

MIL-C-28777A
 3 April 1978
 SUPERSEDING
 MIL-C-28777(EC)
 20 January 1972, and
 MS14009(EC)
 12 December 1969

MILITARY SPECIFICATION

CABLE ASSEMBLY, ELECTRONIC TEST EQUIPMENT, (3 WIRES, 125 and 250 VOLTS AC AND 28 VOLTS DC) GROUNDING PLUG CONNECTOR GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers electrical cable assemblies having a safety ground plug connector attached to one end and various connectors or connection provisions on the other end.

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

W-C-596 - Connector, Plug, Receptacle and Cable Outlet, Electrical Power, General Specification for.

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MIL-I-631 - Insulation, Electrical, Synthetic-Resin Composition, Nonrigid.
 MIL-C-3432 - Cable and Wire, Electrical (Power and Control, Flexible and Extra Flexible, 300 and 600 Volts).
 MIL-I-3930 - Insulating and Jacketing Compounds, Electrical (For Cables, Cords, and Wires).
 MIL-C-5015 - Connector, Electric, AN Type.
 MIL-T-7928 - Terminals, Lug and Splice, Crimp-Style, Copper.
 MIL-C-55442 - Cable Assemblies and Cord Assemblies, Packaging of.
 MIL-M-24041 - Holding and Potting Compound, Chemically Cured Polyurethane (Polyether Based).
 MIL-T-28800 - Test Equipment for use with Electrical and Electronic Equipment, General Specification for.

STANDARDS

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
 MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.

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

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Electronic Systems Command, ATTN: ELEX 5043, Department of the Navy, Washington, DC 20360 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

American National Standards Institute (ANSI)

C33.1 - 1975 - Standard for Flexible Cord and Fixture Wire.

International Commission on Rules for the Approval of Electrical Equipment (CEE)

CEE 22 - Appliance Couplers for Domestic and Similar General Purposes, Specification for.

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018).

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies).

3. REQUIREMENTS

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

3.2 Cable assemblies. Cable assemblies shall be furnished with a nonremovable grounding prong connector molded to the cable jacket on one end and with various connectors or connection provisions on the other end. The cable assembly shall be 96±3 inches (2.44±0.08 meters) long or as specified (see 3.1).

3.2.1 Cable assembly types.

3.2.1.1 Type I cable assembly. Type I cable assemblies are to be used with type I test equipment as classified in MIL-T-28800. Type I cable assemblies shall consist of: Type I cable, a plug connector as indicated in figure 1 or 2 or a MS3106A-18-9P or W-C-596/14 connector, and a type I equipment connector, or a type I terminal. Type I cable assemblies shall meet all the requirements as specified (see 3.1) over the temperature range of -40 to 65°C.

3.2.1.1.1 Type I cable. Type I cable shall conform to Type CO-03MGF(3/16)0365 (13 amperes maximum) or CO-03MGF(3/14)0430 (18 amperes maximum) of MIL-C-3432 as specified, (see 3.1). The color of the jacket of the cable shall be black.

3.2.1.1.2 Type I equipment connector and cable clamp. Type I equipment connectors shall be MS3106R-14S-7S, MS3106A-14S-7S, or MS3106A-18-9S conforming to MIL-C-5015 as specified (see 3.1). Cable clamps shall be MS3057-6A conforming to MIL-C-5015 as specified (see 3.1).

3.2.1.1.3 Type I terminal lugs. Terminal lugs shall be MS25036-108 conforming to MIL-T-7928.

3.2.1.1.4 Type I equipment connector interface. Type I cable-equipment connectors shall be connected as required by the applicable specification sheet (see 3.1).

3.2.1.2 Type II cable assemblies. Type II cable assemblies are to be used with test equipment classified as type II as designated in MIL-T-28800. Type II cable assemblies are those commercial off the shelf assemblies which meet all the requirements as specified (see 3.1) over the temperature range of -20° to 90°C.

3.2.1.2.1 Type II cable. Type II cable shall be three size 18 AWG, stranded, insulated conductors twisted together and jacketed. The wire insulation and jacket shall be free of cracks, holes, and other such defects. Unless otherwise specified, the cable shall meet the requirements for Type SVT cable, Class 12, as specified in ANSI C33.1 for 90°C (194°F) and lower temperatures. Type II cable (18 AWG) shall not be used for applications exceeding 10 amperes. Type II cable leads, color shall be as specified (see 3.1). Type II jacket color not applicable.

3.2.1.2.2 Type II equipment connector. The Type II equipment connectors shall be of the molded vinyl type molded to the cable jacket. Type II equipment connectors shall conform to figure 3 for 125 Volts Service and 250 Volts Service as specified (see 3.1), and shall mate with the Type II equipment connector test receptacle (see figure 4). The contacts shall be brass treated to prevent tarnish and corrosion.

3.2.1.2.3 Type II equipment connector interface. Unless otherwise specified (see 3.1) the green lead with the yellow stripe shall be connected to the safety ground contact, the brown lead shall be connected to the line contact, and the remaining lead shall be connected to the other contact as shown in figure 3.

3.2.1.3 Plug connector. Plug connectors in accordance with figure 1 and figure 2 shall be of the molded type and shall be molded to the cable jacket using specified material (see 3.1). Plug connectors shall conform to figure 1 for 125 volts service and to figure 2 for 250 volts service. Configuration shall be as specified (see 3.1).

3.2.1.3.1 Cable-plug connector interface. For plug connectors of figure 1 and figure 2 the green lead with the yellow stripe shall be connected to the safety ground terminal, the brown lead shall be connected to the line terminal, and the light blue lead shall be connected to the remaining terminal of the plug connector. Plug connector types of other than the above shall be connected as required by the applicable specification sheet (see 3.1).

3.2.1.3.2 Cable-terminal lug interface. The terminal lugs shall be attached to the cable and marked as specified (see 3.1). The wire markers shall be in accordance with Type F, Grade A, Form U, Class 1 of MIL-I-631.

3.3 Endurance. When tested as specified in 4.4.2, the plug and connector shall be serviceable and capable of performing its function at the completion of 1,000 operations.

3.4 Continuity. Each conductor in the cable assembly shall be continuous when tested as specified (see 4.4.3).

3.5 Dielectric withstanding voltage. The cable assembly shall withstand, without breakdown, a voltage of 1,000 volts root mean square (rms), 60 Hertz (Hz) alternating current (ac) for 60 seconds (see 4.4.4).

3.6 Insulation resistance. The insulation resistance of the cable assembly shall not be less than 100 megohms, when tested as specified in 4.4.5.

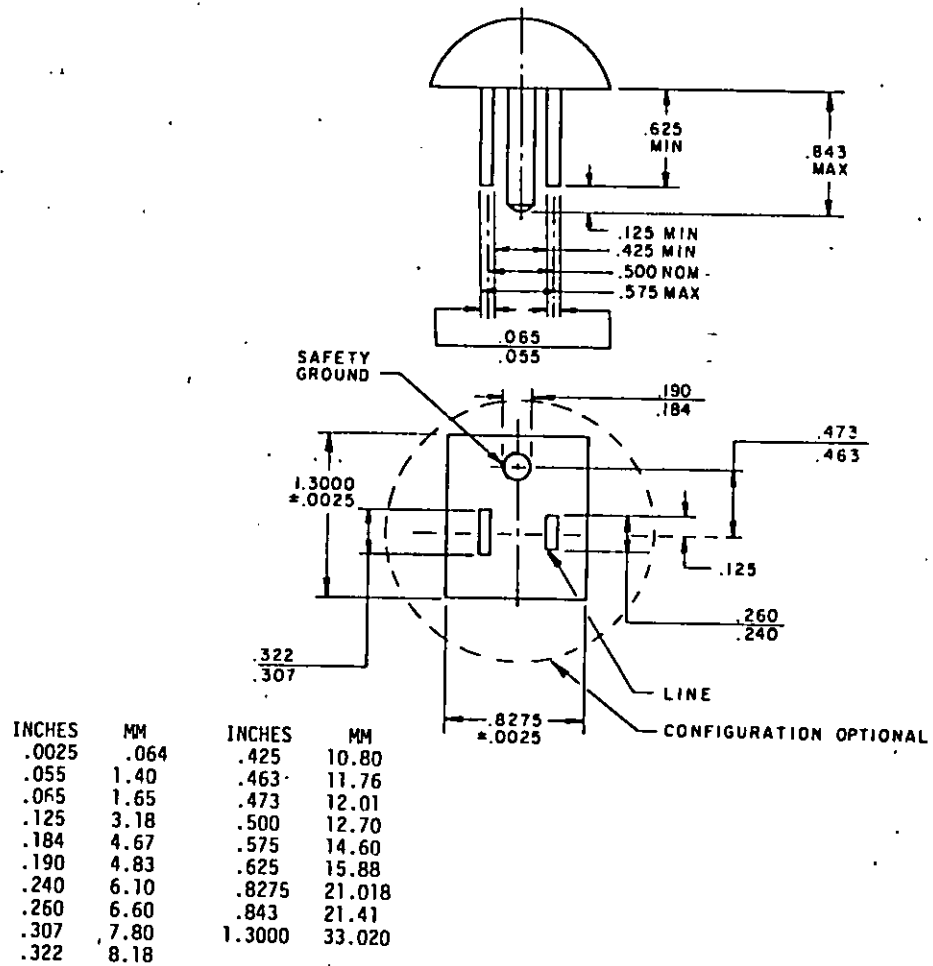
3.7 Marking.

3.7.1 Type I cable assembly marking. Type I cable assemblies shall be marked as in (a) through (d) on a band of suitable material centrally located and attached to the cable assembly (see 3.1).

- a. Army-Navy (AN) nomenclature (if assigned).
- b. Federal Supply Code for Manufacturers (FSCM) code number of manufacturer.
- c. Contract number.
- d. National Stock Number (NSN) (if assigned).

3.7.2 Type II cable assembly marking. Type II cable assemblies shall have printed or embossed cable markings at intervals of 2 feet or less which identify the cable type and maximum rated temperature, in degrees Celsius, such as: Type SVT-90°C (see 3.1).

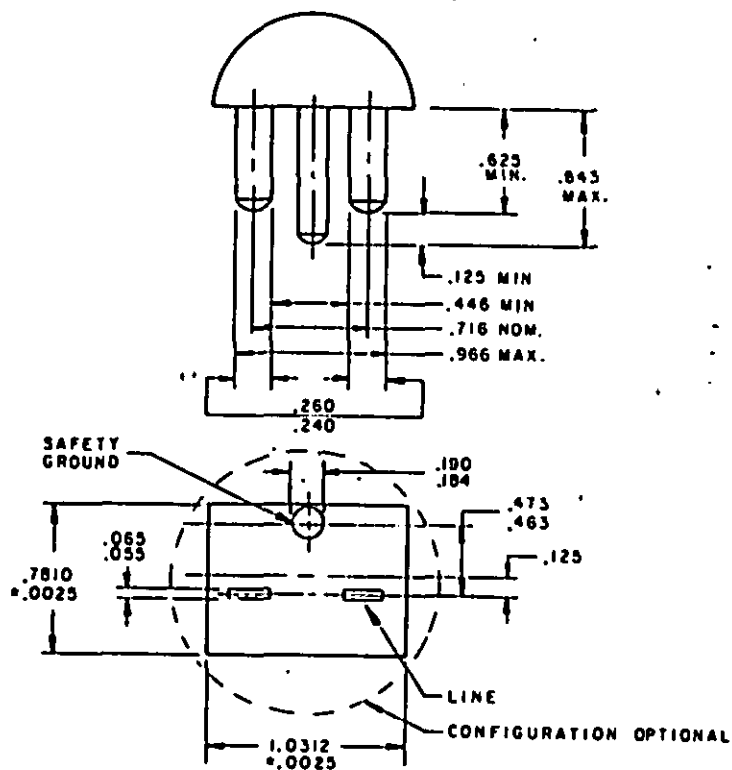
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NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.

FIGURE 1. Plug (2 pole, 3 wire, 15A ampere, 125 V, 50/60 hertz) connector.



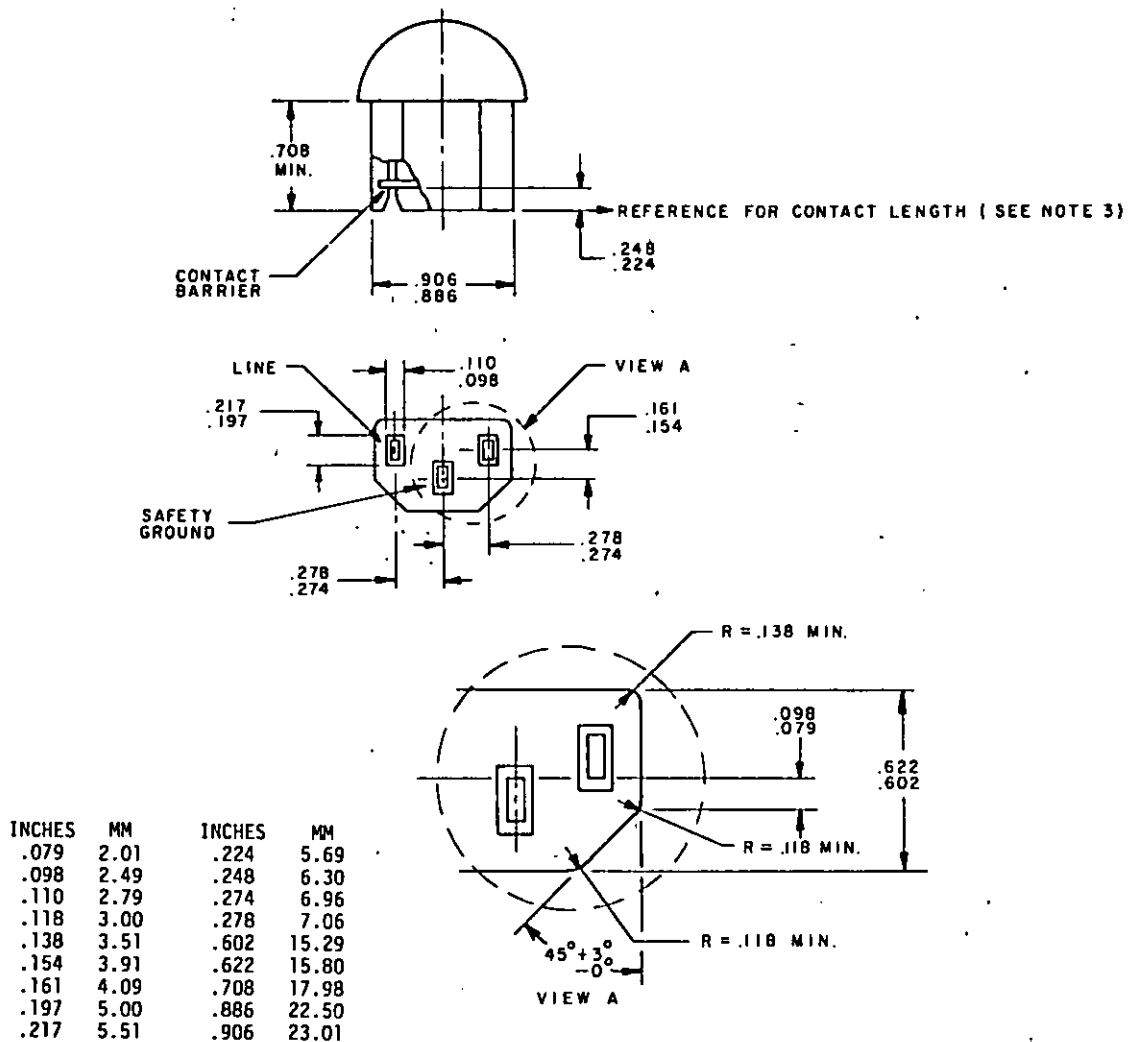
INCHES	MM	INCHES	MM
.0025	.064	.463	11.76
.055	1.40	.473	12.01
.065	1.65	.625	15.88
.125	3.18	.716	18.19
.184	4.67	.7810	19.837
.190	4.83	.843	21.41
.240	6.10	.966	24.54
.260	6.60	1.0312	26.192
.446	11.33		

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.

FIGURE 2. Plug, (2 pole, 3 wire, 15 ampere, 250 V, 50/60 hertz) connector.

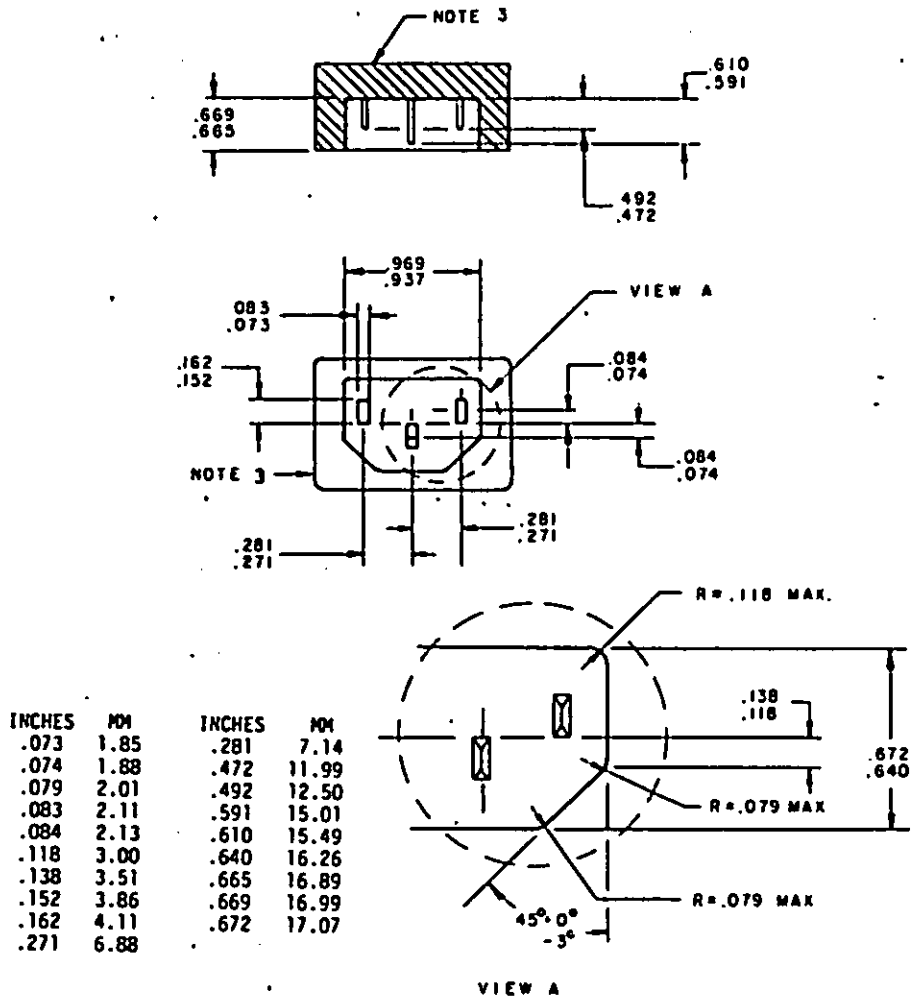
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NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.
3. Contacts shall be designed to mate with male contacts $.157 \pm .005$ (3.99 \pm .13 mm) by $.078 \pm .003$ (1.98 \pm .08 mm). The design shall accommodate contact lengths of .492 (12.50 mm) for line and neutral, and .610 (15.49 mm) for safety ground.
4. Configuration similar to CEE 22 standard type V.

FIGURE 3. Type II equipment connector.



NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.
3. Exterior dimensions are not specified.
4. Configuration similar to CEE 22 standard type VI.

FIGURE 4. Type II equipment connector test receptacle.

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4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary, to assure supplies and services conform to prescribed requirements.

4.1.1 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities shall be of sufficient accuracy, quality and quantity to permit performance of the required inspection. The manufacturer shall establish adequate calibration of test equipment to the satisfaction of the Government.

4.2 Inspection conditions. Unless otherwise specified herein, all inspection shall be made at room ambient temperature, pressure, and humidity.

4.3 Quality conformance inspection.

4.3.1 Inspection of product for delivery. Inspection of product for delivery shall consist of Groups A and B inspection.

4.3.1.1 Inspection lot. An inspection lot shall consist of all cable assemblies of the same type, produced under essentially the same conditions, and offered for inspection at one time.

4.3.1.2 Group A inspection. Group A inspection shall consist of the inspections specified in table I, and shall be made on the same set of sample units in the order shown.

4.3.1.2.1 Sampling plan. Statistical sampling and inspection shall be in accordance with MIL-STD-105 for general inspection level III. The acceptable quality level (AQL) shall be as specified in table I. Critical and major defects shall be as defined in MIL-STD-105. Minor defects are not defined.

4.3.1.2.2 Manufacturer's production inspection. If the manufacturer performs tests similar to those specified in table I as the final step of his production process, Group A inspection may be waived and the data resulting from the manufacturer's production tests may be used instead. Authority to waive the Group A inspection shall be granted by the procuring activity only. The following criteria must be complied with:

- a. Tests conducted by the manufacturer during production shall be clearly identical to or more stringent than those specified for Group A inspection.
- b. The manufacturer subjects 100% of the product supplied under this specification to his production tests.
- c. The parameters measured and the failure criteria shall be the same or more stringent than those specified herein.
- d. The lot rejection criteria is the same or more stringent than that specified herein.

TABLE I. Group A inspection.

Inspection category	Requirement paragraph	Test method paragraph	AQL (percent defective)	
			Critical	Major
1. Safety ground lead (specified see 3.1)	3.2	4.4.1	0.15	---
101. Cable size, numbers, and conductor colors not as specified.	3.2	4.4.1	---	0.15
102. Connector(s) broken or cracked, contacts loose, or connector(s) not as specified.	3.2	4.4.1	---	0.15
103. Cable jacket cracked, split, or bruised, or size not as specified.	3.2	4.4.1	---	0.15
104. Protection against sharp bends (reinforcement) not provided or not as specified	3.2	4.4.1	---	0.15
105. Length of cable less than specified.	3.2	4.4.1	---	0.15
106. Marking not as required.	3.7	4.4.1	---	0.15

4.3.1.3 Group B inspection. Group B inspection shall consist of the inspections specified in table II, and shall be made on sample units which have been subjected to and have passed the inspection of 4.3.1.2.

TABLE II. Group B inspection.

Inspection category	Requirement paragraph	Test method paragraph	AQL (percent defective)	
			Major	Minor
107. Endurance	3.3	4.4.2	1.0	---
108. Continuity	3.4	4.4.3	1.0	---
109. Dielectric withstanding voltage	3.5	4.4.4	1.0	---
110. Insulation resistance	3.6	4.4.5	1.0	---

4.3.1.3.1 Sampling plan. The Group B sampling plan shall be in accordance with MIL-STD-105 for general inspection level III. The AQL shall be as specified in table II.

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

4.3.1.3.3 Disposition of sample units. Sample units which have passed all the Group B inspection may be delivered on the contract, if the lot is accepted and the sample units are still within specified tolerances.

4.3.2 Inspection of packaging. The sampling and inspection of the preservation-packaging, packing and container marking shall be in accordance with the requirements of MIL-C-55442.

4.4 Methods of inspection.

4.4.1 Mechanical and visual inspection. The units shall be given a thorough mechanical and visual inspection to verify that all materials, workmanship, and safety characteristics comply with the requirements of this specification.

4.4.2 Endurance of plug and connector.

4.4.2.1 Endurance of cable-plug. The cable-plug connector (test sample) shall be alternately coupled to and uncoupled from the test receptacle for 1,000 operations, at a rate not exceeding 10 operations per minute. The receptacle shall conform to one of the styles W-C-596/11, W-C-596/12, W-C-596/15, or W-C-596/16 as applicable (see 3.3).

4.4.2.2 Endurance of type II equipment connector. The type II equipment connector (test sample) shall be alternately coupled to and uncoupled from the test receptacle for 1,000 operations, at a rate not exceeding 10 operations per minute. The receptacle shall conform to GEE 22 Standard Sheet VI (see 3.3).

4.4.3 Continuity between connectors. Each conductor of the cable assembly shall be tested for continuity and correct connections between its terminations, using a potential of not more than 10 volts. A suitable indicator such as a flashlight bulb shall be placed in the circuit (see 3.4).

4.4.4 Dielectric withstanding voltage. The cable assembly shall be tested in accordance with Method 301 of MIL-STD-202. The test voltage specified in 3.5 shall be applied between each conductor and the remaining conductors and between the conductors connected together and the metallic connector shells if present (see 3.5).

4.4.5 Insulation resistance of cable assembly. The cable assembly shall be tested in accordance with method 302, test condition A or B of MIL-STD-202. The resistance shall be measured between each conductor and the remaining conductors and between the conductors connected together and the metallic connector shells if present. The electrification time shall be 1 minute (see 3.6).

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-C-55442.

6. NOTES

6.1 Intended use. The cable assemblies covered by this specification are intended for use with small portable test equipment requiring 125 or 250 volts ac or 28 volts dc.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- a. Title, number, and date of this specification.
- b. Type of cable assembly (see 3.2.1).
- c. Cable assembly length if other than as specified (see 3.2).

6.3 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodians:

Army - EL
Navy - EC
Air Force - 99

Review activities:

Navy - AS, MC
Air Force - 11, 85
DLA - GS

Preparing activity:

Navy - EC

Agent:

DLA - ES

(Project 6150-0146)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS: This form is provided to solicit beneficial comments which may improve this document and enhance its use. DoD contractors, government activities, manufacturers, vendors, or other prospective users of the document are invited to submit comments to the government. Fold on lines on reverse side, staple in corner, and send to preparing activity. Attach any pertinent data which may be of use in improving this document. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity. A response will be provided to the submitter, when name and address is provided, within 30 days indicating that the 1426 was received and when any appropriate action on it will be completed.

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A. GIVE PARAGRAPH NUMBER AND WORDING

B. RECOMMENDED WORDING CHANGE

C. REASON FOR RECOMMENDED CHANGE(S)

2. REMARKS

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DATE

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1 OCT 76

EDITION OF 1 JAN 72 WILL BE USED UNTIL EXHAUSTED.