SAE Aerospace
An SAE International Group

AEROSPACE STANDARD

SAE AS81582 | REV. B

Issued 1998-07
Revised 2012-07

Superseding AS81582A

(R) Connectors, Electrical, Bayonet Coupling, Environment Resisting, Umbilical, General Specification For

RATIONALE

Revise to incorporate the Qualifying Activity testing as required by SAE policy, to replace MIL-STD-1344 test methods, to update references/document format with current SAE guidelines, and review specification for known technical issues.

NOTICE

The initial SAE publication of this document was taken directly from U.S. Military Standard MIL-C-81582B, Supplement 1, Amendment 1. This SAE Standard may retain the same part numbers established by the original military document.

Any requirements associated with Qualified Products Lists (QPL) may continue to be mandatory for DoD contracts. Requirements relating to QPLs have not been adopted by the SAE for this standard and are not part of this SAE document.

1. SCOPE

1.1 Scope

This specification covers environment-resisting, quick disconnect, EMI/RFI shielded and non-shielded umbilical, electric connectors and adapter assemblies with removable crimp or nonremovable solder-type contacts and accessories. Connectors are rated for operation from -55 °C (-67 °F) to 200 °C (392 °F). Adapter assemblies are rated for operation from -55 °C (-67 °F) to 125 °C (257 °F). The upper temperature is the maximum internal hot spot temperature resulting from any combination of electrical load and ambient temperature.

1.2 Classification

1.2.1 Classes

All classes shall be environment resistant and shall include the following features as specified in the applicable specification sheet:

Class E - Grommet seal
Class F - Grommet seal and strain relief clamp
Class P - Potted seal
Class J - Insert seal with gland seal for jacketed cable

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SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AS81582B

1.2.2 Contact Designator

Contact style shall be designated by one of the following:

P - Pin contacts
S - Socket contacts

1.2.3 Basic Part Number

The basic part number for qualified items procured in accordance with this specification shall conform to the applicable specification sheet (see 3.1).

1.3 Accessories

This specification also covers the following accessories:

Adapters, Connector to Cable, Straight and 105 degrees, open wiring and shielded cable.

Adapter, Connector to Connector, 90 degree

Connector, Dummy Stowage Receptacle

Caps, Protective

1.4 Insulation Resistance

Minimum insulation resistance versus hot-spot temperature is shown on Figure 1.

1.5 Service Life

Service life is dependent upon hot spot temperature in accordance with Figure 2.

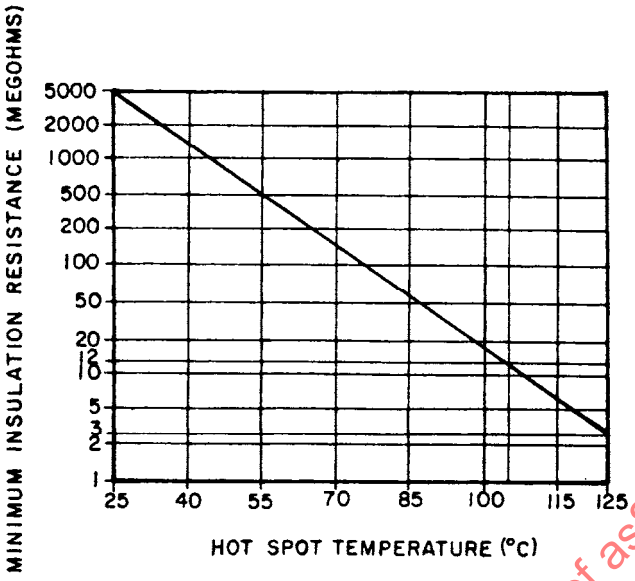


FIGURE 1A - ADAPTER ASSEMBLIES

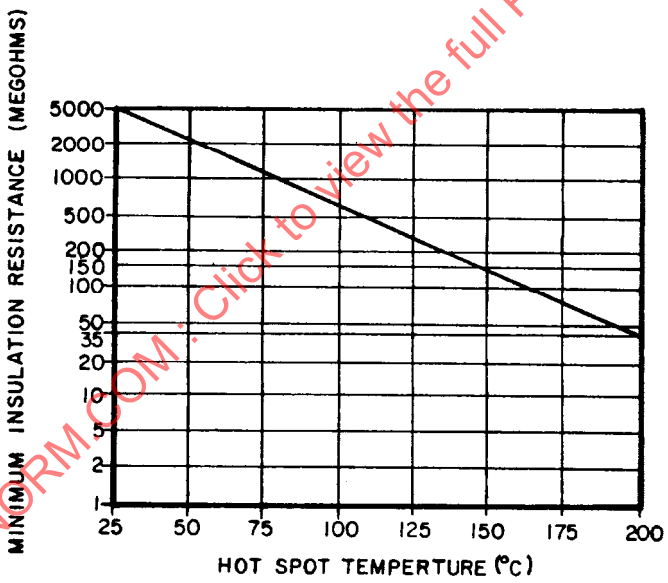


FIGURE 1B - CONNECTORS

FIGURE 1 - MINIMUM INSULATION RESISTANCE VERSUS HOT SPOT TEMPERATURE

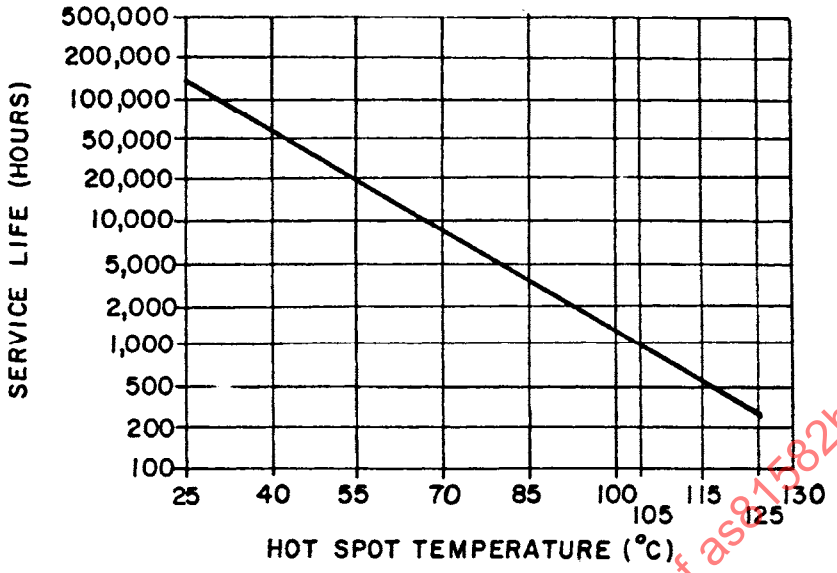


FIGURE 2A - ADAPTER ASSEMBLIES

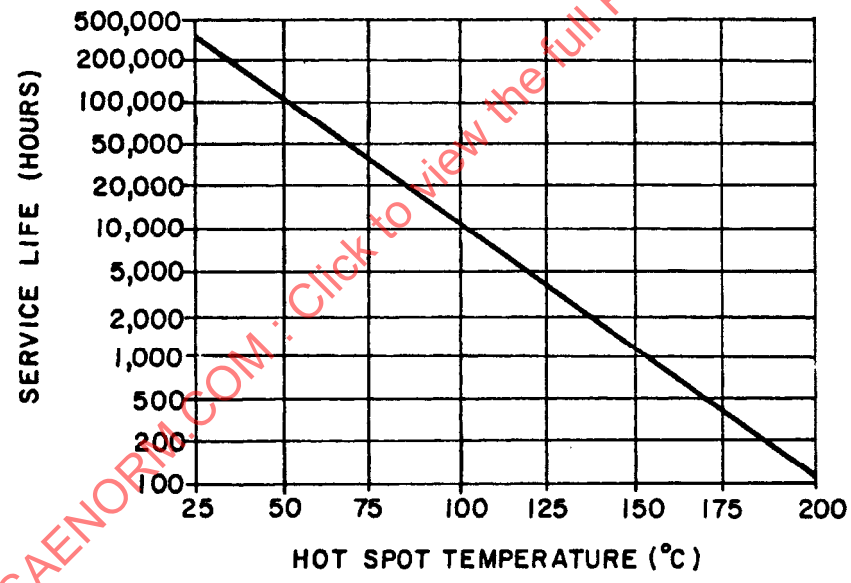


FIGURE 2B - CONNECTORS

FIGURE 2 - SERVICE LIFE VERSUS HOT SPOT TEMPERATURE

2. APPLICABLE DOCUMENTS

2.1 The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS1424	Deicing/Anti-Icing Fluid, Aircraft, SAE Type I
AMS4290	Aluminum Alloy, Die Castings 9.5Si - 0.50Mg (360.0-F), As Cast
AMS4291	Aluminum Alloy, Die Castings, 8.5Si - 3.5Cu (A380.0-F), As Cast
AMS-QQ-A-225	Aluminum and Aluminum Alloy, Bar, Rod, Wire, or Special Shapes; Rolled, Drawn, or Cold Finished; General Specification For
AMS-QQ-A-367	Alluminum Alloy Forgings
AMS-QQ-P-416	Plating, Cadmium (Electrodeposited)
AS22759/4	Wire, Electric, Fluoropolymer-Insulated, TFE-Glass-FEP, Medium Weight, Silver-Coated Copper Conductor, 600-Volt
AS22759/5	Wire, Electrical, Fluoropolymer-Insulated, Abrasion Resistant Extruded PTFE, Silver-Coated Copper Conductor, 600 Volt
AS22759/7	Wire, Electric, Fluoropolymer-Insulated, Abrasion Resistant Extruded PTFE, Medium Weight, Silver-Coated Conductor, 600 Volt
AS22759/9	Wire, Electrical, Fluoropolymer-Insulated, Extruded TFE, Silver-Coated Copper Conductor, 1000 Volt
AS22759/11	Wire, Electrical, Fluoropolymer-Insulated, Extruded TFE, Silver-Coated Copper Conductor, 600 Volt
AS22759/12	Wire, Electrical, Fluoropolymer-Insulated, Extruded TFE, Nickel-Coated Copper Conductor, 600 Volt
AS39029	Contacts, Electrical Connector, General Specification For
AS81582/1	Connectors, Electric, Bayonet, Coupling, Umbilical Receptacle, Jam Nut Mounting, RFI Shielded, Crimp Contact, Class E
AS81582/2	Connector, Plug, Electric, Bayonet Coupling, Lanyard Release, RFI Shielded, Crimp-Type Contacts, Class E
AS81582/4	Connector Adapter, RFI Shielded, Cable to Electric Connector
AS81582/5	Connector Adapter, Right Angle, RFI Shielded, Electric Connector to Electric Connector
AS81582/9	Connector, Electrical, Bayonet Coupling, Environment Resisting, Umbilical, Caps, Protective
SAE J452	General Information-Chemical Compositions, Mechanical and Physical Properties of SAE Aluminum Casting Alloys

2.1.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM A342 Standard Test Methods for Permeability of Feebly Magnetic Materials

ASTM A484 Specification for General Requirements for Stainless Steel Bars, Billets and Forgings

ASTM A582 Specification for Free Machining Stainless Steel Bars

ASTM B26 Standard Specification for Aluminum Alloy Sand Castings

ASTM B85 Standard Specification for Aluminum Alloy Die Castings

ASTM B108 Standard Specification for Aluminum Alloy Permanent Mold Castings

ASTM B211 Standard Specification for Aluminum and Aluminum Alloy Bar, Rod, and Wire

ASTM B339 Standard Specification for Pig Tin

ASTM B545 Standard Specification for Electrodeposited Coatings of Tin

ASTM D471 Standard Test Method for Rubber Property - Effect of Liquids

ASTM D957 Standard Practice for Determining Surface Temperatures of Molds and Plastics

ASTM D4066 Standard Classification System for Nylon Injection and Extrusion Materials (PA)

ASTM D5948 Standard Specification for Molding Compounds, Thermosetting

2.1.3 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-9495, https://assist.daps.dla.mil/quicksearch/.

SPECIFICATIONS

MILITARY

MIL-PRF-5606 Hydraulic Fluid, Petroleum Base; Aircraft, Missile, and Ordnance

MIL-DTL-5624 Turbine Fuel, Aviation Grades JP-4 and JP-5

MIL-S-7742 Screw Threads, Standard, Optimum Selected Series, General Specification for

MIL-PRF-8516 Sealing Compound, Polysulfide Rubber, Electric Connectors and Electric Systems, Chemically Cured

MIL-PRF-46010 Lubricant, Solid Film, Heat Cured

MIL-C-22520/1 Crimping Tool, Contact, Electric, Hand for Contact Size 12 Through 20

MIL-C-22520/2 Crimping Tool, Contact, Electric, Hand for Contact Size 20 Through 28

MIL-PRF-23699 Lubricating Oil, Aircraft Turbine Engines, Synthetic Base

MIL-PRF-87937 Cleaning Compound, Aircraft Surface, Alkaline Waterbase

MIL-DTL-45204 Gold Plating, Electrodeposited

MIL-DTL-55330 Connectors, Electrical and Fiber Optic, Packaging of

STANDARDS

MILITARY

MIL-STD-104 Limits for Electrical Insulation Color

MIL-STD-130 Identification Marking of US Military Property

MIL-STD-202 Test Methods for Electronic and Electrical Component Parts

MIL-HDBK-454 General Guidelines for Electronic Equipment

MIL-STD-810 Environmental Engineering Considerations and Laboratory Tests

MIL-STD-1285 Marking of Electrical and Electronic Parts

MIL-STD-1672 Connector Umbilical, Insert Arrangements for AS81582

MIL-STD-2073-1 Standard Practice for Military Packaging

2.2 Other Publications

2.2.1 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ANSIY14.5-1973 Dimensioning and Tolerancing for Engineering Drawings

ANSI/ISO 10012-1 Quality Assurance Requirements for Measuring Equipment

2.2.2 ASQ Publications

Available from American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53203, Tel: 800-248-1946 (United States or Canada) or +1-414-272-8575 (International), www.asq.org.

ASQC Z1.4 Sampling Procedures and Tables for Inspection by Attributes

2.2.3 NCSL Publications

National Conference of Standards Laboratories, 2995 Wilderness Place, Suite 107, Boulder, CO 80301-5404, Tel: 303-440-3339, www.ncsli.org.

NCSL Z540-1 General Requirements for Calibration Laboratories and Measuring and Test Equipment

2.2.4 Miscellaneous Publications

Application for copies should be addressed to the McGraw-Hill Book Co., Inc. New York, New York.

MIT Radiation Laboratory Series

Volume 10, The Waveguide Handbook

3. REQUIREMENTS

3.1 Specification Sheets

All requirements herein apply to all the connectors and accessories covered by the applicable specification sheet. Detail requirements or exceptions applicable to the individual types shall be as specified herein or on 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

Connector assemblies and accessories furnished under this specification and the applicable specification sheet shall be products which are qualified for listing on the applicable Qualified Products List (QPL) at the time set for the opening of bids (see 4.4 and 6.4).

3.2.1 Use of Basic Part Number Identification

The basic part number identification shall not be applied to a product, except for qualification test samples (see 6.4), until notification has been received from the activity responsible for qualification that the product has been approved for listing on the Qualified Products List (QPL).

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 to meet the performance requirements of this specification and the applicable specification sheet. Acceptance or approval of any constituent material shall not be construed as a guaranty for acceptance of the finished product.

3.3.1 Dissimilar Metals

When dissimilar metals are used in intimate contact with each other, protection against electrolysis and corrosion shall be provided. The use of dissimilar metal in contact, which tends toward active electrolytic corrosion (particularly brass, copper, or steel used in contact with aluminum or aluminum alloy), is not acceptable. However, metal spraying or metal plating of dissimilar base metals to provide similar or suitable abutting surfaces is permitted. Dissimilar metals shall be as defined in 6.7 through 6.7.4 inclusive, and Table 22 in hermetic seals, the 0.25 V difference between the header material and the housing material is not applicable.

3.3.2 Nonmagnetic Materials

The relative permeability of the connector assembly shall be less than 2.0, when measured with an indicator conforming to ASTM A342.

3.3.3 Contact Materials

Contacts shall be made from suitably conductive materials protected from corrosion.

3.3.3.1 Contact Plating

Contact plating shall be in accordance with AS39029.

3.3.4 Dielectric Materials

3.3.4.1 Insert and Grommet

Insert and grommet materials shall be high grade dielectric having hardness, electrical, and mechanical characteristics suitable for the purpose intended.

3.3.4.1.1 Rigid Dielectric Material

Rigid dielectric materials shall be in accordance with L-P-395, ASTM D5948, or ASTM D4066.

3.3.4.1.2 Resilient

Unless otherwise specified (see 3.1), the mating face of pin inserts shall be a resilient material within a Shore A Durometer range of 40 to 68.

3.3.4.1.3 Insert Faces

Insert faces shall be as specified in the applicable specification sheet (see 3.1).

3.3.5 Shells and Metallic Accessories Material

Shells and metal accessories (see 1.3), shall be fabricated of high grade aluminum such as alloy 6061, temper T6 in accordance with AMS-QQ-A-367. Connectors shall have a grounding spring member as specified (see 3.1).

3.3.5.1 Component Parts

Other metal component parts may be fabricated from aluminum conforming to ASTM B211 or AMS-QQ-A-225 or passivated stainless steel in accordance with QQ-S-764.

3.3.5.2 Bayonet Pins

Bayonet pins shall be made of stainless steel.

3.3.5.3 Finish

Unless otherwise specified (see 3.1) aluminum parts shall be cadmium plated to withstand 500 h salt spray (see 4.6.19). A preliminary plating of another metal is permissible. The resultant finish shall be olive drab (light to dark) and shall be electrically conductive.

3.3.5.4 Grounding Spring Member

The grounding spring shall be made of an electrically conductive metal suitable for the intended purpose.

3.4 Design and Construction

Connectors shall be of the design, construction, and physical dimensions specified (see 3.1). Connectors shall be so designed that neither the pins nor the sockets will be damaged during normal mating of counterpart connectors. True position dimensions shown herein and on the specification sheets are in accordance with ASME Y14.5M-1994.

3.4.1 Contact Design

Contacts shall conform to AS39029, except as otherwise specified herein for solder contacts and thru-bulkhead contacts. When specified in the contract or order, connectors may be supplied less crimp type contacts to permit procurement of these items in bulk.

3.4.1.1 Solder Contacts

Solder contacts shall be as specified (see 3.1), and shall be non-removable from the insert. Solder cups shall be such that during soldering no components will be damaged and no liquid solder shall escape.

3.4.1.2 Crimp Contacts

Crimp contacts shall be qualified as specified (see 3.1).

3.4.2 Insert Design and Construction

Inserts shall be of void-less construction and shall be secured to prevent rotation within the shell. The inserts shall be non-removable from the shell and shall be installed in the position specified in the applicable specification sheet. The insert shall be designed and constructed to eliminate all air paths between contacts by permanently attaching the dielectric members to each other. The socket insert shall be designed to prevent a bent pin in a mating counterpart insert from penetrating the insert alongside the socket contact. Inserts shall be so designed that MIL-S-8516 potting material will adhere to the insert without treatment by the user.

3.4.3 Shell Design

Connector shells shall be seamless and shall retain their inserts in a positive manner.

3.4.3.1 Screw Threads

Screw threads shall conform to MIL-S-7742. Slight out-of-roundness beyond the specification tolerance is acceptable if threads can be checked without forcing the thread gages.

3.4.4 Coupling

Unless otherwise specified (see 3.1), the coupling type shall be a 3-pin bayonet design with a lanyard release mechanism. Coupling shall be accomplished by clockwise rotation of the coupling ring; uncoupling shall be accomplished by the application of a force to the lanyard. The design shall also permit uncoupling by counterclockwise rotation of the coupling ring. The coupling rings shall be fluted or knurled to provide a gripping surface.

3.4.4.1 Engagement of Connectors

Counterpart connectors of any arrangement and accessories shall be capable of being fully engaged and disengaged without the use of tools. Engagement of connectors shall be defined as full insertion of pins into sockets and proper sealing of the mating insert faces. Full engagement shall be indicated by an audible sound at the completion of the coupling cycle, and a positive detent shall be included in the coupling mechanism to lock connectors in the engaged position.

3.4.4.1.1 Bayonet Pins

Unless otherwise specified (see 3.1), bayonet pins on connector shells shall have surfaces whose color is yellow. The color shall be within the limits described in MIL-STD-104. The ends of the pins shall be visible through suitable holes in the coupling ring when the connectors are engaged and the coupling ring is in the locked position.

3.4.4.2 Shell Polarization

Polarization of connectors shall be accomplished by matched integral key(s) and keyway(s) of counterpart connectors. The polarization of counterpart connectors shall take place before coupling rings are engaged, and before any pin contacts can touch the opposing insert face or sockets of the counterpart connector.

3.4.4.3 Engagement Seal

Connectors shall contain sealing means so that engaged connectors comply with the requirements specified herein. The design of the seal shall be such that in mated connectors all air paths between adjacent contacts and between contacts and shells are eliminated. There shall be interfacial mating of the engaged connector insert to provide dielectric under compression of 0.005 in minimum.

3.4.4.4 Lubrication

Bayonet coupling slots, including the inside diameter in the bayonet coupling slot area shall be coated with a lubricant conforming to MIL-L-8937, form B to aid in mating connectors. Features which are intended to provide potting compound anchorage shall be free of lubricant.

3.4.4.5 Protective Covers and Stowage Receptacles

When mated to counterpart connectors, the protective covers and stowage receptacles shall maintain the connector free of moisture, prevent air leakage, and comply with the applicable requirements of Table 17. Protective covers and stowage receptacles shall be provided with an EMI/RFI shielding feature where required (see 3.1).

3.4.4.6 Lanyard

Mounting of the lanyard to the connector shall be such that rotation of the connector for engagement will not shorten the effective length of the lanyard.

3.4.5 Wire Sealing

3.4.5.1 Classes E and F Connectors

Classes E and F connectors shall be provided with a wire sealing resilient grommet and gland nut capable of sealing the wire sizes as specified in Tables 1A and 1B.

3.4.5.2 Class P Connectors

Class P connectors shall be provided with a potting form suitable to accept and bond to MIL-S-8516 potting material. Inserts of class P connectors shall be so designed that potting material will adhere to the shell and insert without treatment by the user.

3.4.5.3 Class J Connectors

Class J connectors shall be provided with a resilient gland and gland nut capable of sealing on appropriate single-jacketed multi-conductor cables.

TABLE 1A - ADAPTER ASSEMBLIES - WIRE RANGE ACCOMMODATIONS

Wire Barrel Size	Wire Size	O.D. of Finished Wire (inch) 1/		Wire Number (Ref) 2/
		Crimp Contact Connectors	Solder Contact Connectors	
20	24	0.046 (min.)	0.060 (min.)	AS22759/7-24
	22	0.047 (min.)	0.060 (min.)	AS22759/11-22, /7-22
	20	0.085 (max.)	0.085 (max.)	AS22759/4-20
16	18	0.066 (min.)	0.066 (min.)	AS22759/11-18
	16	0.109 (max.)	0.109 (max.)	AS22759/4-16
12	14	0.097 (min.)	0.097 (min.)	AS22759/9-14
	12	0.142 (max.)	0.142 (max.)	AS22759/12-10

1/ For outside diameters smaller than that specified, see 6.1h.
2/ Wire numbers are for reference only and are not intended to restrict the use of acceptable wire-types with these adapter assemblies.

TABLE 1B - CONNECTORS - WIRE RANGE ACCOMMODATIONS

Wire Barrel Size	Wire Size	O.D. of Finished Wire (inch)	Wire Number (Ref) 1/
20	24	0.041 (min.)	AS22759/11-24
	22	0.047 (min.)	AS22759/11-22
	20	0.090 (max.)	AS22759/5-20
16	18	0.068 (min.)	AS22759/9-18, /11-18
	16	0.130 (max.)	AS22759/5-16
12	14	0.107 (min.)	AS22759/5-12
	12	0.170 (max.)	

1/ Wire numbers are for reference only and are not intended to restrict the use of acceptable wire-types with these adapter assemblies.

3.4.5.4 Grommet Sealing Plugs

The grommets of classes E and F connectors shall be designed to accept sealing plugs as specified (see 3.1), in lieu of wire where unused contacts are employed. When specified in the contract or order, connectors may be supplied less grommet sealing plugs to permit procurement of these items in bulk.

3.4.6 Grounding Spring Member

When specified (see 3.1), the grounding spring member shall have a minimum of six fingers per inch. The spring fingers shall be shaped in a manner which will ensure proper engagement of the mating shell. The grounding spring shall be permanently fixed to the shell periphery and the attachment of the grounding spring to the shell shall not impede spring flexing. The spring fingers shall engage the mating shell at a minimum of 0.090 in prior to the pin-socket engagement.

3.5 Interchangeability

All connectors and accessories having the same military part number shall be completely interchangeable with each other with respect to installation (physical) and performance (function) as specified herein. Solder and crimp contact connectors shall be intermateable (see 6.1(f)).

3.6 Performance

Connectors shall perform as follows when subjected to the conditions and tests specified.

3.6.1 Contact Protection, Connector Mating

Connectors equipped with pin contacts shall not permit the edge of the shell of the counterpart mating connector to touch the pin contacts (see 4.6.2).

3.6.2 Resistance to Test Probe Damage (size 12 and smaller socket contacts)

Socket contacts shall withstand the bending moment and depth of test probe insertion without evidence of visible damage (see 4.6.3). Contacts shall meet the requirements of 3.6.4 after test.

3.6.3 Contact Insertion and Removal Force (crimp removable contact connectors only)

Contacts shall meet the insertion and removal forces specified in Table 2, when tested as specified (see 4.6.4).

TABLE 2 - CONTACT INSERTION AND REMOVAL FORCES

Contact Size	Insertion and Removal Force (pounds max.)
20-20	20
16-16	20
12-12	20

3.6.4 Contact Engaging and Separating Force

The contact engaging and separating force shall not exceed the applicable values specified in Table 3 (see 4.6.5).

TABLE 3 - CONTACT ENGAGING AND SEPARATING FORCES (OUNCES)

Mating Size	Minimum Separation Force (ounces)	Maximum Average Engagement Force (ounces)	Maximum Engagement Force (ounces)
20	0.7	12	18
16	2	24	30
12	3	24	30

3.6.5 Mating and Un-mating Forces

The coupling torque for mating and un-mating of counterpart connectors shall meet the torque requirements of Table 4. The connectors used in this test shall have the complete complement of contacts. The dummy stowage receptacles and protective covers, when mated with their applicable connector, shall also comply with the torque requirement of Table 4 (see 4.6.6).

TABLE 4 - MATING AND UNMATING FORCES

Shell Size	Torque (pound-inches)	
	Maximum Mating and Unmating Forces	Minimum Unmating Force
8	8	1
10	12	1
12	16	2
14	20	4
16	24	4
18	28	4
20	32	6
22	50	20
24	60	25

3.6.6 Contact Retention

Contacts shall be retained in their inserts when subjected to the contact retention test in accordance with the axial loads of Table 5. The axial displacement of crimp contacts shall not exceed 0.012 in while under load with the accessory tightened or 0.015 in while under load with the accessory removed. The axial displacement of solder contacts shall not exceed 0.012 in after the load has been removed (see 4.6.7).

TABLE 5 - CONTACT RETENTION WITH AXIAL LOADS

Contact Size	Axial Loads (pounds-minimum)	
	Removable Contacts	Non-Removable Contacts
20-20	15	15
16-16	25	25
12-12	25	25

3.6.7 Thermal Shock

There shall be no evidence of damage detrimental to the operation of the connector or assembly after being subjected to the applicable temperature extremes (see 3.1) of Table 6 in accordance with the thermal shock test (see 4.6.8).

TABLE 6 - TEMPERATURE EXTREMES

Test Part	Extremes	Degrees C	Degrees F
Adapter Assemblies	Low High	-55 +0/-3 +125 +3/-0	-67 +0/-5.5 +257 +5.5/-0
Individual Connectors	Low High	-55 +0/-3 +200 +5/-0	-67 +0/-5.5 +392 +9/-0

3.6.8 Dielectric Withstanding Voltage

Connectors shall show no evidence of breakdown or flashover when subjected to the test voltages and altitudes of Table 7 (see 4.6.9).

TABLE 7 - TEST VOLTAGE (AC, RMS) 1/

Condition	Service Rating I		Service Rating II	
	Sea Level	70 000 ft	Sea Level	70 000 ft
Mated	1500	1000 2/, 350 3/	2300	1200 2/, 500 3/
Unmated	1500	275	2300	500

1/ These are not working voltages.
2/ Integral grommet or potted only.
3/ Removable grommet or no grommet.

3.6.9 EMI/RFI Shielding Effectiveness

3.6.9.1 Shielding Effectiveness

When specified (see 3.1), the shells shall exhibit a leakage attenuation equal to or greater than that specified in Table 8 (see 4.6.10.1).

TABLE 8 - EMI/RFI SHIELDING EFFECTIVENESS

Frequency (MHz)	Leakage Attenuation (dB)	Frequency (MHz)	Leakeage Attenuation (dB)
100	65	400	55
150	60	600	50
200	60	800	45
300	55	1000	45

3.6.9.2 Shell to Shell Continuity

The overall DC resistance shall not exceed 0.005 Ω (see 4.6.10.2).

3.6.10 Fluid Immersion

Unmated connectors shall mate within the torque specified in Table 4, after being subjected to fluid immersion (see 4.6.11).

3.6.10.1 Retention System Fluid Immersion

When tested as specified in 4.6.11.1, the insert assemblies shall meet the requirements of contact retention (see 3.6.6). Effect of the fluids on resilient sealing members shall not be a consideration of this test.

3.6.11 Durability

Counterpart connectors shall show no mechanical or electrical defects detrimental to the operation of the connector after 500 cycles of coupling and uncoupling (see 4.6.12).

3.6.12 Vibration

Mated connectors shall not be damaged and there shall be no loosening of parts due to vibration. Counterpart connectors shall be retained in full engagement and there shall be no interruption of electrical continuity longer than 1 µs (see 4.6.13).

3.6.13 Shock

Mated connectors shall not be damaged and there shall be no loosening of parts, nor shall there be an interruption of electrical continuity longer than 10 µs during the exposure to mechanical shock for adapter assemblies or 1 µs for individual connectors.

3.6.14 Acceleration

Mated connectors shall not be damaged and there shall be no loosening of parts due to acceleration. Counterpart connectors shall be retained in full engagement and there shall be no interruption of electrical continuity longer than 1 µs when tested in accordance with 4.6.15.

3.6.15 Acoustic Noise

When specified (3.1), mated connectors shall not be damaged and there shall be no loosening of parts when exposed to acoustic noise. Counterpart connectors shall be retained in full engagement and there shall be no interruption of electrical continuity longer than 1 µs during exposure to acoustic noise (see 4.6.16).

3.6.16 Moisture Resistance

Mated connectors, subjected to the moisture resistance test shall maintain an insulation resistance of 100 MΩ or greater at 25 °C for adapter assemblies and 1000 MΩ or greater at 25 °C for individual connectors (see 4.6.17).

3.6.17 Insulation Resistance

Insulation resistance shall be measured at ambient and elevated temperatures.

3.6.17.1 Insulation Resistance at Ambient Temperature

The insulation resistance at ambient temperature (25 °C or 77 °F) shall be greater than 5000 MΩ (see 4.6.18.1).

3.6.17.2 Insulation Resistance at Elevated Temperature

Table 9 shows the minimum insulation resistance after exposure to the required conditions (see 4.6.18.2).

TABLE 9 - TEMPERATURE

Test Part	Ambient Temperature	Qualification Inspection	Group B Inspection	Insulation Resistance megohms (min.)
Adapter Assemblies	105 °C 125 °C	1000 h 250 h	720 h 250 h	12 3
Individual Connectors	150 °C 200 °C	1000 h 100 h	720 h 100 h	150 35

3.6.18 Salt Spray (Corrosion)

Unmated connectors, stowage receptacles, protective covers, and accessories shall show no exposure of basis metal due to corrosion which will affect performance (see 4.6.19).

3.6.19 External Bending Moment

Connectors, stressed using the applicable bending moment shown in Table 10 shall exhibit no evidence of damage as revealed by inspection with 3X magnification. There shall be no interruption of electrical continuity (see 4.6.20).

TABLE 10 - EXTERNAL BENDING MOMENT

Shell Size	Bending Moment (inch-pounds)
10	200
12	300
14	350
16	419
18	433
20	437
22	440
24	450

3.6.20 Temperature Life

The connectors shall perform satisfactorily after exposure to the temperature life test and shall pass the succeeding tests in the qualification test sequence (see 4.6.21).

3.6.21 Ozone Exposure

The connectors shall show no evidence of cracking of materials or other damage due to ozone exposure that will adversely affect subsequent performance in the qualification test sequence (see 4.6.22).

3.6.22 Magnetic Permeability

The relative magnetic permeability of connectors and accessories shall be less than 2 (see 4.6.23).

3.6.23 Insert Retention

The insert shall retain its normal position in the connector shell for at least 5 s at maximum specified pressure (see 4.6.24).

3.6.24 Air Leakage

3.6.24.1 Connectors, Non-removable Contacts and Accessories

The air leakage rate shall not be greater than 1 in^3/h (4.55 x 10^{-3} cm^3/s) (see 4.6.25.1).

3.6.24.2 Stowage Receptacles and Protective Covers

The air leakage rate shall not be greater than 1 in^3/h (4.55 x 10^{-3} cm^3/s) (see 4.6.25.3).

3.6.25 Altitude Immersion (Connectors Only)

Unless otherwise specified (see 3.1), individual connectors shall have an insulation resistance of at least 5000 megohms after being subjected to altitude immersion, and shall maintain a dielectric withstanding voltage at sea level as specified in Table 7 (see 4.6.26).

3.6.26 Contact Resistance

Contacts in the mated condition shall meet the contact resistance requirements of Table 11 in addition to the requirements of AS39029 (see 4.6.27).

TABLE 11 - CONTACT RESISTANCE LIMITS

Contact Size	Wire Size	Test Current (amperes)	Maximum Voltage Drop (millivolts)	
			Initial	After Corrosion
20-20	20	7.5	55	65
	22	5.0	45	55
	24	3.0	45	55
16-16	16	13.0	50	60
	18	10.0	45	55
	20	7.5	45	55
12-12	12	23.0	50	60
	14	17.0	45	55

3.6.27 Cover Chains

Protective covers with sash chains or wire rope as specified (see 3.1) shall withstand a 25-lb tensile test without damage (see 4.6.28).

3.6.28 Lanyard Retention

The lanyard, including all hardware and joints shall withstand an axial tensile force of 150-lb minimum (see 4.6.29).

3.6.29 Lanyard Release Force

The lanyard release force shall be less than 50 lb at ambient temperature and less than 300 lb at -55 °C (see 4.6.30).

3.6.30 Coupling Ring Retention

The connector shall withstand an axial separation force between coupling mechanism and plug shell when applied in both directions. There shall be no loosening of component parts when subjected to the minimum force specified in Table 12 (see 4.6.31).

TABLE 12 - COUPLING RING RETENTION FORCES (MIN)

Shell Size	Force (pounds)	Shell Size	Force (pounds)
8	45	18	75
10	45	20	95
12	45	22	110
14	45	24	130
16	60		

3.6.31 Low Temperature High Humidity

Mated wired connectors shall show no signs of deterioration or breakage and shall pass the lanyard release tests at -55 °C (see 4.6.32).

3.6.32 Systems Compatibility

Certification of compliance of systems compatibility shall be furnished to the qualifying activity by the connector or accessory manufacturer. However, certification to the requirements indicated herein does not relieve the manufacturer of responsibility for qualification testing of the product (see 4.4). Verification of systems compatibility shall be conducted by the qualifying activity (see 4.6.33).

3.6.33 Stores Release

Connectors and connector assemblies furnished under this specification and the applicable specification sheet shall be products which have been successfully installed and operated in the system for which the products are intended (see 4.6.33.1).

3.7 Identification of Product

Each connector and accessory shall be legibly and permanently marked on the shell or coupling ring in accordance with MIL-STD-130 and MIL-STD-1285. The part number shall be as shown (see 3.1).

3.7.1 Insert Marking

Inserts shall be marked as shown on the applicable specification sheet. Raised or depressed characters shall not be used on mating faces.

3.7.1.1 Contact Designations

Contact locations shall be designated by identifiable characters of contrasting color on the front and rear faces of the insert or insert assembly. Positioning and arrangement of the characters shall be such that the appropriate contact cavity be readily identifiable. On the rear face of solder contact inserts, those individual contact designations may be omitted where space limitations may result in marginal identification marking. The characters on any face of the connectors shall remain identifiable after completion of the tests specified in Tables 13 through 17.

3.7.2 Grommet Marking

Wire openings on the rear face of grommets shall be marked with legible characters of contrasting colors corresponding to the insert contact designators. On grommets of solder contact connectors it is permissible to identify, where space limitations dictate, only those wire openings which are located on the vertical centerline.

TABLE 13 - QUALIFICATION INSPECTION FOR REMOVABLE CONTACT TYPE CONNECTOR

Title	Requirement Paragraph	Test Paragraph	Test Sample Number						Mating Shell 1 & 2
			1	2	3	4	5	6	
EXAMINATION OF PRODUCT	3.1, 3.3 thru 3.5, 3.7, 3.8	4.6.1	X	X	X	X	X	X	X
EMI/RFI shielding effectiveness	3.6.9.1	4.6.10.1							X
Contact protection, connector mating	3.6.1	4.6.2	X		X				
Contact resistance, initial	3.6.26	4.6.27	X	X					
Probe damage	3.6.2	4.6.3	X						
Contact insertion and removal force	3.6.3	4.6.4	X		X				
Coupling torque	3.6.5	4.6.6	X	X	X	X			
Coupling ring retention	3.6.30	4.6.31	X						
Contact retention	3.6.6	4.6.7	X	X					
Thermal shock	3.6.7	4.6.8	X	X					
Dielectric withstanding voltage (mated at sea level)	3.6.8	4.6.9.1	X	X			X		
Fluid immersion (lubricating oil)	3.6.10	4.6.11		X					
Fluid immersion (hydraulic fluid)	3.6.10	4.6.11			X				
Vibration	3.6.12	4.6.13	X						
Shock	3.6.13	4.6.14	X						
Acceleration	3.6.14	4.6.15			X				
Acoustic noise	3.6.15	4.6.16				X			
Moisture resistance	3.6.16	4.6.17					X		
Insulation resistance (ambient temp.)	3.6.17.1	4.6.18.1	X	X	X	X	X		
Salt spray (corrosion)	3.6.18	4.6.19					X		X
External bending moment	3.6.19	4.6.20					X		
Temperature life	3.6.20	4.6.21	X						
Insulation resistance (elevated temp.)	3.6.17.2	4.6.18.2	X						
Ozone exposure	3.6.21	4.6.22		X					
Magnetic permeability	3.6.22	4.6.23	X						
Insulation resistance (ambient temp.)	3.6.17.1	4.6.18.1		X			X		
Insert retention	3.6.23	4.6.24	X	X	X	X			
Low temperature high humidity	3.6.31	4.6.32	X						
Coupling torque	3.6.5	4.6.6	X	X	X	X			
Coupling ring retention	3.6.30	4.6.31	X						
Lanyard release force	3.6.29	4.6.30			X				
Altitude immersion	3.6.25	4.6.26				X			
Insulation resistance (ambient temp.)	3.6.17.1	4.6.18.1				X			
Dielectric withstanding voltage (mated at sea level)	3.6.8	4.6.9.1				X	X		
Contact retention	3.6.6	4.6.7	X	X	X	X			
Dielectric withstanding voltage (mated at altitude)	3.6.8	4.6.9.2	X						
Dielectric withstanding voltage (mated at altitude)	3.6.8	4.6.9.2	X						
Contact insertion and removal force	3.6.3	4.6.4		X		X			
Contact resistance	3.6.26	4.6.27	X	X					
EMI/RFI shielding effectiveness	3.6.9.1	4.6.10.1					X		X
Durability	3.6.11	4.6.12				X			X
Examination of product	3.1, 3.3 thru 3.5, 3.7, 3.8	4.6.1	X	X	X	X	X		X
Systems compatability	3.6.32	4.6.33						X	
Stores release	3.6.32.1	4.6.33.1						X	

TABLE 14 - QUALIFICATION INSPECTION FOR NONREMOVABLE CONTACT TYPE CONNECTORS

Title	Requirement Paragraph	Test Paragraph	Test Sample Number							
			1	2	3	4	5	6	H-1	H-2
EXAMINATION OF PRODUCT	3.1, 3.3 thru 3.5, 3.7, 3.8	4.6.1	X	X	X	X	X	X	X	X
Contact protection, connector mating	3.6.1	4.6.2	X		X				X	X
Contact resistance, initial	3.6.26	4.6.27	X	X					X	
Contact engaging and separating force	3.6.4	4.6.27	X	X	X	X				
Probe damage	3.6.2	4.6.3	X		X	X				
Coupling torque	3.6.5	4.6.6	X		X	X				
Coupling ring retention	3.6.30	4.6.31	X							
Contact retention	3.6.6	4.6.7	X	X	X	X				
Thermal shock	3.6.7	4.6.8	X	X	X	X				
Contact retention	3.6.6	4.6.7	X	X	X	X				
Dielectric withstanding voltage (mated at sea level)	3.6.8	4.6.9.1					X		X	X
Fluid immersion (lubricating oil)	3.6.10	4.6.11		X					X	
Fluid immersion (hydraulic fluid)	3.6.10	4.6.11			X				X	
Vibration	3.6.12	4.6.13	X						X	
Shock	3.6.13	4.6.14	X						X	
Acceleration	3.6.14	4.6.15			X				X	
Acoustic noise	3.6.15	4.6.16				X				X
Moisture resistance	3.6.16	4.6.17					X			X
Insulation resistance (ambient temp.)	3.6.17.1	4.6.18.1	X	X	X	X	X		X	X
Salt spray (corrosion)	3.6.18	4.6.19					X		X	
External bending moment	3.6.19	4.6.20					X			
Temperature life	3.6.20	4.6.21	X							X
Insulation resistance (elevated temp.)	3.6.17.2	4.6.18.2	X							X
Ozone exposure	3.6.21	4.6.22		X						
Magnetic permeability	3.6.22	4.6.23	X							
Insulation resistance (ambient temp.)	3.6.17.1	4.6.18.1		X			X			
Insert retention	3.6.23	4.6.24	X	X	X	X				
Low temperature humidity	3.6.31	4.6.32	X							
Coupling torque	3.6.5	4.6.6	X	X	X	X			X	X
Lanyard release force	3.6.29	4.6.30			X					
Altitude immersion	3.6.25	4.6.26				X			X	
Insulation resistance (ambient temp.)	3.6.17.1	4.6.18.1				X			X	
Dielectric withstanding voltage (mated at sea level)	3.6.8	4.6.9.1				X	X			
Air leakage	3.6.24.1	4.6.25.1	X		X					
Contact retention	3.6.6	4.6.7	X	X	X	X				
Dielectric withstanding voltage (mated at altitude)	3.6.8	4.6.9.2	X							X
Dielectric withstanding voltage (mated at altitude)	3.6.8	4.6.9.2	X							X
Contact resistance	3.6.26	4.6.27	X	X					X	
EMI/RFI shielding effectiveness	3.6.9.1	4.6.10.1				X				
Durability	3.6.11	4.6.12				X			X	
Examination of product	3.1, 3.3 thru 3.5, 3.7, 3.8	4.6.1	X	X	X	X	X		X	X
Systems compatability	3.6.32	4.6.33						X		
Stores release	3.6.32.1	4.6.33.1						X		

TABLE 15 - GROUP B (RETENTION) INSPECTION FOR REMOVABLE CONTACT TYPE CONNECTORS

Title	Requirement Paragraph	Test Paragraph	Connector Tests	Mating Shell 1 & 2
EXAMINATION OF PRODUCT	3.1, 3.3 thru 3.5, 3.7, 3.8	4.6.1	X	X
Coupling torque	3.6.5	4.6.6	X	
Insulation resistance (ambient temp.)	3.6.17.1	4.6.18.1	X	
Salt spray (corrosion)	3.6.18	4.6.19		X
Insert retention	3.6.23	4.6.24	X	
Coupling torque	3.6.5	4.6.6	X	
Altitude immersion	3.6.25	4.6.26	X	
Insulation resistance (ambient temp.)	3.6.17.1	4.6.18.1	X	
Dielectric withstanding voltage (mated at sea level)	3.6.8	4.6.9.1	X	
Contact retention	3.6.6	4.6.7	X	
Contact insertion and removal force	3.6.3	4.6.4	X	
Durability	3.6.11	4.6.12	X	X
Examination of product	3.1, 3.3 thru 3.5, 3.7, 3.8	4.6.1	X	X

TABLE 16 - GROUP B (RETENTION) INSPECTION FOR NONREMOVABLE CONTACT TYPE CONNECTORS

Title	Requirement Paragraph	Test Paragraph
EXAMINATION OF PRODUCT	3.1, 3.3 thru 3.5, 3.7, 3.8	4.6.1
Contact engaging and separating force	3.6.4	4.6.5
Probe damage	3.6.2	4.6.3
Coupling torque	3.6.5	4.6.6
Contact retention	3.6.6	4.6.7
Thermal shock	3.6.7	4.6.8
Contact retention	3.6.6	4.6.7
Insulation resistance (ambient temp.)	3.6.17.1	4.6.18.1
Insert retention	3.6.23	4.6.24
Coupling torque	3.6.5	4.6.6
Altitude immersion	3.6.25	4.6.26
Insulation resistance (ambient temp.)	3.6.17.1	4.6.18.1
Dielectric withstanding voltage (mated at sea level)	3.6.8	4.6.9.1
Contact retention	3.6.6	4.6.7
Examination of product	3.1, 3.3 thru 3.5, 3.7, 3.8	4.6.1

TABLE 17 - QUALIFICATION INSPECTION
FOR CONNECTOR ACCESSORIES AND CRIMP CONTACT RETENTION FEATURE

Title	Requirement Paragraph	Test Paragraph	Test Sample		
			1	2	3
PROTECTIVE COVERS, STOWAGE RECEPTACLES AND CABLE CLAMPS					
EXAMINATION OF PRODUCT	3.1, 3.3 THRU 3.5, 3.7, 3.8	4.6.1	X	X	X
MAGNETIC PERMEABILITY	3.6.22	4.6.23		X	X
LOW TEMPERATURE HIGH HUMIDITY	3.6.31	4.6.32	X	X	
COUPLING TORQUE	3.6.5	4.6.6	X	X	
VIBRATION	3.6.12	4.6.13	X	X	
MOISTURE RESISTANCE	3.6.16	4.6.17	X	X	
COVER CHAINS, TENSILE STRENGTH	3.6.27	4.6.28		X	X
AIR LEAKAGE	3.6.24.1	4.6.25.1	X	X	
EMI/RFI SHIELDING EFFECTIVENESS	3.6.9	4.6.10.2	X	X	
EXAMINATION OF PRODUCT	3.1, 3.3 THRU 3.5, 3.7, 3.8	4.6.1	X	X	X
CRIMP CONTACT RETENTION FEATURE					
EXAMINATION OF PRODUCT	3.1, 3.7, 3.8	4.6.1	82 CONTACT CAVITIES MINIMUM		
CONTACT INSERTION AND REMOVAL FORCES	3.6.3	4.6.4			
CONTACT RETENTION	3.6.6	4.6.7.2			
CONNECTOR ASSEMBLIES, CLASS J					
EXAMINATION OF PRODUCT	3.1, 3.3 THRU 3.5, 3.7, 3.8	4.6.1	X	X	X
MAGNETIC PERMEABILITY	3.6.22	4.6.23		X	X
EXTERNAL BENDING MOMENT	3.6.19	4.6.20	X	X	
THERMAL SHOCK	3.6.7	4.6.8	X	X	
VIBRATION	3.6.12	4.6.13	X	X	
MOISTURE RESISTANCE	3.6.16	4.6.17	X	X	
SALT SPRAY (CORROSION)	3.6.18	4.6.19		X	X
AIR LEAKAGE	3.6.24.1	4.6.25.1	X	X	
EMI/RFI SHIELDING EFFECTIVENESS	3.6.9	4.6.10	X	X	
FLUID IMMERSION (LUBRICATING OIL)	3.6.10	4.6.11	X	X	
FLUID IMMERSION (HYDRAULIC FLUID)	3.6.10	4.6.11	X	X	
EXAMINATION OF PRODUCT	3.1, 3.3 THRU 3.5, 3.7, 3.8	4.6.1	X	X	X
DIELECTRIC AFTER FLUID IMMERSION					
EXAMINATION OF PRODUCT	3.1, 3.7, 3.8	4.6.1	X	X	
DIELECTRIC WITHSTANDING VOLTAGE AT SEA LEVEL	3.6.8	4.6.9	X	X	
COUPLING TORQUE	3.6.5	4.6.6	X	X	
FLUID IMMERSION	3.6.10	4.6.11	X	X	
DIELECTRIC WITHSTANDING VOLTAGE AT SEA LEVEL	3.6.8	4.6.9	X	X	
COUPLING TORQUE	3.6.5	4.6.6	X	X	
EXAMINATION OF PRODUCT	3.1, 3.7, 3.8	4.6.1	X	X	
RETENTION SYSTEM AFTER FLUID IMMERSION					
EXAMINATION OF PRODUCT	3.1, 3.7, 3.8	4.6.1	X	X	
RETENTION SYSTEM FLUID IMMERSION	3.6.10.1	4.6.11	X	X	
CONTACT RETENTION	3.6.6	4.6.7.2	X	X	
EXAMINATION OF PRODUCT	3.1, 3.7, 3.8	4.6.1	X	X	

TABLE 18 - GROUP B (RETENTION) INSPECTION
FOR CONNECTOR ACCESSORIES AND CRIMP CONTACT RETENTION FEATURE

Title	Requirement Paragraph	Test Paragraph	Test Sample	
			1	2
PROTECTIVE COVERS, STOWAGE RECEPTACLES AND CABLE CLAMPS				
EXAMINATION OF PRODUCT	3.1, 3.3 THRU 3.5, 3.7, 3.8	4.6.1	X	X
MAGNETIC PERMEABILITY	3.6.22	4.6.23	X	X
COUPLING TORQUE	3.6.5	4.6.6	X	X
COVER CHAINS, TENSILE STRENGTH	3.6.27	4.6.28	X	X
EXAMINATION OF PRODUCT	3.1, 3.3 THRU 3.5, 3.7, 3.8	4.6.1	X	X
CRIMP CONTACT RETENTION FEATURE				
EXAMINATION OF PRODUCT	3.1, 3.7, 3.8	4.6.1	82 CONTACT CAVITIES MINIMUM	
CONTACT INSERTION AND REMOVAL FORCES	3.6.3	4.6.4		
CONTACT RETENTION	3.6.6	4.6.7.2		
CONNECTOR ASSEMBLIES, CLASS J				
EXAMINATION OF PRODUCT	3.1, 3.3 THRU 3.5, 3.7, 3.8	4.6.1	X	X
MAGNETIC PERMEABILITY	3.6.22	4.6.23	X	X
EXTERNAL BENDING MOMENT	3.6.19	4.6.20	X	X
SALT SPRAY (CORROSION)	3.6.18	4.6.19	X	X
EXAMINATION OF PRODUCT	3.1, 3.3 THRU 3.5, 3.7, 3.8	4.6.1	X	X

3.8 Workmanship

Connectors and accessories shall meet all design dimensions and intermateability requirements of this specification. Loose contacts, poor molding fabrication, loose materials, defective bonding, damaged or improperly assembled contacts, peeling, or chipping or plating or finish, galling of mating parts, nicks and burrs of metal parts and post molding warpage will be considered adequate basis for rejection of items of quality inferior for the purpose intended.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

With the exception of the stores release requirements, the supplier is responsible for the performance of all inspection requirements as specified herein unless otherwise specified in the contract or purchase order. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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. Qualification by similarity may be granted. The acceptance and extent of qualification by similarity shall be determined by the Qualifying Activity. Similarity is established through a rationale that certain designs, materials, and/or processes are identical to those already approved through qualification of the components. Verification testing for the new product is not required for designs, materials, and/or processes already approved. When a Qualified Products List is being established the qualification by similarity rationale shall be approved by the qualifying activity prior to initiation of the remaining portions of the qualification inspection process.

4.1.1 Test Equipment and Inspection Facilities

Test equipment and inspection facilities shall be of sufficient accuracy, quality, and quantity to permit performance of the required inspection. The supplier shall establish calibration of inspection equipment to the satisfaction of the Government. Calibration of the standards which control the accuracy of inspection equipment shall comply with the requirements of ANSI/NCSL Z540-1 or ISO 10012-1.

4.2 Classification of Inspection

The inspection of connectors shall be classified as follows:

a. Qualification inspection (see 4.4).

b. Quality conformance inspection (see 4.5).

1. Inspection of product for delivery (see 4.5.1).

2. Inspection of preparation for delivery (see 4.5.2).

4.3 Inspection Conditions and Preparation of Samples

4.3.1 Inspection Conditions

Unless otherwise specified, all inspections shall be made in accordance with the general requirements of EIA 364. . Performance of the inspection shall be the responsibility of the qualification applicant under authorization of the qualifying activity (NAVAIR). The qualifying activity shall authorize the applicant to begin qualification testing by written notice that describes the requirements of submission in accordance with this specification. The qualification applicant shall furnish test results, certifications, and tested product to the qualifying activity. Certifications shall be provided on government form DD Form 1718, "Certification of Qualified Products" or equivalent. The samples shall be taken from the same lot as tested by the supplier and plainly identified by attached durable tags marked with the information listed below. The tags must be stamped by the supplier and qualifying activities designated quality Assurance Representative (QAR) inspector as representative samples of the manufacturer's normal production capability. Samples submitted without the stamp will not be accepted.

4.3.2 Preparation of Samples

Connectors (except for the systems compatibility test) shall be wired with approximately 3 feet of wire, as applicable from Table 1. A MIL-C-22520/1 or MIL-C-22520/2 crimping tool, as applicable, shall be used to crimp removable contacts to the wires. Soldering shall be in accordance with requirement 5 of MIL-HDBK-454 for non-removable contacts. All test samples required for the Qualifying Activity testing shall comply with 4.3.1 and shall be forwarded to the Qualifying Activity prior to the start of the supplier’s testing.

4.4 Qualification Inspection

Qualification inspection shall consist of the examinations and test performed in the sequence in either Table 13 or Table 14, and Table 17. The supplier shall perform all testing with the exception of the test sample 1 testing and the Mating Shell testing. The test sample 1/Mating shell testing will be performed by the Qualifying Activity. The qualification test samples shall be as specified in 4.4.1. After receipt of the letter of authorization from the activity responsible for qualification (see 6.4), the applicant shall submit the test report (certified by the Government inspector indicating the extent to which the tests were witnessed), along with all other documentation required by 4.3.1.

4.4.1 Samples

Test samples shall be produced with materials, equipment, and procedures normally used in production.

4.4.1.1 Connector Assemblies (classes E, F, and P)

Five complete connector assemblies, class E wall-mount receptacles and class E or F straight plugs shall be provided. These assemblies shall have the most compact insert arrangements in each voltage and temperature range and in each shell size for which qualification is desired. Separate samples are required for crimp-contact connectors and solder-contact connectors. Crimp contacts shall not be installed in connectors submitted for qualification testing. The wired samples of class P connectors shall be potted with a material suitable for the temperature conditions of 4.6.21.

a. The connectors for test samples 1, 3, and 5 shall be assembled with wire approaching the applicable minimum diameter shown in Table 1.

b. Connectors for test samples 2 and 4 shall be assembled with wire approaching the applicable maximum diameter shown in Table 1.

c. Qualification of these samples shall admit qualification of other types and the balance of insert patterns in classes E, F, and P by similarity. If qualification of classes E and F is not sought, samples of class P shall be substituted for class E or F in the foregoing, except that nominal gage wire may be used. However, qualification of class P samples alone shall not admit qualification of classes E and F connectors.

4.4.1.2 Connector Assemblies (class J)

Two mated pairs of class J connector assemblies, in each shell size, shall be supplied.

a. The connectors need not be wired but shall be assembled using a solid polychloroprene cylinder of suitable length and OD in accordance with Table 18. The Shore A durometer of the test cylinder shall be from 75 to 85.

b. Qualification of these samples when subjected to the tests of Table 17 will admit qualification of all class J assemblies if classes E and F are being qualified at the same time or have previously been qualified to this specification. If not, class J assemblies shall be subjected to all of the tests of Tables 13 and 14.

TABLE 19 - TEST CYLINDER OD SIZES

Shell Size	Diameter ±0.016 in
8	0.214
10	0.250
12	0.384
14	0.462
16	0.596
18	0.646
20	0.681
22	0.716
24	0.817

4.4.1.3 Connector Assembly for Systems Compatibility

One complete connector assembly, in accordance with the applicable specification sheet, shall be provided for the systems compatibility inspection.

4.4.1.4 Shells for EMI/RFI Testing

Two pairs of mating shells shall be selected for qualification and shall be tested without inserts or contacts installed. These pairs of mating shells shall be submitted to the applicable qualification sequence specified in Table 13.

4.4.1.5 Contact Retention Feature Samples

A sufficient number of additional connectors shall be supplied to provide a minimum of 82 contact cavities of the size of contacts for which qualification of the crimp contact retention feature is desired.

4.4.1.6 Protective Covers

Two protective covers of each shell size with mating classes E or F connectors, shall be subjected to the tests of Table 17 for group B.

4.4.1.7 Stowage Receptacles

Two stowage receptacles of each size, with mating class E or F connectors, shall be subjected to the tests of Table 17.

4.4.1.8 Adapters (cable to connector and connector to connector)

Four adapters of each type shall be selected for qualification. They shall be tested with a qualified connector or an accessory device having identical mating features. Two of each type adapter selected shall be submitted to the applicable qualification inspection specified in Table 17. The remaining untested samples shall be forwarded to the qualifying activity with the qualification test reports.

4.4.2 Test Routine

Sample units shall be subjected to the applicable inspection specified in Tables 13 and 14 in the order shown. Connector accessories shall be subjected to the inspection test sequence of Table 17 in the order shown.

4.4.3 Qualification Rejection

There shall be no failures during any examination or tests of the connectors or accessories detrimental to the operation of the connector submitted for qualification tests. After notification of any failure, detrimental to the operation of the connector, the activity responsible for qualification testing shall receive details of corrective action from the supplier before initiating any further tests deemed necessary to assure compliance with connector requirements.

4.4.4 Retention of Qualification

Retention of qualification inspection (Table 15 or 16 and Table 18) shall be performed by the Qualifying Activity on sample units produced with equipment and procedures normally used in production. To retain qualification, the supplier shall forward their periodic qualification submittal every 36 months to the Qualifying Activity. The Qualifying Activity shall establish the initial reporting date. Failure to submit test samples/data within 30 days after the end of the sampling interval may result in loss of qualification for the products. Except where the results of these inspections show non-compliance with the applicable requirements, delivery of products which have passed group A/B inspection shall not be delayed pending the results of retention of qualification inspections.

a. A summary of the results of the tests performed for Group A/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. 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. The form of the report shall be in accordance with the Qualifying Activity requirements. No more than one reporting period may be certified.

4.4.5 Assembly Plants

Assembly plants must be listed on or approved for listing on the applicable qualified products list. The qualified connector supplier shall certify that the assembly plant is approved for the distribution of the supplier's parts. The assembly plant shall use only piece parts supplied by the qualified connector supplier. No testing other than visual examination is required of certified piece parts obtained from the qualified connector supplier, except when there is cause for rejection. All assemblies produced at the assembly plant shall be subjected to the quality assurance provisions specified herein. Quality control requirements, including Government inspection surveillance, shall be the same as required for the qualified connector supplier.

4.5 Quality Conformance Inspection

4.5.1 Inspection of Product for Delivery

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

4.5.1.1 Inspection Lot

An inspection lot, as far as practicable, shall consist of all connectors covered by one specification sheet, produced under essentially the same conditions, and offered for inspection at one time.

4.5.1.2 Disposition of Sample Units

Sample units which have been subjected to the group A inspection may be delivered on the contract or order. Sample units which have been subjected to the group B inspection shall not be delivered on the contract or order.

4.5.1.3 Group A Inspection

Group A inspection shall consist of the examinations and tests specified in table 20 and shall be made on the same set of sample units in the order shown. In process control of component parts, unrelated to lot sizes of finished connectors, may be used in lieu of examination of these components in the finished connectors to assure performance of these component parts.

TABLE 20 - GROUP A INSPECTION

Examination or Test	Connector Type		Accessories	Requirement Paragraph	Test Paragraph
	Removable	Non-removable			
Examination of Product	X	X	X	3.1, 3.3 thru 3.5, 3.7, 3.8	4.6.1
Insulation Resistance	X	X		3.6.17	4.6.18
Dielectric Withstanding Voltage (unmated)	X	X		3.6.8	4.6.9

4.5.1.3.1 Sampling Plan

Statistical sampling and inspection shall be in accordance with ANSI/ASQC Z1.4 for general inspection level II. The acceptable quality shall be 1.0. Major and minor defects shall be as defined herein (see 6.8).

4.5.1.3.2 Rejected Lots

If an inspection lot is rejected, the supplier shall withdraw the lot, re-work it to correct the defects, or screen out the defective units, as applicable, and re-inspect. Such lots shall be separate from new lots, and shall be clearly identified as re-inspected lots. Rejected lots shall be re-inspected using tightened inspection.

4.5.1.4 Group B Inspection

Group B inspection shall consist of the applicable examinations and tests specified in either Table 15 or Table 16, and Table 18. Shipment shall not be held up pending results of this inspection.

4.5.1.4.1 Sampling Plan

Sample units of one size, insert configuration, and each class representative of production at the time of selection shall be selected at 6-month intervals. Upon passing this inspection, the supplier may select sample units every 12 months. If the second level of sampling is passed two successive times, the supplier may select sample units every 24 months. In the event of a failure, sampling shall revert to the 6-month interval.

4.5.1.4.2 Noncompliance

If a sample fails to pass group B inspection, the supplier shall take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials, processes, etc., and which are considered subject to the same failure. Acceptance of related lots shall be discontinued until corrective action, acceptable to the Government, has been taken. After the corrective action has been taken, group B inspection shall be repeated on new samples. Group A inspection may be reinstituted; however, final acceptance shall be withheld until the group B inspection has shown that the corrective action was successful. In the event of failure after re-inspection, information concerning the failure and corrective action taken shall be furnished with contracting officer and to the qualifying activity who will initiate action to remove the failing product from the qualified products list.

4.5.2 Inspection of Preparation for Delivery

Sample packages and packs and the inspection of the preservation-packaging, packing and marking for shipment and storage shall be in accordance with the requirements of MIL-DTL-55330.

4.6 Methods of Examination

4.6.1 Examination of Product

The connectors, accessories, and piece parts shall be examined to insure conformance with this specification and the applicable specification sheets. In process control of component parts, unrelated to lot sizes of finished connectors, may be utilized in lieu of examination of these components in the finished connectors to assure conformance of these component parts.

4.6.2 Contact Protection, Connector Mating

The front edge of the shell of the plug connector shall be scooped as deep as possible within the front aperture made by the shell of the mating receptacle. The front edges of both shells shall be in contact during this test (see 3.6.1).

4.6.3 Resistance to Test Probe Damage

One socket contact of each size shall be tested in accordance with method EIA364-25. The contact shall be installed in a collet type holder or connector for this test. Probe depths used shall be 1/2, 3/4 and full depth (see 3.6.2).

4.6.4 Contact Insertion and Removal Force (removable crimp contacts only)

Connectors shall be tested in accordance with method EIA364-5. Insertion and removal shall be done 9 times. Contacts shall not be wired.

4.6.5 Contact Engaging and Separating Force

Socket contacts shall be tested in accordance with the contact engagement and separation test of AS39029. Socket contacts may be tested installed in the connectors (see 3.6.4).

4.6.6 Mating and Unmating Forces

Receptacles, plugs, dummy stowage receptacles, and protective covers shall be engaged with and disengaged from counterpart connectors in accordance with method EIA364-13. The torque shall be applied at a uniform rate of approximately 1 in-lb/s (see 3.6.5).

4.6.7 Contact Retention

Retention of contacts shall be tested in accordance with method EIA364-13 and Table 5. One sample of each connector shall be tested. Measurement of displacement shall be done while maximum load is applied and shall meet the requirements of 3.6.6.

4.6.7.1 Crimp Contacts

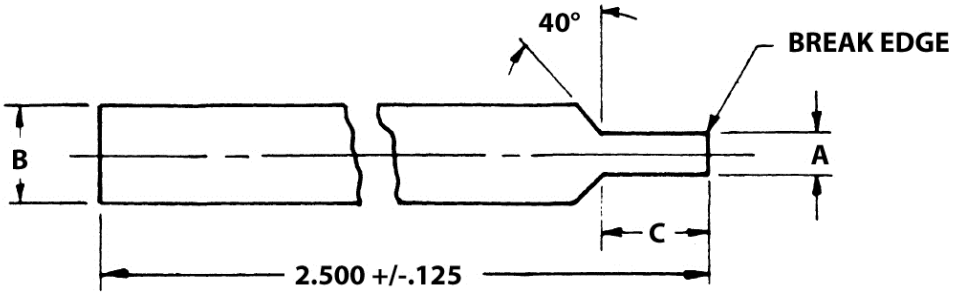
Contacts shall be tested as specified in 4.6.7. Rear accessory hardware shall be connected and tightened on connector; the axial load shall be applied in the outward direction from the mating end of contacts only (see 3.6.6).

4.6.7.2 Crimp Contact Retention Feature

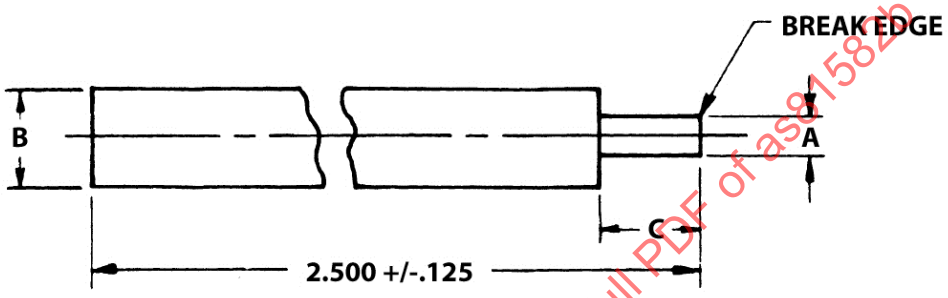
Connectors shall be tested as specified in 4.6.7.1, except that the rear accessory hardware shall be removed prior to the test and the loads shall be applied successively to the mating and wire barrel ends of the contacts. The contacts selected for this test shall be crimped to metal rods complying with Figure 3. The rods shall be capable of being crimped to the contacts with the MIL-C-22520/1 or MIL-C-22520/2 tool and shall be capable of being used to apply the specified axial load, without excessive bending, to the rear of the contacts during this test. Contact cavities not filled with rod contact assemblies shall be filled with wired contacts (see 3.6.6).

4.6.7.3 Solder Type

Contacts shall be tested as specified in 4.6.7. The load shall be applied only to the mating ends of contacts and the grommet retaining nut shall be loose. Displacement shall be measured after the specified load is removed (see 3.6.6).



ROD FOR SIZE 20 CONTACT



ROD FOR SIZE 16 AND 12 CONTACTS

CONTACT SIZE	A DIAMETER	B DIAMETER	C ± 0.010
20	0.047/0.045	0.080/0.075	0.187
16	0.065/0.063	0.100/0.095	0.294
12	0.097/0.095	0.142/0.137	0.294

FIGURE 3 - ROD FOR RETENTION FEATURE TEST

4.6.8 Thermal Shock

Unmated connectors or unmated connectors with adapters shall be tested in accordance with method EIA364-32, except that during the low temperature extreme of the fifth cycle, while at a minimum (-55 °C) ambient, the connectors shall be mated and unmated 5 times. At the completion of the last cycle, the connectors shall be returned to room temperature for further inspection. Test condition B shall be used for connectors and test condition C shall be used for adapter assemblies (see 3.6.7).

4.6.9 Dielectric Withstanding Voltage (see 3.6.8)

4.6.9.1 Dielectric Withstanding Voltage (sea level)

Mated and unmated connectors shall be tested in accordance with method EIA364-20. The applicable test voltages (see Table 7) shall be applied between all adjacent contacts and between the shell and each contact closest to the shell. If an insert possesses more than one service rating, similar connections shall be made for the different test voltages as necessary (see 3.6.8).

4.6.9.2 Dielectric Withstanding Voltage (altitude)

The connectors shall be tested in accordance with method EIA364-20, Test Condition IV. After 30 min at the simulated altitude, the connectors shall be tested as specified in 4.6.9.1 (see 3.6.8).

4.6.10 EMI/RFI Shielding Effectiveness (see 3.6.9)

4.6.10.1 Shielding Effectiveness

The electromagnetic susceptibility of mated pairs of shells shall be measured in a tri-axial radio frequency leakage tester as shown on Figure 4. The RF leakage from the coaxial line through the shells of the connector pairs into outer coaxial geometry shall be measured at the frequency shown in Table 8 (accuracy of frequency ±5%). The level of detected signal power indicated by a tuned radio frequency field intensity meter is a result of RF leakage from the mated pair of shells. The test set-up and procedure shall be as shown on Figure 5 (see 3.6.9.1).

4.6.10.2 Shell to Shell Continuity

The DC resistance of the wired, mated, assembled connectors shall be measured between the points shown on Figure 5. The applied potential shall be 1.5 V DC maximum. A resistance shall be inserted in the circuit to limit the current to 0.100 A ± 0.010 A. Probes with spherical ends of 0.05 in minimum shall be used to make the voltage measurements and shall be placed on the simulated panel and at the extreme edge of the plug as shown on Figure 6. The probe shall not puncture or otherwise damage the connector (see 3.6.9.2).

4.6.11 Fluid Immersion

Connector samples shall be subjected to the test procedures and fluids as specified in method EIA364-10 (one sample per fluid). Following the fluid immersion cycles the connectors shall be tested for coupling torque as specified in 4.6.6, and dielectric withstanding voltage at sea level as specified in 4.6.9.1 within 3 h.

4.6.11.1 Retention System Fluid Immersion (see 3.6.10.1)

Unmated connectors with contacts removed shall be immersed in the fluids specified in method EIA364-10 (one sample per fluid) for 2 h at room temperature. After removal, excess fluid shall drain from the connectors for 4 h and the contacts reinstalled. Following the test, the connectors shall be subjected to contact retention as specified in 4.6.7.

4.6.12 Durability

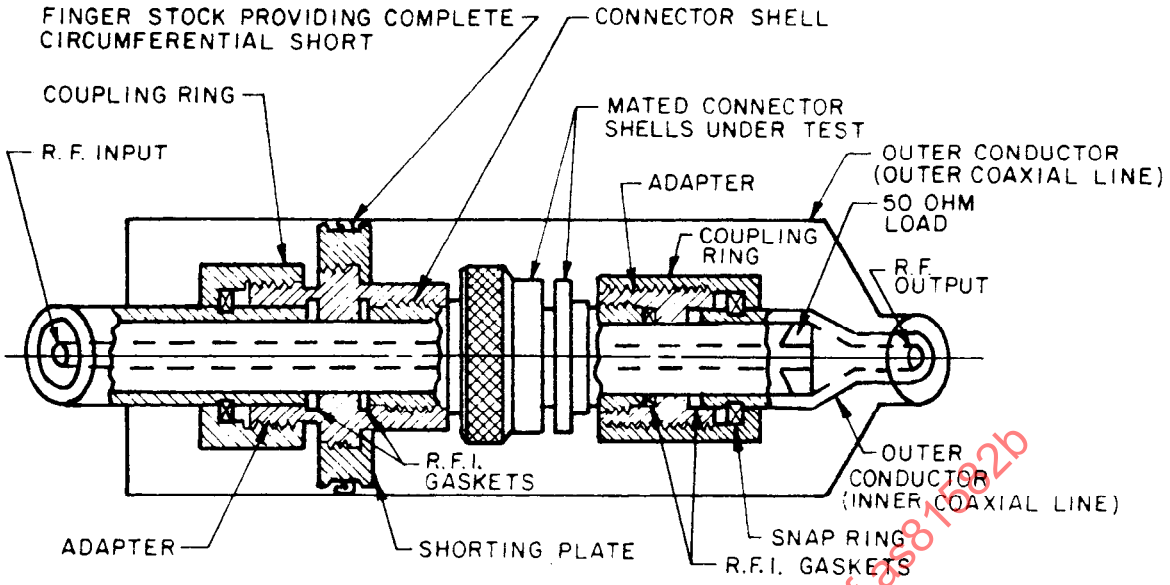
Counterpart connectors shall be mated and unmated at a maximum rate of 300 cph in a manner to simulate actual service in that plugs and receptacles shall be completely separated during each cycle (see 3.6.11) (see 4.6.19).

4.6.12.1 Uncoupling (coupling ring)

Connectors shall be mated and unmated 300 times with the coupling rings.

4.6.12.2 Uncoupling (lanyard release)

Connectors shall be mated and unmated 200 times using the lanyard release. The connector shall be rigidly mounted as in service. The direction of force application shall be at an angle of 15 degrees from the connector longitudinal axis for the first 50 cycles, along the longitudinal axis for the next 100 cycle cycles and 15 degrees from the connector longitudinal axis on the opposite side for the last 50 cycles. The force shall be applied at maximum rate of 50 lb/s.

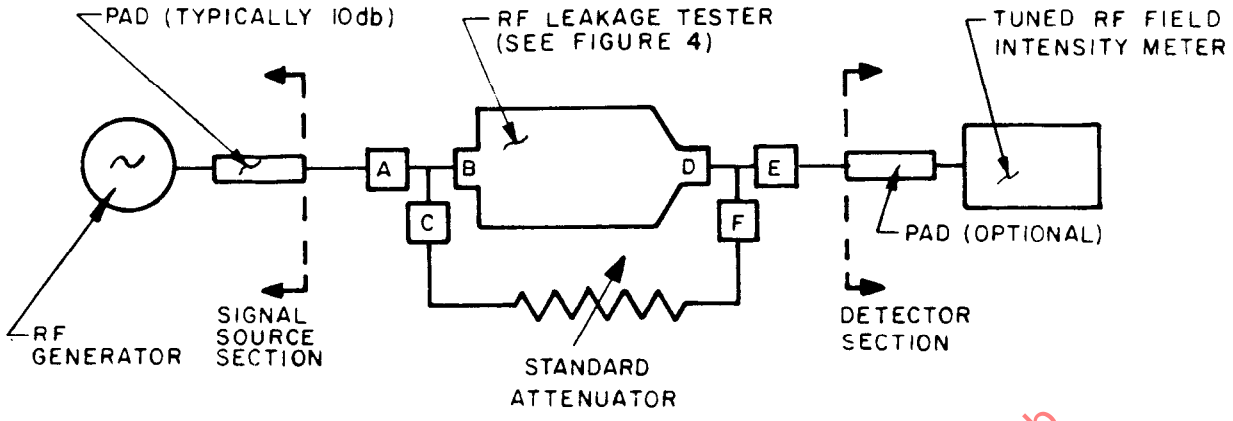


The mated pairs of connector shells shall be connected to the center coaxial line as shown and tested as shown in fig. 5. Attachment of the connector shells to the outer conductor of the inner coaxial line shall be accomplished using R.F. gaskets to prevent leakage through the adapters.

TESTER DESIGN REQUIREMENTS AND TERMINATIONS.

a. The characteristic impedances of the coaxial lines comprising the leakage tester shall be a nominal 50 ohms.
b. The VSWR (Zo = 50 ohms) looking into B shall be 1.5 or less when the mated pairs of connector shells are removed and replaced by a 50 ohm line section.
c. Existance of higher order modes, especially the transverse electric 1.1 (TE_{11}) mode will cause errors in required measurements. The frequencies at which these modes exist must be avoided. The frequencies may be calculated by referring to Section 2.4b of The Waveguide Handbook, Vol. 10 of the M.I.T. Radiation Laboratory Series, when the diameters of the outer coaxial section are known.
d. The input and output VSWR of the standard attenuator (see fig. 6) should be less than 1.5 in the 20 to 100 dB attenuation range.
e. The output impedance of the signal source and the input impedance of the detector (see fig. 5) shall be a nominal 50 ohms having a maximum allowable VSWR of 1.5.
f. Connectors A, B, C, D, E, and F (see fig. 6) should be of a low leakage type which exhibit R.F. leakage attenuation of >100 dB.

FIGURE 4 - TRI-AXIAL RF LEAKAGE TESTER



A standard attenuator capable of providing at least 100 dB (accuracy ±3 dB) of attenuation in one dB steps shall be used to measure the RF leakage.

1. Tune the detector to the generator signal frequency by connecting C to A and F to E, using approximately 85 dB attenuation in the standard attenuator.
2. Disconnect C from A and F from E and couple A to B and D to E. Adjust frequency slightly, if necessary, to maximize output indication on the tuned Radio Field Intensity Meter. Record output level.
3. Disconnect A from B and D from E. Connect C to A and F to E within one minute, so as to prevent excessive drift of voltage in the signal source and of calibration in the Tuned Radio Frequency Field Intensity Meter. Adjust the standard attenuator until the output level recorded in Step 2 is reached. The value of the attenuation provided by the standard attenuator is a measure of the RF leakage attenuation of the mated pair of shells, measured in dB of power.

FIGURE 5 - TEST SET-UP AND PROCEDURE FOR SHIELDING SUSCEPTIBILITY TEST

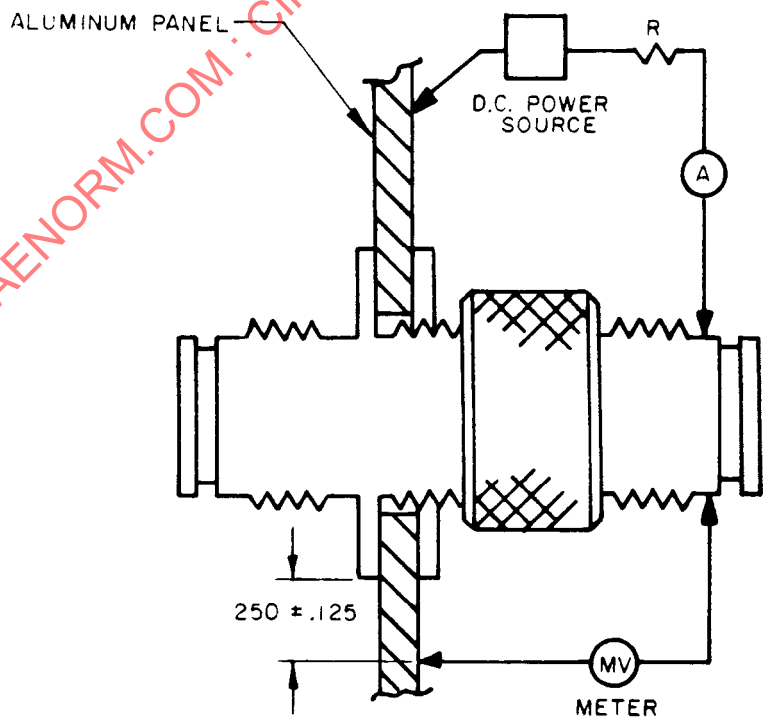


FIGURE 6 - SHELL TO SHELL CONTINUITY TEST DIAGRAM

4.6.13 Vibration

Each receptacle shall be mounted on a suitable fixture, which in turn shall be attached to a vibration table. A suitable sensor shall monitor the vibration of the receptacle at a point on or near the receptacle. A counterpart plug shall be engaged with the receptacle and held by normal locking means without the use of safety wire. The wire bundles shall be clamped to non-vibrating points at least 8 in from the rear of the connectors. The wire bundle shall be defined as a complete compliment of size 20 wire, one braided cable shield, and an outer jacket of an acceptable insulation material to meet the temperature requirements. The average cable weight shall be 0.4 oz/in minimum and shall have a minimum length of 24 in. The connector assembly shall be tested in accordance with method 214, test condition I, test condition letter A, of MIL-STD-202. All contacts shall be wired in series, and a current of 100 10 mA shall flow through the series circuit during the test. A suitable instrument shall monitor the current flow and indicate any discontinuity longer than 10 µs. The assembly shall be vibrated 8 h in the longitudinal direction and 8 h in the perpendicular direction (see 3.6.12).

4.6.14 Shock

Mated connector shall be tested in accordance with method EIA364-27, test condition A, except only one shock instead of three shall be applied in each direction (6 shocks). Receptacles shall be mounted similar to 4.6.13.1. Plugs shall be engaged with the receptacles and held by normal locking means only. All contacts shall be wired in series and the wire bundles or cables shall be clamped to structures that move with the connectors. A minimum of 8 in of wire or cable shall be unsupported behind the rear of each connector. A suitable instrument shall be employed to indicate any discontinuity or interruption of current flow (see 3.6.13).

4.6.15 Acceleration

Connectors shall be tested in accordance with method EIA364-1, test condition A. Contacts shall be wired to check for continuity during test (see 3.6.14).

4.6.16 Acoustic Noise

The mated and wired connectors shall be mounted as in normal service to a rigid plane and tested in accordance with Method 515 of MIL-STD-810. The noise level and duration of exposure shall be category C for 30 min. At least 100 mA shall flow through the series wired contacts during the test. A suitable instrument shall be employed to monitor the current flow and to indicate any discontinuity of contact or interruption of current flow (see 3.6.15).

4.6.17 Moisture Resistance

Moisture resistance test specimens shall be subjected to the high humidity (see 4.6.17.1), or extreme humidity range (see 4.6.17.2) moisture tests, as applicable. The connectors shall be wired and mated to the counterpart connectors. They shall be mounted horizontally with the wires descending into the backshell with no drip loops or splices within the chamber. The wires shall leave the chamber through vapor tight seals. Connectors without rear seal grommets shall have their terminals suitably protected. Prior to the beginning of the test and at the end of the test period and while at the high humidity, the insulation resistance between each contact and other contacts shall be determined as specified in 4.6.18 (see 3.6.16).

4.6.17.1 Moisture Resistance at High Humidity (crimp contact connectors)

Mated crimp contact connectors shall be tested in accordance with method EIA364-31 (except for vibration).