INCH-POUND

MIL-DTL-25707F
16 April 2008
SUPERSEDING
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23 July 1999

DETAIL SPECIFICATION

ANTENNA, FLUSH MOUNT, L-BAND,
GENERAL SPECIFICATION FOR

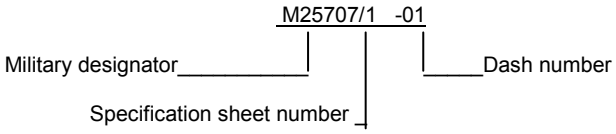
This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This document covers the general requirements for flush mounted L-band antennas within the frequency range of 960 to 1,220 MHz.

1.2 Classification. Antennas covered by this document are classified by style, as specified (see 3.1).

1.3 Part or Identifying Number (PIN). The PIN consists of the letter M, the basic number of the specification sheet, and an assigned dash number (see 3.1) as shown in the following:



2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, issues of these documents are those cited in the solicitation or contract (see 6.2).

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-3643	-	Connectors, Coaxial, Radio Frequency, Series HN, and Associated Fittings, General Specification for.
MIL-PRF-5606	-	Hydraulic Fluid, Petroleum Base; Aircraft, Missile, and Ordnance.
MIL-DTL-5624	-	Turbine Fuel, Aviation, Grades JP-4, JP-5, and JP-5/JP-8ST.
MIL-PRF-39012	-	Connectors, Coaxial, Radio Frequency: General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-810	-	Test Methods Standard for Environmental and Engineering Considerations and Laboratory Tests.
MIL-STD-1285	-	Marking of Electrical and Electronic Parts.

Comments, suggestions, or questions on this document should be addressed to: Commander, Defense Supply Center Columbus, ATTN: DSCC-VAT, P.O. Box 3990, Columbus, OH 43218-3990, or e-mailed to TubesAmps@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://assist.daps.dla.mil/.

(Unless otherwise indicated, copies of the above specifications and standards are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094 or online from http://assist.daps.dla.mil.)

2.2 Non-Government publications. The following publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of documents which are DoD adopted are those cited in the solicitation or contract (see 6.2).

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE Std 149-1979 - Test Procedures for Antennas.

(IEEE standards are available online at http://www.ieee.org or from IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated specifications or specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheets. In the event of any conflict between requirements of this specification and the specification sheet, the latter shall govern.

3.2 First article. This specification makes provisions for first article testing. Antennas furnished under this specification shall be a product which has been tested in accordance with the first article tests prescribed herein (see 4.3) and approved by the respons ble acquiring activity (see 6.4).

3.3 Materials and finish. Materials shall be as specified herein (see 3.1). Where a definite material is not specified, materials and finish used on construction of the antenna shall resist erosion of surfaces due to action of rain, ice crystals, and other impinging particles at velocities as specified in accordance with applicable specification sheet (see 3.1). Acceptance or approval of any constituent material shall not be construed as a guaranty of acceptance of the finished product.

3.3.1 Nonflammable material. Materials shall be nonflammable when tested by accepted industry methods.

3.3.2 Fungus inert material. The antenna materials shall be fungus inert or resistant.

3.3.3 Pure tin. The use of pure tin as an underplate or final finish is proh bited both internally and externally. Tin content of the amplifier components and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see 6.7).

3.4 Design and construction. Antenna shall be of design and physical dimensions specified (see 3.1).

3.4.1 Connectors. The antenna connectors shall be designed to accommodate plug UG-59( )/U and meet the interface requirements in accordance with MIL-DTL-3643. The test probe connector shall be designed to accommodate plug P/N M39012/16-0001 in accordance with MIL-PRF-39012.

3.4.2 Temperature operating range. The antenna shall operate without electrical or mechanical deterioration over the specified temperature range in accordance with the application specification sheet (see 3.1).

3.4.3 Seal (see 4.6). All openings of the antenna cavity shall be sealed to prevent air leakage during all changes in surface pressure encountered in air operations between pressure altitudes of 0 to 70,000 feet.

3.4.4 Resistance to solvents (see 4.7). All materials used in construction shall withstand direct contact with aromatic fuels and hydraulic liquid without causing electrical or mechanical deterioration.

3.5 Environmental requirements. The antenna shall withstand the environmental tests of 4.5.7 without mechanical or electrical deterioration. Following each environmental test, the antennas shall meet the electrical requirements specified.

3.5.1 High temperature. When tested as specified in 4.5.7.7, the antenna shall meet the electrical requirements of 3.6.2, 3.6.3 and 3.6.4.

3.5.2 Temperature altitude. When tested as specified in 4.5.7.1, the antenna shall meet the electrical requirements of 3.6.2 through 3.6.4.

3.5.3 Shock. When tested as specified in 4.5.7.2, the antenna shall meet the electrical requirements of 3.6.2 through 3.6.4.

3.5.4 Vibration. When tested as specified in 4.5.7.3, the antenna shall meet the electrical requirements of 3.6.2 through 3.6.4.

3.5.5 Humidity. When tested as specified in 4.5.7.4, the antenna shall meet the electrical requirements of 3.6.2 through 3.6.4.

3.5.6 Fungus. When tested as specified in 4.5.7.5, the antenna shall meet the electrical requirements of 3.6.2 through 3.6.4.

3.5.7 Salt fog. When tested as specified in 4.5.7.6, the antenna shall meet the electrical requirements of 3.6.2 through 3.6.4.

3.6 Electrical requirements.

3.6.1 Frequency. The antenna shall provide performance over a specified radio frequency band in accordance with the applicable specification sheet (see 3.1).

3.6.2 Voltage standing wave ratio (VSWR). When antennas are tested as specified in 4.5.2, the VSWR (as referenced to a 50 Ω system) at the antenna input shall be no greater than specified in the applicable specification sheet (see 3.1).

3.6.3 Sampling probe VSWR. When antennas are tested as specified in 4.5.3, the VSWR of the sampling probe shall be no greater than specified (see 3.1).

3.6.4 Sampling probe attenuation. when antennas are tested as specified in 4.5.4, the sampling probe attenuation shall be no greater than specified (see 3.1).

3.6.5 Radiation pattern. When tested as specified in 4.5.5, the gain of the antenna system in the region extending completely around the antenna, in azimuth (Φ), shall, at each zenith angle (Θ), be essentially omnidirectional with nulls no greater than 2.0 dB down from the maximum. The gain at all zenith angles from 70 degrees to 110 degrees shall not be more than 2.0 dB below the gain of a matched quarter-wave stub antenna in the same location (see figure 1).

3.6.6 Polarization. When tested as specified in 4.5.6, the antenna shall transmit or receive vertically polarized signals. The axial ratios of polarization ellipses in the specified directions shall be equal to or better than that obtained in each of the same directions from a vertically polarized quarter-wave stub antenna at any frequency specified herein.

3.7 Weight. The weight of the antenna shall be in accordance with the applicable specification sheet (see 3.1).

3.8 Marking. Antenna shall be marked in accordance with MIL-STD-1285 as shown on the applicable specification sheet (see 3.1) and will include the following minimum marking: Part or Identifying Number (PIN) (see 1.3), national stock number (NSN), type number (if applicable), contract number, serial number, date code (year, month) and Manufacturer Code (FSCM).

Example: PIN M25707/1-01
NSN: 5985-XXX-XXXX (as applicable)
Type AT-740/A (if applicable)
Contract DLA XXXXXXXXXXXXX
Serial No. 1234
7701 12345

3.9 Maintainability. The antennas covered by this specification shall be considered as nonrepairable items, which, in the event of failure, shall be replaced.

3.10 Workmanship. Workmanship must be in accordance with accepted industry practices.

4. VERIFICATION

4.1 Classification of inspections. The inspections specified herein are classified as follows:

a. First article inspection (see 4.3).

b. Conformance inspection (see 4.4).

4.2 Inspection conditions. Unless otherwise specified, herein all inspections shall be performed at temperature of 25 C ± 10 C, barometric 650 to 800 millimeters of mercury, and relative humidity of 45 percent to 90 percent.

4.3 First article inspection. First article inspection shall be performed by the contractor, after award of contract and prior to production, at a location acceptable to the Government. First article inspection shall be performed on sample units produced with equipment and procedures normally used in production [see 6.2.c.(4)]. First article approval is valid only on the contract under which it is granted, unless extended by the Government to other contracts.

Due to similarity of items covered by specification sheets, a manufacturer may apply for first article approval on items not on the current contract. Approval may be granted by successfully performing first article tests on a combination of antennas. The combination of antennas shall be as specified in contract (see 6.2).

4.3.1 Sample size. One antenna shall be subjected to first article inspection as specified in table I, unless otherwise specified by contract.

4.3.2 Inspection routine. Each sample shall be subjected to the inspections specified in table I in the order shown.

TABLE I. First article inspection.

Inspection	Requirement paragraph	Test method paragraph
Visual and mechanical inspection (materials, design and construction, physical dimensions, weight, marking 1/ and workmanship)	3.1, 3.3, 3.4, 3.7, 3.8, and 3.10	4.5.1
VSWR	3.6.2	4.5.2
Sampling probe VSWR	3.6.3	4.5.3
Sampling probe attenuation	3.6.4	4.5.4
Radiation pattern	3.6.5	4.5.5
Polarization	3.6.6	4.5.6
High temperature	3.5.1	4.5.7.7
Temperature altitude	3.5.2	4.5.7.1
Shock	3.5.3	4.5.7.2
Vibration	3.5.4	4.5.7.3
Humidity	3.5.5	4.5.7.4
Fungus	3.5.6	4.5.7.5
Salt fog	3.5.7	4.5.7.6
Seal test	3.4.3	4.6
Resistance to solvents	3.4.4	4.7

1/ Marking defects are based on visual examination only and shall be charged only for illegible, incomplete, or incorrect marking.

4.3.3 First article test program. The manufacturer shall prepare a test program which shall be approved by the preparing activity (see 6.4) prior to any formal first article testing. The test program shall include the procedures and equipment used in performing the first article and acceptance tests.

4.4 Conformance inspection.

4.4.1 Inspection of product for delivery. Inspection of product for delivery shall consist of group A inspection.

4.4.1.1 Inspection lot. An inspection lot shall consist of all antennas of a particular style (see 3.1) from a production line or lines, produced essentially under the same conditions and offered for inspection during a single work month.

4.4.1.2 Group A inspection. Group A inspection shall consist of the inspections specified in table II, in the order shown.

TABLE II. Group A inspection.

Inspection	Requirement paragraph	Test method paragraph
Visual and mechanical inspection		
Materials	3.1, 3.3	4.5.1
Physical dimensions	3.4	4.5.1
Marking	3.8	4.5.1
Workmanship	3.10	4.5.1
VSWR	3.6.2	4.5.2
Sampling probe VSWR	3.6.3	4.5.3
Sampling probe attenuation	3.6.4	4.5.4

4.4.1.2.1 Group A sampling plan. Statistical sampling and inspection shall be performed on an inspection lot basis (see 4.4.1.1) with a random sample of antennas selected in accordance with table III. The acceptance levels shall be based upon the zero defective sampling plan. No failures shall be permitted.

TABLE III. Group A sampling plan.

Lot size	Sample size
1 - 13	100 percent
14 - 150	13
151 - 280	20
281 - 500	29
501 - 1,200	34
1,201 - 3,200	42
3,201 - 10,000	50
10,001 - 35,000	60
35,001 - 150,000	74
150,001 - 500,000	90
500,001 and over	102

4.4.1.2.2 Rejected lots. If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units and resubmit for reinspection. Resubmitted lots shall be inspected using tightened inspection. Such lots shall be separated from new lots and shall be clearly identified as reinspected lots.

4.4.2 Periodic inspection. Periodic inspection shall consist of group B. Except where the results of these inspections show noncompliance with the applicable requirements (see 4.4.2.1.2), delivery of products which have passed group A shall not be delayed pending the results of these periodic inspections.

4.4.2.1 Group B inspection. For individual procurements involving small quantities of antennas, Group B testing shall be at the option of the acquiring activity (see 6.4) and of the procurement contract (see 6.2). Group B inspection shall consist of the tests specified in table IV, in the order shown. Group B inspection shall be made on one sample unit per contract, unless otherwise specified, which has been subjected to and passed group A inspection.

TABLE IV. Group B inspection.

Inspection	Requirement paragraph	Test method paragraph
Radiation pattern	3.6.5	4.5.5
Polarization	3.6.6	4.5.6
High temperature	3.5.1	4.5.7.7
Temperature altitude	3.5.2	4.5.7.1
Shock	3.5.3	4.5.7.2
Vibration	3.5.4	4.5.7.3
Humidity	3.5.5	4.5.7.4
Salt fog	3.5.7	4.5.7.6
Seal test	3.4.3	4.6

4.4.2.1.1 Sampling plan. Unless otherwise specified by contract, sampling shall consist of one unit per contract.

4.4.2.1.2 Noncompliance. If a sample fails to pass group B inspection, the manufacturer shall notify the acquiring activity of such failure and take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected and which were manufactured under essentially the same conditions with essentially the same materials and processes, and which are considered subject to the same failure. Acceptance and shipment of product shall be discontinued until corrective action, acceptable to the acquiring activity, has been taken. After the corrective action has been taken, group B inspection shall be repeated on additional sample units (all inspections, or the inspection which the original sample failed, at the option of the acquiring activity. Group A inspection may be reinstated; however, final acceptance and shipment shall be withheld until the group B re-inspection has shown that the corrective action was successful. In the event of failure after re-inspection, information concerning the failure and the corrective action taken shall be furnished to the cognizant preparing activity (see 6.4).

4.5 Methods of inspection.

4.5.1 Visual and mechanical. Antennas shall be examined to verify that the materials, design construction, physical dimensions, marking, and workmanship are in accordance with applicable requirements (see 3.1).

4.5.2 VSWR (see 3.6.2). The VSWR of the antenna shall be measured as specified in 4.5.2.1. The antenna shall be mounted in the center of a four foot diameter circular ground plane, in its normal mounting configuration, assuming the ground plane represents the aircraft skin. In order to mount a curved antenna on a ground plane (which is flat), an intermediate fixture may be used which mounts to the flat ground plane on its one side and simulates curved aircraft skin (matching the antenna curvature) on its opposite side. Precautions shall be taken to insure that the reflected energy does not effect the VSWR measurements greater than 4 percent of the maximum specified VSWR (see 3.1). The overall accuracy of VSWR measurements shall be such that the (absolute VSWR) = (measured VSWR) $\pm$ 0.08 (maximum specified VSWR-1). VSWR measurements shall be made before and after each environmental test specified in 4.5.7.

4.5.2.1 Network analyzer method. Measurements shall be made using a network analyzer or equivalent.

4.5.3 Sampling probe VSWR (see 3.6.3). The VSWR of the sampling probe shall be measured in accordance with 4.5.2 over the specified frequency range (see 3.1).

4.5.4 Sampling probe attenuation measurements (see 3.6.4). Attenuation measurements shall be made using a network analyzer or equivalent Each antenna shall be subjected to the attenuation tests both before and after completion of the environmental tests.

4.5.5 Radiation pattern (see 3.6.5). Measurements of the radiation pattern shall be made with the antenna mounted in the center of a four-foot diameter circular ground plane, in its normal mounting configuration, assuming the ground plane represents the aircraft skin. In order to mount a curved antenna on a ground plane (which is flat), an intermediate fixture may be used which mounts to the flat ground plane on its one side and simulates curved aircraft skin (matching the antenna curvature) on its opposite side. The radiation patterns shall be made on a continuously recording radio range of the automatic type. Care shall be taken to avoid errors due to reflections from nearby objects, including earth. Azimuth (Φ) patterns shall be made at zenith (Θ) angles of 70, 80, 90, 95, 100, 105, and 110 degrees, at the zenith angle of maximum radiation, and at any other zenith angle deemed advisable (see figure 1). Vertical patterns shall be made in the plane through the centers of the antenna and of the probe and in the plane at right angles thereto. Like patterns shall be made for comparison, using the same test power levels on a matched quarter-wave stub antenna except that a single vertical pattern will suffice. Unless otherwise precluded by procuring activity contract, the design of the quarter-wave stub antenna and matching section shall be approved by the acquiring activity prior to manufacture. The above tests shall be made at frequencies of 960, 1050, and 1220 MHz but need not be repeated after environmental exposure.

4.5.6 Polarization test (see 3.6.6). Polarization tests shall be conducted in the continuously recording radio range in the same manner as the tests for radiation pattern, in accordance with one of the standard methods discussed in Chapter 11 of IEEE Std 149-1979. Polarization tests need to be made at only one frequency (1,050 MHz). For each test antenna, the axial ratio of the polarization ellipse shall be determined in each of the following directions (θ, Φ) degrees: (90, 0), (90, 90), (90, 180), (90, 270), (60, 0), (60, 90), (60, 180), (60, 270), (30, 0), (30, 90), (30, 180), (30, 270). The measurements shall then be repeated on a quarter-wave stub antenna mounted at the same location, at identical power levels and sensitivities.

4.5.7 Environmental tests (see 3.5). Environmental tests shall be in accordance with MIL-STD-810 in the sequence shown herein. Following each of the first six environmental tests below, the antenna shall meet the electrical requirements of 3.6.2 through 3.6.6.

4.5.7.1 Temperature altitude (see 3.5.2). Method 520 of MIL-STD-810 shall be tailored for variations in temperature and altitude only. This test shall not include vibration or humidity environments.

a. Test conditions:

Step	Temperature (°C)	Altitude (ft)	Time
1	-62 1/	site	2 hours
2	-54 1/	site	---
3	-54 1/	75,000	---
4	-10	site	---
5	Standard ambient conditions		
6	125 2/	site	16 hours
7	95	site	4 hours
8	125 2/	site	30 minutes
9	150 2/	site	10 minutes
10	60	50,000	4 hours
11	90	50,000	30 minutes
12	-10	75,000	4 hours
13	20	75,000	30 minutes
14	45	75,000	10 minutes
15	Standard ambient conditions		

1/ For MIL-DTL-25707/2 antennas use -48.3 ˚C.
2/ For MIL-DTL-25707/2 antennas use +96.6 ˚C.

Step 1. With antenna de-energized, adjust chamber to step 1 conditions. After antenna temperature is stabilized, maintain conditions for 2 hours.

Step 2. With antenna de-energized, adjust chamber to step 2 conditions, and maintain. After antenna temperature is stabilized, operate antenna at lowest specified input voltage. The antenna shall operate satisfactorily immediately following the specified warm-up time. All characteristics likely to be affected by low temperature shall be checked first. If time to check exceeds 15 minutes beyond the warm-up time, the test item shall again be stabilized at the step 2 temperature and the operational check continued.

Step 3. With antenna de-energized, adjust chamber to step 3 temperature and stabilize antenna temperature. Energize the antenna at highest specified input voltage and adjust chamber pressure to step 3 altitude. At step 3 pressure and temperature, the antenna shall be checked for satisfactory operation.

Step 4. With antenna de-energized, adjust chamber to step 4 conditions. After antenna temperature has stabilized, open chamber door and permit frost to form (use artificial moisture, if required) on antenna. The door shall remain open long enough for the frost to melt, but not long enough for the moisture to evaporate. The chamber door shall be closed and the test item operated at the highest specified input voltage to ascertain satisfactory operation immediately following the specified warm-up time. The antenna shall be energized and de-energized at least three times.

Step 5. Adjust the chamber to standard ambient conditions. After antenna temperature has stabilized, an operational and performance check of the antenna shall be made.

Step 6. With antenna de-energized, adjust chamber to step 6 conditions. Stabilize antenna temperature and maintain for 16 hours. Visually inspect, if practicable.

Step 7. With antenna de-energized, adjust chamber to step 7 conditions. After antenna temperature is stabilized, while maintaining chamber temperature, operate the antenna continuously at the highest specified input voltage for 4 hours, recording thermal sensor readings of antenna temperature every 30 minutes. At the end of the 4 hour time period, while maintaining the test conditions, the test item shall be checked for satisfactory operation.

Step 8. With antenna de-energized, adjust chamber to step 8 conditions. After antenna temperature has stabilized, the antenna shall be operated at the highest specified input voltage for four time periods each of 30 minute duration. The first three time periods of operation shall be followed by a 15 minute period with antenna de-energized. The test item shall be checked for satisfactory operation during each operating time period. Thermal sensor readings of antenna temperature shall be recorded every 10 minutes of antenna operation.

Step 9. With antenna de-energized, adjust chamber to step 9 conditions. After antenna temperature is stabilized, antenna shall be operated at the highest specified input voltage for four time periods each of 10 minutes. The first three periods of operation shall be followed by a 15 minute period with the antenna de-energized. Check antenna for satisfactory operation during each operating time period. Thermal sensor readings of antenna temperature shall be recorded at the beginning and the end of each operating period.

Step 10. With antenna de-energized, adjust chamber temperature to step 10 conditions. Stabilize antenna temperature. Operate antenna at highest specified input voltage, and adjust chamber pressure to step 10 altitude. Maintain test conditions for 4 hours. Thermal sensor readings of antenna temperature shall be recorded every 30 minutes. At the end of the 4 hour period, while maintaining test conditions, the antenna will be checked for satisfactory operation.

Step 11. With test item de-energized, adjust chamber temperature to step 11 conditions. The antenna temperature shall be stabilized, and the antenna shall be energized at the highest specified input voltage, while chamber pressure is adjusted to simulate step 11 altitude. The antenna shall be operated for 4 time periods each of 30 minutes. The first three time periods of operation shall be followed by a 15 minute period of operation, followed by a 15 minute period with the antenna de-energized. The test item shall be checked for satisfactory operation during each operating time period. Thermal sensor readings of antenna temperature shall be recorded every 10 minutes of antenna operation.

Step 12. With the antenna de-energized, adjust chamber temperature to step 12 conditions (following steps where a change in temperature at low pressure is required, the pressure may be increased to ambient before changing temperature and then returned to the required pressure following temperature stabilization.) The antenna temperature shall be stabilized and the antenna shall be energized at the highest specified input voltage and chamber pressure adjusted to step 12 conditions. Maintain for step 12 duration. Thermal sensor readings of antenna temperature shall be recorded every 30 minutes. At end of 4 hours, while maintaining test conditions, check antenna for satisfactory operation.

Step 13. With the antenna de-energized, adjust the chamber temperature to step 13 conditions and maintain. The antenna temperature shall be stabilized. The antenna shall be energized at the highest specified input voltage and the chamber pressure adjusted to step 13 altitude. The antenna shall be operated for four time periods of 30 minutes. The first three time periods shall be followed by a 15-minute period with the antenna de-energized. The antenna shall be checked for satisfactory operation during each operating time period. Thermal sensor readings shall be recorded every 10 minutes of antenna operation.

Step 14. With antenna de-energized, adjust chamber temperature to step 14 conditions (following steps where a change in temperature at low pressure is required, pressure may be increased to ambient before changing the temperature and then returned to the required pressure following temperature stabilization) and maintain. Antenna temperature shall be stabilized. The antenna shall be energized at the highest specified input voltage and chamber pressure adjusted to step 14 altitude. The antenna shall be operated four time periods each of 10-minute duration and shall be followed by a 15-minute period with the antenna de-energized. The antenna shall be checked for satisfactory operation during each operating period. Thermal sensor readings of antenna temperature shall be recorded at the beginning and end of each operating time period.

Step 15. Adjust chamber test conditions to standard ambient. After the antenna temperature has stabilized, an operational and performance check of the antenna shall be made. Results shall be compared with performance before temperature-altitude test.

4.5.7.2 Shock (see 3.5.3). Method 516 of MIL-STD-810.

a. Procedure: Three shocks in each direction applied along three orthogonal axes of the antenna (total of 18 shocks).

b. Terminal sawtooth pulse, 20 g's peak, 11 ms duration.

c. Operation not required during test.

4.5.7.3 Vibration (see 3.5.4). Method 514 of MIL-STD-810.

Vibration test procedure: The sinusoidal vibration shall be applied along each of three mutually orthogonal axes of the antenna. The acceleration levels or double amplitudes (see figure 2) shall be maintained at the antenna mounting points (mounted without vibration isolators). When input vibration is measured at more than one central point, the control signal shall be the average of all the accelerometers.

(1) Resonance search. Resonant frequencies of the antenna shall be determined by varying the frequency of applied v bration slowly through the specified range at reduced test levels but with sufficient amplitude to excite the item. Sinusoidal resonance search may be performed using the test level and cycling time specified for sinusoidal cycling test, provided the resonance search time is included in the required cycling time.

(2) Resonance dwell. The antenna shall be v brated along each axis at the most severe resonant frequencies determined. Dwell time at each resonant frequency shall be 30 minutes (per axis).` If more than four significant resonant frequencies are found for any one axis, the four most severe resonant frequencies shall be chosen for dwell test. If a change in resonant frequency occurs during the test, its time of occurrence shall be recorded and immediately the frequency shall be adjusted to maintain the peak resonance condition. The final resonant frequency shall be recorded.

(3) Cycling. The antenna shall be vibrated along each axis in accordance with test levels of figure 1. Sinusoidal cycling time (per axis) shall be 3 hours less dwell time. Sweep time 5 - 500 - 5 Hz shall be 15 minutes. The frequency of applied vibration shall be swept over the specified range logarithmically in accordance with figure 1. The specified sweep time is that of an ascending plus a descending sweep.

4.5.7.4 Humidity (see 3.5.5). Method 507 of MIL-STD-810.

a. Procedure I.

b. Ten 24-hours cycles, then operational test at 30 C and 85 percent relative humidity.

c.

Humidity test cycle	Temperature	Relative humidity
0 - 2 hours	Gradual increase from ambient to +65 C (+149 F)	Gradual increase from uncontrolled to 95 +5, -3 percent
2 - 8 hours	Maintain +65 C (+149 F)	Maintain 95 +5, -3 percent
8 - 24 hours	Gradual decrease to +30 C (+86 F)	Maintain ≥ 85 percent

4.5.7.5 Fungus (see 3.5.6). Method 508 of MIL-STD-810. The manufacturer shall certify that all materials are fungus resistant or perform the test specified in method 508.

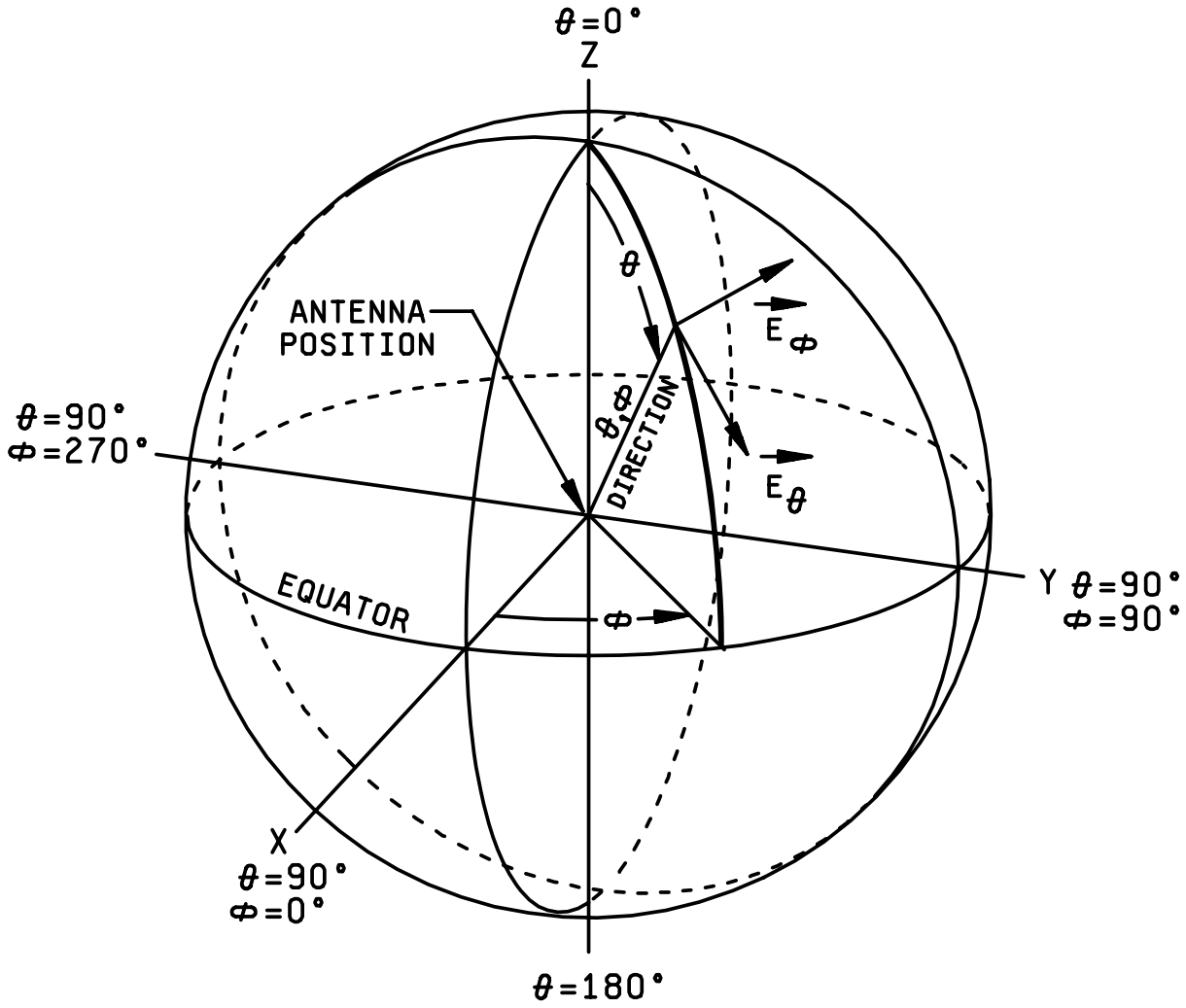


FIGURE 1. Standard spherical coordinate system used in antenna measurements.

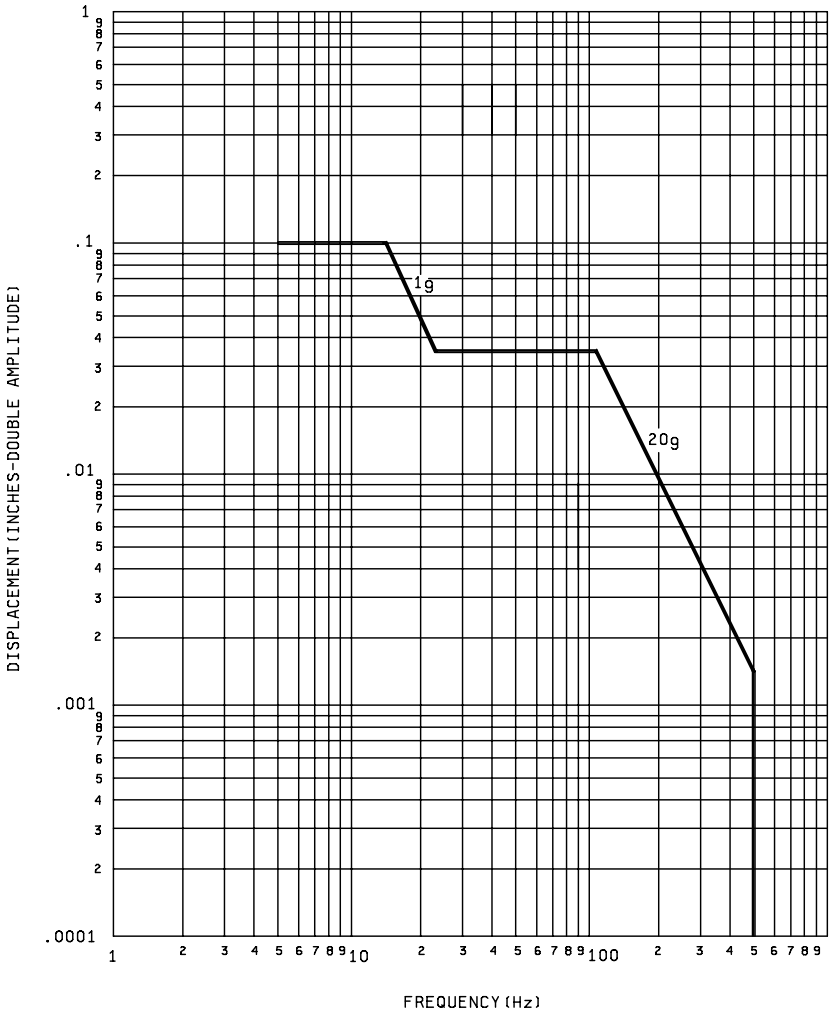


FIGURE 2. Vibration test curve.

4.5.7.6 Salt fog (see 3.5.7). Method 509 of MIL-STD-810, in accordance with test apparatus and procedures detailed in method 509, section II, including Procedure I. The following details shall be specified in the equipment specification:

a. Pretest data required.

b. Failure criteria.

c. Applicable salt solution, if other than 5 percent.

d. Salt fog exposure period, if other than 48 hours.

e. Drying period, if other than 48 hours.

f. Inspection and operation after 24 hours of salt fog exposure where buildup of salt deposits are critical to the proper operation of the test item.

g. If operation of electrical system is required.

4.5.7.7 High temperature (see 3.5.1). The sample antennas shall be placed within a chamber and the internal temperature shall be raised to the temperature specified in accordance with the applicable specification sheet (see 3.1). The antenna will be placed in the chamber with the radome cover upwards. No retaining screws or devices will be placed on the antenna. The antenna shall remain in this environment for two hours; at the end of which time, the antenna shall be removed from the chamber, visually inspected and immediately tested: The antenna shall meet the electrical requirements of 3.6.2, 3.6.3, and 3.6.4.

4.6 Seal test (see 3.4.3). All samples shall be subjected to a seal test by the altitude chamber method. The antennas shall be fully submerged in a water-filled, transparent container. The test antenna connectors may be covered with a mating cap simulating the mating connection. The chamber shall be evacuated to a pressure of 1.06 inches of mercury simulating an altitude of 75,000 feet and remain there for a minimum of five minutes. The chamber pressure shall then be raised to 2.5 inches of mercury simulating an altitude of 57,000 feet and maintained at that condition for a minimum of ten minutes. The chamber pressure shall then be raised to standard atmospheric pressure for a minimum of one hour. The antennas, upon completion of the seal test, shall be removed and all excess moisture wiped from the antenna. Any evidence of leakage either by a flow of bubbles during evacuation or subsequent entrance of water shall be considered a failure. Immediately after the examination, the VSWR and attenuation tests shall be made.

4.7 Resistance to solvents (see 3.4.4). Place the sample antenna, completely immersed, in the test liquid for a minimum of 24 hours. Upon removal, shake or wipe excess surface liquid from the antenna and test VSWR in accordance with 4.5.2. The above procedure shall be performed with each of the following test liquids: JP-4 fuel (MIL-DTL-5624) and hydraulic fluid (MIL-PRF-5606).

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the respons ble packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point’s packaging activities within the Military Service or Defense Agency, or within the military service’s system commands. Packaging data retrieval is available from the managing Military Department’s or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

6.1 Intended use. The antenna is a radiation element having an essentially omnidirectional, vertically polarized, radiation pattern intended for use with airborne identification beacon and TACAN sets. The antenna is military unique since it must survive and meet performance requirements while mounted on military aircraft, throughout mission, lifecycle, worldwide environments.

6.2 Ordering data. Acquisition documents must specify the following:

a. Title, number, and date of this specification.

b. Title, number, and date of the applicable specification sheet and the complete PIN (see 3.1 and 1.3).

c. First article samples and tests.

(1) Number of first article samples and combination of antennas, if applicable.

(2) Point of inspection.

(3) Requirement for concurrent delivery of each sample and its test data. The acquiring activity should be given at least 10 days prior notice when the first article tests are to be conducted so that they may be supervised or witnessed, if desired, by a Government representative.

(4) Whether or not for individual procurements involving small quantities of antennas, first article inspection requirements are waived for manufacturer with a history of reliability and a service life warranty.

(5) Group B samples and tests.

6.3 Definitions.

6.3.1 Antenna. An antenna for the purpose of this document is an assembly of components including input terminal mounting provisions and radomes required to radiate or to receive electromagnetic energy.

6.3.2 Band of doubt. A VSWR value is considered to be in the band of doubt if the measured VSWR = (the maximum allowable) VSWR $\pm$ 0.08 (the maximum allowable VSWR-1). If VSWR values are within the band of doubt, a frequency band of $\pm$ 10 percent must be investigated about the point.

6.4 Acquiring activity. The activity responsible for all antennas acquired under this specification is the acquiring activity. This activity is respons ble for all waivers of first article testing.

6.5 Subject term (key word) listing.

Altitude	Radiation
Attenuation	Salt fog
Fungus	Seal
Impedance	Shock
Nonflammable	Solvents
Polarization	VSWR

6.6 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent poss ble to meet the requirements of this specification. As of the dating of this document, the U.S. Environmental Protection Agency (EPA) is focusing efforts on reducing 31 priority chemicals. The list of chemicals is available on their website at http://www.epa.gov/epaoswer/hazwaste/minimize/chemlist.htm. Further information is available at the following EPA site: http://www.epa.gov/epaoswer/hazwaste/minimize/. Included in the EPA list of 31 priority chemicals are cadmium, lead, and mercury. Use of the materials on the list should be minimized or eliminated unless needed to meet the requirements specified herein (see Section 3).

6.7 Tin whisker growth. The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead, by mass, have shown to inh bit growth of tin whiskers (see 3.3.3). For additional information on this matter, refer to ASTM-B545 (Standard Specification for Electrodeposited Coatings of Tin).

6.8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:
Air Force - 11
DLA - CC

Preparing activity:
DLA - CC

(Project 5985-2008-010)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and respons bilities can change, you should verify the currency of the information above using the ASSIST Online database at http://assist.daps.dla.mil.