TM 11-5820-767-34

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DIRECT SUPPORTAND GENERAL SUPPORT

MAINTENANCE MANUAL

INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST
(INCLUDING DEPOT MAINTENANCE
REPAIR PARTS AND SPECIAL TOOLS)

RADIO SET

AN/URC-68

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

HEADQUARTERS, DEPARTMENT OF THE ARMY

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TECHNICAL MANUAL
No. 11-5820-767-34

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *10 March 1971*

Direct Support and General Support Maintenance Manual

Including Repair Parts and Special Tools List

(Including Depot Maintenance Repair Parts and Special Tools)

For

RADIO SET AN/URC-68

(FSN 5820-832-9158)

Current as of 15 February 1973

*This manual supersedes TM 11-5820-767-35, 25 September 1968, including C1, 14 April 1969.

LIST OF ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

1-1. Scope
(fig. 1-2 and 1-3)

a. This manual contains instructions for the combined direct support (DS) and general support (GS), maintenance for Radio Set AN/URC-68. It includes instructions appropriate to DS and GS maintenance for troubleshooting, testing, adjusting and repairing as applicable to the AN/URC-68.

b. Instructions pertaining to operator and organizational maintenance are discussed in TM 11-5820-767-12.

1-2. Indexes of Equipment Publications

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

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are Modification Work Orders (MWOs) pertaining to the equipment.

1-3. Report of Equipment Manual Improvements

The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended changes to Publications) and forwarded direct to U.S. Army Electronics Command, ATTN: AMSEL-ME-NMP-AD, Fort Monmouth, N.J. 07703.

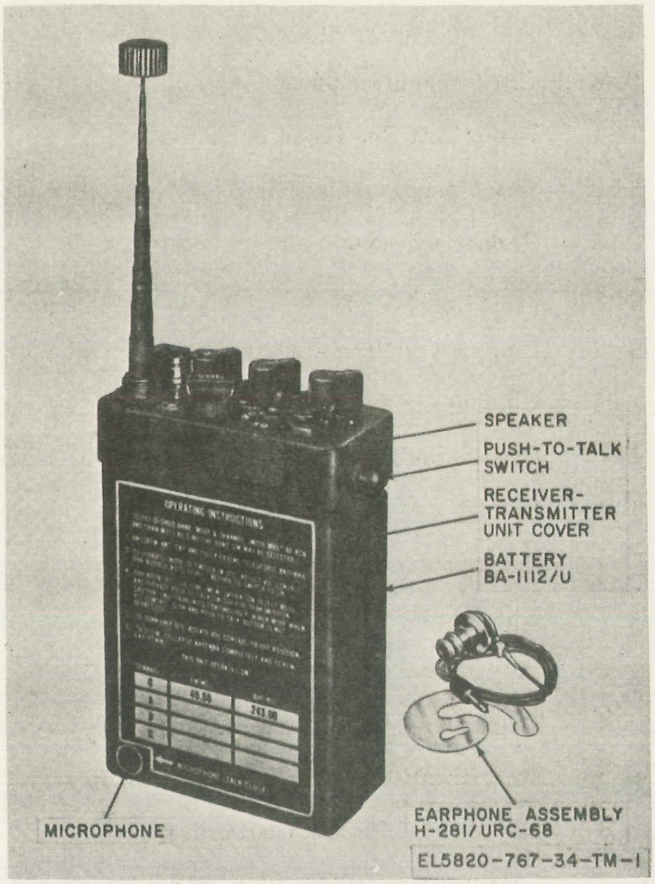


Figure 1-1. Radio Set AN/URC-68.

CHAPTER 2

FUNCTIONING OF EQUIPMENT

2-1. General
(fig. 2-1)

The receiver-transmitter unit, shown in figure 2-1, is designed and manufactured with a non-reparable, throw-away modular concept. An overall block diagram, figure 2-2, illustrates the radio set modular concept and shows the basic interconnections.

2-2. Functions of Equipment

The following discussion of the radio set functions is keyed to the block diagrams of the five main electronic modules and the band-pass filter. These modules, illustrated in figure 2-2, are described below.

a. Receiver-Converter Module (fig. 2-3). The receiver-converter module is used to accept received signals in both the uhf band (230.5 to 250.5 MHz) and the fm band (38 to 42 MHz) and convert them to a common intermediate frequency (if.) of 10.125 MHz, for further amplification and demodulation. The receiver-converter also supplies 200 MHz injection to the uhf transmitter and 50 MHz injection to the fm transmitter.

(1) In the uhf mode of operation, signals between 230.5 and 250.5 MHz pass through a high-pass filter (see figure 2-3) which provides 30 dB of image rejection. The cutoff frequency is such that response to signals in the image frequency range of 154.5 to 166.5 MHz are attenuated at least 30 db. A uhf preamplifier, following the high-pass filter, provides 10 to 12 db of gain over the 230.5 to 250.5 MHz range. A low-noise device at this point establishes a good noise figure for the receiver. Since the uhf preamplifier is followed by a diode switch and a relatively high noise (240-40 MHz) mixer, sufficient gain is necessary to maintain a good receiver noise figure.

(2) The diode switch disables the fm band input when in uhf operation. It also disables the uhf band input when in fm operation. A diode with low forward loss and high reverse isolation helps maintain a good receiver noise figure. The diode also holds forward losses to 1 db or less and provides 30 db of isolation between adjacent networks. The diode switch also contains a low-pass fm filter which helps to reduce the fm image frequency band of 58 to 62 MHz. Three more tuned circuits, ahead of the first fm mixer also help reduce the fm band image to more than −30 db. The operation of the diode switches is controlled by the control panel MODE switch.

(3) Dual conversion is used in the uhf mode to obtain the 10.125 MHz if. frequency. Single conversion is sufficient when in the fm mode. Operation in both bands with one oscillator, four preset channels and one set of four crystals, is achieved in the following manner: The first if. frequency for uhf operation has the same frequency range as the desired fm band of frequencies. The first mixer injection frequency is below the uhf frequency, for best oscillator stability. Also, the first mixer injection is an even harmonic of the local oscillator, allowing the use of balanced doublers for best odd harmonic suppression. A fourth subharmonic is used, permitting two doublers to be used and high-side injection for the second mixer. Consequently fewer spurious problems are encountered, in the fm mode, due to harmonics of the oscillator mixing with incoming signals. This method of generating a common if. frequency, results in a second if. frequency of approximately 10 MHz. The 40.5 MHz and 243 MHz guard frequencies are obtained with the same basic local oscillator frequency, so that one channel position on the front panel serves both guard frequencies, also, the automatic beacon operation, where a signal is transmitted on both guard frequencies simultaneously. A block diagram, figure 2-4, best describes this oscillator and second if. frequency selection.

(4) When it is desired to operate the AN/URC-68 on a particular uhf or fm channel, the frequency of the crystal required for such oper-

ation can be determined by using the following equations.

(*a*) $XTAL = \frac{Uhf + 10.125}{5}$

(*b*) $XTAL = FM + 10.125$

(*c*) A sample calculation for determining the required crystal frequency for operation on the uhf channel frequency of 248 MHz is shown below:

$$XTAL = \frac{Uhf + 10.125}{5} = \frac{248 + 10.125}{5}$$
$$= 51.625 \text{ MHz}$$

(5) The local 50 MHz oscillator is a Colpitts type feedback design which covers the frequency range of 48.125 to 52.125 MHz with an output constant within 1 db. Crystals with a frequency stability of .0025% are used to obtain the .005% basic frequency accuracy of the transceiver, since the oscillator can not be tuned to each individual crystal frequency during normal operation. All crystals meet the CR-77/U specification.

(6) The balanced doubler circuits suppress the odd-order harmonics by at least 30 db and suppression of the 150 MHz and 250 MHz spurious outputs are no problem. Tightly wound tri-filar toriodal coils, for coupling between the oscillator and doublers, provide good balance aiding the odd order harmonic suppression. Sufficient gain is provided in this type of doubler to supply ample drive to the transmitter circuits as well as the receiver without diode switching at the second doubler output.

(7) The first mixer is a balanced mixer which rejects both incoming signals at its output by at least 20 db. This is necessary since the output is relatively broad having to pass a band of frequencies between 38 and 42 MHz. Tightly coupled bifilar toriodal transformers are used on the two input lines to assure as good balance as possible. Cores which require at least 10 turns of wire insure that lead inductance differences will be small in comparison to total inductance.

(8) The output of the first mixer feeds the first of two 38–42 MHz amplifiers. These amplifiers provide if. gain in the uhf mode and RF gain in the fm mode. Each stage is AGC'd in uhf and fm modes. The band-width of each stage is set so that the overall bandwidth is sufficient to pass frequencies between 38 and 42 MHz equally. Since there are three tuned circuits between the first and second mixer stage, bandwidths must be twice that of the overall bandwidth. Each stage has approximately 15 db gain and is 10 MHz wide.

(9) The second mixer converts the 38–42 MHz if. (uhf) and RF (fm) signals to the 10.125 MHz second if. frequency. Injection for this mixer is generated from the 50 MHz oscillator by way of a 50 MHz isolation amplifier stage. This buffer stage is used to decouple a secondary path between the two mixer stages. To prevent instability, the isolation stage suppresses 50 MHz oscillator outputs from being amplified by the 40 MHz amplifiers. The 50 MHz oscillator outputs are attenuated 30 to 40 db by the balanced doublers. The buffer stage also provides additional isolation for the transmitter circuits which the 50 MHz and 20 MHz outputs serve. The second mixer output is matched to the 50 ohm bank-pass filter.

(10) Power for the receiver-converter module is obtained from various sources. A regulated 9 Vdc which is well decoupled, is obtained from the if.–af module, decoupled and used to power the uhf pre-amplifier, mixers, and amplifiers. A separate regulator is provided within the 50 MHz oscillator which also powers the 50 MHz buffer stage which is "on" in all modes of operation, both uhf and fm. Power for the doubler stages is obtained through the front panel switching only when operating in the uhf mode. Power for the uhf/fm diode switch is also determined by front panel control settings.

b. IF–AF Amplifier Module (fig. 2–5). The if.–af amplifier module accepts signals from the band-pass filter within the 10.125 MHz range. The module provides if. amplification detection and audio amplification to a maximum of 250 mw of audio power delivered to the earphone or the speaker. Provisions for squelch are also incorporated in the module.

(1) In the fm mode of operation, four stages of amplification boost the if. signal level by 70 to 80 db. The last stage of amplification acts as a limiter stage. The bandwidth of the four-stage amplifier is approximately 10 times that of the band-pass filter. Selectivity in the if. strip is provided to keep the noise generated by the first stage of amplification from destroying the overall noise figure of the radio set. Selectivity is provided by means of single tuned interstage coupling transformers.

(2) The output of the limiter stage feeds signals to a frequency discriminator. Discriminator bandwidth is set up for peak-to-peak separation of 100 kHz. This provides ample discrim-

ination sensitivity while providing sufficient bandwidth to keep the output linear over the full temperature range. Adjustment is provided in two variable transformers so that bandwidth and sensitivity can be set. A series trap is provided at the discriminator output so the 10.125 MHz carrier can be completely decoupled from the audio system. Detected audio signals are routed to two separate preamplifiers. One preamplifier provides gain for audio frequencies while the other provides amplification of noise components for the squelch system. Audio gain of 40 db is provided by the two audio stages with the last stage being a complementary symmetry stage delivering 250 mw of audio power output. Audio frequency shaping is provided in the two stages with the 300 and 2500 Hz frequencies down 5 db and the 150 and 5000 Hz frequencies down 12 db. A volume control is provided for audio level setting. Battery power is supplied to the last stage in both receive and transmit modes so that sidetone generated in the two transmitters can be amplified and delivered to the speaker. When the phone jack is used with an earphone, the speaker is automatically disconnected. During the fm mode of operation, the uhf detector is disabled and the agc amplifier provides delayed agc action to the if. and RF amplifiers of the receiver-converter module.

(3) In the uhf mode of operation, 3 stages of if. amplification are used to boost the uhf signals from the converter by 60 to 70 db. The fourth stage of if. amplification is used as a limiter for squelch operation, much in the same manner as for fm operation. A diode detector provides an audio signal for the audio amplifiers and a dc voltage for the agc amplifier. The discriminator is used for the uhf mode, providing noise levels for the squelch system. By clamping the first portion of the audio preamplifier stage, discriminator noise is not fed into the audio system. In the uhf mode of operation, the agc amplifier provides sufficient dc gain so that receiver-converter input levels of 100 mw can be accepted without undue distortion.

(4) The squelch system is identical for both uhf and fm operation since the noise is clipped by the common limiter stage. The receiver squelch derives its input from the discriminator, the output bandwidth of which is determined by the r-c filter at the discriminator. The filter time constant effects any discriminator output bandwidth that is considerably wider than the required audio bandwidth. It is therefore possible to synthesize a signal-to-noise squelch circuit by coupling a portion of the discriminator output spectrum which is above the highest modulating signal frequency. Squelch action is then independent of modulation. When no signal is present, a large noise power output spectrum is present from the discriminator. When a signal is present, quieting occurs causing a decrease in the output noise. This change can be used to change the state of an electronic switch to disable or enable the receiver audio system, depending upon the existing signal-to-noise ratio. Such a circuit requires only one adjustment to set the signal-to-noise ratio at which squelch action is desired, and provides audio output only when an intelligible signal is present.

(5) The functional elements of the signal-to-noise squelch circuit are a squelch preamplifier, a bandpass filter, a rectifier, and a Schmitt Trigger. The bandpass filter is a Twin-Tee feedback circuit which provides a very narrow bandpass in the vicinity of 8 kHz. The response of the two-stage noise amplifier is 30 db down at 3000 Hz, the top of the normal-voice frequency range. Therefore, the amplifier samples only noise components around the 8 kHz range. The narrow filter is used to obtain narrow effective noise bandwidth, to provide a large signal-plus-noise change with a small input signal applied. This provides the required squelch sensitivity. The output of the narrow-band amplifier is rectified and applied to the Schmitt Trigger. The Schmitt-Trigger output is coupled to the audio preamplifier stage through a diode. When no input signal is applied, the Schmitt Trigger output stage is cut off and the diode is forward-biased, a voltage drop is developed across a portion of the emitter resistance in the second amplifier of the audio preamplifier and the stage is cut off, squelching the radio set. When sufficient quieting occurs, due to an input signal, the Schmitt Trigger changes state. In this case, the anode of the coupling diode in the Schmitt Trigger output is placed at the collector-to-emitter saturation potential of the Schmitt Trigger and operation of the audio amplifier is allowed to return to normal, and the receiver is unsquelched.

(6) A 9-volt series regulator is incorporated in the if.–af module which provides regulated voltage for all of the critical gain stages of the receiver. The very low source impedance of the regulator also provides dc stability sufficient to prevent "motor boating."

c. Modulator (fig. 2–1). The modulator portion of the radio set accepts speech signals from

the microphone, generates tone signals and delivers a modulated 10.125 MHz signal to the fm transmitter. The modulator also contains all of the power switching circuitry for automatic beacon operation.

(1) The speech portion of the modulator is made up of a speech preamplifier stage which boosts the signal from the microphone to a sufficient level to be fed to the speech clipper stage. The gain of the preamplifier is approximately 35 db which increases the 10 to 20 mv level of the microphone to 1 volt at the clipper input. The speech clipper is an amplifier stage with sufficient dc and ac feedback to act as a very linear amplifier up to the point of limiting, at which time hard limiting takes place clipping both negative and positive peaks simultaneously. The input to the clipper is adjusted so that normal voice peaks are just clipped and the output of the clipper is adjusted so that normal voice peaks will produce an 8 kHz deviation of the 10.125 MHz oscillator. The clipper stage also incorporates a two-section lowpass filter which produces 12 db per octave of roll-off above the highest frequency of 3000 Hz. A speech amplifier after the low-pass filter brings the speech level back to a level high enough to drive the modulator circuit. A speech modulator stage provides a very low source impedance and has enough voltage handling capability to deliver 5 volts rms to the varicap driven oscillator. The speech modulator stage is made up of emitter-follower stages with a large degree of feedback. The speech modulator stage is not activated in the uhf mode of operation, so speech frequencies do not shift the varicap oscillator.

(2) A 150 Hz tone oscillator provides 2 to 3 kHz of deviation in the fm mode, which is necessary to open the squelch circuits. The 150 Hz oscillator is an r-c feedback low frequency oscillator, compensated by a thermistor to hold the frequency within ±3 Hz over the temperature range of −40° to +131° F. A selected fixed resistor is used to preset each oscillator precisely on 150 Hz at room temperature. The 150 Hz tone output is fed to the junction of the speech amplifier and speech modulator through an isolation resistor.

(3) In fm beacon operation, a swept-tone oscillator is used which is located in the modulator module. The output of the oscillator is a swept tone beginning at 1000 Hz and decreasing to 300 Hz, repeating itself 2 to 3 times a second. The oscillator uses a unijunction transistor to trigger the sweep rate as well as provide a trigger for a multivibrator circuit which is used to switch between uhf and fm operation, when in beacon mode of operation, on the guard channel frequency. The swept-tone oscillator can also be stabilized at an output of 1,000 Hz by not applying voltage to the sweeper portion of the oscillator. This provides means for mcw operation. Because of the low level of the swept-tone oscillator its output is fed to the speech amplifier which boosts its level sufficiently so that 8 kHz of deviation can be achieved. The trigger output of the swept-tone oscillator triggers a bistable multivibrator. The square wave output of the multivibrator is used to turn on and off high current transistor switches which alternately turn on power to either of the two transmitters. The multivibrator and high current switches are set up so that if only uhf beacon operation is desired, the power applied to the uhf transmitter is applied 100% of the time. If only fm beacon operation is desired, power is also applied to the fm transmitter 100% of the time. When in the guard frequency position and operation is desired on both transmitters, the BAND switch is placed in the "SW" position to switch the applied power back and forth.

(4) The 10.125 MHz oscillator consists of two stages of amplification, each with 15 db gain and a feedback system containing a crystal and varicap diode. The output of the last amplifier has a neutralizing winding which is used to cancel the effects of the C_o capacitance of the crystal. This allows the crystal to be more easily shifted in the frequency by changing the series varicap capacitance while maintaining very good frequency tolerance over the temperature range. The frequency of the crystal oscillator is initially set by adjusting a potentiometer to develop a preset voltage across the varicap diode. The audio voltage of 4 volts rms from the speech modulator then varies the voltage across the varicap around the preset voltage. The full 4 volts rms will change the series capacitance sufficiently to produce 12 kHz maximum deviation of the basic oscillator frequency.

(5) The modulator module is provided with a 6.8-volt regulator which supplies regulated voltage for some of the critical circuits. The regulator is a series type similar to the one used in the .if–af module. To conserve current drain, the front panel mode switch removes power from the speech amplifiers during beacon or tone operation.

d. FM Transmitter (fig. 2-7). The fm transmitter provides an output of greater then 500 mw to the antenna. The fm transmitter accepts 10 MHz signals from the modulator and 50 MHz injection signals from the basic crystal-controlled oscillator located in the receiver-converter module. By using this side step method of obtaining the output frequency, a common transmit and receive oscillator can be used.

(1) The 10 MHz input is −20 db below a milliwatt and is boosted to the 1 mw level by a buffer stage. The stage has a high Q output tank to reduce the harmonic content being fed to the mixer stage. The balanced mixer stage uses push-pull inputs and a parallel output to suppress the input signals and mixes the 10.125 MHz modulated signal with the 50 MHz signals to produce the desired output operating frequency. The gain of the mixer stage, due to its broad-band output, is not sufficient to drive the class C driver stage; so a preamplifier stage between the mixer and driver provides enough output to fully drive the driver stage. The buffer stage provides enough gain and power handling capability to provide an output to drive the mixer of the uhf transmitter.

(2) The power level at the input to the driver stage is 5 to 10 mw. Interstage coupling networks between stages are of a low-pass nature to cut down on harmonic radiation and 50 MHz injection signals. The net-work between driver stage and final stage is factory adjusted for the highest possible efficiency. The final stage delivers power to a low-pass filter which is also factory adjusted for maximum efficiency. The output lowpass filter is a two section low-pass filter which reduces the second harmonic by at least 30 db.

(3) A small portion of the output is fed to a sidetone gate. The sidetone gate is made up of a detector and a gating circuit that opens or closes an audio line when sufficient power level is present at the final output stage. If the RF power level is not sufficient to trigger the gate circuit, mcw and beacon signals will not be heard in the speaker. The sidetone gate is set so that 200 mw of power output will open the gate. The overall efficiency of the fm transmitter is approximately 50%.

e. UHF Transmitter (fig. 2-8). The uhf transmitter provides a 90% amplitude modulated 200 mw signal to the antenna. The RF inputs to the uhf transmitter are a 200 MHz injection signal and a 40 MHz signal.

(1) An output of the 50 MHz basic transceiver oscillator located in the receiver-converter module (fig. 2-3) passes through two balanced doublers and becomes the 200 MHz injection signal which is applied to the 200 MHz buffer located in the uhf transmitter module.

(2) A second output of the 50 MHz basic transceiver oscillator passes through a 50 MHz buffer stage and is applied to the 10-40 MHz mixer stage located in the fm transmitter module. The 40 MHz output of the mixer stage is amplified by the 40 MHz buffer and applied to the uhf transmitter. The 200 MHz input is amplified by a buffer stage to the 1 mw level. The output level of the 200 MHz buffer stage is fed to the uhf mixer stage.

(3) The 40 MHz signals from the fm transmitter are amplified in a 40 MHz buffer stage the gain of which is controlled by the feedback system to be explained in (4) below. The 40 MHz signals are then fed to the uhf mixer stage. The mixer stage is similar to the fm transmitter mixer in that it has push-pull inputs and a parallel output tuned to 240 MHz. This tends to reduce the spurious signals caused by both inputs. Since the necessary bandwidth of the mixer output is in excess of 20 MHz, very little gain is noted in the mixer stage. Therefore, a preamplifier is required to boost the level high enough to drive the uhf driver stage into class C operation. A high-pass filter is used between the preamplifier and the driver to reduce the 200 and 160 MHz spurious responses of the mixer. A low-pass matching network is used between the driver stage and the final amplifier. Both driver and final amplifier are provided a certain degree of degeneration in the form of a very low-value resistor in their emitter leads. This helps maintain the stability of the stages. The output of the final stage passes through a low-pass filter to reduce the marnonics generated in the final stage by at least 30 db.

(4) A small portion of the rf output is sampled, demodulated and fed to one side of a differential amplifier. The audio from the modulator module is amplified and fed to the other side of the differential amplifier. The differential output of this amplifier is then fed back to one of the low-level stages. The 40 MHz buffer stage ahead of the mixer is used so the mixer level is not disturbed. Any distortion of the envelope in the stages between this buffer and the final amplifier is compensated by the differential gain of the differential amplifier. If the voltage pre-

sented to one side of the differential amplifier does not match the low-distortion input audio fed to the other side, the difference shows up as more or less gain in the buffer stage to clear up the distortion. A variable resistor feeding one side of the differential amplifier adjusts the modulation output level to 200 mw. A portion of the demodulated audio also is used as sidetone and fed to the if.-af amplifier audio output stage and speaker.

f. Chassis and Frame Assembly (fig. 4-7 through 4-14). The chassis and frame assembly provides support and interconnecting circuitry (fig. 4-7) for the switching arrangement, antenna, antenna coupler and all removable components. Figure 4-9 is a functional schematic diagram showing the interconnecting circuitry and serves as an aid in understanding the switching setup and in troubleshooting and testing the AN/URC-68. Functional schematic diagram of the plug-in modules are contained in figures 4-10 through 4-14.

(1) The antenna coupler is comprised of the antenna switching and matching networks. All signals, both transmitted and received, pass through and are processed in the antenna coupler.

(2) The BAND and MODE switches are two 3-position switches, used in conjunction with the CHAN switch to determine how the AN/URC-68 will operate and what circuitry will be used.

(3) The VOL control contains a power on-off switch that is actuated when turned clockwise from the PWR OFF position. The VOL control also controls the gain of the audio output.

(4) The CHAN switch is a multi-position switch, used to select any one of four installed crystals which determine the frequencies upon which the AN/URC-68 will operate.

(5) When the earphone is used, the speaker is disconnected automatically to provide a quiet mode of signal reception.

(6) Sidetone provides a means for checking the radio set, during tone or beacon operation, to indicate whether or not an RF carrier is being transmitted.

g. Antenna Assembly (fig. 2-1). The antenna assembly is polarized vertically with respect to the case and accepts signals in the 40 MHz and 240 MHz ranges. The radiation pattern in both frequency ranges is essentially that of a base loaded, vertical antenna, of less than 1/4 wave length at 40 MHz and 1/2 wave length at 240 MHz.

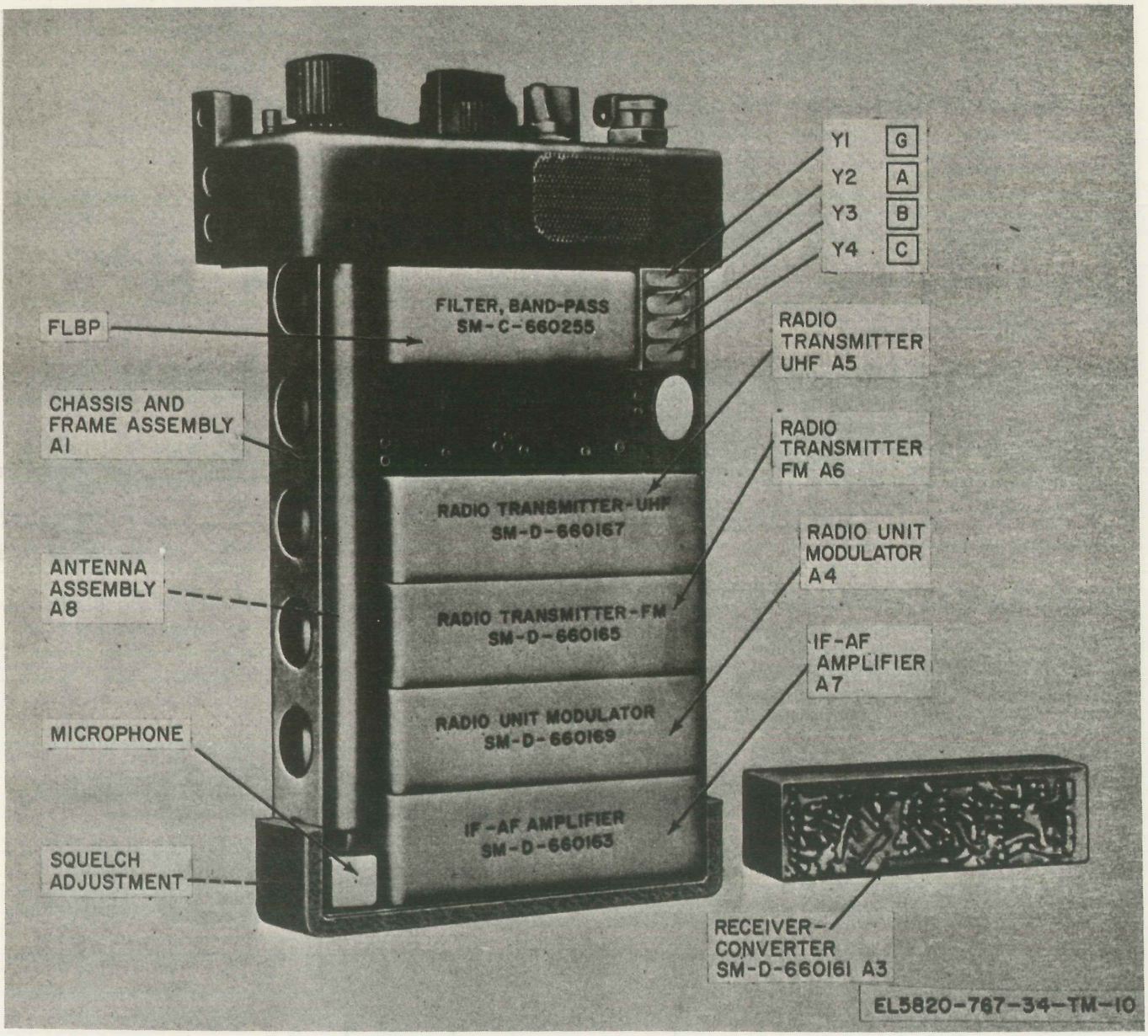


Figure 2-1. Receiver-transmitter unit, cover removed.

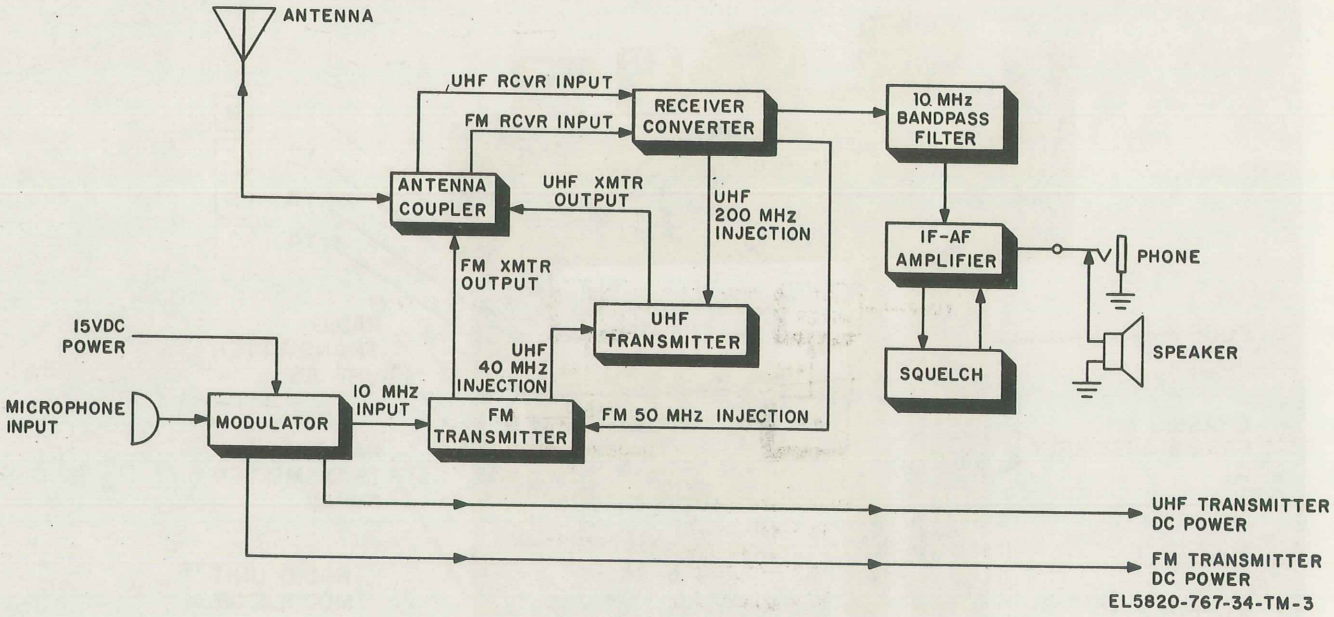


Figure 2-2. AN/URC-68 overall block diagram.

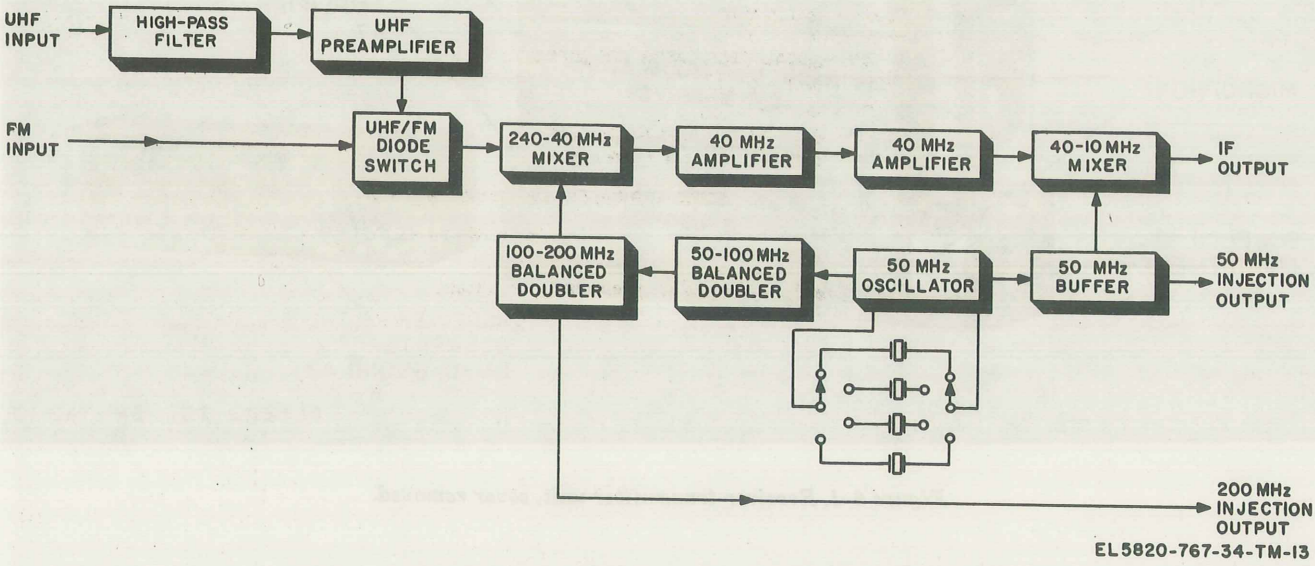
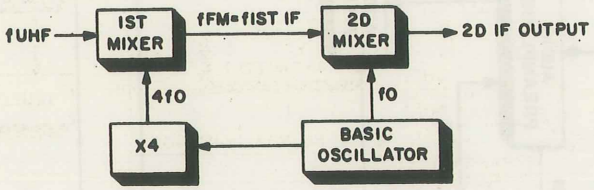


Figure 2-3. Receiver-converter module block diagram.



$f_{UHF} = 4f0 + f1ST\ IF$

$243 = 4f0 + 40.5$

$f0 = \frac{243 - 40.5}{4}$

$f0 = 50.625\ MHz$

$f1ST\ IF = f0 - f2D\ IF$

$40.5 = f0\ f2D\ IF$

$40.5 = 50.625 - f2D\ IF$

$f2D\ IF = 50.625 - 40.5$

$f2D\ IF = 10.125\ MHz$

f0 = LOCAL OSCILLATOR FREQUENCY
fUHF = 243 MHz [G]
fFM = 40.5 MHz [G]
f1ST IF = UHF 1ST IF (MUST ALSO = fFM)
f2D IF = CRYSTAL FILTER FREQUENCY

NOTE:
▭ INDICATES EQUIPMENT MARKING

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Figure 2–4. Second if. frequency selection.

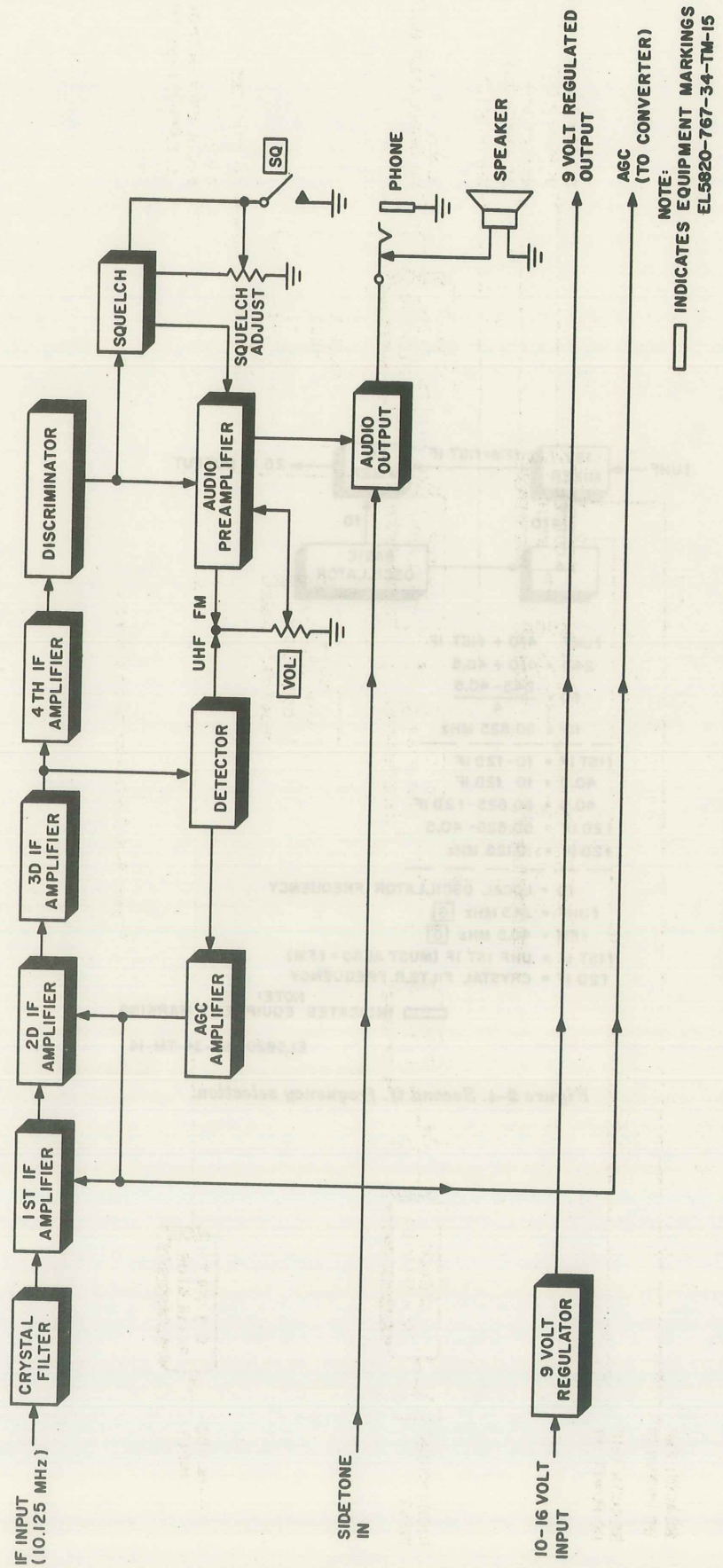


Figure 2-5. If-af amplifier block diagram.

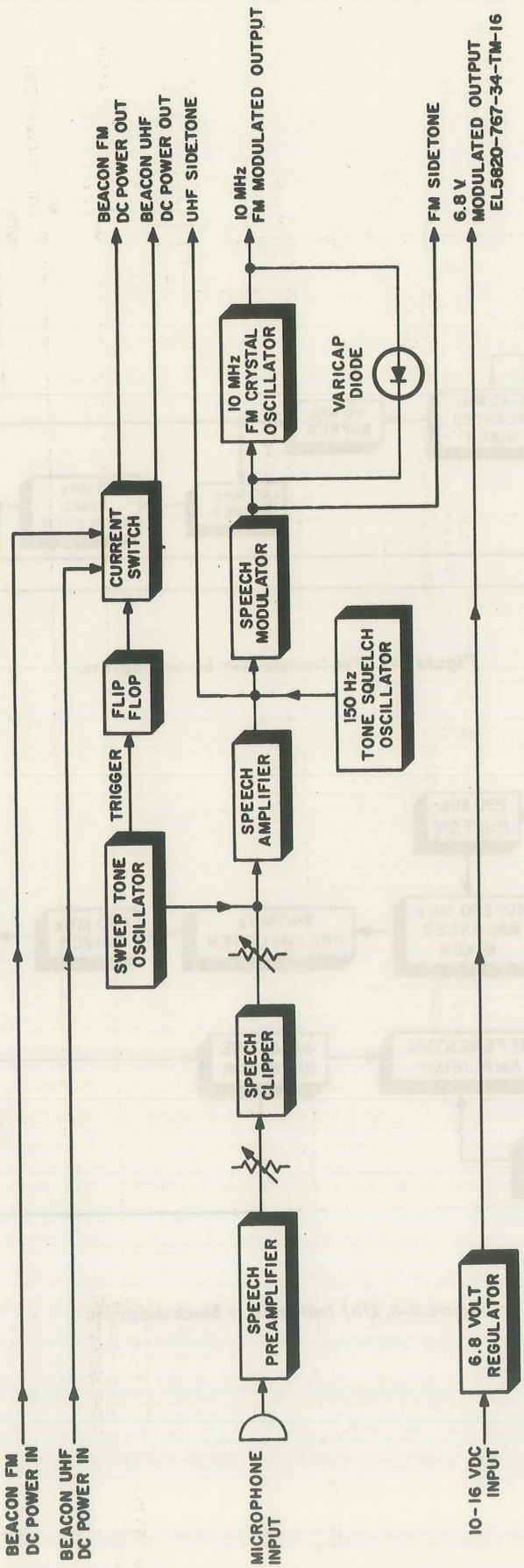


Figure 2-6. Modulator block diagram.

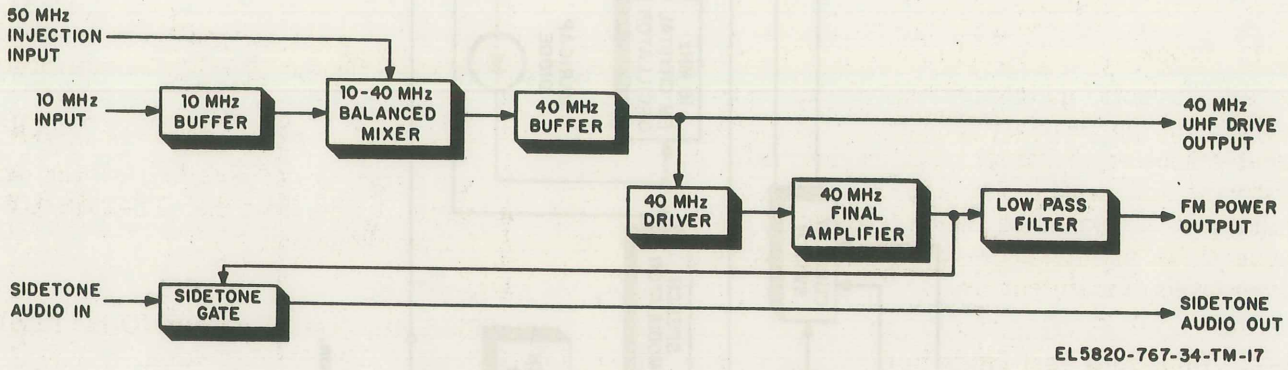


Figure 2-7. Fm transmitter block diagram.

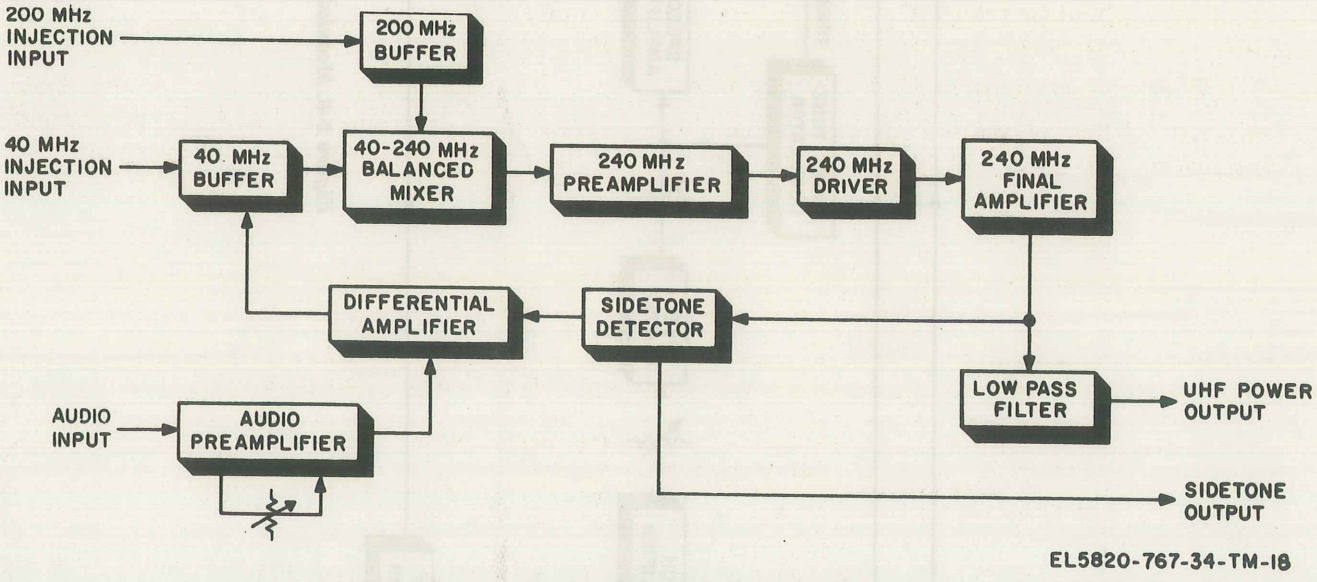


Figure 2-8. Uhf transmitter block diagram.

CHAPTER 3

DIRECT SUPPORT (DS) MAINTENANCE

Section I. GENERAL

3–1. Scope

Direct support maintenance includes requirements for performing quarterly maintenance, troubleshooting, removal and replacement, adjustment and testing the AN/URC–68. This requirement is expanded when necessary, to include those maintenance operations assigned to lower levels of maintenance.

3–2. Tools and Test Equipment (fig. 3–1)

Radio Test Set TS–2688/URC–68, TM 11–6625–1712–12, is used to indicate the condition of the battery and to indicate the RF power output level of the uhf and fm transmitters.

3–3. Quarterly Preventive Maintenance Chart

Quarterly preventive maintenance is defined as being every 120 days. When the radio set is stowed as part of a survival kit, the inspection interval for the survival kit may be substituted.

3–4. Operation and Reliability Test Procedure

Test the operation and reliability of the AN/URC–68, using Radio Test Set TS–2688/URC–68, in the following manner:

a. Battery Test.

(1) Shift the Test Set RADIO-BATTERY toggle switch to BATTERY position.

(2) Remove the battery from the receiver-transmitter unit and connect to the test set BATTERY test prod.

(3) Press the momentary PRESS-TO-TEST switch, located on the end of the BATTERY test prod.

(4) Read the indication on the test set meter and determine the average life remaining in the battery, from the chart in the cover.

Sequence No.	*Item*	*Procedure*	*Unit*
1	Cleanliness	Clean the entire unit both inside and outside.	TM 11–5820–767–12
2	Preservation	Remove any fungus or corrosion. Preserve and paint as needed.	TM 11–5820–767–12
3	O-rings	Replace damaged or aging O-rings and gaskets.	Paragraph 3–16
4	Modules	Check for proper seating. Replace damage or malfunctioning modules.	Paragraph 3–6
5	Operation and reliability	Check the overall operation of AN/URC–68 using Radio Test Set TS–2688/URC–68.	Paragraph 3–4
6	Spare parts	Check all spare parts for general condition and method of storage. No overstock should be evident and shortages must be on valid requisitions.	Appendix B
7	Publications	Check to see that all publications pertinent to the AN/URC–68 are hand, complete, serviceable, and current.	Appendix A
8	Modifications	Check DA Pam 310–7 to determine whether new applicable MWOs have been published. All URGENT MWOs must be applied immediately. All NORMAL MWOs must be scheduled.	TM 38–750 and DA Pam 310–7

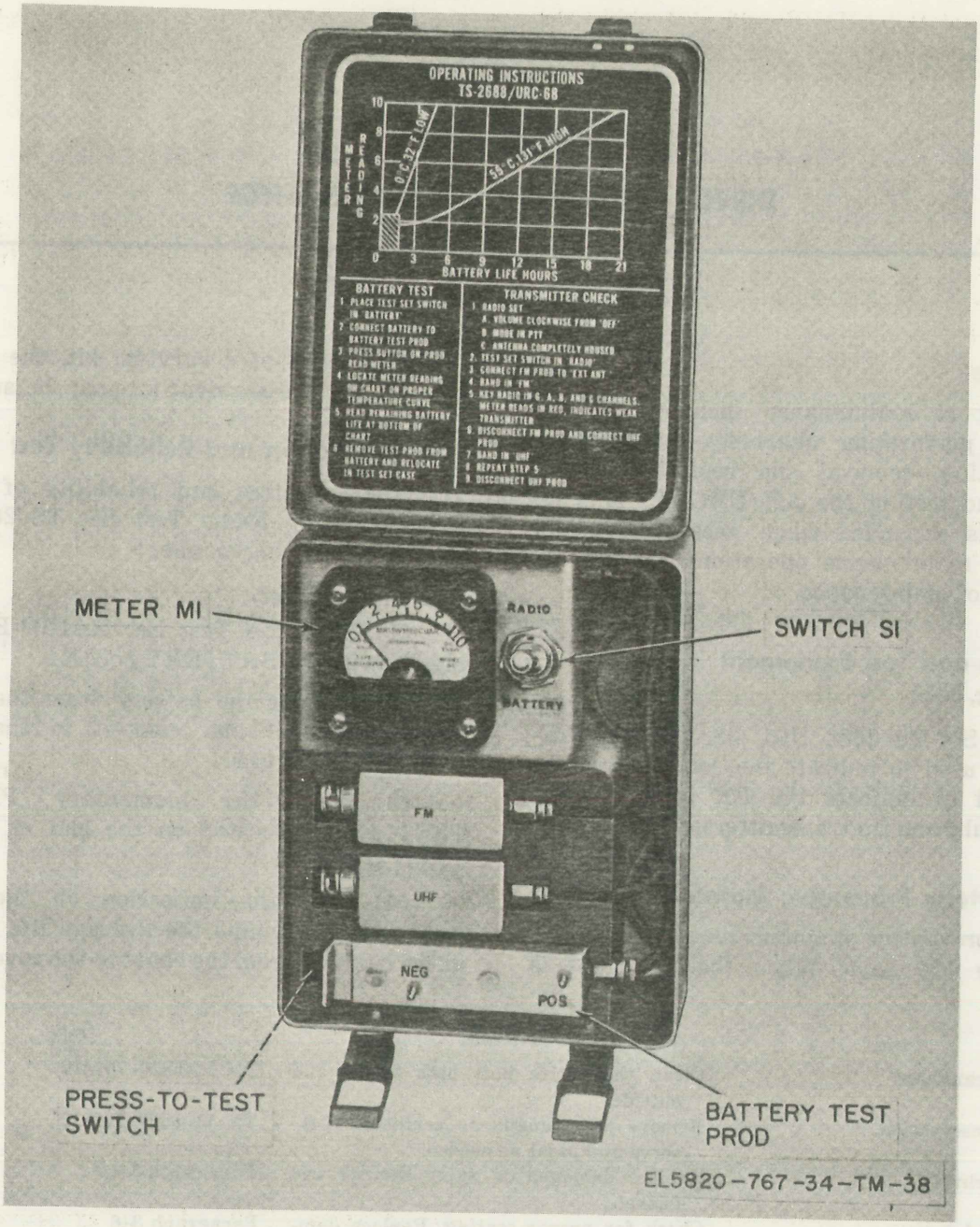


Figure 3-1. Radio Test Set, TS-2688/URC-68.

(5) Install a new battery if the requirement is so indicated.

b. FM Transmitter RF Power Output Test.

NOTE

When making the RF power output tests, any indication on the test set meter less than half scale indicates a faulty transmitter that should be replaced.

(1) Install a good battery on the receiver-transmitter unit.

(2) Completely collapse the telescopic antenna in the receiver-transmitter unit.

(3) Shift the BATTERY-RADIO toggle switch, on the test set to RADIO position.

(4) Connect the test set FM test prod to the AN/URC-68 control panel EXT ANT connector.

(5) Adjust the AN/URC-68 controls to the following positions:

BAND-FM
MODE-PTT
CHAN-G
VOL-1/4 turn clockwise
SQ-OFF

(6) Press the push-to-talk switch on the AN/URC-68.

(7) The test set meter should indicate greater than half scale.

(8) Repeat the above test with the CHAN switch set to each of the channel frequencies used.

(9) Place MODE switch to MCW position. An audible tone will be heard in the speaker when the press-to-talk switch is pressed.

(10) Place MODE switch to BCN position. A changing (swept) tone will be heard in the speaker.

c. FM Beacon Power Output Test. Maintain test connections as described in (1) through (5) of subparagraph *b* above.

(1) Set MODE switch in BCN position.

(2) Test meter indication should be greater than half scale.

d. UHF Transmitter RF Power Output Test. Perform the test described in *b* above with the following exceptions to the setup:

(1) Connect the test set UHF prod to the EXT ANT connector on the AN/URC-68 front panel.

(2) Set the AN/URC-68 controls to the following positions:

BAND-UHF
MODE-PTT
CHAN-G
VOL-1/4 turn clockwise
SQ-OFF

(3) Press the push-to-talk switch on the AN/URC-68.

(4) The test set meter should indicate greater than halfscale.

(5) Speak into the microphone and note that the indication on the test set meter varies.

(6) Perform the above test with the CHAN switch set to each of the channel frequencies used.

(7) Place MODE switch to MCW position. An audible tone will be heard in the speaker.

(8) Place MODE switch to BCN position. A changing (swept) tone will heard in the speaker.

e. UHF Beacon Power Output Test. Maintain test connections as described in (1) through (2) of subparagraph *d* above.

(1) Set MODE switch in BCN position.

(2) Test meter indication should be greater than half scale.

f. SW Band Position Test.

(1) Adjust the AN/URC-68 controls to the following positions:

MODE-BCN
CHAN-G
BAND-SW
VOL-1/4 turn clockwise
SQ-OFF

(2) Changing (swept) tones will be heard alternately in the speaker. One tone will be identical to that heard on fm and the other identical to that heard on uhf.

g. Sidetone. The MODE switch must be in BCN or MCW position for sidetone output to be audible in speaker or earphone. Sidetone is not used in voice (PTT) due to excessive acoustic feedback.

Section II. TROUBLESHOOTING

3-5. General

Troubleshooting at direct support maintenance level consists of verifying and localizing troubles in defective equipment. It also includes a check-out of new equipment for proper operation before use. Refer to troubleshooting chart, paragraph 3-6, for the troubleshooting procedures. Replace defective modules as necessary. Knobs are permanently attached and cannot be replaced. A defective knob will necessitate replacing the entire chassis and frame assembly. Troubleshooting is based upon reported defects and results of quarterly preventive maintenance checks, paragraph 3-3.

3–6. Troubleshooting Chart

Item No.	Trouble symptom	Probable trouble	Checks and corrective measures
1	Sidetone on some but not all channels in beacon mode.	Defective crystals	Check crystals on silent channels (fig. 2–1).
2	No sidetone on any channel in beacon mode.	Defective modulator	Set MODE switch to MCW. If sidetone is now heard, replace the modulator (fig. 2–1).
3	No sidetone on any channel with MODE switch in MCW position.	*a.* Defective uhf transmitter.	*a.* Set Band switch to FM and MODE switch to BCN. If sidetone is heard replace the uhf transmitter and set BAND switch to UHF. If sidetone is still heard, uhf transmitter was defective (fig. 2–1).
		b. Defective receiver converter	*b.* If replacing the uhf transmitter in 3*a*, above, does not restore sidetone, replace the receiver-converter. If sidetone is now restored receiver-converter was defective and original uhf transmitter should be returned to unit.
4	No sidetone on any channel with BAND switch in FM and MODE switch in BCN position.	*a.* Defective fm transmitter	*a.* Replace fm transmitter. If sidetone is now heard fm transmitter was bad. Replace original receiver-converter and uhf transmitter.
		b. Defective IF–AF amplifier	*b.* Replace the IF–AF amplifier. If sidetone is heard, IF–AF amplifier assembly was defective.
		c. Defective modulator	*c.* If replacing the IF–AF amplifier does not correct trouble, replace the modulator. If sidetone is now restored, the modulator was defective and original IF–AF amplifier should be returned to unit.
		d. Defective chassis and frame assembly.	*d.* If replacing the modulator in 4*c*, above, does not restore the sidetone, the chassis and frame assembly is defective and all modules should be placed in a new chassis and frame assembly.
5	Sidetone on all channels in uhf beacon mode, but none in mcw mode.	Defective modulator	Replace the modulator.
6	Sidetone in uhf beacon and mcw modes, but none in fm beacon mode.	*a.* Defective fm transmitter	*a.* Replace fm transmitter (fig. 2–1). If sidetone is restored, fm transmitter was defective.
		b. Defective modulator	*b.* If replacing the fm transmitter does not correct trouble, replace the modulator. If sidetone is now restored, the modulator was defective and the original fm transmitter should be returned to the unit.
		c. Defective chassis and frame assembly.	*c.* If replacing the modulator does not correct the trouble, the chassis and frame assembly is defective and all modules should be placed in a new chassis and frame assembly.
7	Sidetone not present in switched beacon mode.	Defective modulator	Replace the modulator.

Item No.	Trouble symptom	Probable trouble	Checks and corrective measures
8	Absence of receiver noise on all uhf channels in receive operation.	*a.* Defective receiver-converter	*a.* Replace receiver-converter (fig. 2–1). If receiver noise is now heard, receiver-converter was defective.
		b. Defective IF–AF amplifier	*b.* If replacing the receiver-converter does not correct trouble, replace the IF–AF amplifier.
9	Receiver noise on some but not all fm channels. *NOTE.* Noise may be heard with no crystal installed.	*a.* Crystals	*a.* Check for good contact in sockets and for good operation. If receiver noise is now restored, IF–AF amplifier was defective and original receiver-converter should be returned to unit.
		b. Defective bandpass filter	*b.* If replacing the IF–AF amplifier does not correct the trouble, replace the band-pass filter (fig. 2–1). If receiver noise is now restored, return the original IF–AF amplifier and receiver-converter to the unit.
		c. Defective chassis and frame assembly.	*c.* If replacing the bandpass filter does not correct the trouble, the chassis and frame assembly is defective.
10	Receiver noise on uhf channels but not on fm channels in receive operation.	*a.* Defective receiver-converter *b.* Defective chassis and frame assembly.	*a.* Replace the receiver-converter. *b.* If replacing the receiver-converter does not restore the normal receiver-noise, the chassis and frame assembly is defective.
11	No squelch in fm operation.	Defective squelch switch.	Replace squelch switch (higher echelon repair required, paragraph 4–22).
12	Unable to perform RF power output test on fm or uhf transmitter.	Defective PTT switch	Replace PTT switch (higher echelon repair required, paragraph 4–22).
13	Damaged antenna.	Defective antenna	Replace antenna assembly (paragraph 3–11).
14	Phone jack cover damaged.	Defective phone jack	Replace phone jack cover (paragraph 3–15).
15	Unable to connect external antenna.	Damaged external antenna connector	Replace external antenna connector (higher echelon repair required, paragraph 4–23).
16	Holes in boots of squelch or PTT switches.		Replace boots (paragraph 3–13 and 3–14).

Section III. ADJUSTMENT, ALIGNMENT, REPAIR, REMOVAL AND REPLACEMENT

3–7. General

The nonreparable, throw-away modular concept and the general construction features of the AN/URC–68 provide no means to align the equipment. Procedures for removing, repairing, and replacing those parts that are replaceable and making squelch adjustments are described in the succeeding paragraphs. Upon completion of any removal and replacement procedure perform operation test described in paragraph 3–4*b* through 3–4*f*.

3–8. Removal and Replacement of Battery (fig. 1–1)

a. Removal.

(1) Unscrew the large slotted captive screw near the bottom of the battery.

(2) Pull battery out slightly and down to separate it from the receiver-transmitter unit.

b. Replacement.

(1) Align contacts on battery with those on receiver-transmitter unit.

(2) Press battery up and in, then tighten large slotted captive screw near bottom of battery.

3-9. Removal and Replacement of Receiver-Transmitter Unit Cover
(fig. 1-1)

CAUTION

Exercise care, during removal and particularly during replacement, so that wiring on rear of printed circuit board is not pinched nor disturbed.

a. Removal.

(1) Remove the battery (paragraph 3-8).

(2) Unscrew the two captive Phillips-head screws on the face of the front panel.

(3) Remove the receiver-transmitter unit cover.

b. Replacement.

(1) Place receiver-transmitter unit cover on receiver-transmitter unit and tighten the two captive Phillips-head screws on the face of the front panel.

(2) Replace the battery (paragraph 3-8).

3-10. Removal and Replacement of Modules
(fig. 2-1)

a. Removal.

(1) Remove the battery and receiver-transmitter unit cover (paragraphs 3-8 and 3-9).

(2) Pull modules straight out, being careful not to bend or break contact pins.

b. Replacement.

(1) Align pins on module with holes on printed circuit board and press module in. Use care not to bend module pins.

NOTE

The band-pass filter only can be incorrectly installed. Correct position is indicated when lettering is in same reading position as the other modules.

(2) Replace the receiver-transmitter unit cover and battery.

NOTE

If modules have not been pushed in all the way, the receiver-transmitter unit cover cannot be installed properly.

3-11. Removal and Replacement of Antenna Assembly
(fig. 2-1)

a. Removal.

(1) Remove the receiver-transmitter unit cover and the battery (paragraph 3-8 and 3-9).

(2) Remove the cushioning material from the bottom of the chassis and frame assembly in the vicinity of the microphone making visible the bottom screw of the antenna assembly.

(3) Unscrew the knurled protective cap at the top of the antenna assembly and extend the largest diameter section of the antenna assembly. The antenna assembly should not be fully extended.

(4) While holding the large diameter section of the antenna assembly, loosen and remove the screw and washer from the bottom end of the antenna assembly.

(5) Slowly pull the antenna assembly out of the receiver-transmitter unit.

b. Replacement.

(1) Slide antenna assembly into receiver-transmitter unit through antenna receptacle.

(2) Rotate the antenna assembly while performing (1) above.

NOTE

Electrical connection to the antenna assembly is made by a spring pressure clip. When the antenna assembly is removed this clip will spring forward. When inserting new antenna, rotate slowly clockwise as the antenna is pushed into the antenna housing so that clip will not be damaged.

(3) Install the screw and washer removed in *a*(4) above.

(4) Tighten the knurled protective cap on antenna.

(5) Replace receiver-transmitter unit cover and battery (paragraphs 3-8 and 3-9).

3-12. Squelch Adjustment
(fig. 2-1)

The squelch adjustment potentiometer is located inside the receiver-transmitter unit cover at the base of the antenna assembly and behind the small microphone. The potentiometer adjustment is located on the battery side of the chassis. Remove the receiver-transmitter unit cover and set the squelch adjustment as follows:

a. Apply a source of 11 vdc to the battery spring-contacts on the chassis. The contact nearest the center of the chassis is positive.

b. Set the MODE switch to PTT.

c. Set the CHAN switch to G.

d. Set the BAND switch to UHF.

e. Set the SQ switch to ON.

f. Rotate the squelch adjustment potentiometer full counter-clockwise and note the receiver noise.

g. Rotate the squelch adjust potentiometer clockwise very slowly until the receiver noise just stops.

h. Rotate the CHAN switch to positions A, B, and C. If the receiver noise level reappears, turn the squelch potentiometer slightly further clockwise until the receiver noise just stops.

i. Set the BAND switch to FM. Note if any fm channels require further adjustment. Proper adjustment is obtained when all four uhf and fm channels are quiet when the SQ switch is ON.

3–13. Removal and Replacement of Squelch Switch Boot
(fig. 3–2)

The hex nut securing the squelch switch boot to the radio set front panel assembly is an integral part of the switch boot.

a. Removal. Use a 3/8-inch hollow-shaft hex nutdriver to remove boot from switch.

NOTE

The squelch switch is mounted in a D-hole, therefore, the boot may be removed and replaced without removal of the battery assembly and unit cover. The switch body will not rotate during replacement procedure.

b. Replacement. Use 3/8-inch hollow-shaft hex nutdriver to secure new switch boot. Tighten sufficiently to provide a secure watertight connection.

CAUTION

Do not overtighten boot or damage may occur to the rubber portion of the boot.

3–14. Removal and Replacement of PTT Switch Boot
(fig. 3–2)

a. Removal.

(1) Remove battery assembly and unit cover from the radio set.

(2) Hold PTT switch body to prevent rotation of the switch during boot replacement procedure.

(3) Remove boot using a 3/8-inch hollow-shaft hex nutdriver.

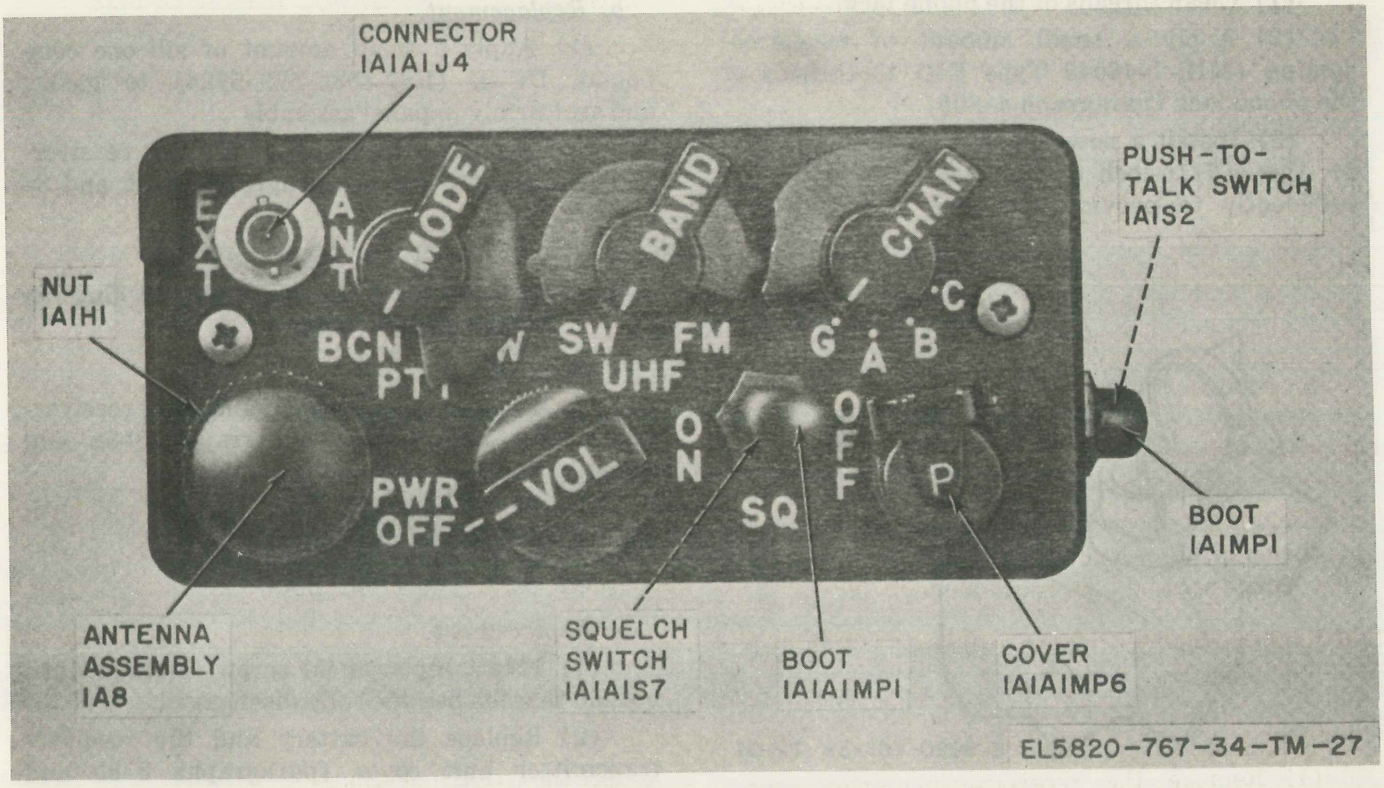


Figure 3–2. Front panel, replacement parts location.

b. Replacement.

Use a 3/8-inch hollow-shaft hex nutdriver to replace the boot. Hold the body of the switch to prevent rotation while tightening. Tighten sufficiently to provide a secure watertight connection.

CAUTION

Do not overtighten the boot or damage may occur to the rubber portion of the boot.

3–15. Removal and Replacement of Phone Jack Cover

(figs. 3–2, 3–3 and 3–4)

a. Removal.

(1) Open the phone jack cover. Using a hack saw, cut through both walls along the axis shown in fig. 3–3.

CAUTION

Do not cut into threaded area below shoulder of phone jack cover.

(2) Insert the blade of a screw driver into the hack saw cut as shown in fig. 3–3. Twist the screwdriver blade sufficiently to break phone jack cover away from the threaded area.

b. Replacement.

(1) Clean threads of the phone jack.

(2) Apply a small amount of conformal coating (MIL–I–46048 Type ER) to threads of the phone jack (paragraph 4–20*b*).

(3) Install a new phone jack cover (fig. 3–4). Use a 7/16-inch open-end wrench to tighten sufficiently to provide a secure watertight fit.

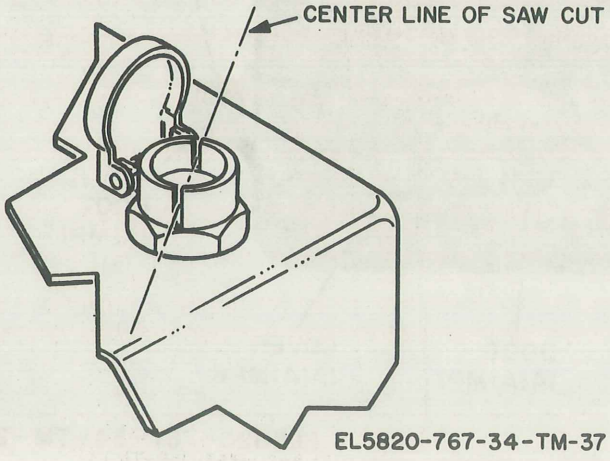


Figure 3–3. Phone jack cover, removal cutting axis.

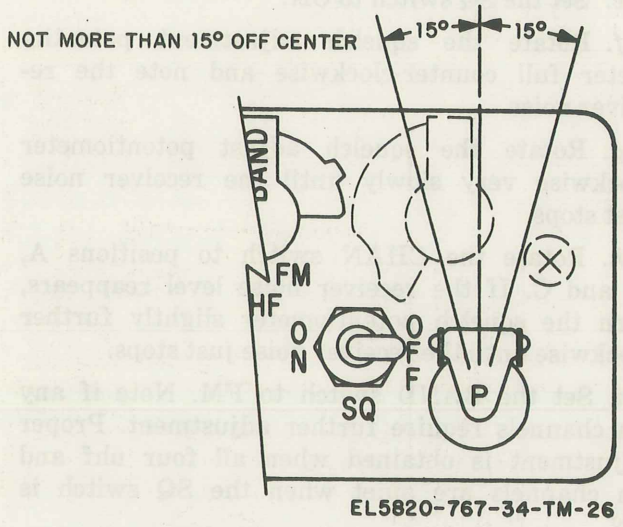


Figure 3–4. Phone jack cover position.

3–16. Removal and Replacement of Gasket

(fig. 3–5)

a. Removal.

(1) Remove the battery and the receiver-transmitter unit cover (paragraphs 3–8*a* and 3–9*a*).

(2) Remove gasket from underside edge of panel assembly.

b. Replacement.

(1) Apply a small amount of silicone compound, DC–4, (FSN8030–569–5724) to gasket and seat firmly in panel assembly.

(2) Replace the battery and the receiver-transmitter unit cover (paragraphs 3–8*b* and 3–9*b*).

3–17. Removal and Replacement of Captive Front Panel Screws

a. Removal.

(1) Remove the battery and the receiver-transmitter unit cover (paragraphs 3–8*a* and 3–9*a*).

(2) Pull disengaged screw straight out until bottom threads become engaged.

(3) Unscrew completely.

b. Replacement.

(1) Insert replacement screw. Tighten until bottom threads become fully disengaged.

(2) Replace the battery and the receiver-transmitter unit cover (paragraphs 3–8*b* and 3–9*b*).

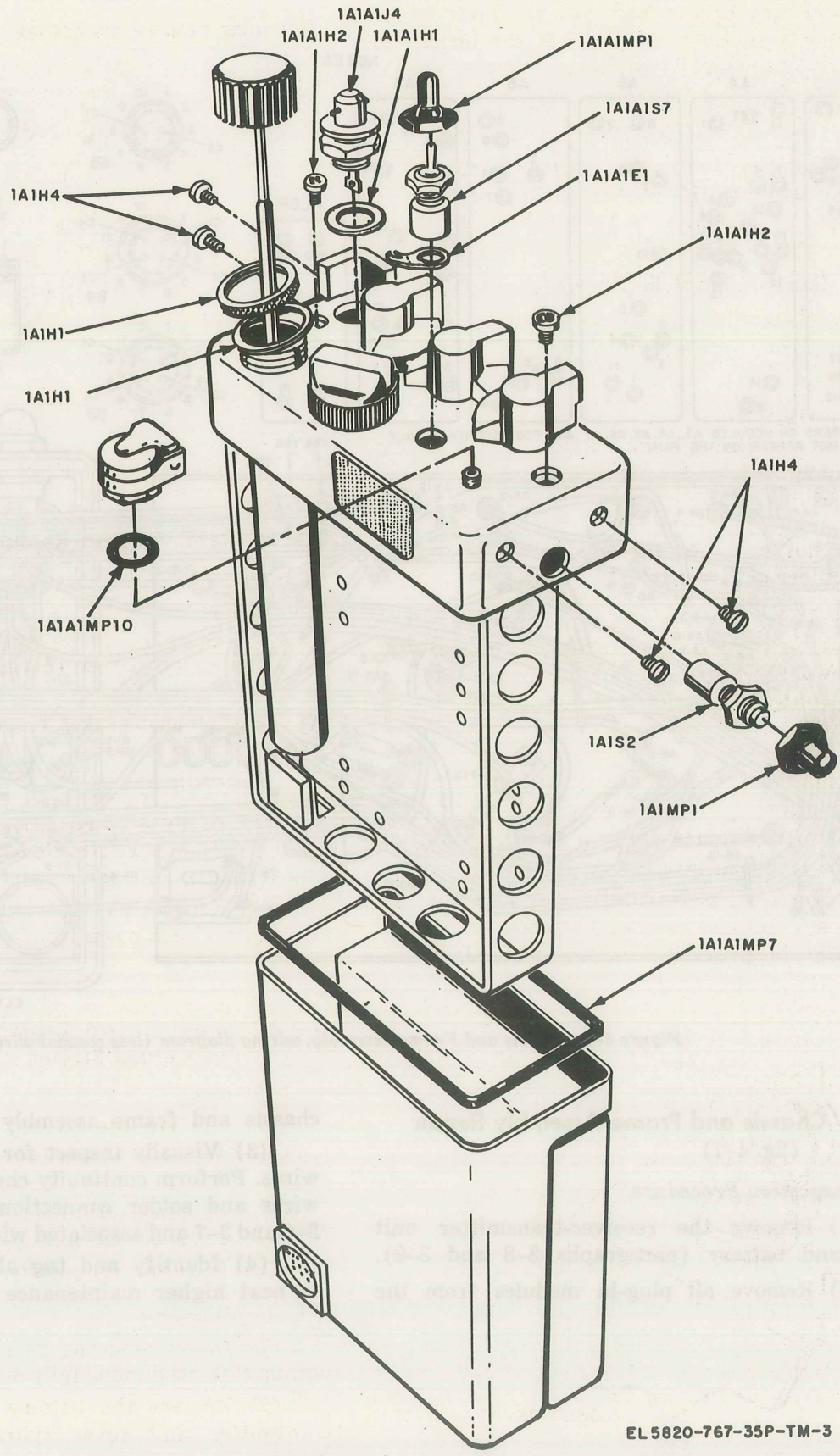


Figure 3-5. Chassis and Frame assembly, exploded view.

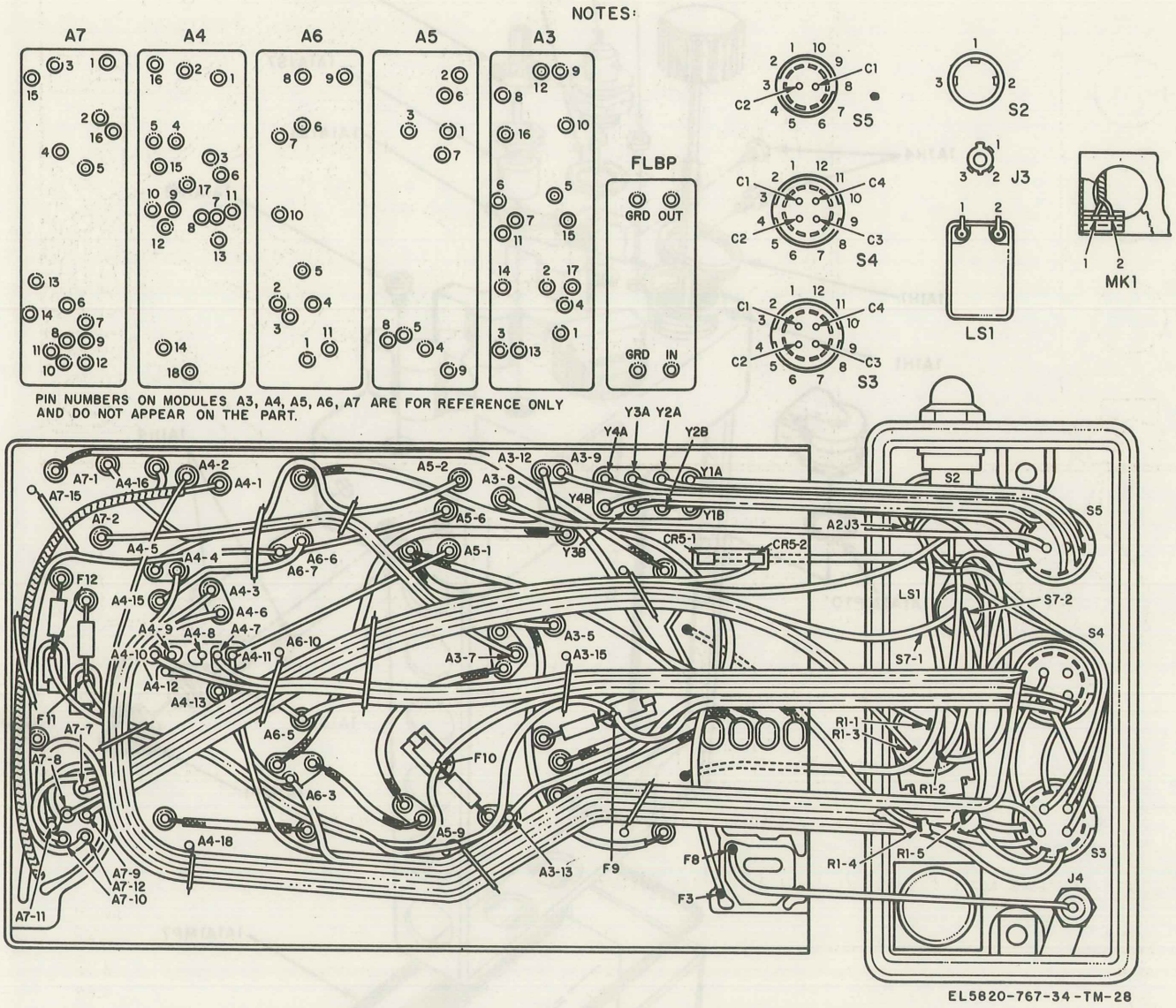


Figure 3–6. Chassis and Frame assembly, wiring diagram (less coaxial wires).

3–18. Chassis and Frame Assembly Repair (fig. 4–7)

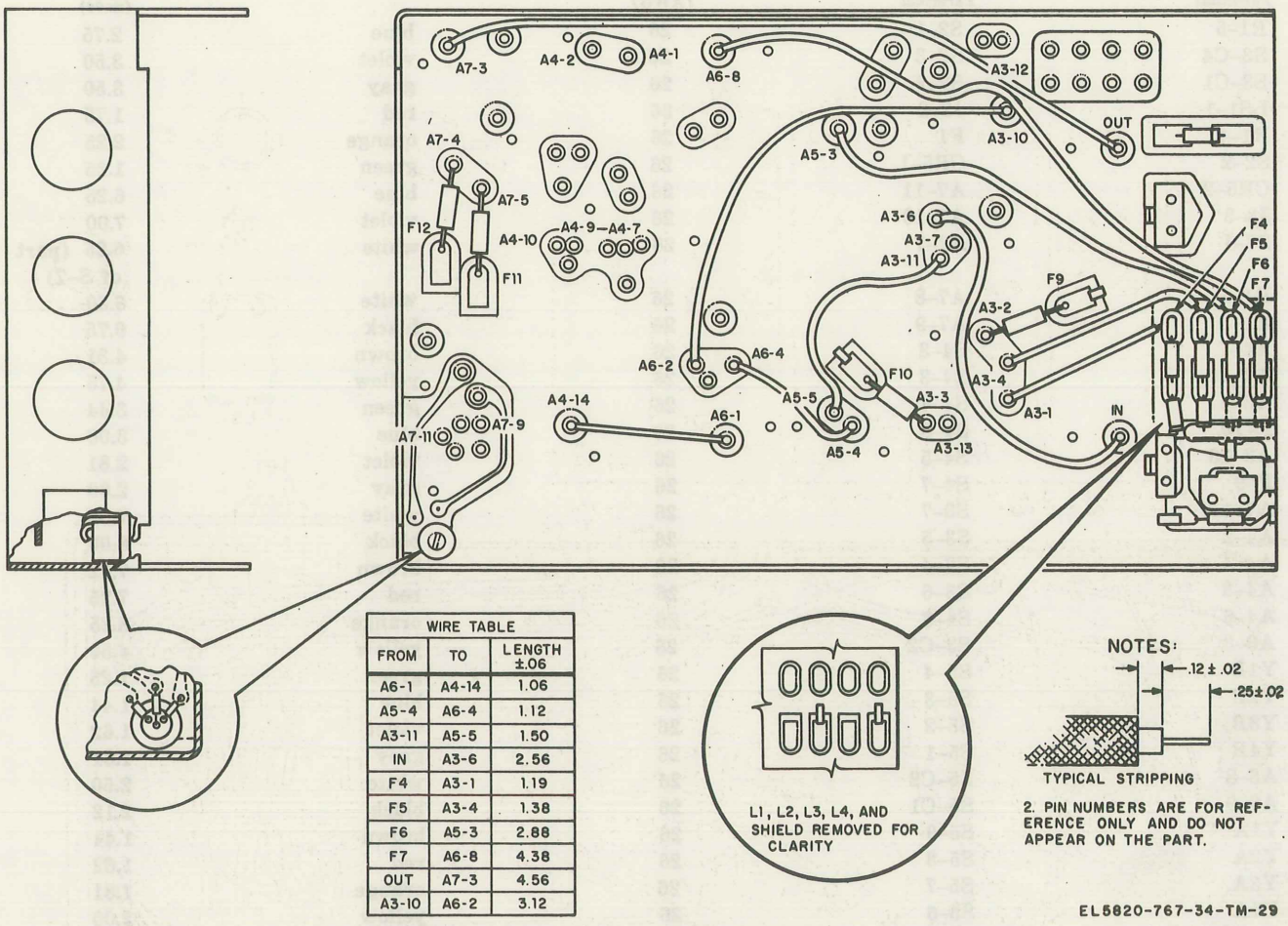
a. Inspection Procedure.

(1) Remove the receiver-transmitter unit cover and battery (paragraphs 3–8 and 3–9).

(2) Remove all plug-in modules from the chassis and frame assembly (paragraph 3–10).

(3) Visually inspect for damaged or broken wires. Perform continuity checks on all suspected wires and solder connections. Refer to figures 3–6 and 3–7 and associated wire charts.

(4) Identify and tag all defects and refer to next higher maintenance echelon for repair.



WIRE TABLE		
FROM	TO	LENGTH ±.06
A6-1	A4-14	1.06
A5-4	A6-4	1.12
A3-11	A5-5	1.50
IN	A3-6	2.56
F4	A3-1	1.19
F5	A3-4	1.38
F6	A5-3	2.88
F7	A6-8	4.38
OUT	A7-3	4.56
A3-10	A6-2	3.12

Figure 3-7. Chassis and Frame Assembly, coaxial wire location.

3-19. Chassis and Frame Assembly Wire Chart

From Terminal	*To Terminal*	*Size (AWG)*	*Color*	*Length Inches (±.06)*
F12	F10	26	brown	3.75
F11	F9	26	red	4.62
A4-10	A6-5	26	orange	1.68
A4-13	A6-3	26	yellow	1.38
A4-11	A5-1	26	green	2.12
A4-11	A3-13	26	blue	6.25
A6-7	A5-6	26	violet	1.75
A4-15	A6-6	26	gray	1.68
A4-5	A5-2	26	white	6.00
A7-12	A6-7	26	black	1.62
A7-1	A3-7	26	brown	3.81
A7-2	A3-5	26	red	3.75
MK1-2	A4-1	30	yellow	5.25
MK1-1	A4-16	30	black	5.25
A3-12	F3	26	green	4.75
S3-10	S3-11	24	buss	.62
S3-1	S3-2	24	buss	.62
J4	F8	20	white	1.25
S3-1	S4-C3	26	red	1.50
S3-11	S4-C2	26	orange	1.62
S3-3	S4-C1	26	yellow	1.75
S3-C3	R1-5	26	green	3.25

From Terminal	*To Terminal*	*Size (AWG)*	*Color*	*Length Inches (±.06)*
R1-5	S2-1	26	blue	2.75
S3-C4	S2-3	26	violet	3.50
S3-C1	S2-2	26	gray	3.50
LS1-1	J3-2	26	red	1.75
R1-4	F1	26	orange	2.25
S2-2	CR5-1	26	green	1.25
CR5-2	A7-11	26	blue	6.25
J3-3	A7-10	26	violet	7.00
S7-1	A7-7	26	white	6.25 (part of S-7)
R1-1	A7-8	26	white	6.50
R1-3	A7-9	26	black	6.75
A4-7	S4-3	26	brown	4.31
A4-10	S4-3	26	yellow	4.75
A6-5	S4-4	26	green	3.44
F-10	S4-8	26	blue	3.00
A3-13	S4-5	26	violet	2.81
F-9	S4-7	26	gray	2.00
A7-11	S3-7	26	white	7.06
A4-2	S3-5	26	black	8.00
A4-4	S3-4	26	brown	7.12
A4-3	S3-6	26	red	7.25
A4-6	S4-3	26	orange	8.25
A6-3	S3-C2	26	yellow	4.50
Y1B	S5-4	26	green	1.25
Y2B	S5-3	26	blue	1.44
Y3B	S5-2	26	violet	1.62
Y4B	S5-1	26	gray	1.81
A3-8	S5-C2	26	white	2.50
A3-9	S5-C1	26	black	2.12
Y1A	S5-9	26	brown	1.44
Y2A	S5-8	26	red	1.62
Y3A	S5-7	26	orange	1.81
Y4A	S5-6	26	yellow	2.00
S4-1	S4-4	24	buss	.62
S4-2	S4-5	24	buss	.62

3-20. Chassis and Frame Assembly Continuity and Resistance Chart

Test Equipment	*Control Settings Equipment Under Test*	*Test Procedure*	*Standard Performance*
TS-352/B lowest resistance scale.	All modules removed.	*a.* Test for continuity between following points on chassis assembly (refer to figure 3-7). *Note.* In addition, check each test point to ground to insure that a short does not exist.	
		From A3-1 — *To* F4	Continuity
		A3-4 — F5	Continuity
		A3-11 — A5-5	Continuity
		A3-6 — IN	Continuity
		A3-10 — A6-2	Continuity
		A5-4 — A6-4	Continuity
		A5-3 — F6	Continuity
		A6-1 — A4-14	Continuity
		A6-8 — F7	Continuity
		A7-3 — OUT	Continuity
TS-352B/U lowest resistance scale.	All modules removed.	*b.* Test for continuity between following points on chassis assembly: (refer to figure 3-6).	
		From A6-5 — *To* A4-12	Continuity
		A3-13 — A4-11	Continuity

Test Equipment	Control Settings Equipment Under Test	Test Procedure		Standard Performance
		From	To	
		A4–11	A5–1	Continuity
		A5–6	A6–7	Continuity
		A6–7	A7–12	Continuity
		A4–15	A6–6	Continuity
		A4–5	A5–2	Continuity
		A7–1	A3–7	Continuity
		A7–2	A3–5	Continuity
		A3–12	F3	Continuity
		LS1	A7–10	Continuity
		R1–1	A7–8	Continuity
		R1–3	A7–9	Continuity
		c. Test for continuity between following points: *Note.* Disregard the position of any switch not mentioned below.		
TS–352B/U				
		From	To	
Lowest resistance scale.	CHAN: G	A3–8	Y1B	Continuity
	A	A3–8	Y2B	Continuity
	B	A3–8	Y3B	Continuity
	C	A3–8	Y4B	Continuity
	C	A3–9	Y4A	Continuity
	B	A3–9	Y3A	Continuity
	A	A3–9	Y2A	Continuity
	G	A3–9	Y1A	Continuity
	MODE: BCN	A4–13	A4–3	Continuity
	PTT	A4–13	A4–2	Continuity
	MCW	A4–13	A4–4	Continuity
	SQ: OFF	Measure resistance between A7–7 and ground.		Zero-ohms (short indicated)
	SQ: ON	Measure resistance between A7–7 and ground while rotating squelch adjustment R2 over its full range. *Note.* After completion of tests, readjust R2 in accordance with para. 3–12.		0 to 25K ohms
	VOL: PWF OFF	Measure resistance between A7–8 and ground.		Zero-ohms (short indicated)
TS–352B/U	VOL: Fully Clockwise position	Measure resistance between A7–8 and ground.		25K ohms

3–21. Chassis and Frame Assembly Voltage Checkout Chart

Test Equipment	Control Settings Equipment Under Test	Test Procedure	Standard Performance
PP–1104/G voltage: 13vdc at 25 ma	VOL: ON	Remove all modules. Connect power supply to plus and minus spring clips of the interconnect board. Measure voltage at test points indicated below for each combination of switch positions listed. Refer to fig. 3–8 for test point location.	
	MODE: BCN	A4–6	13 vdc
	BAND: SW	A4–7	13 vdc
	Push to talk:	A4–10	13 vdc
	Receive	A7–11	13 vdc
	MODE: BCN	A4–6	13 vdc
	BAND: UHF	A4–7	13 vdc
	Push to talk:	A4–9	13 vdc
	Receive		
	MODE: BCN	A4–6	13 vdc
	BAND: FM	A4–8	13 vdc
	Push to talk:	A4–10	13 vdc
	Receive		

Test Equipment	Control Settings Equipment Under Test		Test Procedure	Standard Performance
	MODE: PTT BAND: FM Push to talk: Receive	A3-2		13 vdc
	MODE: PTT BAND: FM Push to Talk Transmit	A6-5		13 vdc
	MODE: PTT BAND: UHF Push to talk: Receive	A5-3		13 vdc
	MODE: PTT BAND: UHF Push to talk: Transmit	A5-13		13 vdc
	MODE: MCW BAND: UHF Push to talk: Receive	A5-3 A7-11		13 vdc 13 vdc
	MODE: MCW BAND: UHF Push to talk: Transmit	A3-13		13 vdc
	MODE: MCW BAND: FM Push to talk: Receive	A3-2		13 vdc
	MODE: MCW BAND: FM Push to talk: Transmit	A6-5		13 vdc

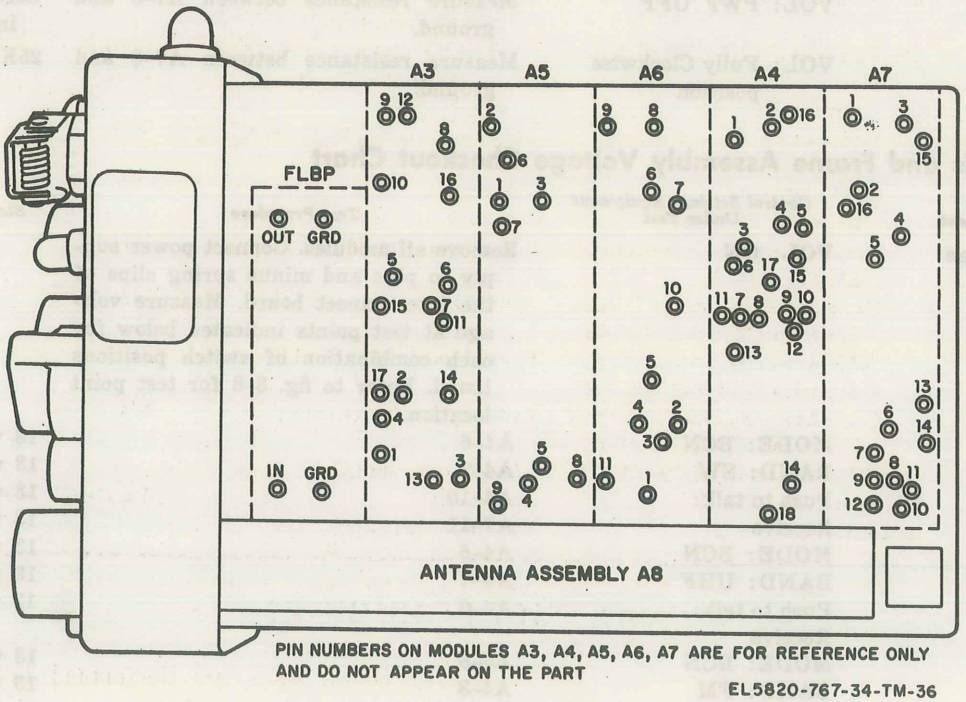


Figure 3-8. Chassis and Frame Assembly, module pin identification.

CHAPTER 4
GENERAL SUPPORT MAINTENANCE

Section I. INTRODUCTION

4-1. General

General support maintenance includes the test procedures described in this chapter and all maintenance allocated to lower levels of responsibility. These test procedures are prepared for use by maintenance activities responsible for general support maintenance of Radio Set AN/URC-68. The tests determine the success of the repairs by indicating the level of performance of the AN/URC-68 and its functional reliability. Follow the procedural steps of the tests in the order given and set all controls accurately as described in each test. Verify the results of the test by comparison with the test requirements. The equipment required to perform the tests is listed in the chart in paragraph 4-2.

4-2. Test Equipment Chart

Item No.	*Test equipment*	*Common name or use*	*Technical manual or p/n*
1	Signal Generator AN/URM-127	Audio Oscillator	TM 11-6625-683-15
2	Modulation Meter ME-57/U	Deviation Meter	TM 11-6625-400-12
3	Spectrum Analyzer TS-723A/U	Distortion Analyzer	TM 11-5097
4	Electronic Counter AN/USM-207	Frequency Meter	TM 11-6625-700-10
5	Oscilloscope AN/USM-140B	Oscilloscope	TM 11-6625-535-15
6	Regulated Power Supply PP-1104/G	Power Supply	TM 11-6130-246-12
7	Signal Generator AN/URM-48	Signal Generator (FM)	TM 11-1257, TO16-30URM48-5
8	Signal Generator AN/USM-44A	Signal Generator (AM)	TM 11-6625-508-10
9	Electronic Voltmeter ME-30B/U	AC VTVM	TM 11-6625-320-12
10	Electronic Voltmeter AN/URM-145	RF VTVM	TM 11-6625-524-14
11	Radio Test Set, TS-2688/URC-68	Test Set (rf and battery output)	TM 11-6625-1712-12
12	RF Detector DT-307/G	Demodulate audio to check amplitude modulation capability	Telonic XD3A
13	Test Facilities Kit MK-1559/URC-68	Provides maintenance accessories	(fig 4-1.1)
	Simulator, Antenna Receiver SM-633/URC-68	Fm antenna simulator (receive mode)	W1A
	Simulator, Antenna Receiver SM-636/URC-68	Uhf antenna simulator (receive mode)	W1B
	Simulator, Antenna Transmitter SM-634/URC-68	Fm antenna simulator (transmit mode)	W1C
	Simulator, Antenna Transmitter SM-635/URC-68	Uhf antenna simulator (transmit mode)	W1D
	Cable Assembly, Special Purpose Electrical CX-12841/URC-68	Audio output cable assembly	W3
	Cable Assembly, Special Purpose Electrical CX-12843/URC-68	Power Input cable assembly	W2
	Cable Assembly, Special Purpose Electrical CX-12842/URC-68	Audio input cable assembly	W4
	Cable Assembly, Rf CG-409H/U	Rf cable assembly (2)	
14	Multimeter TS-352B/U	Multimeter	TM 11-6625-366-15
15	Attenuator CN-796/U	Variable Attenuator	

Section II. TEST PROCEDURES

4-3. General

a. This section describes step-by-step bench test procedures for the receiver-transmitter unit to be performed at the general support maintenance level. This bench tests are performed to determine the effectiveness of equipment maintenance and to indicate the expected level of performance of the radio set.

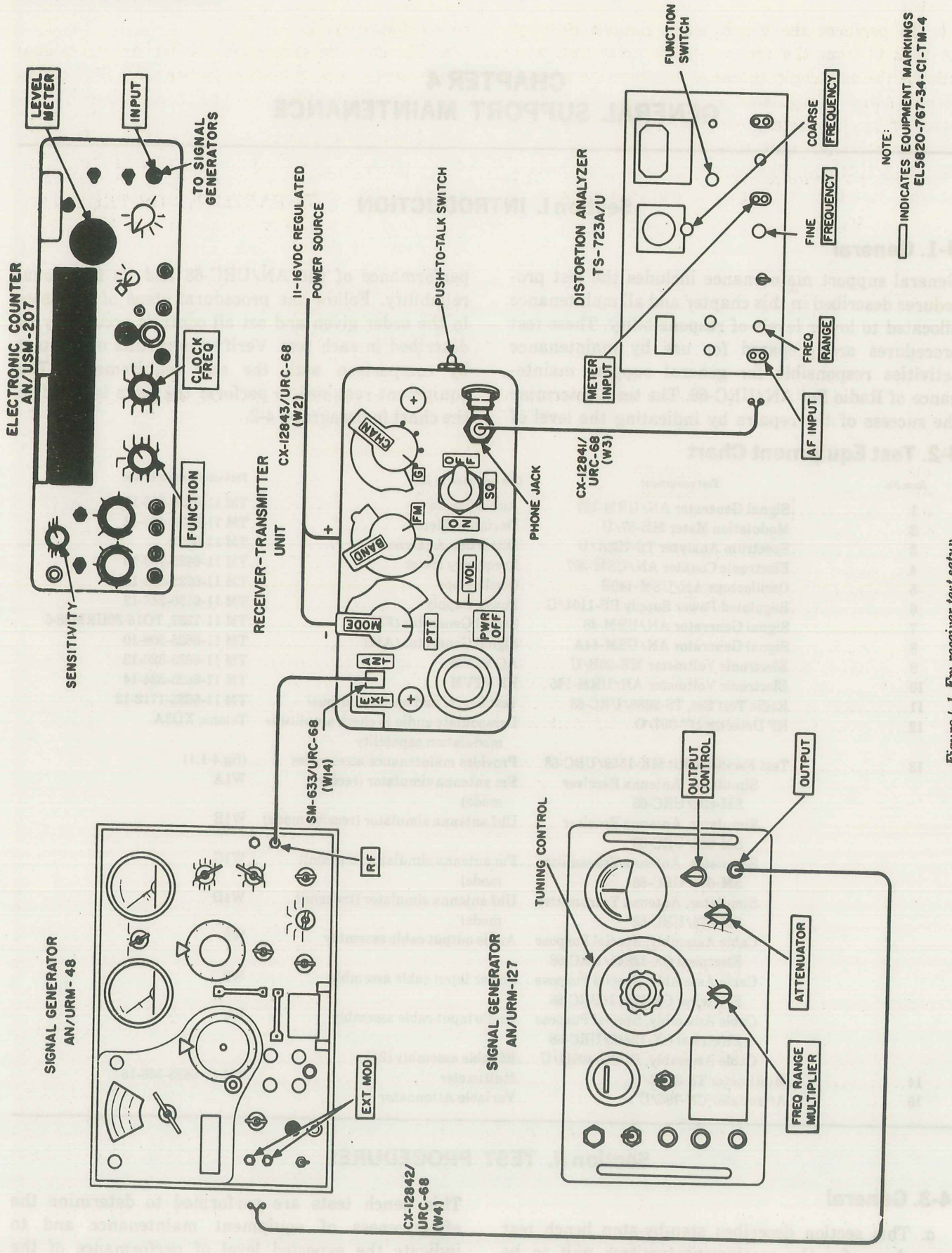


Figure 4-1. Fm receiver test setup.

b. To perform the bench tests, remove Battery BA-1112/U from the receiver-transmitter unit and collapse the telescopic antenna. All tests are accomplished using a regulated 11-16 vdc power source attached to the battery connector pins on the receiver-transmitter unit (use cable assembly (W2) CX-12843/URC-68). The battery connector pin nearest the center of the receiver-transmitter unit is positive polarity.

c. The chart in paragraph 4-4 lists the individual bench tests and indicates the related illustration and paragraph number that applies to each test.

4-4. List of Bench Tests

The following chart indicates the AN/URC-68 bench-type tests by paragraph number and figure number.

Paragraph No.	*Figure No.*	*Name of test*
4-5	4-1	FM Receiver Sensitivity Test
4-6	4-2	UHF Receiver Sensitivity Test
4-7	4-1	FM Noise Operated Squelch Test
4-8	4-2	UHF Noise Operated Squelch Test
4-9	4-1	FM Receiver AGC and Limiting Test
4-10	4-2	UHF Receiver AGC and Limiting Test
4-11	4-1	FM Receiver Audio Test
4-12	4-2	UHF Receiver Audio Test
4-13	DELETED	DELETED
4-14	DELETED	DELETED
4-15	4-3	FM Transmitter RF Power Output and Frequency Accuracy Test
4-16	4-3	UHF Transmitter RF Power Output and Frequency Accuracy Test
4-17	4-4	Transmitter Tone Tests
4-18	4-5	FM Transmitter Modulation Test
4-19	4-6	UHF Transmitter Modulation Test

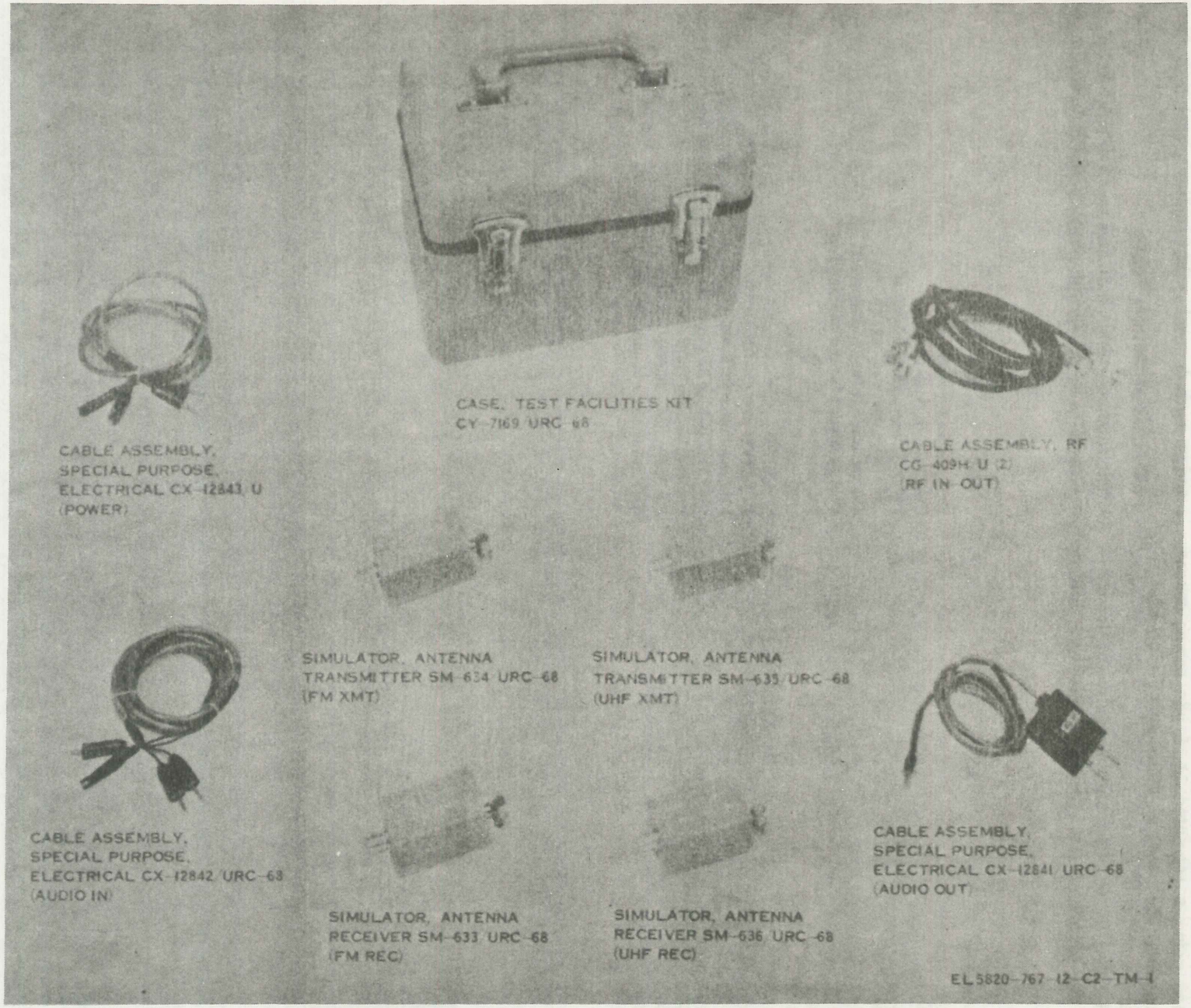


Figure 4-1.1. Test Facilities Kit MK-1559/URC-68.

NOTES

1. The following tests specify the use of Signal Generator AN/URM-48 (SG-12/U) without the normally required rf cable attenuator. The rf output cable is connected directly to the unit under test. Omission of the attenuator causes the following:

a. A 50-ohm output impedance from the rf cable instead of a 10-ohm output impedance from the attenuator.

b. An output equal to five-times that indicated on the RF ATTENUATOR MICROVOLTS control. (The attenuator causes a 5:1 voltage division; the RF ATTENUATOR MICROVOLTS control is calibrated to the output of the attenuator.)

2. The following tests specify use of Signal Generator AN/USM-44A which provides a "hard" or unpadded rf output. If an equivalent generator with a "soft" or padded rf output is used, double the output level is required.

3. Monitor the signal generator outputs by use of Electronic Counter AN/USM-207. Insure that frequency required is applied within accuracy of the AN/USM-207.

4-5. FM Receiver Sensitivity Test Chart

(fig. 4-1)

Test No.	Test equipment	Control settings: Equipment under test	Test procedure	Standard performance
1	*PP-1104/G* Voltage: 13.6 vdc *AN/URM-48* Frequency: 40.50 MHz DEVIATION RANGE: 25 DEVIATION: 8 kHz OPERATION: 1,000 Hz Output: 10 uv (Rf attenuator volts set to 2) *TS-723A/U* FUNCTION: Meter METER RANGE: 3.0 vrms Receiver-transmitter audio output connected to METER input.	MODE: PTT BAND: FM CHAN: G VOL: Clockwise SQ: OFF	*a.* Connect equipment as shown in figure 4-1. (AN/URM-127 is not required.) *b.* Adjust the receiver-transmitter unit VOL control for 0 db output as indicated on the TS-723A/U. *c.* Remove the modulation from AN/URM-48. *d.* Record the reading in db below, 0 db as indicated on the TS-723A/U METER.	Sensitivity in signal plus noise-to-noise ratio shall be 10 db minimum.
2	Repeat previous test with power supply set for 11 vdc and AN/URM-48 output set for 15μv (RF attenuator volts set at 3).		Connect the equipment as shown in figure 4-1.	Same performance as in Test No. 1 above.

4-6. UHF Receiver Sensitivity Test Chart

(fig. 4-2)

Test No.	Test equipment	Control settings: Equipment under test	Test procedure	Standard performance
1	*PP-1104/G* Voltage: 13.6 vdc *AN/USM-48* Frequency: 243 MHz Output: 25μv Modulation: 30% at 1,000 Hz *TS-723A/U* FUNCTION: METER METER RANGE: 3.0 vrms Receiver-transmitter unit audio output connected to METER input.	MODE: PTT BAND: UHF CHAN: G VOL: Turn clockwise SQ: OFF	*a.* Connect equipment as shown in figure 4-2. *b.* Adjust the receiver-transmitter unit VOL control for 0 db as indicated on the TS-723A/U. *c.* Remove modulation from the AN/USM-44A. *d.* Record the reading in db below 0 db as indicated on the TS-723A/U METER.	Sensitivity in signal plus noise-to-noise ratio shall be 10 db minimum.
2	Repeat test with PP-1104/G set for 11 vdc and AN/USM-44A output set for 40μv.		Equipment connected as shown in figure 4-2.	Same performance as test No. 1 above.

4-7. FM Noise Operated Squelch Test Chart

(fig. 4-1)

Test No.	Test equipment (Control settings)	Equipment under test	Test procedure	Standard performance
1	*PP-1104/G* Voltage: 11 vdc *AN/URM-48* Frequency: 40.50 MHz Output: Minimum DEVIATION RANGE: 25 DEVIATION: 8kHz OPERATION: 1,000 Hz *TS-723A/U* FUNCTION: METER METER RANGE: 3.0 vrms Receiver-transmitter unit audio output connected to METER input.	MODE: PTT BAND: FM CHAN: G VOL: Turn clockwise SQ: ON	*a.* Connect the equipment as shown in figure 4-1. *b.* Increase the AN/URM-48 output until receiver-transmitter unit output signal appears on TS-723A/U.	Audio shall appear with an output from the AN/URM-48 of 10μv or less (the rf attenuator volts control indicates 2).

4-8. UHF Noise Operated Squelch Test Chart

(fig. 4-2)

Test No.	Test equipment (Control settings)	Equipment under test	Test procedure	Standard performance
1	*PP-1104/G* Voltage: 11 vdc *AN/USM-44A* Frequency: 243 MHz Modulation: 30% at 1,000 Hz Output: Minimum *TS-723A/U* FUNCTION: METER METER RANGE: 3.0 vrms Receiver-transmitter unit audio output connected to METER input.	MODE: PTT BAND: UHF CHAN: G VOL: Turn clockwise SQ: ON	*a.* Connect the equipment as shown in figure 4-2. *b.* Increase the AN/USM-44A RF output until audio output signal appears on TS-723A/U.	Audio shall appear at the TS-723A/U input with less than 25μv rf input.

4-9. FM Receiver AGC and Limiting Test Chart

(fig. 4-1)

Test No.	Test equipment (Control settings)	Equipment under test	Test procedure	Standard performance
1	*PP-1104/G* Voltage: 12.5 vdc *AN/URM-48* Frequency: 40.5 MHz DEVIATION RANGE: 25 DEVIATION: 8kHz OPERATION: 1,000 Hz OUTPUT: 20μv (Rf attenuator set at 4μv) *TS-723A/U* FUNCTION: METER METER RANGE: 3.0 vrms Receiver-transmitter unit audio output connected to METER input.	MODE: PTT BAND: FM CHAN: G VOL: Turn clockwise SQ: OFF	*a.* Connect the equipment as shown in figure 4-1. *b.* Adjust receiver-transmitter VOL control for -3 db on METER, of TS-723A/U. *c.* Increase AN/URM-48 RF output level to maximum.	Increasing the AN/URM-48 rf output shall not produce more than 0 db reading on TS-723A/U METER.

4-10. UHF Receiver AGC and Limiting Test Chart

(fig. 4-2)

Test No.	Test equipment	Control settings: Equipment under test	Test procedure	Standard performance
1	*PP-1104/G* Voltage: 12.5 vdc *AN/USM-44A* Frequency: 243 MHz Modulation: 30% at 1,000 Hz Output: 5 mv *TS-723A/U* FUNCTION: METER METER RANGE: 3.0 vrms Receiver-transmitter unit audio output connected to METER input	MODE: PTT BAND: UHF CHAN: G VOL: Turn clockwise SQ: OFF	*a.* Connect the equipment as shown in figure 4-2. *b.* Adjust receiver-transmitter for -5 db on TS-723A/U METER. *c.* Vary AN/USM-44A RF output level between 25 μv and 250 mv.	Varying the AN/USM-44A output shall not vary audio outputs greater than ± 5 db from the reference (-5 db) as read on the TS-723A/U METER.

4-11. FM Receiver Audio Test Chart

(fig. 4-1)

Test No.	Test equipment	Control settings: Equipment under test	Test procedure	Standard performance
1	*PP-1104/G* Voltage: 13.6 vdc *AN/URM-48* Frequency: 40.5 MHz DEVIATION RANGE: 25 DEVIATION: 8 kHz OPERATION: 1,000 Hz OUTPUT: 10 mv (Rf attenuator set for 2 Kuv) *AN/URM-127* Audio output set for 8 kHz deviation as indicated on AN/URM-48. Frequency: 1,000 Hz *TS-723A/U* FUNCTION: METER METER RANGE: 3.0 vrms Receiver-transmitter unit audio output connected to TS-723A/U METER input.	MODE: PTT BAND: FM CHAN: G VOL: Turn clockwise SQ: OFF	*a.* Connect the equipment as shown in figure 4-1. Set AN/URM-48 for EXT. MOD. *b.* Adjust the receiver-transmitter unit VOL control for 2.75 vrms audio input on TS-723A/U. *c.* Connect the receiver-transmitter unit audio output to AF INPUT on TS-723A/U. *d.* Measure distortion. *e.* Connect receiver transmitter unit audio output to TS-723A/U METER input. *f.* Switch TS-723A/U FUNCTION switch to METER and reduce receiver-transmitter unit VOL control for 1.75 vrms audio output on TS-723A/U. *g.* Connect receiver-transmitter unit audio output to TS-723A/U AF INPUT. *h.* Switch TS-723A/U FUNCTION switch to SET LEVEL and adjust TS-723A/U input sensitivity control for 0 db on METER. *i.* Vary the AN/URM-127 frequency between 150 and 5,000 Hz.	Distortion limited to 10%. Audio Response: 150 Hz -12 ± 3 db; 300 Hz -5 ± 2 db; 1,000 Hz 0 db (ref); 2,500 Hz -5 ± 2 db; 5,000 Hz -12 ± 3 db.

4-12. UHF Receiver Audio Test Chart

(fig. 4-2)

Test No.	Test equipment	Control settings: Equipment under test	Test procedure	Standard performance
1	*PP-1104/G* Voltage: 13.6 vdc *AN/USM-44A* Frequency: 243 MHz Modulation: 30% at 1,000 Hz Output: 5 mv *AN/URM-127* Audio output set for 30% modulation as indicated on AN/USM-44A. Frequency: 1,000 Hz *TS-723A/U* FUNCTION: METER METER RANGE: 3.0 vrms Audio input connected to METER input.	MODE: PTT BAND: UHF CHAN: G VOL: Turn clockwise SQ: OFF	*a.* Connect the equipment as shown in figure 4-2. Connect the AN/URM-127. *b.* Adjust the receiver-transmitter unit VOL control for 2.75 vrms audio output. *c.* Measure distortion . . . . . . *d.* Connect receiver-transmitter unit audio output to TS-723A/U METER input. *e.* With TS-723A/U function switch to METER, reduce receiver-transmitter unit VOL control for 1.75 vrms audio output on TS-723A/U. *f.* Connect receiver-transmitter unit audio output to TS-723A/U AF INPUT. *g.* Switch TS-723A/U function switch to SET LEVEL and adjust INPUT SENSITIVITY control on TS-723A/U for 0 db on METER. *h.* Vary AN/URM-127 frequency between 150 and 5,000 Hz.	Distortion limited to 10%. Audio Response: 150 Hz - -15 ± 3 db; 300 Hz -5 ± 2 db; 1,000 Hz 0 db (ref); 2,000 Hz -5 ± 2 db; 5,000 Hz -12 ± 3 db.

4-13. Deleted.

4-14. Deleted.

4-15. FM Transmitter RF Power Output and Frequency Accuracy

(fig. 4-3)

Test No.	Test equipment	Control settings: Equipment under test	Test procedure	Standard performance
1	*PP-1104/G* Voltage: 12.5 vdc *AN/URM-145* 1 volt scale *AN/USM-207* 40 MHz scale	MODE: PTT BAND: FM CHAN: G VOL: Turn clockwise SQ: OFF	*a.* Connect the equipment as shown in figure 4-3. *b.* Press push-to-talk switch and note the RF output voltage on AN/URM-145. *c.* Disconnect the AN/URM-145 and connect the AN/USM-207. Press the push-to-talk switch and note the radio set output frequency.	0.41 volt minimum. The frequency should be 40.5 MHz ± 2.025 kHz.

4-16. UHF Transmitter RF Power Output and Frequency Accuracy Test Chart

(fig. 4-3)

Test No.	Test equipment	Control settings: Equipment under test	Test procedure	Standard performance
1	*PP-1104/G* Voltage: 12.5 vdc *AN/URM-145* .3 volt scale *AN/USM-207* 240 MHz scale	MODE: PTT BAND: UHF CHAN: G VOL: Turn clockwise SQ: OFF	*a.* Connect the equipment as shown in figure 4-3. Replace W1-C with W1-D.	
			b. Press push-to-talk switch and note the rf output voltage on AN/URM-145.	0.28 volt minimum
			c. Disconnect the AN/URM-145 and connect the CN-796/U attenuator and the AN/USM-207. Press the push-to-talk switch. Note the receiver-transmitter unit frequency output. Attenuator should be set at approximately 10 db.	243 MHz ± 12.15 kHz

4-17. Transmitter Tone Test Chart

(fig. 4-4)

Test No.	Test equipment	Control settings: Equipment under test	Test procedure	Standard performance
1	*PP-1104/G* Voltage: 16 vdc *AN/URM-145* 1 volt scale *AN/USM-207* 150 Hz *AN/USM-140B* RANGE: 150 Hz to 1,000 Hz 3V P-P Range *ME-57/U* No specific setting	MODE: MCW BAND: FM CHAN: G VOL: Turn clockwise SQ: OFF	*a.* Connect the equipment as shown in figure 4-4.	
			b. Press the push-to-talk switch.	
			c. Note the tone frequency indicated on AN/USM-140B.	1,000 Hz + 300
			d. Shift receiver-transmitter unit MODE switch to BCN and BAND switch to SW. DO NOT press the push-to-talk switch.	The audio frequency shall vary between 1,000 Hz ± 300 and 300 Hz ± 100 2 to 3 times a second. Visually estimate for this standard; do not measure.
			e. Shift receiver-transmitter unit MODE switch to FM. Change W1D to W1C, and repeat *b* through *d* above.	
			f. Connect the rf output of the receiver-transmitter unit to the ME-57 Detector Input; connect the Detector Output to the AN/USM-207, cover the receiver-transmitter unit microphone and set the MODE switch to PTT.	
			g. Press the push-to-talk switch and note the 150 Hz ± 3 tone frequency on AN/USM-207.	

4-18. FM Transmitter Modulation Test Chart

(fig. 4-5 and 4-7)

Test No.	Test equipment	Control settings: Equipment under test	Test procedure	Standard performance
1	*PP-1104/G* Voltage: 12.5 vdc *ME-57/U* DEVIATION KC RANGE: 50 DEVIATION: 25 kHz FREQUENCY RANGE MC: 20-55 FREQUENCY: 40.5 MHz *AN/URM-127* Frequency: 300 Hz *ME-30B/U* 1 volt scale	MODE: PTT BAND: FM CHAN: G VOL: Turn clockwise SQ: OFF	*a.* Connect equipment as shown in figure 4-5.	
			b. Remove receiver-transmitter unit cover and connect the AN/URM-127 output to modulator pins 1 and 16 at lower corner of receiver-transmitter unit printed circuit board (fig. 4-7).	
			c. Press the push-to-talk switch and increase the audio input level on AN/URM-127. Check deviation as indicated on ME-57/U.	6 kHz or greater deviation.
			d. Adjust the AN/URM-127 for 2,500 Hz.	
			e. Repeat procedure *c* above	6 kHz or greater deviation.
			f. Adjust the AN/URM-127 to 1,000 Hz and repeat procedure *c* above.	6 kHz or greater deviation.
			g. Increase the audio level on AN/URM-127, ± 20 db and note increase in deviation on ME-57/U with push-to-talk switch depressed.	15 kHz maximum as on ME-57/U.

4-19. UHF Transmitter Modulation Test Chart

(fig. 4-6 and 4-7)

Test No.	Test equipment	Control settings Equipment under test	Test procedure	Standard performance
1	*PP-1104/G* Voltage: 12.5 vdc *AN/URM-127* Frequency: 1,000 Hz *AN/USM-140B* Frequency: 1,000 Hz	MODE: PTT BAND: UHF CHAN: G VOL: Turn clockwise SQ: OFF	*a.* Connect the equipment as shown in figure 4-6. *b.* Remove receiver-transmitter unit cover and connect output of AN/URM-127 to pin 1 and pin 16 (ground at the lower corner of the receiver-transmitter unit printed circuit board) (fig. 4-7). *c.* Press the push-to-talk switch and vary the AN/URM-127 audio input level.	Note that varying audio output is indicated on the AN/USM-140B when the AN/URM-127 audio output is varied.

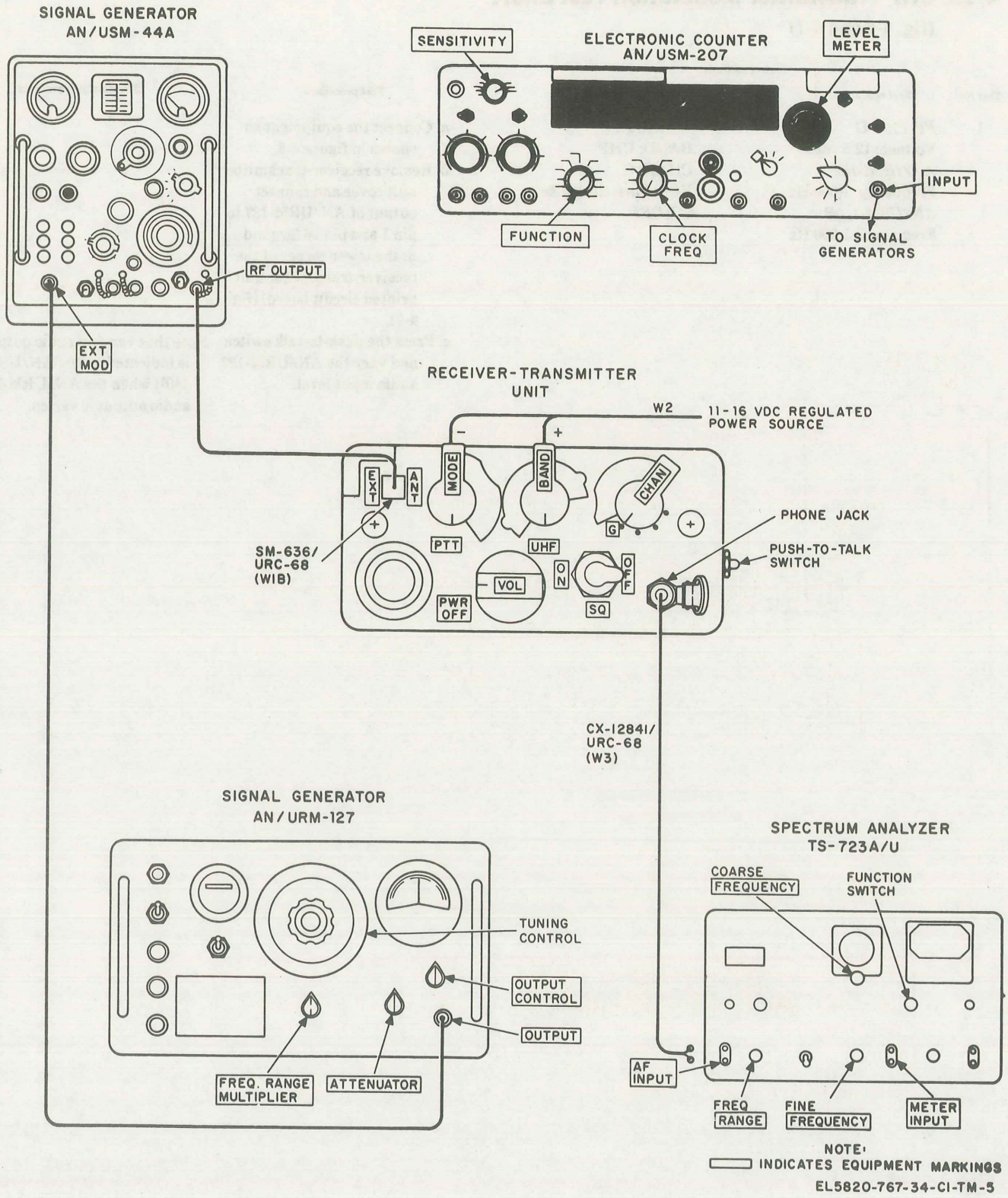


Figure 4-2. UHF receiver test setup.

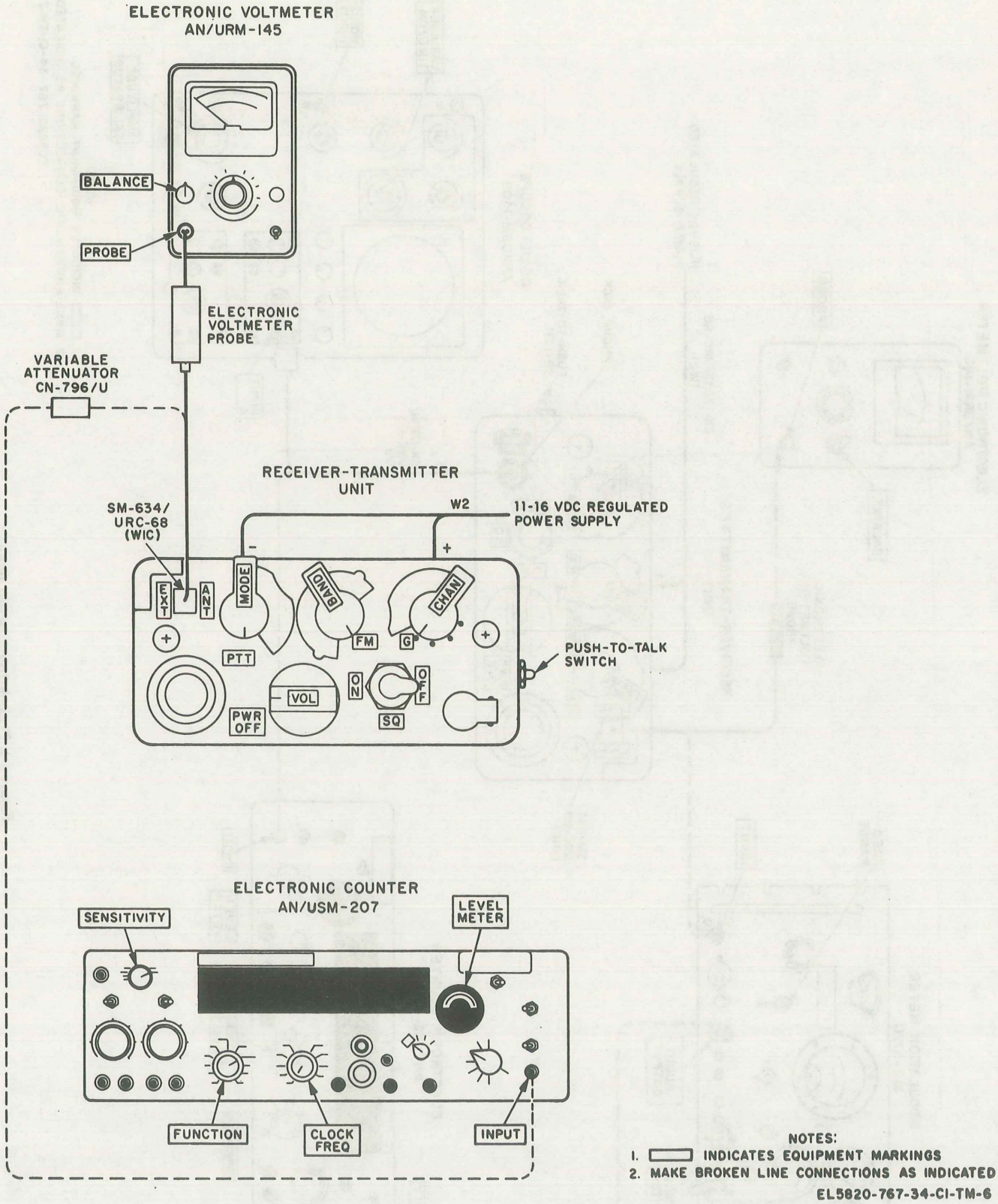


Figure 4-3. Transmitter power output test setup.

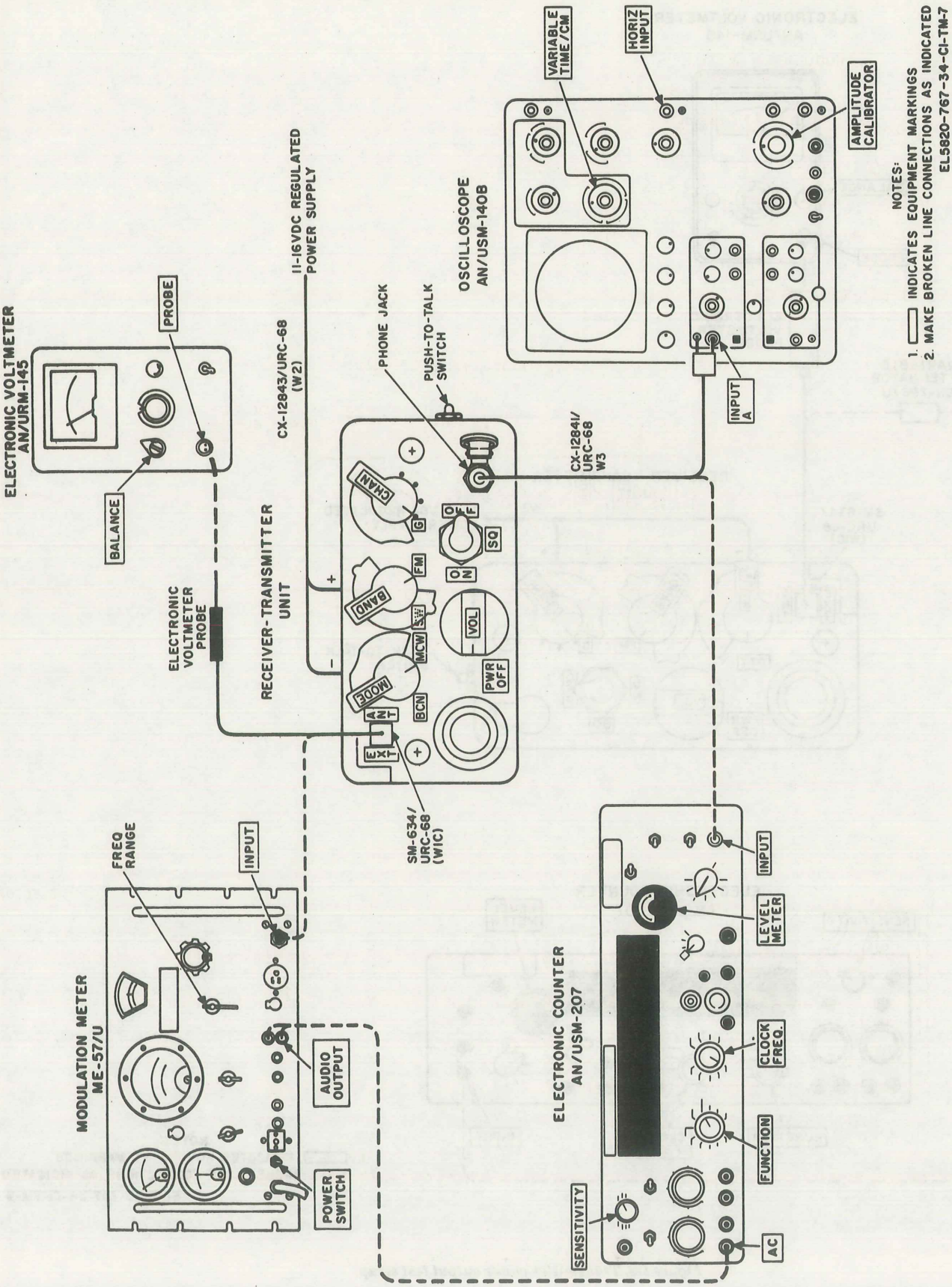


Figure 4-4. Transmitter tone test setup.

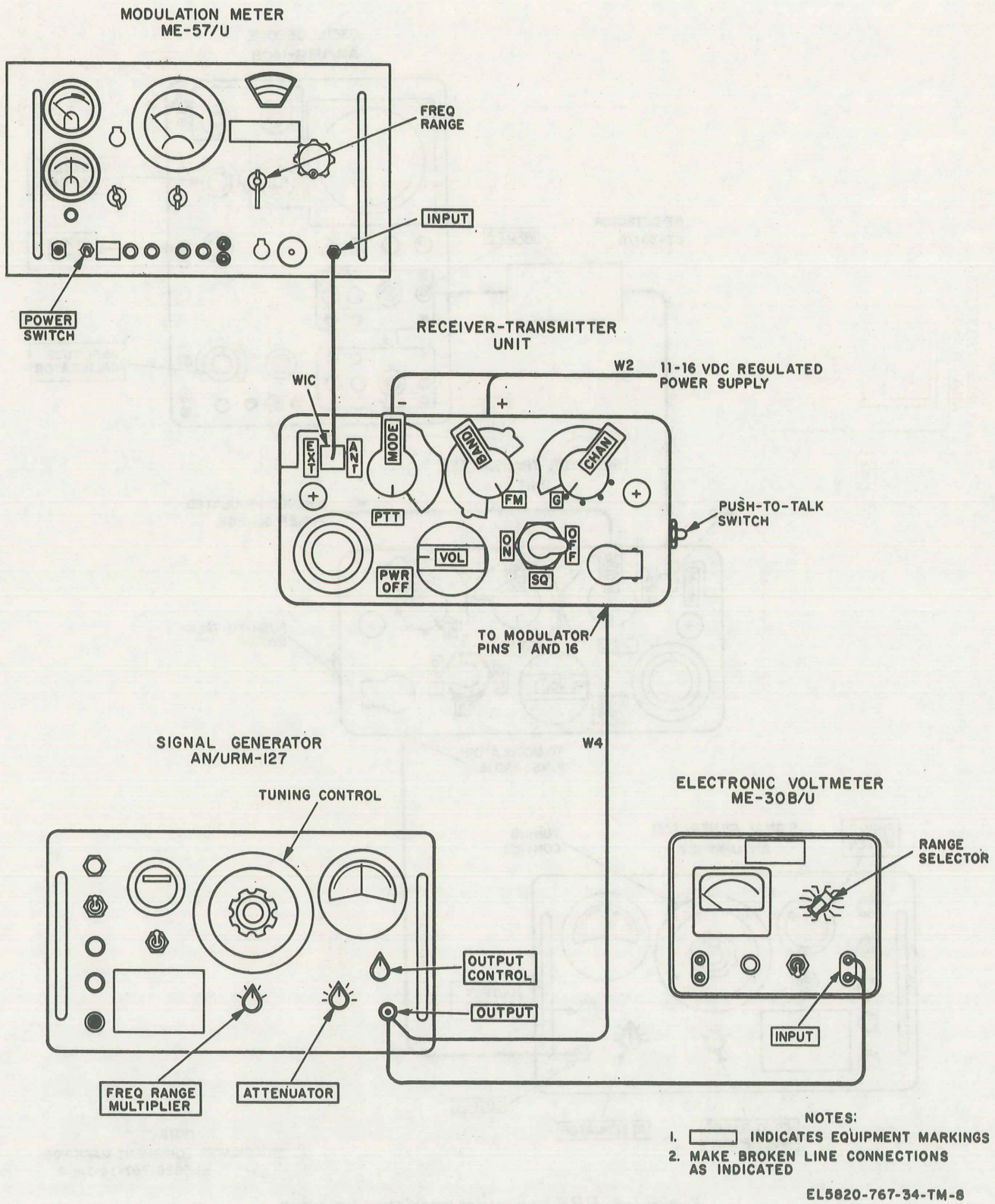


Figure 4–5. FM transmitter modulation test setup.

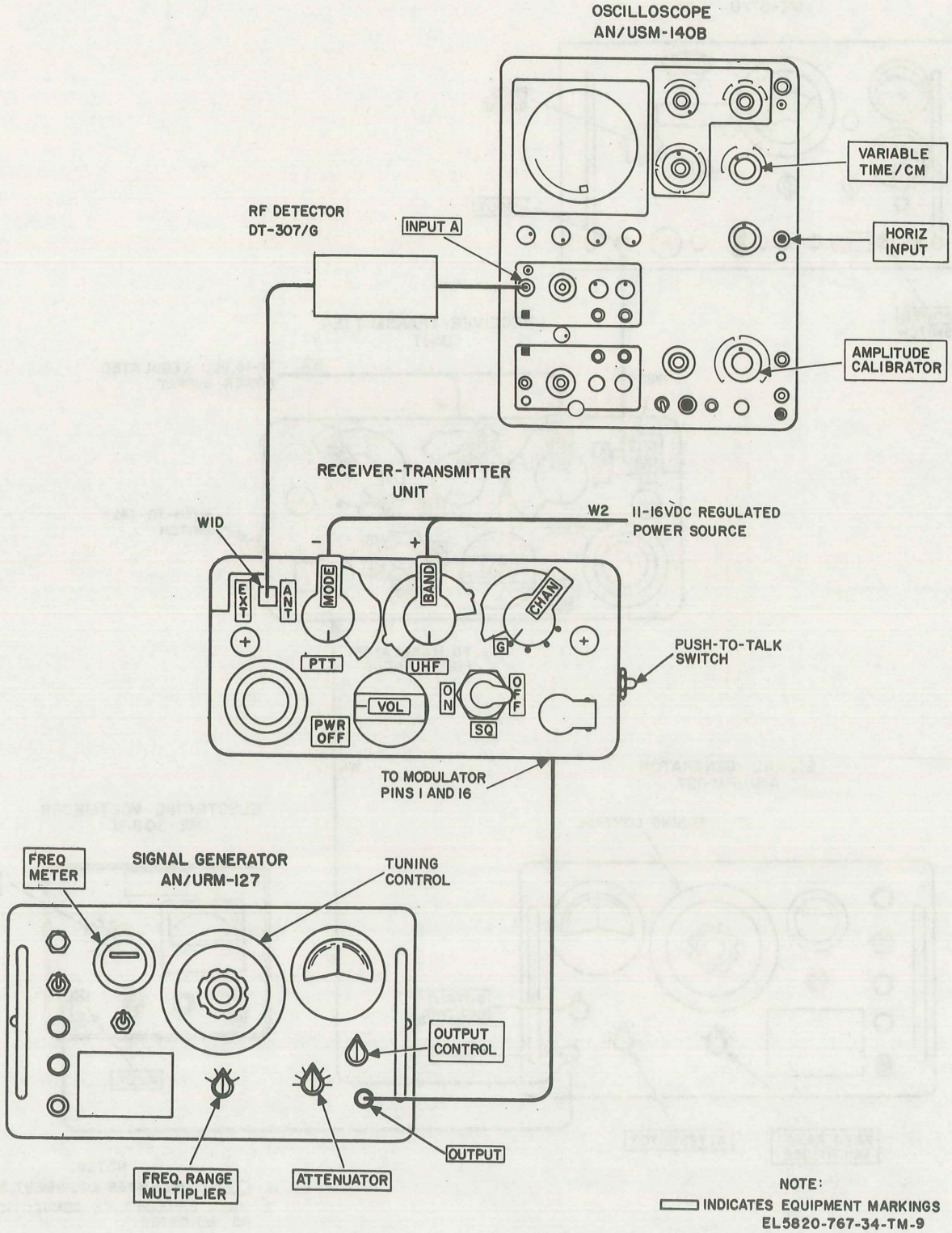


Figure 4-6. UHF transmitter modulation test setup.

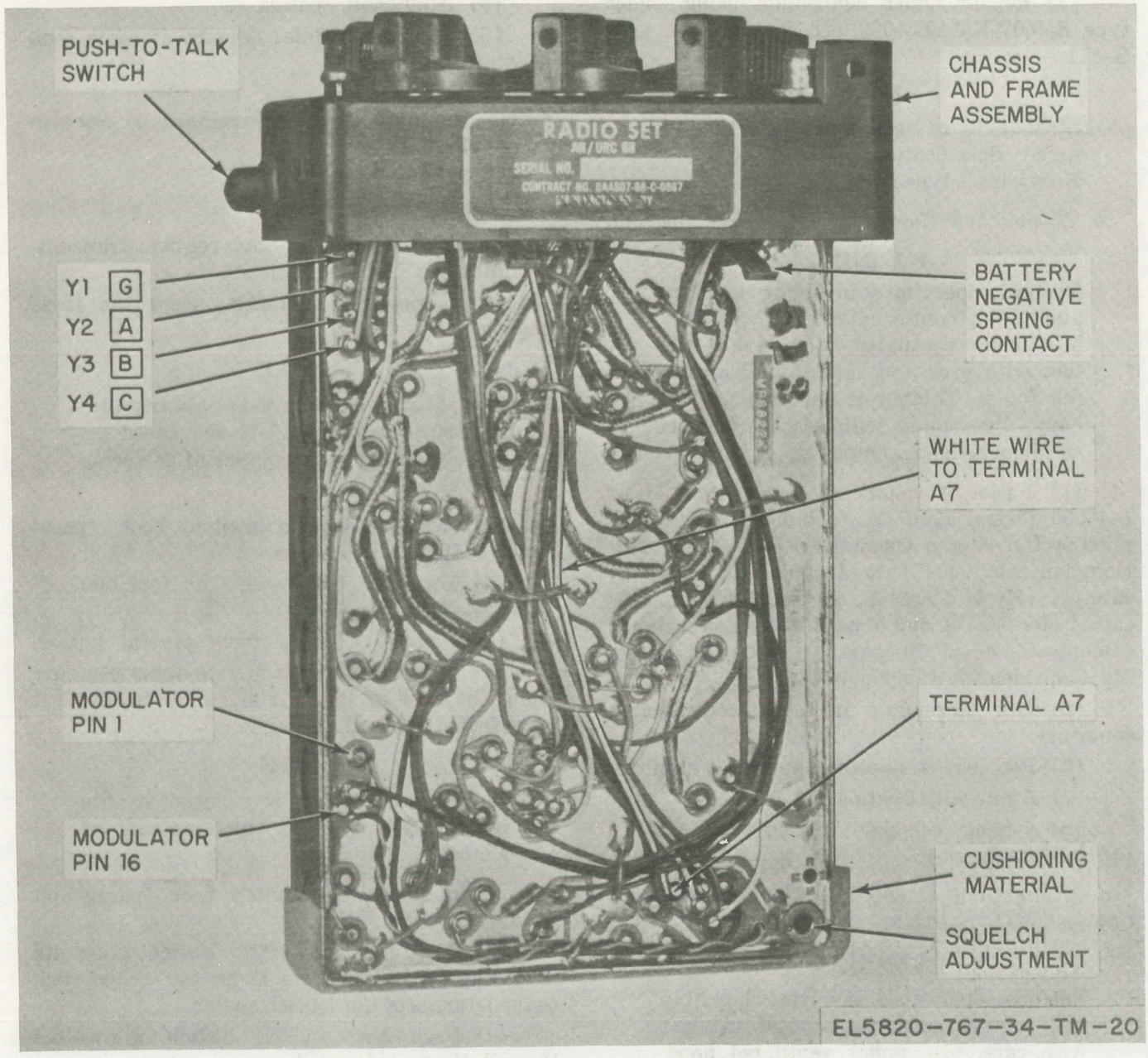


Figure 4-7. Receiver-transmitter unit, printed circuit board.

Section III. REPAIR PROCEDURES

4-20. General

Repair of the chassis and frame assembly is limited to the replacement of the squelch switch, push-to-talk switch, and external antenna connector; and to the repair of broken wires and solder connections as determined by a visual inspection. Before attempting repair of chassis and frame assembly wiring observe the repair techniques detailed in the following paragraphs.

a. Solder Requirements.

(1) Remove conformal coating from solder connections.

NOTE

Replace plug-in module associated with the terminal being repaired in order to prevent terminal from falling out of the terminal board and to insure that terminal remains properly aligned with the module pin.

(2) Repair solder connection using solder type SN60WRMAP2-032 per Specification QQ-S-571.

NOTE

Stranded wire must conform with military Specification MIL-W-16878/4. Buss wire is type S per QQ-W-343.

b. Mixing and Curing of Conformal Coating.

WARNING

Perform operations involving handling and mixing conformal coating with care. Mix under ventilated hood. Avoid contact with eyes and skin. Avoid breathing fumes. Thinner is flammable. Wash hands thoroughly with soap and water after operation is completed.

(1) 1 part by volume epoxy resin per MIL-I-46058 (Hysol 12007-A, turbid yellow, as supplied by Hysol Corp. Olean, New York. Code Identification No. 04347) to 1 part by volume of catalyst (Hysol 12007-B, amber, Code identification No. 04347) and 1 part by volume thinner (Dennis Chemical Co. part No. 4600, St. Louis, Mo. Code identification No. 07432).

(2) Mix thoroughly in a clean disposable container.

(3) Pot life is approximately 45 minutes.

(4) Apply with Spatula.

(5) Curing schedule: 2-hours at 75° C. (167° F. maximum).

c. Mixing and Curing of Epoxy Resin and Catalyst, MIL-L-16912.

WARNING

Perform operations involving handling and mixing epoxy resin and catalyst with care. Mix under ventilated hood. Avoid contact with skin and eyes. Avoid breathing fumes. Wash hands thoroughly with soap and water after operation is completed.

(1) 100 grams of epoxy resin per MIL-I-16912 (Eccobond 285, unpigmented as supplied by Emerson and Cuming Inc., Canton, Massachusetts. Code identification No. 04552, or equal) to 3 to 4 grams of catalyst (Eccobond No. 9 Code identification No. 04552, or equal).

(2) Weigh carefully into a clean disposable container.

(3) Mix very thoroughly.

(4) Pot life is approximately 45-minutes.

(5) Apply with spatula.

(6) Curing schedule: 4-hours at room temperature.

4-21. Removal and Replacement of Squelch Switch

(fig. 3-2)

a. Removal.

(1) Remove battery and receiver-transmitter unit cover from the radio set.

(2) Remove all modules except the if.-af module.

NOTE

The if.-af module must remain installed to secure terminal A7 to the board assembly during performance of soldering operation.

(3) Remove squelch switch boot (paragraph 3-13*a*).

(4) Unsolder white wire at terminal A7 (figure 4-7).

(5) Remove crystals from crystal holder.

(6) Using thumb and fingers apply pressure along the base of the crystal holder to break it loose from the board assembly.

NOTE

The crystal holder is secured to the board assembly by a small amount of adhesive.

(7) Remove PTT switch boot (paragraph 3-14*a*).

(8) Carefully push PTT switch from its mounting hole and move it as far as possible to the left side of the squelch switch.

(9) Push the squelch switch downward through the mounting hole.

(10) Unsolder black wire of the squelch switch from the ground lug connection.

(11) Remove the white wire of the squelch switch from beneath the tie downs on the board assembly and lift squelch switch from the radio set.

b. Replacement.

(1) Thread the white lead of the replacement switch over the top of the board assembly and beneath the tie downs so that it is routed along the same path as the original wire.

(2) Solder the black wire of the replacement switch to the ground lug. Wire length and

lead dress can be determined from the original switch.

(3) Position switch in the mounting hole and tighten switch boot.

(4) Solder white lead to terminal A7.

NOTE

Remove and replace the if.–af module to determine that terminal A7 is properly aligned with the module pin.

(5) Reinstall the PTT switch in position and replace boot (paragraph 3–14b).

(6) Replace crystal block and crystals (paragraph 4–22b(3)).

(7) Apply conformal coating (MIL–I–46058 Type ER) over the reworked areas of the terminal board.

4–22. Removal and Replacement of Push-To-Talk (PTT) Switch

(fig. 3–2)

a. Removal.

(1) Remove the battery and the receiver-transmitter unit cover (paragraphs 3–8*a* and 3–9*a*).

(2) Remove all modules (paragraph 3–10a).

(3) Remove crystals from crystal holder.

(4) Using thumb and fingers apply sufficient pressure at the base of the crystal holder to break it loose from board assembly.

NOTE

The crystal holder is secured to the board assembly by a small amount of adhesive.

(5) Use 3/8-inch hollow-shaft hex nutdriver to remove boot from PTT switch. Hold bottom of switch to prevent switch from rotating during removal procedure.

(6) Carefully push PTT switch through opening.

(7) Unsolder wires from switch terminals.

b. Replacement.

(1) Solder wires to replacement switch terminals (fig. 4–8).

(2) Insert PTT switch through opening and replace switch boot. Hold bottom of switch to prevent rotating while tightening boot.

(3) Mixing, handling, and curing of epoxy resin and catalyst (MIL–I–16912) is described in paragraph 4–20*c*.

(4) Exercise care and apply a small amount of mixed MIL–I–16912 epoxy along side of crystal socket holes.

(5) Insure that there is no epoxy in crystal socket holes and replace crystal holder.

(6) Replace crystals.

(7) Hold bottom of PTT switch and tighten boot (paragraph 3–14*b*).

(8) Replace battery and receiver-transmitter unit cover (paragraphs 3–8*b* and 3–9*b*).

4–23. Removal and Replacement of External Antenna Connector

(fig. 3–2).

a. Removal.

(1) Remove the battery and the receiver-transmitter unit (paragraphs 3–8 and 3–9).

(2) Unsolder white wire from external antenna connector.

(3) Loosen the two screws on side nearest external antenna connector.

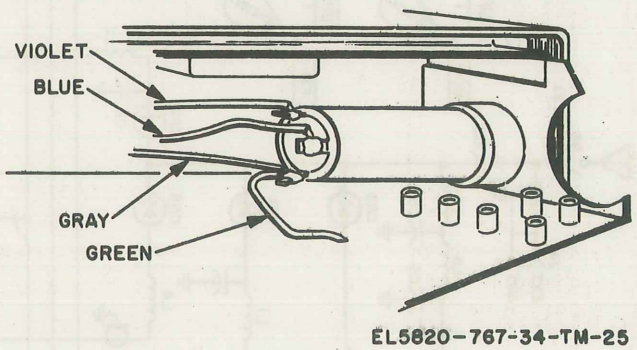


Figure 4–8. Push-to-talk switch wiring.

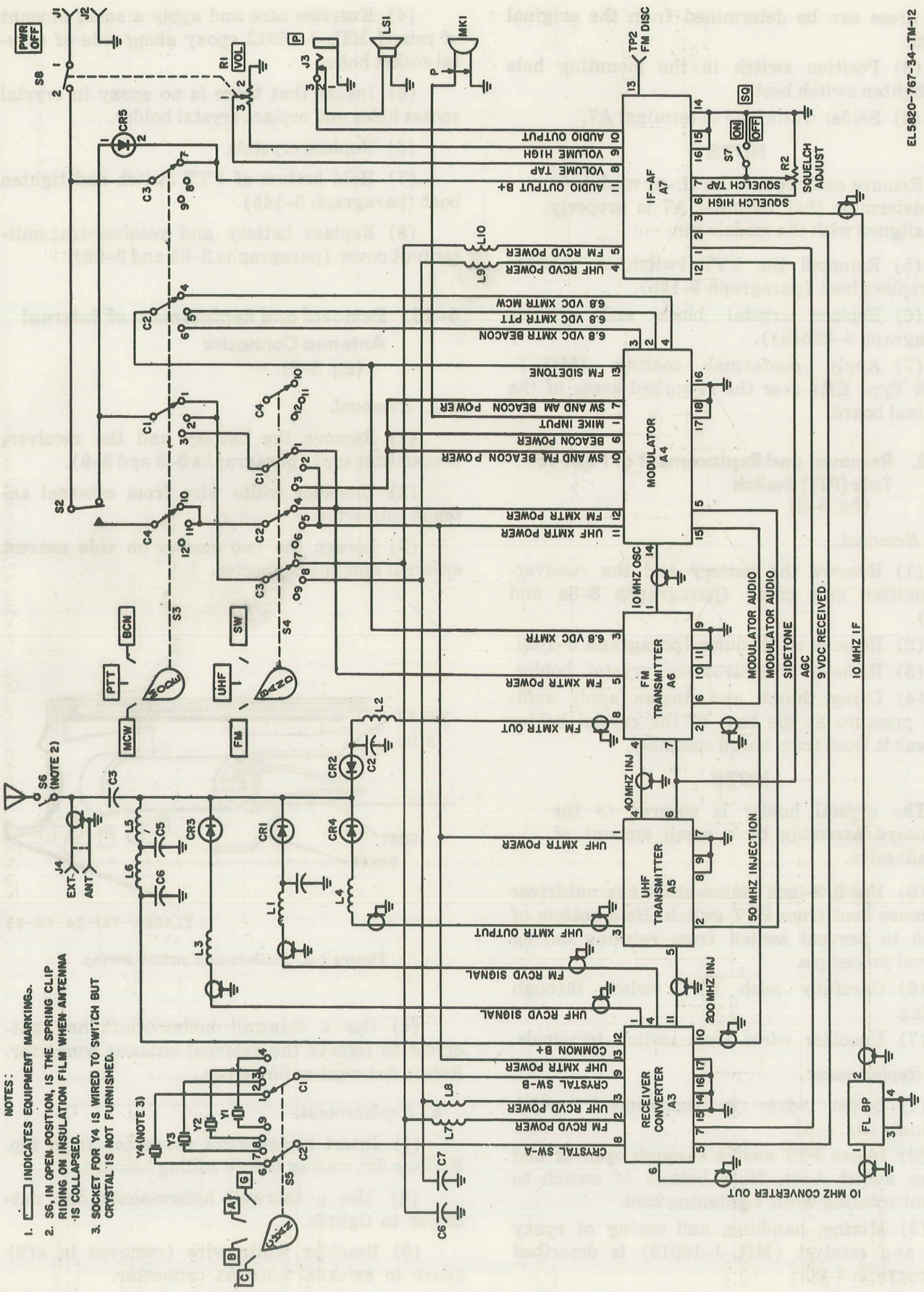
(4) Use a thinwall hollow-shaft hex nutdriver to remove the external antenna connector. Retain flat washer for re-use.

b. Replacement.

(1) Insert replacement connector from top. Replace flat washer before adding hex nut.

(2) Use a thinwall hollow-shaft hex nutdriver to tighten.

(3) Resolder white wire (removed in a(2) above to external antenna connector.



EL5820-767-34-TM-12

Figure 4-9. Radio Set AN/URC-68 schematic diagram.

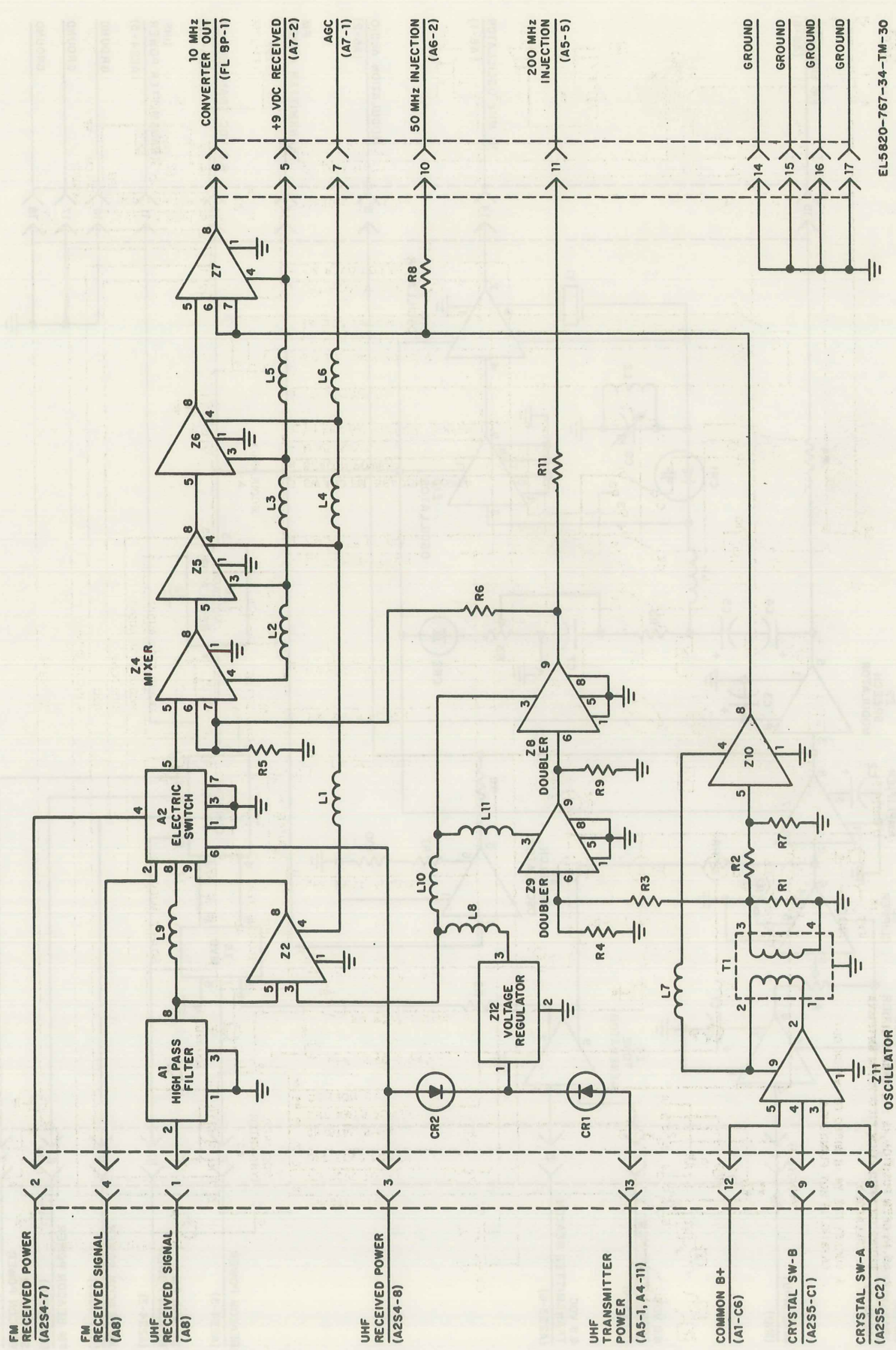


Figure 4-10. Receiver-converter module A8, schematic diagram.

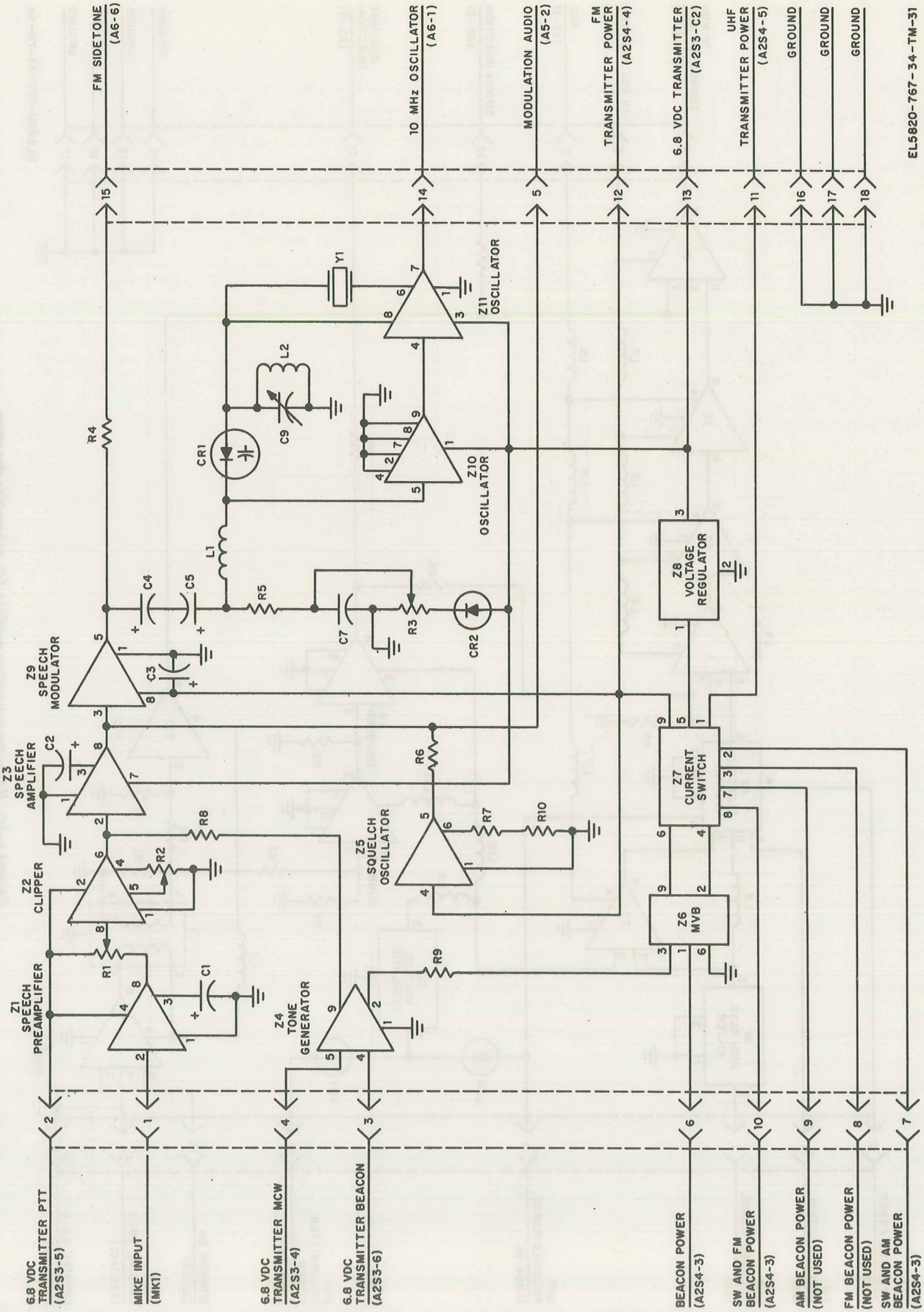


Figure 4-11. Modulator module A4 schematic diagram.

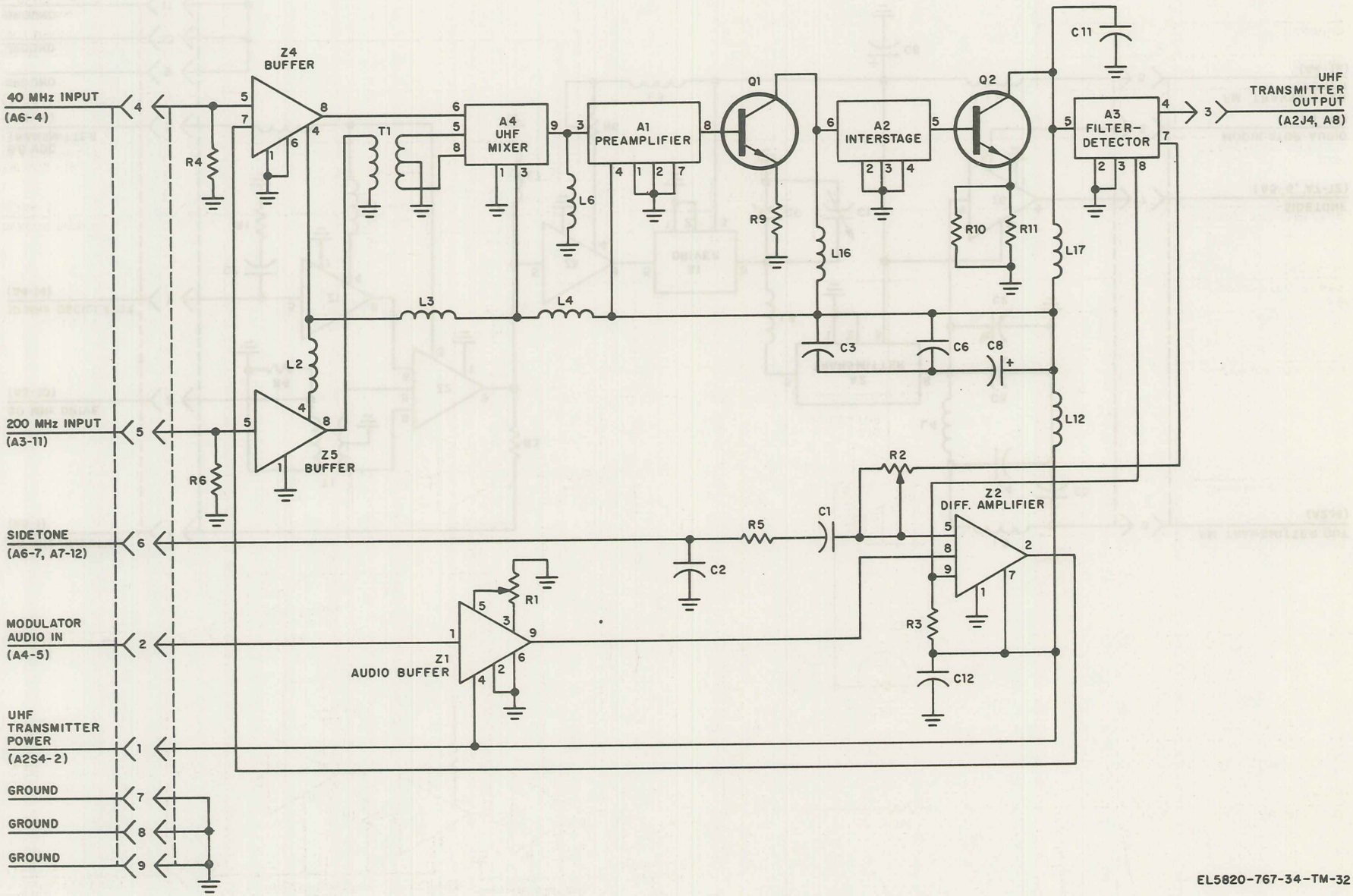


Figure 4–12. Uhf transmitter module A5 schematic diagram.

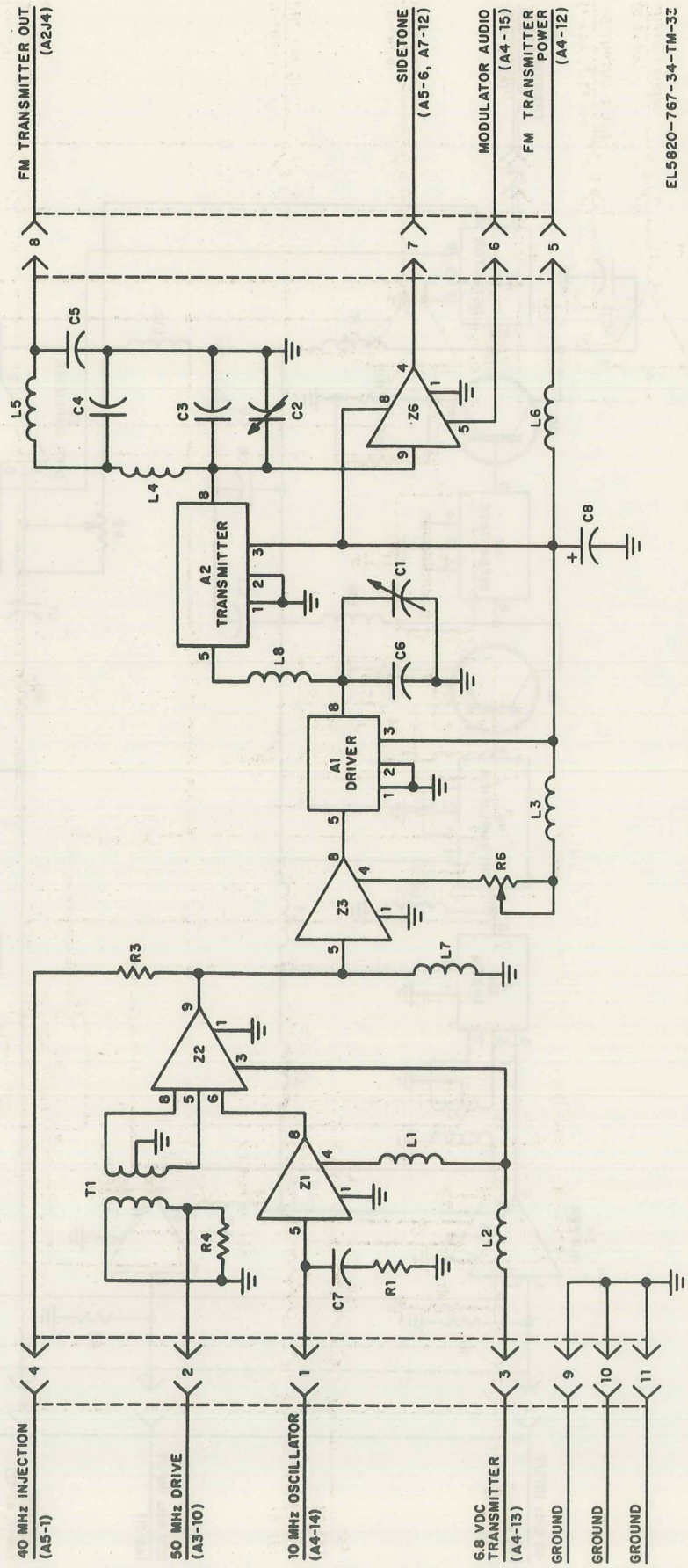


Figure 4-13. FM transmitter module A6 schematic diagram.

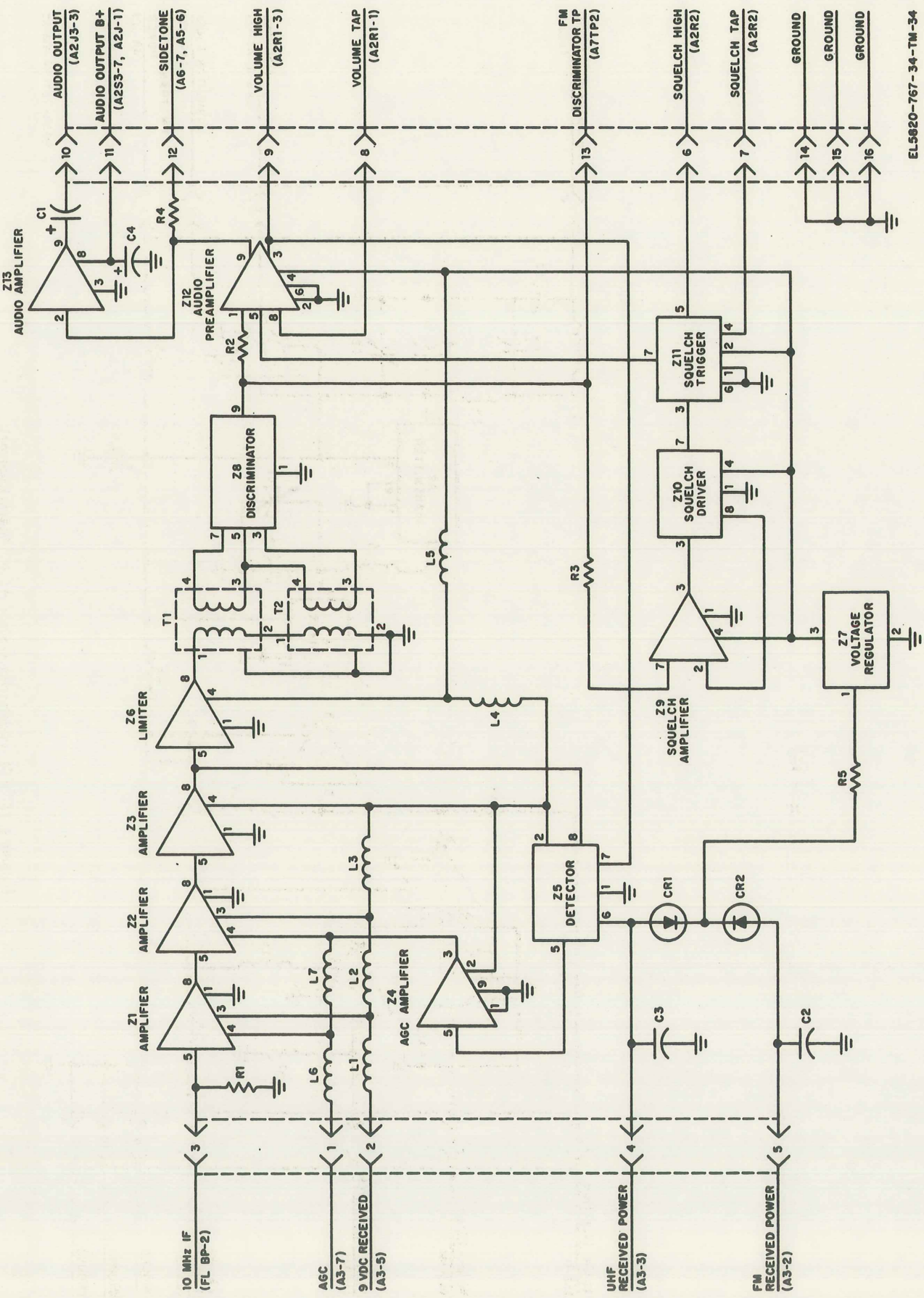
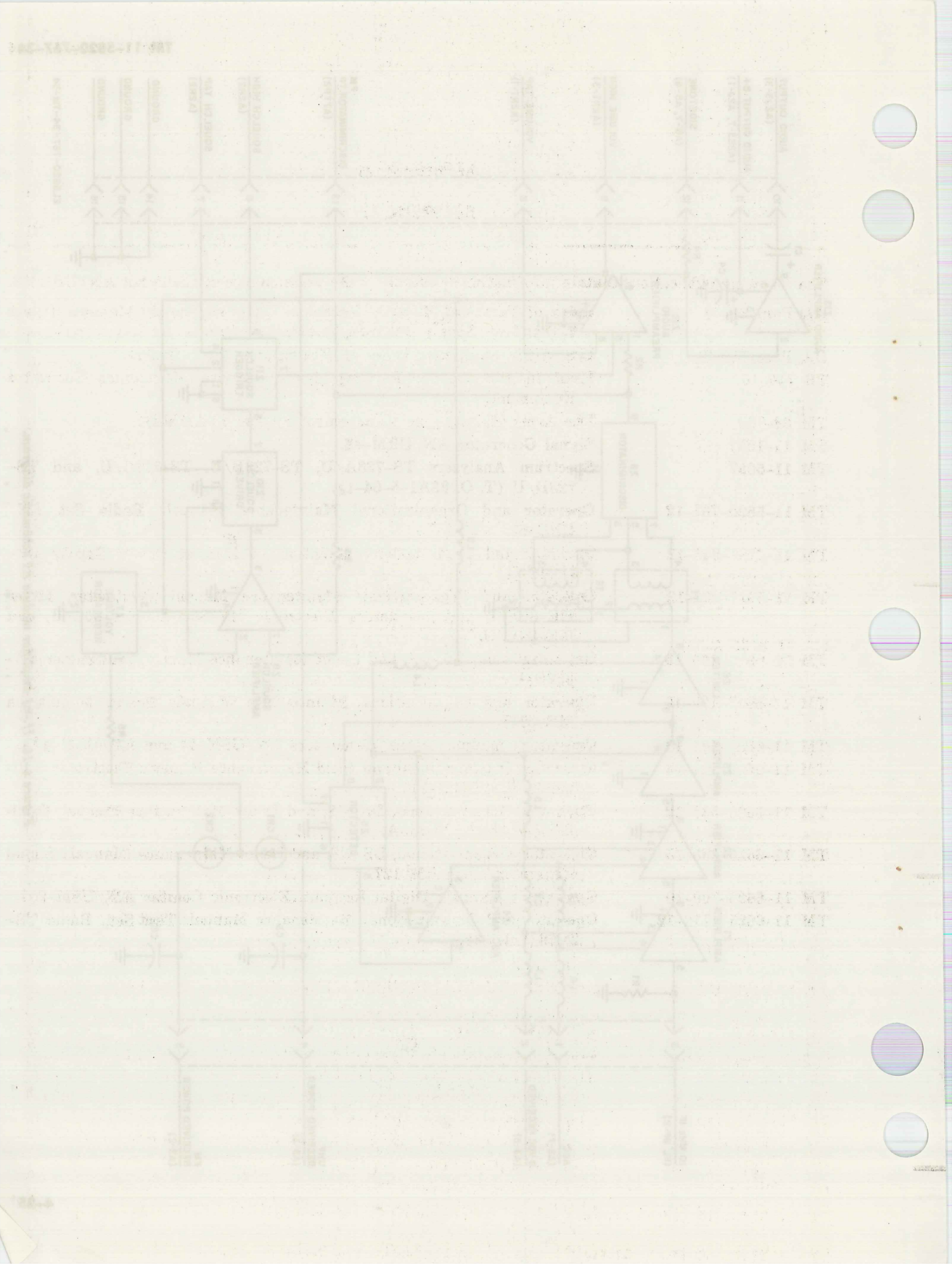


Figure 4-14. If.-af amplifier module A7 schematic diagram.



APPENDIX A

REFERENCES

The following publications contain information applicable to the maintenance of Radio Set AN/URC-68.

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8 and 9), Supply Bulletins, Lubrication Orders.
DA Pam 310-7	U.S. Army Equipment Index of Modification Work Orders.
TB 746-10	Field Instructions for Painting and Preserving Electronics Command Equipment.
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 11-1257	Signal Generator AN/URM-48.
TM 11-5097	Spectrum Analyzers TS-723A/U, TS-723B/U, TS-723C/U, and TS-723D/U (T. O. 33A1-5-64-1).
TM 11-5820-767-12	Operator and Organizational Maintenance Manual: Radio Set AN/URC-68.
TM 11-6130-246-12	Operator and Organizational Maintenance Manual, Power Supply PP-1104C/G.
TM 11-6625-320-12	Operator and Organizational Maintenance Manual; Voltmeter, Meter ME-30A/U and Voltmeters, Electronic ME-30B/U, ME-30C/U, and ME-30E/U.
TM 11-6625-366-15	Organizational, DS, GS, and Depot Maintenance Manual, Multimeter TS-352B/U.
TM 11-6625-400-12	Operator and Organizational Maintenance Manual: Meter, Modulation ME-57/U.
TM 11-6625-508-10	Operator's Manual: Signal Generators AN/USM-44 and AN/USM-44A.
TM 11-6625-524-14	Operator, Organizational and Field Maintenance Manual: Electronic Voltmeter, AN/URM-145.
TM 11-6625-535-12	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Oscilloscope AN/USM-140A.
TM 11-6625-683-15	Operator, Organizational, DS, GS, and Depot Maintenance Manual: Signal Generator AN/URM-127.
TM 11-6625-700-10	Operator's Manual: Digital Readout, Electronic Counter AN/USM-207.
TM 11-6625-1712-12	Operator and Organizational Maintenance Manual: Test Set, Radio TS-2688/URC-68.

APPENDIX B

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST (INCLUDING DEPOT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS)

Section I. INTRODUCTION

B-1. Scope.

This appendix lists repair parts and special tools required for the performance of direct support, general support, and depot maintenance of the AN/URC-68.

B-2. General.

This Repair Parts and Special Tools List is divided into the following sections:

a. Repair Parts List—Section II. A list of repair parts authorized at the direct support, general support, and depot levels for the performance of maintenance. The list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending numerical sequence, with parts in each group listed in figure and item number sequence.

b. Special Tools List—Section III. A list of special tools, test and support equipment authorized for the performance of maintenance at the direct support, general support, and depot levels.

c. Federal Stock Number and Reference Number Index—Section IV. A list, in ascending numerical sequence, of all Federal stock numbers appearing in the listings, followed by a list, in alphanumeric sequence, of reference numbers appearing in the listings. Federal stock numbers and reference numbers are cross-referenced to each illustration figure and item number appearance.

B-3. Explanation of Columns.

The following provides an explanation of columns found in the tabular listings:

a. Source, Maintenance, and Recoverability Codes (SMR).

(1) *Source code.* Source codes are assigned to support items to indicate the manner of acquiring support items for maintenance, repair, or overhaul of end items. Source codes are entered in the first and second positions of the Uniform SMR Code Format as follows:

Code	*Definition*
PA	Item procured and stocked for anticipated or known usage.
PB	Item procured and stocked for insurance purposes because essentiality dictates that a minimum quantity be available in the supply systems.
PC	Item procured and stocked and which otherwise would be coded PA except that it is deteriorative in nature.
PD	Support item, excluding support equipment, procured for initial issue or outfitting and stocked only for subsequent or additional initial issues or outfittings. Not subject to automatic replenishment.
PE	Support equipment procured and stocked for initial issue or outfitting to specified maintenance repair activities.
PF	Support equipment which will not be stocked but which will be centrally procured on demand.
PG	Item procured and stocked to provide for sustained support for the life of the equipment. It is applied to an item peculiar to the equipment which because of probable discontinuance or shutdown of production facilities would prove uneconomical to reproduce at a later time.
KD	An item of depot overhaul/repair kit and not purchased separately. Depot kit defined as a kit that provides items required at the time of overhaul or repair.
KF	An item of a maintenance kit and not purchased separately. Maintenance kit defined as a kit that provides an item that can be replaced at organizational or intermediate levels of maintenance.
KB	Item included in both a depot overhaul/repair kit and a maintenance kit.
MO	Item to be manufactured or fabricated at organizational level.
MF	Item to be manufactured or fabricated at direct support maintenance level.
MH	Item to be manufactured or fabricated at general support maintenance level.
MD	Item to be manufactured or fabricated at depot maintenance level.
AO	Item to be assembled at organizational level.
AF	Item to be assembled at direct support maintenance level.
AH	Item to be assembled at general support maintenance level.
AD	Item to be assembled at depot maintenance level.

Code — *Definition*

XA—Item is not procured or stocked because the requirements for the item will result in the replacement of the next higher assembly.

XB—Item is not procured or stocked. If not available through salvage, requisition.

XD—Support item that is not stocked. When required, item will be procured through normal supply channels.

NOTE

Cannibalization or salvage may be used as a source of supply for any items source coded above except those coded XA, XD, and aircraft support items as restricted by AR 700-42.

(2) *Maintenance code.* Maintenance codes are assigned to indicate the levels of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the Uniform SMR Code Format as follows:

USE (THIRD POSITION). The maintenance code entered in the third position indicates the lowest maintenance level authorized to remove, replace, and use the support item. The maintenance code entered in the third position indicates one of the following levels of maintenance.

Code — *Application/Explanation*

C—Crew or operator maintenance performed within organizational maintenance.

O—Support item is removed, replaced, used at the organizational level.

I—Support item is removed, replaced, used by the direct support element of integrated direct support maintenance.

F—Support item is removed, replaced, used at the direct support level.

H—Support item is removed, replaced, used at the general support level.

D—Support items that are removed, replaced, used at depot, mobile depot, Specialized Repair Activity only.

NOTE

Codes "I" and "F" will be considered the same by direct support units.

REPAIR (FOURTH POSITION). The maintenance code entered in the fourth position indicates whether the item is to be repaired and identifies the lowest maintenance level with the capability to perform complete repair (i.e., all authorized maintenance functions). This position will contain one of the following maintenance codes:

Code — *Application/Explanation*

O—The lowest maintenance level capable of complete repair of the support item is the organizational level.

F—The lowest maintenance level capable of complete repair of the support item is direct support level.

Code — *Application/Explanation*

H—The lowest maintenance level capable of complete repair of the support item is general support level.

D—The lowest maintenance level capable of complete repair of the support item is the depot level, performed by depot, mobile depot, or Specialized Repair Activity.

L—Repair restricted to designated Specialized Repair Activity.

Z—Nonrepairable. No repair is authorized.

B—No repair is authorized. The item may be reconditioned by adjusting, lubricating, etc., at the user level. No parts or special tools are procured for the maintenance of this item.

(3) *Recoverability code.* Recoverability codes are assigned to support items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the Uniform SMR Code Format as follows:

Recoverability Code — *Definition*

Z—Nonrepairable item. When unserviceable, condemn and dispose at the level indicated in position three.

O—Repairable item. When uneconomically repairable, condemn and dispose at organizational level.

F—Repairable item. When uneconomically repairable, condemn and dispose at the direct support level.

H—Repairable item. When uneconomically repairable, condemn and dispose at the general support level.

D—Repairable item. When beyond lower level repair capability, return to depot. Condemnation and disposal not authorized below depot level.

L—Repairable item. Repair, condemnation, and disposal not authorized below depot/Specialized Repair Activity level.

A—Item requires special handling or condemnation procedures because of specific reasons (i.e., precious metal content, high dollar value, critical material or hazardous material). Refer to appropriate manual/directive for specific instructions.

b. Federal Stock Number. Indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. Indicates the Federal item name and a minimum description required to identify the item. The last line indicates the reference number followed by the applicable Federal Supply Code for Manufacturer (FSCM) in parentheses. The FSCM is used as an element in item identification to designate manufacturer or distributor or Government agency, etc., and is identified in SB 708-42.

d. Unit of Measure (U/M). Indicates the standard or basic quantity by which the listed item is used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation, e.g., ea., in., pr., etc. and is the basis used to indicate quantities and allowances in subsequent columns. When the unit of measure dif-

fers from the unit of issue, the lowest unit of issue that will satisfy the required units of measure will be requisitioned.

e. Quantity Incorporated in Unit. Indicates the quantity of the item used in the breakout shown on the illustration figure, which is prepared for a functional group, subfunctional group, or an assembly. A "V" appearing in this column in lieu of a quantity indicates that no specific quantity is applicable, e.g., shim, spacers, etc.

f. 30-Day DS/GS Maintenance Allowances.

(1) The repair parts indicated by asterisk entries in separate allowance columns for DS and GS represent those authorized for use at that category of maintenance to be requisitioned on an "as required" basis.

(2) Allowance quantities are indicated in the Special Tools List section for special tools, TMDE, and other support equipment.

g. 1-Year Allowances Per 100 Equipment/Contingency Planning Purposes. Column intentionally left blank.

h. Depot Maintenance Allowance Per 100 Equipments. This column indicates that the items identified with an asterisk are authorized to be requisitioned as required.

i. Illustrations. This column is divided as follows:

(1) *Figure number.* Indicates the figure number of the illustration on which the item is shown.

(2) *Item number.* Indicates the callout number used to reference the item on the illustration.

B-4. Special Information.

a. Detailed manufacture instructions for items source-coded to be manufactured are found in chapters 3 and 4 of this manual.

b. Dry batteries shown are used with the equipment but are not considered part of the equipment. They will not be preshipped automatically but are to be requisitioned in quantities necessary for the particular organization in accordance with SB 11-6.

c. Crystal units, other than those listed in this repair parts list, will be requisitioned in the quantities and frequencies as authorized by the Army Commander, or theatre of operation commander.

d. The basis of issue for authorized special tools, test and support equipment is the number of end items of equipment supported and the number of maintenance personnel allocated to perform the required maintenance operations.

B-5. How to Locate Repair Parts.

a. When Federal stock number or reference number is unknown:

(1) *First.* Using the table of contents, determine the functional group within which the repair part belongs. This is necessary since illustrations are prepared for functional groups, and listings are divided into the same groups.

(2) *Second.* Find the illustration covering the functional group to which the repair part belongs.

(3) *Third.* Identify the repair part on the illustration and note the illustration figure and item number of the repair part.

(4) *Fourth.* Using the Repair Parts Listing, find the functional group to which the repair part belongs and locate the illustration figure and item number noted on the illustration.

b. When Federal stock number or reference number is known:

(1) *First.* Using the Index of Federal Stock Numbers and Reference Numbers, find the pertinent Federal stock number or reference number. This index is in ascending FSN sequence, followed by a list of reference numbers in ascending alphanumeric sequence, cross-referenced to the illustration figure number and item number.

(2) *Second.* Using the Repair Parts Listing, find the functional group of the repair part and the illustration figure number and item number referenced in the Index of Federal Stock Numbers and Reference Numbers.

B-6. Abbreviations.

Abbreviation	*Explanation*
AF	Audiofrequency
FM	Frequency modulation
IF	Intermediate frequency
UHF	Ultra-high frequency

SECTION II. REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REFERENCE NUMBER & MFR. CODE / USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(7) 30-DAY GS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(8) 1 YR ALW PER EQUIP CNTGCY	(9) DEPOT MAINT ALW PER 100 EQUIP	(10) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
		GROUP 01 EARPHONE AND PARACHUTE ADAPTOR												
PAFZZ	5820-055-6051	COVER ASSEMBLY SMC660256 (80063)	EA	1	*	*	*	*	*	*		*	1	1
	6135-935-5241	BATTERY ASSEMBLY BA-1112/U (80058)	EA	1									1	2
PAOZZ	5820-134-5428	ADAPTOR SMD660175 (80063)	EA	1	*	*	*	*	*	*		*	1	3
PAOZZ	5935-488-5318	PLUG ASSEMBLY SMC660373 (80063)	EA	1	*	*	*	*	*	*		*	1	4
PAOZZ	5965-055-0648	EARPHONE H-281/URC-68 (80058)	EA	1	*	*	*	*	*	*		*	1	5
PAOZZ	5820-134-5429	ANTENNA ASSEMBLY SMC660370 (80063)	EA	1	*	*	*	*	*	*		*	1	6
MDFZZ		INSTRUCTION PLATE SMC660282 (80063)	EA	1									1	7
		GROUP 02 CRYSTALS AND MODULES												
PAFZZ	5955-054-9133	CRYSTAL CR77U50-625 (81349)	EA	1	*	*	*	*	*	*		*	2	1
PAFZZ	5995-054-9134	CRYSTAL CR77U49-025 (81349)	EA	1	*	*	*	*	*	*		*	2	2
PAFZZ	5995-055-0636	CRYSTAL CR77U50-225 (81349)	EA	1	*	*	*	*	*	*		*	2	3
PAFZZ	5940-406-7367	BLOCK SMC660463 (80063)	EA	1	*	*	*	*	*	*		*	2	4
PAFZZ	5820-055-7080	RADIO TRANSMITTER-UHF SMD660167 (80063)	EA	1	*	*	*	*	*	*		*	2	5
PAFZZ	5820-055-7119	RADIO TRANSMITTER-FM SMD660165 (80063)	EA	1	*	*	*	*	*	*		*	2	6
MFFZZ		PAD SMB660462 (80063)	EA	1									2	7
PAFZZ	5820-055-6091	IF-AF AMPLIFIER SMD660163 (80063)	EA	1	*	*	*	*	*	*		*	2	8
PAFZZ	5820-055-6920	RADIO UNIT MODULATOR SMD660169 (80063)	EA	1	*	*	*	*	*	*		*	2	9
PAFZZ	5820-055-6171	RECEIVER-CONVERTER SMD660161 (80063)	EA	1	*	*	*	*	*	*		*	2	10
PAFZZ	5915-789-7633	FILTER, BAND-PASS SMC660255 (80063)	EA	1	*	*	*	*	*	*		*	2	11
		GROUP 03 ANTENNA, CONNECTOR, SWITCHES												
PAFZZ	5820-055-7052	ANTENNA ASSEMBLY SMC660306 (80063)	EA	1	*	*	*	*	*	*		*	3	1
PAFZZ	5305-144-0394	SCREW SMB660217 (80063)	EA	2	*	*	*	*	*	*		*	3	2
PAFZZ	5935-917-5396	CONNECTOR SMC660216 (80063)	EA	1	*	*	*	*	*	*		*	3	3
PAFZZ	5310-781-9483	WASHER NAS620C10L (80205)	EA	1	*	*	*	*	*	*		*	3	4
PAFZZ	5930-892-9362	BOOT SMD660304-1 (80063)	EA	1	*	*	*	*	*	*		*	3	5
PAFZZ	5930-119-3547	SWITCH SMC660239 (80063)	EA	1	*	*	*	*	*	*		*	3	6
PAFZZ	5940-644-7963	TERMINAL LUG SMB662650 (80063)	EA	1	*	*	*	*	*	*		*	3	7

SECTION II. REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE (CONTINUED)

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REFERENCE NUMBER & MFR. CODE / USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(7) 30-DAY GS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(8) 1 YR ALW PER EQUIP CNTGCY	(9) DEPOT MAINT ALW PER 100 EQUIP	(10) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
PAFFD	5820-055-6152	FRAME AND PANEL ASSEMBLY SMD660254 (80063) (LESS ITEMS 1, 13, 14)	EA	1								*	3	8
PAFZZ	5305-563-3064	SCREW SMC660358 (80063)	EA	4	*	*	*	*	*	*		*	3	9
PAFZZ	5930-119-3546	SWITCH SMC660242 (80063)	EA	1	*	*	*	*	*	*		*	3	10
PAFZZ	5930-950-4541	BOOT SMD660254-1 (80063)	EA	1	*	*	*	*	*	*		*	3	11
PAFZZ	5330-179-1031	GASKET SMC660221 (80063)	EA	1	*	*	*	*	*	*		*	3	12
PAFZZ	5305-054-5647	SCREW MS51957-13 (96906)	EA	1	*	*	*	*	*	*		*	3	13
PAFZZ	5310-143-6308	WASHER SMB660292 (80063)	EA	1	*	*	*	*	*	*		*	3	14
PAFZZ	5330-182-3051	PACKING, PREFORMED SMB660173 (80063)	EA	1	*	*	*	*	*	*		*	3	15
PAFZZ	5935-488-5317	COVER SMC660253 (80063)	EA	1	*	*	*	*	*	*		*	3	16
PAFZZ	5365-150-3977	WASHER SMB660473 (80063)	EA	1	*	*	*	*	*	*		*	3	17
PAFZZ	5310-796-8398	NUT SMB660335 (80063)	EA	1	*	*	*	*	*	*		*	3	18

SECTION III. SPECIAL TOOLS, TEST & SUPPORT EQUIPMENT FOR DIRECT SUPPORT, GENERAL SUPPORT & DEPOT MAINTENANCE

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REFERENCE NUMBER & MFR. CODE / USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(7) 30-DAY GS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(8) 1 YR ALW PER 100 EQUIP CNTGCY	(9) DEPOT MAINT ALW PER 100 EQUIP	(10) ILLUSTRATIONS (a) FIG NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
	6625-782-0389	TEST SET, RADIO TS-2688/URC-68 (80058) (SEE TM 11-6625-1712-35)	EA		1	1	2	1	1	2		4	4	1
	5820-936-5077	TEST FACILITIES KIT MK-1559/URC-68 (80058) (SEE TM 11-6625-1712-35)	EA		1	1	2	1	1	2		4	4	2

SECTION IV. INDEX-FEDERAL STOCK NUMBER CROSS REFERENCE TO FIGURE AND ITEM NUMBER OR REFERENCE DESIGNATION

FEDERAL STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER OR REF. DESIGNATION
5305-054-5647	3	13
5305-144-0394	3	2
5305-563-3064	3	9
5310-143-6308	3	14
5310-781-9483	3	4
5310-796-8398	3	18
5330-179-1031	3	12
5330-182-3051	3	15
5365-150-3977	3	17
5820-055-6051	1	1
5820-055-6091	2	8
5820-055-6152	3	8
5820-055-6171	2	10
5820-055-6920	2	9
5820-055-7052	3	1
5820-055-7080	2	5
5820-055-7119	2	6
5820-134-5428	1	3
5820-134-5429	1	6
5915-789-7633	2	11
5930-119-3546	3	10
5930-119-3547	3	6
5930-892-9362	3	5
5930-950-4541	3	11
5935-488-5317	3	16
5935-488-5318	1	4
5935-917-5396	3	3
5940-406-7367	2	4
5940-644-7963	3	7
5955-054-9133	2	1
5965-055-0648	1	5
5995-054-9134	2	2
5995-055-0636	2	3
6135-935-5241	1	2

REFERENCE NO.	MFG CODE	FIG NO.	ITEM NO.
BA-1112/U	80058	1	2
CR77U49-025	81349	2	2
CR77U50-225	81349	2	3
CR77U50-625	81349	2	1
H-281/URC-68	80058	1	5
MS51957-13	96906	3	13
NAS620C10L	80205	3	4
SMB660173	80063	3	15
SMB660217	80063	3	2
SMB660292	80063	3	14
SMB660335	80063	3	18
SMB660462	80063	2	7
SMB660473	80063	3	17
SMB662650	80063	3	7
SMC660216	80063	3	3
SMC660221	80063	3	12
SMC660239	80063	3	6
SMC660242	80063	3	10
SMC660253	80063	3	16
SMC660255	80063	2	11
SMC660256	80063	1	1
SMC660282	80063	1	7
SMC660306	80063	3	1
SMC660358	80063	3	9
SMC660370	80063	1	6
SMC660373	80063	1	4
SMC660463	80063	2	4
SMD660161	80063	2	10
SMD660163	80063	2	8
SMD660165	80063	2	6
SMD660167	80063	2	5
SMD660169	80063	2	9

SECTION IV. INDEX-FEDERAL STOCK NUMBER CROSS REFERENCE

TO FIGURE AND ITEM NUMBER OR REFERENCE DESIGNATION (CONTINUED)

REFERENCE NO.	MFG CODE	FIG NO.	ITEM NO.
SMD660175	80063	1	3
SMD660254	80063	3	8
SMD660254-1	80063	3	11
SMD660304-1	80063	3	5

FEDERAL STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER OR REF. DESIGNATION

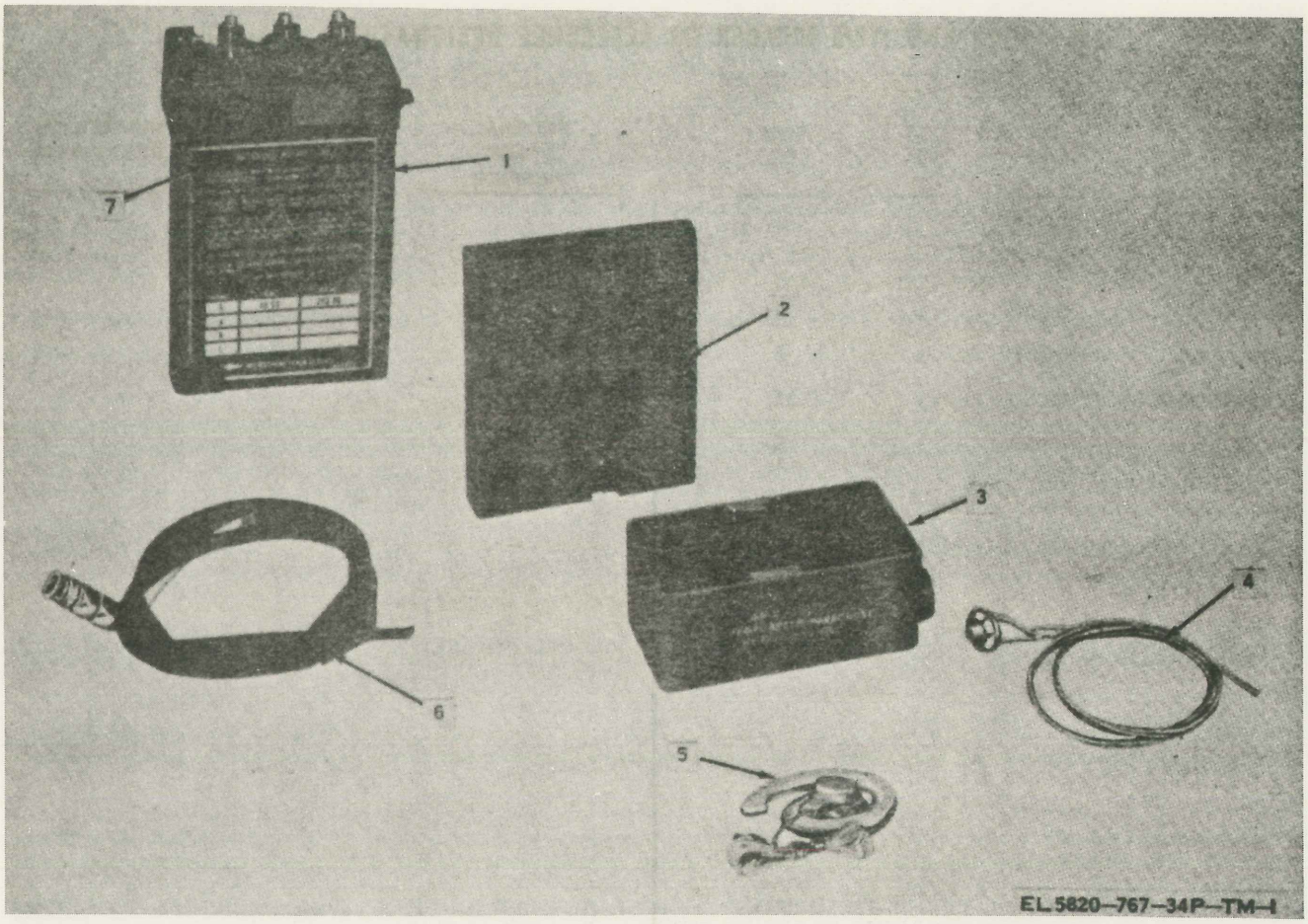


Figure 1. Earphone and Parachute Adaptor.

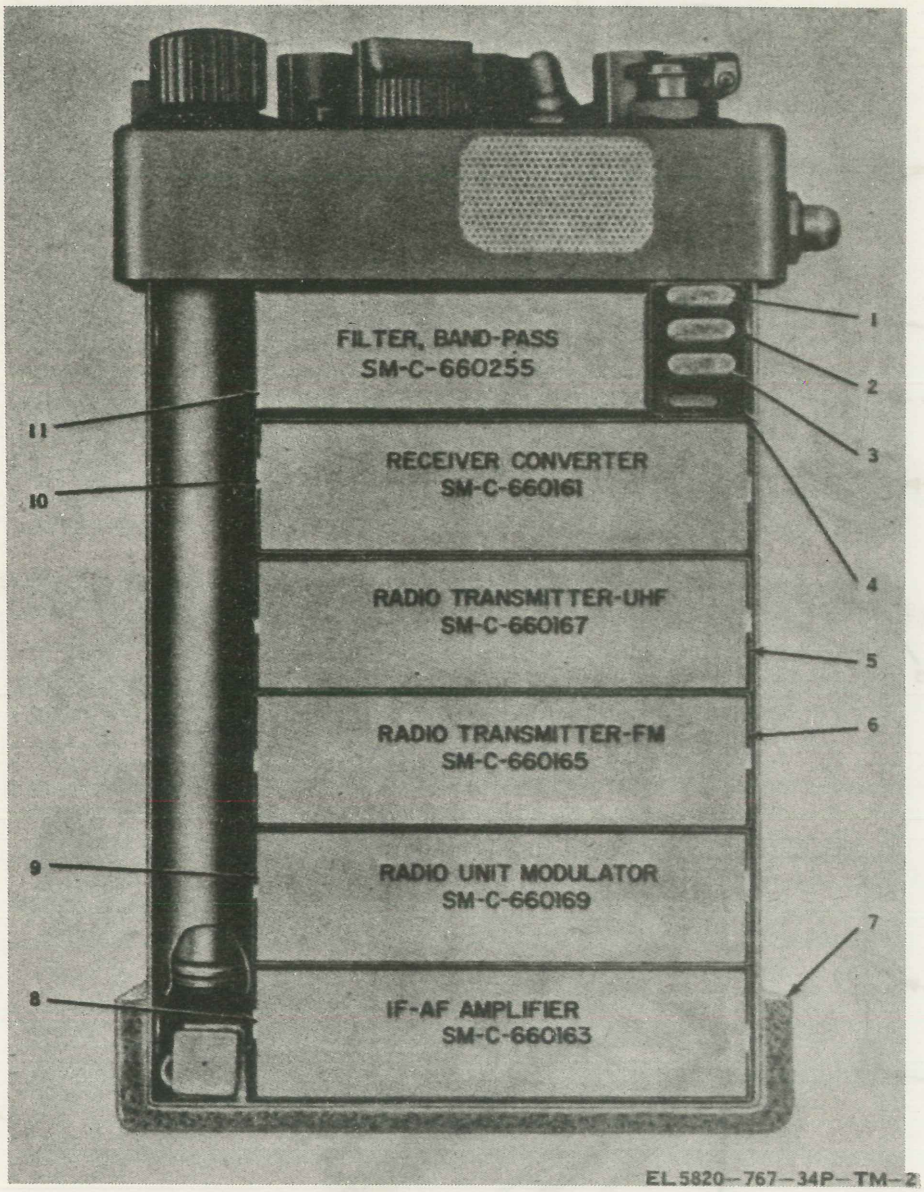


Figure 2. Crystals and Modules.

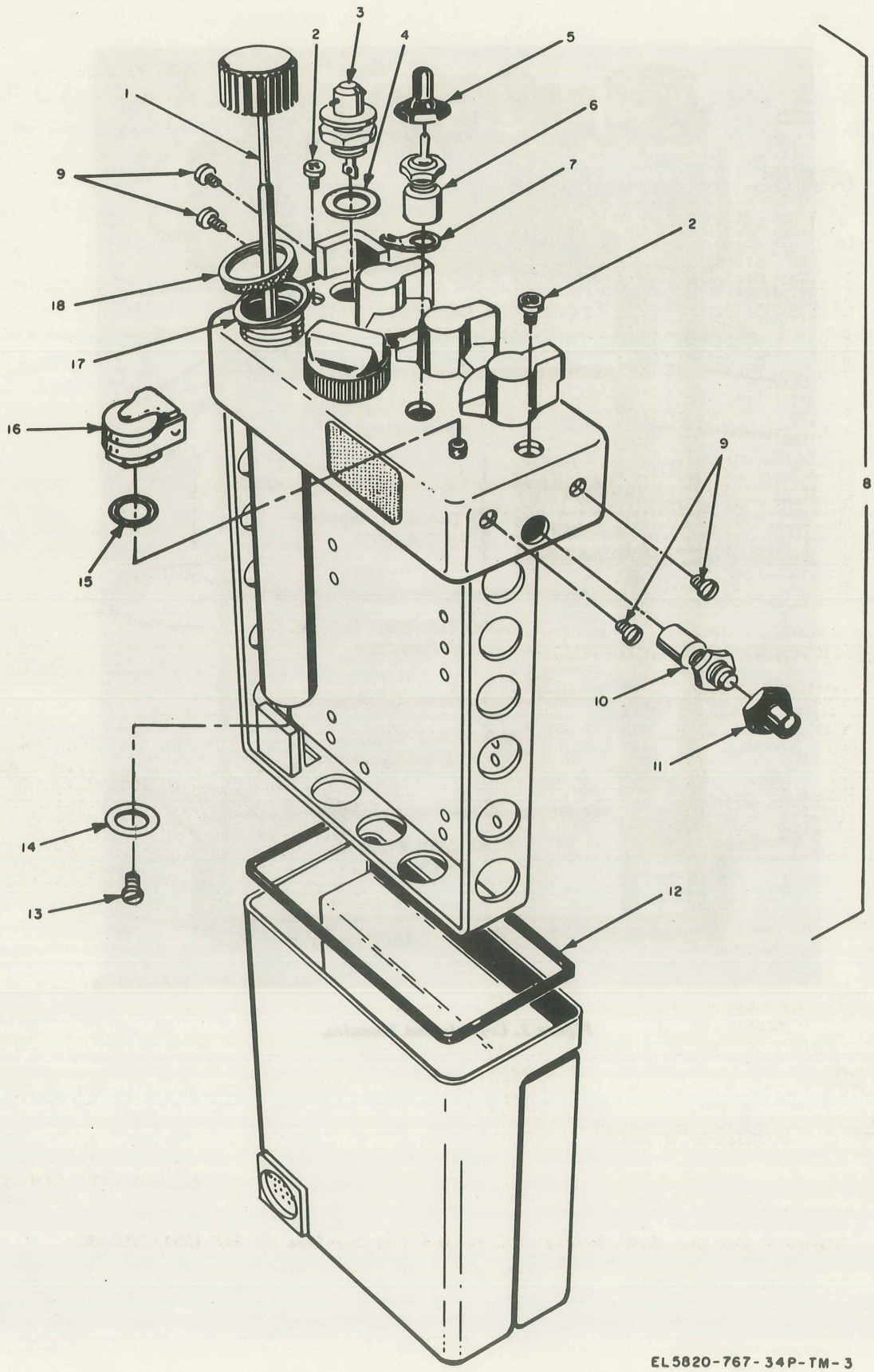


Figure 3. Antenna, Connector, and Switches.

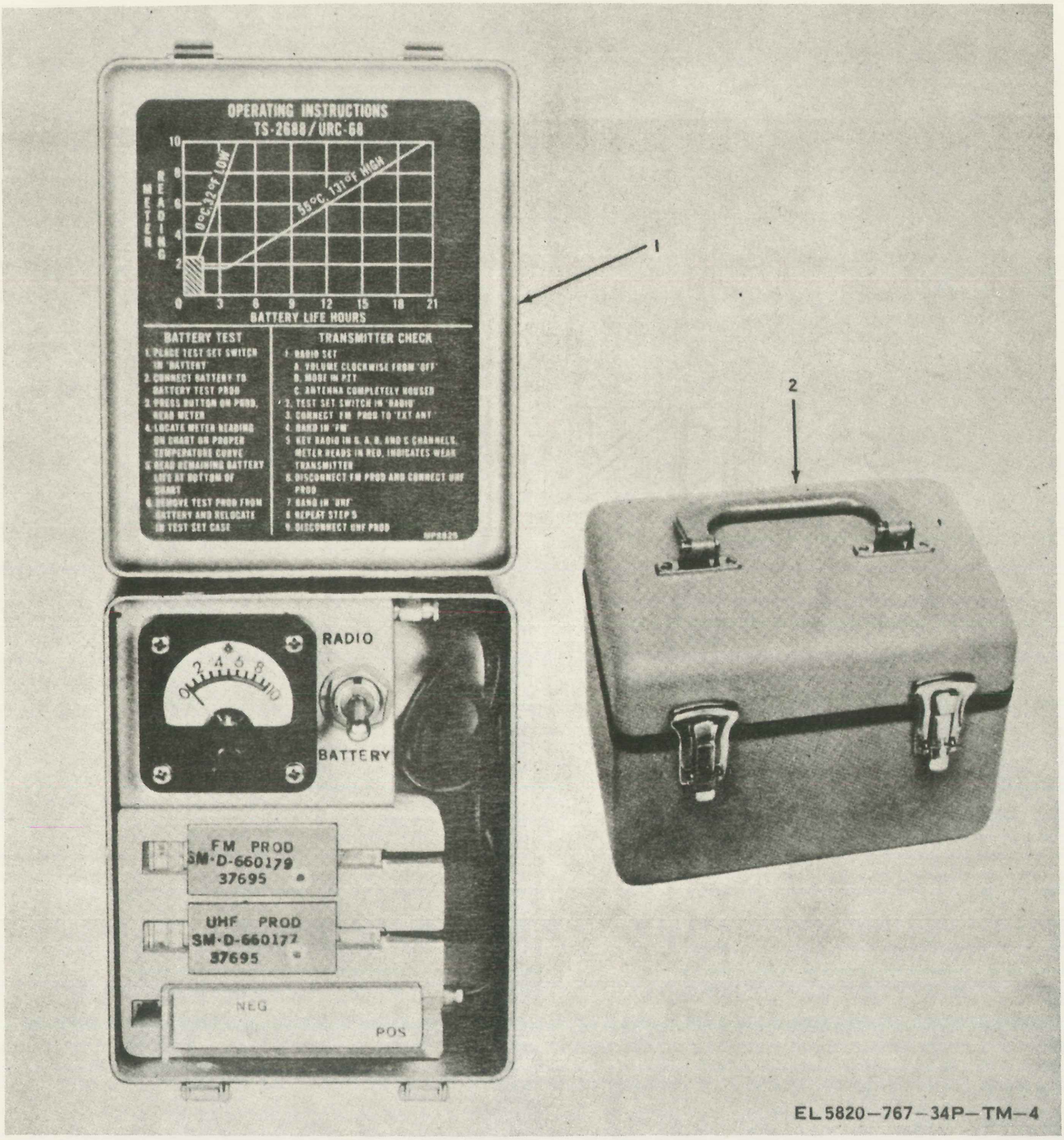


Figure 4. Test Set, Radio TS-2688/URC68 and Test Facilities Kit MK-1559/URC-68.

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By Order of the Secretary of the Army:

W. C. WESTMORELAND,
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