

# TM11-5820-667-35

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

---

DS, GS, AND DEPOT MAINTENANCE

MANUAL

RADIO SET AN/PRC-77

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HEADQUARTERS, DEPARTMENT OF THE ARMY

FEBRUARY 1968

**WARNING**

**DON'T TAKE CHANCES!**

**CAUTION**

This equipment is transistorized. Before connecting test equipment within the modules, insulate test prods and clips with insulating tape or sleeving. Leave an absolute minimum of exposed metal, and be extremely careful to avoid short circuits; they may cause extensive damage. Do not make resistance measurements unless specifically directed to do so.



By Order of the Secretary of the Army:

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

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*Brigadier General, United States Army*  
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DEPARTMENT OF THE ARMY  
WASHINGTON, DC, 15 January 1986

**Direct Support, General Support, and  
Depot Maintenance Manual  
RADIO SET AN/PRC-77  
(NSN 5820-00-930-3724)**

TM 11-5820-667-35, 16 February 1968, is changed as follows:

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C1

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Direct Support, General Support and

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RADIO SET AN/ PRC-77

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**5**

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

**1**

DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

**2**

IF POSSIBLE , TURN OFF THE ELECTRICAL POWER

**3**

IF YOU CANNOT TURN OFF THE ELECTRICAL  
POWER, PULL, PUSH, OR LIFT THE PERSON TO  
SAFETY USING A WOODEN POLE OR A ROPE OR  
SOME OTHER INSULATING MATERIAL

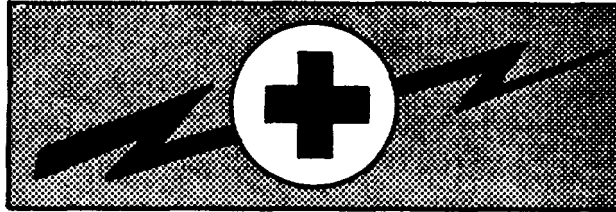
**4**

SEND FOR HELP AS SOON AS POSSIBLE

**5**

AFTER THE INJURED PERSON IS FREE OF  
CONTACT WITH THE SOURCE OF ELECTRICAL  
SHOCK, MOVE THE PERSON A SHORT DISTANCE  
AWAY AND IMMEDIATELY START ARTIFICIAL  
RESUSCITATION

## WARNING



## HIGH VOLTAGE

is used in the operation of this equipment

## DEATH ON CONTACT

may result if personnel fail to observe safety precautions

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections or 115 volt ac input connections when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through the body.

**Warning:** Do not be misled by the term "low voltage". Potentials as low as 50 volts may cause death under adverse conditions.

For Artificial Respiration, refer to FM 21-11.

**WARNING****DON'T TAKE CHANCES!****WARNINGS**

Adequate ventilation should be provided while using TRICHLOROTRI-FLUOROETHANE. 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 TRICHLOROTRI-FLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

Lithium type batteries may be used with your equipment. These batteries are potentially dangerous if misused or tampered with before, during and after discharge. The following precautions must be strictly observed to prevent possible injury to personnel or damage to the equipment:

DO NOT crush, puncture, disassemble, or otherwise mutilate the batteries. DO NOT heat or incinerate the batteries.

DO NOT short circuit.

DO NOT try to recharge.

DO NOT use batteries which look bulged or have burst. Turn these batteries in to the Defense Reutilization and Marketing Office (DRMO).

DO NOT bypass any internal fuse or replace the fuse with a fuse of a different rating. If the battery uses replacement fuses, they will be packed two per every ten batteries.

DO NOT use carbon dioxide extinguishers on exposed lithium metal fires. Flood the burning material with water or use graphite-type compounds or graphite-type extinguishers to extinguish burning lithium.

You can tell the difference between Magnesium Battery BA-4386/U and Lithium Battery BA-5598/U by looking at their size. The Lithium Battery is half the size of (smaller than) the Magnesium Battery. Magnesium Batteries shall be turned into the Defense Reutilization and Marketing Office (DRMO) for disposal.

DO NOT store in equipment during periods of disuse in excess of 30 days. TURN OFF the equipment if you feel the battery compartment becoming hot, hear battery venting (hissing sound), or smell sulfur dioxide gas (pungent, irritating fumes). Wait 30 to 60 minutes for the battery to cool before removing,

Remove the battery from the Battery Box (CY-2562/PRC-25) when the radio is not in use. This is required to insure that dangerous gases do not accumulate. Personnel can be injured and equipment damaged if the boxes explode.

PREVENT personal injury when applying or removing steel strapping by wearing heavy gloves and a face shield. DO NOT handle packing cartons by steel strapping.

**CAUTION**

This equipment is transistorized. Before connecting test equipment within the modules, insulate test prods and clips with insulating tape or sleeving. Leave an absolute minimum of exposed metal, and be extremely careful to avoid short circuits; they may cause extensive damage. Do not make resistance measurements unless specifically directed to do so.

**DIRECT SUPPORT, GENERAL SUPPORT, AND  
DEPOT MAINTENANCE MANUAL**

**RADIO SET AN/PRC-77**

(NSN 5820-00-930-3724)

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistakes or if you know of away to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703-5000. In either case, a reply will be furnished direct to you.

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## CHAPTER 1

### INTRODUCTION

#### 1-1. Scope

a. This manual contains instructions for direct and general support and depot maintenance for Radio Set AN/PRC-77. It includes instructions appropriate for direct support (DS), general support (GS), and depot maintenance troubleshooting, testing, aligning, and repairing the equipment. Detailed functions of the equipment are covered in chapter 2.

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

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

#### 1-3. Maintenance Forms, Records, and Reports

a. *Reports of Maintenance and Unsatisfactory Equipment.* Department of the Army forms and procedures used for equipment maintenance will be those prescribed by 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 AR 735-11 -2/DLAR

4140.551NAVMATINST 4355.73A/AFR 400-54/MCO 4430.3F.

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

#### 1-4. Reporting Equipment Improvement Recommendations (EIR)

If your AN/PRC-77 needs improvement, let us know, Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703-5007. We will send you a reply.

#### 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.



## CHAPTER 2

## FUNCTIONING OF RADIO SET AN/PRC-77

## Section 1. BLOCK DIAGRAM ANALYSIS

## 2-1. Receive Mode Signal Path

(fig. 7-15)

Receiver-Transmitter, Radio RT-841/PRC-77 is tunable in 50-kilohertz (KHz) increments over a frequency range of 30.00 to 75.95 megacycles (MHz) to provide 920 channels. The frequency range is covered in two bands: the low band is 30.00 to 52.95 MHz; the high band is 53.00 to 75.95 MHz. The front panel tuning controls and the BAND switch are used for tuning the RT-841/PRC-77 to the desired frequency.

a. The incoming radiofrequency (RF) signals are coupled from the antenna through the antenna loading network to antenna relay K1 in receiver input module A32. The antenna loading network matches the circuit impedance to the long or short antenna. Relay K1 connects the antenna loading network to the transmitter power amplifier when in the transmit mode. In the receive mode, the antenna network is connected through K1 to the receiver input tuned tank, which couples the RF signal to the first RF amplifier. The amplified signal from the first RF amplifier is applied to the second RF amplifier, where it is amplified and applied to the receiver mixer,

b. The output from the synthesizer, variable frequency oscillator (vfo), ranging in frequency from 41.50 to 64.45 mc in 50-KHz increments, is applied through the vfo buffer to the receiver mixer. The receiver mixer heterodynes the two signals to produce the 11.5-MHz intermediate frequency (IF). The vfo frequency is stabilized by the output of the frequency synthesizer system (para 2-4). The ganged tuning capacitor is positioned by the mc and kc tuning controls through a gear train.

c. The 11.5-mc IF output of the receiver mixer stage is coupled through the 11.5-mc crystal filter, and amplified by the receiver first, second, third, fourth, fifth and sixth IF amplifiers. The six receiver IF stages (A21A) have a power gain of approximately 70 decibels (db). The receiver sixth IF amplifier output is applied to the receiver discriminator driver. The receiver discriminator driver output is applied to the receiver discriminator. The driver output is fully limited. The limited IF signal is applied to the receiver discriminator, which demodulates the IF signal. The audio output of the receiver discriminator is applied to the receiver first audio amplifier.

d. The two stage receiver first audio amplifier output is applied to the VOLUME control, to the squelch input amplifier, and to pin P of power plug J3 for wideband signal operation. The VOLUME control controls the audio signal level to the receiver audio output amplifier. The amplified signal from the receiver audio output amplifier is fed to the handset. The two receiver audio amplifiers also amplify sidetone signals from the speech amplifier limiter of the transmitter section during transmission.

e. During squelch operation, when no signal is being received, the audio output circuit is shorted to ground through contacts of squelch relay K3. If an RF carrier having a squelch tone is received, K3 is energized by an output from the relay driver, the short circuit is removed, and audio signals are fed to Handset H-189/GR. Relay K3 will be energized only if the output from the receiver first audio amplifier includes a 150-Hertz-per-second (Hz) tone signal. During transmission, the transmitter tone generator provides a 150-cps signal to the squelch input amplifier to prevent shorting the sidetone.

f. The receiver audio amplifier output, including the 150-Hz tone, is applied to the squelch input amplifier. The squelch TWIN TEE bandpass feedback amplifier passes the 150-cps tone, which is rectified in the squelch direct current (dc) detector amplifier. When the squelch relay driver receives a signal from the dc detector amplifier, it provides the current necessary to energize K3. When K3 is energized, the ground is removed from the audio output amplifier to allow the audio signal to be fed to the handset.

g. Relay K3 functions as previously described, in addition, relay K3 provides a transmitter keying function when two AN/PRC-77's are used for retransmission. During this type of service, the receiving AN/PRC-77 is set for retransmit operation. When a signal is received, energizing K3, a ground circuit is completed through the interconnecting cable to key the transmitting AN/PRC-77. The transmitting AN/PRC-77, also set for retransmit, has the squelch circuitry deactivated to prevent the transmitter tone from energizing K3.

## 2-2. Transmit Mode Signal Path

(fig. 7-16)

a. The audio signal developed in the handset microphone is amplified in the first and second speech amplifiers, and limited in the output limiter stage. The output limiter stage has two outputs: it applies the audio signals to the receiver first audio amplifier as sidetone, and applies the audio signal to the modulator. The modulator also has a 150-cps tone input from the 150-cycle tone oscillator, through the speech amplifier output, for normal voice operation. The modulating voltages, applied through the modulator attenuator to the modulator, cause the sidestep oscillator (sso) output frequency to vary at the input audiofrequency (AF) rate from the microphone and at the 150-cps rate. The output from the 150-cps tone generator is also applied to the squelch input amplifier (para 2-1e). When the transmitter is used for wideband transmission (para 2-3), the speech amplifier output is shorted; therefore eliminating the tone modulation,

b. The frequency stability of the sso is greatly improved by the quarter-wave network. The quarter-wave network is a crystal-controlled passive network connected across the sso tuned circuit. The quarter-wave network improves the stability of the sso approximately 40 times relative to its free-running state.

c. The frequency-modulated (FM) output of the sso is coupled through the sso buffer to a 11.5-me phase detector where it forms the reference signal for phase-locking the transmitter vfo.

d. The output of the transmitter vfo, ranging in frequency from 30.00 mc to 75.95 mc, is fed through a buffer amplifier to the transmitter mixer. The transmitter mixer heterodynes this signal with the synthesizer vfo signal to produce an 11.5-mc signal. This 11.5-mc signal is amplified in module A31 by two IF amplifiers and fed to the 11.5-mc phase detector where it is compared to the sso signal. The dc phase error voltage is applied to the transmitter vfo to achieve phase-lock for keeping the vfo on frequency. If the frequency of the vfo is beyond the range of the phase detector, a 100-cps sweep oscillator is activated. The oscillator voltage is fed to the automatic phase control (apc) line of the vfo causing its frequency to vary at a 100-cps rate. As the vfo passes through the proper frequency, phase-lock occurs and the sweep oscillator is disabled.

e. The output of the transmitter vfo is also fed through a separate buffer amplifier to the broadband intermediate power amplifier (ipa). The amplified signal from the ipa drives a tuned-input, tuned-output transistor power amplifier (pa). The signal from the pa is fed through relay K1 in the receiver input module (para 2-1a) to the antenna loading network, where it is coupled to the antenna. During transmission, relay K2 supplies the operating voltages for all the transmitter stages.

### 2-3. Wideband Signal Transmission Mode (fig. 2-1)

Radio Set AN/PRC-77 also has a wide bandwidth transmission capability. This is possible since the bandwidth is restricted only in the speech amplifier (A22 of the transmitter) and the final audio amplifier stage (A55 of the receiver),

a. *Transmitter Loop.* Wideband modulation is applied to wideband attenuator module A60, through pin R of power plug J3. The normal voice input to the A60 module is shorted to ground through pin L of J3. This short removes the noise at the output of speech amplifier A22. Also, this short also removes the 150-cps tone input that is received by module A22 from tone generator module A23. The wideband attenuator output of module A60 is applied directly to the sso from the modulator of module A31. The remainder of the transmitter path is the same as described in paragraph 2-2.

b. *Receiver Loop.* The receiver loop is the same during the wideband transmission mode as described in paragraph 2-1, except that the wideband audio output is fed from the top of the VOLUME control to pin P of

J3. To prevent loading and feedback from the final audio stage during wideband transmission, the VOLUME control should always be set at approximately one-half volume.

### 2-4. Frequency Synthesizer System (fig. 7-17)

The frequency synthesizer system (fss) is a closed loop, automatic phase control system which locks the vfo on frequency. The fss is used both during reception and during transmission. The synthesizer vfo frequency is the same during transmit and receive. The frequencies shown on figure 7-17 represent the fss frequencies associated with two typical frequencies, and are used to illustrate the frequency relationships. The two typical frequencies are 31.10 mc (low band) and 68.45 mc (high band).

a. The vfo output frequency ranges from 41.50 mc to 64.45 mc. The specific frequency depends on the channel selected and whether the channel is in the high or low band.

(1) When the low band is used, the vfo operates at 11.50 mc above the carrier frequency. For ex-

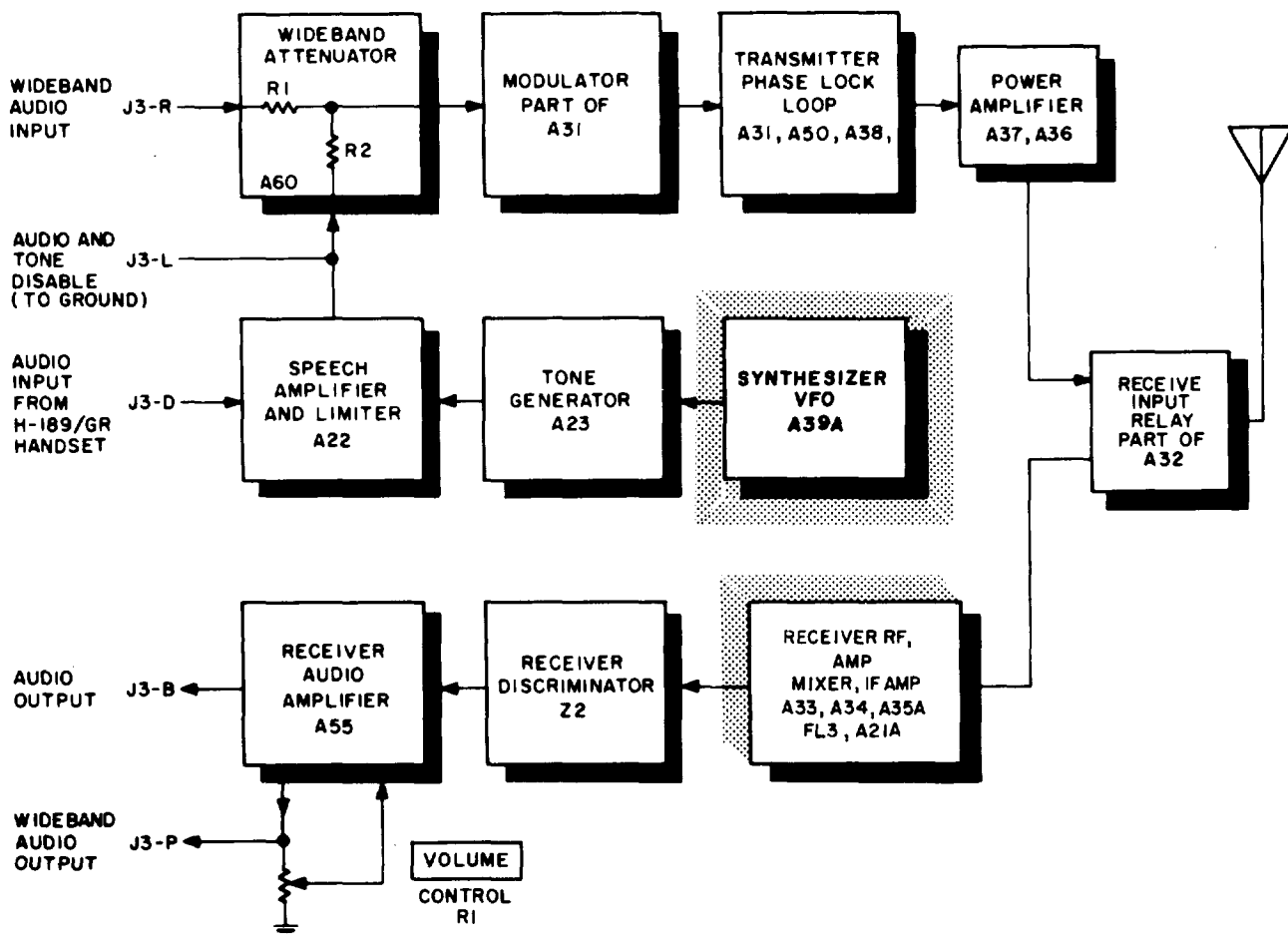


Figure 2-1. Wideband transmission mode, block diagram.

E L 4 F D O 3 9

ample, at a frequency of 31.10 mc, the vfo frequency is 42.60 mc.

- (2) When the high band is used, the vfo operates at 11.50 mc below the carrier frequency, For example, at a carrier frequency of 68.45 mc, the vfo frequency is 56.95 mc.

b. The vfo output (a above) is applied through the fss buffer to the fss first mixer. The buffer stage isolates the vfo from the fss first mixer to prevent feedback of sidebands created in the mixer. The fss first mixer receives another input from the spectrum generator, which is driven by the output of the 1.0-mc crystal oscillator, The sinusoidal output of the 1-mc crystal oscillator is applied to the spectrum generator where it is shaped into pulses that are rich in harmonic content, The output of the spectrum generator, which is applied to the fss first mixer, is a frequency spectrum ranging from 1 through 12 mc in 1-mc increments. The fss first mixer heterodynes the inputs and applies the resultant spectrum to the 53-mc filter,

c. Because the frequencies developed in the first mixer output will be the two original signals plus their sum and difference, a frequency (plus its upper and lower sidebands) which approaches the 53-mc band-pass will always be generated, regardless of the vfo output frequency. For example, when the vfo is operating at 44.60 mc, the sum of the eighth harmonic (8 mc) of the pulse generator output frequency and the vfo frequency (44.60 mc) equals 52.60 mc.

d. The 53-mc filter passes a band of frequencies, centered at 53 mc, to the fss second mixer. The fss second mixer is also supplied an input signal from the 100-kc interval oscillator (e below) through the tuned network, which reduces spurious frequencies. The fss second mixer heterodynes the two signals to produce

their difference, which is the fss IF. It is applied to the fss IF amplifier.

e. The output frequency of the 100-kc interval oscillator, which is independent of the receive-transmit condition, ranges from 46.85 to 47.75 mc in 100-kc increments, one increment for every two consecutive channels. The specific frequency depends on the frequency selected by the kc tuning knob. The frequency relationship is such that the output of the 100-kc interval oscillator is 46.85 mc above a specific 100-kc channel point (0.00 mc, 0.10 mc, 0.20 mc, etc) and 46.90 mc above a specific 50-kc channel point (0.05 mc, 0.15 mc, 0.25 mc, etc). However, at the 0.95-mc channel point, the 100-kc interval oscillator is 45.90 mc above the kc indication so with the kc tuning knob set at the 0.95- or 0.00-mc channel point, the 100-kc interval oscillator frequency will be 46.85 mc; at a 0.05- or 10-mc channel point, the frequency will be 46.95 mc; at a 0.15- or 0.20-mc channel point, the frequency will be 47.05 mc; at a 0.85- or 0.90-mc channel point, the frequency will be 47.75 mc.

(1) The fss IF will always be 5.65 mc at the 100-kc channel points.

(2) The fss IF will always be 5.60 mc at the 50-kc channel points.

f. The fss IF amplifier has a power gain of approximately 30 db to provide adequate limiting for a constant output amplitude. The fss IF amplifier output is applied to the discriminator and to the phase comparator. The phase comparator also has an input from the 50-kc interval oscillator.

g. The 50-kc interval oscillator generates either 5.60 mc, or 5.65 mc. The specific frequency depends on the frequency selected by

the kc tuning knob (50-or 100-kc increments). When a 50-kc channel point (37.45, 71.25, etc) is selected, the 50-kc interval oscillator output frequency will be 5.60 mc. When a 100-kc channel point (37.40, 71.20, etc) is selected, the 50-kc interval oscillator output frequency will be 5.65 mc,

h. The output of the 50-kc interval oscillator (g above) is applied as a reference signal to the phase comparator. The phase of the two input signals (reference signal from the oscillator buffer and fss IF) is compared and a control voltage is developed in the phase comparator. The control voltage is applied through the antihunt network to the apc modulator. If a phase lock exists, the apc voltage will assume the reference level to maintain the vfo on frequency. If a phase difference exists, an error voltage is developed in the phase comparator. This error voltage varies the apc voltage applied to the apc modulator from the reference level to correct the operating frequency of the vfo.

i. If the vfo output is too far from its proper frequency to be corrected by the phase comparator output, the discriminator (which extends the capture range of the fss) will develop a hunt voltage, which in-

creases the deviation of the apc voltage. Because the vfo is far from its correct frequency, the frequency of the signal applied to the discriminator (f above) will be considerably removed from the proper fsa IF (e above). The discriminator will develop a large error (hunt) voltage. This hunt voltage which is applied through the antihunt network to the apc modulator, changes the vfo output frequency to within the pull-in and hold-in capabilities of the phase comparator. The antihunt network stops the hunting action of the vfo when the phase comparator has control of the vfo frequency.

## 2-5. Receiver-Transmitter Overall Diagram (fig. 7-18)

The chassis interconnections between modules are shown on figure 7-18, the overall chassis interconnection diagram. When tracing a circuit out of module schematic, note the pin number. Locate the module block and pin number on the overall diagram and trace the circuit to the interconnected module and note that pin number. Go to that interconnected module's schematic diagram and continue to trace the circuit through the interconnected pin.

## Section II. RECEIVER CIRCUIT ANALYSIS

### 2-6. Receiver Input Module A32 (fig. 2-2)

The receiver input module contains a harmonic rejection filter, antenna relay K1, the receiver input tuned tanks, and switch S1. On transmit, the pa output from the transmitter is connected directly to the antenna loading network by activating K1. The T-network formed by L4, L3, and C7 forms a low-pass filter to suppress transmitter harmonic radiation. Inductor L5 and capacitors C3 and C8 form a pi-type RF filter in the  $\pm 12.5$ -volt transmit line that is used to activate the relay. In the receive mode, relay K1 connects the receiver input tank at S1 to the antenna loading network. Switch S1 is positioned by the BAND switch control on the front panel. Figure 2-2 shows the position of switch S1 when the BAND switch control is set at 30-52 for low-band operation. The two input circuits are tuned as follows:

a. *Low Band.* Transformer T1, capacitors C1 and C2, and tuning capacitor C2B comprise the low-band tuned tank. Inductor L1 matches the tank to the input impedance of first rf amplifier A33. The position of tuning capacitor C2B is determined by the mc and kc controls on the front panel.

b. *High Band,* Transformer T2 and capacitors C2, C4, C5, C2B, and C6 comprise the high-band input tuned tank circuit. Inductor L1 matches the tank to the input impedance of first RF amplifier module A33.

### 2-7. First RF Amplifier Module A33 (fig. 7-29)

First RF amplifier module A33 amplifies the signal received from module A32 (para 2-6). The first RF amplifier consists of a single transistor amplifier, switch S1, and tuned output circuits.

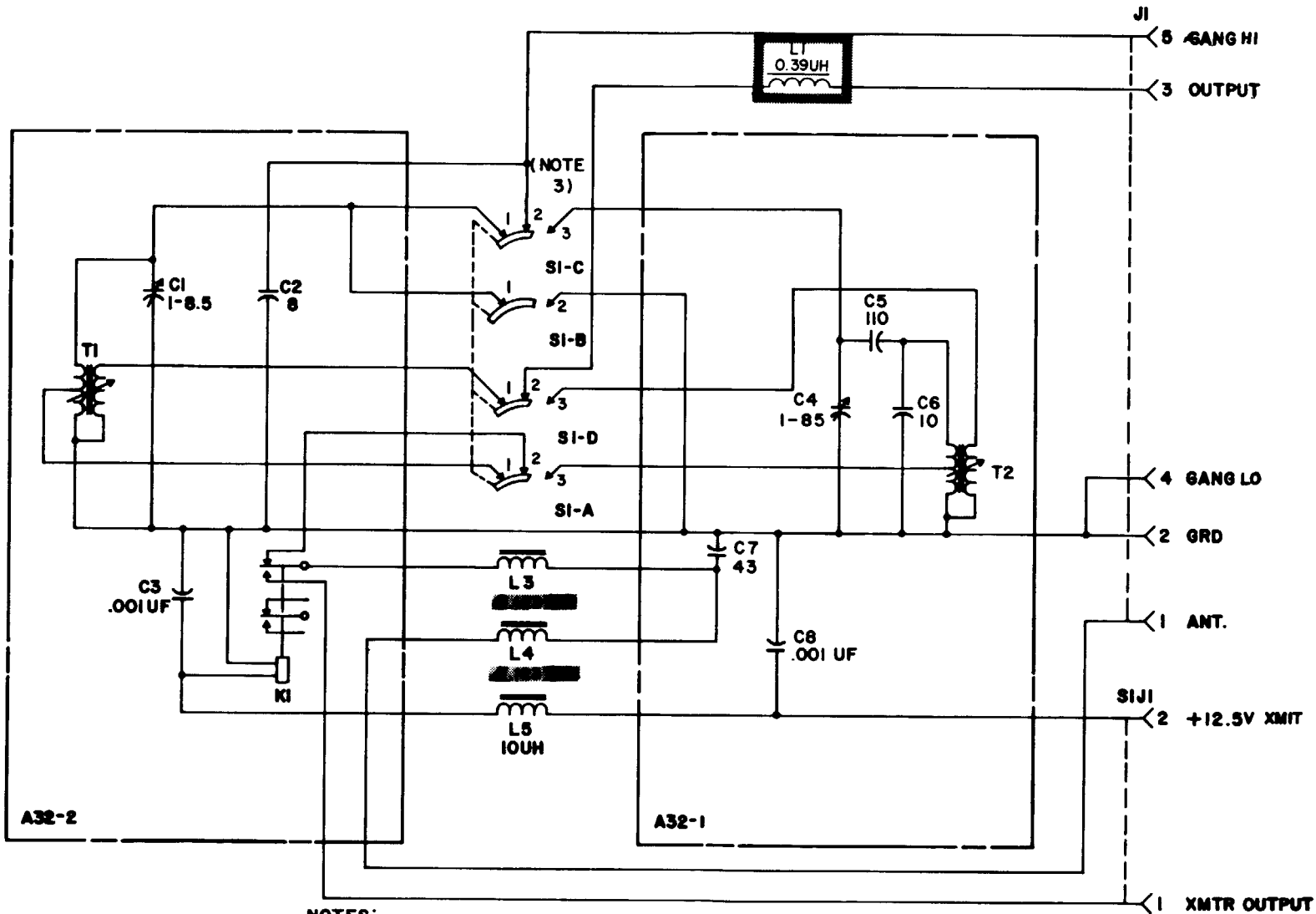
a. The input signal from module A32 is coupled through transformer T1 and coupling capacitor C3 to the base and emitter of transistor Q1. The center-tap of the secondary of T1 is returned to RF ground through capacitor C2. The output of Q1 is taken from the collector through coupling capacitor C5 and resistor R4 to switch S1 positioned by the BAND switch. Resistor R4 suppresses parasitic oscillations. Diode CR1 protects transistor Q1 from overload in the presence of a strong RF signal at the antenna.

b. Switch S1 is positioned by the BAND switch control on the front panel. The collector circuit of Q1 is tuned in each of the two BAND positions as follows:

(1) *Low Band.* Transformer T2, fixed capacitor C8, trimmer capacitor C7, and tuning capacitor C2C (fig. 7-29) make up the tuned circuit. The position of tuning capacitor C2C is determined by the mc and kc controls on the front panel. Figure 7-29 shows the position of S1 when the BAND switch control is set at 30-52 for low-band operation.

(2) *High Band,* Transformer T3, fixed capacitors C11 and C10, trimmer capacitor C9, and tuning capac-

Figure 2-2



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS CAPACITANCES ARE IN UUF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED PREFIX THE PART DESIGNATION WITH A32.
3. SWITCH SI IS SHOWN IN THE POSITION FOR LOW BAND OPERATION.

BOTTOM VIEW OF MODULE A32

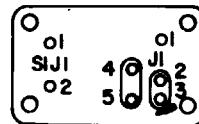


Figure 2-2. Receiver input module A32, schematic diagram.



itor C2C make up the tuned circuit. Switch S1-D shorts the low-band tuned circuit to prevent loss of

energy when operating on the high band.



c. The combination of resistors R5, R3, and R2 establishes the fixed bias for transistor Q1, Resistor R1 is the emitter swamping resistor. Capacitor C6 and resistor R4 form a parasitic suppressor. Inductor L3 is an RF decoupling coil. Capacitors C1 and C4 and inductor L1 make up a pi-type RF filter which prevents RF leakage into the power supply. Capacitor C10 is connected in series with tuning capacitor C2C on the high band by SIC to decrease the effect of tuning capacitor C2C. Test jack J2 can be used for measuring the input signal to module A33. Inductor L3 (in the chassis) is an RF filter choke in series with the +10-volt receiver regulated input to module A33.

### 2-8. Second RF Amplifier Module A34 (fig. 7-19)

Second RF amplifier module A34 amplifies the signal from first amplifier module A33 (para 2-7). The A34 output is applied to receiver mixer module A35A (para 2-9). The second rf amplifier consists of a single transistor amplifier, switch S1, and tuned output circuits. The circuit configuration and operation of module A34 is similar to that of first RF amplifier module A33 (para 2-7), except that tuning capacitor C2D is used and no limiting diode (A33CR1) is used.

### 2-9. Receiver Mixer Module A35A (fig. 2-3)

Receiver mixer module A35A heterodynes the RF signal from second RF amplifier module A34 (para 2-8) with the vfo output to produce an IF of 11.5 mc. Module A35A consist of a receiver mixer stage, a vfo buffer stage, a coupling transformer, and tuned output circuit. The dc operating voltage from the + 10-volt receiver regulated supply is available to this module during reception only.

a. The RF signal input is coupled to the base of receiver mixer Q1 through isolating resistor R2 and coupling capacitor C2. The vfo input signal from module A39 is coupled to the base of vfo buffer Q2 through isolating resistor R1 and coupling capacitor C1. The vfo buffer output is coupled to the emitter circuit of transistor Q1 through coupling transformer T1.

b. The potential on the base of transistor Q1 is varying at the RF signal frequency and the emitter potential is varying at the vfo frequency; the collector output circuit is tuned to the difference between the two input frequencies which is 11.5 mc. The collector circuit consists of the primary of transformer T2 and capacitor C6.

c. Capacitors C4, C5, and C7 are RF bypass capacitors. The combination of capacitor C8 and inductor L1 decouples the module circuit from the 10-volt dc supply. Resistors R5 and R6 develop base bias for transistor Q2. Resistor R8 develops base bias for Q1. Resistor R7 is the emitter swamping resistor for A2. Resis-

tor R3 provides damping for the primary of coupling transformer T1.

### 2-10. Receiver IF Amplifier Module A21A (fig. 7-20)

The IF amplifiers provide amplification of the 11.5-mc IF signal from 11.5-mc filter, A57FL3. The IF amplifier module consists of six stages of amplification which include a discriminator drive output.

#### a. IF Amplifiers Q1, Q2, and Q3.

(1) The input from the 11.5-mc filter module is coupled through inductor L1, developed across resistor R1, and coupled to the base of receiver first IF amplifier Q1 through capacitor C1. The signal output from Q1 is coupled through capacitor C4 and developed across base resistor R8 of Q2. Amplifier Q2 develops its output signal across resistor R10. This output signal is coupled through capacitor C7 and is developed across base resistor R12 of third IF amplifier Q3. The collector output of Q3 is developed across the tuned circuit consisting of capacitor C9 and the primary winding of transformer T1,

(2) The combination of resistors R2 and R3, R7 and R8, and R11 and R12 develops base-to-emitter bias for Q1, Q2, and Q3, respectively. Resistors R4, R9, and R13 are emitter swamping resistors. Capacitors C3, C6, and C8 are emitter RF bypass capacitors for Q1, Q2, and Q3, respectively. Resistors R5 and R10 are collector load resistors for amplifiers Q1 and Q2, respectively. The input signal to module A21 can be measured at test jack J3.

b. Receiver Fourth and Fifth IF Amplifiers Q4 and Q5. Transistors Q4 and Q5 amplify the IF signal and also limit strong signals.

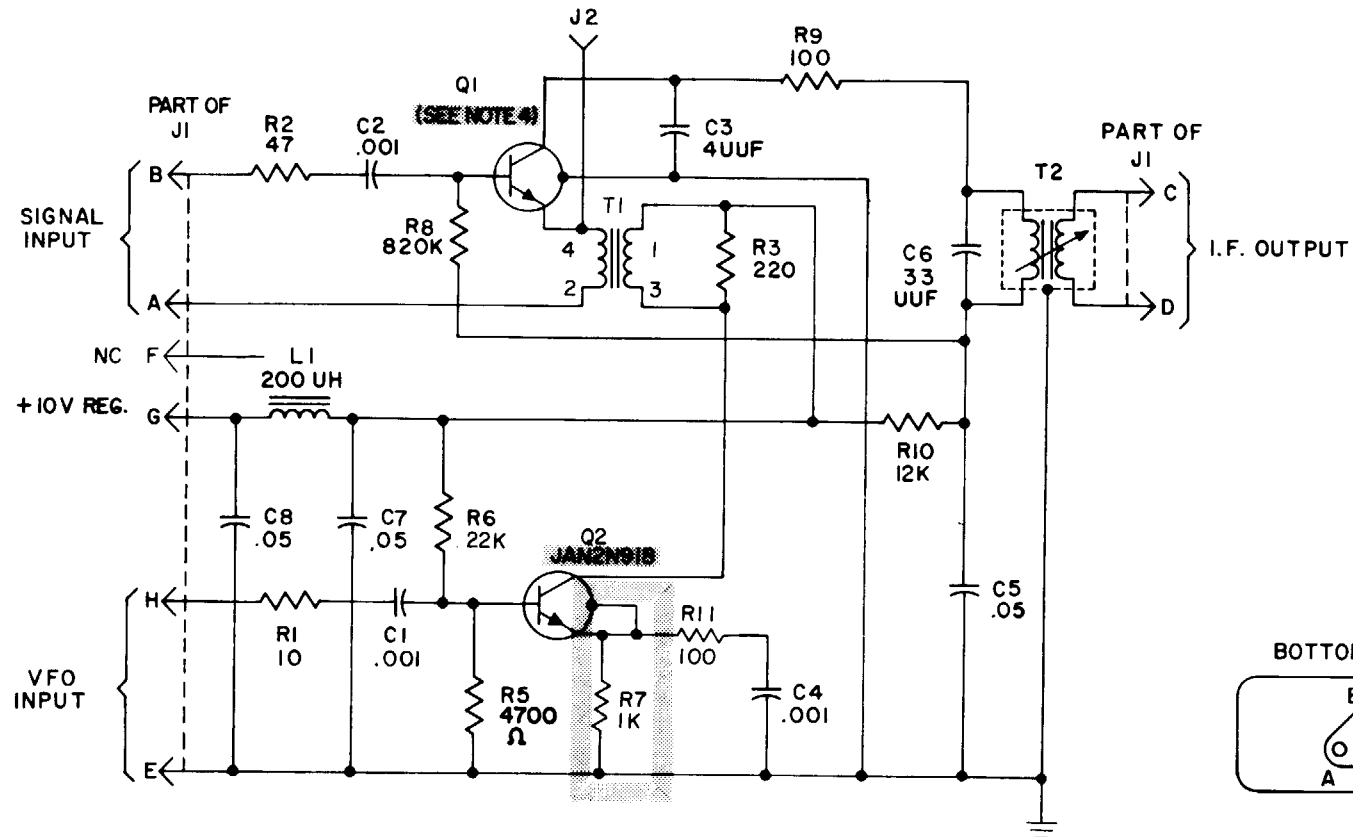
(1) The output from the secondary of T1 is coupled to the base of Q4 by capacitor C10. The output of Q4 is developed across collector load resistor R17 and is coupled through capacitor C12 to the base of fifth IF amplifier Q5. The collector output of amplifier Q5 is developed across load resistor R21 and applied through coupling capacitor C15 to the base of receiver discriminator driver Q6.

(2) Resistors R14 and R15, and R18 and R19 develop base-to-emitter bias for Q4 and Q5, respectively. Resistors R16 and R20 are emitter swamping resistors and capacitors C11 and C14 are the emitter bypass capacitors for Q4 and Q5, respectively.

c. Receiver Discriminator Driver Q6. The receiver discriminator driver amplifies and limits the 11.5-mc IF signal output from Q5 and applies a strong signal of constant amplitude to discriminator Z2.

(1) The 11.5-mc signal from Q5 is coupled through C15 to the base of Q6. The driver output is developed across a tuned circuit consisting of C18 and the primary of T2. The tuned circuit consisting of C21 and variable inductor L4 tune the input impedance of dis-

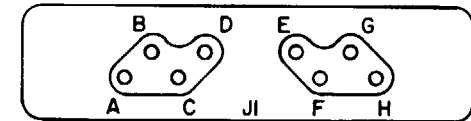
Figure 2-3



## NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED PREFIX THE PART DESIGNATION WITH A35A.
3. SYMBOL R4 NOT USED.
4. FOR TRANSISTOR Q1 SPECIFICATION SEE SM-B-448902.

BOTTOM VIEW OF MODULE A35A



EL4FD003

Figure 2-3. Receiver mixer module A35A, schematic diagram.

criminator Z2. R25 and C19 form a compensating network improving the response and linearity of the input signal to Z2.

(2) R22 and R23 develop the base-to-emitter bias

for driver Q6. R24 is the emitter swamping resistor and C16 is the emitter bypass. R26 is a filter resistor in the + 10-volt supply line.



The combination of capacitors C17 and C13, inductor L3, and resistor R26 prevents rf leakage into the supply. The output is coupled thru C20 to Z2. The output from T2 can be measured at test point J4.

d. *Discriminator Z2.* Z2 detects audio signals (and 150 cps) and applies them to A55 (para 2-11). 12K resistor (fig. 7-18) eliminates false alarms while the radio is being used in squelched receive mode retransmit operation.

### 2-11. Receiver Audio Amplifier Module A55 (fig. 7-21)

Receiver audio amplifier module A55 amplifies the audio output from the 11.5-mc discriminator Z2, or amplifies the sidetone from module A22 and applies it to the handset.

a. The audio output from Z2 is coupled through coupling capacitor C1 to the base of emitter follower Q1. The output of Q1 is developed across resistors R6 and R7 and is resistively coupled to the base of Q2 through R5. The output of Q2, developed across resistor R9, is coupled by capacitor C4 to VOLUME control R1 (on the front panel), to pin P of POWER plug J3 (on the front panel) for wideband audio output (para 2-3b) and to tone squelch module A54A (para 2-12). Capacitor C2 provides negative feedback to the base of Q1 through resistor R2. Capacitor C3 acts as a bypass to reduce Q2 emitter degeneration to resistor R7. Resistor R6 also provides the degenerative feedback from Q2 emitter. This degenerative feedback minimizes audio distortion, and provides a high input impedance to prevent the loading of Z2. The base-to-emitter bias for Q1 is provided by resistors R3 and R4; resistors R5, R6, and R8 establish the operating bias for Q2.

b. Since the first two audio stages have very wide bandwidth, the audio signal at the moving contact of the VOLUME control is applied through coupling capacitor C5 to the low-pass filter comprised of resistor R10 and capacitor C6. Resistor R10 and capacitor C6 attenuate the higher audio frequencies, and pass voice signals to the base of amplifier Q3. The base bias for transistor Q3 is provided by resistors R12 and R13. The emitter swamping resistor, R14, is bypassed by capacitor C7. The output signal at the collector of Q3 drives the primary of audio transformer T1. Resistors R11 and R15 provide a degenerative feedback which reduces the output impedance of Q3 to match the primary impedance of T1. Capacitor C8 shapes the high

frequency response at the collector of Q3. The resulting audio output is fed to the handset through filter network FL1 or FL2 and pin B of POWER plug J3 (on the front panel).

c. The input to audio amplifier module A55 can be measured through isolation resistor R1 at test jack J3. The output of A55 can be measured at test jack J4.

d. During transmission, the sidetone audio is coupled from module A22 (para 2-13) through capacitor C9 to the input circuit of Q1. In the SQUELCH and RETRANS modes, resistor R16 properly terminates this audio module (A55) while relay K3 is not activated (para 2-12) since the output at J4 is grounded.

e. Capacitor C11 (in the chassis) is an RF bypass capacitor on the + 10-volt regulated input to module A55.

### 2-12. Tone Squelch Module A54A (fig. 7-22)

a. When the function switch on the front panel is at SQUELCH, +10 volts dc is applied to tone squelch module A54A. Audio input signals from audio amplifier module A55 are applied through the input attenuator (consisting of resistors R2 and R5 and capacitor C1) and are coupled to the positive input of operational amplifier U1 through capacitor C2.

b. The twin-tee active bandpass filter essentially rejects all of the audio and passes only the 150-Hz tone. This 150-Hz tone is then detected (turned in into a dc level by the active AM detector) which is made up by another operational amplifier housed in U1 and transistor Q1. When sufficient 150-Hz tone is received at the input, the dc level on the collector of Q1 will drop sufficiently low to allow relay K3 to activate and unshort the output of the audio amplifier A55.

c. Capacitor C1 reduces the higher audio frequencies in the amplifier output at J3. Potentiometer R19 provides negative feedback to the input of U1 which is used to adjust the total amplifier gain. Potentiometer R19 is normally adjusted so that a 60-millivolt 150-Hz input will cause squelch relay K3 to become energized.

d. During transmission in the SQUELCH mode, tone generator module A23 (para 2-14) provides the 150-cps signal through resistor R1. This permits the operator to hear the sidetone in his handset.

e. In the RETRANS mode (two AN/PRC-77 sets interconnected to retransmit a signal) dc power for module A54A exists only in the receive condition.

## Section III. TRANSMITTER CIRCUIT ANALYSIS

### 2-13. SPEECH Amplifier Limiter Module A22 (fig. 2-4)

The speech amplifier limiter amplifies the audiofrequency signals from the microphone section of the handset. This module consists of two speech amplifiers

and an output limiter stage. The audio output is applied to sidetone oscillator and sidetone output is supplied to receiver audio amplifier module A55 (para 2-11).

a. Audio signals are coupled through an

input matching pad consisting of resistor R1, inductor L1, and capacitor C1 through coupling capacitor C2 to the base of first speech amplifier

Q1. The amplified audio output from the collector of Q1 is applied through coupling



capacitor C5 to the base of second speech amplifier Q2. The audio signal output from Q2 is applied through coupling capacitor C7 to the base of output limiter Q3. The output limiter signal is developed across collector load resistors R17 and R18. The audio output, to the sso part of A31 (para 2-15), through wideband attenuator A60 (para 2-3a), is coupled through capacitor C10 while the sidetone output to receiver audio module A55 is directly coupled from the junction of resistors R17 and R18. A 150-cps tone signal from the tone generator module is superimposed on the audio output signal to the sso through isolation resistor R19.

b. Resistors R2 and R3 establish base-to-emitter fixed bias for transistor Q1. Resistor R5 is an emitter swamping resistor for Q1. The combination of resistor R4 and capacitor C4 decouples the emitter circuit from the + 10-volt supply. Resistor R6 is the collector load for first speech amplifier Q1. Resistor R11 is the collector load resistor for second speech amplifier Q2. The combination of resistors R7 and R8 and diode CR1 establishes base-to-emitter bias for speech amplifier Q2. Because of the negative temperature coefficient of diode CR1, the bias varies inversely with temperature; therefore, the bias remains constant despite wide variations in temperature. Resistor R10 is the emitter swamping resistor for Q2. The combination of resistor R9 and capacitor C6 decouples the Q2 emitter circuit from the + 10-volt supply.

c. Resistive divider R13 and R14 provides base-to-emitter bias for output limiter Q3. Resistor R16 is the emitter swamping resistor for Q3. The combination of resistor R15 and capacitor C8 decouples the emitter circuit from the + 10-volt supply. The combination of inductor L2 and capacitor C9 decouples the module from rf on the + 10-volt supply, Resistor R12 is a power supply voltage dropping resistor. Capacitor C3 filters the power supply voltage for transistors Q1 and Q2. The audio output to module A31 can be measured at test jack J3. Capacitor C10 (in the chassis) is an RF bypass capacitor on the + 10-volt regulated input to modules A22 and A23.

#### 2-14. Tone Generator Module A23

(fig. 7-23)

a. The tone oscillator functions only during transmission. The 150-cps output tone is applied to the speech amplifier limiter module (para 2-13) which frequency-modulates the transmitter output carrier signal with the tone at all times during narrow band transmission. The 150-cps tone disables the squelch circuit in the distant receiver.

b. During transmission, + 10-volt dc operating voltage is applied to transistor Q1 which oscillates at 150 cps. The frequency is determined by the resistance-capacitance (rc) phase-shifting network consisting of capacitors C1 and C2, and resistors R3 and R7. Slight

adjustment of the frequency can be made by adjustment of *FREQ ADJ* potentiometer R1. oscillation in this Wien bridge rc oscillator is sustained by a feeding back the collector output of Q3 through phase-shifting capacitors C1 and C2 to the base of Q1. The rc feedback to the base of Q1 is in-phase at only one frequency and the regenerative 180° phase shift is provided by amplifier Q3. Oscillator gain is stabilized by degenerative feedback through R8 to the emitter circuit of Q1.

c. Temperature compensation is achieved by thermistor RT1, which provides a temperature compensated bias on the base of Q1. Transistor Q2 and Q3 provide sufficient gain to produce stable oscillations. The tone output is taken from the collector of Q3 across potentiometer R15. The 150-cycle tone output is applied to speech amplifier A22 (para 2-13) in the transmitter section and to tone squelch amplifier A54A (para 2-12) in the receiver section. Potentiometer R15 is the output level adjustment for the 150-cps tone output. The 150-cps tone output from R15 can be measured at test jack J3.

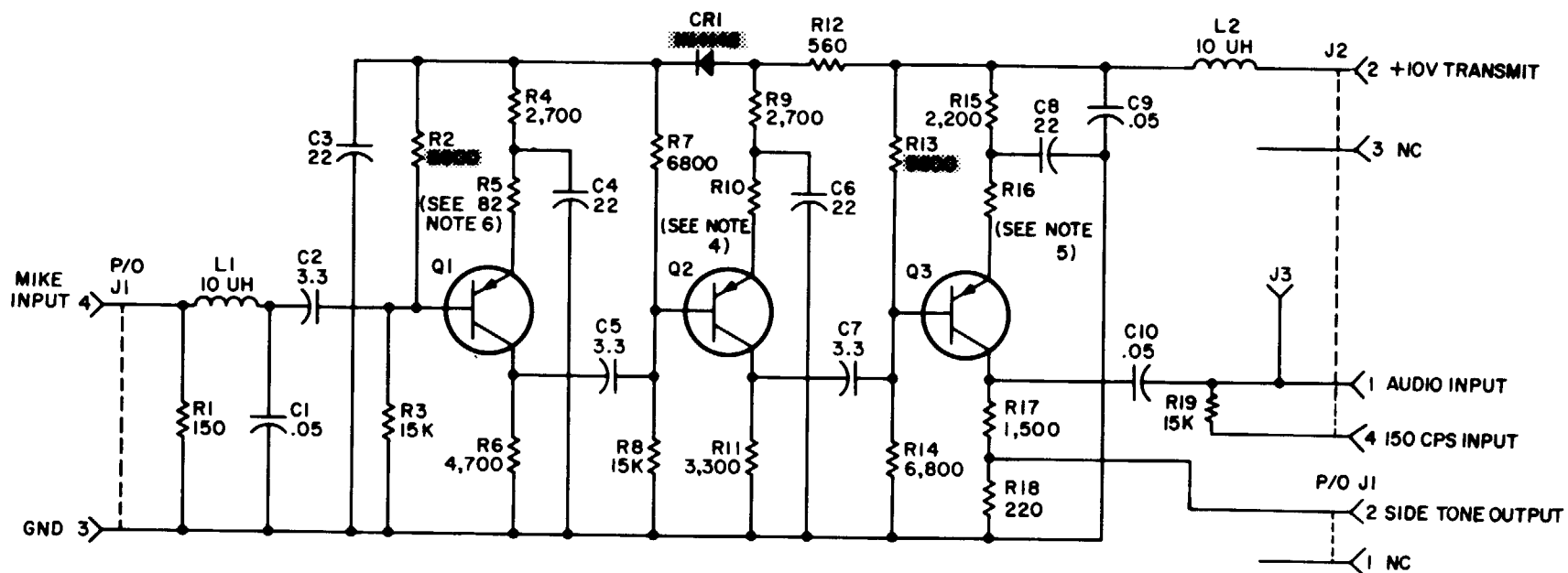
#### 2-15. Transmitter Frequency Control Module A31

(fig. 7-12)

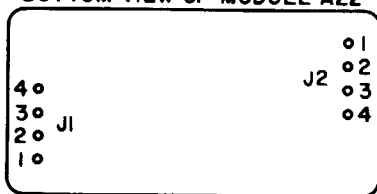
Frequency control module A31 contains a 11.5-mc transmitter IF amplifier, a 11.5-mc phase detector, the sso FM modulator and quarter-wave network, and the sweep oscillator. The module receives the 11.5-mc signal from the transmitter mixer and amplifies it in a two-stage, double-tuned transmitter IF amplifier. The amplified signal drives the phase detector. The reference signal is the sso output which is frequency-modulated by the audio input signal from tone generator A23 and speech amplifier A22. The phase detector output is a dc voltage that is proportional to the phase difference between the two RF signals. The dc voltage is passed through an antihunt filter to the phase correction output terminal of this module. The dc phase correction voltage is fed back on the apc line to the transmitter vfo to keep it on frequency and in phase with the sso. The transmitter vfo then has the same fm modulation as appears on the sso. The two-stage 100-cps sweep generator oscillates only when the two RF injections to the phase detector are out-of-phase lock. The sweep generator signal is fed to the apc output line which causes the transmitter vfo, A38, to vary in frequency. The transmitter IF then varies until it equals that of the sso. At this point, phase-lock occurs and the sweep oscillator is disabled by effectively opening its feedback circuit through the phase detector.

a. *Reference Oscillator and Frequency Modulator.* The sidestep oscillator is a modified Hartley type. A quarter-wave network is connected to the oscillator

Figure 2-4



BOTTOM VIEW OF MODULE A22



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE PART DESIGNATION WITH A22.
3. TRANSISTORS Q1, Q2, Q3 - JAN2N2907.
4. NOMINAL VALUE 100 OHMS, MAY SELECT IN TEST 82 OR 150 OHMS.
5. NOMINAL VALUE 150 OHMS, MAY SELECT IN TEST 82 OR 100 OHMS.
6. NOMINAL VALUE 82 OHMS, MAY SELECT IN TEST 82 OR 100 OHMS.

Figure 2-4. Speech amplifier limiter module A22, schematic diagram.

EL4FD004

tuned circuit to stabilize the frequency. The network contributes a stability factor about 40 times greater than that of a free-running oscillator.

(1) *Sidestep oscillator, 11.50Mc.*

(a) The audio signal of speech amplifier limiter module A22, from wideband attenuator module A60, is coupled to the sso through coupling capacitor C14 and isolating resistors R13 and R14, across diode CR2. Diode CR2 is a variable capacitance diode. When

the audio signal is applied across the diode, the effective capacitance of CR2 changes as the voltage across it varies. These capacitance changes are coupled through capacitor C16, which blocks the audio signal, across the sso tuned circuit consisting of inductor T5 and capacitor C20. The effective capacitance of the tuned circuit, and the output frequency, varies at the audio rate;



therefore, the output frequency of the sso is frequency-modulated.

- (b) The ac component of the emitter current flows through part of T5, coupling capacitor C22, and swamping resistor R20 to the emitter of Q4. This signal induces an in-phase voltage at the top of T5 which is coupled through coupling capacitor C21 to the base of Q4 to sustain oscillation. Resistors R18 and R19 provide base-to-emitter bias for Q4. Resistor R21 is the emitter load resistor. Resistors R15 and R16 establish a dc bias for CR2. Capacitor C15 is an RF bypass capacitor for the audio input circuit. The oscillator level can be measured at test jack J5.
  - (c) The frequency-modulated RF output from the oscillator tuned circuit is coupled from a tap on T5 through capacitor C24 to the base of buffer Q5. The buffer stage isolates the sso from load variations. The buffer output is developed across the tuned circuit consisting of transformer T6 and capacitor C25. Resistors R22 and R23 establish the base-to-emitter bias for Q5. Resistor R24 is the emitter voltage dropping resistor; capacitor C26 is the emitter bypass. An L-type filter consisting of capacitor C23 and inductor L5 prevents RF leakage into the + 10-volt dc supply. The RF output from Q5 can be measured at test jack J3.
- (2) *Quarter-wave network.* The quarter-wave network consists of a crystal Y1 and a pi-filter network. The crystal is used to control the sso frequency. The network is an artificial quarter-wave line. An impedance or reactance at one end is reflected as the exact opposite at the other end. This permits the use of a low-impedance crystal with the high-impedance tank circuit in the sso. If the crystal were connected directly into the tuned circuit, deviation of the sso frequency would not be possible. Inductor L4 is used to control the amount of coupling between the crystal and the tuned circuit.
- b. *Transmitter IF Amplifier and Phase Detector.*
- (1) The 11.5-mc signal from transmitter mixer module A50 is capacity-coupled to the base of transistor Q2. The first IF amplifier output is double-tuned, providing a power gain of 10 db. Transformers T1 and T2 and capacitors C4, C5, C6, and C7 comprise the tuned circuit. The output is capacity-coupled to the next amplifier stage (Q3).
  - (2) Capacitors C27, C28, C29, diodes CR3 and CR4, and resistors R25, R26 and R33 (driven by the secondaries of transformers T4 and T6) comprise the phase detector. The secondary of transformer T6 is the output from the buffer amplifier of the sso, which is the reference signal from the phase-detection process. The transmitter phase detector is the same circuit as that used in synthesizer phase comparator A17A. The detailed functioning of operation is explained in paragraph 2-28b. The phase detector compares the difference in phase between the 11.5-mc transmitter IF and the reference signal by detecting both signals equally across diodes CR3 and CR4. The resulting output is a dc voltage on the apc line which is proportional to the instantaneous phase difference of the two injections. If either injection changes in phase, the apc voltage will change, therefore changing the transmitter vfo phase. Since the sso is frequency-modulated, the modulation will appear as phase error on the apc line at the phase detector output. This phase error will modulate transmitter vfo A38. Resistors R27 and R28 and capacitor C30 comprise the antihunt filter in the phase-lock loop which prevents undesired loop oscillations.
  - (3) Transistors Q6 and Q7 and transformer T7 are coupled through the phase detector to form a 100-cps sweep oscillator. The 100-cps sweep oscillator voltage from T7 is connected to the dc reference point in the phase detector. The polarity of the voltage is such that when it is allowed to pass through the T4 secondary, diodes CR3 and CR4, and resistors R25, R26, and R33 (with a small amount of attenuation to the base of transistor Q6), the circuit oscillates at approximately 100 cps with an amplitude of 10 volts peak-to-peak.
  - (4) The base of Q6 is also the apc output of the module; therefore, the sweep signal is formed. At the transmitter vfo sweeps through a range of frequencies, the transmitter IF changes frequency. When the IF equals that of the sso, phase lock occurs. The phase detector then generates a dc voltage which opposes the 100-cps voltage from T7, keeping the apc and Q6 base voltage constant. At this point, the sweep oscillator has been overridden by the phase detector and oscillations cease.
  - (5) Power to the frequency control module is supplied from the + 12.5-volt transmit B+ line. The 12.5-volt battery supply is passed through transistor Q1 to produce a regulated 9.5 volts dc for the module circuitry. The +10 volts from voltage regulator A16A (9.5 volts dc nominal) provide the reference level for series regulator Q1; diode CR1 is used to clamp the base voltage of regulator Q1 at a reference

voltage level of +10 volts, and capacitor C33 decouples RF from the 12.5 volts supply.

## 2-16. Synthesizer Variable Frequency Oscillator Module A39A

(fig. 2-5)

Variable frequency oscillator Q1 functions as the local oscillator during reception and as the master oscillator during transmission. The vfo is a modified Hartley type that generates a signal in the frequency range of 41.50 mc to 64.45 mc. The tank circuit for Q1 receives an automatic phase control dc voltage from module All (para 2-29). The apc voltage is applied to capacitance diode CR1. The effective capacitance of CR1 varies with the voltage applied to it. Capacitance diode CR1 is connected across the vfo tank. Any vfo output frequency deviation will develop an error signal and cause a change in the apc voltage that will change the effective capacitance of CR1; this condition causes the vfo output to return to its proper frequency. The vfo has outputs to the fss buffer and the mixer buffer. The fss-buffer provides gain isolation, and proper match for the vfo signal applied to the fss. The second vfo output is applied to mixer buffer Q2. The output from this mixer buffer drives receiver mixer A35A and transmitter mixer A50.

### a. Synthesizer Vfo Q1.

- (1) Collector-to-emitter feedback through capacitors C2 and C3, and transformer T1 maintains oscillation in Q1. The tuned circuit consists of transformer T1, trimmer capacitors C14, fixed capacitor C15, capacity diode CR1, and ganged tuning capacitors C1E and C1F which are varied by the tuning controls on the front panel. Trimmer capacitor C10 controls the effect of CR1.
- (2) Input error signals from the frequency synthesizer system are applied through a filter network consisting of inductor L5 and capacitor C9, and through isolating resistor R10 to capacitance diode CR1. The capacitance of CR1 varies directly with the applied error voltage to correct the output frequency of the vfo. The automatic phase control voltage from module A11A can be measured at test jack J3.
- (3) Resistors R1 and R2 develop the base bias for Q1. Resistor R3 is the emitter swamping resistor. The RF signal at the tuned circuit can be measured at test jack J4.
- (4) Capacitors C1 and C2 (in the chassis) are RF bypass capacitors on the automatic phase control voltage line. Capacitor C9 (in the chassis) is an RF bypass capacitor on the + 10-volt regulated input line.

### b. Fss Buffer Amplifier Q3.

- (1) The output from the vfo is applied through

coupling capacitor C11 to the base of Q3. Transformer T2 couples the output of this stage to the input of the fss.

- (2) Voltage-divider resistors R12 and R13 develop the fixed base bias for Q3. Resistor R14 is the emitter swamping resistor. Capacitor C12 is the RF bypass capacitor for the emitter. Inductor L3 and capacitor C13 form a filter network to prevent RF leakage into the power supply.

c. *Mixer Buffer* Q2. The mixer buffer acts as an emitter follower to isolate the synthesizer vfo from transmitter mixer module A50 and receiver mixer module A35A. The vfo input is through resistor R4 and capacitor C4 to the base of Q2. Resistors R5 and R6 provide base bias for Q2. The output signal is taken from the emitter across resistor R7 and through capacitor C5 to resistors R8 and R9 which separate the signal into two outputs. One output is fed through resistor R8 to A50 (xmtr mixer); the other output is fed to A35A (rec mixer).

## 2-17. Transmitter Mixer Module A50

(fig. 2-6)

a. The transmitter mixer functions only during transmission. The transmitter vfo, A38, signal is fed through isolation resistor R2 and coupling capacitor C1 to the base of the transmitter mixer, Q1. The synthesizer vfo output is applied through resistor R1 and capacitor C1 to the base of Q1.

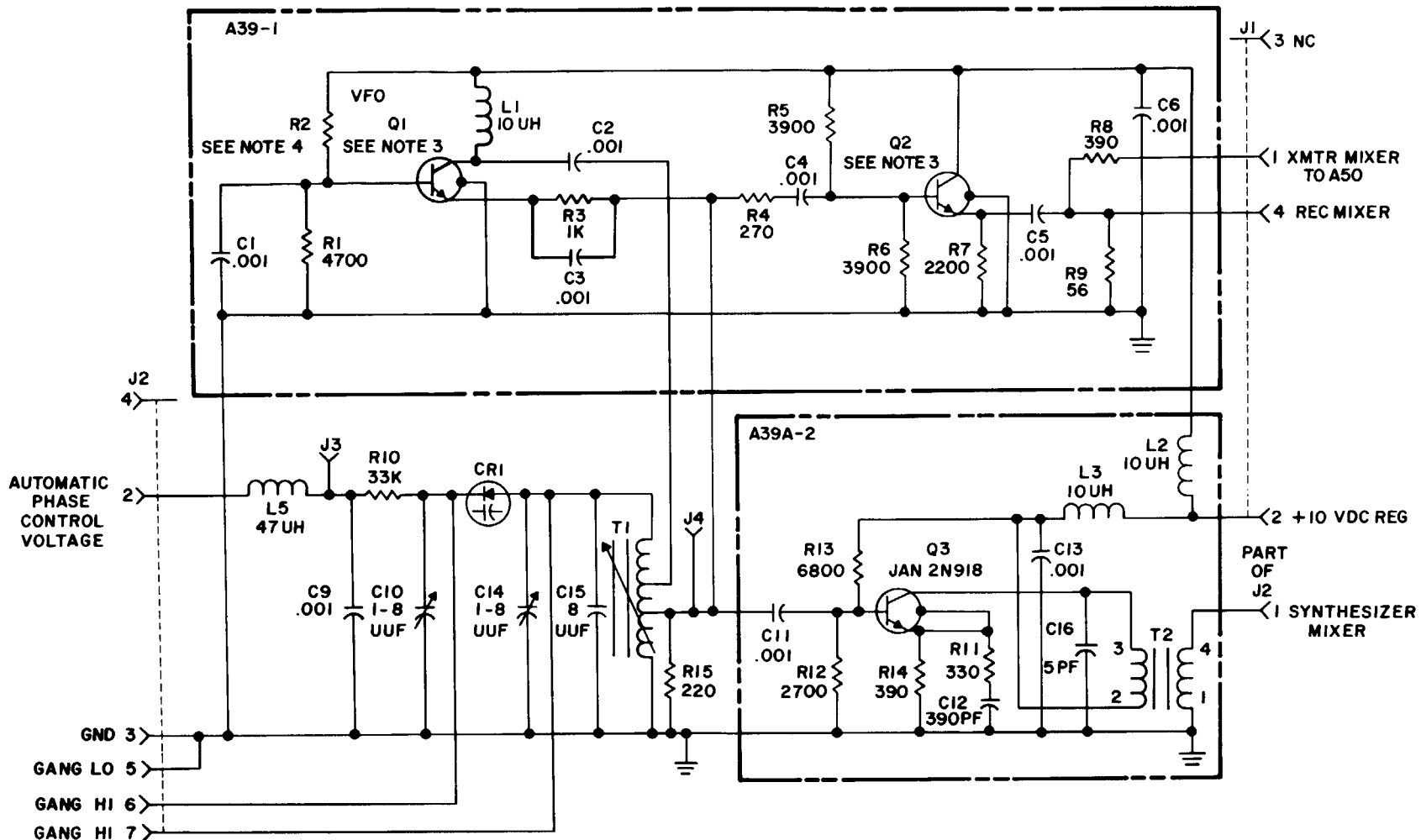
b. The mixer heterodynes the two vfo signals to form the 11.5-mc transmitter IF signal. The 11.5-mc signal is fed through a pi-matching network consisting of C3, C4, C5, and L2 to become the 11.5-mc transmitter IF output signal to frequency control module A31.

## 2-18. Transmitter Variable Frequency Oscillator Module A38

(fig. 7-28)

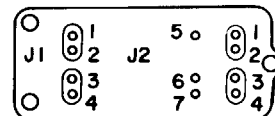
Variable frequency oscillator Q1 functions as the transmitter power oscillator and is operative only during the transmit mode. The vfo is a modified Hartley oscillator, band switched to generate 30.00 mc to 75.95 mc in two bands (30.00 to 52.95 mc and 53.00 to 75.95 mc). The apc voltage from frequency control module A31 is applied to capacity diode CR1 in the vfo tank circuit. The capacity change of the diode causes the vfo frequency to vary with the apc voltage. The apc voltage therefore corrects any frequency error of the vfo. The transmitter vfo is phase-locked to synthesizer vfo A39A (para 2-16) and the sso which is also in frequency control module A31 (para 2-15a). The vfo output is coupled through buffer amplifier Q2 to the transmitter mixer (module A50). A second vfo output is coupled through buffer amplifier Q3 to ipa module A37 (para 2-19).

a. *Variable Frequency Oscillator* Q1. Transistor



NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE PART DESIGNATION WITH A39A.
3. FOR TRANSISTORS Q1 AND Q2 SEE SM-B-620789.
4. SELECT A VALUE OF R2 FROM 10K, 11K OR 12K OHMS TO MEET THE MODULE OUTPUT REQUIREMENTS AS SPECIFIED IN TEST PROCEDURE SC-A-405593.



BOTTOM VIEW OF MODULE A39A.

EL4FDO05

Figure 2-5. Synthesizer variable frequency oscillator module A39A, schematic diagram.

stage Q1 oscillates at a frequency determined by the oscillator tank. The oscillator tank is band switched by S1, which is positioned by the BAND switch control on the front panel. The capacity diode CR1 is switched by S1, so that it is always across the oscillator tank. Transformer T1 and capacitors C2 and C3 comprise the fixed low-band tuning elements. Transformer T2 and capacitors C8, C9, and C10 comprise the fixed high-band tuning elements which are switched by S1. Variable gang capacitors C1C and C1D provide continuous tuning across the band. Figure 7-28 shows the position of switch S1 when the BAND switch is set at 30-52 for low-band operation. Variable gang capacitor C1C and capacitor C17 adjust the coupling of CR1 into the tank circuit in a continuous manner so that the modulation sensitivity is constant across the band. Since the apc voltage range from the phase detector is the same for all frequencies, the catch range of the transmitter loop is mainly a function of the vfo modulation sensitivity at CR1. By keeping this constant, the catch range of the transmitter vfo is nearly constant across the full range of frequencies, 30.00 mc to 75.95 mc. Capacitors C6 and C7 couple Q1 to the oscillator tank. Capacitor C5 is an RF bypass. Inductor L2 and resistors R2, R3, R4, and R5 comprise the dc bias circuitry.

*b. Buffer Amplifiers Q2 and Q3.* Buffer amplifiers Q2 and Q3 are identical. Each transistor stage is a common-emitter broadband amplifier with a taped transformer in the collector. The output is capacity coupled from transformers T3 and T4 by capacitors C12 and C15, respectively.

### 2-19. Transmitter Intermediate Power Amplifier Module A37

(fig. 2-8)

The intermediate power amplifier module (ipa) amplifies the signal from the transmitter vfo (A38) and drives the transmitter power amplifier (A36). The amplifier has approximately 20-db power gain. The ipa is comprised of a common-emitter amplifier, Q1, with a transformer-coupled input, T1, and a transformer-coupled output, T2, which drives a bootstrap amplifier, Q2. The ipa is a broadband amplifier covering the frequency range of from 30 mc to 76 mc, without band switching or other external tuning means. Transformers T1 and T2 are broadband; resistor R1 terminates the module input; and diode CR1 provides temperature compensation for Q1. Resistor R4 is the collector load which assures wide bandwidth; inductors L2 and L3 are shunt peaking coils which together with capacitor C4 increase the high-frequency response. Capacitors C6 and C7 remove high-frequency parasitic due to Q2 collector lead inductance. Power is supplied from the 12.5-volt transmit B+ line by receive-transmit relay K2.

### 2-20. Transmitter Power Amplifier Module A36

(fig. 7-13)

The transmitter power amplifier (pa) amplifies the ipa output to 2 watts of RF power and feeds it to antenna relay K1 in receiver input module A32 (para 2-1a and 2-6). The pa is a class-C, common-emitter, transistor power amplifier with single-tuned input and output circuits. The pa tank module contains two switches, S1 and S2, which are positioned by the BAND switch control on the front panel. Switch S1 switches the input tuned circuit; S2 switches the output tuned circuit. On figure 2-9, both switches are shown as they are positioned when the BAND switch is set at 30-52 for low-band operation.

#### *a. Low-Band Tuned Circuits.*

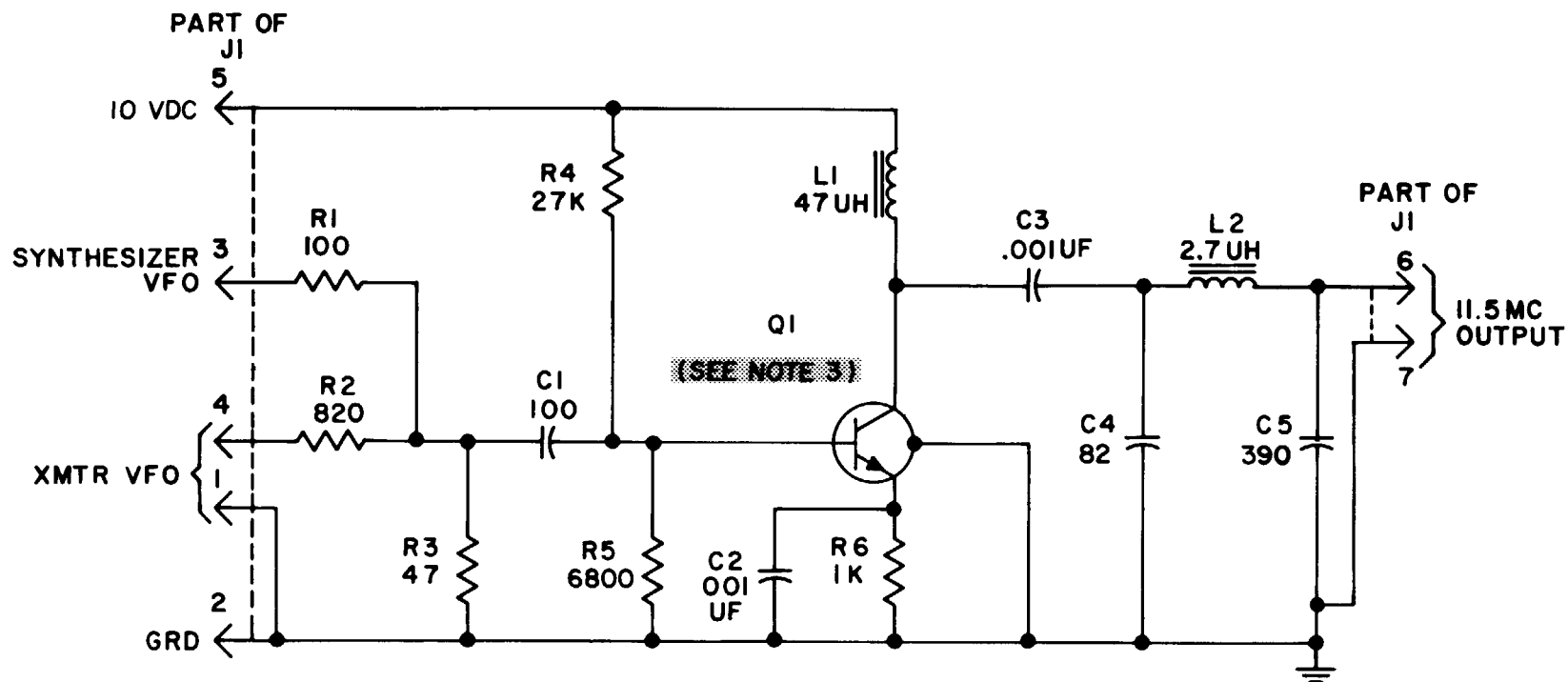
- (1) Switch S1 connects the low-band input fixed tuning elements to the module input and the base of transistor Q1. Transformer T1 and capacitors C1, C2, and C1B comprise the tuned circuit. Variable gang capacitor C1B provides continuous tuning across the band. Inductors L1, L2, and L7, and capacitor C3 and the circuit match the base impedance of transistor Q1 to the ipa output impedance and suppress the harmonic frequencies.
- (2) Switch S2 connects the low-band pa output tuned circuit to the collector of transistor Q1 and to module output terminals. Transformer T3 and capacitors C8 and C9, and gang capacitors C1A comprise the tuned circuit. Inductor L5 matches the load impedance to the collector of transistor Q1. Inductor L6 and capacitor C10 form a low-pass RF filter to suppress harmonic radiation. The parallel combination of resistors R10 and R11 provides a load to the collector of Q1.

*b. High-Band Tuned Circuits.* The high-band input and output tuned circuits have the same configuration as the respective low-band circuits. The values of inductance and capacitance are different than the low band since the tanks are tuned to operate in the high-band frequency range of from 53.00 mc to 75.95 mc. Gang capacitors C1B and C1A provide continuous tuning for the input and output tuned circuits, respectively.

#### *c. Power Amplifier.*

- (1) Capacitor C19 is the base coupling capacitor for Q1. Inductor L9 and resistor R2 maintain the base bias for Q1. The module receives its dc power from the + 12.5-volt transmit B+ line through relay K2. Capacitors C16 and C17 and inductors L10 and L11 prevent RF leakage to the power supply.
- (2) Capacitor C11, diode CR1, and resistor R6 provide a load to the output of the input tank cir-





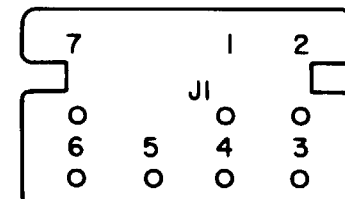
NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.

2. REFERENCE DESIGNATIONS ARE ABBREVIATED, PREFIX THE PART DESIGNATION WITH A50.

3. FOR TRANSISTOR Q1, SEE SM-D-620700.

BOTTOM VIEW OF MODULE A50



EL4FDO06

Figure 2-6. Transmitter mixer module A50, schematic diagram.



Figure 2-7 is replaced by Figure 7-28.

cuit on negative voltage swings.

- (3) Capacitor C20, resistors R7 and R8, and capacity diode CR2 minimize the output capacitance variation of transistor Q1 during each cycle of the output to prevent parasitic oscillations.

#### 2-21. **Antenna Loading Network Module A28** (fig. 2-9)

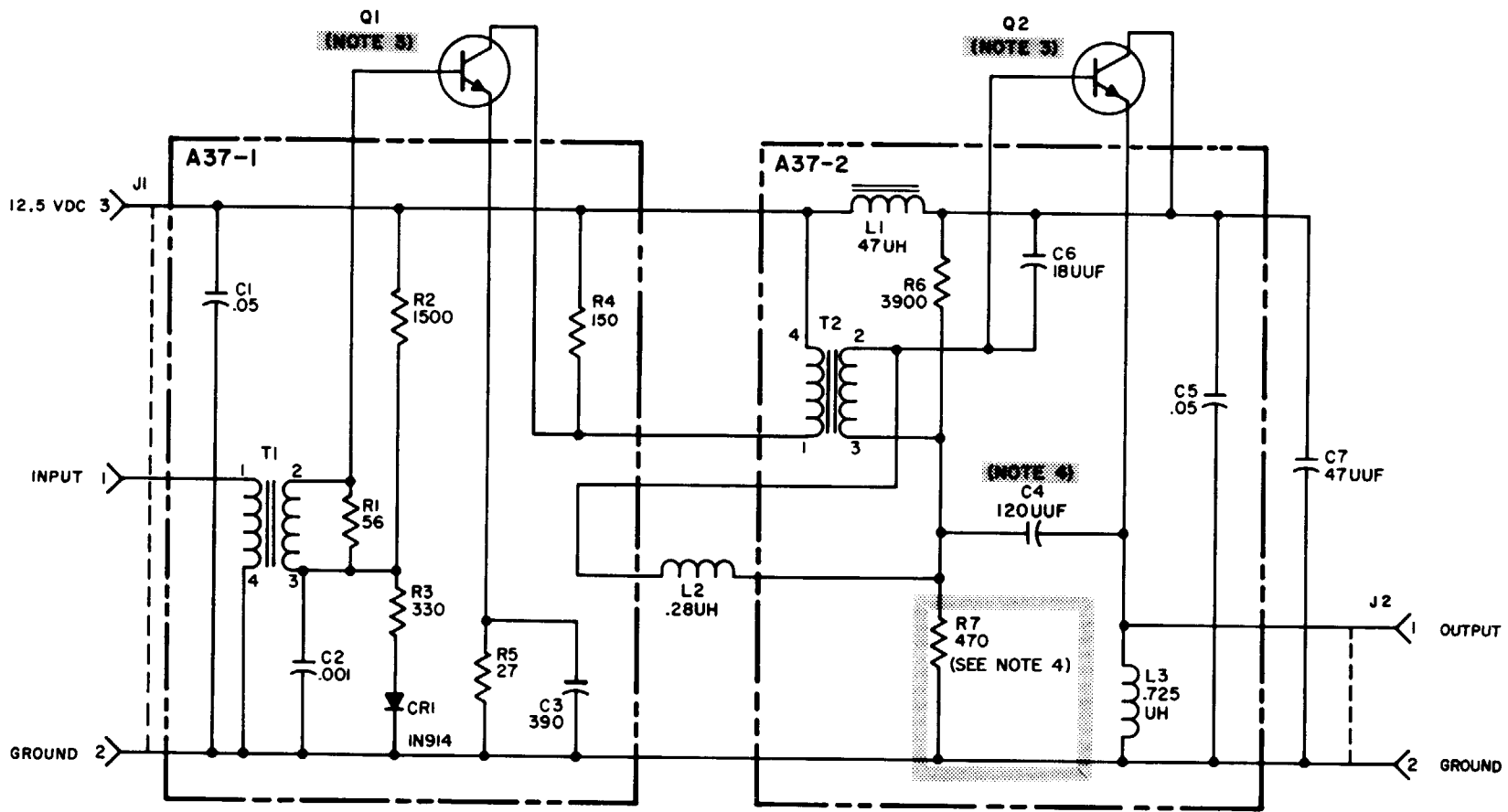
The antenna loading network matches the short or long antenna to the RT-841/PRC-77 by means of tuned coils and switching assemblies.

a. When the long antenna is used on the low band, a plunger of antenna post (ANT) connector J1 activates a leaf spring of the antenna loading network to engage microswitches S2 and S3. The long antenna is matched to 50 ohms with fixed inductor L4 and gang capacitor C2A through the contacts of S1. The proper selection

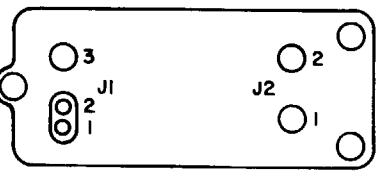
of S1 contacts is provided by the BAND switch control on the front panel.

b. When the long antenna is used on the high band, switches S1, S2, and S3 select variable inductor L1 and capacitor C2 in series with the antenna to provide tracking.

c. With the short antenna, microswitches S2 and S3 are open circuits. On the low band, switch S1 selects fixed capacitor C1 and variable inductor L3 in series with the antenna. Fixed capacitors C1 and C2 and variable inductor L2 are selected by S1 on the high band and are placed in series with the short antenna to provide a match of the antenna impedance to the 50-ohm impedance at antenna connector (ANT) J2. Variable inductors L1, L2, and L3 and gang capacitor C2A are driven by the frequency selector mechanism to provide continuous tuning of the matching network.



BOTTOM VIEW OF MODULE A37



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED, PREFIX THE PART DESIGNATION WITH A37.
3. FOR TRANSISTORS Q1 AND Q2 SEE SM-C-820774 FOR SPECIFICATION.

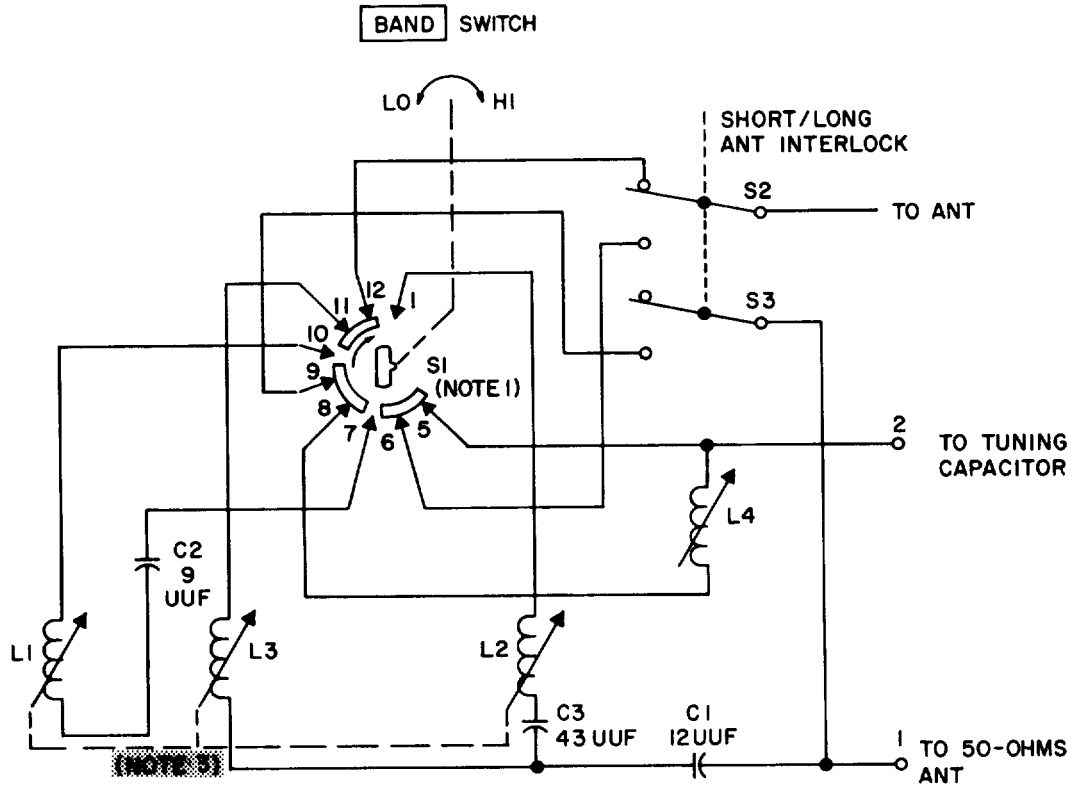
Figure 2-8. Transmitter intermediate power amplifier module A37, on board A49, schematic diagram.

Change 2

2-19

EL4FDO08

TM 11-5820-667-35



NOTES:

1. SWITCH S1 SHOWN IN CCW POSITION VIEWED FROM CONTROL END OF SHAFT.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED, PREFIX THE PART DESIGNATION WITH A28.
3. INDUCTORS L1, L2, AND L3 ARE DRIVEN BY THE FREQUENCY SELECTIVE MECHANISM.

EL4FD040

Figure 2-9. Antenna network module A28, schematic diagram.

## Section IV. SYNTHESIZER SYSTEM CIRCUIT ANALYSIS

**2-22. Frequency Synthesizer System First Mixer Module A44A**

(fig. 2-10)

**NOTES**

Module A44A is an improved version, developed to overcome false lock on the operating frequency other than that selected by the tuning controls.

Fss first mixer module A44A heterodynes the output of vfo module A39A (para 2-16) with the output of 1 mc spectrum generator module A45A to produce a band of frequencies around 53 mc. This output is supplied to 53 mc filter A43 (para 2-25). This fss first mixer contains the fss first buffer amplifier and a mixer circuit.

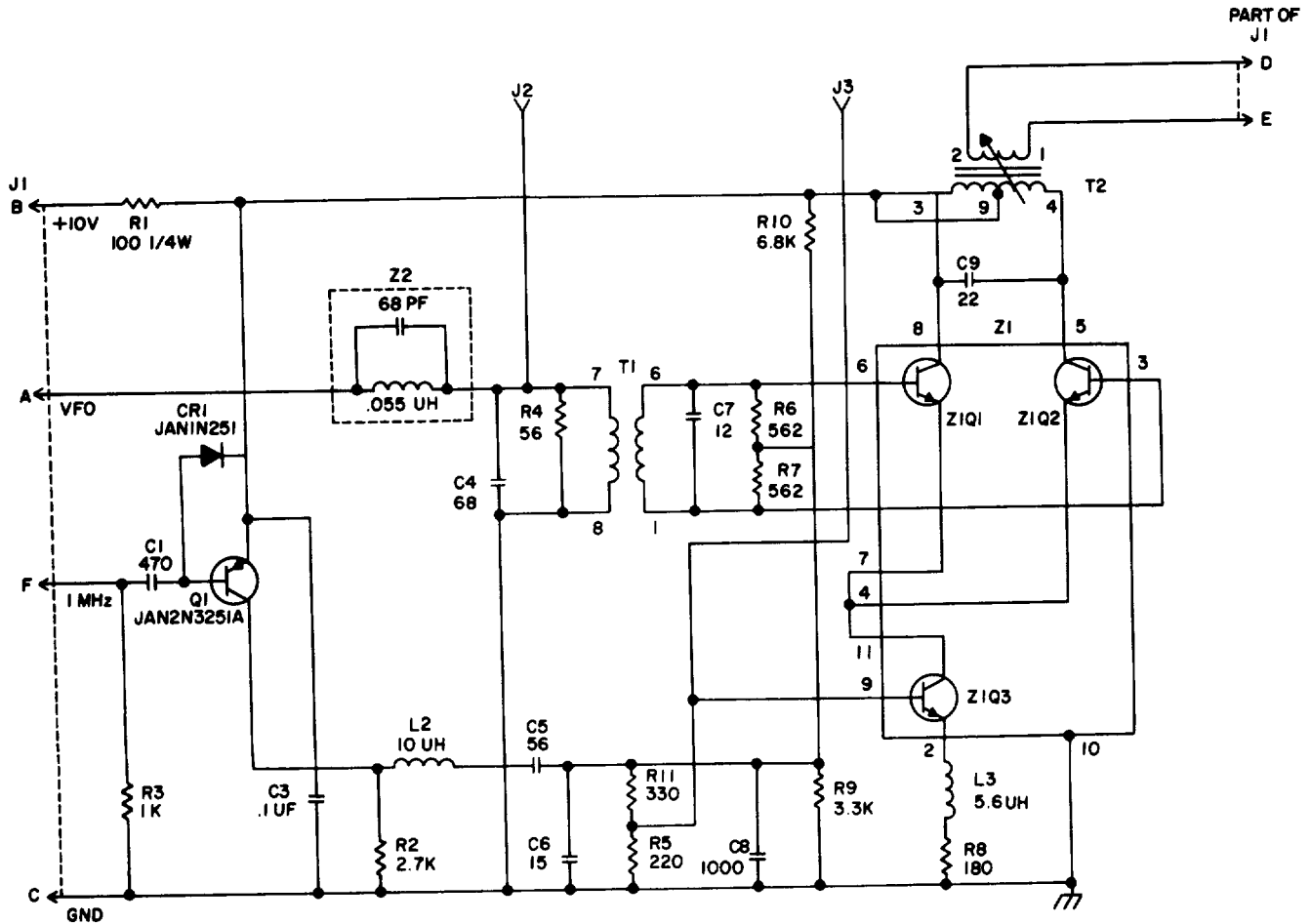
a. The rf input signal from synthesizer vfo A39A is applied through filter network Z2 which suppresses the spurious second harmonic of the rf signal. Z2 is a parallel-resonant circuit at approximately  $84 \pm 1$  mc. Capacitor C4 tunes the primary of transformer T1 to approximately 53 mc (for frequencies between 41.50 and 64.45 mc). Resistor R4 loads the primary to make its response broad and, together with capacitor C4, causes the input to be approximately 50 ohms (the proper termination for the preceding vfo A39). Capacitor C7 and transformer T1 form an isolating tuned network to provide a balanced signal level to the bases of mixer transistors Z1Q1 and Z1Q2. Resistors R6 and R7 are a voltage divider network which establishes these balanced signal levels and determines the input impedance to transistors Z1Q1 and Z1Q2. Resistors R19 and R9 are bias resistors for Z1Q1 and Z1Q2. Capacitor C8 bypasses the rf signal at the junction of resistors R6 and R7.

b. The first mixer buffer Q1 provides isolation and low power gain for the 1-mc spectrum from spectrum generator A45A. The spectrum signal is applied through terminating resistor R3 and applied through coupling capacitor C1 to the base of transistor Q1.

Diode CR1 provides emitter-to-base biasing for transistor Q1 causing it to conduct only on negative-going pulses of the input spectrum signal. The output at the collector of Q1 is essentially a positive-going square wave signal across load resistor R2. The 1 MHz spectrum generator A45A output contains the first through 12th harmonic of the fundamental 1 MHz pulse. Since the signal level of each succeeding harmonic is reduced in signal level from the signal level of the preceding harmonic signal, the network consisting of inductor L2 and capacitors C5 and C6 is used to equalize the harmonic components of the generated spectrum. Capacitor C6 in this network transforms the 1 MHz spectrum a 0.05 microsecond pulse. The network is broadly tuned to 7mc. The resultant signal is a spectrum of sharply defined positive pulses applied across voltage dividing resistors R11 and R5 to transistor Z1Q3, which conducts only on positive pulses. The collector of Z1Q3 is common to the emitters of Z1Q1 and Z1Q2.

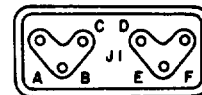
c. Transistors Z1Q1 and Z1Q2, connected in push-pull configuration, are operative only when proper bias is present at their emitters. Biasing is provided by transistor Z1Q3 conducting when a pulse is present at collector of Z1Q3. In this way, the vfo signal from transformer T1 is mixed with the 1-mc spectrum signals from transistor Q1 in the fundamental vfo signal and the sum and differences of the 1 MHz harmonics. Inductor L3 and resistor R8 limit the 1 MHz spectrum amplitude at harmonics above the twelfth. Transformer T2 and capacitor C9 provide a tunable balanced output circuit to compensate for the varying transistor impedances. The mixed signal in the secondary of transformer T2 is approximately 53 MHz which is applied to 53 MHz filter A43 (para 2-25).

d. The combination of resistor R1 and capacitor C3 prevent rf leakage into the +10 volt dc supply. The rf input signal from A39 can be measured at test jack J2. The input signal from A45 can be measured at test jack J3.



NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED, PREFIX THE PART DESIGNATION WITH A44A.
3. UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE 1/8 WATT.



BOTTOM VIEW OF MODULE A44A.

EL4F0010

Figure 2-10. Frequency synthesizer system first mixer module A44A, schematic diagram.



## 2-22.1. Frequency Synthesizer System First Mixer Module A44A.

(fig, 2-10.1 )

### NOTE

First mixer module is provided in two versions: A44 and A33A. Module A44A is an improved version, developed to overcome false lock on the operating frequency other than that selected by the tuning controls. Module A44 is discussed in paragraph 2-22; module A44A is discussed in this paragraph.

Fss first mixer module A44A heterodynes the output of vfo module A39 (para 2-16) with the output of 1-mc spectrum generator module A45 to produce a band of frequencies around 53 mc. This output is supplied to 53 mc filter A43 (para 2-25). This fss first mixer contains the fss first buffer amplifier and a mixer circuit.

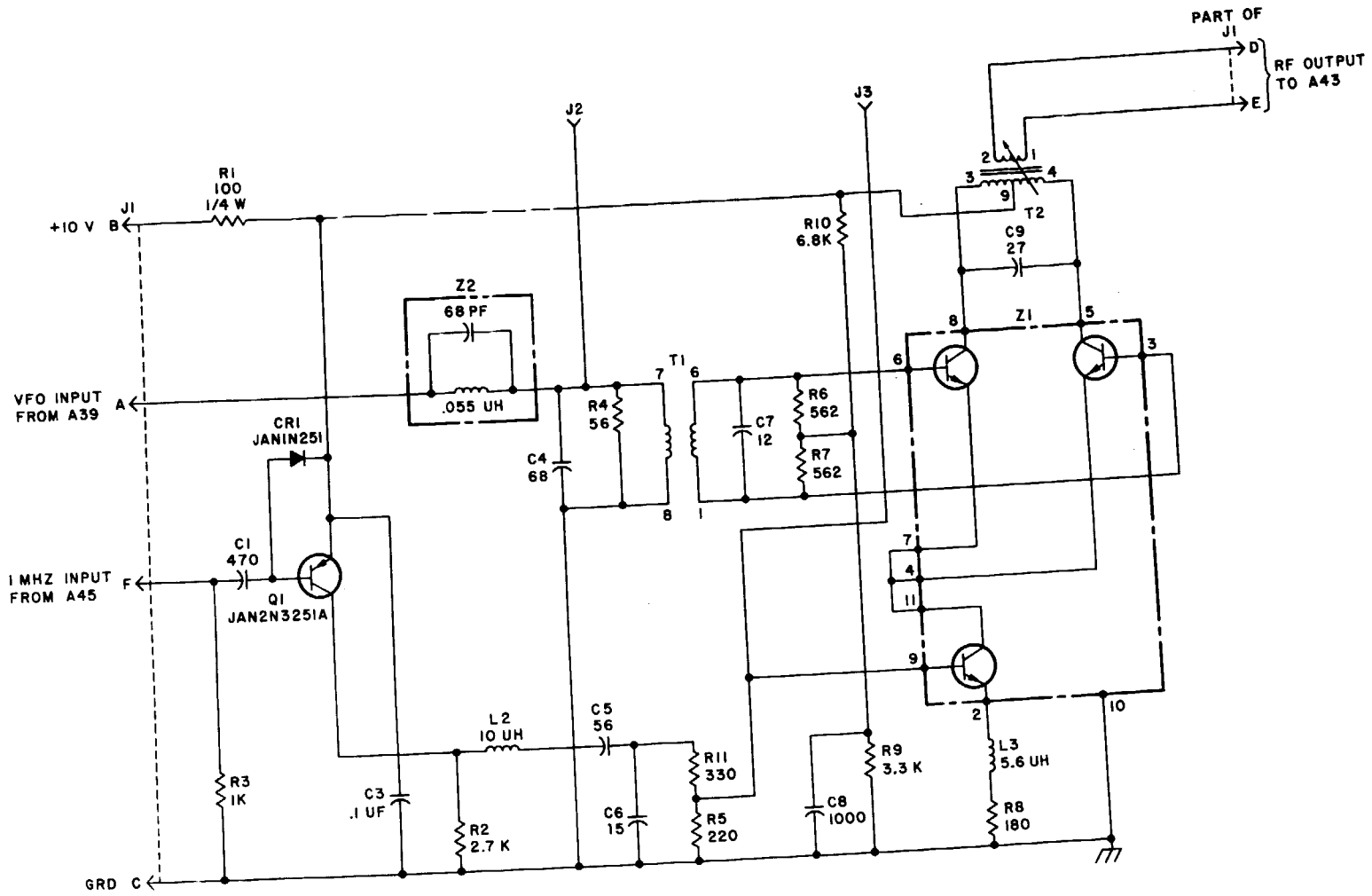
a. The rf input signal from synthesizer vfo A39 is applied through filter network Z2 which suppresses the spurious second harmonic of the rf signal. Z2 is a parallel-resonant circuit at approximately  $84 \pm 1$  mc. Capacitor C4 tunes the primary of transformer T1 to approximately 53 mc (for frequencies between 41.50 and 64.45 mc). Resistor R4 loads the primary to make its response broad and, together with capacitor C4, causes the input to be approximately 50 ohms (the proper termination for the preceding vfo A39). Capacitor C7 and transformer T1 form an isolating tuned network to provide a balanced signal level to the bases of mixer transistors Z1Q1 and Z1Q2. Resistors R6 and R7 are a voltage divider network which establishes these balanced signal levels and determines the input impedance to transistors Z1Q1 and Z1Q2. Resistors R19 and R9 are bias resistors for Z1Q1 and Z1Q2. Capacitor C8 bypasses the rf signal at the junction of resistors R6 and R7.

b. The first mixer buffer Q1 provides isolation and low power gain for the 1-mc spectrum from spectrum generator A45. The spectrum signal is applied through terminating resistor R3 and

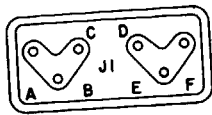
applied through coupling capacitor C1 to the base of transistor Q1. Diode CR1 provides emitter-to-base biasing for transistor Q1 causing it to conduct only on negative-going pulses of the input spectrum signal. The output at the collector of Q1 is essentially a positive-going square wave signal across load resistor R2. The 1-kc spectrum generator A45 output contains the first through 12th harmonic of the fundamental 1-mc pulse. Since the signal level of each succeeding harmonic is reduced in signal level from the signal level of the preceding harmonic signal, the network consisting of inductor L2 and capacitors C5 and C6 is used to equalize the harmonic components of the generated spectrum. Capacitor C6 in this network transforms the 1-mc spectrum a 0.05 microsecond pulse. The network is broadly tuned to 7mc. The resultant signal is a spectrum of sharply defined positive pulses applied across voltage dividing resistors R11 and R5 to transistor Z1Q3, which conducts only on positive pulses. The collector of Z1Q3 is common to the emitters of Z1Q1 and Z1Q2.

c. Transistors Z1Q1 and Z1Q2, connected in push-pull configuration, are operative only when proper bias is present at their emitters. Biasing is provided by transistor Z1Q3 conducting when a pulse is present at collector of Z1Q3. In this way, the vfo signal from transformer T1 is mixed with the 1-mc spectrum signals from transistor Q1 in the fundamental vfo signal and the sum and differences of the 1-mc harmonics. Inductor L3 and resistor R8 limit the 1-mc spectrum amplitude at harmonics above the twelfth. Transformer T2 and capacitor C9 provide a tunable balanced output circuit to compensate for the varying transistor impedances. The mixed signal in the secondary of transformer T2 is approximately 53 mc which is applied to 53-mc filter A43 (para 2-25).

d. The combination of resistor R1 and capacitor C3 prevent rf leakage into the +10 volt dc supply. The rf input signal from A39 can be measured at test jack J2. The input signal from A45 can be measured at test jack J3.



- NOTES:**
1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.
  2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE PART DESIGNATION WITH A44A.
  3. UNLESS OTHERWISE INDICATED, ALL RESISTORS ARE 1/8 WATT.



BOTTOM VIEW OF MODULE A44A

EL5820-667-35-CI-TM-12.1

Figure 2-10.1. Frequency synthesizer system first mixer module A44A, schematic diagram.

## 2-23. One-Mc spectrum Generator Module A45A

(fig. 2-11)

The 1-mc spectrum generator module (A45A) produces harmonics of 1.0 mc crystal-controlled oscillator for injection into fss mixer module A44A (para 2-22). Module A45A consists of a 1 mc crystal oscillator and a spectrum generator.

a. The 1-mc crystal oscillator is a modified Hartley type. Transistor Q1, fixed capacitor C2, coil T1, and series resonant crystal Y1 form the oscillator circuit. Resistors R1 and R2 form a voltage divider which provides the fixed bias portion of emitter base bias. Resistor R3 is the emitter swamping resistor for Q1. Capacitor C1 bypasses the base to ground.

b. The sinusoidal 1-mc oscillations are applied to spectrum generator Q2 through coupling capacitor C3. The spectrum generator is normally cut off by the reverse base bias applied through R4, and conducts only on the negative half cycles of the 1-mc signal. A positive pulse, rich in harmonics, is developed in the collector output. This output is applied across transformer T2 and coupled to first mixer module A44A.

c. Capacitor C5 broadly tunes output transformer T2 to 7 mc. Capacitor C4 is an emitter bypass. Resistor R5 is the emitter swamping resistor for Q2. The 10-volt dc supply is decoupled from the 1-mc spectrum generator by coil L1 and capacitor C6.

## 2-24. Interval Oscillator Module A40A

(fig. 7-24)

Interval oscillator module A40 supplies the fss with two crystal-controlled signals. This module has two crystal-controlled oscillators: Q1 generates frequencies of 46.85 mc to 47.75 mc in 100-kc increments, and Q2 generates frequencies of 5.60 and 5.65 mc. The 10-volt B+ is applied to the module during the transmit and receive modes. The frequencies of the two oscillators are the same for both modes.

a. *Oscillator Q1, 46.85 to 47. 75 Mc.*

(1) Transistor Q1 is connected in a crystal-controlled oscillator that uses 1 of 10 crystals. Crystal selection is determined by the kc tuning control on the front panel through switch S1B. The tuned collector circuit is composed of capacitors C1 and C2 and the primary of transformer T1. Oscillation is sustained by feeding back part of the energy in the collector bank through capacitor C1 to the emitter. Resistor R4 is the tuned circuit damping resistor. The crystal supplies low impedance to base Q1 at the frequency of series resonance to provide sufficient gain for oscillation.

(2) Resistors R2 and R21 thru R30 form a voltage-divider network which develops the base bias for Q1. Resistor R3 is the emitter swamping resistor. Resistor R18, inductor L1, and capacitors C16 and C3 form a filter network in the +10-volt supply to Q1. The rf output of Q1 can be measured at test J2.

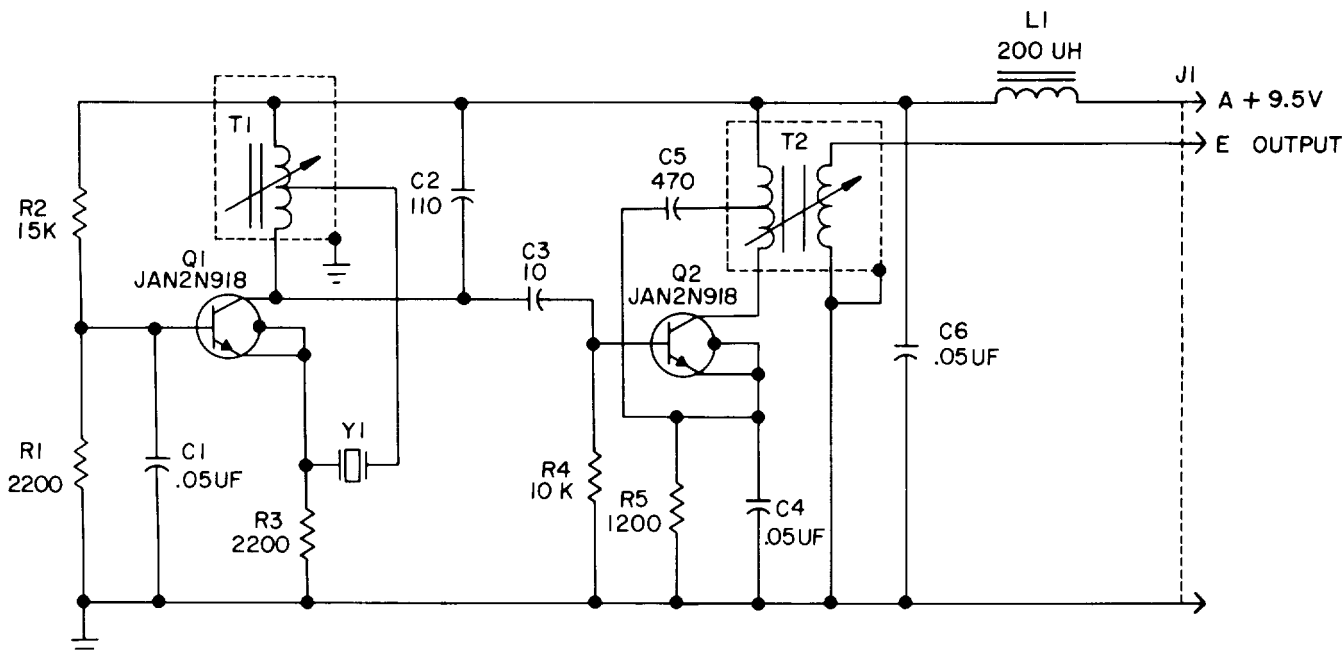
(3) As switch S1B is rotated by the kc tuning control from 0.00 to 0.95 mc the sequence of frequencies will be: once 46.85; twice each 46.95, 47.05, 47.15, 47.25, 47.35, 47.45, 47.55, 47.65, 47.75; and finally 46.85 again.

b. *Oscillator Q2, 5.60 or 5.65 Mc.*

(1) Transistor Q2 is connected in a crystal-controlled oscillator circuit that uses one of two crystals to generate the frequency reference for phase comparison in module A17A. The tuned collector circuit is made up of capacitors C9 and C10 and the primary of transformer T2. Oscillation is sustained by feeding back part of the energy in the collector circuit from the junction of C9 and C10 to the selected crystal ((2) below), and the contacts of S1A to the emitter of Q2; this action completes the regenerative circuit.

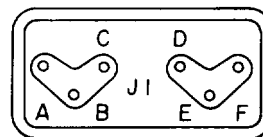
(2) Crystal selection is determined by the frequency selected by the kc tuning control on the front panel. If the RT-841/PRC-77 is operating on a 100-kc channel (31 .10 mc, 74.20 mc, etc), S1A will be in the position shown on figure 7-24 and crystal Y11 (5.65 mc) will be selected through contacts 8 and 11 of S1A; this action completes the regenerative circuit to the emitter of Q2. If the





**NOTES:**

1. UNLESS OTHERWISE SPECIFIED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE PART DESIGNATION WITH A45A.



BOTTOM VIEW OF MODULE A45A .

EL4FDOII

**Figure 2-11. One-megahertz spectrum generator module A45A. schematic diagram.**

RT-841/PRC-77 is operating on a 50-kc channel (31.15 mc, 74.25 mc, etc), S1A will be turned clockwise one position from that shown and crystal Y12 (5.60 mc) will be connected through contracts 8 and 9 of S1A; this action completes the regenerative circuit to the emitter of Q2.

- (3) Capacitor C8 is a coupling capacitor between the base and collector circuit. Resistors R10, R11, and R12 develop fixed bias.

**c. Buffer QS.**

- (1) The output from oscillator Q2 is coupled through transformer T2 to the base and emitter of Q3. The buffer isolates Q2 from any varying loading effects.
- (2) Resistors R15 and R16 develop fixed-base bias. Resistor R13 is the emitter swamping resistor. Capacitors C11 and C13 are RF bypass capacitors. Inductor L2 and capacitor C15 form a decoupling network to prevent RF leakage into the power supply. The RF output from Q3 can be measured at test jack J3.

**2-25. Filter A43, 53-Mc (fig. 2-12)**

The 53-mc filter has two input signals.

a. The output signal from 100-kc interval oscillator module A40A is coupled through isolation resistor R1 and a matching network consisting of capacitors C6 and C7 and transformer T3 to fss second mixer module A12A (para 2-26). This circuit minimizes spurious frequency injection into the second mixer.

b. The 53-mc signal from first mixer module is coupled to the filter through transformer T1 to a triple-tuned network. The three tuned circuits are the secondary of T1 and C1, L1 and C3, T2 and C5. Capacitors C2 and C4 are coupling capacitors. This triple-tuned network provides 3 mHz bandpass at the 3-decibel (db) points. The output of this network is coupled to second mixer module A12A.

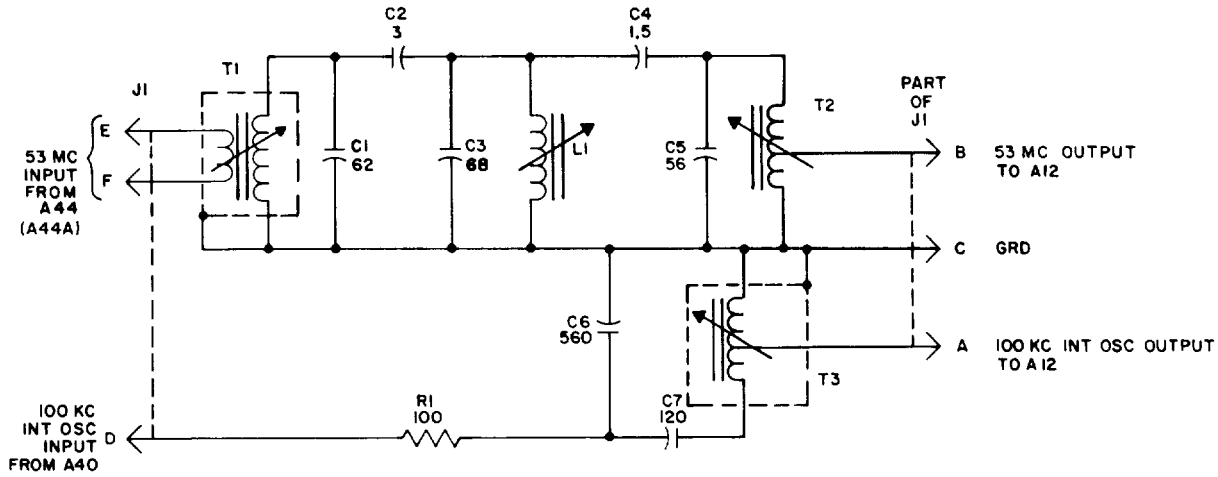
**2-26. Frequency Synthesizer System Second Mixer Module A12A (fig. 2-13)**

The fss second mixer module heterodynes the output from 53-mc filter A43 (para 2-25) with the 46.85- to 47.75-mc output of the 100-kc interval oscillator (applied through A43) to produce an fss IF of 5.60 or 5.65 mc. This output is applied to fss IF amplifier module A18A (para 2-27).

- a. The 53-mc input from module A43 is coupled

through capacitor C1 to the base of Q1. The 46.85- to 47.75-mc input from A43 is coupled through capacitor C2 to the emitter of Q1. Transistor Q1 heterodynes

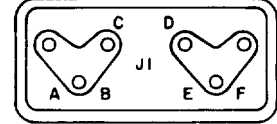
these two input signals; the resultant output signals at the collector of Q1 are applied to the frequency selective network.



**NOTES:**

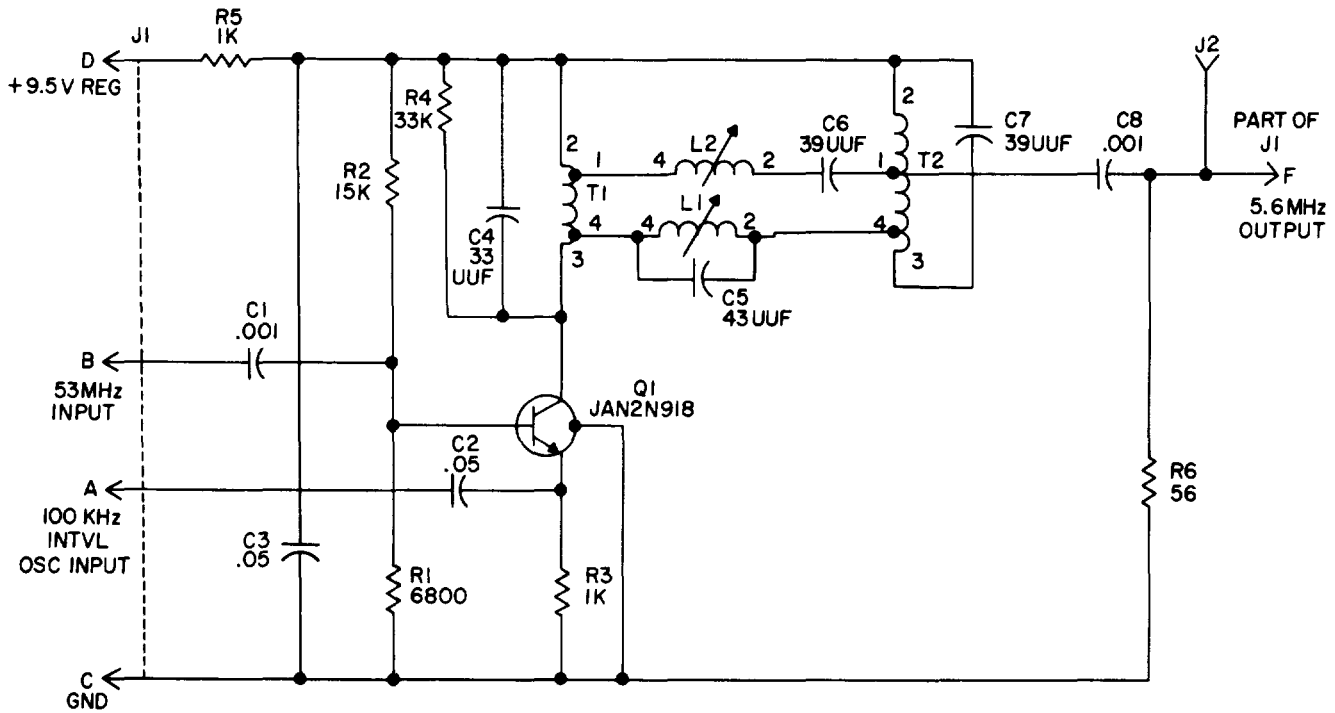
1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED PREFIX THE PART DESIGNATION WITH A43.

BOTTOM VIEW OF MODULE A43



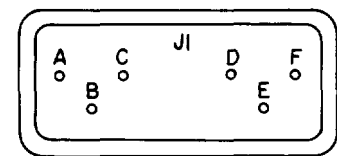
TM5820-667-35-14

Figure 2-12. 53-megahertz filter module A43, schematic diagram.



**NOTES :**

1. UNLESS OTHERWISE SPECIFIED, CAPACITOR VALUES ARE IN UF.
2. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS.
3. REFERENCE DESIGNATIONS ARE ABBREVIATED, PREFIX THE PART DESIGNATION WITH A12A.



**BOTTOM VIEW OF MODULE A12A**

**EL4FDO13**

Figure 2-13. Frequency synthesizer system second mixer module A12A, schematic diagram,

b. The frequency selective network is composed of capacitors C4 through C7, variable transformers T1 and T2, and variable inductors L1 and L2. The outputs from Q1 are the two original frequencies plus their sum and difference. The frequency selective network passes only the difference frequency. The network is a bandpass filter which has a flat characteristic resonant frequency of 5.6 mc.

c. Resistor R5 and capacitor C3 filter RF signals from the + 10-volt dc supply. Resistors R1 and R2 provide the fixed-base bias. Resistor R3 is the emitter swamping resistor. Resistors R4 and R6 terminate the filter properly and minimize variations due to the varying impedances of transistors. The radiofrequency (RF) output of module A12A can be measured at test jack J2.

**2-27. IF 5.6 mHz Amplifier Module A18A**  
(fig. 7-14)

The fss IF amplifier module (A18A) amplifies the 5.6-mc signal input from fss second mixer module A12A (para 2-26) and applies it to fss discriminator driver

module A11A (para 2-29) and phase comparator module A17A (para 2-28). The fss IF amplifier circuit consists of two cascaded, double-tuned, transformer-coupled amplifier stages. The signal amplitude applied to the fss IF amplifier is sufficient to cause limiting.

a. First IF Amplifier Q1.

- (1) The 5.6-mc IF signal from module A12A is coupled through capacitor C1. A12 is coupled through capacitor C1 to the base of Q1. The signal output is developed across the tuned collector circuit, consisting of variable inductor L1 and capacitor C3. The signal developed across this tuned circuit is coupled through capacitor C4 to a second tuned circuit consisting of capacitor C5 and the primary of tuned coupling transformer T1.
- (2) Resistors R1 and R2 form a voltage-divider network to develop the fixed-bias portion of the emitter-to-base bias of Q1. Resistor R3 stabilizes the emitter current. Capacitor C2 is an RF bypass capacitor for the Q1 emitter.

b. Second IF Amplifier Q2.

- (1) The amplified 5.6-mc signal from transistor Q1 is applied from the secondary of transformer T1 through coupling capacitor C6 to the base of Q2. The signal output is developed across resistor R12 and the tuned collector circuit consisting of variable inductor L2 and capacitor C8. Resistor R12 provides parasitic suppression. The signal developed across this tuned circuit is then coupled through capacitor C9 to the second tuned circuit, consisting of capacitor C10 and the primary of transformer T2.
- (2) Resistors R6 and R7 form a voltage divider network which develops the fixed-bias portion of the emitter-to-base bias of Q2. Resistor R5 stabilizes the emitter current. Capacitor C7 is a bypass capacitor for the center tap of transformer T1. Resistor R10, across the secondary of transformer T2, provides the proper output termination. The combination of inductor L3 and capacitors C11 and C12 prevents RF leakage into the +10-volt dc supply.
- (3) The RF output of module A18A can be measured at test jack J2.

#### 2-28. Phase Comparator Module A17A (fig. 2-14)

Phase comparator module A17A contains phase comparator driver Q1 and the phase comparator. The phase comparator compares the phase of the signal from fss IF module A18A (para 2-27) with that from interval oscillator module A40A (para 2-24). The input signal from A18A is initially generated by the vfo; the frequency of this signal may be varying. The signal from A40A is generated by a crystal-controlled oscillator; this signal is the reference frequency. The dc

output voltage, proportional to the phase difference, is the automatic phase control voltage applied to vfo module A39A (para 2-16). If the two signals are in phase, the apc voltage will assume a reference level to maintain the vfo output frequency. If a phase difference is detected, an error voltage is developed in the phase comparator. This change in apc voltage opposes any change in vfo output frequency by returning the vfo output to its correct frequency, and establishes a phase lock.

*a. Phase Comparator Driver.* The input from fss IF module A18A is coupled through capacitor C1 and resistor R8 to the base of phase comparator drive Q1. The amplified signal is coupled to the phase comparator by transformer T1. Resistors R1 and R2 form a voltage divider which provides the fixed-bias portion of the emitter-to-base bias. Emitter resistor R3 establishes the other fixed portion of the emitter-to-base bias and stabilizes the emitter current. Capacitor C2 is a bypass capacitor for the Q1 emitter. Capacitors C5 and C6 and inductor L1 form a pi-filter which prevents any RF signals from entering the 10-volt dc supply.

*b. Phase Comparator.* The phase comparator consists of the tapped secondary winding of T1, coupling capacitors C3 and C4, diodes CR1 and CR2, and resistors R4 and R5. The output voltage of the phase comparator depends on the phase relationship of the two signals applied to the circuit. The voltage output is pivoted about a +3.8-volt dc reference level at the junction of resistors R6 and R7 which is applied to the center tap of transformer T1 and, through the secondary winding of transformer T3 in module A40A, to the junction of diodes CR1 and CR2. This voltage is established by the divider action of resistors R6 and R7 which are connected across the 10-volt power supply. Capacitor C7 is an RF bypass capacitor.





work module A11A to the apc line. The change in apc voltage corrects the vfo output frequency and returns the apv voltage to the reference level when a phase lock is established.

- (6) The control voltage output of module A17 can be measured at test jack J2.

## 2-29. Frequency Synthesizer System Discriminator Module A11A

(fig. 2-15)

Fss discriminator driver module A11A extends catching range of the fss. It receives two input signals and develops the apc voltage in its output circuit. The two input signals are the fss IF signal from fss IF amplifier module A18A (para 2-27) and a dc voltage from phase comparator module A17A (para 2-28). The apc voltage is applied to the capacitance diode circuit of the vfo. If a phase-locked condition exists (that is, if the vfo is on frequency, the apc voltage will assume the reference level to maintain the vfo output on frequency. If the vfo output frequency changes, the fss discriminator will develop ac and dc hunting voltages. These error signals change the apc voltage applied to the frequency control circuit of the vfo, which shifts the vfo output frequency to within the pull-in and hold-in range of the phase comparator.

a. A signal from fss IF module A18A is applied to the base of discriminator driver Q1 through coupling capacitor C1. The signal is amplified by Q1 and applied to the discriminator (b below). Base-biasing voltage for Q1 is provided by voltage-divider resistors R1 and R2. Resistor R3 is the emitter swamping resistor for Q1. Resistors R4 and R7 provide series and shunt loading, respectively, for the collector tuned circuit. Capacitor C2 is an RF bypass capacitor for the Q1 emitter.

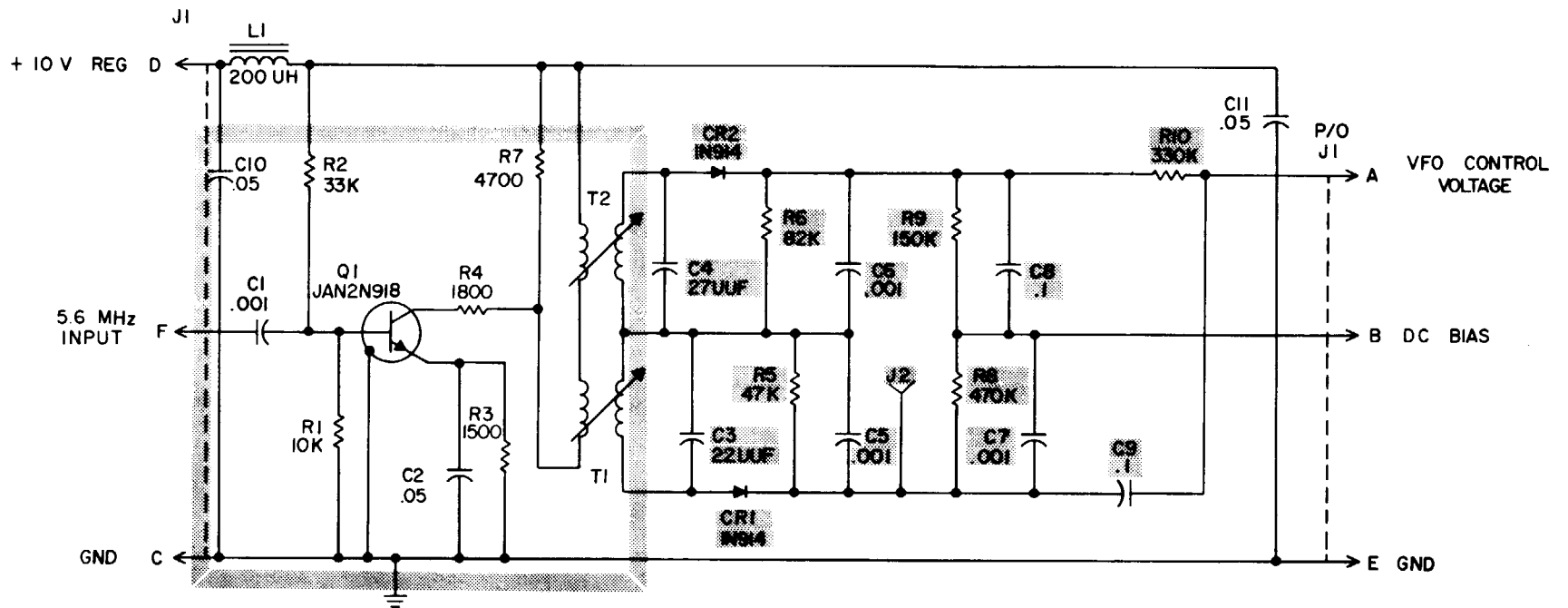
b. The discriminator is a Travis-type circuit. The tuned circuit, consisting of transformer T1 secondary and capacitor C3, is tuned to 5.95 mc. The tuned circuit, consisting of transformer T2 secondary and ca-

pacitor C4, is tuned to 5.25 mc. At the center frequency of 5.6 mc, both tank circuits have equal currents induced in them. The voltage rectified by diode CR1 and developed across resistor R5, is equal to the voltage rectified by diode CR2 and developed across resistor R6. Since these voltages are equal but of opposite polarity, there is no output. At frequencies above or below the signal center frequency, the voltage applied across resistors R5 and R6 are unequal and a resultant output voltage is developed. Capacitors C5 and C6 are RF filter capacitors across load resistors R5 and R6, respectively. The discriminator output can be measured at test jack J2.

c. The discriminator output is pivoted about the control voltage input from A17A at the junction of resistors R8 and R9. The larger portion of the discriminator voltage is developed across resistor R8, and is applied in series with the comparator output to the antihunt network (d below) through coupling capacitor C9 as the ac portion of the apc voltage. The remainder of the discriminator voltage developed across resistor R9; its polarity is opposite to that developed across resistor R8. This voltage, plus the phase comparator output dc voltage, is applied to the antihunt network through discriminator load resistor R10 as the dc portion of the apc voltage.

d. Both the ac and the dc portions of the apc voltage are applied through this network to the vfo. However, the main effect will occur on the ac portion (developed by the fss discriminator) since the higher the frequency of the error voltage, the higher the attenuation (by virtue of the ac shunting through capacitor C10). To prevent regeneration, this antihunt network damps the fss loop gain and stops the hunting action of the vfo when the phase comparator acquires control of the Vfo.

e. Choke L1 and capacitors C10 and C11 form a decoupling network to prevent rf from being coupled into the power supply.



NOTES:

1. UNLESS OTHERWISE INDICATED RESISTANCES ARE IN OHMS, CAPACITANCES ARE UF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED, PREFIX PART DESIGNATION WITH A11A.

BOTTOM VIEW OF MODULE A11A

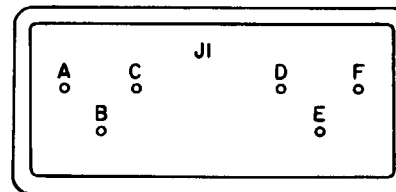
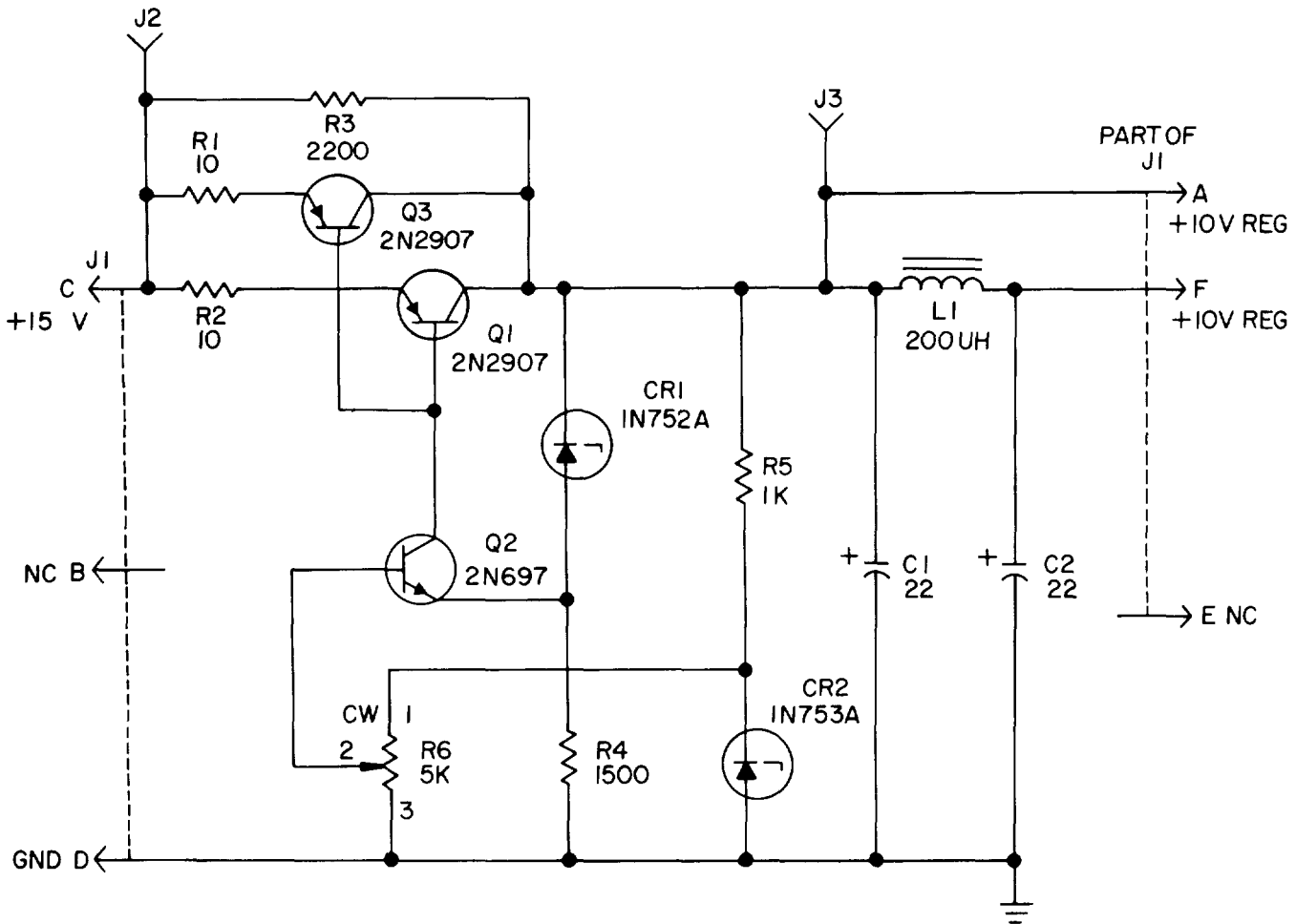


Figure 2-15. Frequency synthesizer system discriminator module A11A, schematic diagram.

**2-30. Voltage Regulator Module A16A**  
(fig. 2-16)

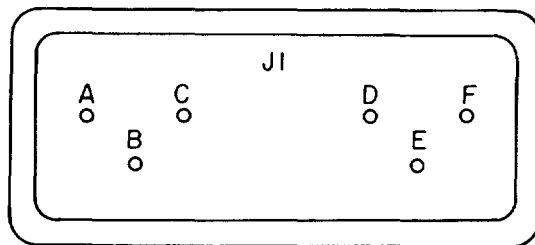
The voltage regulator circuit supplies the entire fss, including the vfo, with a regulated +10 volts dc (+9.5 volts dc nominal). The regulator uses two transistors (Q1 and Q3). (Q1) as a series regulator. Transistor Q2 operates as a dc amplifier. The combination of resistor R5, potentiometer R6, and diode CR2 form a constant reference voltage source for the base of the dc amplifier. The combination of diode CR1 and emitter resistor R4 forms a voltage divider. Any variation in output voltage appears across resistor R4, since CR1 maintains a constant voltage drop. When the output volt-

age increases due to a decrease in load or an increase in the input voltage, a proportional positive voltage increase appears at the emitter of dc amplifier Q2 and results in less current flow through Q2. The base of series regulator Q1 goes more positive; conduction through Q1 decreases, which effectively increases the impedance of series regulator Q1. The effect is a decrease in the regulator output; the circuit has compensated for the increase in output voltage. The opposite series of events takes place when the output voltage decreases because of a load increase or input voltage decrease. Potentiometer R6 varies the output voltage of the voltage regulator to provide a nominal output of



**NOTES:**

1. UNLESS OTHERWISE SPECIFIED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE PART DESIGNATION WITH A16A.



**BOTTOM VIEW OF MODULE A16A**

EL4FDO16

Figure 2-16. Voltage regulator module A16A, schematic diagram

9.5 volts dc. The regulator provides two + 10-volt outputs, one filtered and one unfiltered. The filtered output is filtered by a pi-filter network consisting of coil L1 and capacitors C1 and C2. The filtered output is supplied to modules A44A (para 2-22) and A45A (para 2-23). The unfiltered output is supplied to the remainder of the circuits requiring regulated +10 volts. The unregulated input voltage to module A16A can be

measured at test jack J2; the regulated output voltage from module A16A can be measured at test jack J3.

**NOTE**

All references to +10 volts dc regulated imply that voltage regulator A16A supplies this voltage. The nominal output of A16A is +9.5 volts dc.

*Figure 2-17. Deleted.*



## Section V. POWER DISTRIBUTION CIRCUIT ANALYSIS

### 2-31. Power Distribution

(fig. 7-25 and 7-26)

The primary power source for Radio Set AN/PRC-77 can be either a Magnesium Battery BA-4386/U or Lithium Battery BA-5598/U or an Amplifier-Power Supply Group OA-3633/GRC which is used when the RT-841/PRC-77 is operated in a vehicle. The power distribution described in b and c below is for use with the OA-3633/GRC. The power distribution, when a battery is used, is similar except that a shorting cap is installed on J3 which jumpers pins F and E and the battery is connected to J4 (J4-B is connected to J3-F by inductor L8).

### 2-32. Receive

(fig. 7-25)

When function switch S1 is at ON, and the handset push-to-talk button is not depressed, the RT-841/PRC-77 will receive. The input voltage from the primary power source is applied through connector J3.

a. The input voltage from pin E of connector J3 (+ 12.5 volts) is connected to contact 1 of S1 (rear). The + 12.5 volts is applied through contact 2 of switch S1 (rear) and pin C of connector A16AJ1 to the input of module A16A. Regulated + 10 volts from module A16A is applied through pin A16AJ1-F and the individual module connectors to (A44A) and A45A and through A16AJ1-A to modules A39A, A40A, A11A, A17A, A18A and A55. Regulated +10 volts is supplied from module A18A through contacts D of J14 and D of J 18 to module A12A. Regulated + 10 volts is also applied from J11-A through contacts 4 and 6 of transmit-receive relay K2, and choke L4 to module A35A, from contact 6 of K2 to module A21A and A34, and from contact 6 of K2 through choke L3 to module A33. Relay K2 opens these circuits during transmission. When function switch S1 is at SQUELCH, regulated +10 volts is applied from J11-A through contacts 4 and 3 of S1 (front) to module A54A. This circuit is opened when switch S1 is at positions other than SQUELCH.

b. When switch S1 is at SQUELCH, a ground is connected through contacts 8 and 10 of switch S1 (front) and through contacts 8 and 2 of deenergized SQUELCH relay K3 to terminal 9 of motherboard A57. This condition grounds the output of module A55, which prevents audio signals from being applied

to the handset. When K3 is energized, the ground is removed from contact 2 of K3 and applied to contact 3 of K3 to allow the audio output of module A55 to be applied to the handset. Relay K3 is energized by the squelch relay driver stage (Q5) in module A54A.

c. In the RETRANS mode, function switch S1 will move one position clockwise. During receive, dc voltage is supplied to A54A and to relay K3 from pin 6 of K2, and through contacts 3 and 5 of S1 to A57 pin 13. When a signal is received to activate K3; pin E of FL1 and FL2 and J3-K receive a ground connection through contacts 4 and 7 of K3 and through contacts 12 and 8 of S1 (this ground is used to provide push-to-talk signal to the other transceiver of the relay station); and the audio output of A55 is activated by the removal of a short to ground through contacts 2 and 8 of K3 and contacts 11 and 8 of S1. Since squelch relay K3 and module A54A are deactivated during the transmit mode, to prevent a ground potential at pin 7 of K3, the output of A55 is grounded and no sidetone can be delivered to the handset. A transceiver is capable of normal transmission in the RETRANS mode, except for the presence of sidetone.

### 2-33. Transmit

(fig. 7-26)

When function switch S1 is at ON and the handset push-to-talk switch is pressed, the ground circuit of relay K2 is completed and the transmitter circuits are activated.

a. The input voltage from connector J3-E (+ 12.5 volts) is applied, through contacts 8 and 3 of relay K2, to relay K1 in module A32 and to modules A31, A36, and A37.

b. The input voltage to A16A is applied from connector J3-E through function switch S1 to input connector A16AJ1-C. The regulated + 10-volt output of A16A is coupled from J11-A to contact 4 of relay K2. With relay K2 energized (on transmit), the regulated + 10 volts is transferred to contact 7 of K2 and is applied to modules A38, A31, A22, A23 and A50. The regulated + 10 volts is applied from module A16A through J11-A direct to modules A39A, A40A, A11A, A17A, A18A and A55 and from J11-F to A44A and A45A when both are on transmission and reception.





## CHAPTER 3

## DIRECT SUPPORT MAINTENANCE

## Section I. GENERATOR TROUBLESHOOTING TECHNIQUES

*Warning:* Be extremely careful when servicing the RT-841/PRC-77. Before operating or repairing this equipment, refer to TB SIG 291.

**3-1. Scope of Direct Support Maintenance**

**Note.** Troubleshooting and repair of Handset H-189/GR is covered in TM 11-5965-280-15.

The direct support maintenance procedures in this manual supplement the maintenance procedures described in TM 11-5820-667-12. The systematic troubleshooting procedure, which begins with the operational and sectionalization checks, is carried to a higher category in this manual. Sectionalizing, localizing, and isolating techniques used in the troubleshooting procedures contained in paragraphs 3-4 and 3-5 are more advanced. The organization of direct support troubleshooting procedures and test point information for the rapid location of a faulty module are provided below. Paragraphs 3-6 through 3-20 contain direct support repairs and direct support alignment procedures. Paragraphs 3-21 through 3-26 contain direct support testing procedures.

**3-2. Organization of Direct Support Troubleshooting Procedures**

a. *General.* The first step in troubleshooting a defective RT-841/PRC-77 is to sectionalize the fault to a major area such as the power supply, function switch circuits, or case wiring. The second step is to localize the fault to a defective module assembly or area. The third step is to locate the defective module, faulty component part, or circuit board within an assembly.

b. *Sectionalization.* The following group of tests is arranged to reduce unnecessary work and to aid

in troubleshooting a defective RT-841/PRC-77. Sectionalize the trouble to faulty units by following the procedures listed in (1) and (2) below:

- (1) *Visual inspection.* Visual inspection may locate faults without testing or measuring the circuits. Check for faulty front panel indications, or physical damage to wiring or module assemblies.
- (2) *Operational tests.* Operational tests frequently indicate the general location of a trouble. In many instances, operational tests, such as the equipment performance checklist (TM 11-5820-667-12), will help in determining the exact nature of the fault.

c. *Localization and Isolation.* The procedures given in (1) through (4) below will aid in localizing and isolating the trouble. Localize the trouble to an area, and then isolate the trouble to a defective part. Use the following methods:

- (1) *Troubleshooting chart.* The trouble symptoms listed in the troubleshooting charts (para 3-5e(1) through (4)) will aid in localizing and isolating trouble to a part or to a module assembly.
- (2) *Test points.* The RT-841/PRC-77 has test points, located on various modules, which will enable a maintenance man to rapidly locate a faulty module. Figures 3-1 through 3-8 illustrate the modules, the test points, and alignment control identifications and locations. The test points should be used, whenever possible, to avoid needless

disassembly of the equipment. If used properly, the signal and/or supply voltages at these test points will expedite the maintenance efforts.

- (3) *Voltage and resistance measurements.* Most troubles must be located by voltage and resistance measurements. The RT-841/PRC-77 is transistorized. Observe the following precautions to prevent transistor damage.

*Caution: Make voltage and resistance measurements only as specified.* When measuring voltages, use tape or sleeving to insulate the entire test probe, except the extreme tip. A momentary short circuit can ruin a transistor. (For example, if bias is shorted out, excessive current between the emitter and the base may ruin the transistor.) Exercise care in the performance of all troubleshooting techniques.

- (4) *Intermittent troubles.* The possibility of intermittent troubles should not be overlooked. If present, this type of trouble may often be made to appear by tapping or jarring the RT-841/PRC-77. For such trouble, check the wiring, the connections, and the plugs and jacks of the various modules.

**3-3. Test Equipment and Additional Equipment Required**

The following charts list the test equipment required for troubleshooting the RT-841/PRC-77. These charts also list the associated technical manuals for the equipments. If the specific test equipment models are not available, other test equipment having similar characteristics may be used.

*a. Test Equipment.*

| Test Equipment                                  | Technical manual |
|---|------------------|
| Digital Readout, Counter Electronic AN/USM-207. | TM11-6625-700-10 |
| Wattmeter AN/URM-120                            | TM11-6625-446-15 |

| Test equipment  | Technical manual                      |
|---|---------------------------------------|
| Dummy Load, Electrical DA-75/U (part of AN/URM-120).    | TM 11-6625-446-15 (FSN 6625-177-1639) |
| Generator, Signal AN/URM-103.                           | TM 11-6625-586-12                     |
| Signal Generator AN/URM-127 (two quired).               | TM 11-6625-683-15                     |
| Voltmeter, Electronic AN/URM-145.                       | TM 11-6625-524-14                     |
| Voltmeter ME-30A/U                                      | TM 11-6625-320-12                     |
| Multimeter ME-26B/U                                     | TM 11-6625-200-15                     |
| Multimeter TS-352B/U                                    | TM 11-6625-366-15                     |
| Power Supply, Hewlett-Packard, Model HP-721A; PP-3514/U | TM 11-6625-617-12                     |

*b. Additional Equipment Required.*

| Equipment  | References                            |
|--|---------------------------------------|
| Antenna AT-892 /PRC-25   | TM 11-5820-667-12                     |
| Handset H-189/GR   | TM 11-5820-667-12                     |
| Battery, Dry BA-4386/U   | SB 11-6                               |
| Battery, Lithium BA-5598/U                                       | SB 11-6                               |
| Module extender <sup>a</sup>                                     | Fig. 3-9                              |
| Alignment cover for module A31 <sup>a</sup>                      | Fig. 3-10                             |
| Resistor, 130 ohms ±1%, 8 watt, deposited carbon, non-inductive  | Para 3-15b                            |
| Resistor, 61.9 ohms ±1%, 8 watt, deposited carbon, non-inductive | Para 3-15b                            |
| Resistor, 34.8 ohms ±1%, 8 watt, deposited carbon, non-inductive | Para 3-15b                            |
| Capacitor, 2 pf ±5%, 400 vdc                                     | Para 3-18f                            |
| Capacitor, 10 pf ±5%, 400 vdc                                    | Para 3-15b                            |
| Capacitor, 12 pf ±5%, 400 vdc                                    | Para 3-15b                            |
| Capacitor, 29 pf ±5%, 400 vdc                                    | Para 3-15b                            |
| Test cable No. 1 and No. 2 <sup>a</sup>                          | Fig. 3-11                             |
| Test cable No. 3 (CG-409/U, or equal)                            |                                       |
| Adapter UG-201/U (three required).                               |                                       |
| Tool Kit, Electronic Equipment TK-100/G.                         | FSN 5180-605-0079 (SM 11-4-5108-S21)  |
| Tool Kit, Electronic Equipment TK-105/G.                         | FSN 5180-610-8177 (SC 5180-91-CL-R07) |

<sup>a</sup>Must be fabricated by maintenance personnel E 3-9, 3-10, and 3-11).

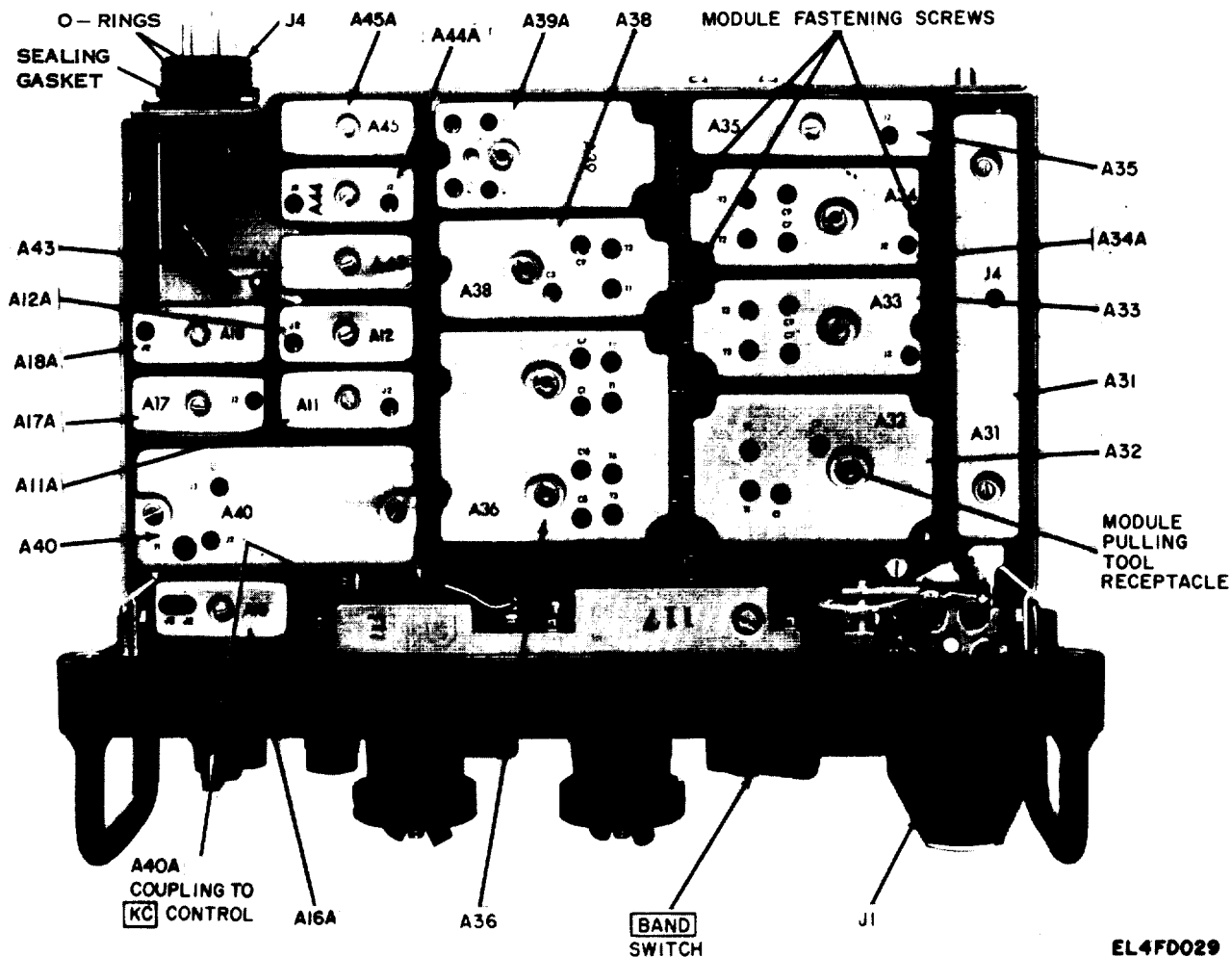
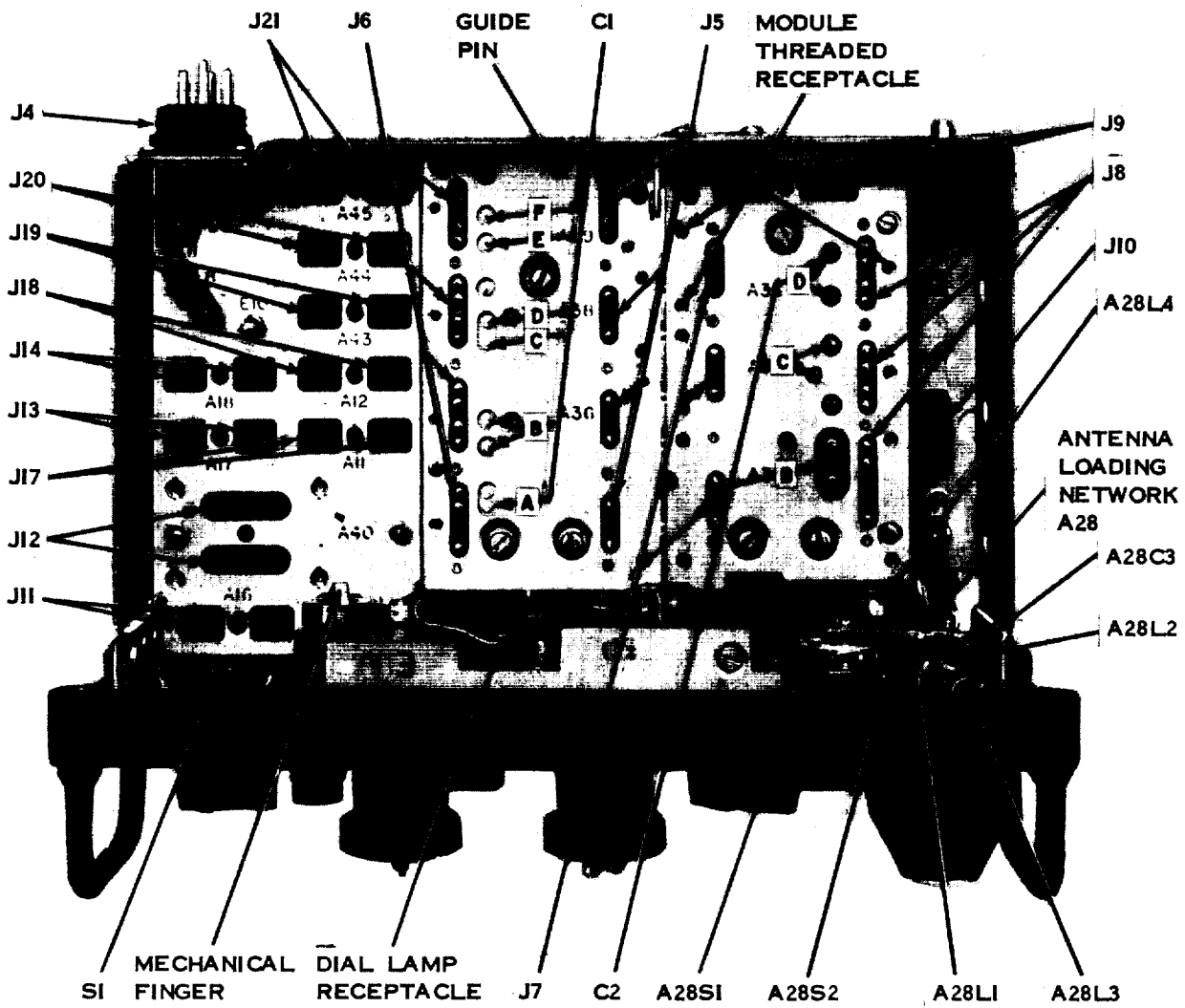


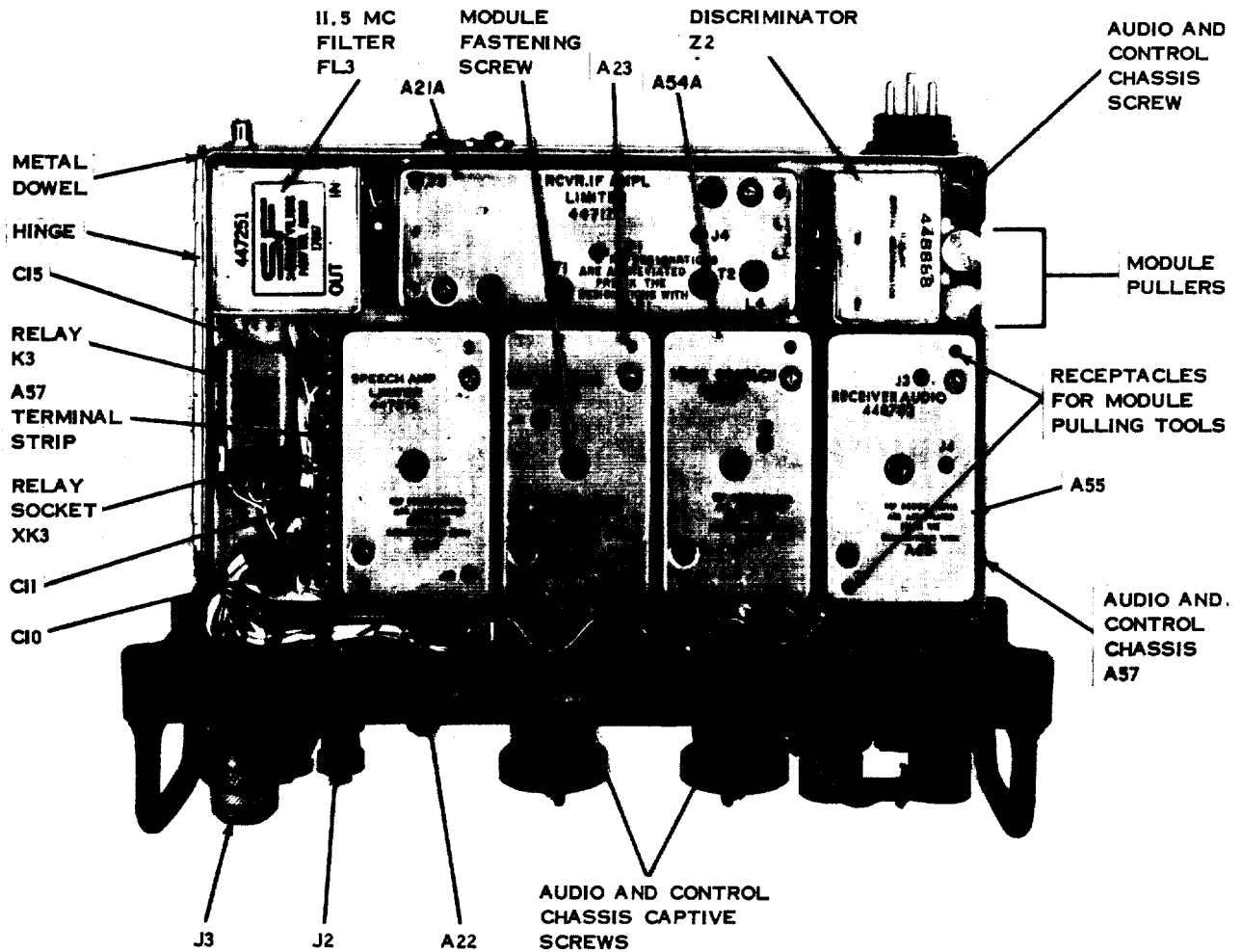
Figure 3-1. Receiver-Transmitter, Radio RT-841/PRC-77, bottom view.

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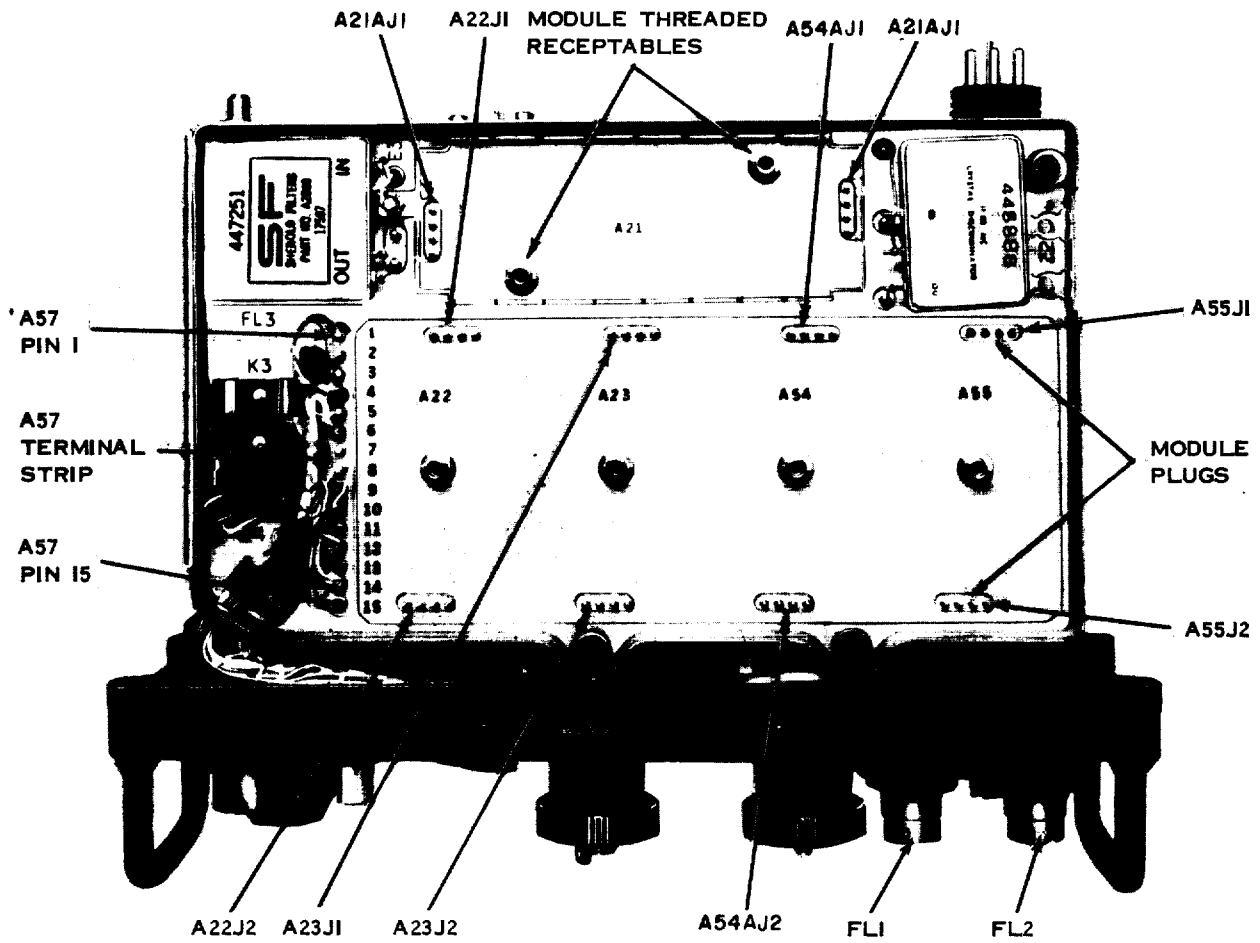
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figure 3-2. Receiver-Transmitter, Radio RT-841/PRC-77, bottom view, modules removed.



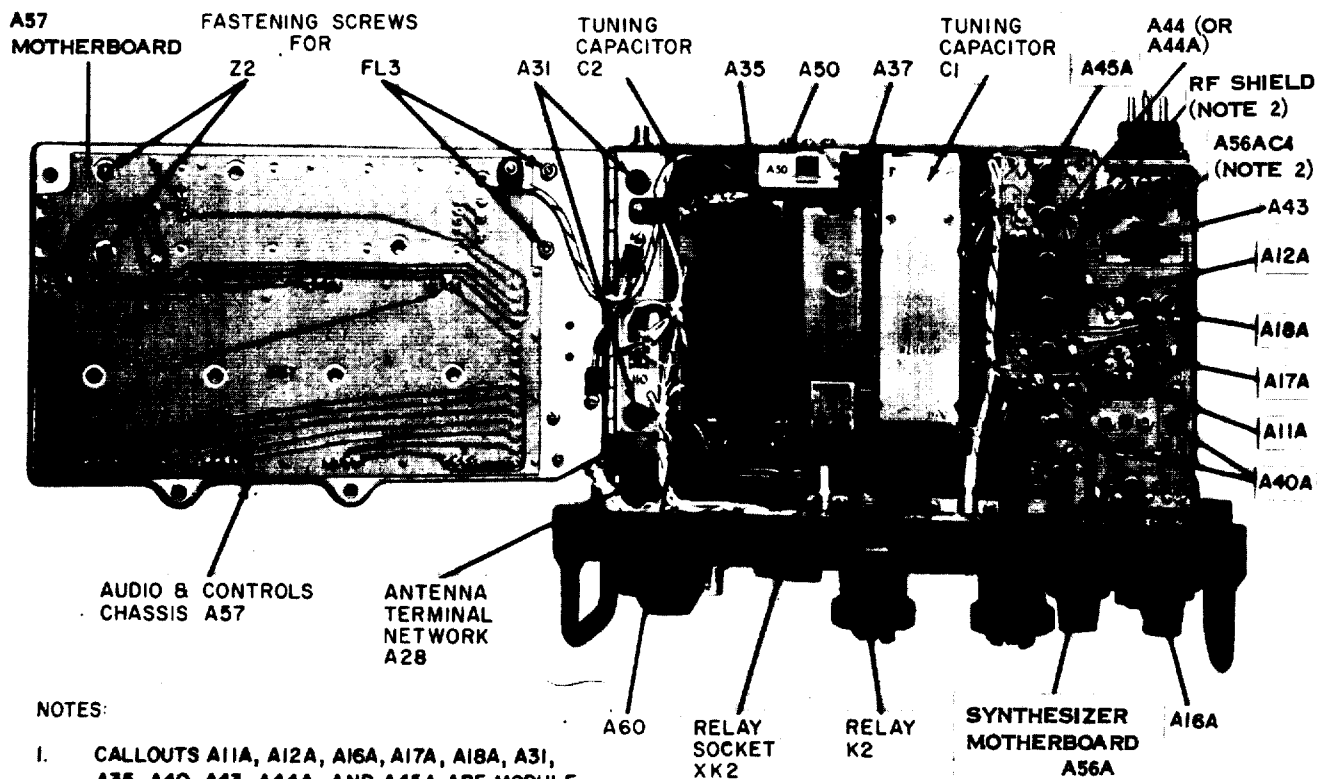
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Figure 3-3. Receiver-Transmitter, Radio RT-841/PRC-77, top view.



EL4FDO32

Figure 3-4. Receiver-Transmitter, Radio RT-841PRC-77, top view, modules removed.

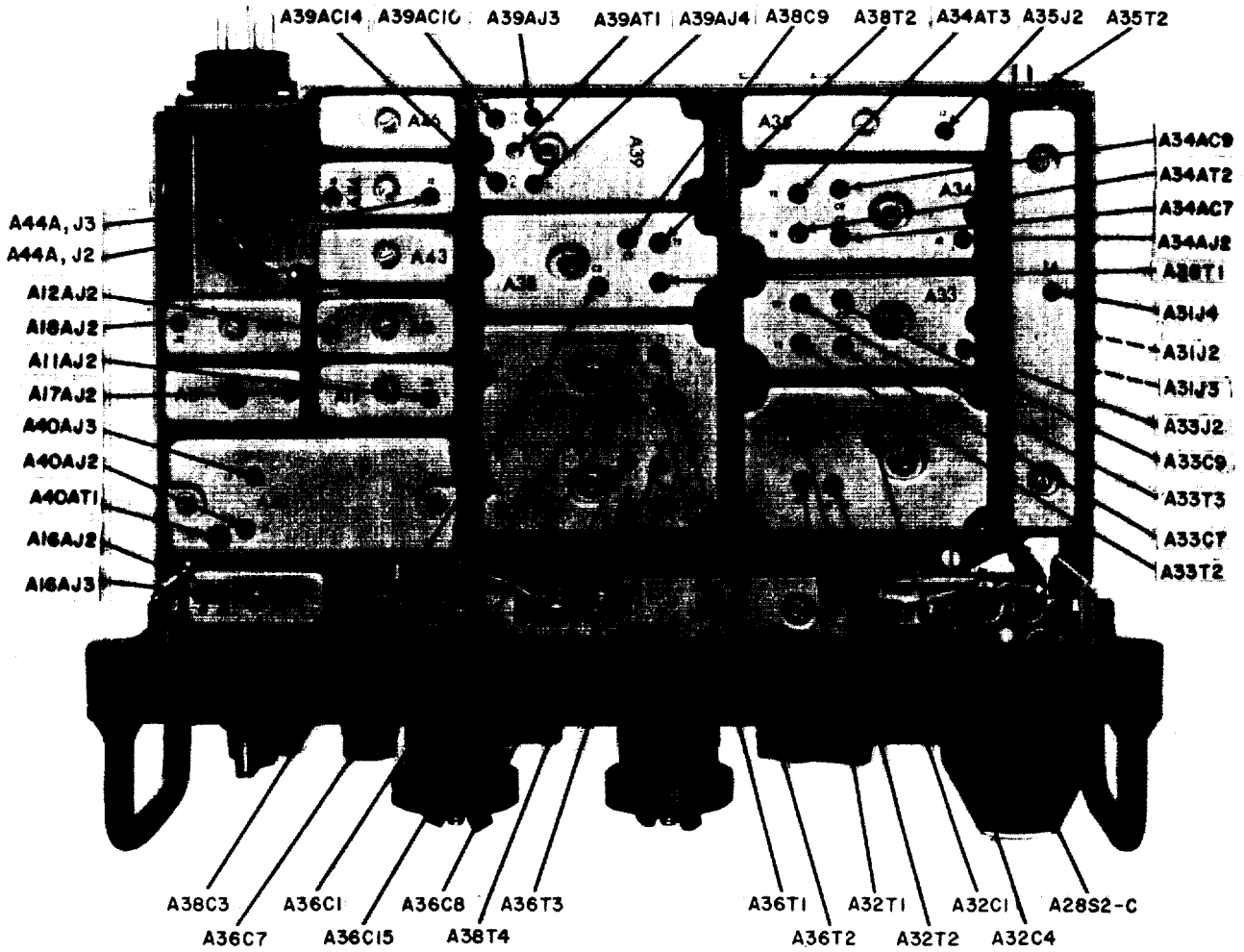


NOTES:

1. CALLOUTS A11A, A12A, A16A, A17A, A18A, A31, A35, A40, A43, A44A, AND A45A ARE MODULE FASTENING SCREWS.
2. RF SHIELD AND A56AC4 PROVIDED WITH A56A.

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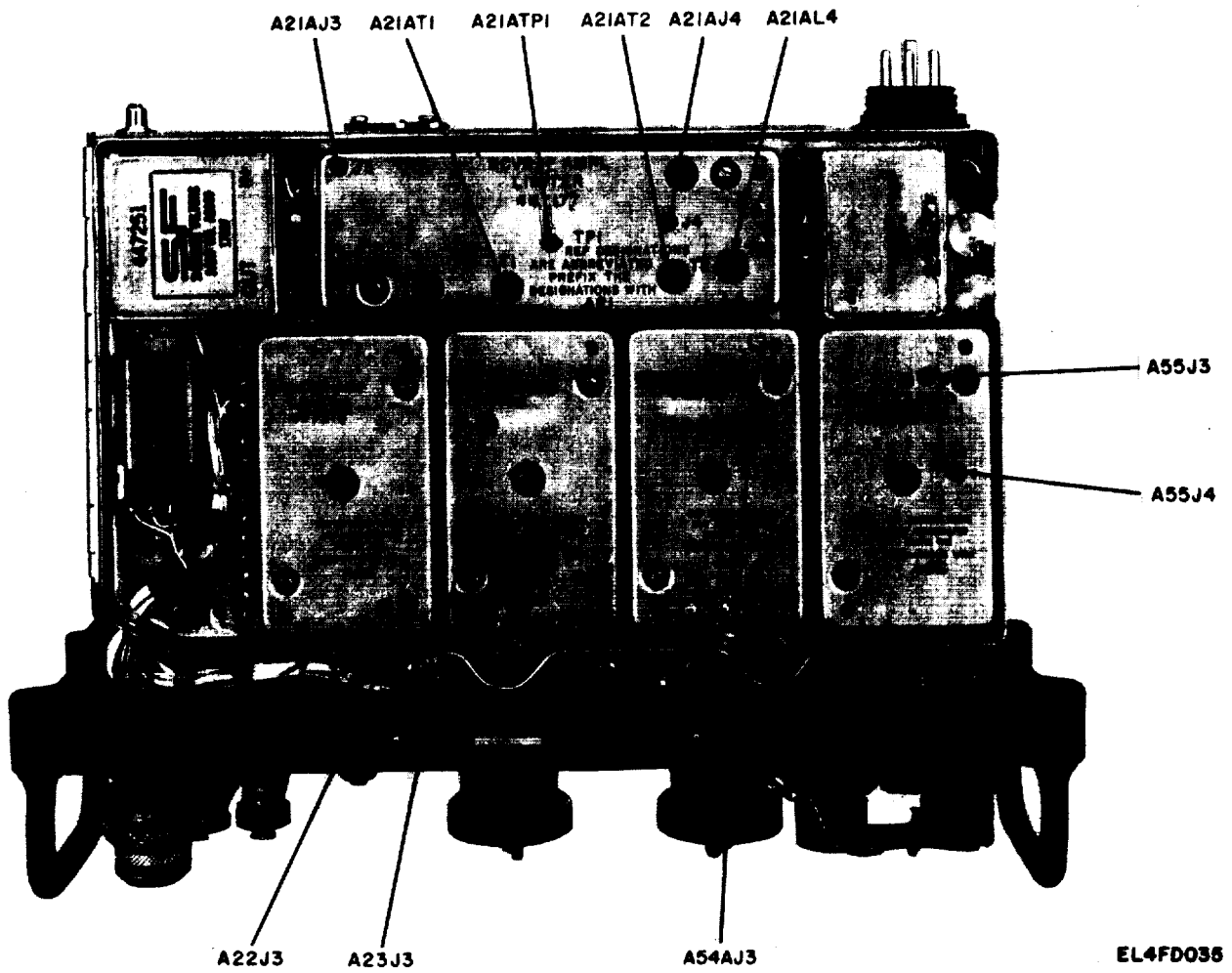
■ Figure 3-5 Receiver-Transmitter, Radio RT-841/PRC-77, audio and control chassis A57 open.



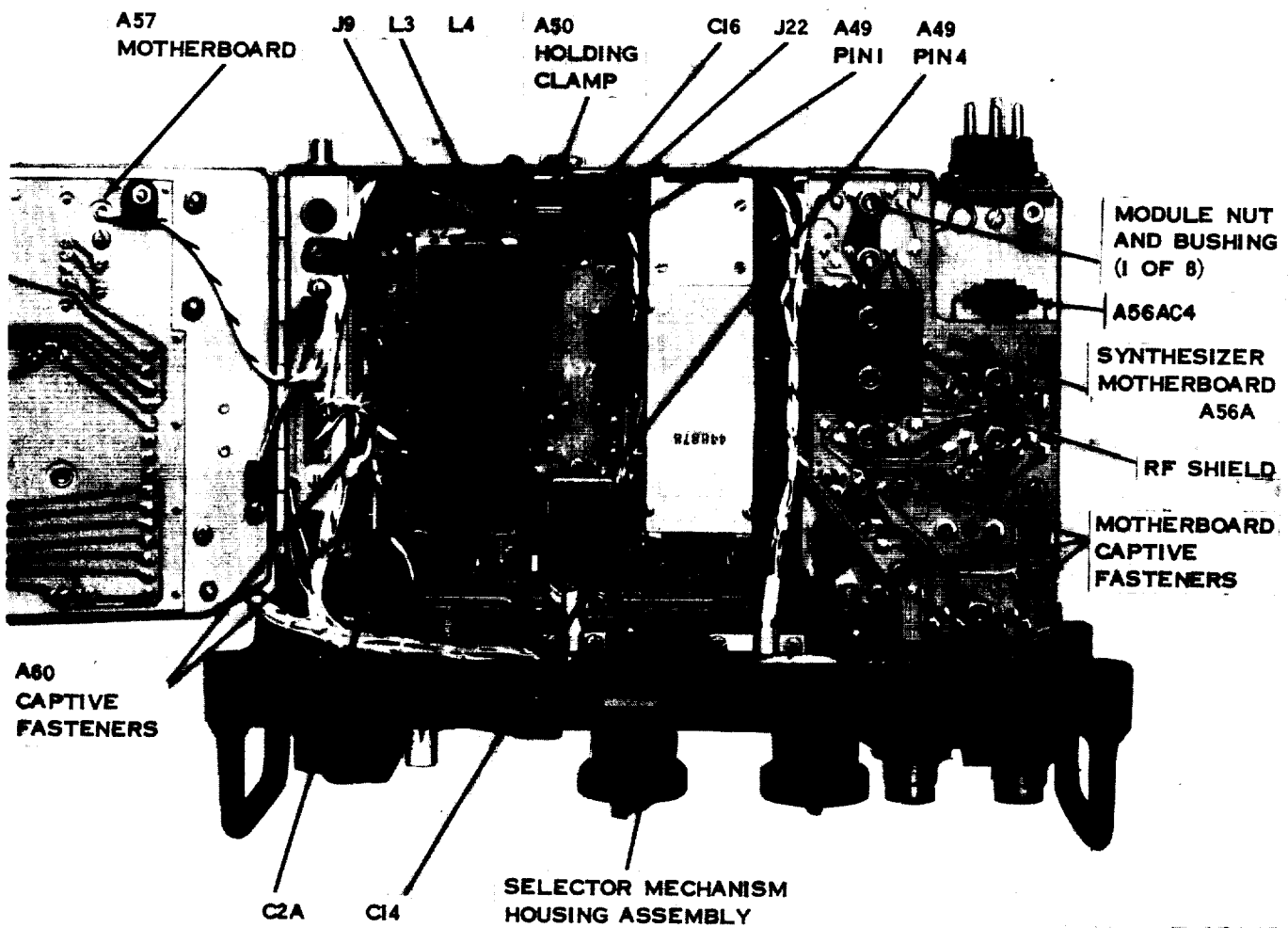
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Figure 3-6 Receiver-Transmitter, Radio RT-841/PRC-77, bottom view, test points and alignment control positions.

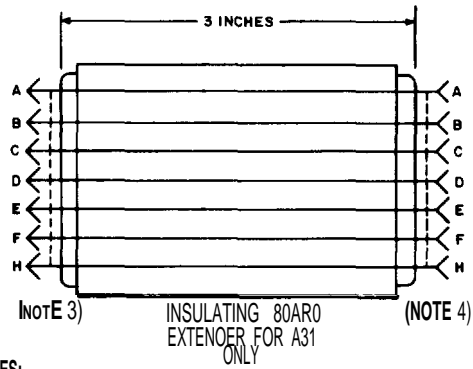
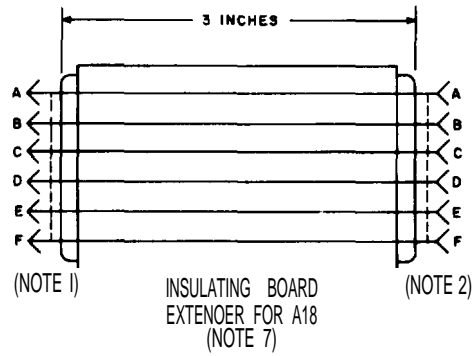




■ Figure 3-7. Receiver Transmitter, Radio RT-841/PRC-77, top view, test points and alignment control locations.



■ Figure 3-8 Receiver-Transmitter, Radio RT-841/PRC-77, top view, audio and control chassis A57 open, test points locations.

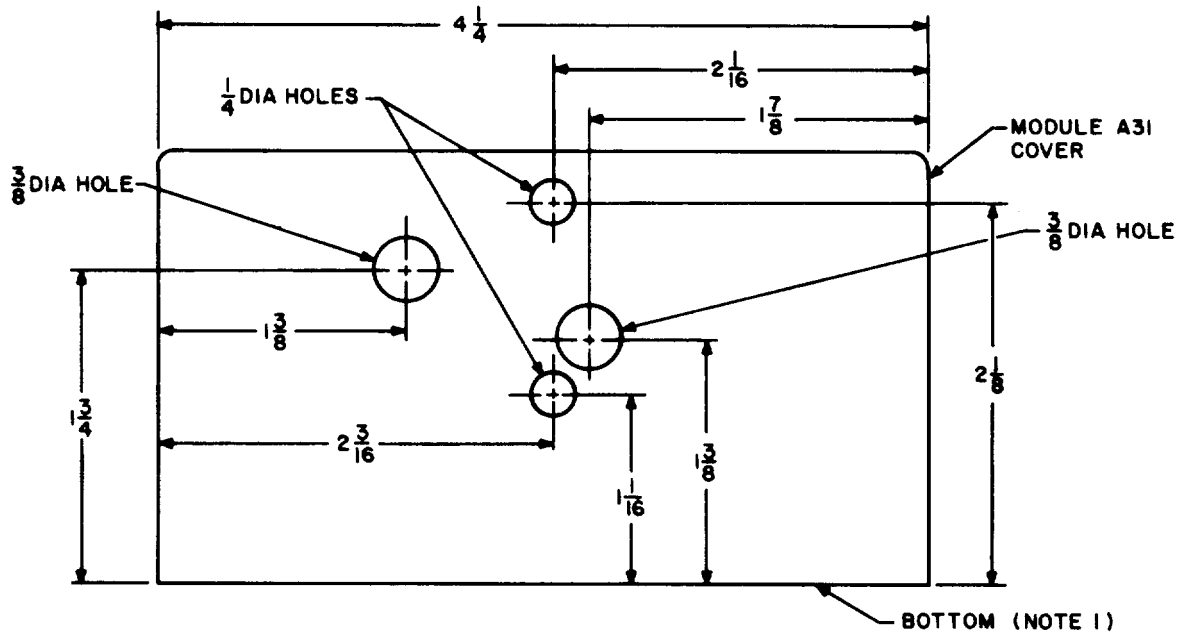


NOTES:

1. USE CONNECTOR SIMILAR TO J1 ON MODULE A18.
2. USE CONNECTOR SIMILAR TO J14 IN RECEIVER-TRANSMITTER RT-841/PRC-77.
3. USE CONNECTOR SIMILAR TO J1 ON MODULE A31.
4. USE CONNECTOR SIMILAR TO J10 IN RECEIVER-TRANSMITTER RT-041/PRC-77.
5. FOR INTERCONNECTIONS, USE NO. 10 AWG STRANDED WIRE.
6. MOUNT CONNECTORS ON INSULATING BOARD.
7. USE EXTENDER TYPICAL FOR A18 FOR MODULES A11, A12, A16, A17, A43, A44, AND A45.

TM 11-5820-667-35-28

Figure 3-9. Typical module extenders for modules A18 and A31.

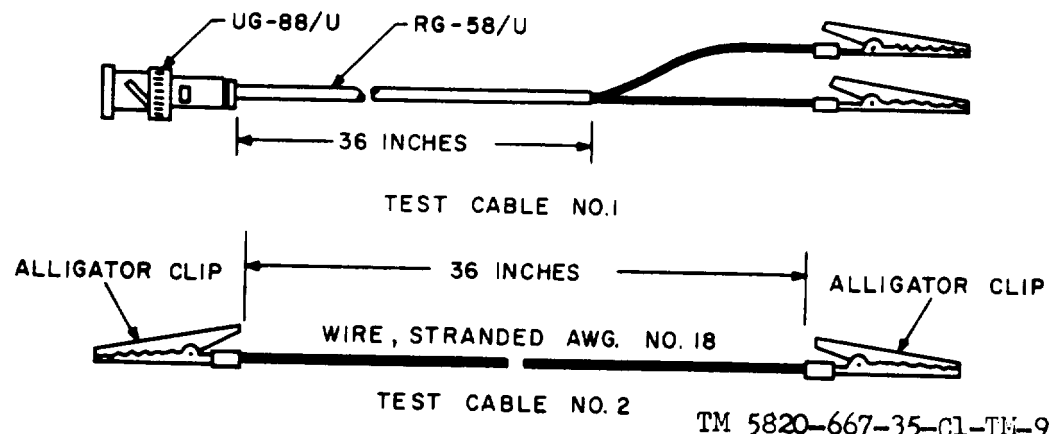


NOTES:

1. USE MODULE A31 COVER.
2. DRILL HOLES, AS INDICATED, ON THE SIDE NOT INSULATED.
3. DIMENSIONS ARE IN INCHES.

TM5820-667-35-29

Figure 3-10 Typical alignment cover for module A31.



TM 5820-667-35-CL-TM-9

Figure 3-11. Fabrication details for test cables No. 1 and 2,

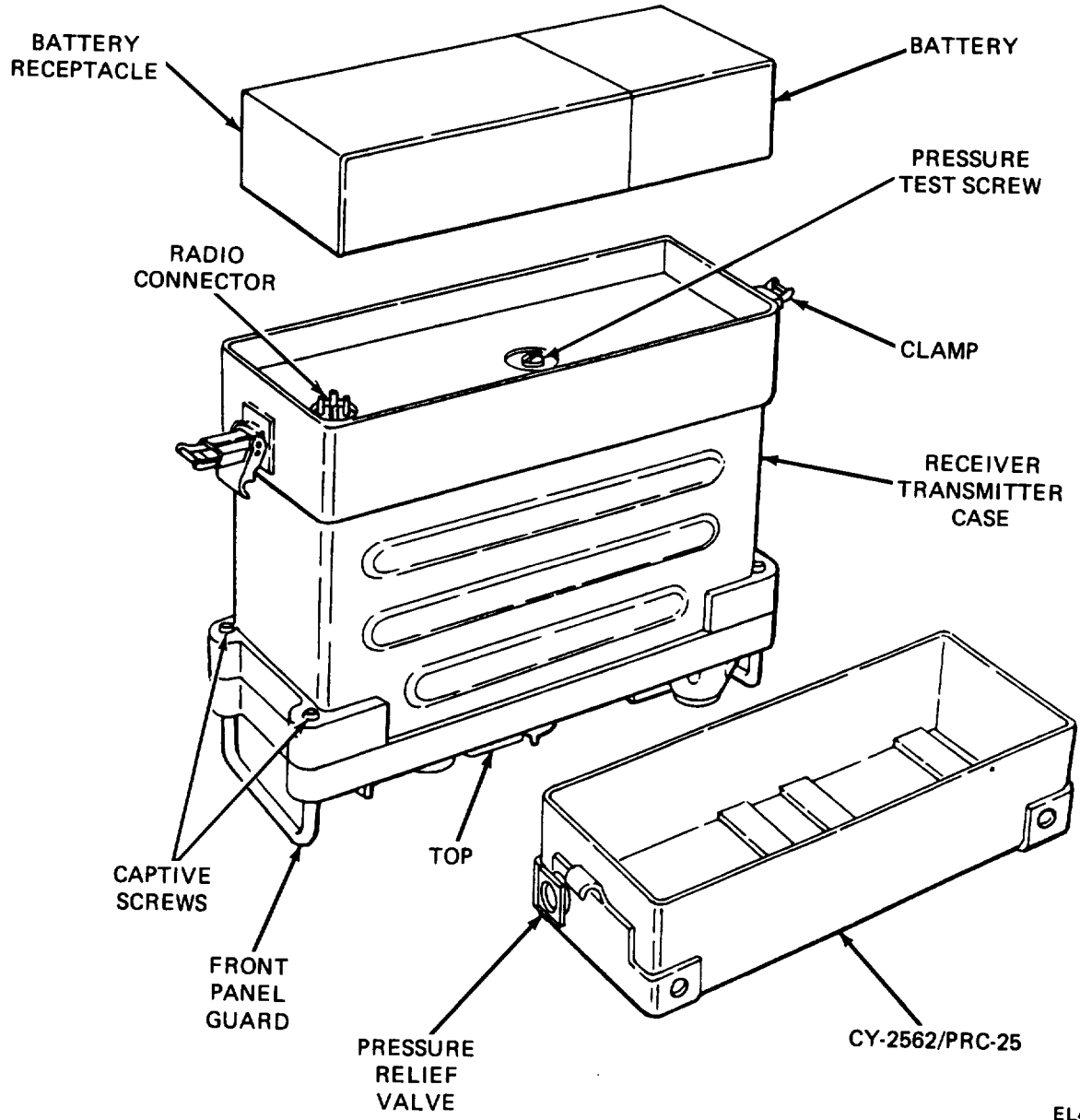
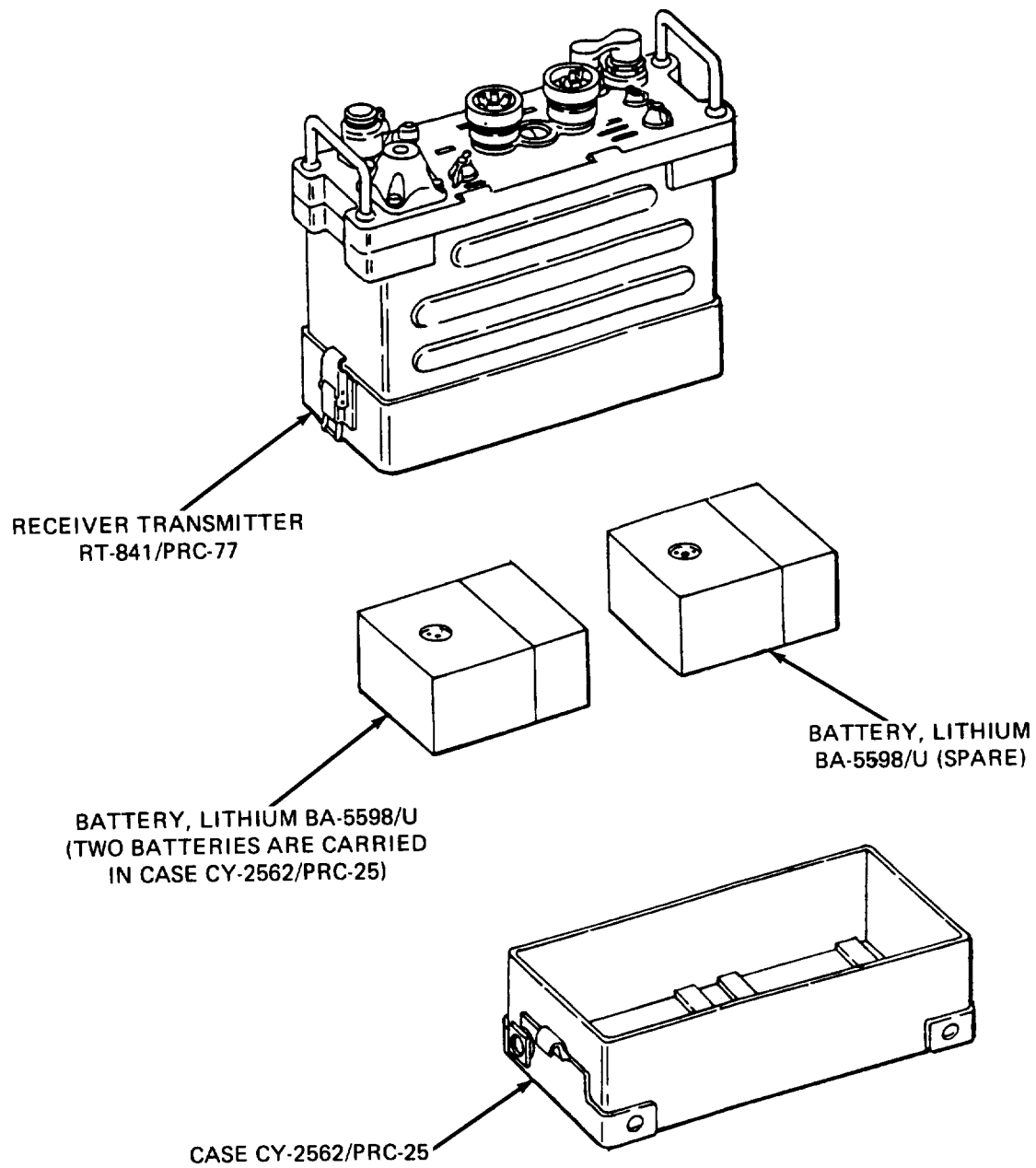


Figure 3-12. Installing magnesium battery BA-4386/U in radio.

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EL4FD058

Figure 3-12.1. Installing lithium battery BA-5598/U in radio.

## Section II. DIRECT SUPPORT TROUBLESHOOTING

### 3-4. Test Setup

a. General. Bench test procedures are provided for the RT-841/PRC-77 in:

- (1) Receive mode (fig. 3-13).
- (2) Transmit mode (fig. 3-14).
- (3) Frequency synthesizer system (fig. 3-15).

b. Preparation. Prepare the RT-841/PRC-77 for bench testing as follows:

#### WARNINGS

Lithium type batteries may be used with your equipment. These batteries are potentially dangerous if misused or tampered with before, during and after discharge. The following precautions must be strictly observed to prevent possible injury to personnel or damage to the equipment: DO NOT crush, puncture, disassemble, or otherwise mutilate the batteries.

DO NOT heat or incinerate the batteries. DO NOT short circuit.

DO NOT try to recharge.

DO NOT use batteries which look bulged or have burst. Turn these batteries in to the Defense Reutilization and Marketing Office (DRMO).

DO NOT bypass any internal fuse or replace the fuse with a fuse of a different rating. If the battery uses replacement fuses, they will be packed two per every ten batteries.

DO NOT use carbon dioxide extinguishers on exposed lithium metal fires. Flood the burning material with water or use graphite type compounds or graphite-type extinguishers to extinguish burning lithium.

You can tell the difference between Magnesium Battery BA-4386/U and Lithium Battery BA-5598/U by looking at their size. The Lithium Battery is half the size of (smaller than) the Magnesium Battery. Magnesium Batteries shall be turned into the Defense Reutilization and Marketing Office (DRMO) for disposal.

DO NOT store in equipment during periods of disuse in excess of 30 days.

TURN OFF the equipment if you feel the battery compartment becoming hot, hear battery venting (hissing sound), or smell sulfur dioxide gas (pungent, irritating fumes). Wait 30 to 60 minutes for the battery to cool before removing.

Remove the battery from the Battery Box (CY-2562/PRC-25) when the radio is not in use. This is required to insure that dangerous gases do not accumulate. Personnel can be injured and equipment damaged if the boxes explode.

(1) Remove Battery Box CY-2562/PRC-25 and the case from the RT-841/PRC-77.

(2) Be sure the POWER receptacle cover is on the POWER receptacle. The cover contains jumpers necessary for battery operation.

(3) Connect the battery (BA-4386/U or BA-5598/U or equivalent) to the RT-841/PRC-77 battery receptacle J4. Check the battery as follows:

(a) Set the function switch to ON and measure dc voltage at A16AJ2 (fig. 3-6); it should be between 12.5 and 15 volts. Key the radio; the voltage indication should not be less than 12.5 volts.

(b) Measure the dc voltage at A16J3; it should be +9.5 +0.5 volts. Key the radio; the same voltage indication should be obtained.

(c) If A16AJ3 voltage is near 0 volt, remove battery and measure resistance from J11, pins A and F (fig. 3-2); interchange ohmmeter leads for each measurement. Normal resistance indications are as follows: Pin A: 280 or 500 ohms  $\pm 10$  percent; pin F: 1,400 or 4,000 ohms  $\pm 10$  percent. If less than normal is obtained, remove, in turn, associated modules until one with the short permits the normal indication to return.

c. Test Equipment.

(1) *Receiver section test.*

(a) Use the AN/URM-103 to provide 1-kHz test signal on the carrier frequency with 10-kHz deviation, Tune the AN/URM-103 to 45.00 or 64.00 MHz, as required in the test procedures,

(b) Connect the AN/URM-103 LO RF output to the CU-901/U.





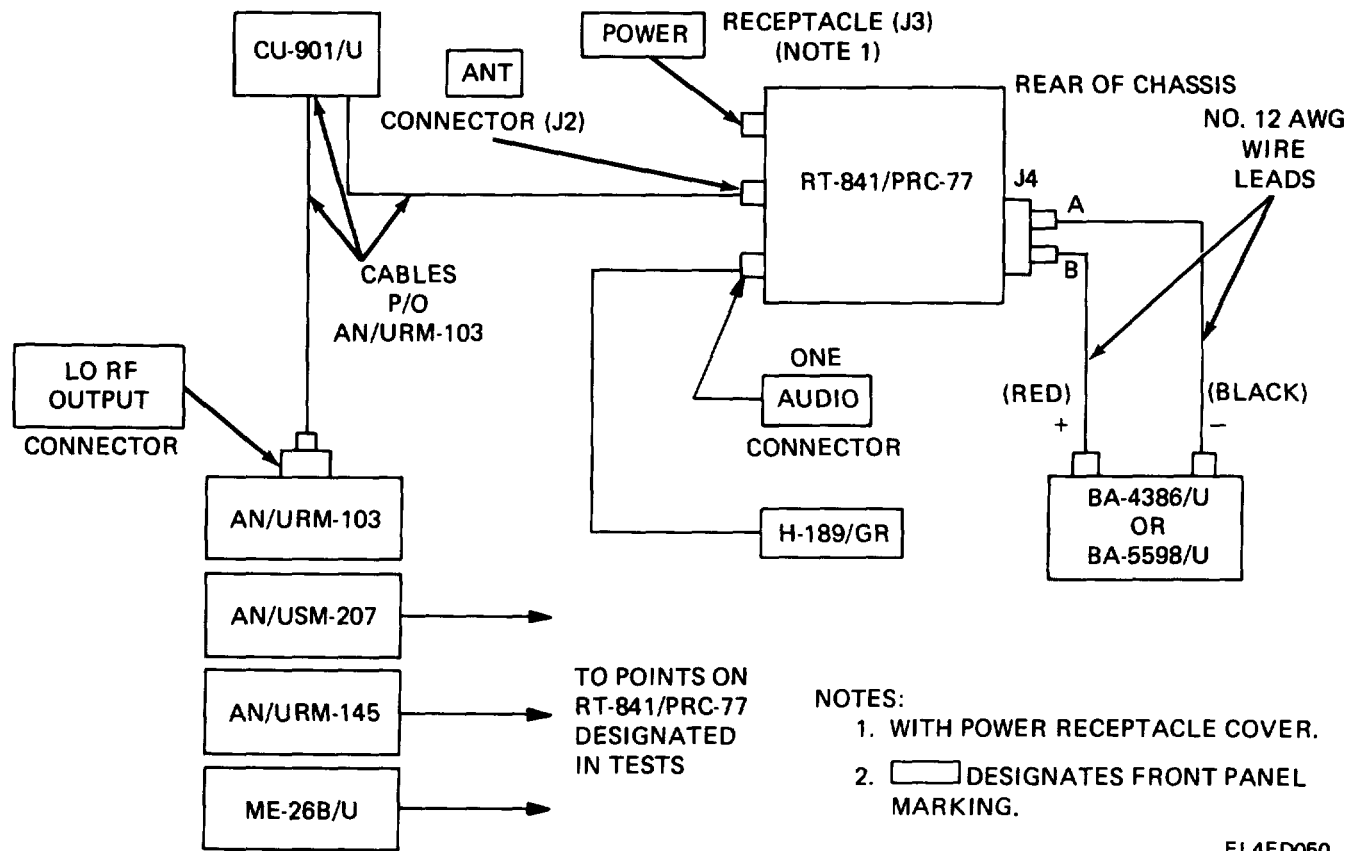


Figure 3-13. RT-841/PRC-77 receive test Setup, block diagram.

- (c) Connect the other end of the CU-901/U to the RT-841/PRC-77 ANT connector J2.
- (d) Connect Handset H-189/GR to one of the RT-841/PRC-77 AUDIO connectors.
- (e) Set the RT-841/PRC-77 controls as follows:

| Control                   | Position or indication |
|---------------------------|------------------------|
| Function switch . . . . . | 30-52                  |
| BAND switch . . . . .     | OFF                    |
| Tuning controls. . . . .  | 45.00                  |
| VOLUME control . . . . .  | 5                      |

- (f) Use Multimeter ME-26B/U to make most of the voltage and resistance checks directed in the troubleshooting chart; use Voltmeter, Electronic AN/URM-145 to make RF voltage checks up to 3 volts.
- (2) Transmitter section.
  - (a) Use Wattmeter AN/URM-120 (containing Coupler-Detector CU-754/URM-120) connected with Dummy Load, Electrical DA-75/U for the transmitter. Set the power range knob of the AN/URM-120 to the 10 WATTS position and turn the detector arrow toward the load.

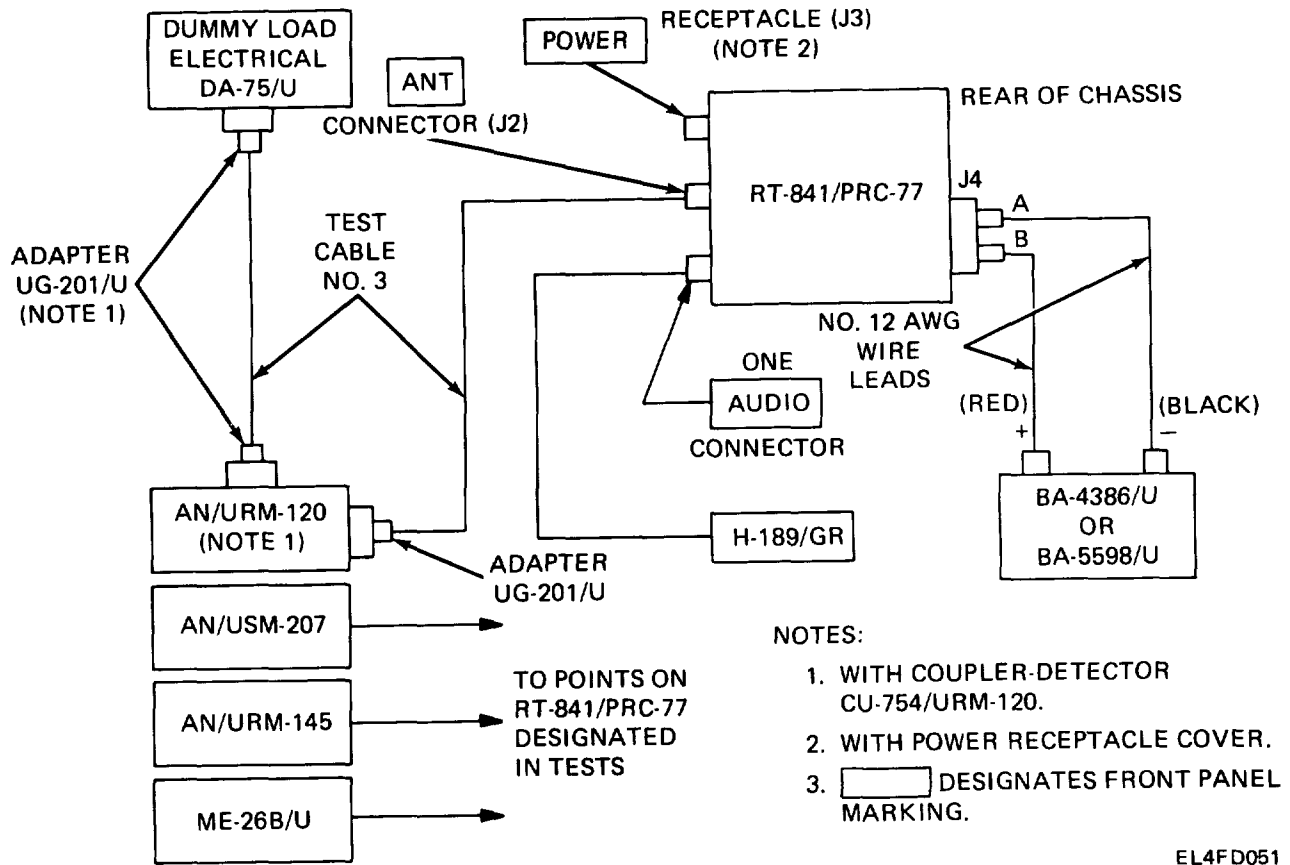


Figure 3-14. RT-841/PRC-77 transmit test setup, block diagram.

- (b) Connect the AN/URM-120 to the RT-841/PRC-77 ANT connector J2.
- (c) Connect Handset H-189/GR to one of the RT-841/PRC-77 AUDIO connectors.
- (d) Set the RT-841/PRC-77 controls as follows:

- (b) Set the RT-841/PRC-77 controls as indicated in (2)(d) above.
- (c) Use Multimeter ME-26B/U to make dc voltage, resistance, and rf voltage (above 1 volt) measurements. Use the AN/URM-145 voltmeter to make RF voltage checks up to 3 volts.

Control position or indication

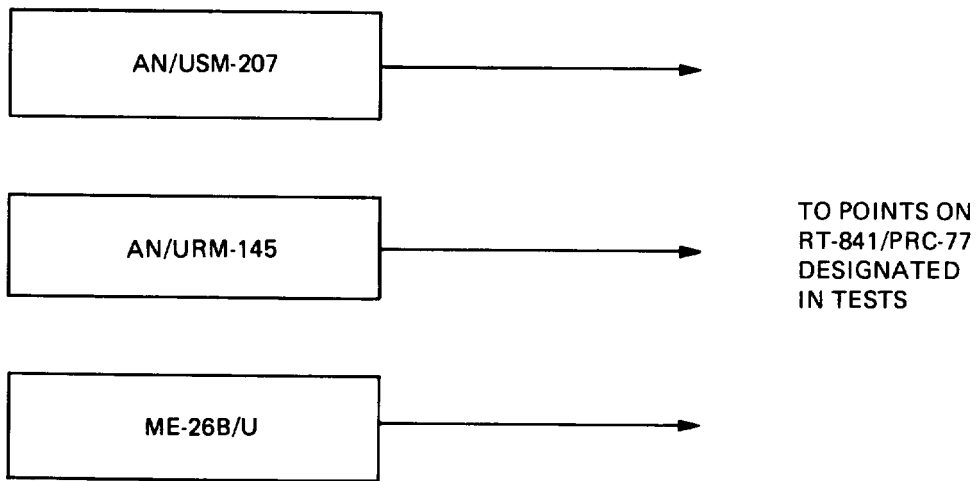
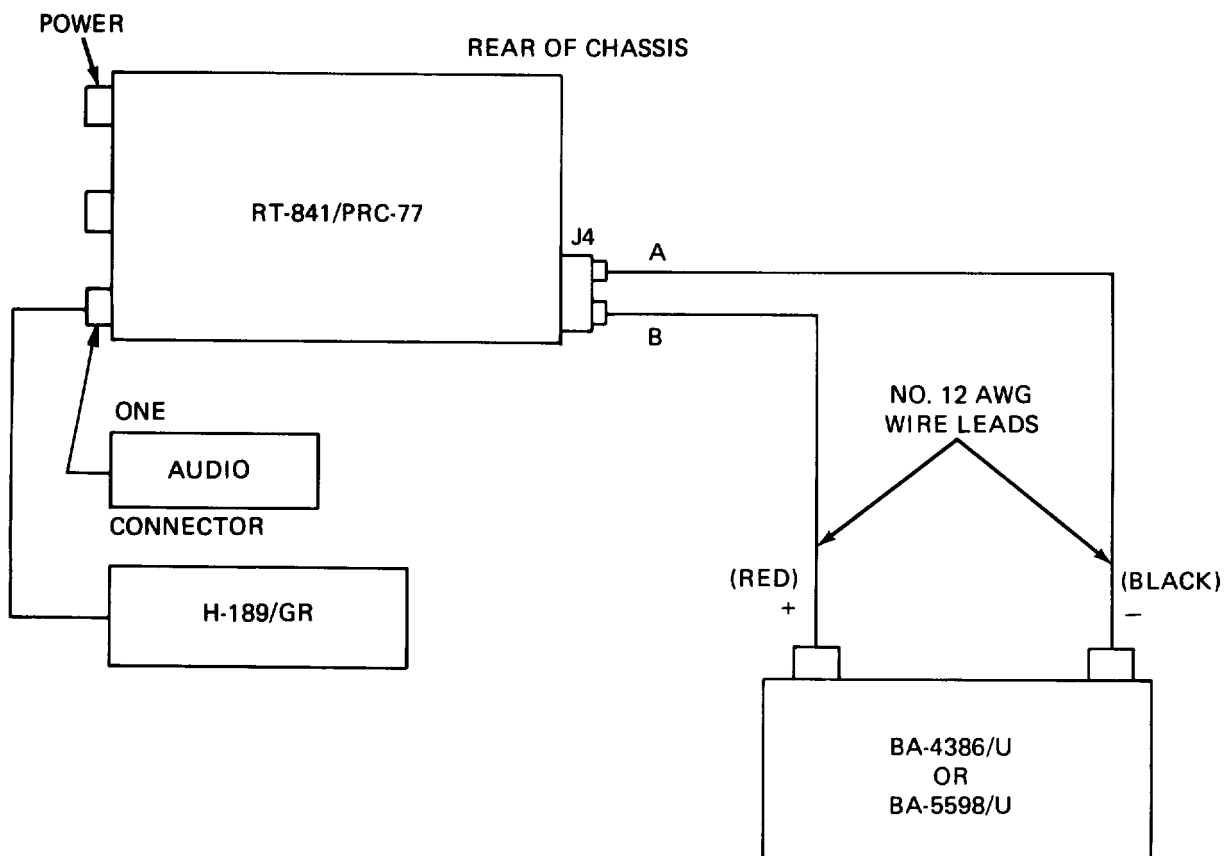
|                           |       |
|---------------------------|-------|
| Function switch . . . . . | OFF   |
| BAND switch . . . . .     | 30-52 |
| Tuning controls . . . . . | 45,00 |
| VOLUME control . . . . .  | 5     |

(3) Frequency synthesizer system.

- (a) Connect Handset H-189/GR to one of the RT-841/PRC-77 AUDIO connectors.

3-5, Localizing and Isolating Troubles

a. Test Conditions. Perform all checks as outlined in the troubleshooting charts with the equipment under test as described. Troubleshooting at the direct support category isolates the trouble to a defective module or part which may be replaced. A suspected module may be



**NOTE:**  
 DESIGNATES FRONT PANEL MARKING

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Figure 3-15. RT-841/PRC-77 frequency synthesizer system setup block diagram,

replaced with an operative module from supply. All input and output signals, and supply voltages to the assembly should be checked from the designation point to chassis ground (unless noted otherwise) before determination is made that the module or a part is defective. Since the equipment is transistorized, resistance readings should be avoided, except through a relay or switch contacts. When making other resistance checks, disconnect the battery.

b. Test Procedure. The RT-841/PRC-77 is tested by troubleshooting the unit to localize a defective module or part. Also, signals may be traced throughout the unit to further test the unit under many operating frequencies. A particular defect may be selected for troubleshooting, according to either a visual presentation that is obtained or from the results of signal tracing. Organizational tests given in TM 11-5820-667-12 may reveal a specific defect which may be selected from the appropriate troubleshooting chart. For a test procedure, turn the test equipment on and allow for a 5-minute warmup, Set the function switch of the RT-841/PRC-77 at ON.

Note. For renewal and replacement of modules, refer to paragraph 3-9,

c. Localizing Troubles. A few simple steps should be taken to determine the general location of a defect, If the complete set fails to operate, or if the channel dial lamp does not light when the function switch is at LITE, the power supply circuits should be checked, The troubleshooting chart (d(1) below) can be used for this purpose. If the transmitter operates normally but the receiver is malfunctioning, the receiver circuits should be tested. The technician then uses the receiver troubleshooting chart (e(2) below) to find the specific fault. If the receiver operates normally but the transmitter is malfunctioning, the transmitter circuits (e(3) below) should be tested, If neither the receiver, nor transmitter is functioning, the frequency synthesizer system (fss) should be suspected and the fss troubleshooting chart (e(4) below) should be used for trouble localization. In all troubles, however, the +12.5-volt supply (battery and module A16) should be checked first (fig. 7-16) since neither the receiver, transmitter, nor frequency synthesizer circuits are operative without this supply. After the

localization of trouble has been made, the reference described in the appropriate troubleshooting chart should then be followed.

d. Transmitter Power Output Standards. In order to determine if the RT-841/PRC-77 meets acceptability criteria, when performing troubleshooting for the transmitter section ((3) below), observe the following minimum power output standards:

|           |            |
|-----------|------------|
| 30.00 MHz | 1.75 watts |
| 42.00 MHz | 1.75 watts |
| 52.95 MHz | 1.5 watts  |
| 53.00 MHz | 1.5 watts  |
| 65.00 MHz | 1.5 watts  |
| 75.95 MHz | 1.0 watts  |

e. Troubleshooting Charts, Four charts are provided for troubleshooting the RT-841/PRC-77. The first chart lists the possible defects which may cause power supply failure within the RT-841/PRC-77. The second chart lists a group of possible defects that may occur during receive operation, with possible cause for the defect and the procedure required to correct or remedy the defect. On the third chart, the defects that may occur during transmit operation are detailed in a similar fashion. The fourth chart troubleshoots for the frequency synthesizer system.

**Note.** Before attempting to diagnose a defect, perform the operations in the equipment performance checklist described in TM 11-5820-667-12.

**Caution:** Before using an ohmmeter to test transistors or transistor circuits, check the open-circuit voltage across the ohmmeter test leads. Do not use the ohmmeter if the open circuit voltage exceeds 1.5 volts. Also, since the RX1 range normally connects the ohmmeter internal battery directly across the test leads, the comparatively high current (50 milliampere (ma) or more) may damage the transistor under test.

(1) Troubleshooting chart for RT-841/PRC-77 receiver and transmitter input power.

| Indication  | Probable trouble   | Procedure   |
|---|--|---|
| REC-TRANS FREQUENCY channel dial lamp does not light when the function switch is at LITE, | a. Low input battery voltage . . . . .   | a. Check voltage at A16AJ2; unregulated input of + 12.5 vdc (minimum) is acceptable, fig. 3-1.  |
|   | (1) Open circuit between A16 and J4. .   | (1) Check continuity between pin C of J11 and pin B of J4, fig. 3-2.  |
|   | (2) Connector J3 or J4 defective . .   | (2) Check J3 and J4 for bent, broken, or missing pins, figs. 3-2, and 3-3.  |
|   | (3) Switch S1 defective . . . . .  | (3) Check wiring between switch S1, terminal 7, and XDS1. Check wiring between terminals 6 and 2 of S1. Check continuity from S1, terminal 8 to ground, fig. 3-2. |
|   | b. Defective operating voltage output  | b. Check voltage at A16AJ3; regulated operating voltage output of + 9.5 ± 20% is satisfactory. If not satisfactory, replace A16, fig. 3-1.                        |
|   | (1) Connector J11 defective  | (1) Check physical condition of J11, fig. 3-2,  |
| (2) Defective wiring in the + 10-volt distribution line.                                  | (2) Connect the common lead of the ME-26 B/U to pin A of J11 and check for a short to ground on regulated + 10-volt line (normal indication is infinite ohms without modules), fig. 3-2. |   |

(2) Troubleshooting chart for receiver section of RT-841/PRC- 77,

| Item | Indication  | Probable trouble  | Procedure   |
|------|---|---|---|
| 1    | No 1,000-cps output signal from the AN/URM-103 is heard in the H-189/GR and/or H-250 when the function switch is at ON. | a. Defective receiver input module A32,                   | a. Check rf signal input at A33J2; 3.8 mv, RF ± 20% with a 1-mv, 0.5-me signal from AN/URM-103 applied to ANT connector J2 is acceptable. If not satisfactory, replace A32, fig. 3-1.                                       |
|      |   | b. Defective first RF amplifier module A33.               | b. Check RF signal input at A34J2; 8 mv, at ± 25% should be present (with RF input signal from AN/URM - 103 same as item la above), If not satisfactory, replace A33, fig. 3-1.   |
|      |   | c. Defective RF signal input to IF amplifier module A21A, | a. Check rf signal input at A21AJ3; 25 mv, RF ± 20% is acceptable (with RF signal input from AN/URM - 103 same as item la above), fig. 3-3.   |
|      |   | (1) Defective 11.5-mc filter FL3 .,                       | (1) If not satisfactory, check the RF signal input at the IN terminal of A57FL3; 37.5 mv, RF ± 30% is acceptable, Check FL3 by substitution, fig. 3-3.  |
|      |   | (2) Defective mixer stage, ., ., .,                       | (2) Disconnect AN/URM - 103 from ANT connector J2 and check vfo input at A35AJ2, If satisfactory 80 mv, rf ± 20% signal is present, check the vfo frequency at A35AJ2 with AN/USM-207, The channel frequency should be dial |

| <i>Item</i> | <i>Indication</i> | <i>Probable trouble</i>                  | <i>Procedure</i>   |
|-------------|-------------------|--|--|
|             |                   |  | frequency + 11.50 mc $\pm$ 2 kc for low-band frequency -11.50 mc $\pm$ 2 kc for high-band operation. If satisfactory, replace A34 and/or A35A, if the channel frequency is unsatisfactory, proceed to the frequency synthesizer system troubleshooting chart ((4) below). If vfo input at A35AJ2 is unsatisfactory, fig. 3-1.<br>(a) Replace A35A, fig. 3-1.<br>(h) Proceed to the frequency synthesizer system troubleshooting chart ((4) above). |
|             |                   | d. Defective F amplifier module A21A,    | d, Check signal output at A21AJ4, 800 mv, RF $\pm$ 20% (with RF signal input from AN/URM - 103 same as item 1a above) is satisfactory. If not satisfactory, replace A21A, fig. 3-3.  |
|             |                   | e. Defective 11.5-mc discriminator Z2.   | e, Check demodulated signal input at A55J:3; 200 mv, at $\pm$ 20% is acceptable (with RF signal input from AN/URM-103 same as item 1a above). If unacceptable, replace Z2, fig. 3-3.   |
|             |                   | f Defective audio amplifier module A55   | f. Check the audio output at A55J4; 4.5 volts, AF $\pm$ 20% is satisfactory (with rf signal input from AN/URM - 103 same as item 1a and VOLUME control fully clockwise). If audio output is not satisfactory, replace A55, fig. 3-3,   |
|             |                   | g. Open circuit between A16 and A57      | k. Check physical condition of J11, Check printed wiring of A57 by visual inspection and continuity measurements Check continuity between pin A of J11 and pin 11 of A57, and between pin D of J11 and pin 4 of A57, fig. 3-2, and 3-3   |
|             |                   | h. Open circuit between A55J2 and A57 ., | h, Check continuity between pins 1, 2, and 3 of A55J2, and pins 11, 10, and 9, respectively, of A57 terminal strip, figs. 3-3, and 3-4.  |

| Item  | Indication | Probable trouble   | Procedure   |
|---|------------|--|---|
|   |            | i, Open circuit between A57 and FL1 or FL2.  | i, Check continuity between pins 9 and 10 of A57 terminal strip, and pins B and A, respectively, of FL1 and FL2, fig. 3-4.  |
|   |            | j, Defective relay K3 or relay socket XK3  | j. Check continuity between terminals 2 and 8 of relay K3 (normal indication is 0 ohm), Check continuity between terminals 3 and 8 of relay K3 (normal indication is infinity), Check physical condition of XK3, fig. 3-3,  |
|   |            | k, Defective wiring between XK3 and A57,   | k. Check continuity between pin 2 of XK3 and pin 9 of A57 terminal strip, fig. 3-3, and 3-4,  |
|   |            | 1. Defective capacitor A57C10 or A57C11,   | f, Check resistance of troth A57C10 and A57C11. (Ohmeter should indicate several megohms.) Fig. 3-3,  |
| 2 Received signals are not heard, but a rushing noise is heard in the H-189/GR and/or H-250 when the function switch is at ON and the long antenna is installed at ANT connector J1. Received signals from the AN/URM- 103 (connected per item 1a above) are normal with the short antenna installed, |            | a. Antenna loading network module A28 misaligned,<br>b. Defective part on module A28 . . . | a. Refer to para 3-19 for alignment procedure.<br>b, Follow the procedures described in (1), (2), and (3) below. If it appears that a defective part is on module A28, higher maintenance level is required, fig. 3-2.  |
|   |            | (1) Defective A28S2 or A28S3 . .   | (1) Check physical condition of A28S2 and A28S3, Check continuity through A28S2 and A28S3 with long antenna installed, fig. 3-2,  |
|   |            | (2) Defective A28S1 or A28L4 ...   | (2) Change bands and retest. If signal is received on the high band but not on the low, turn S1 to the low-band position and check continuity between pins 1 and 2 of A28, If resistance is infinity, check continuity of A28L4 and between pins 8 and 9 of A28S1. Check continuity between J1 and pin 1 of A28. If resistance is high, check continuity between terminals 5 and 6 of A28S1. Check C2A, and main frame, fig. 3-2. |

| <i>Item</i> | <i>Indication</i>   | <i>Probable trouble</i>  | <i>Procedure</i>  |
|-------------|---|--|---|
|             |   | (3) Defective A28S1, A28L1, or A28C2.  | (3) If signal is received on a low band but not on the high, turn S1 to highband position and check continuity between A28S1, terminal 10 and A28, terminal 1. Check A28L1 and A28C2, figs. 3-2, and 4-1.   |
| 3           | Received signals are not heard, but a rushing noise is heard in the H-189/GR and/or H-250 when the function switch is at ON and the short antenna is installed at ANT connector J1. Received signals from the ANN/URM-103 (connected per item 1a above) are normal with the long antenna installed. | <p>a. Antenna loading network module A28 misaligned</p> <p>b. Defective part on module A28. . . . .</p> <p>(1) Defective A28S1 or A28L3 . . . . .</p> <p>(2) Defective A28S1 or A28L2 . . . . .</p> <p>(3) Defective A26C1 . . . . .</p> | <p>a. Refer to para 3-19 for alignment procedure.</p> <p>b. Follow the procedures described in (1), (2), and (3) below. If it appears that a defective part is on module A28, higher maintenance category is required.</p> <p>(1) Change bands and retest. If signal is received on high band but not on low, turn S1 to the low-band position and check continuity between J1 and A28S1, terminal 11. Check A28L3, figs. 3-1, and 3-2.</p> <p>(2) If signal is received on the low band but not on the high, turn S1 to the high-band position and check continuity between J1 and A28S1, terminal 1. Check A28L2 and A28C3, figs. 3-1 and 3-2.</p> <p>(3) If signal is not received on either band (with short antenna) but is normal with long antenna, check A28C1, fig. 3-2.</p> |
| 4           | When signals from the AN/URM-103 are applied, one band operates properly but on the other band, a rushing noise is heard in the H-189/GR when the function switch is at ON.   | a. Defective module A32, A38, or A34 . . . . .   | a. Follow the procedures described in item 1, probable troubles a, b, and c; supplying a 1 mv, 45-mc signal from AN/URM-103.  |
| 5           | When signals from the AN/URM-103 are applied, a rushing noise is heard in the H-189/GR on either band when the function switch is at ON. Transmit operation is normal.  | <p>b. Defective BAND switch shaft . . . . .</p> <p>a. Defective receiver section module . . . . .</p> <p>b. Defective relay K2. . . . .</p> <p>c. Defective wiring to relay A32K1 . . . . .</p>  | <p>b. Higher maintenance category required.</p> <p>a. Follow the procedures described in item 1.</p> <p>b. Check continuity between terminals 4 and 6 of K2 (normal indication is 0 ohm), fig. 3-5.</p> <p>c. Check voltage at pin 5 of J7 (normal indication is 0 volt), fig. 3-2.</p>   |



| Item | Indication | Probable trouble  | Procedure   |
|------|------------|---|---|
|      |            | d. Defective wiring in the regulated + 10-volt line to A33, A34, A35, or A21. | d. Connect the common lead of the ME-26B/U to pin A of J11 and successively check continuity to the following points: pin 1 of A57; pins 1, 2, and 3 of J7; and pin G of J9. If the indication obtained at pin 3 of J7 is infinity, check L3. If the indication obtained at pin G of J9 is infinity, check L4. Check the physical condition of J1 and J9, figs 3-2 and 3-3. |
|      |            | e. Defective wiring between A32 and A33.                                      | e. Check continuity between pin 9 of J8 and pin 8 of J8. Check physical condition, fig. 3-2.  |
|      |            | f. Defective wiring between A33 and A34                                       | f. Check continuity between pin 5 and pin 4 of J8, and pin 6 and 8 of J8, fig. 3-2.   |
|      |            | g. Defective wiring between A34 and A35A.                                     | g. Check continuity between pin 1 of J8 and pin B of J9; and between pin 2 of J8 and pin A of J9, fig. 3-2.   |
|      |            | h. Defective wiring between A39A and A35A.                                    | h. Check continuity between pin 4 of J5 and pin H of J9. Recheck wiring, Fig. 3-2.  |
|      |            | i. Defective wiring between A35A and 11.5-mc filter FL3.                      | i. Check continuity between pin C of J9 and IN terminal of FL3, figs. 3-2 and 3-3.  |
|      |            | j. Defective 11.5-mc filter FL3. . . . .                                      | j. Examine external filter wiring for breaks or other signs of deterioration. Check FL3 by substitution, fig. 3-3.  |
|      |            | k. Defective wiring between FL3 and A21A.                                     | k. Check continuity between OUT terminal of FL3 and pin 2 of connector A21AJ1 figs. 3-3 and 3-4.  |
|      |            | l. Defective wiring between A21 and 11.5-mc discriminator Z2.                 | l. Check continuity between pin 3 of A21AJ2 and IN terminal of Z2, figs. 3-3 and 3-4.   |
|      |            | m. Defective 11.5-mc discriminator Z2   | m. Examine external filter wiring for breaks or other signs of deterioration. Check Z2 by substitution, fig. 3-3.   |
|      |            | n. Defective wiring between Z2 and A55.                                       | n. Check continuity between OUT terminal of Z2 and pin 1 of A55J1, fig. 3-4.  |
|      |            | o. Defective wiring between A55 and R1 (VOLUME control).                      | o. Check continuity between center tap of R1 and pin 3 of A55J1. Check continuity between pin 3 of A57, pin 4 of A55J1, and top of R1, fig. 3-4.  |

| Item | Indication   | Probable trouble   | Procedure   |
|------|--|--|---|
| 6    | A rushing noise is heard in the H-189/GR when the function switch is at ON, when either antenna is used on either band. The transmitter is also inoperative. | <ul style="list-style-type: none"> <li>a. Defective regulated + 10-volt wiring to A29A.</li> <li>b. Defective C1 or C2. . . . .</li> <li>c. Defective frequency synthesizer system.</li> </ul>   | <ul style="list-style-type: none"> <li>a. Check continuity between pin A of J11 and pin 2 of J5, fig. 3-2.</li> <li>b. Check physical condition of C1 and C2. Higher maintenance category repair required, figs. 3-2 and 3-5.</li> <li>c. Follow the procedures described in the fss troubleshooting chart ((4) below). Check continuity between pin 4of A55J1 and pin 1 of A54AJ1, fig. 3-4.</li> </ul>  |
| 7    | No output is heard in the H-189/GR when the function switch is at SQUELCH with a proper (150-cps modulated) signal being received.                           | Defective wiring between A55 and A54A. . . .   | <ul style="list-style-type: none"> <li>a. Check continuity between contacts 8 and 3 of relay K3. (Normal indication is infinity, with no signal input. ) Fig. 3-3.</li> <li>b. Check physical condition of A54AJ2. Remove relay K3 from XK3 and check continuity between pin 3 of A54AJ2 and ground. (Normal indication is infinity with A54 removed.) Figs. 3-3 and 3-4.</li> <li>c. Check the voltage at pin 3 of A54AJ2 (for K3); 8 volts dc minimum, is acceptable. If unacceptable, replace A54A, fig. 3-4.</li> </ul>   |
| 8    | When a signal is not being received, a rushing noise is heard in the H-189/GR with the function switch at SQUELCH.   | <ul style="list-style-type: none"> <li>a. Defective relay K3. . . . .</li> <li>b. Defective A54AJ2 . . . . .</li> <li>c. Defective module A54A . . . . .</li> </ul>  | <ul style="list-style-type: none"> <li>a. Check continuity between pins 8 and 10 of S1 and between pins 3 and 4 of S1, fig. 3-2.</li> <li>b. Check continuity between pin 10 of S1 and pin 8 of XK3, Check continuity between pin 4 of S1 and pin 1 of XK3, figs. 3-2, and 3-3.</li> <li>c. Check continuity between pin 4 of S1 and pin 1 of A54AJ2, fig. 3-2 and 3-4.</li> <li>d. Check continuity between pin 3 of A54AJ2 and pin 5 of relay socket XK3, figs. 3-3 and 3-4.</li> <li>e. Check relay K3 by substitution, fig. 3-3.</li> <li>f. Follow the procedures described in (1) and (2) below:</li> </ul> |
| 9    | No output is heard in the H-189/GR when the function switch is at SQUELCH in either the receive or transmit mode of operation.                               | <ul style="list-style-type: none"> <li>a. Defective S1. . . . .</li> <li>b. Defective wiring between S1 and K3. . . .</li> <li>c. Defective wiring between S1 and A54 . .</li> <li>d. Defective wiring between A54 and K3. .</li> <li>e. Defective relay K3 . . . . .</li> <li>f. Defective squelch tone module A54A. . . .</li> </ul> |   |

| Item | Indication                                | Probable trouble   | Procedure   |
|------|---|--|---|
| 10   | Receives signal on the wrong channel.     | a. Defective frequency synthesizer system.<br>b. Improper alignment of C1. . . . . | (1) Check squelch tone signal at A54AJ2, 1.7 ± 10% volts, 150 cps, ± 1.5 cps with rf signal input from nearby AN/PRC-77 (known to be good) transmitting on the same channel is acceptable. If not satisfactory, replace A54A, fig. 3-3.<br>(2) Check voltage at pin 12 of A57; 1 volt dc (maximum) is acceptable. If unacceptable, replace A54A, fig. 3-3.<br>a. Follow the procedures described in the fss troubleshooting chart ((4) below).<br>b. Higher maintenance category is required. |
| 11   | High-frequency noise in the audio output. | FL1 or FL2 defective . . . . .   | Replace FL1 or FL2, fig. 3-4.   |
| 12   | Tuning knobs do not function properly.    | Selector mechanism defective. . . . .  | Higher maintenance category repair required.  |

(3) *Troubleshooting chart for transmitter section of RT-841/PRC-77.* CAUTION: *Replacement modules A28, A31, A36, A38, and A39 must be aligned (para 3-19,-18,-20,-16, -17).*

| Item | Indication  | Probable trouble   | Procedure  |
|------|---|--|--|
| 1    | No RF power output indicated on the AN/URM-120 on either band. Receive operation is normal. | a. Defective drive from transmitter intermediate power amplifier A37. (Damage to A36Q1 and/or A37Q1, A37Q2 may be caused by: reversing battery leads, or by changing BAND switch or the MHz or KHz controls while the radio is keyed.) | a. Depress the push-to-talk switch on H-189/GR and check the rf output of A37 (to A36) at pin 4 of A49; 4.5 volts, rf (minimum) is acceptable. If satisfactory, proceed as follows:<br>(1) Replace A36, fig. 3-1.<br>(2) Replace A32, fig. 3-1.<br>(3) Check the transmitter frequency control as described in item 5, figs. 3-1 and 3-3. If unsatisfactory, check the rf input to A37 (from A38) at pin 1 of A49 with AN/URM-145, 0.3 volt, RF (minimum) is acceptable. If satisfactory, replace A37. If unsatisfactory, replace A38, fig. 3-3, and align |

**NOTE**

RF Power Output: The minimum radio frequency power delivered a 50 ohm resistive load shall be as follows:

| Frequency Range (MHz) | Power (Watts) |
|-----------------------|---------------|
| 30.00-33.95           | 1.75          |
| 34.00-49.95           | 2.00          |
| 50.00-52.95           | 1.75          |
| 53.00-70.95           | 1.5           |
| 71.00-75.95           | 1.3           |

- b. Defective FL1 or FL2. . . . . b. Connect the handset to AUDIO connector FL1, press the H-189/GR push-to-talk switch. Repeat the procedure with the H-189/GR connected FL2. If the transmitter operates properly from one AUDIO connector, but not the other, replace the defective connector, fig. 3-4.
- c. Defective wiring between A36 and ANT connector J2. c. Remove module A36. Key the transmitter and check continuity between J2 (center conductor) and pin 9 of J5; and from pin 9 of J5 to pin 6 of J7. The resistance should be zero when the transmitter is keyed. After this check, return module A36 to its position, figs. 3-2 and 3-3.
- d. Defective relay K2. . . . . d. With handset keyed, check voltage across contacts 8 and 3 and across contacts 4 and 7 of K2. In each case, 0 volt should be measured, indicating closed (energized) relay contacts, fig. 3-5.

| <i>Item</i> | <i>Indication</i>   | <i>Probable trouble</i>   | <i>Procedure</i>   |
|-------------|---|---|--|
|             |   | <p>e. Defective +12.5-volt distribution wiring.</p> <p>f. Defective +9.5-volt distribution wiring.</p> <p>g. Defective wiring between A31 and A50.</p> <p>h. Defective wiring between A50 and A38.</p> <p>i. Defective wiring from A38 to A37 and/or A31.</p> <p>j. Defective wiring between A37 and A36.</p> | <p>e. Check continuity between contact 3 of K2 and the following points, fig. 3-5:</p> <ol style="list-style-type: none"> <li>(1) Pin 5 of J7, Fig. 3-2.</li> <li>(2) Pin 10 of J5, Fig. 3-2.</li> <li>(3) Pin 3 of A49, Fig. 3-8.</li> <li>(4) Pin B of J10, Fig. 3-2.</li> </ol> <p>f. Check continuity between contact 7 of J2 and the following points, Fig. 3-4:</p> <ol style="list-style-type: none"> <li>(1) Pin 14 of A57, Fig. 3-4.</li> <li>(2) Pin C of J10, Fig. 3-2.</li> <li>(3) Pins 3 and 6 of J5, Fig. 3-2.</li> <li>(4) Pin 5 of J22, Fig. 3-8.</li> </ol> <p>g. Check continuity between pin A of J10 and pin 6 of J22, Fig. 3-2, and 3-8.</p> <p>h. Check continuity between pin 4 of J22 and pin 5 of J6, Figs. 3-2, and 3-8.</p> <p>i. Check continuity between pin 5 of J5 and pin 1 of A49; and between pin 8 of J6 and pin H of J10, Figs. 3-2, and 3-8.</p> <p>j. Check continuity between pin 4 of A49 and pin 7 of J5, Figs. 3-2 and 3-8.</p> |
| <p>2</p>    | <p>No RF power output indicated on the AN/URM-120 on one band. Receiver also defective on the same board.</p> | <p>Defective BAND switch shaft. . . . .</p>   | <p>Higher maintenance category required.</p>   |

| <i>Item</i> | <i>Indication</i>   | <i>Probable trouble</i>  | <i>Procedure</i>   |
|-------------|---|--|--|
| 3           | No RF power output indicated on the AN/URM-120 on one band. Receiver operation is normal on both bands. | <ul style="list-style-type: none"> <li>a. Defective transmitter power amplifier module A36.</li> <li>b. Defective frequency control. . . . .</li> <li>c. Defective C1 . . . . .</li> </ul>   | <ul style="list-style-type: none"> <li>a. Replace A36, Fig. 3-1.</li> <li>b. Follow the procedures described in item 4.</li> <li>c. Higher maintenance category is required.</li> </ul>  |
| 4           | Transmits on the wrong frequency on either band.  | <ul style="list-style-type: none"> <li>a. Defective transmitter vfo module A38. . . . .</li> <li>b. Improper alignment of A38. . . . .</li> <li>c. Improper sidestep oscillator alignment of transmitter frequency control module A31.</li> </ul>  | <ul style="list-style-type: none"> <li>a. Check A38 vfo output (to A50) at pin 4 of J22 with AN/URM-145; 0.3 volt, rf (minimum) is acceptable, If unacceptable, replace A38 and align that module (para 3-16), Fig. 3-8.</li> <li>b. Check the alignment of A38(para 3-16), Fig. 3-1.</li> <li>c. Check the alignment of A31 (para 3-18), Fig. 3-1.</li> </ul>   |
| 5           | Transmits on the wrong channel on both bands. Receiver operation is normal.                             | <ul style="list-style-type: none"> <li>a. Improper alignment of A38. . . . .</li> <li>b. Improper sidestep oscillator alignment of A31.</li> <li>c. Low input signals to transmitter,mixer module A50.</li> <li>d. Low 11.5-mc IF gain . . . . .</li> <li>e. Defective 100-cps sweep oscillator of A31.</li> </ul> | <ul style="list-style-type: none"> <li>a. Check the alignment of A38 (para 3-16), Fig. 3-1.</li> <li>b. Check the alignment of A31 (para 3-18), Fig. 3-1.</li> <li>c. Follow the procedures described in (1) and (2) below:                             <ul style="list-style-type: none"> <li>(1) Check rf input from A38 to A50 at pin 4 of J22 with AN/URM-145; 0.3 volts rms (minimum) is acceptable. If unsatisfactory, replace A38 and align that module (para 3-16), Figs. 3-5, and 3-8.</li> <li>(2) With RT-841/PRC-77 in the receive mode, check the RF input from A39A to A50 at pin 3 of J22 with AN/URM-145; a minimum of 15 millivolts rms is acceptable. If unacceptable, replace module A39A and align that module (para 3-17), Figs. 3-6, and 3-8.</li> </ul> </li> <li>d. Check the 11.5-mc rf level at test point A31J2; 1.5 volts, rms (minimum) is acceptable. If unsatisfactory, check modules A31 and A50 by substitution and replace as required, Fig. 3-5.</li> <li>e. Remove module A38 and check the phase detector-transmitter vfo apc at</li> </ul> |

| Item | Indication  | Probable trouble  | Procedure  |
|------|---|---|--|
|      |   |   | test point A31J4; a 100-cps, 2 volts rms (minimum) signal is acceptable. If unsatisfactory, replace A31, recheck the A31J4 output. If satisfactory, replace A38, Fig. 3-6.   |
|      |   | f. Defective + 10-volt distribution wiring.                       | f. Check continuity between contact 7 of K2 and the following points, Fig. 3-5:<br>(1) Pin 14 of A57, Fig. 3-4,<br>(2) Pin C of J10, Fig. 3-2.<br>(3) Pin 6 of J5, Fig. 3-2.<br>(4) Pin 5 of J57, Fig. 3-3.          |
|      |   | g. Defective wiring between A31 and A50.                          | g. Check continuity between pin A of J10 and pin 6 of J22, Fig. 3-2.   |
|      |   | h. Defective wiring between A50 and A38.                          | h. Check continuity between pin 4 of J22 and pin 5 of J6, Figs. 3-2, and 3-8.  |
|      |   | i. Defective wiring from A38 to A37 and/or A31.                   | i. Check continuity between pin 5 of J5 and pin 1 of A49; and between pin 8 of J6 and pin H of J10, Figs. 3-2, and 3-8.  |
| 6    | Transmits and receives signals on wrong channel on either band.                                       | Defective fss circuitry . . . . .                                 | Perform the procedures outlined in the fss troubleshooting chart ((4) below).  |
| 7    | Transmits a continuous-wave carrier, but sidetone is heard in H-189/GR.                               | Defective wiring between A22 and A31                              | Check continuity between pin 1 of A22J2 and pin D of J10. (Typically 1,200 ohms.) Check open circuit to ground, Figs. 3-2, and 3-4.  |
| 8    | Transmits a cw carrier but no sidetone is heard in H-189/GR when the function switch is at ON.        | a. Defective FL1 or FL2. Defective wiring from FL1 or FL2 to A22. | a. Check physical condition of FL1 and FL2, Check continuity between pin D of FL1 and FL2 and pin 4 of A22J1. Check physical condition of A57 printed wiring, Fig. 3-4.  |
|      |   | b. Defective + 10-volt regulated wiring to A22.                   | b. Check continuity between pin 7 of K2 and pin 2 of A22J2, Figs. 3-4, and 3-5.  |
|      |   | c. Defective module A22 . . . . .                                 | c. Depress the push-to-talk switch on H-189/GR, whistle into the microphone, and check the speech amplifier limiter output at A22J3; 1.25 volts, $\pm 20\%$ is acceptable. If unsatisfactory, replace A22, Fig. 3-7. |
| 9    | Transmits a modulated carrier but no sidetone is heard in H-189/GR when the function switch is at ON. | Defective wiring between A22 and A55                              | Check continuity between pin 2 of A22J1 and pin 4 of A55J2, Fig. 3-4.  |

| <i>Item</i> | <i>Indication</i>   | <i>Probable trouble</i>  | <i>Procedure</i>   |
|-------------|---|--|--|
| 10          | Transmits a modulated carrier but no audio is heard in the H-189/GR in either the transmit or receive mode of operation when the function switch is at SQUELCH.       | Defective squelch circuitry . . . . .  | Perform the procedures outlined in item 9 of (2) above.  |
| 11          | Transmits a modulated carrier but no idetone is heard in the H-189/GR when the function switch is at SQUELCH. Receiver operation is normal.                           | Defective wiring between A23 and A54. . .  | Check continuity between pin 1 of A23J1 and pin 4 of A54J1, Fig. 3-4.  |
| 12          | Transmits a modulated carrier that cannot be received when an RT-841/PRC-77 at the receiving site is in the SQUELCH mode of operation. Sidetone is heard in H-189/GR. | Defective wiring between A23 and A22. . .  | Check continuity between pin 1 of A23J2 and pin 4 of A22J2, Figs. 3-4, and 3-7.  |
| 13          | Same as item 12, except no sidetone is heard in H-189/GR.   | a. Defective module A23. . . . .<br><br>b. Defective + 10-volt regulated wiring to A23.                              | a. Check the tone generator output at A23J3; 0.7 to 2.5 volt, 150-Hz $\pm$ 20% while transmitting is acceptable. If not satisfactory, replace A23, Fig. 3-7.<br><br>b. Check continuity between pin 7 of XK2 and pin 2 of A23J2, Figs. 3-4, and 3-5. |
| 14          | BAND switch does not function properly.   | BAND switch defective. . . . .   | Higher maintenance category required.  |
| 15          | Tuning knobs do not function properly.  | Selector mechanism defective . . . . .   | Higher maintenance category required.  |
| 16          | No output is heard in the H-138/U during transmit operation when the function switch is at SQUELCH. Output is normal during receive operation.                        | a. Defective module A23<br>b. Defective wiring between A23 and A54A.<br><br>c. Defective wiring between A57 and A23. | a. Same as step 13a above.<br>b. Check continuity between pin 1 of A23J1 and pin 4 of A54AJ1, Fig. 3-4.<br>c. Check continuity between pin 14 of A57 and pin 2 of A23J2, Fig. 3-4.   |

(4) *Troubleshooting chart for frequency synthesizer system of RT-841/PRC-77.*

| <i>Item</i> | <i>Indication</i>                                   | <i>Probable trouble</i>   | <i>Procedure</i>   |
|-------------|---|---|--|
|             | Receives and transmits signal on the wrong channel. | a. Defective modules preventing crystal frequency control.<br>(1) Defective module A39A.<br><br>(2) Module A39A improperly aligned. . . | a. Check the fss oscillator as follows:<br><br>(1) Check the vfo output at A39AJ4 with AN/URM - 145; an 0.3 volt rms RF (minimum) signal is acceptable, Fig. 3-1.<br>(2) Check the alignment of A39 (para 3-17), Fig. 3-1. |

| Item | Indication | Probable trouble   | Procedure  |
|------|------------|--|--|
|      |            | (3) Defective module A45A. . . . .                             | (3) Use test cable No. 1 and check the spectrum generator input signal at A44AJ3 with AN/URM- 145; a 1-mc $\pm 20$ cps frequency pulse with level of 0.15 volt rms is acceptable. If unsatisfactory, replace A45A, Fig. 3-1.   |
|      |            | (4) Defective module A40A. . . . .                             | (4) Check the A40AQL oscillator rf output level at A40J2 with AN/URM-145; 0.38 volt rms, RF, $\pm 25\%$ is acceptable. Use test cable No. 1 and measure the frequency of this output; 46.85 to 47.75-mc $\pm$ kc is acceptable, Fig. 3-1.<br><br><i>Note:</i> The frequency at A40AJ2 can be determined by rounding off the kc dial frequency and adding it to 46.85. For example at 38.45, 0.45 rounds off to .50 + 46.85= 47.85. Therefore, 47.35 mc is the desired frequency, Check the A40AQ3 oscillator rf output level at A40AJ3; 1.8 volts rms $\pm 20\%$ is acceptable. Use test cable No. 1 and measure the frequency of this output; 5.65 mc $\pm$ 500 cps on even channels and 5.60 mc $\pm$ 500 cps on odd channels is satisfactory, Fig. 3-1. If these checks are unsatisfactory, Replace A40A, Fig. 3-1. |
|      |            | (5) Improper reference voltage for the frequency control loop. | (5) Check the dc voltage at A40AJ3; 3.8 volts dc $\pm 20\%$ is acceptable. If unsatisfactory, replace A17A and realign A39A (para 3-17), Fig. 3-1.   |
|      |            | (6) Low vfo input to the fss. . . . .                          | (6) Check the vfo input signal at A44AJ2 (from A39A) with AN/URM - 145; 0.3 volt rms (minimum) RF signal is acceptable. If not satisfactory, replace A44A and/or A39A; realign A39A (para 3-17), Fig. 3-1.   |
|      |            | (7) Defective fss second mixer module A12A                     | (7) Check the fss if, output at A12AJ2; 10 mv minimum (at 5.6 mc) is acceptable. If unsatisfactory, re-  |



| <i>Item</i> | <i>Indication</i>                                       | <i>Probable trouble</i> | <i>Procedure</i>   |
|-------------|---|-------------------------|--|
|             |   |                         | place A12A, A43, and/or A44A, Fig. 3-1.  |
|             | (8) Defective 5.6-mc IF amplifier module A18A.          |                         | (8) Check the output of A18AJ2; 0.20 volt RF (minimum) is acceptable. If unsatisfactory, replace A18A, Fig. 3-1.   |
|             | (9) Defective phase comparator module A17A.             |                         | (9) Check the control voltage output at A17AJ2; 3.8 vdc $\pm$ 20% is satisfactory, if A39 is properly aligned. If not satisfactory, or dc voltage at A39AJ3 is not constant and approximately 3.8 vdc ((5) above), replace A17A, Fig. 3-1.   |
|             | (10) Defective fss discriminator module A11A.           |                         | (10) Check the discriminator output at A11J2; 4.0 $\pm$ 1.0 vdc (with vfo properly aligned) is acceptable. If unsatisfactory, replace A11. If satisfactory place a jumper between J13 pins D and E on motherboard A56; a minimum 10-cps signal of 0.5 volts rms should be present at A11AJ2. If unacceptable, replace A11A, Fig. 3-1, and 3-8.   |
|             | (11) Defective C1 .....                                 |                         | (11) If A39A and a replaced A39A can not be properly aligned, higher maintenance category is required, Fig. 3-1.   |
|             | b. Defective regulated + 10-volt wiring to fss modules. |                         | b. Check continuity between the following points.<br>(1) Pin A of J11 and pin D of J17, Fig. 3-2.<br>(2) Pin A of J11 and pin A of J13, Fig. 3-2.<br>(3) Pin A of J11 and pin C of J14, Fig. 3-2.<br>(4) Pin A of J11 and pin 2 of J5, Fig. 3-2.<br>(5) Pin A of J11 and pin G of J12, Fig. 3-2.<br>(6) Pin A of J11 and pin H of J12, Fig. 3-2.<br>(7) Pin F of J22 and pin B of J20, Fig. 3-2.<br>(8) Pin F of J11 and pin A of J21, Fig. 3-2.<br>(9) Pin D of J14 and pin D of J18, Fig. 3-2. |

| Item | Indication | Probable trouble                             | Procedure  |
|------|------------|--|--|
|      |            | c. Defective wiring between A39 and A44A.    | c. Check continuity between pin 1 of J6 and pin A of J20. Check printed wiring of A56A. Check physical condition of J6 and J20, Figs, 3-2, and 3-5.          |
|      |            | d. Defective wiring between A44A and A43.    | d. Check continuity between pin E of J20 and pin F of J19, and between pin D of J20 and pin E of J19. Check physical condition of J19, Fig. 3-2.             |
|      |            | e. Defective wiring between A45A and A44A.   | e. Check continuity between pin E of J21 and pin F of J20. Check physical condition of J21, Fig. 3-2.  |
|      |            | f. Defective wiring between A43 and A40A.    | f. Check continuity between pin J of J12 and pin D of J19, Check physical condition of J12, Fig. 3-2.  |
|      |            | g. Defective wiring between A43 and A12A.    | g. Check continuity between pin B of J19 and pin B of J18, and between pin A of J19 and pin A of J18. Check physical condition of J18, Fig. 3-2.             |
|      |            | h. Defective wiring between A12A and A18A.   | h. Check continuity between pin F of J18 and pin F of J14. Check physical condition of J14, Fig. 3-2.  |
|      |            | i. Defective wiring between A18A and A11A.   | i. Check continuity between pin A of J14 and pin F of J17. Check physical condition of J17, Fig. 3-2.  |
|      |            | j. Defective wiring between A18A and A17A.   | j. Check continuity between pin A of J14 and pin B of J13. Check physical condition of J13, Fig. 3-2.  |
|      |            | k. Defective wiring between A40A and A17A.   | k. Check continuity between pin B of J12 and pin E of J13, and between pin A of J12 and pin D of J13.  |
|      |            | l. Defective wiring between A17A and A11A.   | l. Check continuity between pin F of J13 and pin B of J17, Fig. 3-2.   |
|      |            | m. Defective wiring between A11A and A39A.   | m. Check continuity between pin A of J17 and pin 2 of J6, Fig. 3-2.  |
|      |            | n. Capacitor C1 and/or C2 of A56A defective. | n. Check leakage resistance of capacitors A56AC1 and A56AC2 with A39A and A11A removed. (Leakage resistance should be several megohms.), Figs. 3-5, and 3-6. |

## Section III . DIRECT SUPPORT REPAIRS

**3-6. Scope of Direct Support Repairs**

This section contains information on the repair functions for Radio Set AN/PRC-77 which may be accomplished by the direct support repairperson. The repair duties for direct support maintenance are limited to the procedures listed below.

- a. Removal and replacement of the RT-841/PRC-77 case (para 3-7).
- b. Replacement of dial lamp (para 3-8).
- c. Replacement of all modules, except A28 (para 3-9); if A28 is defective, the removal and replacement of that module should not be attempted by direct support repairmen; higher maintenance category is required.
- d. Replacement of relay K2 (para 3-10).
- e. Removal and replacement of audio and control chassis A57 (para 3-11).
- f. Removal and replacement of synthesizer motherboard A56 or A56A (para 3-12).
- g. Removal and replacement of ipa motherboard A49 (para 3-13).

**3-7. Removal and Replacement of RT-641/PRC-77 CASE**

(fig. 2-2, TM 11-5820-667-12)

**NOTE**

Remove the CY-2562/PRC-25 and the battery (BA-5598/U or BA-4386/U) before removing the RT-841/PRC-77 case.

**CAUTION**

The gaskets and the joints between the case and the panel of the RT-841/PRC-77 insure that an assembled unit will be watertight. The aluminum case and panel must never be handled in such a manner as to destroy or distort metal surfaces or edges which together with good gaskets make up a continuous seal. Never attempt to repair a case with chipped or burned edges; replace with a new one.

**WARNING**

When using magnesium battery BA-4386/U, the following items A through E must be inspected and corrected if necessary. These conditions are required to insure that the hydrogen gas (a by-product of magnesium battery BA-4386/U discharge action) cannot enter the RT-841/PRC-77 case. Personnel can be injured and the equipment severely damaged if the gas explodes. See page C for further battery warnings and cautions.

A. SEALING GASKET MUST BE INSTALLED ON RT-841/PRC-77 BATTERY CONNECTOR J4 (FIG. 3-1; (b)(1) (b)3 below).

B. THE O-RINGS ON RT-841/PRC-77 BATTERY CONNECTOR J4 (FIG. 3-1) MUST NOT BE CUT OR SHEARED, OR LOOSE IN THEIR RECESSES (b)(1) (b)2 below).

C. THE PRESSURE TEST SCREW (FIG. 3-12) MUST BE SCREWED TIGHTLY AND COVERED WITH EPOXY (b)(2) (c) below).

D. THE PRESSURE RELIEF VALVE (FIG. 3-12) MUST BE INSTALLED IN CY-2562/PRC-25 (b)(3) (c) below).

E. THE MAGNESIUM BATTERY BA-4386/U MUST NOT BE INSTALLED (FIG. 3-12) UNLESS THE RADIO IS BEING USED FOR COMMUNICATION OR BEING TESTED.

*a. Removal.*

(1) Loosen the four captive screws that secure the chassis to the case.

(2) Pull the RT-841/PRC-77 chassis straight out of its case.

*b. Inspection and Repair.**(1) RT-841/PRC-77 chassis.*

*(a)* Inspect the condition of the preformed packing behind the front panel. Replace the packing if it is damaged or it is not flush with the case. To avoid damaging the packing, use a tweezers or a small unpointed instrument to remove and install the packing. Before inserting into the recess, wipe a light coating of Dow Corning No. 4, or equivalent on the packing.

*(b)* Inspect and correct as necessary the following battery connector J4 features (fig. 3-1).

1. Replace the connector if the pins are damaged or are not firm in the receptacle.

2. Replace the O-rings if they are cut or sheared, or are loose in their recesses. Coat the O-rings with Dow Corning No. 4 silicone grease, or equivalent.

3. The sealing gasket (FSN 5330-109-6450) (fig. 3-1) must *be installed* on J4. Replace it if it is cut, sheared, or out of shape. It must be flush with the base of the connector and with the body of the connector. It must not rest on the connector screws. Coat the gasket with Dow Corning No. 4 silicone grease, or equivalent.

4. Loosen the four connector screws slightly so that the connector "floats".

(2) *RT-841/PRC-77* case (fig. 3-12).

(a) Clean the inside of the case.

(b) Use a crocus cloth on the end of a broom handle, or equivalent, and round off the edges of the hole in the bottom of the case through which the *RT-841/PRC-77* battery connector J4 is inserted.

(c) Tighten the pressure test screw and coat it with epoxy. (The opening is used during manufacture for pressure test instruments.)

(3) *CY-2562/PRC-25* (fig. 3-16).

**NOTE**

**If Lithium Battery BA-5598/U is used, be sure two additional rubber pads have been installed in the battery box to prevent movement of batteries.**

(a) Install the rubber pads if they are missing; glue them if they are loose.

(b) Inspect the condition of the preformed packing. Follow the instructions given in (1) (a) above.

(c) The pressure relief valve must be installed. Tighten it using the nut on the inside of the case.

**NOTE**

The pressure relief valve is provided on new equipment and on used equipment in accordance with MWO 11-5800-211-30-1, 13 September 1972 (LIMITED URGENT). It is required in order to vent hydrogen gas (a by-product of discharge action of magnesium battery BA-4386/U) from the *CY-2562/PRC-25* and thus prevent the gas from escaping into the *RT-841/PRC-77* chassis. Personnel can be injured and the equipment severely damaged if the hydrogen gas explodes.

c. *Replacement* (fig. 3-16).

(1) Set the *RT-841/PRC-77* chassis on a level surface with the front panel guards downward.

(2) Before securing the case to the *RT-841/PRC-77*, coat the threads of the four case-securing screws with antiseize compound. Carefully move the case over the chassis, make sure that the terminals clear the holes in the rear. Also, be sure that the case is seating evenly on all surfaces of the gasket before tightening the screws.

**CAUTION**

If the case should be distorted in a concave or convex manner when securing it to the panel, damage will result. Therefore, make sure that the case is resting properly against

the gasket and that it does not touch metal at any point. Never attempt to tighten one screw completely, for example, take up a turn from each one, while continuing to check the condition of the gasket.

**3-8. Replacement of Dial Lamp (DS1)**

(fig. 3-2)

a. *Removal.*

(1) Remove the *RT-841/PRC-77* case (para 3-7 a).

(2) Remove module A36 (para 3-9 i).

(3) Remove the receptacle securing screw, lockwasher, and flatwasher that secure the dial lamp receptacle to the tuning mechanism housing (fig. 3-2).

(4) Remove the dial lamp receptacle.

(5) Carefully remove dial lamp DS1 from the tuning mechanism housing with long-nosed pliers.

b. *Replacement.*

(1) Carefully place dial lamp DS1, glass envelope downward, into its location in the tuning mechanism housing.

(2) Place the dial lamp receptacle over the dial lamp.

(3) Replace the flatwasher and lockwasher. Replace and tighten the receptacle securing screw that was removed (a (3) above).

(4) Replace module A36 (para 3-9 j).

(5) Replace the *RT-841/PRC-77* case (para 3-7 b and c).

**3-9. Replacement of Modules**

**CAUTION**

Be extremely careful in the removal and replacement of a module. Rough handling will result in deformed connectors and pins, and in subsequent malfunctions due to this type of irregularity. If module A28 is defective, higher maintenance category is required.

a. *Removal of Modules A21A, A22, A23, A54A, and A55* (fig. 3-3).

(1) Remove the module pulling tools from the module pulling toolholder.

**CAUTION**

Be careful not to crossthread the module pulling tools into the module tool receptacles.

(2) Screw the module pulling tools into the module tool receptacle of the module.

(3) Loosen the module fastening screws.

(4) Pull the module out with the module pulling tools.

(5) Remove the module pulling tools from the module, and replace them in the module pulling toolholder.

*b. Replacement of Modules A21A, A22, A23, A54A, and A55 (fig. 3-3).*

**CAUTION**

**Make sure that the module jacks mate with the module plugs when the modules are being replaced.**

(1) Place the module in position in the RT-841/PRC-77.

(2) Seat the module in its connectors by applying equal pressure to both ends of the module.

(3) Tighten the module fastening screws.

*c. Removal of Modules A11A, A12A, A16AA, A17A, A18A, A31, A35A, A43, A44A, and A45A (fig. 3-1 and 3-5).*

(1) Loosen the three captive screws that hold audio and control chassis A57 in position (fig. 3-3).



- (2) Swing A57 open (on its hinge) to reach the module fastening screws.
- (3) Loosen the module fastening screws (fig. 3-5).
- (4) Pull out the module with your fingers (slight pressure on loosened fastening screws may aid this removal).

**d. Replacement of Modules A11A, A12A, A16A, A 17A, A18A, A31, A35A, A43, A44A and A45A** (fig. 3- 1 and 3-5). *Caution: new A31 must be aligned* (para 3-18).

**Caution: Make sure that the module jacks mate with the module plugs when the modules are being replaced.**

- (1) Place the module into position in the RT-841/PRC-77.
- (2) Seat the module in its connector by applying pressure to the center of the module.
- (3) Tighten the module fastening screws (fig. 3-5).
- (4) Swing the audio and control chassis (A57) back into position.
- (5) Tighten the three captive screws that were loosened (c(1) above).

**e. Removal of Modules A32, A33, A34, A38, and A39A** (fig. 3- 1).

- (1) Remove a module pulling tool from the module pulling toolholder (fig. 3-3).

*Caution: Be careful not to cross-thread the module pulling tool into the module tool receptacle.*

- (2) Screw the module pulling tool into the module tool receptacle.
- (3) Loosen the module fastening screws.
- (4) Remove the module by pulling the module pulling tool.
- (5) Remove the module pulling tool from the module; replace it in the module pulling toolholder (fig. 3-3).

**f. Replacement of Modules A32, A33, A34, A38, and A39A** (fig. 3-2).

*Caution: new A38 and A39A must be aligned* (para 3-16, -17).

**Caution: Make sure that the module jacks mate with the module plugs, and the guide pins mate with the module guide pin receptacles when the modules**

are being replaced.

- (1) Place the module into position in the RT-841/PRC-77.
- (2) Seat the module by applying equal pressure to both ends of the module.
- (3) Tighten the module fastening screws (fig. 3-1).

**g. Removal of Module A37**(fig. 3-5).

- (1) Loosen the three captive screws that hold audio and control chassis A57 in position (fig. 3-3)
- (2) Swing A57 open on its hinge to allow access to A37.
- (3) Remove a module pulling tool from the module pulling toolholder (fig. 3-3).  
*Caution: Be careful not to cross-thread the module pulling tool into the module tool receptacle.*
- (4) Screw the module pulling tool into the module tool receptacle of the module.
- (5) Loosen the module fastening screws.
- (6) Remove the module by pulling the module pulling tool.
- (7) Remove the module pulling tool from the module; replace it in the module pulling toolholder.

**h. Replacement of Module A37**(fig. 3-8).

*Caution: Make sure that the module jacks mate with the module plugs when the module is being replaced.*

- (1) Place the module into position in the RT-841/PRC-77.
- (2) Seat the module in its connectors by applying equal pressure to both ends of the module.
- (3) Tighten the module fastening screws.
- (4) Swing audio and control chassis A57 back into position.
- (5) Tighten the three captive screws that were loosened (.g(5) above).

**i. Removal of Module A36** (fig. 3- 1).

- (1) Remove the two module pulling tools from the module pulling toolholder (fig. 3-3).

*Caution: Be careful not to cross-thread the module pulling tools into the module tool receptacles.*

(2) Screw the module pulling tools into the module tool receptacles of the module.

(3) Remove the module fastening screws.

(4) Remove the module by pulling the module pulling tools.

(5) Remove the module pulling tools from the module; replace them into the module pulling toolholder.

j. *Replacement of Module A36* (fig. 3-2).

#### CAUTIONS

1. New A36 must be aligned (para 3-20).

2. Make sure that the module jacks mate with the module plugs when the module is being replaced.

(1) Place the module in position in the RT-841UPRC-77.

(2) Seat the module in its connectors by applying equal pressure to both sides of the module.

(3) Tighten the module fastening screws.

k. *Removal of Module A40A* (fig. 3-1 and 3-5).

#### CAUTION

When removing and replacing module A40, make sure REC-TRANS FREQUENCY kHz control is positioned at 50 and that a shim is inserted between the mechanical finger (fig. 3-2) in the kHz coupling and the coupling in module A40. To facilitate the removal and replacement of module A40A and prevent damage to the mechanical finger, fabricate a shim from metal, cambric, or stiff plastic (such as a credit card) 3½ inches (9 cm) long and 2 inches (5 cm) wide.

(1) Loosen the three captive screws that hold audio and control chassis A57 in position (fig. 3-3).

(2) Swing the audio and control chassis open (on its hinge) to reach the module fastening screws (fig. 3-5).

(3) Set the REC-TRANS FREQUENCY kHz control to 50 and insert the shim between the mechanical finger (fig. 3-2) and the A40A coupling.

(4) Loosen the two module fastening screws.

(5) Insert a small screwdriver through the associated hole on synthesizer motherboard A56 (midway between the two module fastening screws) and push the A40A module out.

1. *Replacement of Module A40A* (fig. 3-1 and 3-5).

#### CAUTIONS

1. Make sure the module jacks mate with the module plugs when the module is being replaced.

2. Make sure the REC-TRANS FREQUENCY kHz control is set to 50 and the shim is inserted between the mechanical finger and A40A module coupling.

(1) Set the REC-TRANS FREQUENCY kHz control to 50 position.

(2) On A40A module rotate the coupling so that the slot points toward the bottom of the module (to facilitate its engagement with the mechanical finger on the kc control coupling).

(3) Place the shim on the side of A40A module over the coupling and lower the module into position in the RT-841/PRC-77.

(4) Set the module into its connector by applying pressure to the center of the module.

(5) Remove the shim and tighten the module fastening screws.

(6) Rotate the REC-TRANS FREQUENCY kHz control back and forth and check to see that the mechanical finger has seated in the slot in A40A module coupling.

(7) Swing audio and control chassis A57 back into position.

(8) Tighten the three captive screws that were loosened (k(1) above).

2. Make sure REC-TRANS FREQUENCY kHz control is set at 50 and the shim is inserted between the mechanical finger and A40 module coupling.

(1) Set the REC-TRANS FREQUENCY kHz tuning control to 50 position.

(2) Place the shim on the side of A40A module over the coupling and lower the module into position in the RT-841/PRC-77.

(3) Set the module in its connector by applying pressure to the center of the module.

(4) Remove the shim and tighten the module fastening screws.

(5) Rotate the REC-TRANS FREQUENCY kHz control back and forth and check to see that the mechanical finger has seated into the recess in A40 module coupling.



*m. Removal of Module A50* (fig. 3-5).

(1) Loosen the three captive screws that secure audio and control chassis A57 (fig. 3-3).

(2) Swing out audio and control chassis on its hinges.

(3) Pull module A50 from its connector and straight out of its holding clamp (fig. 3-5 and 3-8).

*n. Replacement of Module A50* (fig. 3-5).

#### CAUTION

**Make sure that the module connector pins mate with connector J22 and are not bent during replacement of the module in the holding clamp.**

(1) Place the module into its holding clamp (fig. 3-5 and 3-8) and push the module into its connector.

(2) Switch audio and control chassis A57 into place and tighten the three captive screws (fig. 3-3).

*o. Removal of module A60* (fig. 3-5).

(1) Remove module A31 (c above).

(2) Through the holes in the side of the chassis, remove the two captive screws that secure A60 to the chassis (fig. 3-8).

(3) Tag and unsolder all wire leads to A60.

*p. Replacement of Module A60* (fig. 3-5).

(1) Solder all electrical lead to module A60.

(2) Align the two captive fasteners of A60 with the associated holes on the chassis.

(3) Replace and tighten the two screws that hold A60 to the chassis.

(4) Replace module A31 (d above).

### 3-10. Replacement of Relay K2

(fig. 3-5)

*a. Removal.*

(1) Remove the RT-841/PRC-77 case (para 3-7a).

(2) Loosen the three captive screws that secure audio and control chassis A57 (fig. 3-3).

(3) Swing out audio and control chassis A57 on its hinge.

(4) Pull the relay straight out of its socket.

*b. Replacement.*

#### CAUTION

**Make sure that the pins of relay K2 are not bent during placement of the relay in holding clamp.**

(1) Push the relay straight into its socket.

(2) Swing audio and control chassis A57 into place and tighten the three captive screws (fig. 3-3).

(3) Replace the RT-841/PRC-77 case (para 3-7b).

### 3-11. Removal and Replacement of Audio and Control Chassis A57

(fig. 3-3).

*a. Removal.* If a new A57 is to be installed, three capacitors, C10, C11, and C15, connected to A57 terminal strip must be removed ((7) below) and put on the re-

placement A57 (b(6) below).

(1) Remove modules A21A, A22, A23, A54A, and A55 (para 3-9a).

(2) Remove relay K3.

#### NOTE

**On some units, the relay is larger than clips that hold it and is therefore held between the prongs of the clip with a silicon rubber compound.**

(3) Remove the module pullers.

(4) Unsolder and remove 11.5-mc filter FL3 (para 3-14a).

(5) Unsolder and remove discriminator Z2 (para 3-14a).

(6) Tag and unsolder all wiring to relay socket XK3.

(7) Tag and unsolder capacitors C10, C11, and C15 and all wiring to audio and control chassis A57 terminal strip.

(8) Remove the bonding strap and the wire clamp holding the wire that was attached to IN terminal. of 11.5-mc filter ((4) above) and grounding stud E2.

(9) To remove the metal dowel in the audio and control chassis A57 hinge, either cut off one end of the dowel with a hacksaw or remove the hinge from the chassis by removing screws holding A31 (fig. 3-5). If the dowel is crimped on both ends, use the hacksaw to cut the end nearer the front panel. If the dowel is crimped only on the end nearer the front panel, remove the hinge. Grasp one end of the metal dowel with a pliers and remove the dowel from the hinge.

(10) Remove audio and control chassis A57 from the RT-841UPRC-77.

*b. Replacement.* Compare the removed A57 with the replacement A57 to determine if other parts of the removed A57 must be removed and put on the replacement A57.

(1) Align the hinge and the audio and control chassis A57 and insert the original dowel or a new dowel (a(9) above) through the entire hinge. Crimp the dowel on the end that is nearer the front panel.

(2) Reconnect the bonding strap to the chassis. Make sure the toothed lockwasher is *under the terminal* lug of the bonding strap.

(3) Replace the wire clamp on the wire that will be connected to 11.5-mc filter FL3. Make sure the lockwasher is under the nut.

(4) Replace 11.5-mc filter FL3 and solder the connections (para 3- 14 b). Make sure the shield of the wire that comes through the grommet from J9 is connected to grounding stud E3.

(5) Replace receiver discriminator Z2 and solder the three connections (para 3- 14 b).

(6) Solder all the electrical leads to XK3 and to audio control chassis A57 terminal strip. Make sure to connect the capacitors removed in a(7) above to the

proper terminals on the terminal strip; refer to figure 7-18 for the proper pins on the terminal strip to which capacitors C10, C11, and C15 are connected.

(7) Replace relay K3 in its socket XK3.

**NOTE**

If the relay is larger than the clips that are provided for it, apply silicon rubber compound around the clips to hold the relay in place.

(8) Replace modules A21A, A22, A23, A54A and A55 (para 3-9b).

**3-12. Removal and Replacement of Synthesizer Motherboards A56 and A56A.**

(fig. 3-5).

*a. Removal.*

(1) Remove modules A11A, A12A, A16A, A17A, A18A, A43, A44A, A45A (para 3-9c) and A40A (para 3-9k).

(2) Remove the eight module nuts, lockwashers, and washers.

(3) Loosen the four motherboard captive screws.

(4) Carefully pull the motherboard away from the chassis.

(5) Tag and unsolder all wires from the motherboard.

(6) Remove the jumper wire connections from terminal 3 to terminal F of J9, and from terminal 16 to terminal G of J9 (fig. 7-18). However, do not remove these wires if the motherboard is to be put back on the RT-841/PRC-77.

(7) If the RF shield is provided and it is not provided on the new motherboard, remove it for use on the new motherboard.

*b. Replacement.*

(1) Solder the jumper wires (using the same ones that were provided on the original motherboard (a)(6)

above) or new wires) between terminal 3 and terminal F of J12, and between terminal 16 and terminal G of J12, and between terminals G and H of J12 (fig. 7-18).

(2) Solder all other electrical leads removed in a(5) above to the motherboard.

(3) Align the four motherboard captive fasteners with the holes in the chassis and secure the motherboard captive fasteners.

(4) Install the eight module washers, locknuts, and nuts.

(5) Replace module A40A (para 3-9l), and the other modules that were removed (para 3-9d).

(6) If the RF shield from the old motherboard is available (a(7) above) and it is not provided on the new motherboard, install it under the modules screws for modules A12A and A43.

**3-13. Removal and Replacement of Ipa Motherboard A49**

*a. Removal.*

(1) Loosen the three captive screws that secure audio and control chassis A57 (fig. 3-3) and swing out the chassis on its hinge (fig. 3-5).

(2) Remove modules A50 (para 3-9m) and A37 (para 3-9g).

(3) Remove the two screws that secure relay socket XK2 to the front panel (fig. 3-8) and lift XK2 toward the front panel.

(4) Remove the three screws that secure A49 to the main chassis (fig. 3-8).

(5) Tag and unsolder all electrical leads to A49.

(6) Note the connections of inductor L7, capacitor C12 (0.05 UF), and capacitor C16 (0.0047 UUF to A49 terminals. If a new module is to be installed (b below), unsolder these parts from A49 (fig. 7-18). These parts are soldered to unused A49 terminals for convenience in wiring.

(7) Lift out the ipa motherboard A49.

*b. Replacement.*

(1) If the replacement motherboard A49 is new, solder inductor L7, and capacitors C12 and C16 (removed from the old A49 (a(6) above)) to the proper terminals (fig. 7-18).

(2) Place ipa motherboard A49 into position for mounting.

**CAUTION**

Be careful not to pinch wires between A49 and the main chassis.

(3) Solder all electrical leads to ipa motherboard A49.

(4) Align the three A49 captive fasteners with the associated holes in the main chassis and replace and tighten the screws that secure A49 in position.

(5) Replace relay socket XK2 in position (fig. 3-8) and tighten the two screws that secure XK2 to the front panel.

(6) Replace module A37 (para 3-9h) and module A50 (para 3-9n).

(7) Swing audio and control chassis A57 into place and tighten the three captive screws (fig. 3-3).

**3-14. Removal and Replacement of 11.5-MHz Filter FL3 and Discriminator (fig. 3-3)**

*a. Removal.*

(1) Tag and unsolder the wiring to the terminals of the part (FL3 and/or Z2) to be removed.

(2) Loosen the three captive screws that hold audio and control chassis A57 in position (fig. 3-3).

(3) Swing A57 open on its hinge to reach the fastening screws of FL3 and Z2 (fig. 3-5).

(4) Remove the nuts and bushings from the fastening screws and remove the part (FL3 and/or Z2) to be replaced.

*b. Replacement.*

(1) Place the replacement part (FL3 or Z2) into position on audio and control chassis A57 (fig. 3-3).

(2) Replace and tighten the nuts and bushings to the fastening screws (fig. 3-5).

(3) Swing audio and control chassis A57 into place and tighten the three captive screws (fig. 3-3).

(4) Solder all electrical leads to the terminals.



## Section IV. DIRECT SUPPORT ALIGNMENT PROCEDURES

## 3-15. General

a. The direct support alignment procedures consist of aligning transmitter variable frequency oscillator module A38, synthesizer variable frequency oscillator module A39A, the sidestep oscillator (sso) in frequency control module A31, antenna loading network module A28, and transmitter power module A36. These procedures are contained in paragraphs 3-16, 3-17, 3-18, 3-19, and 3-20, respectively. The alignment of tuning capacitor C1, or tuning capacitor C2 should not be attempted at the direct support maintenance category; a higher maintenance category is required.

b. The following test equipment and tools are required:

- (1) Digital Readout, Counter Electronic AN/USM-207.
- (2) Wattmeter AN/URM-120 (part of Coupler-Detector CU-754/URM-120).
- (3) Dummy Load, Electrical DA-75/U (part of AN/URM-120).
- (4) Multimeter ME-26B/U.
- (5) Module extender for module A31 (fig. 3-9).
- (6) Alignment cover for module A31 (fig. 3-10).
- (7) Capacitor, 2 pf  $\pm 0.5$ , for module A31 alignment (para 3-18).
- (8) Antenna load adapters No. 1 and No. 2 (fig. 3-16).
- (9) Transmitter dummy loads for module A28 alignment (see fig. 3-16 for fabrication details) are –
  - (a) Long antenna loads for specified frequencies as follows:
    - 30.00 MHz – Resistor, 130 ohms  $\pm 1\%$ , 8 watt, deposited carbon, non-inductive (Caddock model MS281N) (NSN 5905-00-552-2451).
    - 65.00 MHz – Resistor, 61.9 ohms  $\pm 1\%$ , 8 watt, deposited carbon, non-inductive (Caddock model MS281N) (NSN 5905-00-543-8368); and capacitor, 10 pf  $\pm 5\%$ , 400 vdc (NSN 5910-00-840-0148).
  - (b) Short antenna loads for specified frequencies as follows:
    - 37.50 MHz – Resistor, 34.8 ohms  $\pm 1\%$ , 8 watt, deposited carbon, noninductive (Caddock model MS281N); and capacitor, 12 pf  $\pm 5\%$ , 400 vdc (NSN 5910-00-806-2716).

65.00 MHz – Resistor, 61.9 ohms  $\pm 1\%$ , 8 watt, deposited carbon, non-inductive (Caddock model MS281N); and capacitor, 29 pf  $\pm 5\%$ , 400 vdc (NSN 5910-00-044-5837).

### 3-16. Alignment of Transmitter Variable Frequency Oscillator Module A38 (fig. 3-1 and 3-6)

#### NOTE

Before aligning module A38, use Multimeter ME-26B/U and observe the apc voltage indication at test J4 of module A31 as the transmitter frequency is varied (by turning the mc control). The apc voltage indication should be between +2.2 and +3.8 volts dc (maximum) with the transmitter keyed. If variation is greater, check A38 alignment as described below.

a. Connect the dc power supply HP-721A or equivalent between A31J4 and ground. Set the voltage of the HP-721A to 3.0 volts.

#### CAUTION

Do NOT apply more than 8.0 volts at this test point.

b. Connect the AN/USM-207 between A49 pin 1 and ground. Connect the AN/URM-120 with the CU-754/URM-120 and DA-75/U to the RT-841/PRC-77 ANT connector J2.

c. Carefully remove module A50 to disable the apc action and prevent it from interfering with the alignment of A38.

d. Set the RT-841/PRC-77 BAND switch to 30-52 and the tuning controls to 30.00 MHz. Connect Handset H-189/GR to one of the AUDIO connectors on the RT-841/PRC-77 and press the push-to-talk switch on the H-189/GR.

e. Adjust A38T1 until the AN/USM-207 indicates a frequency of 30.00 MHz  $\pm 10$  kHz.

f. Set the RT-841/PRC-77 tuning controls to 52.95 MHz. (Depress the push-to-talk switch on the H-189/GR.)

g. Adjust A38C3 until the AN/USM-207 indicates a frequency of 52.95 MHz  $\pm 10$  kHz.

h. Repeat the procedures given in d through g above several times to insure proper alignment of A38 on the low band.

i. Set the RT-841/PRC-77 BAND switch to 53-75 and the tuning controls to 53.00 MHz. (Depress the push-to-talk switch on the H-189/GR.)

- j. Adjust A38T2 until the AN/USM-207 indicates a frequency of 53.00 MHz  $\pm$ 10 kHz.
- k. Set the RT-841/PRC-77 tuning controls to 75.95 MHz. (Depress the push-to-talk switch on the H-189/GR.)
- l. Adjust A38C9 until the AN/USM-207 indicates a frequency of 75.95 MHz  $\pm$ 10 kHz.
- m. Repeat the procedures given in i through l above several times to insure proper alignment of A38 on the high band.
- n. Replace module A50.

### 3-17. Alignment of Synthesizer Variable Frequency Oscillator Module A39A (fig. 3-1 and 3-6)

- a. Connect the AN/USM-207 between A44AJ2 and ground.
- b. Set the RT-841/PRC-77 BAND switch to 30-52, and set the tuning controls to 30.00 MHz.
- c. Remove module A12 to disable the apc action.
- d. Check the dc voltage at A39AJ3; 4 vdc,  $\pm$ 1.0 vdc should be present.
- e. Adjust A39AT1 until the AN/USM-207 indicates a frequency of 41.500 MHz.
- f. Set the RT-841/PRC-77 tuning controls to 52.95 MHz.
- g. Adjust A39AC14 until the AN/USM-207 indicates a frequency of 64.450 MHz.
- h. Repeat the procedures given in b through g above several times to ensure proper alignment.
- i. Replace module A12.

### 3-18. Alignment of Sidestep Oscillator in Frequency Control Module A31 (fig. 3-1 and 3-6)

- a. Remove module A31.
- b. Insert the module extender (fig. 3-9) into J10.
- c. Remove the cover from module A31 and place the alignment cover (fig. 3-10) on the module.
- d. Connect module A31 to the module extender.
- e. Set the RT-841/PRC-77 BAND switch at 30-52.
- f. Connect the AN/USM-207 between A31J3 and ground through a small coupling (2 pf) capacitor.
- g. Connect the AN/URM-120 (with CU-754/URM-120) to the RT-841/PRC-77 ANT connector J2.
- h. Connect Multimeter ME-26B/U, set for rf voltage measurement, between A31J3 and ground.
- i. Connect the H-189/GR to an RT-841/PRC-77 AUDIO connector.

j. Press the H-189/GR push-to-talk switch and adjust A31T5 for an indication of 11.500 MHz  $\pm$ 500 Hz on the AN/USM-207.

k. Adjust A31T6 for a maximum indication on the ME-26B/U. The minimum level of 3 volts RF is acceptable.

l. Remove module A31 and the module extender from J10.

m. Remove the module alignment cover from module A31.

n. Replace the cover on module A31.

o. Replace module A31.

### 3-19. Alignment of Antenna Loading Network Module A28 (fig. 3-2)

a. Perform the alignment of antenna loading network module A28 with the equipment connected in a standard transmitter test setup (para 3-23 and fig. 3-17), except, disconnect the input load at the RT-841/PRC-77 coaxial ANT connector (J2). Install the transmitter antenna loads as described in b, c, and d below, and connect the ME-26B/U in parallel with the resistor of the transmitter load (fig. 3-16).

b. Loosen a mounting screw from one corner of the whip ANT jack (J1) and install antenna load adapter No. 1 (ground connection) under screw. Tighten screw.

c. Install antenna load adapter No. 2 (without the brass adapter nut) in the whip ANT jack (J1) and make sure it operates the microswitches in the ANT jack housing. Two clicks should be heard. (Use the brass adapter nut for short antenna tests only.)

d. Install the transmitter long antenna load for 30.00 MHz (para 3-15 b(9)(a)) between the alligator clip and the spade lug as indicated in figure 3-16. Ground the resistor end of the transmitter load.

e. Set the BAND switch and timing controls of the RT-841/PRC-77 for 30.00-MHz operation and set the function switch to ON.

f. Press the push-to-talk switch on the H-189/GR and read the RF voltage across the resistor of the transmitter load with the ME-26B/U. A reading of 9.0 volt root mean square (rms) minimum should be observed.

g. If the minimum rms voltage is not present, press the push-to-talk switch on the H-189/GR and adjust inductor A28 L4 (fig. 3-2).

h. Set the function switch to OFF.

i. Install the transmitter long antenna load for 65.00 MHz (para 3-15 b(9)(a)) between the alligator clip and the spade lug as indicated in figure 3-16. Ground the resistor end of the transmitter load.

j. Set BAND switch and timing controls of RT-841/PRC-77 for 65.00-MHz operation and set the function switch to ON.

k. Press the push-to-talk switch on the H-189/GR and read the rf voltage across the resistor of the transmitter load with the ME-26B/U. A reading of 6 volts (rms) minimum should be observed.

l. If the minimum rms voltage is not present, press the push-to-talk switch on the H-189/GR and adjust inductor A28L1.

m. Set the function switch to OFF.

n. Unscrew and remove antenna load adapter No. 2.

o. Mount the brass adapter nut on antenna load adapter No. 2 and reinstall the adapter in the whip ANT jack (J1).

#### NOTE

Load adapter No. 2, with the brass nut, should not energize the ANT housing microswitches.

p. Install the short antenna 37.50-MHz transmitter load (para 3-15b(9)(b)) between the spade lug and the alligator clip. Make sure that the resistor end of the load is grounded.

q. Set the BAND switch and tuning controls of the RT-841/PRC-77 for 37.50-MHz operation and set the function switch to ON.

r. Press the push-to-talk switch on the H-189/GR and read the RF voltage across the resistor of the transmitter load with the ME-26B/U. A reading of 4.5 volts (rms) minimum should be observed.

s. If the minimum rms voltage is not present, press the push-to-talk switch on the H-189/GR and adjust inductor A28L3.

t. Set the function switch to OFF.

u. Install the short antenna 65.00-MHz transmitter load (para 3-15b(9)(b)) between the alligator clip and the spade lug.

v. Set the BAND switch and timing controls of the RT-841/PRC-77 for 65.00-MHz operation and set the function switch to ON.

w. Press the push-to-talk switch on the H-189/GR and read the rf voltage across the resistor of the transmitter load with the ME-26B/U. A reading of 6 volts (rms) minimum should be observed.

x. If the minimum rms voltage is not present, press the push-to-talk switch on the H-189/GR and adjust inductor A28L2.

y. Set the function switch to OFF. Remove the antenna load adapters and replace the screw in the corner of the ANT jack.

#### 3-20. Alignment of Transmitter Power Module A36 (fig. 3-1 and 3-6)

a. Interconnect RT-841/PRC-77 and associated test equipment as shown in figure 3-14. Set BAND switch to 30-52 position and select a frequency of 30.10 MHz. Connect a power cable to the POWER connector on the RT-841/PRC-77 to be tested.

#### NOTE

RT-841/PRC-77 should be in Transmit (Key Down) only after Frequency Dials are set and the Key closed during actual reading or adjustments.

b. Remove case from RT-841/PRC-77 and insert DC probe of the multimeter in test point J4 of module A31.

c. With a frequency selector setting of 30.10 MHz, adjust T1 of A38 for meter reading between 2.6 and 3.0 vdc. Change to 53.10 MHz and adjust T2 for 2.8 to 3.0 vdc.

d. Set a frequency of 75.90 MHz and adjust C9 of A38 for meter reading between 2.8 and 3.0 vdc. With the dial at 53.90 adjust C3 for 2.6 to 3.0 vdc.

e. Repeat paragraphs b and c to be sure adjustments are within limits, then disconnect the multimeter.

f. Connect shorting jumper between A23 test point and chassis.

g. Connect the multimeter ac-probe to the Transmitter Dummy Load. Set the multimeter to 30-volt ac range.

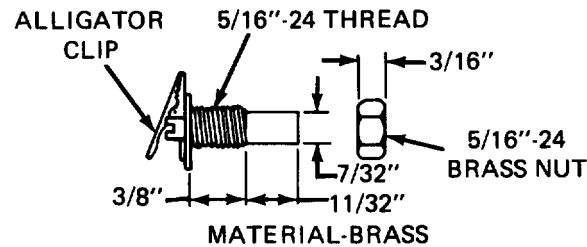
h. Set the RT-841/PRC-77 frequency to 53.10 MHz and with the transmitter ON, adjust T2 and T4 of A36 for maximum reading on the multimeter (at least 8.7 volts).

i. Set the RT-841/PRC-77 frequency to 30.10 MHz. With the transmitter ON, adjust T1 and T3 of A36 for maximum reading on the multimeter (at least 9.4 volts).

j. Set the RT-841/PRC-77 frequency to 75.90 MHz. With the transmitter ON, adjust C7 and C15 of A36 for maximum reading on the multimeter (at least 8.1 volts).

k. Set the RT-841/PRC-77 frequency to 52.90 MHz. With the transmitter ON, adjust C1 and C8 of A36 for maximum reading on the multimeter. (at least 9.4 volts).

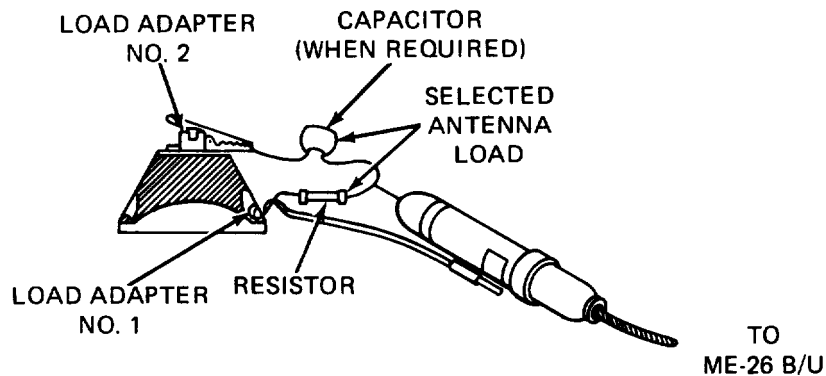
l. Repeat the adjustments of paragraphs g through j.



A. ANTENNA LOAD ADAPTER NO. 2



B. ANTENNA LOAD ADAPTER NO. 1



C. TYPICAL CONNECTION FOR ANTENNA LOAD TESTS

EL4FD053

Figure 3-16. Transmitter dummy load adapters, fabrication and connection details.

### Section V. DIRECT SUPPORT TESTING PROCEDURES

m. Measure the dc voltage at A31J4, for each increment of 1 MHz, starting at 30.50 through 52.50 MHz for the low band and 53.50 through 75.50 MHz for the high band. The limits are 2.2 to 4.0 vdc. Disconnect the shorting jumper from A23.

#### 3-21. General

a. The direct support test procedures consist of the transmitter power and whip antenna output tests, frequency accuracy test, receiver audio output power test, and squelch sensitivity test (paragraphs 3-23 through 3-26, respectively). Comply with the instructions preceding each chart before proceeding to the chart. Perform each test in sequence. A summary of the performance standards is given in paragraph 4-26.

b. Fabricate test cables 1 and 2 as shown in figure 3-11.

c. Fabricate the RF attenuator as shown in figure 4-8.

d. Fabricate the test box as shown in figure 4-9.

e. Fabricate the dummy antenna as shown in figure 7-3.

#### 3-22. Test Equipment, Tools, and Materials Required

a. Unless otherwise specified, all tests are to be performed with the RT-841/PRC-77 connected to the battery.

b. Conduct electrical tests in a screen room. Battery should supply at least 12.5 vdc to the radio while in transmit.

c. The following test equipment, tools and materials are required:



- (1) Digital Readout, Counter Electronic AN/USM-207.
- (2) Generator, Signal AN/URM-103.
- (3) Generator, Signal AN/URM-127 (two required).
- (4) Multimeter ME-26B/U.
- (5) Wattmeter AN/URM-120 (part of Coupler-Detector CU-754/URM-120).
- (6) Dummy Load, Electrical DA-75/U (part of AN/URM-120).
- (7) Voltmeter, Meter ME-30A/U (two required).
- (8) Resistors: 120 ohm  $\pm 5\%$ , 1 watt (two required); and 2,200 ohm  $\pm 5\%$ , 1 watt (two required).
- (9) Dummy antenna.
- (10) RF attenuator.
- (11) Adapter UG-201/U (three required).
- (12) Adapter, T UG-274B/U.
- (13) Toggle switch, single pole, double throw (two required).

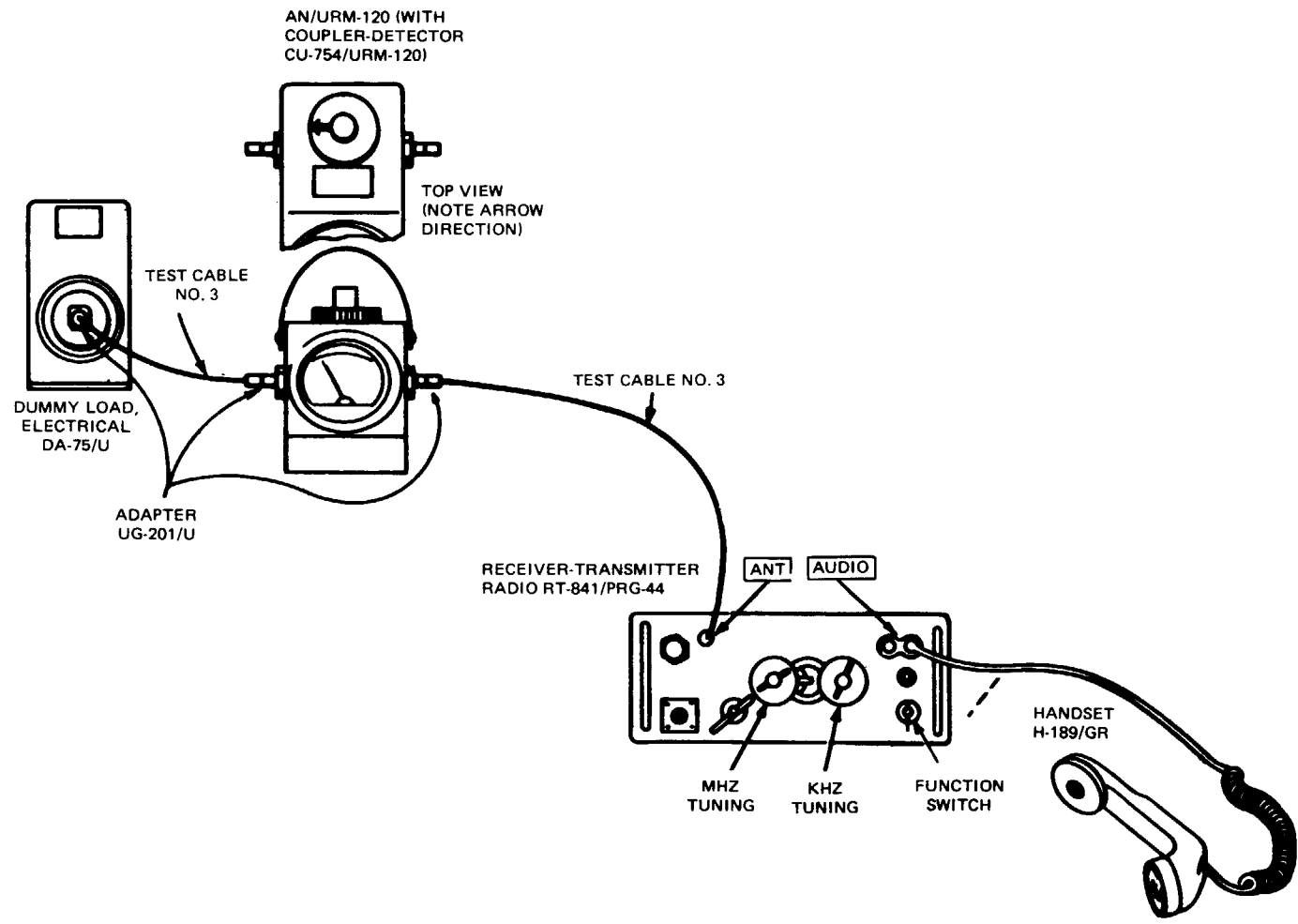
- (14) Test cable No. 1 and No. 2.
- (15) Test cable No. 3 (CG-409/U) (four required).
- (16) Test box.
- (17) Wire, stranded, AWG No. 18 (approximately 15 ft).

### **3-23. Transmitter Power and Whip Antenna Output Tests**

#### *a. Test Equipment and Materials.*

- (1) Wattmeter AN/URM-120 (part of Coupler-Detector CU-7~4/URM-120).
- (2) Dummy Load, Electrical DA-75/U.
- (3) Handset H-189/GR.
- (4) Test Cable No. 3 (two required).
- (5) Adapter UG-201/U (three required).

*b. Test Connections and Conditions.* Connect the equipment as shown in figure 3-17.



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■ Figure 3-17. Transmitter power output test setup.

*c. Procedure.*

| Step No. | Test equipment control settings  | Equipment under test control settings   | Test procedure   | Performance standard  |
|----------|--|---|--|---|
| 1        | <p><i>AN/URM-120</i><br/>                     Power range knob:<br/>                     10 watts.<br/>                     Power direction arrow toward<br/>                     DA-75/U.</p> | <p>BAND switch: 30-52<br/>                     REC-TRANS FREQUENCY<br/>                     (MHz) control: 30<br/>                     REC-TRANS FREQUENCY<br/>                     (kHz) control: 00<br/>                     VOLUME control: 0<br/>                     FUNCTION switch: ON</p> | <p>a. Press the H-189/GR push-to-talk switch and note the AN/URM-120 meter indication. Release the H-189/GR push-to-talk switch.</p> <p>b. Repeat <i>a</i> above with the RT-841/PRC-77 REC-TRANS FREQUENCY controls set to frequencies of 42.00 MHz and 52.95 MHz.</p>      | <p>a. The AN/URM-120 meter indicates at least 1.75 watts.</p> <p>b. Same as <i>a</i> above.</p> |
| 2        | <p>Same as step No. 1 above.</p>   | <p>BAND switch: 53-75<br/>                     REC-TRANS FREQUENCY<br/>                     (MHz) control: 53<br/>                     REC-TRANS FREQUENCY<br/>                     (kHz) control: 00<br/>                     VOLUME control: 0<br/>                     FUNCTION switch: ON</p> | <p>a. Press the H-189/GR push-to-talk switch and note the AN/URM-120 meter indication. Release the H-189/GR push-to-talk switch.</p> <p>b. Repeat step <i>a</i> above with the RT-841/PRC-77 REC-TRANS FREQUENCY controls set to frequencies of 65.00 MHz and 75.95 MHz.</p> | <p>a. The AN/URM-120 meter indicates at least 1.5 watts.</p> <p>b. Same as <i>a</i> above.</p>  |
| 3        | <p>Refer to para. 3-19, steps <i>a</i> through <i>y</i> (Antenna Loading Network Module A28 alignment).</p>  | <p>Refer to para. 3-19, steps <i>a</i> through <i>y</i>.</p>  | <p>a. Refer to para. 3-19, steps <i>a</i> through <i>y</i>.</p>  | <p>a. Refer to para 3-19, steps <i>a</i> through <i>y</i>.</p>                                  |

### 3-24. Frequency Accuracy Test

#### a *Test Equipment and Materials.*

- (1) Wattmeter AN/URM-120 (part of Coupler-Detector CU-754/URM 120).
- (2) *Dummy Load*, Electrical DA-75/U.
- (3) Digital Readout, Counter Electronic AN/USM-207.
- (4) Adapter UG-201/U (three required).

(5) Adapter T UG-274B/U.

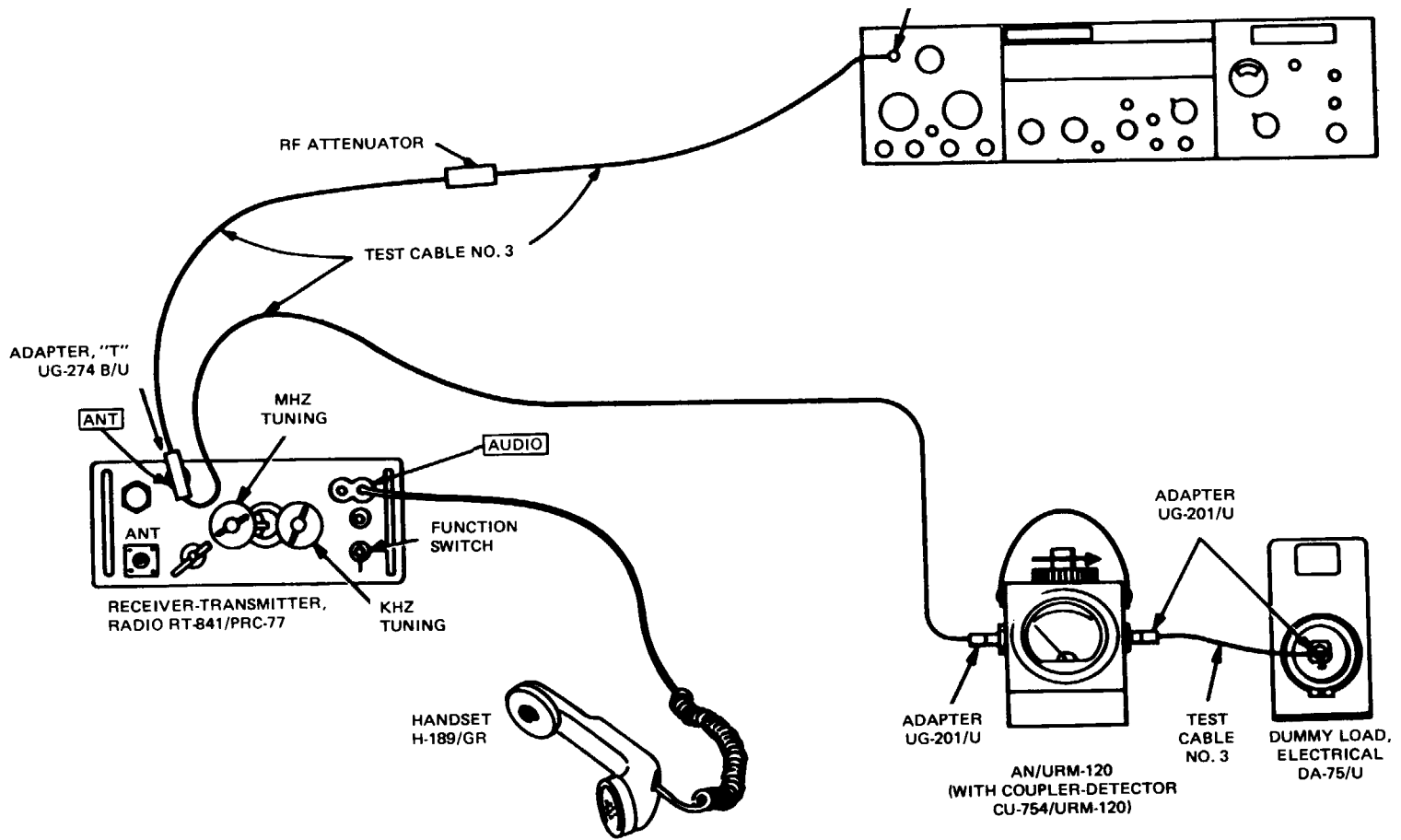
(6) Handset H-189/GR.

(7) Rf attenuator (fig. 4-8).

(8) Test Cable No. 3 (four required)

b. *Test Conditions and Connections.* Connect the equipment as shown in figure 3-18. Turn on the equipment and allow it to warmup for 5 minutes.

Figure 3-18. Frequency accuracy test setup



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■ Figure 3-18. Frequency accuracy test setup.

## c. Procedure.

| Step No. | Test equipment control settings  | Equipment under test control settings  | Test procedure  | Performance standard  |
|----------|--|--|---|---|
| 1        | AN/URM-120<br>Power range knob:<br>10 WATTS.<br>Power direction arrow:<br>toward DA-75/U.<br>AN/USM-207<br>DISPLAY control:<br>desired display time.<br>SENSITIVITY switch: 100V<br>Time base switch: GATE<br>TIME (SEC <sup>-1</sup> ) 10 <sup>2</sup> .<br>FUNCTION switch: FREQ | BAND switch: 53-75<br>REC-TRANS FREQUENCY (MHz)<br>control: 75.<br>REC-TRANS FREQUENCY (kHz)<br>control: 00.<br>Function switch: ON<br>VOLUME control: 5 | a. Press the H-189/GR push-to-talk switch.<br>b. Adjust the AN/USM-207 SENSITIVITY switch counter-clockwise until a stable reading is obtained.<br>c. Read the frequency on AN/USM-207.<br>d. Release the H-189/GR push-to-talk switch. | a. None.<br>b. None.<br>c. 75.00 MHz ± 3.5 kHz.<br>d. None. |
| 2        | Same as step No. 1.  | Same as step No. 1 except:<br>REC-TRANS FREQUENCY (kHz) control: 05.   | Same as step No. 1 above.   | 75.05 MHz ± 3.5 kHz.  |
| 3        | Same as step No. 1   | Same as step No. 1 except:<br>REC-TRANS FREQUENCY (kHz) control: 10.   | Same as step No. 1 above.   | 75.10 MHz ± 3.5 kHz.  |
| 4        | Same as step No. 1   | Same as step No. 1 except:<br>REC-TRANS FREQUENCY (kHz) control: 20.   | Same as step No. 1 above.   | 75.20 MHz ± 3.5 kHz.  |
| 5        | Same as step No. 1   | Same as step No. 1 except:<br>REC-TRANS FREQUENCY (kHz) control: 30.   | Same as step No. 1 above.   | 75.30 MHz ± 3.5 kHz.  |
| 6        | Same as step No. 1   | Same as step No. 1 except:<br>REC-TRANS FREQUENCY (kHz) control: 40.   | Same as step No. 1 above.   | 75.40 MHz ± 3.5 kHz.  |
| 7        | Same as step No. 1   | Same as step No. 1 except:<br>REC-TRANS FREQUENCY (kHz) control: 50  | Same as step No. 1 above.   | 75.50 MHz ± 3.5 kHz.  |
| 8        | Same as step No. 1   | Same as step No. 1 except:<br>REC-TRANS FREQUENCY (kHz) control: 60.   | Same as step No. 1 above.   | 75.60 MHz ± 3.5 kHz.  |
| 9        | Same as step No. 1   | Same as step No. 1 except:<br>REC-TRANS FREQUENCY (kHz) control: 70.   | Same as step No. 1 above.   | 75.70 MHz ± 3.5 kHz.  |
| 10       | Same as step No. 1   | Same as step No. 1 except:<br>REC-TRANS FREQUENCY (kHz) control: 80.   | Same as step No. 1 above.   | 75.80 MHz ± 3.5 kHz.  |

| Step No. | Test equipment control settings   | Equipment under test control settings  | Test procedure            | Performance standard     |
|----------|---|--|---------------------------|--------------------------|
| 11       | Same as step No. 1  | Same as step No. 1, except:<br>REC-TRANS FREQUENCY<br>(kHz) control: 90.   | Same as step No. 1 above. | 75.90 MHz $\pm$ 3.5 kHz. |
| 12       | Same as step No. 1  | Same as step 1, except:<br>REC-TRANS FREQUENCY<br>(kHz) control: 95.   | Same as step No. 1 above. | 75.95 MHz $\pm$ 3.5 kHz. |
| 13       | Same as step No. 1 except:<br>AN/USM-26:<br>MIXING FREQUENCY<br>MCS switch: 50.<br>TUNING control: 20 | Same as step No. 1, except: BAND<br>switch: 30-52.<br>REC-TRANS FREQUENCY<br>(MHz) control: 52.<br>REC-TRANS FREQUENCY<br>(kHz) control: 00. | Same as step No. 1 above. | 52.00 MHz $\pm$ 3.5 kHz. |

**3-25. Receiver Audio Output Power Test**

*a. Test Equipment and Materials.*

- (1) Voltmeter, Meter ME-30A/U.
- (2) Generator, Signal AN/URM-103.
- (3) Generator, Signal AN/URM-127.
- (4) Dummy antenna (fig. 7-3).
- (5) Teat Box (fig. 4-9).

(6) Adapter UG-201/U.

(7) Test Cable No. 1 (two required),

(8) Test Cable No. 3 (two required).

*b. Test Connections and Conditions.* Connect the equipment as shown in figure 3-19. Turn on the equipment and allow it to warmup for 5 minutes,



Figure 3-19 Receiver audio output power test setup.

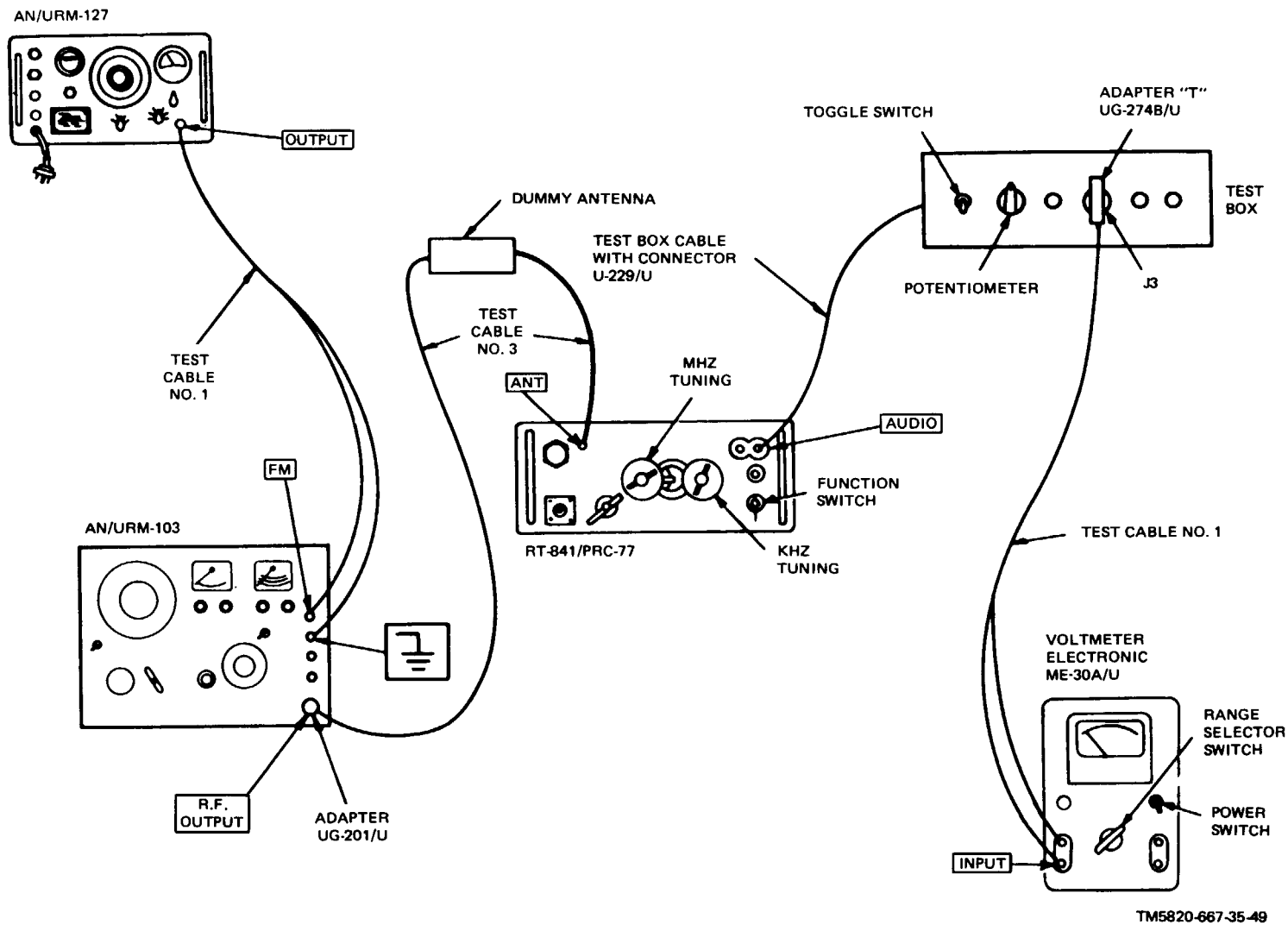


Figure 3-19. Receiver audio output power test setup.

## Control settings

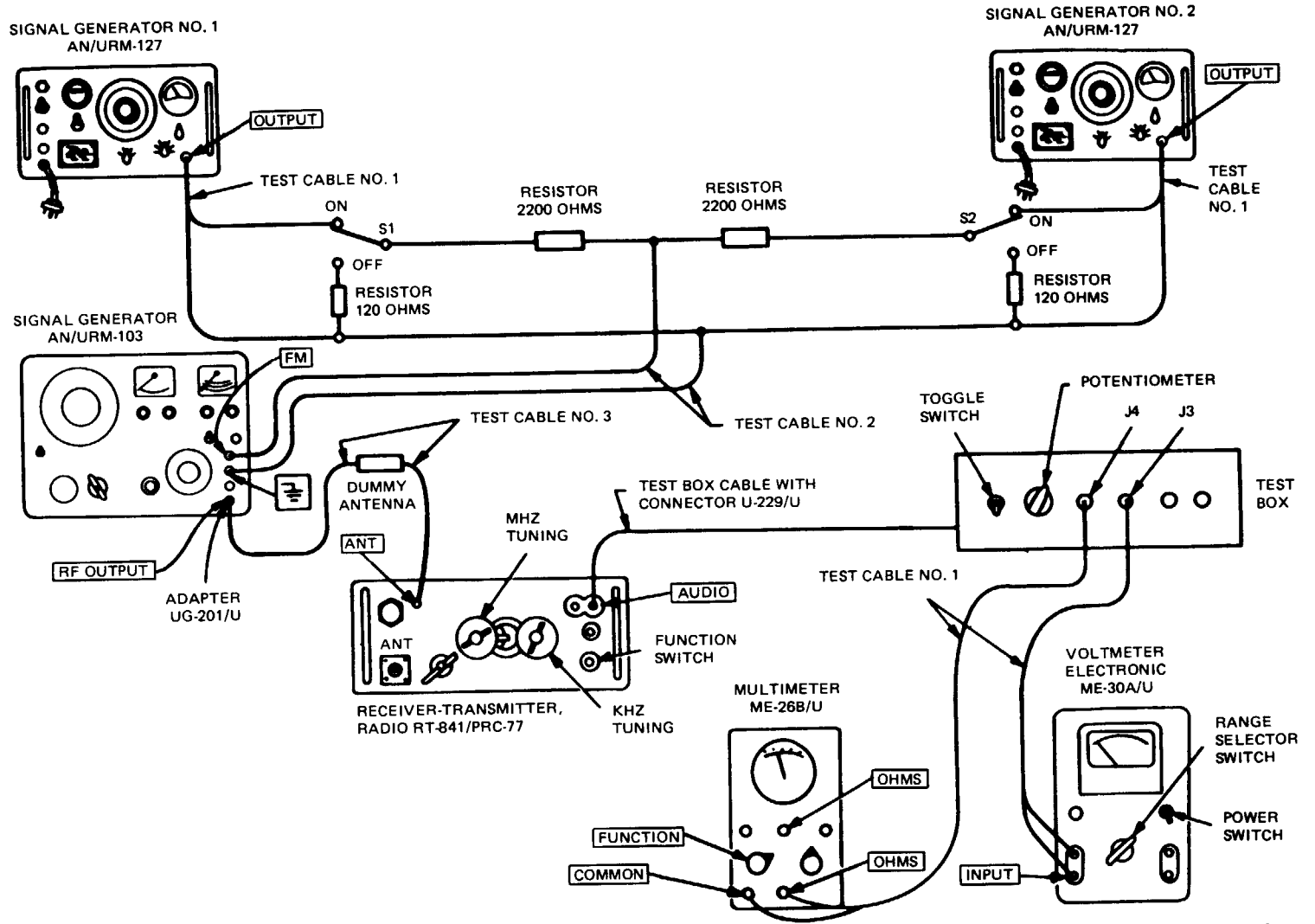
| Step No. | Test equipment  | Equipment under test  | Test procedure  | Performance standard   |
|----------|---|---|---|--|
| 1        | <p><i>ME-30A/U</i><br/>           Power switch: ON.<br/>           Range selector switch:<br/>           3 VOLTS, +10 DB.<br/> <i>AN/URM-103</i><br/>           RANGE switch: B.<br/>           Control switch: EXT. F.M.<br/>           MOD. INC. FREQ. switch:<br/>           MOD. 0-20.<br/>           SET CARRIER control:<br/>           adjust to line on CARRIER<br/>           LEVEL meter.<br/>           COARSE TUNING control:<br/>           41.<br/>           ATTENUATOR control:<br/>           10 uv on -6 db line<br/> <i>AN/URM-127</i><br/>           FREQ RANGE<br/>           MULTIPLIER switch: X10.<br/>           Frequency range dial: 100<br/>           ATTENUATOR switch: X1.<br/>           OUTPUT CONTROL:<br/>           fully counterclockwise and<br/>           adjust for the reading of 10<br/>           on the 0-20 scale of AN/<br/>           URM-103 MODULATION<br/>           &amp; INCREMENTAL<br/>           FREQUENCY meter.</p> | <p>BAND switch: 30-52.<br/>           REC-TRANS FREQUENCY (MHz)<br/>           control: 41.<br/>           REC-TRANS FREQUENCY (kHz)<br/>           control: 00.<br/>           Function switch: ON.<br/>           VOLUME control: 10.</p> | <p>Adjust the AN/URM-103 COARSE and<br/>           FINE TUNING controls for maximum<br/>           reading on the ME-30A/U.</p> | <p>The ME-30A/U should indicate at<br/>           least 2 volts.</p> |

**3-26. Squelch Sensitivity Test***a. Test Equipment and Materials.*

- (1) Voltmeter, Meter ME-30A/U.
- (2) Generator, Signal AN/URM-103.
- (3) Generator, Signal AN/URM-127 (two required).
- (4) Multimeter ME26B/U.
- (5) Dummy antenna (fig. 7-3).
- (6) Test Box (fig. 4-9).
- (7) Resistor 120 ohms,  $\pm 5$  percent, 1 watt (two required).
- (8) Resistor 2,200 ohms,  $\pm 5$  percent, 1 watt (two required).
- (9) Toggle switch, single pole, double throw (two required).
- (10) Adapter UG-201/U.
- (11) Test Cable No. 1 (four required).
- (12) Test Cable No. 2 (two required).
- (13) Test Cable No. 3 (two required).

*b. Test Connections and Conditions.* Connect the equipment as shown in figure 3-20. Turn on the equipment and allow it to warmup for 5 minutes.

■ Figure 3-20. Squelch sensitivity test setup.



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■ Figure 3-20. Squelch sensitivity test setup.

c. Procedure.

| Step No. | Test equipment  | Equipment under test   | Control settings | Test procedure   | Performance standard  |
|----------|---|--|------------------|--|---|
| 1        | <p>ME-26B/U<br/>Function switch: OHMS.<br/>ME-30A/U<br/>POWER switch: ON.<br/>Range selector<br/>switch: 3 volts, ± 10 DB.<br/>AN/URM-127 No. 1<br/>FREQ RANGE MULTI-<br/>PLIER switch: X10.<br/>Frequency range dial: 100<br/>ATTENUATOR switch:<br/>V X10.<br/>OUTPUT CONTROL:<br/>fully counterclockwise.<br/>AN/URM-127 No. 2<br/>FREQ RANGE MULTI-<br/>PLIER switch: X1<br/>Frequency range dial: 150.<br/>ATTENUATOR switch:<br/>VX10.<br/>OUTPUT CONTROL:<br/>fully counterclockwise.<br/>AN/URM-103<br/>RANGE switch: B.<br/>Control switch: EXT.<br/>F.M. MOD. INC. FREQ<br/>switch: MOD. 0-20.<br/>COARSE TUNING control:<br/>30.<br/>SET CARRIER control:<br/>Adjust to line on<br/>CARRIER LEVEL meter.<br/>ATTENUATOR control:<br/>Set -6 db line to 0.5 uv.</p> | <p>BAND switch: 30-52 MHz.<br/>REC-TRANS FREQUENCY (MHz)<br/>control: 30.<br/>REC-TRANS FREQUENCY (kHz)<br/>control: 00.<br/>Function switch: ON.<br/>VOLUME control: 5.</p> |                  | <p>a. Set switch S1 to ON and<br/>switch S2 to OFF.<br/>b. Set AN/URM-127 No. 1<br/>OUTPUT CONTROL for<br/>10-kHz indication on the<br/>AN/URM-103 MODULATION<br/>&amp; INCREMENTAL<br/>FREQUENCY meter.<br/>c. Adjust the AN/URM-103<br/>COARSE and FINE TUNING<br/>controls for a peak<br/>indication on ME-30A/U.<br/>Adjust RT-841/PRC-77<br/>VOLUME CONTROL for<br/>1 volt.<br/>d. Set switch S1 to OFF and<br/>switch S2 to ON.<br/>e. Adjust AN/URM-127 No. 2<br/>OUTPUT control for a 3-kHz<br/>indication on the<br/>MODULATION &amp;<br/>INCREMENTAL<br/>FREQUENCY<br/>meter of the AN/URM-103.<br/>f. Turn the RT-841/PRC-77<br/>function switch to SQUELCH<br/>position. Set switch S1 to ON.<br/>g. Turn the RT-841/PRC-77<br/>function switch to RETRANS<br/>position.<br/>h. Adjust A54R15 with 0.5 uv rf<br/>signal with 10 kHz of devia-<br/>tion at 1 kHz modulation and<br/>3 kHz of deviation at 150 Hz<br/>modulation, so that K3 is<br/>energized. Set the AN/URM-<br/>103 ATTENUATOR control<br/>to 0.35 uv.<br/>i. Set the AN/URM-103 ATTENU-<br/>ATOR control for a reading of<br/>0 and reset to 0.3 to 0.5 uv<br/>after performance has been<br/>checked.</p> | <p>a. None.<br/>b. None.<br/>c. None.<br/>d. None.<br/>e. None.<br/>f. ME-30A/U should indicate<br/>an output (squelch<br/>relay energized).<br/>g. ME-30A/U should indicate<br/>an output. ME-26B/U<br/>should indicate 0 ohm<br/>(squelch relay energized).<br/>h. ME-30A/U should indicate an<br/>output. ME-26B/U should<br/>indicate 0 ohm (squelch<br/>relay energized).<br/>i. ME-30A/U should indicate no<br/>output and ME-26B/U should<br/>indicate an open circuit<br/>(infinite resistance; squelch<br/>deenergized) with input at<br/>0 microvolt.</p> |

## Control settings

| Step No. | Test equipment   | Equipment under test | Test procedure   | Performance standard   |
|----------|--|----------------------|--|--|
|          |  |                      | <p><i>j.</i> Set switch S2 to OFF and set AN/URM-127 No. 1 OUTPUT CONTROL for a 15-kHz indication on the AN/URM-103 MODULATION &amp; INCREMENTAL FREQUENCY meter.</p> <p><i>k.</i> Set AN/URM-127 No. 1 OUTPUT CONTROL for a 12-kHz indication on the AN/URM-103 MODULATION &amp; INCREMENTAL FREQUENCY meter and set switch S2 to ON.</p> | <p><i>j.</i> ME-30A/U should indicate no output and ME-26B/U should indicate an open circuit.</p> <p><i>k.</i> ME-30A/U should indicate an output, ME-26B/U should indicate 0 ohm (squelch relay energized).</p> |
| 2        | Same as step No. 1, except:<br>AN/URM-103<br>RANGE switch: B.<br>COARSE TUNING<br>control: 41. |                      | Repeat step No. 1 above.....   | Same as step No. 1 <i>f</i> through <i>k.</i>  |
| 3        | Same as step No. 2 above,<br>except: C.<br>RANGE switch: C.<br>COARSE TUNING<br>control: 52.   |                      | Repeat step No. 1 above.....   | Same as step No. 1 <i>f</i> through <i>k.</i>  |
| 4        | Same as step 2 above,<br>except:<br>RANGE switch: C.<br>COARSE TUNING<br>control: 53.          |                      | Repeat step No. 1 above.....   | Same as step No. 1 <i>f</i> through <i>k.</i>  |
| 5        | Same as step 2 above,<br>except:<br>RANGE switch: C<br>COARSE TUNING<br>control: 65.           |                      | Repeat step No. 1 above.....   | Same as step No. 1 <i>f</i> through <i>k.</i>  |
| 6        | Same as step 2 above,<br>except:<br>RANGE switch: C.<br>COARSE TUNING<br>control: 75.          |                      | Repeat step No. 1 above.....   | Same as step No. 1 <i>f</i> through <i>k.</i>  |

## CHAPTER 4

## GENERAL SUPPORT MAINTENANCE

## Section 1. GENERAL SUPPORT REPAIRS

**4-1. Scope of General Support Repairs**

The general support maintenance procedures contained in this chapter, supplement those functions allocated to the direct support maintenance category (chap. 3). Repair of the AN/PRC-77 equipment to be performed at the general support category are described below. The alignment procedures for module A28 and tuning capacitors C1 and C2 are contained in paragraphs 4-7 through 4-10. The required general support testing procedures for this equipment are given in paragraphs 4-11 through 4-26. Any repair on the selector mechanism or on module A40A should not be attempted at the general support maintenance category; higher maintenance category is required. The assigned repair procedures for the general support category are as follows:

- a. Removal and replacement of front panel (para 4-2).
- b. Removal and replacement of selector mechanism (para 4-3).
- c. Replacement of antenna loading network module A28 (para 4-4).
- d. Replacement of tuning capacitor C1 (para 4-5).
- e. Replacement of tuning capacitor C2 (para 4-6).
- f. Replacement of power connector J3 (para 46.1).

**4-2. Removal and Replacement of Front Panel***a. Removal.*

- (1) Remove modules A32, A36, A40A and A16A (para 3-9e, *i*, *k*, and *c*, respectively).
- (2) Remove the Allen head screw that secures the module band positioning arm to the yoke assembly (fig. 4-1).
- (3) Remove the dial lamp (DS1) receptacle and the lamp (para 3-8a).
- (4) Unsolder and tag the wire connected to pin 11 of J8 (fig. 4-2 and 4-3).
- (5) Unsolder and tag the wire connected to the contact on the left side of tuning capacitor C2A (fig. 4-2).
- (6) Unsolder and tag the shield and center conductor of the coaxial cable connected to the ANT connector (fig. 4-2).
- (7) Remove the two clamps that secure the electrical leads to the selector mechanism housing assembly (fig. 4-2).

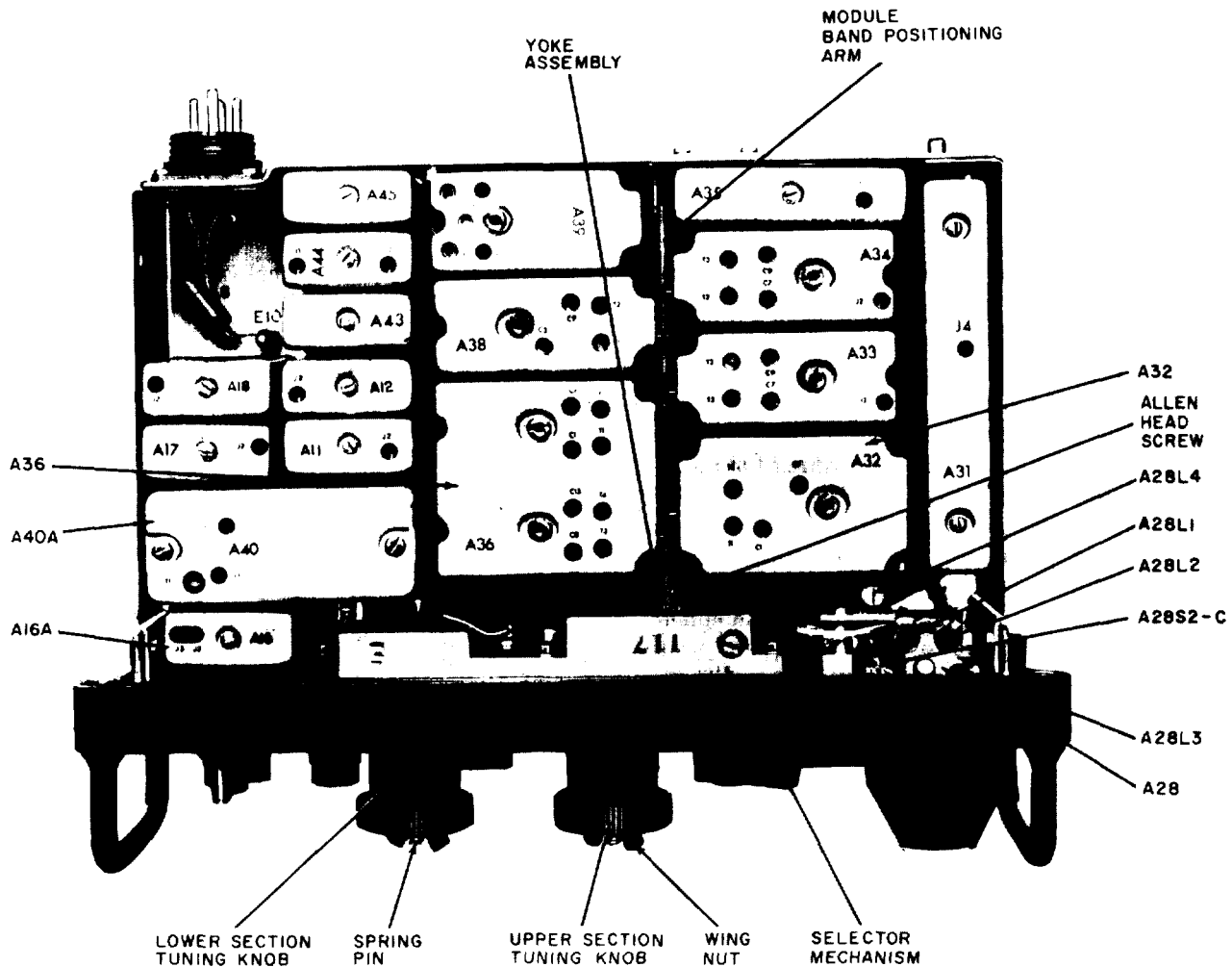
- (8) Remove the two screws that secure relay socket XK2 to the spacer legs and remove the assembly (fig. 4-2).
- (9) Remove the four screws that secure the two tuning capacitors (C1 and C2) to the selector mechanism housing assembly.
- (10) Loosen the clamps around the shafts of tuning capacitors C1 and C2 (fig. 4-2).
- (11) Remove the two screws that secure the selector mechanism housing assembly to the chassis.
- (12) Remove the six screws that secure the front panel to the chassis (fig. 4-3).
- (13) Remove the nuts (fig. 4-4) on the front panel that secure the AUDIO connectors in place.
- (14) Remove the POWER connector nut (fig. 4-4).
- (15) Remove the VOLUME control retaining screw and the VOLUME control knob (fig. 4-4). A retaining nut and a lockwasher are under the knob; remove them.
- (16) Remove the function switch retaining screw and the function switch knob. A retaining nut is under the knob; remove it.
- (17) Gently pull the front panel away from the chassis.

Note. It may be necessary to loosen or remove the three screws that secure antenna loading network A28 (fig. 4-2) to the front panel so that the POWER connector can be worked loose.

*b. Replacement.*

- (1) Secure the POWER and AUDIO connectors in their respective openings on the front panel with the retaining nut.
 

Note. If necessary, tighten the three screws that secure antenna loading network A28 to the front panel after the POWER connector has been replaced.
- (2) Replace the function switch shaft nut and knob,
- (3) Replace the star washer, retaining nut, knob, the VOLUME control, the lockwasher, nut, and knob.
- (4) Replace the six screws that secure the chassis to the front panel.
- (5) Replace the two screws that secure the selec-



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Figure 4-1. Receiver-Transmitter, Radio RT-841/PRC-77, bottom view, disassembly.

tor mechanism housing assembly to the chassis,

- (6) Replace tuning capacitors C1 and C2 and secure them to the selector mechanism assembly with the four screws.

Note. Do not tighten the clamp on the shaft of tuning capacitors C1 and C2 at this time.

- (7) Replace the relay socket assembly (for K2) on the spacer legs and secure it with screws.
- (8) Replace the clamps that secure the electrical leads to the selector mechanism housing assembly.
- (9) Solder the shield and center conductor to ANT

connector J2,

- (10) Solder the wire removed in a(5) above; wire to the contact on the left side of tuning capacitor C2 and wire to pin 11 of J8.
- (11) Replace the lamp in the lamp receptacle and secure it to the selector mechanism housing assembly with the flat washer, lockwasher, and screw.
- (12) Place the module band positioning arm into the yoke assembly and secure with the Allen head screw.
- (13) Replace modules A32, A36, A40A and A16A (para 3-9f, g, l, and d, respectively).



Figure 4-2. Tuning capacitor assembly

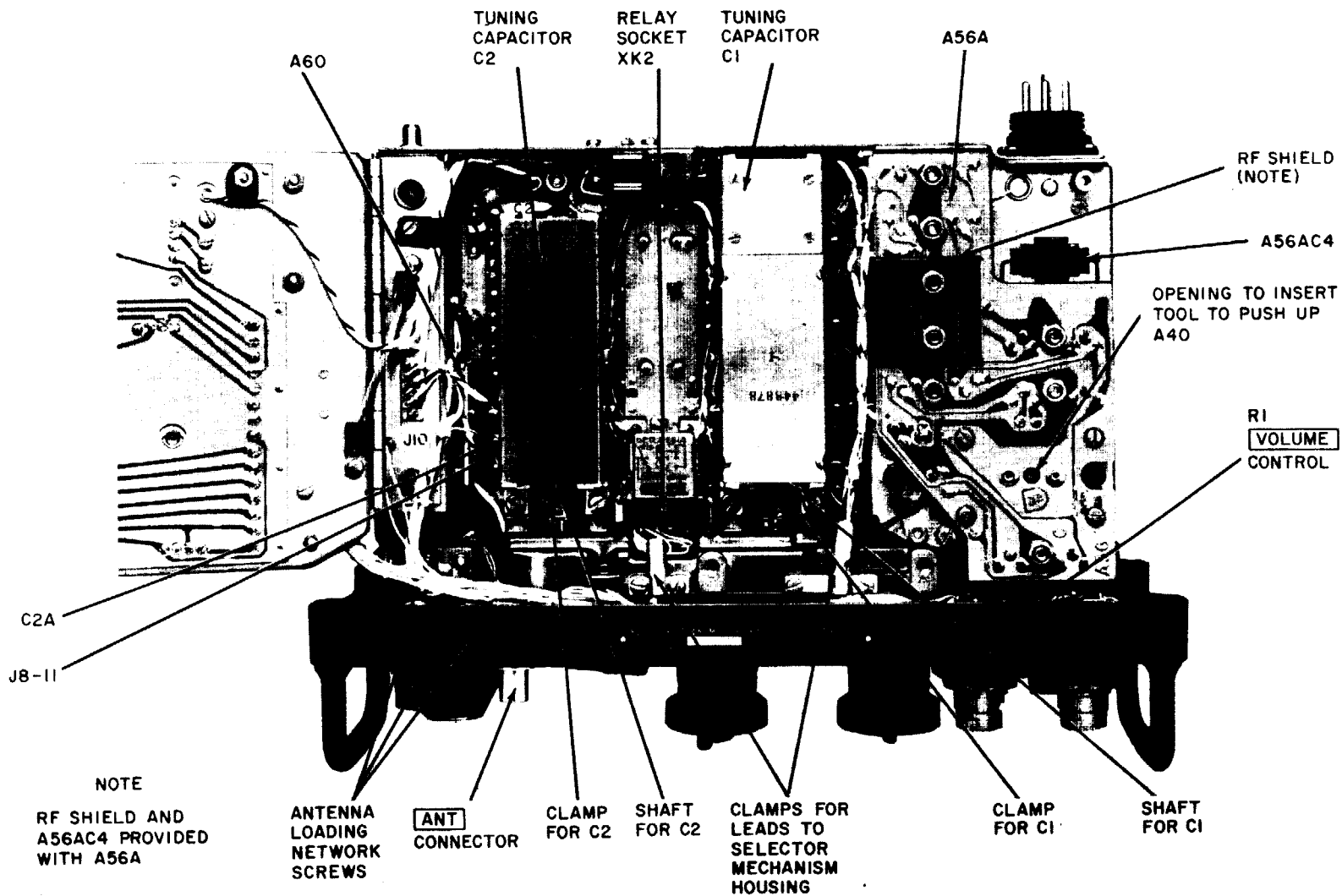
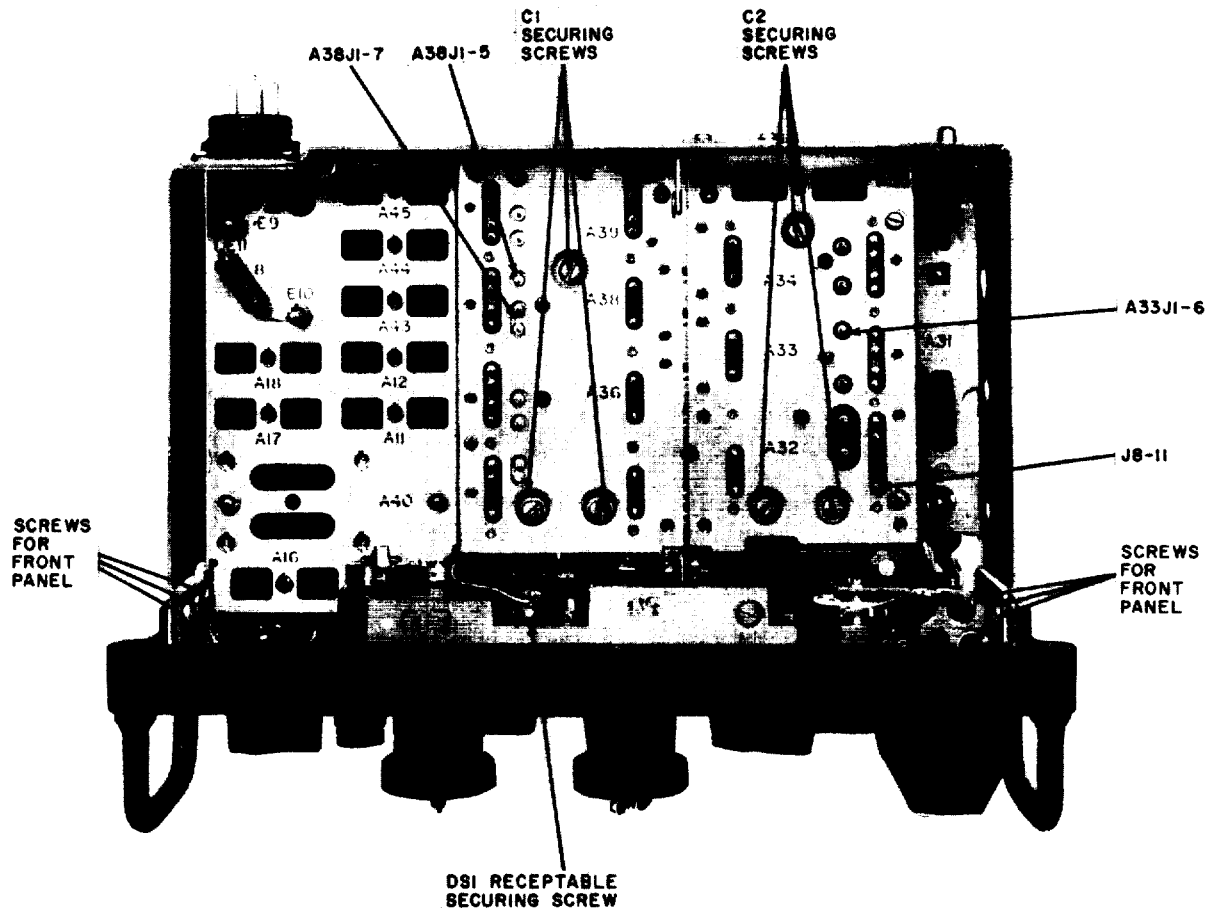
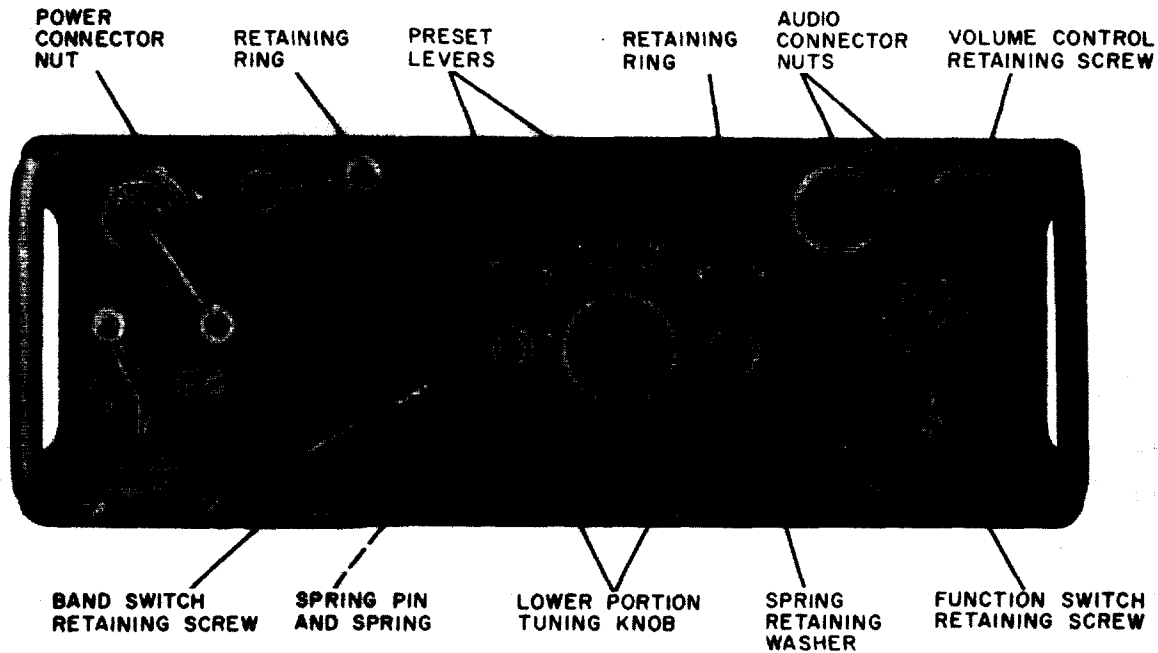


Figure 4-2. Tuning capacitor assembly.



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Figure 4-3. Receiver-Transmitter, Radio RT-841/PRC-77, main chassis, bottom view



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Figure 4-4. Receiver-Transmitter, Radio RT-841/PRC-77, front panel, tuning knobs removal

- (14) Align tuning capacitors C1 and C2 (para 4-7 and 4-8).
- (15) Close audio and control chassis A57 and secure it with the three audio and control chassis captive screws.

#### 4-3. Removal and Replacement of Selector Mechanism

(fig. 4-4,4-5, and 4-6)

##### a. Removal.

- (1) Remove the front panel (para 4-2).
- (2) Remove the RT-841/PRC-77 tuning knobs as follows (fig. 4-6):

*Note.* Removal of the mc and the kc tuning knob assemblies from their respective shafts is identical. Removal of the kc stop assembly can be accomplished without disassembling the kc tuning knob assembly. Removal of the mc atop assembly and plate mounting, however, requires the disassembly and removal of the entire mc tuning knob assembly.

- (a) Remove the roll pin that retains the

wingnut on the selector mechanism shaft.

- (b) Remove the wingnut, lockwasher, flat washer, and upper knob.
- (c) Remove the tru-arc retaining ring from the sleeve assembly and remove the retaining washer and spring.
- (d) Remove the lower knob.
- (e) Remove the spring pin that secures the sleeve assembly to the selector mechanism shaft.
- (f) Remove the sleeve assembly.
- (g) Remove the stop assembly and plate mounting (PRESET mechanical lever) on the mc tuning knob shaft by removing the four fillister head screws around the shaft.
- (h) Remove the stop assembly (PRESET mechanical (lever) on the kc tuning knob shaft by removing the two screws and two washers that secure it to the front panel.

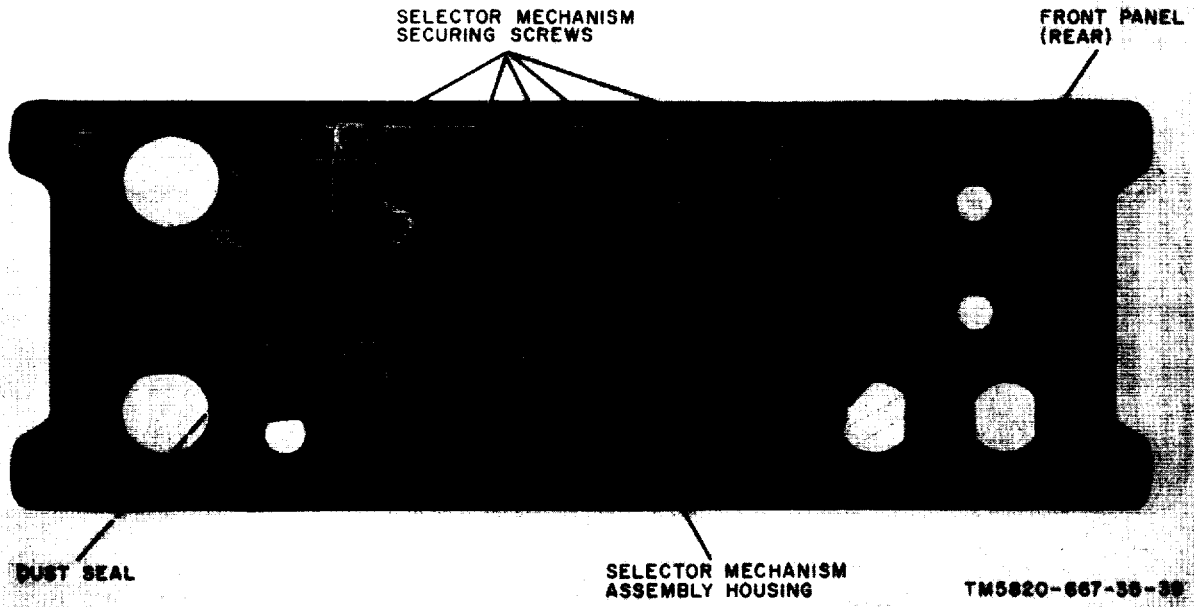
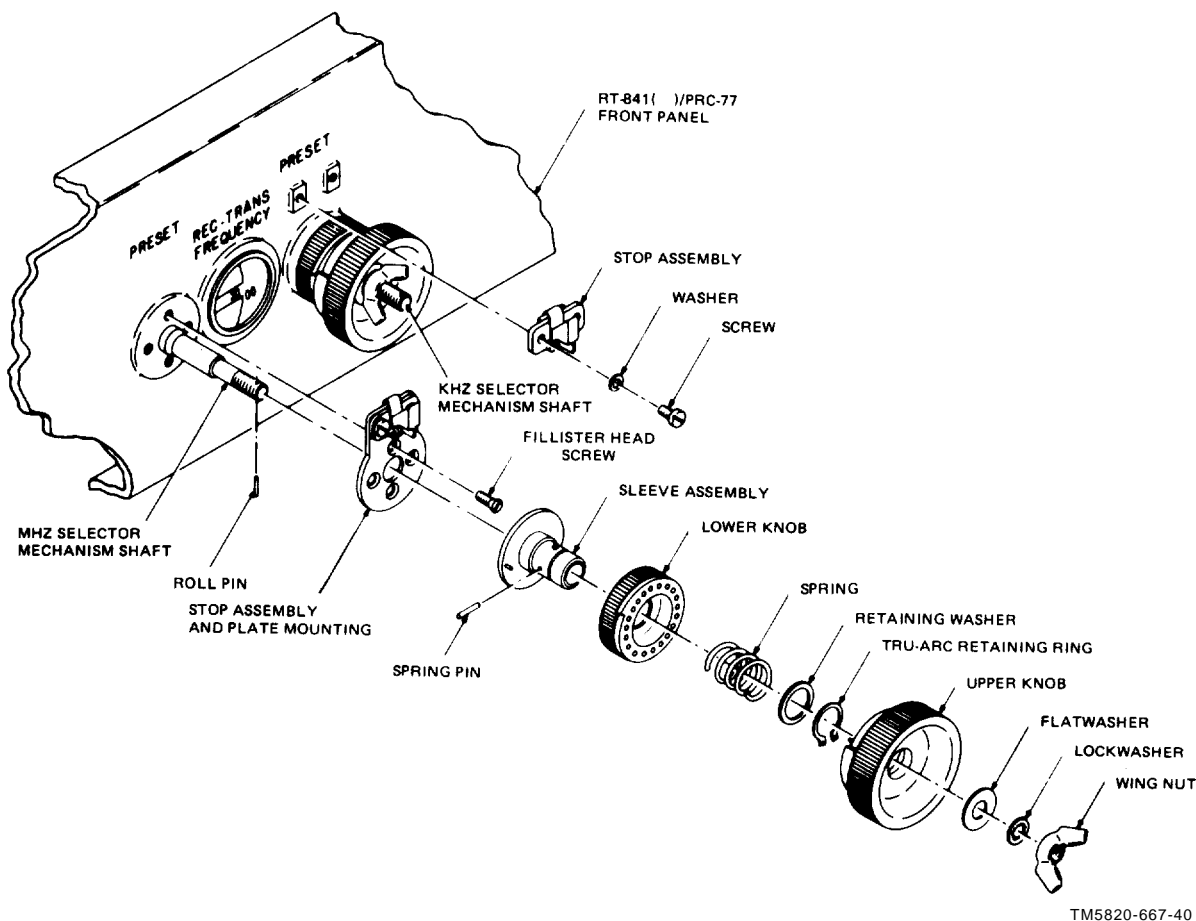


Figure 4-5. Front panel, rear view.

- (3) Remove the BAND switch retaining screw that secures the BAND switch knob (fig. 4-4) to the shaft and remove the BAND switch knob.
  - (4) Remove the dust seal from the selector mechanism housing assembly (fig. 4-5).
  - (5) Remove the five selector mechanism securing screws that secure the selector mechanism housing assembly to the front panel.
  - (6) Separate the selector mechanism housing assembly from the front panel by tapping the RT-841/PRC-77 tuning knobs gently.
- b. Replacement.*
- (1) Reassemble the selector mechanism housing assembly and front panel.
  - (2) Replace the five selector mechanism securing screws that secure the selector mechanism housing assembly to the front panel.
  - (3) Replace the dust seal.
  - (4) Replace the BAND switch knob to the shaft and secure the knob with the BAND switch retaining screw.
  - (5) Replace the RT-841/PRC-77 tuning knobs as follows:
    - (a) Replace the stop assembly (PRESET mechanical lever) on the kc tuning knob shaft and secure it to the front panel with the two screws and two washers.
    - (b) Replace the stop assembly and plate mounting (PRESET mechanical lever) on the mc tuning knob shaft and secure with the four fil- lister head screws around the shaft.
    - (c) Replace the sleeve assembly.
    - (d) Replace the spring pin that secures the sleeve assembly to the shaft.
    - (e) Replace the lower knob.
    - (f) Replace the spring, retaining washer, and tru-arc retaining ring.
    - (g) Replace the upper knob.
    - (h) Replace the flat washer, lockwasher, and wingnut.
    - (i) Replace the roll pin that retains the wingnut on the shaft.
  - (6) Replace front panel (para 4-2b).



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Figure 4-6. MHZ selector mechanism, exploded view.

**4-4. Replacement of Antenna Loading Network Module A28**  
(fig. 4-1)

- (1) Remove the front panel (para 4-2a).
- (2) Unsolder and tag the wire connected to pin C of switch A28S2 (from ANT connector J1; fig. 4-1).
- (3) Unsolder and tag the wires connected to pins 1 (from pin 11 of J8) and 2 (from tuning capacitor C2A) of module A28.
- (4) Remove the three screws that secure A28 to the front panel (fig. 4-2).
- (5) Set the RT-841/PRC-77 tuning controls to 52.95 MHz.
- (6) Lift module A28 from the front panel.

*b. Replacement.*

- (1) Solder the wires removed in a(3) above to the associated contacts on module A28,
- (2) Slide A28 into space on the back of the front panel and be certain to engage both the BAND switch coupling and the selector mechanism coupling.
- (3) Solder the wire from ANT connector J1 (removed in a(2) above) to pin C of switch A28S2.

- (4) Replace the three screws (removed in a(4) above) and secure module A28 to the front panel.
- (5) Replace the front panel (para4-2b).

**4-5. Replacement of Tuning Capacitor C1**  
(fig. 4-2)

*a. Removal.*

- (1) Remove modules A37 (para 3-9g), A38, and A39A (para 3-9e),
- (2) Remove the front panel (para 4-2a).
- (3) Unsolder and tag the wires connected to tuning capacitor C1.
- (4) Remove the three screws that secure tuning capacitor C1 to the main chassis (fig. 4-3).
- (5) Lift out the tuning capacitor from the chassis.

*b. Replacement.*

- (1) Place and hold tuning capacitor C1 in position.
- (2) Replace the three screws (removed in a(4) above) that secure tuning capacitor C1 to the main chassis,
- (3) Solder the wires removed in a(3) above to the associated contacts on tuning capacitor C1.
- (4) Replace the front panel (para 4-2b(1) through (13)).

- (5) Align tuning capacitors C1 and C2 (para 4-8 and 4-9).
- (6) Replace modules A37 (para 3-9h), A38, and A39A (para 3-9f.)
- (7) Close audio and control chassis A57 and secure it with the three audio and control chassis captive screws.

**4-6. Replacement of Tuning Capacitor C2 (fig. 4-2)**

*a. Removal.*

- (1) Remove modules A33, A34 (para 3-9e), and (para 3-9g).
- (2) Remove the front panel (para 4-2a).
- (3) Remove the three screws that secure tuning capacitor C2 to the main chassis (fig. 4-3).
- (4) Lift out tuning capacitor C2 from the chassis.

*b. Replacement.*

- (1) Place and hold tuning capacitor C2 in position.
- (2) Replace the three screws that secure tuning capacitor C2 to the main chassis.
- (3) Replace the front panel (para 4-2b(1) through (13)).
- (4) Align tuning capacitors C1 and C2 (para 4-8 and 4-9).

- (5) Replace modules A37 (para 3-9h), A33, and A34 (para 3-9f).
- (6) Close the audio and control chassis and secure it with the three audio and control chassis captive screws.

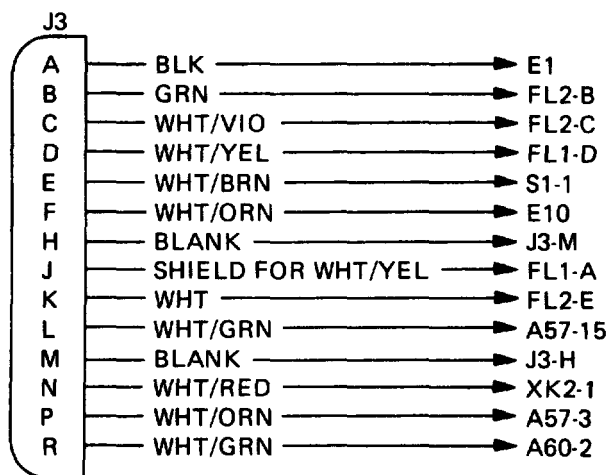
**4-6.1. Replacement of Power Connector J3 (fig. 4-4)**

*a. Removal.*

- (1) Remove the front panel (para 4-2a).
- (2) Pull power connector J3 out of the front panel,
- (3) Remove the insulated tubing from the connector wires,
- (4) Unsolder the wires leading to connector J3.

*b. Replacement.*

- (1) Solder the wires removed in a(4) above to the associated connector J3 pins in accordance with the color coding shown in figure 4-6.1.
- (2) Replace the insulated tubing over the connector wires.
- (3) Perform a continuity check to ensure that connector J3 has been properly wired.
- (4) Position connector J3 in the front panel and hold in place.
- (5) Replace the front panel (para 4-2 b).



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Figure 4-6.1. Power connector J3 wiring color coding.

## Section II. GENERAL SUPPORT ALIGNMENT

### 4-7. General

a. *Scope of General Support Alignment Procedures.* The alignment procedures on the RT-841/PRC-77 for general support maintenance consist of aligning tuning capacitors C1 and C2, alignment of antenna loading network module A28, and adjustment of the squelch circuit. Capacitors C1 and C2 must be aligned whenever the front panel is replaced, or whenever tuning capacitor C1 or C2 is replaced. The alignment of module A28 must be made and checked upon the replacement of that module or one of its parts.

b. *Test Equipment Required.*

- (1) A Ballantine Direct Capacity Meter, Model 520 (or equivalent) (ZM-3/U or TS-617/U) is required for the alignment of tuning capacitor C1 or C2,
- (2) Multimeter ME-26B/U, or equivalent, for the alignment of module A28.
- (3) Signal Generator AN/URM-103 (or equivalent) is required for the Squelch circuit adjustment.

c. *Additional Equipment Required.* The following equipment is also required for the alignment of module A28:

- (1) Antenna load adapters No. 1 and No. 2 (fig. 3-16).
- (2) Transmitter dummy loads (refer to fig. 3-16 for fabrication details) are –
  - (a) Long antenna loads for the specified frequencies as follows:
    - 30.00 MHz – Resistor, 130 ohms  $\pm$  1%, 8 watt, deposited carbon, non-inductive (Caddock model MS281N) (NSN 5905-00-552-2451).
    - 65.00 MHz – Resistor, 61.9 ohms  $\pm$  1%, 8 watt, deposited carbon, non-inductive (Caddock model MS281N) (NSN 5905-00-543-8368); and capacitor, 10 pf  $\pm$  5%, 400 vdc (NSN 5910-00-840-0148).
  - (b) Short antenna loads for the specified frequencies as follows:
    - 37.50 MHz – Resistor, 34.8 ohms  $\pm$  1%, 8 watt, deposited carbon non-inductive (Caddock model MS281N); and capacitor 12 pf  $\pm$  5%, 400 vdc (NSN 5910-00-806-2716).
    - 65.00 MHz – Resistor, 61.9 ohms  $\pm$  1%, 8 watt, deposited carbon, non-inductive; and capacitor, 29 pf  $\pm$  5%, 400 vdc (NSN 5910-00-044-5837).

### NOTE

The above dummy loads are approximate. More accurate measurements may be made if the resistive element is measured at the test frequency by a high-frequency admittance meter and if additional reactance is placed in parallel so that the element is purely resistive. Similarly, the series reactive element (capacitive in the above cases) should be measured and adjusted to the proper value at the test frequency on a high-frequency admittance meter.

### 4-8. Tuning Capacitor C1 Alignment (fig. 4-2)

Align tuning capacitor C1 as outlined in a through h below. Do not change the control settings unless specifically directed.

a. Remove module A38 from the chassis.

b. Set the BAND switch at 30-52 and adjust the RT-841/PRC-77 tuning knobs for 30.00 MHz.

c. Use a Ballantine Direct Capacity Meter, Model 520, or equivalent, Connect the ground lead of the 520 capacity meter to the rotor section of tuning capacitor C1 at A38 pin 5 (fig. 4-3).

d. Connect the other lead from the 520 capacity meter to the stator section of tuning capacitor C1 at A38 pin 7 (fig. 4-3),

e. Set the 520 capacity meter to the X10 picofarads (pf) scale, loosen the clamp on the C1 tuning shaft, and adjust the shaft of tuning capacitor C1 for an indication of 6.6 on the 520.

### NOTE

Check to see that this adjustment has been made on the proper side of the capacity-per-degree rotation curve by turning C1 counterclockwise (from shaft end) and noting that the 520 capacity meter indicates a decrease in capacity. Reset to 66 picofarads (pf).

f Tighten the clamp on the C1 tuning shaft.

g. Adjust the RT-841/PRC-77 tuning knobs to 52.95. The 520 capacity meter should indicate 8 pf, or a difference of 58 pf from the 30.00-MHz indication (e above),

h. If a difference of approximately 58 pf is not obtained, repeat the procedure given in b through g above.

i. Replace module A38 in the chassis.

**4-9. Tuning Capacitor C2 Alignment (fig. 4-2)**

Align tuning capacitor C2 as outlined below. Do not change the control settings unless specifically directed,

- a. Remove module A33 from the chassis.
- b. Set the BAND switch at 30-52 and adjust the tuning knobs for 30.00 MHz.
- c. Use a Ballantine Direct Capacity Meter, Model 520, or equivalent. Connect the ground lead to the RT-841/PRC-77 chassis.
- d. Connect the other lead of the 520 capacity meter to the stator section of tuning capacitor C2 at A33 (pin 6 (fig, 43).
- e. Set the 520 capacity meter on the X10 pf scale, loosen the clamp on the C1 tuning shaft, and adjust the shaft of tuning capacitor C2 for an indication of 6.6 on the 520 capacity meter.

**NOTE**

Check to see that this adjustment has been made on the proper side of the capacity-per-degree rotation curve by turning C2 clockwise (from shaft end) and noting that the 520 capacity meter indicates a decrease in capacity; reset to 66 pf.

- f. Tighten the clamp on the C2 tuning shaft.
- g. Adjust the tuning knobs to 52.95 mc. The 520 capacity meter should indicate a difference of approximately 58 pf.
- h. If a difference of approximately 58 pf is not obtained, repeat the procedure given in *b* through *g* above.
- i. Replace module A33 in the chassis.

**4-10. Antenna Loading Network Module A28 Alignment**

Refer to paragraph 3-19 for antenna loading network module A28 alignment procedures.

**4-10.1. Squelch Adjustment.****NOTE**

Before performing the squelch adjustment procedure, check the squelch function by setting the RT-841/PRC-77 function switch to SQUELCH or RETRANS while listening for squelch and unsquelch indications.

- a. Perform the receiver sensitivity test (paragraph 4-21). If the requirements are met, proceed to steps *b* through *g* below.

- b. Using the CN-901/G and 50-ohm rf cable (type UG-88/U) of the AN/URM-103, connect the AN/URM-103 to the RT-841/PRC-77 ANT receptacle. Modulate the AN/URM-103 with 150 Hz at 3 kHz deviation.

- c. Connect a handset to the RT-841/PRC-77 and set the function switch to the ON position. A rushing noise should be heard. Set the function switch to the SQUELCH position. Rushing noise should not be heard. Leave the function switch in the SQUELCH position.

- d. Starting at 0  $\mu v$ , increase the AN/URM-103 rf output. The RT-841/PRC-77 shall be unsquelched at or before 0.6  $\mu v$ . Disconnect the AN/URM-103 cable from the RT-841/PRC-77. The radio should squelch. Reconnect the AN/URM-103 cable. The radio should unsquelch,

- e. If the requirements in step *d* are not met, remove the cover from module A54. Set the AN/URM-103 rf output signal level to 0.6  $\mu v$  and adjust R15 of module A54 until the RT-841/PRC-77 is unsquelched.

- f. Repeat the procedure in step *d* with the cover installed on A54.

- g. If the requirements in step *d* above are met, apply a small amount of glyptol on the edge of R15.





Figure 4-7 is deleted and replaced by Figure 3-16

### Section III. GENERAL SUPPORT TESTING PROCEDURES

#### 4-11. General

a. The testing procedures are prepared for use by Signal Field Maintenance Shops and Signal Service organizations responsible for general support maintenance of signal equipment to determine the acceptability of repaired signal equipment. These procedures set forth specific requirements that a repaired Receiver-Transmitter, Radio RT-841/PRC-77 must meet before it is returned to the using organization. The testing procedures may also be used as a guide for the testing of equipment by direct support maintenance if the proper tools and test equipments are available. A summary of the performance standards is given in paragraph 4-26.

b. Comply with the instructions preceding each chart before proceeding to the chart, Perform each test in sequence. Do not vary the sequence. For each step, perform all the actions required in the *Test equipment control settings* and *Equipment under test control settings* columns; then perform each specific test procedure and verify it against its performance standard.

#### 4-12. Test Equipment, Tools, Materials, and Additional Equipment Required

a. *General.* All test equipment, tools, materials, and other equipment required to perform the testing procedures given in this section are listed in the following charts and are authorized under TA 11-17 and TA 11-100-(11-17).

b. Special Requirements.

- (1) Specific models of test equipment were used to perform the test procedures given in paragraphs 4-15 through 4-25. If these test procedures are performed using other models of the test equipments, it may be necessary to allow for test connections or test indications that may differ from those given in the test procedures.
- (2) Unless otherwise specified, all tests are to be performed with the RT-841/PRC-77 connected to the battery.
- (3) Conduct electrical tests in a screen room.

Note. Battery should supply at least 12.5 volts dc to the radio while in transmit.

c. Test Equipment.

| Nomenclature  | Technical manual  |
|---|-------------------|
| Analyzer, spectrum TS-723B/U.                                   | TM 11-5097        |
| Digital Readout, Counter Electronic AN/USM-207.                 | TM 11-6625-700-10 |
| Generator, Signal AN/URM-108.                                   | TM 11-3625-586-12 |
| Generator, Signal AN/URM-127 (two required).                    | TM 11-6625-683-15 |
| Meter, Modulation ME-57/U.                                      | TM 11-6625-400-12 |
| Multimeter ME-26 B/U - - - -                                    | TM 11-6625-200-15 |
| Multimeter TS352B/U - - - -                                     | TM 11-6626-366-15 |
| Oscilloscope AN/USM-140.-                                       | TM 11-6625-535-15 |
| Wattmeter AN/URM-120 (part of Coupler Detector CU-764/URM-120). | TM 11-6625-446-15 |
| Dummy Load, Electrical DA-75/U (part of AN/URM-120).            |                   |
| Voltmeter, Meter ME-80A/U (two required).                       | TM 11-6625-320-12 |
| Voltmeter, Electronic AN/URM-145.                               | TM 11-6625-524-14 |
| Direct Capacity Meter; Ballantine Labs Inc., Model 520.         |                   |
| Power Supply; Hewlett-Packard, Model HP-721A.                   |                   |

d. Additional Equipment.

| Nomenclature   | Federal stock No. |
|--|-------------------|
| Inclosure, Electromagnetic Shielding MX-1761/C or equivalent | 4940-542-0002     |
| Tool Kit, Electronic Equipment TK-100/G.                     | 5180-605-0079     |
| Tool Kit, Electronic Equipment TK-105/G.                     | 5180-610-8177     |
| Resistors:   |                   |
| 120 ohm $\pm 5\%$ , 1 watt (two required),                   |                   |
| 2,200 ohms $\pm 5\%$ , 1 watt (two required)                 |                   |
| 15,000 ohms $\pm 5\%$ , 1 Watt                               | 5905-102-2824     |
| Capacitor, 0.005 $\mu f \pm 10\%$ , 600 vdc                  | 5910-112-7619     |
| Dummy antenna, consisting of:                                |                   |
| Connector UG-657/U (two required).                           |                   |
| Resistor, 31.6 ohms $\pm 1\%$ , 1 watt.                      | 5905-722-1805     |
| Resistor, 51.1 ohms $\pm 1\%$ , 1 watt.                      | 5905-722-1804     |
| Aluminum container, 6 in. by 2 1/2 in. by 2 1/2 in.          | None              |
| Wire, stranded, AWG No. 18 (as required).                    | 6145-160-5291     |
| RF attenuator, consisting of:                                |                   |
| Connector UG-447/U (two required)                            |                   |
| Resistor, 56 ohms $\pm 1\%$ , 1 watt.                        | 5906-114-1607     |
| Resistor, 510 ohms $\pm 1\%$ , 1 watt.                       |                   |
| Aluminum container, 6 in. by 2 1/2 in. by 2 1/2 in.          | None              |
| Wire, stranded, AWG No. 18 (as required).                    | 6145-160-5291     |
| Adapter UG-201/U (three required)                            |                   |
| Adapter, T, UG-274 B/U                                       |                   |
| Toggle switch, single pole double throw (two required)       |                   |
| Test cable No. 1, consisting of:                             |                   |
| Connector UG-88/U  |                   |
| Cable RG-58/U (86 inches).                                   | 6145-542-6092     |

| Nomenclature  | Federal stock No. |
|---|-------------------|
| Test cable No. 2, consisting of: <sup>a</sup>                                 |                   |
| Clip, Electrical, Alligator style.  | 5940-186-9835     |
| Wire, stranded AWG No. 18.  | 6145-160-5291     |
| Teat cable No. 3 (Cord CG-530/U) (four required), consisting of: <sup>a</sup> |                   |
| Connector UG-88/U (two required).   |                   |
| Cable RG-58A/U (48 inches).   | 6145-542-6092     |
| Test box (two required) consisting of: <sup>a</sup>                           |                   |
| Connector U-229/U   |                   |
| Connector UG-447/U (four required)  |                   |
| Resistors:  |                   |
| 150 ohms ± 5%, 1 watt.  | 5905-683-2243     |
| 1,000 ohms ± 1%, 1 watt.  | 5905-892-6330     |
| 1,000 ohms ± 5%, 1 watt, variable.  | 5905-892-6543     |
| 15,000 ohms, ± 5%, 1 watt.  | 5905-102-2824     |
| Toggle switch, single pole, single throw.                                     | 5905-102-2824     |

| Nomenclature  | Federal stock No. |
|---|-------------------|
| Aluminum container, 6 in. by 2 1/2 in. by 2 1/2 in. | None              |
| Grommet, rubber (with 1/4 in. hole).                | MS 35489-6        |
| Wire, stranded, AWG No. 18 (approximately 15 ft)    | 6145-160-5291     |

Must be fabricated by maintenance personnel (para 4-13).

**4-13. Fabrication of Test Equipment**

a. *Dummy Antenna*. A special 50-ohm, 6-db pad (dummy antenna) is required to couple the output of Generator, Signal AN/URM-103 to the input of the RT-841/PRC-77. Fabricate the special 50-ohm, 6-db dummy antenna as shown in figure 3-16 and 7-3.

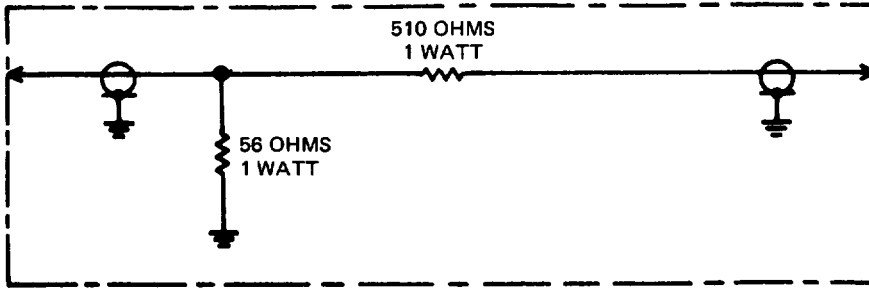
b. *RF Attenuator*. Fabricate the RF attenuator as illustrated in figure 4-8.

c. *Test Box*. Fabricate the test box as illustrated in figure 4-9.

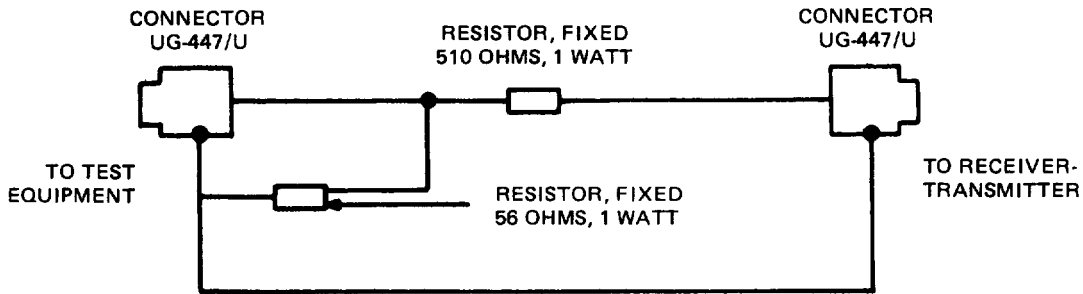
4-14, Physical Tests and Inspection

a. *Test Equipment and Materials*. None.

b. *Test Connections and Conditions*. Remove Battery Box CY-2562/PRC-25, Battery Dry BA-386/PRC-25, and the RT-841/PRC-77 case.



A. SCHEMATIC DIAGRAM



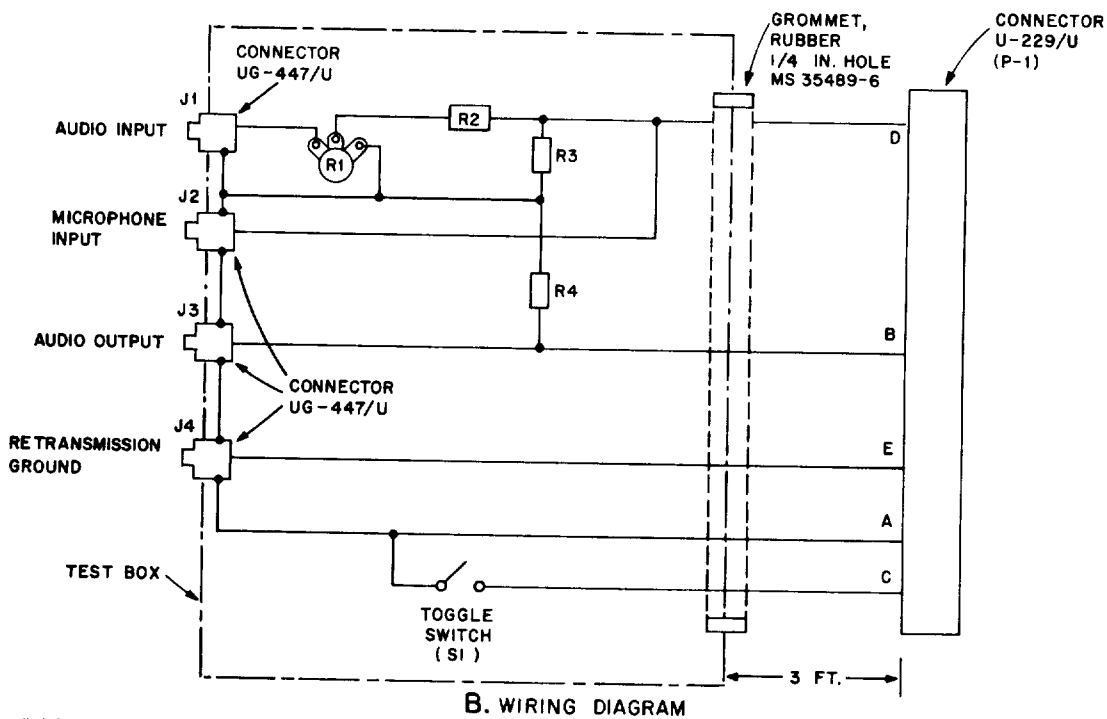
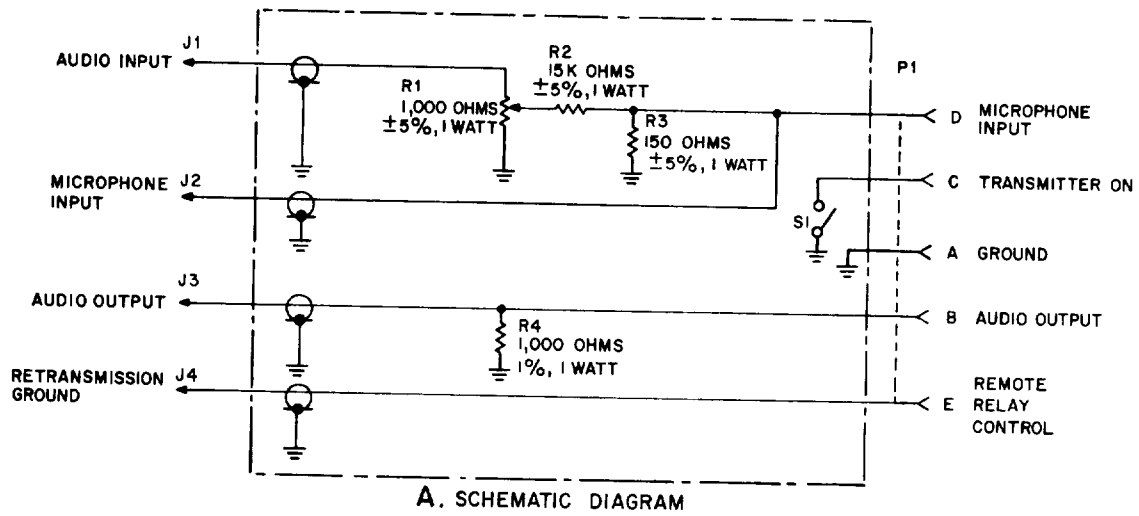
B. WIRING DIAGRAM

NOTES:

1. PLACE ASSEMBLY IN AN ALUMINUM CAN APPROXIMATELY 6 INCHES BY 2.5 INCHES BY 2.5 INCHES.
2. ALL WIRING IS WIRE, STRANDED, AWG NO. 18.
3. USE STANDARD RF PROCEDURES. KEEP LEADS SHORT AS POSSIBLE.

TM5B20-667-35-42

Figure 4-8, Fabrication details of RF attenuator.



NOTES:

1. PLACE ASSEMBLY IN AN ALUMINUM CAN APPROXIMATELY 6 INCHES BY 2.5 INCHES BY 2.5 INCHES.
2. ALL WIRING IS WIRE, STRANDED, AWG NO. 18.

TM5820-667-35-43

Figure 4-9. Fabrication details of test box.

## c. Procedure.

| Step No. | Test equipment control settings | Equipment under test control settings | Test procedure   | Performance standard   |
|----------|---------------------------------|---------------------------------------|--|--|
| 1        | N/A-----                        | Controls may be in any position.      | <p>a. Inspect all controls and external assemblies for loose or missing screws.</p> <p>b. Inspect connector for looseness or damage.</p> <p>c. Inspect the RT-841/PRC-77 case and front panel for damage, missing parts, and condition of finish.</p> <p><i>Note.</i> Touchup painting is recommended in lieu of refinishing wherever practicable. Screwheads and connectors will not be painted or polished with abrasives.</p> | <p>a. Screws will be tight; none missing.</p> <p>b. No looseness or damage evident.</p> <p>c. No damage or missing parts evident. Painted external surfaces will not show bare metal. Panel lettering will be legible.</p> |
| 2        | N/A-----                        | Controls may be in any position.      | <p>a. Turn the BAND and function switches to each of their operating positions.</p> <p>b. Turn the VOLUME and REC-TRANS FREQUENCY (mc and kc) controls throughout their limits of travel.</p>  | <p>a. Switches operate freely, without binding or excessive looseness.</p> <p>b. Controls rotate freely, without binding or excessive looseness.</p>   |
| 3        | N/A-----                        | Controls may be in any position.      | <p>a. Loosen captive screws securing audio and control motherboard and swing motherboard out on its hinges. Inspect the motherboard for loose or missing screws.</p> <p>b. Inspect connections for looseness or damage.</p>  | <p>a. Screws will be tight; none missing.</p> <p>b. No looseness or damage evident.</p>  |
| 4        | N/A-----                        | Controls may be in any position.      | <p>a. Inspect modules for loose or missing screws.</p> <p>b. Inspect connectors for looseness or damage.</p>   | <p>a. Screws will be tight; none missing.</p> <p>b. Connectors will be undamaged and firmly seated.</p>  |

#### 4-15. Transmitter Power and Whip Antenna Output Tests

Refer to paragraph 3-23 for transmitter power output and whip antenna output test procedures.

#### 4-16. Tone Oscillator Frequency and Transmitter Modulation Test

##### a. Test *Equipment and Materials*.

- (1) Wattmeter (part of Coupler-Detector CU-754/URM-120)
- (2) Dummy Load, Electrical DA-75/U.
- (3) Meter, Modulation ME-57/U.
- (4) Digital Readout, Counter Electronic AN/USM-207.

- (5) Handset H-189/GR.
- (6) Adapter T UG-274B/U.
- (7) Resistor, 15,000 ohms,  $\pm 5\%$ , 1 watt.
- (8) Capacitor, 0.05  $\mu f$ .
- (9) Rf attenuator (fig. 4-8),
- (10) Test Cable No. 1.
- (11) Test Cable No. 3 (four required).
- (12) Adapter UG-201/U (*three required*).
- (13) Wire, Stranded, AWG No. 18.

*b. Test Conditions and Connection.* Connect equipment as shown in figure 4-11. Turn on the equipment and allow it to warmup for 5 minutes.

Figure 4-10 is deleted and replaced by figure 3-17.

Pages 4-19 and 4-20 deleted.





Figure 4-11. Tone oscillator frequency and transmitter modulation test setup.

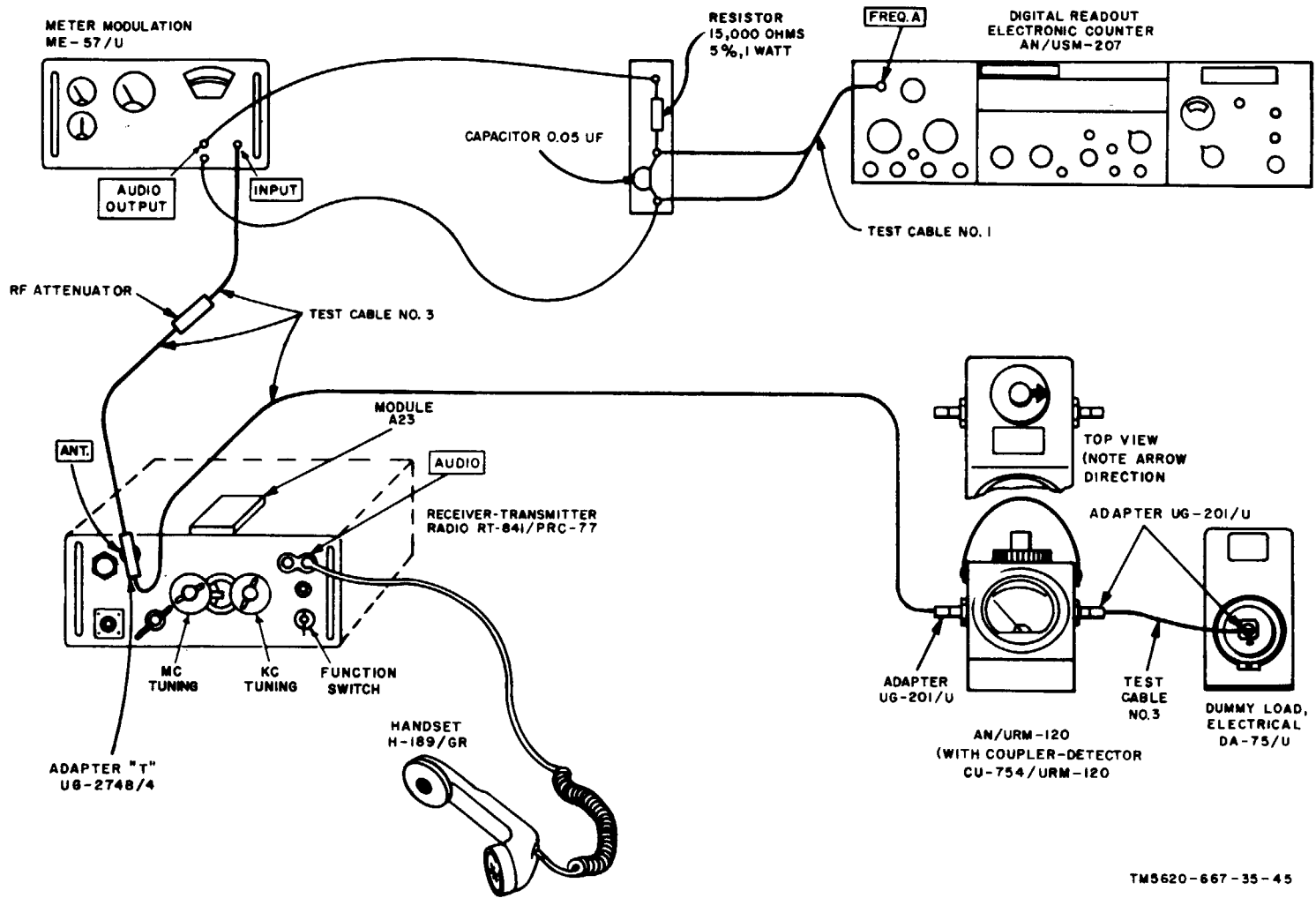


Figure 4-11. Tone oscillator frequency and transmitter modulation test setup.

## c. Procedure.

| Step No. | Test equipment control settings   | Equipment under test control settings   | Test procedure  | Performance standard  |
|----------|---|---|---|---|
| 1        | <p><i>AN/URM-120</i></p> <p>Power range knob: 10 watts.</p> <p>Power direction arrow: toward DA-75/U.<br/><i>AN/USM-20</i></p> <p>Display control: fully counterclockwise.</p> <p>Sensitivity switch: 100V</p> <p>Time base switch: Gate Time (SEC-1) 10<sup>-1</sup>.</p> <p>Function switch: <b>FREQ</b></p> <p>Power switch: <b>STORE</b></p> <p><i>ME-57/U</i></p> <p><b>TUNE-FINE TUNE</b> switch: <b>TUNE</b>.</p> <p><b>DEVIATION RANGE KC</b> switch: 1000 <b>TUNE</b>.</p> <p><b>FREQUENCY RANGE-MC</b> switch: 20-55.</p> <p><b>FREQUENCY RANGE-MC</b> <b>TUNING</b> control: 41.</p> | <p><b>BAND</b> switch : 30-52</p> <p><b>REC-TRANS FREQUENCY (mc)</b> control: 41.</p> <p><b>REC-TRANS FREQUENCY (kc)</b> control : 00.</p> <p><b>Function</b> switch: <b>ON</b></p> <p><b>VOLUME</b> control: 5</p> | <p>a. Remove module A23.</p> <p>b. Press and hold the H-189/GR push-to-push.</p> <p>c. Adjust the ME-57/U <b>TUNING</b> control until the <b>CARRIER SHIFT</b> meter reads zero.</p> <p>d. Set the ME-57/U <b>TUNE-FINE TUNE</b> switch to the <b>FINE TUNE</b> position.</p> <p>e. Adjust the ME-57/U <b>TUNING</b> control until the <b>CARRIER SHIFT</b> meter again reads zero.</p> <p>f. Adjust the ME-57/U <b>GAIN</b> control until the ME-57/U <b>LIMITING</b> meter reads in the black area.</p> <p>g. Release the H-189/GR push-to-talk switch.</p> <p>h. Replace module A23.</p> | <p>a. None.</p> <p>b. None.</p> <p>c. None.</p> <p>d. None.</p> <p>e. None.</p> <p>f. None.</p> <p>g. None.</p> <p>h. None.</p> |
| 2        | Same as step No. 1  | Same as step No. 1  | <p>a. Press and hold the H-189/GR push-to-talk switch.</p> <p>b. Turn the ME-57/U <b>DEVIATION RANGE KC</b> switch to obtain the highest reading on the <b>DEVIATION</b> meter without pegging the meter.<br/><i>Note.</i> When the 1000 <b>TUNE</b> position is used, multiply the 0-100 scale reading on the <b>DEVIATION</b> meter by 10.</p> <p>c. Adjust the AN/USM-207 <b>SENSITIVITY</b> switch counterclockwise until stable readings are obtained.</p> <p>d. Release the H-189/GR push-to-talk switch.</p>   | <p>a. None.</p> <p>b. Deviation should be 3.0 ± 0.5 KC.</p> <p>c. Frequency should be 150 ± 1.5 cps.</p> <p>d. None.</p>        |

**4-17. System Distortion Test***a. Test Equipment and Materials.*

- (1) Voltmeter, Meter ME-30A/U (two required).
- (2) Generator, Signal AN/URM-127.
- (3) Analyzer, Spectrum TS-723B/U.
- (4) Radio Set AN/PRC-77.
- (5) Test Box (fig. 4-9; two required),

(6) Adapter, T UG-274B/U.

(7) Test Cable No. 1 (three required).

*b. Test Conditions and Connections.* Two people are required to perform this test. Connect the equipment as shown in figure 4-12, and install Antenna AT-892 /PRC-25 in the RT-841/PRC-77's for the test. Turn on the equipment and allow it to warmup for 5 minutes.

Figure 4-12. System distortion test setup.

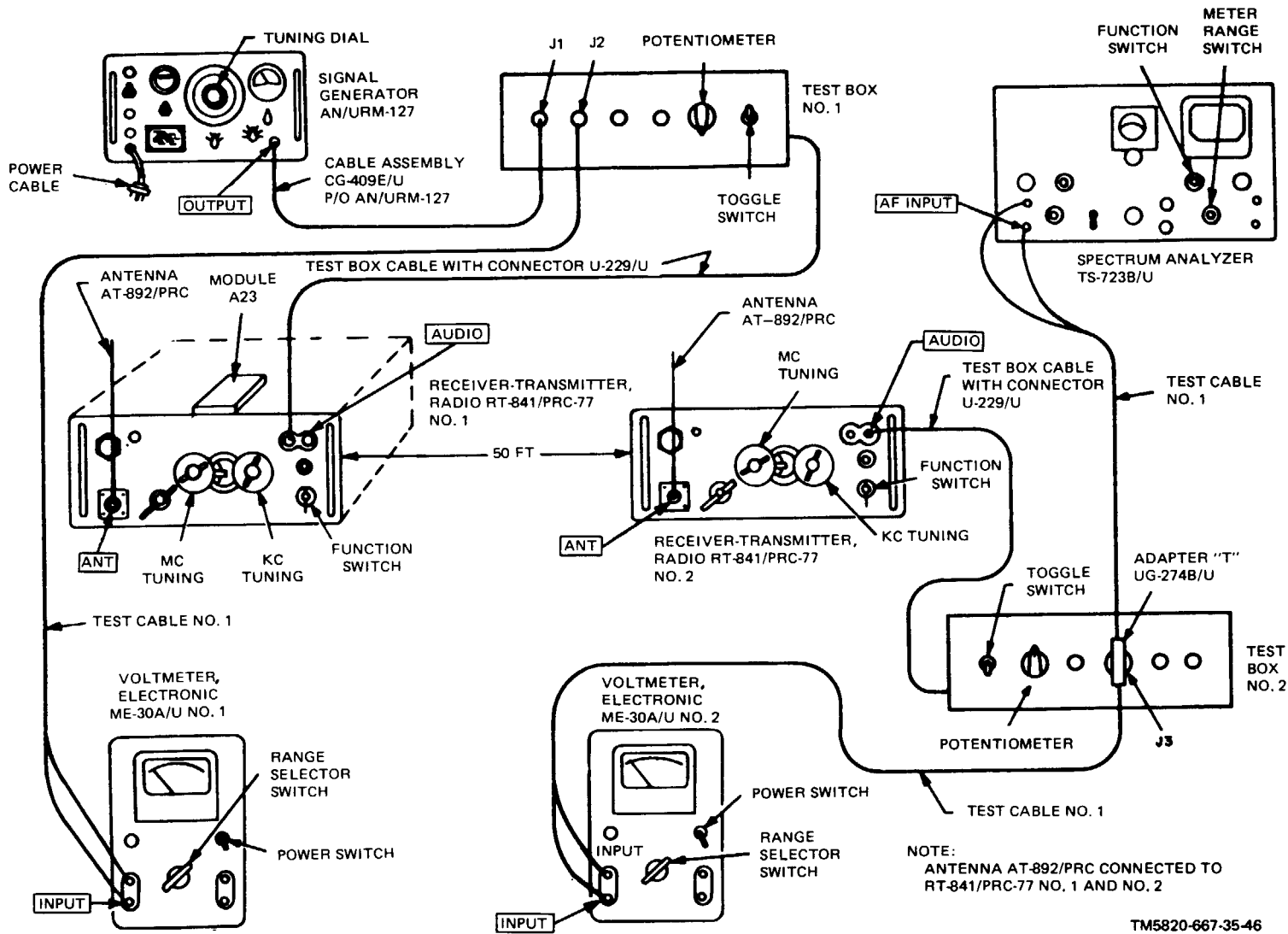


Figure 4-12. System distortion test setup.

*c. Procedure.*

| Step No. | Test equipment control settings  | Equipment under test control settings   | Test procedure   | Performance standard  |
|----------|--|---|--|---|
| 1        | <p><i>ME-30A/U No. 1</i><br/>           Power switch: ON<br/>           Range selector switch:<br/>           .003 VOLTS, -50 DB.<br/> <i>ME-30A/U No. 2</i><br/>           Power switch: ON<br/>           Range selector switch:<br/>           3 VOLTS, +10 DB.<br/> <i>AN/URM-127</i><br/>           FREQ RANGE<br/>           MULTIPLIER switch:<br/>           X10.<br/>           ATTENUATOR switch:<br/>           X1<br/>           OUTPUT CONTROL:<br/>           fully counterclockwise.<br/>           Frequency range dial:<br/>           100.<br/> <i>RT-841/PRC-77 No. 2</i><br/>           Function switch: ON<br/>           BAND switch: 30-52<br/>           REC-TRANS FRE-<br/>           QUENCY (mc)<br/>           control: 41.<br/>           REC-TRANS FREQUENCY<br/>           (kc) control : 00.<br/>           VOLUME control: 0</p> | <p><i>RT-841( )/PRC-77 No. 1</i><br/>           BAND switch: 30-52<br/>           REC-TRANS FREQUENCY (mc)<br/>           control : 41.<br/>           REC-TRANS FREQUENCY (kc)<br/>           control: 00.<br/>           Function switch: ON<br/>           VOLUME control: 5<br/>           Same as in step No. 1.</p> | <p>a. Remove module A23.<br/>           b. Set the AN/URM-127<br/>           OUTPUT CONTROL to<br/>           its maximum clockwise<br/>           position. Adjust the test<br/>           box No. 1 potentiometer<br/>           until ME-30A/U No. 1<br/>           indicates 1.4 millivolts (mv).<br/>           c. Close the toggle switch on<br/>           RT-841/PRC-77 No. 1.<br/>           d. Adjust RT-841/PRC-77<br/>           No. 2 VOLUME control<br/>           until ME-30A/U No. 2<br/>           indicates 1 volt.</p> | <p>a. None.<br/>           b. None.<br/>           c. None.<br/>           d. None.</p> |
| 2        | <p>Same as in step No. 1,<br/>           except:<br/> <i>TS-723B/U</i><br/>           Frequency RANGE switch:<br/>           X10.<br/>           FREQUENCY controls;<br/>           dial indication of 100.<br/>           Signal INPUT control:<br/>           MIN.<br/>           AF-RF selector switch:<br/>           AF.</p>  | <p>Same as in step No. 1.</p>   | <p>Adjust the TS-723B/U as<br/>           follows:<br/>           a. Slowly turn the signal INPUT<br/>           control clockwise until the<br/>           TS-723B/U meter pointer<br/>           reaches full scale<br/>           deflection.<br/>           b. Turn the function switch to<br/>           DISTORTION.<br/>           c. Adjust the coarse FREQUENCY<br/>           control knob (upper) until<br/>           the TS-723B/U meter<br/>           pointer drops sharply.</p>   | <p>a. None.<br/>           b. None.<br/>           c. None.</p>                         |

Test equipment  
control settings

Function switch: SET  
LEVEL.  
Meter range switch: 100%.

Equipment under test  
control settings

Test procedure

- d. Adjust the fine FREQUENCY control knob (lower) for maximum dip of the meter pointer.

*Note.* The tuning becomes more critical as the meter reading decreases.

- e. Adjust the BALANCE control for a minimum meter reading.

*Note.* The tuning becomes more critical as the meter reading decreases.

- f. Readjust the FREQUENCY and BALANCE controls until no further reduction in the meter reading can be obtained. As adjustment progresses, decrease the setting of the meter range switch to maintain a midscale meter indication.

- g. Note the TS-723B/U meter reading.

Performance standard

d. None.

e. None.

f. None.

g. TS-723B/U meter indicates distortion of 10 percent or less.

**4-18. Frequency Accuracy Test**

Refer to paragraph 3-24 for frequency accuracy test procedures.

Figure 4-13 is deleted and replaced by figure 3-18.

Pages 4-29 and 4-30 deleted.





**4-19, Maximum Signal Plus Noise-to-Noise Ratio Test***a. Test Equipment and Materials.*

- (1) Voltmeter, Meter ME-30A/U (two required).
- (2) Generator, Signal AN/URM-127.
- (3) Radio Set AN/PRC-77.

(4) Test Box (fig. 4-9; two required),

(5) Test Cable No. 1 (two required).

*b. Test Conditions and Connections.* Two people are required to perform this test. Connect equipment as shown in figure 4-14 and install Antenna AT-892/PRC in the RT-841/PRC-77's for all tests. Turn on the equipment and allow it to warmup for 5 minutes,

## c. Procedure.

| Step No. | Test equipment control settings  | Equipment under test control settings  | Test procedure   | Performance standard   |
|----------|--|--|--|--|
| 1        | <p><i>AN/URM-127</i><br/> <b>FREQ. RANGE</b><br/> <b>MULTIPLIER</b> switch:<br/> X10.<br/> <b>Frequency range dial:</b><br/> 100.<br/> <b>ATTENUATOR</b> switch:<br/> X1<br/> <b>OUTPUT CONTROL:</b><br/> fully counterclockwise.<br/> <i>ME-30A/U No. 1</i><br/> <b>Power switch:</b> ON<br/> <b>Range selector switch:</b><br/> .003 VOLTS, -50 DB.<br/> <i>ME-30A/U No. 2</i><br/> <b>Range selector switch:</b><br/> 3 VOLTS, +10 DB.<br/> <i>RT-841/PRC-77 No. 2</i><br/> <b>BAND</b> switch: 30-52 mc<br/> <b>REC-TRANS FREQUENCY</b><br/> (mc) control: 41<br/> <b>REC-TRANS FREQUENCY</b><br/> (kc) control: 00.<br/> <b>Function switch:</b> ON<br/> <b>VOLUME</b> control: 5</p> | <p><i>RT-841/PRC-77 No. 1</i><br/> <b>BAND</b> switch: 30-52<br/> <b>REC-TRANS FREQUENCY</b> (mc)<br/> control: 41.<br/> <b>REC-TRANS FREQUENCY</b> (kc)<br/> control: 00.<br/> <b>Function switch:</b> ON<br/> <b>VOLUME</b> control: 5</p> | <p>a. Set the <i>AN/URM-127</i><br/> <b>OUTPUT CONTROL</b> at its<br/> maximum clockwise<br/> position. Adjust the test<br/> box No. 1 potentiometer<br/> until <i>ME-30A/U</i> No. 1<br/> indicates 1.4 millivolts (mv).<br/> b. Remove A23<br/> c. Close the toggle switch.<br/> d. Adjust <b>VOLUME</b> control on<br/> <i>RT-841/ARC-77</i> No. 2 to<br/> 1 volt on <i>ME-30A/U</i>.</p> | <p>a. None.<br/><br/> b. None.<br/> c. None.<br/> d. Note reading on <i>ME-30A/U</i>.</p>                                  |
| 2        | <p>Same as in step No. 1<br/> except:<br/> <i>ME-30A/U No. 2</i><br/> <b>Range selector switch:</b><br/> .01 VOLTS, -40 DB.</p>  | <p>Same as step No. 1</p>  | <p>a. Set the <i>AN AN/URM-127</i><br/> <b>OUTPUT CONTROL</b> at full<br/> counterclockwise position.<br/> Adjust test box No. 2<br/> potentiometer to zero<br/> output.<br/> b. Note and record <i>ME-30A/U</i><br/> No. 2 meter indication.<br/> c. Open the toggle switch.</p>  | <p>a. None.<br/><br/> b. Indication should be at least<br/> 40 db greater than that of<br/> step No. 1d.<br/> c. None.</p> |

Figure 4-14. Maximum signal plus noise-to-noise ratio test setup

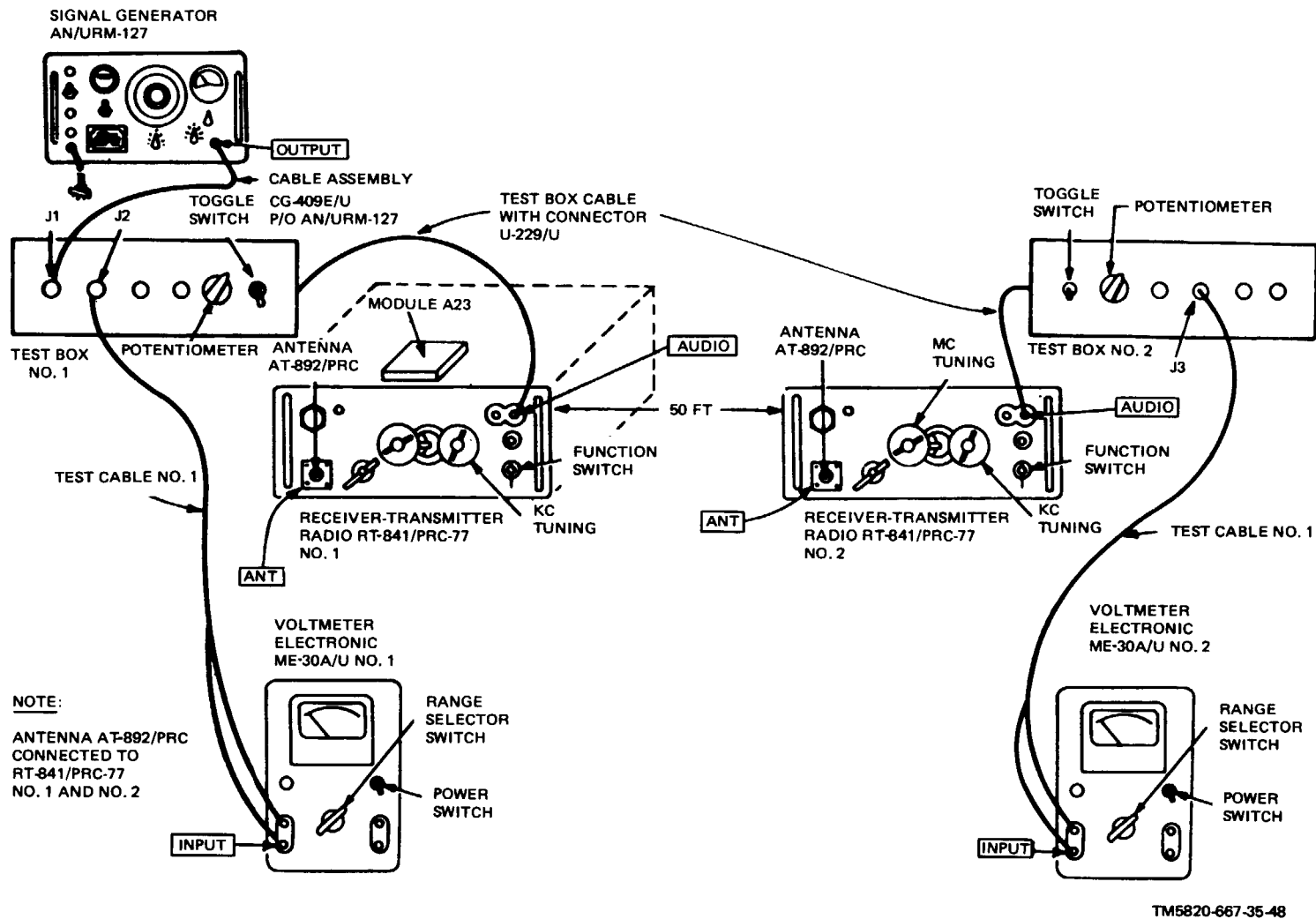


Figure 4-14. Maximum signal plus noise-to-noise ratio test setup.

**4-20. Receiver Audio Output Power Test**

Refer to paragraph 3-25 for receiver audio output power test procedures.

Figure 4-15 is deleted and replaced by figure 3-19.

Pages 4-35 and 4-36 deleted.

**4-21. Receiver Sensitivity Test***a. Test Equipment and Materials.*

- (1) Voltmeter, Meter ME-30A/U.
- (2) Generator, Signal AN/URM-103.
- (3) Generator, Signal AN/URM-127.
- (4) Analyzer, Spectrum TS-723B/U.
- (5) Dummy antenna (fig. 7-3).
- (6) Adapter UG-201/U.

(7) Adapter, T UG-274B/U.

(8) Test Cable No. 1 (three required).

(9) Test Cable No. 3 (two required).

(10) Test Box (fig. 4-9).

*b. Test Connections and Conditions.* Connect the equipment as shown in figure 4-16. Turn on the equipment and allow it to warmup for 5 minutes.

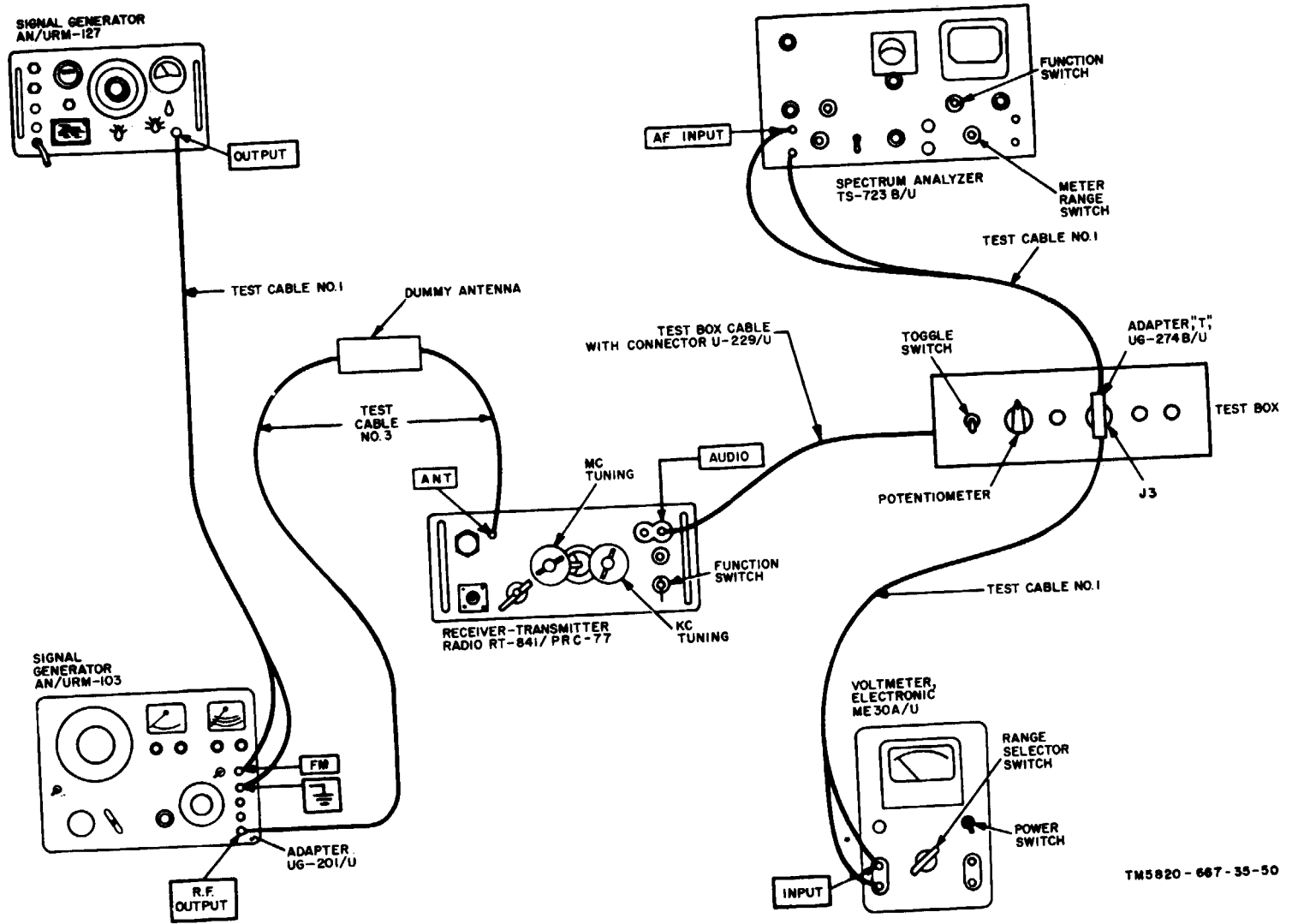
## c. Procedure.

## Control settings

| Step No. | Test equipment  | Equipment under test   | Test procedure  | Performance standard  |
|----------|---|--|---|---|
| 1        | <p><i>ME-30A/U</i><br/>           Power switch: ON.<br/>           Range selector switch:<br/>           3 VOLTS, +10 DB.<br/> <i>AN/URM-103</i><br/>           RANGE switch: B.<br/>           Control switch: EXT. F. M.<br/>           MOD. INC. FREQ switch:<br/>           MOD. 0-20.<br/>           SET CARRIER control:<br/>           adjust pointer to line on<br/>           CARRIER LEVEL meter.<br/>           COARSE TUNING control:<br/>           30.<br/>           ATTENUATOR control:<br/>           1.0 uv on -6 db line.<br/> <i>Note:</i> The actual rf-level pre-<br/>           sent at the RT-841/PRC-77<br/>           coaxial ANT input is 0.5 <math>\mu</math>v<br/>           when the AN/URM-103 out-<br/>           put attenuator is set to 1 <math>\mu</math>v<br/>           through a 6 db attenuator.<br/> <i>TS-723B/U</i><br/>           Frequency RANGE switch:<br/>           X10<br/>           Signal INPUT control:<br/>           MIN.<br/>           FREQUENCY controls:<br/>           indication of 100 on dial.<br/>           Function switch: METER<br/>           Meter range switch: +10 DB.<br/>           AF-RF selector switch: AF.<br/> <i>AN/URM-127</i><br/>           FREQ. RANGE<br/>           MULTIPLIER switch: X10.<br/>           Frequency range dial: 100.<br/>           ATTENUATOR switch: X1.<br/>           OUTPUT CONTROL:<br/>           fully counterclockwise<br/>           and adjust clockwise</p> | <p>BAND switch: 30-52 MHz.<br/>           REC-TRANS FREQUENCY (MHz)<br/>           control: 30.<br/>           REC-TRANS FREQUENCY (kHz)<br/>           control: 00.<br/>           Function switch: ON.<br/>           VOLUME control: 5.</p> | <p>a. Adjust the AN/URM-103<br/>           COARSE and FINE TUNING<br/>           controls for a peak indication<br/>           on the ME-30A/U.<br/>           b. Adjust the RT-841/PRC-77<br/>           VOLUME control for a 1-volt<br/>           indication on the ME-30A/U.<br/>           c. Turn the TS-723B/U function<br/>           switch to SET LEVEL.<br/>           d. Slowly rotate the TS-723B/U<br/>           signal INPUT control until<br/>           the TS-723B/U meter<br/>           pointer rests at 0 DECIBELS.<br/>           e. Turn the TS-723B/U function<br/>           switch to DISTORTION.<br/>           f. Adjust the TS-723B/U coarse<br/>           FREQUENCY control until the<br/>           TS-723B/U meter pointer<br/>           dips sharply.<br/>           g. Adjust the TS-723B/U fine<br/>           FREQUENCY control for the<br/>           maximum dip of the TS-<br/>           723B/U meter pointer.<br/>           h. Adjust the TS-723B/U<br/>           BALANCE control for<br/>           the minimum TS-723B/U<br/>           meter reading.<br/>           i. Readjust the TS-723B/U<br/>           FREQUENCY and BALANCE<br/>           controls until no further<br/>           reduction in the TS-723B/U<br/>           meter indication can be obtained.<br/>           As adjustment progresses, decrease<br/>           the setting of the meter range<br/>           switch to maintain midscale meter<br/>           deflections.</p> | <p>a. None.<br/>           b. None.<br/>           c. None.<br/>           d. None.<br/>           e. None.<br/>           f. None.<br/>           g. None.<br/>           h. None.<br/>           i. None.</p> |

| Step No. | Test equipment  | Control settings            | Equipment under test  | Test procedure  | Performance standard   |
|----------|---|-----------------------------|---|---|--|
|          | for 10 on the 0-20 scale of AN/URM-103 MODULATION & INCREMENTAL FREQUENCY meter.      |                             |   | j. Record the TS-723B/U meter indication; then turn the TS-723B/U function switch to SET LEVEL and record the TS-723B/U meter indication. | j. TS-723B/U meter indication obtained in DISTORTION position should be at least 10 db lower than the meter indication obtained in the SET LEVEL position. |
| 2        | Same as step No. 1, except: AN/URM-103 RANGE switch: B. COARSE TUNING control: 41.    | Same as step No. 1, except: | REC-TRANS FREQUENCY (mc) control: 41.<br>REC-TRANS FREQUENCY (kc) control: 00.                        | Repeat step No. 1 above.....  | Same as step No. 1 above.  |
| 3        | Same as step No. 1, except: AN/URM-103 RANGE switch: C. COARSE TUNING control: 52.    | Same as step No. 1, except: | REC-TRANS FREQUENCY (mc) control: 52.<br>REC-TRANS FREQUENCY (kc) control: 00.                        | Repeat step No. 1 above.....  | Same as step No. 1 above.  |
| 4        | Same as step No. 1, except: AN/URM-103 RANGE switch: C. COARSE TUNING control: 53.    | Same as step No. 1, except: | REC-TRANS FREQUENCY (mc) control: 53.<br>REC-TRANS FREQUENCY (kc) control: 00.<br>BAND SWITCH; 53-75. | Repeat step No. 1 above.....  | Same as step No. 1 above.  |
| 5        | Same as step No. 1, except: AN/URM-103 RANGE switch: C. COARSE TUNING control: 65.    | Same as step No. 1, except: | REC-TRANS FREQUENCY (mc) control: 65.<br>REC-TRANS FREQUENCY (kc) control: 00.<br>BAND SWITCH: 53-75. | Repeat step No. 1 above.....  | Same as step No. 1 above.  |
| 6        | Same as step No. 1, except: AN/URM-103 RANGE switch: C. COARSE TUNING control: 75-95. | Same as step No. 1, except: | REC-TRANS FREQUENCY (mc) control: 75.<br>REC-TRANS FREQUENCY (kc) control: 95.<br>BAND SWITCH: 53-75. | Repeat step No. 1 above.....  | Same as step No. 1 above.  |

Figure 4-16. Receiver sensitivity test setup.



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Figure 4-16. Receiver sensitivity test setup.



**4-22. Receiver Catching Range Test***a. Test Equipment and Materials.*

- (1) Voltmeter, Meter ME-30A/U.
- (2) Generator, Signal AN/URM-103.
- (3) Dummy antenna (fig. 7-3).
- (4) Test Box (fig. 4-9).

(5) Adapter UG-201/U.

(6) Test Gable No. 1.

(7) Test Cable No. 3 (two required).

*b. Test Connections and Conditions.* Connect the test equipment as shown in figure 4-17. Turn on the equipment and allow it to warmup for 5 minutes.

## c. Procedure.

| Test equipment |   | Test equipment  |  |  |
|----------------|---|---|--|--|
| Step No.       | Test equipment  | Equipment under test  | Test procedure   | Performance standard   |
| 1              | <p><i>ME-30A/U</i><br/>           Power switch: ON.<br/>           Range selector switch:<br/>           3 VOLTS, +10 DB.<br/> <i>AN/URM-103</i><br/>           RANGE switch: B.<br/>           Control switch: INT.F.M<br/>           MOD. FREQ. switch:<br/>           1 kc/s.<br/>           COARSE TUNING<br/>           control: 31.5.<br/>           SET CARRIER control:<br/>           adjust pointer to line<br/>           on CARRIER LEVEL<br/>           meter.<br/>           MOD. INC. FREQ switch:<br/>           MOD. 0-20.<br/>           SET MODULATION<br/>           control: adjust clockwise<br/>           for 10 on 0-20 scale of<br/>           MODULATION &amp;<br/>           INCREMENTAL<br/>           FREQUENCY meter.<br/>           ATTENUATOR control:<br/>           10 uv on -6 db line.</p> | <p>BAND: 30-52.<br/>           REC-TRANS FREQUENCY (mc)<br/>           control: 31.50</p> | <p>Adjust the RT-841/PRC-77<br/>           VOLUME control for a<br/>           1-volt indication on the<br/>           ME-30A/U after adjusting<br/>           AN/URM-103 COARSE and<br/>           FINE TUNING controls for<br/>           maximum on ME-30A/U.</p> <p>a. Disable the RT-841/PRC-77<br/>           crystal switch assembly by<br/>           disengaging the mechanical<br/>           coupling (A40).</p> <p>b. Rotate the RT-841/PRC-77<br/>           REC-TRANS FREQUENCY<br/>           (kc) control higher in<br/>           frequency in 50-kc increment.</p> <p>c. Turn the RT-841/PRC-77<br/>           function switch momentarily<br/>           from ON to OFF, and then<br/>           back to ON after each change<br/>           of frequency.</p> <p>d. Record the highest<br/>           RT-841/PRC-77<br/>           frequency at which an<br/>           indication is obtained on the<br/>           ME-30A/U.</p> <p>e. Rotate the RT-841/PRC-77<br/>           REC TRANS FREQUENCY<br/>           (kc) control lower in<br/>           frequency in the 50-kc increments.</p> <p>f. Turn the RT-841/PRC-77<br/>           function switch momentarily<br/>           from ON to OFF, and then<br/>           back to ON after each change<br/>           of frequency.</p> <p>g. Record the lowest RT-841/PRC-<br/>           77 frequency at which an<br/>           indication is obtained on<br/>           the ME-30A/U.</p> | <p>a. None.</p> <p>b. None.</p> <p>c. None.</p> <p>d. Frequency should be at least<br/>           350 kc higher than 31.50 mcs.</p> <p>e. None.</p> <p>f. None.</p> <p>g. Difference between the upper<br/>           and lower frequency<br/>           indications should be at least<br/>           800 kc.</p> |

| Step No. | Test equipment   | Control settings  | Equipment under test | Test procedure   | Performance standard   |
|----------|--|---|----------------------|--|--|
| 2        | Same as step No. 1, except:<br><i>AN/UPM-103</i><br>RANGE switch: C.<br>COARSE TUNING control: 51.5. | Same as step No. 1, except:<br>REC-TRANS FREQUENCY (mc) control: 51.<br>REC-TRANS FREQUENCY (kc) control: 50. |                      | h. Engage the crystal switch by turning the RT-841/PRC-77 REC-TRANS FREQUENCY control. (Mechanical coupling is self-engaging.)<br>Repeat step No. 1 above----- | h. None.<br><br>Frequency indication for 51.50 mc should be the same as indicated for 31.50 mc in 1 <i>d</i> and <i>g</i> above. |

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Figure 4-17. Receiver catching range test setup.

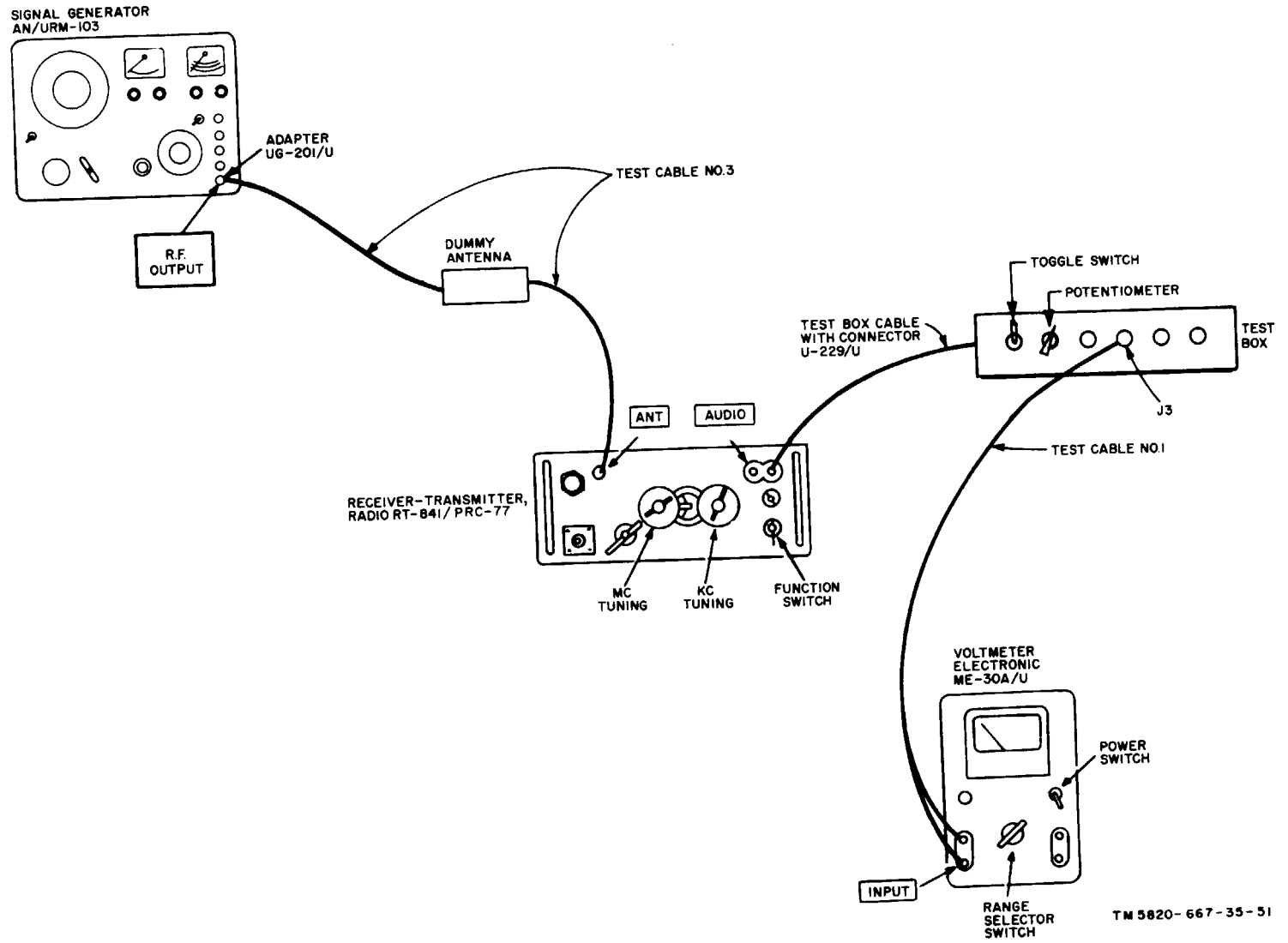


Figure 4-17. Receiver catching range test setup.

**4-23. Squelch Sensitivity Test**

Refer to paragraph 3-26 for squelch sensitivity test procedures.

Figure 4-18 is deleted and replaced by figure 3-20.

Pages 4-47 and 4-48 deleted.



**4-24. Receiver Distortion Test***a. Test Equipment and Materials.*

- (1) Generator, Signal AN/URM-103.
- (2) Analyzer, Spectrum TS-723B/U.
- (3) Voltmeter, Meter ME-30A/U.
- (4) Generator, Signal AN/URM-127.
- (5) Dummy antenna (fig. 7-3).
- (6) Test Box (fig. 4-9).

(7) Adapter UG-201/U.

(8) Adapter T UG-274B/U.

(9) Test Cable No. 1 (three required).

(10) Test Cable No. 3 (two required).

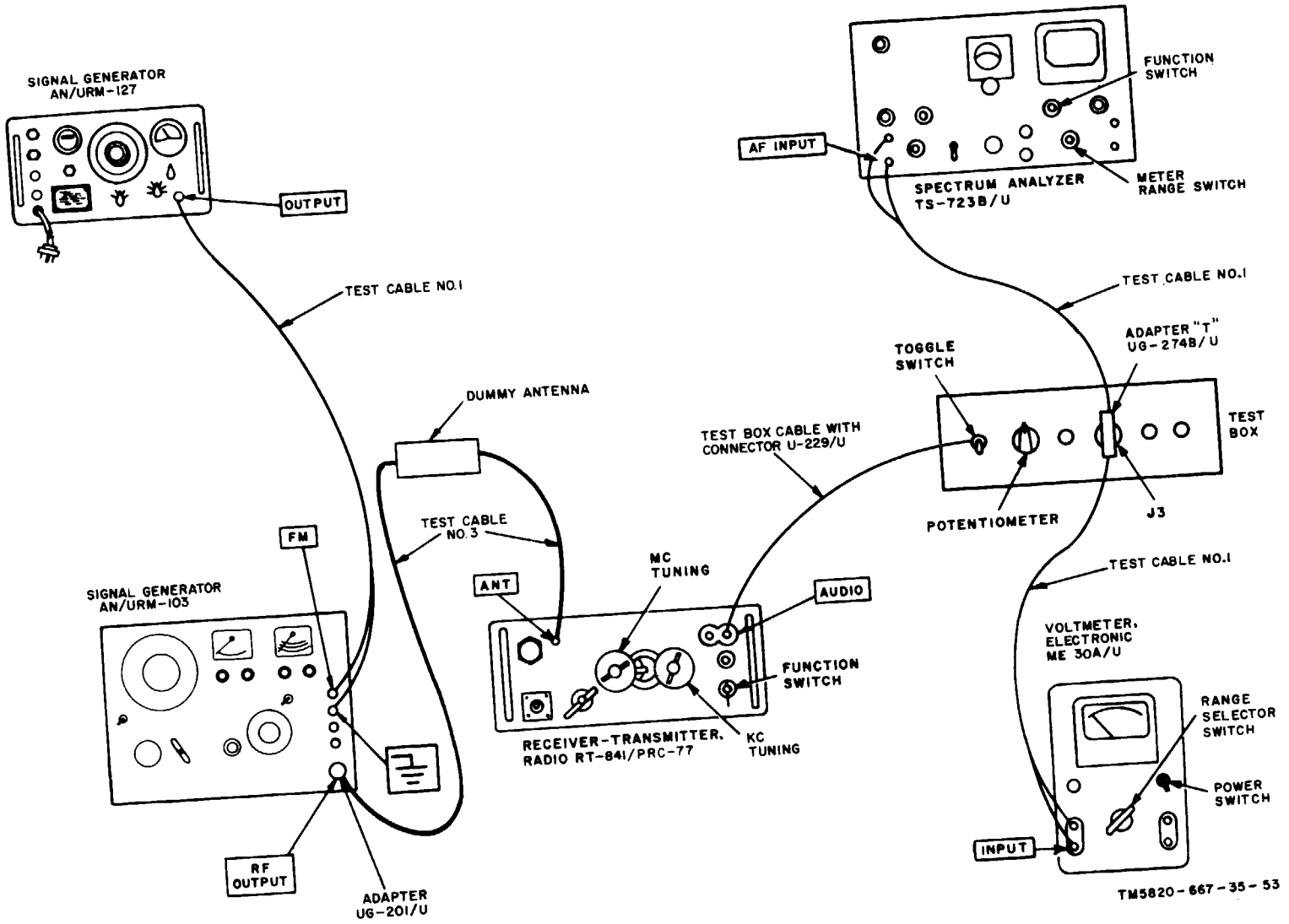
*b. Test Connections and Conditions.* Connect the test equipment as shown in figure 4-19. Turn on the equipment and allow it to warmup for 5 minutes.

## c. Procedure.

| Control settings |  |   |   |                      |
|------------------|--|---|---|----------------------|
| Step No.         | Test equipment   | Equipment under test  | Test procedure  | Performance standard |
| 1                | <p><i>ME-30A/U</i><br/>           Power switch: ON.<br/>           Range selector switch:<br/>           3 VOLTS, +10 DB.<br/> <i>TS-723B/U</i><br/>           Frequency RANGE switch:<br/>           X10<br/>           FREQUENCY controls:<br/>           dial indication of 100.<br/>           Signal INPUT control:<br/>           MIN.<br/>           FUNCTION switch:<br/>           SET LEVEL.<br/>           Meter range switch: 100%.<br/>           AF-RF selector switch: AF.<br/> <i>AN/URM-103</i><br/>           RANGE switch: B.<br/>           Control switch: EXT. F.M.<br/>           MOD. INC. FREQ switch:<br/>           MOD. 0-20.<br/>           COARSE TUNING control:<br/>           41<br/>           SET CARRIER control:<br/>           Adjust to line on the<br/>           CARRIER LEVEL meter.<br/>           ATTENUATOR control:<br/>           Set -6 db line to 10 uv.<br/> <i>AN/URM-127</i><br/>           FREQ. RANGE<br/>           MULTIPLIER switch: X10.<br/>           Frequency range dial: 100.<br/>           ATTENUATOR switch: X1.<br/>           OUTPUT CONTROL:<br/>           fully counterclockwise for<br/>           10 on the 0-20 scale of<br/>           AN/URM-103 MODULA-<br/>           TION &amp; INCREMENTAL<br/>           FREQUENCY meter.</p> | <p>BAND switch: 30-52 mc.<br/>           REC-TRANS FREQUENCY (mc)<br/>           control: 41.<br/>           REC-TRANS FREQUENCY (kc)<br/>           control: 00.<br/>           Function switch: ON.<br/>           VOLUME control: 5.</p> | <p>Adjust the AN/URM-103<br/>           COARSE and FINE TUNING<br/>           controls for maximum<br/>           indication on the ME-30A/U.</p> | <p>None.</p>         |



| Step No. | Test equipment      | Equipment under test  | Test procedure  | Performance standard   |
|----------|---------------------|---|---|--|
| 2        | Same as step No. 1. | Same as step No. 1 except:<br>VOLUME: adjusted for 1-volt indication on ME-30A/U. | <p>Adjust the TS-723B/U as follows:</p> <p>a. Slowly route the signal INPUT control clockwise until the TS-723B/U meter pointer reaches full scale deflection.</p> <p>b. Turn the function switch to to DISTORTION.</p> <p>c. Adjust the coarse FREQUENCY control (upper) until the TS-723B/U meter pointer dips sharply.</p> <p>d. Adjust the fine FREQUENCY control (lower) for the maximum dip of the TS-723B/U meter pointer. The tuning becomes more critical as the meter reading decreases.</p> <p>e. Adjust the BALANCE control for the minimum TS-723B/U meter reading. The tuning becomes more critical as the meter reading decreases.</p> <p>f. Readjust the FREQUENCY and BALANCE controls until no further reduction in the TS-723B/U meter reading can be obtained. As adjustment progresses, decrease the setting of the meter range switch to maintain a midscale meter indication.</p> <p>g. Note the distortion indication on the TS-723B/U meter.</p> | <p>a. None.</p> <p>b. None.</p> <p>c. None.</p> <p>d. None.</p> <p>e. None.</p> <p>f. None.</p> <p>g. TS-723B/U distortion indication of 6% or less.</p> |
| 3        | Same as step No. 1. | Same as step No. 1.   | <p>a. Adjust the RT-841/PRC-77 VOLUME control for a 2-volt indication on the ME-30A/U.</p> <p>b. Perform the procedures given in step No. 2 above.</p>  | <p>a. None.</p> <p>b. TS-723B/U distortion indication of 10% or less.</p>  |



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4-52  
Figure 4-19. Receiver distortion test setup.

**4-25. Transmitter Deviation Test***a. Test Equipment and Materials*

- (1) Generator, Signal AN/URM-127.
- (2) Voltmeter, Meter ME-30A/U.
- (3) Wattmeter AN/URM-120 (part of Coupler-Detector CU-754/URM-120).
- (4) Dummy Load, Electrical DA-75/U.
- (5) Meter, Modulation ME-57/U.
- (6) RF Attenuator (fig. 4-8).
- (7) Test Box (fig. 4-9).
- (8) Adapter UG-201/U (three required).
- (9) Adapter T UG-274B/U
- (10) Test Cable No. 1
- (11) Test Cable No. 3 (four required).

*b. Test Equipment and conditions. Connect the test equipment as shown in figure 4-20. Turn on the equipment and allow it to warm up for 5 minutes.*

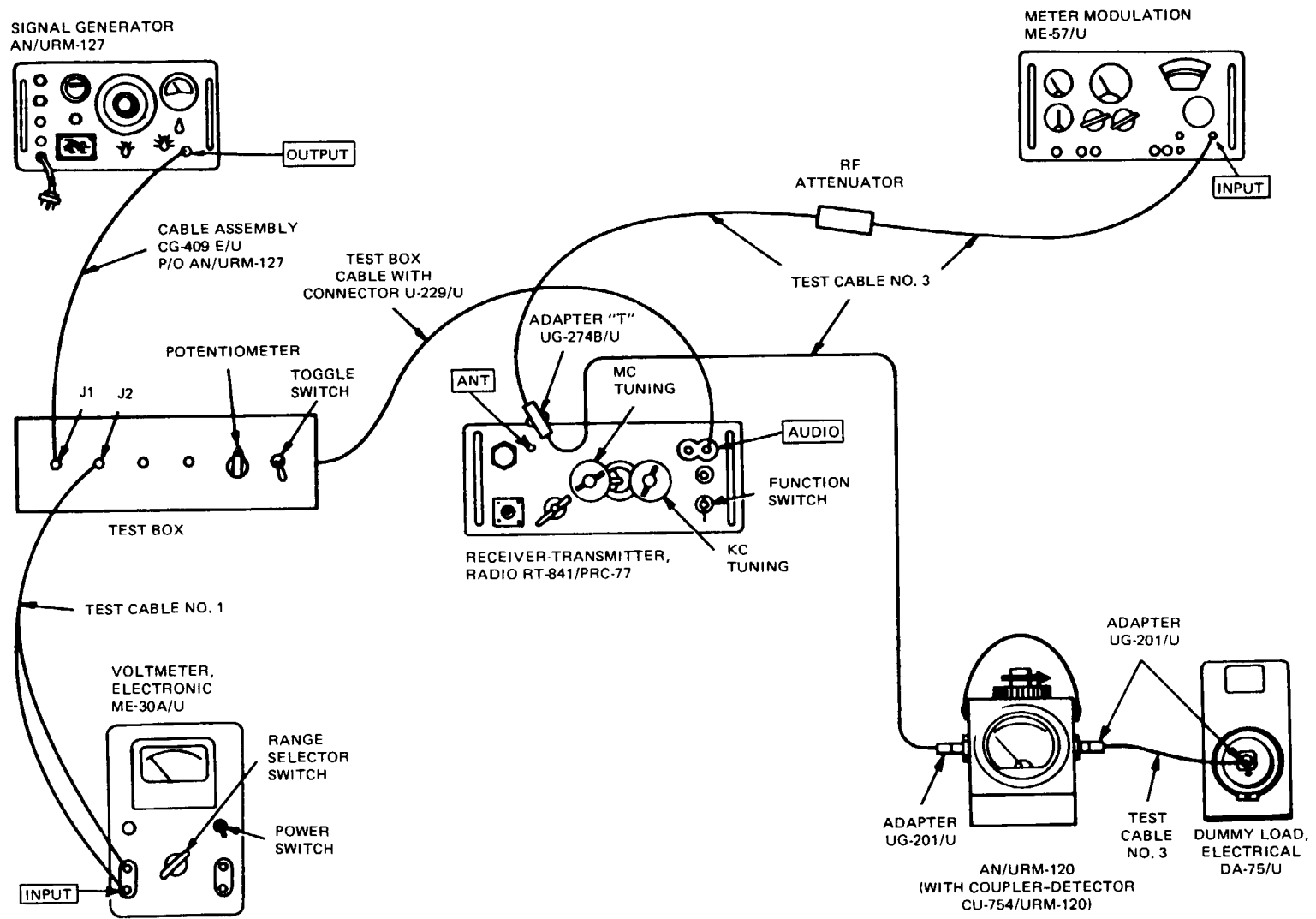
## c. Procedure.

| Step No. | Test equipment   | Control settings | Equipment under test  | Test procedure  | Performance standard   |
|----------|--|------------------|---|---|--|
| 1        | <b>ME-30A/U</b><br>Power switch: ON.<br>Range selector switch:<br>.003 VOLTS, -50 DB.<br><b>AN/URM-127</b><br>FREQ. RANGE MULTI-<br>PLIER switch X10.<br>Frequency range dial: 100.<br>ATTENUATOR switch: X1.<br>OUTPUT control: fully<br>counterclockwise.<br><b>AN/URM-120</b><br>Power range knob: 10 watts.<br>Power direction arrow:<br>toward DA-75/U.<br><b>ME-57/U</b><br>TUNE-FINE TUNE<br>switch: TUNE.<br>DEVIATION RANGE KC<br>switch: 1000 TUNE.<br>FREQUENCY RANGE-MC<br>switch: 20-55.<br>FREQUENCY RANGE-MC<br>TUNING control: 30. |                  | BAND switch: 30-52.<br>REC-TRANS FREQUENCY (mc)<br>control: 30.<br>REC-TRANS FREQUENCY (kc)<br>control: 00.<br>VOLUME control: 0.<br>Function switch: ON. | a. Adjust the AN/URM-127<br>OUTPUT control fully<br>clockwise and adjust the test<br>box potentiometer until the<br>ME-30A/U indicates 1.4<br>millivolts.<br>b. Disconnect the AN/URM-127.  | a. None.<br>b. None.   |
| 2        | Same as step No. 1 above.  |                  | Same as step No. 1 above.   | a. Close the toggle switch.<br>b. Rotate the ME-57/U TUNING<br>control until the CARRIER<br>SHIFT meter reads zero.<br>c. Turn the ME-57/U TUNE-<br>FINE TUNE switch to the<br>FINE TUNE position.<br>d. Rotate the ME-57/U TUNING<br>control until the CARRIER<br>SHIFT meter again reads<br>zero.<br>e. Adjust the ME-57/U GAIN<br>control until the ME-57/U<br>LIMITING meter reads in<br>the black area.<br>f. Reconnect the AN/URM-127<br>as shown in figure 4-22. | a. None.<br>b. None.<br>c. None.<br>d. None.<br>e. None.<br>f. None. |

| Step No. | Test equipment   | Control settings  | Equipment under test | Test procedure   | Performance standard   |
|----------|--|---|----------------------|--|--|
| 3        | Same as step No. 1, except:<br><i>ME-57/U</i><br>FREQUENCY RANGE-MC TUNING control: 52.    | Same as step No. 1, except:<br>REC-TRANS FREQUENCY (mc) except: 52                          |                      | g. Rotate the ME-57/U DEVIATION RANGE KC control to obtain the highest upscale reading without pegging the meter. Record this indication.<br><i>Note.</i> If the 1,000 TUNE position is used, multiply the 0-100 scale reading on the DEVIATION meter by 10.<br>h. Open the toggle switch.<br>Repeat steps No. 1 and 2 above.<br>Record reading. | g. Deviation should be $10 \pm 2$ kc.<br><br>h. None.<br>Same as step No. 2g above.                          |
| 4        | Same as step No. 1, except:<br><i>ME-57/U</i><br>FREQUENCY RANGE-MC TUNING control: 54.    | Same as step No. 1, except:<br>BAND switch: 53-75.<br>REC-TRANS FREQUENCY (mc) control: 54. |                      | Repeat steps No. 1 and 2 above.<br>Record reading.   | Same as step No. 2g above.   |
| 5        | Same as step No. 1, except:<br><i>ME-57/U</i><br>FREQUENCY RANGE-MC TUNING control: 75.    | Same as step No. 4 above, except:<br>REC-TRANS FREQUENCY (mc) control: 75.                  |                      | Repeat steps No. 1 and 2 above.<br>Record reading.   | Same as step No. 2g above.   |
| 6        | Same as step No. 1, except:<br><i>ME-30A/U</i><br>Range selector switch: .01 VOLTS, -40DB. | Same as in step No. 1 above.  |                      | a. Connect the ME-30A/U as shown in figure 4-22. Adjust the test box potentiometer until the ME-30A/U indicates 7.1 millivolts.<br>b. Disconnect the AN/URM-127-----<br>c. Repeat step No. 2 above-----  | a. None.<br><br>b. None.<br>c. Indication should not be more than 1.414 times that indicated in step No. 2g. |

| Step No. | Control settings  | Equipment under test  | Test procedure               | Performance standard   |
|----------|---|---|------------------------------|--|
| 7        | Same as step No. 1, except:<br><i>ME-57/U</i><br>Range selector switch:<br>.01 VOLTS, -40DB.<br><i>ME-57/U</i><br>FREQUENCY RANGE-<br>MC TUNING control:<br>52.     | Same as step No. 1, except:<br>REC-TRANS FREQUENCY (mc):<br>52. | Repeat step No. 6 above----- | Indication should not be more than 1.414 times that indicated in step No. 3. |
| 8        | Same as step No. 1, except:<br><i>ME-30A/U</i><br>Range selector switch:<br>.01 VOLTS, -40DB.<br><i>ME-57/U</i><br>FREQUENCY RANGE-<br>MC TUNING control:<br>54.    | Same as step No. 4.   | Repeat step No. 6 above----- | Indication should not be more than 1.414 times that indicated in step No. 4. |
| 9        | Same as step No. 1,<br>except:<br><i>ME-30A/U</i><br>Range selector switch:<br>.01 VOLTS, -40DB.<br><i>ME-57/U</i><br>FREQUENCY RANGE-<br>MC TUNING control:<br>75. | Same as step No. 5.   | Repeat step No. 6 above----- | Indication should not be more than 1.414 times that indicated in step No. 5. |

Figure 4-20. Transmitter deviation test setup



TM5820-667-35-54

Figure 4-20. Transmitter deviation test setup

**4-26. Summary of Test Data**

Personnel may find it convenient to arrange the checklist similar to that shown below.

| Test   | Test data | Performance standard   |
|--|-----------|--|
| <b>1. TRANSMITTER POWER OUTPUT</b>                             |           |  |
| a. 30.00 MHz   |           | 1.75 watts minimum   |
| b. 42.00 MHz   |           | 1.75 watts minimum   |
| c. 52.95 MHz   |           | 1.5 watts minimum  |
| d. 53.00 MHz   |           | 1.5 watts minimum  |
| e. 65.00 MHz   |           | 1.5 watts minimum  |
| f. 75.95 MHz   |           | 1.0 watts minimum  |
| <b>2. TONE OSCILLATOR FREQUENCY AND TRANSMITTER MODULATION</b> |           |  |
| a. Frequency deviation at 41.00 MHz                            |           | 3.0 kHz $\pm$ 0.5  |
| b. Modulating frequency at 41.00 MHz                           |           | 150 Hz $\pm$ 1.5   |
| <b>3. SYSTEM DISTORTION</b>                                    |           | 10% max  |
| Distortion at 41.00 MHz  |           |  |
| <b>4. FREQUENCY ACCURACY</b>                                   |           |  |
| a. 75.00 MHz   |           | 75.00 MHz $\pm$ 3.5 kHz  |
| b. 75.05 MHz   |           | 75.05 MHz $\pm$ 3.5 kHz  |
| c. 75.10–75.90 MHz (in 100-kHz increments)                     |           | 75.10-75.90 MHz $\pm$ 3.5 kHz  |
| d. 75.95 MHz   |           | 75.95 MHz $\pm$ 3.5 kHz  |
| e. 52.00 MHz   |           | 52.00 MHz $\pm$ 3.5 kHz  |
| <b>5. MAXIMUM SIGNAL PLUS NOISE-TO-NOISE RATIO</b>             |           |  |
| At 41.00 MHz   |           | Not less than 40 db greater than indication in test procedure step No. 1d (para 4-19).   |
| <b>6. RECEIVER AUDIO OUTPUT POWER</b>                          |           |  |
| At 41.00 MHz   |           | Not less than 2 volts on ME-30A/U.   |
| <b>7. RECEIVER SENSITIVITY</b>                                 |           |  |
| a. 30.00 MHz   |           | 10 db less in DISTORTION position than SET LEVEL position on TS-723B/U.  |
| b. 41.00 MHz   |           | Same as above.   |
| c. 52.00 MHz   |           | Same as above.   |
| d. 53.00 MHz   |           | Same as above.   |
| e. 65.00 MHz   |           | Same as above.   |
| f. 75.95 MHz   |           | Same as above.   |
| <b>8. RECEIVER CATCHING RANGE</b>                              |           |  |
| a. 31.50 MHz   |           | 350 kHz minimum deviation above and below 31.50 MHz.   |
| b. 51.50 MHz   |           | 350 kHz minimum deviation above and below 51.50 MHz.   |
| <b>9. SQUELCH SENSITIVITY</b>                                  |           |  |
| a. Function switch in SQUELCH (30.00 MHz).                     |           | Squelch relay energizes with 0.5 uv, 150 Hz tone modulation; relay remains activated with 0.35 uv signal, and deactivates without the proper signal. |
| b. Function switch in SQUELCH (41.00 MHz).                     |           | Same as above.   |



| Test   | test data | Performance standard    |
|--|-----------|-------------------------|
| c. Function switch in SQUELCH (52.00 mc).                  |           | Same as above.          |
| d. Function switch in SQUELCH (53.00 mc).                  |           | Same as above.          |
| e. Function switch in SQUELCH (65.00 mc).                  |           | Same as above.          |
| f. Function switch in SQUELCH (75.00 mc).                  |           | Same as above.          |
| 10. RECEIVER DISTORTION                                    |           |                         |
| a. At 41.00 mc   |           | 6% max                  |
| b. At 2-volt output  |           | 10% max                 |
| 11. TRANSMITTER DEVIATION.<br>(1.4 millivolts on ME-30A/U) |           |                         |
| a. 30.00 mc  |           | 10 kc $\pm$ 2           |
| b. 52.00 mc  |           | 10 kc $\pm$ 2           |
| c. 54.00 mc  |           | 10 kc $\pm$ 2           |
| d. 75.00 mc  |           | 10 kc $\pm$ 2           |
| 12. TRANSMITTER DEVIATION<br>(7.1 millivolts on ME-30A/U)  |           |                         |
| a. 30.00 mc  |           | Less than 1.414 of 11a. |
| b. 52.00 mc  |           | Less than 1.414 of 11b. |
| c. 54.00 mc  |           | Less than 1.414 of 11c. |
| d. 75.00 mc  |           | Less than 1.414 of 11d. |



## CHAPTER 5

### DEPOT MAINTENANCE

#### Section I. DEPOT MAINTENANCE CATEGORY REPAIRS

##### 5-1. Scope of Depot Maintenance

a. The functions allocated to the depot maintenance category are the replacement of parts in the selector mechanism assembly and in module A40. These functions supplement the procedures for the general support maintenance category (chap. 4). Information pertaining to the voltage and resistance measurements for the modules of the RT-841/PRC-77 are contained in paragraphs 5-5 through 5-8.

b. Paragraphs 5-2 and 5-3, respectively, contain the instructions for selector mechanism disassembly and reassembly, Paragraph 5-4 contains the instructions for disassembly and reassembly of module A40A.

##### 5-2. Selector Mechanism Disassembly Procedure (fig. 7-27)

To determine if there is a defective part, turn the selector mechanisms through their entire range. Verify that each number is legible and appears centered in the window. While turning, check for excessive looseness, tightness, end-to-end or side-to-side movement. Also, listen to the detents engage and disengage as the mechanism is rotated.

Although these actions will identify an obvious problem, a more thorough examination may be required. To the extent possible, check the internal parts of the selector mechanism for dirt, corrosion, cracks, excessive wear, rust, bent, stretched or missing parts. Disassemble the gear train only to the degree required to correct the defect.

a. Remove the selector mechanism from the receiver-transmitter (para 43a).

b. Remove the taper pin (48) from the arm assembly (49), and then remove the arm assembly. Remove the taper pin (13) from the stop (14), and then remove the stop.

Note. The setscrews (47 and 15) are not supplied with the selector mechanism, but are used to secure the arm assembly (49) and stop (14) to their respective shafts while drilling replacement parts (para 5-3).

c. Disconnect the spring (32) from the spring retainer (18) and move the arm assembly (33) away from the shaft assembly (30) to facilitate removal of the shaft assembly.

d. Remove the retaining ring (12) from the shaft assembly (30), and then remove the shaft assembly, with the thrust washer (31) and O-rings (29), from the housing assembly (59).

e. Remove the pin (5) that secures the arm (4) to the housing assembly (59), and then remove the arm (4) and spring (6). Remove the bushing (3) from the sleeve (2).

f. Remove the taper pin (7) that secures the sleeve (2) to the shaft assembly (16), and then remove sleeve.

Note. The setscrew (8) is not supplied with the selector mechanism, but is used to secure the sleeve (2) to the shaft assembly (16) during drilling of the replacement parts (para 5-3).

g. Remove the retaining ring (1) that secures the shaft assembly (16) to the housing assembly (59). Remove the shaft assembly (16) and thrust washer (17) from the housing assembly (59).

h. Remove the retaining ring (34) that secures the arm assembly (33) to the retaining arm (35). Remove the arm assembly (33) and spring (32).

i. Remove the ball plunger (38) from the housing assembly (59).

Note. To facilitate disassembly, remove the shaft assemblies (57 and 69) in one operation (j below).

j. Remove the retaining rings (45 and 46) that secure the shaft assemblies (57 and 69) to the housing assembly (59).

k. Remove the shaft assemblies (57 and 69) with all attached parts from the housing assembly (59).

Note. Treat the shaft assembly (57), together with the gear segment (81) and gear (82), as one unit. Do not disassemble further.

l. Remove the sleeve (85) from the spring retainer (18) and disconnect the spring (83) from the spring retainer (18).

m. Remove the screw (50) and lockwasher (51) that secure the mask assemblies (53 and 54) to the shaft assembly (57),

n. Remove the O-rings (52), mask assemblies (53 and 54), thrust washer (58), O-rings (55), and spring (56) from the shaft assembly (57),

o. Remove the spring (83) and sleeve (84) from the mask assembly (53).

p. Remove the retaining ring (79) that secures the arm assembly (78) to the shaft assembly (57). Remove the arm assembly (78).

q. Remove the spring (56) from the arm assembly (78).

r. Remove the thrust washer (70) from the shaft assembly (69). Remove the taper pin (68) from the gear (67); then remove the O-rings (65) and gear (67) from the shaft assembly (69).

Note. The setscrew (66) is not supplied with the selector mechanism, but it is used to secure the gear (67) to the shaft assembly (69) during drilling of the replacement parts (para 5-3).

s. Remove the taper pin (42) and setscrew (43) that secure the coupler assembly (44), and then remove the coupler assembly (44).

t. Remove the retaining ring (41) that secures the antibacklash gear assembly (36) to the housing assembly (59), and then remove the antibacklash gear assembly (36) and thrust washer (37).

Note. Do not disassemble the antibacklash gear assembly (36) further.

u. Remove the retaining ring (71) that secures the gear arm (72) and spur gear (73) to the stud (74). Remove the gear arm (72), spur gear (73), and thrust washer (77).

v. Remove the taper pin (62) and setscrew (64) that secure the coupler assembly (63) to the shaft assembly (75); remove the coupler assembly (63).

w. Remove the retaining ring (61) from the shaft assembly (75). Remove the shaft assembly (75) and thrust washer (76) from the housing assembly (59).

x. Remove the screw (9), lockwasher (10), and plate (11) that secure the thrust washer (19), gear (20), worm (21), and thrust washer (22) to the housing assembly (59).

Note. Do not disassemble the screw (39), yoke (40), and worm (21).

y. Remove the screw (28), lockwasher (27), flatwasher (26), and housing (25) from the housing assembly (59). Remove the lamp (24) from the housing (25). If

the bushing (23) is damaged, press it from the housing assembly (59).

### 5-3. Selector Mechanism Reassembly Procedure

(fig. 7-27)

When reassembling the gear train, start at that point in the procedure in which the defective part is replaced.

Caution: Before inserting a taper pin through a gear and a shaft, be sure that the taper pinholes are aligned correctly. Failure to observe this procedure will cause serious damage to the parts.

Note. Make all pinning operations with the dials set at 30.00 mc. The setscrews (8, 15, 47, and 66) are not supplied with the selector mechanism, but are used to secure the replacement parts to the gear shafts while drilling. After the pinning operations are completed, remove the setscrews. The setscrews (43 and 64) are supplied with the selector mechanism and are to be replaced in the coupler assemblies (44 and 63).

a. When replacing the bushing (23), apply locktite (American Sealant, Grade C, or equal) to the outside shank of the bushing (23) and press it into the housing assembly (59).

b. If replacement is required, replace the yoke (40), worm (21), screw (39), and gear (20) at one time. Install the thrust washer (22) into the housing assembly (59). Insert the gear (20) and worm (21) into the housing assembly (59) with the yoke (40) positioned through the housing assembly (59). Place the thrust washer (19) over the gear (20), and secure in place with the plate (11), lockwasher (10), and screw (9).

Note. After the gear (20) and worm (21) are secured in the housing assembly (59), the yoke (40) extension should be 0.462 inch  $\pm$  0.015. Measure this distance from the centerline of the outer drill hole in the yoke (40) to the casting of the housing assembly (59).

c. Place the thrust washer (70) on the shaft assembly (69), insert the shaft assembly (69) through the housing assembly (59), and secure in place with the retaining ring (46). Install the arm assembly (49) on the shaft assembly (69) and secure the taper pin (48).

d. Apply loctite (American Sealants, Grade C, or equivalent) to the threads of the ball plunger (38). Install the ball plunger (38) into the housing assembly (59); bottom the ball plunger (38) against the cam (80) on the shaft assembly (69) and then back off the ball plunger one-eighth to one-quarter turn.

Note. Before meshing the antbacklash gear assembly (36) with another gear, advance the antbacklash floating gear two teeth and then mesh.

e. Place the thrust washer (76) on the shaft assembly (75). Insert the shaft assembly (75) through the housing assembly (59), and secure with the retaining ring (61). Position the coupler assembly (63) on the shaft assembly (75). Align the holes; insert and secure the taper pin (62) and setscrew (64).

f. Place the thrust washer (77) and spur gear (73) on the stud (74) with the gear hub facing away from the housing assembly (59). Mount the gear arm (72) on the stud (74) while obtaining gear mesh between the gear arm (72) and shaft assembly (75). Install the retaining ring (71) on the stud (74) and secure. Check all parts for freedom of operation.

g. Install the thrust washer (37) on the shaft of the antbacklash gear assembly (36), and insert the antbacklash gear assembly (36) into the housing assembly (59). Install and secure the retaining ring (41) on the shaft of the antbacklash gear assembly (36). Place the coupler assembly (44) on the shaft of the antbacklash gear assembly (36), align the holes, and secure the taper pin (42) and setscrew (43).

h. Connect the spring (56) to the arm assembly (78).

i. Install the arm assembly (78) to the shaft assembly (57) and secure with the retaining ring (79). Install the O-rings (55) on the shaft assembly (57).

j. Place the sleeve (84) and spring (83) on the mask assembly (53). Place the sleeve (85) on the spring retainer (18).

k. Place the mask assemblies (53 and 54) on the shaft assembly (57); secure in place with the screw (50) and lockwasher (51).

l. Install the O-rings (52) on the mask assembly (53) and position the spring (56) in place on the shaft assembly (57). Slide the thrust washer (58) on the retainer ringside of the shaft assembly (57); then position the shaft assembly (57) into the housing assembly (59) and secure in place with the retaining ring (45).

m. Install the gear (67) on the shaft assembly (69) with the hub of the gear (67) facing inboard. Insert the taper pin (68) and secure the gear (67) on the shaft assembly (69). Install the two O-rings (65) on the shaft assembly (69).

n. Place the thrust washer (17) on the shaft assembly (16). Insert the shaft assembly (16) through the housing assembly (59) and mesh the gear on the shaft assembly (16) with the gear segment (81) on the shaft assembly (57). Secure the shaft assembly (16) in place with the retaining ring (1).

Note. During the drilling operation (if required) maintain 0.015 inch end play in the shaft assembly (16) and 0.005 inch end play in the shaft assembly (30).

o. Position the arm assembly (33) on the retaining arm (35) and secure in place with the retaining ring (34).

p. Install the two O-rings (29) on the shaft assembly (30). Place the thrust washer (31) over the retaining ringside of the shaft assembly (30).

q. Insert the shaft assembly (30) through the housing assembly (59) and secure in place with the retaining ring (12).

r. Place the stop (14) on the shaft assembly (30), align the taper pinholes, and insert and secure the taper pin (13).

s. *Install* one end of the spring (32) on the arm assembly (33) and the other on the spring retainer (18).

t. Place the sleeve (2) on the shaft assembly (16) and align the taper pinholes. Insert and secure the taper pin (7). Place the bushing (3) on the sleeve (2).

u. Secure the spring (6) to the housing assembly (59) and arm (4). Position the forked end of the arm (4) in the bushing (3) and secure the arm (4) to the housing assembly (59) with the pin (5). Crimp over both ends of the pin (5).

Note. Upon completion of the above assembly procedures, check all parts for freedom of movement.

v. Place the lamp (24) in the housing (25), position the housing (25) in the bushing (23), and secure in place with the flat washer (26), lockwasher (27), and screw (28).

w. When replacing the spacer (60) into the housing assembly (59), apply Loctite (American Sealant, Grade C, or equivalent) to the threads.

#### 5-4. Disassembly and Reassembly of Interval Oscillator Module A40A

(fig. 5-1)

##### a. Disassembly.

- (1) Remove the two panhead screws (10) and lockwashers (9) that secure the cover (8) to the header-shield assembly (7). Remove the cover.
- (2) Remove the retaining ring (16) that secures the coupling assembly (1) in the header-shield assembly (7); remove the coupling assembly (1).
- (3) Remove the four screws (2 and 4) that support the bearing assemblies (3 and 14) to the header-shield assembly (7), and remove the two

support bearing assemblies.

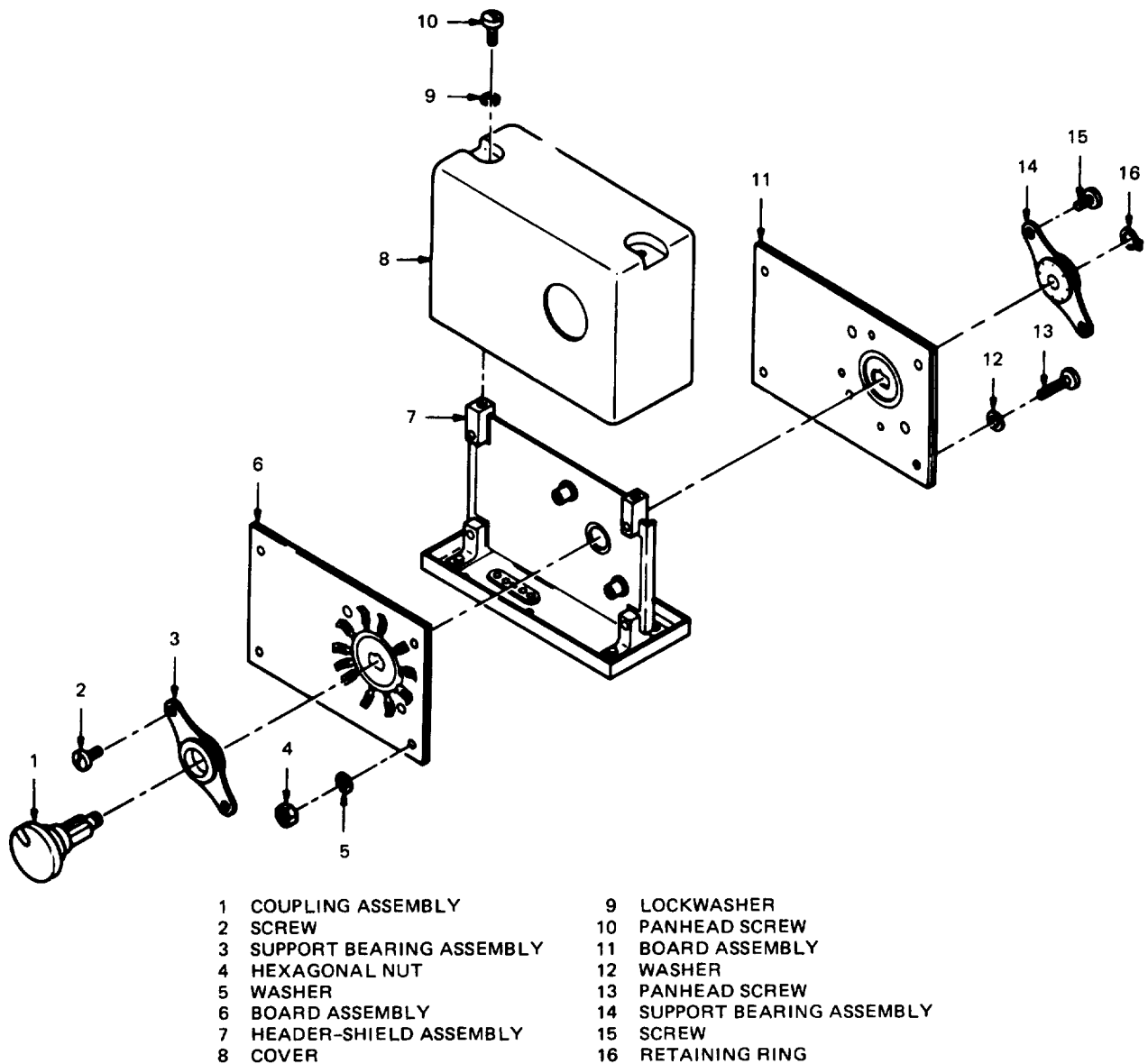
- (4) Remove the four panhead screws (13), four hexagonal nuts (4) and eight washers (12) that secure the board assemblies (6 and 11) to the header-shield assembly (7); remove the two board assemblies.

*b. Reassembly.*

- (1) Install the board assemblies (6 and 11) on the header-shield assembly (7) and secure them with the four panhead screws (13), eight lockwashers (5 and 12), and four hexagonal nuts (4).
- (2) Apply locktite staking compound to the screws (2 and 15) for the support bearing as-

semblies (3 and 14). Install the two support bearing assemblies (3 and 14) on the header-shield assembly (7) and secure with the four panhead screws (2 and 15).

- (3) Lubricate the bearing surfaces of the support bearing assemblies (3 and 14) with disulphide molybdenum grease. Position the coupler assembly (1) through the support bearing assemblies (3 and 14). Secure it with the retainer ring (16).
- (4) Install the cover (8) on the header-shield assembly (7) and secure it with the two panhead screws (10) and lockwashers (9).



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*Figure 5-1. Module A40, exploded view.*

## Section II. MODULE VOLTAGE AND RESISTANCE MEASUREMENTS

Caution: The RT-841/PRC-77 equipment is transistorized. Before connecting test equipment within the modules, insulate test prods and clips with insulating tape or sleeving. Leave an absolute minimum of exposed metal, and be extremely careful to avoid short circuits; they may cause extensive damage. Do not make resistance measurements unless specifically directed to do so.

**5-5. General**

This section contains the information required to make module voltage and resistance measurements. It provides signal voltage charts and dc voltage charts that list the voltages for module connector pins and transistors. Voltages and signal identification names are supplied for all module test points. Such voltage measurements may be made by the use of extender cables (c below) or test cables (para 4-12d) to permit the plug-in modules to be accessible while energized. When using these charts, refer to the associated schematic and interconnecting diagrams so that the continuity of the expected signal (or level) may be made throughout the unit.

*a. Signal Measurements.* RF test signals are unmodulated unless otherwise specified. When the frequency of a signal generator is specified without an accompanying tolerance (for example: frequency with a specified tolerance is 29,950 kHz  $\pm 5$ ), set in frequency, by using the AN/USM-207, to the exact number of significant figures designated. The associated test point signals and levels are listed on signal voltage charts to assist in signal tracing.

*b. Voltage Measurements.* The voltage measurements to be taken at the connector pins and transistors of the modules are listed on the dc voltage charts. Such voltage measurements may be taken to isolate the faulty part. Throughout these charts, in a designation such as J1-A, J1 indicates the module connector and the letter following the hyphen indicates the specific connector pin terminal.

*Caution:* Do not make resistance checks unless positive determination is made that transistors or diodes are not included in the resistance path.

*c. Module Extenders.* Many of the modules are inaccessible unless an extender board is used to connect the chassis connector with the module connector. The instructions for fabrication of such module extenders are contained in figure 3-9.

**5-6. Test Equipment and Additional Equipment Required**

*a. Test Equipment.*

| Nomenclature  | Technical manual              |
|---|-------------------------------|
| Analyzer, Spectrum TS-723B/U.   | TM 11-5097                    |
| Digital Readout, Counter Electronic AN/USM-207.                         | TM 11-6625-700-10             |
| Generator, Signal AN/URM-103  | TM 11-5551D<br>TM 11-6625-586 |
| Generator, Signal AN/URM-127  | TM 11-6625-683-15             |
| Multimeter ME-26B/U   | TM 11-6625-200-15             |
| Multimeter TS-352B/U  | TM 11-6625-366-15             |
| Oscilloscope AN/USM-140A  | TM 11-6625-535-15, -15-1      |
| Wattmeter AN/URM-120 (part of Coupler-Detector CU-754/URM-120)          | TM 11-6625-446-15             |
| Dummy Load, Electrical DA-75/U (part of AN/URM-120)                     |                               |
| Voltmeter, Meter ME-30A/U   | TM 11-6625-320-12             |
| Voltmeter, Electronic AN/URM-145.                                       | TM 11-6625-524-14             |
| Direct Capacity Meter; Ballantine Labs, Inc. Model 520.                 |                               |
| Power Supply; Hewlett-Packard, Model HP-721A.                           |                               |
| Power Supply; Trygon Electronics, Inc., Model T20-2.                    |                               |
| Voltmeter, Heterodyne; B&K Instruments, Inc. Model 2005,                |                               |
| Carrier Deviation Meter; Marconi Instruments, Model TF-791D or ME-57/U. |                               |

*b. Additional Equipment Required.*

- (1) Test cable No. 3 (fig. 7-5).
- (2) Battery cable; a three-conductor cable of suitable length, with a battery plug on one end and a battery receptacle on the other.
- (3) Alignment cover (fig. 3-10).
- (4) Module extender (fig. 3-9).
- (5) Adapter UG-274B/U.
- (6) Resistor, 50 ohms  $\pm 5\%$ , 4 watts.



- (7) Resistor, 470 ohms, 1 watt.
- (8) Resistor, 510 ohms  $\pm 5\%$ , 2 watts.
- (9) Receiver-Transmitter, Radio RT-841/PRC-77 (two required).
- (10) Handset H-189/GR.
- (11) Dummy antenna (fig. 3-16).

**5-7. Test Setup**

Use a RT-841/PRC-77 (that is known to be good) as a test set. This test set is referred to as RT-841/PRC-77 No. 1. When working on a module, remove the cover and plug the module into the test set. When alignment is required, replace those covers that have alignment holes. Use the module extender only when directed for A18A or A31.

a. Remove Battery Box CY-2562/PRC-25 from the RT-841/PRC-77 case.

b. Remove the RT-841/PRC-77 No. 1 from its case.

c. Connect the power supply (Trygon Electronics, Inc., Model T20-2) with positive output connection to J4-B and ground connection to J4-A. Set the power supply for 12.5 volts. If a battery is to be used, connect the battery cable between Battery, Dry BA-386/PRC-25 (that is known to be good) and the battery plug.

d. Turn on the test equipment and allow a 5-minute warmup period.

*Caution:* Do not place the RT-841/PRC-77 No. 1 in a transmit condition without having a wattmeter connected or an antenna installed.

**5-8. Module Voltage and Resistance Measurements**

*a. Module A11A.*

- (1) Remove module A43.
- (2) Apply a 5.6-MHz, 0.2-volt rms signal from the AN/URM-25D between A18AJ2 and chassis ground.
- (3) Measure the voltages at the points outlined in the charts in (a) and (b) below. Compare these voltage measurements with the listed normal signal and dc voltages. Refer to figure 2-15 for the schematic diagram of A11A.

*Note.* Measure all voltages to ground. A tolerance of  $\pm 20$  percent is within limits, except where otherwise stated or where minimum voltages are indicated.

*(a) Signal voltage chart.*

| <i>Point of measurement</i> | <i>Volts (rms)</i> |
|-----------------------------|--------------------|
| J2. ....                    | 0.039              |
| Q1 base. ....               | 1.4                |
| Q1 collector. ....          | 0.07               |
| Q1 emitter. ....            | 0.006              |

*(b) Dc voltage chart.*

| <i>Point of measurement</i> | <i>Volts (dc)</i> |
|-----------------------------|-------------------|
| J1-D. ....                  | 2.9               |
| Q1 base. ....               | 7.8               |
| Q1 collector. ....          | 2.1               |
| Q1 emitter. ....            | 1.5               |
| J2. ....                    | 9.6               |

*b. Module A12A.*

- (1) Remove module A43.
- (2) Apply a 5.6-MHz, 10-mv rms signal from AN/URM-25D) across a 50-ohm resistor between pin B of J19 and ground.
- (3) Measure the voltages at the points outlined in the charts in (a) and (b) below. Compare these voltage measurements with the listed normal signal and dc voltages. Refer to figure 2-13 for the schematic diagram of A12A.

*Note.* Connect a jumper between pins A and C of J19 (for ground) for the measurements listed below. A tolerance of  $\pm 20$  percent is within limits, except where otherwise stated or where minimum voltages are indicated.

*(a) Signal voltage chart.*

| <i>Point of measurement</i> | <i>Volts (rms)</i> |
|-----------------------------|--------------------|
| J2. ....                    | 0.150              |
| Q1 base. ....               | 0.0096             |
| Q1 emitter. ....            | Min 0.002          |

*(b) Dc voltage chart.*

| <i>Point of measurement</i> | <i>Volts (dc)</i> |
|-----------------------------|-------------------|
| J1-D. ....                  | 9.6               |
| Q1 base. ....               | 7.6               |
| Q1 collector. ....          | 1.6               |
| Q1 emitter. ....            | 2.3               |

*c. Module A16A.*

- (1) Connect the RT-841/PRC-77 No. 1 to a 12.5-volt, dc power source.
- (2) Measure the voltages at the points outlined in the chart below. Compare them with the normal dc voltages listed. Refer to figure 2-16 for the schematic diagram of A16.

*Note.* Measure all voltages to ground. A tolerance of  $\pm 0.5$  volt is within limits.

| <i>Point of measurement</i> | <i>Volts (dc)</i> |
|-----------------------------|-------------------|
| J2. ....                    | 12.5              |
| J3. ....                    | 9.6               |
| Q1 collector. ....          | 9.6               |
| Q2 emitter. ....            | 4.2               |
| Q2 base. ....               | 4.8               |
| Q2 collector. ....          | 11.6              |

*d. Module A17A.*

- (1) Remove modules A40A and A43.
- (2) Connect a jumper between J12-A and J12-B.
- (3) Apply a 5.6-MHz, 0.2-volt rms signal from the AN/URM-25D to A18AJ2.
- (4) Measure the voltages at the points listed in the charts in (a) and (b) below. Compare them with the normal signal and dc voltages listed. Refer to figure 2-14 for the schematic diagram of A17A.

*Note.* Measure all voltages to ground. A tolerance of  $\pm 20$  percent is within limits, except where otherwise stated or where minimum voltages are indicated.

*(a) Signal voltage chart.*

| <i>Point of measurement</i> | <i>Volts (rms)</i> |
|-----------------------------|--------------------|
| Q1 base. ....               | Min. 0.070         |
| Q1 emitter. ....            | Min. 0.050         |
| Q1 collector. ....          | Min. 1.5           |

(b) Dc voltage chart.

| Point of measurement   | Volts (dc) |
|------------------------|------------|
| J1-A . . . . .         | 9.6        |
| Q1 base . . . . .      | 2.1        |
| Q1 emitter . . . . .   | 1.5        |
| Q1 collector . . . . . | 9.5        |
| J1-E . . . . .         | 3.9        |
| J2 . . . . .           | 3.8        |

e. Module A18A.

- (1) Remove module A43.
- (2) Set the AN/URM-25D output frequency to 5.600 mc, as indicated by the AN/USM-207, and adjust the voltage level between pin F of A12AJ2 and chassis ground to 2 millivolts as indicated by the AN/URM-145.
- (3) Measure the voltages at the points listed in the charts given in (a) and (b) below. Compare these with the normal signal and dc voltages listed. Refer to figure 7-14 for the schematic diagram of A18A.

Note. Measure all voltages to ground. A tolerance of  $\pm 20$  percent is within limits, except where otherwise stated or where minimum voltages are indicated.

(a) signal voltage chart.

| Point of measurement   | Volts (rms) |
|------------------------|-------------|
| Q1 Base . . . . .      | Min. 0.0015 |
| Q1 Collector . . . . . | Min. 0.030  |
| Q1 Emitter . . . . .   | Min. 0.0015 |

Point of measurement

| Point of measurement   | Min. | Volts (rms) |
|------------------------|------|-------------|
| Q2 Base . . . . .      | Min. | 0.0015      |
| Q2 Collector . . . . . | Min. | 0.200       |
| Q2 Emitter . . . . .   |      | Min. 0.0015 |
| J2 . . . . .           | Min. | 03.030      |

(b) Dc voltage chart.

| Point of measurement   | Volts (dc) |
|------------------------|------------|
| Q1 Base . . . . .      | 3.7        |
| Q1 Collector . . . . . | 9.6        |
| Q1 Emitter . . . . .   | 3.0        |
| Q2 Base . . . . .      | 3.7        |
| Q2 Collector . . . . . | 8.2        |
| Q2 Emitter . . . . .   | 3.0        |
| J1-C . . . . .         | 9.6        |

f. Module A21A.

- (1) Remove module A35A.
- (2) With the AN/URM-103 set to 11.50 mc, adjust the output level at J9, pins C and D, as indicated in the notes of the chart given in (a) below.
- (3) Measure the voltages at the points listed in the charts in (a) and (b) below. Compare them with the normal signal and dc voltage listed. Refer to figure 7-20 for the schematic diagram of A21A.

Note. Measure all voltages to ground. A tolerance of  $\pm 20$  percent is within limits, except where otherwise stated or where minimum voltages are indicated.

(a) Signal voltage chart.

| Point of measurement      | Volts (RMS) |
|---------------------------|-------------|
| Q1 Collector              | 0.230       |
| Q1 Base <sup>a</sup>      | 0.026       |
| Q2 Collector <sup>a</sup> | 0.400       |
| Q2 Base <sup>a</sup>      | 0.230       |
| Q2 Emitter <sup>a</sup>   | 0.022       |
| Q3 Collector              | Min. 0.014  |
| Q4 Collector b            | Min. 0.040  |
| Q5 Collector c            | Min. 0.140  |
| Q6 Collector c            | Min. 0.600  |

a Make this measurement with the AN/URM-103 output adjusted to 30 millivolts.

b Make this measurement with the AN/URM-103 output adjusted to 30 microvolts.

c Make this measurement with the AN/URM-103 output adjusted to 5 microvolts.

(b) Dc voltage chart.

| Point of measurement | Volts(DC) |
|----------------------|-----------|
| Q1 Collector         | 4.7       |
| Q1 Base              | 2.8       |
| Q1 Emitter           | 2.1       |
| Q2 Collector         | 6.1       |
| Q2 Base              | 2.3       |
| Q2 Emitter           | 1.6       |
| Q3 Collector         | 6.5       |
| Q3 Base              | 3.0       |
| Q3 Emitter           | 2.2       |
| Q4 Collector         | 6.2       |
| Q4 Base              | 4.0       |
| Q4 Emitter           | 3.2       |
| Q5 Collector         | 6.0       |
| Q5 Base              | 4.3       |
| Q5 Emitter           | 3.8       |
| Q6 Collector         | 6.8       |
| Q6 Base              | 3.0       |
| Q6 Emitter           | 2.6       |

g. Module A22.

(1) With the RT-841/PRC-77 function switch set to OFF and the H-189/GR push-to-talk switch depressed, set the AN/URM-127 to 1 kc and adjust its output for a 1.4-millivolt rms indication on the ME-30A/U at A22J1-4.

(2) Turn the function switch to ON.

(3) With the push-to-talk switch pressed, measure the voltages at the points listed in charts ((a) and (b) below). Compare them with the normal signal and dc voltages listed. Refer to figure 2-4 for the schematic diagram of A22.

Note. Measure all voltages to ground. A tolerance of  $\pm 20$  percent is within limits.

(a) Signal voltage chart.

| Point of measurement | Millivolts (rms) |
|----------------------|------------------|
| Q1 base              | 1.4              |
| Q1 emitter           | 1.0              |
| Q1 collector         | 22               |
| Q2 base              | 22               |
| Q2 emitter           | 16.5             |
| Q2 collector         | 215              |
| Q3 base              | 215              |
| Q3 emitter           | 170              |
| Q3 collector         | 1.9 volts        |
| J3                   | 1.85 volts       |

(b) Dc voltage chart.

| Point of measurement | Volts(dc) |
|----------------------|-----------|
| Q1 base              | 5.6       |
| Q1 emitter           | 5.7       |
| Q1 collector         | 3.4       |
| Q2 base              | 5.6       |
| Q2 emitter           | 5.7       |
| Q2 collector         | 2.9       |
| Q3 base              | 5.6       |
| Q3 emitter           | 5.75      |
| Q3 collector         | 2.7       |
| J2-2                 | 9.5       |

h. Module A23.

(1) Place the radio set in the transmit mode.

(2) Measure the voltages at the points listed in the charts ((a) and (b) below). Compare them with the normal signal and dc voltages listed. Refer to figure 7-23 for the schematic diagram of A23.

Note. Measure all voltages to ground. A tolerance of  $\pm 20$  percent is within limits, except where noted otherwise.

(a) Signal voltage chart.

| Point of measurement | Millivolts(rms)             |
|----------------------|-----------------------------|
| Q1 base              | .505                        |
| Q1 emitter           | 515                         |
| Q1 collector         | .150                        |
| Q2 base              | .148                        |
| Q2 emitter           | .140                        |
| Q3 base              | .120                        |
| Q3 collector         | 1.65 volts                  |
| Q3 emitter           | 0.0                         |
| J3                   | 1.1 volts<br>( $\pm 10\%$ ) |

(b) Dc voltage chart.

| Point of measurement | Volts (dc) |
|----------------------|------------|
| Q1 base              | 7.9        |
| Q1 emitter           | 8.0        |
| Q1 collector         | 2.0        |
| Q2 base              | 2.0        |
| Q2 emitter           | 2.2        |
| Q2 collector         | 0.0        |
| Q3 base              | 5.3        |
| Q3 emitter           | 5.4        |
| Q3 collector         | 3.0        |
| J3                   | 2.7        |
| J2-2                 | 9.5        |

i. Module A31.

(1) Remove the module and place it in the module extender (fig. 3-9). Connect the module extender into the jack from which the module was removed.

(2) Connect the AN/URM-120 (with CU-754/URM-120 and connected to DA-75/U) to connect the J2. Connect the H-189/GR handset to an AUDIO connector.

(3) Set the BAND switch at 30-52 and set the tuning controls for 30.00 mc.

(4) Press the H-189/GR push-to-talk switch and measure the voltage at the points listed in the chart in (a) and (b) below. Compare there with

the normal signal and dc voltages listed. Refer to figure 7-12 for the schematic diagram of A31.

Note. Measure all voltages to ground. A tolerance of ±20 percent is within limits.

(a) Signal voltage chart.

| Point Of measurement        | Millivolts (rms) |
|-----------------------------|------------------|
| Q2 base.                    | 19               |
| Q2 collectors.              | 830              |
| Q2 emitter.                 | 17               |
| Q3 base.                    | 57               |
| Q3 collector.               | 5.0 volts        |
| Q3 emitter.                 | 28               |
| Q4 base.                    | 2.15 volts       |
| Q4 collector.               | 82               |
| Q4 emitter.                 | 1.7 volts        |
| Q5 base.                    | 850              |
| Q5 collector.               | 4.7 volts        |
| Q5 emitter.                 | 180              |
| Q6 base <sup>a</sup> .      | 2.5 volts        |
| Q6 emitter <sup>a</sup> .   | 2.28 volts       |
| Q7 base <sup>a</sup> .      | 2.28 volts       |
| Q7 collector <sup>a</sup> . | 3.4 volts        |
| Point of measurement        | Millivolts(rms)  |
| Q7 emitter.                 | 2.1 volts        |
| J2.                         | 2.1 volts        |
| J3.                         | 4.7 volts        |
| J4.                         | 140              |
| J4 <sup>a</sup> .           | 2.5 volts        |
| J5.                         | 5.6 volts        |

<sup>a</sup>With module A39 removed, the sweep oscillator output is checked.

(b) Dc voltage chart

| Point of measurement | Volts (dc)    |
|----------------------|---------------|
| Q1 base.             | 10.0          |
| Q1 collector.        | 10.10 to 15.0 |
| Q1 emitter.          | 9.4           |
| Q2 base.             | 4.3           |
| Q2 collector.        | 9.4           |
| Q2 emitter.          | 3.5           |

| Point of measurement      | Volts (dc) |
|---------------------------|------------|
| Q3 base.                  | 3.5        |
| Q3 collector.             | 8.8        |
| Q3 emitter.               | 2.7        |
| Q4 base.                  | 3.5        |
| Q4 collector.             | 9.4        |
| Q4 emitter.               | 4.0        |
| Q5 base.                  | 3.7        |
| Q5 collector.             | 9.3        |
| Q5 emitter.               | 3.4        |
| Q6 base <sup>b</sup> .    | 3.00       |
| Q6 collector.             | 9.3        |
| Q6 emitter <sup>b</sup> . | 2.43       |
| Q7 base <sup>b</sup> .    | 2.43       |
| Q7 collector.             | 9.3        |
| Q7 emitter <sup>b</sup> . | 1.34       |
| J2.                       | 0.0        |
| J3.                       | 9.3        |
| J4 <sup>a</sup> .         | 4.0        |
| J4 <sup>b</sup> .         | 3.0        |
| J5.                       | 0          |

<sup>a</sup>With module A39 removed, the sweep oscillator output is checked.

<sup>b</sup> With module A38 properly aligned.

j. Module A32.

- (1) Adjust the AN/URM-103 for a 25-millivolt RF signal at the frequencies listed in the chart below.
- (2) Tune for maximum receiver quieting.
- (3) Measure the voltages at the switch terminals listed in the chart below. Compare them with the normal signal voltages listed. Refer to figure 2-2 for the schematic diagram of A32.

Note. Measure all voltages to ground. A tolerance of ±20 percent is within limits.

| Point of measurement | Frequency input (mc) | Millivolts (rms) |
|----------------------|----------------------|------------------|
| SID-2                | 30                   | 29               |
| SIA-2                | 30                   | 24               |

| Point of measurement | Frequency input (mc) | Millivolts (rms) |
|----------------------|----------------------|------------------|
| SIC-2                | 30                   | 105              |
| SID-2                | 53                   | 74               |
| SIA-2                | 53                   | 44               |
| SIC 2                | 53                   | 135              |

k. Modules A33 and A34.

- (1) Apply a 30.00-mc signal to the RT-841/PRC-77 ANT connector.
- (2) Adjust the applied input signal for a 10-millivolt indication at test point J2 of A33.
- (3) Measure the voltages at the points outlined in charts (a) and (b) below. Compare them with the normal signal and dc voltages listed. Refer to figure 2-17 for the schematic diagram A33. Refer to figure 7-19 for the schematic diagram of A34.

Note. Measure all voltages to ground. A tolerance of ±20 percent is within limits.

(a) Signal voltage chart.

| Point of measurement | Millivolts (rms) |     |
|----------------------|------------------|-----|
|                      | A33              | A34 |
| 1 collector. . . . . | 190              | 480 |
| Q1 base. . . . .     | 16               | 44  |
| Q1 emitter. . . . .  | 18               | 62  |
| J1-1 . . . . .       | 10               | 65  |
| J 1 - 4 . . . . .    | 64               | 270 |
| J2 . . . . .         | 10               | 69  |

(b) Dc voltage chart.

| Point of measurement    | volts (dc) |     |
|-------------------------|------------|-----|
|                         | A33        | A34 |
| C4-L1 junction. . . . . | 9.5        | 9.5 |
| Q1 collector. . . . .   | 9.5        | 9.5 |
| Q1 base. . . . .        | 1.7        | 1.4 |
| Q1 emitter. . . . .     | 1.1        | 0.7 |
| J 1 - 1. . . . .        | 0.0        | 0.0 |
| J1-4 . . . . .          | 0.0        | 0.0 |

l. Module A35.

- (1) Apply a 30.00-mc, 30-millivolt signal to the module under test.
- (2) Measure the voltages at the points outlined in charts in (a) and (b) below. Compare the outputs with the normal signal and dc voltages listed. Refer to figure 2-3 for the schematic diagram of A35.

Note. Measure all voltages to ground. A tolerance of ±20 percent is within limits, except where otherwise indicated or where minimum voltages are indicated.

(a) Signal voltage chart

| Point of measurement     | Volts (RMS) |
|--------------------------|-------------|
| Q1 Collector . . . . .   | Min. 0.400  |
| Q1 Base. . . . .         | 0.410       |
| J2 . . . . .             | 0.100       |
| R9-C6 Junction . . . . . | Min. 0.350  |
| Q2 Collector . . . . .   | 0.200       |
| Q2 Base. . . . .         | 0.185       |
| Q2 Emitter . . . . .     | 0.175       |

(b) Dc voltage chart.

| Point of measurement  | volts (DC) |
|-----------------------|------------|
| J1-G. . . . .         | 9.6        |
| Q1 Collector. . . . . | 5.0        |
| Q1 Base. . . . .      | 0.65       |
| Q1 Emitter . . . . .  | 0          |
| Q2 Collector. . . . . | 9.6        |
| Q2 Base. . . . .      | 1.6        |
| Q2 Emitter. . . . .   | 0.95       |

m. Module A36. Use a RT-841/PRC-77 (that is known to be good), an RF attenuator, and an adjustable power supply as the signal generator for this test. This signal generator equipment will be referred to as RT-841/PRC-77 No. 2. Connect this equipment as described in (1) below. Refer to (2) below for the actual A36 test procedure.

- (1) Signal generator. Provide a 1-volt signal to drive module A36 under test as follows:
  - (a) Connect a coaxial cable to ANT connector J2 of RT-841/PRC-77 No. 2.
  - (b) Connect a 50-ohm ±5 percent, 5-watt, resistor between the two leads at the other end of the coaxial cable ((a) above). Terminate the ground lead of the cable to the chassis of RT-841/PRC-77 No. 1.
  - (c) Connect a 510-ohm ±5 percent, 2-watt, resistor between the signal lead of the coaxial cable and J5-5 of RT-841/PRC-77 No. 1.
  - (d) Vary the power supply voltage supplied to RT-841/PRC-77 No. 2 from 10 to 15 volts dc, as required, to adjust for a 1-volt level at J5-5 of RT-841/PRC-77 No. 1.

Caution: Do not reduce the power supply voltage beyond the 10- to 15-volt dc range. If necessary, change the 510-ohm resistor to a suitable value to provide satisfactory adjustment.

(2) Test procedure.

- (a) Connect the AN/URM-120 to ANT connector J2 of RT-841/PRC-77 No. 1 (with the module under test), and connect the H-189/GR handset to an AUDIO connector.
- (b) Connect the Trygon Model T20-2 power supply output to connector J4 as described in paragraph 5-7c.
- (c) Set the BAND switch at 30-52 and set the timing controls for 30.00 mc.
- (d) Remove module A38, press the H-189/GR push-to-talk switch, and apply a 1-volt rms (approximately) 30.00-mc signal (from RT-841/PRC-77 No. 2) to J5-5. This should provide a 6.0-volt rms signal at A49-4. (Note that this level may appear at a lower input (0.3-volt) but increase beyond this point to place A36Q1 in conduction.)
- (e) Measure the voltages at the points listed in charts given in 1 and 2 below. Compare

them with the normal signal and dc voltages listed. Refer to figure 7-13 for the schematic diagram for A36.

Note. Measure all voltages to ground. A tolerance of  $\pm 20$  percent is within limits.

1. *Signal voltage chart.*

| Point of measurement      | Volts (rms) |
|---------------------------|-------------|
| Q1 base. . . . .          | 3.9         |
| Q1 collector. . . . .     | 16.5        |
| Q1 emitter. . . . .       | 1.6         |
| S 2 J 1 - 1 . . . . .     | 14          |
| R7-CR2 junction. . . . .  | 6.8         |
| SIJ1-1. . . . .           | 5.1         |
| C11-CR1 junction. . . . . | 4.7         |

2. *Dc voltage chart.*

| Point of measurement      | Volts (dc) |
|---------------------------|------------|
| Q1 base. . . . .          | 0.0        |
| Q1 collector. . . . .     | 12.2       |
| Q1 emitter. . . . .       | 0.89       |
| C11-CR1 junction. . . . . | +2.2       |
| R7-CR2 junction. . . . .  | -5.5       |

n. *Module A37.* Use RT-841/PRC-77 No. 2 (m above) as the signal generator for this test. Connect this equipment as described in m (1) above, and proceed as follows for the test:

- (1) Connect the AN/URM-120 to ANT connector J2 of the RT-841/PRC-77 No. 1 (with the module under test), and connect the H-189/GR handset to an AUDIO connector.
- (2) Connect the Trygon Model T20-2 power supply output to connector J4 as described in

paragraph 5-7c.

- (3) Set the BAND switch at 30-52 and set the tuning controls for 30.00 mc.
- (4) Remove module A38, press the H-189/GR push-to-talk switch, and apply a 1-volt rms, 30.00-mc signal (from RT-841/PRC-77 No. 2) to J5-5.
- (5) Measure the voltages at the points listed in the charts ((a) and (b)-below). Compare them with the normal signal and dc voltages listed. Refer to figure 2-8 for the schematic diagram of A37.

Note. Measure all voltages to ground. A tolerance of  $\pm 20$  percent is within limits.

(a) *Signal voltage chart.*

| Point of measurement  | Volts (rms) |
|-----------------------|-------------|
| J1-1 . . . . .        | 1.0         |
| Q1 emitter . . . . .  | 0.76        |
| Q1 collector. . . . . | 10.0        |
| Q1 base . . . . .     | 1.05        |
| Q2 emitter . . . . .  | 5.8         |
| Q2 collector. . . . . | 1.95        |
| Q2 base . . . . .     | 7.7         |
| J2-1 . . . . .        | 6.2         |

(b) *Dc voltage chart.*

| Point of measurement  | Volts (dc) |
|-----------------------|------------|
| Q1 emitter . . . . .  | 1.9        |
| Q1 base . . . . .     | 2.1        |
| Q1 collector. . . . . | 12.4       |
| Q2 emitter . . . . .  | 0.0        |
| Q2 base . . . . .     | 1.9        |
| Q2 collector. . . . . | 12.2       |

**o. Module A38.**

- (1) Connect the H-189/GR handset to an AUDIO connector.
- (2) Connect the AN/URM-120 to A36-S1J1-1 and chassis ground with the RT-841/PRC-77 No. 1 (fig. 3-11).
- (3) Set the BAND switch at 30-52 and set the tuning controls for 30.00 mc.
- (4) Remove modules A39A and A36. Apply +3 volts dc from the Hewlett-Packard Power Supply, model HP-72/A to A31J4.
- (5) Press the H-189/GR push-to-talk switch and measure the voltages at the points listed in charts (a) and (b) below. Compare the measurements with the normal signal and dc voltages listed. Refer to figure 2-7 for the schematic diagram of A38.

Note. Measure all voltages to ground. A tolerance of  $\pm 20$  percent is within limits, except where otherwise stated or where minimum voltages are indicated.

**(a) Signal voltage chart.**

| Point of measurement  | Millivolts (rms) |
|-----------------------|------------------|
| Q1 base. . . . .      | 100              |
| Q1 collector. . . . . | 3.1 volts        |
| Q1 emitter. . . . .   | 1.2 volts        |
| Q2 base. . . . .      | 170              |
| Q2 collector. . . . . | 1.2 volts        |
| Q2 emitter. . . . .   | 36               |
| Q3 base. . . . .      | 210              |
| Q3 collector. . . . . | 3.1 volts        |
| Q3 emitter. . . . .   | 57               |
| J1-1. . . . .         | 0.50             |
| S1J1-1. . . . .       | 0.65             |

**(b) Dc voltage chart.**

| Point of measurement  | Volts (dc) |
|-----------------------|------------|
| Q1 base. . . . .      | 2.1        |
| Q1 emitter. . . . .   | 9.5        |
| Q1 collector. . . . . | 2.6        |
| Q2 base. . . . .      | 1.9        |
| Q2 emitter. . . . .   | 9.5        |
| Q2 collector. . . . . | 1.25       |
| Q3 base. . . . .      | 1.9        |
| Q3 emitter. . . . .   | 9.5        |
| Q3 collector. . . . . | 1.3        |

**p. Module A39A.**

- (1) Measure the voltages at the points listed in charts given in (a) and (b) below.
- (2) Compare the measured voltages with typical voltages listed in the charts. Refer to figure 2-5 for the schematic diagram of A39A.

**(a) Signal voltage chart.**

| Point of measurement  | volts (RMS)    |
|-----------------------|----------------|
| Q1 Collector. . . . . | 2.1            |
| Q2 Collector. . . . . | 0.02           |
| A44AJ2. . . . .       | 0.150 to 0.500 |

**(b) Dc voltage chart.**

| Point of measurement  | volts(DC) |
|-----------------------|-----------|
| Q1 Collector. . . . . | 9.6       |
| Q2 Collector. . . . . | 9.6       |
| Q3 Collector. . . . . | 9.6       |
| Q3 Emitter. . . . .   | 2.0       |
| J3. . . . .           | 3.8       |

**q. Module A40A.**

- (1) Set the timing knobs for 30.00 mc.
- (2) Rotate the kc frequency control and measure the voltages at the points listed in chart in (a) below. During rotation of the kc control, the readings should not vary more than  $\pm 20\%$ .
- (3) Compare the voltage measurements with the normal signal and the dc voltages listed in charts (a) and (b) below. Refer to figure 7-24 for schematic diagram and figure 5-1 for an exploded view of module A40A.

Note. Measure all voltages to ground. A tolerance of  $\pm 20$  percent is within limits, except where otherwise stated or where minimum voltages are indicated.

**(a) Signal voltage chart.**

| Point of measurement | Volts (RMS)   |
|----------------------|---------------|
| Q1 Base. . . . .     | 0.250 or less |
| Q1 Emitter. . . . .  | 0.700         |
| Q2 Base. . . . .     | 0.400         |
| Q2 Emitter. . . . .  | 0.300         |
| Q3 Base. . . . .     | 0.135         |
| J2. . . . .          | 0.500         |
| J3. . . . .          | 1.9           |

**(b) Dc Voltage Chart**

| Point of measurement | volts (DC) |
|----------------------|------------|
| Q1 Base. . . . .     | 2.42       |
| Q1 Emitter. . . . .  | 2.55       |
| Q2 Base. . . . .     | 2.3        |
| Q2 Emitter. . . . .  | 1.9        |
| Q3 Base. . . . .     | 2.8        |
| J3. . . . .          | 3.9        |

**r. Module A43.**

- (1) Remove modules A40A and A44A.
- (2) Insert the module extender into the connector for module A43 (J19) on the synthesizer motherboard.
- (3) Insert module A43 to be tested into the module extender.
- (4) Terminate the coaxial cable from the AN/URM-103 with a 50-ohm resistor and apply a 10-millivolt RF signal of the frequency indicated on the chart below.
- (5) After a maximum or minimum peak is obtained, check the frequency and the input signal level. Measure the voltages across the parts indicated. Refer to figure 2-12 for the schematic diagram of A43.

Note. Measure all voltages to ground. A tolerance of  $\pm 20$  percent is within limits, except where otherwise stated or where minimum or maximum voltages are indicated.

| Injection location | Point of measurement | Input frequency (mc) | Voltage (mv rms) | Remarks <sup>a</sup> |
|--------------------|----------------------|----------------------|------------------|----------------------|
| A44AJ1-E and D     | C1-C2 junction       | 48.9                 | 37               | Max                  |
|                    |                      | 50.2                 | 36               | Min                  |
|                    |                      | 51.0                 | 28.5             |                      |
| A44AJ1-E and D     | C2-C3 junction       | 49.1                 | 31               | Max                  |
|                    |                      | 51.4                 | 10               | Min                  |
|                    |                      | 52.5                 | 29               | Max                  |
| A44AJ1-E and D     | C4-C5 junction       | 49.2                 | 24               |                      |
|                    |                      | 52.5                 | 48               |                      |
|                    |                      | 50.8                 | 30               | Max                  |
| A44AJ1-J and K     | C7-T3 junction       | 46.5                 | 8                | Max                  |

<sup>a</sup> Maximum and minimum responses are due to input impedance charges along with the natural response characteristic. When the input level is restored to 10 millivolts, the effective response is found.

s. Module A44A.

- (1) Remove modules A43 and A39A.
- (2) Insert the module extender into the connector for module A44A (J20) on the synthesizer motherboard.
- (3) Insert module A44A to be tested into the module extender and remove the cover from that module.
- (4) Apply a 53-megahertz 0.05-volt signal between pin A of A44AJ1 and chassis ground.
- (5) Measure the voltages at the points listed in the charts in (a) and (b) below. Compare the measurements with the normal signal and dc voltages listed. Refer to figure 2-10 for the schematic diagram of A44A.

Note. Measure all voltages to ground. A tolerance of  $\pm 20$  percent is within limits, except where otherwise stated or where minimum voltages are indicated.

(a) Signal voltage chart.

| Point of measurement     | Volts (rms)                                  |
|--------------------------|--|
| Q1 base. . . . .         | 0.600  |
| Q1 collector. . . . .    | 2.4  |
| J2. . . . .              | Min. 0.030                                   |
| A43J1 E&F (Grd). . . . . | Min. 0.060                                   |
| J3. . . . .              | .1.5 (Measured without input signal applied) |

(b) Dc voltage chart.

| Point of measurement | Volts (dc) |
|----------------------|------------|
| J 1 - B. . . . .     | 9.6        |
| Q1 emitter. . . . .  | 9.3        |
| Q1 base. . . . .     | 9.2        |
| Z1-8. . . . .        | 9.3        |
| Z1-5. . . . .        | 9.3        |

t. Module A45A.

- (1) Insert the module extender into the A45A connector on the synthesizer.



motherboard (J21). Insert module A45 under test into the module extender.

- (2) Place the function switch on RT-841/PRC-77 No. 1 to ON.
- (3) Measure the voltages at the points listed in the charts in (a) and (b) below. Compare them with the normal signal and dc voltages listed. Refer to figure 2-11 for the schematic diagram of A45A.

Note. Measure all voltages to ground. A tolerance of  $\pm 20$  percent is within limits, except where otherwise stated or where minimum/maximum voltages are indicated.

(a) Signal voltage chart.

| Point of measurement  | Volts (rms) |
|-----------------------|-------------|
| Q1 base. . . . .      | 0.021       |
| Q1 emitter. . . . .   | 0.750       |
| Q1 collector. . . . . | 3.0         |
| Q2 base. . . . .      | 2.0         |
| Q2 collector. . . . . | 1.4         |
| J1-E. . . . .         | 2.0         |

(b) Dc voltage chart.

| Point of measurement    | Volts (dc)         |
|-------------------------|--------------------|
| J1-A. . . . .           | .9.6               |
| L1-C6 junction. . . . . | .9.6               |
| Q1 base. . . . .        | .1.1               |
| Q1 emitter. . . . .     | 0.80               |
| Q2 base. . . . .        | (-)0.100 to (+)0.5 |
| Q2 emitter. . . . .     | 2.6                |

u. Module A50.

- (1) Remove modules A39, A38, and A37 from RT-841/PRC-77 No. 1
- (2) Remove the cover from module A50 to be tested and insert the module into connector J22.
- (3) Apply a 11.500-megacycle, 50-millivolt signal from the AN/URM-103 to the terminal specified in the chart in (a) below.
- (4) Connect Handset H-189/GR and depress the push-to-talk switch.
- (5) Measure the voltages as indicated in the charts in (a) and (b) below. Compare the measurements with the normal signal and dc voltages listed. Refer to figure 2-6 for the schematic of A50.

Note. Measure all voltages to ground. A tolerance of  $\pm 20$  percent is within limits.

(a) Signal voltage chart.

| Point of measurement                | Millivolts (rms) |
|-------------------------------------|------------------|
| Q1 base <sup>a</sup> . . . . .      | 17               |
| Q1 emitter a. . . . .               | 6.2              |
| Q1 collector <sup>a</sup> . . . . . | 150              |
| J1-2 <sup>a</sup> . . . . .         | 27               |
| J 1 - 2 <sup>n</sup> . . . . .      | 10               |

<sup>a</sup> Apply input signal at J5-1.  
<sup>b</sup> Apply input signal at J6-5.

(b) Dc voltage chart.

| point of measurement  | Volts (dc) |
|-----------------------|------------|
| Q1 base. . . . .      | + 1.1      |
| Q1 emitter. . . . .   | +0.36      |
| Q1 collector. . . . . | +9.5       |

v. Module A54A.

- (1) Remove module A55 and mount module A54A to be tested.
- (2) Set the AN/URM-127 frequency to 150 cps  $\pm 0.5$ , and for a level of 60 millivolts at A54AJ1 pins 1 and 2.
- (3) Place the function switch of RT-841/PRC-77 No. 1 to the SQUELCH position.
- (4) Measure the voltages at the points listed in the charts in (a) and (b) below. Compare them with the normal signal and dc voltages listed. Refer to figure 7-22 for the schematic diagram of A54A.

Note. Measure all voltages to ground. A tolerance of  $\pm 10$  percent is within limits.

(a) Signal voltage chart.

| Point of measurement | Volts (rms) |
|----------------------|-------------|
| U1-5. . . . .        | 0.005       |
| U1-7. . . . .        | 3.5         |
| J - 3. . . . .       | 0.170       |

(b) Dc voltage chart.

| Point of measurement  | Volts (dc) |
|-----------------------|------------|
| Q1 base. . . . .      | 0          |
| Q1 emitter. . . . .   | 0.700      |
| Q1 collector. . . . . | 0.125      |
| J2 - 1. . . . .       | 9.6        |

w. Module A55.

- (1) Set the AN/URM-127 to 1 kc.
- (2) Apply the input signal to the output terminals of Z2 and adjust the AN/URM-127 output for an 0.25-volt rms indication on the ME-30A/U at A25J3.
- (3) Adjust the VOLUME control of RT-841/PRC-77 No. 1 for a 1-volt rms signal at A55J4.
- (4) Measure the voltages at the points listed in the charts in (a) and (b) below. Compare them with the normal signal and dc voltages listed. Refer to figure 7-21 for the schematic diagram of A55.

Note. Make all voltages to ground. A tolerance of  $\pm 20$  percent is within limits.

(a) Signal voltage chart.

| Point of measurement      | Millivolts (rms) |
|---------------------------|------------------|
| J3 <sup>a</sup> . . . . . | 250              |
| Q1 base. . . . .          | 250              |
| J1-4. . . . .             | 630              |
| Q1 emitter. . . . .       | 240              |
| Q1 collector. . . . .     | 0.0              |
| Q2 base. . . . .          | 120              |
| Q2 emitter. . . . .       | 110              |
| Q2 collector. . . . .     | 640              |
| Q3 base. . . . .          | 6.5              |
| Q3 emitter. . . . .       | 4.8              |
| J4. . . . .               | 1 volt           |

<sup>a</sup> The 2.5-volt rms signal is required at A55J2-4 to obtain 250 millivolts at A55J3.

(b) Dc voltage chart.

|    | Point of measurement | volts (dc) |
|----|----------------------|------------|
| Q1 | base. . . . .        | 4.0        |
| Q1 | emitter. . . . .     | 4.2        |
| Q1 | collector. . . . .   | 0.0        |
| Q2 | base. . . . .        | 4.4        |

|    | Point of measurement | Volts (dc) |
|----|----------------------|------------|
| Q2 | emitter. . . . .     | 4.6        |
| Q2 | collector. . . . .   | 1.6        |
| Q3 | base. . . . .        | 8.4        |
| Q3 | emitter. . . . .     | 8.6        |

**CHAPTER 6**  
**SHIPMENT AND LIMITED STORAGE AND DEMOLITION**  
**TO PREVENT ENEMY USE**

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**Section I. SHIPMENT AND LIMITED STORAGE**

**6-1. Disassembly of Equipment**

The following instructions are recommended as a guide for preparing the AN/PRC-77 for shipment and limited storage.

- a. Remove the antenna and disconnect the H-189/GR.
- b. Remove Support, Antenna AB-591/PRC-25 (if used).
- c. Fold the Antenna AT-271A/PRC and wrap the H-189/GR cord. Store the antennas, the AB-591/PRC-25, and the H-189/GR in the compartments of Bag, Cotton Duck CW-503/PRC-25.
- d. Unclip the CW-503/PRC-25 from Harness Electrical ST-138/PRC-25. Remove the RT-841/PRC-77 from the ST-138/PRC-25. Wrap the ST-138/PRC-25.
- e. Remove the BA-386/PRC-25 from the CY-2562/PRC-25.
- f. Refasten the CY-2562/PRC-25 to the RT-841/PRC-77 case.

**6-2. Repackaging for Shipment or Limited Storage**

The exact procedure for repackaging depends on the material available and the condition under which the equipment is to be shipped or stored. Adapt the procedure outlined below whenever possible. Information concerning the original packaging (TM 11-5820-667-12) may also be helpful.

*a. Material Requirements.* The following materials are required for packaging Radio Set AN/PRC-77. For stock numbers of materials, consult SB 38-100.

| Material              | Quantity |
|-----------------------|----------|
| Cardboard carton      | 1ea      |
| Waterproof paper tape | 10 ft    |
| Wrapping paperboard   | 12 Sq ft |
| Waterproof paper      | 50 Sq ft |
| Filler material       | 10 Sq ft |
| Corrugated cardboard  | 12 sq ft |

*b. Packaging.* The items of the AN/PRC-77 are to be packaged as outlined below.

- (1) Wrap the major component completely with wrapping paperboard and secure with waterproof tape.
- (2) Group the minor components and wrap them completely with paperboard and secure with waterproof tape.
- (3) Wrap the technical manuals in waterproof paper and seal with waterproof tape.
- (4) Line the inside of the cardboard carton with waterproof paper.
- (5) Place the two paperboard packages and technical manuals in the cardboard carton so that there will be adequate clearance on all sides of the packages.
- (6) Stuff the filler material in the spaces around the packages.
- (7) Seal the cardboard carton with waterproof tape.

*c. Packing.* Pack the cardboard in a wooden box as in the original packing. If the original box is not available, construct a new wooden box large enough to allow 1-inch clearance on all sides. Line the inside of the wooden box with waterproof paper and corrugated cardboard. Place the cardboard carton inside the box and nail the wooden box cover.

## Section II. DEMOLITION TO PREVENT ENEMY USE

### 6-3. Authority for Demolition

Demolition of the equipment will be accomplished only upon the order of the commander. The destruction procedures outlined in paragraph 6-4 will be used to prevent further use of the equipment.

### 6-4. Methods of Destruction

Any of the methods of destruction given below may be used. The time available will be the major determining factor for the method used. The tactical situation will determine in what manner the destruction order will be carried out.

*a. Smash.* Smash the channel indicator, controls, and connectors with the heaviest tool available if time does not, permit the removal of the equipment from the case; use sledges, axes, handaxes, pickaxes, hammers, crowbars, or heavy tools available to smash the interior of the equipment.

*b. Cut.* Cut the cabling, cording, and wiring. Cut all cords and cables in a number of places; use axes, machetes, and similar tools. If time permits, slash the interior wiring and cabling.

**Warning:** Be extremely careful with explosives and incendiary devices. Use these only when the need is urgent.

*c. Burn.* Burn as much of the equipment as is flammable; use gasoline, oil, flamethrower, or similar tools. Burn the technical manual first. Pour gasoline on the cut cables and ignite it. Use a flamethrower to burn the spare parts or pour gasoline on the spares and ignite it. Use incendiary grenades to complete the destruction of the equipment interior.

*d. Explode.* Use explosives to complete the demolition or cause maximum destruction when time does not permit demolition by other means. Powder charges, fragmentation grenades, or incendiary grenades may be used. Place the explosive charges against the side of the RT-841/PRC-77 case to cause maximum destruction; the second most effective location is against the front panel. Incendiary grenades are usually most effective if destruction of small parts and wiring is desired.

*e. Dispose.* Bury or scatter the destroyed parts in slit trenches or foxholes, or throw them into streams.

**CHAPTER 7**  
**DEPOT OVERHAUL AND SCHEMATICS AND BLOCK**  
**DIAGRAMS**

**Section I. DEPOT OVERHAUL STANDARD**

**7-1. Applicability of Depot Inspection Standards**

The tests outlined in this section are designed to measure the performance capability of a repaired Radio Set AN/PRC-77. Equipment that is returned to stock should meet the standards given in these tests.

**7-2. Applicable References**

a. *Repair Standards.* Applicable procedures of the depots performing these tests, and the depot standards for repaired signal equipment given in TB SIG 355-1, TB SIG 355-2, and TB SIG 355-3, form a part of the requirements for testing this equipment.

b. *Technical Publications.* The following

technical publications are applicable to Radio Set AN/PRC-77:

(1) TM 11-5820-667-12, Operator's Manual.

(2) TM 11-5820-667-35P, Direct Support, General Support, and Depot Maintenance Manual., Repair Parts

c. *Modification Work Orders.* Perform all applicable modification work orders pertaining to Radio Set AN/PRC-77 before making the tests specified. DA Pam 310-7 lists all available MWO'S.

**7-3. Test Facilities Required**

The following equipment, or suitable equivalents, will be used in determining compliance with the requirements of this specific standard.

a. *Test Equipment.*

| Equipment  | Federal Stock No. | Quantity<br>required | Technical manual   |
|--|-------------------|----------------------|--------------------|
| Analyzer, Spectrum TS-723B/U -----   | 6625-668-9418     | 1                    | TM 11-5097         |
| Digital Readout, Counter Electronic AN/USM-207 ----                        | 6625-911-6368     | 1                    | TM 11-6625-700-10  |
| Generator, Signal AN/USM-44 -----  | 6625-669-4031     | 1                    | TM 11-6625-508-10  |
| Generator, Signal AN/URM-103 (or equal). . .                               | 6625-868-8352     | 1                    | TM 11-6625-586-12  |
| Generator, Signal AN/URM-127 -----   | 6625-783-5965     | 2                    | TM 11-6625-683-15  |
| Multimeter ME-26B/U -----  | 6625-542-6407     | 1                    | TM 11-6625-200-12  |
| Oscilloscope AN/USM- 281A -----  | 6625-228-2201     | 1                    | TM 11-6625-1703-15 |
| Wattmeter, Bird Model 61 (2.5-10 watts)..                                  |                   | 1                    |                    |
|  |                   | 1                    |                    |
| Voltmeter, Meter ME-30A/U -----  | 6625-669-0742     | 1                    | TM 11-6625-320-12  |
| Voltmeter, Electronic AN/URM-145-----                                      | 6625-973-3986     | 1                    | TM 11-6625-524-14  |
| Power Supply; Trygon Electronics, Inc., Model T20-2                        |                   | 1                    |                    |
| Carrier Deviation Meter; Marconi Instruments.<br>Model TF-791D (or equal). |                   | 1                    |                    |
| Attenuator, Variable Coaxial; Hewlett-Packard,<br>Model HP-355D.           |                   | 1                    |                    |

b. Additional Equipment.

| Equipment  | Federal stock No. | Quantity required |
|--|-------------------|-------------------|
| Tool Kit, Electronic TK-100/G.   | 5180-605-0079     | 1                 |
| Tool Kit, Electronic Equipment TK-105/G.   | 5180-610-8177     | 1                 |
| Signal adder, consisting of (refer to fig. 7-1 for fabrication details):           |                   |                   |
| Resistor, 120 ohms $\pm 5\%$ , 1 watt, fixed composition.                          |                   | 2                 |
| Resistor, 2,200 ohms $\pm 5\%$ , 1 watt, fixed composition.                        |                   | 2                 |
| Switch, toggle, single-pole, double-throw.   |                   | 2                 |
| Barrier terminal block, Cinch Jones type No. 8-172-Y (8 terminals)                 |                   | 1                 |
| Wire, stranded, AWG No. 18.  | 6145-160-5291     | As required       |
| Chassis, aluminum (2 1/2 in. by 2 1/2 in. by 6 in. suggested nominal size).        |                   | 1                 |
| Test Assembly, consisting of: (Refer to fig. 7-2 for fabrication details.)         |                   |                   |
| Lamp, indicator, with push-to-test feature, 12 volts.                              |                   | 1                 |
| Connector, Method type No. SM-C-454687.  |                   | 1                 |
| Resistor, 150 ohms $\pm 5\%$ , 1 watt, fixed composition                           | 5905-688-2248     | 1                 |
| Resistor, 1,000 ohms $\pm 1\%$ , 1 watt, fixed composition.                        | 5905-892-6330     | 1                 |
| Resistor, 10,000 ohms $\pm 5\%$ variable, linear taper, composition.               | 5905-892-6542     | 1                 |
| Resistor, 15,000 ohms $\pm 5\%$ , 1 watt, fixed composition.                       | 5905-102-2824     | 1                 |
| Switch, toggle, single-pole, single-throw.   | 5930-665-1517     | 1                 |
| Barrier terminal block, Cinch Jones type No. 2-172-Y (2 terminals).                |                   | 1                 |
| Barrier terminal block, Cinch Jones type No. 9-172-Y (9 terminals)                 |                   | 1                 |
| Cable, coaxial, type RG-58A/U.   | 6145-542-6092     | 12 ft             |
| Wire, stranded, AWG No. 18.  | 6145-160-5291     | 16 ft             |
| Knob, control  |                   | 1                 |
| Chassis, aluminum (5 in. by 9 1/2 in. by 2 in. suggested nominal size).            |                   | 1                 |
| Receiver Dummy Antenna consisting of: (Refer to fig. 7-8 for fabrication details.) |                   |                   |
| Resistor, 51.1 ohms $\pm 1\%$ , 1 watt, deposited carbon.                          | 5905-722-1804     | 1                 |

| Equipment   | Federal stock No.  | Quantity required |
|---|--|-------------------|
| Resistor, 31.6 ohms ±1%, 1 watt, deposited carbon.                          | 5905-722-1805  | 1                 |
| Connector UG-657/U  | 5935-511-6618  | 2                 |
| Adapter, Connector UG-491A/U.   | 5935-259-7463  | 1                 |
| Aluminum container 2 3/4 in. by 2 1/8 in. by 1 5/8 in.                      |  | 1                 |
| Wire, stranded SWG No. 18.  | 6145-160-5291  | As required       |
| Transmitter Dummy Loads: (Refer to fig. 3-16 for fabrication details.)      |  |                   |
| Long Antenna Loads for the specified frequencies as follows:                |  |                   |
| 30.0 MHz-Resistor, 130 ohms ±1%, 1 watt, deposited carbon.                  | 5905-00-552-2451   | 1                 |
| 52.5 MHz-Resistor, 619 ohms ±1%, 1 watt, deposited carbon.                  | 5905-581-1009  | 1                 |
| 53.5 MHz-Resistor, 400 ohms ±1%, 1 watt, deposited carbon.                  | 5905-00-552-3898 or<br>5905-00-883-9174 or<br>5905-00-539-3531 or<br>5905-00-988-0156* | 1                 |
| Capacitor, 8 pf ±5% 400 vdc   | 5910-00-841-3133   | 1                 |
| 75.0 MHz-Resistor, 61.9 ohms ±1%, 1 watt, deposited carbon.                 | 5905-00-543-8368   | 1                 |
| Capacitor, 68 pf ±5%, 400 vdc.  | 5910-615-9812  | 1                 |
| Short Antenna Loads for the specified, frequencies as follows:              |  |                   |
| 30.0 MHz-Resistor, 26.1 ohms ±1%, 1 watt, deposited carbon.                 | 5905-059-8157  | 1                 |
| Capacitor, 12 pf ±5%, 400 vdc.  | 5910-00-806-2716   | 1                 |
| 52.5 MHz and 53.3 MHz-Resistor, 56.2 ohms ±2%, 1 watt, deposited carbon.    | 5905-817-6049  | 1                 |
| Capacitor, 18 pf ±5%, 400 vdc.  | 5910-823-1971  | 1                 |
| 75.0 MHz-Resistor, 61.9 ohms ±1%, 1 watt, deposited carbon.                 | 5905-00-543-8368   | 1                 |
| Capacitor, 82 pf ±5%, 400 vdc.  | 5910-553-7147  | 1                 |
| Adapters, Antenna Load: (Refer to fig. 3-16 for fabrication details.)       |  |                   |
| No. 1 -----   | -----  | 1                 |
| No. 2 -----   | -----  | 1                 |
| Adapter T UG-274/U -----  | 5935-201-2411  | 1                 |
| Attenuator, RF, consisting of: (Refer to fig. 7-4 for fabrication details.) |  |                   |

\*A 400 ohm resistance may also be obtained by combining a 392 ohm resistor and a 10 ohm resistor in series. The following National Stock Numbers may be used: 5905-00-493-1405 (392 ohms), 5905-00-556-5942 (392 ohms), and 5905-00-552-5121 (10 ohms).

| Equipment  | Federal stock No. | Quantity required |
|--|-------------------|-------------------|
| Resistor, 56 ohms ±5%, 1 watt, fixed film.   | -----             | 1                 |
| Resistor, 510 ohms ± 5%, 1 watt, fixed film.   | -----             | 1                 |
| Connector UG-447/U<br>Aluminum container<br>2 1/2 in. by 2 1/2 in. by 6 in.            | .....             | 3                 |
| Decoupling Tool; sheet metal 1 in. by 4 in. by 0.018 in. to 0.035 in. (20 to 26 gage). | -----             | 1                 |
| Test Cable No. 1 (fig. 7-5)<br>consisting of:  | 6625-880-6098     | 1                 |
| Clip, electrical, alligator style.   | 5940-186-9835     | 1                 |
| Plug, pin (test lead probe).   | .....             | 1                 |
| Wire, stranded AWG No. 18.   | 6145-160-5291     | 6 in.             |
| Test Cable No. 2 (fig. 7-5)<br>consisting of:  |                   |                   |
| Cable RG-58A/U   | 6145-542-6092     | 6 ft.             |
| Connector UG-88/U  | 5935-149-4006     | 2                 |
| Connector UG-536B/U  | .....             | 2                 |
| Test Cable No. 3 (fig. 7-5)<br>consisting of:  |                   |                   |
| Cable RG-58A/U   | 6145-542-6092     | 3 ft.             |
| Connector UG-536B/U  | .....             | 2                 |
| Test Cable No. 4 (fig. 7-5)<br>consisting of:  | 6625-880-6137     |                   |
| Cable RG-58A/U .....   | 6145-542-6092     | 16 ft.            |
| Lugs, spade .....  | -----             | 16                |
| Test Cable No. 5 (fig. 7-6)<br>consisting of:  | 6625-880-6144     | 1                 |
| Cable RG-58A/U   | 6145-542-6092     | 3 ft.             |
| Connector UG-88/U  | 5935-149-4066     | 1                 |
| Lugs, spade  | .....             | 2                 |
| Test Cable No. 6 (fig. 7-6)<br>consisting of:  | 6625-880-6147     | 1                 |
| Cable RG-58A/U   | 6145-542-6092     | 3 ft.             |
| Connector UG-88/U  | 5935-149-4066     | 1                 |
| Insulating Terminal Board,<br>1 in. by 2 in. by 1/16 in.                               | .....             | 1                 |
| Resistor, 15,000 ohms ±5%,<br>1 watt.  | 5905-537-6458     | 1                 |
| Capacitor, 0.05 µf ± 10%, 400 vdc.   | .....             | 1                 |
| Wire, stranded AWG No. 18.<br>Lugs, spade .....  | 6145-160-5291     | As required<br>2  |
| Test Cable No. 7 (fig. 7-6)<br>consisting of:  | 6625-880-6148     | 4                 |
| Wire, stranded AWG No. 18.   | 6145-160-5291     | 16 ft.            |
| Lugs, spade .....  | .....             | 8                 |
| Test Cable No. 8 (fig. 7-7)<br>consisting of:  | 6625-880-6146     | 1                 |
| Cable RG-58A/U   | 6145-542-6092     | 3 ft.             |



| Equipment  | Federal stock No. | Quantity required |
|--|-------------------|-------------------|
| Insulating Terminal Board,<br>1 in. by 2 in. by 1/16 in. | -----             | 1                 |
| Capacitor, 0.1 µf ±.10%, 400<br>vdc.                     | 5910-161-5264     | 1                 |
| Wire, stranded AWG No. 18                                | 6145-160-5291     | As required       |
| Lugs, spade-----   | -----             | 4                 |
| Test Cable No. 9 (fig. 7-7)<br>consisting of:            | 5995-518-3073     | 2                 |
| Cable RG-58A/U   | 6145-542-6092     | 6 ft.             |
| Connector UG-88/U  | 5935-149-4236     | 4                 |
| Test Cable No. 10 (fig. 7-7)<br>consisting of:           |                   |                   |
| Cable RG-58A/U   | 6145-542-6092     | <b>3 ft.</b>      |
| Insulating Terminal Board,<br>1 in. by 2 in. by 1/16 in. | -----             | <b>1</b>          |
| Resistor, 39,000 ohms ±5%,<br>1 watt.                    | -----             | 1                 |
| Capacitor, 0.001 µf ±1%, 400<br>vdc.                     | -----             | 1                 |
| Wire, stranded, AWG No. 18.                              | 6145-160-5291     | As required       |
| Lugs, spade  |                   | 4                 |
| Handset H-189/GR   |                   | 1                 |

**7-4. General Test Requirements**

Most of the test will be performed under the conditions listed below and illustrated in figure 7-8 (for the receiver system tests) and in figure 7-9 (for the transmitter system tests). Testing will be simplified if preliminary standard control settings are made initially and changes from these settings are then made as required for the individual tests. Perform all tests in an electromagnetic shielded enclosure. Do not apply power to the equipment under test until all test connections are made and the power supply output voltages are set.

**Caution: When adjusting the power supply output voltages, do not exceed 3 volts and 15 volts.**

a. Remove the shorting cap from POWER connector J3 on the front panel of the RT-841/PRC-77.

b. Loosen and disengage the four captive screws that hold the case to the front panel of the RT-841/PRC-77. Remove the case.

c. Connect the RT-841/PRC-77 into the applicable test setup (fig. 7-8 for receiver system tests and fig. 7-9 for transmitter system tests).

d. Apply power to the RT-841/PRC-77 and allow sufficient stabilization (warmup) time for the test equipment. No warmup is required for the RT-841/PRC-77.

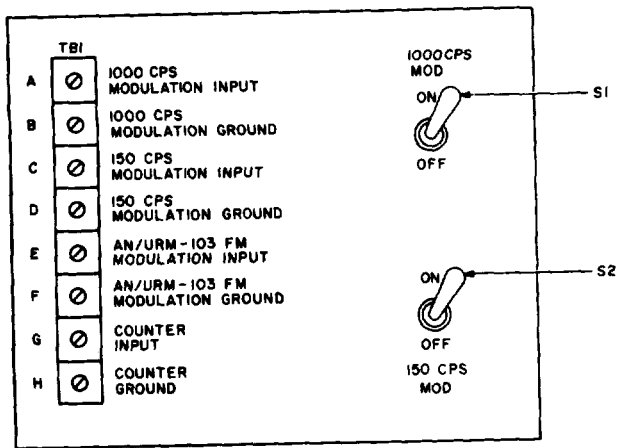
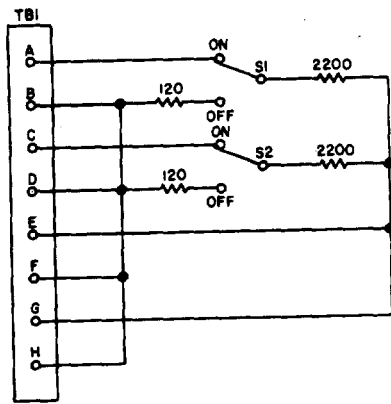
e. All specified signal levels apply to the signal at the RT-841/PRC-77 input and not at the signal generator output. The dummy load used in the receiver test setup reduces the RF voltage delivered at the coaxial ANT connector to half of the signal generator output attenuator setting (6 db loss).

f. The oscilloscope used in test setups is included for the convenience of maintenance personnel, but is not necessary to perform the tests. It provides a convenient output indication for both receiver and transmitter tests.

g. In all receiver tests, set every fm signal generator frequency within +3.5kc of dial frequency selected and to produce minimum distortion (onTS-723B/U) before making any readings.

**7-5. Receiver Test Setup**  
(fig. 7-8)

a. Plug test assembly connector P1 into POWER connector J3 on the front panel of the RT-841/PRC-77.



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Figure 7-1. Signal adder, schematic/wiring diagrams.

b. Connect test cable No. 7 from the ground of the power supply (12.5 volts) to terminal D of test assembly board TB1.

c. Connect test cable No. 7 from the positive output of the power supply (12.5 volts) to terminal F of test assembly terminal board TB1.

d. Connect test cable No. 4 from the af input terminal of the TS-723B/U (shield to ground) to terminals C and D (shield), respectively, of test assembly terminal board TB1.

e. Connect test cable No. 4 from the audio input terminals to the meter terminals of the TS-723B/U.

f. Connect test cable No. 4 from the af input

terminals of the TS-723B/U to the vertical input of the AN/USM-281A.

g. Connect the receiver dummy antenna to the RT-841/PRC-77 coaxial ANT jack J2. Use Connector UG491A/U for connection to ANT jack J2.

h. Connect test cable No. 9 from the receiver dummy antenna to the AN/URM-103 rf input.

i. Connect test cable No. 8 from the AN/URM-103 external frequency modulation input to terminals E and F of signal adder terminal board TB1.

j. Connect a test cable No. 5 from terminals G and H of signal adder terminal board TB1 to the AN/USM-207 FREQ. A input connector.

k. Connect test cable No. 5 from terminals A and B (shield) of signal adder terminal board TB1 to the AN/URM-127 set A OUTPUT connector. Connect another test cable No. 5 from terminals C and D (shield) of signal adder terminal board TB1 to the AN/URM-127 set B OUTPUT connector.

l. Do not turn on the RT-841/PRC-77. Turn on all test equipment and allow sufficient warmup time.

m. Adjust the power supply to 12.5 volts.

n. Set the RT-841/PRC-77 function switch to ON and select a frequency of 41.00 mc.

o. Adjust the AN/URM-103 to produce an RF output of 41.00 mc at a 20-microvolt level with 10-kc deviation at 1,000-cps modulation frequency. With signal adder switch S1 set to ON and switch S2 set to OFF, set the AN/URM-127A and 1,000-cps and adjust the level for a 10-kc deviation on the AN/URM-103.

**Note.** The dummy antenna used in series with the AN/URM-103 output provides 6 db of attenuation. The actual rf level delivered at the RT-841/PRC-77 coaxial ANT input is 10 microvolts when the AN/URM-103 output attenuator is set to 20 microvolts.

p. Adjust the RT-841/PRC-77 VOLUME control to produce a 1-volt reading on the TS-723B/U (used as a vacuum-tube voltmeter by setting the function switch to METER).

q. Perform the receiver system tests indicated in paragraph 7-7. Observe requirement specified in paragraph 7--4g.

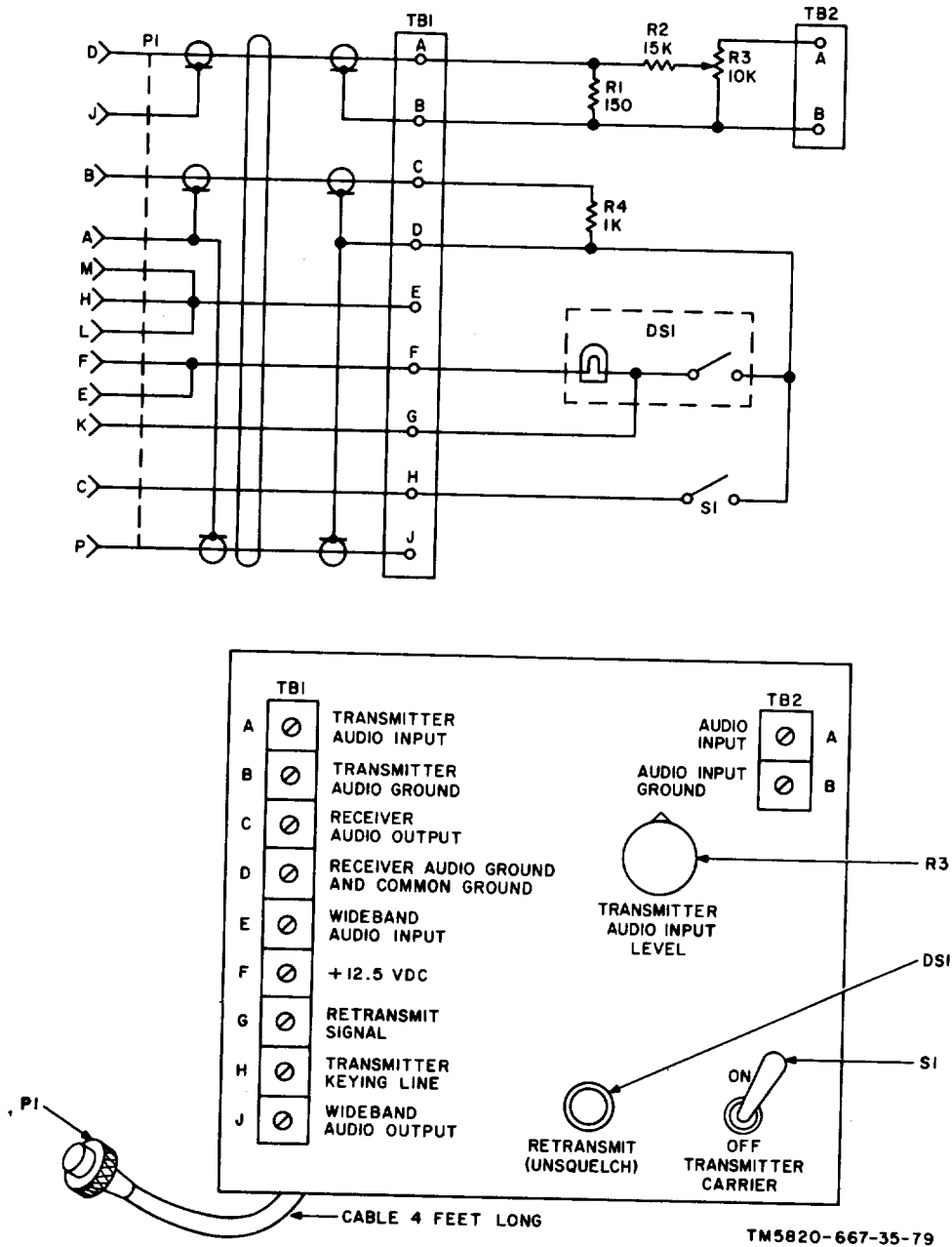


Figure 7-2. Test assembly, schematic/wiring diagram.

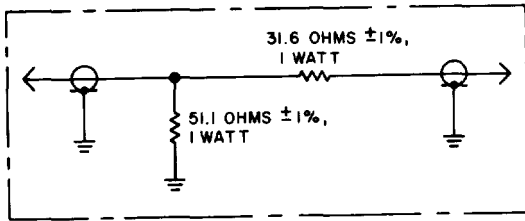
7-6. Transmitter Test Setup

(fig. 7-9)

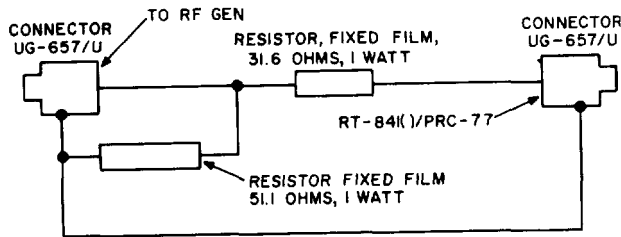
a. Plug the test assembly connector into POWER connector J3 on the front panel of the RT-841/PRC-77.

b. Connect test cable No. 7 from the ground of the power supply (12.5 volts) to terminal D of test assembly terminal board TB1.

c. Connect test cable No. 7 from the positive output of the power supply (12.5 volts) to terminal F of test assembly terminal board TB1.



A. SCHEMATIC DIAGRAM.



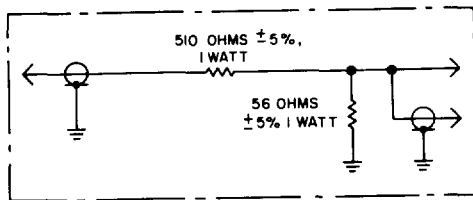
B. WIRING DIAGRAM.

NOTES:

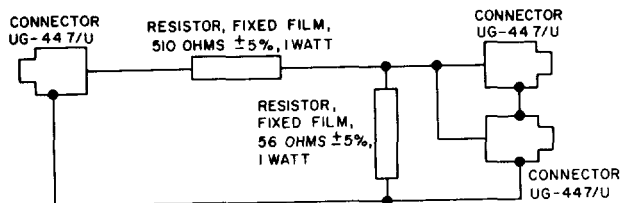
1. PLACE ASSEMBLY IN AN ALUMINUM CAN APPROXIMATELY 2-3/4 INCHES BY 2-1/8 INCHES BY 1-5/8 INCHES.
2. ALL WIRING IS WIRE, STRANDED, AWG NO. 18

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Figure 74. Receiver dummy antenna, schematic/wiring diagram.



A. SCHEMATIC DIAGRAM.



B. WIRING DIAGRAM.

NOTES:

1. PLACE ASSEMBLY IN AN ALUMINUM CAN APPROXIMATELY 6 INCHES BY 2 5/8 INCHES BY 2 5/8 INCHES

- 2 ALL WIRING IS WIRE, STRANDED, AWG NO 18.

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Figure 7-4. If attenuator, schematic/wiring diagram.

d. Connect test cable No. 5 from the AN/URM-127 audio output to test assembly terminals A and B (shield) of terminal board TB2.

e. Connect test cable No. 4 from the ME-30A/U input to test assembly terminals A and B (shield) of terminal board TB1.

f. Connect coaxial ANT jack J2 of the RT-841/PRC-77 to the AN/URM-120 with a test cable No. 9, the UG-274B/U T adapter, and test cable No. 2.

g. Connect test cable No. 3 from the AN/URM-120 to the DA-75/U and place the detector direction arrow of the AN/URM-120 toward the DA-75/U.

h. Connect the rf attenuator input connector to the UG-274B/U T adapter.

i. Connect test cable No. 9 from one output of the rf attenuator to the FREQ. A input of the AN/USM-207. Connect another test cable No. 9 from the other output of the rf attenuator to the low level input of the Carrier Deviation Meter, Marconi Model TF-791D.

j. Connect a test cable No. 10 from L.F. OUTPUT of the carrier deviation meter to the input of the TS-723B/U.

k. Connect test cable No. 4 from L.F. OUTPUT of the carrier deviation meter to the AN/USM-40 vertical input.

l. Connect test cable No. 4 from test assembly terminals C and D (shield) of terminal board TB1 to the meter terminals of the TS-723B/U.

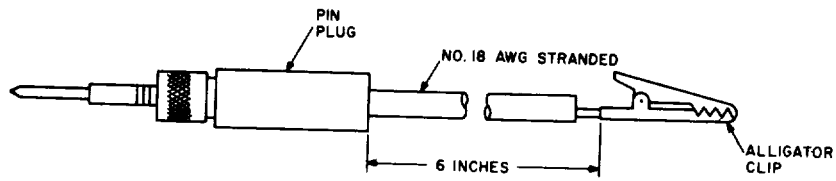
m. Do not turn on the RT-841/PRC-77. Turn on all test equipment and allow sufficient warmup time.

n. Adjust the power supply to 12.5 volts.

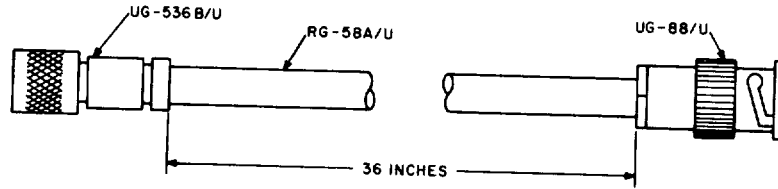
o. Set the RT-841/PRC-77 function switch to ON and select a frequency of 41.00 mc.

p. Adjust the AN/URM-127 to 1,000 cps. Adjust the TRANSMITTER AUDIO INPUT LEVEL control on the test assembly and the AN/URM-127 output level to produce a 1.4-millivolt reading on the ME-30A/U.

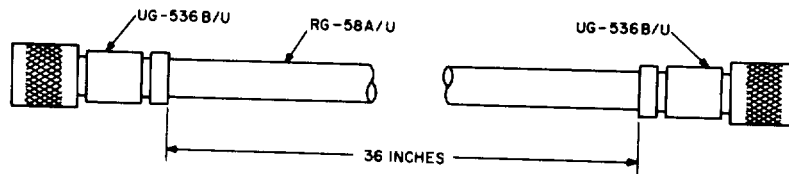
q. Perform the transmitter system tests indicated in paragraph 7-8.



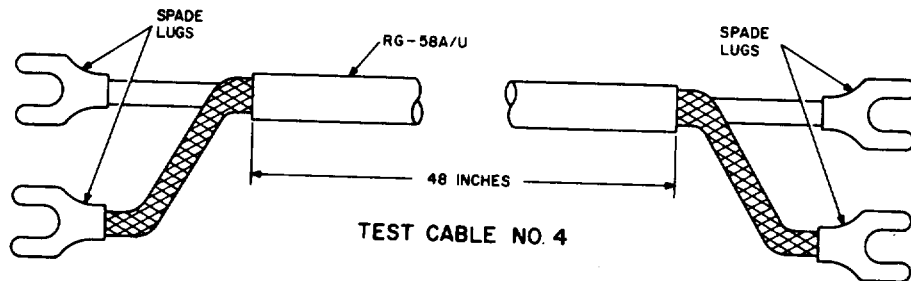
TEST CABLE NO. 1



TEST CABLE NO. 2



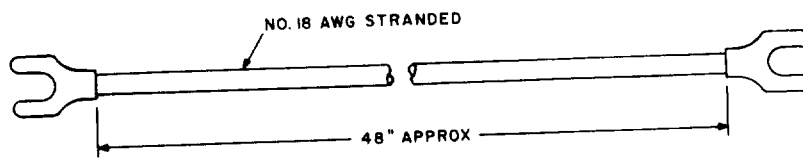
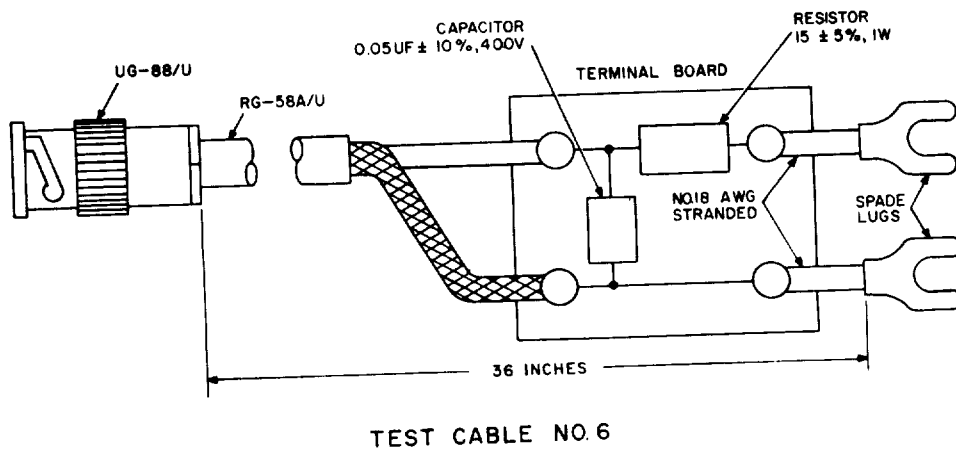
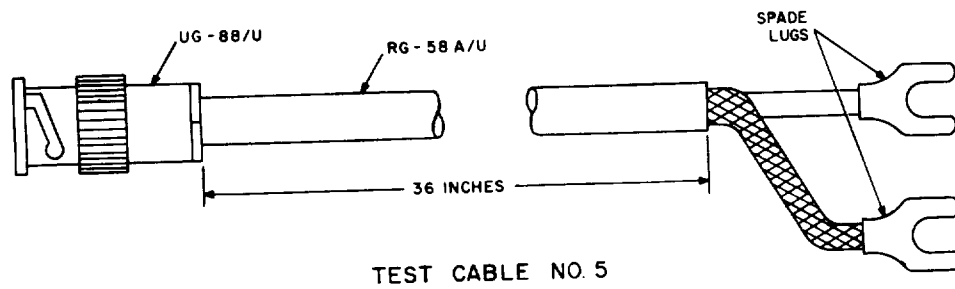
TEST CABLE NO. 3



TEST CABLE NO. 4

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Figure 7-5. Test cables No. 1, 2, 3, and 4.



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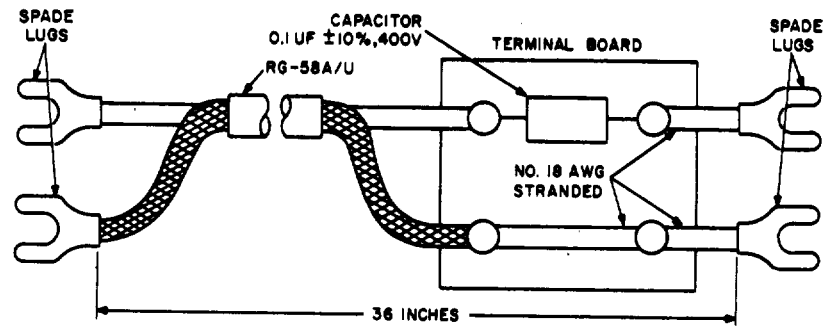
Figure 7-6. Test cables No. 5, 6, and 7.

**7-7. Receiver System Tests, Radio Set AN/PRC-77**

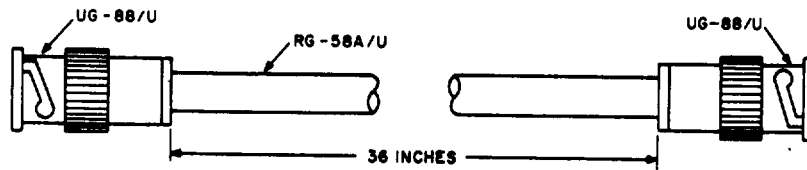
*a. Sensitivity Test.*

- (1) Perform the sensitivity test with the equipment connected in a standard receiver test setup (para 7-5 and fig.

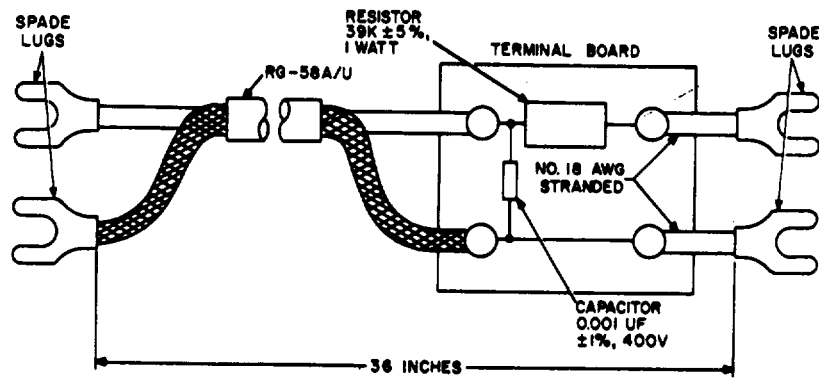
- 7-8), except set the rf signal level at the RT-841/PRC-77 coaxial ANT input to 0.5 microvolt.
- (2) Measure the signal-plus-noise-plus distortion to noise-plus-distortaion ratio on the TS-723B/U, and record. The ratio should be at least 10 db



**TEST CABLE NO. 8**  
( FSN 6625-880-6146; SC-D-621013 )



**TEST CABLE NO. 9**  
( FSN 5995-518-3073; CG-409G/U ( 3 FT ) )



**TEST CABLE NO. 10** TM5820-667-35-84

**Figure 7-7. Test cables No. 8, 9, and 10.**

with the volume control set for a 1-volt audio output level.

- (3) Repeat the procedures given in (2) above at 30.00, 52.00, 53.00, 65.00, and 75.95 mc.

*b. Distortion, Audio power Output, Volume Control, and Audio Frequency Response Tests.*

- (1) Perform these tests with the equipment connected in a standard receiver test setup (para 7-5 and fig. 7-8).
- (2) Measure the percentage of distortion on the TS-728B/U. Maximum allowable distortion is 6 percent.
- (3) Adjust the VOLUME control on the RT-841/PRC-77 to produce a 2-volt

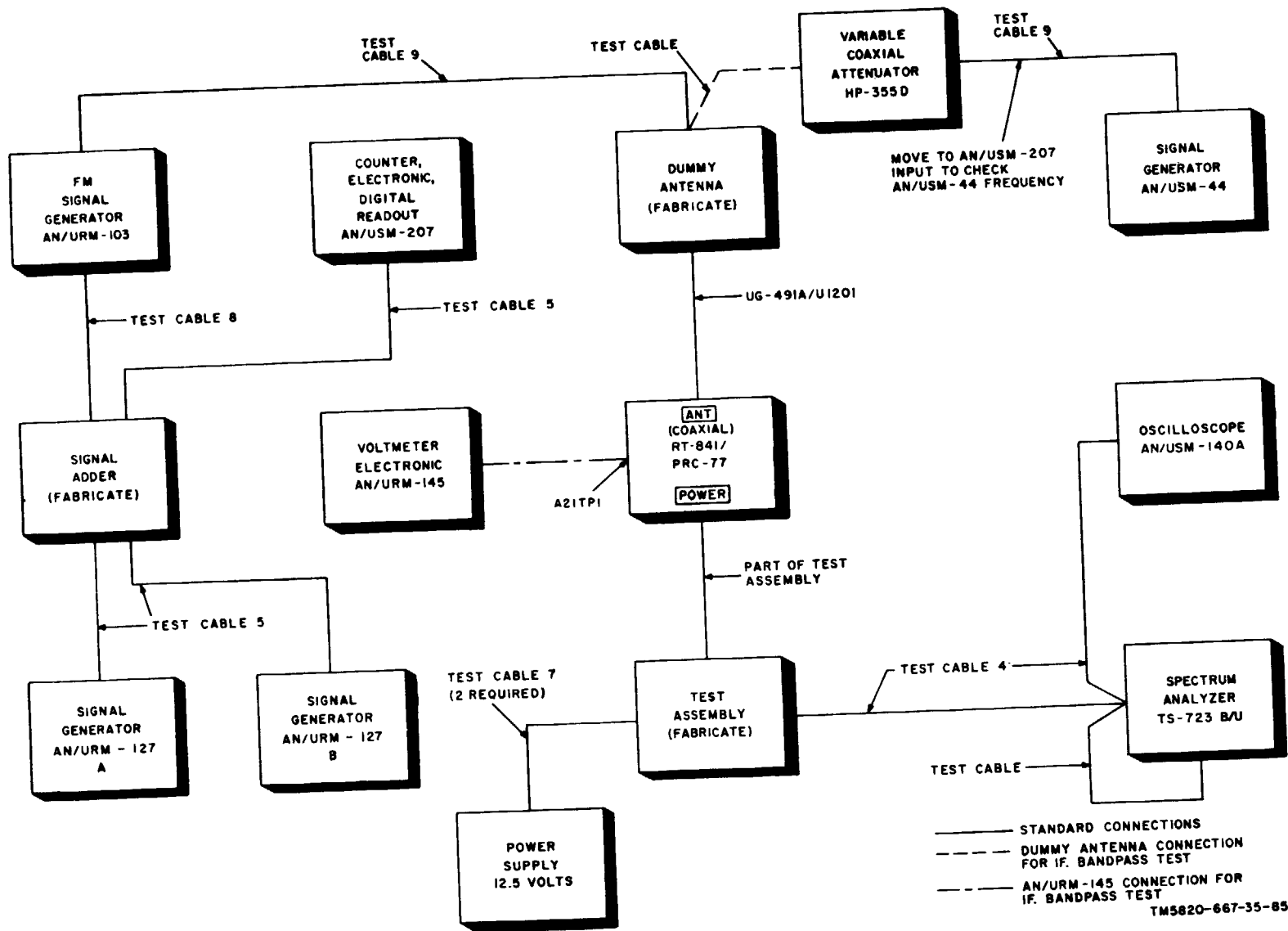
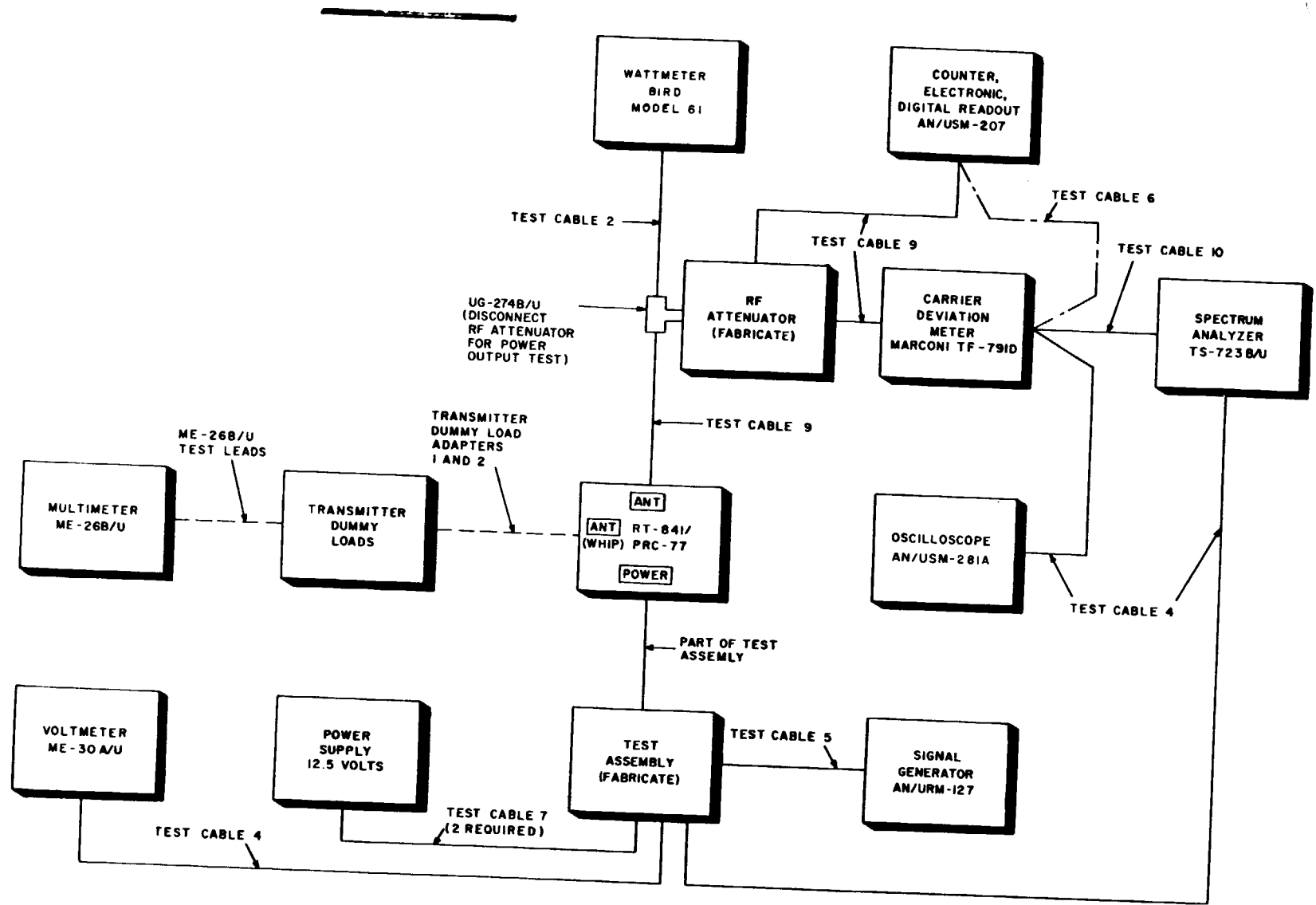


Figure 7-8. RT-841/PRC-77, receiver test setup.





- STANDARD CONNECTIONS
- - - CONNECTIONS FOR ANTENNA LOADING TESTS
- · - AN/USM-207 CONNECTION FOR TONE OSCILLATOR TEST

Figure 7-9. RT-841/PRC-77, transmitter test setup.

- reading on the TS-728B/U (used as a vacuum-tube voltmeter).
- (4) Measure the percentage of distortion on the TS-728B/U. Maximum allowable distortion is 10 percent.
  - (5) Set the VOLUME control on the RT-841/PRC-77 fully clockwise. The output indicated on the TS-728B/U (used as a vacuum-tube voltmeter) should be at least 2 volts.
  - (6) Set the VOLUME control on the RT-841/PRC-77 fully counterclockwise and disconnect the rf output cable from the AN/URM-103. The output indicated on the TS-728B/U (used as a vacuum-tube voltmeter) should be not greater than 0.02 volt.
  - (7) Reestablish the standard receiver test conditions.
  - (8) Without changing the RT-841/PRC-77 VOLUME control setting, determine the receiver audio output level produced with modulation frequencies of 300, 500, 2,000, and 3,000 cps (at 10-kc deviation) by varying the frequency of AN/URM-127 set A. Acceptable frequency response is +0, -6 db (from the 1,000-cps reference) at 300 cps, and +3, -6 db at 500, 2,000, and 3,000 cps.

*Limiting Test.*

- (1) Perform the limiting test with the equipment connected in a standard receiver test setup (para 7-5 and fig. 7-8), except set the RF signal level at the RT-841/PRC-77 coaxial ANT input to 1 microvolt.
- (2) Adjust the AN/URM-103 frequency for minimum distortion as checked on the TS-728B/U.
- (3) Increase the AN/URM-103 output to produce 100 millivolts at the RT-841/PRC-77 coaxial ANT input.
- (4) Readjust the AN/URM-103 frequency for minimum distortion. The new audio output level on the TS-723B/U (used as a vacuum-tube voltmeter) must be within  $\pm 3$  db of the original setting (of 1 volt).

- (5) Repeat the procedures given in (1) through (4) above at 30.00, 52.00, 65.00, and 75.00 mc.
- d. *Squelch Sensitivity and Retransmit Tests.*
- (1) Perform the squelch sensitivity and retransmit test with the equipment connected in a standard receiver test setup (para 7-5 and fig. 7-8), except set the rf signal level at the RT-841/PRC-77 coaxial ANT input to 0.5 microvolt, the RT-841/PRC-77 function switch to SQUELCH, and modulate the AN/URM-103 simultaneously at 1,000 cps and 150 cps as described in (2) through (5) below.
  - (2) Set the AN/URM-127 set A to 1,000 cps (using the AN/USM-207 to check the frequency) and adjust its output level for a 10-kc deviation on the AN/URM-103.
  - (3) Adjust the AN/URM-103 frequency for minimum distortion as checked on the TS-723B/U.
  - (4) Set signal adder switch S1 to OFF and S2 to ON. Adjust the level of set B AN/URM-127 for 3-kc deviation on the AN/URM-103 modulation meter; use a 10-second count on the AN/USM-207 to adjust the output frequency of the AN/URM-127 set B to 150 cps  $\pm 0.5$ .
  - (5) Set signal adder switches S1 and S2 to ON.
  - (6) Set the RT-841/PRC-77 function switch to RETRANS. The test assembly RETRANSMIT lamp should light and the TS-723B/U (used as a vacuum-type voltmeter) should indicate receiver audio output. The RETRANSMIT lamp provides a convenient method of monitoring operation of the squelch circuit.
  - (7) Momentarily set the RT-841/PRC-77 function switch of OFF and then back to RETRANS to verify that the receiver will unsquelch (RETRANSMIT lamp lighted) with an RF input level of 0.5 microvolt.
  - (8) Slowly decrease the rf input level at the RT-841/PRC-77 coaxial ANT

input to 0.35 microvolt. The receiver should remain unscelched.

- (9) Disconnect the AN/URM-103 RF output from the receiver coaxial ANT input. The receiver should squelch, the lamp associated with the test assembly should go out, and the TS-723B/U (used as a vacuum-tube voltmeter) should indicate no receiver audio output.
- (10) Set signal adder switch S2 to OFF and increase the 1,000-cps modulation to produce a 15-kc deviation. Set the rf level at the RT-841/PRC-77 coaxial ANT jack to 10 microvolts. The receiver should be squelched (with no audio output).
- (11) With signal adder switch S2 set to OFF, decrease the 1,000-cps modulation to produce a 12-kc deviation and set the rf level at the RT-841/PRC-77 coaxial ANT jack to 10 microvolts. Set signal adder switch S2 to ON and the receiver should unscelch.
- (12) Repeat the procedures given in (2) through (11) above at a test frequency of 53.00 mc.

e. *Catching Range Test.*

- (1) Perform the catching range test with the equipment connected in a standard receiver test setup (para 7-5 and fig. 7-8), except set the AN/URM-103 and the RT-841/PRC-77 to 31.50 mc. Place the RT-PRC-77 upside down for this test.

*Caution:* Check to see that the RT-841/PRC-77 is set to a frequency ending in 50 (XX.50) when disengaging the coupling in the procedure given in (2) below; otherwise the coupling may become damaged.

- (2) Disengage the mechanical coupling finger (fig. 3-2). This disables the crystal switching assembly from module A40. To disengage the coupling, fabricate a tool from a piece of sheet metal that measures 1 by 4 inches and is between 0.018 and 0.035 inch thick (20 to 26 gage). Insert one end of the sheet metal tool into the space between module A40A and the brass wheel-like part of the coupling.
- (3) Adjust the RT-841/PRC-77 to a frequency 50-kc higher than its current setting.
- (4) Momentarily set the RT-841/PRC-77 function switch to OFF, back to ON, and then verify the receiver audio output by observing the oscilloscope and the TS-723B/U (used as a vacuum-tube voltmeter) indications.
- (5) Repeat the procedures given in (3) and (4) above until a frequency setting produces no audio output within 3 seconds, or until a frequency of 31.95 mc is reached. Record the maximum frequency that produces an audio

output.

- (6) Adjust the RT-841/PRC-77 to 31.50 mc and repeat the procedures given in (3) and (4) above except *reduce* the frequency by 50.kc for each successive step until the audio output is not obtained or until a frequency of 31.00 mc is reached. Record the minimum frequency that produces an audio output.
- (7) Withdraw the decoupling tool and rotate the kilocycle frequency selector to 50 to reengage the coupling.
- (8) Adjust the RT-841/PRC-77 to 51.50 mc and disengage the coupling (2) above).
- (9) Repeat the procedures given in (3) and (4) above until a frequency produces no audio output within 3 seconds or until a frequency of 51.95 mc is reached. Record the maximum frequency that produces an audio output.
- (10) Adjust the RT-841PRC-77 to 51.50 mc and repeat the procedures given in (3) and (4) above except reduce the frequency for each successive step until the audio output is not obtained or until a frequency of 51.00 mc is reached. Record the minimum frequency that produces an audio output.
- (11) Withdraw the decoupling tool and rotate the kilocycle frequency selector to 50 to reengage the coupling.
- (12) Evaluate the test results. At both test frequencies (31.50 and 51.50 mc, the minimum acceptable catching range is 750 kc with at least 300 kc on each side of the test frequen-

f. *Selectivity Test.*

- (1) Perform the selectivity test with the equipment connected in a standard receiver test setup (para 7-5 and fig. 7-8), except disconnect test cable No. 9 from the AN/URM-103 output and connect it to the Variable Attenuator, Hewlett-Packard Model HP-355D (HP-355D) output. Monitor the RF voltage at A21ATP1 with the AN/URM-145.
- (2) Set the HP-355D for 70 db of attenuation.
- (3) Adjust the AN/USM-44 for a 41.00-mc continuous wave signal and tune for a maximum indication on the AN/URM-145.
- (4) Increase the RF output of the AN/USM-44 to the point where limiting just starts (where an increase in the AN/USM-44 output does not increase the reading on the AN/URM-145).
- (5) Reduce the AN/USM-44 RF output for an indication on the AN/URM-145 that is 6 db below the limiting level. Sweep the AN/USM-44 frequency across the selectivity passband and select the frequency that provides the highest peak. Readjust the

AN/USM-44 output level so that the selected peak is 6 db below the limiting level.

- (6) Determine the passband irregularities and the 6-db down points. The passband irregularities should be within 2 db and the 6-db down points should be at least 32-kc apart. Use the AN/USM-207 to determine the AN/USM-44 frequency at the 6-db points. Disconnect test cable No. 9 from the HP-355D input and reconnect cable No. 9 to the AN/USM-207 FREQ. A input.
- (7) Set the AN/USM-44 to the frequency of the highest peak of the selectivity passband and to an output level 6 db above the noise level. (Read the noise level on the AN/URM-145 with the AN/USM-44 output at zero; then increase the AN/USM-44 RF output until a 6-db increase is indicated by the AN/URM-145.)
- (8) Remove the 60-db attenuation from the HP-355D and locate the two frequencies that produce the same output level (6 db above

noise) as read on the AN/URM-145 ((7) above). Determine and record the frequencies by use of the AN/USM-207. The two recorded frequencies are the 60-db down points. They should be less than 100-kc apart.

**Note.** The receiver system tests are now completed. Perform the procedures indicated in paragraph 7-6 before proceeding.

#### 7-8. Transmitter System Tests, Radio Set AN/PRC-77

**Caution:** Do not change BAND, MC, or KC controls with *xmtr* keyed.

##### a. Power Output Test.

- (1) Perform the power output test with the equipment connected in a standard transmitter test setup (para 7-6 and fig. 7-9), except set the AN/URM-127 output level to zero and the RT-841/PRC-77 frequency to 30.00 mc and disconnect the RF attenuator from the UG-274B/U adapter.
- (2) Set the test assembly TRANSMITTER CARRIER switch to ON.

- (3) Record the power output indicated on the AN/URM-120.
- (4) Set the test assembly TRANSMITTER CARRIER switch to OFF.
- (5) Repeat the procedures given in (2), (3), and (4) above at 42.00, 52.95, 53.00, 65.00, and 75.95 mc.
- (6) Evaluate the test results. Minimum acceptable power output is as follows:  
30.00 – 49.95 mc: 1.75 w;  
50.00 – 70.95 mc: 1.50 w; and  
71.00 – 75.95 mc: 1.0 w.

*b. Frequency Accuracy Test.*

- (1) Perform the frequency accuracy test with the equipment connected in a standard transmitter test setup (para 7-6 and fig. 7-9), except set the AN/URM-127 output level to zero, and the RT-841/PRC-77 frequency to 75.00 mc.
- (2) Set the test assembly TRANSMITTER CARRIER switch to ON.
- (3) Record the selected frequency (from the RT-841/PRC-77 REC-TRANS FREQUENCY indicators) and the output frequency as indicated by the AN/USM-207.
- (4) Set the test assembly TRANSMITTER CARRIER switch to OFF.
- (5) Repeat the procedures given in (2), (3), and (4) above at 75.05, 75.10, 75.20, 75.30, 75.40, 75.50, 75.60, 75.70, 75.80, and 75.90 mc.
- (6) Repeat the frequency check (5) above in reverse order (75.95 mc first).
- (7) Turn the megacycles control from 75 to 53, back to 75, and then repeat the procedures given in (2), (3), and (4) above.
- (8) Return the RT-841/PRC-77 to 75.00 mc, set the power supply to 10.00 volts, and repeat the procedures given in (2) through (5) above.
- (9) Return the RT-841/PRC-77 to 75.00 mc, set the power supply to 15.00 volts, and repeat the procedures given in (2) through (5) above.

- (10) Evaluate the test results. Maximum acceptable frequency inaccuracy is  $\pm 3.5$  kc for all tests.

*c. Tone Oscillator Frequency and Modulation Tests.*

- (1) Perform the tone oscillator frequency and modulation tests with the equipment connected in a standard transmitter test setup (para 7-6 and fig. 7-9), except set the AN/URM-127 output level to zero, connect test cable No. 6 from the AN/USM-207 FREQ. A input to the Carrier Deviation Meter, Marconi Model TF-791D (TF-791D) L.F. output, and set the AN/USM-207 for a 10-second count.
- (2) Set the test assembly TRANSMITTER CARRIER switch to ON.
- (3) Record the deviation indicated by the TF-791D and the frequency indicated by the AN/USM-207.
- (4) Set the test assembly TRANSMITTER CARRIER switch to OFF.
- (5) Evaluate the test results. Acceptable deviation is 3 kc  $\pm 0.5$  and acceptable frequency is 150 cps  $\pm 1.5$  (in a 10-second count).

*d. Modulation Capability and Deviation Tests.*

- (1) Perform the modulation capability and deviation tests with the equipment connected in a standard transmitter test setup (para 7-6 and fig. 7-9). Set the RT-841/PRC-77 frequency to 47.00 mc, ground A23J3 with test cable No. 1, and adjust the AN/URM-127 output. Adjust the TRANSMITTER AUDIO INPUT LEVEL control for a 1.4-millivolt reading on the ME-30A/U, as required.
- (2) Set the test assembly TRANSMITTER CARRIER switch to ON.
- (3) Record the RF and audio frequencies being used and the deviation indicated on the TF-791D.
- (4) Set the test assembly TRANSMITTER CARRIER switch to OFF.

- (5) Repeat the procedures given in (2), (3), and (4) above with modulation frequencies of 300, 2,000, and 3,000 Hz.
- (6) Repeat the procedures given in (2), (3), and (4) above with the RT-841/PRC-77 set to 60.00 MHz and modulation frequencies of 300, 1,000, 2,000, and 3,000 Hz.
- (7) Evaluate the test results. At both 47.00 and 60.00 MHz, acceptable deviation must be within the limits shown in the chart below:

| Modulation frequency (Hz) | Acceptable deviation (kHz) |
|---------------------------|----------------------------|
| 300                       | 10 + 3, -4                 |
| 1,000                     | 10 ±2                      |
| 2,000                     | 10 ±3                      |
| 3,000                     | 10 ±3                      |

e. *Sidetone Test.*

- (1) Perform the sidetone test with the equipment connected in a standard transmitter setup (para 7-6 and fig. 7-9), except set the RT-841/PRC-77 VOLUME control fully clockwise.
- (2) Set the test assembly TRANSMITTER CARRIER switch to ON. The TS-732B/U (used as a vacuum-tube voltmeter) should indicate no more than 2.0 volts ac.
- (3) Set the test assembly TRANSMITTER CARRIER switch to OFF.

f. *Antenna Loading Tests.*

- (1) Perform the antenna loading test with the equipment connected in a standard transmitter test setup (para 7-6 and fig. 7-9), except disconnect test cable No. 9 from the RT-841/PRC-77 coaxial ANT connector, set the RT-841/PRC-77 to 30.00 MHz, install the transmitter long antenna 30-MHz load as described in (2), (3), and (4) below, and connect the ME-26B/U in parallel with the resistor of the transmitter load (fig. 3-16).
- (2) Loosen a mounting screw from one corner of the whip ANT jack and install antenna load adapter No. 1 (ground connection).

**Caution:** The accuracy of this test depends on how closely the antenna loads meet the required load characteristic. The resistance should have no reactive component. For example: the resistor, with an ME-26B/U across it, should be measured on an admittance meter and the reactive component should be resonated out with shunt components.

- (3) Install antenna load adapter No. 2 in the whip ANT jack; make sure it operates the microswitch in the ANT jack housing. (Use the brass adapter nut for short antenna tests only.)
- (4) Install the selected transmitter load between the spade lug and alligator clip as indicated in figure 3-16. Always ground the resistor end of the transmitter load. The transmitter long antenna load characteristics and minimum acceptable rf voltages developed across the resistor of each load are identified in the chart below. See paragraph 3-19 for adjustments.

| Test frequency (MHz) | Long antenna loading Load characteristics |                  | Minimum voltage (rms) |
|----------------------|---|------------------|-----------------------|
|                      | Resistance (ohms)                         | Capacitance (pf) |                       |
| 30.00 -----          | 180                                       | 0                | 9                     |
| 52.50 -----          | 619                                       | 0                | 11                    |
| 53.50 -----          | 400                                       | 8                | 16                    |
| 75.00 -----          | 61.9                                      | 70               | 8                     |

- (5) Set the test assembly TRANSMITTER CARRIER switch to ON and read the RF voltage across the resistor of the transmitter load with the ME-26B/U. The minimum acceptable reading is listed in the chart in (4) above.
- (6) Set the test assembly TRANSMITTER CARRIER switch to OFF.
- (7) Repeat the procedures in (4), (5), and (6) above at 52.50, 53.50, and 75.00 MHz. Use the chart given in (4) above to correlate the required test frequency, transmitter load, and minimum acceptable voltage.
- (8) Unscrew and remove antenna load adapter No. 2.
- (9) Install the brass adapter nut on antenna load adapter No. 2 and reinstall the adapter in the whip ANT jack.

**Note.** Load adapter No. 2, with the brass nut, should not energize the ANT housing microswitch.

- (10) Install the short antenna 30-MHz transmitter load between the spade lug and alligator clip; make sure that the resistor end of the load is grounded. Transmitter short antenna characteristics and minimum acceptable RF voltage are identified in the chart below, see paragraph 3-19 for adjustments.

| Test frequency (MHz) | Short antenna loading |                  | Minimum voltage (rms) |
|----------------------|-----------------------|------------------|-----------------------|
|                      | Resistance (ohms)     | Capacitance (pf) |                       |
| 30.00                | 26.1                  | 12               | 4                     |
| 52.50                | 56.2                  | 18               | 7                     |
| 53.50                | 56.2                  | 18               | 5                     |
| 75.00                | 61.9                  | 82               | 7                     |

- (11) Set the test assembly TRANSMITTER CARRIER switch to ON and read the RF voltage across the resistor of the transmitter load with the ME-26B/U. The minimum acceptable reading is listed in the chart in (10) above.
- (12) Set the test assembly TRANSMITTER CARRIER switch to OFF.
- (13) Repeat the procedures given in (10), (11), and (12) above at 52.50, 53.50, and 75.00 MHz. Use the chart given in (10) above to correlate test frequency, transmitter load, and minimum acceptable voltage.
- (14) Remove the antenna load adapters and replace the screw in the corner of the whip ANT jack.

*g. Distortion Test.*

- (1) Perform the distortion test with the equipment connected in a standard transmitter test setup (para 7-6 and fig. 7-9), except connect test cable No. 1 from test point A23J3 to chassis ground. The TF-791D is used as a receiver for this test; therefore, a known good RT-841/PRC-77 receiver may be substituted for the TF-791D.
- (2) Set the test assembly TRANSMITTER CARRIER switch to ON.
- (3) Tune the TS-723B/U for minimum distortion.

- (4) Read the distortion on the TS-723B/U. Maximum allowable distortion is 10 percent.
- (5) Set the test assembly TRANSMITTER CARRIER switch to OFF.

**7-9. Miscellaneous System Tests and Inspection, Radio Set AN/PRC-77**

*a. Tests.*

- (1) Perform the miscellaneous system tests with the equipment connected in a standard transmitter test setup (para 7-6 and fig. 7-9).
- (2) Connect Handset H-189/GR to one of the AUDIO connectors on the front panel of the RT-841/PRC-77.
- (3) Press the H-189/GR keying button and speak into the microphone. The AN/URM-120, TF-791D, and AN/USM-140 should indicate transmitter output, and sidetone should be heard from the earphone.
- (4) Connect the H-189/GR to the other AUDIO connector and repeat the procedure given in (3) above.
- (5) Set the RT-841/PRC-77 function selector switch to SQUELCH and repeat the procedure given in (3) above.
- (6) Set the RT-841/PRC-77 function selector switch to RETRANS and repeat the procedure given in (3) above. In this case, no sidetone should be heard from the earphone.
- (7) Set the RT-841/PRC-77 function selector switch to LITE and observe that the RECYCLED FREQUENCY dials are lighted.
- (8) With the ME-26B/U, measure the terminal voltages of battery connector J4. Voltage measurements between terminals and ground should be 0 volt at terminal A, and 12.5 volts at terminal B.

*b. Inspection.*

- (1) Perform the inspection procedure as a final step before replacing the RT-841/PRC-77 case.
- (2) Inspect the RT-841/PRC-77 PRESET knobs. Operate the elements of the presetting feature to assure proper operation.

- (3) Inspect the gasket at the rear of the front panel of the RT-841/PRC-77. It should be resilient, properly seated in its channel, and in general good condition.
- (4) Inspect the O-ring on J4. It should be resilient, properly seated in its channel, and in general good condition. When replacing the RT-841/PRC-77 case, be sure that the

O-ring is not damaged and that the case is properly seated against the gasket on the rear of the front panel. If either gasket is in poor condition or not properly seated, the unit will not be waterproof.

- (5) Replace the RT-841/PRC-77 in its case. Inspect the four captive screws before engaging them. Engage and tighten the captive screws.

**Section II. SCHEMATICS AND BLOCK DIAGRAMS**

**7-10. General**

This section contains the fold-out schematics and some of the block diagrams for Radio Set AN/PRC-77. All text pertaining to the function of this set is given in chapter 2.

**7-11. Troubleshooting Data**

The following information will aid the repairman in the location of the correct schematic diagram and in parts location:

| <i>Reference</i>  | <i>Figure No.</i> | <i>Reference</i>   | <i>Figure No.</i> |
|---|-------------------|--|-------------------|
| <i>a. Receive Mode.</i>   |                   | <i>b. Transmit Mode.</i>   |                   |
| (1) RT-841/PRC-77 block diagram, receiver mode signal path.                           | 7-1               | (1) RT-841/PRC-77 block diagram, transmit mode signal path.                            | 7-2               |
| (2) Power distribution, receive condition, simplified schematic diagram.              | 7-25              | (2) Wideband transmission mode, block diagrams.  | 2-1               |
| (3) RT-841/PRC-77 receive test setup, block diagram (for direct support maintenance). | 3-13              | (3) Power distribution, transmit condition, simplified schematic diagram.              | 7-26              |
| (4) General support test setups:  |                   | (4) RT-841/PRC-77 transmit test setup, block diagram (for direct support maintenance). | 3-14              |
| (a) Receiver audio output test setup.   | 3-19              | (5) General support test setups:   |                   |
| (b) Receiver catching range test setup.   | 4-17              | (a) Frequency accuracy test setup.   | 4-13              |
| (c) Receiver distortion test setup.   | 4-19              | (b) Maximum signal plus noise-to-noise ratio test setup.                               | 4-14              |
| (d) Receiver sensitivity test setup.  | 4-16              | (c) System distortion test setup.  | 4-12              |
| (e) Squelch sensitivity.  | 3-20              | (d) Tone oscillator frequency and transmitter modulation test setup.                   | 4-11              |
|   |                   | (e) Transmitter deviation test setup.  | 4-20              |
|   |                   | (f) Transmitter power output test setup.   | 3-17              |
|   |                   | <i>c. Frequency Synthesizer System.</i>  |                   |
|   |                   | (1) Frequency synthesizer system, block diagram.                                       | 7-17              |



| <i>Reference</i>  | <i>Figure No.</i> |   | <i>Figure No.</i> |
|---|-------------------|---|-------------------|
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|   |                   | (a) Modules removed.                                      | 3-4               |
|   |                   | (b) Audio and control chassis open.                       | 3-5               |
|   |                   | (c) Test point and alignment control locations.           | 3-7               |
| d. <i>Overall chassis Interconnection Diagram.</i>                        | 7-18              | (d) Audio and control chassis open, test point locations. | 3-8               |
| e. <i>Receiver-Transmitter, Radio RT-841/PRC-77 illustrations.</i>        |                   | (3) Tuning capacitor assembly.                            | 4-2               |
| (1) <i>Bottom view.</i>   | 3-1               | (4) Tuning knob assembly.                                 | 4-6               |
| (a) Modules removed.  | 3-2               | (5) Front panel, tuning knobs removed.                    | 4-4               |
| (b) Disassembly.  | 4-1               | (6) Front panel, rear view.                               | 4-5               |
| (c) Test point and alignment control locations.                           | 3-6               | (7) Selector mechanism, exploded view.                    | 7-27              |
| (d) Main chassis, bottom view.  | 4-3               |   |                   |

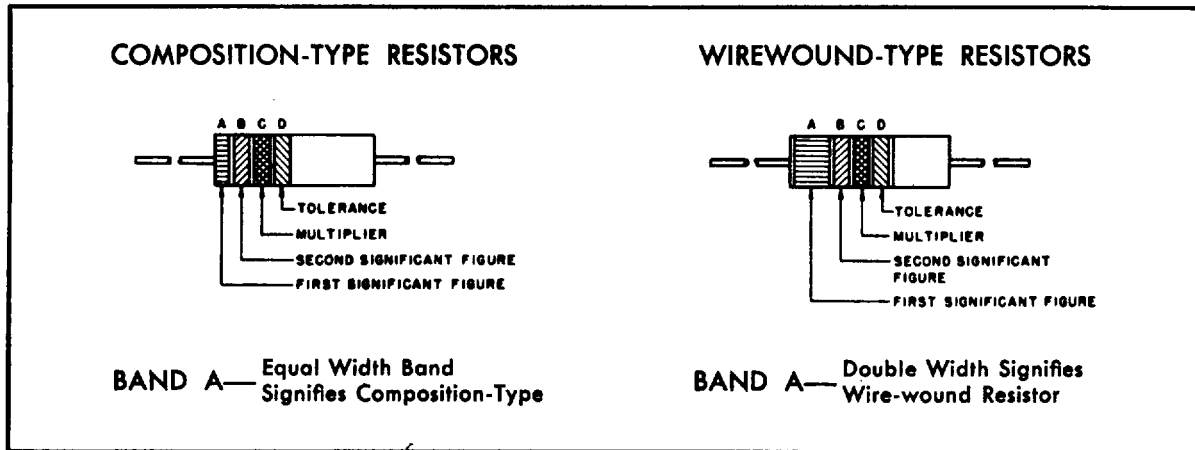
*f. Module Reference Diagrams.*

| <i>Module symbol</i> | <i>Reference</i>   | <i>Figure No.</i> |
|----------------------|--|-------------------|
| A11A                 | Frequency synthesizer system discriminator module A11A, schematic diagram. | 2-15              |
| A12A                 | Frequency synthesizer system second mixer module A12A, schematic diagram.  | 2-13              |
| A16A                 | Voltage regulator module A16A, schematic diagram                           | 2-16              |
| A17A                 | Phase comparator module A17A, schematic diagram                            | 2-14              |
| A18A                 | 5.6-megacycle IF amplifier module A18A, schematic diagram.                 | 7-14              |
| A21A                 | Receiver IF amplifier module A21A, schematic diagram.                      | 7-20              |
| A22                  | Speech amplifier limiter module A22, schematic diagram.                    | 2-4               |
| A23                  | Tone generator module A23, schematic diagram.                              | 7-23              |
| A28                  | Antenna loading network module A28, schematic diagram.                     | 2-9               |
| A31                  | Transmitter frequency control module A31, schematic diagram.               | 7-12              |
| A32                  | Receiver input module A32, schematic diagram.                              | 2-2               |
| A33                  | First RF amplifier module A33, schematic diagram.                          | 7-29              |
| A34                  | Second RF amplifier module A34, schematic diagram.                         | 7-19              |
| A35A                 | Receiver mixer module A35A, schematic diagram.                             | 2-3               |
| A36                  | Transmitter power amplifier module A36, schematic diagram.                 | 7-18              |
| A37                  | Transmitter intermediate power amplifier module A37, schematic diagram.    | 2-8               |
| A38                  | Transmitter variable frequency oscillator module A38, schematic diagram.   | 7-28              |
| A39A                 | Synthesizer variable frequency oscillator module A39A. schematic diagram.  | 2-5               |
| A40A                 | Module A40, exploded.  | 5-1               |
|                      | Interval oscillator module A40A, schematic diagram.                        | 7-24              |
| A43                  | 53-megacycle filter module A43, schematic diagram.                         | 2-12              |
| A44A                 | Frequency synthesizer system first mixer module A44A, schematic diagram.   | 2-10              |
| A45A                 | One-megacycle spectrum generator module A45A, schematic diagram.           | 2-11              |
| A50                  | Transmitter mixer module A50, schematic diagram.                           | 2-6               |
| A54A                 | Tone squelch module A54A, schematic diagram.                               | 7-22              |
| A55                  | Receiver audio amplifier module A55, schematic diagram.                    | 7-21              |

**Note.** The schematic diagram of modulator attenuator module A60 is contained on figure 7-4



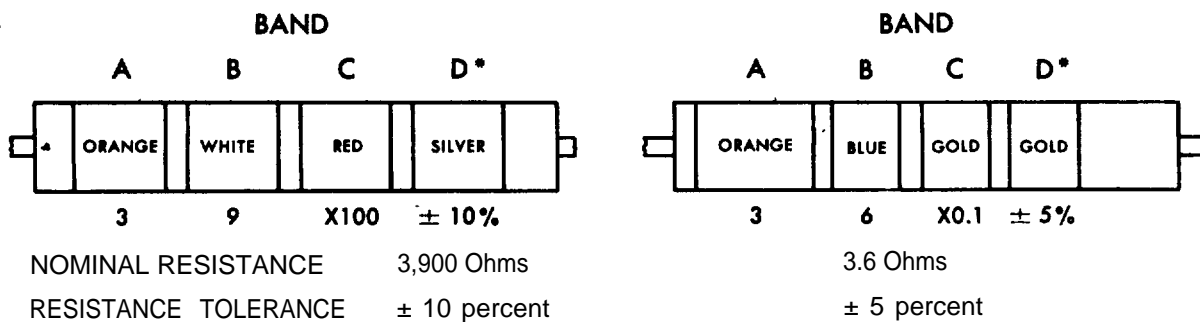
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS



COLOR CODE TABLE

| BAND A          |                          | BAND B          |                           | BAND C |            | BAND D* |                                |
|-----------------|--------------------------|-----------------|---------------------------|--------|------------|---------|--------------------------------|
| COLOR           | FIRST SIGNIFICANT FIGURE | COLOR           | SECOND SIGNIFICANT FIGURE | COLOR  | MULTIPLIER | COLOR   | RESISTANCE TOLERANCE (PERCENT) |
| BLACK           | 0                        | BLACK           | 0                         | BLACK  | 1          |         |                                |
| BROWN           | 1                        | BROWN           | 1                         | BROWN  | 10         |         |                                |
| RED             | 2                        | RED             | 2                         | RED    | 100        |         |                                |
| ORANGE          | 3                        | ORANGE          | 3                         | ORANGE | 1,000      |         |                                |
| YELLOW          | 4                        | YELLOW          | 4                         | YELLOW | 10,000     | SILVER  | ± 10                           |
| GREEN           | 5                        | GREEN           | 5                         | GREEN  | 100,000    | GOLD    | ± 5                            |
| BLUE            | 6                        | BLUE            | 6                         | BLUE   | 1,000,000  |         |                                |
| PURPLE (VIOLET) | 7                        | PURPLE (VIOLET) | 7                         |        |            |         |                                |
| GRAY            | 8                        | GRAY            | 8                         | SILVER | 0.01       |         |                                |
| WHITE           | 9                        | WHITE           | 9                         | GOLD   | 0.1        |         |                                |

EXAMPLES OF COLOR CODING

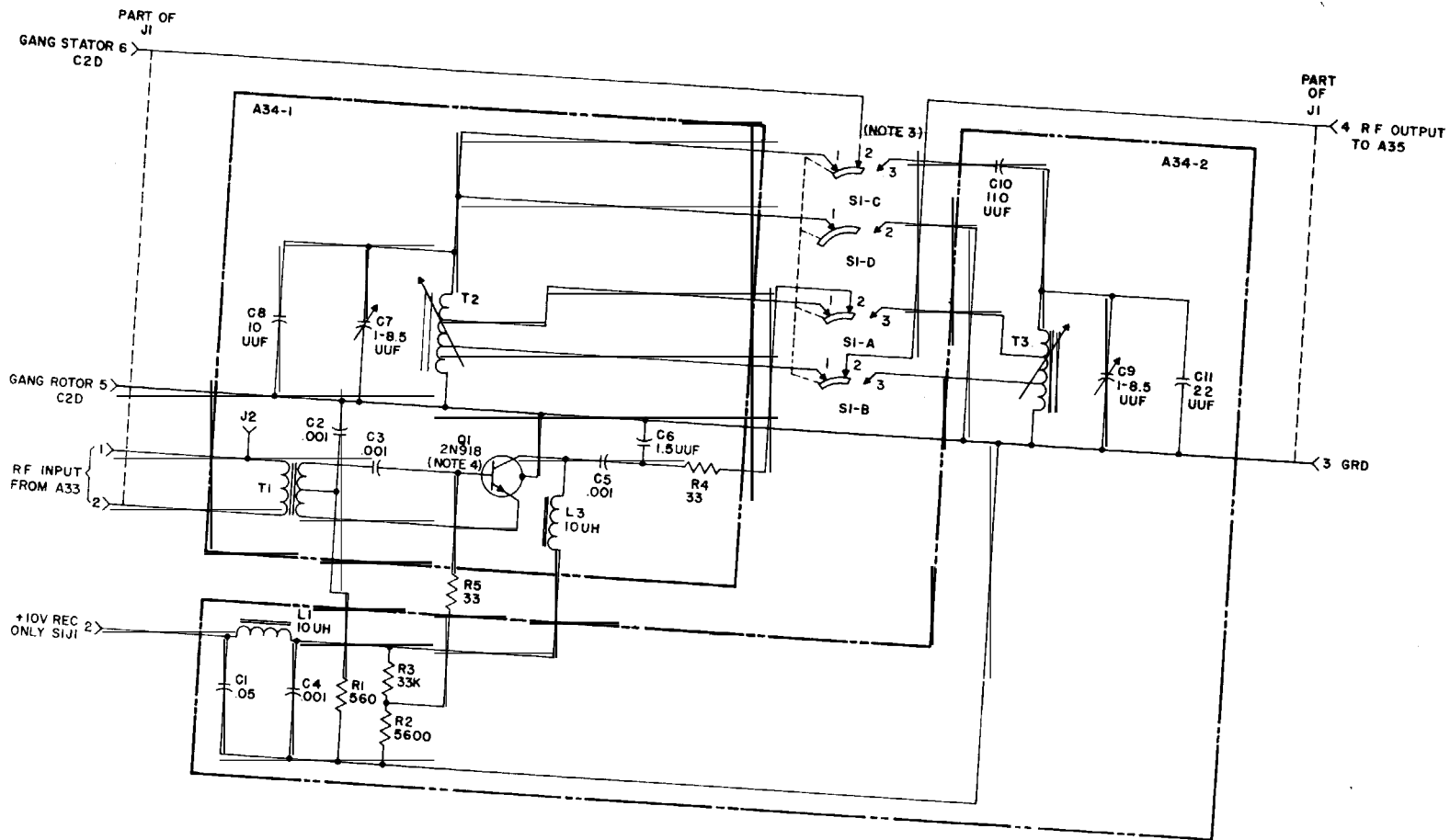


\*If Band D is omitted, the resistor tolerance is ± 20%, and the resistor is not Mil-Std.

TM5820-667-35-101

Figure 7-10. Color code marking for military standard resistors.





Change 1 7-41

- NOTES:
1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
  2. REFERENCE DESIGNATIONS ARE ABBREVIATED, PREFIX DESIGNATIONS WITH A34.
  3. SWITCH SI IS SHOWN IN THE POSITION RESULTING WHEN THE BAND SWITCH CONTROL (ON THE FRONT PANEL) IS SET AT [30-52] FOR LOW BAND OPERATION.

4. Q1 IN ACCORDANCE WITH SM-B-620789.

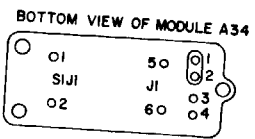


Figure 7-19. Second RF amplifier module A34. schematic diagram.

EL5820-667-35-CI-TM-55



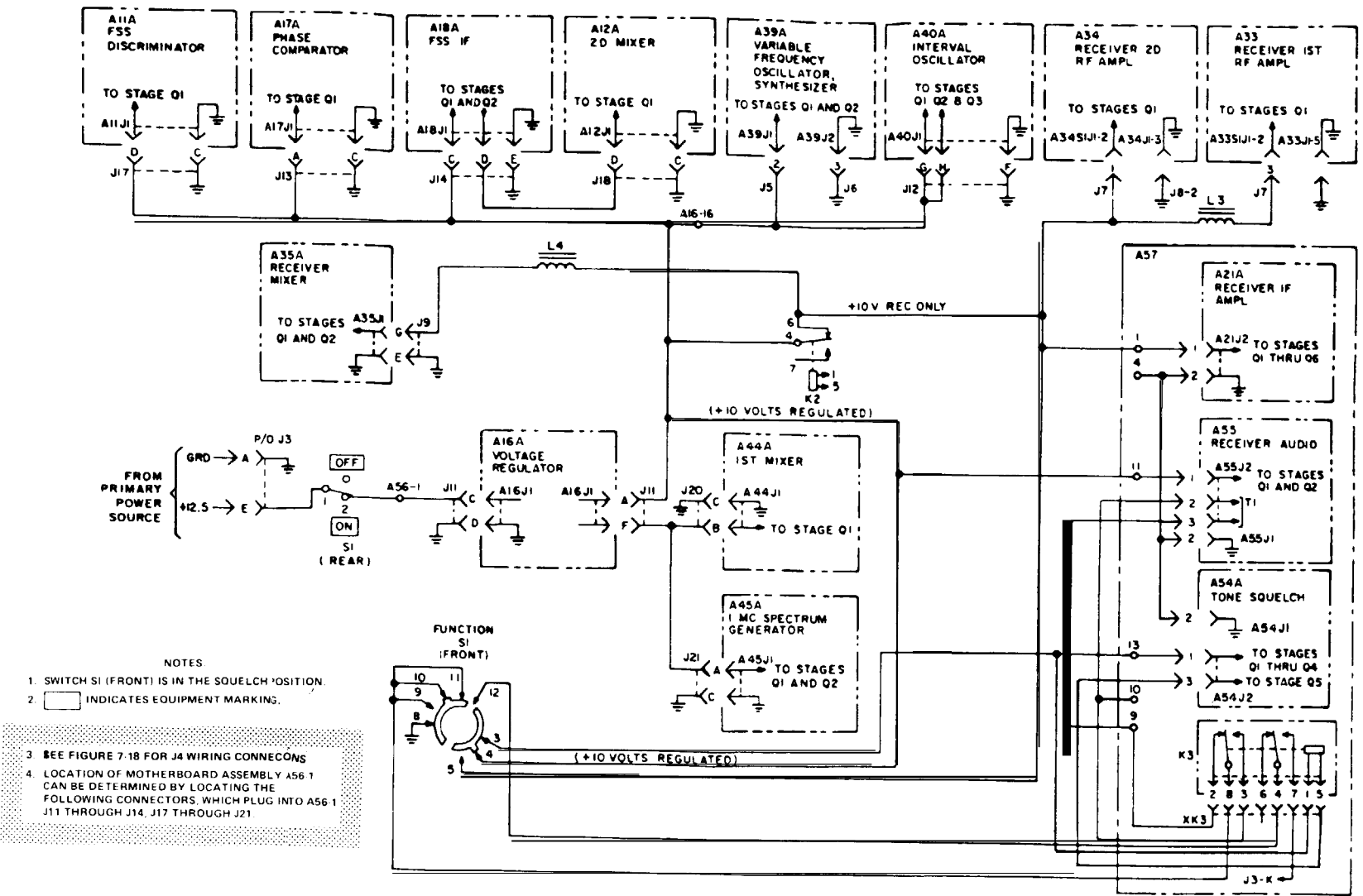
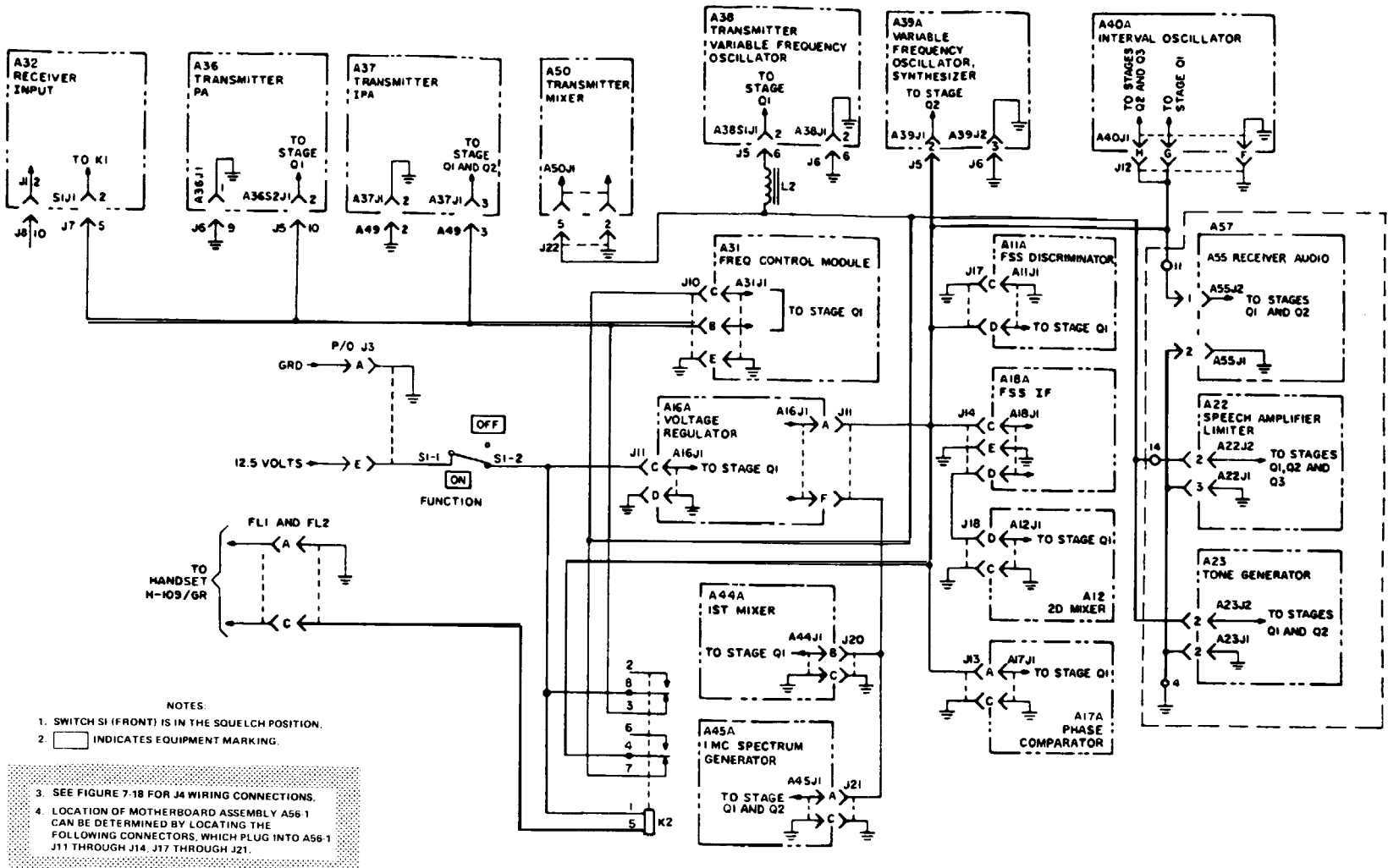


Figure 7-25. Power distribution, receive condition, simplified schematic diagram.





Figure 7-26. Power distribution, transmit condition, simplified schematic diagram.





## APPENDIX

### REFERENCES

The following is a list of applicable references available to the maintenance repair technician of Radio Set AN/PRC-77.

|                   |   |
|-------------------|---|
| DA Pam 310-1      | Consolidated Index of Army Publications and Blank Forms.  |
| DA Pam 738-750    | The Army Maintenance Management System (TAMMS).   |
| SB 11-6           | FSC Class 6135: Primary Battery Supply Data.  |
| SB 38-100         | Preservation, Packaging, Packing and Marking Materials, Supplies and Equipment Used by the Army.  |
| SF 361            | Discrepancy in Shipment Report (DISREP).  |
| SF 364            | Report of Discrepancy (ROD).  |
| SF 368            | Quality Deficiency Report (Category II).  |
| TA 11-17          | Signal Field Maintenance Shops.   |
| TA 11-100 (11-17) | Allowances of Signal Corps Expendable Supplies for Signal Field Field Maintenance Shops.  |
| TB SIG 291/       | Safety Measure to be Observed When Installing and Using Whip Antennas, Field-Type Masts, Towers and Antennas and Metal Poles That are Used with Communications, Radar and Direction Finder Equipment.               |
| TM 11-5551D       | RF Signal Generator Set AN/URM-25D.   |
| TM 11-5820-667-12 | Operator's and Organizational Maintenance Manual: Radio Set AN/PRC-77 (NSN 5820-00-930-3724) (Including Receiver-Transmitter, Radio RT-841/PRC-77) (5820-00-930-3725).  |
| TM 11-5965-280-15 | Operator's, Organizational, Direct Support, General Support and Depot Maintenance Manual (Including Repair Parts and Special Tools List): Handset H-189/GR (NSN 5965-00-069-8886).                                  |
| TM 11-6625-200-15 | Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual: Multimeters ME-26A/U (NSN 6625-00-360-2493), ME-26B/U and ME-26 C/U (6625-00-646-9409), and ME-26D/U (6625-00-913-9781). |
| TM 11-6625-255-14 | Operator's, Organizational, Direct Support and General Support Maintenance Manual: Spectrum Analyzer TS-723/U, TS-723A/U, TS-723B/U, TS-723C/U and TS-723D/U (NSN 6625-00-668-9418).                                |
| TM 11-6625-320-12 | Operator's and Organizational Maintenance Manual: Voltmeter, Meter ME-30A/U and Voltmeters, Electronic ME-30B/U, ME-30C/U, and ME-30E/U.  |
| TM 11-6625-366-15 | Operator's, Organizational, Direct Support, General Support and Depot Maintenance Manual: Multimeter TS-352B/U (NSN 6625-00-553-0142).  |
| TM 11-6625-400-12 | Operator's and Organizational Maintenance Manual for Meter, Modulation ME-57/U.   |
| TM 11-6625-446-15 | Operator's, Organizational, Direct Support, General Support and Depot Maintenance Manual for Wattmeter, AN/URM-120 (NSN 6625-00-813-8430).  |
| TM 11-6625-508-10 | Operator's Manual: Signal Generators AN/USM-44 and AN/USM-44A.  |
| TM 11-6625-524-14 | Operator's, Organizational and Field Maintenance Manual: Voltmeter, Electronic AN/URM-145.  |
| TM 11-6625-535-15 | Operator's, Organizational, DS, GS, and Depot Maintenance Manual: Oscilloscope AN/USM-140A.   |

- TM 11-6625 -535-15-1 Organizational, Direct Support, General Support, and Depot Maintenance Manual (Including Repair Parts and Special Tool Lists): Oscilloscopes AN/USM-140B, AN/USM-140C, AN/USM-141A and AN/USM-141B.
- TM 11-6625-586-12 Operator's and Organizational Maintenance Manual: Signal Generator AN/URM-103.
- TM 11-6625-617-12 Operator's and Organizational Maintenance Manual Including Repair Parts List: Power Supply PP-3514/U.
- TM 11-6625-700-10 Operator's Manual: Digital Readout, Electronic Counter AN/USM-207 (NSN 6625-00-911-6368).
- TM 11-6625-1703-15 Operator's, Organizational, Direct Support, General Support and Depot Maintenance Manual: Oscilloscope AN/USM-281A (NSN 6625-00-228-2201).
- TM 750-244-2 Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

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