

INCH-POUND

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DETAIL SPECIFICATION

ANTENNA GROUP OE-303()/GRC

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

1. SCOPE

1.1 Scope. This specification covers a broadband directional VHF antenna system to be designated as Antenna Group OE-303()/GRC. The OE-303 is also referenced herein as: the antenna system.

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 6.3).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

MIL-F-14072 - Finishes for Ground Based Electronic Equipment.

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
MIL-STD-252 - Wired Equipment, Classification of Visual and Mechanical Defects.
MIL-STD-810 - Environmental Engineering Considerations & Laboratory Tests.
MIL-STD-2073-1 - DoD Standard for Military Packaging.
MIL-STD-13231 - Marking of Electronic Items.

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

HANDBOOKS

DEPARTMENT OF DEFENSE

MIL-HDBK-454 - General Guidelines for Electronic Equipment.

(Unless otherwise indicated, 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.)

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

DRAWINGS

Electronics Command

DL-A3010408 - Antenna Group OE-303/GRC.

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

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 that are DoD adopted are those listed in 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 6.3).

Electronic Industries Alliance (EIA)

RS-329 - Minimum Standards for Communication Antennas, Part I - Base Station Antennas.

(Applications for copies should be addressed to Electronic Industries Alliance, Corporate Engineering Department, 2500 Wilson Boulevard, Arlington, Virginia, 22201.)

2.4 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 Classification of requirements. The requirements for this item are classified herein as follows:

<u>Requirement</u>	<u>Paragraph</u>
Construction	3.2
Structural Integrity	3.3
Electrical	3.4
Environmental	3.5

3.1.1 First article. When specified, a sample shall be subjected to first article inspection (see 4.3).

3.2 Construction.

3.2.1 General. All piece-parts, sub-assemblies, and the final assembly of Antenna Group OE-303()/GRC shall be constructed in accordance with the drawings listed on Data List DL-A3010408.

3.2.2 Interchangeability. Like units, sub-assemblies, assemblies, and replaceable parts shall be physically and functionally interchangeable without modification of the items or of the antenna system. Individual items shall not be handpicked for fit or performance. Reliance shall not be placed on any dimension, rating, characteristic, etc. not specified on the drawings. Like units, assemblies and replaceable parts guidance is found in guideline 7 of MIL-HDBK-454 (see 4.13, Table III).

3.2.3 Workmanship. Workmanship guidance is found in guideline 9, MIL-HDBK-454. Classification of defects shall be in accordance with MIL-STD-252. The specified camouflage paint has a flat, dull finish which is easily polished (marked) when parts are rubbed together. Occasional small marks are expected and can be tolerated. Excessive polishing is considered to exist when greater than ten percent of the surface area of a given part is marked. Such a condition may be induced by certain mechanical tests. When excessive polishing exists, the finish shall be given a paint touch-up prior to final acceptance (see 4.4).

3.2.4 Finish. The antenna system shall be finished in accordance with the drawings and the paint finish requirements of MIL-F-14072 (see 4.12, 4.4).

3.2.5 Marking. Marking shall be in accordance with the drawings and MIL-STD-13231. Classification of defects in MIL-STD-13231 is applicable (see 4.14, 4.4).

3.2.6 Weight. For First Article samples, weight of the complete antenna, with all parts, transmission line and the technical manual stowed in the bag, shall not exceed 42 pounds. For all other inspection samples weight shall not exceed 42 pounds or shall be within + 1/2 lb of the average weight of First Article samples, whichever is least. Weight of each matching transformer assembly shall not exceed 18 oz (see 4.10.2, Table III).

3.2.7 Transport size. For First Article samples, the outside dimensions of the closed bag, with all required items properly stowed, shall not exceed the following:

	<u>length</u>	<u>perimeter</u>
Antenna Bag	24 inches	28 inches
OE-303/GRC Bag	42 inches	36 inches

For all other inspection samples, the dimensions shall not exceed the dimensions above or + 1 inch of the average length and + 2 inches of the average perimeter of the First Article samples, whichever is smaller. (see 4.10.4, Table III).

3.2.8 Parts, materials and processes. Parts, materials and processes shall be in accordance with best manufacturing practices.

3.3 Matching transformer structural integrity. The structural integrity of the matching transformer structure (Drawing A3010435) shall be such that it is capable of withstanding, without damage or indication of separation, an axial tensile force of 250 pounds applied (separately) at the following connectors: the matching transformer coaxial connector, the antenna wire assembly connector, and the ground connector (see 4.10.3, Table III).

3.4 Electrical. The antenna system shall meet the following electrical requirements. Where a test is referenced, meeting the test shall be considered as compliance with the requirement.

3.4.1 Matching transformer. The following electrical requirements apply to the Matching Transformer Assembly (Drawing A3010410).

3.4.1.1 Coupling loss. Coupling loss through the matching transformer shall not exceed 0.5 dB (see 4.6.6. and Table II).

3.4.1.2 Matching transformer VSWR. Voltage standing wave ratio of each matching transformer shall be consistent with the free space VSWR requirements of 3.4.2.4 for the complete system. For Group A tests, the test limit shall be the worst measurement of matching transformer VSWR of first article samples where that matching transformer was part of an antenna system that complied with the free space VSWR requirement. A matching transformer for which a poorer VSWR is measured, is acceptable provided that the requirement for free space is complied with when it is tested at the input of the antenna system (50 foot transmission line not used) (see 4.6.5, Table II).

3.4.1.3 Matching transformer leakage (construction tightness). Each matching transformer shall show no evidence of air leakage through sealed seams, joints, gaskets, fastening screws, etc. when tested and corrected in accordance with 4.10.5.

3.4.2 Electrical characteristics. The following electrical requirements apply to the complete assembly antenna system, including the transmission line, unless otherwise stated.

3.4.2.1 Bandwidth. The assembled antenna system shall comply with all the following electrical characteristics, at all frequencies within the specified range of frequency coverage, without electrical tuning, switching, or physical adjustment.

3.4.2.2 Frequency range. Frequency range of the antenna system shall be at least from 30 to 88 MHz. It is not required that performance decline above and below this range.

3.4.2.3 Impedance. The reference load impedance for all measurements, at the end of the transmission line opposite the antenna, shall be 50 ohms, unbalanced to ground.

3.4.2.4 Free space VSWR. Free space voltage standing wave ratio for the antenna system, measured at the 50 ohm connection of the input matching transformer (50 foot transmission line not used), shall not exceed 1.5 to 1 in the frequency range of 30 to 60 MHz and shall not exceed 2.0 to 1 in the frequency range of 60 to 88 MHz (see 4.6.1.1).

3.4.2.5 Antenna gain. The average antenna gain over the required frequency range shall be at least 6 db above the gain of the vertical dipole antenna, but not less than 3.5 db at any particular frequency (see 4.6.1.5 Table III).

3.4.2.6 Radiation pattern. The radiation pattern shall be in accordance with paragraph 2.7.2 of EIAS Standard RS-329 (see 4.6.3, Table III).

3.4.2.7 RF power level. Continuous duty RF power capability of the complete antenna system shall be 350 watts (see 4.6.1.2).

3.4.2.8 Front to back ratio. The front to back ratio shall not be less than 12 dB (see 4.6.3, Table III).

3.4.2.9 Dielectric withstanding voltage. Insulation material in the matching transformers and mast insulator shall show no visible effects or evidence of dielectric breakdown due to an applied voltage of 10,000 volts after the system has been subjected to environmental stresses of the service conditions specified in paragraph 4.6.1.4.

3.5 Service conditions. As a result of being subjected to the following environmental conditions, according to the methods set forth in the test schedules, the antenna system shall not exhibit any effect that would be harmful to performance or reliability. The parts of the system shall not be deformed, defaced, or frayed in any manner or exhibit evidence of corrosion. Corrosion is any visible degradation that can be attributed to flaky, pitted, blistered or otherwise loosened finish on metal surface. Harmful electrical performance is performance below the test limits stated herein (see 4.10.1, 4.11).

3.5.1 Temperature.

a. High temperature. (see 4.11.1.1, Table IV)

(1) Operating. The antenna system shall be operable without degradation in specified performance and shall sustain no physical deterioration, at ambient air temperature as high as 71°C (+160°F). This includes effects of solar radiation at a rate of 360 BTU/ft/hr.

(2) Storage and transportation. The antenna system shall withstand exposure to ambient temperatures as high as 71°C (+160°F).

b. Low temperature. (see 4.11.1.2, Table IV)

(1) Operating. The antenna system shall be operable without degradation in specified performance and shall sustain no physical deterioration at ambient air temperatures as low as -45.6°C (-50°F).

(2) Storage and transportation. The antenna system shall withstand exposure to ambient temperature as low as -57°C (-70°F).

3.5.2 Rain. The antenna system shall be capable of operating for extended periods in heavy rainfall without harmful structural deterioration, without degradation in specified performance, without insulation breakdown, and without electrical flashover (see 4.11.6, Table IV).

3.5.3 Humidity. The antenna system shall be operable without degradation in specified performance and shall sustain no harmful physical deterioration, during and after prolonged exposure to extreme high humidity levels encountered in tropical areas. The antenna system shall be capable of meeting the test of method 507.1, procedure II of MIL-STD-810 (see 4.11.9, Table IV).

3.5.4 Fungus. The antenna system shall show no evidence of viable fungus of corrosion when subjected to environmental conditions which would be favorable to their development, namely high humidity, warm atmosphere, and presence of inorganic salts. The antenna system shall be capable of meeting the test of method 508.1, procedure I of MIL-STD-810 (see 4.11.8, Table IV).

3.5.5 Salt fog. The antenna system shall be capable of operation for extended period in the saline atmosphere of a seacoast environment without harmful structural deterioration, without degradation in specified performance, without insulation breakdown and without electrical flashover. The antenna system shall be capable of meeting the test of method 509.1, Procedure I of MIL-STD-810 (see 4.11.4, Table IV).

3.5.6 Dust. The antenna system shall be capable of operating for extended periods in a dry, windy (17 knots), sandy environment without harmful structural deterioration, without degradation in specified performance, without insulation breakdown, and without electrical flashover. The antenna system shall be capable of meeting the test of method 510.1, procedure I of MIL-STD-810 (see 4.11.3, Table IV).

3.5.7 Immersion. The antenna system, stowed in its bags, (less technical manual and transmission line), shall be capable of being immersed to a covering depth of 3 feet of fresh water for a period of 2 hours. The immersion shall not result in any form of physical deterioration, loss of fit, or reduction in electrical performance below specified limits (see 4.11.5, Table IV).

3.5.8 Bounce, loose cargo. The antenna system, disassembled and stowed in its bags, shall be capable of withstanding shocks and exposure to wear induced during field transport as loose cargo. Some wear to the bags is expected as a result of the test of 4.7. However, the bags shall not be frayed or torn to the extent that it ceases to perform its function of containing and protecting its contents (see 4.7, Table IV).

3.5.9 Sunshine. The antenna system shall withstand solar radiation occurring at a rate up to 360 British thermal units per square foot per hour without harmful deterioration (see 4.11.7, Table IV).

3.5.10 Drop shock. The antenna system, disassembled and stowed in its bags, shall be capable of being repeatedly dropped a distance of 30 inches onto any surface or edge without harmful damage to any component or to the bags (see 4.8, Table IV).

3.5.11 Wind/ice load. The antenna system, when erected for field operation according to the instructions, shall be capable of withstanding 90 mile per hour winds without ice load and 60 mile per hour winds with 1/2 inch of radial ice and remain erected, without harmful damage to the antenna, or to the mast including the guy system. (Note that the test specified herein is for 90 mph winds only since this is easier to implement and performs essentially the same purpose as a combined wind/ice load test (see 4.11.10, Table IV).

3.6 Systems safety engineering.

3.6.1 Personnel hazards. Personnel hazards shall be kept to a minimum. Guidance of MIL-HDBK-454, guidelines 1 and 8 applies to tasks and efforts such as the selection of parts, the complete manufacturing and assembly process, and any product baseline configuration changes that may be implemented during the course of the contract. Verification that compliance with this requirement has been achieved shall be through visual inspection (see 4.10.1.1, Table I).

3.6.2 Edge rounding exposed. Exposed edges shall be rounded to a minimum radius of 0.04 inches (1 mm), and exposed corners to a minimum of 0.5 inches (13 mm).

3.6.3 Radioactive materials. Radioactive materials shall not be used (eg. luminous dials/markings, electron tubes, surge arrestors and lenses).

4. VERIFICATION

4.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.2 Classification of inspection. Inspection shall be classified as follows:

- a. First Article inspection (does not include preparation for delivery) (see 4.3).
- b. Inspection covered by subsidiary documents (see 4.4).
- c. Conformance inspection (see 4.5).
 - (1) Conformance inspection of equipment before packaging (see 4.5).
 - (2) Packaging inspection (see 4.15).

4.2.1 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in 4.6 through 4.15.

4.3 First article. Unless otherwise specified in the contract or purchase order, the first article inspection shall be performed by the contractor and shall consist of the following:

4.3.1 First article units. The contractor shall furnish five (5) first article units of the complete OE-303/GRC that shall reflect material and conditions that will be used in production.

4.3.2 First article inspection. The first article inspection shall consist of the inspection specified in subsidiary documents covering the items listed in 4.4, the inspection specified for Group A, Group B and Group C. The inspection shall be performed in the following order: 4.4, Group A and Group B for all units, and Group C as specified in Table I. After completion of Group C test, conforming units shall be reinspected and shall pass all Group A inspection. The contractor shall be required to repair and retest at his own expense any units that have failed tests required herein until those units have satisfactorily passed specified requirements.

4.4 Inspection covered by subsidiary documents. The following shall be inspected under the applicable subsidiary documents as part of the inspection of equipment before preparation for delivery.

Item	Paragraph
Workmanship	3.2.3
Finish	3.2.4
Marking	3.2.5
Parts, materials and processes used in electronic equipment	3.2.8

4.5 Conformance inspection of equipment before packaging. The contractor shall perform the inspection specified in 4.4. through 4.15. This does not relieve the contractor of his responsibility for performing any additional inspection that is necessary to control the quality of the product and to assure compliance with all specification requirements. The Government will review and evaluate the contractor's inspection procedures and examine the contractor's inspection records. In addition, the Government - at its discretion, may perform all or any part of the specified inspection, to verify the contractor's compliance with specified requirements. Test equipment for Government verification inspection, shall be made available by the contractor. Further, all facilities and services necessary for the placement, operation and maintenance, of this test equipment shall be provided by the contractor.

4.5.1 Group A inspection. Each unit on contract or purchase order shall be inspected for conformance to inspections specified in Table II. Discrete lots shall be formed from units that pass this inspection. Each lot shall be subjected to sampling inspection.

4.5.1.1 Order of inspection within Group A. Group A inspection shall be performed in an order satisfactory to the Government.

4.5.1.2 Procedure in the event of failure during Group A inspection. In the event of failure to pass any Group A inspection item, the unit shall be corrected as necessary and then resubmitted to Group A inspection.

4.5.2 Group B inspection. This inspection (including sampling) shall conform to Table III. Group B inspection shall normally be performed on inspection lots that have passed Group A inspection and on samples selected from units that have been subjected to and that have met Group A inspection.

4.5.2.1 Group B sampling plan.

4.5.2.2 Order of inspection within Group B. Group B inspection shall be performed in any order which is satisfactory to the Government.

TABLE I. First Article Test Schedule.

Title	Req't Para	Test Para					
Inspection covered by subsidiary documents		4.4	Mandatory inspection to be performed on all First Article units.				
Group A Inspection		4.5.1					
Group B Inspection		4.5.2					
Group C Inspection			SEQUENCE				
			Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Environmental:	3.5	4.11					
Sunshine	3.5.9	4.11.7				1	
Low temperature	3.5.1b	4.11.2.2	1				
High temperature	3.5.1a	4.11.2.1	2				
Immersion	3.5.7	4.11.5	3				
Humidity	3.5.3	4.11.9		1			
Bounce/loose cargo	3.5.8	4.7		2			
Shock drop	3.5.10	4.8			1		
Dust	3.5.6	4.11.3				2	
Salt Fog	3.5.5	4.11.4				3	
Fungus	3.5.4	4.11.8					1
Rain	3.5.2	4.11.6			2		
Wind/ice load	3.5.11	4.11.10	4				

TABLE II. Group A Inspection.

Title	Req't Para	Test Para
Mechanical/visual inspection		4.10.1
Antenna impedance	3.4.2.3	4.6.2
Transmission line	3.4.2.3	4.6.4
Matching transformer VSWR	3.4.1.2	4.6.5
Coupling loss	3.4.1.1	4.6.6
Dissipation transmission line	3.4.2.3	4.6.4
Matching transformer leakage	3.4.1.3	4.10.5

4.5.2.3 Procedure in the event of failure during Group B inspection. In the event of failure to pass any Group B inspection item the unit shall be corrected as necessary then resubmitted to Group B inspection.

4.5.3 Group C inspection. This inspection shall consist of the tests specified in Table IV and shall be performed on sample units that have been subjected to and that have met Group A and Group B inspection. Sample units shall be selected in accordance with paragraph 4.5.3.1.

TABLE III. Group B Inspection.

Title	Req't Para	Test Para
Weight	3.2.6	4.10.2
Transport size	3.2.7	4.10.4
Matching transformer structural integrity	3.3	4.10.3
Interchangeability	3.2.2	4.13
Radiation pattern	3.4.2.6, 3.4.2.8	4.6.3
Antenna gain	3.4.2.5	4.6.1.5

TABLE IV. Group C Inspection.

Title	Req't Para	Test Para	Sampling Para
Low temperature	3.5.1b	4.11.1.2	4.5.3.1.a
High temperature	3.5.1a	4.11.1.1	
Immersion	3.5.7	4.11.5	
Matching transformer structural integrity	3.3	4.10.3	
Humidity	3.5.3	4.11.9	4.5.3.1.b
Bounce/loose cargo	3.5.8	4.7	4.5.3.1.c
Drop	3.5.10	4.8	
Rain	3.5.2	4.11.6	
Wind/ice load	3.5.11	4.11.10	4.5.3.1.d
Sunshine	3.5.9	4.11.7	
Dust	3.5.6	4.11.3	
*Salt fog	3.5.5	4.11.4	
*Fungus	3.5.4	4.11.8	4.5.3.1.e

*The equipment shall be thoroughly washed, cleaned, dried and refurbished after this inspection before proceeding with subsequent inspection.

4.5.3.1 Sampling for inspection of equipment. Units selected for each Group C inspection shall be selected without regard to their quality in accordance with the following:

a. Two units from the first 50 production units shall be selected for this first Group C inspection. For subsequent Group C inspections, two units from each successive 250 or two per month if less than 250 are produced monthly, shall be selected. Both units shall be subjected to all testing in the order specified in Table IV.

b. Two units from the first 50 production units shall be selected for this Group C inspection. For subsequent Group C inspections, two units from each successive 500, or two every two months, if less than 500 are produced during a two month period. One unit shall be subjected to humidity testing, one unit shall be subjected to bounce (loose cargo) testing.

c. Two units from the first 50 production units shall be selected for the first Group C inspection. For subsequent Group C inspections, two units shall be selected from each successive 600, or two every three months, if less than 600 are produced during this three month period. All tests need not be performed on each unit. The testing may be divided between the two units as long as all tests are performed.

d. Two units from the first 50 production units shall be selected for the first Group C inspection. For subsequent Group C inspections, two units shall be selected from every six (6) months production. The tests may be divided between the two units.

e. Two units from the first 500 production units shall be selected for the first Group C inspection.

4.5.3.2 Procedure in the event of failure during Group C inspection. The contractor shall immediately report in writing each Group C failure occurrence, including details of the failure and characteristics affected. The contractor shall immediately investigate the cause of failure and further report the results of investigation and details of the proposed corrective action on (1) the process and materials, as applicable, and (2) all units of product which were manufactured under the same conditions and which the Government considers subject to the same failure. Reports shall be forwarded to the responsible technical activity designated in the contract through the Quality Assurance Representative for evaluation. After corrective action has been taken, additional sample units shall be subjected to Group C inspection (all inspections, or the inspections which the sample failed, at the option of the Government) and Groups A and B inspection may be reinstated; however, final acceptance and shipment will be withheld until Group C reinspection results have shown that the corrective action was effective.

4.5.3.3 Reinspection of conforming Group C sample units. Unless otherwise specified, sample units which have been subjected to and passed Group C inspection may be accepted on the contract or order provided all damage is repaired and the sample units are resubjected to and pass Groups A and B inspection.

4.6 Electrical performance.

4.6.1 Antenna array. The contractor shall perform the following tests on the antenna system to demonstrate performance in accordance with the specification requirements.

4.6.1.1 Free space VSWR. The test shall be in accordance with 2.3.3 of RS-329 except that the measurement shall be performed with a vector impedance meter or other instrument of equivalent accuracy (see 3.4.2.4).

4.6.1.2 RF power capability. The antenna system shall be installed using a metal mast. To electrically include the mast insulator in the test, a ground connection shall be completed between the support mast section and the ground side of the input matching transformer ground connector. Three hundred and fifty (350) watts of power shall be applied to the assembly at the input matching transformer connector. The power source shall be a continuous wave, radio frequency source having a nominal output impedance of 50 ohms. The test frequency shall be at a high end of the specified frequency range. Power shall be applied for a period of 30 minutes. During the period when power is applied, the insulation material shall be observed for evidence of RF flashover or leakage. After power is removed the insulation material shall be inspected for evidence of RF flashover or leakage. Evidence of RF flashover or leakage shall constitute a failure. The test shall be completed within 1 hour of the time of completion of exposure to the environmental condition (see 3.4.2.7).

4.6.1.3 Matching transformer power. For convenience of test instrumentation, two matching transformers are employed in the test with the balanced sides joined together by the shortest possible connections. Both matching transformers are subjected to the service conditions and the results are adjusted to account for the doubling to effects of the test. Power from a radio frequency source having a 50 ohm output impedance shall be fed to the coax connector of one matching transformer through an in-line RF wattmeter capable of measuring forward and reverse power. The coax connector of the second balun shall be connected to an RF wattmeter having a 50 ohm load impedance. The signal source shall be adjusted to supply 200 watts forward power at the in-line wattmeter. VSWR shall be measured at the in-line wattmeter and coupling efficiency shall be observed by measuring power at the load wattmeter (see 3.4.1.1, Table II).

4.6.1.4 Dielectric withstanding voltage. The antenna system shall be subjected to the test in accordance with Method 301 of MIL-STD-202 (see 3.4.2.9).

4.6.1.5 Antenna gain test. The relative power gain of the antenna compared to a half-wave dipole, adjusted to resonance, shall be measured. The gain of the array and dipole shall be recorded and compared at 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, and 88 MHz. The gain shall meet the requirements of 3.3.5 with the test conducted in vertical polarization. The requirement of 3.3.6 and 3.3.8 shall also be satisfied (see 3.4.2.5, Table III).

4.6.2 Antenna impedance. The antenna impedance shall be measured over the frequency range of the antenna (30 to 88 MHz) by use of a vector impedance meter or similar device. The measurement shall be made with the antenna properly erected and terminated. A dummy load shall then be designed having the same impedance variations across its terminals as the measured antenna impedance. A drawing shall be provided with the test plan showing the design of the dummy load which represents the resistive and reactive components of the antenna impedance for the complete required frequency range. Alternatively, a series of dummy loads may be designed for the same purpose and drawings for each shall be attached to the test plan (see 3.4.2.3, Table II).

4.6.3 Radiation Pattern. The antenna system shall be subjected to the test of paragraph 2.7.3 of EIA RS-329 with pattern measurements recorded at 5 MHz intervals starting at 30 MHz. Patterns in elevation and azimuth of E and H planes shall be made with the antenna oriented for vertical polarization. This test shall demonstrate compliance with paragraphs 3.4.2.6 and 3.4.2.8.

4.6.4 Transmission line and dissipation transmission line. A reflectometer shall be used to test the correct impedance and continuity (see 3.4.2.3, Table II).

4.6.5 Matching transformer VSWR. The antenna impedance test of 4.6.2 must be completed before the matching transfer test can be conducted. The dummy load, designed as specified in the antenna impedance test of 4.6.2 shall be placed across the antenna wire assembly connector of the matching transformer. VSWR shall be measured at the matching transformer coaxial connector using commercially available equipment having a load impedance of 50 ohms, and having the capability of displaying VSWR over the complete required frequency range. VSWR shall be observed over the complete range and recorded at the frequency having the largest VSWR (see 3.4.1.2, Table II).

4.6.6 Coupling loss. For convenience of test instrumentation, two matching transformers are employed in the test with the antenna wire assembly connectors joined together by the shortest possible connections. Test results are adjusted to account for the doubling of effects of the test. Power from a radio frequency source having a 50 ohm output impedance shall be fed to the coaxial connector side of one matching transformer through an in-line RF wattmeter. The coaxial connector side of the second balun shall be connected to an RF wattmeter having a 50 ohm load impedance. The signal source shall be adjusted to supply a fixed forward power at the in-line wattmeter. Power at the load wattmeter shall be measured and loss computed (see 3.4.1.1, Table II).

4.7 Bounce/loose cargo. As a pretest, the antenna system shall be subjected to the Free Space VSWR test of 4.6.1.1. The antenna system shall be tested in accordance with test Method 514.2, Procedure XI, Part 2 of MIL-STD-810. The testing, as specified in 4.6.1.1, 4.6.12, 3.4.13 and 3.5 shall be made after loose cargo testing (see 3.5.8, Table IV).

4.8 Drop Shock. As a pretest, the antenna system shall be subjected to the Free Space VSWR test of 4.6.1.1. The antenna system, with all components stowed in the bag, shall be subjected to the test of Method 516.2, Procedure II of MIL-STD-810. After drop test, the testing specified in 4.6.1.1, 4.6.1.2, 3.3, 3.4.1.3, and 3.5 shall be made (see 3.5.10, Table IV).

4.9 Test methods:

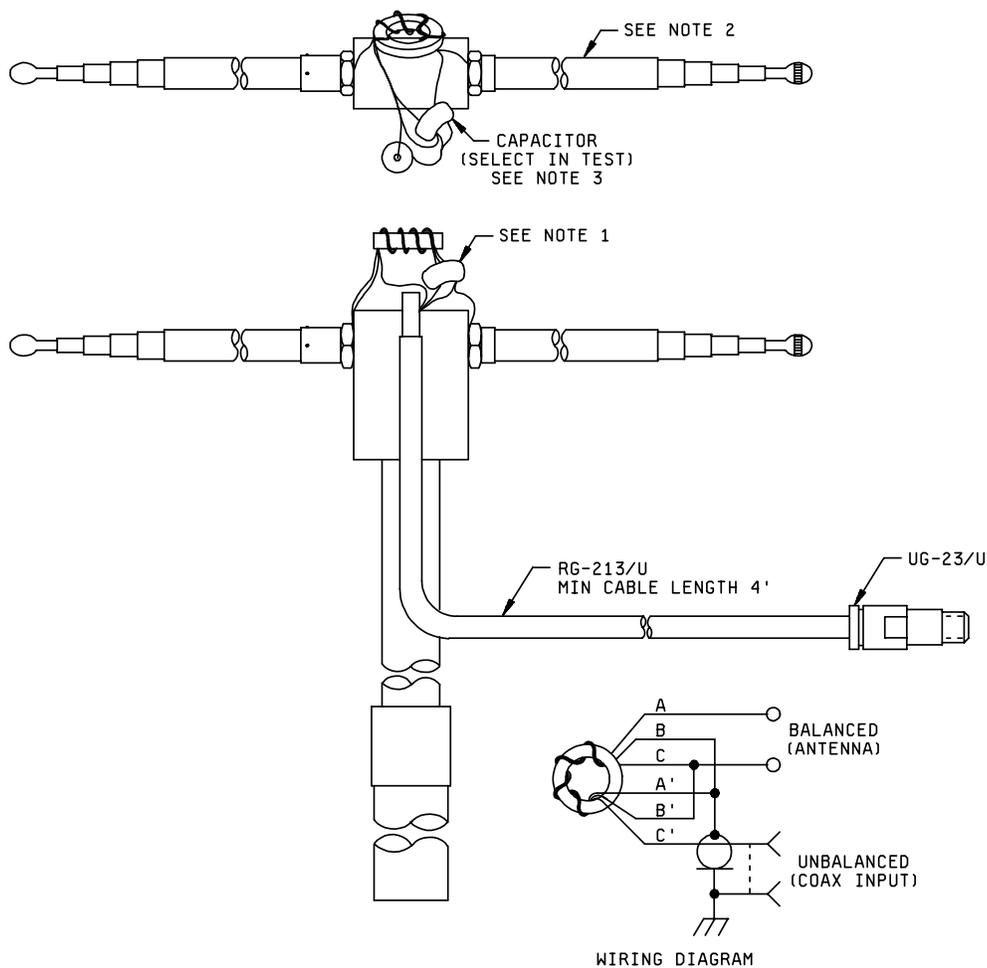
4.9.1 Standard test conditions. Unless otherwise specified, the following standard test conditions shall prevail during testing.

<u>Condition</u>	<u>Value/tolerance</u>
Temperature	Prevailing ambient
Altitude	Ground level

4.9.2 Test equipment. All electrical test equipment employed, except for the RF power source, shall be commercially available items for which calibration service, referencing back to primary standards, is available. The RF power source for matching transformer testing may be any unmodulated generator capable of adjustment to the required power level, capable of adjustment to the designated test frequency, and having a harmonic content of less than 10%. All test equipment shall be supplied by the contractor.

4.9.3 Reference dipole antenna. The reference dipole antenna for gain measurements shall be a vertically polarized balanced dipole. Length of the dipole shall be continuously adjustable. At each test frequency, length shall be adjusted to half-wave length resonance, considering end effects (usually 95% to 97% of one half wave length). When so adjusted, free space VSWR shall be less than 2.0 to 1. The coupling balun shall have a 1 to 1 impedance ratio. Balun coupling loss shall be less than 1 dB. The transmission line shall be the same line or an identical line to that of the antenna under test. Free space VSWR of the antenna and coupling loss of the balun shall be measured over the frequency range of the antenna under test. Maximum VSWR and maximum coupling loss shall be recorded in the space provided for on the test data sheet for gain measurements. A typical antenna for this purpose is shown in Figure 1.

4.10 Mechanical tests:



NOTES:

1. Indiana general part # F624-19, 02, ferrimagnetic toroid or equal with 10 turns #18 enameled wire, trifilar winding.
2. Whip sections must extend anywhere from 25 feet to 8.5 feet to adjust to frequency of measurement.
3. Value of capacitor to be selected so as VSWR of the balun is 1:1 across the frequency range of the balun.

FIGURE 1. Reference dipole antenna.

4.10.5.3.1 Performance of test. Every joint, screw, seam, gasket, and any other area where two pieces interface on the Balun Housing Subassembly half of the Matching Transformer shall be thoroughly painted with a soap and water solution. Without touching the painted half, carefully place the Matching Transformer into the vacuum chamber in a manner that will allow close visual examination of the painted portion while the vacuum chamber is being operated. While the Balun Housing Subassembly is still wet from the painted soap and water solution, a vacuum of 2.5 psig shall be applied to the chamber interior. While the vacuum is being maintained, there shall be no leaks, as evidenced by bubbling or sputtering of the wet solution. If there is a leak(s), rework shall be accomplished. Detection of a leak(s) at this stage shall be considered as having failed this test. The reworked area(s) shall then be reinspected per 4.10.5.3.

4.10.5.4 Housing plate assembly. The matching transformer shall be placed in a position that allows access to all exterior joints and fasteners on the Housing Plate Assembly surface and shall be tested as follows.

4.10.5.4.1 Performance of test. Every joint, screw, seam, gasket, and any other area where two pieces interface on the Housing Plate Assembly half of the Matching Transformer shall be thoroughly painted with a soap and water solution. Without touching the painted half, carefully place the Matching Transformer into the vacuum chamber in a manner that will allow close visual examination of the painted portion while the vacuum chamber is being operated. While the Housing Plate Assembly is still wet from the painted soap and water solution, a vacuum of 2.5 psig shall be applied to the chamber interior. While the vacuum is being maintained, there shall be no leaks, as evidenced by bubbling or sputtering of the wet solution. If there is a leak(s), rework shall be accomplished. Detection of a leak(s) at this stage shall be considered as having failed this test. The reworked area(s) shall then be reinspected per 4.10.5.4.

4.11 Environmental tests. The antenna system shall be subjected to the environmental tests specified below. Prior to each test, the test items shall be subjected to the free space VSWR test (4.6.1.1) and shall meet the requirements of 3.3.4. Immediately after exposure to each environmental test specified below the test items shall be subjected to the following inspections: RF Power Level of 4.6.1.2; Dielectric Withstanding Voltage of 3.4.2.9; Free Space VSWR of 4.6.1.1; and Service Conditions of 3.5. Specific tests may be waived, with Government approval, for those items which have previously been qualified.

4.11.1 Temperature. The antenna shall be subjected to the following temperature tests.

4.11.1.1 High temperature. The antenna system shall be subjected to the test of Method 501.1, Procedure II of MIL-STD-810. At Step 4 and 7, the chamber temperature shall be 71°C (+160°F). During Step 8, the matching transformers shall be subjected to the matching transformer power test, 4.6.1.3 for one hour. During the test all items of the antenna system shall be stowed in the bag except for the matching transformer. After exposure, the tests of 4.6 shall be conducted. When any combination of high temperature, low temperature and immersion are done on the same sample, paragraph 4.6.3 need only be done once after completion of these tests (see 3.5.1a, Table IV).

4.11.1.2 Low temperature. The antenna system shall be subjected to the test of method 502.1, Procedure I of MIL-STD-810. During Step 2, the chamber temperature shall be maintained at -57°C (-70°F) for not less than 2 hours after stabilization of the test items. Delete Step 3. During Step 4, the chamber temperature shall be maintained at -45.6°C (-50°F) for not less than 4 hours after stabilization of the test items. During Step 5, the matching transformers shall be subjected to the matching transformer power test 4.6.1.3 for one hour. During the test all items of the antenna system shall be stowed in the bag, except for the matching transformer. After exposure, the tests of 4.6 shall be conducted. When any combination of high temperature, low temperature and immersion are done on the same sample, paragraph 4.6.3 need only be done once after completion of these tests (see 3.5.1.b, Table IV).

4.11.3 Dust. The antenna system shall be subjected to test Method 510.1, Procedure I of MIL-STD-810. Operation is not required during the test. The antenna system shall be tested in accordance with 4.6.1 following this test (see 3.5.6, Table IV).

4.11.4 Salt fog. The antenna system shall be subjected to test Method 509.1, Procedure I of MIL-STD-810. Mechanical failure criteria shall be limited to corrosion of finishes and metals only. Such corrosion shall be defined as any visible degradation of the equipment surfaces that can be attributed to flaky, pitted, blistered, or otherwise loosened finish on metal surfaces (see 3.5.5, Table IV).

4.11.5 Immersion. The antenna system, as prepared for fixed transport, shall be subjected to the immersion test in accordance with Method 512, Procedure I of MIL-STD-810. At completion of this test, the antenna system shall be subjected to post test procedures without being dried in any manner other than induced by necessary handling. Post tests, as specified in 4.6 shall be completed. When any combination of high temperature, low temperature and immersion are done on the same sample, paragraph 4.6.3 need only be done once after completion of these tests (see 3.5.7, Table IV).

4.11.6 Rain. The antenna system shall be subjected to rain test in accordance with Method 506, Procedure I of MIL-STD-810. During each 30 minute rain period, wind shall be maintained for 15 minutes, commencing 5 minutes after the start of the period as specified in the procedure. The test specified in 4.6 shall be performed at the end of this test (see 3.5.2, Table IV).

4.11.7 Sunshine. The antenna system shall be exposed to the sunshine test in accordance with MIL-STD-810, Method 505, Procedure II. Before and after test, the test specified in 4.6.1 shall be performed (see 3.5.9, Table IV).

4.11.8 Fungus. The antenna system, with all covers removed, shall be tested in accordance with test Method 508.1, Procedure I of MIL-STD-810. There shall be abundant growth colonization (see 6.7) on 50 percent or more of the area control item after 14 and 28 days. No cleaning of the equipment together with cases and accessories, is permitted for 72 hours prior to the start of fungus test. Failure of the equipment to meet the requirements of 3.5.4 shall constitute failure of this test (see 3.5.4, Table IV).

4.11.9 Humidity. The antenna system shall be subjected to test Method 507.1, Procedure II of MIL-STD-810, except that in Step 6 the number of humidity cycles shall be reduced from 5 to 3. At Step 8, the antenna system shall be removed from the chamber and the tests of 4.6 shall be conducted (see 3.5.3, Table IV).

4.11.10 Wind/ice load. The antenna system shall be subjected to the load test of figure 2. Visual and mechanical inspection, paragraph 4.10.1, shall be conducted as pretest and post test (see 3.5.11, Table IV).

4.12 Finish. Finish shall be inspected in accordance with the quality assurance provisions of MIL-F-14072 and of paragraph 4.10.1 (see 3.2.4, 4.4).

4.13 Interchangeability.

4.13.1 Inspection during first article testing. Within each system all parts required by the design to be fitted together shall be assembled or fitted together. Observation for correctness of fit shall be conducted. These parts shall then be interchanged among other first article samples and assembled or fitted together. Observation of correctness of fit shall be repeated (see 3.2.2, Table I).

4.13.2 Inspection during Group B acceptance tests. Within each antenna system under Group B test parts shall be designated by the Government Quality Assurance Representative for interchangeability test. These parts shall be interchanged two ways with like parts in the accepted first article sample in the custody of the Government QAR. Observation of correctness of fit in both systems shall be observed (see 3.2.2, Table III).

4.14 Marking. Marking shall be visually inspected to determine compliance with 3.2.5 and 4.10.1 (see 3.2.5, 4.4).

4.15 Packaging inspection. Packaging inspection requirements specified herein are classified as follows:

- a. First article inspection of packaging.
- b. Conformance inspection of packaging.

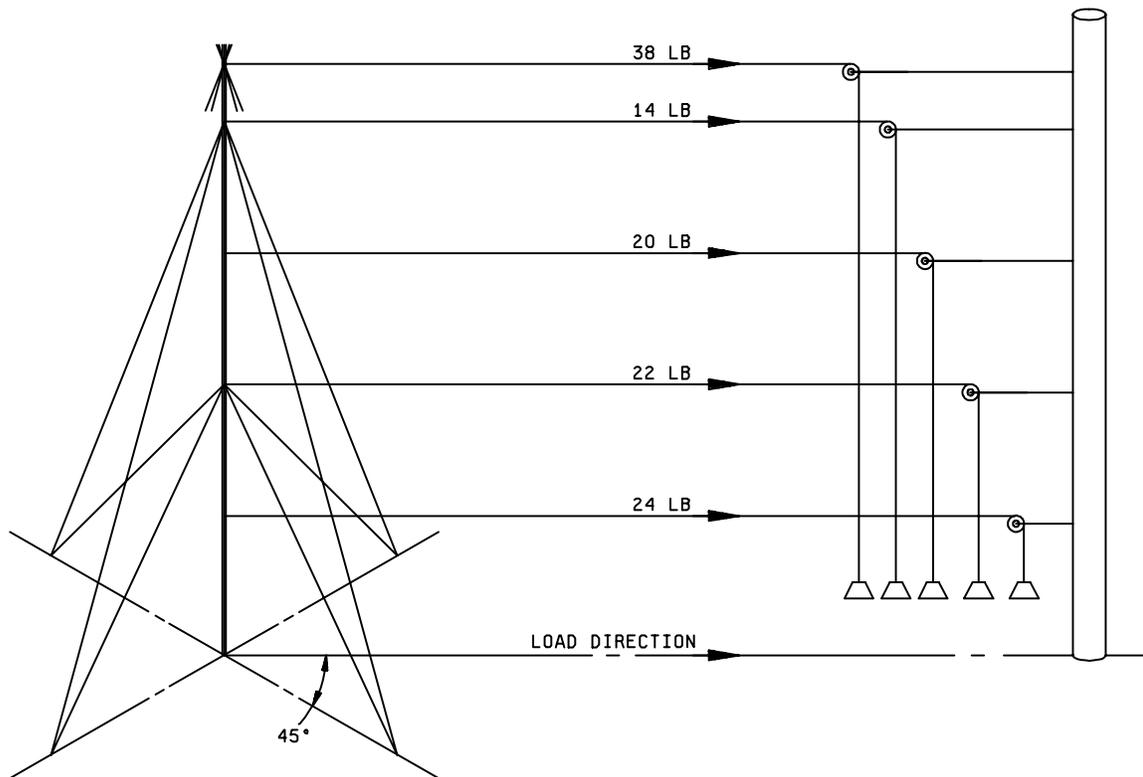
4.15.1 First article inspection of packaging. Unless otherwise specified in the contract, first article inspection of packaging shall be in accordance with the unit pack design validation requirements of MIL-STD-2073-1.

4.15.2 Conformance inspection of packaging.

4.15.2.1 Materials inspection. All materials to be used in packaging shall be inspected in accordance with the applicable material specification.

4.15.2.2 Preservation inspection. Inspection of preservation and interior markings shall be in accordance with MIL-STD-2073-1. Lot formation and sampling procedures shall be as specified therein.

4.15.2.3 Packaging inspection. Inspection of packing and the marking for shipment and storage shall consist of the examinations specified in Table V, "PACKING INSPECTION PROVISIONS". Lot formation shall consist of all packs made of the same materials during an identifiable period and submitted at one time for acceptance.



NOTES:

1. Test to be conducted with antenna mounted or with equivalent antenna dead weight.
2. Loads to be applied at guy levels & midway between guy levels, & bisecting adjacent guys.
3. Indicated loads simulate a 90 mph wind velocity.
4. Weights to be calibrated to develop forces indicated at mast.

FIGURE 2. Antenna group OE-254/GRC wind load test.

TABLE V. Packing inspection provisions.

No.	Characteristic	Method of inspection
101	Intermediate container not as specified.	Visual
102	Improper closure of intermediate container.	Visual
103	Shipping containers not in accordance with specification.	Visual
104	Excessive cube.	Visual
105	Improper blocking and bracing.	Visual
106	Closure not in accordance with specification.	Visual
107	Weight and size exceed container limitations.	Weight & Measure
108	Strapping not in accordance with specification, incorrectly applied, omitted.	Visual
109	Marking omitted, incorrect, or illegible.	Visual

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). 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 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. Antenna Group OE-303()/GRC is intended for use with radio sets AN/VRC-12, AN/VRC-43 through AN/VRC-49, AN/VRC-53, AN/VRC-64, AN/GRC-125, and AN/GRC-160.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- (a) Title, number, and date of this specification and any amendment thereto.
- (b) Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2).
- (c) Packaging requirements (see 5.1).
- (d) Place of final inspection.
- (e) MIL-STD-810 is used for test requirements and procedures in 3.5, 4.7, 4.8, and 4.11.
- (f) When the rough handling test is required.
- (g) When first article inspection rough handling tests are not required.
- (h) When first article packaging inspection reports require acquisition activity approval prior to production unit packing.

6.3 Environmental. Environmental pollution prevention measures are contained in the packaging material specifications referenced herein. Refer to material specifications or preparing activity for recommended disposability methods.

6.4 Group C inspection. Approval to ship may be withheld, at the discretion of the Government, pending the decision from the contracting officer on the adequacy of corrective action (see 4.5.3.2).

6.5 Nomenclature. The parenthesis in the nomenclature will be deleted or replaced by a letter identifying the particular design; for example: OE-303W/GRC. The contractor should apply for nomenclature in accordance with the applicable clause in the contract.

6.6 Verification inspection. Verification by the Government will be limited to the amount deemed necessary to determine compliance with any contract and will be limited in severity to the definitive quality assurance provisions established in this specification and the contract. The amount of verification inspection by the Government will be adjusted to make maximum utilization of the contractors quality control system and the quality history of the product.

6.7 Level B preservation. When level B preservation is specified, this level of protection will only be used under known favorable conditions during transportation, storage, and handling.

6.8 Subject term (keyword) listing.

Bandwidth
Coupling loss
Dielectric withstanding voltage
Frequency range
Gain
Impedance
Matching transformer
Radiation pattern
Radio sets
Reference dipole
VSWR

Custodians:
Army - CR
DLA - CC

Preparing activity:
DLA - CC

(Project 5985-1240)

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.
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-49295A	2. DOCUMENT DATE 14 January 2002
3. DOCUMENT TITLE Antenna Group OE-303()/GRC		
4. NATURE OF CHANGE <i>(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)</i>		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) Commercial DSN FAX EMAIL	7. DATE SUBMITTED
8. PREPARING ACTIVITY		
a. Point of Contact ATTN: DSCC-VAT	b. TELEPHONE Commercial DSN FAX EMAIL 614-692-0506 850-0506 614-692-6939 david.arms@dscd.dla.mil	
c. ADDRESS Defense Supply Center Columbus 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	