# MILITARY SPECIFICATION

## RECEIVER-TRANSMITTER, RADIO RT-1250A/ARC

This specification is approved for use by the Naval Air Systems Command, Department of the Navy and is available for use by all departments and agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope. This specification establishes the design, performance, and acceptance requirements for Radio RT-1250A/ARC Receiver-Transmitter hereinafter referred to as receiver-transmitter. The receiver-transmitter is capable of providing simplex two-way communication of normal and secure voice amplitude modulated (AM) or frequency modulated (FM) signals. The receiver-transmitter is remote controlled with the primary control function being handled via a MIL-STD-1553B Time Division Multiplex Bus and secondary control via a slow serial data bus.

## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specification and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Engineering Center, Systems Engineering and Standardization Department (SESD) Code 93, Lakehurst,NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

SPECIFICATIONS

Military

| | |
|---|---|
| MIL-B-5087 | Bonding, Electrical, and Lightning Protection, for Aerospace Systems |
| MIL-W-5088 | Wiring; Aerospace Vehicle |
| MIL-E-5400 | Electronic Equipment, Airborne, General Specification for |
| MIL-T-5422 | Testing, Environmental, Aircraft Electronic Equipment |
| MIL-A-8625 | Anodic Coatings for Aluminum and Aluminum Alloys |
| MIL-T-18303 | Test Procedures; Preproduction, Acceptance and Life for Aircraft Electronic Equipment, Format for |
| MIL-N-18307 | Nomenclature and Identification for Electronic, Aeronautical, and Aeronautical Support Equipment Including Ground Support Equipment |
| MIL-S-25879 | Switch, Coaxial, Radio Frequency Transmission Fine |
| MIL-M-38510 | Microcircuits General Specification for |
| MIL-C-38999 | Connectors, Electrical, Circular, Miniature, High Density, Quick Disconnect, Environmental Resistant, Removable Crimp Contacts; General Specification for |
| MIL-H-46855 | Human Engineering Requirements for Military Systems, Equipment and Facilities |
| MIL-G-81665 | Generator-Transmitter Group AN/ASA-76 |
| MIL-C-85666 | Equipment Specification, Radio Control Units C-10319A/ARC, C-10776A/ARC, and C-11131/ARC |

STANDARDS

Federal

| | |
|---|---|
| FED-STD-595 | Colors |
| QQ-P-416 | Plating |

Military

| | |
|---|---|
| MIL-STD-129 | Marking for Shipment and Storage |
| MIL-STD-415 | Test Provisions for Electronic Systems and Associated Equipment, Design Criteria for |
| MIL-STD-454 | Electronic Equipments, General Requirements for |
| MIL-STD-461A with Notice 3 | Electromagnetic Interference Characteristics, Requirements for Equipment |
| MIL-STD-462 and Notice 2 | Electromagnetic Interference Characteristics, Measurement of |
| MIL-STD-471 | Maintainability Demonstration |
| MIL-STD-704 | Aircraft, Electric Power Characteristics |
| MIL-STD-781 | Reliability Tests; Exponential Distribution |
| MIL-STD-785 | Reliability Program for Systems and Equipment Development and Production |
| MIL-STD-810 | Environmental Test Methods |
| MIL-STD-883 | Test Methods and Procedures for Microelectronics |
| MIL-STD-965 | Parts Control Program |
| MIL-STD-1472 | Human Engineering Design Criteria for Military Systems, Equipment, and Facilities |
| MIL-STD-1553B | Aircraft Internal Time Division Command/Response Multiplex Data Bus |
| MIL-STD-1562 | Lists of Standard Microcircuits |
| MIL-STD-2074 | Failure Classification for Reliability Testing |
| MIL-STD-2076 | Unit Under Test Compatibility with Automatic Test Equipment, General Requirements for |
| MIL-STD-2084 | Maintainability of Avionics and Electronic Systems and Equipment, General Requirements for |

2.1.2 Other Government documents, and publications. The following Government documents, and publications form a part of this specification to the extent specified herein.

National Security Agency

| | |
|---|---|
| CSEEB-13 | TSEC/KY-28 Speech Security Equipment Engineering Bulletin |

| | |
|---|---|
| CSEEB-14 | Communications Security Equipment System Document for TSEC/KY-57/58 |
| CSEEB-32 | TSEC/KY-57/58 Communications Security Equipment Engineering Bulletin |

NAVAIRSYSCOM Drawing

| | |
|---|---|
| 1533AS118 | Equipment Specification, C-10319()/ARC-182, HAVE QUICK Radio Set Control |

(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.1.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

## 3. REQUIREMENTS

3.1 Item description. The receiver-transmitter shall be capable of providing simplex two-way communication of normal and secure voice amplitude modulated (AM) or frequency modulated (FM) signals in 25 Kilohertz (KHz) increments within RF bands: 30.000 MHz through 87.975 MHz (FM), 118.000 MHz through 155.975 MHz (AM), 156.000 MHz through 173.975 MHz (FM) and 225.000 through 399.975 MHz (AM and FM). The receiver-transmitter shall provide a receive only mode of operation of normal and secure voice from 108.000 MHz through 117.975 MHz (AM). The receiver-transmitter shall be remote controlled with the primary control function being handled via a MIL-STD-1553B Time Division Multiplex Bus and secondary control via a slow serial data bus.

3.2 First article. A sample shall be subjected to first article inspection (see 4.4 and 6.3).

3.3 Parts and materials. In the selection of parts and materials, the prime considerations are fulfillment of performance requirements, logistics supportability and reliability assurance in a cost effective design. The following shall govern in parts and material selection.

a. Subassemblies shall be designed and fabricated to be repairable. Maximum economic standardization of parts and materials shall be exercised. Parts selection shall be made in the following order of precedence:

(1) Military Standard parts shall be selected in accordance with MIL-STD-454.

(2) Nonstandard parts previously qualified for other programs.

(3) Nonstandard parts.

b. Nonstandard parts and nonestablished reliability military standard parts shall be screened to the requirements of the most similiar military standard or standard nonestablished reliability part. Integrated circuits and hybrids shall use MIL-STD-883, Method 5004, Class B, as a basis for tailored screens.

3.3.1 Component rescreening. The contractor shall conduct 100 percent incoming inspection of all active components. Functional and parametric checks of active components will be performed at the components rated temperature extremes and at ambient. Components which are not compliant with their specification shall not be used in the ARC-182.

3.3.2 Parts derating and application. All parts used shall be applied well within their ratings. The derating shall encompass the appropriate and meaningful application conditions such as voltage, current, power, temperature, mechanical, and duty cycle. Electronic and electromechanical parts shall conform to Table I electronic parts derating for worst case electrical and environmental stress unless formal written approval is received from the procuring activity prior to incorporation into the design. Part level stress analysis shall be used to verify that all parameter stresses are within the derated values at worst case circuit and environmental conditions. The following limitations on parts usage shall apply:

a. Prohibited application

(1) Non-hermetically sealed semiconductors except power transistors
(2) Photo couplers (photo transistors)
(3) Hot carrier (Schottky) rectifiers
(4) Microcircuit sockets
(5) Non-hermetically sealed wet tantalum capacitors

3.3.3 Parts control and standardization program. The contractor shall establish and maintain a parts control and standardization program in accordance with the requirements of MIL-STD-965, Procedure I and as specified herein. The program shall control part standardization and the criteria for the selection, application, and testing of parts to achieve the reliability required. As a minimum, a parts program equivalent to that specified herein shall be required of subcontractors and suppliers.

3.3.4 Non-standard parts and material approval. The contractor shall obtain procuring activity approval of all non-standard parts used in the equipment. Standard parts are defined in MIL-E-5400. In addition to the MIL-E-5400 requirements for standard parts, microelectronic parts are standard only if:

a. The device is listed in MIL-STD-1562, and

b. Sources (at least two) are listed on the Qualified Parts List (QPL), and

c. The part is procured from one of the qualified sources, and

d. Quality level "B" (or better) of MIL-M-38510 is required.

TABLE I. Electronic parts derating.

| Part Type | Parameter | Maximum Allowable Application Stress |
|---|---|---|
| Capacitor | Applied Voltage (Ripple Voltage for Tantalum) | 50% of rating Note 1/ |
| Resistors | Power<br>Voltage | 50% of rating<br>70% of rating |
| Diodes | Power<br>Current<br>Voltage<br>Junction Temperature | 50% of rating<br>75% of rating<br>60% of rating<br>Note 2/ |
| Transistors | Power<br>Voltage<br>Junction Temperature | 55% of rating<br>60% of rating<br>Note 2/ |
| Integrated Circuits | | |
| Digital | Fan-Out, Fan-In<br>Junction Temperature | 80% of rating<br>Note 2/ |
| Linear | Power<br>Junction Temperature | 75% of rating<br>Note 2/ |
| Transformers, Inductive Devices | Parts shall be used at a winding temperature of at least 30 degrees below rated temperature. In addition, the maximum voltage between windings or between a winding and a shield shall be not greater than 60% of rated voltage for the steady state conditions and 90% of rated voltage with transients. General purpose inductors, audio and power transformers shall be applied at no more than 70% of rated current. | |

1/ For solid tantalum and all electrolytic capacitors, the maximum applied voltage shall be not greater than 70 percent of the vendor rated value. "Applied voltage" is the sum of the applied peak ripple voltage and the applied DC voltage.

2/ Semiconductor devices shall be mounted and operated in such manner to insure worst-case junction temperature does not exceed 110 degrees C at +71 degrees C ambient temperature. Any deviation requires procuring activity approval. Power semiconductor devices, on a very selective basis, may be mounted and/or operated with worst case junction temperatures not to exceed 150 degrees C at +71 degrees C ambient temperatures.

The approval procedure shall be in accordance with MIL-E-5400 and MIL-STD-965, Procedure I. In addition to the requirements of MIL-E-5400, approval of non-standard parts will be based on:

a. Suitability for the application

b. Conformance to this specification and to MIL-E-5400

c. Interchangeability

d. Screening (burn-in) method

3.3.5 Samples of non-standard parts and materials. Samples of non-standard parts and materials are not required unless specified in the contract. Where non-standard parts or materials samples are specified in the contract, the sample shall be in accordance with MIL-E-5400 (see 6.2.1).

3.3.6 Cabling and connections.

3.3.6.1 Cables and connectors. The receiver-transmitter shall provide for the use of cables and connectors in accordance with MIL-E-5400. The design of the connectors shall be such that improper assembly, mating or installation is impossible. Non-RF connectors shall meet the requirements of MIL-C-38999. All external connectors shall be scoop-proof, have cadmium plating finish in accordance with QQ-P-416 (over a suitable underplating) to withstand a 500 hour salt test, and provide 360 degrees circumferential grounding techniques for grounding prior to contact engagement.

3.3.6.2 Interconnection cabling. The receiver-transmitter shall be capable of required operation using external wiring in accordance with the applicable requirements of 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 provide 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 receiver-transmitter.

3.3.7 Interchangeability. Physical and functional interchangeability shall exist for all units and replaceable assemblies, subassemblies, and parts of the receiver-transmitter in accordance with MIL-E-5400. The receiver-transmitter shall be constructed to preclude the requirement for any adjustment when replacing an item by another item of the same type designation. Provision shall be made for adjustment of sidetone level, microphone input sensitivity, and squelch thresholds on the main and guard receiver.

3.4 Design and construction. The receiver-transmitter shall conform with all the applicable requirements of MIL-E-5400 for design, construction, and workmanship except as otherwise specified herein. In any case, it is a condition of final acceptance that the receiver-transmitter shall meet all the performance requirements of this specification.

3.4.1 Reliability. Unless otherwise specified in the contract or purchase order, the contractor shall establish a reliability program conforming to MIL-STD-785 (see 6.2.1). Task 104 of MIL-STD-785 shall be

implemented to establish and maintain a closed-loop failure reporting system. This system will identify failure trends and patterns at all levels of assembly prior to acceptance of the hardware and will also identify failure trends related to field failures throughout the contract period. The contractor shall develop and implement corrective action for significant failure trends. The reliability program shall include provisions for assuring the reliability of the receiver-transmitter or any portion of the equipment when supplied for use as spare or repair part.

3.4.1.1 Operational stability. The receiver-transmitter shall operate with specified performance for at least the specified mean (operating) time between failures without the necessity for readjustment of any controls which are inaccessible to the operator during normal use.

3.4.1.2 Operating life. The receiver-transmitter shall have a total operating life of 20,000 hours with minimal servicing and replacement of parts. Parts requiring scheduled replacement shall be specified by the contractor.

3.4.1.3 Reliability in MTBF (mean time between failure). The receiver-transmitter, including, any built-in-test (BIT) provisions, shall have a specified mean (operating) time between failures, upper test MTBF ($\theta_0$) of 1000 hours (as specified in MIL-STD-781), and a lower test MTBF ($\theta_1$) of 500 hours when tested and accepted as specified under the requirements of 4.4.6 and 4.5.4.

3.4.2 Maintainability. Maintainability (built-in test features, construction and packaging, provision for test points and other maintainability parameters) shall be as specified in MIL-STD-2084. The encapsulation requirements of MIL-STD-2084 shall not be required for the three voltage controlled oscillators (VCO), the temperature compensated crystal oscillator (TCXO), the two loop filters, the power amplifier, and the preamplifier assemblies. The fault detection percentage requirement of MIL-STD-2084 shall be 95 percent minimum for the critical path circuitry.

3.4.2.1 Compatibility with ATE. The receiver-transmitter shall be compatible with Automatic Test Equipment (ATE) for WRA testing and fault isolation to a faulty SRA in accordance with MIL-STD-2076.

3.4.2.2 Maintainability design. All electrical/electronic circuits and parts shall be packaged on replaceable and repairable, plug-in modules. Circuit breakers, indicators, and other items which may logically be bolted and soldered, or otherwise more rigidly electrically and mechanically fastened to the receiver-transmitter housing shall not be considered modules. SRAs (Shop Replacement Assemblies) shall be QRAs (Quick Replaceable Assemblies) as specified in MIL-STD-2076. SRA arrangement shall be such that access to any SRA does not require the removal of adjacent SRAs or parts other than access panels. The use of a special tool or tools shall not be required for SRA removal. Fuses may be used in lieu of circuit breakers.

3.4.2.2.1 Keying. Connectors shall be keyed to prevent the insertion of a connector or subassembly into an improper location within or on the receiver-transmitter. All connectors shall be legibly marked with reference designations.

3.4.2.2.2 Access panels. Access panels shall be retained by fasteners suitable to the procuring agency.

3.4.2.2.3 Service access. Fasteners required to be loosened for removal of the WRA shall be held by retaining devices suitable to the procuring agency.

3.4.2.2.4 Adjustments. No adjustment or alignment shall be required at the organizational level. Adjustment or alignment if required at a higher maintenance level (e.g., intermediate or depot), shall not require the removal of the part to be adjusted or aligned, or of the hardware element to which it is attached.

3.4.2.2.5 Test points. All test points shall be in accordance with MIL-STD-2084 and MIL-STD-415 to accommodate approved test equipment. MIL-STD-2084 takes precedence over MIL-STD-415 requirements. The sub-SRA test points and related connector requirements of MIL-STD-2084 are waived where prohibited by space or circuit performance considerations. Conformal coating may be applied to PC pads used as test points. The sub-SRA test points and related connector requirements philosophy shall be reflected in appropriate maintenance data. Injection test points in the BIT circuits are not required.

3.4.2.2.5.1 Module test points. Module test points shall be accessible while power remains applied to the modules. Test points shall become accessible with minimum removal of protective covers or enclosures.

3.4.2.2.5.2 Test points utilized at intermediate/depot level. Test points shall be provided for verification of faulty equipments and isolation of faulty modules at the intermediate level and repair of equipments and modules at the depot level. Injection test points in the Built-In-Test circuits shall not be required.

3.4.2.2.5.2.1 Power supply test points. Accessible, individual test points shall be provided on the receiver-transmitter to measure the power supply voltages. The power supply test points and related connector requirements philosophy shall be reflected in appropriate maintenance data.

3.4.2.2.6 Organizational level maintainability. The receiver-transmitter shall provide the operator or organizational maintenance technician, while airborne or on the ground with performance/readiness test and fault (GO/NO-GO) indication.

3.4.2.2.6.1 Performance/readiness test requirements. BIT provisions shall be incorporated in the receiver-transmitter to provide a GO/NO-GO indication of receiver-transmitter readiness. These provisions may be in conjunction with, but not necessarily as part of, the fault isolation features. The operation of the performance/readiness test provision shall be both a manually energized or continuous test mode of operation. RF radiation is not permitted during performance readiness tests. Normal equipment

performance may be interrupted during the manually initiated BIT sequence and, if necessary, switches may be used in series paths for purposes of introducing BIT stimuli or measuring equipment performance. Self-test of the BIT is not required.

3.4.2.2.6.2 Fault isolation. In conjunction with, but not necessarily as part of, the performance/readiness test features, there shall be features incorporated which provide fault isolation to the SRA.

3.4.2.2.6.3 MTTR (mean time to repair). For organizational maintenance, the MTTR shall be not greater than 15 minutes to remove and replace and verify operation of the replaced equipment. The receiver-transmitter design shall be such that no ancillary test equipment is required for organizational level maintenance.

3.4.2.2.7 Intermediate level maintainability. Intermediate level maintenance may be performed with the assistance of separate test equipment to isolate a fault to the SRA level. The MTTR to isolate the fault to a SRA, replace the SRA, and return to full performance at the intermediate level maintenance shall be not greater than 20 minutes.

3.4.3 Transportability. The receiver-transmitter shall be transportable by air, rail, truck and ship when packaged as specified in Section 5.

3.4.4 Standard conditions. The following conditions shall be used to establish normal performance characteristics under standard conditions and for making laboratory bench tests, except that required field tests may be conducted under outside ambient conditions:

| | | |
|---|---|---|
| a. | Temperature | Room ambient |
| b. | Altitude | Normal ground |
| c. | Vibration | None |
| d. | Humidity | Room ambient up to 90 percent relative humidity |
| e. | Input power voltage | 28 ± 0.5 VDC |

3.4.4.1 Service conditions. The receiver-transmitter shall operate as required under any of the environmental service conditions or combination of these conditions as specified in MIL-E-5400 for Class 2 equipment, except as modified herein.

3.4.4.1.1 Sinusoidal vibration. The receiver-transmitter shall operate as required when subjected to sinusoidal vibration in accordance with test procedures of MIL-T-5422 to the requirements of MIL-E-5400, Curve IVA, with isolators, equipment designed for operation with isolators, but with isolators removed, shall operate as required when mounted on the MT-4934/ARC and subjected to MIL-E-5400 Curve IIIB vibration requirements.

3.4.4.1.2 Random vibration. The receiver-transmitter shall operate as required when subjected to the random vibration requirements specified in 4.4.5.

3.4.4.1.3 Thermal conditions. The receiver-transmitter shall operate as required under the thermal conditions specified by MIL-E-5400, Class 2, without the requirement for auxiliary cooling.

3.4.4.1.4 Temperature shock. The receiver-transmitter shall meet the temperature shock requirements of MIL-STD-810.

3.4.4.2 Warm-up time. The time required for the receiver-transmitter to warm up prior to operation shall be kept to a minimum and shall be not greater than 10 seconds at standard conditions. Under service conditions, the warm-up time shall be not greater than 20 seconds.

3.4.4.3 Electromagnetic interference (EMI). The receiver-transmitter shall comply with MIL-STD-461A with Notice 3 for Class I equipment except as modified in Tables II, III, and herein. These requirements shall be met under all combinations of operating modes and frequencies of the receiver-transmitter.

3.4.4.3.1 Conducted and radiated emissions limits. The conducted and radiated emissions of the receiver-transmitter shall comply with the limits of the following requirements of MIL-STD-461A:

a. CE01

b. CE02

c. CE03

d. CE04

e. CE06

f. RE01

g. RE02

3.4.4.3.2 Conducted and radiated susceptibility limits. The receiver-transmitter shall comply with conducted and radiated susceptibility limits of the following requirements of MIL-STD-461A:

a. CS01

b. CS02

c. CS03 (upper test frequency limit of 1.5 GHz)

d. CS04 (upper test frequency limit of 4 GHz)

e. CS05

TABLE II. Exceptions to MIL-STD-461

| | |
|---|---|
| CE03/04 | Conducted Emissions, 20 KHz to 50 MHz<br><br>Up to 6 dB above spec. Limit at frequencies between 2 MHz and 6 MHz for narrowband emissions. |
| CE06 | Conducted Emissions, Antenna, 10 KHz to 12.4 GHz<br><br>Transmit: No exceptions<br><br>Receive: First injection frequencies and harmonics up to 10 dB above limit.<br><br>Second injection harmonics up to 10 dB above limit. |
| RE02 | Radiated Emissions, 14 KHz to 10 GHz<br><br>Transmit: Transmit frequency up to 35 dB above limit. Harmonics of transmit frequency up to 15 dB above limit.<br><br>Receive: No exceptions. |
| CS02 | This requirement shall apply to all neutrals and grounds whether or not they are internally returned to chassis. |
| CS04 | Conducted Susceptibility, Receiver Spurious<br><br>VHF Bands: Up to 15 dB below limit at UHF frequency associated with VHF channel frequency. Up to 20 dB below limit for frequencies outside of 30 to 400 MHz band. Up to 15 dB below spec. Limit for 1/2 frequency in low VHF-FM band (i.e., Fo = 60 MHz with Fx = 30 MHz). |
| RS03 | Radiated Susceptibility, Electric Field<br><br>Receive: Susceptibility limit reduced to 0.1 volts/meter at frequencies offset 29 MHz from harmonics of the second injection frequencies.<br><br>Transmit: No exceptions. |
| High Level RS03 | High level RS03 shall be in accordance with the field levels and modulation as specified in Table III. |

TABLE III. High level RS03 signals

| Frequency (MHz) | Modulation | | | | Power Density ($mw/cm^2$) 5/ | v/m (ref) 6/ | Scan Rate (sec) 7/ | Dwell Time (msec) 7/ |
|---|---|---|---|---|---|---|---|---|
| 220 8/ | PAM1/ | 10 usec2/ | PW3/ | 200 pps4/ | 10.6 | 200 | 4 | 500 |
| 220 | PAM | 200 usec | PW | 200 pps | 10.6 | 200 | 4 | 500 |
| 425 | PAM | 15 usec | PW | 300 pps | 10.6 | 200 | 10 | 200 |
| 900 | PAM | 2 usec | PW | 1000 pps | 20 | 275 | 5 | 50 |
| 900 | PAM | 125 usec | PW | 300 pps | 20 | 275 | 5 | 50 |
| 1250 | PAM | 10 usec | PW | 3000 pps | 10.6 | 200 | 5 | 50 |
| 1350 | PAM | 5 usec | PW | 3000 pps | 10.6 | 200 | 5 | 50 |
| 3000 | PAM | 3 usec | PW | 1000 pps | 160 | 775 | 5 | 50 |
| 3000 | PAM | 70 usec | PW | 200 pps | 160 | 775 | 5 | 50 |
| 3600 | PAM | 1 usec | PW | 1000 pps | 100 | 610 | 5 | 50 |
| 5600 | PAM | 1 usec | PW | 600 pps | 10.6 | 200 | 5 | 50 |
| 9100 | PAM | 0.5 usec | PW | 1000 pps | 10.6 | 200 | 5 | 50 |
| 9375 | PAM | 0.2 usec | PW | 1000 pps | 10.6 | 200 | 5 | 50 |
| 13900 | PAM | 0.2 usec | PW | 50000 pps | 10.6 | 200 | 0 | CONT |
| 15500 | PAM | 0.2 usec | PW | 50000 pps | 10.6 | 200 | 0 | CONT |
| 33200 | PAM | 0.2 usec | PW | 2000 pps | 0.106 | 20 | 0 | CONT |

1/ Pulse Amplitude Modulation.
2/ Microseconds.
3/ Pulse Width.
4/ Pulses Per Second.
5/ Peak Power Density for PAM signals is defined as the power density measured by an average power measuring device if the generator is run CW; i.e., average power density within the pulse envelope.
6/ Volts Per Meter equivalent shown for reference only.
7/ Scan and Dwell refer to simulated antenna rotation. The signal shall be disabled except for the specified dwell. The signal shall be periodically enabled for the specified dwell time with the period equal to the specified scan time.
8/ Frequency ranges listed with more than one modulation shall be repeated as necessary to include all different modulations shown.

f. CS06

g. CS08 (upper test frequency limit of 4 GHz)

h. RS01

i. RS02

j. RS03

The receiver-transmitter shall exhibit no susceptibility as defined in 3.4.4.3.3 when subjected to an RS03 test to the limits of MIL-STD-461A. In addition, the receiver-transmitter shall exhibit no susceptibility in accordance with the criteria of 3.4.4.3.3b when subjected to signals at the levels of Table III.

3.4.4.3.3 Susceptibility definition. The following criteria shall be applied to determine whether the receiver-transmitter is susceptible:

a. Any failure of the receiver-transmitter to comply with the requirements of 3.6.1.13 and 3.6.1.14 shall be considered an indication of susceptibility.

b. Any repeatable non-command change in the modes of operation or present frequencies of the receiver-transmitter shall be considered an indication of susceptibility. This shall apply whether the failure is transient (momentary) or non-transient (permanent) in nature. In addition the inability to change radio frequency or mode of operation while exposed to the susceptibility signal be considered indication of susceptibility.

3.4.4.3.4 Ground plane interference. All receiver-transmitter interface circuits shall be capable of specified performance when subjected to the following aircraft chassis noise between the WRA's.

a. Three volts rms from 320 Hz to 500 Hz. (Not to be greater than 150ma rms applied current.)

b. One volt rms from 500 Hz to 20 MHz. (Not greater than 150ma rms applied current for frequencies between 500 Hz and 50 kHz. Not to be greater than 1 watt (CW) from a 50-ohm source for frequencies above 50 kHz.)

c. ± eight volt pulses, 70 µsec wide at 100 pps. (Not to be greater than 15a peak current spikes.)

In addition, to the susceptibility definitions of 3.4.4.3.3, the radio shall maintain intelligible communications during a "talk thru" test with another radio set using a low level signal (not to exceed 20µ volts input to the receiver).

3.4.4.3.5 Conducted susceptibility test, interconnecting and signal leads. The unit shall exhibit no susceptibility, as defined by paragraph 3.4.4.3.3 when subjected to 100 mv rms 2 to 30 MHz coupled into its interconnecting and signal leads.

3.4.4.3.6 Grounding requirements. The grounding system between WRA's of the equipment shall be compatible and consistent with the following aircraft grounding scheme specified in 3.4.4.3.6.1 through 3.4.4.3.6.3. All WRA's shall be grounded in such a manner as to prevent ground loops and common ground returns for signal and power circuits, provide effective shielding for signal circuits, minimize EMI, and to protect personnel from electrical hazards.

3.4.4.3.6.1 Chassis grounds. A ground wire of minimum length connected internally to the WRA chassis shall be provided at a pin on each primary power connector. No circuit shall be allowed to utilize this wire as its primary return.

3.4.4.3.6.2 Shielding grounding. A separate connector pin shall be provided for each aircraft wire shield unless suitable grounding is provided in external cable backshells. The connector shield pins shall be grounded to the equipment chassis inside the WRA adjacent to the connector mounting and by the shortest means practical.

3.4.4.3.6.3 Component grounds. All externally exposed metal parts, shields, control shafts, switch handles, connectors, and bushings, shall be grounded to the chassis.

3.4.4.3.7 Shielding gaskets. Shielding gaskets and similar devices for RF applications shall avoid the use of materials which represent severe dissimilar metal combinations with the interface.

3.4.5 Dimensions. The dimensions of the receiver-transmitter shall be as specified in Figures 1, 2, and 3.

3.4.6 Weight. The weight of the receiver-transmitter shall be not greater than 10 pounds.

3.4.7 Color. The exterior color of the receiver-transmitter shall be lusterless black. Painted surfaces shall be in accordance with FED-STD-595, Color No. 37038 and anodized surfaces shall meet the requirements of MIL-A-8625 Type II, Class 2, Color Black.

3.4.8 Nameplates and identification marking. Serial number assignment, nameplate approval and identification marking shall be in accordance with MIL-N-18307. Nameplates and identification markings shall include the following information:

a. Unit name (Radio Receiver-Transmitter)

b. Unit nomenclature (RT-1250A/ARC)

c. Contract number

d. Manufacturer's code number

e. Equipment drawing number

f. Procuring activity

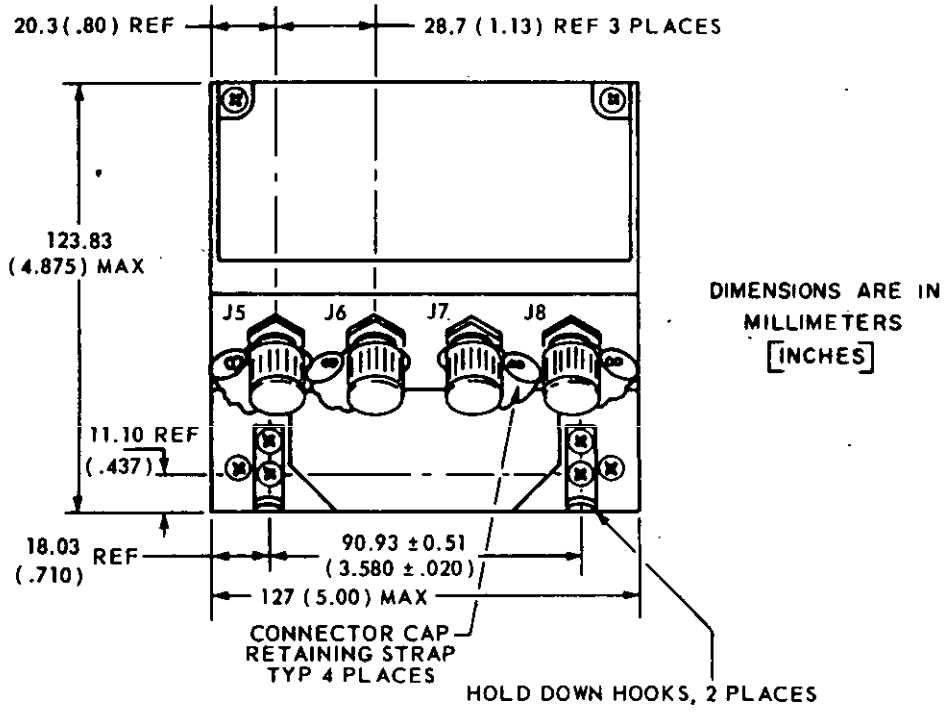



FIGURE 1. Front view, Radio RT-1250A/ARC, Receiver-Transmitter

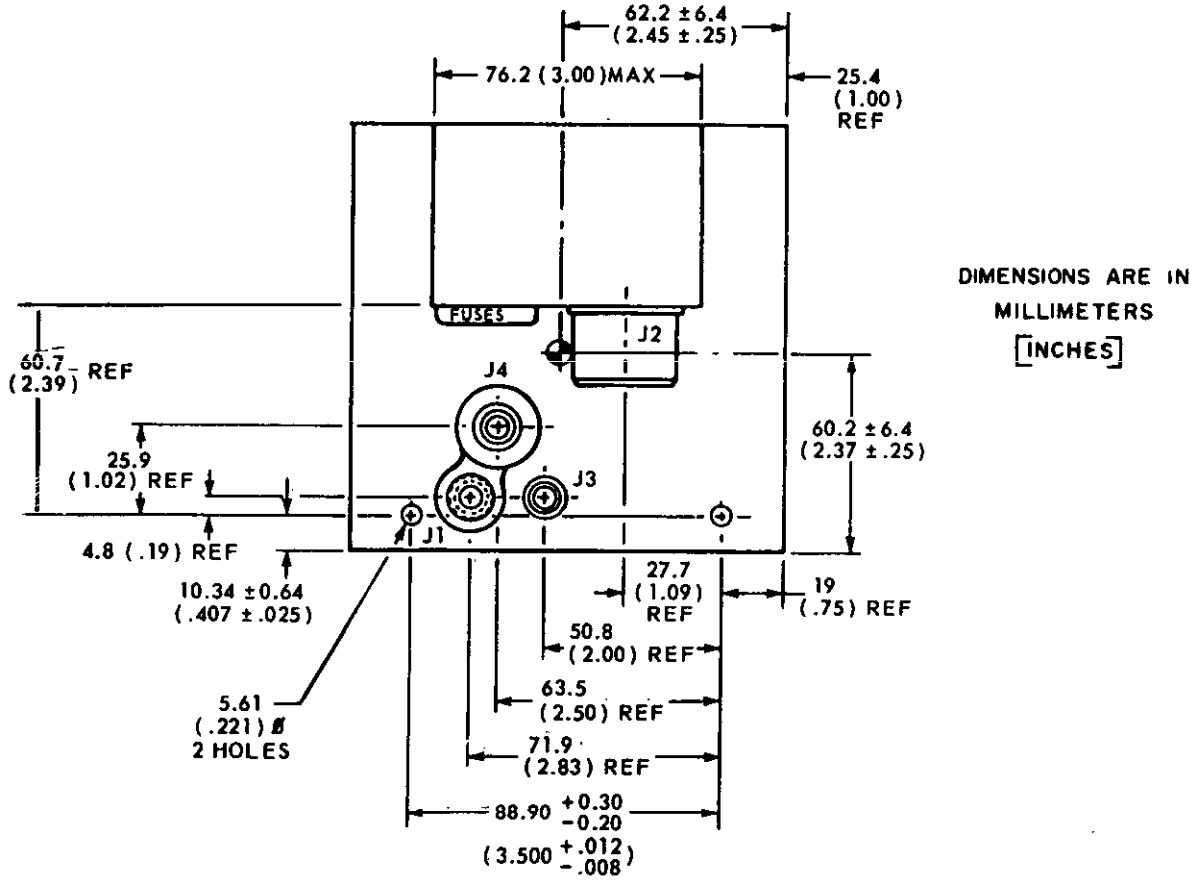



FIGURE 2. Rear view, Radio RT-1250A/ARC, Receiver-Transmitter

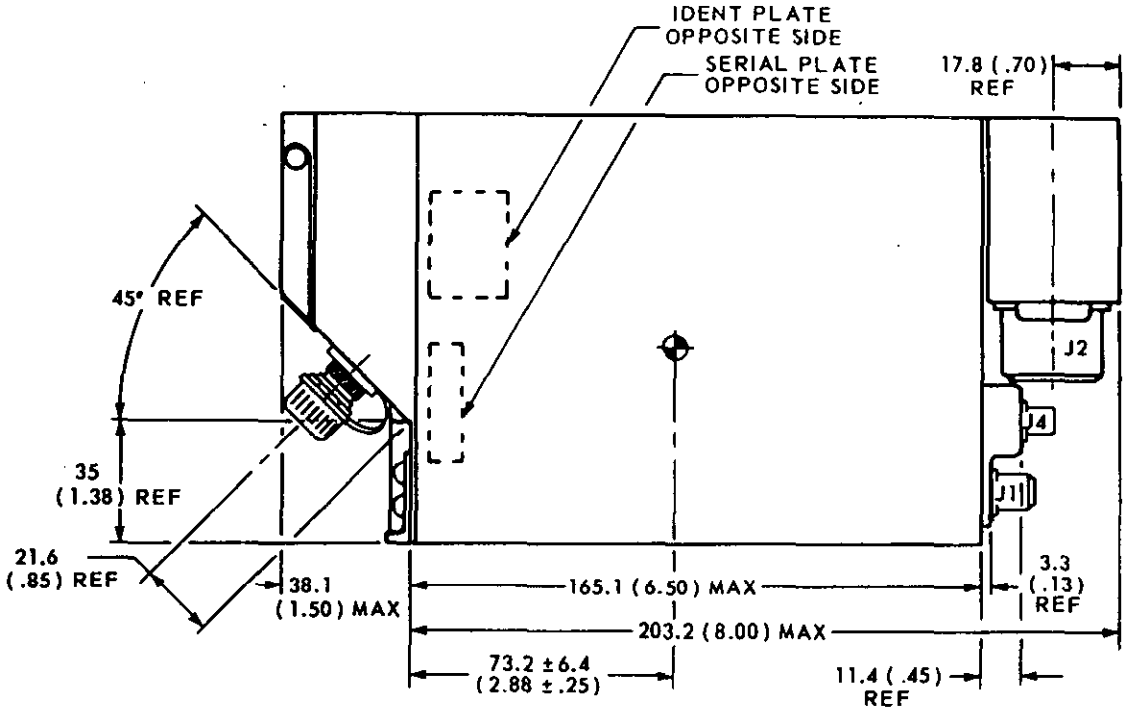



FIGURE 3. Side view, Radio RT-1250A/ARC Receiver-Transmitter

3.4.8.1 Decals, nameplates, and marking locations. All decals, nameplates, and marking shall be affixed to the receiver-transmitter in accordance with Figures 1, 2 and 3.

3.4.8.2 Serial numbers. Serial numbers will be assigned by the procuring activity for the receiver-transmitter under contract or purchase order. The contractor shall serialize sequentially all receivers-transmitters which are delivered under the contract.

3.4.9 Input electrical power.

3.4.9.1 Operating power. The receiver-transmitter 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 specified in MIL-STD-704. The voltage supplied shall be 28 volts DC. The power required shall be not greater than 20 watts in receive, 125 watts when transmitting at frequencies between 30 MHz and 174 MHz, or 150 watts when transmitting between 225 MHz and 400 MHz.

3.4.9.2 Degraded performance. Degraded performance will be permitted for voltage transients with durations of 75 microseconds to 0.5 seconds during normal electrical system operation. Operation shall return to normal within five seconds with no resulting damage to the receiver-transmitter.

3.4.9.3 Emergency voltage. During operation in the emergency steady state electric power condition as specified in MIL-STD-704, the receiver-transmitter shall remain safe and control functions shall be maintained. The emergency power source will impose an interval of zero voltage at time of loss of primary power for a maximum period of 30 seconds. The receiver-transmitter is not required to perform during this period of power loss but shall return to performance as specified above after return to emergency power conditions in accordance with MIL-STD-704. Performance characteristics at emergency limit voltage shall be:

| | | |
|---|---|---|
| a. | RF power output: | 2 watts minimum |
| b. | Receiver sensitivity | -97 dBm AM and -104 dBm FM maximum for 10 dB signal plus noise-to-noise ratio |
| c. | Audio output power: | 6 dB maximum below standard conditions |

3.4.9.4 Undervoltage protection. The receiver-transmitter shall not be damaged by voltages below the minimums specified by MIL-STD-704, and shall be capable of resuming normal operation when the voltage returns within normal limits.

3.4.9.5 Reverse polarity protection. The receiver-transmitter shall be protected such that it will not be damaged by application of reverse polarity voltages.

3.5 Performance. Unless otherwise specified herein, values set forth to establish specified 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 herein.

3.5.1 Operation. The receiver-transmitter shall provide the functions and capabilities specified in 3.1 for operation in military aircraft and helicopters. Additionally the receiver-transmitter shall be compatible with associated equipment listed in 6.4 to provide operations specified in 3.6.

3.6 Detail requirements.

3.6.1 Receiver-transmitter RT-1250A/ARC. The receiver-transmitter shall be capable of being controlled by a high speed TDM bus in accordance with MIL-STD-1553B, or by a slow speed serial data bus from a remote control unit in accordance with MIL-C-85666, such as the C-10319A/ARC. The slow speed serial data characteristics are specified in MIL-C-85666.

3.6.1.1 Function. The receiver-transmitter shall provide simplex two-way communication among tactical platforms in the frequency bands as specified in a through o. Channel spacing in all bands shall be 25 KHz.

a. Low VHF (FM). 30.000 MHz through 87.975 MHz, frequency modulation, normal voice, secure voice, homing, squelch tone transmission, and slow frequency hop.

b. VHF (AM). 108.000 MHz through 155.975 MHz, amplitude modulation, normal voice, secure voice, automatic direction finding (ADF), 1020 Hz tone transmission and slow frequency hop. Transmit shall be inhibited from 108.000 through 117.975 MHz.

c. VHF (FM). 156.000 MHz through 173.975 MHz, frequency modulation, normal voice, secure voice, automatic direction finding, 1020 Hz tone transmission, and slow frequency hop.

d. UHF (AM). 225.000 MHz through 399.975 MHz, amplitude modulation, normal voice, secure voice, automatic direction finding (ADF), 1020 Hz tone transmission and slow frequency hop.

e. UHF (FM). 225.000 MHz through 399.975 MHz, frequency modulation, normal voice, secure voice, automatic direction finding (ADF), 1020 Hz tone transmission, and slow frequency hop.

f. Continuous monitoring of the guard frequency in the selected band. The guard frequency for each band is listed in Table IV.

TABLE IV. Guard frequency for each band.

| Range | Guard Channel |
|---|---|
| 30-87.975 MHz | 40.5 MHz-FM |
| 108-155.975 MHz | 121.5 MHz-AM |
| 156-173.975 MHz | 156.8 MHz-FM |
| 225-399.975 MHz | 243.0 MHz-AM |

g. Compatibility with TSEC/KY-28 and TSEC/KY-58 secure voice equipment.

h. Automatic relaying whereby interconnection of two radio sets results in automatic transmission on one radio set of the signals being received by the other radio set.

i. Slow serial data interface for display of the receiver-transmitter operating frequency or preset channel number on remote indicators.

j. Guard channel precedence operation whereby an external control automatically turns the radio on and tunes both the transmitter and main receiver to the 243.000 MHz (AM) guard frequency.

k. Compatibility with time division multiplex (TDM) data bus in accordance with MIL-STD-1553B.

l. Direct replacement of the AN/ARC-159(V) radio set in regard to form factor and interface functions such that the radio sets will maintain the capabilities of the AN/ARC-159(V) but will operate in all the frequency bands from 30 to 400 MHz.

m. Operation with equipment listed in 6.4 or equal.

n. Transmission of signals from a reference signal generator of CASS or DICASS on an assigned channel.

o. Compatibility with HAVE QUICK when controlled by C-11128/ARC, C-11129/ARC or C-11130/ARC (Developed in accordance with NAVAIRSYSCOM Drawing 1533AS118) or equal.

3.6.1.2 Controls. All control of the functions specified herein shall be provided through the MIL-STD-1553B bus interface or the slow serial interface along with parallel control lines as specified in the Appendix.

3.6.1.3 Operation modes.

a. OFF. In this mode, the internal DC power shall be electronically switched/removed from all but the on/off circuitry of the radio set.

b. Main receiver-transmitter mode (T/R). In this mode, the main receiver shall be turned on and the guard receivers shall be in the OFF condition. The transmitter shall be in the ready (key up) condition.

c. Main receiver-transmitter guard mode (T/R+G). In this mode, both main and guard receivers shall be turned on and the operator shall be able to hear the audio output of both receivers simultaneously. The guard receiver selected shall be that one which is in the frequency band of the main receiver frequency selected. The radio set shall have the same transmit-receiver capabilities as specified in the main receiver-transmitter mode.

d. ADF/homing mode. In this mode, the main receiver-transmitter and guard receiver shall be operating as specified in 3.6.1.3c above, plus the radio set shall be capable of operation with the associated automatic direction finder or homing equipment.

e. Built-in-test. In this mode a performance check shall be run to verify radio set operation. The GO/NO-GO results of the BIT shall be returned to the remote control or to the MUX BUS control terminal for display.

3.6.1.4 Frequency select modes. The frequency select modes shall allow the operator to select emergency, guard, manual, or preset modes of frequency selection. In addition, provisions shall be made for the preset loading and preset read functions.

a. Emergency mode (243). In this mode, the receiver-transmitter shall be turned on and tune the transmitter and the main receiver to the 243.000 MHz (AM) guard frequency. When operating in this mode, all other controls shall be inoperative. This mode shall have precedence over all other modes.

b. Manual mode. This mode shall allow the operator to rapidly and easily select any one of the possible operating frequencies. When operating in the manual mode, it shall be impossible to change or affect the operating frequency of the radio set by means of the preset frequency select control. The transmitter and receivers shall be disabled while changing frequencies.

c. Guard mode. In this mode, the receiver-transmitter shall automatically tune the main receiver and transmitter to the guard channel of the selected frequency band. The selected frequency band shall be considered to be the frequency band that incorporates the frequency or channel last selected on either the preset (if the RT was last used in the preset mode) or the manual frequency controls (if the RT was last used in the manual mode). When operating in this mode, the preset frequency selector control as well as the manual frequency selector shall be inoperative.

d. Preset mode. Not applicable. Only panel mount receiver-transmitter's and remote control units have capability for preset channel selection, loading, and storage. The receiver-transmitter retains only the operating frequency and mode through power on/off cycles.

3.6.1.5 Improper frequencies. Under no conditions shall the receiver-transmitter tune to improper frequencies. These frequencies are: below 30.000 MHz, between 88.000 through 107.975 MHz, between 174.000 through 224.975 MHz and above 399.975 MHz. In the frequency range from 108.000 MHz through 117.975 MHz where the receive mode is proper, the equipment shall not permit transmission.

3.6.1.6 Main and guard receiver controls. Screwdriver adjustable squelch level controls shall be accessible on the main and guard receivers without opening the receiver-transmitter. A screwdriver adjustable audio output control shall be accessible on the main receiver without opening the receiver-transmitter. (See 3.6.1.13.3.)

3.6.1.6.1 Squelch control. A pin on the rear connector (J2) shall be provided which will disable the main squelch circuit when the pin is grounded. Grounding the pin shall not affect the guard receiver squelch.

3.6.1.6.2 Take control function. A pin shall be provided on the rear connector (J2) which shall, when grounded, disable MIL-STD-1553 control of the receiver-transmitter and permit control through the slow serial data bus.

3.6.1.6.3 Memory device. The memory device shall be a nonvolatile type such that power off, power line interruptions or any combination of environmental conditions will not cause a loss or change of operating frequency and mode.

3.6.1.7 Duty cycle. The receiver-transmitter shall have at least a one minute transmit, five minute receive duty cycle. For extended periods of transmit operation (in excess of duty cycle), thermal sensing periods of the transmitter shall automatically limit the power dissipation of the transmitter to maintain safe operating temperatures and prevent damage to the unit. The radio set shall contain a thermal circuit for protection against the overheating of the transmitter power amplifiers. If, by inadvertently leaving the RT in the transmit condition or by some other means, the transmitter power

amplifiers become overheated, the thermal protective circuit shall so reduce the dissipated power of the power amplifiers so that no damage will occur to any component part and the receiver-transmitter will satisfactorily operate again when the temperature of the power amplifier is returned to normal. The available RF power output under extended time transmission shall be two watts minimum.

3.6.1.8 Electrical connections. Connections to external circuits shall be in accordance with Table V.

TABLE V. Connections to external circuits.

| Reference Designation | Receptacle Type | Function |
|---|---|---|
| J1 | TNC M39012/31-001 | Comm. Antenna |
| J2 | Bendix P/N 21-529017-200 | Power/Control |
| J3 | TPS-Bendix P/N 7034-7 | ADF/Homing (Right) |
| J4 | TPS-Bendix P/N 7037-8 | Homing (Left) |
| J5, J7 | Bendix Triax TNC 8359-1 | 1553 Direct Coupled Mux Bus |
| J6, J8 | Bendix Triax TNC 8358-1 | 1553 Transformer Coupled Mux Bus |

The receiver-transmitter shall communicate with its associated controls as specified in the Appendix.

3.6.1.9 Transmit frequency accuracy. The transmitted RF carrier frequency shall be within ±1.5 part per million (±1.5 Hz per MHz) of the selected operating frequency at the time of delivery under service conditions.

3.6.1.9.1 Aging. The change in transmitter radio frequency due to aging shall be less than or equal to 0.5 part per million per year with an adjustment capability for eight years.

3.6.1.9.2 Frequency accuracy adjustment. The transmitter radio frequency shall be adjustable to within ±1 part in $10^8$.

3.6.1.10 Channel changing time. The time from the instant any channel is selected (after warm-up and including band switching time) frequency controls to the time that the radio set is ready on the selected frequency for either transmission or reception shall be not greater than 65 milliseconds.

3.6.1.10.1 Transceiver frequency transition time. The transceiver frequency settling time as controlled by an external applique shall be not greater than four milliseconds for channel changes within any band.

3.6.1.11 Spontaneous channel change. When operating there shall be no spontaneous change of channels when the equipment is subject to any combination of environmental conditions or electrical input. Turning the radio off shall not cause a change in frequency when the radio is turned back on.

3.6.1.12 Antenna circuits. Three antenna ports shall be provided. The main receiver, transmitter, and guard receivers shall normally all operate with the same antenna through connector J1. The receivers shall be so isolated during transmission that no damage or degradation in performance shall result from using a common antenna. No damage shall occur to any part of the radio set when the transmitter is operated with the RF output shorted, open-circuited or terminated in any complex impedance. Two RF connectors shall be provided for automatic direction finding and homing. When the radio is in the ADF/homing mode and tuned to the lower (30-88 MHz) VHF (FM) band, the main receiver shall be connected to antenna ports J3 and J4. When the radio is in the ADF/homing mode and tuned to any band other than the lower VHF (FM) band, the main receiver shall be connected to antenna port J3. The transmitter shall be connected in all cases to J1. The guard receivers shall remain operational in the ADF/homing mode.

3.6.1.12.1 External antenna switch. The receiver-transmitter shall provide a ground or open on a separate pin of connector J2 for control of an external antenna switch SA-521/A (MIL-S-25879) or an appropriate equivalent to switch between the ADF and homing antennas on the J3 antenna port. A ground shall be provided on this pin only when in the ADF/homing mode and when not operating in the 30-88 MHz band. This pin shall be open circuited in all other conditions. (See 3.6.1.18.b)

3.6.1.13 Receiver characteristics. Unless otherwise specified in the contract, the following receiver characteristics shall apply to both the main and the guard receiver (see 6.2.1). All signal levels (dBm) assume a receiver impedance of 50 ohms.

3.6.1.13.1 Sensitivity. A (S + N)/N of not less than 10 dB shall be produced at the normal voice output of the receiver for the signal levels specified in Tables VI and VII. The test signal shall be frequency modulated by 1 kHz at ± 2.4 kHz deviation for the FM bands and amplitude modulated 30 percent at 1 kHz for the AM bands. A pin on the rear connector shall be provided which shall reduce the sensitivity of the main and guard receiver in the 108 MHz to 174 MHz range by 10 dB when the pin is grounded.

3.6.1.13.2 Selectivity. The main receiver shall incorporate a narrowband and a wideband filter such that the receiver is capable of working with transmitters that have ± 10 KHz stability. Design and location of the filters shall be such that they can be replaceable at the intermediate maintenance level with filters with different bandwidth characteristics. Bandwidths are as follows:

a. Narrowband for normal voice and baseband secure.
   Bandwidth: ± 17.0 KHz min. at 6 dB points referenced to center frequency.
   ± 35 KHz max. at 60 dB points referenced to center frequency.

TABLE VI. Main receiver sensitivity

| Frequency | Mode | Signal Level | |
|---|---|---|---|
| | | Standard Conditions | Service Conditions |
| 30-87.975 MHz | FM | -112 dBm | -110 dBm |
| 108-155.975 MHz | AM | -103 dBm | -101 dBm |
| | | -93 dBm 1/ | -91 dBm 1/ |
| 156-173.975 MHz | FM | -110 dBm | -108 dBm |
| | | -100 dBm 1/ | -98 dBm 1/ |
| 225-399.975 MHz | AM | -103 dBm | -101 dBm |
| 225-399.975 MHz | FM | -110 dBm | -108 dBm |

1/ Receiver sensitivity control pin grounded

TABLE VII. Guard receiver sensitivity

| Frequency | Mode | Signal Level | |
|---|---|---|---|
| | | Standard Conditions | Service Conditions |
| 40.5 MHz | FM | -112 dBm | -110 dBm |
| 121.5 MHz | AM | -103 dBm | -101 dBm |
| | | -93 dBm 1/ | -91 dBm 1/ |
| 156.8 MHz | FM | -110 dBm | -108 dBm |
| | | -100 dBm 1/ | -98 dBm 1/ |
| 243.0 MHz | AM | -103 dBm | -101 dBm |

1/ Receiver sensitivity control pin grounded

b. Wideband for diphase secure. Bandwidth:
± 34.5 KHz min. at 6 dB points referenced to center frequency;
± 85 KHz max. at 60 dB points referenced to center frequency.

c. Guard receiver bandwidth:
± 14.0 KHz min. at 6 dB points referenced to center frequency.
± 40.0 KHz max. at 60 dB points referenced to center frequency.

Pass band ripple shall be not greater than 3 dB over 80 percent of the specified 6 dB bandwidth.

3.6.1.13.2.1 Adjacent channel rejection. The main receiver shall be capable of 60 dB rejection of normal and FM secure voice signals on channels at least 50 KHz away with the specified narrow band IF selectivity. (See 3.6.1.13.2.)

3.6.1.13.3 Squelch. The main and guard receivers shall have squelch circuits that are compatible with CLIMAX and AN/PRC-90 swept tone type emergency beacons and that operate in the normal voice circuits for both AM and FM to allow a receiver output only when the received signal plus noise-to-noise ratio is at or above 5 dB. An adjustment shall be provided to select the signal plus noise-to-noise level of squelch operation over the range of 5 dB to 15 dB. The squelch circuits shall prohibit receiver output when the received signal plus noise-to-noise ratio is below the adjusted threshold level.

3.6.1.13.3.1 Squelch attack/release times. Squelch attack and release times shall be not greater than 150 milliseconds for a signal level of -70 dBm.

3.6.1.13.3.2 Squelch overlap. Squelch overlap is specified as the difference of the RF voltage required to unsquelch the main and guard receiver outputs to the voltage at which the output is again squelched. This difference shall be at least 1.5 dB and in no case shall a change of more than 12 dB be required.

3.6.1.13.4 Main and guard receiver audio outputs. Audio output tests described below shall be conducted with maximum audio output (250 mW across 600 ohms) unless otherwise required.

3.6.1.13.4.1 Normal audio output. The main and guard receivers shall have a common output. The audio outputs of the main and guard receiver shall be in phase. The common output shall be available at the unattenuated audio output as specified in 3.6.1.13.4.7 and also at the 150/600 balanced output. The audio output at the balanced output shall be 250 mW minimum with an input signal of -53 dBm with 30 percent AM or ± 2.4 KHz FM deviation. Volume control of the audio output is not provided in the RT-1250A/ARC. Provision shall be made to set the audio output at any level between 100 mW and 400 mW using a screwdriver adjustment on the receiver module. Access to the adjustment shall not require disassembly of the receiver-transmitter. The adjustment is provided to accommodate variation in system requirements. The standard output as delivered from the factory shall be 250 mW minimum for 30 percent AM or ± 2.4 KHz FM deviation. Under service conditions the audio output shall be 200 mW minimum.

3.6.1.13.4.2 Audio/gain level control. The automatic gain control (AGC) or automatic level control (ALC) shall maintain the main and guard receiver audio output level to within ± 3 dB over the following RF input ranges when referenced from -53 dB.

a. AM: -103 to +7 dBm

b. FM: -112 to +7 dBm

In addition, for a constant -53 dBm input the audio level change shall be not greater than 2 dB when changing from band to band or when changing between main and guard receivers.

3.6.1.13.4.3 Audio output protection. The receivers shall operate as specified after the audio outputs have been subjected to both open and short circuit conditions.

3.6.1.13.4.4 Bandwidth. The normal audio output frequency response shall be ± 3dB relative to 1 KHz reference for signals from 400 Hz to 3.0 KHz. Frequencies 150 Hz and below and frequencies 4.0 KHz and above shall be attenuated at least 30 dB.

3.6.1.13.4.5 Normal audio output impedances. The normal audio output impedance shall be suitable for operation into both 150 and 600 ohm loads. This output shall be floating with respect to chassis ground. External grounding of one of the output leads shall have no adverse effects on receiver performance. Only one output shall be loaded for normal operation.

3.6.1.13.4.6 Normal audio output distortion. Total harmonic distortion at the normal audio output when terminated by either 150 or 600 ohms shall be not greater than six percent over the RF input range with 30 percent modulation or ±2.4 KHz deviation when the audio level is adjusted to maximum levels required. Under service conditions the distortion shall be not greater than 10 percent.

3.6.1.13.4.7 Unattenuated audio output. In addition to the normal audio output loaded into 150 or 600 ohms, an unattenuated, unbalanced audio output shall be provided on a separate pin on the external connector. With the 150 or 600 ohm output properly terminated, the unattenuated output level shall be 6.5 ± 1.0 volts rms when loaded with 1000 ± 10 percent ohms for an RF input of -53 dBm modulated 30 percent AM or deviated ± 2.4 KHz FM at 1 KHz. Under service conditions, the audio output level shall be no less than 5.0 VRMS. The frequency response shall be as specified in 3.6.1.13.4.4. Distortion shall be not greater than six percent at 1000 Hz with 30 percent modulation AM or ± 2.4 KHz deviation FM. Under service conditions the distortion shall not exceed 10 percent. Source impedance of the output shall be not greater than 60 ohms. In systems where the audio output has been reduced (see 3.6.1.13.4.1), the unattenuated audio output will be reduced proportionally. For example: 100 mW audio output corresponds to 4.0 VRMS versus 6.5 VRMS at 250 mW.

3.6.1.13.4.8 X-mode receive audio. Provision shall be made to return deciphered audio from secure voice equipment through the audio interface of the receiver-transmitter. When the x-mode audio select line (J2-17) is grounded, the internal audio amplifiers shall be disconnected from the unattenuated audio output and the normal voice output, and replaced with deciphered audio from the secure voice equipment. An audio input of 6.5 VRMS into 110 ohms is required to provide the output levels specified in 3.6.1.13.4.1 and 3.6.1.13.4.7.

3.6.1.13.5 AM internal noise level. The signal plus noise-to-noise (modulated to unmodulated) ratio of the main and guard receivers shall be 30 dB minimum when a -53 dBm signal modulated 30 percent at 1,000 Hz is applied.

3.6.1.13.6 FM noise quieting. An RF signal of -70 dBm deviated ± 8.0 KHz by 1 KHz shall produce a signal plus noise-to-noise ratio of 30 dB minimum for both main and guard receivers.

3.6.1.13.7 Noise peak limiter. The detector of the main and guard receivers (following the intermediate frequency amplifier) shall be provided with an instantaneous noise peak limiter. The noise limit action shall effectively limit the audio output voltage of modulating surges or peaks exceeding 100 percent modulation of the RF signal. Its action shall eliminate noise spikes of one microsecond or less duration to prevent loss of intelligibility due to reduction in receiver gain under the influence of continuous RF noise such as are caused by commutators, ignition systems, etc.

3.6.1.13.8 Cross modulation and desensitization. Cross modulation and desensitization effects of interfering signals (modulated 30 percent at 1,000 Hz) on channels more than one (1) MHz from and at a level 70 dB above the desired channel reference level (-103 dBm at 10 dB signal plus noise-to-noise) shall permit a signal plus noise-to-noise ratio of the desired signal of at least six dB for both main and guard receivers.

3.6.1.13.9 Channel interference. For a -43 dBm unmodulated carrier signal on any channel with no signal on any other channel, the quieting measured on any other channel greater than 100 KHz away shall be not greater than the quieting produced on that channel for a signal of -110 dBm (squelch disabled) for both main and guard receivers.

3.6.1.13.10 RF intermodulation. For an RF input of two individual unmodulated carriers each of minus 43 dBm on any two channels, there shall be no quieting on any other channel greater than the quieting produced on that channel by a minus 110 dBm unmodulated carrier at that channel (squelch disabled) for both main and guard receivers.

3.6.1.13.11 Intermediate frequency rejection. The IF rejection of the main and guard receivers shall be as specified in Tables VIII and IX.

TABLE VIII. Main receiver IF rejection

| Channel Frequency | 1st IF Rejection (29 MHz) | 2nd IF Rejection (455 KHz) |
|---|---|---|
| 30-40 MHz | NLT 55 dB | NLT 90 dB |
| 40-88 MHz | NLT 65 dB | NLT 90 dB |
| 108-174 MHz | NLT 80 dB | NLT 90 dB |
| 225-400 MHz | NLT 80 dB | NLT 90 dB |

TABLE IX. Guard receiver IF rejection

| Frequency | 1st IF Rejection (28.045 MHz) | 2nd IF Rejection (500 KHz) |
|---|---|---|
| 40.5 MHz | NLT 80 dB | NLT 90 dB |
| 121.5 MHz | NLT 80 dB | NLT 90 dB |
| 156.8 MHz | NLT 80 dB | NLT 90 dB |
| 243.0 MHz | NLT 80 dB | NLT 90 dB |

3.6.1.13.12 Image and spurious rejection. Image rejection shall be at least 80 dB relative to the response to the desired signal for the main and guard receivers except that the image frequency rejection of the 156.8 MHz guard receiver shall be at least 60 dB. Spurious rejection of the main and guard receivers shall be at least 70 dB relative to the response of the desired signal.

3.6.1.13.12.1 Internal spurious. Degradation of sensitivity of the main or guard receivers due to internal spurious shall be limited to no more than 100 channels out of the 11,960 channels available. In addition, no more than 50 of the 100 shall require a signal level of more than -97 dBm to meet a S + N/N ratio of 10 dB (see 3.6.1.13.1). The complete list of degraded channels shall be reported to the procuring activity and the frequencies, sensitivity level, and these channels shall be listed in handbooks and support documentation.

3.6.1.13.13 AGC recovery and blocking. When signals up to +7 dBm are present, it shall be possible to obtain a 10 dB signal-plus-noise-to-noise ratio with -103 dBm input not later than 0.25 second after the one volt signal has been removed for both main and guard receivers. Blocking shall not occur on desired signals up to +7 dBm. Blocking is defined as a 3 dB or greater reduction of the 250 mW audio output level across 600 ohms or 150 ohms.

3.6.1.13.14 Input signal protection. The main and guard receivers shall not be damaged by inputs up to +27 dBm (on channel).

3.6.1.13.15 Regeneration. The interstage and overall regeneration of the main and guard receiver shall be minimized so that no evidence of instability occurs at maximum gain.

3.6.1.13.16 Receiver amplitude variation (FM). The limiting characteristics of the main and guard receivers shall be such that the audio output shall not vary more than 3 dB when the RF input signal deviated 8.0 KHz FM at 1 KHz is varied from the specified sensitivity level (see 3.6.1.13.1) up to +7 dBm.

3.6.1.13.17 Main receiver characteristics. The main receiver shall meet all the requirements of 3.6.1.13 through 3.6.1.13.16 plus the following when the radio is in the transmit/receive, transmit/receive plus guard or ADF/homing modes.

3.6.1.13.17.1 Wideband audio outputs. The main receiver shall have one wideband audio output for use with secure voice systems and one for use with ADF systems. The outputs shall not pass through the squelch circuit and shall be operative at all times when in the receive mode. The ADF output shall be connected to the AM detector regardless of whether the receiver-transmitter is operating in AM or FM.

3.6.1.13.17.2 Wideband audio load impedance. The radio set shall provide specified output performance on the secure voice and ADF outputs when loaded with unbalanced load impedances between 2000 ohms and 20,000 ohms.

3.6.1.13.17.3 Wideband audio output levels. The TSEC/KY-28/58 system output level shall be 0.250 volts rms minimum to 8.3 volts rms maximum across 20,000 ohms with inputs modulated 90 percent (AM) or deviated ±8.0 KHz (FM) at

1,000 Hz. The ADF system output level shall be 4.0 volts peak to peak minimum across 20,000 ohms with an RF input of -53 dBm modulated 90 percent (AM) at 1,000 Hz.

3.6.1.13.17.4 Wideband audio output responses. The receiver wide band audio output for TSEC/KY-28/58 shall be within +2 to -4 dB of the 1,000 Hz reference level for modulating signals between 30 Hz and 25 KHz. The frequency response of the ADF audio shall be within ±2dB of the 1,000 Hz reference level for modulating signals between 50 Hz and 10 KHz.

3.6.1.13.17.5 Wideband audio output distortion. Total harmonic distortion at the receiver wideband audio outputs shall be not greater than eight percent for 90 percent modulation (AM) or deviation of ± 8.0 KHz (FM) at 1,000 KHz with signal levels up to +7 dBm. Under service conditions, the distortion shall be not greater than 10 percent.

3.6.1.13.17.6 Wideband audio output phase. The ADF audio output shall be not greater than 20 degrees out of phase with the negative portion of the RF signal modulation envelope when the RF signal is modulated 30 percent at 200 Hz. (Nominal phase delay = $180° + 18 \times 10^{-3} F_M$ where $F_M$ = ADF modulation frequency.)

3.6.1.13.17.7 Homing mode outputs (VHF-FM 30 to 88 MHz band only). When the radio set is placed in the homing mode, and signals are present across the 50 ohms homing inputs, the homing circuits in the radio shall operate so that movements of indicator ID1351/A, or equal, shall indicate the conditions of 3.6.1.13.17.7.1 through 3.6.1.13.17.7.5.

3.6.1.13.17.7.1 Homing sensitivity. The overall sensitivity of the homing system shall be such that inputs of -109 dBm at connectors J3 and J4 are sufficient to obtain a general heading indication on the ID1351/A and place the red flag in the down position (grounded pin capable of sinking 100 milliampere) to indicate signal adequacy.

3.6.1.13.17.7.2 Dynamic range. All equal phase signals between -109 and -25 dBm applied to homing inputs shall result in the homing needle being in the center position (0 ± 120 microamperes).

3.6.1.13.17.7.3 Deflection. An electrical phase shift of 1° to ± 25° between the homing inputs shall deflect the homing needle from center scale. With a 25° phase shift introduced at the input ports the unbalanced current deflection shall be 100 microamperes minimum and 500 microamperes maximum. The unbalanced meter drive shall not vary more than 20 percent of signal levels from 105 dBm to -25 dBm. The meter load shall be 1000 ohms.

3.6.1.13.17.7.4 Station approach indication. A station approach signal shall be provided capable of driving a 0-150 microamperes, 1000 ohm movement. The output current shall increase gradually from a value of 0 microamperes for an input level between -105 dBm and -95 dBm to a value of 150 microamperes ± 25 microamperes for a signal of -30 dBm. Under service conditions, the zero microampere condition shall occur between -110 dBm and -90 dBm and the current at 30 dBm shall be 150 microamperes ± 35 microamperes.

3.6.1.13.17.7.5 Communication while homing. Operation of the main receiver for FM voice communication shall be provided simultaneously while homing. The receiver sensitivity shall be -104 dBm for a 10 dB signal plus noise-to-noise ratio. Internal noise due to operation of the homing circuits shall be such as to enable a maximum signal plus noise-to-noise ratio of not less than 16 dB with a -84 dBm input signal with deviation of ± 2.4 KHz at 1000 Hz. Operation of the push-to-talk circuit while in the homing mode shall automatically switch operation from homing circuits to the communications antenna.

3.6.1.13.17.8 Receiver FSK capability. In the wide band mode, the receiver shall be capable of demodulating FSK signals with data rates up to 10 KB/S with deviation up to ± 20 KHz. The following characteristics pertain to the wideband output.

a. Output level. 2VPP minimum into 600 ohms, unbalanced for ± 20 KHz deviation at bit rates from 50 B/S to 10 KB/S.

b. Phase. Positive going deviation from center frequency shall produce a positive going demodulated output.

c. Delay. 50 microseconds ± 15 microseconds at the 50 percent amplitude points.

d. Rise and fall times. No more than 20 microseconds between the 10 percent and 90 percent amplitude points.

3.6.1.13.18 Guard receiver characteristics. The guard receiver shall meet the applicable requirements of 3.6.1.13 through 3.6.1.13.16 plus the following when in the transmit/receive plus guard, ADF/homing, emergency, guard precedence or guard select modes. The requirements of 3.6.1.13.17 do not apply to the guard receiver. The guard receiver shall be capable of operation on fixed frequencies which are 40.5 MHz, 121.5 MHz, 156.8 MHz, and 243 MHz. The guard receiver shall be required to receive AM normal voice and pulsed tone at 121.5 MHz and 243.0 MHz and FM normal voice and pulsed tone at 40.5 MHz and 156.8 MHz. The guard receiver shall share the RF antenna input with the main receiver. Both the main and guard receiver shall be able to receive signals simultaneously when the receiver-transmitter is in the receive condition.

3.6.1.13.18.1 Low level guard audio output. A separate line shall be provided for a low level guard receiver output. The level shall be between 0.15 V and 0.45 VRMS into a 600 ohm ± 10 percent resistive load at -53 dBm input level, 30 percent AM at 1 KHz or -53 dBm input level, ± 2.4 KHz FM at 1 KHz. This guard receiver output is for use with the TSEC/KY-28/58. With a reference input of -53 dBm, 30 percent modulated AM or ± 2.4 KHz FM at 1 KHz, the frequency response shall be within +1 to -3 dB from 500 to 3,500 Hz and distortion at 1,000 Hz shall be not greater than five percent. It shall be possible for this output level to be increased to over 2.75 volts by intermediate maintenance level personnel. Under service conditions, the distortion shall be not greater than 10 percent.

3.6.1.13.18.2 Guard precedence operation. The radio set shall have provision for guard precedence frequency selection from an external switch. This mode which is intended for emergency use is activated by closing an external switch (not included in receiver-transmitter) to provide an electrical ground on an assigned pin. When this switch is closed the front panel controls are disabled, the radio is turned on; the main transmitter and receiver are tuned to the 243.000 MHz (AM) guard frequency. Activation of this mode shall take precedence over any other mode of operation selected.

3.6.1.14 Transmitter characteristics.

3.6.1.14.1 Unmodulated power output.

3.6.1.14.1.1 FM power. Under all service conditions except as specified below, the RF power output shall be not less than 15 watts over the frequency range of 30 to 87.975 MHz, 156 to 173.975 MHz, and 225 to 399.975 MHz. From 22 to 18 VDC input the RF power output may decrease from 15 watts to a minimum of two watts. From 55 degrees C to 71 degrees C ambient the RF power output may decrease 3 dB relative to power level at 55 degrees C. From 71 degrees C to 95 degrees C ambient the RF power output may decrease 6 dB relative to the power level at 55 degrees C.

3.6.1.14.1.2 AM power. Under all service conditions except as specified below, the RF power output shall be not less than 10 watts with an unmodulated carrier over the frequency range of 118.000 through 155.975 MHz and 225.000 through 399.975 MHz. From 22 to 18 VDC input the RF power output may decrease from a minimum of 10 watts to two watts minimum. From 55 degrees C to 71 degrees C ambient the RF power output may decrease 3 dB relative to the power level at 55 degrees C. From 71 degrees C to 95 degrees C ambient the RF power output may decrease 6 dB relative to the power level at 55 degrees C.

3.6.1.14.2 Transmitter RF termination. The transmitter shall meet the specific performance requirements with an RF termination of 50 ohms ± 3 ohms.

3.6.1.14.3 Transmitter output circuit. The transmitter shall operate as specified after being subjected to either an open or short circuit load impedance or any load impedance.

3.6.1.14.3.1 Mismatch load. The transmitter shall meet the requirements of 3.6.1.14.1.1 and 3.6.1.14.1.2 when terminated in the load of 3.6.1.14.2. At the worst case phase angle at a voltage standing wave ratio (VSWR) of 2.5:1, the power turndown shall be not greater than 2 dB. The transmitter shall turn down gradually for VSWR greater than 2.5:1 and the transmitter shall deliver a minimum of two watts forward power regardless of VSWR.

3.6.1.14.4 Tone transmissions.

3.6.1.14.4.1 Squelch tone. In the 30-88 MHz VHF (FM) band a squelch keying tone shall be transmitted along with the normal voice modulation. The tone shall be 150 Hz ± 2 percent and shall frequency modulate the transmitter output 3 KHz ± 500 Hz. The tone shall be inhibited during secure voice and AJ transmissions.

3.6.1.14.4.2 Tone. The transmitter modulator circuit shall include a tone generator for modulating the transmitter with a 1.020 KHz ± 10 percent frequency on any channel above 118 MHz. The percentage of modulation shall be a minimum of 60 percent or FM deviation of ± 3.4 KHz. A separate connector pin shall be provided for tone activation. The tone shall be transmitted by grounding this pin.

3.6.1.14.5 Transmit precedence. Activating the transmit keyline shall cause the transmitter to transmit through the communications antenna port, J1, only.

3.6.1.14.6 Transmit key lines. Two pins shall be provided on the rear connector to control radio set transmissions. The transmit keyline (push-to-talk or PTT) shall cause transmitter output if the other keyline (transmit blanking) is open (not grounded). If the transmit blanking line is grounded, the transmitter shall be inhibited regardless of whether the PTT line is at ground or open.

3.6.1.14.6.1 RF carrier delay from PTT line. The RF carrier shall reach 90 percent of specified output level within 70 milliseconds after actuation of the push-to-talk (PTT) line.

3.6.1.14.6.2 RF carrier rise and fall time. With the PTT line grounded, the RF carrier shall rise to 90 percent of full power output within 200 microseconds after the transmit blanking line is ungrounded. The RF carrier shall fall to -80 dBc within 80 microseconds after the transmit blanking line is grounded.

3.6.1.14.7 Transmitter sidetone. In the AM mode (normal voice) a transmitter sidetone shall be developed by sampling a portion of the modulated transmitter carrier in the antenna circuit. The sidetone signal shall be introduced into the audio portion of the main receiver. In the FM (normal voice) mode the sidetone may be sampled from the modulation audio circuitry and gated with the forward power monitor.

3.6.1.14.7.1 Sidetone level. With a normal voice audio input voltage of 0.5 volt rms closed-circuit at 1,000 Hz, the sidetone audio output at the main receiver shall be 250 milliwatts minimum across 600 ohms when the volume control is in full clockwise position. An internal pot shall be provided to permit adjustment of the sidetone level to 3 dB below the standard level.

3.6.1.14.8 AM/FM inputs. Inputs shall be provided for normal voice, secure voice and retransmit. The normal voice input shall provide a screwdriver adjustment accessible from outside the radio set which permits adjustment of the normal voice input level such that a level between 0.25 volt rms and 1.5 volts rms (closed circuit) will produce 90 percent AM or ± 5.6 KHz FM deviation. The nominal factory setting shall be 0.5 volt rms.

3.6.1.14.8.1 Audio input impedances. The normal voice audio input impedance shall be 175 ohms ± 25 percent unbalanced. The secure voice audio input impedance shall be 2,000 ohms ± 25 percent unbalanced. The retransmit audio input impedance shall be 1000 ohms ± 10 percent minimum unbalanced.

3.6.1.14.8.2 Amplitude modulation.

3.6.1.14.8.2.1 Percent modulation. Under standard conditions the percent modulation shall be linear with at least 80 percent upward and between 90 and 100 percent downward for a 0.5 volt rms (closed circuit) 1000 Hz signal at the normal voice audio input, a 6.5 volt rms (closed circuit) 1000 Hz signal at the retransmit audio input, or a 12 volt peak-to-peak 16,000 bits per second closed circuit signal at the secure voice audio input. The average modulated power out shall be at least 1.30 times the unmodulated power output. Under environmental conditions, the percent modulation shall not be less than 65 percent upward and between 80 and 100 percent downward. The average modulated power output shall be at least 1.20 times the unmodulated power output for environmental conditions.

3.6.1.14.8.2.2 Carrier fidelity. With a constant normal voice audio input voltage of 0.5 volt rms (closed circuit) adjusted to any frequency between 500 and 3,500 Hz, the demodulated audio voltage shall be within +1 dB, -3 dB of the demodulated audio voltage resulting from a 0.5 volt (closed circuit) 1,000 Hz audio input. With a constant retransmit audio input voltage of 6.5 volts rms (closed circuit) adjusted to any frequency between 500 and 3,500 Hz, the demodulated audio voltage shall be within +1 dB, -3 dB of the demodulated audio voltage resulting from a 6.5 volt (closed circuit) 1,000 Hz audio input. With a constant secure voice audio input voltage of 12 ± 1 volts peak to peak (closed circuit) adjusted to any frequency between 16 and 10,000 Hz when the narrow band premodulation filter is used (see 3.6.1.14.8.4) and 300 and 20,000 Hz when the wideband premodulation filter is used, the demodulated audio voltage shall be within +1 dB, -3 dB of the demodulated output at 1,000 Hz modulation.

3.6.1.14.8.2.3 Distortion. With a normal voice audio input of 0.35 VRMS (closed circuit) or a retransmit audio input of 4.5 VRMS (closed circuit) adjusted to any frequency between 500 Hz and 3500 Hz, the demodulated audio harmonic distortion shall be not greater than five percent. Under service conditions the distortion shall be not greater than eight percent. With a secure voice audio input of 3.0 VRMS (closed circuit) adjusted to any frequency between 16 Hz and 10,000 Hz with the narrowband premodulation filter or between 300 Hz and 20,000 Hz with the wideband premodulation filter, the demodulated audio harmonic distortion shall be not greater than 10 percent, under standard or service conditions.

3.6.1.14.8.2.4 Incidental frequency modulation. With the RF carrier amplitude modulated at least 75 percent upward and 90 percent downward at 1,000 Hz, the peak frequency deviation arising from incidental frequency modulation (FM) of the transmitter shall be not greater than ± 2 KHz.

3.6.1.14.8.3 Frequency modulation characteristics. The frequency modulation of the RF output for the normal voice, secure voice and retransmit inputs, shall have the following characteristics.

3.6.1.14.8.3.1 Deviation. An audio signal of 0.5 volts rms (closed circuit) applied to the normal voice audio input or an audio signal of 6.5 VRMS (closed circuit) applied to the retransmit audio input shall produce an FM modulated transmitter RF output signal with a deviation of ± 5.6 KHz ± 0.5 KHz. An audio signal of 12 V ± 1 V peak-to-peak (closed circuit) applied to

the secure voice input shall produce an FM modulated transmitter output signal with a deviation of ± 5.6 KHz ± 0.5 KHz. Under service conditions, the deviation produced shall be not less than ± 4.5 KHz.

3.6.1.14.8.3.2 Audio frequency response. With a constant normal voice audio input voltage of 0.5 volt rms (closed circuit) adjusted to any frequency between 500 and 3500 Hz, the deviation shall be ± 5.6 KHz ± 1.2 KHz. With a constant retransmit audio input voltage of 6.5 volts rms (closed circuit) adjusted to any frequency between 500 and 3500 Hz, the deviation shall be ± 5.6 KHz ± 1.2 KHz. With a constant secure voice audio input voltage of 12 ± 1 volts peak-to-peak (closed circuit) adjusted to any frequency between 16 Hz and 10,000 Hz when the narrowband premodulation filter is used, and any frequency between 300 Hz and 20,000 Hz when the wideband premodulation filter is used, the deviation shall be ± 5.6 KHz ± 1.2 KHz.

3.6.1.14.8.3.3 Modulation distortion. With any audio input frequency specified in 3.6.1.14.8.3.2 for the normal voice, secure voice and retransmit inputs and with the audio input adjusted for ± 5.6 KHz deviation, the distortion shall be not greater than five percent. Under service conditions the distortion shall be not greater than eight percent.

3.6.1.14.8.3.4 Deviation capability. The radio set shall be capable of FM/FSK deviation up to ± 25 KHz for AJ applications.

3.6.1.14.8.3.5 Incidental AM. With maximum deviation (± 5.6 KHz) the amplitude modulation of the carrier shall be not greater than four percent.

3.6.1.14.8.4 Premodulation filters. Two filters shall be incorporated in the radio to shape the audio input prior to modulation and after limiting. Bandwidths are shown in Table X.

TABLE X. Filter bandwidth

| Filter type | 6dB | 60dB |
|---|---|---|
| Narrowband Filter | 18 + 0.5, -2.0 KHz | 50 KHz max. |
| Wideband Filter | 25 ± 2.0 KHz | 100 KHz max. |

The narrowband filter shall allow adjacent channel operation between AN/ARC-182(V) radio sets in the normal and FM secure modes. The filters shall be selectable and shall operate in conjunction with the receiver selectivity filters such that when the receiver is in the narrowband mode the transmitter shall be in narrowband mode. When the receiver is in the wideband mode the transmitter shall also be in the wideband mode.

3.6.1.14.9 Frequency shift key (FSK) operation. In the wideband mode, the transmitter shall be capable of transmitting FSK at data rates of 50 B/S to 10 KB/S with deviation of ± 20 KHz.

a. Input. Nine VPP minimum at the wideband input shall produce ± 20 KHz ± 1 KHz deviation.

b. Phase. Positive going modulation shall produce a positive frequency shift from the center frequency.

c. Delay. No more than 50 microseconds at the 50 percent amplitude points.

d. Rise and fall time. No more than 30 microseconds measured between the 10 percent and 90 percent amplitude points.

3.6.1.14.10 Microphone bias voltage. The normal voice audio input shall provide bias voltage and current to operate an amplifier (AM-3597C/A type) for a dynamic microphone. The voltage supplied shall be 16 volts DC minimum with an external 1000 ohm resistive load. Under emergency power conditions, the voltage supplied shall be at least 12 volts DC with an external 1000 ohm resistive load.

3.6.1.14.11 Transmit energy spectrum. The transmitter output shall meet the requirements of 3.6.14.11.1 through 3.6.1.14.11.3.

3.6.1.14.11.1 Transmit noise floor. The transmitter broadband noise level shall be no more than -120 dBm/Hz at any frequency 10 percent or more removed from the carrier. For carriers above 100 MHz, the 10 percent removal requirement is reduced to 10 MHz removal.

3.6.1.14.11.2 Spectral containment. Ninety-nine percent of normal and baseband secure voice transmitted energy shall be contained within the operating 25 KHz channel.

3.6.1.14.11.3 Transmitter spurious. Transmitter spurious outputs greater than 100 KHz from the carrier shall be at least 66 dB below the carrier except for crossover spurious as specified in Table XI.

3.6.1.14.11.4 Transmitter harmonics. The transmitter harmonics shall be not greater than the limits of Table XII.

3.6.1.14.12 Noise modulation of transmitter.

a. AM. The noise on the unmodulated carrier shall be 40 dB below the detected audio voltage of a carrier modulation of 90 percent at 1 KHz, measured in a 3 KHz audio bandwidth.

b. FM. The noise of the unmodulated carrier shall be 30 dB below the detected audio voltage of a 1 KHz tone having a deviation of ± 5.6 KHz, measured in a 3 KHz audio bandwidth.

3.6.1.14.13 Transmitter keying. When operating in normal or secure voice modes the transmit key line shall key the transmitter when voltages from ground to ± 5V are applied. An open circuit or above 12 VDC on the key line shall cause the radio to operate in receive mode.

3.6.1.14.14 CASS/DICASS operation. The radio set shall operate in conjunction with the CASS/DICASS reference signal generator described in MIL-G-81665 to transmit signals provided by the signal generator.

TABLE XI. Transmitter spurious limits

| Crossover Center Frequency (MHZ) 1/ | Frequency Range Of Crossover (MHz) 2/ | DF Range Of Crossover (MHz) 3/ | Spurious Level dB Below Carrier (DBC) 4/ |
|---|---|---|---|
| 34.600 | 34.450 to 34.750 | ± 0.3 | -50 |
| 40.800 | 40.650 to 40.950 | ± 0.5 | -50 |
| 57.450 | 57.350 to 57.550 | ± 0.6 | -50 |
| 66.075 | 65.550 to 65.875 | ± 1.6 | -50 |
| | 65.900 to 66.200 | ± 0.5 | -40 |
| | 66.225 to 66.450 | ± 1.6 | -50 |
| 68.000 | 67.550 to 67.825 | ± 1.4 | -50 |
| | 67.850 to 68.150 | ± 0.25 | -40 |
| | 68.175 to 68.450 | ± 1.4 | -50 |
| 81.800 | 81.600 to 82.000 | ± 0.5 | -50 |
| 134.075 | 133.600 to 133.875 | ± 1.4 | -50 |
| | 133.900 to 134.200 | ± 0.4 | -40 |
| | 134.225 to 134.450 | ± 1.4 | -50 |
| 136.000 | 135.500 to 135.825 | ± 1.6 | -50 |
| | 135.850 to 136.150 | ± 0.25 | -40 |
| | 136.175 to 136.500 | ± 1.6 | -50 |

1/ Crossover center frequency is where the crossover spurious lie exactly on or very close to the carrier frequency.
2/ Frequency range of crossover refers to the channel frequencies where the crossover pair of spurious exceed -66 DBC.
3/ DF range of crossover specifies the maximum spacing from carrier where the pair exceed -66 DBC.
4/ The spurious level specifies the maximum level of the crossover pair in the frequency range.

TABLE XII. Transmitter harmonic limits

| Frequency Band | Harmonic Level (DBC) | | | | | |
|---|---|---|---|---|---|---|
| | 2ND | 3RD | 4TH | 5TH | 6TH | 7TH |
| 30-88 MHz | -55 | -55 | -66 | -55 | -66 | -66 |
| 118-174 MHz | -55 | -55 | -66 | -66 | -66 | -66 |
| 225-400 MHz | -55 | -55 | -66 | -66 | -66 | -66 |

3.6.1.14.14.1 CASS/DICASS input characteristics. A separate audio input shall be provided for CASS or DICASS signals to be transmitted. The CASS/DICASS interface will provide the external transmit (key) switch actuation at least 50 milliseconds prior to input of CASS/DICASS signals to the radio set.

3.6.1.14.14.2 CASS/DICASS input impedance. The input impedance presented by the radio set to the CASS/DICASS signal generator shall be 100 ohms ± five percent resistive.

3.6.1.14.14.3 CASS/DICASS signal levels. The CASS/DICASS input shall be designed for 0.5 volt rms (closed circuit) input signals.

3.6.1.14.14.4 CASS/DICASS input frequency range. The CASS/DICASS input shall be designed for input signals between 1 KHz and 50 KHz.

3.6.1.14.14.5 CASS/DICASS modulation characteristics. CASS/DICASS signal modulation of the transmitter RF carrier output shall have the following characteristics:

a. Percent modulation. Under standard conditions the percent AM modulation shall be between 85 and 100 percent for a 0.5 volt rms (1 KHz to 50 KHz) closed circuit signal at the CASS/DICASS input. Under environmental conditions, the percent modulation shall be not less than 70 percent.

b. Carrier fidelity. With a constant CASS/DICASS input voltage of 0.5 volts rms closed circuit adjusted to any frequency between 1 KHz and 50 KHz, the demodulated signal voltage shall be constant within ±2 dB.

c. Modulation distortion. With a CASS/DICASS input of 0.35 volt rms closed circuit adjusted to any frequency between 1 KHz and 50 KHz, the demodulated signal total harmonic distortion shall be not greater than 10 percent.

d. Intermodulation distortion. The demodulated level of the sum and difference frequencies of two equal level 0.175 volt rms (open circuit) discrete (non-harmonically related) modulating CASS/DICASS signals shall be 25 dB below either modulating signal.

e. Carrier noise modulation. The requirements of 3.6.1.14.12 shall apply.

f. Phase linearity. The phase response of the modulating frequency shall be linear with frequency within ±15 degrees throughout the 1 KHz to 50 KHz spectrum. In addition, the phase versus frequency slope shall be not greater than 3.5 degrees per Hz.

3.6.1.15 Automatic relaying operation. In the T/R or T/R PLUS guard mode the main receiver and transmitter of the radio set shall operate in an automatic relaying mode (both normal and secure voice) when used in conjunction with another AN/ARC-182(V) or AN/ARC-159(V) radio set plus C-10320A/ARC(V) control, radio set and SA-2157A/ARC(V) switching unit or other appropriate external interface switching circuitry. The set shall provide on pins of the main power connector, the following inputs, outputs, and controls that allow the radio set to be used for automatic relaying in the transmit/receive or transmit/receive plus guard mode:

a. Main receiver audio outputs

b. Retransmit audio inputs

c. Relay trigger voltage (squelch indication)

d. Transmit control (T/R control line)

The application to the antenna circuit of either radio set, of a signal on the receiver selected frequency, and of a level sufficient to open the receiver squelch circuit shall cause the other radio set to automatically generate and emit a radio frequency carrier wave of the units rated power on its selected frequency. Removal of the actuating receiver signal shall cause the cessation of the generated carrier. When the actuated signal is 3 dB or more above the level required for relaying as described above, the generated carrier shall reach 90 percent of rated power level within the receiver and transmitter operate times. The system shall return to standby conditions after removal of the actuating signal. The receiver-transmitter shall perform relay function on any two RF channels in any of the frequency bands (see 3.6.1.1) provided a frequency separation of at least 10 MHz exists between the two channels with an isolation of 45 dB between the two antennas, and the spurious frequencies are not selected as relay channels.

3.6.1.16 TSEC/KY-28/58 operation. In the T/R or T/R+G mode the radio set shall operate in conjunction with the TSEC/KY-28 or TSEC/KY-58 speech security equipment described in publication CSEEB-13, CSESD-14, and CSEEB-32 respectively. Specific radio circuits required for secure voice operation in the AM or FM mode shall be actuated by actuating two designated pins as required on the radio connector. When required (for diphase secure operation) actuating one pin will switch the transmitter premodulation filter and the receiver if to the wide bandpass. In AM mode the receiver-transmitter shall be capable of baseband and diphase operation; in FM mode-baseband only. In the FM mode the baseband secure voice signals shall be contained in the 25 KHz channel.

3.6.1.17 Maritime offset. The receiver-transmitter shall provide half-duplex operation in selected channels in the maritime band when a pin on the rear connector (J2) is grounded. The frequency which is displayed in any form in the system shall be the frequency of the transmitter. The receiver frequency shall be ± 4.6 MHz offset from the transmit frequency dependent on the transmit frequency chosen. Table XIII lists the maritime offset channels of the receiver-transmitter available when the pin is grounded. If the pin is not grounded, the transmitter and receiver are on the same frequency.

3.6.1.18 Mode indications. All circuits connected to pins for indication or external control purposes shall be capable of pulling in a 100 milliampere external relay when a ground indication is provided. The indicator circuit shall withstand open circuit voltages up to 30 VDC and have leakage current of no more than 150 microamperes.

a. AM/FM mode indicator. A ground (<1 VDC) shall be provided when the receiver-transmitter is operating in AM. An open circuit shall be provided for FM operation.

TABLE XIII. Maritime offset frequencies

| Transmit Frequency 1/ (MHz) | Receiver Frequency Offset (MHz) |
|---|---|
| 156.000 | 0 |
| 156.025 through 156.275 | +4.6 |
| 156.300 | 0 |
| 156.325 | +4.6 |
| 156.350 | +4.6 |
| 156.375 through 156.875 | 0 |
| 156.900 through 157.425 | +4.6 |
| 157.450 through 160.600 | 0 |
| 160.625 through 160.875 | -4.6 |
| 160.900 | 0 |
| 160.925 | -4.6 |
| 160.950 | -4.6 |
| 160.975 through 161.475 | 0 |
| 161.500 through 162.025 | -4.6 |
| 162.050 through 173.975 | 0 |

1/ The transmit frequency is displayed during half-duplex operation.

b. ADF mode indicator. A ground (<1 VDC) shall be provided when the receiver-transmitter is operating in the DF mode at frequencies in the range of 108-173.975 MHz and 225-399.975 MHz. An open shall be provided for all other operating modes.

c. UHF band indicator. A ground (<1 VDC) shall be provided when the receiver-transmitter is operating in the frequency range of 225-399.975 MHz. An open circuit shall be provided for all other modes.

d. Low VHF-FM band indicator. A ground (<1 VDC) shall be provided when the receiver-transmitter is operating in the frequency range of 30-87.975 MHz. An open circuit shall be provided for all other bands.

e. Retransmit key. A ground (<1 VDC) shall be provided when the S+N/N ratio of the receive signal exceeds the squelch break threshold. An open circuit shall be provided when the receiver resquelches.

f. Homing flag. A ground (<1 VDC) shall be provided when the receiver-transmitter is operating in the DF mode at frequencies between 30 MHz and 87.975 MHz and the receiver S+N/N exceeds the squelch break threshold. An open circuit shall be provided for all non-homing modes and when the receiver resquelches in homing mode.

3.6.1.19 Equipment ready. The receiver-transmitter shall provide a balanced, 5V (±1 VDC), differential output on pins 32 and 33 of J2 which indicates that the 1553 interface is operating and ready to receive and transmit data on the 1553 mux bus. The true state shall be with pin 32 positive with respect to pin 33.

3.7 Mounting base, electrical equipment MT-4934/ARC-182. The mounting base shall be designed to secure the RT-1250A/ARC receiver-transmitter to an airframe structure outside the cockpit area. The mount shall have provisions for solidly securing it to the airframe structure. No vibration isolators shall be used with this mount. It shall provide two pins at the rear and positive self-locking thumbscrew fasteners at the front for solidly securing the RT-1250A/ARC to the mount. The mount with the RT-1250A/ARC attached shall meet the crash safety requirements of MIL-E-5400 and the vibration requirements of 3.4.4.1.1.

3.7.1 Dimensions (MT-4934/ARC-182). The dimensions of the mount with RT-1250A/ARC receiver-transmitter shall be as specified in Figure 4.

3.7.2 Weight (MT-4934/ARC-182). The weight of the mount shall be not greater than 1.3 pounds.

3.8 Mounting base, electrical equipment, MT-4935/ARC-182. The mounting base shall be designed for attachment to the RT-1250A/ARC in a manner equivalent to that of the MT-4934/ARC-182. This mount shall incorporate vibration isolators for protection of the RT-1250A/ARC from vibration. The mount, with the RT-1250A/ARC attached, shall meet the crash safety requirements of MIL-E-5400 and shall provide vibration isolation to the RT-1250A/ARC as necessary for compliance in accordance with 3.4.4.1.1.

3.8.1 Dimensions (MT-4935/ARC-182). The dimensions of the mount with RT-1250A/ARC receiver-transmitter shall be as specified in Figure 5.

3.8.2 Weight (MT-4935/ARC-182). The weight of the mount shall be not greater than 1.6 pounds.

3.9 Safety. The receiver-transmitter safety requirements shall be in accordance with MIL-E-5400 except resistance from ground pin to chassis shall be 20 milliohms maximum.

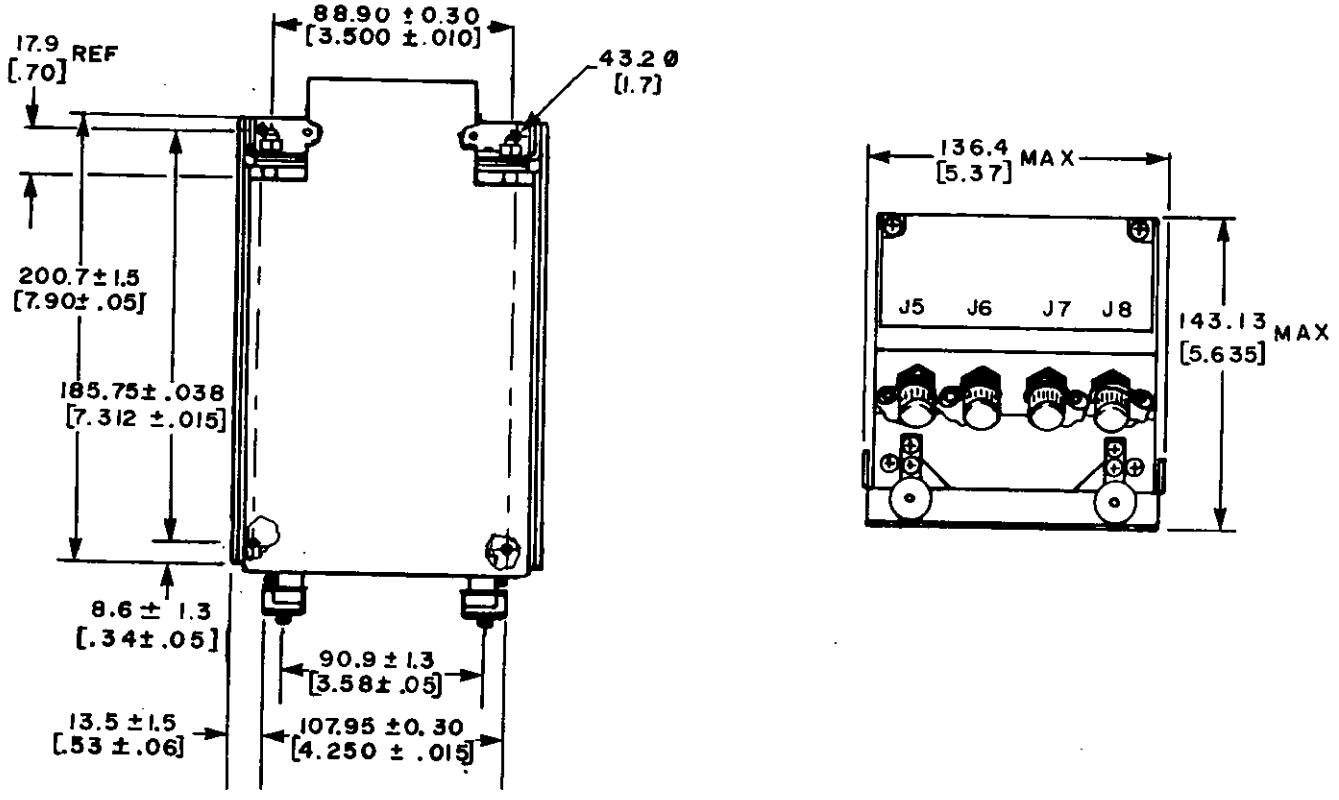
3.9.1 Human performance/human engineering. MIL-STD-1472 and MIL-H-46855 shall be used as a design guide for the receiver-transmitter and all component parts therein.

3.10 Bonding. Bonding shall be in accordance with MIL-B-5087.

3.11 Workmanship. Workmanship for the receiver-transmitter shall conform with Requirement 9 of MIL-STD-454.

## 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor 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 supplies and services conform to prescribed requirements.




DIMENSIONS ARE IN MILLIMETERS [INCHES]

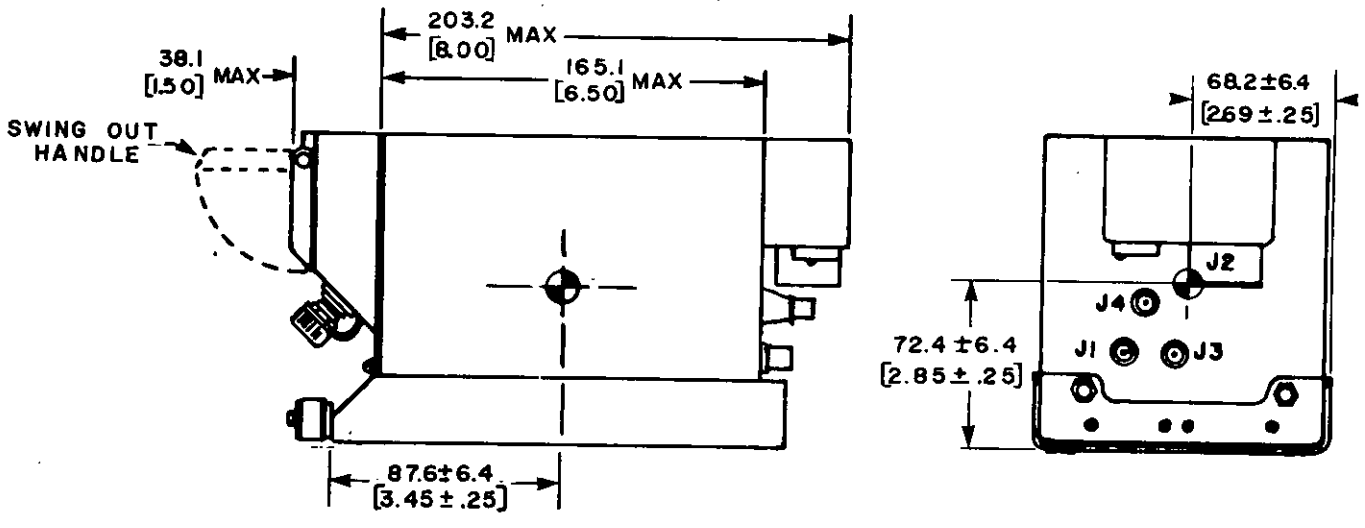
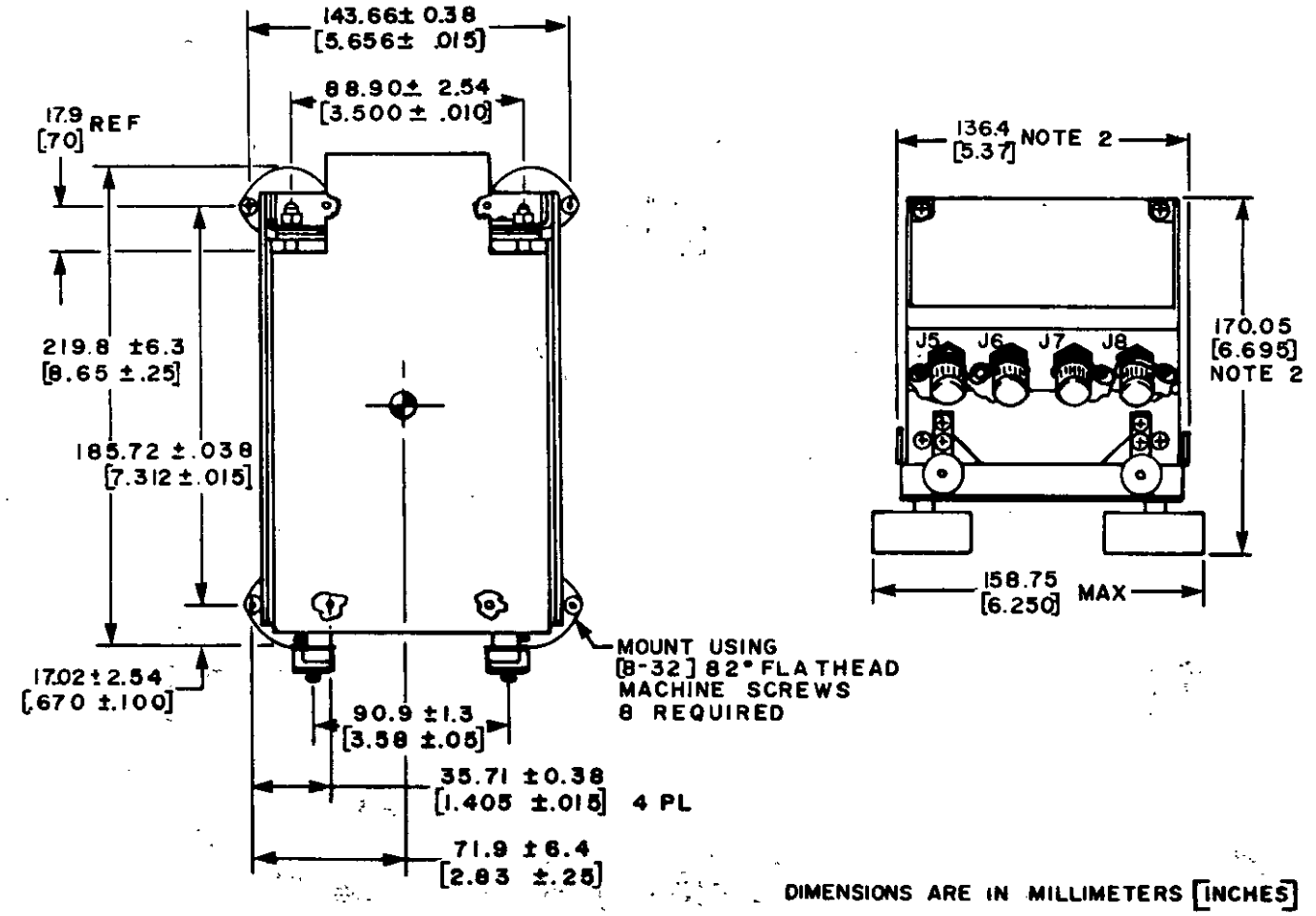



FIGURE 4. Electronic Equipment Mounting Base MT-4934/ARC and Radio Receiver-Transmitter RT-1250A/ARC, outline and mounting dimensions



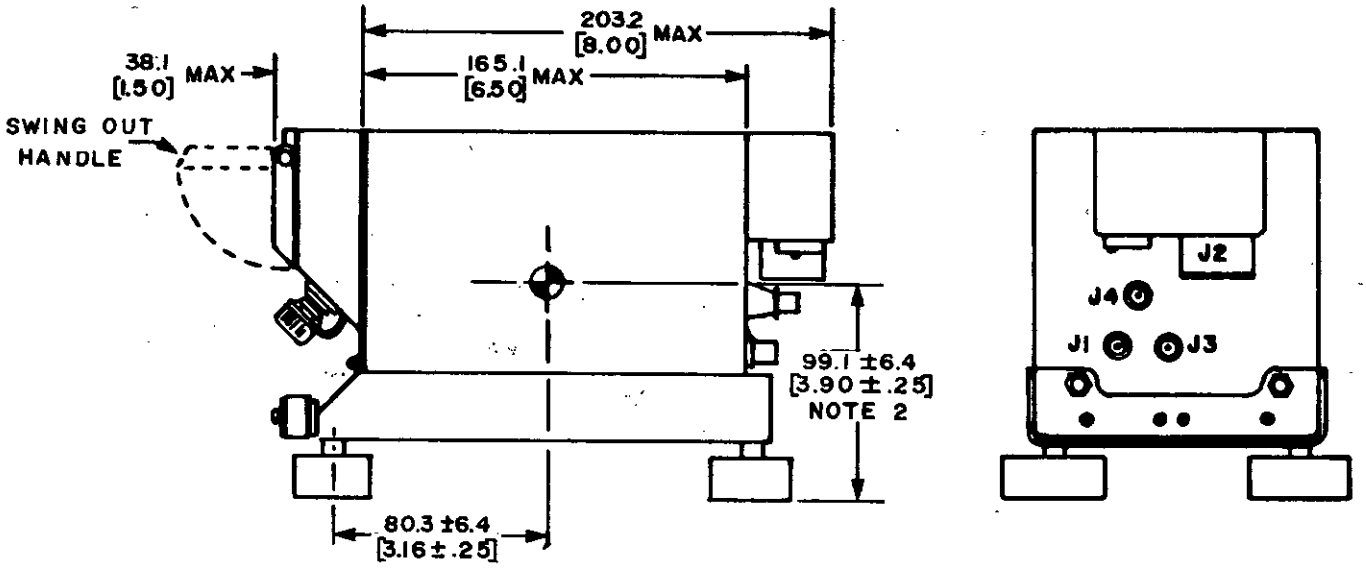




FIGURE 5. Electronic Equipment Mounting Base MT-4935/ARC and Radio Receiver-Transmitter Rt-1250A/ARC, outline and mounting dimensions

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.4).

b. Quality conformance inspection (see 4.5).

4.3 Standard conditions. Unless otherwise specified herein, all inspections shall be performed with conditions specified as follows:

| | | |
|---|---|---|
| a. | Temperature | Room ambient (25 ± 10°C) |
| b. | Altitude | Normal ground |
| c. | Vibration | None |
| d. | Humidity | Room ambient up to 90 percent relative humidity |
| e. | Input Power | 28 ± 0.5 volt dc |

4.4 First article inspection. First article inspection shall be conducted by the contractor on receiver-transmitters representative of the production receiver-transmitters to be supplied under the contract. First article tests shall be accomplished under the authorized test procedures (see 4.6). No first article inspections shall be conducted prior to acceptance of the first article test procedure by the procuring activity (see 6.2.2).

4.4.1 First article test data. The contractor shall make available data collected in conducting first article test to the procuring activity (see 6.2.2).

4.4.2 Scope of first article tests. First article tests shall include all tests in the approved test procedures to determine that the receiver-transmitter meets all the requirements of this specification, other applicable specifications and the contract. First article tests shall include environmental tests in accordance with the procedures of MIL-T-5422 including temperature shock, a random vibration test as specified in 4.4.5, and an electromagnetic compatibility test in accordance with MIL-STD-461 and MIL-STD-462, as modified in 4.4.4. The first article test may also include a reliability qualification test.

4.4.3 First article approval. Approval of the first article sample will be by the procuring activity upon completion of all tests and the first article test report being made available to the procuring activity (see 6.2.2).

4.4.4 Electromagnetic interference tests. Compliance with the requirements of 3.4.4.3 shall be demonstrated by tests. These tests shall be performed in accordance with MIL-STD-462, with Notice 1.

4.4.4.1 EMI test plan. The contractor shall perform EMI tests in accordance with an EMI Test Plan. The Test Plan shall describe all EMI tests required to demonstrate compliance with the requirements of 3.4.4.3, and shall address all anomalies, inconsistencies, and omissions (if any). The Test Plan shall detail a combination of operating modes and frequencies to be tested. The combination shall represent all operating modes of the receiver-transmitter and at least four frequencies. The Test Plan shall be approved by the procuring agency prior to the commencement of EMI testing.

4.4.4.2 Ground plane interference. The contractor shall devise a procedure to demonstrate that the receiver-transmitter complies with the requirements of 3.4.4.3.4. The procedure shall be included in the EMI Test Plan.

4.4.4.3 Conducted susceptibility test, interconnecting and signal leads. In addition to the requirements of MIL-STD-461 the following RF susceptibility test shall be conducted. No malfunction, undesirable response, or change in indication beyond the tolerance given in the equipment specification or approval test plan shall be produced in any equipment when the RF signal levels listed in Table XIV are coupled into the interconnecting wiring.

TABLE XIV. Susceptibility test signals

| Frequency | Required Signal Levels In One Turn Loop |
|---|---|
| 2 to 30 MHz | 100 MV RMS |

The RF signal shall be modulated 80 percent with 400 Hz and with that frequency and/or type of modulation to which the test sample is most susceptible. This requirement applies to all interconnecting wires or cable between component parts of subsystems, and to wires and cables connected to other equipment. The RF signal shall be measured in the one-turn loop with an RF voltmeter as shown in Figure 6. The signal generator shall have an output impedance of 50 ohms or less and a maximum open-circuit voltage of at least 3 volts rms. The test procedure shall be as follows:

a. With the current probe clamped around the wire bundles under test, set the signal generator for maximum output and slowly scan from 2 MHz to 30 MHz.

b. At those frequencies where a response is noted, move the current probe along the wire for maximum indication. Reduce the signal generator output and determine the threshold of susceptibility of the wire bundle. When a response is found on an interconnecting wire bundle, probe each wire in the bundle separately to determine the susceptible wire(s).

c. Record and include in the test report the threshold of susceptibility data (frequency, amplitude, and description of responses) obtained in (b) above. Also include in the test report the corrective action required for each wire that does not meet the required level.

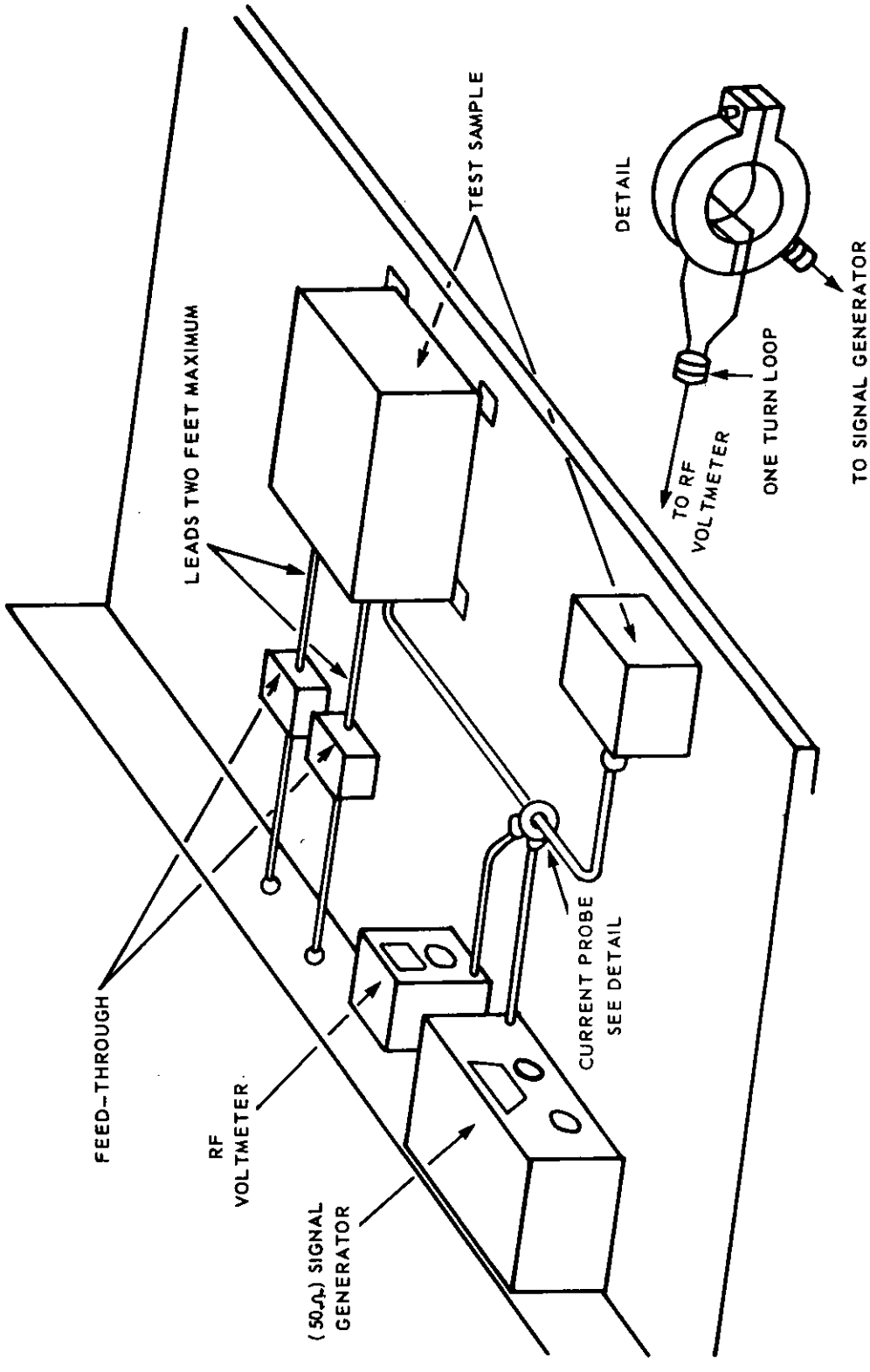



FIGURE 6. Conducted susceptibility test setup

Wire bundles may be tested in sections if the current probe will not fit around the complete wire bundles. Chassis or circuit grounds not normally routed with the interconnecting wiring shall be measured individually and shall not be included in the wire bundle under test. Power ground return leads shall not be placed in the probe.

4.4.5 Random vibration test. A random vibration test shall be conducted as specified in 4.4.5.1 through 4.4.5.4.

4.4.5.1 Test item operation. The test item shall be operated during application of random vibration so that the functional effects caused by these tests may be evaluated. The test item shall meet performance requirements, as specified, while the functional vibration levels are being applied and immediately preceding and following the application of the endurance levels.

4.4.5.2 Mounting techniques. The test item shall be hard mounted either directly to the vibration exciter or transition table, or by means of a rigid fixture capable of transmitting the vibration conditions specified herein. Precautions shall be taken in the establishment of mechanical interfaces to minimize the introduction of extraneous responses in the test setup. The test load shall be distributed as uniformly as possible on the vibration exciter table in order to minimize effects of unbalanced loads. The input control sensing device(s) shall be rigidly attached to the vibration table, or fixture if used, as near as possible to the attachment point(s) of the test item. Additional vibration sensors shall be located in or on the test item to determine resonant frequencies and amplification factors. Locations to be selected should include main structure, printed circuit boards, large components, and modules, where practicable. The sensor sizes and weights shall be limited so that their effect on the dynamic responses being measured is minimal.

4.4.5.3 Performance of test. The individual equipment test item shall be subjected to broadband random vibration excitation with the power spectral density envelope shown in Figure 7. The test item shall be attached to the vibration exciter according to 4.4.5.2. Vibration shall be applied sequentially along each of the three orthogonal axes of the test item. Two test levels are required, a functional level and an endurance level. For each axis, one half of the functional test shall be conducted first, then the endurance test, followed by the second half of the functional test. The equipment shall perform according to the operating requirements as specified in 4.4.5.1. The acceleration power spectral density ($g^2$/Hz) of applied vibration, as measured on the test fixture at mounting points of the test item, shall be as specified in 4.4.5.4. Test times shall, for each axis, be one hour each for functional and endurance levels. The instantaneous random vibration acceleration peaks may be limited to three times the rms acceleration level. The power spectral density of the test control signal shall not deviate from the specified requirements by more than +100, -30 percent (+3, -1.5 dB) below 500 Hz and +100, -50 percent (±3 dB) between 500 Hz and 2,000 Hz except that deviations as large as +300, -75 percent (±6 dB) shall be allowed over a cumulative bandwidth of 100 Hz maximum, between 500 and 2,000 Hz. Tolerance levels in terms of dB are specified as:

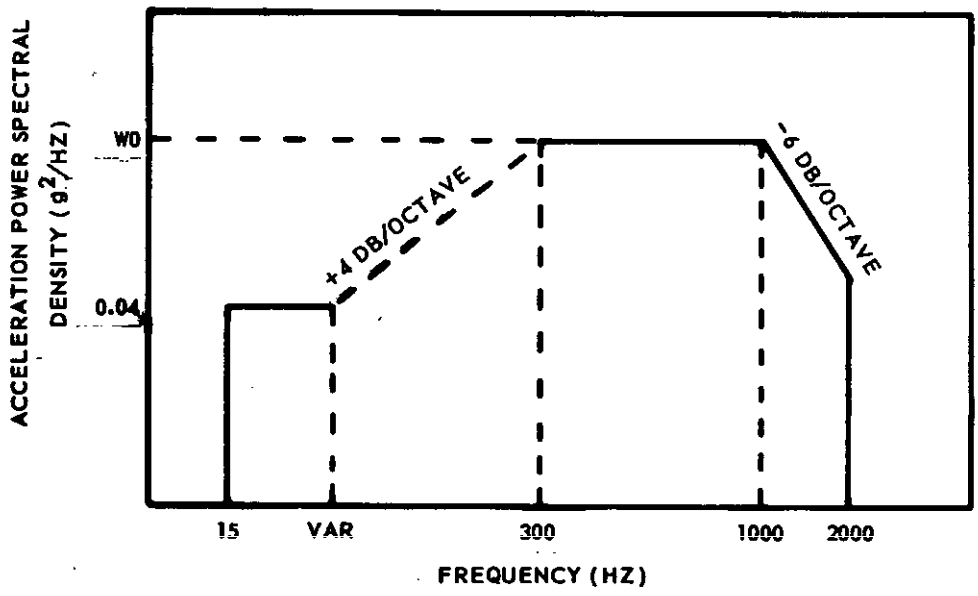



FIGURE 7. Random vibration envelope

$$dB = 10 \text{ Log}_{10} \frac{W1}{W0}$$

Where W1 = measured acceleration power spectral density in $g^2$/Hz units, the term W0 defines the specified level in $g^2$/Hz units. Confirmation of these tolerances shall be made by use of an analysis system providing statistical accuracies corresponding to a bandwidth-time constant product, BT=50 minimum. Specific analyzer characteristics shall be as specified below or equivalent, subject to the BT=50, minimum limitation.

a. On-line, contiguous filter, equalization/analysis system having a bandwidth as follows:

B=25 Hz, maximum between 20 and 200 Hz
B=50 Hz, maximum between 200 and 1,000 Hz
B=100 Hz, maximum between 1,000 and 2,000 Hz

b. Swept frequency analysis systems characterized as follows:

(1) Constant bandwidth analyzer.

(a) Filter bandwidth as follows:

B=25 Hz, maximum between 20 to 200 Hz
B=50 Hz, maximum between 200 to 1,000 Hz
B=100 Hz, maximum between 1,000 to 2,000 Hz

(b) Analyzer averaging time =T= 2 RC = 1 second, where T= true averaging time constant

(c) Analysis sweep rate (linear) =

$$R = \frac{B}{4RC} \text{ or } \frac{B^2}{8} \quad \text{(Hz/second)}$$

(2) Constant percentage bandwidth analyzer

(a) Filter bandwidth - pfc=one-tenth of center frequency maximum (0.1 fc) where p=percentage and fc=analyzer center frequency

(b) Analyzer average time = T = $\frac{50}{pfc}$, minimum

(c) Analysis sweep rate (logarithmic) =

$$T = \frac{pfc}{4RC} \text{ or } \frac{(pfc)^2}{8}$$

(Hz/second), maximum, whichever is smaller

Digital power spectral density analysis employing quantization techniques providing accuracies corresponding to the above approach.

4.4.5.3.1 Worst case axis. During the vibration testing, data shall be obtained to identify the worst case axis for purpose of vibration screening tests on production equipments.

4.4.5.4 Test levels. For the purpose of the random vibration test, the following test levels shall be used:

a. Functional Level-$W_o$ = 0.05 $g^2$/Hz (8.5g rms minimum)

b. Endurance Level-$W_o$ = 0.12 $g^2$/Hz (12.7g rms minimum)

4.4.6 Reliability qualification test. A reliability qualification test may be included in the first article tests. A maximum of six receiver-transmitters shall be tested in accordance with MIL-STD-781 using the reliability qualification test - mission profile in this specification. (See Figures 8 and 9.) Each receiver-transmitter shall have successfully completed the normal burn-in and all equipment test (AET) prior to the start of RQT. The mission profile test cycle should begin at the "12 hour" point which is a cold day ground stabilization (-54°C) prior to ground operation and flight in a cold day. Random vibration should be applied with the units hard-mounted (without vibration isolators). The accept-reject criteria imposed shall be those of MIL-STD-781, Test Plan IIIC, with the upper test MTBF specified in 3.4.1.3.

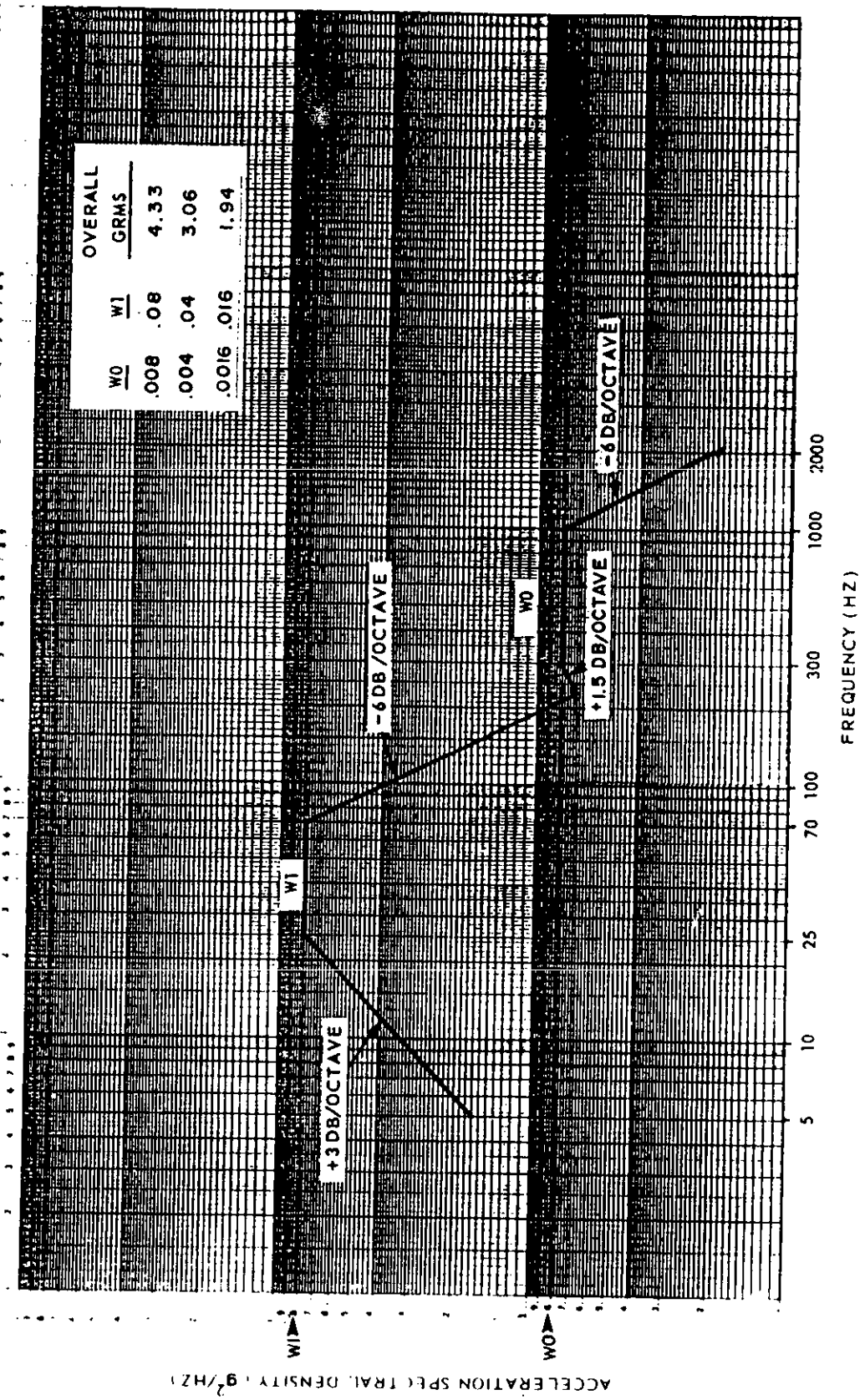



FIGURE 8. RQT vibration envelope (see 4.4.6)

NOTES:

1. THE CHAMBER AIR TEMPERATURE RATE OF CHANGE SHALL BE 5° C/MINUTE
2. THE INPUT VOLTAGE SHALL BE TURNED OFF LONG ENOUGH TO STABILIZE
3. DURING THE TEST THE INPUT VOLTAGE SHALL BE ADJUSTED BETWEEN 30.8 VDC 28.0VDC AND 25.2 VDC THE EQUIPMENT SHALL BE OPERATED FOR 7.5 "ON" HOURS (ALTERNATELY) AT EACH INPUT LEVEL

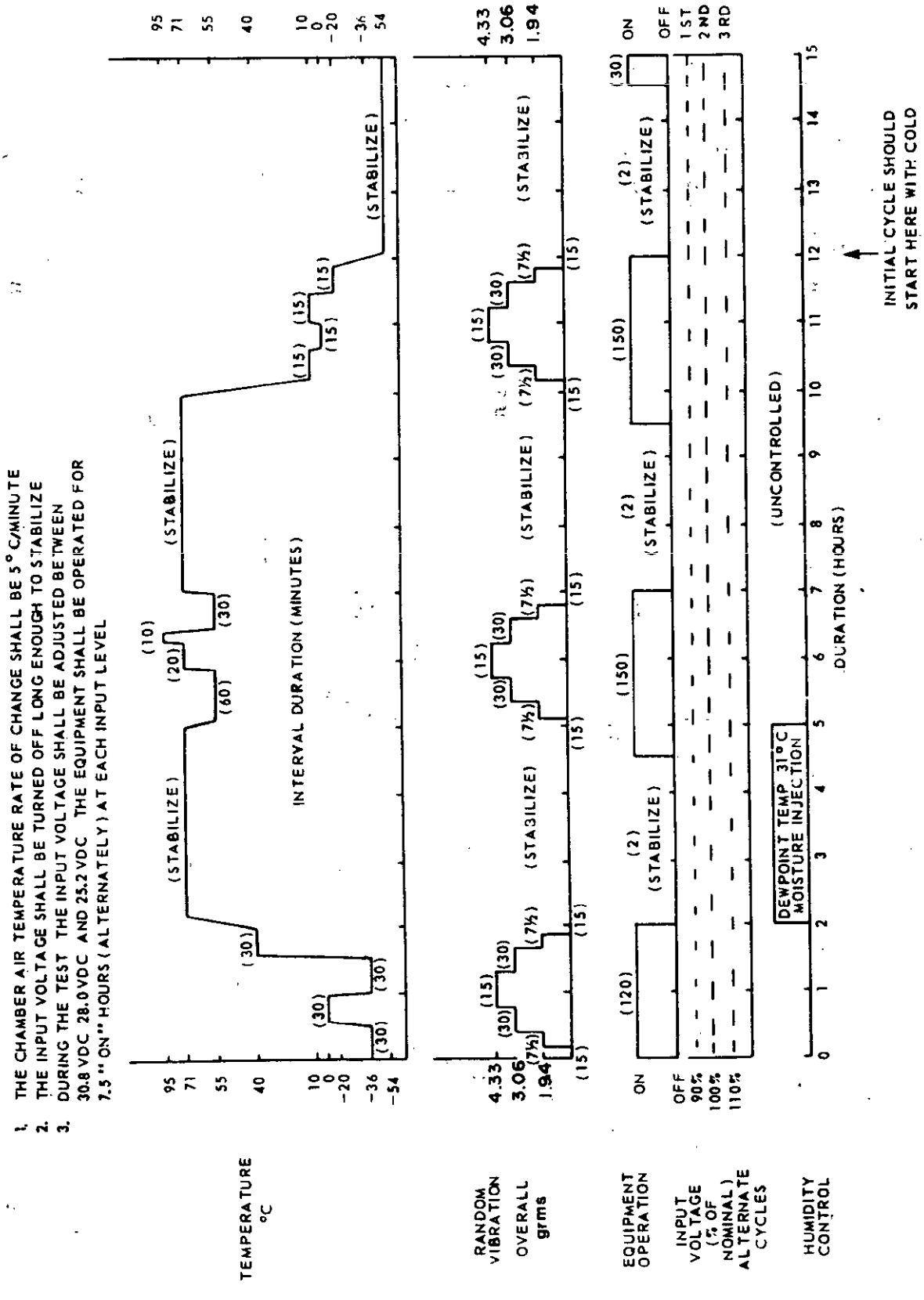



FIGURE 9. RQT mission profile test cycle (see 4.4.6 and 4.5.4.1)

4.4.7 Maintainability demonstration. A maintainability demonstration for intermediate level requirements shall be conducted in accordance with MIL-STD-2084 and MIL-STD-471. Test Method 1, Test Plan B of MIL-STD-471, shall be used.

4.4.8 Production receiver-transmitters. Receiver-transmitters supplied under the contract shall in all respects, including design, construction, workmanship, performance and quality, be capable of successfully passing the same tests as specified herein.

4.5 Quality conformance inspection. The contractor shall furnish all samples and shall be responsible for accomplishing the quality conformance tests. All inspection and testing may be under the supervision of the customer representative. The contractor shall retain test data showing quantitative results for all quality conformance tests. Such tests shall be signed/stamped 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. Quality conformance tests shall consist of the following:

a. Individual tests (see 4.5.1)

b. Manufacturing screening (see 4.5.2)

c. Sampling tests (see 4.5.3)

d. Reliability assurance tests (see 4.5.4)

e. Special tests (see 4.5.5)

4.5.1 Individual tests. Each receiver-transmitter submitted for acceptance shall be subjected to the individual tests. The tests shall be adequate to determine compliance with the requirements of materials, workmanship, operational adequacy and reliability. As a minimum, each receiver-transmitter accepted shall have passed the following tests:

a. Examination of product (see 4.5.1.1)

b. Operational test (see 4.5.1.2)

4.5.1.1 Examination of product. Each receiver-transmitter shall be examined carefully to determine that the material and workmanship requirements have been met.

4.5.1.2 Operational test. Each receiver-transmitter shall be operated long enough to permit the equipment temperature to stabilize and to check sufficient characteristics and record data to assure specified equipment operation.

4.5.2 Manufacturing screening. The contractor shall subject each WRA to manufacturing screening/burn-in prior to undergoing sample tests or reliability assurance tests. Manufacturing screening/burn-in shall consist of WRA random vibration and temperature cycling. An additional burn-in period may be used at the option of the contractor. If an additional burn-in period

is to be used, the details thereof must be included in the approved test procedures and must be the same for all equipment, including spare units.

4.5.2.1 WRA random vibration. Prior to conducting WRA temperature cycling, each WRA shall have completed a 10-minute failure-free vibration screen at 6.1g rms. Power spectral density shall cover 20-2000 Hertz. Pseudo-random vibration methods are acceptable. Vibration envelope is shown in Figure 10. The test item shall be hard mounted without vibration isolators and shall be operating throughout the test.

4.5.2.2 WRA temperature cycling. Each WRA shall undergo 25 temperature cycles between -54°C and 71°C. The rate of temperature change between extremes shall be at least 5°C per minute. When the WRA temperature has stabilized within 5°C or either temperature extreme, the WRA shall be soaked. Hot soak at +71°C shall be two hours; cold soak at -54°C duration shall be one hour. At the conclusion of each soak, the next temperature ramp shall begin. The WRA shall be energized throughout temperature cycling except during the cooldown period from +71°C to -54°C and during the 60 minute soak at -54°C. In addition, the WRA shall be turned off for one minute at points 30, 60, and 90 minutes into each hot soak period. Receiver-transmitter performance shall be periodically checked during each cycle and repairs shall be made to correct failures. The last five consecutive temperature cycles shall be failure free. One temperature cycle is defined as: operation at +71°C for the 120 minute hot soak (including three minutes "off"), non-operational cooldown to -54°C, 60 minute non-operational cold soak at -54°C, operational temperature increase to +71°C.

4.5.3 Sampling tests. Receiver-transmitters shall be subjected to sampling tests. Receiver-transmitters selected for sampling tests shall first have passed the individual tests. Receiver-transmitters will be selected for sampling tests by the government inspector in accordance with Table XV.

TABLE XV. Sampling test sample selection

| Quantity of equipments offered for acceptance | Quantity to be selected for sampling test |
|---|---|
| First 10 | 1 |
| Next 50 | 1 |
| Next 75 | 1 |
| Next 100 | 1 |
| | 1 for each additional 200 or fraction thereof |

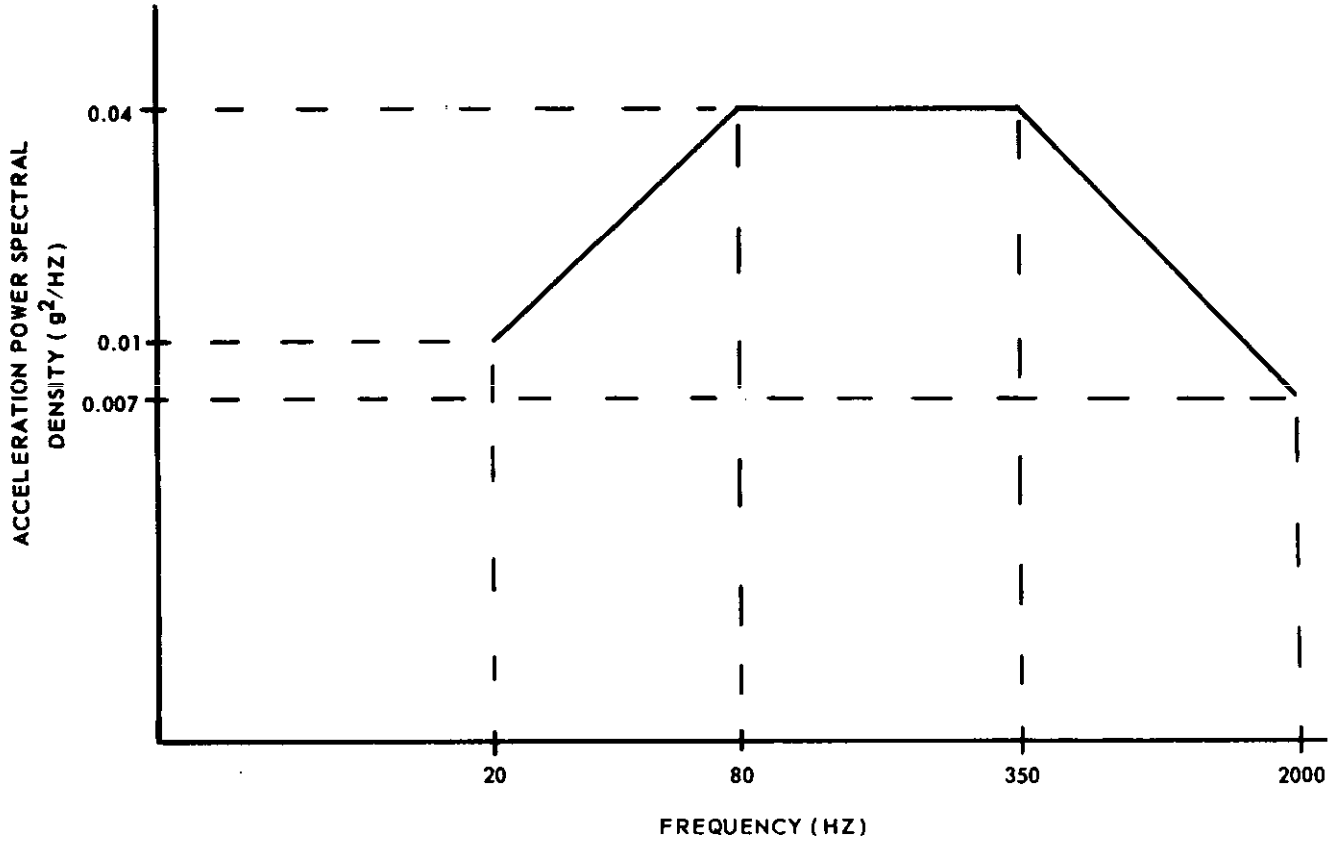



FIGURE 10. Manufacturing screening random vibration envelope (see 4.5.2.1)

Sampling tests are not required when reliability assurance tests are conducted.

4.5.3.1 Scope of sampling tests. As a minimum, each receiver-transmitter selected for sampling tests shall be subjected to the following tests:

a. Complete operational test at ambient room conditions, making all necessary measurements to assure that all applicable specification requirements have been met.

b. Operational test at certain environmental conditions. The conditions may vary for each receiver-transmitter tested and should be based on results of the first article, individual and special tests.

c. During the reliability sample test specified in 4.5.4.2, each failure shall be analyzed as to cause and remedial action necessary to reduce the possibility of its recurring in future equipment taken.

4.5.4 Reliability assurance tests. A reliability assurance test shall be conducted using MIL-STD-781. Classification of failure shall be in accordance with 4.5.7.

4.5.4.1 All equipment test. Each receiver-transmitter shall be tested as specified in MIL-STD-781 and modified herein. Temperature cycling and power on/off cycling shall be in accordance with Figure 9 and vibration in accordance with Figure 8 are required. The equipment shall be subjected to 4 1/2 hours of random vibration with equipment operating during temperature cycle 7, 8 or 9 and 4 1/2 hours of random vibration with equipment operating during or after successful completion of the last two temperature cycles. Each 4 1/2 hour random vibration period shall consist of three consecutive 90 minute cycles with three stepped levels in accordance with Figure 8, and durations in accordance with Figure 9. Random vibration may or may not be performed simultaneously with temperature cycling. Each receiver-transmitter shall have successfully completed 10 minutes of failure free random vibration as specified in 4.5.2 prior to the start of the test. Each equipment (WRA) shall be tested for 125 equipment operating hours with the last two cycles failure free and in addition, the last 4 1/2 hours of random vibration shall be failure free. For determining MTBF compliance each equipment (WRA) shall be tested separately as opposed to testing as an equipment system. The test MTBF shall be as listed in 3.4.1.3. To determine whether the MTBF is being met at any time during the contract the operating time and the failures therein (not counting any burn-in failures or burn-in operating time) shall be totaled and the results compared with the reject line of Test Plan XVIIIC of MIL-STD-781. (Extend the line as necessary to accommodate the data.) These totals shall accumulate so that at any time the experience from the beginning of the contract is included. At the conclusion of the month the test results shall be submitted to the customer. At any time that the current totals of test hours and test failures plotted on Test Plan XVIIIC curves show a reject situation, the procuring activity shall be notified. The procuring activity reserves the right to stop the acceptance of receiver-transmitter at any time that a reject situation exists pending a review of the contractors efforts to improve the equipment, the equipment parts, the equipment workmanship, so that the entire compilation will show other than a reject decision.

4.5.4.2 Reliability sample test. When specified in the contract a monthly sample test of equipments shall replace the reliability test of 4.5.4.1. Units shall be tested as specified in MIL-STD-781 as modified herein. Temperature cycling and power on/off cycling are required and shall be per Figure 9. Each sample equipment (WRA) shall be tested for 256 hours with the last two cycles failure free. For determining MTBF compliance each designated equipment (WRA) shall be tested separately as opposed to testing as an equipment system. The MTBF for each designated equipment shall be those listed in 3.4.1.3. To determine whether the MTBF is being met at any time during the contract the operating test hours and the failures therein (not counting any burn-in failures or burn-in operating time) shall be totaled and the results compared with the reject line of Test Plan IIIC 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 made available to the procuring activity as specified in the contractual data requirements list. The sample size shall be based on the production quantity of that equipment for the month as specified in Table XVI.

TABLE XVI. Reliability test sample size

| Production Quantity | Sample Size |
|---|---|
| 2 - 5 | 1 |
| 6 - 25 | 2 |
| 26 - 50 | 3 |
| 51 - 100 | 4 |

4.5.4.3 Test details. Test details such as the performance criteria to be measured, special failure criteria, preventive maintenance to be allowed during the test, shall be part of the test procedures to be prepared and made available by the contractor prior to the beginning of the reliability assurance tests (see 6.2.2).

4.5.4.4 Reliability assurance for spares and repair parts. Equipment, components, or parts which are supplied as spares or repair parts shall receive a reliability screening test as specified in 4.7. Details of the reliability screening test to be performed shall be included in the reliability program plan, the drawing for the item, and in the contractor's test procedures.

4.5.5 Special tests. When specified in the contract, special tests shall be conducted for the purpose of checking the effect of any design or material change on the performance of the receiver-transmitter and to assure quality control (see 6.2.1). The receiver-transmitter selected for special tests may be selected from receiver-transmitter previously subjected to the sampling or reliability tests.

4.5.5.1 Special test schedule. Selection of receiver-transmitters for special tests shall be made as follows:

a. On an early equipment after an engineering or material change.

b. Whenever failure reports or other information indicate that additional tests are required. (This will be determined by the procuring activity.)

4.5.5.2 Scope of special tests. Special tests shall consist of such tests as authorized by the procuring activity. Test procedures previously approved for the first article tests shall be used where applicable. When not applicable, the contractor shall prepare a test procedure and make it available to the procuring activity for acceptance prior to conducting the tests (see 6.2.2).

4.5.6 Equipment failure. Should a failure occur during either the sampling, reliability qualification, reliability assurance or special tests, the following action shall be taken:

a. Determine the cause of failure and the equipment BIT performance in detecting and isolating the failure.

b. Determine if the failure is an isolated case or design defect or pattern failure.

c. Prepare and make available to the procuring activity for review, proposed corrective action intended to reduce the possibility of the same component or BIT failure(s) occurring in future tests or documented justification where no corrective action is proposed (see 6.2.2).

d. Where practical, include a test in the individual test to check all receiver-transmitters for this requirement until assurance is obtained that the defect has been corrected.

4.5.7 Failure classification. All incidents occurring during reliability assurance tests shall be classified and reported as either relevant or non-relevant in accordance with MIL-STD-2074 and MIL-STD-781. Only those incidents classified as relevant failures shall be accountable for making an accept/reject decision.

4.5.7.1 Relevant failures. All test incidents shall be considered as relevant failures unless determined to be non-relevant in accordance with the criteria of MIL-STD-2074.

4.5.7.2 Non-relevant failures. Although non-relevant failures are not used for reliability assurance test accept/reject decisions, all test article incidents and equipment failures shall be recorded and reported (see 6.2.2).

4.6 Test procedures. The procedures used for conducting all tests required by Section 4 shall be prepared by the contractor and made available to the procuring activity for review and acceptance (see 6.2.2). The right is reserved by the procuring activity or the government representative to modify the tests or require any additional tests deemed necessary to determine compliance with the requirements of the specification or the contract (see 6.2.1). MIL-T-18303 shall be used as a guide for preparation of test procedures.

4.7 Testing of spares and repair parts. Equipment delivered as spare or repair parts shall undergo acceptance tests to ensure that the items meet performance and reliability requirements not less than those imposed in production.

4.7.1 Weapons replaceable assemblies. All items to be delivered as spares at the weapons replaceable assembly (WRA) or higher level shall receive performance, burn-in and reliability assurance tests commensurate with that afforded the original production equipment.

4.7.2 Shop replaceable assemblies. All items to be delivered as spares at the shop replaceable assembly (SRA) or sub-SRA level shall receive functional checks and a burn-in under conditions and for a duration commensurate with that imposed on that assembly in the original production.

4.7.3 Repair parts. All electronic component parts to be delivered as repair parts shall receive functional and burn-in screening tests equivalent to those imposed for the nearest military standard part.

4.7.4 Test details. The details of acceptance tests to be performed on SRA's and WRA's supplied as spare or repair parts shall be incorporated into item specifications and drawings.

4.8 Presubmission testing. No item, part, or complete equipment shall be submitted until it has been previously tested by the manufacturer and found to comply with all applicable requirements of this specification and the contract.

## 5. PACKAGING

5.1 General. All major units and parts of the receiver-transmitter shall be preserved, packaged, packed, and marked in accordance with MIL-E-17555 for the level of shipment specified in the contract or purchase order (see 6.2.1).

5.2 Marking. Shipments shall be marked in accordance with requirements of MIL-STD-129.

## 6. NOTES

6.1 Intended use. The receiver-transmitters specified herein are one portion of the AN/ARC-182(V) radio system. The AN/ARC-182(V) is a variable configuration of units using common modules that can be used to meet the prime and back-up UHF voice plus prime UHF/VHF/AM/FM voice and data communication requirements in any tactical aircraft. The variable configurations are intended to provide direct physical replacement of AN/ARC-159(V) radios. They are intended for production incorporation in new aircraft plus retrofit in selected aircraft.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number and date of this specification

b. If a first article inspection is not required (see 3.2, 6.3)

c. If reliability program is not to be established by contractor (see 3.4.1)

d. If receiver characteristics for main and guard receivers are not to be the same (see 3.6.1.13)

e. Test procedure modifications or additional tests, if required (see 4.6)

f. Selection of applicable levels of packaging and packing (see 5.1)

g. Whether all Equipment Test or Reliability Sample Test is required (see 4.5.4.1, 4.5.4.2)

6.2.2 Data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL) the data requirements identified below will be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (DD Form 1423) incorporated into the contract. When the provisions of DAR-7-104.9(n) are invoked, and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraphs:

| Paragraph | Data requirement title | Applicable DID option |
|---|---|---|
| 4.4, 4.6 | Procedure, First Article Inspection | DI-T-4901 |
| 4.4.1, 4.4.3 | Report, First Article Inspection | DI-T-4902 |
| 4.5.4.3 | Procedures, Reliability Tests | DI-R-7035 |
| 4.5.5.2 | Procedures, Production/Acceptance Inspection | DI-T-4903 |
| 4.5.6c | Plan, Failure Data Collection, Analysis and Corrective Action | UDI-T-23719 |
| 4.5.7.2 | Report, Failure | DI-R-4805 |

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed a such in DoD 5000.19L., Vol. II AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.3 Options. The following options are available:

a. An additional burn-in period is allowable at the option of the contractor (see 4.5.2).

b. Acceptance of equipment may be stopped any time a reject situation exists in the All Equipment Test. This is at the option of the procuring activity (see 4.5.4.2).

6.4 First article. When a first article inspection is required the item will be tested and should be a first article sample. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examination test, approval, and disposition of the documents' first article.

6.5 Associated equipment. The receiver-transmitter should operate with the associated equipment listed in Table XVII which should not be supplied as part of this equipment:

TABLE XVII. Associated equipment

| Item | Equipment Designation | Military Specification |
|---|---|---|
| Intercommunications Sets | AN/AIC-10, AN/AIC-14<br>AN/AIC-18, AN/AIC-25<br>C-6533/ARC | MIL-I-22353<br>MIL-I-27543<br>MIL-C-55653 |
| Microphones, Boom Mounted | M-96A/A | MIL-M-22179 |
| Amplifiers, Audio Frequency | AM-3597B/A | MIL-A-23595 |
| Antenna | AS-3191/A<br>AS-3238/A<br>AS-3585/A<br>AS-3584/A | MIL-A-85670 |
| Switch | SA-521A/A with Selector Antenna C-2193B/A | MIL-S-25879 |
| Direction Finder Group | AN/ARC-25, AN/ARC-48<br>AN/ARA-50, AN/ARD-6987 | MIL-D-7030<br>MIL-D-38402 |
| Speech Security Equipment | TSEC/KY-28<br>TSEC/KY-58 | CSEEB-13<br>CSEEB-32/<br>CSESD-14 |
| VHF Homing Indicator | ID-1351/A | SCS-405 |
| Radio Set, Survival | AN/PRC-90 | MIL-R-81493 |
| Night Vision Goggles | AN/PVS-5 | MIL-N-49065 |

TABLE XVII. Associated equipment - Continued

| Item | Equipment Designation | Military Specification |
|---|---|---|
| Indicator, Frequency/Channel | ID-2121A/ARC<br>ID-2229A/ARC<br>ID-2303/ARC | MIL-I-85671(AS)<br>MIL-I-85671(AS)<br>MIL-I-85671(AS) |
| Control, Radio Set | C-10319A/ARC<br>C-10776A/ARC<br>C-11131/ARC | MIL-C-85666<br>MIL-C-85666<br>MIL-C-85666 |
| Control, Radio Set | C-10320A/ARC<br>C-10777A/ARC<br>C-11132/ARC | MIL-C-85674<br>MIL-C-85674<br>MIL-C-85674 |
| Control Radio Set | C-11128/ARC<br>C-11129/ARC<br>C-11130/ARC | |
| Generator-Transmitter Group | AN/ASA-76 | MIL-G-81665 |
| Switching Unit | SA-2157A/ARC | MIL-S-85673 |

Preparing Activity:
Navy AS
(Project 5821-N174)

# EXTERNAL CONTROL INTERFACE

## 10. SCOPE

10.1 Scope. This appendix details the external control interface for the Radio RT-1250A/ARC Receiver-Transmitter and associated data. This appendix is mandatory part of this specification. The information contained herein is intended for compliance.

## 20. APPLICABLE DOCUMENTS

Specifications

Military

| | |
|---|---|
| MIL-C-85666 | Control, Radio Sets C-10319A/ARC, C-10776A/ARC, C-11131/ARC |

Standards

Military

| | |
|---|---|
| MIL-STD-1553 | Aircraft Internal Time Division Multiplex Data Bus |

## 30. REQUIREMENTS

30.1 Parallel control lines. The receiver-transmitter shall interface with other equipment in the system using the parallel lines of J2 as specified in Table XVIII.

30.2 Serial data bus. The serial data bus shall be used to communicate between the remote controls, indicators, and host receiver-transmitter. The serial data bus shall consist of a shielded twisted pair for the data bus and a shielded twisted pair for the clock bus. The characteristics of the lines are specified in Table XIX (Pins J2-J18, 19, 26 and 27). Further definition of the serial interface is contained in MIL-C-85666. The receiver-transmitter shall have capability of being operated as one of two receiver-transmitters from one remote control unit via the slow speed bus.

30.3 Mux bus interface (MIL-STD-1553B). The receiver-transmitter shall interface with the aircraft time division multiplex data bus as specified in MIL-STD-1553. The receiver-transmitter shall provide dual (redundant) driver/receiver interconnection directly to the 1553B Bus using the word structure and protocol specified in MIL-STD-1553B, except that the response time to a valid transmit data command shall be between the limits of four and seven microseconds using the test conditions specified in MIL-STD-1553. The message format for the receiver-transmitter shall be as defined in Table XVII.

TABLE XVIII Receiver-transmitter power/control connector (J2) interface characteristics 1/

| Pin No. | I/O | Function | Characteristics |
|---|---|---|---|
| 1 | I | 1553 Terminal Address A0 | Ground=0, Open=1, LSB of 5 Bit Address |
| 2,3 | I | Input Power | +28 VDC per MIL-STD-704C<br>150 watts maximum in transmit<br>20 watts maximum in receive |
| 4 | I/O | System On/Off | 0 to 7 VDC turns RT on, open circuit turns RT off. 25 mA current sink capability required of external switch if used. Open circuit DC resistance shall be >100 KOHMS |
| 5 | I | Squelch Disable | Ground or 0 VDC ± 5 VDC disables main receiver squelch. Open circuit enables main receiver squelch. |
| 6 | I | Tone Transmit | Ground or 0 VDC ± 5 VDC keys transmitter with 1000 Hz tone modulation. Open circuit for not tone transmit. |
| 7 | I | 1553 Terminal Address A1 | Ground=0, Open=1 |
| 8,9 | I | Ground | Ground return for input power and signal circuits. |
| 10 | I | 1553 Terminal Address A2 | Ground=0, Open=1 |
| 11 | I | External Sync | Used with have quick applique to strobe data into RT-ground or 0 to ± 0.5 VDC no data transfer. Open=data transfer. Pulse duration ≥ 20 microseconds. Function is used only in conjunction with pin 41. |
| 12 | I | 1553 Terminal Address A3 | Ground=0, Open=1 |
| 13 | I | Guard Precedence | Ground or 0 ± 5 VDC turns on RT to 243 MHz, open for normal operation. Open circuit impedance shall be > 100K Ohms. |

1/ This Table indicates nominal characteristics for specification limits see appropriate paragraphs, herein.

TABLE XVIII. Receiver-transmitter power/control connector (J2) interface characteristics - Continued

| Pin No. | I/O | Function | Characteristics |
|---|---|---|---|
| 14 | I | 1553 Terminal Address A4 | Ground=0, Open=1, MSB of 5 Bit address |
| 15 | I | Receiver Sensitivity | Ground or 0 VDC ± 1 VDC reduces receiver sensitivity by 10 dB in frequency range of 108 to 174 MHz. Open circuit for full sensitivity. |
| 16 | 0 | UHF Band Indicator | Open collector transistor output capable of sinking up to 100 mA. At Eo < 1 VDC for UHF mode. Open circuit in all VHF bands. |
| 17 | I | X-Mode Audio Select | Ground or 0 VDC ± 5 VDC for X-mode audio select. Open circuit for normal operation. 40 mA current sink capability required of external switch contact. |
| 18 | I/O | Clock (HI) | Active only when control information is being sent, "1"=3.5 VDC to 5.5 VDC. "0"=0 VDC to 1.0 VDC. 2.7K Ohm source impedance, 22K load impedance. Line is at "0" when not active. |
| 19 | I/O | Data (HI) | Same as pin 18, except line is at "1" when not active. |
| 20 | 0 | ADF Indicator | Same as pin 16 except ground (≤1 VDC) is provided when in ADF mode. |
| 21 | 0 | Homing Direction | Unbalanced DC meter drive current of ±100 microamp to ±500 microamp for 25 degrees phase shift between homing antenna ports. Load impedance=1000 ohms. |
| 22 | I | CASS/DICASS | 0.5 vrms for 90% AM modulation |
| 23 | 0 | Low VHF-FM Band | Same as pin 16 except ground (<1 VDC) is indicator provided for low VHF-FM band operation. |
| 24 | 0 | Homing Flag | Same as pin 16 except ground (≤1 VDC) is provided when RT is in homing mode and signal strength is adequate to break squelch. |

TABLE XVIII. Receiver-transmitter power/control connector (J2) interface characteristics - Continued

| Pin No. | I/O | Function | Characteristics |
|---|---|---|---|
| 25 | I | Take Control-Normal | Open circuit=RT under 1553 Bus control. Ground=RT under remote control. |
| 26 | I/O | Clock (LO) | Same as pin 18 except line is at "1" when not active. |
| 27 | I/O | Data (LO) | Same as pin 18 except line is at "1" when not active. |
| 28 | O | AM Mode Indicator | Same as pin 16 except ground ($\leq$1 VDC) is provided when RT is in AM mode. |
| 29 | O | Wideband Receive | 0.25 VRMS to 8.3 VRMS into 20K Ohms +2, -4 dB from 30 Hz to 25 KHz. |
| 30 | I | Transmit Blanking | Ground or 0 VDC ±1 VDC inhibits transmitter. Open enables normal transmitter controls. |
| 31 | O | ADF Audio Out | 4 VPP minimum into 20K Ohms; Freq response ± 2 dB from 50 Hz to 10 KHz. |
| 32 | O | Equip Ready (HI) | 5 VDC (±1 VDC) differential logic |
| 33 | O | Equip Ready (LO) | "1"=pin 32 positive with respect to pin 33 (1553 interface ready)<br>"0"=pin 33 positive with respect to pin 32 (1553 interface not ready) |
| 34 | I | Bandwidth Control | Ground or 0 VDC ±5 VDC=wideband open or > 10 VDC=narrowband 5 mA current sink capability required of external switch |
| 35 | - | Spare | |
| 36 | O | Voice Output (150) | High side of 150 Ohm balanced output. Pin 44 is common side. |
| 37 | O | Voice Output (600) | High side of 600 Ohm balanced output. Pin 44 is common side. |
| 38 | O | Guard Low Level Output | .15 VRMS to .45 VRMS into 600 Ohm load, unbalanced. |

TABLE XVIII. Receiver-transmitter power/control connector (J2) interface characteristics - Continued

| Pin No. | I/O | Function | Characteristics |
|---|---|---|---|
| 39 | O | Retransmit Control | Same as pin 16 except ground (<1 VDC) is (key) provided when received signal strength is sufficient to break squelch. |
| 40 | I | Retransmit Audio In | 6.5 VRMS into 1000 Ohms provide 90 percent AM or ± 5.6 KHz FM deviation. |
| 41 | I | Take Control-Special | Used for HAVE QUICK mode of operation. Ground or 0 VDC ± 1 VDC=HAVE QUICK open=normal mode. |
| 42 | O | Retransmit Audio Out | 6.5 VRMS ± 1 VRMS into 1000 Ohms for 30 percent AM or ± 2.4 KHz FM deviation with 250 mW output. Output impedance = 60 Ohms max. |
| 43 | I | Push to Talk (PTT) | Ground or 0 VDC ± 5 VDC-transmitter keyed open or > 10 VDC=receive mode. |
| 44 | O | Voice Output (Common) | Common side of balanced voice output. |
| 45 | O | Station Approach | Unbalanced DC meter drive current of 150 microamps at input signal strength of -30 dBm; load impedance=1000 Ohms. 0 microamps at approx. -100 dBm. |
| 46 | O | GD if AGC | Test point - positive going voltage between 1 VDC and 7 VDC for increasing signal strength. |
| 47 | I | Mic Audio In (LO) | Common side of microphone input. Grounded in RT. |
| 48 | I | Wideband Transmit Audio In | 12 VPP ± 1V into 2000 Ohms produces 90 percent AM or ± 5.6 kHz FM deviation. |
| 49 | I | Maritime Offset | Ground or 0 VDC ± 5 VDC causes RT to operate in half-duplex mode with 4.6 MHz offset on selected frequencies in the maritime band. Open or 10 VDC=normal simplex operation. |

TABLE XVIII. Receiver-transmitter power/control connector (J2) interface characteristics - Continued

| Pin No. | I/O | Function | Characteristics |
|---|---|---|---|
| 50 | - | Spare | |
| 51 | I | X-Mode Receive Audio In | Deciphered audio from secure voice equipment. 6.5 VRMS into 110 Ohms required for 250 MW output. |
| 52 | O | Unattenuated Audio out | Same as pin 42 except is disconnected from RT audio circuits when pin 17 is grounded. |
| 53 | I | Mic Audio In (HI) | Adjustable 0.25 VRMS to 1.5 VRMS for 90 percent AM or ± 5.6 kHz FM deviation. Input impedance=175 Ohm ± 25 percent normally adjusted for 0.5 VRMS input. |
| 54 | - | Spare | |
| 55 | I | Ground | Chassis ground in RT |

TABLE XIX. Receiver-transmitter message format

MESSAGE 1: BUS CONTROLLER TO RT-1250A
(FREQUENCY/MODE CONTROL)

| COM (T/R =0) | D.W. #1 | D.W. #2 | * | STATUS |
|---|---|---|---|---|

MESSAGE 2: RT-1250A TO BUS CONTROLLER
(FREQUENCY/MODE STATUS REPORT)

| COM (T/R =1) | * | STATUS | D.W. #1 | D.W. #2 |
|---|---|---|---|---|

MESSAGE 15: RT-1250A TO BUS CONTROLLER
BUILT-IN TEST (BIT) REPLY

| COM (T/R =1) | * | STATUS | D.W. #1 | D.W. #2 |
|---|---|---|---|---|

MESSAGE 30: BUS CONTROLLER TO RT-1250A
BIT INITIATE

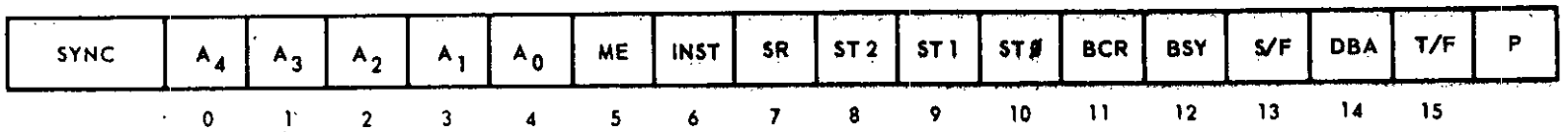
| COM (T/R =0) | D.W. #1 | D.W. #2 | * | STATUS |
|---|---|---|---|---|

MODE CONTROL:
BUS CONTROLLER TO RT-1250A

2. TRANSMIT STATUS WORD
4. TRANSMITTER SHUTDOWN (BUS DRIVER)
5. OVERRIDE TRANSMITTER SHUTDOWN (BUS DRIVER)
8. RESET REMOTE TERMINAL

| COM (T/R =1) | * | STATUS |
|---|---|---|

TABLE XIX. Receiver-transmitter message format - Continued

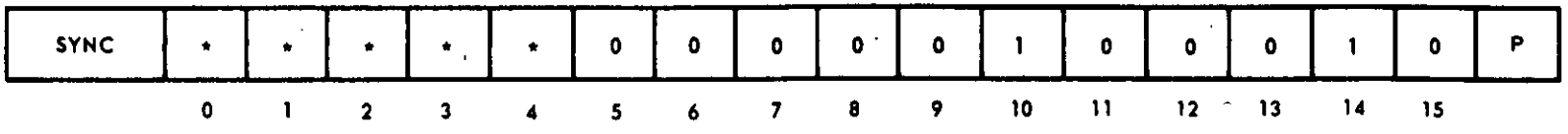


| SYNC | $A_4$ | $A_3$ | $A_2$ | $A_1$ | $A_0$ | ME | INST | SR | ST 2 | ST 1 | ST Ø | BCR | BSY | S/F | DBA | T/F | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | |

| BIT # | FUNCTION |
|---|---|
| 0 | $A_4$ – 1553 ADDRESS (MSB) |
| 1 | $A_3$ – 1553 ADDRESS |
| 2 | $A_2$ – 1553 ADDRESS |
| 3 | $A_1$ – 1553 ADDRESS |
| 4 | $A_0$ – 1553 ADDRESS (LSB) |
| 5 | ME – 1=MESSAGE ERROR |
| 6 | INST – INSTRUMENTATION BIT, ALWAYS "0" |
| 7 | SR – SERVICE REQUEST (NOT USED) |
| 8 | ST 2 – SPARE |
| 9 | ST 1 – SPARE |
| 10 | ST Ø – SPARE |
| 11 | BCR – 1=BROADCAST COMMAND RECEIVED |
| 12 | BSY – 1=BUSY |
| 13 | S/F – SUBSYSTEM FLAG, 1=R/T FAULT |
| 14 | DBA – DYNAMIC BUS ACCEPTANCE (NOT USED) |
| 15 | T/F – TERMINAL FLAG, 1=1553 TERMINAL FAULT |

MESSAGE NO. ALL
WORD NO. STATUS
FROM: RT–1250A
TO: BUS CONTROLLER

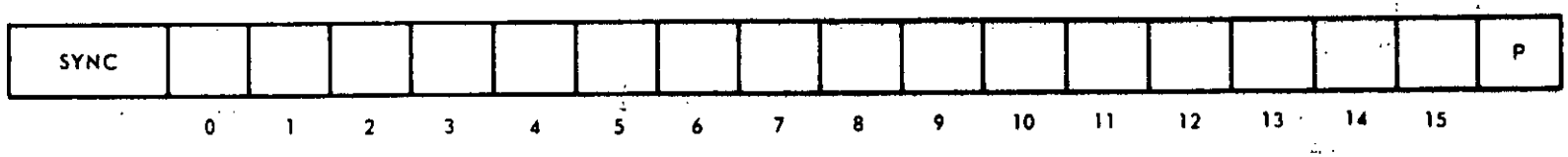
TABLE XIX. Receiver-transmitter message format - Continued




* TERMINAL ADDRESS

MESSAGE NO. 1
WORD NO. COMMAND
FROM: BUS CONTROLLER
TO: RT-1250A

TABLE XIX. Receiver-transmitter message format - Continued




| BIT # | FUNCTION | |
|---|---|---|
| 0 | 80 | MHZ |
| 1 | 40 | |
| 2 | 20 | |
| 3 | 10 | |
| 4 | 8 | MHZ |
| 5 | 4 | |
| 6 | 2 | |
| 7 | 1 | |
| 8 | 800 | KHZ |
| 9 | 400 | |
| 10 | 200 | |
| 11 | 100 | |
| 12 | 50 | KHZ |
| 13 | 25 | |
| 14 | 200 | MHZ |
| 15 | 100 | |

MESSAGE NO. 1
WORD NO. 1
FROM: BUS CONTROLLER
TO: RT-1250A

TABLE XIX. Receiver-transmitter message format - Continued

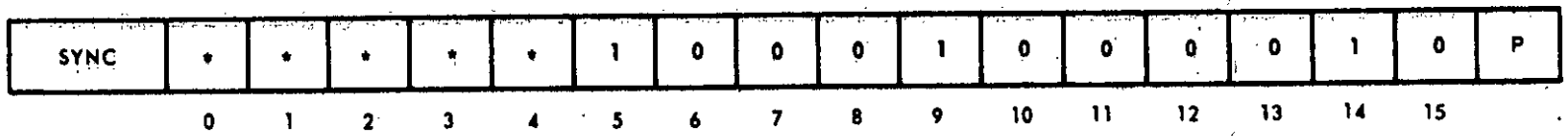
| SYNC | MDA | MDB | SQL | A/F | SP Ø | SP 1 | MO | GM | SP 4 | SP 5 | SP 6 | SP 7 | SP 8 | SP 9 | SP 10 | SP 11 | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | |

| BIT # | FUNCTION |
|---|---|
| 0 | MDA – MODE A |
| 1 | MDB – MODE B |
| 2 | SQL – Ø=SQUELCH DISABLED |
| 3 | A/F – AM/FM, Ø=UHF FM DISABLED |
| 4 | SP Ø — SPARE |
| 5 | SP 1 — SPARE |
| 6 | MO – 1=MARITIME OFFSET |
| 7 | GM – 1=GUARD MODE |
| 8 | SP 4 — SPARE |
| 9 | SP 5 — SPARE |
| 10 | SP 6 — SPARE |
| 11 | SP 7 — SPARE |
| 12 | SP 8 — SPARE |
| 13 | SP 9 — SPARE |
| 14 | SP 10 — SPARE |
| 15 | SP 11 — SPARE |

| OPERATION MODE | MODE A | MODE B |
|---|---|---|
| T/R | 0 | 0 |
| T/R+G | 0 | 1 |
| SPARE | 1 | 0 |
| DF | 1 | 1 |

MESSAGE NO. 1
WORD NO. 2
FROM: BUS CONTROLLER
TO: RT-1250A

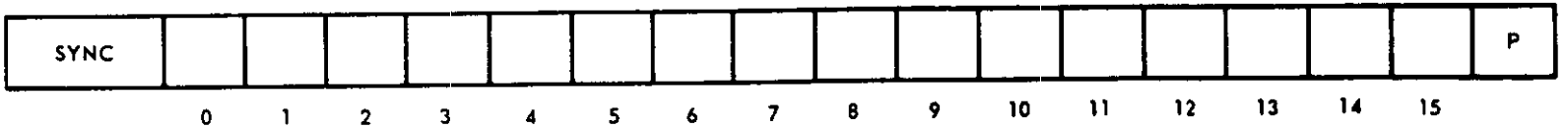
TABLE XIX. Receiver-transmitter message format - Continued




* TERMINAL ADDRESS

MESSAGE NO. 2
WORD NO. COMMAND
FROM: RT-1250A
TO: BUS CONTROLLER

TABLE XIX. Receiver-transmitter message format - Continued




| BIT # | FUNCTION | |
|---|---|---|
| 0 | 80 | MHZ |
| 1 | 40 | |
| 2 | 20 | |
| 3 | 10 | |
| 4 | 8 | MHZ |
| 5 | 4 | |
| 6 | 2 | |
| 7 | 1 | |
| 8 | 800 | KHZ |
| 9 | 400 | |
| 10 | 200 | |
| 11 | 100 | |
| 12 | 50 | KHZ |
| 13 | 25 | |
| 14 | 200 | MHZ |
| 15 | 100 | |

MESSAGE NO. 2
WORD NO. 1
FROM: RT-1250A
TO: BUS CONTROLLER

TABLE XIX. Receiver-transmitter message format - Continued

| SYNC | MDA | MDB | SQL | A/F | T/R | IF | MO | GM | HQ | SQS | AFS | SP 7 | SP 8 | SP9 | SP 10 | SP 11 | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | |

| BIT # | FUNCTION |
|---|---|
| 0 | MDA – MODE A |
| 1 | MDB – MODE B |
| 2 | SQL – Ø = SQUELCH DISABLED |
| 3 | A/F – AM/FM, Ø = UHF FM DISABLED |
| 4 | T/R – Ø = RADIO KEYED |
| 5 | IF – 1 = INVALID FREQUENCY |
| 6 | MO – 1 = MARITIME OFFSET |
| 7 | GM – 1 = GUARD MODE |
| 8 | HQ – 1 = HQ MODE |
| 9 | SQL STATUS Ø = SQUELCH DISABLED |
| 10 | AM/FM STATUS OF RT Ø = AM |
| 11 | SP 7 — SPARE |
| 12 | SP 8 — SPARE |
| 13 | SP 9 — SPARE |
| 14 | SP 10 — SPARE |
| 15 | CONFIGURATION 1=RT-1250A |

| OPERATION MODE | MODE A | MODE B |
|---|---|---|
| T/R | 0 | 0 |
| T/R + G | 0 | 1 |
| SPARE | 1 | 0 |
| DF | 1 | 1 |

MESSAGE NO. 2

WORD NO. 2

FROM: RT-1250A

TO: BUS CONTROLLER

TABLE XIX. Receiver-transmitter message format - Continued

| SYNC | * | * | * | * | * | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | |

* TERMINAL ADDRESS

MESSAGE NO. 15
WORD NO. COMMAND
FROM: RT-1250A
TO: BUS CONTROLLER

TABLE XIX. Receiver-transmitter message format - Continued

| SYNC | RØ | R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 | R10 | R11 | R12 | R13 | R14 | R15 | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | |

| BIT # | FUNCTION |
|---|---|
| 0 | RØ |
| 1 | R1 |
| 2 | R2 |
| 3 | R3 |
| 4 | R4 |
| 5 | R5 |
| 6 | R6 |
| 7 | R7 |
| 8 | R8 |
| 9 | R9 |
| 10 | R10 |
| 11 | R11 |
| 12 | R12 |
| 13 | R13 |
| 14 | R14 |
| 15 | R15 |

TERMINAL TEST CODE
RANDOM BIT PATTERN
FROM MESSAGE 30, WORD 2

MESSAGE NO. 15
WORD NO. 1
FROM: RT-1250A
TO: BUS CONTROLLER

TABLE XIX. Receiver-transmitter message format - Continued

| SYNC | | | | | | | | | | | | | | | | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |

| BIT # | FUNCTION | | |
|---|---|---|---|
| 0 | BUILT IN TEST | 1 = IN TEST | Ø = NOT IN TEST |
| 1 | EQUIPMENT GO/NO-GO | 1 = NO-GO | Ø = GO |
| 2 | BIT COMPLETE | 1 = TEST COMPLETE | Ø = TEST NOT COMPLETE |
| 3 | RADIO GO/NO GO | 1 = NO-GO | Ø = GO |
| 4 | ANTENNA GO/NO-GO | 1 = NO-GO | Ø = GO |
| 5 | RT TYPE | | |
| 6 | RT TYPE | | |
| 7 | BIT 3.2 (MSB) | BINARY NUMBER OF MOST LIKELY SRA FAULT | |
| 8 | BIT 3.1 | | |
| 9 | BIT 3.0 (LSB) | | |
| 10 | BIT 2.2 (MSB) | BINARY NUMBER OF 2ND MOST LIKELY SRA FAULT | |
| 11 | BIT 2.1 | | |
| 12 | BIT 2.0 (LSB) | | |
| 13 | BIT 1.2 (MSB) | BINARY NUMBER OF 3RD MOST LIKELY SRA FAULT | |
| 14 | BIT 1.1 | | |
| 15 | BIT 1.0 (LSB) | | |

| | B5 | B6 |
|---|---|---|
| RT-1250 | 0 | 0 |
| RT-1250A | 0 | 1 |
| SPARE | 1 | 0 |
| SPARE | 1 | 1 |

EXAMPLE: 6-5-1

| B7 | B8 | B9 | B10 | B11 | B12 | B13 | B14 | B15 |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |

MESSAGE NO. 15
WORD NO. 2
FROM: RT-1250A
TO: BUS CONTROLLER

TABLE XIX. Receiver-transmitter message format - Continued

| SYNC | * | * | * | * | * | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | |

* TERMINAL ADDRESS

MESSAGE NO. 30
WORD NO. COMMAND
FROM: RT-1250A
TO: BUS CONTROLLER

TABLE XIX. Receiver-transmitter message format - Continued

| SYNC | IBIT | SP Ø | MCS | SP 2 | SP 3 | SP 4 | SP 5 | SP 6 | SP 7 | SP 8 | SP 9 | SP 10 | SP 11 | SP 12 | SP 13 | SP 14 | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | |

Ø = STANDARD CONFIGURATION

NOTE: R/T WILL INITIALIZE MCS BIT TO A LOGICAL "Ø" ON POWER-UP. IF BIT IS SET TO LOGICAL "1" BY BUS CONTROLLER, USE OF BUSY BIT AND TERMINAL FLAG WILL BE SUPPRESSED.

| BIT # | FUNCTION |
|---|---|
| 0 | IBIT – INITIATE BUILT IN TEST |
| 1 | SP Ø – SPARE |
| 2 | MCS – MUX CONFIGURATION STATUS |
| 3 | SP 2 |
| 4 | SP 3 |
| 5 | SP 4 |
| 6 | SP 5 |
| 7 | SP 6 |
| 8 | SP 7 |
| 9 | SP 8 |
| 10 | SP 9 |
| 11 | SP 10 |
| 12 | SP 11 |
| 13 | SP 12 |
| 14 | SP 13 |
| 15 | SP 14 |

SPARE

MESSAGE NO. 30
WORD NO. -1
FROM: BUS CONTROLLER
TO: RT-1250A

TABLE XIX. Receiver-transmitter message format - Continued

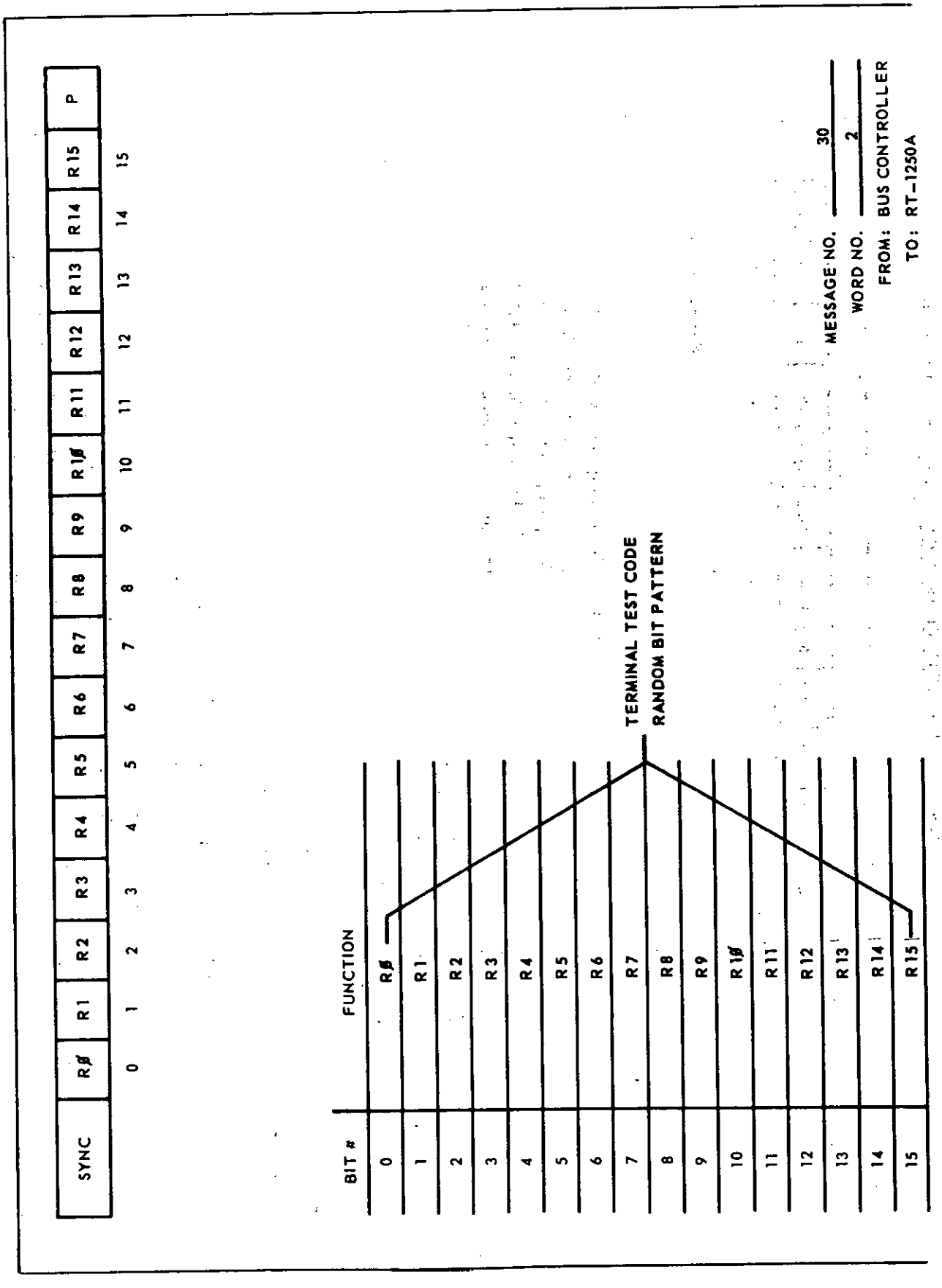


TABLE XIX. Mode Control Command Message Formats
(Bus Controller to RT-1250A) - Continued

**MODE CODE 2: TRANSMIT STATUS WORD**

| SYNC | * | * | * | * | * | 1 | 0 0 0 0 0 OR 1 1 1 1 1 | 0 | 0 | 0 | 1 | 0 | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 7 8 9 10 | 11 | 12 | 13 | 14 | 15 | |

**MODE CODE 4: TRANSMITTER SHUTDOWN (BUS DRIVER)**

| SYNC | * | * | * | * | * | 1 | 0 0 0 0 0 OR 1 1 1 1 1 | 0 | 0 | 1 | 0 | 0 | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 7 8 9 10 | 11 | 12 | 13 | 14 | 15 | |

**MODE CODE 5: OVERRIDE TRANSMITTER SHUTDOWN**

| SYNC | * | * | * | * | * | 1 | 0 0 0 0 0 OR 1 1 1 1 1 | 0 | 0 | 1 | 0 | 1 | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 7 8 9 10 | 11 | 12 | 13 | 14 | 15 | |

**MODE CODE 8: RESET REMOTE TERMINAL**

| SYNC | * | * | * | * | * | 1 | 0 0 0 0 0 OR 1 1 1 1 1 | 0 | 1 | 0 | 0 | 0 | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 7 8 9 10 | 11 | 12 | 13 | 14 | 15 | |

* TERMINAL ADDRESS



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# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

*(See Instructions – Reverse Side)*

| 1. DOCUMENT NUMBER | 2. DOCUMENT TITLE |
|---|---|
| MIL-R-85664(AS) | Receiver-Transmitter, Radio RT-1250A/ARC, Specification for |

| 3a. NAME OF SUBMITTING ORGANIZATION | 4. TYPE OF ORGANIZATION *(Mark one)* |
|---|---|
| | ☐ VENDOR |
| b. ADDRESS *(Street, City, State, ZIP Code)* | ☐ USER |
| | ☐ MANUFACTURER |
| | ☐ OTHER *(Specify)*: _____ |

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

| 7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional | b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional |
|---|---|
| c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional | 8. DATE OF SUBMISSION *(YYMMDD)* |

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