

INCH-POUNDS

MIL-DTL-4946D  
 8 January 2008  
 SUPERSEDING  
 MIL-DTL-4946C  
 10 December 2004

## DETAIL SPECIFICATION

## ANTENNA ASSEMBLY AT-197( )/GR

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

## 1. SCOPE

1.1 Scope. This specification covers the requirements for one type of discone antenna assembly, designed to operate at an impedance of 50 ohms, within the frequency range of 225 through 500 megahertz (MHz)([see 6.1](#)).

1.2 Classification.

1.2.1 Type designation ([see 6.2](#)). The type designation of the antenna is derived from the Joint Electronic Type Designation System specified in [MIL-STD-196](#).

## 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 of documents cited in sections 3 and 4 of this specification, whether or not they are listed

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 cited in the solicitation or contract.

## FEDERAL STANDARDS

[FED-STD-595/24084](#) - Green, Semigloss

## DEPARTMENT OF DEFENSE SPECIFICATIONS

[MIL-C-17/79](#) - Cables, Radio Frequency Flexible, Coaxial, 50 Ohms Unarmored  
 M17/79-RG218, and Armored M17/79-RG-219.

[MIL-DTL-3643](#) - Connectors, Coaxial, Radio Frequency, Series HN, and Associated Fittings,  
 General Specification for.

Comments, suggestions, or questions on this document should be addressed to Defense Supply Center Columbus, ATTN: DSCC-VAT, P.O. Box 3990, Columbus, OH 43218-3990 or e-mailed to [TubesAmps@dsccl.dla.mil](mailto:TubesAmps@dsccl.dla.mil). Contact information can change, so verify currency of address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

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[MIL-DTL- 14072](#)- Finishes for Ground Based Electronic Equipment.

### DEPARTMENT OF DEFENSE STANDARDS

[MIL-STD-130](#) - Identification Marking of U.S. Military Property.

[MIL-STD-202](#) - Test Method Standard, Electronic and Electrical Component Parts.

[MIL-STD-810](#) - Environmental Engineering Considerations and Laboratory Tests.

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or <http://www.assist.daps.dla.mil/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

### AIR FORCE DRAWING

[64C3418](#) - Antenna Assembly, AT-197( )/GR, Discone.

[64C3419](#) - Antenna Mounting.

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

### OFFICIAL CLASSIFICATION COMMITTEE

Uniform Freight Class Rules.

(Application for copies should be addressed to the Official Classification Committee, One Park Avenue at 33<sup>rd</sup> Street, New York, New York 10016.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, 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 Preproduction. The antenna furnished under this specification shall be a product that has been tested, and passed the preproduction tests specified in [4.4](#).

3.2 General service requirements. General service requirements shall conform to best manufacturing practice. Exceptions and additions shall be as follows.

3.2.1 Ambient temperature. The antenna shall be designed to operate over a temperature range of -54°C (-65°F) to +71°C (+160°F).

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3.2.2 Relative humidity. The antenna shall be capable of operation up to a relative humidity of 95 percent between the temperature of 20°C (68°F) and 71°C (160°F) ([see 4.6.4.5](#)).

3.2.3 Service conditions (electrical). The electrical service condition requirements for the antenna shall be as specified herein ([see 4.6.2](#)).

3.2.4 Service life. The antenna shall be designed and constructed for continuous operation with a life expectancy of 5 years.

3.3 Material. The material for the antenna shall be of a type that will permit the antenna to meet the performance and environmental requirements of this specification.

3.3.1 Pure tin. The use of pure tin, as an underplate or final finish, is prohibited both internally and externally. Tin content of radio and microwave frequency fixed attenuator components and of solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum 3 percent lead, by mass ([see 6.3](#)).

3.4 Design and construction. The antenna shall have the design, construction, and physical dimensions specified in AF Drawing 64C3418.

3.4.1 Polarization. The antenna shall be designed for vertical polarization.

3.4.2 Antenna mounting. The antenna mounting shall be as specified in AF Drawing 64C3419 for mounting to antenna mast AB-158/GR.

3.4.3 Input connector. The input connector shall be of HN female series and shall have mating dimensions as specified in [MIL-DTL-3643](#).

3.4.4 Cable. The cable from the input connector to the radiating elements shall be M17/79-RG218 (unarmored) in accordance with [MIL-C-17/79](#).

3.4.5 Weight. The total weight of the antenna shall not exceed 15 pounds.

3.4.6 Finishing. Before painting, the antenna shall be given a protective finish in accordance with the requirements of [MIL-F-14072](#).

3.4.7 Color. The color of the paint finish applied to the antenna, shall be number 24084 in accordance with [FED-STD-595](#) ([see 4.6.1](#)).

### 3.5 Performance.

3.5.1 Gain. The gain from 225 through 400 MHz, shall not be less than 0.3 decibels (db) over that obtained from a half-wave dipole, tuned to maximum efficiency ([see 4.6.3.1](#)).

3.5.2 Voltage standing wave ratio (VSWR). The VSWR over the entire frequency range shall not exceed 2 to 1 with respect to 50 ohms ([see 4.6.3.2](#)).

3.5.3 Impedance. Normal impedance of the antenna shall be 50 ohms ([see 4.6.3.3](#)).

3.5.4 Radiation pattern. The horizontal radiation pattern shall be omni-directional and shall not vary from circular by more than 0.5 db ([see 4.6.3.4](#)).

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3.5.5 Frequency range. The antenna shall be capable of satisfactory operation without hiatus at any frequency throughout the 225 through 400 MHz range. Mechanical tuning to operate the antenna at any specified frequency in this range, after initial manufacturing or factory adjustments, shall not be required ([see 4.6.3.5](#)).

3.5.6 Power capability. The antenna shall be capable of satisfactory operation with a radio-frequency (RF) carrier input of 1 kilowatt, amplitude modulated 100 percent by a 1,000 cycle per second signal ([see 4.6.3.6](#)).

3.5.7 Environmental. The antenna shall successfully pass all environmental tests listed in [4.6.4](#).

3.5.8 Marking. The antenna shall be marked in accordance with [MIL-STD-130](#) with the type designation and manufacturer's name, on a nameplate fastened to the antenna tube.

3.5.9 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.5.10 Workmanship. Antennas shall be processed in such a manner as to be uniform in quality and all surfaces shall be free of burrs, die marks, chatter marks, scratches, dirt, grease, scale, splinters, and other defects that will affect life, serviceability or appearance.

#### 4. VERIFICATION

4.1 Test equipment and inspection facilities. Test equipment and inspection facilities shall be of sufficient accuracy, quality and quantity to permit performance of the required inspection. The supplier shall establish calibration of inspection equipment to the satisfaction of the Government.

4.2 Classification of inspection. The examination and testing of the antennas shall be classified as follows:

- (a) Preproduction inspection ([see 4.4](#)).
- (b) Conformance inspection ([see 4.5](#)).
- (c) Inspection of product for delivery ([see 4.5.1](#)).

4.3 Inspection conditions. Except where specified herein, all inspections shall be made at room ambient temperature, relative humidity, and pressure as specified in [MIL-STD-202](#).

4.3.1 Order of tests. The tests shall be run in the order shown in [table I](#).

4.4 Preproduction inspection. Preproduction inspection shall be performed by the supplier after award of contract and prior to production, at a location designated by the Government ([see 6.2](#)).

4.4.1 Sample. Three antenna shall be submitted for preproduction inspection.

4.4.2 Test routine. Sample units shall be subjected to group of examinations and tests listed in [table I](#) for that individual antenna.

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4.4.3 Failures. Failure in any of the examinations or tests will be cause for refusal to grant approval of the antennas represented by the samples.

TABLE I. Preproduction Inspection.

Examination or test	Requirement paragraph	Method paragraph
<u>Antennas 1, 2 and 3</u>		
Visual and Mechanical	3.3, 3.4 to 3.4.7 incl. 3.5.8, and 3.5.10	4.6.1
Electrical	3.2.3	4.6.2
Performance	3.5 to 3.5.6 incl.	4.6.3 to 4.6.3.6 incl
<u>Antenna 1</u>		
Rain	3.5.7	4.6.4.9
Salt fog	3.5.7	4.6.4.8
Wind	3.5.7	4.6.4.10.1
Ice	3.5.7	4.6.4.10.2
<u>Antenna 2</u>		
Fungus	3.5.7	4.6.4.1
Sand and dust	3.5.7	4.6.4.2
Low pressure	3.5.7	4.6.4.6
Vibration	3.5.7	4.6.4.7
Operating dynamic vibration	3.5.7	4.6.4.11
<u>Antenna 3</u>		
High temperature	3.5.7	4.6.4.3
Low temperature	3.5.7	4.6.4.4
Humidity	3.5.7	4.6.4.5
Vibration	3.5.7	4.6.4.7
Operating dynamic vibration	3.5.7	4.6.4.11

4.5 Conformance inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of groups A, B and C.

4.5.1.1 Inspection lot. An inspection lot, as far as practicable, shall consist of all the antennas produced under essentially the same conditions and offered for delivery at one time.

4.5.1.2 Group A inspection. Group A inspection shall consist of the examinations and tests specified in Table II and each antenna offered on the contract or order shall be subjected to these tests.

TABLE II. Group A Inspection.

Examination or test	Requirement paragraph	Method paragraph
Visual and mechanical	3.3, 3.4 to 3.4.7 incl., 3.5.8, and 3.5.10	4.6.1
Electrical	3.2.3	4.6.2
VSWR	3.5.2	4.6.3.2

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4.5.1.2.1 Disposition of items. Items which have passed the group A inspection shall be subjected to the Group B inspection. Items which do not pass the group A inspection shall not be acceptable on the contract or order.

4.5.1.3 Group B inspection. Group B inspection shall consist of the tests specified in [table III](#).

TABLE III. Group B inspection.

Examination or Test	Requirement paragraph	Method paragraph
Performance	<a href="#">3.5 to 3.5.5 Incl.</a>	<a href="#">4.6.3 to 4.6.3.5 Incl.</a>

4.5.1.3.1 Sampling plan. Statistical sampling and inspection shall be performed on an inspection lot basis with a random sample of units selected in accordance with [table IV](#). The acceptance levels shall be based upon the zero defective sampling plan. No failures shall be permitted.

TABLE IV. Group B Sampling Plan.

Lot size	Sample size
1-13	100 percent
14-150	13
151-280	20
281-500	29
501-1200	34
1201-3200	42
3201-10,000	50

4.5.1.4 Group C inspection. Group C inspection shall consist of the power test ([see 4.6.3.6](#)), vibration ([see 4.6.4.7](#)) and rain ([see 4.6.4.9](#)) and shall be conducted on one antenna out of each lot of 200 or fraction thereof produced on the contract or order, except that the first samples selected shall be from the first units produced.

#### 4.6 Methods of examination and test.

4.6.1 Visual and mechanical examination. The antenna shall be examined to verify that the design, construction, physical dimensions, weight, finishing, color, input connector, marking, and workmanship are in accordance with the applicable requirements ([see 3.3, 3.4 to 3.4.7 inclusive, 3.5.8, and 3.5.10](#)).

4.6.2 Electrical test. Each electrical component shall be given a continuity test to ascertain that it is wired and connected correctly and that good electrical contact is obtained ([see 3.2.3](#)).

#### 4.6.3 Performance.

4.6.3.1 Gain. The gain of the antenna shall be computed by the comparison of a received signal strength from the test antenna to the received signal strength from a standard half-wave dipole antenna. Measurements shall be made with appropriate test equipment at 225, 310, and 400 MHz ([see 3.5.1](#)).

4.6.3.2 VSWR. The VSWR of the antenna shall be determined by the slotted line method, UHF bridge method, or a method approved by the contracting agency. Measurements shall be made at both extreme frequencies and at least three other evenly spaced frequencies within the operating frequency range. The values shall not exceed that specified ([see 3.5.2](#)).

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4.6.3.3 Impedance. The impedance of the antenna shall be measured by one of the methods for measuring VSWR ([see 3.5.3](#)).

4.6.3.4 Radiation pattern. The radiation pattern shall be determined by the use of a "field-strength" or pattern measuring system, or other method acceptable to the procuring agency ([see 3.5.4](#)).

4.6.3.5 Frequency range. The frequency range requirements shall have been met if the antenna meets the requirements for gain, VSWR and power capability at the frequencies specified ([see 3.5.5](#)).

4.6.3.6 Power capability. Maximum power shall be applied to the antenna for a period of 2 minutes from a transmitter designed to operate with such an antenna, without malfunction of, or damage to, the antenna ([see 3.5.6](#)). The continuity and VSWR shall then be checked in accordance with [4.6.2](#) and [4.6.3.2](#).

4.6.4 Environmental tests. The antenna shall be subjected to the following environmental conditions in accordance with [MIL-STD-810](#), with the following exceptions, without deterioration of quality or performance ([see 3.5.7](#)). After each environmental test, the continuity and VSWR shall be checked in accordance with [4.6.2](#) and [4.6.3.2](#).

4.6.4.1 Fungus. The antenna shall be subjected to the fungus test in accordance with method 508, procedure I. A certified statement by the contractor that all materials are non-nutrient will be acceptable in lieu of this test.

4.6.4.2 Sand and dust. The antenna shall be subjected to the sand and dust test in accordance with method 510, procedure I.

4.6.4.3 High temperature. The antenna shall be subjected to the high temperature test in accordance with method 501, procedure I, except the temperature shall be held at 71°C (160°F) for 4 hours and then at 52°C (126°F) for 20 hours in lieu of 48 hours at 71°C (160°F).

4.6.4.4 Low temperature. The antenna shall be subjected to the low temperature test in accordance with method 502, procedure I.

4.6.4.5 Humidity. The antenna shall be subjected to the low temperature test in accordance with method 507, procedure I.

4.6.4.6 Low pressure. The antenna shall be subjected to the low pressure test in accordance with method 500, procedure I.

4.6.4.7 Vibration. The antenna shall be subjected to the vibration test in accordance with method 514, procedure I.

4.6.4.8 Salt fog. The antenna shall be subjected to the salt fog test in accordance with method 509, procedure I. After exposure, the salt deposits shall be removed by a gentle wash or a dip in running water not warmer than 38°C (100°F) and a light brushing. The antenna shall then be inspected.

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4.6.4.9 Rain. A simulated rainfall equivalent to 4 inches per hour shall be applied to the antenna under the following conditions and in the order specified:

- (a) The antenna shall be erected in its normal operating position with the antenna non-operating.
- (b) The first hour the rainfall shall be vertical; the second hour the rainfall shall be 45 degrees to the perpendicular, 15 minutes to a side.
- (c) With the simulated rainfall still applied, 1.0 kilowatts of RF power, within the operating frequency range of the antenna, 100 percent amplitude modulated, shall be applied for 2 minutes. 1132 volts, 60 Hz with one ampere available may be used instead of 1 kW RF.
- (d) A simulated rainfall shall then be 90 degrees to the perpendicular for 1 hour, 15 minutes to a side, then back to the vertical for 1 hour and the power test repeated.
- (e) The performance of the antenna shall not be below the minimum specified in section 3.

#### 4.6.4.10 Loading tests.

4.6.4.10.1 Wind. The antenna, with its normal method of mounting, shall be subjected to direct or simulated loading of wind at 100 miles per hour (mph) for a period of 1 hour. The antenna shall then be examined and shall show no damage.

4.6.4.10.2 Ice. The antenna shall be loaded with 1 inch of radial ice and subjected to a 60 mph wind for 1 hour. The antenna shall be checked for performance during the test.

4.6.4.11 Operating dynamic vibration. The antenna shall be subjected to operating dynamic vibration tests across the 225 MHz to 400 MHz band. With the transmitter at one frequency and the receiver tuned to different frequencies within the band, the antenna shall be shaken such that the total excursion of any part of the antenna shall not be less than 2 inches. When vibrated, the antenna shall not generate or force the transmitter to generate spurious radiation. The purpose of this test is to dynamically simulate wind vibrations as occur under operational environments.

## 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 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 Department's 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 that may be helpful but is not mandatory)

6.1 Intended use. The antenna AT-197( )/GR covered by this specification is intended for use as an antenna for a ground radio transmitter and receiver such as the AN/GRC-27, AN/GRC-29 and AN/TRC-32 for communication with aircraft equipped with UHF command radio sets and such ground UHF stations as necessary in the UHF terminal area.



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6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) The complete type designation ([see 1.2.1](#)).
- (c) Packaging ([see 5.1](#)).
- (d) Location where preproduction inspection is to be performed ([see 4.4](#)).

6.3 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 inhibit the growth of tin whiskers ([see 3.3.1](#)). For additional information on this matter, refer to ASTM-B545 (Standard Specification for Electrodeposited Coatings of Tin).

6.4 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. As of the dating of this document, the U.S. Environmentally 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).

6.5 Subject term (key word) listing.

Discone antenna  
Gain  
HN connector  
Ice  
Loading  
Omni-directional  
Polarization  
Preproduction inspection  
Radiation  
Radio  
Service life  
UHF  
VSWR  
Wind

6.6 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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Custodians:

Army - CR  
Air Force - 11  
DLA - CC

Preparing Activity:

DLA - CC

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Review Activities:

Air Force - 99

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