TM 11-5820-641-14

TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT,

AND GENERAL SUPPORT MAINTENANCE MANUAL

RECEIVING SET, RADIO AN / URR-70

(NSN 5820-00-013-8911)

This copy is a reprint which includes current pages from Changes 1 and 2.

HEADQUARTERS, DEPARTMENT OF THE ARMY

NOVEMBER 1976

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. The voltage is present at the input to the power transformer which is not accessible unless the transformer is removed from the chassis. Do not remove the power transformer from the chassis during testing. The voltage is also present at the fuse terminals and at the FUNCTION switch terminals. Use caution to avoid these areas while testing.

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 gases.

Change
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 15 December 1983

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL RECEIVING SET, RADIO AN/URR-70 (NSN 5820-00-013-8911)

TM 11-5820-641-14, 5 November 1976 is changed as follows:

1. New or changed materiel is indicated by a vertical bar in the margin of the page.

2. Added or revised illustrations are indicated by a vertical bar adjacent to the illustration identification number.

3. Remove old pages and insert new pages as indicated below.

Remove Pages	Insert Pages
i and ii	i and ii
v and 1-0	v and 1-0
1-1 through 1-3	1-1 through 1-3/(1-4 blank)
4-1 through 4-4	4-1 through 4-4
A-1	A-1/(A-2 blank)
Index 1 and Index 2	Index 1 and Index 2

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

By Order of the Secretary of the Army:

JOHN A. WICKHAM JR.
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Chief of Staff

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ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-51A-1, Operator Maintenance requirements for AN/URR-70-69, 70, 71.

TM 11-5820-641-14
C1
Change
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 26 November 1982

Operator's, Organizational, Direct Support, and General Support Maintenance Manual
RECEIVING SET, RADIO AN/URR-70
(NSN 5820-00-013-8911)

TM 11-5820-641-14, 5 November 1976, is changed as follows:

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i and ii	i and ii
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7-5 and 7-6	7-5 and 7-6
A-1	A-1
C-1 through C-5	C-1 through C-5
FO-5	FO-5
FO-18	FO-18
FO-20	FO-20

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By Order of the Secretary of the Army:

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Chief of Staff

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Major General, United States Army
The Adjutant General

5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1. DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL
2. IF POSSIBLE , TURN OFF THE ELECTRICAL POWER
3. IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A WOODEN POLE OR A ROPE OR SOME OTHER INSULATING MATERIAL
4. SEND FOR HELP AS SOON AS POSSIBLE
5. AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

WARNING

TIGHTENING TERMINAL SCREWS AND STUDS

Be extremely careful when tightening terminal screws and studs. Bodily injury and damage to the equipment may result if the torque wrench accidentally causes a short circuit.

PRINCIPALS OF CORROSIVE CHEMICAL FIRST-AID

In the event of contact with the eyes, *immediately* flush the eyes with water and continue to flush for 15 minutes. *The first few seconds after contact* are critical and *immediate flushing* of the eyes may prevent permanent damage. An eyewash fountain is preferred; however, an eyewash hose of any other source of water should be used in an emergency. Alkali (base) burns are usually more serious than acid burns.

- Strong chemicals burn the skin rapidly. There is no time to waste. Begin flushing the area with water immediately. Remove and discard clothing, including socks and shoes (obtain other clothes and shoes). Continue to flood the area, while clothing is being removed.
- The precautionary warning on the product label should be consulted for full first-aid information. Provide the label information to the attending physician.
- Neutralizers and solvents (alcohol, etc.) should not be used by the first aider. The spread of skin absorbing corrosive poison, like phenol, can result in death. Don't depend upon spilled chemicals to evaporate from your clothes. Exposure of skin can *kill* you.
- Compressed air shall not be used for cleaning purposes except where reduced to less than 29 pounds per square inch (psi) and then only with effective chip guarding and personnel protective equipment. Do not use compressed air to dry parts when TRICHLOROTRIFLUOROETHANE has been used. Compressed air is dangerous and can cause serious bodily harm if protective means or methods are not observed to prevent chip or particle (of whatever size) from being blown into the eyes or unbroken skin of the operator or other personnel.
- Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

TECHNICAL MANUAL

No. 11-5820-641-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *5 November 1976*

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

RECEIVING SET, RADIO AN / URR-70

(NSN 5820-00-013-8911)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

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

LIST OF ILLUSTRATIONS

LIST OF TABLES

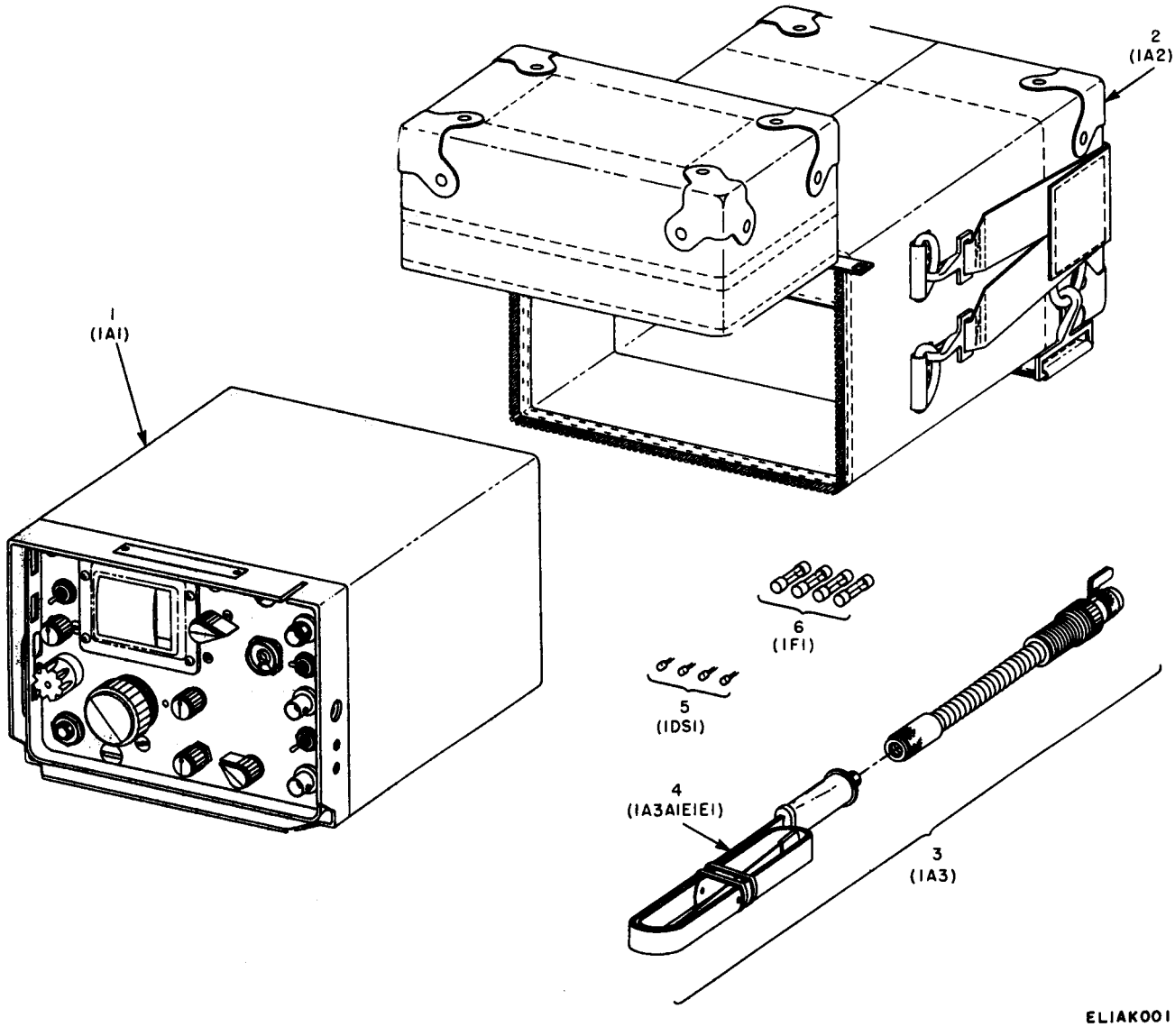


Figure 1-1. Receiving Set, Radio AN/URR-70.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

This manual describes Receiving Set, Radio AN/URR-70 (fig. 1-1). Topics covered include installation, operation, functioning, and instructions for operator, organizational, direct support, and general support maintenance. It should be noted that *intermediate* level repairs are performed by direct and/or general support.

1-2. Consolidated Index of Army Publications and Blank Forms

Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes or additional publications pertaining to the equipment.

1-3. Maintenance Forms, Records, and Reports

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (Army).

b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/ DLAR 4140.55/NAVMATINST 4355.73A/AFR 400-54/MCO 4430.3F.

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 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

1-4. Reporting Equipment Improvement Recommendations (EIR)

If your Radio Receiving Set needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703. We'll send you a reply.

1-5. Administrative Storage

Administrative Storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage the PMCS should be performed to assure operational readiness. Disassembly and repacking of equipment for shipment or limited storage are covered in TM 740-90-1.

1-6. Destruction of Army Electronics Materiel

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

Section II. DESCRIPTION AND DATA

1-7. Purpose and Use

Receiving Set, Radio AN/URR-70 is a solid-state superheterodyne receiving set. The receiver frequency range is in the 0.536 to 20.5 MHz band, operating from fixed sites, vehicular installations, or as a backpack radio. Operating modes include amplitude modulation (am.), lower sideband (lsb), and upper sideband (usb). Continuous wave (cw) signals are received in the lsb and usb modes. The radio set may be powered by 220 vac, 110 vac, or 24 vdc external power or from internal batteries.

1-8. Description

(fig. 1-1)

a. Receiving Set, Radio AN/URR-70. Receiving Set, Radio AN/URR-70 consists of Receiver R-1218/UR, Antenna AS-2887/UR, and Field Pack CW-1005/UR. These items are described in the following subparagraphs.

b. Receiver R-1218/UR. Receiver R-1218/UR (1, fig. 1-1) is housed in a rectangular metal case. Operating controls, indicators and connectors are installed on the front and rear panels of the unit. The

metal case detaches from the front panel and may be removed to provide access for internal maintenance. A rear cover may be removed from the case for battery installation.

c. Antenna AS-2887/UR. Antenna AS-2887/UR (3, fig. 1-1) is a whip antenna terminated by a male TNC connector suitable for use with Receiver R-1218/UR antenna input connector #1.

d. Field Pack, CW-1005/UR. Field Pack CW-1005/UR (2, fig. 1-1) is a cotton duck carrying case capable of containing Receiver R-1218/UR, Antenna AS-2887/UR, and running spare parts (5 and 6, fig. 1-1).

e. Tabulated Data. Table 1-1 lists the items comprising Receiving Set, Radio AN/URR-70. 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.

1-9. Items Comprising an Operable Equipment

The components comprising an operable equipment are listed in table 1-1. For operation other than with batteries, a power cable (available as part of Accessory Kit MK-1517/UR) and a headset are required but are not furnished with the equipment. For vehicular operation, Shock Mount MT-4034/U must be provided (also a part of the MK-1517/UR).

1-10. Common Names

A list of nomenclature and common names for the major components of the radio set are given in table 1-1. The common names and reference designation of major assemblies within the receiver are shown in table 1-3.

Table 1-1. Items Comprising an Operable Equipment

NSN	Item	Common name	Qty	Dimensions (in.)			Weight (lb)
				Length	Width	Height	
5820-00-013-8911	Receiving Set Radio AN/URR-70 consisting of:	Radio set	1				
5620-00-013-8442	Receiver R-1218/UR	Receiver	1	9-3/8	7-1/8	5	11 max (less batteries)
.5820-00 -013-9005	Antenna AS-2887/UR	Antenna	1	39			
5820-00-763-3101	Field Pack CW-1005/UR	Field pack	1	13	8	5½	2½

Table 1-2. Technical Characteristics

Power requirements	110 or 220-volt 50 to 400 Hz, or 26 vdc external power, or twelve BA-30/U type batteries for internal power.
Maximum power consumption	5.5 watta for ac external: 2.5 watts for dc external; 1 watt for intarnal battery.
Frequency range	0.536 to 20.50 MHz in 5 continuous tuned bands: Band 1, 0.536 to 1.16 MHz Band 2, 1.10 to 2.37 MHz Band 3, 2.26 to 4.87 MHz Band 4, 4.63 to 10.00 MHz Band 5, 9.50 to 20.50 MHz
Frequency stability	±0.015 %, zero to five minutes of operation at ambient temperature; ± 0.015% five minutes to sixty minutes of operation at ambient temperature.
Temperature stability	±0.75% over the temperature range of —40° F to + 154° F.
Tuning rate	Fast mode -12 turns per band, continuous tune. Slow mode - approximately one-fortieth of the fast tuning rate.
Am. sensitivity	1.2 microvolt for 10 db $\frac{S+N}{N}$ (30%, 1000-HZ amplitude modulated signal).
Lsb, usb. cw sensitivity	0.4 microvolt for 10 db $\frac{S+N}{N}$.
Spurious responses	*a.* Image rejection: At least 80-db suppression from 0.536 to 3.0 MHz and 50 db from 3.0 to 20.50 MHz. *b.* If. rejection: At least 50-db suppression from 0.536 to 3.0 MHz and 80 db from 3.0 to 20.50 MHz. *c.* Intermodulation: At least 66-db suppression except in-band third order products, 60 db. *d.* Crossmodulation: Separation of ±20 kHz. suppression at least 40 db: ±50 kHz. 60 db: ±125 kHz. 80 db.

Table 1-2. Technical Characteristics - **Continued**

If. frequency	455 kHz.
If. bandwidth	3 kHz.
Audio output	20 milliwatts minimum with 18 vdc internal supply. VOL control at maximum.
Audio response	300 to 2.500 Hz nominal.
Diode output	2 volts or greater negative voltage across a 50.000-ohm load.
Calibration oscillator frequency	100 kHz ±0.002% for 0.536 to 4.87 MHz; 500 kHz ±0.002% for 4.63 to 20.50 **MHz**.

Table 1-3. Common Numerical Assignments

Common name	Reference designation
Control panel assembly	A1A1A1
Rf tuner and dial assembly	A1A1A2
Rf tuner assembly	A1A1A2A1
Tuner subassembly	A1A1A2A1A1
Circuit card motherboard	A1A1A2A1A1A1
Tuning capacitor	A1A1A2A1A1C1
Rf preselector	A1A1A2A1A2
First rf amplifier	A1A1A2A1A3
Second rf amplifier	A1A1A2A1A4
Rf mixer circuit card	A1A1A2A1A5
Rf local oscillator	A1A1A2A1A6
If. amplifier assembly	A1A1A3
If. amplifier circuit card	A1A1A3A1
Detector assembly	A1A1A4
Detector circuit card	A1A1A4A1
Power supply assembly	A1A1A5
Power supply circuit card	A1A1A5A1
Regulator	A1A1A5A2
Audio amplifier assembly	A1A1A6
Audio amplifier circuit card	A1A1A6A1
Calibration oscillator board assembly	A1A1A7
Dust cover assembly	A1A2

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 electromagnetic radiation 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) 110 vac or 220 vac power available.

(6) Site clear of electromagnetic radiation 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.

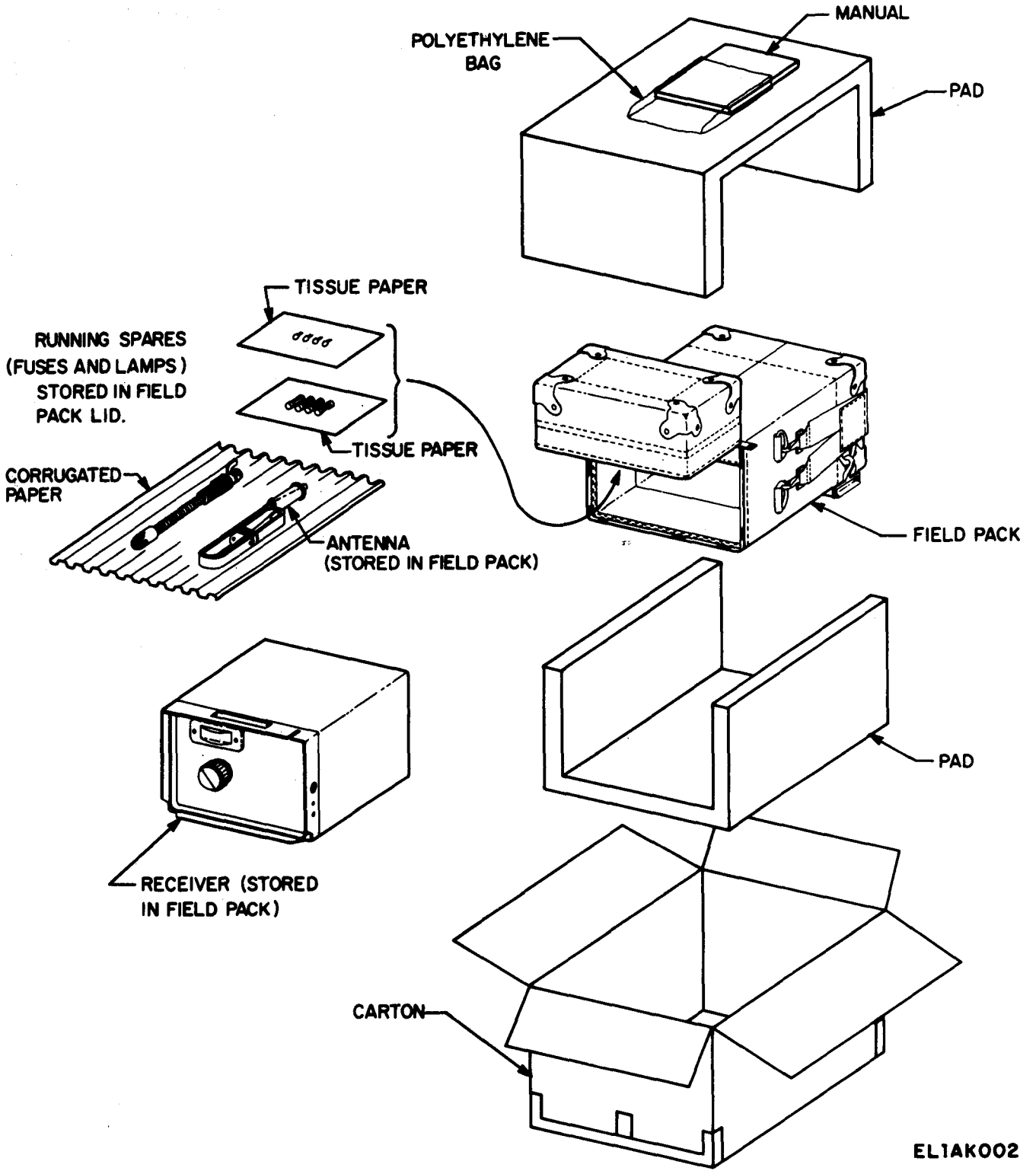


Figure 2-1. Typical packing diagram.

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 1-3).

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 1-3. 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 control panel, near the nomenclature plate. Check also to see whether all currently applicable MWOS have been applied. Current MWOs applicable to the equipment are listed in DA Pam 310-6 or DA Pam 310-7 as applicable.

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

Section III. INSTALLATION INSTRUCTIONS

2-5. Backpack or Fixed Configuration

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

a. Battery *Installation* (fig. FO-17).

(1) Remove the rear cover (5) of the receiver by loosening the two attaching captive thumbscrews.

(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 thumbscrews.

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

(1) Connect antenna AS-2887/UR to receiver ANT input No. 1.

(2) Set the ANT switch to No. 1.

(3) Connect a headset to the AUDIO connector.

(4) Set the rear panel POWER switch to INT.

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

(6) Activate LITE to M ON and check that panel light operates.

Figure 2-2. Typical backpack installation.

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

(1) Set the handle/stand (fig. 3-1) to the *stand* position.

(2) Connect the desired 50 ohm antennas to the receiver. If a doublet antenna is used, connect it to the #2 ANT connector. The whip antenna will be connected to the #1 ANT connector.

(3) Set the ANT switch to the desired input.

(4) Set the rear panel POWER switch to EXT.

(5) Connect the 110 vac or 220 vac power cable to the POWER connector and to a suitable outlet. Power cables are contained in Accessory Kit MK-1517/UR.

(6) Connect a headset to the AUDIO connector.

(7) Refer to chapter 3 and operate the receiver in AM mode.

(8) Position LITE switch to ON and check that panel light operates.

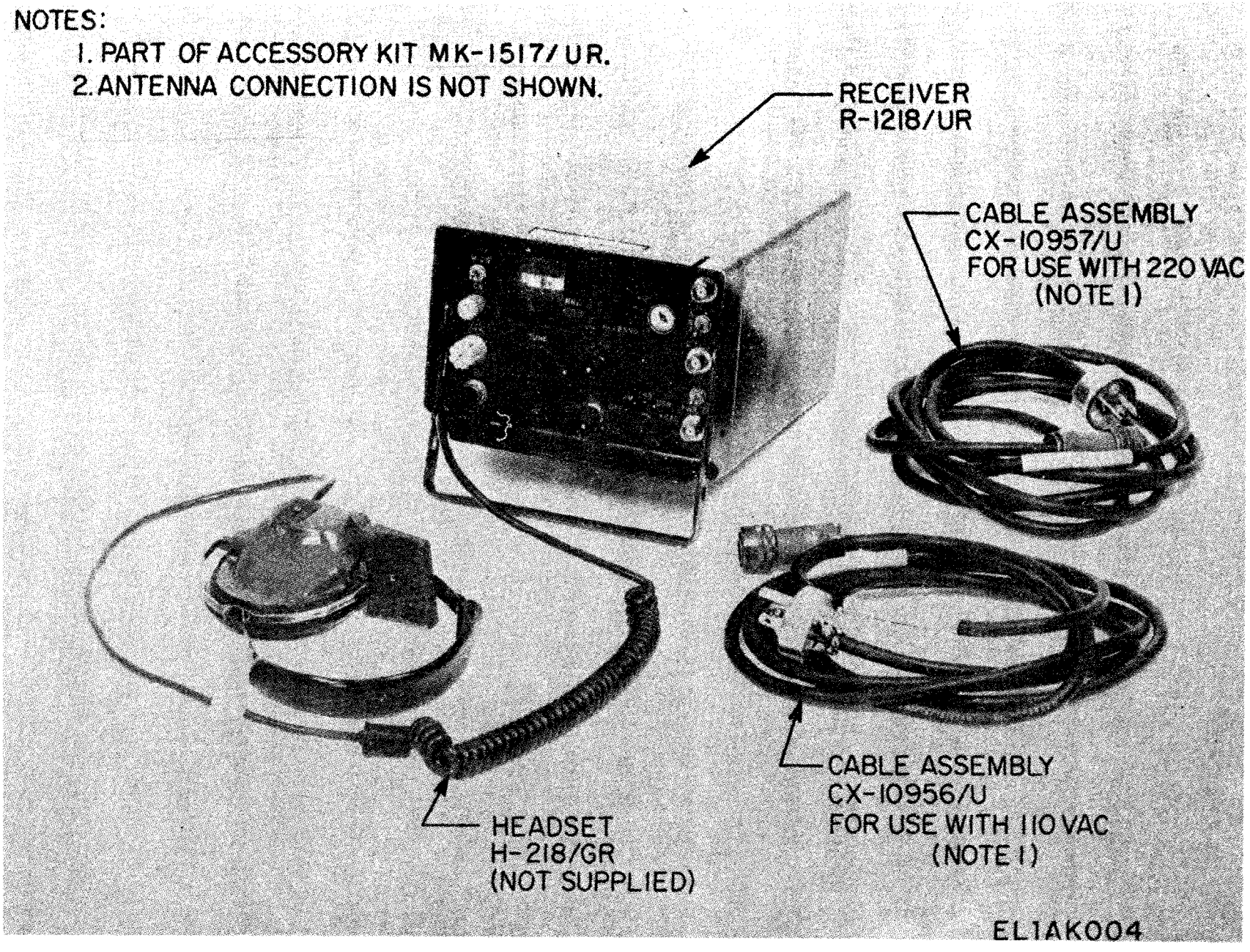


Figure 2-3. Typical fixed installation.

2-6. Vehicular Configuration

(fig. 2-4)

Install the radio set in the vehicular configuration as follows:

a. Install the shock mount (part of MK 1517/UR) in the vehicle (if not already installed) with the attaching hardware. Refer to TM 11-5820-807-14&P.

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

c. Connect the whip antenna to the receiver #1 ANT connector.

d. Set the ANT switch to 1.

e. Connect a headset to the AUDIO connector.

f. Set the rear panel POWER switch to EXT.

g. Connect the 24 vdc power cable (part of MK-1517/UR) to the POWER connector and to the vehicle.

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

i. Position LITE switch to ON and check that panel light operates.

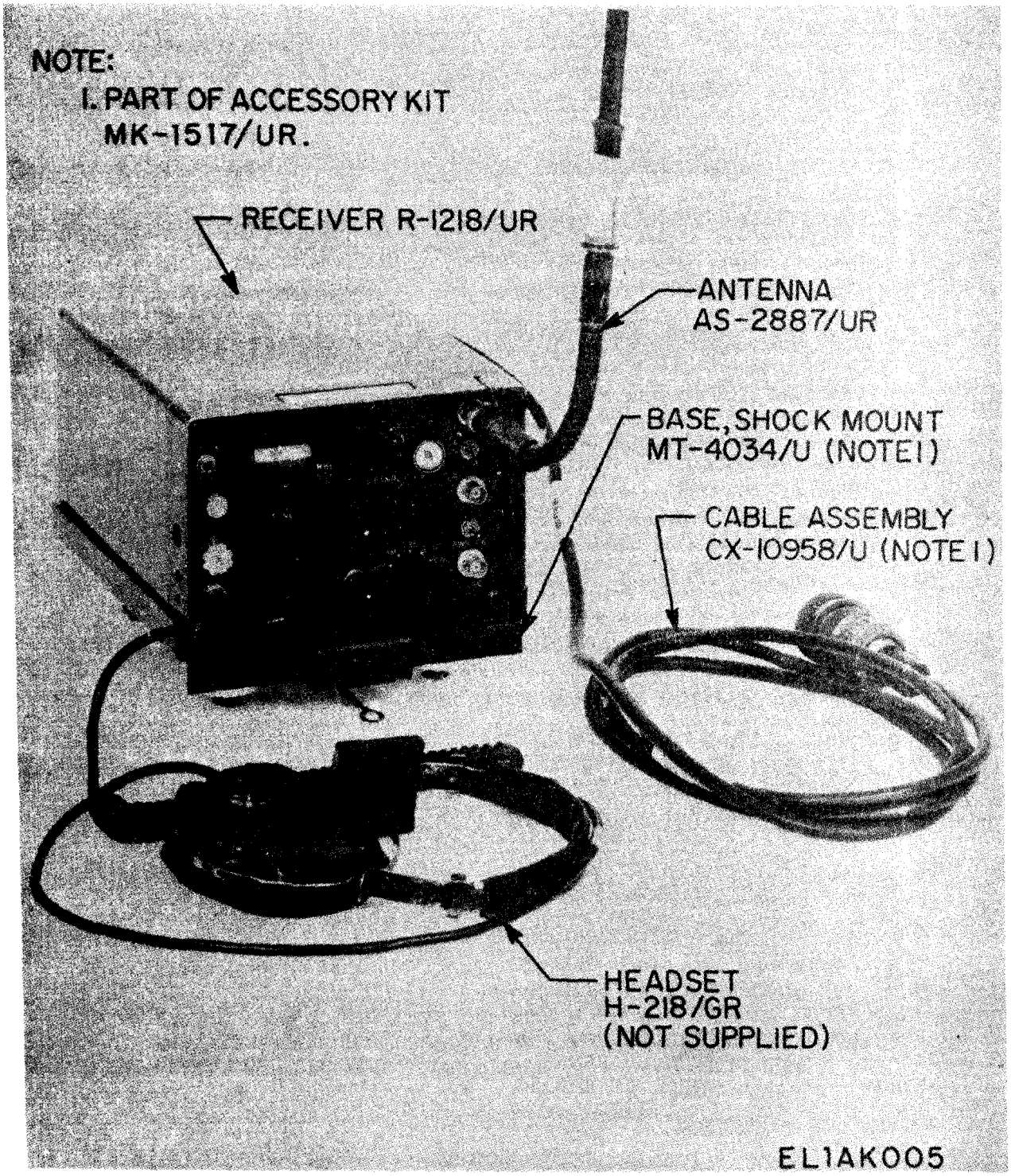


Figure 2-4. Typical vehicular installation.

CHAPTER 3

OPERATING INSTRUCTIONS

Section I. CONTROLS AND INSTRUMENTS

3-1. Damage From Improper Settings

No damage will result to the receiver from improper control settings.

3-2. Description of Operator Controls, Indicators, and Connectors

(fig. 3-1)

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

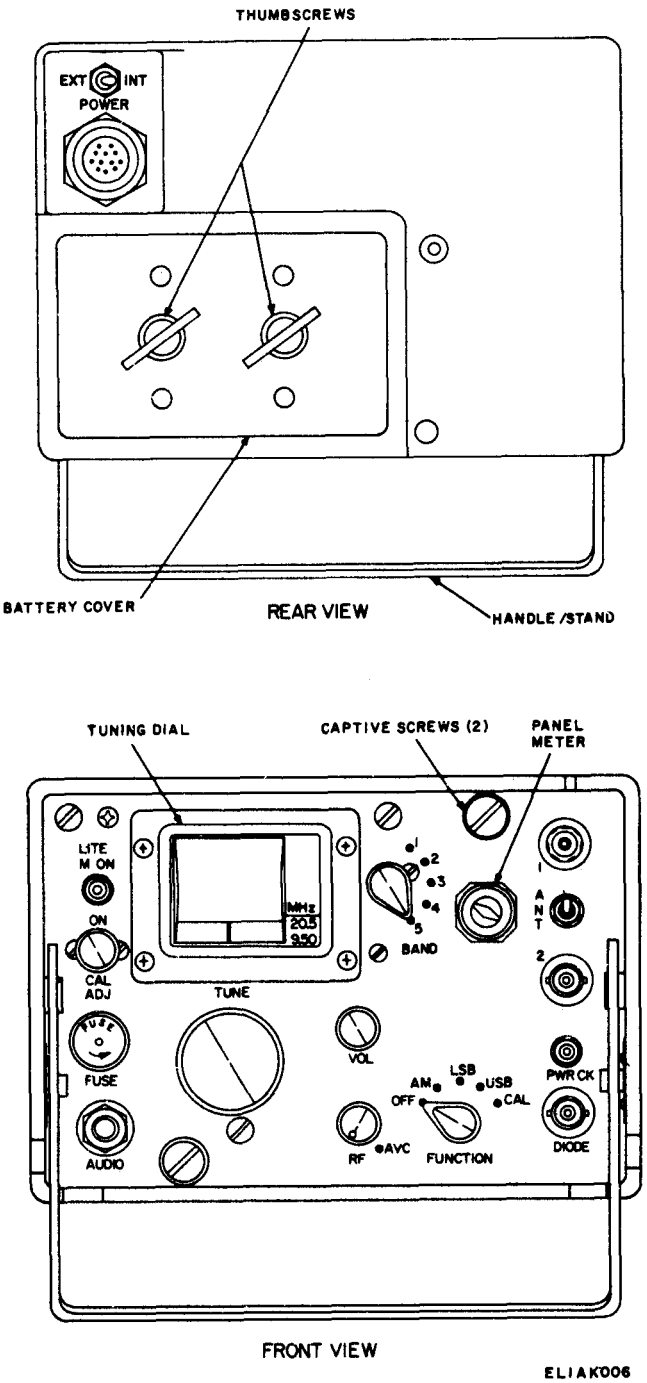


Figure 3-1. Controls, indicators, and connectors.

Table 3-1. Controls, Indicators, and Connectors

Front panel control indicator or connector	Function
FUNCTION switch	Applies power to the receiver and selects the operating mode. Switch positions include OFF, AM, LSB, USB, and CAL.
VOL control	Controls the audio output level of the receiver.
RF gain control	Controls the overall gain of the receiver. Extreme clockwise position, AVC, initiates automatic gain control.
TUNE control	Selects the operating frequency of the receiver. With the tuning knob pressed, 12 turns scan the band. In the non-pressed mode the tuning rate is approximately one-forthieth the scan rate.
BAND switch	Selects the operating frequency band of the receiver (table 1.2).
MHz display window (tuning dial)	Displays the receiver tuning as selected by the BAND switch and TUNE control.
Panel meter	Displays signal level when PWR CHK switch is in the normal position; or the battery voltage level, or internal power converter output voltage level in the activated position of the PWR CHK switch.
PWR CHK switch	Selects the equipment voltage level (spring-loaded in this position) or signal level for display on the panel meter.
LITE switch	Controls dial light with switch position ON. center off, and M ON, a momentary on (spring loaded) position.
CAL ADJ	Used to mechanically shift the tuning cursor to align it with a calibration frequency on the tuning dial.
ANT connectors	Used to couple a whip antenna to the receiver using a TNC connector (input 1) ro a 50 ohm antenna using a BNC connector (input 2).
ANT switch	Used to select the desired antenna input.
DIODE connector	Dc voltage from the diode detector is supplied to this connector for output to external equipment.
AUDIO connector	Used to connect a headset to the receiver.
Rear panel	
POWER switch	Selects internal (INT) battery power or external (EXT) power for application to the receiver.
P O W E R c o n n e c t o r	Provides connection for the following circuits:
110 vac	110 volts, 50 to 400 Hz input power.
220 vac.	220 volts, 50 to 400 Hz input power.
24 vdc.	24 volts dc input power.
Audio output.	Same output signal as at AUDIO connector.
Diode output.	Same output signal as at DIODE connector.
AGC output	The internal gain control signal is applied to this output. In the AVC mode it is the internally generated agc signal; otherwise, a dc level set by the rf gain control.

Section II. OPERATION UNDER USUAL CONDITIONS

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. Press the PWR CHK switch and read the battery voltage on the panel meter. Release the switch. If the meter indication was in the REPLACE (red) range, replace the batteries (para 2-5).

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

Control	Setting
FUNCTION switch	OFF
VOL control	Midrange
BAND switch	Desired band
TUNE control	Desired frequency
LITE switch	OFF
RF gain control	Maximum clockwise
ANT switch	Desired input

d. Set the controls on all ancillary equipment to the preliminary settings listed in the applicable technical manual.

3-4. Initial Adjustments

No initial adjustments of the radio set 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 FUNCTION switch to the desired operating mode.

(2) Start ancillary equipment per applicable technical manuals.

b. Single Sideband Reception (ssb).

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

(2) Tune in the desired signal with the TUNE control. Press tuning knob for fast scan tuning, release for fine tuning.

(3) If the level of the incoming signal is stable, set the VOL control to about ¾ clockwise and adjust the audio level, using the RF gain control.

(4) If the level of the signal is varying, set the RF gain control to AVC (fully clockwise) and adjust the audio level, using the VOL control.

c. Amplitude Modulation Reception (am.).

(1) Set the FUNCTION switch to AM.

(2) Tune in the desired signal with the TUNE control. Press the tuning knob for fast scan tuning, release for fine tuning.

(3) Set the RF gain control to AVC (fully clockwise).

(4) Adjust the audio level with the VOL control.

3-6. Equipment Stopping Procedures

To stop the receiver, set the FUNCTION switch to 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 LITE switch to its center (off) position.

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 #1 ANT connector and set the ANT switch to 1.

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 ANT 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 fequency. 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 in-

creasing 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 VOL control is turned to maximum.

(5) *Gulls.* This signal consists of a quick rise and a slow 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. Vary the rf gain control. This may reduce the jamming signal enough to permit the weaker desired signal to be heard.

d. Use either lsb or usb mode. These modes are less susceptible to jamming.

e. If both whip and doublet antennas are connected to the receiver, switch the ANT switch to obtain the best reception.

Section IV. PREPARATION FOR MOVEMENT

3-10. Backpack or Fixed Configuration

a. Backpack Configuration. The backpack 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 FUNCTION switch to OFF.

(2) Disconnect the whip antenna from the ANT connector.

(3) Disconnect the headset from the AUDIO connector.

(4) Remove the radio from the field pack.

(5) Remove the rear cover of the receiver by loosening the two captive thumbscrews.

(6) Remove the batteries from the receiver.

(7) Reinstall the rear cover and secure with the two captive thumbscrews.

(8) Place the radio and antenna in the field pack.

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

(1) Set the FUNCTION switch to OFF.

(2) Disconnect the 100 vac or 220 vac power cable from the POWER connector and from the power outlet.

(3) Disconnect the whip antenna (if installed) from the #1 ANT connector.

(4) Disconnect the doublet antenna (if installed) from the #2 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 thumbscrews.

(7) Remove the batteries from the receiver.

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

3-11. Vehicular Configuration

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 FUNCTION switch to OFF.

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

c. Disconnect the whip antenna from the #1 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 thumbscrews.

h. Remove the batteries from the receiver.

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

CHAPTER 4

MAINTENANCE

Section I. GENERAL

4-1. Scope of Maintenance

This chapter describes the operator and organizational maintenance requirements for Radio Set AN/URR-70. These requirements include preventive and corrective maintenance, troubleshooting, cleaning, inspection, repainting and refinishing, testing, and authorized replacements and repairs.

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 (app C).

Section II. OPERATOR/CREW MAINTENANCE

4-4. Operator/Crew Preventive Maintenance

NOTE

Refer to TM 750-244-2 for proper procedures for destruction of this equipment to prevent enemy use.

a. Operator/crew preventive maintenance is the systematic care, servicing and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to maintain equipment in serviceable condition. To be sure that your receiver is always ready for your mission, you must do scheduled preventive maintenance checks and services (PMCS).

(1) BEFORE OPERATION, perform your B PMCS to be sure that your equipment is ready to go.

(2) Use the ITEM NO. column in the PMCS table to get the number to be used in the TM ITEM NO. column on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) when you fill out the form.

b. Routine checks like CLEANING, PRESERVATION, DUSTING, WASHING, CHECKING FOR FRAYED CABLES, STOWING ITEMS NOT IN USE, COVERING UNUSED RECEPTACLES, CHECKING FOR LOOSE NUTS AND BOLTS AND CHECKING FOR COMPLETENESS are not listed as PMCS checks. They are things that you should do any time you see they must be done. If you find a routine check like one of those listed in your PMCS, it is because other operators reported problems with this item.

WARNINGS

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

NOTE

The PROCEDURES column in your PMCS chart instructs how to perform the required checks and services. Carefully follow these instructions and, if tools are needed, get organizational maintenance to do the necessary work.

4-5. Operator/Crew Preventive Maintenance Checks and Services

NOTE

The checks in the interval column are to be performed in the order listed.

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

Item No.	Interval B	Item to be Inspected	Procedures — Check for and have repaired or adjusted as necessary	Equipment is Not Ready/Available If:
1	•	Mission Essential Equipment	Check for completeness and satisfactory condition of the equipment. Report missing items.	Available equipment is insufficient to support the combat mission.
2	*	Battery Check	Check batteries for full charge (use Control Panel meter) Replace bad batteries.	Batteries are bad.
3	*	Operational Check	Perform operational check as described in paragraph 4-8.	

*Do this check **before each deployment** to **a mission location. This will permit any existing problems to be corrected before the mission starts. The check does not need to be done again until redeployment.**

Paragraph 4-6 deleted.

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, tuning dial, or panel meter face.

4-8. Operational Checks

a. Install the batteries in the receiver (para 2-5a).

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

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

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

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

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

g. Repeat *c* above.

h. Shut down the equipment (para 3-6).

i. Unless further operation is anticipated, disassemble the vehicular configuration (para 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 category 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 table 4-1. When an abnormal condition or result is observed, locate the appropriate trouble symptom in table 4-2. The procedure listed in the checks and corrective action column should then correct the trouble. Refer any trouble that is beyond the scope of operator and organizational maintenance to a higher category of maintenance.

Table 4-2. Operator's Troubleshooting

Item	Trouble symptom	Probable trouble	Checks and corrective action
1	Receiver completely inoperative.	*a.* Fuse.	*a.* Replace fuse.
		b. POWER switch not in proper position for source	*b.* Check position of POWER switch for proper position.
		c. Defective source voltage.	*c.* Replace if defective.
		d. Defective power plug.	*d.* Check plug for damage. Refer to a higher category of maintenance for repair.
2	Low signal power (weak audio output).	*a.* Antenna in wrong area.	*a.* Move antenna.
		b. RF gain or VOL control out of adjustment.	*b.* Readjust controls.
		c. Damaged antenna connection.	*c.* Check antenna for damage, tighten, or replace. Refer to higher category of maintenance for repair.
		d. Weak batteries (when used).	*d.* Check and replace if required.
3	Static or noise in receiver.	*a.* Enemy jamming.	*a.* See paragraph 3-9.
		b. Loose antenna connection.	*b.* Tighten connection.
4	Panel lamp inoperative.	Defective panel lamp.	Refer to higher category of maintenance for replacement.
5	Signals weak or fading rapidly.	Improper setting of RF gain control.	Set RF gain control to AVC.

Table 4-3. Organizational Troubleshooting

Malfunction	Probable cause	Corrective action
Radio set inoperative from internal batteries.	**a.** Batteries defective.	**a.** Replace batteries (para 2-5a).
	b. Receiver defective.	***b.*** Replace receiver.
Radio sat inoperative from 110 vac power.	***a.*** Blown fuse.	***a.*** Replace fuse (para 4-13).
	b. 110 vac power cable defective.	***b.*** Replace cable. Forward defective cable to higher category maintenance.
	c. Receiver defective.	***c.*** Replace receiver.
Radio set inoperative from 220 vac power.	***a.*** Blow fuse.	***a.*** Replace fuse (para 4-13).
	b. 220 vac power cable defective.	***b.*** Replace cable. Forward defective cable to higher category maintenance.
	c. Receiver defective.	***c.*** Replace receiver.
Radio set inoperative 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 category maintenance.
	c. Receiver defective.	***c.*** Replace receiver.
Only noise heard in headset (no signals received).	***a.*** Antanna 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.
Dial light or panel meter inoperative.	Receiver defective.	Replace receiver.

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.

4-11.1. Organizational Preventive Maintenance Check and Service

There are no organizational preventive maintenance checks and service on this equipment. The operator will perform scheduled PMCS.

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

b. Perform the checks and corrective measures indicated in the troubleshooting chart, tables 4-2 and 4-3. Refer any troubles beyond the scope of the organizational level to a higher category of

maintenance.

4-12. Equipment Removal and Installation

a. When the equipment is used in the backpack or fixed configuration, disassemble the receiver as outlined 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 for the backpack or fixed configuration (para 2-5, or for the vehicular configuration (para 2-6).

4-13. Receiver Parts Removal and Replacement

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

b. Fuse Replacement. Replace the front panel fuse as follows:

NOTE

A spare fuse (stored in the field pack) is provided to allow the receiver to be placed back in service quickly after a fuse blows. If a spare fuse is installed in the receiver, restock a new 1/8-ampere fuse in the field pack as soon as the operational or tactical situation allows.

(1) Set the FUNCTION switch to OFF.

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

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

CAUTION

Do not replace the fuse with one of a higher rating. Use a 1/8-ampere fuse as specified in the Repair Parts and Special Tools List.

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

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

c. Antennu Repair. Unscrew leaf assembly (4, fig. 1-1) from antenna base and replace with a serviceable part.

4-14. Maintenance of Ancillary Items

a. External Power Cables. The 110 vac, 220 vac, and 24 vdc power cables are not repairable at the organizational maintenance category. Forward damaged or defective cables to higher category maintenance for repair.

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

CHAPTER 5

FUNCTIONING OF EQUIPMENT

Section I. UNIT FUNCTIONING

5-1. General

This section covers the basic functioning of Radio Receiver R-1218/UR. Functioning details for the rf tuner and dial assembly and the am. receiver subsystem integrated circuit are given in paragraphs 5-3 through 5-9 of this chapter. The information in these sections may be used as a troubleshooting aid to isolate a fault to a specific subassembly. Paragraph 5-11 covers the functioning of the dust cover.

5-2. Block Diagram Analysis

(fig. FO-1)

a. General. The received rf signal (0.536 to 20.50 MHz) enters the receiver through the WHIP (1) or 50 ohm (2) antenna connector on the control panel. The signal passes into the rf tuner where it is bandwidth limited, amplified, and mixed with the output of the local oscillator to produce the 455 kHz if. signal. This signal flows through the if. amplifier assembly where it is filtered and amplified and passed on to the detector assembly. The detector assembly demodulates the signal and passes it to the audio amplifier assembly which furnishes the audio output of the receiver. The detector assembly also provides diode output, meter drive, and agc voltage to the rf tuner and if. amplifier circuits. Basically, the receiver is composed of six blocks of circuits. These are the rf tuner and dial assembly (A2), calibration oscillator (A7), if. amplifier assembly (A3), detector assembly (A4), audio amplifier assembly (A6), and power supply assembly (A5). Each of these circuits is described in the following subparagraphs.

b. Rf Tuner and Dial Assembly (A2). The rf tuner and dial assembly is composed of the following subassemblies which are, in signal flow order, the preselector, first rf amplifier, second rf amplifier, mixer, and local oscillator.

(1) The preselector is composed of a tunable bandpass filter and is used to provide a portion of the receiver selectivity and to provide the proper impedance match for the first rf amplifier, thereby contributing to the sensitivity of the receiver. The first and second rf amplifiers are tunable amplifiers whose gain is controlled, either by the agc voltage developed in the detector assembly, or by the rf gain control on the receiver front panel.

(2) The mixer consists of a 3-db pad at the rf input port, a 4-db pad at the local oscillator port, and passive balanced mixer U1. The balanced mixer mixes the rf input with the output of the local oscillator to produce the 455 kHz signal input to the if. amplifier assembly.

(3) The local oscillator is a tunable 1c oscillator which operates at a frequency 455 kHz above the tuned rf signal and is coupled to one of the input ports of the mixer.

(4) Due to the complexity of the band switching arrangement and the mechanical configuration, further details of the rf tuner and dial assembly are given in section II of this chapter.

c. Calibration Oscillator (A7). The calibration oscillator consists of a crystal controlled 500 kHz oscillator, a divide-by-five circuit and its associated control, and a differentiation network. The oscillator is formed by two nand gates and produces a square wave output which is routed either to the divide-by-five circuit or to the differentiator by the control circuit. The control circuit is activated by the BAND switch on the receiver front panel. In bands 1, 2, and 3, the divide-by-five circuit is activated and the 500 kHz signal from the oscillator is divided to produce a 100 kHz square wave which is passed to the differentiator circuit. In bands 4 and 5, the divide-by-five circuit is bypassed and the 500 kHz signal from the oscillator is passed directly to the differentiator circuit. The differentiator network produces an impulse which contains all necessary harmonics of the 100 or 500 kHz input signal. This spectrum is routed to the input of the rf tuner and dial assembly and is used as reference frequencies for calibrating the receiver dial.

d. If. Amplifier Assembly (A3). The if. amplifier assembly consists of a 3-db pad, a mechanical filter, two stages of amplification, and an agc amplifier. The output from the mixer in the rf tuner and dial assembly passes through the matching pad to the 455 kHz mechanical filter. The —6-db bandwidth of the filter is 2.5 kHz. The filter rejects all of the mixer products except

the desired 455 kHz if. signal. The first and second if. amplifier stages are tuned amplifiers with a maximum voltage gain of 60 db, controlled by the agc amplifier. The agc amplifier is an inverting dc amplifier that converts the agc voltage from the detector or the voltage from the receiver front panel rf gain control to the proper polarity for controlling the gain of the if. amplifiers.

e. Detector Assembly (A4). The detector assembly contains a third stage of if. amplification (U1), a multipurpose am. receiver subsystem integrated circuit (U2), meter amplifier (Q1), crystal controlled beat frequency oscillator (bfo) Q2, and product detector (U3).

(1) The if. amplifier stage is similar to those in the if. module except it has a fixed voltage gain of approximately 20 db. The am. receiver subsystem (am. ic U2) operates in all receiver modes and provides the following functions: am. detector, diode output amplifier, agc detector and amplifier, and audio preamplifier.

(2) The bfo and product detector are energized only when the receiver front panel FUNCTION switch is in the LSB, USB, or CAL modes. The bfo operates on one of three crystal controlled frequencies depending on the position of the front panel FUNCTION switch. The frequencies are 453.3 kHz in the LSB mode, 456.7 kHz in the USB mode, and 455.0 kHz in the CAL mode. The output of the bfo is routed to the product detector where the sideband signals are demodulated and routed to the audio preamplifier in the am. receiver subsystem.

(3) The agc output from the am. receiver subsystem is also used to drive the meter amplifier which produces a current that is proportional to the rf input to the receiver. The output of the meter amplifier is used to drive the front panel signal strength meter. Due to the many functions contained within the am. receiver subsystem, additional details are given in section III of this chapter.

f. Audio Amplifier Assembly (A6). The audio amplifier assembly consists of a bandpass filter network and an amplifier. The amplifier has a voltage gain of approximately 20 db, a 6-db bandwidth of 2.5 to 3.5 kHz, and is used to supply the necessary audio output power for the receiver.

g. Power Supply Assembly (A5). The power supply assembly consists basically of a rectifier and filter, a +18-volt preregulator, and a +11.2-volt regulator. A power transformer, external to the power supply assembly, is used to supply the proper voltage to the power supply when operating from an ac source with any frequency between 50 and 400 Hz. The primary of the transformer can be connected for either 110 or 220 vac operation. This is accomplished by jumpers in the power cable to the receiver which connects with the rear panel connector. In addition to ac operation, the power supply can also operate from a nominal +24-volt vehicular power source or from an internal battery. Selection of the internal batteries, or external ac or vehicular power, is accomplished by the INT-EXT switch located on the back panel of the receiver dust cover. The rectifier and filter circuits consist of a bridge rectifier and capacitive filter and is used only during ac operation. The +18-volt preregulator circuit is a conventional zener diode and series pass transistor arrangement. It is used to supply power to non-voltage sensitive circuits of the receiver and to limit the input voltage to the +11.2-volt regulator. The +11.2-volt regulator is a precision integrated circuit regulator which is short-circuit protected and is used to supply power to all voltage sensitive circuits in the receiver.

Section II. RF TUNER AND DIAL ASSEMBLY

5-3. General

(fig. FO-4)

The rf tuner is contained in a metal chassis that is divided into five compartments. The compartments are used to provide rf isolation between the subassemblies. The motherboard is located in the bottom of the rf tuner chassis and is used to provide interconnections among the subassemblies and the main tuning capacitor. There are five subassemblies, one per compartment, within the rf tuner; the preselector, first rf amplifier, second rf amplifier, mixer, and local oscillator. Each subassembly is explained in the following paragraphs. In addition to the subassemblies, the main tuning capacitor is connected to one side of the rf tuner chassis. The capacitor contains five sections; each section located directly opposite the subassembly with which it is electrically associated.

a. The simplified schematic diagram, figure Fo-4, is shown for a typical band and is representative of any of the five bands. Interconnections from the motherboard to the various subassemblies are not shown except for the pertinent signal from one subassembly to the next.

b. Switch S1 is the BAND switch and is activated from the front panel. It is composed of

ten wafer sections, two per subassembly, and a common shaft that spans the entire length of the rf tuner and mates with the detent mechanism on the front panel. For clarity, only the functioning contacts for a typical band are shown and are represented schematically as spst switches labeled with the appropriate wafer section. The wafer contact numbers are shown for band 1 as a further illustration. The open switches are used to illustrate that the tank circuit is active. The four unused tank circuits, not shown, are shorted to prevent any interaction with the active tank circuit.

c. There are five tank circuits in each subassembly, one for each band, however, only the active tank circuit is shown. Components connected with dashed lines are used only in the band shown.

d. Except for the local oscillator and the mixer, the output circuit for a subassembly is located on the next subassembly. For example, the output tank circuit of the first rf amplifier is located on the second rf amplifier subassembly. This method is used to increase the input-output isolation of each stage.

5-4. Preselector

Resistor R1 and switch S1B-F are used to control the divide-by-five function in the calibration oscillator as explained in paragraph 5-2c. The remaining portion of the preselector subassembly forms half of a two-pole tunable bandpass filter. The remainder of the filter is located on the first rf amplifier subassembly and is composed of R1, L1 (L6), C1, and section C1-B of the main tuning capacitor. Resistor R1 is used to maintain a nominal 50 ohm impedance at the input of the preselector (P1-1). The tap at pin 1 of coil L1 in the first rf amplifier subassembly is selected to provide the best sensitivity consistent with the signal handling requirements of the receiver. The receiver is capable of handling a 0.5-volt signal without blocking, therefore the tap on coil L1 cannot be too high or the first rf amplifier will limit.

5-5. First and Second Rf Amplifiers

a. Both the first and second rf amplifiers are the same except for the agc circuit. Transistor Q1 in each stage is a dual insulated gate field effect transistor. Gate 2 is used for agc. Due to the inherent gain versus gate 2 voltage characteristic, the agc of both stages are delayed relative to the if. amplifiers. In addition, resistor R11 of the second rf amplifier provides a slight delay in the agc action of the second rf amplifier. This is necessary in order to accommodate the large dynamic range of input signals to the receiver, up to 0.5 volts. The total agc range in the rf amplifiers exceeds 60 db.

b. The tank circuit of the first rf amplifier is located on the second rf amplifier subassembly and the tank circuit of the second rf amplifier is located on the mixer subassembly. Resistor R1 on the second rf amplifier subassembly is used to stabilize the gain across the band by providing a low impedance input to the second rf amplifier transistor Q1.

5-6. Mixer

Resistors R4, R5, and R6 form an impedance matching attenuator (3-db pad) to maintain the constant 50-ohm source required at the rf input port of double balanced mixer U1. Resistors R2 and R3 also form an attenuator (4-db pad) to maintain a constant 50-ohm source to the local oscillator port of the balanced mixer. Thus, the balanced mixer is terminated for optimum performance since the output port is also terminated in a 50-ohm load in the if. amplifier assembly.

5-7. Local Oscillator

The local oscillator is a conventional grounded base oscillator with a tapped inductor. The tank circuit is temperature compensated by capacitor C6 to provide very stable operation. The frequency of oscillation is 455 kHz above the rf input signal and is controlled by section C1-E of the main tuning capacitor.

Section III. AM. RECEIVER SUBSYSTEM

5-8. General

The am. receiver subsystem is a multipurpose integrated circuit used in the detector assembly. This integrated circuit is used to perform the following functions: diode amplifier, if. amplifier-am. detector, agc amplifier, and audio preamplifier. The use of this integrated circuit conserves space, increases reliability, and provides better performance than conventional discrete circuits performing the same functions. The am. detector portion of the integrated circuit is virtually unaffected by temperature throughout the operating range of the receiver. The various functions performed by the am. receiver subsystem integrated circuit are discussed in paragraph 5-9, in conjunction with block diagram figure 5-1.

5-9. Block Diagram

(fig. 5-1)

a. The 455 kHz if. signal from the third if. amplifier in the detector assembly is routed to pins 2 and 8 of the integrated circuit. Pin 2 is the input to the diode amplifier which provides approximately 20 db of voltage gain. The output is taken from pin 3 and muted to a voltage doubling circuit to produce the diode output of the receiver. Pin 1 is used to provide the proper bias for the diode amplifier.

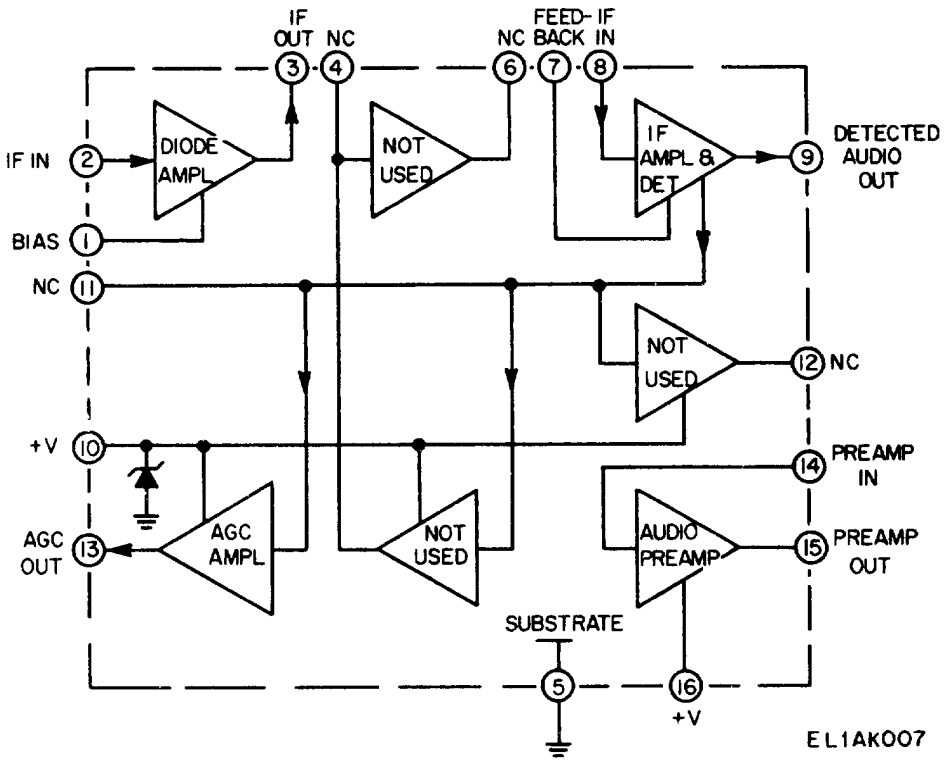


Figure 5-1. Am. receiver subsystem integrated circuit, block dtagram.

b. The if. input signal at pin 8 is routed to the if. amplifier-am. detector portion of the integrated circuit. The detected audio is present at pin 9. The detector also provides a detected agc signal that is routed internally to the agc amplifier. The dc signal from the agc amplifier at pin 13 is used for the agc voltage in the rf tuner assembly and the if. amplifier assembly, and to drive the signal meter amplifier in the detector assembly. Pin 7 is used to provide feedback for the internal if. amplifier stage.

c. Pin 14 is the input to the audio preamplifier. The detected audio in all receive modes is routed to pin 14 through the FUNCTION switch and VOL control on the receiver front panel. The preamplifier provides approximately 20 db of voltage gain and produces the audio output at pin 15 which is routed to the audio amplifier assembly. The total distortion through the if. amplifier-am. detector stage and the audio preamplifier stage is less than three percent.

d. The supply voltage at pin 10 is internally regulated to approximately 5.6 vac by a zener diode for use in voltage sensitive areas of the integrated circuit.

e. Due to the internal configuration of the integrated circuit, it is possible for one function within the integrated circuit to fail and not affect the remaining functions. *For example,* the diode amplifier may fail causing the loss of diode output, but all other functions of the receiver may be normal. If the agc amplifier fails it may be possible to operate the receiver with the manual RF gain control.

Section IV. DUST COVER

5-10. General

The dust cover serves as a protective case for the receiver and contains the battery compartment, the internal-external power switch, the power connector, and the radiofrequency interference (rfi) filter.

5-11. Functioning

(fig. FO-3)

a. Battery Compartment. The battery compartment is used to house twelve BA-30/U cells which power the receiver when the INT-EXT switch is in the INT position. The compartment is watertight and the battery cells are accessible through the cover on the back of the case. A diode, CR1, in series with the positive battery line prevents damage to the receiver if the cells are not properly inserted in the battery compartment.

b. Internal-External Switch. INT-EXT switch S1 is located on the rear of the dust cover and is used to select between battery power or external power. In the internal position, the battery is connected to the receiver power supply. Any external power source that may be connected to the dust cover is then disabled. In the external position, the battery is disconnected from the receiver power supply. The external power source, which is connected to the multipin connector on the rear of the dust cover, is then connected to the receiver power supply.

c. *Power Connector.* Power connector J2 is used to connect external power sources to the receiver and also provides audio, diode, and agc outputs from the receiver. Strapping options in the plug that mates with the power connector provide operation from 110 or 220 vac, 50 to 400 Hz, or 24 vdc vehicular power sources.

d. Rfi Filter. Rfi filter FL1 prevents any radio frequency interference from being conducted through the power cable to the receiver. Each conductor of the power line and the fuse conductors pass through a section of the filter. Thus, any interference that may be present on the power line is filtered out so it will not interfere with the proper operation of the receiver.

CHAPTER 6

DIRECT SUPPORT MAINTENANCE

Section I. GENERAL

6-1. Scope of Maintenance

This chapter describes the direct support maintenance requirements for Receiving Set, Radio AN/URR-70. These requirements include troubleshooting, maintenance, testing, and adjustment. It should be noted that intermediate level repairs are performed by direct and/or general support.

6-2. Tools and Test Equipment

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

Section II. TROUBLESHOOTING

6-3. General

This section contains procedures for isolating and localizing faulty subassemblies in the receiver. The defective subassemblies shall be routed to higher category maintenance for repair.

CAUTION

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

a. Test equipment requires an isolation transformer in the power supply circuit.

b. Observe battery polarity. Polarity reversal may damage transistors.

c. If battery eliminators are used in testing, they must have good voltage regulation and low ac ripple so the voltage rating of the transistor equipment being tested is not exceeded.

6-4. Troubleshooting

a. 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 (chapter 4) has been previously accomplished and the fault has been isolated to the receiver's internal circuits or components, prior to accomplishing these procedures.

b. If a receiver fault cannot be corrected by using the procedure in this table, the fault may be in the wiring of the dust cover or the receiver chassis. Make resistance and continuity checks of the dust cover and the receiver chassis per paragraphs 6-15, 6-16 and 6-22. Refer to TM 11-5820-641-24P to determine if replacement parts are provisioned at the direct support maintenance level. If a replacement part is not available, or if the defect is in front panel assembly A1A1A1, forward the receiver to higher category maintenance for repair.

Table 6-1. Direct Support Troubleshooting

Item	Symptom	Probable trouble	Corrective action
1	Receiver inoperative on batteries and external power (all modes; no power indication).	*a.* Defective power cable.	*a.* Check continuity; replace or repair if needed (see TM 11-5820-807-14&P).
		b. Defective FUNCTION switch.	*b.* Check continuity (para 6-16). If defective forward receiver to higher category maintenance for repair.
		c. Defective INT-EXT switch on dust cover.	*c.* Check continuity (para 6-23). Replace if defective (para 6-6 and 6-9).
		d. Defective power supply assembly.	*d.* Test power supply (para 6-20). Replace if defective (para 6-6 and 6-9).
2	Receiver inoperative on ac external power only.	*a.* Defective power transformer.	*a.* Check power transformer (para 6-15). Replace if defective (para 6-6 and 6-9).

Table 6-1. Direct Support Troubleshooting—Continued

Item	Symptom	Probable trouble	Corrective action
		b. Defective FUNCTION switch.	*b.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
		c. Defective power cable.	*c.* Check continuity; replace or repair if defective (see TM 11-5820-807-14&P).
3	Receiver inoperative on vehicular external power only.	*a.* Defective diode in power supply assembly.	*a.* Test power supply assembly (para 6-20). Replace if defective (para 6-6 and 6-9).
		b. Defective FUNCTION switch.	*b.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
4	Receiver inoperative on internal power only.	*a.* Defective diode in dust cover.	*a.* Check continuity (para 6-23). Replace if defective (para 6-6 and 6-9).
		b. Defective INT-EXT switch in dust cover.	*b.* Check continuity (para 6-23). Replace if defective (para 6-6 and 6-9).
		c. Defective FUNCTION switch.	*c.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
5	No audio output (all modes; have signal meter indication).	*a.* Defective headset.	*a.* Replace headset.
		b. Defective detector assembly	*b.* Test detector assembly (para 6-19). If defective, forward receiver to higher category maintenance for repair.
		c. Defective VOLUME control.	*c.* Check resistance (para 6-16). If defective, forward receiver to higher category maintenance for repair.
		d. Defective FUNCTION switch.	*d.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
6	No audio output and no signal meter indication (power indication normal).	*a.* Defective calibration oscillator, if used.	*a.* Test calibration oscillator (para 6-22). If defective, replace circuit card assembly A1A1A7.
		b. Defective ANT switch.	*b.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
		c. Defective antenna transformer A1A1A1A1T1.	*c.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
		d. Defective detector assembly.	*d.* Test detector assembly (para 6-19). If defective, forward receiver to higher category maintenance for repair.
		e. Defective if. amplifier assembly.	*e.* Test if. amplifier assembly (para 6-18). If defective, forward receiver to higher category maintenance for repair.
		f. Defective audio amplifier assembly.	*f.* Test audio amplifier assembly (para 6-21), If defective, replace circuit card assembly A1A1A6A1.
		g. Defective rf tuner.	*g.* Test rf tuner (para 6-17). If defective, forward receiver to higher category maintenance for repair.

Table 6-1. irect Support Troubleshooting — Continued

Item		Probable trouble	Corrective action
7	No audio output on CAL position only.	*a.* Defective calibration oscillator.	*a.* Test calibration oscillator (para 6-22). If defective, replace circuit card assembly A1 A1A7.
		b. Defective FUNCTION switch.	*b.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
		c. Defective detector assembly.	*c.* Test detector assembly (para 6-19). If defective, forward receiver to higher category maintenance for repair.
8	No audio output on either LSB or USB or both.	*a.* Defective detector assembly.	*a.* Test detector assembly (para 6-19). If defective, forward receiver to higher category maintenance for repair.
		b. Defective FUNCTION switch.	*b.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
9	No audio output on AM.	*a.* Defective detector assembly.	*a.* Test detector assembly (para 6-19). If defective, forward receiver to higher category maintenance for repair.
		b. Defective FUNCTION switch.	*b.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
10	No audio output on one or more bands, but not all bands.	Defective rf tuner.	Test rf tuner (para 6-17). If defective, forward receiver to higher category maintenance for repair.
11	No DIODE output.	Defective detector assembly.	Test detector assembly (para 6-19). If defective, forward receiver to higher category maintenance for repair.
12	Dial light will not light under any condition.	*a.* Defective bulb.	*a.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
		b. Defective LITE switch.	*b.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
13	Dial light remains on under all conditions.	Defective LITE switch.	Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
14	Dial light will not light in M ON position of LITE switch when on INT power.	Defective LITE switch.	Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
15	No audio, agc, or diode output at dust cover connector only.	Broken wire, loose connection, or broken connector.	Check continuity (para 6-23). Repair if defective.
16	Receiver indicates wrong frequency.	Defective rf tuner.	Test rf tuner (para 6-17). If defective, forward receiver to higher category maintenance for repair.
17	Panel meter inoperative under all conditions.	*a.* Defective meter.	*a.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
		b. Defective PWR CHK switch.	*b.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.

Table 6-1. *Direct Support Troubleshooting*—Continued

Item	Symptom	Probable trouble	Corrective action
18	No signal strength indication on meter (power check normal)	*a.* Misadjusted or defective detector assembly.	*a.* Test and readjust detector (para 6-19). If defective, forward receiver to higher category maintenance for repair.
		b. Defective PW R CH K switch.	*b.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
19	No power indication on meter (signal normal).	*a.* Defective PW R CK switch	*a.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
		b. Defective resistor in power supply assembly.	*b.* Test power supply assembly (para 6-20). Replace if defective (para 6-6 and 6-9).
20	Receiver inoperable on ANT 1 only.	*a.* Defective ANT 1 connector.	*a.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
		b. Defective whip antenna, if used.	*b.* Check continuity (para 6-24). Repair or replace, if defective.
		c. Defective ANT switch.	*c.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
		d. Defective antenna transformer A1A1A1T1.	*d.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
21	Receiver inoperable on ANT 2 input only.	*a.* Defective ANT 2 connector.	*a.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
		b. Defective ANT switch.	*b.* Check continuity (para 6-16). If defective, forward receiver to higher category maintenance for repair.
22	Weak signals (low sensitivity).	*a.* If. amplifier assembly misadjusted or defective.	*a.* Test and readjust if. amplifier assembly (para 6-14 and 6-18). If defective, forward receiver to higher category maintenance for repair.
		b. Defective detector assembly.	*b.* Test detector assembly (para 6-19). If defective, forward receiver to higher category maintenance for repair.
		c. Defective rf tuner.	*c.* Test rf tuner (para 6-17). If defective, forward receiver to higher category maintenance for repair.
23	Broken or defective knobs.		Replace knobs (para 6-8).

Section III. MAINTENANCE

6-5. General

This section contains corrective maintenance procedures for the receiver. Instructions are provided for disassembly, inspection, repair, and reassembly.

6-6. Disassembly

a. Disassembly of Radio Receiver A1.

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.

(1) *Dust cover removal* (fig. FO-16).

(a) Turn FUNCTION switch to OFF.

(b) Remove power cable if connected.

(c) Loosen two captive screws on the front panel and pull the radio assembly out of the dust cover assembly.

(2) *Disassembly of dust cover assembly A1A2* (fig. FO-17).

(a) Battery cover and battery removal.

1. Loosen two captive thumbscrews on battery cover.

2. Remove battery cover (5) and twelve BA-30/U cells from the battery compartment.

(b) Components and wiring removal.

NOTE

Replacement of components or repair of broken wires in the dust cover is more easily accomplished if the entire wiring harness and the attached components are removed from the case.

1. Remove the nut from the INT-EXT switch (2).

2. Remove the nut from the POWER connector (1).

3. Remove the two screws (7) securing connector J1 (6).

4. Remove the mounting hardware (13, 14) securing the power filter FL1 (12).

5. Unsolder the wire from terminal E2 and remove the entire wiring and components from the dust cover housing.

b. Disassembly of Radio Assembly A1A1 (fig. FO-18).

(1) *If. amplifier assembly A1A1A3 removal.*

(a) Loosen the two captive screws on top of the assembly.

(b) Pull straight up on the assembly to disengage the connectors and remove the assembly.

(2) *Detector assembly A1A1A4 removal.*

(a) Loosen the two captive screws on top of the assembly (40).

(b) Pull straight up on the assembly to disengage the connectors and remove the assembly.

(3) *Power supply assembly A1A1A5 removal.*

(a) Remove the four sets of hardware (5, 6, 7) on top of the circuit card assemblies (8 and 9).

(b) Pull up on both circuit card assemblies to disengage the connector and the heatsinks.

(4) *Audio amplifier assembly A1A1A6 removal.*

(a) Loosen the two captive screws on top of the assembly (11).

(b) Pull straight up on the assembly to disengage the connector and remove the assembly.

(5) *Calibration oscillator assembly A1A1A7 removal.*

(a) Remove the three screws (14) and washers (13) from the circuit card assembly (48).

(b) Pull up on the circuit card assembly to disengage the connector and remove the circuit card assembly.

(6) *Power transformer A1A1T1 removal.*

(a) Remove the cable shield (21) from the receiver chassis (50) underneath the power transformer (10) by removing the two screws (14, 22) and washer (25) from the shield.

(b) Unsolder and tag all wires from the transformer terminals.

(c) Remove the hardware (14, 25) that secures the transformer to the receiver chassis.

6-7. Inspection

a. Remove and inspect the dust cover for dents, corrosion, loose terminals, loose wires, missing hardware, or signs of arcing or overheating.

b. Inspect the receiver assembly for dents, corrosion, loose terminals, loose wires, missing hardware, or signs of arcing or overheating.

c. Inspect the if. amplifier, detector, and audio amplifier assembly housings for dents, corrosion, or missing hardware.

d. Inspect the if. amplifier, detector, power supply, audio amplifier, and calibration oscillator printed wiring boards (circuit cards) for cracks, warping, corrosion, or signs of overheating.

e. Inspect the power transformer for signs of arcing or overheating.

f. Inspect the front panel controls and the dust cover switch and connectors for damage.

6-8. Repair and Replacement

a. Replacement. Refer to paragraph 6-6 and 6-9 for disassembly and reassembly instructions for the if. amplifier, detector, power supply, audio amplifier, calibration oscillator, and power transformer.

b. Knob Replacement.

NOTE

The tuning control knob cannot be replaced at this maintenance category. Forward receivers with defective tuning control knobs to higher category maintenance for replacement.

(1) If the knob has a pointer, note the position of the pointer.

(2) Remove the defective knob and replace with a serviceable part. Make sure that the pointer, if any, is properly oriented.

6-9. Reassembly

a. Reassembly of Radio Assembly A1A1 (fig. FO-18).

CAUTION

Use care to prevent pinched wires during the installation of the assemblies.

(1) *Power transformer A1A1T1 installation.*

(a) Secure the power transformer (10) to the receiver chassis (50), using two screws (14) and washers (25).

(b) Solder the tagged wires to the transformer terminals and remove the wire tags.

(c) Secure the cable shield (21) to the receiver chassis, using two screws (14, 22) and the washer (25).

(2) *Calibration oscillator assembly A1A1A7 installation.*

(a) Engage the circuit card assembly (48) connector with the chassis connector (47).

(b) Secure the circuit card assembly, using three screws (14) and washers (13).

(3) *Audio amplifier assembly A1A1A6 installation.*

(a) Orient the assembly (11) so that the connector engages with the chassis connector.

(b) Secure the assembly to the chassis, using the two captive screws.

(4) *Power supply assembly A1A1A5 installation.*

(a) Orient the circuit card assemblies (8 and 9) so that the connector and the heatsinks are engaged.

(b) Secure the assembly with four each screws, lock, and plain washers (5, 6, 7) through the circuit card assemblies.

(5) *Detector assembly A1A1A4 installation.*

(a) Orient the assembly (40) so that the connectors engage the sockets on the chassis.

(b) Secure the assembly with the two captive screws.

(6) *If. amplifier assembly A1A1A3 installation.*

(a) Orient the assembly so that the connectors engage the sockets on the chassis.

(b) Secure the assembly with the two captive screws.

b. Reassembly of Dust Cover Assembly A1A2. Reassemble the dust cover by reversing the procedure given in paragraph 6-6a(2). Be sure that the wiring lays in the channel formed by the tabs inside of the dust cover case.

c. Reassembly of Radio Receiver A1. Dust cover installation is accomplished as follows:

(1) Insert the receiver into the dust cover so that the connectors are engaged.

(2) Secure the assembly with two captive screws on the receiver front panel.

Section IV. TESTING

6-10. General

Direct support testing is limited to testing all major subassemblies while these subassemblies are installed in the receiver or extended by means of cable extenders. When testing shows a subassembly to be defective, replace it with a serviceable item (in accordance with the Maintenance Allocation Chart (appx **C)**) and forward the defective subassembly to higher category maintenance for repair.

6-11. Physical Tests and Inspection

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

b. Check all receiver controls for ease of operation.

c. Remove the dust cover and the batteries (para 6-6).

d. Inspect the subassemblies per paragraph 6-7.

6-12. Receiver Electrical Tests, Preliminary Test Setup

WARNING

The 110 vac or 220 vac power to the receiver is lethal. The voltage is present at the input to the power transformer, which is not accessible unless the cable shield or power transformer is removed from the chassis. Do not remove the cable shield or power transformer when testing with power applied to the receiver. The voltage is also present at the fuse terminals and at the FUNCTION switch terminals. Use caution to avoid these areas while testing with power applied to the receiver.

a. Set the FUNCTION switch to OFF.

b. Remove the receiver from the dust cover (para 6-6).

c. Set the POWER switch on the rear of the dust cover to EXT.

d. Connect extension cable CX-12953/U (part of the accessory kit) between the receiver and the dust cover.

e. Connect the applicable 110 vac, 220 vac, or vehicular power cable (part of the accessory kit) to the POWER connector on the rear of the dust cover.

f. Connect the power cable connector to a 110 vac, 220 vac, or 24 vdc vehicular power source, as appropriate.

6-13. Receiver A1 Testing

NOTE

Before testing, be sure the receiver has had power applied for at least 45 minutes to assure temperature stabilization. Additional time may be required if the receiver has been moved from a location that is colder than the testing area.

a. Panel Meter Test.

(1) Perform the preliminary test setup (para 6-12) except omit *b* and *d*.

(2) Connect the test equipment as shown in figure 6-1.

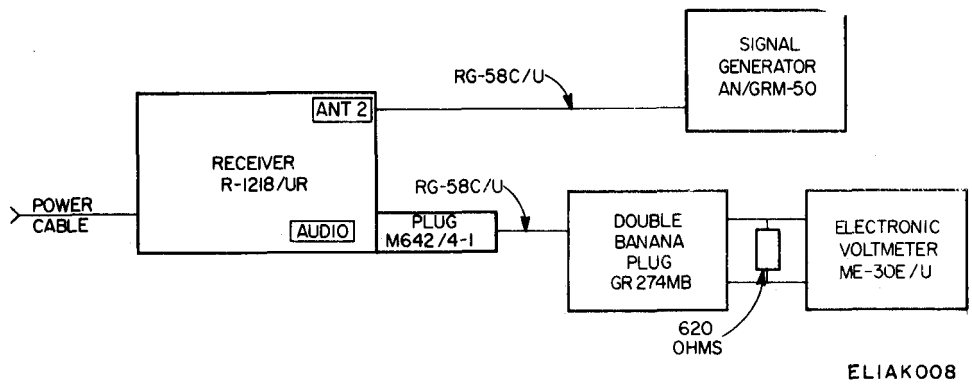


Figure 6-1. Panel meter test connections.

(3) Set the receiver controls as follows:

Control	*Setting*
BAND	1
TUNE	1.0 MHz
ANT	2
VOL	Midrange
RF gain	AVC
FUNCTION	AM

(4) With power applied to the receiver and no input signal, observe a panel meter indication of less than 10 percent of full scale.

(5) Apply power to the signal generator and the electronic voltmeter. Allow 15 minutes for test equipment warmup.

(6) Set the output of the signal generator for a frequency of 1.0 MHz with 30 percent, 1 kHz modulation and a level of 500 millivolts.

(7) Vary the frequency of the signal generator slightly to produce a peak indication on the electronic voltmeter.

(8) Observe a near full scale indication on the panel meter.

(9) Disconnect the signal generator from the test setup.

(10) Activate the PWR CK switch. The panel meter should indicate near the upper limit of the green area.

(11) Remove the power from the receiver and disconnect the test setup.

b. Dial Light Test.

(1) Perform the preliminary test setup (para 6-12) except omit *b* and *d*.

(2) Set the FUNCTION switch to AM.

(3) Place the front panel LITE switch in the ON and M-ON positions. The frequency dial should be illuminated in each position.

c. Am. Sensitivity Test.

(1) Perform the preliminary test setup (para 6-12) except omit *b* and *d*.

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

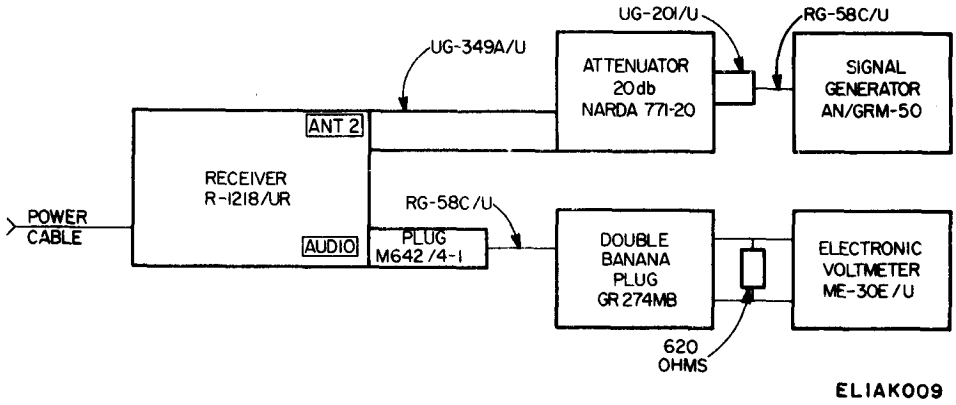


Figure 6-2. Am. sensitivity test connections.

(3) Set the receiver controls as follows:

Control	Setting
ANT	2
RF gain	Maximum clockwise (no AVC)
FUNCTION	AM

(4) Perform (6) through (9) below for each of the following receiver and signal generator frequencies:

Band	*Frequency, MHz*
1	0.536
1	1.16
2	1.10
2	2.37
3	2.26
3	4.87
4	4.63
4	10.00
5	9.50
5	20.50

(5) Apply power to the test equipment and allow 15 minutes for warmup.

(6) Adjust the signal generator for 1 kHz, 30 percent modulation at a level of 12 microvolt.

(7) Adjust the frequency of the signal generator slightly for a peak indication on the electronic voltmeter.

(8) Adjust the receiver VOL control for a 2.45-volt indication on the electronic voltmeter.

(9) Turn the signal generator modulation off. The electronic voltmeter should indicate 0.775 volts or less.

(10) Remove the power from the receiver and disconnect the test setup.

d. Cw Sensitivity Test.

(1) Perform the preliminary test setup (para 6-12) except omit *b* and *d*.

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

(3) Set the receiver controls as follows:

Control	*Setting*
ANT	2
RF gain	Maximum clockwise (no AVC)
FUNCTION	LSB

(4) Perform (6) through (9) below for each of the receiver and signal generator frequencies listed in c(4) above.

(5) Apply power to the test equipment and allow 15 minutes for warmup.

(6) Adjust the signal generator for a cw output at a level of 4.0 microvolts.

(7) Adjust the frequency of the signal generator slightly for a peak indication on the electronic voltmeter.

(8) Adjust the receiver VOL control for a 2.45-volt indication on the electronic voltmeter.

(9) Disconnect the signal generator from the attenuator. The electronic voltmeter should indicate 0.775 volts or less.

(10) Repeat (3) through (9) above with the receiver FUNCTION switch in the USB position.

(11) Remove the power from the receiver and disconnect the test setup.

e. Frequency Calibrator Accuracy Test.

(1) Perform the preliminary test setup of paragraph 6-12.

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

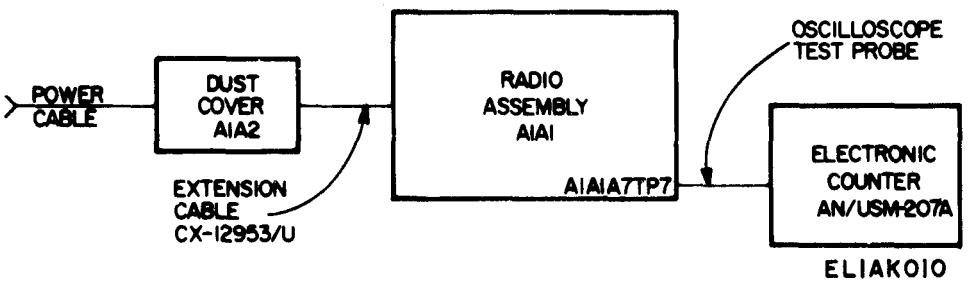


Figure 6-3. Frequency calibrator accuracy test connections.

(3) Set the receiver controls as follows:

Control	*Setting*
ANT	2
FUNCTION	CAL
BAND	As required

(4) Apply power to the test equipment and allow 15 minutes for warmup.

(5) Set the receiver BAND switch to 1. The electronic counter should indicate 99,998 Hz to 100,002 Hz.

(6) Repeat (5) above with the receiver BAND switch in band 2 and 3, respectively.

(7) Set the receiver BAND switch to 4. The electronic counter should indicate 499,990 Hz to 500,010 Hz.

(8) Repeat (7) above with the BAND switch in band 5.

(9) Remove the power from the receiver and disconnect the test setup.

f. Injection Level Test.

(1) Perform the preliminary test setup (para 6-12) except omit *b* and *d*.

(2) Set the receiver controls as follows:

Control	*Setting*
BAND	As required
ANT	2
FUNCTION	CAL

(3) Perform steps 4 and 5 for each of the following receiver frequencies:

Band	*Frequency (MHz)*
1	0.60
1	1.10
2	1.10
2	2.30
3	2.30
3	4.80
4	5.00
4	10.00
5	9.50
5	20.50

(4) Set the receiver RF gain control maximum clockwise (no AVC). The panel meter should indicate greater than half scale.

(5) Set the receiver RF gain control maximum counterclockwise. The panel meter should indicate less than half scale.

(6) Remove the power from the receiver and disconnect the test setup.

g. Dial Readout Error Test.

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

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

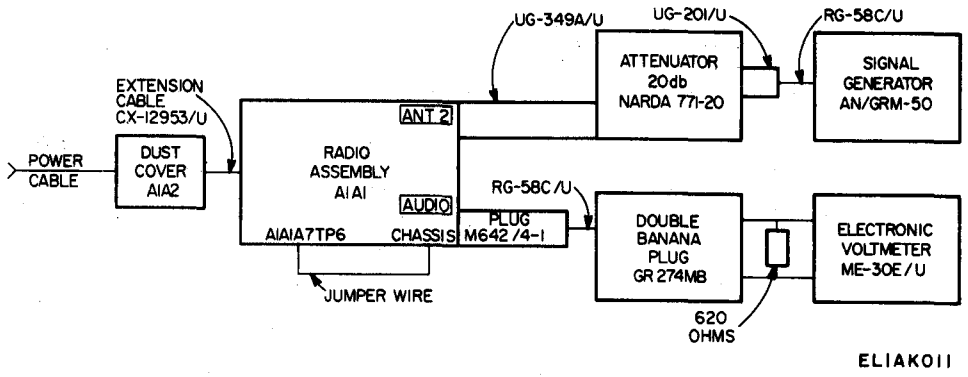


Figure 6-4. Dial readout error test connections.

NOTE

Connecting test point A1A1A7TP6 to mound will disable the calibration oscillator. In this configuration the CAL mode is the same as a normal cw mode.

(3) Set the receiver controls as follows:

Control	*Setting*
BAND	As required
ANT	2
VOL	Midrange
RF gain	AVC
FUNCTION	CAL

(4) Apply power to the test equipment and allow 15 minutes for warmup.

(5) Adjust the signal generator for a cw output of 100 microvolts.

(6) Set the signal generator frequency to the calibration frequency listed in table 6-2.

(7) Tune the receiver to the mechanical stop at the low frequency end of the dial tape.

(8) Tune the receiver, without overshooting, for a zero beat as indicated by a null on the electronic voltmeter.

(9) Adjust the receiver CAL ADJ control until the dial cursor is directly over the calibration frequency mark on the dial tape.

(10) Without overshooting, tune the receiver to the upper calibration point listed in table 6-2.

(11) Adjust the signal generator frequency for a zero beat.

(12) The signal generator frequency should be within the limits specified for the upper calibration point in table 6-2.

(13) Tune the receiver lower in frequency than the lower calibration point of table 6-2.

(14) Without overshooting tune the receiver to the lower calibration point of table 6-2.

(15) Adjust the signal generator frequency for a zero beat.

(16) The signal generator frequency should be within the limits specified for the lower calibration point in table 6-2.

(17) Repeat (5) through (16) above for all calibration frequencies listed in table 6-2.

(18) Remove the power from the receiver and disconnect the test setup.

Table 6-2. Calibration Frequencies

Band	Calibration frequency (MHz)	Upper calibration point (MHz)	Limit (MHz)	Lower calibration point (MHz)	Limit (MHz)
1	0.7	0.8	0.7970 0.8030	0.6	0.5970 0.6030
	0.9	1.0	0.9970 1.0030	0.8	0.7970 0.8030
1	1.0	1.1	1.0970 1.1030	0.9	0.8970 0.9030
2	1.2	1.3	1.2970 1.3030	1.1	1.0970 1.1030

Table 6-2. Calibration Frequencies-Continued

Band	Calibration frequency (MHz)	Upper calibration point (MHz)	Limit (MHz)	Lower calibration point (MHz)	Limit (MHz)
2	1.8	1.9	1.8962 1.9038	1.7	1.6966 1.7034
2	2.2	2.3	2.2954 2.3046	2.1	2.0958 2.1042
3	2.4	2.5	2.4950 2.5050	2.3	2.2954 2.3046
3	3.6	3.7	3.6926 3.7074	3.5	3.4930 3.5070
3	4.7	4.8	4.7904 4.8096	4.6	4.5908 4.6092
4	5.5	6.0	5.9880 6.0120	5.0	4.9900 5.0100
4	7.5	8.0	7.9840 8.0160	7.0	6.9860 7.0140
4	9.5	10.0	9.9800 10.0200	9.0	8.9820 9.0180
5	10.0	10.5	10.4790 10.5210	9.5	9.4810 9.5190
5	15.0	15.5	15.4690 15.5310	14.5	14.4710 14.5290
5	20.0	20.5	20.4590 20.5410	19.5	19.4610 19.5390

h. Agc Characteristic Test.

(l) Perform the preliminary test setup (para 6-12) except omit *b* and *d*.

(2) Connect the test equipment as shown in figure 6-1.

(3) Set the receiver controls as follows:

Control	*Setting*
BAND	3
TUNE	3.5 MHz
ANT	2
RF gain	AVC
FUNCTION	AM

(4) Apply power to the test equipment and allow 15 minutes for warmup.

(5) Adjust the signal generator for 3.5 MHz with 1 kHz, 30 percent modulation at a level of 2.5 microvolts.

(6) Adjust the signal generator frequency slightly for a peak indication on the electronic voltmeter.

(7) Adjust the receiver VOL control for a 0.775-volt indication on the electronic voltmeter.

(8) Adjust the signal generator level to 100 millivolts.

(9) Observe a reading of 0.39 to 1.55 volts on the electronic voltmeter.

(10) Adjust the receiver VOL control for a 0.775-volt indication on the electronic voltmeter.

(11) Adjust the signal generator level to 500 millivolts.

(12) Observe a reading of 0.245 to 2.45 volts on the electronic voltmeter.

(13) Remove the power from the receiver and disconnect the test setup.

i. Audio Output Test.

(1) Perform the preliminary test setup (para 6-12) except omit *b* and *d*.

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

(3) Set the receiver controls as follows:

Control	*Setting*
BAND	1
TUNE	0.90 MHz
ANT	2
VOL	Maximum clockwise
RF gain	Maximum clockwise (no AVC)
FUNCTION	A M

(4) Apply power to the test equipment and allow 15 minutes for warmup.

(5) Adjust the signal generator for 0.90 MHz with 1 kHz, 30 percent modulation and a level of 12 microvolts.

(6) Adjust the signal generator frequency slightly for a peak indication on the electronic voltmeter.

(7) Observe a reading of 3.5 volts or greater, on the electronic voltmeter.

(8) Remove the power from the receiver and disconnect the test setup.

j. Diode Output Test.

(1) Perform the preliminary test setup (para 6-12) except omit *b* and *d*.

(2) Connect the test equipment as shown in figure 6-5.

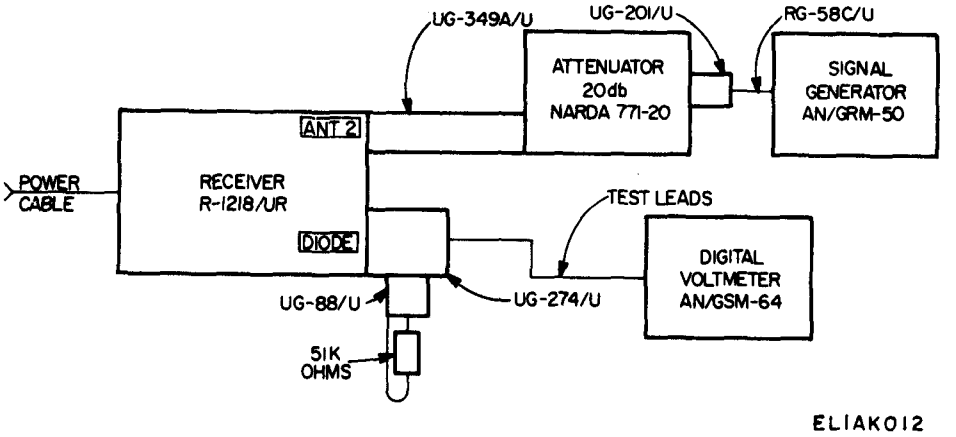


Figure 6-5. Audio output test connections.

(3) Set the receiver controls as follows:

Control	*Setting*
BAND	1
TUNE	0.90 MHz
ANT	2
RF gain	Maximum clockwise (no AVC)
FUNCTION	A M

(4) Apply power to the test equipment and allow 15 minutes for warmup.

(5) Adjust the signal generator for 0.90 MHz with 1 kHz, 30 percent modulation and a level of 12 microvolts.

(6) Adjust the signal generator frequency slightly for a peak indication on the digital voltmeter.

(7) Observe 2 volts dc, or greater, on the digital voltmeter. The voltage should be negative with respect to ground.

(8) Remove the power from the receiver and disconnect the test setup.

k. Am. Whip Sensitivity Test.

(1) Perform the preliminary test setup (para 6-12) except omit *b* and *d*.

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

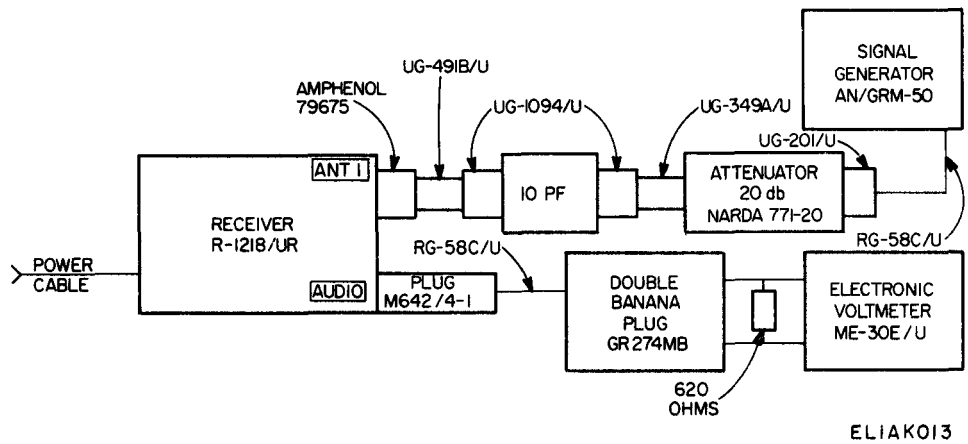


Figure 6-6. Am. whip sensitivity test connections.

(3) Set the receiver controls as follows:

Control	*Setting*
ANT	1
RF aain	Maximum clockwise (no AVC)
FUNCTION	AM

(4) Apply power to the test equipment and allow 15 minutes for warmup.

(5) Perform (6) through (10) below for the following receiver and signal generator frequencies and signal generator levels:

Band	*Frequency (MHz)*	*Signal generator level (microvolt)*
1	0.536	700
1	0.848	420
1	1.16	300
2	1.10	320
2	1.73	220
2	2.37	180
3	2.26	180
3	3.56	120
3	4.87	100
4	4.63	90
4	7.50	80
4	10.00	80
5	9.50	80
5	15.00	80
5	20.50	100

(6) Adjust the signal generator for 1 kHz, 30 percent modulation.

(7) Adjust the signal generator frequency slightly for a peak indication on the electronic voltmeter.

(8) Adjust the receiver VOL control for a 2.45-volt indication on the electronic voltmeter.

(9) Turn the signal generator modulation off.

(10) Observe a reading of 0.775 volts, or less, on the electronic voltmeter.

(11) Remove the power from the receiver and disconnect the test setup.

6-14. Radio Assembly A1A1 Adjustments

a. If. Amplifier Gain Adjustment.

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

(2) Connect the test equipment as shown in figure 6-7.

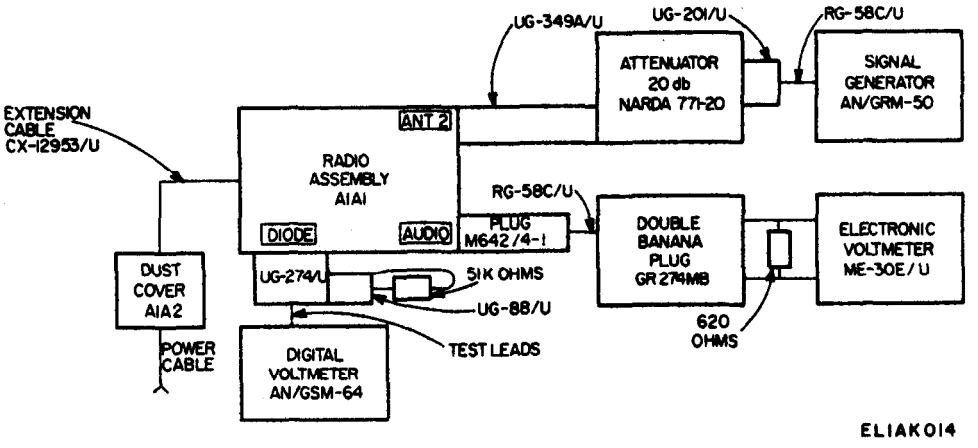


Figure 6-7. If. amplifier *gain adjustment test connections.*

(3) Set the receiver controls as follows:

Control	Setting
ANT	2
BAND	5
TUNE	10 MHz
RF gain	Maximum clockwise (no AVC)
VOL	Maximum clockwise
FUNCTION	AM

(4) Apply power to the test equipment and allow 15 minutes for warmup.

(5) Adjust the signal generator for 10 MHz with 1 kHz, 30 percent modulation at a level of 12 microvolts.

(6) Adjust if. amplifier potentiometer A1A1A3R8 for an indication of —3 volts dc on the digital voltmeter. See figure FO-22 for location of potentiometer. The electronic voltmeter should indicate 4 volts or greater. If it does not, adjust the potentiometer for an indication of 4 volts on the electronic voltmeter.

(7) Remove the modulation from the signal generator and reduce the level to 4 microvolts.

(8) Turn the FUNCTION switch to LSB and vary the frequency of the signal generator slightly for a peak indication on the electronic voltmeter. The electronic voltmeter must indicate 3.5 volts or greater. If it does not, adjust potentiometer A1A1A3R8 for an indication of 3.5 volts.

(9) Repeat (8) above with the FUNCTION switch in the USB position.

(10) Remove the power from the receiver and disconnect the test setup.

b. Signal Meter Adjustment.

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

(2) Connect the test equipment as shown in figure 6-8.

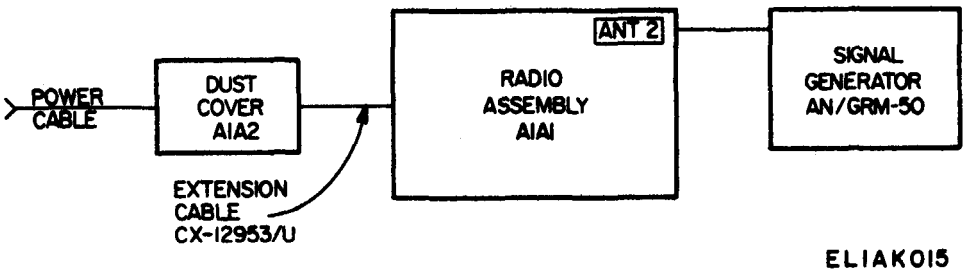


Figure 6-8. Signal meter adjustment, test connections.

(3) Set the receiver controls as follows:

Control	*Setting*
ANT	2
BAND	5
TUNE	10 MHz
RF gain	AVC
FUNCTION	AM

(4) Apply power to the test equipment and allow 15 minutes for warmup.

(5) Adjust the signal generator for 10 MHz with 1 kHz, 30 percent modulation at a level of 500 millivolts.

(6) Adjust detector assembly potentiometer A1A1A4R2 for full scale deflection on the receiver signal meter A1A1A1M1. See figure FO-22 for location of the potentiometer.

(7) Remove the power from the receiver and disconnect the test setup.

6-15. Radio Assembly A1A1 Testing

a. Remove the radio assembly from the dust cover (para 6-6).

b. Remove the subassemblies from the radio assembly (para 6-6) except do not unsolder the leads from the power transformer.

c. Unplug connectors A1A1A2A1P1, A1A1A1W1P1, and A1A1W1P1 from the rf tuner.

d. Make the continuity and resistance checks in table 6-3 as follows:

(1) Refer to the receiver schematic diagram, figure FO-2, and figure FO-17, FO-18 and FO-19 for assistance in locating components. Pin numbers on components are shown in figure 6-9 and 6-10.

Table 6-3. ***Radio Assembly Continuity and Resistance Checks***

Multimeter (+) lead	Multimeter (—) lead	Reading (ohms)	Control setting
a. Rf tuner A2A 1			
R1-C	J5-P	0	Any
P1-C	A2S5C-F11	0	Any
P1-D	J5-H	0	Any
P1-E	A2E5	0	Any
P1-F	A2E1	0	Any
P1-H	J1-R	0	Any
P1-J	A2E6	0	Any
W1P1	W1J1	0	Any
W1J1	A2E5	Infinite	Any
b. If. amplifier A3			
J1-M	A2E5	0	Any
J1-P	A2E6	0	Any
W2J1	W2J2	0	Any
W2J1	A2E5	Infinite	Any
c. Detector A4			
J2-A	A1S5C-R4	0	Any
J2-B	A1S5B-F12	0	Any
J2-C	A1S5B-F3	0	Any
J2-D	A1S5C-R3	0	Any
J2-E	A1S5C-R5	0	Any
J2-F	J3-R	0	Any
J2-H	A1S3-B	0	Any
J2-J	A1J3	0	Any
J2-K	A2E5	0	Any
J2-L	A1S1-3	0	A1S1 pressed
J2-M	A2E5	0	Any
J2-N	A1R1-2	0	Any
J2-P	A2E6	0	Any
J2-R	A1S5B-F2	0	Any
d. Power supply A5			
J4-A	T1-6	0	Any
J4-B	A1S1-1	0	Any
J4-C	A2E1	0	Any
J4-D	A2E5	0	Any
J4-E	A2E6	0	Any
J4-F	A1P2-11	0	Any
J4-P	T1-5	0	Any
J4-K	A1S5B-R8	0	Any

Table 6-3. Radio Assembly Continuity and Resistance Checks–Continued

Multimeter (+) lead	Multimeter (–) lead	Reading (ohms)	Control setting
e. Audio amplifier A6			
J3-A	A2E5	0	Any
J3-D	A1J4	0	Any
J3-P	A2E1	0	Any
f. Calibration oscillator A7			
J5-B	A2E6	0	Any
J5-C	A1R2-3	0	Any
J5-D	A1W1P1	0	Any
J5-D	A2E5	Infinite	Any
J5-E	A2E5	0	Any
J5-M	A2E5	0	Any
g. Power transformer T1			
T1-1	A1P2-14	0	A1S5 to AM, LSB, USB, CAL
T1-2	A1P2-5	0	A1S5 to AM, LSB, USB, CAL
T1-3	A1P2-7	0	A1S5 to AM, LSB, USB, CAL
T1-4	A1P2-6	0	A1S5 to AM, LSB, USB, CAL
T1-1	T1-2	300 to 700	Any (RX10)
T1-3	T1-4	300 to 700	Any (RX10)
T1-5	T1-6	25 to 45	Any
T1-1	T1-5	Infinite	Any
T1-3	T1-5	Infinite	Any

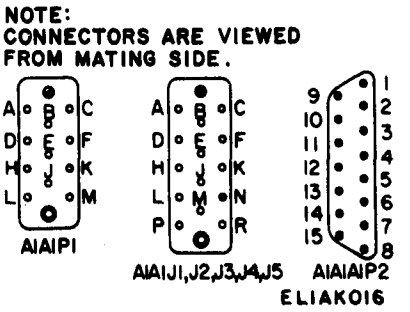


Figure 6-9. Connector pin numbering.

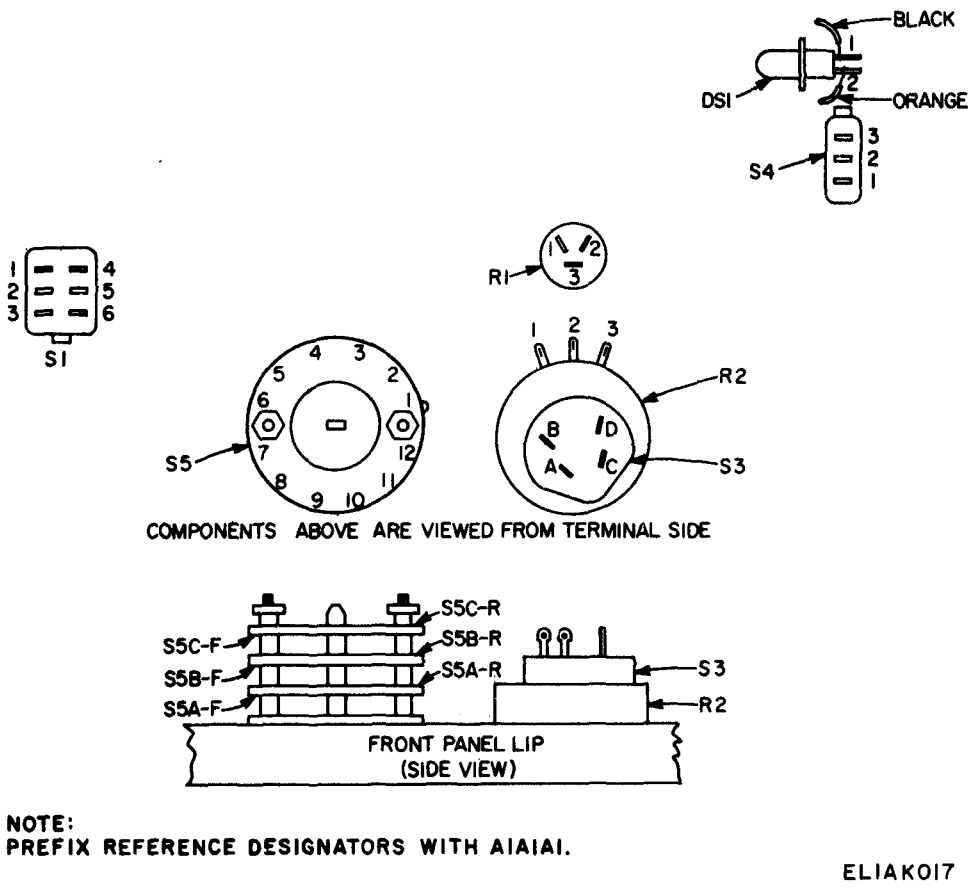


Figure 6-10. Control panel component terminal numbering.

(2) Set the multimeter (TS-352/U) to measure resistance. Unless otherwise specified, all measurements are made on the RX1 scale. Readings of less than 10 ohms are considered the same as zero.

(3) Set the receiver controls as specified in table 6-3. Controls not listed have no effect on the test .

(4) Reference designators listed in table 6-3 are abbreviated. For complete reference designation, prefix with A1A1.

e. Reinstall the subassemblies in the radio assembly (para 6-9).

f. Reinstall the radio assembly in the dust cover (para 6-9).

6-16. Control Panel Assembly A1A1A1 Testing

a. Remove the radio assembly from the dust cover (para 6-6).

b. Remove the subassemblies from the radio assembly (para 6-6) except do not remove the power transformer.

c. Uncouple rf tuner connectors A1A1P1 and A1A1A1W1P1.

d. Refer to the receiver schematic diagram, figure FO-2, and figure FO-18, 6-9, and 6-10 for assistance in locating components and pin numbers.

e. Make the continuity and resistance checks in table 6-4 as follows:

(1) Set the multimeter (TS-352/U) to measure resistance. Unless otherwise specified, all measurements are made on the RX1 scale. Readings of less than 10 ohms are considered the same as zero.

(2) Set the receiver controls as specified in table 6-4. Controls not listed have no effect on the test.

(3) Reference designators listed in table 6-4 are abbreviated. For complete reference designation prefix with A1A1.

f. Reinstall the subassemblies in the radio assembly (para 6-9) and reconnect rf tuner connectors A1A1P1 and A1A1A1W1P1.

g. Reinstall the radio assembly in the dust cover (para 6-9).

Table 6-4. Control Panel Assembly Continuity and Resistance Checks

Multimeter (+) lead	Multimeter (−) lead	Reading (ohms)	Control setting
a. Antenna switch assembly A1A1.			
A1J1	A1W1P1	0	A1S2 to 1
A1J1	A1W1P1	Infinite	A1S2 to 2
A1J2	A1W1P1	0	A1S2 to 2
A1J1	A1J2	Infinite	A1S2 to 2
A1J1	A1J2	0	A1S2 to 1
b. Front panel connector A1P2.			
A1P2-1	A1J4	0	Any
A1P2-2	A2E5	0	Any
A1P2-3	A1P2-15	5 to 20	Any
A1P2-3	A2E5	Infinite	Any
A1P2-4	A1S5B-R3	0	Any
A1P2-8	A1J3	0	Any
A1P2-9	A1S3-C	0	Any
A1P2-2	A1P2-1	Infinite	Any
A1P2-2	A1P2-8	Infinite	Any
A1P2-2	A1P2-9	Infinite	Any
A1P2-10	A1S4-3	0	Any
A1P2-12	A2E5	0	Any
A1P2-13	A1S5B-R9	0	Any
c. Rf gain control A1 R2.			
A1R2-1	A2E5	0	Any
A1R2-1	A1R2-2	3K to 7K	A1R2 to AVC (RX100)
A1R2-2	A1S3-D	0	Any
A1S3-C	A1S3-A	0	Any
A1S3-A	J1-R	0	Any
A1S3-D	A1S3-A	0	A1R2 counterclockwise
A1S3-A	A1S3-B	0	A1R2 to AVC
A1S3-D	A1S3-B	Infinite	Any
d. VOL control A1 R1.			
A2E5	A1S5B-F1	8K to 12K	Any (RX1000)
A2E5	A1R1-2	8K to 12K	A1R1 clockwise (RX1000)
e. Panel meter A1M1.			
A1M1+	A1S1-2	0	Any
A1M1−	A2E5	0	Any
f. PWR CK switch A1S1.			
A1S1-2	A1S1-3	0	A1S1 not pressed
A1S1-2	A1S1-1	0	A1S1 pressed
g. LITE switch A1S4.			
A1DS1-2	A1S4-3	0	A1S4 to ON
A1DS1-2	A2E1	0	A1S4 to M-ON
A1DS1-1	A2E5	0	Any
h. FUNCTION switch A1S5.			
A1P2-5	A1P2-14	300 to 700	A1S5 to AM,LSB,USB,CAL
A1P2-7	A1P2-6	300 to 700	A1S5 to AM,LSB,USB,CAL
A2E6	A1S5B-F12	0	A1S5 to LSB,USB,CAL
A1R1-3	A1S5B-F2	0	A1S5 to AM,LSB,USB,CAL
A1R1-3	A1S5B-F3	0	A1S5 to LSB,USB,CAL
A1P2-13	J4-K	0	A1S5 to AM,LSB,USB,CAL
A1P2-4	A2E1	0	A1S5 to AM,LSB,USB,CAL
A1S5B-R2	A1S5C-F7	0	Any
A1S5C-F7	A1S5C-F11	0	A1S5 to CAL
A1S5C-F1	A2E6	0	Any
A1S5C-F1	A1S5C-R3	0	A1S5 to LSB
A1S5C-F1	A1S5C-R4	0	A1S5 to USB
A1S5C-F1	A1S5C-R5	0	A1S5 to CAL
A1S5C-R6	A2E5	0	Any

6-17. Rf Tuner and Dial Assembly A1A1A2 Testing

a. Gain and Agc Test.

(1) Remove the receiver from the dust cover (para 6-6).

(2) Remove the if. amplifier assembly from the radio assembly (para 6-6).

(3) Perform the preliminary test setup (para 6-12).

(4) Connect the test equipment as shown in figure 6-11.

(5) Be sure that the calibration oscillator A1A1A7 is installed in the radio.

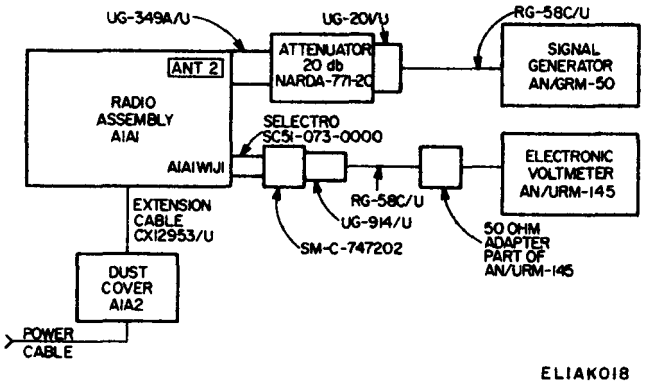


Figure 6-11. Gain and agc test connections.

(6) Set the receiver controls as follows:

Control	*Setting*
ANT	2
RF gain	Maximum clockwise (no AVC)
FUNCTION	LSB

(7) Apply power to test equipment and allow 15 minutes for warmup.

(8) Perform (9) through (13) below at each of the frequencies listed below.

Band	*Frequency (MHz)*
1	0.536
1	1.16
2	1.10
2	2.37
3	2.26
3	4.87
4	4.63
4	10.00
5	9.50
5	20.50

(9) Adjust the signal generator for a cw output at the frequency listed above and a level of 10 millivolts.

(10) Adjust the signal generator frequency slightly for a peak indication on the electronic voltmeter.

(11) Observe a reading of 6 millivolts or more on the electronic voltmeter.

(12) Adjust the rf gain control fully counterclockwise. The electronic voltmeter should indicate less than 1.0 millivolt.

(13) Adjust the rf gain control fully clockwise (no AVC).

(14) Remove the power from the receiver and disconnect the test setup.

(15) Reinstall the if. amplifier in the radio assembly (para 6-9).

6-18. If. Amplifier Assembly A1A1A3 Testing

a. Preliminary.

(1) Remove the detector assembly (para 6-6).

(2) Disconnect connector A1A1W1P1 from the rf tuner assembly.

(3) Perform the preliminary test setup (para 6-12).

(4) Connect the test equipment as shown in figure 6-12.

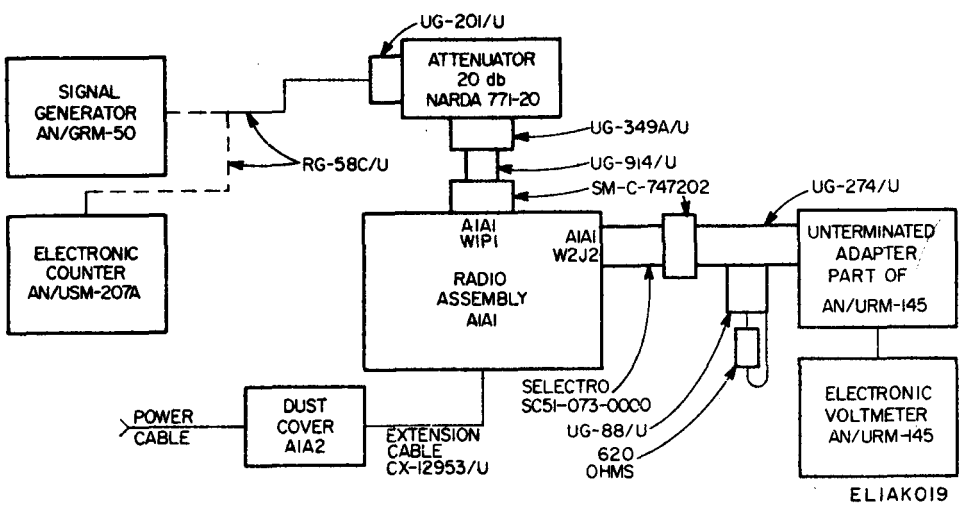


Figure 6-12. If. amplifier test connections.

(5) Set the receiver controls as follows:

Control	*Setting*
RF gain	Maximum clockwise (no AVC)
FUNCTION	A M

(6) Apply power, to the test equipment and allow 15 minutes for warmup.

b. Voltage Gain and Agc Test.

(1) Adjust the signal generator for a cw output at 455 kHz and a level of 1.0 millivolt.

(2) Adjust the signal generator frequency slightly for a peak indication on the electronic voltmeter.

(3) Adjust the if. amplifier gain potentiometer A1A1A3R8 for maximum indication on the electronic voltmeter (fully clockwise).

(4) Observe a reading of 100 millivolts or greater on the electronic voltmeter.

(5) Turn the receiver rf gain control fully counterclockwise.

(6) Increase the signal generator level to 100 millivolts.

(7) Observe a reading of 10 millivolts or less on the electronic voltmeter.

c. Bandwidth Test.

(1) Turn the receiver rf gain control fully clockwise (no AVC).

(2) Adjust the signal generator level for a 10-millivolt indication on the electronic voltmeter.

(3) Adjust the signal generator frequency slightly for a peak indication on the electronic voltmeter and readjust the signal generator level for a 10-millivolt indication on the electronic voltmeter.

(4) Note the signal generator level.

(5) Increase the signal generator level by 6 db.

(6) Increase the signal generator frequency until the electronic voltmeter indicates 10 millivolts. Note the signal generator frequency.

(7) Decrease the signal generator frequency until the electronic voltmeter indicates 10 millivolts. Note the signal generator frequency.

(8) Compute the difference between the frequencies noted in (6) and (7) above.

(9) The difference frequency should be 2.5 to 3.5 kHz.

(10) Increase the signal generator level 60 db above that noted in (4) above.

(11) Repeat (6), (7), and (8) above.

(12) The difference frequency should be 10 kHz or less.

(13) Remove the power from the receiver and disconnect the test setup.

(14) Install the detector assembly in the radio assembly (para 6-9).

(15) Reconnect connector A1A1W1P1 to rf tuner connector A1A1A2A1J2.

(16) Readjust if. amplifier gain potentiometer A1A1A3R8 (para 6-14).

6-19. Detector Assembly A1A1A4 Testing

a. Preliminary.

(1) Remove the dust cover from the receiver (para 6-6).

(2) Remove the if. amplifier assembly and the audio amplifier assembly from the receiver (para 6-6).

(3) Perform the preliminary test setup (para 6-12).

(4) Connect the test equipment as shown in figure 6-13.

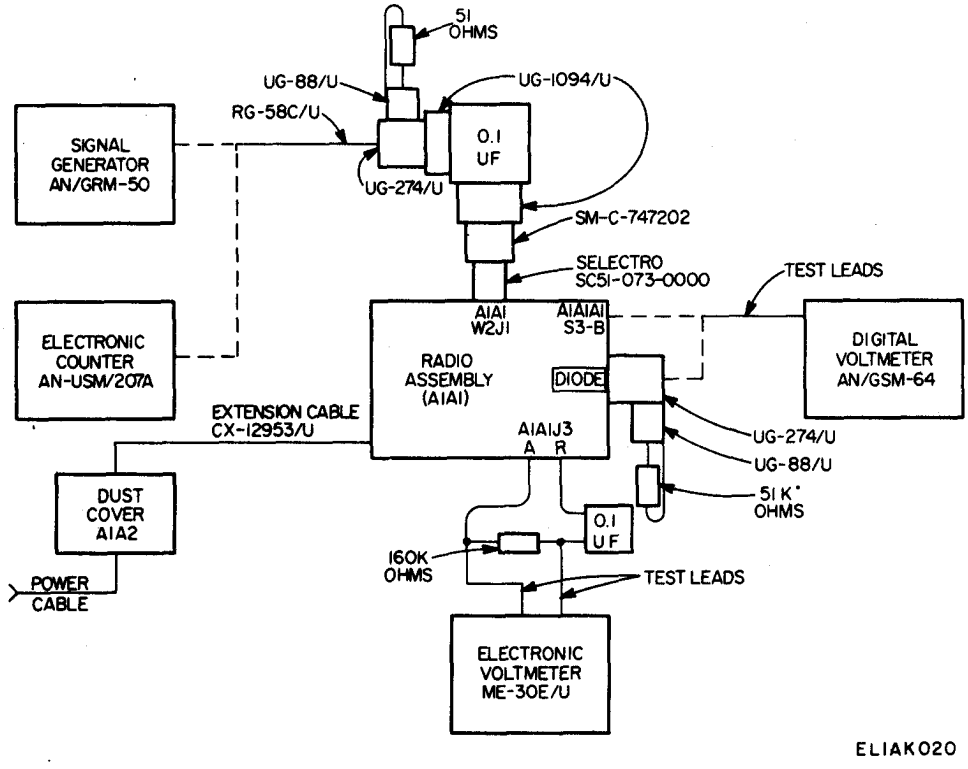


Figure 6-13. Detector assembly test connections.

(5) Set the receiver controls as follows:

Control	*Setting*
VOL	Maximum clockwise
RF gain	Maximum counterclockwise
FUNCTION	AM

(6) Apply power to the test equipment and allow 15 minutes for warmup.

b. Am. Audio and Diode Output Test.

(1) Adjust the signal generator for an output of 455 kHz ±1 kHz with 1 kHz, 30-percent modulation, and a level of 4.5 millivolts.

(2) Observe a reading of 345 millivolts, or greater, on the electronic voltmeter.

(3) Increase the signal generator level to 7 millivolts. When measured at the receiver DIODE output, the digital voltmeter should indicate 2.0 volts or greater. The voltage should be negative with respect to ground.

c. Cw Audio Output and Signal Meter Test.

(1) Set the receiver FUNCTION switch to LSB.

(2) Adjust the signal generator for a cw output at a frequency of 455 kHz and a level of 1.7 millivolts.

(3) Adjust the signal generator frequency slightly for a peak indication on the electronic voltmeter. The voltmeter should indicate 345 millivolts or greater.

(4) Increase the signal generator level to 15 millivolts. The receiver signal level meter should indicate near full scale.

d. Agc Characteristic Test.

(1) Set the receiver FUNCTION switch to AM.

(2) Adjust the signal generator for an output of 455 kHz ±l kHz with 1 kHz, 30-percent modulation, and a level of 0.5 microvolt.

(3) When measured at terminal B of switch A1A1A1S3, the digital voltmeter should indicate 7 volts dc or greater.

(4) Increase the signal generator level to 15 millivolts. The digital voltmeter should indicate 2 volts dc or less.

(5) Remove the power from the receiver and disconnect the test setup.

(6) Install the if. amplifier and audio amplifier assemblies in the receiver (para 6-9).

(7) Install the receiver in the dust cover (para 6-9).

6-20. Power Supply Assembly A1A1A5 Testing

a. Preliminary.

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

(2) Connect the test equipment as shown in figure 6-14.

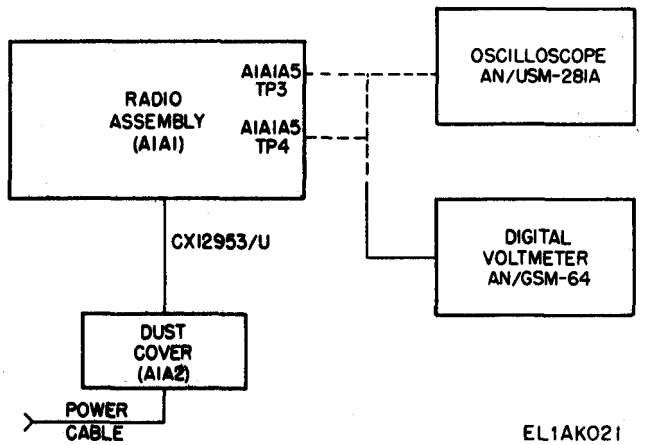


Figure 6-14. Power supply test connections.

(3) Set the receiver controls as follows:

Control	*Setting*
RF gain	Maximum clockwise (no AVC)
VOL	Maximum clockwise
LITE	OFF
FUNCTION	AM

NOTE

Be sure to install the proper power cable for the source voltage to be used. Use power cable CX-10958/U for vehicular power source, CX-10957/U for 220 vac source, and CX-10956/U for 110 vac source. The ac test and voltage adjustment in this section may be performed, using either 110 vac or 220 vac, 50 Hz to 400 Hz power.

b. Ac Operation Test.

(1) With the digital voltmeter connected to test point TP3, the voltmeter should indicate 16 to 19 volts dc.

(2) With the digital voltmeter connected to test point TP4, the voltmeter should indicate 11.2 ±1 volts dc.

(3) With the oscilloscope connected to test point TP3, the ripple at the power source frequency should not exceed 60 millivolts peak-to-peak.

Vehicular Operation Test.

(1) With the digital voltmeter connected to test point TP3, the voltmeter should indicate 16 to 19 volts dc.

(2) With the digital voltmeter connected to test point TP4, the voltmeter should indicate 11.2 ±1 volts dc.

d. Battery Operation Test.

(1) Remove the power cable from the dust cover A1A2.

(2) Install twelve fresh BA-30/U cells in the battery compartment (para 2-5a).

(3) Place the INT-EXT switch on the dust cover A1A2 in the INT position.

(4) Press the PWR CHK switch on the receiver front panel. The panel meter should indicate in the green portion of the scale.

(5) With the digital voltmeter connected to test point TR4, the voltmeter should indicate 11.2 ±0.2 volts dc.

e. 11.2-Volt Adjustment.

(1) Connect the receiver for ac operation.

(2) Be sure that the INT-EXT switch on the dust cover A1A2 is in the EXT position.

(3) Connect the digital voltmeter to test point TP4.

(4) Adjust potentiometer A1A1A5R2 for an indication of 11.2 ±0.1 volts dc on the digital voltmeter.

6-21. Audio Amplifier Assembly A1A1A6 Testing

a. Preliminary.

(1) Remove the dust cover from the receiver . (para 6-6).

(2) Remove the detector assembly from the receiver (para 6-6).

(3) Perform the preliminary test setup (para 6-12).

(4) Connect the test equipment as shown in figure 6-15

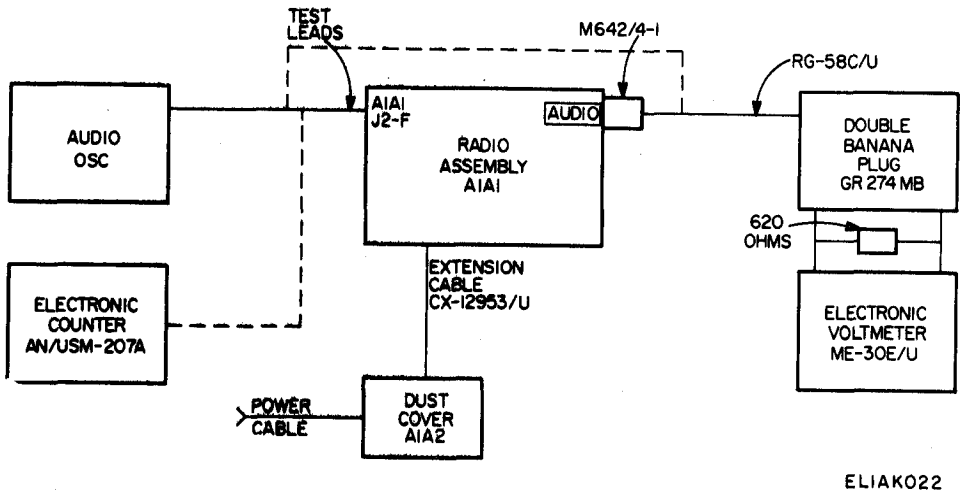


Figure 6-15. Audio amplifier test connections.

(5) Set the receiver FUNCTION switch to AM.

(6) Apply power to the test equipment and allow 15 minutes for warmup.

b. Gain Test.

(1) With the electronic counter and the electronic voltmeter connected to the audio oscillator, adjust the audio oscillator for a frequency of 1,000 Hz ±100 Hz at a level of 350 millivolts.

(2) When connected to the receiver AUDIO output, the electronic voltmeter should indicate 3.4 volts or greater.

(3) Remove the power from the receiver and disconnect the test setup.

(4) Install the detector assembly in the receiver (para 6-9).

(5) Install the receiver in the dust cover (para 6-9).

6-22. Calibration Oscillator Assembly A1A1A7 Testing

a. Preliminary.

(1) Remove the dust cover from the receiver (para 6-6).

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

(3) Connect the test equipment as shown in figure 6-16.

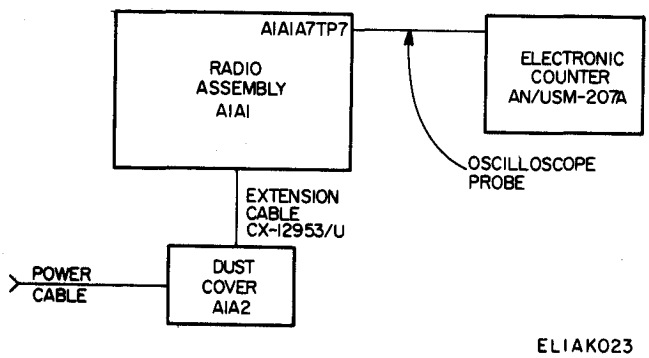


Figure 6-16. Calibration oscillator test connections.

(4) Set the receiver controls as follows:

Control	*Setting*
BAND	As required
FUNCTION	CAL

(5) Apply power to the test equipment and allow 15 minutes for warmup.

b. Frequency Accuracy Test.

(1) Set the receiver BAND switch to 1. The electronic counter should indicate 99,007 Hz to 100,003 Hz.

(2) Repeat (1) above with the receiver BAND switch set to 2 or 3.

(3) Set the receiver BAND switch to 4. The

electronic counter should indicate 499,989 Hz to 500,011 Hz.

(4) Repeat (3) above with the receiver BAND switch set to 5.

(5) Remove the power from the receiver and disconnect the test setup.

(6) Install the receiver in the dust cover (para 6-9).

6-23. Dust Cover Assembly A1A2 Testing

a. Remove the radio assembly from the dust cover (para 6-6).

b. Loosen filter FL1 in the dust cover by removing the four mounting screws and the terminal cover.

c. Refer to the schematic diagram of the dust cover, figure FO-3, and figures 6-17, FO-16, and FO-17 for assistance in locating components and pin numbers.

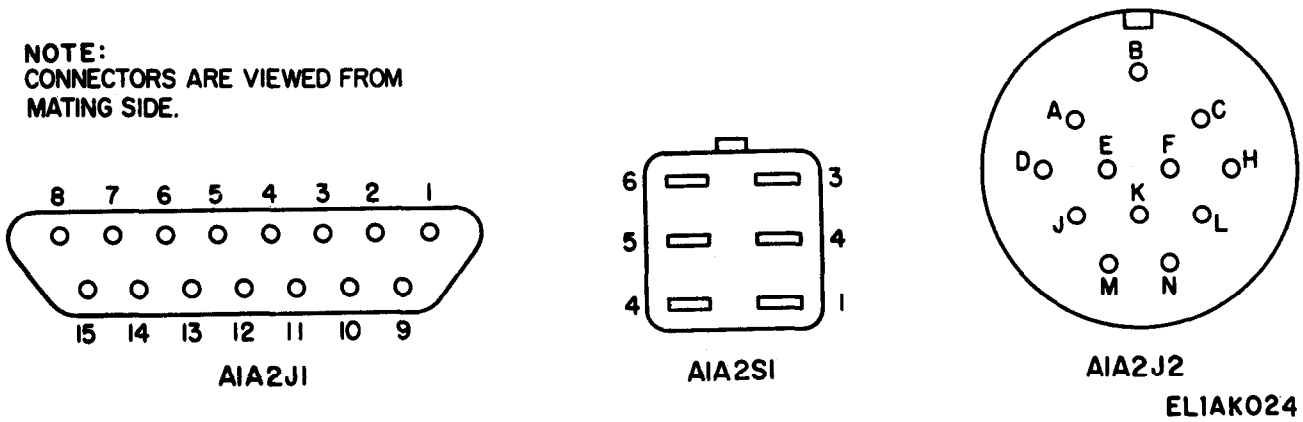


Figure 6-17. Dust cover connector and switch pin numbering.

d. Make the continuity and resistance checks in table 6-5 as follows:

(1) Set the multimeter (TS-352/U) to measure resistance. Unless otherwise specified, all measurements are made on the RX1 scale.

(2) Set the dust cover controls as specified in table 6-5.

(3) Reference designators listed in table 6-5 are abbreviated. For complete reference designation, prefix with A1A2.

e. Reinstall filter FL1 and the terminal cover, using four screws.

f. Reinstall the radio assembly in the dust cover (para 6-9).

Table 6-5. Dust Cover Continuity and Resistance Checks

Multimeter (+) lead	Multimeter (−) lead	Reading (ohms)	Control setting
J1-1	J2-M	0	Any
FL1-7	J2-J	0	Any
J1-3	FL1-6	0	Any
FL1-6	J2-L	0	Any
J1-4	S1-2	0	Any
J1-5	FL1-4	0	Any
FL1-4	J2-C	0	Any
J1-6	FL1-3	0	Any
FL1-3	J2-H	0	Any
J1-7	FL1-2	0	Any
FL1-2	J2-B	0	Any
J1-8	J2-N	0	Any
J1-9	J2-D	0	Any
J1-10	S1-4	0	Any
J1-11	S1-1	0	Any
J1-12	FL1-7	0	Any
FL1-7	J2-F	0	Any
J1-13	J2-E	0	Any
J1-14	FL1-1	0	Any

Table 6-5. Dust Cover Continuity and Resistance Checks—Continued

Multimeter (+) lead	Multimeter (−) lead	Reading (ohms)	Control setting
FL1-1	J2-A	0	Any
J1-15	FL1-5	0	Any
FL1-5	J2-K	0	Any
E1	E2	15 max	Any
E2	E1	15K min	Any (RX1000)
E2	J1-4	0	S1 to INT
E2	J1-10	Infinite	S1 to INT
J1-4	J1-11	0	S1 to EXT
J1-4	J1-10	0	S1 to EXT
FL1-7	J1-14	Infinite	Any
FL1-7	J1-7	Infinite	Any
FL1-7	J1-6	Infinite	Any
FL1-7	J1-5	Infinite	Any
FL1-7	J1-15	Infinite	Any
FL1-7	J1-3	Infinite	Any

6-24. Antenna AS-2887/UR Testing

a. Adjust the multimeter (TS-352/U) for resistance measurement on the RX1 range.

b. Measure the resistance between the antenna connector center pin and the top section of the spring material. The multimeter should indicate 10 ohms or less.

c. Measure the resistance between the antenna connector center pin and the connector body. The multimeter should indicate infinity.

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-70. These requirements include subassembly troubleshooting, inspection, repair, testing, and alignment. It should be noted that *intermediate* level repairs are performed by direct and/or general support.

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 normally are accomplished in conjunction with subassembly testing as described in paragraphs 7-10 through 7-24 and in paragraph 6-4.

7-4. Troubleshooting

Troubleshooting of the subassemblies is accomplished by systematically testing the subassembly inputs and outputs and by making other measurements at available test points. Tables 7-1 through 7-12 contain the subassembly troubleshooting procedures as follows:

Subassembly	*Name*	*Table*
A1A1A2	Rf tuner and dial assembly	7-1
A1A1A2A1A1A1	Motherboard	7-2
A1A1A2A1A2	Rf preselector	7-3
A1A1A2A1A3	First rf amplifier	7-4
A1A1A2A1A4	Second rf amplifier	7-5
A1A1A2A1A5	Rf mixer	7-6
A1A1A2A1A6	Rf local oscillator	7-7
A1A1A3	If. amplifier assembly	7-8
A1A1A4	Detector assembly	7-9
A1A1A5	Power supply assembly	7-10
A1A1A6	Audio amplifier assembly	7-11
A1A1A7	Calibration oscillator	7-12

Table 7-1. *Rf Tuner and Dial Assembly Troubleshooting*

Item of check	Test conditions	Normal readings	Additional checks and remarks
Mechanical testing.	Para 7-13a.	No binding and no backlash.	
Electrical testing.	Para 6-17.	Para 6-17.	
Alignment (oscillator and rf amplifier only).	Para 7-13c.	Para 7-13c.	Be sure that adjustable capacitors and coils have sufficient range. Replacement of the tape dial or five-section variable capacitor requires alignment at depot only.

Table 7-2. Motherboard Troubleshooting

Item of check	Test conditions	Normal readings	Additional checks and remarks
Continuity and resistance.	Para 7-14.	Table 7-17.	Circuit card and connectors.

Table 7-3. Rf Preselector Troubleshooting

Item of check	Test conditions	Normal readings	Additional checks and remarks
Continuity and resistance.	Para 7-15a.	Table 7-18.	Broken coil wires, slugs, glass capacitors.
Functional test.	Para 7-15b.	Para 7-15b.	

Table 7-4. First Rf Amplifier Troubleshooting

Item of check	Test conditions	Normal readings	Additional checks and remarks
Continuity and resistance.	Para 7-16a.	Table 7-19.	Broken coil wires, slugs, glass capacitors.
Functional test.	Para *7-16b.*	Para 7-16b.	

Table 7-5. Second Rf Amplifier Troubleshooting

Item of check	Test conditions	Normal readings	Additional checks a nd remarks
Continuity and resistance.	Para 7-17a.	Table 7-20.	Broken coil wires, slugs, glass capacitors.
Functional test.	Para 7-17b.	Para *7-17b.*	

Table 7-6. Rf Mixer Troubleshooting

Item of check	Test conditions	Normal readings	Additional checks and remarks
Continuity and resistance.	Para 7-18a.	Table 7-21.	Broken coil wires, slugs, glass capacitors.
Functional test.	Para *7-18b.*	Para 7-18b.	

Table 7-7. Rf Local Osciuator Troubleshooting

Item of check	Test conditions	Normal readings	Additional checks and remarks
Continuity and resistance.	Para 7-19a.	Table 7-22.	Broken coil wires, slugs, glass capacitors.
Functional test.	Para 7-19b.	Para 7-19b.	

Table 7-8. If. Amplifier Assembly Troubleshootin

Item of check	Test conditions	Normal readings	Additional checks and remarks
Electrical tests.	Para 6-18.	Para 6-18.	
Alignment.	Para *7-20b.*	Para *7-20b.*	Sufficient range in coils.
Quiescent voltages.	Para 7-20c(2).	Table 7-23.	Defective U1, U2, Q1.
Dynamic voltages.	Para 7-20c(3).	Table 7-24.	*a.* TP2 out of limits; defective Q 1 circuit. *b.* U 1 pin 1 out of limits; defective FL1 circuit. *c.* C8, C9 junction out of limits; defective U 1 circuit. *d.* TP3 out of limits; defective U2 circuit.

Table 7-9. Detector Assembly Troubleshooting

Item of check	Test conditions	Normal readings	Additional checks and remarks
Electrical tests. Alignment. Quiescent voltages. Dynamic voltages.	Para 6-19. Para 7-21 *b*. Para 7-21c(2). Para 7-21c(3).	Para 6-19. Para7-21b. Table 7-25. Table 7-26.	Sufficient range in coils and capacitor. Defective U1, U2, U3, Q1, Q2, *a*. TP2 out of limits; defective U1 circuit. *b*. TP5 out of limits: defective U2 or CR1 -CR2 circuit. *c*. TP4 out of limits: defective U2. *d*. P2-F out of limits; defective U2 or U3 circuit. *e*. TP7 out of limits; defective U2 or Q1 circuit. *f*. TP3 out of limits: defective Q2 circuit.

Table 7-10. Power Supply Assembly Troubleshooting

Item of check	Test conditions	Normal readings	Additional checks and remarks
Electrical tests. Electrical alignment. 115 vac voltage teats.	Para 6-20. Para 7-22b. Para 7.22c(2).	Para 6-20. Para 7-22b. Table 7-27.	Sufficient range in potentiometer. *a*. TP1 out of limits; defective A1CR2 through A1CR5. *b*. TP3 out of limits: defective A2Q1 circuit. *c*. TP4 out of limits; defective A2U1, A2Q2 circuit.
Vehicular voltage tests.	Para 7.22c(3).	Table 7-28.	*a*. TP1 out of limits; defective A1CR1 circuit. *b*. TP3 out of limits: defective A2Q1 circuit. *c*. TP4 out of limits; defective A2U1, A2Q2 circuit..

Table 7-11. Audio Amplifier Assembly Troubleshooting

Item of check	Test conditions	Normal readings	Additional checks and remarks
Electrical tests, Quiescent voltagea. Dynamic voltagea.	Pars 6-21. Para6.23b(2). Pam 7-23b(3).	Para 6-21. Table 7-29. Para7-23b(3).	Defective U1.

Table 7-12. Calibration Oscillator Troubleshooting

Item of check	Test conditions	Normal readings	Additional checks and remarks
Electrical testa. Alignment. Voltage measurements.	Pars 6-22. Pars 7-24b. Para 7-24c.	Para 6-22. Pars 7-24b. Table 7-30.	Sufficient range in capacitor. *a*. TP3 out of limits; defective CR1 or R4. *b*. TP4 out of limits: defective Q1. *c*. TP5 out of limits; defective U1 circuit. *d*. TP7 out of limits; defective U2 circuit.

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 Radio Assembly A1A1 (fig. FO-18).

(1) Remove the if. amplifier assembly (18), detector assembly (40), power supply (4), audio amplifier assembly (11), calibration oscillator (48), and the power transformer (10) (para 6-6).

(2) Remove the outside body of the main tuning knob (45) by pulling straight out from the front panel.

(3) Remove the internal tooth nylon gear by pulling straight out from the front panel.

(4) Remove the nylon spur gear from the shaft by loosening two setscrews.

NOTE

See *b* below for removal of remaining main tuning knob parts. Do not attempt removal at this assembly level.

(5) Remove the front panel assembly (43) from the receiver by removing three screws (44) and pulling the front panel off of the main tuning shaft.

(6) Unsolder and tag all wires on the front panel that come from the remainder of the receiver and disconnect connector A1A1A1W1P1 from the rf tuner and dial assembly (view A).

(7) Remove the main rib assembly (receiver chassis (50)) by removing the attaching hardware (27, 28, 29) (2, 23, 24) (30).

(8) Complete the disassembly of the receiver chassis by removing the cable shield (21) and the attaching hardware from connector J4 (17), J3 (17, 34, 6, 35, 7, 22), J2 (17, 34, 6, 35, 7, 22), J1 (17, 34, 6, 35, 7, 22), W1P1 (38), W1J1 (37, 31, 26), W2J1 (33, 31, 26), and W2J2 (33, 31, 26).

(9) Disconnect connector P1 from the rf tuner and dial assembly (view A, 3).

b. Disassembly of Control Panel Assembly A1A1A1 (fig. FO-19).

(1) Tuning knob removal. Remove the remaining parts of the main tuning knob from the control panel by removing the waterproof nut (46, FO-18).

(2) Remove the knobs from the remaining control panel controls.

(3) Unsolder and tag wiring from the control panel controls, connectors, indicators, etc., which are to be removed.

(4) Remove the control panel controls, connectors, indicators, etc, as required by removing the attaching hardware.

(5) If required, replace lamp DS1 by removing the clear lens cap and pulling the lamp out of the socket. Install a new lamp in the socket and replace the lens cap.

c. Disassembly of Rf Tuner and Dial Assembly A1A1A2 (fig. FO-20, FO-21).

NOTE

Disassemble the rf tuner and dial assembly only if absolutely essential to making repairs. Disassembly will necessitate realignment of the variable capacitor (by the depot) which can only be accomplished after the rf tuner and dial assembly is mated to the front panel assembly.

(1) Remove the bracket (4, FO-21) from the spool posts by removing two screws (2) and lockwashers (3).

(2) Remove the tape guide (1) by removing two screws (2) and lockwashers (3).

(3) Remove the spring (9) at the bottom of the dial tape by removing two screws (2) and lock washers (3).

(4) Remove the two retaining rings (5) from the spool posts and slide the spools (6) and dial tape (7) off of the spool posts. Remove washers (15) from the spool posts.

(5) Remove the gear clamp (10) by loosening four cap screws (11) and sliding the clamp off of the variable capacitor shaft.

(6) Remove the two locked nuts (16) and lockwashers (17) from the stop shaft (14).

(7) Rotate the tuning shaft counterclockwise until the flat on the antibacklash worm gear (12) is engaged fully with the worm (8) and pull the worm gear off of the variable capacitor shaft.

(8) Remove the gear plate assembly (25, fig. FO-20) from the rf tuner assembly (7) by removing three screws and lockwashers (2, 3) near the variable capacitor shaft and one screw (1) near the opposite end of the gear plate assembly.

d. Disassembly of rf Tuner Assembly A1A1A2A1 (fig. FO-20).

(1) Remove the cover (12) from the Rf tuner by removing the attaching hardware (23, 9, 8, 10, 11, 14).

(2) Remove the shaft (13) from the Rf tuner by pulling straight out from the rear of the Rf tuner.

(3) Remove the rf tuner circuit card assemblies (16, 17, 18, 19, 20) by carefully pulling them out of the rf tuner.

e. Disassembly of Rf Tuner Subassembly A1A1A2A1A1 (fig. FO-20).

(1) Unsolder the wires leading from the variable capacitor (22) to the motherboard (24) at joints E1, E2, E3, E4, and E5 on the motherboard.

(2) Remove the five screws (21, 1) and lockwashers (9) securing the variable capacitor to the tuner chassis.

(3) Unsolder the ground tabs of the variable capacitor that protrude through the rf tuner chassis, and remove the variable capacitor.

(4) Remove the mounting hardware from the two coaxial connectors and the multipin connector at the front of the rf tuner chassis.

(5) Unsolder and bend the tabs securing the motherboard to the rf tuner chassis, and remove the motherboard and the connectors.

f. Disassembly of If. Amplifier Assembly A1A1A3 (fig. FO-18).

(1) Remove the assembly cover (20) by removing four screws (16).

(2) Remove the circuit card assembly (19) by removing four screws and flat washers (13, 14).

g. Disassembly of Detector Assembly A1A1A4 (fig. FO-18).

(1) Remove the assembly cover (42) by removing four screws (16).

(2) Remove the circuit card assembly (41) by removing four screws and flat washers (13, 14).

h. Disassembly of Power Supply Assembly A1A1A5 (fig. FO-18).

(1) Fold the power supply circuit card (8) over to expose the wires connecting it to the regular circuit card (9).

(2) Unsolder and tag the wires from the regulator circuit card.

i. Disassembly of Audio Amplifier Assembly A1A1A6 (fig. FO-18).

(1) Remove the assembly cover (15) by removing four screws (16).

(2) Remove the circuit card assembly (12) by removing four screws and flat washers (13, 14).

7-7. Inspection

a. Inspect circuit cards and the interior of the radio assembly as outlined in paragraph 6-7.

b. Inspect the front panel controls, indicators, connectors, terminals, etc for dirt, corrosion, wear, breakage, or signs of overheating.

c. Inspect the rf tuner and dial assembly for the following deficiencies:

(1) Loose screws.

(2) Unsealed setscrews.

(3) Shafts that will not turn.

(4) Bent switch shaft.

(5) Gears not meshed and aligned.

(6) Bent or broken electrical contacts.

(7) Dirt or foreign matter.

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

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 (fig. 7-1 through 7-12). Make repairs to circuit cards 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 a serviceable part, using the attaching hardware.

(4) Use solder type SN60WRMAP2 to solder the component leads to the circuit card or connect the wiring to the component, as applicable, in accordance with MIL-ST-454, requirement 5. Clean the solder connections with trichloroethane and allow the circuit to dry.

WARNING

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

CAUTION

Be extremely careful to avoid breaking the fragile coil wire when cleaning solder connections at or near the coil leads on the rf tuner circuit cards. Use extreme care when soldering near the coils on the rf tuner circuit cards. Accidentally touching the coil winding with a hot soldering iron will ruin the coil.

NOTE

Do not apply conformal coating over adjustment screws, under the circuit card connectors, around hardware, or over the components not previously coated. Do not use conformal coating on the gold plated circuit cards in the rf tuner.

(5) Apply conformal coating to the new component, the solder joints, and to the surrounding area, using a small paint brush. Apply the conformal coating evenly to an approximate thickness of 0.001 to 0.006 inch.

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

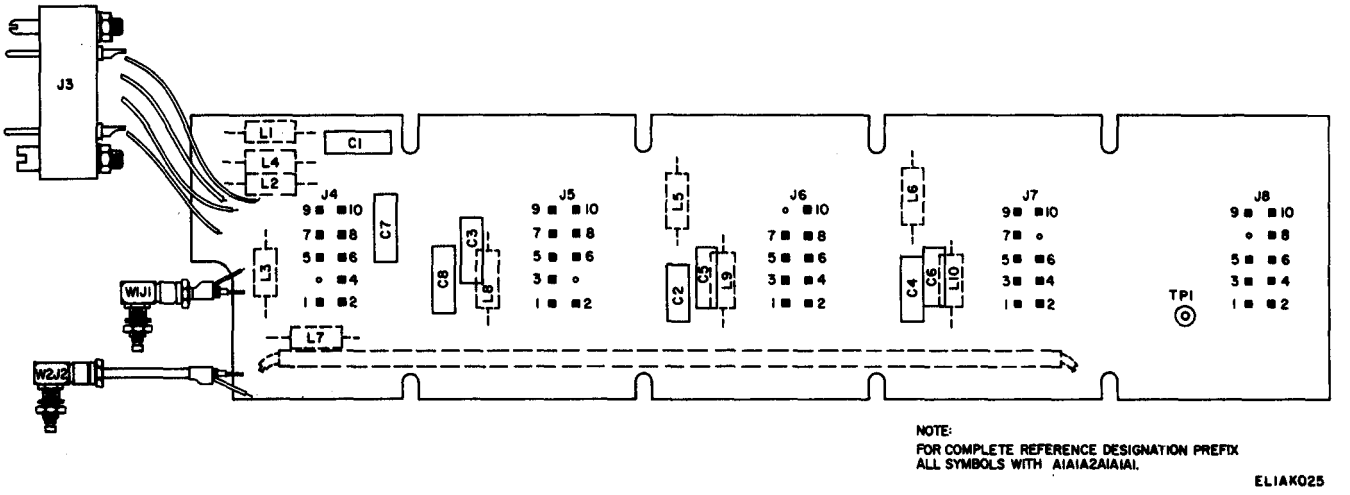
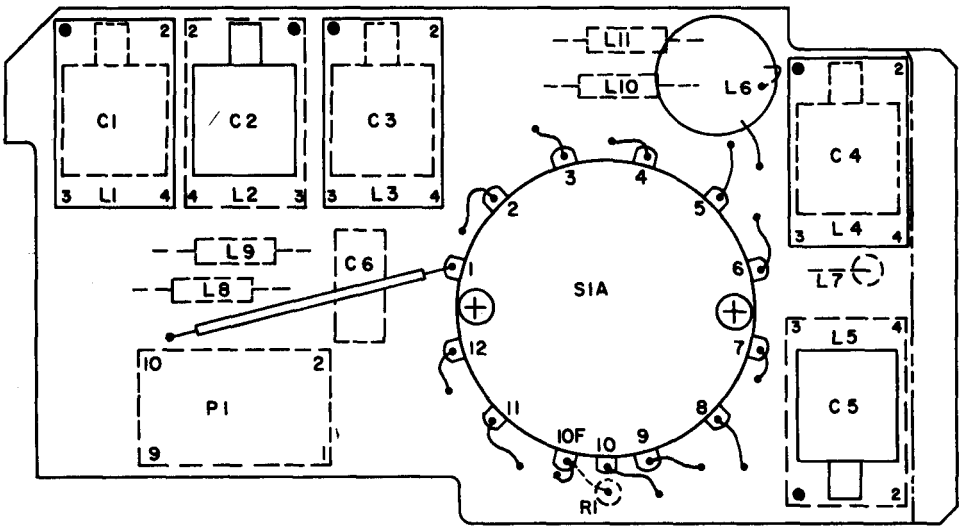


Figure 7-1. Motherboard, A1A1A2A1A1A1, parts location.



NOTE:
FOR COMPLETE REFERENCE DESIGNATION PREFIX
ALL SYMBOLS WITH A1A1A2A1A2.

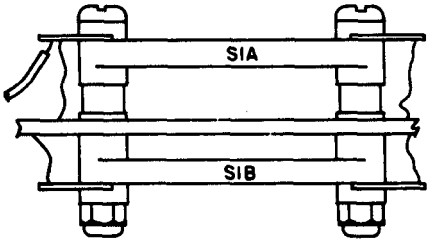


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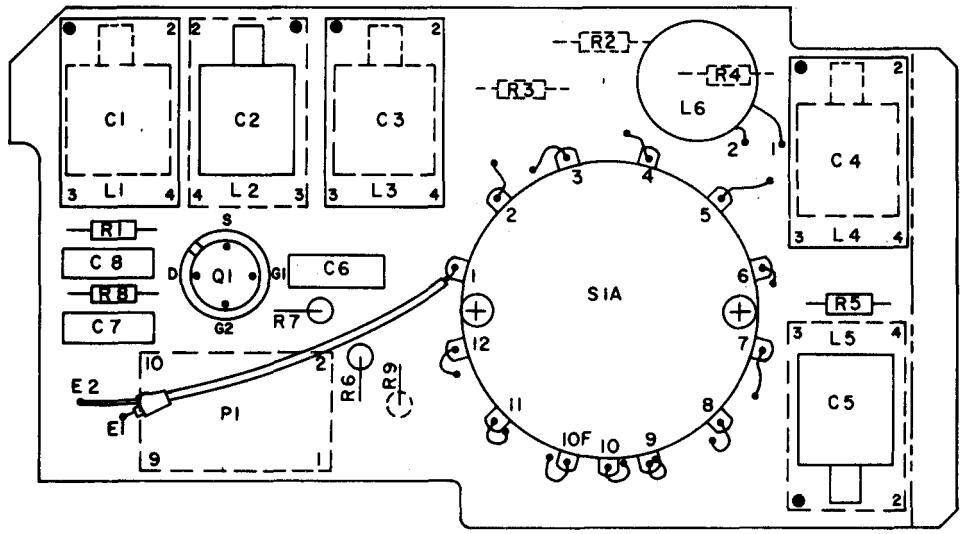
Figure 7-2. Rf preselector. A1A1A2A1A2. parts location.



NOTE:
FOR COMPLETE REFERENCE DESIGNATION PREFIX
ALL SYMBOLS WITH A1A1A2A1A3.

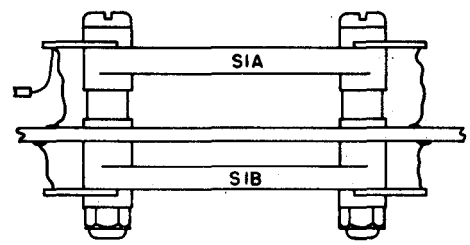


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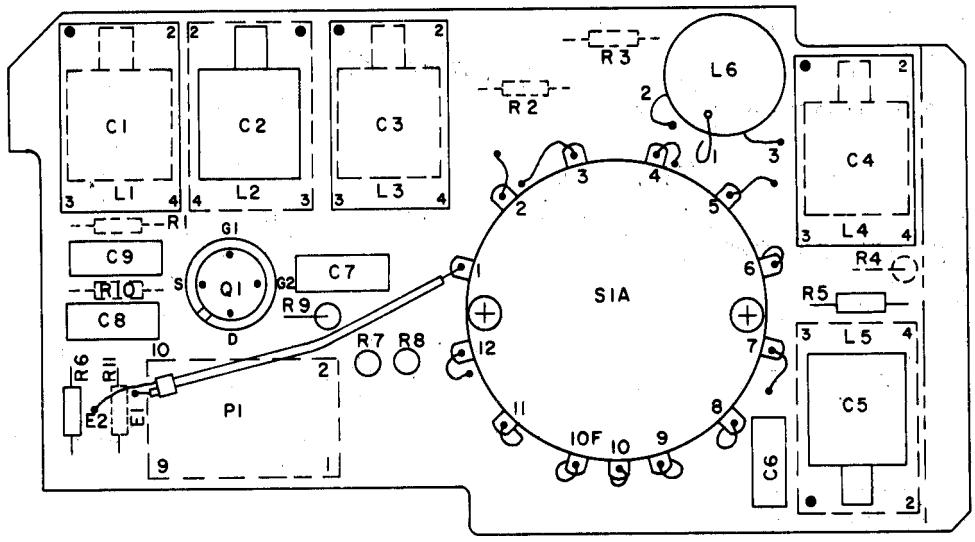
Figure 7-3. First rf amplifier, A1A12A1A3, parts location.



NOTE:

FOR COMPLETE REFERENCE DESIGNATION PREFIX ALL SYMBOLS WITH AIAIA2AIA4.

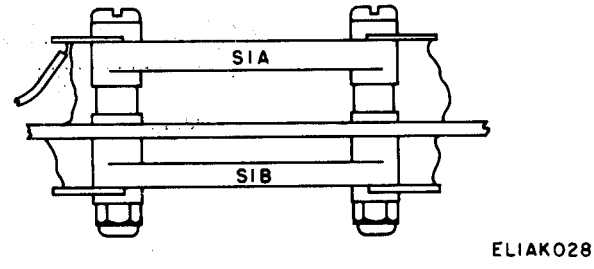
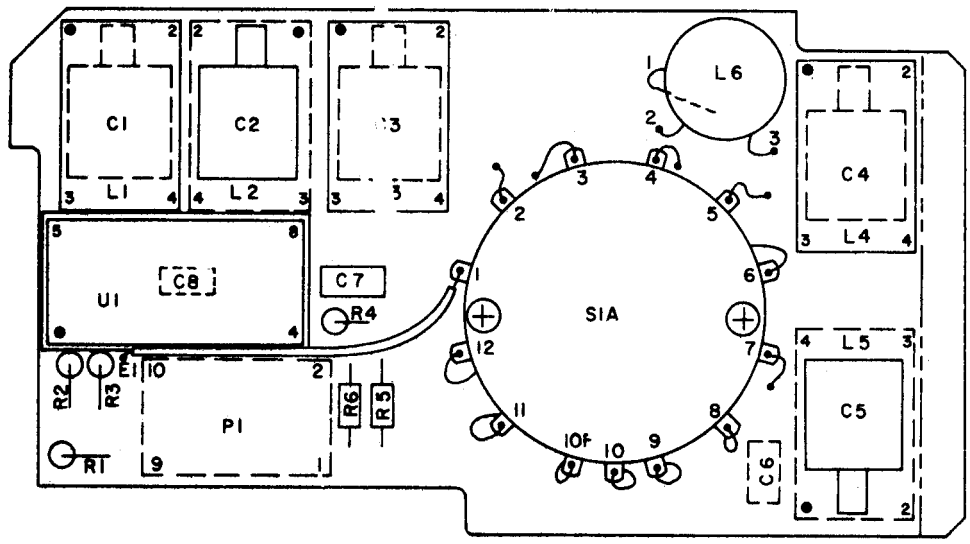


Figure 7-4. Second Rf amplifier, A1A1A2A1A4, parts location.



NOTE:
FOR COMPLETE REFERENCE DESIGNATION PREFIX
ALL SYMBOLS WITH A1A1A2A1A5.

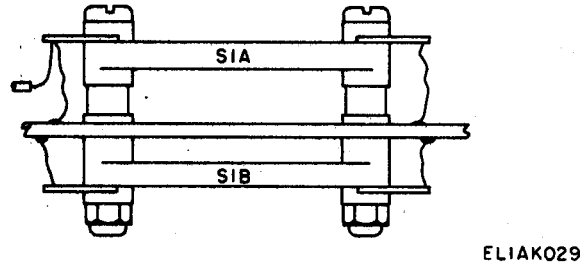
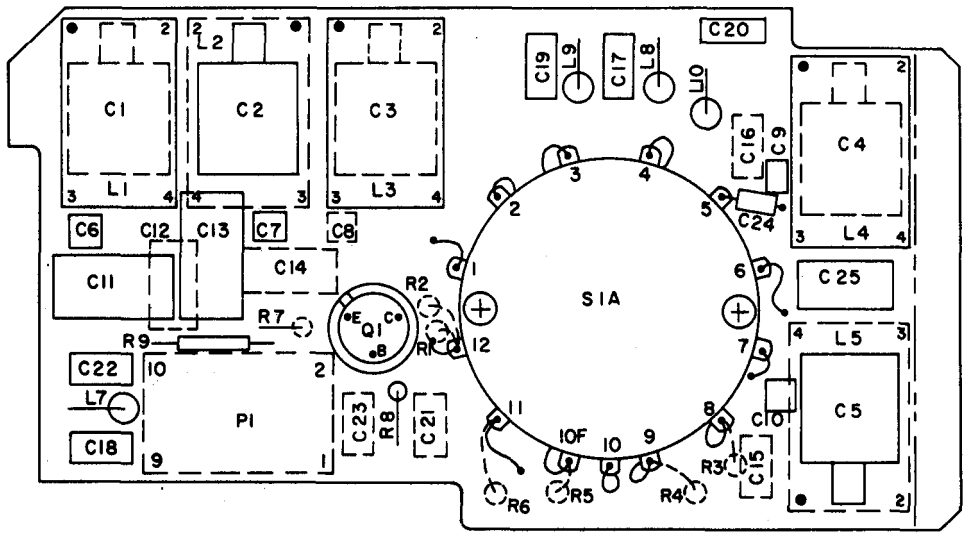


Figure 7-5. rf mixer, A1A1A2A1A5, parts location.



NOTE:

FOR COMPLETE REFERENCE DESIGNATION PREFIX
ALL SYMBOLS WITH AIAIA2AIA6.

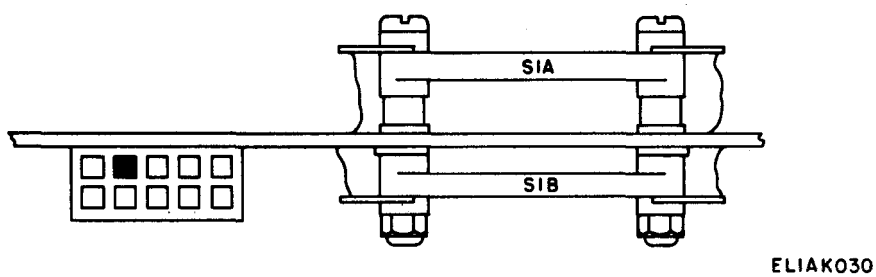


Figure 7-6. Rf local oscillator, A1A1A2A1A6, parts location.

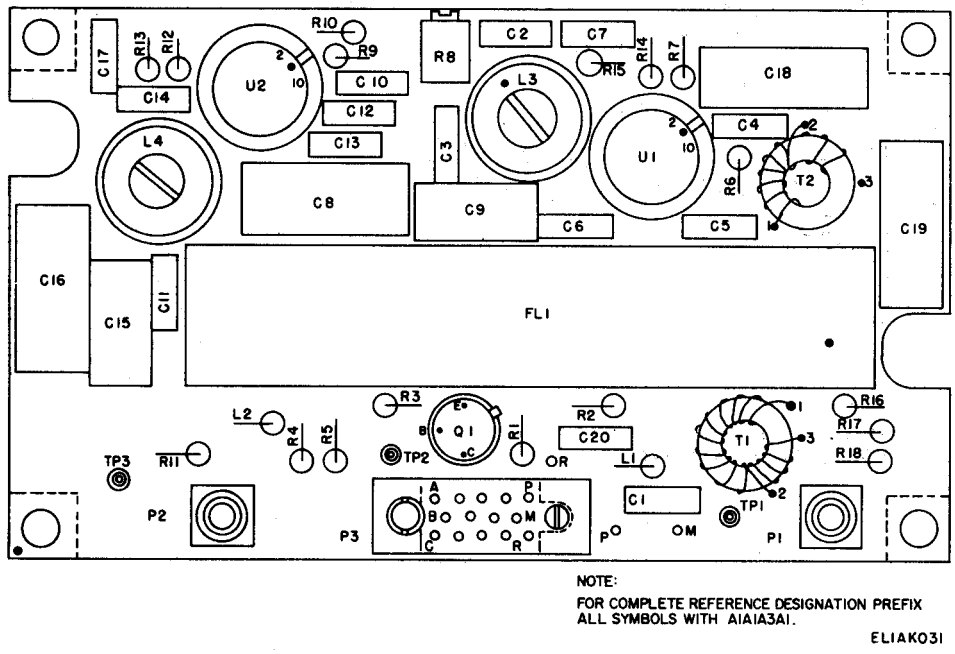


Figure 7-7. If. amplifier, A1A1A3A1, parts location.

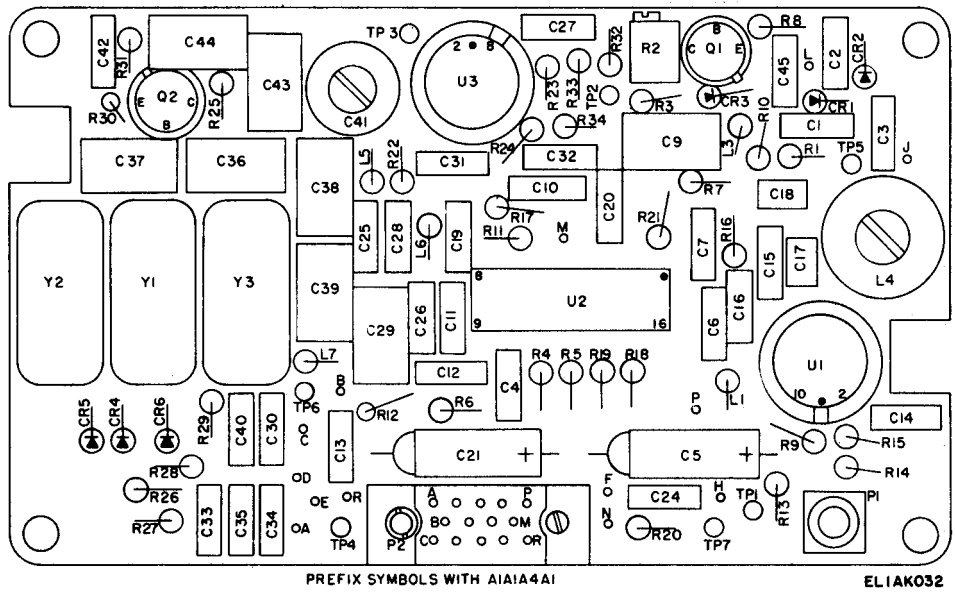


Figure 7-8. Detector, A1A1A4A1, parts location.

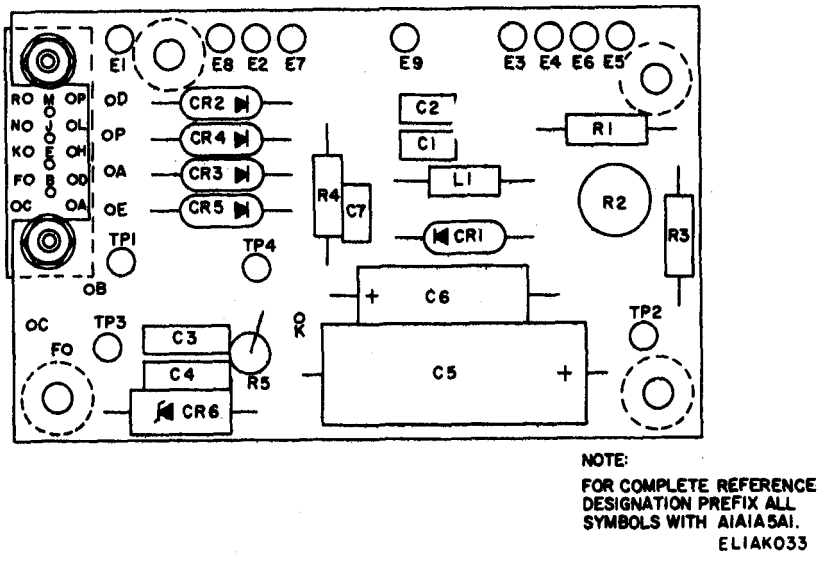


Figure 7-9. Power supply, A1A1A5A1, parts location.

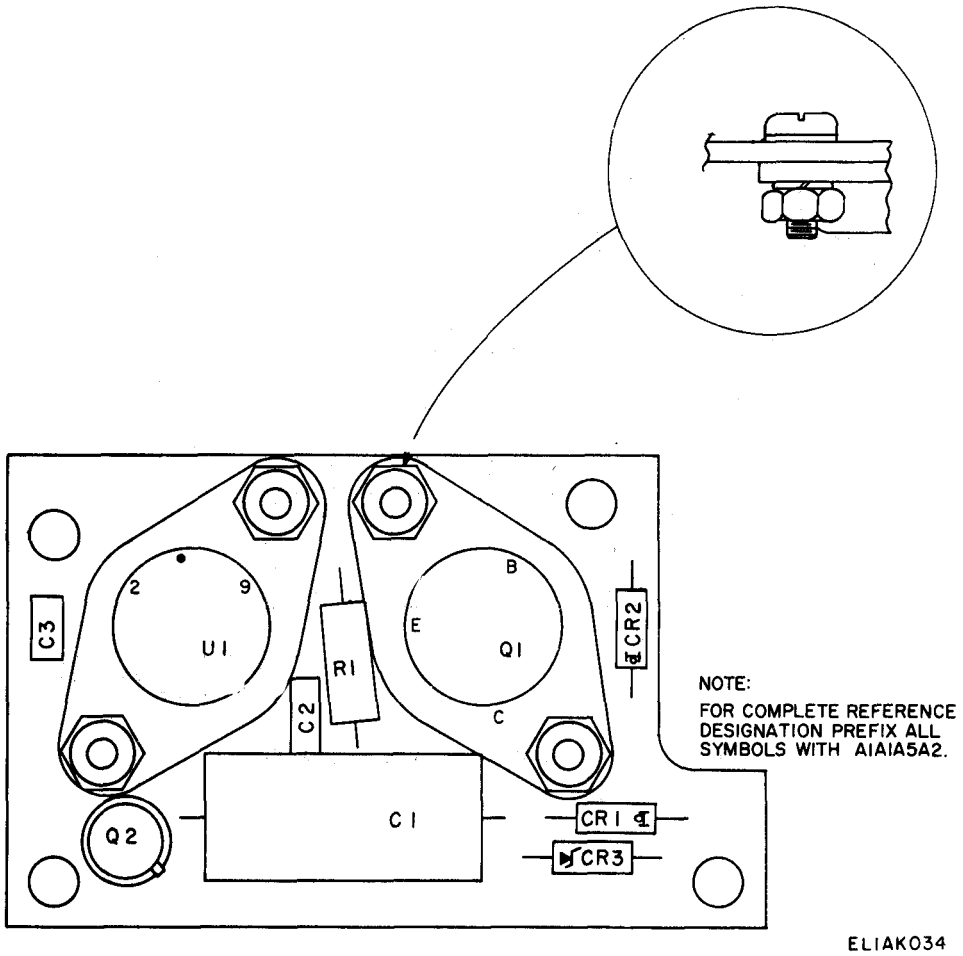


Figure 7-10. Regulator, A1A1A5A2, parts location.

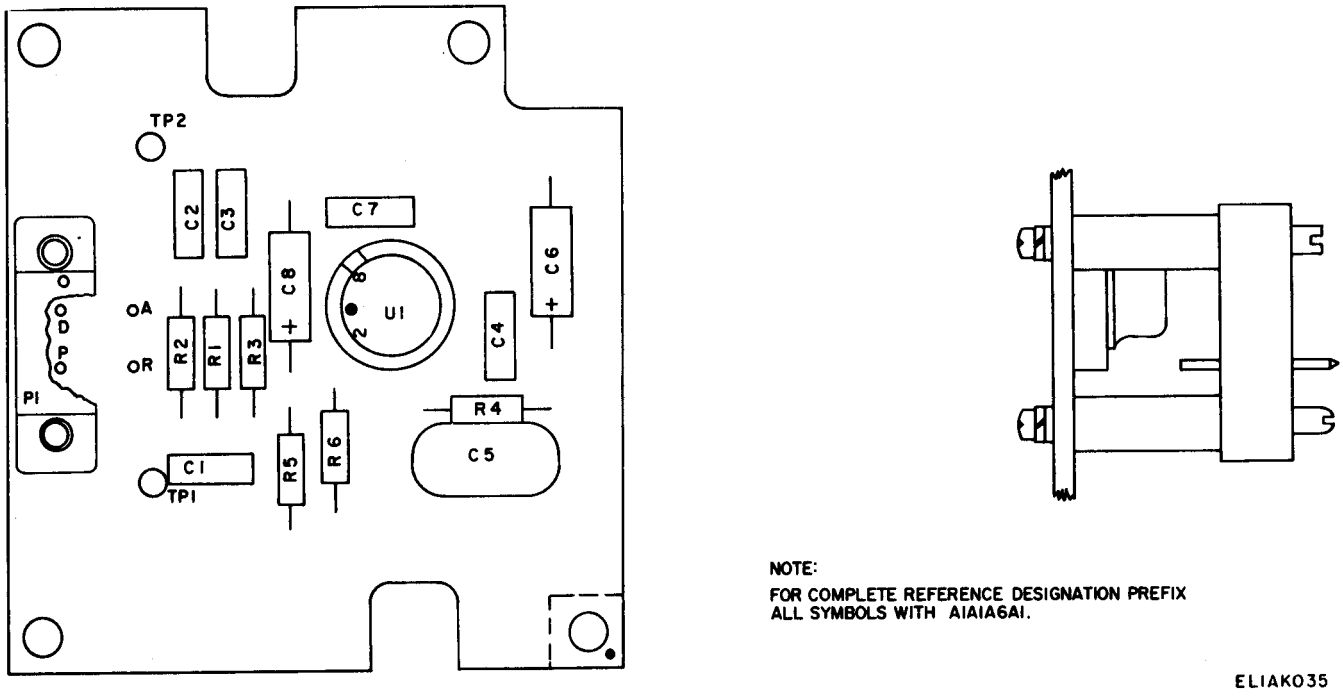
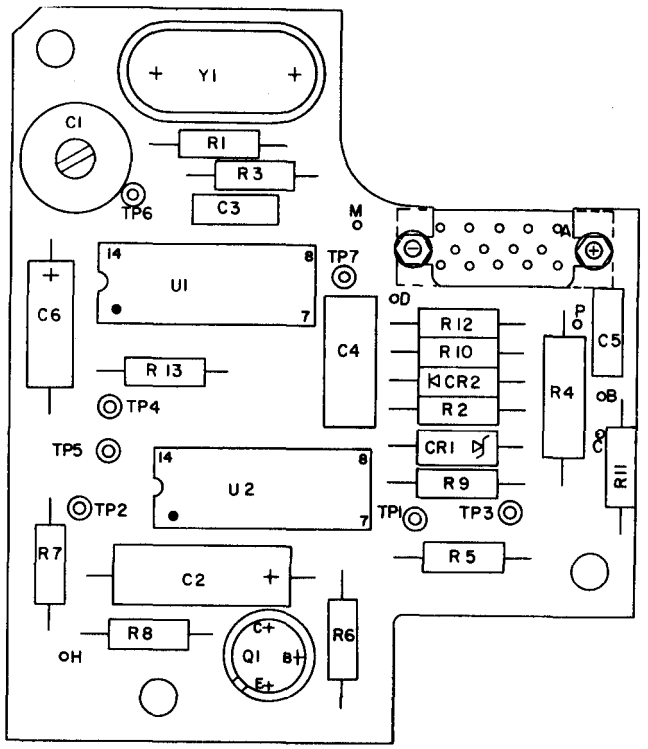


Figure 7-11. Audio amplifier, A1A1A6A1, parts location.



NOTE:
FOR COMPLETE REFERENCE DESIGNATION PREFIX
ALL SYMBOLS WITH AIAIA7.

ELIAK036

Figure 7-12. Calibration oscillator, A1A1A7, parts location.

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 Audio Amplifier Assembly A1A1A6.

(1) Orient the circuit card (12) as shown in figure FO-18.

(2) Secure the circuit card to the chassis, using four screws (14) and flat washers (13).

(3) Orient the cover (15) as shown and secure with four screws (16).

b. Reassembly of Power Supply Assembly A1A1A5 (fig. FO-18).

(1) Wire and solder the regulator circuit card (9) to the power supply circuit card (8) in accordance with the wire list shown in table 7-13.

(2) Fold the power supply circuit card on top of the regulator circuit card so that the connector is properly oriented.

c. Reassembly of Detector Assembly A1A1A4.

(1) Orient the circuit card (41) as shown in figure FO-18.

(2) Secure the circuit card to the chassis, using four screws (14) and flat washers (13).

(3) Orient the cover (42) as shown and secure with four screws (16).

Table 7-13. Power Supply Wire List

Wire No	Origin	Termination	Color	Size (Awg)
1	A1E1	A2E1	White	24
2	A1E2	A2E2	White	24
3	A1E3	A2E3	White	24
4	A1E4	A2E4	White	24
5	A1E5	A2E5	White	24
6	A1E6	A2E6	White	24
7	A1E7	A2E7	White	24
8	A1E8	A2E8	White	24
9	A1E9	A2E9	White	24

d. Reassembly of If. Amplifier Assembly A1A1A3.

(1) Orient the circuit card (19) as shown in figure FO-18.

(2) Secure the circuit card to the chassis, using four screws (14) and flat washers (13).

(3) Orient the cover (20) as shown and secure with four screws (16).

e. Reassembly of RF Tuner Subassembly A1A1A2A1A1 (fig. FO-20).

(1) Orient the motherboard circuit, card (24) as shown and insert it in the tuner chassis. At the same time position the coaxial connectors and the multipin connector in the proper holes in the chassis.

(2) While holding the motherboard in the chassis, temporarily insert the five circuit cards (16, 17, 18, 19, 20) into their respective compartments in the tuner chassis. Be sure that the connectors are fully meshed with the pins on the motherboard and that the circuit cards are centered in the card guides. Be sure that the holes in the switches on the five circuit cards are oriented in the same direction and insert the switch shaft (13) through the tuner chassis and circuit cards.

(3) Bend the tabs on the bottom of the chassis over the motherboard circuit card. Be sure that the circuit cards are still centered in the card guides and solder the chassis tabs to the motherboard.

(4) Remove the switch shaft (13) and the five circuit cards from the tuner chassis.

(5) Secure the coaxial connectors and the multipin connector to the tuner chassis, using the attaching hardware.

(6) Orient the variable capacitor (22) as shown and insert the wires from the capacitor through the nylon insulators in the side of the tuner chassis.

(7) Position the variable capacitor such that the ground tabs protrude through the slots in the side of the tuner chassis and secure the assembly, using two screws (21) and lockwashers (9) on top of the capacitor and three screws (1) and lockwashers (9) at the bottom of the capacitor.

(8) Solder the wires coming from the variable capacitor to the motherboard at points E1, E2, E3, E4, and E5.

(9) Solder the variable capacitor ground tabs to the inside wall of the tuner chassis.

NOTE

Reassembly of the rf tuner assembly A1A1A2A1, which consists of inserting the tuner circuit cards and the switch shaft in the tuner chassis and securing the tuner cover, should not be attempted until after the rf tuner assembly has been mated with the front panel.

f. Reassembly of Control Panel Assembly A1A1A1 (fig. FO-19).

(1) Attach the wavy washer and stationary gear (fig. FO-18) to the TUNE hole in the control panel, using the screw and waterproof nut (46).

(2) Replace the control panel controls, connectors, indicators, etc, using the attaching hardware as shown in figure FO-19.

(3) Replace the knobs on the control panel control shafts. Be sure that pointer type knobs are in the proper position before securing them to the shaft.

(4) Solder the wiring on any controls, connectors, etc. which have been removed and remove the wire tags. Refer to table 7-14 for wiring details.

g. Reassembly of Rf Tuner and Dial Assembly A1A1A2 (fig. FO-20 and FO-21).

(1) Position the rf tuner subassembly (15, fig. FO-20) and the gear plate assembly (25) as shown. Insert the three screws (2) and lockwashers (3) in the gear plate assembly. Do not tighten these screws to their final tightness.

(2) Align the variable capacitor shaft with the worm and the rf tuner subassembly with the gear plate assembly to the dimensions shown on figure 7-13.

(3) Apply sealing compound, MIL-S-22473 grade C, to the threads of-the three screws (2, fig. FO-20) securing the variable capacitor to the gear plate assembly and tighten the screws.

Table 7-14. Receiver Wire List

Wire No.		Length (in.)		To
1	Wht/Yel	8	P1-C	A1S5C-11F
2	Green	8	P1-D	J5-H
3	Black	9	P1-3	A2E2-2
4	Red	9	P1-F	A2E1-3
5	Gray	10	P1-H	A1S3B-C
6	Wht/Red	9	P1-J	A2E6-5
7	Black	14	J1-M	A2E4-2
8	Wht/Red	14	J1-P	A2E6-2
9	Gray	15	J1-R	A1S3-C
10	Wht/Grn	13	J2-A	A1S5C-4F,4R
11	Wht/Blue	13	J2-B	A1S5B-12F
12	Yellow shielded	13	J2-C	A1S5B-3F
13	Wht/Blk/Brown	13	J2-D	A1S5C-3F,4R
14	Wht/Gray	13	J2-E	A2S5C-5F,5R
15	Brown shielded	7	J2-F	J3-R
16	Blue	15	J2-H	A1S3-B
17	Orange shielded	15	J2-J	A1J3
18	Wht/Blk	2-1/2	J2-R shield	J2-K
19	Green	12-3/4	J2-L	A1S1-3
20	Black	13	J2-M	A2E3-4
21	White shielded	13	J2-N	A1R1-2
22	Wht/Red	12-1/2	J2-P	A2E6-3
23	Gray shielded	15	J2-R	A1S5B-2F
24	Black	14	J3-A	A2E3-2
25	Yellow shielded	16	J3-D	A1J4
26	Wht/Blk	2	J3-D shield	J3-E
27	Wht/Blk	2	J3-R shield	J3-N
28	Red	15	J3-P	A2E1-1
29	Brown	5	J4-A	T1-6
30	Yellow	7	J4-B	A1S1-1
31	Red	8	J4-C	A2E1-2
32	Black	8	J4-D	A2E3-3
33	Wht/Red	8	J4-E	A2E6-6
34	Wht/Brn	9	J4-F	P2-11
35	Wht/Orn	8	J4-K	A1S5B-8R
36	Orange	5	J4-P	T1-5
37	Wht/Red	6	J5-B	A2E6-4
38	Orange	7	J5-C	A1R2-3
39	Brown (coax)	6	J5-D	A1S2A-C
40	Wht/Blk	2	J5-3 shield	J5-E
41	Black	6	J5-M	A2E3-1
42	Wht/Yel	7	J5-P	A1S5C-11F
43	Yellow shielded	11	P2-1	A1J4
44	Wht/Blk	2	P2-1 shield	P2-2
45	Violet shielded	10	P2-3	A1F1-1
46	Brown	5	P2-4	A1S5B-3R
47	Gray	5	P2-5	A1S5A-2R
48	White	5	P2-6	A1S5A-6R
49	Orange	5	P2-7	A1S5A-12R
50	Orange shielded	4	P2-8	A1J3
51	Gray shielded	7-1/2	P2-9	A1S3-C
52	Green	11	P2-10	A1S4-3
53	Black	7	P2-12	A2E2-3
54	Wht/Vio	5	P2-13	A1S5B-9R
55	Yellow	5	P2-14	A1S5A-8F
56	Blue shielded	10	P2-15	A1F1-2
57	Wht/Red	3	A1S5C-1F	A1S5B-8F
58				
59				
60				
61	Buss	2	A1S5C-7F	A1S5B-2R
62	Black	7	A1S5C-6R	A2E4-3
63	Red	13	A2E1-6	A1S4-1
64	Black	2	A2E2-1	A2E3-6

Table 7-14. Receiver Wire List-Continued

Wire No.	Color	Length (in.)	From	To
65	Black	8	A2E2-4	A1R2-1
66	Black	2	A2E2-5	A2E5
67	Black	2	A2E2-6	A2E4-1
68	Green	8	A1S5A-1F	T1-2
69	Wht/Brn	7	A1S5A-7F	T1-1
70	Violet	8	A1S5A-5R	T1-4
71	Blue	8	A1S5A-11R	T1-3
72	Red shielded	4	A1S5B-1F	A1R1-3
73	Wht/Red	8	A1S5B-8F	A2E6-1
74	Buss	3	A1S5B-10F	A1S5B-11F, 12F
75	Red	8	A1S5B-2R	A2E1-4
76	Black	13	A2E3-5	A1DS1-1
77	Black	5	A2E4-4	A1M1-(−)
78	Blue	6	A1S1-2	A1M1-(+)
79	Orange	2	A1S4-2	A1DS1-2
80	Buss	3	A1R2-2	A1S3-D
81	Wht/Blk	3	A1R1-2 shield	A1R1-3 shield-1
82	Wht/Blk	3	A1J3 shield	A1J3 shield
83	Wht/Blk	3	A1J3 shield	A1E1 GND
84	Wht/Blk	3	A1J4 shield	A1J4 shield
85	Wht/Blk	3	A1J4 shield	A1J4 GND
86	Black	6	A1R1-1	A2E4-5
87	Black	10-1/2	A1J4 GND	A2E4-6
88	A1A1W1		A2A1A1J2	A3P1
89	A1AW2		A3P2	A4P1
90				
91	Wht/Blk		J2-C shield	J2-F shield
92	Wht/Blk		J2-F shield	J2-J shield
93	Wht/Blk		J2-J shield	J2-N shield
94	Wht/Blk		J2-N shield	J2-R shield
95	Wht/Blk		P2-1 shield	P2-8 shield
96	Wht/Blk		P2-8 shield	P2-9 shield
97	Wht/Blk		A1S5B-1F shield	A1S5B-2F shield
98	Wht/Blk		A1S5B-2F shield	A1S5B-3F shield
99	Buss		A1S3-A	A1S3-C
100	Wht/Blk		A1S3-C shield	A1R2-1
101	Wht/Blk		P2-3 shield	P2-15 shield
102	Wht/Blk		P2-15 shield	A1E1
103	Wht/Blk		A1F1-1 shield	A1F1-2 shield
104	Wht/Blk		A1F1-2 shield	A1J4 ground

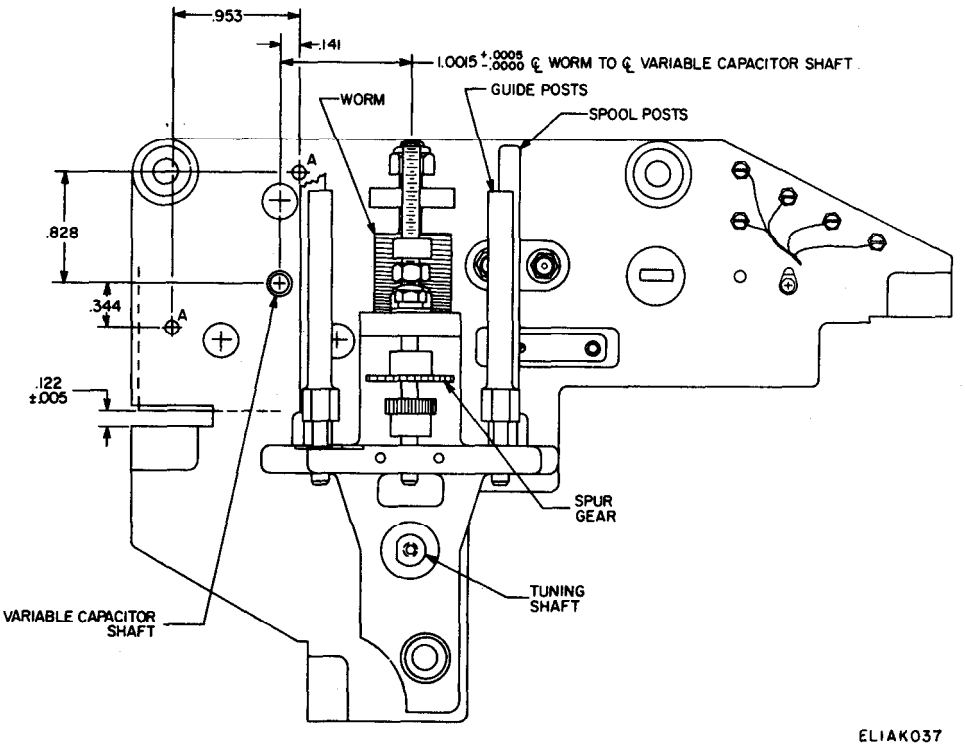


Figure 7-13. Rf tuner reassembly dimensions.

(4) Be sure that the assemblies are still aligned as in (2) above. Drill two 0.1249 to 0. 1252-inch diameter holes (A holes on figure 7-13) to the dimensions shown.

(5) Press two 0.1250 —0.0000 +0.0002 inch diameter by 0.218 +0.010 inch long dowel pins in the holes.

NOTE

When assembling previously used variable capacitors, or gear plate assemblies, do not use the old holes for the dowel pins. Drill two new holes in the approximate area of the old holes.

(6) Secure the rf tuner chassis to the gear plate assembly, using one screw (1, fig. FO-20).

(7) Turn the tuning shaft clockwise until the stop block (13, FO-21) is against the bottom lock nut. Turn the tuning shaft 17 complete turns (±1/8 turn) counterclockwise.

(8) Counterrotate the antibacklash worm gear (12) halves three active teeth. Without losing spring tension on the gear halves, place the worm gear on the variable capacitor shaft so that the flat on the gear is parallel to the worm and engage the gear with the worm (8).

(9) Turn the tuning shaft clockwise until the bottom stop is reached.

NOTE

Be sure to keep the worm gear fully engaged with the worm when turning the tuning shaft so the antibacklash tension is not lost.

(10) Rotate the variable capacitor shaft fully counterclockwise without moving the antibacklash worm gear.

(11) Position the antibacklash worm gear (12, FO-21 on the variable capacitor shaft such that it aligns with the centerline of the worm (8).

(12) Place the gear clamp (10, FO-21) on the hub of the antibacklash worm gear (12) and align the screws in the clamp in the approximate center of the quadrants of the split hub of the gear. Tighten the screws in the gear clamp.

(13) Put a small amount of grease, MIL-G-3278, on the teeth of the antibacklash worm gear and the worm.

(14) Turn the tuning shaft counterclockwise 11-1/8 turns ±1/8 turn. Assemble the two nuts (26), and lockwasher (17), on the stop shaft (14). Bottom them against the stop block (13) and lock the nuts.

(15) Counting turns, turn the tuning shaft clockwise until the bottom stop is reached. There

must be 11-1/8 ±1/8 turns of the tuning shaft between stops.

(16) Place one washer (15, fig. FO-21) on each spool post.

(17) Wind the dial tape (7) on the spools (6) so that the 1.10 mark on band 2 of the tape is located approximately one inch to the right of the center. Turn the tuning shaft counterclockwise until the top stop is reached.

(18) Place the spools and tape on the spool posts such that the dial tape goes around the guide posts, the band 2, 1.10 tape mark is positioned approximately one inch to the right of center, and the tape is engaged with the spur gear (fig. 7-13).

(19) Assemble the spring (9, fig. FO-21) over the dial tape as shown and secure, using two screws (2) and lockwashers (3).

(20) Rotate the tuning shaft from stop to stop to be sure that the ends of the dial tape do not come off of the spools and that the tape end markings are approximately equidistant from the center of the spring. If these conditions are not satisfied, remove the spring (9) and slip the dial tape over the spur gear until these conditions are satified. Replace the spring.

(21) Place the retaining rings (5) on the spool posts. Assemble the guide extension (bracket) (4) and the tape guide (1), using the screws (2) and lockwashers (3).

h. Reassembly of Radio Assembly A1A1 (fig. FO-18).

NOTE

During the following procedure be careful not to pinch wires between assemblies. Carefully observe the polarity of the connectors and the orientation of the various parts shown in figure FO-18.

(1) Attach connectors J4 (17), J3 (17, 34, 6, 35, 7, 22), J2 (17, 34, 6, 35, 7, 22), J1 (17, 34, 6, 35, 7, 22), W1J1 (37, 31, 26), W2J1 (33, 31, 26), and W2J2 (33, 31, 26) to the receiver chassis (50), using the attaching hardware. All wiring leaving the chassis must exit through the large rectangular hole under the section of chassis that contains the power supply assembly (4).

(2) Insert the cable shield (21) in the large rectangular hole in the chassis.

(3) With the rf tuner and dial assembly (1) upside down from that shown, place the two flat washers (shims) (2, 29) over their respective holes in the rf tuner.

(4) Position the receiver chassis over the rf tuner and insert the two screws (23, 27) and nylon washers (bushings) (24, 28) into their respective holes in the chassis, through the flat washers, and into the rf tuner. Do not tighten these screws to their final tightness.

(5) Complete securing the receiver chassis to the rf tuner, using three screws (30). Tighten all screws to final tightness.

(6) Replace and solder, MIL-STD-454 requirement 5, all wires that have been removed from the control panel (43). Remove the wire tags. See table 7-14 for wiring details.

(7) Reconnect connector A1A1A1W1P1 to the rf tuner (view A).

(8) Align the TUNE hole in the control panel with the tuning shaft and slide the control panel onto the shaft. Secure the control panel to the rf tuner and dial assembly, using three screws (44).

(9) Place the spur gear from the tuning knob on the TUNE shaft and secure it to the shaft such that there is 0.156 ±0.005-inch clearance between the spur gear and the stationary gear.

(10) Place the nylon internal tooth gear over the spur gear and onto the stationary gear.

(11) Push the knob body over the rest of the knob assembly.

i. Reassembly of Rf Tuner Assembly A1A1A2A1 (fig. FO-20).

(1) Be sure that the switches on the five rf tuner circuit card assemblies are all in the same position. Insert the circuit card assemblies (16, 17, 18, 19, 20) into the rf tuner, being careful not to bend any pins.

(2) Insert the shaft (13) through the rear of the rf tuner chassis and through the switches in the rf tuner circuit cards.

(3) Turn the control panel BAND switch such that the switch shaft will engage with the coupling on the band switch shaft.

(4) Place the cover (12) on the rf tuner and secure with attaching hardware (23, 8, 9, 10, 11).

(5) Refer to paragraph 6-9 for final radio reassembly procedures.

Section IV. SUBASSEMBLY TESTING

7-10. General

This section contains testing procedures for the various receiver subassemblies. Alignment and adjustment instructions for the subassemblies are also provided. These procedures are used in conjunction with the troubleshooting tables (para 7-4) to isolate a fault within the subassemblies. The proper functioning of the subassemblies after repair can be verified, using these procedures and the testing procedures (para 6-11 through 6-24).

7-11. Radio Assembly A1A1 Testing

Refer to paragraphs 6-13, 6-14, and 6-15 to test and adjust the radio assembly.

7-12. Control Panel Assembly A1A1A1 Testing

Refer to paragraph 6-16 to test the control panel assembly.

7-13. Rf Tuner and Dial Assembly A1A1A2 Testing

a. Mechanical Testing (fig. FO-18).

(1) Rotate the tuning shaft and observe that all gear assemblies operate without binding and that the dial tape is engaged with the drive gear.

(2) Rotate the tuning shaft and count the number of turns between end stops. There should be approximately 11-1/8 turns of the tuning shaft.

(3) Rotate the tuning shaft back and forth slightly and observe that there is no backlash between the tuning shaft and the dial tape drive gear. If excessive backlash is noticed, adjust the spring tension of the antibacklash worm gear (para 7-9g(8)).

b. Electrical Testing. Refer to paragraph 6-17 for electrical tests for the rf tuner and dial assembly.

NOTE

Electrical tests and alignment of the rf tuner and dial assembly can be performed only with the rf tuner and dial assembly installed in the radio assembly. Replacement of the dial tape or variable capacitor requires alignment at depot only.

c. Alignment.

(1) *Local oscillator alignment.*

(a) Perform the preliminary test setup of paragraph 6-12.

(b) Connect the test equipment as shown in figure 7-14.

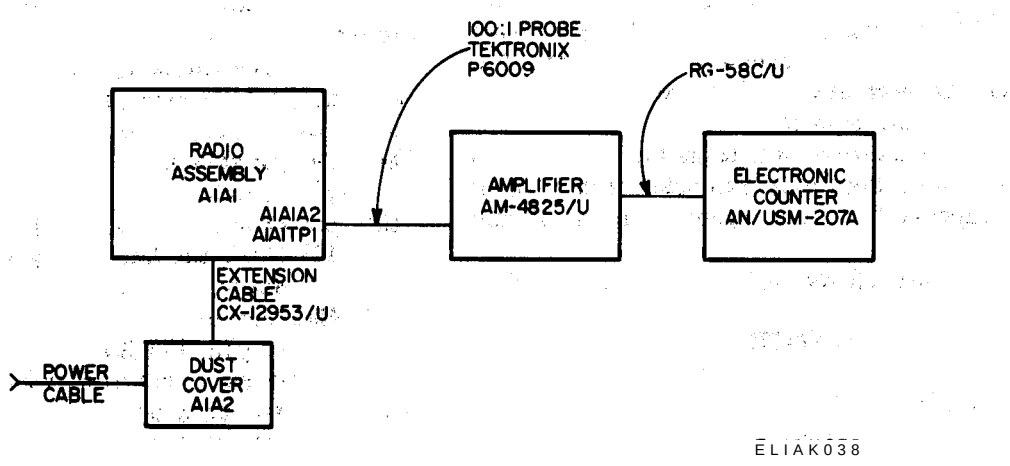


Figure 7-14. Local oscillator alignment, test connections.

(c) Set the receiver FUNCTION switch to AM.

(d) Apply power to the test equipment and allow 15 minutes for warmup.

(e) Adjust the receiver CAL ADJ control so that the cursor is aligned with the paint dot or scribe line on the shutter assembly.

NOTE

Capacitors are adjusted, using the metal tipped tuning tool. All coil adjustments are made, using the non-metallic tuning tool. See figure FO-22 for adjustable components location.

(f) Refer to table 7-15. With the BAND switch in the appropriate position, tune the receiver to the dial tape setting listed in the table and adjust the corresponding component until the frequency indicated by the electronic counter is within the limits listed in the table. It will be necessary to repeat the inductor and capacitor adjustments several times for each band since there is interaction between the adjustments.

(g) Remove the power from the receiver and disconnect the equipment setup.

Table 7-15. Local Oscillator Alignment

Band	Dial tape setting	Adjustment component A6-	A1TP1 frequency (MHz)	Tolerance (kHz)
1	0.60	L1	1.055	±0.5
1	1.10	C1	1.555	±0.5
2	1.10	L2	1.555	±1.0
2	2.30	C2	2.755	±1.0
3	2.30	L3	2.755	±1.0
3	4.80	C3	5.255	±2.0
4	5.00	L4	5.455	±2.0
4	10.00	C4	10.455	±3.0
5	9.50	L5	9.955	±3.0
5	20.50	C5	20.955	±4.0

(2) *Rf amplifier alignment.*

(a) Remove the receiver from the dust cover (para 6-6).

(b) Remove the if. amplifier assembly from the receiver (para 6-6).

(c) Connect a short jumper wire between test point A1A1A7TP6 on the calibration oscillator circuit card and the receiver chassis.

(d) Perform the preliminary test setup (para 6-12).

(e) Connect the test equipment as shown in figure 6-11.

(f) Set the receiver controls as follows:

Control	*Setting*
ANT	2
RF gain	Maximum clockwise (no AVC)
FUNCTION	CAL

(g) Apply power to the test equipment and allow 15 minutes for warmup.

NOTE

Capacitors are adjusted, using the metal tipped tuning tool. All coil adjustments are made, using the non-metallic tuning tool. See figure FO-22 for adjustable components location.

(h) During the following procedure adjust the level of the signal generator as necessary to avoid saturating the rf amplifiers.

(i) Refer to table 7-16. With the BAND switch in the appropriate position, tune the receiver to the dial tape setting listed in the table. Adjust the signal generator for a cw output at the frequency listed in the table. Adjust the corresponding components for a peak indication on the electronic voltmeter. It will be necessary to repeat the inductor and capacitor adjustments several times for each band, since there is interaction between the adjustments.

(j) Remove the power from the receiver and disconnect the equipment setup.

(k) Remove the jumper wire between the calibration oscillator test point and the receiver chassis.

(l) Replace the if. amplifier assembly (para 6-9).

(m) Replace the receiver in the dust cover (para 6-9).

7-14. Motherboard A1A1A2A1A1A1 Testing

(fig. FO-5 and 7-1)

Make the continuity and resistance checks in table 7-17 as follows:

a. Set the multimeter (TS-352/U) to measure resistance. Unless otherwise specified, all measurements are made on the RX1 range.

b. Reference designators listed in table 7-17 are abbreviated. For complete designation, prefix with A1A1A2A1A1A1.

c. Readings of less than 10 ohms are considered a short circuit.

Table 7-16. Rf Amplifier Alignment

Band	Dial tape setting	Input signal frequency (MHz)	Frequency tolerance (kHz)	Adjustment components			
				A2	A3	A4	A5
1	0.60	0.60	±0.5	L1	L1	L1	L1
1	1.10	1.10	±0.5	C1	C1	C1	C1
2	1.10	1.10	±1.0	L2	L2	L2	L2
2	2.30	2.30	±1.0	C2	C2	C2	C2
3	2.30	2.30	±1.0	L3	L3	L3	L3
3	4.80	4.80	±2.0	C3	C3	C3	C3
4	5.00	5.00	±2.0	L4	L4	L4	L4
4	10.00	10.00	±3.0	C4	C4	C4	C4
5	9.50	9.50	±3.0	L5	L5	L5	L5
5	20.50	20.50	±4.0	C5	C5	C5	C5

Table 7-17. Motherboard Continuity and Resistance Checks

NOTE
The ground plane is circuit common.

Multimeter (+) lead	Multimeter (—) lead	Reading (ohms)
J1	J4-1	0
J1	J4-2	Infinite
J2	J7-2	0
J2	J7-1	Infinite
J3-C	J4-5	0
J3 D	J4-7	0
J3-E	Ground plane	0
J3-F	J5-7	0
J3-F	J6-7	0
J3-F	J7-7	0
J3-H	J5-6	0
J3-H	J6-6	0
J3-J	J8-4	0
J4-6	J5-5	0
J4-10	E1	0
J5-2	J6-5	0
J5-10	E2	0
J6-2	J7-5	0
J6-10	E3	0
J7-6	TP1	0
TP1	J8-5	0
J7-10	E4	0
J8-10	E5	0
J3-F	Ground plane	Infinite
J3-H	Ground plane	Infinite
J3-J	Ground plane	Infinite

7-15. Rf Preselector A1A1A2A1A2 Testing

a. Continuity and Resistance Test (fig. FO-6, 7-2, 7-15). Remove the rf preselector circuit card from the rf tuner and make the continuity and resistance checks in table 7-18 as follows:

(1) Set the multimeter (TS-352/U) to measure resistance. Unless otherwise specified, all measurements are made on the RX1 range.

(2) Readings of less than 5 ohms are considered a short circuit.

(3) Reference designators listed in table 7-18 are abbreviated. For complete reference designation, prefix with A1A1A2A1A2.

(4) Figure 7-15 shows the switch configurations for each band.

b. Functional Test.

(1) After performing the resistance and continuity test, insert the rf preselector in the rf tuner.

(2) Align the rf tuner (para 7-13c).

(3) Test the rf tuner (para 6-17).

(4) If the requirements of paragraph 6-17 are not satisfied, replace the rf preselector circuit card and repeat (2) and (3) above.

Table 7-18. Rf Preselector Continuity and Resistance Checks

Multimeter (+) lead	Multimeter (—) lead	Reading (ohms)	Remarks
S1A and S1B to BAND 1			
P1-1	P1-2	0	
P1-1	P1-6	0	
P1-5	P1-7	9K to 11K	RX1000
P1-10	P1-2	20 to 20	
S1A and S1B	BAND 2		
P1-1	P1-2	0	
P1-1	P1-6	0	
P1-5	P1-7	9K to 11K	RX1000
P1-10	P1-2	4 to 8	

Table 7-18. Rf Preselector Continuity and Resistance Checks—Continued

Multimeter (+) lead	Multimeter (—) lead	Reading (ohms)	Remarks
S1A and S1B to BAND 3			
Pi-l	P1-2	0	
RI.]	P1-6	0	
P1-5	P1-7	9K to 11 K	RX1000
Pi-lo	P1-2	3 to 7	
S1A and SIB to BAND 4			
Pi-l	P1-2	0	
PI- I	P1-6	0	
P1-5	P1-7	Infinite	RX1000
P1-7	P1-2	0	
Pi-lo	P1-2	0	
S1A and S1B to BAND 5			
Pi-l	P1-2	0	
Pi-l	P1-6	0	
P1-5	P1-7	Infinite	RX1000
P1-7	P1-2	0	
P1-10	P1-2	0	

7-16. First Rf Amplifier A1A1A2A1A3 Testing

a. Continuity and Resistance Test (fig. FO-7 7-3, 7-15). Remove the first rf amplifier circuit card from the rf tuner and make the continuity and resistance checks in table 7-19 as follows:

M(1) Set the multimeter (TS-352/u) to measure resistance. Unless otherwise specified, all measurements are made on the RX1 range.

(2) Readings of less than 5 ohms are considered a short circuit.

(3) Reference designators listed in table 7-19 are abbreviated. For complete reference designation, prefix with A1A1A2A1A3.

(4) Figure 7-15 shows the switch configurations for each band.

b. Functional Test.

(1) After performing the continuity and resistance test, insert the first rf amplifier in the rf tuner.

(2) Align the rf tuner (para 7-13c).

(3) Test the rf tuner (para 6-17).

(4) If the requirements of paragraph 6-17 are not satisfied, remove the first rf amplifier circuit card from the rf tuner, replace transistor Q1, insert the first rf amplifier in the rf tuner, and repeat (2) and (3) above.

(5) If the requirements of paragraph 6-17 still are not satisfied, replace the first rf amplifier and repeat (2) and (3) above.

Table 7-19. First Rf Amplifier Continuity and Resistance Checks

Multimeter (+) lead	Multimeter (–) lead	Reading (ohms)	Remarks
S1A and SIB to BAND 1			
P1-5	Pi-l	0	
P1-6	Q1-G2	4.2K to 5.2K	RX100
Q1-G1	P1-7	380K to 480K	RX10,000
Q1-G1	P1-1	42K to 52K	RX1000
Pi-lo	S1A-F1	o	
Pi-lo	Pi-l	20 to 30	
S1A-F7	Pi-l	5 toll	
S1A and SIB to BAND 2			
P1-5	P1-1	0	
Pi-lo	P1-1	4 to 8	
S1A-F7	Pi-l	o	
S1A and SIB to BAND 3			
P1-5	Pi-l	0	
Pi-lo	P1-1	2 to 6	
S1A-F7	Pi-l	o	

Table 7-19. First Rf Amplifier Continuity and Resistance Checks—Continued

Multimeter (+) lead	Multimeter (—) lead	Reading (ohms)	Remarks
S1A and S1B to BAND 4			
P1-5	P1-1	0	
P1-10	P1-1	0	
S1A-F7	P1-1	0	
S1A and S1B to BAND 5			
P1-5	P1-1	0	
P1-10	P1-1	0	
S1A-F7	P1-1	0	

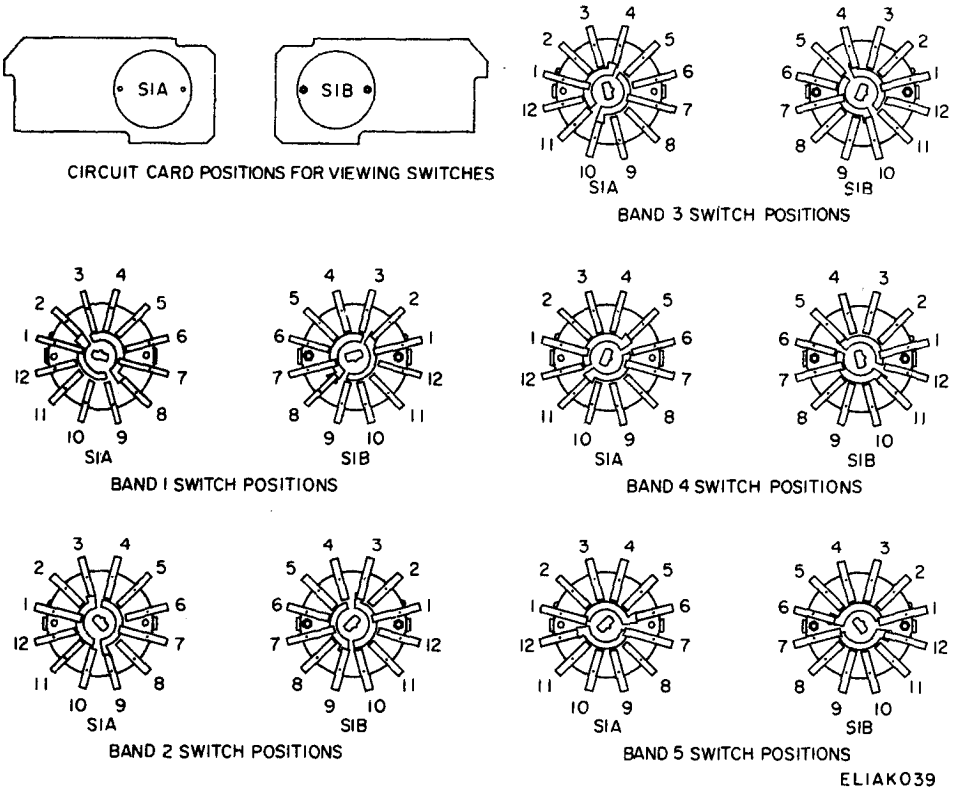


Figure 7-15. Tuner circuit card switch positions.

7-17. Second Rf Amplifier A1A1A2A1A4 Testing

a. Continuity and Resistance Test (fig. FO-8, 7-4, 7-15). Remove the second rf amplifier circuit card from the rf tuner and make the continuity and resistance checks in table 7-20 as follows:

(1) Set the multimeter (TS-352/U) to measure resistance. Unless otherwise specified, all measurements are made on the RX1 range.

(2) Readings of less than 5 ohms are considered a short circuit.

(3) Reference designators listed table 7-20 are abbreviated. For complete reference designation, prefix with A1A1A2A1A4.

(4) Figure 7-15 shows the switch configurations for each band.

b. Functional Test.

(1) After performing the continuity and resistance test, insert the second rf amplifier in the rf tuner.

(2) Align the rf tuner (para 7-13c).

(3) Test the rf tuner (para 6-17).

(4) If the requirements of paragraph 6-17 are not satisfied, remove the second rf amplifier circuit card from the rf tuner, replace transistor Q1, insert the second rf amplifier in the rf tuner, and repeat (2) and (3) above.

(5) If the requirements of paragraph 6-17 still are not satisfied, replace the second rf amplifier and repeat (2) and (3) above.

Table 7-20. Second Rf Amplifier Continuity and Resistance Checks

Multimeter (+) lead	Multimeter (—) lead	Reading (ohms)	Remarks
S1A and S1B to BAND 1			
Q1-G2	P1-7	80K to 120K	RX10,000
Q1-G2	P1-6	4.2K to 5.2K	RX100
Q1-G1	P1-7	380K to 480K	RX10,000
Q1-G1	P1-1	42K to 52K	RX1000
Q1-S	P1-1	450 to 650	RX10
S1A-F1	P1-10	0	
P1-7	P1-10	250 to 330	RX10
P1-7	P1-5	240 to 320	RX10
P1-7	S1B-F1	240 to 320	RX10
S1A and S to BAND 2			
P1-7	P1-10	240 to 320	RX10
P1-7	P1-5	240 to 320	RX10
P1-7	S1B-F1	240 to 320	RX10
S1A and S1 to BAND 3			
P1-7	P1-10	240 to 320	RX10
P1-7	P1-5	240 to 320	RX10
P1-7	S1B-F1	240 to 320	RX10
S1A and S1B to BAND 4			
P1-7	P1-10	240 to 320	RX10
P1-7	P1-5	240 to 320	RX10
P1-7	S1B-F1	240 to 320	RX10
S1A and S1B to BAND 5			
P1-7	P1-10	240 to 320	RX10
P1-7	P1-5	240 to 320	RX10
P1-7	S1B-F1	240 to 320	RX10

18. Rf Mixer A1A1A2A1A5 Testing

a. Continuity and Resistance Test (fig. FO-9, 7-7-15). Remove the rf mixer circuit card from *the* rf tuner and make the continuity and resistance checks in table 7-21 as follows:

(1) Set the multimeter (TS-352/U) to measure resistance. Unless otherwise specified, all easurements are made on the RX1 range.

(2) Readings of less than 5 ohms are con-dered a short circuit.

(3) Reference designators listed in table 7- are abbreviated.

(4) Figure 7-15 shows the switch con-figurations for each band.

b. Functional Test.

(1) After performing the continuity and resistance test, insert ty rf mixer in the rf tuner.

(2) Align the rf tuner (para 7-13c).

(3) Test the rf tuner (para 6-17).

(4) If the requirements of para 6-17 are not satisfied, replace the rf mixer and repeat (2) and (3) above.

Table 7-21. Rf Mixer Continuity and Resistance Checks

Multimeter (+) lead	Multimeter (—) lead	Reading (ohms)	Remarks
S1A and S1B to BAND 1			
P1-6	P1-1	20 to 32	
P1-2	P1-1	5 to 11	
R4-R5 junction	P1-1	15 to 21	
P1-7	P1-10	115 to 145	
P1-7	P1-5	95 to 125	
P1-7	S1B-F1	85 to 115	
S1A and S1B to BAND 2			
P1-7	P1-10	85 to 115	
P1-7	P1-5	85 to 115	
P1-7	S1B-F1	85 to 115	

Table 7-21. Rf Mixer Continuity and Resistance Checks—Continued

Multimeter (+) lead	Multimeter (—) lead	Reading (ohms)	Remarks
S1A and S1B to BAND 3			
P1-7	P1-10	85 to 115	
P1-7	P1-5	85 to 115	
P1-7	S1B-F1	85 to 115	
S1A and S1B to BAND 4			
P1-7	P1-10	85 to 115	
P1-7	P1-5	85 to 115	
P1-7	S1B-F1	85 to 115	
S1A and S1B to BAND 5			
P1-7	P1-10	85 to 115	
P1-7	P1-5	85 to 115	
P1-7	S1B-F1	85 to 115	

7-19. Rf Local Oscillator A1A1A2A1A6 Testing

a. Continuity and Resistance Test (fig. FO-10, 7-6, 7-15). Remove the rf local oscillator circuit card from the rf tuner and make the continuity and resistance checks in table 7-22 as follows:

(1) Set the multimeter (TS-352/U) to measure resistance. Unless otherwise specified, all measurements are made on the RX1 range.

(2) Readings of less than 5 ohms are considered a short circuit.

(3) Reference designators listed in table 7-22 are abbreviated. For complete reference designation, prefix with A1A1A2A1A6.

(4) Figure 7-15 shows the switch configurations or each band.

b. Functional Test.

(1) After performing the continuity and resistance test, insert the rf local oscillator in the rf tuner.

(2) Align the rf tuner (para 7- 13c).

(3) Test the rf tuner (para 6-17).

(4) If the requirements of paragraph 6-17 are not satisfied, remove the rf local oscillator circuit card from the rf tuner, replace transistor Q1, insert the rf local oscillator in the rf tuner, replace transistor Q1, insert the rf local oscillator in the rf tuner, and repeat (2) and (3) above.

(5) If the requirements of paragraph 6-17 still are not satisfied, replace the rf local oscillator and repeat (2) and (3) above.

Table 7-22. Rf Local Oscillator Continuity and Resistance Checks

Multimeter (+) lead	Multimeter (—) lead	Reading (ohms)	Remarks
S1A and S1B to BAND 1			
P1-4	P1-1	13K to 17K	RX1000
S1B-F7	P1-1	550 to 850	RX100
L1-3	P1-4	95 to 145	
S1B-F1	P1-4	85 to 135	
S1A-F7	P1-4	85 to 115	
S1A-F2	P1-10	0	
S1A-F2	P1-4	Infinite	
S1A and S1B to BAND 2			
S1B-F7	P1-1	330 to 450	RX100
L2-3	P1-4	85 to 135	
S1B-F1	P1-4	85 to 135	
S1A-F7	P1-4	85 to 135	
S1A-F3	P1-10	0	
S1A-F3	P1-4	Infinite	
S1A and S1B to BAND 3			
S1B-F7	P1-1	230 to 310	RX100
L3-3	P1-4	85 to 135	
S1B-F1	P1-4	85 to 135	
S1A-F7	P1-4	85 to 135	
S1A-F4	P1-10	0	
S1A-F4	P1-4	Infinite	

Table 7-22. Rf Local Oscillator Continuity and Resistance Checks—Continued

Multimeter (+) lead	Multimeter (—) lead	Reading (ohms)	Remarks
S1A and S1 to BAND 4			
S1B-F7	P1-1	255 to 345	RX100
L4-3	P1-4	85 to 135	
S1B-F1	P1-4	85 to 135	
S1A-F7	P1-4	85 to 135	
S1A-F5	P1-10	0	
F1A-F5	P1-4	Infinite	
S1A and S1 to BAND 5			
S1B-F7	P1-1	365 to 495	RX100
L5-3	P1-4	85 to 135	
S1B-F1	P1-4	85 to 135	
S1A-F7	P1-4	85 to 135	
S1A-F6	P1-10	0	
S1A-F6	P1-4	Infinite	

7-20. If. Amplifier Assembly A1A1A3 Testing

a. Electrical Tests. Refer to paragraph 6-18 for assembly testing.

b. Alignment.

(1) Perform the preliminary test procedure of paragraph 6-18A.

(2) Adjust the signal generator for a cw output at 455 kHz ±1 kHz and a sufficient level for an indication on the electronic voltmeter.

(3) Adjust potentiometer R8 (fig. FO-22) for maximum indication on the electronic voltmeter, fully counterclockwise.

NOTE

Final adjustment of potentiometer R8 is accomplished in the radio assembly adjustments (para 6-14).

(4) Adjust coils L3 and L4 (fig. FO-22) for a peak indication on the electronic voltmeter. Adjust the signal generator level as necessary to avoid limiting.

c. Voltage Measurements (fig. FO-11, 7-7).

(1) *Preliminary.*

(a) Remove the if. amplifier assembly from the receiver (para *6-6b).*

(b) Remove the cover from the if. amplifier assembly (para 7-6f).

(c) Install the if. amplifier assembly, less cover, in the receiver (para 6-9a).

(d) Perform the preliminary test procedure of paragraph 6-18a.

(2) *Quiescent voltages.* With no input signal, and the front panel rf gaib control fully clockwise (no AVC), perkim the dc voltage measurements listed in table 7-23 as follows:

(a) Connect the digital voltmeter (AN/GSM-64) between the if. amplifier chassis and the indicated test points. The digital voltmeter should indicate within the limits listed in table 7-23.

(b) Voltage measurements of less than 0.1 volt are considered the same as zero.

(c) Reference designators shown in table 7-23 are abbreviated. For complete reference designation, prefix with A1A1A3.

(3) *Dynamic voltages.*

(a) Adjust potentiometer R8 for maximum output, fully counterclockwise.

(b) Perform the measurements listed in table 7-24 under the test conditions listed as follows:

1. Use the electronic voltmeter (AN/URM-145) with the high impedance adapter for ac voltage measurements and the digital voltmeter (AN/GSM-64) for dc voltage measurements.

2. All voltages are measured with respect to chassis common.

3. The signal generator frequency shall be 455 kHz ±1 kHz, with no modulation.

4. Reference designators used in table 7-24 are abbreviated. For complete reference designation, prefix with A1A1A3.

(c) Remove the if. amplifier assembly from the receiver (para *6-6b).*

(d) Replace the cover on the if. amplifier assembly (para 7-9d).

Table 7-23. If. Amplifier Quiescent Voltages

Device	Terminal	Dc Volts
U1	1	2.45 — 3.67
	2	1.63 — 2.73
	3	0 — 0.6
	4	0
	5	2.73 — 4.55
	6	11.0 — 11.4
	7	0
	8	3.8 — 7.0
	9	11.0 — 11.4
	10	3.6 — 6.8
U2	1	2.45 — 3.67
	2	1.63 — 2.73
	3	0 — 0.6
	4	0
	5	2.73 — 4.55
	6	11.0 — 11.4
	7	0
	8	3.8 — 7.0
	9	11.0 — 11.4
	10	3.6 — 6.8
Q1	Emitter	2.67 — 4.44
	Base	3.13 — 5.22
	Collector (same as TP2)	2.73 — 4.55

Table 7-24. If. Amplifier Dynamic Voltages

Test point	Indication	Test conditions
P3-M		
P3-P	11.0 — 11.4 vdc	All
P3-R	5.4 — 8.6 vdc	RF gain clockwise (no AVC)
P3-R	0.2 vdc max.	RF gain counterclockwise
TP2	1.0 — 5.0 vdc	RF gain clockwise (no AVC)
TP2	6.0 — 9.0 vdc	RF gain counterclockwise
TP3	170 — 500 mvac	RF gain clockwise (no AVC) TP1 = 0.5 mv, 455 kHz
TP3	7 mvac max.	RF gain counterclockwise TP1 = 0.5 mv, 455 kHz
C8, C9 junction	3.0 — 7.0 mvac	RF gain clockwise (no AVC) TP1 = 0.5 mv, 455 kHz
U1 pin 1	20 — 40 mvac	TP1 = 20 mv, 455 kHz

7-21. Dectector Assembly A1A1A4 Testing

a. Electrical Tests. Refer to paragraph 6-19 for assembly testing.

b. Alignment.

(1) Perform the preliminary test procedure of paragraph 6-19a.

(2) Adjust the signal generator for a 30 percent modulated output at 455 kHz ±1 kHz, and sufficient level for an indication on the electronic voltmeter.

(3) Adjust coil L4 (fig. FO-22) for a peak indication on the electronic voltmeter. Adjust the signal generator level as necessary to avoid limiting.

(4) Connect the electronic counter to test point A1A1A4TP3.

(5) Adjust capacitor C41 to meet the following frequency requirements:

Function	*Frequency (kHz)*
LSB	453.253 to 453.346
USB	456.653 to 456.746
CAL	454.954 to 455.046

NOTE

Adjustment of potentiometer R2 is accomplished in the radio assembly adjustments (para 6-14).

c. Voltage Measurements (fig. FO-12, 7-8).

(1) *Preliminary.*

(a) Remove the detector assembly from the receiver (para *6-6b).*

(b) Remove the cover from the detector assembly (para 7-6g).

(c) Install the detector assembly, less cover, in the receiver (para 6-9a).

(d) Perform the preliminary test procedure of paragraph 6-19a.

(2) *Quiescent voltages.* With no input signal, the VOL control fully clockwise, and the rf gain control set at AVC, perform the dc voltage measurements listed in table 7-25 as follows:

(a) Connect the digital voltmeter (AN/GSM-64) between the detector chassis and the indicated test points. The digital voltmeter should indicate within the limits listed in table 7-25.

(b) Voltage measurements of less than 0.1 volt are considered the same as zero.

(c) Reference designators shown in table 7-25 are abbreviated. For complete reference designation, prefix with A1A1A4.

(3) *Dynamic voltages.*

(a) Perform the measurements listed in table 7-26 under the test conditions listed as follows:

1. Use the electronic voltmeter (ME-30E/U) for all ac voltage measurements, the digital voltmeter (AN/GSM-164) for dc voltage measurements, and the electronic counter (AN/USM-207A) for frequency measurements.

2. All measurements are made with respect to chassis common.

3. The signal generator frequency shall be 455 kHz ±1 kHz and the level shall be 5.0 millivolts, as measured at test point TP1, for all modes.

4. When the control panel FUNCTION switch is in the am. mode, the signal generator output shall be modulated 30 percent with 1 kHz.

5. When the control panel FUNCTION switch is in the LSB, USB, or CAL modes, the signal generator output shall have no modulation.

6. Reference designators used in table 7-26 are abbreviated. For complete reference designation, prefix with A1A1A4.

(b) Remove the detector assembly from the receiver (para 6-6b).

(c) Replace the cover on the detector assembly (para 7-9c).

Table 7-25. Detector Quiescent Voltages

Device	Terminal	Dc Volts	
FUNCTION switch to AM			
U1	1	2.5 — 3.8	Same as TP1
	2	1.8 — 2.8	
	3	0.6 max.	
	4	0	
	5	0	
	6	11.0 — 11.4	
	7	0	
	8	4.0 — 6.0	
	9	11.0 — 11.4	
	10	3.6 — 6.8	
U2	1	0.3 — 1.0	
	2	1.0 — 1.6	
	3	11.0 — 11.4	
	5		
	7	1.1 — 1.7	
	8	1.1 — 1.7	
	9	0.3 — 1.0	
	10	4.5 — 6.7	
	13	6.2 — 9.4	Same as TP7
	14	0.6 — 1.1	
	15	4.0 — 6.0	
	16	11.0 — 11.4	
	4,6,11,12		Not used
FUNCTION switch to LSB			
U3	1	4.3 — 6.5	
	2	1.4 — 2.3	
	3	0	
	4		Not used
	5	4.3 — 6.5	
	6	5.3 — 8.0	
	7	4.4 — 6.6	
	8	11.0 — 11.4	
Q1	Emitter	0.1 — 0.5	
	Base	0.7 — 1.1	

Table 7-25. Detector Quiescent Voltages—Continued

Device	Terminal	Dc Volts	Remarks
Q2	Collector	0.3 — 0.8	
	Emitter	1.1 — 2.56	
	Base	1.5 — 3.44	
	Collector	11.0 — 11.4	

Table 7-26. Detector Dynamic Voltages

Test point	Indication	Remarks
	FUNCTION switch to LSB	
TP2	125 — 400 mvac	
	FUNCTION switch to AM	
TP5	—2 vdc min	
P2-F	0.4 — 0.8 vac	
TP4	14 — 26 mvac	
TP7	6.2 — 9.4 vdc	
	FUNCTION switch to LSB	
TP3	1.0 — 2.0 vac	
TP3	453.253 — 453.346 kHz	
	FUNCTION switch to USB	
TP3	1.0 — 2.0 vac	
TP3	456.653 — 456.746 kHz	
	FUNCTION switch to CAL	
TP3	1.0 — 2.0 vac	
TP3	454.954 — 455.046 kHz	

7-22. Power Supply Assembly A1A1A5 Testing

a. Electrical Tests. Refer to paragraph 6-20 for assembly testing.

b. Alignment. Refer to paragraph 6-20e for adjustment of the power supply assembly.

c. *Voltage Measurements* (fig. 7-9, 7-10, FO-13).

(1) *Preliminary.*

(a) Perform the preliminary test setup per paragraph 6-12.

(b) Remove the four screws that secure the power supply assembly to the chassis.

(c) Disconnect power supply circuit card A1A1A5A1 from the connector but leave regulator circuit card A1A1A5A2 installed with the transistor in the heatsink.

(d) Use extender cable SM-D-747270 to connect the power supply circuit card to the radio chassis connector as shown in figure 7-16.

(e) Connect the equipment as shown in figure 7-16.

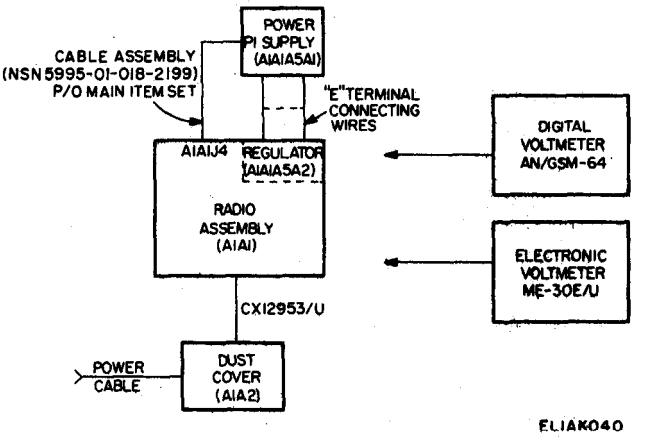


Figure 7-16. Power supply test connections.

(f) Set the receiver front panel controls as follows:

Control	*Setting*
RF gain	Clockwise (no AVC)
VOL	Clockwise
LITE	OFF
FUNCTION	AM

(2) *115 vac 60 Hz voltage tests.* Perform the voltage measurements listed in table 7-27 as follows:

(a) Use the digital voltmeter (AN/GSM-64) for all dc voltage measurements.

(b) All dc voltages are measured with respect to chassis common.

(c) Use the electronic voltmeter (ME-30E/U) for all ac voltage measurements. Be sure that the voltmeter case is not grounded when making measurements.

(d) Voltage measurements of less than 0.1 volts are considered the same as 0 volts.

(e) Reference designators shown in table 7-27 are abbreviated. For complete reference designation, prefix with A1A1A5A1 for the power supply circuit card or A1A1A5A2 for the regulator circuit card.

(f) Use power cable CX-10956/U connected to a nominal 115-volt ac, 60-Hz power source for the tests in table 7-27.

Table 7-27. Power Supply AC Voltage Measurements

Test point		Remarks
P1-A to P1-P	26 — 40 vac	
TP1	30 — 50 vdc	
TP2	16.6 — 19.6 vdc	Same as Q1 base
TP3	16.0 — 19.0 vdc	Same as Q1 emitter
TP4	11.0 — 11.4 vdc	Same as U1-5
E1	0	
E2	30 — 50 vdc	Same as TP1
E3	16.0 — 19.0 vdc	Same as TP3
E4	16.6 — 19.6 vdc	Same as TP2
E5	11.0 — 11.4 vdc	Same as U1-6 and U1-9
E6	3.2 — 4.0 vdc	Same as U1-8
E7	10.5 — 12.8 vdc	Same as U1-1 and Q2 base
E8	11.0 — 11.4 vdc	Same as TP4, U1-5, Q2 emitter
E9	16.0 — 19.0 vdc	Same as TP3, U1-3
U1-2	0	
U1-4	11.7 — 14.4 vdc	Same as Q2 collector
U1-7	11.0 — 11.4 vdc	
Q1 collector	29.4 — 49.4 vdc	

(3) *Vehicular power voltage tests.* Perform the voltage measurements listed in table 7-28 for the same conditions listed in (2) above, except use a nominal 24-volt cd vehicular power source. Use power cable CX-10958/U.

7-23. Audio Amplifier Assembly A1A1A6 Testing

a. Electrical Tests. Refer to paragraph 6-21 for assembly testing.

b. Voltage Measurements (fig. 7-11, FO-14).

(1) *Preliminary.*

(a) Remove the audio amplifier assembly from the receiver (para 6-6b).

(b) Remove the cover from the audio amplifier assembly (para 7-6i).

(c) Install the audio amplifier assembly, less cover, in the receiver (para 6-9a).

(d) Perform the preliminary test procedure of para 6-21a.

(2) *Quiescent voltages.* With no input signal, perform the dc voltage measurements listed in table 7-29 as follows:

(a) Connect the digital voltmeter (AN/GSM-64) between the audio amplifier chassis and the indicated test points. The digitaI voltmeter should indicate within the limits listed in table 7-29.

(b) Voltage measurements of less than 0.1 volt are considered the same as zero.

(c) Reference designators shown in table 7-29 are abbreviated. For complete reference designation, prefix with A1A1A4.

Table 7-28. Power Supply Dc Voltage Measurements

Test point	Indication	Remarks
P1-K	22 — 32 vdc	
TP1	20 — 32 vdc	
TP2	16.6 — 19.6 vdc	Same as Q1 base
TP3	16.0 — 19.0 vdc	Same as Q1 emitter
TP4	11.0 — 11.4 vdc	Same as U1-5
E1	0	
E2	20 — 32 vdc	Same as TP1
E3	16.0 — 19.0 vdc	Same as TP3
E4	16.6 — 19.6 vdc	Same as TP2
E5	11.0 — 11.4 vdc	Same as U1-6 and U1-9
E6	3.2 — 4.0 vdc	Same as U1-8
E7	10.5 — 12.8 vdc	Same as U1-1 and Q2 base
E8	11.0 — 11.4 vdc	Same as TP4, U1-5, and Q2 emitter
E9	16.0 — 19.0 vdc	Same as TP3 and U1-3
U1-2	0	
U1-4	11.7 — 14.4 vdc	Same as Q2 collector
U1-7	11.0 — 11.4 vdc	
Q1 collector	19.8 — 31.4 vdc	

Table 7-29. Audio Amplifier Voltage Measurements

Device	Terminal	Dc volts	Remarks
U1	1		Not used
	2	7.0 — 9.5	
	3	7.0 — 9.5	
	4	0	
	5		Not used
	6	8.0 — 10.5	
	7	14.0 — 19.0	
	8		Not used

(3) *Dynamic voltages.*

(a) Perform the measurements of paragraph 6-21b, except measure the audio oscillator level at test point TPI and the audio output at test point TP2.

(b) Remove the audio amplifier assembly from the receiver (para *6-6b).*

(c) Install the cover on the audio amplifier assembly (para *7-9a).*

7-24. Calibration Oscillator A1A1A7 Testing

a. Electrical Tests (fig. FO-15, 7-12). Refer to paragraph 6-22 for testing.

b. Alignment.

(1) Perform the preliminary test procedure of paragraph *6-22a.*

(2) With the BAND switch set at 5, adjust capacitor C1 for an indication of 499,990 kHz to 500,010 kHz on the electronic counter.

c. Voltage Measurements.

(1) Perform the preliminary test procedure of paragraph 6-22a.

(2) Perform the measurements listed in table 7-30 under the test conditions listed as follows:

(a) Use the electronic voltmeter (ME-30E/U) for all ac voltage measurements, the digital voltmeter (AN/GSM-64) for dc voltage measurements, and the electronic counter (AN/USM-207A) for frequency measurements.

(b) All measurements are made with respect to chassis common.

(c) Reference designators used in table 7-30 are abbreviated. For complete reference designation, prefix with A1A1A7.

Table 7-30. Calibration Oscillator Voltage Measurements

Test point	*Indication*
BAND switch to 1, 2, and 3.	
TP1	14 — 19 vdc
TP3	4.6 — 5.6 vdc
TP2	12 — 17 vdc
TP4	1.0 vdc max.
TP5	0.7 — 1.0 vac
TP5	499,990 — 500,010 Hz
TP6	0.7 — 1.0 vac
TP7	1.0 — 1.6 vac
TP7	99,998 — 100,002 Hz
BAND switch to 4 and 5.	
TP2	0.6 vdc max.
TP4	4.6 — 5.6 vdc
TP7	1.0 — 1.6 vac
TP7	499,990 — 500,010 Hz

APPENDIX A

REFERENCES

DA Pam 310-1	Consolidated Index of Army Publications and Blank Forms.
SB 11-573	Painting and Preservation of Supplies Available for Electronics Command Equipment.
TB 43-0118	Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electrical Equipment Shelters.
TM 11-5820-641-24P	Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tools Lists: (Including Depot Maintenance Repair Parts and Special Tools) for Receiving Set, Radio AN/URR-70 (NSN 5820-00-013-8911).
TM 11-5820-807-14&P	Operator's, Organizational, Direct Support, and General Support Maintenance Manual Including Repair Parts and Special Tools Lists: Accessory Kit MK-1517/UR (NSN 5820-00-001-9328).
TM 11-6625-320-12	Operator's 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 (NSN 6625-00-553-0142).
TM 11-6625-444-15	Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual: Digital Voltmeter AN/GSM-64.
TM 11-6625-508-10	Operator's Manual: Signal Generator AN/USM-44 and AN/USM-44A.
TM 11-6625-524-14-2	Operator's, Organizational, Direct Support, and General Support Maintenance Manual: Voltmeter, Electronic AN/URM-145B (NSN 6625-00-437-4865).
TM 11-6625-700-1Q	Operator's Manual: Digital Readout, Electronic Counter AN/USM-207 (NSN 6625-00-911-6368).
TM 11-6625-1703-15	Operator's, Organizational, DS, GS and Depot Maintenance Manual: Oscilloscope AN/USM-281A (NSN 6625-00-228-2201).
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 740-90-1	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

The appendix provides a summary of the maintenance operations for AN/URR-70. 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 compare those characteristics with prescribed standards.

c. Service. Operations required peridically 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 known 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, remaching, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), 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 "work time" 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 [redacted] maintenance functions vary at different maintenance categories, appropriate "work time" figures will be shown for each category.

The number of task-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, module, end time 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	H - General Support
O - Organizational	D - Depot
F - Direct Support	

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, tests, and support equipment required to perform the designated function.

f. Column 6, *Remarks.* Column 6 contains an alphabetic code which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

C-4. Tool and Test Equipment Requirements (Sec. III)

a. Tool or Test Equipment Reference Code. The number 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 function.

b. Maintenance Category. The code 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 of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

C-5. Remarks (Sec. IV)

a. Reference Code. This code refers to the appropriate item in Section II, column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in section II.

SECTION II MAINTENANCE ALLOCATION CHART
FOR

RECEIVING SET, RADIO AN/URR-70

(1) GROUP NUMBER	(2) COM PONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
00	RECEIVING SET, RADIO AN/URR-70	Inspect	0.3						
		Test		0.5				6,12	1
		Replace		0.5				6,12	1
		Repair				2.0			
		Overhaul					20.0		
01	RECEIVER, RADIO R-1218/UR	Inspect	0.3						
	A1	Test		0.5				6,12	1
		Replace		0.5				6,12	1
		Repair				2.0		1-16	
0101	RADIO ASSEMBLY	Test		0.5				12	1
	A1A1	Adjust			0.5			6, 13	
		Repair			1.0			1-16	
010101	FRONT PANEL ASSEMBLY	Test			0.5				
	A1A1A1	Repair			1.0			6, 13	
		Repair				3.0		6, 13	2
		Replace			3.0			6, 13	
010102	RF TUNNER & DIAL ASSEMBLY	Test			0.5			13	
	A1A1A2	Align			1.0			13	
		Align					5.0	6, 10, 13	3
		Repair				2.0		6,13	
		Replace			3.0			6, 13	
01010201	RF TUNNER ASSEMBLY	Repair				3.0		13	
	A1A1A2A1	Replace				3.0		13	
01010201 01	TUNER SUBASSEMBLY A1A1A2A1A1	Repair				2.0		13	
01010201 011	MOTHERBOARD CIRCUIT CARD A1A1A2A1A1A1	Test				1.0		6, 13	
		Replace				3.0		6, 13, 14	
		Repair				2.0		6, 13	4
01010201 012	RF PRESELECTOR CIRCUIT CARD ASSEMBLY A1A1A2A1A1A2	Test				0.5		1-15	
		Replace				0.5		6, 13, 14	
		Repair				2.0		6, 13	4
01010201 013	FIRST RF AMPLIFIER CIRCUIT CARD ASSEMBLY A1A1A2A1A1A2	Test				0.5		1-16	
		Replace				0.5		6, 13, 14	
		Repair				2.0		6, 13	4
010102 01014	SECOND RF AMPLIFIER CIRCUIT CARD ASSEMBLY A1A1A2A1A1A1A4	Test				0.5		1-16	
		Replace				0.5		6, 13, 14	
		Repair				2.0		6, 13	4
0101020 1015	RF MIXER CIRCUIT CARD ASSEMBLY A1A1A2A1A1A5	Test				0.5		1-16	
		Replace				0.5		6, 13, 14	
		Repair				2.0		6, 13	4
0101020 1016	RF LOCAL OSCILLATOR CIRCUIT CARD ASSEMBLY A1A1A2A1A1A6	Test				0.5		1-16	
		Replace				0.5		6, 13, 14	
		Repair				2.0		6, 13	4
010103	IF AMPLIFIER ASSEMBLY	Test			0.5			1, 16	
	A1A1A3	Align				1.0		1-11, 13	
		Repair				2.0		1-11, 13	4
010103 01	IF AMPLIFIER CIRCUIT CARD ASSEMBLY A1A1A3A1	Test			0.5			1-16	
		Replace			1.0			6, 13	
		Repair				2.0		6, 13, 14	4
010104	DETECTOR ASSEMBLY	Test			0.5			1-16	
	A1A1A4	Align				1.0		1-11, 13	
		Repair				2.0		1-11, 13	4
010104 01	DETECTOR CIRCUIT CARD ASSEMBLY A1A1A4A1	Test			0.5			1-16	
		Replace			1.0			6, 13, 14	
		Repair				2.0		6, 13, 14	4
010105	POWER SUPPLY ASSEMBLY	Test			0.5			3,4,6,7,13	
	A1A1A5	Adjust			0.5			3,4,6,7,13	
		Replace			1.0			6, 13	
		Repair				2.0		3,4,6,7,13	

SECTION II MAINTENANCE ALLOCATION CHART
FOR

RECEIVING SET, RADIO AN/URR-70

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQPT.	(6) REMARKS
)10105)1	POWER SUPPLY CIRCUIT CARD ASSEMBLY A1A1A5A1	Test Adjust Replace Repair			0.5 0.5 1.0	 2.0		3,4,6,7,13 3,4,6,7,13 6, 13 3,4,6,7,13	
)10105)2	REGULATOR CIRCUIT CARD ASSEMBLY A1A1A5A2	Test Adjust Replace Repair			0.5 0.5 1.0	 2.0		3,4,6,7,13 3,4,6,7,13 6, 13 3,4,6,7,13	
)10106	AUDIO AMPLIFIER ASSEMBLY A1A1A6	Test Repair			0.5	 2.0		1-16 1,3,4,6,13	 4
)10106)1	AUDIO AMPLIFIER CIRCUIT CARD ASSEMBLY A1A1A6A1	Test Replace Repair			0.5 1.0	 2.0		1-16 6, 13 1,3,4,6,13	 4
)10107	CALIBRATION OSCILLATOR CIRCUIT CARD ASSEMBLY A1A1A7	Test Replace Repair Align			0.5 0.5 0.5	 2.0 		1-16 6, 13 1,2,5,6,13 1,2,5,6,13	 4 4
)102	DUST COVER ASSEMBLY	Inspect Test Replace Repair			 0.5 0.5	 1.0		 13 13 6, 12	
)10201	COVER ASSEMBLY (BATTERY) A1A2A1	Test Replace						6, 12	
)2	ANTENNA AS-2887/UR A2	Inspect Test Replace Repair		 0.5 	 0.5 1.0	 		 6, 13 13 13	
)3	FIELD PACK, CANVAS CW-1005/UR	Inspect Replace		 0.5					

SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
RECEIVING SET, RADIO AN/URR-70

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	F, H, D	OSCILLOSCOPE AN/USM-281C	6625-00-106-9622	
2	F, H, D	SIGNAL GENERATOR AN/ GRM-50C	6625-00-003-3238	
3	F, H, D	VOLTMETER, ELECTRONIC ME-30 F/U	6625-00-420-9354	
4	F, H, D	DIGITAL VOLTMETER AN/GSM-64B	6625-00-022-7844	
5	F, H, D	COUNTER , ELECTRONIC DI GITAL READOUT AN/ US M-207A	6625-00-044-3228	
6	O, F, H, D	MULTI METER TS-352B/U	6625-00-553-0142	
7	F, H, D	ELECTRONIC VOLTMETER AN/URM-145	6625-00-973-3986	
8	F, H, D	ATTENUATOR 20db (NARDA 771-20)		
9	F, H, D	FET PROBE (TEKTRONIX P6045)	6625-01-037-9447	
10	D	IMPEDANCE BRIDGE ZM-71/U	6625-00-236-1536	
11	H, D	AMPLIFIER AF, RF, AM-4825/U	6625-00-982-2977	
12	O	TOOL KIT, ELECTRONIC EQUIPMENT TK-101/G	5180-00-654-5178	
13	F, H, D	TOOL KIT, ELECTRONIC EQUIPMENT TK-105/G	5180-00-610-8177	
14	H, D	REPAIR KIT, PRINTED WIRING BOARD	5999-00-757-7042	
15	F, H, D	MAINTENANCE ITEM SET SM-B-747494 (80063)	5820-01-018-2138	
16	F, H, D	ACCESSORY ITEMS REQUIRED TO PERFORM TEST AND REPAIR ARE LISTED BELOW :		
		ADAPTER CONNECTOR UG-201A/U	5935-00-842-9614	
		ADAPTER CONNECTOR UG-274B/U (2 EACH)	5935-00-683-7892	
		ADAPTER CONNECTOR UG-349A/U (2 EACH)	5935-00-204-8392	
		ADAPTER CONNECTOR UG-491B/U	5935-00-681-5013	
		ADAPTER CONNECTOR UG-914/U	5935 -00-280-1454	
		ADAPTER CONNECTOR (2 EACH) SELECTR SC51-073-0000		
		ADAPTER CONNECTOR AMPHENOL 7967S	5935-00-701-2215	
		ADAPTER CONNECTOR SM-C-747202		
		CAPACITOR, FI XED GLASS 10PF ±5%(CY10C100J)	5910-00-840-0148	
		CAPACITOR, FIXED GLASS 330PF ±5%(CY15C331J)	5910-00-581-2580	
		CAPACITOR, FIXED, GLASS 0.1 uF ±5%		
		CONNECTOR, PWO, ELECTRICAL UG-88G/U (4 EACH)	5935-00-835-0503	
		CONNECTOR, PWO ELECTRICAL UG-1094/U (4 EACH)	5935-00-665-5718	
		INDUCTOR, 1uh ± 5% (2 EACH) (MS-18130-8)	5950-00-734-3940	
		RESISTOR, FIXED, COMPOSITION 51 ohm ±5% 1/4w (RC07GF310J)	5905-00-106-1249	
		RESISTOR, FIXED, COMPOSITION 620 ohm ± 5% 1/4w (RC07GF621J)	5905-00-801-5998	
		RESISTOR, FIXED, COMPOSITION 3K ± 5% 1/4w (RC07GF302J)	5905-00-131-9729	
		RESISTOR, FIXED, COMPOSITION 51k ± 5% 1/4w (RC07GF513JS)	5905-00-136-3890	

SECTION IV. REMARKS

RECEIVING SET, RADIO AN/URR-70

REFERENCE CODE	REMARKS
1	Denotes a combined effort by operator/crew and organizational technicians, initial test and replacement is performed by the organizational technician.
2	Repair of front panel assembly at direct support maintenance is limited to that which does not require soldering.
3	When realignment and dial scale calibration is required, the set should be returned to depot.
4	Repairs at General (H) level will be performed at a designated Specialized Repair Activity (SRA) particularly those repairs pertaining to Printed Circuit cards and Conformally Coated Boards; namely Preselector, First RF and Second RF Amplifier, IF Amplifier, Detector, Calibration Oscillator and Audio Amplifier PCBs.

INDEX

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

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Commander
Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703

DATE 10 July 1975

PUBLICATION NUMBER	DATE	TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PPC-76

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

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE:
SSG I. M. DeSpiritof 999-1776	SSG I. M. DeSpiritof

DA FORM 1 AUG 74 2028-2 (TEST)

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HISA 1686-75

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USARMIS (1)
Instls (2) except
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Ft Huachuca (10)
Ft Carson (5)
Ft Richardson (ECOM Ofc) (2)
LBAD (14)
SAAD (30)
TOAD (14)
SHAD (3)
Ft Gillem (10)
Sig FLDMS (1)
USAERDAA (1)
USAERDAW (1)
Units org under fol TOE:
(1 copy each unit)
11-500 (AA-AC)
29-134
29-136

NG: None

USAR: None

For explanation of abbreviations used, see AR 310-50.

☆ U.S. GOVERNMENT PRINTING OFFICE : 1986 O—491-421 (40764)

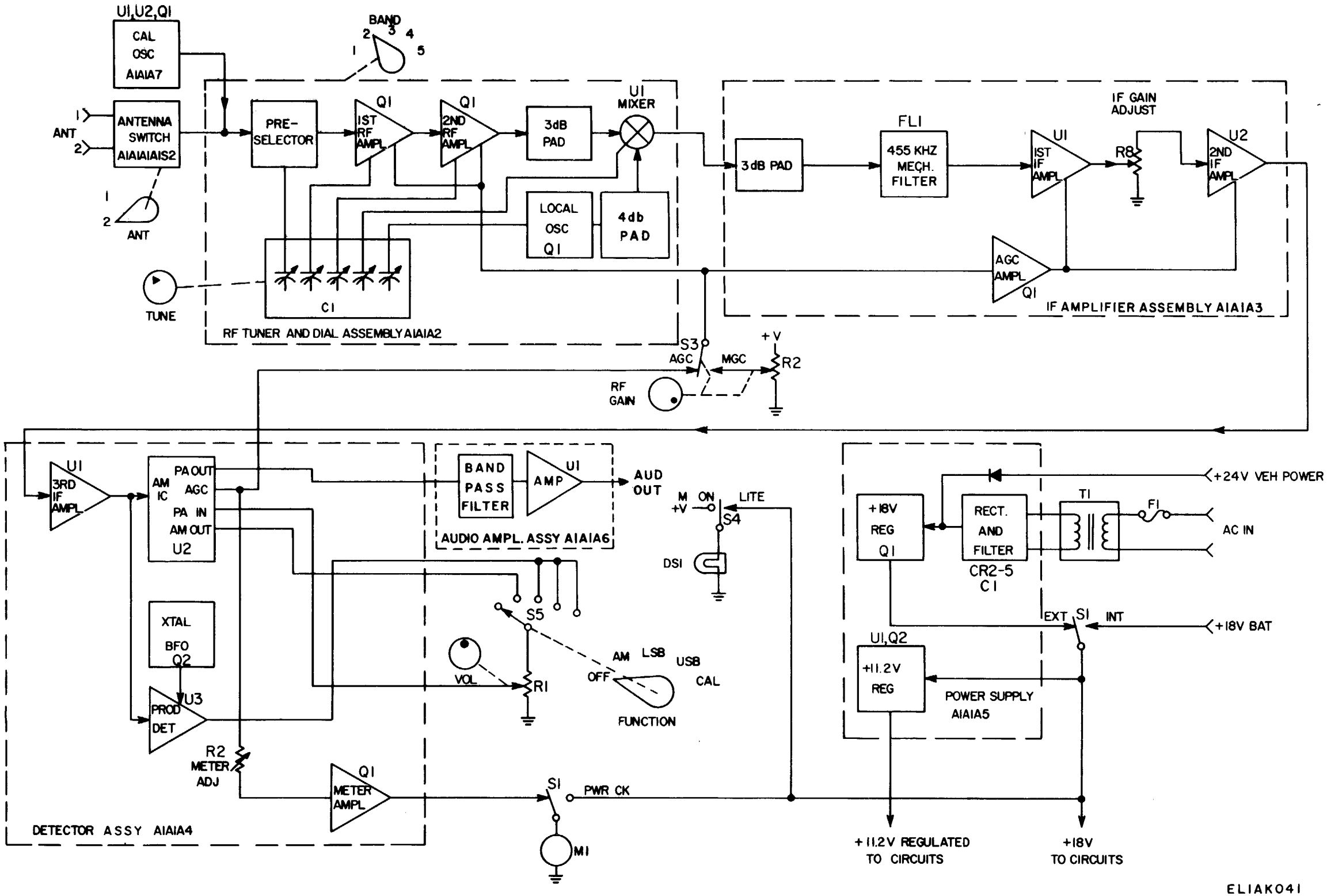


Figure FO-1. AN/URR-70, block diagram.

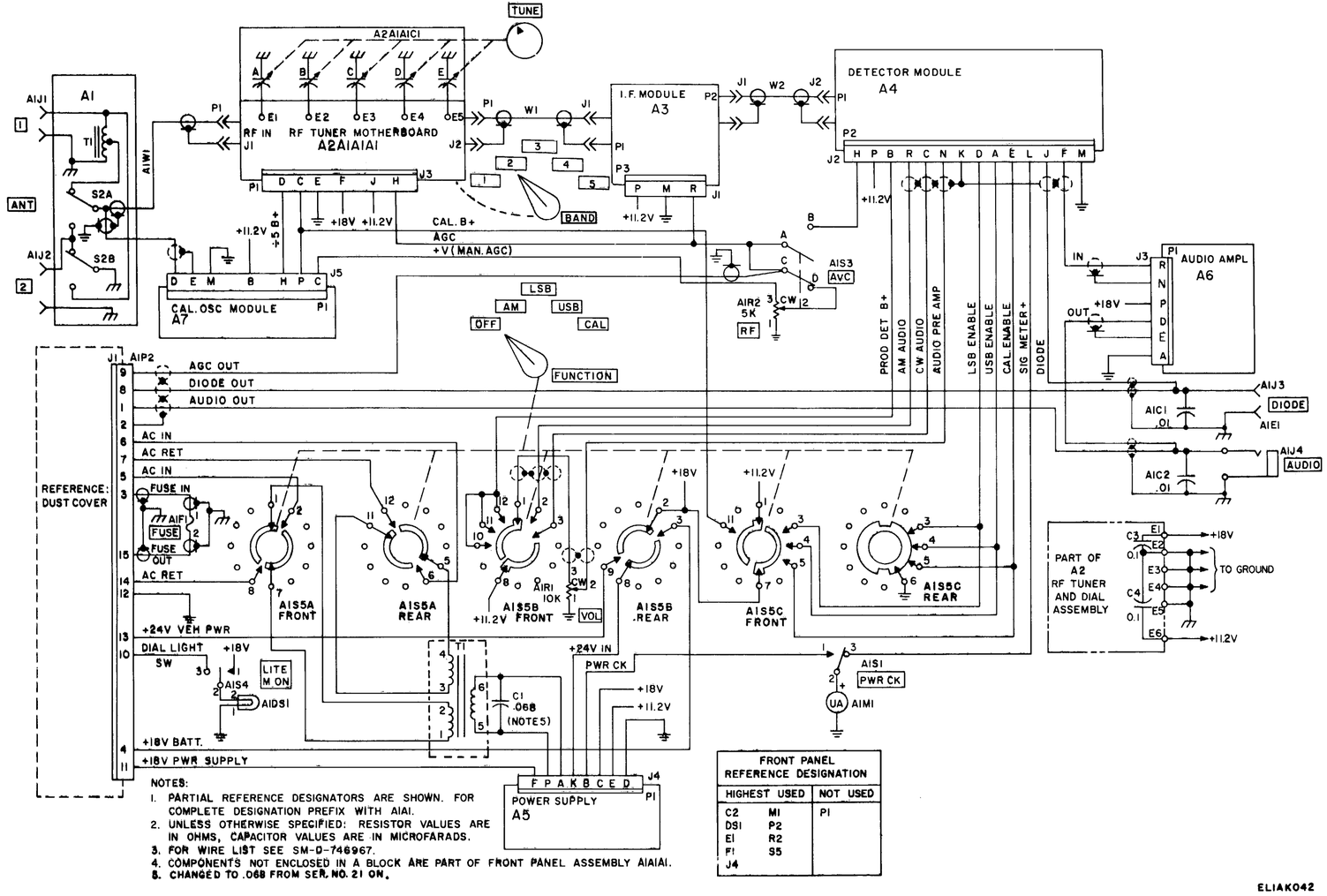
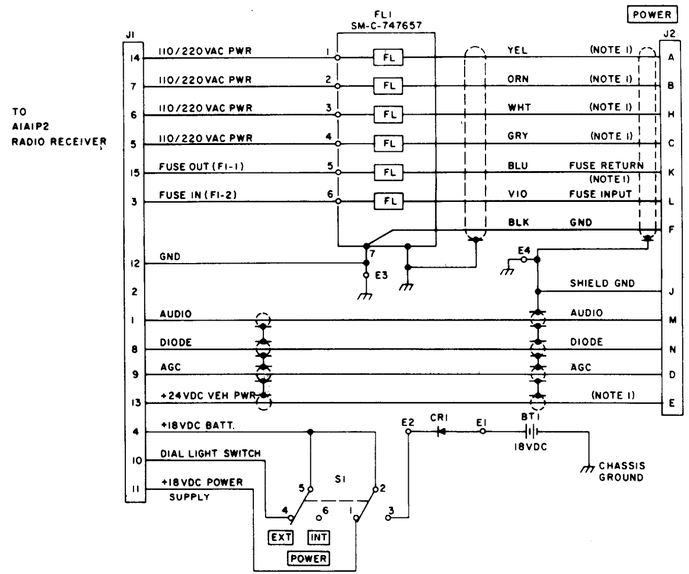


Figure FO-2. AN/URR-70, schematic diagram.



REFERENCE DESIGNATION	
HIGHEST USED	NOT USED
F1 CR1 E4 S1 BT1 J2	

NOTES:

1. WHEN EXTERNAL POWER IS APPLIED, THE FOLLOWING CONNECTIONS ARE PROVIDED BY THE APPLICABLE MX-1517/UR CABLES.

   110 VAC OPERATION:

   SHORT PIN C TO H AND SHORT PINS A AND B TO PIN K. APPLY 110 VAC (HOT) TO PIN L AND 110 VAC (NEUTRAL) TO PIN C AND GROUND TO PIN F.

   220 VAC OPERATION:

   SHORT PIN C TO B AND SHORT PIN A TO K. APPLY 220 VAC (HOT) TO PIN L AND 220 VAC (NEUTRAL) TO PIN H AND GROUND TO PIN F.

   24 VDC VEHICULAR OPERATION:

   SHORT PIN K TO E. APPLY +24 VDC TO PIN L AND THE 24 VDC RETURN TO PIN F.

2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH A1A2.

ELTAK043

Figure FO-3. Dust cover, schematic diagram.

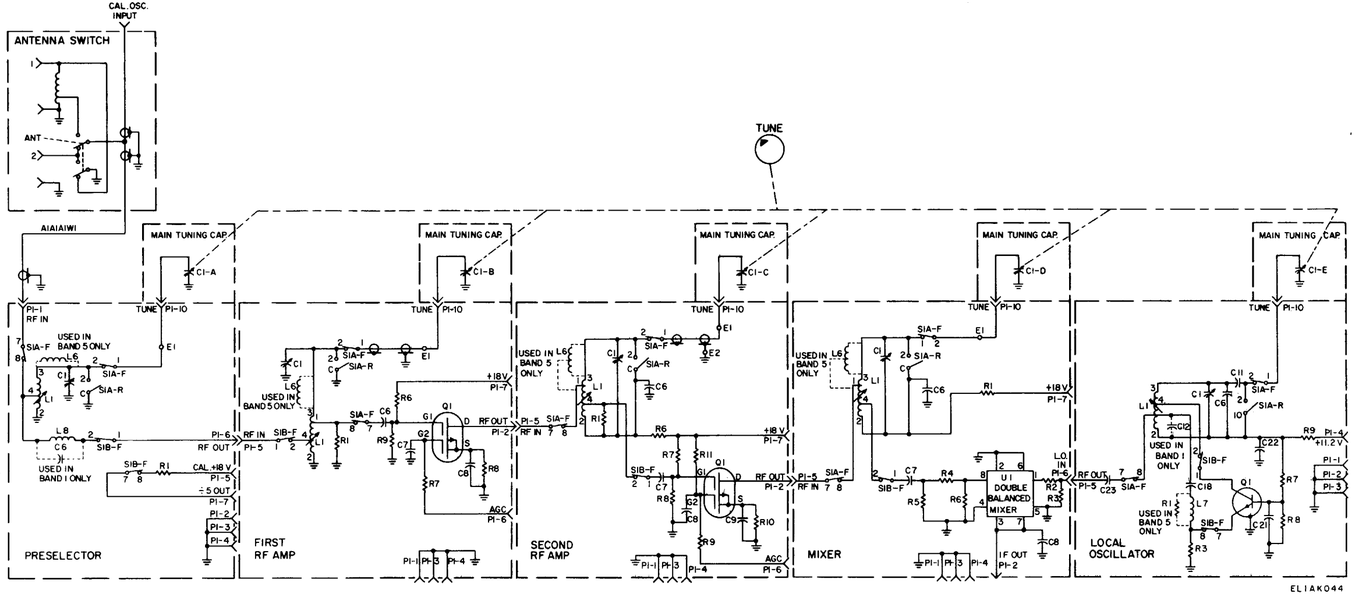
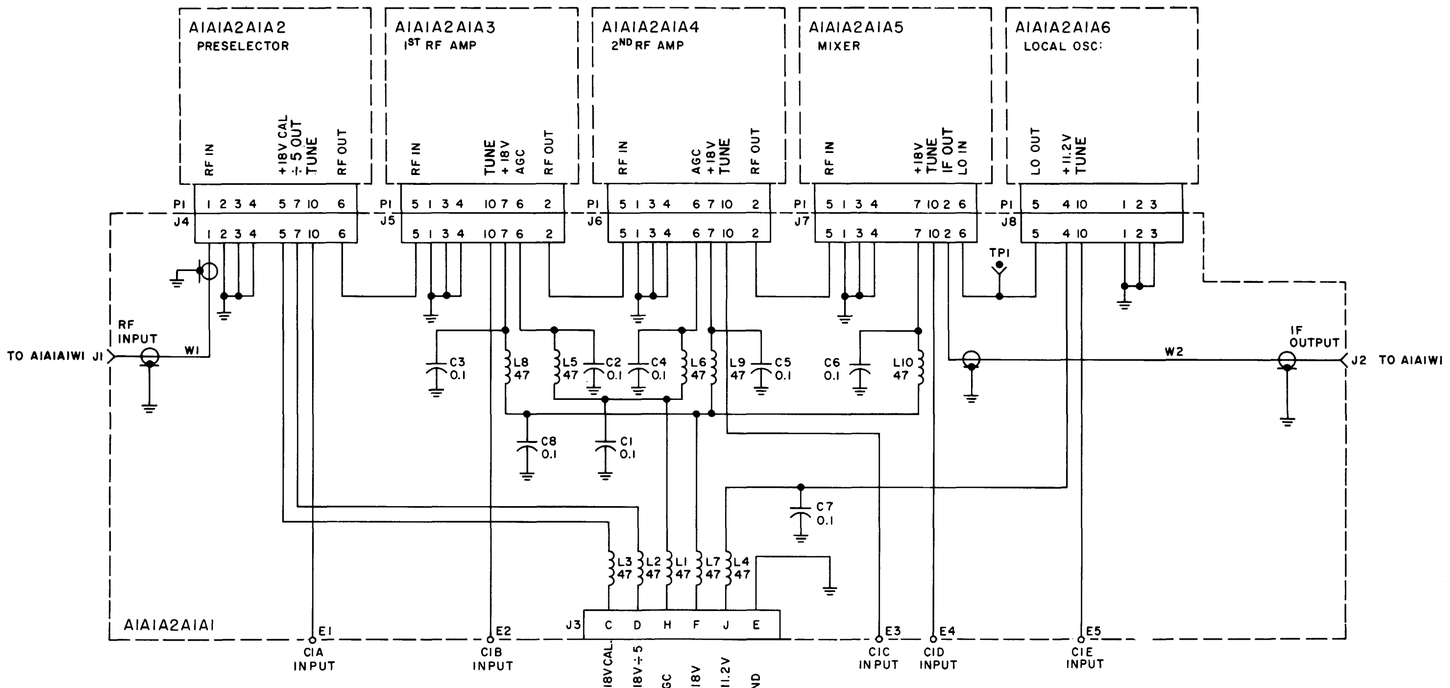


Figure FO-4. Rf tuner, simplifier schematic diagram.



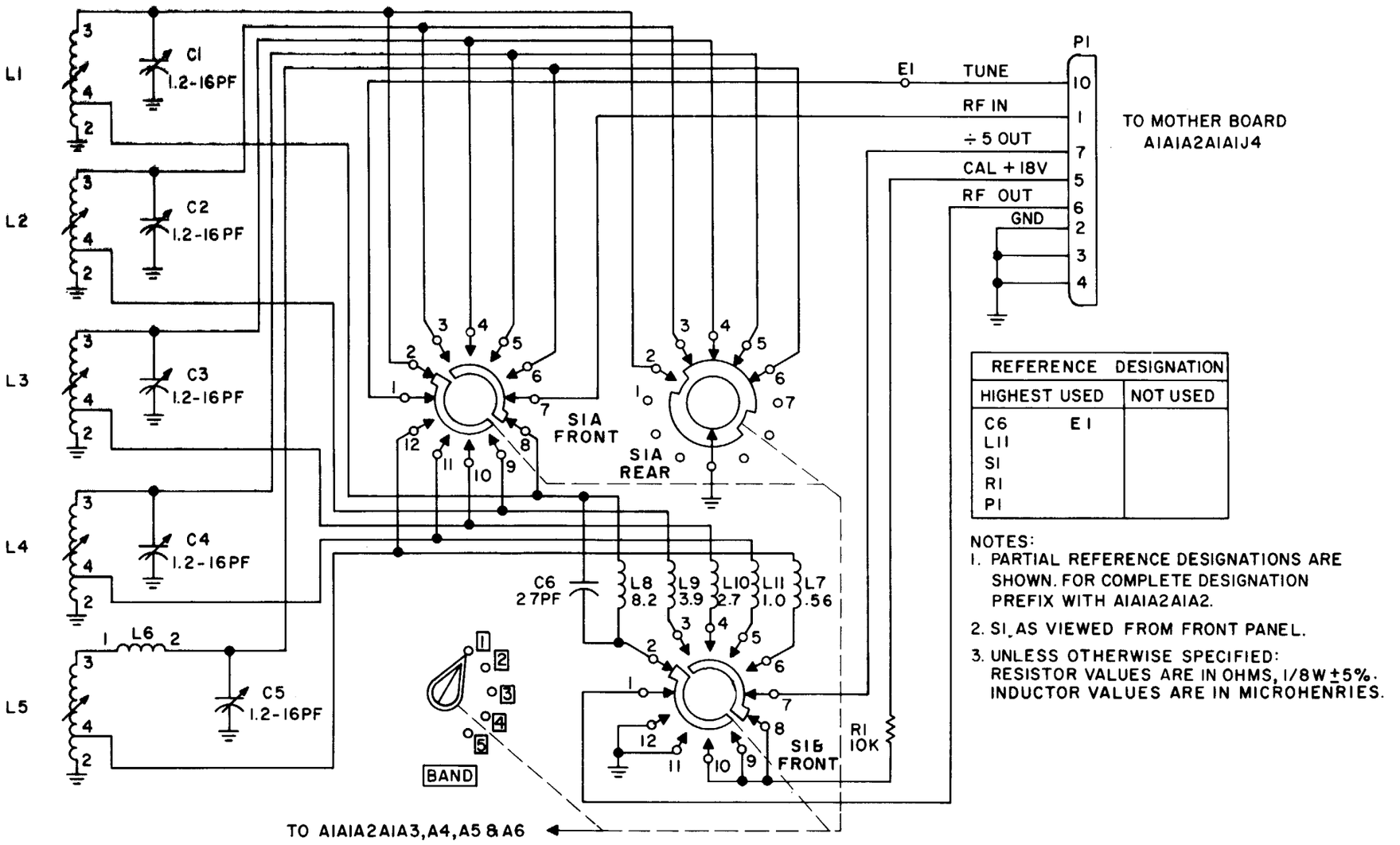
NOTES:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH A1A1A2A1A1A1.
2. UNLESS OTHERWISE SPECIFIED: CAPACITOR VALUES ARE IN MICROFARADS. INDUCTOR VALUES ARE IN MICROHENRIES.

REFERENCE DESIGNATION	
HIGHEST USED	NOT USED
C8	TP1
L10	
J8	
E5	

Figure FO-5. Motherboard, schematic diagram.

ELIAK045.1

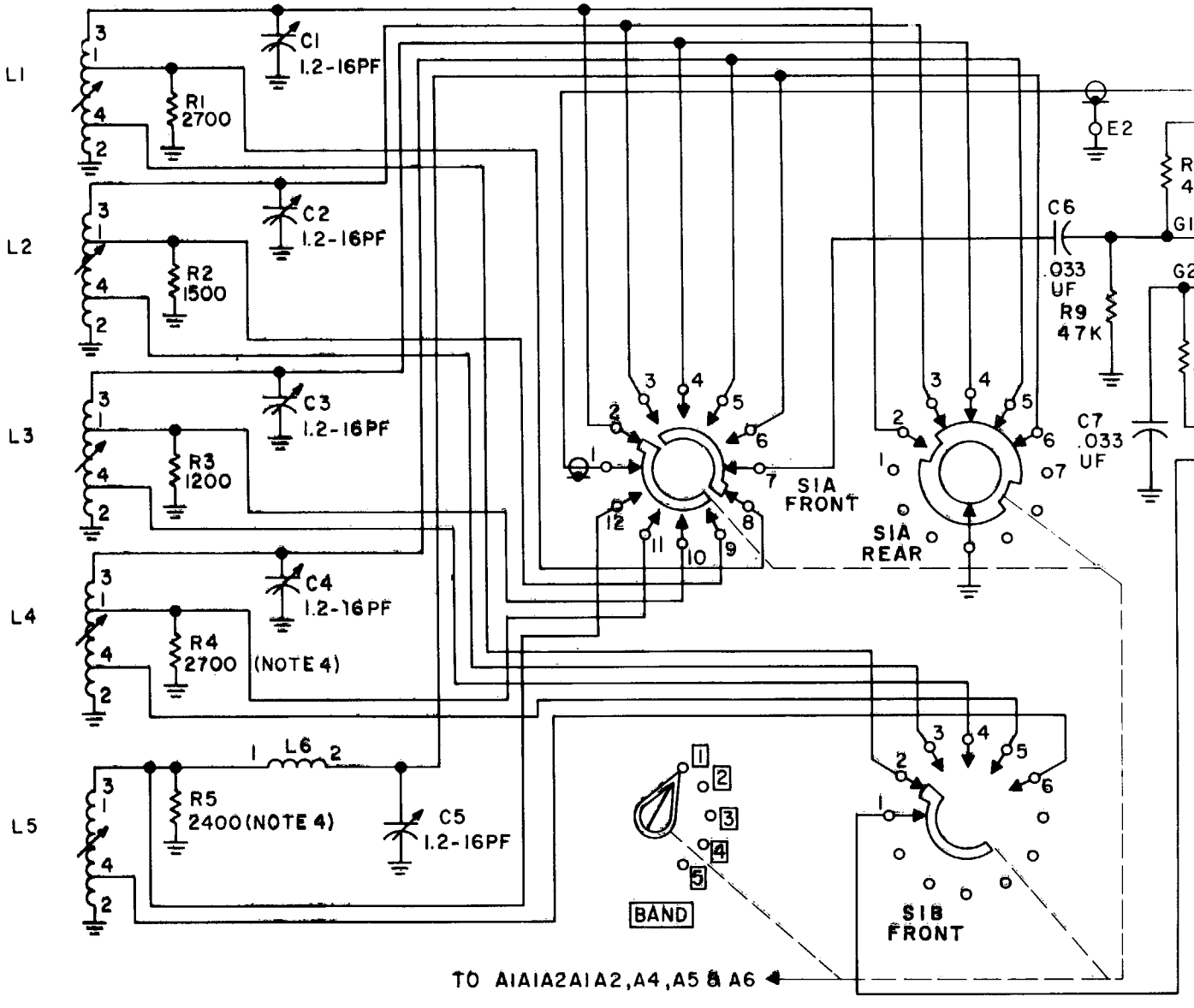


REFERENCE DESIGNATION	
HIGHEST USED	NOT USED
C6 E1 L11 S1 R1 P1	

NOTES:
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH A1A1A2A1A2.
2. S1 AS VIEWED FROM FRONT PANEL.
3. UNLESS OTHERWISE SPECIFIED: RESISTOR VALUES ARE IN OHMS, 1/8W ±5%. INDUCTOR VALUES ARE IN MICROHENRIES.

ELIAK046

Figure FO-6. Rf preselector, schematic diagram.

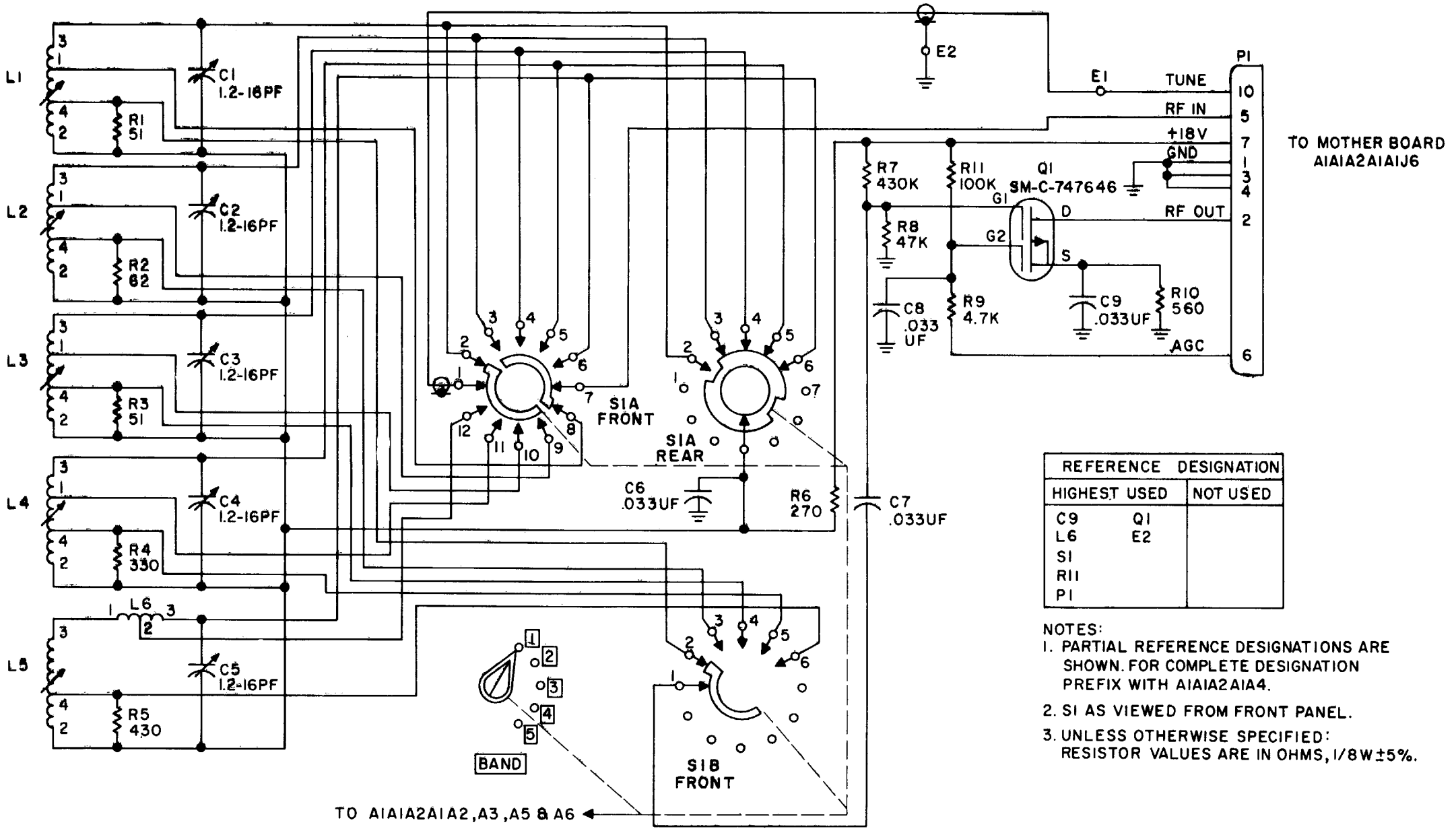


REFERENCE DESIGNATION	
HIGHEST USED	NOT USED
C8 Q1 L6 E2 S1 R9 P1	

NOTES:
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH A1A1A2A1A3.
2. S1 AS VIEWED FROM FRONT PANEL.
3. UNLESS OTHERWISE SPECIFIED: RESISTOR VALUES ARE IN OHMS, 1/8W ±5%
4. CHANGED TO VALUE SHOWN FROM SER. NO. 30 ON.

EL1AK047

Figure FO-7. First rf amplifier, schematic diagram.



REFERENCE DESIGNATION	
HIGHEST USED	NOT USED
C9 Q1 L6 E2 S1 R11 P1	

NOTES:
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH A1A1A2A1A4.
2. S1 AS VIEWED FROM FRONT PANEL.
3. UNLESS OTHERWISE SPECIFIED: RESISTOR VALUES ARE IN OHMS, 1/8W ±5%.

ELIAK048

Figure FO-8. Second rf amplifier, schematic diagram.

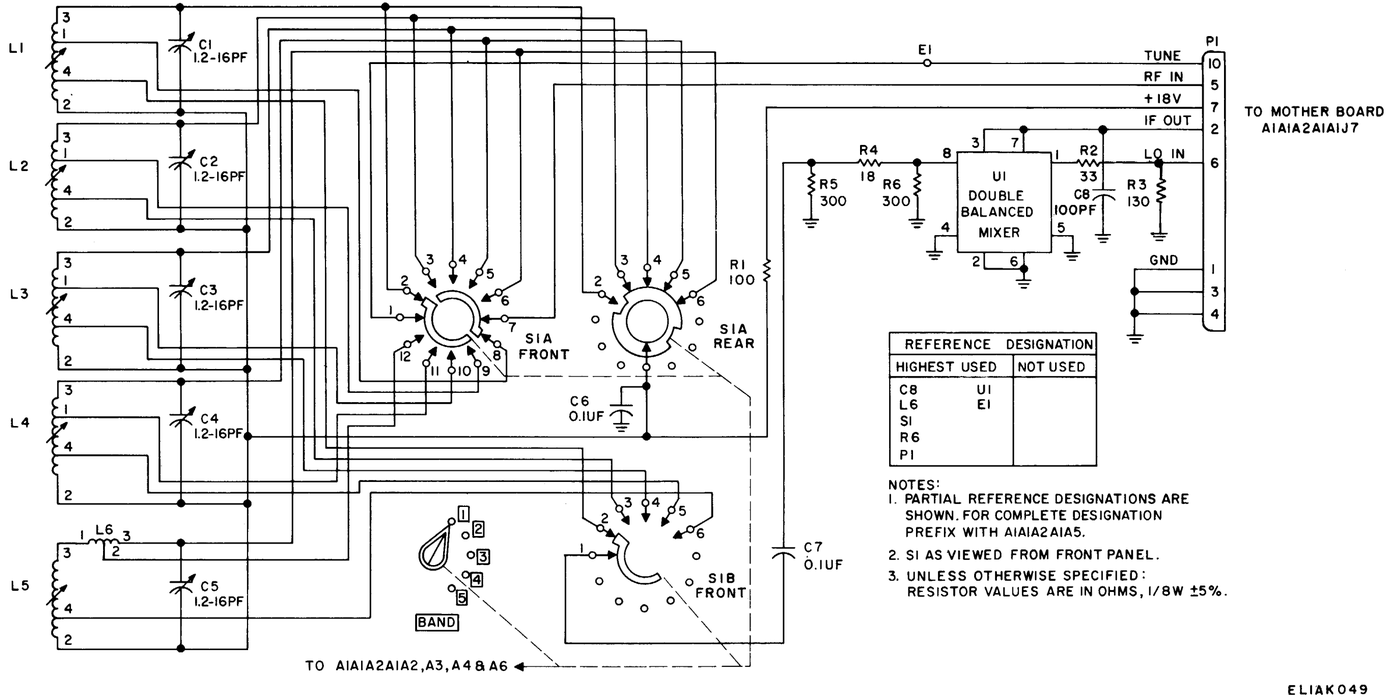
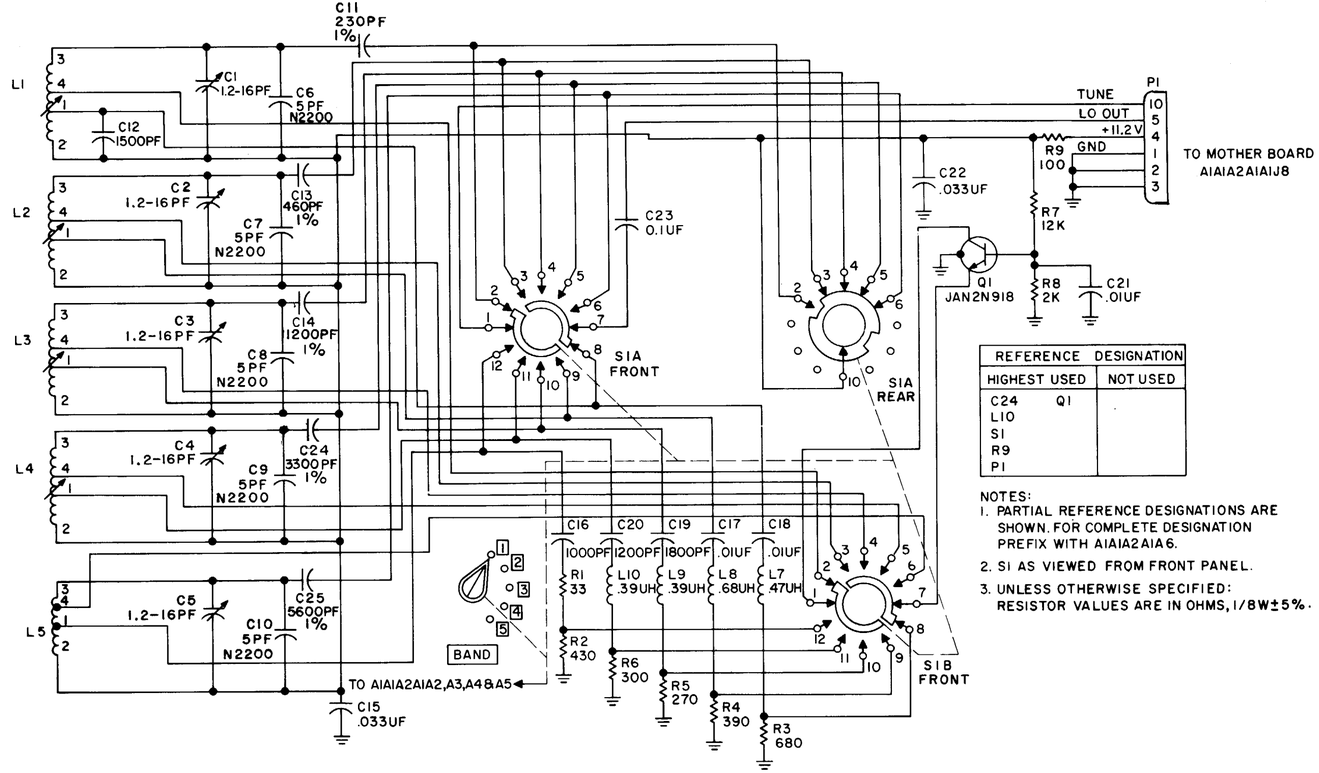


Figure FO-9. Rf mixer, schematic diagram.

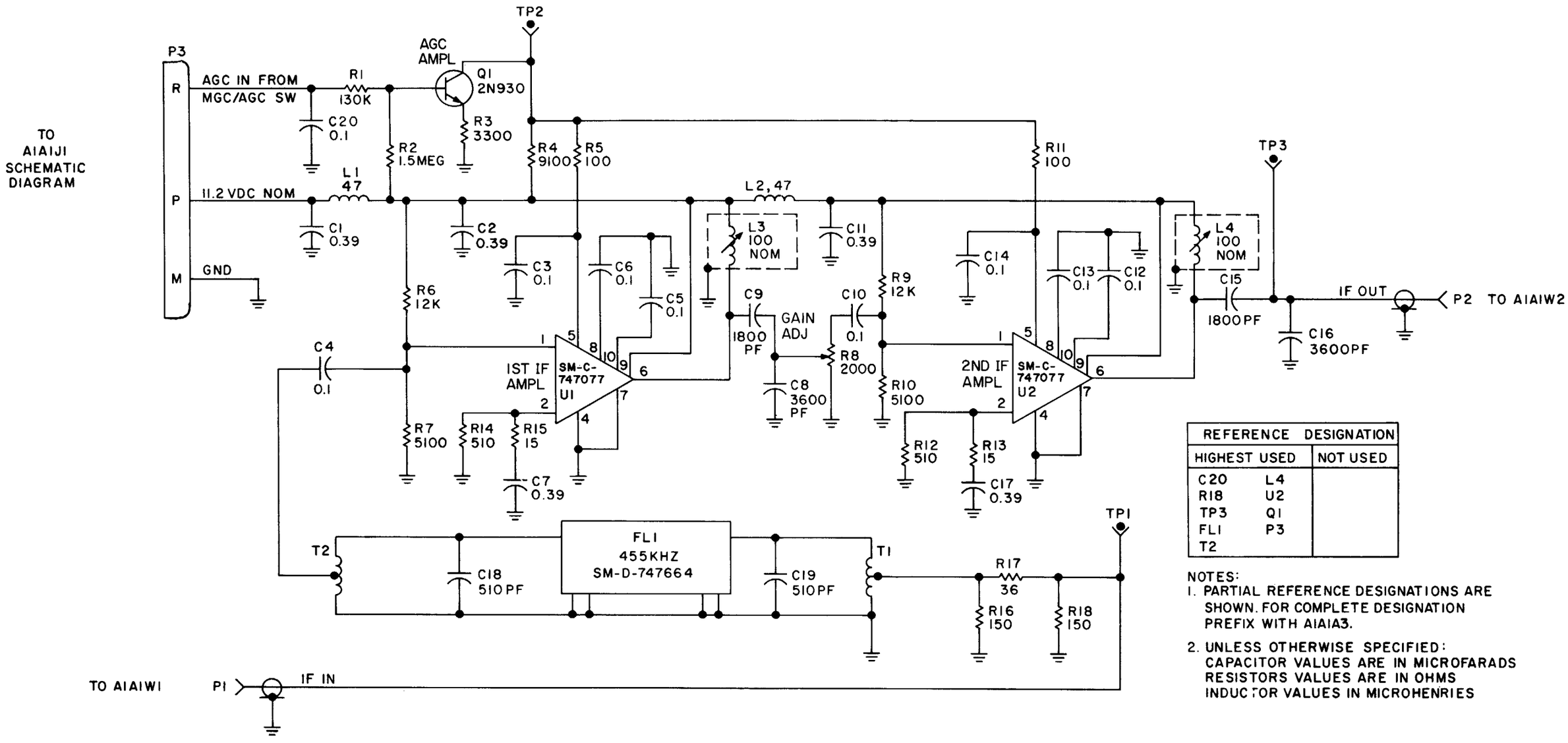


REFERENCE DESIGNATION	
HIGHEST USED	NOT USED
C24 Q1 L10 S1 R9 P1	

NOTES:
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH A1A1A2A1A6.
2. S1 AS VIEWED FROM FRONT PANEL.
3. UNLESS OTHERWISE SPECIFIED: RESISTOR VALUES ARE IN OHMS, 1/8W±5%.

ELIAK050

Figure FO-10. Local oscillator, schematic diagram.

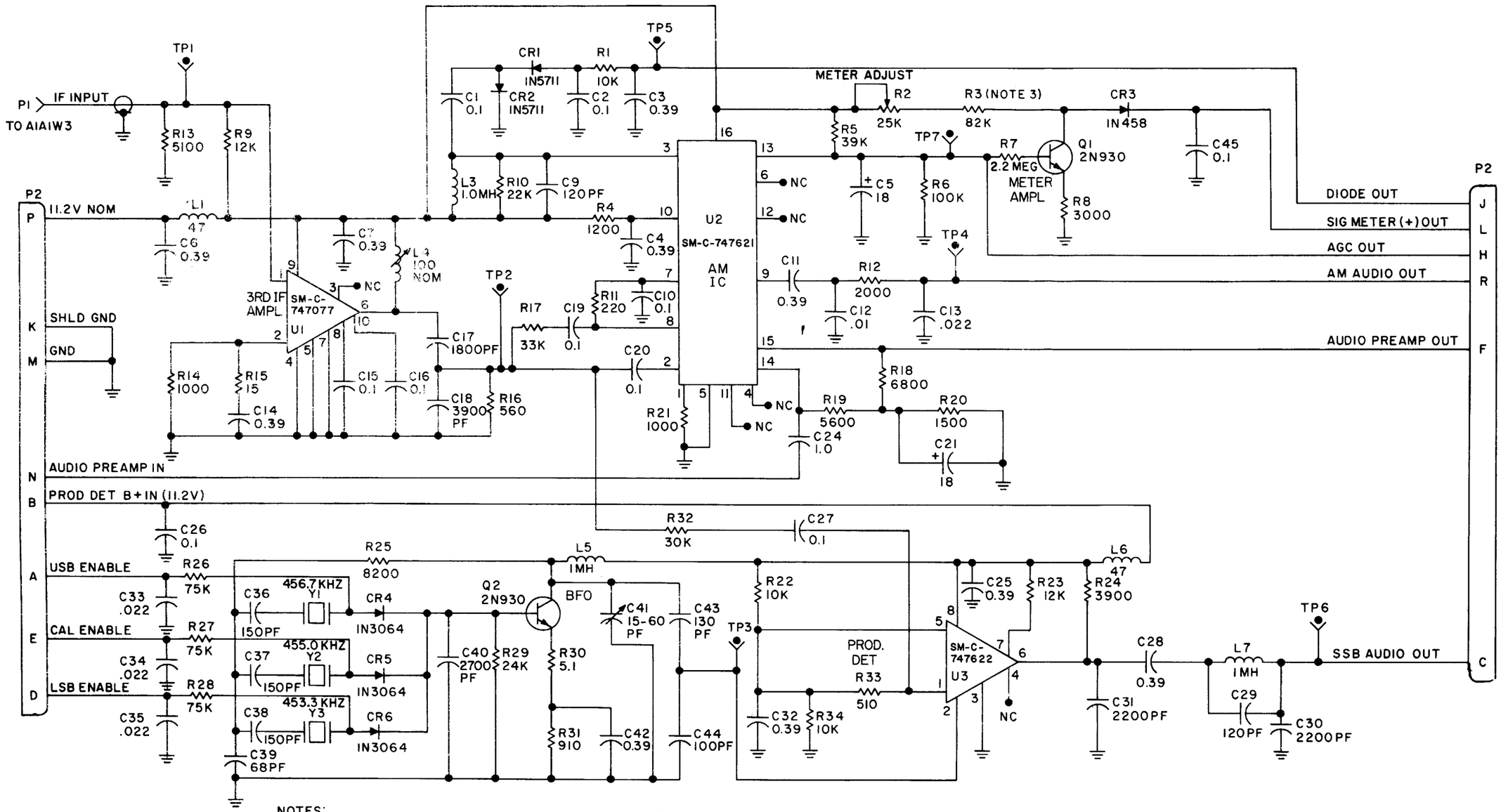


REFERENCE DESIGNATION	
HIGHEST USED	NOT USED
C20	L4
R18	U2
TP3	Q1
FL1	P3
T2	

NOTES:
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH A1A1A3.
2. UNLESS OTHERWISE SPECIFIED:
   CAPACITOR VALUES ARE IN MICROFARADS
   RESISTORS VALUES ARE IN OHMS
   INDUCTOR VALUES IN MICROHENRIES

ELIAK051

Figure FO-11. If. amplifier, schematic diagram.

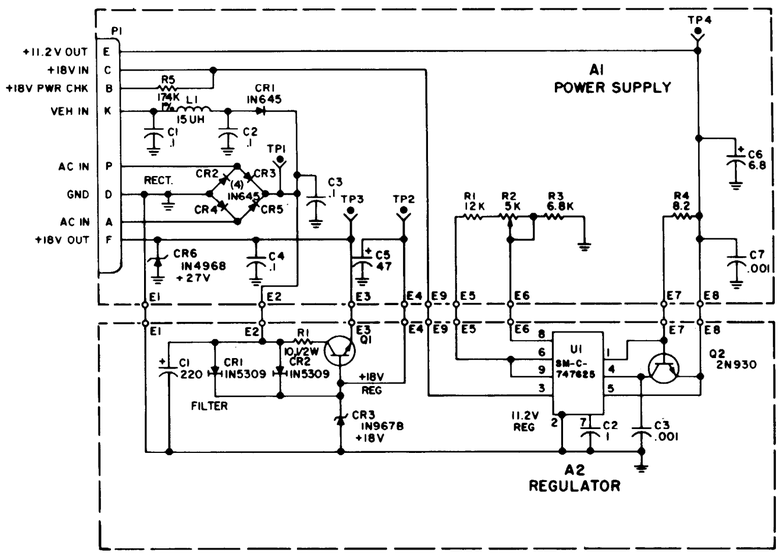


NOTES:
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH A1A1A4A1.
2. UNLESS OTHERWISE SPECIFIED:
   RESISTOR VALUES ARE IN OHMS, 1/4W ±5%
   CAPACITOR VALUES ARE IN MICROFARADS
   INDUCTOR VALUES ARE IN MICROHENRIES
3. R3 CHANGED TO 82K FROM SER. NO. 19 ON.

REFERENCE DESIGNATION		
HIGHEST USED		NOT USED
C45	Q2	C23
L7		L2
R34	Y3	C8
U3	TP7	C22
P2	CR6	

ELIAK052

Figure FO-12. Detector, schematic diagram.



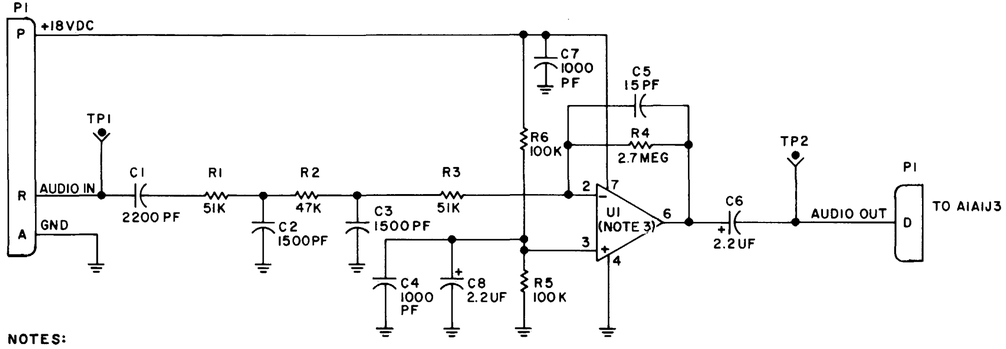
NOTES:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH A1A1A5 AND BOARD DESIGNATOR.
2. UNLESS OTHERWISE SPECIFIED:
   CAPACITOR VALUES ARE IN MICROFARADS.
   RESISTOR VALUES ARE IN OHMS, 1/4W, ±5%.

REFERENCE DESIGNATION			
HIGHEST USED		NOT USED	
A1	A2	A1	A2
C7	C3		
CR6	CR3		
E9	E9		
L1	Q2		
R5	R1		
P1	U1		
TP4			

EL1AK053

Figure FO-13. Power supply, schematic diagram.



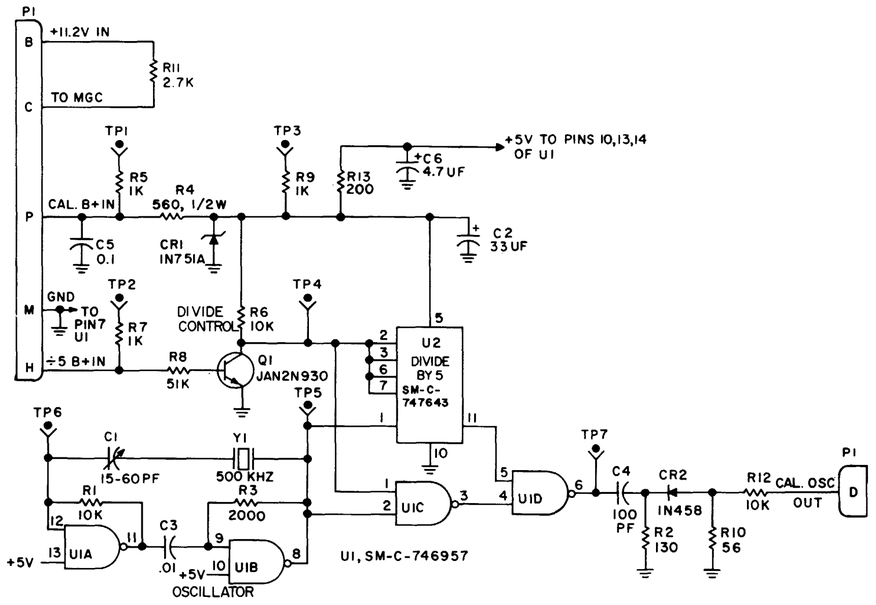
NOTES:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH A1A1A6A1.
2. UNLESS OTHERWISE SPECIFIED: RESISTOR VALUES ARE IN OHMS, 1/4 W ±5%.
3. PART NUMBER OF U1 IS JM38510/10101CGC.

REFERENCE DESIGNATION	
HIGHEST USED	NOT USED
C8 P1 R6 TP2 U1	

EL1AK054

Figure FO-14. Audio amplifier, schematic diagram.



NOTES:
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH A1A1A7.
2. UNLESS OTHERWISE SPECIFIED: RESISTOR VALUES ARE IN OHMS, 1/4W±5%. CAPACITOR VALUES ARE IN MICROFARADS.

REFERENCE DESIGNATION	
HIGHEST USED	NOT USED
C6 U2 CR2 Y1 P1 Q1 R13 TP7	

ELIAK055

Figure FO-15. Calibration oscillator, schematic diagram.

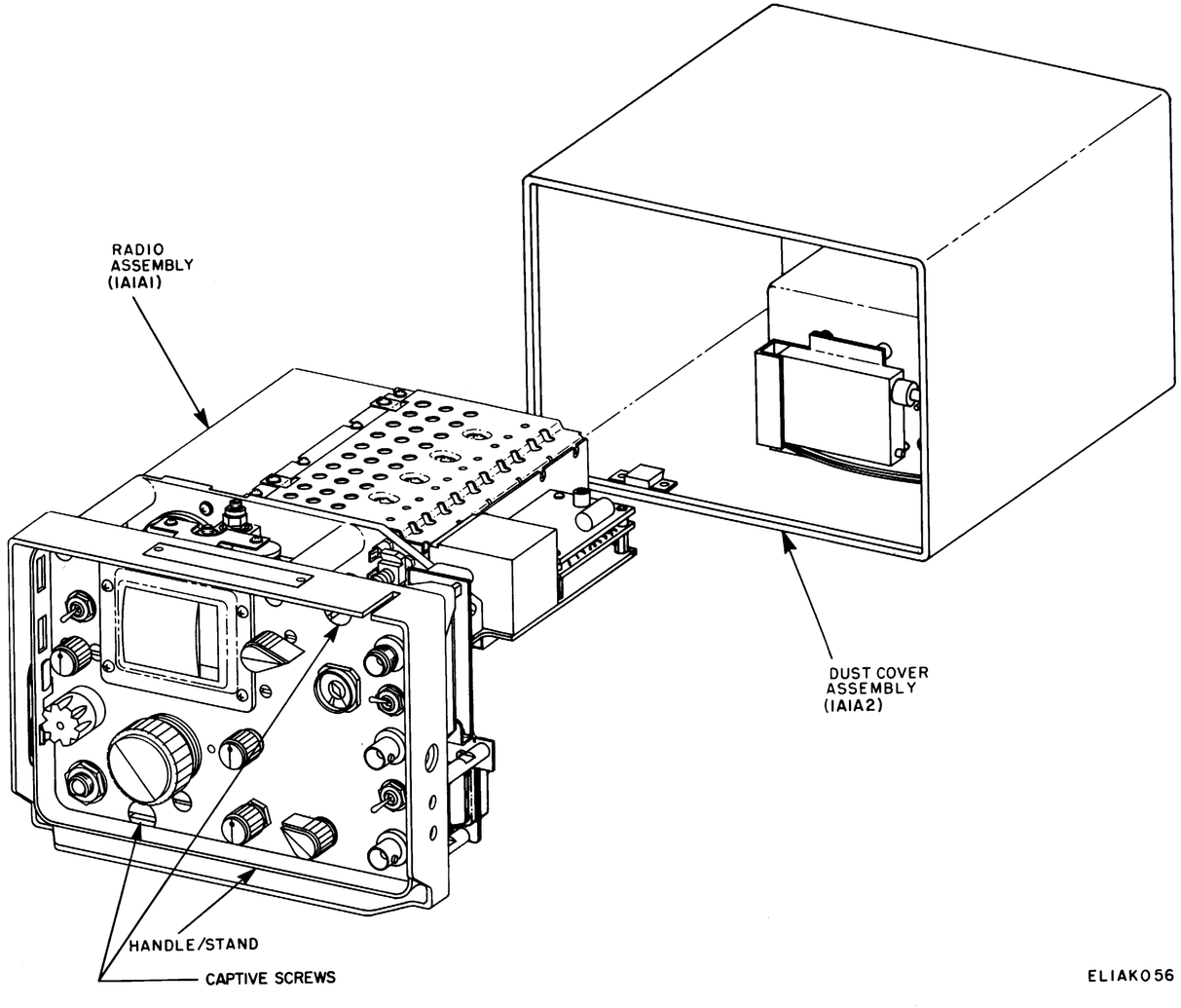
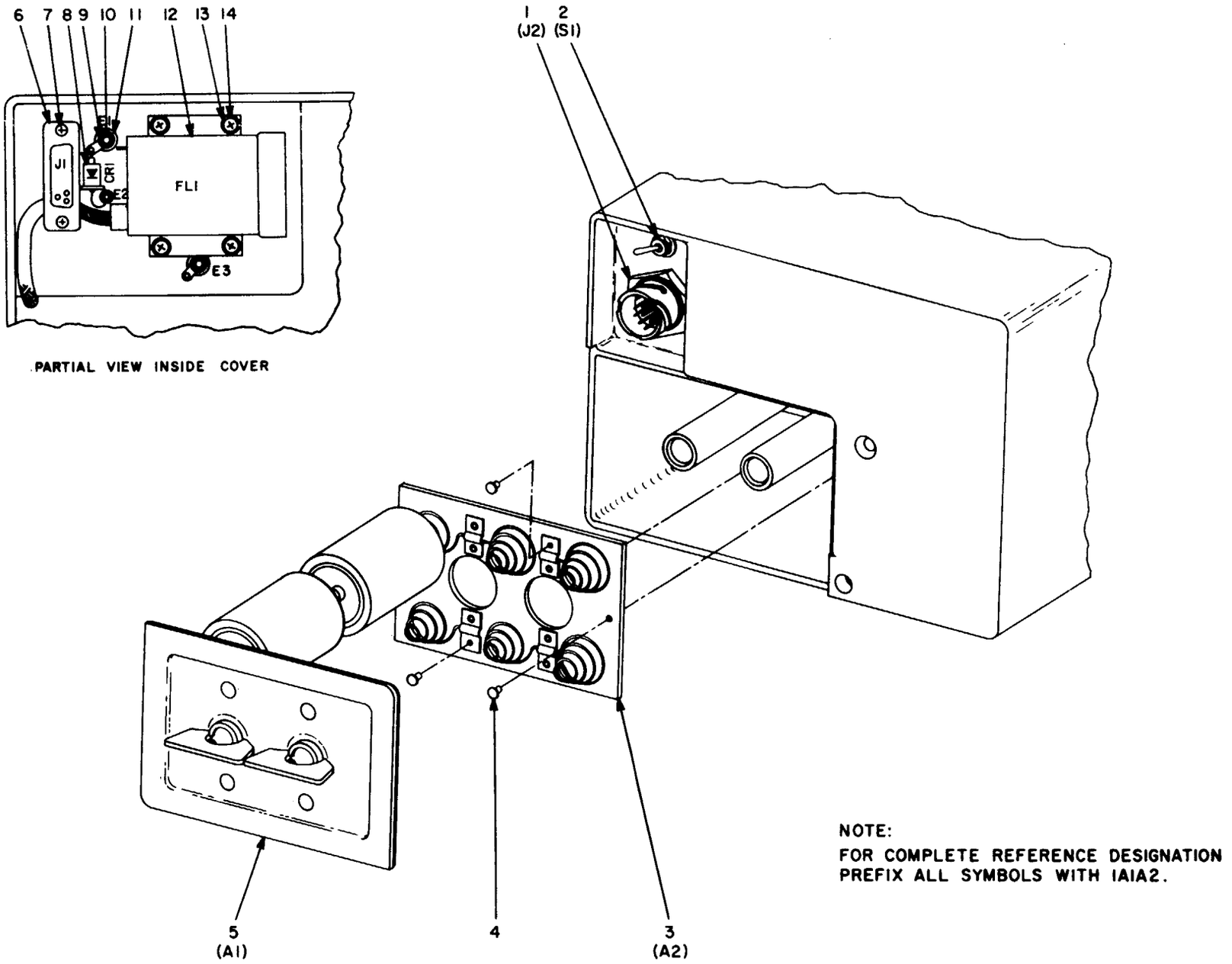
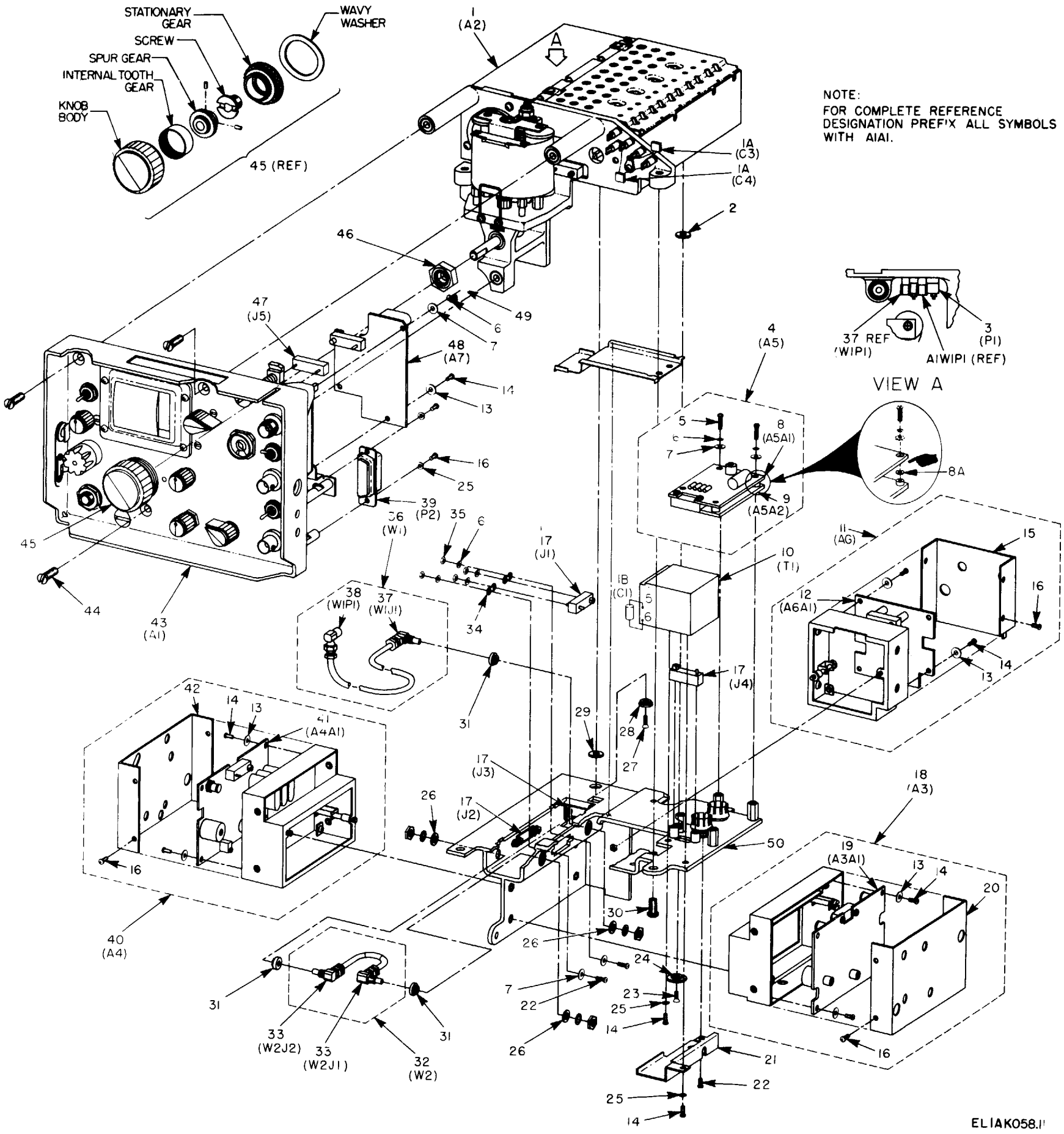


Figure FO-16. Receiver, parts location.



1 POWER connector
2 INT-EXT switch
3 Contact assembly
4 Rivet
5 Battery cover
6 Connector
7 Screw
8 Diode
9 Washer
10 Rivet
11 Washer
12 Filter, power
13 Screw
14 Washer

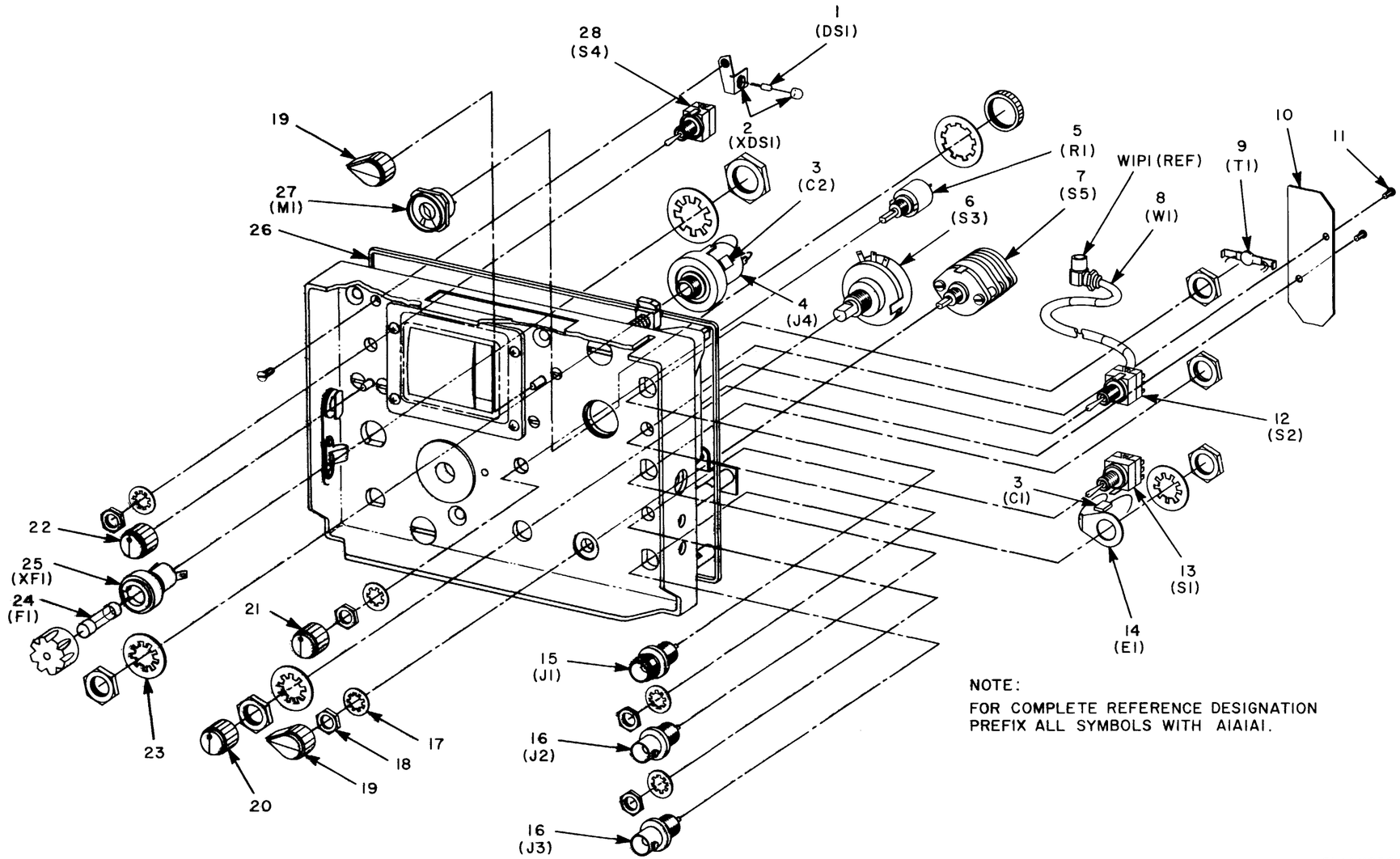
Figure FO-17. Dust cover, parts location.



EL1AK058.1

1 Rf tuner and dial assembly A2
1A Capicator C3, C4
1B Capicator C1
2 Shim (washer)
3 Connector P1
4 Power supply assembly A5
5 Screw
6 Washer
7 Washer
8 Ckt card assy, power supply
8A Insulating washer
9 Ckt card assy, regulator
10 Transformer T1
11 Audio Amplifier assy A6
12 Ckt card assy, audio amplifier
13 Washer
14 Screw
15 Cover
16 Screw
17 Connector J1, J2, J3, J4
18 If. amplifier Assembly A3
19 Ckt card assy, if. amplifier
20 Cover
21 Cable shield
22 Screw
23 Screw
24 Bushing, nylon
25 Washer
26 Washer
27 Screw
28 Bushing, nylon
29 Shim (washer)
30 Screw
31 Washer
32 Cable assembly W2
33 Connector W2J1, W2J2
34 Bracker
35 Nut
36 Cable assembly W1
37 Connector W1J1
38 Connector W1P1
39 Connector P2
40 Detector assembly A4
41 Ckt card assy, detector
42 Cover
43 Front panel assembly A1
44 Screw
45 Knob
46 Boot (waterproof nut)
47 Connector J5
48 Ckt card assy, cal osc
49 Screw
50 Receiver chassis

Figure FO-18. Radio assembly, parts location.



NOTE:

FOR COMPLETE REFERENCE DESIGNATION PREFIX ALL SYMBOLS WITH A1A1A1.

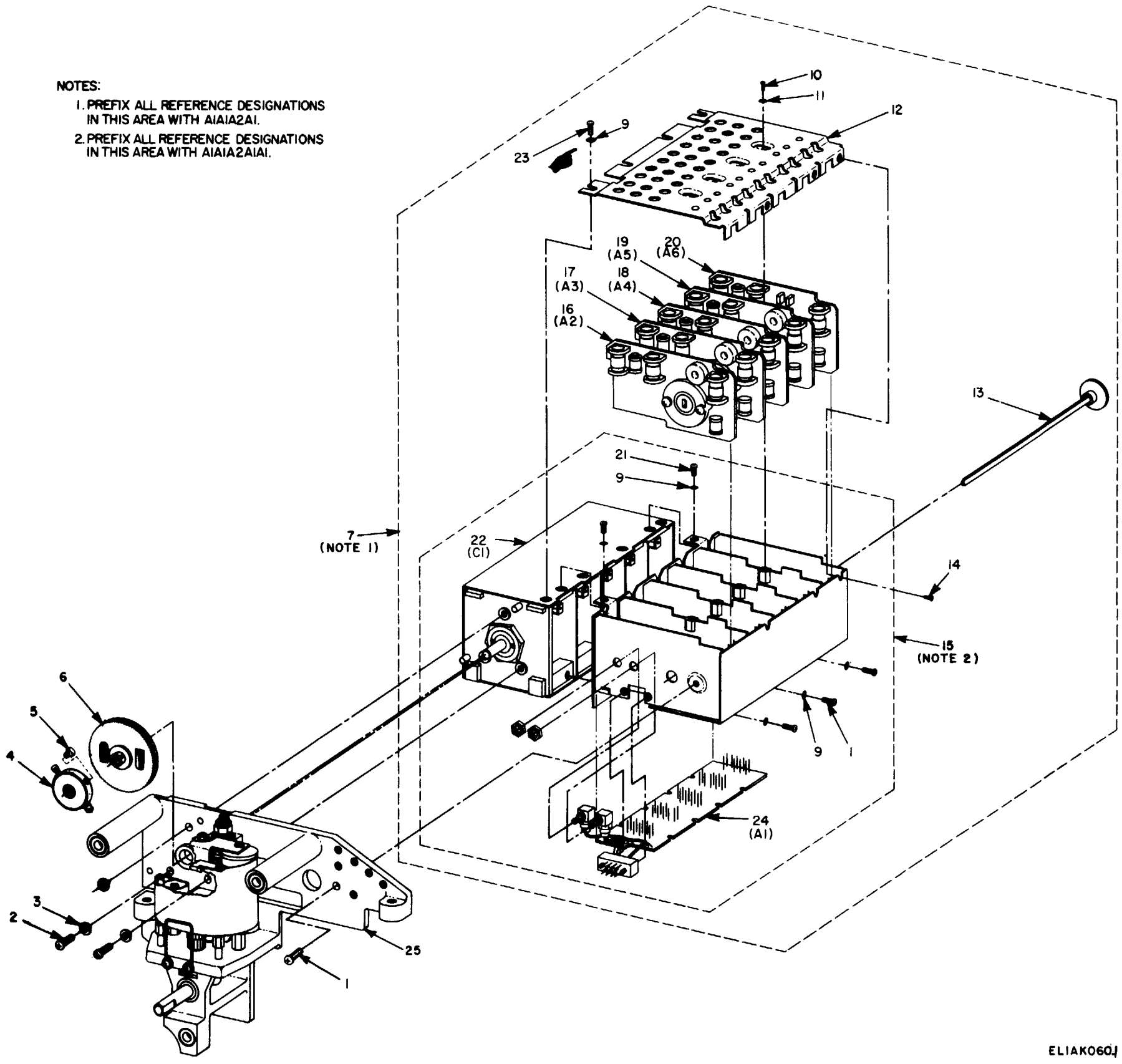
ELIAK059

1 Lamp DS1
2 Indicator XDS1
3 Capacitor C1, C2
4 Jack J4
5 Resistor, variable R1
6 Switch S3, resistor, variable R2
7 Switch S5
8 Cable assembly W1
9 Transformer, Rf (T1)
10 Cover
11 Screw
12 Switch S2
13 Switch S1
14 Terminal
15 Connector J1
16 Connector J2, J3
17 Washer
18 Nut
19 Knob
20 Knob
21 Knob
22 Knob
23 Washer
24 Fuse F1
25 Fuseholder
26 Gasket
27 Meter M1
28 Switch S4

Figure FO-19. Control panel, parts location.

NOTES:

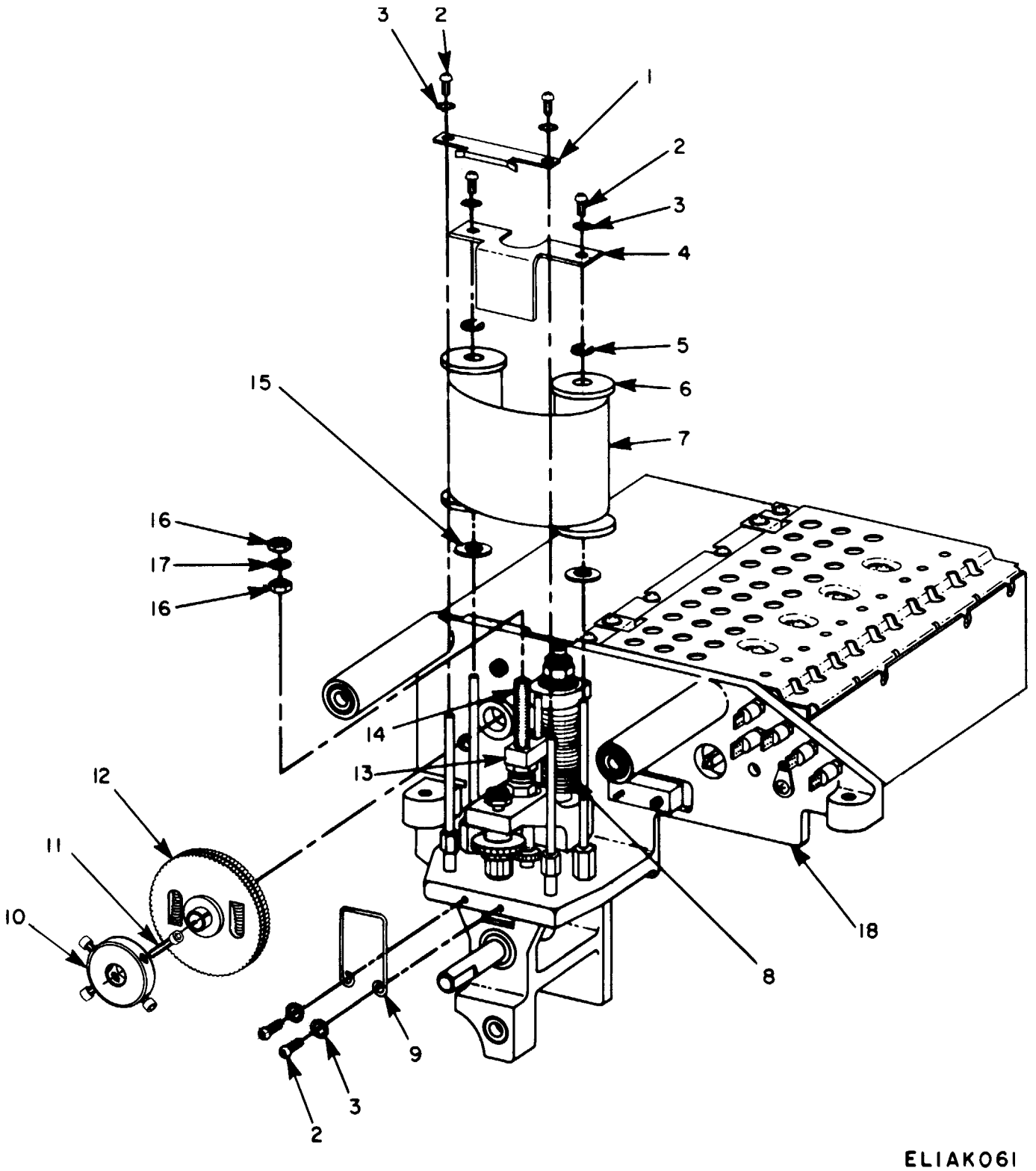
1. PREFIX ALL REFERENCE DESIGNATIONS IN THIS AREA WITH A1A1A2A1.
2. PREFIX ALL REFERENCE DESIGNATIONS IN THIS AREA WITH A1A1A2A1A1.



ELIAK060J

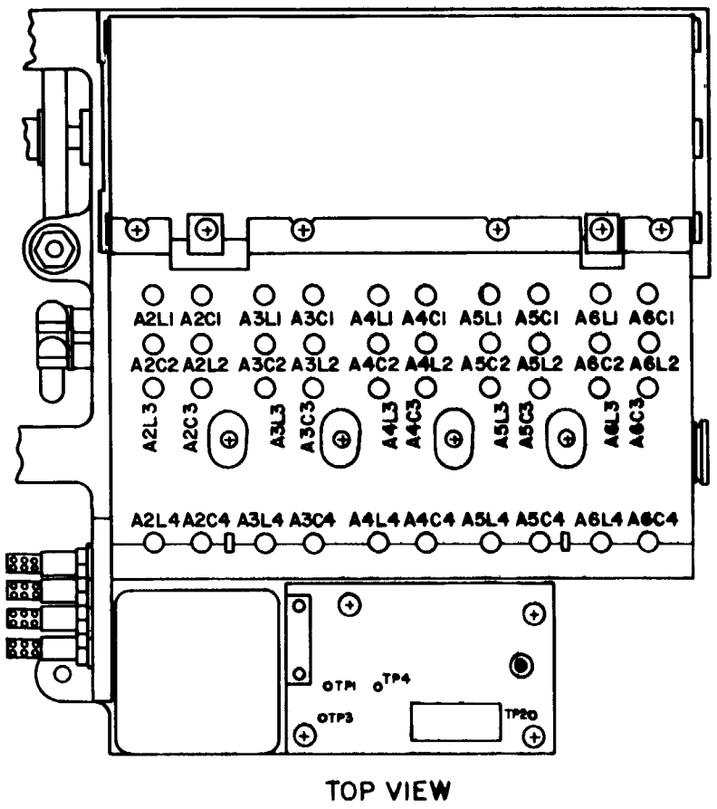
1 Screw
2 Screw
3 Washer, lock
4 Clamp, gear
5 Screw
6 Gear, worm, antibacklash
7 Rf tuner assembly
8 Deleted
9 Washer, lock
10 Screw
11 Washer
12 Cover
13 Shaft
14 Screw
15 Rf tuner subassembly
16 Ckt card assy, rf preselector
17 Ckt card assy, first rf amplifier
18 Ckt card assy, second rf amplifier
19 Ckt card assy, mixer
20 Ckt card assy, local oscillator
21 Screw
22 Capacitor, variable
23 Screw
24 Ckt card assy, motherboard
25 Gear plate assembly

Figure FO-20. Rf tuner assembly, parts location.

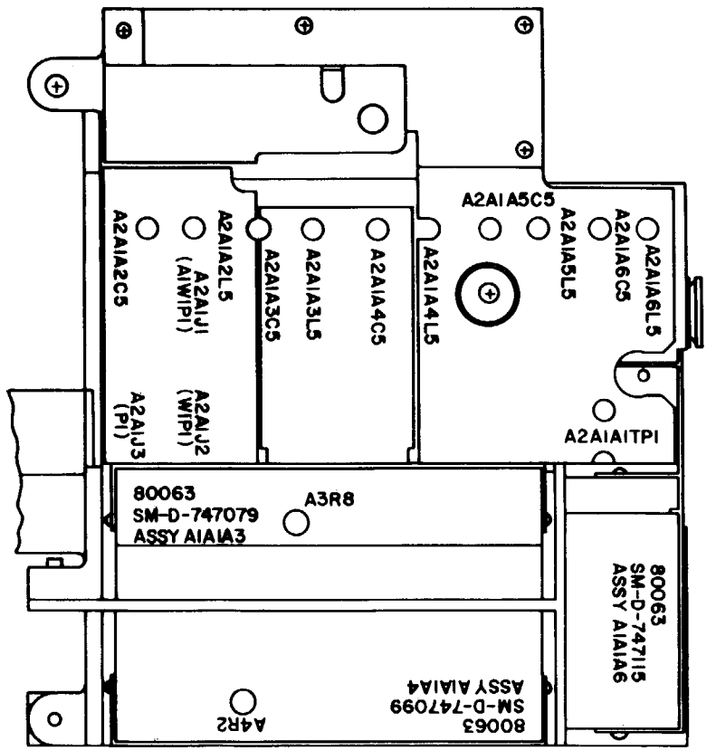


1 Tape guide
2 Screw
3 Washer
4 Bracket
5 Retaining ring
6 Spool
7 Dial tape
8 Worm
9 Spring
10 Gear clamp
11 Cap screw
12 Worm gear, antibacklash
13 Stop block
14 Stop shaft
15 Washer
16 Nut
17 Washer, lock
18 Gear plate assembly

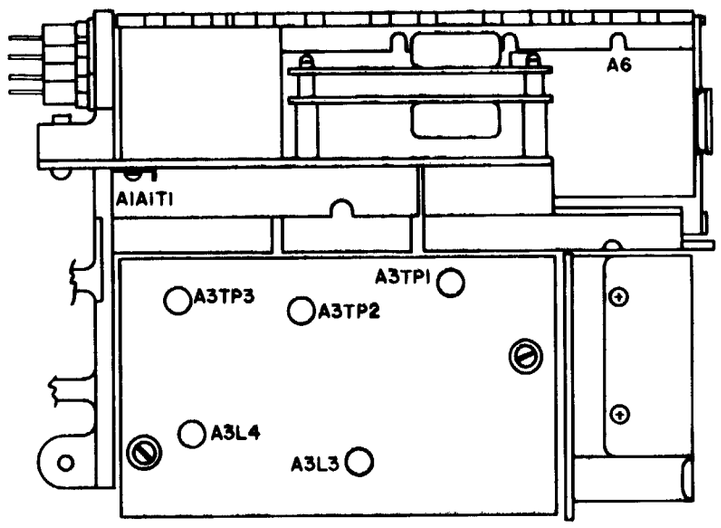
Figure FO-21. Rf tuner and dial assembly, parts location.



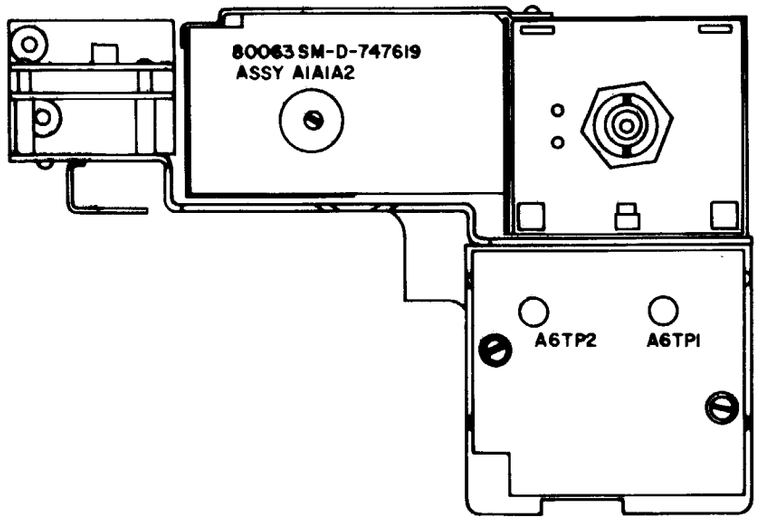
TOP VIEW



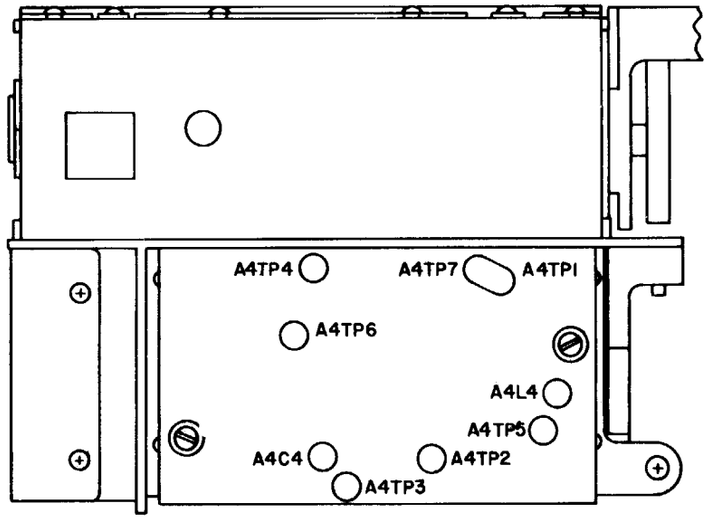
BOTTOM VIEW



RIGHT SIDE VIEW



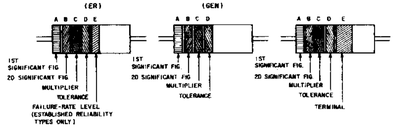
REAR VIEW



LEFT SIDE VIEW

ELIAK062

Figure FO-22. Test point and adjustments location.



COLOR CODE MARKING FOR COMPOSITION TYPE RESISTORS.

COLOR-CODE MARKING FOR FILM-TYPE RESISTORS.

TABLE I
COLOR CODE FOR COMPOSITION TYPE AND FILM TYPE RESISTORS.

BAND A		BAND B		BAND C		BAND D		BAND E	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)	COLOR	FAILURE RATE LEVEL
BLACK	0	BLACK	0	BLACK	1			BROWN	M=1.0
BROWN	1	BROWN	1	BROWN	10			RED	P=0.1
RED	2	RED	2	RED	100			ORANGE	R=0.01
ORANGE	3	ORANGE	3	ORANGE	1,000			YELLOW	S=0.001
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	±10 (COMP. TYPE ONLY)	WHITE	SOLDERABLE
GREEN	5	GREEN	5	GREEN	100,000	GOLD	±5		
BLUE	6	BLUE	6	BLUE	1,000,000	RED	±2 (NOT APPLICABLE TO ESTABLISHED RELIABILITY)		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7						
GRAY	8	GRAY	8	SILVER	0.01				
WHITE	9	WHITE	9	GOLD	0.1				

BAND A — THE FIRST SIGNIFICANT FIGURE OF THE RESISTANCE VALUE (BANDS A THRU D SHALL BE OF EQUAL WIDTH.)

BAND B — THE SECOND SIGNIFICANT FIGURE OF THE RESISTANCE VALUE.

BAND C — THE MULTIPLIER (THE MULTIPLIER IS THE FACTOR BY WHICH THE TWO SIGNIFICANT FIGURES ARE MULTIPLIED TO YIELD THE NOMINAL RESISTANCE VALUE.)

BAND D — THE RESISTANCE TOLERANCE.

BAND E — WHEN USED ON COMPOSITION RESISTORS, BAND E INDICATES ESTABLISHED RELIABILITY FAILURE-RATE LEVEL; PERCENT FAILURE PER 1,000 HOURS. ON FILM RESISTORS, THIS BAND SHALL BE APPROXIMATELY 1½ TIMES THE WIDTH OF OTHER BANDS, AND INDICATES TYPE OF TERMINAL.

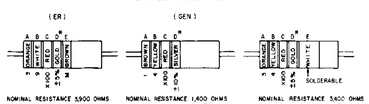
RESISTANCES IDENTIFIED BY NUMBERS AND LETTERS (THESE ARE NOT COLOR CODED.)

SOME RESISTORS ARE IDENTIFIED BY THREE OR FOUR DIGIT ALPHA-NUMERIC DESIGNATORS. THE LETTER R IS USED IN PLACE OF A DECIMAL POINT WHEN FRACTIONAL VALUES OF AN OHM ARE EXPRESSED. FOR EXAMPLE:

2R7 = 2.7 OHMS 10RO = 10.0 OHMS

FOR WIRE-WOUND-TYPE RESISTORS COLOR CODING IS NOT USED; IDENTIFICATION MARKING IS SPECIFIED IN EACH OF THE APPLICABLE SPECIFICATIONS.

EXAMPLES OF COLOR CODING



NOMINAL RESISTANCE 3,900 OHMS
RESISTANCE TOLERANCE ±5%
FAILURE RATE LEVEL M

NOMINAL RESISTANCE 1,400 OHMS
RESISTANCE TOLERANCE ±10%

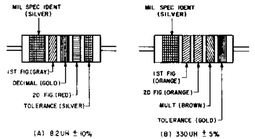
NOMINAL RESISTANCE 5,400 OHMS
RESISTANCE TOLERANCE ±5%
TERMINAL SOLDERABLE

COMPOSITION-TYPE RESISTORS

FILM-TYPE RESISTORS

* IF BAND D IS OMITTED, THE RESISTOR TOLERANCE IS ±20% AND THE RESISTOR IS NOT MIL-STD

A. COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS.



COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES. AT A, AN EXAMPLE OF OF THE CODING FOR AN 82UH CHOKE IS GIVEN. AT B, THE COLOR BANDS FOR A 330UH INDUCTOR ARE ILLUSTRATED.

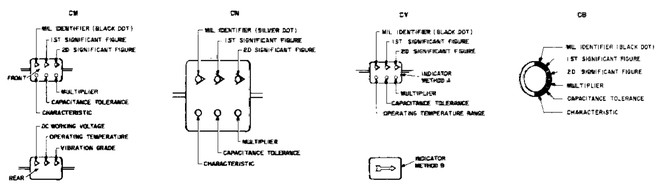
TABLE 2
COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES.

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	INDUCTANCE TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	1
RED	2	100	2
ORANGE	3	1,000	3
YELLOW	4		
GREEN	5		
BLUE	6		
VIOLET	7		
GRAY	8		
WHITE	9		
NONE			20
SILVER			10
GOLD	DECIMAL POINT		5

MULTIPLIER IS THE FACTOR BY WHICH THE TWO COLOR FIGURES ARE MULTIPLIED TO OBTAIN THE INDUCTANCE VALUE OF THE CHOKE COIL.

B. COLOR CODE MARKING FOR MILITARY STANDARD INDUCTORS.

CAPACITORS, FIXED, VARIOUS-DIELECTRICS, STYLES CM, CN, CY, AND CB



MICA-DIELECTRIC — PAPER-DIELECTRIC — GLASS-DIELECTRIC, GLASS CASE — MICA, BUTTON TYPE

TABLE 3 — FOR USE WITH STYLES CM, CN, CY AND CB.

COLOR	MIL ID	1ST SIG FIG	2D SIG FIG	MULTIPLIER	CAPACITANCE TOLERANCE			CHARACTERISTIC			DC WORKING VOLTAGE	OPERATING TEMP RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CB	CM	CX, CW	CM
BLACK	CM, CY, CB	0	0	1			±20%	±20%	A				-55°/+70°C	10-55 Hz
BROWN		1	1	10					B	E	B			
RED		2	2	100	±2%		±2%	±2%	C				-55°/+85°C	
ORANGE		3	3	1,000		±30%			D		G	300		
YELLOW		4	4	10,000					E				-55°/+125°C	10-2,000 Hz
GREEN		5	5		±5%				F			500		
BLUE		6	6										-55°/+150°C	
PURPLE (VIOLET)		7	7											
GRAY		8	8											
WHITE		9	9											
GOLD				0.1			±5%	±5%						
SILVER	CN			0.01	±10%	±10%	±10%	±10%						

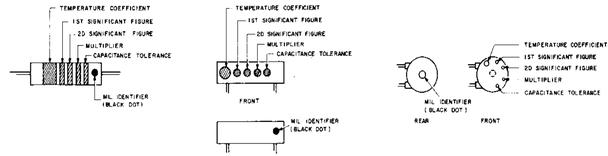


TABLE 4 — TEMPERATURE COMPENSATING, STYLE CC.

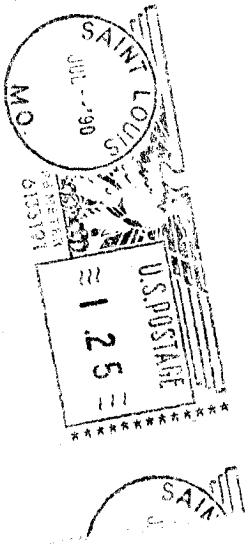
COLOR	TEMPERATURE COEFFICIENT[4]	1ST SIG FIG	2D SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					CAPACITANCES OVER 10 UUF	CAPACITANCES 10 UUF OR LESS	
BLACK	0	0	0	1		±2.0 UUF	CC
BROWN	-30	1	1	10	±1%		
RED	-80	2	2	100	±2%	±0.25 UUF	
ORANGE	-150	3	3	1,000			
YELLOW	-220	4	4				
GREEN	-330	5	5		±5%	±0.5 UUF	
BLUE	-470	6	6				
PURPLE (VIOLET)	-750	7	7				
GRAY			8	0.01[R]			
WHITE			9	0.1[R]	±10%		
GOLD	+100			0.1		±1.0 UUF	
SILVER				0.01			

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-250, MIL-C-11272B, AND MIL-C-10950C RESPECTIVELY.
3. LETTERS INDICATE THE TEMPERATURE RANGE AND VOLTAGE-TEMPERATURE LIMITS DESIGNATED IN MIL-C-11015D.
4. TEMPERATURE COEFFICIENT IN PARTS PER MILLION PER DEGREE CENTIGRADE.
R OPTIONAL CODING WHERE METALLIC PIGMENTS ARE UNDESIRABLE.

C. COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

ESC FA 913-73

Figure FO-23. Resistor, inductor, and capacitor, color code chart.



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