

INCH-POUND
MIL-DTL-83503B
17 June 1998
SUPERSEDING
MIL-C-83503A
1 July 1983

DETAIL SPECIFICATION
CONNECTORS, ELECTRICAL, FLAT CABLE, AND/OR PRINTED
WIRING BOARD, NONENVIRONMENTAL
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 the requirements for multicontact electrical connectors for terminating flexible flat cable, and printed wiring boards (see 6.1).

2. APPLICABLE DOCUMENTS

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

2.2 Government documents

2.2.1 Specifications, standards, and handbooks The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

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 are those cited in the solicitation.

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: VAI, 3990 East Broad Street, Columbus, Ohio 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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SPECIFICATIONS

FEDERAL

- QQ-N-290 - Nickel Plating (Electrodeposited).
- QQ-S-763 - Steel Bars, Wire, Shapes, and Forgings, Corrosion-Resisting.

MILITARY

- MIL-M-24519 - Molding Plastics and Molded Plastic Parts, Thermosetting.
- MIL-C-49055 - Cable, Electrical, (Flexible, Flat, Unshielded), (Round Conductor) General Specification for.
- MIL-P-81728 - Plating, Tin-Lead (Electrodeposited).

STANDARDS

DEPARTMENT OF DEFENSE

- MIL-STD-202 - Tests Methods for Electronic and Electrical Component Parts.
- MIL-STD-1285 - Marking of Electrical and Electronic Parts.
- MIL-STD-1344 - Test Methods for Electrical Connectors.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Defense Printing Service Detachment Building 4D, Customer Service, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM A240 - Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
- ASTM A582 - Free-machining Stainless and Heat-resisting Steel Bars, Hot-rolled or Gold finished.
- ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- ASTM B16 - Rod, Bar, and Shapes for use in Screw Machines, Free Cutting Brass.
- ASTM B103 - Standard Specification for Phosphor Bronze Plate, Sheet, Strip, and Rolled Bar.
- ASTM B122 - Plate, Sheet, Strip and Rolled Bar, Copper-Nickel-Tin Alloy, Copper-Nickel-Zinc Alloy (Nickel Silver) and Copper Nickel Alloy.
- ASTM B139 - Rod, Phosphor Bronze, Bar, and Shapes.
- ASTM B159 - Standard Specification for Phosphor Bronze Wire.
- ASTM B194 - Plate, Copper Beryllium Alloy, Sheet, Strip, and Rolled Bar.
- ASTM B196 - Rod and Bar, Copper Beryllium Alloy.
- ASTM B488 - Standard Specification for Electrodeposited Coatings of Gold for Engineering Uses.
- ASTM D4067 - Reinforced and Filled Polyphenylene Sulfide (PPS) Injection Molding and Extrusion Materials.
- ASTM B579 - Electrodeposited Coatings of Tin-Lead Alloy (Solder Plate).
- ASTM A967 - Chemical Passivation Treatments for Stainless Steel Parts.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

- ANSI/NCCL Z540-1-1994 - Calibration Laboratories and Measuring and Test Equipment, General Requirements.

(Application for copies should be addressed to the American National Standards Institute, Inc. 1430 Broadway, New York, NY 10017.)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

- ISO-100012-1 - Equipment, Metrological Confirmation Systems for Measuring.

(Application for copies should be addressed to the International Organization for Standardization, 1 Rue De Varembe, Case Postale 56, CH-1211 Geneva 20, Switzerland.)

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

3. REQUIREMENTS

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

3.2 Qualification. Connectors furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.5.4 and 6.3).

3.3 Materials. Example reference materials are identified herein. However, when an example reference material is not identified, a material shall be used which will enable the connectors to meet the performance requirements of this specification. Acceptance or approval of a constituent material shall not be construed as a guaranty of acceptance of the finished product.

3.3.1 Reference materials, plating, and processes The identified reference material, plating, and processes have been established to provide assurances that connectors manufactured to this specification will properly interface to similar industry standard or government specified connector systems without problems of electrochemical contamination of critical electrical or mechanical interfaces or generation of incompatible mechanical interface surface wear products. The manufacturer of connectors supplied to this specification are allowed to use alternate recognized industry standard materials, plating, and processes from those identified in paragraph 3.3 of this specification. Alternate materials, plating and processes used must be coordinated with the qualifying activity as part of the qualification process. Use of alternates to those referenced guidance items by the supplier must not result in inferior short or long term performance or reliability of supplied connectors as compared with connectors manufactured using the referenced materials, plating, or processes. Short or long term failures or reliability problems due to use of these alternates shall be the responsibility of the supplier.

3.3.2 Body (and removable insulator, when applicable) Unless otherwise specified, the body (and removable insulator, when applicable) shall be diallylphthalate in accordance with ASTM D5948, type SIG-F (nylon glass filled, type I grade A); Polyester-Glass filled, Type GPT-15F, GPT-20F, GPT-30F per MIL-M-24519; Polyester Glass filled, or Polyphenylene Sulfide-Glass (PPS000G40A43443) filled in accordance with ASTM D 4067 (see 3.1).

3.3.3 Contacts. Contact material shall be in accordance with ASTM B16, ASTM B103, ASTM B122, ASTM B139, ASTM B159, ASTM B194, ASTM B196 and shall meet the applicable requirements as specified herein and as specified (see 3.1).

3.3.3.1 Electrical contact gold guidelines. Electrical contact gold plating shall be in accordance with ASTM B488, Type 2, Code C, class 1.25 (.00005 inch (0.0013 mm)) minimum thickness on the contact mating surface (see 3.1).

3.3.3.2 Contact underplate. All contact finishes shall have an underplate of nickel in accordance with QQ-N-290, class 2, .00003 to .00015 inch thick. Silver shall not be used as an underplate (see 3.3.1).

NOTE: When contacts have been provided in strip form, the absence of plating in the area where the contact was removed from the strip is acceptable provided it is in a nonfunctional area and any corrosion formed as a result of salt spray testing does not creep into the contact mating area.

3.3.3.3.1 Overall finish. All parts of the contact shall be gold in accordance with ASTM B488, Type 2, Code C, class 1.25 (.000050 inch (0.0013 mm)) minimum thickness (see 3.1).

3.3.3.3.2 Localized finish.

3.3.3.3.2.1 Contact mating area. Contact mating area shall be gold in accordance with .ASTM B488, Type 2, Code C, class 1.25 (.000050 inch (0.0013 mm) minimum thickness (see 3.3.3.1), over nickel .000030 to .000150 thick (see 3.3.3.2). Silver shall not be used as an underplate (see 3.1).

3.3.3.3.2.2 Insulation displacement contact (IDC) - wire termination area Shall be gold in accordance .ASTM B488, Type 2, Code C, class 1.25 (.000050 inch (0.0013 mm)) , or ASTM B488, Type 2, Code C, class 0.25 (000010 inch (0.00025 mm) minimum thickness (see 3.3.3.2 for purity and hardness), or tin-lead in accordance with MIL-P-81728, .0001 (0.00025 mm) inch thick minimum (5 percent minimum lead) (see 3.1).

3.3.3.3.2.3 Termination area.

3.3.3.3.2.3.1 Solderless wrappost. Shall be gold in accordance with ASTM B488, Type 2, Code C, class 1.25 (.000050 inch (0.0013 mm)) minimum thickness (see 3.3.3.1), or tin-lead in accordance with MIL-P-81728, .0001 (0.000254 mm) inch thick minimum (5 percent minimum lead) (see 3.1).

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3.3.3.3.2.3.2 Solder tail. Shall be gold in accordance with ASTM B488, Type 2, Code C, (.000050 inch (0.0013 mm)) minimum thickness (see 3.3.3.1), or tin-lead in accordance with MIL-P-81728, .0001 (0.000254 mm) inch thick minimum (5 percent minimum lead) (see 3.1).

3.3.3.3.2.4 Terminations intended for socket contact engagement Shall be gold in accordance with ASTM B488, Type 2, Code C, class 1.25 (.000050 inch (0.0013 mm)) minimum thickness, (see 3.1, 3.3.3.1).

3.3.3.3.2.5 Nonfunctional areas. Any portion of the contact other than the contact or termination area shall be gold, tin/lead (50 to 95 percent minimum tin), or nickel plated 000030 to .000150 thick (see 3.3.3.2 and 6.5.8). Silver shall not be used as an underplate (see 3.3.2).

3.3.4 Grommets and seals. Sealing materials shall be of a resilient dielectric material capable of meeting the performance requirements of this specification.

3.3.5 Dissimilar metals. Unless suitably protected against electrolytic corrosion, dissimilar metals shall not be employed in intimate contact with each other in connector or in mated pairs of connectors conforming to this specification. Dissimilar metals are defined in MIL-STD-889.

3.3.6 Inserts. Insert material shall be of a suitable high grade dielectric material capable of meeting the performance requirements of this specification.

3.3.7 Hardware. Mounting and mating hardware shall be corrosion resistance steel in accordance with ASTM A240 or ASTM A666, 300 series, and ASTM A582 and passivated in accordance with ASTM A967 (see 3.1).

3.3.8 Fungus resistance. Finishes and materials used in the construction of connectors shall be fungus inert in accordance with requirement 4 of MIL-HDBK-454.

3.3.9 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.

3.4 Design and construction. Connectors shall be of the design, physical dimensions, and construction specified to withstand the handling and maintenance expected in installation and normal service use and to comply with the requirements specified herein (see 3.1).

3.4.1 Contacts. The contacts shall be designed to prevent damage to the active member if improperly mated. The contact shall incorporate a wiping action.

3.4.2 Inserts. Inserts shall be designed and constructed with proper sections and radii so that they will not chip, or break in assembly or in normal service. Insert shall be designed so as to positively retain contacts.

3.4.2.1 Contact arrangements. Contact arrangements in inserts shall be as specified (see 3.1).

3.4.3 Interchangeability. The mated connectors and individual plugs and receptacles having the same Part or Identifying Number (PIN) shall be directly and completely interchangeable with each other with respect to installation and performance, as specified herein, and the applicable specification sheet (see 3.1).

3.4.4 Polarization. The polarization of connectors shall be accomplished by a mechanical or visual method that precludes mating in more than one position. The polarization shall be accomplished prior to the electrical engagement of the contacts.

3.4.5 Cable tension relief. When applicable, the connectors shall incorporate suitable means for preventing the forces applied to the conductors from acting directly on the contacts (see 3.1).

3.4.6 Screw threads. Screw threads shall conform to FED-STD-H28.

3.5 Performance. The connectors shall be wired and mated, unless otherwise specified, when subjected to the applicable environments and tests specified.

3.5.1 Preconditioning. Mating connectors shall be preconditioned as specified in 4.7.3 before any performance testing.

3.5.2 Insulation resistance. When the unmated connectors are tested as specified in 4.7.4, the initial insulation resistance shall be greater than 5,000 megohms. Insulation resistance following exposure shall not be less than 1,000 megohms.

3.5.3 Dielectric withstanding voltage. When the connectors are tested as specified in 4.7.5.1 or 4.7.5.2, there shall be no evidence of breakdown, arcing, or damage.

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3.5.4 Cable retention (flat-cable only). When connectors are tested as specified in 4.7.6, they shall withstand the minimum applied force without mechanical damage.

3.5.5 Vibration. When connectors are tested as specified in 4.7.7, there shall be no evidence of loosening of parts, cracks, or breaks, and no loss in continuity greater than 1 microsecond.

3.5.6 Low level circuit. When connectors are tested as specified in 4.7.8, the resistance shall not exceed 50 milliohms.

3.5.7 Salt spray (corrosion) (unmated). When connectors are tested as specified in 4.7.9, there shall not be sufficient corrosion to interfere with mating or unmating or cause exposure of base metal of plated parts. There shall be no evidence of deterioration that will affect their operation. After exposure, the connectors shall meet the requirements of dielectric withstanding voltage and contact resistance as specified in 3.5.3 and 3.5.10, respectively.

3.5.8 Contact retention (removable contacts only). When connectors are tested as specified in 4.7.10, there shall be no resulting damage to the contact, connector insert, housing, or contact retention system.

3.5.9 Connector-cable flexing (flat cable only). When connectors are tested as specified in 4.7.11, there shall be no discontinuity of 1 microsecond or greater during the test. Following the test, the requirements of dielectric withstanding voltage (sea level) specified in 3.5.3, shall be met and there shall be no flaws or damage.

3.5.10 Contact resistance. When connectors are tested as specified in 4.7.12, the resistance shall not exceed the value specified (see 3.1).

3.5.11 Temperature cycling. When connectors are tested as specified in 4.7.13, there shall be no evidence of cracking, crazing, or other physical damage. Discoloration of insulation or sealing material shall not constitute failure. The connectors shall be capable of being manually mated and unmated at extreme low temperature.

3.5.12 Shock (specified pulse). When connectors are tested as specified in 4.7.14, there shall be no evidence of loosening of parts, cracks or breaks and there shall be no loss of electrical continuity during the test greater than 1 microsecond.

3.5.13 Humidity. When the mated connectors are tested as specified in 4.7.15, there shall be no cracking or separation of the insulation. Following the test, the connectors shall meet the requirements of insulation resistance, dielectric withstanding voltage, and contact retention in 3.5.2, 3.5.3, and 3.5.8 respectively.

3.5.14 Mating and unmating forces. When connectors are tested as specified in 4.7.16, the force required to mate and unmated the connector pairs shall be 1.5 to 8 ounce-force times the number of contacts per connector, unless otherwise specified (see 3.1).

3.5.15 Durability. When mated and wired connectors are tested as specified in 4.7.17, there shall be no base metal exposure or damaged parts that will be detrimental to the electrical characteristics. After the test, the connectors shall meet the contact resistance requirements of 3.5.10.

3.5.16 Permeability (when applicable). When unmated connectors and connector assemblies with metal parts and mounting hardware are tested as specified in 4.7.18, the measurements shall be 2.0 μ , maximum.

3.5.17 Fungus. All external materials shall be nonnutrient to fungus growth or shall be suitably treated to retard fungus growth. The manufacturer shall meet the requirement 4 of MIL-HDBK-454. There shall be no evidence of fungus growth on the external surfaces when testing is required.

3.5.18 Temperature life. When connectors are tested as specified in 4.7.19, they shall meet the insulation resistance and contact resistance requirements in 3.5.2 and 3.5.10, respectively.

3.5.19 Solderability. Solder tail terminations shall withstand the test specified in 4.7.20.

3.6 Marking. Connectors are to be marked in accordance with method I of MIL-STD-1285, and are to include the PIN (see 3.1), the manufacturer's name or code symbol, and date code. The marking shall remain legible after completion of the tests specified herein.

3.7 Workmanship. Connectors and accessories shall be processed in such a manner, as to be uniform in quality and shall be free from burrs, crazing, cracks, voids, pimples, chips, blisters, pinholes, sharp cutting degrees (except wire wrappings), and other defects that will affect life, serviceability, or appearance.

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4. VERIFICATION

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

- a. Qualification inspection (see 4.2).
- b. Conformance inspection (see 4.3).
- c. Materials inspection (see 4.4).

4.2 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government (see 6.3) on sample units produced with equipment and procedures normally used in production. Use of alternate materials, plating, and processes (see 3.3.1) shall be identified for inclusion in the product test documentation.

4.2.1 Sample size. Ten complete connectors with the greatest number of contacts from each specification sheet, for which qualification is desired shall be subjected to qualification testing. The connectors shall be assembled to uniform lengths of flat cable and printed wiring boards when applicable, in each connector shall be tested. The conductor size shall be as specified (see 3.1).

4.2.2 Inspection routine. The sample shall be subjected to the inspections specified in table I, in the order shown. All sample units shall be subjected to the inspection of group I. The sample shall then be divided as specified in table I for groups II through V inclusive.

4.2.3 Failures. Failure to pass any one of the tests in table I shall be cause for refusal to grant qualification. All failures shall be attributed to the cause for refusal to grant qualification. All failures shall be attributed to the connector unless data is provided showing failure is due to the cable or test fixture.

4.2.4 Verification of qualification. To retain qualification, the contractor shall verify in coordination with the qualifying activity the capability of manufacturing products which meet the performance requirements of this specification. Refer to the qualifying activity for the guidelines necessary to retain qualification to this particular specification. The contractor shall immediately notify the qualifying activity at any time that the inspection data indicates failure of the qualified product to meet the performance requirements of this specification.

4.2.5 Inspection. Inspection shall be performed at a laboratory acceptable to the Government on sample units produced with equipment and procedures normally used in production (see 6.3).

4.2.6 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, qualify and quantity to permit performance of the required inspection shall be established and maintained by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment (i.e. ANSI/NCCL Z540-1-1994, ISO 10012-1 part 1, or comparable standards) shall be required.

4.2.7 Verification testing. The following identified tests and test methods assure connector integrity within typical operating conditions and applications. Alternate commercial industry standard test methods are allowed, however when an alternate method is used, the alternate method must be coordinated with the qualifying activity prior to performance of the test. The test methods describe herein are proven methods and shall be the referee method in cases of dispute.

4.3 Conformance inspection

4.3.1 Inspection of product for delivery. Inspection of product for delivery shall consist of group A inspection. Except as specified in 4.3.1.2.1, delivery of products which have passed the group A inspection shall not be delayed pending the results of group B inspection.

4.3.1.1 Inspection lot. An inspection lot shall consist of all the connectors, counterpart receptacles, and plugs as indicated in each specification sheet, produced under essentially the same conditions and offered for inspection at one time. When only the plug or receptacle is specified in the contract, the manufacturer shall supply the counterpart receptacle or plug for inspection purposes.

4.3.1.2 Group A inspection. Group A inspection shall consist of the examinations and tests specified in table II, and shall be made on the same set of sample units in the order shown. The sample units may be wired or unwired at the option of the contractor. If unwired samples are submitted, the test apparatus shall meet prior Government approval.

4.3.1.2.1 Sampling plan (group A). Table II tests shall be performed on a lot by lot production run basis. Samples shall be selected in accordance with table III. If one or more defects are found the lot shall be screened for that particular defect and defects removed. A new sample of parts shall be selected in accordance with table III and all group A tests again performed. If one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification.

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4.4 Materials inspection. Materials inspection shall consist of certification supported by verifying data that the materials, as specified by example, in table I, and on the specification sheets (see 3.1), used in fabricating the sockets, are in accordance with the applicable referenced specifications or requirements prior to such fabrication (see 3.5, 4.7.2, and 6.2).

4.4 Inspection conditions. Unless otherwise specified herein, all inspections shall be performed in accordance with the test conditions specified in the "GENERAL REQUIREMENTS" of MIL-STD-1344. Twenty percent minimum but not less than four contacts shall be installed in each connector to be tested. When a dimension is called out as a typical, a random 10% but not less than 5 readings shall be taken.

TABLE I. Qualification inspection.

Inspection	Requirement paragraph	Method paragraph
<u>Group I - (10 sample units)</u>		
Visual and mechanical-----	3.1, 3.3, 3.4, 3.6. and 3.7	4.7.2
Preconditioning -----	3.5.1	4.7.3
Insulation resistance-----	3.5.2	4.7.4
Dielectric withstanding voltage-----		
(sea Level)-----	3.5.3	4.7.5
Cable retention (flat cable only) 1/-----	3.5.4	4.7.6
<u>Group II - (2 sample units)</u>		
Dielectric withstanding voltage		
(altitude) -----	3.5.3	4.7.5.2
Vibration -----	3.5.5	4.7.7
Low level circuit-----	3.5.6	4.7.8
Salt spray (corrosion) (unmated)-----	3.5.7	4.7.9
Contact retention (removable contacts)----	3.5.8	4.7.10
Connector-cable flexing (flat cable only) ---	3.5.9	4.7.11
Insulation resistance-----	3.5.2	4.7.4
Contact resistance -----	3.5.10	4.7.12
<u>Group III - (2 sample units)</u>		
Temperature cycling-----	3.5.11	4.7.13
Shock (specified pulse)-----	3.5.12	4.7.14
Humidity -----	3.5.13	4.7.15
Contact resistance -----	3.5.10	4.7.12
<u>Group IV - (2 sample units)</u>		
Mating and unmating forces-----	3.5.14	4.7.16
Durability-----	3.5.15	4.7.17
Temperature cycling-----	3.5.11	4.7.13
Contact resistance -----	3.5.10	4.7.12
<u>Group V - (2 sample units)</u>		
Permeability (when applicable)-----	3.5.16	4.7.18
Contact resistance -----	3.5.10	4.7.12
Fungus-----	3.5.17	---
Temperature life -----	3.5.18	4.7.19
<u>Group VI - (2 sample units) 2/</u>		
Solderability-----	3.5.19	4.7.20

1/ Four samples selected at random.

2/ These samples shall not be subject to any test in any other group.

In the event that no production occurred during the reporting period, a report shall be submitted certifying that the company still has the capabilities and facilities necessary to produce the item. If during 2 consecutive reporting periods, there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit the products to testing in accordance with the qualifying inspection requirements.

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TABLE II. Group A inspection

Inspection	Requirement paragraph	Method paragraph
Visual and mechanical examination-----	3.1, 3.3, 3.4, 3.6, and 3.7	4.7.2
Insulation resistance-----	3.5.2	4.7.4
Dielectric withstanding voltage (sea level)--	3.5.3	4.7.5.1

TABLE III. Lot and sample size

Lot size	Sample size
1 to 50	5
51 to 90	7
91 to 150	11
151 to 280	13
281 to 500	16
501 to 1200	19
1201 to 3200	23
3201 to 10000	29
10001 to - - -	35

4.6.1.2.2 Rejected lots. If an inspection lot is rejected, the manufacturer may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Resubmitted lots shall be inspected using the sample size of the next higher lot size specified in table III and shall not thereafter be tendered for acceptance unless the former rejection or requirement of correction is disclosed. Such lots shall be separate from new lots and shall be clearly identified as reinspected lots.

4.6.1.2.3 Disposition of sample units. If the lot is accepted, unwired samples may be delivered on the contract. The wired samples with removable contacts may be delivered on the contract provided the wired contacts are replaced with new contacts.

4.6.1.3 Group B inspection. Group B inspection shall consist of the tests specified in table IV, in the order shown, and shall be made on sample units which have been subjected to and have passed the group A inspection.

TABLE IV. Group B inspection

Inspection	Requirement paragraph	Method Paragraph
<u>Subgroup I (2 samples)</u>		
Contact retention (removable contacts)-----	3.5.8	4.7.10
Contact resistance-----	3.5.10	4.7.12
Temperature cycling-----	3.5.11	4.7.13
<u>Subgroup II (2 samples)</u>		
Salt spray (corrosion) (unmated)-----	3.5.7	4.7.9
Dielectric withstanding voltage (sea level)--	3.5.3	4.7.5.1
Low level circuit -----	3.5.6	4.7.8

4.6.1.3.1 Sampling plan. Four connectors of each specification sheet shall be selected at random from production. These inspections shall be performed at least once each 6 months for each class but not more often than 3 months.

4.6.1.3.2 Preparation of sample units. All connector samples shall be assembled to uniform lengths of flat cable in accordance with MIL-C-49055 or printed wiring boards. The conductor size shall be as specified (see 3.1).

4.6.1.3.3 Failures. No failures shall be allowed.

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4.6.1.3.4 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. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

4.6.1.3.5 Disposition of sample units. Sample units which have been subjected to group B inspection shall not be delivered on the contract.

4.6.2 Periodic inspection. Periodic inspection shall consist of group C. Except where the results of these inspections show noncompliance with the applicable requirements (see 6.3), delivery of products which have passed groups A and B shall not be delayed pending the results of these periodic inspections.

4.6.2.1 Group C inspection. Group C inspection shall consist of the tests specified in table V, in the order shown. Group C inspection shall be made on sample units selected from inspection lots which have passed the groups A and B inspection.

TABLE V. Group C Inspection

Inspection	Requirements paragraph	Method paragraph
<u>Subgroup I</u>		
Vibration-----	3.5.5	4.7.7
Low level circuit -----	3.5.6	4.7.8
Salt spray (corrosion) (unmated)-----	3.5.7	4.7.9
Connector - cable flexing (flat cable only)---	3.5.9	4.7.11
Insulation resistance-----	3.5.2	4.7.4
Durability -----	3.5.15	4.7.17
<u>Subgroup II</u>		
Temperature cycling-----	3.5.11	4.7.13
Shock (specified pulse) -----	3.5.12	4.7.14
Humidity-----	3.5.13	4.7.15
<u>Subgroup III</u>		
Permeability (when applicable)-----	3.5.16	4.7.18
Temperature life-----	3.5.18	4.7.19
<u>Subgroup IV</u>		
Preconditioning-----	3.5.1	4.7.3
Mating and unmating forces -----	3.5.14	4.7.16

4.6.2.1.1 Sampling plan. For group C inspection, eight mated pairs with the greatest number of contacts from each specification sheet, of qualified connectors shall be selected at random from units produced within twelve months preceding initial reporting date, and every thirty-six (36) months thereafter. Counter part plugs or receptacles shall be supplied by the manufacturer when necessary for inspection purposes. Two mated sample connectors shall be subjected to each subgroup in table IV. The connectors shall be assembled to printed wiring boards or to uniform lengths of flat cable in accordance with MIL-C-49055.

4.6.2.1.2 Failures. If one or more sample units fail to pass group C inspection, the entire lot shall be considered to have failed.

4.6.2.1.3 Disposition of sample units. Sample units which have been subjected to group C inspection shall not be delivered on the contract.

4.6.2.1.4 Noncompliance. If a sample fails to pass group C inspection, the manufacturer shall notify the qualifying activity and the cognizant inspection activity of such failure and take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected and which are manufactured under essentially the same materials and processes, and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the qualifying activity has been taken. After the corrective action has been taken group C inspection shall be repeated on additional sample units (all tests and examinations, or the test which the original sample failed, at the option of the qualifying activity). Groups A and B inspections may be reinstituted; however, final acceptance and shipment shall be withheld until the group C inspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the cognizant inspection activity and the qualifying activity.

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4.7 Methods of inspection

4.7.1 Test methods. The following identified tests and test method assure socket integrity within typical operating conditions and applications. Alternate commercial industry stand test methods are allowed, however when an alternate method is used, the qualifying activity must be notified prior to performance of the test. The test methods described herein are proven methods and shall be the referee method in cases of dispute.

4.7.2 Visual and mechanical inspection. The connectors, accessories and piece parts shall be examined to verify that the dimensions, materials, design construction, marking, and workmanship are in accordance with the applicable requirements (see 3.1, 3.3, 3.4, 3.6, and 3.7).

4.7.3 Preconditioning (see 3.5.1). Before any environmental tests are conducted, the connectors shall be coupled and uncoupled 3 times.

4.7.4 Insulation resistance (see 3.5.2). The unmated connectors shall be tested in accordance with method 3003 of MIL-STD-1344.

4.7.5 Dielectric withstanding voltage (see 3.5.3)

4.7.5.1 At sea level. The mated connectors shall be tested in accordance with method 3001 of MIL-STD-1344. The following details shall apply:

- a. Points of application: The test voltage shall be applied between two adjacent contacts and between the housing and the contacts nearest the housing, if the housing is conductive see 3.1.
- b. Duration of test voltage: 5 seconds, minimum.

4.7.5.2 At altitude. The connectors shall be tested in accordance with method 3001 of MIL-STD-1344. The following details shall apply:

- a. Special preparations or conditions: Mated connectors shall be placed in a vacuum chamber at a pressure of 33.0 millimeters of mercury (70,000 feet), maximum.
- b. Magnitude of test voltage: A test voltage shall be applied for one minute during the first five minutes at altitude and for one minute during the following thirty minutes while at altitude and after 30 minutes at altitude (see 3.1).

4.7.6 Cable retention (flat cable only) (see 3.5.4). The unmated wired connector with strain relief, when applicable, shall be mounted by normal mounting means and aligned with the test fixture. An axial force of 8 ounces per contact shall be applied. The force shall be applied 6 inches from the mating face of the connector to the cable and shall pull away from the connector in a direction that will put the maximum stress on the contact-cable interface.

4.7.7 Vibration (see 3.5.5). Mated connectors shall be tested in accordance with method 2005 of MIL-STD-1344. The following details shall apply:

- a. Test condition: IV.
- b. Preparation: All contacts shall be wired in series.
- c. Applied current: 10 milliamperes.
- d. Fixture: See figure 1.
- e. The cable shall be supported at a distance of 4 inches from the connector body.

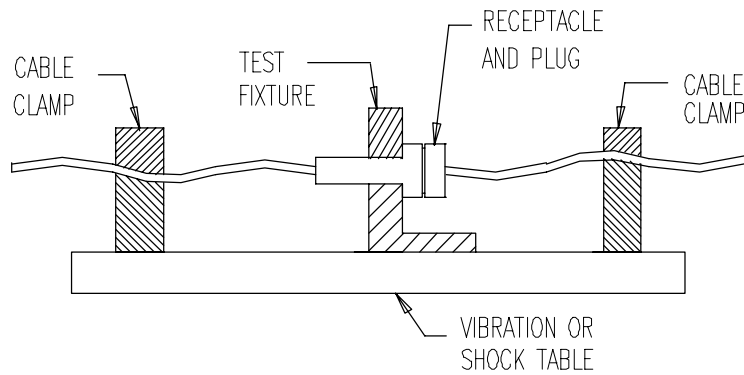
4.7.8 Low level circuit (see 3.5.6). Connectors shall be tested in accordance with method 3002 of MIL-STD-1344. The following details shall apply.

- a. Wire size: As specified (see 3.1).
- b. When connectors are assembled to printed wiring boards, the voltage drop shall be taken at the terminations at the point of attachment to the board.

4.7.9 Salt spray (corrosion) (unmated) (see 3.5.7). Connectors shall be tested in accordance with method 1001 of MIL-STD-1344. The following details shall apply.

- a. Test condition: B.
- b. Measurements after test: Dielectric withstanding voltage and low level resistance shall be measured as specified in 4.7.5.1 and 4.7.8 respectively.

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MOUNTED FLAT CABLE PLUG AND RECEPTACLE CONNECTORS

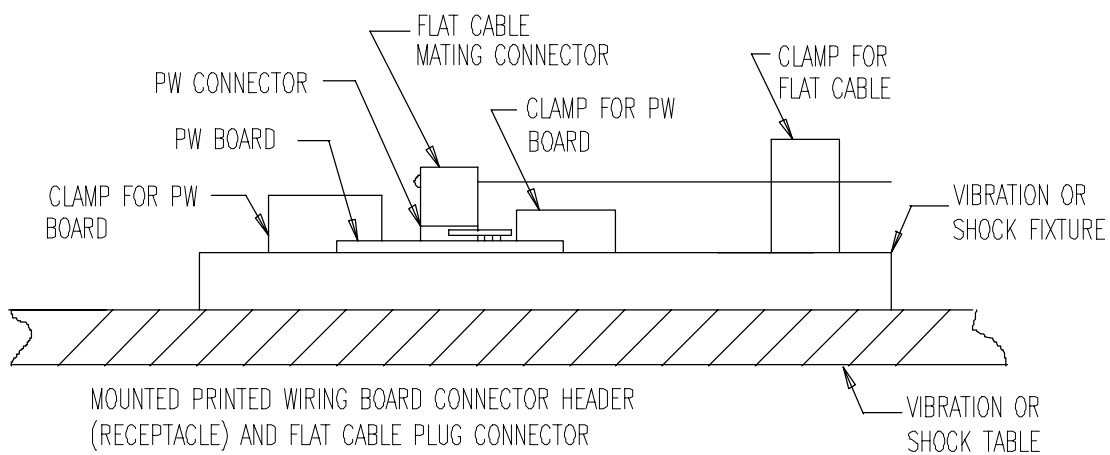
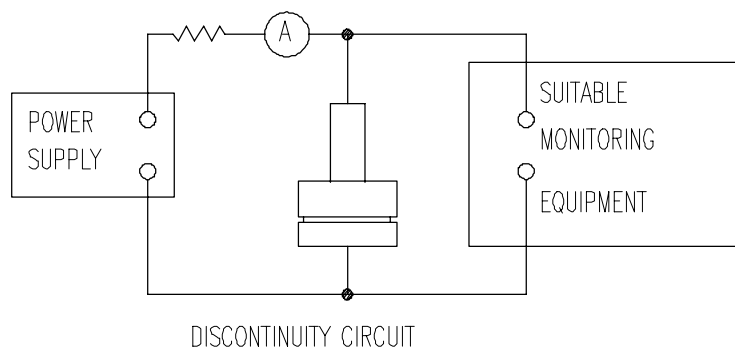


FIGURE 1. Vibration and shock fixtures

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4.7.10 Contact retention (removable contacts only) (see 3.5.8) Connectors shall be tested in accordance with method 2007 of MIL-STD-1344. The following details shall apply:

- a. Axial direction: Shall be applied in both directions.
- b. Axial load: As specified (see 3.1).

4.7.11 Connector - cable flexing (flat cable only) (see 3.5.9)

- a. Equipment: The assembled wired connector shall be installed in fixture.
- b. Test procedure: Each cable shall be gripped 12 inches from the connector with an applied tension of 2 ± 1 pounds per inch of cable width. Each cable shall be individually loaded. The cable or the connector shall be moved through an arc of $140^\circ \pm 10^\circ$ for 50 cycles. One complete cycle shall consist of the rotation of the cable or connector from the neutral position to $70^\circ \pm 5^\circ$ in both directions. The cycling rate shall be 10 ± 1 cycles per minute. A monitoring current of 10 ma shall be applied through the conductor of the test cables and the contacts of the connector in series. Suitable equipment shall be used to monitor the current flow and indicate a 1 microsecond or greater interruption of current flow.
- c. Measurements: A visual inspection shall be made to check for flaws or damage and the dielectric withstanding voltage shall be measured as specified in 4.7.4.1.

4.7.12 Contact resistance (see 3.5.10) Contact resistance shall be tested in accordance with method 3004 of MIL-STD-1344. The following details shall apply:

- a. Wire size: As specified (see 3.1).
- b. Preparation: Connectors mated.
- c. Test current: Maximum contact current rating (see 3.1).
- d. When connectors are assembled to PWB, the voltage drop shall be taken at the point of attachment to the boards.

4.7.13 Temperature cycling (see 3.5.11) Connectors shall be tested in accordance with method 1003 of MIL-STD-1344. The following details shall apply:

- a. Test connectors: Wired and mated.
- b. Test condition letter: A.
- c. Step 3 shall be 120°C .

4.7.14 Shock (specified pulse) (see 3.5.12) The connectors shall be tested in accordance with method 2004 of MIL-STD-1344. The following details shall apply:

- a. Fixture: The test specimens shall to the test fixture using their normal attaching means. The cables shall be rigidly supported at a distance of 4 inches from the connector body (see figure 1).
- b. Test specimens: Wired and mated; conductors shall be connected in series.
- c. Test condition letter: H.
- d. Applied current: 10 milliamperes.
- e. The cable shall be supported at a distance of 4 inches (101.6 mm) from the connector body.

4.7.15 Humidity (see 3.5.13) The plug and receptacles shall be tested in accordance with method 1002 of MIL-STD-1344. The following details shall apply:

- a. Samples: The plugs and receptacles shall be mated and wired, unless otherwise specified (see 3.1).
- b. Test procedure: Type I, test condition B, steady state.
- c. Final measurements: Within 2 hours after test, insulation resistance, dielectric withstanding voltage, and contact retention shall be measured as specified in 4.7.4, 4.7.5.1, and 4.7.10, respectively.

4.7.16 Mating and unmating forces (see 3.5.14) Mated connectors shall be tested in accordance with method 2013 of MIL-STD-1344. The following details shall apply:

- a. Rate of mating and unmating: One to 10 inches per minute.

4.7.17 Durability (see 3.5.15) The connector assemblies shall be subjected to 500 cycles of mating and unmating at a rate of 600 cycles per hour. Following the test, contact resistance shall be measured as specified in 4.7.12.

4.7.18 Permeability (when applicable) (see 3.5.16) Unmated connectors and connector assemblies with metal parts and mounting hardware shall be tested in accordance with method 3006 of MIL-STD-1344.

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4.7.19 Temperature life (see 3.5.18). The connectors shall be tested in accordance with method 1005 of MIL-STD-1344. The following details and exceptions apply:

- a. Sample preparation: Mated and wired connectors.
- b. Test condition: Rated temperature (see 3.1 and 6.4.1).
- c. Test time condition D.
- d. Measurements after test: Insulation resistance and contact resistance shall be measured as specified in 4.7.4 and 4.7.12, respectively.

4.7.20 Solderability (see 3.5.19). The soldertail terminals shall be subject to the testing as specified in MIL-STD-202, method 208.

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 which may be helpful, but is not mandatory.)

6.1 Intended use. The sockets covered by this specification are intended for use on a printed circuit board or mounting into chassis. Terminals may be soldered to the printed circuit board unless otherwise noted (see 3.1). Only plug-in component leads with similar finishes to the mating socket contacts should be mated, reference MIL-HDBK-454, General Guidelines for Electronic Equipment.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number and date of the specification.
- b. Title, number and date of the applicable specification sheet, and the complete PIN (see 1.2.1 and 3.1).
- c. Certificate of compliance covering materials, when required.
- d. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1 and 2.2).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No. 83503 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from the Defense Supply Center Columbus, ATTN: DSCC-VQ, 3990 East Broad Street, Columbus, Ohio 43216-5000. Application procedures should conform to the "Provisions Governing Qualification" (see 6.3.1).

6.3.1 Provisions governing qualification. Copies of "Provisions Governing Qualification" may be obtained upon application to Standardization Document Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

6.4 Subject term (key word) listing

Beryllium
Contacts
Copper
Lead
Nickel
Polarization
Tin

6.5 Definition.

6.5.1 Rated temperature. Rated temperature is the maximum value of the temperature range and also the maximum hot spot temperature of the connector.

6.5 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.

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6.6 Military-Unique rationale. The connectors covered by this specification are military unique because they must be able to operate satisfactorily under high altitude (70,000 feet maximum); resist corrosion due to salt spray; 30 g of shock without discontinuities. Commercial electronic connectors are not designed to withstand such extreme environmental conditions and would experience catastrophic failure.

CONCLUDING MATERIAL

Custodians:
Air Force - 85

Preparing activity
DLA-CC

Review activities:
Air Force - 17, 99

(Project 5935-4110)

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-83503C

2. DOCUMENT DATE (YYMMDD)
980617

3. DOCUMENT TITLE CONNECTORS, ELECTRICAL, FLAT CABLE, AND /OR PRINTED WIRING BOARD, NONENVIRONMENTAL GENERAL SPECIFICATION FOR

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)

7. DATE SUBMITTED
(YYMMDD)

(1) Commercial

(2) DSN (If applicable)

8. PREPARING ACTIVITY

a. NAME

Defense Supply Center Columbus

b. TELEPHONE (Include Area Code)

(1) Commercial 614-692-0573

(2) DSN 850-0573

(3) Fax 614-692-3969

c. ADDRESS (Include Zip Code)

DSCC-VAI

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Columbus, Ohio 43216-5000

IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:

Defense Quality and Standardization Office

5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466

Telephone (703) 756-2340 DSN 289-2340