

MIL-R-81627(AS)

1 July 1971

## MILITARY SPECIFICATION

## RADIO SET AN/ARC-142

This specification has been approved by the Naval Air Systems Command, Department of the Navy.

## 1. SCOPE

1.1 Scope - The equipment covered by this specification shall provide radio frequency reception and transmission, single-sideband communications, in the high frequency 2 to 30 MHz band. It shall provide for two-way simplex communications for voice, teletype, and Link 11 tactical data. The Radio Set RF Amplifier output shall be either 400 watts or 1000 watts average or peak envelope power.

1.2 Classification - The equipment covered by this specification shall consist of the following items:

<u>Item</u>	<u>Type Designation</u>	<u>Paragraph</u>
Receiver-Transmitter	RT-931/ARC-142	3.5.1
Amplifier, Radio Frequency	AM-6114/ARC-142	3.5.2
Control, Radio Set	C-7789/ARC-142	3.5.3
Base, Shock Mount, Electrical Equipment	MT-4063/ARC-142	3.5.4

1.3 Associated Equipment - This equipment shall operate with the associated equipment listed in 6.7 to the extent specified herein. The associated equipment shall not be supplied as part of the Radio Set.

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## 2. APPLICABLE DOCUMENTS

2.1 General - The following documents of the issue in effect on the date of invitation for bids form a part of this specification to the extent specified herein:

### SPECIFICATIONS

#### Military

MIL-C-172	Cases, Bases, Mounting; and Mounts, Vibration (for use with Electronic Equipment in Aircraft)
MIL-W-5088	Wiring, Aircraft, Installation of
MIL-E-5400	Electronic Equipment, Aircraft, General Specification for
MIL-T-5422	Testing, Environmental, Aircraft Electronic Equipment
MIL-I-6181	Interference Control Requirements, Aircraft Equipment
MIL-C-6781	Control Panel; Aircraft Equipment, Rack or Console Mounted
MIL-P-7788	Panels, Information, Integrally Illuminated
MIL-M-7793	Meter, Time Totalizing
MIL-E-17555	Electronic and Electrical Equipment and Associated Repair Parts, Preparation for Delivery of
MIL-T-18303	Test Procedures; Preproduction and Acceptance for Aircraft Electronic Equipment, Format for
MIL-N-18307	Nomenclature and Nameplates for Aeronautical Electronic and Associated Equipment
MIL-T-23103	Thermal Performance Evaluation, Airborne Electronic Equipment; general Requirement for

## SPECIFICATIONS (Continued)

Military

MIL-C-26482                   Connectors, Electric, Circular, Miniature,  
Quick Disconnect, Environment Resisting

MIL-81288                    Mounting Bases, Flexible Plastic Foam

MIL-C-81511                  Connectors, Electric Circular, High Density,  
Quick Disconnect, Environmental Resisting  
Specification for

## NAVAL AIR SYSTEMS COMMAND

AR-5                         Microelectronic Devices Used in Avionics  
Equipment, Procedures for Selection and Approval of

AR-10                        Maintainability of Avionics Equipment and Systems,  
General Requirements for

## STANDARDS

AR-34                        Failure Classification for Reliability, Testing,  
General Requirements for

Military

MIL-STD-704                  Electric Power Aircraft Characteristics and  
Utilization of

MIL-STD-781                  Reliability Tests, Exponential Distribution

MIL-STD-785                  Requirement for Reliability Program for Systems  
and Equipment

MIL-STD-794                  Parts and Equipment, Procedures for Packaging &  
Packing of

MS17322                     Meter, Time Totalizing, Miniature, Digital,  
115 Volt 400 Cycle

## PUBLICATIONS

WR-101                      Part I; Electromagnetic Control Requirements for  
Advanced ASW Avionic Systems

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2.1.1 Availability of Documents - (1) When requesting specifications, standards, drawings, and publications, refer to both title and number. Copies of this specification and applicable specifications required by contractors in connection with specific procurement functions may be obtained upon application to the Commanding Officer, Publications and Forms Center, Code 105, 5801 Tabor Avenue, Philadelphia, Pennsylvania, 19120.

### 3. REQUIREMENTS

3.1 Preproduction- This specification makes provision for preproduction testing.

3.2 Parts and Materials - In the selection of parts and materials, fulfillment of major design objectives shall be the prime consideration. In so doing, the following shall govern:

(1) Microelectronic technology shall be considered and microelectronic items shall conform to requirements specified herein.

(2) Other parts and materials requirements shall conform to Specification MIL-E-5400.

(3) Non-repairable subassemblies shall be used in accordance with AR-10, and as outlined in Specification MIL-E-5400.

(4) When previously produced models of this equipment did not use non-repairable subassemblies, the design shall not be changed to employ non-repairable assemblies without the approval of the procuring activity.

3.2.1 Nonstandard Parts and Materials Approval - Approval for the use of nonstandard parts and materials (including electron tubes, transistors and diodes) other than microelectronic devices shall be obtained as outlined in Specification MIL-E-5400. Microelectronic devices shall be approved as outlined in Specification AR-5.

3.2.2 Microelectronic Modular Assemblies - When used, Microelectronic Modular Assemblies shall meet the requirements of Specification AR-5. Conformal coatings, encapsulants, embedments or potting materials used with modular assemblies containing integrated circuits and discrete parts shall be easily removable without damage to the assembly.

3.2.3 Modules - The electronic portions of the equipment shall be modularized in accordance with Specification AR-10.

3.3 Design and Construction - The equipment shall conform with all the applicable requirements of Specification MIL-E-5400 for design, construction and workmanship, except as otherwise specified herein.

3.3.1 Total Weight - The total weight of the equipment, excluding cables, shall be a minimum consistent with good design and shall not exceed 82 pounds.

3.3.2 Reliability - The contractor shall conduct a reliability program using MIL-STD-785 as a guide. On a reorder from a supplier who has previously produced the equipment, the program previously used may be continued unless otherwise indicated in the contract or order.

3.3.2.1 Operational Stability - The equipment shall operate with satisfactory performance, continuously or intermittently for a period of at least 1200 hours without the necessity for readjustment of any controls which are inaccessible to the operator during normal use.

3.3.2.2 Operating Life - The equipment shall have a total operating life of 10,000 hours with reasonable servicing and replacement of parts. Parts requiring scheduled replacement shall be specified by the contractor.

3.3.2.3 Reliability in Mean-Time-Between-Failure (MTBF) - The equipment, including any built-in test provisions, shall have 1200 hours of specified mean (operating) time between failures ( $\theta_0$ ) when tested and accepted as outlined under the requirements of 4.4.3.

3.3.2.4 Time Totalizing Meter - The following units shall contain time totalizing meter in accordance with Specification MIL-M-7793:

<u>Unit</u>	<u>Type of Meter</u>
Radio Frequency Amplifier	MS17322
Receiver-Transmitter	MS17322

### 3.3.3 Cabling and Connections

3.3.3.1 Cables and Connectors - The equipment shall provide for the use of cables and connectors in accordance with Specification MIL-E-5400.

3.3.3.2 Interconnection Cabling - The equipment shall be capable of satisfactory operation using external wiring in accordance with the applicable requirements of Specification MIL-W-5088. The external wiring shall be unshielded, except that a minimum number of the individual wires may be shielded when demonstrated as necessary to meet interference control requirements and provided the assembly of the cable to its plugs may be easily accomplished. External cables and that portion of the connectors attached to the cables shall not be supplied as part of the equipment.

3.3.3.3 Ground Connections - The ground circuit design shall be in accordance with the following:

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- (a) A separate power ground shall be brought out to an external connector pin and not be grounded within the equipment.
- (b) Chassis ground shall be brought out to an external connector pin.
- (c) Signal return shall be brought out to an external connector pin.
- (d) Common return wires within the equipment for signal returns and DC power grounds shall not be used.
- (e) Shield ground shall be brought out to an external connector pin.
- (f) The outer shield on coaxial cables must be connected to the chassis via the connector shell.

3.3.4 Control Panels - All rack or console mounted control panels shall conform to the applicable requirements of Specification MIL-C-6781. The configuration of all panels shall be approved by the procuring activity prior to preproduction testing.

3.3.4.1 Panel Illumination - The panel shall comply with specification MIL-P-7788. The primary source of power shall be 5.0 volts AC and shall be supplied by the aircraft.

3.3.5 Interchangeability - The equipment shall meet the interchangeability requirements of Specification MIL-E-5400.

3.3.6 Interference Control - The generation of radio interference by the equipment and the vulnerability of the equipment to radio interference shall meet the requirements of MIL-I-6181.

3.3.6.1 Electromagnetic Control Requirements - Electromagnetic control requirements shall be governed by WR-101, Part I.

3.3.7 Provisions for Maintainability - The Maintainability Program, Built-in test features, construction and packaging, provisions for test points, and other maintainability parameters shall be in accordance with Specification AR-10.

3.3.8 Nomenclature, Nameplates and Identification Marking - Nomenclature and serial number assignment, nameplate approval and identification marking shall be in accordance with Specification MIL-N-18307.

3.3.9 Standard Conditions - The following conditions shall be used to establish normal performance characteristics under standard conditions and for making laboratory bench tests:

## 3.3.9 (Continued)

Temperature	Room ambient ( $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ )
Altitude	Normal ground
Vibration	None
Humidity	Room ambient up to 90% relative humidity
Input power voltage	$115 \pm 1.0$ VAC, 3 phase, 400 Hz $5 \pm 0.5$ VAC, 1 phase, 400 Hz $27.5 \pm 0.5$ VDC

3.3.10 Service Conditions - The equipment shall operate satisfactorily under any of the environmental service conditions or reasonable combination of these conditions as specified in Specification MIL-E-5400 for Class IA equipment except as modified herein.

3.3.10.1 Vibration - The equipment shall operate satisfactorily when subjected to the requirements of curves I and II of Specification MIL-E-5400, except that the console control panel shall meet curve I.

3.3.11 Warm-up Time - The time required for the equipment to warm up prior to operation shall be kept to a minimum and shall not exceed 15 minutes under standard conditions and 30 minutes at extreme service conditions.

3.3.12 Input Electrical Power

3.3.12.1 Operating Power - The equipment shall meet all applicable requirements of MIL-STD-704 and shall give specified performance when energized from the following power sources having characteristics and limits as defined in MIL-STD-704. The power required shall not exceed the specified amounts.

(1) AC Power (Three Phase), 115/200V, Category B, 3750 VA

3.3.12.2 Lighting Power - Input power for lighting shall require not more than 1.0 amp at 5 volts AC. Input power for status lights shall require not more than 0.5 amp at 28 volts DC.

3.3.12.3 Degraded Performance - Degraded performance shall be permitted for voltage transients not exceeding 0.5 second during normal electric system operation. Operation shall return to normal with no resulting damage to the equipment.

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3.3.12.4 Standby Power - The equipment shall provide for a standby position whereby rated voltage shall be applied to the frequency standard, power amplifier tube filament, and other critical circuitry. In the standby position the transmitter shall be inhibited and the receiver shall be muted. The standby power shall not exceed 800 VA.

3.3.12.5 Overload Protection - All power supplies shall contain solid state short circuit or overload protection. Provisions shall be made to resume normal operation if fault condition is cleared. Reset shall be performed at the front panel of the control box.

3.3.13 Cooling - The equipment shall have self-contained cooling provisions and shall operate satisfactorily under the service conditions of MIL-E-5400 Class IA. The thermal evaluation shall be in accordance with MIL-T-23103.

3.4 Performance - Unless otherwise specified, values set forth to establish the requirements of satisfactory performance apply to performance under both standard and extreme service and input power conditions. When reduced performance under the extreme conditions is acceptable, tolerances or values setting forth acceptable variations from the performance under the standard conditions will be specified.

3.4.1 Operation - The HF radio set shall contain an automatically tuned multichannel transceiver (including receiver-transmitter and RF amplifier functions) which shall have the operating frequency and modes of operation remotely controlled by means of a radio set control. The radio set shall provide either single sideband suppressed carrier (VO) and single sideband with reinserted carrier (AME) capabilities for voice transmission using upper sideband and voice processing techniques. Reception shall be provided by single sideband suppressed carrier techniques in the VO mode and by normal AM techniques in the AME mode. Audio frequency shift keying (AFSK) and tactical data (e.g. Link 11), and transmission and reception capabilities shall be provided using single sideband suppressed carrier techniques in the upper sideband mode (DATA), in the lower sideband mode (LSB), or both sidebands (DIV). The radio set shall provide necessary control signals for the CU-1809/ARC Antenna Coupler or equivalent.

3.4.2 Channel Selection - All channels of the Radio Set shall be available without the necessity of changing any components or manually adjusting any circuits. When a channel has been selected, both the receiver and transmitter circuits shall adjust automatically for operation on the selected frequency.

3.4.2.1 Channel Selection Time - The time from the instant any channel or frequency is selected to the time that the set is operative for either transmission or reception shall not exceed one (1) second under standard conditions or two (2) seconds under service conditions. The tuning time of the associated Antenna Coupler shall be considered as an independent requirement.



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3.4.3 Frequency Characteristics - It shall be possible to transmit and receive on any carrier frequency in the range of 2 to 29.9999 MHz. All modes of operation as specified in 3.5.3.5 (b) shall be available on all such frequencies. Carrier frequencies shall be located at increments of 100 Hz (280,000 discrete channels) throughout the frequency range commencing with 2.0 MHz. Provisions shall be made for direct frequency readout of 280,000 channels. The equipment shall be calibrated in terms of carrier frequency.

3.4.4 Frequency Calibration Accuracy - Provisions shall be made to permit periodic calibration of the frequency standard to a resolution of one part in  $10^9$ . The adjustment range shall be sufficient to correct for a minimum aging period of three years.

3.4.4.1 Frequency Stability - The stability of the frequency standard shall be within 1 part in  $10^6$  over a period of 24 hours after 30 minutes warm-up without adjustment or an automatic frequency control dependent upon the received signal. The stability of the frequency standard shall be within one part in  $10^6$  after 15 minutes warm-up.

3.4.4.2 Phase Stability - The average RF transmit and receive audio phase deviation over 13.33 milliseconds or 22 milliseconds period shall each not exceed 5 degrees between any two successive periods.

3.4.5 Duty Cycle - The equipment shall be capable of continuous operation in either the Transmit or Receive function.

3.4.6 Receive/Transmit Switching - Upon application of the transmit key control signal, the equipment shall switch to the transmit function and shall be stabilized within seven milliseconds. Transients resulting in P. A. RF voltage shall be inhibited during this time. Upon removal of the transmit key control signal, the equipment shall switch to the receive function within 7 milliseconds.

3.4.6.1 Transmitter Keying - A ground ( $0 \pm 0.25V$ ) on the transmit keyline, capable of sinking 10 ma, shall place the radio set into the transmit function. An open circuit on the keyline shall place the set into the receive function.

3.4.6.2 Keyline Interlock - A ground ( $0 \pm 0.25V$ ) on the transmit keyline interlock capable of sinking 10 ma, shall enable the radio set in the transmit function.

3.4.7 Delay - The total time delay and differential time delay for data audio tones within the range of 800 to 3050 Hz shall be within the limits specified herein.

3.4.7.1 Differential Delay - There shall be less than 1 millisecond delay between any two data audio tones.

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3.4.7.2 Total Time Delay - The total transmitter time delay for any tone shall not exceed 2.3 milliseconds. The total receiver time delay for any tone shall not exceed 2.3 milliseconds.

### 3.4.8 Modulation Characteristic

#### 3.4.8.1 Modulation

3.4.8.1.1 Capability - In all modes, when a single tone in the range from 0.2 to 0.8 Volts RMS at 1000 Hz is applied to the audio input terminals the equipment shall produce rated power output. With two equal tones, 0.1 volt RMS to 0.4 Volts RMS each, the equipment shall produce rated PEP in accordance with 3.5.2.5.1.

3.4.8.1.2 Audio Response - The variation in overall audio response of either the transmitter or the receiver shall be less than 3 db from 300 to 3050 Hz.

3.4.8.1.3 Automatic Level Control - Automatic level control shall be provided to maintain rated power as specified in 3.5.2.5.1 and to maintain the linearity and spurious output requirements of 3.5.2.5.6 and 3.5.2.5.7.

3.4.8.1.4 Data Signal Input - The equipment shall be capable of accepting identical baseband inputs for USB, LSB, and both (DIV).

3.4.8.2 AME Compatibility - The equipment shall be capable of communicating with amplitude modulated radio sets. Compatible transmission shall use upper sideband with carrier reinsertion.

#### 3.4.9 Terminations (All Modes)

3.4.9.1 Receiver RF Input - The receiver antenna input shall be designed to operate from a nominal 52 ohm source. Input VSWR shall not exceed 4.5 to 1.

3.4.9.2 RF Amplifier Output - The RF amplifier shall be designed to operate into a nominal 52 ohm load.

3.4.9.3 Receiver Audio Output - The receiver output shall be center-tapped, balanced ungrounded, designed to be terminated with a 600 ohm resistive load.

3.4.9.4 Transmitter Audio Input - The input circuit of the transmitter shall be a load of 600 ohms nominal, balanced, center-tapped, ungrounded.

#### 3.4.10 Built-in Test Equipment - BITE - Automatic self-test.

3.4.10.1 General - The radio set shall have self-contained, built in test equipment (BITE) which permits overall dynamic testing of the set in less than five (5) seconds.

3.4.10.2 Overall Radio Set Test - Overall testing (Automatic Self-Test) shall be initiated from the Control, C-7789/ARC-142. "GO"/"NO-GO" indications shall be displayed to the operator on the control C-7789. The BITE shall determine whether the overall set is operating satisfactorily and, if not, whether the receiver-transmitter, RT-931 or the RF Amplifier AM-6114 is faulty. A BITE fault indicator shall be located on the front of the RF Amplifier.

3.4.10.3 Isolation of Faulty Functional Assemblies of RT-931 - The radio set BITE shall provide means of determining which of the functional assemblies of the RT-931 is malfunctioning. BITE fault indicators shall be located on each functional assembly of the RT-931, excluding the self-test programmer functional assembly.

3.4.10.4 BITE Reset - The BITE indicators on all functional assemblies shall automatically be reset at the start of a self-test operation. Control box BITE reset shall be from the front panel of the Control Box.

3.4.11 Antenna Coupler Interface - The following auxiliary control lines shall be available for use by the antenna coupler.

3.4.11.1 ON-OFF - A contact grounding capable of grounding a 28 V DC circuit at a maximum of 0.2 amps.

3.4.11.2 Ground Return - The ground return shall be capable of handling 0.5 amps maximum.

3.4.11.3 Band Logic - A ground capable of handling 100 milliamps maximum shall be provided for each band to indicate when the power amplifier is operating in the 2 to 2.99 MHz band or the 3 to 3.99 MHz band.

3.4.11.4 Tune Power - A ground (0 + to 0.25 V DC), on the tune power control line capable of sinking 10 ma, shall cause the transmitter to deliver TUNE POWER when the set is properly keyed.

3.4.11.5 Low Power - A ground capable of handling 100 milliamps maximum shall be provided to indicate when low power operation of the transmitter has been selected.

### 3.5 Detail Requirements

3.5.1 Receiver-Transmitter - The Receiver-Transmitter shall meet the following requirements:

3.5.1.1 Function - The Receiver-Transmitter shall provide the specific capabilities listed in 3.5.1.5 and provide the necessary control and excitation to satisfy the particular applicable requirements of 3.4.

3.5.1.2 Form Factor - The Receiver-Transmitter shall be enclosed in a case 19.50 inches long, 7.78 inches wide, and 10.28 inches high. The RT unit shall mount on the shock mount base described in 3.5.4.

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3.5.1.3 Weight - The weight of the Receiver-Transmitter shall not exceed 34.0 pounds.

3.5.1.4 Contents - The Receiver-Transmitter shall contain the following functional assemblies:

- (a) Power Supply and System Control - The power supply and system control shall generate and regulate the major low voltage sources used in the Radio Set. It shall also provide the logic controls for the transmit-receive switching and shall contain EMI filtering used between the Receiver-Transmitter and external interfaces.
- (b) Frequency Standard - The frequency standard shall provide the stable frequency source used for all accurate, stable frequency generation.
- (c) Frequency Synthesizer - The frequency synthesizer shall generate all required frequencies used in both receive and transmit functions.
- (d) Synthesizer Buffer - The synthesizer buffer shall provide the high purity variable injection signals for both the receive and transmit function using the synthesizer variable signal as a standard frequency reference. It shall also provide the necessary switching logic for band selection.
- (e) Receiver - The receiver shall contain the necessary circuitry to amplify, convert and detect USB, DIV, LSB and AM signals in the 2 to 30 MHz range.
- (f) Self-Test Programmer - The self-test programmer shall provide sequential stimuli and signal sampling of all functional assemblies comprising the Radio Set during the "TEST" condition. It shall fault isolate to a receiver-transmitter functional assembly or the RF amplifier automatically during the TEST condition. The Power Amplifier shall be self-tested using an internal load to maintain radio silence.
- (g) Exciter - The Exciter shall generate the USB, LSB, and DIV signals from the baseband inputs and perform necessary translation to provide RF drive to the RF Amplifier. It shall be capable of reinserting carrier on the USB channel during AME mode operation. It shall supply RF carrier during coupler tuning.

### 3.5.1.5 Characteristics

3.5.1.5.1 Receiver Sensitivity - With the squelch disabled, the sensitivity of the receiver in the SSB modes over the specified frequency range shall be such that an RF input signal of not more than 1.5 hard microvolts RMS (open circuit) applied at the antenna terminals of the Radio Set shall produce a minimum signal-plus-noise-to-noise ratio of 10 db and a minimum voice audio output of 5 milliwatts, across a 600 ohm load. This sensitivity shall be measured with a signal generator, with an effective source impedance of 50 ohms (through a 6 db pad) connected to the antenna terminals of the Radio Set. The same sensitivity applies to either sideband when in DIV

mode of operation. The sensitivity of the receiver in AME mode over the specified frequency range shall be such that an RF input signal of not more than 10 hard microvolts RMS (open circuit) amplitude modulated 30% shall produce a minimum signal-plus-noise-to-noise ratio of 10 db and a minimum audio output of 5 milliwatts across a 600 ohm load. Over the service conditions of this specification, the sensitivity shall not degrade from the above limits by more than 3.0 db.

**3.5.1.5.2 Selectivity** - The overall selectivity of the receiver using the carrier frequency as the frequency reference shall be such that:

- (1) On USB, the response to signals outside the range of -200 Hz to +4100 Hz shall be attenuated at least 60 db relative to the peak response (0 db reference) within the passband of +300 Hz to +3050 Hz.
- (2) On USB, the -3 db response relative to the peak response (0 db reference) shall occur at a frequency less than +300 Hz and greater than +3050 Hz. The peak to valley response shall not exceed 3 db within the +300 to +3050 Hz passband.
- (3) On LSB, the response to signals outside the range of +200 Hz to -4100 Hz shall be attenuated at least 60 db relative to the peak response (0 db reference) within the passband of -300 to -3050 Hz.
- (4) On LSB, the -3 db response relative to the peak response (0 db reference) shall occur at a frequency less than -3050 Hz and greater than -300 Hz. The peak to valley response shall not exceed 3 db with the -3050 to -300 Hz passband.
- (5) The slope of the response from the 3 db attenuation points to the 60 db attenuation points shall be a smooth transition free from regeneration.

NOTE: The plus (+) signs apply to frequencies higher than the carrier frequency and the minus (-) signs apply to frequencies lower than the carrier frequency.

**3.5.1.5.3 Image Rejection** - The receiver response to antenna signals at the image frequencies shall be attenuated at least 100 db relative to the response to the desired signal.

**3.5.1.5.4 IF Rejection** - The receiver response to antenna signals at the same frequencies of the receiver IF amplifier center frequencies shall be attenuated at least 100 db relative to the response to the desired signal.

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3.5.1.5.5 Input Signal Protection - The receiver shall not be damaged by RF signals at the antenna up to 400 hard volts RMS (50 ohm source) at any frequency from 2 to 30 MHz.

3.5.1.5.6 Desensitization - There shall be no more than a 3 db reduction of the receiver audio output produced by a 1 hard microvolt desired signal when a signal 80 db above 1 hard microvolt and  $\pm$  30 KHz from the selected frequency is simultaneously impressed on the receiver input terminals.

3.5.1.5.7 Two-Tone Cross Modulation - The cross modulation product in the receiver output resulting from a two-tone test signal of 100 hard volts RMS per tone 10% removed from the desired signal in parallel with a desired signal of 800 hard microvolts RMS shall be at least -30 db with respect to the desired tone. The two-tone test signals shall be separated by 1000 to 1500 Hz. For test purposes, a single test signal of 115 hard volts RMS modulated 70% by a 1000 to 1500 Hz tone may be substituted.

3.5.1.5.8 In-Channel Intermodulation - The third order intermodulation product in the receiver audio output resulting from two in-channel signals of 20 hard microvolts to 0.2 hard volt per signal shall be at least -50 db relative to the PEV of the desired audio tones.

3.5.1.5.9 Second Order Intermodulation (Out of Channel) - The receiver response to two interfering signals 80 db above 2 hard microvolts shall be less than the response to a 2 hard microvolt desired signal. One interfering signal shall be as close as  $\pm$  30 KHz to the selected frequency.

3.5.1.5.10 Out of Band Third Order Intermodulation - The third order intermodulation shall be at least -85 db. One signal shall be spaced 150 KHz  $\pm$  10 KHz from the carrier frequency, and the other signal shall be spaced 300 KHz  $\pm$  10 KHz from the carrier frequency separated such that the third order product falls inside the receiver 3 db passband. The intermodulation is defined as the ratio of the PEV of the two equal amplitude signals and the third order product that produces a 10 db signal-plus-noise-to-noise ratio.

3.5.1.5.11 Dynamic Range - When the receiver is tuned to a 1.5 hard microvolt signal (50 ohm source), an interfering signal 50 KHz away from the selected channel and 110 db greater shall not reduce the audio output by more than 6 db. The interfering signal shall be single frequency, amplitude modulated 70% by a 1 KHz tone, and having a peak amplitude 110 db above 1.5 hard microvolt RMS.

3.5.1.5.12 Internal Signals - Spurious signal outputs due to heterodyning between various frequency conversion oscillators in the absence of a desired signal shall be less than 1.0 hard microvolt (open circuit) equivalent at the receiver input. The number of channels exceeding the above limit shall not exceed 0.25% of the total number of available channels.

3.5.1.5.13 Squelch - A squelch adjustment shall be provided when in the VO (voice) mode that can be set for squelch operation on input levels from receiver thermal noise to 20 (open circuit) hard microvolts. This adjustment shall be controlled from the Radio Set Control.

3.5.1.5.14 Audio Muting - The USB audio output of the receiver shall be muted during channeling, frequency selection, and when in the standby position.

3.5.1.5.15 Audio Output - The nominal maximum receiver audio output in all modes shall be 250 milliwatts +1, -3 db, supplied to 600 ohm balanced, ungrounded, resistive loading in each channel.

3.5.1.5.16 Audio Harmonic Distortion - The receiver SSB audio output total harmonic distortion shall not be greater than 5.0%.

3.5.1.5.17 Audio Output Control - Each audio output shall be separately controllable by a DC voltage varying from 0V to -12V. Zero volts shall correspond to nominal maximum audio output.

3.5.1.5.18 Hum and Noise - The receiver output hum and noise, measured in a 55 Hz bandwidth, shall be at least 50 db below rated output, with an input signal level of 1000 hard microvolts over the audio output frequency range from 600 to 3000 Hz.

3.5.1.5.19 Automatic Gain Control (Output Level) - The AGC characteristic shall be such that, with an input signal of 1000 hard microvolts as a reference, the audio output shall not vary more than 3 db with RF signal inputs from 20 hard microvolts to 3 hard volts (open circuit) RMS.

3.5.1.5.20 Automatic Gain Control (Time Constants) - The AGC characteristic in the voice mode shall be such that a maximum attack time of 100 milliseconds and a minimum release time of 700 milliseconds shall be used. The receiver AGC control voltage in data modes shall have an attack time such that the effective time constant shall not exceed 12 milliseconds. The decay time shall be such that the time required for the AGC voltage to decay from the level attained at a three hard volts PEV signal to a level attained with a 20 hard microvolt RMS signal shall be less than 20 milliseconds. The AGC must be capable of repeating this operation every 100 milliseconds provided that the period between received data signals is more than 20 milliseconds.

3.5.1.5.21 I.F. Automatic Gain Control Design - Receiver AGC bias voltage shall be developed for each sideband IF amplifier following the selectivity of the respective filter. The gain of each IF amplifier shall be controlled separately by the respective AGC bias voltage. The amount of gain control per unit bias voltage (db per volt) shall be designed to optimize linearity

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## 3.5.1.5.21 (Continued)

and signal-plus-noise-to-noise ratio and to minimize the effect of interfering signals. When operation is in the DIV mode, the AGC circuitry for each sideband must operate independent of the other.

3.5.1.6 Controls - The following controls shall be located on the front panel and shall be adjusted by a screwdriver unless otherwise indicated.

- (a) USB XMT AUDIO - permits input level adjustment by maintenance personnel.
- (b) LSB XMT AUDIO - Same as (a).
- (c) USB SIDETONE - permits periodic level adjustment of USB sidetone level by maintenance personnel.
- (d) LSB SIDETONE - Same as (c).
- (e) CLIPPER ENABLE (Switch) - permits disabling USB clipper.

3.5.1.7 Electrical Connections - Connections to external circuits shall be provided as follows:

<u>Reference Designation</u>	<u>Receptacle Type</u>	<u>Function</u>
A8J1	Burndy L22TE37PONA per MIL-C-26482	Power and Signal
A8J4	MIL-C-81511/01E18-85 P1	Signal
A6A4J1	TNC	Receiver RF Input
A6J5	TNC	Exciter RF Output
A6B1J1	MS-3116E-8-45	Blower Voltage

3.5.2 RF Amplifier - The RF Amplifier shall meet the following requirements:

3.5.2.1 Function - The RF Amplifier shall provide the specific capabilities listed in 3.5.2.5 and provide the necessary applicable operation required by 3.4.



3.5.2.2 Form Factor - The RF Amplifier shall be enclosed in a case 25.75 inches long, 7.62 inches wide, and 10.12 inches high.

3.5.2.3 Weight - The weight of the RF Amplifier shall not exceed 40 pounds.

3.5.2.4 Contents - The RF Amplifier shall contain the power amplifier stage, driver, necessary RF coils, high voltage and filament power supplies, RF filters, and control circuitry.

### 3.5.2.5 Characteristics

3.5.2.5.1 RF Power Output - The transmitter shall be capable of producing rated average and peak envelope power output (into a 52 ohm resistive load) both 400 watts +1db and 1000 watts +1 db in all operating modes. Rated average power shall be in AFSK data mode. Power selection shall be made on the Radio Set Control. Under service conditions, the power output shall not vary more than +1, -3 db from the nominal value.

3.5.2.5.1.1 Tune Power Output - The transmitter shall supply an RF voltage or current level equivalent to 100 watts +2, -1 db when measured into a 50 ohm load upon receipt of ground signals on the coupler tune and key control wires. During the tune cycle, where the load impedance differs from 50 ohms, the tune power limit of voltage and current shall be equivalent to that supplied to a 50 ohm load as follows:

Impedance greater than 50 ohms  
 Maximum voltage - 80 volts  
 Minimum voltage - 60 volts

Impedance less than 50 ohms - Maximum voltage limited to 80 volts  
 Maximum current - 5.1 amperes (Power limited to 100 watts + 2 db)  
 Minimum current - 1.2 amperes

Upon interruption of the key interlock line (during tuning), the tune power level shall be restored to 90% of the applicable current or voltage limit within 7 milliseconds of the restoration of ground on the key interlock line.

3.5.2.5.2 Transmitter VSWR Load - The transmitter shall provide specified power output with normal power amplifier loading when terminated in a 52 ohm nominal load with a voltage standing wave ratio (VSWR) not to exceed 1.3:1.

3.5.2.5.3 Transmitter VSWR Protection - The RF amplifier shall contain a reverse power sensor and control to provide VSWR protection. The sensor control setting range shall not exceed a reverse power level of 250 watts. The RF amplifier shall be inhibited when this reverse power setting is exceeded. The normal setting shall be 150 watts reflected power. The control circuit shall be inhibited during coupler "tune" operation.

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3.5.2.5.4 Automatic Tuning - All circuits requiring tuning shall be automatically tuned for operation at the carrier frequency which has been selected at the associated Radio Set Control unit. RF amplifier tuning shall be performed without RF drive power.

3.5.2.5.5 RF Inputs - Inputs over the range of 2.0 to 30.0 MHz required to drive the RF amplifier to full rated output shall not exceed 2.0 watts PEP.

3.5.2.5.6 SSB Spurious and Harmonic Radiation - The power of any harmonically related unwanted emission shall be at least 60 db below the rated output level, except the second harmonic emission which shall be at least 40 db below the rated output. The power of all other out of band spurious outputs shall be at least 80 db below the rated output.

3.5.2.5.7 SSB Intermodulation Distortion - All intermodulation distortion products shall be at least 40 db below the PEP output level of two equal test tones. Test tones shall be 1000 and 1700 Hz.

3.5.2.5.8 Hum and Noise Output - Hum, ripple, or other extraneous noise shall be at least 50 db below the PEP rated output level of two equal test tones.

3.5.2.5.9 SSB Carrier Suppression - The carrier shall be suppressed a minimum of 50 db below the PEP rated output level of two equal test tones.

3.5.2.5.10 Sidetone (All Modes) - The transmitter shall develop a sidetone audio signal which shall appear at the receiver output terminals. The sidetone shall be introduced into the receiver audio circuitry, during transmission, through a gating circuit that is actuated when the transmitter is producing power output. The maximum available sidetone output shall be adjustable between 50 milliwatts and 250 milliwatts under standard operating conditions.

3.5.2.5.11 Frequency Stability - The frequency stability and accuracy of the transmitter shall be as specified in 3.4.4.

3.5.2.5.12 AFSK Compatibility - The equipment shall be compatible with AFSK teletype signals provided by the associated equipment.

3.5.2.5.13 Unselected Sideband Rejection - The unselected sideband shall be suppressed at least 55 db below rated output.

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3.5.2.5.14 Peak Clipping USB (Voice, AME) - The peak clipper shall be adjustable over a range of 0 to 12 db. The 12 db clipping level shall be defined such that a 12 db increase in audio input shall not result in an increase in peak RF output of more than 4 db. Clipping shall be performed at IF and filtered to minimize distortion products. Normal setting shall be 6 to 8 db.

3.5.2.6 Controls - The RF Amplifier shall contain no operating controls.

3.5.2.7 Electrical Connections - Connections to external circuits shall be provided as follows:

<u>Reference Designation</u>	<u>Receptacle Type</u>	<u>Function</u>
ALJ2	(MIL-C-81511/01E16-55P1)	Control Signal J2
ALJ3	MS 3120E-16-8P	Power J3
ALJ1	TNC	RF Input Signal from RT
ALJ6	TNC	RF Signal to Receiver
ALJ5	N (MIL-C-71)	RF Input to Coupler, Input from Antenna
B2J1	MS-3116E-8-45	Blower Voltage
B3J1	MS-3116E-8-45	Blower Voltage

3.5.3 Radio Set Control - The Radio Set Control shall meet the following requirements:

3.5.3.1 Function - The Radio Set Control shall contain all necessary operator controls to select frequency, condition, mode, and to initiate the self-test function, and to provide voice gain control, squelch threshold and squelch disable. It shall also provide to the operator an indication of coupler readiness and fault, self-test go/no-go, and a transmitter "OFF" condition. It shall also provide a channel change pulse for the associated antenna coupler, when a frequency change of 10 KHz or greater has been initiated.

3.5.3.2 Form Factor - The Radio Set Control shall be enclosed in a case 3.62 inches deep, 5.75 inches wide, and 2.62 inches high. (Depth is measured from rear of panel).

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3.5.3.3 Weight - The weight of the Radio Set Control shall not exceed 1.5 pounds.

3.5.3.4 Contents - The Radio Set Control shall contain all necessary switching and circuitry to perform the functions described in 3.5.3.1.

3.5.3.5 Controls - The following controls shall be provided and shall be located on the front panel for operator adjustment:

- (a) CONDition Switch (Rotary) - shall select transceiver condition as follows: OFF, STBY, HI (power) and LO (power).
- (b) MODE Switch (Rotary) - shall select transceiver mode as follows: VO (voice), AME, DATA, DIV (diversity), and LSB.
- (c) Frequency Selectors (6 Digital Readout) - shall select radio set operating frequency in the range of 2.0000 MHz to 29.9999 MHz in 100 Hz steps.
- (d) VOL (Potentiometer) - shall permit adjustment of the receiver volume level (VOICE and AME modes).
- (e) SQ (Potentiometer) - shall permit adjustment of receiver squelch threshold (Voice and AME modes).
- (f) OFF (Squelch Pushbutton) - shall momentarily disable squelch.
- (g) SYS RESET (Pushbutton) - shall reset system fault indicator.
- (h) TEST - shall initiate self-test cycle and reset Power Amplifier overload - may be combined with (a).

3.5.3.6 Electrical Connections - Connections to external circuits shall be provided through MIL-C-81511/01E18-85P1 receptacle, reference Designation J1.

3.5.3.7 Mounting Panel - The Radio Set Control shall meet the applicable requirements of Specification MIL-C-6781 for Type I control panels. The integrally illuminated panel shall be in accordance with MIL-P-7788.

3.5.3.8 Indicators - The following indications shall be provided on the front panel for operator use:

- (a) Frequency Display (MHz) - Operates in conjunction with frequency selectors to indicate operating frequency of the radio set.
- (b) Mode Display - Operates in conjunction with Mode selector switch.
- (c) Condition Display - Operates in conjunction with Condition selector switch.
- (d) Sys Ready Light - Illuminates to indicate HF radio set has passed self-test.
- (e) Sys Fault Indicator - Magnetic latch indicator shifts from black to red to indicate the HF radio set has failed self-test.
- (f) Xmtr OFF Light - Illuminates to indicate power amplifier overheat, overload, failure of the bandswitch to home, pressure loss or in warm-up period. Transmitter cannot be keyed. Light blinks when set is channeling.
- (g) Cplr Ready Light - The light is operated by the coupler, however it is located on the radio set control for operator convenience. Illuminates to indicate that the antenna coupler is tuned and the system is ready to transmit. A ground of 0 to +1 volt at 50 milliamps DC shall illuminate the light.
- (h) Cplr. Fault Light - The light is operated by the coupler, however, it is located on the radio set control for operator convenience. Illuminates to indicate that the coupler is not tuned and the system is not ready to transmit. A ground of 0 to +1 volt at 50 milliamps DC shall illuminate the light.

B.5.3.9 Channel Change Signal - The radio set control shall provide a channel change pulse for the associated antenna coupler when a frequency change of 10 KHz or greater has been initiated. The channel change circuit shall generate a ground (0  $\pm$ 0.25V DC) at 60 milliamps maximum for a minimum of 80 milliseconds. It shall produce this ground for use at the low end of a 30 volt DC control circuit in the antenna coupler.

3.5.4 Electrical Equipment Shock Mount Base - The Mount Assembly shall be designed in accordance with MIL-M-81288, and shall meet the following requirements:

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3.5.4.1 Function - The Mount shall provide isolated mounting for the Receiver-Transmitter and the Radio Frequency Amplifier.

3.5.4.2 Form Factor - The Mount shall have an outline dimension of 19.29 inches long, 15.58 inches wide, and 2.87 inches high.

3.5.4.3 Weight - The weight of the Mount shall not exceed 6.5 pounds.

3.5.4.4 Contents - The Mount shall contain vibration and shock isolation means, applicable hold downs, and mounting guides for the Receiver-Transmitter and Radio Frequency Amplifier.

3.5.4.5 Controls - The Mount shall contain no controls.

3.5.4.6 Electrical Connections - There shall be no electrical connections to the Mount.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection - Unless otherwise specified, the supplier is responsible for the performance of all tests requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the tests set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Classification of Tests - Items covered by this specification shall be subjected to the following tests to determine compliance with all applicable requirements.

- (1) Preproduction (First Article) Tests
- (2) Initial Production Tests
- (3) Acceptance Tests
- (4) Life Tests

4.2 Preproduction (First Article) Tests - Preproduction tests shall be conducted by the contractor on an equipment representative of the production equipments to be supplied under the contract. Preproduction tests shall be accomplished under the approved test procedure of 4.6. The Government inspector and the procuring activity shall be advised when tests are to be conducted so that a Government representative may be designated to witness or supervise the tests when so desired. Contractors not having adequate facilities to conduct all required tests shall obtain the services of a commercial testing laboratory acceptable to the Government.

4.2.1 Preproduction (First Article) Test Data - The contractor shall submit all data collected in conducting these tests to the procuring activity for review.

4.2.2 Scope of Tests - Preproduction tests shall include all tests deemed necessary by the procuring activity to determine that the equipment meets all the requirements of this specification, other applicable specifications and the contract. Preproduction tests shall include environmental tests in accordance with the procedures of Specification MIL-T-5422.

4.2.3 Preproduction (First Article) Approval - Approval of the preproduction sample shall be by the procuring activity upon satisfactory completion of all tests. No production equipments shall be delivered prior to the approval of the preproduction sample. Prefabrication of production equipment prior to the approval of the preproduction sample is at the contractor's own risk. The approved preproduction sample shall be retained by the contractor for his use in the fabrication and testing of equipment to be submitted for acceptance. The preproduction sample shall not be considered as one of the equipments under the contract.

4.2.4 Production Equipments - Equipments supplied under the contract shall in all respects, including design, construction, workmanship, performance and quality, be equivalent to the approved preproduction sample. Each equipment shall be capable of successfully passing the same tests as imposed on the preproduction sample. Evidence of non-compliance with the above shall constitute cause for rejection and for equipment already accepted by the Government, it shall be the obligation of the contractor to make necessary corrections as approved by the procuring activity.

4.3 Initial Production Tests - One of the first ten production equipments shall be selected and sent at the contractor's expense to a designated Government laboratory for tests. This equipment shall be selected by the procuring activity after the equipment has successfully passed all individual tests. No other tests shall be conducted on the equipment prior to starting the Initial Production Tests. The preproduction sample shall not be selected for this test.

4.3.1 Scope of Tests - This equipment may be subjected to any and all tests the procuring activity deems necessary to assure that the production equipment is equivalent to the previously approved preproduction sample in design, construction, workmanship, performance, and quality and that it meets all applicable requirements.

4.3.2 Accessory Material - In addition to the complete equipment submitted for Initial Production Tests the contractor shall also submit as specified in the contract such accessory material and data necessary to test the equipment.

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4.3.3 Initial Production Sample Approval - Approval of the Initial Production Sample shall be by the procuring activity upon satisfactory completion of all tests. Any design, material or performance defect made evident during this test shall be corrected by the contractor to the satisfaction of the procuring activity. Failure of the Initial Production Sample to pass any of the tests shall be cause for deliveries of equipment under the contract to cease until proper corrective action is approved and accomplished. Corrective action shall also be accomplished on equipment previously accepted when requested by the procuring activity.

4.3.4 Reconditioning of Initial Production Test Sample - On completion of the initial production test the equipment shall be reworked by the contractor by replacing all wear or damaged items. After reworking, the contractor shall resubmit the equipment for acceptance.

4.4 Acceptance Tests - The contractor shall furnish all samples and shall be responsible for accomplishing the acceptance tests. All inspection and testing shall be under the supervision of the Government inspector. Contractors not having adequate facilities for conducting all required tests shall engage the service of a commercial testing laboratory acceptable to the procuring activity. The contractor shall furnish test reports showing quantitative results for all acceptance tests. Such reports shall be signed by an authorized representative of the contractor or laboratory, as applicable. Acceptance or approval of material during the course of manufacture shall not be construed as a guarantee of the acceptance of the finished product. Acceptance tests shall consist of the following:

- (1) Individual Tests
- (2) Sampling Tests
- (3) Reliability Assurance Tests
- (4) Special Tests

4.4.1 Individual Tests - Each equipment submitted for acceptance shall be subjected to the individual tests. These tests shall be adequate to determine compliance with the requirements of material, workmanship, operational adequacy and reliability. As a minimum, each equipment accepted shall have passed the following tests:

- (1) Examination of Product
- (2) Operational Test
- (3) Manufacturing Run-in Test

4.4.1.1 Examination of Product - Each equipment shall be examined carefully to determine that the material and workmanship requirements have been met.



4.4.1.2 Operational Test - Each equipment shall be operated long enough to permit the equipment temperature to stabilize and to check sufficient characteristics and record adequate data to assure satisfactory equipment operation.

4.4.1.3 Manufacturing Run-in Test - Each equipment shall be operated under the conditions specified herein for a period of 10 hours without failure. A failure shall be defined as anything which causes malfunctioning of the equipment. Only those adjustments will be permitted which can be made by using such controls and adjustments that are accessible to the operator during the normal use of the equipment. This test shall be deleted if the reliability test includes a test on each equipment which consumes at least 10 hours of operation.

Temperature	Ambient room
Humidity	Ambient room
Vibration	Any selected frequency within the range of 20 to 30 cps (excluding resonant points) and a minimum amplitude of $\pm 3$ g's

The equipment shall be vibrated (without vibration isolators) for a period of 10 minutes prior to the beginning of the 10 hour period of operation. Where feasible, the equipment shall be operated during this vibration period for the purpose of detecting flaws and imperfect workmanship. Operation within the specified limits of satisfactory performance is not necessarily required during the vibration period. The direction of vibration shall be vertical to the normal mounting plane for 5 minutes and lateral to the plane for 5 minutes. Where it is not feasible to vibrate the equipment in 2 directions the vertical direction shall be used. During the 10 hour period of operation following the 10 minute vibration period, the equipment shall be mechanically cycled periodically through its various phases of operation. Should a failure occur, it should be repaired and the test started over, except that the 10 minute vibration period need not be repeated when it is certain the failure was not a result of the vibration. Should repetitive failures occur, corrective action shall be taken to eliminate this defect from future equipment. A record shall be kept of all failures. The 10 hour period specified above may be composed of two 5 hour periods to conform with standard working hours.

4.4.2 Sampling Tests - Equipments selected for sampling tests shall first have passed the individual tests. Equipment shall be selected for sampling tests by the Government inspector in accordance with the following:

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## 4.4.2 (Continued)

<u>Quantity of Equipments Offered for Acceptance</u>	<u>Quantity to be Selected for Sampling Test</u>
First 10	1#
Next 50	1
Next 75	1
Next 100	1
	1 for each additional 200 or fraction thereof

# One out of first ten need not be selected and tested if initial production tests are conducted.

Sampling Tests are not required when Reliability Assurance Tests are conducted.

4.4.2.1 Scope of Tests - As a minimum, each equipment selected for sampling tests shall be subjected to the following tests:

- (1) Complete operational test at ambient room conditions, making all necessary measurements to assure that all applicable specification requirements have been met.
- (2) Operational test at certain environmental conditions. The conditions may vary for each equipment tested and should be based on results of the preproduction, initial production, individual and special tests.
- (3) Manufacturing run in test specified in 4.4.1.3 except that the test duration shall be 120 hours with no restriction on the number of failures. However, each failure shall be analyzed as to cause and remedial action necessary to reduce the possibility of its recurrence in future equipment.

4.4.3 Reliability Assurance Tests - Reliability Assurance Tests shall be conducted using MIL-STD-781. Tests as required by both the Qualification Phase and the Production Acceptance (Sampling) Phase shall be conducted. Classification of failure shall be in accordance with MIL-STD-781 and AR-34.

4.4.3.1 Qualification Phase - Prior to the acceptance of equipments under the contract or order, a minimum of three (3) equipments shall be tested as outlined in MIL-STD-781, under the section entitled "Qualification Phase of Production Reliability Tests". The maximum number of equipments to be used shall be those listed in Table 5 of MIL-STD-781. For Qualification Phase, Test Level E shall be used. The Accept-Reject Criteria for Test Plan VI shall be used.

4.4.3.2 Reliability Production Acceptance Phase Tests - The equipment throughout production shall be tested as outlined in MIL-STD-781 (as modified herein), under the Section entitled "Production Acceptance (Sampling) Phase of Production Reliability Tests", Test Level E of MIL-STD-781 shall be used.

4.4.3.2.1 All Equipment Test - Each equipment produced shall be tested for 50 hours. Prior to the 50 hour test on each equipment, a burn-in period may be used at the option of the contractor. If the burn-in period is to be used the details thereof must be included in the approved test procedures. To determine whether the MTBF is being met at any time during the contract the operating test hours and the failures thereon (not counting burn-in failures or burn-in operating time) shall be totalled and the results compared with the reject line of Test Plan II of MIL-STD-781. (Extend the line as necessary to accommodate the data.) These totals shall accumulate so that at any one time the experience from the beginning of the contract is included. At the conclusion of each month the test results shall be sent to the procuring activity and to the Naval Air Systems Command, Attention: Avionics Division. At any time that the current totals of test hours and test failures plotted on Test Plan II curves show a reject situation, the procuring activity shall be notified. The procuring activity reserves the right to stop the acceptance of equipment at any time that a reject situation exists pending a review of the contractor's efforts to improve the equipment, the equipment parts, the equipment workmanship, etc., so that the entire compilation will show other than a reject decision.

4.4.3.3 Test Details - The test details such as the length of the test cycle, the length of the heat portion of the cycle, the performance characteristics to be measured, special failure criteria, preventive maintenance to be allowed during the test, etc., shall be part of the test procedures to be submitted and approved by the procuring activity prior to the beginning of the Qualification Test Phase of the Reliability Assurance Tests.

4.4.4 Special Tests - Special tests shall be conducted for the purpose of checking the effect of any design or material change on the performance of the equipment and to assure adequate quality control. The equipment selected for special tests may be selected from equipments previously subjected to the sampling or reliability assurance tests.

4.4.4.1 Special Test Schedule - Selection of equipments for special tests shall be made as follows:

- (1) On an early equipment after an engineering or material change.
- (2) Whenever failure reports or other information indicate that additional tests are required. (This will be determined by the procuring activity.)

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4.4.4.2 Scope of Tests - Special tests shall consist of such tests as approved by the procuring activity. Test procedures previously approved for the preproduction tests shall be used where applicable. When not applicable, the contractor shall prepare a test procedure and submit it to the procuring activity for approval prior to conducting the tests.

4.4.5 Equipment Failure - Should a failure occur during either the sampling, reliability assurance or special tests, the following action shall be taken:

- (1) Determine the cause of failure.
- (2) Determine if the failure is an isolated case or design defect.
- (3) Submit to the procuring activity for approval, proposed corrective action intended to reduce the possibility of the same failure(s) occurring in future tests.
- (4) Where practical, include a test in the individual test to check all equipment for this requirement until reasonable assurance is obtained that the defect has been satisfactorily corrected.

4.5 Life Test - The contractor shall furnish all samples and shall be responsible for accomplishing the life tests. The test shall be of 300 hours duration and shall be conducted on equipments that have passed the individual test. The life test shall be performed under the conditions specified in 4.5.1. The life test sample shall be selected by the Government inspector in accordance with the following. (Equipments which have successfully passed the initial Production Test, Sampling Tests, Reliability Tests, or Special Tests may be selected for life tests. (Test life accumulated during the Reliability Test may be counted toward the Life Test, provided the entire 300 hours are accumulated on a single equipment, and equipment selected is in accordance with the table below):

<u>Quantity of Equipments Offered for Acceptance</u>	<u>Quantity to be Selected for Life Test</u>
First 25	1
Next 175	1
Next 300	1
	1 for each additional 500 or fraction thereof

4.5.1 Test Condition - The life test shall be conducted under the following simulated service conditions:

## 4.5.1 (Continued)

Temperature	Normal room
Altitude	Normal ground (0-5000 ft.)
Humidity	Room ambient
A. C. Voltage	115 $\pm$ 5 volts (at lowest applicable frequency)
D. C. Voltage	27.5 $\pm$ 2.0 volts

4.5.2 Test Periods - The test may be run continuously or intermittently. Any period of operation shall be of sufficient duration to permit the equipment temperature to stabilize. Periodically, the equipment shall be turned on and off several times and put through its various phases of operation.

4.5.3 Performance Check - At approximately 8 hour intervals during the test, a limited performance check shall be made. The performance check proposed by the contractor shall be subject to approval by the procuring activity.

4.5.4 Test Data - The contractor shall keep a daily record of the performance of the equipment, making particular note of any deficiencies or failures. In the event of part failures, the defective part shall be replaced and the operation resumed for the balance of the test period. A record shall be kept of all failures throughout the test. This record shall indicate the following:

- (1) Part type number
- (2) The circuit reference symbol number
- (3) The part function
- (4) Name of the manufacturer
- (5) Nature of the failure
- (6) The number of hours which the part operated prior to failure.

4.5.4.1 Failure Report - In the event of a failure, the Government inspector shall be notified immediately. A report shall be submitted to the procuring activity upon completion of test. In this report, the contractor shall propose suitable and adequate design or material corrections for all failures which occurred. The procuring activity will review such proposals and determine whether they are acceptable.

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4.6 Test Procedures - The procedures used for conducting preproduction tests, acceptance tests and life tests shall be prepared by the contractor and submitted to the procuring activity for review and approval. The right is reserved by the procuring activity or the Government inspector to modify the tests or require any additional tests deemed necessary to determine compliance with the requirements of this specification or the contract. Specification MIL-T-18303 shall be used as a guide for preparation of test procedures. When approved test procedures are available from previous contracts, such procedures will be provided and may be used when their use is approved by the procuring activity. However, the right is reserved by the procuring activity to require modification of such procedures, including additional tests, when deemed necessary.

4.7 Reconditioning of Tested Equipment - Equipment which has been subjected to initial production acceptance and life tests shall be reconditioned by the contractor by replacing all wear or damaged items. After reworking the contractor shall submit the equipment for acceptance.

4.8 Presubmission Testing - No item, part or complete equipment shall be submitted by the contractor until it has been previously tested and inspected by the contractor and found to comply, to the best of his knowledge and belief, with all applicable requirements.

4.9 Rejection and Retest - Equipment which has been rejected may be reworked or have parts replaced to correct the defects and resubmitted for acceptance. Before resubmitting, full particulars concerning previous rejection and the action taken to correct the defects found in the original shall be furnished the Government inspector.

## 5. PREPARATION FOR DELIVERY

5.1 General - All major units and parts of the equipment shall be preserved, packaged and marked for the level of shipment specified in the contract or order in accordance with Specifications MIL-E-17555 and MIL-STD-794. In the event the equipment is not covered in Specification MIL-E-17555, the method of preservation for Level A. shall be determined in accordance with the selection chart in Appendix D of MIL-STD-794.

## 6. NOTES

6.1 Intended Use - See Paragraph 3.4.1.

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6.2 Ordering Data - Purchasers should exercise any desired options offered herein, and procurement documents should specify the following:

- (1) Title, number and date of this specification.
- (2) Selection of applicable levels of packaging and packing (See 5.1).

6.3 Precedence of Documents - When the requirements of the contract, this specification, or applicable subsidiary specifications are in conflict, the following precedence shall apply:

- (1) Contract - The contract shall have precedence over any specification.
- (2) This Specification - This specification shall have precedence over all applicable subsidiary specifications. Any deviation from this specification, or form subsidiary specification where applicable, shall be specifically approved in writing by the procuring activity.
- (3) Reference Specifications - Any referenced specification shall have precedence over all applicable subsidiary specifications referenced therein. All referenced specifications shall apply to the extent specified.

6.4 Performance Objectives - Minimum size and weight, simplicity of operation, ease of maintenance, and an improvement in the performance and reliability of the specific functions beyond the requirements of this specification are objectives which shall be considered in the production of this equipment. Where it appears a substantial reduction in size and weight or improvement in simplicity of design, performance, ease of maintenance or reliability will result from the use of materials, parts and processes other than those specified in Specification MIL-E-5400, it is desired their use be investigated. When investigation shows advantages can be realized, a request for approval shall be submitted to the procuring activity for consideration. Each request shall be accompanied by complete supporting information.

6.5 Type Designations - The type designation may be modified by the procuring activity upon application by the contractor for assignment of nomenclature in accordance with 3.3.8. The correct type number shall be used on nameplates, shipping records and instruction books, as applicable.

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6.6 Revisions - In specification revisions and superseding amendments an asterisk "\*" preceding a paragraph number denotes paragraphs in which changes have been made from the previous issue. This has been done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content as written, irrespective of the asterisk notations and relationship to the last previous issue.

6.7 Associated Equipment - The Radio Set shall operate with the following associated equipment to the extent specified herein:

- (1) Communications System Selector and Switching Matrix (A-345 and A-346)
- (2) Data Terminal Set AN/ACQ-5
- (3) ICS (AIC-22)
- (4) Antenna Coupler, CU-1809/ARC
- (5) Teletype, TT-568/AGC-6
- (6) High-Speed Printer TT-567/AGC-6
- (7) Signal Data Converter (TTY) CV-1053

6.8 This specification is under the cognizance of AIR-53342B2.

6.9 Data Terminal Set Functional Interface - The following functions shall be provided at the interface between the Radio Set (HF) and the Data Terminal Set (DT). Function source and destination shall be as follows:

<u>FUNCTION</u>	<u>SOURCE</u>	<u>DESTINATION</u>	<u>NOTES</u>
Received audio derived from upper sideband	HF	DT	Shielded twisted pair +10 dbm, 600 ohm load impedance, receiver output center-tapped ungrounded transformer
Received audio derived from lower sideband	HF	DT	Shielded twisted pair +10 dbm, 600 ohm load impedance, receiver output center-tapped, ungrounded transformer



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## 6.9 (Continued)

<u>FUNCTION</u>	<u>SOURCE</u>	<u>DESTINATION</u>	<u>NOTES</u>
Transmit audio (upper sideband)	DT	HF	Shielded twisted pair 0 dbm $\pm$ 1 db Transmitter input, center-tapped, ungrounded, transformer
Transmit audio (lower sideband)	DT	HF	Shielded twisted pair 0 dbm $\pm$ 1 db Transmitter input, center-tapped, ungrounded, transformer
Transmit/receive switching	DT	HF	Transmit = 0 + 0.25 VDC, 10 ma. Receive = 5 $\pm$ 0.5 VDC
End-of-Message	DT	HF	Message present 0 + 0.1 VDC, 20 ma No message present +5 $\pm$ 0.5 VDC

6.10 Antenna Coupler Functional Interface - The following functions shall be provided at the interface between the HF Radio Set (HF) and the Antenna Coupler (C). Function source and destination shall be as follows:

<u>FUNCTION</u>	<u>SOURCE</u>	<u>DESTINATION</u>	<u>NOTES</u>
RF Signal	HF	C	1000 or 400 Watts RF
Coupler ON/OFF	HF	C	+28 VDC Ground Return
Band Ident.	HF	C	(2 - 2.99 MHz) Gnd, 100 ma
Band Ident.	HF	C	(3.0 - 3.99 MHz) Gnd, 100 ma
Coupler Tune	C	HF	0 + 0.25 VDC, 10 ma.
Gnd. Return	HF/C	HF/C	0.5 Amp
Keyline Interlock	C	HF	0 + 0.25 VDC, 10 ma.
Keyline	C	HF	0 $\pm$ 0.25 VDC, 10 ma.
Power - Lo (400W)	HF	C	GND, 100 ma.
Rechannel Pulse	HF	C	80 ms minimum, 0 $\pm$ .25 VDC, 60 ma
Coupler Ready	C	HF	0.5 + 0.5 VDC, 50 ma
Coupler Fault	C	HF	0.5 $\pm$ 0.5 VDC, 50 ma

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SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004	
<b>INSTRUCTIONS</b>			
This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).			
SPECIFICATION MIL-R-81627(AS) RADIO SET AN/ARC-142			
ORGANIZATION (Of submitter)		CITY AND STATE	
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$	
MATERIAL PROCURED UNDER A			
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT			
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?			
A. GIVE PARAGRAPH NUMBER AND WORDING.			
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.			
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID			
3. IS THE SPECIFICATION RESTRICTIVE?			
<input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES", IN WHAT WAY?			
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)			
SUBMITTED BY (Printed or typed name and activity)		DATE	