INCH-POUND
MIL-C-29600
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MILITARY SPECIFICATION

CONNECTORS, ELECTRICAL, CIRCULAR, MINIATURE, COMPOSITE, HIGH DENSITY, QUICK COUPLING, ENVIRONMENT RESISTANT, REMOVABLE CRIMP CONTACTS, ASSOCIATED HARDWARE GENERAL SPECIFICATION FOR

1. SCOPE

1.1 Scope. This specification covers miniature, composite, high density, threaded coupling, self locking, circular, environment resistant, electrical connectors utilizing removable crimp contacts, and associated hardware, which are capable of continuous operation within a temperature range of -65° to +175°C. These connectors are supplied under a MIL-STD-790 reliability assurance program. See 6.1 for intended use and applications.

1.2 Description. The connectors employ rear release removable pin and socket contacts with crimp termination. The connectors are designed to assure proper orientation of the mating halves prior to electrical circuit closure. The connectors include EMI shielding capability. They also provide electrical continuity between mated shells prior to contact engagement and have the contacts so located as to be protected from handling damage and inadvertent electrical contact. The connectors consist of a composite material with light weight characteristics and, when used with backshells and contacts specified herein, provide high levels of corrosion resistance and durability.

1.2.1 Design considerations. Connectors are designed to be used as a system with backshells and contacts specified herein. When so used, the connectors are capable of performance during or after, as applicable, under the following environmental conditions:

1.2.1.1 Temperature. -65° to +175°C.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Systems Engineering and Standardization Department (Code 53), Naval Air Engineering Center, Lakehurst, NJ 08733-5100, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 5935

1.2.1.2 Vibration.

a. Random: 41.7 G RMS at rated high and low temperatures without backshell.
49.5 G RMS at ambient temperature with backshell.
b. Sine: 60 G at ambient temperature with backshell

1.2.1.3 Altitude. Altitudes from sea level to 100,000 feet (8 torr). Test voltage will vary with altitude (see Table XII).

1.2.1.4 Shock. Shock as represented by a 3 + 1 milliseconds base half-sine wave peaking at 300 G (see 3.23)

1.2.1.4.1 High impact shock. Per MIL-S-901.

1.2.1.5 Humidity. Humidity conditions up to 98 percent relative humidity including condensation (see 3.25).

1.2.1.6 Corrosion. 2000 hours exposure to salt-laden atmosphere (see 3.15).

1.2.1.7 Temperature cycling. See 4.6.3.

1.2.1.8 Fluid immersion. Immersion, in jet fuel, lubrication oil, liquid coolant, hydraulic fluid, gasoline, cleaning compound, defrosting fluid, and solvents (see 3.29).

1.2.1.9 EMI shielding EMI shielding effectiveness: 100 MHz to 10 GHz, minimum attenuation of 50 dB (see 3.27).

1.2.1.10 Electrolytic erosion. Exposure of uncoupled connector to a salt moisture environment (see 3.34).

1.2.1.11 Durability. 1500 matings and unmatings (see 3.4.1, and 3.10).

Classification.

1.3.1 Connectors. Connectors fabricated to this specification are scoop-proof, self-locking, quick coupling and are as follows:

a. Series: The series A and B connectors are not intermateable.

A - Utilize MIL-C-38999 insert arrangements.
B - Utilize MIL-C-81511 insert arrangements.

b. Types:

(1) Plugs: Straight.
(2) Receptacles: Wall mounting, both front and rear panel mounting, jam nut mounting. Contains grounding member that makes shell contact prior to contact engagement.

c. Class: R - Environment resisting - conductive shell
E - Environment resisting.
G - Environment resisting - conductive shell, space grade.

1.3 2 Contacts:

a. Styles:

(1) Connectors ordered with high performance contacts:

H - Pin
J - Socket

The H or J designators are used to indicate a full complement of applicable high performance contacts rated at 1500 cycles of durability, and shall appear in the part number marked on the connector.

(2) Connectors ordered with standard contacts:

P - Pin
S - Socket

The P or S designators are used to indicate a full complement of applicable standard contacts rated at 500 cycles of durability, and shall appear in the part number marked on the connector.

(3) Connectors ordered without contacts:

A - Less pin contacts. Application specifies 500 cycles of durability.
B - Less socket contacts.
K - Less pin contacts. Application specifies 1500 cycles of durability.
L - Less socket contacts.

The A, B, K, or L designators are used to indicate connectors ordered less contacts, and are intended to have other than all standard power contacts installed (example: shielded, coaxial and thermocouple contacts). The A, B, K, or L designator shall appear in the part number marked on the connector.

Connectors ordered less contacts, but intended for assembly with all high performance or all standard contacts, shall have the H or J designator, or the P or S designator, respectively in the part number marked on the connector the same as connectors ordered with a full complement of applicable contacts.

1.3 3 Associated hardware

a. Types.

(1) Backshells.
(2) Protective covers.
(3) Dummy stowage receptacles.
(4) Sealing plugs.

2. GOVERNMENT DOCUMENTS

2.1 Specifications, standards and handbooks. Unless otherwise specified, the following specifications, standards and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-S-901	Shock Tests, H.I. (High Impact); Shipboard Machinery, Equipment and Systems, Requirements for
MIL-S-7742	Screw Threads, Standard, Optimum Selected Series: General Specification for
MIL-C-22520	Crimping Tools, Terminal, Hand or Power Actuated Wire Termination, and Tool Kits, General Specification for
MIL-W-22759	Wire, Electric, Fluoropolymer-Insulated, Copper or Copper Alloy
MIL-W-25038	Wire, Electrical, High Temperature and Fire Resistant, General Specification for
MIL-C-39029	Contacts, Electrical Connector, General Specification for
MIL-G-45204	Gold Plating, Electrodeposited
MIL-A-46146	Adhesive Sealants, Silicone, RTV, Non-Corrosive (For Use With Sensitive Metals And Equipment)
MIL-C-55330	Connectors, Preparation for Delivery of
MIL-W-81381	Wire, Electric, Polyimide-Insulated, Copper or Copper Alloy
MIL-I-81969	Installing and Removal Tools, Connector, Electrical Contact, General Specification for

STANDARDS

FEDERAL

FED-STD-H28	Screw-Thread Standards for Federal Services
QQ-B-575	Braid, Wire, (Copper, Tin Coated, or Silver Coated, Tubular, or Flat)
QQ-S-571	Solder, Tin Alloy, Lead-Tin Alloy, and Lead Alloy

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-790	Reliability Assurance Program for Electronic Parts Specifications
MIL-STD-889	Dissimilar Metals
MIL-STD-1285	Marking of Electrical and Electronic Parts
MIL-STD-1344	Test Methods for Electrical Connectors
MIL-STD-1373	Screw-Thread, Modified, 60° Stub, Double
MIL-STD-1560	Insert Arrangements for MIL-C-38999 and
MS3425	Insert Arrangements, Electrical Connector, Shell Size 8
MS3426	Insert Arrangements, Electrical Connector, Shell Size 10
MS3428	Insert Arrangements, Electrical Connector, Shell Size 14
MS3429	Insert Arrangements, Electrical Connector, Shell Size 16
MS3430	Insert Arrangements, Electrical Connector, Shell Size 18
MS3431	Insert Arrangements, Electrical Connector, Shell Size 20
MS3432	Insert Arrangements, Electrical Connector, Shell Size 22
MS3433	Insert Arrangements, Electrical Connector, Shell Size 24
MS3435	Test Gage, Contact Location and Retention Feature, MIL-C-0081511 Series 3 and 4 Connectors
MS9068	Packing, Preform - Ams 3304, O-Ring (Asg)

ISO/R 262-1973-ISO-Metric Screw Threads for Screws, Bolts, and Nuts, 6 to 39 MM.
ISO/R 965-1973-
Part 1 - ISO General Purpose Metric Screw Threads, Tolerances, Principles ar Basic Data.
Part 2 - ISO General Purpose Metric Screw Threads, Tolerances, Limits of Sizes for Medium Quality Commercial Bolt and Nut Threads 1.6 to 39 MM.
Part 3 - ISO General Purpose Metric Screw Threads, Tolerances, and Deviations for Constructional Threads 1.6 to 355 MM.

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

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

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

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 b products which are qualified for listing on the applicable Qualified Products t at the time set for opening of bids (see 4.4 and 6.3).

3.2.1 Reliability. The contractors reliability program for assembled connectors and assembly procedures shall meet the requirements of MIL-STD-790 with the exception that the failure reporting period shall be 12 months in lieu of 6 months.

3.3 Materials. Materials shall be as specified herein. However, when a definite material is not specified, a material shall be used which will enable the connectors and accessories to meet the performance requirements of this specification and shall be of the lightest practical weight. Acceptance or approva of any constituent material shall not be construed as a guarantee of the acceptance of the finished product.

3.3.1 Metals. Metals shall be of a corrosion-resistant type or shall be plated or treated to resist corrosion.

3.3.1.1 Dissimilar metals and compatible couples. When dissimilar metals ar used in intimate contact with each other, protection against galvanic corrosion shall be provided. The use of dissimilar metals in contact, which tend toward active galvanic corrosion (particularly brass, copper or steel used in contact wit aluminum or aluminum alloy) is not acceptable. However, metal plating or metal spraying on dissimilar-base metals to provide compatible couples for abutting surfaces is permitted per MIL-STD-889. The use of dissimilar metals separated by appropriate insulating material is also permitted.

3.3.1.2 Hydrolytic stability. All nonmetallic insert materials shall be selected to meet the hydrolytic reversion resistance requirements specified in Requirement 47 of MIL-STD-454 (see 4.6.36.1). When tested as specified in 4.6.36.2, the connector shells shall be without defects detrimental to performance. Connector weight shall not increase greater than 0.75 percent. When subjected to an overtorque at 150 percent of those values specified in Table III, there shall be no evidence of breaking, loosening of parts, or cracking.

3.3.2 Components. Materials for specific components of the connector shall be as follows:

a. Shells, coupling rings, and associated hardware - Corrosion resistant, high performance resins, with or without filler materials, shall be defined by specifications listed in the DODISS or published by professional materials associations. Exceptions may be granted by the preparing activity. No regrind materials will be allowed.

b. Insert - Reinforced epoxy resin or other rigid dielectric material.

c. Grounding members - Heat treated beryllium copper, corrosion resistant steel or conductive elastomer designed to provide electrical contact with the mating shell.

d. Gaskets, grommet and interfacial seal - Silicone, fluorosilicone, or silicone/fluorosilicone blend elastomer.

3.3.3 Magnetic permeability (magnetic materials). The relative permeability of the wired, assembled and fully mated connector assembly shall be less than 2.0 Mu when measured in accordance with 4.6.34.

3.3.4 Fungus resistant. Materials used in the construction of these connectors shall be fungus inert in accordance with Requirement 4 of MIL-STD-454 (see 4.1.3).

3.3.5 Contact materials. Contacts shall be made of conductive copper alloys as specified in MIL-C-39029.

3.3.6 Contact plating. Contacts shall be plated to meet or exceed the performance requirements of MIL-C-39029 and withstand 1500 cycles of durability. (see 4.6.5). Contact finish shall be 5 millionths minimum gold alloy over 45 millionths minimum palladium alloy, over a suitable underplate, and compatible with gold finish as defined in of MIL-C-39029.

3.3.7 Connectors and accessories finish. Conductive connector shells and backshells shall have a finish compatible with 500 millionths minimum tin or tin alloy, over a suitable surface preparation. Electrically conductive connector shells and backshells shall have an EMF range of -.10 to -.40 volts as specified in MIL-STD-889 Coupling rings, jam nuts, dust caps, dummy receptacles, and associated hardware shall meet the requirements of this specification.

3.3.8 Dielectric materials.

3.3 8.1 Insert and grommet. Insert and grommet materials shall have hardness, electrical, and mechanical characteristics for the purpose intended

3 3.8.2 Insert faces. The mating face of socket inserts shall be a hard nonresilient material. The mating face of pin inserts shall be a resilient material which shall provide sufficient sealing to meet the specification performance requirements.

3 4 Design and construction. Connectors and accessories shall be designed and constructed to withstand normal handling incident to installation and maintenance in service. Connectors shall be designed such that neither the pins nor sockets will be damaged during normal mating of counterpart connectors. Connector intermateability control dimensions shall be as specified on Figures 1 through 4, 6 through 9, and 3.4.1.2. Connector accessory interface dimensions shall be as specified in Figures 5 and Figure 10.

3.4.1 Contacts. Contacts shall be designed for crimp termination and shall be as specified to MIL-C-29600/13, /14, /23, and /24. The connectors specified herein are also capable of operating with contacts specified in MIL-C-39029/17, /18, /56 and /58, as applicable. However, when MIL-C-39029 contacts are used, the durability level of the connector system shall be 500 cycles. The quantity of contacts to be supplied with each connector unit package shall consist of a full complement of contacts plus 1 spare contact for each size used in the arrangement utilizing 26 contacts or less. For arrangements utilizing more than 26 contacts, 2 spare contacts for each size used in the arrangement shall be used.

3.4.1.1 Indirect shipment. Connectors may be ordered without contacts (see 1.3.1, 6.2 and 6.4).

3.4.1.2 Insert arrangement. Insert arrangements for MIL-C-29600 Series A connectors shall be as specified in MIL-STD-1560, as applicable (pattern 25-11 is not applicable). Insert arrangements for MIL-C-29600 Series B connectors shall be as specified in MS3425, MS3426 and MS3428 through MS3433, as applicable. The engaging end of the pin contact in assembled connectors shall be located within 0.024 inch (0.61 mm) diameter of true position and the engaging end of socket contacts in assembled connectors shall be located within 0.015 inch (0.38 mm) diameter of true position.

3.4.1.3 Installing and removal tools. Tools required for the assembly and disassembly of the pin and socket contacts into their connector inserts shall be qualified to MIL-I-81969/16 for series B connectors, or MIL-I-81969/8 and MIL-I-81969/14 for series A connectors. One qualified MIL-I-81969/16 or MIL-I-81969/14 tool shall be enclosed in the unit package, as applicable. For indirect shipments, connectors may be ordered without installing and removal tools (see 6 2 and 6.4).

3 4.2 Insert design and construction. The entire insert and wire sealing or wire supporting member of the assemblies shall be one integral part, designed to provide sealing and support around the wires and to be nonremovable. The inserts shall be installed in the locations specified in Figures 1, 2, 6, 7 and 3.4.1.2. The rigid dielectric shall be one molded piece or no more than two pieces bonded so as to form essentially one integral piece. Inserts shall be of construction, eliminating all air paths between contacts The design shall be such as to permit the removal and replacement of individual contacts into their connector inserts with specified installing/ removal tools (see 3.4.1.3). The contact locking device shall be contained or located in the rigid dielectric insert and shall retain the contacts in accordance with the contact retention requirements specified herein (see 3.20).

The inserts shall be secured to prevent rotation or movement within the shell. All pin contact inserts shall have a resilient interface seal bonded to the front face in accordance with the applicable standards. Socket entry holes and pin barrier rings shall conform to Figures 4 and 9.

3.4.3 Sealing.

3.4.3.1 Wire sealing. Environment resisting assemblies shall be designed to meet the environmental requirements of this specification using wire of outer diameter within the applicable range as shown in Table I. Sealing to size 8 cavities of the wire sealing grommet may be accomplished by means of separate resilient bushings which shall be furnished with the connector. Connectors shall meet the requirements specified when:

a. A full complement of wire of the applicable minimum or maximum insulation diameter is installed.

b. Any combination of wire diameters within the extremes of (a) above are used.

TABLE I. Wire sealing.

Contact Size	Wire Size	Outer diameter diameter of finished wire			
		Series A		Series B	
		Inches	MM	Inches	MM
22D-23	28 26 24 22	0.030 Minimum 0.054 Maximum	0.76 Minimum 1 37 Maximum	0.030 Minimum 0.054 Maximum	0.76 Minimum 1.37 Maximum
20	24 22 20	0.040 Minimum 0.083 Maximum	1.02 Minimum 2.11 Maximum	0.040 Minimum 0.074 Maximum	1.02 Minimum 1.88 Maximum
16	20 18 16	0.065 Minimum 0.109 Maximum	1.65 Minimum 2.77 Maximum	0.060 Minimum 0.103 Maximum	1.52 Minimum 2.62 Maximum
12	14 12	0.097 Minimum 0.142 Maximum	2.46 Minimum 3.61 Maximum	0.097 Minimum 0.135 Maximum	2.46 Minimum 3.43 Maximum
8	Shielded Cable	0.120 Minimum 0.155 Maximum	3.05 Minimum 3.94 Maximum	N/A	N/A

3.4.3.2 Grommet sealing plugs. Unless otherwise specified (see 3.1), the grommets of environment resisting connectors shall be designed to accept sealing plugs in accordance with MS27488 in lieu of wire where unwired contacts are

employed. Fifteen percent of the number of contacts, but not less than one, shall be enclosed in the unit package. For indirect shipments, connectors may be supplied without grommet sealing plugs (see 6.4).

3.4.3.3 Interfacial seal. Plugs and receptacles with pin inserts shall have a resilient face with individual pin barriers (see Figures 4 and 9). The pin barrier projections shall seal in their respective lead-in chambers of the hard face socket insert. The resilient interfacial seal shall provide individual contact seals in the mated condition to ensure circuit isolation between each contact and contact to shell.

3.4.4 Shell. Shells, including mounting flanges, shall be of one-piece construction and shall be designed to retain their inserts in one position, both axially and with respect to rotation, by mechanical means. Adhesive may be used as a supplementary retention means for environment resisting connectors. The shells of crimp contact connectors shall have a blue color band in accordance with EIA RS-359, indicating a rear release contact retention system. The blue color band shall be located so that it is readily visible to any person servicing a mounted connector. The shell shall be designed to accept and retain a cable support or other accessory (see Figures 5 and 10).

3.4.4.1 Grounding members. Grounding members shall be designed to provide electrical contact with the mating shell prior to contact engagement.

3.4.4.2 Jam-nut mounting receptacles. Jam-nut mounting receptacles shall be provided with mounting nut MIL-C-29600/7 all with provisions for locking and an MS9068 O-ring.

3.4.4.3 Screw threads. Screw threads shall conform to FED-STD-H28, MIL-S-7742, MIL-STD-1373, ISO/R68-1973, ISO/R261-1973, ISO/R262-1973, and ISO/R965-1973, as applicable. MIL-STD-1373 should be used as a reference for gage design on triple start threads Threads shall be checked using ring or plug gages. Slight out-of-roundness beyond the specified tolerances is acceptable if threads can accept the gages without forcing.

3.4.5 Threaded coupling. Unless otherwise specified (see 3.1), connectors shall be coupled to counterpart connectors by means of a triple start thread. An anti-decoupling mechanism shall be internal to the plug to maintain the mated connector in full engagement. The coupling ring shall be captivated and shall be knurled or fluted to facilitate coupling.

3.4.5 1 Ease of coupling. Counterpart connectors of any arrangement shall be capable of being fully coupled and uncoupled in a normal and accessible location without the use of tools.

3.4.5 2 Locking. A complete coupling shall be accomplished by clockwise rotation of the coupling nut and shall provide shell to shell bottoming. A visual red color band shall be provided on the receptacle to determine complete coupling (see MIL-C-29600/10, /11, /20, and /21).

3.4.5.3 Polarization of connector shells. Polarization of connector shells shall be accomplished by means of five integral keys and suitable matching keyways on the counterpart. Polarization shall be accomplished before initial engagement of

the coupling ring. During axial engagement, pins shall not touch sockets or the insert face until polarization has been achieved (see Figures 3 and 8).

3.4 5.3.1 Alternates. Shells shall also be supplied with the keys (or keyways) rotated from the normal as indicated on Figures 3 and 8.

3.4 5.4 Engagement seal. Connectors shall contain sealing means so that engaged connectors comply with the requirements specified herein. A dynamic seal shall be provided to achieve a peripheral seal between the mated shells.

3.4.5.5 Pin to pin mating prevention. The connector shall be designed such that pin to pin contact (electrical or physical) is not possible in the event that a plug with pin contacts is inadvertently mated with a receptacle with pin contacts.

3.4.5.6 Lubrication. Coupling threads may be coated with a lubricant. All lubricants shall meet the performance requirements specified herein. Lubricants shall be NASA approved for space flight parts.

3.4.6 Cavity fill. If the rear grommet design does not allow for intimate contact between it and the complete inner perimeter of the shell, any resulting cavity between the insert and the shell shall be filled with RTV silicone conforming to MIL-A-46146, or equivalent.

3.5 Interchangeability. All connectors having the same part number shall be completely interchangeable with each other with respect to installation and performance.

3.6 Maintenance aging. When tested as specified in 4.6.2, the contact installation and removal forces shall not exceed the requirements of Table II.

TABLE II. Installing and removal forces.

Contact size	Installing and removal forces (maximum)	
	Pounds	Newtons
22D-23	10	44
20	20	89
16	20	89
12	30	133
8	35	156

3.7 Contact protection, connector mating (scoop-proof). Connectors designed to provide protection in receptacles or plugs equipped with pin contacts shall not permit the edge of the mating plug or receptacle shell to touch the pin contacts. The procedure described in 4.6.37 shall be used.

3.8 Temperature cycling. When tested as specified in 4.6.3, there shall be no damage detrimental to the operation of the connector. There shall be no blistering, peeling, or other separation of the plating.

3.9 Coupling torque. When tested as specified in 4.6.4, the coupling torque for mating and unmating of counterpart connectors shall meet the torque requirements of Table III. The connectors used in this test shall have the complete set of contacts. Protective covers, when mated with their applicable connectors, shall also comply with the torque requirements of Table III

TABLE III. Coupling torque.

Shell size	Torque			
	Maximum engagement and disengagement		Minimum disengagement	
	Inch pound	Newton meters	Inch pound	Newton meters
8-9	8	0.9	2	0.2
10-11	12	1.4	2	0.2
13	16	1.8	2	0.2
14-15	20	2.3	4	0.4
16-17	24	2.7	4	0.4
18-19	28	3.2	4	0.4
20-21	32	3.6	6	0.7
22-23	36	4.1	7	0.8
24-25	40	4.5	7	0.8

3.10 Durability. When tested as specified in 4.6.5, counterpart connectors shall show no damage detrimental to the operation of the connector and shall meet the subsequent requirements.

3.11 Altitude immersion. Connectors shall have an insulation resistance greater than those values specified in Table IV, after being subjected to altitude immersion as specified in 4.6.6 and shall maintain a dielectric withstanding voltage at sea level as specified in 4.6.8.1.

3.12 Insulation resistance.

3.12.1 Insulation resistance at ambient temperature. When tested as specified in 4.6.7.1, the insulation resistance between any pair of contacts and between any contact and the shell shall be greater than 5000 megohms (see Table IV).

3.12.2 Insulation resistance at elevated temperature. When tested as specified in 4.6.7.2, the insulation resistance between any pair of contacts and between any contact and the shell shall be greater than those values specified in Table IV.

3.13 Dielectric withstanding voltage. When tested as specified in 4.6.8.1 or 4.6.8.2, connectors shall show no evidence of flashover or dielectric breakdown.

Table IV. Insulation resistance.

Environmental Condition	Insulation resistance (megohms)	
	Series A	Series B
At ambient temperature	5000	5000
At elevated temperature	1000	2000
After altitude immersion	1000	5000
After humidity	100	500

3.14 Insert retention. When tested as specified in 4.6.9, unmated connectors shall retain their inserts in their proper location in the shell and there shall be no evidence of cracking, breaking, separation from the shell or loosening of parts.

3.15 Salt spray (corrosion). When tested as specified in 4.6.10, connectors shall be without defects detrimental to the mechanical and electrical performance.

3.16 Electrical engagement. When tested as specified in 4.6.11, wired, mated connectors shall provide a minimum of 0.050 inch (1.27 mm) electrical engagement for MIL-C-29600 Series A connectors, and .040 inch (1.02mm) electrical engagement for MIL-C-29600 Series B connectors. This requirement also applies to the outer shield and inner conductor of shielded contacts.

for MIL-C-29600 Series B Connectors and 0.050 inch (1.27 mm) for MIL-C-29600 Series A Connectors. This requirement also applies to the outer shield and inner conductor of shielded contacts.

3.17 External bending moment. When tested as specified in 4.6.12, connectors shall be without defects detrimental to the mechanical and electrical performance.

3.18 Gage location. When tested as specified in 4.6.13, gage locations shall fall within the range specified on Figures 1, 2, 6, and 7.

3.19 Gage retention. When tested as specified in 4.6.14, the applicable test gages conforming to MS3435 and Figure 20, shall be retained in the contact cavities and the axial displacement of the test gages while under load shall not exceed 0 012 inch (0.30 mm).

3.20 Contact retention. When tested as specified in 4.6.15, the axial displacement of the contact shall not exceed 0.012 inch (0.30 mm). No damage to the contacts or inserts shall result.

3.21 Altitude - low temperature. When tested as specified in 4.6 16 the connectors shall meet the requirements of dielectric withstanding voltage as specified in 3.13 and the insulation resistance as specified in 3.12.1.

3.22 Vibration (qualification only). When tested as specified in 4.6.17, there shall be no electrical discontinuity greater than 1.0 microsecond and there shall be no disengagement of the mated connectors, backing off of the coupling mechanism, evidence of cracking, breaking or loosening of parts.

3.23 Shock. When tested as specified in 4.6.18, there shall be no electrical discontinuity greater than 1.0 microsecond and there shall be no disengagement of the mated connectors, evidence of cracking, breaking or loosening of parts.

3.24 Conductivity.

3.24.1 Shell-to-shell conductivity. When tested as specified in 4.6.19.1, the maximum measured resistance between the two connectors shall be 6.0 milliohms. The test probes shall not puncture or damage the connector finish.

3.24.2 Elastomeric o-ring conductivity. When tested as specified in 4.6.19.2, the maximum initial resistance shall be 1.0 milliohm. The maximum measured resistance shall be 2.5 milliohms after exposure. Separate o-rings may be required at the discretion of the qualifying activity.

3.24.3 Shield to shell conductivity (accessories only). Unless otherwise specified (see 3.1), when tested as specified in 4.6.19.3, the maximum resistance measured between the shield terminated to the connector plug and the receptacle flange shall be 20 milliohms.

3.25 Humidity. When tested as specified in 4.6.20, wired, mated connectors shall be without defects detrimental to the mechanical and electrical performance. Following the test, and during the final cycle, insulation resistance shall be greater than those values specified in Table IV.

3.26 Grounding member forces. When tested as specified in 4.6.21, the axial force necessary to overcome the grounding member interference shall be greater than .25 pounds but less than 15 pounds.

3.27 EMI shielding. When tested as specified in 4.6.22.1 and 4.6.22.2, the EMI shielding capabilities of mated shells with approved backshells and cable shall not be less than that specified in Table V at the specified frequencies.

3.28 Ozone exposure (unmated). When tested as specified in 4.6.23, the connectors shall show no evidence of cracking of materials or other damage due to ozone exposure that will adversely affect subsequent performance.

3.29 Fluid immersion. When tested as specified in 4 6.24, connectors shall meet the requirements for coupling torque (see 3.9) and dielectric withstanding voltage (see 3.13) when exposed to all fluids specified in Method 1016 of MIL-STD-1344.

3.29.1 Retention system fluid immersion. When tested as specified in 4.6.24 1, the insert assemblies shall meet requirements of contact retention (see 3.20). Effects of the fluids on resilient sealing members shall not be a consideration of this test.

3.30 Pin contact stability. When tested as specified in 4.6.25, the total displacement of a reference point on the contact tip shall not exceed the amount shown in Table VI.

TABLE V. EMI shielding effectiveness.

Leakage attenuation (db) minimum	
Frequency (MHz)	Class R
100	90
200	88
300	88
400	87
800	85
1,000	85
1,500	69
2,000	65
3,000	61
4,000	58
6,000	55
10,000	50

TABLE VI. Pin contact stability.

	Total displacement				Force			
	Series A		Series B		Series A		Series B	
Contact size	Inches (Maximum)	MM	Inches (Maximum)	MM	Pounds	Newtons	Pounds	Newtons
23	N/A	N/A	0.025	0.635	N/A	N/A	0.25	1.1
22D	0.030	0.762	N/A	N/A	0.28	1.2	N/A	N/A
20	0.054	1.372	0.030	0.762	0.56	2.5	0.50	2.2
16	0.075	1.905	0.048	1.219	1.1	4.9	1.0	4.4
12	0.075	1.905	0.062	1.575	1.1	4.9	1.0	4.4
8	0.100	2.540	N/A	N/A	2.2	9.8	N/A	N/A

3.31 Contact walkout. When tested as specified in 4.6.26, the contacts shall not be dislodged from their normal position.

3.32 Insertion/removal tool abuse. When tested as specified in 4.6.27, there shall be no damage to the contacts, the connector insert, or the contact retaining mechanism. The connectors shall meet the requirements of subsequent testing.

3.33 High temperature exposure with contact retention When tested as specified in 4.6.28, the contacts shall support an axial load equal to 50% of the values specified in Table XIV. The contacts shall maintain their specified locations (see Figures 1, 2, 6, and 7). Electrical discontinuity shall not exceed one (1) microsecond. There shall be no visible leaching of the interfacial seal detrimental to connector performance.

3 33.1 High temperature exposure. When tested as specified in 4 6.28.1 for 1000 hours, connectors shall be without defects detrimental to the mechanical and electrical performance and shall pass succeeding tests in the qualification test sequence.

3 34 Electrolytic erosion. When tested as specified in 4.6.29, pin contacts shall show no exposure of base metal due to electrolytic erosion. Corrosion products shall not be considered as defects.

3.35 Ice resistance. When tested as specified in 4.6.30, connectors shall pass succeeding tests in the qualification table. Uncoupling and recoupling torque shall not exceed the values of Table III by more than 25 percent.

3.36 Dust (fine sand). When tested as specified in 4.6.31, connectors shall pass succeeding tests in the qualification table. Uncoupling and recoupling torque shall not exceed the values listed in Table III by more than 25 percent

3.37 Plating adhesion.

3.37.1 Plating adhesion (solder pull). The connectors shall be subjected to a solder pull test to determine the adhesion of the plating to the composite substrate. When tested as specified in 4.6.32.1, the plating shall adhere to the substrate with a shear strength greater than 750 psi.

3.37.2 Plating adhesion (thermal shock). The connector shells shall be subjected to a thermal shock test to determine the adhesion of the plating to the composite substrate. When tested as specified in 4.6.32.2, there shall be no blistering, peeling or other separation of plating.

3.38 Impact. When connectors are tested as specified in 4.6.33, there shall be no breaking or cracking of inserts or shells. Also, there shall be no bending of contacts nor any damage which would prevent the connectors from mating or unmating.

3.39 Accessory thread strength. When tested as specified in 4.6.35, mated connectors shall have an accessory thread strength of 50 inch pounds minimum for shell sizes 8, 9, 10, 11, 13, 14, 15, 16, 17, 18 and 19, and 100 inch pounds minimum for shell sizes 20, 21, 22, 23, 24 and 25. There shall be no detrimental damage to the connectors.

3.40 Thermal vacuum outgassing (class G only). When tested as specified in 4.6.38, the total mass loss (TML) shall not be greater than 1.0% and collected volatile condensable materials (CVCM) shall not be greater than 0.10%.

3.41 Marking. Connectors and accessories shall be molded, etched or ink stamped with the manufacturer's name or trademark, date code, assembly plant code, and the following information, as applicable. Stamping shall be in accordance with MIL-STD-1285 where space permits. The following example is illustrative:

Identification

M29600/20	R	J	18	P	1
Specification sheet no	Class (see 1.3.1)	Shell size (see Table VII)	Insert arrangement (see 3.4.1.2)	Contact style (see 1.3.2)	Polarization (a number is required for all positions) (see 3.4.5.3 and Figs. 3 and 8)

TABLE VII. Shell size code for part numbering.

Shell Size	Code Letter
8	A
9	B
10	C
11	D
13	F
14	G
15	H
16	J
17	K
18	M
19	N
20	P
21	R
22	S
23	T
24	U
25	W

3.41.1 Contact location identification. Contact locations shall be identified as indicated on the applicable military standard. All positions shall be identified on the front and rear faces of the insert except where space limitations make this impracticable. Location of contact identifying characters shall be in close proximity to the holes but need not be placed exactly where indicated on the standard. Contact identifying characters shall be permanent and shall not be molded, raised characters on the connector interface.

3.42 Workmanship. The connector shall be fabricated in a manner such that the criteria for appearance, fit and adherence to specified tolerances are observed. Particular attention shall be given to neatness and thoroughness of marking parts, finish, molding and bonding. The connector shall be free from crazing, cracks, voids, pimples, chips, blisters, pinholes, sharp cutting edges, burrs and other defects that will adversely affect life, serviceability or appearance.

4. QUALITY ASSURANCE PROVISIONS

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

4.1.1 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality and quantity to permit performance of the required inspection shall be established and maintained by the manufacturer. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with MIL-STD-45662.

4.1.1.1 Assembly plants. Assembly plants must be listed on or approved for listing on the applicable qualified products list. 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 examination is required of certified piece parts obtained from the qualified connector manufacturer, except when there is a cause for rejection. Assemblies produced at the assembly plant shall be subjected to inspection 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.

4.1.2 Reliability assurance program. A reliability assurance program shall be established and maintained in accordance with MIL-STD-790. Evidence of such compliance shall be verified by the qualifying activity of this specification as a prerequisite for qualification and continued qualification.

4.1.3 Fungus resistance certification. Certification of Requirement 4 of MIL-STD-454 is required (see 3.3.4).

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

a. Qualification inspection (see 4.4).
b. Quality conformance inspection (see 4.5).

4.3 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.

4.4 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.

4.4.1 Initial qualification. Initial qualification approval may be granted upon successful completion of the inspections and tests of Table VIII conducted on samples of 4.4.1.1. Additional shell configurations and insert arrangements other than those actually tested may be qualified by similarity, providing that the capability to manufacture these parts is demonstrated by providing exhibit samples acceptable to the qualifying activity.

4.4.1 1 Test samples Samples shall be subjected to qualification and group C periodic tests in the sequence specified in Table VIII.

a Connectors supplied for testing to Table VIII, Group 1 shall consist of two small (sizes 8 through 13), two medium (sizes 14 through 19), and two large (sizes 20 through 25), shell sizes in the most dense contact arrangements One small, one medium, and one large shell size connector shall be exposed to all Table VIII, Group 1 tests except for salt spray (acetic acid) (500 hours) and plating adhesion (thermal shock). The other small, medium and large size connectors shall be exposed to all Table VIII, Group 1 tests except for salt spray (2000 hours) and plating adhesion (solder pull). No sample connector shall be exposed to both salt spray tests or both plating adhesion tests Note. For periodic testing, both connector sample groups shall be subjected to the acetic acid salt spray test.

b. Sample Group 2 in Table VIII shall consist of nine mated pairs of connectors, representative of each contact size and small, medium and large shell sizes. The samples shall be divided equally for testing to the three vibration levels.

c. Sample Groups 3 through 7 in Table VIII shall consist of a small, a medium, and a large shell size in the most dense contact arrangements. Note: Group 5 samples may be provided less inserts.

d. Connectors supplied for testing to Table VIII, Group 8, shall consist of a sufficient quantity to subject 5 contact cavities of each size to the specified tests. Elastomeric o-rings may be supplied separate from the connectors

e. Connectors supplied for testing to Table VIII, Group 9, shall consist of a sufficient quantity to subject 20 contact cavities of each size to each immersion fluid specified. Elastomeric o-rings may be supplied separate from the connectors.

f. Connectors supplied for testing to Table VIII, Group 10, shall consist of one small, one medium, and one large mated pair. No insert is required.

TABLE VIII. Qualification and Group C periodic tests.

Inspection	Requirement Paragraph	Test Paragraph
Group 1		
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Maintenance aging	3.6	4.6.2
Electrical engagement	3.16	4.6.11
Contact retention	3.20	4.6.15
Temperature cycling	3 8	4.6.3
Dielectric withstanding voltage unmated at sea level)	3.13	4.6.8.1
*Altitude immersion	3.11	4.6.6
Insulation resistance (ambient temperature)	3.12.1	4.6.7.1
Durability (first 50 cycles) (see 4.6.10)	3.10	4.6.5
*Salt spray (2000 hours)	3.15	4.6.10.1
Salt spray (acetic acid) (500 hours)	3.15	4.6.10.2
Durability (remaining 1450 cycles) (see 4.6.10)	3.10	4.6.5
Shell-to-shell conductivity	3.24.1	4.6.19.1
Coupling torque	3.9	4.6.4
Accessory thread strength	3.39	4.6.35
Insert retention	3.14	4.6.9
Contact retention	3.20	4.6.15
Dielectric withstanding voltage (unmated at sea level)	3.13	4.6.8.1
*Dielectric withstanding voltage (unmated at altitude)	3.13	4.6.8.2
Plating adhesion	3.37	4.6.32
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Group 2		
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Maintenance aging	3 6	4.6.2
Contact protection	3 7	4.6.37
Insulation resistance at ambient temperature	3.12.1	4.6.7.2
Coupling torque	3 9	4.6.4
Contact retention	3.20	4.6.15
Altitude-low temperature	3.21	4.6.16
Temperature cycling	3.8	4.6.3
Dielectric withstanding voltage (unmated at sea level)	3 13	4.6.8.1
Durability	3.10	4.6.5
*Vibration	3 22	4.6.17
Shock	3.23	4.6.18
Shell to shell conductivity	3.24	4.6.19
High temperature exposure	3 33 1	4.6.28.1

*Qualification only

TABLE VIII. Qualification and Group C periodic tests. (cont'd)

Inspection	Requirement Paragraph	Test Paragraph
Group 2 (cont'd)		
Insulation resistance (elevated temperature)	3.12.2	4.6.7.2
Humidity	3.25	4.6.20
Insulation resistance (ambient temperature)	3.12.1	4.6.7.2
Dielectric withstanding voltage (unmated at sea level)	3.13	4.6.8.1
*Dielectric withstanding voltage (mated at altitude)	3.13	4.6.8.2
*Dielectric withstanding voltage (unmated at altitude)	3 13	4.6.8.2
Coupling torque	3.9	4.6.4
Contact retention	3 20	4.6.15
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Group 3		
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Maintenance aging	3.6	4.6.2
Coupling torque	3.9	4 6.4
Contact retention	3.20	4.6.15
Temperature cycling	3.8	4.6.3
Dielectric withstanding voltage (unmated at sea level)	3.13	4.6.8.1
Shell to shell conductivity	3.24	4.6.19
Ozone exposure (unmated)	3.28	4.6.23
Magnetic permeability	3 3.3	4 6.34
Insulation resistance (ambient temperature)	3.12.1	4.6 7.1
Coupling torque	3.9	4.6.4
Dielectric withstanding voltage (unmated at sea level)	3.13	4.6.8.1
Contact retention	3.20	4.6.15
*Dielectric withstanding voltage (mated at altitude)	3 13	4.6.8.2
Impact	3.38	4.6.33
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Group 4		
Examination of product	3.1 thru 3.5, 3 41 and 3.42	4.6.1
Maintenance aging	3.6	4.6.2
Contact protection	3.7	4.6.37
Contact retention	3.20	4.6.15
Temperature cycling	3.8	4 6.3

*Qualification only

TABLE VIII. Qualificationand Group C periodic tests. (cont'd)

Inspection	Requirement Paragraph	Test Paragraph
Group 4 (cont'd)		
Dielectric withstanding voltage (unmated at sealevel)	3.13	4.6.8.1
Durability	3.10	4.6.5
Insulation resistance (ambient temperature)	3.12.1	4.6.7.1
External bending moment	3.17	4.6.12
Coupling torque	3.9	4.6.4
Dielectric withstanding voltage (unmated at sea level)	3.13	4.6.8.1
Contact retention	3.20	4.6.15
Insulation resistance (ambient temperature)	3.12.1	4.6.7.1
*Dielectric withstanding voltage (mated at altitude)	3.13	4.6.8.2
*Dielectric withstanding voltage (unmated at altitude)	3.13	4.6.8.2
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Group 5		
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Durability	3.10	4.6.5
Grounding member forces	3.26	4.6.21
Shell-to-shell conductivity	3.24.1	4.6.19.1
Salt spray (acetic acid)(500 hours)	3.15	4.6.10.2
EMI Shielding effectiveness	3.27	4.6.22
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Group 6		
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6 1
Dielectic withstanding voltage (at sea level)	3.13	4.6.8.1
Electrolytic erosion	3.34	4.6.29
Examination of product	3.1 thru 3.5 3.41 and 3.42	4.6.1
Group 7		
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Ice resistance	3.35	4.6.30
Coupling torque	3.9	4 6.4
Dust (fine sand)	3.36	4 6.31
Coupling torque	3.9	4.6.4
Thermal vacuum outgassing	3.40	4 6.38
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1

*Qualification only

TABLE VIII. Qualificationand Group C periodic tests. (cont'd)

Inspection	Requirement Paragraph	Test Paragraph
Group 8		
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Gage location	3.18	4.6.13
Gage retention	3.19	4.6.14
Pin contact stability	3.30	4.6.25
Contact walkout	3.31	4.6.26
Maintenance aging	3.6	4.6.2
*Insertion/removal tool abuse	3.32	4.6.27
High temperature exposure with contact retention	3.33	4.6.28
Elastomeric o-ring conductivity	3.24.2	4.6.19.2
Insert retention	3.14	4.6.9
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Group 9		
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Fluid immersion	3.29	4.6.24
Elastomeric o-ring conductivity	3.24.2	4.6.19.2
Coupling torque	3.9	4.6.4
Dielectric withstanding voltage (unmated at sea level)	3.13	4.6.8
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Group 10		
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Retention system fluid immersion	3.29	4.6.24.1
Contact retention	3.20	4 6.15
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Group 11		
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1
Hydrolytic stability	3.3.1.2	4.6.36.2
Examination of product	3.1 thru 3.5, 3.41 and 3.42	4.6.1

4.4.1.2 Preparation of samples. Samples provided for Table VIII, Groups 1 and 2 shall be wired with equal amounts of minimum and maximum diameter wire. The minimum and maximum diameter wire shall be in accordance with MIL-W-22759 for each contact cavity size. Samples provided for Table VIII, Groups 3 and 4, and 6 through 10, shall be wired with nominal wire in accordance with MIL-W-22759 for each contact

cavity size. Connectors for test Groups 1 through 5 shall be assembled with backshells per MIL-C-29600/2. Connectors for test Group 5 shall be supplied without inserts. Connectors for test Group 11 shall be unwired and unmated. Samples provided under 4.4.1.1 shall be wired with a wire having a smooth extruded outer jacket or insulation of waterproof construction.

TABLE IX. Test wire sizes. 1/

Contact size	Maximum Diameter		Minimum Diameter	
22D, 23	M22759/9, /10, /20, /21	-22	M22759/11, /12, /22	-28
			M22759/18, /19, /32, /33, /44, /45, /46	-26
20	M22759/7, /8	-20	M22759/18, /19, /32, /33, /44, /45, /46	-22
			M22759/11, /12, /14, /15, /22, /23	-24
16	M22759/3, /4, /7, /8	-16	M22759/14, /18, /32, /44, /45	-16
12	M22759/7, /8	-12	M81381/7, /8, /11, /12	-12
8	M17/95-RG180	shielded	M17/176-00002	shielded

1/ High-strength 20-26 AWG wire is recommended for use on vibration samples.

4.4.2 Periodic qualification. The manufacturer shall forward a report every 24 months as required by the qualifying activity. The qualifying activity shall establish the initial reporting date. The report shall consist of:

a. A summary of the results of the tests performed for Group B inspection indicating as a minimum the number of lots that have passed and the number that have failed. The results of tests of all reworked lots shall be identified and accounted for.

b. A summary of the results of the tests performed as well as the original data sheets or direct images thereof for group C inspection including the number and mode of failures. At the discretion of the qualifying activity, untested samples may be required at no cost to the government If the summary of the test results indicates nonconformance with the specification requirements, and corrective action acceptable to the qualifying activity has not been taken, action may be taken to remove the failing product from the qualified products list.

c. Failure to submit the report within 30 days after the end of each reporting period may result in loss of qualification for the product In addition to the periodic submission of inspection data, the manufacturer shall inmediately notify the qualifying activity if at any time during the reporting period the inspection data indicate failure of the qualified product to meet the requirements of this specification.

d. 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 two consecutive reporting periods, there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit the products (a representative product of each device) to testing in accordance with the qualification inspection requirements.

4.4.2.1 Group C inspection (periodic tests). Periodic tests shall consist of Group C inspection. Samples submitted to periodic tests shall have passed Group A and B inspections. Except where the results of these inspections show non-compliance with the applicable requirements, delivery of products which have passed Group A and B inspections shall not be delayed pending the results of the verification inspections.

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

4 4.2.1.2 Disposition of sample units. Sample units which have been subjected to Group C inspection shall not be delivered on the contract or purchase order.

4.4.2.1.3 Noncompliance. If a sample fails to pass Group C inspection, the qualifying activity shall be notified prior to implementing corrective action. The manufacturer shall take corrective action on the materials or processes or both, as necessary, and on all units which are to be corrected and which were manufactured with essentially the same materials, processes, etc., and which are considered subject to the same failure. Any shipment of the product (related lots) shall be discontinued until corrective action acceptable to the Government 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 Government). Groups A and B inspections may be reinstated; however, final acceptance shall be withheld until the Group C reinspection has shown that corrective action was successful.

4.5 Quality conformance inspection. Quality conformance inspection applies to products intended for delivery and consists of Groups A and B inspection. The use of in-process controls is allowable only for those requirements that specify such.

4.5.1 Group A inspection. Group A inspection shall consist of the examinations and tests specified in Table X. The documentation requirements of MIL-STD-1344 do not apply.

TABLE X. Group A inspection.

Examination or test (100% inspection)	Requirement paragraph	Test paragraph
Visual examination (4.5.1.1)	3.1. thru 3.5, 3.41 and 3.42	4.6.1
Insulation resistance at ambient temperature 1/ 2/	3.12.1	4.6.7.1
Dielectric withstanding voltage at sea level 1/ 2/	3.13	4.6.8.1

1/ The manufacturer may use in-process controls for this requirement.
2/ Test between two adjacent contacts.

4.5.1.1 Visual examination. Each connector shall be visually examined for completeness, configuration, workmanship and identification requirements.

4.5.2 Group B inspection. Group B inspection shall consist of the examinations and tests specified in Table XI in the order shown and shall be made on sample units which have been subjected to and have passed the Group A inspection. For Group B inspection, the documentation and standard test condition of MIL-STD-1344 do not apply.

TABLE XI. Group B inspection.

Examination or test	Requirement paragraph	Test paragraph	AQL
Visual and mechanical examination 1/	3.1 thru 3.5, 3.41 and 3.42	4.6.1	
Major			0.25
Minor			1.0
Grounding member force 1/ 2/	3.26	4.6.21	

1/ The manufacturer may use in-process controls for this requirement.
2/ Test 5 pieces - no failures permitted.

4.5.2.1 Sampling plan (Group B inspection). The sampling plan shall be in accordance with MIL-STD-105 for special inspection S-4. Major and minor defects shall be as defined in MIL-STD-105 The sample size shall be based on the inspection lot size. The acceptable quality level (AQL) shall be as specified in Table XI

4 5.2.2 Lot definition (Group B inspection). The production lot definition of MIL-STD-790 is further defined as follows:

a. A production lot consists of all connectors covered under one military specification, manufactured from the specified raw materials, processed under the same specification and procedures, produced by the same type of equipment, and submitted for inspection at one time. Each production lot of assembled connectors shall be a group identified by a common manufacturing record through all significant assembly operations.

b Traceability of connectors to specific physical and chemical test reports of incoming raw materials is not required.

c. Common manufacturing records and traceability shall begin with the start of connector assembly.

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

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

4.6 Methods of inspection.

4 6 1 Examination of product (see 3 1 thru 3.5, 3.41 and 3.42). The connectors, accessories and piece parts shall be examined to insure conformance with the basic specification and the applicable specification sheets. In-process control of component parts, unrelated to lot size of furnished connectors may be utilized in lieu of examination of these components in the finished connectors to assure conformance of these component parts. 100% examination of each retention cavity for molding discrepancies, retention feature, and excessive adhesive, shall be a required in-process control for all removable contact connectors.

4.6.2 Maintenance aging (see 3.6). Connectors shall be tested in accordance with Method 2002 of MIL-STD-1344. The following details shall apply: Installing removal tool shall be in accordance with MIL-I-81969/8, MIL-I-81969/14 or MIL-I-81969/16, as specified. A minimum of 20 percent but not less than three contacts of each connector shall be tested.

4.6.3 Temperature cycling (see 3.8). Mated connectors with adapters shall be tested in accordance with Method 1003 of MIL-STD-1344. The temperature range shall be -65°C to +175° C. At the completion of the test cycle, the connectors shall be returned to room temperature for further inspection.

4.6 4 Coupling torque (see 3.9). Receptacles, plugs, dummy stowage receptacles and protective covers shall be engaged with and disengaged from counterpart connectors. The forces or torques which must be applied to the coupling rings in order to facilitate full coupling and uncoupling shall be measured and recorded The force or torque application shall be applied at a uniform rate. The color band shall not be visible at full mating.

4.6.5 Durability (see 3.10). Wired and assembled counterpart connectors shall be mated and unmated 1500 times at a maximum rate of 300 cycles per hour with the coupling rings operated in a manner to simulate actual service (plugs and receptacles shall be completely separated during each cycle).

4.6.6 Altitude immersion (see 3.11). Mated connectors shall be tested in accordance with Method 1004 of MIL-STD-1344. The following details shall apply:

a. All wire ends shall be located within the chamber and exposed to the chamber atmosphere but not submerged or sealed.

b At the end of the third cycle while the connectors are still submerged in the solution, the insulation resistance at ambient temperature shall be measured as specified in 4.6.7.1 and the dielectric withstanding voltage test shall be performed as specified in 4.6.8.1.

4.6.7 Insulation resistance.

4.6.7 1 Insulation resistance at ambient temperature (see 3.12.1). Unmated connectors shall be tested as specified in Method 3003 of MIL-STD-1344. The following details and exceptions apply:

a. For Group A testing, where it is undesirable to install actual contacts in connectors, simulated contacts and special techniques may be used in performing this test.

b. The tolerance on the applied voltage shall be +10 percent.

c. Connectors shall be mated when testing after altitude immersion, altitude-low temperature, and humidity.

4.6.7.2 Insulation resistance at elevated temperature (see 3.12.2). Unmated connectors shall be tested as specified in Method 3003 of MIL-STD-1344. The following details and exceptions shall apply:

a. The tolerance on the applied voltage shall be +10 percent.

b. Measurement shall be taken during the last 30 minutes of high temperature exposure (see 4.6.28).

c. Measurements shall be made while the connectors are still in the chamber at the specified temperature.

4.6 8 Dielectric withstanding voltage (see 3.13).

4 6.8.1 Dielectric withstanding voltage at sea level. Wired, unmated connectors shall be tested in accordance with Method 3001 of MIL-STD-1344. Connectors shall be mated when testing after altitude immersion, humidity and altitude low temperature. The following details and exceptions apply.

a. The magnitude of the test voltage shall be as specified in Table XII

b. Fifty percent of the contacts available shall be tested, but in no case shall less than six dielectric withstanding voltage readings be taken. If the number of contacts is three or less, all contacts shall be tested. The test voltage shall be applied between each wired contact and each adjacent contact and the shell.

c. The test voltage shall be maintained at the specified value for 2 seconds minimum.

d. For quality conformance, simulated contacts and special techniques may be used in performing this test.

TABLE XII. Test voltage, ac RMS, 60 Hz.

	Serv. Rating M 1/		Serv. Rating N 1/		Serv. Rating I 1/		Serv. Rating II 1/		Serv. Rating III 2/	
Altitude	Mated	Unmated	Mated	Unmated	Mated	Unmated	Mated	Unmated	Mated	Unmated
Sea level	1300	1300	1000	1000	1800	1800	2300	2300	1800	1500
50,000 feet	800	550	600	400	1000	600	1000	800	1000	700
70,000 feet	800	350	600	260	1000	400	1000	500	1000	375
100,000 feet	800	200	600	200	1000	200	1000	200	1000	200

1/ Service ratings M, N, I, and II apply to insert patterns defined in MIL-STD-1560.
2/ Service rating III applies to insert patterns defined in MS3425, MS3426 and MS3428 thru MS3433. Service rating III was previously designated as service rating I, in the above MS sheets.

4.6 8.2 Dielectric withstanding voltage at altitude. Mated connectors and unmated connector halves with pin contacts shall be tested in accordance with Method 3001 of MIL-STD-1344 with the following details and exceptions:

a. The magnitude of the test voltage shall be as specified in Table XII.

b. Fifty percent of the contacts available shall be tested, but in no case shall less than six dielectric withstanding voltage readings be taken. If the number of contacts is three or less, all contacts shall be tested. The test voltage shall be applied between each wired contact and each adjacent contact and the shell.

c. The test voltage shall be maintained at the specified value for 2 seconds minimum.

d. The leads of all test circuits shall be brought out through the walls of the chamber. There shall be no wire splices inside the chamber. The wire ends of all leads shall be unsealed.

e. Connectors shall be tested at each of the specified altitude pressure equivalents listed below.

Altitude	Equivalent pressure
50,000 feet	87 torr
70,000 feet	33 torr
100,000 feet	8 torr

4.6.9 Insert retention (see 3.14). Unmated connectors shall be tested in accordance with Method 2010 of MIL-STD-1344 with the following details and exceptions:

a. Force to be applied: 75 + 5 pounds per square inch (5.27 + .352 kilograms per square centimeter). An axial displacement rate of approximately 0.5 inches per minute (1.27 centimeters per minute) shall be used to obtain the specified pressure.

b. Connectors may be wired.

4.6.10 Salt spray (corrosion) (see 3.15).

4.6.10.1 Salt spray (2000 hours) (qualification only). The wired, assembled plugs and receptacles shall be mated and unmated 50 cycles at a rate of 300 cycles per hour maximum. The mating and unmating shall be accomplished so that the plug and receptacle are completely separated during each cycle The connectors shall then be subjected to the salt spray test in accordance with Method 1001 of MIL-STD-1344. The following details and exceptions apply:

a. The connectors shall be tested for 1952 hours mated followed by 48 hours unmated.

b. The connectors shall not be mounted but shall be suspended from the top of the chamber using waxed twine or string, glass rods or glass cord.

c. Wire ends must be protected to prevent salt migration

After the salt spray exposure, the remaining 1450 durability cycles as specified in 4.6.5 shall be completed.

4 6.10 2 Salt spray (acetic acid). The salt spray (acetic acid) test shall be performed in accordance with ASTM G85-85 method B287.

The exposure period shall be 500 hours and the connectors under test shall be in the mated condition.

4.6.11 Electrical engagement (see 3.16). Counterpart plugs and receptacles shall be wired so as to provide a complete series circuit through all contacts of the mated connector. A power source and indicator shall be provided such that the earliest point at which the circuit is completed, during normal connector mating, can be established. Connector halves shall be slowly mated by the normal mating means until first indication of a completed circuit is observed. Means shall be provided to assure that electrical contact is made between the pin and the spring of the socket contact, rather than the hood of the socket contact. The mating operation shall be held at this point and the overall connector length shall be measured from solid reference points on the connector halves. The mating operation shall then be continued until the connector halves are in the completely mated position. A second overall length measurement shall then be taken from the same reference points. The difference of these two measurements shall be no less than specified in 3.16.

4.6.12 External bending moment (see 3.17). The receptacle connector shall be mounted as in normal service to a rigid panel. Before mating the plug connector to the receptacle, an adapter or test torque arm shall be attached as shown on Figure 19. After mating the plug and receptacle connectors, the distance "L" from the point of load application "P" to the mounting panel shall be determined. The load to be applied at point "P" shall then be determined as the bending moment listed in Table XIII divided by the level arm "L." An axial displacement rate of approximately 0.5 inches per minute (1.27 centimeters per minute) shall be used to obtain the specified load. The applied load shall be held for 1 minute, then the load shall be released. Continuity of the contacts shall be monitored during the test. The test circuit used to monitor this shall be capable of detecting a discontinuity in excess of 1 microsecond. The connector shall be removed, unmated and inspected to 3X power magnification for damage detrimental to normal operation of the connector. For those tests not requiring indication of connector performance when tested with accessory, a similarly compatible dummy connector, duplicating mating features, may be used in place of an actual connector.

4.6.13 Gage location (see 3.18). Applicable test gages conforming to MS3434 and Figure 20 shall be installed in three randomly selected cavities in each connector with the accessory rear hardware removed. Connectors shall have contacts installed in the remaining cavities. An axial load of 2 pounds shall be applied to the engaging end of the gage and the location of the gage shall be measured in accordance with Figures 1, 2, 6, 7 and 9. The test shall be repeated on Series A connectors only using gage 20b to seat the pin assemblies forward in the contact cavity.

TABLE XIII. External bending moment.

Shell size	External bending moment	
	(Pound-inches)	(Newton-meters)
8-9	75	8.5
10-11	125	14.1
13	175	19.8
14-15	250	28.2
16-17	325	36.7
18-19	400	45.2
20-21	475	53.7
22-23	550	62.1
24-25	650	73 4

4.6.14 Gage retention (see 3.19). Test gages shall be installed in three randomly selected cavities of each connector with accessory rear hardware removed. Connectors shall have contacts installed in the remaining cavities. The axial load specified in Table XIV shall be applied to individual test gages in both directions. An axial displacement rate of 0.5 inches per minute (1.27 centimeters per minute) shall be used to obtain the specified load Gage displacement shall be measured with respect to the connector shell after an initial load of 2 pounds (0 907 kilograms) has been applied to assure that all slack has been taken up.

TABLE XIV. Contact retention.

Contact size	Axial Load +10 percent	
	Pounds	(Newtons)
22D-23	10	44
20	15	67
16	25	111
12	25	111
8	25	111

4.6.15 Contact retention (see 3.20). The contact retention shall be tested as specified in Method 2007 of MIL-STD-1344. The following details shall apply:

a. Number of samples - The test shall be performed on 20 percent of the contact complement, but not less than three contacts in each connector half.

b. Applied axial load - Preload to 3 pounds maximum (13.3 newtons). Apply load as specified in Table XIV, using an axial displacement rate of 0.5 inches per minute (1.27 centimeters per minute).

c. Special requirements - Where the test sequence requires maintenance aging prior to contact retention, the contacts which are subjected to maintenance aging shall also be selected for contact retention.

d. Axial direction - The applicable forces shall be applied along the longitudinal axis of individual contacts in the directions tending to displace the contacts to the rear and the front of the connector.

e. Only the contacts to be tested need be installed in the connector.

f. Use test probes per Figure 12

4.6.16 Altitude-low temperature (see 3.21). Wired, mated, assembled connectors shall be subjected to the test specified in Method 1011 of MIL-STD-1344. The following details apply:

a. No wire ends or splices inside the chamber.

b. Dielectric withstanding voltage test to be performed at 100,000 feet (30.5 kilometers) and -65°C in accordance with 4.6.8.2.

c. Insulation resistance test to be performed at 100,000 feet (30.5 kilometers) and -65°C in accordance with 4.6.7.1.

4.6.17 Vibration (qualification only) (see 3.22). Wired and mated connectors shall be subjected to the applicable test(s) specified. Connectors shall be mounted on the vibration table by normal means. All contacts shall carry a test current of 100 milliamperes maximum and shall be continuously monitored for discontinuities throughout the test. A detector capable of detecting any discontinuities in excess of 1 microsecond shall be used. All connectors shall be fixtured in accordance with Figure 13 during vibration.

4.6.17.1 Sine vibration. Connectors shall be subjected to a simple harmonic motion from 10 to 2,000 Hz in each of three mutually perpendicular axes. The level of vibration shall be velocity of 254 mm/sec from 10-50 Hz; 1.5 mm double amplitude from 50-140 Hz, and 60 G from 140-2,000 Hz. The entire frequency range from 10-2,000 Hz and back shall be traversed in 20 minutes. The vibration shall be applied for a duration of 12 hours in each of the three mutually perpendicular axes for a total of 36 hours at room ambience. All plugs shall have accessory backshells in accordance with 4.4.1.2.

4.6.17.2 Random vibration. Connectors shall be subjected to the test specified in Method 2005 of MIL-STD-1344. All plugs shall have accessory backshells in accordance with 4.4.1.2. The following details shall apply:

a. Test Condition V - Using the vibration envelope shown on Figure 14 (derived from zone 2, outlined in Aerospace Information Report, AIR 1557).

b. Vibration to be conducted at ambient temperature.

c. Duration shall be 8 hours in the longitudinal direction and 8 hours in a perpendicular direction for a total of 16 hours.

4.6 17.3 Random vibration. Connectors without accessory backshells shall be subjected to the test specified in method 2005 1 of MIL-STD-1344 The following details apply.

a. Test Condition VI - Letter "J".

b Duration shall be 8 hours in longitudinal direction and 8 hours in a perpendicular direction for a total of 16 hours.

c. Vibration shall be conducted at rated temperatures. Four hours in each axis shall be conducted at -65°C while the remaining 4 hours shall be conducted at +175°C. The item under test shall be stabilzed at temperature a minimum of 1 hour prior to vibration. A minimum time period of one half hour shall be provided between temperature extremes.

4.6.18 Shock (see 3.23). Wired and mated connectors shall be subjected to the applicable test specified. Connectors shall be mounted by normal means and held together by normal coupling means. All contacts shall be wired in a series circuit with 100 milliamperes maximum current through the series circuit during shock. Connectors shall be monitored for any discontinuities. A detector capable of detecting all discontinuities in excess of 1 microsecond shall be used.

4.6.18.1 Standard shock. Connectors shall be subjected to the test specified in Method 2004, Test Condition D, of MIL-STD-1344. The following details shall apply:

a. The wire bundle shall be clamped to fixed points at least 8 inches (203.2 mm) from the rear of the connector.

4.6.18.2 High-impact shock. Wired and mated connectors shall be subjected to the test specified in MIL-S-901, grade A, with the following modifications and additions. Mounting fixtures shall be in accordance with MIL-S-901, light weight. The wire bundle shall be supported on a stationary frame in such a manner to provide a free flexing length between the frame and fixture of not less than 36 inches (914.4 mm).

a. Test condition A. Plug shall be terminated with at least 80 percent of wired contacts.

4.6.19 Conductivity.

4.6.19.1 Shell-to-shell conductivity (see 3.24.1). Mated connectors shall be subjected to the test specified in Method 3007 of MIL-STD-1344

4.6.19.2 Elastomeric o-ring conductivity (see 3.24.2). The dc resistance of the elastomeric o-ring shall be measured at the test points specified in Figure 18. The applied potential shall be 1.5 volts dc and resistance shall be added to the circuit to limit the current to 0.100 + 0.010, -0.000 amperes.

4.6.19.3 Shield to shell conductivity (accessories only) (see 3.24 3). The complete assembly (connector receptacle, plug, backshell, and shield) shall be be subjected to the test specified in method 3007 of MIL-STD-1344 except the following details shall apply:

a. The test current shall be caused to flow through the shield, backshell, connector plug, and connector receptacle.

b. The resistance of the mated assembly shall be measured from a point on the shield 1.00+0.25,-0.00 inch from the rear of the plug's backshell to the mounting flange of the receptacle

c. The shield shall be in accordance with QQ-B-575 and shall be tin plated.

4.6.20 Humidity (see 3.25). Wired, mated connectors shall be subjected to the humidity test specified in Method 1002, Type II, of MIL-STD-1344. The following details and exceptions shall apply:

a. The mated connectors shall be mounted in a vertical position.

b. Step 7(a) shall be performed during the last cycle.

c. Three hours minimum after the start of step 7(a), during the final cycle and while the connectors are still subjected to high humidity, the insulation resistance shall be measured when the chamber temperature reaches 20°C +5°C and condensation is observed on the connector.

d. For qualification testing, insulation resistance readings shall be made on a minimum of 50 percent of the circuits. Outer circuits shall be measured to the connector shell.

4.6.21 Grounding member forces (see 3.26). Plugs shall be completely mated and unmated 10 times with counterpart receptacles less inserts. On the mating of the first cycle, the forces necessary to engage the connector shall be within the values specified in 3.26. On the unmating of the last cycle, the forces necessary to separate the connectors shall be within the values specified in 3.26. An axial load shall be applied at a displacement rate of 0.5 inches per minute (1.27 centimeters per minute) to engage/separate the plug with the grounding member of the counterpart mating receptacle.

4.6.22 EMI shielding effectiveness.

4.6.22.1 EMI shielding effectiveness (from 100 to 1000 MHz only) (see 3.27). The EMI shielding effectiveness of mated connectors with approved EMI backshells shall be measured in a triaxial radio frequency leakage fixture as shown on Figure 15 The EMI leakage from the conductor inside the connector in the same inner coaxial line into the outer coaxial line shall be measured at the frequencies specified in Table V within a frequency accuracy of +5%. The level of detected signal power shall be indicated by a tunable radio frequency field intensity meter isolated from the test circuit by a 3 to 10 db pad. Care shall be taken to ensure that the signal is a result of EMI leakage from within the mated connector and not due to a faulty termination inside the fixture. All terminations inside the fixture, whether to the EMI backshells or between internal conductors, shall have a leakage at least 10 db less than the test requirements. The signal source shall be set to the desired frequency The signal shall be fed through a 3 to 10 db isolation pad to a parallel circuit consisting of a coaxial switch, double pole double throw (DPDT), connected so that the signal can be manually or electronically fed alternately to the fixture and to a variable 100 db reference attenuator The attenuator shall be adjustable in 1 db steps and calibrated to $\pm$3 db.

a. The insert may be removed from the connectors under test or the contacts removed and a hole drilled through the insert to accommodate a center conductor of suitable geometry to provide a good 50-ohm impedance match with the inside diameter of the mated connector shells and EMI backshells. Tapered transition may be used to provide a means of changing diameters without introducing significant discontinuities in the line. The maximum VSWR in the inner coaxial line shall be 1.5. The outer shell of the test fixture shall be so constructed as to provide a good 50-ohm impedance match with the outside diameter of the mated connector shells, coupling ring, and EMI backshells. The maximum VSWR of the outer coaxial line shall be 1.5.

b. A sliding circumferential short shall be positioned behind the connector on the signal input end of the fixture to provide for tuning the outer coaxial line for maximum output at each test frequency. The allowable travel of this short shall be greater than 1/2 wave length at the lowest test frequency, 1.5 meters minimum for 100 MHz. The inner coaxial line shall be terminated in a fixed 50 ohm load impedance behind the connector at the output end of the fixture.

c. The connectors used to couple together the various elements of the test system shall be of a low-leakage type which have a nominal impedance of 50 ohms, a VSWR of less than 1.5, and a minimum leakage attenuation of 100 db. The output impedance of the signal source and the input impedance of the detector shall be nominally 50 ohms with a maximum VSWR of 1.5. The input and output VSWR of the standard attenuator shall be less than 1.5 in the 20 to 100 db range.

d. The relative signal level in the variable attenuator shall be equal to the signal level through the leakage fixture by adjusting the attenuator. The signal loss in the fixture can then be read from the setting on the variable attenuator.

4.6.22.2 EMI shielding effectiveness (from 1 to 10 GHz) (see 3.27). The EMI shielding effectiveness of mated connectors with EMI backshells shall be measured using the mode-stirred technique specified in Method 3008 of MIL-STD-1344. The test sample shall be prepared as specified in Method 3008 of MIL-STD-1344 with the following exceptions. The EMI backshells shall be terminated to the outer conductor of the semi-rigid coaxial line by way of an aluminum rap with an over-braid having a 90% minimum coverage. The aluminum rap and over-braid shall be terminated to the outer conductor of the semi-rigid coaxial line 3+0.25,-0.00 inches from the rear of the backshell.

4.6.23 Ozone exposure (see 3.28). The unmated connectors shall be subjected to ozone as specified in Method 1007 of MIL-STD-1344. At the end of the specified period, the samples shall be examined for signs of ozone deterioration as specified.

shown in Figure 11. A weight of 50% of the axial load specified in Table XIV for the applicable contact size shall be suspended freely from each steel core wire. A current of 100 + 10 milliamperes supplied from a 10.0 Vdc maximum power source shall be applied to the test contacts and an instrument shall be used to monitor the circuit for discontinuity in excess of one microsecond. The mated connectors, mounted as shown in Figure 11, shall then be subjected to the temperature of 175° +3°, -0°C for a period of 1000 continuous hours. The internal temperature shall be monitored at a contact closest to the center of the connector. After the connectors return to ambient temperature, they shall be unmated and the contact locations remeasured (see Figures 1, 2, 6, and 7) with 2 pounds (.907 kilograms) axial load applied to seat the contact back against the retention device. The tested contacts shall then be replaced with unwired contacts and sealing plugs, and those cavities shall be exempted from subsequent testing.

4.6.28.1 High temperature exposure (see 3.33.1). Mated connectors shall be subjected to an ambient temperature of 175 +3°, -0°C. The temperature shall be maintained for 1000 hours. Insulation resistance at elevated temperature (see 4.6.7.2) shall be measured in the last 30 minutes of high temperature exposure.

4.6.29 Electrolytic erosion (see 3.34). The wired receptacle half of the connector containing the pin contacts shall be firmly mounted in a vertical position, pins facing up. A salt-water solution (5 percent salt by weight) shall be poured onto the pin interface until the solution level just reaches the pin tips. The solution shall remain in the connector for a minimum of 30 seconds and then poured out, lightly shaking excesses from the connector. The counterpart plug shall immediately be mated with the receptacle. One cell pattern, with all contacts adjacent to a central contact at a positive polarity and the center contact at a negative polarity, shall be set up at a location giving the most uniform distribution of contacts adjacent to the center contact. A potential of 60 volts dc shall be applied between the contacts adjacent to the center contact. The contacts shall be energized for 40 hours. Following this, with the voltage disconnected, the connectors shall be unmated and the pin contacts removed. The contacts shall be examined using 10X magnification for erosion to base metal.

4 6.30 Ice resistance (see 3.35). Mated connectors shall be immersed in tap water for 1 minute and then placed in an ambience of -65°C for 1 hour. A minimum of three such cycles shall be performed until the connector surfaces are completely iced over. Immediately after removal from the last cycle, the frozen connectors shall be uncoupled and then recoupled. The connectors shall be uncoupled and recoupled a second time with the uncoupling and coupling torque measured in accordance with paragraph 4.6.4. The uncoupling and coupling torque shall not be measured on the first uncoupling and recoupling.

4.6.31 Dust (fine sand) (see 3.36). Mated connectors shall be subjected to the sand and dust test of Method 110 of MIL-STD-202.

4.6.32 Plating adhesion.

4.6.32.1 Plating adhesion (solder wire) (see 3.37.1). A 14 AWG or heavier multi-stranded copper wire shall be soldered to the shells in accordance with Figure 17. Sn60 solder conforming to QQ-S-571 shall be used. Prior to soldering, the area to be soldered shall be cleaned to remove any contamination. A soldering iron of 35

watts or less shall be used and the solder footprint on the part shall be about .25 inch in diameter. Heat shall not be applied to the part via the soldering iron for greater than 30 seconds. The part shall be mounted in a tensile testing machine and the wire pulled in the direction shown in Figure 17 until the plating or substrate separates or breaks. After failure, the connector shall be inspected to assure that failure resulted from plating or substrate separation or fracture If failure has ocurred due to any other cause, including, but not limited to, wire breakage, wire pull out from the solder, or solder separation from the plating, then another wire shall be soldered onto a new location and the pull test repeated. The force at separation or breakage shall be noted. Measure and determine the area of the piece pulled loose from the connector that is attached to the wire. Divide the force at separation or breakage by this area to determine the shear strength. Breakage of the substrate at a strength greater than that specified in 3.37.1 shall not be deemed a failure.

4.6.32.2 Plating adhesion (thermal shock) (see 3.37.2). Connector shells shall be subjected to the following adhesion test:

a. The shells shall be placed in an air circulating oven at 200°C for 30 minutes.

b. At the end of this period, they shall be removed from the oven and within 15 seconds immersed in ice water (approximately 0°C).

c. Examine the connector shells for any blistering, peeling or other separation of plating.

4.6.33 Impact (see 3.38). Connectors shall be tested as specified in Method 2015 of MIL-STD-1344. The following conditions shall apply:

a. Drop height shall be 6 feet (1.829M).

b. Number of drops shall be 10.

c. Plate shall be indexed at 36° intervals.

4.6.34 Magnetic permeability (see 3.3.3). Connectors shall be tested as specified in Method 3006 of MIL-STD-1344.

4.6.35 Accessory thread strength (see 3.39). The mated connector shall be mounted to a rigid panel as in normal service. A threaded accessory with a torque wrench attached shall be threaded to the accessory end of the plug and a torque applied at a rate of 10 inch-pounds per second until the specified torque is reached. The torque shall be held for one minute and released. The test shall then be repeated on the accessory end of the receptacle. For those tests not requiring indication of connector performance when tested with accessory, a similarly compatible dummy connector, duplicating mating features, may be used in place of an actual connector.

4.6.36 Hydrolytic stability (see 3.3.1.2).

4.6.36.1 Hydrolytic stability (for insert materials only). Certification of Requirement 47 of MIL-STD-454 is required

4 6.36.2 Hydrolytic stability (for shell materials only). Connector shells including coupling nuts and jam-nuts shall be subjected to the following water absorption tests:

4.6.36 2.1 Hydrolytic stability (initial qualification). The connectors shall be subjected to the test specified in ASTM D570-81 paragraph 7.4, Long-term immersion.

4.6.36.2.2 Hydrolytic stability (periodic qualification). The connectors shall be subjected to the test specified in ASTM D570-81 paragraph 7.5, 2-h Boiling water immersion.

4.6.37 Contact protection (see 3.7). The front edge of the shell of the plug connector shall be scooped within the front aperture made by the shell of the mating receptacle The front edge of both shells shall be in contact during this test

4.6.38 Thermal vacuum outgassing (class G only)(see 3.40). Connectors shall be subjected to the test specified in ASTM E595-84.

5. PACKAGING

5 1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-C-55330.

6. NOTES

6.1 Intended use. Connectors, contacts and associated hardware are intended for general military use as a system. Used as such, they are particularly suitable for light weight applications and corrosive environments where EMI shielding is required.

a. Connectors specified herein are not fully intermountable with those specified in MIL-C-81511 or MIL-C-38999. See detailed specification sheets to determine if these connectors will meet the desired mounting requirements.

b. Connectors specified herein are not intermateable with connectors from any other military specification, even though some of the internal components and subassemblies may be used by other connectors.

c. Connectors specified herein are not intended for use with accessory hardware configured with interfaces consisting of features constructed from a metal base material.

6 1.1 Restrictions of use.

a. Air Force - MIL-C-29600 Series B are not for use.

b. Army - MIL-C-29600 Series B are not for use

c. Navy - Connectors specified herein are not for shipboard jacketed cable applications.

WARNING: MIL-C-29600 Series A Connectors are not intended for mating with MIL-C-29600 Series B Connectors. Doing so may result in damage to the contacts or the inserts of the connectors. It is specifically critical with shell sizes 10 and 11 when size 20 contacts are used and with shell size 20 and 21 when size 12 contacts are used. These connectors shall not be located next to each other in any application unless the shell keying has been selected to guarantee that the shells will never allow the mating process to begin. However, series A and B connectors are interchangeable.

6.2 Ordering data. Procurement documents should specify:

a. Title, number and date of this specification.

b. Complete part number (see 3.42).

c. Whether contacts, sealing plugs and tools are included.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in applicable qualified products list (QPL) whether or not such products have actually been so listed by that date. The attention of the manufacturers is called to this requirement, and they are urged to arrange to have 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.

a. The activity responsible for the QPL is the Naval Air Systems Command. The Naval Avionics Center, Indianapolis, IN, has been designated by the Naval Air Systems Command as agent for establishment of the QPL. Requests for information pertaining to and applications for qualification should be addressed to:

Commanding Officer
Naval Avionics Center
6000 East 21st Street
Indianapolis, IN 46219-2189
Attn: Code B/444
Telephone: (317) 353-3274
AV 369-3274

6.4 Indirect shipments. The preservation, packaging, packing and marking specified in Section 5 apply only to direct purchase by or direct shipment to the Government and are not intended to apply to contracts between the supplier and prime contractor.

6.5 Subject term (key word) listing.

Accessories

Backshells

Composite

Connectors

Contacts

Pin

Plug

Receptacle

Socket

Threaded coupling

6.6 Patents. There are no patents pending on MIL-C-29600 designs.

Custodians:
Army - CR
Navy - AS
Air Force - 85

Review activities:
Army - AV
Navy - EC
Air Force - 15
DLA - ES
NASA - NA

Users:
Army - MI
Navy - SH, MC
Air Force - 15

Preparing activity:
Navy - AS
Project No. 5935-3701

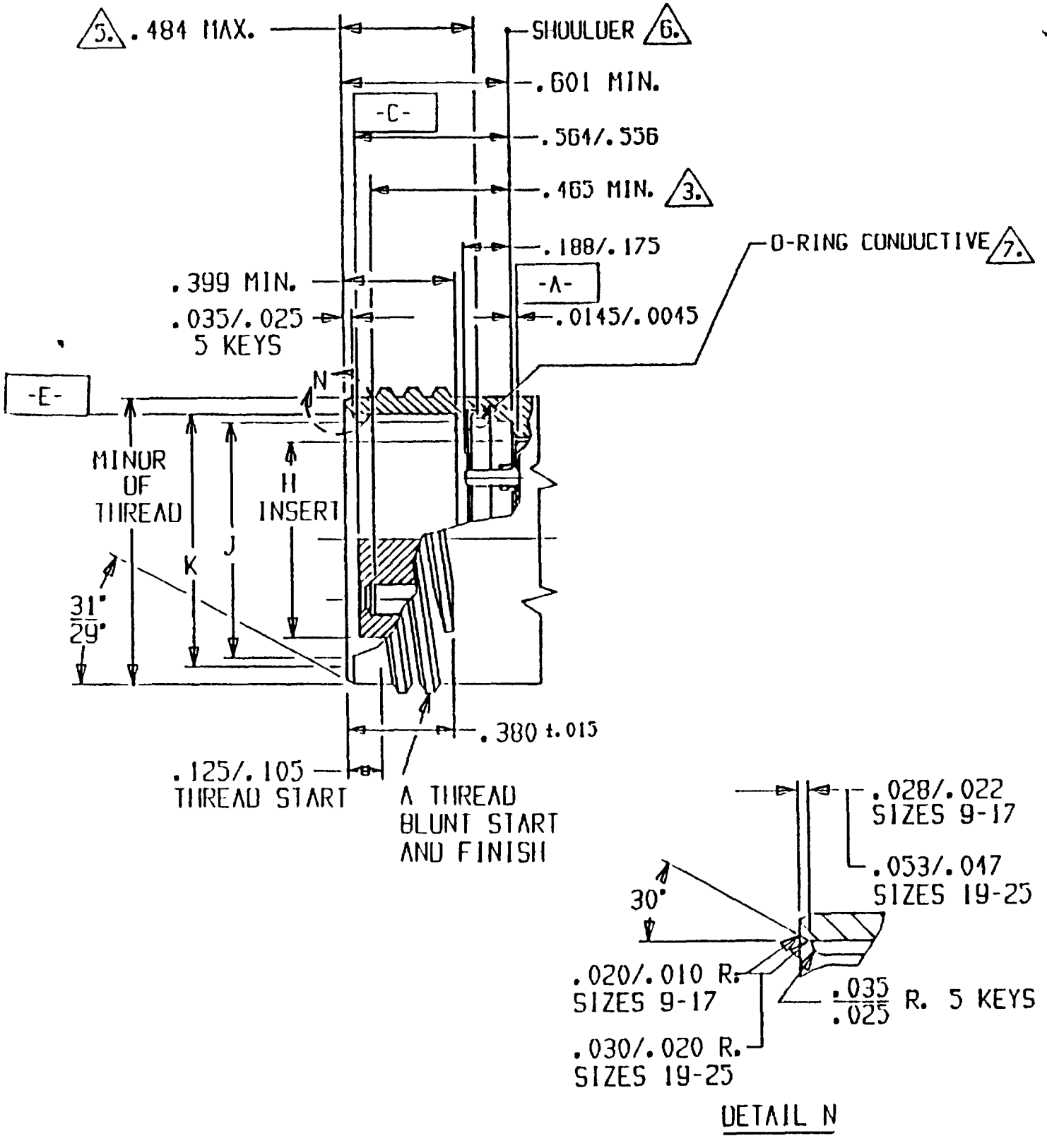


Figure 1. Connector, receptacle intermateability dimensions (Series A).

Shell Size	A Thread Mod Stub 60° .1P-.3L Class 2A				H Ø ±.005	J Ø ±.0025	K Ø ±.0045
	Thread	Major Ø	Pitch Ø	Minor Ø			
9	.6250	.6235 .6155	.5975 .5895	.5675 .5535	.285	.4080	.4745
11	.7500	.7485 .7405	.7225 .7145	.6925 .6785	.413	.5330	.5995
13	.8750	.8735 .8655	.8475 .8395	.8175 .8035	.527	.6580	.7245
15	1.0000	.9985 .9905	.9725 .9645	.9425 .9285	.652	.7830	.8495
17	1.1875	1.1855 1.1735	1.1515 1.1415	1.1135 1.0955	.777	.9090	.9755
19	1.3750	1.3730 1.3610	1.3390 1.3290	1.3010 1.2830	.866	1.0330	1.0995
21	1.5000	1.4980 1.4860	1.4640 1.4540	1.4260 1.4080	.991	1.1580	1.2245
23	1.6250	1.6230 1.6110	1.5890 1.5790	1.5510 1.5330	1.116	1.2820	1.3495
25	1.6875	1.6855 1.6735	1.6515 1.6415	1.6135 1.5955	1.241	1.4080	1.4745

Notes

1. Dimensions are in inches unless otherwise specified.
2. Mating key positions and dimensions are shown in figure 3.
3. Distance from face of insert to the point at which a gage pin, having the same basic diameter as the mating pin and a square face, first enagages the socket contact (see figure 4).
4. Rear end connector design for attachment of accessory hardware is shown in figure 5.
5. Grounding member to plug shell first contact.
6. Shoulder is point of contact to tip of plug shell at full mating.
7. Conductive o-ring material is silver filled silicone/fluorosilicone blend and meets the dimensional requirements of MS9068 or MS9021.

Figure 1. Connector, receptacle intermateability dimensions (Series A) (continued)

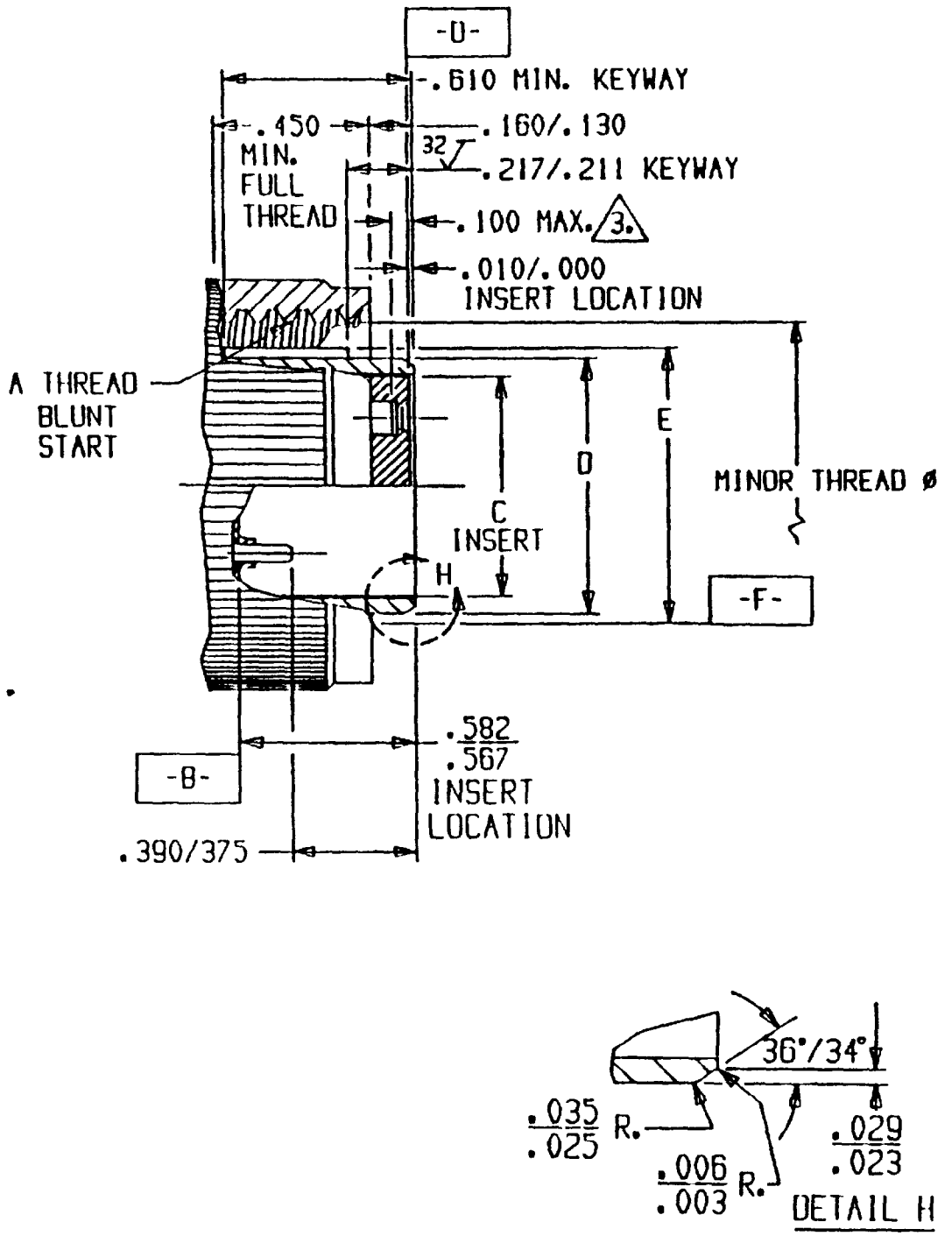


Figure 2. Connector, plug intermateability dimensions (Series A).

Shell Size	A Thread Mod Stub 60° .1P-.3L Class 2B				C ⌀ ±.005	D ⌀ ±.003	E ⌀ ±.003
	Thread	Minor ⌀	Pitch ⌀	Major ⌀			
9	.6250	.5892 .5792	.6090 .5990	.6450 .6290	.285	.385	.454
11	.7500	.7142 .7042	.7340 .7240	.7700 .7540	.413	.510	.579
13	.8750	.8392 .8292	.8590 .8490	.8950 .8790	.527	.635	.704
15	1.0000	.9642 .9542	.9840 .9740	1.0200 1.0040	.652	.760	.829
17	1.1875	1.1394 1.1274	1.1655 1.1535	1.2115 1.1915	.777	.886	.955
19	1.3750	1.3270 1.3150	1.3530 1.3410	1.3990 1.3790	.866	1.010	1.079
21	1.5000	1.4520 1.4400	1.4780 1.4660	1.5240 1.5040	.991	1.135	1.204
23	1.6250	1.5770 1.5650	1.6030 1.5910	1.6490 1.6290	1.116	1.259	1.329
25	1.6875	1.6395 1.6275	1.6655 1.6535	1.7115 1.6915	1.241	1.385	1.454

Notes:

1. Dimensions are in inches unless otherwise specified
2. Mating key positions and dimensions are shown in figure 3
3. Distance from face of insert to the point at which a gage pin, having the same basic diameter as the mating pin and a square face, first enagages the socket contact (see figure 4).
4. Rear end connector design for attachment of accessory hardware is shown in figure 5.

Figure 2 Connector, plug intermateability dimensions (Series A) (continued)

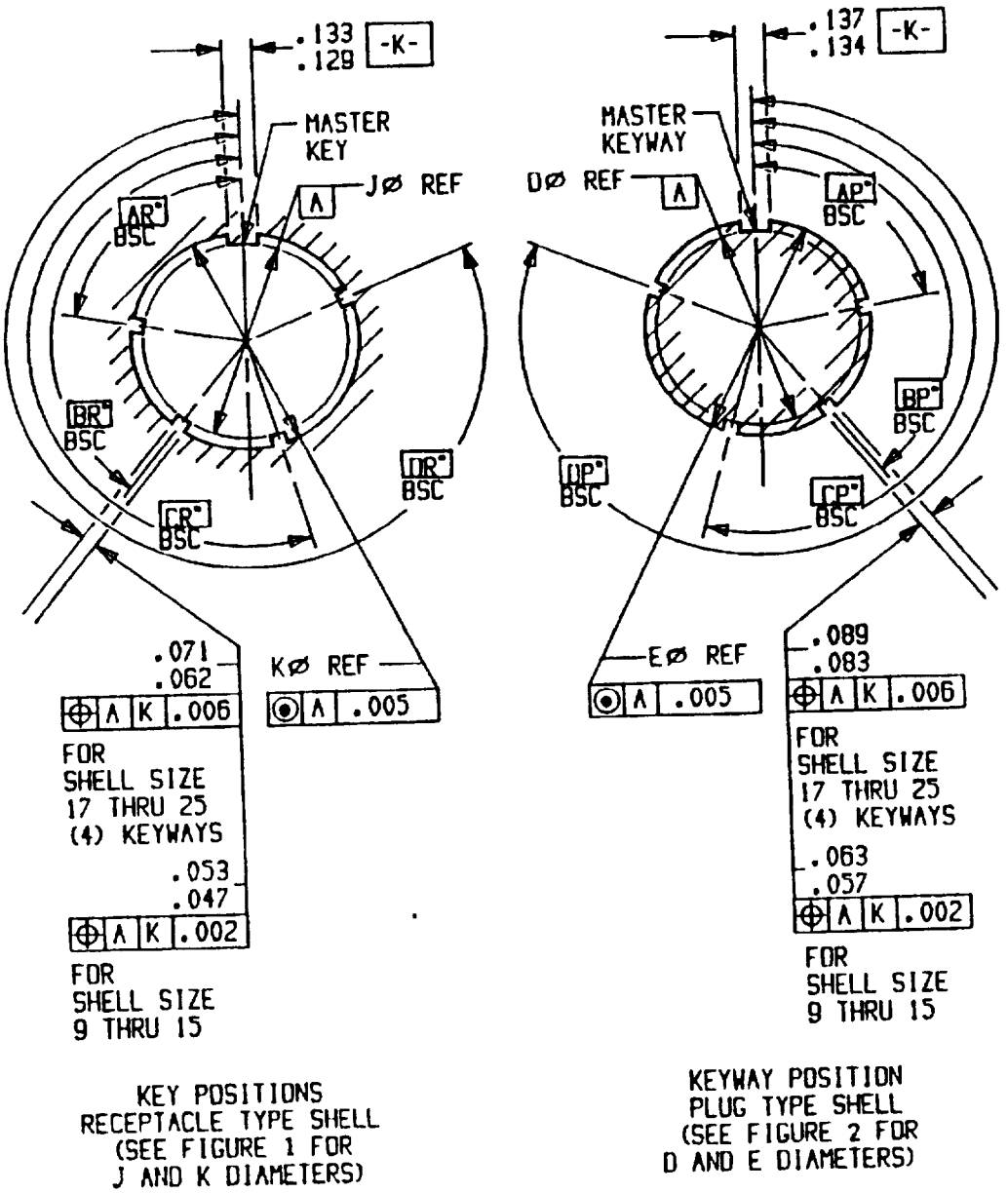
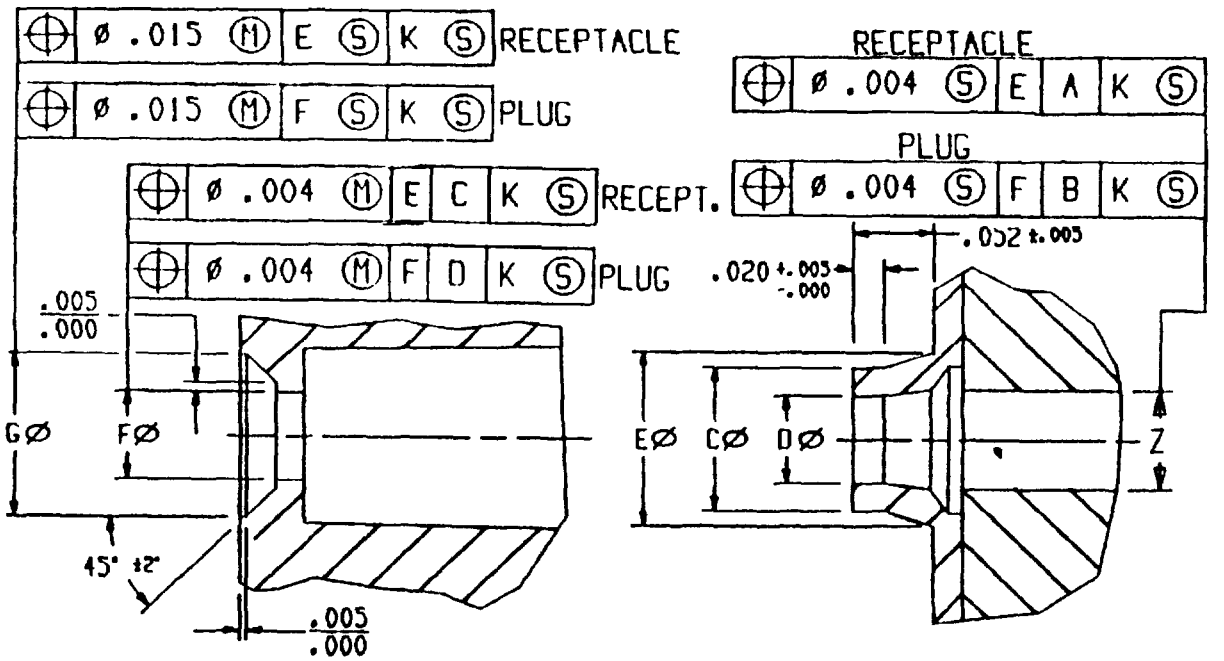


Figure 3 Connector master key/keyway polarization (Series A).

Shell Size	Key & Keyway Arrangement	AR° or AP° BSC	BR° or BP° BSC	CR° or CP° BSC	DR° or DP° BSC
9	1	102	132	248	320
	2	80	118	230	312
	3	105	140	215	265
11 thru 15	1	113	156	182	292
	2	90	145	195	252
	3	95	141	208	236
17 thru 25	1	135	170	200	310
	2	49	169	200	244
	3	80	142	196	293

Notes: 1. Dimensions are in inches unless otherwise specified.

Figure 3 Connector master key/keyway polarization (Series A) (continued).



Contact Size	Detail A		Detail B		
	F Ø	G Ø	E Ø	C Ø	D Ø MAX
22D	.038 .035	.067 .063	.074 .069	.053 .050	.028
20	.052 .049	.089 .085	.096 .091	.075 .072	.038
16	.074 .071	.112 .108	.119 .114	.098 .095	.060
12	.106 .103	.144 .140	.151 .146	.130 .127	.092
8	.230 .277	.268 .264	.278 .273	.256 .251	.216

Notes:
1. Dimensions are in inches unless otherwise specified.
2. Datums A, C, and E are from figure 1
3. Datums B, D, and F are from figure 2.
4. Datum K is from figure 3.

Figure 4. Connector interfacial seal configuration (Series A)

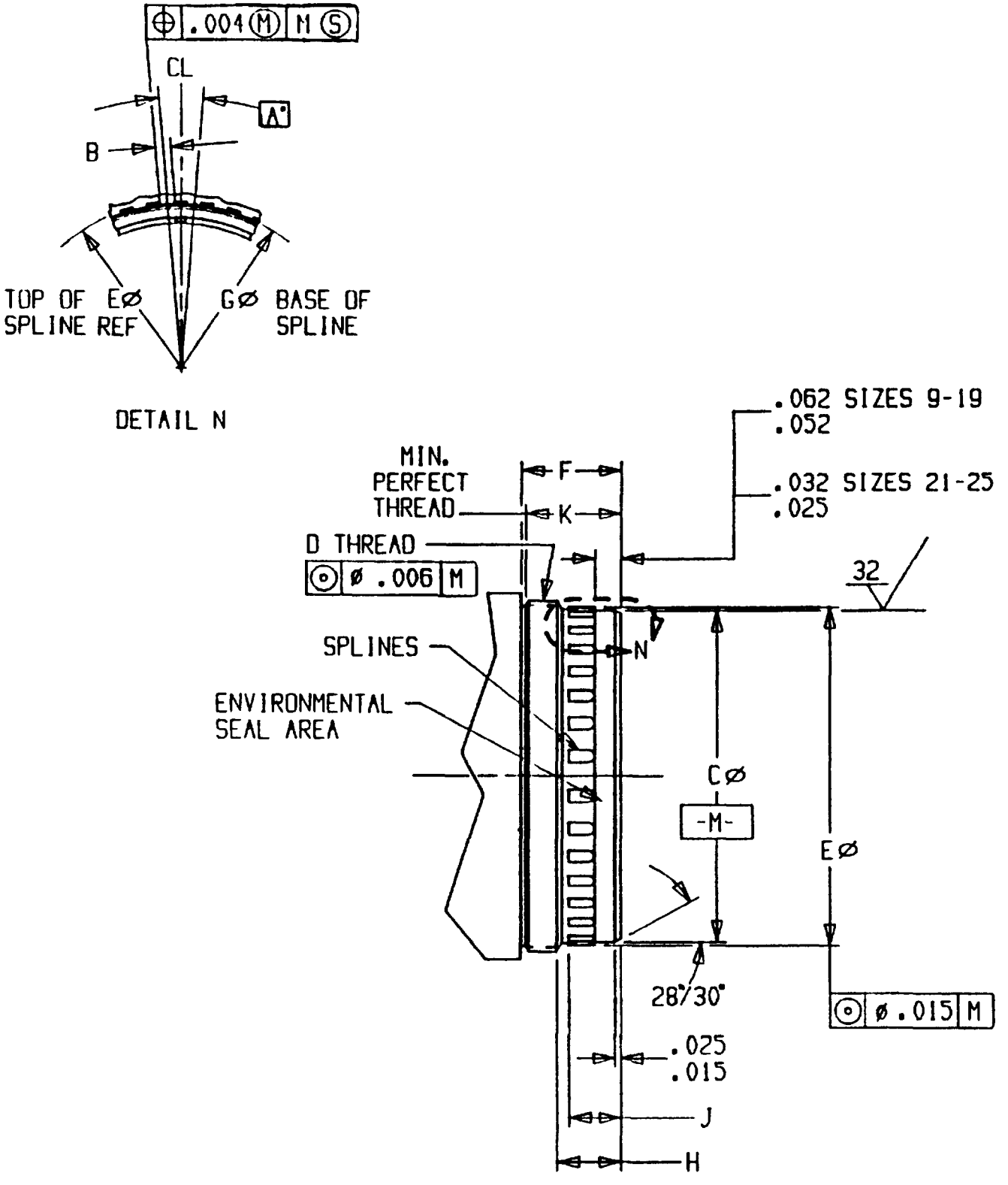


Figure 5. Connector accessory interface dimensions (Series A).

Shell Size	A° Bsc	B	C ø	D Thread	E ø	F Min	G ø	H	J Min	K Min
9	20	.051	.430	.500-28UNEF-2A	.461		.439			
		.046	.424		.455		.433			
11	15	.049	.555	.625-28UN-2A	.586		.564			
		.044	.549		.580		.558			
13	12	.048	.676	.750-28UN-2A	.707		.685			
		.043	.670		.701		.679			
15	12	.054	.805	.875-28UN-2A	.836	.257	.814	.157	.107	.237
		.049	.799		.830		.808	.127		
17	10	.053	.930	1.000-28UN-2A	.961		.939			
		.048	.924		.955		.933			
19	9	.053	1.055	1.125-28UN-2A	1.086		1.064			
		.048	1.049		1.080		1.058			
21	9	.059	1.180	1.250-28UN-2A	1.211		1.189			
		.054	1.174		1.205		1.183			
23	9	.062	1.305	1.375-28UN-2A	1.336	.276	1.314	.158	.108	.263
		.057	1.299		1.330		1.308	.128		
25	9	.069	1.430	1.500-28UN-2A	1.461		1.439			
		.064	1.424		1.455		1.433			

Notes. 1 Dimensions are in inches unless otherwise specified.
2. Dimensions apply after plating.

Figure 5 Connector accessory interface dimensions (Series A) (continued).

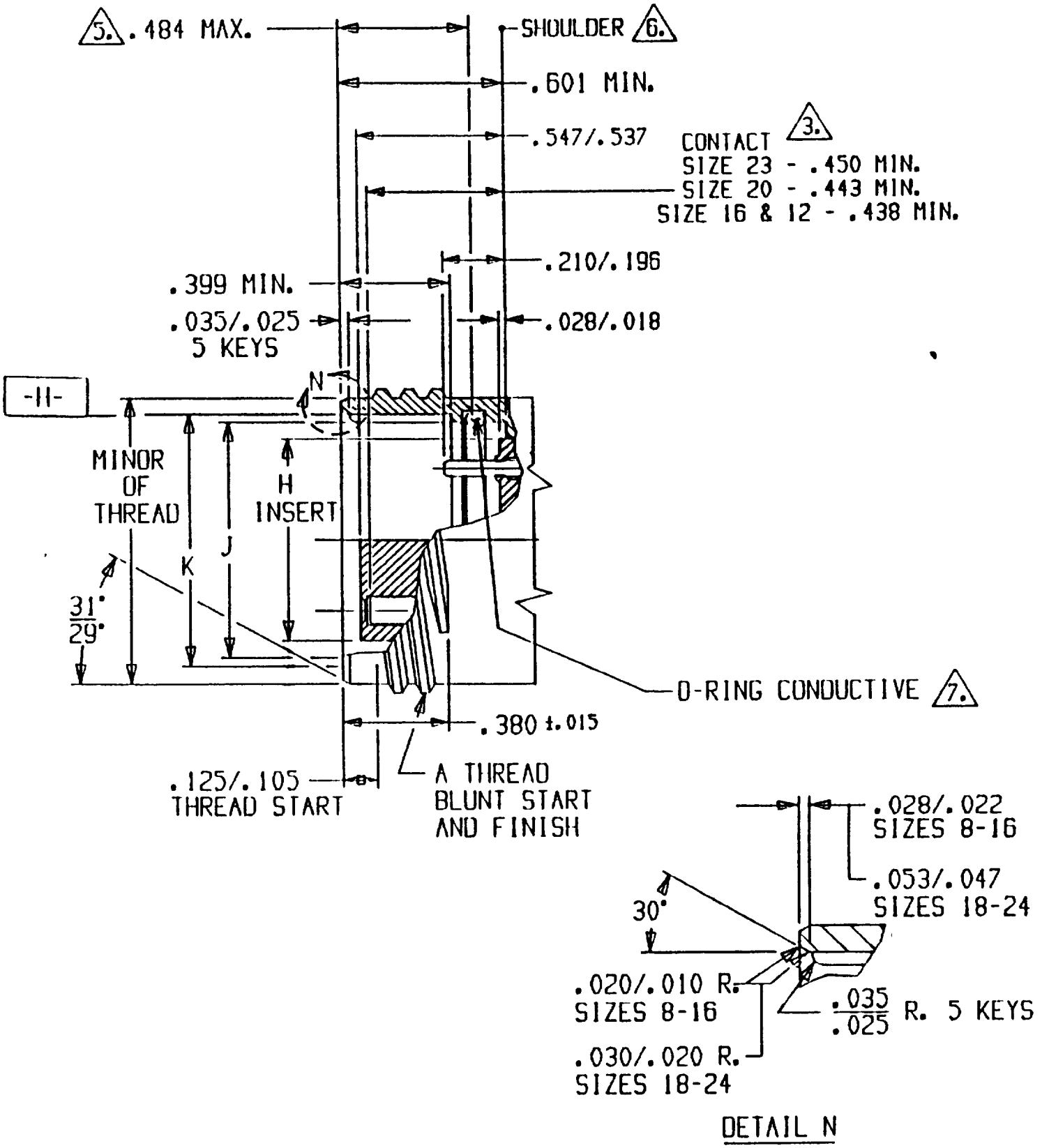


Figure 6. Connector, receptacle intermateability dimensions (Series B)

Shell Size	A Thread Mod Stub 60° .1P-.3L Class 2A				H ø ±.005	J ø ±.0025	K ø ±.0045
	Thread	Major ø	Pitch ø	Minor ø			
8	.6250	.6235 .6155	.5975 .5895	.5675 .5535	.285	.4080	.4745
10	.7500	.7485 .7405	.7225 .7145	.6925 .6785	.410	.5330	.5995
14	1.0000	.9985 .9905	.9725 .9645	.9425 .9285	.660	.7830	.8495
16	1.1875	1.1855 1.1735	1.1515 1.1415	1.1135 1.0955	.786	.9090	.9755
18	1.3750	1.3730 1.3610	1.3390 1.3290	1.3010 1.2830	.911	1.0330	1.0995
20	1.5000	1.4980 1.4860	1.4640 1.4540	1.4260 1.4080	1.036	1.1580	1.2245
22	1.6250	1.6230 1.6110	1.5890 1.5790	1.5510 1.5330	1.161	1.2820	1.3495
24	1.6875	1.6855 1.6735	1.6515 1.6415	1.6135 1.5955	1.286	1.4080	1.4745

Notes.

1. Dimensions are in inches unless otherwise specified.
2. Mating key positions and dimensions are shown in figure 8.
3. Distance from face of insert to the point at which a gage pin, having the same basic diameter as the mating pin and a square face, first engages the socket contact (see figure 9).
4. Rear end connector design for attachment of accessory hardware as shown in figure 10.
5. Grounding member to plug shell first contact.
6. Shoulder is point of contact to tip of plug shell at full mating.
7. Conductive o-ring material is silver filled silicone/fluorosilicone blend and meets the dimensional requirements of MS9068.

Figure 6. Connector, receptacle intermateability dimensions (Series B) (continued).

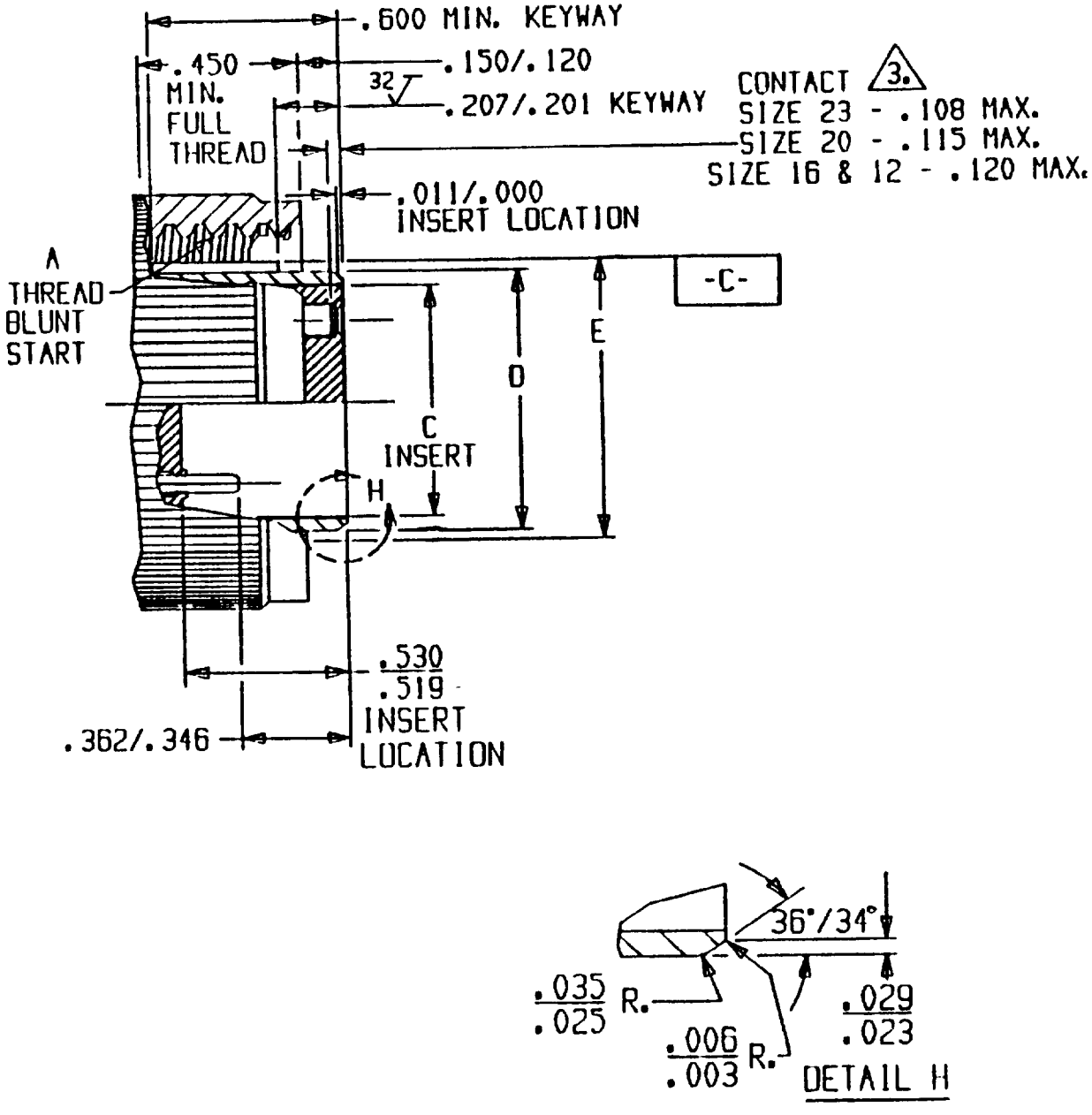


Figure 7. Connector, plug intermateability dimensions (Series B).

Shell Size	A Thread Mod Stub 60° .1P-.3L Class 2B				C Ø ±.005	D Ø ±.003	E Ø ±.003
	Thread	Minor Ø	Pitch Ø	Major Ø			
8	.6250	.5892 .5792	.6090 .5990	.6450 .6290	.285	.385	.454
10	.7500	.7142 .7042	.7340 .7240	.7700 .7540	.410	.510	.579
14	1.0000	.9642 .9542	.9840 .9740	1.0200 1.0040	.660	.760	.829
16	1.1875	1.1394 1.1274	1.1655 1.1535	1.2115 1.1915	.786	.886	.955
18	1.3750	1.3270 1.3150	1.3530 1.3410	1.3990 1.3790	.911	1.010	1.079
20	1.5000	1.4520 1.4400	1.4780 1.4660	1.5240 1.5040	1.036	1.135	1.204
22	1.6250	1.5770 1.5650	1.6030 1.5910	1.6490 1.6290	1.161	1.259	1.329
24	1.6875	1.6395 1.6275	1.6655 1.6535	1.7115 1.6915	1.286	1.385	1.454

Notes:

1. Dimensions are in inches unless otherwise specified
2. Mating key positions and dimensions are shown in figure 8
3. Distance from face of insert to the point at which a gage pin, having the same basic diameter as the mating pin and a square face, first engages the socket contact (see figure 9).
4. Rear end connector design for attachment of accessory hardware as shown in figure 10

Figure 7. Connector, plug intermateability dimensions (Series B) (continued)

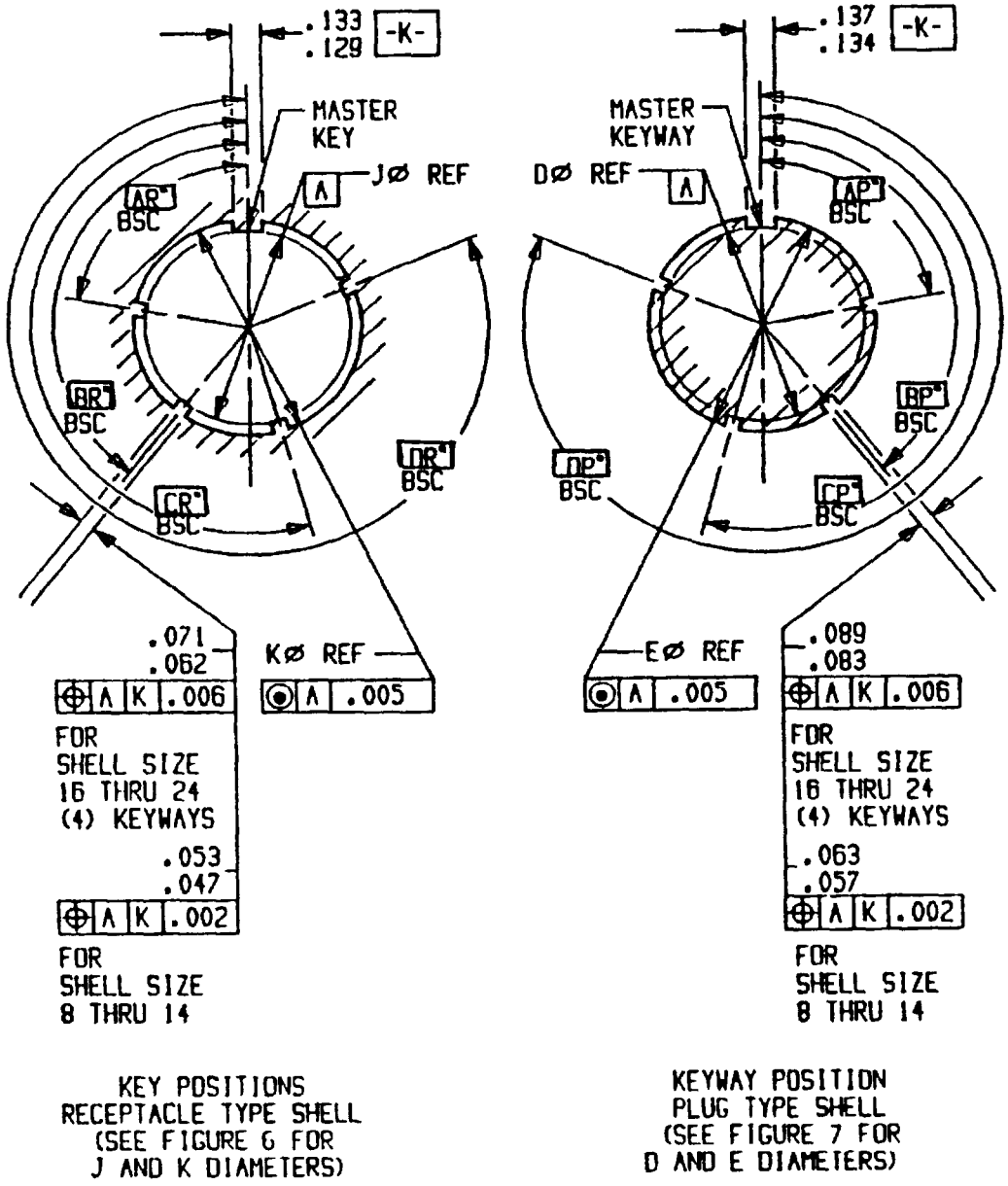


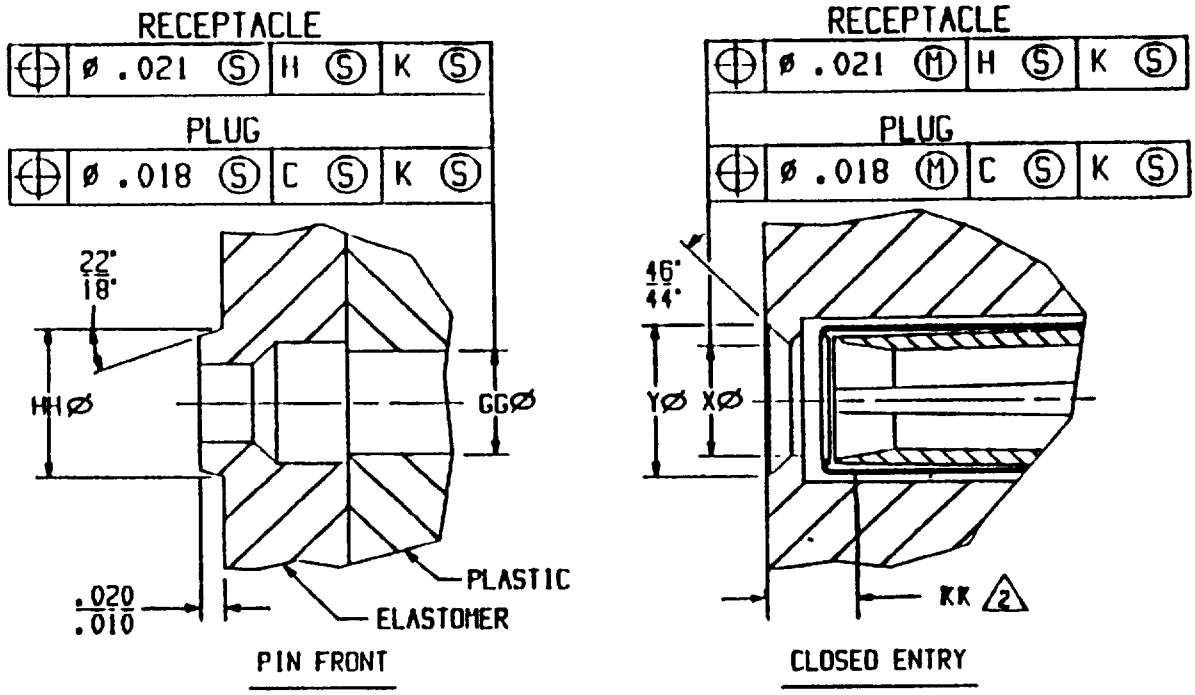
Figure 8. Connector master key/keyway polarization (Series B).

Shell Size	Key & Keyway Arrangement	AR° or AP° BSC	BR° or BP° BSC	CR° or CP° BSC	DR° or DP° BSC
8	1	105	140	215	265
	2	102	132	248	320
	3	80	118	230	312
10 and 14	1	95	141	208	236
	2	113	156	182	292
	3	90	145	195	252
16 thru 24	1	80	142	196	293
	2	135	170	200	310
	3	49	169	200	244

Notes:

1 Dimensions are in inches unless otherwise specified.

Figure 8 Connector master key/keyway polarization (Series B) (continued).



Contact Size	X ø	Y ø	GG ø	HH ø	KK MAX
23-22	.032 .035	.065 .075	.0280 .0300	.062 .068	.083
20	.050 .053	.080 .085	.0415 .0445	.077 .083	.090
16	.074 .077	.103 .108	.0950 .0990	.100 .106	.105
12	.126 .130	.166 .170	.1540 .1580	.163 .169	.105

Notes:

1. Dimensions are in inches unless otherwise specified.
2. Distance from face of insert to the point at which a gage pin, having the same basic diameter as the mating pin and a square face, first engages the socket contact
3. Datum H is from figure 6.
4. Datum C is from figure 7.
5. Datum K is from figure 8.

Figure 9. Connector interfacial seal configuration (Series B).

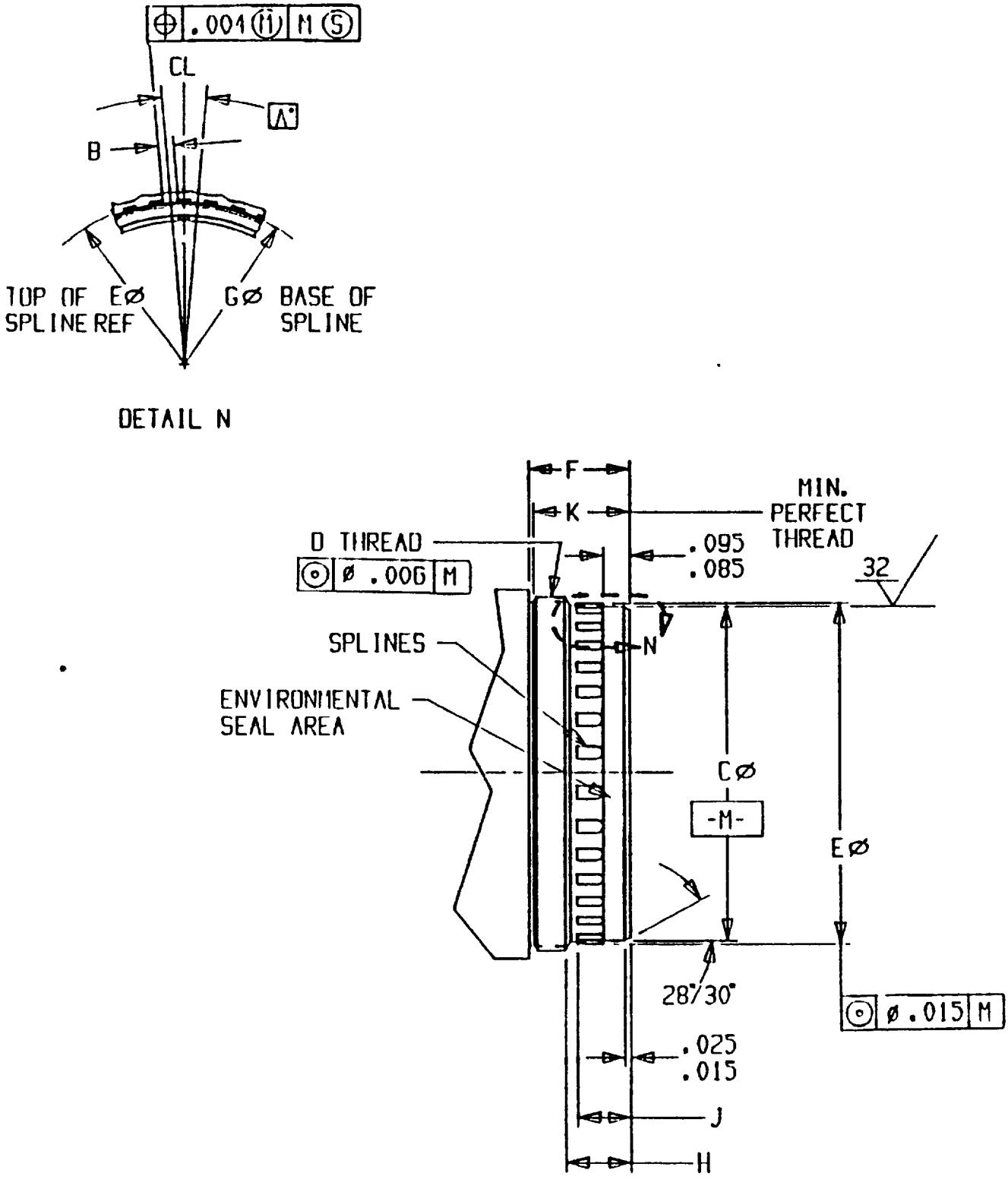


Figure 10. Connector accessory interface dimensions (Series B)

Shell Size	A° Psc	B	C	D Thread	E ø	F Min	G ø	H	J Min	K Min
8	20	.051	.430	.500-28UNEF-2A	.461		.439			
		.046	.424		.455		.433			
10	15	.049	.555	.625-28UN-2A	.586		.564			
		.044	.549		.580		.558			
14	12	.054	.805	.875-28UN-2A	.836	.300	.814	.190	.140	.270
		.049	.799		.830		.808	.160		
16	10	.053	.930	1.000-28UN-2A	.961		.939			
		.048	.924		.955		.933			
18	9	.053	1.055	1.125-28UN-2A	1.086		1.064			
		.048	1.049		1.080		1.058			
20	9	.059	1.180	1.250-28UN-2A	1.211		1.189			
		.054	1.174		1.205		1.183			
22	9	.062	1.305	1.375-28UN-2A	1.336	.338	1.314	.220	.170	.325
		.057	1.299		1.330		1.308	.190		
24	9	.069	1.430	1.500-28UN-2A	1.461		1.439			
		.064	1.424		1.455		1.433			

Notes:

1. Dimensions are in inches unless otherwise specified.
2. Dimensions apply after plating

Figure 10. Connector accessory interface dimensions (Series B) (continued).

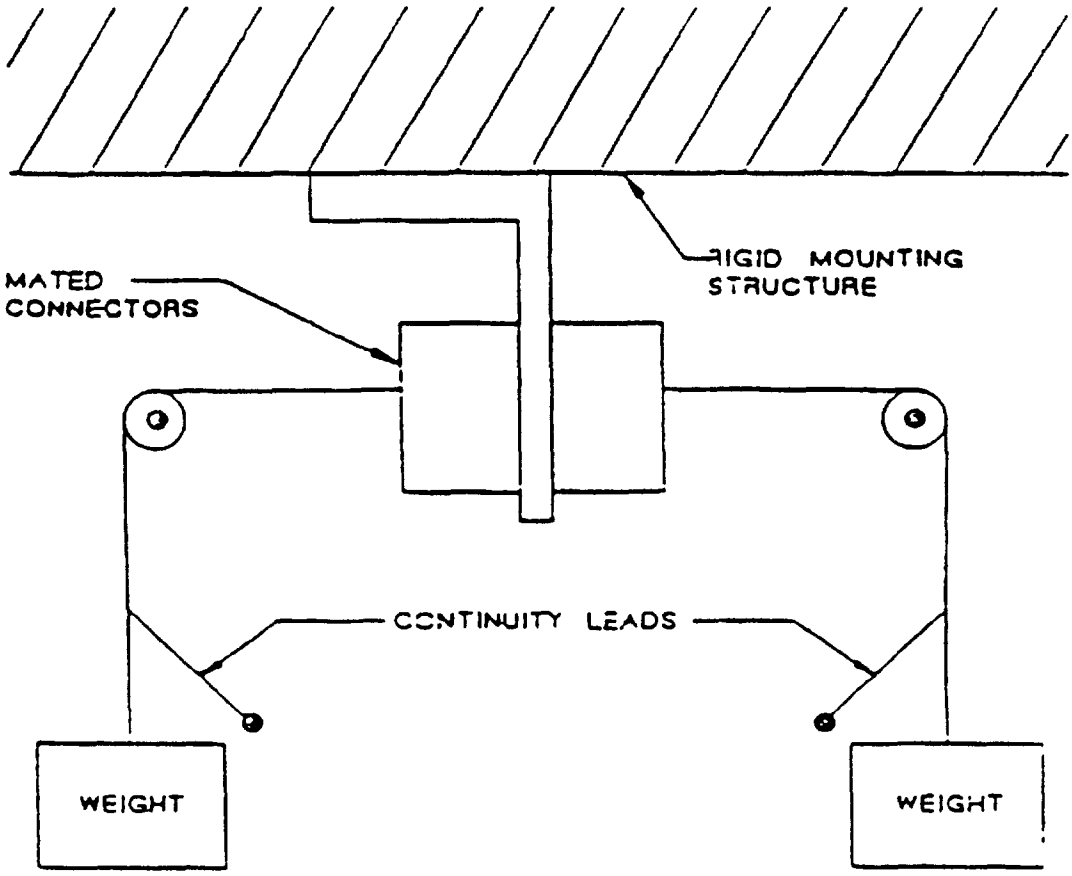
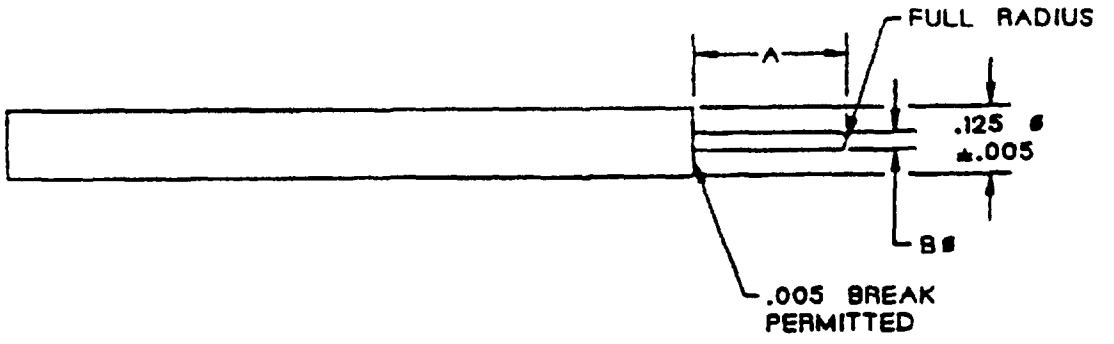
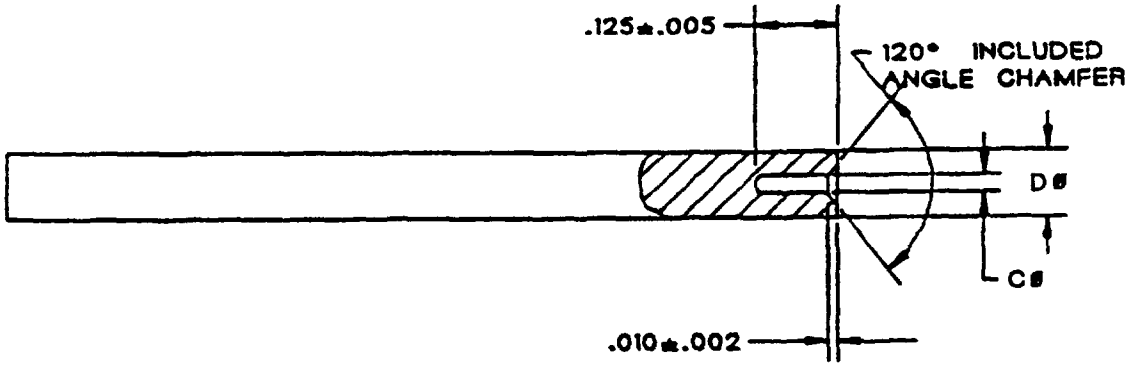


Figure 11 Temperature life with contact retention



SOCKET CONTACT



PIN CONTACT

Contact Size	A +/- .010	B +/- .001	C +/- .001	D +/- .005
23	.300	.026	.029	.125
22D	.300	.026	.032	.125
20	.410	.039	.043	.125
16	.410	.061	.065	.125
12	.410	.093	.097	.156
8	.410	.217	.220	.250

Notes.

1. Dimensions are in inches unless otherwise specified

Figure 12. Contact retention probes.

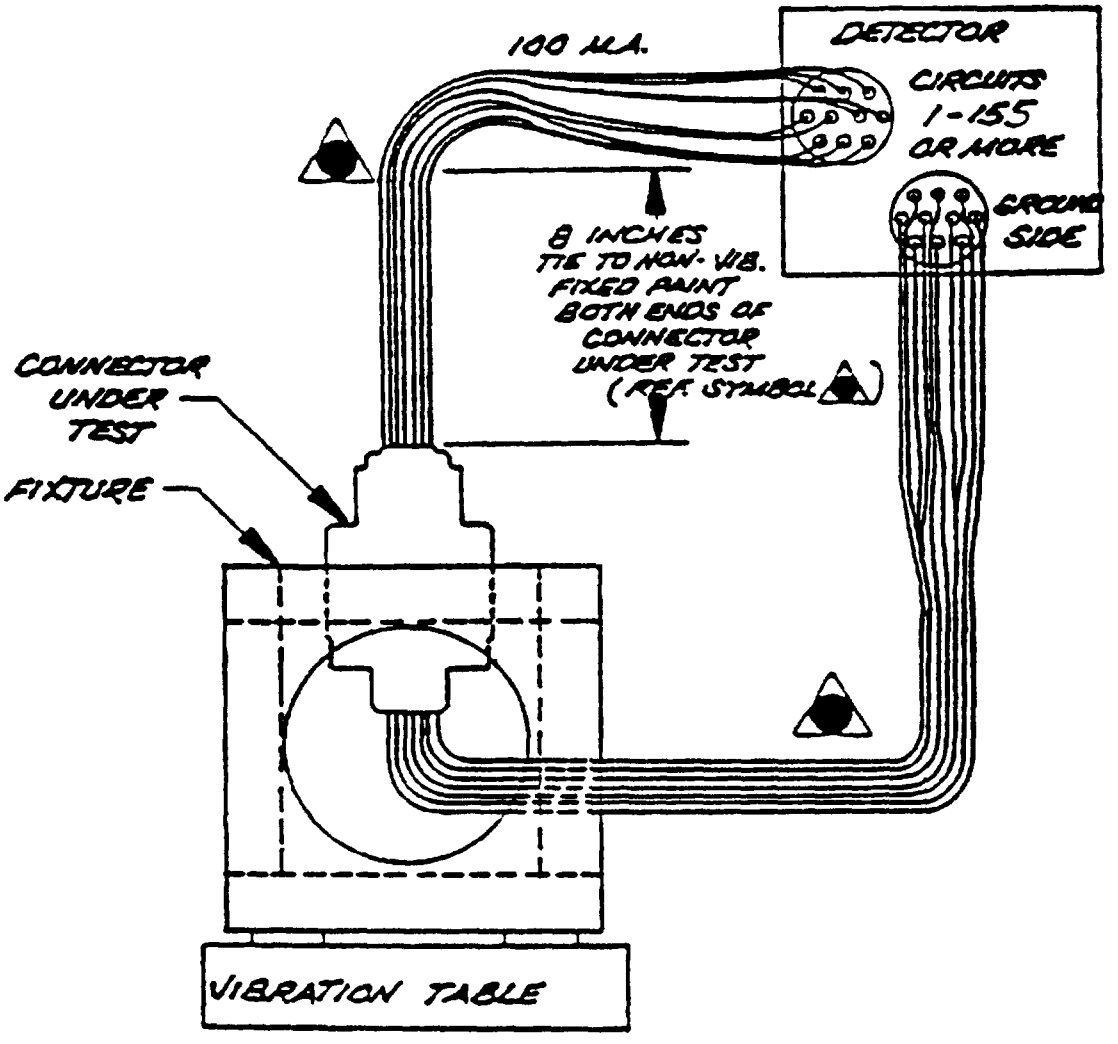


Figure 13. Vibration mounting and discontinuity set-up.

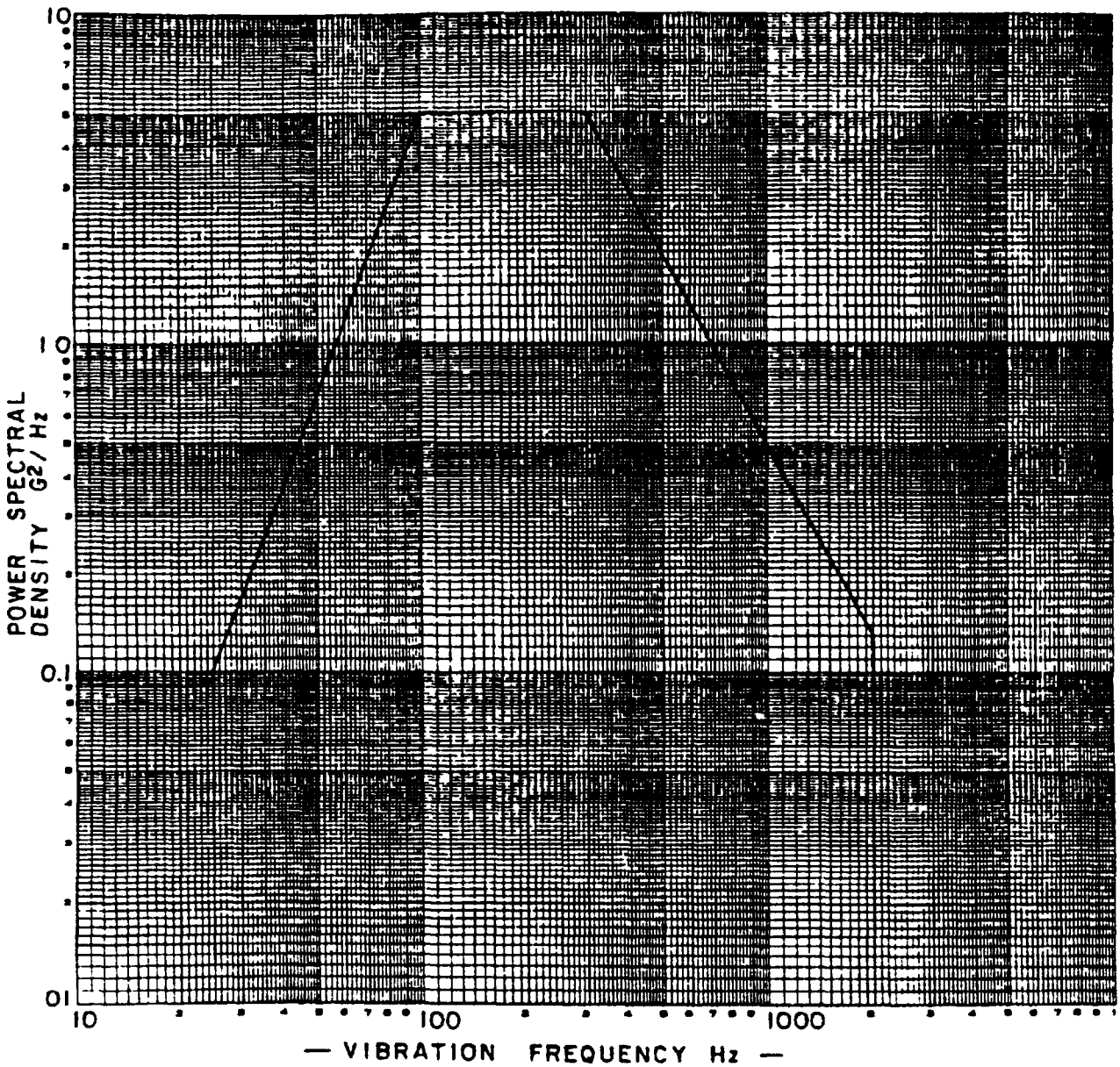
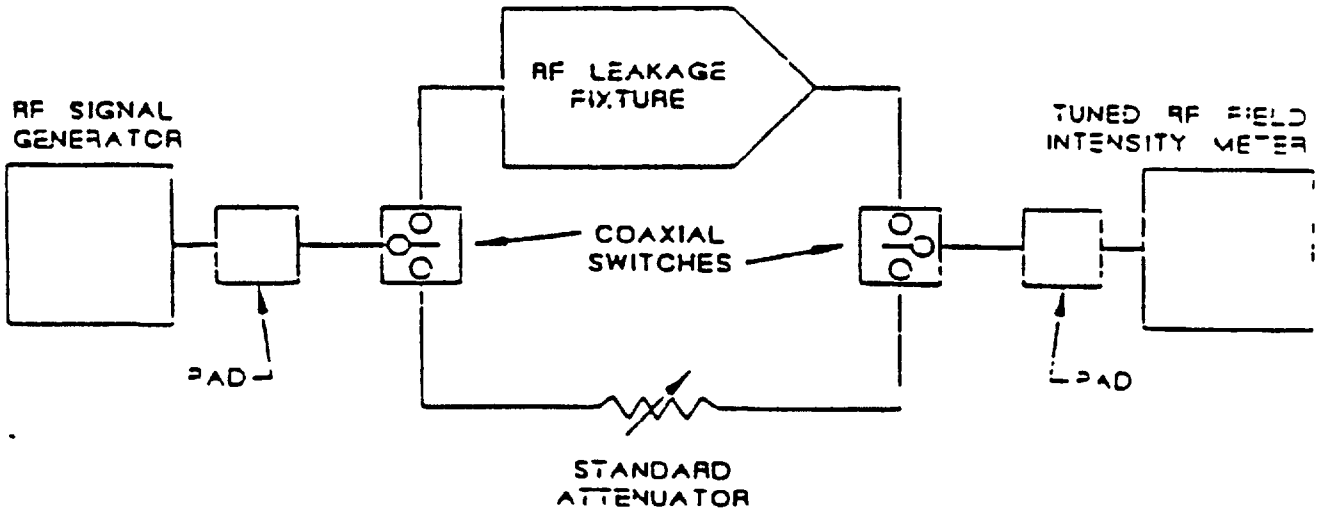


Figure 14. Random vibration.



Schematic test system

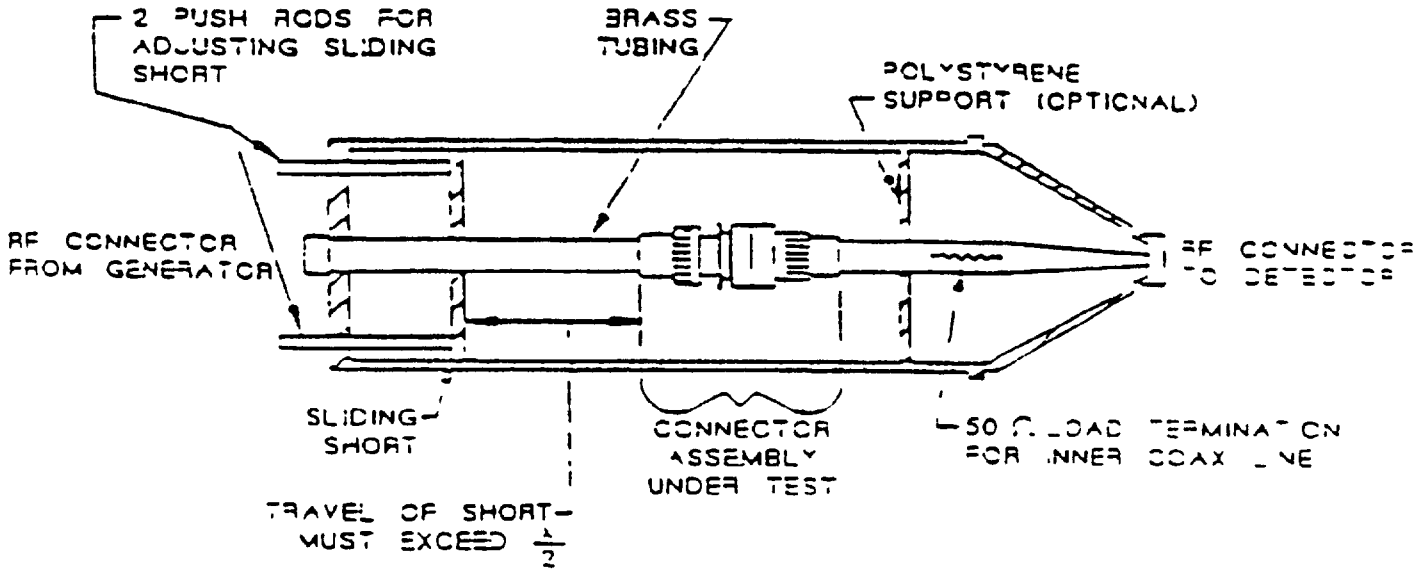
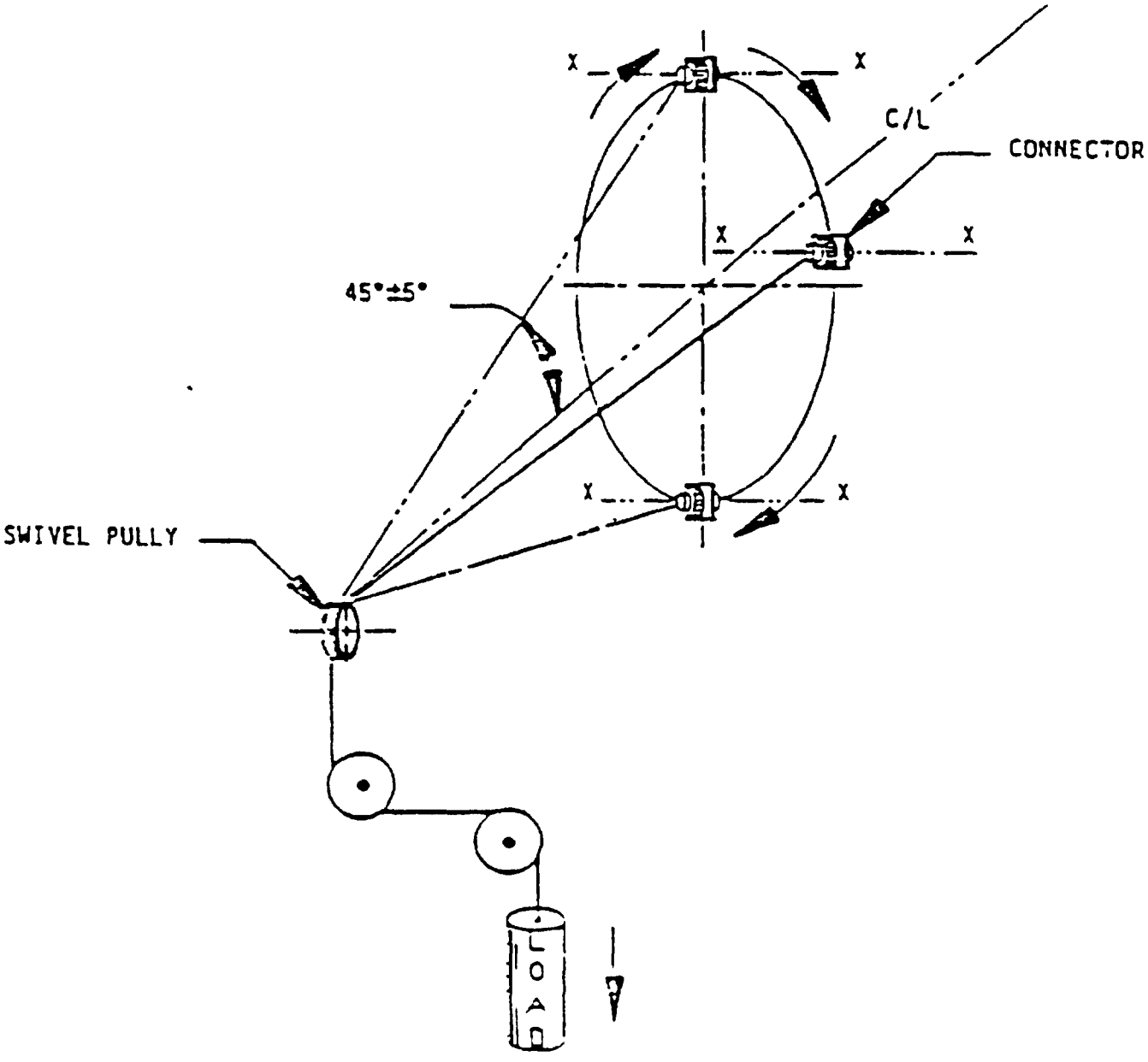
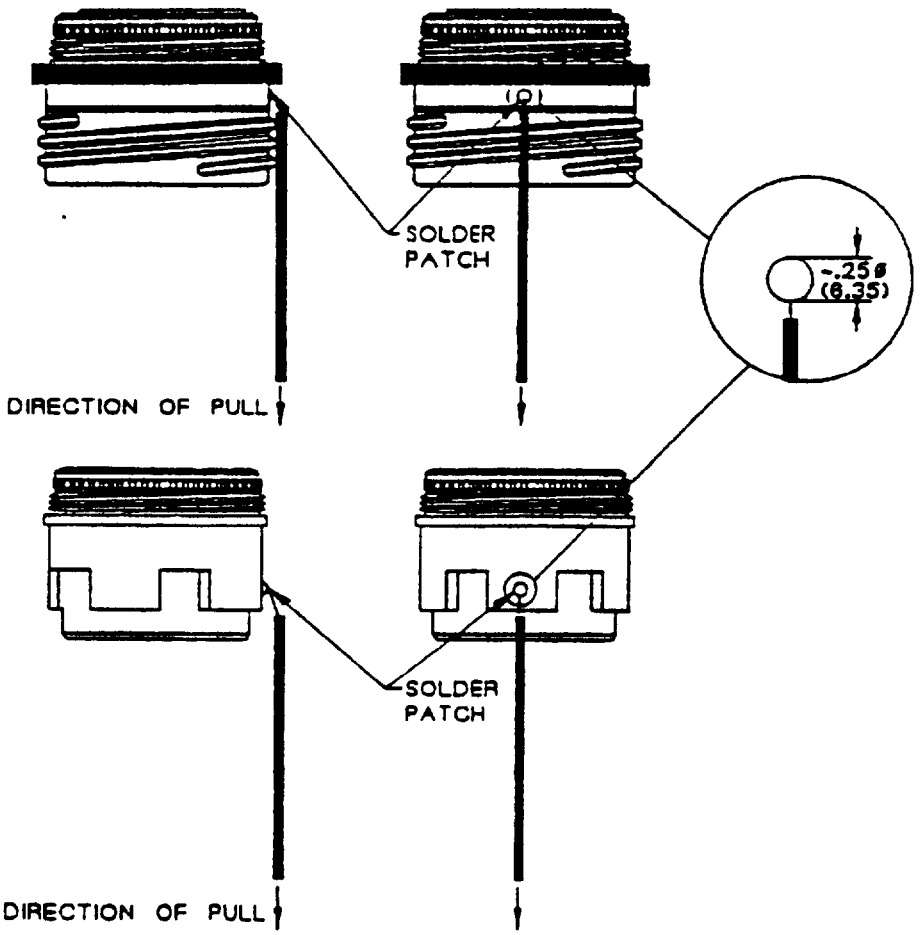


Figure 15 RF leakage test fixture



NOTE: CONNECTOR AXIS (REF X-X) TO REMAIN CONSTANT DURING ROTATION.

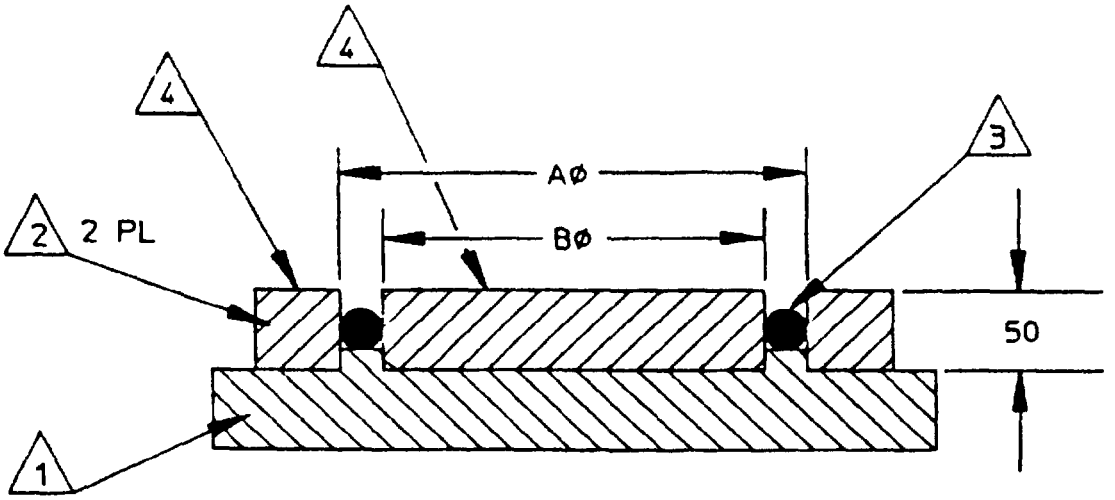
Figure 16. Contact walk-out.



Notes

1 Dimensions are in inches unless otherwise specified
2 Millimeters are in parentheses

Figure 17 Plating adhesion test.



Shell size	Recp ID A +.0002 -.0000	Plug O.D. B +.0000 -.0002
8-9	.506	.382
10-11	631	.507
13	756	632
14-15	881	757
16-17	1007	883
18-19	1131	1007
20-21	1256	1132
22-23	1380	1256
24-25	1506	1382

Notes.

1. Material shall be non-conductive.
2. Material shall be conductive with an overall gold finish per MIL-G-45204, type II, grade C, class 1, over a suitable underplate.
3. Elastomeric o-ring
4. Test points
5. Dimensions are in inches unless otherwise specified

Figure 18 O-ring conductivity test fixture

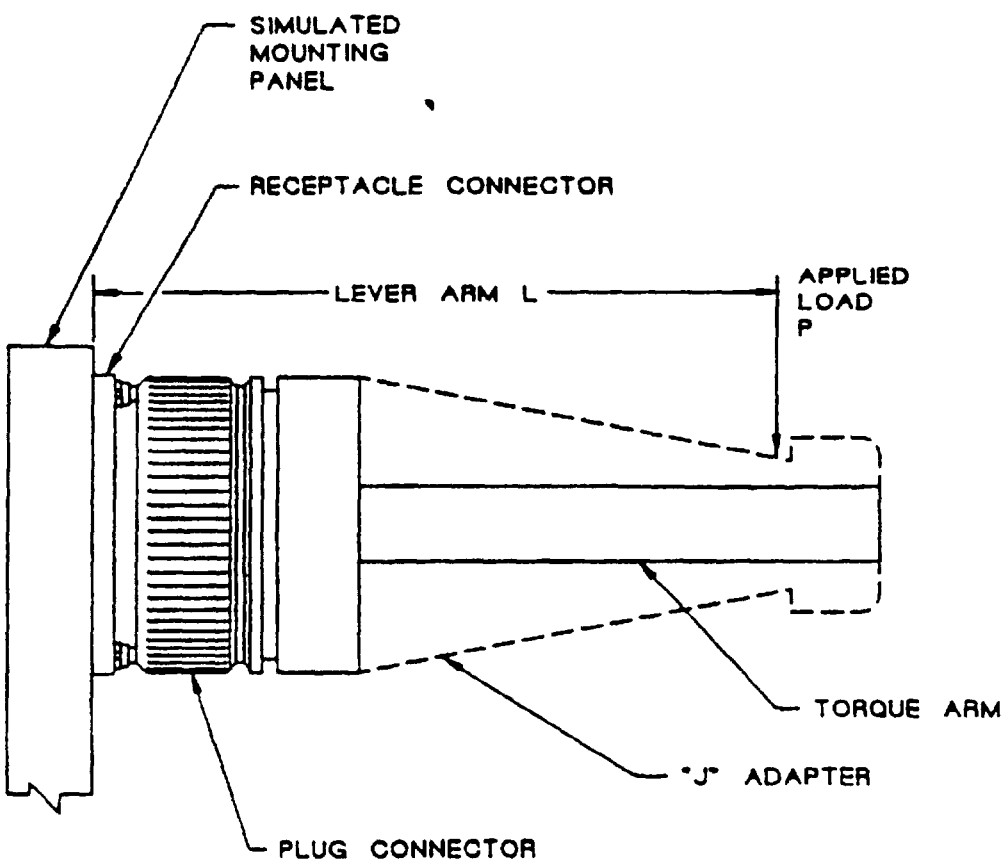
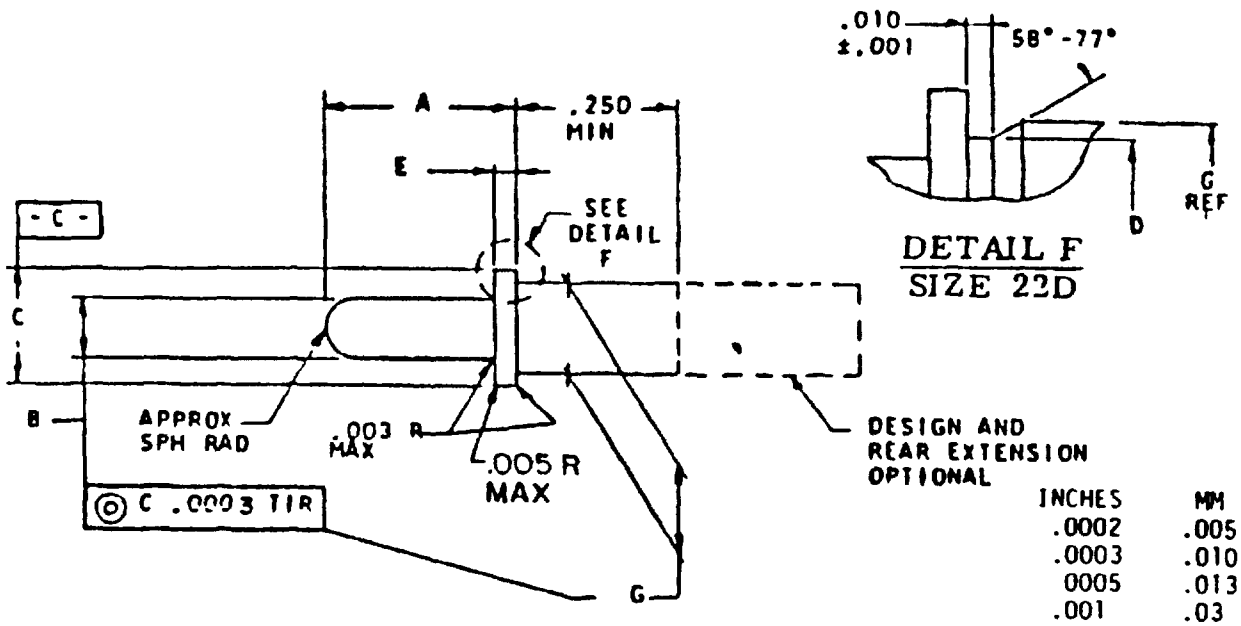


Figure 19 External bending moment test set-up

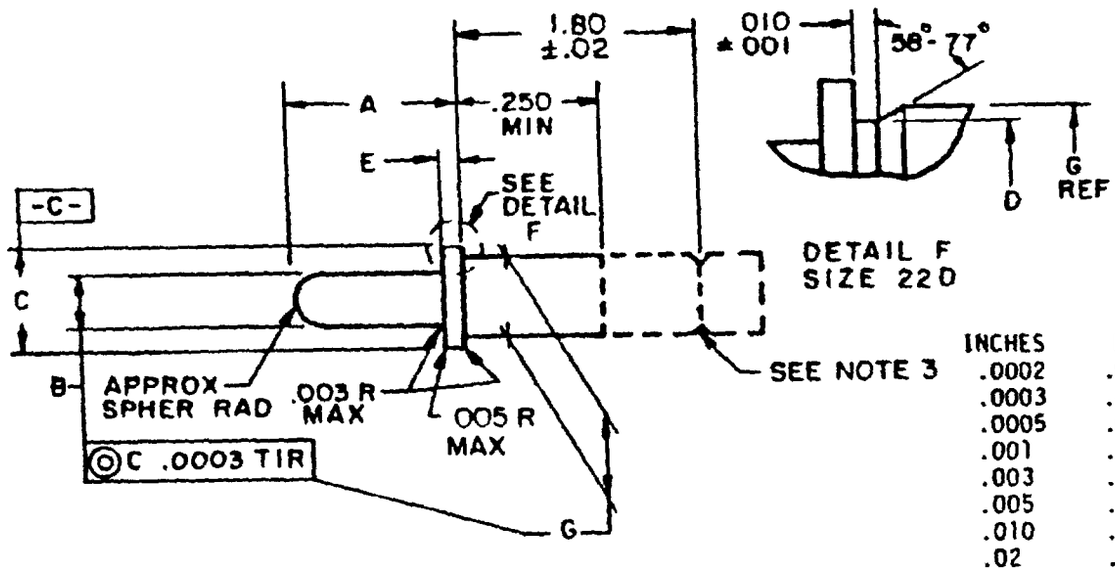


Contact Size	A +.0000 −.0005	B DIA +.0002 −.0000	C DIA +.0002 −.0000	D DIA +.0000 −.0002	E +.0002 −.0000	G DIA +.0000 −.0002
22D	.3000	.0295	.0600	.0410	.0290	.0480
20	.3000	.0390	.0910	-----	.0290	.0700
16	.3000	.0615	.1270	-----	.0290	.1030
12	.3000	.0930	.1790	-----	.0290	.1510
8	.3000	.2170	.3110	-----	.0290	.2760

INCHES	MM
.0002	.005
.0003	.010
0005	.013
.001	.03
.003	.08
.005	.13
.010	25
.0290	.737
.0295	.749
.0390	.991
.0410	1 041
.0480	1.219
.0600	1.524
.0615	1 562
.0700	1 778
0910	2 311
0930	2 362
.1030	2 616
1270	3 226
1510	3 835
.1790	4 547
.250	6 35
.3000	7.620

NOTES:
1. Material: Hardened tool steel
2. Finish: 32 microinches polished
3. Dimensions are in inches
4. Metric equivalents are given for general information only and are based upon 1 00 inch = 25 4 mm

Figure 20a Test gage, pin, gage location (Series A).

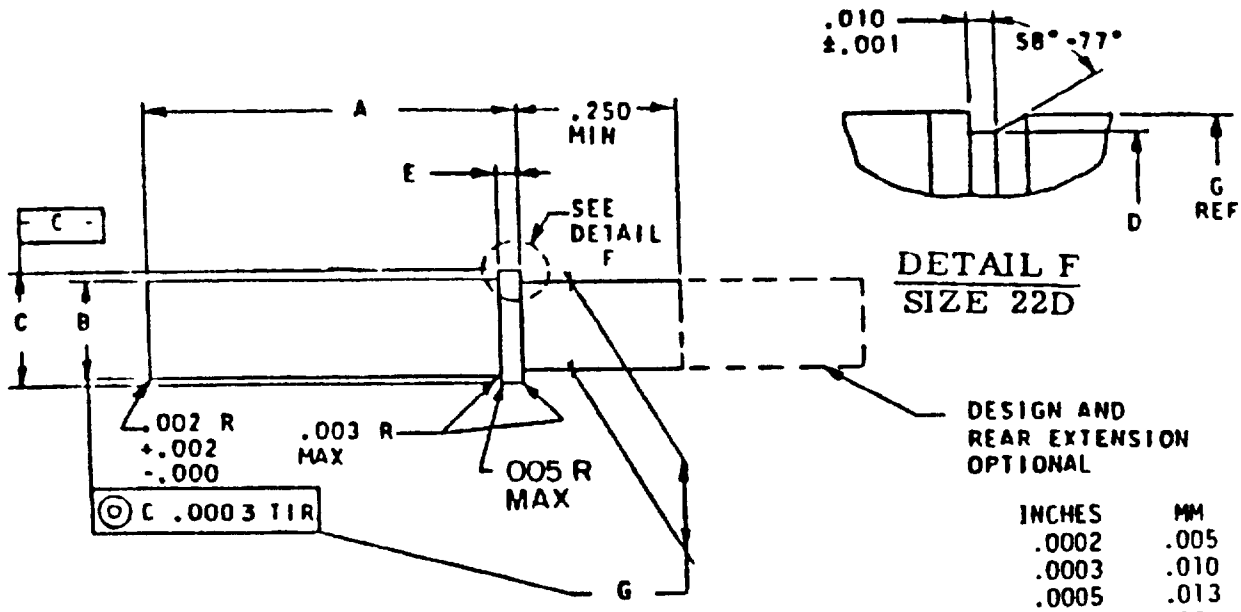


Contact Size	A +.0005 −.0000	B DIA +.0002 −.0000	C DIA +.0002 −.0000	D DIA +.0000 −.0002	E +.0000 −.0002	G DIA +.0000 −.0002
22D	.2950	.0295	.0600	.0410	.0330	.0480
20	.2950	.0390	.0910	-----	.0330	0700
16	.2950	.0616	.1270	-----	.0330	.1030
12	.2950	.0930	.1790	-----	.0330	.1510
8	.2950	.2170	.3110	-----	.0330	.2760

INCHES	MM
.0002	.005
.0003	.010
.0005	.013
.001	.03
.003	.08
.005	.13
.010	.25
.02	.5
.0295	.749
.0330	.838
.0390	.991
.0410	1.041
.0480	1.219
.0600	1.524
.0615	1.562
.0700	1.778
.0910	2 311
.0930	2 362
.1030	2.616
.1270	3.226
1510	3.835
.1790	4.547
.250	6.35
2950	7.493
1.80	45 7

NOTES:
1. Material: Hardened tool steel
2. Finish: 32 microinches polished
3. Design of rear extension is optional, but must have a groove provided as indicated.
4. Dimensions are in inches.
5. Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.

Figure 20b. Test gage, pin, gage location and retention (Series A).

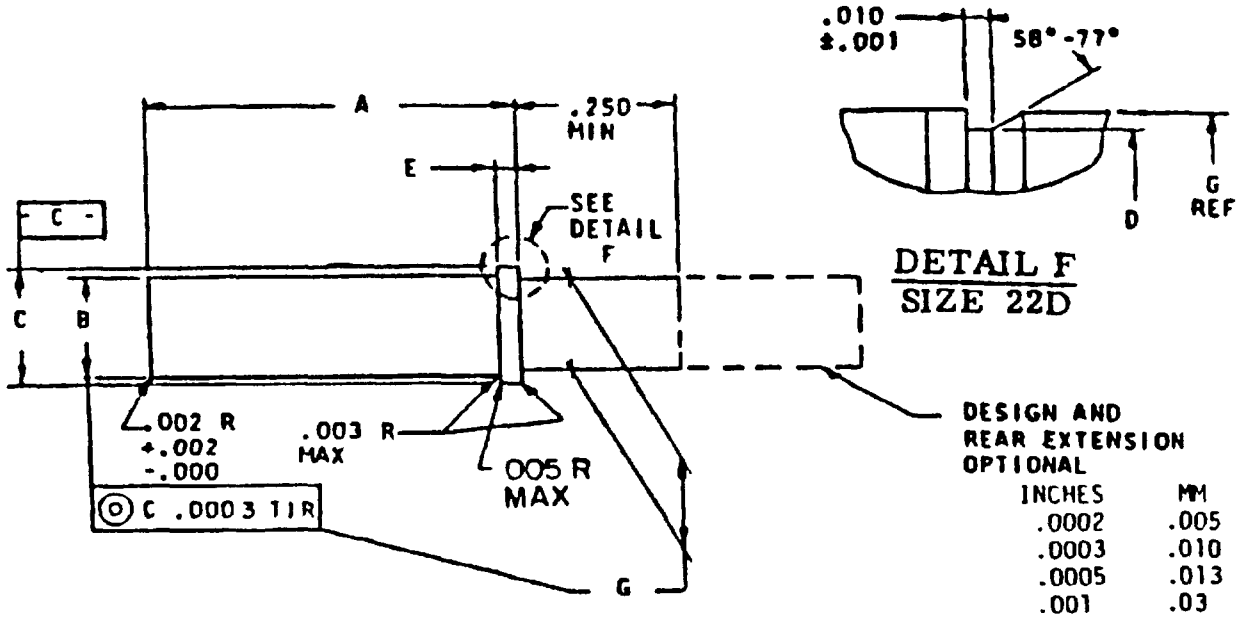


Contact Size	A +.0000 −.0005	B DIA +.0002 −.0000	C DIA +.0002 −.0000	D DIA +.0002 −.0002	E +.0000 −.0002	G DIA +.0000 −.0002
22D	.5850	.0610	.0610	.0410	-----	.0480
20	.5850	.0770	.0910	-----	.0330	.0700
16	.5850	.1120	.1270	-----	.0330	.1030
12	.5850	.1600	.1790	-----	.0330	.1510
8	.5900	.2870	.3110	-----	.0330	.2760

INCHES	MM
.0002	.005
.0003	.010
.0005	.013
.001	.03
.002	.05
.003	.08
.005	.13
.010	.25
.0330	.838
.0410	1 041
.0480	1 219
.0600	1.524
0700	1.778
.0770	1.956
.0910	2.311
.1030	2.616
1120	2 845
.1270	3 226
.1510	3 835
.1600	4 064
.1790	4.547
.5850	14 859

NOTES
1. Material Hardened tool steel
2. Finish 32 microinches polished.
3. Dimension A conforms to point of spring engagement (C and Y, figures 1 and 2).
4. Dimensions are in inches.
5. Metric equivalents are given for general information only and are based upon 1.00 inch = 25 4 mm.

Figure 20c. Test gage, socket, gage location (Series A).

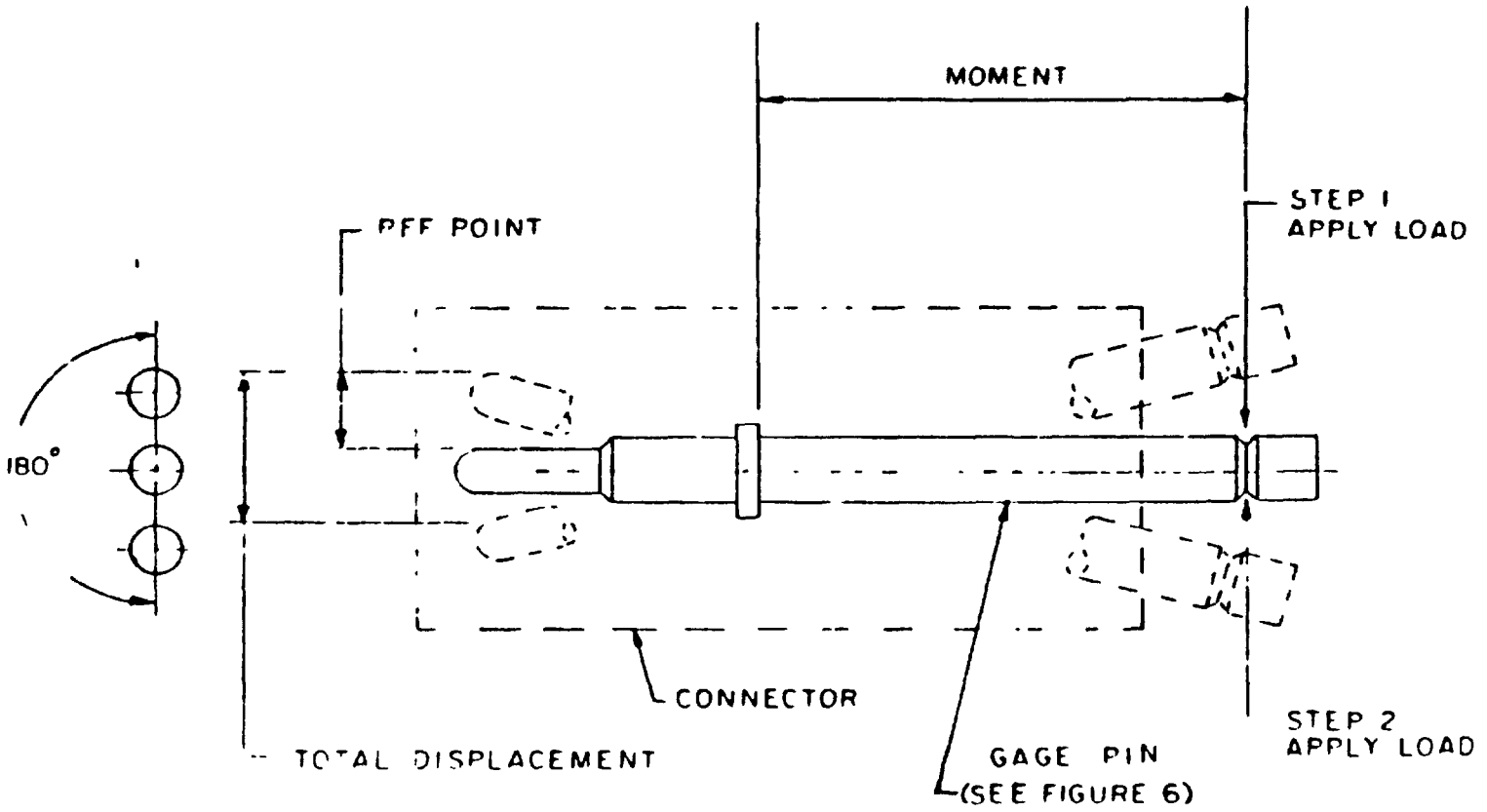


Contact Size	A +.0000 −.0005	B DIA +.0002 −.0000	C DIA +.0002 − 0000	D DIA +.0000 −.0002	E +.0002 −.0000	G DIA +.0000 −.0002
22D	.6260	.0600	.0600	.0410	-----	.0480
20	.6260	.0770	.0910	-----	.0330	.0700
16	.6260	.1120	.1270	-----	.0330	.1030
12	.6260	.1600	.1790	-----	.0330	.1510
8	.6310	.2870	.3110	-----	.0330	.2760

INCHES	MM
.0002	.005
.0003	.010
.0005	.013
.001	.03
.002	.05
.003	.08
.005	.13
.010	.25
.0330	.838
.0410	1.041
.0480	1.219
.0600	1.524
.0700	1.778
.0770	1.956
.0910	2.311
.1030	2.616
.1120	2.845
1270	3.226
1510	3.835
.1600	4 064
.1790	4.547
.250	6.35
.6260	15.900

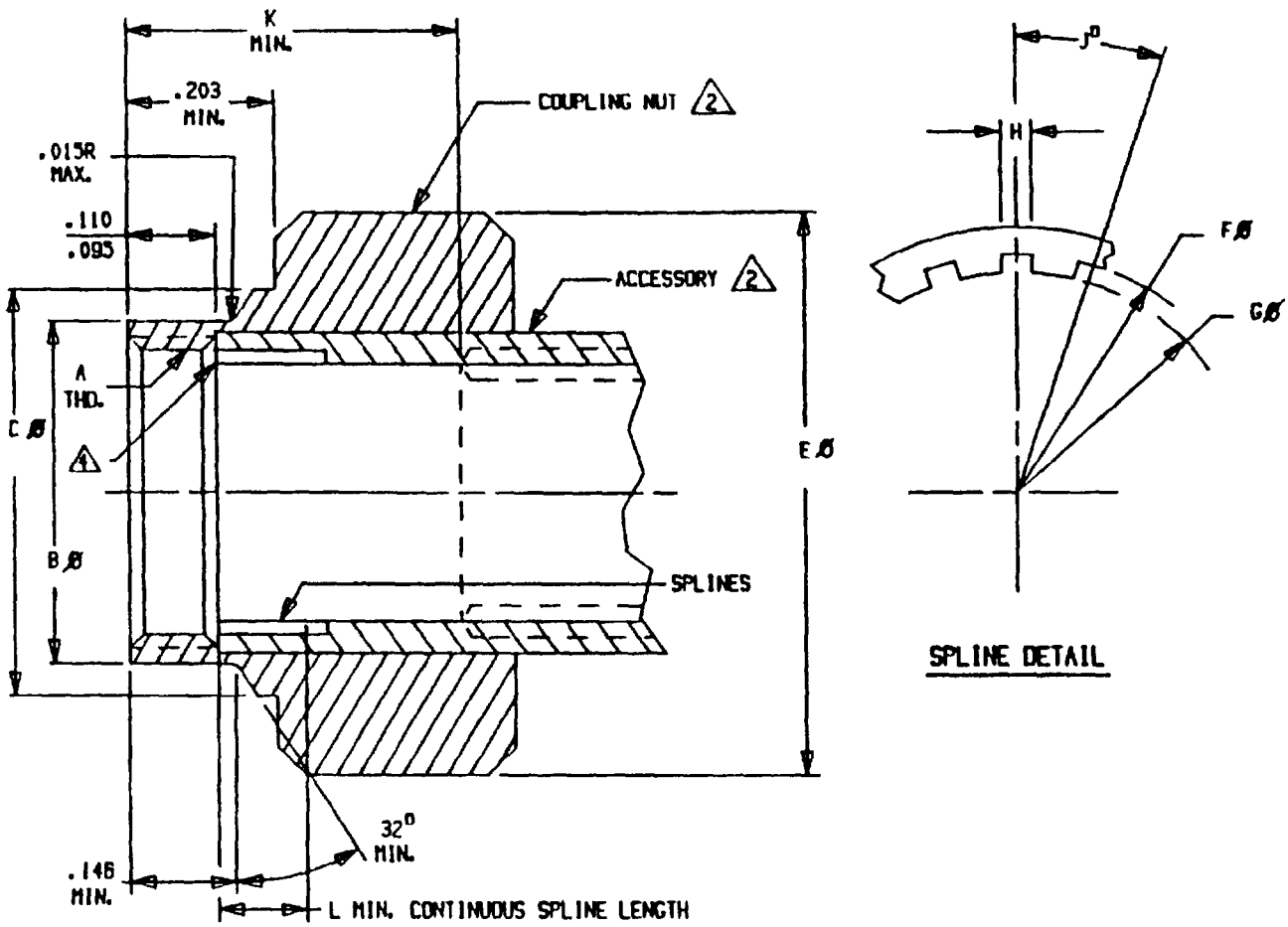
NOTES
1. Material Hardened tool steel.
2. Finish 32 microinches polished
3. Dimensions are in inches.
4. Metric equivalents are given for general information only and are based upon 1.00 inch = 25 4 mm

Figure 20d. Test gage, socket, retention (Series A).



Step 1 - Appl. load to determine reference point.
Step 2 - Apply load in opposite direction (180°) and measure total displacement

FIGURE 21. Pin contact stability test



Notes:

1. Dimensions are in inches unless otherwise specified.
2. Coupling nut shall be captivated to and free to rotate on accessory.
3. Dimensions apply after plating
4. Non-rotateable hardware shall bottom on lead thread (D THD) of connectors (see figures 5 and 10).

Figure 22. Connector accessory front end data (Series A and B)

SHELL SIZE	A THREAD	MOD. MINOR Ø	B Ø	C Ø	E Ø MAX.	F Ø
8/9	.500-28UNEF-2B	.470 .464	.358 .348	.640 .635	.850	.473 .469
10/11	.625-28UN-2B	.595 .589	.683 .671	.785 .760	.975	.598 .594
13	.750-28UN-2B	.720 .714	.808 .796	.890 .885	1.100	.719 .715
14/15	.875-28UN-2B	.845 .839	.933 .921	1.015 1.010	1.225	.848 .844
16/17	1.000-28UN-2B	.970 .964	1.059 1.047	1.140 1.135	1.350	.973 .969
18/19	1.125-28UN-2B	1.095 1.089	1.183 1.171	1.274 1.269	1.475	1.098 1.094
20/21	1.250-28UN-2B	1.220 1.214	1.308 1.296	1.410 1.405	1.624	1.223 1.219
22/23	1.375-28UN-2B	1.345 1.339	1.433 1.421	1.535 1.530	1.749	1.348 1.344
24/25	1.500-28UN-2B	1.470 1.464	1.558 1.546	1.649 1.644	1.874	1.473 1.469

SHELL SIZE	G Ø	H	J	K MIN.	L MIN.
8/9	.446 .443	.050 .048	20°	.500	.078
10/11	.571 .568	.048 .046	15°	.500	.078
13	.692 .689	.047 .045	12°	.500	.078
14/15	.821 .818	.053 .051	12°	.500	.078
16/17	.946 .943	.052 .050	10°	.500	.078
18/19	1.071 1.068	.052 .050	9°	.500	.078
20/21	1.196 1.193	.059 .056	9°	.576	.109
22/23	1.321 1.318	.062 .059	9°	.576	.109
24/25	1.446 1.443	.069 .066	9°	.576	.109

Figure 22. Connector accessory front end data (Series A and B) (continued).

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1 DOCUMENT NUMBER	2 DOCUMENT TITLE
MIL-29600	GENERAL SPECIFICATION FOR CIRCULAR COMPOSITE CONNECTOR

3a. NAME OF SUBMITTING ORGANIZATION	4 TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)* _____

5. PROBLEM AREAS

a. Paragraph Number and Wording

b. Recommended Wording

c. Reason/Rationale for Recommendation

6 REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
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