

MIL-R-55499B(EL)

30 August 1974

SUPERSEDING

MIL-R-55499A(EL)

30 September 1969

## MILITARY SPECIFICATION

## RADIO SET AN/PRC-77( ) AND (UNITS OF)

This specification is approved for use by all Departments and Agencies of the Department of Defense.

## 1. SCOPE

1.1 This specification covers the following units of one type of radio set designated as Radio Set AN/PRC-77( ):

Receiver-Transmitter RT-841( )/PRC-77  
 Support, Antenna AB-591( )/PRC-25  
 Antenna AT-892( )/PRC-25  
 Bag, Cotton Duck CW-503( )/PRC-25  
 Harness, Electrical Equipment ST-138( )/PRC-25

The radio set is a portable man-pack, battery operated, frequency-modulated (fm) equipment which provides voice communication over a frequency range of 30.00 to 75.95 megahertz (MHz). This equipment is also used for vehicular operation (See 6.1 and 6.3).

1.2 Appendices: The appendices listed below form a part of this specification:

a. Production Burn-in (Debugging) Plan for Radio Set AN/PRC-77( ), Receiver-Transmitter RT-841( )/PRC-77 and modules thereof.

b. Reliability Test Plan for Radio Set AN/PRC-77( ).

## 2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

## SPECIFICATIONS

## Federal

L-P-378

NN-P-71

PPP-B-585

PPP-B-601

Plastic Sheet & Strip, Thin Gauge, Polyolefin  
Pallet, Materials Handling, Wood

Box, Wood, Wire Bound

Box, Wood, Cleated-Plywood

FSC 5820

## MIL-R-55499B(EL)

PPP-B-621	Box, Wood, Nailed and Lock Corner
PPP-B-636	Box, Fiberboard
PPP-B-640	Boxes, Folding, Fiberboard, Corrugated, Triple Wall
PPP-F-320	Fiberboard; Sheet, Stock and Cut Shapes
PPP-P-291	Paperboard, Wrapping, Cushioning
PPP-S-760	Strapping, Nonmetallic (and connectors)
PPP-T-45	Tape, Gummed, Paper, Reinforced and Plain, for Sealing and Securing
PPP-T-76	Tape; Pressure-Sensitive, Adhesive, Paper Water Resistant
PPP-T-97	Tape; Pressure-Sensitive, Adhesive, Filament Reinforced
QQ-S-781	Strapping, Steel, Flat and Seals

## Military

MIL-P-116	Preservation, Methods of
MIL-B-117	Bags, Interior Packaging
MIL-T-152	Treatment, Moisture-and Fungus-Resistant, of Communications Electronic, and Associated Electrical Equipment
MIL-V-173	Varnish, Moisture-and-Fungus-Resistant, for the Treatment of Communications, Electronics, and Associated Electrical Equipment
MIL-T-713	Twine and Tape, Lacing and Tying (for use in Electrical and Electronic Equipment)
MIL-P-11268	Parts, Materials and Processes used in Electronic Equipment
MIL-R-11936	Requirement for and Measurement of Spurious Radiation of 0.55 to 100 MC Radio Transmitters
MIL-M-13231	Marking of Electronic Items
MIL-F-14072	Finishes for Ground Signal Equipment
MIL-S-19500	Transistors, General Specification for
MIL-I-46058	Insulating Compound, Electrical (for Coating Printed Circuit Assemblies)
MIL-P-55110	Printed Wiring Boards
MIL-C-55116	Connectors: Miniature Audio, Five-Pin

## Standards

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage

MIL-R-55499B(EL)

MIL-STD-147	Palletized Unit Loads (40" x 48" 4-Way Partial and 4-Way Pallets)
MIL-STD-169	Extreme-Temperature Cycle
MIL-STD-170	Moisture-Resistance Test Cycle for Ground Signal Equipment
MIL-STD-252	Wired Equipment, Classification of Visual and Mechanical Defects
MIL-STD-461	Electromagnetic Interference Characteristics, Requirements for Equipment
MIL-STD-462	Electromagnetic Interference Characteristics, Measurements of
MIL-STD-726	Packaging Requirements Code
MIL-STD-781	Reliability Tests: Exponential Distribution
MIL-STD-810	Environmental Test Methods

## DRAWINGS

## US Army Electronics Command

SC-A-46439	List of Accessories for Package Tester
SC-DL-85712	Drawing and Data List for Support, Antenna AB-591( )/PRC-25
SC-DL-415680	Drawing and Data List for Connector, Receptacle U-183( )/U
SC-GL-323115	Gage List for Battery Box CY-2562( )/PRC-25
SC-GL-323303	Mechanical Gages for RT-841( )/PRC-77 RCVR-XMTR
SC-DL-447208	Drawing and Data List for Harness Electrical Equipment ST-138( )/PRC-25
SC-DL-447214	Drawing and Data List for Bag, Cotton Duck CW-503( )/PRC-25
SC-DL-447354	Drawing and Data List for Battery Box CY-2562( )/PRC-25
SC-DL-135893	Drawing and Data List for Antenna AT-892( )/PRC-25
SC-DL-448723	Drawing and Data List for Receiver-Transmitter RT-841( )/PRC-77

(Copies of specification, standards and drawings required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS - (See Section 4) The equipment described in 3.1 shall be constructed in accordance with the US Army Electronics Command drawings and applicable documents (Section 2) and shall comply with all the requirements of this specification over the frequency range 30 to 75.95 MHz under the specified operational/environmental conditions.

MIL-R-55499B(EL)

3.1 Description.- Radio Set AN/PRC-77( ) is a short-range, 920 channel, man pack, fm equipment in a watertight case. Receiver-Transmitter, Radio RT-841( )/PRC-77, the principal unit, consists of a panel and chassis assembly, its case, and Battery Box CY-2562( )/PRC-25. The receiver-transmitter may be manually tuned from the front panel to any one of 920 channels within the frequency range of 30.00 MHz to 75.95 MHz inclusive in increments of 50 KHz + 3.5 KHz. The equipment is fully transistorized. Modular construction and printed wiring are employed. In addition to the units covered by this specification, Antenna AT-271( )/PRC and Handset H-189( )/GR are part of Radio Set AN/PRC-77( ).

3.2 First Article Samples.- The contractor shall furnish 14 First Article samples of Radio Set AN/PRC-77( ) for approval if required in the invitation for bids and contract. Ten of the First Article samples shall be subjected to the tests of 4.6.1, 4.6.2, 4.5.1, 4.5.2, and 4.19. Four of the First Article samples shall be subjected to the tests indicated in 4.3 except that these 4 units shall not be subjected to the Reliability Test of 4.19.

3.3 Construction.- The units of Radio Set AN/PRC-77( ), covered by this specification shall be constructed in accordance with the applicable drawing and data list indicated below:

<u>Unit</u>	<u>Drawing and Data List</u>
CY-2562( )/PRC-25	SC-DL-447354
AB-591( )/PRC-25	SC-DL-85712
AT-892( )/PRC-25	SC-DL-135893
CW-503( )/PRC-25	SC-DL-447214
ST-138( )/PRC-25	SC-DL-447208
RT-841( )/PRC-77	SC-DL-448723

Parts, Materials, and Processes specified on USAECOM drawings shall conform with Specification MIL-P-11268.

3.4 Printed Wiring Assemblies.- Materials and processes for printed wiring assemblies shall conform to Specification MIL-P-55110.

3.4.1 Conformal Coatings.- Printed wiring assemblies shall be conformally coated with a coating material which conforms to MIL-I-46058. The coating shall be applied to both sides of the cleaned printed wiring assembly. These assemblies shall be cleaned of flux and other contaminants prior to coating. Cleaning compounds shall have no deleterious effects on any part of the printed wiring assembly. The conformal coating shall be compatible

MIL-R-55499B(EL)

with all parts of the printed wiring assembly and the thickness shall be 0.0035 inch  $\pm$  0.0025 inch. Assemblies having adjustable components shall not have the adjustable portion covered with the coating. Electrical and mechanical mating surfaces such as connector contact points, test points, screw threads, bearing surfaces, etc, shall not be coated.

3.5 Welding.-- Welding shall be in accordance with MIL-P-11268.

3.5.1 Cleaning Prior to Welding.-- Cleaning prior to welding shall be in accordance with MIL-P-11268.

3.5.2 Process.-- Process shall be in accordance with MIL-P-11268.

3.5.3 Cleaning after Welding.-- Cleaning after welding shall be in accordance with MIL-P-11268.

3.6 Semiconductors; Transistor and Diode.-- Semiconductors shall conform to Specification MIL-S-19500(See 4.4).

3.7 Cleaning.--

3.7.1 Parts.-- After fabrication, parts shall be cleaned in accordance with good commercial practice, or as specified in an applicable document. Cleaning processes shall have no deleterious effect. Corrosive material shall be removed completely before the parts are mounted on chassis, panels, etc.

3.7.2 Units.-- After assembly, units shall be cleaned thoroughly and shall be free from particles of solder, flux, and other foreign material. In addition, when necessary, such cleaning shall also be performed before final assembly of the units.

3.8 Controls.-- All movable controls shall operate properly without binding or other undue restriction. Controls shall not be assembled in a misaligned condition.

3.9 Finish.-- The equipment shall be finished in accordance with Specification MIL-F-14072 and the equipment drawings (See 4.4). The final paint film on Type 1 surfaces shall be green color (Color Chip No. X-24087) enamel matching a color chip provided by the procuring agency (See 6.6).

3.10 Marking.--

3.10.1 General.-- Marking shall conform to Specification MIL-M-13231 (See 4.4). Front panel markings shall be group 1 as described in that specification and the equipment drawings.

MIL-R-55499B(EL)

3.10.2 Visibility.- Wherever practicable, parts shall be so mounted that their identification markings will be readily visible with minimum disassembly of the equipment.

3.10.3 Serial Numbers.- Receiver-Transmitter, Radio RT-841( )/PRC-77 shall be serialized.

3.11 Riveting.- After riveting, the joints shall be tight, the joined parts shall be undamaged, and the rivet heads shall be properly seated and tight against their bearing surfaces.

3.12 Securing of Parts.-

3.12.1 General.- Brackets, lugs, flanges, inserts, bolts, and other mounting arrangements shall retain items securely when subjected to specified service conditions.

3.12.2 Securing of Parts by Threaded Fasteners.- Nylok or other screws with plastic devices, and Loctite or similar sealants shall not be subjected to temperatures in excess of 250°F (as during baking of paint). Loctite or similar sealants shall be applied in accordance with the manufacturer's instructions.

3.13 Soldering.-

3.13.1 Solder.- Solder shall conform to the equipment drawings.

3.13.2 Acid or Acid Salts.- No acid or acid salts shall be used in preparation for or during soldering; however, exception is permitted for preliminary tinning of electrical connections and for tinning or soldering of mechanical joints not used to complete electrical circuits, but in no case shall acid or acid salts be used where they can come in contact with insulation material. Where acid or acid salts are used, as permitted above, they shall be completely neutralized and removed immediately after use.

3.13.3 Process.- There shall be no sharp points or rough surfaces resulting from insufficient heating. The solder shall feather out to a thin edge, indicating proper flowing and wetting actions, and shall not be crystallized, overheated, or underheated. The minimum necessary amount of flux and solder shall be used for electrical connections. Any means employed to remove an unavoidable excess of flux shall not incur the risk of loose particles of flux, brush bristles, or other foreign material remaining in the equipment; flux being spread over a larger area; or damage to the equipment. Insulation material that has been subjected to heating during the soldering operation shall be undamaged and parts fastened thereto shall not have become loosened.

MIL-R-55499B(EL)

3.14 Wiring and Cabling.- Wiring and cabling shall be neat and sturdy.

3.14.1 Cabling.- Insulated wires shall be formed into cables except where operation of the equipment would be adversely affected thereby or where it is physically impracticable as in the case where the resulting cables would be excessively large and would interfere with operation or maintenance. The cabling of wires shall be effected by tape or twine conforming to Specification MIL-T-713. Individual conductors thus secured shall lie essentially parallel; however, this does not prohibit the use of twisted pairs.

3.14.2 Slack.- Wires and cables shall be as short as practical except that sufficient slack shall be provided for the following purposes:

- a. To prevent undue stress on cable forms, wires, and connections, including connections to resiliently supported parts.
- b. To enable parts to be removed and replaced during servicing without disconnecting other parts.
- c. To provide for at least two replacements of the part to which the wire or cable is connected, except for certain radio-frequency leads which must be as short as possible for electrical reasons.
- d. To facilitate field repair of broken or cut wires.
- e. To prevent chafing or breaking of individual wires due to repeated flexing of hinged parts.

3.14.3 Protection.- Wires and cables shall be so placed and protected as to avoid contact, under specified service conditions, with rough or irregular surfaces or sharp edges. Wires shall not be bent sharply where they enter insulation material.

3.14.4 Support.- Wire and cable shall be properly supported and secured, to prevent undue stress on the conductors and terminals and undue change in position of the wire and cable (i) during and after subjection of the equipment to specified service conditions or (ii) after service or repair of the equipment in a normal manner. Cotton, linen and cloth type twine or tape shall not be used for securing wire and cable. Synthetic cord or tape may be used as approved by the procuring agency.

3.14.5 Clearance.- Clearance between wires or cable, and parts shall be provided to avoid deterioration of the wires or cables because of the heat dissipated by such parts when the equipment is subjected to specified service conditions. Clearance between solder connections or bare conductors, on terminal boards, or other parts, shall be such that no accidental contact can occur between adjacent connections when subjected to specified service conditions.



MIL-R-55499B(EL)

3.14.6 Splicing.-- Wires in a continuous run between two terminals shall not be spliced during the wiring operation.

3.14.7 Connections.--

3.14.7.1 General.-- Before being soldered to terminal lugs or fixed terminals, wires shall be mechanically secured so that the connections are not dependent for strength on solder alone. Where practicable, wires soldered to fixed terminals shall be looped at least one-half turn but not more than three-quarter turn around the terminal before soldering. Bared ends of wire leads to be terminated in solder-type terminal lugs shall be tinned, silver plated, or lead-alloy coated. Electrical connections shall not be made by clamping between a metallic and non-metallic material. Fraying of textile ends of wires shall be prevented mechanically or by application of varnish conforming to Specification MIL-V-173. No varnish, lacquer, inspection paint, or other coating shall be applied to completed electrical connections except as specified herein.

3.15 Five-pin Audio Receptacle Connectors.-- Connector, Receptacle U-183( )/U shall meet the requirements and tests of Specification MIL-C-55116 and shall be constructed in accordance with Drawing and Data List SC-DL-415680 (See 4.4).

3.16 Fabric and Thread (See 4.15).-- Fabric and thread shall be pre-shrunk or allowance shall be made for shrinkage. The finished items shall fit both before and after they are soaked in tap water at normal room temperature for 24 hours and then dried thoroughly at normal room temperature. The harness shall mechanically fit the receiver-transmitter Case and Battery Box CY-2562( )/PRC-25.

3.17 Service Conditions.-- The equipment shall be capable of operating on a 9:1 receive-transmit ratio on normal power for indefinite periods and on transmit for continuous periods of one hour. The equipment shall meet the following service conditions (where a test is referenced, meeting the test shall be considered as compliance with the requirement):

3.17.1 Temperature (See 4.7.1).--

a. Operating: Ambient temperature in the range of +150°F to -40°F. (The +150°F temperature includes effect of sunload.) Exposure at the high temperature extreme not to exceed 4 hours, and at the low temperature extreme not to exceed 72 hours, at any one time.

b. Nonoperating: Exposure in the range +160°F to -80°F; exposure at the high temperature extreme not to exceed 4 hours, and at the low temperature extreme not to exceed 24 hours, at any one time.



MIL-R-55499B(EL)

c. During the testing as specified in 4.7.1, the equipment shall meet the following requirements:

<u>Measurement</u>	<u>Req Para</u>	<u>Insp Para</u>
Sensitivity	3.19.1	4.9.1 (See Note 1)
Distortion	3.19.2	4.9.2
Audio Output Power	3.19.3	4.9.3
Squelch Sensitivity	3.19.6	4.9.6 (See Note 2)
Receiver Catching Range	3.19.7	4.9.7
Input Voltage Range	3.19.15	4.9.15
RF Power Output	3.20.1	4.11.1
Tone Oscillator Frequency	3.20.2	4.11.2
Tone Oscillator Modulation	3.20.3	4.11.3
System Distortion	3.20.4	4.11.4
Maximum Signal Plus Noise-to-Noise	3.20.8	4.11.8
Frequency Accuracy	3.20.9	4.11.9 (See Note 3)
Input Voltage Range	3.20.11	4.11.11
Deviation	3.20.16	4.11.16

NOTE 1: At temperature extremes ( $-40^{\circ}\text{F}$  and  $150^{\circ}\text{F}$ ) Sensitivity (4.9.1) shall be performed with an RF input of 0.6 microvolts to produce a minimum of 10 decibels (db) signal plus noise plus distortion to noise plus distortion ratio.

NOTE 2: At the temperature extreme ( $-40^{\circ}\text{F}$  and  $150^{\circ}\text{F}$ ) the tone squelch shall operate at an RF signal level of 0.7 microvolts or less, and shall remain open when the RF signal is reduced to 0.6 microvolts. At the higher temperature extreme ( $150^{\circ}\text{F}$ ), the squelch circuit may remain open or may open intermittently (false squelch alarm) when no RF input is applied to the receiver.

NOTE 3: At temperature extremes ( $-40^{\circ}\text{F}$  and  $+150^{\circ}\text{F}$ ), the transmitted frequency shall be within  $\pm 5.0$  KHz of the nominal dial frequency.

3.17.2 Moisture Resistance (See 4.7.2). - Up to 97 per cent relative humidity for 20 hours; and exposure at 100 per cent relative humidity, with condensation, for 4 hours for each 24-hour period over the period of time stated in 3.17. There shall be no mechanical deterioration as evidenced by corrosion of metal parts or binding of rotating parts. For the receiver-transmitter, the following measurements shall be made during the test:

MIL-R-55499B(EL)

<u>Measurement</u>	<u>Req Para</u>	<u>Insp Para</u>
Sensitivity	3.19.1	4.9.1
Distortion	3.19.2	4.9.2
Audio Output Power	3.19.3	4.9.3
Squelch Sensitivity	3.19.6	4.9.6
Receiver Catching Range	3.19.7	4.9.7
RF Output Power	3.20.1	4.11.1
Tone Oscillator Frequency	3.20.2	4.11.2
Tone Oscillator Modulation	3.20.3	4.11.3
System Distortion	3.20.4	4.11.4
Maximum Signal Plus Noise-to-Noise	3.20.8	4.11.8
Frequency Accuracy	3.20.9	4.11.9
Deviation	3.20.16	4.11.16
Transmitter Catching Range	3.20.7	4.11.7

NOTE: The receiver and Transmitter catching range tests shall be performed only before and after cycling.

### 3.17.3 Elevation (See 4.7.3).-

- a. Operating: Up to 10,000 feet above sea level.
- b. Nonoperating: Up to 40,000 feet above sea level.
- c. The equipment shall meet full specification performance for the following measurements both during and after testing as specified in 4.7.3.

<u>Measurement</u>	<u>Req Para</u>	<u>Insp Para</u>
Sensitivity	3.19.1	4.9.1
RF Power Output	3.20.1	4.11.1
Operational Inspection	3.28	4.20

### 3.17.4 Immersion (See 4.7.4).- Three feet of water for 2 hours.

### 3.17.5 Orientation (See 4.7.5).-

- a. Operating: Any orientation up to 90° from normal operating position (that is: forward, backward, left, or right).
- b. Nonoperating: Storage in any position for a period of 2 years. Where the contractor is required to make a selection of parts, materials, processes, construction methods, etc., he shall be guided by this requirement.
- c. When tested as specified in 4.7.5, the equipment shall meet the operational test (3.28, 4.20).

MIL-R-55499B(EL)

3.17.6 Sand and Dust (See 4.7.6).- As encountered during heavy traffic over dry clay roads or in desert areas. After testing as specified in 4.7.6, the equipment shall meet full specification performance for the following measurements:

<u>Measurement</u>	<u>Req Para</u>	<u>Insp Para</u>
Sensitivity	3.19.1	4.9.1
RF Power Output	3.20.1	4.11.1
Operational	3.28	4.20

After the above testing, the equipment shall be opened and there shall be no evidence of deterioration of external and internal parts.

3.17.7 Bandswitch Life (See 4.7.11).- The receiver-transmitter in the Receive mode shall meet the sensitivity requirements of paragraph 3.19.1 after being subjected to testing as specified in paragraph 4.7.11. The receiver-transmitter in the Transmit mode shall meet the RF power output levels specified in paragraph 3.20.1, and the output frequency accuracy shall be within  $\pm 3.5$  KHz of the dial frequency, after being subjected to testing as specified in paragraph 4.7.11.

### 3.18 Vibration, Bounce, and Shock.-

3.18.1 Vibration, Internal.- The amplitude of any part, subassembly or structural member of the equipment shall not exceed twice the amplitude of the vibration applied to the equipment at any frequency between 10 and 55 cycles per second (See 4.7.7).

3.18.2 The equipment shall be capable of meeting the requirements of Table I.

TABLE I - Bounce and Shock

<u>Test</u>	<u>Para No</u>	<u>Performance after Test</u>
Bounce	4.7.8	Specified Performance. (Note A) No Physical Damage.
Shock, Bench-handling	4.7.9	Specified Performance. (Note A) No Physical Damage.
Shock, Drop	4.7.10	Specified Performance. (Note A) Any physical damage shall be minor only.

NOTE A: The receiver-transmitter shall meet specified performance for the following measurements:

MIL-R-55499B(EL)

<u>Measurement</u>	<u>Req Para</u>	<u>Insp Para</u>
Sensitivity	3.19.1	4.9.1
Distortion	3.19.2	4.9.2
Audio Power Output	3.19.3	4.9.3
Squelch Sensitivity	3.19.6	4.9.6
Receiver Catching Range	3.19.7	4.9.7
RF Power Output	3.20.1	4.11.1
System Distortion	3.20.4	4.11.4
Frequency Accuracy	3.20.9	4.11.9
Deviation	3.20.16	4.11.16

3.19 Receiver Electrical Requirements, Receiver-Transmitter, Radio RT-841( )/PRC-77.- These requirements shall be met on all channels from and including 30.00 to 52.95 and 53.00 to 75.95 MHz.

3.19.1 Sensitivity (See 4.9.1).- Radio frequency (RF) signal input of 0.5 microvolt shall produce a signal plus noise plus distortion to noise plus distortion ratio of at least 10 decibels (db).

3.19.2 Distortion (See 4.9.2).- The overall total harmonic distortion shall not exceed 10 per cent at four milliwatts output, and shall not exceed 6 per cent at one milliwatt output.

3.19.3 Audio Output Power (See 4.9.3).- The earphone circuit output with full volume control shall be capable of supplying four milliwatts into a 1,000-ohm noninductive load.

3.19.4 Volume Control (See 4.9.4).- The volume control shall vary the headphone output level. At the minimum setting of the control, there shall not be more than 0.02 volt output maximum at the headset terminal with no signal input. At the maximum setting of the control and under standard input conditions, the headset level shall not be less than the level specified in 3.19.3. The function switch shall be in the ON position.

3.19.5 Limiting (See 4.9.5).- The limiting characteristic when measured in accordance with 4.9.5 shall be such that the audio output power shall not vary more than 3 db.

3.19.6 Squelch Sensitivity (See 4.9.6).- The tone operated squelch shall open with an RF signal input of 0.5 microvolt or less. The squelch once having been opened shall remain open when the RF signal is reduced to 0.40 microvolts. Faulty or erratic operation of the squelch circuit shall not occur when the incoming signal is voice modulated. The squelch circuit shall remain closed when no signals are received and the receiver random noise pulses or transients shall not open or cause erratic operation of the squelch circuit.

MIL-R-55499B(EL)

3.19.7 Receiver Catching Range (See 4.9.7)..- The sum of the plus and minus catching ranges of the receiver shall not be less than 750 KHz nor shall either the plus or minus ranges be less than 300 KHz. The requirement does not apply to the following frequencies: 30.00 MHz to 31.00 MHz and 53.00 MHz to 54.00 MHz.

3.19.8 Maximum Signal Plus Noise-to-Noise Ratio (See 4.9.8)..- The maximum signal plus noise-to-noise ratio when measured in accordance with 4.9.8 shall not be less than 50 db.

3.19.9 Desensitization (See 4.9.9)..- In accordance with the measurement of 4.9.9 and chart specified below, the interfering signal frequency when removed + 10 per cent from the desired signal frequency shall not degrade a 26 db  $\bar{S}+N/N$  signal by more than 6 db.

<u>Channel Freq (MHz)</u>	<u>Interfering Freq (MHz)</u>	<u>Minimum level of Interfering Signal (db)</u>
30	27	130
30	33	128
45	40.5	126
45	49.5	128
52	46.8	128
52	57.2	128
53	47.7	126
53	58.3	126
60	54	126
60	66	120
75	67.5	120
75	82.5	120

3.19.10 Control Voltage Variation (See 4.9.10)..- The control voltage to the VFO shall not vary more than 0.00 to +0.50 volts between 30.00 and 30.95 MHz relative to the 30.00 MHz value as the dial is changed in 50 KHz steps. The control voltage variation between 30.00 and 52.00 MHz relative to the 30.00 MHz value shall not vary more than -0.5 to +0.5 volts as the dial is increased in 1 MHz steps.

3.19.11 Audio Response (See 4.9.11)..- The frequency response from 500 to 3000 Hz shall be within +3 db, -6 db of the 1000 Hz reference. The response at 300 Hz shall be within 0, -6 db of the 1000 Hz reference.

3.19.12 VFO Deviation Sensitivity (See 4.9.12)..- The deviation sensitivity of the oscillator shall be within the limits of 225 KHz to 400 KHz for both a positive and negative bias change. Test in accordance with paragraph 4.9.12.

MIL-R-55499B(EL)

3.19.13 VFO Deviation Capability (See 4.9.13).- The deviation of the oscillator shall not be less than 350 KHz nor greater than 900 KHz, above and below nominal VFO frequency, over the tuning range of the oscillator. Test in accordance with paragraph 4.9.13.

3.19.14 Resettability (See 4.9.14).- The dial resettability shall be such that the maximum frequency difference between any two of the 10 settings shall be no greater than 100 KHz when measured in accordance with 4.9.14.

3.19.15 Input Voltage Range (See 4.9.15).- The receiver-transmitter, when in the receive condition shall meet requirements of 3.19.1, 3.19.2, 3.19.3, 3.19.6, 3.19.7, 3.19.25, 3.19.26 when operating from a 10 to 15 volts dc source except that the audio output power under low voltage shall not be reduced by more than 20 per cent from that at the nominal voltage of 12.5 volts dc.

3.19.16 Input Power Consumption (See 4.9.16).- The receiver shall not require more than 0.775 watt of input power when operated at nominal input voltage.

3.19.17 Frequency Range (See 4.9.17).- The receiver-transmitter when in receive condition shall be capable of operating and receiving signals on each dial increment of  $50 \pm 3.5$  KHz over the frequency range of 30.00 to 75.95 MHz inclusive to provide 920 usable channels. The frequency range shall be covered in two selectable bands, the low band shall cover the frequency range of 30.00 to 52.95 MHz inclusive, and the high band shall cover the frequency range of 53.00 to 75.95 MHz inclusive.

3.19.18 Narrow Band Receiver Audio Output Impedance (see 4.9.18).- The narrow band receiver audio (earphone) output circuit shall have an impedance of 1500 ohms  $\pm 30$  per cent.

3.19.19 IF Selectivity (See 4.9.19).- The receiver overall IF selectivity shall meet the following requirements:

- a. Bandwidth 6 db points 32 KHz minimum.
- b. Bandwidth 60 db points 100 KHz maximum.
- c. Bandwidth 70 db points 120 KHz maximum.
- d. Within a 50 KHz range beyond the 70 db point in both the positive and negative direction there shall be no returns above the 70 db response.

The response characteristic in the pass band shall have no irregularities greater than 2 db.

MIL-R-55499B(EL)

3.19.20 Spurious Responses (See 4.9.20).- There shall be no more than 10 spurious responses beyond  $\pm 500$  KHz of the desired frequency which are less than 100 db down from a one microvolt reference, and no more than 10 spurious responses within  $\pm 500$  KHz of the desired frequency which are less than 80 db down from a one microvolt reference.

3.19.21 IF Rejection (See 4.9.21).- The IF rejection ratio shall not be less than 100 db.

3.19.22 Intermodulation (See 4.9.22).- Any third order intermodulation resulting from two undesired carrier frequencies of the same level shall be at least 52 db down from the desired response.

3.19.23 Oscillator Radiation (See 4.9.23).- The radiation of any oscillator within the equipment shall produce an output no greater than 50 microvolts when the receiver is tuned to any frequency within its tuning range. Test in accordance with paragraph 4.9.23.

3.19.24 VFO Temperature Stability (See 4.9.24).- The local oscillator, when tested in accordance with 4.9.24, shall not vary more than  $\pm 150$  KHz.

3.19.25 Wide Band Audio Output (See 4.9.25).- The wide band audio output as measured at Terminal P of the front panel connector J3 shall be not less than 0.55 volts and not more than 25.0 volts peak-to-peak at 1000 Hz, across an external load of 20000 ohms resistive in parallel with 1000 pf.

3.19.26 Wide Band Audio Response (See 4.9.26).- The response at 15 Hz shall be within 0.0 db and -3.0 db of the 1000 Hz reference. The frequency response from 100 to 10,000 Hz shall be within +1.5 db to -2.5 db of the 1000 Hz reference. The response at 15 KHz shall be within +2.0 db to -6.0 db of the 1000 Hz reference. The response at 20 KHz shall be within 0 db to -19 db of the 1000 Hz reference.

3.19.27 Wide Band Audio Output Impedance (See 4.9.27).- The output impedance shall be  $300 \pm 30$  ohms at 1000 Hz reference frequency.

3.19.28 Noise Quieting (See 4.9.28).- The receiver-transmitter when in receive condition shall have no more than eight channels degraded in sensitivity greater than one microvolt for a 10 db S+N+D/N+D ratio due to the inherent receiver noise. Any of the above channel frequencies which pass the test of 4.9.1 (Receiver Sensitivity) shall be considered as meeting the requirements for noise quieting.



MIL-R-55499B(EL)

3.19.29 Relay Operation (See 4.9.29).— The radio set in the receive mode shall be capable of proper functioning in the "RETRANS" position when interfering signals of given magnitudes are present. Signal generators shall be used to simulate desired and interfering signals. Three signal generators shall be used to determine compliance with this requirement. These signal generators shall be connected and adjusted as specified in paragraph 4.9.29. The squelch circuit in the radio set shall not open when the first and second signal generators are connected to the radio set, with signal generator levels and frequencies as specified in 4.9.29. The squelch circuit shall open when the first and third signal generators are connected to the radio set, with signal generator levels and frequencies as specified in 4.9.29.

3.19.30 Synthesizer Lock-up Time (See 4.9.30).— The maximum synthesizer lock-up time shall be 1 second or 3 sweep cycles. Test in accordance with paragraph 4.9.30.

3.20 Transmitter Electrical Requirements, Receiver-Transmitter, Radio RT-841( )/PRC-77.— These requirements shall be met on all channels from and including 30 through 52.95 MHz and 53 through 75.95 MHz.

3.20.1 RF Power Output (See 4.11.1).— The minimum radio frequency power delivered to a 50 ohm resistive load shall be as follows:

<u>Frequency Range (MHz)</u>	<u>Power (Watts)</u>
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

The RF power amplifier shall be capable of being operated without evidence of damage to the output transistor when the antenna connector J2 is terminated with a short or open circuit load for a period of one minute.

3.20.2 Tone Oscillator Frequency (See 4.11.2).— The frequency of the tone oscillator shall be  $150 \pm 1.5$  Hz when measured in accordance with 4.11.2. The requirement does not apply at 34.50, 46.00, 57.50, and 69.00 MHz and within  $\pm 100$  KHz thereof.

3.20.3 Tone Oscillator Modulation (See 4.11.3).— The tone oscillator shall deviate the transmitter  $3.0 \pm 0.5$  KHz above and below the carrier frequency. When tested per requirement of 4.7.1, the tone oscillator deviation shall be 3.0, +1.2, -0.5 KHz above and below the carrier frequency. When the radio is tested at  $40^{\circ}\text{C} \pm 5.0^{\circ}\text{C}$  ( $95^{\circ}\text{F}$  to  $113^{\circ}\text{F}$ ) the tone oscillator deviation shall be +0.8, -0.5 KHz above and below the carrier frequency. The requirement does not apply at 34.50, 46.00, 57.50, and 69.00 MHz and within  $\pm 100$  KHz thereof.

MIL-R-55499B(EL)

3.20.7 Transmitter Catching Range (See 4.11.7).- The transmitter VFO when operating in the transmit condition shall have a frequency catching range capability of not less than 650 KHz in the plus direction and not less than 650 KHz in the minus direction from the measured operating reference frequency.

3.20.8 Maximum Signal Plus Noise-to-Noise Ratio (See 4.11.8).- The maximum overall signal plus noise-to-noise ratio of two receiver-transmitters shall not be less than 40 db. The requirement does not apply at 34.50, 46.00, 57.50, and 69.00 MHz and within  $\pm 100$  KHz thereof.

3.20.9 Frequency Accuracy (See 4.11.9).- The receiver-transmitter when in transmit condition shall be capable of transmitting an output rf carrier on all 920 channels with an accuracy of  $\pm 3.5$  KHz of the dial frequency.

3.20.10 Retransmit Operation (See 4.11.10).- Two each Receiver-Transmitters RT-841( )/PRC-77, with AT-271, AB-591 and Battery shall provide satisfactory operation in the "Retransmit" mode when the two RT units are interconnected with an approved Cable Kit MK-456( )/GRC. The squelch circuit control and operation in "Retransmit" mode shall be tested in accordance with 4.11.10.

3.20.11 Input Voltage Range (See 4.11.11).- The receiver-transmitter unit in transmit condition shall meet full specification requirements on all channels when operating from a dc battery source range of 10.0 to 15.0 volts dc, except the rf power output at low input voltage shall not be less than 0.7 watt for the low band, and 0.5 watt for the high band. Nominal input voltage is 12.5 VDC.

3.20.12 Input Power Consumption (See 4.11.12).- The total power input to the receiver-transmitter under transmit conditions shall not be more than 14.4 watts when operated at nominal input voltages. In the frequency range of 53 to 63 MHz total input power shall not exceed 16.3 watts.

3.20.13 Frequency Range (See 4.11.13).- The receiver-transmitter when in transmit condition shall be capable of transmitting on each dial increment of  $50 \pm 3.5$  KHz over the frequency range of 30.00 to 75.95 MHz, inclusive, to provide 920 usable channels. The frequency range shall be covered in two selectable bands, the low band shall cover the frequency of 30.00 to 52.95 MHz, inclusive, and the high band shall cover the frequency range of 53.00 to 75.95 MHz inclusive.

3.20.14 Microphone Input Impedance (See 4.11.14).- The circuit shall have a nominal impedance of 150 ohms  $\pm 10$  per cent for frequencies in the range of 300 to 3000 Hz.

3.20.4 System Distortion (See 4.11.4).-

3.20.4.1 Narrow Band (See 4.11.4.1).- The total harmonic distortion at the narrow band audio output shall not exceed ten per cent. The requirement does not apply at 34.50, 46.00, 57.50, and 69.00 MHz and within  $\pm 100$  KHz thereof.

3.20.5 Sidetone (See 4.11.5).- The sidetone level at the headphone output shall not be more than 4.0 milliwatts nor less than 0.01 milliwatt with the volume control set at maximum.

3.20.6 Modulation Capability (See 4.11.6).- The receiver-transmitter in the transmit condition shall be capable of being deviated in accordance with the following:

3.20.6.1 Narrow Band Condition.-

<u>Audio Modulation Frequency (Hz)</u>	<u>Deviation Above and Below Carrier Frequency (KHz)</u>
300	10 +3, -4
1000	10 $\pm 2$
2000	10 $\pm 3$
3000	10 $\pm 3$

The transmitter shall not break lock when at each modulation frequency the audio input voltage is gradually increased. The requirement does not apply at 34.50, 46.00, 57.50, and 69.00 MHz and within  $\pm 100$  KHz thereof.

3.20.6.2 Wide Band Condition.-

<u>Audio Modulation Frequency (Hz)</u>	<u>Deviation Above and Below Carrier Frequency (KHz)</u>
15	6 + 4, -3.5
100	6 + 4, -1
500	6 + 4, -1
1000	6 + 4, -1
2000	6 + 4, -1
3000	6 + 4, -1
10000	6 + 4, -1
20000	6 + 4, -1

The transmitter shall not break lock when at each modulation frequency the audio input voltage is gradually increased. The requirement does not apply at 34.50, 46.00, 57.50, and 69.00 MHz and within  $\pm 100$  KHz thereof.

MIL-R-55499B(EL)

3.20.15 Audio Response (See 4.11.15).- The frequency response between 300 and 3000 Hz shall be within +3 db, -6 db of a 1000 Hz reference.

3.20.16 Deviation (See 4.11.16).- The nominal deviation shall be 10 + 2 KHz at a modulating frequency of 1000 Hz and a level of 1.4 mv across the narrow band audio input (microphone) circuit. The requirement does not apply at 34.50, 46.00, 57.50, and 69.00 MHz and within  $\pm$  100 KHz thereof.

3.20.17 Deviation Limiting (See 4.11.17).- Deviation limiting test input voltage shall be applied to the audio input circuit. The deviation limiting test input voltage shall be such that a 14 db increase (referred to the average level in 3.20.16) into the microphone circuit will increase the deviation not more than 3 db.

3.20.18 Spurious Radiations (See 4.11.18).- When measured in accordance with 4.11.18, the number of spurious outputs which exceed 10 db of quieting shall not be greater than 10. This requirement does not supersede the requirements of MIL-STD-461.

3.20.19 Tone Oscillator Stability (See 4.11.19).- The tone oscillator frequency when tested in accordance with 4.11.19, shall be 150 + 4 Hz. The requirement does not apply at 34.50, 46.00, 57.50, and 69.00 MHz and within  $\pm$  100 KHz thereof.

3.20.20 Long Antenna Loading (See 4.11.20).- With the long antenna switch plunger depressed, the RF voltage measured across the antenna load resistor shall be as follows:

3.20.20.1 Long Antenna Loading Operational (See 4.11.20.1).-

<u>Frequency (MHz)</u>	<u>RF Voltage (rms)(Minimum)</u>
37.50	11
65.00	6

3.20.20.2 Long Antenna Loading (See 4.11.20.2).-

<u>Frequency (MHz)</u>	<u>RF Voltage (rms)(Minimum)</u>
30.00	9
47.50	24
50.00	29
52.50	21
53.50	16
75.00	8

MIL-R-55499B(EL)

3.20.21 Short Antenna Loading (See 4.11.21).- The RF voltage measured across the antenna loading resistor shall be as follows:

<u>Frequency (MHz)</u>	<u>RF Voltage (rms) (Minimum)</u>
30.00	4.0
37.50	4.5
47.50	6.0
50.00	6.0
52.50	7.0
53.50	5.0
65.00	6.0
75.00	7.0

3.20.22 Wide Band Audio Input (See 4.11.22).- The carrier deviation shall be  $6.5 \pm 3.5$ , -1.5 KHz when a 4.7 volt peak to peak, 1000 Hz, modulating frequency is applied across the wide band audio input circuit. The requirement does not apply at 34.50, 46.00, 57.50, and 69.00 MHz and within  $\pm 100$  KHz thereof.

3.20.23 Wide Band Audio Frequency Response (See 4.11.23).- The response at 15 Hz shall be within 0.0 and -6 db of the 1000 Hz reference. The frequency response from 100 to 10,000 Hz shall be within 1.7 db of the 1000 Hz reference. The response at 20,000 Hz shall be within +2.5 db to -3.5 db of the 1000 Hz reference. The requirement does not apply at 34.50, 46.00, 57.50, and 69.00 MHz and within  $\pm 100$  KHz thereof.

3.20.24 Wide Band Audio Input Impedance (See 4.11.24).- This circuit shall have a nominal impedance of 1800 ohms  $\pm 20$  per cent.

3.20.25 Transmit 150 Hz Tone Disable (See 4.11.25).- The 150 Hz tone deviation of the carrier shall be disabled upon grounding of the tone disable circuit (ground Terminal L of the power connector J3). The requirement does not apply at 34.50, 46.00, 57.50, and 69.00 MHz and within  $\pm 100$  KHz thereof.

3.20.26 False-Lock (See 4.11.26).- The frequency of the transmitter and receiver shall be within  $\pm 3.5$  KHz of the dial frequency, when measured in accordance with 4.11.26.

3.20.27 Transmitter AFC Lock-up Time (See 4.11.27).- The receiver-transmitter shall be capable of lock-up on the output frequency in fifty milliseconds or less after switching from a receive to transmit condition. There shall be no keying transient during this period of time which would cause the basic frequency synthesizer to unlock the control loop.

MIL-R-55499B(EL)

3.21 Battery Box CY-2562( )/PRC-25.-- The battery box which is part of Receiver-Transmitter RT-841( )/PRC-77 shall be constructed in accordance with Drawing and Data List SC-DL-447354, and shall satisfy the requirements of this specification.

3.22 Support, Antenna AB-591( )/PRC-25.-- Antenna support shall be constructed in accordance with Drawing SC-DL-85712 and shall meet the following requirements.

3.22.1 Torsion Requirements (See 4.12.1).-- The ferrule and casing when assembled shall be capable of withstanding a torque of 150 inch-pounds when applied through the ferrule at right angles to the axis of the assembly in counterclockwise direction with no permanent deformation. The swaged joints shall show no signs of loosening or displacement, and the ferrule shall be secure and unrotated from its original position when subjected to this 150 inch-pound torque.

3.22.2 Neoprene Covering.--

3.22.2.1 Bonding and Curing (See 4.12.2).-- The neoprene covering shall be molded and securely bonded in place. The covering shall be smooth and free of grooves. Curing shall not be injurious nor cause deterioration of the covering.

3.22.2.2 Flexibility (See 4.12.3).-- The neoprene covering shall be flexible and capable of bending through 90° while maintained at a temperature of -40°F without developing any cracks.

3.22.3 Flexibility of Assembly (See 4.12.4).-- The assembled antenna support, when bent 90° from its normal position and then slowly returned to its normal position, shall do so smoothly without internal catching, binding, scraping, or loosening. The bending moment, measured from the axis of the base support, required for a 90° bend shall be from 180 to 260 inch-pounds.

3.22.4 Shock Absorbing Qualities (See 4.12.5).-- The antenna support shall be capable of withstanding 1500 blows at the rate of one blow per second; of such force that the antenna support is bent to an angle of 90° by each blow with no evidence of dimensional changes, loosening of parts or other damage, and upon dissassembly, there shall be no evidence of excessive internal wear, damage, or corrosion.

3.23 Antenna AT-892( )/PRC-25.-- Antenna AT-892( )/PRC-25 shall be constructed in accordance with SC-DL-135893, and shall meet the following requirements.

3.23.1 Leaf Material Temper.-- When inspected in accordance with 4.13.1.1, the leaf material shall show no fracture, and shall withstand straightening without breaking or fracturing of any leaves.

MIL-R-55499B(EL)

3.23.2 Antenna Base Flexure.-- When inspected in accordance with 4.13.2.1, the base of the tape antenna shall withstand the flexing without damage.

3.23.3 Antenna Base Support.-- When inspected in accordance with 4.13.2.2, the end of the ferrule shall not drop more than 1/2 inch when the 1/2 pound downward pressure is applied.

3.24 Bag, Cotton Duck CW-503( )/PRC-25.-- The bag shall be constructed in accordance with Drawing and Data List SC-DL-447214.

3.25 Harness, Electrical Equipment ST-138( )/PRC-25.-- The harness shall be constructed in accordance with Drawing and Data List SC-DL-447208.

3.26 Preconditioning.-- All units shall be bounce preconditioned in accordance with paragraph 3.26.1 prior to submission for electrical preconditioning in accordance with paragraph 3.26.2.

3.26.1 Bounce Preconditioning (See 4.6.1).-- All units shall be capable of meeting the requirements herein, without subsequent processing, after subjection to the bounce preconditioning of 4.6.1. (See 4.5)

3.26.2 Electrical Preconditioning (See 4.6.2).-- All receiver-transmitters on order shall be electrically preconditioned in accordance with Appendix A of this specification.

3.27 Air-seal Test (See 4.17).-- The decrease in vacuum during the one minute period shall not exceed .01 pound when tested in accordance with paragraph 4.17.

3.28 Operational Inspection.-- The operational test specified in 4.20 shall be performed to determine that the equipment is operable prior to packaging and at such other times as required.

3.29 Interchangeability.-- Like units, assemblies, subassemblies, modules, and replaceable parts shall be physically and functionally interchangeable, without modification of such items or of the equipment as determined by the tests specified in paragraph 4.14. However, electrical retuning and realignment of modules during production assembly operations may be expected and are permissible.

3.30 Electromagnetic Interference (See 4.18).-- For informational purposes only, the Electromagnetic Interference Test of 4.18 shall be performed on one preproduction sample only. The results of the test shall have no bearing on the acceptance of the preproduction sample test report. An EMI test plan shall be submitted for approval as indicated in the bid request and contract.



MIL-R-55499B(EL)

3.31 Reliability Test (See 4.19).- Each receiver-transmitter undergoing reliability testing shall demonstrate a specified mean-time-between-failure (MTBF) of 750 hours. The required reliability shall be demonstrated by a reliability test using the Reliability Test Plan for Radio Set AN/PRC-77 (Appendix B).

3.32 Technical Literature.- Technical literature shall be furnished as specified in the contract (See 6.2).

3.33 Workmanship.- The equipment shall be manufactured and assembled in accordance with the equipment drawings and applicable portions of paragraphs 3.3 through 3.14.

3.34 Lite Test (See 4.25).- The Receiver-Transmitter RT-841( )/PRC-77 shall be capable of meeting the test specified in paragraph 4.25.

3.35 Tropicalization.-

3.35.1 Fungus (See 4.23).- Equipment and assemblies shall show no evidence of viable fungus or corrosion when subjected to twenty-eight days of fungus test in accordance with paragraph 4.23. Corrosion is defined as any visible degradation that can be attributed to flaky, pitted, blistered, or otherwise loosened finish or metal surface.

3.35.2 Moisture and Fungus Proof (MFP) Treatment for Equipment and Assemblies.- An MFP coating in accordance with MIL-V-173 shall be applied as specified in Specification MIL-T-152 to equipments, assemblies and parts which have been cleaned prior to coating to remove such contaminants as lubricating oils, mold release agents, sand, corrosion products, solder fluxes, fingerprints and dust. It is required that printed circuit boards receive a conformal coating per Specification MIL-I-46058, and do not receive the MFP coating at any time.

3.36 Salt Fog (See 4.24).- The equipment and assemblies shall be exposed in their operating configuration, to 48 hours of salt fog in accordance with paragraph 4.24, and shall show no evidence of corrosion as evidenced by any visible degradation that can be attributed to flaky, pitted, blistered or otherwise loosened finish or metal surface.

4. QUALITY ASSURANCE PROVISIONS (See Section 3).- The supplier is responsible for equipment construction and performance in compliance with the requirements of this specification and the contract. The inspections required in this section are the minimum deemed essential to demonstrate equipment compliance and to determine product quality. The government shall have the right to direct the supplier to reduce or increase the scope of inspection subject to an equitable contract adjustment.

MIL-R-55499B(EL)

4.1 Responsibility for Inspection.- Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the government. The government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Classification of Inspection.- Inspection shall be classified as follows:

a. First Article inspection (does not include preparation for delivery) (See 4.3).

b. Inspection covered by subsidiary documents. (See 4.4)

c. Quality conformance inspection.

(1) Quality conformance inspection of equipment before preparation for delivery. (See 4.5)

(2) Quality conformance inspection of preparation for delivery. (See 4.21).

4.3 First Article Inspection.- This inspection shall consist of the inspection specified in subsidiary documents covering the items listed in 4.4, the inspection specified for Group A, Group B, and Group C (See Tables III, IV and V respectively) and the inspection specified in paragraph 4.19. The inspection of First Article samples, identified as Unit 1, Unit 2, Unit 3, and Unit 4, shall be performed in the order shown in Table II.

MIL-R-55499B(EL)

TABLE II - ORDER OF FIRST ARTICLE INSPECTION

<u>Inspection (Note 1)</u>	<u>Unit 1</u>	<u>Unit 2</u>	<u>Unit 3</u>	<u>Unit 4</u>
<u>Non-damaging</u>				
Temperature (3.17.1, 4.7.1)	1			
Elevation (3.17.3, 4.7.3)		1		
Immersion (3.17.4, 4.7.4)			1	
Orientation (3.17.5, 4.7.5)	2			
Sand and Dust (3.17.6, 4.7.6)			2	
Vibration (3.18.1, 4.7.7)			3	
<u>Potentially Damaging</u>				
Bandswitch Life (3.17.7, 4.7.11)		2		
Moisture Resistance (3.17.2, 4.7.2)	3			
Fungus (3.35.1, 4.23)				1
Salt Fog (3.36, 4.24)		3		
Bounce (3.18.2, 4.7.8)			4	
Shock, Bench-handling (3.18.2, 4.7.9)			5	
Shock, Drop (3.18.2, 4.7.10)			6	

NOTE 1: Other First Article inspection may precede, follow, or be interspersed between the nondamaging tests.

4.4 Inspection covered by Subsidiary Documents.- The following shall be inspected under the applicable subsidiary documents as part of the inspection of the equipment before preparation for delivery.

<u>Item</u>	<u>Where Required</u>
Printed Wiring Assemblies	3.4
Semiconductors	3.6
Finish, Protective	3.9
Marking	3.10
Five-pin Audio Connectors	3.15

4.5 Quality Conformance Inspection of Equipment before Preparation for Delivery.- The contractor, to demonstrate compliance with specified requirements, shall perform the inspections specified in paragraphs 4.4, 4.5.1 through 4.5.3.2, and 4.19 of this specification. This does not relieve the contractor of his responsibility for performing any additional inspections, which are deemed necessary to control the quality of the product and to assure that all requirements are met for all specified functions and at all frequencies within the specified tuning range. The contractor shall make available, for government review, inspection procedures, inspection records and test data. Test data shall be prepared

MIL-R-55499B(EL)

for each equipment inspected by the contractor or his agents. The data shall present the exact results of measurements made or readings observed and shall be expressed in the same terms as expressed by the requirements. Check marks, and "X", ditto marks or statements that requirements were met, will not be construed as satisfactory data, unless approved in advance by the government. In addition, the government, at its discretion and without notice elsewhere in the contract may perform inspections independent of the inspections required to be performed by the contractor. Such inspections shall be for all or any part of the specified inspections, to verify the contractor's compliance with specified requirements. Test equipment to be used by government representatives for such inspections shall be made available by the contractor. Further, all facilities and services necessary for the placement, operation and maintenance of these test equipments shall be provided by the contractor. All Receiver-Transmitter, Radio RT-841( )/PRC-77 assemblies on order (including first article samples) shall be subjected to electrical preconditioning after final assembly (See 3.26.2). All RT-841( )/PRC-77 assemblies (including first article samples) shall be bounce preconditioned after final assembly (See 3.26.1).

4.5.1 Group A Inspection.- Each unit on contract or purchase order shall be inspected for conformance to the inspections specified in Table III. Discrete lots shall be formed from units that pass this inspection. Factors of lot composition not defined herein, or in the contract or purchase order, shall be in accordance with MIL-STD-105. Each lot shall be subject to sampling inspection, utilizing the procedures of MIL-STD-105, using the general inspection levels, and AQL's indicated in Table III. Group A inspection shall be performed in any order which is satisfactory to the government, except that the air seal test (4.17) shall be next to last and the operational inspection (4.20) shall be last (See 6.4).

TABLE III - GROUP A INSPECTION

<u>Inspection</u>	<u>Req Para</u>	<u>Insp Para</u>	<u>AQL AQL Major</u>	<u>AQL Minor</u>
Visual & Mechanical Receiver- Transmitter Plug-in Modules:	3.33	4.16		
Discriminator Synthesizer (A11)			0.65%	2.5%
2d Mixer (A12)			0.65%	2.5%
Voltage Regulator (A16)			0.65%	2.5%
Phase Comparator (A17)			0.65%	2.5%
5.6 MHz IF Amplifier (A18)			0.65%	2.5%
IF Amplifier (A21)			0.65%	2.5%
Speech Amplifier (A22)			0.65%	2.5%
Tone Generator (A23)			0.65%	2.5%
Tone Squelch (A54)			0.65%	2.5%

MIL-R-55499B(EL)

TABLE III - GROUP A INSPECTION (contd)

<u>Inspection</u>	<u>Req Para</u>	<u>Insp Para</u>	<u>AQL Major</u>	<u>AQL Minor</u>
	3.33	4.16		
Receiver Audio (A55)			0.65%	2.5%
Transmitter Frequency Control (A31)			0.65%	2.5%
Receiver Input (A32)			0.65%	2.5%
Receiver 1st RF (A33)			0.65%	2.5%
Receiver 2d RF (A34)			0.65%	2.5%
Receiver Mixer (A35)			0.65%	2.5%
Transmitter Power Amplifier (A36)			0.65%	2.5%
Transmitter Intermediate Power Amplifier (A37)			0.65%	2.5%
Transmitter VFO (A38)			0.65%	2.5%
Synthesizer VFO (A39)			0.65%	2.5%
Interval Oscillator (A40)			0.65%	2.5%
53 MHz Filter (A43)			0.65%	2.5%
1st Mixer (A44)			0.65%	2.5%
1 MHz Spectrum Generator (A45)			0.65%	2.5%
Transmitter Mixer (A50)			0.65%	2.5%

When presented as an Assembly:

Front Panel Wired Assembly Consisting of:	1.0%	4.0%
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Front Panel Selector Mechanism  
 Synthesizer Mother Board (A56)  
 Antenna Loading Network (A28)  
 Wiring Harness  
 Intermediate Power Amplifier  
 Connector Bracket Assembly (A49)

When presented as Individual Items:

Synthesizer Mother Board (A56)	0.65%	2.5%
Hinged Chassis Assembly (A57)	0.65%	2.5%
Antenna Loading Network (A28)	0.65%	2.5%
Intermediate Power Amplifier		
Connector Bracket Assembly (A49)	0.65%	2.5%
*Complete RT-841/PRC-77 Wired Chassis (including front panel assembly, less modules and case)	1.0%	4.0%
RT-841/PRC-77 Complete, Less Case	1.0%	4.0%

\* Perform Group B dimensional interchangeability per Paragraphs 3.29 and 4.14.1 on samples from same lot submission.

MIL-R-55499B(EL)

TABLE III - GROUP A INSPECTION (contd)

<u>Inspection</u>	<u>Req Para</u>	<u>Insp Para</u>	<u>AQL Major</u>	<u>AQL Minor</u>
	3.33	4.16		
Case, p/o RT-841/PRC			1.0%	4.0%
Battery Box CY-2562( )/PRC-25			1.0%	4.0%
Antenna Support Base AB-591()/PRC-25			1.0%	4.0%
Antenna AT-892( )/PRC-25			1.0%	4.0%
Bag CW-503( )/PRC-25			1.0%	4.0%
Harness ST-138( )/PRC-25			1.0%	4.0%
Electrical RT-841( )/PRC-77:				
Sensitivity	3.19.1	4.9.1		
Distortion (Receiver)	3.19.2	4.9.2		
Audio Output Power	3.19.3	4.9.3		
Volume Control	3.19.4	4.9.4		
Audio Response	3.19.11	4.9.11		
Limiting	3.19.5	4.9.5	1 per cent	
Squelch Sensitivity	3.19.6	4.9.6	for each	
Receiver Catching Range	3.19.7	4.9.7	individual	
Wide Band Audio Output	3.19.25	4.9.25	test.	
Wide Band Audio Response	3.19.26	4.9.26		
Wide Band Audio Output Impedance	3.19.27	4.9.27		
RF Power Output	3.20.1	4.11.1		
Tone Oscillator Frequency	3.20.2	4.11.2		
Tone Oscillator Modulation	3.20.3	4.11.3		
System Distortion (Transmit Mode)	3.20.4	4.11.4		
Sidetone	3.20.5	4.11.5		
Modulation Capability	3.20.6	4.11.6		
Transmitter Catching Range	3.20.7	4.11.7		
Frequency Accuracy (Transmit Mode)	3.20.9	4.11.9		
Long Antenna Loading Operational	3.20.20.1	4.11.20.1		
Wide Band Audio Input	3.20.22	4.11.22		
Wide Band Audio Frequency Response	3.20.23	4.11.23		
Wide Band Audio Input Impedance	3.20.24	4.11.24		
Transmit 150 Hz Tone Disable	3.20.25	4.11.25		
False Lock	3.20.26	4.11.26		

MIL-R-55499B(EL)

TABLE III - GROUP A INSPECTION (contd)

<u>Inspection</u>	<u>Req Para</u>	<u>Insp Para</u>	<u>AQL Major</u>	<u>AQL Minor</u>
Antenna Base Support AB-591( )/PRC-25:				
Torsion Test	3.22.1	4.12.1	1% for the group combined.	
Test of Bonding Neoprene Covering	3.22.2.1	4.12.2		
Bend Test on Assembled Support	3.22.3	4.12.4		
Antenna AT-892( )/PRC-25:				
Antenna Base Support	3.23.3	4.13.2.2	1.0%	
Air Seal	3.27	4.17	1.0%	
Operational	3.28	4.20	100% Test	
Lite Test	3.34	4.25	100% Test	

4.5.2 Group B Inspection.— This inspection, including sampling, shall conform to Table IV and to the procedures for small-sample inspection of Standard MIL-STD-105 using the special inspection levels. Group B inspection shall normally be performed on inspection lots that have passed Group A inspection and on the samples selected from units that have been subjected to and met the Group A inspection.

4.5.2.1 Group B Sampling Plans.— The Group B sampling plans, for the AQL's listed in Table IV, shall be as follows:

<u>AQL</u>	<u>Inspection Level</u>
2.5%	S-4
4.0%	S-4
6.5%	S-4

4.5.2.2 Order of Inspection within Group B.— Group B inspection shall be performed in any order which is satisfactory to the government.



MIL-R-55499B(EL)

TABLE IV - GROUP B INSPECTION

<u>Inspection</u>	<u>Req Para</u>	<u>Insp Para</u>	<u>AQL</u> (See 4.5.2.1)
Electrical, RT-841/PRC-77:			
Maximum Signal Plus Noise-to-Noise Ratio	3.19.8	4.9.8	
Desensitization	3.19.9	4.9.9	
Control Voltage Variation	3.19.10	4.9.10	
Input Voltage Range	3.19.15	4.9.15	
Input Power Consumption	3.19.16	4.9.16	4.0% for the group
VFO Deviation Sensitivity	3.19.12	4.9.12	
VFO Deviation Capability	3.19.13	4.9.13	
Resettability	3.19.14	4.9.14	
Relay Operation	3.19.29	4.9.29	
Maximum Signal Plus Noise-to-Noise Ratio	3.20.8	4.11.8	
Input Voltage Range	3.20.11	4.11.11	
Input Power Consumption	3.20.12	4.11.12	
Antenna AT-892( )/PRC-25:			
Cold Bend Test	3.23.1	4.13.1.1	6.5%

## Interchangeability

When Supplied as p/o RT-841/PRC-77:

Dimensional, RT-841/PRC-77 Chassis (less Plug-in Modules)	3.29	4.14.1	4.0%
Dimensional, Modules	3.29	4.14.1	4.0%
Electrical, Modules	3.29	4.14.2	4.0%

4.5.3 Group C Inspection.-- This inspection shall be as listed in Table V, and shall normally be performed on sample units that have been subjected to and met Group A and Group B inspection.

TABLE V - GROUP C INSPECTION

<u>Inspection</u>	<u>Req Para</u>	<u>Insp Para</u>
Subgroup I (See 4.5.3.1.1)		
Receive Mode:		
Narrow Band Receiver Audio Output Impedance	3.19.18	4.9.18
IF Selectivity	3.19.19	4.9.19

MIL-R-55499B(EL)

TABLE V - GROUP C INSPECTION - Contd

<u>Inspection</u>	<u>Req Para</u>	<u>Insp Para</u>
Spurious Response	3.19.20	4.9.20
IF Rejection	3.19.21	4.9.21
Intermodulation	3.19.22	4.9.22
Oscillator Radiation	3.19.23	4.9.23
VFO Temperature Stability	3.19.24	4.9.24
Synthesizer Lock-up Time	3.19.30	4.9.30
Transmit Mode:		
Re-transmit Operation	3.20.10	4.11.10
Microphone Input Impedance	3.20.14	4.11.14
Audio Response	3.20.15	4.11.15
Deviation	3.20.16	4.11.16
Deviation Limiting	3.20.17	4.11.17
Spurious Radiation	3.20.18	4.11.18
Tone Oscillator Stability	3.20.19	4.11.19
Long Antenna Loading	3.20.20.2	4.11.20.2
Short Antenna Loading	3.20.21	4.11.21
Transmitter AFC Lock-up Time	3.20.27	4.11.27
Subgroup IIa (See 4.5.3.1.2)		
Receive Mode:		
Frequency Range	3.19.17	4.9.17
Noise Quieting	3.19.28	4.9.28
Subgroup IIb (See 4.5.3.1.2)		
Transmit Mode:		
Frequency Range	3.20.13	4.11.13
Subgroup III (See 4.5.3.1.3)		
Immersion	3.17.4	4.7.4
Support, Antenna AB-591( )/PRC-25:		
Cold Bend Test of Neoprene Covering	3.22.2.2	4.12.3
Test for Shock-absorbing Qualities	3.22.4	4.12.5
		(See Note 1)

MIL-R-55499B(EL)

TABLE V - GROUP C INSPECTION - Contd

<u>Inspection</u>	<u>Req Para</u>	<u>Insp Para</u>
Antenna AT-892( )/PRC-25		
Antenna Base Flexure	3.23.2	4.13.2.1
Bag CW-503( )/PRC-25 and Harness ST-138( )/PRC-25:		
Test for Shrinkage	3.16	4.15
Subgroup IV (See 4.5.3.1.4) (See Note 3)		
RT-841( )/PRC-77:		
Moisture Resistance	3.17.2	4.7.2
Elevation	3.17.3	4.7.3
Orientation	3.17.5	4.7.5
Sand and Dust	3.17.6	4.7.6
Shock, Bench-handling	3.18.2	4.7.9
Shock, Drop	3.18.2	4.7.10
Fungus	3.35.1	4.23 (See Note 2)
Salt Fog	3.36	4.24
Subgroup V (See 4.5.3.1.5) (See Note 3)		
Temperature	3.17.1	4.7.1
Vibration, Internal	3.18.1	4.7.7
Bounce	3.18.2	4.7.8
Bandswitch Life	3.17.7	4.7.11
Subgroup VI (See 4.5.3.1.6)		
Radio Frequency Interference	3.30	4.18

NOTE 1: Sample units subjected to this inspection shall not be furnished on the contract.

NOTE 2: This test shall be performed on a separate sample.

NOTE 3: Sample units subjected to this inspection shall be refurbished as necessary and submitted as part of the production equipment.

MIL-R-55499B(EL)

4.5.3.1 Sampling for Inspection of Equipment.- Units selected for each Group C inspection shall be selected without regard to their quality in accordance with the following.

4.5.3.1.1 Subgroup I.- For this subgroup, two units from the first production lot shall be selected for the first Group C inspection. For subsequent Group C inspections two units from each successive 100, or two per month if less than 100 are produced monthly, shall be selected. For this subgroup the maximum number of units to be tested in a single month shall be sixteen.

4.5.3.1.2 Subgroup IIa.- For this subgroup two units from the first production lot shall be selected for the first Group C inspection. For subsequent Group C inspections, two units per month shall be selected.

Subgroup IIb.- For this subgroup one unit from the first production lot and one unit from each fifty units produced thereafter shall be selected for this test throughout the contract.

4.5.3.1.3 Subgroup III.- For this subgroup, two units from the first production lot shall be selected for the first Group C inspection. For subsequent Group C inspections, one each from each 250 (or fraction thereof) production units shall be selected.

4.5.3.1.4 Subgroup IV.- For this subgroup, two units from the first production lot and two units from the first 50 units following the midpoint production quantity shall be selected. No subsequent Group C inspection for the tests in this subgroup will be required.

4.5.3.1.5 Subgroup V.- For this subgroup, two units from the first production lot shall be selected for the first Group C inspection. For subsequent Group C inspections, two units, every three months, shall be selected.

4.5.3.1.6 Subgroup VI.- For this subgroup, one unit from the first production lot and one unit from the first 50 units following the midpoint production quantity shall be selected. No subsequent Group C inspection for the tests in the subgroup will be required.

4.5.3.2 Noncompliance.- All quality conformance inspections shall be halted including Group A and B inspections, upon occurrence of any Group C failure. Each Group C failure occurrence shall immediately be reported in writing, including details of the failure and characteristics affected. The contractor shall immediately investigate the cause of failure and further report the results of investigation and details of the proposed

MIL-R-55499B(EL)

corrective action on (1) the process and materials, as applicable and (2) all units of product which were manufactured under the same conditions and which the government considers subject to the same failure. Reports shall be forwarded to the responsible technical activity designated in the contract through the Quality Assurance Representative. After corrective action has been taken, additional sample units shall be subjected to Group C inspection (all inspections, or the inspections which the sample failed, at the option of the government) and Group A and B inspection may be reinstituted; however, final acceptance and shipment will be withheld until Group C reinspection results have shown that the corrective action was effective.

#### 4.6 Preconditioning.-

4.6.1 Bounce Preconditioning (See 3.26.1).- The receiver-transmitter shall be placed in its normal operating position on the table of the Package Tester, Type 1000-SC, as made by the L.A.B. Corporation, Skaneateles, New York, or equal. The package tester, shafts in phase, shall have a speed such that it is just possible to insert a 1/32 inch thick strip of material under one corner or edge of the equipment to a distance of three inches as the equipment bounces. The equipment shall be subjected to this preconditioning for one minute.

4.6.2 Electrical Preconditioning (See 3.26.2).- All Receiver-Transmitters RT-841( )/PRC-77 on order shall meet the requirements of Appendix A of this specification after being subjected to the burn-in (debugging) process.

4.7 Service Condition Tests.- The electrical tests specified in this paragraph need not be performed in an interference free area; however, necessary precautions shall be taken to prevent ambient interference from entering or affecting either the measuring circuit or equipments under test.

4.7.1 Temperature Test for Equipment (See 3.17.1).- The units shall be subjected to the temperature cycle shown on Standard MIL-STD-169. For the receiver-transmitter, the measurements in 3.17.1c shall be made at Steps 1, 3, 8 and 10.

4.7.2 Moisture Resistance (See 3.17.2).- The units shall be tested as follows:

##### 4.7.2.1 Test Conditions.-

- a. Do not remove equipment from the humidity chamber for measurements.
- b. Start measurements not more than 5 minutes after power is applied to equipment. Complete measurements as rapidly as possible. Do not leave power on after measurements have been completed.

MIL-R-55499B(EL)

c. The units including the receiver-transmitter, shall be tested with the seals intact for a total of five 48-hour cycles. Bring out leads for electrical measurements through a hole in the equipment enclosure and seal against the entrance of moisture.

4.7.2.2 Test Procedure.— The equipment shall be tested as follows:

- a. Dry at  $130^{\circ} \pm 5^{\circ}\text{F}$  for 24 hours.
- b. Condition at  $77^{\circ} \pm 5^{\circ}\text{F}$  and 40 to 50 per cent relative humidity for 24 hours.
- c. Take the measurements if applicable, as specified in 3.17.2 and readjust, if necessary, to meet specification requirements.
- d. All units shall be subjected to a total of five continuous 48-hour cycles. Temperature, relative humidity, and period of time for each portion of the cycle shall conform to MIL-STD-170. Take the measurements specified in 3.17.2 at the times specified on the standard.
- e. After cycling has been completed, condition the equipment for 24-hours at  $77^{\circ} \pm 5^{\circ}\text{F}$  at 40 to 60 per cent relative humidity. No repair or replacement of parts shall be made. After adjustment the equipment shall meet full specification performance for the measurements in 3.17.2.

4.7.2.3 Failure.— If the unit fails to meet the performance specified in 3.17.2 during cycling, it shall be realigned or readjusted once. If the equipment then fails to meet specified performance, or fails subsequently during cycling, it does not pass the test. In addition, if the equipment fails to meet full specification requirements after conditioning and adjustment, it does not pass the test.

4.7.3 Elevation Test (See 3.17.3).— The unit, placed in its normal operating position in an altitude chamber, shall be tested as follows: (To check temperature stabilization, place a thermocouple on the largest internal mass centrally located within the equipment.)

- a. With the unit placed in the chamber, operating and stabilized at room temperature, perform the tests specified in 3.17.3.c.
- b. Reduce the barometric pressure to  $20.6 \pm 0.1$  inches of mercury (simulated 10,000 feet above sea level) and, after temperature and pressure stabilization, repeat the test specified in 3.17.3.c. The unit shall meet specified performance for this test.
- c. Remove the power from the equipment and further reduce the barometric pressure to  $5.5 \pm 0.1$  inches of mercury (simulated 40,000 feet above sea level). Maintain this condition for one hour.

MTL-R-55499B(EL)

d. Return the chamber to ambient pressure. Apply power to the unit and, after stabilization, repeat the test specified in 3.17.3c. The equipment shall meet specified performance for this test.

4.7.4 Immersion (See 3.17.4).— The receiver-transmitter as prepared for field transportation (including Battery Box CY-2562( )/PRC-25 with Battery BA-386/U or equivalent ballast) shall be immersed to a minimum depth of three feet of fresh water for a period of two hours. Immediately prior to immersion, the temperature of the equipment shall be 40°F, or more, above the temperature of the water. The tank in which the equipment is immersed shall be of sufficient capacity to maintain the water within 2°F of its initial temperature, or the temperature of the water shall be maintained within those limits by other means. After completion of the 2-hour period of immersion, the equipment shall be removed from the water and wiped dry on exterior surfaces. When the equipment is opened, there shall be no evidence of leakage within the RT case or the battery box.

4.7.5 Orientation Test (See 3.17.5).— The equipment shall be inclined for a minimum of five minutes in each plane (forward, backward, left, and right) to an angle of  $90 \pm 3$  degrees. During inclination in each plane, the equipment shall meet the operational test of 4.20.

4.7.6 Sand and Dust Test (See 3.17.6).— The equipment shall be tested as follows:

a. Place the equipment in its normal operating position within the test chamber. Raise and maintain the sand and dust density at 0.1 to 0.5 gram per cubic foot within the test space. The relative humidity shall not exceed 30 per cent at any time during the test.

b. The sand and dust shall be of angular structure and shall have a particle size such that the particles can pass through screens as follows:

<u>Screen, US Standard Sieve Series</u>	<u>Per Cent</u>
100-mesh	100
140-mesh	98 $\pm$ 2
200-mesh	98 $\pm$ 2
325-mesh	75 $\pm$ 2

c. Chemical analysis of the sand and dust shall be as follows:

<u>Substance</u>	<u>Per Cent by Weight</u>
SiO <sub>2</sub>	97 to 99
Fe <sub>2</sub> O <sub>3</sub>	0 to 2



MIL-R-55499B(EL)

<u>Substance</u>	<u>Per Cent by Weight</u>
Al <sub>2</sub> O <sub>3</sub>	0 to 1
TiO <sub>2</sub>	0 to 2
MgO	0 to 1
Ignition Losses	0 to 2

d. Maintain internal temperature of test chamber at  $77^{\circ} \pm 4^{\circ}\text{F}$  for a period of six hours, with sand and dust velocity through the test chamber between 100 and 500 feet per minute.

e. After six hours at above conditions, raise the temperature to  $160^{\circ} \pm 4^{\circ}\text{F}$  and maintain it at this value for six hours. The other conditions shall remain the same.

f. Remove equipment from test chamber and allow it to cool to room temperature. Accumulated dust shall be removed by brushing, wiping, or shaking, with care taken to avoid introduction of additional dust into the equipment. However, dust shall not be removed by either blast or vacuum cleaning. The receiver-transmitter shall meet the sensitivity (4.9.1), RF power output (4.11.1), and operational (4.20) tests.

g. Open the equipment. There shall be no evidence of deterioration of external or internal parts.

4.7.7 Test for Internal Vibration (See 3.18.1).— Internal vibration of the equipment shall be measured as follows, to determine conformance to 3.18.1.

a. Secure the equipment directly to a vibration table that can be controlled within 10 per cent of the specified amplitude. Mounting method shall be such that vibration within the equipment can be observed and measured. To facilitate this observation and measurement, sub-assemblies may be tested separately provided they are secured to the table in a manner similar to that used to mount them in the equipment.

b. Vibrate the equipment successively in three mutually perpendicular directions over a frequency range of 10 to 55 Hz. The total excursion of the applied vibration shall be not less than 0.030 inch.

c. In each of three directions, change the frequency in steps of one Hertz and maintain each frequency for at least 10 seconds.

d. Measure vibration amplitudes by optical means, or by other means provided that vibration of the part is not affected by the measurement.

MIL-R-55499B(EL)

e. At the completion of the test, the receiver-transmitter shall meet the sensitivity (4.9.1) RF power output (4.11.1) and operational (4.20) tests.

4.7.8 Bounce Test (See 3.18.2).— The equipment in its case shall be tested on the package tester, Type 1000-SC, as made by the L.A.B. Corporation, Skaneateles, New York, or equal. Accessories shall be selected from those listed on Drawing SC-A-46439. The test shall be as follows:

a. Cover the tester bed with a panel of 1/2 inch plywood. Space six-penny nails, with the heads below the surface, at 6-inch intervals around all four edges and at 3-inch intervals in a 6-inch square in the center.

b. Place the equipment in its case, prepared for field use, on the bed of the package tester. Limit the lateral motion, by wooden fences, to not more than three inches and not less than one inch. Additional barriers may be used to prevent tumbling provided that the fore and aft motion of the equipment against the backstop is not restrained.

c. Operate the package tester, shafts in phase, for a total of three hours at  $284 \pm 2$  rpm. Turn the equipment at the end of each 30 minutes so it will rest on a new face.

d. The equipment shall be energized at the end of each 1/2-hour period and an operational or talk test performed. At the completion of the bounce test, the equipment shall be tested for compliance with performance after test, Table I of 3.18.2.

4.7.9 Shock Test, Bench-Handling (See 3.18.2).— The receiver-transmitter chassis and front panel assembly shall be removed from its enclosure, as for servicing, and placed in a suitable position for servicing on a solid 2-inch fir bench top. The test shall be performed as follows, in a manner simulating shocks liable to occur during servicing.

a. Tilt up the assembly through an angle of  $30^{\circ}$ , using one edge of the assembly as an axis, and permit the assembly to drop back freely to the horizontal. Repeat, using other practicable edges of the same horizontal face as axes, for a total of 4 drops.

b. Repeat a. with the assembly resting on other faces, until it has been dropped for a total of four times on each face on which the equipment might practically be placed for servicing.

c. Upon completion, the RT unit shall be tested for compliance with Performance after Test, Table I of 3.18.2.

MIL-R-55499B(EL)

4.7.10 Shock Test, Drop (See 3.18.2).-

a. Test Method.- The receiver-transmitter in its case shall be dropped a distance of four feet on each corner, edge, and face (total of 26 drops). Drops shall be made from a quick-release hook; or pendulum tester as made by L.A.B. Corporation, Skaneateles, New York, or equal. The floor or barrier receiving the impact shall be of 2-inch fir backed by concrete or a rigid steel frame. Except for abrasion, paint chipping, and small local deformations, no damage shall occur.

b. Performance.- Upon completion of the test and before repairs are made, the receiver-transmitter shall be tested for compliance with Performance after Test, Table I of 3.18.2.

4.7.11 Bandswitch Life (See 3.17.7).- With the receiver-transmitter in the receive mode, measure the receiver sensitivity as specified in paragraph 4.9.1. Place the receiver-transmitter in the transmit mode and measure RF power output and frequency accuracy at the frequencies specified in paragraph 4.11.1. With the power off and with the dial set at any frequency, the bandswitch shall then be subjected to a 10,000 cycle life test. After completion of the 10,000 cycles, repeat the above measurements of receiver sensitivity, RF power output and frequency accuracy to establish compliance with 3.17.7.

4.8 Standard Test Conditions, Receiving.- All electrical tests, except that specified in paragraph 4.9.24, shall be performed in a screened room conforming to Specification MIL-R-11936. Proper shielding techniques shall be utilized to minimize radiation to the extent that the accuracy of any measurement required in paragraph 4.9 is not affected. All measurements shall be made under the test conditions listed below unless otherwise specified in the individual test paragraph.

Temperature	. . . . .	Room Ambient
Humidity	. . . . .	Room Ambient
Dummy Antenna Load	. . . . .	51 ohm Resistor to Ground with 33 ohm Series Resistor, See Figure A1.1 (To be used in series with 50 ohm signal generator).
Function Switch	. . . . .	ON
Input Voltage	. . . . .	12.5 Volts DC Nominal
RF Input (To 50 ohm terminal)	. . . . .	10 Microvolts, $10 \pm 2$ KHz deviation, 1000 Hz modu- lating frequency
Audio Output Level	. . . . .	1 Milliwatt
Audio Output Load Impedance	. . . . .	1000 Ohms $\pm 1\%$

MIL-R-55499B(EL)

4.9 Receiver Electrical Tests. - All tests shall be conducted in accordance with the individual test paragraphs at the following listed frequencies:

<u>Test Para</u>	<u>Test Freq. (MHz)</u>
4.9.1	30.00, 41.00, 52.00, 53.00, 65.00, 75.95
4.9.2	Note 2
4.9.3	Note 2
4.9.4	Note 1
4.9.5	30.00, 41.00, 52.00, 65.00, 75.00
4.9.6	30.00, 41.00, 52.00, 65.00, 75.00
4.9.7	Note 3
4.9.8	Note 2
4.9.9	30.00, 45.00, 52.00, 53.00, 60.00, 75.00
4.9.10	43 channels as specified in para 4.9.10
4.9.11	Note 2
4.9.12	42.00, 52.00, 63.00 (VFO freq)
4.9.13	42.00, 52.00, 63.00 (VFO freq)
4.9.14	31.50, 41.50, 51.50, 54.50, 64.50, 74.50
4.9.15	As specified in para 4.9.15
4.9.16	Note 3
4.9.17	920 channels
4.9.18	Note 1
4.9.19	Note 1
4.9.20	Note 3
4.9.21	30.00, 52.00, 54.00, 75.00
4.9.22	41.50, 52.40
4.9.23	Note 4
4.9.24	42.00, 53.00, 63.00
4.9.25	Note 1
4.9.26	Note 1
4.9.27	Note 1
4.9.28	920 channels
4.9.29	32.15, 56.10, 47.05, 71.10
4.9.30	920 channels

Note 1 - Any channel.

Note 2 - Any channel in high band and any channel in low band.

Note 3 - Any 2 channels in high band and any 2 channels in low band.

Note 4 - Any 3 channels in high band and any 3 channels in low band.

It is the contractor's responsibility to assure that the equipment submitted for acceptance meets the requirements of 3.19; the government reserves the right to select additional test frequencies, in any manner, and perform tests to assure that equipment meets any requirements in paragraph 3.19.

MIL-R-55499B(EL)

4.9.1 Sensitivity (See 3.19.1).-- The receiver shall be operated under standard test conditions except that the RF input to the receiver 50 ohm terminal shall be 0.5 microvolts deviated plus and minus 10 KHz with a 1000 Hz modulating frequency. The ratio of signal plus noise plus distortion to noise plus distortion expressed in db shall be measured at the audio output terminal with an appropriate distortion meter such as Hewlett-Packard Distortion Analyzer Model 331A or equal to determine compliance with 3.19.1. Measurements shall be made at the following frequencies: 30.00, 41.00, 52.00, 53.00, 65.00 and 75.95 MHz.

4.9.2 Distortion (See 3.19.2).-- The receiver shall be operated under standard conditions. The distortion at the audio output terminal shall be measured to determine compliance with 3.19.2. These measurements to determine compliance may be made on any channel in the low band and on any channel in the high band.

4.9.3 Audio Output Power (See 3.19.3).-- The power dissipated in a 1000-ohm load shall be measured to establish compliance with 3.19.3. These measurements to determine compliance may be made on any channel in the low band and on any channel in the high band.

4.9.4 Volume Control (See 3.19.4).-- The output of the headphone circuits shall be recorded for full clockwise and counterclockwise settings of the volume control to establish compliance with 3.19.4. These measurements to determine compliance may be made on any channel.

4.9.5 Limiting (See 3.19.5).-- The receiver shall be operated under standard test conditions except that the RF input shall be 1 microvolt. The signal generator output shall then be increased to 100,000 microvolts and the audio output continuously observed. This test shall be made at the following frequencies: 30.00, 41.00, 52.00, 65.00 and 75.00 MHz to determine compliance with 3.19.5.

4.9.6 Squelch Sensitivity (See 3.19.6).-- The receiver shall be operated under standard test conditions except that the RF input level shall be 0.5 microvolt. The function switch shall be turned to the retransmit position and the RF signal generator modulated with an additional tone of 150 Hz and  $\pm 3$  KHz deviation. With no RF signal applied to the receiver, the audio output shall be zero, and the retransmit contact on the squelch relay shall be open. With the RF signal applied, the audio output shall appear, and the retransmit contact on the squelch relay shall produce a "ground" between Terminal E and Terminal A of each of the five-pin audio receptacles FL 1 and FL 2. The retransmit contact on the squelch relay shall provide a "ground" when the RF signal is reduced to 0.35 microvolt or less. In addition, a voice modulated signal shall be applied, along with an additional tone of 150 Hz, to the receiver and the squelch circuitry checked for proper operation. This test shall be made at the following frequencies: 30.00, 41.00, 52.00, 53.00, 65.00 and 75.00 MHz to determine compliance with 3.19.6.

MIL-R-55499B(EL)

4.9.7 Receiver Catching Range (See 3.19.7).- The frequency selector mechanism shall be set to the midpoint of any megahertz band (.50). Disengage module A40 from the selector mechanism. Monitor and note the APC voltage at test point A39-J3 and the IF frequency at test point A18-J2. (Remove voltmeter from test point A-39-J3 after measuring the APC voltage and before measuring the IF frequency.) Rotate the KHz tuning dial to next detent, (.55). Set the FUNCTION switch to OFF momentarily and determine that the IF frequency still reads the same when monitored. Keep repeating this procedure, in the up-frequency direction to the point where the IF frequency changes more than 5.0 KHz. At the point where these changes are noted, turn dial back one detent, this is the upper catching range. Return KHz dial to .50 and repeat tests in a down-frequency direction, and determine where changes in the IF frequency are noted. Return up-frequency one detent, this is the lower catching range. Add the upper and lower limits to determine overall catching range. Measure to determine compliance at any two channels in the low band and any two channels in the high band.

4.9.8 Maximum Signal Plus Noise-to-Noise Ratio (See 3.19.8).- The receiver shall be operated under standard test conditions except that RF input shall be 100 microvolts. The ratio, expressed in db, of the audio output with and without modulation shall be measured. Measure for compliance on any channel in the low band and on any channel in the high band.

4.9.9 Desensitization (See 3.19.9).- With an on-channel RF signal applied to the input of the receiver having a level which produces a 26 db signal plus noise-to-noise ratio, an interfering signal shall be applied which is  $\pm 10\%$  removed and its level increased until the signal plus noise-to-noise ratio of the desired signal is reduced to 20 db. The level of the interfering signal relative to the on-channel signal shall be recorded to determine compliance with 3.19.9. This test shall be made at the following frequencies: 30.00, 45.00, 52.00, 53.00, 60.00 and 75.00 MHz.

4.9.10 Control Voltage Variation (See 3.19.10).- Arrange a DC VTVM so that the control voltage to the VFO (A-39, J-3) may be measured and noted in the locked condition with a reference frequency of 30.00 MHz. Vary the 50 KHz dial in increments of 50 KHz (for a total of 20 channels) and the noted VFO control voltage shall not vary more than 0.0 to + 0.5 volts from referenced lock condition. The voltage shall not vary more than -0.5 to + 0.5 volts dc from the reference when the MHz dial in the low band is rotated in 1 MHz increments (for a total of 23 channels). The voltage variation shall meet the requirements of 3.19.10.



4.9.11 Audio Response (See 3.19.11).-- The receiver shall be operated under standard test conditions, except that an external audio oscillator shall be used to modulate the RF generator at a deviation of plus and minus 10 KHz with a modulating frequency of 1000 Hz. Measurements of receiver audio output shall be made and recorded at the following audio frequencies: 300, 500, 1000, 2000 and 3000 Hz, to determine compliance with 3.19.11. Measure for compliance on any channel in the low band and on any channel in the high band.

4.9.12 VFO Deviation Sensitivity (See 3.19.12).-- The deviation of the receiver VFO from nominal frequency shall be measured with an increment of plus and minus 1.0 volt dc relative to the dc bias normally applied to the modulator input as measured at test point A39-J3. (Receiver VFO frequencies shall be measured at test point A39-J4.) This test shall be made for nominal VFO frequencies of 42.00, 52.00 and 63.00 MHz to determine compliance with 3.19.12.

4.9.13 VFO Deviation Capability (See 3.19.13).-- The deviation of the receiver VFO from nominal frequency shall be measured with an increment of plus and minus 2.0 volts dc relative to the dc bias normally applied to the modulator input as measured at test point A39-J3. (Receiver VFO frequencies shall be measured at test point A39-J4.) Test shall be made for nominal VFO frequencies of 42.00, 52.00 and 63.00 MHz to determine compliance with 3.19.13.

4.9.14 Resettability (See 3.19.14).-- Disable the receiver VFO control line by applying a clamping voltage, from a regulated power supply, to test point A39-J3. Tune the receiver to 31.50 MHz from a lower frequency. The frequency of the receiver VFO shall then be measured at test point A39-J4. This step shall be repeated five times using both the megahertz and kilohertz knobs. The same frequency shall then be approached from a higher frequency in a similar manner. The procedure shall be repeated for frequencies of 41.50, 51.50, 54.50, 64.50 and 74.50 MHz to determine compliance with 3.19.14.

4.9.15 Input Voltage Range (See 3.19.15).-- To determine compliance with 3.19.15, the tests listed below shall be conducted at input voltages of 10.0 and 15.0 volts dc. Measure for compliance at channels specified in the individual test paragraphs below.

- a. Audio Output Power (4.9.3)
- b. Sensitivity (4.9.1)
- c. Distortion (4.9.2)
- d. Squelch Sensitivity (4.9.6)



## MIL-R-55499B(EL)

- e. Receiver Catching Range (4.9.7)
- f. Wide Band Audio Output (4.9.25)
- g. Wide Band Audio Response (4.9.26)

4.9.16 Input Power Consumption (See 3.19.16).- The input power to the receiver under nominal input voltage conditions shall be measured to determine compliance with 3.19.16. Measure to determine compliance on any two channels in the low band and on any two channels in the high band.

4.9.17 Frequency Range (See 3.19.17).- With the receiver-transmitter in the receive mode, each of the 920 channels shall be tested for compliance with the requirements of paragraph 3.19.17. A signal generator deviated plus and minus 10 KHz with a 1 KHz modulating frequency shall be used to provide an input to the receiver. The carrier frequency of the signal generator shall be monitored with a frequency counter and shall be within  $\pm 3.5$  KHz of the dial frequency on the AN/PRC-77. The RF input carrier and the frequency selecting dials of the receiver-transmitter shall be adjusted over the entire 920 channel range. At each frequency, the audio power output measurement as per 4.9.3 shall be made and the requirements of 3.19.3 shall be met.

4.9.18 Narrow Band Receiver Audio Output Impedance (See 3.19.18).- The headphone output shall be terminated in 1000 ohms and the audio voltage across this termination adjusted with the volume control to 0.5 volt. When the load is removed, the open circuit output voltage shall increase to 1.25 volt  $\pm 0.23$  volt. Measure for compliance on any channel.

4.9.19 IF Selectivity (See 3.19.19).- Tune the receiver and signal generator to any convenient frequency. Monitor the IF at test point A21-TP1 with a VTVM at the highest IF level possible which is not limited by noise with no signal. To measure the 6 db points and other points within the pass band, adjust the RF input until the IF signal is approximately 6 db below saturation. Keep the RF input level constant and vary the frequency to measure the pass band. To measure the 60 db and 70 db points, a new reference is required. Reduce the signal generator output and observe the residual noise at the IF test point. With this IF level as a reference, increase the signal generator output by 60 db or 70 db, whichever is being measured, and tune the signal generator to restore the reference at the IF test point. The results shall comply with the requirements of 3.19.19.

MIL-R-55499B(EL)

4.9.20 Spurious Responses (See 3.19.20).-- The amount of quieting produced by an unmodulated RF carrier of 1 microvolt shall be used as a reference. The signal generator output shall be increased to 100,000 or 10,000 microvolts as required and the generator tuned throughout the range of 20 to 100 MHz. Those frequencies which produce the quieting equal to or greater than the reference shall be recorded to determine compliance with 3.19.20. This test shall be made at any two channels in the low band and any two channels in the high band.

4.9.21 IF Rejection (See 3.19.21).-- The receiver shall be tuned to 30 MHz. The amount of quieting produced by 1 microvolt shall be used as a reference. The signal generator shall then be tuned to 11.5 MHz and its output raised until the amount of quieting is equal to the reference. The number of microvolts shall be recorded to determine compliance with 3.19.21. This test shall be performed at the following frequencies: 30.00, 52.00, 54.00 and 75.00 MHz.

4.9.22 Intermodulation (See 3.19.22).-- The receiver shall be tuned to 41.50 megahertz and an RF unmodulated carrier of 1 microvolt shall be applied to the input of the receiver. The amount of quieting produced by this signal shall be used as a reference. Two similar signal generators, tuned to 41.60 and 41.70 MHz shall be coupled to the input of the receiver. The output of the generators shall be kept equal and simultaneously increased until the reference quieting is produced. The number of microvolts required to produce the reference shall be recorded to determine compliance with 3.19.22. The loading effect of the generators will be taken into account when arriving at the number of microvolts required to produce the reference, that is, the spurious signals shall be 52 db above one microvolt. The test shall be repeated at 52.40 MHz with the spurious frequencies at 52.50 MHz and 52.60 MHz.

4.9.23 Oscillator Radiation (See 3.19.23).-- The receiver-transmitter in receive condition with its case and battery box attached shall be operated under standard operating conditions except that no signal shall be applied to the antenna terminals. Cap CW-922/GR shall be used to shield the whip antenna post, with the cap being grounded to the panel. Connect a field strength meter to the 50 ohm antenna terminal (BNC-J2) connector on the panel of the RT unit. Tune the receiver to any channel and scan tune the field strength meter over the range from 150 KHz through 200 MHz. Measure to establish compliance with 3.19.23. Measure for compliance at any three channels in the low band and any three channels in the high band.

MIL-R-55499B(EL)

4.9.24 VFO Temperature Stability (See 3.19.24).- With the receiver-transmitter frequency dial set at the appropriate frequency, a clamping voltage from a regulated power supply shall be applied to test point A39-J3 to disable the APC line of the receiver VFO. At room temperature, the clamping voltage shall be adjusted to produce a nominal VFO frequency of 42.00 MHz, as measured at test point A39-J4, and both clamping voltage and VFO frequency shall be recorded. The ambient temperature shall then be lowered to -40°F and held at that temperature for one hour. The original clamping voltage shall then be applied and the VFO frequency measured at the -40°F temperature level for compliance with 3.19.24. The test shall be repeated for an ambient temperature of +150°F. Repeat also for VFO frequencies of 53.00 and 63.00 MHz and for input voltages of 10.0 and 15.0 VDC.

4.9.25 Wide Band Audio Output (See 3.19.25).- The voltage across a load of 20,000 ohms in parallel with 1000 pf shall be measured at Terminal P of the front panel power connector J3 to establish compliance with 3.19.25. The RF input to the receiver shall be deviated plus and minus 6.5 KHz with a 1 KHz modulation frequency. Measure for compliance on any channel.

4.9.26 Wide Band Audio Response (See 3.19.26).- A signal generator shall be modulated with an external audio oscillator and the deviation set to 6.5 +0.5, -0 KHz at 1000 Hz modulating frequency. The voltage at Terminal P of the front panel power connector J-3 shall be measured across a load of 20,000 ohms in parallel with 1000 pf and shall be recorded for 15 Hz, 100 Hz, 1000 Hz, 10,000 Hz, 15,000 Hz, and 20,000 Hz to establish compliance with 3.19.26. Measure for compliance on any channel.

4.9.27 Wide Band Audio Output Impedance (See 3.19.27).- The wide band audio output circuit impedance shall be measured at Terminal P of the front panel power connector J3 at 1000 Hz to establish compliance with 3.19.27. Measure for compliance on any channel.

4.9.28 Noise Quieting Test (See 3.19.28).- The Receiver-Transmitter RT-841/PRC-77, with case on, shall be operated under standard receiver test conditions except that the 10 microvolt RF input signal shall be removed and the BNC antenna terminal (J2) on the front panel of the RT unit shall be shorted to the case. The receiver noise audio output level shall be set for 1.0 volt across a 1000 ohm non-inductive audio output load. The RT unit shall be tuned to any channel as the reference test frequency. The channel shall be checked to measure the reference output noise. Using this as the reference level, the front panel selector tuning on the RT unit shall then be rotated to each channel in higher 50 KHz increments and each channel in lower 50 KHz increments of rotation and the audio noise voltage noted at each channel setting. A noise voltage difference reading of 3 db or greater between any channel to that of the reference channel shall be noted. Those channels showing audio noise

MIL-R-55499B(EL)

voltage readings of 3 db or greater shall be measured for receiver sensitivity. The noise measurement shall be made on all 920 channels and shall comply with 3.19.28.

4.9.29 Relay Operation (See 3.19.29)..- The equipment shall be tested as follows:

a. Place the function switch on the radio set under test to RETRANS position. The radio set shall be operated with nominal input supply voltages. Three signal generators, two of which shall be used at one time, each with a 50 ohm output impedance, shall be connected through a T-connector to the 50 ohm terminal on the radio set.

b. One signal generator whose output shall be 200,000 microvolts and set to a frequency separation of 3.0 MHz above 32.15 and 56.10 MHz, and 3.0 MHz below the test frequencies of 47.05 and 71.10 MHz shall be used as one of two of the interference signals.

c. A second signal generator shall be set to a carrier frequency of 11.45 MHz above the frequency of the first generator when testing the radio sets on the low band. This signal generator shall be set to a carrier frequency 11.45 MHz below the first generator frequency when the radio set is tested on the high band. The output shall be set at 50,000 microvolts and shall be modulated with a 150 Hz tone at plus and minus 3 KHz deviation. With the first and second generators connected to the T-connector, the operational requirements of 3.19.29 shall be met.

d. A third signal generator shall be connected to the radio set and the test frequency modulated at three KHz deviation with a 150 Hz tone. The carrier output shall be set to 1.5 microvolts. This third signal generator shall be connected in place of the second signal generator and the operational requirements of 3.19.29 shall be met.

4.9.30 Synthesizer Lock-up Time (See 3.19.30)..- The APC voltage at test point A39-J3 shall be applied to the vertical input of an oscilloscope. The oscilloscope shall be set for a horizontal sweep of .5 sec/cm and for internal positive triggering. The 50 ohm dummy antenna load shall be connected to the transmitter output and a 1000 ohm load connected to the audio output circuit. Determine from the oscilloscope trace that the synthesizer locks on the correct frequency within one second (or three cyclic changes) from the time of selecting a channel or turning on the receiver-transmitter. The receiver-transmitter shall be in the receive mode. Measure for compliance with 3.19.30 on 920 channels.

MIL-R-55499B(EL)

4.10 Standard Test Conditions, Transmitting.-- All measurements shall be made under the test conditions listed below unless otherwise specified in the individual test paragraph.

Temperature	Room Ambient
Humidity	Room Ambient
Dummy Antenna Load	50 ohm resistive $\pm 1\%$
Function Switch	ON
Input Voltage	12.5 Volts DC Nominal

Audio Input Conditions:

- |                               |                    |
|-------------------------------|--------------------|
| a. Microphone Input Level     | 1.4 Millivolts RMS |
| b. Input Modulating Frequency | 1000 Hertz         |

4.11 Transmitter Electrical Tests.-- All tests shall be conducted at the following frequencies in accordance with the individual test paragraphs:

<u>Test Para.</u>	<u>Test Freq. (MHz)</u>
4.11.1	30.00, 42.00, 52.95, 53.00, 65.00, 75.95, 41.00
4.11.2	Note 1 (Note frequencies exempted in 3.20.2)
4.11.3	Note 1 (Note frequencies exempted in 3.20.3)
4.11.4	Note 1 (Note frequencies exempted in 3.20.4)
4.11.5	Note 1
4.11.6	Note 2 (Note frequencies exempted in 3.20.6)
4.11.7	30.00, 75.95
4.11.8	30.00, 41.00, 52.95, 53.00, 64.00, 75.95
4.11.9	Each 50 KHz step from 30.00 MHz to 30.95 MHz, Each 50 KHz step from 41.00 to 41.95 MHz, Each 50 KHz step from 51.00 to 53.95 MHz, & at 42.00, 65.00, 75.00, 75.05, 75.10, 75.20, 75.30, 75.40, 75.50, 75.60, 75.70, 75.80, 75.90, & 75.95 MHz.
4.11.10	As specified in para 4.11.10.
4.11.11	As specified in para 4.11.11.
4.11.12	Note 3
4.11.13	920 channels
4.11.14	Note 1
4.11.15	30.00, 52.00, 54.00, 75.00
4.11.16	30.00, 52.00, 54.00, 75.00
4.11.17	30.00, 52.00, 54.00, 75.00
4.11.18	34.50, 46.00, 57.50, 69.00
4.11.19	Note 1 (Note frequencies exempted in 3.20.19)
4.11.20	As specified in para 4.11.20
4.11.21	As specified in para 4.11.21

MIL-R-55499B(EL)

4.11.22	30.00, 52.00, 54.00, 75.00
4.11.23	30.00, 52.00, 54.00, 75.00
4.11.24	Note 1
4.11.25	Note 1 (Note frequencies exempted in 3.20.25)
4.11.26	30.00, 41.00, 52.00, 53.00, 65.00, 75.95
4.11.27	920 channels

Note 1 - Any channel.

Note 2 - Any channel in high band and any channel in low band.

Note 3 - Any 2 channels in high band and any 2 channels in low band.

It is the contractor's responsibility to assure that the equipment submitted for acceptance meets the requirements of 3.20; the government reserves the right to select additional test frequencies, in any manner and perform tests to assure that the equipment meets any requirement in paragraph 3.20.

4.11.1 RF Power Output (See 3.20.1).- The receiver-transmitter shall be operated in the transmit mode under standard test conditions. The RF power output shall be measured at 30.00, 42.00, 52.95, 53.00, 65.00 and 75.95 MHz. The transmitter shall again be operated under standard test conditions at 41.00 MHz except the transmitter output at the BNC antenna connector (J2) will in turn be terminated in a short circuit for one minute and in an open circuit for one minute. The receiver-transmitter shall then be placed in the receive mode for ten minutes before returning it to the transmit mode (under standard test conditions) and repeating the RF power output measurement at 41.00 MHz. Measure to determine compliance with 3.20.1.

4.11.2 Tone Oscillator Frequency (See 3.20.2).- The transmitter shall be operated under the standard conditions with no modulation except the internal 150 Hz tone modulation. The tone frequency shall be measured to determine compliance with 3.20.2. Measure for compliance on any channel, except those channels exempted in 3.20.2.

4.11.3 Tone Oscillator Modulation (See 3.20.3).- The transmitter shall be operated under standard conditions with no modulation except the internal 150 Hz tone modulation. The transmitter deviation shall be measured to determine compliance with 3.20.3. Measure for compliance on any channel, except those channels exempted in 3.20.3.

4.11.4 System Distortion (See 3.20.4).-

4.11.4.1 Narrow Band (See 3.20.4.1).- This test shall be made with the receiver-transmitter unit under test transmitting to an approved unit operating in the receive mode. The RF signal level to the receiver shall not be less than 3.0 microvolts. With both receiver and transmitter



MIL-R-55499B(EL)

operating under appropriate standard test conditions, disable the transmitter 150 Hz tone generator and measure the distortion across a 1000 ohm load at 1000 Hz modulating frequency to determine compliance with paragraph 3.20.4.1. Measure for compliance on any channel except those channels exempted in 3.20.4.1.

4.11.5 Sidetone (See 3.20.5)- The transmitter shall be operated under standard test conditions. The output of the headphone circuit shall be measured across a one per cent tolerance load resistor. The volume control shall be at maximum setting. Measure for compliance with 3.20.5 on any channel.

4.11.6 Modulation Capability (See 3.20.6).-

4.11.6.1 Narrow Band Deviation (See 3.20.6.1).- The transmitter shall be operated under the standard test conditions, except the 150 Hz tone generator shall be disabled. The transmitter frequency deviation above and below the carrier frequency shall be measured at audio modulating frequencies of 300, 1000, 2000, and 3000 Hz, and shall meet the requirements of 3.20.6.1. The transmitter shall not break lock when, at each modulation frequency, the audio input voltage is gradually increased to 7.0 millivolts RMS. Measure for compliance on any channel on the low band and any channel on the high band except those channels exempted in 3.20.6.1.

4.11.6.2 Wide Band Deviation (See 3.20.6.2).- The transmitter shall be operated under the standard test conditions, except the modulation frequency signal shall be a square wave signal of 4.7 volts peak-to-peak amplitude applied between pins R&L of J3 of the RT-841/PRC. Pin L shall be grounded. The transmitter frequency deviation above and below the carrier frequency shall be measured at audio modulating frequencies of 15, 100, 500, 1000, 2000, 3000, 10000, and 20000 Hz, and shall meet the requirements of 3.20.6.2. The transmitter shall not break lock when, at each modulation frequency, the audio input voltage is gradually increased to 9.4 volts peak-to-peak. Measure for compliance on any channel on the low band and on any channel on the high band except those channels exempted in 3.20.6.2.

4.11.7 Transmitter Catching Range (See 3.20.7).- The receiver-transmitter, in the transmit mode, shall be operated under standard test conditions with the frequency dial set to 30.00 MHz. Do not apply any external modulation. Disable the 150 Hz Tone Modulation by connecting a ground to test terminal A23-J3 and grounding the audio input FL-1 or FL-2, Terminal D. Record the frequency of the transmitter and the APC voltage as measured at test point J4 of Transmitter Frequency Control Module A-31. The frequency shall be within  $\pm 3.5$  KHz of the dial setting. With an auxiliary power supply applied to the A-31 test point J4, to hold the APC voltage at the initial value recorded above, adjust either, but not both, C3 or T1 of the transmitter VFO module (A38), to increase the transmitter frequency by at least 650 KHz. Remove the auxiliary power supply and record the new



MIL-R-55499B(EL)

APC voltage and the transmitter frequency. The transmitter frequency must be the same as the initial frequency measured above with  $\pm 200$  Hz. The radio set shall be placed in the transmit mode by operating the handset switch (or equivalent circuitry) on and off three times, noting the return of the APC voltage and transmitter frequency. This test must be successful on three out of three tries. Readjust the C3 or T1 of A-38, which was adjusted above, until the initial APC voltage is restored. Repeat the above procedure except reduce the transmitter frequency by at least 650 KHz. Repeat the above procedure at 75.95 MHz except adjust either, but not both, T2 or C9 of the transmitter VFO module (A-38) when increasing or decreasing the transmitter frequency. This test shall comply with 3.20.7.

4.11.8 Maximum Signal Plus Noise to Noise Ratio (See 3.20.8).- The transmitter shall be operated under the standard conditions except the tone oscillator shall be disabled. An accepted RT-841( )/PRC-77 shall be tuned to the transmitter frequency and its audio signal plus noise to noise ratio measured to determine compliance with 3.20.8. The level of the signal received by the Receiver-Transmitter RT-841( )/PRC-77 under test shall be a minimum of 100 microvolts rms into 50 ohms. Measure for compliance on the following frequencies (MHz): 30.00, 41.00, 52.95, 53.00, 64.00, 75.95.

4.11.9 Frequency Accuracy (See 3.20.9).- The transmitter shall not be externally modulated. The output of the transmitter shall be attenuated to the proper level and fed into a Hewlett-Packard Model 524A Counter, or equal, which has been properly calibrated. The transmitter output frequency shall be measured and recorded at the following frequencies: Each 50 KHz step from 30.00 to 30.95 MHz. Each 50 KHz step from 41.00 to 41.95 MHz. Each 50 KHz step from 51.00 to 53.95 MHz and at 42.00, 65.00, 75.00, 75.05, 75.10, 75.20, 75.30, 75.40, 75.50, 75.60, 75.70, 75.80, 75.90, and 75.95 MHz. The deviation from the frequency indicated by the dial in KHz should be measured and recorded. The frequency accuracy shall comply with 3.20.9.

4.11.10 Retransmit Operation (See 3.20.10).- The equipment shall be tested as follows:

a. Set up two each Receiver Transmitters RT-841( )/PRC-77 for operation without harness equipment. Separate the RT units at a distance of 25 feet. Place the function switch on each RT-841( )/PRC-77 under test to RETRANS position. Interconnect Cable MK-456/GRC to the 5-pin audio connector FL1 or FL2 on the front panel of each of the RT units. Install and connect Antenna AT-271A, Antenna Support AB-591 and Battery BA-386 to each RT-841( )/PRC-77.

MIL-R-55499B(EL)

b. Set up a signal generator to serve as a "distant transmitter" on the operating frequency of RT-841( )/PRC-77 #1 under test, set for "Retransmit" operation.

c. Set up a third RT-841( )/PRC-77 with the function switch in the "squellch" position, to serve as a "distant receiver", on the operating frequency of RT-841( )/PRC-77 #2 under test.

d. Adjust RT-841( )/PRC-77 #1 to receive on 32.15 MHz.

e. Adjust RT-841( )/PRC-77 #2 to transmit on 37.15 MHz, when actuated by the "retransmission" signal from RT-841( )/PRC-77 #1.

f. Adjust RT-841( )/PRC-77 #3 ("distant receiver") to receive on 37.15 MHz.

g. Adjust the signal generator to 32.15 MHz. Modulate the signal generator with two tones for exciting the receiver of RT-841( )/PRC-77 #1 as follows:

(1)  $150 \pm 1.5$  Hz, producing  $3.0 \pm 0.5$  KHz deviation.

(2)  $1,000 \pm 25$  Hz, producing  $10 \pm 2.0$  KHz deviation.

h. Adjust the signal generator output level to produce a received signal strength of 1.0 microvolt (10 db S+N/N) at RT-841( )/PRC-77 #1.

i. The received signal at RT-841( )/PRC-77 #1 shall cause RT-841( )/PRC-77 #2 to retransmit the 150 Hz and 1,000 Hz tones to the "distant receiver" RT-841( )/PRC-77 #3.

j. By use of rf attenuators, or by adjustment of the antenna on RT-841( )/PRC-77 #3, adjust the received signal level at RT-841( )/PRC-77 #3 for an rf signal input of 1 microvolt (10 db S+N/N).

k. Insure that proper retransmission of signals is obtained.

l. Repeat the test for operating frequencies as follows:

Signal Generator and  
RT-841( )/PRC-77 #1

RT-841( )/PRC-77 #2 and  
"Distant Receiver"

32.15 MHz	42.15 MHz
32.15 MHz	52.15 MHz
32.15 MHz	62.15 MHz
32.15 MHz	72.15 MHz
52.15 MHz	57.15 MHz
52.15 MHz	62.15 MHz
52.15 MHz	72.15 MHz
52.15 MHz	47.15 MHz
52.15 MHz	42.15 MHz
52.15 MHz	32.15 MHz

m. Interchange the test frequencies of RT-841( )/PRC-77 units at positions #1 and #2 and repeat all of the above tests to prove that the retransmit function operates satisfactorily in both directions.

n. Receiver-Transmitter RT-841( )/PRC-77 shall be tested in the RETRANSMIT mode with an approved Cable MK-456, for compliance with paragraph 3.20.10. Not more than three cyclic switching actions shall occur when the two RT-841s are interconnected by Cable MK-456, and operated as a retransmission system. RT units which fail to switch properly in the RETRANSMIT mode shall be analyzed to determine the cause of the malfunction. Such examination should determine whether the effect of frequency separation of RT-841( )/PRC-77 #1 and RT-841( )/PRC-77 #2 is the cause if malfunction occurs.

4.11.11 Input Voltage Range (See 3.20.11). - To determine compliance with 3.20.11 the tests listed below shall be conducted at low and high input voltages and at the frequencies specified in the individual test paragraphs.

a. RF Power Output (4.11.1). Omit short and open circuit antenna termination test.

b. Tone Oscillator, Frequency and Modulation (4.11.2 and 4.11.3).

c. Maximum Signal Plus Noise-to-Noise Ratio (4.11.8).

d. System Distortion (4.11.4).

e. Frequency Accuracy (4.11.9).

4.11.12 Input Power Consumption (See 3.20.12). - The input power to the receiver-transmitter under nominal input voltage conditions, shall be measured to determine compliance with 3.20.12. Measure for compliance on any two channels on the high band and on any two channels on the low band.

## MIL-R-55499B(EL)

4.11.13 Frequency Range (See 3.20.13).- The transmitter output frequency for each of the 920 channels shall be measured to determine compliance with 3.20.13.

4.11.14 Microphone Input Impedance (See 3.20.14).- The input circuit impedance shall be measured at 1 KHz with a General Radio Bridge Model 1650-A, or equal, to establish compliance with 3.20.14. Measure for compliance on any channel.

4.11.15 Audio Response (See 3.20.15).- The transmitter, with the 150 Hz tone generator disabled, shall be set to 30.00 MHz and the deviation measured for the following modulating frequencies: 300, 500, 1000, 2000, 3000 Hz. The ratio expressed in db, of the deviation at each frequency to that at 1000 Hz shall be recorded and shall comply with the requirements of 3.20.15. This procedure shall be repeated for the following frequencies: 52.00, 54.00, 75.00 MHz.

4.11.16 Deviation (See 3.20.16).- The transmitter, with the 150 Hz tone generator disabled, shall be operated under the standard test conditions, except the RF output shall be attenuated and coupled to an FM deviation meter. The deviation shall be measured at 30.00, 52.00, 54.00, and 75.00 MHz to determine compliance with 3.20.16. Repeat the test at high and low input voltages.

4.11.17 Deviation Limiting (See 3.20.17).- The deviation of the transmitter shall be measured while operating under the standard test conditions, except with the 150 Hz tone generator disabled. The audio input voltage shall then be increased by 14 db and the deviation measured and recorded. The ratio expressed in db of the deviation so obtained shall be recorded to establish compliance with the requirement of 3.20.17. This test shall be performed at the following frequencies: 30.00, 52.00, 54.00, and 75.00 MHz.

4.11.18 Spurious Radiations (See 3.20.18).- The transmitter shall be operated under the standard test conditions except that no external modulation shall be applied, and the 150 Hz tone generator shall be disabled. The output of the transmitter shall be connected to a receiver which demonstrated compliance with 3.19.28, through a 50 ohm attenuator adjusted to provide 70 millivolts at the 50 ohm receiver antenna connector. With the transmitter on any one of the frequencies listed below, the receiver shall be tuned throughout the tuning range 30 to 75.95 MHz in 50 KHz intervals and frequency channels of quieting which exceed 10 db shall be recorded to determine compliance with 3.20.18. (When a transmitter exceeds the limits of 3.20.18 on any channel, the standard receiver must be checked to assure that the failure does not result from a spurious

MIL-R-55499B(EL)

response in the receiver. The receiver should be checked on a suspect channel by applying a 70 millivolts unmodulated signal from a signal generator at the same frequency. If the receiver still exhibits quieting on that channel, the channel should be deleted from the test.) This measurement shall be made at the following transmitter frequencies: 34.50, 46.00, 57.50 and 69.00 MHz.

4.11.19 Tone Oscillator Stability (See 3.20.19).- The frequency of the tone oscillator shall be measured at room temperature. The ambient temperature shall then be lowered to  $-40^{\circ}\text{F}$  and held at that temperature for one hour and the frequency measured. The test shall be repeated for an ambient temperature of  $+150^{\circ}\text{F}$  and the results recorded to establish compliance with 3.20.19. Measure for compliance on any channel, except those channels exempted in 3.20.19.

4.11.20 Long Antenna Loading (See 3.20.20).- The long antenna load shall be connected between the insulated antenna terminal post (J1) and a short lead to ground. The load impedance shall consist of a nonreactive resistor connected in series with a variable reactance. The reactance shall be connected to the antenna terminal and the resistor to ground. The long antenna switch plunger shall be depressed. A low input capacitance RF voltmeter shall be used to measure the rms value of voltage across the load resistor. The stray capacity of the antenna load shall be held to a minimum. The voltage measured shall meet the requirements of 3.20.20. The test shall be made at the following frequencies using the corresponding value of resistance and capacitance or inductance.

4.11.20.1 Long Antenna Loading Operational (See 3.20.20.1).-

<u>Freq. (MHz)</u>	<u>Resistance (Ohms)</u>	<u>Req Capacitance or Inductance</u>
37.50	178	0.7 microhenry
65.00	61.9	10.0 picofarads

4.11.20.2 Long Antenna Loading (See 3.20.20.2).-

<u>Freq. (MHz)</u>	<u>Resistance (Ohms)</u>	<u>Req Capacitance or Inductance</u>
30.00	130	0.0
47.50	825	1.2 microhenry
50.00	1025	1.2 microhenry
52.50	619	0.0
53.50	400	8.0 picofarads
75.00	61.9	70.0 picofarads

MIL-R-55499B(EL)

4.11.21 Short Antenna Loading (See 3.20.21)..- The short antenna load shall be connected between the insulated antenna terminal (J1) post and front panel. The load impedance shall consist of a nonreactive resistor connected in series with a variable reactance. The reactance shall be connected to the antenna terminal and the resistor to ground. A low input capacitance RF voltmeter shall be used to measure the rms voltage across the load resistor. The stray capacitance of the antenna load shall be held to a minimum. The voltage measured shall meet the requirements of 3.20.21. The test shall be made at the following frequencies using the corresponding value of resistance and capacitance.

<u>Freq. (MHz)</u>	<u>Resistance (Ohms)</u>	<u>Req Capacitance (Picofarads)</u>
30.00	26.1	12
37.50	34.8	12
47.50	51.1	16
50.00	51.1	15
52.50	56.2	18
53.50	56.2	18
65.00	61.9	29
75.00	61.9	82

4.11.22 Wide Band Audio Input (See 3.20.22)..- The transmitter shall be operated under the standard test conditions except a 4.7 volt peak-to-peak audio level shall be applied to the wide band input circuit (Terminal R of the front panel power connector J3) and the RF output shall be attenuated and coupled to an FM deviation meter. Terminal L of the front panel power connector J3 shall be grounded. The deviation shall be measured at 30.00, 52.00, 54.00 and 75.00 MHz and recorded to determine compliance with 3.20.22. Repeat test at high and low input voltage.

4.11.23 Wide Band Audio Frequency Response (See 3.20.23)..- The transmitter shall be set to 30.00 MHz and 4.7 volt peak-to-peak audio level shall be applied to the wide band input circuit (Terminal R of the front panel power connector J3). Terminal L of the front panel power connector J3 shall be grounded. Measure the deviation for the following modulating frequencies: 15, 100, 500, 1000, 2000, 3000, 10000 and 20000 Hz. The ratio expressed in db, of the deviation at each frequency to that at 1000 Hz shall be recorded and shall comply with 3.20.23. This procedure shall be repeated for the following frequencies: 52.00 MHz, 54.00 MHz and 75.00 MHz.

4.11.24 Wide Band Audio Input Impedance (See 3.20.24)..- Connect General Radio Company GR-1432, decade box, or equal to the wide band input Terminals L and R of J3 on the RT-841( )/PRC-77 panel receptacle. Terminal L only shall be grounded when impedance measurement is made. The wide band input circuit impedance shall be measured at 15 Hz, 1000 Hz and 10000 Hz to establish compliance with 3.20.24. Measure to determine compliance on any channel when in the transmit mode.

MIL-R-55499B(EL)

4.11.25 Transmit 150 Hz Tone Disable (See 3.20.25).- Monitor the 150 Hz tone on a deviation meter or another RT-841( )/PRC-77. Ground the tone disable circuit (Terminal L of the front panel power connector, J3) and observe the absence of tone for compliance with 3.20.25. Measure for compliance on any channel except those channels exempted in 3.20.25.

4.11.26 False-lock (See 3.20.26).- The radio set shall be keyed 10 times at each of the following frequencies: 30.00, 41.00, 52.00, 53.00, 65.00, and 75.95 MHz. At each frequency, the exact receiver frequency shall be recorded first, then the transmitter shall be keyed on and the transmitter output frequency recorded; following this, the unit shall be keyed to receive, and the exact receiver frequency recorded again. Once the receiver frequency is recorded during set up at each frequency, the keying cycle shall be: transmit for 5 seconds, receive for 5 seconds, for a total of 10 cycles at each test frequency cited above. A frequency counter shall be used to verify that the transmitter output conforms to the requirements of 3.20.26. During the keying cycle, the receiver shall be operated under standard conditions and the audio output monitored. A change of 6 db or more in voltage shall constitute a failure of the radio to remain on frequency.

4.11.27 Transmitter AFC Lock-up Time (See 3.20.27).- The transmitter APC voltage as obtained at test point A31-J4 shall be applied to the vertical input of an oscilloscope. The oscilloscope shall be set for a horizontal sweep of 10 ms/cm and for external triggering. One-half of a DPST switch shall be connected to Terminal C of one of the front panel audio connectors FL1 or FL2 and to ground (shunting the handset push-to-talk button). The other half of the switch shall connect a dc power supply to the external sync terminal of the oscilloscope. A 50 ohm dummy antenna load shall be connected to the transmitter output and a 1000 ohm load (+ 1%) connected to the audio output circuit. The APC voltage at test point A39-J3 shall be monitored with a VTVM. Turn the DPST switch on and observe the pulse duration on the oscilloscope for compliance with 3.20.27. This test shall be performed on 920 channels.

4.12 Support, Antenna AB-591( )/PRC-25.-

4.12.1 Torsion Test (See 3.22.1).- A torque of 150-inch pounds shall be applied through the ferrule, at right angles to the axis of the assembly, in a counterclockwise direction. After the torque has been released, the casting shall show no evidence of permanent deformation, there shall be no loosening nor displacement at the swaged joints, and the ferrule shall be secure and unrotated from its original position.



MIL-R-55499B(EL)

4.12.2 Test of Bonding of the Neoprene Covering (See 3.22.2.1).- After the neoprene covering has been bonded and cured in place, the subassembly of the antenna support shall be inspected and tested as follows:

a. The edges of the bonded covering shall be inspected for satisfactory adhesion.

b. Before the greasing operation, air at a pressure of 50 pounds per square inch shall be forced into the grease hole. The subassembly shall be completely covered with soap bubble lather during the test. There shall be no evidence of air leakage, as shown by bubbles in the lather, and the neoprene covering shall not bulge at any point. If the leakage is caused by an unsatisfactory neoprene bond, the antenna support may be rebonded.

4.12.3 Cold-bend Test of Neoprene Covering (See 3.22.2.2).- The antenna support shall be maintained at a temperature of  $-40^{\circ}\text{F}$  for 24 hours. After this conditioning period, the sample, while still at  $-40^{\circ}\text{F}$  shall be quickly bent to an angle of  $90^{\circ}$  and allowed to snap back to normal position. The samples shall then be allowed to return to room temperature, and shall then be bent to the  $90^{\circ}$  position, so that the same side of the covering will again be stretched. While in the bent position, the covering shall be examined for cracks. Any sample that evidences cracks shall be considered to have failed the test.

4.12.4 Bend Test on Assembled Antenna Support (See 3.22.3).- The completely assembled antenna support shall be secured in a vise or equivalent holding device, bent to a  $90^{\circ}$  position, and then allowed to return slowly to its normal position by decreasing the restraining force from the maximum value corresponding to the  $90^{\circ}$  position, to zero. The support shall return to its normal vertical position smoothly, with no evidence or sound of internal catching, binding, or scraping and there shall be no perceptible looseness. The bending moment, measured from the axis of the antenna support, required for a  $90^{\circ}$  bend shall conform to 3.22.3.

4.12.5 Test for Shock-absorbing Qualities (See 3.22.4).- Antenna Support AB-591(.) / PRC-25 shall be given 1500 blows at the rate of one blow per second, of such force that the antenna support is bent to an angle of  $90^{\circ}$  by each blow. The required number of blows may be accumulated at the specified rate successively or intermittently if necessary to prevent excessive heating of the antenna base support. The AB-591(.) / PRC-25 shall be mounted during test. The units subjected to this test shall not be furnished on contract.

MIL-R-55400B(EL)

#### 4.13 Antenna AT-892( )/PRC-25.-

##### 4.13.1 Leaf Material Temper.-

4.13.1.1 Cold Bend Test.- A section containing three leaves shall be bent 180° with the aid of a vise. The jaws shall then be reduced to 1/8 inch. The leaf material shall be examined for fracture and then straightened and examined for breakage or fracture. The requirements of 3.23.1 shall be met.

##### 4.13.2 Antenna Base.-

4.13.2.1 Antenna Base Flexure (See 3.23.2).- The antenna base shall be flexured for 3000 cycles. Each cycle shall consist of a bend of 90° from a vertical position so that the ferrule end is horizontal, back to the vertical, then 90° in the opposite direction in the same vertical plane and then back to the vertical. The rate of flexure shall be at a rate not exceeding 30 cycles per minute.

4.13.2.2 Antenna Base Support.- The finished antenna base shall be mounted in an inverted position about a vertical axis, and the flexible part of the antenna bent completely to a 2-3/4 inch inside radius. This should result in an arc of greater than 90°. The ferrule shall then be lowered until the cylindrical surface of the ferrule is horizontal. The requirements of 3.23.3 shall then be met when 1/2 pound downward pressure is applied to the end of the ferrule.

4.14 Inspection for Interchangeability.- Receiver-Transmitters RT-841( )/PRC-77, including Battery Box CY-2562( )/PRC-25, which have passed all Group A inspections and Group B electrical inspections shall be tested as stated below for compliance with the requirements of paragraph 3.29. The specified number of samples of RT-841( )/PRC-77 units shall be selected from the lot and the modules therein shall be identified with the serial number of the radio set from which they are removed. Following testing, the modules shall be replaced in the radio set from which they were removed. From the time of selection, through the test period and replacement of the modules in the radio sets, the modules shall not be retuned, realigned, modified or otherwise altered. The mechanical dimensions and electrical performance required by the mechanical gage drawings and electrical test fixture drawings shall be measured with the government furnished gages and test fixtures for compliance with the interchangeability requirement. Modules which fail to meet specified gage or test fixture limits shall be considered not acceptable. Radio sets which fail to meet the dimensional interchangeability requirement or which contain modules which fail to meet the specified gage or test fixtures limits shall be considered to have failed the interchangeability requirement. The following dimensions or performance shall be gaged or measured.

MIL-R-55499B(EL)

4.14.1 Mechanical (Dimensions).-- In accordance with the gage points covered by gage lists: SC-GL-323303 (RT-841( )/PRC-77) and SC-GL-323115 (Battery Box CY-2562( )/PRC-25).

4.14.2 Electrical Performance (Modules).-- Modules shall be tested to determine compliance with the performance requirements specified in the applicable test procedure drawing referenced in drawings covering construction of the modules.

4.15 Test for Shrinkage.-- Harness, Electrical Equipment ST-138( )/PRC and Bag CW-503( )/PRC-25 shall be inspected for compliance with 3.16.

4.16 Visual and Mechanical Inspection.-- The units shall be examined for the applicable defects listed in MIL-STD-252 and Table VI. The bag and harness shall be examined for workmanship, mechanical fit, application of specified treatment, and miscellaneous defects. Fastening devices shall be inspected for mechanical operation.

TABLE VI

CLASSIFICATION OF VISUAL AND MECHANICAL DEFECTS  
OF BAG AND HARNESS

<u>Classification</u>	<u>Defects</u>
Major	End clips missing or loose. Broken stitches. Strap missing or loose. Fastening devices missing, inoperable or incorrectly attached. Loose stitching. Holes in material.
Minor	Color not as specified. Marking not as specified. Stains on material.

4.17 Air-seal Test (See 3.27).-- The equipment shall be opened and closed again in such a manner as to break and remake the seals. Immediately thereafter, the equipment not including the battery box, as field transported, shall be subjected to a vacuum of one pound per square inch (one pound per square inch less than atmospheric pressure surrounding the equipment) applied through the screw hole in the back panel of the RT-841( )/PRC-77 case to the interior of the equipment enclosure.

MIL-R-55499B(EL)

The vacuum shall then be valved off and interior pressure measured during the ensuing period of one minute. The decrease in vacuum shall comply with 3.27. The gage used for measurement of the vacuum shall be of such accuracy that a difference of .01 pound can be determined readily.

4.18 Electromagnetic Interference (See 3.30).- The receiver-transmitter shall be operated in manpack and vehicular configurations and subjected to the tests specified in MIL-STD-461, Table A-1-MIL-E-55301, Equipment Class CE (the vehicular configuration utilizes the Amplifier-Power Supply Group OA-3633/GRC for this mode of operation, cited in paragraph 6.1). Testing shall be in accordance with the applicable provisions of Standards MIL-STD-461 and MIL-STD-462.

4.19 Reliability Test (See 3.31).- Receiver-transmitters shall be selected from production lots that have successfully passed burn-in (debugging) requirements of Appendix A, and Group A and B tests of this specification (paragraphs 4.5.1 and 4.5.2) and shall be subjected to Reliability Testing in accordance with the Reliability Test Plan for Radio Set AN/PRC-77 (Appendix B). For the purposes of reliability testing each months productions shall be considered a reliability lot. No reliability lot or lots (i.e. depending on frequency of testing by the required spec) shall be shipped until the sample representing that lot or lots has successfully met the requirements of the reliability test. Units subjected to the reliability test shall be refurbished, as necessary, and retested to Group A requirements before shipment.

4.20 Operational Inspection (See 3.28).- The receiver-transmitter to be operationally inspected shall be talk tested with a "standard" RT-841/PRC-77 on frequencies of 30.00, 53.00, 52.95 and 75.95 MHz. The two test positions and distance between shall be such that communication over a range of 3 or 5 miles is simulated when the radio set under inspection is operated with short and long antenna dummy loads, respectively. In both the receive and transmit modes the RT unit under inspection shall be monitored for proper operation of squelch, as well as normal signal strength, excessive noise, and hum and proper sidetone level. Satisfactory operation of the squelch circuitry shall also be checked in the RETRANS position of the function switch.

4.21 Acceptance Inspection of Preparation for Delivery.- Preparation for delivery shall be inspected in accordance with Specification MIL-P-116 to determine conformance to the requirements of Section 5.

MIL-R-55499B(EL)

4.22 Rough Handling Test (Preparation for Delivery).-- When rough handling test in accordance with Specification MIL-P-116 is required by the contract (See 6.2) the operational inspection (See 4.20) of the receiver-transmitter shall be conducted to determine freedom from operational malfunction caused by rough handling.

4.23 Fungus (See 3.35.1).-- The equipment and assemblies shall be subjected to 28 days of the fungus test specified in Method 508 of MIL-STD-810. The parts and materials of the chassis shall be sprayed with the spore suspension. The interior of the case shall also be sprayed. The equipment shall be subjected to the test in this open condition.

4.24 Salt Fog (See 3.36).-- The equipment and assemblies shall be exposed in their operating configuration to salt fog in accordance with Method 509 of MIL-STD-810 for 48 hours. Equipment and assemblies shall not be opened and shall not be required to be operated.

4.25 Lite Test (See 3.34).-- Set the receiver-transmitter function selector switch to "LITE" and observe that the frequency dials are lighted. Measure for compliance on any channel.

## 5. PREPARATION FOR DELIVERY

5.1 Preservation and Packaging.-- Preservation and packaging shall be level A or C, as specified.

### 5.1.1 Level A.--

5.1.1.1 Cleaning.-- Each Radio Set AN/PRC-77( ) and units of shall be cleaned in accordance with process C-1 of MIL-P-116.

5.1.1.2 Drying.-- Each Radio Set AN/PRC-77( ) and units of shall be dried in accordance with the applicable procedure of MIL-P-116.

5.1.1.3 Preservation Application.-- None required.

5.1.1.4 Unit Packaging.-- Unit packaging shall be in accordance with the methods prescribed in MIL-P-116 as specified herein.

5.1.1.4.1 Receiver-Transmitter RT-841( )/PRC-77 with attached Battery Box CY-2562/PRC-25.-- Each receiver-transmitter with attached battery box shall be packaged in accordance with items 1 through 3 of table VII and Figure 1.

MIL-R-55499B(EL)

5.1.1.4.2 Support, Antenna AB-591( )/PRC-25; Antenna AT-892( )/PRC-25; Antenna AT-271( )/PRC-25; Harness, Electrical Equipment ST-138( )/PRC-25; Bag, Cotton Duck CW-503( )/PRC-25 or Handset H-189( )/GR.- Each item shall be individually packaged method III as follows: Cushion each item by wrapping in paperboard conforming to PPP-P-291, type I, and secure wrap with gummed paper tape conforming to PPP-T-45, type III, grade A. Place the cushioned item within a close-fitting bag conforming to MIL-B-117 or bag, made of L-P-378 material, fabricated in accordance with MIL-B-117. Closure may be by staples, tape, adhesive or heat seal.

5.1.1.4.2.1 Intermediate Container.- A quantity of 25 each Support, Antenna AB-591( )/PRC-25, Antenna AT-892( )/PRC-25, Antenna AT-271( )/PRC-25, Handset H-189( )/GR, Bag, Cotton Duck CW-503( )/PRC-25 or 5 each Harness, Electrical Equipment ST-138( )/PRC-25, packaged as specified in 5.1.1.4.2 and bearing the same stock number, shall be placed within a close-fitting box conforming to PPP-B-636, W5c. Close the box in accordance with the appendix of the box specification.

5.1.1.4.3 Radio Set AN/PRC-77( ).- Each Radio Set AN/PRC-77( ) shall be packaged in accordance with items 1 through 5 of Table VII and Figure 2.

5.1.2 Level C.- Radio Set AN/PRC-77( ) or individual units thereof, shall be packaged in a manner that will afford adequate protection against physical and environmental damage during shipment, handling and limited intransit storage.

5.2 Packing.- Packing shall be level A, B or C, as specified. Shipping containers for all levels shall be capable of stacking and supporting superimposed loads during shipment and storage without damaging the container(s) or its contents (See 6.2c).

#### 5.2.1 Level A.-

5.2.1.1 Consolidation.- A quantity of Receiver-Transmitter RT-841( )/PRC-77, with attached Battery Box CY-2562( )/PRC-25, Support, Antenna AB-591( )/PRC-25, Antenna AT-892( )/PRC-25, Antenna AT-271( )/PRC-25, Harness, Electrical Equipment ST-138( )/PRC-25, Bag, Cotton Duck CW-503( )/PRC-25 or Handset H-189( )/GR, packaged as specified in 5.1 and bearing the same stock number, shall be packed within a close-fitting fiberboard box conforming to PPP-B-636, type CF, class weather-resistant. Box closure shall be as specified in the appendix of the box specification. To facilitate palletization, fiberboard boxes shall be uniform in size and contain equal quantities of the packaged items to the greatest extent practicable.



MIL-R-55499B(EL)

**5.2.1.2 Palletized Load.-** A quantity of Radio Set AN/PRC-77( ), packaged as specified in 5.1, or a quantity of items, packed as specified in 5.2.1.1, and bearing the same stock number, shall be placed on a pallet, load type I, conforming to MIL-STD-147, except that the pallet shall be softwood conforming to NN-P-71, type IV, size 2. A fiberboard cap shall be employed over the load having two sides extending down the stacked load at least 12 inches to accommodate marking requirements. The cap shall be fabricated of fiberboard conforming to PPP-F-320, class weather-resistant, W5s or V3c. The load shall be "bonded" to the pallet by strapping conforming to QQ-S-781, type I, finish A or shrink film.

**5.2.1.3 Less than palletized load.-** When quantities per destination are less than a pallet load, the containers used for packaging the Radio Set AN/PRC-77( ), as specified in 5.1, or the containers, packed as specified in 5.2.1.1 shall be waterproofed, with tape conforming to PPP-T-76, in accordance with the taping requirements of the appendix of the box specification. A quantity of waterproofed containers shall be packed within a close-fitting box conforming to PPP-B-601, overseas type; PPP-B-621, style 4, class 2; or PPP-B-585, style 2 or 3, class 3. When the gross weight exceeds 200 pounds, or the container length and width is 48 x 24 inches or more and the weight exceeds 100 pounds, 3 x 4 inch skids, laid flat, shall be applied in accordance with the requirements of the container specification, or if not specified in the specification, in a manner which will adequately support the item and facilitate the use of material handling equipment. Closure and strapping shall be in accordance with the applicable container specification or appendix thereto except that metal strapping shall conform to QQ-S-781, type I, finish A.

## **5.2.2 Level B.-**

**5.2.2.1 Consolidation.-** A quantity of Receiver-Transmitter RT-841( )/PRC-77. with attached Battery Box CY-2562( )/PRC-25, Support, Antenna AB-591( )/PRC-25, Antenna AT-892( )/PRC-25, Antenna AT-271( )/PRC-25, Harness, Electrical Equipment ST-138( )/PRC-25, Bag, Cotton Duck CW-503( )/PRC-25 or Handset H-189( )/GR, packaged as specified in 5.1, and bearing the same stock number shall be packed as specified in 5.2.1.1.

**5.2.2.2 Palletized Load.-** A quantity of Radio Set AN/PRC-77( ), packaged as specified in 5.1, or a quantity of items, packed as specified in 5.2.2.1, shall be palletized as specified in 5.2.1.2.

## **5.2.2.3 Less than Palletized Load.-**

**5.2.2.3.1** When quantities per destination are less than a pallet load, the containers used to pack the items as specified in 5.2.2.1, shall be reinforced by pressure-sensitive filament tape banding conforming to PPP-T-97, type IV as specified in the appendix of the box specification. No further packing shall be required.



MIL-R-55499B(EL)

5.2.2.3.2 When quantities per destination are less than a pallet load, a quantity of Radio Set AN/PRC-77( ), packaged as specified in 5.1, shall be packed within a close-fitting fiberboard box conforming to PPP-B-640, class 2, style E, or PPP-B-636, type CF, class weather-resistant, variety DW. The gross weight of boxes conforming to PPP-B-640 shall not exceed 250 pounds. When the gross weight exceeds 200 pounds, or the container length and width is 48 x 24 inches or more and the weight exceeds 100 pounds, containers will be pallet-mounted on pallets conforming to NN-P-71, type IV. Closure shall be in accordance with the appendix of the applicable box specification. Reinforcing shall be by pressure-sensitive filament tape banding or nonmetallic strapping conforming to PPP-T-97, type IV and PPP-S-760, type II, respectively; selection of the material and application shall be in accordance with the appendix of the applicable box specification.

### 5.2.3 Level C.-

5.2.3.1 Consolidation.- A quantity of Receiver-Transmitter RT-841( )/PRC-77 with attached Battery Box CY-2562( )/PRC-25, Support, Antenna AB-591( )/PRC-25, Antenna AT-892( )/PRC-25, Antenna AT-271( )/PRC-25, Harness, Electrical Equipment ST-138( )/PRC-25, Bag, Cotton Duck CW-503( )/PRC-25 or Handset H-189( )/GR, packaged as specified in 5.1, and bearing the same stock number shall be packed as specified in 5.2.1.1, except that the fiberboard boxes shall be class domestic.

5.2.3.2 Palletized Load.- A quantity of Radio Set AN/PRC-77( ), packaged as specified in 5.1, or a quantity of items, packed as specified in 5.2.3.1, shall be palletized as specified in 5.2.1.2, except that the fiberboard cap shall be class domestic.

### 5.2.3.3 Less than Palletized Load.-

5.2.3.3.1 When quantities per destination are less than a pallet load, the containers used to pack the items as specified in 5.2.3.1, shall be used as the shipping container. No further packing shall be required.

5.2.3.3.2 When quantities per destination are less than a pallet load, a quantity of Radio Set AN/PRC-77( ), packaged as specified in 5.1, shall be packed as specified in 5.2.2.3.2, except that the fiberboard boxes shall conform to PPP-B-640 and PPP-B-636, class 1 and class domestic, respectively, and reinforcing shall not be required for boxes conforming to PPP-B-636.

5.3 Marking.- In addition to any special marking required by the contract or order, interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

MIL-R-55499B(EL)

BILL OF MATERIAL  
TABLE VII

REF No.	ITEM Nomenclature	No. Reqd	Method MIL-P- 116	SIZE - INCHES			REQUIREMENT			
				L	W	D	Spec No.	T	C	V
1	Technical Literature	1	IC-1							
	Bag	1		11-1/2	9		MIL-B-117	II	C	
2	Receiver-Transmitter RT-S41/PRC-77 with attached Battery Box			10-3/4	4	10-1/4	(Bare wt. 13 lbs.)			
	OX-2562/PRC-25	1	III	11	3	4	(Bare wt. 0.75 lbs.)			
3	Box, Fiberboard	1		11-1/4	4	11	PPP-B-636	CF	MR	SV
4	Box, Fiberboard Containing: Bag CW-503/PRC-25 with Antenna AT-892/PRC-25, Antenna AT-271/PRC-25, Support Antenna AB-591( )/PRC-25 and Handset H-189/G2 with Harness, Electrical Equipment ST-138/PRC-25	1	III	11-1/4	3-3/4	16-1/2	PPP-B-636	CF	MR	SV
		1	III	6	4	19	(Bare wt. 0.75 lbs.)			
		1	III				(Bare wt. 0.5 lbs.)			
		1	III				(Bare wt. 0.75 lbs.)			
		1	III				(Bare wt. 0.75 lbs.)			
		1	III				(Bare wt. 1.75 lbs.)			
5	Box, Fiberboard	1	III	11-5/8	8-1/2	17	PPP-B-636	CF	MR	SV

Place the packaged receiver-transmitter, item 3, boxed accessories, item 4, within item 5. Place packaged technical manual, item 1, directly under flaps of item 5 on top of the packaged receiver-t

T - Type    C - Class    V - Variety    G - Grade    S - Style

MIL-R-55499B(EL)

# RECEIVER-TRANSMITTER RT-841( )/PRC-77

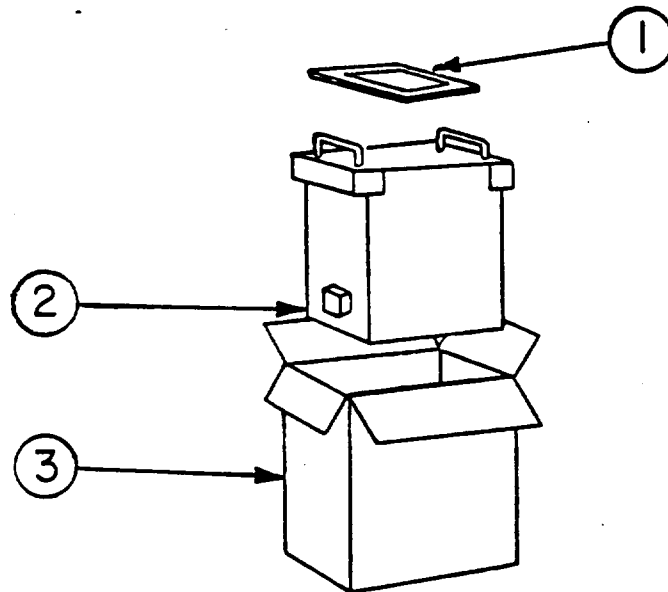


FIGURE 1

MIL-R-55499B(EL)

RADIO SET  
AN/PRC-77

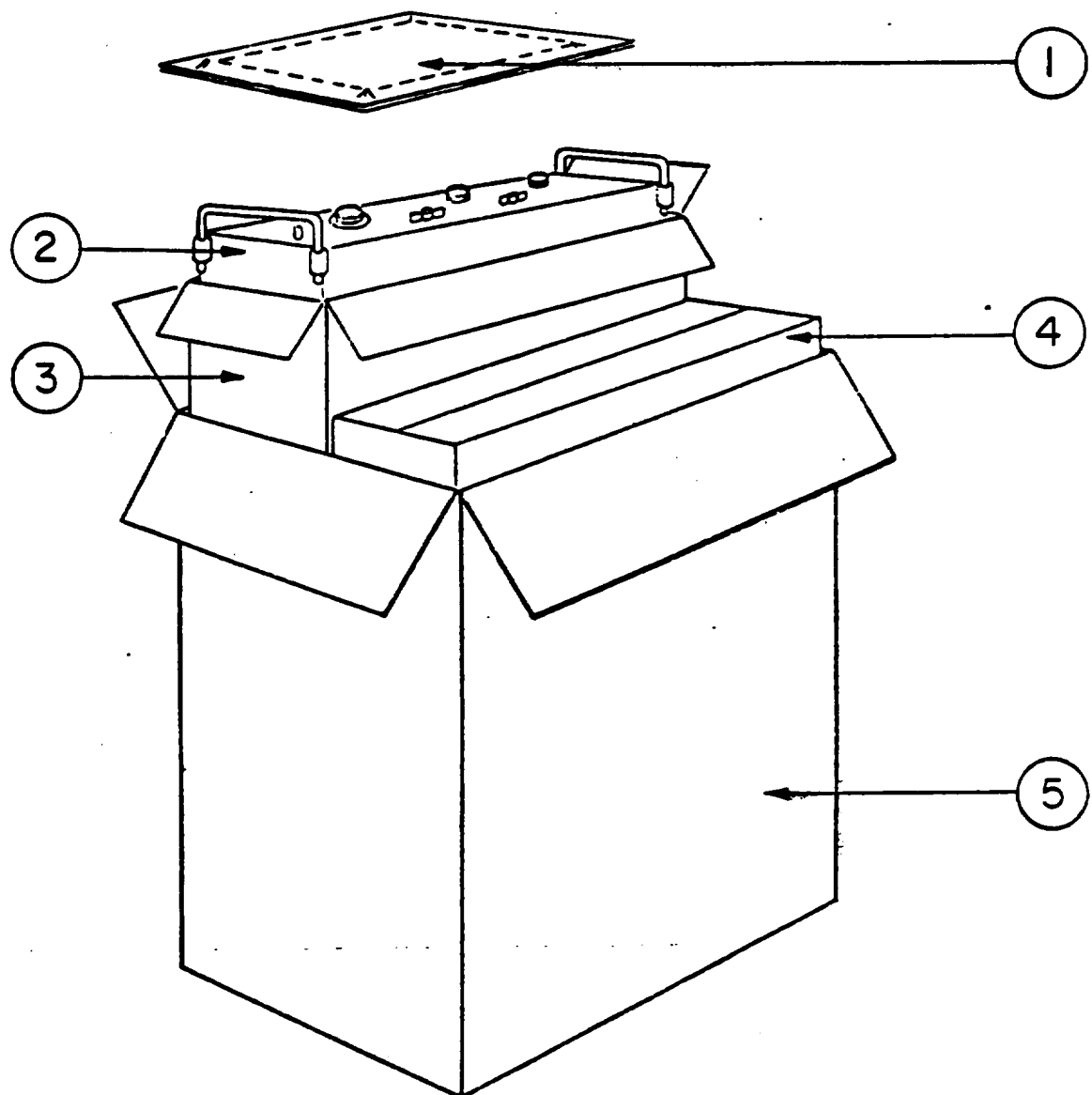


FIGURE 2

MIL-R-55499B(EL)

## 6. NOTES

6.1 Intended Use.-- Radio Set AN/PRC-77( ) is intended to provide short-range communications (3 to 5 miles) for combat troops. Provisions are made for homing, vehicular operation, and remote control when used with the proper auxiliary equipment. Receiver-Transmitter Radio, RT-841( )/PRC-77 is used also as part of Radio Sets AN/VRC-53( ) and AN/GRC-125( ).

6.2 Ordering Data.-- Procurement documents should specify the following:

- a. Title, number, and date of this specification and any amendment thereto.
- b. Type required.
- c. Levels of preservation and packaging and packing (See Section 5).
- d. When rough handling and functional tests are required.
- e. Marking and shipping of samples.
- f. Place of final inspection.
- g. Technical literature required (See 3.32).

6.3 Nomenclature.-- The parentheses in the nomenclature will be deleted or replaced by a letter identifying the particular design; for example RT-841W/PRC-77. The contractor should apply for nomenclature in accordance with the applicable clause in the contract (See 1.1).

6.4 Location of Operational Inspection and Air-seal Test.-- It is desirable that the operational inspection (4.20) and air-seal test (4.17) be performed at a location that will minimize handling (which might cause damage to the equipment) after this inspection is completed. Any preparation for shipment which would require breaking of the equipment seal should be accomplished prior to the air-seal test so that the seal may remain intact thereafter. It is recommended that the entire lot (including all previously inspected sample units) be sampled immediately prior to packaging.

6.5 Group C Inspection.-- Approval to ship may be withheld, at the discretion of the government, pending the decision from the contracting officer on the adequacy of corrective action (See 4.5.3.2).

6.6 Color.-- The color chip furnished by the procuring agency (3.9) will match color chip No. X-24087, and may be obtained upon request to Commander, US Army Electronics Command, Procurement and Production Directorate, Fort Monmouth, New Jersey 07703.

MIL-R-55499B(EL)

6.7 Verification Inspection. - Verification by the government will be limited to the amount deemed necessary to determine compliance with the contract and will be limited in severity to the definitive quality assurance provisions established in this specification and the contract. The amount of verification inspection by the government will be adjusted to make maximum utilization of the contractor's quality control system and the quality history of the product.

6.8 Dimensional Data. - Dimensions of packaging material in the Bill of Material Table are based on the dimensions of the equipment cited in the tables. When the dimensions of the equipment vary from those cited, the dimensions of the packaging materials shall be adjusted accordingly.

6.9 Government Furnished Gages. - Government acceptance inspection, for interchangeability requirements on parts or assemblies of the end item or on spares procured as part of the end item, shall be performed with dimensional and electrical gages provided by the government. The contractor shall provide facilities and space, at the point of government acceptance, for the storage of the gages. Such facilities and space shall provide for safe keeping of the government owned property and shall provide protection from environmental deterioration. Entrance to the space provided shall be under the control of the government. The contractor shall also provide all necessary test equipment to be used by the government for acceptance inspection, which is specified in the applicable test procedure drawings provided with the government owned gages.

6.10 Deviations. - Request for deviations in packaging and packing design shall be supported by test data proving the ability of the equipment, packaging and packed in accordance with the proposed design change, to withstand the applicable test for the selected method, including the rough handling tests in accordance with MIL-P-116. Deviation approval shall be contingent on availability of packaging and packing materials selected and economies realized (See Section 5).

Custodian:  
Army - EL

Preparing Activity  
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Project 5820-A639

MIL-R-55499B(EL)

## APPENDIX A

PRODUCTION BURN-IN (DEBUGGING) PLAN FOR RADIO SET AN/PRC-77( ),  
RECEIVER- TRANSMITTER RT-841( )/PRC-77 AND MODULES THEREOF

A1.0 SCOPE.- This plan defines the requirements, methods and procedures applicable to the burn-in (debugging) of Radio Set AN/PRC-77( ), Receiver-Transmitter RT-841( )/PRC-77 and modules thereof.

A2.0 APPLICABLE DOCUMENTS.- The following specification forms a part of this document to the extent referenced herein: MIL-STD-781 Reliability Tests, Exponential Distribution.

A3.0 REQUIREMENTS.- The contractor shall subject every Receiver-Transmitter RT-841( )/PRC-77 on contract to a burn-in process specified herein prior to acceptance testing. When the performance measurements called for herein indicate a failure, the units will be repaired as required to eliminate the failure and returned for continuation of the burn-in process. Units for acceptance shall have completed at least 42 hours of burn-in. Modules used for repair shall have completed at least 28 hours at the end of the burn-in period.

A3.1 Test Procedures.-

A3.1.1 Performance Parameters to be Measured.- The following tests shall be performed on all units prior to and following the 42 hour burn-in process of paragraph A3.0.

<u>Receiver Tests</u>	<u>Spec Reqt Para (for ref only)</u>	<u>Test Para (for ref only)</u>	<u>Burn-in Test Para</u>
Sensitivity	3.19.1	4.9.1	A4.1.1.1
Audio Output Power	3.19.3	4.9.3	A4.1.1.2
Squelch Sensitivity	3.19.6	4.9.6	A4.1.1.3
<u>Transmitter Tests</u>			
RF Power Output	3.20.1	4.11.1	A4.1.2.1
Tone Oscillator Frequency	3.20.2	4.11.2	A4.1.2.2
Tone Oscillator Modulation	3.20.3	4.11.3	A4.1.2.3
Modulation Capability	3.20.6	4.11.6	A4.1.2.4
Transmitter Catching Range	3.20.7	4.11.7	A4.1.2.5
Frequency Accuracy	3.20.9	4.11.9	A4.1.2.6



MIL-R-55499B(EL)

A3.2 Environmental and Operational Stresses. - The vibration cycling requirements shall be employed as stated in test level "B" of Standard MIL-STD-781.

A3.2.1 Temperature Test Condition. -  $40^{\circ}\text{C} \pm 5^{\circ}\text{C}$  ( $95^{\circ}\text{F}$  to  $113^{\circ}\text{F}$ )

A3.2.2 Vibration Condition. -  $2.2\text{G} \pm 10\%$  at any non-resonant frequency between 20 and 60 Hz measured at the mounting points on the equipment. This vibration shall be applied for 10 minutes out of each hour of "on" time.

A3.2.3 Input Voltage Cycling Test Condition. - The input voltage shall be varied in accordance with the following:

- a. Nominal Voltage - 50% of the time.
- b. 120% Nominal (HIGH) Voltage - 25% of the time.
- c. 80% Nominal (LOW) Voltage - 25% of the time.

This cycling procedure is to be repeated continuously throughout the burn-in process.

A3.2.4 Burn-in Cycle. - The burn-in cycle shall be 42 hours minimum in accordance with the applicable conditions of paragraph A3.3.

A3.3 Applicable Conditions. -

A3.3.1 Cycle. - The cycling shall be conducted on a 24-hour day continuous basis to satisfy the burn-in exposure requirements.

A3.3.2 Duty Cycle. - The radio set shall be operated on a 10-minute duty cycle of 9 minutes Receive and one minute Transmit.

A3.3.3 Monitoring. - The radio sets shall be continuously monitored throughout every duty cycle to detect catastrophic failures or major degradation in transmit and receive operation.

A3.3.4 Maintenance. - No adjustment or repair will be made on the radio set except that necessary to enable a failed radio set to perform as specified. Operator controls shall be adjusted as required.

MIL-R-55499B(EL)

A3.4 Documentation Failure Reporting and Analysis.-- Records shall be maintained on all units and modules to demonstrate to the government inspector that units or modules presented for acceptance have complied with this document. In addition, a monthly report shall be submitted to the government production engineering division identified in the contract categorizing all failures by types, numbers and cycle and furnishing an analysis as to the reasons for the failures and corrective actions taken or recommended, if applicable. This report shall be submitted no later than 30 days after the month covered and shall be furnished in five copies.

#### A4.0 PERFORMANCE

A4.1 Test Procedures.-- For each receiver-transmitter under test, the following performance parameters will be measured for compliance with paragraph A3.1 of this test plan.

A4.1.1 Receiver Tests.-- Standard conditions for the receiver tests will be as follows:

Temperature . . . . .	40°C + 5°C (95°F to 113°F)
Humidity . . . . .	Room Ambient
Dummy Antenna . . . . .	Used in series with 50 ohm signal generator (See Fig. A1-1)
Input Voltage . . . . .	12.5 volts DC nominal.
RF Input . . . . .	10 microvolts, 10 KHz deviation above and below carrier frequency at 1000 Hz modulation frequency.
Function Switch . . . . .	On
Audio Output Level . . . . .	1 milliwatt
Audio Output Load Impedance . . . . .	1000 ohm + 1%
Frequency . . . . .	41.00 MHz

##### A4.1.1.1 Sensitivity.--

a. Use the test set-up of Figure A1 except use internal 1 KHz modulation for the signal generator. Put the AN/PRC-77 in the standard condition except set the frequency dial to 30.00 MHz and apply the RF input according to the directions below.

b. Set the RF signal generator to 10 mv cw and adjust the frequency to 30.00 MHz using the counter. Set the signal generator attenuator to 0.5 microvolt under the -6 db line on the cursor. Apply the RF signal through the dummy antenna to the BNC antenna terminal (J2) of the AN/PRC-77. Set the generator on internal 1 KHz FM modulation. Set the deviation to 10 KHz.

MIL-R-55499B(EL)

c. Apply the audio output of the AN/PRC-77 to the 1000 ohm dummy load in parallel with the distortion analyzer. Measure signal + noise distortion to noise + distortion with the distortion analyzer. It must be greater than 10 db.

d. Repeat the above three steps at 52.00, 53.00 and 75.95 MHz.

e. Repeat above four steps with the input DC voltage reduced to 10 volts DC.

#### Al.1.1.2 Audio Output Power.-

a. Use the test set-up of Figure A1 and put the AN/PRC-77 in the standard receive condition.

b. Set the volume control at maximum and measure the voltage across the 1000 ohm audio dummy load. It shall be greater than 2.0 VRMS.

c. Decrease the DC input voltage to 10 volts DC and repeat above.

#### Al.1.1.3 Squelch Sensitivity.-

a. Use the test set-up of Figure A1. Put the receiver in the standard condition except change the dial frequency and the RF generator frequency to 30.00 MHz, set the function switch to the "squelch" position and set up the modulation as indicated below.

b. Set audio generator #1 to 1.0 KHz and apply through input #1 of the audio signal adder (See Fig. A1-2) to the external FM modulation terminals of the RF generator. Set audio generator #2 to 150 Hz and apply through input #2 of the audio signal adder to the external FM modulation terminals of the RF generator.

c. Put the audio signal adder switch S1 in position 1 and S2 in position 2. Using the deviation meter adjust the amplitude of audio generator #1 until the deviation is plus and minus 10 KHz.

d. Apply the RF generator to the AN/PRC-77 through the dummy antenna and set the signal generator attenuator to 0.5 microvolt under the -6 dB line on the cursor. Keep S + N + D at 1.0 VRMS with the volume control (It will be necessary to turn the function switch from the "Squelch" position to the "on" position to set up this audio reference level.)

e. Put the audio signal adder switch S1 in position 2 and S2 in position 1. Using the deviation meter, adjust audio generator #2 for + 3 KHz deviation.

MIL-R-55499B(EL)

f. Put the audio signal adder switches S1 and S2 in the 1 position. (Be sure the function switch is in the squelch position.) There shall be 1.0 VRMS or greater of audio output in this condition and the re-transmit contact on squelch relay shall produce a "short" between Terminal E and Terminal A of each of the five-pin audio receptacles FL1 and FL2. Reduce the RF input 3 db. The audio output shall remain within 3 db of 1.0 VRMS and the re-transmit relay contact shall still produce a "short".

g. Remove the RF signal from the receiver. The audio output shall drop to zero (at least 50 db below 1.0 VRMS). The re-transmit contact on the squelch relay shall produce an "open" between Terminal E and Terminal A of each of the five-pin audio receptacles FL1 and FL2.

h. Repeat above seven steps with the RF generator and receiver dial frequencies at 41.00, 52.00, 53.00, 65.00 and 75.00 MHz.

A4.1.2 Transmitter Tests.- Standard conditions for the transmitter tests will be as follows:

Temperature . . . . .	40°C $\pm$ 5°C (95°F to 113°F)
Humidity . . . . .	Room ambient
Dummy Antenna Load . . . . .	50 ohms resistive $\pm$ 1%
Nominal Input Voltage . . . . .	12.5 volts DC nominal
Audio Input Conditions -	

- a. Microphone Input Level - 1.4 mv rms at 1000 Hz
- b. 150 Hz Tone Generator - Carrier deviation  $\pm$  3.0 KHz
- c. Microphone Input Impedance - 150 ohms  $\pm$  10%

Frequency . . . . . 41.00 MHz

A4.1.2.1 RF Power Output.-

a. Use the test set-up of Figure A2. Put the transmitter in the standard condition except set the frequency dial to 30.00 MHz.

b. Measure the output power of the transmitter with the Termaline watt meter. It should be greater than 1.75 watts.

c. Repeat above two steps with the dial frequency at 52.95 MHz.

d. Repeat first two steps with the dial frequency at 53.00 MHz and 75.95 MHz except in this case the power must be greater than 1.5 watts and 1.3 watts respectively.

e. Return the frequency dials to 41.00 MHz. In turn operate the transmitter into a short circuit at the BNC antenna connector (J2) for one minute then into an open circuit for one minute. Leave in receive mode for 10 minutes.

## MIL-R-55499B(EL)

f. Return the unit to the transmit mode and measure the HF power output in the standard test condition at 41.00 MHz. It must exceed 2.0 watts.

g. Repeat first four steps at 10.0 volts DC, except the HF power output on low band shall be at least 0.7 watts and the power output on high band shall be at least 0.5 watts.

A4.1.2.2 Tone Oscillator Frequency.-

a. Operate the transmitter in the standard condition at 41.00 MHz except do not apply any external audio modulation.

b. Measure the frequency at test point A23-J3. It shall be  $150 \pm 1.5$  Hz.

c. Repeat above step at 10.0 volts DC.

A4.1.2.3 Tone Oscillator Modulation.-

a. Use the test set-up of Figure A2. Put the transmitter in the standard condition at 41.00 MHz except do not apply external modulation.

b. Apply the transmitter output through the two attenuators to the deviation meter. Set the variable attenuator to 35 db.

c. Measure the transmitter deviation above and below carrier frequency. It shall be  $3.0 \pm 0.8$ ,  $-0.5$  KHz in both cases.

d. Repeat above step at 10.0 volts DC.

A4.1.2.4 Modulation Capability.-

a. Use the test set-up of Figure A2. Put the transmitter in the standard condition except set the frequency to 47.00 MHz and ground test point A23-J3 to the chassis.

b. Hold the audio level at the modulation input at 1.40 mv rms and measure the deviation above and below the carrier frequency for compliance with the following:

<u>Modulation Frequency (Hz)</u>	<u>Deviation from Carrier Frequency (KHz)</u>
300	$10 \pm 3, -4$
1000	$10 \pm 2$
2000	$10 \pm 3$
3000	$10 \pm 3$

MIL-R-55499B(EL)

- c. Repeat above two steps at a dial setting of 60.00 MHz.

#### Al.1.2.5 Transmitter Catching Range.-

- a. Use the test set-up of Figure A3. Put the transmitter in the standard condition except do not apply any external modulation and set the frequency dial to 30.00 MHz.
- b. Measure the APC voltage at test point A31-J4. Record this initial value for future readjustment of the transmitter. Measure the frequency of the transmitter. It must be within  $\pm 3.5$  KHz of the dial setting.
- c. Apply the auxiliary power supply to test point A31-J4 and hold the voltage at the initial value recorded above.
- d. Adjust either but not both, C3 or T1 of the Transmitter VFO module A-38 to increase the transmitter frequency by at least 650 KHz.
- e. Remove the auxiliary power supply and note the new APC voltage and the transmitter frequency. The transmitter frequency must be the same as the initial frequency measured above within  $\pm 200$  Hz.
- f. Key the transmitter off then back on and note that the frequency and APC voltage return to the new voltage and frequency noted above. Turn the AN/PRC-77 off then back on and note that the frequency and APC voltage return again. This test must be successful three out of three tries.
- g. Readjust the C3 or T1 of A-38 (which was adjusted above) until the initial APC voltage above is restored.
- h. Repeat the above steps except adjust either C3 or T1 but not both to reduce the transmitter frequency by at least 650 KHz.
- i. Repeat the above steps at 75.95 MHz, except adjust either, but not both, T2 or C9.

#### Al.1.2.6 Frequency Accuracy.-

- a. Use the test set-up of Figure A2. Put the transmitter in the standard condition except set the dial frequency to 75.00 MHz and do not externally modulate.
- b. Apply the transmitter output through the attenuators to the frequency counter with the variable attenuator set at 35 db.

MIL-R-55499B(EL)

c. Measure the frequency at the following dial settings: Each 50 KHz step from 30.00 to 30.95 MHz. Each 50 KHz step from 41.00 to 41.95 MHz. Each 50 KHz step from 51.00 to 53.95 MHz and 75.00, 75.05, 75.10, 75.20, 75.30, 75.40, 75.50, 75.60, 75.70, 75.80, 75.90, and 75.95 MHz. The frequency shall, in all cases be within  $\pm 3.5$  KHz of the dial frequency.

d. Repeat above three steps at 10.0 volts DC.

#### Al.1.3 Test Equipment Required (or equivalent).-

<u>Description</u>	<u>Number Needed</u>	<u>Manufacturer and Model #</u>
Audio Signal Generator	1	HP202 or Waveforms 512
RF Signal Generator	1	Marconi 1066B
Frequency Counter	1	HP524D
Counter Plug-in Unit	1	HP525A
Deviation Meter	1	Marconi TF-791-D
Distortion Analyzer	1	HP331A
Volt-Ohm-Ammeter	2	Simpson 269
Power Supply	1	*Power Designs 3240
Power Supply	1	HP721A
Audio Voltmeter	1	Ballantine 314
DC Voltmeter	1	RCA Senior Volt-Ohmyst WV-98A
Variable Attenuator	1	Kay Electric 30-0
RF Power Meter	1	Termaline 61

\* This power supply is capable of supplying 2 amps at 10-15 volts DC.  
Two 1 amp supplies may be substituted.

#### Al.1.4 Special Test Equipment Required.-

Temperature Chamber - Capable of maintaining temperatures in the range  
 $40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ .

Vibration Tables

Dummy Antenna (for receive tests) (See Figure A1-1).

Fixed 2 Watt Attenuator (12.6 db) (See Figure A2-1).

Audio Signal Adder (for receive tests) (See Figure A1-2).

Al.2 Environmental and Operational Stresses.- The environmental and operational stress facilities will be provided as follows:



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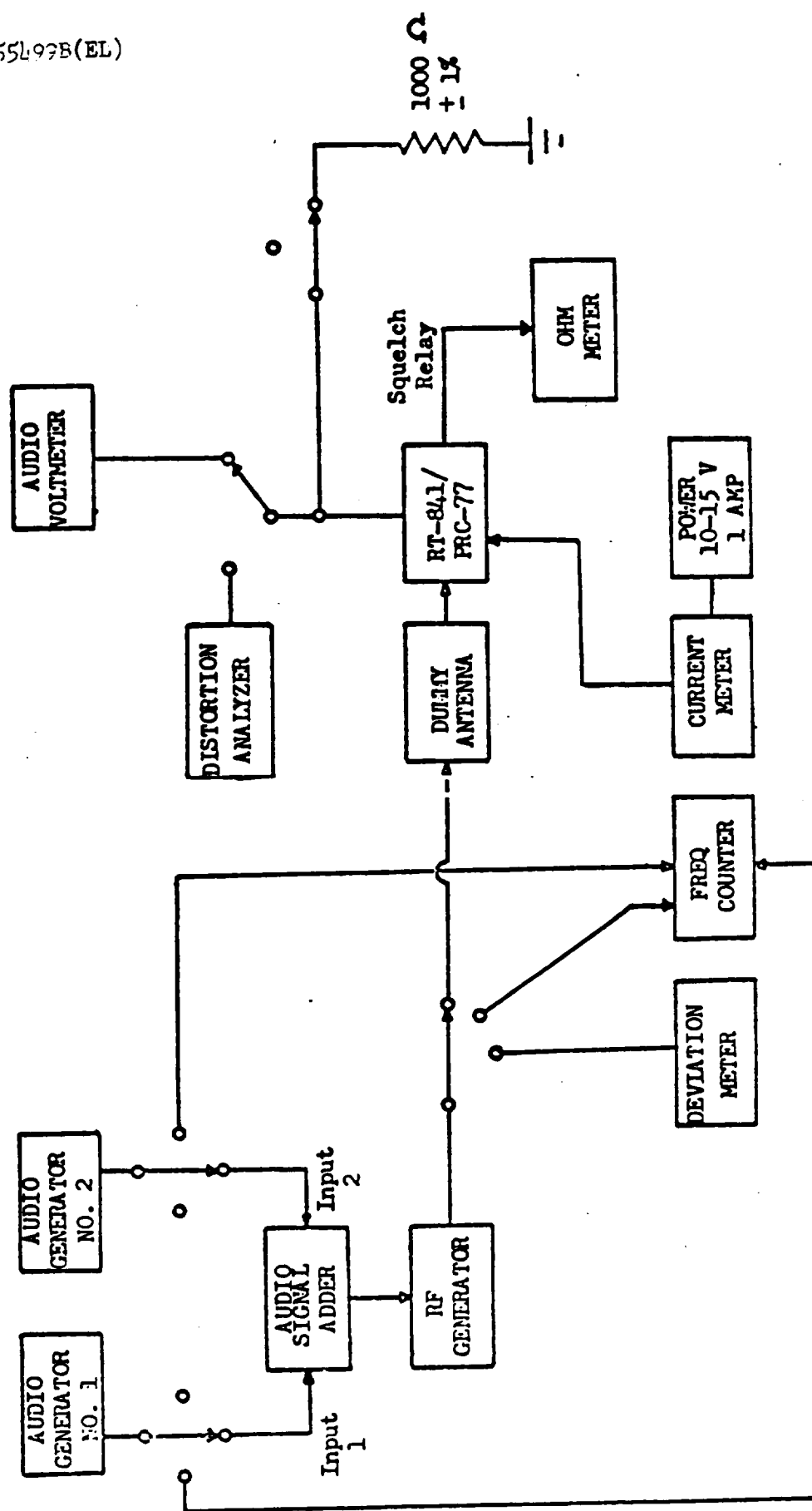
A4.2.1 Temperature Test Condition.- A heat chamber, thermostatically controlled, will provide the  $40^{\circ}\text{C} \pm 5^{\circ}\text{C}$  ambient temperature. The temperature will be recorded automatically. Thermal runaway will be prevented by a ( $50^{\circ}\text{C}$ ) thermal fuse which, when overstressed, will remove heater power.

A4.2.2 Vibration Test Condition.- A vibration table located within the heat chamber, will provide the vibration of  $2.2\text{G} \pm 10\%$  at any non-resonant frequency between 20 and 60 Hz measured at the mounting points on the equipment. The vibration table will be energized for ten minutes out of each hour of "on" time.

A4.2.3 Input Voltage Cycling Test Condition.- A two amp power supply will provide the input voltages of 10-15 volts DC.

A4.2.4 ON-OFF Cycle Test Condition.- On-Off cycling as specified in paragraph A3.2.4, will be performed in the heat chamber referenced in paragraph A4.1.4.

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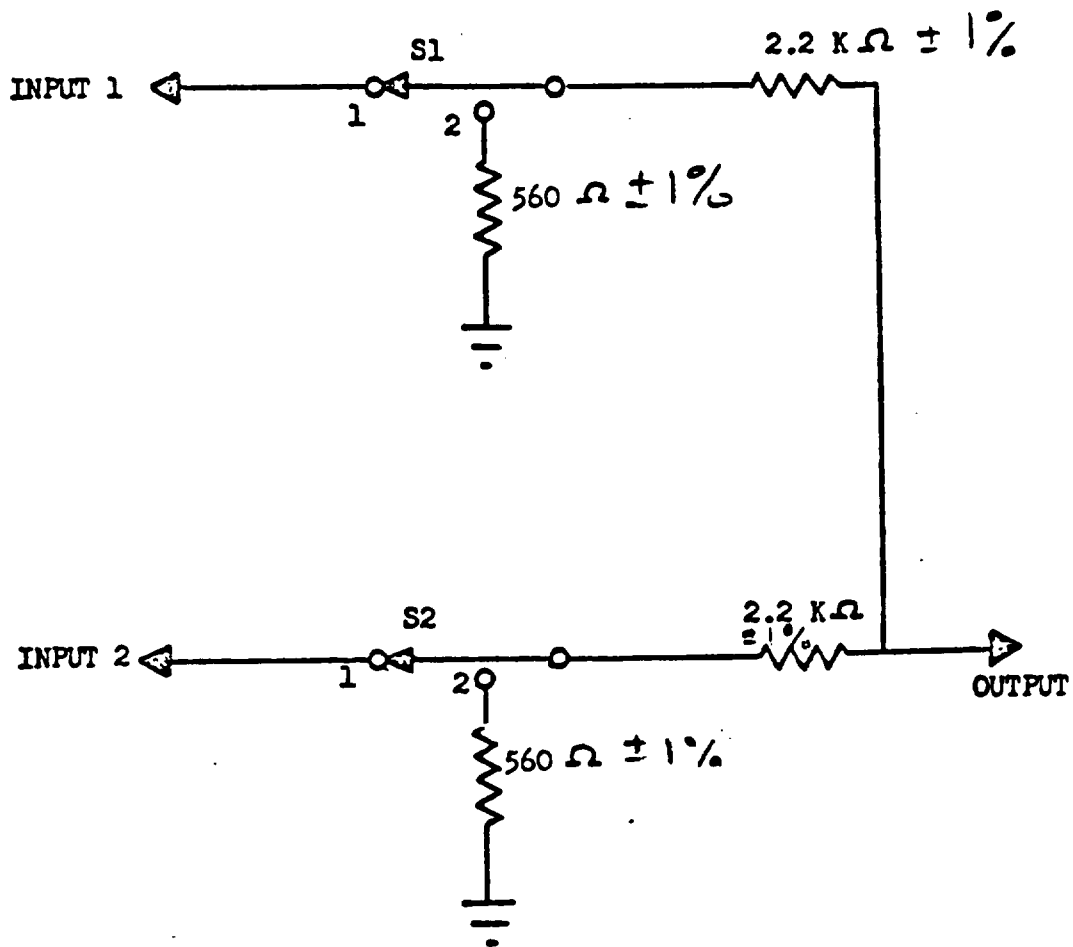


FIGURE A1-2 AUDIO SIGNAL ADDER SCHEMATIC

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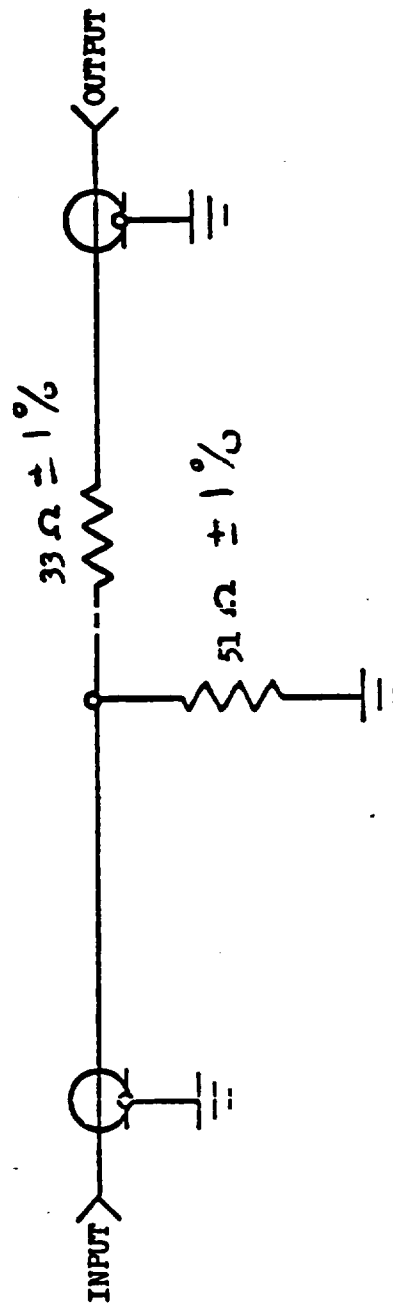


FIGURE A1-1 DUMMY ANTENNA SCHEMATIC

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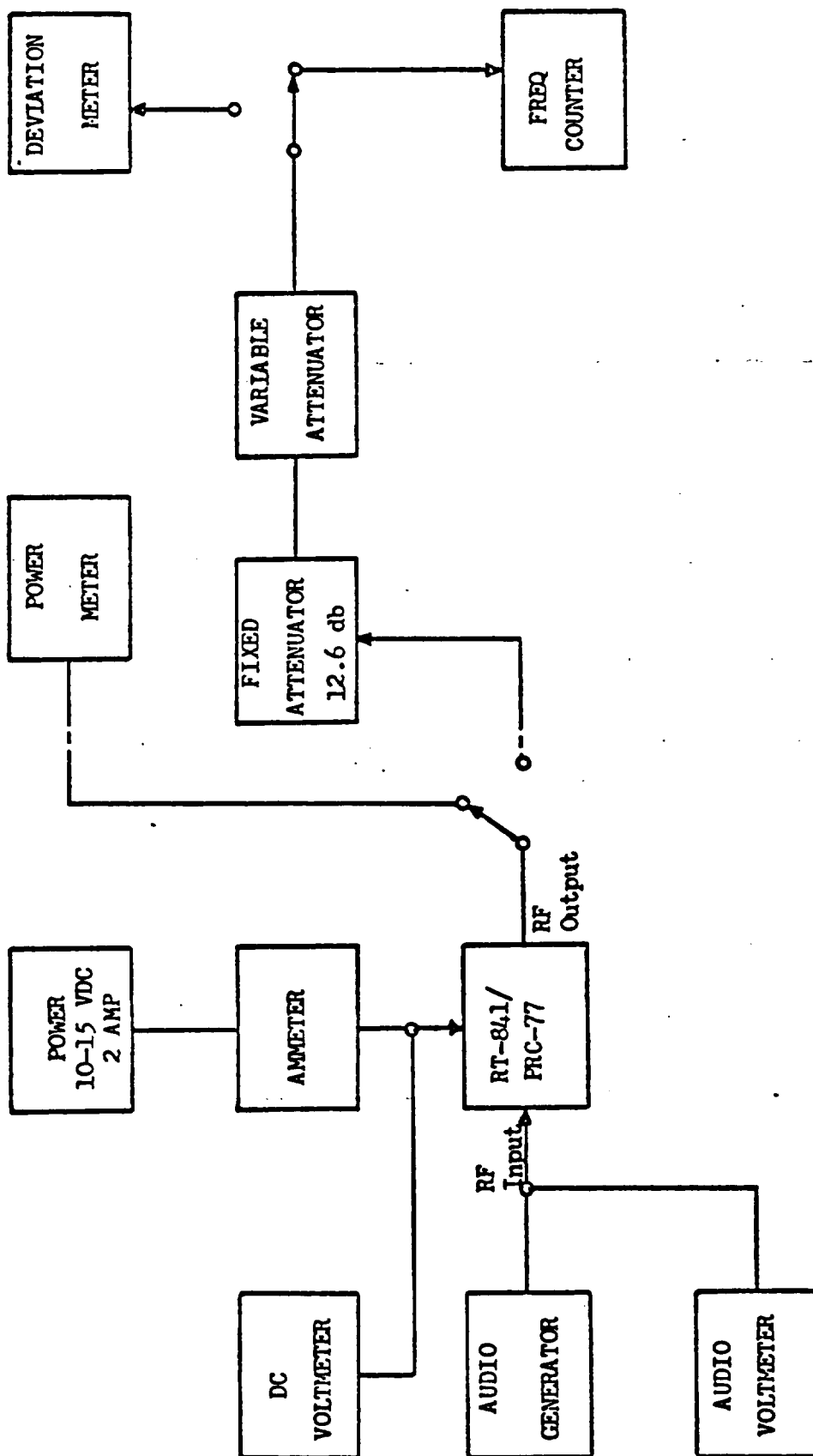


FIGURE A2 TRANSMITTER TEST SET-UP #1

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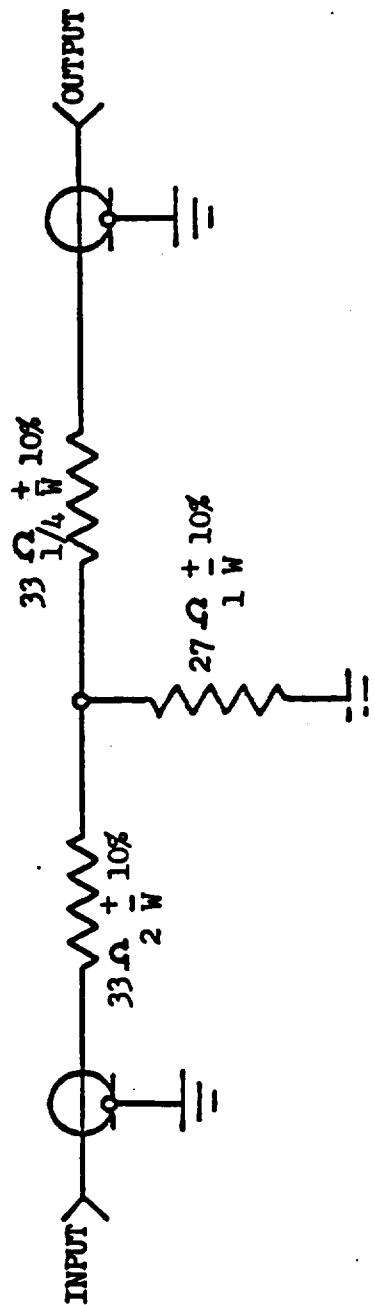


FIGURE A2-1 FIXED 12.6 DB ATTENUATOR SCHEMATIC

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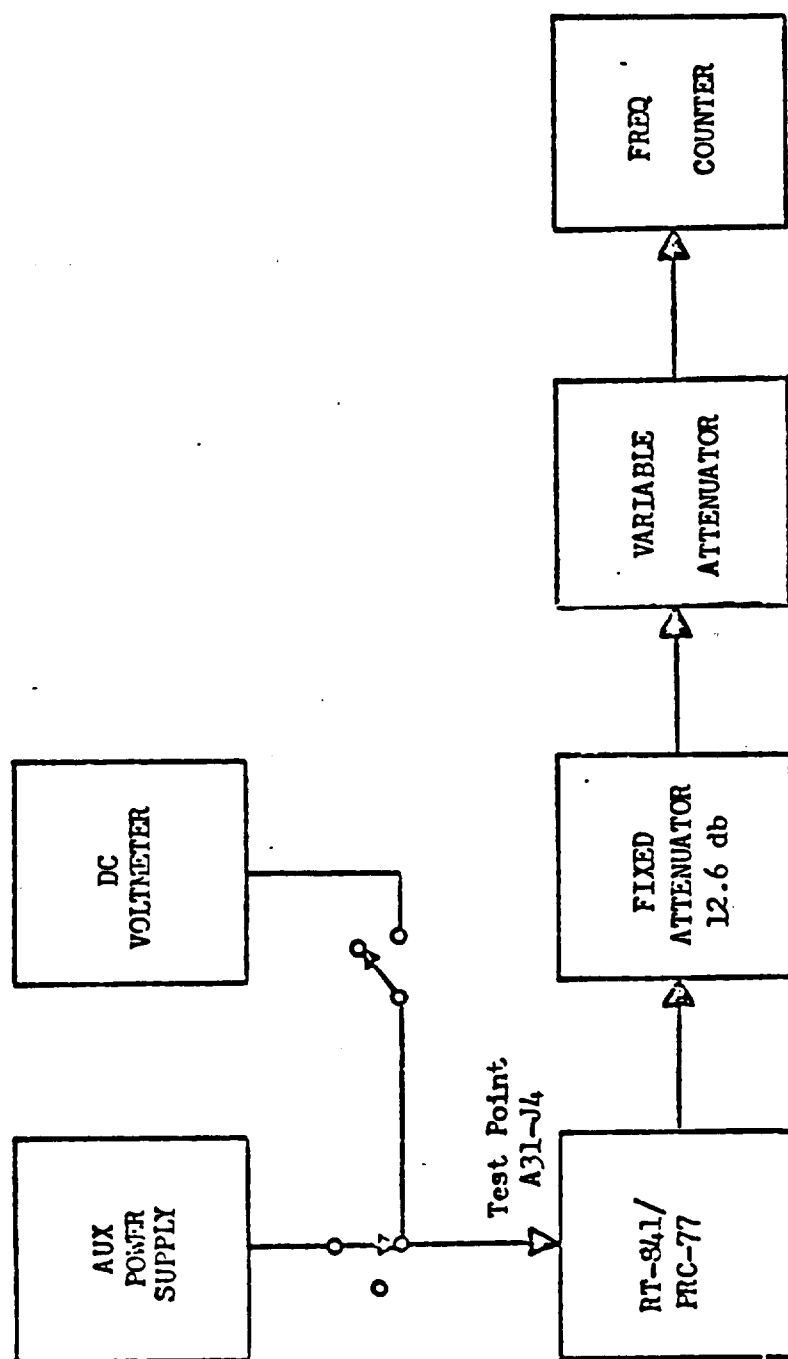


FIGURE A3 TRANSMITTER TEST SET-UP #2.



MIL-R-55499B(EL)

## APPENDIX B

### RELIABILITY TEST PLAN FOR RADIO SET AN/PRC-77( )

B1.0 SCOPE.- This test plan defines the methods and procedures to be used to perform the Reliability Test.

B2.0 APPLICABLE DOCUMENTS.- The following publication forms a part of this document to the extent referenced herein: MIL-STD-781 Reliability Tests, Exponential Distribution.

B3.0 REQUIREMENTS.- Sample units selected at random from each reliability lot or lots (depending on the frequency of testing required by this specification) in accordance with paragraph 4.19 of this specification, shall be subjected to a reliability acceptance test based on a specified mean-time-between-failures ( $\theta_0$ ) of 750 hours. The total test time per sample unit shall be in accordance with paragraph 4.2.2.4 of MIL-STD-781. Paragraphs 5.5 through 5.9 inclusive of MIL-STD-781 shall apply. A reliability testing program shall be conducted in accordance with the following:

a. A first article reliability qualification test shall be performed on ten sample units as stated in 3.2 of this specification using test plan III of MIL-STD-781.

b. Monthly Reliability Acceptance Testing shall commence with the first month of production. A sample of ten equipments, randomly selected from each reliability lot shall be subjected to Test Plan III of MIL-STD-781. If each of three consecutive monthly tests, as tested above, has an observed MTBF (total equipment "On" time/number of relevant failures) greater than  $2.0 \theta_0$ , the contractor may institute reduced testing in accordance with c below, otherwise testing shall continue on a monthly basis as specified above.

c. Reduced Reliability Acceptance Testing - When requirements for reduced testing specified in b above have been met, bi-monthly testing (i.e., one reliability acceptance test every two months) using test plan V of MIL-STD-781 may be initiated. A sample of ten units selected at random shall represent two consecutive reliability lots. The sample may be selected from early part of the first months reliability lot of each two months production.

MIL-R-55499B(EL)

If the observed (total equipment "On" time/number of relevant failures) for an individual test is greater than  $1.75 \sigma_0$  the reduced reliability acceptance test procedures described above may be continued. However, if the observed MTBF is less than  $1.75 \sigma_0$  monthly reliability testing in accordance with b above shall be initiated. Reduced inspection may be re-initiated only when conditions of b above are fulfilled. Anytime a reject decision occurs when using Test Plan V of MIL-STD-781 corrective action shall be taken and the reliability acceptance test shall be repeated using Test Plan III of MIL-STD-781.

### B3.1 Test Procedures.-

B3.1.1 Performance Parameters to be Measured.- The following tests shall be performed on all units.

<u>Receiver Tests</u>	<u>Spec Reqt Para (for ref only)</u>	<u>Spec Test Para (for ref only)</u>	<u>Appendix B (Reliability) Test Para</u>
Sensitivity	3.19.1	4.9.1	B4.1.1.1
Audio Output Power	3.19.3	4.9.3	B4.1.1.2
Squelch Sensitivity	3.19.6	4.9.6	B4.1.1.3
<u>Transmitter Tests</u>			
RF Power Output	3.20.1	4.11.1	B4.1.2.1
*Tone Oscillator Frequency	3.20.2	4.11.2	B4.1.2.2
Tone Oscillator Modulation	3.20.3	4.11.3	B4.1.2.3
*Modulation Capability	3.20.6	4.11.6	B4.1.2.4
*Transmitter Catching Range	3.20.7	4.11.7	B4.1.2.5
Frequency Accuracy	3.20.9	4.11.9	B4.1.2.6

\*Those tests marked with an asterisk (\*) shall be performed prior to the first cycle of testing and at the completion of the final cycle of testing. All other tests shall be performed prior to the first cycle of testing, at least once each 24 hours thereafter, and after the completion of the final cycle of testing.

B3.2 Environmental and Operational Stresses.- The vibration cycling requirements shall be employed as stated in test level "B" of Standard MIL-STD-781.

B3.2.1 Temperature Test Condition.-  $40^{\circ}\text{C} \pm 5^{\circ}\text{C}$  ( $95^{\circ}\text{F}$  to  $113^{\circ}\text{F}$ ).

## MIL-R-55499B(EL)

B3.2.2 Vibration Test Condition. - 2.2G  $\pm$  10% at any non-resonant frequency between 20 and 60 Hz measured at the mounting points on the equipment. This vibration shall be applied for 10 minutes out of each hour of "ON" time.

B3.2.3 Input Voltage Cycling Test Condition. - The input voltage shall be varied in accordance with the following:

- a. Nominal voltage - 50% of the time.
- b. 120% nominal (HIGH) voltage - 25% of the time.
- c. 80% nominal (LOW) voltage - 25% of the time.

This cycling procedure is to be repeated continuously throughout the reliability test.

B3.2.4 ON-OFF Cycle Test Condition. - "ON" 3 hours 54 minutes "OFF" 6 minutes. The ON-OFF cycle test condition shall be repeated every four hours. Any exception to the above referenced on-off periods must be approved by the government.

### B3.3 Test Conditions. -

B3.3.1 Cycle. - The testing shall be conducted on a 24-hour, 7 days per week basis.

B3.3.2 Duty Cycle. - The radio set shall be operated on a 10 minute duty cycle of 9 minutes Receive and 1 minute Transmit.

B3.3.3 Test Measurements. - Performance measurements shall be taken on each of the radio sets after thermal equilibrium has been reached during the "ON" period of the "ON-OFF" cycling in accordance with paragraph B3.1 of this test plan.

B3.3.4 Monitoring. - The radio sets shall be monitored to detect catastrophic failures or major degradation in transmit or receive operation.

B3.3.5 Burn-in (Debugging) Period. - Each radio set shall have been subjected to the specified burn-in period to exclude the early failure period. Failures that occurred during this period will be considered non-relevant.

B3.3.6 Maintenance Measures to be Performed. - Maintenance shall be performed only as scheduled.

MIL-R-55499B(EL)

B3.3.7 Configuration.- Each radio set shall undergo testing while enclosed in the RT case, except for testing prior to the first cycle and at the completion of the last cycle.

B3.4 Failure Reporting and Analysis.- A failure reporting and analysis system shall be implemented.

B3.5 Reliability Test Report.- The report of the reliability test shall be as specified by paragraph 5.11 of Standard MIL-STD-781.

B3.6 Accept-Reject Criteria.- The accept/reject criteria shall be either Test Plan III or Test Plan V of MIL-STD-781 depending on the phase of testing being conducted in accordance with B3.0 provisions.

#### B4.0 PERFORMANCE.-

B4.1 Test Procedures.- For each receiver-transmitter under test, the following performance parameters will be measured for compliance with paragraph B3.1 of this test plan.

B4.1.1 Receiver Tests.- Standard conditions for the receiver tests will be as follows:

Temperature . . . . .	40°C $\pm$ 5°C (95°F to 113°F)
Humidity . . . . .	Room ambient
Dummy Antenna . . . . .	Used in series with 50 ohm signal generator (See Figure B1-1)
Input Voltage . . . . .	12.5 volts DC nominal
RF Input . . . . .	10 microvolts, 10 KHz deviation above and below carrier frequency at 1000 Hz modulation frequency
Function Switch . . . . .	ON
Audio Output Level . . . . .	1 milliwatt
Audio Output Load Impedance . . . . .	1000 ohms $\pm$ 1%
Frequency . . . . .	41.00 MHz

##### B4.1.1.1 Sensitivity.-

a. Use the test set-up of Figure B1 except use internal 1 KHz modulation for the signal generator. Put the AN/PRC-77 in the standard condition except set the frequency dials to 30.00 MHz and apply the RF input according to the directions below.

## MIL-R-55499B(EL)

b. Set the RF signal generator to 10  $\mu$ v cw and adjust the frequency to 30.00 MHz using the counter. Set the signal generator attenuator to 0.5 microvolts under the -6 db line on the cursor. Apply the RF signal through the dummy antenna to the BNC antenna terminal (J2) of the AN/PRC-77. Set the generator on internal 1 KHz FM modulation. Set the deviation to 10 KHz.

c. Apply the audio output of the AN/PRC-77 to the 1000 ohm dummy load in parallel with the distortion analyzer. Measure signal + noise + distortion to noise + distortion  $(S+N+D)/(N+D)$  with the distortion analyzer. It must be greater than 10 db.

d. Repeat the above three steps at 52.00, 53.00 and 75.95 MHz.

e. Repeat above four steps with the input DC voltage reduced to 10 VDC.

B4.1.1.2 Audio Output Power.-

a. Use the test set up of Figure B1 and put the AN/PRC-77 in the standard receive condition.

b. Set the volume control at maximum and measure the voltage across the 1000 ohm audio loading resistor. It shall be greater than 2.0 VRMS.

c. Decrease the dc input voltage to 10 VDC and repeat above.

B4.1.1.3 Squelch Sensitivity.-

a. Use the test set-up of Figure B1. Put the receiver in the standard condition except change the dial frequency and the RF generator frequency to 30.00 MHz, set the function switch to the "squelch" position and set up the modulation as indicated below.

b. Set audio generator #1 to 1.0 KHz and apply through input #1 of the audio signal adder (Figure B1-2) to the external FM modulation terminals of the RF generator. Set audio generator #2 to 150 Hz and apply through input #2 of the audio signal adder to the external FM modulation terminals of the RF generator.

c. Put the audio signal adder switch S1 in position 1 and S2 in position 2. Using the deviation meter adjust the amplitude of audio generator #1 until the deviation is plus and minus 10 KHz.

MIL-R-55499B(EL)

d. Apply the RF generator to the AN/PRC-77 through the dummy antenna and set the signal generator attenuator to 0.5 microvolts under the -6 db line on the cursor. Keep S+N+D at 1.0 VRMS with the volume control. (It will be necessary to turn the function switch from the "squench" position to the "ON" position to set up this audio reference level.)

e. Put the audio signal adder switch S1 in position 2 and S2 in position 1. Using the deviation meter, adjust audio generator #2 for  $\pm 3$  KHz deviation.

f. Put the audio signal adder switches S1 and S2 in the 1 position. (Be sure the function switch is in the squench position.) There shall be 1.0 VRMS or greater of audio output in this condition and the re-transmit contact on the squench relay shall produce a "short" between Terminal E and Terminal A of each of the five-pin audio receptacles FL1 and FL2. Reduce the RF input 3 db. The audio output shall remain within 3 db of 1.0 VRMS and the re-transmit relay contact shall still produce a "short".

g. Remove the RF signal from the receiver. The audio output shall drop to zero (at least 50 db below 1.0 VRMS). The re-transmit contact on the squench relay shall produce an "open" between Terminal E and Terminal A of each of the five-pin audio receptacles FL1 and FL2.

h. Repeat above seven steps with the RF generator and receiver dial frequencies at 41.00, 52.00, 53.00, 65.00 and 75.00 MHz.

B4.1.2 Transmitter Tests.- Standard conditions for the transmitter tests will be as follows:

Temperature	. . . . .	40°C $\pm$ 5°C (95°F to 113°F)
Humidity	. . . . .	Room Ambient
Dummy Antenna Load	. . . . .	50 ohms resistive
Nominal Input Voltage	. . . . .	12.5 volts DC nominal
Audio Input Conditions		
Microphone Input Level	. . . . .	1.4 mv rms at 1000 Hz
150 Hz Tone Generator(Internal)		- Carrier deviation $\pm$ 3.0 KHz
Microphone Input Impedance	. . . . .	150 ohms $\pm$ 10%
Frequency	. . . . .	41.00 MHz

B4.1.2.1 RF Power Output.-

a. Use the test set-up of Figure B2. Put the transmitter in the standard condition except set the frequency dial to 30.00 MHz.

b. Measure the output power of the transmitter with the Termaline watt meter. It should be greater than 1.75 watts.

MIL-R-55499B(EL)

- c. Repeat above two steps with the dial frequency at 52.95 MHz.
- d. Repeat first two steps with the dial frequency at 53.00 MHz and 75.95 MHz except in this case the power must be greater than 1.5 watts and 1.3 watts respectively.
- e. Return the frequency dial to 41.00 MHz. In turn operate the transmitter into a short circuit at the BNC ANT connector (J2) for one minute then into an open circuit for one minute. Leave in receive mode for 10 minutes.
- f. Return the unit to the transmit mode and measure the RF power output in the standard test condition at 41.00 MHz. It must exceed 2.0 watts.
- g. Repeat first four steps at 10.0 volts DC, except the RF power output on low band shall be at least 0.7 watts and the power output on high band shall be at least 0.5 watts.

#### B4.1.2.2 Tone Oscillator Frequency.-

- a. Operate the transmitter in the standard conditions at 41.00 MHz except do not apply any external audio modulation.
- b. Measure the frequency at test point A23-J3. It shall be  $150 \pm 1.5$  Hz
- c. Repeat above step at 10.0 volts DC.

#### B4.1.2.3 Tone Oscillator Modulation.-

- a. Use the test set-up of Figure B2. Put the transmitter in the standard condition at 41.00 MHz except do not apply external modulation.
- b. Apply the transmitter output through the two attenuators to the deviation meter. Set the variable attenuator to 35 db.
- c. Measure the transmitter deviation above and below the carrier frequency. It shall be  $3.0 \pm 0.8$ ,  $-0.5$  KHz.
- d. Repeat above step at 10.0 volts DC.

#### B4.1.2.4 Modulation Capability.-

- a. Use the test set-up of Figure B2. Put the transmitter in the standard condition except set the frequency to 47.00 MHz and ground test point A23-J3 to the chassis.

MIL-R-55499B(EL)

b. Hold the audio level at the modulation input at 1.40 millivolts rms and measure the deviation above and below the carrier frequency for compliance with the following:

<u>Modulation Frequency (Hz)</u>	<u>Deviation from Carrier Frequency (KHz)</u>
300	10 + 3, -4
1000	10 + 2
2000	10 ± 3
3000	10 ± 3

c. Repeat above two steps at a dial setting of 60.00 MHz.

#### B4.1.2.5 Transmitter Catching Range.-

a. Use the test set-up of Figure B3. Put the transmitter in the standard condition except do not apply any external modulation and set the frequency dial to 30.00 MHz.

b. Measure the APC voltage at test point A31-J4. Record this initial value for future readjustment of the transmitter. Measure the frequency of the transmitter. It must be within  $\pm 3.5$  KHz of the dial setting.

c. Apply the auxiliary power supply to test point A31-J4 and hold the voltage at the initial value recorded above.

d. Adjust either but not both, C3 or T1 of the Transmitter VFO module A-38 to increase the transmitter frequency by at least 650 KHz.

e. Remove the auxiliary power supply and note the new APC voltage and the transmitter frequency. The transmitter frequency must be the same as the initial frequency measured above within  $\pm 200$  Hz.

f. Key the transmitter off then back on and note that the frequency and APC voltage return to the new voltage and frequency noted above. Turn the AN/PRC-77 off then back on and note that the frequency and APC voltage return again. This test must be successful three out of three tries.

g. Readjust C3 or T1 of A-38 (which was adjusted above) until the initial APC voltage above is restored.

h. Repeat the above steps except adjust either C3 or T1 but not both to reduce the transmitter frequency by at least 650 KHz.

i. Repeat the above steps at 75.95 MHz except adjust either, but not both, T2 or C9.



MIL-R-55499B(EL)

B4.1.2.6 Frequency Accuracy.-

a. Use the test set-up of Figure B2. Put the transmitter in the standard condition except set the dial frequency to 75.00 MHz and do not externally modulate.

b. Apply the transmitter output through the attenuators to the frequency counter with the variable attenuator set at 35 db.

c. Measure the frequency at the following dial settings: Each 50 KHz step from 30.00 to 30.95 MHz. Each 50 KHz step from 41.00 to 41.95 MHz. Each 50 KHz step from 51.00 to 53.95 MHz and 75.00, 75.05, 75.10, 75.20, 75.30, 75.40, 75.50, 75.60, 75.70, 75.80, 75.90 and 75.95 MHz. The frequency shall in all cases be within  $\pm 3.5$  KHz of the dial setting.

d. Repeat above three steps at 10.0 volts DC.

B4.1.3 Test Equipment Required (or equivalent).-

<u>Description</u>	<u>Number Needed</u>	
Audio Signal Generator	1	HP202 or Waveforms 512
RF Signal Generator	1	Marconi 1066B
Frequency Counter	1	HP524D
Counter Plug-in Unit	1	HP525A
Deviation Meter	1	Marconi TF-791-D
Distortion Analyzer	1	HP331A
Volt-Ohm-Ammeter	2	Simpson 269
Power Supply	*1	*Power Designs 3240
Power Supply	1	HP721A
Audio Voltmeter	1	Ballantine 3114
DC Voltmeter	1	RCA Senior Volt Ohmyst WV-98A
Variable Attenuator	1	Kay Electric 30-1
RF Power Meter	1	Termaline 61

\* This power supply is capable of supplying 2 amps at 10-15 volts DC. Two 1 amp supplies may be substituted.

B4.1.4 Special Test Equipment Required.-

Temperature Chamber - Capable of maintaining temperature in the range  $40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ .

Vibration Table

Dummy Antenna (for receive tests) (See Figure B1-1)

Fixed 2 Watt Attenuator (12.6 db) (See Figure B2-1)

Audio Signal Adder (for receive tests) (See Figure B1-2)

MIL-R-55499B(EL)

B4.2 Environmental and Operational Stresses.- The environmental and operational stress facilities will be provided as follows:

B4.2.1 Temperature Test Condition.- A heat chamber, thermostatically controlled, will provide the  $40^{\circ}\text{C} \pm 5^{\circ}\text{C}$  ambient temperature. The temperature will be recorded automatically. Thermal runaway will be prevented by a ( $50^{\circ}\text{C}$ ) thermal fuse which when overstressed will remove heater power.

B4.2.2 Vibration Test Condition.- A vibration table, located within the heat chamber, will provide the vibration of  $2.2\text{G} \pm 10\%$  at any non-resonant frequency between 20 and 50 Hz measured at the mounting points on the equipment. The vibration table will be energized for ten minutes out of each hour of "on" time.

B4.2.3 Input Voltage Cycling Test Condition.- A 2 amp power supply will provide the input voltages of 10-15 volts DC.

B4.2.4 ON-OFF Cycle Test Condition.- On-off cycling, as specified in paragraph B3.2.4, will be performed in the heat chamber referenced in paragraph B4.1.4.

B4.3 Test Conditions.-

B4.3.1 Cycle.- The testing will be conducted on a 24-hour, 7-days-per-week basis until an accept-reject criteria has been reached.

B4.3.2 Duty Cycle.- The radio set will be placed in the receive mode for 9 minutes and the transmit mode for 1 minute out of every 10 minutes for the entire "ON" period. Figure B4 shows the duty cycle in relation to the vibration and "ON-OFF" cycle. This cycle will not apply to a radio set that is being checked for performance. The duty cycle will be automatically sequenced by a 10-minute timer.

B4.3.3 Test Measurements.- Time required to perform test measurements on each equipment shall be added to the daily operating time to provide a total daily accumulated time. The total accumulated time will be used in determining the MTBF. Performance measurements shall be made under the standard test conditions as specified in B4.1.1 and B4.1.2 on each radio set each day during the "ON" period of the "ON-OFF" cycling.

B4.3.4 Monitoring.- The audio and radio frequency outputs of the radio sets will be automatically monitored for catastrophic failure or major degradation in transmit or receive operation. When a failure in either output occurs, an alarm system will be activated which will turn off the input voltages and the elapsed operating time meter.

MTL-R-55499B(EL)

B4.3.5 Burn-in (Debugging) Period.- The radio sets selected for reliability testing shall have undergone the burn-in process called for in the specification. The debugging time will be 42 hours of "ON" time. Failures occurring during debugging will not be considered as relevant failures for the reliability test. Operating time accumulated during this period will not be counted as "ON" time.

B4.3.6 Maintenance Measures to be Performed.- No adjustment or repair will be made on the radio set except that necessary to enable a failed radio set to perform as specified. Operator controls shall be adjusted as required.

B4.4 Failure Reporting and Analysis.-

B4.4.1 Failure Reporting and Documentation.-

B4.4.1.1 Each failure occurring during the reliability test will be reported and analyzed; and have corrective action taken.

B4.4.1.2 The failure will be documented on a failure report form which will describe the method used to detect the failure. The failure mode and the repair necessary to make the radio set operational.

B4.4.1.3 Each failure will be documented on the appropriate log of failures which contains (in part) the accumulated operating time at time of failure, and the failure report number.

B4.4.1.4 The accumulated operating time on all radio sets will be record on the operating time log when a failure occurs.

B4.4.1.5 When a radio set is removed from the heat chamber for repair, a failure tag will be attached to the unit showing (in part) the failure report number, associated reports and the operation sheet page and line number.

B4.4.1.6 A failure detected during performance measurement tests will have the data entry circled on the operation sheet.

B4.4.1.7 A failed radio set will be sent to troubleshoot and repair where the radio set will be analyzed to isolate and repair the failure. The findings will be documented on the failure report and the equipment repair sheet.

MIL-R-55499B(EL)

B4.4.1.8 When a failed radio set is returned to test, the elapsed operating time meter readings will be recorded on the operating time log and the date of return will be recorded on the log of failures.

B4.4.2 Failure Analysis.-

B4.4.2.1 Each failure occurring during the reliability test will be analyzed and classified. Paragraph 5.5.1 of MIL-STD-781 shall apply.

B4.4.2.2 The failure report will accompany the failed part which will be analyzed to determine the cause of failure.

B4.4.3 Corrective Action.- A corrective action system shall be implemented in accordance with MIL-STD-781.

B4.5 Reliability Test Report.- The Reliability Test Report will comply with paragraph 5.11 of MIL-STD-781. Bi-weekly reports of performance shall also be submitted.

B4.5.1 Reliability Test Procedure.- The Reliability Test Report will include a complete description of the test procedures (paragraph B4.1): environmental and operational stresses (paragraph B4.2); and test conditions (paragraph B4.3).

B4.5.2 Failure Summary and Analysis.- The failure summary and analysis will comply with paragraph 5.11.2.1 of MIL-STD-781. (See paragraph B4.4)

B4.6 Accept-Reject Criteria.- The decision to reject, continue testing or to accept the reliability test will be determined by either Test Plan III or Test Plan V of MIL-STD-781, depending on the phase of Testing being conducted in accordance with B3.0 provisions.

B5.0 DEFINITIONS.- The following definitions apply to this Reliability Test:

B5.1 Debugging.- A process (burn-in) to eliminate the early failure period and stabilize the radio set prior to reliability testing, submission for acceptance, and preproduction testing.

B5.2 Failure.- A failure, for this test, will be:

a. Cessation of performance.

b. Major degradation of performance during monitoring to 0.40 watts of radio frequency output or to 2.0 VRMS across a 1000-ohm audio loading resistor.

MIL-R-55499B(EL)

c. Performance measurements out of the limits specified herein.

B5.3 Dependent Failure (Secondary). - One which is caused by the malfunctioning of associated items. Not independent.

B5.4 Independent Failure (Primary). - One which occurs without being related to the malfunctioning of associated items. Not dependent.

B5.5 "ON" Time. - The period of time that power is applied to the radio set while the set is on reliability test.

B5.6 Reliability. - The probability of performing without failure a specified function under given conditions for a specified period of time.

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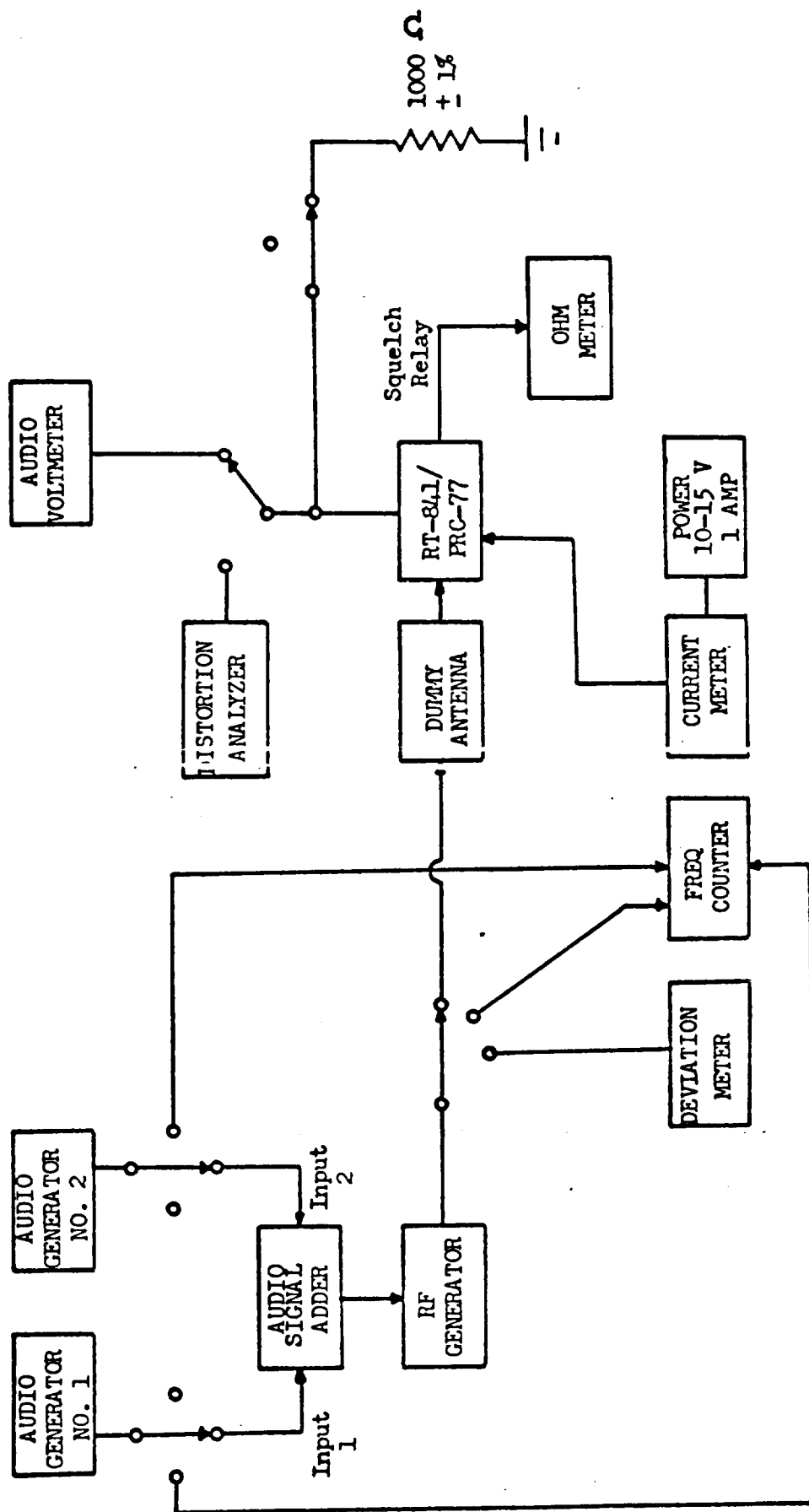


FIGURE B1 RECEIVER TEST SET-UP #1

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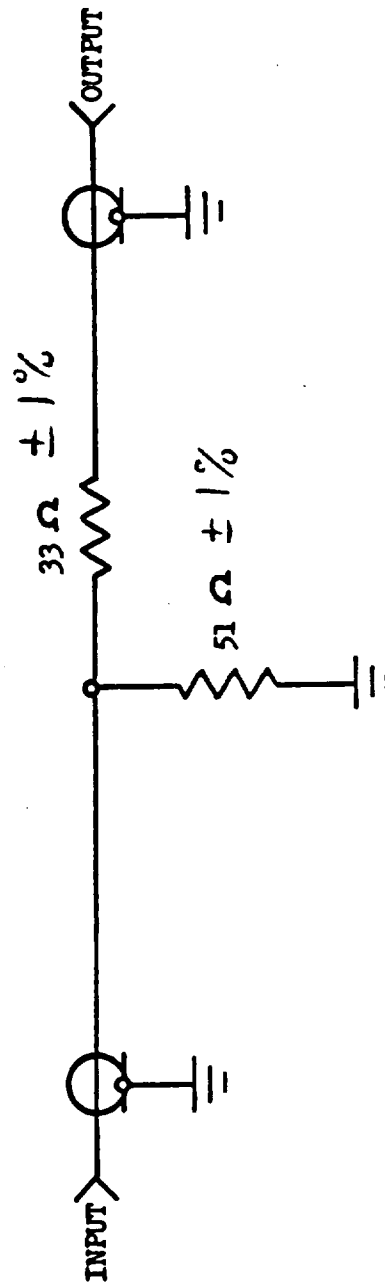


FIGURE B1-1 DUN A PI-NETWORK SCHEMATIC

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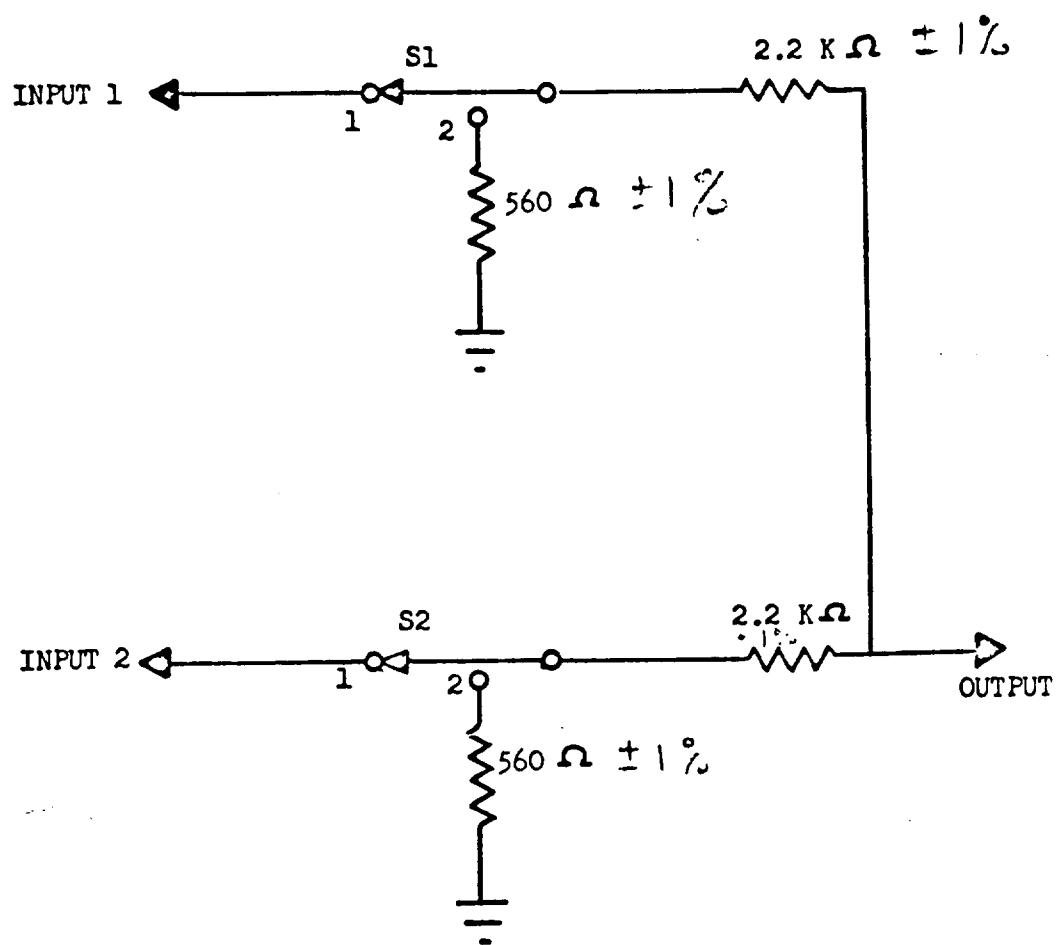
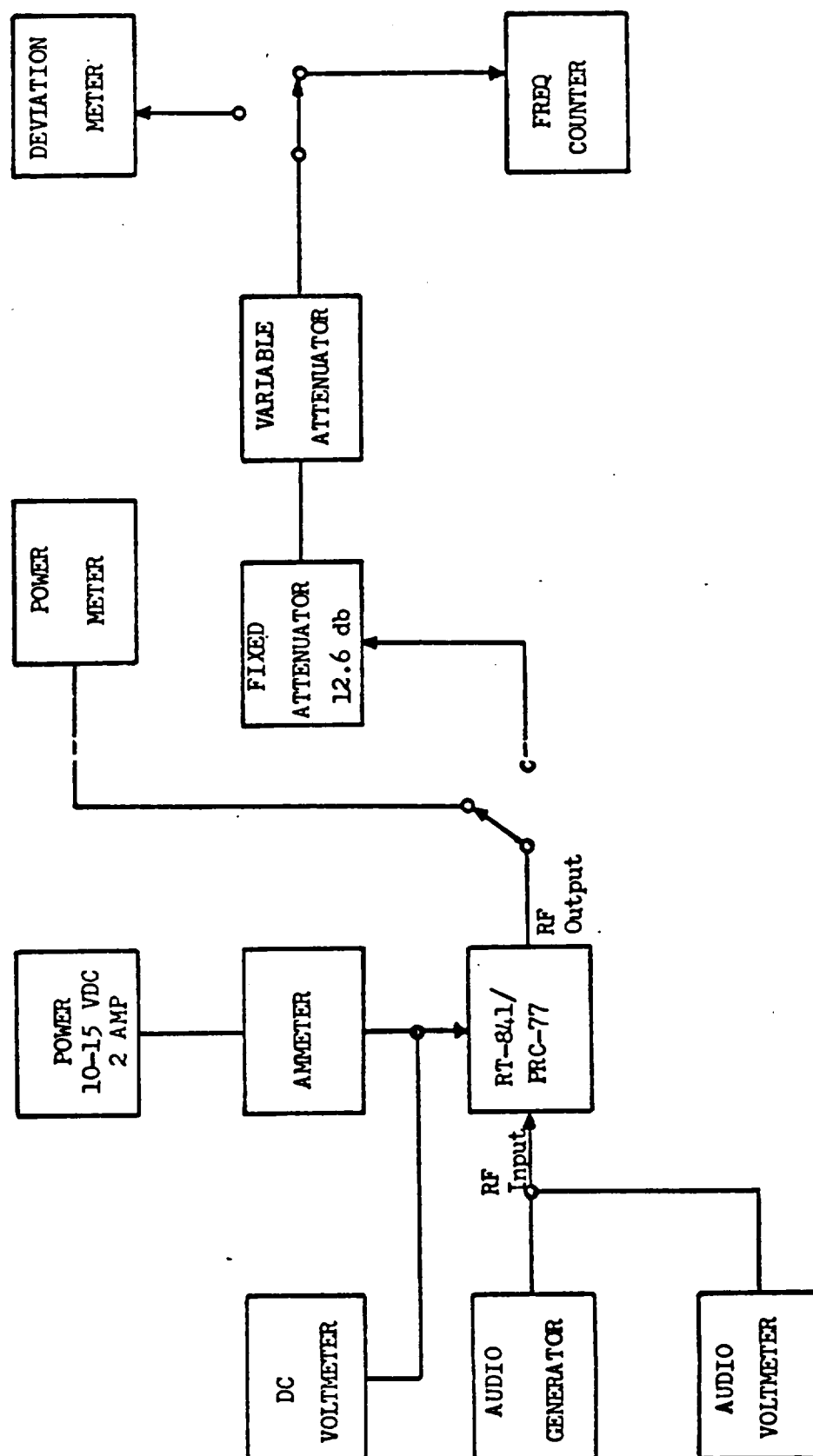


FIGURE B1-2 AUDIO SIGNAL ADDER SCHEMATIC



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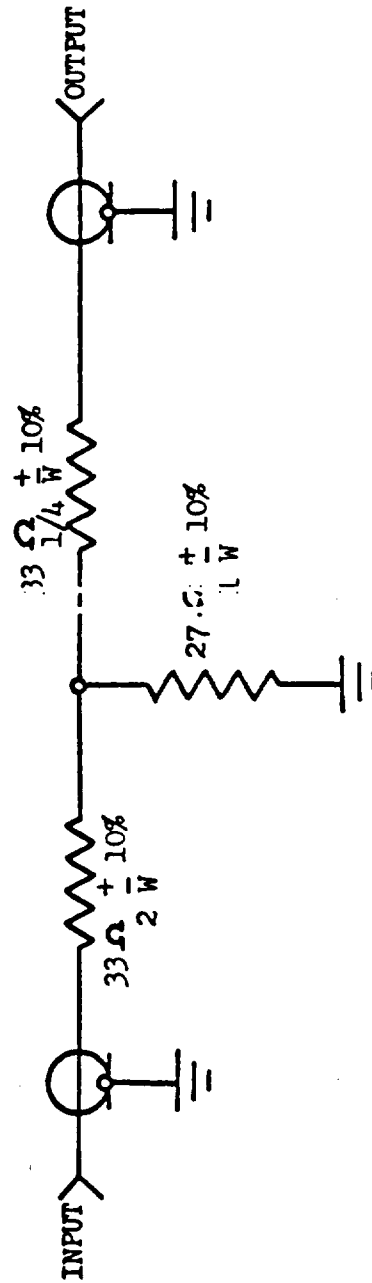
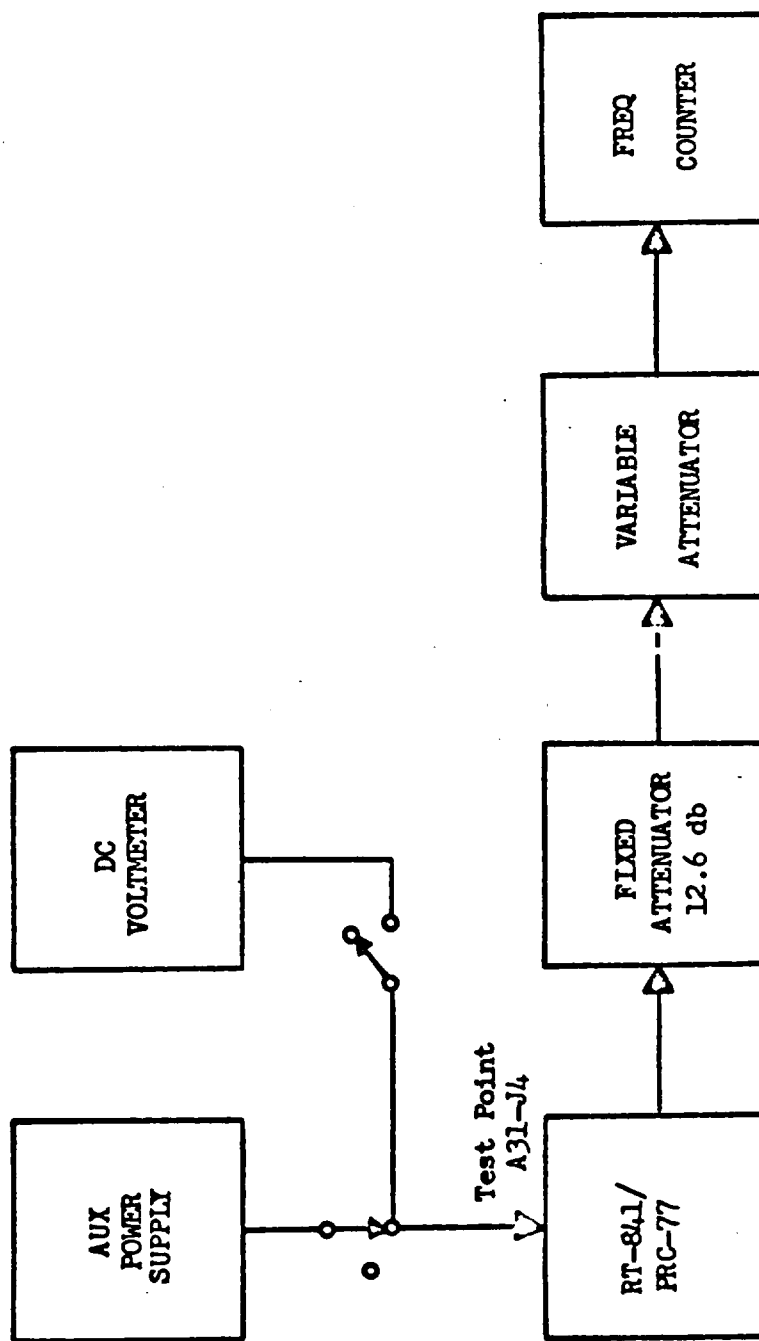


FIGURE B2-1 FIXED 12.6 DB ATTENUATOR SCHEMATIC

MIL-R-55499B(EL)



104

FIGURE B3 TRANSISTOR TEST SET-UP #2

MIL-R-55499B(EL)

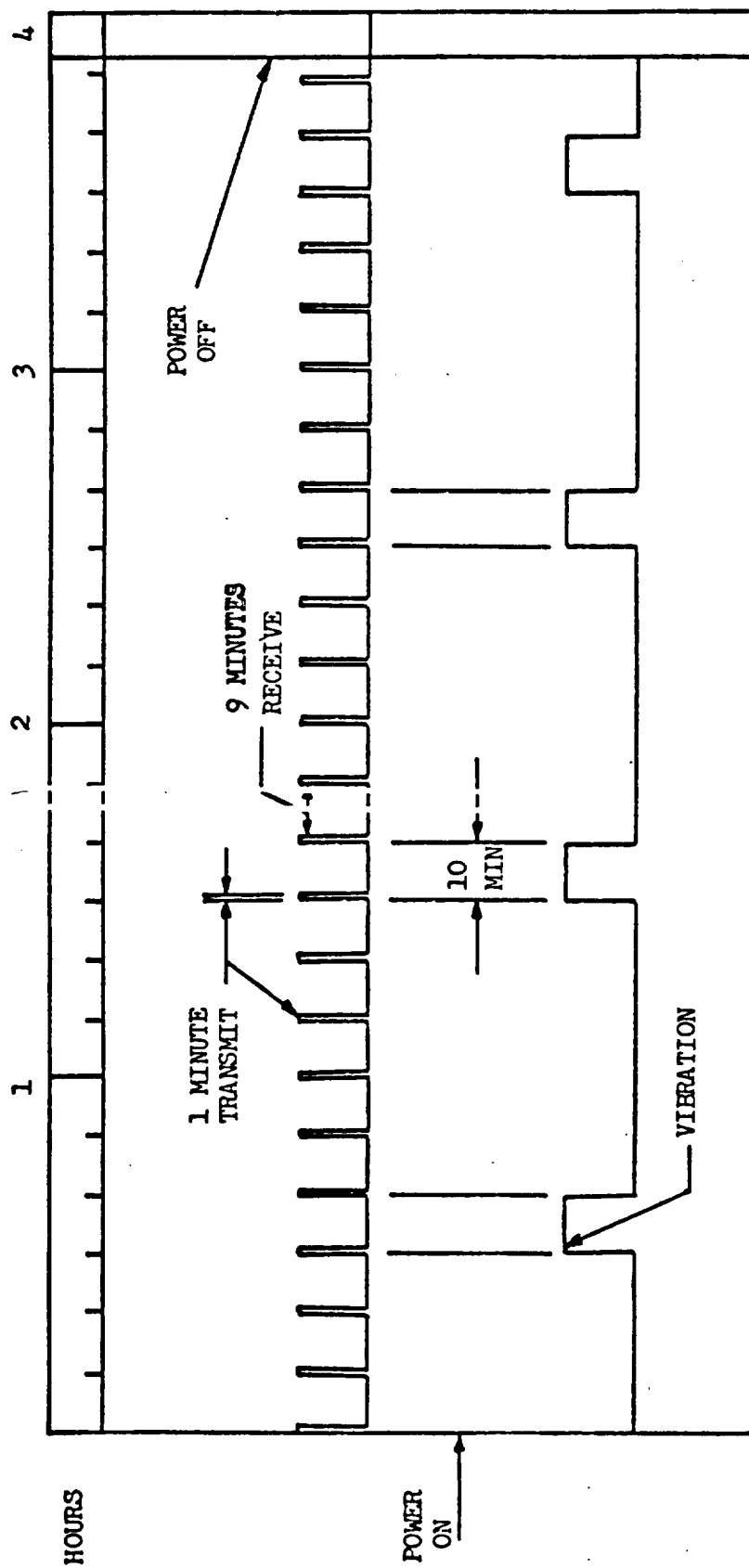


FIGURE B4. DUTY AND VIBRATION CYCLE

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