TM 11-5820-771-14

TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT,

AND GENERAL SUPPORT

MAINTENANCE MANUAL

RECEIVING SET, RADIO

AN/URR-69

This copy is a reprint which includes current pages from Changes 1 and 2.3

HEADQUARTERS, DEPARTMENT OF THE ARMY

JUNE 1974

WARNING

HIGH VOLTAGE

is used in operation of this equipment. Exercise care to prevent contact with high voltage connections during operation or maintenance. DEATH or injury could result. Do *not* service or adjust this equipment alone. Personnel working with high voltage equipment should be familiar with modern methods of first aid.

The 115-vac or 230-vac power to the receiver is lethal. This voltage is present at the input to transformer T1, which is *not* accessible unless the rear panel is removed. Do not remove the rear panel of the receiver during the electrical tests.

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CHANGE

No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 11 September 1985

OPERATOR'S ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL RECEIVING SET, RADIO AN/URR-69 (NSN 5895-00-307-9376)

TM 11-5820-771-14, 7 June 1974, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page. Added or revised illustrations are indicated by a vertical bar in front of the figure caption.

Remove pages	*Insert pages*
1-3	1-3/(1-4 blank)
5-1 and 5-2	5-1 and 5-2
6-3 through 6-10	6-3 through 6-10
6-15 and 16	6-15 and 16
Figure 15 ①	Figure 15 ①
Figure 15 ②	Figure 15 ②
None	Figure 15 ③
Figure 16 ①	Figure 16 ①
Figure 16 ②	Figure 16 ②

2. File this change sheet in front of the publication for reference purposes.

By Order of the Secretary of the Army:

JOHN A. WICKHAM JR.
General, United States Army
Chief of Staff

Official:

DONALD J. DELANDRO
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-51 literature requirements for AN/URR-69.

TECHNICAL MANUAL
NO. 11-5820-771-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *7 June 1974*

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

RECEIVING SET, RADIO AN/URR-69 (NSN 5895-00-307-9376)

LIST OF ILLUSTRATIONS

LIST OF TABLES

CHAPTER 1

INTRODUCTION

Section 1. GENERAL

1-1. Scope

This manual describes Receiving Set, Radio AN/URR-69 (fig. 1-1). Topics covered include installation, operation, functioning, and instructions for operator, organizational, and direct support maintenance. In accordance with the current maintenance allocation chart provided in appendix C, general support maintenance instructions formerly contained in this manual have been transferred to the depot maintenance category, which is covered in DMWR 11-5820-771.

1-2. Indexes of Publications

a. DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

1-2.1. 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 and prescribed by TM 38-750.

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. Destruction of Army Materiel

Demolition and destruction of electronic equipment will be under the direction of the commander and in accordance with TM 750-244-2.

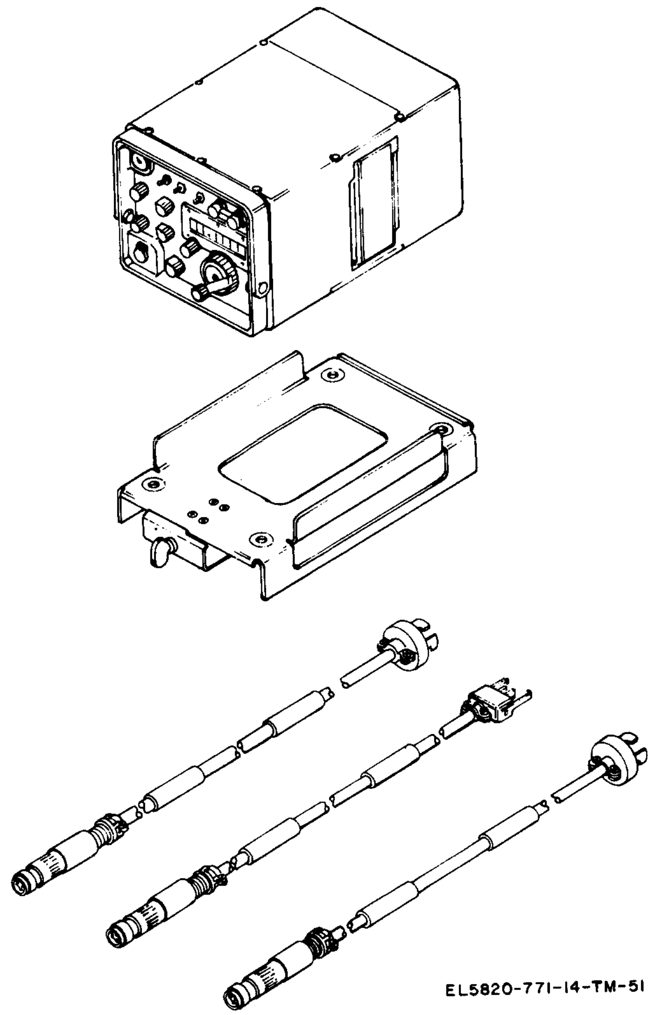


Figure 1-1. Receiving Set, Radio AN/URR-69.

1-4. Administrative Storage

For procedures, forms and records, and inspection required during administrative storage of this equipment, refer to TM 740-90-1.

1-5. Reporting of Errors

Reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded direct to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703.

1-5.1. Reporting Equipment Improvement Recommendations (EIR)

EIR's will be prepared using Standard Form 368, Quality Deficiency Report. Instructions for preparing EIR's are provided in TM 38-750, the Army Maintenance Management System. EIR's should be mailed direct to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, New Jersey 07703. A reply will be furnished direct to you.

Section II. DESCRIPTION AND DATA

1-6. Purpose and Use

Receiving Set, Radio AN/URR-69 is a solid-state hf receiving set. The receivers frequency range is in the 0.5-to 30. 0-MHz band from fixed sites, vehicular installations, or as a manpack radio. Operating modes include cw, fsk, lsb, usb, am, and fm. This radio set may be powered by 230-vac, 115-vac, or 24-vdc external power or from internal batteries.

1-7. Description

a. Receiving Set, Radio AN/URR-69. Receiving Set, Radio AN/URR-69 (fig. 1-1) consists of Receiver R-1444/UR and Accessory Kit Part No. 0154-1-2002. These items are described in the following subparagraphs.

b. Receiver R-1444/UR. Receiver R-1444/UR is housed in a rectangular metal case. Operating controls, indicators, and connectors are installed on both the tint and rear panels of the unit. The top and bottom covers are removable for internal maintenance and a rear cover may be removed for battery installation.

c. Accessory Kit 0154-1-2002. Accessory Kit 0154-1-2002 consists of Mounting Base MT-4542/URR-69 and Cable Assemblies 0154-1-4026, 0154-1-4027, and 0154-1-4028. The mounting base is made up of a metal plate and a clamp assembly. A thumbscrew is tightened to secure the receiver in the mounting base. All of the cable assemblies are similar in appearance. The receiver connectors on all cables are identical but the connectors on the opposite ends are different. Internally, the cables are wired in such a way that the receiver cannot be connected to the improper voltage.

d. Tabulated Data. Table 1-1 lists the items comprising Receiving Set, Radio AN/URR-69. Physical characteristics and the common name are also listed for each item. These equipment common names will be used throughout this manual. The technical characteristics of the various items are listed in Table 1-2.

1-8. Deleted

1-9. Items Comprising an Operable Equipment

The components comprising an operable equipment are listed in table 1-1. For operation, an antenna and headset will be required, but are not furnished with the equipment.

1-10. Common Names

A list of nomenclature and common numerical assignments for the major components of Radio Receiver R-1444 are given in table 1-3.

Table 1-1. Items Comprising an Operable Equipment

Item	*Common name*	*Qty*	*Length (in.)*	*Width (in.)*	*Height (In.)*	*Weight (lb.)*
Receiving Set Radio AN/URR-69	Radio Set	1				
Receiver *R-1444/UR*	Receiver	1	$10\frac{5}{8}$	$7\frac{1}{8}$	5	*17* max (batteries installed)
Mounting Base MT-4542/URR-69	Vehicle mount	1	11	$7\frac{1}{4}$	$2\frac{3}{4}$	
Cable Assembly 0154-1-4026	24-vdc power cable	1	100	—	—	
Cable Assembly 0154-1-4027	115-vac power cable	1	100	—	—	
Cable Assembly 0154-1-4028	230-vac power cable	1	100	—	—	

Table 1-2. Technical Characteristics

	Mode	Sensitivity
Power requirements:		115 or 230 vac or 24-26.5 vdc external power to ten BA-30 type batteries for internal power. Maximum power consumption: 3 watts, dc external power 2.3 watts, internal battery.
Frequency range:		0.5 to 30.0 MHz continuous.
Frequency stability:		Long term: ± 50 Hz per 8 hours at ambient temperature. Short term: ± 5 Hz at ambient temperature. Temperature stability ± 15 Hz over the temperature range of -25° F. to + 155° F.
Tuning rate:		Scan mode: 25 turns/MHz in 100 Hz steps. Tune mode 275 turns/MHz in 100 Hz steps.
Sensitivity (for 10 db S +S/N):	am.	1.0 microvolt, 30%, 1000-Hz modulated signal at 4-kHz bandwidth.
	fm.	0.8 microvolt, 8 kHz deviated, 1000-Hz modulated signal at 25-kHz bandwidth.
	cw/fsk	0.25 microvolt at 1-kHz bandwidth.
	ssb	0.25 microvolt at 2.5-kHz bandwidth.
Spurious responses:		a. Maximum of 24 internally-generated spurious responses above a 5 db S + S/N ratio with antenna disconnected. *b.* Image rejection for all mixer conversions-suppressed at least 80 db. c. Inband im (inter-modulation) distortion products-third order in distortion products at least 40 db below two - 15 dbm inband signals. *d.* Out-of-band im distortion products-Second order im distortion products at least 80 db below two -15 dbm out-of-band signals.
IF bandwidth:		1.0,4.0, or 25.0 kHz selectable (- 3 db attenuation points).
IF ripple and shape factor:		Ripple less than ± 1.5 db. Shape factor 4.1 minimum.
IF output:		465 kHz, 0.25 milliwatt into a 50-ohm load.
Audio output:		10 milliwatts minimum into a 600-ohm load.
Audio response:		± 1.5 db over the frequency range of 300 to 3500 Hz.
Diode output:		-1.0 volt minimum to - 3.0 volt maximum into a 50,000-ohm load, with a frequency response of ± 1 db from dc to 1 kHz.
Recorder output:		15 milliwatts minimum into a 600-ohm load, with a frequency response of ± 1.5 db over a frequency range of 300 to 12,000 Hz.

Table 1-3. Common Numerical *Assignments*

Common name	*Reference designation*
Receiver control assembly	1A1
Rotary switch	1A1A1
Receiver control	1A1A2
Preselector	1A2
RF oscillator	1A2A1
Frequency converter	1A2A2
Frequency mixer stage	1A2A3
Bandpass filter	1A2A4
RF oscillator	1A2A5
Bandpass filter	1A2A6
Frequency mixer stage	1A2A7
Mixer amplifier	1A2A8
Output switch	1A2A9
RF coil assembly	1A3
Ciruit card assembly	1A4
Circuit card assembly	1A5
RF oscillator	1A6
Converter amplifier	1A7
IF amplifier	1A8
Power supply assembly	1A9
Circuit card assembly	1A10
Receiver housing	1MP1
Vehicle mount	2A1
Front end assembly	1A1 thru 1A3

CHAPTER 2

SERVICE UPON RECEIPT AND INSTALLATION

Section I. SITE AND SHELTER REQUIREMENTS

2-1. Siting

a. Portable or Vehicular Use. Ideal operating sites are often not available when the radio set is operated in a portable or vehicular configuration. However, when the tactical situation allows, make an effort to obtain the following operating conditions:

(1) Antenna clear of nearby obstructions.

(2) Site clear of noise sources (high-tension lines, operating electric motors, etc.).

(3) Good ground conditions available.

b. Fixed Installation. Consider the following general requirements when choosing a site for a fixed installation of the radio set:

(1) Ample clear space to install an antenna for the lowest operating frequency.

(2) Antenna site as high above surrounding terrain as possible.

(3) Good ground conditions available.

(4) Adequate shelter available for operators and equipment.

(5) 115-vac or 230-vac power available.

(6) Site clear of noise sources (high-tension lines, operating electric motors, etc.).

2-2. Shelter Requirements

The radio set is capable of operation in severe environments and requires no special shelter. Use shelter, if available, to keep the equipment dry and free of dust. This could help reduce corrective maintenance requirements.

Section II. SERVICE UPON RECEIPT

2-3. Unpacking

Figure 2-1 shows typical packaging for the receiving set. Open top cover of outer carton, remove top pad and corrugated spacers, and carefully remove receiving set from shipping container.

2-4. Checking Unpacked Equipment

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6 (para 1-2).

b. Check the equipment against the component listing in table 1-1 and the packing slip to see if the shipment is complete. Report all discrepancies in accordance with paragraph 1-2. The equipment should be placed in service even though a minor assembly or part that does not affect proper functioning is missing.

c. Check to see whether the equipment has been modified. (Equipment which has been modified will have the MWO number on the front panel, near the nomenclature plate.) Check also to see whether all currently applicable MWO's have been applied. (Current MWO's applicable to the equipment are listed in (DA PM 310-6 or DA PM 310-7 as applicable.)

d. See SB 700-20 for dimensions, weights, and volume of packaged items.

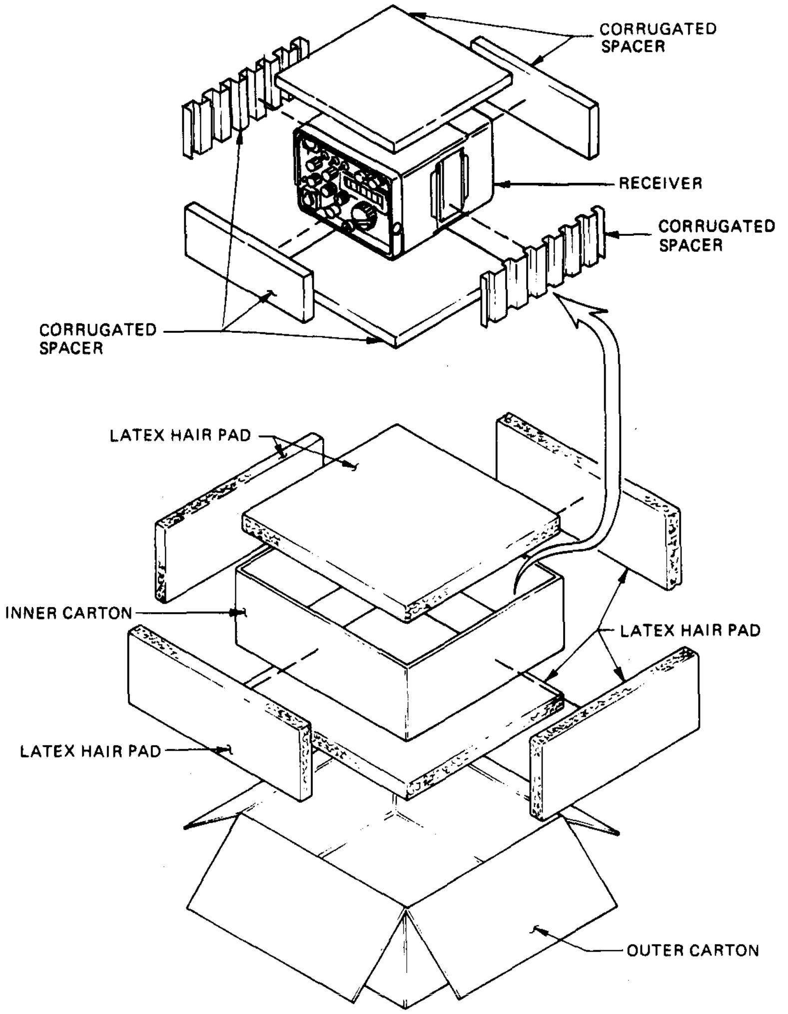


Figure 2-1. Typical packing diagram.

Section III. INSTALLATION INSTRUCTIONS

CAUTION

When the R-1444/UR receiver is installed close to a transmitting antenna, as is common practice at some system training sites, make certain that the WHIP/50 Ω ANT switch is *not* set to the position of the selected antenna connector during transmission, This receiver does *not* have front end protection circuitry.

2-5. Manpack or Fixed Configuration

Install the radio set in the manpack or fixed configuration as follows:

a. Battery Installation (fig. 3-1).

(1) Remove the rear cover of the receiver by loosening the two attaching captive screws.

(2) Install the batteries with the polarity as shown on the inside of the rear cover.

(3) Reinstall the rear cover and secure with the two captive screws.

b. Manpack Installation (fig. 2-2).

(1) Connect a whip antenna to the receiver WHIP connector.

(2) Set the WHIP/50 Ω ANT switch to WHIP.

(3) Connect a headset to the AUDIO connector.

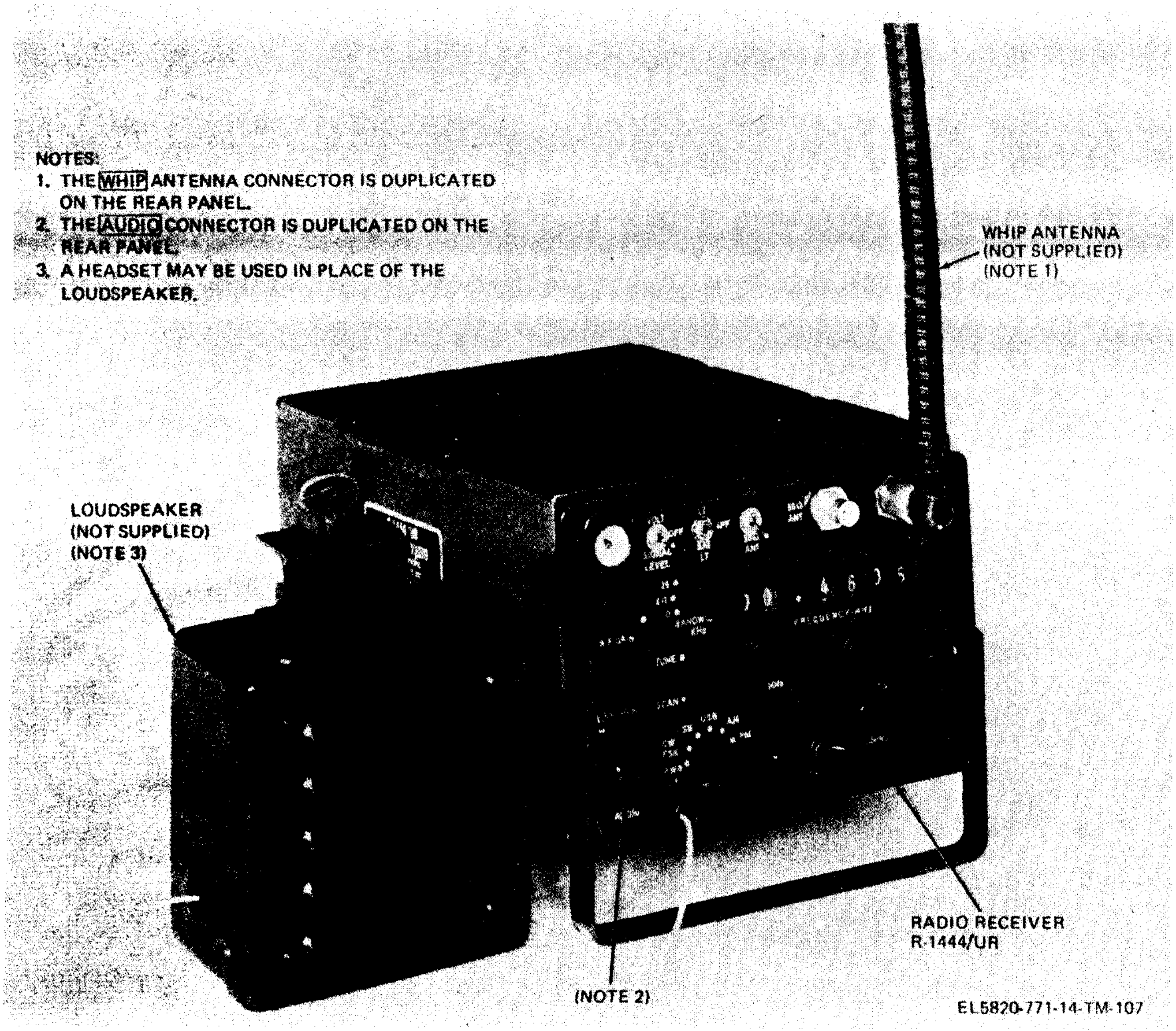


Figure 2-2. Typical manpack installation.

(4) Set the rear panel POWER MODE switch to BATTERY.

(5) Refer to chapter 3 and operate receiver in am mode.

(6) Position light switch to BAT LT and check that panel light operates.

c. Fixed Installation (fig. 2-3).

(1) Connect the desired antennas to the receiver. If a doublet antenna is used, connect it to the 50 Ω ANT connector. A whip antenna will be connected to the WHIP ANT connector. Both connectors are duplicated on the front and rear panels.

(2) Set the WHIP/50 Ω ANT switch to the desired antenna.

(3) Set the rear panel POWER MODE switch to EXTERNAL.

(4) Connect the 115-vac or 230-vac power cable to the EXTERNAL POWER connector and to a suitable outlet.

(5) Connect a headset to either of the AUDIO connectors.

(6) Refer to chapter 3 and operate receiver in am mode

(7) Position light switch to EXT-PWR LT and check that panel light operates.

2-6. Vehicular Configuration

(fig. 2-4)

Install the radio set in the vehicular configuration as follows:

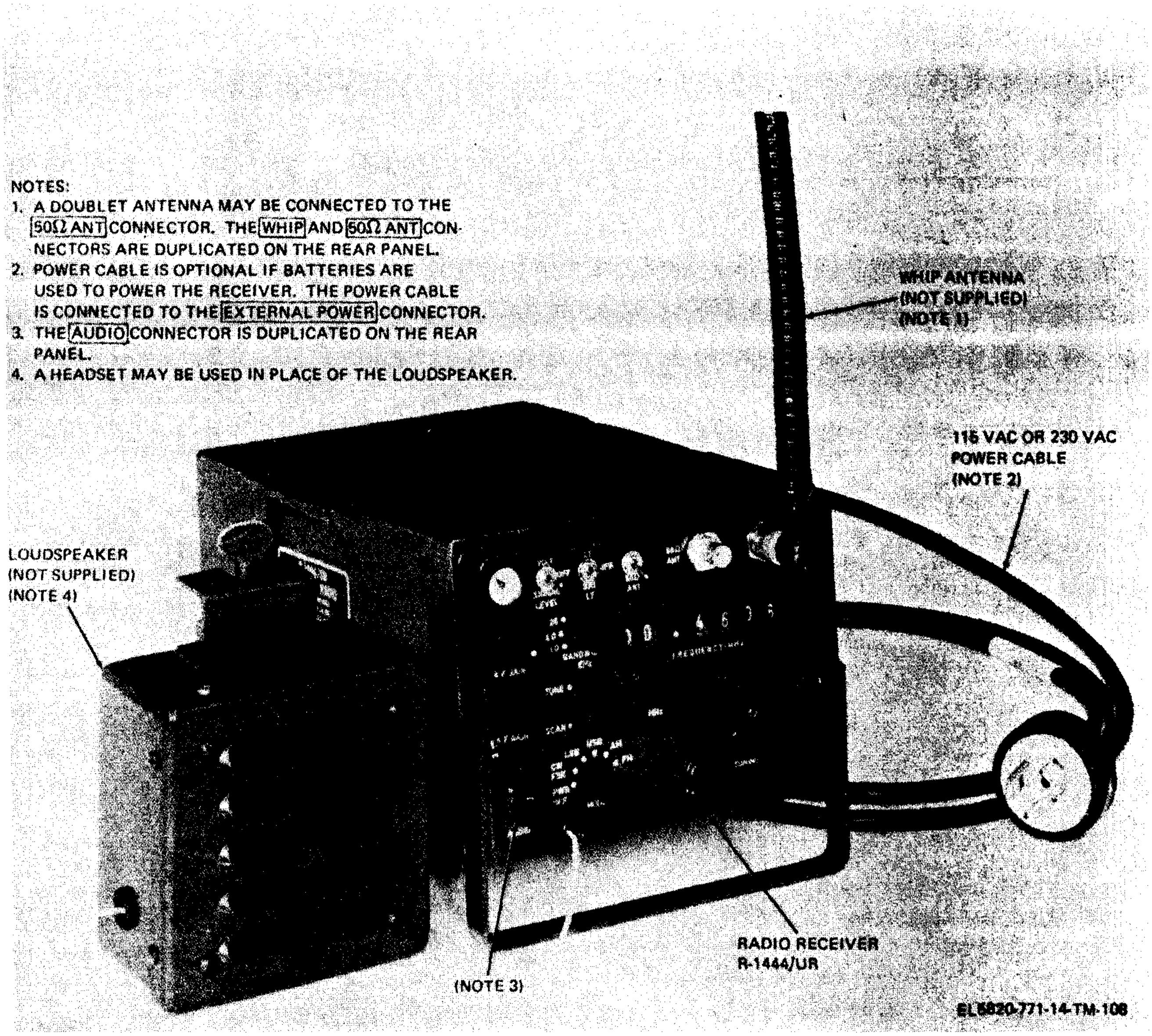


Figure 2-3. Typical fixed installation.

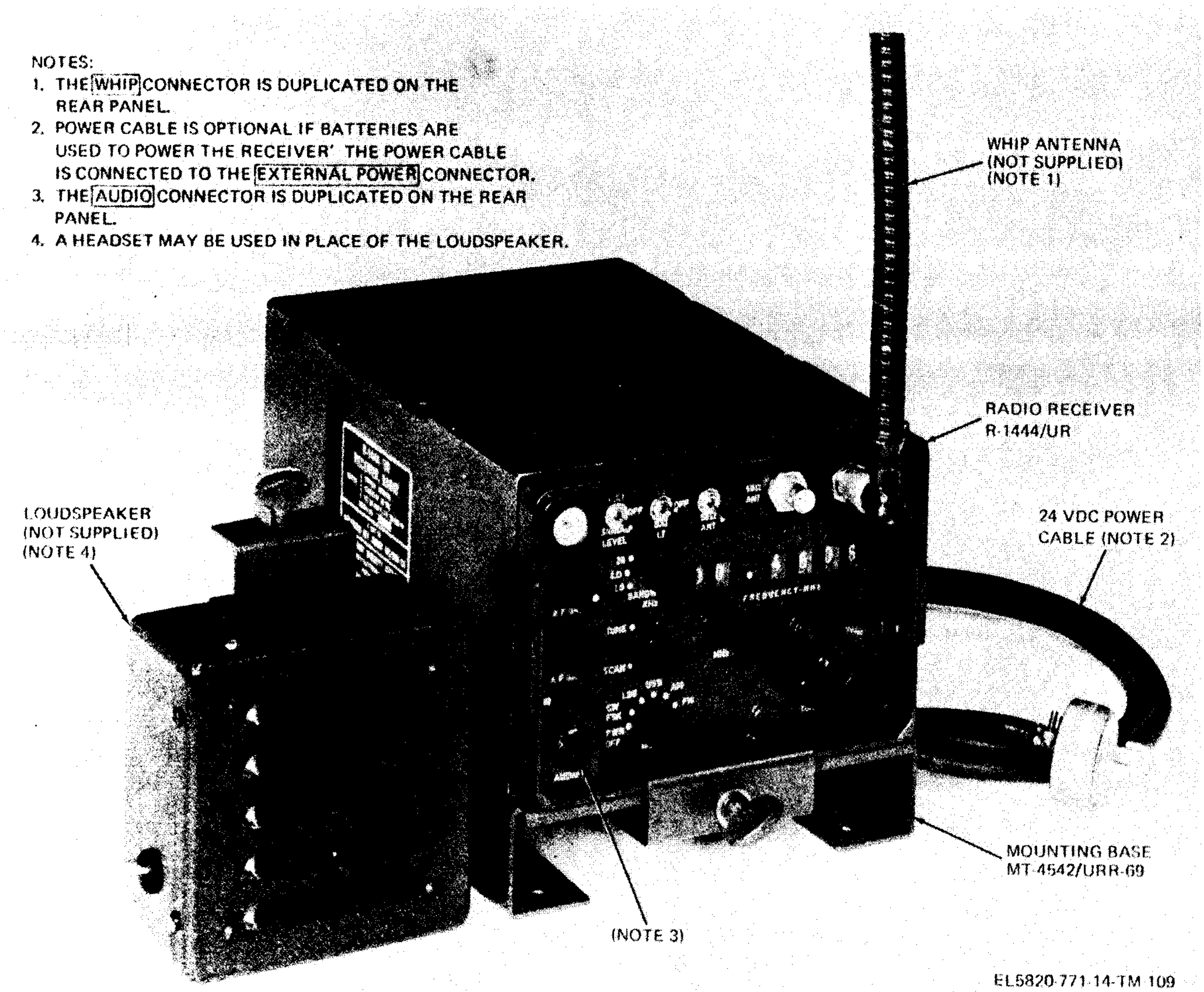


Figure 2-4. Typical Vehicle Installation

a. Install the vehicle mount in the vehicle (if not already installed) with the attaching hardware,

b. Install the receiver in the mount and secure with the thumbscrew.

c. Connect a whip antenna to the receiver WHIP connector.

d. Set the WHIP/50 Ω ANT switch to WHIP.

e. Connect a headset to the AUDIO connector.

f. Set the rear panel POWER MODE switch to EXTERNAL.

g. Connect the 24-vdc power cable to the EXTERNAL POWER connector and to the vehicle.

h. Refer to chapter 3 and operate receiver in am mode.

i. Position light switch to EXT-PWR LT and check that panel light operates.

CHAPTER 3

OPERATING INSTRUCTION

Section I. CONTROLS AND INSTRUMENTS

3-1. Damage From Improper Settings

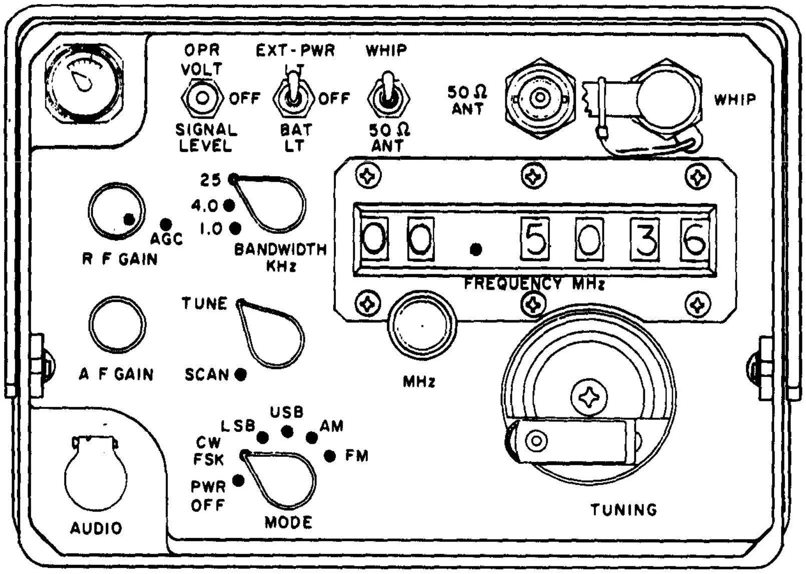
No damage will result to the receiver from improper control settings, except as indicated in paragraph 3-3 caution.

3-2. Description of Operator/Crew Controls and Indicators

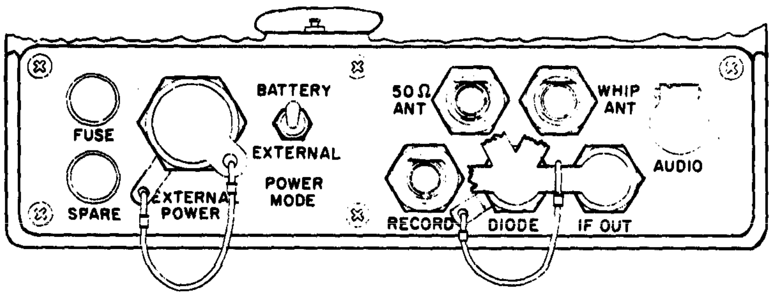
The receiver front panel (fig. 3-1) controls and indicators including the rear panel and their functions are listed in table 3-1.

Table 3-1. Controls and Indicators

Control, indicator, or connector	*Function*
Front Panel:	
MODE switch	Applies power to the receiver and selects the operating mode. Switch positions include PWR OFF, CW FSK, LSB, USB, AM, and FM.
AF GAIN control	Controls the audio output level of the receiver.
RF GAIN control.	Controls the overall gain of the receiver.
BANDWIDTH KHz control	Sets the if bandwidth of the receiver for 1.0, 4.0, or 25 kHz bandwidth for cw, am and fm.
TUNE/SCAN control	Controls the tuning rate of the TUNING control. In the TUNE position, 100 turns of the TUNING control produce a 1-MHz change. In the SCAN position, 10 turns of the TUNING control produce a 1-MHz change.
MHz control.	Selects the MHz portion of the operating frequency in the range of 00 to 29 MHz.
FREQUENCY MHz display	Displays the operating frequency in MHz.
TUNING control	Controls the receiver tuning within the MHz band selected by the MHz control. The tuning rate is controlled by the TUNE/SCAN control (above).
Panel meter	Displays operating voltage or signal level as selected by the OPR VOLT/SIGNAL, LEVEL, switch.
OPR VOLT/SIGNAL LEVEL switch.	Selects the operating voltage (springloaded in this position) or signal level, respectively, for display on the panel meter. A center OFF position is also provided.
EXT-PWR LT/BAT LT switch.	Center-off switch selects the power source for the dial lights. Switch is spring-Loaded in the BAT LT position.
WHIP/50 Ω ANT switch	Selects the antenna input which will be connected to the receiver.
50 Ω ANT connector	Used to connect a doublet antenna to the receiver.
WHIP connector	Used to connect a whip antenna to the receiver.
AUDIO connector	Used to connect a headset to the receiver.
Rear Panel:	
AUDIO connector.	Used to connect a headset to the receiver.
FUSE	0.5-ampere fuse for overload protection.
SPARE	Storage location for a spare fuse.
EXTERNAL POWER connector.	Connection for 115-vac, 230-vac, or 28-vdc power input to the receiver.
POWER MODE switch.	Selects EXTERNAL (115-vac, 230-vac, or 24-vcd) power or BATTERY (internal batteries) as a power source for the receiver.
50Ω ANT connector	Auxiliary connector for a doublet antenna.
WHIP ANT connector	Auxiliary connector for a whip antenna.
RECORD connector	Audio output connector for a tape recorder.
DIODE connector.	Dc voltage from the agc detector is connected to this connector for output to. external equipment.
IF OUT connector	455-kHz if output (110 milli volts minimum at 50 Ω) for external equipment.



FRONT VIEW



BACK VIEW EL5820-771-14-TM-32

Figure 3-1. Controls and indicators.

Section II. OPERATION UNDER USUAL CONDITIONS

CAUTION

When the R-1444/UR receiver is installed close to a transmitting antenna, as is common practice at some system training sites, make certain that the WHIP/50 Ω ANT switch is *not* set to the position of the selected antenna connector during transmission. This receiver does *not* have front end protection circuitry.

3-3. Preliminary Starting Procedures

Perform the preliminary operations listed below before starting the equipment as outlined in detail in paragraph 3-5.

a. Install the batteries and connect the equipment in the desired configuration (para 2-5 and 2-6).

b. Set the OPR VOLT/SIGNAL LEVEL switch to the OPR VOLT position and read the battery voltage on the panel meter. If the meter reads in the "REPLACE" range, replace the batteries (para 2-5). Return the switch to the OFF position.

c. Set the controls on the front of the receiver (fig. 3-1) as follows:

Control	Setting
MODE switch...	PWR OFF
AF GAIN control	Midrange
RF GAIN control	Maximum clockwise
TUNE/SCAN control	SCAN
BANDWIDTH kHz switch	25
MHz control	Desired band
Tuning	Desired frequency
OPR VOLT/SIGNAL LEVEL switch	OFF
EXT-PWR LT/ BAT LT switch	OFF
WHIP/50Ω ANT switch	Desired antenna

d. Set the controls on all ancillary equipment (recorder, etc.) to the preliminary settings listed in the applicable technical manual.

3-4. Initial Adjustments

No initial adjustments of Radio Set AN/URR-69, are necessary. However, when ancillary equipment is used with the radio set, this equipment may require initial adjustment. Refer to the applicable technical manuals for initial adjustment of this equipment.

3-5. Operating Procedures

a. Equipment Starting. With the controls set as described in paragraph 3-3, perform the following procedures:

(1) Start the receiver by setting the MODE switch to the desired operating mode.

(2) Start ancillary equipment per applicable technical manuals.

b. Cw/Fsk Reception.

(1) Set the MODE switch to CW/FSK.

(2) Set the BANDWIDTH KHz switch to 4.0.

(3) Tune in the desired signal with the TUNING control. For final tuning, set the TUNE/SCAN control to TUNE.

(4) If the level of the incoming signal is stable, set the AF GAIN control to about 3/4 clockwise and adjust the audio level using the RF GAIN control.

(5) If the level of the signal is varying, set the RF GAIN control to AGC (fully clockwise) and adjust the audio level using the AF GAIN control.

(6) To eliminate interference, set the BANDWIDTH KHz controls to 1.0 (This bandwidth may be too narrow for some fsk signals, depending on the frequency shift being used.)

c. Single Sideband Reception.

(1) Set the MODE switch to LSB for lower sideband or to USB for upper sideband.

(2) Set the BANDWIDTH KHz switch to 4.0.

(3) Tune in the desired signal with the TUNING control. For final tuning, set the TUNE/SCAN control to TUNE.

(4) If the level of the incoming signal is stable, set the AF GAIN control to about 3/4 clockwise and adjust the audio level using the RF GAIN control.

(5) If the level of the signal is varying, set the RF GAIN control to AGC (fully clockwise) and adjust the audio level using the AF GAIN control.

d. Amplitude Modulation Reception.

(1) Set the MODE switch to AM.

(2) Set the BANDWIDTH KHz switch to 4.0.

(3) Tune in the desired signal with the TUNING control. For final tuning, set the TUNE/SCAN control to TUNE.

(4) Set the RF GAIN control to AGC (fully clockwise).

(5) Adjust the audio level with the AF GAIN control.

e. Frequency Modulation Reception.

(1) Set the MODE switch to FM.

(2) Set the BANDWIDTH KHz switch to 25.

(3) Tune in the desired signal with the TUNING control. For final tuning, set the TUNE/SCAN control to TUNE.

(4) Set the FR GAIN control to AGC (fully clockwise).

(5) Adjust the audio level with the AF GAIN control.

3-6. Equipment Stopping Procedure

To stop the receiver, set the MODE switch to PWR OFF. Refer to the applicable technical manuals for ancillary equipment stopping procedures.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

3-7. Operation Under Emergency Conditions

a. Operation on Low Batteries. To conserve batteries, set the EXT-PWR LT/BAT LT switch to OFF.

b. Operation with Random-Length Antennas. In an emergency, the radio set may be operated using practically any random length of wire as an antenna. Connect the random-length antenna to the WHIP connector and set the WHIP/50 Ω ANT switch to WHIP.

3-8. Recognition and Identification *of* Jamming

Under real or simulated tactical conditions the receiver can be jammed by the enemy. Enemy jamming is done by transmitting a strong signal on the same frequency as that used by the receiver for communication, making it difficult or impossible to receive the desired signal. Unusual noises or strong interference heard on the receiver may be enemy jamming, signals from a friendly station noise from a local source, or the receiver may be defective. To determine if the interference is originating in the receiver, disconnect and remove the antenna leads, or short the WHIP post to the chassis. If the interference continues, the receiver is defective. Enemy jamming signals may be typed as continuous wave or modulated. A jamming signal may be intended to block a single frequency. This is called spot jamming. The enemy may use one or several transmitters to jam a block or band of frequencies. This method is called barrage jamming.

a. Continuous-Wave Jamming. Cw jamming is transmitted as a steady carrier. This signal beats with another signal and produces a steady tone in the headset. Cw jamming signals may also be keyed by using a random on-and-off signal or using actual code characters keyed to the same rate or a little faster than the signal being received.

b. Modulated Jamming. Modulated jamming signals may consist of noise, laughter, singing, music, various tones, or most any unusual sound, or it may be a combination of these sounds. Various types of modulated jamming signals are explained below.

(1) *Spark.* This is one of the simplest, most effective, and most easily produced jamming signals. This type of signal sounds very rough, raspy, and sometimes like an operating electric motor with sparking brushes. The signal is very broad; therefore, it will interfere with a large number of communication channels.

(2) *Sweep-through.* This signal is the result of sweeping or moving a carrier back and forth across your frequency at a slow or rapid rate. The numerous signals of varying amplitude and frequency produce a sound like that of a low-flying airplane passing overhead. This type of jamming is effective over a broad range of frequencies. When it is varied rapidly, it is effective against all types of voice signals.

(3) *Stepped tones or bagpipes.* This signal usually consists of several separate tones. The tones are transmitted in the order of first increasing and then decreasing pitch, repeated over and over. The audible effect is like the sound of a Scottish bagpipe.

(4) *Noise.* Noise is random both in amplitude and frequency. It produces a sound similar to that heard when a receiver is not tuned to a station and the AF GAIN control is turned to maximum.

(5) *Gulls.* This signal consists of a quick rise and a low fall of a variable audio frequency. The sound is similar to the cry of the sea gull.

(6) *Tone.* This signal consists of a single audio frequency of unvarying tone. It produces a steady howl in the headset. Another use of tone is to vary it slowly. This produces a howling sound of varying pitch.

3-9. Antijamming Procedures

When it is determined that the incoming signal is being jammed, notify the immediate superior officer and continue to operate the equipment. To provide maximum intelligibility of jammed signals, follow one or more of the operational procedures below. If these procedures do not provide sufficient signal separation for satisfactory operation, change to an alternate frequency.

a. Operate the receiver as outlined in paragraph 3-5.

b. Detune the tuning control several degrees on either side of the desired signal. This may cause some separation of the desired signal and the jamming signal.

c. Set the BANDWIDTH KHz control to the narrowest bandwidth which will allow reception of the desired signal.

d. Vary the RF GAIN control. This may reduce the jamming signal enough to permit the weaker desired signal to be heard.

e. Use either lsb, usb, or standard cw mode. These modes are less susceptible to jamming.

f. If both whip and doublet antennas are connected to the receiver, switch the WHIP/50 Ω ANT switch to obtain the best reception.

Section IV. PREPARATION FOR MOVEMENT

3-10. Manpack or Fixed Configuration

a. Manpack Configuration. The manpack configuration of the radio set may be transported while assembled if further use is anticipated. However, if the equipment will not be used immediately at the new location, it should be disassembled as follows:

(1) Set the MODE switch to PWR OFF.

(2) Disconnect the ship antenna from the WHIP connector.

(3) Disconnect the headset from the AUDIO connector.

(4) Remove the rear cover of the receiver by loosening the two captive screws.

(5) Remove the batteries from the receiver.

(6) Reinstall the rear cover and secure with the two captive screws.

b. Fixed Configuration. Disassemble the fixed configuration as follows:

(1) Set the MODE switch to PWR OFF.

(2) Disconnect the 115-vac or 230-vac power cable from the EXTERNAL POWER connector and from the power outlet.

(3) Disconnect the whip antenna (if installed) from the WHIP ANT connector.

(4) Disconnect the doublet antenna (if installed) from the 50 Ω ANT connector.

(5) Disconnect the headset from the AUDIO connector.

NOTE

Perform the following steps only if batteries are installed in the receiver.

(6) Remove the rear cover of the receiver by loosening the two captive screws.

(7) Remove the batteries from the receiver.

(8) Reinstall the rear cover and secure with the two captive screws.

3-11. Vehicular Cofiguration

(fig. 2-4).

The vehicular configuration is not normally disassembled for movement unless no further use of the radio set is anticipated. If the radio set will not be used immediately at the new location, or if it will be installed in a different vehicle, disassemble the equipment as follows:

a. Set the MODE switch to PWR OFF.

b. Disconnect the 24-vdc power cable from the EXTERNAL POWER connector and from the vehicle power connector.

c. Disconnect the whip antenna from the WHIP ANT connector.

d. Disconnect the headset from the AUDIO connector.

e. Loosen the thumbscrews on the vehicle mount and remove the receiver from the mount.

f. Remove the vehicle mount by removing the attaching hardware.

NOTE

Perform the following steps only if batteries are installed in the receiver.

g. Remove the rear cover of the receiver by loosening the two captive screws.

h. Remove the batteries from the receiver.

i. Reinstall the rear cover and secure with the two captive screws.

CHAPTER 4

OPERATOR AND ORGANIZATIONAL MAINTENANCE

Section I. GENERAL

4-1. Scope of Maintenance

This chapter describes the operator and organizational maintenance requirements for Radio Set AN/URR-69. These requirements include preventive maintenance, troubleshooting, adjustment, removal, cleaning, inspection, repainting and refinishing, installation, and testing.

4-2. Maintenance Duties

Operator maintenance of the radio set is limited to visual inspection, operational testing, external cleaning, and minor retouching of paint. Organizational maintenance includes all of the preventive and corrective maintenance duties described in this chapter.

4-3. Tools and Equipment

All tools and equipment required for operator and organizational maintenance are listed in the Maintenance Allocation Chart (Appendix C).

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

4-4. General

To insure that the radio set is always ready for operation, it must be inspected systematically so that any defects may be discovered and corrected before they result in serious damage or failure.

4-5. Preventive Maintenance Checks and Services Charts

The necessary preventive maintenance checks and services to be performed are listed and described in tables 4-1 and 4-2. The item numbers indicate the sequence of minimum inspection requirements. If defects are discovered during operation as soon as operation has ceased. Stop operation immediately if a deficiency is noted which would damage the equipment. Record all deficiencies, together with the corrective action taken in accordance with TM 38-750.

4-6. Cleaning

a. Clean dust and loose dirt from exterior surfaces with a damp cloth. Mild detergent may also be used, if desired.

WARNING

The fumes of TRICHLOROETHANE are toxic. Provide thorough ventilation whenever it is used; avoid prolonged or repeated breathing of vapor. Do not use near an open flame or hot surface; trichoroethane is nonflammable but heat converts the fumes to a highly toxic phosgene gas the inhalation of which could result in serious injury or death. Prolonged or repeated skin contact with trichoroethane can cause skin inflammation. When necessary, use gloves, sleeves and aprons which the solvent cannot penetrate.

b. Remove grease, fungus, corrosion, and ground-in-dirt from exterior surfaces using a clean cloth dampened in trichloroethane. Use a short-bristled brush on connectors and hard to reach areas. Allow the surface to air dry.

4-7. Repainting and Refinishing

a. Refer to SB 11-573 to determine the proper finish to use.

b. Refer to TB 43-0118 for refinishing procedures.

c. Do *not* paint connectors, controls, FREQUENCY MHz windows, or panel meter face.

4-8. Operational Checks

a. Install the batteries in the receiver per paragraph *2-5a.*

b. Install the radio set in the manpack configuration (para 2-5).

c. Operate the radio set in each operating mode on several assigned frequencies. Verify that satisfactory reception is possible on each assigned frequency.

d. Install the radio set in the freed configuration (para *2-5c).* (If available, install both a whip and a doublet antenna).

e. Repeat step c above. Test operation using both the whip and doublet antennas, if available.

f. Install the radio set in the vehicular configuration (para 2-6).

Table 4-1. Operator/Crew Preventive Maintenance Checks and Services

Sequence No.	*Item to be inspected*	*Procedure*	*References*
1	Exterior surfaces	Clean the exterior surfaces of the unit. **WARNING** Do not clean the equipment if the power is on.	(Para 4-6.)
2	Intercabling and connectors	Check all interconnecting cables and connectors for cracks and breaks. Replace cables that have cracks or broken connectors.	(Fig. 3-1.)
3	Meter face and and dial face	Check to see that the meter face and dial face are not loose or broken.	(Fig. 3-1.)
4	Fuses	Check fuses for correct value. Check spare for proper value.	
5	Batteries	Check batteries for a full charge (using front panel meter). Replace batteries if necessary.	*(Para 2-5a.)*
6	Knobs, controls, and switches	While making the operational checks (item 7) observe that the mechanical action of each knob, switch, and control is smooth and free of external or internal binding.	(Fig. 3-1.)
7	Operational check..	Operate the equipment on an authorized frequency to verify its capabilities.	(Para 4-8.)
8	Panel light. . . .	Check operation of panel light.	(Para *2-5b.)*

Table 4-2. Organizational Preventive *Maintenance Checks and Services*

Sequence No.	*Item to be inspected*	*Procedure*	References
1	115-vac power cable	Inspect cable for cuts, loose connectors, or other damage.	
2	24-vdc power cable	Inspect cable for cuts, loose connectors, or other damage.	
3	230-vac power cable	Inspect cable for cuts, loose connectors, or other damage.	
4	Vehicle.	a. Inspect mount for dents, cracks, scratches, or other obvious damage.	
		b. Inspect mount for dirt, grease, fungus, or corrosion. Clean as necessary.	(Para 4-6.)
		c. Impact mount for *damage to* finish. Repaint as necessary.	(Para 4-7.)
5	Receiver	Operationally test the receiver.	(Para 4-8.)

g. Repeat step c, above.

h. Shutdown the equipment per paragraph 3-6.

i. Unless further operation is anticipated, disassemble the vehicular configuration per paragraph 3-11.

Section III. TROUBLESHOOTING

4-9. General

When an equipment malfunction occurs, the information in this section will aid in isolating the trouble to a defective unit or item of equipment. The defective equipment may then be forwarded to a higher level of maintenance.

4-10. Troubleshooting Chart

Troubleshooting of the radio set is accomplished in conjunction with the operational checks (para 4-8) and preventive maintenance checks listed in tables 4-1 and 4-2. When an abnormal condition or result is observed, locate the appropriate symptom in the Malfunction column of table 4-3. The procedure listed in the Corrective action column should then correct the trouble. Refer any trouble that is beyond the scope of operator and organizational maintenance to a higher level of maintenance.

Section IV. ORGANIZATIONAL MAINTENANCE

4-11. General

This section describes the corrective maintenance procedures required by organizational maintenance to return the radio set to service following a malfunction.

a. Troubleshooting of this equipment is based upon the operational checks (para 4-8) and the preventive maintenance checks listed in tables 4-1 and 4-2.

b. Perform the checks and corrective measures indicated in the troubleshooting chart tables 4-3 and 4-4. Refer any troubles beyond the scope of the organizational level to a higher level of maintenance.

4-12. Equipment Removal and Installation

a. When the equipment is used in the manpack or fixed configuration disassemble the receiver as out lined in paragraph 3-10. When the equipment is used in a vehicular configuration follow the procedures outlined in paragraph 3-11.

b. To install the equipment after maintenance has been performed follow the procedures outlined in paragraph 2-5 for the manpack or fixed configuration and paragraph 2-6 for the vehicular configuration.

Table 4-3. Operator's Troubleshooting

Item	*Trouble sympton*	*Probable trouble*	*Checks and corrective action*
1	Receiver completely inoperative.	*a.* Fuse	Replace fuse.
		b. POWER MODE switch not in proper position for source voltage	Check position of POWER MODE switch for proper position.
		c. Defective source voltage	Replace if defective.
		d. Defective power plug	Check plug for damage. Refer to a higher level of maintenance for repair.
2	Low signal power(Weak audio output)	*a.* Antenna in wrong area	Move antenna.
		b. RF Gain or AF GAIN control out of adjustment	Readjust controls.
		c. Damaged antenna connection	Check antenna for damage, tighten, or replace. Refer to higher level of maintenance for repair.
		d. Weak batteries (when used)	Check and replace if required.
3	Static or noise in Receiver	*a.* Enemy jamming	
		b. Loose antenna connection	Tighten connection.
4	Panel lamp inoperative	Defective panel lamp	Refer to higher level maintenance for replacement.
5	Improper setting of switches.	a. BANDWIDTH kHz switch in improper setting.	Check for proper setting.
		b. RF GAIN control. Signals weak or fading rapidly.	Set RF GAIN control to AGC.

Table 4-4. Organizational Troubleshooting

Malfunction	*Probable cause*	*Corrective* action
Radio set inoperative from internal batteries.	a. Blown fuse	*a.* Replace fuse (para 4-13).
	b. Batteries defective.	*b.* Replace batteries (para 2-5a.
	c. Receiver defective	*c.* Replace receiver.
Radio set inoperative from 115-vac power.	*a.* Blown fuse	*a.* Replace fuse (para 4-13).
	b. 115-vac power cable defective	*b.* Replace cable. Forward defective cable to higher level maintenance.
	c. Receiver defective	*c.* Replace receiver.
Radio set inoperative from 230-vac power.	*a.* Blown fuse..	*a.* Replace fuse (para 4-13).
	b. 230-vac power cable defective	*b.* Replace cable. Forward defective cable to higher level maintenance.
	c. Receiver defective	*c.* Replace receiver.
Radio set in operative from 24-vdc power.	*a.* Blown fuse	a. Replace fuse (para 4-13).
	b. 24-vdc power cable defective	*b.* Replace cable. Forward defective cable to higher level maintenance.
	c Receiver defective	*c.* Replace receiver.
Only noise heard in headset (no signals received).	*a.* Antenna defective.	a. Replace antenna.
	b Receiver defective.	*b.* Replace receiver.
Receive audio weak or garbled (all modes and frequencies)	*a.* Headset defective	*a.* Replace headset.
	b Antenna defective.	*b.* Replace antenna
	c. Receiver defective.	*c.* Replace receiver.
Receive audio week or garbled (one mode or one frequency band only)	Receiver defective.	Replace receiver.
Dial light or panel meter inoperative.	Receiver defective.	Replace receiver.

4-13. Receiver Parts Removal and Replacement

a. General. Maintenance and repair of the receiver at the organizational level is limited to the replacement of batteries, knobs, and fuses.

b. Fuse Replacement.

(1) Replace the rear-panel fuse as follows:

NOTE

A spare fuse (SPARE location) is provided to allow the receiver to be placed back in service quickly after a fuse blows. If the spare fuse is installed in the receiver, install a new 0.5-ampere fuse in the SPARE location as soon as the operational or tactical situation allows.

(a) Set the MODE switch to PWR OFF.

(b) Disconnect the external power cable (if connected).

(c) Remove the cap from the fuseholder by turning counterclockwise.

CAUTION

Do not replace the fuse with one of a higher rating. Use a 0.5-ampere fuse as specified in the repair parts and special tools list.

(d) Remove the fuse from the cap and replace it with the new fuse.

(e) Install the cap on the fuseholder and tighten by turning clockwise.

(2) Replace internal fuses as follows:

NOTE

Refer to figure FO-25 for locations of internal fuses. Two spare fuses are provided to allow the receiver to be placed back into service quickly after a fuse blows. One of the spare fuses is rated at 1/8 ampere and is a replacement for F2 or F4. The other spare fuse is rated at ¾ ampere and is the replacement for F3. If one of the spare, fuses is used as a replacement, install a proper rated fuse in spare location as soon as possible.

(a) Set the MODE switch to PWR OFF.

(b) Disconnect the external power cable (if connected).

(c) Remove the receiver bottom cover by loosening the three captive screws.

CAUTION

Do not replace the fuses with ones of higher rating. Use 1/8 ampere or ¾ ampere fuses as specified in the repair parts and special tools list.

(d) Remove the blown fuse pulling straight out of the parent board.

(e) Install a new fuse by inserting the two pins into the sockets in the parent board.

(f) Reinstall the receiver bottom cover and secure with the three captive screws.

4-14. Vehicle Mount Disassembly and Reassembly (fig. 4-1)

a. Disassembly of Mount (fig. 4-1).

(1) Remove the thumbscrew/retainer assembly from mounting base plate by removing four mounting screws.

(2) Remove pin from thumbscrew.

(3) Remove half clamp by turning thumbscrew counterclockwise.

(4) Remove retainer, flat washer, and lock-washer from thumbscrew.

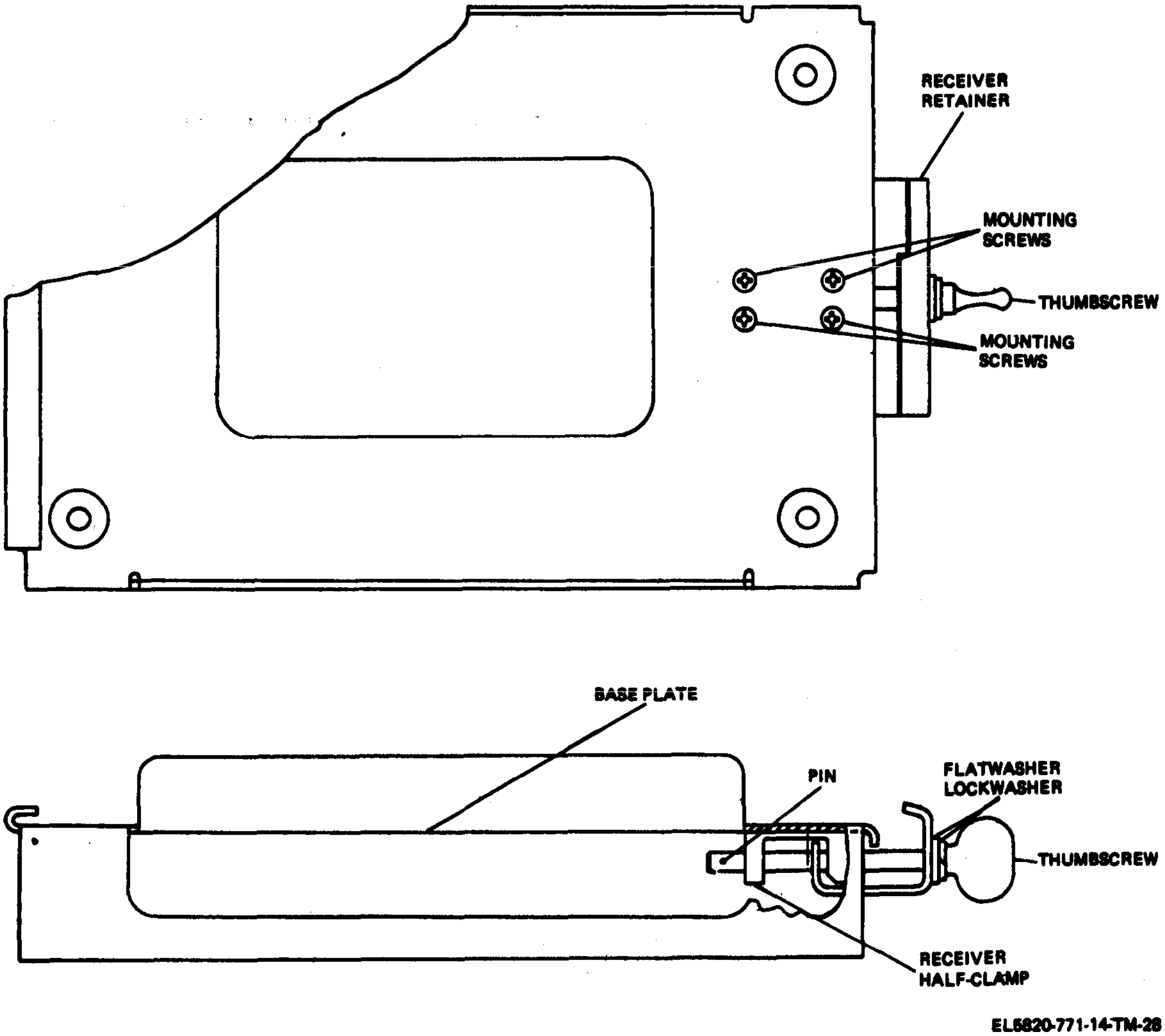


Figure 4-1. Vehicle mount parts locations.

b. Inspection.

(1) Inspect all parts of the thumbscrew-retainer assembly for damage, signs of wear, or corrosion.

(2) Inspect mounting base plate for dents, cracks, warping, or damage to finish.

c. Cleaning. Refer to paragraph 4-6 for general cleaning procedures.

d. Repainting and Refinishing. Refer to paragraph 4-7 for repainting and refinishing instructions.

e. Reassembly (fig. 4-1).

(1) Slide lockwasher, flat washer, and retainer on thumbscrew.

(2) Pass thumbscrew through the front hole (slide with leveled edge) of half clamp, through the back hole of retainer, then through the other hole-in half clamp. Turn thumbscrew clockwise to thread it through half clamp.

(3) Install pin in thumbscrew.

(4) Install the thumbscrew/retainer assembly on mounting base plate with the four mounting screws.

(5) Secure mounting screws by using a small amount of Locktite Grade H on the threads of each Screw.

4-15. Maintenance of Ancillary Items

a External Power Cables. The 115-vac, 230-vac, and 24-vdc power cables are not repairable at the organizational maintenance level. Forward damaged or defective cables to higher level maintenance for repair.

b. Other Ancillary Items. Organizational maintenance of other ancillary items (headset, antennas, etc.). are covered in separate technical manuals.

CHAPTER 5

FUNCTIONING OF EQUIPMENT

Section I. UNIT FUNCTIONING

5-1. General

This section covers component functioning of Radio Receiver R-1444/UR. The information in this section may be used as a troubleshooting aid to isolate a fault to a specific subassembly.

5-2. Block Diagram Analysis

(fig. FO-1).

a General. The received rf signal (0.5000 to 29.9999MHz) enters the receiver through the WHIP or 50Ω ANT connector on the front or rear panel of the unit. The signal passes through a bandpsss filter (A6) to an amplifier/mixer (A7, A8) stage. Here, the signal is upconverted to the first if of 159.545 MHz. After amplification, the signal is converted to the second if of 455 kHz. Control signals for the oscillators (pump vfo's) are provided by the synthesizer circuits for both of these conversions. The 455 kHz signal is amplified (A8) and demodulated to produce the receiver's audio, if, and diode outputs (at the front and rear panel connectors). Basically, the receiver contains six blocks of circuits. These are the preselector, control, synthesizer, if amplifier, demodulator, and power circuits. Each of these circuits are described in the following subparagraphs.

b. Preselector Circuits. The preselector assembly (1A2) contains the switched input bandpass filters and the amplifier/mixers and oscillators (A1 through A9) required for the two frequency conversions. The bandpass filters are contained on two subassemblies. Subassembly filter (A4) contains the 0.5 to 9.0 MHz filters and subassembly filter (A6) contains the 9.0 to 30.0 MHz filters. Filter selection is provided by rotary wafer switches at the inputs (S1) and outputs (A9) of the filter networks. The bandpass filters aid in image rejection and isolation of the if and mixer frequencies from the antenna. The first frequency conversion (to 159.545 MHz) is performed by the parametric amplifier frequency mixer stags module (A7). The (hf) oscillator (2A1) used for this conversion is precisely controlled by the synthesizer using phase-lock techniques. A second mixer amplifier (A8) and oscillator (2A2) are used to convert the signal to the 455 kHz second if. A fixed 160 MHz oscillator is used for this conversion.

This 160-MHz signal is additionally mixed with a 5.545 to 6.545 MHz signal from phase-locked (if) oscillator (A5). The resulting 165.545 to 166.545 MHz signal is routed through helical filter 1A3, then back to high loop mixer (A3). This mixer also receives a 129.545 to 159.045 MHz imput from the hf vfo. The resulting 7 to 36 MHz signal is fed to 1A4 to complete the MHz frequency servo loop *(d* below).

c. Control Circuits. Most of the receiver's manual controls and associated circuits are contained in module 1A1. Refer to paragraph 3-2 for a complete description of the various controls. The frequency control portion of assembly 1A1 contains eight printed-circuit wafer switches. Six of these switches generate a 21-bit data word which is used to preset the synthesizer variable dividers on modules 1A4 and 1A5 *(d* below). The other two switches have precision resistors deposited on the circuit board between the contacts. These switches provide precise control voltages to the two pump vfo's on preselector 1A2 *(d* below).

d. Synthesizer Circuits. Portions of the synthesizer are located on modules 1A2, 1A4, 1A5, and 1A6. The synthesizer contains two frequency servo loops. A megahertz loop provides for 1-MHz frequency interpolations by translating a pump variable frequency down to a 1-MHz reference signal. Preselector module 1A2 *(b* above) contains the pump vfo for this loop (A1). The high-frequency variable divider is located in module 1A4. Module 1A6 contains the 1-MHz reference oscillator for this loop. A 100-Hz loop provides 100-Hz, 1-kHz, 10-kHz, and 100-kHz frequency interpolation by the pump vfo frequency down to a 100-Hz reference signal. Module (A2) also contains the pump vfo for this loop (A5). The low-frequency divider is located in module 1A5. The 100-Hz reference signal is developed on rf oscillator 1A6.

e. IF Amplifier. A separate if amplifier is provided for the 455 kHz second if. This amplifier (module 1A8) provides approximately 100 db of gain as well as selectivity. Agc for the preselector circuits is also developed by this module.

f Demodulator Circuits. The demodulator circuits are contained on module 1A7. This module converts the 455-kHz if signal to an audio signal for output to the AUDIO and RECORD connectors.

g. Power Circuits. The receiver is capable of operation from internal batteries or from 24 vdc, 115 vac, or 230 vac external power. Selection of the power source is accomplished by setting the POWER MODE switch to the desired position and connecting the receiver to the power source using the proper cable. If the internal batteries are selected, the 10 to 16 vdc battery power is routed through the POWER MODE switch (INTERNAL position) and the front panel MODE switch to power supply 1A9. When external vdc is used, the power is routed through a filter and an 0.5-ampere fuse, then through the MODE switch to 1A9. When operation is from 115 vac or 230 vac, the power is applied through a transformer where it is stepped down to approximately 24 volts. The power is rectified and filtered into 24 vdc, then routed to 1A9 through the fuse and the MODE switch. Module 1A9 converts the 10 to 15 vdc battery voltage or the 24 vdc power to +5, -5, +9, and +50 vdc outputs. The +5, -5, and +9 vdc outputs are used by modules 1A1 through 1A8 to power the receiver circuits. The +5 vdc power is used in control assembly 1A1 to develope the vfo control voltages for preselector module 1A2.

Section II. Deleted

Section III. Deleted

CHAPTER 6

DIRECT SUPPORT MAINTENANCE

Section I. GENERAL

6-1. Scope

This chapter describes the direct support maintenance requirements for Receiving Set, Radio AN/URR-69. These requirements include troubleshooting, maintenance, testing, and adjustment.

6-2. Tools and Test Equipment

All tools and test equipment required for direct maintenance are listed in the Maintenance Allocation Chart (app C).

Section II. TROUBLESHOOTING

CAUTION

This equipment contains transistor circuits so observe the following precautions to prevent damage to the components.

1. Test equipment requires an isolation transformer in the power supply circuit.
2. Use a coupling capacitor before connecting the test equipment directly to transistor circuits (not necessary for multimeters or VTVM's)
3. OBSERVE BATTERY POLARITY. Polarity reversal may damage transistors.
4. Battery eliminators used in testing must have good voltage regulation and low ac ripple so the voltage rating of the transistor equipment being tested is not exceeded.

6-3. General

This section contains procedures for isolating and localizing faulty subassemblies in Receiver R-1444/UR. The defective subassemblies shall be routed to depot maintenance for repair.

6-4. Troubleshooting Chart

Troubleshooting of the receiver is accomplished by systematically testing the receiver and subassembly inputs and outputs. Table 6-1 should be used as a guide in isolating common faults in the receiver. Be sure that organizational troubleshooting (table 4-4) has been previously accomplished, and the fault has been isolated to the receiver's internal circuits or components prior to accomplishing these procedures.

Section III. MAINTENANCE

6-5. General

This section contains corrective maintenance procedures for Receiver R-1444/UR. Instructions are provided for disassembly, inspection, repair and reassembly of the receiver.

6-6. Disassembly of Receiver
(figs. FO-15 and FO-16)

NOTE

Disassemble the receiver only to the extent necessary to make repairs. Do not disassemble the receiver beyond that which is specified in this paragraph. The receiver control/preselector (front end assembly) (1A1 thru 1A3) shall not be disassembled, but shall be replaced with a spare unit when probable fault is determined to be in 1A1 thru 1A3 during troubleshooting.

a. Cover and Battery Removal (fig. FO-15 and FO-16)

(1) Set the MODE switch to PWR OFF.

(2) Remove the battery cover (1) (fig. FO-15) by loosening the two captive screws (2).

(3) If batteries are installed in the receiver, remove them.

(4) Remove the top cover (3) by removing the five attaching screws (4).

Table 6-1. Troubleshooting

NOTE

If a receiver fault cannot be corrected by using the procedures in this table, the fault may be in the wiring or components of receiver housing (1MP1). Make resistance and continuity checks of the receiver housing assembly per paragraph 6-23 and figure FO-16. Refer to TM 11-5820-771-24P to determine if replacement components are provisioned at the direct support maintenance level. If a replacement part is not available, forward the receiver housing to depot maintenance for repair.

It	*Symptom*	*Probable trouble*	*Corrective action*
1.	Receiver inoperative on batteries or external power (all modes and bandwidths).	*a.* POWER MODE switch (1S1) or MODE switch (1A1S5) defective.	*a.* Measure switch continuity (fig. FO-16 and para *6-3e).* Replace defective front end assembly (para *6-6c* and *6-9c).*
		b. Power supply 1A9 defective.	*b.* Test 1A9 (para 6-22). Replace 1A9 if needed (para *6-6f* and *6-9d).*
		c. Fuse 1F2, 1F3, or 1F4 blown.	*c.* Replace fuse (fig. FO-15).
2.	Receiver inoperative on external power only.	*a.* Fuse/F1 blown.	*a.* Replace fuse.
		b. Power cable defective.	*b.* Replace and repair cable (para *6-8b).*
		c. POWER MODE switch (S1) defective.	*c.* Measure switch continuity (fig. FO-16). Replace front end assembly if necessary.
		d. Power supply 1A9 defective.	*d.* Test 1A9 for 24 vdc input and 12.5 vdc output (para 6-22). Replace 1A9 if needed (para *6-6f* and *6-9d).*
3.	No audio signal output at either AUDIO connector.	*a.* MODE switch (1A1S5) or AF GAIN control (1A1R2) defective.	*a.* Make 1A1 resistance and continuity checks (table *6-2e* and *h).* Replace front end assembly if defective (para *6-6c* and *6-9c).*
		b. Preselector 1A2 defective.	*b.* Test 1A2 (para 6-15). Replace front end assembly if necessary (para *6-6c* and *6-9c).*
		c. Demodulator/audio converter amplifier assembly 1A7 defective.	*c.* Test 1A7 (para 6-20). Replace 1A7 if necessary (para *6-6b* and *6-9e).*
		d. If amplifier 1A8 defective.	*d.* Test 1A8 (para 6-21). Replace 1A8 if necessary (para *6-6b* and *6-9e).*
		e. Power supply 1A9 defective.	*e.* Test 1A9 (para 6-22). Replace 1A9 if necessary (para *6-6f* and *6-9d).*
4.	Audio signal abnormal in one mode only (cw, 1sb, usb, am, or fm).	*a.* MODE switch (1A1S5) defective.	*a.* Measure switch continuity (table *6-3e)* and replace front end assembly if defective (para *6-6c* and *6-9c).*
		b. Demodulator/audio assembly 1A7 defective.	*b.* Test 1A7 (para 6-20). Replace 1A7 if necessary (para *6-6b* and *69e).*
		c. If amplifier 1A8 defective.	*c.* Test 1A8 (para 6-21). Replace 1A8 if necessary (para *6-6b* and *6-9e).*
5.	Audio signal abnormal in one bandwidth only.	*a.* BANDWIDTH kHz switch (1A1S4) defective.	*a.* Measure switch continuity (table *6-3f)* and replace front end assembly if defective (para *6-6c* and *6-9c).*
		b. If amplifier 1A8 defective.	*b.* Test 1A8 (para 6-21). Replace 1A8 if necessary (para *6-6b* and *6-9e).*
6.	Audio signal abnormal in one band of frequencies only (0.5-1, 1-2, 2-3, 3-5, 5-9, 9-15, 15-22, 22-30 MHz).	Preselector 1A2 defective.	Test 1A2 (para 6-15). Replace front end assembly if necessary (para *6-6c* and *6-9c).*
7.	DIODE connector output abnormal or missing.	If amplifier 1A8 defective.	Test 1A8 (para 6-21). Replace 1A8 if necessary (para *6-6b* and *6-9e).*
8.	IF OUT connector output abnormal or missing.	If amplifier 1A8 defective.	Test 1A8 (para 6-21). Replace 1A8 if necessary (para *6-6b* and *6-9e).*
9.	RECORD connector output abnormal or missing.	*a.* Demodulator/audio assembly 1A7 defective.	*a..* Test 1A7 (para 6-20). Replace 1A7 if necessary (para *6-6b* and *6-9e).*

Table 6-1. Troubleshooting-Continued

It Symptom	Probable trouble	Corrective action
	b. If amplifier 1A8 defective.	*b.* Test 1A8 (para 6-21). Replace 1A8 if necessary (para *6-6b* and *6-9e).*
10. Receiver frequency is unstable (frequency control loop out of lock).	*a.* High frequency divider 1A4 defective.	*a.* Check all inputs and outputs of 1A4 (para 6-17). Trace abnormal inputs back to their source (1A1, 1A2, 1A5, or 1A6) and make additional measurements as required. If all inputs are normal, replace 1A4 (para *6-6b* and *6-9e).*
	b. Abnormal or missing preset from 1A1.	*b.* Check 1A1 preset outputs (tables 6-6 through 6-10). Replace front end assembly if an improper output is noted (para *6-6c* and *6-9c).*
	c. Abnormal or missing 7-36 MHz output from 1A2.	*c.* Check 7-36 MHz output from 1A2 (para 6-15). Replace front end assembly if an improper output is noted (para *6-6c* and *6-9c).*
	d. Abnormal or missing control line output from 1A5.	*d.* Check the control line output from 1A5 (para *6-18f).* Replace 1A5 if an improper output is noted (para 6-*6b* and *6-9e).*
	e. Abnormal 1 MHz output from 1A6.	*e.* Check the 1 MHz output from 1A6 (para *6-19d).* Replace 1A6 if an improper output is noted (para 6-*6b* and *6-9c).*
11. Receiver dial does not agree with received signal frequency (control loop locked off frequency).	*a.* Preselector 1A2 defective.	*a.* Check the 7-36 MHz output from 1A2 (para *6-17f).* If this signal is abnormal, replace front end assembly (para *6-6c* and *6-9c).*
	b. Low frequency divider 1A5 defective.	*b.* Test 1A5 (para 6-18). If all inputs to 1A5 are normal and one of the outputs is improper replace 1A5 (para *6-6b* and *6-9e).*
	c. High frequency divider 1A4 defective.	*c.* Check all inputs and outputs of 1A4 (para 6-17). Trace abnormal inputs back to their source (1A1, 1A2, 1A5 or 1A6) and make additional measurements as required. If all inputs are normal replace 1A4 (para *6-6b* and *6-9e).*
12. Receiver frequency is unstable (unlocked) on some MHz frequencies only.	MHz preset line open or shorted.	Check the MHz preset outputs from 1A1 (table 6-6). Replace front end assembly if an improper output is noted (para *6-6c* and *6-9e).*
13. Receiver frequency is unstable (unlocked) on some kHz frequencies only.	kHz preset line open or shorted.	Check the kHz preset outputs from 1A1 (tables 6-7 through 6-10). Replace front end assembly if an improper output (para *6-c* and *6-9c).*

(5) Remove the bottom cover (5) by removing the three attaching screws (6).

b. Circuit Card *Removal.* Remove circuit cards 1A4 through 1A8 (7, 8, 9, 10, 11) by pulling straight out with a card removal tool.

c. Receiver Control/Preselector (Front End Assembly) (1A1 through 1A3) Removal (fig. FO-15 and FO-16).

(1) Remove the 10 screws (12) (fig. FO-15) securing the front end assembly (13) in the receiver housing.

(2) Slide the assembly out of the housing to gain access to the internal connectors. Assembly fits snugly and may require movement to release seal.

d. **Deleted.**

e. **Deleted.**

f. Power Supply 1A9 Removal (figs *FO-15,* FO-16).

(1) Remove the self locking nuts (22) from the four power, supply mounting studs.

(2) Unsolder and tag the wiring connected to the power supply terminals (23).

(3) Remove the power supply (24) from housing assembly (25) by removing the two remaining attaching screws (26).

6-7. Inspection

(fig. FO-15)

a. Remove and inspect circuit cards 1A4 through 1A8 (7, 8, 9, 10, 11) for cracks, warping, corrosion, or signs of overheating.

b. **Deleted.**

c. Inspect control/preselector assembly 1A1 (13) and 1A2 (19) for damage, corrosion, loose or missing hardware, or signs of overheating.

d. Inspect the exterior of power supply assembly 1A9 (24) for dents, corrosion, loose terminals, or other damage.

e. Inspect the interior of receiver housing assembly (25) for damage, corrosion, loose wires, missing hardware, or signs of arcing or overheating.

f. Inspect the covers for damage, corrosion, or missing hardware.

6-8. Replacement and Repair

a. Replacement. Refer to paragraphs 6-6 and 6-9 for replacement instructions for subassemblies 1A1 through 1A9.

b. Lamp DSI Replacment.

(1) Remove the knobs from front panel TUNING and MHz controls.

(2) Remove 10 screws (12) (fig. FO-15) securing front panel to case.

(3) Slide the assembly (13) straight out of case to gain access to lamp assembly (1) (fig. FO-17).

(4) Remove outside screw (2) from MP19 and lift lamp retaining assembly (3) to replace lamp (4).

(5) Reassemble and replace front panel and tighten screws.

c. Cable *Repair.* Repair of the power cables consists of replacing faulty connectors. Refer to figure 6-1 for wiring details. Tag all wires as they are disconnected to aid in replacement.

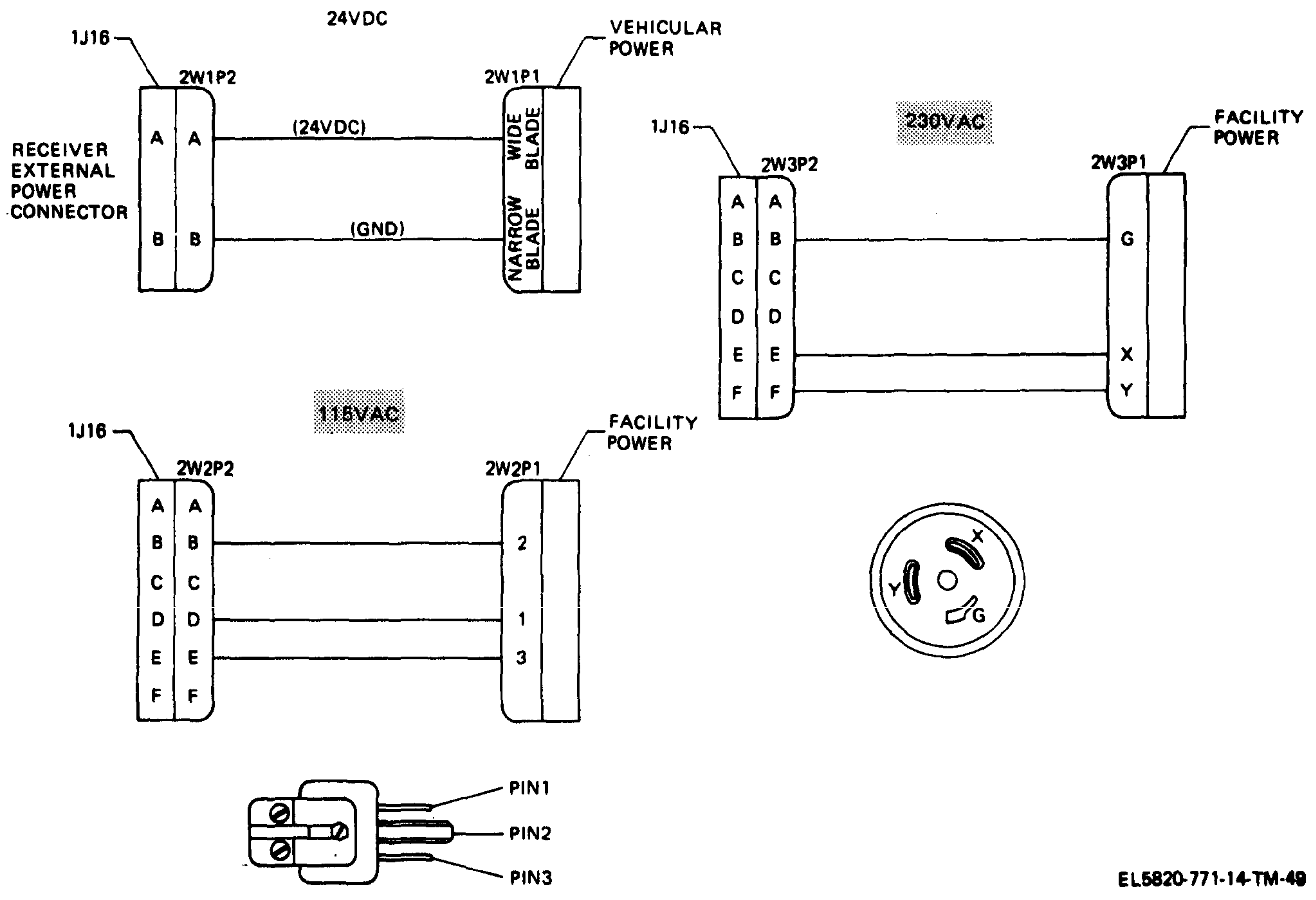


Figure 6-1. Cable wiring diagram.

6-9. Reassembly
(fig. FO-15)

a. **Deleted.**

b. **Deleted.**

c. Front End Assembly (1A1 through 1A3) Installation (fig. FO-15).

(1) Slide the assembly (13) into the receiver housing (25).

(2) Secure the assembly in the housing with the 10 attaching screws (12).

d. Power Supply 1A9 Installation (fig. FO-15).

(1) Remove wiring tags and connect the wiring to the power supply terminals (23).

(2) Install the power supply (24) in housing assembly (25) and secure with the hardware (22) on the four mounting studs.

(3) Install the two attaching screws (26) on top of the power supply.

e. Circuit Card Installation. Install circuit cards 1A4 through 1A8 (7, 8, 9, 10, 11) in the receiver case by pushing straight in to the parent board.

f. Cover and Battery Installation (fig. FO-15).

(1) If batteries will be used, install them in the battery compartment.

(2) Install the battery cover (1) with the two captive screws (2).

(3) Install the bottom cover (5) with the three attaching screws (6).

(4) Install the top cover (3) with the five attaching screws (4).

Section IV. TESTING

6-10. General

Direct support testing is limited to the testing of all major subassemblies (1A1 through 1A9) while these subassemblies are installed in the receiver or extended by means of card or cable extenders. When testing shows a subassembly to be defective, replace it with a serviceable item and forward the defective subassembly to depot maintenance for repair

6-11 Physical Tests and Inspection

a. Inspect the exterior of the unit as described in table 4-1.

b. Check the MHz and TUNING controls for torque (less than 25 inch/ounces), and ease of operation.

c. Remove all covers and the batteries per paragraph *6-6a.*

d. Inspect the circuit cards and other subassemblies per paragraph 6-7.

6-12. Receiver Electrical Tests, Preliminary Test Setup

NOTE

These preliminary test setup procedures are not applicable when testing modules 1A3, or 1A9. Refer to paragraphs 6-16 and 6-22, respectively.

a. Set the MODE switch to PWR OFF.

b. Set the POWER MODE switch to EXTERNAL.

c. Connect the applicable 115 vac or 230 vac power cable to the EXTERNAL POWER connector.

d. Connect the power cable connector to a 115 or 230-vac outlet, as appropriate.

WARNING

The 115-vac or 230-vac power to the receiver is lethal. This voltage is present at the input to transformer 1T1, which is not accessible unless the rear panel is removed. Do not remove the rear panel of the receiver during the electrical tests.

e. Set the OPR VOLT SIGNAL LEVEL and the EXT-PWR LT/BAT LT switches to OFF.

6-13. Receiver R-1444/UR (Unit 1) Testing

a. IF Output Test.

(1) Accomplish the preliminary test setup (para 6-12).

(2) Connect the test equipment as shown in figure 6-2.

(3) Set the receiver controls as follows:

Control	*Setting*
MODE	AM
TUNE/SCAN	TUNE
BANDWIDTH kHz	4.0
MHZ and TUNING	1.9125 MHz
OPR VOLT/SIGNAL LEVEL	SIGNAL LEVEL
RF GAIN	AGC
AF GAIN	fully clockwise
WHIP/50 Ω ANT	50 Ω ANT

(4) Apply power to the signal generator.

(5) Set the signal generator for an output of 1.9125 MHz at 1.0 microvolts.

(6) Vary the generator frequency to produce a peak reading on the electronic voltmeter. The

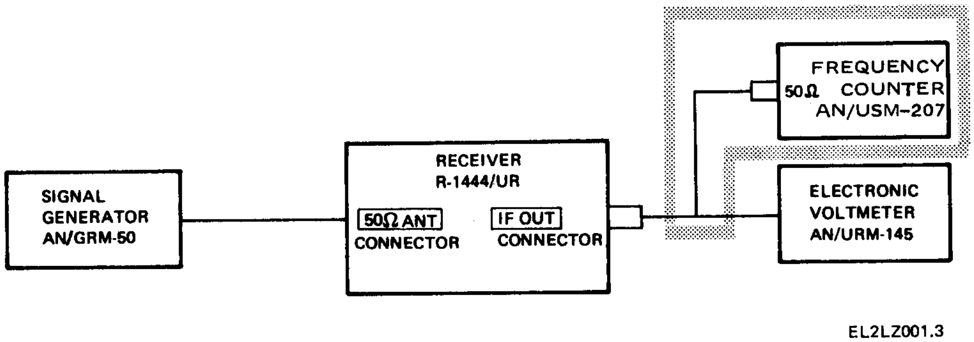


Figure 6-2. IF output test connections.

voltmeter should indicate at least 110 millivolts.

(7) Disconnect the test setup.

b. Audio and Recorder Output Test.

(1) Set the receiver controls per step a. (3) above, except set the receiver MHz and TUNING controls for a frequency of 10.1000 MHz.

(2) Connect the test equipment as shown in figure 6-3.

(3) Set the signal generator for a frequency of 10.1000 MHz with 1000 Hz, 30% amplitude modulation, with an output level of 1 microvolt. Vary the generator frequency to produce 455.000 kHz IF output.

(4) Measure the output at the receiver front panel AUDIO connector, then at the rear panel AUDIO connector using the voltmeter. The output at both points should be 2.45 vrms minimum.

(5) Set signal generator to 2.5 µv output and modulation level to 50%.

(6) Measure the output at the rear panel RECORD connector. This level should be 3.0 vrms minimum.

(7) Disconnect the test setup.

c. Agc Test.

(1) Set the receiver controls per step *a.* (3) above, except for the following controls:

Control	*Setting*
MODE	USB
MHz and TUNING	15.9125
RF GAIN	AGC

(2) Connect the test equipment as shown in figure 6-3.

(3) Set the signal generator for an output of 15.9125 MHz at 0.25 microvolts. Move the generator frequency to produce a peak reading on the voltmeter ME-30E/U. Counter should read 454.0 kHz.

(4) Adjust the receiver AF GAIN control to produce output of 2.45 vrms indication on the voltmeter ME-30E/U.

(5) Change the signal generator output to 300 mv. The voltmeter should indicate less than 4.90 vrms minimum.

(6) Disconnect the test setup.

d. Diode Output Test.

(1) Set the receiver controls per step *a* (3) above, except set the RF GAIN control to midrange.

(2) Connect the test equipment as shown in figure 6-4.

(3) Set the signal generator for a frequency of 10.1000 MHz with an output level of 1.0 microvolts (no modulation).

(4) Measure the output at the rear panel DIODE connector with the multimeter TS-352 B/U. The level at this point should be between -1.0 and -3.0 vdc.

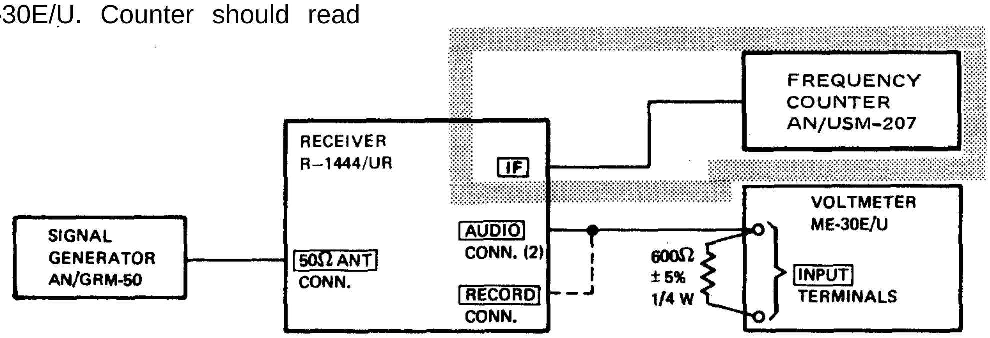
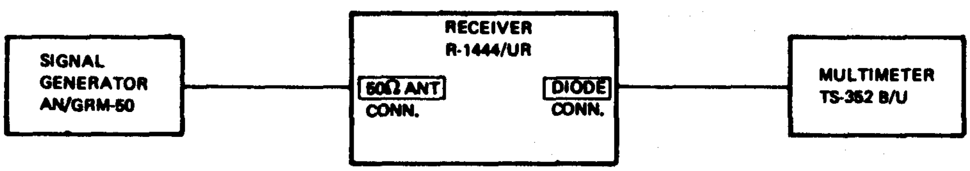


Figure 6-3. Audio and recorder output and agc test connections. EL2LZ005



EL5820-771-14-TM-106

Figure 6-4. Diode output test connections.

(5) Disconnect the test setup.

e. Sensitivity Measurement. Overall receiver sensitivity cannot be measured at the direct support level, since the test equipment required is not normally available at this maintenance level. Refer to paragraphs 6-13a and 6-21 for approximate sensitivity checks. If poor receiver sensitivity cannot be corrected by these measures, return the receiver to depot maintenance.

6-14. Receiver Control 1A1 Testing

a. Remove the front end assembly from the receiver as described in paragraph 6-6c.

b. Make the continuity and resistance checks in table 6-2 as follows:

(1) Set Multimeter TS-352 B/U to measure resistance (RX1 or RX100 scale as required by the measurement being made).

(2) Connect the multimeter leads as listed in table 6-2 (FO-15, sheet 1).

(3) Set the receiver controls as specified in table 6-2.

c. Use extender cables to connect the front end assembly to the receiver housing.

d. Set the MODE switch to CW/FSK.

e. Apply power to the differential voltmeter AN/USM-98 and allow 15 minutes warmup.

Table 6-2. 1A1 General Continuity and Resistance Checks

Multimeter +lead	Multimeter -lead	Reading (OHMS)	Control settings
a. General Wiring 1A1.			
J3 pin 1	P2 pin 69	0	Any
Gnd	J4-J	0	Any
Gnd	P2-1O	0	Any
Gnd	P2-11	Infinity	Any
Gnd	P2-14	0	Any
Gnd	P2-16	0	Any
Gnd	P2-18	0	Any
Gnd	P2-20	0	Any
Gnd	P2-26	0	Any
Gnd	P2-38	0	Any
Gnd	P2-33	0	Any
Gnd	P2-55	0	Any
J4-H	P2-7	0	Any
J4-D	P2-11	0	Any
J4-C	P2-9	0	Any
J4-B	P2-37	0	Any
P3-A8	P5	0	Any
P3-A4 shield	P5 shield	0	Any
P3-A7 shield	P4	0	Any
P3-A7	P4 shield	0	Any
P3-A5	P6	0	Any
P3-A5 shield	P6 shield	0	Any
P3-A4	P7	0	Any
P3-A4 shield	P7 shield	0	Any
P3 -A3	P8	0	Any
P3-A3 shield	P8 shield	0	Any

Table 6-2. 1A1 (General Continuity and Resistance Checks –Continued

Multimeter +lead	Multimeter -lead	Reading (OHMS)	Control settings
b. *WHIP/50 Ω ANT Switch.*			
P3-A2	Gnd	0	ANT switch to WHIP
P3-A1	P1	0	ANT switch to WHIP
J1 (WHIP)	P1	0	ANT switch to WHIP
J2 (50Ω ANT)	P1	0	ANT switch to 50 Ω
P3-A2	P1	0	ANT switch to 50Ω
P3-A1	Gnd	0	ANT switch to 50 Ω
P3-A2 shield	Gnd	0	
P3-A1 shield	Gnd	0	

c. EXT-PWR LT/ BAT LT Switch (S2).

Multimeter +lead	Multimeter –lead	Reading (OHMS)	Control settings
Gnd	P2-65	Infinity	S2 to OFF
Gnd	P2-65	55 ohms ± 10%	S2 to EXT-PWR
Gnd	P2-15	55 ohms ± 10%	S2 to BAT LT
Gnd	P2-15	Infinity	S2 to OFF

d. OPR VOLT/SIGNAL LEVEL Switch (S3).

Multimeter +lead	Multimeter -lead	Reading (OHMS)	Control settings
P2-75 (RX10K)	Gnd	Infinity	S3 to OFF
P2-75 (RX10K)	Gnd	12 kilohms ± 10%	S3 to SIGNAL LEVEL
P2-75	J4-B	7 kilohms ± 10%	S3 to SIGNAL LEVEL
Gnd	J4-B	10 kilohms ± 10%	S3 to SIGNAL LEVEL
Gnd	P2-75	Infinity	S3 to OPR VOLT
P2-15	Gnd	112 kilohms ± 10%	S3 to OPR VOLT
Gnd	J4-B	Infinity	S3 to OPR VOLT

e. MODE Switch (S5).

Multimeter +lead	Multimeter -lead	Reading (OHMS)	Control settings
P2-37	P2-56	0	S5 to CW
P2-37	P2-56	0	S5 to LSB
P2-37	P2-56	0	S5 to USB
P2-37	P2-58	0	S5 to AM
P2-37	P2-59	0	S5 to FM
P2-37	P2-33	0	S5 to LSB
P2-37	P2-34	0	S5 to USB
P2-17	P2-19	Infinity	S5 to PWR OFF
P2-17	P2-19	0	S5 to all remaining positions
P2-13	P2-15	Infinity	S5 to PWR OFF
P2-13	P2-15	0	S5 to all remaining positions

f. BANDWIDTH kHz Switch (S4) and MODE Switch (S5).

Multimeter +lead	Multimeter -lead	Reading (OHMS)	Control settings
P2-37	P2-30	0	S4 to 1 kHz S5 to CW, AM, FM
P2-37	P2-31	0	S4 to 4 kHz S5 to CW, AM, FM
P2-37	P2-32	0	S4 to 25 kHz S5 to CW, AM, FM
P2-37	P2-33	0	S5 to LSB
P2-37	P2-34	0	S5 to LSB

Table 6-2. 1A1 General Continuity and Resistance Checks
-Continued

g. RF GAIN Control (R1)

Multimeter +lead	*Multimeter -lead*	*Reading (OHMS)*	*Control settings*
P2-57	*P2-74*	Infinity	R1 to CW (AGC)
P2-57	*P2-74*	1.0 kilohm ± 10%	R1 to CCW
Gnd	*P2-74*	*0*	R1 to CCW

h. AF GAIN Control (R2).

Multimeter +lead	*Multimeter –lead*	*Reading (OHMS)*	*Control settings*
P2-76	Gnd	0	R2 to CCW
P2-76	P2-78	0	R2 to CW
Gnd	P2-78	2.5 kilohms ± 10%	R2 to CW

NOTE

Refer to figure FO-17 for locations of 1A1 terminals and connectors and to figure FO-19 for locations of 1A2 filters and connectors.

f. Connect the differential voltmeter negative AN/USM-98 lead to ground and the positive lead to 1A2FL4 (24). The voltmeter should indicate +50.00±.05 volt. If this voltage requires adjustment, refer to paragraph 6-22.

g. Connect the differential voltmeter negative lead to ground and the positive lead to 1A2FL5 (25).

h. Rotate the TUNING control so that a 5 is displayed in the 100 kHz dial position (first digit to the right of the decimal point).

i. Rotate the MHz control through each position from 00 to 29. Null the differential voltmeter at each position and measure the voltage. The results should agree with those listed in table 6-3.

j. Set the MHz control to 01 and set the TUNE/ SCAN control to SCAN.

k. Rotate the TUNING control through each 100 kHz position (first digit right of the decimal point) from 0 to 9. Null the differential voltmeter at each position and measure the voltage. The results should agree with those listed in table 6-4, test 1.

l. Move the differential voltmeter positive lead to 1A2FL14 (26).

m. Repeat step k, except that the results should agree with table 6-4b, test 2.

n. Set the MODE switch to PWR OFF.

o. Turn off the differential voltmeter and disconnect it from the receiver.

p. Connect a jumper between panel side of R6 and ground terminal WT7 (12) (fig. FO-17). Disconnect preselector connector 1A1P2 from the extender cable.

NOTE

Pin numbers are marked on 1A1P2 (13).

q. Connect the ohmmeter negative lead to ground and the positive lead to 1A1P2 (13), pins 64, 44, 45, 6 and 5, in turn. Each time the positive lead is connected to a new pin, rotate the MHz control through each position from 00 through 29. The ohmmeter should indicate 0 or 2.7 kilohms as shown in table 6-5.

r. Disconnect the jumper from 1A1WT6 (11) and ground.

Table 6-3. 1A1 MHz Switch Voltage Checks

MHz dial	*Reading (volts)*	*Upper limit*	Lower *limit*
00	46.860	*46.910*	46.810
01	44.500	*44.550*	42.230
02	42.280	*42.330*	44.450
03	40.180	40.230	40.130
04	38.190	38.240	38.140
05	36.310	36.360	36.260
06	34.530	34.580	34.480
07	32.840	32.890	32.790
08	31.230	31.280	31.180
09	29.700	29.750	29.650
10	28.240	28.290	29.190
11	26.840	26.890	26.790
12	25.520	26.570	25.470
13	24.260	24.310	24.210
14	23.050	23.100	23.000
15	21.900	21.950	21.850
16	20.790	20.840	20.740
17	19.730	19.780	19.680
18	18.720	18.770	18.670
19	17.760	17.810	17.710
20	16.850	16.900	16.800
21	15.970	16.030	16.930
22	15.140	15.190	15.090
23	14.350	14.400	14.300
24	13.590	13.640	13.540
25	12.860	12.910	12.810
26	12.170	12.220	12.120
27	11.510	11.560	11.460
28	10.870	10.920	10.820
29	10.260	10.310	10.210

Table 6-4. 1A1 100-kHz Switch Voltage Checks

100-kHz dial	*Reading (volts)*	*Upper limit*	*Lower limit*
a. Test 1.			
0	46.821	46.9355	46.7065
1	46.283	46.3960	45.1700
3	46.017	45.1295	44.9045
4	44.757	44.8689	44.6451
5	44.500	44.3556	44.1344
7	43.994	44.1040	43.8800
8	43.744	43.8534	43.6346
9	43.497	43.6057	43.3883
b. Test 2.			
0	48.187	48.427	47.947
1	32.829	32.993	32.665
3	27.339	27.476	27.187
4	22.921	23.036	22.787
5	19.295	19.391	19.195
6	16.299	16.380	16.218
7	13.885	13.954	13.816
8	11.791	11.840	11.732
9	10.018	10.068	9.968

Table 6-5. 1A1 MHz Preset Check

NOTE

A short circuit (less than 10 ohms) is indicated by a 0 in the table,

MHz dial	64	44	45	6	5
00	0	2.7K	0	2.7K	0
01	0	2.7K	0	2.7K	2.7K
02	0	2.7K	2.7K	0	2.7K
03	0	2.7K	2.7K	0	0
04	0	2.7K	2.7K	2.7K	0
05	0	2.7K	2.7K	2.7K	2.7K
06	0	0	0	0	2.7K
07	0	0	0	0	0
08	0	0	0	2.7K	0
09	0	0	0	2.7K	2.7K
10	0	0	2.7K	0	2.7K
11	0	0	2.7K	0	0
12	0	0	2.7K	2.7K	0
13	0	0	2.7K	2.7K	2.7K
14	2.7K	0	0	0	2.7K
15	2.7K	0	0	0	0
16	2.7K	0	0	2.7K	0
17	2.7K	0	0	2.7K	2.7K
18	2.7K	0	2.7K	0	2.7K
19	2.7K	0	2.7K	0	0
20	2.7K	0	2.7K	2.7K	0
21	2.7K	0	2.7K	2.7K	2.7K
22	2.7K	2.7K	0	0	2.7K
23	2.7K	2.7K	0	0	0
24	2.7K	2.7K	0	2.7K	0
25	2.7K	2.7K	0	2.7K	2.7K
26	2.7K	2.7K	2.7K	0	2.7K
27	2.7K	2.7K	2.7K	0	0
28	2.7K	2.7K	2.7K	2.7K	0
29	2.7K	2.7K	2.7K	2.7K	2.7K

s. Connect the ohm meter negative lead to ground and the positive lead to 1A1P2 (13), pins 4, 24. 43, **and** 63, in turn. Each time the positive lead is connected to a new pin, rotate the TUNING control so that the 100 kHz dial varies from 0 to 9 in one-digit increments. The ohm meter should indicate an open or short for each dial position **as shown in table** 6-6.

t. Connect the ohmmeter positive lead to lA1P2 (13), pins 3, 23, 42, and 62, in turn. Each time the positive lead is connected to a new pin, rotate the TUNING control so that the 10 kHz dial (second digit right of the decimal point) varies from 0 to 9 in one-digit increments. The ohm meter should **indicate an** open or short for each dial position as shown in table 6-7.

u. Set the TUNE/SCAN control to TUNE.

v. Connect the ohmmeter positive lead to 1A1P2 (13), pins 2, 22, 41, and 61, in turn. Each time the positive lead is connected to a new pin, rotate the TUNING control so that the 1 kHz dial (third digit right of the decimal point) varies from 0 to 9 in one-digit increments. The ohmmeter should indicate an open or short for each dial position as shown in table 6-8.

w. Connect the ohmmeter positive lead to 1A1P2 (13), pins 1, 21, 40 and 60, in turn. Each time the positive lead is connected to a new pin, rotate the TUNING dial so that the 100 Hz dial (last digit on the right) varies from 0 to 9 in one-digit increments. The ohmmeter should indicate an open or short for each dial position as shown in table 6-9.

x. Reinstall the front end assembly in the receiver (para 6-9).

Table 6-6. 1A1 100-kHz Preset Check

NOTE

A short circuit *(less than 10 ohms) is* indicated by a () in the table. An open circuit (infinite resistance) is indicated by a dash line (-).

100 *kHz* *dial*	*1A1P2 Pin No.* 4	24	43	63
0	-	-	-	-
1	-	-	()	-
2	-	()		-
3	-	()	()	-
4	()			-
5	()		()	-
6	()	()		-
7	()	()	()	-
8	-	-		()
9	-	-	()	()

Table 6-7. 1A1 10-kHz Preset Check

NOTE

A short circuit (less than 10 ohms) is indicated by a () in the table. An open circuit (infinite resistance) is indicated by a dash line (-).

10 kHz *dial*	*1A1P2 Pin No.* 3	23	42	62
0	-	-	-	-
1	-	-	()	-
2	-	()	-	-
3	-	()	()	-
4	()	-	-	-
5	()	-	()	-
6	()	()	-	-
7	()	()	()	-
8	-	-	-	()
9	-	-	()	()

Table 6-8. 1A1 1-kHz Preset Check

NOTE

A short circuit (less than 10 ohms) is indicated by a () in the table. An open circuit (infinite resistance) is indicated by a dash line (-).

1 kHz *dial*	*1A1P2 Pin No.* 2	22	41	61
0	-	-	-	
1	-	-	()	-
2	-	()	-	-
3	-	()	()	-
4	()	-	-	-
5	()	-	()	-
6	()	()	-	-
7	()	()	()	-
8	-	-	-	()
9	-	-	()	()

Table 6-9. 1A1 100-Hz Preset Check

NOTE

A short circuit (less than 10 ohms) is indicated by a () in the table. An open circuit (infinite resistance) is indicated by a dash line (-).

100-Hz *dial*	*1A1P2 Pin No.* 1	21	40	60
0	-	-		-
1	-	-	()	-
2	-	()		-
3	-	()	()	-
4	()	-		-
5	()	-	()	-
6	()	()		-
7	()	()	()	-
8	-	-		()
9	-	-	()	()

6-15. Preselector 1A2 Testing

a. DC Voltage Test.

(1) Remove the front end assembly from the receiver (para 6-6c). Use extender cables to connect the front end assembly to the receiver housing (1A1P3/1J2 and 1A1P2/1J1. Remove the receiver bottom cover (para 6-6a).

NOTE

See figure FO-19 for 1A2 filter locations.

(2) Accomplish the preliminary test setup (para 6-12).

(3) Set the receiver MODE switch to AM.

(4) Use the multimeter to measure between the following indicated preselector filter 1A2FL No. and chassis ground:

1A2FL No.	*Voltage*
1 (27)	+5 ±0.1 vdc
10 (28)	-5 ±0.l vdc
9 (29).....	+9 ±0.4 vdc
13 (30)	+50 ± 0.05 vdc

NOTE

If the +50 vdc input requires adjustment, refer to paragraph 6-22.

b. Tuning Voltage and Control Line Voltage Tests.

NOTE

See figure FO-19 for 1A2 filter locations Terminal numbers are marked on the parent board (part of 1MP1).

(1) Use the differential voltmeter and measure the tuning voltage at 1A2FL5 (25) and 1A2FL14

(26). Both points should be between +9 to +50 vdc. The voltage at 1A2FL5 should vary as the MHz control is changed. The voltage at 1A2FL14 should vary as the TUNING control is changed.

(2) Measure the control line voltage on the parent board at (FO-25) terminals E29 and E19. This reading should be between -3 and +7 vdc.

c. Rf Input and IF Output Test. Refer to paragraph 6-21 *a* through *h.* Additionally, repeat step *h* with the signal generator and receiver dials set to 29.9999MHz.

6-16. Deleted

6-17. High-Frequency Divider 1A4 Testing

a. Accomplish the preliminary test setup (para 6-12).

b. Set the MODE switch to AM.

NOTE

The following measurements are made at the connector pins on J5 of parent board assembly 1TB2 (fig. FO-25). Place the receiver with the bottom up to gain access to these points. FO-25 shows the pin number locations from the top of the receiver. The pin order is reversed when viewed from the bottom.

c. Use a voltmeter to measure the input power to 1A4 as follows:

J5 pin No.	*Voltage*
7 and 8	-5 vdc
30	+5 vdc
1	+9 vdc

d. Set the receiver MHz control to each of the following positions. For each setting, verify that the proper voltage is present on J5 pins 45, 47, 49, 51, and 53. (This check verifies that the proper MHz preset data is being received by 1A4.)

NOTE

In the following chart, a 0 indicates a grounded input and a 1 indicates a positive voltage (2.0 vdc minimum).

MHz	*J5 pin No.*				
control	*45*	*47*	*49*	*51*	*53*
00	1	1	0	0	0
15	0	0	0	0	1
29	1	1	1	1	1

e. Use an oscilloscope to verify the presence of the 1.0 MHz reference signal input at J5 pin 35. The level at this point should be 3.5 volts peak-to-peak (squarewave).

f. Use an oscilloscope to verify the presence of the 7 to 36 MHz input at J5 pin 56.

g. Use the voltmeter to observe the control line output on terminal E19 (fig. FO-25). This signal should be a well-filtered dc voltage at a level between -3 and +7 volts. A sawtooth at this point indicates that the high-frequency servo loop is out of lock.

h. Vary the MHz and TUNING controls and verify that the control line voltage changes.

i. Disconnect the test equipment from the receiver and set the MODE switch to PWR OFF.

6-18. Low-Frequency Divider 1A5 Testing

a. Accomplish the preliminary test setup (para 6-12).

NOTE

The following measurements are made at the connector pine on J6 of parent board assembly 1TB2 (fig, FO-25). Place the receiver with the bottom up to gain access to these points. The pin number locations are marked on the parent board.

b. Set the MODE switch to AM.

c. Measure the +5 vdc input at J6 pin 1 with a voltmeter.

d. Use an oscilloscope to measure the RF input signal at J6 pin 5. The level should be at least 25 millivolts rms (70 millivolts peak-to-peak).

e. Use an oscilloscope to measure the 100 Hz output at J6 pin 33. The level should be approximately 5 volts peak-to-peak (squarewave).

f. Perform step *g* of paragraph 6-17.

NOTE

The following step verifies that the frequency preset inputs (from 1A1 are present at 1A5.

g. Set the receiver MHz and TUNING controls for each frequency listed in table 6-10 and verify that the voltages shown are present at the 1A5 inputs.

h. Disconnect the test equipment from the receiver and set the MODE switch to PWR OFF.

6-19. RF Oscillator 1A6 Testing

a. Accomplish the preliminary test setup (para 6-12).

b. Set the MODE switch to AM.

NOTE

The following measurements are made at the connector pins on J7 of the parent board assembly 1TB2 (fig. FO-25). Place the receiver with the bottom up to gain access to these points. The pin number locations are marked on the parent board.

Table 6-10. 1A5 Preset Input Checks

NOTE

A 0 indicates a grounded input and a 1 indicates a positive voltage (2.4 vdc nominal).

Frequency	*J6 Pin No.*															
(MHz)	*32*	*12*	*31*	*30*	*29*	*9*	*13*	*11*	*10*	*25*	*27*	*28*	*23*	*26*	*4*	*24*
01.0000	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
01.1111	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1
01.2222	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1
01.3333	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
01.4444	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1
01.5555	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
01.6666	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1
01.7777	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1
01.8888	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0
01.9999	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0

c. Use a voltmeter to measure the input power to 1A6 as follows:

J7 pin No.	*Voltage*
15 and 35	-5 vdc
1 and 21	+5 vdc
2 and 22	+9 vdc

d. Use an oscilloscope to measure the 100 Hz input at J7 pins 3 and 23. The level at this point should be 5 volts peak-to-peak (squarewave).

e. Use an oscilloscope to measure the 1.0 MHz output at. J7 pins 11 and 31. The level at this point should be 3.5 volts peak-to-peak (squarewave).

f. Use an oscilloscope to observe the if control output at J7 pins 20 and 40. This signal should be a dc voltage between -3 and +7 volts. A sawtooth at this point indicates that the low frequency servo loop is out of lock.

g. Disconnect the test equipment from the receiver and set the MODE switch to PWR OFF.

6-20. Demodulator/Audio Assembly 1A7 Testing

a. Accomplish the preliminary test setup (para 6-12).

b. Set the MODE switch to CW/FSK.

NOTE

The following measurements are made at the connector pins on J8 of parent board assembly 1TB2 (fig. FO-25). Place the receiver with the bottom up to gain access to these points. The pin number locations are marked on the parent board.

c. Use a voltmeter to measure the input power to 1A7 as follows:

J8 pin No.	*Voltage*
11, 14, and 31	-5 vdc
32	+5 vdc
10 and 30	+9 vdc

d. Set the MODE switch to each position listed below and use a voltmeter to verify that the -5 vdc mode control signal is present at the applicable J8 pin.

Mode	*J8 pin No.*
CW/FSK	12
LSB	12
USB	12
AM	20
FM	13

e. Set the receiver controls as follows:

Control	*Setting*
MODE	AM
TUNE/SCAN	TUNE
BANDWIDTH kHz	4.0
MHz and TUNING	10.1000 MHz
ORP VOLT/SIGNAL LEVEL	SIGNAL LEVEL
RF GAIN	AGC
AF GAIN	Fully clockise
WHIP/50 Ω ANT	50 Ω ANT

f. Set the signal generator for a frequency of 10.1000 MHz with 1000 Hz, 30% amplitude modulation and a level of 100 microvolt. Connect the signal generator to the 50 Ω ANT connector.

g. Use the AN/URM-145 electronic voltmeter to measure the if input signal level at J8 pin 15. This should be a 455 kHz signal with a level of 20 millivolts minimum.

h. Use an oscilloscope to measure the audio output level at terminal E-32 (fig. FO-25). A level of 2.45 vrms minimum (6.93 volts peak-to-peak) should be obtained.

i. Use an oscilloscope to measure the recorder output level at 1MP1-E30 or at the RECORD connector. A level of at least 3 vrms (8.48 volts peak-to-peak) should be obtained.

j. Disconnect the test equipment from the receiver and the MODE switch to PWR OFF.

6-21. IF Amplifier 1A8 Testing

a. Accomplish the preliminary test setup (para 6-12).

b. Set the MODE switch to CW/FSK.

NOTE

The following measurements are made at the connector pins on J9 of parent board assembly 1TB2 (fig. FO-25). Place the receiver with the bottom up to gain access to these points. The pin number locations are marked on the parent board.

c. Use a voltmeter to measure the input power to 1A8 as follows:

J9 pin No.	*Voltage*
26 and 57	+5 vdc
17 and 47	-5 vdc
13 and 43	+9 vdc

d. Connect the signal generator to the front panel 50 Ω ANT connector.

e. Set the signal generator for an output of 0.5 MHz at 100 microvolt.

f. Set the receiver dials to 0.5000 MHz.

g. Connect the AN/URM-145 electronic voltmeter to 1MP1-E54.

h. Vary the signal generator frequency to produce a peak reading on the voltmeter. A level of at least 10 millivolts should be obtained.

i. Use the voltmeter to measure the 455 kHz if signal at J9 pin 19. A minimum indication of 10 millivolts should be obtained at each point.

j. Use the voltmeter to measure the if output at terminal E39 or at the rear panel IF OUT connector. A level of 110 millivolts minimum should be present at this point.

k. Set the RF GAIN control to AGC (fully clockwise).

l. Set the BANDWIDTH kHz switch to each of the following positions. For each setting, verify that the proper voltage is present on the J9 pins listed.

BANDWIDTH	*J9 pins*		
KHz Switch	*7 and 37*	*9 and 39*	*11 and 41*
1.0	0v	0v	–5 v
4.0	0v	-5 v	0v
25	–5v	0v	0v

m. Set the MODE switch to each of the following positions. For each setting, verify that the proper voltage is present on the J9 pins listed.

MODE	*J9 Pins*	
switch	*9 and 33*	*5 and 35*
LSB	0v	–5v
USB	5v	0v
AM	0v	0v

n. Use a multimeter to measure the tuner agc voltage on J9 pins 21, 20, and 50. This should be a 0 to -4 vdc signal.

o. Use a multimeter to measure the diode output signal level at J9 pins 27, 28, and 58. This should be a 0 to -3 vdc signal.

p. Disconnect the test equipment from the receiver and set the MODE switch to PWR OFF.

6-22. Power Supply 1A9 Testing

a. Accomplish the preliminary test setup paragraph 6-12.

b. Set the MODE switch to AM.

NOTE

See figure FO-15 for location of terminals called out in steps *c* and *d*.

c. Use a differential voltmeter (AN/USM-98) to measure the input power to 1A9 as follows:

1A9 terminal (view B)	*Voltage*
E5.	+10 to +15 vdc
E6	+20 to +32 vdc

d. Measure the output voltages from 1A9 as follows:

1A9 terminal (View B)	*Voltage*
E3	+5±0.25 vdc
E4	+9±0.50 vdc
E9	-5±0.25 vdc
E1	+50±0.05 vdc

e. If the +50 vdc output requires adjustment, insert a small screwdriver through the hole in the top of the power supply (fig. FO-15) and adjust the potentiometer.

f. Disconnect the test equipment from the receiver and set the MODE switch to PWR OFF.

6-23. Receiver Housing 1MP1 Testing

NOTE

The preliminary test setup (para 6-12) is not accomplished prior to testing 1MP1. The following measurements are made at the connector pins of J1 through J9 on parent board assembly 1TB2 (fig. FO-25) and on power supply 1A9 (fig. FO-15). The pin number locations are marked on the parent board and on 1A9.

a. Make certain that the receiver is disconnected from external power and that the batteries are removed.

b. Remove the top (fig. FO-15) (3) and bottom covers (4) from the receiver (25) (para *6-6a).*

c. Remove the front end assembly (13) from the receiver (para *6-6c).*

d. Set the POWER MODE switch to EXTERNAL.

e. Measure the resistance between J1-13 and 1A9-E7 (fig. FO-16). A reading of 0 ohms is normal.

f. Set POWER MODE switch to BATTERY.

g. Make the continuity and resistance checks listed in table 6-11.

k Disconnect the test equipment.

i. Reinstall the front end assembly and covers on the receiver (para 6-9).

Table 6-11. Receiver Housing Assembly 1MP1 Continuity and Resistance Checks

Multimeter		*Reading*	*Multimeter*		*Reading*
+ lead	*− lead*	*(ohms)*	*+ lead*	*− lead*	*(ohms)*
J1-1	J6-4	0	J1-39	J6-1	0
J1-2	J6-27	0	J1-39	J7-1	0
J1-3	J6-13	0	J1-39	J7-21	0
J1-4	J6-31	0	J1-39	J8-32	0
J1-5	J5-51	0	J1-39	J9-26	0
J1-6	J5-45	0	J1-39	J9-57	0
J1-7	J9-20	0	J1-39	A9-E3	0
J1-7	J9-21	0	J1-40	J6-23	0
J1-7	J9-50	0	J1-41	J6-10	0
J1-9	J5-1	0	J1-42	J6-29	0
J1-9	J7-2	0	J1-43	J6-32	0
J1-9	J7-22	0	J1-44	J5-47	0
J1-9	J8-10	0	J1-45	J5-49	0
J1-9	J9-13	0	J1-55	GND	0
J1-9	J9-43	0	J1-56	J8-12	10-20
J1-9	A9-E4	0	J1-74	J9-23	0
J-10	GND	0	J1-74	J9-53	0
J1-11	J1-25	0	J1-58	J8-20	10-20
J1-11	A9-E1	0	J1-59	J8-13	10-20
J1-12	GND	0	J1-60	J6-24	0
J1-13	WT-3	0			
J1-14	GND	0	J1-61	J6-28	0
J1-15	A9-E5	0	J1-62	J6-11	0
J1-16	GND	0	J1-63	J6-30	0
J1-18	GND	0	J1-64	J5-53	0
J1-19	A9-E6	0	J1-65	A9-E6	170-190
J1-20	GND	0	J1-69	J8-26	0
J1-21	J6-26	0	J1-69	J10-Center	0
J1-22	J6-25	0	J1-57	J9-25	0
J1-23	J6-9	0	J1-57	J9-55	0
J1-24	J6-12	0	J1-57	J9-56	0
J1-26	GND	0	J1-75	J9-22	0
J1-30	J9-11	0	J1-75	J9-52	0
J1-30	J9-41	0	J1-76	J8-1	0
J1-31	J9-9	0	J1-77	J9-24	0
J1-31	J9-39	0	J1-77	J9-54	0
J1-32	J9-7	0	J1-78	J8-5	0
J1-32	J9-37	0	J2-A1	J11	0
J1-32	J9-5	0	J2-A2	J12	0
J1-33	J9-35	0	J2-A3	J6-5	0
J1-34	J9-3	0	J2-A4	J7-20	0
J1-34	J9-33	0	J2-A4	J7-40	0
J1-36	GND	0	J2-A5	J6-19	0
J1-37	J5-7	0	J2-A7	J9-1	0
J1-37	J5-8	0	J2-A8	J5-58	0
J1-37	J7-15	0	J5-11	GND	0
J1-37	J7-35	0	J5-12	J6-15	0
J1-37	J8-11	0	J5-12	J6-35	0
J1-37	J8-14	0	J5-13	GND	0
J1-37	J8-31	0	J5-35	J7-11	0
J1-37	J9-17	0	J5-35	J7-31	0
J1-37	J9-47	0	J5-41	GND	0
J1-37	A9-E9	0	J5-43	GND	0
J1-38	GND	0	J6-2	GND	0
J1-39	J5-30	0	J6-6	GND	0

Table 6-11. Receiver Housing Assembly 1MP1 Continuity and Resistance Checks-Continued

Multimeter		*Reading*	*Multimeter*		*Reading*	*Multimeter*		*Reading*	*Multimeter*		*Reading*
+lead	*−lead*	*(ohms)*	*+lead*	*−lead*	*(ohms)*	*+lead*	*−lead*	*(ohms)*	*+lead*	*−lead*	*(ohms)*
J6-7	GND	0	J7-19	GND	0	J8-40	GND	0	E31	GND	0
J6-8	GND	0	J7-24	GND	0	J9-27	J14	0	E33	GND	0
J6-14	J7-3	0	J7-30	GND	0	J9-28	J14	0	E40	GND	0
J6-14	J7-23	0	J7-32	GND	0	J9-30	J13	0	E42	GND	0
J6-17	J2-A5 GND	0	J7-39	GND	0	J9-31	E53	0	E61	GND	0
J6-18	J2-A5 GND	0	J8-15	J9-19	0	J9-44	GND	0	E62	GND	0
J6-21	GND	0	J8-15	J9-49	0	J9-45	GND	0	E63	GND	0
J6-22	GND	0	J8-27	J15	0	J9-46	GND	0	J16-A	J1-17	7K
J6-33	J7-3	0	J8-33	GND	0	J9-58	J14	0	J16-B	GND	0
J6-33	J7-23	0	J8-34	GND	0	J9-59	E40	0	J16-D	J16-E	190-210
J6-37	J2-A5 GND	0	J8-35	GND	0	J9-60	E40	0	J16-D	J16-F	325-375
J6-38	J2-A5 GND	0	J8-36	GND	0	E1	GND	0	J16-F	J16-E	450-550
J7-4	GND	0	J8-37	GND	0	E18	J6-17	0	TB1-5	GND	>7K
J7-10	GND	0	J8-38	GND	0	E25	GND	0	TB1-2	GND	>7K
J7-12	GND	0	J8-39	GND	0	E28	GND	0	WT2	GND	0

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CHAPTER 7

GENERAL SUPPORT MAINTENANCE

Section I. GENERAL

7-1. Scope, of Maintenance

This chapter describes general support maintenance requirements for Receiving Set Radio AN/URR-69. These requirements include subassembly troubleshooting, inspection, repair, testing, adjustment, and alignment.

7.2. Tools and Test Equipment Required

All tools and test equipment required for general support maintenance are listed in the Maintenance Allocation Chart (app C).

Section II. TROUBLESHOOTING

7-3. General

This section contains procedures for isolating and localizing faulty circuits or components within the various subassemblies. These procedures are normally accomplished in conjunct ion with subassembly testing as described in section IV of this chapter, or in chapter 6.

7-4. Troubleshooting Charts

Troubleshooting of the subassemblies (para 1-10) is accomplished by systematically testing the subassembly inputs and outputs and by making other measurements at available test points. Tables 7-1 through 7-19 contain the subassembly troubleshooting procedures as follows:

Subassembly	*Troubleshooting table*
1A1A1	7-1
1A1A2	7-2
1A2	7-3
1A2A1	7-4
1A2A2	7-5
1A2A3	7-6
1A2A4	7-7
1A2A5	7-8
1A2A6	7-9
1A2A7	7-10
1A2A8	7-11
1A2A9	7-12
1A3	7-13
1A4	7-14
1A5	7-15
1A6	7-16
1A7	7-17
1A8	7-18
1A9	7-19

Table 7-1. Rotary Switch 1A1A1 Troubleshooting

Item of Check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Switch voltages	Per paragraph 7-12*a*.	Per table 7-23.	(Use Figs. 7-12A and FO-7)
Switch continuity	Per paragraph 7-12*b*.	Continuity with no intermittent contacts.	(Use Figs. 7-12B and FO-7)

Table 7-2. Receiver Control 1A1A2 Troubleshooting

Item of Check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Mechanical functioning	Per paragraph 7-13*a*.	Torque: MHz shaft: 5 to 9 oz. in. kHz shaft (tune mode): 3 to 7 oz. in. kHz shaft (scan mode): 3 to 7 oz. in. Stops: 00 to 29 MHz. Dial operation: adjacent dials change in unison when a 0 appears on the right hand dial. Backlash (maximum): Dials 1 and 2: 4.9°. Dials 2 through 6: 1.5°. Misalignment: Per figure 7-13.	Perform the inspection procedures of paragraph 7-7.
Electrical functioning	Per paragraph 7-13*b*.	Per tables 7-24 and 7-25.	Electrical tests use Fig. 7-13A and C; Fig. FO-7.

Table 7-3. Preselector 1A2 Troubleshooting

NOTE

For 1A2 circuit details refer to paragraph 5-3, figures FO-1, and FO-16, sheet 2. Refer to figure FO-19 for parts locations. When a faulty subassembly of 1A2 has been located, proceed to the troubleshooting chart for the faulty module (tables 7-4 through 7-12).

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Bandswitches and filters	Per paragraph 7-14*b*.	Per table 7-26.	Test 1A2A4, 1A2A6, and 1A2A9 per paragraphs 7-18, 7-20, and 7-23, respectively.
160-MHz oscillator	Per paragraph 7-14*c*.	Frequency: 160.0 MHz −2, +3 kHz. Level: 0.016 vrms minimum.	Test 1A2A2 per paragraph 7-16.
High-frequency vfo	Per paragraph 7-14*d*.	Tuning voltage and frequency: Voltage Frequency 10.260 v 130.045 MHz ± 40 kHz 21.900 v 144.045 MHz ± 150 kHz 46.860 v 159.045 MHz ± 60 kHz Level: 190 millivolts (minimum).	Test 1A2A1 per paragraph 7-15.
Low-frequency vfo	Per paragraph 7-14*e*.	Tuning voltage and frequency: Voltage Frequency 10.00 v 5.595 MHz ± 10 kHz 27.38 v 6.195 MHz ± 10 kHz 6.495 MHz ± 10 kHz	Test 1A2A5 per paragraph 7-19.
Combined functions of 1A2A1, 1A2A2, 1A2A3, 1A2A5, and 1A3.	Per paragraph 7-14*f*.	High loop mixer level: 40 millivolts minimum.	Test 1A2A1, 1A2A2, 1A2A3, 1A2A5, and 1A3 per paragraphs 7-15, 7-16, 7-17, 7-19, and 7-24, respectively.
Tracking, gain, and sensitivity	Per paragraph 7-14*g*.	Tracking: 1A2A7C6 requires less than ¼ turn for peaking at 500 kHz and 29 MHz. Gain and sensitivity: per table 7-27.	Test 1A2A7 and 1A2A8 per paragraphs 7-21 and 7-22, respectively.
Preselector agc characteristics	Per paragraph 7-14*h*.	500 kHz agc characteristics: Level TAGC voltage +10 db −2.22 to −2.37 volts +40 db −1.74 to −1.95 volts 29.5 MHz agc characteristics: Level TAGC voltage +10 db −2.20 to −2.35 volts +40 db −1.73 to −1.95 volts	Test 1A2A7 and 1A2A8 per paragraphs 7-21 and 7-22, respectively.

Table 7-4. RF 1A2A1 Troubleshooting

NOTE

For 1A2A1 circuit details, refer to figure FO-2 and paragraph 5-4. Refer to figure 7-2 for parts locations.

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Output frequency versus tuning voltage input	Per paragraph 7-15c.	Per table 7-28.	*a.* Oscillator misaligned (para 7-15*b*.) *b.* Defective component in oscillator.
Control loop sensitivity	Per paragraph 7-15*d*.	Tuning voltage at +46.86 vdc: frequency variable between 1.1 and 1.4 MHz when the control line voltage is varied from −3 to +7 volts. Tuning voltage at +10.26 vdc: frequency variable between 600 and 900 kHz when the control line voltage is varied from −3 to +7 volts.	*a.* CR1 has no input voltage. *b.* CR1, C1 or C2 defective.
Output levels	Per paragraph 7-15*e*.	Per table 7-29.	*a.* If E1 is correct and E7 is not correct, Q3/Q4 circuit is defective. *b.* If E7 is correct and E1 is not correct, Q2 circuit is defective.
Output spectrum	Per paragraph 7-15*f*.	Non-harmonically related signal level: > −60 db. Parasitic oscillation or squegging: Nonexistant.	Check oscillator circuit.

Table 7-5. Frequency Converter 1A2A2 Troubleshooting

NOTE

For 1A2A2 circuit details refer to figure FO-3 and paragraph 5-5. Refer to figure 7-3 for parts locations.

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Oscillator operation	Per paragraph 7-16*a* and *c*.	Oscillator starts and operates with input voltage reduced from −5 to −4 vdc.	Change Y1 or R4.
Oscillator frequency	Per paragraph 7-16*a* and *c*.	160.0 MHz, +3, −2 kHz.	*a.* Adjust C8. *b.* Change Y1.
Oscillator level	Per paragraph 7-16*a* and *c*.	20 millivolts minimum.	Defective component in crystal oscillator circuit.
Mixer level	Per paragraph 7-16*a* and *c*.	6.5 to 9.0 millivolts.	If E3 is correct, check the amplifier or mixer circuitry.

Table 7-6. Frequency Mixer Stage 1A2A3 Troubleshooting

NOTE

For 1A2A3 circuit details, refer to figure 5-4 and paragraph 5-6. Refer to figure 7-4 for parts locations.

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Output frequency and level versus input frequency	Per paragraph 7-17*a* and *d*.	Per table 7-30.	*a.* Paragraph 7-17*b* and *c*. *b.* Check Z1 input at ports L and R. *c.* If input at port R is incorrect check input buffer stage. *d.* If inputs at ports R and L are correct, check output amplifier stage.

Table 7-7. Bandpass Filter 1A2A4 Troubleshooting

NOTE

For 1A2A4 circuit details, refer to figure 5-5 and paragraph 5-7. Refer to figure 7-5 for parts locations.

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Band 1 input response	Per paragraph 7-18*a* and *b* and table 7-28.	See figure FO-26 details B(1) through (3).	NOTE For all checks of 1A2A4, the faulty circuitry will be in the particular band under test.
Band 2 input response	Per paragraph 7-18*a* and *c* and table 7-28.	See figure FO-26, details B(1) through (3).	
Band 3 input response	Per paragraph 7-18*a* and *d* and table 7-28.	See figure FO-26, details B(1) through (3).	
Band 4 input response	Per paragraph 7-18*a* and *e* and table 7-28.	See figure FO-26, details B(1) through (3).	
Band 5 input response	Per paragraph 7-18*a* and *f* and table 7-28.	See figure FO-26, details B(1) through (3).	
Band 1 filter output response	Per paragraph 7-18*a* and *g* and table 7-28.	See figure FO-26, detail E.	
Band 2 filter output response	Per paragraph 7-18*a* and *h* and table 7-28.	See figure FO-26, detail E.	
Band 3 filter output response	Per paragraph 7-18*a* and *i* and table 7-28.	See figure FO-26, detail E.	
Band 4 filter output response	Per paragraph 7-18*a* and *j* and table 7-28.	See figure FO-26, detail E.	
Band 5 filter output response	Per paragraph 7-18*a* and *k* and table 7-28.	See figure FO-26, detail E.	
Band 1 frequency response	Per paragraph 7-18*a* and *l* and table 7-28.	Per tables 7-32 and 7-33.	
Band 2 frequency response	Per paragraph 7-18*a* and *m* and table 7-28.	Per tables 7-32 and 7-33.	
Band 3 frequency response	Per paragraph 7-18*a* and *n* and table 7-28.	Per tables 7-32 and 7-33.	
Band 4 frequency response	Per paragraph 7-18*a* and *o* and table 7-28.	Per tables 7-32 and 7-33.	
Band 5 frequency response	Per paragraph 7-18*a* and *p* and table 7-28.	Per tables 7-32 and 7-33.	

Table 7-8. RF Oscillator 1A2A5 Troubleshooting

NOTE

For 1A2A5 circuit details, refer to figure FO-4 and paragraph 5-8. Refer to figure 7-6 for parts locations.

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Output frequency	Per paragraph 7-19*a* and *b*.	Control line (v): +3.5 ± 0.03 +3.5 ± 0.03 Tuning voltage (v): 10.00 ± 0.025 48.19 ± 0.025 Frequency: 5.595 MHz ± 6 kHz 6.495 MHz ± 7 kHz	None
Vfo tuning	Per paragraph 7-19*a* and *c*.	Per table 7-34.	*a*. Check alignment per paragraph 7-19*b*. *b*. Check varactors and replace as required.
Output levels	Per paragraph 7-19*a* and *d*.	E1: 12 to 26 millivolts. E7:20 to 50 millivolts.	*a*. Replace Q1. *b*. If Q1 level is correct replace Q2.

Table 7-9. Bandpass Filter 1A2A6 Troubleshooting

NOTE

For 1A2A6 circuit details, refer to figure 5-7 and paragraph 5-9. Refer to figure 7-7 for parts locations.

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Filter response	Per paragraph 7-20*a* and *b*.	Per table 7-35 and figure 7-25.	Go through alignment procedure, paragraph 7-20*b* to isolate malfunction to particular band. Replace components as required.

Table 7-10 Frequency Mixer Stage 1A2A7 Troubleshooting

NOTE

For 1A2A7 circuit details, refer to figure FO-5 and paragraph 5-10. Refer to 7-8 for parts locations.

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Pump amplifier operation	Per paragraph 7-21*a* and *b*.	Output of 85 to 95 millivolts from 129 to 160 MHz.	*a*. Check B+ on Q1. *b*. Check input filter response.
Mixer balance	Per paragraph 7-21*a* and *c*.	Levels of two inputs to the mixer within 0.5 db of each other.	Check alignment (para 7-21*c*).
Tracking	Per paragraph 7-21*a* and *d*.	Per table 7-36.	*a*. Check alignment (para 7-21*c*). *b*. Check CR3 and CR4.

Table 7-11. Mixer Amplifier 1A2A8 Troubleshooting

NOTE

For 1A2A8 circuit details, refer to figure FO-6 and paragraph 5-11. Refer to figure 7-9 for parts locations.

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Q2 circuit	Per paragraph 7-22*a* and *b*.	Output level: 400 to 600 millivolts.	Replace Q2.
Q3 circuit	Per paragraph 7-22*a* and *c*.	Gain: 40 x input (minimum).	Replace Q3.
Q4 circuit	Per paragraph 7-22*a* and *d*.	Gain: Approximately +15 db.	Check alignment (para 7-22*d*).
Conversion gain and sensitivity	Per paragraph 7-22*a* and *e*.	Output level: 20 to 50 millivolts. Gain (signal to noise ratio): 15 db.	Replace Q4.
Agc amplifier	Per paragraph 7-22*a* and *f*.	Input: −2.300 v ± 2 millivolts. Output: +2.22 to 2.36 v.	*a*. Follow procedure in paragraph 7-22*g*. *b*. Check Q5, Q6, and Q7.

Table 7-12. RF Coil Assembly 1A2A9 Troubleshooting

NOTE

For 1A2A9 circuit details, refer to figure 5-10 and paragraph 5-12. Refer to figure 7-10 for parts locations.

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Inductance of inductors	Per paragraph 7-23.	Per table 7-37.	Replace bad inductor.

Table 7-13. RF Coil Assembly 1A3 TROUBLESHOOTING

NOTE

For 1A3 circuit details, refer to figure 5-11 and paragraph 5-14.

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Alignment, insertion loss, 160 MHz rejection and 2 db bandwidth	Per paragraph 7-24.	Per paragraph 7-24.	Replace entire 1A3 module if an or alignment parameters cani satisfied.

Table 7-14. Circuit Card Assembly 1A4 Troubleshooting

NOTE

For 1A4 circuit details, refer to figure FO-8 and paragraph 5-15, AND FO-20 FOR PARTS LOCATION.

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Variable divider	Per paragraph 7-25*a*.	Per table 7-38.	*a.* Follow divider chain until malfunction is located. *b.* Check pulse shaper output on collector of Q3.
Phase detector	Per paragraph 7-25*b*.	A stable linear sawtooth for each frequency listed in table 7-38.	*a.* Check 1 MHz input at Q4 base. *b.* Check 1 MHz input at Q5 collector. *c.* Check for sawtooth on R22. *d.* Check U12 pin 6 output. *e.* Adjust R24.
Dc power	Per paragraph 7-25*c*.	Voltage — Maximum current +5 v — 175 milliamps +9 v — 10 milliamps −5 v — 2 milliamps	*a.* Check for shorts or open circuits. *b.* Check for damaged components. *c.* Measure transistor bias levels per figure FO-8.

Table 7-15. Circuit Card Assembly 1A5 Troubleshooting

NOTE

For 1A5 circuit details, refer to figure FO-9 and paragraph 5-16. Refer to figure FO-21 for parts locations.

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Variable divider	Per paragraph 7-26*a*.	Per table 7-39.	*a.* Check collector of Q2 for shaper output. *b.* Follow pulse down divider chain until malfunction is located.
Hf control line filter	Per paragraph 7-26*b*.	Frequency — Input/output level difference 200 kHz — ±5 db maximum 400 kHz — ±5 db maximum 600 kHz — +5, −10 db 800 kHz — −10 db minimum 1 MHz — −20 db minimum 5 MHz — −30 db minimum	Replace malfunctioning component.

Table 7-16. RF Oscillator 1A6 Troubleshooting

NOTE

For 1A6 circuit details, refer to figure FO-10 and paragraph 5-17. Refer to figure FO-22 for parts locations.

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Reference oscillator output	Per paragraph 7-27*a*.	Frequency: 1.0 MHz ± 0.5 Hz Level: 3.0 to 4.2 volt squarewave.	*a.* Check Y1 for 4 MHz output. *b.* Check U1 for 4 to 1 division.
Phase detector operation	Per paragraph 7-27*b*.	1 Hz sawtooth with a peak-to-peak swing of +6.7 v to −2.2 v minimum.	*a.* Check Q3 collector for sawtooth. *b.* Check Q5 collector for pulse. *c.* Check C16 for sawtooth. *d.* Check junction of R17 and R19 for sawtooth.

Table 7-16. RF Oscillator 1A6 Troubleshooting - Continued

Item of check	Test conditions	Normal readings	Additional checks and remarks
Dc power input	Per paragraph 7-27c.	+5v, 18 to 22 milliamps +9 v, 8 to 13 milliamps −5 vo, 0.0 to 1.0 milliamps	a. +9 v incorrect—Replace Q1. b. −5 v incorrect—Replace Q2. c. +5 v incorrect—Check for shorts in integrated circuit leads.

Table 7-17. Converter Amplifier 1A7 Troubleshooting

NOTE

For 1A7 circuit details, refer to figure FO-11 and paragraph 5-18. Refer to FO-23 for parts locations.

Item of check	Test conditions	Normal readings	Additional checks and remarks
Fm discriminator alignment	Per paragraph 7-27a.	Frequency limits: 405.0 ± 1.0 kHz and 520.0 ± 1.0 kHz	a. Check Q14 output. b. Troubleshoot fm section.
Volume control adjustment	Per paragraph 7-27b.	Output level: 2.45 vrms.	Check Q1 through Q5 and associated circuitry.
Narrowband frequency response	Per paragraph 7-27c.	Input frequency (kHz) — Attenuation (db) 455.050 — −20 minimum 455.300 — −0.5 maximum 456.000 — 0.0 (reference) 458.500 — −0.5 maximum 465.000 — −20.0 minimum	Check U2, Q25 and Q26.
Wideband frequency response	Per paragraph 7-27d.	Input frequency (kHz) — Attenuation (db) 455.050 — −20.0 minimum 455.300 — −0.5 maximum 468.000 — −0.6 maximum 515.000 — −20.0 minimum	Check Q19, Q21, Q22, Q23, and Q24 and associated circuitry.
Bfo frequency	Per paragraph 7-27e.	1000, −10, +17 Hz.	Check Y1 and Q6, Q7 and Q8 outputs.
Cw output and distortion	Per paragraph 7-27f.	Narrowband output: 2.2 vrms minimum with 2.5% maximum distortion. Wideband output: 3.0 vrms minimum with 2.5% maximum distortion.	Paragraph 7-28c, d, and e. Paragraph 7-28c, d, and e.
Am output and distortion	Per paragraph 7-27g.	3.0 vrms minimum with 2% maximum distortion.	Paragraph 7-28c, d, and e.
Fm output and distortion	Per paragraph 7-27h.	3.0 vrms minimum with 2% maximum distortion.	Paragraph 7-28c, d, and e.
Output SIGNAL swing capability	Per paragraph 7-27i.	Wideband output: Clipping level greater than 3.3 vrms with 2% maximim distortion. Narrowband output: Clipping level greater than 3.2 vrms with 2% maximum distortion.	Paragraph 7-28i.

Table 7-18. IF Amplifier 1A8 Troubleshooting

NOTE

For 1A8 circuit details, refer to figure FO-13 and paragraph 5-19. Refer to figure FO-24 for parts locations.

Item of check	Test conditions	Normal readings	Additional checks and remarks
Dc power input	Per paragraph 7-29b.	+9 v at 0.3 to 0.7 milliamps: +5 v at 1.34 to 1.74 milliamps: −5 v at 7.0 to 9.0 milliamps.	Check for shorts.
IF gain and sensitivity	Per paragraph 7-29c.	Signal to noise ratio: 7 db. If output: 110 millivolts minimum. Demodulated if output: 10 millivolts minimum. Gain reserve: 1 db nominal.	Check alignment per paragraph 7-29a.

Table 7-18. IF Amplifier 1A8 Troubleshooting- Continued

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
25 kHz filter selectivity	Per paragraph 7-29*d*.	Passband ripple: < 2 db. 6 db attenuation points: < 478 kHz, > 432 kHz. 60 db attenuation points: < 488 kHz, > 422 kHz.	Replace FL1.
4 kHz filter selectivity	Per paragraph 7-29*e*.	Passband ripple: < 2 db. 3 db attenuation points: 452.20 453.00 and 457.00 - 457.80 kHz. 60 db attenuation points: < 463.00 kHz, > 447.00 kHz.	Replace FL2.
1 kHz filter selectivity	Per paragraph 7-29*f*.	Passband ripple: < 2 db. 3 db attenuation points: 454.10 - 454.50 kHz and 455.50 455.90 kHz. 60 db attenuation points: < 457.000 kHz, > 453.00 kHz.	Replace FL3.
Usb filter selectivity	Per paragraph 7-29*g*.	Passband ripple: < 2 db. 3 db attenuation points: < 455.50 kHz and 458.00 - 458.80 kHz. 60 db attenuation points: < 461.60 kHz, > 453.50 kHz. Sideband carrier rejection: ≥ −30 db.	Replace FL4.
Lsb filter selectivity	Per paragraph 7-29*h*.	Passband ripple: < 2 db. 3 db attenuation points: 451.20 - 452.00 kHz and < 454.50 kHz. 60 db attenuation points: < 456.50, > 448.50 kHz. Sideband carrier rejection: ≥ −30 db.	Replace FL5.
Auxiliary outputs	Per paragraph 7-29*i*.	IF output: 120 to 130 millivolts. Tagc output: −3.5 vdc minimum. Meter agc output: −3.5 vdc nominal. Diode output: −1.0 vdc minimum.	Adjust R75 for 120−130 millivolts.
Agc tracking	Per paragraph 7-29*j*.	Agc saturation conditions: if output > 3 db, < 5 db from 110 millivolts reference level. Diode output: −3.0 maximum. Meter agc output: ≥ 0.3 v variation from −3.5 vdc nominal. Tagc outputs ≤ −1.7 vdc.	Check Q13 and Q14.
Diode output response	Per paragraph 7-29*k*.	Diode output not clipped. Level difference between 1 kHz and 400 Hz modulation: < 2 db.	Check Q13 and Q14.
Am distortion	Per paragraph 7-29*l*.	≤ 7 % distortion.	Check Q1 through Q4.

Table 7-19. Power Supply Assembly 1A9 Troubleshooting

NOTE

For 1A9 circuit details, refer to figure FO-14 and paragraph 5-20. Refer to figure 7-11 for parts locations.

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
20-32 vdc input operation	Per paragraph 7-30*b*.	Per table 7-41.	*a.* Check Q16 collector for proper waveshape and level. *b.* Check Q14 and Q15 for proper dc level.
Battery operation input current	Per paragraph 7-30*c*.	Per table 7-42.	Check 1A9 for shorts.

Table 7-19. Power Supply 1A9 Troubleshooting—Continued

Item of check	*Test conditions*	*Normal readings*	*Additional checks and remarks*
Flattery operation output voltage	Per paragraph *7-30d.*	Per table 7-43.	*a.* +5 v-Check Q5 and Q6; adjust R11. *b. -5* v-Check Q20 and Q21; adjust R50. c. +9 v-Check Q23 through Q25; adjust R59. *d.* +50 v-Check Q7 through Q12; adjust R24.

Section iii. MAINTENANCE

7-5. General

This section describes general support corrective maintenance procedures for the receiver and the various subassemblies.

7-6. Disassembly of receiver

NOTE

Refer to paragraph 6-6 for disassembly of the receiver to the subassembly level. Disassemble the subassemblies only to the extent necessary to make repairs.

a. *Disassembly of 1A1* (fig. FO-17).

(1) Remove preselector *1A2* and RF coil assembly 1A3 from the control panel assembly per paragraph 6-6.

(2) On the front panel remove the knobs from the TUNING *(4)* and MHz (5) controls.

(3) Remove the four screws (6) securing the gear box assembly (7) to the front panel.

(4) Unsolder and tag the wiring from the three switch boards (FO-7 and FO-17) (1A1S6, 1A1S7, and 1A1A1 (8, 9, 10) and from wire terminals WT5 and WT6 (11).

(5) Remove the switch boards (8, 9, 10) and gear box assembly (7) by removing the remaining attaching hardware.

(6) Remove the knobs from the remaining front-panel controls.

(7) Unsolder and tag wiring from front panel controls, connectors, etc., which are to be removed.

(8) Remove front-panel controls, connectors, indicators, terminals, etc., as required, by removing the attaching hardware before disassembling receiver control gear box 1A1A2.

(9) Disassemble gear box 1A1A2 (7) as described in *b* below.

(10) If required, replace DS1 lamp per paragraph 6-8.

b. Disassembly of Receiver Control Gear Box 1A1A2 (fig. FO-18).

NOTE

Disassemble the receiver control box only to the extent required to replace parts that are defective, or suspected of being defective. Complete disassembly instructions are provided for use as required for repair.

(1) Remove tuner control (102) by removing two screws (136) from bearing housing (101), then remove shaft (102), bearing housing (101), bearing (100), shim (99), pin (138), and bearing (97).

(2) Push in and hold clutch lever (106) and loosen set screws (105) on clutch actuator (104). Hold pressure on spring (103) until set screws are loose, then carefully remove the clutch lever, clutch actuator, and spring.

(3) Remove four screws (3) from right hand end plate (2) and remove end plate from housing (1).

(4) Tape the right end of shaft (41) hole in housing to prevent shaft from sliding out.

(5) Remove two screws (79) from bottom of housing (1) which secure bearing bracket (78).

(6) Carefully remove four screws (14 and 17) and washers (13 and 26) from kHz dial assembly plates (12 and 25).

(7) Carefully lift differential and tuner/clutch assembly to clear the dowel pins in bearing bracket (78), and remove assembly out of right side of the housing (1).

CAUTION

Do not allow idler shaft (41) to move too far to the right to disengage idler gear (42) under MHz dials 5 (117) and 6 (116), or MHz dial assembly will require disassembly to reinstall idler gear. Hole in housing (1) for shaft (41) should have been taped in step (4), above.

(8) Carefully move kHz dial assembly shaft

(34) to the right to disengage gear (35) from gear (48) and remove complete kHz dial assemblies 1 through 4.

CAUTION

Exercise care to prevent damage to rotary switch (46) 1A 1A2A1 during removal and installation. The rotary switch is fragile.

(9) Remove two screws (43), washers (44), and four metallic washers (45 and 47) from rotary switch (46) 1A1A2A1.

(10) Carefully remove rotary switch (46) from shaft (139).

(11) Remove two retaining rings (50 and 51), and remove gear (48) and shaft (139) from housing (1), and bearings (49 and 52).

(12) Remove pin (140) from gear (48) and shaft (139), then remove gear (48) from shaft (139).

(13) Idler gears (38 and 39) may now be removed by moving shaft (41) to the right approximately 1/16 inch. Remove the idler gears one at a time from right side of shaft. (Note the way the idler gear splines are positioned or facing the shaft for reinstallation purposes.)

NOTE

The MHz tuner shaft and stop assembly (53) and the gear and shaft assembly (64) are connected by bevel gears (55 and 61), and must be disassembled as one unit.

(14) Remove shaft and stop assembly (53), and gear and shaft assembly (64), as follows:

- - - *(a)* Remove three screws (110) from left end plate, and remove end plate.

- - - *(b)* Remove two screws (107) and two nuts (108) from end plate.

CAUTION

Spring (69) and check ball (68) under detent will pop out and may be lost when gear and detent shaft (64) is pulled out. Restrain the check ball when gear and shaft are removed.

- - - *(c)* Loosen two set screws (62) on bevel gear (61) and remove detent shaft (64), gear (61), spring (69), and ball (68).

- - - *(d)* Remove two set screws (66) and gear (65) from detent shaft (64).

- - - *(e)* Remove bearing (67) from end plate (109) and bearing (63) from housing (1).

- - - *(f)* Loosen two set screws (60) on shaft collar (59) and remove collar and bearing (58).

- - - *(g)* Loosen set screw (57) and remove pin (56) from bevel gear (55).

- - - *(h)* Remove shaft (53), bearing (54), and bevel gear (55).

- - - (15) Remove MHz dial assembly (116 and (117), and shaft (121) from housing (1).

- - - (16) Disassemble the MHz dial assembly as follows:

- - - *(a)* Loosen two set screws (113) on spur gear (112), and remove bearing (111) and gear (112) from shaft (121).

- - - *(b)* Remove shims (114 and 115) and dial 6 (116) from shaft (121).

- - - *(c)* Remove pin (118) from dial 5 (117) and shaft (121). Remove dial 5 (117).

- - - *(d)* Remove retaining ring (119) and bearing (120) from shaft (121).

- - - (17) Remove idler gear (42) from shaft (41).

- - - (18) Remove retaining ring (40) from shaft (41). Remove idler gears (38 and 39), remove shaft (41) from housing (1).

CAUTION

When disassembling dials 1 through 4, exercise care to prevent bending contact fingers mounted on dials.

- - - (19) Disassemble dial assemblies 1 through 4 as follows:

- - - *(a)* Loosen two set screws (36) on spur gear (35), then removing bearing (37), spur gear (35) and spring (137) from shaft (34).

- - - *(b)* Remove dial 4 (32) along with printed wiring boards TB4 (33) and TB3 (23) and spacer (31) from shaft (34).

- - - *(c)* Remove two screws (30), washers (29), and plates (28 and 24) from spacer plate (25). Remove printed wiring boards TB4 (33) and TB3 (23), dial 4 (32), and spacer (31).

- - - *(d)* Remove dial 3 (22) and spacer (21) from shaft (34).

- - - *(e)* Remove dial 2 (19) along with printed wiring boards TB2 (20) and TB1 (10) and spacer (18) from shaft (34).

- - - *(f)* Remove two screws (17), washers (16), and plates (15 and 11) from spacer plate (12). Remove printed wiring boards TB2 (20) and TB1 (10), dial 2 (19), and spacer (18).

- - - *(g)* Remove retaining ring (9) and dial 1 (8) from shaft (34).

- - - *(h)* Loosen two set screws (7) on collar (6). Remove collar (6).

- - - *(i)* Remove retaining ring (5) and bearing (4) from shaft (34).

(20) Disassemble differential and tuner/clutch assembly as follows:

NOTE

Do not disassemble except as required to gain access to defective parts.

- - - *(a)* Loosen two set screws (124) on spur gear (123), and remove retaining ring (125) from shaft (127).

- - - *(b)* Remove bearing (135) and retaining ring (134) from shaft (127).

- - - *(c)* Remove bearing (70) and retaining rings (71 and 76) from shaft (75).

- - - *(d)* Remove pin (74) from gear (72) and remove gear from shaft (75).

- - - *(e)* Remove shaft (127) from bearing bracket (78), bearing (122), gear (123), and bearing (126).

- - - *(f)* Remove gear (133) from shaft (127).

- - - *(g)* Remove pin (130) from differential housing (129), and remove housing and gear (128) from shaft (127).

- - - *(h)* Loosen set screws (73) and remove collar (141) from shaft (127).

- - - *(i)* Remove four pins (132) and remove four gears (131) from differential housing (129).

- - - *(j)* Remove retaining rings (96), spring (95), and retaining ring (94) from shaft (75).

- - - *(k)* Remove two screws (93), washers (92), and bracket (91) from bearing bracket (78).

- - - *(l)* Remove pin (90) and clutch (89) from shaft (75).

- - - *(m)* Loosen set screws (86, 84, and 82). Remove clutch shaft (88) from bearing bracket (78).

- - - *(n)* Remove shaft (75) from bearing (87), spur gear (85), bevel gear (83), shaft collar (81), bearing (80), and bearing housing (78).

- - - *c. Disassembly of Preselector 1A2* (fig. FO-19).

- - - (1) Remove six cover plates (2, 7, 10, 13, 17, 21) from the preselector by removing the attaching screws.

- - - (2) Unsolder and tag the wiring from subassemblies (1, 4, 5, 6, 9, 12, 15, 16) 1A2A1 through 1A2A8 (only from those subassemblies that are to be removed) (see table 7-21 for wiring).

(3) Remove subassemblies 1A2A1 through 1A2A8, as required, by removing the attaching screws.

(4) Remove switch 1A2S1 (20) by removing the attaching screws.

- - - (5) Remove switch 1A2S1 (20) and subassembly (22) by unsoldering and tagging the wiring and removing the attaching hardware.

- - - (6) Remove filters, terminals, and connectors (fig. FO-19), as required, by unsoldering and tagging the wiring and removing the attaching hardware.

- - - (7) Refer to paragraph 7-8 for repair instructions for circuit cards 1A2A1 through 1A2A9.

NOTE

RF coil assembly 1A3 is not disassembled. If this subassembly is defective, replace the entire subassembly as a unit.

- - - *d. Disassembly of Circuit Card Assemblies 1A4 through 1A8.* Refer to paragraph 6-6 for removal of assemblies 1A4 through 1A8 and paragraph 7-8 for replacement.

- - - *e. Disassembly of Power Supply Assembly 1A9* (fig. 7-11).

- - - (1) Remove the power supply cover by removing the four attaching screws.

- - - (2) Remove the three screws securing the two power supply circuit cards.

- - - (3) Remove additional components, as required by unsoldering. Tag wires which are disconnected from the circuit cards or the connector.

- - - *f. Disassembly of Housing Assembly 1MP1* (fig. FO-15 and FO-25).

- - - (1) Remove cover, batteries, circuit cards, filters, and power supply from the receiver housing assembly as outlined in paragraph 6-6.

- - - (2) Remove the rear panel (29) (fig. FO-15) by removing the six attaching screws (30).

- - - (3) Disconnect and tag wiring from connectors, switches, and fuses which will be removed from the rear panel (see table 7-22 for wiring details).

- - - (4) Remove components from the rear panel (29), as required, by removing the attaching hardware.

- - - (5) Disconnect and tag wiring from T1 (47), TB1 (45), CR6 (51), and L1 (49) (only those components to be removed) (fig. FO-15, sheet 2).

- - - (6) Remove T1 (47), TB1 (45), CR6 (51), and L1 (49) as required, by removing the attaching hardware (48, 46, 52, 50) (fig. FO-15, sheet 2).

- - - (7) Remove subassembly cover (31) by removing the four attaching screws (32).

- - - (8) Disconnect and tag wiring from FL1 (33) through FL3 (35) and from C1 (36) (only those components to be removed) (fig. FO-15, sheet 2).

- - - (9) Remove FL1 (33) through FL3 (35) and C1 (36), as required, by removing the attaching hardware.

- - - (10) Remove the attaching hardware from connectors J1 (39) and J2 (38), terminals WT5 through WT8 (40, 41, 42, 43), and parent board assembly TB2 (37).

(11) Remove J3, (39), J2 (38), WT 5 through WT8 (40, 41, 42, 43,), and TB2 from the case, along with the wiring harness (fig. FO-15, sheet 2).

- - - (12) Remove the remaining parts from the wiring harness, as required, by unsoldering and tagging the wiring.

- - - (13) Remove components from TB1 (45) and TB2 (37), as required per paragraph 7-8 *b.*

7-7. Inspection

a. Inspect circuit cards 1A4 through 1A8, filter 1A3, assemblies 1A1, 1A2, 1A9, and interior of housing assembly as outlined in paragraph 6-7.

- - - *b.* Inspect gear box assembly 1A1A2 for the following deficiencies:

- - - (1) *Loose* screws.

- - - (2) Unsealed set screws.

- - - (3) Shafts that will not turn.

- - - (4) Gears not meshed and aligned.

- - - (5) Dials that are misaligned.

- - - (6) Clutch does not engage and disengage correctly.

- - - (7) Bent or broken electrical contacts.

- - - (8) Dirt or foreign matter present.

- - - (9) Damaged switch wafrers.

c. Inspect front-panel controls, indicators, connectors, terminals, etc., for dirt, corrosion, wear, or signs of overheating.

d. Inspect circuit cards 1A2A1 through 1A2A9 and 1A2S1 for cracks, warping, corrosion, or signs of overheating.

e. Inspect 1A9TB1 and 1A9TB2 for cracks, warping, corrosion, or signs of overheating.

7-8. Replacement and Repair of Subassemblies and Circuit Cards

(fig. 7-1 through 7-11 and FO-20 through FO-25)

a. Subassembly Replacement. To replace a subassembly, follow the detailed instructions in paragraphs 6-6, 6-9, 7-6, and 7-9.

b. Circuit Card Repairs. Make repairs to circuit cards 1A2A1 through 1A8, 1A9TB1, and 1A9TB2 by accomplishing the following general parts replacement procedures:

(1) Remove attaching hardware as required to remove the defective part.

(2) Unsolder the part from the circuit card or unsolder the wiring from the part as applicable.

(3) Remove the part from the circuit card and replace with attaching hardware.

(4) Use solder type SN60WMAP2 to solder the component leads to the circuit card or connect the wiring to the component, as applicable, per MIL-STD-454 requirement 5. Clean solder connections with trichloroethane and allow circuit card to dry.

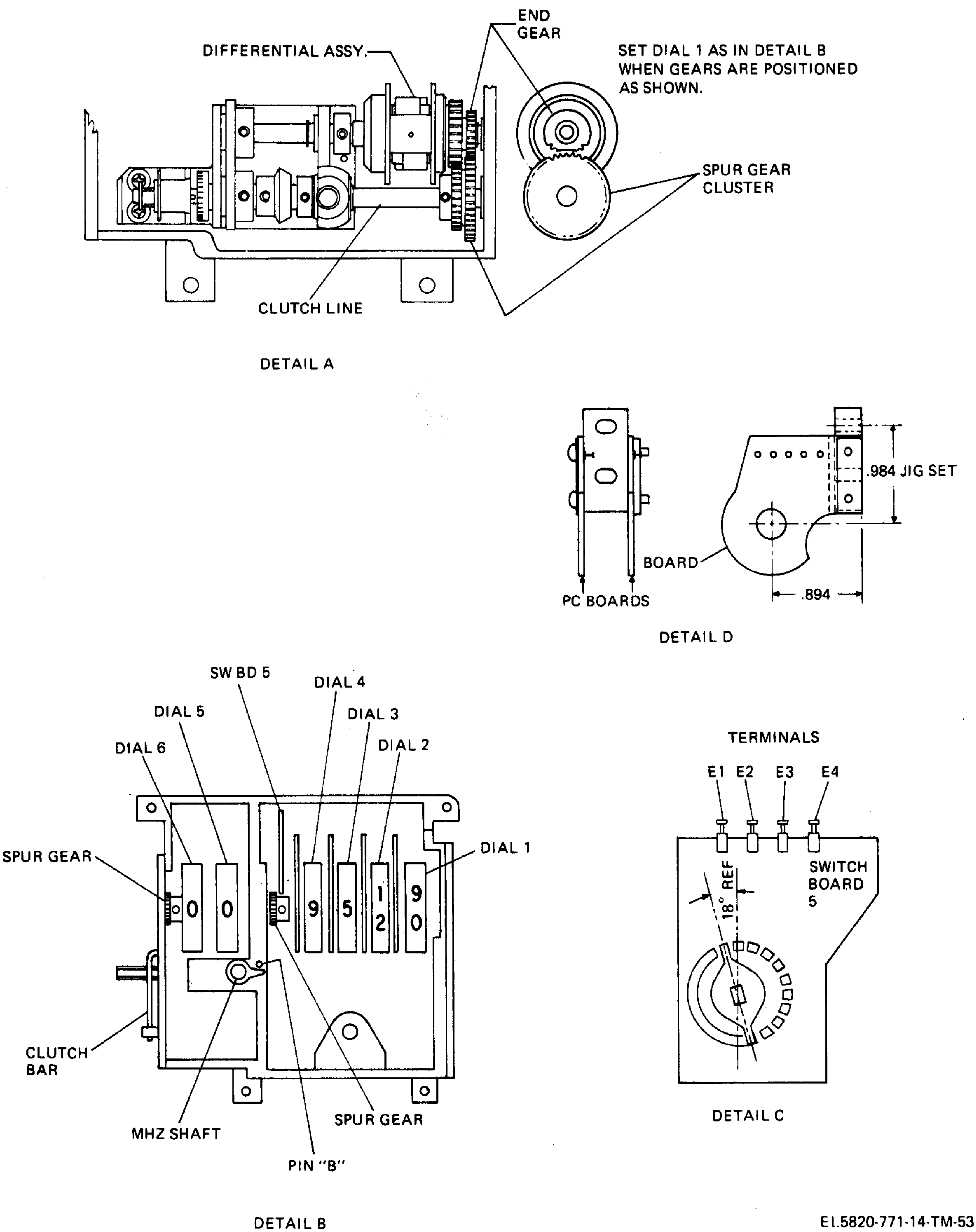


Figure 7-1. 1A1A2 alignment diagram.

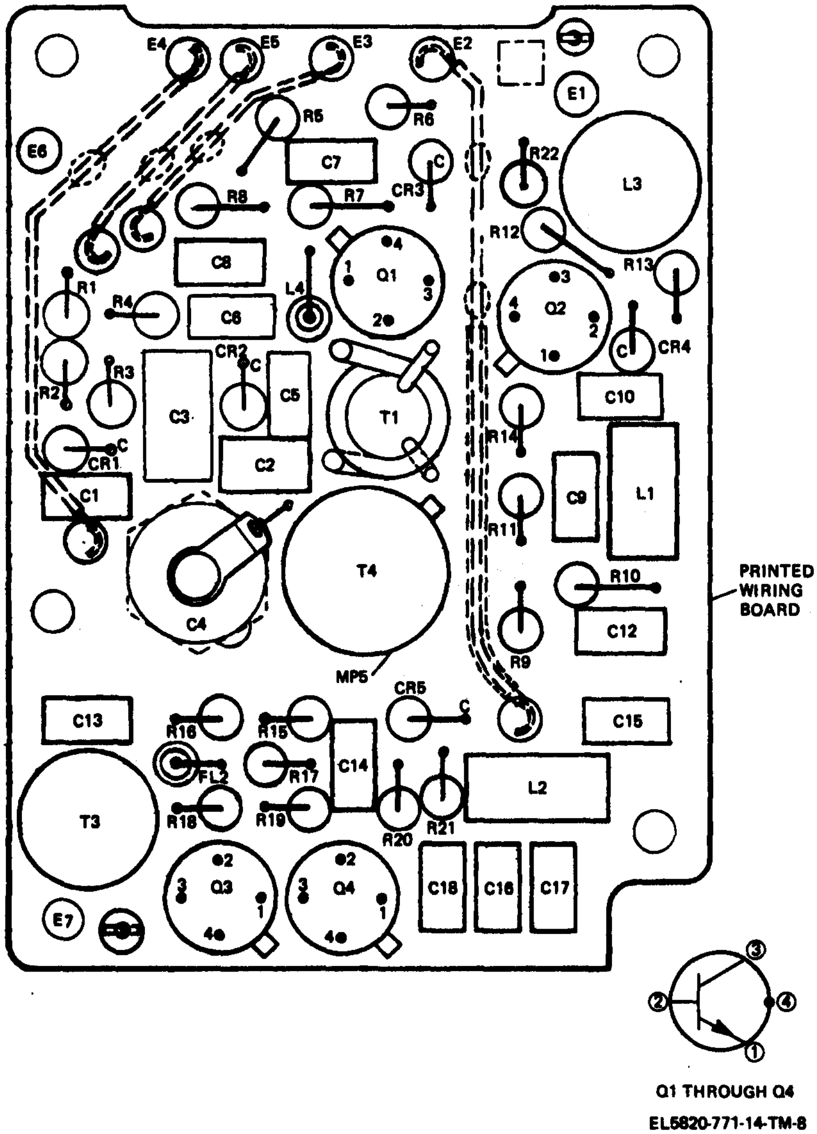


Figure 7-2. 1A2A1 parts locations.

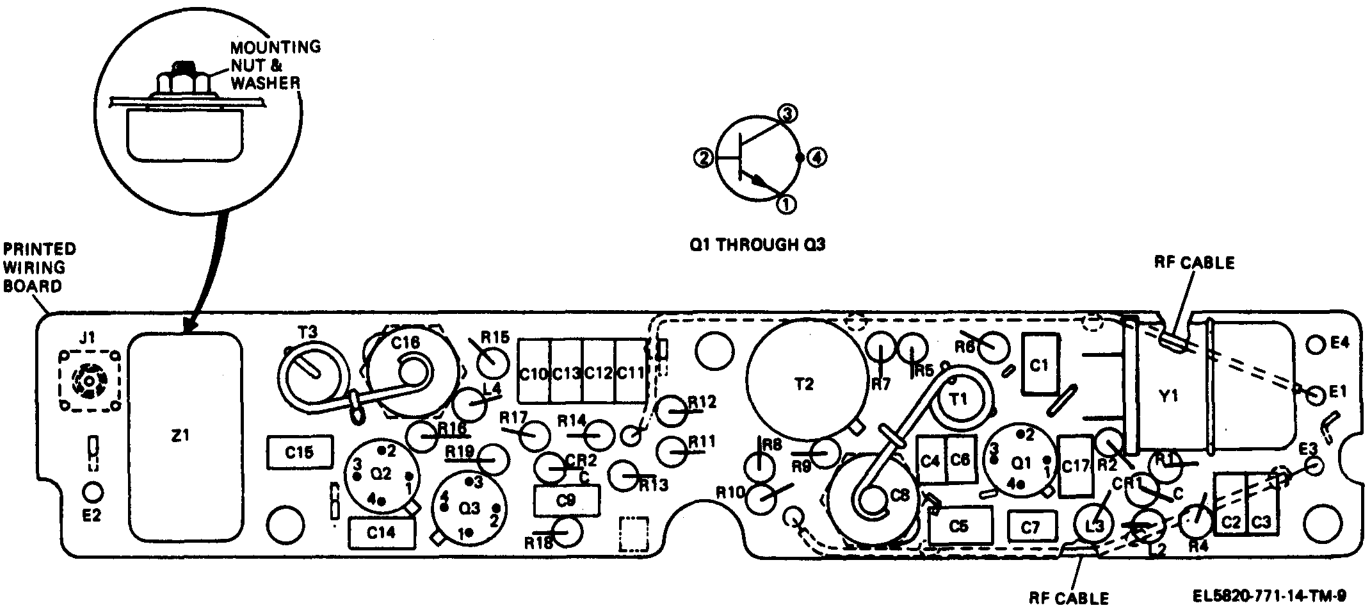


Figure 7-3. 1A2A2 parts locations.

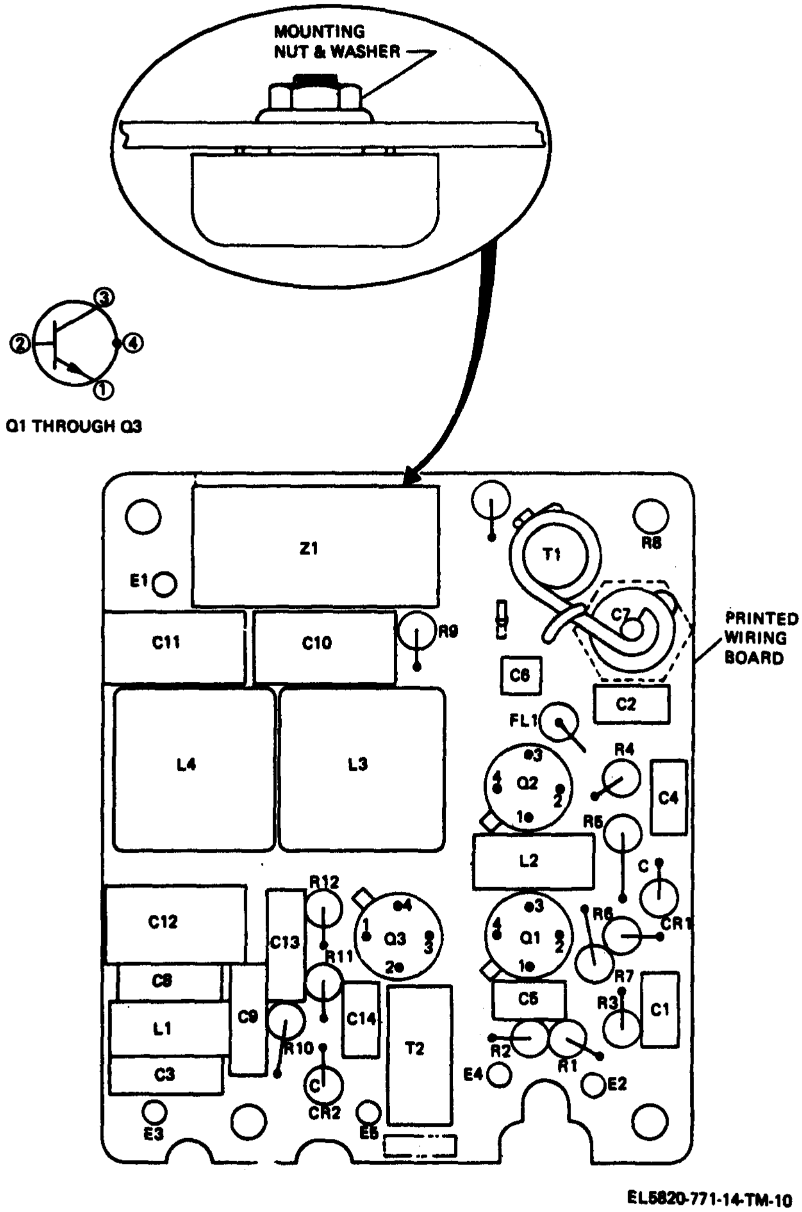


Figure 7-4. 1A2A3 parts locations.

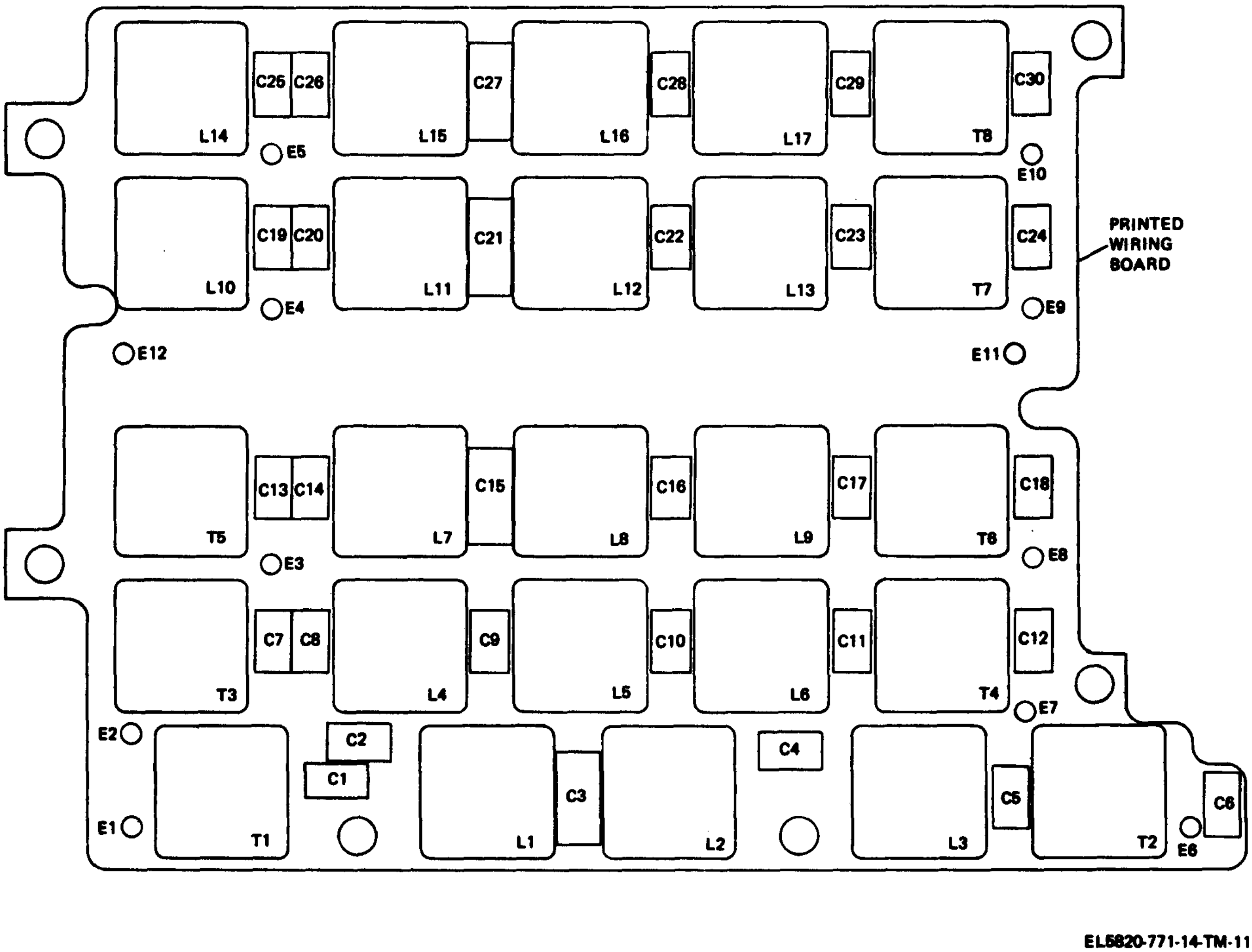
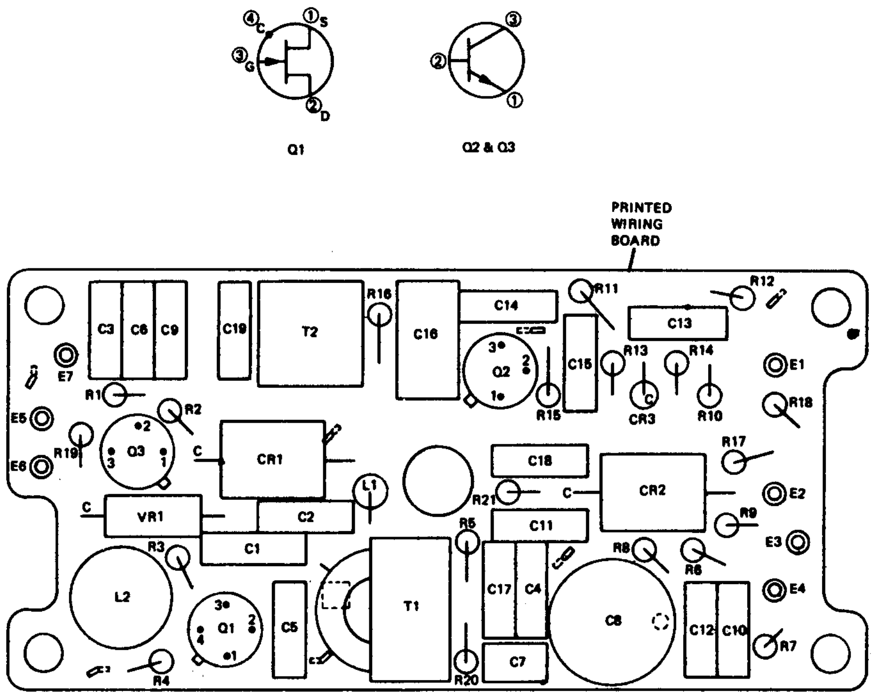
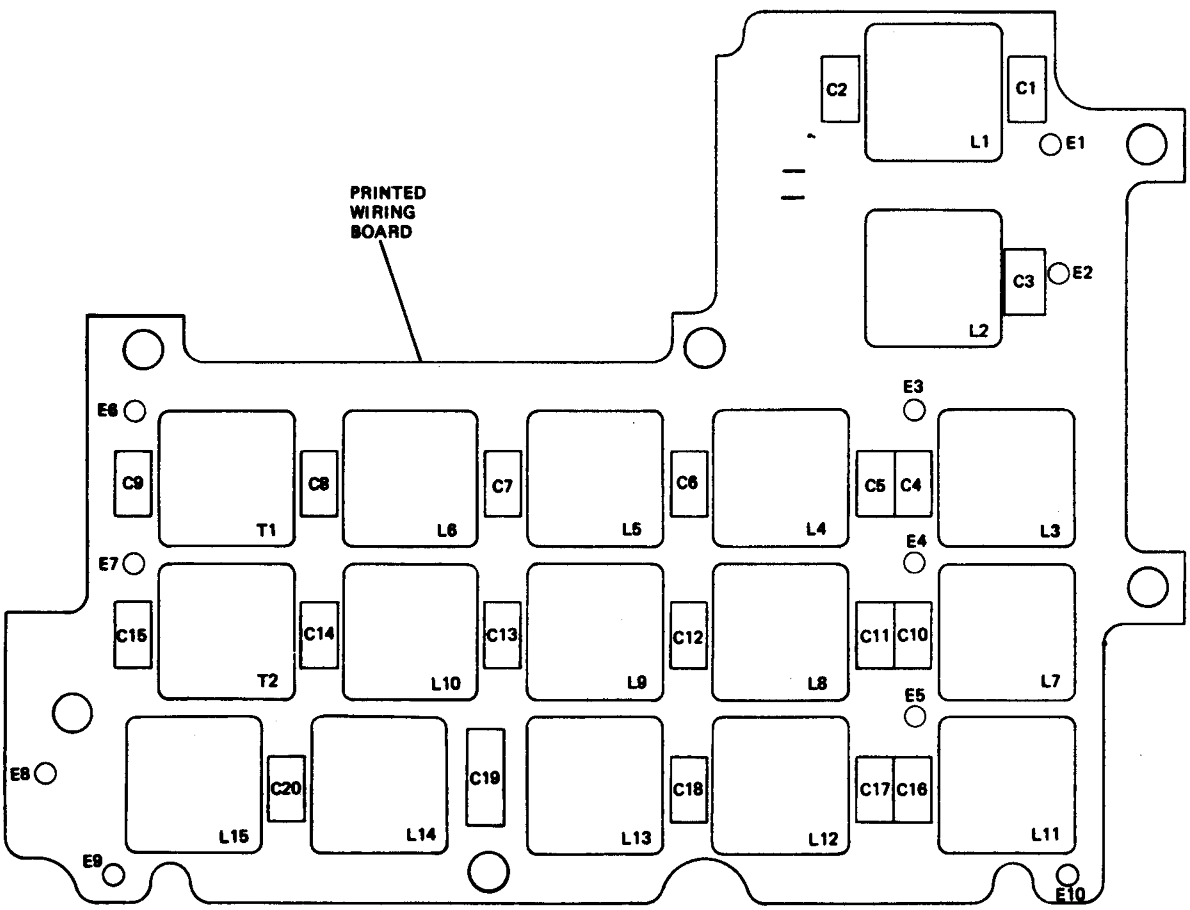


Figure 7-5. 1A2A4 parts locations.



EL5820-771-14-TM-12

Figure 7-6. 1A2A5 parts locations.



EL5820-771-14-TM-13

Figure 7-7. 1A2A6 parts locations

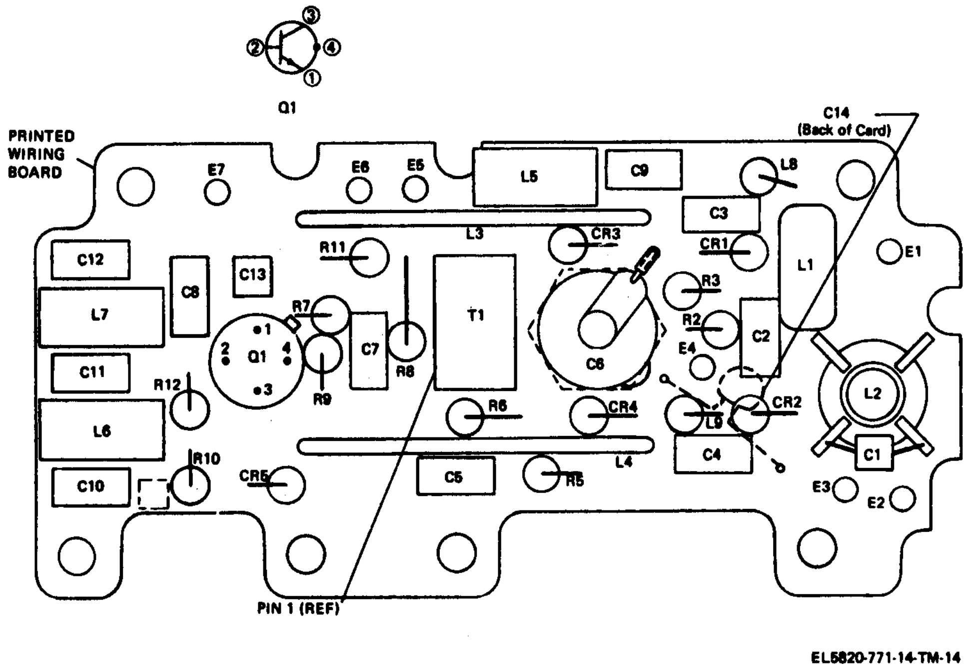


Figure 7-8. 1A2A7 parts locations.

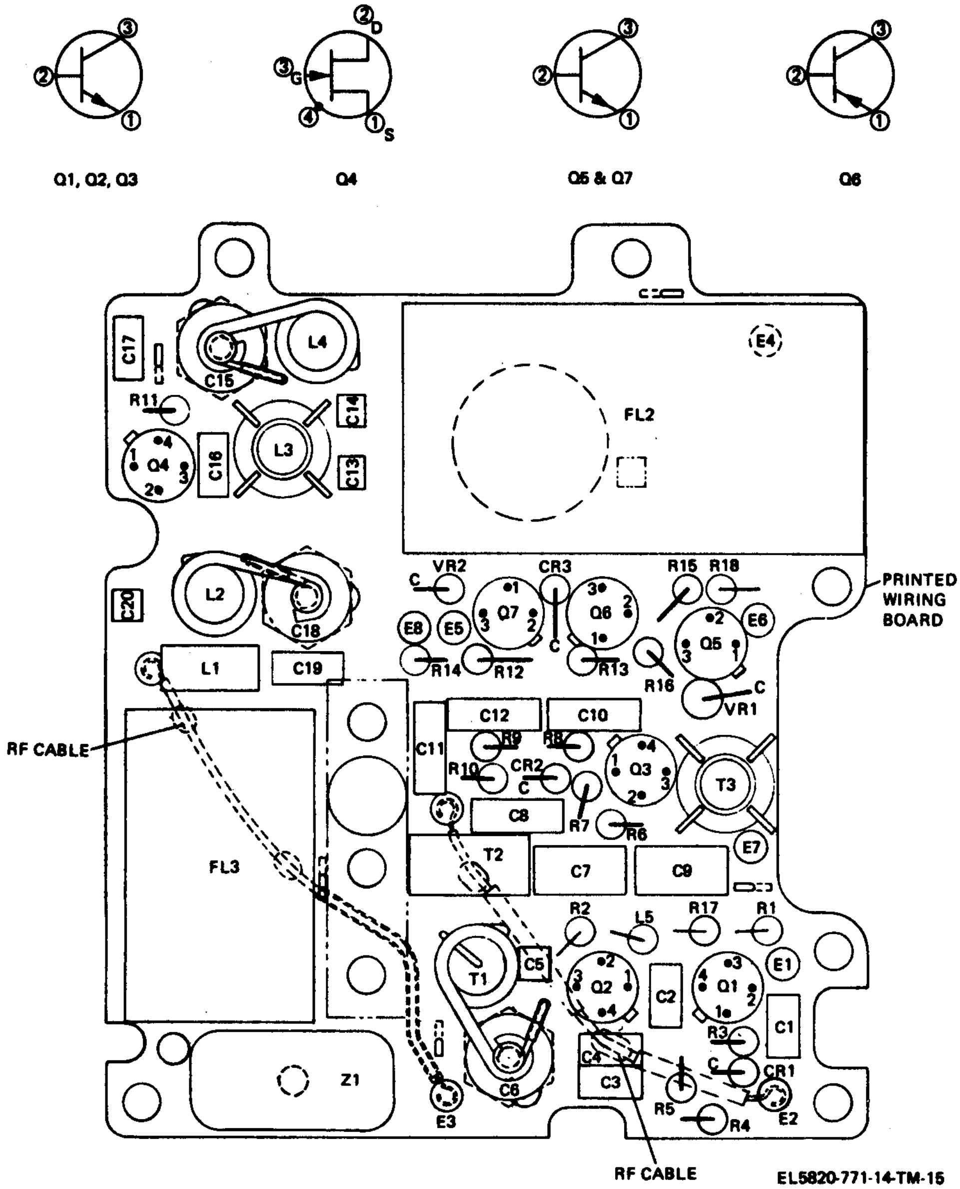


Figure 7-9. 1A2A8 parts locations.

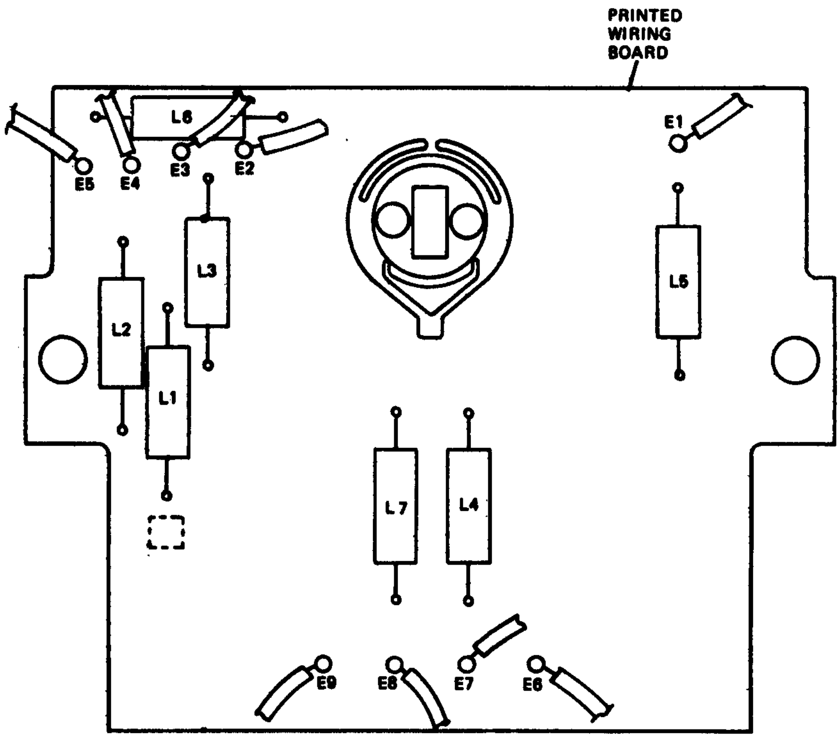


Figure 7-10. 1A2A9 parts locations.

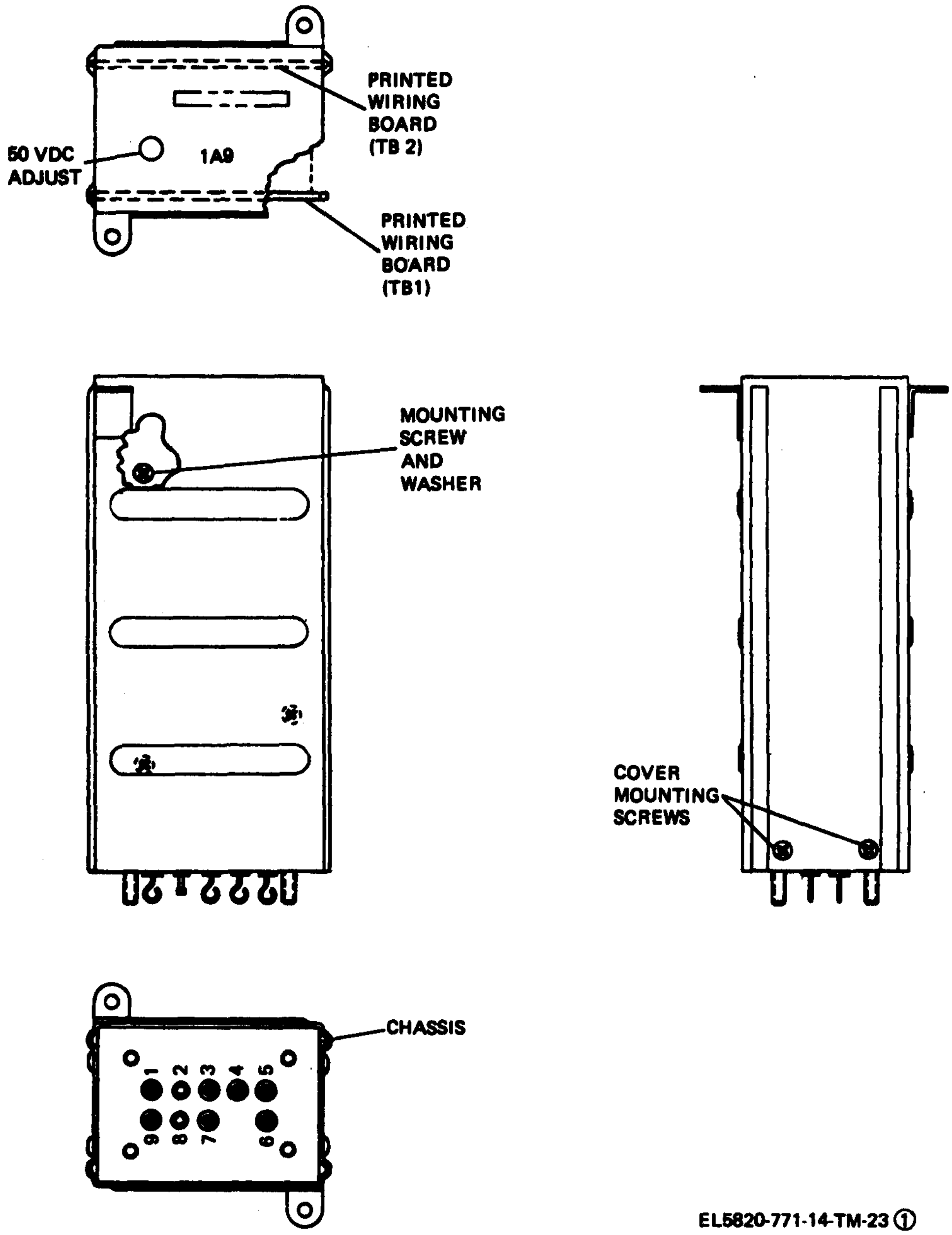


Figure 7-11①. 1A9 parts locations (sheet 1 of 3).

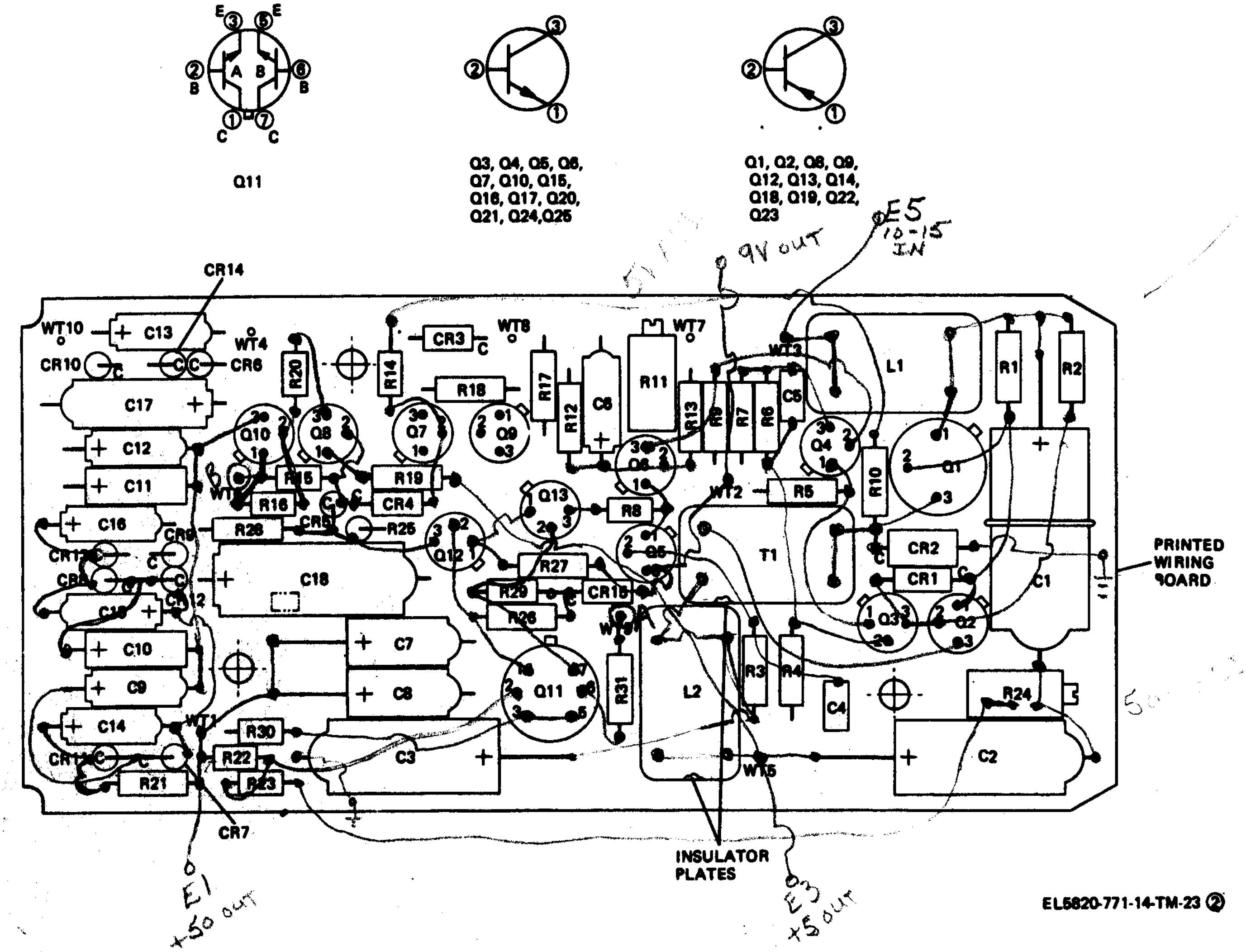


Figure 7-11. ② .1A9 parts locations (sheet 2 of 3).

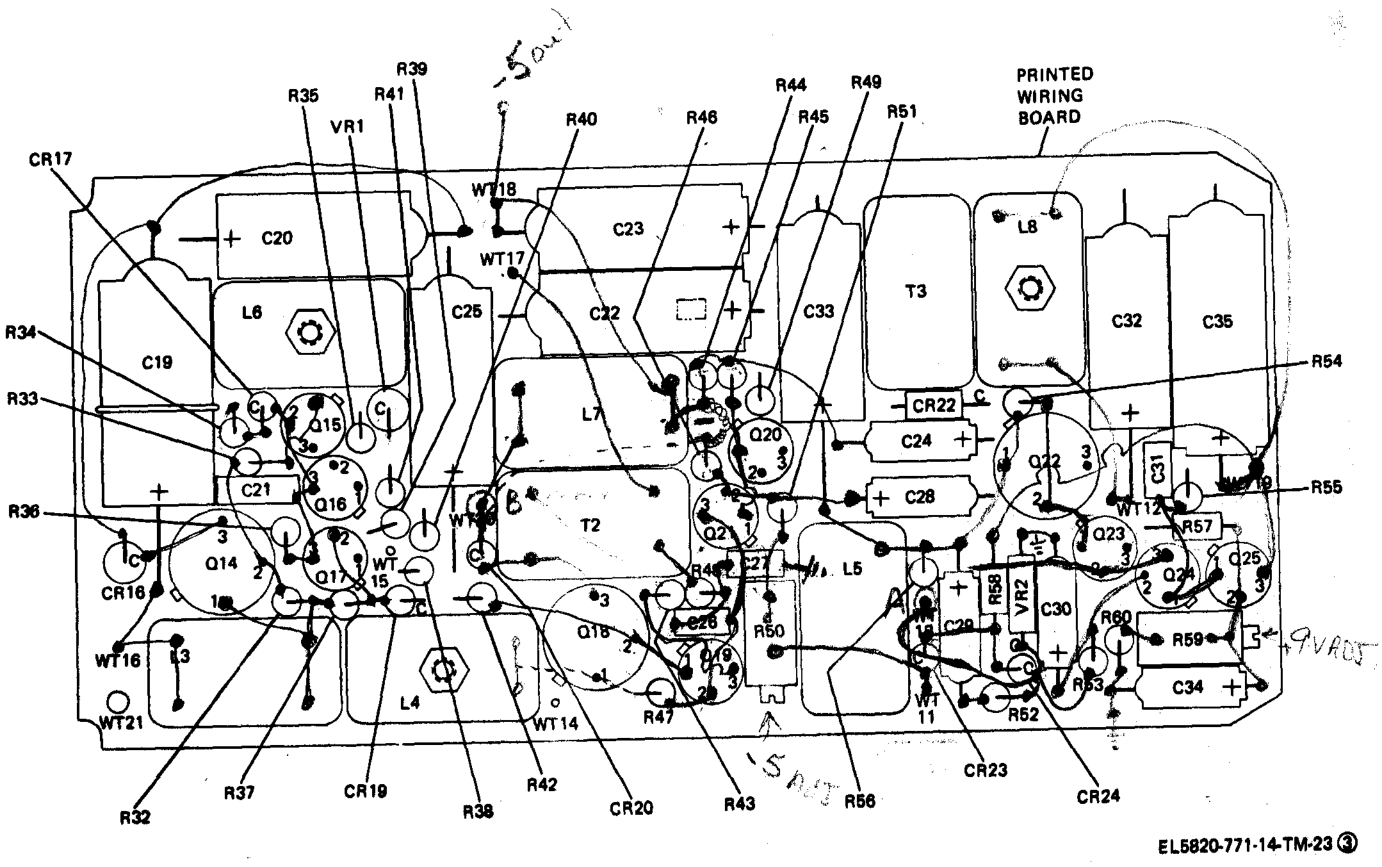


Figure 7-11 (③ 1A9 parts locations sheet 3 of 3).

WARNING

The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. DO NOT-USE NEAR AN OPEN FLAME. Trichloroethane is not flammable, but exposure of the fumes to an open flame or hot metal forms highly toxic phosgene gas.

NOTE

Do not apply conformal coating over adjustment screws, under the card connector, around hardware, or over the components not previously coated.

(5) Apply conformal coating (Conothane CE-1155, parts A and B) to the new component, the solder joints, and to the surrounding area using a small paint brush. Apply the coating evenly to an approximate thickness of .001 to .006 inch.

(6) Allow the conformal coating to air cure at ambient temperature for 24 hours. This process can be speeded by baking in accordance with MIL-STD-275.

c. *Repair of Other Subassemblies.* Subassemblies not covered in detail will have components replaced and repaired as outlined in procedures for general parts replacement in paragraphs 7-6 and 7-9.

7-9. Reassembly of Receiver Components

NOTE

Refer to paragraph 6-9 for final assembly procedures for the receiver. In the following procedures, disregard steps involving components not previously removed.

a. *Reassembly of Gear Box Assembly 1A1A2* (fig. 7-1 and FO-18).

NOTE

When the receiver control is only partially disassembled, follow the instructions below, as required, for assembly.

(1) Install pin (140) in gear (48) and shaft (139).

(2) Install bearing (49). Insert shaft (139) through housing (1), and bearing (49), then install retaining rings (50 and 51), and bearing (52) on shaft (139).

CAUTION

Exercise care to prevent damage to rotary switch during removal and installation.

(3) Insert two screws (43) through washers 44), nonmetallic washers (45), rotary switch (46), nonmetallic washers (47), and start threads in housing (1) screw receptacles.

(4) Carefully fit rotary switch over shaft (139) and snug screws (43) to secure rotary switch. Do not tighten screws excessively or switch board will break at screw attaching points.

(5) Align switch as shown in detail C, figure 7-1.

(6) Install idler shaft (41) through housing receptacle on right side of housing, and install idler gears (38, 39, and 42), facing properly on shaft (41), then install retaining ring (40) on shaft (41) sliding when housing is turned.

(7) Install MHz dials 5 and 6 assembly a follows:

(a) Install shaft (121) into bearing (120) and install retaining ring (119) on shaft (121).

(b) Install dial 5 (117) and pin (118) dial to shaft (121).

(c) Install dial 6 (116) on shaft (121).

(d) Install shims (114 and 115), spur gear (112), and bearing (111) on shaft (121). Do not secure set screws (113).

(e) Position idler gear (42) to fit between dials 5 (117) and 6 (116), and install MHz assembly into housing.

(f) Measure distance from left side of spur gear (112) to left side of bearing (120), which shall be 0.848-inch to 0.852-inch. If incorrect, add or remove shims as required.

(8) Install shaft and stop assembly (53) through bearing (54) and housing (1), bevel gear (55), housing and bearing (58), then install shaft collar (59) to remove end play and tighten set screws (60) to secure collar. Do not tighten bevel gear set screw (56) at this time.

(9) Remove two screws (66) and gear (65 from shaft (64).

(10) Insert spring (69) and check ball (68) in housing receptacle. Tape or tie the ball in depressed position until shaft (64) gear is in stalled, then remove tape or tie-down.

(11) Insert bevel gear (61) inside housing approximately over the bearing (63) hole, with gear-side away from shaft, so shaft (64) can be inserted.

(12) Insert shaft (64) through bearing (63) and into bevel gear (61). Remove tape or tie-down from check ball (68).

(13) Adjust bevel gears (55 and 61) so that they mesh evenly and turn freely, without excessive end play, then tighten set screws (42 and 57), install 0.046 to 0.048" pin in gear (55). Set dials 5 and 6 and stop as shown in detail B of figure 7-1. Install gear (65) and screws (66).

(14) Apply grade H Locktite sparingly to set screws (60, 57, 62) and to screw (66) heads.

(15) Install two switch screws (107) and nuts (108) on left end plate (109). Apply grade A Locktite sparingly to nuts and threads.

(16) Install three bearings (52, 67, and 111) in end plate (109), then install-end plate (109) onto housing (1) and secure with three screws (110).

(17) See detail B of figure 7-1 and set MHz dial 5 and 6 as shown, set shaft and stop as shown, then secure set screws (113) in gear (112). Apply grade H Locktite sparingly to set screws (113).

(18) Assemble kHz dial 1 through 4 assembly as follows:

CAUTION

When assembling dials 1 through 4 exercise care to prevent bending contact fingers mounted on dials.

(a) Install shaft (34) through board (20), dial 2 (19), spacer bushing (18), board (10) install retaining ring (9), dial 1 (8), shaft collar (6), retaining ring (5), and bearing (4). Do not secure set screws (7) at this time.

(b) Install two screws (17) through washers (16), plate (15), board (20), spacer plate (12), board (10) and plate (11). Snug screws down lightly .

(c) Install on shaft (34), from the left side, spacer bushing (21), dial 3 (22), board (23), bushing (31), dial 4 (32), and board (33).

(d) Install two screws (30) through washers (29), plate (28), board (33), spacer plate (25), board (23), and plate (24). Snug screws down lightly.

(e) Install spring (137) and spur gear (35) on shaft (34). Do not secure set screws (36) at this time.

(f) Insert bearing (37) into housing (1) receptacle.

(19) Align idler gears approximately to fit between dials 4 and 3 and between dials 3 and 2.

(20) Insure rotary switch 46 is aligned as shown in detail C of figure 7-1 and kHz dials 1 through 4 are aligned as shown in detail B.

(21) Install dial assembly shaft (34) into bearing (37) receptacle, mesh gear (35) with gear (48) without disturbing setting on rotary switch (46), and position idler gears to align between dials 4 and 3 and between 3 and 2. Do not secure spacer plates (12 and 25) at this time.

NOTE

Refer to table 7-20 for 1A1 wiring details.

(2) Remove tags and reconnect wiring to front-panel components as required.

(3) Remove tags and reconnect wiring to switch boards 1A1S6 (8), 1A1S7 (9), and 1A1A1 (10).

(4) Install receiver control gear box 1A1A2 (7) with the four attaching screws (6).

Table 7-20. Receiver Control 1A1 Wire List

Wire Number	Origin	Termination	Color	(AWG) Size	Remarks
1	P2-1	S11-E1	White/brown/red	26	
2	P2-2	S10-E1	White/red/orange	26	
3	P2-3	S9-E1	White/yellow/green	26	
4	P2-4	S8-E1	White/black/brown	26	
5	P2-5	S7-E2	White/black/violet	26	
6	P2-6	S7-E1	White/brown/orange	26	
7	P2-7	J4-H	White/brown/red	26	3/8 inch sleeving req.
8	P2-9	J4-C	Orange	26	3/8 inch sleeving req.;
				26	Twisted with wire 9.
9	P2-10	WT7	Black	26	Twisted with wire 8.
10	P2-11	J4-D	Blue		3/8 inch sleeving req.
				26	Twisted with wire 11.
11	P2-12	WT7	Black		Twisted with wire 10.

Table 7-20. Receiver Control 1A1 Wire List-Continued

Wire Number	Origin	Termination	Color	Size (AWG)	Remarks
12	P2-13	S5B-8	Violet	26	Twisted with wire 13.
13	P2-14	WT4	Black	26	Twisted with wire 12.
14	P2-15	S5B-12	White/brown/red	26	Twisted with wire 15.
15	P2-16	WT4	Black	26	Twisted with wire 14.
16	P2-17	S5C-8	Red	26	Twisted with wire 17.
17	P2-18	WT4	Black	26	Twisted with wire 16.
18	P2-19	S5C-6	White/black/violet	26	Twisted with wire 19.
19	P2-20	WT4	Black	26	Twisted with wire 18.
20	P2-21	S11-E2	White/brown/orange	26	
21	P2-22	S10-E2	White/red/green	26	
22	P2-23	S9-E2	White/yellow/blue	26	
23	P2-24	S8-E2	White/black/red	26	
24	P2-25	A2-E4	Blue	26	Twisted with wire 25.
25	P2-26	A2-E3	Black	26	Twisted with wire 24.
26	P2-30	S4-1	White/green/blue	26	
27	P2-31	S4-2	White/green/violet	26	
28	P2-32	S4-3	White/green/grey	26	
29	P2-33	S5A-9	White/red/green		
30	P2-34	S5A-10	White/yellow/blue	26	
31	P2-36	WT4	Black	26	Twisted with wire 32.
32	P2-37	S5A-7	Brown	26	Twisted with wire 31.
33	P2-38	WT7	Black	26	Twisted with wire 34.
34	P2-39	WT6	White	26	Twisted with wire 33.
35	P2-40	S11-E3	White/brown/yellow	26	
36	P2-41	S10-E3	White/red/blue	26	
37	P2-42	S9-E3	White/yellow/violet	26	
38	P2-43	S8-E3	White/black/orange	26	
39	P2-44	S6-E2	White/green/violet	26	
40	P2-45	S6-E4	White/black/brown	26	
41	P2-55	WT3	Black	26	
42	P2-56	S5-A2	White/brown/blue	26	
43	P2-57	R1-1	White/brown/violet	26	
44	P2-58	S5A-5	White/brown/grey	26	
45	P2-59	S5A-6	White/orange/green	26	
46	P2-60	S11-E5	White/brown/green	26	
47	P2-61	S10-E5	White/red/grey	26	
48	P2-62	S9-E5	White/yellow/grey	26	
49	P2-63	S8-E5	White/black/yellow	26	
50	P2-64	A1-E3	White/yellow/green	26	
51	P2-69	J3-1	White/yellow/green	26	
52	P2-74	S12-2	White/green/blue	26	
53	P2-75	S3-1	White/brown/red	26	
54	P2-76	R2-2	White/orange/violet	26	
55	Not used.				
56	P2-78	R2-1	White/orange/grey	26	
57	P3-A1	S1-5	Coax		
58	P3-A2	S-12	Coax		
59	P3-A3	P8	Coax		
60	P3-A4	P7	Coax		
61	P3-A5	P6	Coax		
62	P3-A7	P4	Coax		
63	P3-A8	P5	Coax		
64	S1-1	S1-6	Bare	26	
65	S1-3	S1-4	Bare	26	
66	S1-2	J2	Coax		
67	S1-5	J1	Coax		
68	S1-1	P1	Coax		
69	S2-3	P2-65	White/black/violet	26	
70	Not used.				
71	S3-6	WT3	Black	26	
72	S3-5	WT2	Resistor R3		
73	Not used.				

Table 7-20. Receiver Control 1A1 Wire List – Continued

Wire Number	Origin	Termination	Color	Size (AWG)	Remarks
74	S3-4	S5A1	Brown	26	
75	S3-3	S2-1	Resistor R5		
76	S3-2	M1-1	Blue	26	
77	S4-4	S5A-12	White/black/brown	26	
78	S5A-1	S5A-7	Bare	26	
79	WT6	J4-A	White	26	
80	S5A-3	S5A-2	Bare	26	
81	S5A-4	S5A-3	Bare	26	
82	S5A-8	S5A-11	Bare	26	
83	S5A-11	S5A-12	Bare	26	
84	WT5	WT6	Resistor R6		
85	S5B-1	S5B-2	Bare	26	
86	S5B-2	S5B-4	Bare	26	
87	S5B-4	S5B-8	Bare	26	
88	S5B-6	S5B-10	Bare	26	
89	S5B-10	S5B-12	Bare	26	
90	S5B-6	S2-1	White/black/red	26	
91	Not used.				
92	S5C-1	S5C-2	Bare	26	
93	S5C-4	S5C-8	Bare	26	
94	S5C-6	S5C-10	Bare	26	
95	S5C-10	S5C-12	Bare	26	
96	Not used.				
97	S5C-2	S5C-4	Bare	26	
98	R1-3	WT3	Black	26	
99	S12-1	R1-2	Bare	26	
100	R1-3	WT3	Black	26	
101	WT2	M1-2	Bare	26	
102	WT2	WT3	Resistor R4		
103	Shield of wire 57	WT1	Bare	26	
104	Shield of wire 58	WT1	Bare	26	
105	Shield of wire 66	WT1	Bare	26	
106	Shield of wire 67	WT1	Bare	26	
107	Shield of wire 68	WT1	Bare	26	
108	S1-3	WT1	Bare	26	
109	S1-4	WT1	Bare	26	
110, 111	Not used.				
112	J3-2	WT4	Black	26	
113	DS1-1	S-2	White/green/violet	26	
114-188	Not used.				
119	J4-B	S3-4	Brown	26	
120	J4-E	A1-E5	Yellow	26	
121	J4-F	A2-E2	Green	26	
122	J4-J	WT7	Black	26	
123	A2-E3	S8-E4	Black	26	
124	A1-E1	A1-E4	Black	26	
125	A1-E4	WT-7	Black	26	
126	A1-E6	A2-E1	White/black/yellow	26	
127	S7-E4	A1-E1	Bare	26	
128	S6-E1	WT7	Black	26	
129	WT5	S7-E3	White/orange	26	
130	S6-E3	S7-E3	Bare	26	
131	S6-E3	A1-E2	Bare	26	
132	Not used.				
133	S8-E4	S9-E4	Black	26	
134	S9-E4	S10-E4	Black	26	
135	S10-E4	S11-E4	Black	26	
136	S11-E4	WT3	Black	26	

(5) Install switch boards 1A1S6, 1A1S7, and 1A1A1 (8, 9, 10) with the attaching hardware.

(6) Install the knobs on all front-panel controls.

c. Reassembly of Preselector 1A2 (fig. FO-19).

(1) Install filters, terminals, and connectors, as required, with the attaching hardware.

NOTE

Refer to table 7-21 for 1A2 wiring details.

(2) Remove tags and reconnect wiring to the components installed in step (1).

(3) Install switch 1A2S1 (20) and subassembly 1A2MP2 (22) with the attaching hardware.

(4) Remove tags and reconnect wiring to 1A2S1.

(5) Install subassemblies 1A2A1 through 1A2A8 (1, 4, 5, 6, 9, 12, 15, 16), as required, with the attaching hardware.

(6) Remove tags and reconnect wiring to 1A2A1 through 1A2A8.

(7) Install six cover plates (2, 7, 10, 13, 17, 21) on the preselector with the attaching hardware.

d. Reassembly of Subassemblies 1A4 *through 1A8.*

Refer to paragraph 7-8 for reassembly of 1A4 through 1A8.

Table 7-21. Preselector 1A2 Wire List

Wire Number	Origin	Termination	Color	Size (AWG)	Remarks
1	1A2P1-A	1A2FL1-1	White	26	Twisted with wire 84; 5/16 inch of sleeving req.
2	1A2P1-B	1A2FL10-1	Brown	26	Twisted with wire 83; 5/16 inch of sleeving req.
3	1A2P1-C	1A2FL9-1	Orange	26	Twisted with wire 8, 5/16 inch of sleeving req.
4	1A2P1-D	1A2FL7-1	Blue	26	Twisted with wire 85; 5/16 inch of sleeving req.
5	1A2P1-E	1A2FL5-1	Yellow	26	Twisted with wire 86; 5/16 inch of sleeving req.
6	1A2P1-F	1A2FL14-1	Green	26	Twisted with wire 87; 5/16 inch of sleeving req.
7	1A2P1-H	1A2FL6-1	White/brown/red	26	Twisted with wire 88; 5/16 inch of sleeving req.
8	1A2P1-J	1A2WT10	Black	26	Twisted with wire 3; 5/16 inch of sleeving req.
9	1A2FL11-1	1A2FL10-1	Brown	26	
10	1A2FL11-1	1A2FL8-1	Brown	26	
11	1A2FL8-1	1A2FL2-1	Brown	26	Twisted with wire 78.
12	1A2FL12-1	1A2FL9-1	Orange	26	Twisted with wire 81.
13	1A2FL7-1	1A2FL4-1	Blue	26	Twisted with wire 79.
14	1A2FL4-1	1A2FL13-1	Blue	26	Twisted with wire 80.
15	1A2FL5-1	1A2FL3-1	Yellow	26	Twisted with wire 82.
16	1A2A1-E1	1A2A7-E7	Coax		
17	1A2A1-E2	1A2FL2-2	Brown	26	
18	1A2A1-E3	1A2FL2-3	Yellow	26	
19	1A2A1-E4	1A2FL4-2	Blue	26	
20	1A2A1-E5	1A2J1	White	26	
21	1A2A1-E6	1A2WT6	Black	26	
22	1A2A1-E7	1A2A3-E1	Bare	26	
23	1A2A2-E1	1A2FL10-2	Brown	26	
24	1A2A2-E2	1A2A5-E7	Brown	26	
25	1A2A6-E1	1A2J7	White	26	
26	1A2A3-E2	1A2J5	White	26	
27	1A2A3-E3	1A2FL11-2	Brown	26	
28	1A2A3-E4	1A2WT7	Black	26	
29	1A2A3-E5	1A2J4	Violet	26	
30	Not used.				
31	1A2A6-E2	1A2S1-E9	Violet	26	
32	1A2A6-E3	1A2S1-E8	White/black/blue	26	
33	1A2A6-E4	1A2S1-E7	White/black/violet	26	
34	1A2A6-E5	1A2S1-E6	White/black/grey	26	
35	1A2A6-E7	1A2A8-E8	White/black/blue	26	
36	1A2A6-E6	1A2A9-E7	White/black/violet	26	
37	1A2A6-E8	1A2A9-E9	White/black/grey	26	
38	1A2A5-E1	1A2J2	Violet	26	
39	1A2A5-E2	1A2J3	White	26	

Table 7-21. Preselector 1A2 Wire List - Continued

Wire Number	Origin	Termination	Color	Size (AWG)	Remarks
40	1A2A5-E3	1A2WT-11	Black	26	
41	1A2A5-E4	1A2FL13-2	Blue	26	
42	1A2A5-E5	1A2FL14-2	Green	26	
43	1A2A5-E6	1A2FL12-2	Orange	26	
44	Not used.				
45	1A2A4-E1	1A2S1-E3	White/black/brown	26	
46	1A2A4-E2	1A2S1-E2	White/black/red	26	
47	1A2A4-E3	1A2S1-E4	White/black/orange	26	
48	1A2A4-E4	1A2S1-E1	White/black/yellow	26	
49	1A2A4-E5	1A2S1-E5	White/black/green	26	
50	1A2A4-E6	1A2A9-E5	White/black/brown	26	
51	1A2A4-E7	1A2A9-E4	White/black/red	26	
52	1A2A4-E8	1A2A9-E3	White/black/orange	26	
53	1A2A4-E9	1A2A9-E2	White/black/yellow	26	
54	1A2A4-E10	1A2A9-E1	White/black/green	26	
55	1A2A7-E1	1A2WT17	Coax		Shield connected to 1A2WT3.
56	1A2A7-E2	1A2A8-E4	Bare	26	½ inch of sleeving req.
57	1A2A7-E3	1A2FL5-2	Yellow	26	
58	1A2A7-E4	1A2A8-E8	Coax		Shield connected to 1A2A8 ground plane.
59	1A2A7-E5	1A2WT5	Black	26	
60	1A2A7-E6	1A2FL1-2	White	26	
61	Not used.				
62	1A2A8-E1	1A2A2-E3	Brown	26	
63	1A2A8-E2	1A2FL8-2	Brown	26	
64	1A2A8-E3	1A2FL9-2	Orange	26	
65	Not used.				
66	1A2A8-E5	1A2FL7-2	Blue	26	
67	1A2A8-E6	1A2FL6-2	White/brown/red	26	
68	1A2A8-E7	1A2J6	Coax		
69	1A2A8-E9	1A2WT4	Black	26	
70 and 71	Not used.				
72	1A2A6-E10	WT1	Black	26	
73	1A2A6-E9	1A2WT2	Black	26	
74	1A2A4-E11	1A2WT3	Black	26	
75	1A2A2-E4	1A2WT8	Black	26	
76	1A2A4-E12	1A2WT9	Black	26	
77	1A2E1	1A2A9-E6	White	26	
78	1A2WT13	1A2WT14	Black	26	Twisted with wire 11.
79	1A2WT12	1A2WT14	Black	26	Twisted with wire 13.
80	1A2WT12	1A2WT11	Black	26	Twisted with wire 14.
81	1A2WT10	1A2WT15	Black	26	Twisted with wire 12.
82	1A2WT13	1A2WT15	Black	26	Twisted with wire 15.
83	1A2WT16	1A2WT14	Black	26	Twisted with wire 2.
84	1A2WT16	1A2WT13	Black	26	Twisted with wire 1.
85	1A2WT16	1A2WT15	Black	26	Twisted with wire 4.
86	1A2WT16	1A2WT15	Black	26	Twisted with wire 5.
87	1A2WT15	1A2WT16	Black	26	Twisted with wire 6.
88	1A2WT16	1A2WT15	Black	26	Twisted with wire 7.

e. Reassembly of Lower Supply 1A9 (fig. 7-11).

(1) Install components on TB1 and TB2 per paragraph *7-8b.*

(2) Remove tags and reconnect wiring as required (fig. FO-14).

(3) Install the three screws securing the two circuit cards.

(4) Install the power supply cover with the four attaching screws.

f. Reassembly of Housing Assembly (fig. FO-15).

NOTE

Refer to table 7-22 for housing assembly wiring details.

(1) Remove tags and connect wiring to TB2 (37), J1 (39), J2 (38), and terminals WT5 through WT8 (40, 41, 42, 43), as required.

(2) Install TB2 (37), J1 (39), J2 (38), WT5 through WT8, (40, 41, 42 43) and the wiring harness in the housing with the attaching hardware.

(3) Install FL1 through FL3 (33, 34, 35) and C1 (36) with the attaching hardware.

(4) Remove tags and reconnect wiring to FL1 through FL3 (33, 34, 35) and C1 (36).

(5) Install cover (31) with the four attaching screws (32).

(6) Install components on TB1 (45), as required, per paragraph *7-8b.*

Table 7-22. Housing Assembly 1MP1 Wire List

Wire Number	Origin	Termination	Color	Size (AWG)	Remarks
1	E2	J2-A8	Coax		
2	E3	J1-64	White/yellow/green	26	
3	E7	J-6	White/brown/orange	26	
4	E5	J1-45	White/black/brown	26	
5	E6	J1-44	White/green/violet	26	
6	E4	J1-5	White/black/violet	26	
7	E8	J1-43	White/black/orange	26	
8	E9	J1-4	White/black/brown	26	
9	E10	J1-63	White/black/yellow	26	
10	E11	J1-42	White/yellow/violet	26	
11	E12	J1-61	White/red/green	26	
12	E13	J1-2	White/red/orange	26	
13	E14	J1-21	White/brown/orange	26	
14	E15	J1-22	White/red/green	26	
15	E16	J1-60	White/brown/green	26	
16	E17	J1-40	White/brown/yellow	26	
17	E19	J2-A5	Coax		
18	E20	J1-3	White/yellow/green	26	
19	E21	J1-24	White/black/red	26	
20	E22	J1-62	White/yellow/grey	26	
21	E23	J1-41	White/red/blue	26	
22	E24	J1-23	White/yellow/blue	26	
23	E27	J2-A3	Coax		
24	Wire 23 shield	E25	Bare	26	
25	E26	J1-1	White/brown/red	26	
26	Wire 27 shield	E28	Bare	26	
27	E29	J2-A4	Coax		
28	Wire 29 shield	E31	Bare	26	
29	E30	J15	Coax		
30	E32	J1-69	White/yellow/green	26	
31	E32	J10-1	Coax		
32	Wire 31 shield	J10-2	Bare	26	
33	Wire 31 shield	E33	Bare	26	
34	E38	J1-58	White/brown/grey	26	
35	E35	J1-59	White/orange/green	26	
36	E36	J1-56	White/brown/blue	26	
37	E38	J1-76	White/orange/violet	26	
38	E37	J1-78	White/orange/grey	26	
39	E43	J1-57	White/brown/violet	26	
40	E44	J1-77	White/green/grey	26	
41	E41	J14	Coax		
42	Wire 41 shield	E42	Bare	26	
43	E45	J1-74	White/green/blue	26	
44	E46	J1-75	White/brown/red	26	
45	E47	J1-7	White/brown/red	26	

Table 7-22. Housing Assembly 1MP1 Wire List –Continued

Wire Number	Origin	Termination	Color	Size (AWG)	Remarks
46	E39	J13	Coax		
47	Wire 46 shield	E40	Bare	26	
48	E49	J1-31	White/green/violet	26	
49	E52	J1-34	White/yellow/blue	26	
50	E48	J1-30	White/green/blue	26	
51	E51	J1-33	White/red/green	26	
52	E50	J1-32	White/green/grey	26	
53	E54	J2-A7	Coax		
54	Wire 53 Shield	E53	Bare	26	
55	E55	1A9E9	Brown	26	
56	E56	1A9E3	White	26	
57	E57	1A9E4	Orange	26	
58	E58	J1-37	Brown	26	Twisted with wire 61.
59	E59	J1-39	Grey	26	Twisted with wire 62.
60	E60	J1-9	Orange	26	Twisted with wire 63.
61	E61	J1-36	Black	26	Twisted with wire 58.
62	E62	J1-38	Black	26	Twisted with wire 59.
63	E63	J1-10	Black	26	Twisted with wire 60.
64	1A9E1	J1-11	Blue	26	Twisted with wire 70.
65	1A9E2	WT5	Black	26	
66	1A9E5	J1-15	White/black/red	26	Twisted with wire 71.
67	1A9E6	J1-19	White/black/violet	26	Twisted with wire 72.
68	1A9E8	WT5	Black	26	
69	1A9E1	J1-25	Blue	26	Twisted with wire 73.
70	WT6	J1-12	Black	26	Twisted with wire 64.
71	WT6	J1-16	Black	26	Twisted with wire 66.
72	WT6	J1-20	Black	26	Twisted with wire 67.
73	WT6	J1-26	Black	26	Twisted with wire 69.
74	F1-2	CR6-C	Red	26	
75	F1-2	FL1-1	Red	26	
76	TB1-1	TB1-5	Diode CR1		Cathode to TB1-5
77	TB1-1	TB1-6	Diode CR2		Cathode to TB1-1
78	TB1-2	TB1-6	Diode CR3		Cathode to TB1-2
79	TB1-2	TB1-7	Diode CR4		Cathode to TB1-7
80	TB1-3	TB1-7	Diode CR5		Cathode to TB1-7
81	TB1-4	TB1-8	Resistor R1		
82	TB1-1	T1-4	Bare	22	
83	TB1-2	T1-5	Bare	22	
84	J16-A	TB1-3	Red	26	
85	J16-B	WT4	Black	26	
86	J16-D	T1-2	Green	22	
87	J16-E	T1-3	White	22	
88	J16-F	T1-1	Blue	22	
89	J12	J2-A2	Coax		
90	J11	J2-A1	Coax		
91	WT3	TB1-6	Bare	24	
92	S1-1	WT-2	White/brown/red	26	
93	S1-2	FL2-1	Violet	26	
94	S1-3	FL3-1	Grey	26	
95 and 96	Not used.				
97	J1-13	FL2-2	Violet	26	Twisted with wire 98.
98	J1-14	WT1	Black	26	Twisted with wire 97.
99	J1-17	FL1-2	Red	26	Twisted with wire 100.
100	J1-18	WT1	Black	26	Twisted with wire 99.
101	FL3-2	1A9E7	Grey	26	Twisted with wire 102.
102	WT5	WT1	Black	26	Twisted with wire 101.
103	TB1-4	TB1-6	Yellow	26	
104	TB1-5	TB1-7	Yellow	26	
105	TB1-4	C1(–)	Black	26	
106	C1(–)	WT1	Black	26	
107	L1-1	TB1-5	Red	24	
108	L1-2	C1(+)	Brown	24	

Table 7-22. Housing Assembly 1MP1 Wire List-Continued

Wire Number	Origin	Termination	Color	Size (AWG	Remarks
109	C1(+)	TB1-8	Brown	26	
110	Not used.				
111	Wire 1 shield	E1	Bare	26	
112	WT5	J1-55	Black	26	
113	Wire 17 shield	E18	Bare	26	
114	WT7	WT8	Resistor R2		
115	J1-65	WT7	White/black/violet	26	
116	WT8	1A9E6	White/black/violet	26	
117	TB1-8	F1-1	Red	26	

(7) Install T1 (47), TB1 (45), CR6 (51), and L1 (48) with the attaching hardware (48, 46, 52, 50).

(8) Remove tags and reconnect wiring to T1 (47), TB1 (45), CR6 (51), and L1 (49).

(9) Install components on the rear panel (29) with the attaching hardware.

(10) Remove tags and connect wiring to the rear-panel components.

(11) Complete assembly of the receiver per paragraph 6-9.

Section iV. SUBASSEMBLY TESTING

7-10. General

This section contains testing procedures for the various receiver subassemblies. Adjustment instructions for the subassemblies are also provided. These procedures are used in conjunction with the troubleshooting charts (section II) to isolate a fault within the subassemblies. Also, the proper functioning of the subassemblies after repair can be varified using these procedures.

7-11. 1A1 Testing

Refer to paragraph 6-14 to test control assembly 1A1.

7-12. Rotary Switch 1A1A1 Voltage and Resistance Tests

a. Voltage Checks.

(1) Connect the test equipment as shown in figure 7-12, detail A.

(2) Set the power supply for an output voltage of 46.860 volts dc.

(3) Rotate the switch rotor counterclockwise through each position and read the voltage on the differential voltmeter. The results should agree with table 7-23.

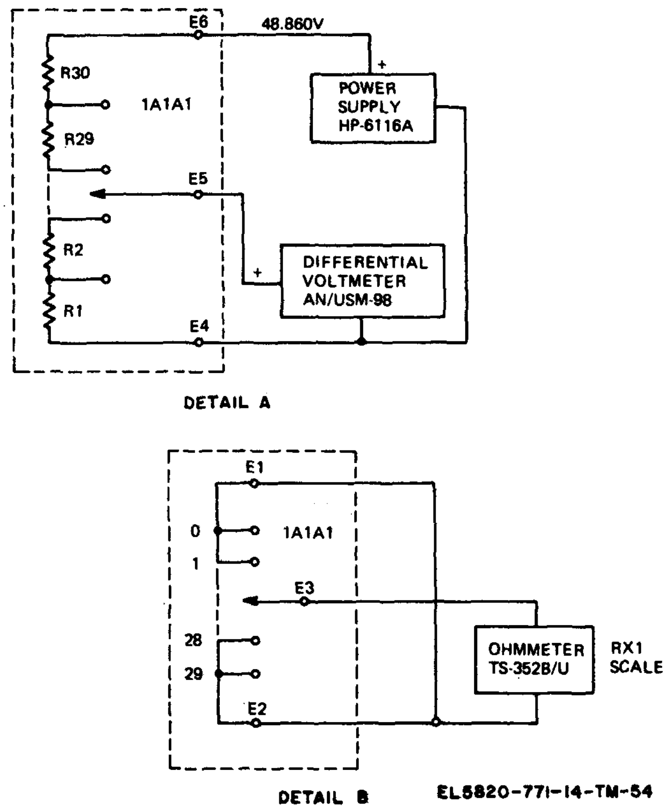


Figure 7-12. 1A1A1 test connections.

Table 7-23. 1A1A1 Voltage Tests

Nominal (v)		*Minimum (v)*	*Maximum (v)*
R30	46.860	46.860	46.860
29	44.500	44.450	44.550
28	42.280	42.230	42.330
27	40.180	40.130	40.230
26	38.190	38.140	38.240
25	36.310	36.260	36.360
24	34.530	34.480	34.580
23	32.840	32.790	32.890
22	31.230	31.180	31.280
21	29.700	29.650	29.750
20	28.240	28.190	28.290
19	26.840	26.790	26.890
18	25.520	25.470	25.570
17	24.260	24.210	24.310
16	23.050	23.000	23.100
15	21.900	21.850	21.950
14	20.790	20.740	20.840
13	19.730	19.680	19.780
12	18.720	18.670	18.770
11	17.760	17.710	17.810
10	16.850	16.800	16.900
9	15.970	15.920	16.020
8	15.140	15.090	15.190
7	14.350	14.300	14.400
6	13.590	13.540	13.640
5	12.860	12.810	12.910
4	12.170	12.120	12.220
3	11.510	11.460	11.560
2	10.870	10.820	10.920
1	10.260	10.210	10.310

(4) Disconnect the test setup.

b. Resistance Checks.

(1) Connect the ohmmeter to the switch as shown in figure 7-12 detail B.

(2) Set the ohmmeter to the RX1 scale.

(3) Rotate the switch counterclockwise through each position and check for intermittent contact each time.

(4) Disconnect the test setup.

7-13. Receiver Control 1A1A2 Mechanical and Electrical Testing

(fig. 7-13)

a. Mechanical Tests.

(1) Check the full rotation and stops for the MHz shaft. In the extreme counterclockwise position of the MHz shaft, a stop on the shaft locks against pin "B", preventing further rotation. Dials 6 and 5 should show 00 in viewing position "A". In the extreme clockwise position, the MHz shaft again locks against pin "B" and dials 6 and 5 should show 29 in the viewing position "A".

(2) Turn the kHz shaft to rotate dial 1 through all digits from 1 to 0 in viewing position A. When 0 appears on dial 1, the next number on dial 2 must change in unison with the 0 on dial 1.

(3) Repeat step (2) for dials 2 and 3.

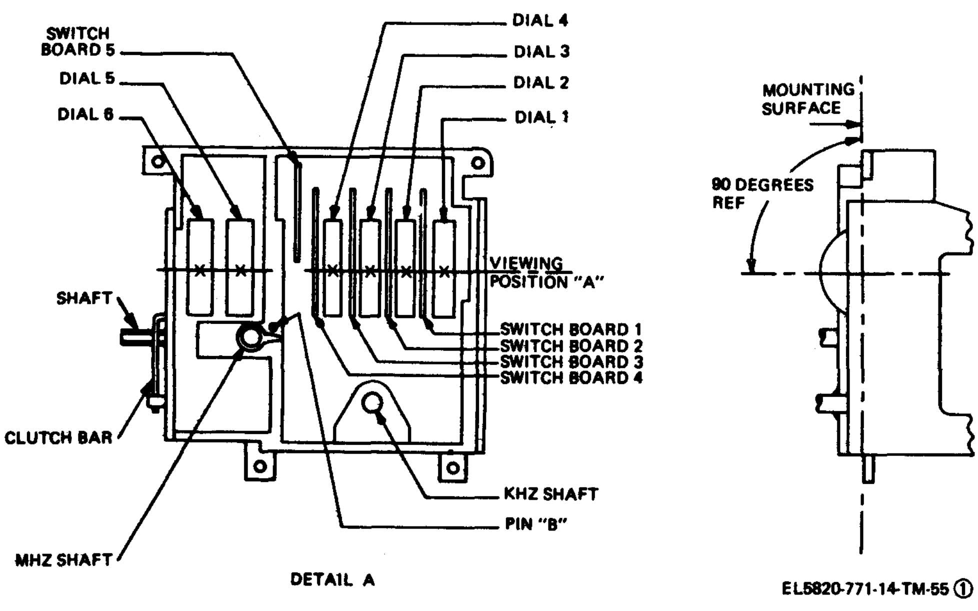


Figure 7-13①. 1A1A2 test diagram (sheet 1 of 2).

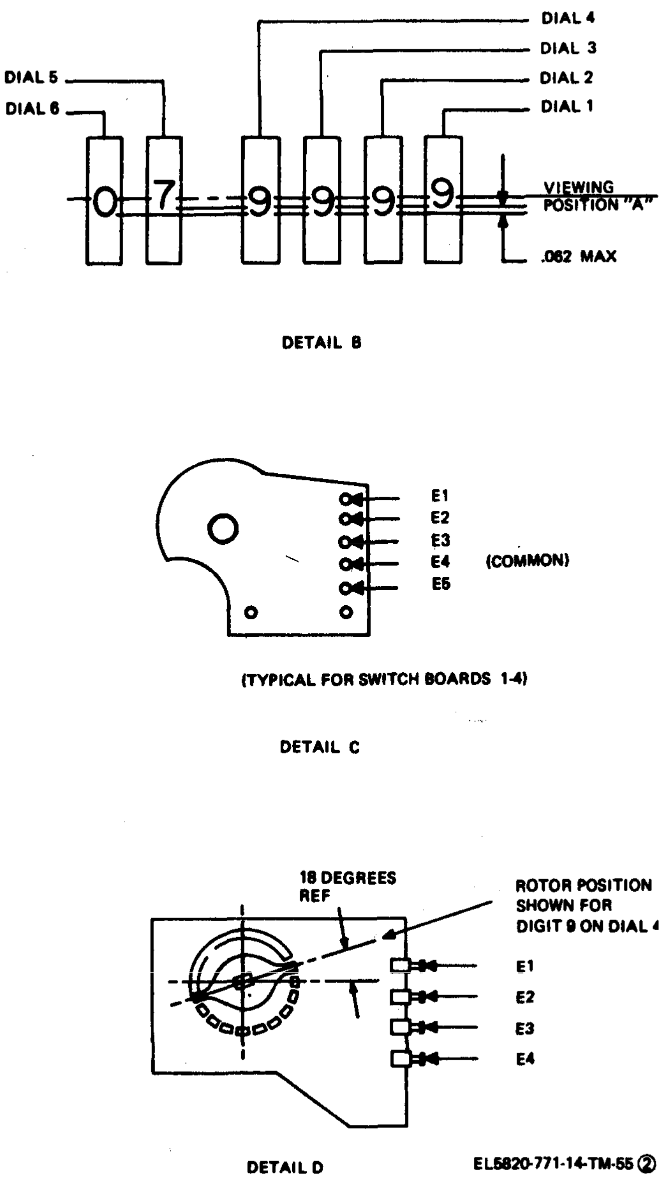


Figure 7-13②1A1A2 test diagram (sheet 2 of 2).

(4) Repeat step (2) for dials 3 and 4.

(5) Turn the MHz shaft to rotate dial 5 through all digits from 1 to 0 in viewing position A. When 0 appears on dial 5, the next number on dial 6 must change in unison with the 0 on dial 5.

(6) Depress the clutch bar and lock dial 1 while turning the kHz shaft slightly. The backlash between dials 1 and 2 should be no more than 4.9 degrees.

(7) Hold dial 2 and rotate the kHz shaft slightly. The backlash between dials 2 and 3 should be no more than 1.5 degrees.

(8) Repeat step (7) for dials 3 and 4.

(9) Hold dial 5 and rotate the MHz shaft slightly. The backlash between dials 5 and 6 should be no more than 1.5 degrees.

(10) Set the MHz and kHz shafts for a frequency of 07.9999 in viewing position A. The maximum misalignment of the dials should be as shown in figure 7-13, detail B.

b. Electrical Tests.

(1) Connect one lead of an ohmmeter to terminal E4 of switch board 1 (see fig. 7-13, details A and C).

(2) Engage the clutch and rotate the kHz shaft to rotate dial 1 from 0 to 9. At each dial position, check continuity between E4 and E1, E2, E3, and E5. The results should agree with those shown in table 7-20.

(3) Move the ohmmeter lead to terminal E4 of switch board 2.

(4) Disengage the clutch and rotate the kHz shaft to rotate dial 2 from 0 to 9. At each dial position, check continuity between E4 and E1, E2, E3, and E5. The results should agree with those shown in table 7-24.

(5) Move the ohmmeter lead to terminal E4 of switch board 3.

(6) Repeat step (4) for dial 3.

(7) Move the ohmmeter lead to terminal E4 of switch board 4.

(8) Repeat step (4) for dial 4.

(9) Disconnect the ohmmeter from switch board 4.

(10) Connect the ohmmeter to switch board 5 terminals indicated in table 7-25 (see fig. 7-13, details A and D for terminal locations).

(11) Rotate the kHz shaft to rotate dial 4 from 0 to 9. At each dial position, measure the resistance at switch board 5 terminals as indicated in table 7-25.

(12) Disconnect the ohmmeter.

7-14. 1A2 Alignment and Testing

(fig. 7-14 through 7-20).

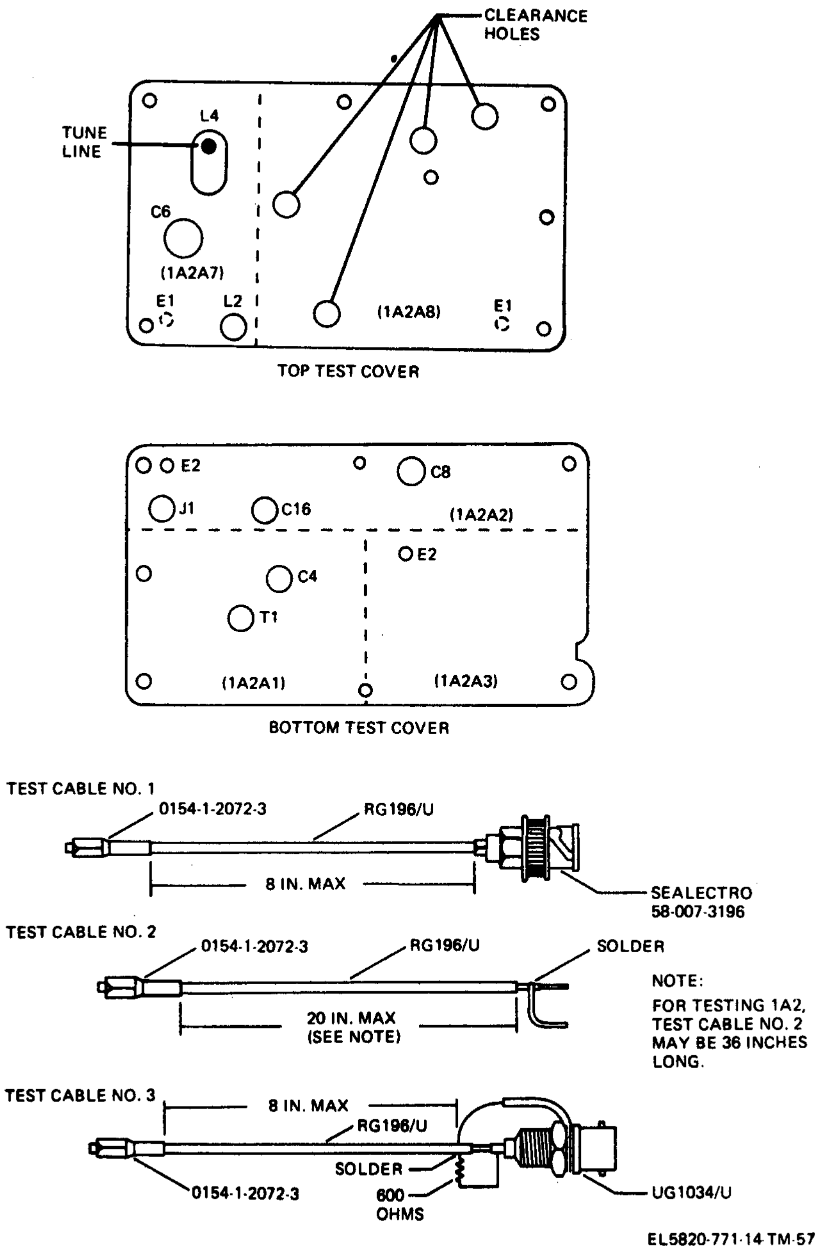


Figure 7-14. 1A2 special test fixtures.

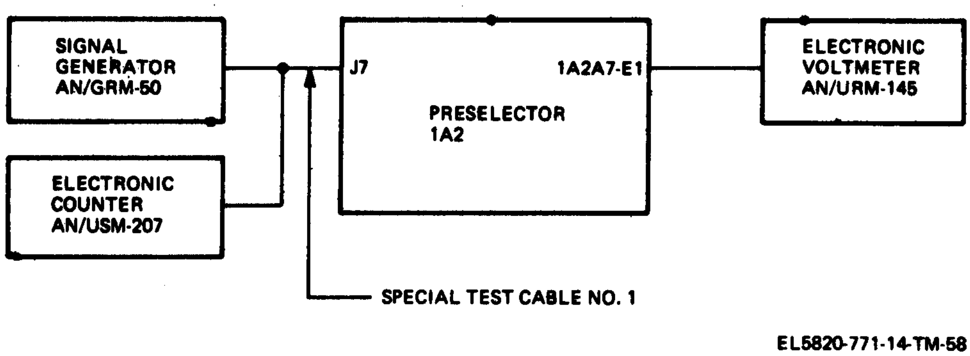


Figure 7-15. 1A2 bandwidth and filter test connections.

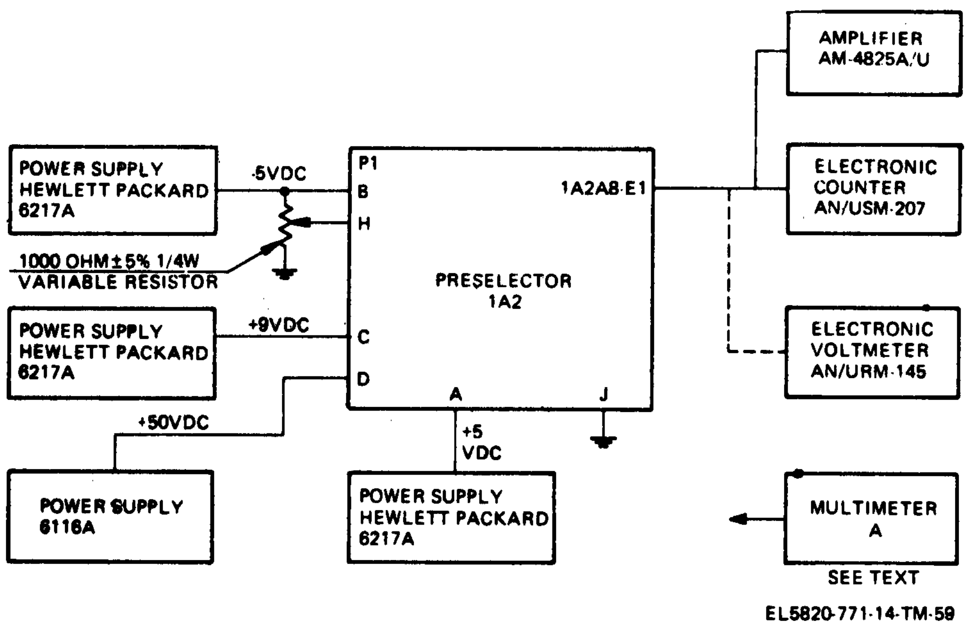


Figure 7-16. Preselector 1A2 160-MHz oscillator test connections.

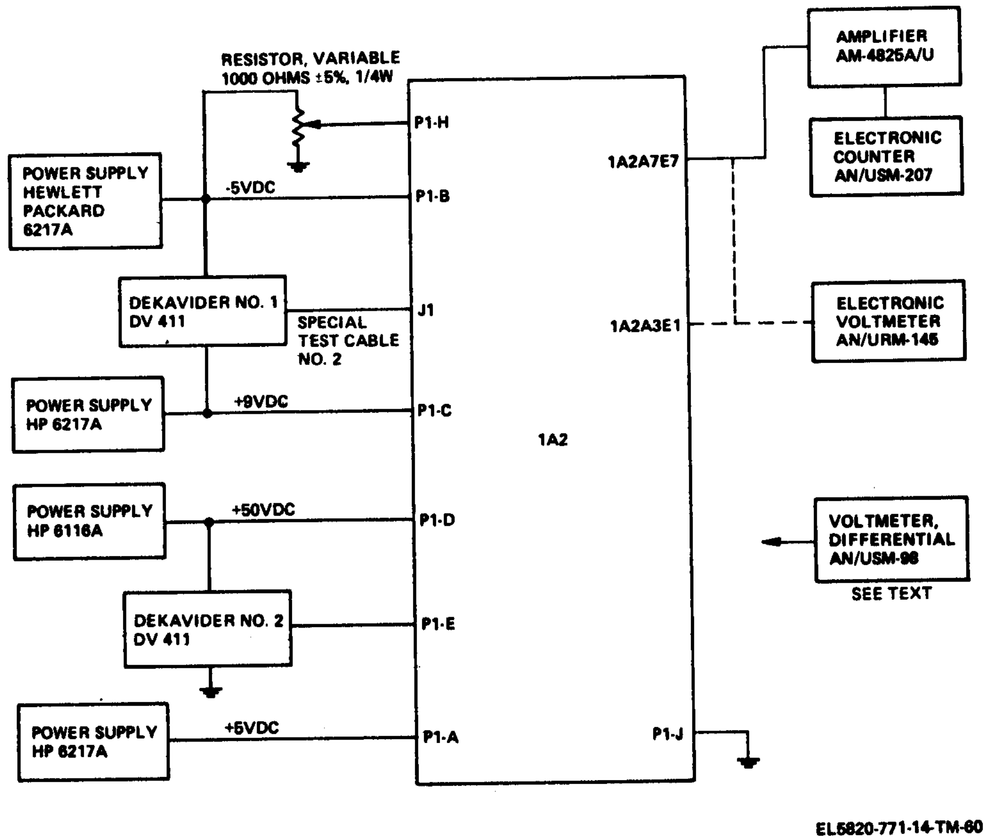


Figure 7-17. Preselector 1A2 high-frequency vfo test connections.

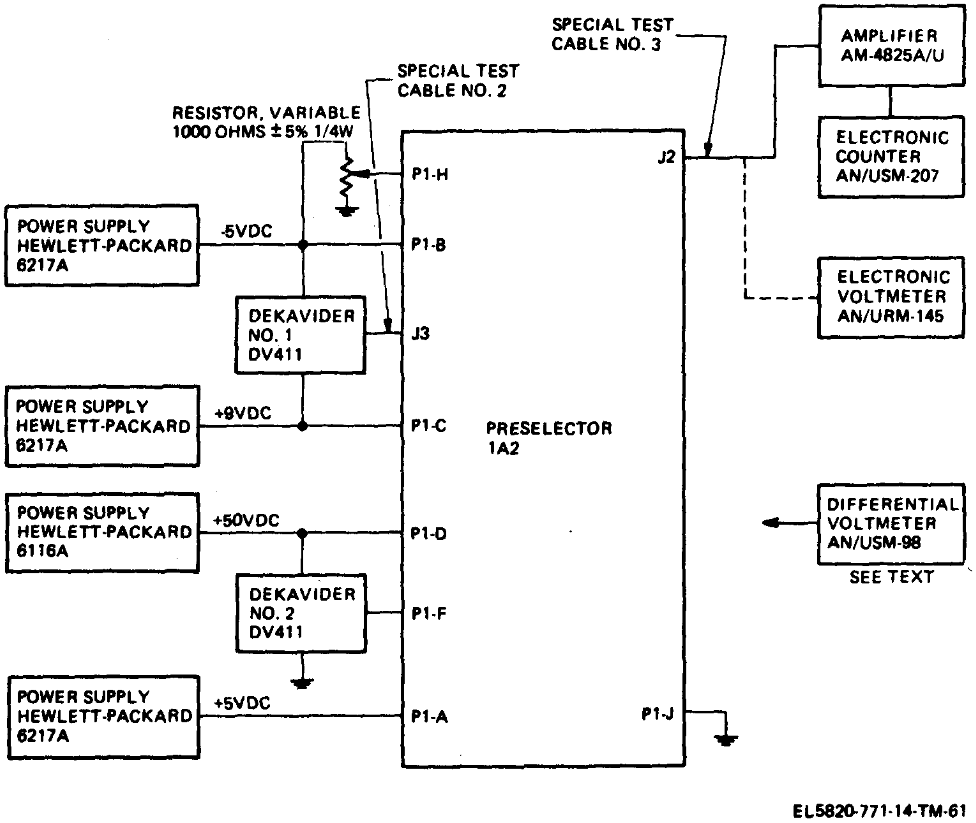


Figure 7-18. Preselector 1A2 low-frequency vfo test connections.

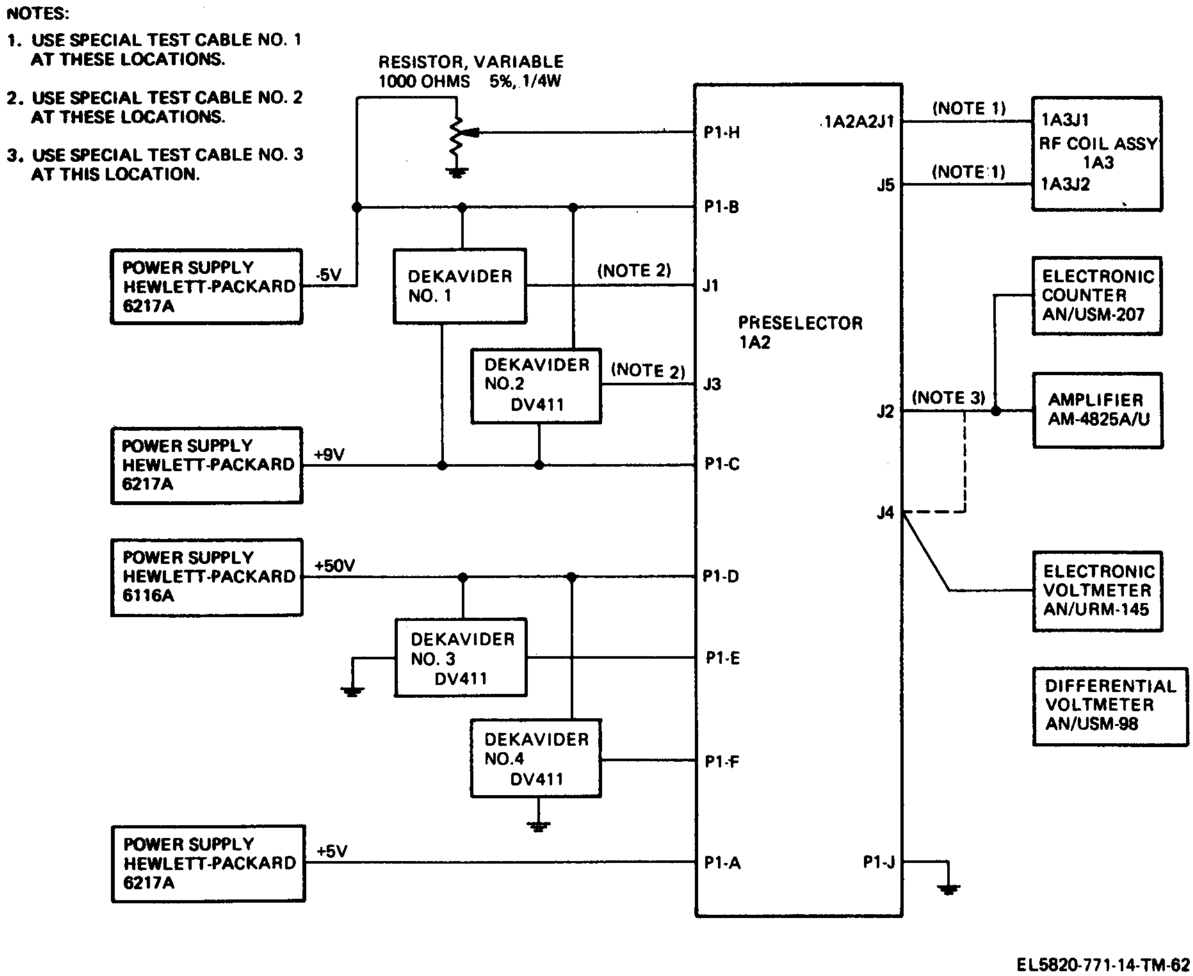


Figure 7-19. 1A2 combined function test connections.

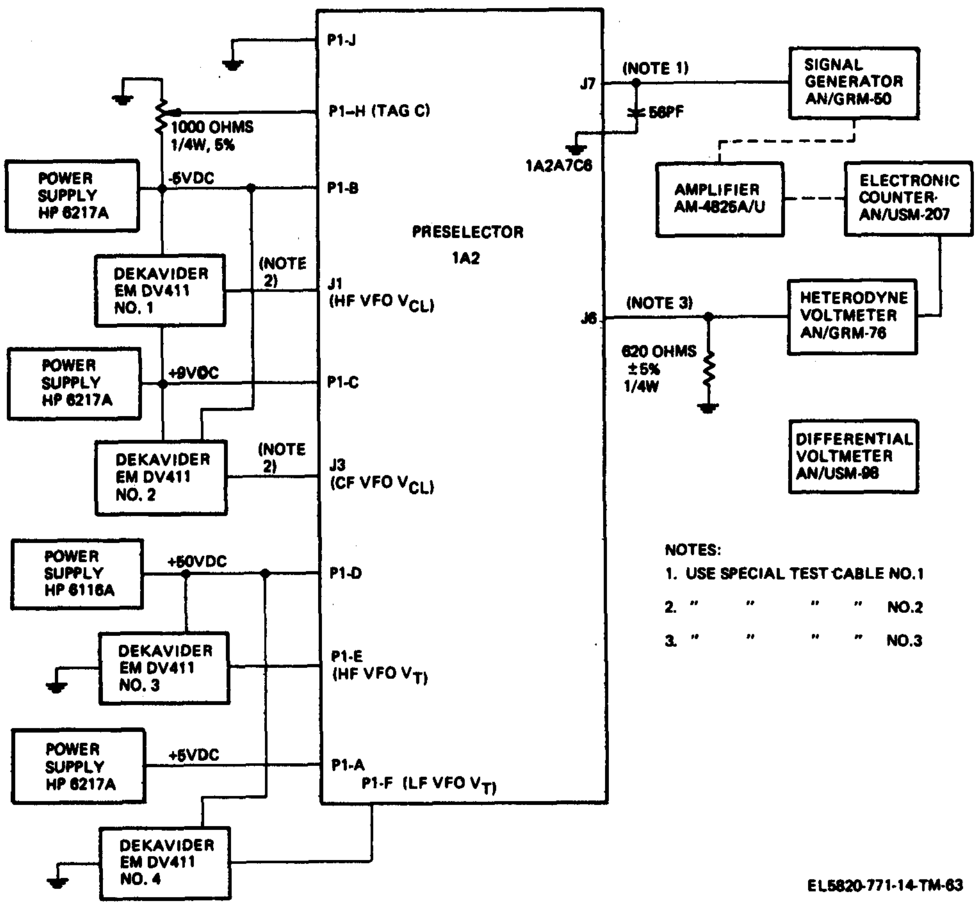


Figure 7-20. 1A2 test connections for tracking, gain, sensitivity, and agc tests.

Table 7-24. 1A1A2 Continuity Checks

Note: X Indicates continuity between terminal shown and E4 Indicates open circuit.

Dial No.	Terminal E1	E2	E3	E5
0	-	-	-	-
1	-	-	X	-
2	-	X	-	-
3	-	X	X	-
4	X	-	-	-
5	X	-	X	-
6	X	X	-	-
7	X	X	X	-
8	-	-	-	X
9	-	-	X	X

a. General. The procedures given here are used to test preselector 1A2 while it is removed from the receiver. Refer to paragraph 6-16 for testing the dc input, control line and tuning voltages, rf input, and if output of the preselector while it is installed in the receiver. Before performing any tests of 1A2, remove the top and bottom covers. Install the two test covers as directed in the following procedures. Special test fixtures are shown in figure 7-21.

NOTE

Test cable No. 2 is 20 inches long for all uses except control line voltage connection. When used for control line voltage connection (to 1A2J1 or 1A2J3), this cable may be up to 36 inches long,

b. Testing of Bandswitches and Filters.

NOTE

In the following procedures, position the bandswitches by rotating the gear at the center of the preselector. Position 1 is selected when the hole in the gear is centered directly away from the preselector cover. Other positions are located by referring to the numbers stamped on the gear and setting the desired switch position directly away from the cover.

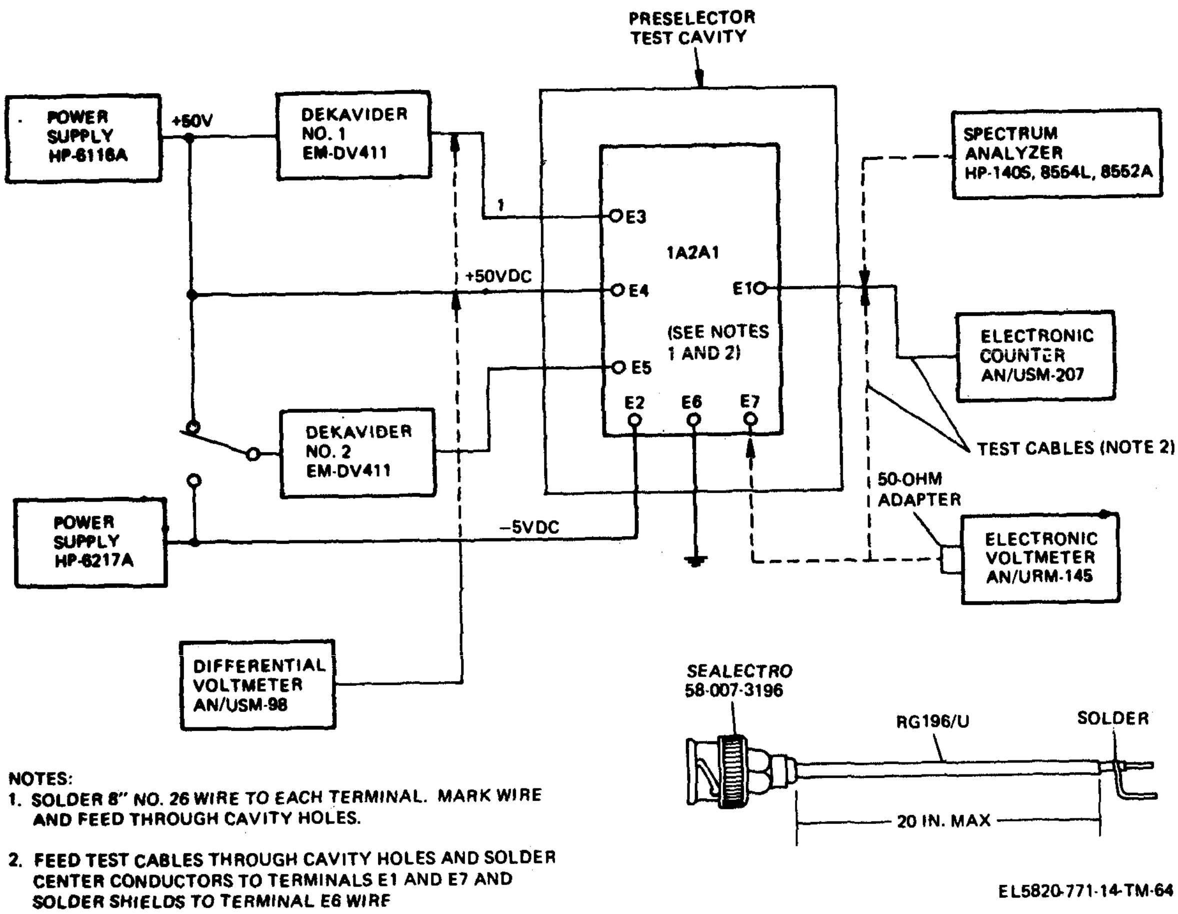


Figure 7-21. RF oscillator 1A2A1 test connections.

Table 7-25. 1A1A2 Resistance Checks

100kHz dial (4) No.	Resistance in ohms	Measure between terminals
0	9.05 k	E2 & E4
1	51.80 k	
2	85.70 k	
3	113.10 k	
4	135.15 k	
5	153.25 k	
6	168.20 k	
7	180.25 k	
8	190.70 k	
9	199.55 k	E2 & E4
9	50.00 k	E2 & E3
0	1690	El & E4
1	1980	
2	2270	

Table 7-25. 1A1A2 Resistance Checks - Continued

100 kHz dial (4) No.	Resistance in ohms	Measure between terminals
3	2560	
4	2850	
5	3140	
6	3430	
7	3720	
8	4010	
9	4300	E1 & E4

(1) Connect the test equipment as shown in figure 7-15 and apply power to the test equipment. No power is applied to the preselector for these checks.

(2) Set the bandswitches to each position listed in table 7-26. At each position, set the signal generator to the frequency specified in the FREQUENCY column of the table at a level of 0 db. The minimum output voltage (indicated on the electronic voltmeter) should be as shown in table 7-26.

c. 160 MHz Oscillator Tests.

(1) Connect the test equipment as shown in figure 7-16 and apply power to the test equipment. Do not install the test covers.

(2) Connect the multimeter between 1A2P1-H (–) and ground (+).

(3) Adjust the 1,000-ohm variable resistor to obtain a 2.6 volt tagc reading on the multimeter.

(4) Connect the electronic voltmeter between 1A2A8-E1 (fig. 7-14) and ground.

(5) Read the 160 MHz oscillator output level on the electronic voltmeter. A level of 0.016 vrms should be obtained.

Table 7-26. Preselector 1A2 Bandswitch and Filter Test Parameters

Bandswitch position	*Frequency (MHz)*	*Output voltage*
1	0.7	2.00
2	1.7	1.50
3	2.7	1.80
4	3.7	1.00
5	4.7	0.90
6	5.7	1.00
9	8.7	1.10
10	9.7	0.50
15	14.7	0.40
16	15.7	0.50
22	21.7	0.35
23	22.7	0.30
30	29.7	0.07

(6) Connect the counter to *1A2A8-E1* and read the 160 MHz oscillator frequency on the counter. A frequency of 160.0 MHz +3. -2 kHz should be obtained. If the oscillator frequency is out of tolerance, refer to paragraph 7-16 for adjustment procedures.

(7) Disconnect the test equipment.

d. High-Frequency Vfo Tests.

(1) Connect the test equipment as shown in figure 7-17 and apply power to the test equipment. Remove the covers from the preselector. Install the bottom test cover.

(2) Connect the differential voltmeter positive lead to 1A2P1-H and negative lead to ground.

(3) Adjust the 1000-ohm variable resist or to obtain a - 2.6 volt tagc reading on the differential voltmeter.

(4) Connect the differential voltmeter probe to the output of dekavider number 1.

(5) Adjust dekavider number 1 to obtain a reading (control line voltage of +3.000 ± 0.005 vdc on the differential voltmeter.

(6) Connect the differential voltmeter probe to dekavider number 2.

(7) Adjust dekavider number 2 (tuning voltage) for each of the following voltages, as indicated on the differential voltmeter. For each voltage read the corresponding output frequency at 1A2A7-E7 on the electronic counter.

Tuning Voltage	*Frequency*
10.260	190.045 MHz ± 40 kHz
21.900	144.045 MHz ± 150 kHz
46.860	159.045 MHz ± 60 kHz

(8) If the vfo frequencies are incorrect, adjust 1A2A1T1 (figure 7-2) for 130.045 MHz and 1A2A1C4 for 159.045 MHz.

(9) Reset dekavider number 2 for 10.260 volts and a corresponding counter frequency of 130.045 MHz ± 40 kHz.

(10) Disconnect the electronic counter from 1A2A7-E7.

(11) Connect the probe of the electronic voltmeter to 1A2A7-E7. A signal level of 150 millivolts minimum should be indicated at this point.

(12) Move the probe of the electronic voltmeter to 1A2A3-E1. A signal level of at least 190 millivolts should be indicated at this point.

(13) Disconnect the test equipment. Remove the test cover and reinstall the normal preselector covers with the attaching screws.

e. Low-Frequency Vfo Tests.

(1) Connect the test equipment as shown in figure 7-18 and apply power to the test equipment.

(2) Adjust the tagc voltage as described in steps d (2) and (3) above.

(3) Connect the differential voltmeter probe to the output of dekavider number 1.

(4) Adjust dekavider number 1 (control line voltage) for +3.5 volts at J3 as indicated on the differential voltmeter.

(5) Connect the differential voltmeter probe to 1A2P1-F.

(6) Adjust dekavider number 2 (tuning voltage) for each of the following voltages, as indicated on the differential voltmeter. For each voltage read the corresponding output frequency at 1A2J2 on the electronic counter.

Tuning Voltage	*Frequency*
10.00 vdc	5.595 MHz ± 10 kHz
27.38 vdc	6.195 MHz ± 10 kHz
48.19 vdc	6.495 MHz ± 10 kHz

(7) Move the differential voltmeter probe to the output of dekavider number 1.

(8) Adjust dekavider number 1 to obtain a frequency of 6.445 MHz on the electronic counter. The differential voltmeter should indicate a control line voltage of +4.7 ± 0.3 volts.

(9) Adjust dekavider number 2 (for 10.00 vdc) to produce a frequency of 5.595 MHz as indicated on the electronic counter.

(10) Disconnect the electronic counter and connect the electronic voltmeter to 1A2J2. A low-frequency vfo output level of 12 millivolts minimum should be indicated on the electronic voltmeter.

(11) Disconnect the test equipment.

f. Combined Function Tests.

NOTE

The procedures given in this subparagraph are used to test the combined functions of 1A2A1, 1A2A2, 1A2A3, 1A2A5, and 1A3.

(1) Install rf coil assembly 1A3 on the preselector. (Refer to para 6-9 and fig. 6-1).

(2) Connect the test equipment as shown in figure 7-19 and apply power to the test equipment.

(3) Connect the differential voltmeter probe to 1A2P1-F.

(4) Adjust dekavider number 4 for 19.35 volts, as indicated on the differential voltmeter.

(5) Move the differential voltmeter probe to the output of dekavider number 2.

(6) Adjust dekavider number 2 for approximately 3.5 volts as indicated on the differential voltmeter. Continue to adjust the dekavider to produce an lf vfo frequency of 6.045 MHz ± 100 Hz as indicated on the electronic counter at J2.

(7) Move the counter input connector to 1A2J4.

(8) Move the differential voltmeter probe to 1A2P1-E.

(9) Adjust dekavider number 3 for 21.90 volts as indicated on the differential voltmeter.

(10) Move the differential voltmeter probe to the output of dekavider number 1.

(11) Adjust dekavider number 1 for approximately 3.0 volts as indicated on the differential voltmeter. Continue to adjust the dekavider to produce a high loop mixer frequency of 22.000 MHz ± 1.5 kHz as indicated on the electronic counter.

(12) Move the electronic counter input to 1A2J2.

(13) Connect the electronic voltmeter to 1A2J4. A high loop mixer level of at least 40 millivolts should be indicated by the electronic voltmeter.

(14) Using the differential voltmeter, set dekavider number 1 (1A2J1) for 5.0 volts and dekavider number 4 (1A2P1-F) for 10.00 volts. The electronic voltmeter should continue to indicate a minimum level of 40 millivolts.

(15) Using the differential voltmeter, set dekavider number 1 (1A2J1) for 2.0 volts and dekavider number 4 (1A2P1-F) for 48.19 volts. The electronic voltmeter should continue to indicate a minimum level of 40 millivolts.

(16) Disconnect the counter, electronic voltmeter, and differential voltmeter. The remaining test equipment may be left connected for the tests of g below.

g. *Tracking, Gain, and Sensitivity Tests.*

(1) Calibrate the heterodyne voltmeter for a frequency of 455 ± lkHz and a level of 10 millivolts. Use the narrowband mode of the voltmeter. Remove the preselector top and bottom covers and install the top and bottom test covers.

(2) Connect the test equipment as shown in figure 7-20.

NOTE

For the following step, the counter requires an input level of at least 100 millivolts. Set the signal generator to this level for initial frequency adjustment, then reduce the level as required.

(3) Set the signal generator for an output frequency of 500 ± 1 kHz at a level of approximately 1 microvolt.

(4) Rotate the bandswitch (gear at the center of the preselector) to position 1 (500 kHz).

(5) Using the differential voltmeter, adjust the 50 vdc power supply for a voltage of 50.000 ± 0.005 volts .

(6) Set dekavider number 3 for a resistance or 93.72 kilohms.

(7) Using the differential voltmeter, set the 1-kilohm potentiometer for -2.6 ±0.1 vdc.

(8) Adjust dekavider number 1 to produce a maximum reading on the heterodyne voltmeter.

(9) Adjust 1A2A7-C6 (see fig. 7-14) to produce a maximum reading on the heterodyne voltmeter.

(10) Set the preselector bandswitch to position 30 (29.5 MHz).

(11) Set dekavider number for 20.52 kilohms.

(12) Set the signal generator for an output frequency of 29.5 MHz ± 1 kHz at a level of approximately 1 microvolt.

(13) Repeat steps (8) and (9) above.

NOTE

If the preselector is tracking correctly, 1A2A7-C6 should not require adjustment of more than one-fourth turn in step (13). If more than one-fourth turn of adjustment is required, line inductors 1A2A7-L3 and 1A2A7-L4 must be changed in length. If the capacitance of 1A2A7-C6 was increased (clockwise) lengthen L3 and L4. Shorten L3 and L4 if the capacitance was decreased (counterclockwise). Change L3 and L4 equally to retain balance.

(14) Adjust 1A2A7-L2 for a maximum reading of the heterodyne voltmeter.

(15) Repeat steps (3) through (12), as required, to obtain correct tracking.

(16) Repeat steps (3) through (5), except set the signal generator output level at 0.25 microvolt.

(17) Read and record the heterodyne voltmeter reading.

(18) Move the signal generator off frequency approximately 100 kHz and read the heterodyne voltmeter. If this reading (noise) is not at least 15 db below the reading obtained in step (17) accomplish step (19).

(19) Insert a thin-tipped soldering iron through the access hole in the test cover and heat the joint at the ground end of the tune line (see fig. 7-15). Push or pull the line with a pair of long-nose pliers to obtain the minimum noise reading on the heterodyne voltmeter. Remove the soldering iron and hold the tune line in place until the joint cools, noting that the noise does not increase. If the noise increases more than 1 db, repeat the procedure.

(20) Repeat steps (10) through (12).

(21) Repeat step (14).

(22) Reduce the signal generator output to 0.25 microvolt.

(23) Repeat steps (17) and (18) and, if required, step (19).

(24) Disconnect the heterodyne voltmeter.

(25) Repeat steps (1) and (2).

(26) Accomplish the combined gain and sensitivity measurements of table 7.24 as follows:

(a) Set the signal generator frequency, bandswitch position, and dekavider number 3 as listed for each test in table 7-27.

(b) Set the signal generator output level to 100 microvolt for gain measurement or to 0.25 microvolt for sensitivity measurement.

(c) Adjust dekavider number 1 to obtain a maximum reading on the heterodyne voltmeter.

(d) The preselector gain can now be computed from the formula:

$$\text{Gain} = \frac{\text{Heterodyne voltmeter reading}}{\text{100 microvolts}}$$

(e) For sensitivity measurements, read the hetrodyne voltmeter for the signal input, then move the signal generator frequency approximately 100 kHz and read the noise level on the heterodyne voltmeter. The sensitivity is then equal to the difference in the two heterodyne voltmeter readings.

(27) Disconnect the test setup. Remove the test covers and reinstall the normal preselector covers with the attaching screws.

Table 7-27. Preselector 1A2 Gain and Sensitivity Measurements

Signal generator frequency (MHz ± 1 kHz)	*Bandswitch*	*Dekavider No. 3 setting (kilohms volts)*	*Minimum gain (millivolts)*	*Minimum sensitivity (db)*
0.5	1	92.72/46.36	14.0	15
1.5	2	89.00/44.50	11.0	14
2.5	3	84.56/42.28	10.0	14
3.5	4	80.36/40.18	8.0	13
5.5	6	72.62/36.31	7.0	12
9.5	10	58.40/29.20	7.0	12
14.5	15	46.10/23.05	6.0	12
15.5	16	43.80/21.90	6.0	11
21.5	22	31.94/15.97	6.0	10
22.5	23	30.28/15.14	6.0	10
29.5	30	20.52/10.26	6.0	10

h. Preselector Agc Characteristics Test.

(1) Accomplish steps (1) through (7) of g above.

(2) Remove the preselector top test cover to gain access to 1A2A7.

(3) Lightly couple a probe cable to 1A2A7-C6 (fig. 7-14). Connect the amplifier and counter to this ca0ble as shown in figure 7-20.

(4) Set the signal generator level to approximately 5 microvolt.

(5) Read and record the heterodyne voltmeter reading.

(6) Increase the signal generator level to +10 db.

NOTE

When the tagc voltage (1 kilohm potentiometer) is changed in the next step, the high frequency vfo will probably be pulled off frequency. Observe the electronic counter while adjusting the potentiometer. If the frequency changes, adjust dekavider number 1 (vfo control line voltage) to reset the vfo to the original frequency, as observed on the counter.

(7) Adjust the 1 kilohm potentiometer to produce the same heterodyne voltmeter reading as was observed in (5) above.

(8) Using the differential voltmeter, measure the tagc at 1A2P1-H. A voltage between -2.22 and -2.37 volts should be obtained.

(9) Increase the signal generator level to +40 db .

(10) Repeat steps (7) and (8), except that a tagc voltage of between -1.74 and -1.95 volts should be obtained. (See the note preceding step (7).)

(11) Set the signal generator for an output of 29.5 MHz at 5 microvolt.

(12) Set 1A2 bandswitch to position 30.

(13) Using the differential voltmeter, set the 1 kilohm potentiometer for a tagc voltage of -2.60 volts. (See the note preceding step (7).)

(14) Using the differential voltmeter, set dekavider number 3 for 10.26 volts.

(15) Adjust dekavider number 1 to obtain the maximum reading on the heterodyne voltmeter.

(16) Read the heterodyne voltmeter reading for reference.

(17) Repeat steps (4) through (9), except that the following tagc readings should be obtained:

Signal Generator Level	*Tagc (volts)*
+10 db	−2.20 to −2.35
+40 db	−1.73 to −1.95

(18) Turn off all power and disconnect the test equipment. Remove the test covers and reinstall the normal preselector covers with the attaching screws.

7-15. RF Oscillator 1A2A1 Alignment and Testing

a *Test Setup.*

(1) Install module to be checked in preselector test cavity.

(2) Connect test equipment as shown in figure 7-21 with electronic counter on terminal E1.

b. Alignment Procedure.

(1) Apply the following voltages to the assembly under test.

Terminal	*Voltage*
E2	−5.00 vdc ± 0.25%
E3	+48.860 vdc ± 5 millivolts
E4	+50.00 vdc ± 5 millivolts
E5	+3.00 vdc ± 5 millivolts

(2) Check terminal E1 for an output frequency of 159.045 MHz ± 20 kHz.

(3) If necessary, adjust C4 to bring oscillator within limits specified in step (2).

(4) Set voltage at terminal E3 to ± 10.260 vdc 1 millivolt.

(5) Check terminal E1 for an output frequency of 130.045 MHz ± 20 kHz.

(6) If ncessary, vary the turns spacing of T1 to bring the frequency within limits specified.

(7) Repeat steps (2) through (6) above until two point tracking is achieved.

c. *Output Frequency Measurement.*

(1) Apply input voltages as specified in paragraph b. (1).

(2) Set dekavider number 1 for input voltages listed in tracking voltage column on table 7-28 at terminal E3.

(3) Check the output frequency at terminal E1 with the electronic counter. The frequency measured at E1 for specific voltage input at E3 should be as listed in table 7-28.

d. Loop Sensitivity Test.

(1) Set the input voltages as specified in paragraph b. (1).

(2) Set the input voltage at E5 to -3 volts ± 5 millivolts and read the output frequency at terminal E1 on the counter.

Table 7-28. RF Oscillator 1A2A1 Output Frequencies

Tracking voltage terminal (E3)	*Frequency* *Nominal*	*Tolerance*
10.260 v ± 1 millivolt	130.045 MHz	± 40 kHz
21.900 v ± 2 millivolt	144.045 MHz	± 100 kHz
29.700 v ± 3 millivolt	150.045 MHz	± 100 kHz
40.180 v ± 4 millivolt	156.045 MHz	± 100 kHz
46.860 v ± 5 millivolt	159.045 MHz	± 40 kHz

(3) Set input voltage at E5 to +7 volts ± 5 millivolts and record output frequency at terminal E1.

(4) Subtract the frequency obtained in (2) from that obtained in (3) above. The result should be between 1.1 and 1.4 MHz.

(5) Set input voltage at E3 to 10.260 volts ± 1 millivolts.

(6) Repeat steps (2), (3) and (4) above.

(7) The result obtained should be between 600 and 900 kHz.

e. Output Levels Test.

(1) Set voltages at terminals E2 and E4 for -5.00 vdc and +50.00 vdc respectively.

(2) Set voltage input at terminal E5 to 3.00 vdc ± 5 millivolts.

(3) Set input voltage at terminal E3 to 10 vdc ± 1 millivolt.

(4) Connect electronic voltmeter with load to terminals E1 and E7.

(5) Check to insure that output voltages at terminals E1 and E7 are in accordance with values specified in table 7-29 for a 10 vdc input at E3.

(6) Change voltage at E3 to values stated in left hand column of table 7-29 and check output voltages at E1 and E7 for each respective input voltage.

(7) Disconnect voltmeter from terminals E1 and E7.

Table 7-29. 1A2A1 Output Levels

Tracking voltage terminal E3	*Output level terminal E1 (millivolts)*	*Output level terminal E7 (millivolts)*
10.260 vdc ± 1 millivolt	210 ± 30	220 ± 25
21.900 vdc ± 2 millivolts	220 ± 30	200 ± 20
29.700 vdc ± 3 millivolts	210 ± 30	185 ± 15
40.180 vdc ± 4 millivolts	205 ± 30	170 ± 15
46.860 vdc ± 5 millivolts	200 ± 30	165 ± 15

f. Spectrum Verification.

(1) Apply the following input voltages to assembly under test.

Terminal	*Voltage*
E2	−5.00 vdc ± 10 millivolts
E4	+50.00 vdc ± 5 millivolts
E5	+3.00 vdc ± 5 millivolts

(2) Connect spectrum analyzer to terminal E1.

(3) Set input voltage at terminal E3 to + 10.260 vdc.

(4) Check spectrum analyzer display for the following:

Non-harmonically related signal level	> -60 db
Parasitic oscillation	non existent
Squegging	non existent

(5) Vary input voltage at E3 throughout the range of +10.260 to 46.860 vdc.

(6) observe spectrum analyzer for conditions stated in step (4).

(7) Disconnect the test equipment.

7-16. Frequency Converter 1A2A2 Alignment and Testing

a. *Test Setup.*

(1) Calibrate heterodyne voltmeter for operation at 166 MHz using the electronic counter and signal generator number 2, then disconnect the signal generator.

NOTE

Refer to figure 7-22 detail D for terminal, jack and adjustment locations.

(2) Connect test equipment as shown in figure 7-22 detail A with frequency counter and voltmeter connected to output terminal E3.

(3) Apply a 6 MHz, 20 millivolts to terminal E2.

(4) Set input at E1 to -5 v ± 100 millivolts.

b. Alignment.

(1) Adjust C8 (fig. 7-22) maximum counterclockwise until the oscillator starts.

(2) In the event the oscillator does not start, R4 (FO-3) may have to be replaced with a resistor of a slightly lower value and step (1) above repeated.

(3) If the oscillator starts and stabilizes at a frequency of 160 MHz +10 to +50 kHz replace crystal Y1 and repeat steps (1) and (2) above.

(4) Adjust C8 for maximum output at E3 as indicated on the voltmeter then readjust C8 for 1 db less than peak output.

c. *Testing.*

(1) Reduce -5 volts input at E1 to -4 volts ± 100 millivolts and check that oscillator continues to start and run.

(2) Measure the output frequency at E3. The frequency should be 160 MHz +3 kHz -2 kHz.

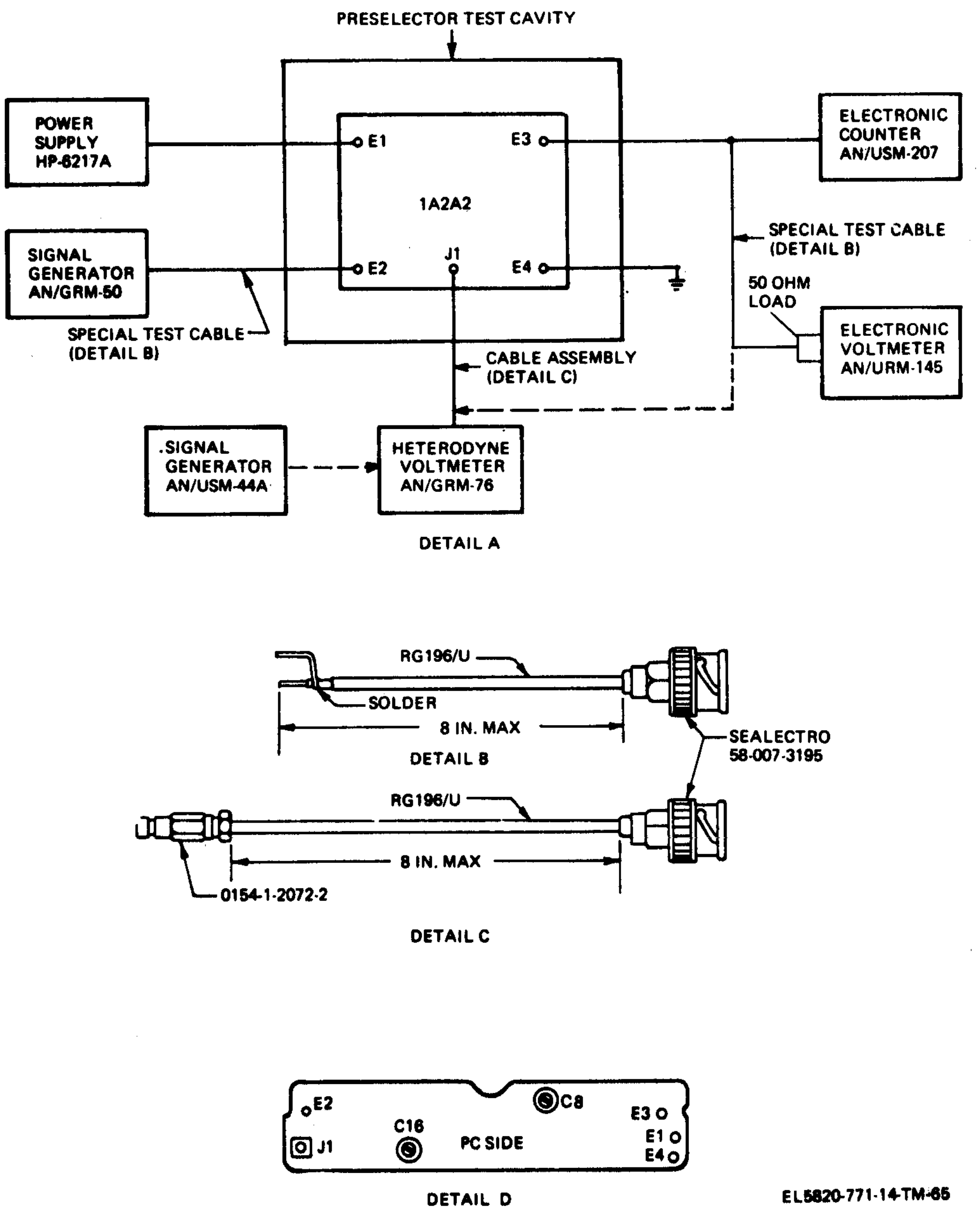


Figure 7-22. Frequency converter 1A2A2 test connections.

(3) Measure the 160 MHz signal level at terminal E3. The level should be 20 millivolts minimum.

(4) Adjust C16 for maximum output at J1.

(5) Measure the output level at J1 using the heterodyne voltmeter and the electronic voltmeter. The mixer output level at J1 should be 6.5 to 9.0 millivolts.

(6) Disconnect the test equipment.

7-17. Frequency Mixer Stage 1A2A3 Alignment and Testing

a. Test Setup.

(1) Install module to be checked in preselector housing.

(2) Connect test equipment as shown in figure 7-23, detail A.

(3) Check figure 7-23, detail C for adjustment locations.

b. Alignment Procedure (Amplitude).

(1) Set the following input signals at terminals indicated:

Terminal	*Input signal*
E1	0 volts
E2	4.5 millivolts, 166.045 MHz
E3	−5 v ± 100 millivolts

(2) Adjust C7 for maximum signal amplitude at 166.045 MHz as observed on spectrum analyzer at E5.

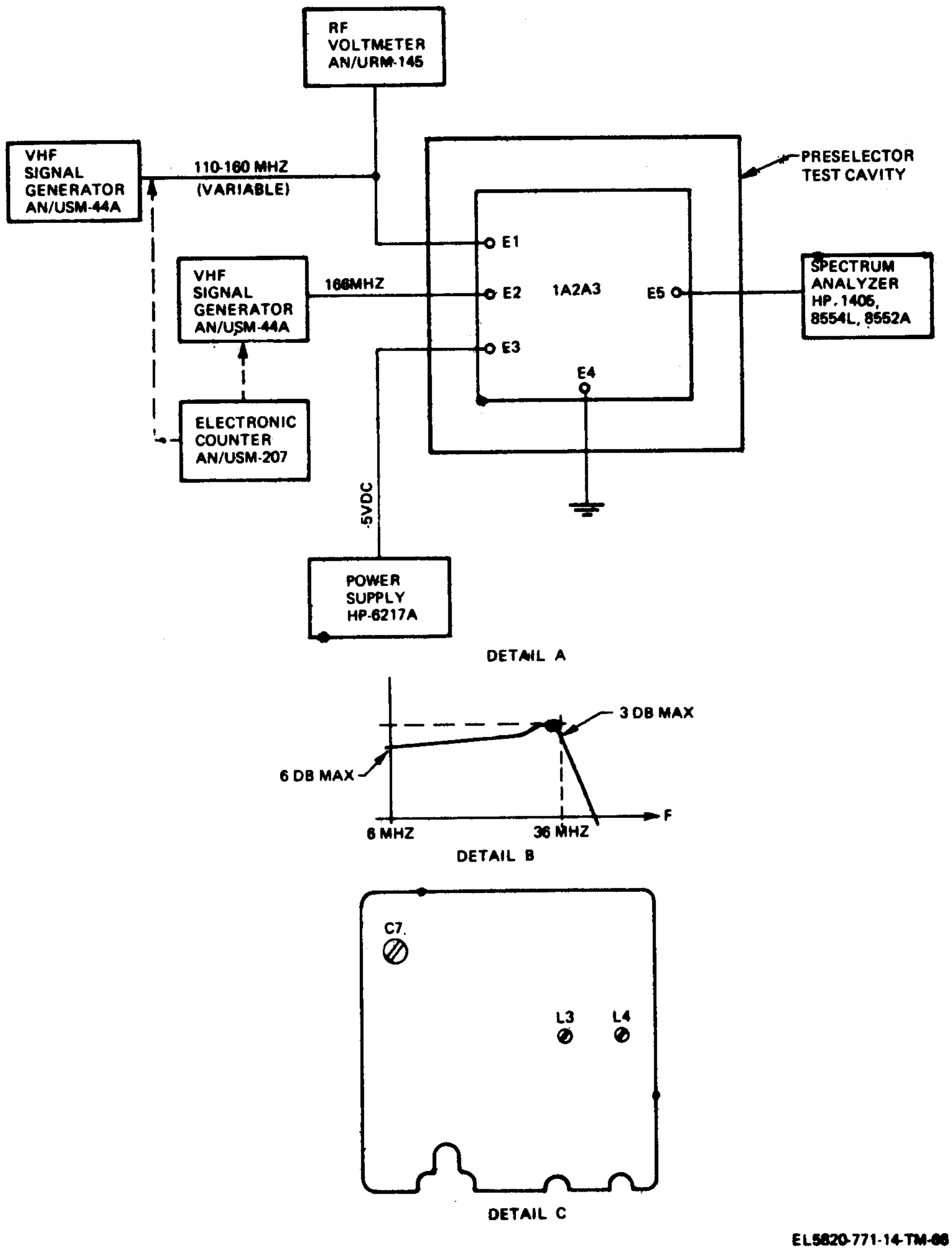


Figure 7-23. Frequency mixer stage 1A2A3 test diagram

c. *Alignment Procedure (Output Response).*

(1) Set the following input signals at terminals indicated.

Terminal	Input signal
E1	222 millivolts, 110.0 to 160.0 MHz variable
E2	4.5 millivolts, 166.0 MHz
E3	−5 v ± 100 millivolts

(2) Adjust L3 and L4 for a response on the spectrum analyzer as shown in figure 7-23, detail B.

d. *Input and Output Measurements.*

(1) Set the following input signals at terminals indicated:

Terminal	Input signal
E1	Per table 7-30 at 175 millivolts
E2	166.045 MHz at 4.5 millivolts
E3	−5 v ± 100 millivolts

(2) Verify input current as 5 milliamps maximum before making checks in step (3) below.

(3) Verify output levels on spectrum analyzer as specified in table 7-30.

(4) Disconnect the test equipment.

7-18. Bandpass Filter 1A2A4 Alignment and Testing.

a. *Filter Input Response Alignment Test Setup.*

(1) Connect test equipment as shown in figure FO-26, detail A.

(2) Check figure FO-26, detail G for terminal and adjustment locations.

NOTE

Refer to table 7-31 for listing of bands referenced in paragraphs b. through k. below.

b. *Input Response Alignment (Band 1).*

Table 7-30. Frequency Mixer Stage 1A2A3 Input and Output Parameters

Input signal frequency (E1) (MHz)	Output frequency (E5) (MHz)	Output level (−db)
160.000	6.000	19-23
155.000	11.000	18-22
150.000	16.000	18-22
140.000	26.000	15-19
135.000	31.000	15-19
130.000	36.000	14-18
120.000	46.000	27-31
110.000	56.000	40-46

Table 7-31. Bandpass Filter 1A2A4 Input/Output Alignment Data

Column 1 Band	2 Frequency MHz	3 Marker MHz	4 Input terminal	5 Output terminal	6 Pins 4 & 1	7 Pins 3 & 1	8 Series load ohms	9 Parallel load ohms
1	0.50 to 1.00	0.68	E1	E6	L2	T2	1500	1500
2	1.00 to 2.00	1.33	E2	E7	L5	T4	750	820
3	2.00 to 3.00	2.42	E3	E8	L8	T6	560	620
4	3.00 to 5.00	4.00	E4	E9	L12	T7	240	300
5	5.00 to 9.00	6.70	E5	E10	L16	T8	150	200

NOTE

Refer to table 7-31 for all column references.

(1) Tune sweep generator to sweep frequency indicated in column 2 for band 1.

(2) Tune marker for an output at the frequency indicated in column 3 for band 1.

(3) Connect center probe clip of cable assembly on input terminal E1 for band 1 as indicated in column 4.

(4) Connect ground clip of cable assembly to terminal E12 of assembly under test and leave ground clip on this terminal for all input response tests.

(5) Place short across pins 4 and 1 of L2 as indicated in column 6.

(6) Adjust L1 and T1 for a deep symmetrical notch at the marker frequency. The spectrum analyzer trace should look similar to figure FO-26. detail B(1) when proper alignment is obtained.

(7) Remove short from pins 4 and 1 of L2.

(8) Place short across pins 3 and 1 of T2 as indicated in column 7 for band 1 alignment.

(9) Refer to figure FO-26, detail B(2) and adjust coil L3 so that marker is at bottom of second notch. Adjust coil L2 for a symmetrical pattern.

(10) Remove short from pine 3 and 1 of T2.

(11) A trace similar to figure FO-26, detail B(3) should appear on scope. Tune output transformer T2 so that marker is at top of middle peak.

c *Input Response Alignment (Band 2).*

NOTE

Refer to table 7-31 for all column references.

(1) Tune sweep generator to sweep band 2 frequency per column 2.

(2) Tune marker to frequency indicated in column 3.

(3) Connect center probe clip to terminal E2.

(4) Install short as indicated in column 6 for band 2.

(5) Adjust T3 and L4 for figure FO-26, detail B(1) display.

(6) Remove short.

(7) Install short as indicated in column 7, band 2.

(8) Adjust L6 and L5 for figure FO-26, detail B(2) display.

(9) Remove short.

(10) Tune T4 to place marker on top of peak per figure FO-26, detail B(3).

d. Input Response Alignment (Band 3).

NOTE

Refer to table 7-31 for all column references.

(1) Tune sweep generator per column 2, band 3.

(2) Tune marker per column 3, band 3.

(3) Connect center probe clip per column 4, band 3.

(4) Install short as indicated in column 6.

(5) Adjust T5 and L7 for figure FO-26, detail B(1) display.

(6) Remove short.

(7) Install short as indicated in column 7.

(8) Adjust L9 and L8 for figure FO-26, detail B(2) display.

(9) Remove short.

(10) Tune T6 to obtain figure FO-26, detail B(3) display.

e. *Input Response Alignment (Band 4).*

NOTE

Refer to table 7-31 for all column references.

(1) Tune sweep generator to column 2 frequency for band 4.

(2) Tune marker to column 3 frequency for band 4.

(3) Connect center probe clip per column 4.

(4) Install short as indicated in column 6.

(5) Adjust L1O and L11 for figure FO-26, detail B(1) display.

(6) Remove short.

(7) Install short as indicated in column 7.

(8) Adjust L13 and L12 for figure FO-26 detail B(2) display.

(9) Remove short.

(10) Tune T7 to place marker on top of peak per figure FO-26 detail B(3).

f. Input Response Alignment (Band 5).

NOTE

Refer to table 7-31 for all column references.

(1) Tune sweep generator to column 2 frequency for band 5.

(2) Tune marker to column 3 frequency for band 6.

(3) Connect center probe clip per column 4.

(4) Install short as indicated in column 6.

(5) Adjust L14 and L15 for figure FO-26, detail B(1) display.

(6) Remove short.

(7) Install short as indicated in column 7.

(8) Adjust L16 and L17 for figure FO-26, detail B(2) display.

(9) Remove short.

(10) Tune T8 to obtain figure FO-26, detail B(3) display.

(11) Disconnect test equipment.

g. *Filter Output Response Alignment {Band 1).*

NOTE

Refer to table 7-31 for all column references.

(1) Setup test equipment as shown in figure FO-26, detail C.

(2) Connect input cable assembly clips to terminals E1 and E12.

(3) Connect output cable assembly clips to terminals E6 and E11.

(4) Install load as indicated in table 7-31 for band 1.

(5) Set tracking generator for column 2, band 1 frequency.

(6) Set marker for column 3, band 1 frequency.

(7) A trace similar to that in figure FO-26, detail E should appear on the spectrum analyzer. If necessary, slightly readjust inductors and transformers so that marker is in center of bandpass.

(8) Move marker frequency to upper and lower frequency limits of bandpass as indicated in column 2.

(9) If necessary, readjust inductors and transformers so that the upper and lower frequency points fall within the filter bandpass as shown in figure FO-26, detail E.

h. Filter Output Response Alignment (Band 2).

NOTE

Refer to table 7-31 for all column references.

(1) Connect input cable assembly center probe clip to terminal E2.

(2) Connect output cable assembly center conductor clip to terminal E6.

(3) Install load indicated in column 8 for band 2.

(4) Set tracking generator for band 2 frequency, column 2.

(5) Set marker for column 3, band 2 frequency.

(6) If necessary, slightly readjust inductors and transformers so that marker is in center of bandpass.

(7) Move marker frequency to upper and lower frequency limits of bandpass as indicated in column 2.

(8) If necessary, slightly readjust inductors and transformers so that the upper and lower frequency points fall within the filter bandpass as shown in figure FO-26, detail E.

i. Filter Output Response Alignment (Band 3).

NOTE

Refer to table 7-31 for all column references.

{1) Connect input probe clip to terminal E3.

(2) Connect output probe clip to terminal E8.

(3) Install load indicated in column 8 for band 3.

(14) Set tracking generator for band 3 frequency, column 2.

(5) Set marker for column 3, band 3 frequency.

(6) If necessary, slightly readjust inductors and transformers so that marker is in center of bandpass.

(7) Move marker frequency to upper and lower frequency limits of bandpass as indicated in column 2.

(8) If necessary, slightly readjust inductors and transformers so that the upper and lower frequency points fall within the filter bandpass as shown in figure FO-26, detail E.

j. Filter Output Response Alignment (Band 4).

NOTE

Refer to table 7-31 for all column references.

(1) Connect input probe clip to terminal E4.

(2) Connect output probe clip to terminal E9.

(3) Install load indicated in column 8 for band 4.

(4) Set tracking generator for band 4 frequency, column, 2.

(5) Set marker for column 3, band 3 frequency.

(6) If necessary, slightly readjust inductors and transformers so that marker is in center of bandpass.

(7) Move marker frequency to upper and lower frequency limits of bandpass shown in column 2.

(8) If necessary, slightly readjust inductors and transformers so that the upper and lower frequency points fall within the filter bandpass as shown in figure FO-26, detail E.

k. *Filter Output Response Alignment (Band 5).*

NOTE

Refer to table 7-31 for all column references.

(1) Connect input probe clip to terminal E5.

(2) Connect output probe clip to terminal E10

(3) Install load indicated in column 8 for band 5.

(4) Set tracking generator for band 5 frequency, Column 2.

(5) Set marker for column 3, band 5 frequency.

(6) If necessary, slightly readjust inductors and transformers so that marker is in center of bandpass.

(7) Move marker frequency to upper and lower frequency limits of bandpass as indicated in column 2.

(8) If necessary, slightly readjust inductors and transformers so that the upper and lower frequency points fall within the filter bandpass as shown in figure FO-26, detail E.

(9) Disconnect test equipment.

1. Frequency Response Tests (Band 1).

(1) Setup test equipment as shown in figure FO-26, detail C. Connect load per table 7-31, column 9.

(2) Connect input cable assembly signal clip to terminal E1 and ground clip to terminal E12. Leave ground clip on terminal E12 for remainder of tests.

(3) Connect output cable assembly signal clip to terminall E6 and ground clip to terminal E11. Leave ground clip on terminal E11 for remainder of tests.

(4) Set attenuator to 0 db. Set generator for reference level on meter at frequency listed in column 3, table 7-31 for band 1.

(5) Slowly tune rf generator stopping at each frequency listed for band 1 in table 7-32.

(6) Observe that readings on rf voltmeter do not exceed those listed in table 7-32 for respective frequency generated.

(7) Increase attenuator setting by 20 db.

(8) Tune rf generator to frequency, above 1.00 MHz that gives rf voltmeter reading of 0.6 db.

(9) Observe that rf generator output frequency is lower than frequency listed in column 5, table 7-33.

Table 7-32. Bandpass Filter 1A2A4 Response Data

Band 1		*Band 2*	
Frequency (MHz)	*Attenuation Limit (db)*	*Frequency (MHz)*	*Attenuation Limit (db)*
0.450	1 min	0.950	0.0 min
0.500	0.6 max	1.000	0.6 max
0.550	0.25 max	1.10	0.25 max
0.600		1.20	
0.700		1.30	
0.800		1.40	
0.900		1.50	
1.000	0.6 max	1.60	
1.050	0.5 min	1.70	
		1.80	
		1.90	
		2.00	0.6 max
		2.150	0.5 min

Table 7-32. Bandpass Filter 1A2A4 Response Data -Continued

Band 3 Frequency	Band 3 Attenuation	Band 4 Frequency	Band 4 Attenuation
1.950	1 min	2.950	1 min
2.00	0.6 max	3.00	0.6 max
2.10	0.25 max	3.20	0.25 max
2.20		3.40	
2.30		3.60	
2.40		3.80	
2.50		4.00	
2.60		4.20	
2.70		4.40	
2.80		4.60	
2.90		4.80	
3.00	0.6 max	5.00	0.6 max
3.05	0.5 min	5.50	0.5 min

Band 5 Frequency	Band 5 Attenuation
4.70	1 min
5.00	0.6 max
5.40	0.25 max
5.80	
6.20	
6.60	
7.00	
7.40	
7.80	
8.20	
8.60	
9.00	0.6 max
9.50	0.5 min

Table 7-33. Bandpass Filter 1A2A4 *Bandpass* Data

Column 1	2	3	4	5
	Filter frequency		Frequency limits	
Band	Lowest MHz	Highest MHz	Lower	Upper
1	0.50	1.00	0.324	1.41
2	1.00	2.00	0.590	3.04
3	2.00	3.00	1.540	3.88
4	3.00	5.00	2.060	7.20
5	5.00	9.00	3.540	11.81

(10) Tune rf generator to frequency below 0.5 MHz that gives rf voltmeter reading of 0.6 db.

(11) Observe that rf generator output frequency is higher than frequency listed in column 4, table 7-33.

m. Frequency Response Tests (Band 2).

(1) Connect input cable assembly signal clip to terminal E2. Connect load per table 7-31, column 9.

(2) Connect output cable assembly signal clip to terminal E7.

(3) Set attenuator to 0 db. Set generator for a reference level on the meter at the frequency listed in column 3, table 7-31 for band 2.

(4) Slowly tune rf generator stopping at each frequency listed for band 2 in table 7-32.

(5) Observe that readings on rf voltmeter do not exceed those listed in table 7-32 for respective frequency generated.

(6) Increase attenuator setting by 20 db.

(7) Tune rf generator to frequency above 2.00 MHz that gives rf voltmeter reading of 0.6 db.

(8) Observe that rf generator output frequency is lower than frequency listed in column 5, table 7-33.

(9) Tune rf generator to frequency below 1.00 MHz that gives rf voltmeter reading of 0.6 db.

(10) Observe that rf generator output frequency is higher than frequency listed in column *4,* table 7-33.

n. Frequency Response Tests (Band 3).

(1) Connect input cable assembly signal clip to terminal E3. Connect load per table 7-31, column 9.

(2) Connect output cable assembly signal clip to terminal E8.

(3) Set attenuator to 0 db. Set generator for a reference level on the meter at the frequency listed in column 3, table 7-31 for band 3.

(4) Slowly tune rf generator stopping at each frequency listed for band 3 in table 7-32.

(5) Observe that readings on rf voltmeter do not exceed those listed in table 7-32 for respective frequency generated.

(6) Increase attenuator setting by 20 db.

(7) Tune rf generator to frequency above 3.00 MHz that gives rf voltmeter reading of 0.6 db.

(8) Observe that rf generator output frequency is lower than frequency listed in column 5, table 7-33.

(9) Tune rf generator to frequency below 2.00 MHz that gives rf voltmeter reading of 0.6 db.

(10) Observe that rf generator output frequency is higher than frequency listed in column 4, table 7-33.

o. Frequency Response Tests (Band 4).

(1) Connect input cable assembly signal clip to terminal E4. Connect load per table 7-31, column 9.

(2) Connect output cable assembly signal clip to terminal E9.

(3) Set attenuator to 0 db. Set generator for a reference level on the meter at the frequency listed in column 3, table 7-31 for band 4.

(4) Slowly tune rf generator stopping at each frequency listed for band 4 in table 7-32.

(5) Observe that readings on rf voltmeter do not exceed those listed in table 7-32 for respective frequency generated.

(6) Increase attenuator setting by 2o db.

(7) Tune rf generator to frequency above 5.00 MHz that give rf voltmeter reading of 0.6 db.

(8) Observe that rf generator output frequency is lower than frequency listed in column 5, table 7-33.

(9) Tune rf generator to frequency below 3.00 MHz that give rf voltmeter reading of 0.6 db.

(10) Observe that rf generator output frequency is higher than frequency listed in column 4, table 7-33.

p. Frequency Response Tests (Band 5).

(1) Connect input cable assembly clip to terminal E5. Connect load per table 7-31, column 9.

(2) Connect output cable assembly clip to terminal E10.

(3) Set attenuator to 0 db. Set generator for a reference level on the meter at the frequency listed in column 3, table 7-31 for band 5.

(4) Slowly tune rf generator stopping at each frequency listed for band 5 in table 7-32.

(5) Observe that readings on rf voltmeter do not exceed those listed in table 7-32 for respective frequency generated.

(6) Increase attenuator setting by 20 db.

(7) Tune rf generator frequency above 9.00 MHz that gives rf voltmeter reading of 0.6 db.

(8) Observe that rf generator output frequency is 1ower than frequency listed in column 5, table 7-33.

(9) Tune rf generator to frequency below 5.00 MHz that gives rf voltmeter reading of 0.6 db.

(10) Observe that rf generator output frequency is higher than frequency listed in column 4, table 7-33.

(11) Disconnect test equipment.

7-19. 1A2A5 Alignment and Testing

a. *Test Setup.*

(1) Place board to be tested in preselector housing (part number 0154-1-5009). Do not install mounting screws at this time.

(2) Solder test wires and cables to 1A2A5 as shown on figure 7-24. Feed wires through holes in cavity.

(3) Setup test equipment as shown in figure 7-24.

(4) Set power supply number 1 to 50 ± 0.25 vdc (using the differential voltmeter).

(5) Set power supply number 2 to +9 ± 0.25 vdc using the differential voltmeter.

b. Alignment Procedure.

(1) Use the differential voltmeter and, set dekavider number 2 for 3.5 ± 0.03 vdc input to terminal E2.

(2) Set dekavider number 1 for 10 ± 0.025 vdc input to terminal E5.

(3) Install the mounting screws for the board and tighten securely. Install the cover on the test cavity with the attaching screws.

(4) Measure the output frequency at E1 and E7 with the electronic counter. A frequency of 5.595 MHz ± 6 kHz should be indicated. If the proper frequency is not obtained, remove the board from the cavity and adjust C8 a small amount.

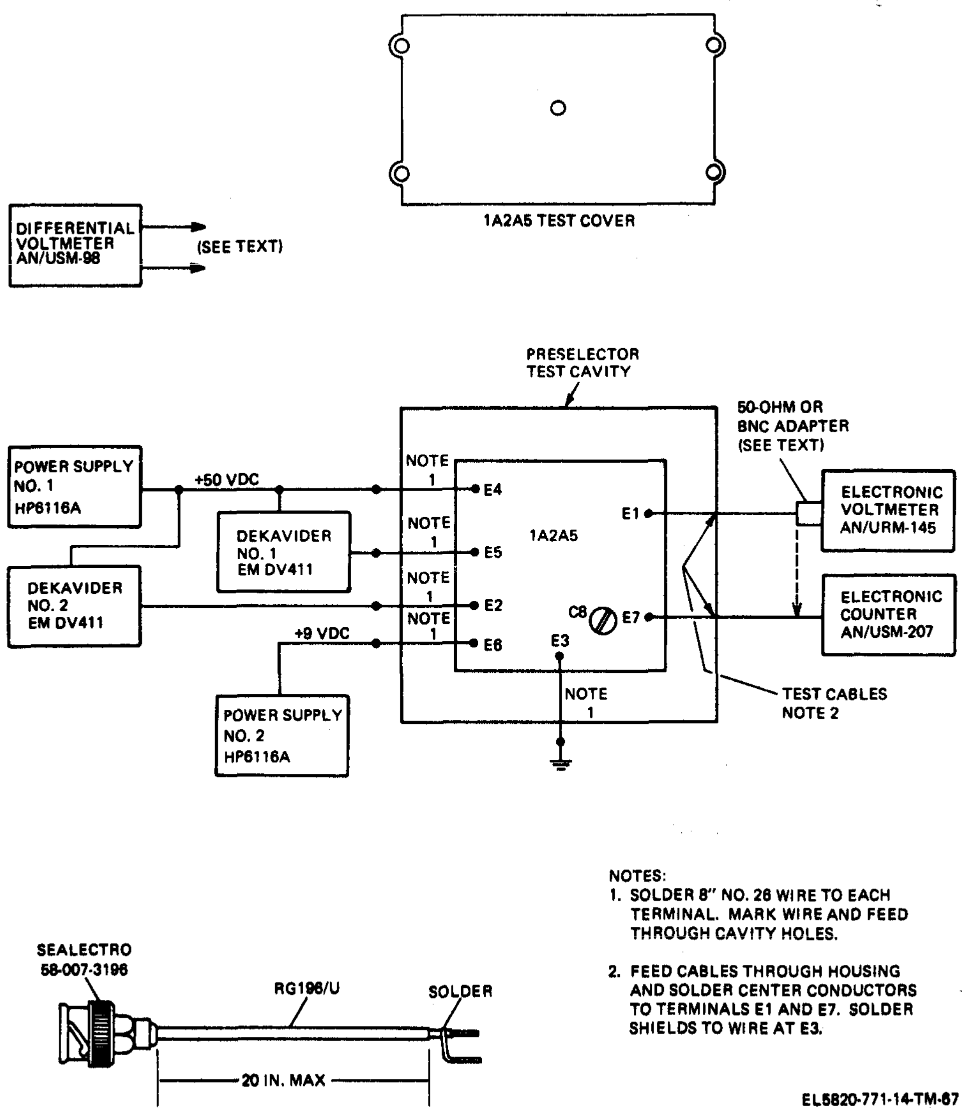


Figure 7-24. RF oscillator 1A2A5 test *connections.*

(5) Repeat steps (3) and (4) until the proper frequency is indicated.

(6) Set dekavider number 1 for +48.19 ±0.025 vdc input to terminal E5.

(7) With the board and cover installed in the cavity, check to insure frequency output at terminals E7 and E1 is 6.495 MHz ±7 kHz as indicated by the electronic counter.

(8) If the output frequency is not within the limits stated in step 7, remove the board and increase or decrease the inductance of T1 (FO-4) by increasing or decreasing the distance between the windings of T1. In extreme cases a turn may have to be added or removed from T1 Reinstall the board and cover and repeat this procedure until the proper frequency is obtained.

c. Test Procedure, Vfo Tuning.

NOTE

This test consists of setting a fixed tuning voltage (with the differential voltmeter) and varying the control line voltage to give a desired frequency as indicated by the counter connected to E7.

(1) Refer to table 7-34 and for each tuning voltage (V_T) listed, vary the control line voltage (V_{CL}) to give the required frequency output.

(2) Check to insure that the control line voltage falls within ± 0.3 volts of voltage listed in V_{CL} column in table 7-34.

d. Test Procedure, Output Levels.

(1) Use the differential voltmeter and, set dekavider number 2 for 3.5 ± 0.03 vdc input at terminal E2.

(2) Set dekavider number 1 for input voltage listed below and, using the electronic voltmeter, check to insure that voltages at output terminals E1 and E7 fall within the values stated. Make each measurement with the electronic voltmeter connected through the BNC adapter. Repeat each test at E1 only with the electronic voltmeter connected through the 50-ohm adapter.

input (vdc)	*Output (millivolts)*		
	E7	*E1 (50-ohm adapter)*	*E1 (BNC adapter)*
10.00	20 to 50	12 to 26	150 to *280*
22.97	20 to 50	12 to 26	150 to 280
48.19	20 to 50	12 to 26	150 to 280

(3) Disconnect test equipment.

7-20. Bandpass Filter 1A2A6 Alignment and Tests

a. Test Setup.

Table 7-34. RF Oscillator 1A2A5 *Vfo Tuning Test Data*

E5 V_T ±0.025v	*Nominal frequency (MHZ)*	*E2 V_{CL} (volts)*
	5.545	5.4
10.00	5.595	3.5
	5.645	1.3
	5.645	5.3
11.77	5.695	3..5
	5.745	1.4
	5.745	5.2
13.86	5.795	3.5
	5.845	1.5
	5.845	5.1
16.36	5.895	3.5
	5.945	1.6
	5.945	5.0
19.35	5.995	3.5
	6.045	1.7
	6.045	5.0
22.97	6.095	3.5
	6.145	1.8
	6.145	4.9

Table 7-34. RF Oscillator 1A2A5 Vfo Tuning Test Data -Continued

E5 V_T ± 0.025v	*Nominal Frequency (MHz)*	*E2 V_{CL} (volts)*
27.38	6.195	3.5
	6.245	1.9
	6.245	4.8
32.86	6.295	3.5
	6.345	2.0
	6.345	4.8
39.64	6.395	3.5
	6.445	2.0
	6.445	4.7
48.19	6.495	3.5
	6.545	2.1

(1) Setup test equipment as shown in figure 7-25, detail A with the load shown in detail C connected.

(2) Set tracking generator output for -30 dbm into the rf input section of the spectrum analyzer and adjust the variable input sensitivity control of the if section to establish a zero db display reference trace.

b. Filter Response Test.

NOTE

See figure 7-25, detail F for locations of terminals and adjustments.

(1) Set bandwidth and scanwidth of analyzer rf section as indicated in detail G(1) for band 8.

(2) Increase signal input from tracking generator by approximately 1 db below maximum allowable insertion loss given for band 8 (8.5 db) to position passband display in top centimeter of analyzer display.

(3) Adjust the cores shown in table 7-35 for band 8 to obtain the bandpass response shown in figure 7-25, detail G(1). (Use marker position control to check the band edges.) The ripple and/or overall slope should be 1 db maximum and the insertion loss 8.5 db maximum.

(4) Repeat similar adjustments for bands 6 and 7 per table 7-35 and figure 7-25, details G(2) and G(3).

Table 7-35. Bandpass Filter 1A2A6 Test Data

Band	*Adjust*	*Jumper connection*	*Signal in*	*Signal out*	*Maximum ripple*	*Maximum insertion loss*	*Load (figure 7-25 detail)*
8 - 22 - 30 MHz	L1, 2, 11, 12, 13, 14 T3	E2 to E5	E1	E8	1db	8.5 db	C
7 - 15 - 22 MHz	L7, 8, 9, 10, T2	E2 to E4	E1	E7	1 db	6.5 db	D
6 - 9 - 25 MHz	L3, 4, 5, 6, T1	E2 to E3 Ground	E1 E10	E6 E9	1 db	9.0 db	E

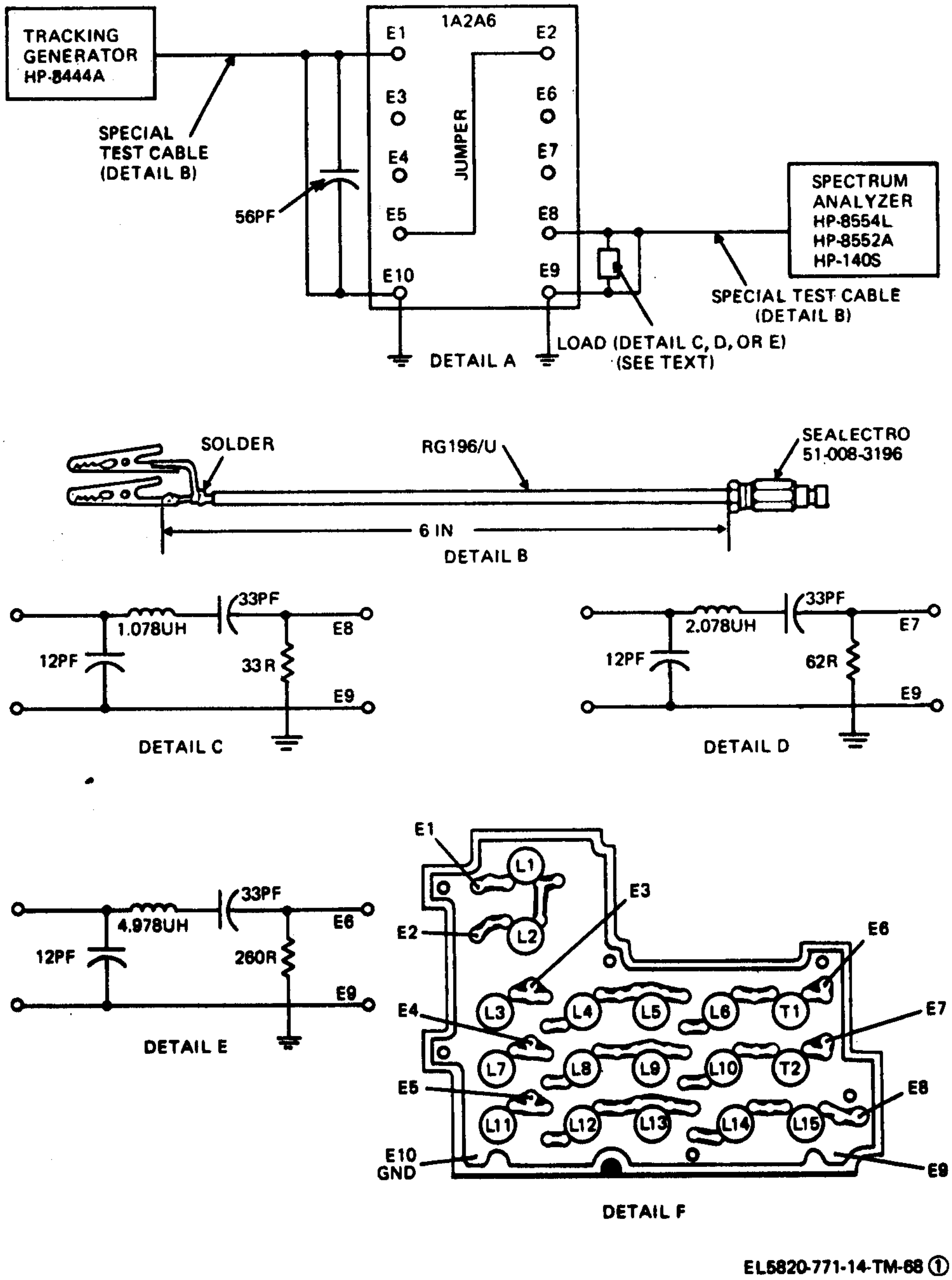


Figure 7-25 ① Bandpass filter 1A2A6 test diagram (sheet 1 of 2).

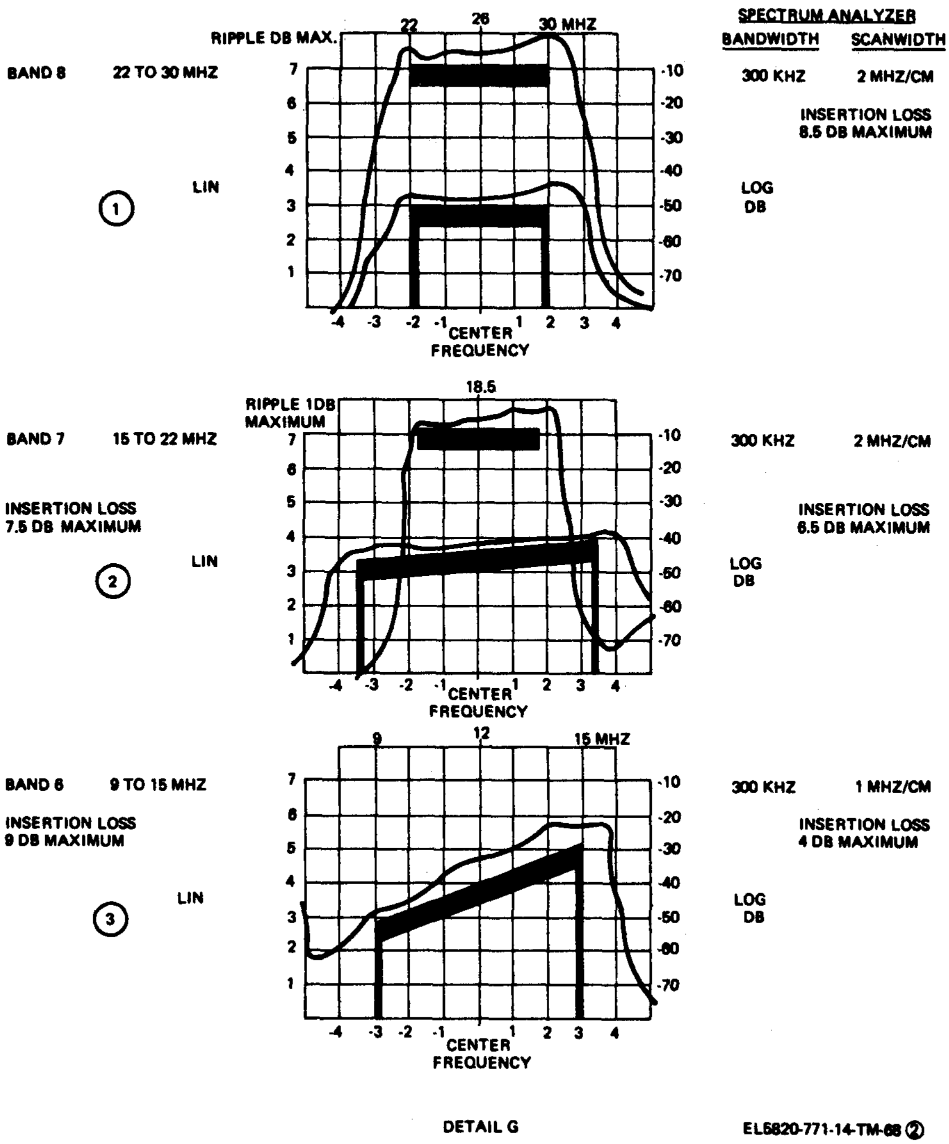


Figure 7-25②Bandpass filter 1A2A6 test diagram (sheet 2 of 2).

(5) Disconnect test equipment.

7-21. 1A2A7 Alignment and Testing

a. Test Setup.

(1) Install the module to be tested in the preselector housing and tighten all mounting screws.

(2) Connect test equipment as shown in figure 7-26, detail A. Do not turn on the power supplies at this time.

NOTE

See figure 7-26, detail B for locations of terminals and components.

b. Pump Amplifier Test.

(1) Set the signal generator for a 160 MHz. 80 mv signal input to terminal E7.

(2) Connect the electronic voltmeter probe to the base of Q1.

(3) Vary the signal generator output frequency from 129 to 160 MHz while observing the electronic voltmeter. The voltmeter readings should be between 85 and 95 millivolts for all frequencies.

c. Mixer Balance Alignment.

(1) Turn on power supplies.

(2) Adjust the signal generator for a 156.50 MHz ± 5 kHz -3 db signal input to terminal E7.

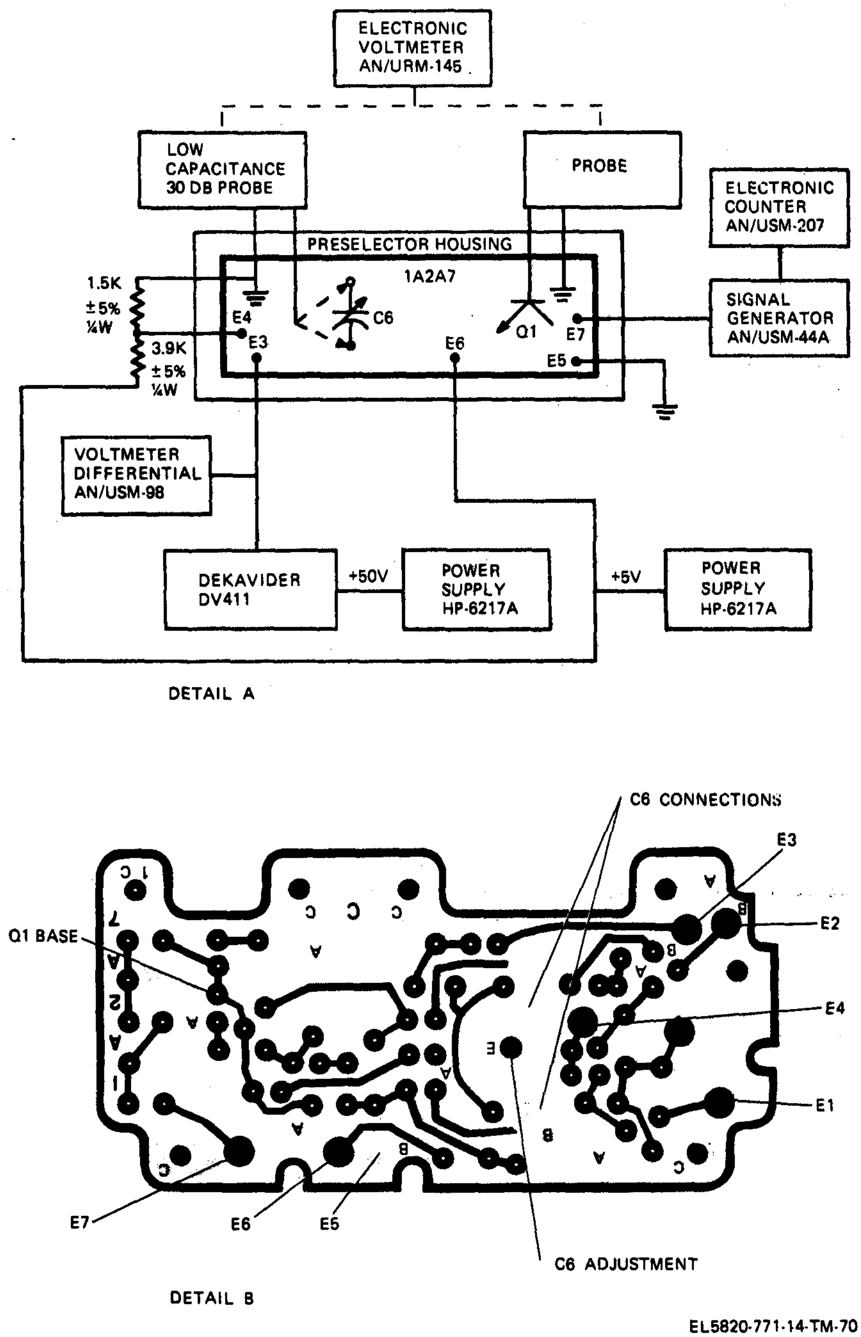


Figure 7-26. Frequency mixer stage 1A2A7 test diagram.

(3) Set input to terminal E3 at 46.86 ± 0.01 volt.

(4) Connect low capacitance probe to either end of C6 and adjust C6 for a maximum reading on the voltmeter. Reset the signal generator dial to ensure true peak frequency during adjustment of C6.

(5) Adjust the signal generator for a 130.00 MHz, 0 db signal.

(6) Set input at terminal E3 to 10.26 ± 0.01 volt.

(7) Connect low capacitance probe to the same end of C6 measured in step (4) and vary signal generator frequency for a peak reading on the voltmeter. The peak reading on the voltmeter should occur at 130 ± 0.5 MHz.

(8) Reset signal generator to 157.00 MHz and voltage input to 46.86 vdc.

(9) Use low capacitance probe to ensure that signal level is equal within 0.5 db at both terminals of C6.

d. Tracking Tests,

(1) Set the voltage input at terminal E3 to each of the values listed in table 7-36.

(2) For each E3 voltage setting, connect the electronic voltmeter to either end of C6 using a low capacitance probe.

(3). For each E3 voltage, vary the signal generator frequency to produce a peak on the electronic voltmeter. The signal generator frequency at this point should be as listsd in the frequency column of table 7-36.

Table 7-36. Frequency Mixer Stage 1A2A7 Test Data

E1input voltage	*Generator level (dbm)*	*Frequency (MHz)*	*Balance (dbm)*	*Tolerance (volts)*
10.26 ± 0.01	0	130.0 ± 0.5	0.5	1.00 to 1.30
28.24 ± 0.01	−2.0	149.0 ± 1.5	0.5	0.85 to 1.10
46.86 ± 0.01	−3.0	156.5 ± 0.5	0.5	0.80 to 1.00

(4) Move the low capacitance probe to the other end of C6. The signal level at this point should be within the balance tolerance limits listed in table 7-36 for each E1 voltage.

(5) Disconnect the test equipment.

7-22. Mixer Amplifier 1A2A8 Alignment and Testing

a. ***Test Setup.***

(1) Install the module to be tested in the preselector housing and tighten all mounting screws securely.

(2) Setup test equipment as shown in figure 7-27, detail A. (See fig. 7-25, detail B for special test cable.)

NOTE

See figure 7-27, detail B for locations of adjustments and terminals.

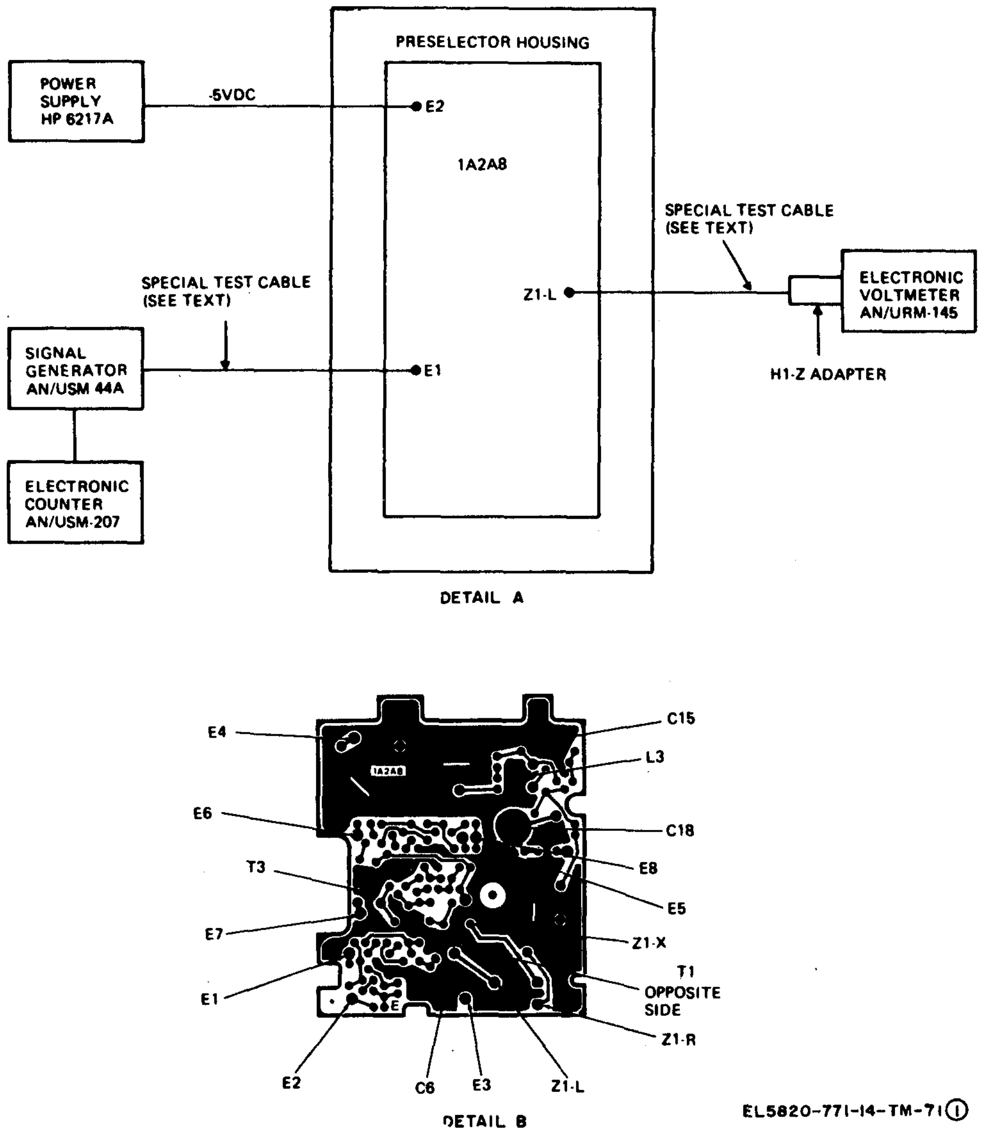


Figure 7-27 ① Mixer amplifier 1A2A8 test diagram (sheet 1 of 3).

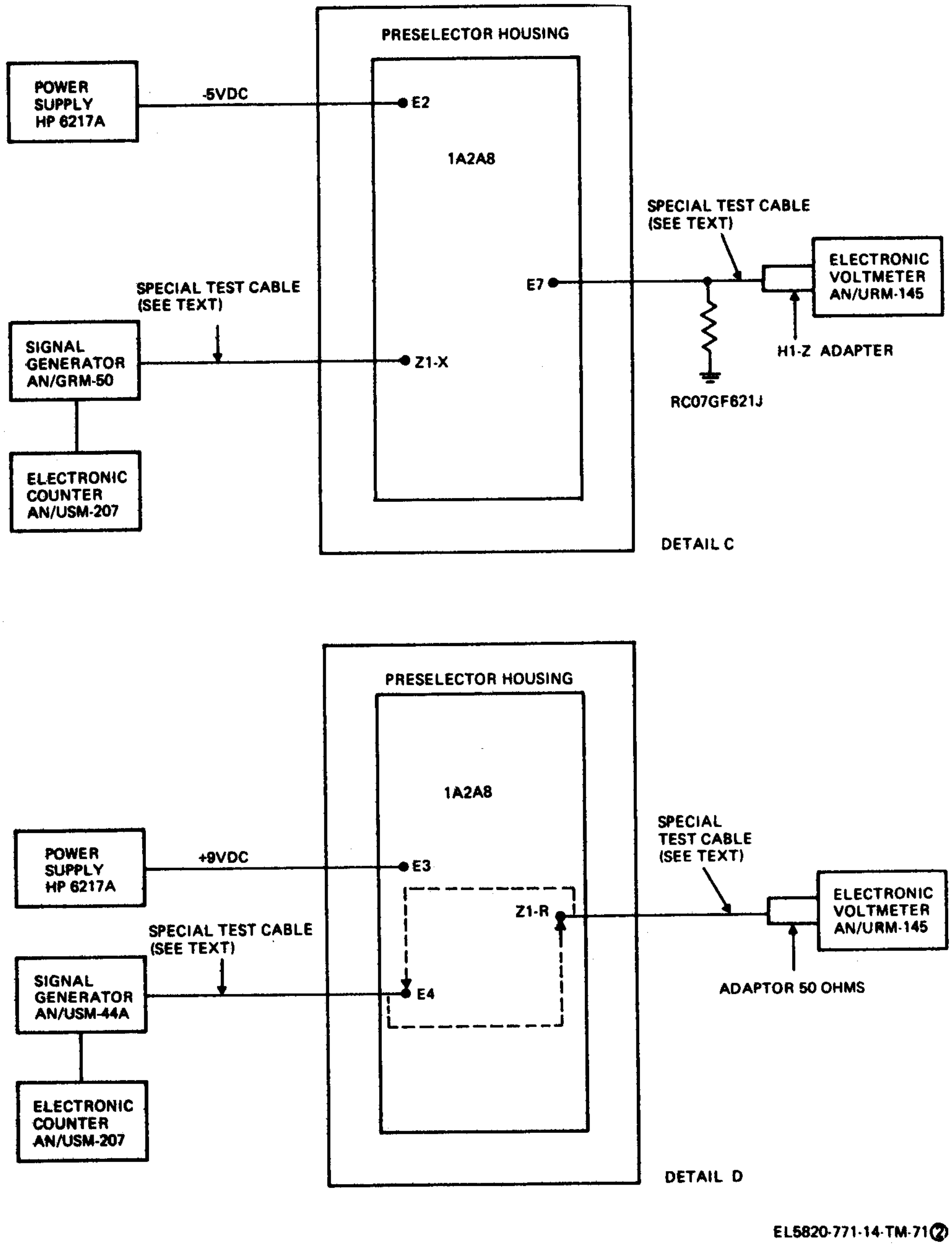


Figure 7-27②. Mixer amplifier 1A2A8 test diagram (sheet 2 of 3).

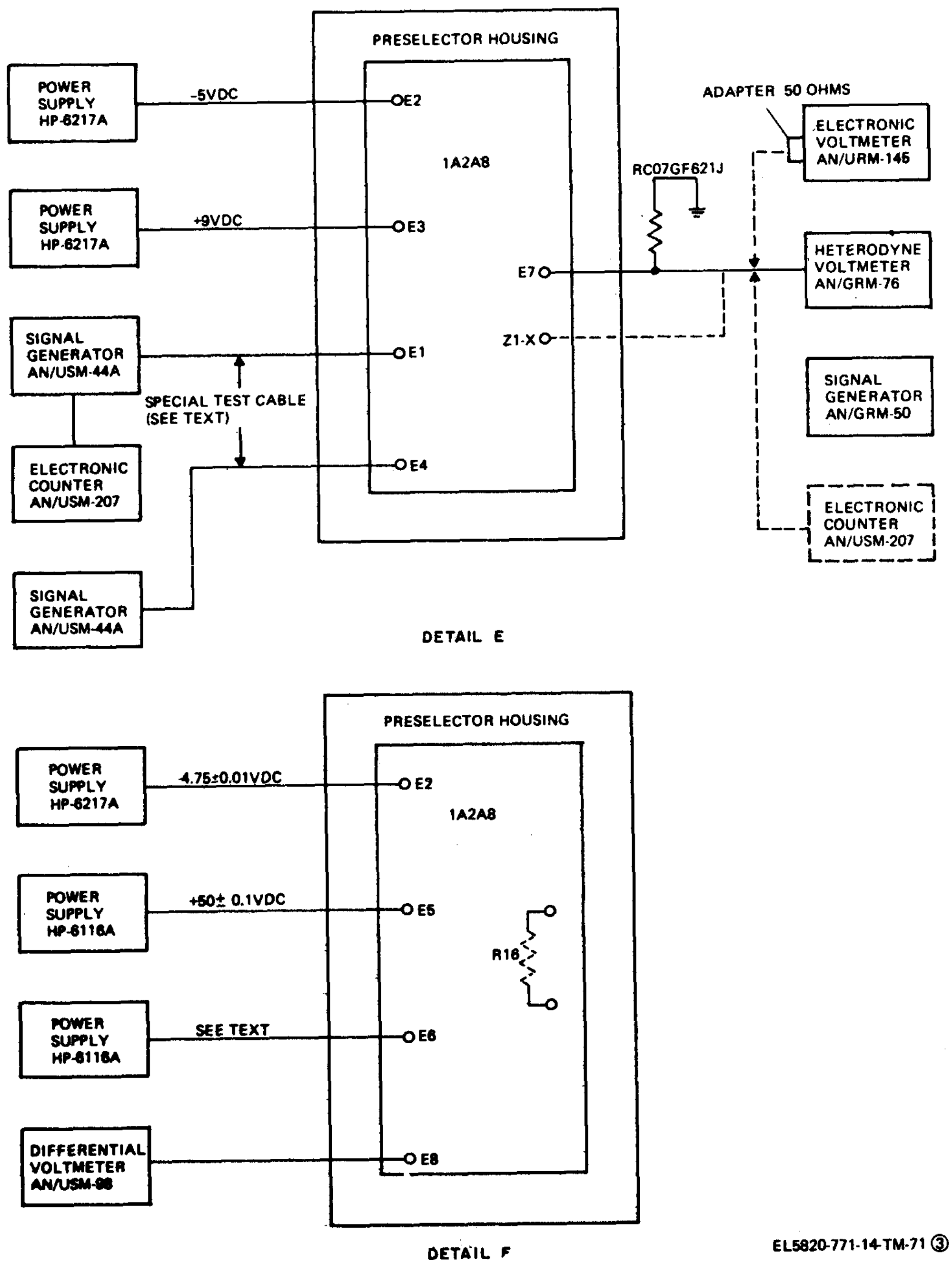


Figure 7-27③Mixer amplifier 1A2A8 test diagram (sheet 3 of 3).

b. Alignment of Q2 *Circuit.*

(1) Set the signal generator for an output of 160 MHz ± 2 kHz at a 20 millivolts level.

(2) Adjust C6 for a maximum output at Z1-L.

(3) If C6 is at either end of its travel the module must be removed from the test circuit and the inductance of T1 increased or decreased as required. After the module is reinstalled in the test circuit C6 must be readjusted.

(4) The output measured at Z1-L should be between 400 and 600 millivolts.

(5) Disconnect test cables from E1 and Z1-L.

c. *Alignment of* Q3 *Circuit.*

(1) Setup test equipment as shown in figure 7-27, detail C.

(2) Set the signal generator for an output frequency of 455 kHz ± 2 kHz and at a level to make the voltmeter at terminal E7 read approximately 50 millivolts.

(3) Adjust T3 for a maximum output as read at terminal E7. Adjust the signal generator to keep the output at E7 below 100 millivolts while adjusting T3.

(4) Set the signal generator for a 1.0 millivolt level and measure the gain of the Q3 circuit at terminal E7.

(5) The gain measured should be a minimum of 40.

(6) Disconnect all test equipment.

d. Alignment of Q4 Circuit.

(1) Setup test equipment as shown in figure 7-27, detail D.

(2) Adjust C18, C15 and L3 to approximately maximum counterclockwise positions.

(3) Set the signal generator for a frequency of 159.545 MHz ± 2 kHz and a level to make the voltmeter at Z1-R read 10 millivolts or less.

NOTE

While doing the following adjustment, oscillation will occur. When this happens disconnect the signal generator and adjust L3 clockwise to just stop the oscillation each time it starts.

(4) Adjust C18 and C15 for maximum gain as read on the voltmeter.

(5) Connect the signal generator probe to Z1-R and the voltmeter probe to terminal E4.

(6) Increase the signal generator output level until the voltmeter reads 10 millivolts or less.

(7) Adjust L3 for the best null obtainable.

(8) Connect the signal generator to terminal E4 and the voltmeter to Z1-R.

(9) Retune C18 and C15 only.

(10) Repeat the procedures in steps (5) through (9) until Q4 is at maximum gain and the feedback loop is nulled.

(11) Disconnect special test cable from Z1-R.

e. Conversion Gain and Sensitivity Test.

(1) Calibrate the heterodyne voltmeter at 455 ± kHz with the signal generator, then disconnect the signal generator.

(2) Setup test equipment as shown in figure 7-27, detail E with the voltmeter connected to Z1-X.

(3) Set signal generator input at terminal E1 to 160.000 MHz ± 1 kHz at a level of 20 millivolts.

(4) Set signal generator input at terminal E4 to approximately 159.545 MHz at a level of 0.5 millivolts. Peak the signal generator output to obtain a maximum reading on the voltmeter. The reading obtained should be 0.5 to 1.2 millivolts.

(5) Remove test cable from Z1-X and connect to terminal E7 with a 620 ohm load.

(6) Peak the signal generator as in step (4) above, then touch up alignment of C6, C15, C18 and T3 for maximum output. Do not adjust L3. The reading obtained should be 20 to 50 millivolts.

(7) Reset the signal generator input level at terminal E4 to 0.5 microvolt. Peak the frequency output and note the voltmeter reading in db.

(8) Detune the signal generator input approximately 100 kHz and note the voltmeter reading in db.

(9) The difference between the readings taken in (7) and (8) above should be 15 db minimum.

(10) Disconnect all test equipment.

f. Agc Amplifier Test.

(1) Setup test equipment as shown in figure 7-27, detail F.

(2) Set voltage input at terminal E6 to -2.300 v ± 2 millivolts.

(3) Measure output voltage at terminal E8. The voltage output at E8 should be +2.22 to 2.36 volts.

(4) If the reading obtained in (3) above is correct, the test is concluded and all test equipment disconnected. If the proper output is not obtained follow the procedure in g below.

g. *Selection of R16.*

(1) Remove R16 from circuit.

(2) Setup test equipment as shown in figure 7-27, detail F.

(3) Set voltage input at terminal E6 to -2.300 v ± 2 millivolts.

(4) Measure voltage at terminal E8 and determine resistance to make voltage at E8 +2.3 ± 0.3 vdc.

(5) From the parts list, select the resistance value for R16 which is nearest to the resistance value selected in step (4).

(6) Install selected resistor in circuit.

(7) Set power supply input at terminal E6 to obtain output voltages at terminal E8 as follows.

The input voltage at terminal E6 should be within the value listed for respective output voltage at E8.

Input E6 (volts)	*Output E8 (volts)*
-2.40 to -2.70	1.4
-2.22 to -2.36	2.3
-1.75 to -1.90	10.5
-1.45 to -1.60	28.0
-1.20 to -1.50	40.0

(10) Disconnect the test equipment.

7-23. RF Coil Assembly 1A2A9 Testing

a. Connect one lead of Q meter to terminal E6 of assembly under test.

b. Connect the other Q meter lead to terminal indicated in left hand column of listing below for respective inductor to be tested.

c. Rotate switch to select coil indicated in inductor symbol column in listing below.

d. Measure inductance of each inductor as indicated in table 7-37.

Table 7-37. RF Coil Assembly 1A2A9 Inductance Values

Terminal	*Inductor symbol*	*Inductance (uH)*	*Tolerance (±%)*
E5	L2	66	10
E4	L1	56	10
E3	L3	56	10
E2	L6	15	10
E1	L5	6.8	10
E7	L4	3.9	10
E8	L7	1.0	10

7-24. RF Coil Assembly 1A3 Alignment and Testing

a. Test Setup.

(1) Setup test equipment as shown in figure 7-28, detail A with input and output pads connected together.

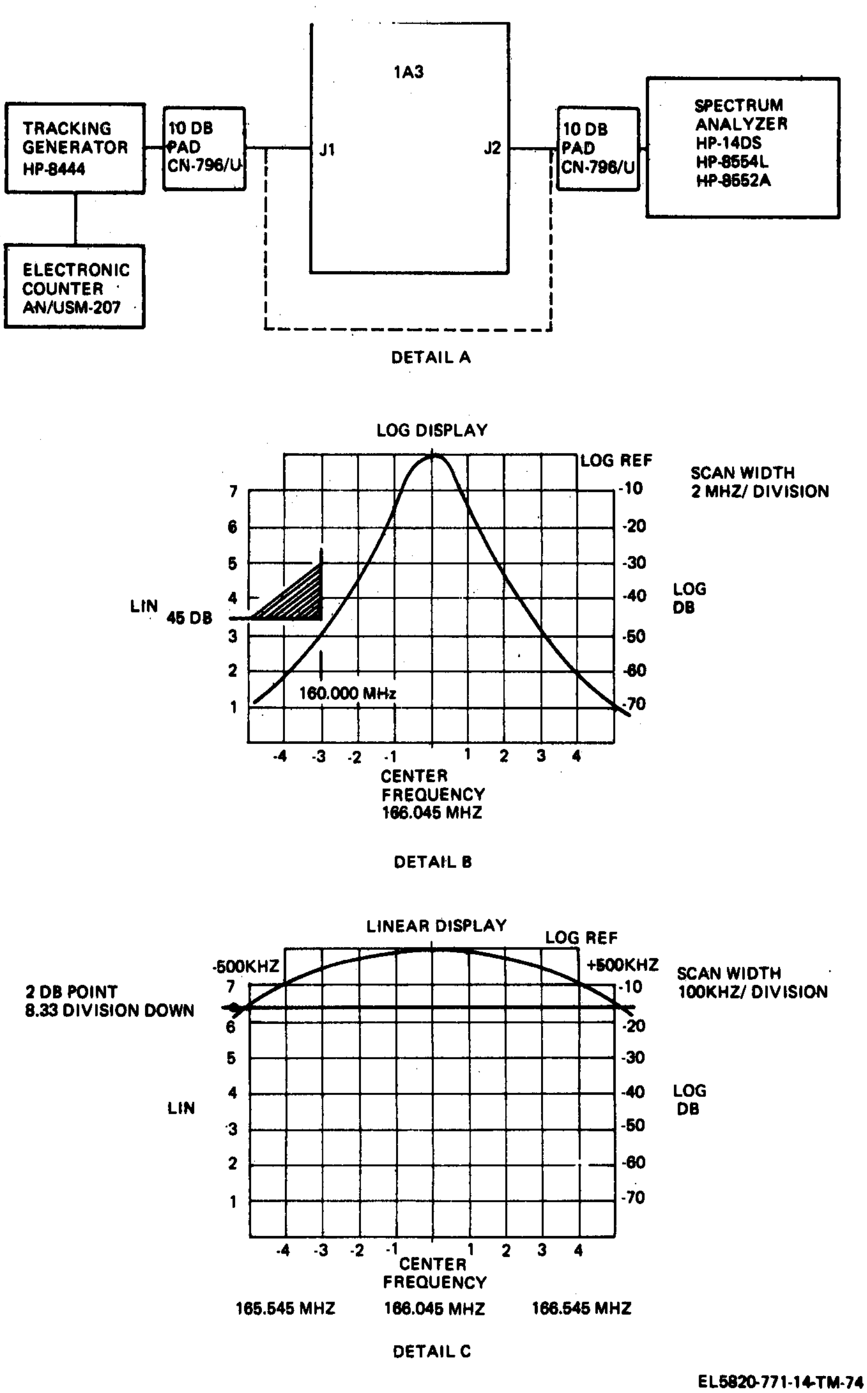


Figure 7-28. RF coil assembly 1A3 test diagram.

(2) Adjust if section level control for a 0 db log reference display on spectrum analyzer.

(3) Connect unit to be tested into test circuit.

(4) Make settings on test equipment as follows:

Tracking generator	*If section*	*Rf section*
Output level maximum	Log mode	Bandwidth 300 kHz
	Gain set at -20 db	Scan width 2 MHz/Division
	Scan time 2 milliseconds	Input attenuation 0 db
	Video filter 10 kHz	Display at 166.000 MHz
	Scan mode internal	

b. Initial Check and Alignment, Insertion Loss and 45 db Bandwidth Check.

(1) Randomly adjust tuning screws L1 through L4 for maximum amplitude and symmetrical display centered at 166.045 MHz.

(2) The insertion loss should be no greater than 6 db below the zero db reference level established in paragraph a (2).

(3) Increase vertical gain adjust until peak of display is at the zero log reference level as shown in figure 7-28, detail B.

(4) Check that response at 160.00 MHz is down a minimum of 45 db.

c. 2-Db Bandwidth Check.

(1) Switch scan width control of rf section from 2 MHz to 100 kHz per division.

(2) Switch if section from log to linear mode and reduce gain to position the maximum response point of display at zero reference as shown in figure 7'28, detail C.

(3) Recheck frequency at center of display using frequency counter, and adjust fine tune control on rf section until counter reads 166.045 MHz ± 20 kHz.

(4) Readjust tuning screws slightly as required to give a symmetrical display with 500 kHz points down a maximum of 2 db. Tighten the adjusting screws' locknuts securely.

(5) Disconnect test equipment.

7-25. Circuit Card Assembly 1A4 Testing

a Variable Divider Tests.

(1) Conect the test equipment as shown in figure 7-29 and apply power.

(2) Set the electronic counter as follows:

Output to 1 MHz
Mode to internal standard
Time base to external
Sensitivity to 0.1 volt
Function to 1 period average

(3) Turn the synthesizer output level counterclockwise to 0 dbm and the attenuator pad setting to 10 db.

(4) Adjust power supply number 1 to +9 ± 0.25 volts, number 2 to -5 ± 0-25 volts and number 3 to +5 ± 0.25 volts.

(5) Connect the synthesizer output to the electronic counter EXT TIME connector.

(6) Connect a probe from the electronic counter dc input to 1A4-U8 pin 11.

(7) Set the toggle switches and read the division ratios directly from the electronic counter for 7, 14, 21, 28 and 30 MHz as shown in table 7-38.

b. Phase Detector Tests.

(1) Perform the procedures described in step a (1) through (6) above.

(2) Set the synthesizer to 10.001 MHz.

(3) Set the toggle switches for a division ratio of 10 (refer to table 7-38) and remove probe from 1A4-U8 pin 11.

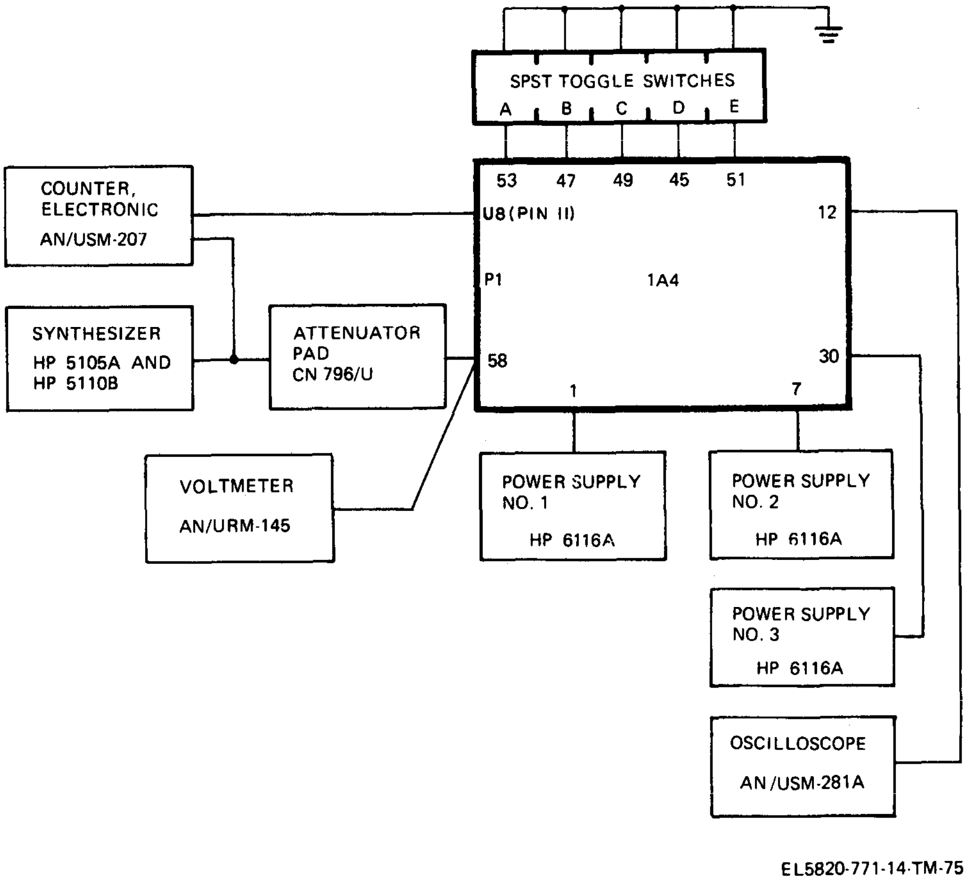


Figure 7-29. Circuit card assembly 1A4 test connections.

(4) Adjust 1A4-R24 while observing the oscilloscope until a 100 Hz sawtooth is displayed. The sawtooth slope should be centered at approximately +2.2 volts. Measure and record the peak levels of the sawtooth. The peaks should be at +6.5 volts and -2.5 volts (minimum levels).

(5) Set the toggle switches for a division ration of 36. Increase the input frequency until the sawtooth becomes unstable. The frequency at this point should be 39 MHz minimum.

(6) Set the synthesizer to 36 MHz. Increase the attenuation of the pad until the sawtooth becomes unstable. The rf voltmeter reading should be 40 millivolts maximum.

(7) Set the toggle switches for a division ratio of 7. Set the synthesizer to 7 MHz.

(8) Increase the attenuation of the pad until the sawtooth becomes unstable. The rf voltmeter should indicate 15 millivolts maximum.

(9) Set the synthesizer to 5 kHz above each of the frequencies listed in table 7-38 and set the toggle switches as listed. Examples are: synthesizer to 7.005 MHz with switches to 01010 (7 MHz) and synthesizer to 36.005 MHz with switches to 11111 (36 MHz).

(10) Observe a stable, linear sawtooth on the oscilloscope for each frequency listed.

Table 7-38. Circuit Card *Assembly 1A4 Test Data*

Division ratio	*Switches* 53 *A*	47 *B*	49 *C*	45 *D*	51 *E*
7	0	1	0	1	0
8	0	1	0	1	1
9	0	1	1	0	1
10	0	1	1	0	0
11	0	1	1	1	0
12	0	1	1	1	1
13	0	0	0	0	1
14	0	0	0	0	0
15	0	0	0	1	0
16	0	0	0	1	1
17	0	0	1	0	1
18	0	0	1	0	0
19	0	0	1	1	0
20	0	0	1	1	1
21	1	0	0	0	1
22	1	0	0	0	0
23	1	0	0	1	0
24	1	0	0	1	1
25	1	0	1	0	1
26	1	0	1	0	0
27	1	0	1	1	0
28	1	0	1	1	1
29	1	1	0	0	1
30	1	1	0	0	0
31	1	1	0	1	0
32	1	1	0	1	1
33	1	1	1	0	1
34	1	1	1	0	0
35	1	1	1	1	0
36	1	1	1	1	1

c. Dc Power Tests.

(1) With all specified test equipment connected as shown in figure 7-29, measure the current on the dc power lines.

(2) +5 volt power supply number 3 current meter should indicate 175 milliamps maximum.

(3) +9 volt power supply number 1 current meter should indicate 10 milliamps maximum.

(4) -5 volt power supply number 2 current meter should indicate 2 milliamps maximum.

(5) Disconnect the test setup.

7-26. Circuit Card Assembly 1A5 Testing

a. Variable Divider Tests.

(1) Connect the test equipment as shown in figure 7-30, detail A and apply power to the test equipment.

(2) Set the electronic counter as follows,

Time base to external
Sensitivity to 0.1 volts
Set level to preset
Function to 1 period average

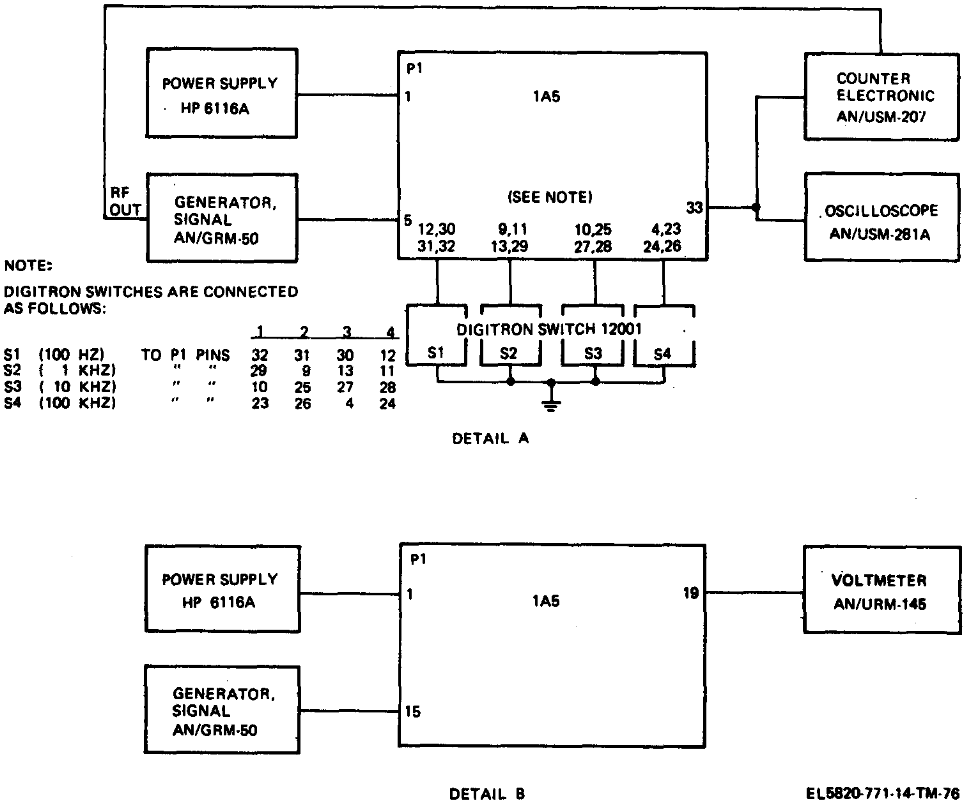


Figure 7-30. Circuit card assembly 1A5 test connections.

(3) Connect the signal generator uncalibrated rf output to the electronic counter timebase external input.

(4) Turn on and set the power supply to +5 v ± 5%.

(5) Adjust the signal generator frequency to 7 MHz and the output level to 25 millivolts.

(6) Read the division ratio directly on the electronic counter for each of the digitron switch settings shown in table 7-39 and check for a 3-volt peak to peak minimum square wave on the oscilloscope.

(7) Set the switches to zero and decrease the signal generator frequency to 6.6 MHz.

(8) Decrease the signal generator output level while observing the electronic counter until an incorrect count occurs. The signal generator level should be 12 millivolts maximum.

(9) Check that the power supply output current is 70 milliamps maximum.

b. Hf Control Line Filter Tests.

(1) Connect the test equipment as shown in figure 7-30, detail B.

Table 7-39. Circuit Card Assembly 1A5 Test Data

100kHz	*10 kHz*	*1kHz*	*100 Hz*	*Division ratio*
0	0	0	0	65450
0	0	0	1	65449
0	0	0	2	65448
0	0	0	3	65447
0	0	0	4	65446
0	0	0	5	65445
0	0	0	6	64544
0	0	0	7	65443
0	0	0	8	64542
0	0	0	9	65441
0	0	1	0	65440
0	0	2	0	64539
0	0	3	0	65420
0	0	4	0	65410
0	0	5	0	65400
0	0	6	0	65390
0	0	7	0	65380
0	0	8	0	65370
0	0	9	0	65360
0	1	0	0	65350
0	2	0	0	65250
0	3	0	0	65150
0	4	0	0	65050
0	5	0	0	64950
0	6	0	0	64850
0	7	0	0	64750
0	8	0	0	64650
0	9	0	0	64550
1	0	0	0	64450
2	0	0	0	63450
3	0	0	0	62450
4	0	0	0	61450
5	0	0	0	60450
6	0	0	0	59450
7	0	0	0	58450
8	0	0	0	57450
9	0	0	0	56450
9	9	9	9	55451

(2) Adjust the signal generator frequency to 200 kHz and the output level to 1.0 vrms. Turn off the power supply.

(3) Measure the difference in decibels between the input (1-15) and the output (P1-19). The difference should be ± 5 db maximum.

(4) Readjust the signal generator frequency and measure the input (P1-15) to output (P1-19) difference in decibels as follows:

Frequency	*Difference*
400 kHz	± 5 db maximum
600 kHz	+5 to -10 db
800 kHz	-10 db minimum
1 MHz	-20 db minimum
5 MHz	-30 db minimum

(5) Disconnect the test setup.

7-27. RF Oscillator 1A6 Testing

a. 1-MHz Reference Tests.

(1) Connect test equipment as shown in figure 7-31, detail A.

(2) Set controls and connect input/outputs to the frequency counter as follows:

100 Hz output to P1-3
Dc input to P1-31
Time base to 1 second
Function to frequency
External input to the signal generator
Frequency standard to internal.

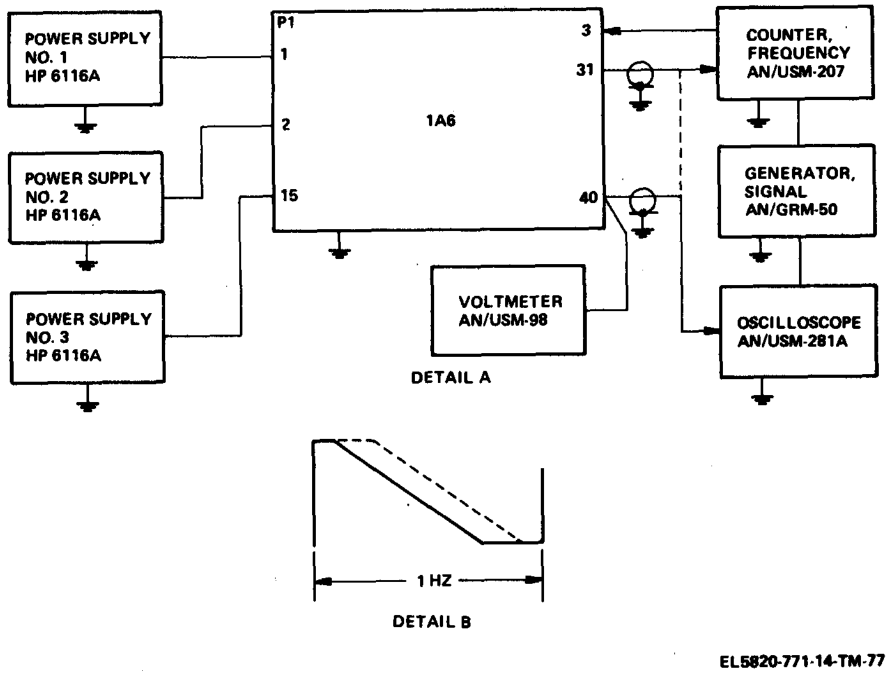


Figure 7-31. RF oscillator 1A6 test diagram.

(3) Adjust the power supply voltage outputs as follows:

Power supply Number 1 to +5 ± 0.25 volts
Power supply Number 2 to +9 ± 0.5 volts
Power supply Number 3 to -5 ± 0.25 volts

(4) Check the frequency of the 1 MHz output shown on the frequency counter. A frequency of 1 MHz ± 0.5 Hz should be indicated.

(5) Connect oscilloscope to the 1 MHz output (P1-31) and observe a 3.0 to 4.2 volt peak-to-peak, 1-MHz squarewave.

b. Phase Detector Tests.

(1) Set the frequency standard to external and the standard select output switch to 100 Hz on the frequency counter.

(2) Set the signal generator frequency to 1 MHz and the amplitude to 1 vrms.

(3) While monitoring the frequency counter, adjust the signal generator frequency until a beat frequency of 1.0 Hz is obtained.

(4) Connect the oscilloscope to P1-40 and observe a 1 Hz sawtooth approximately 10 volts in amplitude with a flat at top peak as shown in figure 7-31, detail B.

(5) While observing the voltmeter, reduce the output frequency of the signal generator until the peak-to-peak swing can be read. The frequencv should be less than 0.1 Hz and the voltage swing +6.7 to -2.2 minimum. If the voltage swing is incorrect R20 and R26 may have to be replaced with resistors of different resistances.

c. Dc Power Test.

(1) Measure the current of the power supplies (using the power supply panel meters) as follows:

Power supply Number 1(+5v) 18 to 22 milliamps
Power supply Number 2(+9v) 8 to 13 milliamps
Power supply Number 3 (-5v) 0.1 to 1.0 milliamps

(2) Disconnect all test equipment.

7-28. Converter Amplifier 1A7 Alignment and Testing

a. Fm Discriminator Alignment.

(1) Setup test equipment as shown in figure 7-32, detail A with the voltmeter connected to TP-5. Set MODE switch to FM.

(2) Apply a 10 millivolt rms cw signal at a frequency of 405 kHz to pin 15 of P1.

(3) Monitor the voltmeter at TP-5 and slowly vary the input frequency above and below 405 kHz. The voltmeter should indicate a minimum kHz reading at 405.0 ± 1.0 kHz.

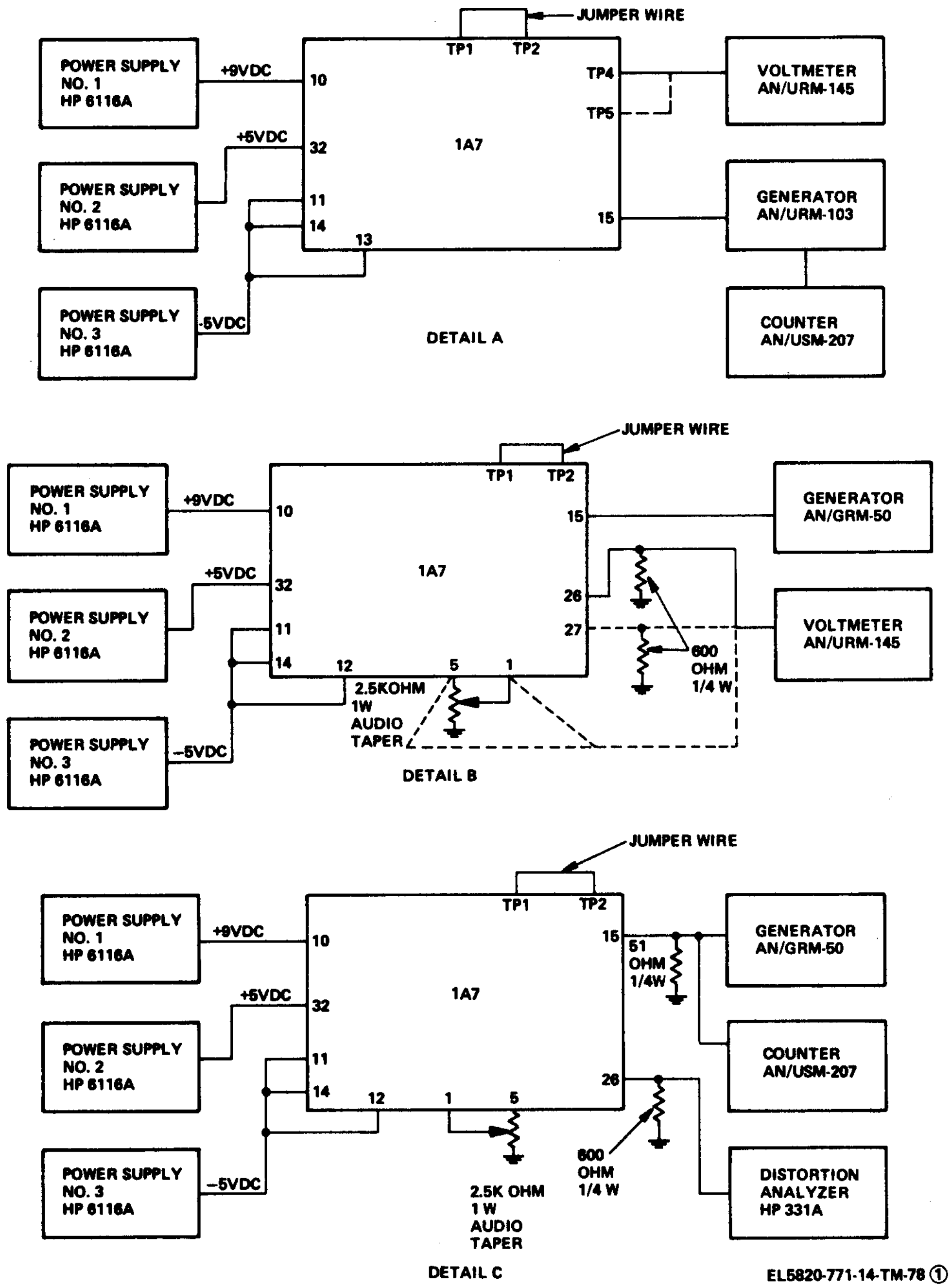


Figure 7-32 ① Converter amplifier 1A7 test connections (sheet 1 of 3).

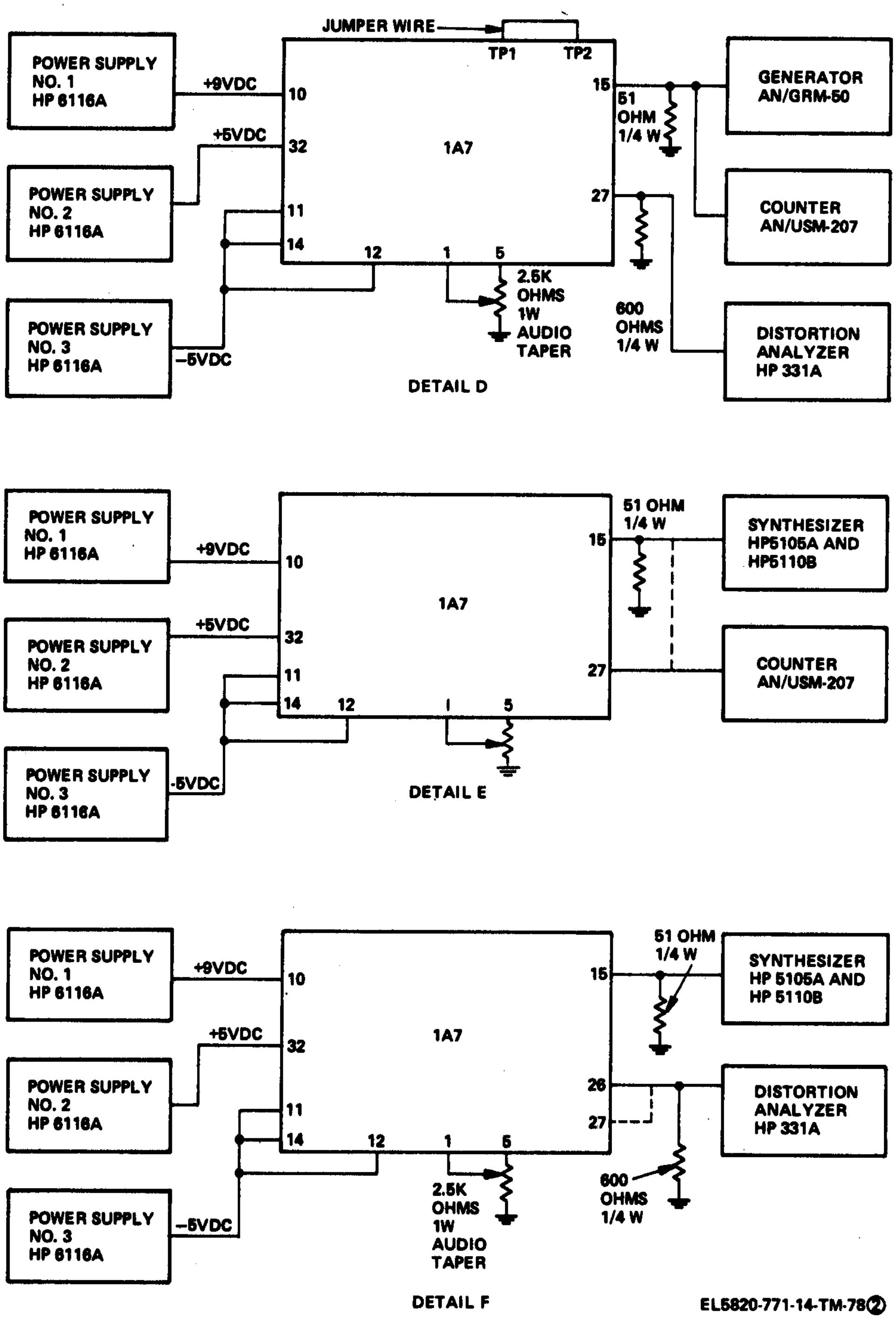


Figure 7-32②Converter amplifier 1A7 test connections (sheet 2 of 3).

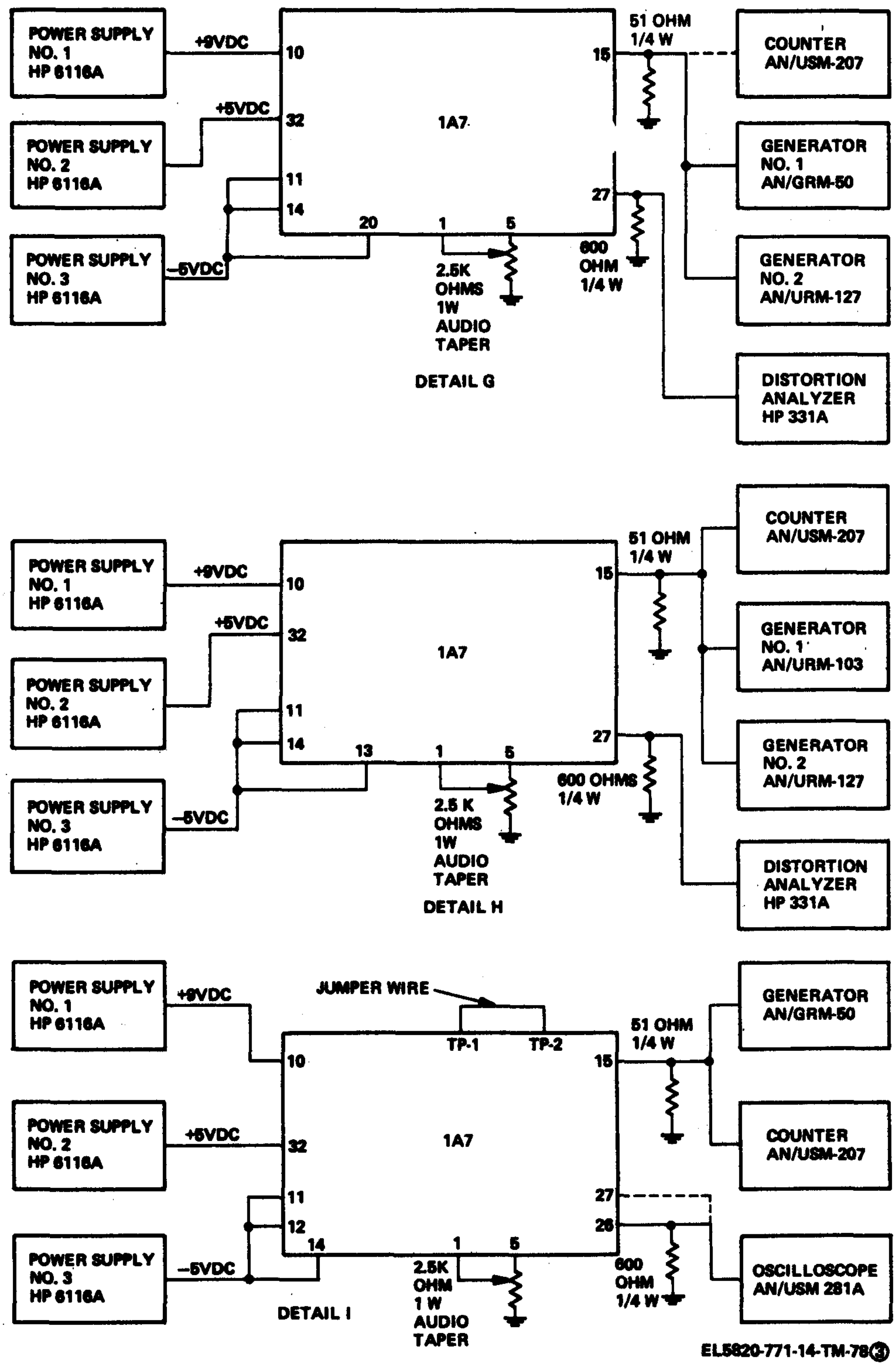


Figure 7-32 ③. Converter amplifier 1A7 test connections (sheet 3 of 3).

NOTE

In the event components have been changed in the fm discriminator circuitry, it may be necessary to change the value of C31 to meet the requirements of step (3). See figure FO-23 for component locations. To select C31:

$$C31 = 454pf \left(\frac{405kHz}{F\ Resonance}\right)^2 - 430\ pf$$

For close-in adjustment, the frequency sensitivity to C31 is $\frac{-1\ kHz}{2.25\ pf}$. Increasing C31 by 2.25 pf will lower the peak by 1kHz and decreasing C31 by 2.25 pf will raise the peak by 1 kHz.

(4) Connect the voltmeter to TP-4 and slowly vary the input frequency above and below 520 kHz. The voltmeter should peak positive at 520 ± 1 kHz.

NOTE

If the requirements of step (4) cannot be met, C28 may have to be replaced with a capacitor of different value. To select C28:

$$C28 = 366\ pf \left(\frac{520\ kHz}{F\ Resonance}\right)^2 - 330\ pf$$

For close-in adjustment. the frequency sensitivity to C28 is $\frac{-1\ kHz}{1.41\ pf}$. Increasing C28 by 1.41 pf will lower the peak 1kHz and decreasing C28 by 1.41 pf will raise the peak 1 kHz.

b. Volume Control Adjustments.

(1) Setup test equipment as shown in figure 7-32, detail B.

(2) Set the signal generator for a frequency of 456.0 kHz at a level high enough to produce a 3.0 vrms output at pin 27 of J1. The signal generator output level required should be 14 millivolts ± 2 db.

(3) With the signal generator set at the level obtained in step (2) adjust the variable resistor connected between pins 1 and 5 for 2.45 vrms measured at pin 26 of P1.

(4) Measure the voltage at pins 1 and 5 of P1. The voltages should be approximately 0.35 volt at pin 1 and 0.7 at pin 5. Leave the variable resistor at this setting for the remainder of the tests of 1A7.

c. Narrow band Frequency Response Test.

(1) Setup test equipment as shown in figure 7-32, detail C.

(2) Set the signal generator for a frequency of 456 kHz.

(3) Set the distortion analyzer function switch to distortion and the frequency dial to 1 kHz.

(4) Adjust the signal generator frequency slightly to null the distortion analyzer meter.

(5) Switch the distortion analyzer function switch to meter and adjust the signal generator output level for a 2.45 vrms reading on the distortion analyzer meter. Leave the signal generator at this output level.

(6) Reset the signal generator frequency and distortion analyzer dials to obtain the frequencies listed in the chart below. The attenuation of the output signal level at these frequencies should be at the values listed.

Frequency (kHz)	*Attenuation (db)*
455.050	-20.0 minimum
455.300	-0.5 maximum
456.000	0.0 (reference)
456.500	-0.5 maximum
465.000	-20.0 minimum

d. Wideband Frequency Response Test.

(1) Setup test equipment as shown in figure 7-32, detail D.

(2) Follow the procedures outlined in steps c(2), (3), (4), and (5), but set the signal generator level high enough for a 3.0 vrms output at pin 27 of P1.

(3) Keep the signal generator at this level and measure the output signal attenuation for the frequencies listed below.

Frequency (kHz)	*Attenuation (db)*
455.050	-20.0 minimum
455.300	-0.5 maximum
468.000	-0.6 maximum
515.000	-20.0 minimum

e. Bfo Frequency Test.

(1) Setup test equipment as shown in figure 7-32, detail E with the counter connected to the synthesizer.

(2) Apply a 15 millivolts rms 454.000 kHz signal to pin 15 of P1.

(3) Disconnect the counter from the synthesizer and connect it to pin 27 of P1.

(4) Count the frequency to the nearest cycle.

(5) The frequency should be 1000-10 +17 Hz.

f. Cw Output and Distortion Test.

(1) Setup test equipment as shown in figure 7-32, detail F with the distortion analyzer connected to pin 26 of P1.

(2) Apply a 15 millivolts rms synthesized 456.000 kHz signal to pin 15 of P1.

(3) Measure the voltage level and distortion of the output signal. The voltage level should be 2.5 vrms with a maximum of 2.5% distortion. (The 2.5 kilohm audio taper resistor may be adjusted to attain the 2.5 vrms level.)

(4) Using the 2.5 vrms reference obtained in step (3) check the output levels with a 455.350 kHz then with a 458.500 kHz input signal. The output level should be 2.2 vrms minimum with 2.5% maximum distortion for both input frequencies.

(5) Connect the distortion analyzer to pin 27 of P1.

(6) Apply, in turn, 15 millivolts rms input signals of 454.000, 455.350, 456.000 and 467.000 kHz at pin 15. The output signal levels should be 3.0 vrms minimum with 2.5% maximum distortion.

(7) If the voltage level of step (6) above is low, replace R63 and R64 (FO-23) with resistors of higher value.

g. Am Output and Distortion Test.

(1) Setup test equipment as shown in figure 7-32, detail G.

(2) Set signal generator number 1 for a 15 millivolts, 455 kHz output signal.

(3) Modulate the above signal 60% am at frequencies of 300 Hz, 1.0 kHz, 3.5 kHz and 12 kHz with signal generator number 2.

(4) Apply the modulated signal to pin 15 and read the output at pin 27 on the distortion analyzer. The output signal should be at a level of 3.0 vrms minimum, with a maximum of 2% distortion for each modulation frequency.

(5) If the Voltage level of step (4) above is low, replace R63 and R64 with resistors of higher value.

h. Fm Output and Distortion Test.

(1) Setup test equipment as shown in figure 7-32, detail H.

(2) Set signal generator number 2 for a 15 millivolts rms fm signal of 455 kHz with a peak deviation of 8 kHz.

(3) Set signal generator number 1 for a 1 kHz modulating frequency.

(4) Apply this modulated signal to pin 15 and read the out put at pin 27 on the distortion analyzer. The output signal should be at a level of 3.0 vrms minimum with a maximum of 2% distortion.

(5) If the output level of step (4) above is low, replace both R63 and R64 with resistors of a higher value.

i. Output Signal Swing Capability Test.

(1) Setup *test* equipment as shown in figure 7-32, detail I with the oscilloscope connected to pin 27.

(2) Set the signal generator for a frequency output of 455 kHz at a level high enough to cause the output signal, viewed on the oscilloscope, to begin to clip.

(3) Measure the clipping level on the oscilloscope to ensure that the clipping level is greater than 3.3 vrms and the distortion is less than 2%.

(4) Connect the oscilloscope to pin 26 and repeat step. (2) above.

(5) Measure the clipping level and distortion. The clipping level should be greater than 3.2 vrms and the distortion less than 2%.

(6) If the clipping level measured in step (3) is below 3.3 vrms, R67 will have to be replaced with a resistor of some lower value.

(7) Disconnect all test equipment.

7-29. IF Amplifier 1A8 Alignment and Testing

a. Preliminary Adjustments.

NOTE

The filter assembly and if amplifier contain selected capacitors whose value must be chosen individually for optimum performance of the module. These components are indicated by asterisks on the 1A8 schematic diagram, figure FO-13. Selected values are a nominal 15 pf but may range from 0 (no component) to 20 pf.

(1) *IF amplifier tuning.*

(a) Connect test equipment as shown in figure 7-33. Connect the voltmeter to P1-30.

(b) Attach a 10 kilohm potentiometer between ground and P1-25. Connect the wiper to P1-23. Turn potentiometer fully clockwise.

(c) Apply -5 volts to P1-7 to activate the 25 kHz filter.

(d) Apply a 455.00 kHz, 31.6 microvolt unmodulated input to P1-1. Select C43 and C50 for maximum output at P1-30.

(2) *1-kHz filter tuning.*

(a) Remove -5 volts from P1-7 and connect to P1-11 to activate the 1-kHz filter.

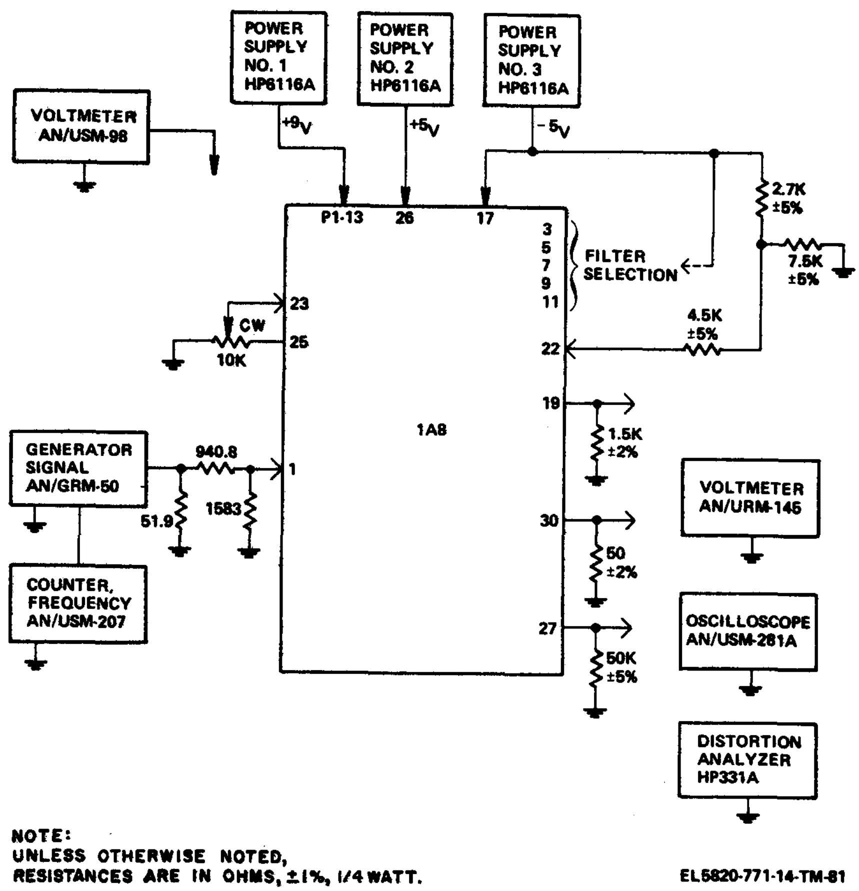


Figure 7-33. IF amplifier 1A8 test connections.

(b) With the same input as in (1) above, adjust input and output trimmers C13 and C27 for maximum output at P1-30. Sweep each trimmer over full range and observe two peaks. If double peaks are not present proceed to (c).

(c) Add C11 and/or C25 (15 pf) as needed to tune trimmer for double peaks.

(d) Sweep input signal across filter passband and measure ripple at output P1-30. If ripple exceeds 1.5 db peak-to-peak, retune filter for optimum signal within ripple limits.

(3) 4-kHz filter tuning.

(a) Remove -5 volts from P1-11 and connect to P1-9 to activate the 4-kHz filter.

(b) With the same input as in (1) above, adjust input trimmer C10 for double peak. Add C8 if double peak is not present then return C10 and add C22 for peak output.

(c) Sweep input signal across filter passband and measure ripple at output P1-30. If ripple exceeds 1.5 db peak-to-peak retune filter for optimum signal within ripple limits.

(4) *Usb filter tuning.*

(a) Remove -5 volts from P1-9 and connect to P1-5 to activate the upper sideband filter.

(b) With the same input as in (1) above, adjust the usb trimmer C16 for a double peak. Add C14 and/or C28 as necessary, then retune.

(c) Sweep input signal across filter passband and measure ripple at output P1-30. If ripple exceeds 1.5 db peak-to-peak, retune filter for optimum signal within ripple limits.

(5) *Lsb filter tuning.*

(a) Remove -5 volts from P1-5 and connect to P1-3 to activate the lower sideband filter.

(b) With the same input as in (1) above, adjust the 1sb trimmer C19 for a double peak. Add C17 and/or C31 as necessary, then retune.

(c) Sweep input signal across filter passband and ripple at output P1-30. If ripple exceeds 1.5 db peak-to-peak, retune filter for optimum signal within ripple limits.

b. Dc Power Test.

(1) Disconnect the signal generator from P1-1 and remove -5 volts from P1-3 and connect it to P1-9.

(2) Remove 10 kilohm potentiometer wiper connection from P1-23.

(3) Connect voltmeter to P1-13 and adjust power supply number 1 for +9 volts indication.

(4) Set the power supply meter to measure current and measure 0.3 to 0.7 milliamp. Set meter to voltage and readjust to 9 volts.

(5) Connect voltmeter to P1-26 and adjust power supply number 2 for +5 volts indication.

(6) Set the power supply meter to indicate current and measure 1.34 to 1.74 milliamp. Set meter to voltage and readjust to +5 volts.

(7) Connect voltmeter to P1-17 and adjust power supply number 3 for -5 volts reading.

(8) Set the power supply meter to indicate current and measure 7.0 to 9.0 milliamps. Set meter to voltage and readjust to -5 volts reading.

c. IF Sensitivity and Gain Test.

(1) With equipment connected as in *b.* above, connect the voltmeter to P1-30 and measure the noise.

(2) Reconnect the signal generator to P1-1 and adjust for 455.00 kHz.

(3) Increase the signal generator level until the voltmeter at P1-30 indicates 7 db greater than the noise measured in (1). Record the generator signal level (30 microvolt maximum) for signal to noise ratio.

(4) Increase the signal generator level to 31.6 microvolt and measure the if output at P1-30 (110 millivolts minimum).

(5) Connect the voltmeter to P1-19 and measure the demodulated if output (10 millivolts minimum).

(6) Connect the 10 kilohm potentiometer wiper to P1-23 and turn the potentiometer fully clockwise.

(7) Reduce the generator output until the if output indicates the same value as in (4). Subtract the generator signal level from -76.8 db to give 1 db nominal gain reserve.

d. 25-kHz Filter Selectivity Test.

(1) Remove -5 volts from P1-9 and connect it to P1-7 to activate the 25 kHz filter.

(2) Adjust the signal generator to produce an output (at P1-30) of 120 millivolts at the peak response frequency. Record the generator level as the reference level.

(3) Determine the passhand ripple by subtracting the reference level from -28.5 db. A ripple of <2 db is acceptable.

(4) Maintain the generator output level constant while varying the frequency between 442.00 to 468.00 kHz and record the lowest output level.

(5) Measure the upper and lower 6 db attenuation frequencies (less than 478 kHz and greater than 432 kHz, respectively).

(6) Increase the generator level 60 db above the reference level recorded in (2) above. Vary the generator frequency slowly and record the points at which the output is 120 millivolts as the upper and lower 60 db attenuation frequencies (< 488 kHz and > 422kHz, respectively).

e. 4-kHz Filter Selectivity Test.

(1) Remove -5 volts from P1-7 and connect it to P1-9 to activate the 4 kHz filter.

(2) Adjust the signal generator level to produce an output at P1-30 of 100 millivolts at the peak response frequency. Record the generator level as the reference level.

(3) Determine the passband ripple by subtracting the reference level from -30 db. A ripple of < 2 db is acceptable.

(4) Vary the generator frequency above and below the reference to determine the 3 db attenuation frequencies. These points should be at 452.20 to 453.00 kHz and 457.00 to 457.80 kHz.

(5) Increase the generator level 60 db above the reference level. Vary the frequency and record the two points at which the output at P1-30 is 100 millivolts as the upper and lower 60 db attenuation frequencies. These points should be > 447.00 kHz and > 463.00 kHz.

f. 1-kHz Filter Selectivity Test.

(1) Remove -5 volts from P1-9 and connect it to P1-11 to activate the 1 kHz filter.

(2) Repeat *e* (2) through (4) above. The 3 db attenuation points should be 454.10 to 454.50 kHz and 455.50 to 455.90 kHz.

(3) Repeat *e* (5) above. The 60 db attenuation points should be > 453.00 kHz and < 457.00 kHz.

g. Usb Filter Selectivity Test.

(1) Remove -5 volts from P1-11 and connect it to P1-5 to activate usb filter.

(2) Repeat *e* (2) through (4) above. The 3 db attenuation points should be < 455.50 kHz and 458.00 to 458.80 kHz.

(3) Repeat *e* (5) above. The 60 db attenuation points should be > 453.50 kHz and < 461.60 kHz.

(4) To measure the single sideband carrier rejection, set the generator frequency to 455.00 kHz. Increase the generator level until the if output is 100 millivolts. The difference between the reference measured in *e* (2) above and the generator level should be ≥ 30 db.

h. Lsb Bandwidth Selectivity Test.

(1) Remove -5 volts from P1-5 and connect it to P1-3 to activate the lsb filter.

(2) Repeat *e* (2) through (4) above. The 3 db attenuation points should be 451.20 to 452.00 kHz and < 454.50 kHz.

(3) Repeat *e* (5) above. The 60 db attenuation points should be > 448.50 kHz and < 456.50 kHz.

(4) Repeat *g* (4) above.

i. Auxiliary Output Tuning Test.

(1) Remove -5 volts from P1-3 and connect it to P1-9 to activate the 4 kHz filter.

(2) Disconnect 10 kilohm potentiometer wiper from P1-23.

(3) Adjust the generator level to 31.6 microvolt. Adjust 1A7-R75 until if output (P1-30) is 120 to 130 millivolts.

(4) Connect voltmeter to tagc output (P1-21) and measure -3.5 vdc minimum. Adjust R75 within output limits if necessary.

(5) Connect voltmeter to meter agc output (P1-22) and measure -3.3 vdc minimum.

(6) Connect voltmeter to diode output (P1-27) end measure -1.0 vdc minimum.

j. *Agc Tracking Test.*

(1) Remove signal generator input from P1-1.

(2) Connect multimeter and measure voltage at the following points:

Tagc (P1-21) is -3.5 vdc minimum
Diode (P1-27) is -0.3 vdc maximum
Meter agc (P1-22) is -3.5 vdc nominal.

(3) Set the signal generator for a 455 kHz unmodulated, 1 microvolt output and connect it to P1-1. Check that -5 volts is applied to P1-9.

(4) Increase generator level to 31.6 microvolt. Connect multimeter and measure voltage as follows:

IF output (P1-30) is 110 millivolts minimum
Diode (P1-27) is -1.0 volts minimum
Meter agc (P1-22) is -3.5 volts nominal
Tagc (P1-21) is -3.6 volts nominal.

NOTE

If diode (P1-27) output is low, adjust R75.

(5) Increase generator level in 10 db steps, observing outputs change in one direction only until saturation (approximately +90 db).

(6) Measure final values when saturation is reached. Adjust R75 and repeat test if outputs are out of the following limits:

IF output (P1-30) > 3.0 and < 5.5 db from (4)
Diode (P1-27) is -3.0 volts maximum
Meter agc (P1-22) ≥ 0.3 volts difference from (4)
Tagc (P1-21) ≥ -1.7 vdc.

k. Diode Output Response Test.

(1) Connect wiper of 10 kilohm potentiometer to P1-23.

(2) Apply a generator input to P1-1 of 455.0 kHz, 30% modulation, with a 30.0 millivolts signal level.

(3) Connect oscilloscope and distortion analyzer to diode out (P1-27) and adjust 10 kilohm potentiometer to center 1 kHz dynamic signal within clipping region. Signal should be a nominal +5 db.

(4) Switch to 400 Hz modulation and observe on oscilloscope that diode output is not clipped. The level difference between the 1 kHz and 400 Hz modulation should be 2 db maximum.

l. Am Distortion Test.

(1) Disconnect wiper of 10 kilohm potentiometer from P1-23.

(2) Apply a generator input (to P1-1) of 455.0 kHz, 30% modulation at 1 kHz, with a 31.6 microvolt signal level.

(3) Connect the distortion analyzer to P1-30. The analyzer should indicate less than 7% distortion.

(4) Increase the generator output in 10 db steps to 200 millivolts. The distortion should remain at 7% or less.

(5) Remove power and disconnect all test equipment.

7-30. Power Supply Assembly 1A9 Alignment and Testing

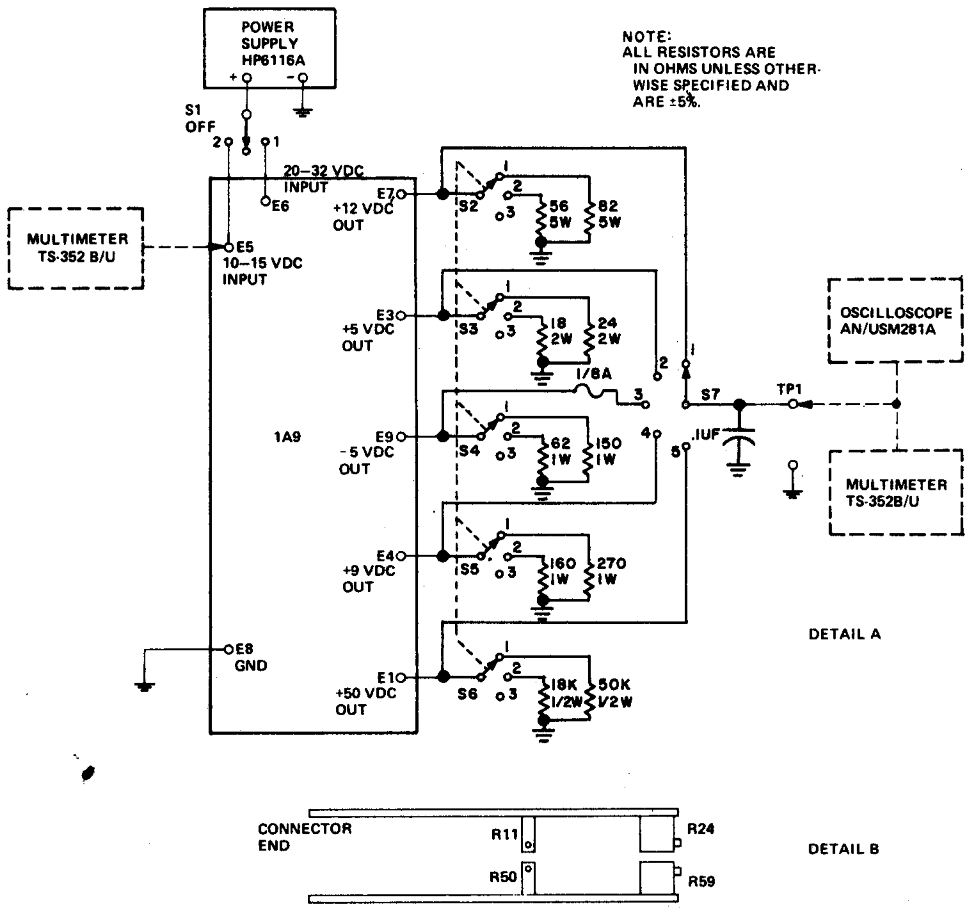
NOTE

The following steps are to be adhered to during test of this module.

1. With S1 in position 1, the HP6116A power supply is to be in the range of 20 to 32 vdc.
2. With S1 in position 2, the HP6116A power supply is to be within the range of 10 to 15 vdc.
3. With the module energized, the printed circuit boards are not to be touched. The added stray capacitance will cause excessive circuit switching times, which will stress internal components and result in inoperation or marginal performance.

a. Preliminary Setup.

(1) Setup test equipment as shown in figure 7-34, detail A. Turn on the HP6116A power supply and adjust its output to +26 vdc.



DETAIL C

OUTPUT VOLTAGE VDC	S7 POSITION	S3 THRU S6 SWITCH & POSITION	LOAD
+5	2	S3-1	LIGHT
-5	3	S4-1	LIGHT
+9	4	S5-1	LIGHT
+50	5	S6-1	LIGHT
+5	2	S3-2	HEAVY
-5	3	S4-2	HEAVY
+9	4	S5-2	HEAVY
+50	5	S6-2	HEAVY

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Figure 7-34. Power supply assembly 1A9 test diagram.

(2) Check for a nominal reading of + 12.5 vdc and approximately 100 milliamps at TP-1.

(3) Adjust the HP6116A power supply to +12 vdc and place S1 in position 2. Check the input current for approximately 160 milliamps

(4) Adjust the outputs of the power supply under test in accordance with table 7-40. (Refer to figure 7-34, detail B for adjustment locations.)

b. Vehicular Source Operation (20-32 Vdc Input).

(1) Place all switches in position 1 (light load).

Table 7-40. Power Supply Assembly 1A9 Preliminary Test Setup.

HP6116A output (vdc)	Positions S1	S2 thru S6	S7	TP1 (vdc)	Adjust
12.0	2	1	2	+5 ± 0.00	R11
12.0	2	1	3	- 5.05 ± 0.005	R50
12.0	2	1	4	+9 ± 0.005	R59
12.0	2	1	5	+50 ± 0.005	R24

(2) Measure the input current and 12.5 vdc output voltage and ripple for the values listed under light load for the respective input voltages in table 7-41.

(3) Place S2 in position 2 and repeat the measurements for the values listed under heavy load. (Ignore switching transients when reading ripple.)

c. Battery Operation Input Current.

Table 7-41. 1A9 20-32 Vdc Input Test Data

V_{IN} (vdc ± 0.1)	Light load V_{OUT} (vdc)	Light load V_{RIPPLE} (mv pp)	Light load Limits (amperes)	Heavy load V_{OUT} (vdc ± 0.1)	Heavy load V_{RIPPLE} (mv pp)	Heavy load Limits (amperes)
20	12.5 ± 1	150	0.120	12.5 ± 1	200	0.170
26	12.5 ± 1	150	0.100	12.5 ± 1	200	0.140
32	12.5 ± 1	150	0.090	12.5 ± 1	200	0.120

(1) Place switch S1 in position 2.

(2) Place switches S2 through S6 in position 1.

(3) Measure the input current for the values listed under light load for the respective input voltages in table 7-42.

(4) Place switches S2 through S6 in position 2 and repeat the measurements for values listed under heavy load.

d. Battery Operation Output Voltage.

Table 7-42. 1A9 Battery Input Test Data

V_{IN} (vdc ± 0.1)	Light load limits (amperes)	Heavy load limits (amperes)
10.0	0.210	0.320
12.5	0.170	0.270
15.0	0.150	0.220

(1) Refer to figure 7-34, detail C for switch positions used while making these checks.

(2) Measure the output voltages and ripple at TP-1 for the respective input voltages listed in table 7-43.

7-31. Receiver Housing Assembly 1MP1 Testing

Testing of housing assembly 1MP1 is limited to continuity and resistance measurements. Refer to paragraph 6-23, table 6-11, and figure 6-2 when making these checks. Disregard procedures involving front panel switches (part of 1A1) or other subassemblies not available at the general support maintenance level.

Table 7-43. 1A9 Battery Output Test Data

Input voltage (vdc)	Output (vdc)	Light load Ripple (mv pp)	Output (vdc)	Heavy load Ripple (mv pp)
a. +5 Volt Output.				
10.0	5.0 ± 0.1	10	5.0 ± 0.1	10
12.5	5.0 ± 0.1	10	5.0 ± 0.1	10
15.0	5.0 ± 0.1	10	5.0 ± 0.1	10
b −5 Volt Output.				
10.0	−5.0 ± 0.1	15	−5.0 ± 0.2	25
12.5	−5.0 ± 0.1	15	−5.0 ± 0.2	25
15.0	−5.0 ± 0.1	15	−5.0 ± 0.2	25
c. +9 Volt Output.				
10.0	9.0 ± 0.4	10	9.0 ± 0.4	10
12.5	9.0 ± 0.2	10	9.0 ± 0.2	10
15.0	9.0 ± 0.2	10	9.0 ± 0.2	10
d. +50 Volt Output.				
10.0	50.00 ± 0.25	10	50.00 ± 0.25	10
12.5	50.00 ± 0.25	10	50.00 ± 0.25	10
15.0	50.00 ± 0.25	10	50.00 ± 0.25	10

7-32. Overall Receiver Sensitivity Test

a. Connect the test equipment as shown in figure 7-35 and apply power to the test equipment.

b. Set the receiver controls as follows:

Control	*Setting*
MODE	AM
TUNE/SCAN	TUNE
BANDWIDTH KHz	4.0
OPR VOLT/ SIGNAL LEVEL	SIGNAL LEVEL
RF GAIN	AGC
AF GAIN	Fully clockwise

c. Accomplish the sensitivity measurements of table 7-44 as follows:

(1) Set the receiver MHz and TUNING controls as listed in the frequency column of the table. Also, set the signal generator to the same frequency as the receiver.

NOTE

For LSB tests, move the signal generator frequency 1 kHz below the receiver frequency. For USB tests, move the signal generator frequency 1 kHz above the receiver frequency.

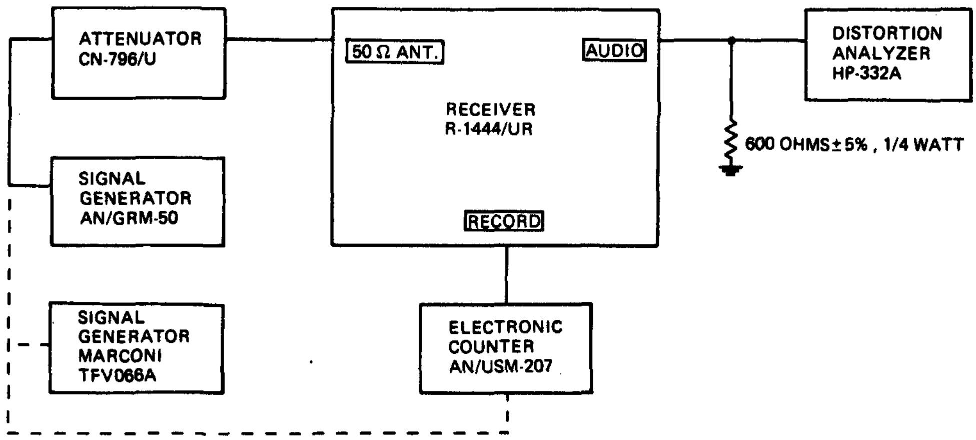

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Figure 7-35. Overall receiver sensitivity test connections.

Table 7-44. Sensitivity Test Data

Frequency	*Input level (microvolts)*				
MHz	*CW*	*LSB*	*USB*	*AM (30%, 1 kHz modulation)*	*FM 8 kHz deviation 1 kHz modulation)*
0.9125	0.25	0.25	0.25	-	-
1.9125	0.25	-	-	-	-
2.9125	0.25	-	-	1.00	-
3.9125	0.25	-	0.25		-
6.9125	0.25	-	-	1.00	-
11.9125	0.25	0.25	-	-	-
18.9125	0.32		-	1.26	-
28.9125	0.32	0.32	0.32	-	0.80

(2) Set receiver MODE switch to each mode as shown in the table. For each mode, adjust the signal generator output for the level shown in the table.

(3) For each test, set the receiver BANDWIDTH KHz switch for the proper bandwidth as follows:

Mode	*Bandwidth (kHz)*
CW	1
AM	4
FM	25
LSB/USB	Any position

(4) For each frequency and mode, the receiver sensitivity $\left(\frac{S+N+D}{N+D}\right)$ as observed on the distortion analyzer at either audio connector, should be at least 10 db.

d. Disconnect the test equipment.

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	U.S. Army Equipment Index of Modification Work Orders.
SC 5180-91-CL-R07	Sets, Kits, and Outfits Components List: Tool Kit, Electronic Equipment TK-105/G.
TM 11-5820-771-24P	Organizational and Direct Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Radio Set AN/URR-69.
TM 11-6625-320-12	Operator and Organizational Maintenance Manual: Voltmeter, Meter Me-30A/U and Voltmeters, Electronic ME-30B/U, ME-30C/U, and ME-30E/U.
TM 11-6625-366-15	Operator's, Organizational, DS, GS, and Depot Maintenance Manual; Multimeter TS-352B/U.
TM 11-6625-438-15	Organizational, DS, GS, and Depot Maintenance Manual: Electronic Voltmeter AN/USM-98.
TM 11-6625-508-10	Operator's Manual: Signal Generators AN/USM-44 and AN/USM-44A.
TM 11-6625-524-15-1	Operator, Organizational, DS, GS, and Depot Maintenance Manual: Electronic Voltmeter AN/URM-145.
TM 11-6625-573-14	Operator's, Organizational, DS and GS Maintenance Manual: Signal Generator AN/GRM-50.
TM 11-6625-700-10	Operator's Manual: Digital Readout, Electronic Counter AN/USM-207.
TM 11-6625-1703-15	Operator, Organizational, DS, GS and Depot Maintenance Manual Including Repair Parts and Special Tools List: Oscilloscope AN/USM-281A.
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 940-90-1	Administrative Storage of Equipment.
TM 750-244-2	Procedures for Destruction of Electronics Material to Prevent Enemy Use (Electronics Command).

APPENDIX C

MAINTENANCE ALLOCATION

Section i. Introduction

C-1. General.

This appendix provides a summary of the maintenance operations for Radio Receiving Set AN/URR-69.

It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

C-2. Maintenance Function.

Maintenance functions will be limited to and defined as follows:

a. *Inspect.* To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of know accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

C-3. Column Entries.

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a "worktime" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "worktime" figures will be shown for each category. The number of task-hours specified by the "worktime" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

C-Operator/Crew
O-Organizational
F-Direct Support
H-General Support
D-Depot

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, *Remarks.* Not applicable.

C-4. Tool and Test Equipment Requirements (Sect. III).

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

C-5. Remarks (Sect. IV).

Not applicable.

(Next printed page is C-3)

SECTION II MAINTENANCE ALLOCATION CHART
FOR
RECEIVING SET, RADIO AN/URR-69

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQPT.	(6) REMARKS
00	RECEIVING SET, RADIO AN/URR-69								
01	RECEIVER, RADIO R-1444/UR	Inspect		0.5					
		Test			1.0			2,3,5,11, 25	
		Service		1.0				5,25	
		Repair			3.0			2,3,5,6, 11,12,25	
0101	RECEIVER ASSEMBLY, FRONT END (1A1, 1A2, 1A3)	Inspect			0.5				
		Test			2.0			2,3,5,11, 15,25	
		Replace			2.0			5,25	
		Repair					5.0	2,3,5,6, 11,12,15, 25	
010101	CONTROL, RECEIVER (1A1)	Inspect			0.5				
		Test			1.0			1,5,25	
		Replace					2.0	5,25	
		Repair					3.0	1,5,25	
01010101	SWITCH SUBASSEMBLY (1A1A1)	Replace					3.0	1,5,25	
		Repair					4.0	1,5,20, 25	
01010102	RECEIVER SUBASSEMBLY (1A1A2) (GEAR BOX ASSEMBLY)	Replace					3.0	25	
		Repair					4.0	25	
010102	RECEIVER SUBASSEMBLY (1A2)	Inspect			1.0				
		Test			2.0			3,5,6,11, 15,25	
		Replace					3.0	5,25	
		Repair					4.0	1,3,5,6, 11,15,17, 19,20,24, 25	
01010201	OSCILLATOR, RADIO FREQUENCY (1A2A1)	Replace					3.0	5,25	
		Repair					4.0	1,3,5,13, 17,19,20, 21,25	
01010202	CONVERTER, FREQUENCY ELECTRICAL (1A2A2)	Replace					3.0	5,25	
		Repair					4.0	3,5,6,9, 11,25	
01010203	MIXER STAGE, FREQUENCY (1A2A3)	Replace					3.0	5,25	
		Repair					4.0	3,5,9,11, 13,21,25	
01010204	FILTER, BANDPASS (1A2A4)	Replace					3.0	5,25	
		Repair					4.0	3,5,9,10, 11,13,25	
01010205	OSCILLATOR, RADIO FREQUENCY (1A2A5)	Replace					3.0	5,25	
		Repair					4.0	1,5,11, 17,20,25	
01010206	FILTER, BANDPASS (1A2A6)	Replace					3.0	5,25	
		Repair					4.0	5,10,13, 25	
01010207	MIXER STAGE FREQUENCY (1A2A7)	Replace					3.0	5,25	
		Repair					4.0	1,3,5,9, 11,17, 19,21,25	
01010208	AMPLIFIER-MIXER (1A2A8)	Replace					3.0	5,25	
		Repair					4.0	1,3,5,6, 9,11,19, 20,21,25	
01010209	COIL ASSEMBLY, RADIO FREQUENCY (1A2A9)	Replace					3.0	5,25	
		Repair					4.0	5,7,25	

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(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQPT.	(6) REMARKS
01010210	SWITCH SUBASSEMBLY (1A2S1)	Replace					3.0	5,25	
		Repair					4.0	1,5,25	
010103	COIL ASSEMBLY, RADIO FREQUENCY (1A3)	Replace					3.0	5,25	
		Repair					4.0	3,5,10,11, 12,22,25	
0102	HIGH FREQUENCY DIVIDER (1A4)	Inspect			1.0				
		Test			2.0			3,5,11,25	
		Replace			1.0			5,25	
		Repair					4.0	3,5,11,12, 15,16,18, 20,25	
0103	LOW FREQUENCY DIVIDER (1A5)	Inspect			1.0				
		Test			2.0			3,5,6,11, 15,25	
		Replace			1.0			5,25	
		Repair					4.0	3,5,6,11, 15,20,25	
0104	OSCILLATOR, RADIO FREQUENCY (1A6)	Inspect			1.0				
		Test			2.0			1,5,6,11, 15,25	
		Replace			1.0			5,25	
		Repair					4.0	1,5,6,11, 15,20,25	
0105	AMPLIFIER-CONVERTER (1A7)	Inspect			1.0				
		Test			2.0			3,5,11, 15,25	
		Replace			1.0			5,25	
		Repair					4.0	3,5,8,11, 14,15,16, 20,23,25	
0106	AMPLIFIER, INTERMEDIATE FREQUENCY (1A8)	Inspect			1.0				
		Test			2.0			1,3,5,11, 15,25	
		Replace						5,25	
		Repair					4.0	1,3,5,6, 11,13,15, 20,25	
0107	POWER SUPPLY (1A9)	Inspect			1.0				
		Test			2.0			5,15,25	
		Adjust			0.5			5,25	
		Replace			2.0			5,25	
		Repair					4.0	5,15,20, 25	
0108	HOUSING ASSEMBLY, RECEIVER (1MP1)	Inspect			1.0				
		Test			2.0			5,25	
		Replace					2.0	5,25	
		Repair					4.0	5,25	
02	ACCESSORY KIT, RADIO	Inspect		0.5					
		Replace		1.0					
		Repair			2.0			5,25	
0201	MOUNTING BASE, ELECTRICAL EQUIPMENT MT-4542/URR-69(2A1)	Inspect		0.5					
		Replace		1.0				25	
		Repair			2.0			25	
0202	CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL (2W1)	Inspect		0.5					
		Test		1.0				5,25	
		Replace		0.5					
		Repair			2.0			5,25	
0203	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL (2W2)	Inspect		0.5					
		Test		1.0				5,25	
		Replace		0.5					
		Repair			2.0			5,25	

SECTION II MAINTENANCE ALLOCATION CHART FOR RECEIVING SET , RADIO AN/URR-69

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
0204	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL (2W3)	Inspect		0.5					
		Test		1.0				5,25	
		Replace		0.5					
		Repair			2.0			5,25	

DRSEL-MA Form 6031, (1 Jul 76)

HISA-FM 1440-76

SECTION TOOL AND TEST EQUIPMENT REQUIREMENTS FOR RECEIVING SET, RADIO AN/URR-69

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	F,D	VOLTMETER, ELECTRONIC AN/USM-98	6625-00-753-2115	
2	F,D	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
3	F,D	VOLTMETER, ELECTRONIC AN/URM-145	6625-00-973-3986	
4	F,D	VOLTMETER, ELECTRONIC AN/GRM-76 (IF NOT AVAILABLE, USE AN/URM-145)	6625-00-954-3498	
5	O,F,D	MULTIMETER TS-352B/U	6625-00-242-5023	
6	F,D	GENERATOR, SIGNAL AN/GRM-50	6625-00-868-8353	
7	D	"Q" METER ZM-61	6625-00-144-3070	
8	F,D	GENERATOR, SIGNAL AN/URM-103	6625-00-868-8352	
9	D	GENERATOR, SIGNAL AN/USM-44* (2)	6625-00-669-4031	
10	D	GENERATOR HP 8444A	6625-00-185-4802	
11	F,D	COUNTER, ELECTRONIC DIGITAL READOUT AN/USM-207	6625-00-911-6368	
12	F,D	ATTENUATOR, VARIABLE CN-796/U	5985-00-831-5991	
13	D	SPECTRUM ANALYZER IP-1216(P)/GR (DISPLAY SECTION) WITH PLUG-IN HP 8554B, and HP 8552B	6625-00-424-4370	
14	D	DISTORTION ANALYZER AN/UPM-184A ALT: SPECTRUM ANALYZER TS-723B, D/U	6625-00-802-8718 6625-00-668-9418	
15	F,D	OSCILLOSCOPE AN/USM-281A	6625-00-228-2201	
16	D	SYNTHESIZER HP 8660B-100 (W/PLUG IN 86601A & 86631B)		
17	D	DEKAVIDER DV-411* (4)	6625-00-912-9895	
18	D	SWITCH, DIGITRAN 12001* (5)		
19	D	POWER SUPPLY HP 6217A* (3)		
20	D	POWER SUPPLY HP 6116A* (3)		
21	D	CHASSIS, ELECTRICAL EQUIPMENT (CAVITY)	5821-01-024-9718	
22	D	RF COIL ASSEMBLY	5950-00-631-6170	
23	F,D	GENERATOR SIGNAL AN/URM-127	6625-00-783-5965	
24	D	AMPLIFIER, AUDIO FREQUENCY AM-4825/U	6625-00-982-2977	
25	O,F,D	TOOL KIT, ELECTRONIC EQUIPMENT TK-105/G	5180-00-610-8177	
		IN ADDITION TO THE TOOL AND TEST EQUIPMENT LISTED THE FOLLOWING ACCESSORY ITEMS ARE REQUIRED TO PERFORM TEST AND REPAIR.		
	F,D	CABLE, EXTENDER	5995-01-056-7405	
	F,D	CABLE, EXTENDER	5995-01-056-7404	
	D	CABLE ASSEMBLY, TEST	5995-01-056-7403	
	D	CABLE ASSEMBLY, TEST	5995-01-056-7402	
	D	CABLE ASSEMBLY, TEST	5995-01-056-7401	
	D	CABLE ASSEMBLY TEST* (2)	5995-01-056-7400	
	D	COVER, AMPLIFIER-MIXER (TOP COVER)	5820-01-056-7398	
	D	COVER, OSCILLATOR-PRESELECTOR (BOTTOM COVER)	5820-01-056-7397	
	D	DUMMY LOAD (1.078 uh) (22 to 30 mHz)	5985-01-050-7635	
	D	DUMMY LOAD (2.078 uh) (15 to 22 mHz)	5985-01-050-6763	
	D	DUMMY LOAD (4.78 uh) (9 to 15 mHz)	5985-01-056-7399	
		*DESIGNATES MAXIMUM REQUIRED AMOUNTS. SEE TEXT FOR USE WITH INDIVIDUAL CIRCUIT BOARDS.		

DRSEL-MA Form 6013
1 Oct 77

(Edition of 1 Oct 74 may be used until exhausted)

HISA-FM 2132-77

INDEX

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS,
General, United States Army,
Chief of Staff.

Official:
VERNE L. BOWERS
Major General, United States Army,
The Adjutant General.

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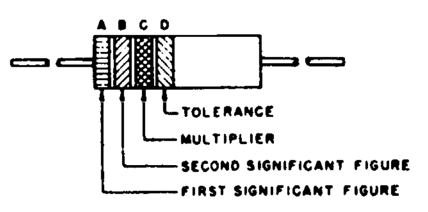
SAAD (30)
TOAD (14)
ATAD (10)
USA Dep (2)
Sig Sec USA Dep (2)
Sig Dep (2)
Sig FLDMS (1)
USAERDAA (1)
USAERDAW (1)
MAAG (1)
USARMIS (1)
Units org under fol TOE:
(1 copy each)
11-500 AA-AC
29-134
29-136

NG: State AG (3)
USAR: None
For explanation of abbreviations used, see AR 310-50.

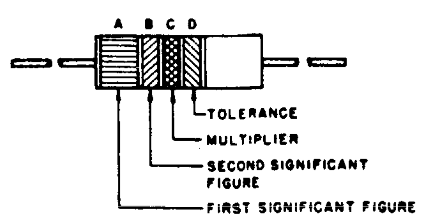
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

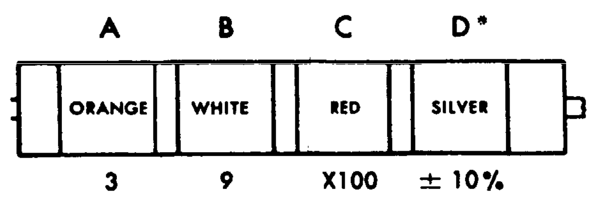


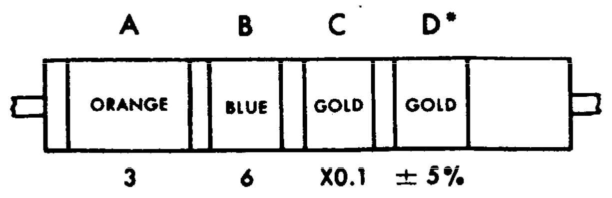
BAND A— Double Width Signifies Wire-wound Resistor

COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	SILVER	0.01		
WHITE	9	WHITE	9	GOLD	0.1		

EXAMPLES OF COLOR CODING





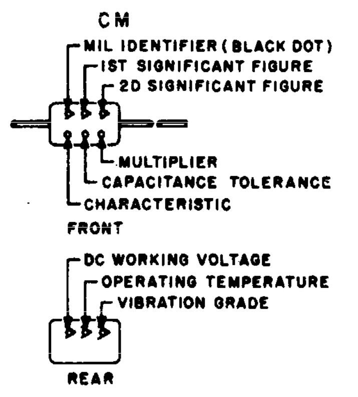
NOMINAL RESISTANCE	3,900 Ohms	3.6 Ohms
RESISTANCE TOLERANCE	± 10 percent	± 5 percent

STD-R2

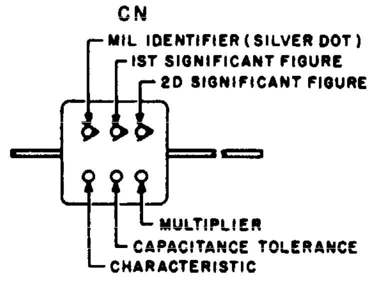
*If Band D is omitted, the resistor tolerance is ±20%, and the resistor is not Mil-Std.

COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

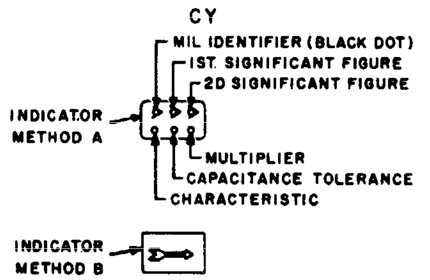
GROUP I Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY, and CB



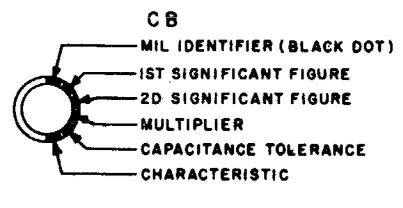
MICA-DIELECTRIC



PAPER-DIELECTRIC

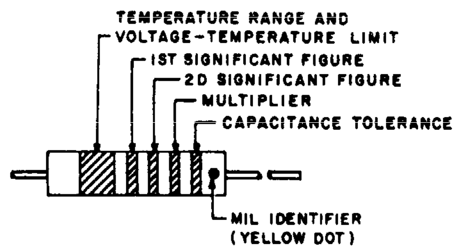


GLASS-DIELECTRIC, GLASS CASE

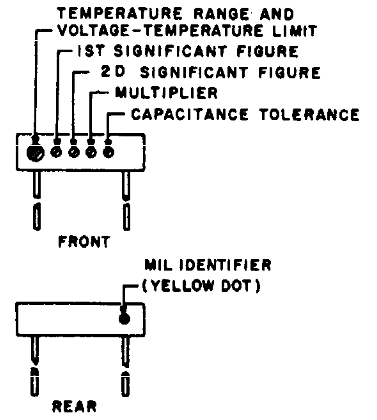


MICA, BUTTON TYPE

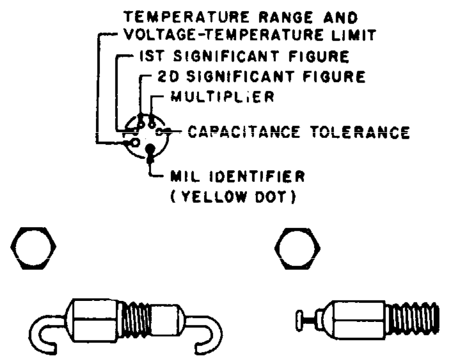
GROUP II Capacitors, Fixed Ceramic-Dielectric (General Purpose) Style CK



AXIAL LEAD

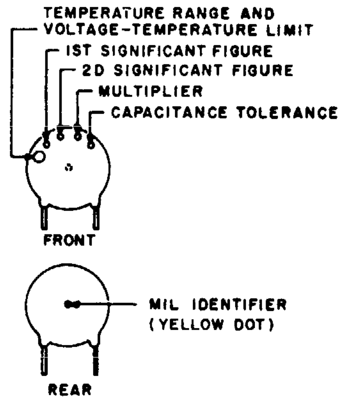


RADIAL LEAD



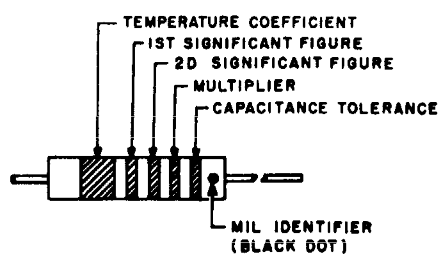
FEED-THROUGH

STAND-OFF

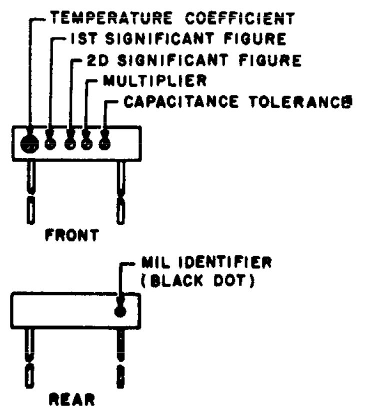


DISK-TYPE

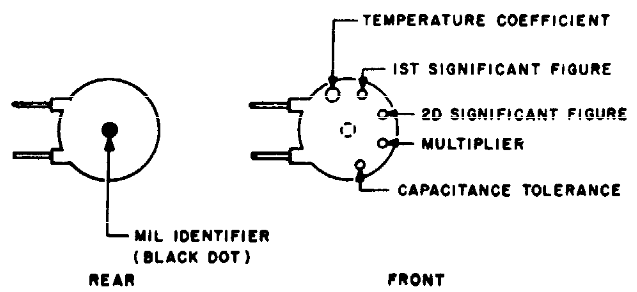
GROUP III Capacitors, Fixed, Ceramic-Dieletric (Temperature Compensating) Style CC



AXIAL LEAD



RADIAL LEAD



DISK-TYPE

COLOR CODE TABLES

TABLE I – For use with Group I, Styles CM, CN, CY and CB

COLOR	MIL ID	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]				DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CY	CB	CM	CM	CM
BLACK	CM, CY CB	0	0	1			± 20%	± 20%		A				−55° to +70°C	10–55 cps
BROWN		1	1	10					B	E		B			
RED		2	2	100	± 2%		± 2%	± 2%	C		C			−55° to +85°C	
ORANGE		3	3	1,000		± 30%			D			D	300		
YELLOW		4	4	10,000					E					−55° to +125°C	10–2,000 cps
GREEN		5	5		± 5%				F				500		
BLUE		6	6											−55° to +150°C	
PURPLE (VIOLET)		7	7												
GREY		8	8												
WHITE		9	9												
GOLD				0.1			± 5%	± 5%							
SILVER	CN				± 10%	± 10%	± 10%	± 10%						•	

TABLE II – For use with Group II, General Purpose, Style CK

COLOR	TEMP. RANGE AND VOLTAGE – TEMP. LIMITS[3]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE	MIL ID
BLACK		0	0	1	± 20%	
BROWN	AW	1	1	10	± 10%	
RED	AX	2	2	100		
ORANGE	BX	3	3	1,000		
YELLOW	AV	4	4	10,000		CK
GREEN	CZ	5	5			
BLUE	BV	6	6			
PURPLE (VIOLET)		7	7			
GREY		8	8			
WHITE		9	9			
GOLD						
SILVER						

TABLE III – For use with Group III, Temperature Compensating, Style CC

COLOR	TEMPERATURE COEFFICIENT[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					Capacitances over 10uuf	Capacitances 10uuf or less	
BLACK	0	0	0	1		± 2.0uuf	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25uuf	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5%	± 0.5uuf	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0uuf	
SILVER							

1. The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the capacitance in uuf.
2. Letters indicate the Characteristics designated in applicable specifications: MIL–C–5, MIL–C–91, MIL–C–11272, and MIL–C–10950 respectively.
3. Letters indicate the temperature range and voltage-temperature limits designated in MIL–C–11015.
4. Temperature coefficient in parts per million per degree centigrade.

STD-C8

FO-A. Resistor/capacitor color code.

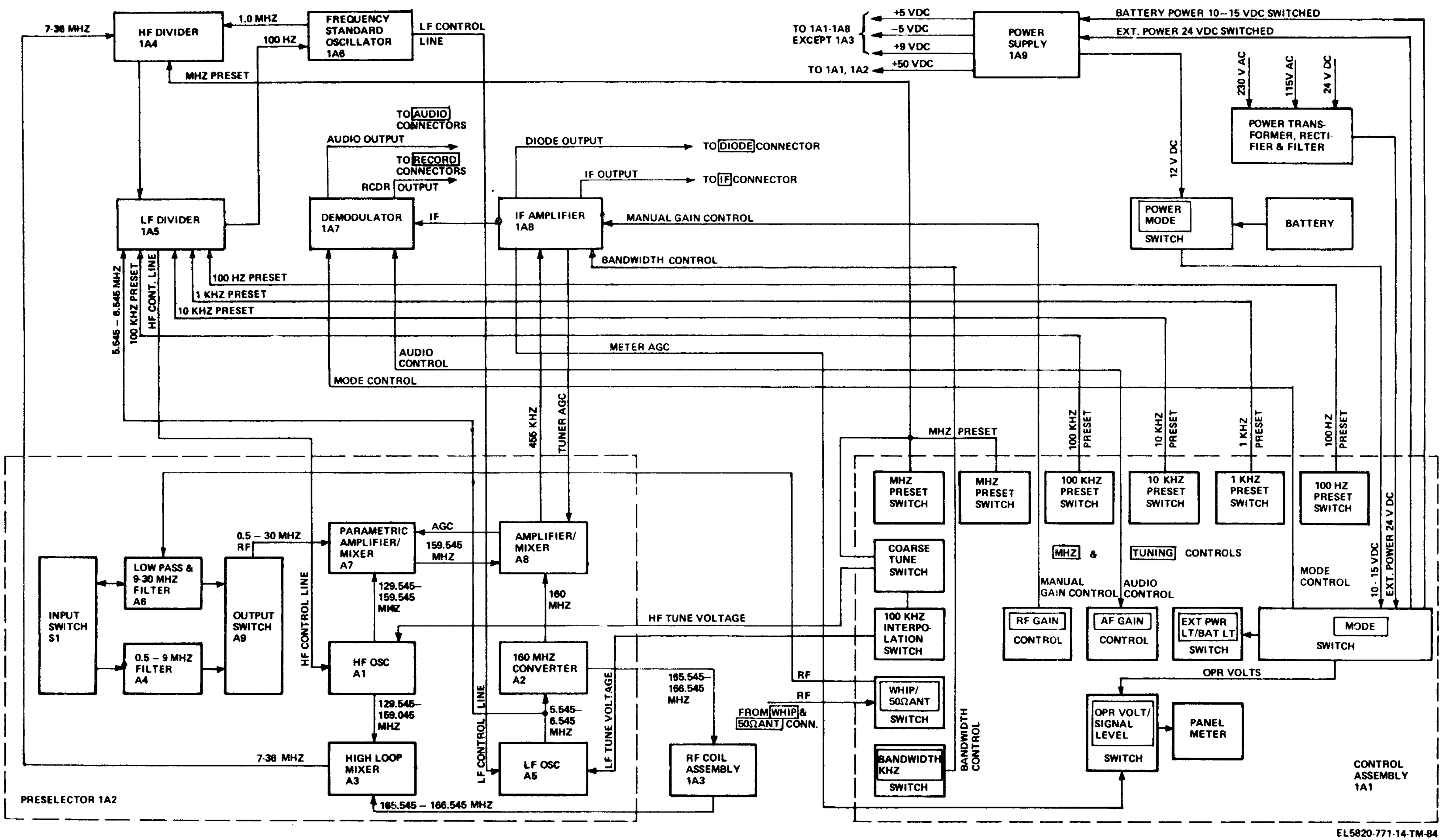
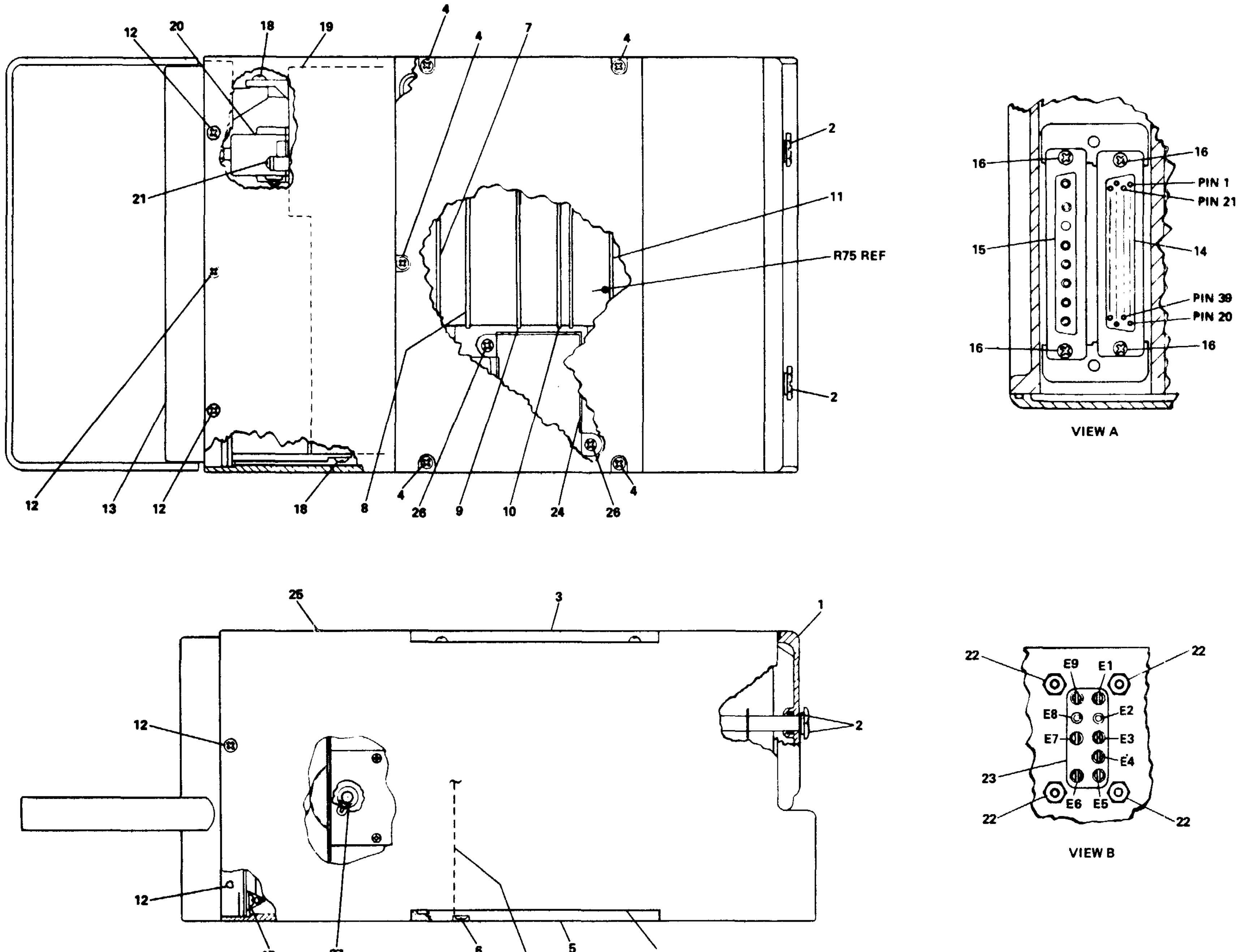


Figure FO-1. Overall block diagram.



EL5820-771-14-TM-1 ①

1 Battery cover
2 Battery cover captive screws
3 Top cover
4 Top cover attaching screws
5 Bottom cover
6 Bottom cover attaching screws
7 Circuit card 1A4
8 Circuit card 1A5
9 Circuit card 1A6
10 Circuit card 1A7
11 Circuit card 1A8
12 Control / preselector securing screws
13 Control / preselector assembly
14 Connector 1A1P2
15 Connector 1A1P3
16 Connector attaching hardware
17 Ground lug securing screw
18 Preselector securing screws
19 Preselector 1A2
20 Helical coil 1A3
21 Helical coil attaching screws
22 Power supply, self locking nuts
23 Power supply wire terminals
24 Power supply 1A9
25 Receiver case assembly
26 Power supply attaching screws
27 Preselector aligning hole
28 +50VDC adjustment 1A9R24
29 Rear panel
30 Panel attaching screws
31 Subassembly cover
32 Cover attaching screws
33 Filter 1FL1
34 Filter 1FL2
35 Filter 1FL3
36 Capacitor 1C1
37 Parent Board 1TB2
38 Connector 1J2
39 Connector 1J3
40 Terminal WT5
41 Terminal WT6
42 Terminal WT7
43 Terminal WT8
44 Parent Board attaching screws
45 Component Board 1TB1
46 Component Board attaching screws
47 Transformer 1T1
48 Transformer mounting screws
49 Inductor 1L1
50 Inductor mounting screw
51 Semiconductor diode 1CR6
52 Diode mounting hardware

Figure FO-15① . Receiving unit external and internal parts location (sheet 1 of 2).

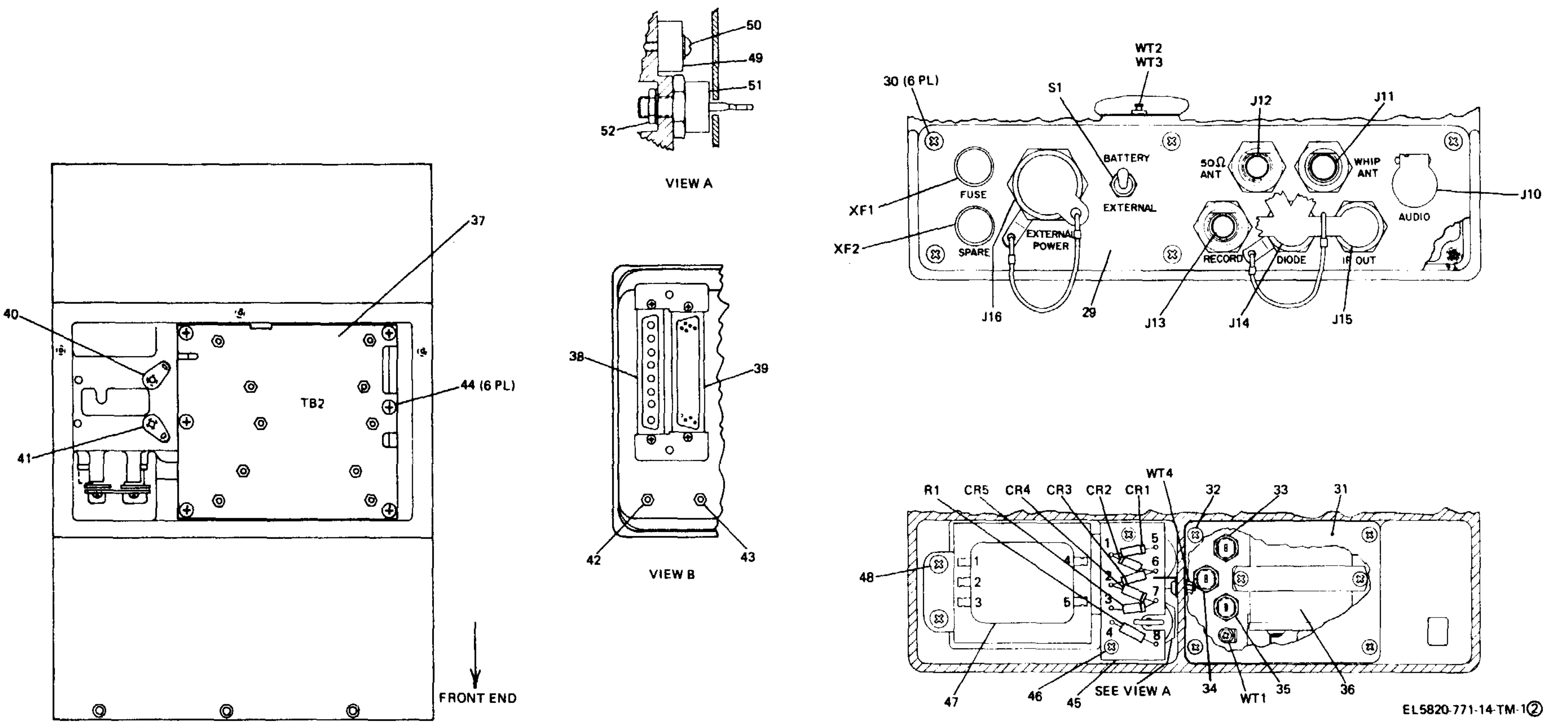


Figure FO-15 ② . Receiving unit, external and internal parts location (sheet 2 of 2).

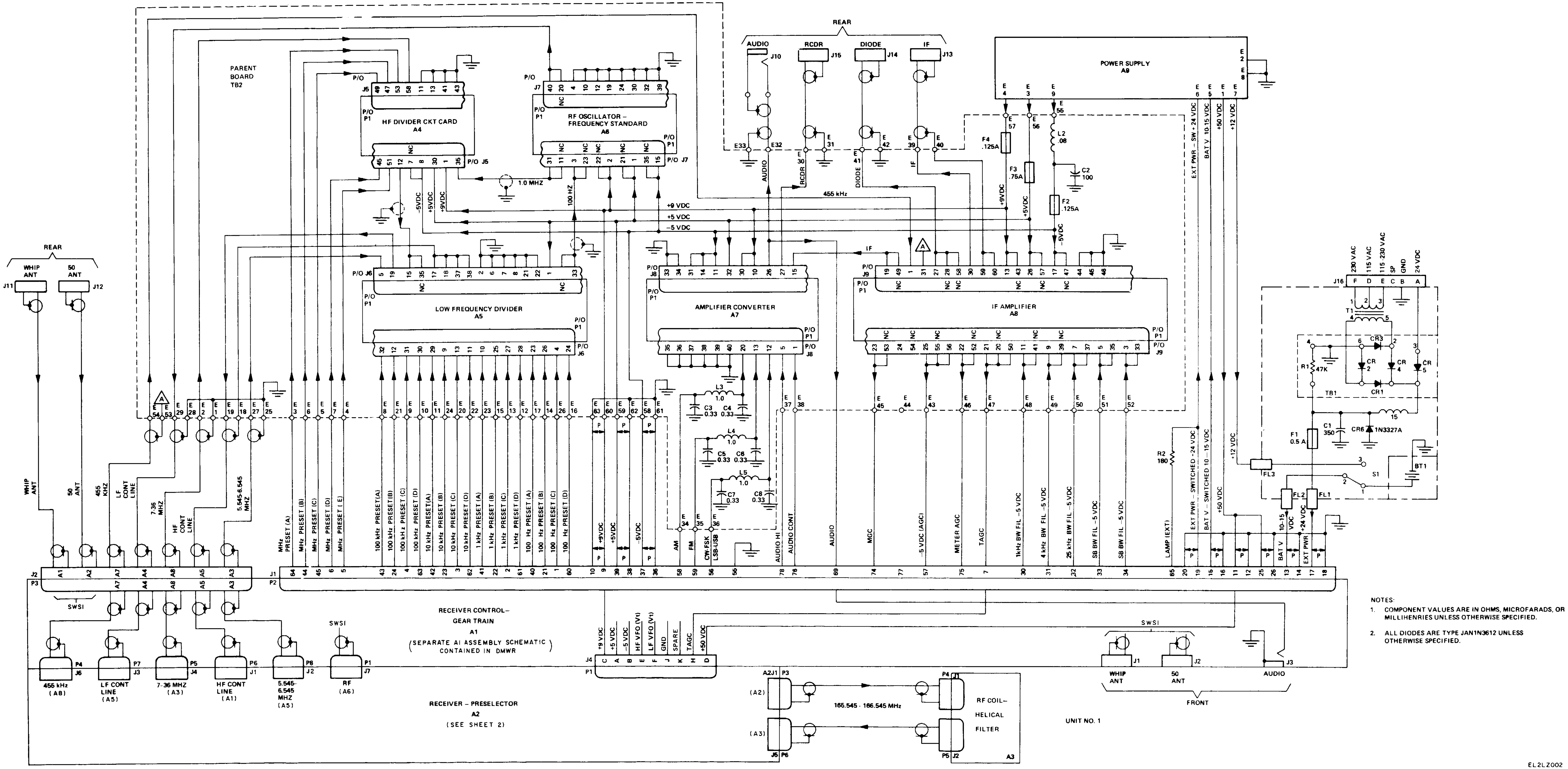


Figure FO-16①. Receiving unit wiring diagram (sheet 1 of 2).

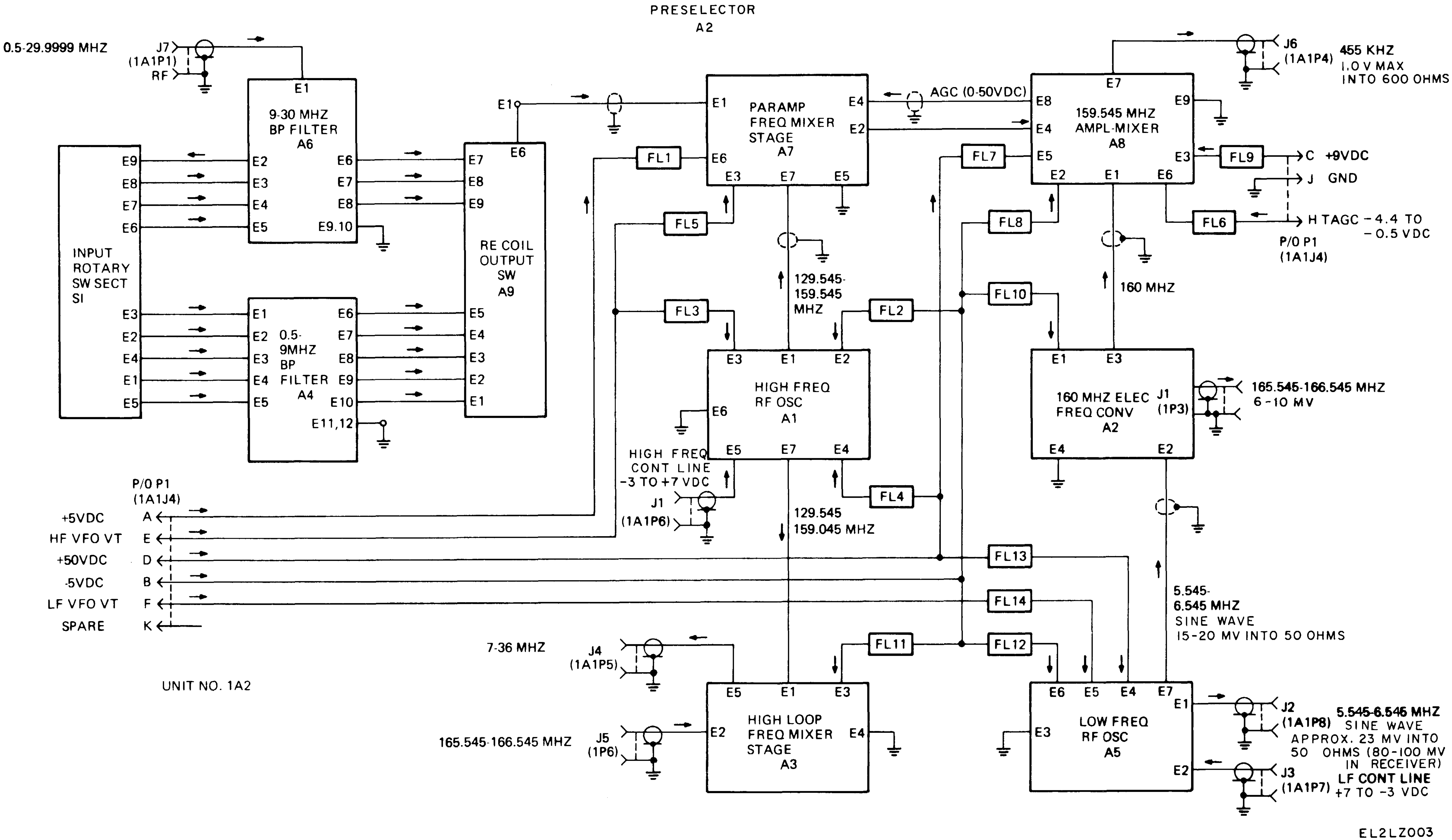
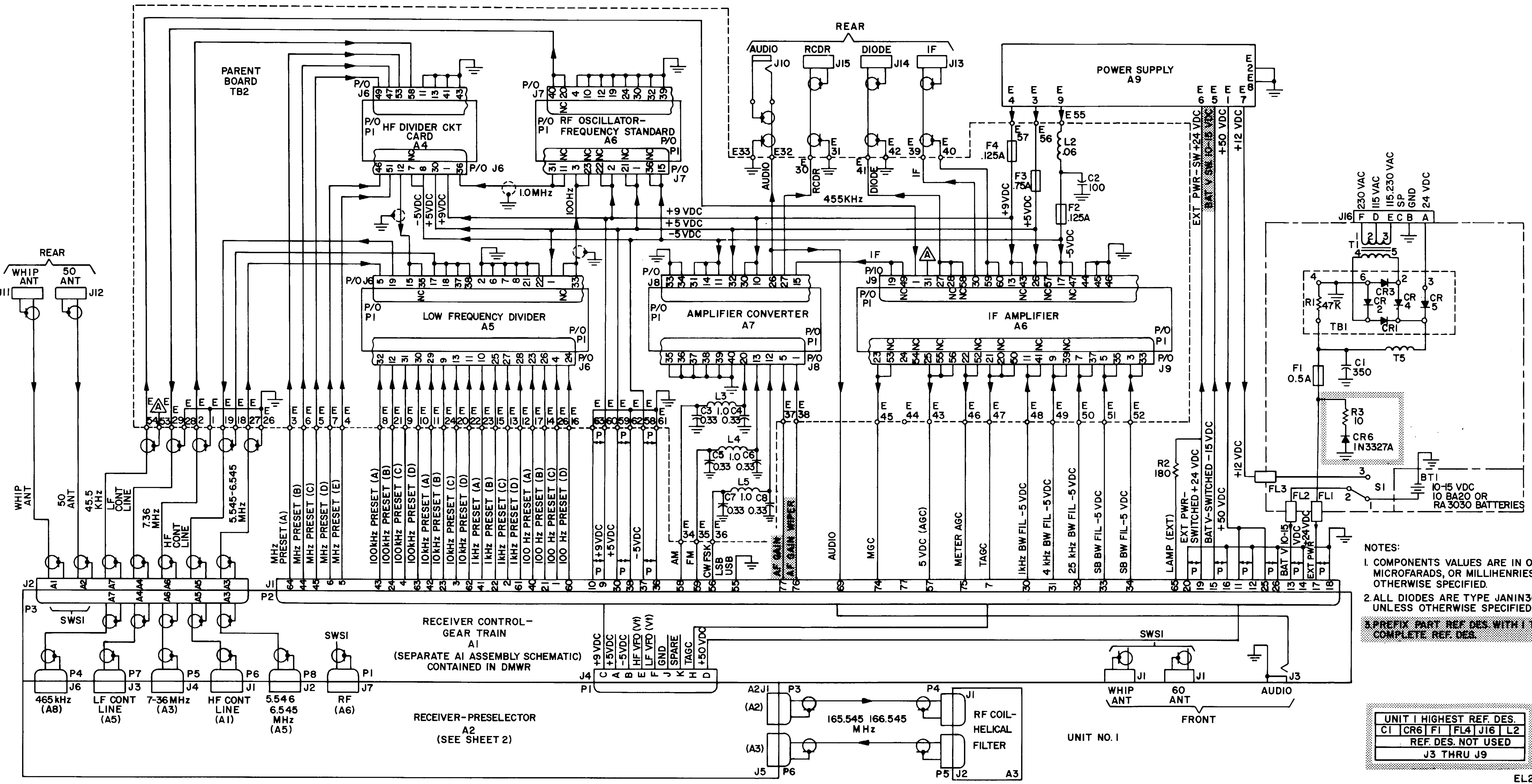


Figure FO-16②. Receiving unit wiring diagram (sheet 2 of 2).

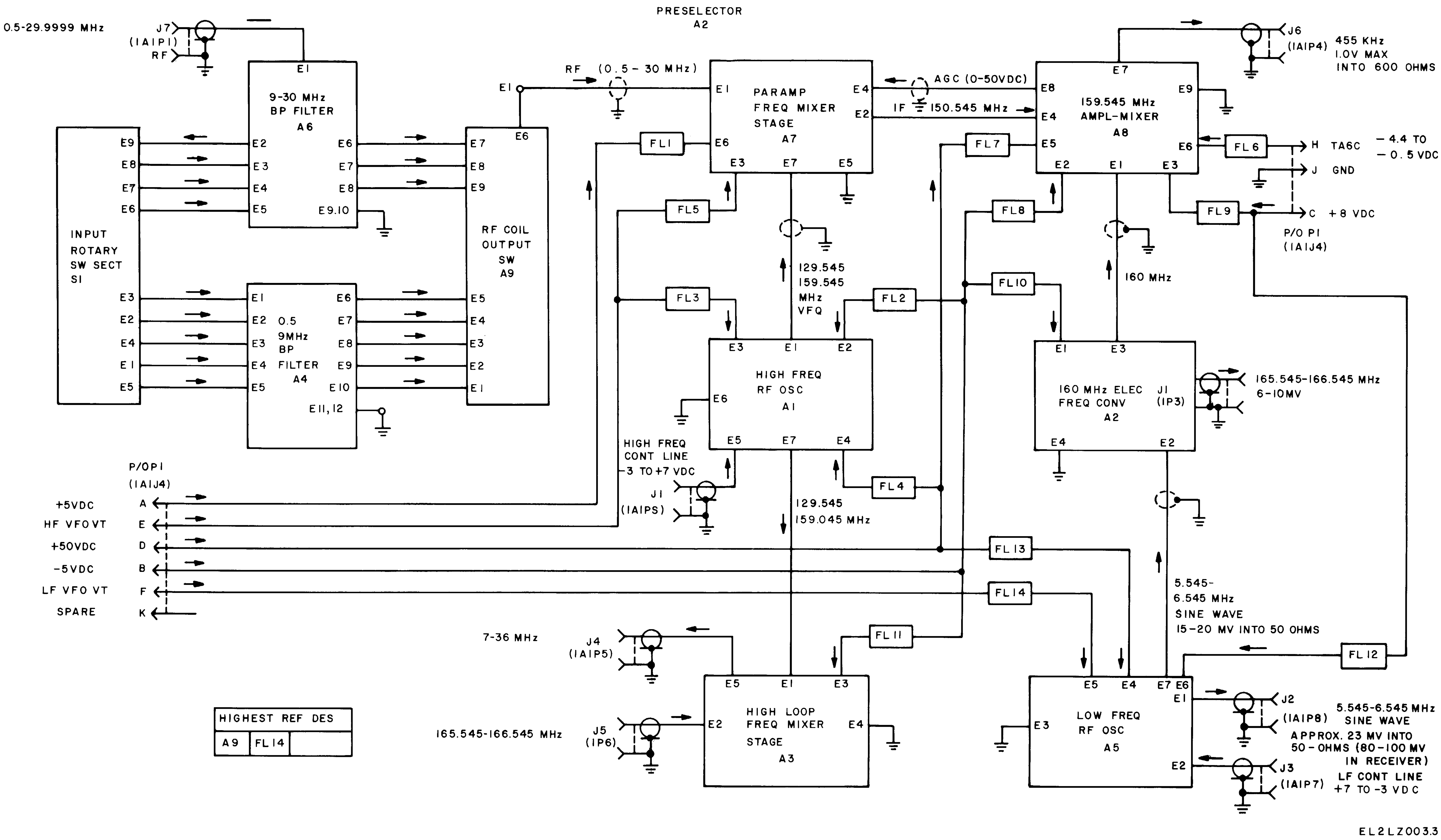


NOTES:

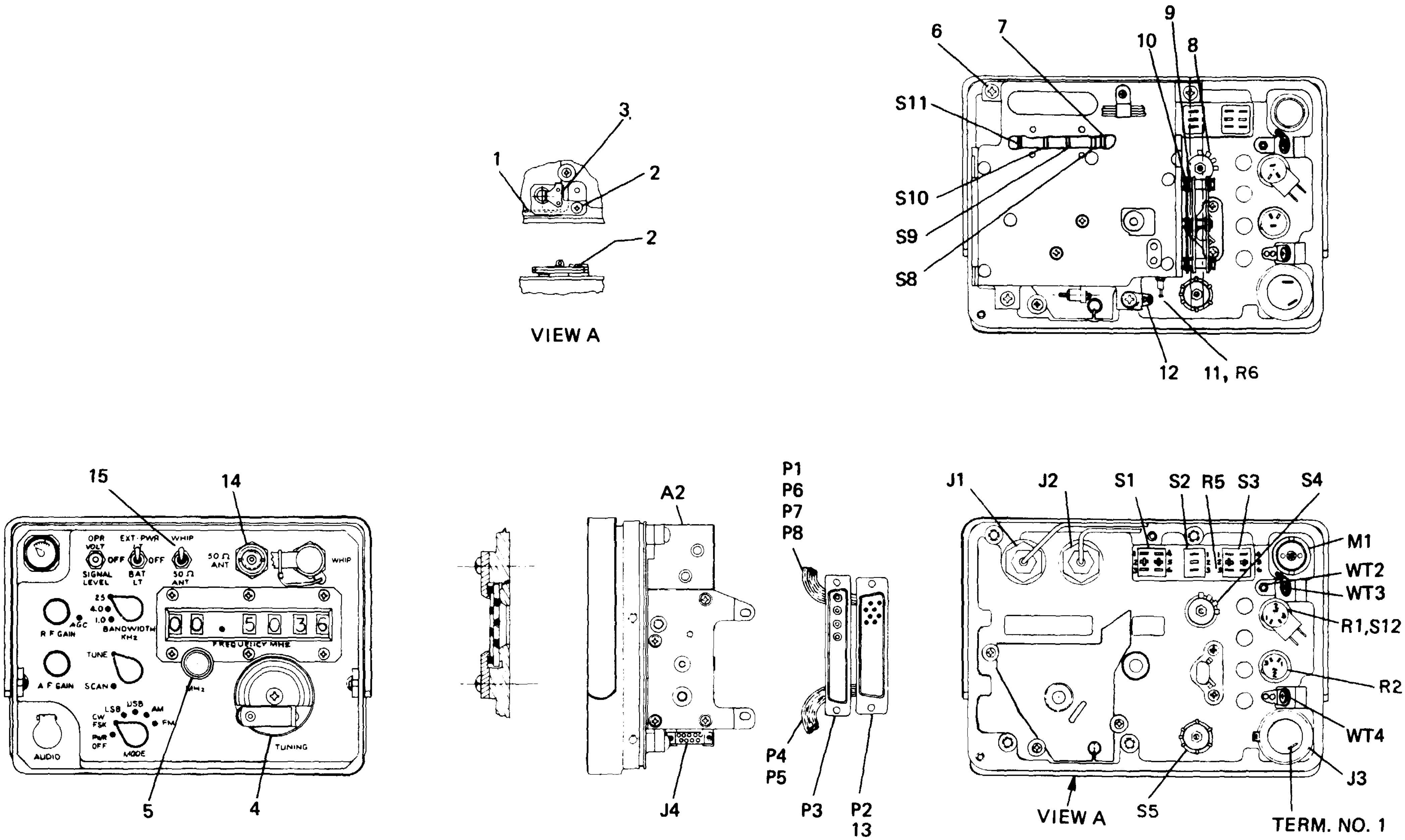
1. COMPONENTS VALUES ARE IN OHMS, MICROFARADS, OR MILLIHENRIES UNLESS OTHERWISE SPECIFIED.
2. ALL DIODES ARE TYPE JAN1N3612 UNLESS OTHERWISE SPECIFIED.
3. PREFIX PART REF DES WITH 1 TO COMPLETE REF. DES.

UNIT 1 HIGHEST REF. DES.					
C1	CR6	F1	FL4	J16	L2
REF. DES. NOT USED					
J3 THRU J9					

EL2LZ002.3



0.5-29.9999 MHz
J7 (1A1P1) RF
PRESELECTOR A2
RF (0.5-30 MHz)
J6 (1A1P4)
455 KHz 1.0V MAX INTO 600 OHMS
9-30 MHz BP FILTER A6
PARAMP FREQ MIXER STAGE A7
AGC (0-50VDC)
IF 150.545 MHz
159.545 MHz AMPL-MIXER A8
INPUT ROTARY SW SECT S1
RF COIL OUTPUT SW A9
H TA6C -4.4 TO -0.5 VDC
J GND
C +8 VDC
P/O P1 (1A1J4)
129.545 159.545 MHz VFQ
160 MHz
0.5 9MHz BP FILTER A4
HIGH FREQ RF OSC A1
160 MHz ELEC FREQ CONV A2
J1 (1P3)
165.545-166.545 MHz 6-10MV
HIGH FREQ CONT LINE -3 TO +7 VDC
J1 (1A1P5)
P/O P1 (1A1J4)
+5VDC A
HF VFO VT E
+50VDC D
-5VDC B
LF VFO VT F
SPARE K
129.545 159.045 MHz
5.545-6.545 MHz SINE WAVE 15-20 MV INTO 50 OHMS
7-36 MHz
J4 (1A1P5)
HIGH LOOP FREQ MIXER STAGE A3
LOW FREQ RF OSC A5
J2 (1A1P8)
5.545-6.545 MHz SINE WAVE APPROX. 23 MV INTO 50-OHMS (80-100 MV IN RECEIVER)
165.545-166.545 MHz
J5 (1P6)
J3 (1A1P7)
LF CONT LINE +7 TO -3 VDC
HIGHEST REF DES
A9 FL14
EL2LZ003.3



EL2LZ004

Figure FO-17. 1A1 parts location.

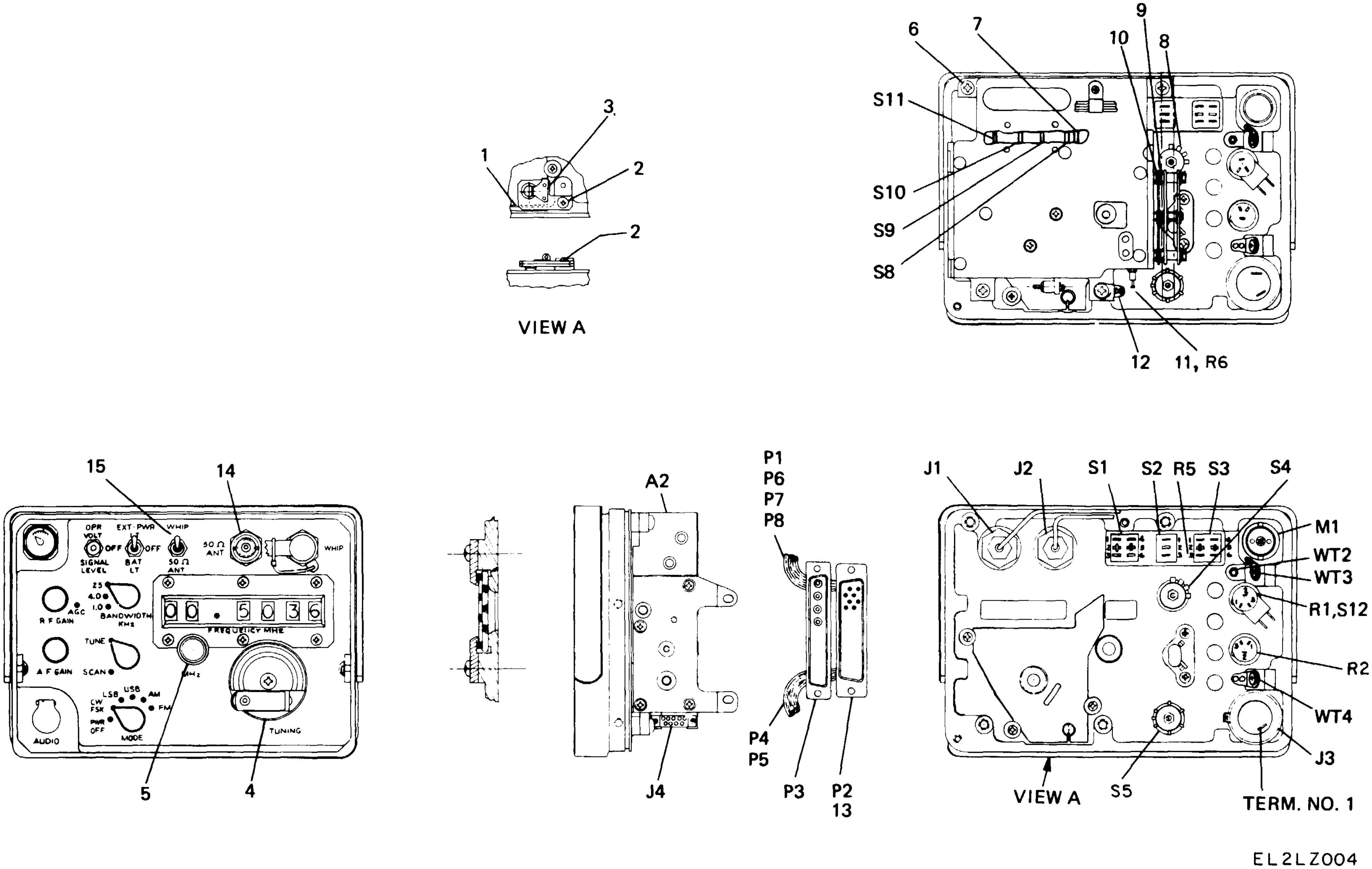
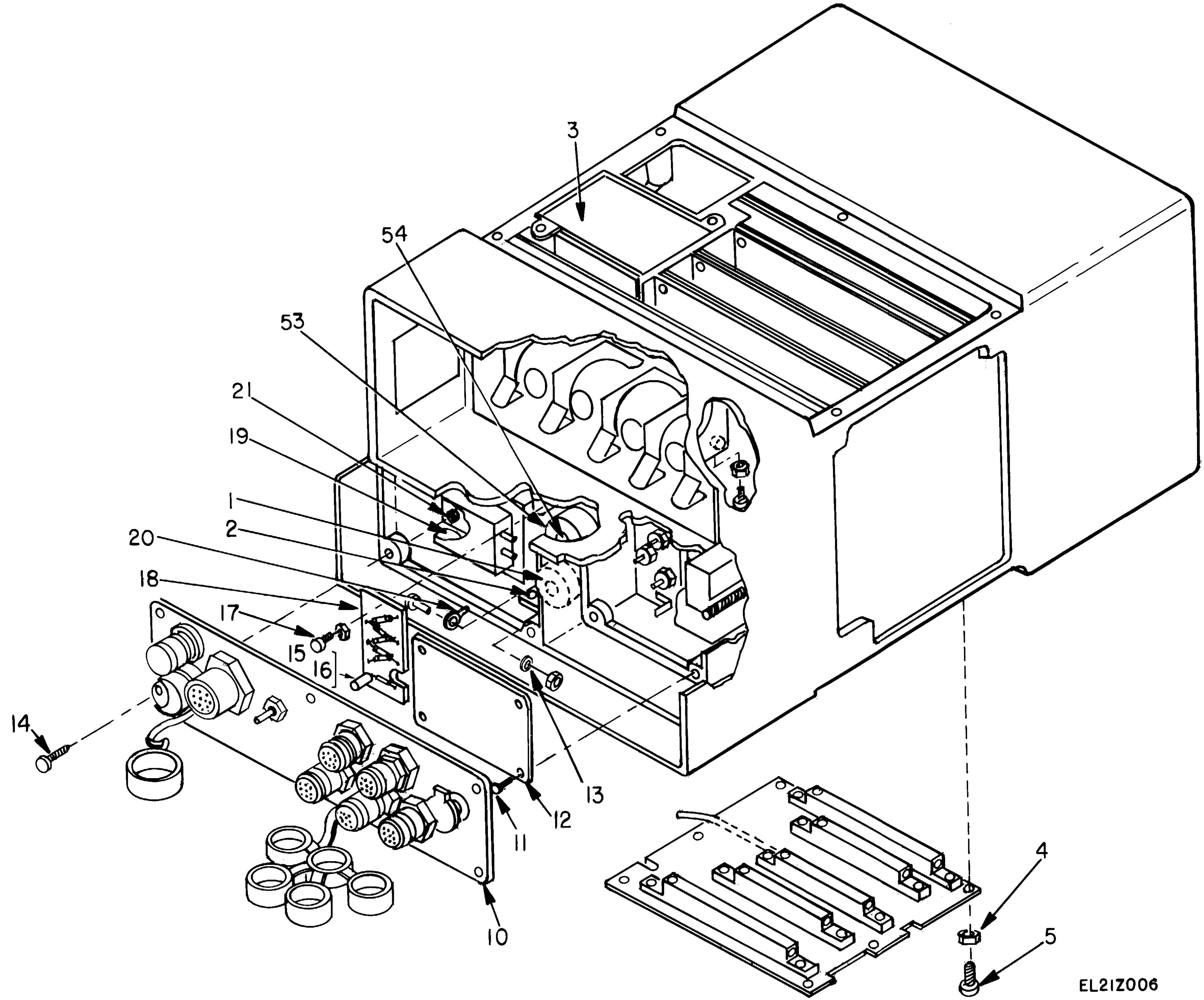
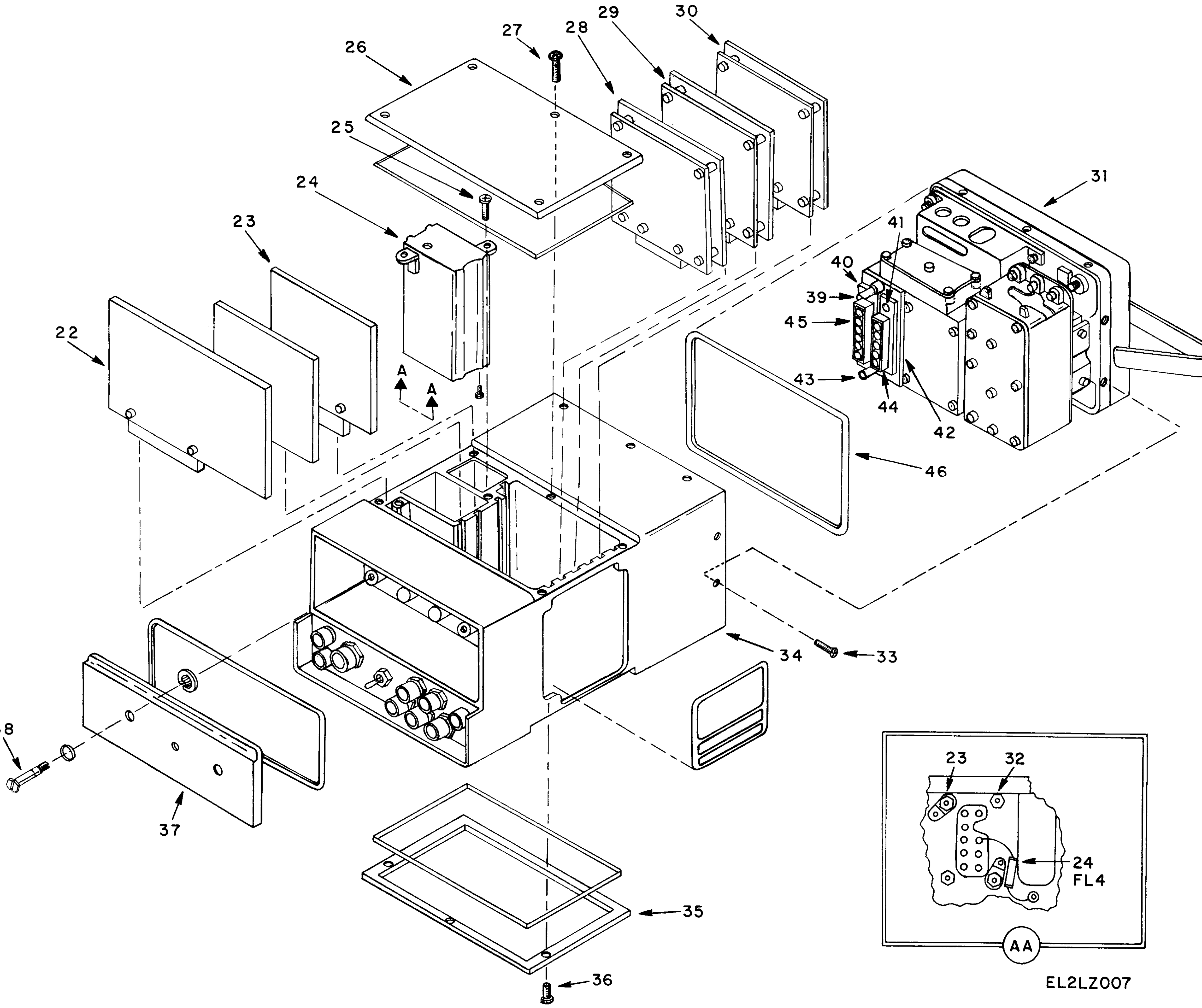


Figure FO-17. 1A1 parts location.



EL21Z006



22
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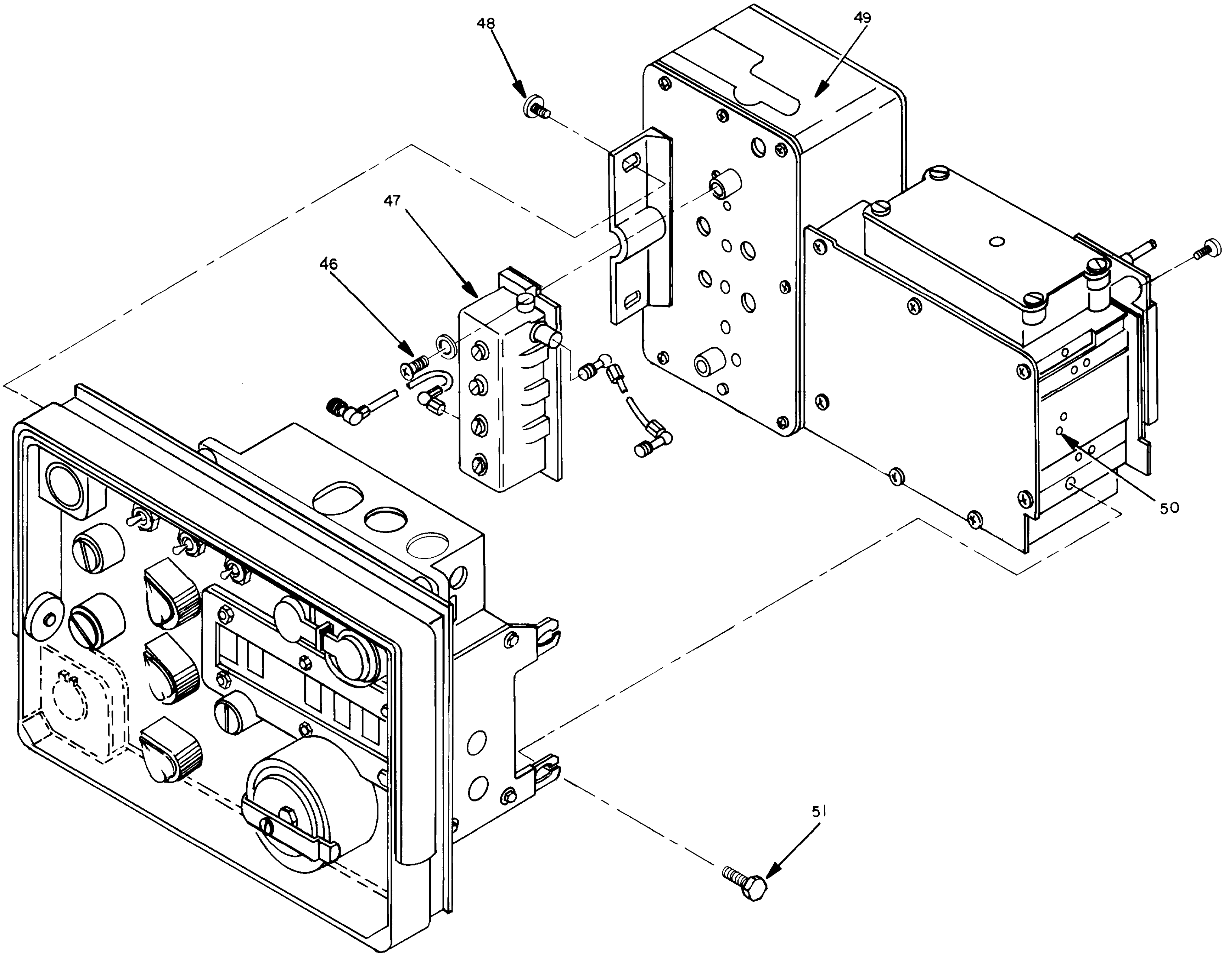
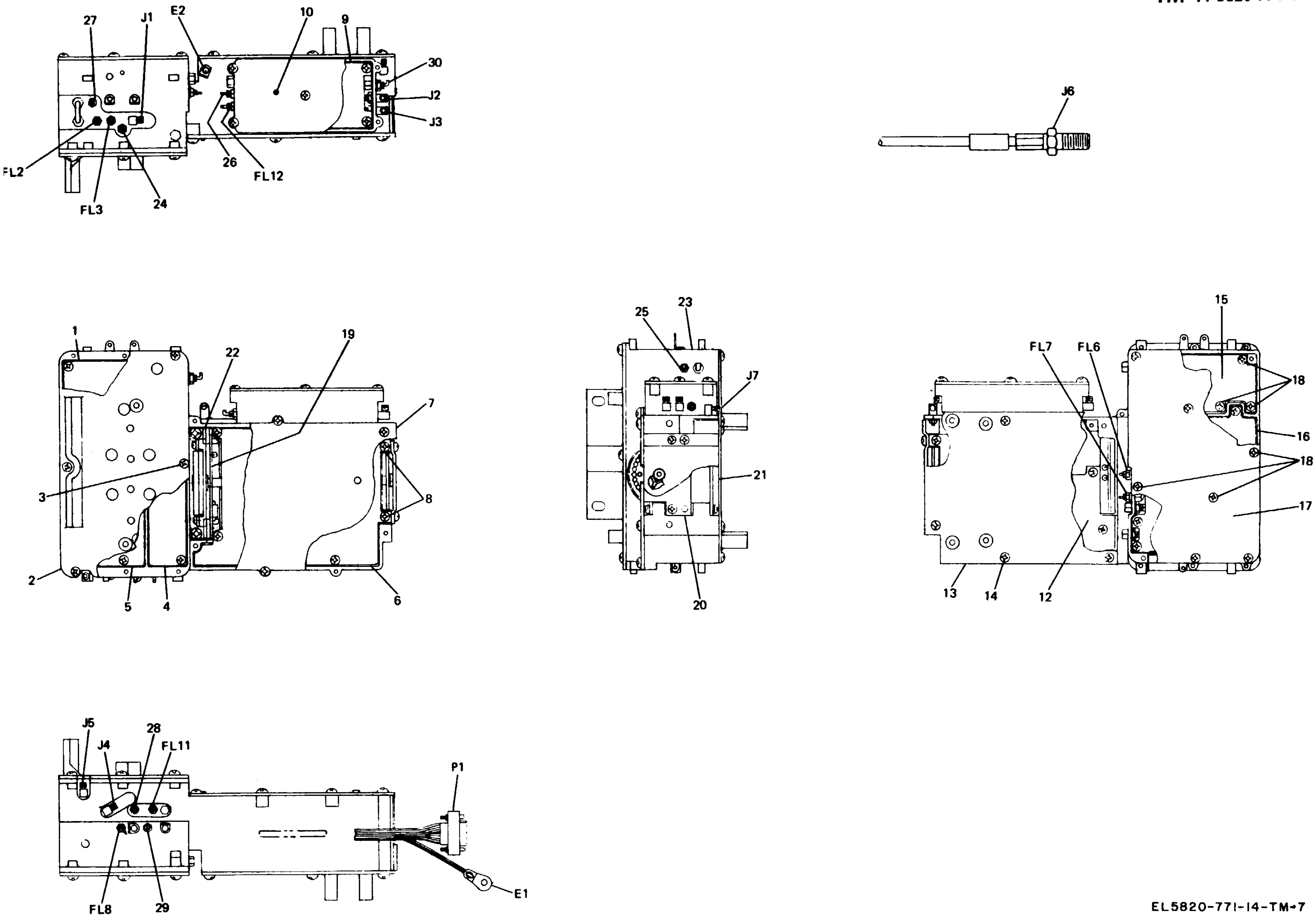
FL4
AA
EL2LZ007



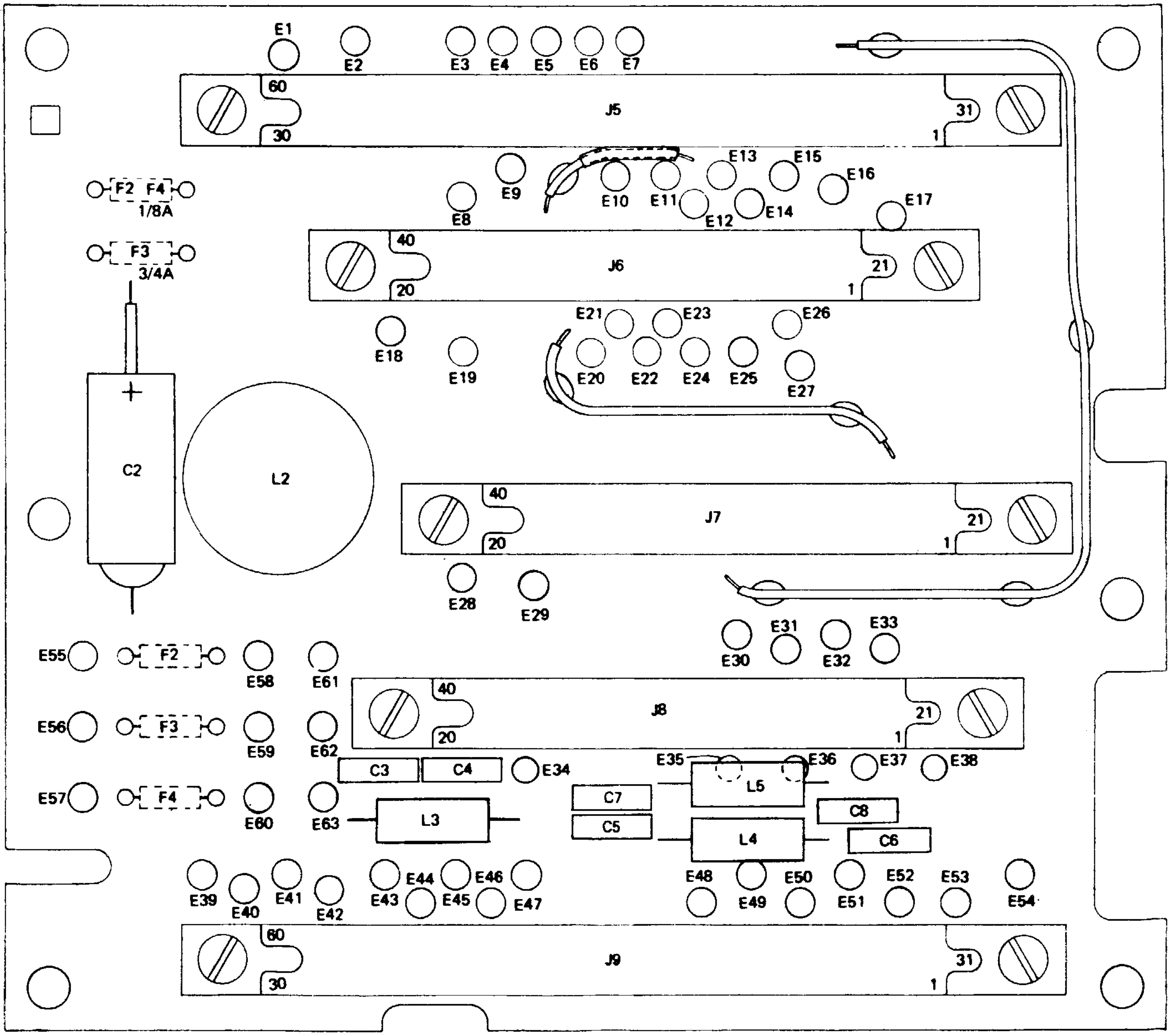
1 SEMICONDUCTOR DIODE ICR6
2 DIODE MOUNTING HARDWARE
3 +50 VDC ADJUSTMENT IA9R24
4 PARENT BOARD
5 PARENT BOARD ATTACHING SCREWS
6 FILTER IFL1
7 FILTER IFL2
8 FILTER IFL3
9 CAPACITOR IC1
10 REAR PANEL
11 COVER ATTACHING SCREWS
12 SUBASSEMBLY COVER
13 TERMINAL WT6
14 PANEL ATTACHING SCREWS
15 TERMINAL WT10
16 TERMINAL WT9
17 COMPONENT BOARD ATTACHING SCREWS
18 COMPONENT BOARD ITB1
19 TRANSFORMER IT1
20 TERMINAL WT5
21 TRANSFORMER MOUNTING SCREWS
22 CIRCUIT CARD IA8
23 CIRCUIT CARD IA7
24 POWER SUPPLY IA9
25 POWER SUPPLY ATTACHING SCREWS
26 TOP COVER
27 TOP COVER ATTACHING SCREWS
28 CIRCUIT BOARD IA6
29 CIRCUIT CARD IA5
30 CIRCUIT CARD IA4
31 CONTROL/PRESELECTOR ASSEMBLY
32 POWER SUPPLY, SELF LOCKING NUTS
33 CONTROL/PRESELECTOR SECURING SCREWS
34 RECEIVER CASE ASSEMBLY
35 BOTTOM COVER
36 BOTTOM COVER ATTACHING SCREWS
37 BATTERY COVER
38 BATTERY COVER CAPTIVE SCREWS
39 CONNECTOR IAIP3
40 CONNECTOR IJ2
41 CONNECTOR ATTACHING HARDWARE
42 CONNECTOR IJ3
43 CONNECTOR IAIP2
44 TERMINAL WT8
45 TERMINAL WT7
46 HELICAL COIL ATTACHING SCREWS
47 HELICAL COIL IA3
48 PRESELECTOR SECURING SCREWS
49 PRESELECTOR IA2
50 PRESELECTOR ALIGNING HOLE
51 GROUND LUG SECURING SCREW
52 POWER SUPPLY FILTER IFL4
53 INDUCTOR IL1
54 INDUCTOR MOUNTING SCREW

EL2LZ008



1 RF oscillator 1A2A1
2 RF oscillator cover
3 Cover retaining screws
4 Frequency converter 1A2A2
5 Frequency mixer 1A2A3
6 Band pass filter 1A2A4
7 Filter cover
8 Cover retaining screws
9 RF oscillator 1A2A5
10 Oscillator cover
11 Cover retaining screws
12 Band pass filter 1A2A6
13 Filter cover
14 Cover retaining screws
15 Frequency mixer 1A2A7
16 Amplifier mixer 1A2A8
17 Amplifier mixer cover
18 Cover retaining screws
19 RF coil assembly 1A2A9
20 Rotary switch 1A2S1
21 Switch cover
22 Switch subassembly
23 Preselector Housing
24 Filter, FL4
25 Filter, FL5
26 Filter, FL14
27 Filter, FL1
28 Filter, FL10
29 Filter, FL9
30 Filter, FL13

Figure FO-19. 1A2 parts location.



NOTE:
1TB2 IS VIEWED FROM THE TOP
OF THE RECEIVER.

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Figure FO-25. 1MP1 parts location.

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	353298	N83116	3117 13658	

TAGO FORM 4-26s, 1 SEP 78

PREVIOUS EDITION OF THIS FORM IS OBSOLETE