TECHNICAL MANUAL

UNIT AND INTERMEDIATE DIRECT SUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)

RADIO SET AN/PRC-68A (NSN 5820-01-180-8943)

HEADQUARTERS, DEPARTMENT OF THE ARMY

15 JUNE 1987

Technical Manual

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HEADQUARTERS
DEPARTMENT' OF THE ARMY
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UNIT AND INTERMEDIATE DIRECT SUPPORT MAINTENANCE MANUAL
(Including Repair Parts and Special Tools List)
for
RADIO SET AN/PRC-68A
(NSN 5820-01-180-8943)

Current as of 17 March 1987

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve procedures, please let us know. Mail your letter, DA Form 2028 (Recommnended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of-this manual direct to: Commander, U.S. Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, NJ 07703-5000. A reply will be furnished direct to you.

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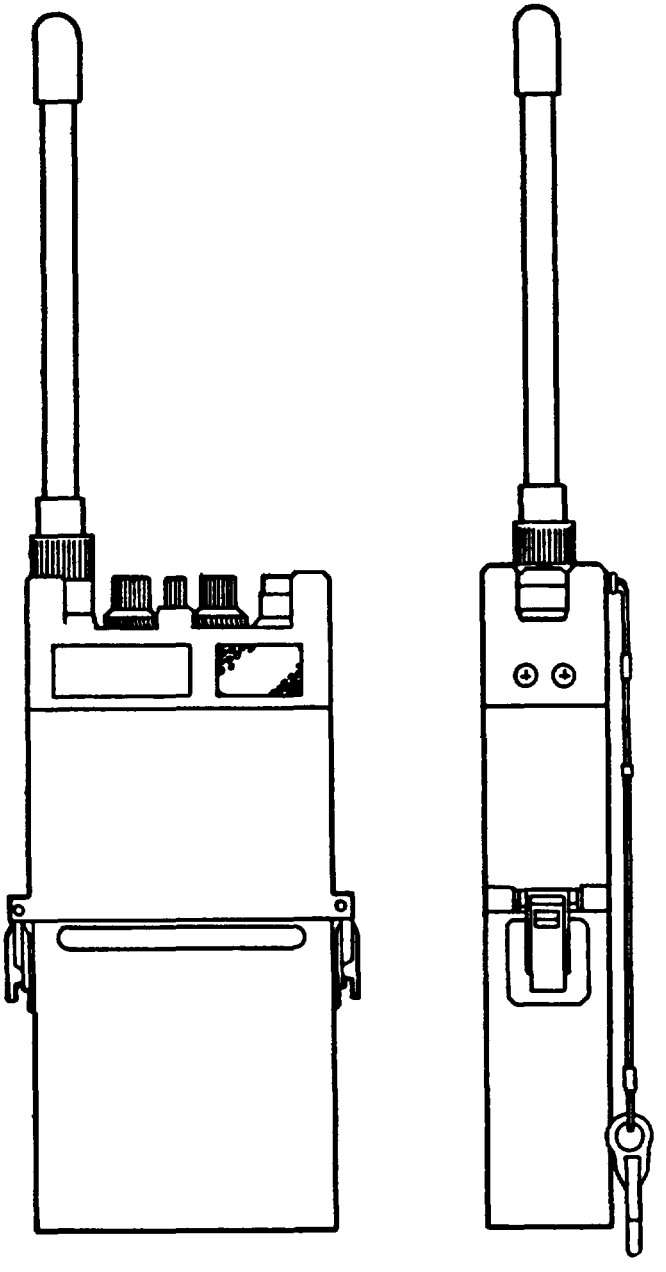


Figure 1-1. Radio Set AN\PRC-68A.

CHAPTER 1
INTRODUCTION

Section I. GENERAL INFORMATION

1-1. Scope

This manual describes Radio Set AN/PRC-68A (fig. l-l) and provides unit and intermediate direct support maintenance instructions for the equipment.

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

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

1-3. Maintenance Forms, Records, and Reports

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army fore-and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in Maintenance Management Update.

b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 [Report of Discrepancy (ROD)] as prescribed in AR735-11-2/DLAR 4140.55/NAVMATINST 4355.73B/AFR 400-54/MCO 4430.3H.

c. Discrepancy in Shipnent Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/ NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

1-4. Administrative Storage

Equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS chart before administrative storage. When equipment is removed from administrative storage, PMCS should be performed to ensure operational readiness. Disassembly and repacking of equipment for shipment or limited storage are covered in paragraphs 2-20 and 2-21.

1-5. Destruction of Army Electronics Materiel

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

1-6. Reporting Equipment Improvement Recommendations (EIR)

If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, U.S. Army Communi-cations-Electronics Comnand and Fort Monmouth, ATTN: AMSEL-PA-MA-D, Fort Monmouth, NJ 07703-5000. We'll send you a reply.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-7. Equipment Characteristics, Capabilities, and Features

Radio Set AN/PRC-68A is a hand-held receiver-transmitter that provides ground-to-ground voice communications in the frequency range from 30 to 79.975 MHz. The radio set is capable of secure speech operation when it is used with a secure voice module (SVM). The radio set can be used with a short or long antenna, with a standard military handset, or with its built-in speaker-microphone.

1-8. Location and Description of Major Components

Figure 1-2 shows the major components of the radio set. The radio set consists of the receiver-transmitter (RT) unit, a battery, a short antenna, a tuning tool, and a lanyard which attaches to the RT unit case. The RT unit contains the frame and panel assembly, two plug-in modules, and all necessary operating controls and connectors; the module cover, held by two captive screws to the chassis frame; and the battery case, which snaps onto matching connectors on the chassis frame. A long antenna, an H-250/U handset, and a canvas carrier are also provided as basic issue items for use with the radio set.

CAUTION

Use lanyard or canvas carrier to carry radio set. Lifting the set by the antenna can damage the equipment.

1-9. Location of Controls and Connectors

Figure 1-3 shows the location of the radio set external controls and connectors. The internal controls and connectors are illustrated in figure 1-4.

Provision is made for future use of an SVM for secure voice operation. The SVM shorting plug (see fig. 1-4) must be removed to install the WM. A cavity is provided on the bottom of the frame and panel assembly for storing the shorting plug. For normal operation without an SVM the shorting plug must be installed in the connector, with the retainer (tether attached to the plug) first wrapped around the connector to prevent damage to the retainer line. The radio will not work unless the shorting plug or an SVM is installed.

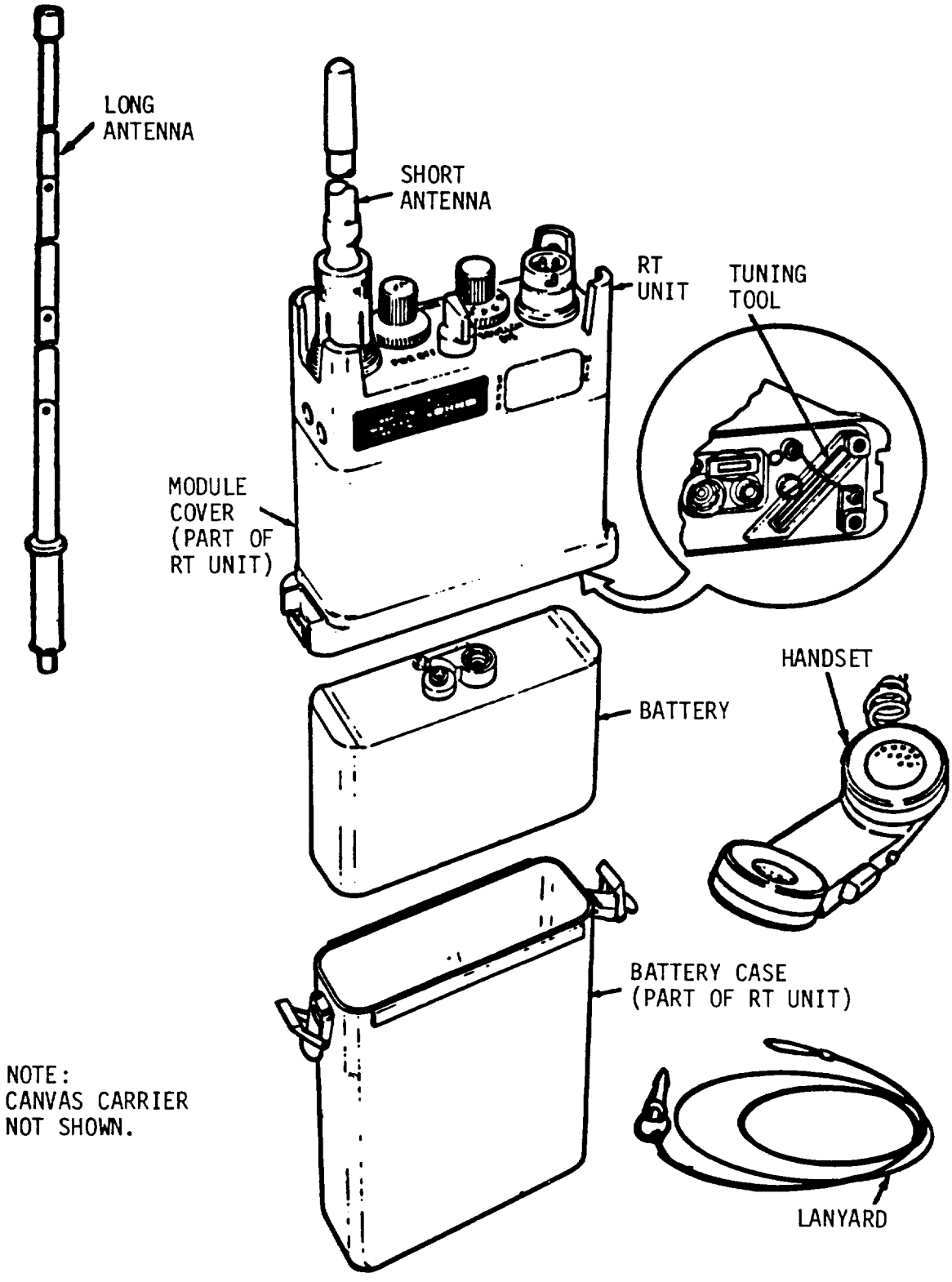
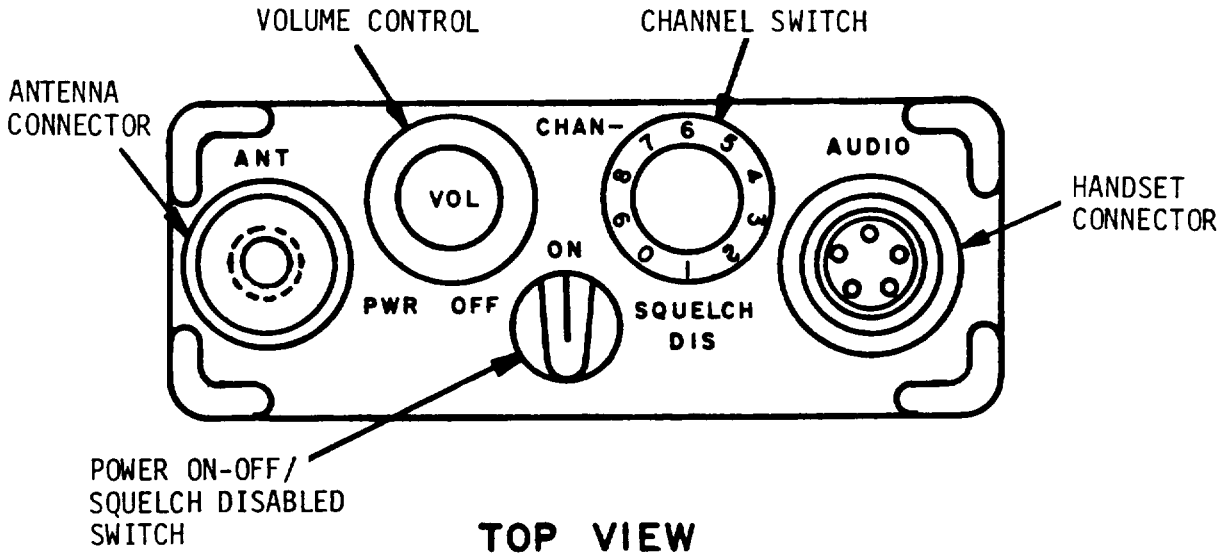


Figure 1-2. Radio Set Major Components.



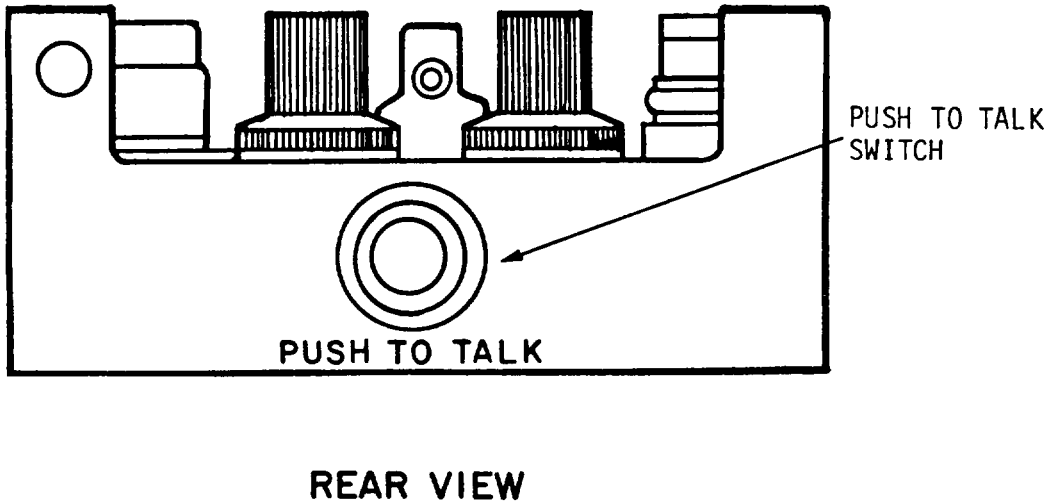


Figure 1-3. External Controls and Connectors.

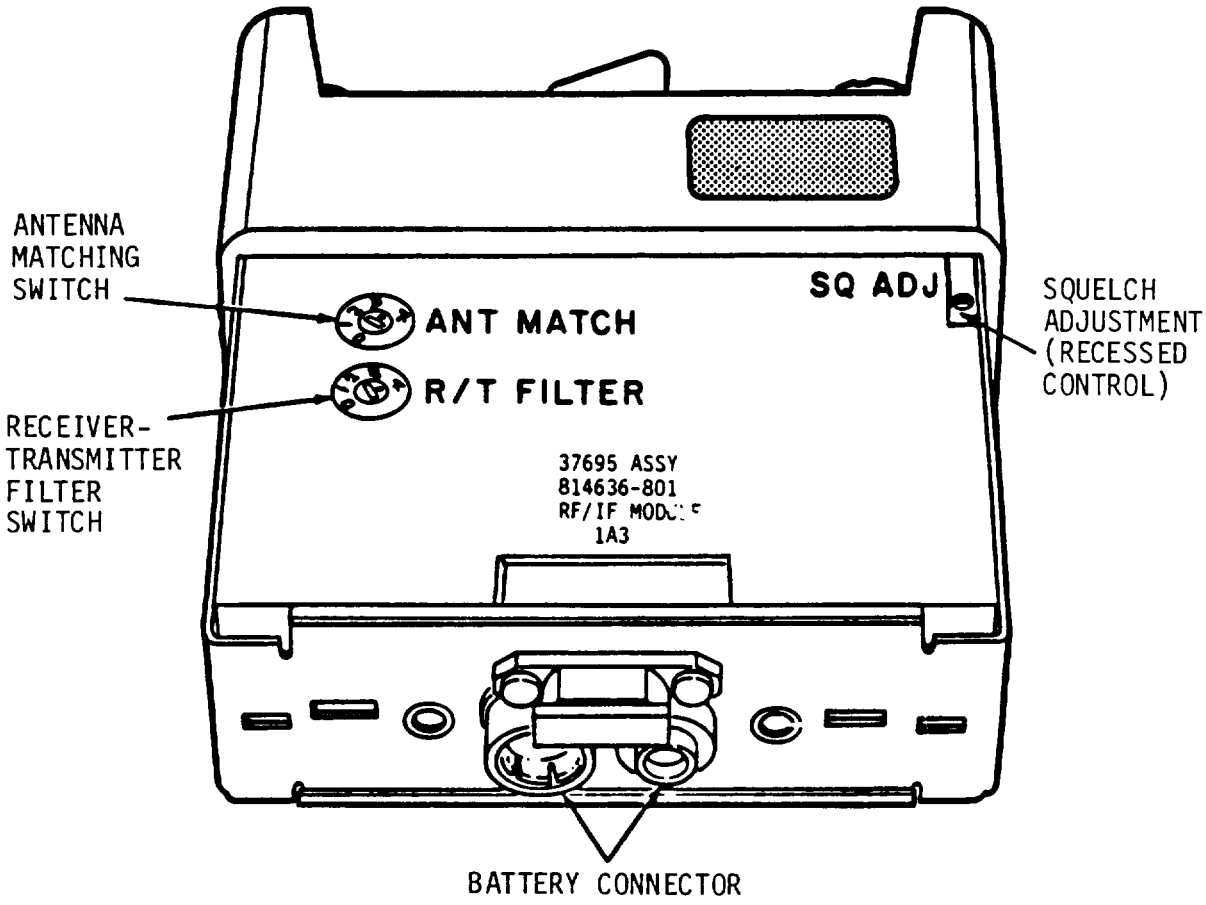


Figure 1-4. Internal Controls and Connectors (Sheet 1 of 2).

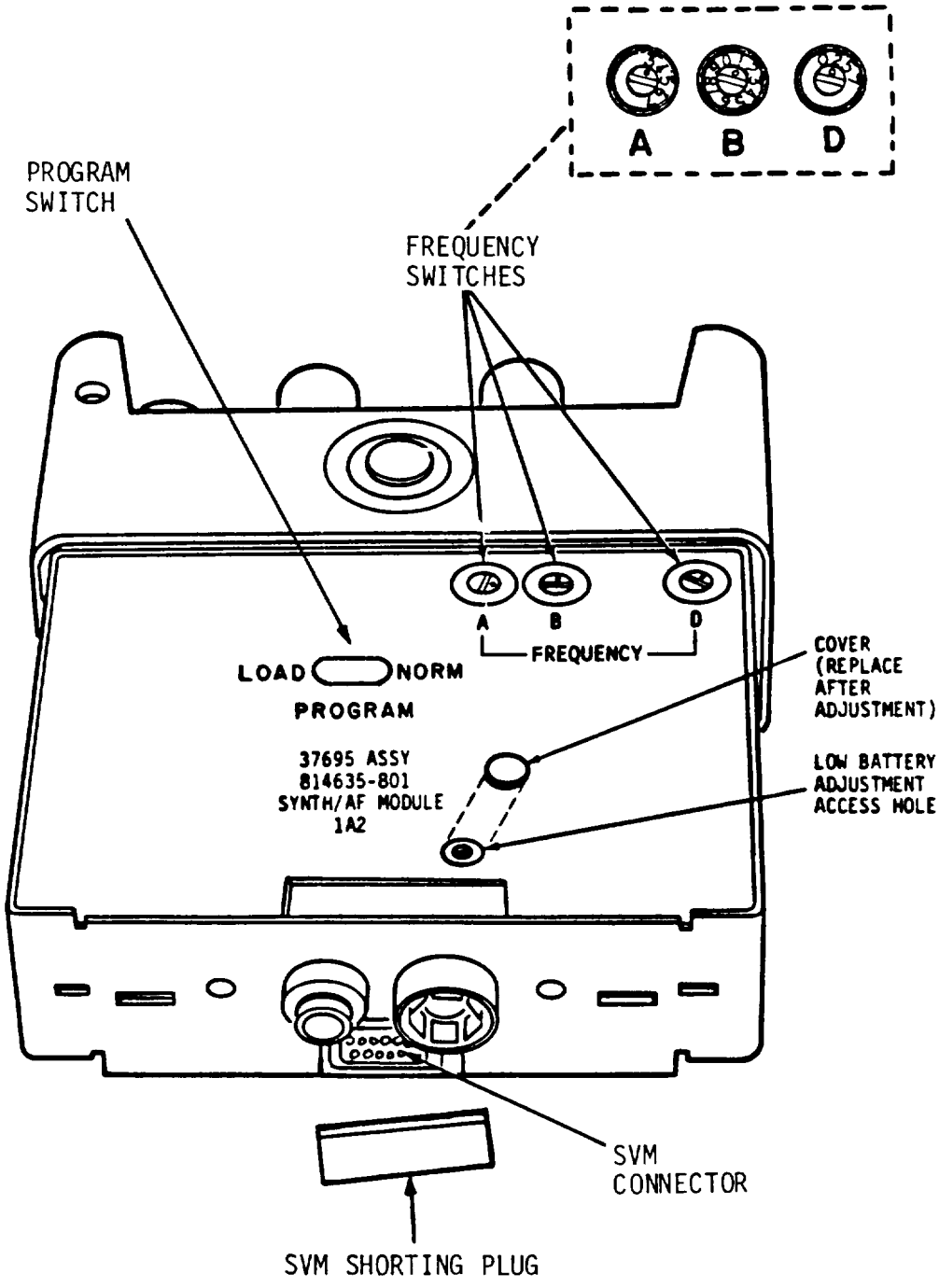


Figure 1-4. Internal Controls and Connectors (Sheet 2 of 2).

1-10. Equipment Data

GENERAL

Frequency	30.000 tO 79.975 MHz
Available channels	.2000
Charnel spacing	.25 kHz
Preset channels	.10
Preset channel spacing	random within one of four bands
Modulation	frequency modulation (FM)
Range:	
Short antenna	.330 yards (300 meters)
Long antenna	l mile (1.6 kilometers)
Power source, battery operated	16 VDC
operating temperature range	-40°F to +150°F (-40°C to +65°C)
Weight (includinq battery and antenna, no handset)	50 02 (1.41 kg)
Size	9.35 in.(237.5mn) H x 3.80 in.(96.5mm) W x 1.52 in.(38.6mn) D

TRANSMITTER

Fewer output	1 watt
Frequency control	.built-in synthesizer
Frequency stability	.+0.005 percent
Spurious and harmonics radiation	50 dB below RF-carrier level (2nd harmonic 40 dB)
Modulation limiting	±15 kHz deviation (maximun)
Squelch tone (2.5-3.5 kHz deviation)	148 to 152 Hz

RECEIVER

Adjacent charnel rejection	-60 dB
Image rejection	-40 dB
Sensitivity	.0.5 uV for 10 dB SINAD*
Squelch sensitivity	.0.5 Uv
Selectivity:	
6 dB down	.bandwidth greater than ±15 kHz
60 dB down	bandwidth less than ±50 kHz
Response to spurious signals	-60 dB
Frequency stability	.+0.005 percent
Audio output	less than 10 percent distortion at 20 mW

*SINAD $\frac{\text{Signal + Noise + Distortion}}{\text{Noise + Distortion}}$

Section III. PRINCIPLES OF OPERATION

1-11. General

The radio set contains two plug-in modules which provide all the circuitry necessary for frequency and channel programing, frequency synthesis, receive operation, and transmit operation. These functions are described below.

1-12. Frequency and Channel Programming

The radio set provides 10 independent preset channels for frequency selection. The only restriction in selecting channel frequencies is that all 10 must be located within one of four manually preset RF operating bands. These bands are 30 to 40 MHz, 40 to 54 MHz, 50 to 64 MHz, and 60 to 80 MHz. A microcontroller data processor and a nonvolatile programmable memory are used to provide the independent preset channels capability.

1-13. Frequency Synthesis

The frequency synthesizer section of the radio set generates a stable frequency signal for the transmit and receive mixers. The synthesizer frequency range is from 42 to 68 MHz in 25 kHz increments (minimum channel spacing). The required frequency accuracy and stability are achieved by phase-locking a variable frequency (42 to 68 MHz) voltage controlled oscillator (VCO) to a fixed frequency standard (6.4 MHz) crystal-controlled reference oscillator. The channel frequency of the synthesizer is determined by the digital data from the microcontroller and preset channel memory.

1-14. Receiver Operation (fig. 1-5)

When the radio set is turned on, the unit is in the receive mode (squelch is on, no receiver noise present). Signals entering the antenna are routed through the antenna matching networks and harmonic filters to the converter stage (RF amplifiers and 1st mixer). The output of the mixer is the difference product of 12 MHz (lst IF) obtained by mixing the incoming signal (30 to 54 MHz or 54 to 80 MHz in two RF amplifier bands) with the 42 to 68 MHz frequency synthesizer signal. A 12 MHz crystal filter provides a channel bandwidth of ±16 kHz and greater than 60 dB attenuation to adjacent channels. The 12 MHZ signal is amplified and converted to 500 kHz (2nd IF) in the filter/IF section. The 500 kHz signal is amplified, limited, and applied to an FM quadrature detector for demodulation. The audio output from the detector is filtered and amplified in the AF section and routed to the internal speaker-microphone or external handset.

1-15. Transmitter Operation (fig. 1-6)

When the radio set is in the transmit mode, the speaker-microphone is used as a microphone to apply a voice signal to the modulation circuits. The speech signal is frequency modulated on a 12 MHz intermediate carrier signal (deviation oscillator) and applied to the transmit mixer along with the frequency synthesizer signal (42 to 68 MHz). The output signals from the mixer are the sum (54 to 80 MHz) and difference (30 to 54 MHz) products which are selected, filtered, and amplified

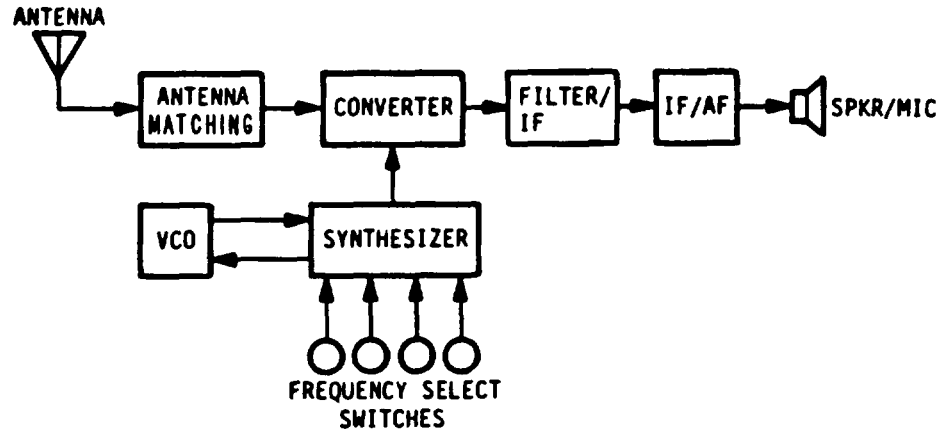


Figure 1-5. Receiver Operation Functional Diagram.

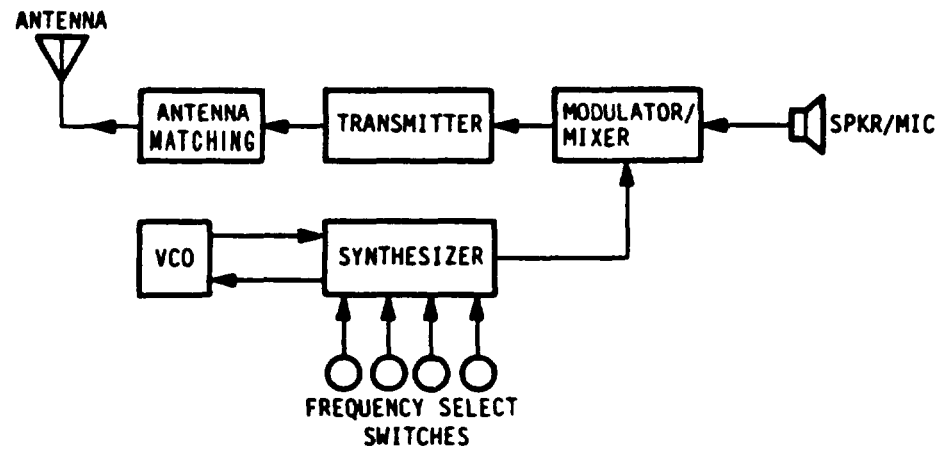


Figure 1-6. Transmitter Operation Functional Diagram.

by one of the two RF amplifiers and applied to the power amplifiers. The frequency modulation on the 12 MHz signal is transferred to the 30 to 80 MHz carrier signal by the mixing process. The power amplifiers increase the FM carrier signal to 1 watt minimum. The signal is then filtered and transformed by the antenna matching network to the antenna for radiation.

Section IV. CIRCUIT DESCRIPTIONS

1-16. Circuit Functioning

Circuit functioning of the radio set (see fig. FO-l and FO-2) can be broken down into circuits that perform separate functions (receive and transmit) and circuits that are used for both functions (synthesizer, VCO, voltage-tuned RF stages, and RF filter/matching networks). Special functions are also discussed. These functions include the battery saver, 150 Hz squelch tone, and low-battery warning circuits.

1-17. Receive Operation

The receiver is packaged in both the RF/IF and SYNTH/AF modules. The RF/IF module (fig. FO-1) contains the RF, IF, FM detector, squelch, and wideband audio circuits. The SYNTH/AF module (fig. FO-2) contains the narrowband audio circuits which include the speech filter, squelch gate, audio amplifier, and speaker mute.

a. RF Section. The RF section includes the antenna matching networks, low-pass ham—nit filters, diode switches, varactor-tuned RF amplifiers, and the receiver 1st mixer.

(1) Antenna Matching Networks. These networks provide optimum impedance matching and power transfer between the radio set antenna and the receiver or transmitter. The networks are divided into four operating bands of 30 to 40 MHz, 40 to 54 MHz, 50 to 64 MHz, and 60 to 80 MHZ and are manually selected with the ANT MATCH switch. This switch is normally set to the same position as the R/T FILTER switch. An additional switch position is provided (“O” or zero) which bypasses all matching networks, allowing direct 50 ohm interface with the receiver or transmitter. This switch setting is used when troubleshooting or making performance measurements.

(2) Low-Pass Harmonic Filters. These filters are used in both receive and transmit modes of operation and are divided into the same four operating bands as the antenna matching networks. The bands are manually selected with the R/T FILTER switch, which is normally set to the same position as the ANT MATCH switch. In the receive mode of operation these filters provide attenuation to out-of-band signals which could cause interference. In the transmit mode of operation the filters provide attenuation to the harmonic frequencies of the transmitter carrier frequency.

(3) Diode Switches. Diode switches are used to transfer the incoming RF signal from the antenna to the receiver RF amplifier, to transfer the synthesizer VCO injection signal to the receiver 1st mixer, and to select one of the two RF amplifier operating bands. These diodes are turned on by forward-bias current from the receiver B+ control lines in the receive mode, and are turned off and reverse biased in the transmit tie. The band select diodes are on in both transmit and receive modes.

(4) RF Amplifiers. The amplifier section consists of two bandswitched, varactor-tuned RF amplifiers. The low-band amplifier covers the frequency range from 30 to 54 MHz, and the high-band amplifier covers the frequency range from 54 to 80 MHZ. The bandswitch and tuning voltages for both amplifiers are generated automatically by the synthesizer when a new frequency selection is made. The tuning voltage range is 2 to 11 VDC. The gain of each amplifier is nominally 20 dB. The output from the RF amplifier is routed to the receiver 1st mixer. The amplifier section is also used in the transmit mode of operation to provide selectivity to undesired transmit-mixer products. Transfer of operation is accomplished with diode switches.

(5) 1st Mixer. The receiver 1st mixer translates the incoming amplified RF signal to the 1st IF. This function is accomplished by mixing the RF signal with the synthesizer VCO signal and selecting the difference product of 12 MHz with a crystal filter. The crystal filter rejects all other mixer products. The synthesizer VCO frequency range is 42 to 68 MHz which provides both high-side and low-side injection to the 1st mixer. If a low-band frequency is selected, the VCO frequency will be 12 MHz above (high side) the RF signal. If a high-band frequency is selected, the VCO frequency will be 12 MHz below (low side) the RF signal. The 1st mixer provides a nominal conversion gain of 6 dB from RF to IF. The crystal filter provides a -6 dB (pass) bandwidth of 32 kHz and a -60 dB (stop) bandwidth of 80 kHz. The filter insertion loss is 2 dB. The total receiver gain to the input of the IF section is 24 dB.

b. IF Section. The IF section consists of the 2nd mixer, 12.5 MHz local oscillator, 500 kHz IF amplifier, FM detector, and squelch circuit. The active portions of these functions are contained within one integrated circuit.

(1) 2nd Mixer. The receiver 2nd mixer translates the 12 MHz IF to a 2nd IF of 500 kHz by mixing the 12 MHz signal with a 12.5 MHz local oscillator and selecting the difference product of 500 kHz. An LC bandpass filter following the mixer rejects all products except the 500 kHz product.

(2) 12.5 MHz Local Oscillator. This crystal controlled oscillator is accurate to within +50 ppm (parts per million) over the temperature range and provides the local oscillator injection signal for the 2nd mixer.

(3) 500 kHz IF Amplifier. This amplifier consists of a five-stage limiter and provides most of the overall 100 dB gain of the IF section. The limiting function improves the sensitivity and interference rejection capability of the receiver.

(4) FM Detector. The limiter-amplifier drives a FM quadrature detector which converts the modulation information on the frequency modulated IF signal to a wide-band audio signal. The bandwidth of the audio output signal is one-half of the crystal filter bandwidth, or 16 kHz. This wideband output is used for processing 16 kb/s secure voice data in the SVM when it is attached to the radio set. Otherwise in normal operation, a shorting plug is inserted into the SVM connector which routes the wideband audio signal directly to the narrowband audio circuits in the SYNTH/AF module.

(5) Squelch Circuit. The squelch circuit mutes or quiets the audio output of the receiver when a signal is not being received. This circuit samples the noise above the standard speech band (3 kHz) in the range from 6 to 16 kHz and converts it to a DC control signal. When no carrier is present, the noise level is high and the DC control signal will be high. When a carrier is present, the noise level is reduced which reduces the DC control level. The DC signal drives a threshold comparator which provides a two-state output - on or off. This output is routed to the SYNTH/AF module where it is used to control the operation of the micro-controller and the squelch gate for the receiver audio output. The RF input level at which the squelch is disabled (or turned off) is presettable by an internal adjustment in the RF/IF module. The squelch may also be momentarily disabled by setting the power switch on the radio set panel to the SQUELCH DIS position.

c. Narrowband AF Section. These functions are contained in the SYNTH/AF module and include the speech filter, audio amplifier, squelch gate, and speaker mute circuits.

(1) Speech Filter. In normal unsecured speech operation the information bandwidth is 300 Hz to 3 kHz. The speech filter passes this frequency band and attenuates frequencies above and below it. Of special importance is the attenuation of the wideband audio noise above 3 kHz which improves the receiver output signal-to-noise ratio by 6 dB. The output from the speech filter is routed to the audio power amplifier.

(2) Audio Amplifier. This audio amplifier provides 26 dB of gain which increases the audio output level to 60 mW for the internal speaker (65 ohms) and 7 mW for the handset (600 ohms). The DC power to this amplifier is controlled by the squelch gate.

(3) Squelch Gate. This circuit controls (or gates) the receiver audio output by switching the audio amplifier off when no RF signal is present or by switching the amplifier on when an RF signal is present. The squelch gate is controlled by a DC voltage from the squelch circuits in the RF/IF module. This feature not only quiets the receiver output but also reduces power consumption.

(4) Speaker Mute. This circuit automatically quiets the internal speaker when a handset is connected to the audio connector on the radio set. When the handset is removed, the internal speaker is automatically enabled. Control is acconplished by detecting the DC resistance of the handset earpiece and generating a DC control voltage which turns a series FET switch on or off.

1-18. Transmit Operation

The transmitter is packaged in both modules. The RF/IF module contains the RF and transmit mixer functions. The SYNTH\AF module contains the AF and transmit IF functions.

a. AF Section. Included in this section are the microphone speech limiter-amplifier, 150 Hz amplifier and filter, and the speech filter.

(1) Speech Limiter-Amplifier. This circuit linearly anplifies the low-level microphone signal to a nominal level of 6V p-p while providing a symmetrically limited output of 8V p-p for higher than normal speech level. The limiter function prevents over-modulation by restricting the maximum carrier frequency deviation to a specified level. The amplifier provides a gain of 70 dB.

(2) 150 Hz Amplifier. This circuit amplifies the 150 Hz square-wave tone generated by the microcontroller to a level of 5V p-p. An RC low-pass filter following the amplifier shapes the 150 Hz tone to a sawtooth waveform with an amplitude of 2V p-p. The 150 Hz tone is generated only in the transmit mode and is used to trigger the tone-squelch circuit in the AN/PRC-77 and AN/VRC-12 radio sets. The 150 Hz tone is disabled (J1-9) when an SVM is attached to the radio set.

(3) Speech Filter. The purpose of this circuit is to attenuate the harmonic frequencies generated by the limiter-amplifier in order to minimize the modulation bandwidth of the transmitted signal. The circuit is a unity gain, active low-pass filter with a cutoff (-3 dB) frequency of 3 kHz. The filter also attenuates any high-frequency bandground noise which may be picked up by the microphone. When an SVM is attached to the radio set, the output signal from the speech filter (J2-15) is routed to the SVM for speech ciphering. In normal use, without an SVM, the signal is routed through the shorting plug (J1-14 to 1) and back to the 12 MHz deviation oscillator in the SYNTH/AF module (J2-26). This normal mode of operation is plain text, nonsecure speech. The SVM mode is cipher text, secure speech.

b. IF Section. This section includes the 10 VDC voltage regulator, 12 MHz deviation oscillator, and 12 MHZ low-pass filter.

(1) 10 VDC Regulator. This regulator provides a stable supply voltage for the deviation oscillator and bias voltage for the varactor-tuned modulation circuits.

(2) 12 MHz Deviation Oscillator. The purpose of this circuit is to frequency modulate a 12 MHz IF transmit carrier signal with either a cipher signal from the SVM or a plain signal directly from the speech amplifier. This frequency modulation is accomplished by superimposing the cipher or plain signal on a DC bias voltage and applying the combined signal to a varactor diode (voltage variable capacitor) . The amplitude changes of the audio signal vary the capacitance of the varactor diode, which in conjunction with other components in the modulation circuit changes or deviates the oscillator carrier frequency symmetrically on either side of the 12 MHZ center frequency. The frequency deviation is directly proportional to the positive and negative audio amplitude variations superimposed on the varactor DC bias voltage, which is analogous to the carrier center frequency. An internal potentiometer allows adjustment of the bias voltage and therefore the 12 MHZ carrier center frequency. The normal frequency deviation for plain speech is +8 kHz with a sine-wave audio input- amplitude of 6V p–p (±3V p-p on DC bias). The frequency deviation for secure speech is approximately ±5.5 kHz with a ciphered digital input signal. When the input signal to the microphone is louder than normal, the limiter-amplifier clips the signal to a constant amplitude to prevent over-modulation of the carrier. An internal variable capacitor adjustment allows maximum frequency deviation to be set to a level less than ±15 kHz proportional to the amplitude of the limited speech signal. The nominal setting for this adjustment is ±12 kHz deviation. The nominal frequency deviation for the 150 Hz squelch tone is ±2.5 kHz with a 2V p-p input signal.

(3) 12 MHz Low-Pass Filter. This filter passes the 12 MHz transmit IF carrier signal and attenuates all harmonics by greater than 20 dB in order to minimize unwanted spurious products in the transmit mixer circuit. The 12 MHz transmit IF output signal is routed through J2-8 to the transmit mixer in the RF/IF module.

c. RF Section. This section consists of the transmit mixer, varactor-tuned preamlifiers, diode switches, power amplifiers, power control, harmonic filters, and antenna matching circuits.

(1) Transmit Mixer. This circuit is a passive double-balanced, diode mixer. The desired output signal from the mixer is the sum and difference products of the 12 MHz transmit IF input and the 42 to 68 MHz frequency synthesizer input. The sum product comprises the high-band frequencies from 54 to 80 MHz, and the difference product comprises the low-band frequencies from 30 to 56 MHz. The 2 MHz overlap is necessary to provide identical tune voltage curves for each band-preamplifier. In actual use the low band covers from 30 to 54 MHz. The varactor-tuned preamplifiers following the mixer select and amplify the difference or sum product depending on low-band or high-band operation, respectively.

(2) Varactor-Tuned RF Preamplifiers. These low-level RF amplifiers are also used in the receive mode (para l-17a). Diode switches transfer the receive-transmit signals for the respective-ties of operation. In the transmit mode the amplifiers are used to amplify one of the two band products from the transmit mixer. If the operating frequency is in the 30 to 53.975 MHZ range, the low-band amplifier is automatically turned on and the high-band amplifier is turned off. The opposite switching occurs if the operating frequency is in the 54 to 79.975 MHz range. Each amplifier has a nominal power gain of 20 dB and provides 50 dB relative attenuation to the transmit mixer image product (other band). The amplifiers are voltage tuned with the synthesizer phase-lock-loop (PLL) control voltage tune volts (J2-14) . Frequency versus voltage tracking is accomplished with a set of five matched varactor diodes [VCO (l), high band (2), low band (2)] and series capacitive padders in the VCO and high-band tuned circuits which warp these two tuning curves to fit the low-band curve. The tracking error is maintained to within 3 dB maximum. The nominal preamplifier output signal level is 70 mV at the power amplifier input.

(3) Power Amplifiers. This section consists of three stages of power gain. The amplifiers are broadband covering the complete 30 to 80 MHZ frequency range in one band with no manual tuning required. The overall power gain is 42 dB with a nominal output power level of 1.5 watts. The predriver and driver amplifiers each have a nominal gain of 15 dB. The final power amplifier has a nominal gain of 12 dB . The output signal is routed through a diode switch to the harmonic filters.

(4) Diode Switches. The diode switches transfer the transmitter output signal to the harmonic filters while isolating the receiver input from the transmitter and filters. These switches are controlled by the transmit and receive B+ lines as determined by the PUSH TO TALK switch position.

(5) Harmonic Filters. These filters pass the desired transmit carrier frequency while rejecting the harmonics of the carrier. Four filter bands are necessary to provide the required amount of attenuation to the harmonics. The bands are: 30 to 40 MHz, 40 to 54 MHz, 50 to 64 MHz, and 60 to 80 MHz. Band selection is accomplished by manually setting the R/T FILTER switch to the correct position.

(6) Antenna Matching Networks. This section is divided into four bands identical to the harmonic filters. Band selection is also accomplished manually by setting the ANT MATCH switch to the correct position. These circuits impedance match the antenna to the transmitter to provide maximum radiated power from the antenna.

The ANT MATCH switch can also be set to the "O" (zero) position to provide a bypass mode of operation for direct 50 ohm interface with test equipment or other antenna systems . In this mode the antenna matching networks are disconnected and bypassed with a short circuit. The matching networks are designed to match both long and short antennas with no manual tuning other than setting the bandswitch.

1-19. Frequency Synthesizer Operation

The frequency synthesizer circuits consist of two sections. The PLL is contained in the SYNTH/AF module except for the VCO, which is contained in the RF/IF module. The control section is contained in the SYNTH/AF module.

a. PLL Section. The PLL section includes the VCO buffer amplifier-regulator, ÷40/41 prescaler, frequency synthesizer, 6.4 MHz reference oscillator, and loop filter. The PLL generates a stable 42 to 68 MHz IF for the transmit and receive mixers. This stability is accomplished by phase-locking a variable frequency VCO (42 to 68 MHz) to a fixed frequency reference oscillator (6.4 MHz). Both oscillators are frequency divided to a phase detector frequency of 25 kHz for phase comparison. A DC voltage proportional to phase difference is then generated, filtered, and applied to a voltage variable capacitor (varactor diode) in the VCO circuit. When phase locked (or slaved) to the reference oscillator, the VCO frequency stability is ±25 ppm over the -40°C to +65°C temperature range. At 68 MHz the maximum frequency error would be ±1700 Hz. The receive mode frequency stability is the same as the VCO stability. In the transmit mode the stability of the deviation oscillator is added to the VCO stability. The resultant transmit frequency stability is ±50 ppm for a worst case frequency error of ±4000 Hz at 80 MHz.

(1) Voltage Controlled Oscillator. This oscillator is tuned from 42 to 68 MHz with a 2 to 11 VDC control voltage (tune volts) generated by the PLL. A voltage variable capacitance diode (varactor) is used in conjunction with other tuned circuit components to provide the required frequency control.

(2) Buffer Amplifier-Regulator. This circuit provides a dual function. The buffer amplifier isolates the VCO from load reflections to minimize VCO noise and spurious signals within the PLL. The regulator provides a stable DC supply voltage for the VCO and the ÷40/41 prescaler. The nominal output signal level from buffer amplifier to the transmit and receive mixers is 300 mV. The nominal VCO output signal is 100 mV and is superimpose on the regulated +7.5 VDC supply voltage to the ÷40/41 prescaler in the SYNTH/AF module (J2-6).

(3) *40/41 Prescaler. This circuit is a frequency divider which divides by 40 or 41 as determined by a control signal generated within the frequency synthesizer. The combination of these two circuits determines the overall frequency division ratio required to reduce the VCO frequency to 25 kHz for phase comparison.

(4) Frequency Synthesizer. This circuit consists of additional frequency dividers, the reference oscillator amplifier, and the phase-frequency detector. The frequency divider ratio is internally programmed by serial input data from the microcontroller. This data is determined by the setting of the FREQUENCY and CHAN switches. Bandswitch control is also provided as determined by the frequency selection. If the selected frequency is between 30.000 and 53.975 MHz, the low band will be activated. If the selected frequency is between 54.000 and 79.975 MHz, the high band will be activated. This ban%"switch control is applied to the tuned RF amplifiers in the RF/IF module.

(5) Phase-Frequency Detector. A fixed frequency divider (÷ 256) divides the 6.4 MHz reference oscillator down to 25 kHz for phase comparison in the phase-frequency detector. The frequency detector senses the difference in frequency between the fixed reference oscillator and the variable VCO and generates a sweep voltage which pulls the VCO closer to the reference oscillator. As the VCO frequency approaches the reference oscillator frequency, the phase detector takes control and generates a DC control voltage which phase-locks the VCO to the reference oscillator. In this phase-locked condition the stability and accuracy of the VCO frequency is equivalent to the reference oscillator.

(6) Reference Oscillator. The active circuitry for this oscillator is contained within the frequency synthesizer integrated circuit. The reference oscillator generates the PLL frequency standard to which the VCO is phase locked for frequency stability and accuracy. The room temperature accuracy of the reference oscillator is adjustable to within ±5 ppm to compensate for long-term aging. The temperature stability of the oscillator is ± 25 ppm over the -40°C to +65°C temperature range. The VCO performance is equivalent when phase locked to the reference oscillator. The reference oscillator frequency is quartz-crystal controlled.

(7) Loop Filter. The PLL filter provides two functions. The first section is a phase-gain compensation network,which stabilizes the phase-lock response parameters of the PLL. The last section is an active low-pass filter which attenuates the phase detector fundamental (25 kHz) and harmonic frequencies. The attenuation provided by this filter reduces the incidental FM on the VCO frequency to less than 100 Hz deviation. The loop filter also provides DC amplification of the phase detector control signal to the 2 to 11 VDC range required by the VCO for frequency coverage from 42 to 68 MHz. The output of the loop filter is the tune-volts line (J2-14).

b. Control Section. The control section includes the frequency select switches, microcontroller, preset channels memory, and channel programming switch. This section provides digital data conversion and processing of selected frequency and channel information. This digital processing is done in parallel format between the frequency switches and microcontroller and in serial format between the frequency synthesizer, microcontroller, and preset channels memory.

(1) Frequency Select Switches. This group consists of FREQUENCY switches A, B, and D and the CHAN switch. The CHAN switch is used as the C-switch when making frequency selections, and as the channel switch when selecting a preprogrammed channel frequency. The frequency select switches can not be used to manually align the radio but are used only to program frequencies for the preset channels memory.

(2) Microcontroller. The microcontroller is the central processing unit for conversion of frequency selection information to serial digital data and distribution of serial frequency data to the memory for storage, or from the memory to the frequency synthesizer when a channel selection is made. The instruction program for the microcontroller is permanently masked into an internal read-only-memory (ROM). The microcontroller also generates the waveforms for the 150 Hz squelch tone, battery saver chopped B+, and the low-battery warning tone. A 76.8 kHz crystal-controlled oscillator provides the clock standard for waveform timing and data conversion, processing, and transfer.

(3) Preset Channels Memory. This device is an electrically-erasable-programmable-read-only-memory (EEPROM) with the capacity to store frequency selection data for 10 channels. All 10 channels can be randomly programed to unrelated frequencies in one of four operating bands, and stored for an indefinite period of time. Frequency data recall and frequency changing of the radio set are accomplished immediately when a channel selection is made. The memory is nonvolatile and does not require power to retain data after it has been programed.

(4) Programing Switch. The PROGRAM switch selects one of two functions. The NORM function is used during normal operation and allows the selection of one of 10 independent preset operating channels (or frequencies). During the programming cycle the switch is set to the NORM position for setting the frequency select switches to the desired frequency. The switch is then set to the LOAD position for setting the CHAN switch to the desired channel number selection. The switch is then set back to the NORM position to transfer the selected frequency data into the selected channel number memory location. Data recall for each charnel is accomplished automatically by setting the CHAN switch to that channel number when the PROGRAM switch is in the NORM position. If the PROGRAM switch is left in the LOAD position, the radio set will not function properly.

1-20 . Special Functions

The special functions generated by the microcontroller circuit are the 150 Hz tone, battery saver timing waveform, and low-battery warning tone.

a. 150 Hz Tone. This signal is a periodic square wave with an amplitude of 5V peak and a frequency of 150 ± 1 Hz. The tone is derived from the 76.8 kHz clock standard and therefore has the same accuracy. The 150 Hz tone is filtered and used to modulate the transmit carrier signal for compatibility with the tone-squelch in the AN\PRC-77 and AN/VRC-12 radio set receivers. This tone is generated only during the transmit mode.

b. Battery Saver Timing Waveform. This signal is a periodic square wave with an amplitude of 5V peak. The on-time (+5 VDC) is 54 milliseconds and the off-time is 161 milliseconds-. The timing accuracy is derived from the 76.8 kHz clock standard. This signal is amplified to 15V peak and used for the choppped B+ to duty-cycle portions of the receiver during the squelched-standby mode of operation. This duty cycle (25-percent ON and 75-percent OFF) reduces the average power consumption of the radio, thus increasing the battery life (battery saver). The chopped B+ line is also routed to the SVM (J1-3) to accomplish the same purpose in that module. The battery saver signal is generated only in the squelched-standby mode of operation.

c. Low-Battery Warning Tone. This signal consists of a series of three 400 Hz "beeps" every five seconds. In conjunction with a voltage comparator-gating circuit this-tone is used to provide the operator with an aural warning that the battery is nearing end-of-life. The warning circuits monitor the battery voltage and compare it to a preset, fixed reference voltage. When the battery voltage drops helm the preset reference, the comparator switches state and turns on the speaker-headphone amplifier, allowing the tone to be heard by the operator. The tone amplitude is adjustable with the VOL control. The low-battery tone is generated only during the squelched-standby mode and is automatically disabled when a signal is being received or when the radio is used to transmit.

CHAPTER 2
UNIT MAINTENANCE INSTRUCTIONS

Section 1. REPAIR PARTS , SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

2-1. Cannon Tools and Equipment

For authorized common tools and equipment refer to Modified Table of Organization and Equipment (MTOE) applicable to your unit.

2-2. Special Tools, TMDE, and Support Equipment

Refer to Maintenance Allocation Chart (appx B of this manual) for tools and equipment to be used at unit maintenance level.

2-3. Repair Parts

Repair parts are listed in the Repair Parts and Special Tools List (appx D of this manual) covering unit and intermediate direct support maintenance for this equipment.

Section II. SERVICE UPON RECEIPT

2-4. Checking Unpacked Equipment

a. Inspect equipment for damage incurred during shipment. If equipment has been damaged, report damage on SF 364, Report of Discrepancy.

b. Check equipment against packing slip to see if shipment is complete. Report all discrepancies in accordance with instructions of DA Pam 738-750.

c. Check DA Pam 310-1 to see whether equipment has been modified. Check to ensure your maintenance manual is latest issue.

2-5. Preliminary Servicing and Adjustment of Equipment

Perform all preventive maintenance checks and services (para 2-7) for all periods.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-6. General

To ensure that the radio set is always ready for operation, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. Preventive maintenance procedures are designed to help maintain equipment in serviceable condition. They include what items should be checked and how to check them. These checks and services are to be made at specific intervals.

2-7. PMCS Table

Table 2-1 describes the preventive maintenance checks and services for the radio set. Routine checks like cleaning, dusting, washing, checking for frayed cables, stowing items not in use, covering unused receptacles, and checking for loose parts are not listed as PMCS checks. They are procedures that should be done as required. If you find a routine check like one of those listed, in your PMCS, it was listed because problems with this item were reported.

Table 2-1. Preventive Maintenance Checks and Services (PMCS)

w - Weekly M - Monthly			Q - Quarterly s - semiannually		A - Annually		
Item No.	Interval					Item To Be Inspected	Procedures
	w	M	Q	S	A		
1					●	Radio Set	Check for missing or damaged knobs, antenna, lanyard.
2					●	Operation	Perform operational check (table 2-3).
3		●				Battery	Check voltage (table 2-3).

2-8. Disassembly Instructions

To disassemble radio set for battery replacement or for changing channel-frequency selections, perform applicable steps (refer to fig. 2-1) :

a. Make sure that PWR OFF/ON/SQUELCH DIS switch is set to OFF.

CAUTION

Handle battery case carefully as damaged case will not seal properly.

b. Unfasten latches on battery case and remove battery case.

c. Remove battery by disconnecting snap terminals.

d. For access to frequency controls, remove module cover by turning counter-clokwise two captive screws located on bottom of module cover.

2-9. Reassembly Instructions

To reassemble radio set, perform following steps:

a. Apply thin coat of silicone grease to top edge of module cover.

b. Line up module cover as shown in figure 2-1.

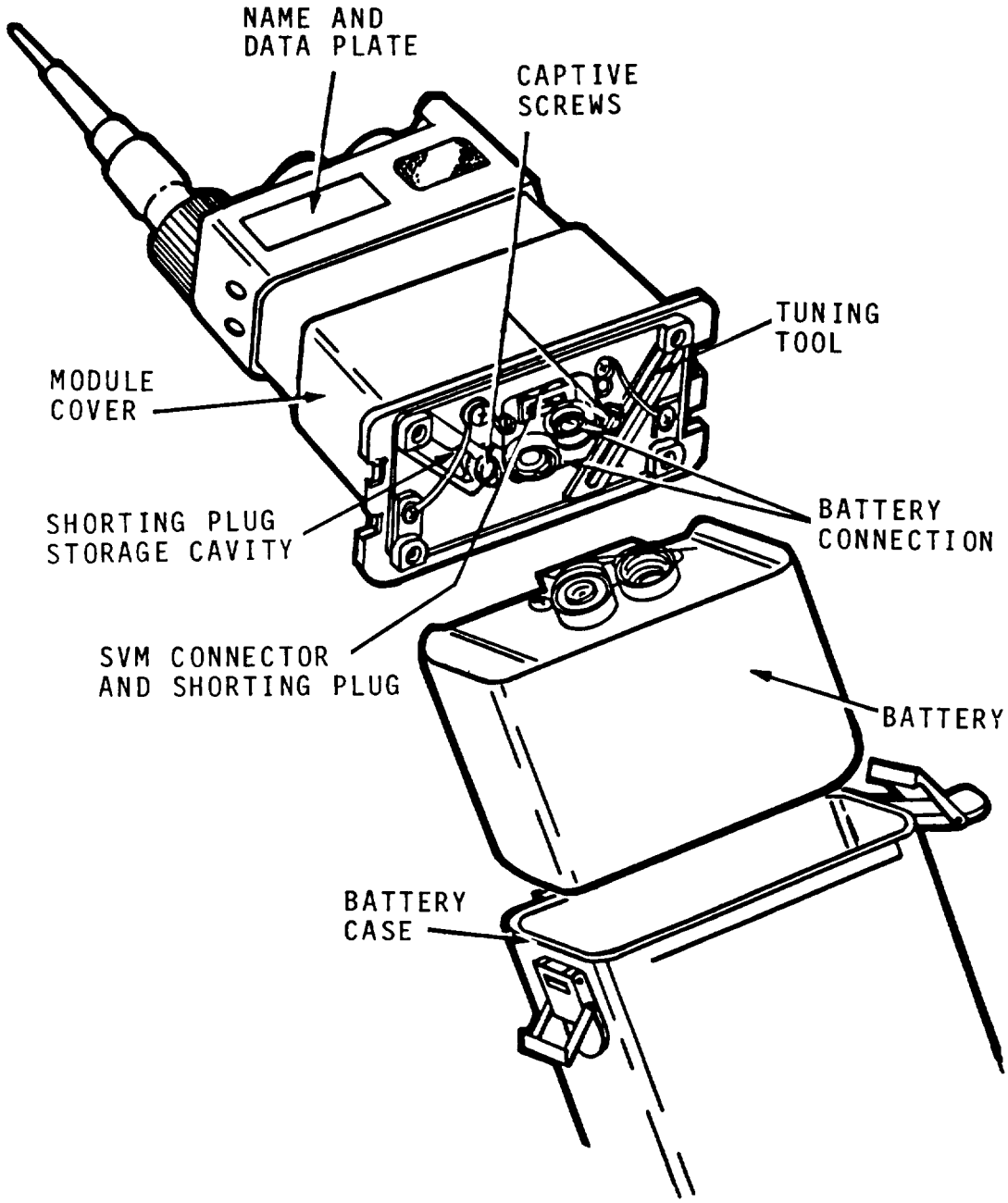


Figure 2-1. Radio Set Disassembly.

c. Slide module cover onto frame and panel assembly and secure with two captive screws located on bottom of cover (turn clockwise).

d. Reinstall tuning tool in its storage cavity.

e. Make sure SVM shorting plug is installed and in good condition. The radio will not work unless the shorting plug or an SVM is installed.

CAUTION

To prevent damage to equipment, set PWR OFF/ON/SQUELCH DIS switch to OFF before installing battery.

f. Attach battery to battery connector.

g. Apply thin coat of silicone grease to top edge of battery case to facilitate O-ring sealing.

CAUTION

To prevent water seepage, make sure battery case and rubber gasket are not damaged. Check that battery case and module cover are properly aligned before fastening latches.

h. Attach battery case and secure with two latches.

2-10. Frequency-Charnel Selection and Squelch Adjustment

The radio set provides random selection of 10 independent, preset operating channels and frequencies. Frequency-channel programing is accomplished by use of the FREQUENCY switches (A, B, and D) and the CHAN switch. The only restriction in selecting the channel (O through 9) frequencies is that all 10 must be located within one of four operating bands as follows:

@crating Band (MHz)	R/T FILTER Switch	ANT MATCH Switch
30 to 39.975	1	1
40 to 53.975	2	2
50 to 63.975	3	3
60 to 79.975	4	4

Whenever the charnel frequencies are changed, the R/T FILTER switch and the ANT MATCH switch must be set to the same position corresponding with the selected operating band.

a. Frequency and Channel Programming. To change frequency and channel selection, perform following steps:

NOTE

The information printed on the battery is not suitable for setting the frequency of the radio set.

(1) Disassemble unit (para 2-8).

(2) Connect battery.

(3) Set PWR OFF/ON/SQUELCH DIS switch to ON.

(4) Determine frequency band of operation from information listed above, and set R/T FILTER switch and ANT MATCH switch to proper band position. All 10 channels must be programmed for this band selection.

(5) Ensure that PROGRAM switch is in NORM position.

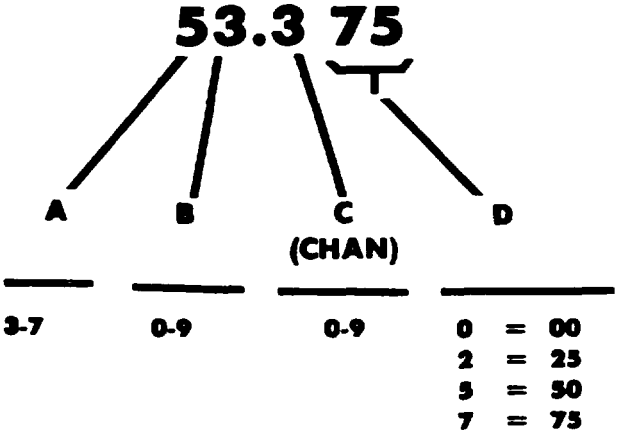
CAUTION

Care must be taken in handling the spring clip that holds the tuning tool in its storage cavity. The clip can switch over and hit the battery connectors, causing a shorted - and gassing - battery.

(6) Using tuning tool, set FREQuENCY switches A, B, and D and CHAN switch for desired frequency.

NOTE

The FREQUENCY switches (A, B, and D) and the CHAN (C) switch provide direct readout of the operating frequency to be programmed. For example, switch settings of A=5, B=3, C(CHAN)=3, and D=7 represent 53.375 MHZ, as indicated by switch positions given below. (Refer to para 2-10c for degraded channel frequencies.)



(7) Set PROGRAM switch to LOAD position.

(8) Set CHAN switch to desired channel number.

(9) Set PROGRAM switch to NORM position. The selected frequency has now been programmed into the selected channel location in the preset channels memory.

(10) Repeat steps (6) through (9), observing requirement of step (4), for other nine channel positions of CHAN switch.

b. Squelch Adjustment. The squelch adjustment should be made each time the preset channel frequency band is changed. Adjustment on one of the channels is sufficient for all channels within an operating band. Squelch adjustment should not be made on a degraded frequency (para 2-10C) because nondegraded frequencies would then have reduced sensitivity due to a higher squelch threshold level. If possible, degraded frequencies should not be used if maximum sensitivity and range are required. Perform following steps to adjust squelch threshold:

(1) Using tuning tool, turn SQ ADJ control counterclockwise until noise is heard.

(2) Slowly turn SQ ADJ control clockwise until receiver quiets, then advance control one full turn clockwise.

c. Degraded Channel Frequencies. The channel frequencies listed in table 2-2 may have reduced receiver sensitivity and possible incorrect squelch operation due to internally generated spurious signals causing desensitization of the receiver. These frequencies may be usable for most applications except when maximum comnunication distance is necessary and squelch operation is needed.

Table 2-2. Degraded Channel Frequencies

Band 1	Band 2	Band 3	Band 4
30.000 to 39.975	40.000 to 53.975	50.000 to 63.975	60.000 to 79.975
32.000	44.800	50.000	62.500
32.675	48.000	51.200	64.000
32.700	48.025	56.650	65.300
32.725	48.050	56.675	65.400
32.750	48.075	56.700	70.400
32.775	50.000	56.725	72.000
32.800	51.200	56.750	72.025
37.500		56.775	72.050
38.400		56.800	72.075
		57.600	76.800
		62.500	

Section IV. TROUBLESHOOTING

2-11. Preliminary Inspection

When radio set fails to operate properly, inspect exterior of equipment for missing or damaged parts.

2-12. Troubleshooting Procedures

If preliminary inspection does not locate source of malfunction, consult trouble-shooting table 2-3. If the source of malfunction is still not located, higher level troubleshooting is required. Note on repair tag equipment malfunction observed at time of failure.

NOTE

Low band (30.050 MHz) and high band (54.050 MHz) operation should be checked for each malfunction in the table.

2-13. Test Equipment Required

Radio Test Set AN/PRM-34, a 50 ohm dummy load, a 44.2 ohm load resistor, and Digital Multimeter AN/PSM-45 are used to troubleshoot the radio set. See figures 2-2 and 2-3 for test equipment hookups.

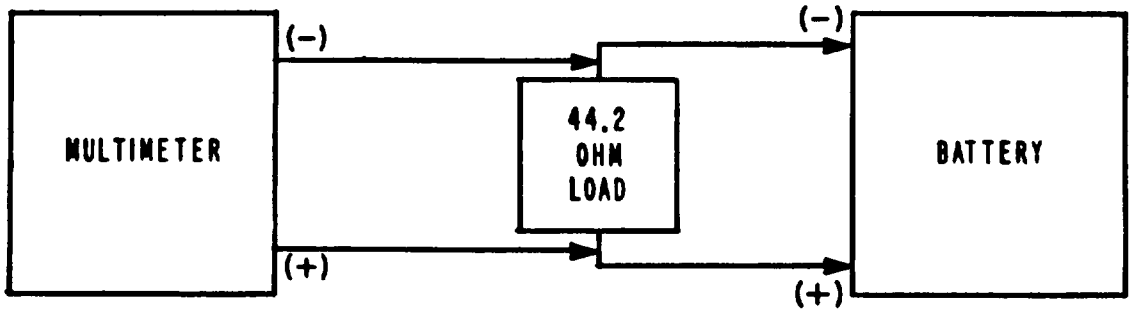


Figure 2-2. Battery Test Interconnection Diagram.

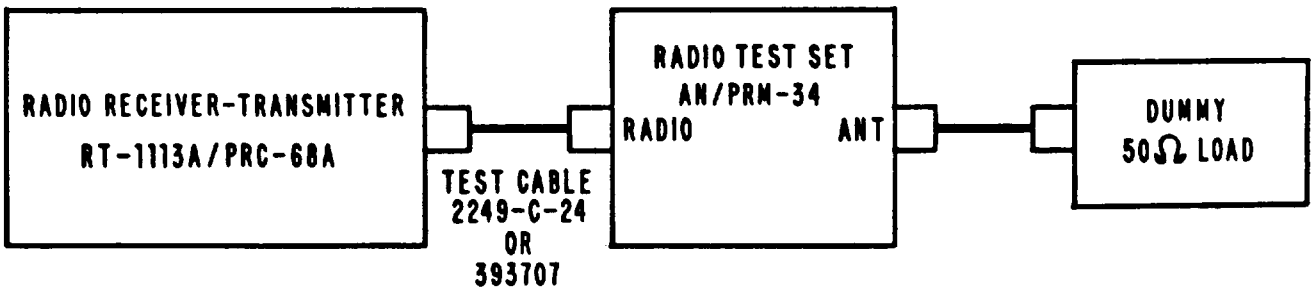


Figure 2-3. Radio Set and Test Set Interconnection Diagram.

Table 2-3. Troubleshooting procedures

Malfunction	Test or Inspection	Corrective Action
Radio set will not transmit or receive	WARNING Resistor value must be at least 5 watts. Intense heat is generated if resistor of lower value is attached to battery. a. Remove battery and connect 44.2 ohm load resistor across battery terminals. Measure voltage with multimeter (fig. 2-2). A meter readinq greater than 12 volts indicates a usable battery. A reading of 12 volts or less indicates an unusable battery. b. Check condition of antenna. Remove antenna and check connector for damage, dirt, or corrosion. c. Check for missing or broken SVM shorting plug. d. Radio set is still defective or observed to have mechanical damage.	a. Replace battery if defective. b. Replace antenna if damaged. Clean connector if dirty; if stripped or damaged in any way, higher level maintenance required. **c.** Replace SVM shorting plug. d. Refer to higher level maintenance.

Table 2-3. Troubleshooting Procedures - Continued

Malfunction	Test or Inspection	Corrective Action
Radio set has poor or no transmit functions, receive OK	a. Check frequency channel selection and squelch adjustment. b. Perform forward power test, using PRM-34 test set: (1) Remove battery case, battery, and module cover from radio set. (2) Reconnect battery. (3) Connect radio set and test set (fig. 2-3). (4) Connect handset to radio set. Set test set MODE switch to FWD PWR. Set radio set controls for low-frequency operation. CAUTION Before keying transmitter, be sure test set connections to radio set and 50 ohm dummy load are secure. Absence of dummy load (or open connections) can cause damage to radio set. (5) Key transmitter by operating handset PIT switch. Press and hold test set PUSH '10 TEST switch. Record test set display of output power in watts. Value obtained should be 0.35 ±0.05. (6) Release handset PIT and test set PUSH TO TEST sw: switches.	a. Refer to paragraph 2-10. b. If correct value is not obtained in step (5), higher level maintenance required.

Table 2-3. Troubleshooting Procedures - Continued

Malfunction	Test or Inspection	Corrective Action
	(7) Set radio set controls for high-frequency operation. (8) Repeat steps (5) and (6). Value obtained should be 0.55 ±0.05. c. Perform frequency test, using PRM-34 test set (fig. 2-3). Observe CAUTION for step (5) above. NOTE Forward power test should be completed before performing frequency test. Low forward power of radio set can result in inaccurate frequency display. (1) Connect handset to radio set. (2) Set test set MODE switch to FREQ. (3) Set radio set controls for low-frequency operation. (4) Key transmitter by operating handset PIT switch. Press test set PUSH TO TEST switch. Compare test set display of output frequency with radio set frequency data. (5) Release handset PIT and test set PUSH TO TEST switches. (6) Set radio set controls for high-frequency operation.	**c.** If frequency reading in step (4) does not conform to specifications, higher level maintenance required.

Table 2-3. Troubleshooting Procedures - Continued

Malfunction	Test or Inspection	Corrective Action
	(7) Repeat steps (4) and (5). (8) Disconnect radio set from test set. Set radio set controls to desired operating frequency, then reassemble unit.	
	d. Check radio set, by talk-testing to another unit, for quality of modulation, distortion, and on-channel operation.	d. If defective, higher level maintenance required.
Radio set has poor or no receive function, transmit OK	a. Check squelch operation by placing PWR OFF/ON/SQUElch DIS switch to SQUELCH DIS and listen for receiver noise.	a. Readjust squelch control (para 2-10b) .
	b. Perform receiver sensitivity squelch test, using PRM-34 test set: (1) Remove battery, module cover, and antenna from radio set. (2) Reconnect battery. (3) Connect radio set and test set (fig. 2-3). NOTE To prevent reception of unwanted signals, make sure test set antenna is disconnected. (4) Set test set MODE switch to SENS SQ. (5) Check radio set controls for unsquelched level. (6) Connect handset to radio set.	b. If correct test results not obtained, higher level maintenance required.

Table 2-3. Troubleshooting Procedures - Continued

Malfunction	Test or Inspection	Corrective Action
	(7) Set radio set to 35 MHz. Press test set PUSH '10 TEST switch and listen for 900 Hz tone with low background noise level. (8) Repeat step (7) for 45, 60, and 70 MHz operation. (9) Set radio set controls for squelched operation at 75 MHZ. (10) Press test set PUSH TO TEST switch and listen for 900 Hz tone. Background noise level should disappear, with 900 Hz tone being clearly audible. (11) Disconnect radio set from test set. Set radio set controls to desired operating frequency, then reassemble unit. c. Check radio set, by talk-testing to another unit, for quality of receiver audio and/or low sensitivity.	c. If defective, higher level maintenance required.

Section V. MAINTENANCE PROCEDURES

2-14. General

Maintenance rcadures for the radio set at the unit level are limited to cleaning, painting, and replacement of broken external parts (knobs and antenna), and battery replacement.

2-15. Cleaning

Inspect exterior of radio set. The exterior surfaces should be clean, free from dust, dirt, grease, salt, and fungus.

a. Remove dust and loose dirt with clean soft cloth.

WARNING

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

b. Remove grease, fungus, and ground-in dirt from radio set; use cloth dampened (not wet) with trichlorotrifluoroethane.

c. Remove dust or dirt from antenna and audio connectors with brush.

d. Remove salt from exterior surfaces and antenna with fresh water.

2-16. Touchup Painting Instructions

Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on bare metal to protect from further corrosion. Refer to SB 11-573 and TB 43-0118.

2-17. Knob Replacement

The three **knobs** on the radio set are held onto their shafts by setscrews. If replacement becomes necessary:

a. Loosen setscrews with appropriate hex key.

b. Remove defective knob.

c. Install new knob.

d. Tighten setscrews (if knob has two setscrews, tighten setscrew that engages flatted shaft first).

2-18. Antenna Replacement

If antenna replacement becomes necessary:

a. Remove defective antenna from connector by turning antenna counterclockwise.

b. Inspect connector on radio set for corrosion or thread damage. Remove any signs of corrosion. If connector is damaged, refer radio set to higher level of maintenance.

c. Insert new antenna into connector and hand tighten clockwise.

2-19. Battery Replacement

Perform steps a through c of paragraph 2-8 to remove battery. Refer to paragraph 2-9, steps f through h, to install battery.

Section VI. PREPARATION FOR STORAGE OR SHIPMENT

2-20. Packaging, Marking, and Shipping Requirements

Refer to figure 2-4 for. packaging diagram.

2-21. Type of Storage

Short term (administrative storage) is from one to 45 days. Ad'ministrative storage covers storage of equipment which can be readied for mission performance within 24 hours. Before placing an item in administrative storage, the next scheduled preventive maintenance checks and services should be performed, all known deficiencies corrected, and all current modification work orders applied. The adiministrative storage site should provide required protection from the elements and allow access for visual inspection and exercising when applicable.

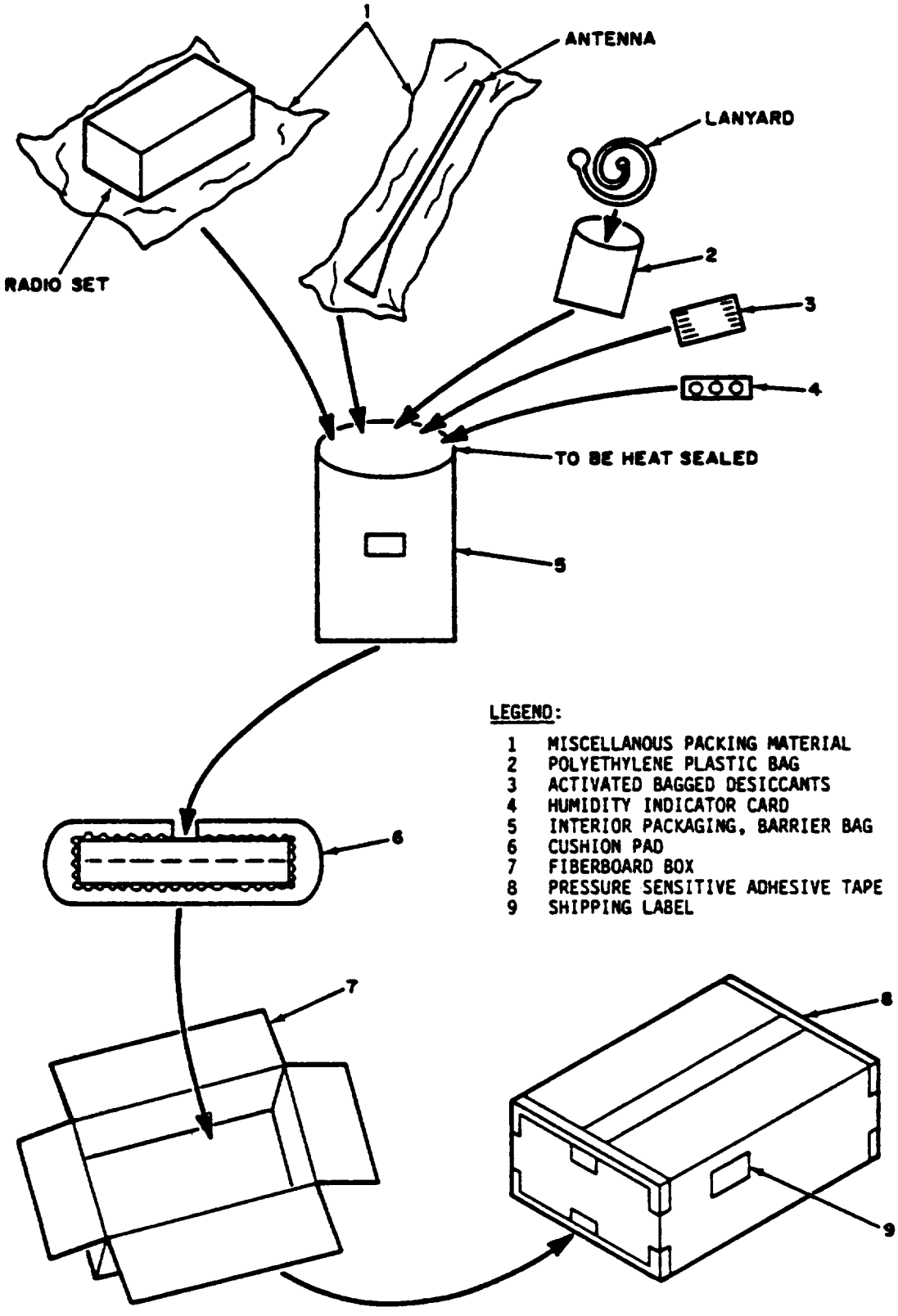


Figure 2-4. Radio Set Packaging Diagram.

CHAPTER 3
INTERMEDIATE DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

3-1. Common Tools and Equipment

For authorized common tools and equipment refer to Modified Table of Organization and Equipment (MTOE) applicable to your unit.

3-2. Special Tools, TMDE, and Support Equipment

Refer to Maintenance Allocation Chart (appx B of this manual) for tools and equipment to be used at intermediate direct support maintenance level.

3-3. Maintenance Kits

Figure 3-1 shows the maintenance kit used with the test equipment to perform diagnostic testing of the radio set. Table 3-1 provides a brief description of the contents of the kit.

3-4. Repair Parts

Repair parts are listed in the Repair Parts and Special Tools List (appx D of this manual) covering unit and intermediate direct support maintenance for this equipment.

Section II. DIAGNOSTIC TESTING

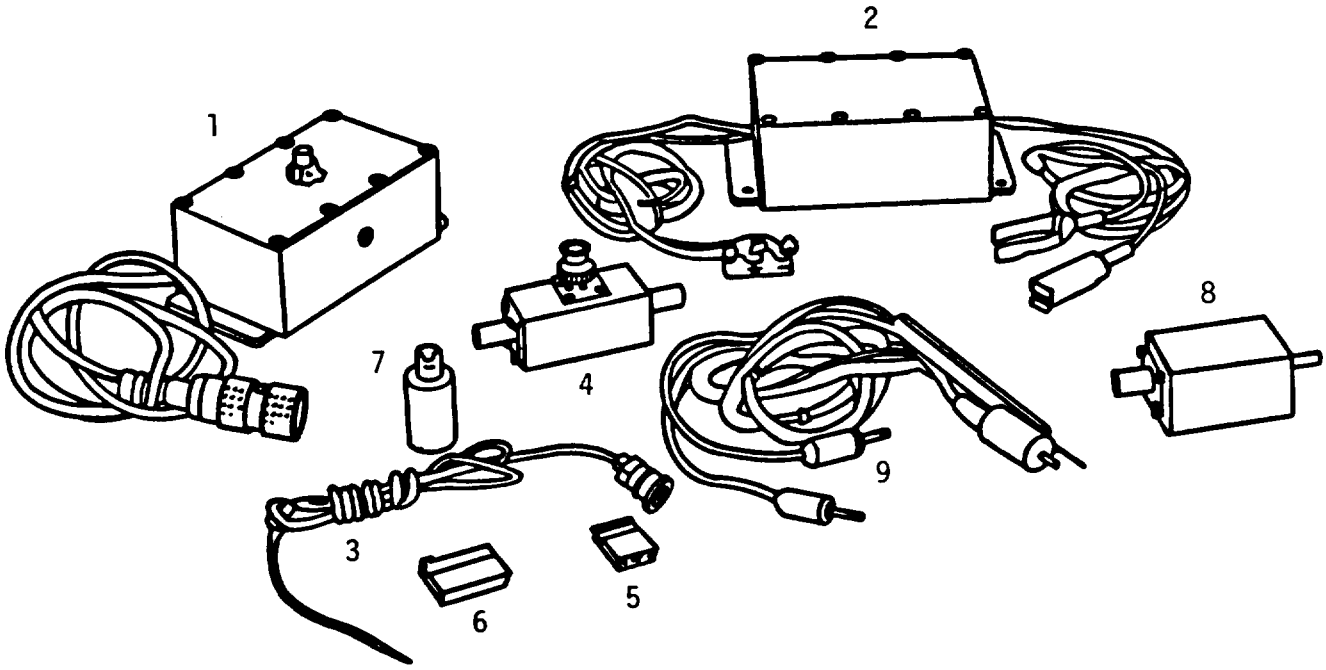
3-5. Preliminary Inspection

a. Verify that channel frequencies are properly set up (refer to para 2-10) and that battery is good. Check battery as described in table 2-3, or substitute it with power supply (para 3-7) and power supply cable assembly (table 3-l).

CAUTION

If burned or charred spots are observed, do not install known good module. Installing a good module may cause it to be damaged also.

b. Remove and inspect modules (refer to para 3-8) and frame and panel assembly for defects such as broken flex strip, burned spots on PC boards, or damaged connector. Repair obvious defects before continuing testing. If no defects are observed, reinstall modules.



NOTE: REFER TO TABLE 3-1
FOR DESCRIPTION.

Figure 3-1. Maintenance Kit MK-2137/PRC-68.

Table 3-1. Maintenance Kit MK-2137/PRC-68 Description

Item No.	Part No.	Name	Use
1	914877-801	Audio Adapter Assembly	Provides means of keying transmitter and interfacing test equipment through audio connector on radio set.
2	565460-801	Power Cable Assembly	Provides regulated 15±.05 VDC to radio set from external power supply (20 to 30 VDC).
3	565461-801	RF Cable Assembly	(Not used with AN/PRC-68A.)
4	914876-801	RF Attenuator Assembly	(Not used with AN/PRC-68A.)
5	565462-801	Jumper Plug Assembly	(Not used with AN/PRC-68A.)
6	565462-802	Jumper Plug Assembly	(Not used with AN/PCR-68A.)
7	914598-801	Antenna Adapter	Provides means of connecting antenna of radio set to test equipment.
8	914878-801	150 Hz Filter Assembly	Provides filtering of 150 Hz squelch tone during distortion tests.
9	565463-801	Test Lead Assembly	(Not used with AN/PRC-68A.)

3-6. Diagnostics Test

This test (table 3-2) is used to determine the general nature of a malfunction and, after a repair has been made, to ensure the radio set is working properly for all functions. By using the test procedures described, the radio set may be fault isolated to a defective module or frame and panel assembly. If the problem cannot be located, higher level maintenance of the radio set is required. In all cases, after a defective module has been replaced or a repair made to the radio set, the diagnostics test must be performed again to ensure that the radio set is fully operational.

3-7. Test Equipment Required

a. The following test equipment is used to perform diagnostic testing of the radio set:

Official Nomenclature	Common Name
Digital Multimeter AN/PSM-45	multimeter
Power Supply PP-3940/G	power supply
Digital Readout Electronic Counter AN/USM-459	frequency counter
Maintenance Kit MK-2137/PRC-68	maintenance kit
Tool Kit, Electronic Equipment TK-105/G	tool kit
Radio Test Set AN/GRM-l14A	GRM-114A test set

b. The test setup requirements are shown in figures 3-2 through 3-4. The maintenance kit required for the test setup is described in table 3-1.

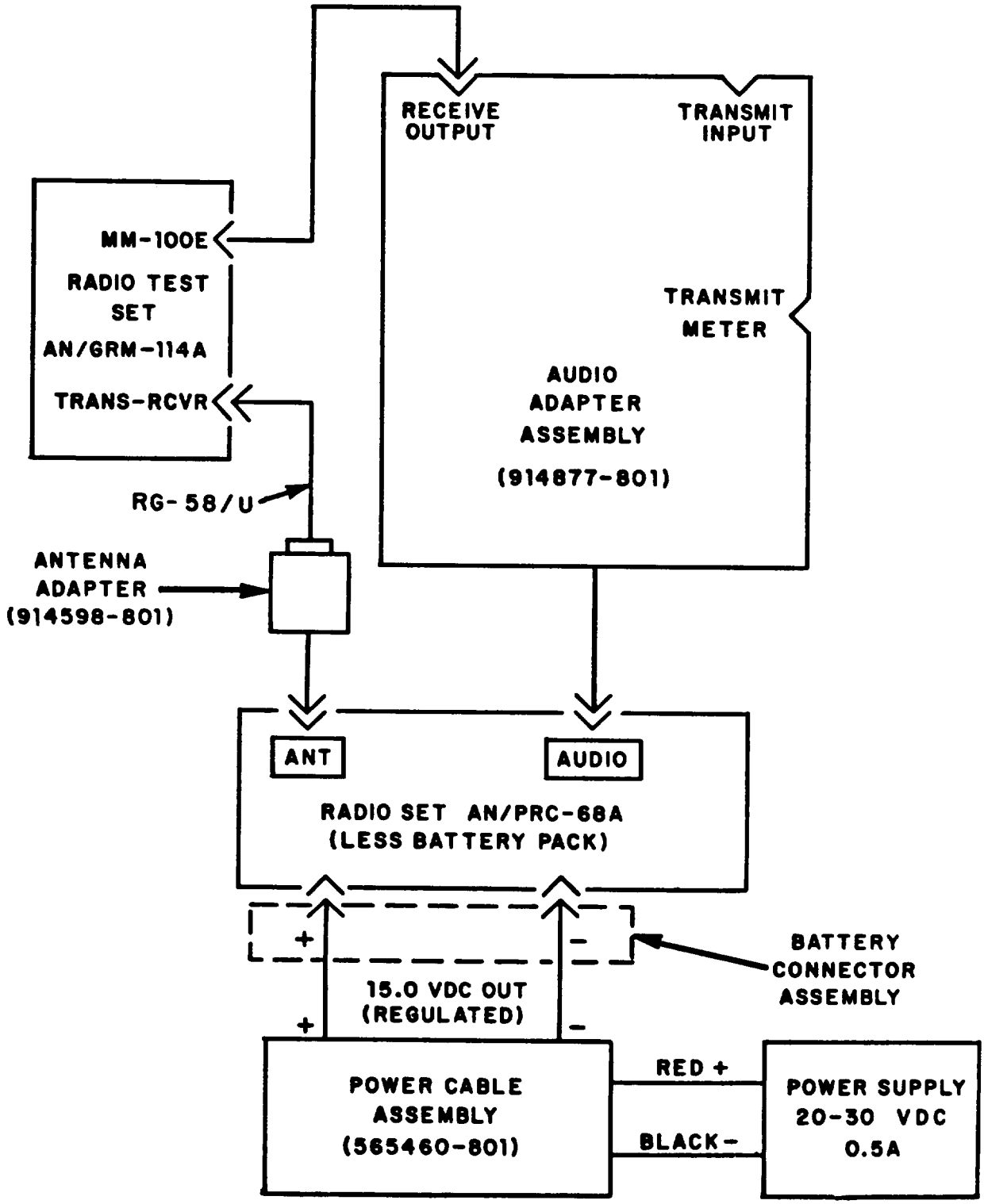


Figure 3-2. Receiver Diagnostics Test Setup.

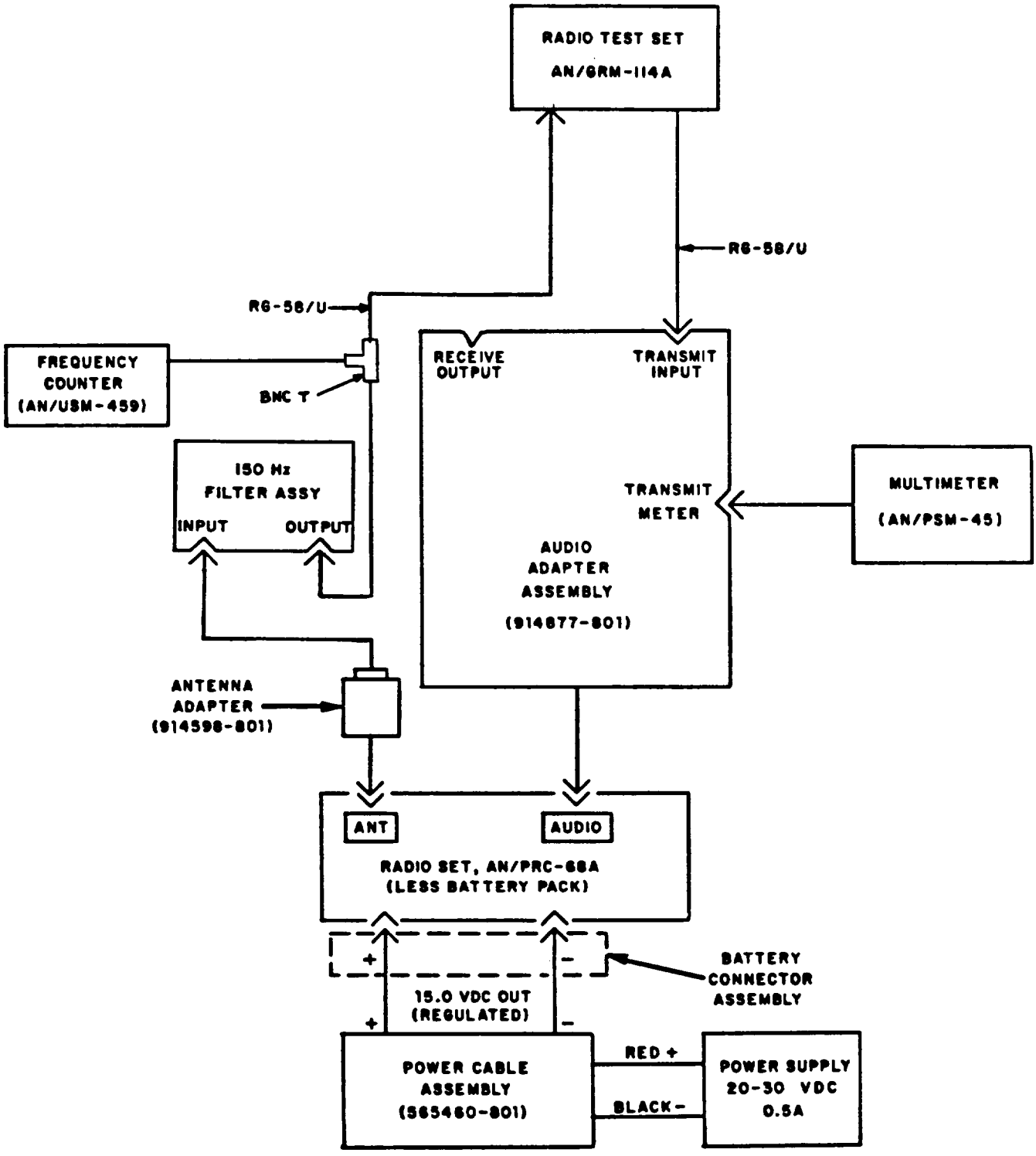


Figure 3-3. Transmitter Diagnostics Test Setup.

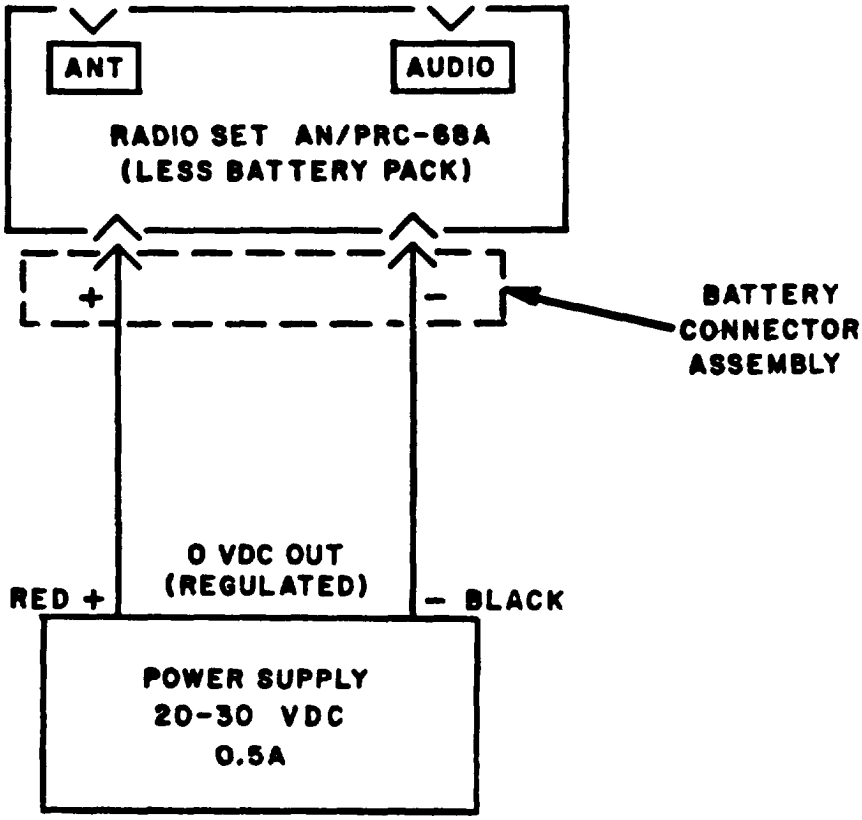


Figure 3-4. Low Battery Test Setup.

Table 3-2. Diagnostics Test

Step	Procedure	Required Indication	Fault Correction
	NOTE Minimum performance tests should be performed for operating frequencies of 30.050, 43.050, 54.050, and 67.050 MHz to ensure complete operational checkout of all transmitter and receiver bands.		
	RECEIVER MEASUREMENTS		
	CAUTION Do not press PUSH TO TALK switch on radio set or PUSH '10 TRANSMIT switch on audio adapter assembly when radio is connected for receiver measurements.		
1	Check that radio set is OFF.		
2	Remove radio set antenna, handset, battery case, battery, and module cover.		
3	Connect radio set and test equipment (fig. 3-2). Apply power and turn radio set ON. Set ANT MATCH switch to O and R/T FILTER switch to correct operating band position, then tune radio set to operating frequency of 30.050 MHz (refer to para 2-10 for setting frequency).		
4	Adjust RF signal generator of GRM-114A test set at 30.050 MHz for 0.5 uV output level with modulation set for 1 kHz at 8 kHz deviation. Adjust radio set VOL control for 1.2 vrms audio output level on distortion analyzer voltmeter of GRM-114A.		

Table 3-2. Diagnostics Test - Continued

Step	Procedure	Required Indication	Fault Correction
	CAUTION 113 not remove or install modules with power applied.		
5	Measure audio output SINAD ratio on distortion analyzer of GRM-114A.	SINAD ratio 10 dB minimum for 0.5 uV input	a. Remove RF/IF module and install known good spare module. If reading still not normal, proceed to step b. If normal, check suspect RF/IF module in known good spare radio set, b. Remove spare RF/IF module and replace with original module. Remove SYNTH/ AF module and install known good spare module. If reading still not normal, proceed to step c. If normal, check suspect SYNTH/AF module in known good spare radio set. **c.** Remove spare SYN/AF module and replace with original module, Remove frame and panel assembly and install known good spare assembly. If reading still not normal, higher level maintenance required. If normal, check suspect frame frame and panel assembly in known good radio set, d. Refer defective module or frame and panel assembly to higher level maintenance.

Table 3-2.41 Diagnostics Test - Continued

Step	Procedure	Required Indication	Fault Correction
6	Disconnect audio adapter assembly from radio set. Reduce RF signal generator output level of GRM-114A to minimum (zero). Squelch should activate and quiet receiver audio output . Slowly increase RF signal generator output level until squelch releases and normal receiver audio output is restored.		
7	Observe RF signal generator output level of GRM-114A.	Less than 0.5 Uv	Same as for step 5.
8	Reconnect audio adapter assembly to radio set. The 1 kHz modulation tone should not be heard (muted) from speaker.	1 kHz tone muted	Same as for step 5.
9	Adjust RF signal generator of GRM-114A for 1.0 mV output level with modulation still set for 1 kHz at 8 kHz deviation.		
10	Measure receiver audio output harmonic distortion on distortion analyzer of GRM-114A.	Less than 10% distortion	Same as for step 5.
11	Repeat steps 1 through 9 for operating frequencies of 43.050, 54.050, and 67.050 MHz.		
12	Turn radio set and power supply off. Disconnect radio set from test setup.		
	TRANSMITTER MEASUREMENTS		
13	Connect radio set and test equipment (fig. 3-3). Apply power and turn radio set ON. set ANT MATCH switch to O and R/T FILTER switch to correct operating band position, then tune radio set to operating frequency of 30.050 MHz.		

Table 3-2. Diagnostics Test - Continued

Step	Procedure	Required Indication	Fault Correction
14	Set audio generator frequency of GRM-114A to 1 kHz and output level to minimum (zero).		
15	Press and hold audio adapter assembly PUSH TO TRANSMIT switch and measure power output on wattmeter of GRM-114A. Release PUSH TO TRANSMIT switch. CAUTION Do not remove or install modules with power applied.	1 watt minimum	
16	Press and hold PUSH TO TALK switch on radio set and measure power output on wattmeter of GRM-114A. Release PUSH TO TALK switch.	1 watt minimum	Same as for step 5.
17	Press and hold PUSH TO TRANSMIT switch on audio adapter assembly. Measure transmitter output frequency on frequency counter. Release PUSH TO TRANSMIT switch.	30.0485 to 30.0515 MHz or Test frequency ± .002%	Same as for step 5.
18	Press and hold PUSH TO TRANSMIT switch on audio adapter assembly and measure 150 Hz squelch tone deviation on deviation meter of GRM-114A. Release PUSH TO TRANSMIT switch.	2.5 to 3.5 kHz deviation	Same as for step 5.
19	Disconnect frequency counter from RF input of deviation meter and connect to deviation meter audio output . Press and hold PUSH TO TRANSMIT switch and measure 150 Hz squelch tone frequency on counter. Release PUSH TO TRANSMIT switch.	150 ±2 Hz	Same as for step 5.

Table 3-2. Diagnostics Test - Continued

Step	Procedure	Required Indication	Fault Correction
20	Press and hold PUSH TO TRANSMIT switch on audio adapter assembly and increase audio generator output level of GRM-114A until modulation deviation is 8 kHz on deviation meter. Measure transmit input level with multimeter (connected to TRANSMIT METER on audio adapter assembly) . Release PUSH TO TRANSMIT switch.	Less than 1 mV	Same as for step 5.
21	Reconnect frequency counter to RF input. Press and hold PUSH TO TRANSMIT switch and measure harmonic distortion of 1 kHz modulation tone from deviation meter audio output. Release PUSH TO TRANSMIT switch.	Less than 10% distortion	Same as for step 5.
22	Increase output of audio signal generator of GRM-114A until reading of 10 mV on multimeter is obtained. Press and hold PUSH TO TRANSMIT switch and measure limited modulation deviation on deviation meter of GRM-114A. Release PUSH TO TRANSMIT switch.	Less than 12 kHz deviation	Same as for step 5.
23	Disconnect audio adapter assembly from AUDIO connector on radio set.		
24	Press and hold PUSH TO TALK switch on radio set. Speak into microphone (hold about 1 in. from mouth) and observe modulation on deviation meter. Release PUSH TO TALK switch.	Approximately 8 kHz deviation with peaks limited to less than 12 kHz	If step 22 indication normal but step 24 indicates abnormally low microphone sensitivity, internal speaker-microphone probably defective. Higher level maintenance required.

Table 3-2. Diagnostics Test - Continued

Step	Procedure	Required Indication	Fault Correction
25	Repeat steps 13 through 24 for operating frequencies of 43.050, 54.050, and 67.050 MHz.		
26	Turn radio set and power supply off. Disconnect radio set from test setup.		
27	Connect antenna to radio set and install battery. Turn radio set ON and tune frequency to 30.050 MHz, with R/T FILTER and ANT MATCH switches set to correct operating band position.		
28	Use GRM-114A test set with antenna as field strength meter to measure radiated power of radio set. Hold radio set approximately 2 feet from test set antenna and key radio set transmitter with PUSH TO TALK switch.	Radiated RF indication on test set field strength meter.	Same as for step 5.
29	Repeat steps 27 and 28 for operating frequencies of 43.050, 54.050, and 67.050 MHz.		
30	Turn radio set off and remove battery and antenna. LOW BATTERY WARNING TEST NOTE Perform this procedure in a quiet area to ensure that speaker can be properly heard.		
31	Turn power supply on and adjust for minimum output voltage (zero VDC). Connect power supply directly to radio set (fig. 3-4) observing proper polarity.		

Table 3–2. Diagnostics Test - Continued

Step	Procedure	Required Indication	Fault Correction
32	Adjust power supply for 14.5 VDC using multimeter to monitor at battery terminals. Turn radio set ON.		
33	Turn radio set VOL control fully clockwise (maximum audio output setting). Verify that radio set is quiet (squelch working properly).	No noise is heard in radio set speaker	Adjust squelch for proper setting.
34	Adjust low battery control on SYNTH/AF module (fig. 1-4) fully counterclockwise (ten turns minimum) . NOTE Adjustment of low battery control in step 35 must be done slowly (one-half turn per second).		
35	Adjust power supply for 13.5 VDC. Hold radio set speaker to ear and slowly adjust low battery control clockwise until low level noise is heard from speaker. Approximately 5 seconds after low level noise is heard, low battery warning tone should start and be heard at much higher level than low level noise. The low battery warning tone is a series of three 400 Hz “beeps” at 5 second intervals.		
36	Adjust power supply for 13.8 VDC and verify low battery warning tone stops (disabled).	Warning tone not heard in radio set speaker	Perform low battery adjustment.
37	Adjust power supply back to 13.5 VDC and wait 5 seconds. Verify that low battery warning tone restarts (enabled).	Warning tone heard in radio set speaker	Perform low battery adjustment.
38	Turn off radio set and power supply, disconnect all test equipment, and reassemble radio set.		

Section III. MAINTENANCE PROCEDURES

3-8. Removal and Installation of Modules

The following procedure is used for removal and installation of modules in the radio set:

a. To remove module, hold frame and panel assembly in palm of one hand and grip module with thumb and forefinger of other hand. Fingerholds are provided on the module through open areas in the frame. Gently rock module and pull straight out of frame.

CAUTION

The special instructions given in paragraph 3-9 must be observed to prevent secondary damage and failures.

b. To install module, align frame connector pins with module mating sockets and gently push straight into frame until module housing is seated on frame divider plate.

3-9. Special Instructions

a. Always inspect frame connectors for bent or broken pins before installing module. To straighten bent pins, use needle-nose or long-nose pliers with smooth jaws. Position jaws so that whole pin is straightened simultaneously (see fig. 3-5).

b. When inspecting for bent pins, the pins should appear to be reasonably vertical in relation to the connector surface. Bent pins usually result when excessive prying force is applied to only one end or side of a module. The thumb of the opposite hand should always be used to stop the module travel and oppose the prying force.

c. Always inspect module socket for damage before inserting module. A normal socket should have two spring leafs visible. If the last leaf breaks off or is damaged inside the socket, the module should be sent to higher level maintenance for replacement.

3-10. Lubrication

All sealing surfaces (module cover and battery case) should have a thin film of silicone grease applied to help preserve watertightness and keep the rubber seals pliable. If a handset is to be used with the radio set, a small amount of silicone grease should also be applied to the O-ring in the connector to facilitate insertion.

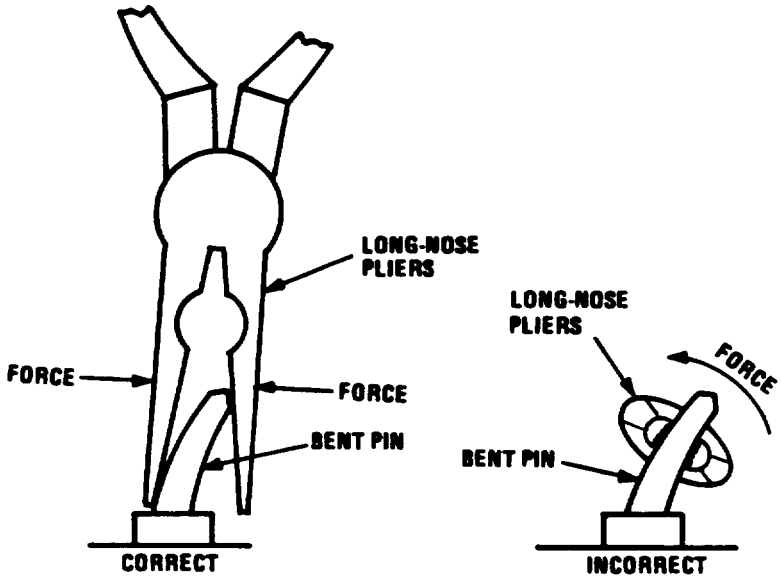


Figure 3-5. Pin Straightening Procedure.

3-11. Packaging of Replaceable Assemblies

Package the defective assembly in the same packaging material in which the spare was packed at the time of receipt. If the original container is not available, pack the item in accordance with figure 3-6.

CAUTION

The Synth/AF and RF/IF modules contain electrostatic sensitive devices. Refer to DOD-HDBK-263 for correct handling and packaging instructions.

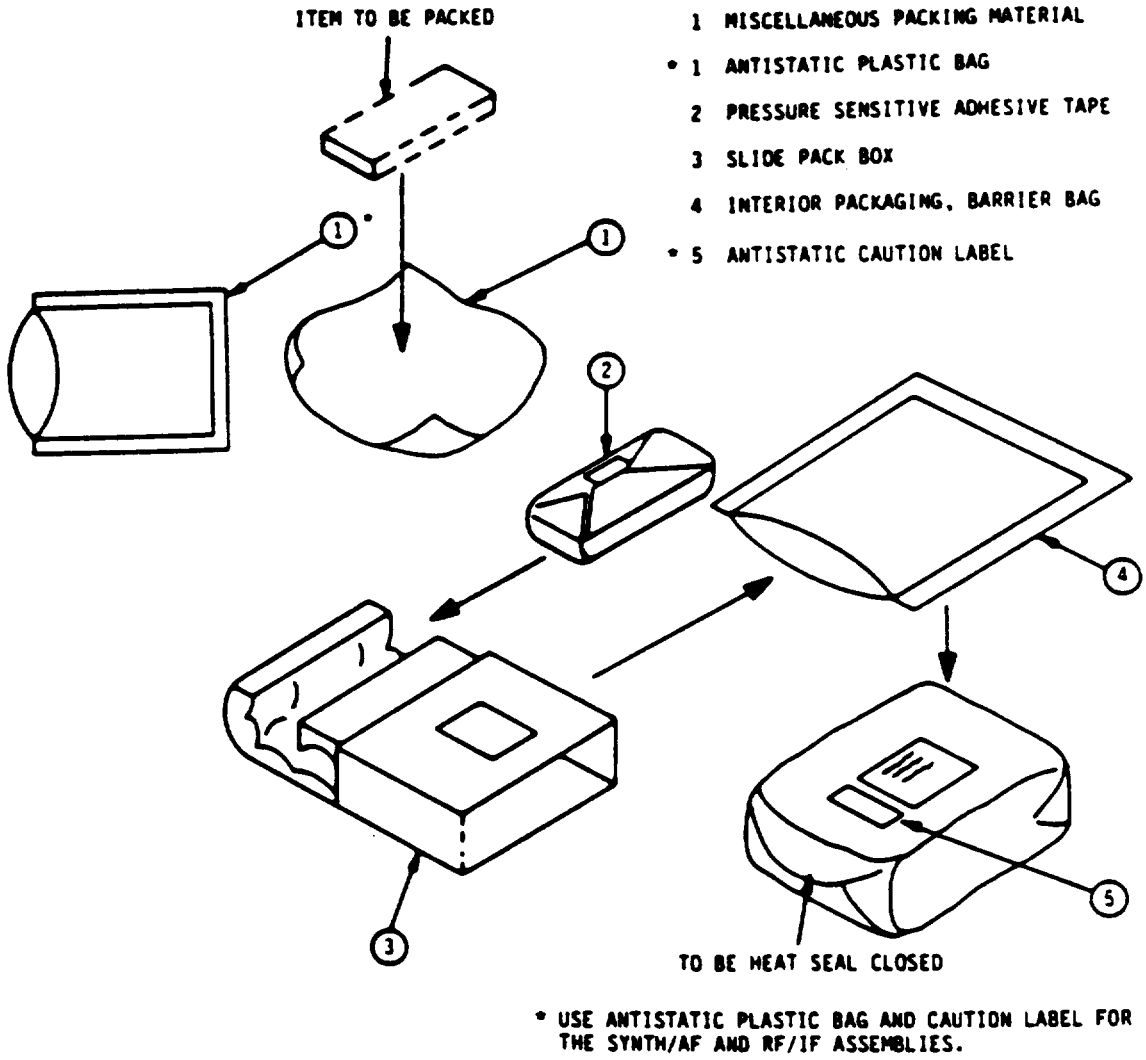


Figure 3-6. Replaceable Assemblies Packaging Diagram.

APPENDIX A
REFERENCES

A-1 . scope

This appendix lists the forms and publications that are referenced in this manual or that contain information applicable to the maintenance of Radio Set AN/PRC-68A.

A-2 . Forms

DA Form 2028	Recommended Changes to Publications and Blank Forms
DA Form 2028-2	Recommended Changes to Equipment Technical Publications
SF 361	Discrepancy in Shipment Report (DISREP)
SF 364	Report of Discrepancy (ROD)
SF 368	Quality Deficiency Report

A-3 . Publications

DA Pam 310-1	Consolidated Index of Army Publications and Blank Forms
DA Pam 738-750	The Army Maintenance Management System (TAMMS)
TB 43-0118	Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electronics Equipment Shelters
TM 11-5820-882-10-1	Operator's Manual: Radio Set AN/PRC-68A (NSN 5820-01-180-8943)
TM 11-582O-882-1O-1-HR	Hand Receipt Covering Components of End Item (COEI), Basic Issue Items (BII), and Additional Authorization List (AAL): Radio Set AN/PRC-68A (NSN 5820-01-180-8943)
TM 11-6625-2941-14&P	Operator's, Organizational, Direct Support, and General Support Maintenance Manual (Including Repair Parts and Special Tools List): for Counter, Electronic, Digital Readout AN/USM-459 (NSN 6625-01-061-8928)
TM 11-6625-3015-14	Operator's, Organizational, Direct Support and General Support Maintenance Manual: Radio Test Set AN/PRM-34 (NSN 6625-01-094-5646)
TM 11-6625-3016-10-1	Operator's Manual: Radio Test Set AN/GRM-l14A (NSN 6625-01-144-4481)

A-3 . Publications - continued

TM 11-6625-3052-14	Operator's, Organizational, Direct Support and General Support Maintenance Manual: Multimeter, Digital AN/PSM-45 (NSN 6625-01-139-2512)
TM 11-6130-247-15	Operator's, Organizational, Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools Lists): Power supply PP-3940/G (NSN 6130-00-404-1727)
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command)
SB 11-573	Painting and Preservation Supplies Available for Field Use for Electronics Command Equipment
SB 38-100	Preservation, Packaging, Packing and Marking Materials, Supplies and Equipment Used by the Army
SC 5180-91-CL-RO7-HR	Hand Receipt Catalog Covering Content of: Sets, Kits, and Outfits Components List for Tool Kit, Electronic Equipment TK-105/G (NSN 5180-00-610-8177)
SC 5180-91-CL-R13-HR	Hand Receipt Catalog Covering Content of: Sets, Kits, and Outfits Components List for Tool Kit, Electronic Equipment TK-101/G (NSN 5180-00-064-5178)

APPENDIX B
MAINTENANCE ALLOCATION

Section I. INTRODUCTION

B-1. General

This appendix provides a summary of the maintenance operations for the AN/PRC-68A. It authorizes levels of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

B-2 . Maintenance Functions

Maintenance functions will be limited to and defined as follows:

a. Inspect. TO determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test . TO verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain~ within Prescribed limitsf by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to bring abut optimun or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/canponents.

B-3 . Column Entries

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4, Maintenance Level. Column 4 specifies, by the listing of a “work time figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the functions listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels appropriate “work time” figures will be shown for each level. The number of task-hours specified by the “work time” figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows :

UNIT
C - Operator/Crew
O - Organizational

INTERMEDIATE
F - Direct Support
H - General Support

DEPOT
D - Depot

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains an alphabetic cede which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

B-4 . Tool and Test Equipment Requirements (Sect. III)

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Level. The codes in this column indicate the maintenance level allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO) stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

B-5 . Remarks (Sect. IV)

a. Reference Code. This code refers to the appropriate item in section II, column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in section II.

SECTION II MAINTENANCE ALLOCATION CHART
FOR
RADIO SET AN/PRC-68A

(1) GROUP NUMBER	(2) COMPONENT / ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQPT.	(6) REMARKS
			UNIT		INTERMEDIATE		DEPOT		
			C	O	F	H	D		
00	RADIO SET AN/PRC-68A 705956-804	Inspect		0.10					
		Test		0.10				1,2,9,10	
		Service		0.10					
		Repair		0.20				7	A
		Service	0.05						C
01	RECEIVER-TRANSMITTER RT-1113A/PRC-68A 707236-801	Inspect		0.05					
		Replace		0.05					
		Adjust		0.15				7	
		Test			0.10			1 thru 6,9	
		Repair			0.20			8	B
0101	FRAME AND PANEL ASSEMBLY 812699-801	Inspect			0.05				
		Replace			0.20			8	B
		Repair					2.0		
0102	SYNTHESIZER/AF MODULE ASSEMBLY 814635-801	Inspect			0.05				
		Replace			0.20			8	B
		Repair					2.0		
0103	RF/IF MODULE ASSEMBLY 814636-801	Inspect			0.05				
		Replace			0.20			8	B
		Repair					2.0		

SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
RADIO SET AN/PRC-68A

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	O	RADIO TEST SET AN/PRM-34	6625-01-094-5646	
2	O,F	DIGITAL MULTIMETER AN/PSM-45	6625-01-139-2512	
3	F	POWER SUPPLY PP-3940/G OR EQUIVALENT	6130-00-404-1727	
4	F	RADIO TEST SET AN/GRM-144A	6625-01-144-4481	
5	F	DIGITAL READOUT ELECTRONIC COUNTER AN/USM-459	6625-01-061-8928	
6	F	MAINTENANCE KIT MK-2137/PRC-68	5820-01-117-7664	
7	O	TOOL KIT, ELECTRONIC EQUIPMENT TK-101/G	5180-00-064-5178	
8	F	TOOL KIT, ELECTRONIC EQUIPMENT TK-105/G	5180-00-610-8177	
9	O,F	FIXED WIRE RESISTOR (RER65F44R2R) OR EQUIVALENT 5-WATT RESISTOR	5905-01-102-3406	
10	O	50 OHM DUMMY LOAD DA-437/GRC-103 OR EQUIVALENT	5985-00-089-8990	

SECTION IV. REMARKS

REFERENCE CODE	REMARKS
A	REPAIR OF RADIO SET AN/PRC-68A AT THE UNIT LEVEL OF MAINTENANCE CONSISTS OF TIGHTENING/REPLACING THE FRONT PANEL KNOBS, REPLACING THE ANTENNA, AND REPLACING THE BATTERY. DEFECTIVE KNOBS AND ANTENNA ARE CONSIDERED THROWAWAY ITEMS.
B	REPAIR OF THE RT-113A/PRC-68A AT THE INTERMEDIATE DIRECT SUPPORT LEVEL OF MAINTENANCE CONSISTS OF REPLACING THE FOLLOWING ITEMS: 1) FRAME AND PANEL ASSEMBLY, 812699-801 2) SYNTHESIZER/AF MODULE, 814635-801 3) RF/IF MODULE, 814636-801 ALL THESE ITEMS ARE SENT TO THE MARINE CORPS SUPPLY CENTER, ALBANY, GA 31704, USING A REPAIR DEPOT ROUTING IDENTIFIER CODE OF MAB AND A PROJECT CODE OF 3AL FOR CREDIT.
C	REPLACE BATTERY. ALL BATTERIES NO LONGER CAPABLE OF PERFORMING THE REQUIRED MISSION SHALL BE DISPOSED OF BY BEING TURNED IN, ACCOMPANIED BY A COMPLETED DD FORM 1348-1, TO THE LOCAL DEFENSE REUTILIZATION AND MARKETING OFFICE (SEE DOD 4160.21-M).

APPENDIX C
EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

C-1 . Scope

This appendix lists expendable supplies and materials you will need to operate and maintain the AN/PRC-68A. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

C-2 . Explanation of Columns

a. column 1 - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5, App. D").

b. Column 2 - Level. This column identifies the lowest level of maintenance that requires the listed item.

UNIT
C - Operator/Crew
o - Organizational

INTERMEDIATE
F - Direct Support
H - General Support

c. column 3 - National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. column 4 - Ascription. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Cede for Manufacturer (FSCM) in parentheses, if applicable.

e. Column 5 - Unit of Measurement (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

SECTION II EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NO.	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION PART NO. AND FSCM	(5) UNIT OF MEAS
1	O	8020-00-721-9657	BRUSH	EA
2	O	7920-00-862-6710	CLOTH	EA
3	O		PAINT	OZ
4	O		SANDPAPER	SH
5	O	6850-00-177-5094	SILICONE GREASE	OZ
6	O	6850-00-105-3084	TRICHLOROTRIFLUOROETHANE	OZ
7	O		THINNER	OZ

APPENDIX D
ORGANIZATIONAL AND DIRECT SUPPORT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST

SECTION I
INTRODUCTION

D-1. Scope

This appendix lists and authorizes spares and repair parts; special tools; special test, measurement, and diagnostic equipment (TMDE), and other special support equipment required for performance of organizational and direct support maintenance of the AN/PRC-68A. It authorizes the requisitioning, issue, and disposition of spares, repair parts and special tools as indicated by the source, maintenance and recoverability (SMR) codes.

D-2. General

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

a. Section II. Repair Parts List. A list of spares and repair parts authorized by this RPSTL far use in 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 numeric sequence, with the parts in each group listed in ascending item number sequence. Figure numbers are listed directly beneath the group header. Bulk materials are listed in item name sequence. Repair part kits are listed separately in their own functional group within section II. Repair parts for reparable special tools are also listed in this section. Items listed are shown an the associated illustration.

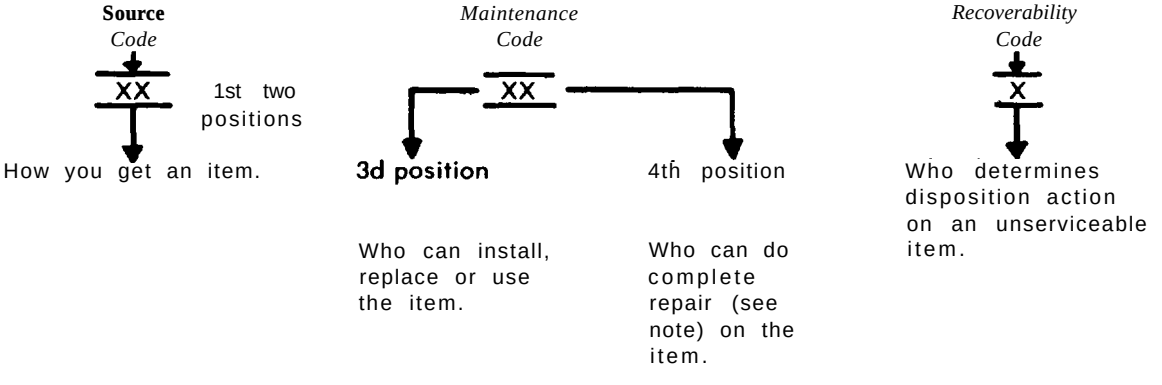
b. Section III. Special Tools List. Not applicable.

c. Section IV. National Stock Number and Part Number Index. A list, in National item identification number (NIIN) sequence, of cdl National stock numbered items appearing in the listings, followed by a list in alphameric sequence of all part numbers appearing in the listings. National stack numbers and part numbers are cross-referenced to each illustration figure and item number appearance.

D-3. Explanation of Columns (Section II and III)

a. [tern No. (Column (1)). Indicates the number used to identify items called out in the illustration,

b. SMR Code (Column (2)). The source, maintenance, and recoverability (SMR) code is a five-position code containing supply/requisitioning information, maintenance category authorization criteria, and disposition instruction, as shown in the following breakout:



NOTE

Complete repair: Maintenance capacity, capability, and authority to perform all corrective maintenance tasks of the "Repair" function in a use/user environment in order to restore serviceability to a failed item.

(1) *Source Code. The* source code tells you how to get an item needed for maintenance, repair, or overhaul of an end item/equipment. Explanations of source codes follows:

Code	*Explanation*
PA PB PC PD PE PF PG	Stocked items; use the applicable NSN to request/requisition items with these source codes. They are authorized to the category indicated by the code entered in the third position of the SMR code. **NOTE** Items coded PC are subject to deterioration.
KD KF KB	Items with these codes are not to be requested/requisitioned individually. They are part of a kit which is authorized to the maintenance category indicated in the third position of the SMR code. The complete kit must be requisitioned and applied.
MO — Mode at org/ AVUM ,category MF — Made at DS/ AVUM category MH—Made at GS category ML- Mode at Specialized Repair Activity (SRA) MD- Mode at Depot	Items with these codes are not to be requested/requisitioned individually. They must be mode from bulk materiel which is identified by the part number in the description and usable on code (WC) column and listed in the Bulk Material group of the repair parts list. If the item is authorized to you by the third position code of the SMR code, but the source code indicates it is made at a higher category, order the item from the higher category of maintenance.
AO — Assembled by org/ AVUM category AF — Assembled by DS/ AVIM category AH — Assembled by GS category AL — Assembled by SRA AD — Assembled by Depot	Items with these codes ore not to be requested/requisitioned individually. The parts that make up the assembled item must be requisitioned or fabricated and assembled at the category of maintenance indicated by the source code. If the third position code of the SMR code authorizes you to replace the item, but the source code indicates the item is assembled at a higher category, order the item from the higher category of maintenance.

XA — Da not requisition an "XA" coded item. Order its next higher assembly.
XB — If an "XB" item is not available from salvage, order it using the FSCM and part number given.
XC — Installation drawing, diagram, instruction sheet, field service drawing, that is identified by manufacturers part number.
XD — Item is not stocked. Order an "XD" coded item through normal supply channels using the FSCM and part number given, if no NSN is available.

NOTE

Cannibalization or controlled exchange, when authorized, may be used as a source of supply for items with the above source codes, except for those source coded "XA" or those aircraft support items restricted by requirements of AR 750-1.

(2) *Maintenance Code.* Maintenance codes tell you the category of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the SMR code as follows:

(a) The maintenance code entered in the third position tells you the lowest maintenance category authorized to remove, replace, and use an item. The maintenance code entered in the third position will indicate authorization to one of the following categories of maintenance.

Code	*Application/Explanation*
C	— Crew or operator maintenance done within organizational or aviation maintenance.
O	— Organizational or aviation unit category can remove, replace, and use the item.
F	— Direct support or aviation intermediate category can remove, replace, and use the item.
H	— General support category can remove, replace, and use the item.
L	— Specialized repair activity can remove, replace, and use the item.
D	— Depot category can remove, replace, and use the item.

(b) The maintenance code entered in the fourth position tells whether or not the item is to be repaired and identifies the lowest maintenance category with the capability to do complete repair (i. e., perform all authorized repair functions). This position will contain one of the following maintenance codes:

NOTE

Some limited repair may be done on the item at a lower category of maintenance, if authorized by the Maintenance Allocation Chart (MAC) and SMR codes.

Code	*Application/Explanation*
O	— Organizational or aviation unit is the lowest category that can do complete repair of the item.
F	— Direct support or aviation intermediate is the lowest category that can do complete repair of the item.
H	— General support is the lowest category that can do complete repair of the item.
L	— Specialized repair activity (designate the specialized repair activity) is the lowest category that can do complete repair of the item.
D	— Depot is the lowest category that can do complete repair of the item.
z	— Nonreparable. No repair is authorized.
B	— No repair is authorized. (No parts or special tools are authorized for the maintenance of a "B" coded item.) However, the item may be reconditioned by adjusting, lubricating, etc., at the user category.

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

Recoverability codes	*Application/Explanation*
Z	— Nonreparable item. When unserviceable, condemn and dispose of the item at the category of maintenance shown in the third position of SMR Code.
O	— Reparable item. When uneconomically reparable, condemn and dispose of the item at organizational or aviation unit category.
F	— Reparable item. When uneconomically reparable, condemn and dispose of the item at the direct support or aviation intermediate category.
H	— Reparable item. When uneconomically reparable, condemn and dispose of the item at general support category.
D	— Reparable item. When beyond lower level repair capability, return to depot. Condemnation and disposal of item not authorized below depot category.
L	— Reparable item. Condemnation and disposal not authorized below specialized repair activity (SRA).
A	— Item requires special handling or condemnation procedures because of specific reasons (e.g., precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals/directives far specific instructions.

c. FSCM (Column (3)). The Federal Supply Code for Manufacturer (FSCM) is a 5-digit numeric code which is used to identify the manufacturer, distributor, or Government agency, etc., that supplies the item.

d. Part Number (Column (4)). Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

NOTE

When you use a NSN to requisition an item, the item *you* receive may have o different part number from the part ordered.

e. Description and Usable on Code (UOC)(Column (5)). This column includes the following information.

(1) The Federal item name and, when required, a minimum description to identify the item.

(2) The statement “END OF FIGURE” appears just below the last item description in Column (5) for a given figure in both section II and section III.

f. Qty (Column (6)). Indicates the quantity of the item used in the breakout shown an 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 the quantity is variable and the quantity may vary from application to application.

D-4. Explanation of Columns (Section IV)

a. National Stock Number (NSN) Index.

(1) Stock number column. This column lists the NSN by National item identification number (NIIN) sequence. The NIIN consists of the last nine digits of the NSN. When using this column to locate an item, ignore the first four digits of the NSN. When requisitioning items use the complete NSN (13 digits).

(2) *Fig. column.* This column lists the number of the figure where the item is identified/located. The illustrations are in numerical sequence in sections II and III.

(3) *Item column.* The item number identifies the item associated with the figure listed in the adjacent Fig. column. This item is also identified by the NSN listed on the same line.

b. Part Number Index. Port numbers in this index are listed by part number in ascending alphameric sequence.

(1) FSCM column. This column lists the Federal supply code for manufacturer (FSCM).

(2) *Part number column.* This column indicates the part number assigned to the item.

(3) *Stock number column.* This column lists the National stock number for the associated part number and manufacturer identified in the part number and FSCM columns to the left.

(4) *Fig. column.* This column lists the number of the figure where the item is identified/located in sections II and Ill.

(5) *Item column. The* item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

D-5. Special Information

National stock numbers (NSN's) that are missing from P source coded items have been applied for and will be added to this TM by future change/revision when they are entered in the Army Master Data File (AMDF). Until the NSN'S are established and published, submit exception requisitions to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-MM, Fort Monmouth, NJ 07703-5000 for the part required to support your equipment.

D-6. How to Locate Repair Parts

a. When National stock number or part number is not known.

(1) First. Using the table of contents, determine the assembly group or subassembly group to which the item belongs. This is necessary since figures are prepared for assembly groups and subassembly groups, and listings are divided into the same groups.

(2) Second. Find the figure covering the assembly group or subassembly group to which the item belongs.

(3) *Third.* Identify the item on the figure and note the item number.

(4) Fourth. Refer to the Repair Parts List for the figure to find the part number for the item number noted on the figure.

(5) *Fifth.* Refer to the Part Number Index to find the NSN, if assigned.

b. When National stock number or part number is known.

(1) First. Using the Index of National stock numbers and part numbers, find the pertinent National stock number or part number. The NSN index is in National item identification number (NIIN) sequence (para 4?(1)). The part numbers in the part number index are listed in ascending alphameric sequence (para *4b).* Both indexes cross--reference you to the illustration figure and item number of the item you are looking for.

(2) Second. After finding the figure and item number, verify that the item is the one you're looking for, then locate the item number in the repair parts list for the figure.

D-7. Abbreviations

Nat applicable.

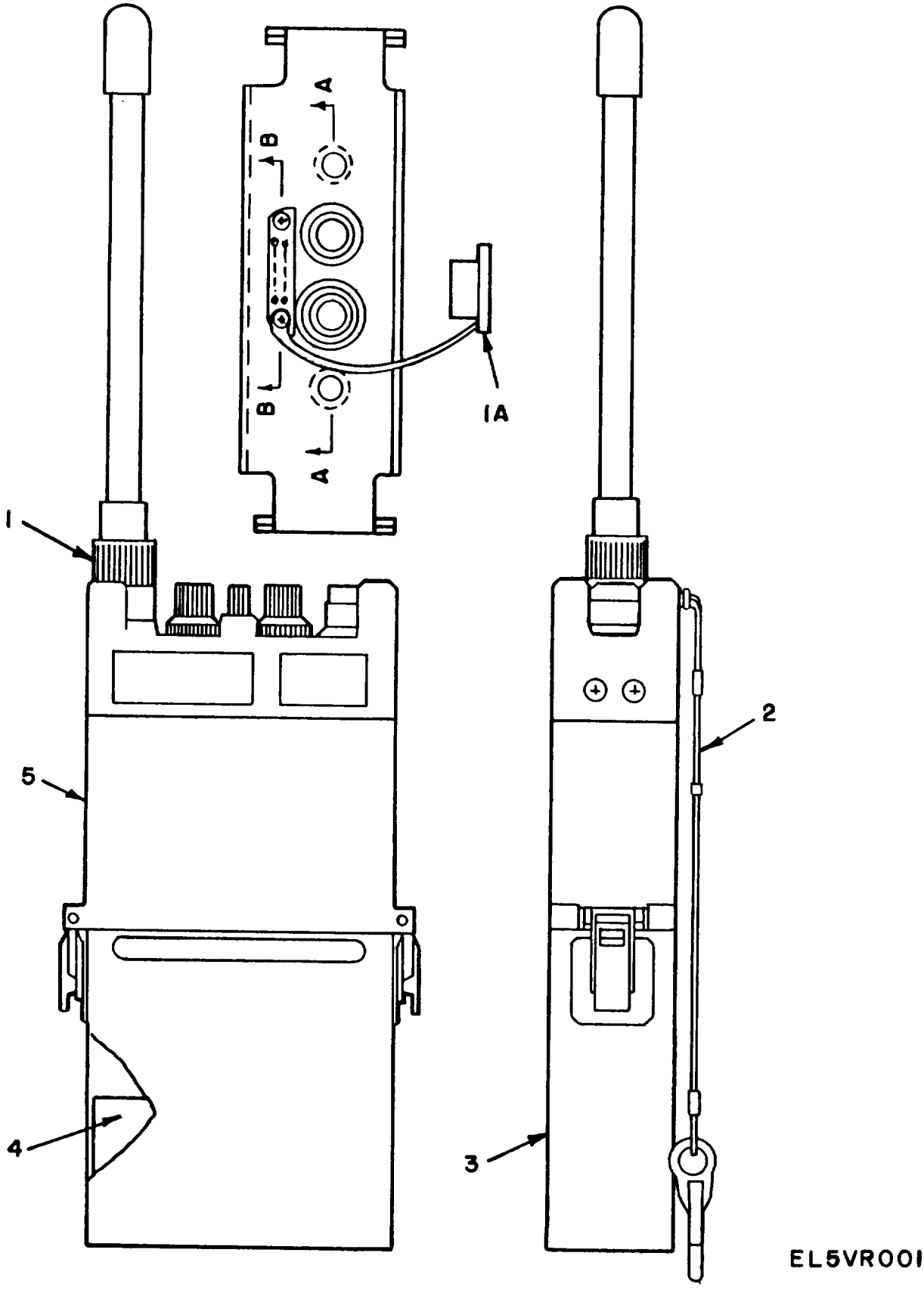
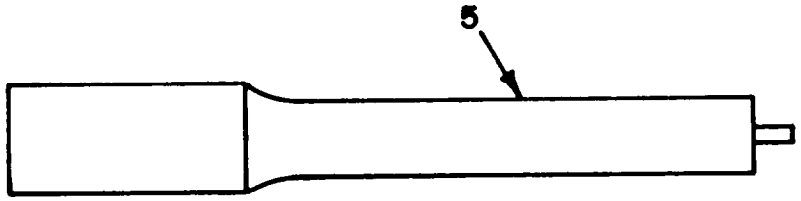


Figure D-1. Radio Set AN/PRC-68A (Sheet 1 of 2).



EL5VR009

Figure D-1. Radio Set AN/PRC-68A (Sheet 2 of 2).

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODE (UOC)	(6) QTY
				GROUP 00 RADIO SET AN/PRC-68A	
				FIG.D-1	
1	PAOZZ	37695	914161-803	ANTENNA	1
1A	PAFZZ	98278	095-9003-0024	DUMMY CONNECTOR,REC	1
2	PAOZZ	80063	SM-B-523304	LANYARD ASSEMBLY	1
3	PDFDD	80058	RT-1113A/PRC-68A	RECEIVER-TRANSMITTE	1
4	PBOZZ	37695	914153-803	BATTERY HOUSING	1
5	PAOZZ	37695	808234-1	TOOL,TUNING	1
				END OF FIGURE	

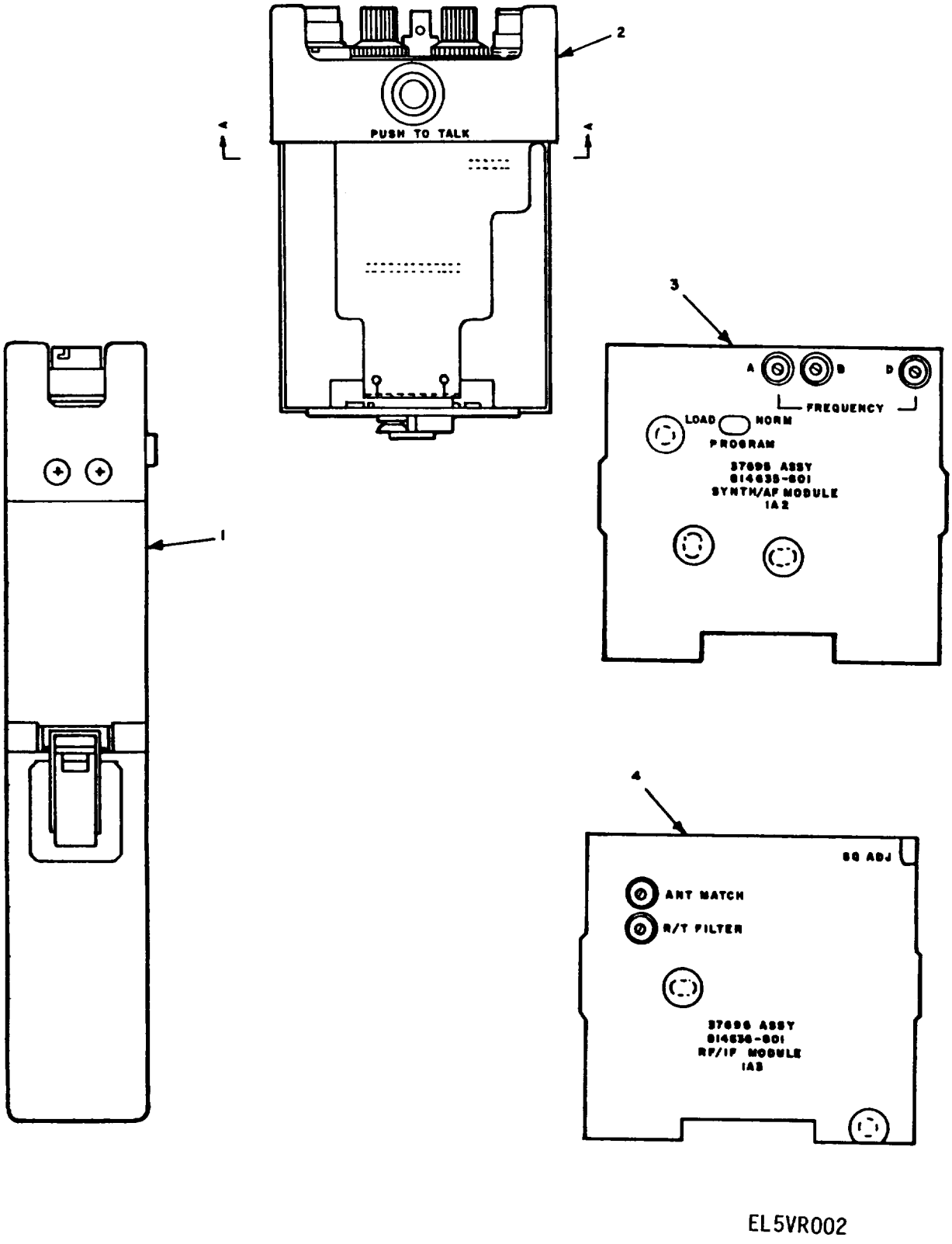


Figure D-2. Receiver/Transmitter RT-113A/PRC.

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODE (UOC)	(6) QTY
				GROUP 01 RECEIVER TRANSMITTER RT-1113A/PRC-68A	
				FIG.D-2	
1	PAFZZ	37695	918267-804	MODULE COVER ASSEMB	1
2	PAFHD	37695	812699-801	FRAME AND PANEL ASS	1
3	PAFDD	37695	814635-801	CIRCUIT CARD ASSEMB	1
4	PAFDD	37695	814636-801	CIRCUIT CARD ASSEMB	1
				END OF FIGURE	

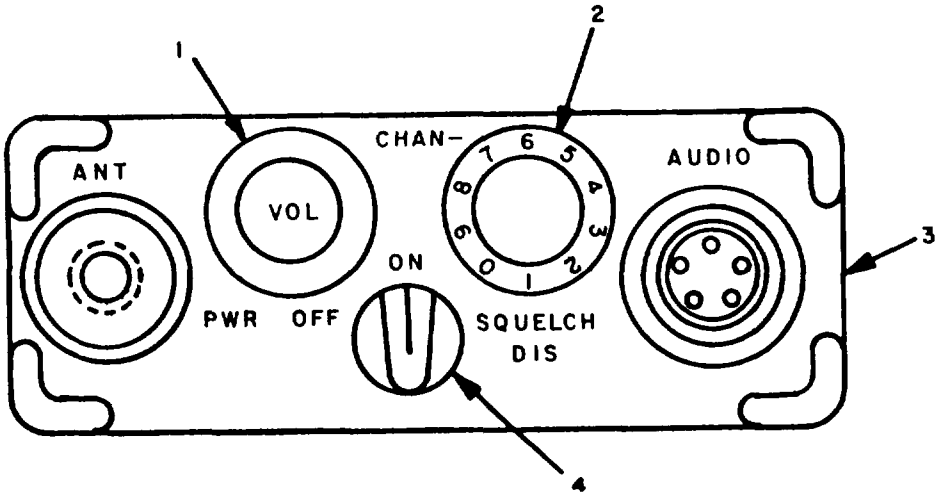


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Figure D-3. Panel Assembly.

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODE (UOC)	(6) QTY
				GROUP 02 PANEL ASSEMBLY	
				FIG.D-3	
1	PAOZZ	37695	148069-2	KNOB	1
2	PAOZZ	37695	148069-1	KNOB	1
3	PAFZZ	37695	345110-1	SEAL,NONMETALLIC ST	1
4	PAOZZ	37695	148029-1	KNOB	1
				END OF FIGURE	

NATIONAL STOCK NUMBER AND PART NUMBER INDEX

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM	STOCK NUMBER	FIG.	ITEM
5985-00-933-2454	D-1	2			
5985-01-096-9396	D-1	1			
5820-01-096-9410	D-1	5			
5355-01-097-4285	D-3	2			
5355-01-097-4286	D-3	1			
5355-01-097-4287	D-3	4			
5935-01-099-0005	D-1	1A			
6140-01-151-4062	D-1	4			
5820-01-190-4209	D-2	2			
5999-01-191-0073	D-2	3			
5999-01-192-0241	D-2	4			
5330-01-218-8312	D-3	3			
5820-01-229-6812	D-1	3			

NATIONAL STOCK NUMBER AND PART NUMBER INDEX

PART NUMBER INDEX

FSCM	PART NUMBER	STOCK NUMBER	FIG.	ITEM
80058	RT-1113A/PRC-68A	5820-01-229-6812	D-1	3
80063	SM-B-523304	5985-00-933-2454	D-1	2
98278	095-9003-0024	5935-01-099-0005	D-1	1A
37695	148029-1	5355-01-097-4287	D-3	4
37695	148069-1	5355-01-097-4285	D-3	2
37695	148069-2	5355-01-097-4286	D-3	1
37695	345110-1	5330-01-218-8312	D-3	3
37695	808234-1	5820-01-096-9410	D-1	5
37695	812699-801	5820-01-190-4209	D-2	2
37695	814635-801	5999-01-191-0073	D-2	3
37695	814636-801	5999-01-192-0241	D-2	4
37695	914153-803	6140-01-151-4062	D-1	4
37695	914161-803	5985-01-096-9396	D-1	1
37695	918267-804		D-2	1

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4 April 1978

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5840-340-14&P	23 Jan 74	Radar Set AN/PRC-76

BE EXACT PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°. REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
E-5				For item 2, change the NSN to read: 5835-00-134-9186. REASON: Accuracy.
E-8		E-3		Identify the cover on the junction box (item no. 5). REASON: It is a separate item and is not called out on figure 19.
E-9				Add the cover of the junction box as an item in the listing for figure 19. REASON: Same as above.

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE
SSG I. M. DeSpiritof 999-1776	SSG I.M. DeSpiritof

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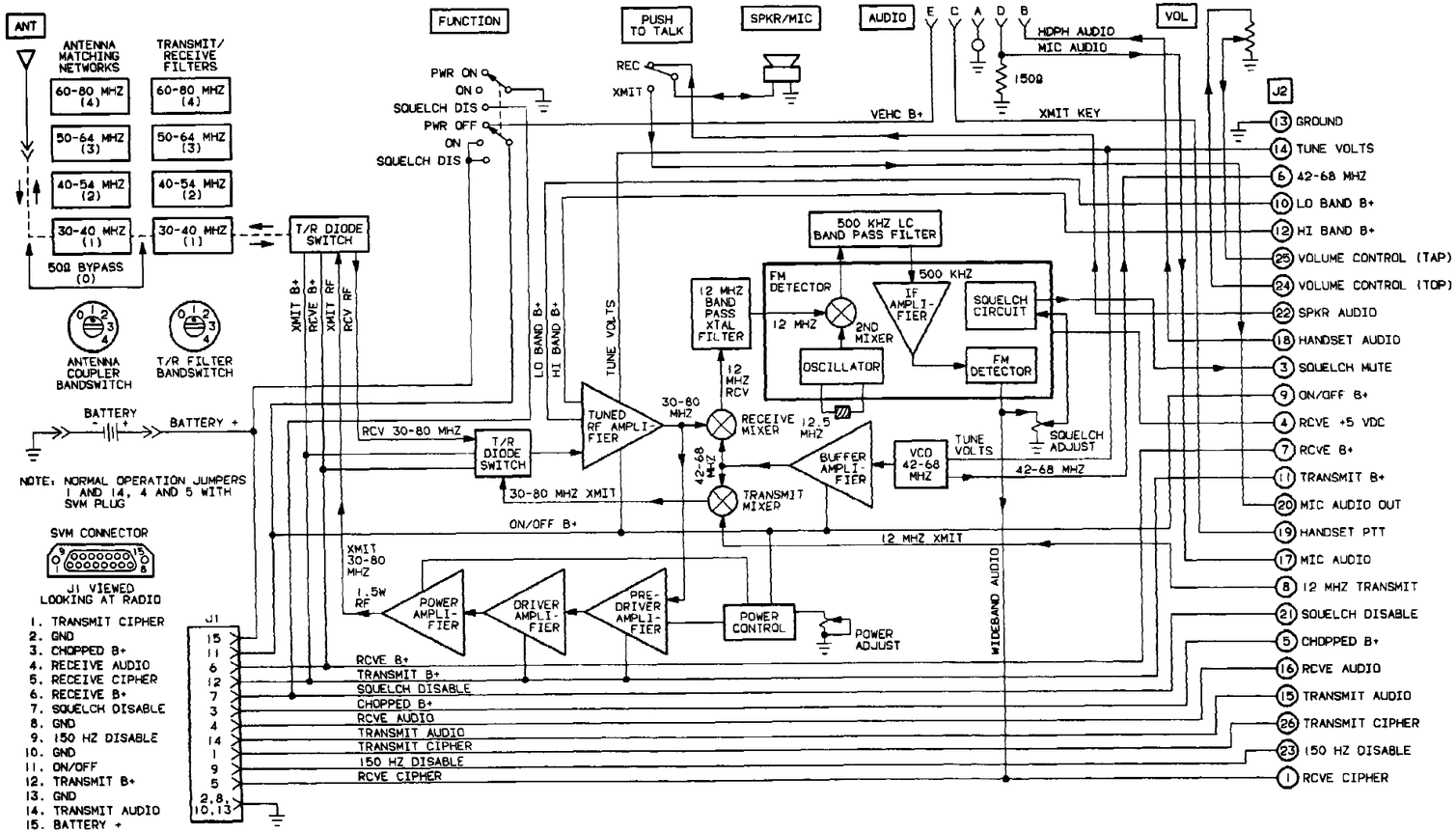
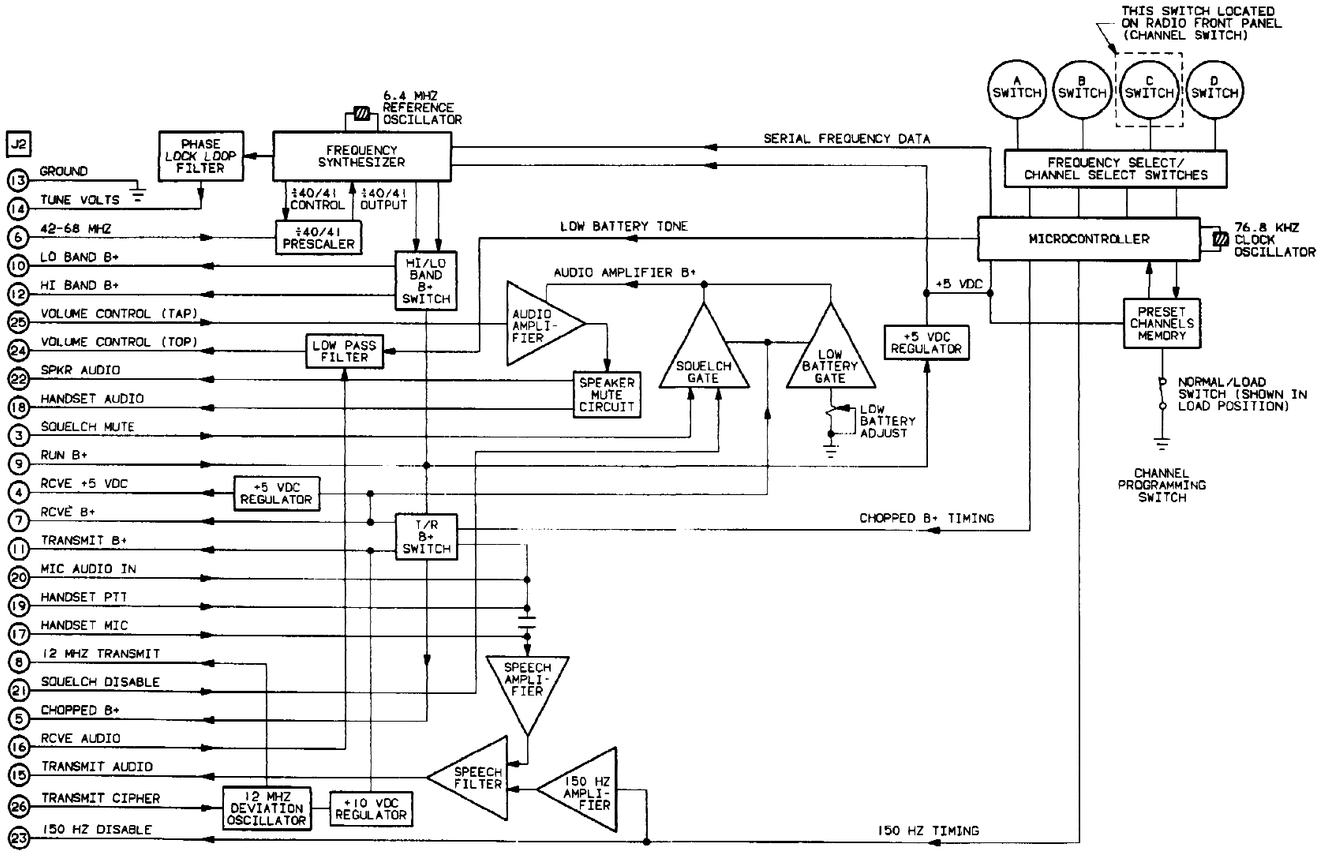


FO-1. RF/IF Module Functional Diagram



FO-2. SYNTH/AF Module Functional Diagram.

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