INCH - POUND
MIL-DTL-55302G
w/AMENDMENT 2
16 November 2015
SUPERSEDING
MIL-DTL-55302G
w/AMENDMENT 1
23 January 2013

DETAIL SPECIFICATION

CONNECTORS, PRINTED CIRCUIT SUBASSEMBLY AND ACCESSORIES

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

1. SCOPE

1.1 Scope. This specification covers connectors (plugs and receptacles) for printed circuit subassembly and their accessories, for use with single-sided printed wiring, double-sided printed wiring, and multilayer printed wiring conforming to IPC-2221 and MIL-PRF-31032, respectively (see 6.1). Contact termination types available (see 3.1) are crimp, dip solder, flex, hand solder, and wire wrappost.

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 cited in the solicitation or contract (see 6.2).

FEDERAL STANDARD

FED-STD-H28 - Screw-Thread Standards For Federal Services

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-14072	-	Finishes for Ground Based Electronic Equipment
MIL-M-24519	-	Molding Plastics, Electrical Thermoplastic
MIL-PRF-31032	-	Printed Circuit Board/Printed Wiring Board, General Specification For

(See supplement 1 for list of specification sheets.)

Comments, suggestions, or questions on this document should be addressed to DLA Land and Maritime, ATTN: VAI, 3990 East Broad Street, Columbus, OH 43218-3990 or email RectangularConnector@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil.

AMSC N/A FSC 5935

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-202 - Electronic and Electrical Component Parts
MIL-STD-810 - Environmental Engineering Considerations and Laboratory Tests
MIL-STD-889 - Dissimilar Metals
MIL-STD-1285 - Marking of Electrical and Electronic Parts

(Copies of these documents are available online at https://assist.dla.mil/quicksearch/)

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 these documents are those cited in the solicitation or contract (see 6.2).

ASTM INTERNATIONAL

ASTM A240/A240M - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels for General Applications
ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes
ASTM A342/A342M - Materials, Feebly Magnetic, Permeability Of
ASTM A480/A480M - Plate, Steel , Sheet and Strip, Flat-Rolled Stainless and Heat-Resisting
ASTM A484/A484M - Steel, Bars, Billets and Forgings, Stainless
ASTM A580/A580M - Standard Specification for Stainless Steel Wire
ASTM A581/A581M - Steel Wire and Wire Rods, Free Machining Stainless and Heat-Resisting
ASTM A582/A582M - Free-Machining Stainless and Heat-Resisting Steel Bars
ASTM B16/B16M - Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines
ASTM B36/B36M - Plate, Brass, Sheet, Strip, and Rolled Bar
ASTM B103/B103M - Plate, Phosphor Bronze, Sheet, Strip, and Rolled Bar
ASTM B121/B121M - Plate, Leaded Brass, Sheet, Strip, and Rolled Bar
ASTM B134/B134M - Standard Specification for Brass Wire
ASTM B139/B139M - Rod, Phosphor Bronze, Bar, and Shapes
ASTM B159/B159M - Phosphor Bronze Wire
ASTM B194 - Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar
ASTM B196/B196M - Rod and Bar, Copper-Beryllium Alloy
ASTM B197/B197M - Wire, Alloy Copper-Beryllium
ASTM B206/B206M - Copper-Nickel-Zinc Alloy (Nickel-Silver) Wire and Copper-Nickel Alloy Wire
ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate, Standard Specification For
ASTM B301/B301M - Copper Rod, Bar, Wires, and Shapes, Free Cutting
ASTM B422 - Copper-Aluminum-Silicon-Cobalt Alloy, Copper-Nickel-Silicon-Magnesium Alloy, Copper-Nickel-Silicon Alloy, Copper-Nickel-Aluminum-Magnesium Alloy, and Copper-Nickel-Tin alloy Sheet and Strip, Standard Specification For
ASTM B441 - Copper Cobalt Beryllium (UNS NO. C17500) and Copper-Nickel-Beryllium (UNS NO. C17510), Rod and Bar
ASTM B453/B453M - Copper Zinc Lead Alloy, (Lead Brass) Rod, Bar, and Shapes
ASTM B734 - Electrodeposited Copper for Engineering Uses, Standard Specification For
ASTM B740 - Copper Nickel Tin Spinodal Alloy Strip
ASTM B768 - Copper-Cobalt-Beryllium Alloy and Copper-Nickel-Beryllium Alloy Strip and Sheet, Specification For
ASTM B888 - Copper Alloy Strip for Use in the Manufacture of Electrical Connectors or Spring Contacts, Standard Specification For
ASTM D4067 - Material, Molding and Extrusion, Reinforced and Filled Polyphenylene Sulfide (PPS) Injection
ASTM D5138 - Liquid Crystal Polymers (LCP), Standard Specification For
ASTM D5927 - Thermoplastic Polyester (TPES) Injection and Extrusion Materials Based on ISO Test Methods, Standard Specification For
ASTM D5948 - Compounds, Molding, Thermosetting

ASTM D6358 - Standard Classification System and Basis for Specification for Ply (Phenylene Sulfide) (PPS) Injection Molding and Extrusion Materials Using ISO Methods

(Copies of these documents are available online at http://astm.org)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B46.1 - Surface Texture (Surface Roughness Waviness and Lay)

(Copies of these documents are available online at http://www.asme.org)

INTERNATIONAL ORGANIZATION FOR STANDARDS (ISO)

ISO 10012 – Measurement Management Systems – Requirements for Measurement Process and Measuring Equipment

(Copies of these documents are available from www.ansi.org)

THE INSTITUTE FOR INTERCONNECTING AND PACKAGING ELECTRONIC CIRCUITS (IPC)

IPC-2221 - Printed Board Design, Generic Standard For

(Copies of these documents are available online from http://www.ipc.org)

ELECTRONIC COMPONENTS INDUSTRY ASSOCIATION (ECIA)

EIA-364 - Electrical Connector/Socket Test Procedures Including Environmental Classifications
EIA-364-06 - Contact Resistance Test Procedure for Electrical Connectors
EIA-364-08 - Crimp Tensile Strength Test Procedure for Electrical Connectors
EIA-364-20 - Withstanding Voltage Test Procedure for Electrical Connectors, Sockets and Coaxial Contacts
EIA/ECA-364-21 - Insulation Resistance Test Procedure for Electrical Connectors, Sockets, and Coaxial Contacts
EIA-364-23 - Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets
EIA/ECA-364-26 - Salt Spray Test Procedure for Electrical Connectors, Contacts and Sockets
EIA-364-27 - Mechanical Shock (Specified Pulse) Test Procedure for Electrical Connectors
EIA-364-28 - Vibration Test Procedure for Electrical Connectors and Sockets
EIA/ECA-364-29 - Contact Retention Test Procedure for Electrical Connectors
EIA-364-31 - Humidity Test Procedure for Electrical Connectors and Sockets
EIA-364-32 - Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors and Sockets
EIA-364-37 - Contact Engagement and Separation Force Test Procedure for Electrical Connectors

(Copies of these documents are available online at http://www.eciaonline.org)

NATIONAL CONFERENCE OF STANDARD LABRATORIES (NCSL)

NCSL Z540.3 - Requirements for the Calibration of Measuring and Test Equipment

(Copies of these documents are available online at http://www.ncsli.org)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA-HP3 - Electrical and Electronic PTFE (Polytetrafluoro-ethylene Insulated High Temperature Hook-up Wire, Types ET (250 Volts), E (600 Volts) and EE (1000 Volts)

(Copies of these documents are available online at http://www.nema.org)

SOCIETY OF AUTOMOTIVE ENGINEERS, INC (SAE)

SAE-AMS-QQ-N-290	- Nickel Plating (Electrodeposited)
SAE AMS-P-81728	- Plating, Tin-Lead (Electrodeposited)
SAE AMS2418	- Copper, Plating
SAE AMS5514	- Steel, Corrosion Resistant, Sheet, Strip, and Plate 18CR - 11.5NI (SAE 30305) Solution Heat Treated - UNS S30500
SAE AMS2700	- Passivation of corrosion resistant steel
SAE AS31971	- Pin, Gage, For Socket Contact Engagement Test
SAE EIA-557	- Statistical Process Control Systems

(Copies of these documents are available online from http://www.sae.org.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein (except for related 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 (see 6.2).

3.2 Qualification. Connectors and accessories furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list (QPL) before contract award (see 4.5 and 6.3).

3.2.1 Statistical process control (SPC). The contractor shall implement and use SPC techniques in the manufacturing process for parts covered by this specification. The SPC program shall be developed and maintained in accordance with SAE EIA-557. Where SPC cannot be utilized because of non-continuous production requirements, a lot sampling plan for inspection in accordance with group A lot (see 4.4.1.2.1) and sample size with c = 0 can be utilized. The SPC and c = 0 programs shall be documented and maintained as part of the overall reliability assurance program as specified in SAE EIA-557. Evidence of such compliance shall be verified by the qualifying activity of this specification as a prerequisite for qualification.

3.3 Materials. Materials shall be as identified herein or as approved by the qualifying activity. However, when a definite material is not specified, a material shall be used which will enable the connectors and accessories to meet performance requirements. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of finished product.

3.3.1 Reference materials, platings and processes. The identified reference materials, platings, 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 manufacturers of connectors supplied to this specification are allowed to use alternate recognized industry standard materials, platings, and processes from those specified in 3.3 of this specification. Alternate materials, platings and processes used must be coordinated with the qualifying activity as part of the qualification process. Use of alternates by the supplier shall not result in inferior short or long term performance or reliability as compared with connectors manufactured using the referenced materials, platings, 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 Recycled, recovered, or environmentally preferable, or biobased materials. Recycled, recovered, or environmentally preferable, or biobased 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.

3.3.3 Nonmagnetic materials. All parts shall be made from materials which are classed as nonmagnetic (permeability ≤ 2μ using indicator in accordance with ASTM A342/A342M) (see 3.3).

3.3.4 Plastic molded materials. Unless otherwise specified (see 3.1), the body material shall conform to SDG-F or GDI-30F in accordance with ASTM D5948 (see 3.3) or type TPES013G30 or type GPT-30F in accordance with ASTM D5927 or PPS000G40A30330E01F01Y11 in accordance with ASTM D4067 or type GPT-30F or GST-40F or PPS011G40A33443 in accordance with ASTM D6358 or MIL-M-24519 or type GLCP-30F in accordance with ASTM D5138 or MIL-M-24519. Reground materials shall not be used.

3.3.5 Metals.

3.3.5.1 Contacts and connector hardware.

3.3.5.1.1 Socket contacts and hermaphroditic contacts. Socket contacts, hermaphroditic contacts and contact terminations shall be copper nickel tin alloy C72900 of ASTM B740, or beryllium copper as specified in ASTM B194, ASTM B196/B196M or ASTM B197/B197M or C17500 in accordance with ASTM B441, or C17400 in accordance with ASTM B768**,** or phosphor bronze in accordance with ASTM B103/B103M or ASTM B139/B139M, or ASTM B159/B159M, or copper alloy C70260 in accordance with ASTM B422, or C52180 in accordance with ASTM B888**,** or contact terminations of brass alloy in accordance with ASTM B16/B16M or ASTM B134/B134M.

3.3.5.1.2 Pin contacts and contact terminations. Pin contacts shall be copper nickel tin alloy C72900 as specified in ASTM B740 or brass as specified in ASTM B16/B16M, ASTM B36/B36M, ASTM B134/B134M, or ASTM B121/B121M, or phosphor bronze in accordance with ASTM B139/B139M, or ASTM B159/B159M, or beryllium copper as specified in, ASTM B194, ASTM B196/B196M, ASTM B197/B197M, or C18700 in accordance with ASTM B301/B301M.

3.3.5.1.3 Connector hardware. Guide pins and guide bushings shall be free cutting brass as specified in ASTM B16/B16M or ASTM B36/B36M or ASTM B121/B121M, C33500 in accordance with ASTM B453/B453M, or copper alloy as specified in ASTM B134/B134M, or ASTM B159/B159M, or ASTM B206/B206M, or stainless steel as specified in ASTM A240/A240M or ASTM A582/A582M or SAE AMS5514.

3.3.5.2 Aluminum. Where applicable, aluminum shall be as specified in ASTM B209 and anodized to meet the requirements of MIL-DTL-14072 (see 3.1).

3.3.5.3 Corrosion-resistant steel. Where applicable, corrosion-resistant steel shall be 300 series, low magnetic permeability in accordance with ASTM A276, ASTM A480/A480M, ASTM A580/A580M, ASTM A581/A581M, ASTM A582/A582M, or ASTM A484/A484M and passivated in accordance with SAE AMS2700 type 2 or type 6, or to finish E300 as specified in MIL-DTL-14072 (see 3.1).

3.3.5.4 Plating. Unless otherwise specified (see 3.1), contacts shall be gold plated, in accordance with MIL-DTL-45204 or equivalent as approved by the qualifying and preparing activities, type II, class 1, grade C over suitable underplate (one of the underplates below).

3.3.5.4.1 Copper underplate (see 3.3). Copper underplate shall be 100 micro inches, as specified in SAE AMS2418 or ASTM B734.

3.3.5.4.2 Nickel underplate. Nickel underplate shall be in accordance with SAE-AMS-QQ-N-290, class 2, 30 to 150 micro inches.

3.3.5.4.3 Localized finish. Localized systems such as selective plating, welded dot, etc. are permitted in lieu of overall plating providing the following conditions are met:

a. Contact engagement end - shall be gold plated in accordance with MIL-DTL-45204 or equivalent as approved by the qualifying and preparing activities, type II, class 1, grade C over nickel underplate in accordance with 3.3.5.4.2.

b. Contact termination end plating (solderless wrap) shall be tin lead (50-95) composition in accordance with SAE AMS-P-81728 (see 3.3), 100 to 300 microinches thick over nickel underplate in accordance with 3.3.5.4.2.

c. Contact termination end plating (crimp), tin lead (50-95) composition, 100 microinches min over nickel underplate in accordance with 3.3.5.4.2.

d. Contact termination end plating (all solder terminations) shall be tin lead (50-70%) composition 100 microinches min thickness in accordance with SAE AMS-P-81728 over nickel underplate in accordance with 3.3.5.4.2. Solder dipping is permitted, providing it meets procedures and requirements of MIL-STD-202, method 208.

e. Nonfunctional areas: Nonfunctional areas need not be overplated, provided they have a minimum thickness of 30 microinches of nickel in accordance with SAE-AMS-QQ-N-290, class 2.

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 contact mating area.

3.3.6 Restricted materials.

3.3.6.1 Flammable, explosive, or toxic. Material shall be nonflammable, non-explosive, and nontoxic over the operating temperature range.

3.3.6.2 Corrosion resistance. Connectors and accessories shall be of corrosion-resistant materials or treated to prevent corrosion.

3.3.6.3 Ferrous. Material containing more than 5 percent iron shall not be used for current carrying parts.

3.3.7 Dissimilar metals. Where dissimilar metals are used in intimate contact with each other, protection against electrolysis and corrosion shall be provided. Dissimilar metals shall be as specified in MIL-STD-889. Dissimilar metals such as brass, copper, or steel (except corrosion resisting steel, passivated in accordance with 3.3.5.3) shall not be used in intimate contact with aluminum or aluminum alloy.

3.3.8 Fungus resistance. Finishes and materials used in the construction of these connectors shall be fungus inert (see 4.2.3).

3.3.9 Pure tin. The use of pure tin is prohibited. Tin content used in connector materials shall not exceed 97 percent, and an alloy material shall be chosen to inhibit the growth of tin whiskers (see 6.4).

3.4 Design and construction. Connectors shall be of the design, construction, and physical dimensions specified (see 3.1).

3.4.1 Threaded parts. Unless otherwise specified (see 3.1), all threaded parts shall be in accordance with FED-STD-H28. Where practicable, all threads shall be in conformity with the coarse-thread series. The fine-thread series shall be used only for applications that might show a definite advantage through their use.

3.4.1.1 Engagement of threaded parts. All threaded parts shall engage by at least two full threads.

3.4.2 Connector assembly. No parts of the connector assembly shall be permanently displaced from their original, normal, fitted position (see 3.1) at completion of the specified tests.

3.4.2.1 Contact compliance. The contact shall be designed to assure proper operation without dependence on mechanical float, and to assure that minimum force (see 3.1) is transmitted to the connection joining the contact to the interconnecting media during mating and unmating. Contacts assembled to printed circuit boards (PCB) shall not move or display looseness after assembly, or during and after mate and unmate cycles.

3.4.3 Contact cavities. The arrangement of contact cavities in the insulator body of connectors shall be as specified (see 3.1). Each contact cavity shall be fitted with a contact assembly so confined within the cavity that accidental removal is prevented, and positive alignment of the respective contacts, including the contact termination, is effected.

3.4.3.1 Contact clearance. The tops of the sockets, in their uppermost position, shall be below the upper edge of the contact cavity wall.

3.4.4 Printed wiring terminations. Unless otherwise specified (see 3.1), terminations for both plug and receptacle shall be located on intersections of 0.025-inch modular grid. The termination layout shall be in accordance with the printed wiring requirements as specified in IPC-2221 and MIL-PRF-31032.

3.4.5 Hook up wire termination. The form factor and dimensions of wire termination contacts for those connectors shall be as specified (see 3.1).

3.4.6 Contact identification. Contact positions shall be identified by legible letters or numbers, molded or stamped or etched on the front face of the connector body adjacent to each contact and on the front and back of wire type terminals as specified (see 3.1). Where space does not permit legible characters on front and back faces, contact positions may be indicated by stamping on side(s) of connectors.

3.4.7 Body design. Connector bodies shall be designed and constructed with proper sections and radii so that they will not crack, chip, or break in assembly or in normal service. The insulator body of each plug and receptacle shall be one molded piece or no more than two pieces bonded so as to form essentially one integral piece. Depressions, when used to achieve longer creepage paths, shall not cause structural weakness.

3.4.8 Polarization. A polarization feature shall be incorporated in each connector assembly to assure correct insertion.

3.4.9 Alignment. Each connector shall have a feature which will insure proper alignment of contact before mating.

3.4.10 Method of mounting. A method of mounting shall be provided to assure that the forces applied to mate and unmate the mounted connector are not transmitted to the printed wiring termination solder joints. The printed board mounted connector shall be secured to the printed wiring board by additional means other than the circuits solder connections (see 3.1).

3.5 Interchangeability. Receptacles of a given type shall be capable of being mated with associated plugs meeting the requirements of this specification. The mated connectors and individual plugs and receptacles having related Part or Identifying Numbers (PINs) shall be directly and completely interchangeable with each other with respect to installation and performance as specified herein (see 4.5.1.2).

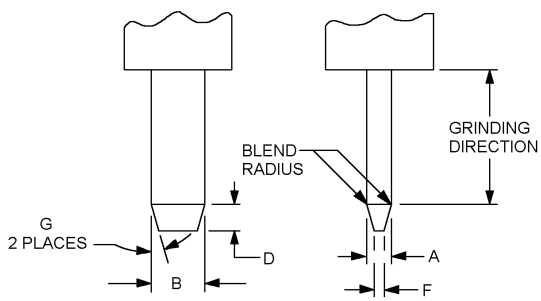
3.6 Oversized pin exclusion (sockets only). The mating end of the socket contacts shall exclude the entry of a test pin 0.005 inch larger than the allowable maximum pin diameter in the connector when tested in accordance with 4.5.2.

3.7 Contact engagement and separation forces. When tested as specified in 4.5.3, contact forces shall conform to the forces specified in table I and on figure 1, unless otherwise specified (see 3.1).

TABLE I. Contact engagement and separation force.

Contact size													
20		.0395/.0415 Dia		22		23		24		.0240/.0260 Dia		.050 ±.005 width 1/ .0190/.0210 thick	
Min	Max	Min .0395 +.0001 -.0000 inch	Max .0415 +.0000 -.0001 inch	Min	Max	Min	Max	Min	Max	Min .0240 +.0001 -.0000 inch	Max .0260 +.0000 -.0001 inch	Min .0190 +.0001 -.0000 inch	Max .0210 +.0000 -.0001 inch
oz	oz	oz	oz	oz	oz	oz	oz	oz	oz	oz	oz	oz	oz
2.0	8.0	2.0	8.0	1.5	6.0	1.0	6.0	1.0	6.0	1.0	6.0	1.0	5.0

1/ See specimen A, on figure 1.



Grid Spacing	A ±.0002	B +.002 -003	D ±.010	F Max	G ±3
.100	.0200	.050	.040	.008	15

Inches	mm
.002	0.05
.003	0.08
.008	0.20
.010	0.25
.040	1.02
.050	1.27
.100	2.54

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for information only.
3. Material: Hardened tool steel.
4. Hardness: Rockwell “C” 50-55.
5. Surface finish: 4-8 Micro-inches on working surfaces in accordance with ASME B46.1.
6. Grinding to be in the direction of blade movement during test.

FIGURE 1. Test gauge.

3.8 Mating and unmating. When tested in accordance with 4.5.4, the maximum and minimum mating and unmating forces shall be as specified (see 3.1).

3.9 Contact rating. Maximum current rating of contacts shall be as specified (see 3.1).

3.10 Contact resistance. When tested in accordance with 4.5.5, the contact resistance requirements shall be as specified in table II, unless otherwise specified (see 3.1).

TABLE II. Contact resistance.

Wire size, AWG type E as specified in NEMA-HP3, type E	Test current (AMP)	Maximum contact resistance (mΩ)	Maximum potential drop (mV)
20	7.5	9.0	67.5
22	5.0	15.0	75
24	3.0	20.7	60
26	2.0	25.0	50
28	1.5	40.0	60
30	1.0	50.0	50

3.11 Contact retention. When tested as specified in 4.5.6, unless otherwise specified (see 3.1). Contacts with printed wiring terminations shall withstand an axial load of five pounds and contacts with all other types of terminations shall withstand an axial load of ten pounds without damage to the contact, insert, or contact retaining clip, if applicable. The contact retention test is not applicable to mounted PCB connectors.

3.12 Operating temperature. Unless otherwise specified (see 3.1), connectors shall have an operating temperature of +125°C maximum and -65°C minimum (see 4.5.18.2).

3.13 Dielectric withstanding voltage. When tested in accordance with 4.5.7, there shall be no evidence of breakdown of insulation or flashover.

3.14 Insulation resistance. When tested in accordance with 4.5.8, the initial insulation resistance shall be not less than 5,000 megohms.

3.15 Contact life. When tested in accordance with 4.5.9, connectors shall show no evidence of cracking or breaking, the contact resistance requirements of 3.10 shall not be exceeded, and mating and unmating requirements of 3.8 shall be met.

3.16 Vibration. When tested in accordance with 4.5.10, there shall be no physical or mechanical damage to the connector body or contacts. During vibration there shall be no interruption in continuity greater than one microsecond of the test circuit, which incorporates mated contacts. After the vibration test, the mounting hardware shall show no signs of loosening, fracture or other deterioration.

3.17 Salt spray (corrosion). When mated connector pairs are tested in accordance with 4.5.11, there shall be no peeling, chipping, or blistering of metal surfaces or exposure of base metal.

3.17.1 Contacts supplied in reels. When contacts are separated from the carrier strip, base metal may be exposed. Following the salt spray test any corrosion that may occur in the region of the separation shall not interfere with the ability of the contacts to meet the subsequent test requirements, either for contacts tested separately, or as part of the connector, including the ability to mate or unmate the connectors.

3.18 Low level contact resistance. When tested in accordance with 4.5.12, the contact resistance shall be as specified in table III, unless otherwise specified (see 3.1).

TABLE III. Low level contact resistance.

Wire size, AWG type E as specified in NEMA-HP3, type E	Maximum test current (AMP)	Maximum contact resistance (mΩ)	Maximum potential drop (mV)
20	0.1	9	0.9
22	"	15	1.5
24	"	20	2.0
26	"	25	2.5
28	"	40	4.0
30	"	50	5.0

3.19 Temperature cycling. When a mated pair of connectors is tested in accordance with 4.5.13, there shall be no evidence of cracking or crazing of the connector body or other physical damage to the connector assembly. The contact resistance shall be not greater than the value specified on the individual specification sheet (see 3.1).

3.20 Shock (specified pulse). When tested in accordance with 4.5.14, there shall be no physical damage to the connector. During the test there shall be no interruption in continuity greater than one microsecond of the test circuit which incorporates mated contacts.

3.21 Humidity. When tested in accordance with 4.5.15, insulation resistance shall be greater than 1,000 megohms.

3.22 Solderability. Terminations shall withstand the test specified in 4.5.16.

3.23 Resistance to soldering heat. Connectors shall withstand the test specified in 4.5.17.

3.24 Crimp tensile strength. When any type contacts are tested as specified in 4.5.20, the contact to wire crimp shall not break nor pull out at less than the minimum tensile strength specified in table IV.

TABLE IV. Crimp tensile strength.

Wire size (AWG) type-E as specified in NEMA-HP3, type	Minimum tensile strength (pounds)
20	20.0
22	12.0
24	8.0
26	5.0
28	3.0
30	1.5

3.25 Auxiliary parts. Mechanical, nonelectrical parts, such as polarizing keys, keying accessories, covers, cable clamps, etc., shall be as specified in the individual specification sheet (see 3.1).

3.26 Marking. Connectors and accessories shall be marked in accordance with MIL-STD-1285.

3.27 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 edges, and other defects that will adversely affect life, serviceability, or appearance.

3.27.1 Riveting, upsetting, and spinning-over. When riveting, upsetting, or spinning-over processes are employed, there shall be no evidence of fatigue or deformation of uninvolved surfaces of the material being riveted, upset, or spun over.

4. VERIFICATION

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

a. Qualification inspection (see 4.3).
b. Conformance inspection (see 4.4).

4.2 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-202 and EIA-364.

4.2.1 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality 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 NCSL Z540.3 and ISO 10012.

4.2.2 Assembly plants. Assembly plants shall be listed on or approved for listing on the applicable (QPL). The qualified connector manufacturer shall certify that the assembly plant is approved for the distribution of the manufacturer's parts. The assembly plant shall use only piece parts supplied by the qualified connector manufacturer. No testing other than visual inspection is required of certified piece parts obtained from the qualified connector manufacturer, except when there is cause for rejection. All assemblies produced at the assembly plant shall be subjected to inspection of product to assure that the assembly process conforms with that established at the qualified manufacturing plant. Quality control requirements, including Government inspection surveillance, shall be the same as required for the qualified connector manufacturer.

4.2.3 Fungus resistance. Certification of method 508.5 of MIL-STD-810 is required (see 3.3.8).

4.3 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, platings and processes (see 3.3) shall be identified for inclusion in the product test documentation.

4.3.1 Sample. Six-mated pairs of connectors with the largest number of contacts and two-mated pairs of each of the other PINs (not including variations in termination types), from each specification sheet to be qualified, shall be subjected to qualification inspection.

4.3.1.1 Sample inspection for contacts. To qualify only contacts described by military specification sheets and supplied unassembled to the connector body, the contacts shall be assembled into a qualified connector body and tested as a connector. When crimp type contacts are specified, a number of sample contacts shall be provided to permit testing in accordance with 4.5.20.

4.3.1.2 Sample inspection for auxiliary parts. Auxiliary parts as described by individual military specification sheets shall be tested as part of the applicable connector qualification sample and shall meet all of the requirements outlined by the individual specification sheet. A minimum of four (4) samples of each item tested in this way shall be assembled to the connector.

4.3.1.3 Sample size, contact measurements. Unless otherwise specified, a total of 7 contact positions shall be measured per sample in each subgroup. For connectors with 7 or less contacts, all positions shall be measured. This shall apply to the requirements as specified in 4.5.2, 4.5.3, 4.5.5, 4.5.6, 4.5.12, 4.5.16, 4.5.17, and 4.5.20. The same contact positions shall be monitored throughout the test sequences.

4.3.2 Inspection routine. Sample units shall be subjected to the inspections specified in table V in the order shown. All sample units shall be subjected to the inspections of subgroup 1. The sample units shall then be divided into three equal sample groups consisting of one third the number of each size connector being inspected. One sample group shall then be subjected to the subgroup 2 inspections, one sample group subjected to the subgroup 3 inspections, and the other sample group to subgroup 4 inspections.

4.3.3 Failures. One or more failures shall be cause for refusal to grant qualification approval.

4.3.4 Verification of qualification. To retain qualification, the contractor shall verify in coordination with qualifying activity the capability of manufacturing products which meet the requirements of this specification. Refer to the qualifying activity for the guidelines necessary to retain qualification to this 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 requirements of this specification.

TABLE V. Qualification inspection.

Inspection	Requirement paragraph	Method paragraph
Subgroup 1 (all sample units)		
Visual and mechanical	3.4 to 3.4.10 incl., and 3.26 to 3.27.1 incl.	4.5.1
Interchangeability	3.5	4.5.1.2
Oversized pin exclusion	3.6	4.5.2
Contact engagement and separation forces	3.7	4.5.3
Contact resistance	3.10	4.5.5
Low level contact resistance	3.18	4.5.12
Contact retention	3.11	4.5.6
Dielectric withstanding voltage (sea level)	3.13	4.5.7.1
Insulation resistance	3.14	4.5.8
Mating and unmating	3.8	4.5.4
Subgroup 2 (one- third the sample units)		
Dielectric withstanding voltage (high altitude)	3.13	4.5.7.2
Contact life	3.15	4.5.9
Mating and unmating 1/	3.8	4.5.4
Low level contact resistance	3.18	4.5.12
Vibration	3.16	4.5.10
Shock (specified pulse)	3.20	4.5.14
Low level contact resistance	3.18	4.5.12
Contact resistance	3.10	4.5.5
Mating and unmating 1/	3.8	4.5.4
Salt spray	3.17	4.5.11
Low level circuit	3.18	4.5.12
Contact resistance	3.10	4.5.5
Visual and mechanical	3.4.6 and 3.26 to 3.27.1 incl.	4.5.1
Interchangeability	3.5	4.5.1.2
Subgroup 3 (one-third the sample units)		
Temperature cycling	3.19	4.5.13
Mating and unmating 1/	3.8	4.5.4
Humidity	3.21	4.5.15
Low level contact resistance 2/	3.18	4.5.12
Insulation resistance	3.14	4.5.8
Visual and mechanical	3.4.6 and 3.26 to 3.27.1 incl.	4.5.1
Subgroup 4A (applicable to solder contact units)		
Solderability	3.22	4.5.16
Resistance to soldering heat	3.24	4.5.17
Subgroup 4B (applicable to crimp contact units)		
Crimp tensile strength	3.24	4.5.20
Subgroup 4C		
Visual and mechanical	3.4 to 3.4.10 incl. and 3.26 to 3.27.1 incl.	4.5.1
Interchangeability	3.5	4.5.1.2
Mating and unmating	3.8	4.5.4

1/ Cycling of connector three times is not required.
2/ Monitoring forces not required.

4.4 Conformance inspection.

4.4.1 Inspection of product for delivery. Inspection of product for delivery shall consist of groups A and B inspection.

4.4.1.1 Inspection lot. An inspection lot shall consist of all the connectors of the same PIN, produced under essentially the same conditions, and offered for inspection at one time.

4.4.1.2 Group A inspection. Group A inspection shall consist of the inspections specified in table VI, in the order shown.

4.4.1.2.1 Sampling plan (group A). Table VI tests shall be performed on each production lot. Samples shall be selected as specified in table VII. 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 as specified in table VII 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.

TABLE VI. Group A inspection.

Inspection	Requirement paragraph	Method paragraph
Visual and mechanical inspection 1/	3.4 to 3.4.10 & 3.26 to 3.27.1	4.5.1
Contact engagement & separation force 2/	3.7	4.5.3
Interchangeability	3.5	4.5.1.2

1/ Mechanical inspection measurements on two samples only. If one or more of two samples fail, the lot sample shall then be inspected for physical dimensions.
2/ Applicable to contacts (In process inspection may be used including removable contacts furnished but not assembled to connector).

TABLE VII. Lot and sample size.

Lot size	Sample size
2 to 13	100%
14 to 150	13
151 to 280	20
281 to 500	29
501 to 1,200	34
1,201 to 3,200	42
3,200 to 10,000	50
10,001 to 35,000	60
35,001 to 150,000	74
150,001 to 500,000	90
500,001 and over	102

4.4.1.3 Group B inspection. Group B inspection shall consist of the inspections specified in table VIII, in the order shown. Group B inspection shall be made on sample units selected from inspection lots which have passed the group A inspection.

TABLE VIII. Group B inspection.

Inspection	Requirement paragraph	Method paragraph
Mating and unmating 1/	3.8	4.5.4
Low level circuit 2/	3.18	4.5.12
Contact resistance	3.10	4.5.5
Insulation resistance 3/	3.14	4.5.8
Dielectric withstanding voltage 3/ (sea level) - 5 seconds exposure	3.13	4.5.7.1
Crimp tensile strength 4/	3.24	4.5.20

1/ Applicable to connectors furnished with assembled contacts.
2/ When applicable. (see 3.1).
3/ Applicable to connectors only.
4/ Applicable to crimp type contacts only.

4.4.1.3.1 Sampling plan (group B). Every 6 months two sample pairs containing the largest number of contact positions with a full complement of contacts (not including the variation in terminal types or mounting hardware types) available at time of inspection shall be selected at random from production lot items. Where crimp type contacts are specified, that type shall be used in group B samples. A sample of parts shall be randomly selected. If one or more defects are found, the lot shall be screened for those particular defects, and the defective parts shall be removed. Alternatively, parts may be reworked and returned to the lot where defects do not affect the form, fit, or function of the device, such as marking, residue, etc. Such lots shall be clearly identified as reinspected. After screening and removal of defects, a new sample of parts shall be randomly selected, if one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification.

4.4.1.3.2 Disposition of sample units. Sample units which have passed the group B inspection may be delivered on a contract or purchase order if the lot is accepted.

4.4.2 Periodic inspection. Periodic inspection shall consist of group C inspection. Except where the results of these inspections show noncompliance with the applicable requirements (see 4.4.2.1.4), the delivery of products which have passed groups A and B shall not be delayed pending the results of these periodic inspections.

4.4.2.1 Group C inspection. Group C inspection shall consist of the inspections specified in table IX, in the order shown. Group C inspection shall be made on sample units which have passed the groups A and B inspections. For testing of contacts only, described by military specification sheets and supplied unassembled to the connector body, the contacts shall be assembled into a qualified connector body and tested as a connector.

4.4.2.1.1 Sampling plan (group C). Every 36 months two sample-connector pairs of each specification sheet (not including variations in terminal types or mounting hardware types) shall be selected at random from items produced. The sample units shall be divided into two equal-sample groups. One sample group shall be subjected to subgroup 1 inspections and the other sample group to the subgroup 2 inspections in table IX. For connectors with solder contacts an additional two samples shall be subjected to subgroup 3.

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

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

TABLE IX. Group C inspection.

Inspection	Requirement	Method
Subgroup 1		
Visual and mechanical	3.4.6, 3.26 and 3.27.1	4.5.1
Oversized pin exclusion	3.6	4.5.2
Contact engagement and separation forces	3.7	4.5.3
Contact retention	3.11	4.5.6
Dielectric withstanding voltage (high altitude)	3.13	4.5.7.2
Contact life	3.15	4.5.9
Mating and unmating 1/	3.8	4.5.4
Low level contact resistance	3.18	4.5.12
Vibration	3.16	4.5.10
Shock (specified pulse)	3.20	4.5.14
Low level contact resistance	3.18	4.5.12
Mating and unmating	3.8	4.5.4
Salt spray	3.17	4.5.11
Low level circuit	3.18	4.5.12
Contact resistance	3.10	4.5.5
Interchangeability	3.5	4.5.1.2
Subgroup 2		
Dielectric withstanding voltage (sea level)	3.13	4.5.7.1
Temperature cycling	3.19	4.5.13
Contact resistance	3.10	4.5.5
Humidity	3.21	4.5.15
Insulation resistance	3.14	4.5.8
Low level resistance	3.18	4.5.12
Mating and unmating 1/	3.8	4.5.4
Interchangeability	3.5	4.5.1.2
Subgroup 3		
Solderability (contact only)	3.22	4.5.16

1/ Cycling of connector three times is not required.

4.4.2.1.4 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 were manufactured under essentially the same conditions, with 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 inspections, or the inspection which the original sample failed, at the option of the qualifying activity). Groups A and B inspection 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 made available to the qualifying activity.

4.5 Methods of inspection.

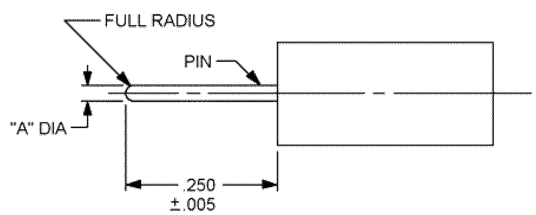
4.5.1 Visual and mechanical examination. Examination shall be made to determine compliance with each of the requirements of 3.4 to 3.4.10 inclusive, and 3.2 to 3.27.1 inclusive.

4.5.1.1 Test methods. 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 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.

4.5.1.2 Interchangeability. Physical configuration and dimensional measurements shall meet the requirements of 3.5 and 4.5.1 and as specified in the individual specification sheet (see 3.1).

4.5.2 Oversized pin exclusion (see 3.6). The applicable steel pin, shown on figure 2, for the size contacts to be tested, shall be applied to the sockets of the connector for a period of 10-seconds without the pin entering the socket or causing damage to the socket. A minimum of seven contacts shall be measured on each specimen.

4.5.3 Contact engagement and separation forces (see 3.7). Sockets (contacts) shall be mounted in a suitable position or fixture for applying gradually increasing loads for the engagement and separation of the test pin from the sockets (contacts). Maximum and minimum test pins shall be in accordance with SAE AS31971 except as specified herein for flat blade type contacts (see 3.1). Insertion of test pins shall be to a depth of .140 ±.020 inch when measured from the front of the socket contact. The test pin shall not bottom in the socket contact. This test shall be performed in the sequence as specified in test procedure EIA-364-37, method A. A minimum of seven contacts shall be measured on each specimen.



PIN: TOOL STEEL, HARDEN & DRAW TO ROCKWELL C50-55

HANDLE: SHAPE OPTIONAL, SIZE TO BE DETERMINED BY SPECIFIED TOTAL WEIGHT

Inches	mm
.0000	0.000
.0001	0.003
.005	0.13
.0290	0.737
.0305	0.775
.0330	0.838
.0360	0.914
.0465	1.181
.250	6.35

"A" DIA +.0001 -.0000	Applied force (ounces)	Contact size
.0465	80.0 +.5 -.0	20
.0360	45.0 +.5 -.0	22
.0330	32.0 +.5 -.0	23
.0305	21.0 +.5 -.0	24
.0290	12.0 +.5 -.0	.6mm

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for information only.

FIGURE 2. Socket test pin gage.

4.5.4 Mating and unmating (see 3.8). After 3 unmonitored cycles of insertion and withdrawal, the force required to fully insert and withdraw a plug from the receptacle shall be measured. Each plug and receptacle so mated shall be considered as one test specimen where further testing of the plug or receptacle is indicated. The measuring equipment shall conform to the following.

a. The axis of insertion of the pin contacts and mating receptacle contacts or hermaphroditic contacts, as applicable, shall coincide during insertion and withdrawal.
b. The speed of insertion of the plug into the receptacle contacts shall not exceed 60-cycles per hour for constant speed machines, or the rate of loading shall not exceed 80-pounds per minute for constant-rate-of-force machines.
c. Scale mechanisms shall have no dashpots or other damping devices.
d. Scales shall be calibrated in 1/8-pound steps or less, and shall be accurate to within 1/8-pound.

NOTE: When mating and unmating tests are required by another test such as contact life, the preconditioning cycles are not required.

4.5.5 Contact resistance (see 3.10). The contact resistance shall be measured individually between each mated pair of contacts. A minimum of seven mated pairs of contacts shall be measured on each test specimen in accordance with test procedure EIA-364-06.

a. Method of connection - Attach current-voltage leads at extreme ends of contacts. For crimp type contacts, attach current-voltage leads to wires, at closest point to contact without touching contact.
b. Test current - See rated current (see 3.1).

4.5.6 Contact retention (see 3.11). Connectors shall be tested in accordance with test procedure EIA/ECA-364-29. The following details and exceptions shall apply:

a. Number of samples - A minimum of seven contacts per test specimen shall be tested.
b. Applied axial load – Approximately one pound per second until the load specified in 3.11 has been reached. Maintain load for 5 seconds. (When hook up wire is used, the wire shall be large enough to withstand the applied load).
c. Maximum allowable contact displacement during application of specified force and after removal of specified force - .015 inches.
d. Axial direction - Straight.
e. Removable type contacts shall withstand an axial load (see 3.11) applied in the normal removal direction after 10 insertions and withdrawals from the same contact hole.

4.5.7 Dielectric withstanding voltage (see 3.13). Mated connector pairs shall be tested in accordance with 4.5.7.1 and, when specified, in accordance with 4.5.7.2 (see 3.1).

4.5.7.1 At sea level. Mated connectors shall be tested in accordance with test procedure EIA-364-20, method A**.** The following details and exceptions shall apply:

a. Preparation - Mated, and may be mounted to printed wiring board.
b. Magnitude of test voltage - As specified (see 3.1).
c. Nature of potential - AC (rms).
d. Points of application of test voltage - Between the closest contacts, and between the contacts and all other metallic parts connected together.
e. Method of connection of test voltage to specimen - Affix test probes to terminations described in 4.5.7.1d above by clips or solder.

4.5.7.2 At high altitude. Mated connector pairs shall be tested as specified in 4.5.7.1, and in accordance with test procedure EIA-364-20, method A. The following details shall apply:

a. Magnitude of test voltage - As specified (see 3.1).
b. Test condition - IV.
c. Tests during reduced pressure - Voltage test only (see 3.1).

4.5.8 Insulation resistance (see 3.14). Mated connectors shall be tested in accordance with test procedure EIA/ECA-364-21. The following details and exceptions shall apply:

a. Special preparation:
    (1) The connector shall be mated, and may be mounted on a printed wiring board.
    (2) The printed wiring board may be conformal coated or otherwise protected.
b. Point of measurement - Check between pins and hardware, between pin and pin, and between pins and shell (on shell-constructed connectors).

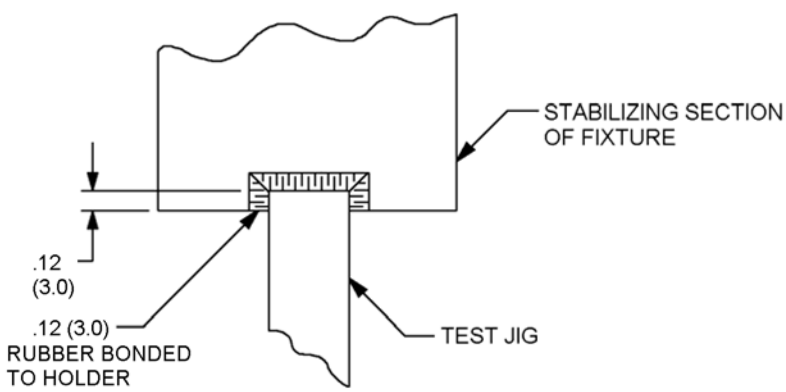
4.5.9 Contact life (see 3.15). Each unit shall be subjected to 500 insertion and withdrawal cycles. The following details shall apply:

a. The axis of the pin contacts and mating receptacle contacts shall coincide during insertion and withdrawal.
b. The speed of insertion of the plug into the receptacle shall be 400 to 600 cycles per hour.

c. At the conclusion of this test, the contact resistance shall be measured in accordance with 4.5.5, and the mating and unmating forces shall be measured in accordance with 4.5.4.

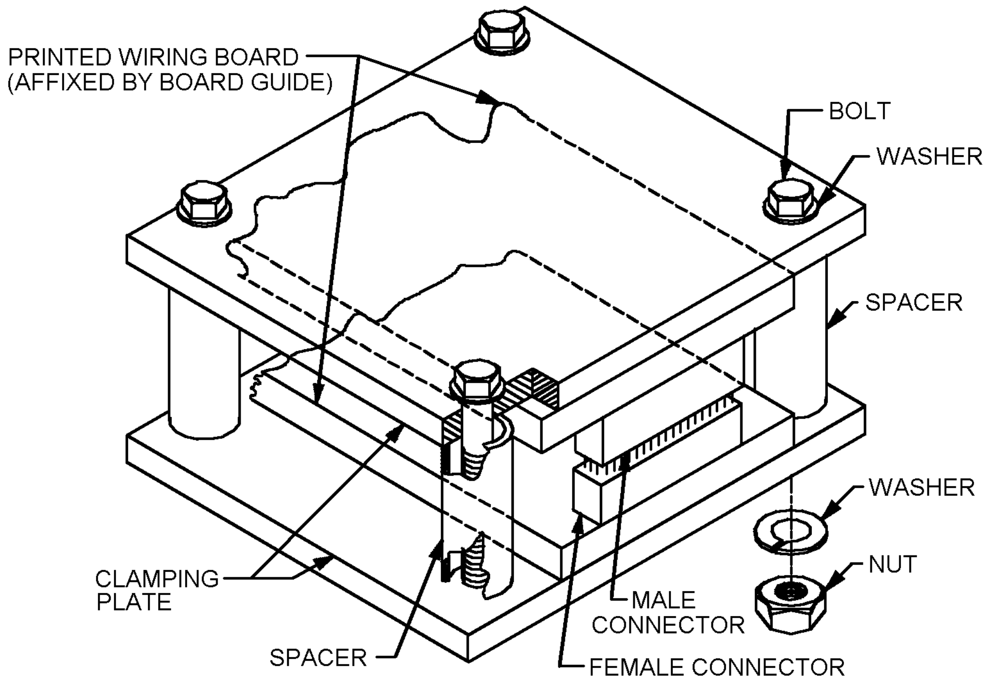
4.5.10 Vibration (see 3.16). Connectors shall be tested in accordance with test procedure EIA-364-28. The following details shall apply:

a. Mounting - For right angle connectors, the receptacle shall be mounted on an epoxy glass printed wiring board, 1/16-inch minimum (plus added tolerances) thick (see 3.1) and clamped to a suitable fixture which in turn shall be firmly mounted on the vibration table. Each plug shall be mounted in the normal manner at one end of a rectangular epoxy glass laminate board. The board shall be 1/16-inch minimum thick and the width shall be equal to the length of the plug plus 1/8-inch maximum. A stabilizing arrangement shall be provided as indicated on figure 3, such that a resisting force shall exist through a compliant material (rubber with a Shore A durometer of about 25) which will prevent the mated connectors from separating during vibration and shock. The resisting medium shall contact the top and side surfaces on the test jig only, and no initial load shall be imparted to the connector other than the weight of the test jig. For straight through connectors, a mated pair shall be mounted on individual parallel wiring boards and secured by bolts and stand-offs as indicated on figure 4 so that the distance between the wiring boards is equal to the height of the assembled connectors. A suitable monitoring circuit shall be provided to detect any interruption greater than 1 microsecond.
b. Electrical-load conditions - 100 milliamperes.
c. Test condition - III.
d. At the conclusion of this test, the connector's mounting hardware shall be visually examined for loosening, fracture, or other deterioration.



NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for information only.

FIGURE 3. Stabilizing arrangement.



FIXTURE MAY BE A MULTIPLE TYPE

FIGURE 4. Bolts and standoffs.

4.5.11 Salt spray (corrosion) (see 3.17). Mated connectors shall be tested in accordance with test procedure EIA/ECA-364-26. The following details shall apply:

a. Applicable salt solution.
b. Test condition - B.

4.5.12 Low level circuit (see 3.18). A minimum of seven mated pairs of contacts on each test specimen shall be individually measured in accordance with test procedure EIA-364-23. The following details shall apply:

a. Method of connection - Attach current-voltage leads at extreme ends of contacts. For crimp type contacts, attach current-voltage leads to wires, at closest point to contact without touching contact.
b. 100 milliamperes dc maximum.

4.5.13 Temperature cycling (see 3.19). Mated connectors shall be tested in accordance with test procedure EIA-364-32. The following details shall apply:

a. Special mounting - The connector halves shall be mounted on 1/16-inch thick, or appropriate thickness (see 3.1), epoxy glass printed wiring boards.
b. Method A, Test condition III, 5 cycles - Except that the minimum temperature shall be -65° +0°, -5°C and the maximum temperature shall be 125° +3°, -0°C.
c. Test measurement - The connector shall be capable of mating and unmating at the temperature extremes (force shall be unmonitored) during the fifth cycle.
d. After testing, connectors shall be examined for evidence of cracking or crazing or other physical damage, and the contact resistance shall be measured in accordance with 4.5.5.

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4.5.14 Shock (specified pulse) (see 3.20). Mated connectors shall be tested in accordance with test procedure EIA-364-27. The following details shall apply:

a. Mounting method and accessories - In accordance with 4.5.10a and suitable monitoring circuit to detect any interruption greater than 1 microsecond.
b. Test condition - G.
c. Number of blows - One blow in both directions along each of three mutually perpendicular axes for a total of six shocks.
d. Test current - 100 milliamperes.

4.5.15 Humidity (see 3.21). Connectors shall be tested in accordance with test procedure EIA-364-31, method IV, except steps 7a and 7b shall not be required. The mated pairs shall be connected as specified in 4.5.7. The printed wiring board may be conformal coated or otherwise protected. The loading voltage shall be 100 volts dc. Insulation resistance shall be measured in accordance with 4.5.8 upon completion of step 6 of final cycle, after removal of surface moisture from connector.

4.5.16 Solderability (see 3.22). Each terminal, except wrappost and crimp, shall be subjected to method 208 of MIL-STD-202. Connectors containing contacts with solder terminations shall have a minimum of 7 contacts tested per specimen.

4.5.17 Resistance to soldering heat (see 3.23). All connectors with solder terminations shall be tested in accordance with method 210 of MIL-STD-202, condition C, except connectors with solder cup terminations shall be tested in accordance with the following details:

a. The applicable wire size properly prepared for the solder cup size shall be inserted into the contact termination. A minimum of seven contacts shall be tested.
b. An appropriately prepared resistance soldering iron with an appropriate tip shall be applied to the lower portion of the solder cup configuration where the wire enters the termination.
c. The solder shall be applied in the normal manner.
d. The resistance soldering iron shall be applied to the system. The wattage shall be adjusted as to obtain a proper solder fillet in a minimum of 4 seconds.
e. After application, the soldering iron shall be removed and a visual and mechanical inspection performed.
f. The connector shall show no evidence of distortion or damage to any area of the connector housing. The contact shall meet the contact retention requirement (4.5.6).The contact shall not interfere with normal floating conditions as applicable and shall meet applicable location dimensions.

4.5.18 Electrical characteristics.

4.5.18.1 Contact rating. Conformance to the requirements of 3.3.3 and applicable specification sheets (see 3.1) constitutes verification of 3.9.

4.5.18.2 Operating temperature. Conformance to the requirements of 3.19 constitutes verification of 3.12.

4.5.19 Inspection for interchangeability. The dimensions indicated below shall be gauged or measured to determine conformance to the physical interchangeability requirements of 3.5. When a listed dimension is not within specified design limits, it shall be considered a major defect.

a. External and internal dimensions of cases, covers and insertable assemblies, when such dimensions affect mating parts.
b. Dimensions of cavities, when such dimensions affect insertion of items.
c. Location of connectors, locking pins, fasteners, slides and mountings, as applicable, which receive mating parts of plug-in assemblies and major units, and location of the mating parts on the plug-in assembly or major unit.

4.5.20 Crimp tensile strength (see 3.24) (applicable to crimp contacts only). The test shall be performed in accordance with test procedure EIA-364-08. Samples for test shall be placed in a standard tensile testing machine and the load applied at an approximate rate as specified to pull the wire out of the sample or break the wire sample. Values shall be as shown in table IV. Note that these values are for NEMA HP3, type E wire used in conjunction with the proper crimp contact. Seven samples of each wire size (both pin and receptacle types) shall be tested.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirement shall be as specified in the contract or order (see 6.2). When packaging of material is to be performed by DoD or in-house contractor 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 Service or Defense Agency, or within the military Department's services system commands. Packaging data retrieval is available from the managing Military Department 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. These connectors are designed for printed wiring board-to-printed wiring board or printed wiring board-to-cable interconnection of miniaturized equipment subassemblies with low-power requirements and are intended for use in airborne, ground support and shipboard electrical and electronic equipment.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. Packaging requirements (see 5.1).
c. Title, number, and date of the applicable specification sheet, and the complete PIN (see 3.1).

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 the applicable QPL No. 55302, 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 orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from the Defense Supply Center Columbus (DSCC-VQ), Document Control Unit, Columbus, OH 43216 or e mail: vqc.chief@dla.mil . An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at https://assist.dla.mil.

6.4 Tin whisker growth. The use of alloys with tin content greater than 97 percent may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after, and can develop under typical operation conditions on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead have shown to inhibit the growth of tin whiskers.

6.5 Definitions.

6.5.1 Two-part printed circuit connector. A two-part printed circuit connector consists of two plastic bodies containing the pin and socket electrical contacts, and integral aligning hardware to assure proper mating of the contacts. The contact pairs are designed with sufficient compliance that mechanical float of the contacts is not necessary to overcome unavoidable tolerance misalignments when the connector is assembled on printed wiring boards. There are two major categories, as follows:

6.5.1.1 Printed wiring plug and receptacle. A printed wiring plug or receptacle is a plug or receptacle where the contact terminations are designed for direct mounting on a printed wiring board.

6.5.1.2 Hook-up wiring receptacle. A hook-up wiring receptacle is a receptacle where the terminations are designed for the attachment of one or more hook-up wires.

6.5.2 Connector body. A connector body is that part which holds the contacts in their proper arrangement and electrically insulates them from each other.

6.5.3 Receptacle. A connector receptacle is that portion of the connector assembly which is normally fixed, and is intended to be rigidly attached to a supporting surface.

6.5.4 Plug. A connector plug is that portion of a connector assembly which normally is "free to move".

6.5.5 Socket. A connector socket is a female contact. It is normally connected to the "live" side of a circuit.

6.5.6 Pin connector. A pin connector contains pin contacts.

6.5.7 Socket connector. The socket connector contains socket contacts.

6.5.8 Mated pairs. A mated pin and socket connector.

6.5.9 Contacts. A term used in referring to pins or sockets when it is not necessary to distinguish between them.

6.5.10 Hermaphroditic contact. A hermaphroditic contact is a contact that mates with another identical contact (excluding termination type).

6.5.11 Termination. That part of a contact which is attached to the printed wiring board or hookup wire.

6.5.12 Mechanical float. Freedom of the entire contact and termination to change position within fixed mechanical limits.

6.6 Operating temperature. The operating temperature of the connector does not necessarily eliminate the possibility of local hot spots when several adjacent contacts are carrying their maximum rated current.

6.7 Design considerations. Contact terminations will accommodate wire gauges of a higher current carrying capacity or permit a multiplicity of smaller gauge wires. However, the maximum rated current of the contact (see 3.4.1) should not be exceeded and the total current in any connector or the ambient environment should not cause local hot spots above 150ºC.

6.8 Subject term (keyword) listing.

Contacts
Dip solder
Hand solder
Plug
Receptacle
Right angle
Straight through
Wire wrappost

6.9 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. As of the dating of this document, the U.S. Environmental Protection Agency (EPA) is focusing efforts on reducing 31 priority chemicals. The list of chemicals and additional information is available on their website http://www.epa.gov/osw/hazard/wastemin/priority.htm. Included in the EPA list of 31 priority chemicals are cadmium, lead, and mercury. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein (see Section 3).

6.10 Amendment notations. The margins of this specification are marked with vertical lines to indicate modifications generated by this amendment. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

CONCLUDING MATERIAL

Custodians:
Army - CR
Navy - EC
Air Force - 85
DLA - CC

Preparing activity:
DLA - CC

(Project 5935-2015-215)

Review activities:
Army - AR, AT, AV, CR4, MI
Navy - AS, MC, OS
Air Force - 19
MISC - MDA

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