

DETAIL SPECIFICATION

ANTENNA AT-948/U

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

1. SCOPE

1.1 Scope. This specification covers one type of UHF Antenna, the AT-948/U, a vertically-polarized omni-directional antenna having overhead coverage to fill in the cone of silence and operating over a frequency range of 400 through 550 megahertz (MHz) for shipboard and shore station applications.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 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 and 4 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, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

MIL-PRF-27	-	Transformers and Inductors (Audio, Power, and High-Power Pulse), General Specification for.
MIL-S-901	-	Shock Tests, H.I. (High-Impact) Shipboard Machinery, Equipment, and Systems, Requirements for.
MIL-T-18303	-	Test procedures; Pre-production, Acceptance, and Life, for Aircraft Electronic Equipment, Format for.
MIL-N-18307	-	Nomenclature and Identification for Aeronautical Systems Including Joint Electronics Type Designated Systems and Associated Support Systems.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Supply Center, Columbus, ATTN: DSCC-VAT, Post Office Box 3990, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-167-1	-	Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).
MIL-STD-810	-	Environmental Engineering Considerations and Laboratory Tests.
MIL-STD-889	-	Dissimilar Metals.
DOD-STD-1399-301	-	Interface Standard for Shipboard Systems, Section 301, Ship Motion and Attitude.

(Copies of the above specifications, standards, and handbooks are available from the Document Automation and Production Service, Building 4D (DPM-DoDSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDiss cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI S2.15	-	Specification for the Design, Construction, and Operation of Class HI (High-Impact) Shock-Testing Machine for Lightweight Equipment.
------------	---	--

(Application for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

2.4 Order of precedence. In the event of conflict between text of this document and 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 Design and construction.

3.1.1 General. The equipment shall meet the requirements of best manufacturing practice except as specified herein. The design objectives of a high-strength-to-weight ratio, reliability, simplicity, ease of installation and maintenance consistent with the need of the military service, shall be considered during all phases of equipment design and construction.

3.1.2 Service conditions.

3.1.2.1 Temperature. The equipment shall meet the temperature requirements for exposed - unsheltered (ship or shore) operating temperature range -54°C to +65°C and non-operating temperature range -62°C to +71°C.

3.1.2.2 Wind load. The equipment shall be capable of withstanding a 120-knot wind.

3.1.2.3 Salt atmosphere. The equipment shall be capable of operating without failure for a period normal to similar electronic equipment aboard ship, without being adversely affected by humid salt atmosphere.

3.1.2.4 Inclination, vibration and shock. The antenna, its mounting, and representative structure for its mounting (what is important to simulate the installation) shall meet the applicable inclination, vibration and shock requirements of 4.4.1, 4.4.2 and 4.4.3. For inclination requirements of 4.4.1, shipboard equipment shall operate in all attitudes encompassed by DOD-STD-1399-301. A shock spectrum and transient duration shall be defined which represent extreme design conditions to be encountered and the shock test levels for use in 4.4.3.

3.1.3 Construction. Equipment shall be constructed to conform to the service conditions as specified herein.

3.1.3.1 Dissimilar metals. Unless suitably protected against electrolytic corrosion, dissimilar metals (see MIL-STD-889) shall not be used in intimate contact with each other. Dissimilar metals are defined as metal specimens that are in contact or otherwise electrically connected to each other in a conductive solution and that generate an electrical current.

3.1.3.2 Pressurization. The antenna shall be normally operated non-pressurized. Design shall be such that when mounted vertically on a supporting structure, water or other liquids cannot collect to an extent that could ultimately result in failure or deterioration of performance of the antenna.

3.1.3.3 Maintenance and repair. The antenna shall be so constructed that maintenance and repairs can be made with a minimum of disturbance to other components. Antennas shall be readily demountable and interchangeable to provide ease of servicing, maintenance and replacement.

3.1.3.4 Mounting brackets. The antenna shall have, at its base, a mounting flange with bolt holes to anchor the antenna firmly in position when it is installed aboard ship.

3.1.3.5 Standardization. Every effort shall be made to standardize the units and parts entering into the construction, in conformance with MIL-PRF-27, however, it is not intended to compromise the design or performance of the antenna produced as a result of this specification.

3.1.3.6 Tropicalization. Tropicalization will not be required.

3.2 Performance Requirements.

3.2.1 Performance. The antenna shall be so manufactured that when mounted, in an unobstructed area, and sufficiently elevated above ground (or equivalent), the pattern of the antenna shall be such as to provide essential spatial coverage throughout a hemispherical volume.

3.2.2 Frequency. Antenna and feed system shall operate over the frequency range of 400 to 550 megahertz (MHz).

3.2.3 Polarization. The antenna shall transmit rf energy, vertically polarized in the horizontal field.

3.2.4 Gain. The gain of the antenna in the horizontal field shall be approximately five (5) decibels (db) above an isotropic (spherical radiation) source, or approximately three (3) db above a half-wave dipole source.

3.2.4.1 Vertical Gain. The gain of the antenna in the vertical (overhead) direction shall be approximately nine (9) db below an isotropic or approximately eleven (11) db below a half-wave dipole source. This is approximately fourteen (14) db below the maximum horizontal gain.

3.2.5 Power rating (RF). The antenna shall be capable of handling 2000 watts of rf power over the frequency range 400 to 550 megahertz (MHz).

3.2.6 Voltage Standing Wave Ratio. The impedance at the input to the antenna shall match the 50-ohm impedance of the input coaxial cable so that the VSWR does not exceed 1.8:1.0 over the entire 400 to 550 megahertz range.

3.2.7 Circularity. The antenna shall have a horizontal pattern that is omni-directional to within ± 1.0 db over the 400 to 550 megahertz frequency band.

3.2.8 Tilt. The antenna shall be designed to tilt the vertical lobe upwards to place the lower half-power point on or below the horizon.

3.3 Detail requirements.

3.3.1 Functional description. Antenna AT-948/U shall be a two-element dipole collinear array housed within a polyester fiberglass vapor-tight cylindrical supporting structure. The dipole array shall produce omni-directional vertically-polarized energy and overhead coverage sufficient to fill in the cone of silence. The mounting flange shall be an integral part of the fiberglass watertight enclosure.

3.3.2 Overhead coverage. To produce minimum interference with the rest of the pattern and optimum overhead coverage over the entire frequency region, the upper element of the dipole array shall be designed to provide orthogonal current distributions so as to fill in the cone of silence overhead.

3.3.3 Dimensions and weight. The AT-948/U shall have a maximum height of 50 inches and a nominal diameter of 5-13/16 inches. The weight of the complete antenna shall not exceed 25 pounds.

3.3.4 Mounting provisions. The mounting flange base of the AT-948/U Antenna shall be an integral part of the fiberglass weatherproof housing and shall be a flange 10 inches in diameter and approximately 3/4-inch thick with an 8-1/2-inch bolt circle on which there are eight 3/4-inch diameter holes for mounting. The mounting flange shall mate with a standard class 125-type flange.

3.3.5 RF connectors. The rf input to the antenna shall be by means of a connector capable of mating with connector UG-154A/U (controlling P/N MS91604-154A).

3.3.6 Nomenclature and nameplates. Nomenclature assignment and nameplate approval for equipment identification shall be in accordance with specification MIL-N-18307.

3.4 Workmanship. Antenna and subcomponents shall be manufactured and processed in a careful and workmanlike manner, with good design and sound engineering and production practice, and to the requirements of this specification. Antenna shall be free from tool marks, deep scratches, corrosion, and defects that affect life, serviceability, appearance.

4. VERIFICATION

4.1 Classification of tests. Equipments shall be subjected to the following tests to determine compliance with all the applicable requirements.

- a. Pre-production tests.
- b. Acceptance tests.

4.2 Pre-production tests. Pre-production tests shall be made on one or more equipments representative of the production equipments to be supplied under the contract. Pre-production tests shall consist of the following:

- a. Contractor's demonstration tests.
- b. Service approval tests.

4.2.1 Contractor's demonstration tests. Contractor's demonstration tests shall be accomplished under the responsibility of the contractor and shall be conducted in accordance with the approved test procedure of 4.6. Data obtained by the contractor in conducting these tests shall be submitted to the procuring activity for review and approval prior to shipping the equipment to the specified destination for service approval tests. The Government Inspector and the procuring activity shall be advised when tests are to be conducted so that a representative may be designated to witness or supervise the tests when so desired. Contractors not having adequate facilities to conduct all required tests shall obtain the service of a commercial testing laboratory satisfactory to the procuring activity.

4.2.2 Service approval tests. At the completion of the contractor's demonstration tests and when requested by the procuring activity, the equipment shall be delivered to a specified government laboratory for additional testing. This additional testing may consist of duplicating tests previously conducted and such other tests deemed necessary to determine compliance with all applicable design and performance requirements.

4.2.3 Scope of tests. Pre-production tests shall include all tests deemed necessary to determine that the equipment meets all the requirements of this specification and the contract. Pre-production tests shall include as a minimum the tests of 4.4.

4.2.4 Pre-production approval. Approval of the pre-production model shall be by the procuring activity upon satisfactory completion of all tests. No production equipments shall be delivered prior to the approval of the pre-production model. Prefabrication of production equipment prior to the approval of the pre-production model is at the contractor's own risk. The approved pre-production model will be returned to the contractor for his use in the fabrication and testing of equipment to be submitted for acceptance. The pre-production model shall not be considered as one of the equipments under the contract; however, it may be reworked by the contractor and submitted for acceptance as production equipment.

4.3 Acceptance tests. The contractor shall furnish all samples and shall be responsible for accomplishing the acceptance tests. All inspection and testing shall be under the supervision of the Government Inspector. Contractors not having testing facilities satisfactory to the procuring activity shall engage the service of a commercial testing laboratory acceptable to the procuring activity. The contractor shall furnish test reports showing quantitative results for all acceptance tests. Such reports shall be signed by an authorized representative of the contractor or laboratory, as applicable. Acceptance or approval of material during the course of manufacture shall not be construed as a guarantee of the acceptance of the finished product. Acceptance tests shall consist of the tests of 4.5 as a minimum.

4.4 Pre-production tests. The pre-production model antenna shall be subjected to the tests in the specification as follows, and conducted at a laboratory designated by the procuring activity.

4.4.1 Inclination. The antenna shall be subjected to inclination test limits specified herein. Shipboard equipment shall be inclined at the rate of 5 to 7 cycles per minute in one phase to angles of 45 degrees on both sides of the vertical for a minimum period of 30 minutes. During inclination testing, equipment with drawer slides shall be extended on its slides, so as to verify that the slides have sufficient lateral strength to support equipment in all test directions. The test shall be repeated with the equipment reoriented 90 degrees to the plane in which it was originally tested. The equipment shall be energized and fully operating during the test. At the conclusion of the cyclic tests, the cyclic motion shall be stopped and the inclination adjusted to an angle of 15 degrees. The equipment shall then be operated for a sufficient period to ensure that the continuous operation can be maintained. The equipment shall then be rotated through the vertical to 15 degrees in the opposite direction, and the test for continuous operation repeated. The test shall be repeated with the equipment reoriented 90 degrees to the plane in which it was originally tested. Equipment intended for submarine installation shall be subjected to the test herein, except that the maximum angle shall be 60 degrees.

4.4.2 Vibration (shipboard-mounted equipment). Shipboard-mounted antennas shall be subjected to vibration tests in accordance with Type I requirements of MIL-STD-167-1. Equipment shall be operating when tested. Vibration test levels shall be tailored to the application platform levels. A vibration response investigation shall be performed. Equipment shall be subjected to endurance testing at fixed frequencies based upon the critical resonance frequencies determined from the vibration response investigation. When vibration response investigation does not identify critical frequencies, tests shall be conducted at the maximum vibration frequency. The test duration at each frequency shall be 2 hours. The vibration frequency range and amplitude shall be as specified in Table I.

TABLE I. Vibration frequency range and amplitude (shipboard-mounted equipment).

Frequency range	Vibration amplitude Mast-mounted equipment	Vibration amplitude All other equipment
4 Hz to 10 Hz	2.54 mm	0.76 mm
11 Hz to 15 Hz	0.76 mm	0.76 mm
16 Hz to 25 Hz	0.51 mm	0.51 mm
26 Hz to 33 Hz	0.25 mm	0.25 mm
34 Hz to 40 Hz	Not applicable	0.13 mm
41 Hz to 50 Hz	Not applicable	0.076 mm

4.4.3 Shock (shipboard-mounted equipment) (see 3.1.2.4). Shipboard-mounted antennas shall be subjected to shock tests simulating weapons effects as follows. Grade A items shall be fully operational before, during, and after the shock event. Momentary malfunction is acceptable only if the malfunction is self correcting and has no detrimental effect on grade A items. Grade A and grade B equipment shall be tested in accordance with MIL-S-901. As an alternate, equipment with less than 113 kilograms mass shall be tested in accordance with ANSI S2.15 tailored to require hammer drop heights of 0.30 m, 0.91 m, and 1.52 m in each of three mutually perpendicular axes of the item tested. Grade B items, and parts thereof, shall not come adrift or become a safety hazard before, during, or after the shock test.

4.5 Acceptance tests. Each antenna produced shall be subjected to the acceptance tests detailed herein for acceptance before delivery. These tests are designed to insure that the complete antenna is in conformance with this specification.

4.5.1 Table of tests. The tests to be performed shall be subdivided into two categories: (a) electrical and (b) mechanical.

4.5.1.1 Electrical test No. 1. Measurement of VSWR of complete antenna.

4.5.1.2 Mechanical test No. 1. Perform mechanical and visual inspection of complete antenna.

4.5.2 Test procedure. Unless specified otherwise, all tests shall be performed under the following conditions:

Atmospheric conditions - The tests shall be performed at prevailing factory or laboratory atmospheric conditions.

4.5.2.1 Electrical tests. The antenna shall be tested in accordance with an approved test procedure.

4.6 Test procedures. The procedures used for conducting pre-production tests and acceptance tests shall be prepared by the contractor and submitted to the procuring activity for review and approval. The right is reserved by the procuring activity or the Government Inspector to modify the tests or require any additional tests deemed necessary to determine compliance with the requirements of this specification or the contract. Specification MIL-T-18303 shall be used as a guide for preparation of test procedures. When approved procedures are available from previous contracts the procuring activity will furnish the procedures to be used for testing.

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

4.8 Rejection and retest. Equipment that has been rejected may be reworked or have parts replaced to correct the defects and resubmitted for acceptance. Before resubmitting, full particulars concerning previous rejection and the action taken to correct the defects found in the original shall be furnished the Government Inspector. Units rejected after retest shall not be resubmitted without the specific approval of the procuring activity.'

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.3). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Departments or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

6.1 Intended use. The AT-948/U antenna is intended for use with drone command transmitting and receiving equipment in the frequency range from 400 to 550 megahertz (MHz). The antenna is a general purpose antenna, however, and can be used for other applications within the limits of its frequency range, power, and gain characteristics. Primarily it is intended for installation in the uppermost point aboard a ship.

6.1.1 Alternate construction. This specification is not intended to be restricted with respect to the details of construction, except where such details are specified. Alternate forms of construction will be considered, provided that the contractor submits to the procuring activity a clear description for the points of difference of approval and provided that all performance requirements on this specification are met.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification and specification sheet.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1).
- c. Packaging requirements (see 5.1).

- d. Equipment shock grade.
- e. Antenna mounting location.
- f. Inclination requirements.

6.3 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet requirements of this specification. Table II lists the Environmental Protection Agency (EPA) top seventeen hazardous materials targeted for major usage reduction. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein (see Section 3).

TABLE II EPA top seventeen hazardous materials.

Benzene	Dichloromethane	Tetrachloroethylene
Cadmium and Compounds	Lead and Compounds	Toluene
Carbon Tetrachloride	Mercury and Compounds	1, 1, 1 - Trichloroethane
Chloroform	Methyl Ethyl Ketone	Trichloroethylene
Chromium and Compounds	Methyl Isobutyl Ketone	Xylenes
Cyanide and Compounds	Nickel and Compounds	

6.4 Subject term (key word) listing.

circularity
dipole
mounting brackets
salt atmosphere
tilt
VSWR
wind load

Custodians:
Navy - AS
DLA - CC

Preparing activity:
DLA - CC

(Project 5985-1272)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7, and send to preparing activity.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-DTL-22354B	1. DOCUMENT DATE (YYMMDD) 030818
3. DOCUMENT TITLE ANTENNA AT-948/U		
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME (Last, First, Middle initial)T	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2)DSN (if applicable)	7. DATE SUBMITTED (YYMMDD)
8. PREPARING ACTIVITY		
a. NAME Defense Supply Center Columbus ATTN: DSCC-VAT	b. TELEPHONE (Include Area Code) (1) Commercial 614-692-0506	(2) DSN 850-0506
c. ADDRESS (Include Zip Code) P. O. Box 3990 Columbus, OH 43216-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman Road, Suite 2533 Fort Belvoir, Virginia 22060-6221 Telephone (703) 767-6888 DSN 427-6888	