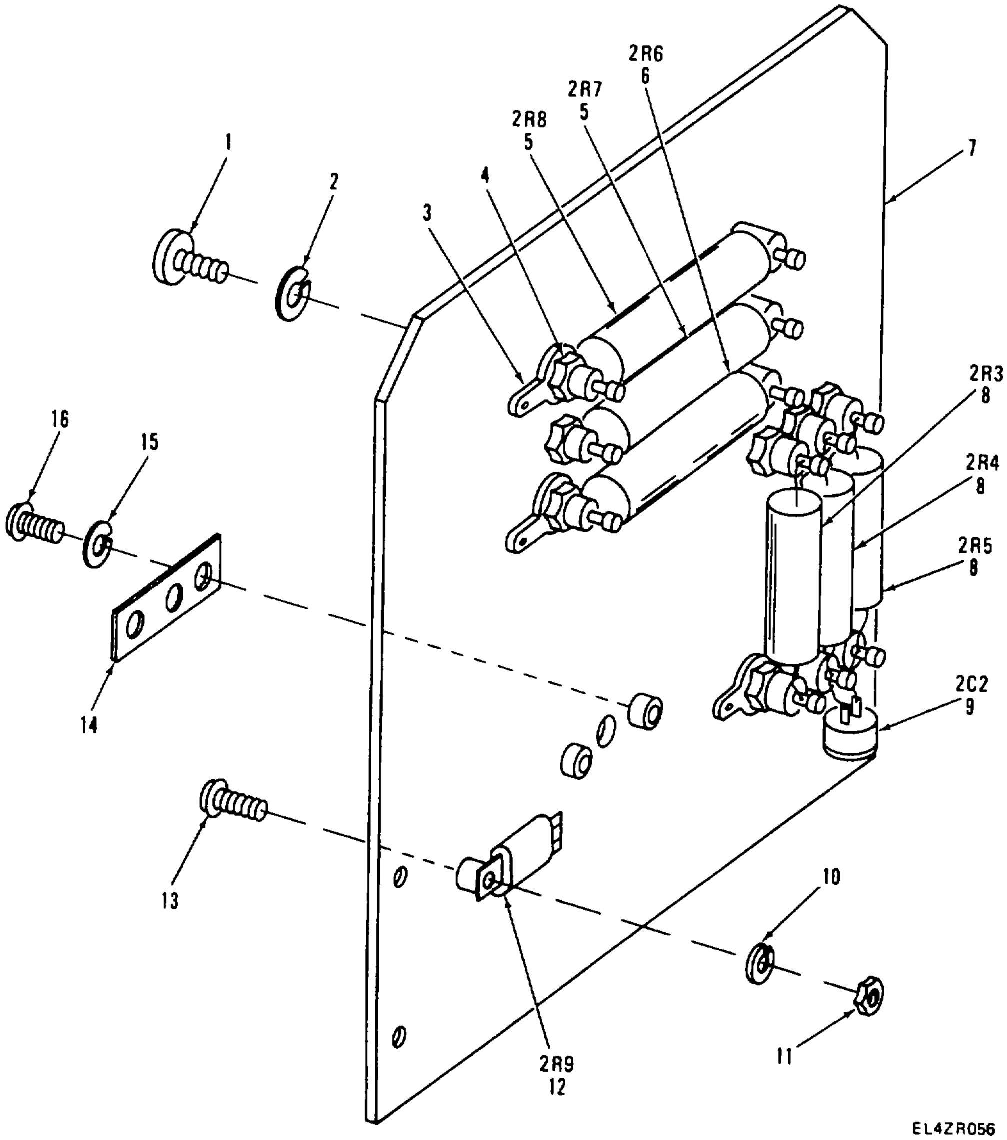
PREFIX ALL REFERENCE DESIGNATORS WITH 2A3A

LEGEND

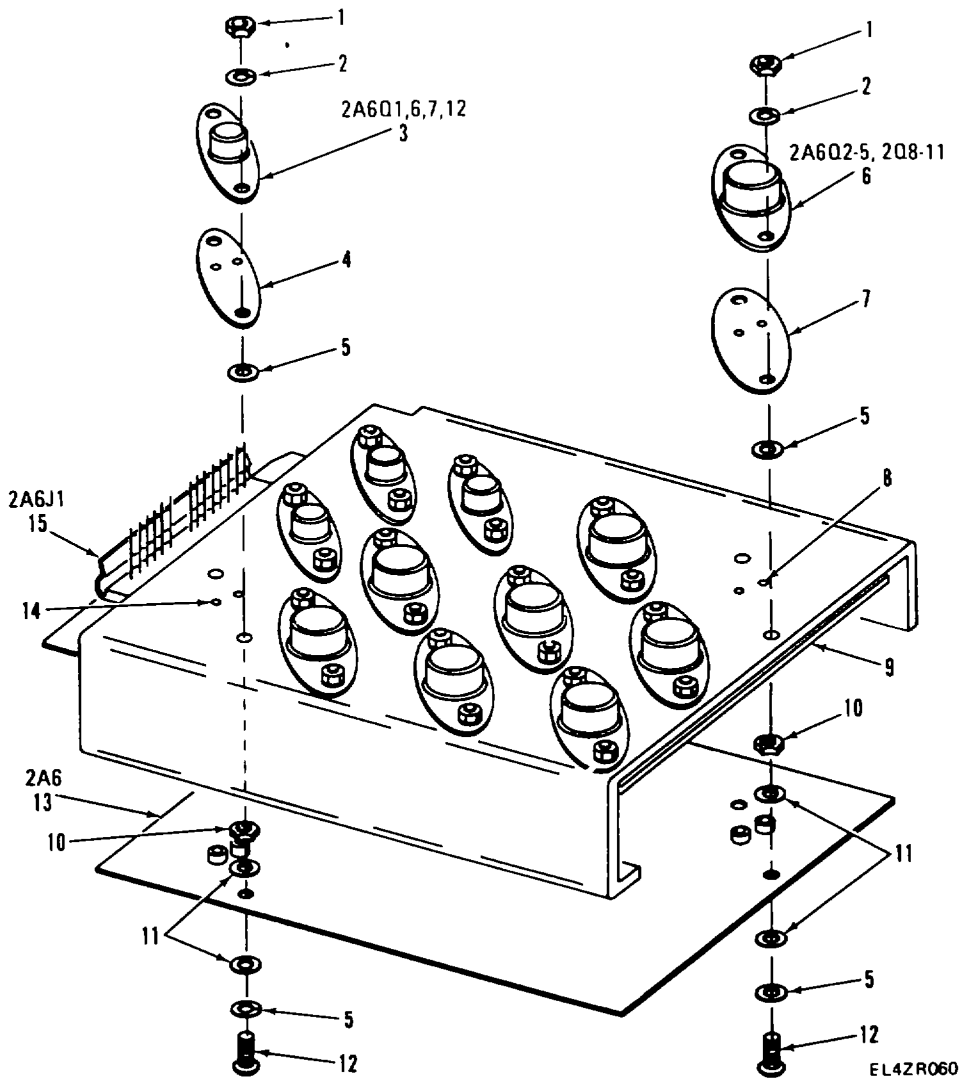
REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO	REF DES	ITEM NO
C2	1	C10	1	C18	1	L4	2
C3	1	C11	1	C19	1	L5	2
C4	1	C12	1	C20	1	L6	2
C5	1	C13	1	C21	1	L7	2
C6	1	C14	1	C22	1	L8	2
C7	1	C15	1	C23	1	L9	2
C8	1	C16	1	L2	2	L10	3
C9	1	C17	1	L3	2	L11	3
L12	4						

EL4ZR058

4-64 PCB Filter (CCA)



4-65 Rear Panel-Exploded View



4- 66 Electrical Equipment Mounting Base MT- 4982URC-92

APPENDIX A

REFERENCES

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	US Army Equipment Index of Modification Work Orders.
SB 700-20	Army Adopted/Other Items Selected for Authorization/List of Reportable Items.
TB SIG 291	Safety Measures to Be Observed When Installing and Using Whip Antennas, Field Type Masts, Towers, Antennas, and Metal Poles That Are Used with Communication, Radar, and Direction Finder Equipment.
TB 43-0118	Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electrical Equipment Shelters
TB 38-750	The Army Maintenance Management System.
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

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Subject	*Paragraph Figure, Table, Number*

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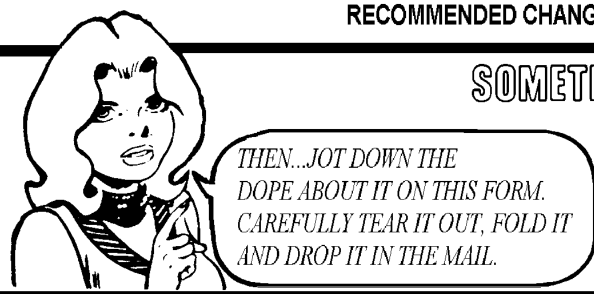

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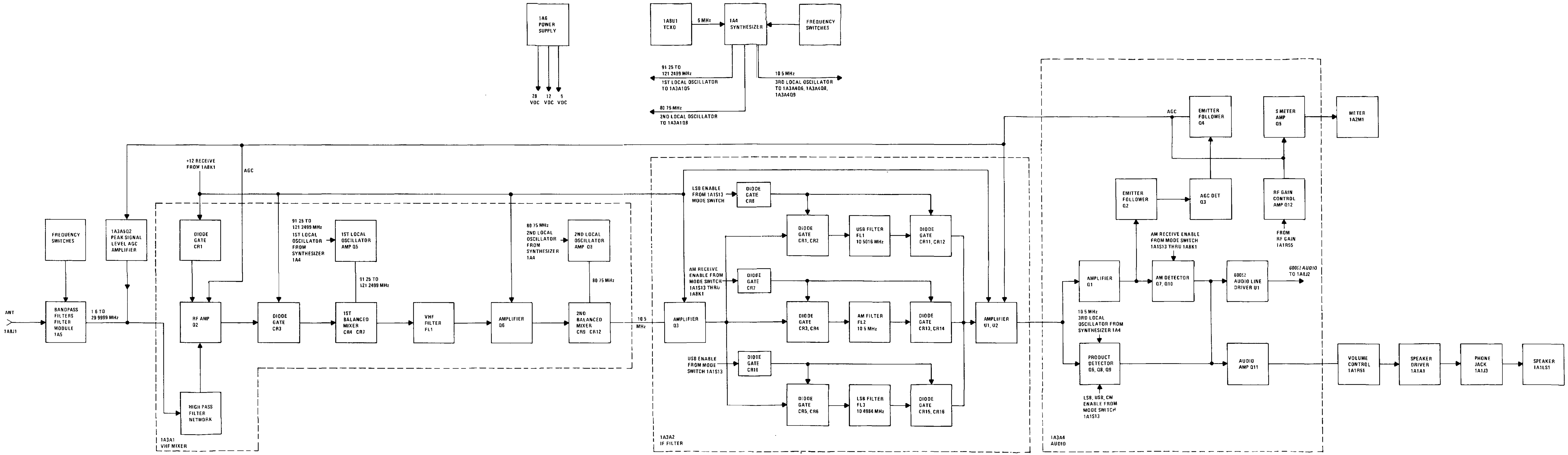
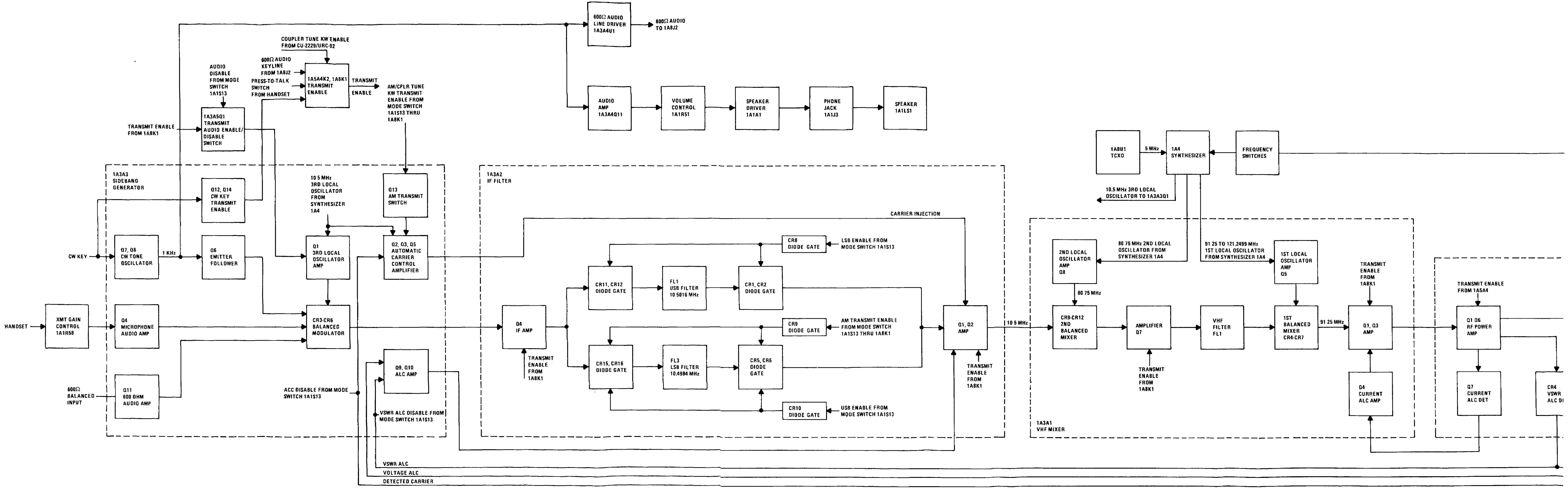
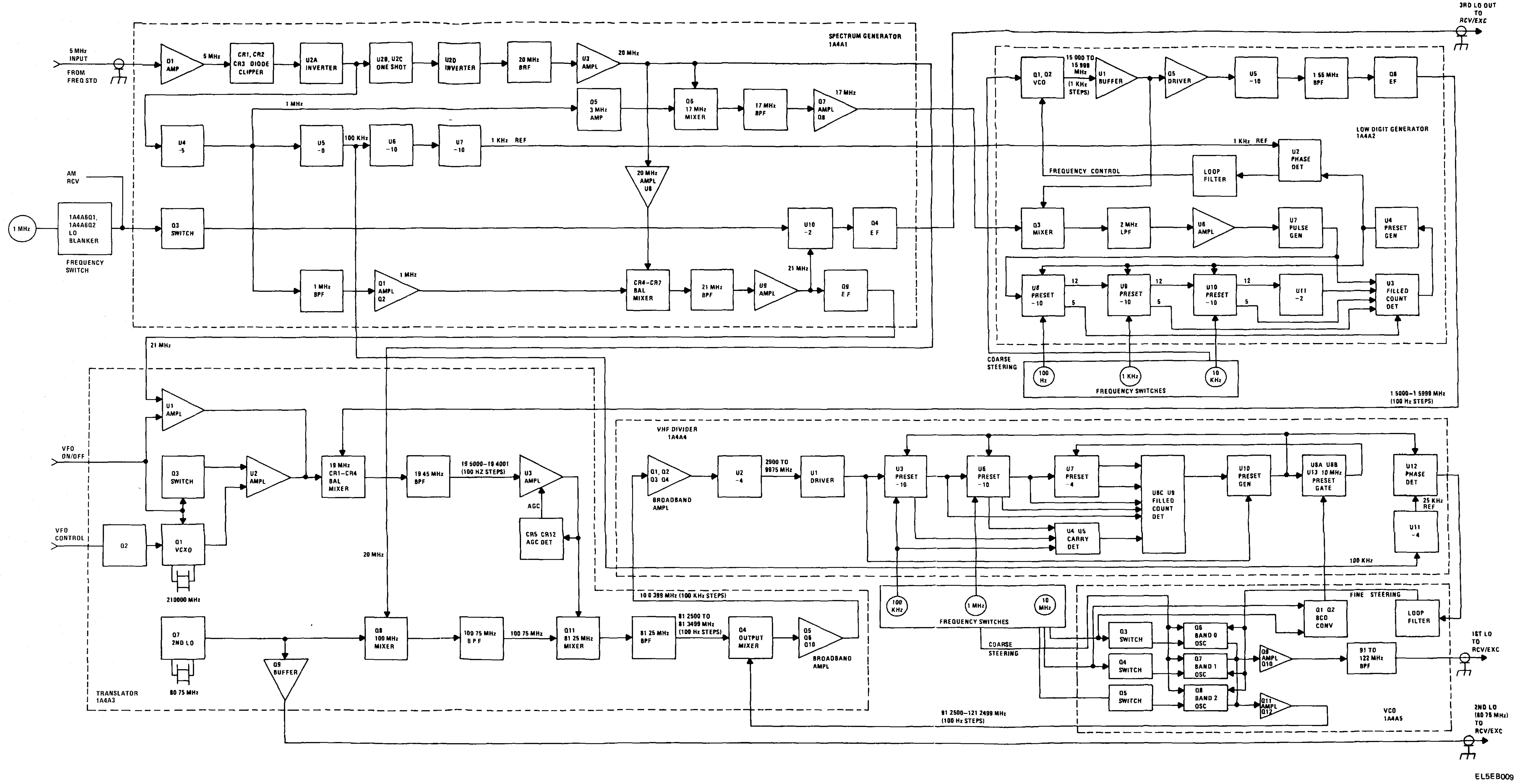


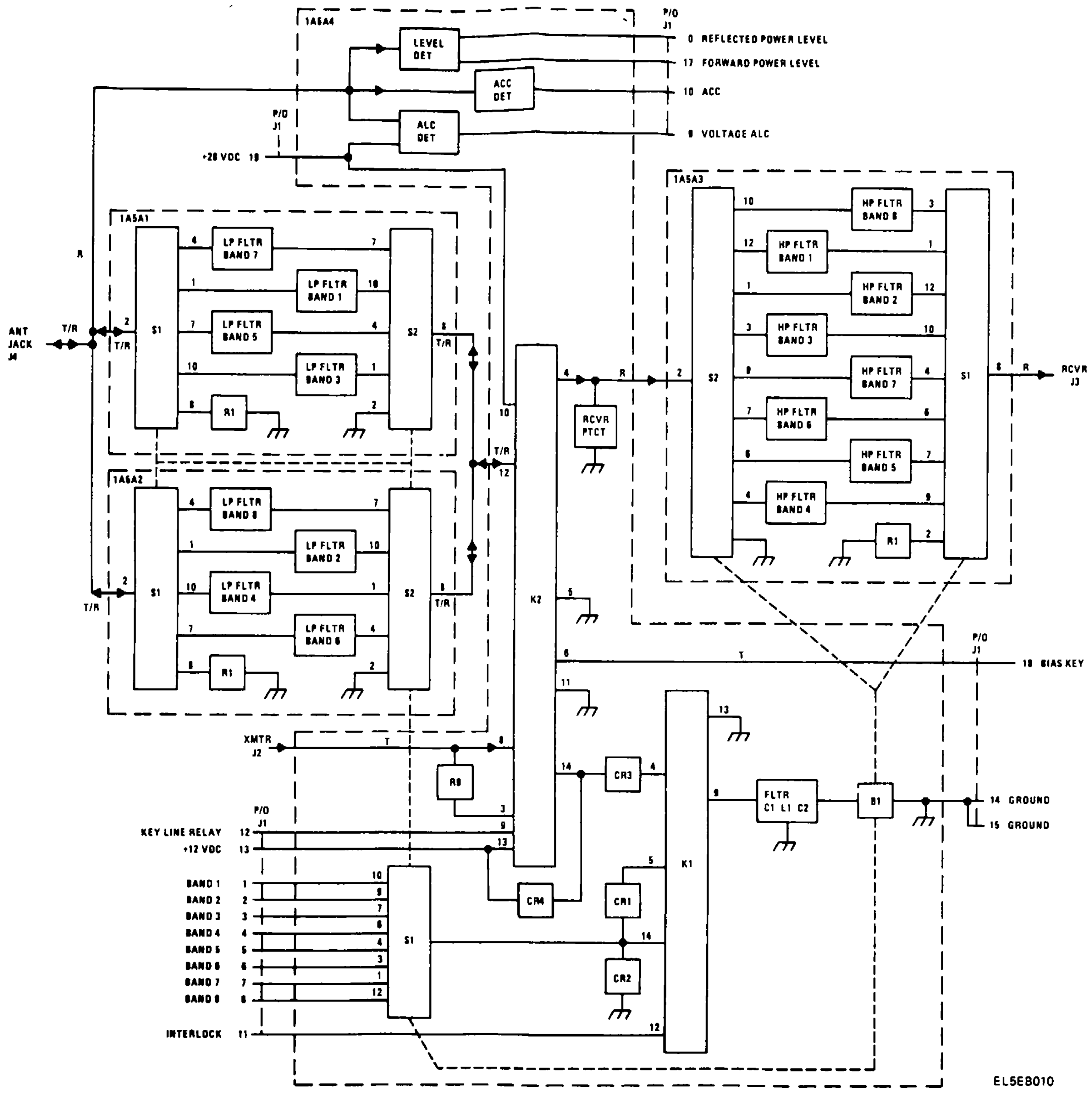
FO-1 Receiver Block Diagram



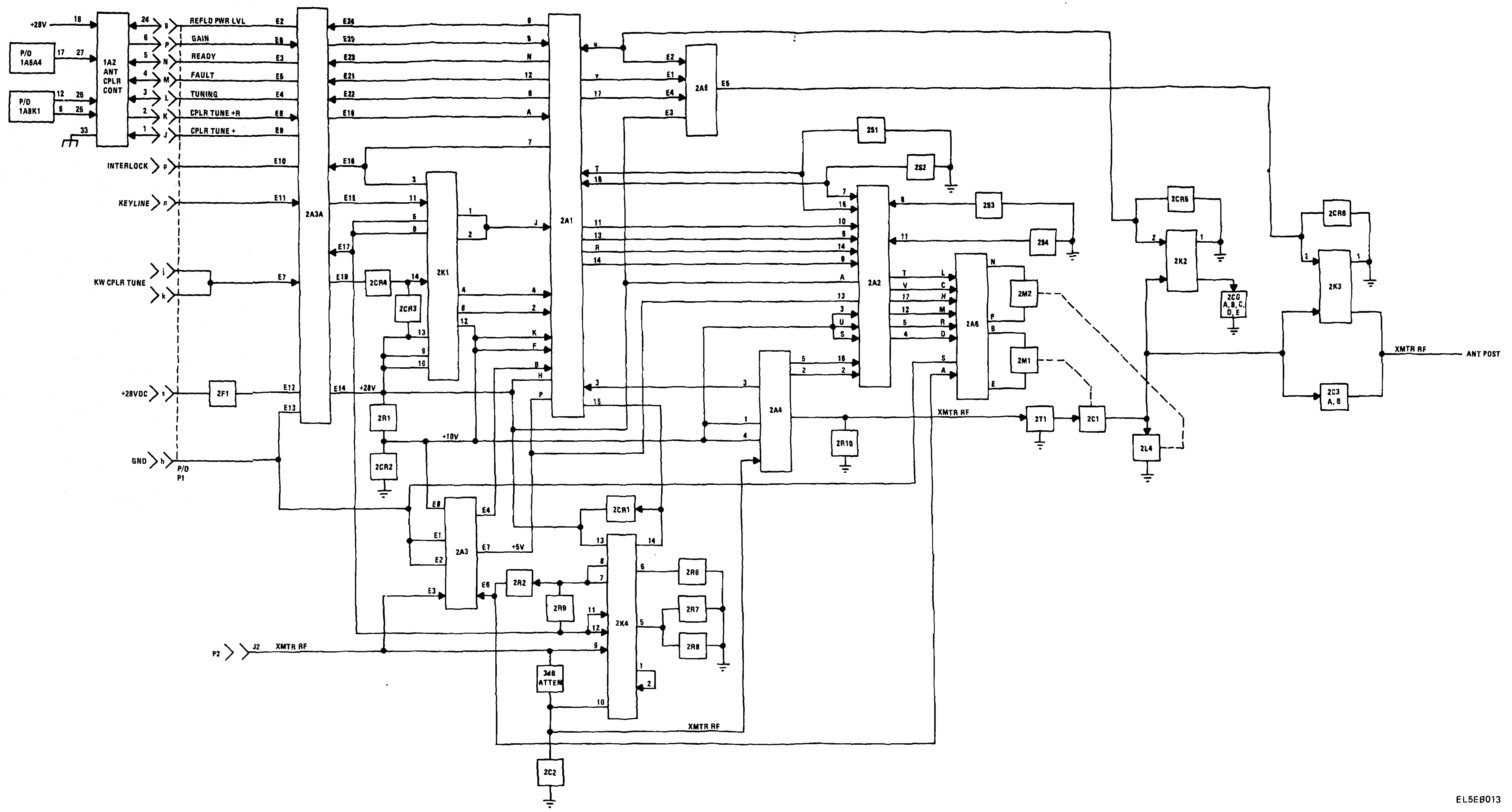
FO-2 Transmitter Block Diagram



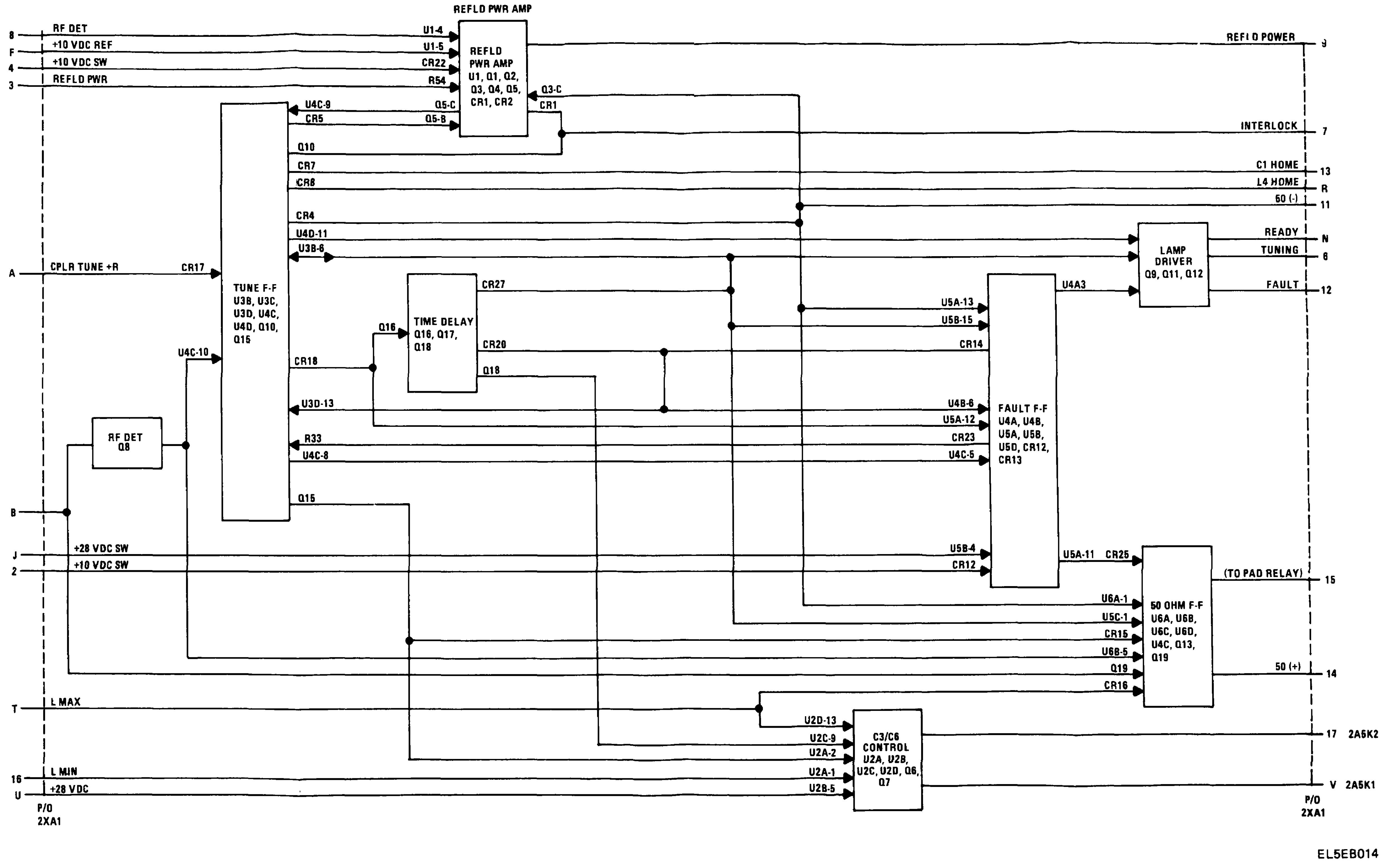
FO-3 Synthesizer Block Diagram



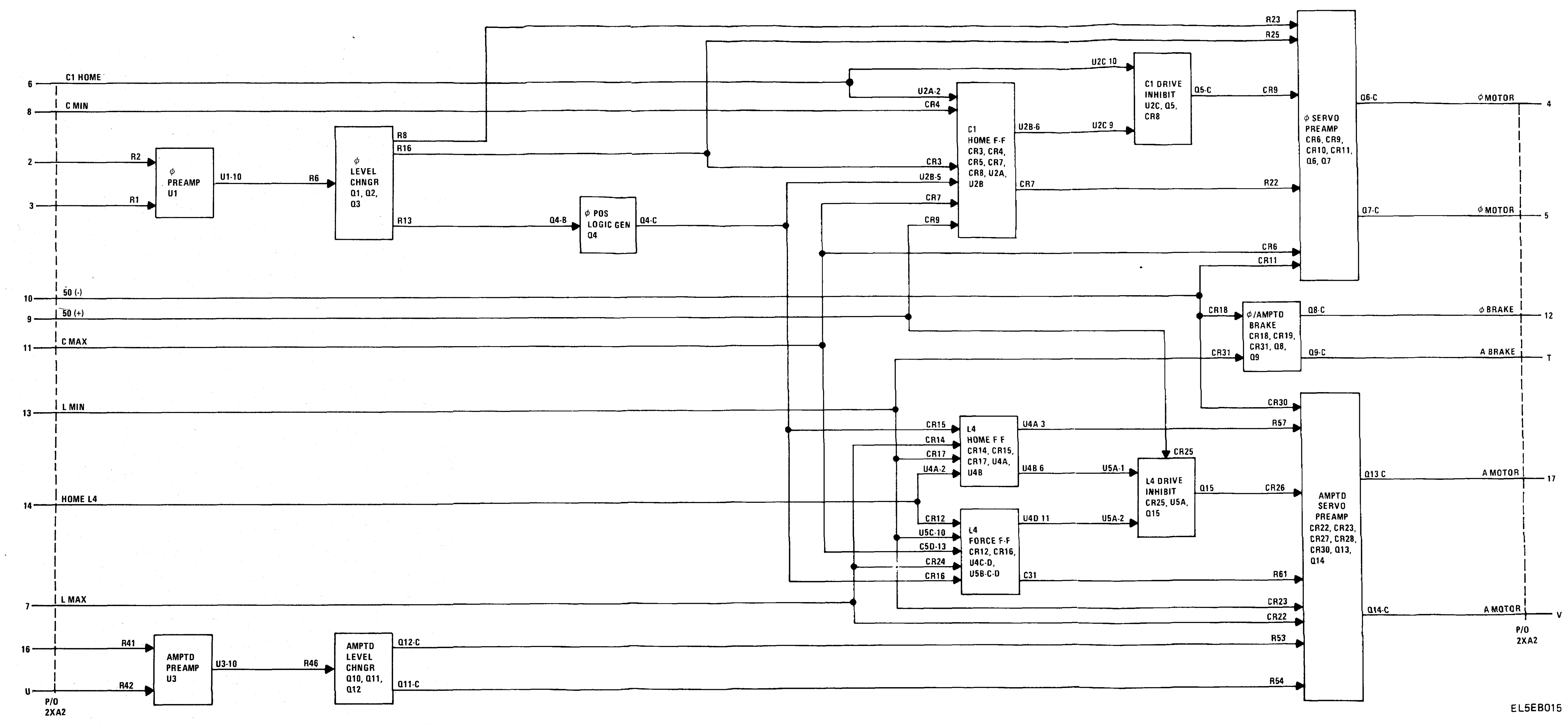
FO-4 Filter Module Block Diagram



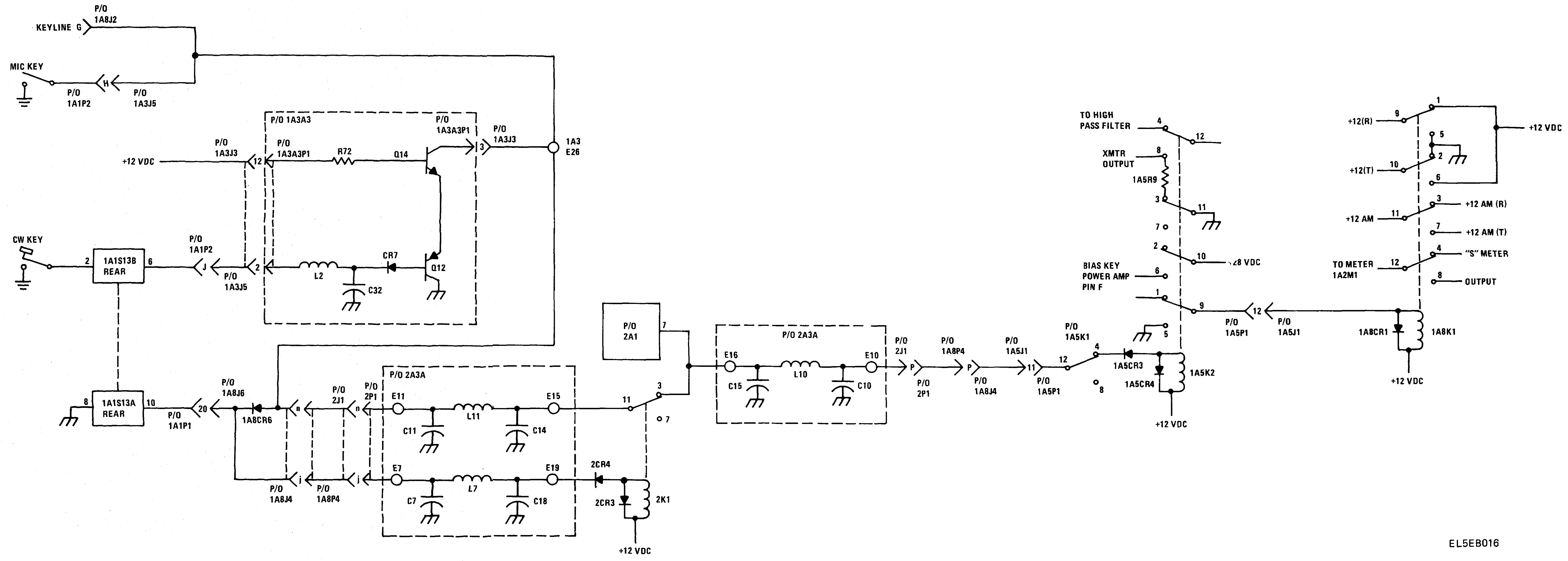
FO-5 Antenna Coupler Block Diagram



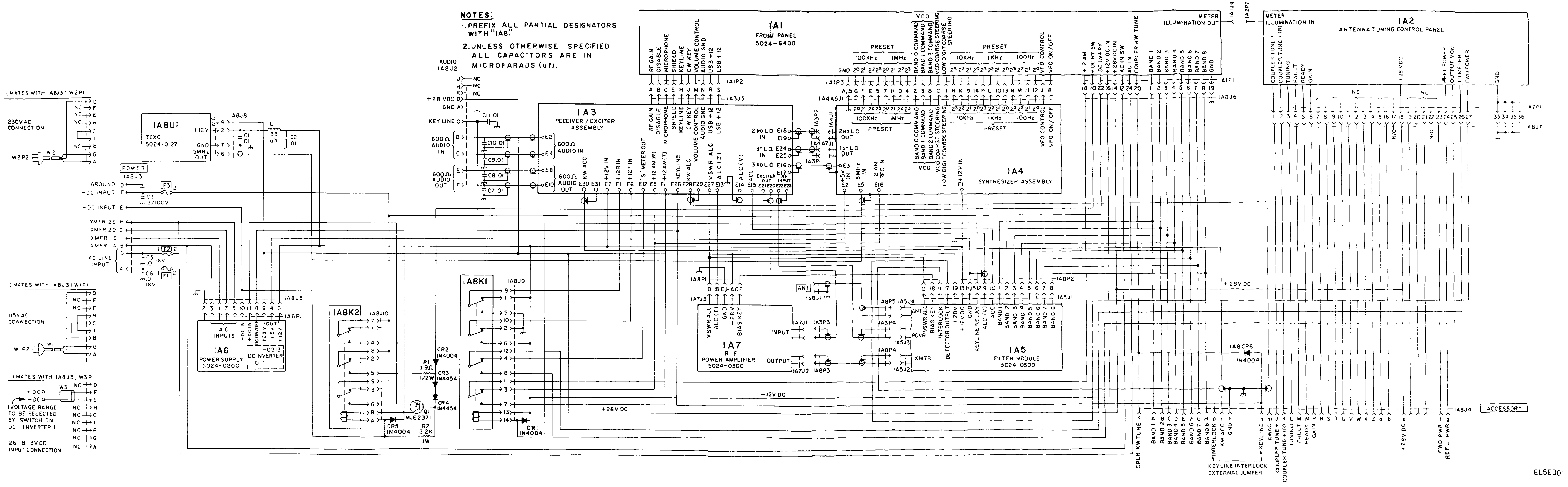
FO-6 Control Logic Board Diagram



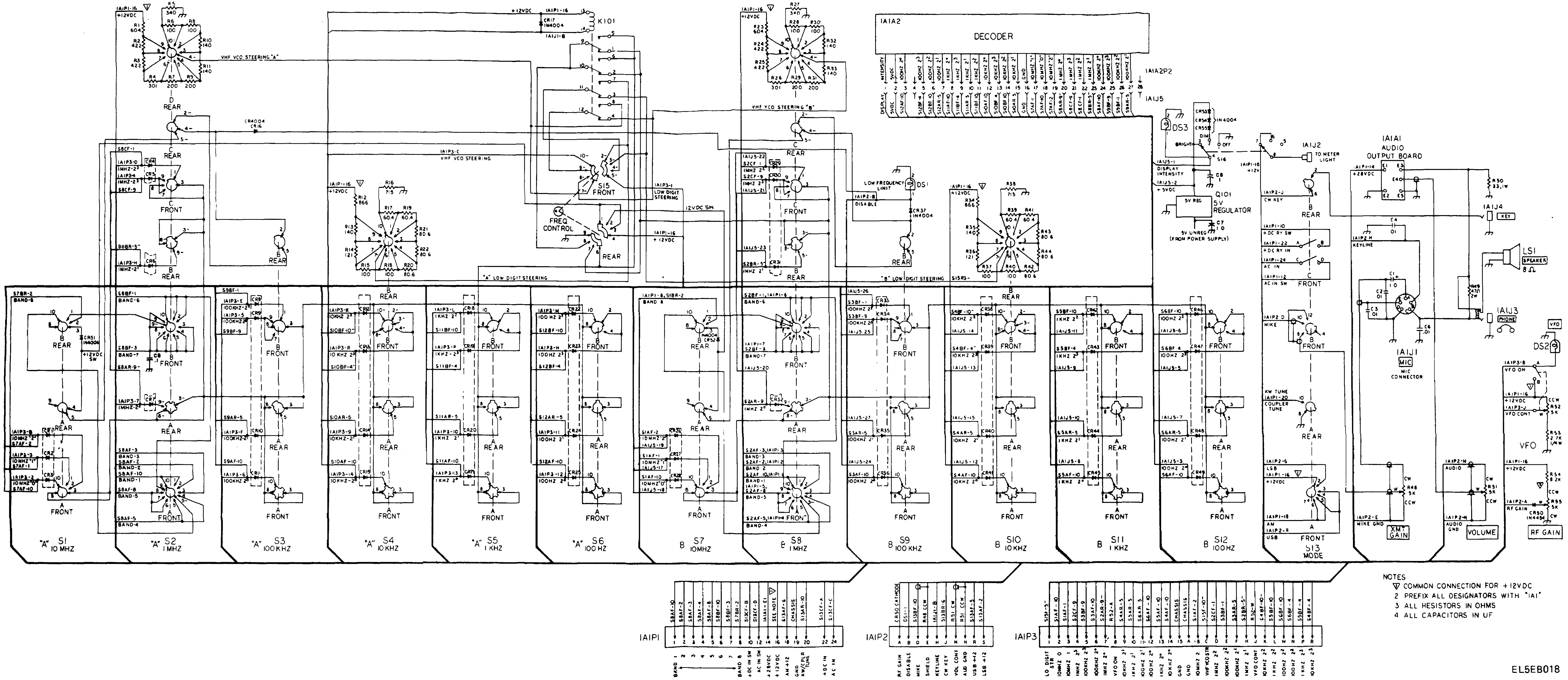
FO-7 Phase & Amplitude Control Block Diagram



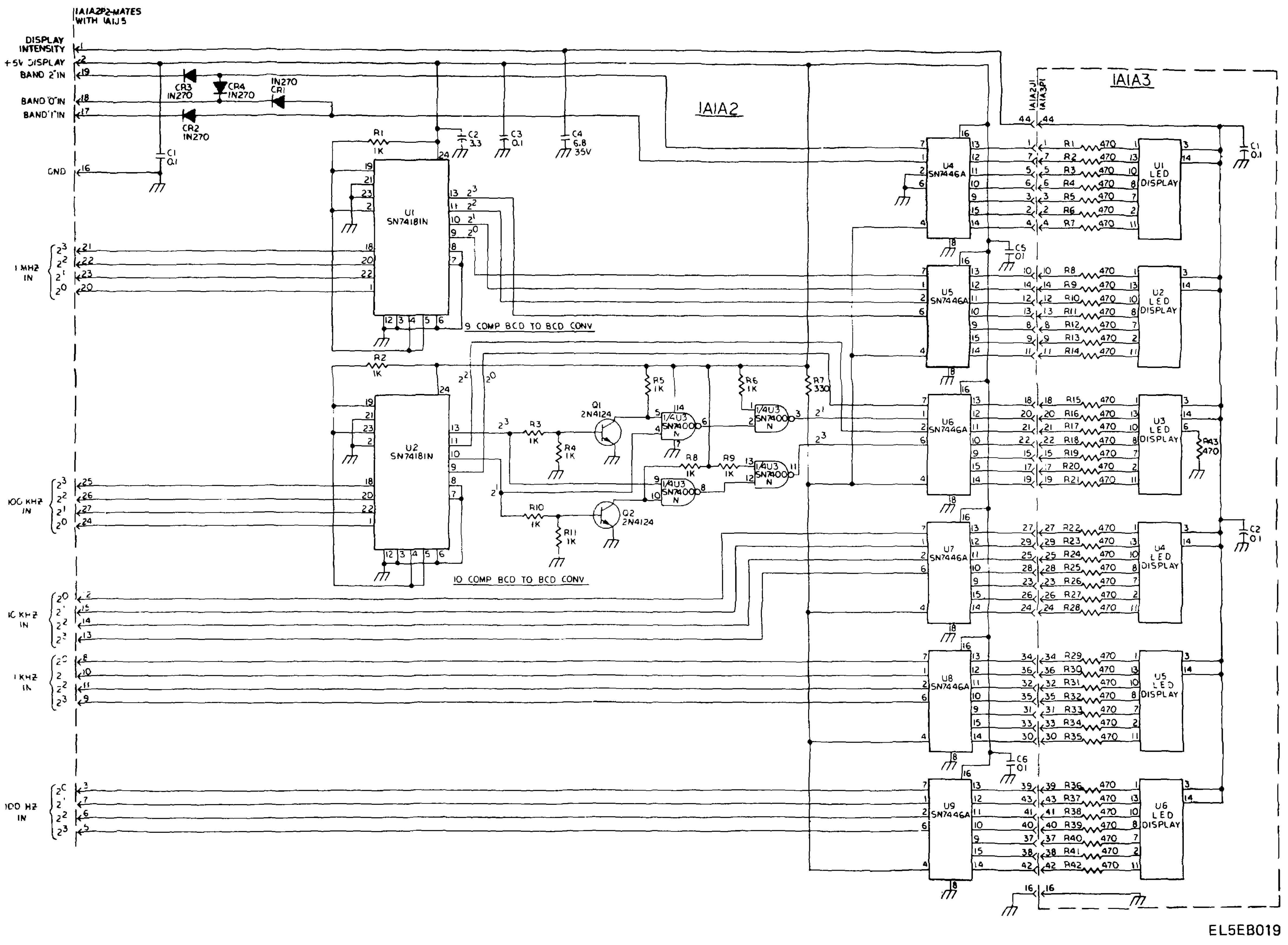
FO-8 Keyline Simplified Diagram



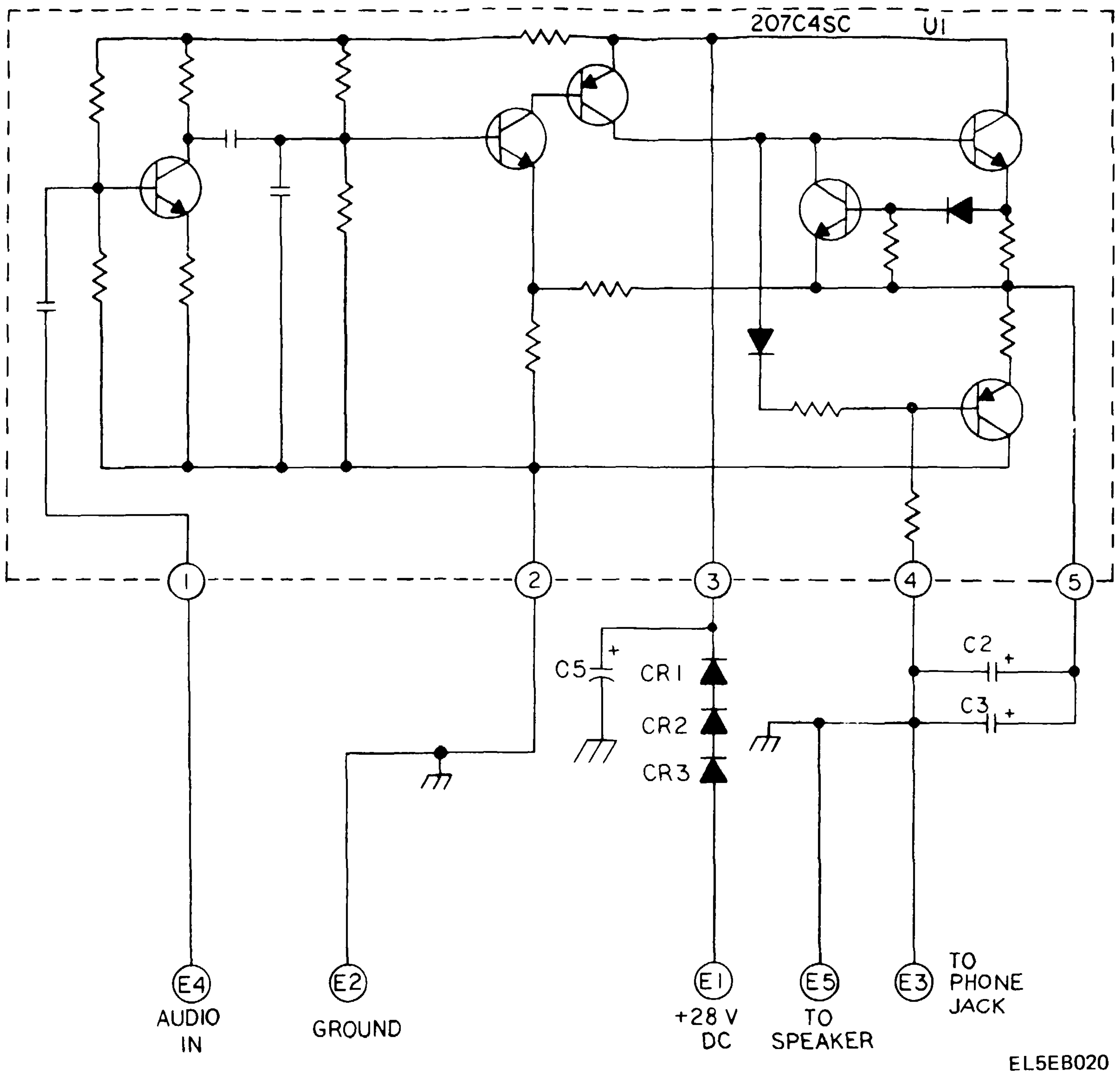
FO-9 Main Frame Wiring



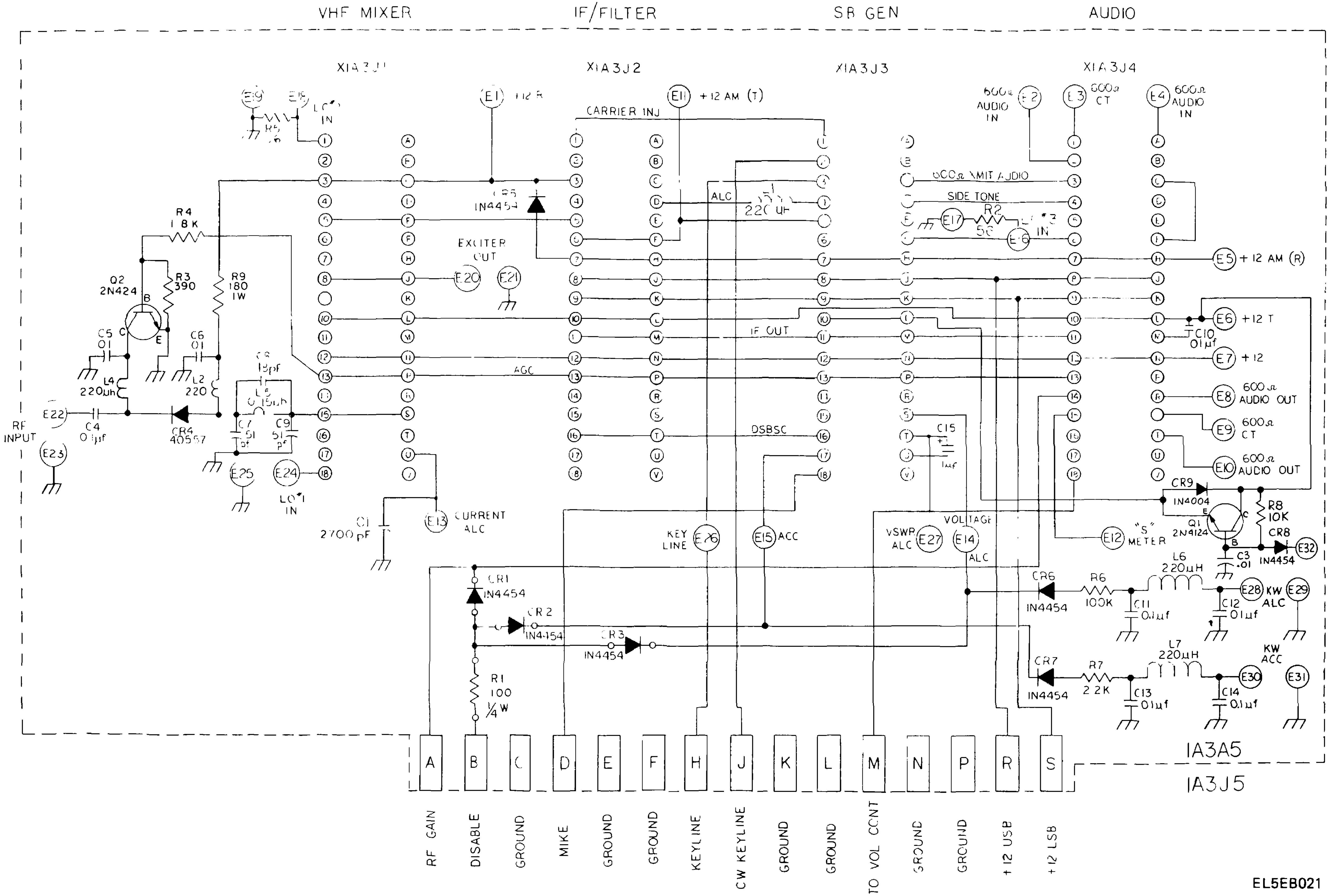
FO-10 Half Duplex Front Panel Wiring Diagram



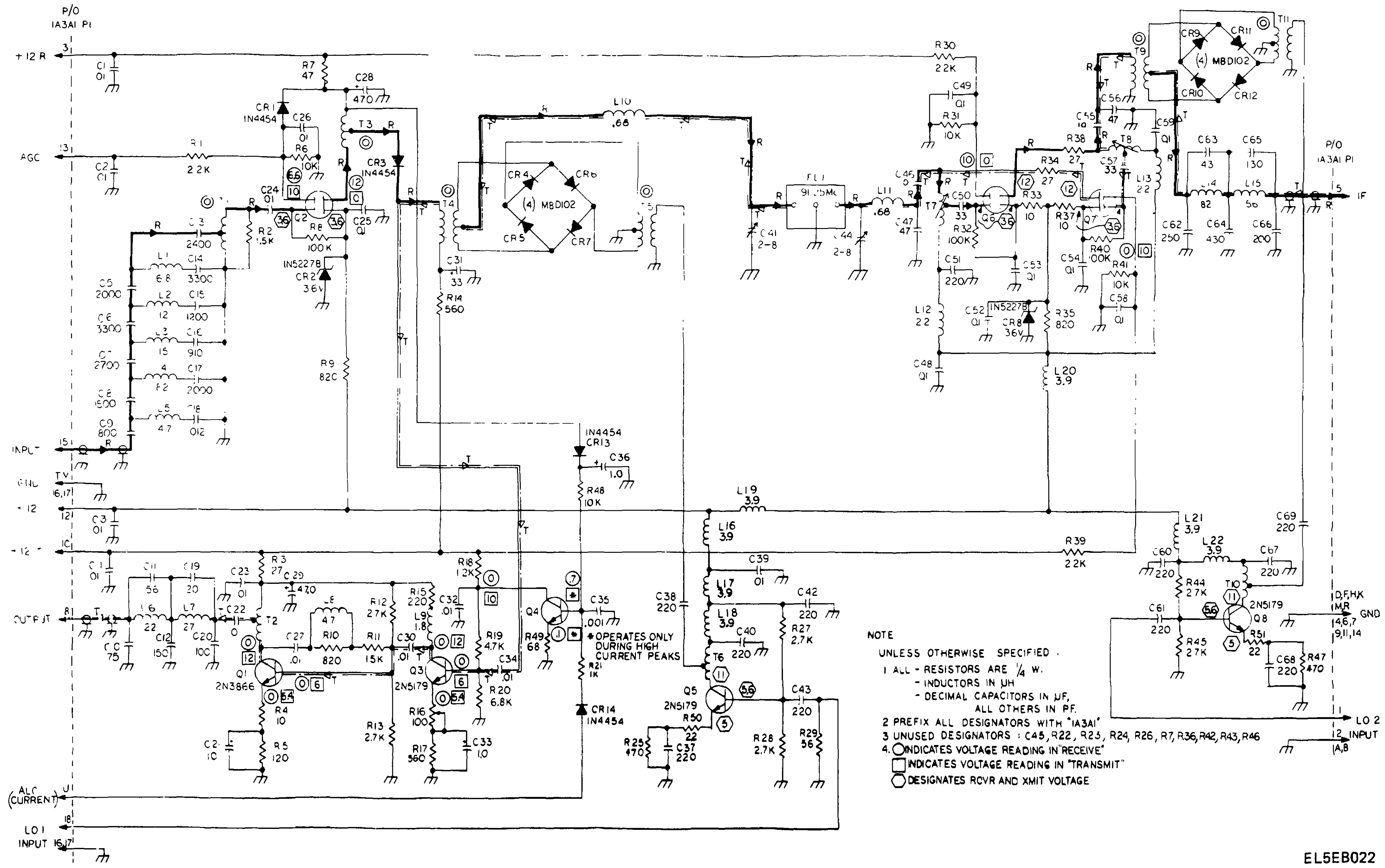
FO-11. Decoder and Display Schematic



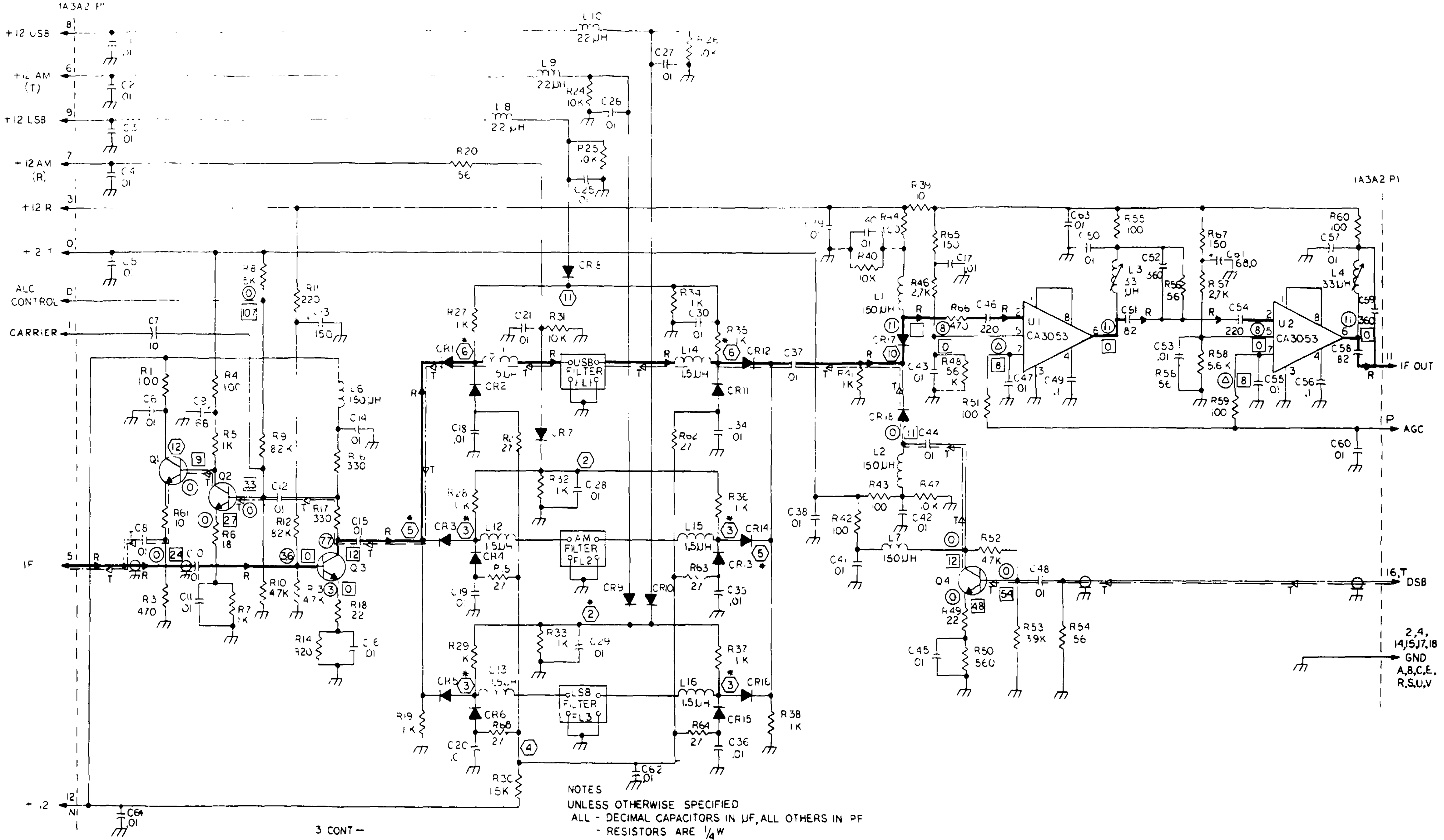
FO-12. Speaker Driver Schematic



FO-13. Receiver/Exciter Schematic



FO-14. VHF Mixer Schematic

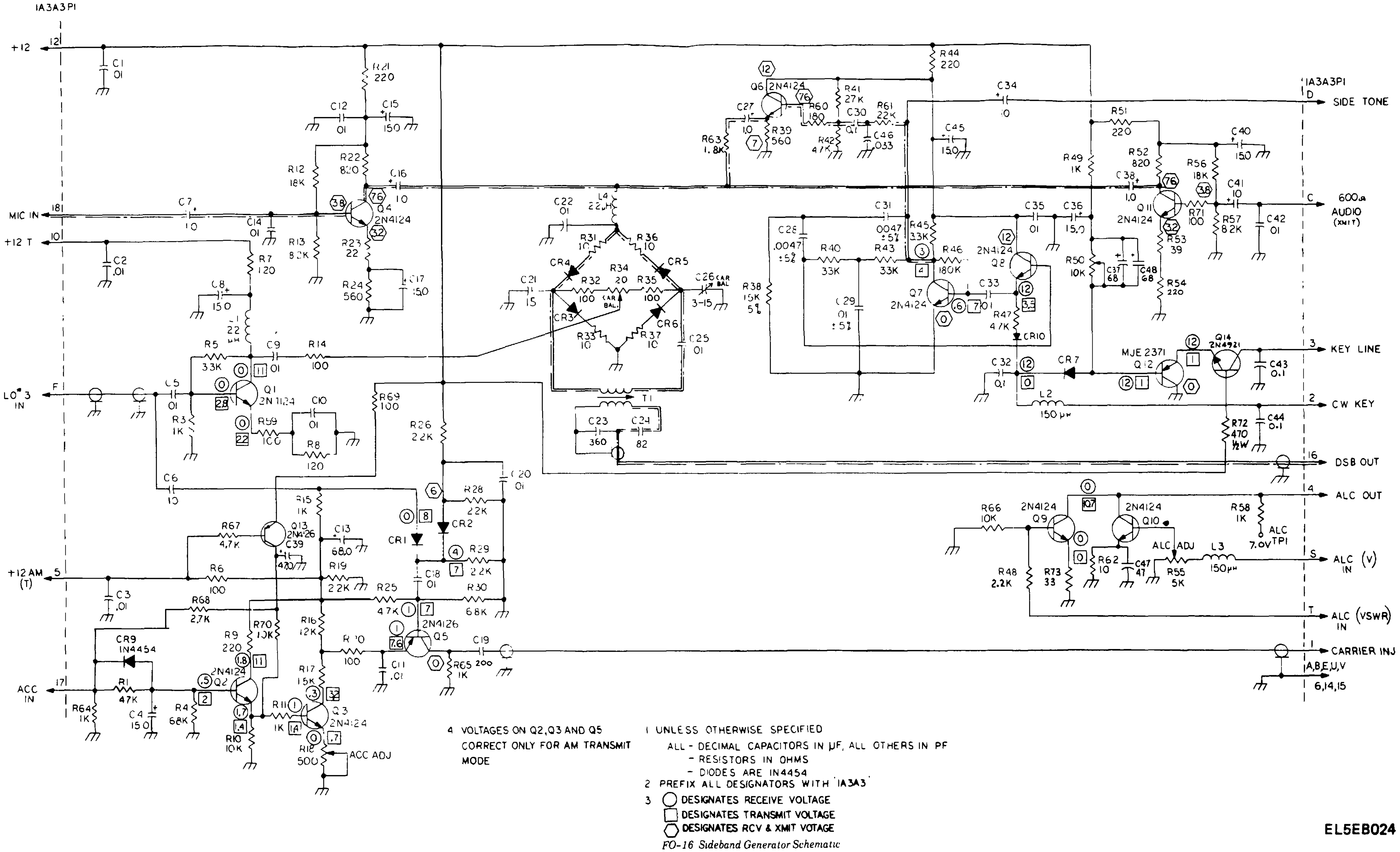


NOTES
UNLESS OTHERWISE SPECIFIED
ALL - DECIMAL CAPACITORS IN μF, ALL OTHERS IN PF
- RESISTORS ARE 1/4W
- DIODES ARE 1N4454
- TRANSISTORS ARE 2N4124
2 PREFIX ALL DESIGNATORS WITH "1A3A2"
3 * VOLTAGES SHOWN WITH LSB MODE SELECTED
◯ DESIGNATES VOLTAGE READING IN "RECEIVE"

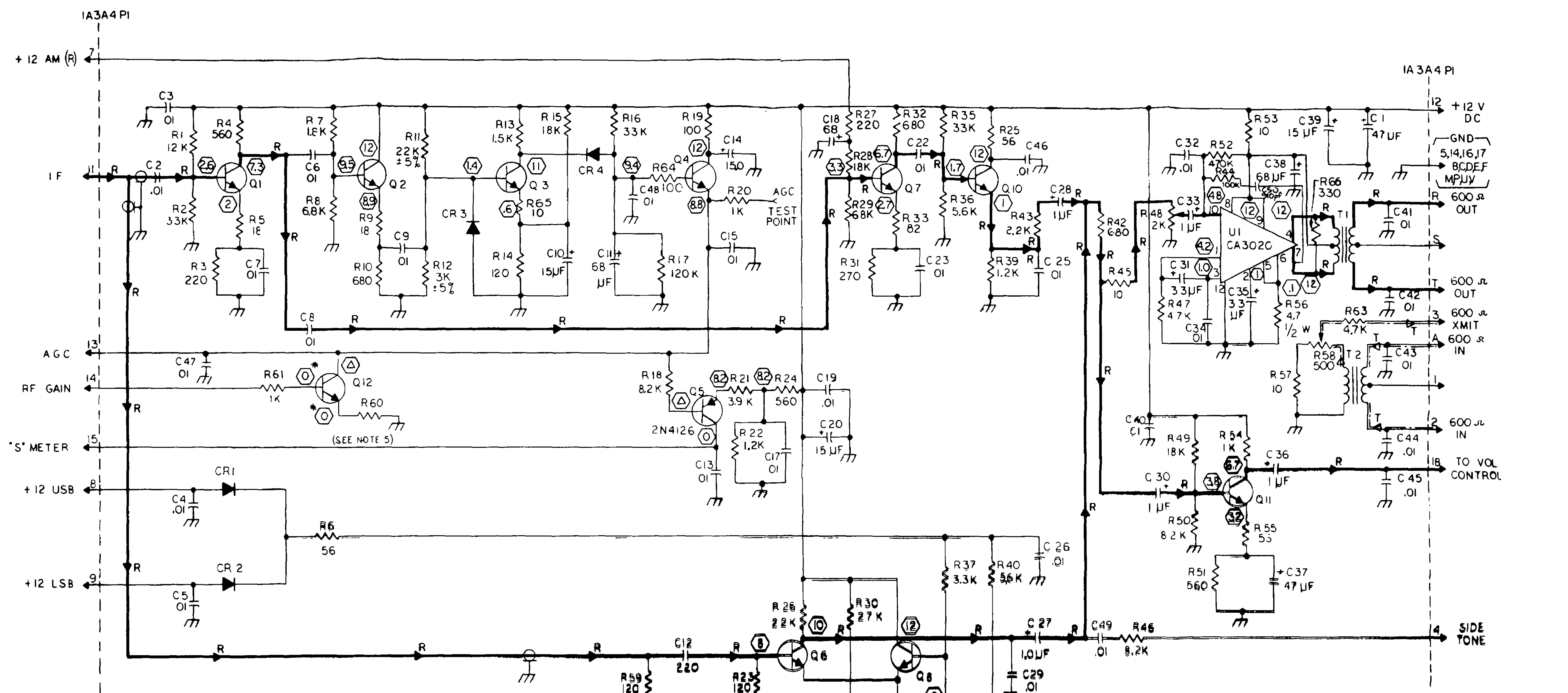
3 CONT—
□ DESIGNATES VOLTAGE READING IN "TRANSMIT"
⬡ DESIGNATES NON-SWITCHED VOLTAGE
△ VOLTAGE DEPENDS ON RECEIVED SIGNAL LEVEL: 8V NO SIGNAL, 2V MAX SIGNAL

EL5EB023

FO-15. IF Filter Schematic



FO-16. Sideband Generator Schematic



1. UNLESS OTHER WISE SPECIFIED
ALL DIODES ARE TYPE 1N4454
TRANSISTORS ARE TYPE 2N4124
DECIMAL CAPACITORS IN µF ALL OTHERS IN PF
RESISTORS IN OHMS, ¼ W

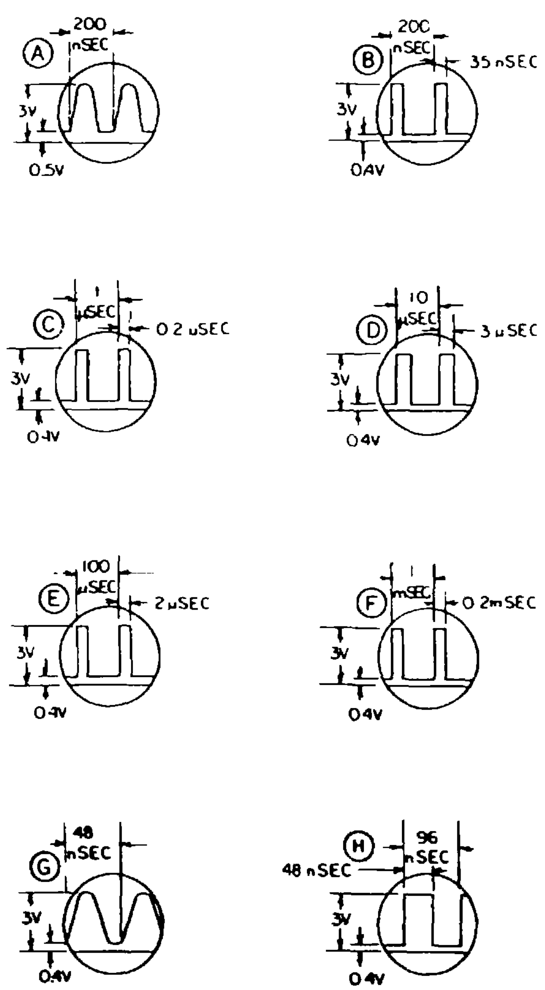
2. PREFIX ALL DESIGNATORS WITH "1A3A4"

3. ⬡ DESIGNATES RCVR AND XMIT VOLTAGES
△ VARIES WITH RECEIVED SIGNAL: 8V NO SIG, 2V MAX SIG

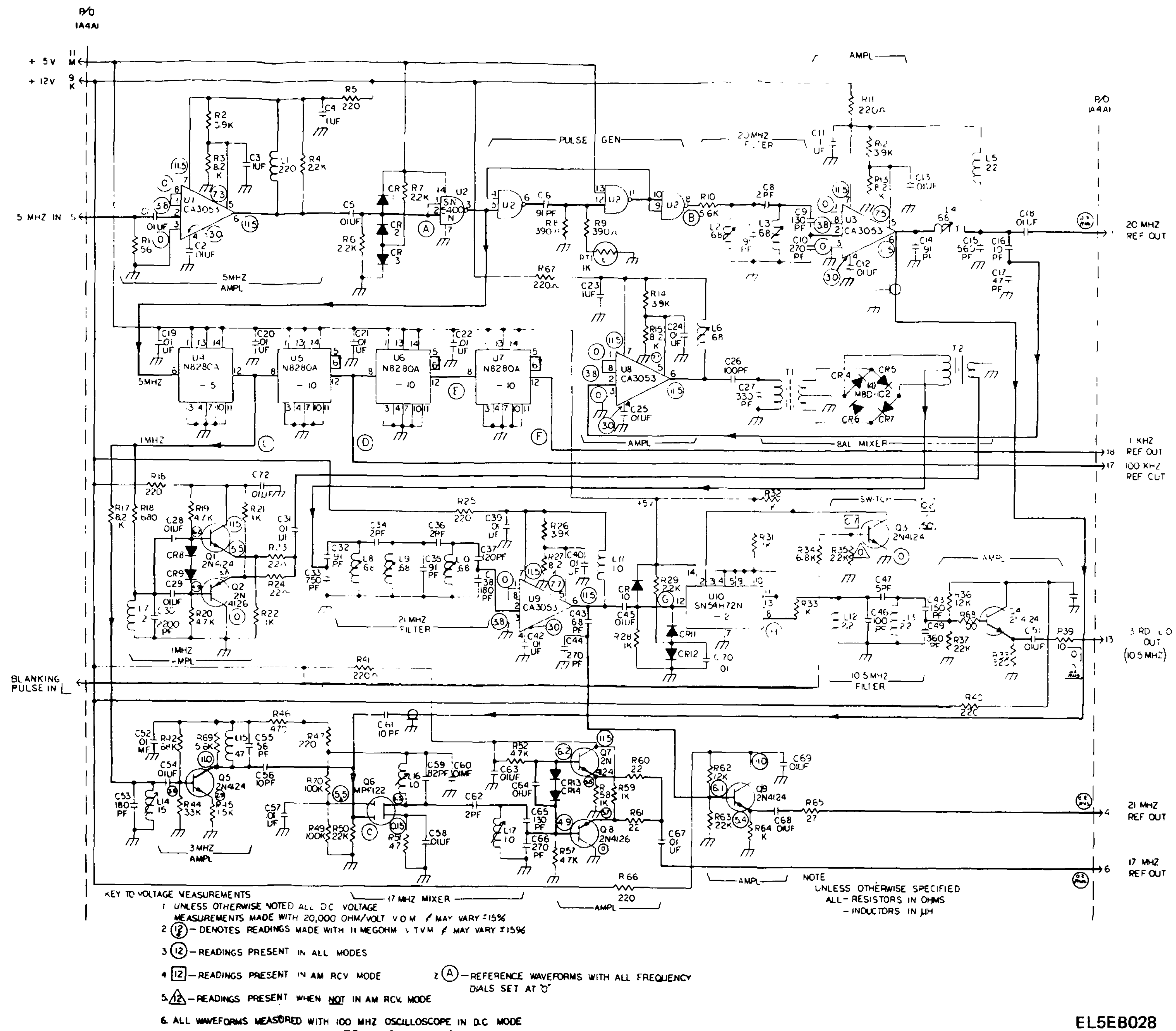
4. * RF GAIN CONTROL FULLY CW

5. VALUE OF R60 SELECTED IN TEST: 12 TO 22 OHMS

FO-17 Audio Board Schematic



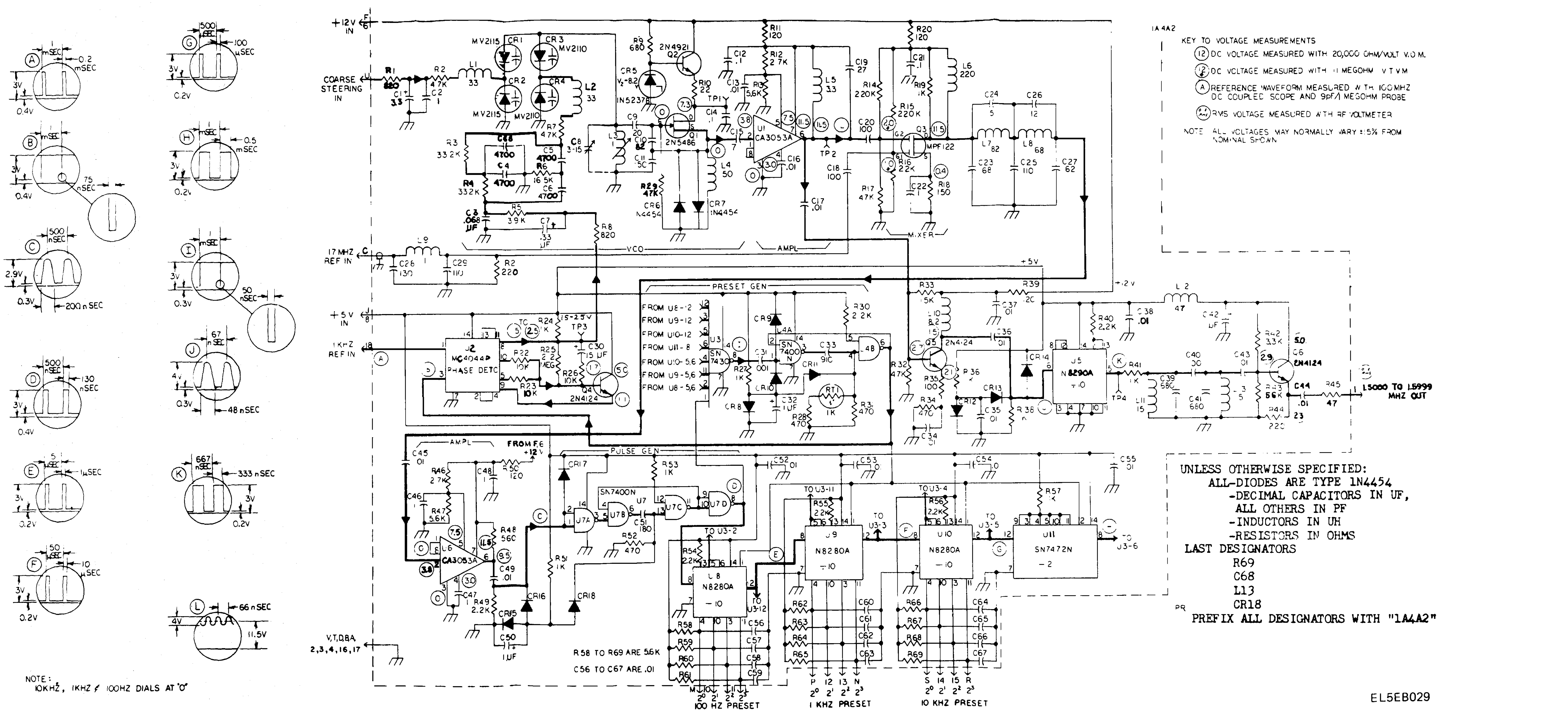
NOTE. H DOES NOT CLOCK IN AM. RC MODE



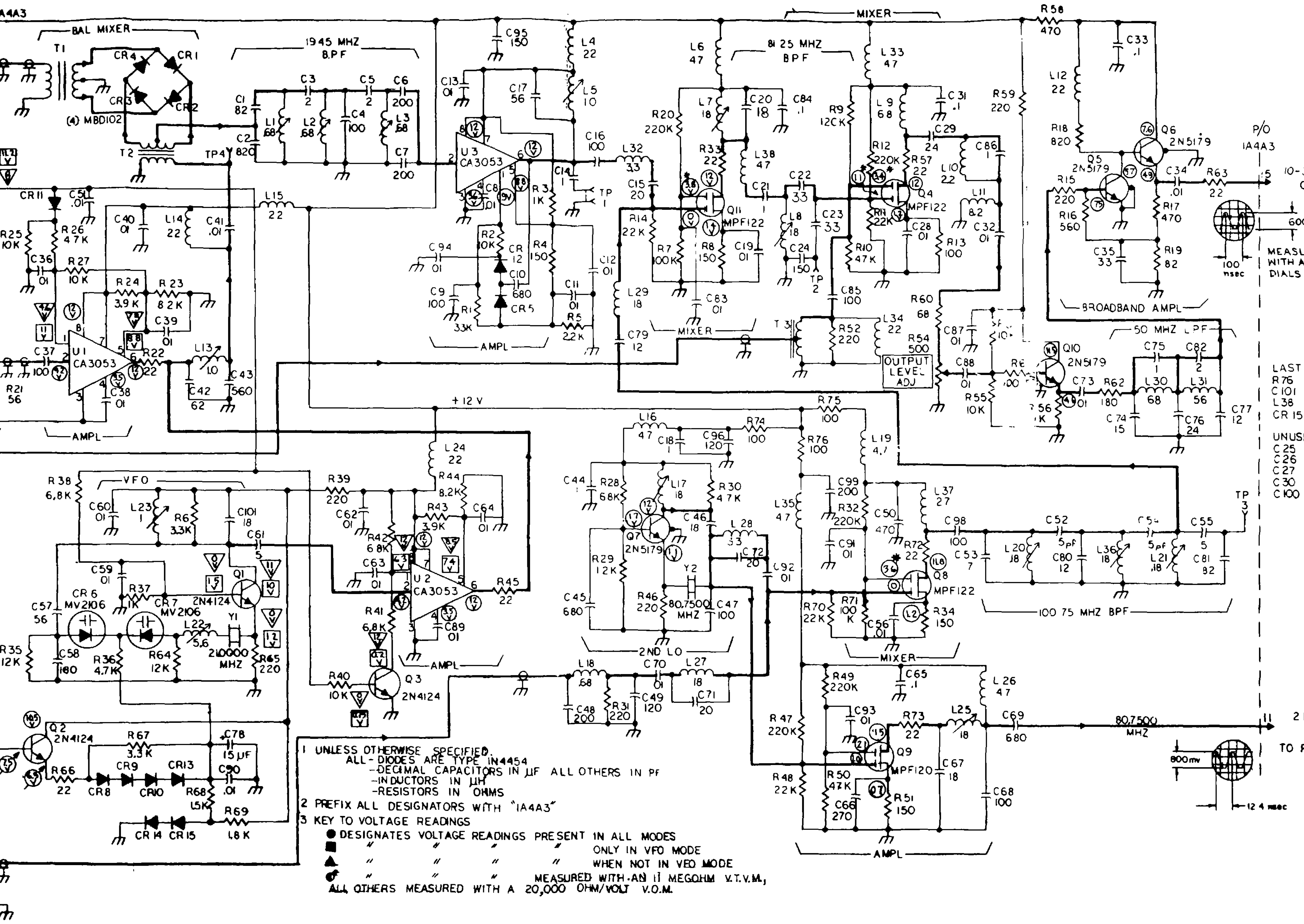
FO-18 Spectrum Generator Schematic

EL5EB028

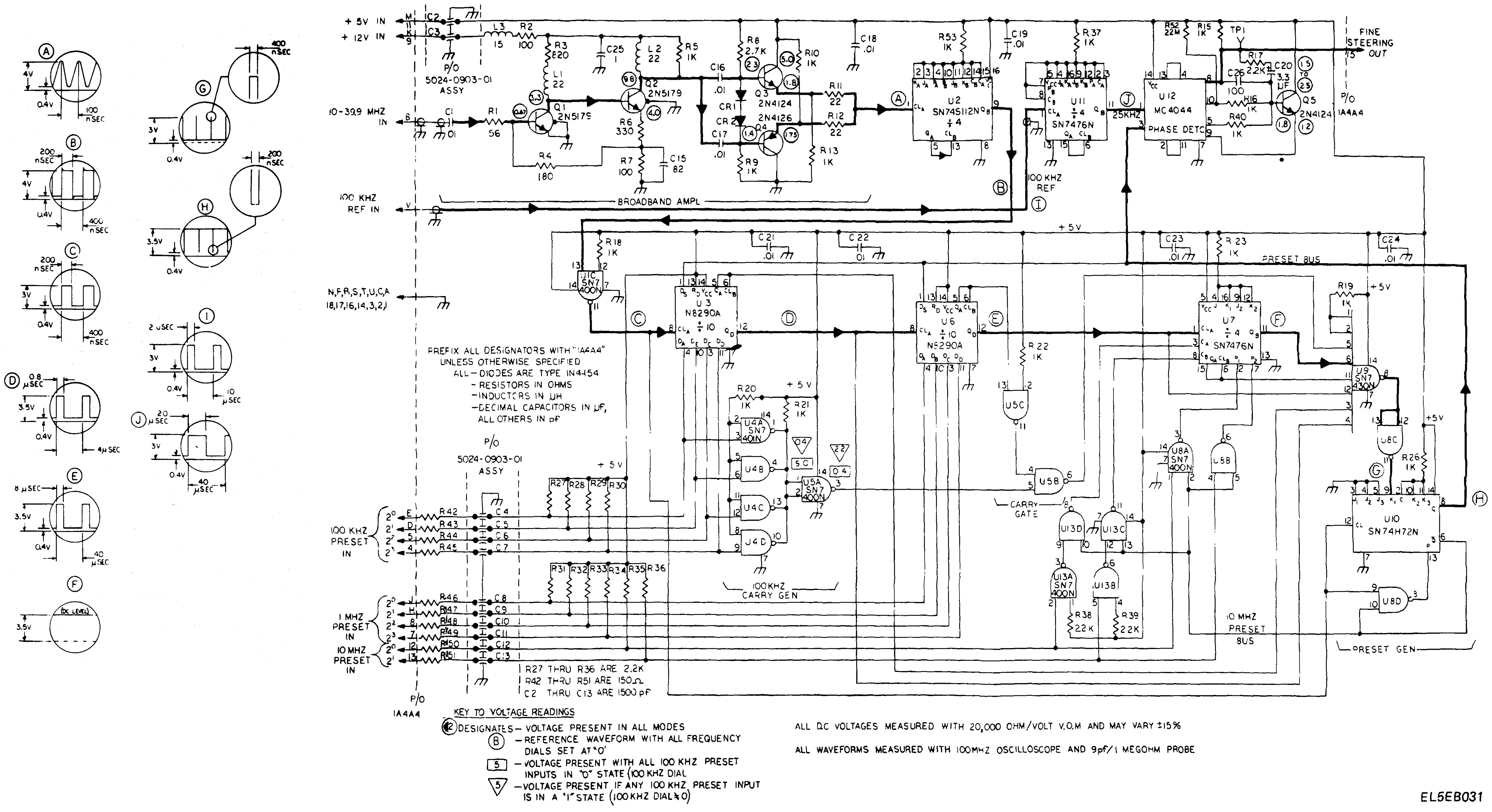
FO-18 Spectrum Generator Schematic



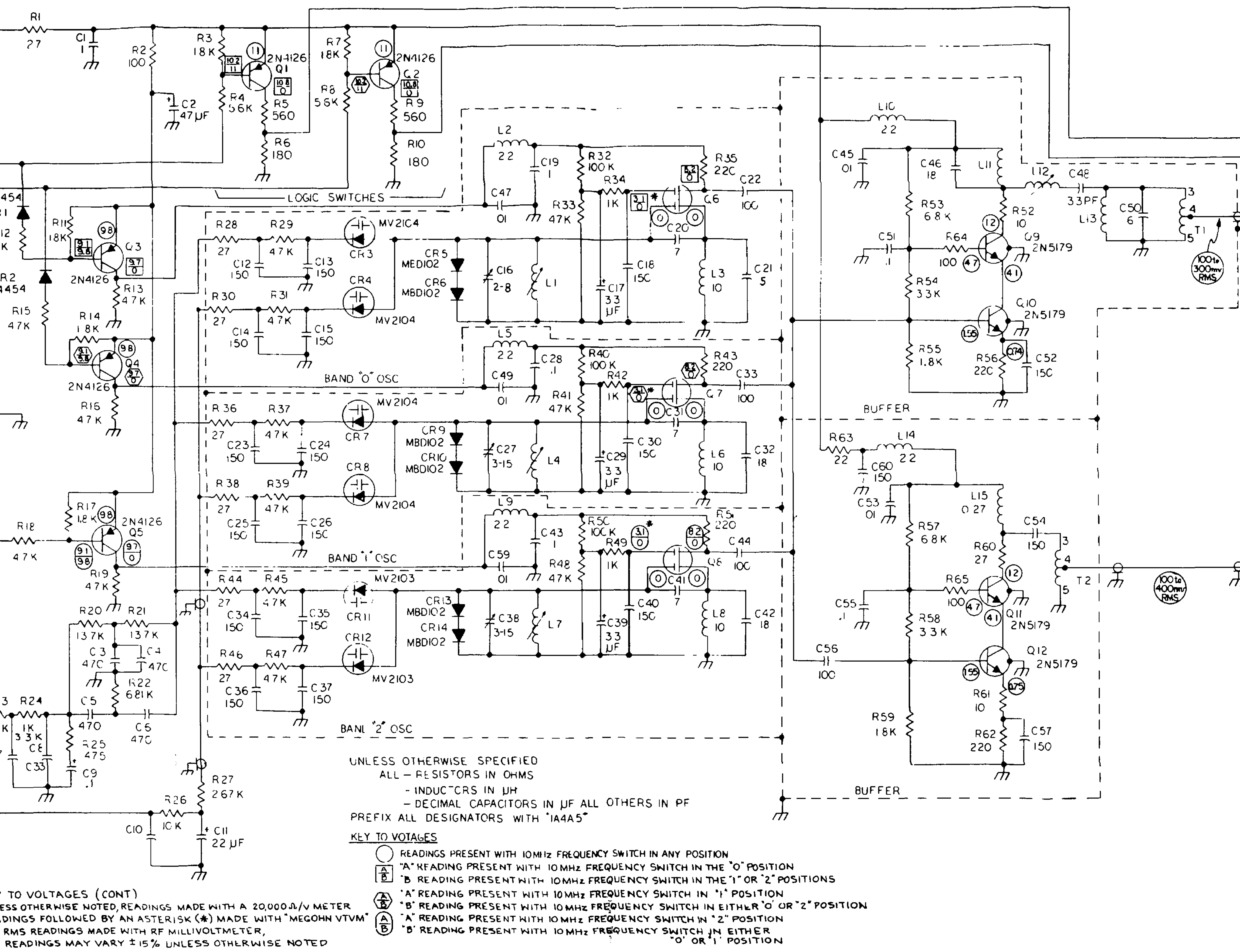
FO-19 Low Digit Generator Schematic



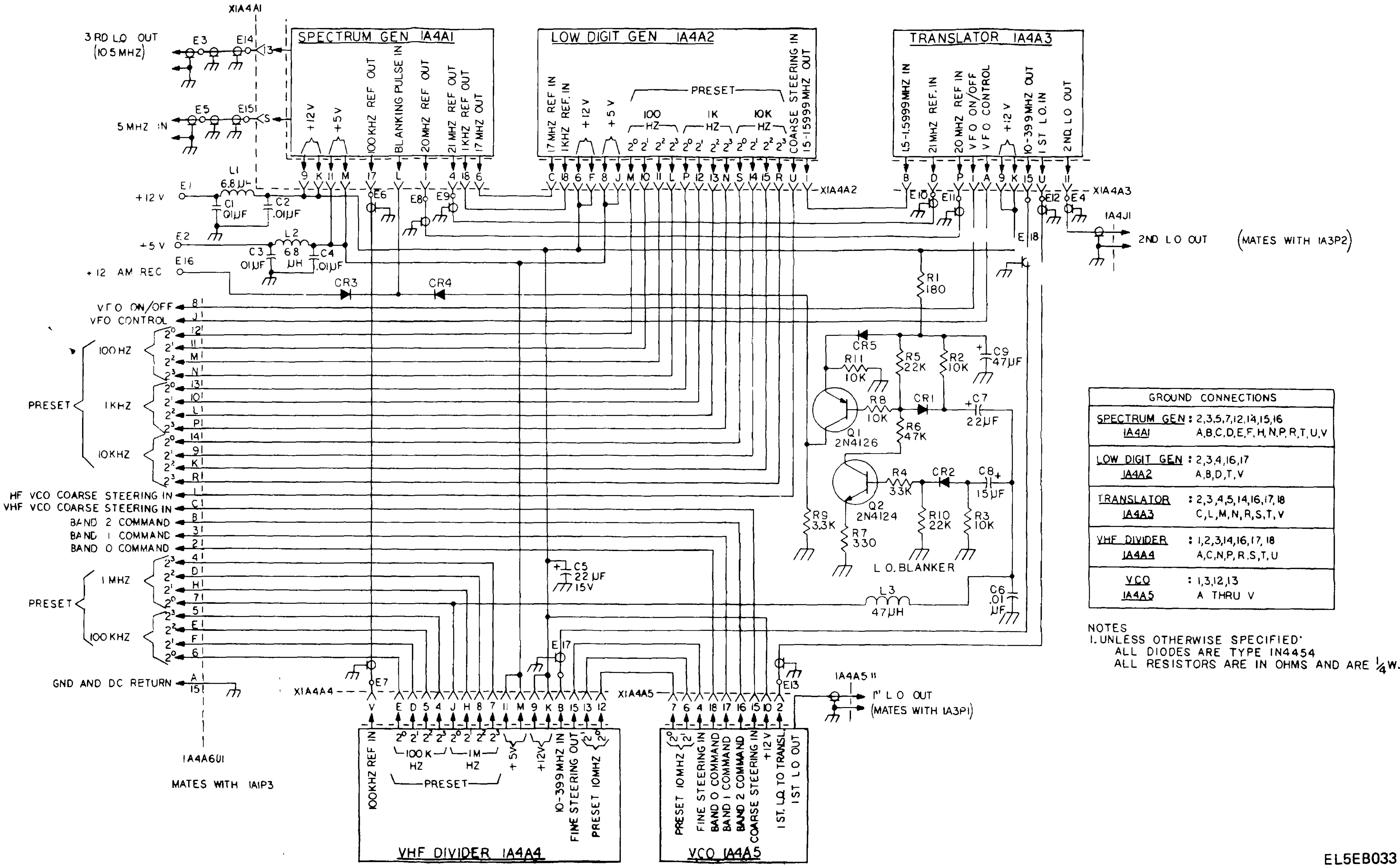
FO-20 Translator Schematic



FO-21 VHF Divider Schematic



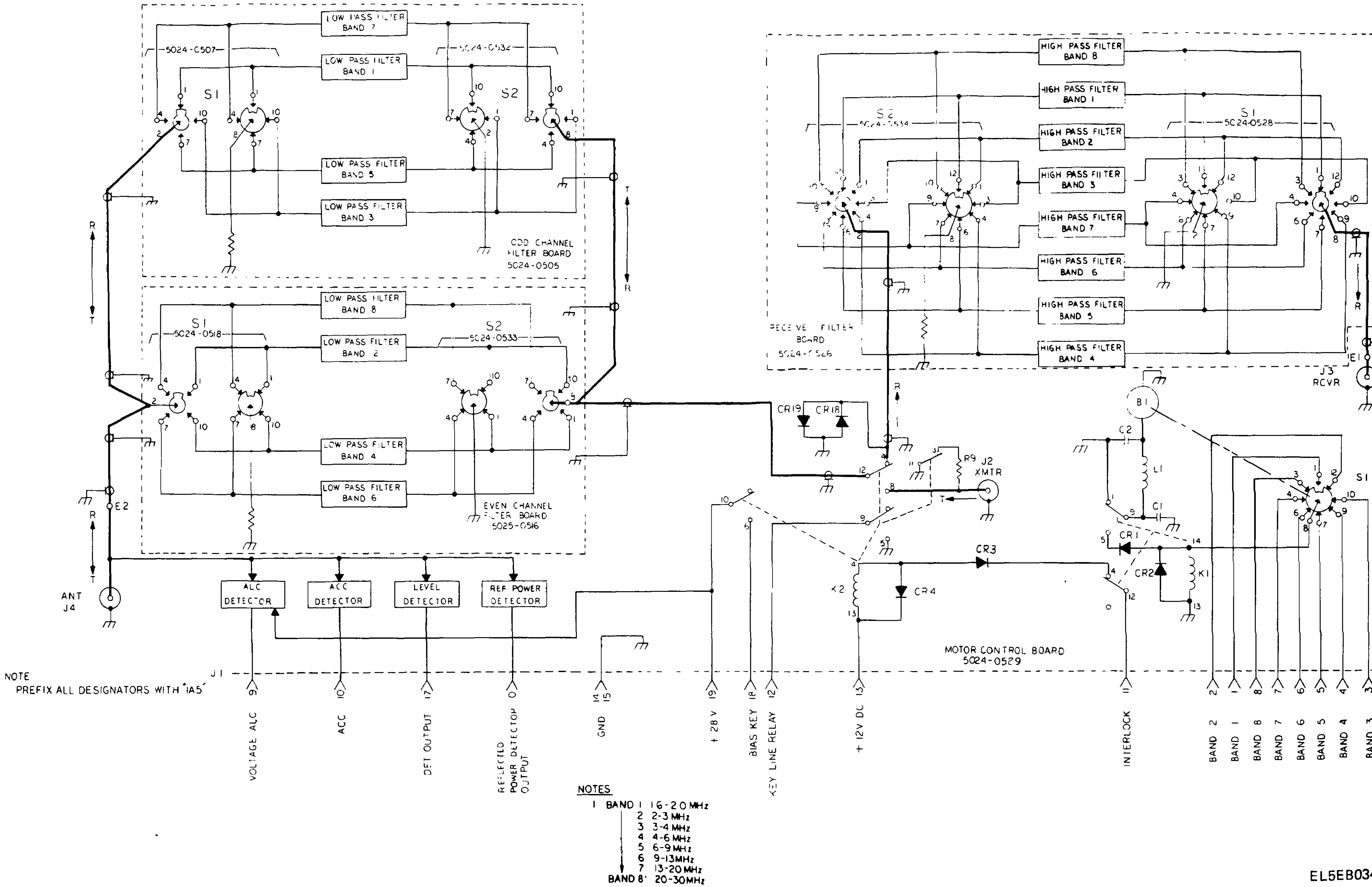
FO-22 VCO Schematic



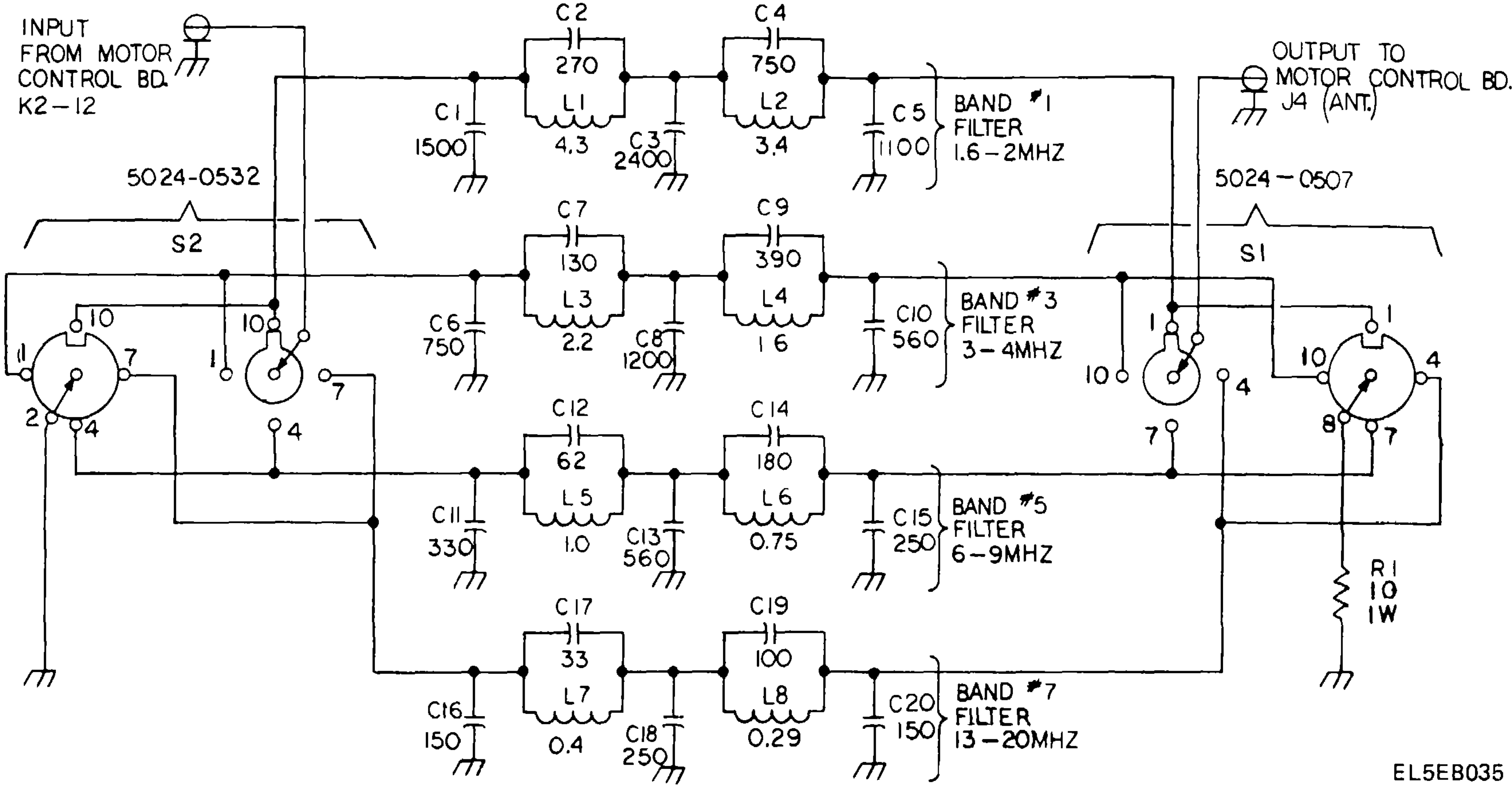
GROUND CONNECTIONS	
SPECTRUM GEN 1A4A1	: 2,3,5,7,12,14,15,16 A,B,C,D,E,F,H,N,P,R,T,U,V
LOW DIGIT GEN 1A4A2	: 2,3,4,16,17 A,B,D,T,V
TRANSLATOR 1A4A3	: 2,3,4,5,14,16,17,18 C,L,M,N,R,S,T,V
VHF DIVIDER 1A4A4	: 1,2,3,14,16,17,18 A,C,N,P,R,S,T,U
VCO 1A4A5	: 1,3,12,13 A THRU V

NOTES
1. UNLESS OTHERWISE SPECIFIED:
ALL DIODES ARE TYPE 1N4454
ALL RESISTORS ARE IN OHMS AND ARE 1/4W.

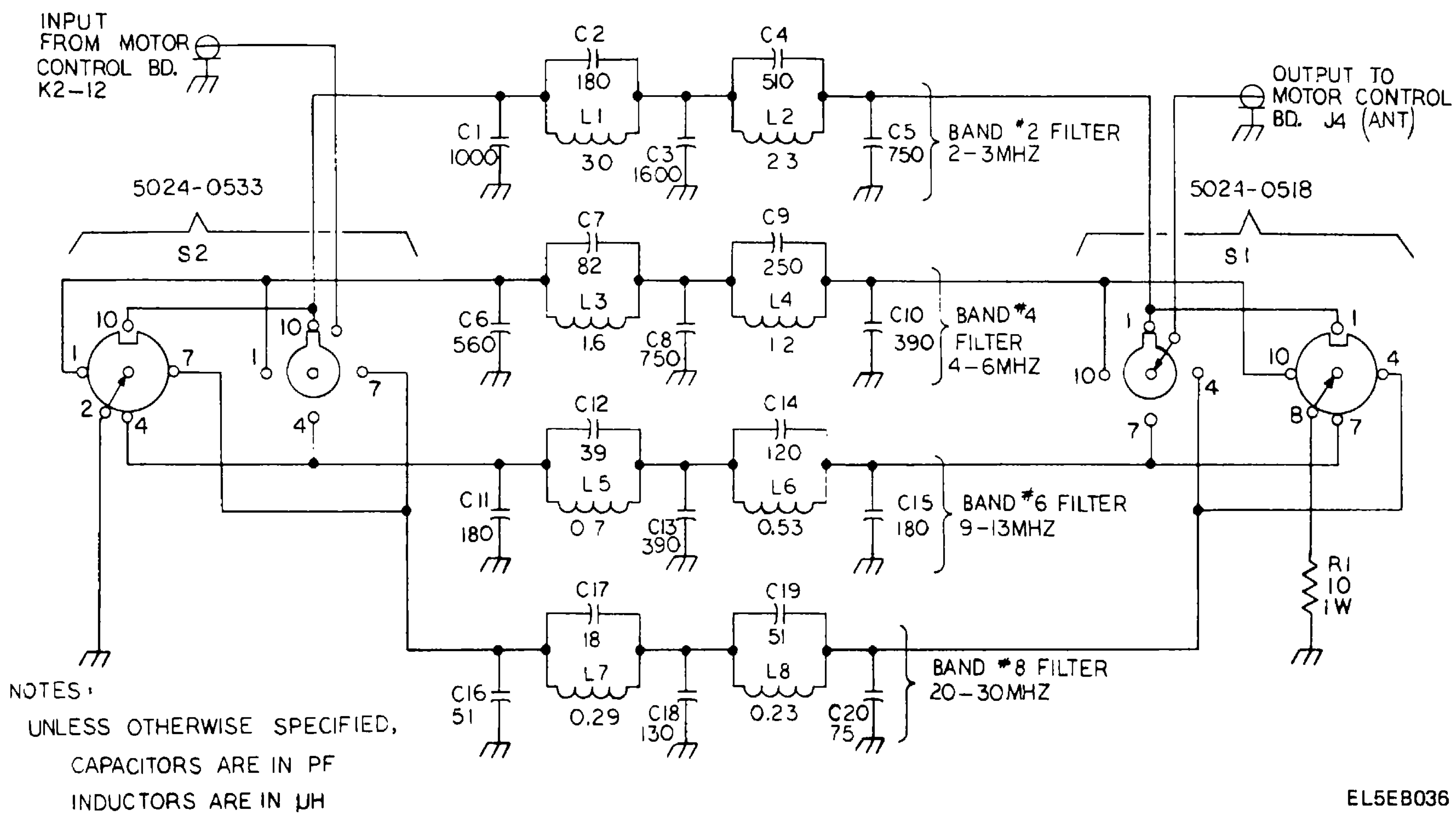
FO-23. Synthesizer Mother Board Schematic.



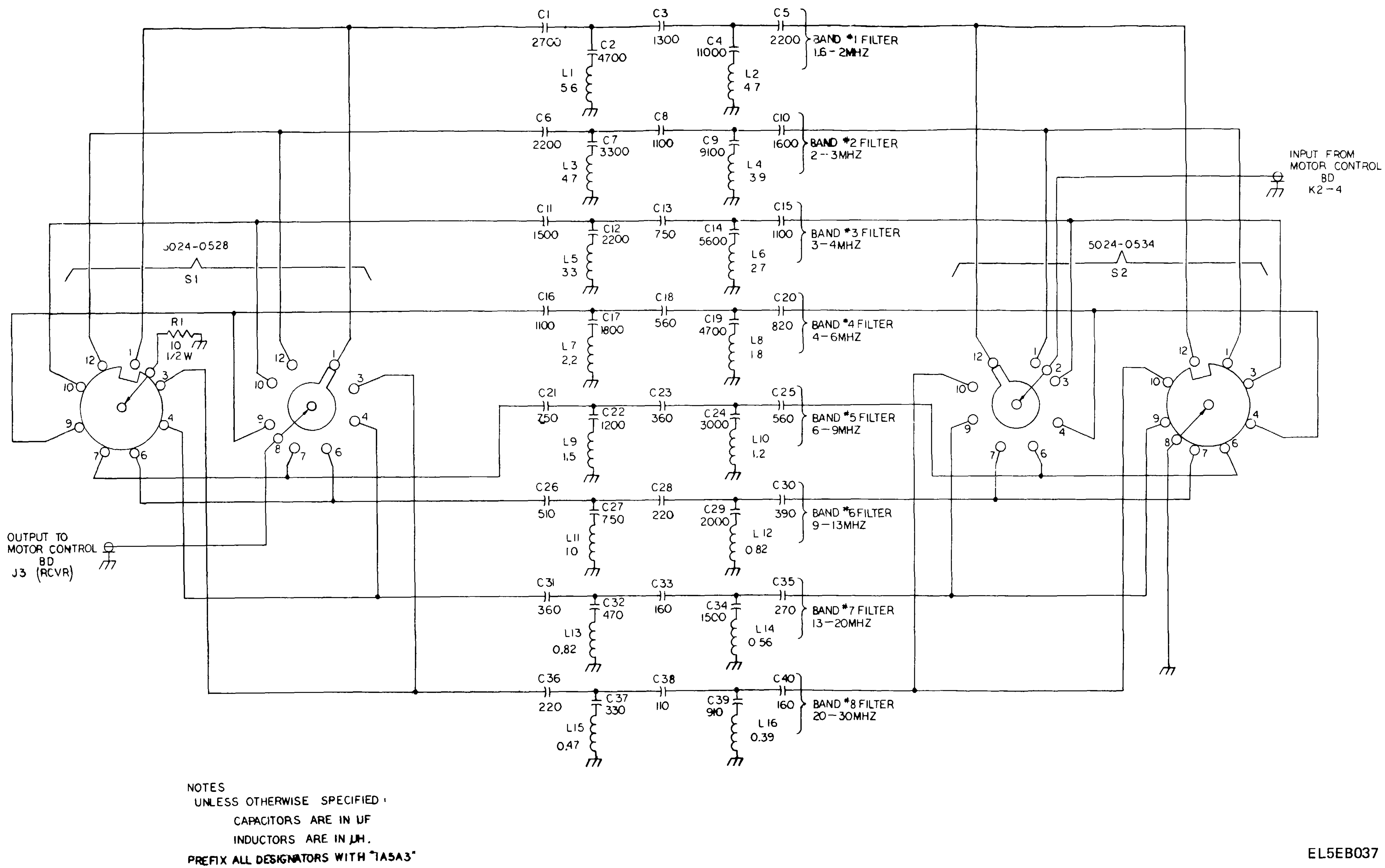
FO-24. Filter Module Block Diagram.



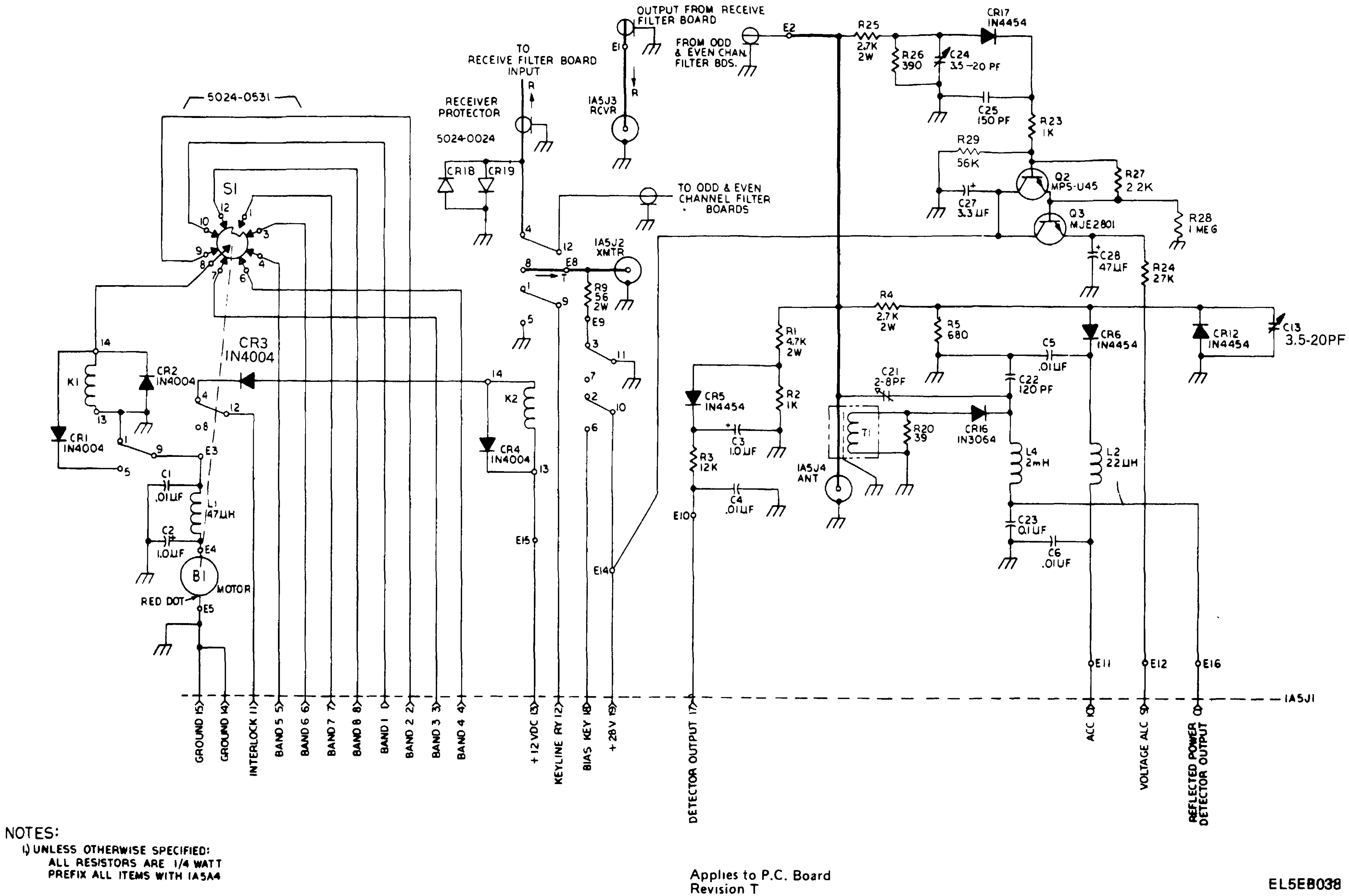
FO-25. Odd Channel Filter Schematic.



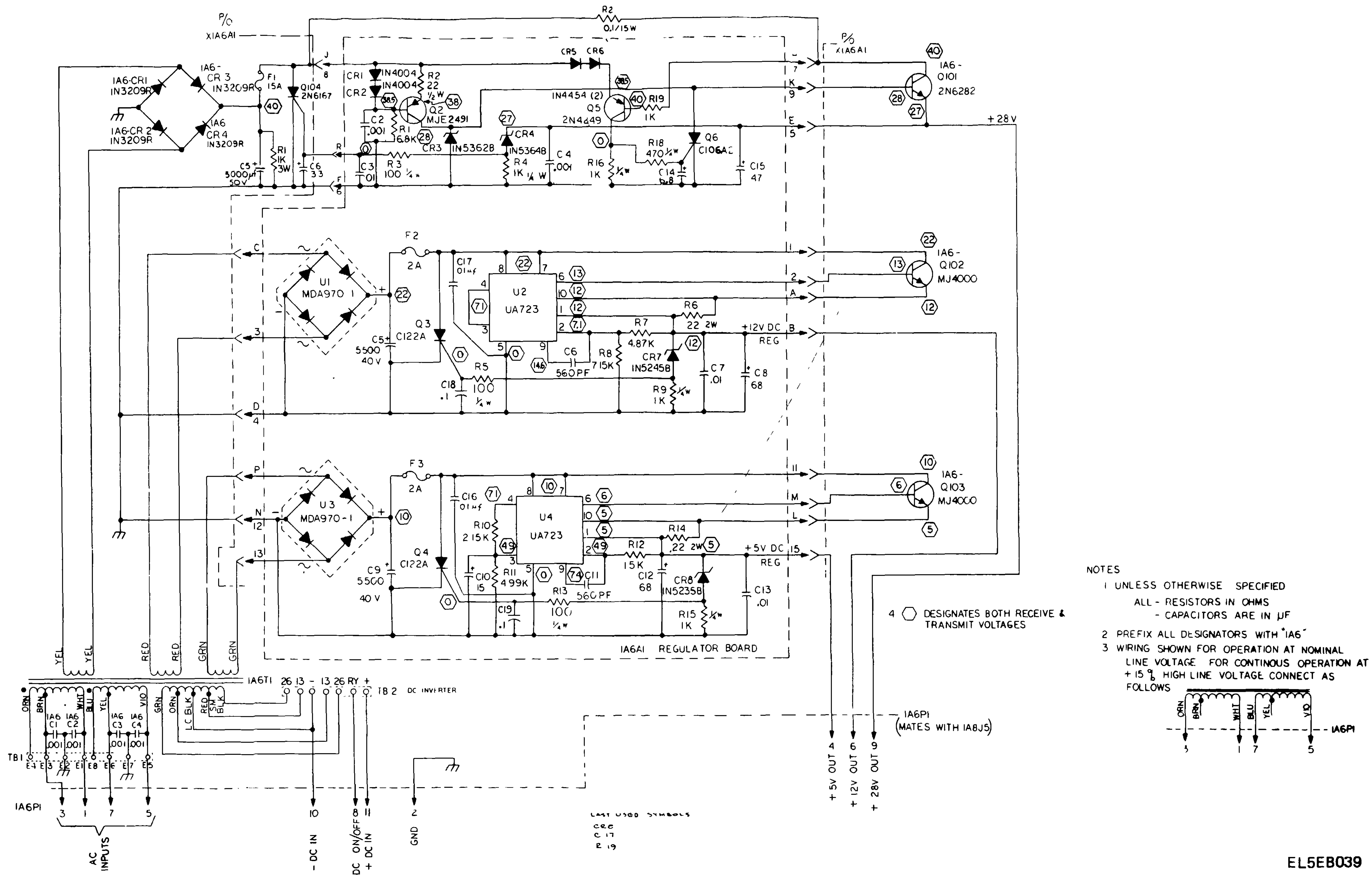
FO-26. Even Channel Filter Schematic.



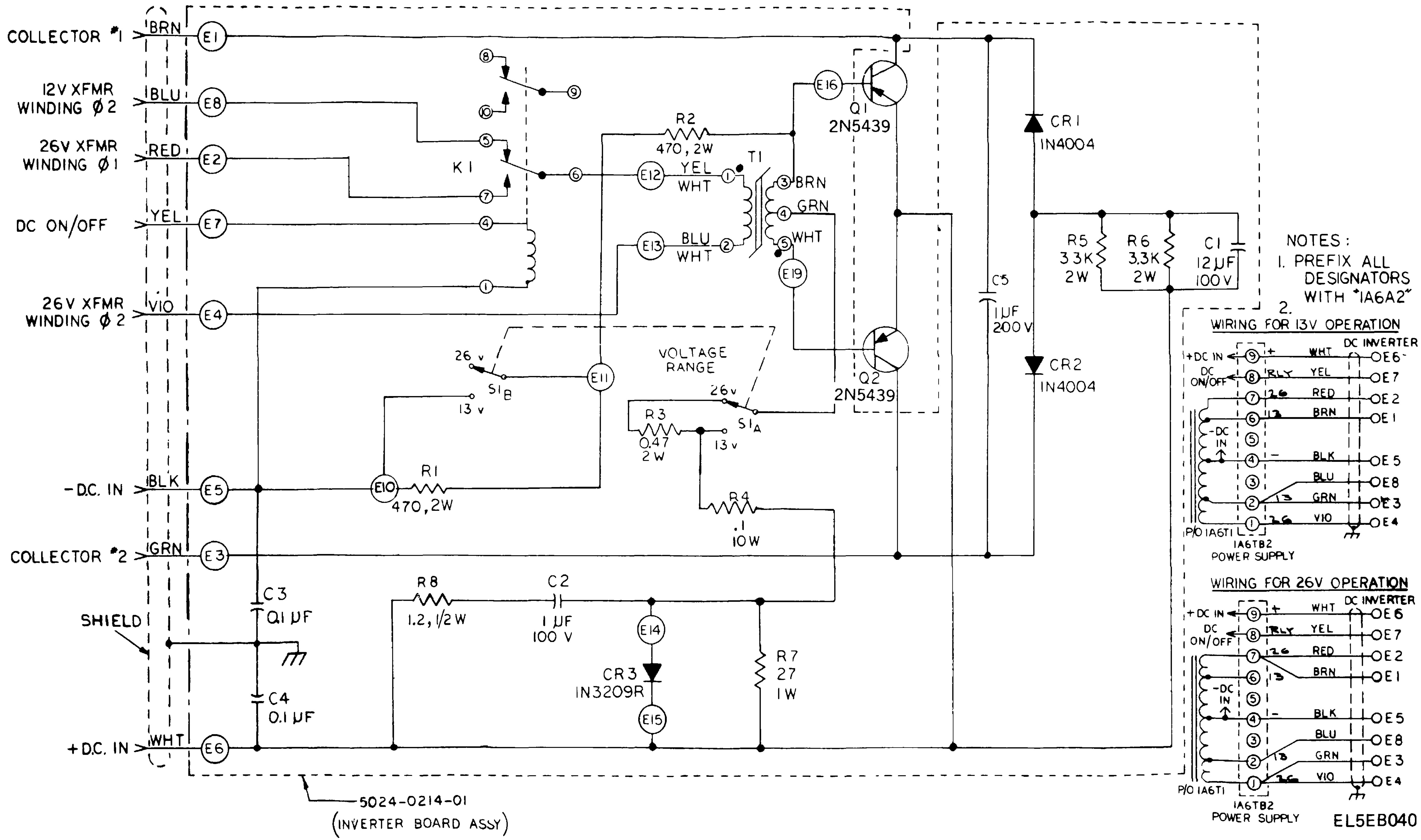
FO-27. Receive Filter Board Schematic.



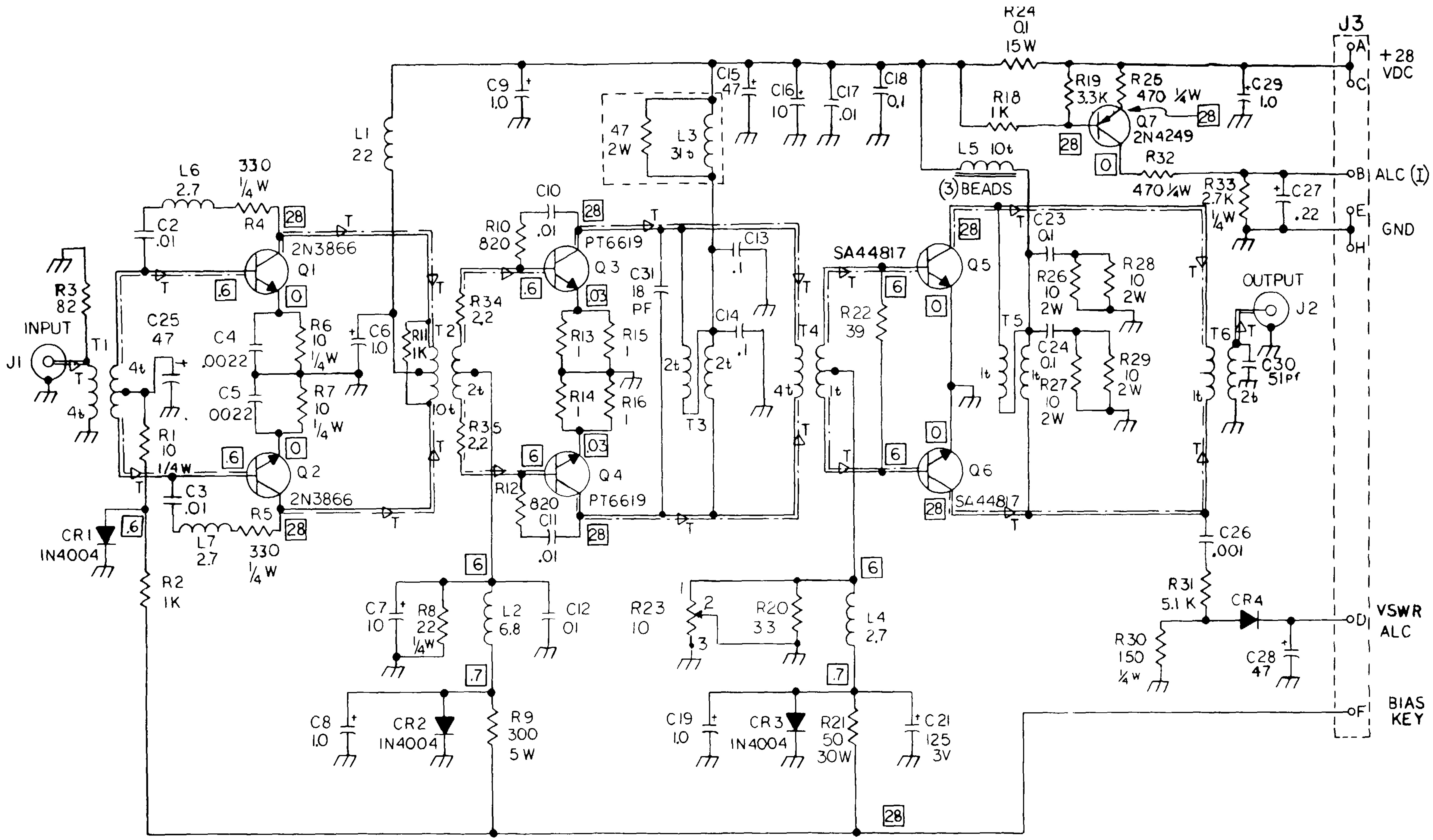
FO-28. Motor Control Board Schematic.



FO-29 Power Supply Schematic



FO-30 DC Inverter Schematic

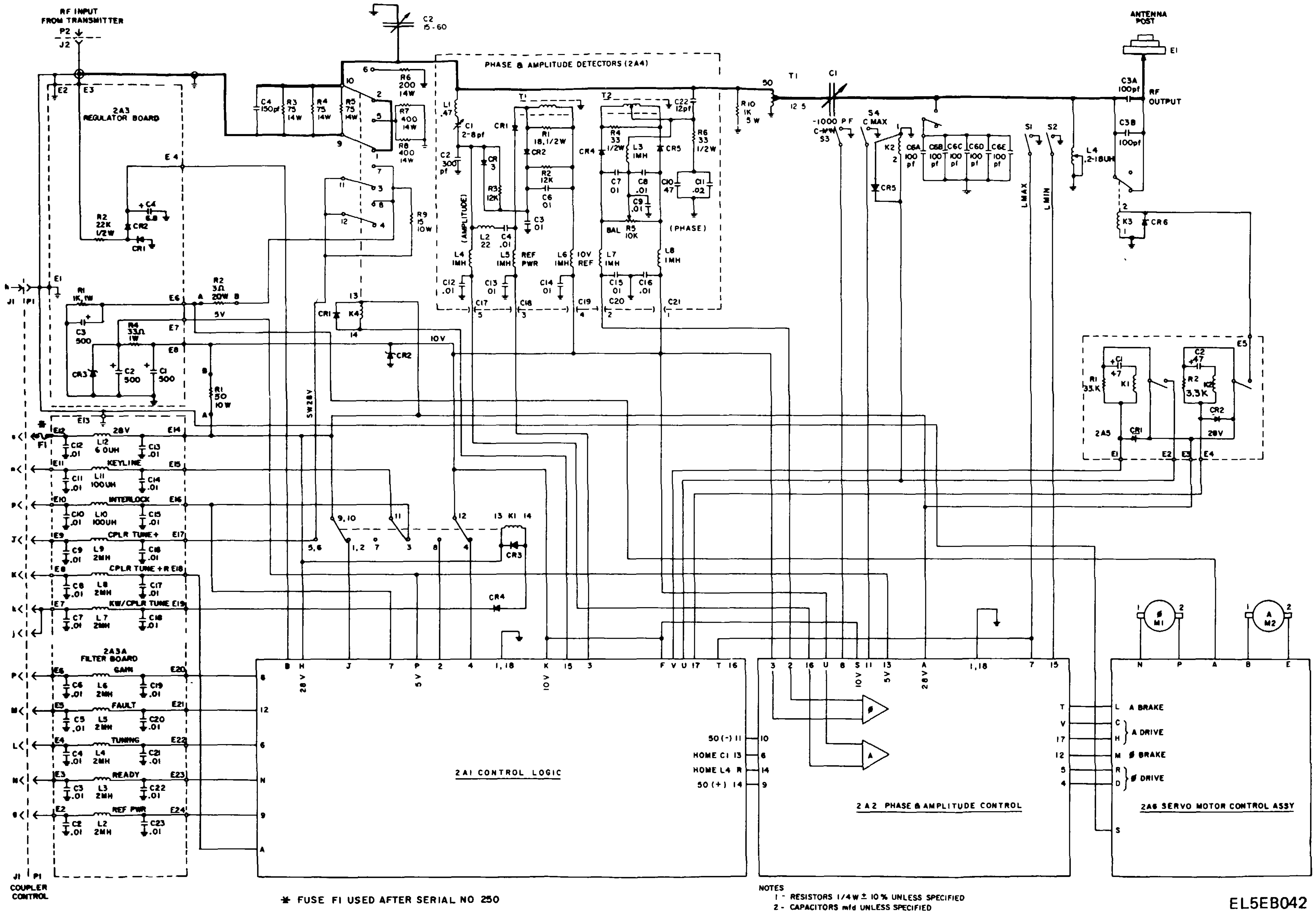


UNLESS OTHERWISE SPECIFIED:

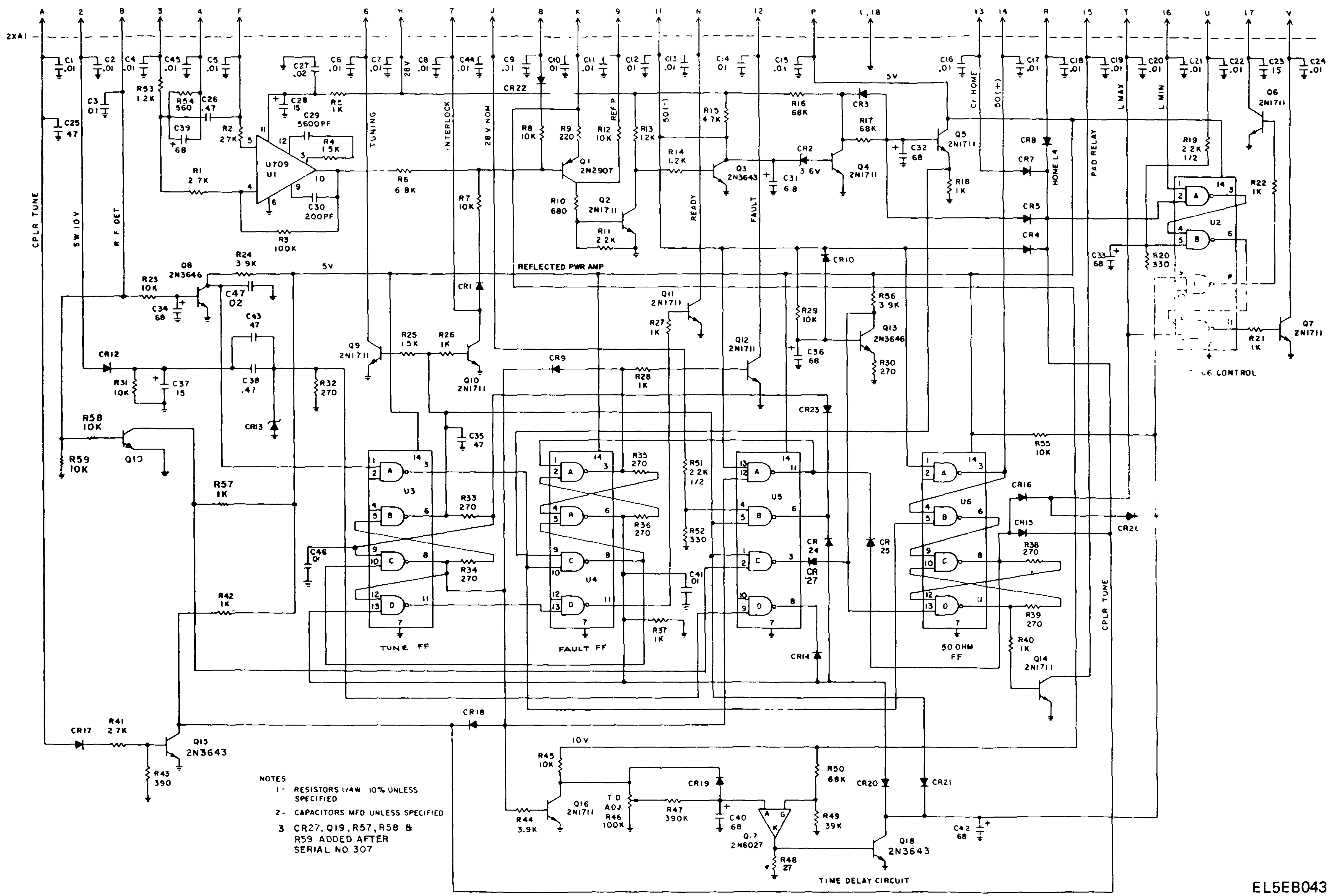
1. ALL-RESISTORS IN OHMS, 1/2 W
   - CAPACITORS IN μF
   - INDUCTORS IN μH
   - DIODES ARE IN4454
2. PREFIX ALL DESIGNATORS WITH "1A7A1"
3. UNUSED DESIGNATORS: R17
4. VOLTAGES ARE GIVEN WITH XMTR KEYED IN SSB AND NO MODULATION

EL5EB041

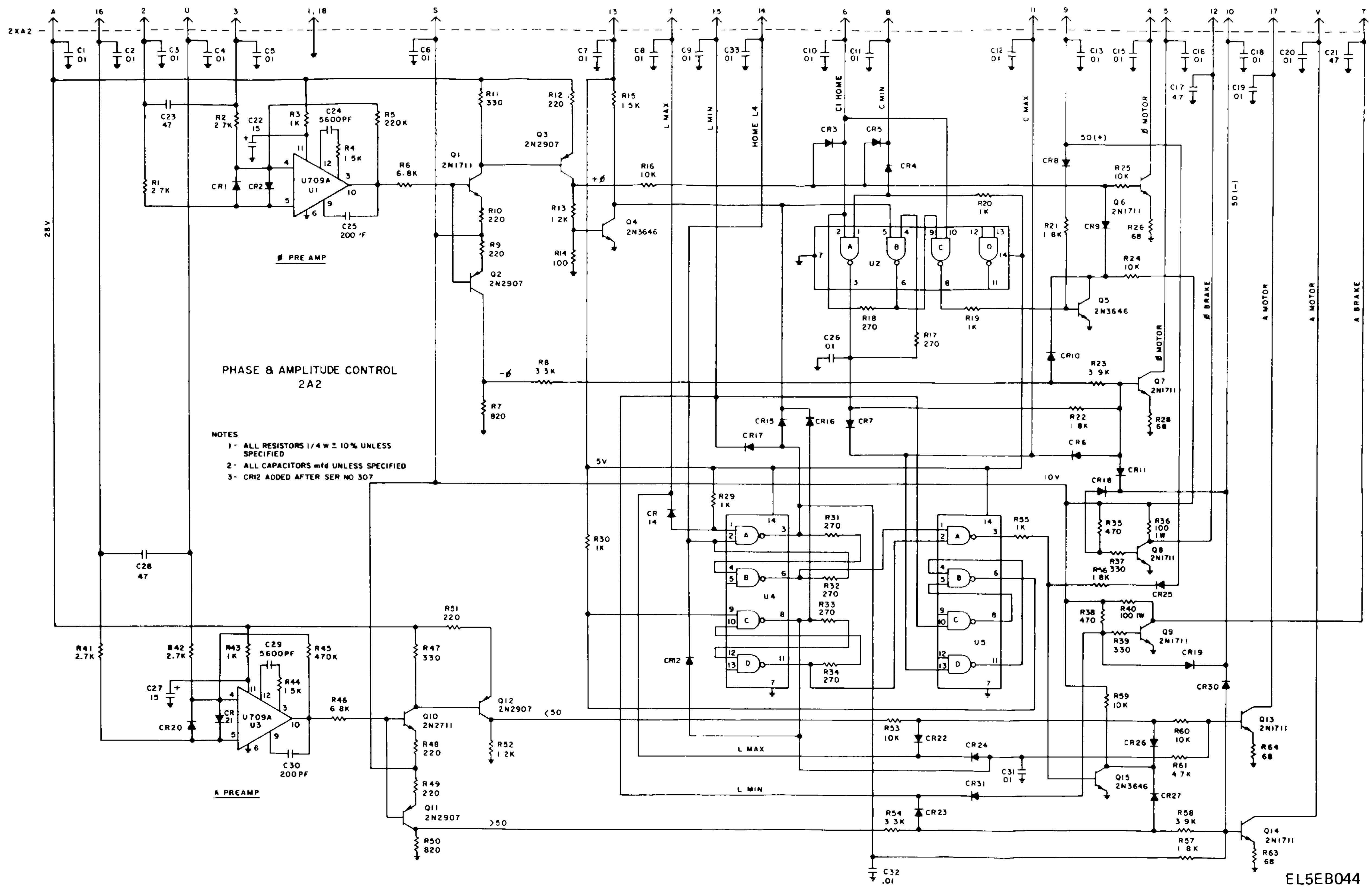
FO-31 RF Power Amplifier Schematic



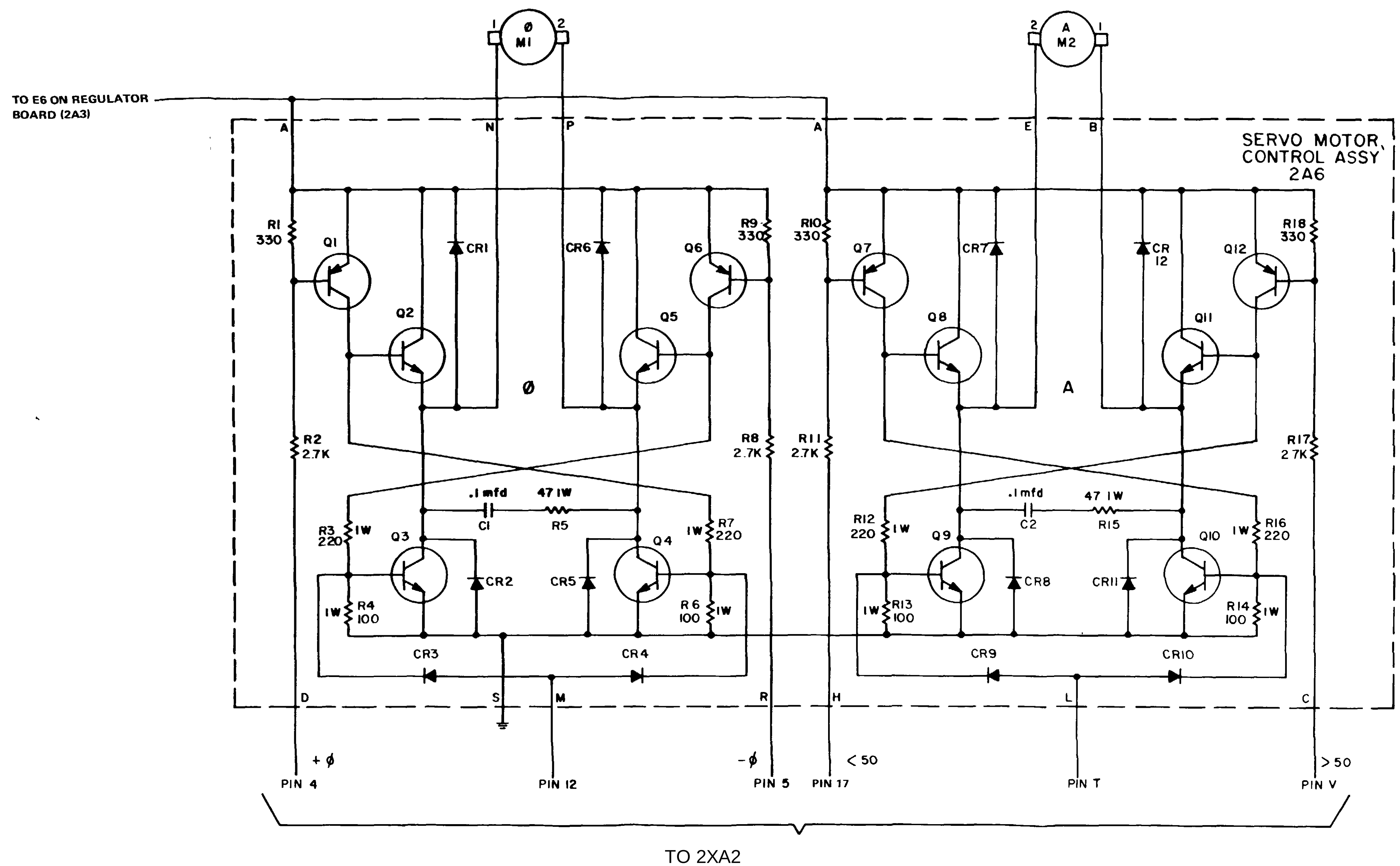
FO-32 CU° 2229 Chassis Wiring Schematic Diagram



FO-33 Control Logic Schematic Diagram



FO-34 Phase and Amplitude Control Schematic Diagram



NOTE:

I - RESISTORS ½ W, ± 10% UNLESS SPECIFIED

EL5EB045

FO-35. Servo Amplifier Schematic Diagram

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General, United States Army
Chief of Staff

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USAICS (3)
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Ft Richardson (CERCOM Ofc) (2)
Army Dep(1)except
LBAD(14)
SAAD (30)
TOAD(14)
SHAD (3)
USA Dep (1)
Sig Sec USA Dep (1)
Units org under fol TOE (2)
29-207
29-610
NG: None
USAR: None
For explanation of abbreviations see, AR 310-50

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 044616-000